WILLIAMSON COUNTY SOILS

SOIL REPORT 79

UNIVERSITY OF ILLINOIS
AGRICULTURAL EXPERIMENT STATION
In cooperation with SOIL CONSERVATION SERVICE, U. S. Department of Agriculture

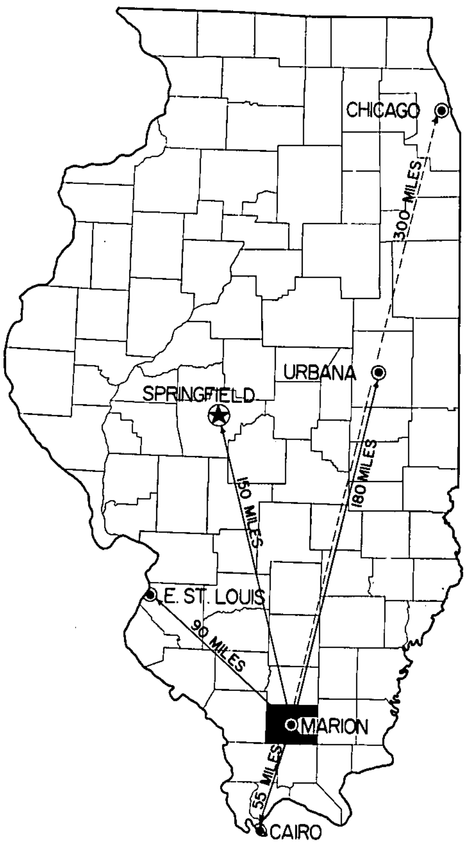
COVER PICTURE

The picture on the cover of this report is a view from the air of an area in the west-central part of Williamson county.

Portions of the towns of Carterville and Crainville show in the upper right of the picture. Part of one strip coal mine shows in the upper left, and a small part of a second strip mine ("S. M."), at the far right. A small neck of Crab Orchard Lake extends into the lower part of the picture. Highway Illinois 13 runs east and west through the central part.

Soil type boundaries and numbers have been added to the photograph. The four soil types shown are Hosmer silt loam (214), Stoy silt loam (164), Weir silt loam (165), and Belknap silt loam (382). Hosmer, occurring on moderate to steep slopes along the draws, is moderately well drained. Stoy, which occurs on gentle slopes, is imperfectly drained, while Weir, which is found on flats, is poorly drained. Belknap, an alluvial soil, occurs in the bottoms of drainageways.

(Picture supplied by
U. S. Department of Agriculture)



Williamson county lies in southern Illinois. Marion, the county seat, is 150 miles from Springfield, 180 miles from Urbana, and 300 miles from Chicago.

CONTENTS

Authors: J. B. Fehrenbacher, Assistant Professor of Soil Physics, and R. T. Odell, Professor of Soil Physics.

The authors are indebted to the following men who assisted with the field work in the Williamson county survey: J. D. Alexander, R. A. Bohannon, and R. H. Rust, University of Illinois Agricultural Experiment Station; and H. R. McCulloch, Soil Conservation Service, U. S. Department of Agriculture. Laboratory studies and soil correlations were made by the Illinois Agricultural Experiment Station in cooperation with the U. S. Department of Agriculture. The authors are indebted to W. F. Purnell of the Agronomy staff for most of the photographs used in this soil report; and to the Agronomy staff members in charge of soil experiment fields for the data in tables 20, 21, and 22. Also the authors are indebted to W. R. Boggess of the Forestry Department for the estimated timber yields given in table 23; to G. D. Smith of the Soil Conservation Service for helpful suggestions on the taxonomic classification section; and to T. H. Thornburn of the Civil Engineering Department, A. C. Orvedal of the Soil Conservation Service, U. S. Department of Agriculture, and P. C. Smith of the U. S. Bureau of Public Roads, for review of the section on engineering applications.

Urbana, Illinois May, 1959

WILLIAMSON COUNTY SOILS

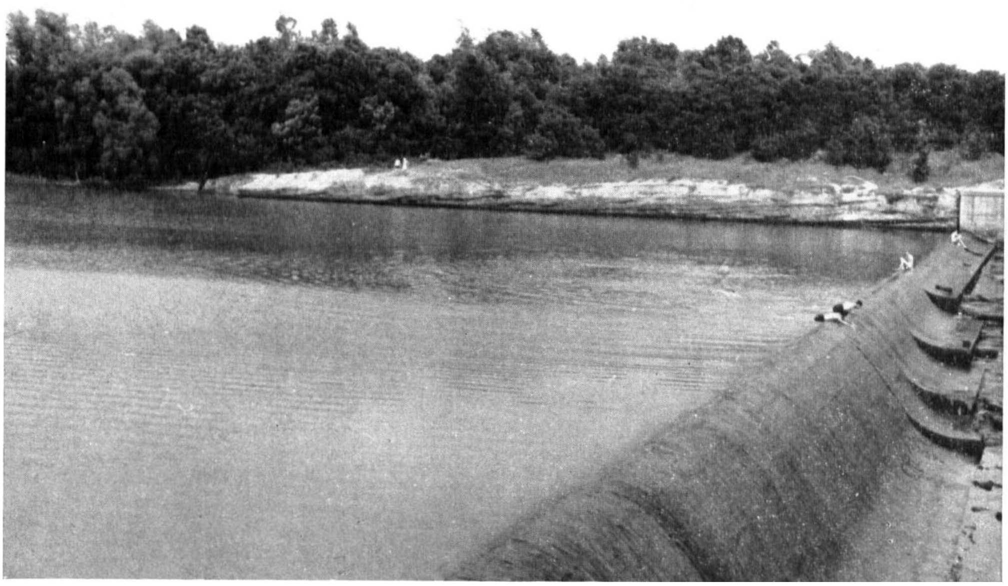
By J. B. FEHRENBACHER and R. T. ODELL

THIS SOIL REPORT has been prepared to help answer these questions about the soils of Williamson county: *What soils occur in the county? What are their characteristics and how are they classified? What crops are adapted to each soil and how much will they yield? What are the natural and cultural features of the county important to its agricultural development?*

The soil map shows the extent and location of the various soil types and also the slope and erosion conditions of each area delineated.

This report is concerned primarily with those soil characteristics which do not change much over a period of years. Thus, the facts gained from past experience and experimentation can be used in classifying soils and in predicting their behavior under various uses and management systems. Some interpretive groupings of the soils are made. It is probable that reinterpretation and regroupings of the soils may be needed from time to time to meet various planning needs.

Characteristics that are important in determining the best uses of soils are also considered. Specific management suggestions, however, are not included.



Spillway at Crab Orchard lake dam. The largest man-made lake in Illinois, Crab Orchard adds materially to the water resources of Williamson county. (Fig. 1)

Instead, they are given in a separate soil management guide entitled, "How to Know Your Soils and Manage Them Wisely, A Personal Guide for Every Farmer in Williamson County, Illinois" (*5*)[a, b]. This guide may be revised from time to time as new management facts become known and new farming techniques are developed. In other words, it is designed to give the farmer up-to-date, specific management suggestions for his own farm. The guide also includes a large-scale soil map of an individual farm on an aerial photograph, rather than the assembled small-scale county soil map accompaning the present report. The large-scale map is especially useful in planning soil and water conservation measures on individual farms.

HOW TO USE THE SOIL MAP AND SOIL REPORT

Examine the soil map. The soil map of Williamson county consists of six sheets. On the back of each is indicated the part of the county that it covers.

General soil conditions are indicated by broad color groups on the soil map. Various shades of *yellow* and *brown* are used for light-colored upland soils developed under forest, while shades of *blue* are used for soils that develop under prairie grass. Terrace soils are indicated by shades of *pink* and bottomland soils by shades of *green.*

Soil types are subdivided into smaller mapping units on the basis of slope and the thickness of remaining surface and subsurface or degree of erosion. Each mapping unit is indicated by a symbol consisting of two or three parts: *First,* the soil type number; *second,* a capital letter indicating the slope group; and *third,* a dash above or below the slope group letter to indicate the thickness of remaining surface and subsurface soil (absence of a dash indicates little or no erosion). For example $14\overline{C}$ is the symbol used for Ava silt loam (indicated by the "14"), where the slope is 4 to 7 percent (indicated by the "C"), and where there are 3 to 7 inches of surface and subsurface soil (indicated by the bar above the letter). In the vicinity of Herrin, the symbol + following the slope group letter on small bottomlands indicates that mine-wash material has covered the area. A star following the complete soil type, slope, and erosion symbol (for example, $214\underline{C}^{*}$) indicates the presence of numerous mine sinks.

The same color is used on the map for all areas of a given soil type regardless of the slope or erosion symbol. The various soil type names, soil type numbers, and the meanings of the slope group letters, erosion symbols, and other symbols are given in the legend on each map sheet.

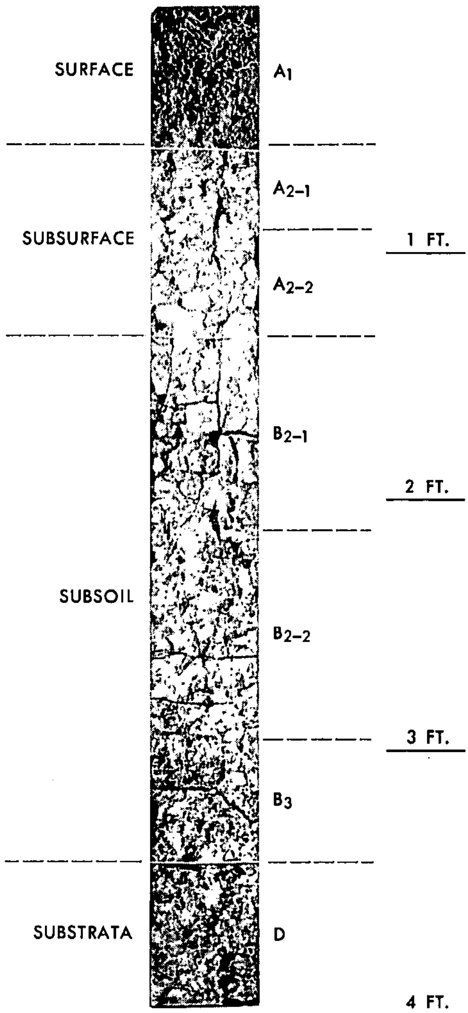
To help in finding a particular farm or tract of land, many cultural features such as roads, railroads, towns, and farmhouses are indicated. Section boundaries, section numbers, township and range numbers, and physical features such as streams, lakes, and reservoirs are also shown. If the legal description is known, a tract of land can be easily

[a] Italicized numbers in parentheses refer to the literature cited on page 71.

[b] The Williamson county soil management guide is available through the offices of either the Williamson county farm adviser or the Williamson county soil conservation district.

located by using township and range and section numbers. Otherwise, you can start with a recognized point, such as a town or crossroad, and if you know the distance and direction of a tract of land, you can easily find it.

Study the characteristics of the soils. After you have located the tract of land you are interested in and have identified the mapping units on it, turn to the index, page 72, to find where your soil types are described.



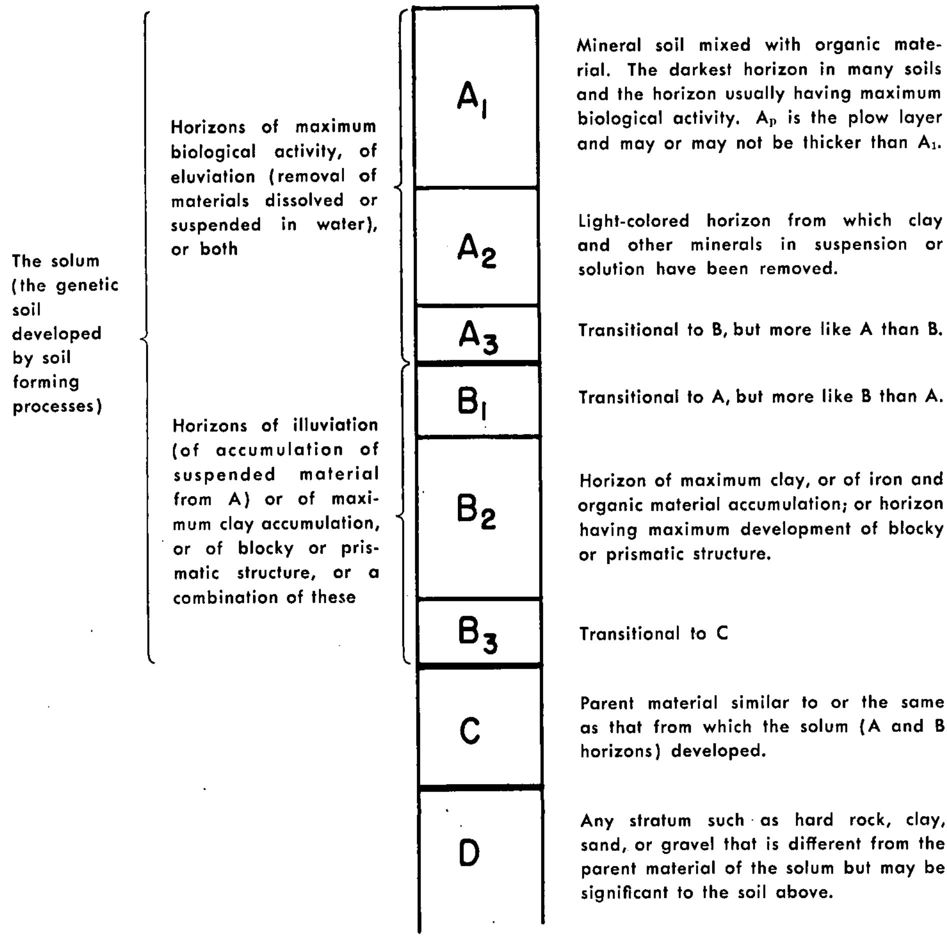
This profile of Cisne silt loam shows the various layers or horizons to a depth of 4 feet, as well as the relationship between general horizon terms (on the left) and the more technical horizon letter designations on the right. (Fig. 2)

In studying the soil type descriptions note particularly that soils are separated into types on the basis of their characteristics to a depth of 40 inches or more, *not on surface character alone*. The surface or A horizon of one type is frequently little or no different from that of another, and yet the two types may differ widely in agricultural value because of differences in the B horizon. The nature of the B horizon is important in determining the drainability and water-supplying power of most soils, especially during critical periods of excess rainfall or drouths.

As shown in Figure 2, a soil profile is a vertical section from the top down through the various horizons to a depth of 40 inches or more. Most upland soils have three or four main horizons, an A, B, C, and sometimes a D. The relationship of these letter designations of horizons to the general horizon terms such as surface, subsurface, subsoil, and substratum is also indicated in Figure 2.

In this report the letter designations of horizons are used in the soil type descriptions and are defined as shown in Figure 3. Many soils do not have all of the horizons and subhorizons indicated in this diagram.

In studying the characteristics of various soils, it is also important to understand that each soil type includes a range in properties, and that the boundaries between soil types are not necessarily sharp. Sometimes types are so intermingled that it is impossible to show them separately on the soil map. Hickory loam and Ava silt loam, in many areas of Williamson county, are two such intermingled types. They are shown on the map as 8-14 and indicated in the legend as a complex.



Principal horizons of upland soils. Not every horizon and subhorizon shown here, however, is necessarily present in all soils. (Adapted from *Nomenclature of soil horizons*, U. S. Dept. Agr. Handbook 18, pp. 174-183. 1951.) (Fig. 3)

NATURAL FEATURES OF WILLIAMSON COUNTY

Location and size of county. Williamson county is located near the center of the southern tip of Illinois. The Mississippi river is about 20 miles west of the county; the Ohio river is about 30 miles away on the east, and about 25 miles on the south.

Williamson county has an area of 441 square miles and is rectangular in shape, being about 24 miles east and west and about 18 miles north and south. The county courthouse in Marion is located very nearly, if not exactly, in the center of the county.

Physiography. The northern three-fourths (approximately) of the county is in the Mount Vernon Hill Country of the Central Lowland province (*10*), and the southern one-fourth is in the Shawnee Hills section of the Interior Low Plateau province. The northern portion was covered by the Illinoian glaciation except for a few, relatively high, isolated areas in the east-central and northeastern parts. These isolated areas are essentially similar to the unglaciated southern part of the county.

The glaciated section is characterized by low relief, wide valleys, and a relatively well-developed drainage system. The glacial drift is thin, and the topography is largely controlled by the underlying bedrock of Pennsylvanian age. The thinness of the drift is evident in a belt of strip coal mines running more or less east and west across the central part of the county (Figure 4).

A large portion of the county drains westward into the Mississippi river through Crab Orchard creek and Big Muddy river. The eastern part of the county drains eastward into Saline river and finally into the Ohio river.

In 1940 a dam was completed across Crab Orchard creek valley very near the western boundary of Williamson county to form Crab Orchard lake (*15*). At the present time this is the largest man-made lake in Illinois, having a shoreline of about 103 miles and a total area of about 11 square miles or 7,000 acres at spillway level. The lake is used as a migratory waterfowl refuge, as a source of water for industries and towns, and for fishing and other recreation.

Two auxiliary lakes to Crab Orchard are in the hilly, unglaciated southwestern part of the county. After a delay during World War II, one of these, Little Grassy, was completed, and work on Devil's Kitchen lake was resumed during the later part of 1955.

A prominent physiographic feature in the northwestern part of Williamson county is the broad lake-laid terrace along Big Muddy river. This nearly level area varies from 1 to 4 miles in width.

The southern unglaciated section of the county is a complex dissected upland having narrow ridgetops between deeply

Cut along a strip-mined area showing thinness of drift (about 30 feet) above bedrock. (Fig. 4)

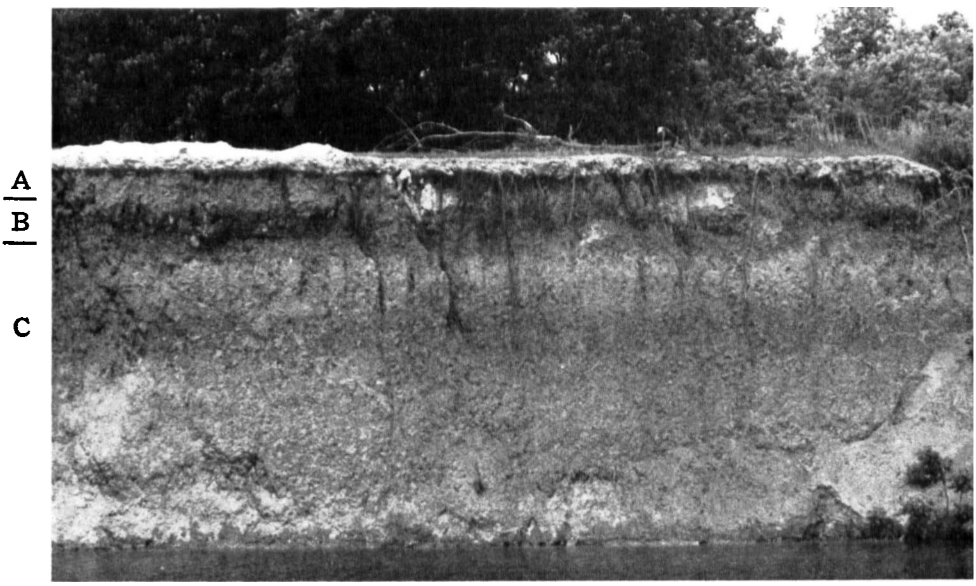
incised valleys. Many rock outcrops, chiefly of sandstone, occur along the valley walls.

Elevations near the southern boundary of Williamson county vary from 410 feet above mean sea level at Stonefort, which is in a valley, to 600 feet at Pulleys Mill, and over 700 feet at places in Grassy township in the southwestern corner. Following are some of the elevations in the central and northern parts of the county: Hurst and Bush, 400 feet; Herrin and Johnston City, 420 feet; Marion, 430 feet; Crab Orchard, 500 feet; Corinth, 520 feet. The concrete spillways of Crab Orchard lake and Little Grassy lake have crest elevations of 405 and 500 feet respectively.

Geology. The bedrock surface of all of Williamson county is a part of the Pennsylvania system (7). The county is near the southern limit of the Illinois basin, and the regional dip of the formations, in general, is towards the center of this basin to the north and northeast.

In the northern part of the county, the bedrock has a thin covering of glacial till of Illinoian age. When this till was deposited it was calcareous and about a loam in texture. Before it was covered by loess, it was exposed to weathering long enough that, on nearly level to gently sloping areas, carbonates were leached to depths varying from 10 to 20 feet; and well-developed soils were formed in its upper part. During the Wisconsin glacial age the old till soils were covered by two distinct loess sheets — the Farmdale and later the Peorian — from which the present upland soils have developed.

In the unglaciated sections of the county, the Peorian and Farmdale loess sheets are underlain by a third loess sheet, the Loveland. This was deposited somewhat earlier than the Illinoian glacial till and is the oldest loess sheet in the area. It lies directly on bedrock or on residual soils developed from the bedrock. Well-developed soils were formed in the Loveland loess before the Farm-



Cut along a strip-mined area showing the overlap of Wisconsin-age clays on older soils: A — loess; B — 1 to 2 feet of Wisconsin-age clays; C — Illinoian till-derived soil with some early Wisconsin loess in upper part. (Fig. 5)

Open strip coal mine operation in Williamson county. (Fig. 6)

dale was deposited, but they are preserved only on the flatter ridgetops, where they escaped serious erosion.

The main source of the loess in Williamson county was the Mississippi river valley. Total loess thicknesses on gently sloping, uneroded areas vary from about 150 inches in the southwestern part of the county to about 40 inches in the northeastern part. As will be discussed later (page 49), loess thickness has an important bearing on the degree of weathering in Williamson county soils.

The loess, when first deposited, was calcareous and composed mainly of silt-size (.05 to .002 millimeters) particles. Since deposition of the loess, enough time has elapsed for all the carbonates to have been removed by leaching. There are, however, a few places near the southern extent of the Illinoian glaciation where calcareous silts (apparently laid down in ice margin ponds) are exposed in road cuts.

The lake-laid sediments in the terrace area along Big Muddy river in the northwestern part of the county are of Wisconsin age. Although the Wisconsin glacier reached only as far south as central Illinois, it is believed that, as the ice melted, the extremely high waters of the Mississippi river flowed upstream in the Big Muddy river and deposited the fine-textured sediments over the nearby lowlands. In some roadcuts and strip coal mines near the upland border of this terrace area, Wisconsin-age clay lenses as thin as 1 or 2 feet overlap the older loess and Illinoian till soils (Figure 5). The broad, flat, high-level terraces were covered later with 6 to 24 inches of loess. Narrow, low-level terraces occur next to the Big Muddy flood plain. They probably were formed by the river cutting down into the lake-bed deposits. Since the low-level terraces are more recent than those at the higher level, the loess covering them is seldom more than 12 or 14 inches thick, if it is present at all.

Mineral resources. The most important mineral resource of Williamson county is coal (*2*). The county is part of one of the largest bituminous coal-producing districts in the United States. Both shaft and open strip mines are used (Figure 6). Other important mineral resources in nearby counties include limestone, sand and gravel, oil, fluorspar, fuller's earth, tripoli, and shale and clay.

Water resources. Natural water resources of Williamson county are not great (*8*). The Big Muddy river terrace area has glacial deposits in which small water wells are a possibility. Shallow drift wells and cisterns are used on most farms in the Illinoian till area; cisterns, together with some shallow wells, are used in the southern unglaciated section. Deep rock wells, in general, are not a very good source of water. Many farmers depend upon ponds for water for livestock and other uses. Surface water is also the principal water source for towns and industries. Topography, rainfall, and soil conditions are generally favorable to the development of reservoirs in this area.

Besides Crab Orchard, Little Grassy, and Devil's Kitchen lakes, most towns in Williamson county have their own municipal reservoirs.

Climate. At the Carbondale station (*12*), a few miles west of Williamson county, the mean July temperature for 1910 through 1946 was 79.8° F., and the mean January temperature was 34.9° F. Average annual rainfall was 44.7 inches, with a low of 30.76 inches in 1914 and a high of 74.50 inches in 1945. Average annual snowfall was 13.6 inches. From 1921 through 1946, the average rainfall during the growing season, April through September, was 24.07 inches, with a low of 12.23 inches in 1941 and a high of 44.20 inches in 1945. The average date of the last killing frost in the spring was April 13 and the average date of the first killing frost in the fall was October 23. Thus the average growing season was 193 days.

CULTURAL FEATURES OF WILLIAMSON COUNTY

Organization and population. Between 1810 and 1826, various settlements were made in what is now Williamson county. After that the population grew rapidly, and Williamson county with its present boundaries was established February 28, 1839, by legislative act. It was named after a county in Tennessee.

According to U. S. Census data, the population of the county increased steadily until it reached 53,880 in 1930, then declined to 48,621 in 1950 (Table 1). Herrin, Johnston City, and Carterville have followed essentially similar trends, but the population of Marion has continued to rise, reaching 10,459 in 1950.

Transportation and industrial development. Transportation facilities are well developed in Williamson county. At the present time the county has five Illinois

Table 1. — POPULATION OF WILLIAMSON COUNTY AND OF FOUR TOWNS IN THE COUNTY

County or town	1890	1910	1930	1940	1950
Williamson county	22 226	45 098	53 880	51 424	48 621
Marion	1 338	7 093	9 033	9 251	10 459
Herrin	......	6 861	9 708	9 352	9 331
Johnston City	......	3 248	5 955	5 418	4 479
Carterville	969	2 971	2 866	2 893	2 716

Table 2. — PERCENT OF LAND USED FOR VARIOUS CROPS AND FOR OTHER PURPOSES IN WILLIAMSON COUNTY, 1890-1954

Land use	1890	1910	1930	1940	1950	1954
	percent of total acreage					
Corn	16	18	11	8	9	10
Soybeans	..	..	1	2	4	4
Winter wheat	10	3	1	2	2	2
Oats	7	1	1	1	1	1
Tame hay	6	8	10	9	4	4
Woodland and other unimproved land	..	13	8	7	6	6
Pasture and other land in farms	..	36	39	33	32	25
Land not in farms	16	21	29	38	42	48

state highways and one U. S. highway, and numerous concrete pavements connect towns in the northern coal-mining section. Most of the township roads in all parts of the county are graveled.

Several railroads, the Chicago and Eastern Illinois, the Illinois Central, the New York Central, the Chicago, Burlington, and Quincy, and the Missouri and Pacific, have through lines in the county.

Air transportation is available through the Williamson County Airport located south of Herrin and west of Marion.

Many industries, both large and small, are located in the county (*2*). Coal mining has been the largest single industry since 1810. The Illinois Ordnance Plant on Crab Orchard lake, a shell-loading plant during World War II, has been developed into an industrial community under the supervision of the U. S. Department of the Interior. Among the industries in this area are a foundry, a paint-mixing plant, and factories for the manufacture of electronic products, furniture, farm equipment, and chemical fertilizers. Marion and Herrin also have sizable industries of their own.

A large labor force, good transportation, the water resources of Crab Orchard, Little Grassy, and Devil's Kitchen lakes, and coal are among the major attractions of Williamson county to industry.

Agriculture. Agriculture has been important in Williamson county from the first, although the percentage of land in farms steadily decreased from 84 percent in 1890 to 58 percent in 1950. In 1950 there were 2,057 farms with an average size of 78 acres and 9.4 percent tenancy. Average size of farms in 1890 was 87 acres. Census data for 1954 show 1,319 farms with an average size of 109 acres and 7.2 percent tenancy. The average size of farms is relatively small because many are operated by part-time farmers.

The percentages of land in Williamson county used for various crops and for other purposes are given in Table 2. From 1890 to 1950 the percentages of land in the various crops except soybeans decreased. By 1954 pasture and other land in farms had decreased 7 percentage points from 1950, and land not in farms had increased 6 percentage points.

Livestock and chicken numbers on Williamson county farms for various years are given in Table 3. Swine numbers were at a peak in 1890 and lowest in 1930 and 1940, with a marked rise in 1950. Sheep numbers gradually declined from 6,131 in 1890 to 1,046 in 1950. Cattle numbers have not changed greatly, whereas horse and mule numbers have dropped considerably since 1910. The number of chickens was at a peak in 1890 and lowest in 1940.

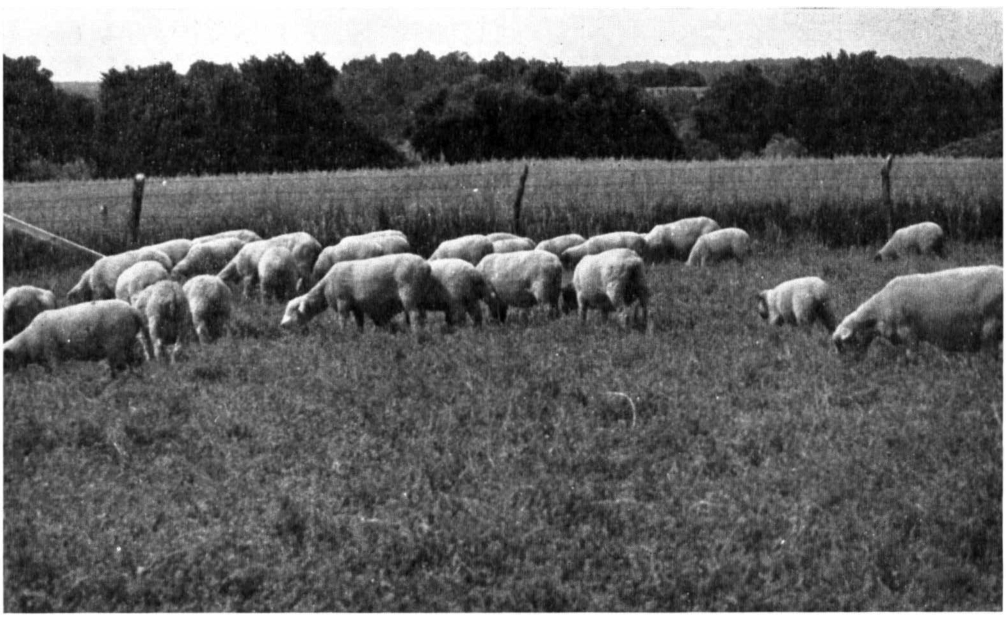
Since about 1940 a notable trend to

Table 3. — LIVESTOCK AND CHICKEN POPULATION IN WILLIAMSON COUNTY, 1890-1950

Kind of animal	1890	1910	1930	1940	1950
Swine	39 747	16 976	9 929	9 951	14 102
Sheep	6 131	2 446	1 725	1 271	1 046
Dairy cattle	5 012	5 025	6 279	4 833	4 164
Beef cattle	7 211	6 406	7 937	9 416	7 748
Horses and mules	8 528	10 302	6 550	5 076	3 200
Chickens	271 938	127 801	149 477	97 161	101 411

improved grassland farming has been taking place in Southern Illinois. Both the University of Illinois Agricultural Experiment Station and the U. S. Department of Agriculture have been instrumental in the promotion of better farming in this area. In 1940 the University of Illinois assumed full direction of the Dixon Springs Experiment Station (*14*) located in Pope county about 20 miles southeast of Williamson county. On this station various methods of grassland farming, involving mainly pasture and livestock management, are being developed and demonstrated (Figure 7). A large number of farmers from Illinois and adjacent states visit the Dixon Springs Station each year, and many in Williamson county as well as in other counties have adopted practices proven at the station.

While there has been a trend to improved grassland farming in Williamson county, a much greater shift in that direction is needed. Many of the soils of the county are better adapted, in general, to this type of agriculture than to any other.



Sheep grazing on birdsfoot trefoil at the Dixon Springs Experiment Station, located in Pope county not far from Williamson county. (Fig. 7)

DESCRIPTION OF WILLIAMSON COUNTY SOILS

On the following pages will be found a description of each soil type in Williamson county, including general occurrence, formation, relationship to other soils, and detailed profile characteristics.

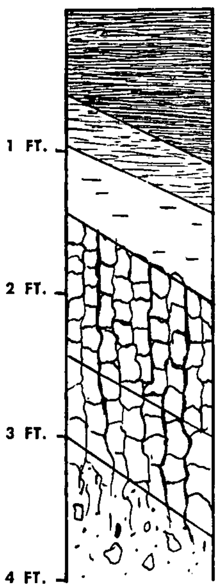
The profile characteristics are shown by means of (1) a generalized drawing and (2) a description of a representative specific profile. The drawings show the major horizons. Slanting lines between horizons indicate the main variations in thickness. The drawings do not, however, indicate all detailed variations that may be found in a soil type. In the profile descriptions, the horizons are designated by letters, as discussed on page 5. Thicknesses of the A horizons are for areas that have not been seriously eroded. Munsell color notations[1] and consistence are for moist soils.

The soil types are in numerical order, as they are also in Table 4, pages 14 and 15, which shows the area of each type in the county. Table 4 also shows the area of each soil mapping unit (combination of soil type, slope, and erosion).

Cisne silt loam (2)

Cisne silt loam is a dark to very dark grayish-brown upland soil developed under native grass on slopes of less than 1½ percent. The loess from which Cisne developed is underlain by weathered Illinoian till, usually at depths of less than 65

Generalized profile



Description of representative profile, Cisne silt loam

A_1	(0-9″)	Dark to very dark grayish-brown (10YR 4/2-3/2) friable silt loam with weak, fine crumb structure. pH 5.2.
A_{2-1}	(9-12″)	Grayish-brown (10YR 5/2) friable silt loam with weak crumb structure. pH 5.0.
A_{2-2}	(12-18″)	Light gray (10YR 7/2) friable silt loam with weak crumb to platy structure. pH 4.7.
B_2	(18-30″)	Gray (10YR 6/1) to light brownish-gray (10YR 6/2) very firm silty clay loam to silty clay mottled with yellowish-brown (10YR 5/6). Blocky structure arranged in prismatic form. pH 4.8.
B_3	(30-40″)	Grayish-brown (10YR 5/2), mottled with yellowish-brown (10YR 5/8), very firm silty clay loam with weak blocky structure. pH 5.2.
D	(40″+)	Grayish-brown (10YR 5/2) firm silty clay loam to clay loam weathered Illinoian till.

[1] These notations refer to soil color standards developed by the Munsell Color Company, Inc. The notations consist of three variables: hue, value, and chroma. In the notation 10YR 4/2, for example, the hue is denoted by the 10YR (YR=yellow-red), the value by the 4, and the chroma by the 2. Hue is the dominant spectral (rainbow) color and is related to the dominant wave length of the light. Value refers to the relative lightness of color and is a function of the total amount of light. Chroma is the relative purity or strength of the spectral color.

Table 4. — WILLIAMSON COUNTY SOILS: Areas of the Different Types Grouped According to Slope and Erosion

Type No.	Type name	Percent of total area	Area in square miles	Area in acres	Acres of various slope and erosion groups							
					Erosion group	A slope 0-1.5%	B slope 1.5-4%	C slope 4-7%	D slope 7-12%	E slope 12-18%	F slope 18-30%	G slope over 30%
2	Cisne silt loam.........	.83	3.66	2 339	None to slight	2 339	.....	.....	.....	.....	.....	.....
3	Hoyleton silt loam......	1.74	7.69	4 915	None to slight	402	4 248	.....	.....	.....	.....	.....
					Moderate	.....	196	44	.....	.....	.....	.....
					Severe	.....	.....	25	.....	.....	.....	.....
4	Richview silt loam......	.28	1.26	804	None to slight	.....	156	260	.....	.....	.....	.....
					Moderate	.....	16	343	.....	.....	.....	.....
					Severe	.....	.....	29	.....	.....	.....	.....
5	Blair silt loam..........	.61	2.70	1 725	None to slight	.....	.....	105	.....	.....	.....	.....
					Moderate	.....	.....	1 427	30	.....	.....	.....
					Severe	.....	.....	137	26	.....	.....	.....
8	Hickory loam..........	.46	2.05	1 306	Moderate	.....	.....	.....	.....	27	522	517
					Severe	.....	.....	.....	30	88	94	28
8-14	Hickory loam-Ava silt loam, complex........	6.73	29.70	19 002	Moderate	.....	.....	.....	325	1 658	844	.....
					Severe	.....	.....	.....	10 135	5 775	265	.....
8-214	Hickory loam-Hosmer silt loam, complex....	1.08	4.78	3 060	Moderate	.....	.....	.....	37	186	258	.....
					Severe	.....	.....	.....	308	2 240	31	.....
9	Steep rocky land, sandstone material........	.41	1.81	1 151	Moderate	.....	.....	.....	.....	24	395	664
					Severe	.....	.....	.....	.....	.....	34	34
11	Loy silt loam...........	.05	.23	143	None to slight	143	.....	.....	.....	.....	.....	.....
12	Wynoose silt loam......	1.85	8.18	5 231	None to slight	5 231	.....	.....	.....	.....	.....	.....
13	Bluford silt loam.......	7.05	31.10	19 899	None to slight	1 361	18 217	.....	.....	.....	.....	.....
					Moderate	.....	321	.....	.....	.....	.....	.....
14	Ava silt loam...........	19.80	87.24	55 843	None to slight	.....	15 874	7 030	227	114	.....	.....
					Moderate	.....	151	11 748	2 504	260	.....	.....
					Severe	.....	.....	6 815	10 560	560	.....	.....
70	Beaucoup silty clay loam	1.25	5.51	3 518	None to slight	3 518	.....	.....	.....	.....	.....	.....
71	Darwin clay............	.32	1.43	917	None to slight	917	.....	.....	.....	.....	.....	.....
72	Sharon silt loam........	2.85	12.58	8 047	None to slight	8 047	.....	.....	.....	.....	.....	.....
84	Okaw silt loam.........	.92	4.08	2 609	None to slight	532	20	.....	.....	.....	.....	.....
					Moderate	2 044	13	.....	.....	.....	.....	.....
85	Jacob clay.............	.05	.20	132	None to slight	132	.....	.....	.....	.....	.....	.....
108	Bonnie silt loam........	2.44	10.77	6 891	Mine wash	45	.....	.....	.....	.....	.....	.....
					None to slight	6 846	.....	.....	.....	.....	.....	.....
109	Racoon silt loam........	.19	.86	548	None to slight	548	.....	.....	.....	.....	.....	.....
122	Colp silt loam..........	1.51	6.65	4 261	None to slight	.....	989	7	.....	.....	.....	.....
					Moderate	.....	180	636	350	120	35	8
					Severe	.....	.....	653	914	204	101	64

Table 4. — Concluded

Type No.	Type name	Percent of total area	Area in square miles	Area in acres	Erosion group	A slope 0-1.5%	B slope 1.5-4%	C slope 4-7%	D slope 7-12%	E slope 12-18%	F slope 18-30%	G slope over 30%
					Acres of various slope and erosion groups							
132	Starks silt loam	.11	.50	318	None to slight	318	.....	.....	.....	.....	.....	.....
134	Camden silt loam	.15	.64	416	None to slight	5	222	22	.....	.....	.....	.....
					Moderate	.....	.....	56	8	17	.....	.....
					Severe	.....	.....	44	42	.....	.....	.....
164	Stoy silt loam	3.12	13.75	8 800	None to slight	299	7 885	.....	.....	.....	.....	.....
					Moderate	.....	31	460	.....	.....	.....	.....
					Severe	.....	.....	125	.....	.....	.....	.....
165	Weir silt loam	.76	3.34	2 139	None to slight	2 139	.....	.....	.....	.....	.....	.....
167	Lukin silt loam	.04	.17	110	None to slight	33	77	.....	.....	.....	.....	.....
176	Marissa silt loam	.07	.32	201	None to slight	143	58	.....	.....	.....	.....	.....
214	Hosmer silt loam	11.61	51.14	32 742	None to slight	.....	6 911	4 408	60	87	.....	.....
					Moderate	.....	24	4 697	1 052	90	.....	.....
					Severe	.....	.....	2 961	12 039	413	.....	.....
287	Chauncey silt loam	.02	.08	56	None to slight	56	.....	.....	.....	.....	.....	.....
288	Petrolia silty clay loam	.10	.44	282	Silty deposition	27	.....	.....	.....	.....	.....	.....
					None to slight	255	.....	.....	.....	.....	.....	.....
301	Grantsburg silt loam	3.12	13.74	8 800	None to slight	.....	1 708	4 056	.....	.....	.....	.....
					Moderate	.....	.....	1 726	428	.....	.....	.....
					Severe	.....	.....	249	633	.....	.....	.....
335	Robbs silt loam	.11	.49	317	None to slight	31	286	.....	.....	.....	.....	.....
337	Creal silt loam	.34	1.51	966	None to slight	127	839	.....	.....	.....	.....	.....
338	Hurst silt loam	2.12	9.38	5 998	None to slight	5 998	.....	.....	.....	.....	.....	.....
339	Wellston silt loam	5.34	23.55	15 079	Moderate	.....	.....	.....	11	1 983	4 076	2 009
					Severe	.....	.....	.....	672	5 214	1 114	.....
340	Manitou silt loam	4.99	21.99	14 077	Moderate	.....	.....	.....	467	912	264	.....
					Severe	.....	.....	.....	4 373	7 975	86	.....
382	Belknap silt loam	12.30	54.20	34 692	Mine wash	322	.....	.....	.....	.....	.....	.....
					None to slight	34 370	.....	.....	.....	.....	.....	.....
	Borrow pit, mine dump and surface mine	1.92	8.48	5 427								
	Water	3.36	14.80	9 479								
	TOTAL	**100.00**	**441.00**	**282 240**		**76 228**	**58 422**	**48 063**	**45 231**	**27 947**	**8 119**	**3 324**
	Area of each erosion and slope group											
	Silty deposition and mine wash	.14	.62	394	Silty deposition and mine wash	394	.....	.....	.....	.....	.....	.....
	None to slight	52.32	230.72	147 656	None to slight	73 790	57 490	15 888	287	201	.....	.....
	Moderate	15.66	69.06	44 194	Moderate	2 044	932	21 137	5 212	5 277	6 394	3 198
	Severe	26.60	117.32	75 090	Severe	.....	.....	11 038	39 732	22 469	1 725	126

Table 5. — CHEMICAL ANALYSES AND PARTICLE SIZE DISTRIBUTION OF CISNE SILT LOAM[a]

Horizon	Depth	pH	Organic carbon[b]	Exchangeable cations[c] Ca	Mg	K	Cation exchange capacity	Base saturation	Particle size distribution Sand 2-.05 mm.	Silt .05-.002 mm.	Clay[d] <.002 mm.
	in.		*pct.*	*me./ 100 gm.*	*me./ 100 gm.*	*me./ 100 gm.*	*me./ 100 gm.*	*pct.*	*pct.*	*pct.*	*pct.*
A_1	0–8	4.4	1.5	2.6	0.2	...	10.7	28	5.6	76.7	17.7
A_{2-1}	8–14	4.1	.8	1.7	0.2	...	8.2	16	6.2	75.7	18.1
A_{2-2}	14–21	4.3	.3	1.1	0.2	...	7.0	17	9.4	76.0	14.6
B_{2-1}	21–31	4.4	.5	6.6	4.0	...	28.3	39	2.8	51.2	46.0
B_{2-2}	31–38	4.6	.4	7.5	5.0	...	28.8	41	3.5	54.6	41.9
B_{3-1}	38–46	4.8	.2	7.8	5.1	...	24.3	55	5.9	60.6	33.5
B_{3-2}	46–53	5.0	.2	8.5	5.2	...	20.7	69	5.6	63.8	30.6
C_1	53–56	5.2	.2	9.1	5.3	...	20.0	78	5.9	66.5	27.6
D	56+	...	...	...	...	...	....	..	...	....	....

[a] Profile sampled in Fayette county. Township 7 north, Range 1 east, Section 4, northeast ¼, northeast 40 acres, northeast 10 acres.
[b] Percent organic carbon times 1.724 = percent organic matter.
[c] One me. of Ca (calcium) per 100 gms. soil = 400 pounds per acre or per 2 million pounds soil. One me. of Mg (magnesium) per 100 gms. soil = 240 pounds per acre or per 2 million pounds soil.
[d] Clay <.002 mm. interpolated between <.005 and <.001 mm.

inches. Cisne, a poorly drained soil, occurs in association with Hoyleton (3), an imperfectly drained soil, and Richview (4), a moderately well-drained soil. Hoyleton and Richview occur on more sloping areas than Cisne.

Since Cisne is a nearly level claypan soil (Figure 20, page 61) in which tile do not function properly, drainage is usually provided by means of surface ditches or dead furrows. Cisne is strongly acid and low in plant nutrients. However, it responds well to soil treatment and good soil management (see Tables 20 and 21, pages 65 and 66). Conventional fertilization of Cisne has been found to markedly increase root penetration of corn (*3*). This permits the corn plant to draw upon a much larger volume of soil for nutrients and water.

Cisne is used mainly for corn, soybean, wheat, and hay production.

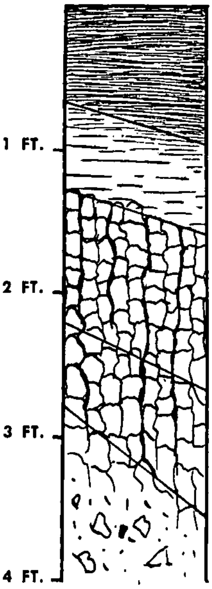
Hoyleton silt loam (3)

Hoyleton silt loam is a dark to very dark grayish-brown, imperfectly drained, upland soil developed under grass from less than 65 inches of loess over weathered Illinoian till. Slopes range from 1 to 7 percent. Hoyleton is intermediate in many characteristics between Cisne (2) and Richview (4), two soils with which it is commonly associated.

Some chemical and physical properties of Hoyleton silt loam are given in Table 6. The thinness of the A_{1p} and shallow depth (11 inches) to the B horizon indicate that the profile described in this table probably was somewhat eroded.

Hoyleton usually has enough slope for good surface drainage. Many of the more sloping areas have a serious erosion problem. Hoyleton is strongly acid and low in plant nutrients. It has less clay in the B horizon than Cisne and probably should respond even more than Cisne to good soil management (see Tables 20 and 21, pages 65 and 66). It is used primarily for corn, soybeans, wheat, and hay.

Generalized profile



Description of representative profile, Hoyleton silt loam

A_1 (0-9″) Dark to very dark grayish-brown (10YR 4/2-3/2) friable silt loam with weak, fine crumb structure. pH 5.4.

A_2 (9-18″) Pale brown (10YR 6/3) to light yellowish-brown (10YR 6/4) friable silt loam with weak crumb to platy structure. pH 4.7.

B_2 (18-30″) Pale brown (10YR 6/3) to light yellowish-brown (10YR 6/4) very firm silty clay loam, highly mottled with red (2.5YR 4/6) and gray (10YR 5/1). Blocky structure arranged in prismatic form. pH 5.0.

B_3 (30-40″) Gray (10YR 5/1), mottled with yellowish-brown (10YR 5/8), very firm silty clay loam with weak blocky structure. pH 5.1.

D (40″+) Grayish-brown (10YR 5/2) firm silty clay loam to clay loam weathered Illinoian till.

Table 6. — CHEMICAL ANALYSES AND PARTICLE SIZE DISTRIBUTION OF HOYLETON SILT LOAM[a]

Horizon	Depth	Cation exchange capacity	Base saturation	Particle size distribution: Sand 2-.05 mm.	Particle size distribution: Silt .05-.002 mm.	Particle size distribution: Clay <.002 mm.	Fine clay <.0002 mm.
	in.	*me./100 gm.*	*pct.*	*pct.*	*pct.*	*pct.*	*pct.*
A_{1p}	0–6	15.2	26	10.2	70.2	19.6	12.7
A_2	6–11	15.1	31	6.0	72.9	21.1	12.8
B_2	11–30	23.7	50	2.6	59.4	38.0	26.4
B_3	30–38	18.9	76	5.0	65.4	29.6	20.7
D	38–45	10.4	84	30.5	51.6	17.9	13.6

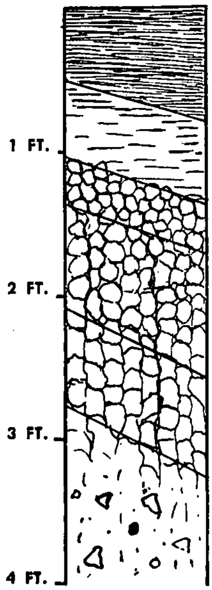
[a] Profile sampled in Shelby county. Township 9 north, Range 5 east, Section 18, northeast ¼, northwest 40 acres, northeast 10 acres.

Richview silt loam (4)

Richview silt loam is a dark to very dark grayish-brown upland soil found in association with Cisne (2) and Hoyleton (3) soils. It occurs on slopes ranging from about 3 to 7 percent, and has developed under grass vegetation from less than 65 inches of loess over weathered Illinoian till. Richview is moderately well drained. (A profile description and Table 7, giving some chemical and physical properties, are on page 18.)

Although Richview is a highly weathered soil, it does not have a pronounced claypan as does Cisne (Figure 20, page 61). It responds well to good soil management, but in general, because of steeper slopes and greater erosion, it is not quite as well adapted to grain production as Hoyleton.

Generalized profile



Description of representative profile, Richview silt loam

A_1	(0-8″)	Dark to very dark grayish-brown (10YR 4/2 to 3/2) friable silt loam with weak, fine crumb structure. pH 5.2.
A_2	(8-14″)	Brown (10YR 5/3) friable silt loam with crumb to weak platy structure. pH 5.0.
B_1	(14-20″)	Yellowish-brown (10YR 5/4) firm silty clay loam with well-developed subangular blocky structure. Some small red (2.5YR 4/8) mottles are sometimes present. pH 4.9.
B_2	(20-30″)	Brown (10YR 5/3), highly mottled with red (2.5YR 4/6) and some gray (10YR 5/1), firm silty clay loam with subangular to angular blocky structure. pH 4.9.
B_3	(30-36″)	Grayish-brown (10YR 5/2), mottled with yellowish-brown (10YR 5/8), firm silty clay loam with coarse blocky structure. pH 5.0.
D	(36″+)	Grayish-brown to brown (10YR 5/2 to 5/3) firm clay loam to silty clay loam weathered Illinoian till.

Table 7. — CHEMICAL ANALYSES AND PARTICLE SIZE DISTRIBUTION OF RICHVIEW SILT LOAM[a]

Horizon	Depth	Cation exchange capacity	Base saturation	Particle size distribution			Fine clay <.0002 mm.
				Sand 2-.05 mm.	Silt .05-.002 mm.	Clay <.002 mm.	
	in.	*me./100 gm.*	*pct.*	*pct.*	*pct.*	*pct.*	*pct.*
A_1	0–6	12.4	61	8.8	73.7	17.5	9.5
A_2	6–13	11.5	63	6.6	72.7	20.7	11.2
B_1	13–18	15.6	49	2.4	70.8	26.8	16.4
B_2	18–24	22.2	39	1.0	62.8	36.2	26.7
B_3	24–31	17.6	41	4.1	64.3	31.6	23.0
D	31–40	14.0	35	17.1	60.6	22.3	15.7

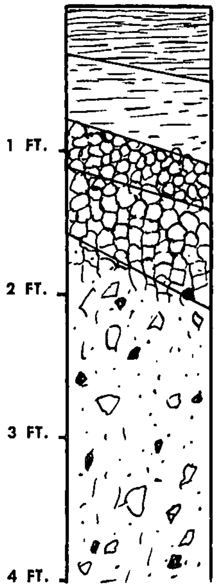
[a] Profile sampled in Shelby county. Township 9 north, Range 5 east, Section 8, southeast ¼, southwest 40 acres, southeast 10 acres.

Blair silt loam (5)

Blair silt loam is a light-colored, upland soil found on slopes of 4 to 12 percent. It developed under forest vegetation from less than 24 inches of loess over leached Illinoian till. Blair is imperfectly drained and occurs in association with Bluford (13), Ava (14), and Hickory (8) soils. Most areas of Blair have been moderately to severely eroded, and therefore may have a thinner A horizon than indicated in the description of a representative profile on page 19.

The upper layers of Blair are strongly acid, low in available phosphorus, and low to medium in available potassium, unless they have had soil treatment. The weathered glacial till in the lower part of the profile, however, is often high in

Generalized profile



Description of representative profile, Blair silt loam

A_p	(0-5″)	Dark grayish-brown (10YR 4/2) to brown (10YR 5/3) friable silt loam with weak crumb structure. pH 4.8.
A_2	(5-11″)	Pale brown (10YR 6/3) friable silt loam with platy structure. pH 4.7.
B_1	(11-14″)	Pale brown (10YR 6/3), mottled with light gray (10YR 7/2), firm silty clay loam with fine subangular blocky structure. pH 4.7.
B_2	(14-22″)	Pale brown (10YR 6/3) to light yellowish-brown (10YR 6/4), mottled with light gray (10YR 7/2) and yellowish-brown (10YR 5/8), firm silty clay loam to clay loam with blocky to subangular blocky structure. pH 4.8.
D	(22-48″)	Mottled light gray (10YR 7/2) and brown (10YR 5/3) firm clay loam till. pH 4.8.

available potassium. Because Blair is highly weathered and occurs on sloping land, the main problems on this soil are improving fertility and controlling erosion. Blair is better adapted for hay and pasture production than for grain crops. Some of the least sloping and least eroded areas may be used for grain production if conservation practices such as contouring, strip cropping, or terracing are followed.

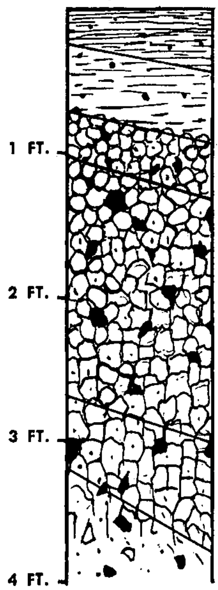
When properly managed, the less steep areas of Hickory loam (described on next page) produce good pasture. (Fig. 8)

Hickory loam (8)

Hickory loam is a light-colored upland soil developed under forest vegetation on slopes ranging from 10 to over 30 percent. The parent material is mainly Illinoian till. Some of the less sloping areas had a thin loess cover, but it is doubtful if the steeper areas have been influenced by loess.

Hickory loam, besides occurring alone in mappable areas in Williamson county, also occurs in a complex with Ava silt loam in areas marked 8-14 on the soil map. It also occurs with Hosmer in a similar complex (8-214 on the map). The profile drawing and description below are from uncultivated, relatively uneroded areas. Because of erosion, the A horizon is nearly always absent in areas that have been cleared and cultivated for a number of years.

Generalized profile



Description of representative profile, Hickory loam

A_1	(0-4″)	Grayish-brown (10YR 5/2) to dark grayish-brown (10YR 4/2) friable loam to silt loam with weak, fine crumb structure. Some pebbles present. pH 6.3.
A_2	(4-10″)	Pale brown (10YR 6/3) friable loam with granular structure. Some pebbles and small rocks present. pH 6.2.
B_1	(10-15″)	Brown (10YR 5/3), mottled with some yellowish-brown (10YR 5/8), firm, coarse clay loam with some pebbles present and fine to medium subangular blocky structure. pH 6.0.
B_2	(15-35″)	Pale brown (10YR 6/3), mottled with yellowish-brown (10YR 5/8) and light gray (10YR 7/1), firm clay loam with subangular to angular blocky structure. Some pebbles present. pH 6.3.
B_3	(35-45″)	Mixed pale brown (10YR 6/3) and yellowish-brown (10YR 5/8), mottled with light gray (10YR 7/1), pebbly clay loam with weak, coarse blocky structure. pH 6.6.
C	(45″+)	Brown (10YR 5/3) to yellowish-brown (10YR 5/6) friable loam with pebbles present and nearly structureless. Nearly neutral to alkaline.

Since Hickory occurs on steep slopes, erosion is generally a serious problem. On the steepest slopes Hickory is better adapted to forest than to anything else. North slopes produce the most timber since they are cooler and moister than south slopes. Many areas of Hickory that have been cleared and are seriously eroded should be reforested to shortleaf and loblolly pine. Hickory is moderately well drained in Williamson county, and where eroded, the remaining portion is about a clay loam in texture. Pine trees make reasonably good growth under such conditions.

Some of the least sloping areas produce reasonably good pasture following proper soil treatment (Figure 8). Hickory varies from strongly to slightly acid, and usually is low in available phosphorus and medium to high in available potassium.

Hickory loam — Ava silt loam complex (8-14)

In areas marked 8-14 on the soil map Hickory loam and Ava silt loam are so intermingled that they could not be shown separately on a small-scale map. Both Hickory and Ava are light-colored soils developed under forest. The Hickory-Ava complex occurs on slopes ranging from about 8 to 30 percent in Williamson county. Ava usually occupies the upper one-fourth to one-half of a slope, and Hickory occupies the lower portion, where weathered Illinoian glacial till rather than loess is present.

Hickory loam — Hosmer silt loam complex (8-214)

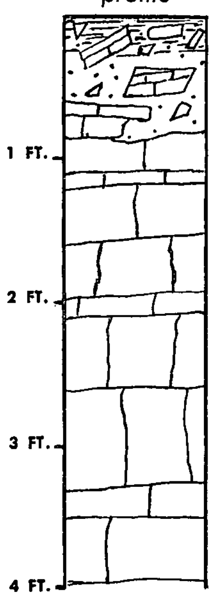
In some areas Hickory loam and Hosmer silt loam are too intermingled to be shown separately on the soil map and are indicated as 8-214. The Hickory-Hosmer complex usually occurs on slopes between 8 and 30 percent, but a few areas are on steeper slopes. Hosmer usually occupies the upper third to half of a slope; and Hickory, the lower portion, where the parent material is glacial till rather than loess.

Like Hickory, Hosmer is a light-colored soil developed under forest.

Steep rocky land, sandstone material (9)

Steep rocky land, sandstone material occurs on very steep slopes. This land type is a mixture of sand, silt, and numerous rocks, and outcrops of sandstone bedrock are common (Figure 9). Little soil development is evident in most areas. On areas having about 10 inches of soil material above the bedrock, however, some soil development, including a weak B horizon, can be detected. On such areas, the soil material is approaching Wellston silt loam (339). Steep rocky land should be used for forest or wild life. Timber management may be used to advantage in some areas, but at best, tree growth is slow on this land type.

Generalized profile



Description of representative profile

A Grayish-brown (10YR 5/2) to brown (10YR 5/3) mixed silt, sand, and numerous rocks and rock ledges.

Bedrock (sandstone).

An area of steep rocky land with sandstone outcropping in the background. (Fig. 9)

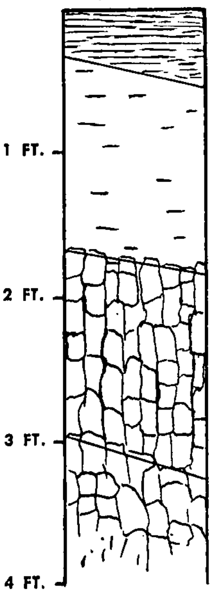
Loy silt loam (11)

Loy silt loam is a light-colored upland soil found on very flat land or in slight depressions. It has developed under forest vegetation from less than 65 inches of loess over weathered Illinoian till. Loy is very poorly drained and occurs in association with the poorly drained Wynoose (12), imperfectly drained Bluford (13), and the moderately well-drained Ava (14) soils.

Drainage is a difficult problem on this soil. The claypan profile is very slowly permeable to water, and the only way to remove excess water is with surface ditches. Yet many areas do not have sufficient fall for surface ditches to adequately remove excess water during very wet periods. Providing fertility is also a problem. Loy is strongly acid and low in available phosphorus and available potassium.

This soil is best suited for pasture and hay crops unless adequate drainage can be provided.

Generalized profile



Description of representative profile, Loy silt loam

A_p	(0-7")	Grayish-brown (10YR 5/2) friable silt loam with weak, fine crumb to thin platy structure. Some light gray (10YR 7/2) and yellowish-brown (10YR 5/8) iron stains present. pH 4.9.
A_2	(7-20")	Light gray (10YR 7/1) friable silt loam mottled with white (10YR 8/1) and yellowish-brown (10YR 5/8) iron concretions. Medium platy structure. pH 4.8.
B_2	(20-35")	Light gray (10YR 7/1) very firm silty clay to silty clay loam with prismatic structure. Faint brownish-yellow (10YR 6/8) mottles and some dark grayish-brown (10YR 4/2) iron concretions are present. pH 5.0.
B_3	(35"+)	Light gray (10YR 7/1) to light brownish-gray (2.5Y 6/2) firm silty clay loam with weak, coarse blocky structure. pH 5.1.

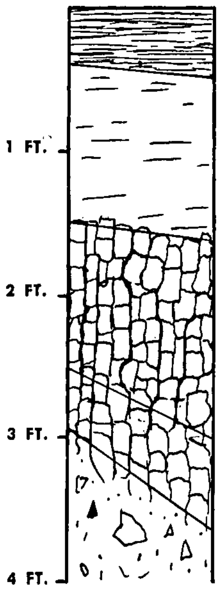
Wynoose silt loam (12)

Wynoose silt loam is a poorly drained upland soil developed from less than 65 inches of loess over weathered Illinoian till. It is a light-colored soil, having developed under forest vegetation, and occurs on slopes of less than 1½ percent. Wynoose is associated with Loy (11), Bluford (12), and Ava (14) soils.

Wynoose is used for corn, soybeans, wheat, and hay. Before these crops can be grown successfully, however, this claypan soil must be drained with surface ditches, and large amounts of limestone and fertilizer must be applied. Wynoose is strongly acid and low in available phosphorus and available potassium. Because the surface soil is low in organic matter, maintaining good physical condition is also a problem.

Some chemical and physical properties of Wynoose are given in Figure 21, page 62, as well as in Table 8.

Generalized profile



Description of representative profile, Wynoose silt loam

A_p (0-6″) Grayish-brown to dark grayish-brown (10YR 5/2-4/2) friable silt loam with weak, fine crumb to thin platy structure. pH 4.6.

A_2 (6-18″) Light gray (10YR 7/2) friable silt loam with streaks and mottles of yellowish-brown (10YR 5/8). Iron concretions present. Thin to medium platy structure. pH 4.8.

B_2 (18-35″) Light gray (10YR 7/1) very firm silty clay to silty clay loam mottled with pale brown (10YR 6/3) and having numerous very dark grayish-brown (10YR 3/2) iron concretions. Prismatic structure. pH 4.9.

B_3 (35-45″) Gray (10YR 6/1) very firm silty clay loam mottled with yellowish-brown (10YR 5/8). Weak, coarse blocky structure. pH 5.0.

D (45″+) Gray (10YR 5/1) firm silty clay loam with some pebbles. Weathered Illinoian till.

Table 8. — CHEMICAL ANALYSES AND PARTICLE SIZE DISTRIBUTION OF WYNOOSE SILT LOAM[a]

Horizon	Depth[b]	pH	Organic carbon[c]	Cation exchange capacity	Base saturation	Particle size distribution		
						Sand 2-.05 mm.	Silt .05-.002 mm.	Clay[d] <.002 mm.
	in.		*pct.*	*me./100 gm.*	*pct.*	*pct.*	*pct.*	*pct.*
A_1	0–4	4.4	1.28	9.5	28	4.7	80.5	14.8
A_2	4–20	4.3	.40	10.0	17	3.6	79.0	17.4
B_2	20–35	4.0	.23	30.8	29	1.4	52.3	46.3
B_3	35–42	4.0	.14	20.6	33	4.0	67.2	28.8
D	42+	4.8	.13	....	..	6.8	71.4	21.8

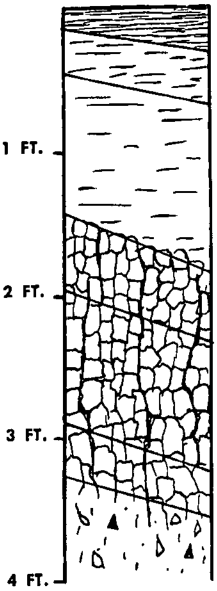
[a] Profile sampled in Jefferson county. Township 1 south, Range 2 east, Section 10, northwest ¼, northeast 40 acres, northeast 10 acres.
[b] Complete thicknesses were not sampled in all horizons.
[c] Percent organic carbon times 1.724 = percent organic matter.
[d] Percent clay <.002 mm. interpolated between <.005 and <.001 mm.

Bluford silt loam (13)

Bluford silt loam is an upland soil, occurring on slopes ranging from about 1 to 4 percent. It has developed under forest vegetation from less than 65 inches of loess over weathered Illinoian till. Bluford is imperfectly drained and is intermediate in many characteristics between two soils associated with it — the poorly drained Wynoose (12) and the moderately well-drained Ava (14) silt loams.

Some chemical and physical properties of Bluford silt loam are given in Table 9. The samples were taken from the same profile described at the top of page 24, which was in a wooded area that had never been farmed.

Generalized profile



Description of representative profile, Bluford silt loam

A_1	(0-3″)	Dark grayish-brown (10YR 4/2) friable silt loam with weak, fine crumb structure. pH 4.5.
A_{2-1}	(3-10″)	Yellowish-brown (10YR 5/4) friable silt loam with crumb to weak platy structure. pH 4.4.
A_{2-2}	(10-19″)	Light yellowish-brown (10YR 6/4) friable silt loam with platy structure. pH 4.5.
B_{2-1}	(19-25″)	Light yellowish-brown (10YR 6/4) very firm silty clay loam with pale brown (10YR 6/3) coatings and yellowish-brown (10YR 5/6) iron stains. Prismatic structure breaking to medium blocky. pH 4.4.
B_{2-2}	(25-35″)	Grayish-brown (10YR-2.5Y 5/2) very firm silty clay to silty clay loam mottled with yellowish-brown (10YR 5/6). Prismatic structure breaking to coarse blocky. pH 4.3.
B_3	(35-42″)	Grayish-brown to light grayish-brown (10YR 5/2-6/2) very firm silty clay loam with coarse blocky structure. pH 4.4.
D	(42+″)	Grayish-brown (10YR 5/2) to brown (10YR 5/3) firm clay loam weathered Illinoian till.

Table 9. — CHEMICAL ANALYSES AND PARTICLE SIZE DISTRIBUTION OF BLUFORD SILT LOAM[a]

Horizon	Depth	pH	Organic carbon[b]	Exchangeable cations[c]			Cation exchange capacity	Base saturation	Particle size distribution		
				Ca	Mg	K			Sand 2-.05 mm.	Silt .05-.002 mm.	Clay <.002 mm.
	in.		*pct.*	*me./ 100 gm.*	*me./ 100 gm.*	*me./ 100 gm.*	*me./ 100 gm.*	*pct.*	*pct.*	*pct.*	*pct.*
A_1	0–3	4.5	1.8	.6	.6	.2	15.4	17	7.4	79.3	13.3
A_{2-1}	3–10	4.4	.6	...	...	...	....	..	7.8	79.3	12.9
A_{2-2}	10–19	4.5	.2	1.2	1.0	.2	12.3	21	6.9	74.8	18.3
B_{2-1}	19–25	4.4	.2	...	...	...	....	..	3.3	57.6	39.1
B_{2-2}	25–35	4.3	.2	5.0	5.8	.5	31.2	37	3.4	54.8	41.8
B_3	35–42	4.4	.1	...	...	...	....	..	3.8	61.3	34.9

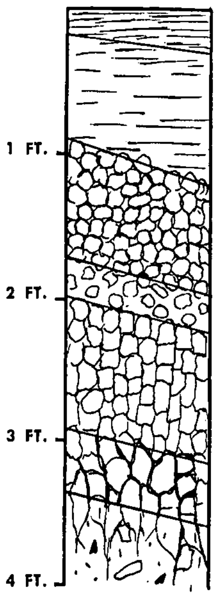
[a] Profile sampled in Williamson county. Township 8 south, Range 3 east, Section 35, northeast ¼, northeast 40 acres, southeast 10 acres.
[b] Percent organic carbon times 1.724 = percent organic matter.
[c] One me. of Ca (calcium) per 100 gm. soil = 400 pounds per acre or per 2 million pounds soil. One me. of Mg (magnesium) per 100 gm. soil = 240 pounds per acre or per 2 million pounds soil. One me. of K (potassium) per 100 gm. soil = 780 pounds per acre or per 2 million pounds soil.

Bluford is strongly acid and low in available phosphorus and available potassium. However, it responds well to good soil management, including proper soil treatment, and is used mostly for corn, soybean, wheat, and hay production. Bluford has enough slope that excess water can be removed easily with a few well-placed furrows. The more sloping areas have some erosion problems.

Ava silt loam (14)

Ava silt loam is a light-colored, upland soil developed under forest vegetation from less than 65 inches of loess over leached Illinoian till. Where Ava occurs on uneroded ridgetops in Williamson county, loess thickness ranges from about 40 to 65 inches. On the steeper slopes into drainageways, loess thickness may be considerably less than 40 inches. Ava is the moderately well-drained member of the catena that

Generalized profile



Description of representative profile, Ava silt loam

A_1	(0-3″)	Dark grayish-brown (10YR 4/2) friable silt loam with crumb structure. pH 4.6.
A_2	(3-14″)	Yellowish-brown (10YR 5/6) friable silt loam with weak platy structure. pH 4.4.
B_1	(14-23″)	Strong brown (7.5YR 5/6) friable to firm, fine silt loam with subangular blocky structure. pH 4.6.
Gray layer	(23-28″)	Brown (10YR 5/3) firm silty clay loam with blocky to subangular blocky structural aggregates mottled and coated with light gray (10YR 7/2). pH 4.4.
B_2	(28-36″)	Yellowish-brown (10YR 5/6) firm silty clay loam mottled with light brownish-gray (10YR 6/2). Blocky structure arranged in prismatic form. pH 4.4.
Fragipan B	(36-41″)	Brown (7.5YR 4/4) firm, fine silt loam mottled with pale brown (10YR 6/3). Coarse blocky structure arranged in large polygonal aggregates bounded by gray streaks. pH 4.4.
D	(41-48″)	Brown (10YR 5/3) firm clay loam mottled with some gray (10YR 6/1). Weathered Illinoian till.

Table 10. — CHEMICAL ANALYSES AND PARTICLE SIZE DISTRIBUTION OF AVA SILT LOAM[a]

Horizon	Depth	pH	Organic carbon[b]	Exchangeable cations[c] Ca	Mg	K	Cation exchange capacity	Base saturation	Particle size distribution Sand 2-.05 mm.	Silt .05-.002 mm.	Clay <.002 mm.
	in.		*pct.*	*me./100 gm.*	*me./100 gm.*	*me./100 gm.*	*me./100 gm.*	*pct.*	*pct.*	*pct.*	*pct.*
A_1........	0–4	4.6	1.20	1.3	.7	.3	13.2	18	2.5	82.8	14.7
A_2........	6–11	4.4	.17	...	...	...	....	..	2.1	80.3	17.6
B_1........	14–20	4.6	.02	.6	2.4	.2	16.3	20	2.1	73.6	24.3
Gray layer	23–28	4.4	.04	...	...	...	....	..	1.7	65.0	33.3
B_2........	30–36	4.4	.04	3.4	6.7	.4	28.3	38	1.4	63.8	34.8
Fragipan B	36–41	4.4	.03	...	...	...	....	..	1.5	71.8	26.7

[a] Profile sampled in Williamson county. Township 8 south, Range 3 east, Section 35, northeast ¼, northeast 40 acres, northeast 10 acres.
[b] Percent organic carbon times 1.724 = percent organic matter.
[c] One me. of Ca (calcium) per 100 gm. soil = 400 pounds per acre or per 2 million pounds soil. One me. of Mg (magnesium) per 100 gm. soil = 240 pounds per acre or per 2 million pounds soil. One me. of K (potassium) per 100 gm. soil = 780 pounds per acre or per 2 million pounds soil.

includes the very poorly drained Loy (11), the poorly drained Wynoose (12), and the imperfectly drained Bluford (13) soils.

Ava occurs on slopes of 2 to 18 percent. Many areas, especially on the steeper slopes, have been moderately to severely eroded.

In some areas of Williamson county Ava is so intermingled with Hickory loam (8) that the two could not be shown separately on the small-scale soil map. These complex areas are marked 8-14 on the map.

Ava is low in plant nutrients. Another problem is that the fragipan tends somewhat to restrict root penetration. Areas with slopes greater than 4 percent often are eroded. The more sloping and eroded areas should be used for hay, pasture, or timber production. Areas having slopes between 2 and 7 percent, if used for row crops, should be contoured, strip-cropped, or terraced.

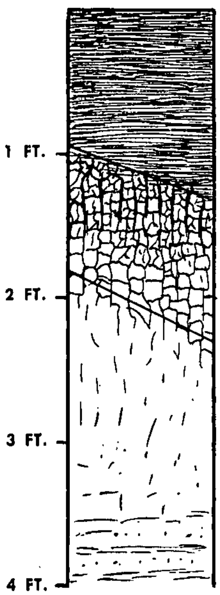
Beaucoup silty clay loam (70)

Beaucoup silty clay loam is a slightly acid to neutral, moderately dark-colored bottomland soil found on the flood plains of the Big Muddy river in northwestern Williamson county. Beaucoup is poorly to very poorly drained and is associated with Darwin clay (71). It occurs on slopes of less than 1½ percent.

Much of the Beaucoup in Williamson county is in timber. It is a productive soil for most farm crops if adequate drainage can be provided. Tile function slowly, and therefore open ditches are often the best means of removing excess water.

Beaucoup is low in available phosphorus and about medium in available potassium. Maintaining good physical condition in the surface soil is somewhat of a problem. The soil should be cultivated only when moisture conditions are favorable, and sod crops should be used in the rotation.

Generalized profile



Description of representative profile, Beaucoup silty clay loam

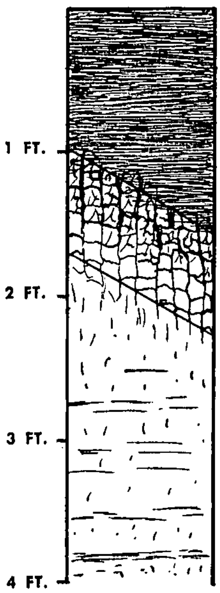
A_1	(0-14″)	Very dark gray (10YR 3/1) to dark gray (10YR 4/1) firm silty clay loam with granular to fine blocky structure. pH 6.0.
BC	(14-30″)	Gray (10YR 5/1) firm silty clay loam mottled with light gray (10YR 7/1) and yellowish-brown (10YR 5/8). Blocky to granular structure. pH 6.4.
C	(30″+)	Grayish-brown (10YR 5/2) firm silty clay loam with some soft, rusty iron concretions. pH 6.8.

Darwin clay (71)

Darwin clay is a moderately dark-colored bottomland soil that occurs in association with Beaucoup silty clay loam (70) on the flood plains of Big Muddy river. It is a very fine-textured, very poorly drained soil.

Darwin clay is usually difficult to drain and farm. Water passes through it very slowly, making tile drainage impractical. Open ditches are commonly used to remove excess water, but sometimes it is difficult to obtain suitable outlets. Maintaining tilth in the surface soil is also a problem. Darwin is slightly acid to neutral in reaction, and about medium in available phosphorus and available potassium.

Generalized profile



Description of representative profile, Darwin clay

A_1	(0-12″)	Very dark gray (10YR 3/1) to dark gray (10YR 4/1) very firm clay to silty clay with fine blocky to granular structure. pH 6.1.
BC	(12-24″)	Gray (10YR 5/1 to 6/1) very firm clay to silty clay mottled slightly with yellowish-brown (10YR 5/8). Weak, coarse blocky structure breaking to coarse granular in upper part. pH 6.3.
C	(24″+)	Olive gray (5Y 5/2) very firm clay. Structureless. pH 6.5.

Swampy area of Darwin clay. Note duck blind in upper right of picture. (Fig. 10)

Table 11.—CHEMICAL ANALYSES AND PARTICLE SIZE DISTRIBUTION OF DARWIN CLAY[a]

Depth	pH	Organic carbon[b]	Exchangeable cations[c] Ca	Exchangeable cations[c] Mg	Exchangeable cations[c] K	Cation exchange capacity	Base saturation	Particle size distribution: Sand 2-.05 mm.	Particle size distribution: Silt .05-.002 mm.	Particle size distribution: Clay <.002 mm.
in.		*pct.*	*me./ 100 gm.*	*me./ 100 gm.*	*me./ 100 gm.*	*me./ 100 gm.*	*pct.*	*pct.*	*pct.*	*pct.*
0-15	6.5	1.30	29.5	10.1	.6	47.0	88	.8	42.1	57.1
15-25	7.0	.92	30.2	11.6	.4	48.0	90	.6	41.4	58.0
25-32	7.4	.67	30.0	12.2	.4	46.5	94	.6	42.1	57.3
32-44	7.5	.52	29.7	12.5	.4	46.1	95	.6	42.6	56.8
44-55	7.8	.41	34.3	12.4	.4	49.6	98	.5	43.3	56.2

[a] Profile sampled in Lawrence county. Township 2 north, Range 12 west, Section 8, southwest ¼, northeast 40 acres, northeast 10 acres.
[b] Percent organic carbon times 1.724 = percent organic matter.
[c] One me. of Ca (calcium) per 100 gm. soil = 400 pounds per acre or per 2 million pounds soil. One me. of Mg (magnesium) per 100 gm. soil = 240 pounds per acre or per 2 million pounds soil. One me. of K (potassium) per 100 gm. soil = 780 pounds per acre or per 2 million pounds soil.

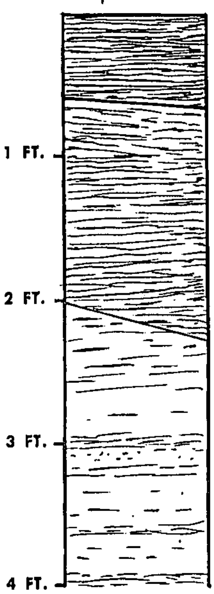
Some areas in which drainage can be provided without undue costs are used for corn and soybean production. Many areas, however, are used for pasture and hay. Very wet areas, such as most of those along the Big Muddy river, are used for timber production or wildlife (Figure 10).

Some chemical and physical properties of Darwin clay are given in Table 11 and in Figure 19, page 60.

Sharon silt loam (72)

Sharon silt loam is a light-colored soil found in small bottomlands in association with Belknap silt loam (382) and Bonnie silt loam (108). It has a thicker surface

Generalized profile



Description of representative profile, Sharon silt loam

A_{1p} (0-7″) Dark grayish-brown (10YR 4/2) friable silt loam with weak crumb structure. pH 5.5.

A_1 (7-26″) Brown (10YR 4/3) to dark grayish-brown (10YR 4/2) friable silt loam with some fine crumb structure. pH 5.1.

C (26″+) Brown (10YR 5/3), mottled with very pale brown (10YR 7/3) and yellowish-brown (10YR 5/8), friable silt loam to loam with occasional sandy lenses. pH 5.4.

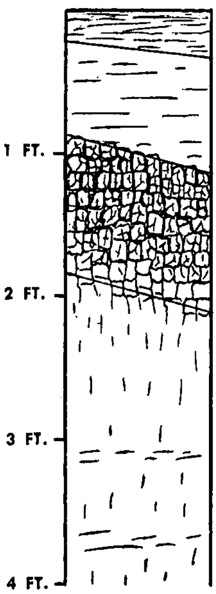
soil than Belknap or Bonnie and has better drainage, being moderately well-drained to well-drained. Sharon has formed in recent alluvium and does not show much soil development.

Where untreated, Sharon is medium acid, low in available phosphorus, and medium to low in available potassium. After proper treatment, it is a productive soil, and is used largely for corn and soybean production. In very small bottoms Sharon is often used for pasture.

Okaw silt loam (84)

Okaw silt loam is a nearly level to depressional, light-colored, poorly to very poorly drained soil found on terraces along the Big Muddy river. In Williamson county it has developed under timber vegetation from less than 14 inches of silty material on Wisconsin-age, slack-water-deposited clays. It is associated with Hurst (338) and Colp (122) soils. Okaw differs from Hurst, principally, in having developed from less silty material and in being somewhat more poorly drained. It differs from Colp mainly in having poorer natural drainage.

Generalized profile



Description of representative profile, Okaw silt loam

A_1	(0-4″)	Grayish-brown (10YR 5/2) firm silt loam to silty clay loam with weak crumb to weak platy structure. pH 4.6.
A_2	(4-7″)	Light gray (10YR 7/1 to 7/2) firm silt loam to silty clay loam with weak platy to granular structure. pH 4.8.
B	(7-20″)	Grayish-brown (10YR 5/2) to light olive brown (2.5Y 5/4) very firm clay with blocky structure breaking to coarse granular. pH 4.6.
C	(20″+)	Grayish-brown (2.5Y 5/2) very firm clay with very little structural development. pH 5.0. pH values usually increase with depth and material may be calcareous below 50 inches.

Okaw is naturally low in productivity. It is strongly acid, low in available phosphorus, and low to medium in available potassium. It also has a very fine-textured B horizon, which has somewhat unfavorable moisture conditions for plants. Drainage is a problem. Tile do not function satisfactorily, so open ditches must be used.

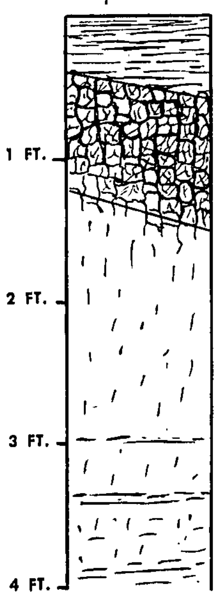
Okaw is better adapted for small-grain crops and pasture than for row crops such as corn and soybeans. It will support fair growth of pin oak and gum trees (Figure 11).

Pin oaks growing on Okaw silt loam. Okaw is not well suited to row crops, but may be used for small grains and pasture, as well as for pin oak and gum trees. (Fig. 11)

Jacob clay (85)

Jacob clay is a very poorly drained, very fine-textured, light-colored soil found on flat, low-lying, or depressional bottomland areas. It is not an extensive soil type in Williamson county. Jacob occurs in association with Beaucoup (70) and Darwin (71) soils, along the Big Muddy river in the northwestern part of the county.

Generalized profile



Description of representative profile, Jacob clay

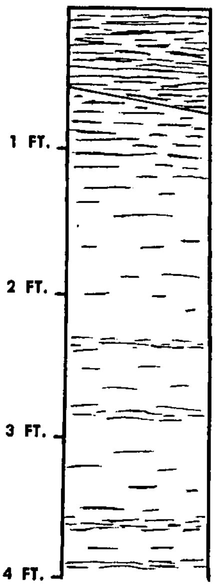
A_1	(0-5″)	Dark gray (10YR 4/1) to gray (10YR 5/1) very firm clay to silty clay with weak granular structure. pH 4.9.
BC	(5-14″)	Gray (10YR 6/1) to light gray (10YR 7/1) very firm clay with weak, medium blocky structure breaking to coarse granular. pH 4.4
C	(14″+)	Gray (5Y 6/1) to light olive gray (5Y 6/2) very firm clay with some weak blocky structure, but for the most part nearly massive. pH 4.4 in upper part, but may become calcareous below 60 inches.

Jacob clay is very difficult if not impossible to drain adequately. It is strongly acid, low in available phosphorus, and about medium in available potassium. Because of its adverse physical properties, soil treatment may not be profitable on this soil although there is very little information available on this point. Jacob is sometimes used for pasture but most areas are in trees, often pure stands of pin oak.

Bonnie silt loam (108)

Bonnie silt loam is a gray, poorly to very poorly drained soil found in low-lying bottomland areas that have had poor natural outlets. It occurs in association with the imperfectly drained Belknap (382) and the moderately well-drained to well-drained Sharon (72) soils. Besides being more poorly drained than Belknap and Sharon, Bonnie also has a thinner surface horizon (less than 8 inches thick). It has developed from light-colored, acid, medium-textured sediments.

Generalized profile



Description of representative profile, Bonnie silt loam

A_1	(0-4″)	Dark grayish-brown (10YR 4/2) to grayish-brown (10YR 5/2) friable silt loam with weak crumb to platy structure. pH 4.7.
C	(4-15″)	Light brownish-gray (10YR 6/2) to light gray (10YR 7/2) friable silt loam with numerous very dark grayish-brown (10YR 3/2) iron stains and concretions. Nearly structureless. pH 4.7.
C	(15″+)	Mixed light brownish-gray (10YR 6/2) and white (10YR 8/1) friable silt loam with numerous iron concretions. Structureless, breaking out in large irregular clods when dry. pH 4.3.

A large improved pasture on Bonnie silt loam. Although Bonnie can be used for row crops if it is properly drained and fertilized, it is often better used for pasture or timber. (Fig. 12)

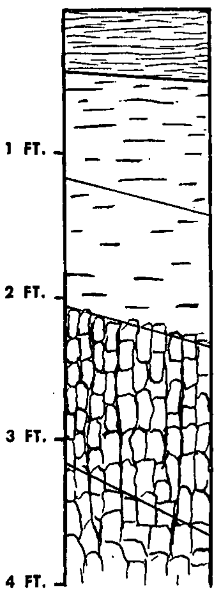
Bonnie is strongly acid and low in available phosphorus and available potassium. Besides having a fertility problem, Bonnie also has a drainage problem. Open ditches are commonly used to remove excess water since tile seldom function satisfactorily in this soil. Low organic-matter content of the surface soil makes the maintenance of good physical condition a problem. Bonnie, if adequately drained and fertilized, grows reasonably good crops of corn and soybeans. However, many areas are used for pasture and some areas are in timber (Figure 12).

Racoon silt loam (109)

Racoon silt loam is a light-colored, very poorly to poorly drained soil formed from colluvial sediments at the bases of slopes or near the heads of drainageways. It has developed on slopes of less than 1½ percent under forest vegetation. Where Racoon occurs at the base of a slope, it usually grades gradually into bottomland soils such as Bonnie silt loam (108). The depth to the B horizon in Racoon ordinarily varies between 24 and 35 inches.

Racoon is used for grain and hay production as well as for pasture. However, for good crop growth, drainage by means of ditches must be provided, and large applications of soil amendments must be made. Racoon, besides being strongly acid, is usually low in both available phosphorus and available potassium.

Generalized profile



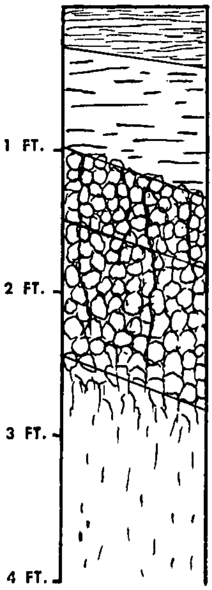
Description of representative profile, Racoon silt loam

A_p	(0-6″)	Grayish-brown (10YR 5/2) friable silt loam with weak crumb structure. pH 5.0.
A_{2-1}	(6-18″)	Light brownish-gray (10YR 6/2) friable silt loam with weak platy structure and many very dark grayish-brown (10YR 3/2) iron concretions. pH 4.9.
A_{2-2}	(18-25″)	Light gray (10YR 7/1) friable silt loam with thin platy structure. Numerous iron concretions. pH 4.8.
B_2	(25-35″)	Light gray (10YR 7/2) firm silty clay loam mottled with yellowish-brown (10YR 5/8). Prismatic structure breaking to blocky. pH 4.8.
B_3	(35-48″)	Light gray (10YR 7/2) firm silty clay loam mottled with pale brown (10YR 6/3) and yellowish-brown (10YR 5/8). Weak, coarse blocky structure. pH 5.0.

Colp silt loam (122)

Colp silt loam is a light-colored, moderately well-drained soil developed under forest. It occurs in the terrace area along Big Muddy river where the sediments are Wisconsin-age, lake-laid clays covered with less than 24 inches of loess. Colp

Generalized profile



Description of representative profile, Colp silt loam

A_1	(0-3″)	Dark gray (10YR 4/1) friable silt loam with weak, granular to crumb structure. pH 5.1.
A_2	(3-14″)	Pale brown (10YR 6/3) to brown (10YR 5/3) friable silt loam with weak platy structure. pH 4.8.
B_1	(14-20″)	Yellowish-brown (10YR 5/4) to brown (10YR 5/3) firm silty clay loam to silty clay with subangular blocky structure. pH. 4.8.
B_2	(20-30″)	Brown (10YR 5/3) very firm clay, mottled with light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/8), in lower part. Subangular blocky to blocky structure. pH 4.9.
C	(30″+)	Pale brown (10YR 6/3) very firm clay, extremely plastic when moist and lacking structure except in the upper part. pH 6.3.

occurs in association with Hurst (338) and Okaw (84) soils. Slopes of Colp range from about 2 percent to over 30 percent.

Profiles of Colp on the steeper slopes are somewhat thinner than the one described above. On steep slopes that have been cultivated, the A horizon is often absent because of erosion.

Colp soils on the lesser slopes are used largely for grain production. Moderate slopes are used for grain, hay, and pasture. Many of the steep slopes are in forest and should remain so. Colp is strongly acid, low in available phosphorus, and medium to high in available potassium. Because of the slow permeability of the lower subsoil, runoff on Colp is often rapid, causing serious erosion on slopes greater than about 3 percent.

In Williamson county some naturally imperfectly drained soil areas were included with Colp.

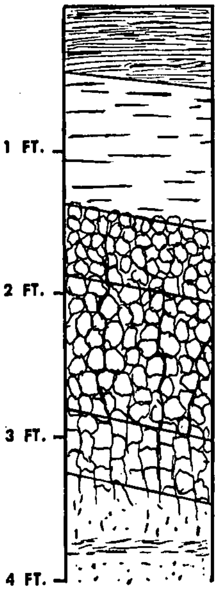
Starks silt loam (132)

Starks silt loam is a light-colored terrace soil developed under forest vegetation on slopes of less than 1½ percent. The parent materials are medium-textured sediments, with some sandy lenses usually present below about 40 inches. Starks occurs in association with Camden silt loam (134) in the Big Muddy river terrace area on the upper terrace level, usually near the break into the lower terrace level.

Because Starks occurs on nearly level areas, drainage is often required for the best crop growth. A few well-placed furrows are usually sufficient to remove excess water.

Starks is moderately acid, about medium in available phosphorus, and usually high in available potassium. Organic-matter content is low. Starks responds well to good soil management and is used mainly for corn, soybean, wheat, and hay production.

Generalized profile



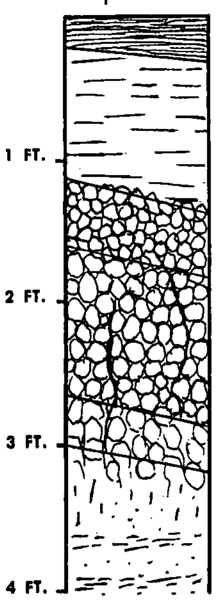
Description of representative profile, Starks silt loam

A_p	(0-7″)	Dark grayish-brown (10YR 4/2) friable silt loam with weak crumb structure. pH 5.8.
A_2	(7-18″)	Pale brown (10YR 6/3) friable silt loam with platy structure. pH 5.5.
B_1	(18-24″)	Brown (10YR 5/3) firm silty clay loam mottled with yellowish-brown (10YR 5/8) and gray (10YR 6/1). Subangular blocky structure. pH 5.0.
B_2	(24-35″)	Yellowish-brown (10YR 5/4) firm silty clay loam mottled with light brownish-gray (10YR 6/2). Subangular blocky structure. pH 5.2.
B_3	(35-40″)	Light yellowish-brown (10YR 6/4) firm silty clay loam mottled with gray (10YR 6/1). Weak blocky structure. pH 5.2.
C	(40″+)	Pale brown (10YR 6/3) loam to loose sandy loam. Structureless. pH 5.3.

Camden silt loam (134)

Camden silt loam is a light-colored, well-drained to moderately well-drained soil developed from medium-textured, Wisconsin-age sediments under forest vegetation. It occurs in the terrace area along Big Muddy river in association with Starks

Generalized profile



Description of representative profile, Camden silt loam

A_1	(0-3″)	Dark grayish-brown (10YR 4/2) friable silt loam with weak crumb structure. pH 5.8.
A_2	(3-14″)	Brown (10YR 5/3) friable silt loam with platy structure. pH 5.4.
B_1	(14-20″)	Yellowish-brown (10YR 5/4) firm silty clay loam with subangular blocky structure. pH 5.5.
B_2	(20-34″)	Yellowish-brown (10YR 5/6) to dark yellowish-brown (10YR 4/4) firm silty clay loam with subangular blocky structure. pH 5.6.
B_3	(34-40″)	Yellowish-brown (10YR 5/6) firm clay loam with weak subangular blocky structure. pH 5.6.
C	(40″+)	Brown (10YR 5/3) loose sandy loam to loam. Structureless. pH 5.5.

Table 12. — CHEMICAL ANALYSES AND PARTICLE SIZE DISTRIBUTION OF CAMDEN SILT LOAM[a]

Horizon[b]	Depth	pH	Organic carbon[c]	Exchangeable cations[d]			Cation exchange capacity	Base saturation	Particle size distribution		
				Ca	Mg	K			Sand 2-.05 mm.	Silt .05-.002 mm.	Clay <.002 mm.
	in.		*pct.*	*me./ 100 gm.*	*me./ 100 gm.*	*me./ 100 gm.*	*me./ 100 gm.*	*pct.*	*pct.*	*pct.*	*pct.*
A_2	5½–12	6.8	.60	4.9	1.8	.2	10.2	70	15.5	60.5	12.0
B_{2-1}	18–23	4.9	.12	5.0	2.1	.3	16.6	45	15.3	29.9	27.4
B_{2-2}	23–30	4.8	.13	4.7	2.7	.3	17.8	43	21.0	23.0	28.0
B_{2-3}	30–40	4.8	.14	5.7	3.6	.3	20.4	47	10.1	31.1	29.4
B_3	40–48	4.8	.10	5.8	3.7	.3	21.3	46	4.3	37.3	29.2
C_1	48–60	4.6	.07	5.0	3.4	.3	18.2	48	19.5	29.9	25.3

[a] Profile sampled in Lawrence county. Township 4 north, Range 12 west, Section 21, southeast ¼, northeast 40 acres, northwest 10 acres.
[b] Analyses were not run on the following horizons: A_p, 0-5½ inches; A_3, 12-15 inches; B_1, 15-18 inches.
[c] Percent organic carbon times 1.724 = percent organic matter.
[d] One me. of Ca (calcium) per 100 gm. soil = 400 pounds per acre or per 2 million pounds soil. One me. of Mg (magnesium) per 100 gm. soil = 240 pounds per acre or per 2 million pounds soil. One me. of K (potassium) per 100 gm. soil = 780 pounds per acre or per 2 million pounds soil.

silt loam (132) and is usually found on the break from the higher terrace level to the lower terrace level. Camden in Williamson county occurs on slopes ranging from 1 to about 18 percent gradient.

Camden is moderately to strongly acid, usually low in available phosphorus, and about medium in available potassium. It responds well to good management, and where not too sloping, is used for corn, soybean, and wheat production. The steeper slopes should be used for hay and pasture.

Some physical and chemical properties of Camden are given in Figure 21, page 62, as well as in Table 12.

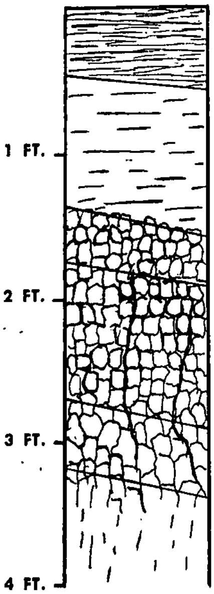
Stoy silt loam (164)

Stoy silt loam is a light-colored upland soil found in association with Weir (165) and Hosmer (214) in western and southwestern Williamson county. These soils have developed from thicker loess (65 to about 150 inches) than Wynoose (12), Bluford (13), and Ava (14) in the northeastern part of the county, and are not as highly weathered.

The loess from which Stoy has developed may be underlain by weathered Illinoian till, bedrock residuum, or sandstone bedrock. Stoy has developed under forest on slopes ranging between 1 and 7 percent and is imperfectly drained.

Stoy is strongly acid, low in available phosphorus, and low to medium in available potassium. Organic matter and nitrogen are also low. However, this soil responds well to soil treatment and is used for corn, soybean, wheat, and hay production.

Generalized profile



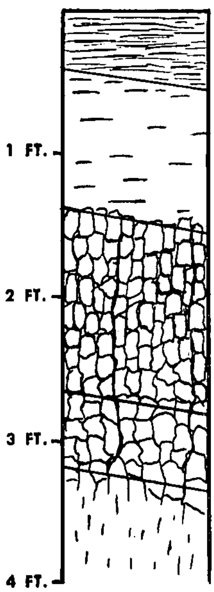
Description of representative profile, Stoy silt loam

A_p	(0-6″)	Dark grayish-brown (10YR 4/2) to grayish-brown (10YR 5/2) friable silt loam with weak crumb structure. pH 5.0.
A_2	(6-18″)	Pale brown (10YR 6/3) to light yellowish-brown (10YR 6/4) friable silt loam with platy structure. pH 4.9.
B_1	(18-22″)	Brown to pale brown (10YR 5/3 to 6/3) firm silty clay loam with blocky-to subangular blocky structure. Some light gray (10YR 7/1) mottles are present. pH 4.6.
B_2	(22-32″)	Brown (10YR 5/3) firm silty clay loam mottled with light brownish-gray (10YR 6/2). Blocky structure. pH 4.7.
B_3	(32-40″)	Pale brown (10YR 6/3), mottled with light brownish-gray (10YR 6/2), firm silty clay loam. Coarse blocky structure. pH 4.8.
C	(40″+)	Pale brown (10YR 6/3), mottled with gray (10YR 6/1), friable silt loam. Nearly structureless. pH 4.9.

Weir silt loam (165)

Weir silt loam is a light-colored, poorly to very poorly drained, upland soil developed under forest. The parent material is 65 to about 150 inches of loess on weathered Illinoian till, bedrock residuum, or sandstone bedrock. Weir occurs on slopes of less than 1½ percent in association with Stoy (164) and Hosmer (214). In morphology, Weir is quite similar to Wynoose silt loam (12), but since it has

Generalized profile



Description of representative profile, Weir silt loam

A_p	(0-6″)	Grayish-brown (10YR 5/2) friable silt loam with weak crumb structure. pH 4.9.
A_2	(6-19″)	Light gray (10YR 7/1 to 7/2) friable silt loam with platy structure. pH 4.8.
B_2	(19-34″)	Mixed light gray (10YR 7/1) and pale brown (10YR 6/3), with spots of yellowish-brown (10YR 5/8), firm to very firm silty clay loam with blocky structural aggregates, arranged in prismatic form. pH 4.7.
B_3	(34-42″)	Light brownish-gray (10YR 6/2) mottled with yellowish-brown (10YR 5/8) firm silty clay loam with coarse blocky structure. pH 4.6.
C	(42″+)	Light brownish-gray (10YR 6/2), mottled faintly with yellowish-brown (10YR 5/8), friable silt loam with little structure. pH 5.0.

Table 13. — CHEMICAL ANALYSES AND PARTICLE SIZE DISTRIBUTION OF WEIR SILT LOAM[a]

Horizon	Depth	pH	Organic carbon[b]	Exchangeable cations[c]			Cation exchange capacity	Base saturation	Particle size distribution		
				Ca	Mg	K			Sand 2-.05 mm.	Silt .05-.002 mm.	Clay <.002 mm.
	in.		*pct.*	*me./100 gm.*	*me./100 gm.*	*me./100 gm.*	*me./100 gm.*	*pct.*	*pct.*	*pct.*	*pct.*
A_1	0–8	6.2	.70	6.8	2.1	.3	13.6	69	7.5	79.3	13.2
A_2	8–17	4.6	.07	2.6	1.0	.3	11.1	37	7.6	77.8	14.6
B_1	17–21	4.4	.05	4.3	4.0	.5	23.2	39	4.7	65.1	30.2
B_2	21–39	4.6	.08	10.7	3.7	.5	32.4	48	3.1	58.7	38.2
B_3	39–46	4.8	.02	7.0	6.7	.4	24.3	60	2.7	70.7	26.6

[a] Profile sampled in Lawrence county. Township 3 north, Range 12 west, Section 2, northwest ¼, northwest 40 acres, northwest 10 acres.
[b] Percent organic carbon times 1.724 = percent organic matter.
[c] One me. of Ca (calcium) per 100 gm. soil = 400 pounds per acre or per 2 million pounds soil. One me. of Mg (magnesium) per 100 gm. soil = 240 pounds per acre or per 2 million pounds soil. One me. of K (potassium) per 100 gm. soil = 780 pounds per acre or per 2 million pounds soil.

developed from thicker loess, it is less weathered and less developed than Wynoose (Tables 8 and 13).

Weir is strongly acid, low in available phosphorus, and low to medium in available potassium. While this soil responds fairly well to soil amendments and good cultural practices, drainage is one of the first requirements for improving its productivity. Drainage can usually be provided best by means of surface ditches, since tile do not function satisfactorily in the slowly permeable, claypan B horizon. A few areas are so low-lying that rather deep cuts must be made through surrounding soils to secure adequate outlets.

In the fall of 1955, deep tillage and deep fertilization experiments were started on Weir silt loam at the Cooperative Agronomy Research Center, Carbondale (*4*). To date neither deep tillage nor deep fertilization has increased yields over those obtained with conventional tillage or soil treatment.

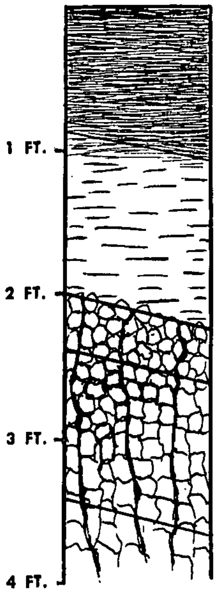
Weir is used for grain, hay, and pasture production.

Lukin silt loam (167)

Lukin silt loam is a dark to very dark grayish-brown soil developed under grass from loess and colluvial sediments near drainageways or at the base of slopes from surrounding higher land. It occurs on topography with 1- to 4-percent gradients. An imperfectly drained soil, Lukin is associated with the poorly to very poorly drained Chauncey silt loam (287) and also with Hoyleton (3) and Richview (4) soils. In many respects, it is somewhat similar to Hoyleton silt loam but differs chiefly in that the depth to the B horizon is greater than 24 inches, whereas the depth to the B in Hoyleton is less than 24 inches.

Lukin silt loam is a productive soil and is used largely for grain production. Since it is strongly acid, low in available phosphorus, and about medium in available potassium, rather large amounts of limestone and fertilizer must be applied to produce high crop yields. Ordinarily drainage is not a serious problem on Lukin. Erosion may become serious on the more sloping areas if steps are not taken to control it.

Generalized profile



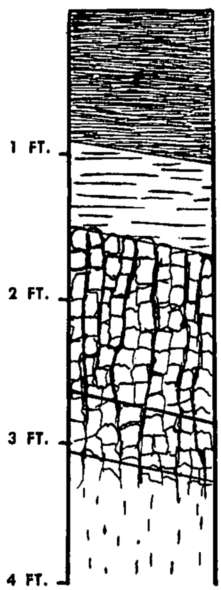
Description of representative profile, Lukin silt loam

A_1	(0-12″)	Dark to very dark grayish-brown (10YR 4/2 to 3/2) friable silt loam with weak crumb structure. pH 5.5.
A_2	(12-26″)	Brown to pale brown (10YR 5/3 to 6/3) friable silt loam with weak crumb or coarse granular to weak platy structure. pH 5.1.
B_1	(26-30″)	Pale to very pale brown (10YR 6/3 to 7/3) firm silty clay loam mottled with light gray (10YR 7/1) and yellowish-brown (10YR 5/8). Blocky to subangular blocky structure. pH 4.8.
B_2	(30-38″)	Gray (10YR 6/1) to light brownish-gray (10YR 6/2), mottled with yellowish-brown (10YR 5/8), firm silty clay loam with blocky structure. pH 4.6.
B_3	(38-48″)	Light brownish-gray (10YR 6/2), mottled with yellowish-brown (10YR 5/8), firm, coarse silty clay loam with weak blocky structure. pH 5.0.

Marissa silt loam (176)

Marissa silt loam is a moderately dark-colored, poorly to imperfectly drained soil formed from less than 24 inches of silty material on water-deposited silty clay or clay of Wisconsin age. Marissa developed under mixed grass and forest vegetation.

Generalized profile



Description of representative profile, Marissa silt loam

A_1	(0-9″)	Very dark gray (10YR 3/1) to dark gray (10YR 4/1) friable silt loam with crumb to granular structure. pH 6.0.
A_2	(9-18″)	Grayish-brown (10YR 5/2) to light brownish-gray (10YR 6/2) friable silt loam with granular to weak platy structure. pH 5.0.
B_2	(18-32″)	Gray (10YR 5/1) mottled with yellowish-brown (10YR 5/8) firm, fine silty clay loam with blocky structure. pH 5.2.
B_3	(32-40″)	Gray (10YR 5/1), mottled with yellowish-brown (10YR 5/8), very firm silty clay with weak blocky structure. pH 5.4.
C	(40″+)	Gray (10YR 6/1) to light brownish-gray (2.5Y 6/2) very firm silty clay or clay with little structure. pH 6.3.

Although it was forested at the time of settlement, the trees had not entirely changed some of the characteristics imparted by the earlier grass.

Marissa occurs on the Big Muddy river terrace area in the northwestern part of the county in association with Okaw (84), Hurst (338), and Colp (122) soils. Slopes of Marissa in this area range between ½ and 4 percent.

Marissa is one of the most productive soils in Williamson county. It is darker colored and has a greater nitrogen supplying power than most of the other soils. It is moderately acid, low in available phosphorus, and medium to high in available potassium.

On the more level areas, drainage is a problem. Surface ditches are usually the most satisfactory means of removing excess water although tile usually function satisfactorily if outlets are available.

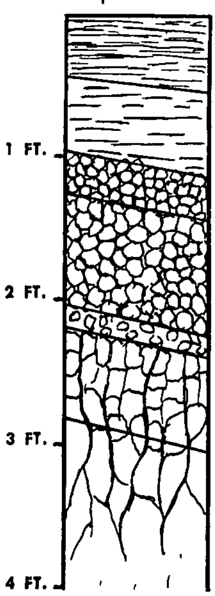
Hosmer silt loam (214)

Hosmer silt loam is a light-colored, moderately well-drained, upland soil developed under forest on 2- to 18-percent slopes. The parent material is usually about 65 inches or more of loess, but on the steeper areas, where Hosmer grades into Manitou soils, the loess may be as thin as 40 inches. Hosmer occurs in western and southwestern Williamson county, where the loess may be underlain by weathered Illinoian till, bedrock residuum, or sandstone bedrock. It is associated with the Weir (165), Stoy (164), and Manitou (340) soils.

In some areas in Williamson county, Hosmer is so intermingled with Hickory loam (8) that the two could not be shown separately on the small-scale soil map. These complex areas are marked 8-214 on the map.

The upper part of the Hosmer profile has good physical properties; it has good moisture-storage capacity and is permeable to water and plant roots. However,

Generalized profile



Description of representative profile, Hosmer silt loam

A_p	(0-6″)	Dark grayish-brown (10YR 4/2) friable silt loam with weak crumb structure. pH 5.0.
A_2	(6-14″)	Brownish-yellow to yellowish-brown (10YR 6/6-5/4) friable silt loam with platy structure. pH 4.7.
B_1	(14-18″)	Yellowish-brown (10YR 5/4) firm silty clay loam with granular to fine subangular blocky structure. pH 4.7.
B_2	(18-26″)	Yellowish-brown (10YR 5/4) to brown (7.5YR 5/4) firm silty clay loam with subangular blocky structure. pH 4.8.
Gray layer	(26-30″)	Yellowish-brown (10YR 5/4) firm silty clay loam with subangular blocky structural aggregates that are coated with light gray (10YR 7/2). pH 4.8.
Lower B	(30-38″)	Yellowish-brown (10YR 5/4), mottled with gray (10YR 6/1), firm silty clay loam with prismatic to blocky structure. pH 4.8.
Fragipan B	(38-48″+)	Yellowish-brown (10YR 5/4), mottled with light gray (10YR 7/2), firm silt loam with large polygonal or many-sided aggregates bounded by white (10YR 8/1) streaks of clay and silt. Hard and also brittle when dry. pH 4.9.

Table 14. — CHEMICAL ANALYSES AND PARTICLE SIZE DISTRIBUTION OF HOSMER SILT LOAM[a]

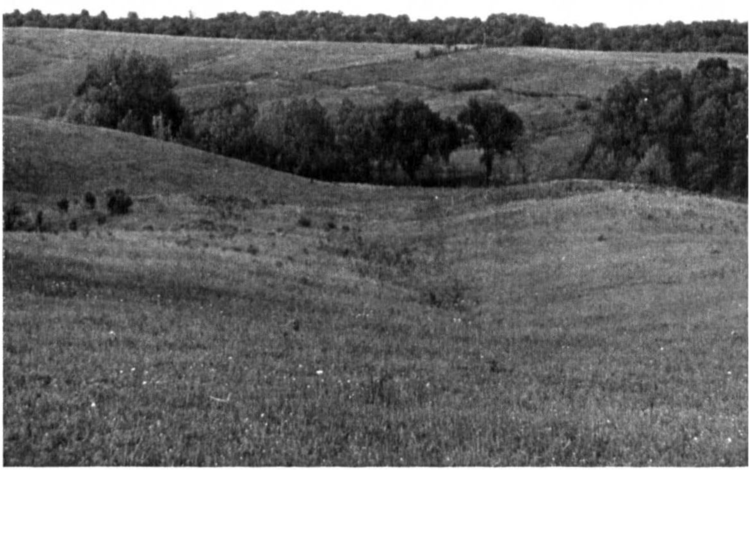
Horizon	Depth	pH	Organic carbon[b]	Exchangeable cations[c]			Cation exchange capacity	Base saturation	Particle size distribution		
				Ca	Mg	K			Sand 2-.05 mm.	Silt .05-.002 mm.	Clay <.002 mm.
	in.		*pct.*	*me./100 gm.*	*me./100 gm.*	*me./100 gm.*	*me./100 gm.*	*pct.*	*pct.*	*pct.*	*pct.*
A_p	0–8	6.5	.71	6.8	1.6	.1	13.2	66	4.5	80.7	14.8
A_2	8–15	5.0	.31	...	...	...	....	..	2.0	79.9	18.1
B_2	15–25	4.7	.05	2.6	1.7	.2	14.9	32	1.8	75.8	22.4
Gray layer	25–28	4.6	.04	...	...	...	....	..	1.4	68.2	30.4
Lower B	28–36	4.6	.04	3.7	4.5	.3	24.0	38	1.3	67.0	31.4
Fragipan B	36–48	4.6	.01	...	...	...	....	..	1.0	72.5	26.5
Fragipan C	48–56	4.7	.01	5.8	5.3	.3	20.3	59	1.0	76.0	23.0

[a] Profile sampled in Williamson county. Township 9 south, Range 2 east, Section 19, northwest ¼, northeast 40 acres, northwest 10 acres.
[b] Percent organic carbon times 1.724 = percent organic matter.
[c] One me. Ca (calcium) per 100 gm. soil = 400 pounds per acre or per 2 million pounds soil. One me. Mg (magnesium) per 100 gm. soil = 240 pounds per acre or per 2 million pounds soil. One me. K (potassium) per 100 gm. soil = 780 pounds per acre or per 2 million pounds soil.

the slightly to moderately well-developed fragipan in the lower part of the profile restricts root penetration to the gray streaks. Since few roots penetrate the fragipan, little moisture is obtained in this zone.

Hosmer is strongly acid, low in available phosphorus, and about medium in available potassium. It responds well to soil treatment and where not too steep is used for grain crops. Slopes over about 7 percent are best used for hay and pasture since erosion is severe if these slopes are cultivated (Fig. 13).

Some chemical and physical properties of Hosmer silt loam are given in Figure 21, page 62, as well as in Table 14.



Hosmer silt loam occurs on the ridge tops and more gentle slopes in this pasture. Manitou silt loam is present on the steeper slopes. (Fig. 13)

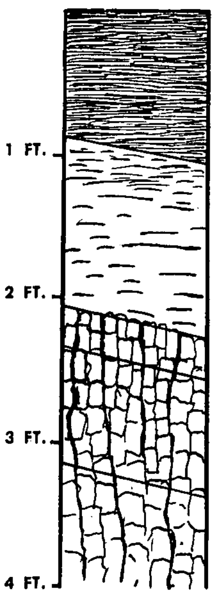
Chauncey silt loam (287)

Chauncey silt loam is a dark to very dark grayish-brown upland soil developed under grass from loess and colluvial sediments near drainageways or at the base of slopes from surrounding higher land. It occurs on land that has less than 1½ percent gradient. Chauncey is poorly to very poorly drained and is associated with the imperfectly drained Lukin silt loam (167), and also with Cisne (2) and Hoyleton (3) soils. Chauncey differs from Cisne chiefly in that the depth to the B horizon is greater than 24 inches, whereas the depth to the B horizon in Cisne is less than 24 inches.

Chauncey is moderately to strongly acid, low in available phosphorus, and low to medium in available potassium. It responds well to soil treatment provided adequate drainage has been established. The heavy texture and very slow permeability of the subsoil makes the use of tile impractical. Most areas have enough slope that a system of ditches can be used effectively to remove excess water.

Chauncey is used mainly for corn, soybean, wheat, and hay production.

Generalized profile



Description of representative profile, Chauncey silt loam

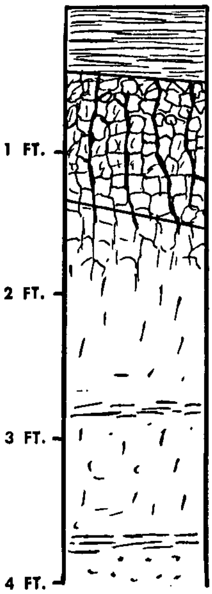
A_1	(0-14″)	Dark gray (10YR 4/1) to dark grayish-brown (10YR 4/2) friable silt loam with weak crumb structure. pH 5.0.
A_2	(14-25″)	Light gray (10YR 7/1) friable silt loam with platy structure. pH 5.0.
B_1	(25-28″)	Gray (10YR 6/1) firm silty clay loam mottled with pale brown (10YR 6/3) and rusty iron concretions. Prismatic breaking to blocky structure. pH 5.2.
B_2	(28-40″)	Light brownish-gray (10YR 6/2), mottled with pale brown (10YR 6/3), firm silty clay loam to silty clay. Prismatic breaking to blocky structure. pH 5.0.
B_3	(40-48″)	Gray (10YR 5/1) firm silty clay loam with coarse blocky structure. pH 5.2.

Petrolia silty clay loam (288)

Petrolia silty clay loam is a light-colored bottomland soil found in a few small, low-lying areas along South Fork Saline river. It is associated with Bonnie (108), Belknap (382), and Sharon (72) soils in Williamson county.

This soil is poorly to very poorly drained, and providing proper drainage is a serious problem on most areas. Surface ditches are usually best for removing excess water, although tile will function slowly if suitable outlets are available. Maintenance of good physical condition is sometimes difficult because the surface soil is low in organic matter, and also because the soil is often cultivated when it is too wet.

Generalized profile

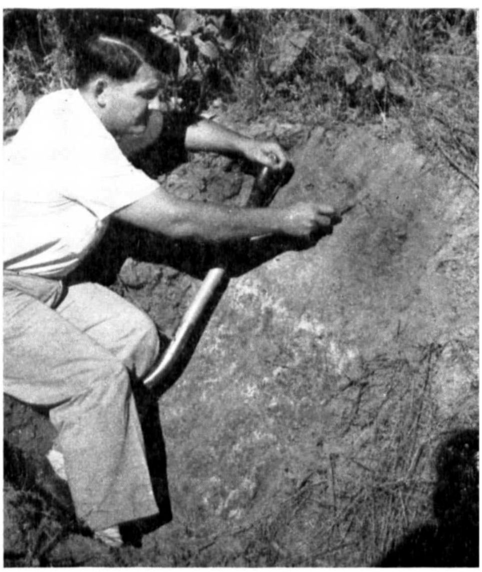


Description of representative profile, Petrolia silty clay loam

A_p	(0-6″)	Grayish-brown (10YR 5/2) firm silty clay loam with granular to fine blocky structure. pH 6.0.
BC	(6-18″)	Light brownish-gray (10YR 6/2) firm silty clay loam mottled with very dark brown (10YR 2/2) soft iron concretions. Blocky to granular structure. pH 6.4.
C	(18″+)	Light brownish-gray (10YR 6/2) and light gray (10YR 7/1), mottled with yellowish-brown (10YR 5/8), firm silty clay loam. Weak, fine blocky structure in upper part, structureless below. pH 6.4.

Petrolia is slightly acid, low in available phosphorus, and low to medium in available potassium. It responds well to soil treatment if adequately drained. Most areas of this limited soil type in Williamson county are in timber.

Grantsburg silt loam (301)

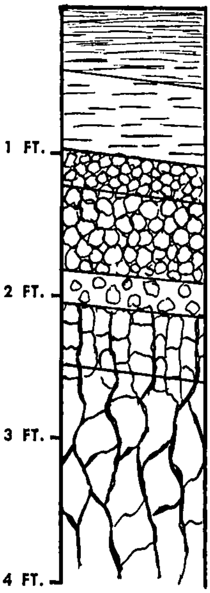


Profile of Grantsburg silt loam. Note the gray mottled fragipan zone in the lower part. (Fig. 14)

Grantsburg is a light-colored soil that has developed under forest on slopes ranging from 2 to 12 percent. It occurs in eastern and southeastern Williamson county in association with Robbs silt loam (335) and Manitou silt loam (340). Parent material of Grantsburg and Robbs is loess over sandstone residuum or sandstone bedrock, the loess seldom exceeding 80 inches in thickness. These soils have thus developed from thinner loess than Hosmer (214), Stoy (164), and Weir (165) in the southwestern part of the county, and are therefore more highly weathered.

The fragipan in Grantsburg is more strongly developed and somewhat nearer the surface of the soil profile than the fragipan of Hosmer. As a result, the Grantsburg fragipan is probably more restrictive to plant roots. Like Hosmer, Grantsburg responds well to soil treatment (see Table 22, page 66), although it is in general a more weathered and leached soil.

Generalized profile



Description of representative profile, Grantsburg silt loam

A_p (0-6″) Dark brown (10YR 4/3) friable silt loam with crumb structure. pH 5.2.

A_2 (6-12″) Yellowish-brown (10YR 5/4) friable silt loam with platy structure. pH 4.9.

B_1 (12-16″) Yellowish-brown (10YR 5/4) firm silty clay loam with granular to subangular blocky structure. pH 4.8.

B_2 (16-23″) Yellowish-brown (10YR 5/4) firm silty clay loam with subangular blocky structure. pH 4.7.

Gray layer (23-27″) Brown (10YR 5/3) firm silty clay loam with light gray (10YR 7/1) coatings. Subangular blocky structure. pH 4.6.

Lower B (27-34″) Yellowish-brown (10YR 5/4), mottled with light gray (10YR 7/1), firm silty clay loam. Prismatic structure. pH 4.7.

Fragipan (34-48″+) Brown (10YR 5/3), mottled with light gray (10YR 7/1), firm silt loam with large polygonal or many-sided aggregates bounded by white (10YR 8/1) streaks of clay and silt. Extremely hard and brittle when dry. pH 4.8.

Table 15. — CHEMICAL ANALYSES AND PARTICLE SIZE DISTRIBUTION OF GRANTSBURG SILT LOAM[a]

Horizon	Depth[b]	pH	Organic carbon[c]	Exchangeable cations[d]			Cation exchange capacity	Base saturation	Particle size distribution		
				Ca	Mg	K			Sand 2-.05 mm.	Silt .05-.002 mm.	Clay <.002 mm.
	in.		*pct.*	*me./100 gm.*	*me./100 gm.*	*me./100 gm.*	*me./100 gm.*	*pct.*	*pct.*	*pct.*	*pct.*
A_2	1-6½	4.2	.72	.5	.3	.3	10.2	14	2.4	84.6	13.0
B	12-17	4.7	.24	1.2	3.0	.3	16.7	28	2.5	71.1	26.4
B	20-24	4.6	.14	1.0	3.2	.3	16.4	28	3.7	75.1	21.2
Gray layer	24-27	4.6	.17	2.6	6.6	.4	23.7	41	1.7	66.2	31.3
Lower B	27-33	4.5	.10	3.5	7.8	.3	23.1	47	2.1	65.8	32.1
Fragipan	38-45	4.6	.05	4.1	7.4	.3	21.5	57	1.7	68.3	25.0
Fragipan	52-61	5.2	.03	4.2	5.5	.2	15.2	70	3.4	78.6	18.0

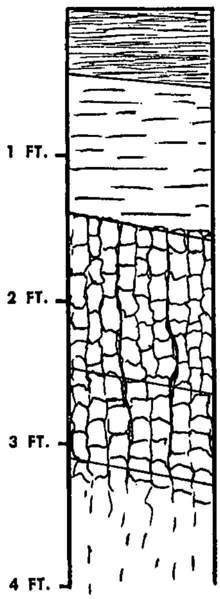
[a] Profile sampled in Pope county. Township 13 south, Range 5 east, Section 4, northwest ¼, northeast 40 acres, northeast 10 acres.
[b] Analyses were not run on all depths sampled.
[c] Percent organic carbon times 1.724 = percent organic matter.
[d] One me. Ca (calcium) per 100 gm. soil = 400 pounds per acre or per 2 million pounds soil. One me. Mg (magnesium) per 100 gm. soil = 240 pounds per acre or per 2 million pounds soil. One me. K (potassium) per 100 gm. soil = 780 pounds per acre or per 2 million pounds soil.

Robbs silt loam (335)

Robbs silt loam is an imperfectly drained upland soil developed under forest from less than 80 inches of loess over bedrock or residuum. It occurs in eastern and southeastern Williamson county in association with Grantsburg silt loam (301). Robbs is similar in many ways to Stoy silt loam (164), but has developed from thinner loess and is a more weathered soil. It occurs on slopes between 1 and 4 percent.

Since Robbs occurs on gentle slopes, neither drainage nor erosion is ordinarily a serious problem. This soil is strongly acid, low in available phosphorus, and low to medium in available potassium. Response to soil treatment is generally good (see Table 22, page 66). Robbs is used for corn, soybean, wheat, hay, and pasture production.

Generalized profile



Description of representative profile, Robbs silt loam

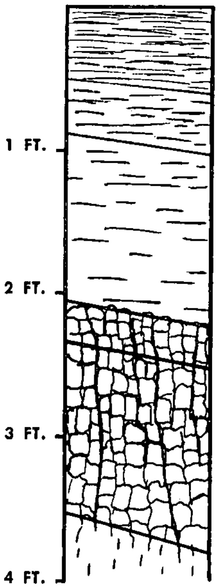
A_p	(0-6″)	Dark grayish-brown (10YR 4/2) to brown (10YR 4/3) friable silt loam with weak crumb structure. pH 5.2.
A_2	(6-19″)	Light yellowish-brown (10YR 6/4) friable silt loam with platy structure. pH 5.1.
B_2	(19-32″)	Light brownish-gray (10YR 6/2) very firm silty clay loam mottled with light gray (10YR 7/1) and dark yellowish-brown (10YR 4/4). Prismatic breaking to blocky structure. pH 4.8.
B_3	(32-42″)	Pale brown (10YR 6/3) very firm silty clay loam mottled with light gray (10YR 7/1) and yellowish-brown (10YR 5/8). Coarse blocky structure. pH 4.9.
C	(42″+)	Pale brown (10YR 6/3) to brown (10YR 5/3), mottled with gray (10YR 6/1), friable to firm silt loam. Structureless. pH 5.1.

Creal silt loam (337)

Creal silt loam is an imperfectly drained light-colored soil associated with the poorly to very poorly drained Racoon silt loam (109). Creal developed under forest from loess and colluvial sediments near drainageways or at the base of slopes from surrounding higher land. The areas where Creal occurs have grades of 1 to 4 percent. Creal resembles Bluford silt loam (13) in many of its characteristics, but has a greater depth to the B horizon (over 24 inches).

Drainage and erosion are not ordinarily serious problems. Creal is strongly acid, low in available phosphorus, about medium in available potassium, and low in organic matter. It responds well to soil amendments and is used largely for grain and hay production.

Generalized profile



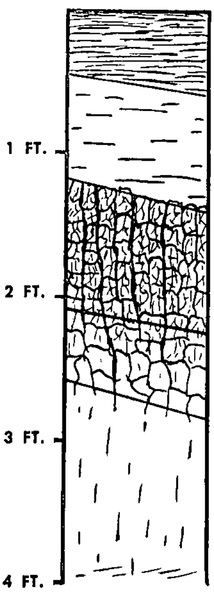
Description of representative profile, Creal silt loam

A_p	(0-6″)	Dark brown (10YR 4/3) to brown (10YR 5/3) friable silt loam with weak crumb structure. pH 5.1.
A_{2-1}	(6-12″)	Pale brown (10YR 6/3) friable silt loam with weak crumb structure. pH 5.0.
A_{2-2}	(12-26″)	Light yellowish-brown (10YR 6/4), with some very pale brown (10YR 7/4), friable silt loam with platy structure. pH 4.9.
B_1	(26-30″)	Pale brown (10YR 6/3), mottled with yellowish-brown (10YR 5/8) and light gray (10YR 7/2), firm silty clay loam with blocky structure. pH 4.9.
B_2	(30-44″)	Light brownish-gray (10YR 6/2), mottled with yellowish-brown (10YR 5/8) and light gray (10YR 7/1), firm silty clay loam. Weak prismatic breaking to blocky structure. pH 5.0.
C	(44″+)	Light brownish-gray (10YR 6/2), nearly structureless, firm to friable silty clay loam to silt loam. pH 5.3.

Hurst silt loam (338)

Hurst silt loam is a light-colored soil developed under forest from less than 24 inches of silty material over Wisconsin-age lake-laid clays. It occurs on slopes of less than 1½ percent on the terrace area along Big Muddy river and is associated with

Generalized profile



Description of representative profile, Hurst silt loam

A_p	(0-6″)	Dark grayish-brown (10YR 4/2) to grayish-brown (10YR 5/2) friable silt loam with weak crumb structure. pH 4.8.
A_2	(6-15″)	Light brownish-gray (10YR 6/2) to light gray (10YR 7/1) in lower part; friable silt loam with platy structure. pH 4.8.
B_2	(15-32″)	Light brownish-gray (2.5Y 6/2) very firm silty clay to clay with fine blocky structure arranged in prismatic form. pH 4.9.
B_3	(32-36″)	Grayish-brown (2.5Y 5/2) to olive gray (5Y 5/2) very firm clay with coarse blocky structure. pH 5.5.
C	(36″+)	Olive gray (5Y 5/2) very firm clay with little structure. pH 5.6.

Okaw (84) and Colp (122) soils. Hurst differs from Okaw chiefly in having developed from thicker silty material and in being somewhat better drained.

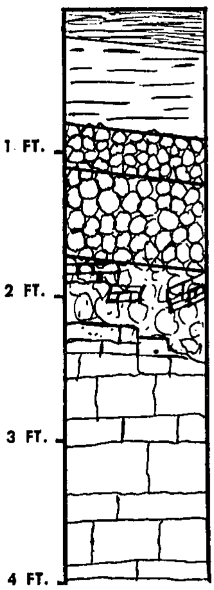
Hurst is naturally poorly to imperfectly drained. Open ditches are recommended on this soil type since the very slowly permeable subsoil will not permit satisfactory tile drainage.

Hurst is strongly acid, low in available phosphorus, and medium to high in available potassium. It is used for grain and hay production.

Wellston silt loam (339)

Wellston silt loam is a well-drained upland soil developed under forest from about 10 to 20 inches of loess over sandstone residuum or sandstone bedrock. It occurs on slopes varying from 10 to over 30 percent, in association with Manitou silt loam (340) and steep rocky land (9).

Generalized profile



Description of representative profile, Wellston silt loam

A_1	(0-3″)	Dark gray (10YR 4/1) friable silt loam with crumb structure: pH 5.2.
A_2	(3-10″)	Pale brown (10YR 6/3) to yellowish-brown (10YR 5/4) friable silt loam with crumb to platy structure. pH 5.1.
B_1	(10-14″)	Strong brown (7.5YR 5/8) firm, coarse silty clay loam with subangular blocky structure. pH 5.0.
B_2	(14-20″)	Strong brown (7.5YR 5/8) firm silty clay loam with subangular blocky structure. pH 4.9.
D_1	(20-30″)	Dark brown (7.5YR 4/4) firm to friable clay loam to sandy loam with weak structure. pH 4.9. Sandstone residuum.
D_2	(30″+)	Sandstone bedrock.

Wellston is found in unglaciated sections in the southern part of Williamson county, and also in small elevated areas in the eastern part that were not overridden by the glacier.

Wellston is not adapted for cultivated crops in Williamson county. Some areas that are not too steep may be used for pasture, but the strongly sloping areas should be used mainly for timber.

Wellston is strongly acid, low in available phosphorus, and usually high in available potassium. Because of shallow depth to bedrock, this soil is somewhat drouthy. Erosion losses, which reduce the thickness of the soil over bedrock, further decrease the moisture-supplying capacity of this soil.

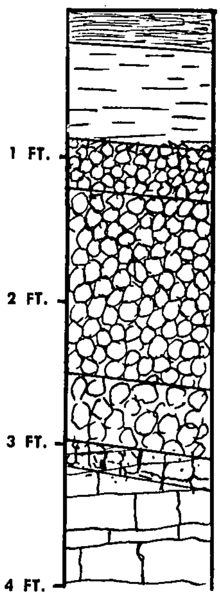
Manitou silt loam (340)

Manitou silt loam is a well-drained to moderately well-drained, light-colored soil developed under forest from about 20 to 40 inches of loess over sandstone residuum or sandstone bedrock. It occurs on 10- to 30-percent slopes in the unglaciated southern and eastern sections of Williamson county, in association with Grantsburg (301), Hosmer (214), and Wellston (339) soils, and steep rocky land (9).

Few areas of Manitou in Williamson county are adapted to cultivated crops. It is used primarily for pasture or hay production, with some areas devoted to forest.

Manitou is strongly acid, low in available phosphorus, and medium to high in available potassium. Pastures on this soil respond well to soil treatment and to good management in general. Erosion is a serious problem, but can be controlled reasonably well if vigorous pastures are grown and overgrazing is prevented.

Generalized profile



Description of representative profile, Manitou silt loam

A_1	(0-4″)	Brown to dark brown (10YR 4/3) friable silt loam with weak crumb structure. pH 6.0.
A_2	(4-12″)	Yellowish-brown (10YR 5/4) friable silt loam with weak platy structure. pH 5.0.
B_1	(12-18″)	Brown (7.5YR 4/4 to 5/4) firm, fine silt loam with granular to subangular blocky structure. pH 4.9.
B_2	(18-26″)	Brown to dark brown (7.5YR 4/4) firm silty clay loam with subangular blocky structure. pH 4.8.
B_3	(26-34″)	Brown (7.5YR 5/4) firm, fine silt loam with subangular blocky structure. pH 4.9.
D_1	(34-40″)	Brown (7.5YR 5/4) firm to friable sandy clay loam residuum.
D_2	(40″+)	Sandstone bedrock.

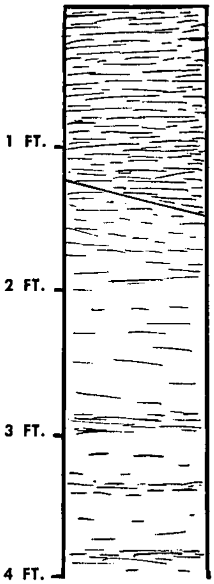
Belknap silt loam (382)

Belknap silt loam is an imperfectly drained light-colored soil derived from acid, medium-textured sediments on the flood plains of small streams in Williamson county. It occurs on slopes of less than 1½ percent in association with Bonnie silt loam (108) and Sharon silt loam (72), and in many respects is intermediate between these two soils.

Providing drainage, improving fertility, and maintaining good tilth are the major problems on Belknap. Although tile will function satisfactorily in many areas under good management, open ditches are usually the best means of securing adequate drainage. Belknap is moderately to strongly acid, and low in available phosphorus, available potassium, and organic matter; but it responds well to soil amendments if adequately drained. Sod crops in the rotation will help provide fresh supplies of organic matter and will help maintain good physical condition in the surface soil.

Belknap is used for corn, soybean, and pasture production (Figure 15). Overflow and wetness in late winter and early spring makes the growth of small grains hazardous on this soil.

Generalized profile



Description of representative profile, Belknap silt loam

A_1	(0-15″)	Dark grayish-brown (10YR 4/2) to brown (10YR 5/3) friable silt loam with weak crumb to weak platy structure. pH 5.4.
C	(15-22″)	Brown (10YR 5/3) friable silt loam. Generally massive or structureless. pH 5.3.
C	(22″+)	Very pale brown (10YR 7/3) to light gray (10YR 7/2) mottled with yellowish-brown (10YR 5/8) friable silt loam; structureless. Numerous iron concretions. pH 5.2.

A cultivated area of Belknap silt loam in a small bottomland. (Fig. 15)

GENESIS AND CLASSIFICATION OF WILLIAMSON COUNTY SOILS

Factors of Soil Formation in Various Soil Associations

Soils are developed primarily by the action of climate and living plants and animals upon parent materials. Relief or topography indirectly affects soil formation by influencing drainage conditions. The time during which parent materials have been subjected to these forces partly determines the degree to which the present soils have weathered and developed.

How these five major factors of soil development — parent material, climate, biological activity or living organisms, relief, and time — have influenced the soils of Williamson county and their distribution is discussed in the following paragraphs. (See also soil association map, page 54, and soil key, page 56.)

Parent materials result mainly from the weathering of rock. Glaciers, wind, and water may move these materials from place to place. Most Williamson county soils developed from glacial till, deposited by the ice of glaciers; loess, deposited by the wind; or alluvium and lake-bed sediments, deposited by water. Of lesser importance is residuum or parent material formed in place by the weathering of sandstone on the steep, unglaciated slopes in the southern part of the county

Glacial till, originally about a loam in texture, is the parent material of Hickory loam in soil associations H and O on the steeper slopes of the glaciated section of the county. No doubt some of these slopes were once covered by loess, but it was removed by erosion. The sand and pebbles in the Hickory soils are very little changed from what they were in the original glacial till. Some of the clay deposited in the surface of the till, as well as that formed in place, has been washed down into the B horizon or subsoil, making it a clay loam in texture.

Both glacial till and loess, when first deposited in Williamson county, were calcareous or relatively high in limestone and also contained various minerals. Soils developed from them were probably high in plant nutrients at first. But, as will be discussed later, the action of climate and living organisms over long periods of time has leached plant nutrients in varying degrees from these parent materials. The result has been soils which, in general, require large applications of lime and fertilizer for good crop growth.

As was mentioned earlier (page 9), total loess thickness on nearly level, uneroded, upland areas varies from about 150 inches in the southwestern part of the county to about 40 inches in the northeastern part. The thickness of the loess deposits has an important bearing on the degree of leaching and profile development that has taken place in the soils. Upland soils in soil association O, which developed from less than 65 inches of loess, and association X, developed from less than 80 inches, are more highly leached of plant nutrients and more strongly developed than those in soil association H (developed from more than about 65 inches) and Q (developed from more than about 80 inches).

In the thinner loess area, where annual deposits were small, considerable leaching probably occurred during each year of loess deposition. Many of the readily soluble minerals were removed as fast as they were deposited. In the soils formed from thicker deposits, annual leaching may not have kept up with the deposition of lime carbonates and other minerals. This means simply that in the same period of time, soils formed from thick loess deposits will not be developed as much as soils from thinner loess.

When deposited, the loess was predominantly of silt size and this is reflected in the silt loam texture of the A horizon. Weathering and the downward movement of fine materials in soils have increased the clay content of the B horizon in comparison with the parent loess.

Most areas of alluvial soils in Williamson county (soil association Z) are derived from sediment washed from weathered, upland soils. They are therefore acid and rather low in plant nutrients. The main soils of this character are Sharon, Belknap, and Bonnie silt loams.

The Beaucoup and Darwin soils (soil association Y), which are the main alluvial soils along the Big Muddy river, are strongly influenced by sediments from the lake-laid terrace area (soil association J) bordering the Big Muddy flood plain. Sediments and drainage waters from this terrace area are less acid than those from the upland soils and as a result Beaucoup and Darwin are not as strongly leached as Sharon, Belknap, and Bonnie.

The parent materials of soil association J are of Wisconsin age. The material is mainly clay, originally calcareous, covered by loess up to about 24 inches in thickness. The very fine clay texture has kept water from moving rapidly through the soil, and this in turn has resulted in relatively shallow leaching. Some coarser materials containing considerable sand were deposited in small areas near the break from the upper to the lower terrace level. The Camden and Starks soils have developed from these coarser, more permeable parent materials.

Sandstone bedrock is an important parent material on the steep, rocky slopes in soil associations Q and X, in the southern part of the county. These slopes originally received loess deposits, but are so steep that practically all the loess has been removed by erosion. On many of the slopes part of the weathered sandstone has also been washed away, leaving thin soils and many rock outcrops. Although the soils in this area are predominantly sandy, there is some mixing of silt washed down from loess deposits higher up on the slopes.

Most sandstone of this area (*1*) is 95 percent or more SiO_2 (silica), 1 to 2 percent Al_2O_3, and less than 1 percent Fe_2O_3 by weight. MgO and CaO content is less than 0.1 percent and K_2O is less than 0.4 percent. The sandstones of this area, therefore, do not form particularly good parent materials for soils.

Climate and vegetation. Climate is important in soil development because it influences the type of vegetation growing on soils and also largely determines the type of weathering that takes place. The humid, temperate climate of Williamson county is conducive to the growth of forest, although prairie grass was still growing on several small areas (occupied by soil association P) at the time of settlement.

In general, soils developed under grass are darker colored and higher in organic matter than those developed under forest. When forest invades prairie, it takes some time, perhaps a few centuries, for the soil to lose organic matter to the point where that remaining can be maintained or stabilized under the forest cover. It is for this reason that some soils having good forest growth when first settled appear much darker than others. The areas of Marissa silt loam in soil association J, for example, are believed to have originally developed under grass. Forest later invaded these areas, but not long enough ago to completely obliterate some of the soil features for which the grass vegetation was responsible.

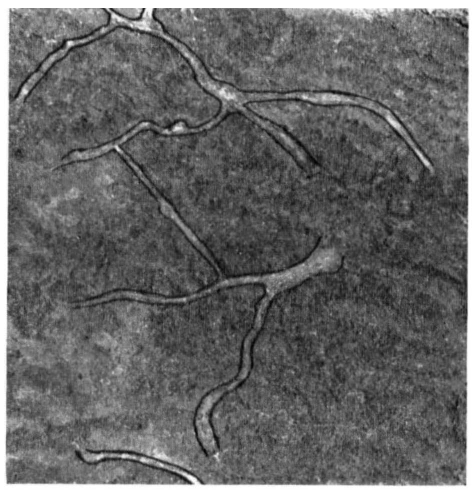
The humid, temperate climate and the forest vegetation that originally prevailed over most of Williamson county account for the predominant type of weathering in the county. In such a climate the decay of forest litter forms carbonic and other acids that increase the rate of leaching by downward-percolating water. Eventually the soils become highly acid and leached of most of the bases.

Clay and some iron and aluminum are removed from the A horizon and carried down into the B horizon, resulting in a well-developed solum. This translocation of materials is particularly pronounced on the more level-lying areas, and with time, the result is a very fine-textured B horizon or "claypan."

With climatic conditions like those in Williamson county, essentially the same type of weathering takes place under grass as under forest, and the end results are quite similar. Weathering under grass, however, is slower. Therefore, soils developed under the two types of vegetation differ more in the early and middle stages of development than in the later stages. It so happens that most of the soils of Williamson county are in the later stages of development. Differences resulting from the two types of vegetation are therefore less pronounced here than in central and northern Illinois. These differences, however, are still apparent in Williamson county. For example, Cisne, Hoyleton, and Richview (soil association P), which developed under grass, have under cultivation somewhat darker and thicker A_1 and A_p horizons than Wynoose, Bluford, and Ava (soil association O), developed under forest. In the virgin or uncultivated state the A_1 is about the same color under the two types of vegetation, but it is much thicker under grass.

While the poorly drained soils of Williamson county under both types of vegetation are either "claypan" soils or are developing in this direction, some other soils are developing fragipans or siltpans in the lower part of their profiles. These are moderately well-drained soils, formed under forest vegetation, that are undergoing a somewhat secondary stage of weathering. The Grantsburg, Hosmer, and Ava soils all have fragipans of varying degrees of development. Some recent work on fragipan soils in Illinois (*6*) gives general characteristics, field relationships, mineralogy, and micromorphology of the Hosmer.

The genesis of the fragipan in these soils is believed to be related to the stage of weathering, perhaps the texture of the parent material, and the depth to a temporary or perched water table. The fragipans of southern Illinois restrict root growth. They are very slowly permeable to water and when dry are very hard and brittle, appearing to be cemented. Upon wetting, however, the fragipans lose this hard, brittle consistency and if thoroughly wet slake down to a nonsticky or only slightly sticky mass. Whether the hardness and brittle-



Gray streaks surrounding large polygonal structure blocks in the fragipan in the lower part of a profile of Hosmer silt loam. (Fig. 16)

ness are due to cementation by some chemical agent or merely dehydration of small amounts of clay between closely packed silt particles is not definitely known. The fragipans have very coarse prismatic structural blocks bounded by gray silty and clayey streaks or channels 1 to 2 inches wide. On a horizontal plane cut through the fragipan the large blocks bounded by the gray streaks form a polygonal pattern (Figure 16).

Relief. Under given climatic conditions and in uniform parent materials relief largely controls the amount of moisture in the soil. It influences the amount of runoff, infiltration, drainage water, and also the degree of erosion. The direction of slopes is of some importance. Because south-facing slopes receive direct rays from the sun, they have more evaporation and are generally drier than north-facing slopes.

In Williamson county many of the flat areas have received runoff from higher slopes. This, coupled with the normal rainfall, has brought about a high degree of soil development, causing much of the clay originally in the A horizons to move into the B horizons and form the "claypans" already mentioned. On the more sloping areas, part of the rainfall runs off, and with less water passing through the profile, soil development has not proceeded quite as far. Soil horizons are not so strongly differentiated and chemical weathering has not been as severe. On quite steep slopes, where run-off is very rapid, geologic erosion or the removal of soil under natural conditions may almost keep pace with soil development. Soils on these slopes usually are thin and weakly developed.

Time as a factor in soil formation cannot be measured strictly in years. The length of time necessary for a certain soil to develop depends upon the other factors involved. An acid soil, for example, will develop much faster from parent materials low in lime than from materials very high in lime. Fine-textured parent materials which impede downward movement of water are leached free of lime much more slowly than are coarse-textured materials, other things being equal.

In general, soil development is faster in humid climates that support good vegetative growth than in dry climates supporting little vegetation.

On slopes where geologic erosion is great, soils may be in the early stages of development even though the slopes have been exposed to weathering for thousands of years.

Grouping of Soils According to Soil-forming Factors

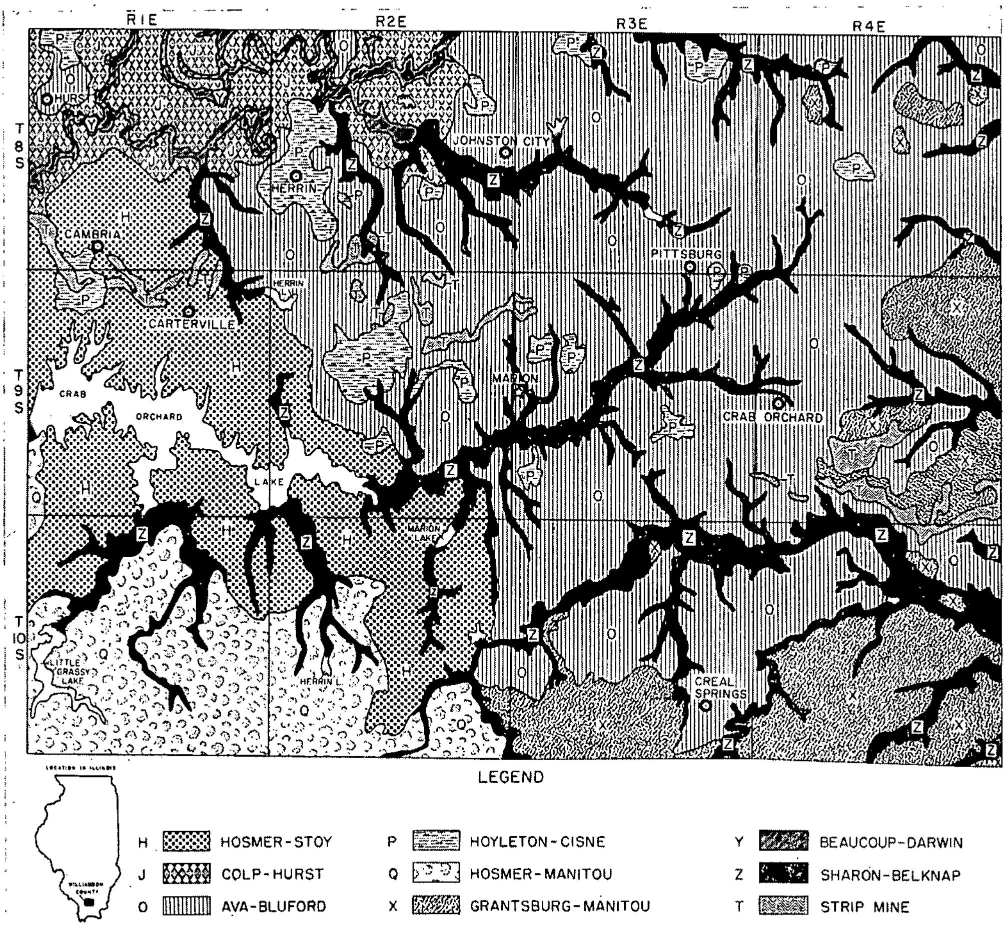
Various combinations of the five soil-forming factors just discussed have been operative in the different areas of the county. In Table 16 Williamson county soils are grouped according to parent materials and physiography, native vegetation, degree of development or degree of weathering, and natural soil drainage class. The general climate over the entire county is essentially the same.

As can be seen in Table 16, the soils of Williamson county belong to eight broad soil association areas. The location of these areas is shown in Figure 17. Also shown on this map are the major strip mine areas. Reclamation of strip mine spoil banks for pasture and forest production (Figure 18) varies with such factors as the acidity, texture, and rocky nature of the spoils (*11*).

Table 16. — WILLIAMSON COUNTY SOILS: Grouped According to Parent Materials, Native Vegetation, Degree of Development, and Natural Soil Drainage

Soil association and physiography	Parent material	Native vegetation	Degree of development	Natural soil drainage class: Very poor	Poor	Imperfect	Moderately well	Well
H (Upland)	Loess (>65″) on weathered till	Forest	Moderately strong	Weir (165)	Weir (165)	Stoy (164)	Hosmer (214)	....
	Till	Forest	Moderately strong	....	....	....	Hickory (8)	....
J (Terrace)	Loess (<24″) on lake-bed clays	Forest	Moderately strong					
			<14″ to B[b]	Okaw (84)	Okaw (84)	....	....	....
			>14″ to B	....	Hurst (338)	Hurst (338)	Colp (122)	....
		Forest-grass[a]	Moderate	....	Marissa (176)	Marissa (176)	....	....
	Mixed sand, silt, and clay	Forest	Moderate	....	....	Starks (132)	Camden (134)	Camden (134)
O (Upland)	Loess (<65″) on weathered till	Forest	Strong					
			<24″ to B	Loy (11)	Wynoose (12)	Bluford (13)	Ava (14)	....
			>24″ to B	Racoon (109)	Racoon (109)	Creal (337)	....	....
	Loess (<24″) on weathered till	Forest	Strong	....	....	Blair (5)	....	....
	Till	Forest	Moderately strong	....	....	....	Hickory (8)	....
P (Upland)	Loess (<65″) on weathered till	Grass	Strong					
			<24″ to B	....	Cisne (2)	Hoyleton (3)	Richview (4)	....
			>24″ to B	Chauncey (287)	Chauncey (287)	Lukin (167)	....	....
Q (Upland)	Loess (>80″) on sandstone	Forest	Moderately strong	....	....	Stoy (164)	Hosmer (214)	....
	Loess (40-20″) on sandstone	Forest	Moderately strong	....	....	....	Manitou (340)	Manitou (340)
	Loess (20-10″) on sandstone	Forest	Moderately strong	....	....	....	....	Wellston (339)
	Sandstone	Forest	Weak	....	....	....	....	Steep rocky land (9)
X (Upland)	Loess (<80″) on sandstone	Forest	Strong	....	....	Robbs (335)	Granstburg (301)	....
	Loess (40-20″) on sandstone	Forest	Moderately strong	....	....	....	Manitou (340)	Manitou (340)
	Loess (20-10″) on sandstone	Forest	Moderately strong	....	....	....	....	Wellston (339)
	Sandstone	Forest	Weak	....	....	....	....	Steep rocky land (9)
Y (Bottomland, slightly acid to neutral)	Light-colored silty clay loam	Forest	Weak	Petrolia (288)	Petrolia (288)	....	....	....
	Light-colored clay	Forest	Weak	Jacob (85)	....	....	....	....
	Moderately dark silty clay loam	Forest	Weak	Beaucoup (70)	Beaucoup (70)	....	....	....
	Moderately dark clay	Forest	Weak	Darwin (71)	....	....	....	....
Z (Bottomland, acid)	Light-colored silt loam	Forest	Weak	Bonnie (108)	Bonnie (108)	Belknap (382)	Sharon (72)	Sharon (72)

[a] "Forest-grass" indicates that forest has invaded a grassland area but has not yet entirely changed the soil features developed under the grass vegetation.
[b] Depth to B or total thickness of A horizon assumes no or only slight erosion. Depth to B is not necessarily associated with degree of development but is included here to indicate one of the important differences between certain groups of soils.



Broad soil associations in Williamson county. (Fig. 17)

Pine trees growing on strip mine spoil banks. They do best where spoils are somewhat leveled. (Fig. 18)

Taxonomic Classification of Williamson County Soils

In Table 17 the soils of Williamson county are classified into six categories: series, family, subgroup, group, suborder, and order. Category I, the soil type, is not included in Table 17. The soil types of Williamson county are described on pages 13 to 48.

Classification is based on profile characteristics and genesis without reference to geographic occurrence (*9*). Soils from several different soil association areas may be classified the same in the higher categories (groupings above soil type and soil series).

At the present time the soil classification system is being re-examined (*16*), and the system presented here is designed to fit into the new over-all scheme in so far as our present knowledge will permit. Soil type and the six categories in Table 17 are explained below. It will be noted from the following explanations that while soil characteristics or soil properties are the chief basis of classification, the soil characteristics having genetic significance tend to be emphasized more and more from Category V to Category VII inclusive.

Soil type (Category I) is the lowest category used in this report. It is the unit of classification with the least variation and is based on a consideration of more detailed characteristics or soil properties than any other category.

Series (Category II). The soil series differs from the soil type only in that texture of the surface soil is not considered. In other words, a soil series is divided into soil types on the basis of surface soil texture. A soil series is a group of soils that have developed from a particular kind of parent material and that have genetic horizons similar in differentiating characteristics and arrangement in the profile. These differentiating characteristics include such morphological features as kind, thickness, and arrangement of horizons, as well as their color, structure, reaction, consistence, mineralogical and chemical composition, and texture below the A horizon.

The soil series is the lowest category in the taxonomic key, Table 17.

Family (Category III). Soil series are grouped into families which are nearly uniform in properties that affect the development of plant roots and the movement and retention of soil moisture. Many of the properties used for groupings in Category III are the same as those used in Category II, but they have a wider range in Category III. The main properties considered in Category III are texture of the B horizons, permeability, consistence, bulk density, and chemical composition of the solum below 6 inches; and soil depth class or thickness of the plant rooting zone. In the Williamson county taxonomic soil key texture of the surface soil is included also, although it is a basis for separation into soil types (Category I) rather than soil families.

Subgroup (Category IV). Families are combined into subgroups on the basis of kind and sequence of all horizons considered significant genetically.

Many of the subgroups represent the central concept of the groups discussed below. Other subgroups are somewhat intermediate between the central concept of various groups in Category V, and, therefore, are called intergrades between the groups of Category V.

Group (Category V). Groups are uniform in the kind and sequence of all significant horizons except those most apt to be destroyed by cultivation or lost by erosion. Groups are based on characteristics of horizons which are be-

Table 17. — TAXONOMIC KEY OF WILLIAMSON COUNTY SOILS

Series (II)	Family (III)	Subgroup (IV)	Group (V)	Suborder (VI)	Order (VII)
Bonnie	Silt loam sediments to 42″ or more, slow permeability. pH<5.8.	Light-colored, poorly and very poorly drained soils.	Soils with more than 5% alterable minerals and water content less than 125% of mineral and organic portion.	Soil saturated with water longer than 6 weeks at some period of the year with wetness characteristics (at depths of less than 20″) of hues yellower than 10YR but no bluer than 10Y, chromas of 3 or less if with distinct or prominent mottles and 1 or less if lacking mottles.	Mineral soils with weak or no horizon development. Youthful soils which may have weak (light-colored) A_1 or A_p horizons but no B horizon. (Includes light-colored alluvial or bottomland soils with weak A_1 or A_p horizons, and other weakly developed, light-colored soils in Williamson county.)
Petrolia	Silty clay loam sediments to 42″ or more, moderately slow permeability. pH>5.8.				
Jacob	Clay sediments to 42″ or more, very slow permeability. pH<5.0.				
Sharon	Silt loam sediments to 42″ or more, moderate permeability. pH<5.8.	Light-colored, moderately well drained and well-drained soils.	Same as in Category VI and lacking evidence of a buried soil that is quite different from that of the upper 12 inches.	Soils with more than 5% minerals that weather to liberate iron or aluminum or recombine to form silicate minerals, usually or always moist but not saturated with water for periods longer than 6 weeks. Colors in hues from 10YR to and including 5Y, chromas of more than 1 if mottled, and of more than 3 if with distinct or prominent mottles.	
Belknap	Silt loam sediments to 42″ or more, moderately slow permeability. pH<5.8.	Light-colored, imperfectly drained soils, intergrades between poorly drained and well drained soils.			
Steep rocky land (A land type rather than a soil series)	Shallow solum soils (<10″), medium-textured material, D is sandstone.	Light-colored, well drained soils, intergrades to forest soils with textural B horizons.			
Beaucoup	Silty clay loam material to 42″ or more, moderately slow permeability. pH>5.8.	Moderately dark-colored, poorly and very poorly drained soils without textural B horizons.	Same as in Category VI and without textural B horizons.	Wet soils without E* horizons, saturated with water at some period during the year and with hues of 10YR or yellower but no bluer than 10Y, chromas of 3 or less on ped surfaces if mottled, or 1 or less if not mottled.	Mineral soils with moderately dark-colored A_1 horizons. (Includes the darker colored soils of Williamson county.)
Darwin	Silty clay to clay material to 42″ or more, very slow permeability. pH>5.8.				

* See footnote, page 59.

Table 17. — Continued

Series (II)	Family (III)	Subgroup (IV)	Group (V)	Suborder (VI)	Order (VII)
Marissa	Silt loam A, silty clay loam to silty clay B, silty clay or clay C, moderately slow to slow permeability.	Moderately dark-colored, imperfectly drained soils. Intergrades between moderately well-drained soils developed under grass and light-colored, poorly drained soils developed under forest.	Same as in Category VI and with textural B.	Moderately well drained and well-drained soils with textural B and having chroma of 2 or more in A_1 if solum is free of mottles, or 1 or more if mottled.	*(see above)*
Loy **Wynoose** **Racoon**	Silt loam A, silty clay loam to silty clay B, very slow permeability.	Light-colored, poorly and very poorly drained claypan soils developed under forest.	Soils with weak A_1 and abrupt textural change A to B, without irregular A to B boundary; with E* and slow to very slow permeability in E or B when saturated; without fragipan.	Soils with textural B and characteristics associated with wetness; namely mottles or iron-manganese concretions in any E* which lies immediately below the A_1 or A_p and with distinct or prominent mottles in the B, or if not mottled, chromas in B of 1 or less.	Mineral soils lacking dark-colored A_1 horizons, but having weak A_1 or A_p and a textural B with base saturation of B above or near 35% and increasing with depth into the C. Includes light-colored soils having textural B horizons in Williamson county.
Okaw	Silt loam A < 14″ thick on clay B and C, noncalcareous upper C, very slow permeability.				
Cisne **Chauncey**	Silt loam A, silty clay loam to silty clay B, very slow permeability.	Poorly drained, grassland claypan soils. A_1 thicker and somewhat darker than A_1 or A_p of forested claypans. Intergrades to dark-colored claypan soils.			
Weir **Hurst**	Silt loam A, silty clay loam to clay B, slow to very slow permeability.	Light-colored, poorly drained soils lacking abrupt textural change from A to B of true claypan soils.	Soils with weak A_1, without abrupt textural change from A to B, with E*, and without fragipan.		
Camden	Silt loam A, silty clay loam to clay loam B, sandy loam to loam C, moderate permeability.	Light-colored, moderately well drained and well-drained soils developed under forest and without fragipans (Note: Manitou sometimes has a weak fragipan).	Same as in Category VI and without fragipan or E* horizon, but with A_2 horizon.	Moderately well drained and well-drained soils with textural B with chromas of 6 or less; usually moist in some part of solum, but with seasonal dryness in parts of solum.	
Hickory	Loam to silt loam A, clay loam B, bulk density of C > 1.6, moderately slow permeability.				

* See footnote, page 59.

(*Table 17 is continued on page 58.*)

Table 17. — Continued

Series (II)	Family (III)	Subgroup (IV)	Group (V)	Suborder (VI)	Order (VII)
Colp	Silt loam A, silty clay to clay B, slow to very slow permeability.	*(see page 57)*	*(see page 57)*	*(see page 57)*	*(see page 57)*
Manitou	Silt loam A, silty clay loam B, solum 20-40″ thick on sandstone rock or residuum.				
Wellston	Silt loam A, silty clay loam B, solum 10-20″ thick on sandstone rock or residuum.				
Starks	Silt loam A, silty clay loam B, sandy loam to silt loam C, moderate permeability.	Light-colored, imperfectly drained soils. Intergrades between moderately well drained and poorly drained forest soils.			
Blair **Bluford** **Creal**	Silt loam A, silty clay loam to silty clay B, silty clay loam to clay loam C or D, slow to very slow permeability.	Light-colored, imperfectly drained soils. Intergrades between moderately well drained soils developed under forest and poorly drained claypan soils developed under forest.			
Hoyleton **Lukin**	Silt loam A, silty clay loam B, slow to very slow permeability.	Imperfectly drained grassland soils. Intergrades between moderately well drained soils developed under forest and poorly drained, dark-colored claypan soils.			

Table 17. — Concluded

Series (II)	Family (III)	Subgroup (IV)	Group (V)	Suborder (VI)	Order (VII)
Richview	Silt loam A, silty clay loam B, clay loam to silty clay loam C, slow to moderately slow permeability.	Moderately well-drained grassland soils. Intergrades between moderately well drained forest soils and moderately well drained grassland soils.	*(see above)*	*(see above)*	*(see above)*
Ava **Hosmer** **Grantsburg**	Silt loam A, silty clay loam B, moderately slow to slow permeability.	Light-colored, moderately well drained forest soils with E and fragipan.	Same as Category VI and with fragipan and tonguing of E* into B.		
Robbs **Stoy**	Silt loam A, silty clay loam B, slow permeability.	Light-colored, imperfectly drained forest soils. Intergrades between moderately well drained forest soils with fragipans and poorly drained forest soils.			

* An E horizon is a strongly developed (bleached) A_2 horizon in which the color is due primarily to the color of the sand and silt particles rather than to their coating of iron oxides.

lieved to reflect processes of less genetic importance than those considered in Category VI, the next highest category. Genetically significant differences in the horizons themselves are also considered, such as the presence or absence of fragipans, hardpans, major differences in kinds of horizon boundaries, and color and thickness of A_1 horizons.

Suborder (Category VI). Suborders are uniform in characteristics which are most important genetically. Soils within a suborder have similarities in genesis and morphology of the main horizons. This means that they are similar in mineralogy and chemistry, degree of gleying and soil moisture regimes, presence or absence of B horizons, and prominent accumulations of soluble materials.

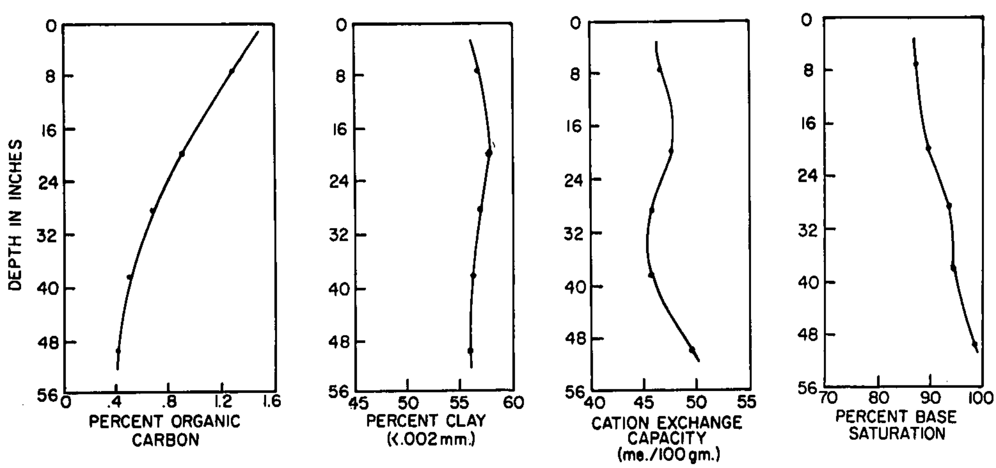
Order (Category VII). The orders are based on several critical horizons whose presence or absence provide a key either to lack of development or to the main soil-forming processes that have been active. Because of the importance of climate to soil formation, the orders are to some extent climatic zonal groups, and tend to have definite geographic ranges. If the critical horizons are B horizons, and two are present in the same solum, only the upper one is considered in Category VII.

Some Chemical and Physical Characteristics of Soils Representing Six Subgroups in the Taxonomic Classification System

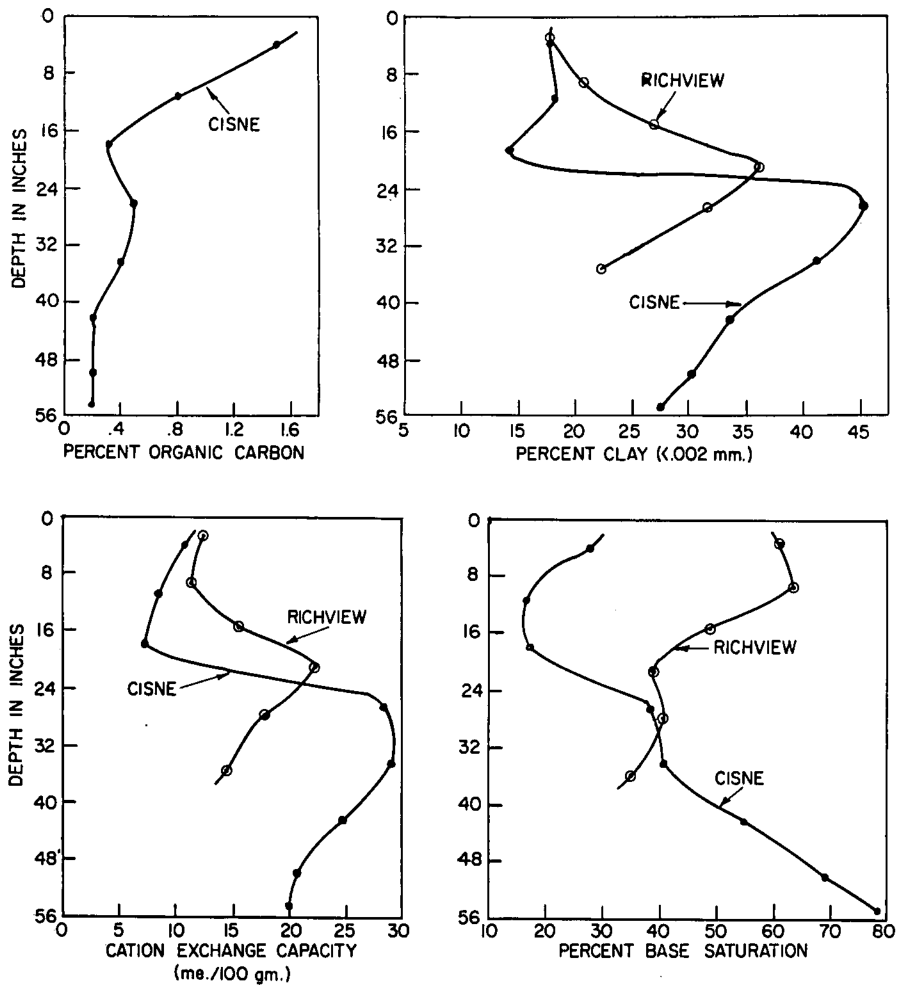
In Table 17, the soils of Williamson county are placed into 16 subgroups (Category IV). Selected chemical and physical properties of soils representing six of these subgroups are given in Figures 19, 20, and 21. These soils are also briefly discussed below. Additional data for each soil are given with the appropriate soil type description.

In Darwin, the percentage of clay (less than 2 microns) changes very little to a depth of 50 inches (Figure 19). Besides lacking a textural B horizon, Darwin has a high cation exchange capacity and high percent base saturation.

Cisne and Richview (Figure 20), are related genetically and are representative



Some chemical and physical properties of Darwin clay — a very poorly drained, moderately dark-colored, fine-textured soil without a textural B horizon. (Fig. 19)

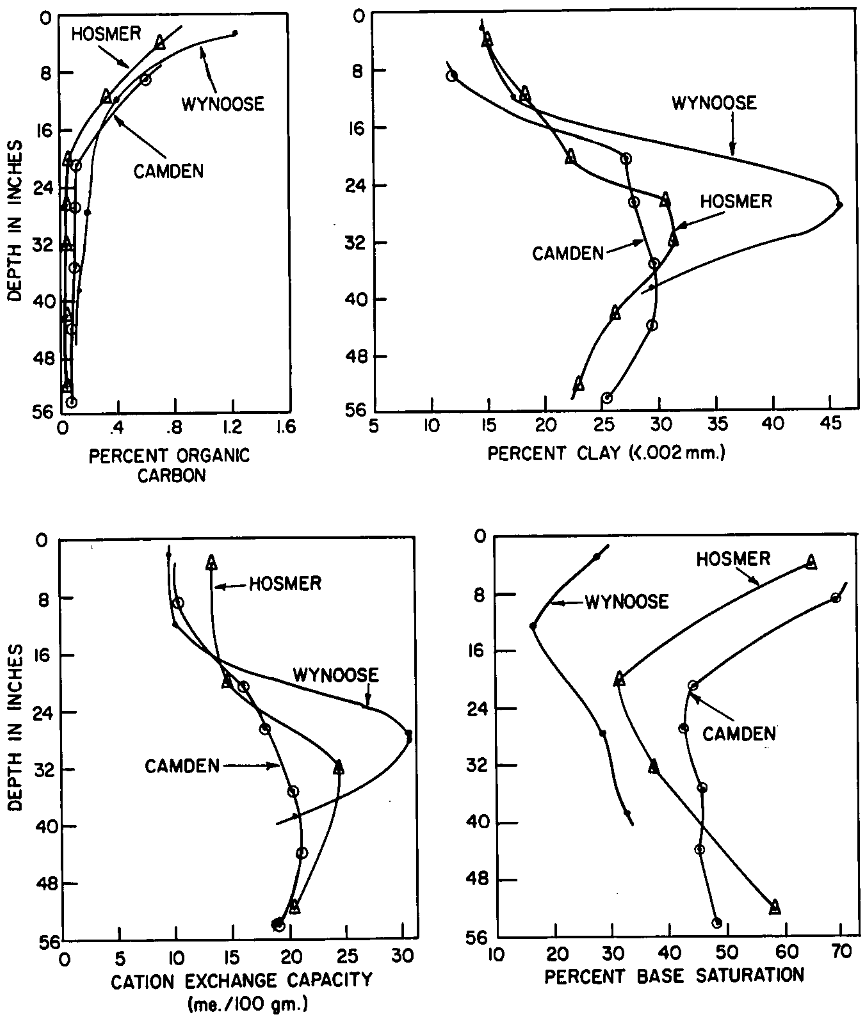


Some chemical and physical properties of Cisne and Richview silt loams. Cisne is a poorly drained claypan soil and Richview is moderately well drained. Both developed under grass, but Richview intergrades to forest soils. (Fig. 20)

of soils developed under grass. The differences between them are due largely to differences in the topography and natural drainage under which they developed. Richview is a moderately well-drained soil. Cisne, which developed on flatter areas, is a poorly drained soil with a pronounced claypan.

In Williamson county the chief differences between the two soils are that Cisne has a more abrupt textural change from the A to the B horizon and a greater maximum percentage of clay in the B than Richview. Because the B horizon of Cisne has more clay, it has a higher cation exchange capacity. The fact that the A horizon of Richview has a greater percentage of base saturation than that of Cisne may be partly related to liming.

Wynoose, Camden, and Hosmer (Figure 21) are all light-colored soils developed under forest. Wynoose is very similar to Cisne in the distribution of clay in the profile, the cation exchange capacity, and the percent base saturation (Figures 20 and 21). There is less similarity between the two soils in the



Some chemical and physical properties of Wynoose, Camden, and Hosmer silt loams. Wynoose is considered representative of light-colored claypan soils developed under forest; Camden, of light-colored, moderately well drained and well-drained forest soils without fragipans; and Hosmer, of similar soils with fragipans. (Fig. 21)

organic carbon percentages. Cisne has a thicker and somewhat darker colored A_1 horizon than Wynoose. Both soils have rather abrupt textural changes from the A to B horizon, which is typical of claypans.

Hosmer is a moderately well drained soil with a fragipan; Camden, without a fragipan, is moderately well drained to well drained. The clay distribution, the cation exchange capacity, and the percent base saturation of these two soils are quite different than those of Wynoose. Camden has a somewhat higher base saturation than Hosmer above a depth of 36 inches, but differences due to the presence or absence of a fragipan in the lower B horizon are not apparent in the data given in Figure 21. The lower B horizon of Hosmer, because of the fragipan, is generally much less permeable to water, air, and plant roots than the lower B of Camden. The A and upper B of both soils are permeable.

Table 18. — SUMMARY OF RECOMMENDED ROTATIONS FOR WILLIAMSON COUNTY BY MAPPING UNIT AND TYPE OF CONSERVATION PRACTICE

Most intensive crop rotations recommended for listed mapping units[a]

R-R-G-M[b]	R-R-G-M-M	R-R-G-M-M-M	R-G-M-M	G-M-M-M-M
		No practice[c]		
2A, 3A, 11A, 12A, 13A, 70A, 71A, 72A, 108A, 109A, 132A, 134A, 164A, 165A, 167A, 176A, 287A, 288A, 335A, 337A, 338A, 382A, 14B, 122B, 134B, 176B, 214B, 301B.	3B, 4B, 13B, 14B̄, 164B, 167B, 214B̄, 335B, 337B.		3B̄, 4B̄, 13B̄, 14C, 14C̄, 122B̄, 134C, 134C̄, 134C̲, 164B̄, 214C, 214C̄, 301C, 301C̄.	3C̄, 3C̲, 4C, 4C̄, 4C̲, 5C, 5C̄, 5C̲, 14C̲, 122C̄, 122C̲, 134D̄, 134D̲, 164C̄, 164C̲, 214C̲, 214D, 214D̄, 301C̲.
		Contouring		
3B, 4B, 13B, 14B, 14B̄, 122B, 134B, 164B, 167B, 176B, 214B, 214B̄, 301B, 335B, 337B.	3B̄, 4B̄, 13B̄, 14C, 14C̄, 122B̄, 134C, 134C̄, 134C̲, 164B̄, 214C, 214C̄, 301C, 301C̄.		3C̄, 4C, 4C̄, 5C, 5C̄, 122C, 122C̄, 134D̄, 164C̄.	3C̲, 4C̲, 5C̲, 5D̄, 8-14D̄, 8-214D̄, 14C̲, 14D, 14D̄, 122C̲, 122D̄, 134D̲, 164C̲, 214C̲, 214D, 214D̄, 301C̲, 301D̄, 339D̄, 340D̄.
		Strip cropping		
		3B, 3B̄, 4B, 4B̄, 4C, 5C, 13B, 13B̄, 14B, 14B̄, 14C, 14C̄, 122B, 122B̄, 122C, 122C̄, 134B, 134C, 134C̄, 134C̲, 134D̄, 164B, 164B̄, 164C̄, 167B, 176B, 214B, 214B̄, 214C, 214C̄, 214C̲, 301B, 301C, 301C̄, 335B, 337B.	3C̄, 4C̄, 5C̄.	3C̲, 4C̲, 5C̲, 5D̄, 8-14D̄, 8-214D̄, 14C̲, 14D, 14D̄, 122C̲, 122D̄, 134D̲, 134Ē, 164C̲, 214D̲, 214D̄, 301C̲, 301D̄, 339D̄, 339D̲, 340D̄.
		Terracing[d]		
3B, 3B̄, 3C̄, 4B, 4B̄, 4C, 4C̄, 5C, 5C̄, 13B, 13B̄, 14B, 14B̄, 14C, 14C̄, 122B, 122B̄, 122C, 122C̄, 134B, 134C, 134C̄, 164B, 164B̄, 164C̄, 167B, 176B, 214B, 214B̄, 214C, 214C̄, 301B, 301C, 301C̄, 335B, 337B.	134C̲, 134D̄.			3C̲, 4C̲, 5C̲, 5D̄, 14C̲, 14D, 14D̄, 122C̲, 122D̄, 134D̲, 134Ē, 164C̲, 214C̲, 214D, 214D̄, 301C̲, 301D̄.

Permanent cover, pasture, or woodland (above rotations do not apply)

5D̄, 5D̲, 8D̲, 8Ē, 8E̲, 8F̄, 8F̲, 8Ḡ, 8G̲, 8-14D̄, 8-14D̲, 8-14Ē, 8-14E̲, 8-14F̄, 8-14F̲, 8-214D̄, 8-214D̲, 8-214Ē, 8-214E̲, 8-214F̄, 8-214F̲, 8-214G̲, 9Ē, 9F̄, 9F̲, 9Ḡ, 9G̲, 14D, 14D̄, 14D̲, 14E, 14Ē, 14E̲, 84A, 84Ā, 84B, 84B̄, 85A, 122D̄, 122D̲, 122Ē, 122E̲, 122F̄, 122F̲, 122Ḡ, 122G̲, 134Ē, 214D̲, 214E, 214Ē, 214E̲, 301D̄, 301D̲, 339D̄, 339D̲, 339Ē, 339E̲, 339F̄, 339F̲, 339Ḡ, 340D̄, 340D̲, 340Ē, 340E̲, 340F̄, 340F̲.

[a] A mapping unit consists of a soil type, of limited slope range and of limited range in total thickness of A horizon, having large enough area to be shown on the soil map (page 65).

[b] R = row crop; G = small grain; M = rotation hay or pasture; for example, an R-R-G-M rotation includes 2 years of row crops, 1 year of small grain crops; and 1 year of rotation hay or pasture in a 4-year period.

[c] An R-G-M-M-M-M rotation may be used with no conservation practice on mapping unit 122C.

[d] An R-G-M-M-M rotation may be used with terracing on mapping units 8-14D̄, 8-214D̄, and 340D̄, although permanent cover, pasture, or woodland is generally recommended for these units.

INTERPRETIVE GROUPINGS OF SOILS FOR SPECIFIC PURPOSES

Grouping of Mapping Units According to Recommended Crop Rotations and Land Use

Some of the most important soil-management problems and the main crops grown on each soil are mentioned briefly in the soil type descriptions (pages 13 to 48). Slope and degree of erosion, as well as the soil type, need to be considered for detailed farm planning, including choice of land use and

Table 19. — AVERAGE YIELDS OF CROPS ON WILLIAMSON COUNTY SOILS UNDER A HIGH LEVEL OF MANAGEMENT[a]

Type No.	Type name	Hybrid corn	Soy-beans	Wheat	Winter oats[b]	Alfalfa hay	Mixed pasture
		bu.	*bu.*	*bu.*	*bu.*	*tons*	*days*[c]
2	Cisne silt loam	**69**	**30**	**30**	55	2.5	120
3	Hoyleton silt loam	**69**	**29**	**32**	58	2.6	125
4	Richview silt loam	64	27	29	54	2.6	125
5	Blair silt loam	50	20	22	42	2.3	110
8	Hickory loam	N	N	18	30	1.7	80
8-14	Hickory loam-Ava silt loam complex	N	N	19	32	2.0	95
8-214	Hickory loam-Hosmer silt loam complex	N	N	20	35	2.2	105
9	Steep rocky land, sandstone material	N	N	N	N	N	20
11	Loy silt loam	54	22	24	45	2.0	95
12	Wynoose silt loam	**58**	**25**	**27**	50	2.4	115
13	Bluford silt loam	**62**	**28**	**29**	54	**2.5**	120
14	Ava silt loam	**60**	26	**27**	52	**2.5**	120
70	Beaucoup silty clay loam	**65**	30	33	55	2.8	135
71	Darwin clay	**50**	24	23	45	**2.5**	120
72	Sharon silt loam	**70**	30	31	55	3.2	155
84	Okaw silt loam	N	N	17	28	1.5	80
85	Jacob clay	N	N	15	25	1.3	75
108	Bonnie silt loam	55	26	**25**	45	2.5	120
109	Racoon silt loam	**65**	27	**28**	54	2.6	125
122	Colp silt loam	58	24	26	50	2.5	120
132	Starks silt loam	80	32	32	64	2.6	125
134	Camden silt loam	75	31	31	62	2.8	135
164	Stoy silt loam	**69**	30	**30**	60	**2.7**	130
165	Weir silt loam	64	28	27	55	2.5	120
167	Lukin silt loam	74	30	**34**	60	3.0	145
176	Marissa silt loam	78	32	34	64	3.2	155
214	Hosmer silt loam	67	28	28	58	2.7	130
287	Chauncey silt loam	74	31	32	58	2.8	135
288	Petrolia silty clay loam	56	**25**	23	50	2.6	125
301	Grantsburg silt loam	58	24	26	52	2.5	120
335	Robbs silt loam	59	25	26	54	2.5	120
337	Creal silt loam	68	29	30	58	2.7	130
338	Hurst silt loam	56	25	27	50	2.4	115
339	Wellston silt loam	N	N	N	N	1.5	80
340	Manitou silt loam	55	22	24	48	2.0	95
332	Belknap silt loam	60	28	28	50	2.8	135

[a] Yields are for uneroded or only slightly eroded conditions; yields from bottomlands assume no damage from flooding. N means crop not adapted. Yields in **bold face** are based on experiments by the Illinois Agricultural Experiment Station and long-time records kept by farmers in cooperation with the Department of Agricultural Economics; the others are estimated yields. A high level of management includes intensive and near optimum application (under present conditions) of the following management practices: adequate drainage, timely use of good cultural practices, careful handling of manure, the use of limestone, phosphate, and potash as soil tests indicate, and the use of a cropping system which retards erosion and helps to maintain good tilth and the nitrogen supply. Optimum levels of nitrogen are maintained by the use of additional nitrogen fertilizers where necessary.

[b] Although winter oats occasionally fail because of winter freezing, they produce higher yields than spring oats over a period of years in Williamson county.

[c] Estimated number of days that one acre will carry one cow.

crop rotations. As mentioned earlier (page 4), specific recommendations for each mapping unit (combination of soil type, slope, and degree of erosion or total thickness of A horizon) are given in the Williamson county soil management guide (*5*).

These recommendations are summarized in Table 18, which gives land use and crop rotations with and without various conservation practices. The mapping units given in Table 18 are those shown on the assembled soil map accompanying this report. They are fewer in number than the mapping units shown on the field photographs accompanying the soil management guide. It was necessary to combine some of the mapping units to show them on the small-scale soil map. The combinations involved only the degree of erosion and were made as follows: The "0" and "1" erosion areas were combined and labeled with the soil type number and slope letter alone. The "2" erosion areas were unchanged and labeled with the soil type number and slope letter, with a bar above the letter; and "3" and "4" erosion areas of the same soil type and slope group were combined and labeled with the soil type number and slope letter, with a bar below the letter. The complete soil type, slope, and erosion legend is shown on each sheet of the soil map.

Seven rotations are recommended in Table 18. Two of them — the R-G-M-M-M and the R-G-M-M-M-M — are of minor importance and are referred to only in footnotes. The other five rotations are arranged from left to right in order of increasing protection against soil losses. They are the most intensive that can be used and still keep soil losses within reasonable limits. Less intensive rotations may of course be used. Rotations having greater percentages of grass and legumes are often more desirable,

Table 20. — ANNUAL ACRE YIELDS — BROWNSTOWN SOIL EXPERIMENT FIELD, CHIEFLY CISNE (2) AND HOYLETON (3) SILT LOAMS WITH SOME HUEY SILT LOAM (120)

8-year Average, 1949-1956, Series 100-400

Treatment[a]	Corn	Soybeans	Wheat	Mixed hay
	bu.	*bu.*	*bu.*	*tons*
0	22±4.0[b]	13±1.4[b]	4±1.4[b]	.1±.04[b]
N_2	26±6.4	15±1.9	4±2.2	.4±.13
P_2	29±3.7	14±1.9	11±3.2	.3±.12
K_2	22±3.5	14±1.8	3±1.3	.2±.06
L	39±3.5	17±1.5	17±4.2	1.3±.26
N_2P_2	24±4.5	13±1.6	10±2.8	.5±.13
N_2K_2	13±2.3	11±1.3	1±0.4	.3±.09
P_2K_2	31±9.1	14±1.7	10±3.5	.3±.09
LN_2	42±6.1	18±1.8	14±3.6	1.2±.17
LP_2	46±7.1	18±2.0	26±5.9	1.7±.25
LK_2	65±10.2	22±2.2	20±4.8	1.6±.25
$N_2P_2K_2$	44±7.4	18±2.4	21±5.1	.5±.14
LN_2P_2	49±4.7	18±2.0	31±6.2	1.7±.24
LN_2K_2	66±8.0	22±2.3	20±4.7	1.6±.24
LP_2K_2	69±10.6	23±2.3	28±5.3	2.3±.16
$LN_2P_2K_2$	75±8.6	25±3.1	40±7.0	2.3±.23

[a] 0 = no treatment; N_2 = ammonium nitrate—40 lb. on wheat and 80 lb. on corn; P_2 = superphosphate—200 lb. drilled with wheat and 200 lb. broadcast on corn; K_2 = muriate of potash—200 lb. on corn and 200 lb. on wheat; L = limestone—4 tons 1940-1942 and 2 tons 1948-1949.

[b] Standard error of mean, $SEm = \frac{SEx}{\sqrt{n}}$. The standard error of a mean indicates the variability of sample means around the true mean, and hence the reliability of the observed mean. On the basis of 8 annual crop yields included in each mean, the true mean would be expected to fall within ±2.3 SEm approximately 95 percent of the time. The standard error of the mean is also useful in judging the significance of differences between two means. If the actual difference between two means is greater than 3 times the larger SEm of the means being compared, the difference is probably significant.

especially if livestock can utilize the roughage to advantage.

Permanent cover of pasture or woodland, rather than a rotation, is recommended for a large number of mapping units. Most of them are strongly sloping and eroded, but a few, such as 84A, 84B, and 85A, are most suitable for pasture or woodland because of unfavorable soil characteristics.

Yields of crops and timber. Average yields of crops under a high level of management are given in Table 19. A footnote to the table lists the management practices under which these yields can be expected. The yields are based on current information. In time, with improvements in soil technology, crop varieties, and farming techniques, yields can be expected to reach higher levels.

Yields obtained on the Brownstown, Ewing, and Dixon Springs soil experiment fields are given in Tables 20, 21, and 22 respectively. These tables strik-

Table 21. — ANNUAL ACRE YIELDS — EWING SOIL EXPERIMENT FIELD, CHIEFLY CISNE SILT LOAM (2) AND HOYLETON SILT LOAM (3)

8-year Average, 1949-1956, Series 100-400

Treatment[a]	Corn	Soybeans	Wheat	Mixed hay
	bu.	*bu.*	*bu.*	*tons*
0	10±2.0[b]	7±1.3[b]	.7±0.4[b]	0
M	36±2.8	10±1.5	5±2.0	0
ML	65±5.5	17±2.9	20±3.2	1.6±.35[b]
MLP	66±5.8	15±2.9	24±4.6	1.8±.34
0	19±1.4	8±1.4	1.8±0.9	0
R	30±3.8	10±1.8	5±1.6	.1±.03
RL	42±8.2	12±2.3	15±3.1	.9±.19
RLP	49±9.1	12±2.6	19±3.2	1.2±.20
RLK	65±5.5	17±3.1	16±3.0	1.1±.19
RLPK	77±5.4	19±3.5	21±3.0	1.7±.28
RLPK (0-10-20)	75±5.0	18±3.3	29±4.4	2.1±.34

[a] 0=no treatment; M=manure—1 ton for each ton of crops removed; R=crop residues—stover, straw, legumes; L=limestone—6 applications for total of 16 tons since 1910; P=rock phosphate—4 applications for total of 4 tons since 1910; K=muriate of potash—332 lb. per rotation (166 lb. on wheat and 166 lb. on corn); 0-10-20—1,000 lb. per rotation (500 lb. on wheat and 500 lb. on corn).
[b] See footnote b, Table 20.

Table 22. — ANNUAL ACRE YIELDS — DIXON SPRINGS PLOTS, CHIEFLY GRANTSBURG SILT LOAM (301) WITH SOME ROBBS SILT LOAM (335)

8-year Average, 1950-1957, Series 500-800

Treatment[a]	Corn	Wheat	Alfalfa-brome hay
	bu.	*bu.*	*tons*
0	12±2.4[b]	8±2.0[b]	.4±.19[b]
L	33±4.7	12±1.6	.7±.28
LsP (0-20-0)	45±6.7	23±2.5	1.2±.36
LK	33±4.4	14±1.9	.8±.31
LKrP	47±6.1	21±3.0	1.4±.42
LKsP (0-20-0)	47±7.0	24±3.5	1.5±.38
LKP (fused)	48±8.4	25±3.2	1.6±.46
LKP (meta)	46±7.5	20±3.6	1.2±.39

[a] 0=no treatment; L=limestone—800 lb. an acre annually; rP=rock phosphate—187 lb. an acre annually; sP=superphosphate (20 percent), 100 lb. an acre annually; P (fused) = fused rock phosphate—66 lb. an acre annually; P (meta) = metaphosphate—26 lb. an acre annually; K=muriate of potash—100 lb. an acre annually beginning in 1950.
[b] See footnote b, Table 20.

ingly show the need for and the large responses to complete fertilization, including limestone, on highly weathered soils such as occur on most of the uplands of Williamson county.

Trees adapted to Williamson county soils, together with their growth rates under good management, are given in Table 23. Good management for timber is defined in a footnote to that table.

Table 23. — TREES ADAPTED TO WILLIAMSON COUNTY SOILS
Estimated Annual Growth Rates in Good Stands Under Good Management[a]

Type No.	Type name	Black oak, red oak, post oak	White oak, red oak, black oak, yellow poplar	Oak (wet site species), sweet gum, sycamore, cottonwood, soft maple, ash	Shortleaf and loblolly pine
		growth in board feet per acre			
2	Cisne silt loam	100–120	...	...	....
3	Hoyleton silt loam	...	300	...	Do well
4	Richview silt loam	...	300	...	Do well
5	Blair silt loam	...	300	...	Do well
8	Hickory loam	...	150	...	Do moderately well
8-14	Hickory loam-Ava silt loam complex	...	250	...	Do moderately well
8-214	Hickory loam-Hosmer silt loam complex	...	300	...	Do moderately well
9	Steep rocky land, sandstone material[b]	...	...	...	....
11	Loy silt loam	100	...	...	....
12	Wynoose silt loam	100–200	...	...	Do fair
13	Bluford silt loam	...	300	...	Do well
14	Ava silt loam	...	500	...	Do well
70	Beaucoup silty clay loam	...	...	400–500	....
71	Darwin clay	...	...	400	....
72	Sharon silt loam	...	...	700–800	....
84	Okaw silt loam[c]	...	...	...	....
85	Jacob clay[c]	...	...	...	....
108	Bonnie silt loam	...	...	450	....
109	Racoon silt loam	200	...	...	....
122	Colp silt loam	...	300	...	Do well
132	Starks silt loam	...	350	...	Do well
134	Camden silt loam	...	500	...	Do well
164	Stoy silt loam	...	300	...	Do well
165	Weir silt loam	200	...	...	....
167	Lukin silt loam	...	300	...	Do well
176	Marissa silt loam	...	300	...	....
214	Hosmer silt loam	...	500	...	Do well
287	Chauncey silt loam	120	...	...	....
288	Petrolia silty clay loam	...	...	450	....
301	Grantsburg silt loam	...	450	...	Do well
335	Robbs silt loam	...	300	...	Do well
337	Creal silt loam	...	300	...	Do well
338	Hurst silt loam	100–200	...	...	....
339	Wellston silt loam	...	250	...	Do fair
340	Manitou silt loam	...	300	...	Do well
382	Belknap silt loam	...	...	500–600	....

[a] Good management includes harvesting mature, defective, and less desirable trees unless they are needed to provide vegetative cover for small, desirable species; and protection from fire and grazing to prevent damage to young trees and encourage growth of new ones.
[b] Red cedar, black oak, southern red oak, and post oak will yield about 100 board feet.
[c] Pin oak and gum do fairly well.

Engineering Applications for Non-agricultural Purposes

Information useful in engineering is limited for the soils of Williamson county. The U. S. Bureau of Public Roads, however, has made tests on Belknap and Hosmer in Wabash county, and on Cisne in Perry county (Table 24). These three soils are representative of the soils on considerable areas of Williamson county.

Belknap, an imperfectly drained, silt loam bottomland soil, is intermediate in many characteristics between the moderately well-drained to well-drained Sharon and the poorly to very poorly drained Bonnie bottomland soils. Test results for Belknap would therefore be expected to represent average values for the acid, silt loam bottomland soils of Williamson county.

Hosmer, of wide extent itself, is representative of the moderately well-drained upland soils developed from loess, with fragipans (page 51) in the lower portion of their profiles. Engineering tests on Grantsburg would be expected to give results similar to those on Hosmer although Grantsburg has a more strongly developed fragipan. Likewise Ava has many similarities to Hosmer from an engineering standpoint. Ava differs from Hosmer principally in having weathered glacial till at shallower depths and in being a more highly leached and weathered soil.

Cisne is representative of the poorly drained claypan soils developed from thin loess over Illinoian till.

Although this report has been written chiefly from an agronomic standpoint, the engineer should find much of the information valuable, particularly the descriptions of the various soil types. The soil profile descriptions, as well as the mapping of soil types, are of necessity somewhat generalized. However, they should be useful in planning detailed field surveys in the immediate area of an engineering construction project.

Of the several systems used by engineers to classify soils (*17, 18*), the one most commonly used is that approved by the American Association of State Highway Officials (AASHO). In this system, seven main groups are recognized, ranging from A-1 (stone fragments, gravel, and sand) to A-4 (nonplastic to moderately plastic silty soils), A-6 (medium plastic clays), and finally A-7-6 (highly plastic clays). The numbers in parentheses following the soil group symbol in the AASHO classification in Table 24 are group index numbers, which range from 0 for the best to 20 for the poorest soil material for engineering purposes within each of the seven main groups.

The unified soil classification system used by some engineers includes 15 classes — 8 considered as coarse-grained, 6 as fine-grained, and 1 as highly organic. In this system Belknap, Hosmer, and Cisne are all classified as fine-grained; that is, over 50 percent of the soil material passes the number 200 sieve. ML includes inorganic silts and very fine sands, rock flour, silty or clayey fine sands, and clayey silts of slight plasticity. CL includes inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, and lean clays. Both ML and CL have liquid limits below 50. MH includes inorganic silts, micaceous or diatomaceous fine sandy or silty soils, and elastic silts. CH includes inorganic clays of high plasticity and fat clays.

The various classes in both systems have general interpretations as to their value or rating for subgrade, foundation material, embankments, compaction, etc.

In earthwork, optimum stability is usually obtained if soil material is compacted to about maximum dry density when it is about at the optimum mois-

Table 24. — ENGINEERING TEST DATA FOR BELKNAP, HOSMER AND CISNE SOILS

Soil type number, name, and description	Portion of range represented	Horizon and depth in inches from surface	Classification		Grain sizes			Maximum dry density (lb./cu. ft.)	Optimum moisture (percent)	Liquid limit	Plasticity index
			Unified	AASHO	Percent passing #10 sieve	Percent passing #200 sieve	Percent clay[a] <.002 mm.				
382 Belknap silt loam Silt loam with some sand and clay layers below 5 to 7 feet. Imperfectly drained bottomland soil on 0 to 1.5 percent slopes. Watertable variable—near surface in spring and below 5 feet in late summer.	Modal (imperfectly drained)	A_p (0–6)..........	ML	A-4(8)	100	92	12	104	17	25	2
		C (6–23).........	ML	A-4(8)	100	89	15	108	15	24	3
		C (27–59).........	ML	A-4(8)	100	86	12	111	15	22	1
	Low (imperfectly drained)	A_p (0–7)..........	ML	A-4(8)	100	79	13	111	14	23	2
		C (7–17).........	ML-CL	A-4(8)	100	78	17	115	14	24	5
		C (17–40).........	ML	A-4(6)	100	67	9	114	13	NP[b]	NP[b]
	High (imperfectly drained)	A_1 (0–15).........	ML-CL	A-4(8)	100	87	14	108	15	25	4
		C (15–30).........	ML-CL	A-4(8)	100	96	15	107	16	27	4
		C (30–50).........	ML-CL	A-4(8)	100	85	19	108	17	30	8
214 Hosmer silt loam About 1 foot of silt loam over 2-2½ feet of fine silt loam to coarse silty clay loam underlain by silt loam. Fragipan common between 2½ and 4 feet. Moderately well drained upland soil with watertable near 3 feet in spring and below 10 feet in summer. Spring watertable is sometimes a perched watertable. Slopes range from 2 to 18 percent.	Modal (moderately well drained)	A_p (0–6)..........	ML-CL	A-4(8)	100	96	9	105	16	26	4
		B_2 (14–27).........	ML-CL	A-7-6(13)	100	99	31	103	20	45	19
		B_3 (38–60).........	ML-CL	A-6(9)	100	99	21	109	17	34	12
	Low (moderately well drained)	A_p (0–6)..........	ML	A-4(8)	100	92	12	105	15	33	1
		B_2 (20–34).........	CL	A-7-6(18)	100	97	32	105	19	50	29
		C (34–43).........	CL	A-6(12)	100	96	27	109	17	40	20
	Shallow to till	A_p (0–5)..........	ML-CL	A-4(8)	100	97	20	107	16	30	8
		B_2 (5–15).........	CL	A-7-6(13)	100	99	32	104	20	45	21
		D (35–45).........	CL	A-4(8)	100	82	23	119	12	24	10
2 Cisne silt loam About 1½ feet of silt loam over 2 to 3 feet of fine silty clay loam to coarse silty clay underlain by a silty clay loam to silty clay Illinoian till soil. Poorly drained upland soil with watertable near surface in spring and below 5 feet in late summer. Slopes range from 0 to 1½ percent.	Modal (poorly drained)	A_2 (8–21).........	ML-CL	A-4(8)	100	95	17	108	16	27	5
		B_2 (21–39).........	MH-CH	A-7-6(19)	100	98	47	96	25	57	28
		C (44–55).........	CL	A-7-6(16)	100	97	34	105	20	49	26
	Better drained side of Cisne	A_2 (8–15).........	ML-CL	A-4(8)	100	95	22	110	16	29	7
		B_2 (15–26).........	MH-CH	A-7-6(20)	100	98	46	96	22	59	30
		B_3 (26–39).........	CL	A-7-6(14)	100	98	29	106	19	45	22
		C (39–58).........	CL	A-6(9)	100	93	21	115	15	31	12
	Lighter colored and poorer drained side of Cisne	A_2 (7–17).........	ML-CL	A-4(8)	100	94	18	109	16	25	5
		B_2 (17–33).........	CH	A-7-6(18)	100	98	45	98	23	54	27
		C (43–59).........	CL	A-7-6(15)	100	98	30	108	20	47	24

[a] Percent clay by hydrometer method.
[b] NP means nonplastic.

ture content. This is the moisture content at which maximum compaction is reached with a constant compaction force. Compaction decreases as moisture content either decreases or increases from the optimum. Maximum dry density is the maximum weight, in pounds per cubic foot, of oven-dry soil which can be obtained with specified compaction effort. The values presented in Table 24 were obtained according to AASHO standard test procedures.

The liquid limit and the plastic limit tests give the range in moisture over which a soil is in the plastic state of consistency. The numerical difference between the liquid and the plastic limit is known as the plasticity index.

The liquid limit is defined as that moisture content (percent moisture by weight on oven-dry basis) at which the soil passes from the plastic to the liquid state, or at which the soil will just begin to flow when jarred slightly.

The plastic limit is defined as that moisture content at which cohesive soils pass from the semi-solid to the plastic state. It is the lowest moisture content (percent moisture by weight on oven-dry basis) at which a soil can be rolled by the hand into a thread 1/8 inch in diameter without crumbling.

With the above definitions in mind the three soils for which engineering test data are given in Table 24 would be characterized from an engineering standpoint as follows:

Belknap is a fine-grained bottomland soil (mostly silt), low in organic matter and having slight or low plasticity and fair to poor drainage. Because it is apt to contain soft, compressible layers, it is fair to poor foundation material and should be investigated thoroughly before foundations for heavy structures are built. Belknap is poor to unsuitable subgrade material, with poor stability in embankments and generally poor compaction characteristics. It can be used for embankments if moisture is closely controlled in compaction with a pneumatic-tire or sheepsfoot roller. Flooding occurs at irregular intervals on Belknap, and footings of foundations are often at or below the water table.

Hosmer is also a fine-grained soil low in organic matter. The upper 12 to 15 inches are a silt loam with similar percentages of silt and clay as in Belknap. Test data indicate that the 0-6 inch layer of Hosmer would have engineering properties very similar to those of Belknap. The B horizon (middle layers) of Hosmer contains more clay and less silt than either the A horizon or the C horizon (lower layers) and is therefore a better binder material having a higher liquid limit and plasticity index. The B horizon would be rated fair foundation material for many structures such as homes or single-story buildings. However, for major structures, detailed investigations should be made at the site to determine the variations in the character of the underlying material. The B horizon is poor or unsuitable subgrade material, stable embankment material suitable for use in impervious cores and blankets, and fair to good for compaction with pneumatic-tire or sheepsfoot roller. It would be rated as practically impervious to drainage when compacted. The lower layers of Hosmer (generally C horizon) have ratings somewhat intermediate between those of the A (upper 12 to 15 inches) and the B horizons.

Cisne, like Belknap and Hosmer, is a fine-grained soil low in organic matter. It is poorly drained. The A horizon has slight or low plasticity and is fair to poor foundation material. Thorough investigations should be made before it is used as foundation material for heavy structures. It is poor subgrade material and has only fair stability in embankments. Compaction characteristics are about fair, but close control of moisture in compaction is essential. The B horizon is high in clay and has high plasticity and a liquid limit greater than 50 percent. It is poor to very poor foundation material for heavy structures, and in general, is not suitable for subgrade material. It has poor to fair stability in embankments and fair to poor compaction characteristics. The C horizon of Cisne contains less clay than the B. It has fair to good compaction characteristics and stability in embankments. It can be used as impervious cores and blankets. In general, the C horizon is fair to poor for foundation material and generally not suitable as subgrade material.

Small structures should find adequate bearing in the B or preferably in the C horizon of Cisne. There is some possibility of expansion or contraction of the B horizon material, which may cause differential movements in the structure. Major structures will probably find adequate bearing in the unweathered portion of the underlying drift. However, soil exploration at the site is essential for proper design of heavy structures.

LITERATURE CITED

1. Biggs, D. L., and Lamar, J. E. Sandstone resources of extreme southern Illinois. Ill. State Geol. Surv. Report of Investigations No. 188. 1955.
2. Bitterman, Norman G. Industrial possibilities of southern Illinois. Joint Committee on Southern Illinois, So. Ill. Booklet No. 3. Univ. of Ill. 1948.
3. Fehrenbacher, J. B., and Snider, H. J. Corn root penetration in Muscatine, Elliott, and Cisne soils. Soil Sci. **77**, 281-291. 1954.
4. Fehrenbacher, J. B., Vavra, J. P., and Lang, A. L. Deep tillage and deep fertilization experiments on a claypan soil. Soil Sci. Soc. Amer. Proc. **22**, 553-557. 1958.
5. Fehrenbacher, J. B., and Walker, G. O. How to know your soils and manage them wisely, a personal guide for every farmer in Williamson county, Illinois. Ill. Agr. Exp. Sta. and Ext. Serv. in cooperation with U. S. Dept. Agr. Soil Conserv. Serv. 1955.
6. Grossman, R. B., et al. Fragipan soils of Illinois: I, II, and III. Soil Sci. Soc. Amer. Proc. **23**, 65-75. 1959.
7. Horberg, Leland. Bedrock topography of Illinois. Ill. State Geol. Surv. Bul. 73. 1950.
8. Illinois State Water Survey Staff. Water resources of southern Illinois. Joint Committee on Southern Illinois, So. Ill. Booklet No. 2. Univ. of Ill. 1948.
9. Kellogg, Charles E., et al. Soil classification. Soil Sci. **67** (2), 77-191. 1949.
10. Leighton, M. M., Ekblaw, G. E., and Horberg, L. Physiographic divisions of Illinois. Ill. State Geol. Surv. Report of Investigations No. 129. 1948.
11. Limstrom, G. A., and Dietschman, G. H. Reclaiming Illinois strip coal lands by forest planting. Ill. Agr. Exp. Sta. (in cooperation with Central States For. Exp. Sta.) Bul. 547. 1951.
12. Page, John L. Climate of Illinois. Ill. Agr. Exp. Sta. Bul. 532. 1949.
13. Peck, Ralph B., Hanson, Walter E., and Thornburn, Thomas H. Foundation engineering. John Wiley & Sons, Inc., New York. 1953.
14. Rusk, H. P., Burlison, W. L., Fuelleman, R. F., Kammlade, W. G., and Webb, R. J. Dixon Springs Experiment Station, what it is doing to develop agriculture in southern Illinois. Ill. Agr. Ext. Serv. Cir. 586. 1944.
15. Stall, J. B., Fehrenbacher, J. B., Bartelli, L. J., Walker, G. O., Sauer, E. L., and Melsted, S. W. Water and land resources of the Crab Orchard lake basin. Ill. Dept. Registration and Education, State Water Surv. Div. Bul. 42. 1954.

16. UNITED STATES DEPARTMENT OF AGRICULTURE, Soil Conservation Service in Cooperation With State Agricultural Experiment Stations. Development of a taxonomic classification system for soils. Unpublished. 1957.

17. ZIEGLER, CHARLES M. Field manual of soil engineering (third ed.). Mich. State Highway Dept. 1952.

ALPHABETICAL INDEX TO SOIL TYPES

3500—5-59—67490

SOIL REPORTS PUBLISHED

Adams, 24	Henry, 41	Moultrie, 2
Bond, 8	Iroquois, 74**	Ogle, 38
Boone, 65	Jackson, 55	Peoria, 19
Bureau, 20*	Jasper, 68	Piatt, 47
Calhoun, 53	Johnson, 30	Pike, 11
Cass, 71	Kane, 17	Putnam, 60
Champaign, 18	Kankakee, 13	Randolph, 32
Christian, 73	Kendall, 75	Rock Island, 31
Clay, 1	Knox, 6	Saline, 33
Clinton, 57	Lake, 9	Sangamon, 4
Coles, 44	LaSalle, 5	Schuyler, 56
Cumberland, 69	Lawrence, 78	Shelby, 66
DeKalb, 23*	Lee, 37	St. Clair, 63
DeWitt, 67	Livingston, 72**	Stark, 64
Douglas, 43	Logan, 39	Tazewell, 14
DuPage, 16	Macon, 45	Vermilion, 62*
Edgar, 15	Macoupin, 50	Wabash, 61
Edwards, 46	Marion, 34	Warren, 70
Effingham, 48	Marshall, 59	Washington, 58
Fayette, 52	Mason, 28	Wayne, 49
Ford, 54*	McDonough, 7	Whiteside, 40
Fulton, 51	McHenry, 21	Will, 35
Grundy, 26	McLean, 10	Williamson, 79
Hancock, 27	Menard, 76	Winnebago, 12
Hardin, 3	Mercer, 29	Woodford, 36
Henderson, 77	Morgan, 42	

* No longer available for distribution.
** Reports 74 for Iroquois county and No. 72 for Livingston county replace Nos. 22 and 25 previously published for these two counties.

Much new information about soils has been obtained since the older soil maps and reports in the above list were printed, especially Nos. 1 to 53 issued before 1933. For many areas this newer information is necessary if the maps and other soil information in the reports are to be correctly interpreted. Help in making these interpretations can be obtained by writing Department of Agronomy, University of Illinois, Urbana.

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

Nondiscrimination Statement

Nondiscrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (http://directives.sc.egov.usda.gov/33081.wba) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Supplemental Nutrition Assistance Program

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (http://directives.sc.egov.usda.gov/33085.wba).

All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (http://directives.sc.egov.usda.gov/33086.wba).