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Soil Survey
of
Polk County, Texas

By

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and

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Texas Agricultural Experiment Station

Bureau of Chemistry and Soils

In cooperation with the Texas Agricultural Experiment Station

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By H. M. SMITH, United States Department of Agriculture, in Charge, and T. C. REITCH, HARVEY OAKES, L. G. RAGSDALE, and A. H. BEAN, Texas Agricultural Experiment Station

COUNTY SURVEYED

Polk County is in east-central Texas (fig. 1). It is irregular in outline, has a maximum east-and-west width of 35 miles and an extreme north-and-south length of 44 miles. Neches River forms the northern boundary and Trinity River the southwestern. The other boundaries are land lines. The total area is 1,006 square miles, or 643,840 acres. Livingston, the county seat, is about 75 miles northeast of Houston.

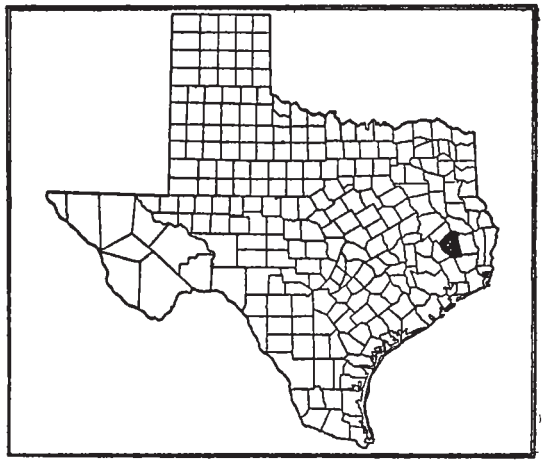

FIGURE 1.—Sketch map showing location of Polk County, Tex

The county occupies a dissected rolling sandy section of the coastal plain, having a general southeasterly regional slope toward the Gulf of Mexico. It is mainly rolling upland consisting of smooth divides having steep slopes near the drainageways. It lies in that region of timbered light-colored sandy soils known as the east Texas timber country.

The valleys of the larger streams running across the county are broad and shallow. Many small streams with narrow valleys extend into all parts, providing rapid drainage for most sections. There are some flat upland areas so slightly dissected that drainage is slow or practically lacking. The largest of these, in the southeastern part of the county, comprises a northwestern extension of a large body of flatwoods country, locally termed the "Big Thicket." The smaller flat areas lie chiefly directly north, west, and northwest of the Big Thicket, and a few are in the north-central part of the county. These small flats occur on the drainage divides. Those in the southern part of the county differ from those in the north-central part, in that they are slightly depressed and hold water for longer periods. Locally they are called "May-haw ponds."

Bodies or strips of flat land occur on benches adjacent to and from 20 to 50 feet above some of the large stream valleys. They appear

to be composed of old stream deposits now above overflow, which were laid down during the early period of stream dissection and valley formation. In many places where these benches are composed of sandy materials, mainly in Neches River Valley, the surface is dotted with low small dome-shaped mounds of fine sand; and those flats composed of clay material, occurring entirely in Trinity River Valley, have surfaces pitted by numerous small depressed areas, locally termed "hog wallows." Many low sandy ridges, ranging from 5 to 10 feet above present overflow lands and consisting of more recent alluvium, are in the larger valleys and in places are adjacent to the smaller streamcourses.

The valley slopes are steep and are subject to severe erosion, although as yet tree growth is sufficiently abundant in most places to minimize destruction by this means. In many places, because of the unconsolidated geological formations and the high precipitation, long gentle sandy colluvial slopes occur at the bases of many steep slopes. Owing to dense clay subsoils, some upland areas are very deficient in underdrainage, and here, even on slopes, the soils remain wet for a long time. As a rule, most of the stream bottoms remain wet much of the time during the cooler seasons, but in places, particularly in the Trinity River bottom, sufficient natural drainage occurs to allow successful cultivation, although occasional overflows during the growing season damage growing crops. A feature of the Trinity River bottom and those smaller stream bottoms which have adequate natural drainage for cultivation is that the stream banks are high and the channels are well defined, but in the very wet bottom-land areas the stream banks are low, the channels indefinite, and overflows frequent. The bottom lands along Trinity River, Kickapoo Creek, and Long King Creek have fairly rapid drainage, but the flood plains of Neches River, Piney Creek, and many of the smaller creeks remain wet much of the time.

The elevation above sea level ranges from 69.8 feet at the point where Trinity River leaves the county at the southern boundary to about 360 feet in the northwestern part. The highest points are along the main divide between Trinity River and Neches River, and the lowest points are along Trinity River. The divide enters the county near the northwestern corner and follows a winding course in a general southeasterly direction, widening to a low flat area as it merges with the Big Thicket area. Trinity River has a fall of about 45 feet throughout its course along the southwestern border of the county. Neches River, following the northeastern boundary for a distance of about 20 miles, has a fall of only about 20 feet. The elevation at the point where it enters the county is approximately 140 feet and where it leaves, about 120 feet. Elevations near the upper reaches of the divide in the western and northern parts of the county near the town of Carmona and at Moscow are 330 and 310 feet, respectively. The elevation near the Trinity River bridge on State Highway No. 35, is 92.7 feet; at Goodrich, 97 feet; at Livingston, 194 feet; and on the Neches River bottom, just north of the river in Angelina County, an elevation of 155 feet is recorded.

The native vegetation consisted of forest, much of which has been cut, leaving large bodies of land almost bare of large trees.

[1] U. S. Geological Survey topographic sheets

After longleaf pine has been removed, a heavy growth of native grasses appears, consisting largely of species of *Andropogon*, *Paspalum*, and other coarse grasses. Where shortleaf pine or hardwood is cut, a dense growth of shrubs and brambles follows. Where the best methods of lumbering are systematically practiced and care is taken to protect the cut-over lands, a natural reforestation of both longleaf and shortleaf pines occurs. It is reported that shortleaf pine reforests the land much more rapidly than does longleaf. Over most of the county the growth consists of mixed pines and hardwoods, the pines including longleaf, shortleaf, and loblolly, and the hardwoods, post oak, blackjack oak, water oak, willow oak, sweetgum, black gum, hickory, black walnut, magnolia, bay, and several other species. A few birch, cypress, beech, and tupelo gum grow along some of the river sloughs and larger creeks in the southern part of the county. In places longleaf pine predominates, largely on sandy ridges or slopes of divides where surface drainage is rapid. However, the underdrainage of the soils on which it grows differs greatly. In other places loblolly and shortleaf pines predominate in the pine group, with little or no longleaf present, regardless of soils or soil conditions. Underbrush is extremely thick in the shortleaf and loblolly pine forests, but in the longleaf stands, the brushy growth is sparse or entirely absent and coarse grasses grow abundantly. As a rule, oak trees predominate on the heavy soils. Tupelo gum occurs in a widely scattered growth extending over almost all soils, ranging from the low bottom lands to the high ridge tops. Hardwoods, consisting of oaks, beech, red maple, ash, hackberry, sycamore, cottonwood, pignut, persimmon, ironwood, dogwood, and redbud, grow extensively on the bottom lands, and some shortleaf and loblolly pine also grow on many of these lowlands. Switch cane and swamp palmetto grow thickly on fairly well drained bottoms and on wet bottoms, respectively.

Large lumbering concerns, cooperating with the Texas Forest Service, are attempting to protect areas of cut-over lands, in order that they may become reforested and furnish a constant supply of timber, but much of this land, chiefly in the western part of the county, is at present receiving no such attention and is used only for grazing livestock on the native grasses which are not highly nutritious.

Polk County was formed from a part of Liberty County in 1846, and the county seat was located at Livingston. Land grants, made by the Mexican Government as early as 1833, were continued until 1836, at which time Texas became an independent republic. One land grant made by the Republic of Texas is of particular interest. This was made by Gen. Sam Houston to a tribe of Indians, known as the "Alabamas", in reward for assistance rendered to white women and children during the war with Mexico. The original grant of 910.7 acres, was recently increased by the Federal Government to about 3,500 acres. The tribe, now numbering 265 Indians, occupies this reservation under Federal supervision.

White settlement in Polk County began with the opening of navigation on Trinity River, about 1840. Previously the Indians occupied this section. Drews Landing, Mariana (now extinct), and Swardout were the first settlements made by the whites. The farms

were cleared in the sandy uplands by immigrants from Alabama and Louisiana. Bold Springs, in the west-central part of the county, was settled by people from Louisiana. The 1930 census reports a population of 17,555 for Polk County, all classed as rural. Livingston, the largest town and county seat, has a population of 1,165. Corrigan, with a population of 1,094, in the northern part, and Moscow near the center, are important local shipping points and trading centers. Other small towns, largely the centers of the local lumber industry, scattered throughout the county, are Camden, Camp Ruby, New Willard, and Carmona.

An important line of the Southern Pacific Railroad (Texas & New Orleans) extending from Houston to Shreveport traverses the central part of the county from north to south and furnishes the chief shipping and transportation facilities. Less important railroads, mainly short lines, reach across parts of the county and are concerned more largely with local shipments, mainly materials connected with the lumber industry. These are the Waco, Beaumont, Trinity & Sabine and the Moscow, Camden & San Augustine Railways.

An improved hard-surfaced highway, the Houston-Shreveport Airline, crosses the county from north to south, serving the towns of Corrigan, Moscow, Leggett, New Willard, Livingston, and Goodrich. Several other highways have been designated or are now under construction. From Livingston, one will traverse the county eastward to Woodville in Tyler County and westward to Point Blank in Trinity County. The eastern extension of this road has been graded and bridges built, but the western extension is still under construction. Another highway has been designated to traverse the territory southeast of Livingston to Liberty, Liberty County. A third highway has been built from Groveton, Trinity County, through Corrigan to Chester, Tyler County. A number of the unsurfaced roads are graded once a year. In wet weather, all unsurfaced roads are difficult to travel, and in places where the heavy clay subsoil lies near the surface, they become almost impassable. In dry weather they are very rough and dusty, and where the sand is deep, it is difficult for automobiles to operate. Bus lines are maintained on the Houston-Shreveport Airline Highway and on the highway from Corrigan to Groveton.

Many sections are reached by rural delivery of mail. Telephone communication is maintained in all the towns and in a few of the rural communities. Churches and schools are located at convenient intervals. With the improvement of roads has come a tendency toward the consolidation of schools.

The largest industrial enterprise is the manufacture of lumber. This industry supports 4 large mills and 5 small ones, which have an approximate total capacity of 335,000 board feet of lumber daily. The largest mills are located at Camden, New Willard, Carmona, and Corrigan. Temporary railroads bring logs to the mills from every section of the county and from other counties, sometimes from a distance of 50 or more miles, and trucks haul a few logs from nearby localities. The lumber is shipped to all parts of the United States. Much timber is cut into railroad ties, poles, and piling by hand labor, and these products are shipped out to nearby creosoting plants.

A sand pit, which produces a fine grade of molding and building sand, is located about 3 miles east of Corrigan on McManus Creek. Its monthly capacity amounts to about 10 carloads.

A gas pipe line passes near the towns of Corrigan, Moscow, Leggett, New Willard, Livingston, and Goodrich and affords them natural-gas service. Electric service is furnished the towns of Corrigan, Moscow, Leggett, and Goodrich by a large power company, and other towns have individual electric-power plants.

Several oil pipe lines pass through the northeastern section of the county. An oil- and gas-producing area, about 9 miles southeast of Livingston, has been recently developed, in which are many large producing oil and gas wells. Oil prospecting is given considerable attention, and little land is sold or bartered without consideration of the oil and mineral rights.

An abundance of good water is obtained from shallow wells throughout the county. Some wells, however, produce water impregnated with lime carbonate, sulphur, or other salts. Deep wells providing good soft water supply the towns of Livingston and Corrigan.

CLIMATE

Polk County lies within the south temperate humid section of the United States Gulf coast region. The climate is characterized by long warm summers and short mild winters. Periods of oppressively high temperatures occur during the summer, but breezes from the Gulf temper them to some extent. During the winter cool pleasant weather prevails, with occasional short periods of cold, during which freezing temperatures may occur.

The average annual rainfall is rather high and ordinarily is ample for growing crops, but in some years it is not well distributed. It is usually lowest during the fall and heaviest during the spring. The rainfall of winter is slow, extends over longer periods, and is often accompanied by more cloudy weather than during other seasons. Summer rains are local and frequently torrential, causing considerable damage by washing sloping lands and by overflowing bottom lands. The snowfall is negligible.

The climate is favorable to a diversified agriculture, and more than one crop may be grown on the land during a year, as the average length of the frost-free season is 222 days—from March 26 to November 3. Frost has been recorded as late as April 25 and as early as October 22. The earliness of the growing season allows the production of early vegetables. Although most of the pasture grasses are killed in winter, except in very protected places, some forage crops and cover crops will grow throughout the year. Tillage is possible at any time when the land is not too wet.

Livestock raising and dairying are favored by the long grazing season, the ease with which roughage may be grown, and the necessity for little winter shelter.

Table 1, compiled from records of the United States Weather Bureau station at Carmona, gives the more important climatic data for Polk County. These records cover the years 1907 to 1915, inclusive.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Carmona, Polk County, Tex.*

[Elevation, 330 feet]

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1910)	Total amount for the wettest year (1914)
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*
December	48.6	81	17	7.18	5.21	9.85
January	51.6	85	7	2.13	1.00	.86
February	52.1	85	15	3.66	3.18	3.34
Winter	50.8	85	7	12.97	9.39	14.05
March	59.8	95	21	3.90	1.13	6.10
April	67.6	90	31	5.42	3.22	6.68
May	73.2	98	37	4.72	2.99	8.27
Spring	66.9	98	21	14.04	7.34	21.11
June	80.3	103	50	1.95	1.76	2.13
July	82.8	103	54	2.67	4.46	.61
August	83.0	108	55	3.62	.60	6.17
Summer	82.0	108	50	8.24	6.82	8.91
September	77.8	103	34	3.13	1.86	2.20
October	66.6	97	22	3.33	3.23	3.06
November	59.1	89	13	3.42	2.18	7.46
Fall	67.8	103	13	9.88	7.27	12.72
Year	66.9	108	7	45.13	30.82	56.79

AGRICULTURE

Agricultural development in Polk County and in the surrounding counties has been very slow. Original settlement by a farming population was probably discouraged by the very heavy forest growth which required much labor in clearing. However, some cotton plantations, operated with slave labor, are reported to have been in the county as early as 1860, probably on the alluvial bottom lands of Trinity River and some of the better drained creek bottoms. With the commercial exploitation of the great pine forests, beginning about 1900, lumbering became an important industry, and with its development small tracts of land were opened up for farming.

The type of agriculture practiced is typical of that throughout the east Texas timber country; that is, cotton is the chief cash crop about which all farming activities are centered. Most of the farms on the upland soils are small, and many are operated by the owners, but in the larger areas of the alluvial soils, especially in the Trinity River bottoms, the plantation system is in effect. This consists of large holdings divided into small farms operated by tenants under the general supervision of the owner. According to the census of 1930, of the 2,300 farms in the county, 1,039 were operated by owners, 1,256 by tenants, and 5 by managers. Under the plantation system, where the owner maintains a rather close supervision of farming operations, practically the same uniformity of operations and methods is practiced as if the owner were operating his whole farm area with hired labor. The plantation method of tenancy seems to give

better results to both landlord and tenant than when many of the small farms are operated at the discretion of the tenant. The universal basis of rental is the one-third and one-fourth system, whereby the owner simply furnishes the land and buildings and receives one-fourth of the cotton crop and one-third of all other crops, and the tenant furnishes all the labor, work animals, and equipment. Where fertilizers are used the cost is usually borne equally by landlord and tenant. Some land, more especially under the plantation system, is rented on the half-and-half plan, whereby the landlord furnishes everything necessary for farming, the tenant furnishes the labor only, and the crop is divided equally. Very little labor is hired for cash, except for short periods in the spring during planting and chopping cotton and at harvesting time in the fall when cotton is picked at contract prices. The supply of day labor is usually adequate, and the laborers are paid about $1.50 a day. Cotton picking is paid for at a rate ranging from 75 cents to $1 a hundred pounds of seed cotton.

Farm buildings and improvements are in general of simple construction, and, although some owners have substantial homes and outbuildings, a very large proportion of the buildings are small.

Single-draft tillage equipment is in general use on the farms on the light-colored sandy soils, but heavier implements and larger draft power are employed more generally on the farms having heavier soils and on the alluvial lands. The work animals are mainly lightweight mules.

Most farms have a small number of livestock other than work animals. On many farms good grade dairy cattle, hogs, and poultry are kept to supply home requirements and for incidental sale to such demand as may occur in the local markets. However, large numbers of cattle and hogs of native stock or mixed breeding range at will over the timberlands and gain a meager sustenance from the grazing and browse afforded by the native vegetation.

The few small towns afford a market for only a small quantity of the farm produce. Within the last few years the commercial production of early table tomatoes has become important in a few sections. In 1928, 19 carloads were shipped to northern markets. This number was increased to 30 carloads in 1929 and to 148 carloads in 1930.[2] The principal areas of tomato production are in the vicinities of Livingston, Goodrich, and Corrigan, on the light-colored sandy soils.

Commercial fertilizers are used to some extent, chiefly for cotton and tomatoes, and mostly on the light-colored sandy soils. The opinion prevails that the use of fertilizers has proved generally profitable. Certainly crop yields are greatly increased by their use. The chief fertilizers used for cotton have been either high-grade complete fertilizers, such as a 4–12–4 [3] mixture, or high-grade superphosphate and cottonseed meal. For truck crops, fertilizer mixtures, such as 6–12–6, 4–10–2, 5–15–5, are commonly used, although some sodium nitrate, ammonium sulphate, and other special materials are also used.

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[2] Figures supplied by Polk County Chamber of Commerce

[3] Percentages, respectively, of nitrogen, phosphoric acid, and potash

The agriculture on practically all the farms consists mainly of the production of cotton as the main cash crop. Other crops grown are principally corn, forage crops, and hay or pasture crops grown for feeding the farm livestock, and such crops as sweetpotatoes, sugarcane, and peanuts grown for home use and incidental local demands. The new industry of growing early tomatoes is carried on largely in connection with cotton farming. Most farms, especially the owner-operated ones, have a small vegetable garden and an orchard including peaches, plums, grapes, and berries for a home supply of fruit. A few fruit trees of other varieties are grown around the farm home.

According to the census, the total value of all agricultural crops produced in 1929 was $1,125,776. The value of all livestock was $1,067,598, of which cattle were valued at $498,848; horses, $89,688; mules, $220,455; and swine, $211,630. The cotton acreage occupied slightly more than 41 percent of the crop land and corn almost 17 percent.

Cotton, the chief crop, was grown on 28,272 acres in 1929, yielding 7,927 bales, or approximately one-third of a bale an acre. This comparatively high average compares very favorably with that of some of the great cotton-producing black-land counties and is doubtless owing to the fact that a very large proportion of the cotton was grown on the alluvial soils and dark-colored upland soils. The crop is grown indiscriminately on all the soils farmed, but as a rule the yields, quality, and length of staple are reported to be best on the alluvial soils, next best on the dark-colored upland soils, and poorest on the light-colored sandy upland soils, when no fertilizer is used.

Half-and-half is the principal variety of cotton grown on the light-colored sandy upland soils, largely because these soils are well suited to this variety and because it turns out a high proportion of lint, although the staple is short. However, in a market where discrimination is made in favor of longer staple it is doubtful whether this variety would prove as profitable as some variety having a longer staple. The varieties grown on the dark-colored upland soils and alluvial soils are principally Mebane, Acala, and Lone Star. Cotton is sold on the local markets to buyers who ship it to outside markets.

Cotton root rot, a fungus disease, attacks cotton on the dark-colored upland soils, and at times much of the crop is killed. The bollweevil and other insect pests attack the crop, and they probably do more damage to cotton on the alluvial soils than on the other soils, owing, perhaps, to the denser foliage which affords a protective shelter from such climatic conditions as tend to destroy the insects.

Corn was grown on 11,484 acres in 1929, of which 11,209 acres were devoted to grain production. The yield was 103,150 bushels, or about 9 bushels an acre. Corn is grown largely for livestock feed, and some is ground into meal and used in the home. This crop is grown on all the soils, but the best yields are obtained on the alluvial soils and the lowest, as a rule, on the light-colored upland sandy soils.

The census report for 1880 shows 20.3 percent of the area of the county in farms, of which 21.3 percent was improved land. The average size of farms at that time was 208 acres. In 1930, there were 153,015 acres, or 19.6 percent of the total area, in farms, 48.6 percent of which was classed as improved land—including crop land and plowable pasture. The average size of farms in that year was 66.5

acres. These figures show that the size of farms has been materially reduced and that the proportion of improved land has increased. The early farms included large, unfenced, forested tracts of land with only a small cleared and fenced area for crops. According to the census of 1930, only 8.8 percent of the total land area of the county was devoted to crops in 1929.

In general, the farms are well supplied with cattle, hogs, and poultry. Most of the cattle are low-quality grades which graze on the free range that is everywhere available, except near some towns. A few dairy cattle are maintained near the principal towns to supply the people with milk. The value of dairy products, excluding those used at home was $22,044 in 1929. Most of the hogs are of native unimproved stock, although better breeds, such as Duroc-Jersey and Poland China, are also raised. The better bred hogs are generally penned and fattened on domestic feeds, but the others are allowed to roam in the woodlands, gaining a livelihood mainly from oak mast. Such hogs become half wild and are hunted with rifles and dogs. A number of farms in the southeastern part of the county are stocked with small herds of goats, and a few sheep are raised in other parts. The total value of the wool shorn in 1929 was $523.

The poultry kept are mainly chickens, although some geese, ducks, guineas, and turkeys are also raised. Rhode Island Red, Barred Plymouth Rock, and Leghorn are the principal breeds of chickens. The value of poultry raised in 1929 was $51,902 and of chicken eggs produced was $86,790.

SOILS AND CROPS

Polk County lies entirely within that part of the Gulf coastal plain occupied mainly by timbered light-colored sandy soils, which, in Texas, is known as the east Texas timber country. The principal soils are developed from unconsolidated beds of clay, sand, sandy clay, or clay-shale materials comprising old noncalcareous sediments of Tertiary or Pleistocene age. Included small areas of dark-colored soils have developed from calcareous clays, and recent alluvial sediments in the valleys comprise soil materials washed from local sandy areas and from dark prairie soils outside the county.

The county is too small to have any great differences of climatic conditions, and the differences in soils and soil characteristics are caused chiefly by differences in the native vegetation, in the character of the parent materials, and in surface features that affect drainage. The soils developed from calcareous materials seem to have been prairies originally and probably were developed under a grass cover, but trees later encroached to some extent, though not so thickly as on the sandy soils.

The light-colored upland soils are very similar in the general character of their surface layers, except a rather wide range in texture. They show many differences, however, in subsoil characteristics. Although some of the soils occur in large areas several square miles in extent, numerous small areas are scattered throughout most sections of the county.

Besides the general grouping of soils as light-colored upland soils, dark-colored upland soils, and alluvial soils, the light-colored upland

soils, by far the most extensive group, occupy two general divisions based on the characteristics of their subsoils—(1) those having friable or crumbly permeable subsoils and (2) those having dense heavy clay subsoils which are almost impervious to the passage of water. These subsoil characteristics have a direct relationship to agricultural value and utilization of the soils.

The light-colored upland soils range from nearly flat to rolling, and on many slopes erosion is severe. Even where the land is under protection of the virgin forest growth, the surface soil layers are thin, due, in part, to erosion, and, in part, to the greater loss of water by run-off, thus slowing down the processes of soil development. Natural surface drainage is rapid or slow, corresponding largely to the degree of surface slope, and underdrainage is moderately free in the soils having crumbly permeable subsoils but is very slow beneath those having dense heavy clay subsoils.

Soils of the light-colored soils group are normally acid in reaction, low in organic-matter content, and contain only moderate amounts of available plant nutrients. In general, the sandy texture and friable consistence of the topsoils allow cultivation under a rather wide range of moisture conditions, and crops of many kinds can be grown. These soils respond readily to methods of soil improvement, including such practices as the growing of legumes, crop rotation, incorporation of organic matter, and application of organic and commercial fertilizers. In the virgin state, the light-colored soils support a heavy forest growth of pine and hardwoods, mostly oaks. In places, they support a heavy growth of shortleaf and longleaf pine, with some oak, and loblolly pine is also abundant in some sections. In some sections the forest consists of an almost solid stand of pine, although, generally, it consists of a mixed growth of pines and oaks, together with some gum, hickory, and other trees. On the more rolling areas post oak dominates the hardwoods, on the deeper loose sandy soils blackjack oak is abundant, and on flat, slowly drained areas water oak and willow oak are predominant. The pine timber growing on these soils has for many years provided the chief source of a large lumbering industry, and in many sections all the marketable timber has been cut. The cut-over lands are, in places, being reforested, and much of the land is used for the natural pasture afforded cattle and hogs, which range in a half-wild condition over large areas and receive very little attention.

The dark-colored upland soils are chiefly heavy, either of clay or clay loam texture. These soils occupy high smooth areas, most of which are undulating or gently rolling, although some are nearly flat. Surface drainage is fairly rapid, and erosion does considerable damage where the land is unprotected. The subsoils are heavy clays but are not impervious to the passage of water and, therefore, underdrainage, although slow, is in most places adequate for agricultural purposes. The virgin soils are fairly deep and are well supplied with organic matter. The surface soils and upper subsoil layers are slightly acid or neutral, the lower subsoil layers are neutral or calcareous, and the parent materials are calcareous. These soils are very productive and appear to contain a considerable amount of available plant nutrients. They are suited to a smaller number of crops than the sandy soils, as they are less well suited to

fruits, vegetables, and other truck crops, but are better suited to small grains.

On account of the heavy texture and coherent consistence, these soils require stronger and heavier work animals and more power for cultivation, and they may also be worked within a narrower range of moisture conditions. If cultivated under proper conditions of moisture, these soils work into a friable seed bed having a moderately loamy texture. They respond well to crop rotations and to natural means of soil improvement, such as addition of organic matter and organic manures, but the use of commercial fertilizers has not always proved profitable. These soils originally supported a thin growth of shortleaf pine and oak trees, the latter appearing to predominate so far as can be ascertained from the remaining small virgin areas that have not been cleared. A small amount of buffalo grass and grama on the virgin soil indicates an original prairie condition on which the tree growth has encroached from the surrounding forest on the light-colored soils.

The alluvial soils occupy many low bottom lands which comprise the flood plains along the numerous streams. These soils are developed from materials washed from upland soils in different sections, and additional deposits are being made during periodic overflows. These materials have developed no true soil characteristics, as they have not remained undisturbed sufficiently long to have received the impress of the factors of soil development. These soils differ greatly, and some characteristics indicate their relationship to the soils from which the materials have been removed. They range in texture from sand to clay and in color from gray to brown and black. The soils are deep, most of them acid in reaction, and they have a comparatively high content of organic matter and available plant nutrients. They are highly productive and suited to many crops. The sandy topsoils are friable, and, although the heavy soils are worked with greatest difficulty, they can be cultivated readily into a pulverulent condition when the moisture content is suitable.

All these soils are overflowed occasionally. In some areas tne surface slope is sufficient to allow rapid removal of water by run-off, but other areas are so flat that water stands on the surface for extended periods. Underdrainage is very slow beneath some of the heavy clay soils, and during the winter many of them remain saturated with water most of the time. The alluvial soils support a heavy growth of pine (mostly shortleaf), various oaks (mainly water oak and willow oak), gum, hackberry, and other trees. The largest areas occur along Trinity River on the western border of the county and along Neches River at the northeastern edge.

According to the 1930 census, only 8.8 percent of the total land area of the county is devoted to cultivated crops, and agricultural development in the county has been very slow. Farming during the early period of settlement was not generally taken up, probably on account of the difficulty of clearing the land of the very heavy growth of large trees, when soils no less valuable in other sections could be cleared with less labor. Also a very large proportion of the land soon came under the control of interests concerned chiefly with manufacturing lumber. The soils, which are in general of only

moderate productiveness, lie in a section of high rainfall, and drainage conditions are not very good. Most of the roads are of such character that they offer no inducement to locate far from the main lines of transportation.

The alluvial soils are extensively farmed where natural drainage enables crops to do well. The broad bottom-land areas of the Trinity River Valley have long been in cultivation, and many of the larger creek bottoms are also used for growing crops. Some of these areas, however, are so deficient in drainage that no attempt is made to farm them. All the alluvial soils are overflowed at times, but from many areas the water flows off in time to allow successful crop production, and, even though occasional overflows may injure the crops, the high productiveness of the alluvial soils in cultivation usually offsets the losses sustained from overflows.

Practically all the well-drained dark-colored upland soils are in cultivation. These soils are highly productive, for the most part, have good natural drainage, and appear to hold up well under continuous cropping. These soils, however, constitute only a small proportion of the total land area.

As stated, the soils of the county are included in three main groups, separated according to their soil characteristics and on the basis of agricultural value. The first group includes soils having light-colored surface soils, mainly of light texture, and most of them are underlain by subsoils that are considerably heavier than the surface soils, and which, on the basis of structural characteristics, are of two general kinds. The second group comprises dark upland soils, most of which have comparatively heavy textures; and the third group includes the alluvial soils of the bottom lands.

In the following pages the soils of Polk County are described in detail, and their agricultural relationships are discussed; their distribution and location are shown on the accompanying soil map; and their acreage and proportionate extent are given in table 2.

TABLE 2.—*Acreage and proportionate extent of soils mapped in Polk County, Tex.*

Type of soil	Acres	Per-cent	Type of soil	Acres	Per-cent
Segno fine sandy loam	114,688	17 8	Wilson clay	16,192	2.5
Segno fine sand	85,952	13.4	Crockett clay loam	14,656	2 3
Ruston fine sandy loam	6,720	1 0	Garner clay	10,176	1 6
Caddo fine sandy loam	20,032	3 1	Ochlockonee fine sandy loam	7,168	1 1
Caddo fine sand	21,568	3 3	Ochlockonee clay loam	9,152	1 4
Kalmia fine sand	12,800	2.0	Ochlockonee clay	12,864	2 0
Susquehanna fine sandy loam	155,520	24 2	Ochlockonee fine sand	1,088	2
Leaf fine sandy loam	11,648	1.8	Johnston clay	3,584	6
Leaf clay loam	1,344	.2	Bibb fine sandy loam	10,432	1 6
Lufkin fine sandy loam	98,816	15 3	Bibb loamy fine sand	5,248	8
Lufkin very fine sandy loam	2,496	4	Bibb clay loam	3,840	.6
Lufkin very fine sandy loam, depression phase	5,760	9	Bibb clay	5,376	.8
Myatt very fine sandy loam	2,688	.4	River wash	384	1
Myatt very fine sand, mound phase	3,648	.6	Total	643,840	

LIGHT-COLORED UPLAND SOILS

The soils of the light-colored group occupy the greater part of the county and are generally referred to as "sandy land." Most of these soils are light brown or gray in the top layer and yellow in the subsurface layer. The surface soils are composed chiefly of fine

sand, and, as a rule, the subsoils are heavier than the surface soils. The surface soils are acid in reaction and low in organic-matter content and available plant nutrients; that is, they are not naturally highly productive. These soils are members of the Segno, Caddo, Ruston, Kalmia, Susquehanna, Lufkin, Myatt, and Leaf series.

The surface relief is generally undulating or rolling, although the less extensive Kalmia, Caddo, Myatt, and Leaf soils and some areas of the other soils lie on nearly flat areas. Surface drainage is fairly rapid in most areas, and in places, especially where unprotected, the cultivated soils are subject to injurious sheet and gully erosion. The single-grain structure of the surface soils allows ready cultivation with light tillage implements, and their open porous character allows free downward movement of water where the subsoils are not too heavy. Consequently, the soils are easily leached, and the organic matter, by reason of ready access of air, is rapidly dissipated.

The soils of this group fall naturally into two divisions, according to subsoil characteristics. In one, the subsoils are more or less sandy, crumbly, and friable, allowing free passage of water, air, and plant roots; and the other comprises soils with dense, heavy, almost impervious, or very slowly penetrable subsoils. The soils of the Segno series typify soils of the friable-subsoil division in which are also included soils of the Ruston, Caddo, and Kalmia series; and the dense-subsoil division is represented by soils of the Susquehanna series, together with the related soils of the Lufkin, Myatt, and Leaf series. The soils of both divisions occur in numerous large and small areas indiscriminately associated with one another, but, on the whole, soils of the Segno division are dominant in the southern part of the county, and those of the Susquehanna division in the northern part. The soils of the Segno division have free underdrainage and, therefore, are better suited to growing cultivated crops. The soils of the Susquehanna division remain wet for a long time after rains and warm up slowly in the spring. In many places the soils of the Susquehanna division appear to be better suited for timber growing than for cultivated crops. All the soils of both divisions respond well to fertilization and to the incorporation of organic matter. Commercial fertilizers may be leached out of the soils with friable subsoils, if the rainfall is heavy, and experimental results have shown it to be advantageous not to apply all the fertilizers at one time, but to side dress with applications during the growing season. Although experimental results are not as yet conclusive, it appears that the use of commercial fertilizers on the soils with friable subsoils has proved more generally profitable than on those having dense subsoils.

SOILS OF THE SEGNO DIVISION

The subsoils of the light-colored soils of the Segno division range in texture from fine sand to clay, and although the clay subsoils are fairly heavy, they allow water to pass downward readily. These soils include Segno fine sandy loam, Segno fine sand, Caddo fine sandy loam, Caddo fine sand, Ruston fine sandy loam, and Kalmia fine sand. Segno fine sandy loam is the most extensive and most largely cultivated soil of the group. Very little of the Segno fine sand is farmed, as it is a rather thin soil and most of it is distant from good roads. For the same reasons, and also on account of

the rather flat surface and slow drainage, neither Caddo fine sand nor Caddo fine sandy loam are cultivated to a great extent. The crops grown on the soils of this division are chiefly cotton, corn, other feed crops, and tomatoes. A small acreage is devoted to various vegetable and vine crops. Segno fine sandy loam appears to be the most productive soil of the division and the best suited to general-farm and truck crops, except Ruston fine sandy loam which is of such small extent that it is not an important factor in the agriculture.

Segno fine sandy loam.—The surface soil of Segno fine sandy loam consists of a layer of loose and very slightly coherent fine sand, ranging from 10 to 18 inches in thickness. The upper part of the layer, to a depth of 2 or 3 inches, is gray or light brown and is slightly darkened by a very small content of organic matter, and the lower part is yellow. In cultivated fields the gray or light-brown color extends to a depth of 6 or 8 inches, owing to a deeper incorporation of organic matter by tillage implements. The surface sand layer grades into yellow friable fine sandy clay which, below a depth ranging from 2 to 4 feet, is splotched with red, and in places gray, streaks extending throughout the yellow mass color. This material grades, at a depth ranging from 3 to 5 feet, into the parent material consisting of mottled gray, yellow, and red brittle sandy clay. On some slopes where erosion has been active, the parent material lies within a depth ranging from 1 to 2 feet of the surface. Small hard ironstone pebbles occur throughout the surface soil and subsoil, but in places these are very few.

This is a fairly extensive soil and is considered one of the best agricultural soils of the light-colored sandy group. It occurs mainly in the southern half of the county. The surface relief is in general gently rolling or rolling, although in places smooth divides have an undulating surface relief. Both surface drainage and underdrainage are free, and on some unprotected slopes erosion is severe.

Only a small proportion of this soil—probably less than 3 percent—is in cultivation, but probably a larger proportion is farmed than of any other soil of the group. The chief crop is cotton, with small acreages devoted to corn and incidental plantings of other feed crops, such as sorgo, hegari, and sudan grass, and small plantings of cowpeas and beans. Some truck crops are grown, the more important being tomatoes, sweetpotatoes, cucumbers, melons, and cantaloups, and a few peaches, plums, pears, and berries are produced.

Cotton is fertilized by many farmers, and special truck crops, such as tomatoes, also receive heavy applications of commercial fertilizers. Under favorable conditions fertilized cotton yields from one-half to three-fourths of a bale an acre, according to local reports. Half-and-Half cotton is the principal variety grown. Corn yields range from 15 to 30 bushels an acre, and with commercial fertilizer sweetpotatoes yield from 100 to 200 bushels and potatoes from 75 to 100 bushels. Corn and other feed crops receive no fertilizer, as a rule, but follow one of the previously fertilized crops the next season, as do also peanuts and cowpeas. Cowpeas are often planted with corn in alternate rows for the soil-improvement value of the legume.

Hogs are fattened by allowing them to range in the fields of corn, peanuts, and cowpeas, after all or at least a part of the grain has been harvested. Peaches, plums, other tree fruits, grapes, and

berries grow and bear well in the small home plantings, but they are not produced commercially.

Segno fine sandy loam is well suited to many crops. In most locations it warms up early in the spring and allows early planting. The land is easy to cultivate and is very susceptible to improvement by the growth of legumes, incorporation of organic matter, and application of commercial fertilizers. The subsoil is sufficiently heavy and deep to hold a reserve store of moisture for the use of growing crops during the hot dry summer, when rainfall occasionally is inadequate.

No systematic crop rotation is practiced, although crops are changed on the land from time to time. Truck crops, more especially tomatoes, receive acre applications ranging from 400 to 800 pounds of high-grade complete fertilizers, such as 4–12–4, 6–12–6, and 5–15–15, but usually only 200 or 300 pounds of somewhat less concentrated fertilizers are used for cotton.

Segno fine sand.—Segno fine sand differs from Segno fine sandy loam mainly in the character of the subsoil and underlying formations. The surface soils of the two soils are very similar, but the subsoil of the fine sand is loose fine sand several feet thick. The upper 3- or 4-inch layer of the surface soil is gray, being only very slightly darkened by a small content of organic matter, and below this the yellow or pale-yellow color prevails to a depth of several feet—in places to a depth ranging from 10 to more than 15 feet. In places slight gray streaks occur in the subsoil between depths of 2 and 3 feet, and small red spots or splotches are common below a depth of 3 feet.

This soil is widely scattered throughout many parts of the county in both small and large areas, but it is probably more extensive in the southern half. It occupies gently rolling ridges and some moderately steep slopes. Natural drainage is mainly downward through the soil, as the thick porous sand absorbs the rain water and allows little or no run-off or erosion.

This is a thin loose soil, low in organic matter and plant nutrients, owing to the rapid leaching effect of water. It is not highly productive, but fair yields of many crops can be obtained by fertilizing and by practicing methods of soil improvement. Only a few small areas are cultivated, and the land is farmed in about the same way, and the same crops are grown, as on Segno fine sandy loam, but crop yields are, as a rule, somewhat lower. The soil is better suited to vegetables than to the general farm crops, and some tomatoes, cucumbers, and potatoes are grown commercially. It is also well suited to melons, cantaloups, sweetpotatoes, peanuts, grapes, peaches, plums, and berries, small quantities of which are produced.

Ruston fine sandy loam.—The surface layer of Ruston fine sandy loam consists of light-brown or grayish-brown loamy fine sand which grades at a depth of 3 or 4 inches (6 or 8 inches where cultivated) into brown, reddish-brown, or reddish-yellow fine sand. At a depth ranging from 12 to 15 inches this material passes into a reddish-yellow or reddish-brown sandy layer ranging texturally from fine sandy loam to fine sandy clay. This material changes very gradually, at a depth ranging from 3 to 4 feet, into red fine sandy clay or clayey fine sand, containing some gray and yellow mottlings.

Included with this soil as mapped, are small unimportant areas of Ruston fine sand which differs from the fine sandy loam chiefly in that the subsoil is fine sand. Locally there are some small areas of a soil included, which resemble Orangeburg fine sandy loam in that the subsoil is red sandy clay.

Ruston fine sandy loam is of very small extent and occurs in small scattered areas on the tops of ridges associated with the Segno soils. The Ruston soil has free surface drainage and underdrainage. It is a fairly strong soil, probably more productive naturally than Segno fine sandy loam, and is suited to about the same crops. It is farmed with that soil, and the same crops are grown in the same way, with little difference in crop yields.

Caddo fine sandy loam.—The 3- or 4-inch surface layer of Caddo fine sandy loam consists of dark-gray fine sand. It grades into yellow or gray fine sand which in places is faintly mottled with brown and contains a few black or brown concretions. At a depth ranging from 12 to 18 inches, this material grades into mottled yellow and gray friable fine sandy clay, and this, in turn, at a depth ranging from 4 to 5 feet, into the parent material of gray, yellow, and red mottled plastic clay which becomes more sandy with increasing depth.

This soil occurs in many small flat or undulating areas at the heads of many small drainageways. Small mounds of fine sand are distributed irregularly over the surface. Although the surface soil and subsoil are both very permeable to water, the flat surface, together with the rather dense underlying parent clay, results in slow drainage, and the land dries out late in spring. Very little of this soil is in cultivation. General farm crops and a few truck crops are grown. With adequate drainage the soil would be suited to about the same crops as those grown on Segno fine sandy loam, with probably little difference in yields under similar conditions of surface relief and cultural treatment.

Caddo fine sand.—Caddo fine sand has a surface layer about 3 inches thick of gray fine sand which is underlain by grayish-yellow fine sand containing an appreciable quantity of silt and very fine sand. Below a depth of about 24 inches the material is gray and yellow mottled loamy fine sand containing some red and brown spots. A few small brown and black concretions, both soft and hard, occur throughout the surface soil and subsoil. Gray or mottled fine sandy clay or clayey fine sand lies beneath the subsoil at a depth ranging from about 4 to 10 feet.

This soil occupies some fair-sized areas in the southeastern part of the county in the flatwoods or Big Thicket section. Scattered over the surface in many places are small sand mounds, some several feet high, ranging from a few square feet to several acres in size. These sand mounds, locally called "hammock land", consist of small spots of Segno fine sand.

The surface relief of Caddo fine sand ranges from flat to undulating, and drainage is very slow. Very few well-defined drainageways have been formed in areas of this soil, but numerous shallow narrow swales wind about, which seem to comprise the incipient development of a drainage system. Owing to slow drainage, causing a saturated condition of the soil for long periods, together with the isolated location of much of this soil, practically none of the land is

farmed. With adequate drainage it would probably produce good yields of many vegetables and various truck and fruit crops. With fertilization, the general farm crops, such as cotton, corn, peanuts, and feed crops, would produce fairly good yields on the adequately drained areas.

Kalmia fine sand.—Kalmia fine sand is a soil very similar in character to Segno fine sand. It has a 5-inch surface layer of gray or grayish-brown fine sand which passes into yellow fine sand several feet thick. The surface layer contains only a very small quantity of organic matter, and both the surface soil and subsoil are very loose and incoherent. This soil occupies stream terraces adjacent to the bottom lands and also occurs on some ridges lying slightly above overflow in broad bottoms. The surface relief ranges from flat to undulating, and drainage is freely accomplished downward through the porous subsoil.

This soil is suited to the same crops as those grown on Segno fine sand; that is, truck crops, including vine crops and many vegetables. Cotton, corn, and various feed crops are grown chiefly, with yields reported as about the same as on Segno fine sandy loam. This is a very inextensive soil, and less than one-fourth of it is in cultivation.

Mapped areas of this soil include very small spots of Kalmia loamy fine sand which differs from Kalmia fine sand only in having a slightly larger content of very fine sand and silt in the surface soil. Some included spots of Kalmia fine sandy loam differ from the typical soil in that the subsoil is fine sandy clay. These included soils are slightly more productive than Kalmia fine sand.

SOILS OF THE SUSQUEHANNA DIVISION

With the soils of the Susquehanna division the zone of transition from surface soil into subsoil is very thin or, in places where the light-textured surface soil rests abruptly on the clay subsoil, is entirely absent. The subsoils are dense and heavy, and water passes through them very slowly. In flat positions the soils remain saturated or water covers the surface for very long periods during the winter when evaporation is slight. The soils of this division are Susquehanna fine sandy loam; Lufkin fine sandy loam; Lufkin very fine sandy loam; Lufkin very fine sandy loam, depression phase; Myatt very fine sandy loam; Myatt very fine sand, mound phase; Leaf fine sandy loam; and Leaf clay loam. These soils occupy a very large proportion of the county and are more extensively developed in the northern and central parts than in the southern part.

Susquehanna fine sandy loam and Lufkin fine sandy loam are very much more extensive than any other soils of this division. These two soils dominate the rolling uplands, and the other soils of the division are confined to smaller nearly flat or undulating areas. Surface drainage of most areas of these two soils is free, but underdrainage through the dense clay subsoils is so slow that the upper layers soon become saturated and allow rapid run-off so that serious erosion may ensue, removing much of the surface soil.

In general the surface layers of the soils of this division are sandy and are gray or brownish gray, but the subsoils differ greatly in color characteristics. On rolling areas the parent clay formations lie near the surface on many slopes, as only thin surface soil and sub-

soil layers have developed in places. These soils dry out late in spring, and crops are somewhat later than on the soils with permeable subsoils. As a rule these soils are of acid reaction and do not contain a large quantity of organic matter. The sandy texture and friable consistence of the topsoils allow easy cultivation, although some of the very fine sandy loams crust or bake on drying thoroughly. Although these soils are not naturally highly productive, they are susceptible to improvement by the installation of suitable drainage, terracing to increase water absorption and to prevent erosion, the addition of organic matter, and the growing of legumes. Commercial fertilizers are used to some extent and are believed to be generally profitable.

About the same type of farming and the same crops are grown as on the soils of the Segno division, but, owing to late drying of the soils in spring, truck crops are not grown to the same extent as on the soils of that division. The chief crops are cotton, corn, and other feed crops. These soils support a heavy growth of valuable pine timber, where it has not been removed in lumbering operations, and it seems that on at least some areas, reforestation would prove ultimately more profitable than growing cultivated crops. Probably less than 1 percent of the soils of this division is in cultivation. Susquehanna fine sandy loam and Leaf fine sandy loam are probably cultivated more extensively than any other of these soils, although in places small areas of Lufkin fine sandy loam are tilled. Large areas of Lufkin fine sandy loam and Susquehanna fine sandy loam are covered almost exclusively with a growth of longleaf pine, where it has not been cut for lumber.

Susquehanna fine sandy loam.—The surface soil of Susquehanna fine sandy loam consists of gray or light-brown fine sand from 3 to 6 inches thick, the topmost part of which contains a small quantity of organic matter. Where the soil is cultivated, the surface soil is ordinarily from 6 to 10 inches thick. This layer passes below into light-gray or yellow fine sand which, at a depth ranging from 8 to 15 inches, rests on dense heavy plastic red and gray mottled clay with some yellow streaks in places. At a depth ranging from 12 to 30 inches this material passes into the parent clay which consists of bluish-gray dense clay with red and yellow mottlings, or, in places, of yellow, gray, or chocolate-colored shaly clay. On many sloping areas the soil layers are thinner, and the parent clay lies within 1 or 2 feet of the surface and in spots is exposed.

The surface relief of this soil ranges from gently rolling to very rolling. Surface drainage is rapid, owing to the sloping surface and to the slow absorption of water by the dense clay subsoil, so that the soil soon becomes saturated with water and much soil is carried away, especially from land in cultivation. Many of the shallow soils on sloping areas are deficient in soil moisture, and crops suffer if dry periods are long extended. Therefore crops on many areas may be adversely affected both by excess moisture and by a deficiency of moisture.

A number of small unmappable areas of Susquehanna fine sandy loam, deep phase, and of Susquehanna clay loam are included in areas shown on the soil map as Susquehanna fine sandy loam. The deep phase is similar to the typical soil in the topsoil layers, but

the upper part of the subsoil consists of a mottled gray and yellow fine sandy clay layer from 1 to 2 feet thick, which changes below into the typical dense mottled clay subsoil. The clay loam consists of eroded slopes of fine sandy loam, where a layer of gray fine sand from 3 to 5 inches thick rests on the heavy clay subsoil. These included areas are very small and widely scattered.

Susquehanna fine sandy loam occurs in large areas throughout the central and northern parts of the county. Probably less than 1 percent of the land is used for crops, although it is more largely cultivated than any other soil of this division. It is readily cultivated, owing to the light texture, but is only moderately productive. It is used mainly for the general farm crops—cotton, corn, and other feed crops, such as sorgo and sudan grass. Only small acreages are devoted to truck crops, although home vegetable gardens are common. Cotton and truck crops are fertilized to some extent with commercial fertilizers, apparently with good results. Under the most favorable conditions, cotton yields from one-fourth to one-half bale an acre and corn from 10 to 20 bushels. Corn is not fertilized, but it usually follows cotton and receives some advantage from the previous fertilization. Fruits, such as peaches, plums, and pears, do fairly well in the small home orchards, if the soil is of normal depth. Small plantings of cowpeas, peanuts, and miscellaneous crops are also grown successfully.

Leaf fine sandy loam.—Leaf fine sandy loam is of much the same character as Susquehanna fine sandy loam. The surface soil, which consists of gray fine sand from 3 to 5 inches thick, grades below into gray or pale-yellow fine sand which, at a depth ranging from 12 to 18 inches, rests on heavy plastic dense clay mottled red, yellow, and gray. This material, at a depth of about 4 feet, becomes mottled yellow and gray sandy clay.

Small areas occur, in which the surface soil is a very fine sand. A few areas of a deep phase of the fine sandy loam also occur, in which the upper sandy layers extend to a depth of as much as 20 inches. As the areas of Leaf very fine sand and of the deep phase of the fine sandy loam are not large enough to map separately, they are included with areas of Leaf fine sandy loam.

Leaf fine sandy loam is cultivated to some extent, and, next to Susquehanna fine sandy loam, is probably the most extensively farmed soil of this division, but it is of small extent. In productiveness and suitability to crops it ranks about the same as the smoother areas of Susquehanna fine sandy loam. It is farmed in the same way as that soil and produces about equal yields of crops.

Leaf clay loam.—Leaf clay loam occurs in a few small bodies on slopes, associated with Leaf fine sandy loam. The clay loam is characterized by a very thin—only 2 or 3 inches thick—layer overlying the heavy clay subsoil. Owing to its occurrence in such small areas, it is usually cultivated with the surrounding bodies of Leaf fine sandy loam, and the same crops are grown as on that soil.

Lufkin fine sandy loam.—The surface soil of Lufkin fine sandy loam consists of a 6- to 10-inch layer of gray slightly silty fine sand containing a rather large quantity of very fine sand in many places. The surface layer is only 1 or 2 inches thick and contains little organic matter. The surface soil is underlain by light-gray silty

fine sand which, in places, contains a few small brown spots and black concretions. At a depth ranging from 10 to 20 inches (30 inches in places), this fine sand rests on heavy gray clay of a putty-like consistence, and this, in turn, at a depth ranging from 30 to 60 inches, passes into the parent material which in many places is shaly clay.

Included with this soil are small unmappable bodies of Lufkin fine sand which is very similar to the fine sandy loam but differs chiefly in the subsoil which, to a depth ranging from 3 to 5 feet, is gray fine sand.

Lufkin fine sandy loam is an extensive soil and occupies large areas throughout the western and northern parts of the county. The surface relief ranges from undulating to rolling, much of it being gently rolling. The soil has fairly rapid surface drainage, but the dense almost impenetrable clay subsoil causes the soil layers above to remain wet for a long time after becoming saturated.

The land is readily cultivated, though in hot dry weather it crusts and packs on becoming thoroughly dry. It is only moderately productive and is late in spring, owing to the imperfect underdrainage. Although farmed to only a slight extent, many small farms are located on this soil near the railroads and main highways. The chief crops grown are cotton, corn, sorgo, and other feed crops, and in a few places truck crops—mainly tomatoes—are produced. The soil is farmed in much the same way as Susquehanna fine sandy loam, and probably about the same or slightly lower crop yields are obtained. Farmers report that the soil responds well to commercial fertilizers when the seasons are favorable. Small home gardens and orchards produce moderate yields of vegetables and fruits.

Lufkin very fine sandy loam.—Scattered throughout areas of Lufkin fine sandy loam are numerous small bodies of Lufkin very fine sandy loam, which occur on the flat-topped divides and at the heads of drainageways. To a depth of 3 inches this soil consists of light-gray rather compact silty very fine sandy loam, darkened slightly by a small quantity of organic matter. The sandy topsoil layer ranges in thickness from 8 to 12 inches and rests on gray tough fine sandy clay which, at a depth of about 2 feet, grades into gray very tough dense clay. The land is nearly flat, and both surface drainage and underdrainage are very deficient. This soil is not extensive and is not generally cultivated. Moderate yields of cotton, corn, other feed crops, and some truck crops could be grown, but results would depend largely on moisture conditions.

Lufkin very fine sandy loam, depression phase.—Lufkin very fine sandy loam, depression phase, consists of a layer of gray very fine sandy loam 8 or 10 inches thick, the topmost 1 or 2 inches of which contain a slight admixture of organic matter. The soil material contains considerable silt and on drying becomes a very hard structureless mass. It rests on dense heavy gray clay containing a few small yellow and brown streaks and in places a few fine black concretions, some of which are hard and some soft.

This soil occupies slightly depressed small irregular-shaped areas and some winding narrow swales. The absence of surface drainage and the dense impermeable subsoil cause water to stand for a long

time during the rainy or cool seasons when evaporation is slight. Owing to the prevalence of May-haw trees, the areas occupied by this soil are locally called May-haw ponds. The soil occurs only in the southeastern part of the county. None of the land is in cultivation.

Myatt very fine sandy loam.—Myatt very fine sandy loam is similar to Lufkin very fine sandy loam, but it occupies smooth flat areas on terraces adjacent to, but high above, the stream bottoms. It consists of light-gray silty very fine sandy loam, in which the topmost 3 inches are slightly darker, owing to a natural incorporation of a small quantity of organic matter. In most places the surface soil ranges from 6 to 10 inches in thickness, but in places it extends to a depth ranging from 15 to 20 inches, where it rests on dense heavy gray clay containing a few small rust-brown spots. On drying thoroughly, the surface soil becomes very hard and compact, and the subsoil is a very dense, tough, almost impenetrable mass. Both surface drainage and underdrainage are almost entirely absent. Included on the map with this soil are very small spots of Myatt clay and Myatt silt loam.

Only a few very small areas of Myatt very fine sandy loam are farmed, as the soil is generally too wet for successful cultivation. Moderate yields of cotton, corn, and feed crops are produced in a few places.

Myatt very fine sand, mound phase.—Myatt very fine sand, mound phase, occupies some areas on very high old stream terraces in the northeastern part of the county. The 10-inch surface layer consists of light-gray compact silty very fine sand containing numerous very small yellowish-brown iron stains throughout. The immediate surface soil is slightly darker and in places contains many crawfish chimneys. The surface layer passes below into very light gray compact silty very fine sand containing many small black and brown concretions. This subsurface layer, as well as the surface layer, dries out to a very hard mass. At a depth of about 30 inches the subsurface layer rests on gray or brownish-gray clayey fine sand or fine sandy clay. In places the clay is plastic, dense, and puttylike, and contains some layers of gray fine sand.

The land is very flat and is dotted with many more or less circular and domelike sand mounds which range from 50 to 70 feet in diameter, and from 2 to 5 feet in height. The soil of the mounds is gray fine sand several inches thick, underlain by yellow fine sand several feet thick, resting on gray dense clay. None of this land is in cultivation, owing probably to slow drainage, distance from roads, and to the fact that soils more favorable for crops are accessible.

DARK-COLORED UPLAND SOILS

The dark-colored upland soils, here represented chiefly by the soils of the Wilson series, may be termed the Wilson group, and they include Wilson clay, Crockett clay loam, and Garner clay. These soils are not extensive, but they occupy numerous small areas, with an aggregate area of 41,024 acres, scattered throughout the county. The same soils occur in large areas in a number of counties lying just west of the east Texas timber country.

The surface relief ranges from nearly flat to undulating, and some fairly steep slopes have, in places, been greatly eroded. Both gully and sheet erosion have been severe on Wilson clay and have occurred to some extent on Crockett clay loam, but Garner clay lies so nearly flat and drains so slowly that it is not eroded. It remains wet a long time after rains. Although the subsoils of the soils of this group are very heavy, water passes through them more readily than through the subsoils of the soils of the Susquehanna division of the light-colored soils group.

The surface layers of soils of the Wilson group are heavy and require more power for cultivation than the sandy soils of other groups, but if cultivated under optimum moisture conditions they break down to a moderately friable granular condition with a loamy texture. These soils contain a larger quantity of plant nutrients and organic matter than the light-colored soils. and they are less acid. They are also of more lasting fertility than the light-colored soils.

Although the soils of the Wilson group are of small extent as compared with those of other groups, practically all of them are in cultivation. The chief crops grown are cotton, corn, cowpeas, and hegari, sudan grass, and a few miscellaneous crops are grown in a small way. These soils are well suited to the general farm crops, and they produce higher yields than the light-colored sandy soils but are not so well suited to truck crops, and practically no truck is grown commercially. Cotton is the cash crop, and the other crops are grown mainly for home and local use. Some commercial fertilizers have been tried by a few farmers, but the results have been somewhat uncertain, as has been generally the case with these soils in other sections of the State. The soils respond well to applications of organic matter. Terracing to prevent erosion has proved advantageous in conserving the soils.

Wilson clay.—The surface soil of Wilson clay consists of a 10- to 14-inch layer of black or very dark gray clay which is waxy and sticky when wet but coarse granular when dry or when cultivated in a slightly moist condition. This layer grades below into dark bluish-gray or dull-gray clay which extends to a depth ranging from 20 to 30 inches. These upper layers are generally of slightly acid reaction or are neutral and by field test show no free calcium carbonate. The lower layer passes below into gray calcareous clay containing soft and hard white concretions of lime carbonate. In flat areas of the virgin soil, the surface is pitted with minor depressions and elevations, resulting in a hog-wallow condition which is characteristic of the large areas of heavy black-land prairie soils before cultivation.

The surface relief is in general undulating, and drainage is free. Small areas of Houston black clay occur on some slopes in places. This included soil is somewhat darker than Wilson clay, more granular, and highly calcareous. The areas are too small to show separately on a small-scale map.

Practically all of Wilson clay is cultivated, although a few very small virgin areas remain with a thin growth of post oak, shortleaf pine, and some prairie grasses, chief of which are buffalo grass and grama. According to local reports, cotton yields about one-half bale

an acre, and the staple ranges from 1 inch to 1⅛ inches in length, which is somewhat longer than the staple of the Half-and-Half variety so largely grown on the soils of the Susquehanna and Segno divisions. The chief varieties of cotton grown on Wilson clay are Mebane, Acala, and Lone Star. Corn yields from 15 to 30 bushels an acre, and other crops yield well.

Crockett clay loam.—Crockett clay loam seems, in many places, to be a transitional soil between the dark-colored soils and the light-colored soils. It partakes of the characteristics of soils of both groups to some extent. The surface soil and subsoil are slightly acid in reaction, but they are less uniform in color than Wilson clay, and in some areas the colors are very spotted. A typical profile shows about 12 inches of dark-gray or nearly black clay loam which grades into heavy gray clay containing red and yellow streaks or spots. In places the subsoil has a preponderance of red, and in other places yellow and gray are more prominent. No calcareous material occurs above a depth of several feet under many areas, but beneath others calcareous clay lies from 2 to 3 feet beneath the surface. In places there are numerous very small spots of Susquehanna fine sandy loam, which range from a few square feet to a few acres in extent. Some small areas occur in which the surface soil is fine sandy loam to a depth of 2 or 3 inches.

Surface drainage is fairly rapid, and in places erosion is active. The land is readily cultivated when in the proper moisture condition. A large proportion of this soil is in cultivation, though not so large a percentage as of Wilson clay. The natural vegetation is chiefly shortleaf pine, post oak, small amounts of other oaks and hardwoods, and haw trees. The soil is fairly productive but probably slightly less so than Wilson clay. The same crops are grown in about the same way as on that soil.

Garner clay.—Garner clay consists of gray, dark-gray, or brown clay to a depth ranging from 4 to 8 inches. It is underlain by gray and yellow mottled clay, and this, between depths of 3 and 4 feet, passes into gray waxy clay containing brown spots and a few black concretions. At a depth of several feet a few fine concretions of calcium carbonate occur, also some fine crystals of soft material, probably gypsum.

This soil occupies very flat old stream terraces that lie high above present overflow. Surface drainage and underdrainage are slow. The virgin soil contains some hog-wallow depressions. In places some artificial drainage has been advantageously provided by ditching. Areas of this soil in cultivation return yields of the general farm crops (largely cotton) as good or better than on Wilson clay. Shortleaf pine, water oak, and post oak constitute the chief natural growth, although probably some of the land was originally prairie or semiprairie, as the principal area is locally known as "Garner Prairie."

ALLUVIAL SOILS

The alluvial soils—generally referred to as bottom land—occupy many stream-bottom areas, and in the aggregate they comprise a rather large proportion of the total land area. These soils include a wide range of color and textural features. They are Ochlockonee

fine sandy loam, Ochlockonee clay loam, Ochlockonee fine sand, Ochlockonee clay, Bibb fine sandy loam, Bibb loamy fine sand, Bibb clay loam, Bibb clay, Johnston clay, and river wash.

The surface relief in general is flat, and occasional overflows occur, but some areas have sufficient natural drainage to allow successful farming. These soils are deep and contain a large quantity of available plant nutrients. Therefore, where drainage conditions allow cultivation, the soils are largely used for farming. They are in general acid and contain much organic matter. They afford a good reservoir for holding sufficient soil moisture to carry crops through the drier periods of midsummer.

These soils are heavily timbered with a general hardwood growth in which oaks predominate. However, on the sandier areas and in a few of the sandier creek bottoms, shortleaf and loblolly pines take precedence. Areas in the Trinity River bottoms and along many of the larger creeks, where natural drainage is adequate for farming, are cultivated extensively. Ochlockonee fine sandy loam, Ochlockonee clay loam, and Ochlockonee clay are farmed extensively. Johnston clay, a black soil, is highly productive but has very slow natural drainage, and, as it occupies the lowest parts of the Trinity River bottom, only about 50 percent of the land is cultivated. The Bibb soils, which are gray wet soils, lie in some of the most slowly drained bottoms, and only about 15 percent of them is cultivated.

Cotton is the chief crop grown, and, on the stronger soils, such as Johnston clay and the heavier Ochlockonee soils, acre yields range from one-half to 1 bale. The cotton, principally Mebane, Kasch, and Acala varieties, is of good quality, and the staple is said to be of about the same length as of cotton grown on the dark-colored upland soils. Corn on these soils ordinarily yields from 20 to 40 bushels an acre, and other crops, consisting chiefly of feed crops, do well. Native pecan trees grow well on the better drained areas of the Ochlockonee soils. Cotton and corn are more largely grown on the heavier soils. However, if seasonal conditions prove too wet for early cotton, feed crops may be substituted and grown late in the season.

Ochlockonee fine sandy loam.—Ochlockonee fine sandy loam is brown or brownish-gray fine sandy loam to a depth of about 10 inches. It is underlain by brownish-yellow, gray, or slightly mottled clay loam or sandy clay, many feet thick. This is an easily tilled soil, productive, and suited to many crops, although practically no crops other than cotton and corn are grown. Small acreages are devoted to sugarcane which yields well and produces a very high quality of sirup. The soil has moderately free drainage, although it is overflowed occasionally. The land is largely in cultivation.

Ochlockonee clay loam.—Ochlockonee clay loam is dark grayish-brown clay loam to a depth ranging from 1 to 2 feet. This material is underlain by brown or grayish-brown clay with rust-brown streaks. This layer extends to a depth of several feet, and some sandy layers are present at a depth ranging from 4 to 5 feet. This is a strong productive soil and is largely in cultivation. It is used mostly for cotton, corn, and other feed crops. Although the land is nearly flat, it has moderately rapid drainage. This soil occurs chiefly in the Trinity River bottoms.

Ochlockonee clay.—Ochlockonee clay is an extensive soil in the Trinity River bottoms. The 8-inch surface soil consists of grayish-brown crumbly clay containing an appreciable quantity of silt and very fine sand. It is underlain by mottled dark-brown and gray clay which, below a depth of 2 feet, contains some yellow mottlings. This is a strong productive soil. The land is flat, but it has sufficient drainage to allow cultivation, and it is cultivated extensively to cotton and corn. Some other feed crops yield well.

Ochlockonee fine sand.—Ochlockonee fine sand consists of a 6- or 8-inch layer of light-brown fine sand underlain by loose yellow fine sand which extends to a depth of several feet. This soil lies in the higher bottom-land positions and has rapid natural drainage. It is not so highly productive as the heavier soils of the Ochlockonee series and is used mostly for pasture for livestock. Bermuda grass, which is abundant in places, furnishes valuable grazing.

Johnston clay.—Johnston clay consists of black or grayish-black heavy clay to a depth ranging from 1 to 4 feet. It grades into bluish-gray heavy clay. Both the surface soil and subsoil have fine rust-brown streaks running through the soil mass, and both layers are acid in reaction.

This soil occupies low basinlike bottom-land positions in the Trinity River bottoms, and it has very slow drainage. Much of it remains wet a great part of the time and is not cleared or cultivated. It is readily cultivated to a granular mass when the moisture content is slight. The land, where cultivated, produces excellent yields of cotton, corn, and other feed crops. With proper drainage established, this soil would become much more valuable.

Bibb fine sandy loam.—Bibb fine sandy loam is the most extensive soil of the Bibb series. It is light ash-gray loamy fine sand or fine sandy loam to a depth ranging from 1 to 2 feet. This material is underlain by dark-gray silty clay loam several feet thick. The soil is very productive, and small areas having comparatively rapid drainage are used for cotton, corn, and feed crops, which produce good yields. Excellent sugarcane is grown in the better drained areas, in small plantings which yield well and produce sirup of fine quality.

Bibb loamy fine sand.—The 9-inch surface soil of Bibb loamy fine sand consists of gray loamy fine sand mottled with brown. It is underlain by light ash-gray fine sand which extends to a depth of several feet. This bottom-land soil is fairly well drained. It supports a stand of white oak, water oak, willow oak, sweetgum, black gum, and other trees. This land is largely uncultivated.

Bibb clay loam.—Bibb clay loam is light-brown or brownish-gray clay loam to a depth ranging from 6 to 10 inches. This material is underlain by gray clay loam or clay with rust-brown mottlings, which extends to a depth of several feet. Included with this soil as mapped are small areas of Bibb silt loam, in which the surface soil is gray silt loam. Small areas of Bibb clay loam are cultivated, although most of the land is too wet or too frequently overflowed for utilization in crop production. It is naturally a highly productive soil when properly drained. Cotton and corn are the chief crops.

Bibb clay.—To a depth ranging from 1 to 2 feet, Bibb clay is gray heavy clay or sandy clay. This material grades into light-gray

heavy clay containing a few yellow spots. Most of the soil is very flat and low lying, and it has very slow drainage. Therefore very little is cultivated, though it is inherently productive and would produce good yields of cotton, corn, and feed crops if adequately drained.

River wash.—River wash is the name given to beaches of river sand and mud that lie so low along the river or are so mixed with debris from floods that there is no soil material suitable for crop production. It is waste land of very slight extent.

AGRICULTURAL METHODS AND MANAGEMENT

Livestock raising is the most widespread agricultural pursuit in Polk County. Many cattle and hogs are raised for market, but most of them are of inferior quality. They consist of range livestock of no special or improved breeds, roaming the timberlands in a half-wild state. The hogs are largely of native unimproved types often referred to as "razorbacks." Some of the cattle are crossed with Brahman bulls, which are immune to Texas fever, a disease carried by the Texas fever tick, which is common in the county, and preys heavily on the cattle in summer. Dipping vats have been established in many places by the county government, but few are used, as it has proved too expensive and arduous a task to hunt the cattle out of the thickly wooded unfenced timber country for the frequent dippings necessary to keep them tick free. Dipping vats are maintained at all shipping points, and all cattle are dipped when shipped out of the county, as required by law.

In spring the young shoots of the common coarse grasses and the tender growth of shrubs, together with Bermuda grass and lespedeza, which cover abandoned farms and grow wild in open places on moist soils, furnish abundant forage, and the cattle become fat. By midsummer the forage becomes dry and tough, and this unpalatable feed, together with the annoyance of the ticks and flies, causes the cattle to lose weight. Fall rains renew the forage to some extent, but the cattle usually go into the winter in poor condition, except when they have access to domestic forage. In winter some Bermuda grass and lespedeza remain green in sheltered places, and these, together with Spanish-moss, switch cane, which grows on the better drained bottoms, and sweetbay, which grows on areas of Segno fine sand and Caddo fine sand, afford the principal forage. This forage is sufficient to bring most of the cattle through the winter, but some of the weaker ones have to be fed.

There are practically no improved, fenced, permanent pastures. One ranch with a number of fenced wild pastures is in the northeastern part of the county. This ranch is maintained in connection with a reforestation project, and no attempt has been made to improve the quality of the range forage in the pasture.

Many cattlemen have acquired the habit of burning the range each spring, with the idea that it fosters an early grazing crop and kills the ticks. In reality, this practice is injurious to the process of natural reforestation so important to this county, as fires kill many seedling trees and retard the growth of older ones. An effort is being made to protect the land from these expensive fires, and the eastern half of the county is now under intensive fire control by the Texas

Forest Service working in cooperation with a number of the larger lumber companies. For this purpose steel fire towers have been erected, and observers have been assigned the task of preventing forest-fire damage.

Hogs range over the uplands and bottoms, gathering forage from oak mast and the tender roots of longleaf pine seedlings. Because of this practice the free-range hog is very detrimental to natural reforestation. Cholera is common, and many hogs die from this disease. There are a few well-bred domestic hogs, most of which have been introduced through boys' club work or the agricultural extension service. Such hogs are inoculated against cholera.

Aside from those consumed locally, cattle and hogs are sold largely to buyers who collect shipments and forward them to the Fort Worth market.

Goats are not raised commercially, and only inferior breeds are kept. They are considered of value in keeping down the fast-encroaching brushy vegetation on cleared farms, as these animals feed largely on coarse shrubs and bushes.

Two or three small herds of grade Jersey cows are maintained near the main towns for a local supply of milk, but there are no commercial dairy-products plants in the county.

An agricultural industry of importance is the ginning of cotton. A number of gins handle the production each year. Of these, there are two at Livingston and Onalaska, respectively, and one each at Goodrich, Bering, Leggett, Moscow, Corrigan, Blanchard, Kickapoo, Barnes, Hortense, Barnum, East Tempe, and Harrisons Gin. Most of the cotton ginned is sold on the spot market and shipped to the compresses at Houston and Galveston.

Cane sugar is produced at home-operated mills in small quantities for home consumption. A pickle plant at Livingston puts up and ships 7 or 8 carloads of pickled cucumbers each year to a firm in Houston. The packing of early table tomatoes, which are shipped to northern markets, creates employment for a number of people each year.

Land prices in Polk County differ greatly, depending on the location, improvements, and type of soil. Little differentiation in value is made between the light-colored upland soils, but the alluvial soils and the dark-colored upland soils are generally priced higher than are the sandy upland soils.

Land for cultivation is cleared of underbrush and small trees after the merchantable timber has been removed. When clearing the land, fence posts are split from suitable trees, and the hardwood trees are killed by girdling or are treated with arsenical poison. In a few cases the large timber is cut and sawed for firewood, and the stumps are left to rot in the field. The land is listed with a "middle buster", and crops are planted on the ridge. Corn is usually planted for the first 2 or 3 years on the freshly cleared land among the deadened timber. Each year the deadened trees that fall are pulled together and burned.

Fertilizers are not used on any soils during the first 3 years of cropping. The dark-colored upland soils and the heavy bottomland soils are never fertilized. After about 3 years of cropping the light-colored upland soils are fertilized and planted to cotton or truck

crops. The sandy alluvial soils appear to require no fertilization until they have been cropped for several years.

No definite system of crop rotation is used on any of the soils. On the heavier soils cotton is grown continuously, and on the sandy soils cotton and corn or other feed crops alternate, except where truck crops are grown. Truck crops are followed by cotton and the cotton by corn or some other feed crop.

Truck and cotton crops are the only ones receiving applications of commercial fertilizer. Truck crops, especially tomatoes, receive from 400- to 800-pound applications of complete fertilizer an acre. The fertilizers are of medium high concentration. On all other crops 200 pounds an acre is a standard application, regardless of the fertilizer formula.

The cotton markets of Polk County are not discriminating, and not much attention is given to cotton varieties. The Half-and-Half variety is grown extensively on the sandy upland soils, owing to its higher percentage of lint and probably slightly higher yield on these soils, although the length of staple is shorter than that of many other varieties, and in a discriminating market it does not command so high a price as the varieties having a longer staple. The principal varieties grown on the other soils are Mebane, Lone Star, Kasch, and Rowden.

Most of the corn grown is white, but no special varieties are in use. Tight-husk corn is best for this section, as it prevents weevil infestation. Much corn and other feeds are shipped into the county from outside markets.

The principal varieties of tomatoes are Gulf State, Improved Gulf State, and Marglobe, all of which produce well, but the Improved Gulf State is somewhat superior to the others.

Pests on all crops are very common in this humid country. In damp or wet seasons the cotton bollweevil, bollworm, and leafworm are active, but in dry seasons infestation is less severe. Dusting with high-powered dusters, which is effective against these pests, is not practiced. Some hand dusting with a porous sack of poison and a stick is attempted, but this method is unsatisfactory. The weevil which attacks corn may be controlled by fumigation after the corn is gathered. Corn should be gathered as soon as it has ripened, in order to prevent weevil damage in the field. Tomatoes are attacked by the tomato worm and other insects, which may be controlled by proper spraying. The chinch bug attacks cowpeas and other vine crops. Many crop diseases, such as root rot, wilt, blight, and other rots, are common. Some of these may be controlled with sprays, by the use of certified seeds, and to some extent by systems of crop rotation, wherein particular plant hosts are not allowed to remain very long on the soils.

SOILS AND THEIR INTERPRETATION

Polk County lies within a large region occupied mainly by light-colored light-textured timbered soils. This is the great timbered coastal-plain belt which extends westward along the Gulf seaboard and terminates about 100 miles west of Polk County at the eastern border of the black-land prairies. Small isolated areas of these

prairie lands, onto which forest growth has encroached locally, lie thinly scattered throughout sections of the Polk County upland. The rolling surface relief of the county is deeply dissected by numerous narrow valleys occupied by deep beds of water-transported soil materials, which comprise alluvial lands, constituting in the aggregate a considerable proportion of the total land area of the county. Therefore the soils of the county may be included in three general groups—(1) light-colored soils, (2) dark-colored soils, and (3) alluvial soils.

The soils have been developed in a warm, moist climate, mostly beneath a heavy growth of timber, from unconsolidated parent materials comprising interbedded formations ranging from sand and sandy clay to heavy clay, some of which are calcareous. Because of high rainfall, the soil materials are strongly subjected to eluviation, illuviation, and leaching, and the resultant soils have developed characteristics that differ locally in proportion to the extent of these influences which are governed largely by permeability of the materials and by the character of the surface relief. Where the parent materials or soils are of slight penetrability the soils remain wet or thoroughly saturated much of the time, especially in flat positions, during the colder seasons, but they dry out thoroughly during the hot summers. The processes of aeration and oxidation, therefore, also differ locally with reference to the moisture relationships. The generally sloping surface relief has been produced by erosion, and as this agency interrupts soil development by removal of soil material, the developed stage of soil maturity is in proportion to the gradient of the slope. The native vegetation of timber provides but a slight contribution of organic matter to the soil, and the eluviated loose surface layer allows its rapid removal by oxidation and leaching. The soils generally are markedly lower in organic matter than the soils of the prairies that have developed under a grass vegetation. Under these conditions soil maturity is attained only on the very smooth areas, and these are not extensive. The mature soil comprises thoroughly leached and eluviated horizons of acid reaction, low in organic matter and in available bases, particularly calcium, and deficient in plant nutrients.

The light-colored group includes soils developed from beds of noncalcareous or only slightly calcareous sand, sandy clay, or shaly clay, in many places interbedded. These soils are developed beneath a natural growth of pine, together with some hardwoods, including mainly oaks and gum, and they are low in organic matter. The organic matter, comprising fine and coarse particles of leaves, is confined, in the virgin soil, to the 1- to 3-inch gray or brownish-gray surface layer which is the most thoroughly eluviated and leached layer.

Where the parent materials are penetrable and, therefore, have free underdrainage, the mature soil has a thoroughly and deeply eluviated and leached A horizon. The mature soils comprise deep beds of the coarser siliceous sand, as represented by the Segno and Kalmia fine sands which, for the most part, occur in smooth nearly flat areas undisturbed by erosion. Parent materials of dense, almost impervious clay are leached and eluviated more slowly, and the more mature soils comprise a thoroughly eluviated A horizon, and the B

horizon is composed of a concentrated very fine illuviated soil material which is dense and heavy, and through which water passes very slowly.

Therefore two general divisions of soils occur within the light-colored soils group—(1) soils with friable or crumbly subsoils and (2) soils with dense, heavy, almost impenetrable subsoils. The soils of these two divisions are much the same in surface appearance, nearly all having the light-colored coarse sandy layer, from 1 to 3 inches thick, and a sandy subsurface layer, also largely eluviated and containing no organic matter, but differing in color in reference to drainage conditions—being yellow where underdrainage is rapid and gray where free water remains much of the time.

Owing to exposure of the different beds of parent materials by erosion, the soils of the two divisions occur in many small areas, greatly mixed and intimately associated. However, the northern part of the county is more largely made up of soils with dense subsoils, and the largest areas of soils with friable subsoils occur in the southern part.

The soils with friable subsoils are developed largely from readily permeable parent materials, sands and sandy clays, and are largely immature, owing to the prevailingly rolling and sloping surfaces from which erosion has carried away the soil material before complete soil development is attained. On flat areas the mature soils comprise deep beds of fine sands of the Segno and Kalmia series. On the slopes the soils consist of a greatly leached and eluviated A horizon usually made up of two layers, the upper layer being loose gray or brownish-gray fine sand, from 1 to 3 inches thick—the organic-matter layer—and the lower layer being yellow, gray, or brown fine sand. This material passes through a gradual change into the illuviated layer at a depth, differing according to the degree of erosion, in most places ranging from 10 to 20 inches. The illuviated B horizon is sandy clay or moderately heavy crumbly clay through which water passes more or less freely. It also differs in thickness, according to the extent of erosion, but in most places ranges from 2 to 3 feet in thickness and grades below into the parent material. The illuviated horizon is established and maintained beneath the thin covering of eluviated material, because the progress of soil removal by erosion is but little behind soil development, and the sloping surface relief prevents complete eluviation of the lower soil layers. Owing to local differences in the character of the parent materials and the gradient of the slopes, soil characteristics resulting from aeration and oxidation, as well as from leaching processes, differ in many small and large areas. These differences, largely of color, texture, and structure, give rise to soil series which for the most part are made up of soil types classed as fine sandy loams. Where drainage is slow and the soils and parent materials remain wet much of the time, the predominant color, owing to lack of oxidation of the iron compounds, is gray. Where strongly leached and eluviated the surface layer is also gray, owing to the removal of most of the material except grains of siliceous sand. The greatly eluviated and leached lower layers—the lower A horizon and the B horizon—are predominantly yellow, although the lower B horizon in places contains red splotches and spots associated with ironstone pebbles or concretions, as in the Segno soils, or with slight gray

mottlings, as in the Caddo soils. In a very few small areas where surface drainage and underdrainage are moderately free but leaching is not rapid because of a fairly heavy but very permeable horizon of illuviation, a red color develops within the B horizon, giving the reddish-brown or reddish-yellow color characterizing the Ruston soils; and in a very few very small spots where the B horizon is fairly heavy but crumbly, a deep-red color prevails and, together with the other characteristics, constitutes patches of Susquehanna soils.

The soils of this division characterized by dense, tough, slowly permeable subsoils are developed mainly from dense clays and shaly clay. The light-colored siliceous surface layer, from 1 to 3 inches thick, is much the same as in the soils of the other division. Owing to slow underdrainage, the subsurface layer, horizon A_2, is also thoroughly eluviated and rests abruptly on the dense heavy clay of the illuviated B horizon. There is a very sharp line of contact between the two horizons. The surface relief in most areas is sloping, but the dense underlying clay of the illuviated horizon or of the parent materials renders underdrainage so slow that the soil material remains wet a large proportion of the time. Where drainage is especially deficient, the dominant color throughout is gray, and this, associated with other characteristics, produces soils of the Lufkin and Myatt series. The soils of these series are similar in characteristics, the Lufkin being developed from dense impervious clays of the rolling upland, with a comparatively thin horizon of illuviation just above the parent material; and the Myatt, developed on flat benches from ancient alluvial clay sediments, has a thick horizon of illuviation underlain by parent materials which are somewhat more permeable and contain more free water and, therefore, have a higher water table than occurs beneath the Lufkin soils.

Large areas of soils developed on rolling surfaces, beneath which lie slightly more permeable parent materials than those beneath the Lufkin soils, develop yellow and red colors in the upper part of the dense illuviated horizon, which, with the gray, produce a mottled effect. This characterizes the Susquehanna and Leaf soils. The red color develops more rapidly at the top of this layer and decreases with depth, whereas the gray, which is least prominent at the top, increases downward.

The dark-colored soils have been developed from marl or slightly calcareous clays, in which leaching, eluviation, and illuviation, on smooth surfaces, proceed slowly but steadily and uniformly. Prairie grasses (*Bulbilis dactyloides* and species of grama), which grow in a few virgin areas of these soils, indicate that the soils have been developed under a grass cover, which probably accounts for their dark color and the deeper, more thorough, incorporation of organic matter in these soils than in the light-colored soils. The areas of these dark-colored soils are small and are surrounded by the heavily timbered light-colored soils. In places pines and oaks have encroached on the dark-colored soils, but the stand is thin and of more open character. On smooth surfaces soil development has resulted in a dark heavy-textured A horizon which is naturally not very granular and which crusts hard on drying. This grades below into a slightly heavier B horizon which is noncalcareous and less

granular than the material in the A horizon. The material of the B horizon consists of massive clay which on drying cracks and breaks into large clods. This grades below, at a depth of several feet, into the parent calcareous clay. Wilson clay is the representative of the more mature soils of this division. On sloping areas the surface soil is exposed to greater erosion and the horizons are thinner. The A horizon here is less hard on drying, though the material is noncalcareous. The calcareous parent material lies nearer the surface than on the flat areas. In a few small spots, where erosion is rapid, the surface layers are granular and slightly calcareous, grading below into a calcareous B horizon. Such places comprise Houston soils but are too small to show on the soil map. From the least calcareous of the parent materials, usually where considerable of the clay material is similar to that beneath the light-colored soils, but slightly calcareous, the developed soils are dark in the surface layers, moderately granular and noncalcareous, but the B horizon is red, yellow, or mottled red, gray, and yellow heavy clay which grades below into the slightly calcareous parent material of clay. Soils of this character are included with the Crockett series. These soils are intermingled with areas of the Susquehanna soils and plainly show the influence of the mixed character of the parent materials.

In the friable-subsoil division of the light-colored soils group, the soils are included in the Segno, Kalmia, and Ruston series.

The Segno soils are characterized by (1) a thoroughly eluviated horizon A consisting of (*a*) a gray or grayish-brown surface layer, from 1 to 3 inches thick, grading below into (*b*) a yellow subsurface layer which gradually passes below into (2) horizon B of varied thickness and degree of eluviation or illuviation, according to slope and stage of maturity. This material is yellow, and it contains red spots or splotches in the lower part. Both horizons contain small ironstone pebbles which, in places, are very abundant. The lower part of the B horizon merges below with (3) the parent material of sandy clay.

The profile of Segno fine sandy loam is representative of the soils of the friable-subsoil division. A typical profile of this soil is described as follows:

A_1. 0 to 3 inches, gray fine sand containing a small quantity of dark decomposed organic matter—mainly the remains of leaves of trees. This layer contains some small hard ironstone pebbles.

A_2. 3 to 12 inches, yellow fine sand containing some ironstone pebbles. This layer in places extends to a depth of 18 or 20 inches. It passes through a thin transitional zone into the B_1 layer.

B_1. 12 or 20 inches to 30 or 40 inches, yellow fine sandy clay containing in places a few faint mottlings of gray and red colors in the lower part and also containing a few small dark ironstone pebbles. This gradually changes to the material below.

B_2. 30 or 40 inches to 50 or 60 inches, slightly heavier yellow fine sandy clay containing red spots and some small ironstone pebbles which are rather easily broken. In some places the fine earth around the soft pebbles comprises red spots. This material gradually changes at a depth ranging from 4 to 5 feet.

C. Mottled gray, yellow, and red brittle fine sandy clay which contains dark concretionary material surrounded by red spots of fine earth. This is probably the upper and partly weathered bed of parent material.

The layers of the upper, or A, horizon are moderately acid in reaction and are low in organic-matter content. The structure is single grain, and the material is friable and has little coherence. In places

the ironstone pebbles are very abundant, and in other places very few are present. The B horizon layers are friable, crumbly, and absorb water readily, thus affording free underdrainage. The parent clays are moderately permeable and allow fairly free passage of water.

The surface relief of this soil ranges from undulating to rolling, some divides comprising good-sized areas with smooth surface relief, but some slopes are sufficiently steep to allow erosion and consequently only a thin development of the layers of the A horizon. Natural surface drainage and underdrainage, in most places, is moderately free, though some nearly flat areas have such slow drainage that the soil remains saturated with water during rainy seasons.

The native vegetation is mixed pine and hardwoods. Shortleaf pine is most abundant, but considerable longleaf pine grows in places. The hardwoods are chiefly post oak, red oak, blackjack oak, hickory, and some sweetgum, though the latter is less abundant than on the less freely drained soils.

The Caddo soils, also of the friable-subsoil group of light-colored soils, comprise soils somewhat similar to the Segno soils in surface features and in developed layers of the A horizon, but, owing to imperfect drainage caused by a flat surface and heavy dense parent clays, the B horizon has less mature development, as shown by the mottled coloration. A typical profile of Caddo fine sandy loam is described as follows:

A_1. 0 to 3 inches, gray or brownish-gray fine sand containing a very small quantity of dark organic matter.
A_2. 3 to 10 or 15 inches, yellow fine sand
B. 10 or 15 inches to 40 or 60 inches, friable, mottled yellow and gray fine sandy clay containing a small number of dark concretions.
C. 40 to 60 inches +, stiff plastic clay mottled gray, yellow, and red. This is the parent material.

Although the surface soil and subsoil layers are very friable and permeable to water, underdrainage is slow, on account of the rather dense parent clay. This results in considerable variation in color features in horizon B, depending on the degree of aeration and oxidation. Some gray mottlings may occur in the A_2 layer, or in places the gray color may predominate in layers A_2 and B_1.

The native vegetation consists largely of shortleaf pine, sweetgum, some loblolly pine, post oak, white oak, and water oak.

Ruston fine sandy loam is developed in high rapidly drained situations where both surface drainage and underdrainage are comparatively free. More complete oxidation occurs in the B horizon layers than in the corresponding layers of any other soil. The areas, however, are small and few. A description of a profile of this soil follows:

A_1. 0 to 3 inches, light-brown or brownish-gray fine sand.
A_2. 3 to 10 or 15 inches, pale-yellow or brownish-yellow fine sand which passes through a thick zone of transition.
B. 10 or 15 inches to 30 or 40 inches, reddish-brown or reddish-yellow fine sandy clay or fine sandy loam.
C. 30 or 40 inches to several feet, red or mottled red, yellow, and gray friable fine sandy clay or clayey fine sand. This is the parent material.

In places the A and B horizons are slightly mottled with brown, yellow, or red streaks or spots. The structure of the B horizon is cloddy.

The native vegetation is largely shortleaf pine, red oak, beech, ironwood, and there are a few other trees.

The soils of the heavy-subsoil division include Susquehanna fine sandy loam; Lufkin fine sandy loam; Lufkin very fine sandy loam; Lufkin very fine sandy loam, depression phase; Leaf fine sandy loam; Myatt very fine sandy loam; and Myatt very fine sand, mound phase. In some features these soils are similar to those of the friable-subsoil division. The surface soils are practically the same, comprising layers of highly eluviated light-colored sandy material. Both the surface soils and subsoils are acid in reaction. The lower layer of the A horizon rests on dense tough clay layers of the B horizon, and these are almost impenetrable to the passage of water, air, and plant roots. These soils are developed from dense heavy clay parent materials and are very deficient in underdrainage. The soils of the Susquehanna and Leaf series have mottled red and gray B horizons. The soils of the Leaf series occur in smoother areas and have a more thickly developed A horizon, and the water table lies nearer the surface. The soils of the Lufkin and Myatt series have gray B horizons, the Myatt soils occupying more generally flat areas, and the B horizon is somewhat thicker than that beneath the Lufkin soils. The water table beneath the Leaf soils lies nearer the surface, owing to their position on flat old stream terraces over more sandy parent materials.

The profile of Susquehanna fine sandy loam is as follows:

A_1. 0 to 3 inches, gray fine sand containing a very small quantity of organic matter.

A_2. 3 to 12 inches, gray or yellowish-gray fine sand.

B. 12 to 30 inches, dense heavy plastic clay mottled red and gray and containing a few yellow streaks. With increase in depth the red color decreases and the gray increases.

C. 30 inches +, bluish-gray dense clay containing some red and yellow mottling. This is the parent material. In places the color is gray at a depth of several feet.

The B horizon material on drying cracks and separates into small irregular sharp-edged hard clods. In places the A horizon is very thin, owing to erosion. In some places the upper layer of the B horizon is sandy and more permeable than the lower part, and this soil constitutes a deep phase of the typical soil. In other places a solid red color occurs in the upper few inches of the B horizon. In some places calcium carbonate concretions and limy clay are present from 4 to 10 feet beneath the surface. Underdrainage is very slow, owing to the dense B horizon and parent clay.

Leaf fine sandy loam is developed on smoother surface relief than the Susquehanna soil, and it differs from that soil in having somewhat less complete color development in the B horizon, somewhat thicker developed layers, and slightly less sharp definition between the A and B horizons. The profile in an exposed cut bank is as follows:

A_1. 0 to 3 inches, gray fine sand.

A_2. 3 to 12 or 18 inches, pale-yellow fine sand.

B. 12 or 18 inches to 30 or 40 inches, mottled red and gray heavy clay, with some yellow spots.

C_1. 30 or 40 inches to 4 or 5 feet, gray heavy clay containing some red and yellow spots.

C_2. 4 or 5 feet to 15 or 20 feet +, red fine sandy clay interbedded with layers of sand and some gummy gray clay.

In places the upper part of the B horizon is very sandy, and here the soil is a deep phase of the typical soil.

The tree growth is about the same as on Susquehanna fine sandy loam.

The soils of the dark-colored group include Wilson clay, Crockett clay loam, and Garner clay. The parent material, consisting of gray calcareous clay, has developed into these soils on rather smooth surfaces, though some areas are sufficiently sloping to allow erosion. The soils, where normally developed, are deep, contain comparatively large quantities of organic matter, and are neutral or slightly acid in the A and B horizons. The horizons grade into one another without sharp change. The soils are heavy in texture but are sufficiently open in structure to allow slow passage of water.

Wilson clay, the most mature soil of this group, shows the following profile:

A. 0 to 14 inches, black clay.
B_1. 14 to 30 inches, dark bluish-black clay which is very heavy and waxy.
B_2. 30 to 40 inches, dark bluish-gray calcareous clay containing concretions of calcium carbonate.
C. 40 inches +, gray calcareous clay containing a large quantity of concretions of calcium carbonate and some slightly yellow mottlings. Below a depth of 4 feet the clay is nearly white and contains a very large quantity of hard and soft lumps of calcium carbonate.

The material in all layers is heavy but on drying breaks down to clods and grains. The calcareous layers are much more granular than the noncalcareous ones. The surface has a hog-wallow configuration. The soil of the depressions is black to a depth ranging from 2 to 3 feet, but on the humps the black surface layer is very thin and the B horizon layers are brown or yellow.

The forest growth is thin, consisting largely of post oak, hackberry, shortleaf pine, *Bumelia*, and haw bushes. Some buffalo and grama grasses grow on areas of the virgin soil.

On some eroded slopes the surface layers are calcareous and very granular. These represent small spots of Houston black clay. Here normal soil development is inhibited, owing to the steepness of the slopes, and the calcareous material of the parent clay has not been leached from the surface layers.

Crockett clay loam has developed from mixed parent materials, some from calcareous clay and some from the heavy clay underlying the light-colored soils.

The profile in one place shows the material in successive layers as follows:

A. 0 to 6 or 12 inches, dark-gray or nearly black clay loam.
B. 6 or 12 to 40 inches, heavy gray clay containing some red and yellow streaks and spots. This layer contains a few small, round, hard, black concretions and some soft black particles, which increase in number with increase in depth.
C. 40 inches +, bluish-gray clay which contains a few yellow and red spots and many soft black particles resembling iron. No calcium carbonate occurs in this material to a depth ranging from 6 to 7 feet, but in places calcareous clay is present at a depth ranging from 3 to 6 feet or more.

In places there are many small spots having a mottled red or mottled red and gray heavy dense clay subsoil resembling that of the Susquehanna soils. This included soil occurs largely in bodies lying between areas of Wilson clay and Susquehanna fine sandy loam,

and it seems to represent a transitional soil lying between typical dark-colored soils and light-colored soils.

The materials of both the A and B horizons, though heavy, crack on drying and break naturally to small hard clods.

The native vegetation is chiefly post oak, shortleaf pine, and sweetgum, together with some other trees and shrubs.

Table 4 gives the results of mechanical analyses of samples of four soils from Polk County.

TABLE 4.—*Mechanical analyses of four soils from Polk County, Tex.*

Soil type and sample no	Depth	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Segno fine sandy loam								
447621	0- 3	0 9	8 5	14 0	30 3	24 5	16 3	4 5
447622	3- 16	8	5 2	5	39 8	29 5	19 2	4 9
447623	16- 30	4	3 1	7 1	21 5	18 9	15 4	33 5
447624	30- 61	2	1 0	1 8	14 3	32 6	12 1	38 0
447625	61-123	0	3	4	18 4	48 1	6 6	26 2
447626	123+	0	0	.1	19 1	43 1	14 5	23 2
Caddo fine sandy loam								
447662	0- 2	7	1 8	6 1	37 0	25 5	22 3	6.5
447663	2- 9	8	2 0	5 4	37 4	26 0	24 6	3 8
447664	9- 24	1 3	3 8	8 3	39 1	23 9	20 4	3 4
447665	24- 48	7	2 6	6 2	31 5	22 0	20 0	17 0
447666	48- 66	8	2 0	6 8	29 6	18 9	18 0	23 1
447667	66- 84	1 8	5 6	7 1	21 7	13 8	15 1	34 8
Garner clay								
447695	0- 7	.2	5	.5	1 4	1 9	23 6	71 9
447696	7- 14	1	3	4	1 6	2 5	29 8	65 4
447697	14- 48	1	5	.4	1 3	1 8	24 5	71 4
447698	48- 90	1	2	2	7	1 1	14 8	83 0
447699	90-108+	3	3	3	7	1 2	11 0	80 3
Wilson clay								
447627	0- 14	0	.8	3 2	7 5	5 3	24 2	59 1
447628	14- 54	1	6	2 4	6 3	5 1	17 3	68 2
447629	54+	1 3	1.0	.4	2 1	6 4	22 3	66 4

Table 5 gives the pH values of three soils, at different depths, as determined by the hydrogen-electrode and quinhydrone-electrode methods.

TABLE 5.—*pH determinations of three soils from Polk County, Tex.*

[3 cc of soil, 1 : 2 soil-water ratio]

Soil type	Horizon	Depth	Hydrogen-electrode method	Baver method [1]		Smolik-Biilmann method [1]	
				½ minute	2 minutes	½ minute	2 minutes
		Inches	*pH*	*pH*	*pH*	*pH*	*pH*
Susquehanna fine sandy loam	A	0- 3	5 63	5 30	5 59	5 43	5 53
		3-10	4 87	4 45	4 53	4 62	4 53
Do	B	10-62	4 90	4 45	4 67	4 62	4 53
Do	C	62+	5 07	4 53	4 49	4 45	4. 62
Lufkin fine sandy loam	A	0- 3	5 63	5 21	5 30	5 39	5 05
		3-10	4 87	4 69	4 87	4 62	1 59
Do	B	[2] 10-28	5 30	4 87	4 95	4 79	4 79
		[2] 28-50	4 85	4 79	4 79	4 73	4 70
Do	C	50-74	6 30	4 77	5 00	5 75	5 55
		[3] 74+	8 80	8 10	7 99	7 77	7 77
Segno fine sandy loam	A	0- 3	5 72	5 72	5 80	5 57	5 85
		3-16	5 80	5 43	5 67	5 63	5 63
Do	B	16-30	5 39	5 21	5 26	5 39	5 27
		30-61	5 59	5 55	5 59	5 63	5 72
Do	C	61-103	5 13	4 95	4 95	4 96	4 92
		[2] 103+	4 63	4 30	4 35	4 29	4 23

[1] Quinhydrone-electrode method
[2] Moistened when nearly air-dry
[3] 1 4 soil-water ratio

SUMMARY

Polk County lies in east-central Texas. It has an area of 1,006 square miles, or 643,840 acres. The surface relief ranges from gently rolling to rolling. The elevation ranges from about 70 to 360 feet above sea level. The county is drained by Trinity and Neches Rivers.

Railroad facilities are good in parts of the county. Most of the roads are not greatly improved. There are several State highways, some of which are still under construction. The chief industry is the manufacture of lumber. The sawmills are locally reported to have a total daily capacity of 335,000 board feet.

According to the 1930 census, only about 8.8 percent of the land is devoted to cultivated crops. A very large proportion of the crop land lies in the alluvial valleys. Cotton occupies a larger acreage than any other crop, and corn is second in importance. Cowpeas, hegari, peanuts, and sudan grass are the chief forage crops. Small quantities of peaches and pears are produced. Vegetables do well, but are not grown to a great extent. Truck crops, especially early tomatoes and cucumbers, are becoming popular as cash crops in some sections. Hogs, range cattle, and poultry are widely scattered over the county, but the total number of livestock is small.

The use of commercial fertilizers is rather general and is increasing. Systematic crop rotations are not in use.

Farm labor is adequate, and the wages paid are small. Of the 2,300 farms in the county in 1930, 1,039 were operated by owners, 1,256 by tenants, and 5 by managers.

The soils are mainly light-colored sandy soils characteristic of the timbered coastal plain. Upland soils occupy most of the county, but the area of alluvial soils is fairly large. Small areas are occupied by dark-colored heavy soils. The upland soils are included in two groups—light-colored and dark-colored soils. The light-colored soils predominate and comprise two divisions—(1) soils with friable subsoils and (2) soils with dense heavy subsoils. The Ruston, Segno, Caddo, and Kalmia soils are of the friable-subsoil division, and the Susquehanna, Lufkin, Myatt, and Leaf are of the dense-subsoil division. The group of dark-colored soils includes the Wilson, Crockett, and Garner soils. The alluvial soils are of the Johnston, Ochlockonee, and Bibb series.

Polk County includes large areas of undeveloped land, much of it being cut-over timberland. A large part is suited to a diversified agriculture. This county is in the heart of the timber belt of east Texas, and much valuable longleaf and shortleaf pine and hardwoods remain. Reforestation is being practiced by some lumber companies. Land prices are comparatively low.

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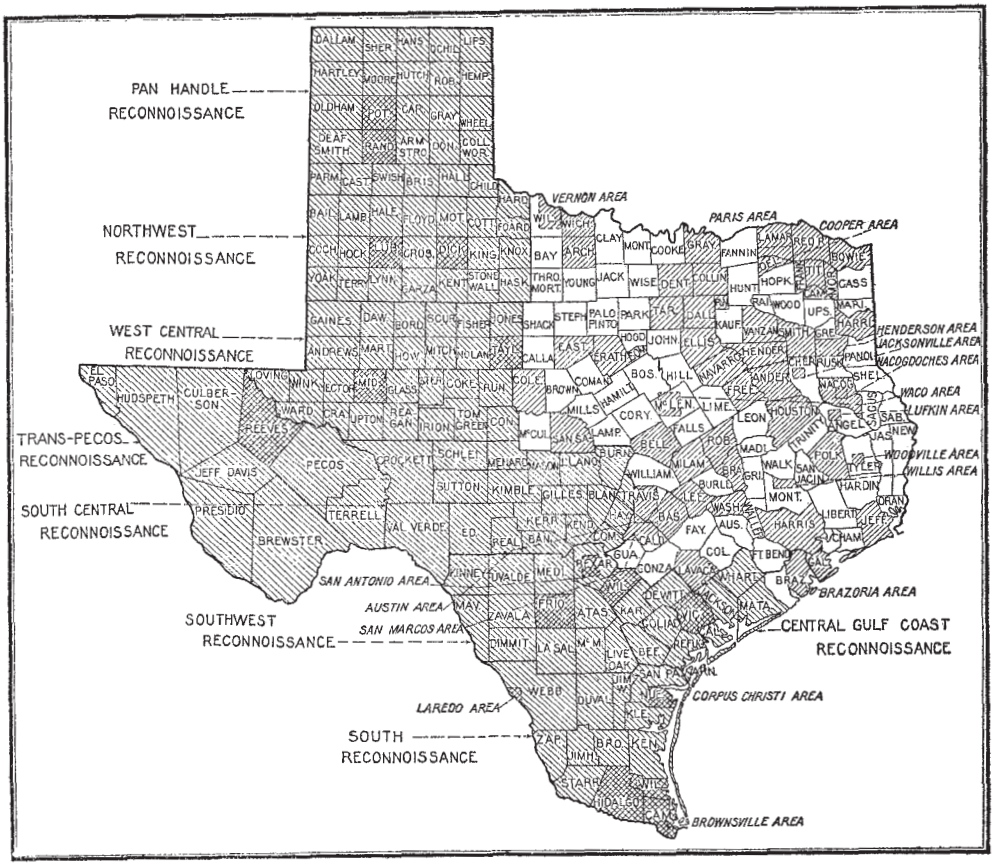

Areas surveyed in Texas shown by shading. Detailed surveys shown by northeast-southwest hatching; reconnaissance surveys shown by northwest-southeast hatching; crosshatching indicates areas covered in both ways.

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