Series 1928 Number 33

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Survey
of
Van Zandt County, Texas

By

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COUNTY SURVEYED

Van Zandt County is in northeastern Texas, at the extreme western limit of the main belt of the east Texas timber country. (Fig. 1.) It lies 70 miles south of the northern border of the State and 90 miles west of the eastern State line. Canton, the county seat, is about 60 miles southeast of Dallas. The greater part of the county is covered by a timber growth of post oak, blackjack oak, red oak, and hickory, with which some shortleaf pine occurs in the extreme southeastern part. A small section including the northwestern part is on the black-land prairie. The county includes 856 square miles, or 547,840 acres.

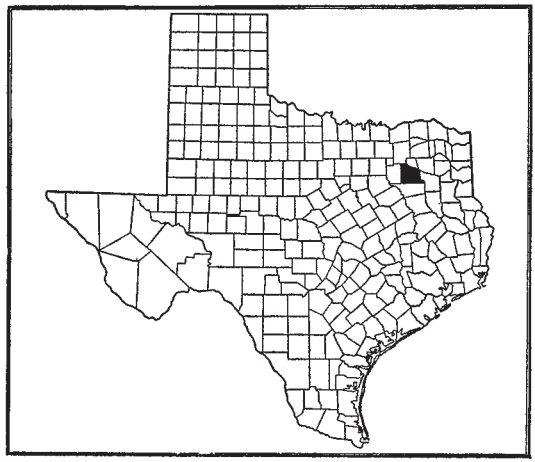

FIGURE 1.—Sketch map showing location of Van Zandt County, Tex.

The relief is that of a high rolling plain dissected by numerous small streams of local origin. The creeks and branches have developed many shallow valleys with slopes, ranging from gentle to steep, leading down to narrow flat flood plains. The larger streams occupy intrenched valleys ranging from 25 to 50 feet below the general surface level of the county. The valley slopes range from long gradual slopes to steep eroded bluffs, the latter being more prevalent in the eastern part of the county where dissection by the headwaters of Neches and Sabine Rivers is deep. The valleys range from one-fourth to one-half mile in width. North of Wills Point a few of the larger stream valleys are characterized by northward-facing blufflike slopes on the south sides, opposite gentle slopes on the north sides.

A major drainage divide extends across the county from northwest to southeast. Along this divide and in the western part of the county the surface is undulating or gently rolling. North of the divide drainage water flows into Sabine and Neches Rivers.

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A few small isolated areas that have not been encroached on by drainage channels occupy the higher flat or undulating divides in different parts of the county. In many places at the higher elevations the divides are covered with deep beds of sandy material. Such an area enters the county on the south at Rocky Point, and probably includes one of the highest points in the county. This is an extension of one of the prominent high-land features, extending from Henderson County and locally known as mountains, which constitute plateaulike eminences surrounded by steep stony slopes.

With the thorough stream dissection in the county, surface drainage is rapid, except on a few flat divides that are underlain by heavy plastic clays. In places the flatter areas are dotted with smooth, small sandy mounds separated by a network of flat slowly drained depressions.

The larger streams of the county maintain a continuous flow during a greater part of the year, except after a prolonged period of dry weather. Streams lie but little below the surface of the bottom lands, and after heavy spring rains overflows occur. At such times fresh alluvium of sand and silt is deposited. The larger stream valleys have wide bottom lands consisting of deep sandy deposits. Much of the surface of the uplands is severely eroded and more or less of the topsoil is washed away. In places the land is badly cut by numerous gullies.

The elevation of the county at Wills Point is 532 feet, at Edgewood 460 feet, at Grand Saline 407 feet, and at Silver Lake 383 feet above sea level.[1]

Van Zandt County was created from Henderson County in 1840, and Canton was made the county seat a few years later. For several years previous to this time settlements had been made in the country by people from Tennessee, Kentucky, the Carolinas, Georgia, Alabama, and Mississippi.

The population of the county, according to the census of 1930,[2] is 32,315 persons, most of whom are native whites. About 2,400 negroes live in the county, and near Edom and Big Rock School there are negro settlements. The population is all classed as rural, though there are a number of small towns. The average density of the population is 38.9 persons a square mile.

Canton, the county seat, with a population of 704, is in the central part of the county. Wills Point, Edgewood, and Grand Saline have, respectively, a population of 2,023, 761, and 1,799. These towns are located in the northern part of the county on the Texas & Pacific Railway, which provides good connections with the chief trading centers of Texas and Louisiana. Important commercial production of salt is made from mines at Grand Saline. Most of the small villages of the county have one or two cotton gins and are important local trading centers.

Good schools are located in the larger towns and at convenient places throughout the rural communities. Telephone lines extend throughout most parts of the county, and rural mail delivery reaches most farm homes. Most of the roads are of dirt construction and,

[1] GANNETT, H. A DICTIONARY OF ALTITUDES IN THE UNITED STATES. U. S. Geol. Survey Bul. 274, Ed. 4, 1,072 p. 1906.

[2] Soil survey reports are dated as of the year in which the field work was completed. Later census figures are given whenever possible.

though graded and kept in fair condition, they become very muddy during very rainy seasons, but during dry seasons they are easily traveled. The courses of the principal roads in the county were determined by the general direction of travel by the early settlers to the local trading centers, and from each of these trading centers the principal roads radiate for several miles into the rural communities. The Bankhead Highway crosses the northern part of the county, and most of it is paved. The Dixie Highway, a graveled road, follows the main divide through Wills Point, Myrtle Springs, Canton, Ben Wheeler, and Edom.

CLIMATE

The climate of Van Zandt County is favorable for the growing of a large variety of crops, including fruits and vegetables, and is favorable for field work during most of the year.

During the winter the weather is variable, periods of mild, cool weather alternating with cold waves, locally termed "northers," which last from two to five days, often with temperatures below freezing. Sometimes the ground is frozen to a depth of a few inches, and winter crops and fruit trees are slightly injured. Sometimes the cold spells extend southward as far as the Gulf and injure much of the early fruit crop of central Texas. Between the cold periods sufficient warm weather occurs at times to cause fruit trees to bud or bloom before the season of killing freezes is past, thereby causing a loss of the fruit crop.

Warm weather begins in March and is usually accompanied by spring rains that provide conditions favorable for plowing and seeding. The summer months are characterized by long periods of hot weather tempered somewhat, especially at night, by southerly breezes. Short periods of drought sometimes occur during the summer. Thunderstorms provide short torrential rainfalls.

The average annual rainfall is 40 inches. The greatest amount falls during the growing season, and the remainder is well distributed throughout the year. The snowfall is negligible.

The fall months are warm and pleasant. The nights are cool and the days have an abundance of sunshine, thus providing ideal weather for harvesting crops. This season of the year ends with a period of slow general rains characteristic of the winter season.

The average dates of the first and last killing frosts, respectively, are November 14 and March 14. This gives an average frost-free season of 245 days. Frost has been recorded as early as October 9 and as late as April 9.

The length of the growing season is sufficient for the proper maturing of all staple crops and many varieties of fruits and vegetables, both early and late. It also facilitates the practice of a very intensive system of farming. Two or more crops can be grown on the same field in many seasons, and a cover crop is also sown for the winter season. With mild weather prevalent during the nongrowing periods, land can be prepared for early spring seeding.

Table 1, compiled from the records of the Weather Bureau station at Kaufman, Tex., 15 miles west of this county, gives the more important climatic data which are believed to be fairly representative of conditions in Van Zandt County.

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

[Elevation, 448 feet]

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1910)	Total amount for the wettest year (1919)
	°F.	°F.	°F.	Inches	Inches	Inches
December	47.0	81	9	3.73	3.45	0.94
January	47.1	91	1	1.78	1.16	2.45
February	49.1	91	3	2.75	2.94	3.45
Winter	47.7	91	1	8.26	7.55	6.84
March	59.1	92	21	2.85	2.44	3.23
April	66.0	96	29	4.68	1.81	3.97
May	73.4	102	37	4.46	3.38	5.17
Spring	66.2	102	21	11.99	7.63	12.37
June	81.7	107	47	3.23	3.62	5.38
July	84.7	110	59	3.16	.55	2.38
August	84.9	112	56	3.30	.91	2.77
Summer	83.8	112	47	9.69	5.08	10.53
September	78.7	105	40	3.06	.56	6.42
October	67.6	98	25	3.63	1.92	11.88
November	57.5	87	19	3.60	.05	7.87
Fall	67.9	105	19	10.29	2.53	26.17
Year	66.4	112	1	40.23	22.79	55.91

AGRICULTURE

The earliest agricultural activities in Van Zandt County were carried on mainly in the timbered sections, as water was plentiful and wood for buildings and fences was available. The prairie section was devoted to the cattle-raising industry, but later, as larger farming implements and wire fencing came into general use, the prairie land was gradually given over to farming. Cotton has been the principal farm crop grown since the first settlement of the county.

During the early days, markets for staple products were not available and only enough land was farmed to grow the food needed for home consumption. Corn, wheat, oats, fruits, and vegetables were the principal crops. A few cattle were kept to supply dairy products, sheep were kept for wool, and hogs for meat. Sometimes the livestock industry branched out as an important source of income. Plenty of land was available where the livestock could graze, the herds increased in size, and the animals not needed for local use were driven to distant markets.

With the entrance of the railroad into the county, in the early seventies, outside markets were made accessible, crop production was stimulated, and farming operations, especially on the prairie lands, were greatly extended.

Cotton is at present the chief money crop in the county. Ravages of insect pests and low prices have led many farmers to engage in the production of other crops, especially truck crops, such as watermelons, strawberries, blackberries, peaches, tomatoes, cucumbers,

peanuts, potatoes, sweetpotatoes, and sugarcane for sirup. On the sandy, timbered soils of the county, local producing organizations have been formed to grow some of the truck crops and to establish a marketing system for the products.

In the prairie section of the county the soils are less well suited to truck and fruit crops, and the general farm crops, including oats, cotton, corn, and other feed crops are chiefly grown.

Mebane, Kasch, and Rowden are the principal varieties of cotton, though some Lone Star and Half-and-half are also grown. The 1930 census shows that in 1929, on 4,899 farms of the county, 162,695 acres were devoted to cotton which produced 32,592 bales.

Preparation for a cotton crop commences in late November or in early January. The land is plowed and sometimes bedded at the time of plowing. In early spring the beds are torn down by harrowing and the land is rebedded with a middle burster and again smoothed down for seeding. Commercial fertilizers are applied to the seed bed about a week before planting. Various kinds of complete fertilizers are used for cotton at a rate ranging from 100 to 300 pounds an acre. Some farmers use a mixture consisting of equal amounts by weight of cottonseed meal and superphosphate (acid phosphate). For the most part fertilizers are used only on the upland sandy soils. Early planting is desirable in order to avoid, so far as possible, damage by the boll weevil and to take advantage of spring moisture conditions. Late March or early April is the favored time for planting cotton.

Cotton is first cultivated when the plants are from 2 to 5 inches high, and it is later thinned to a desired stand by chopping. It is harvested from August to late fall and is hauled to local gins, where the seed is removed and the lint baled. Most of the crop is sold to local cotton buyers. Cotton grown by farmers belonging to pooling associations is shipped to a central warehouse and stored.

Corn is grown chiefly for feeding local livestock. This crop ranks second to cotton in acreage. The 1930 census reports 52,714 acres of corn harvested for grain in 1929, yielding 641,159 bushels.

On bottom-land soils, most of the corn is planted on small ridges to facilitate early drainage, and on the lighter upland soils, which tend to dry out to a great depth, it is planted in furrows. The crop is rarely fertilized, but is often grown on land that previously has been fertilized for cotton. Planting usually commences about the first part of March, but often such early plantings are injured by cold spring rains. The middle part of April is considered the most generally favorable time for planting corn.

The corn crop is usually cultivated three or four times during the growing period. During the first cultivation the stand is thinned to two stalks a hill. At the time of the last cultivation some farmers plant cowpeas in alternate rows with corn. It is reported that such practice improves the soil and increases the yields of corn. Harvesting of corn begins in late August or early September. According to farmers, the Ferguson and other yellow-dent varieties of corn are very successfully grown, though much of the corn planted has no varietal identity.

In 1929, oats for grain were grown on 7,360 acres, yielding 159,296 bushels. Most of this crop is grown on the prairie soils. The oats are fed to farm livestock, and some are shipped to outside markets.

On the sandy soils of the timbered sections of the county, oats are grown for winter grazing and some are cut for hay. Red Rustproof (Texas Red) is the chief variety grown.

Wheat is grown on only a few areas in the county, though at one time a small amount was grown successfully on the heavier prairie soils. A few small patches of rye are sown as a winter cover crop and for grazing. A small acreage, mostly of the dark prairie soils, is devoted to the growing of grain sorghums, and yields are good. Cowpeas are grown on many farms both for soil improvement and for the seed. In 1929, 9,038 acres on 1,073 farms produced 27,825 bushels of peas.

Peanuts are grown on large or small acreages, governed principally by market prices. In 1929, 10,090 bushels were produced on 1,002 acres. The crop is grown mainly on sandy soils, and it is harvested by pulling the vines with the nuts attached and then storing them loosely in sheds for drying. The vines make valuable livestock forage. Sometimes the crop is not harvested, but is used for pasturing hogs, for which it is an excellent feed.

The census reports 159 acres of sugarcane grown in 1929, yielding 20,993 gallons of sirup. Amber and Early Orange varieties of sorgo are grown in small patches for sirup.

Bermuda and carpet grass are valuable grasses grown for pasture. They make a dense growth and prevent soil erosion on steep hillsides. Many of the pastures are overgrazed, and considerable attention is now being given to increasing the acreage of improved pasture grasses. The common pasture grasses are locally known as wire grass, wild barley, needle grass, wild millet, tallow weed, and broom sedge. Though the wild grasses are consumed to some extent by livestock, the more desirable Bermuda grass is preferred. Bermuda grass can be successfully established on all the soils, though more care is required to start it on some of the lighter-textured soils. By scattering Bermuda grass roots over the field and leaving the land undisturbed for a year, except cutting down undesirable vegetation, a good stand is obtained. It is estimated by local farmers that 1 acre of good Bermuda-grass pasture will support two head of cattle a season. This is the chief hay grass in the county. Farmers report that two cuttings a season are usually obtained on the better-drained bottom-land meadows, with a yield ranging from one-half to three-fourths of a ton an acre at each cutting.

Farmers report that stands of alfalfa have been made in places on the prairie soils, but, on account of lack of soil moisture during the long hot summers, the plants do not thrive.

In 1929, according to the census, a total of 2,364 acres was devoted to hay production. The yield was 2,988 tons, an average of more than 1 ton an acre. Miscellaneous hay and forage crops are also obtained from peas, peanuts, sorghums, and small-grain crops. A rather large quantity of hay has to be brought from outside the county to meet the local requirements.

Most of the special vegetable and fruit crops of the county are grown on the sandy soils in the timbered sections. The total sale of these crops brings in an appreciable revenue. Peaches are the principal orchard fruit. They are produced chiefly in small home orchards, preferably on well-drained upland soils having red subsoils, which appear to be best suited to peaches of the best quality.

Elberta, Mamie Ross, Belle of Georgia, and Indian Cling are the principal varieties. In 1929, 45,433 peach trees of bearing age, from which were harvested 31,969 bushels, were on 1,228 farms of the county. The peaches are sold locally, and some of the fruit is trucked to the prairie communities.

Watermelons, tomatoes, beans, peas, potatoes, and sweetpotatoes are the chief truck crops grown for the market. These products are marketed by local truck growers' organizations, though some growers sell their products in the larger cities and towns outside the county.

Orchard fruits, nuts (mainly pecans), small fruits, and berries are produced on many farms, mostly for home and local use, but small surpluses are sold. Pecans grow well in certain well-drained rich soils. In 1929 there were 1,396 bearing trees in the county. Blackberries were grown on 54 acres distributed over 213 farms.

Small herds of cattle are raised on many farms, the census reporting nearly 10,000 head milked on 4,255 farms in 1929. Most of the cattle are dual-purpose animals for supplying home requirements of dairy products. Recently, however, through local encouragement, better grades of cattle have been imported. Through the help of local commercial organizations many purebred cows and bulls have been distributed in the county. Some dairy products are marketed. In 1929, 145,638 gallons of milk, 713 pounds of butter, and 234,144 pounds of cream (as butterfat) were sold. Milk and cream are shipped to Dallas, Texarkana, Fort Worth, and Marshall. The census reports that the value of butter, cream, and milk sold in 1929 amounted to $163,066.

Swine have rapidly increased in numbers during the last few years, there being a few head on most farms. Poland China is the principal breed. The 1930 census reports 11,566 head of swine in the county on April 1 of that year. Small herds of goats and sheep are kept on a few farms, mainly in the uncleared timber sections of the county, where many shrubs and trees provide good browse for goats.

The poultry industry has rapidly expanded in Van Zandt County. Local reports estimate about 500 commercial flocks of poultry in the county. The census reports 174,659 chickens on farms in 1930, and in 1929, 505,879 dozens of eggs and 108,701 chickens were sold.

On the average farm in the county the farm buildings include a residence, a poultry house, and a small barn. During most of the year livestock need no protection from the weather. Most of the buildings on farms operated by the owners are painted and kept in a good state of repair. The farm machinery is of a light type and operated by two mules or horses.

According to the 1930 census, there are 5,201 farms in the county, averaging 85.1 acres a farm. The land used for crops totals 250,130 acres, or an average of 48 acres a farm. The total value of farm land and buildings was $15,361,396 in 1930.

The same authority states that 57.4 per cent of farm operators are tenants. Locally it is estimated that 70 per cent of the prairie farms and 30 per cent of farms in the sandy timbered section are tenant operated. The most common form of rental is on the share-crop basis which provides that the tenant give one-fourth of the grain and one-third of the cotton crop to the landowner. Under

most contracts, the tenant furnishes the machinery and labor. Some farms are rented for one-half of the crop, where the owner furnishes all or a part of the machinery, seed, and work animals.

Most of the farm labor is white, although in a few sections of the county colored labor predominates. Wages range from $20 to $40 a month with board.

Land values are highest in the prairie section of the county and in a few local places in the red lands of the eastern part. In general, the highest prices are paid for soils of the Crockett, Wilson, and Nacogdoches series. Values placed on hilly, gravelly, and badly eroded soils and on deep fine sand are the lowest in the county. Land of this kind includes such soils as Susquehanna fine sandy loam, broken phase, Norfolk fine sand, and Kirvin gravelly fine sandy loam.

SOIL SERIES AND TYPES

The soils of the Susquehanna, Kirvin, and Lufkin series are developed in the timbered part of the county, and the Crockett, Wilson, and Durant soils occupy the prairies. The soils of both divisions are characterized by heavy plastic clay subsoils. The Susquehanna subsoil is composed of red plastic heavy clay mottled with gray and rust brown, the gray color predominating with increase in depth. Beneath the Kirvin soils the subsoil is deeper red, the material is less plastic, and it is underlain by a more friable parent material. The surface layer of the Kirvin soils is brown. The Lufkin soils are imperfectly drained. The surface soil is decidedly gray, and beneath it is a drab-gray plastic subsoil. The surface soils of the Crockett soils are brown or grayish brown, passing below through a thin layer of light-colored material, into dull-red and yellow mottled clay. These soils are underlain by a substratum of laminated clay containing concretions of carbonate of lime. The Wilson topsoils are dark gray or black, and they overlie clay subsoils ranging from gray to nearly black clay. The soils of the Durant series are characterized by brown or dark-brown topsoils underlain within a few inches by yellow clay which extends to a depth of several feet. In places carbonate of lime concretions occur near the surface.

The soils of the Nacogdoches, Ruston, Norfolk, and Bowie series have friable sandy subsoils and, owing to the sandy character of the soil mass, have better underdrainage and more free aeration than the other soils of the county. The Nacogdoches soils have dark-brown or reddish-brown topsoils which pass below into friable deep-red subsoils. The topsoils of the Ruston soils are lighter brown, and these soils differ from the Nacogdoches soils in having lighter red subsoils. Soils of the Bowie series are characterized by a grayish-brown topsoil grading below into a yellow friable subsurface layer which is underlain by a friable subsoil of mottled yellow, gray, and red sandy clay.

The Portsmouth soils represent very poorly drained areas of Norfolk fine sand, except that they contain a high percentage of organic matter which produces the dark-gray or black color. The subsoil is dark-gray sandy clay.

Other soils characterized by a friable subsoil include the Kalmia and Cahaba soils developed on old stream terraces. The surface soils

and subsoils are similar in character to the corresponding horizons of the Norfolk and Ruston soils.

The alluvial soils of the county occupy the first bottoms along streams. They are composed of sediments washed from the upland soils. The Trinity soils are black calcareous soils composed of materials washed from the calcareous dark prairie soils. The Johnston soils, which are similar in color to the Trinity but are not calcareous, are composed of mixed materials brought from sandy timbered and heavy prairie soils. The Ochlockonee soils, which have brown surface soils and brown or mottled subsoils, comprise soil materials brought from the timbered sandy upland soils. The Bibb soils, composed of similar materials to the Ochlockonee, lie in very low, poorly drained locations and are gray in color.

The extent and distribution of the different soils in the county are shown on the accompanying map made to the scale of 1 inch to a mile. Each soil is represented by a special color and symbol, and its boundaries are located according to measurements made in the field. Streams, roads, railroads, farm dwellings, churches, schools, and villages are indicated by symbols. The names of each soil type and the explanation of the symbols are given in the legend on the margin of the map.

This report describes the soil conditions that have relation to the present and future development of agriculture. The meanings of certain terms used in the soil descriptions must be explained in order to obtain proper interpretation of the report. Such textural designations as clay loam or sandy clay represent the proportion of sand, silt, and clay in the surface soil. The term granular refers to the facility with which the soil mass on drying separates naturally into small particles. Cloddy refers to the natural breakage of the soil into large fragments. Compactness means a dense, tight consistence. Friable refers to soil material that offers very little resistance to crushing, breaking, or penetration.

In Van Zandt County 19 soil series are identified, which include 28 soil types and 2 phases of types. In the following pages of this report the different soils are described in detail, and their agricultural relationships are discussed. Table 2 gives the acreage and proportionate extent of each soil mapped in the county.

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

Type of soil	Acres	Per cent	Type of soil	Acres	Per cent
Crockett very fine sandy loam	37,376	6.8	Kirvin gravelly fine sandy loam	7,936	1.4
Crockett fine sandy loam	16,832	3.1	Nacogdoches fine sandy loam	2,176	.4
Crockett clay loam	6,144	1.1	Caddo fine sandy loam	13,120	2.4
Wilson very fine sandy loam	23,040	4.2	Portsmouth fine sandy loam	192	.1
Durant clay loam	6,208	1.1	Ochlockonee very fine sandy loam	40,000	7.3
Durant fine sandy loam	5,696	1.0	Ochlockonee silt loam	15,808	2.9
Susquehanna fine sandy loam	134,592	25.2	Ochlockonee silty clay loam	3,712	.7
Broken phase	3,328		Trinity clay	8,704	1.6
Lufkin very fine sandy loam	17,024	3.1	Johnston silt loam	9,664	1.8
Bowie fine sandy loam	66,176	12.1	Bibb fine sandy loam	512	.1
Norfolk fine sandy loam	19,584	4.4	Bibb silty clay loam	1,152	.2
Deep phase	4,416		Cahaba fine sandy loam	2,112	.4
Norfolk fine sand	56,768	10.4	Kalmia fine sandy loam	2,432	.4
Ruston fine sandy loam	20,800	3.7	Hannahatchee fine sandy loam	576	.1
Ruston fine sand	1,920	.4			
Kirvin fine sandy loam	19,840	3.6	Total	547,840	

CROCKETT VERY FINE SANDY LOAM

The surface soil of Crockett very fine sandy loam is very dark grayish-brown very fine sandy loam which contains a comparatively large amount of organic matter though probably less than the alluvial soils or soils of the Wilson series. This soil is mellow and develops a good tilth under cultivation. In places the surface soil is underlain by a layer from 1 to 4 inches thick of light-gray loose structureless very fine sand which apparently contains no organic matter. The subsoil lies sharply defined beneath this gray layer at an average depth of about 15 inches. (Pl. 1, A.) It consists of mottled dark-gray, dull-red, and yellowish-brown stiff heavy clay extending to a depth of about 35 inches. Below this is olive-yellow or greenish-yellow clay similar in characteristics other than color to the material above. In the lower part of the subsoil the material dries and separates into columns which crack horizontally, producing cubical clods about 1 inch in diameter. It contains carbonate of lime concretions and thin specks of gypsum, although these are not everywhere present. The subsoil is underlain in most places by laminated clay, mottled with rust brown, yellow, and black. The rust-brown material is chiefly sandy material. This layer is streaked with lime concretions in the upper part, and deeper the carbonates are in the form of thin seams or veins.

In places the top of the heavy red subsoil is marked by a smoothly wavelike configuration which, in cut banks, is strikingly featured in the exposed profile. The parent material of bluish-gray laminated marl or clay in places contains some oval-shaped calcareous sandstones which are streaked with seams of calcite. These stones range in size from 6 inches to more than 1 foot in diameter. The laminated substratum is most conspicuously revealed in road cuts south of a line drawn westward from Rocky Point School along the south side of Magbee Creek. It occurs nearest the surface in the vicinity of Wise School, where limy concretions lie near the surface.

Some areas of this soil are featured by the presence of very slight streaks and spots of Wilson soils that are too small to map separately. This variation presents a mixed appearance on recently plowed land. Such areas occur west of Enterprise School and near Center School, and in them road cuts reveal the changeable character of the soil occurring at intervals of several feet.

The surface relief of Crockett very fine sandy loam ranges from nearly flat to undulating. The slope is sufficient in most places to insure good surface drainage. The subsoil, though heavy, allows penetration of water, and moderately rapid underdrainage ensues.

Most of this soil is acid in reaction in the upper layers but neutral or alkaline in the lower ones.

Crockett very fine sandy loam is developed under prairie conditions. It is regarded as a strong productive soil, and commercial fertilizers are not used on it. About 85 per cent of the land is under cultivation. The virgin soil supports a good growth of prairie grasses of which the Andropogons are probably dominant, but in places where the natural vegetation has been destroyed by cultivation such grasses as Bermuda grass and Johnson grass find a ready foothold and make a rank growth.

Cotton and oats are the chief crops grown. Local reports are that cotton yields average about one-half bale an acre and in seasons providing a normal supply of soil moisture, some yields have been as high as one bale. Oats yield from 15 to 45 bushels an acre. This is a crop well suited to this soil under the prevailing climatic conditions. Corn is not grown extensively as the soil is better suited to other feed crops. The yield of corn is said to range from 15 to 35 bushels an acre. Small quantities of grain sorghums, such as kafir, milo, and feterita, are grown by a few farmers who report good yields. Sorgo yields abundantly and is grown in small fields for fodder.

Table 3 shows the results of mechanical analyses of samples of the surface soil, the subsurface soil, and several layers of the subsoil of Crockett very fine sandy loam.

TABLE 3.—*Mechanical analyses of Crockett very fine sandy loam.*[1]

No.	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
447345	Surface soil, 12 to 15 inches	0.2	0.2	0.2	4.7	32.7	41.5	20.4
447346	Subsurface soil, 15 to 19 inches	0	.2	.6	3.2	17.2	27.1	51.8
447347	Subsoil, 19 to 34 inches	.1	.2	.2	2.8	18.0	32.5	46.2
447348	Subsoil, 34 to 48 inches	.2	.1	.2	2.2	19.7	33.8	43.8
447349	Subsoil, 48 +inches	.1	.1	.2	1.5	16.4	31.6	50.1

[1] After treatment with hydrogen peroxide.

CROCKETT FINE SANDY LOAM

The topsoil of Crockett fine sandy loam is grayish-brown or light-brown fine sandy loam about 10 inches thick. This grades below into brown loam or silt loam, which, in turn, grades into mottled dull-red and yellowish-brown stiff heavy clay. (Pl. 1, B.) At a depth of about 28 inches the clay is characterized by an olive color. The clay subsoil has a uniform rise and fall producing a wavelike formation as shown in road cuts. The topsoil and upper subsoil layers range from slightly acid to neutral, but the lower subsoil layer is alkaline though not everywhere calcareous.

The more rapidly drained areas of this soil are underlain by subsoils in which the red color is predominant, but where drainage is slow the dark or mottled effect is present. In some places the subsoil resembles that of the Susquehanna soils, but the surface soil is strongly indicative of the Crockett soils. This soil is representative of transitional prairie-timber lands and in places has been encroached on by timber.

Areas of Crockett fine sandy loam range from nearly level to undulating, and they include some knolls and ridges with long gentle slopes. Surface drainage is good.

It is estimated that about 75 per cent of the land is under cultivation. In virgin areas it maintains a growth of coarse prairie grasses, with some post oak in places.

Cotton, the chief crop, yields from one-fourth to one-half bale and corn from 15 to 35 bushels an acre. Oats are sometimes grown, and they average about 20 bushels an acre. Small fields of grain sorghums and sorgo (sweet sorghum) are grown on many farms and yield well.

CROCKETT CLAY LOAM

Crockett clay loam in Van Zandt County occurs chiefly along the steeper slopes in the prairie section, consequently surface drainage is rapid. The soil has a very dark grayish-brown or black clay loam topsoil about 8 inches thick, which passes below into yellow or reddish-yellow heavy but crumbly clay or silty clay loam. The subsoil is very similar in structure to the surface soil, being granular and friable when dry. Below a depth ranging from 12 to 24 inches the color of the clay changes to greenish yellow or olive, and the material is more or less calcareous and contains concretions of lime carbonate. This layer, at a depth ranging from 3 to 5 feet, is underlain by laminated or shaly clay, gray or rust brown and yellow in color and in most places containing concretions of lime carbonate. An exposed vertical section of this soil reveals the sharply defined differences in the soil layers.

The subsoil effervesces with acid only where lime concretions are abundant. The fine earth fails to produce any reaction with acid in many places, but gives an alkaline reaction when Soiltex is applied.

This is the most granular soil in the county. The topmost part of the surface soil, on drying, separates into small angular grains.

Farmers report this to be a very productive soil. Corn does well, yielding an average between 30 and 45 bushels an acre. Cotton yields have been reported as high as one bale or even more an acre, but average yields are probably one-half bale. On account of the friable character of the subsoil, moisture is more readily available to plants in dry seasons than in the Wilson soils, which are characterized by dense, tight subsoils.

The total area of this soil in Van Zandt County is small. Most of the small areas are in cultivation, and the untilled land is used for pasture. A few steep blufflike slopes occur along Sabine River Valley and are suited only for pasture.

The results of mechanical analyses of samples of the surface soil, the subsurface soil, and the subsoil of Crockett clay loam are given in Table 4.

TABLE 4.—*Mechanical analyses of Crockett clay loam* [1]

No.	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
447358	Surface soil, 0 to 6 inches	0.2	0.3	0.3	2.4	10.8	41.1	44.7
447359	Subsurface soil, 6 to 12 inches	0	.2	.3	1.5	6.7	35.0	56.2
447360	Subsoil, 12 to 36 inches	.3	.4	.4	1.2	4.5	35.2	58.0
447361	Subsoil, 36 +inches	.5	.3	.2	.3	2.7	40.8	55.2

[1] After treatment with hydrogen peroxide.

WILSON VERY FINE SANDY LOAM

Wilson very fine sandy loam is developed on the smoother areas of the prairies in western Van Zandt County. Its chief soil characteristics, as revealed in road cuts, consist of dark-gray or black gradational layers averaging between 3 and 4 feet thick, with the lower part commonly of an olive color. The upper layer, which is 3 or 4

inches thick, is gray friable very fine sandy loam which grades into dark-gray or black silt loam, extending to a depth of about 10 inches. The subsoil is plastic tough black or slate-colored clay that extends to a depth ranging from 30 to 40 inches. Beneath this the material grades into yellowish-brown clay that in exposed banks dries and breaks into blocks about 1 inch in diameter. This soil is not calcareous, though the subsoil is alkaline in reaction and in places is calcareous downward from a few inches beneath the upper part of this layer. The virgin soil contains a moderate amount of organic matter.

In places the surface is dotted with small low sand mounds. Beneath these is a slight mottling in the upper part of the subsoil but not sufficient to effect any marked color change throughout the soil profile. On slopes the subsoil has a faint development of dull-red mottlings, and in places such areas merge with areas of Crockett soils.

Drainage is slightly restricted, and water remains in depressed areas for long periods after rains.

Cotton, corn, and oats are the principal crops grown. Cotton yields from one-fourth to 1 bale an acre, corn from 15 to 30 bushels, and oats from 25 to 45 bushels. Wheat is sometimes grown on a very small acreage, and moderate yields have been reported. Alfalfa has been tried, but moisture deficiencies during the summer, together with cracking of the soil resulting in injury to the roots, are reasons given for lack of success in growing the crop.

A large proportion of this soil is under cultivation. It is locally termed "black land," as it occurs on the black-land prairie in association with darker soils. The virgin soil is covered mainly by coarse bunch grasses, dominantly of Andropogon species.

In Table 5 are given the results of mechanical analyses of samples of the surface soil, the subsurface soil, and several layers of the subsoil of Wilson very fine sandy loam.

TABLE 5.—*Mechanical analyses of Wilson very fine sandy loam*[1]

No.	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
447365	Surface soil, 0 to 4 inches	0.4	0.5	1.0	16.3	15.6	49.6	16.6
447366	Subsurface soil, 4 to 10 inches	.2	.2	.6	15.4	17.9	48.3	17.4
447367	Subsoil, 10 to 36 inches	.1	.2	.6	14.1	16.9	42.8	25.3
447368	Subsoil, 36 to 42 inches	.2	.1	.4	14.0	16.6	33.8	34.9
447369	Subsoil, 42+inches	.1	.4	.6	14.6	16.1	33.6	34.5

[1] After treatment with hydrogen peroxide.

DURANT CLAY LOAM

The surface soil of Durant clay loam consists of gray fine sandy loam or very fine sandy loam to a depth of about 3 inches. In places, owing to colluvial wash, this material may be 6 inches thick. It passes below into reddish-yellow or salmon-red clay loam. With increase in depth the material gradually becomes heavier in texture. The subsoil material is slightly granular when dry, and below a depth of 30 inches it grades into tough plastic greenish-yellow silty clay, which, in turn, at a depth of about 70 inches, grades into a sub-

stratum of bluish-gray and rust-brown laminated clay. The lower part of the subsoil and the substratum show an alkaline reaction with Soiltex. In places large partly rounded calcareous sandstone masses lie on the surface.

This soil occurs principally on timbered slopes along valleys that lead from the light sandy timbered section of the county into the prairies, and it usually lies adjacent to Crockett fine sandy loam or to some of the light-colored soils of the timbered areas of eastern Van Zandt County.

Little of this soil occurs in the county, and none is under cultivation. It is practically all in timber of scattered open growth, consisting principally of red oak, elm, and some post oak, and is used for pasture though range forage is scant. The soil is probably productive and well suited to the general farm and pasture crops.

DURANT FINE SANDY LOAM

The surface soil of Durant fine sandy loam consists of an 8 to 12 inch layer of brown fine sandy loam. It is underlain by heavy red or yellowish-red clay, in places slightly mottled with gray and yellow. Below a depth of 24 inches the subsoil is yellowish red and contains some gray mottlings.

A few small rounded sand mounds occur in places, in which are many small ironstone fragments. The subsoil beneath and near these mounds is very red.

This soil occupies smooth ridges and undulating areas and has good surface drainage. In slight depressions very small spots of Wilson fine sandy loam occur. Durant fine sandy loam occupies areas where the timberlands and prairies merge. An open growth of post oak is on the soil. The total acreage is small.

Much of this soil is cultivated. Cotton, corn, and oats are the principal crops, and yields approximate those obtained on Crockett fine sandy loam. Peaches and vegetables are easily grown.

SUSQUEHANNA FINE SANDY LOAM

Typically the surface soil of Susquehanna fine sandy loam consists of brownish-gray or gray fine sand 2 or 3 inches thick (in cultivated fields from 4 to 8 inches thick), grading below into yellowish-gray or yellow fine sand which extends to a depth ranging from 8 to 14 inches. The organic-matter content is naturally slight. On slopes these layers are subject to severe erosion and in many places are very thin. The surface soil rests on the subsoil in a sharply defined line of separation. The subsoil is mottled red and gray very dense heavy plastic clay. With increase in depth the red color decreases and the gray increases. At a depth ranging from 3 to 6 feet the subsoil grades into gray clay containing small spots of red. In places the dense clay subsoil lies at a depth ranging from 18 to 24 inches beneath the surface, the yellow layer immediately above being subdivided into two definite textural layers, the upper a fine sand and the lower a fine sandy clay. In places the surface is dotted with many smooth rounded mounds of fine sand.

The relief is undulating or rolling, and in some nearly flat areas surface drainage is restricted, and in all places underdrainage, owing

to the dense subsoil, is very imperfect. Where the soil has been cultivated for some time without protection from erosion small spots of the subsoil are exposed or have but a very thin fine sand cover.

More than one-half of this land remains in timber, of which post oak, red oak, blackjack oak, and hickory are the principal trees. A thin cover of underbrush, coarse grasses, and herbaceous plants also occurs.

In a few small areas north of Bright Star and Board Schools it is noted that the parent material is alkaline in reaction, though elsewhere, as a rule, it is distinctly acid.

In places small sloping areas occur in which the upper part of the subsoil is of a solid red color, and here the color profile resembles that of Kirvin fine sandy loam. However, owing to the dense plastic character of the clay these areas were included with the Susquehanna soil.

Cotton is the principal crop grown. Yields vary with seasonal conditions and range from one-fifth to more than one-third bale an acre. Many farmers report that yields are increased by using commercial fertilizers. Corn is grown on many farms and yields from 10 to 20 bushels an acre. Some oats are sown for winter and spring pasture. Potatoes, sweetpotatoes, watermelons, and various garden and truck crops are grown very successfully on the deeper areas of the soil. Fruit orchards are said to be not very successful, especially where the soil is thin, owing to imperfect root development in the heavy stiff clay subsoil.

Crops suffer more quickly from lack of moisture in the shallower areas of this soil than elsewhere. By terracing the land, the soil on many farms is prevented from eroding and thus is enabled to respond more readily to methods of soil improvement and to fertilization.

Susquehanna fine sandy loam, broken phase.—Susquehanna fine sandy loam, broken phase, comprises some narrow steep slopes of the typical soil that have been severely washed and gullied by erosion. The larger areas occur along the slopes of the deeper valleys. Little topsoil material remains in most places, though near the foot of the slope there is in places a deep accumulation of sand. On the less broken surfaces the topsoil consists of a 2 to 4 inch layer of gray fine sandy loam, underneath which is red heavy plastic clay mottled with yellow and bluish gray, and this, in turn, is underlain by gray or bluish-gray clay, the parent material, below a depth ranging from 1 to 3 feet.

This soil is locally known as "clay hills," "post-oak land," or "tight land." The clay subsoil is exposed on many slopes where erosion has been most active. The virgin soil is covered with a scrubby growth of post oaks and a few other trees.

This soil, as a rule, is not cultivated and its best use seems to be for timber and pasture land.

Table 6 shows the results of mechanical analyses of samples of the surface soil, the subsurface soil, and several layers of the subsoil of typical Susquehanna fine sandy loam.

TABLE 6.—*Mechanical analyses of Susquehanna fine sandy loam* [1]

No.	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
447312	Surface soil, 0 to 1½ inches	0.5	1.0	1.8	26.1	31.5	30.3	8.9
447313	Subsurface soil, 1½ to 7 inches	.9	1.0	1.4	24.7	32.9	29.1	10.1
447314	Subsoil, 7 to 16 inches	1.6	.8	.7	8.6	15.5	18.0	54.8
447315	Subsoil, 16 to 22 inches							
447316	Subsoil, 22 to 29 inches							
447317	Subsoil, 29 to 35 inches							
447318	Subsoil, 35 to 41 inches	.2	.2	.4	4.2	16.9	25.0	53.2
447319	Subsoil, 41 to 47 inches							
447320	Subsoil, 47 to 53 inches							
447321	Subsoil, 53 to 58 inches							
447322	Subsoil, 58 to 62 inches	.0	.2	.1	2.8	17.0	32.5	47.4

[1] After treatment with hydrogen peroxide.

LUFKIN VERY FINE SANDY LOAM

Lufkin very fine sandy loam, locally known as "glade land," is confined mainly to flat very poorly drained areas which are readily identified by the gray tight topsoil and stunted timber growth. In the timbered sections the surface is in many places almost free of vegetative covering.

The surface soil to a depth of 6 inches is gray or ash-gray very fine sandy loam which is loose and floury when moist but becomes hard on drying. It is low in organic content and shows a strong acid reaction. Where the surface soil has not been disturbed, the topmost layer consists of about one-half inch of accumulated brown leaf mold which, in early spring, is covered with a fine moss. The topsoil rests on heavy dense plastic gray clay which extends to a depth of several feet.

Lufkin very fine sandy loam is of slight extent. It occupies many small areas distributed throughout the timbered part of the county. Post oak is the main tree growth. Very little of the land is in cultivation.

This soil has very slow or practically no surface drainage, and, owing to the dense, almost impervious, subsoil, underdrainage also is very deficient. Therefore, it is too wet for starting crops in early spring, and on drying it bakes to a hard mass so that crops suffer in dry seasons.

When drained by ditching and furnished with organic matter, the soil produces moderate yields of cotton, corn, sorghums, and sugarcane. With continued tillage the land becomes better suited to cultivation. In places many small sand mounds occur over the surface. These spots afford better drainage, and crops grow well early in the season.

BOWIE FINE SANDY LOAM

Bowie fine sandy loam is one of the most extensive upland soils of the timbered sandy land sections of Van Zandt County. In cultivated areas the surface soil is gray loamy fine sand from 6 to 10 inches thick, though it is only 3 or 4 inches thick in virgin areas. This topsoil is a loose friable mass containing a very small amount of organic matter. It grades into yellow loamy fine sand or fine sandy loam, which at a depth ranging from 20 to 24 inches grades into

A, Profile of Crockett very fine sandy loam, 2½ miles northwest of Wills Point. B, Profile of Crockett fine sandy loam, 5 miles north of Wills Point

yellow friable fine sandy clay containing red and gray splotches. The red spots are centered with small black concretions. At a depth of about 48 inches this material is underlain by heavy plastic yellow and gray mottled clay. Small dark concretions are common throughout the surface soil and subsoil.

This soil occurs on nearly level or undulating areas on drainage divides. Most of the slopes are long and gradual, and severe erosion is not common.

Drainage is moderately rapid, although the soil becomes soggy in long periods of wet weather, owing to the gently sloping surface and slow underdrainage through the heavy substratum. The soil has the capacity to hold a large reserve of soil moisture which enables crops to withstand long periods of dry weather.

This soil is very productive and is well suited to growing many of the regional crops. Probably about 75 per cent of the land is in cultivation. The principal crops grown are cotton, corn, and other feed crops, such as the sorghums. Crop yields are, on the whole, perhaps slightly better than on Susquehanna fine sandy loam.

The soil is well suited to fruits, vegetables, various other truck crops, and berries. Many of these are grown to good advantage. Owing to the more penetrable character of the subsoil, fruits and vegetables do better than on Susquehanna fine sandy loam.

NORFOLK FINE SANDY LOAM

The topmost layer of Norfolk fine sandy loam consists of gray loamy fine sand, about 6 inches thick (2 inches in forest land), grading below into pale-yellow fine sand which extends to a depth of about 15 inches. This layer, in turn, grades into yellow friable heavy fine sandy loam or sandy clay. Some faint spots of red and gray occur in this material below a depth ranging from 3 to 4 feet, and the material here is heavier than that in the layers above.

This soil is not extensive in the county, being confined to a number of small areas. It occurs in association with other soils of the Norfolk series and also with the Ruston and Bowie soils. The largest areas are in the vicinity of Martins Mills.

Norfolk fine sandy loam occupies gently rolling or undulating uplands and has moderately free surface drainage and underdrainage.

The virgin soil supports a forest growth consisting mostly of blackjack oak, post oak, and hickory. Some uncultivated areas have been used to develop good pastures of Bermuda grass.

Most of the land is cultivated and is considered good farming soil. Cotton is the principal crop, and watermelons and various vegetables are also grown successfully, some of them being produced for market. Corn is grown on a sufficient acreage to produce enough feed for the work animals. The average yield of corn is between 15 and 30 bushels an acre. Sweetpotatoes do well, and yields ranging from 100 to 200 bushels an acre have been reported. Strawberries are successful and are grown to a slight extent. Peanuts, cowpeas, and sorghums have proved very successful on this soil in adjoining counties.

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Norfolk fine sandy loam, deep phase.—Norfolk fine sandy loam, deep phase, differs from the typical soil chiefly in the thickness of the yellow topsoil layer. The yellow fine sandy clay subsoil is reached at a depth of not less than 24 inches.

The deep soil occurs in the vicinity of Ben Wheeler and Martins Mills. It occupies nearly level or gently undulating divides. Drainage is good, especially from beneath the soil, on account of the deep porous topsoil and subsoil. Considerable quantities of soil moisture can be stored, as the subsoil is porous enough to absorb a large proportion of the rain water, and it contains sufficient clay to retain the moisture for a long time.

This soil is suited to cotton, corn, sorghums, and other crops such as are grown on the typical soil. It is especially well suited to watermelons, peanuts, sweetpotatoes, and other vine crops, to many vegetables, and to various fruits and berries. Where uncleared the soil is used for the moderate amount of pasturage afforded for cattle and hogs.

The results of mechanical analyses of samples of the surface soil, the subsurface soil, and several layers of the subsoil of typical Norfolk fine sandy loam are given in Table 7.

TABLE 7.—*Mechanical analyses of Norfolk fine sandy loam*[1]

No.	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
4473111	Surface soil, 0 to 10 inches	0.2	0.9	6.2	33.5	30.4	23.2	5.5
4473112	Subsurface soil, 10 to 20 inches	.2	.8	6.2	31.9	30.6	23.5	6.8
4473113	Subsoil, 20 to 38 inches	.4	.8	4.7	26.0	23.5	21.9	22.7
4473114	Subsoil, 38 to 45 inches	.1	.4	4.0	20.8	21.9	21.9	30.8
4473115	Subsoil, 45 +inches	.1	.4	3.0	15.5	19.0	25.3	36.6

[1] After treatment with hydrogen peroxide.

NORFOLK FINE SAND

Norfolk fine sand consists of gray loose fine sand to a depth ranging from 2 to 4 inches. This grades into yellowish-gray or yellow loose fine sand several feet thick. Under timber growth a thin cover of brown leaf mold covers the surface, but the soil contains very little organic matter.

This soil occupies some large areas, some of which enter the county from the south at Walton and south of Ben Wheeler in two irregularly shaped disconnected belts that extend into the central part of the county. A large area is west of Myrtle Springs. Small bodies occur in many parts of the timbered uplands.

Norfolk fine sand occupies undulating plateaulike areas on ridges and divides and in places lies in lower, gently rolling and hilly places. The land is very rapidly drained on account of the loose porous character of both surface soil and subsoil.

About 25 per cent of the land is cultivated. The principal crops grown are cotton, sweetpotatoes, and watermelons, with some corn. Sweetpotatoes and watermelons are the most successful crops. Favored areas for cultivation are those which contain the largest accumulation of organic matter in the surface soil. Sometimes the land is left undisturbed for two or more years in order to allow the

natural accumulation of organic matter from the coarse grasses and plants which invade the soil. The soil is suited to peanuts and various vine crops, to berries, and small fruits, especially plums. All crop yields are low.

The virgin soil supports a timber growth, chiefly of post oak, blackjack oak, sandjack oak, and other trees, with a heavy undergrowth of shrubs consisting of sparkleberry, holly, and other species. The coarse native grasses, consisting largely of Andropogon species, afford little nutritious pasture.

RUSTON FINE SANDY LOAM

Ruston fine sandy loam consists of gray or brownish-gray fine sand to a depth of about 4 inches, and beneath this the material grades into pale-yellow fine sand which extends to a depth of 12 or 14 inches. This, in turn, grades below into reddish-yellow or salmon-red friable fine sandy clay or fine sandy loam. The exposed dried subsoil has slight granulation. The subsoil passes below into friable reddish-yellow fine sand at a depth ranging from 20 to 40 inches. This material is lighter in color than the overlying subsoil, and in cut banks large spots of yellow and yellowish red are noted to a depth of 70 or more inches. In the eastern part of the county some areas are underlain by slightly heavier and more compact clay. These areas are so small that separation is not feasible. Wherever roots penetrate the subsoil of Ruston fine sandy loam a dark streak is developed. At an average depth of about 75 inches layers of bluish-gray laminated clay underlie the subsoil.

The total acreage of this soil is 20,800 acres. The soil is closely associated with the Norfolk, Bowie, and Susquehanna soils and covers small irregular-shaped areas, chiefly in the eastern part of the county.

The surface relief ranges from gently undulating to rolling, and both surface drainage and underdrainage are favorable for growing all crops.

About 50 per cent of the land is cultivated, mainly to cotton and corn. Local reports give cotton yields from one-fourth to one-half bale an acre and corn from 12 to 15 bushels. Peaches, plums, berries, many vegetables, and vine crops do well.

The native timber is mainly post oak, blackjack oak, red oak, and hickory. Excellent pastures of Bermuda grass were seen during the course of the survey.

In the vicinity of Ben Wheeler and Martins Mills the light topsoil layers extend to a depth of 20 or 24 inches in some places. Such areas are probably better suited to vegetables, truck crops, small fruits, and berries than to the staple farm crops.

RUSTON FINE SAND

Ruston fine sand occurs in a few small areas on flat or slightly undulating divides, in close association with Norfolk fine sand. The largest body is northwest of Colfax. Drainage is good, owing to the porous character of both surface soil and subsoil.

The 10-inch surface layer of this soil is dark-gray or gray fine sand, passing below into pale-yellow fine sand which extends to a

depth of about 15 inches. Beneath this is yellowish-red fine sand which is many feet thick.

The greater part of this soil is in cultivation, and the remainder is covered with timber similar to that on Norfolk fine sand. Cotton, corn, and vegetables are the principal crops. Vegetables, sweet potatoes, watermelons, and peanuts are very successfully produced, also various other truck crops, small fruits, and berries.

KIRVIN FINE SANDY LOAM

The surface layer of Kirvin fine sandy loam is brown fine sand which, at a depth of about 4 inches, passes into brownish-yellow fine sand. In most places it contains a few small ferruginous sandstone fragments. At a depth of 12 or 15 inches the topsoil grades into red heavy clay which crumbles into small pieces with slight hand pressure, and on drying it separates into coarse grains. Below a depth of 30 inches the subsoil gradually becomes more sandy, and at a depth of 5 feet the material is yellow friable fine sandy loam.

This soil occurs in small isolated areas within the county. It is developed mostly on knolls and rolling divides. Areas of Kirvin fine sandy loam are gently rolling or undulating, and surface drainage is moderately rapid. Underdrainage is slow, but the clay subsoil is permeable.

A number of good farms are located, in whole or in part, on this soil, and the farmers report that this is one of the best soils for peaches.

In its virgin condition the soil is low in organic matter. Where erosion has caused a shallow surface soil much of the rain water runs off, and therefore no large reserve of soil moisture is held during very dry seasons. Where the soil is deep it is moderately productive. It has been proved that the construction of terraces largely overcomes erosion and greatly improves crop production. Probably 75 per cent of the land is cultivated.

Virgin areas of this soil support a growth of red oak, together with some post oak and blackjack oak. Bermuda grass pastures provide excellent grazing on some farms.

The general farm crops are grown. Yields of one-fourth or one-half bale of cotton and 10 or 12 bushels of corn are produced. Moderate yields of sorghums, cowpeas, vegetables, and fruits are obtained.

KIRVIN GRAVELLY FINE SANDY LOAM

Kirvin gravelly fine sandy loam consists of grayish-brown or brown fine sandy loam to a depth of about 6 inches, where it changes abruptly to red or dull-red heavy but crumbly clay. The surface soil contains a large quantity of small ferruginous sandstone fragments. The subsoil is similar in character to the subsoil of Kirvin fine sandy loam. Beneath it, at a depth of 20 inches, laminated sand and red ferruginous fragments occur. The material is friable and is splotched with yellow and red.

This soil occurs only on hilly and steeply sloping areas. Erosion is severe, and the ironstone fragments are abundant within the soil, with here and there outcrops of large sandstones. The most extensive area is along the bluffs of Sabine River Valley northeast of Grand Saline.

In places all the surface soil has been removed by erosion leaving the subsoil exposed, and in other places fragments of ferruginous sandstone are very abundant. The shallow soil, together with its steep slopes and content of stony material, renders the land unsuited for cultivation. It supports a timber growth of post oak, blackjack oak, and in places some shortleaf pine. The soil is used for the scant pasturage afforded by a few coarse grasses.

This soil, as mapped, includes a number of areas of Nacogdoches gravelly fine sandy loam. The included soil consists of brown or reddish-brown fine sandy loam to a depth ranging from 6 to 12 inches, and it contains a large quantity of irregularly broken ironstone fragments. The surface soil grades below into a subsoil of heavy crumbly red clay which is very permeable, contains many of the broken ironstone fragments, and is many feet thick.

This soil is closely associated with Nacogdoches fine sandy loam. It occurs on high ridges and steep slopes. In places the surface soil is shallow and very red. The slopes and ridge crests are very stony in places, and some very large bowlders of ferruginous sandstone are present.

Kirvin gravelly fine sandy loam also includes a few areas of Ruston gravelly fine sandy loam, which, on account of their small extent, have been included in mapping. The surface soil of the Ruston gravelly fine sandy loam areas consists of a layer of gray fine sand about 4 inches thick, which contains a large quantity of fine and small ironstone fragments, underlain by yellowish-red fine sand which extends to a depth of about 12 inches. The material beneath consists of reddish-brown or red fine sand containing ironstone fragments. In some places the ferruginous fragments make up most of the subsoil. The surface is thickly covered with the same stony material. This included soil occurs on knobs and narrow ridges with gentle slopes. Surface drainage is good and underdrainage is moderately rapid. The largest area is northeast of Sexton School.

NACOGDOCHES FINE SANDY LOAM

Nacogdoches fine sandy loam occurs in several good-sized areas in the southeastern part of the county. Most of the areas occupy rolling or hilly country, with slopes ranging from long and gentle to moderately steep. The topsoil of Nacogdoches fine sandy loam contains a larger proportion of silt and clay than the same layer in the other sandy soils of the county. In places the surface soil has been washed away by erosion, both sheet and gully types, though as a rule erosion damage to this soil seems lighter than on some of the other soils in the county.

This soil, as revealed in deep cuts and gullies, is deep red or blood red throughout the entire profile. The 8 to 10 inch topsoil is brownish-red fine sandy loam which grades into deep-red crumbly clay. Below a depth ranging from 24 to 36 inches the clay contains a larger proportion of sand and is very friable. It is less red in color here, having a yellowish-red shade. In places the deep subsoil is of a green shade, indicating the presence of greensand marl which lies at a great depth beneath some areas of this soil but in few places is seen near the surface. Small fragments of ferruginous sand-

stone are present on the surface and throughout the surface soil and subsoil.

Practically all the land is under cultivation. It is recognized as a very desirable soil that is inherently highly productive and responds well to soil-improvement methods. Cotton and corn are the principal crops grown, and usually no commercial fertilizer is used. It is reported locally that some fields have produced crops for 75 consecutive years without diminution of crop yields. Cotton yields from one-half to 1 bale an acre and corn from 20 to 40 bushels. Peaches and other fruits do exceedingly well, and excellent cigar tobacco has been grown on this soil in some eastern Texas counties. Some tomatoes, potatoes, peanuts, and strawberries are grown successfully by a few farmers.

CADDO FINE SANDY LOAM

The topsoil of Caddo fine sandy loam is gray fine sand underlain at a depth of about 4 inches by yellow fine sand. This material grades at a depth ranging from 12 to 18 inches into yellow or brownish-yellow heavy fine sandy loam or fine sandy clay. The subsoil is very friable and permeable. Slight mottlings of gray are in this layer, and below a depth of 30 inches some black concretions are surrounded by soil of rust-brown color. Below a depth of about 60 inches the subsoil grades into dense compact fine sandy clay which offers considerable resistance to the passage of water. The clay is gray, mottled with yellowish brown and rust brown. Underdrainage is imperfect, and in the flat areas the soil remains wet for a long time after rains.

This soil differs from Bowie fine sandy loam in having a lighter-colored subsoil, in most places mottled with gray; it differs from Norfolk fine sandy loam in that mottled colors are present in the lower part of the subsoil; and it differs from the Lufkin soils in having a friable instead of a dense plastic clay subsoil.

Caddo fine sandy loam is in places associated with areas of Norfolk fine sand and Bowie fine sandy loam, the Norfolk soils occupying the higher locations.

The relief of areas of this soil is nearly flat, and the surface is dotted with low smooth sand mounds, the larger ones consisting of brownish-gray fine sandy loam with a mottled friable subsoil resembling that of Bowie fine sandy loam.

Areas of Caddo fine sandy loam are distributed more generally throughout the southeastern part of the county, but small bodies occur on many smooth nearly flat divides and in slightly depressed positions at the heads of the minor drainage ways.

A large part of this soil is cultivated. It is fairly productive, though it is inclined to be a late soil on account of slow drainage. Cotton, corn, and some sorghums are the chief crops. Crops are planted, for the most part, on low ridges thrown up by the plow to provide more rapid drainage. The flatter areas are not highly suited to vegetables and fruits, because of slow drainage. Crop yields are in general somewhat lower than on Bowie or Norfolk fine sandy loams.

PORTSMOUTH FINE SANDY LOAM

Portsmouth fine sandy loam, to a depth of about 12 inches, consists of dark-gray fine sand containing a large amount of dark organic matter. When wet the soil appears black. This material is underlain by gray fine sand which gradually becomes lighter in color with depth. Some rust-brown iron stains occur in the surface soil and subsoil.

The soil occupies low flat pondlike depressions throughout areas of the sandy upland soils. It remains wet much of the time, owing to seepage from the higher-lying soils.

This soil occurs in only a few small areas in the southern part of the county. Coarse grasses and shrubs grow on this soil which is not suitable for agricultural use in its present wet condition, and at present there seems to be no reason for reclaiming it.

OCHLOCKONEE VERY FINE SANDY LOAM

The surface soil of Ochlockonee very fine sandy loam is light-brown friable fine sandy loam which contains considerable organic matter in the upper 12-inch layer. Below a depth of 12 inches the material grades into material ranging in texture from fine sandy loam to clay and in color from brown to mottled yellow, gray, and rust brown. The variations in texture are due to local differences in manner of soil deposition and the variations in color to position with reference to drainage, the more completely drained areas showing a brown or yellow color because of more complete oxidation. The subsoil, in many places, grades, at a depth of about 30 inches, into bluish-gray very fine sandy loam or sandy clay mottled with rust brown and yellow, indicating very deficient underdrainage. Small areas of a soil having a fine sandy loam texture are included in mapping.

This soil occurs in the low slowly drained first bottoms along the smaller and medium-sized streams. It comprises the alluvium made up of soil materials transported from eroded upland soils. The land is subject to periodic overflow, during which fresh soil materials are deposited.

The surface is flat or very slightly undulating, and though wet in winter and after rains much of the land is sufficiently well drained to enable satisfactory cultivation. In places local drainage is facilitated by ditching and by straightening the stream channels.

This is a productive soil well suited to the production of many crops. Owing to favorable moisture conditions in the summer, crops do not suffer during the occasional short periods of dry weather. Occasional injury to crops by overflows is more than compensated by the favorable productiveness.

Probably about 40 per cent of the land is cultivated, mainly to cotton and corn. In normal seasons cotton yields range from one-fourth to three-fourths bale and corn from 15 to 35 bushels an acre. The soil is especially well suited to corn. Fertilizers are seldom used.

The uncleared land is timbered with swamp white oak, hickory, sweetgum, black gum, maple, elm, and other trees. Bermuda grass

and other grasses furnish excellent pasture in places. Some hay is made, and usually two cuttings a year of Bermuda grass are made, yielding from one-half to 1 ton an acre at each cutting. The hay finds a ready sale locally. The soil is well suited to grasses and other forage crops. It is an excellent soil for producing high yields of sugarcane, from which sirup of fine quality is manufactured in some sections of eastern Texas.

OCHLOCKONEE SILT LOAM

The topsoil of Ochlockonee silt loam is brown or grayish-brown silt loam about 8 inches thick, underlain by yellowish-brown silt loam which, at a depth of about 20 inches, grades into mottled gray and rust-brown silty clay loam several feet thick. Thin layers of material of different textures and of gray or very dark grayish-brown color occur in the subsoil.

This soil occupies areas in the larger stream valleys. Due to the low position and slow drainage, together with the occurrence of periodic overflows, the soil is not farmed extensively, only about 10 per cent being in cultivation. Corn and cotton are the principal crops, sorghum returns good yields, and Bermuda grass makes excellent pasturage. This is a highly productive soil, and with improved drainage and protection it will become very valuable for the production of the general farm crops.

OCHLOCKONEE SILTY CLAY LOAM

Ochlockonee silty clay loam is grayish-brown or brown silty clay loam to a depth of 6 or 8 inches. This layer is underlain by grayish-brown silty clay loam which, with increase in depth, changes to gray or bluish-gray silty clay or clay mottled with rust brown. The soil is friable when moist, moderately sticky and plastic when wet, and on drying becomes rather hard and structureless. This soil occurs chiefly in the wider flood-plain areas, the most important bodies being along Neches River. The flat surface and heavy clay subsoil cause very slow drainage, and the soil remains wet for long periods after rains or overflows.

Probably less than 2 per cent of the land is farmed, the remainder being occupied by the native timber growth similar to that on Ochlockonee very fine sandy loam. This is a highly productive and valuable soil which, when properly drained, will produce good yields of the staple farm crops. It makes good pasture land where cleared. During the course of the survey, an excellent stand of Bermuda grass was seen in places.

TRINITY CLAY

To a depth ranging from 6 to 12 inches Trinity clay is black heavy calcareous clay which is plastic and waxy when wet, but when dry the material separates into small grains. It is underlain by bluish-black clay which extends to a depth of many feet. In places the soil is black from the surface down to a depth of several feet. In other places where drainage is very deficient, the subsoil is mottled slightly with brown and dark brown.

The material comprising this soil has been washed from the dark calcareous soils of the black-land prairie just west of Van Zandt

County. It is highly calcareous both in the surface soil and subsoil and contains much finely divided and thoroughly incorporated organic matter. On drying the surface soil breaks down to grains. Deep cracks extend downward in the soil during long periods of dry hot weather.

This soil occurs chiefly in the Sabine River bottoms and along the small branches lying within the prairie section of the county. Drainage is slow in the Sabine River bottoms but is comparatively free in the smaller stream bottoms. Although not impervious, the clay is sufficiently heavy to cause very slow underdrainage. The land is occasionally overflowed, and during the winter water stands in places for a long time.

Very little of the land is farmed. Cotton, corn, and oats produce large yields on the better-drained areas. In places drainage is facilitated by extending ditches through the lower-lying areas.

Most of this soil is forested with hardwood trees, together with various shrubs. The principal trees are elm, water oak, willow oak, hackberry, red haw, and ash. Sweetgum, sycamore, and honeylocust grow in places. A few black walnut and pecan trees grow on the best-drained areas. The soil is used chiefly for pasture land.

JOHNSTON SILT LOAM

Johnston silt loam has a dark-gray friable surface soil about 10 inches thick, abruptly underlain by a black clay subsoil several feet thick. In Van Zandt County, the light-colored surface soil is due to recent deposits of light-colored soil materials of local origin. In places, slight brown mottlings discolor the subsoil.

This soil is variable in Van Zandt County. In some places the color of the surface soil is brown, in other places, black. Commonly the soil occupies the lower bottoms of prairie streams, which are fringed by narrow belts of Ochlockonee soils.

Johnston silt loam, though typically dark and rich in organic matter, indicating its derivation from dark prairie soils, is not calcareous. Its reaction is alkaline in the lower part of the subsoil. This soil is inextensive in Van Zandt County. It occurs in creek bottoms that originate within or traverse the prairie section of the county. Most of the land is used for pasture. Where cultivated it produces good yields of cotton, corn, and other feed crops. It is very productive and, though fairly well drained, it is probably so unimportant in extent that it is better suited for pasture crops. The virgin soil is timbered with locust, water oak, post oak, elm, and willow oak.

BIBB FINE SANDY LOAM

Bibb fine sandy loam occupies a very small total area in Van Zandt County. It lies mainly in the low slowly drained bottom lands along the larger creeks. The surface is flat, and in wet seasons and during the winter months water remains on the surface for long periods.

The topsoil is gray or slightly brownish gray fine sandy loam with mottlings of yellowish brown and rust brown. At a depth of 6 or 8 inches the soil grades into material ranging in texture from fine sandy loam to clay loam, which is of light-gray color, mottled with reddish brown and rust brown.

Practically none of this soil is cultivated. It supports a timber growth consisting mostly of willow oak, swamp oak, sycamore, hackberry, water oak, sweetgum, black gum, holly, and other trees. In most places it supports a rank undergrowth of smilax, myrtle, and other vines and shrubs.

This is an inherently productive soil, but it is not suitable for crops in its present condition of very ineffective drainage.

BIBB SILTY CLAY LOAM

Bibb silty clay loam consists of heavy gray silty clay loam about 10 inches thick, grading below into bluish-gray silty clay which is more or less mottled with rust brown and yellow and which contains some small ironlike pellets embedded in the material. In places a thin overwash of fine sandy loam, from 1 to 3 inches thick, covers the surface. The subsoil is plastic when wet but very hard and brittle when dry.

The largest area of this soil mapped in Van Zandt County is near the western county line in the bottom land of Lacy Creek. The surface is flat and almost devoid of natural drainage. Rain or overflow water remains on the land for long periods, or until removed by evaporation.

One small field, on which corn and cotton are grown, is cultivated, and during dry seasons fairly good yields are obtained. The soil is naturally highly productive, but under the prevalent condition of very slow natural drainage it can not be used successfully for farming.

The soil supports the timber growth characteristic of the wet bottom lands, which includes various species of oak, such as willow oak and water oak, and some other trees. If cleared of trees the soil would probably support a good growth of some pasture grasses.

CAHABA FINE SANDY LOAM

Cahaba fine sandy loam has a 6 to 10 inch topsoil of yellowish-brown or brown fine sand or loamy fine sand, which grades into reddish-yellow fine sandy loam several feet thick. Slightly depressed small areas of Leaf fine sandy loam are included in mapping, as they are too small to show separately. Yellow and gray mottlings occur in places in the lower part of the subsoil. In some low places the subsoil, or some part of it, is heavy clay.

The surface relief ranges from flat to undulating, and sand mounds occur in places. Natural surface drainage is slow, and underdrainage is free except in the depressions and flat areas underlain by clay. This soil is of slight extent in the county. The largest area is along Gildon Creek northeast of Edgewood. The soil is developed on high second-bottom lands which are rarely subjected to overflow.

About 75 per cent of the land is under cultivation, mainly to cotton and corn. Cotton yields from one-fourth to one-half bale and corn from 10 to 20 bushels an acre. Watermelons, cowpeas, sweetpotatoes, and other truck crops do well. Sorgo (sweet sorghum) grows well, especially in the low areas.

KALMIA FINE SANDY LOAM

The surface soil of Kalmia fine sandy loam consists of grayish-brown or light-brown loamy fine sand 8 or 10 inches thick, underlain by pale-yellow loamy fine sand which, at a depth of 18 inches, grades into yellow friable fine sandy loam. This layer, in turn, grades into yellow fine sandy clay at a depth of about 30 inches. In places where underdrainage is slow the clay subsoil contains some gray, red, or reddish-yellow spots or streaks.

The total acreage of this soil in Van Zandt County is small. The soil occurs on the second bottoms of the wider valleys and is developed from old alluvium now lying above overflow. The surface is gently undulating or flat, and the land slopes gently toward the lower-lying first bottoms. Drainage is good, except in a few small depressions where small bodies of a soil occur, which, if of sufficient extent, would be mapped as Myatt fine sandy loam.

This soil is well suited to the production of cotton, corn, and vegetables. Owing to the good water-holding capacity of the soil, crops withstand drought for long periods.

HANNAHATCHEE FINE SANDY LOAM

The topsoil of Hannahatchee fine sandy loam is reddish-brown fine sandy loam. It is underlain at a depth of about 12 inches by mottled brown and reddish-brown fine sandy loam, though in places the subsoil is heavier and is sandy clay. In places the subsoil is slightly mottled with yellow and gray colors at a depth ranging from 2 to 3 feet.

Hannahatchee fine sandy loam is an alluvial soil. It is subject to overflow during the rainy seasons, but at other times natural drainage is adequate for growing crops. The soil material comprising this soil has been removed by erosion from areas of Nacogdoches soils.

Only a few small areas of this soil occur in the county. These lie in a few stream bottoms in the southeastern part. Practically none of the land is cultivated, though it is a strong soil and produces good crops of cotton, corn, sugarcane, sorghums, and vegetables. The native forest, principally of gum and oak trees, remains over most of the soil.

SOILS AND THEIR INTERPRETATION

Most of Van Zandt County is covered with light-colored, sandy, timbered soils. A narrow belt in the western part represents the dark-colored prairie soils.

The dark-colored prairie soils support a grass type of vegetation which thoroughly covers the ground, and the annual supply of dead plant débris and grass roots furnishes the virgin soil an abundance of decaying organic matter. In places of more favorable surface relief and type of parent materials the organic content is greater, and the result is a proportionally darker-colored surface soil.

On the light-colored timbered soils conditions for the supply of large quantities of organic matter are not so favorable, as the timber growth allows only a scant growth of short, early-maturing grasses and shrubs. Under such conditions the grasses supply very

little plant débris and the trees and shrubs supply only the falling leaves. As a result the organic content is low and the soil is light in color.

The accumulated content of organic matter gives a dark color to the surface soil, but wherever the timber growth invades the dark-colored prairie soils the soil color gradually becomes lighter. A few soil areas are classified as soils commonly known as prairie soils, but which have been invaded by a timber growth, and the surface soil of such areas is lighter in color than that of the true prairie soils of the county. Wherever timber seems to have grown on the prairie soils in the county and to have been removed the surface soil is slightly more sandy.

Large areas of red timbered soils are in the southeastern part of Van Zandt County. In general these soils have a brown or reddish-brown surface layer, and this color may be due to the influence of the parent materials which in most places are near the surface. The parent material contains a high content of iron sandstone fragments, and the oxidation of these materials has resulted in a red color in the weathered material. The timber growth is similar to that on the light-colored sandy soils.

The dark-colored prairie soils and large areas of the light-colored timbered soils have developed well-defined horizons. The first, or A, horizon, ranging from 10 to 15 inches in thickness and in places being as much as 20 inches thick, consists of structureless single-grain material. The second, or B, horizon commences abruptly below the A horizon and consists of heavy plastic clay ranging from 12 to 24 inches in thickness. The third, or C, horizon consists of the parent materials that may be either more friable than, or as heavy as, the materials of the B horizon, depending on the character of the underlying geologic material.

These soils develop, under good drainage, a red clay layer in the upper part of the B horizon. In the dark-colored soils it is commonly dark red or dull red, and in the light-colored timbered soils a brighter-red color prevails. In some places the red color, similar to the color of the B horizon of the light-colored timbered soils, prevails in areas in which the timber growth has comparatively recently invaded the dark-colored prairie soils. In such places the dark-colored prairie soils have become slightly lighter in color, and some difficulty has been experienced in determining the group to which the soils of a particular area belong. This is accomplished by ascertaining the individual characteristics of either the light-colored timbered soils or the dark-colored prairie soils. The prairie soils are characterized by a thin gray layer above the B horizon, by an alkaline reaction with Soiltex applied to the material of the lower part of the B horizon and the underlying C horizon, and by the presence of lime nodules in the last two horizons. The light-colored timbered soils do not have a light-gray layer above the B horizon, and the material in the entire profile gives an acid reaction with Soiltex.

Where the soils occur under slightly restricted drainage, the red part of the B horizon is absent or only faintly developed, and the color of the material in many places very closely resembles the color of the parent material of the C horizon.

The following paragraphs give detailed profile descriptions of the principal soils included in this group. They include the soils of the

Crockett and Wilson series of dark-colored soils, and the soils of the Susquehanna and Lufkin series of light-colored timbered soils.

The Crockett soils represent the better-drained parts of the dark-colored prairie soils. The surface, or A, horizon ranges from 12 to 15 inches in depth and is divided into two layers, designated as A_1 and A_2. A_1 is the surface layer consisting of very dark grayish-brown or black fine sandy loam or silt loam. The material is mellow when moderately moist, and when dry it may be removed in the form of large blocks 8 inches long by 6 inches wide but does not represent a columnar form that is so well defined in the more western prairie soils of Texas. This layer contains a few insect casts, but their presence seems to have no effect on the structure. A few grass roots penetrate the layer but do not, however, produce any binding qualities to form a good turf. A thin dust mulch lies on the surface, owing to the general disturbance of the material by wind, water, change of temperature, and animals.

A_2 represents the lower layer of the surface horizon and directly overlies the B horizon. It consists of light-gray or ash-gray fine sand or very fine sandy loam, which is single grained and can be easily reduced to a fine powderlike form. When the material is crushed, mottlings of gray and rust brown are apparent. This layer is not everywhere present, although it is revealed in many places along road cuts. Its absence in plowed fields is perhaps due to the fact that deep cultivation has mixed it with the darker-colored soil material of the A_1 layer.

The B horizon extends to an average depth of 48 inches. The upper part, about 6 inches thick, is mottled with dull red, gray, and some rust brown. Farther down, the material is greenish yellow to a depth of about 36 inches, where it grades into yellow material which extends to the bottom of the horizon. The material in the entire B horizon is heavy plastic clay which molds itself tightly around the auger bit and breaks from the soil mass into large massive plastic pieces. When dry this material is very hard and brittle, is very difficult to break by hand, and many vertical cracks develop in it. In the lower 12 inches of the horizon the material breaks into large prismatic pieces which further break horizontally to small pieces about 1 inch thick. Various quantities of lime concretions and gypsum occur in this part of the B horizon, and it is only in this part of the profile, including the laminated clay beneath, that an alkaline reaction is obtained with Soiltex.

The C horizon consists of laminated bluish-gray and rust-brown clay. The different colors in this horizon occur in the form of thin bands, and close examination reveals spots of rust-brown and black carbonaceous material embedded in the soil material. This horizon occurs at different depths. It is most conspicuously exposed in road cuts between Magbee Creek and the southern county line. North of this the clay occurs at greater depths. The upper part of the C horizon contains concretions of carbonate of lime.

The soils of the Wilson series occur in the more level areas under slightly restricted drainage. These soils have developed dense black or slate-colored B horizons which distinguish them from the Crockett soils. Structurally the materials in the B horizons in the soils of both are similar, but the Wilson soils give an alkaline reaction with Soiltex within a few inches of the top of the B horizon. A few car-

bonate of lime concretions are embedded in the material in the lower part of the horizon, and black ironlike pellets are numerous throughout the horizon.

The C horizon of the Wilson soils appears to be composed of an entirely different kind of parent material from that of the Crockett soils. It is alkaline in reaction but does not have the laminated clay structure, such as occurs under the Crockett soils. This horizon lies at an average depth between 36 and 48 inches. The material contains an abundance of carbonaceous pellets, is of clay texture, and contains large quantities of very fine sand. When dry, it breaks into horizontal pieces averaging an inch in thickness.

The material of the A horizon seems to be lighter colored, but the immediate surface material is black mellow silt loam or very fine sandy loam. In the lower part of the A horizon, just above the B horizon, the material contains a faint sprinkling of gray but not in sufficient quantity to develop a well-defined gray layer similar to the one described in the Crockett soils.

The soils of the Susquehanna series are representative of the light-colored timbered soils, and they reveal abrupt changes between the A and B horizons. These soils occur in the better-drained sections of the county. The A horizon ranges from 6 to 18 inches in thickness, and it is composed of loose or structureless fine sand or fine sandy loam, gray in the upper part, the A_1 horizon, which is about 3 inches thick, and yellow beneath, in the A_2 horizon. The upper part of the surface soil is slightly stained with organic material but is devoid of a sod development. The lower part is slightly brown in color and contains a few mottlings of gray and rust brown.

The B horizon consists of heavy plastic clay mottled with red and bluish gray. The red color dominates in the upper part and the gray in the lower, giving two distinct subhorizons, B_1 and B_2. The material breaks into large irregular pieces when dry. It gradually merges into the C horizon, or parent material, at a depth of about 36 inches. The color changes principally to bluish-gray sticky clay containing small quantities of very fine sand. The parent material breaks in vertical pieces when dry, and small ironlike pellets and spots of gypsum are embedded in the material. The material throughout the profile shows an acid reaction with Soiltex.

The soils of the Lufkin series occur only in the more poorly drained areas. The underlying parent material is the same as that under the Susquehanna soils. The B horizon is also similar in structure but not in color. The color of the B horizon of the Lufkin soils is drab gray or slate gray. In the better-drained areas, there are a few mottlings of red. The soil material of the A horizon is predominantly much lighter in color than that of the corresponding horizon of the Susquehanna soils, and it contains less organic matter.

The light-colored sandy timbered soils and the red timbered soils, in southeastern Van Zandt County, do not show such abrupt changes between the different horizons. The light-colored soils in most places show a transitional change in color and texture between the horizons, and the red soils show an exceptionally uniform color throughout the entire profile.

The A horizon consists of single-grained structureless fine sand or fine sandy loam to a depth of about 12 inches, in places to a

depth of 18 inches. In the lower part of this horizon, the texture gradually becomes heavier until the B horizon is reached. The B horizon extends to a depth ranging from 24 to 30 inches, and it ranges from fine sandy loam to sandy clay loam in texture. The material is rather friable, and large pieces, if removed when wet, crumble easily by hand pressure. This horizon contains enough of the finer materials to give it a distinct body. The C horizon may consist of sandy or heavy clay material, but in most places it consists of more friable material than commonly occurs beneath the Crockett and Susquehanna soils.

These soils, with a few exceptions, are developed on parent material consisting of yellow or reddish-yellow sand. The deep cuts in the vicinity of Martins Mills and east of Canton reveal thick formations of compact sand. The upper part is splotched with rust brown, yellowish red, and yellow, which occur in vertical streaks. The lower part contains laminated material of reddish-yellow sand and bluish-gray or rust-brown clay. Some red or pink-red ferruginous fragments are embedded in the material. This material, throughout the area of these soils, seems to have been more or less variable in character or to have been subjected to different conditions of weathering. In some places the B horizon is red or yellowish red and in other places yellow is the prevailing color. Where red is the predominating color, the B horizon is usually slightly better drained. The red color is developed in the soils of the Ruston series, and the yellow B horizon is characteristic of the Norfolk and Bowie soils.

The Bowie soils differ from the Norfolk principally in the red and gray mottling in the lower part of the B horizon. In places the Bowie soils have a heavy clay in the upper part of the C horizon very similar to the parent material under the Susquehanna and Lufkin soils. Perhaps the cause for the red mottling in the lower part of the B or upper part of the C horizon is due to the thinness of the layer of parent material that has weathered into a Norfolk soil and to the fact that the heavy clay substratum retained the leached iron materials above the point where it became oxidized and at the same time it made more friable the upper part of the clay C horizon which would otherwise be similar to the Susquehanna C horizon in tightness. Therefore, the Bowie series may represent Norfolk soils with shallow B horizons underlain by a clay parent material such as commonly occurs beneath the Susquehanna soils.

In many places, however, the underlying material of the Bowie soils consists of dense compact sand that is difficult to penetrate with a sharp-pointed tool. In such places the same condition may arise as above the heavy clay material and cause the development of the red mottlings in the lower part of the B horizon.

The following paragraphs contain detailed descriptions of the soils of two series representative of the above profile development. The description also applies to soils of the Ruston, Norfolk, Bowie, Kirvin, and Nacogdoches series.

The A horizon of the Ruston soils is variable both in color and texture. Near the surface it is slightly darker, on account of the larger content of organic matter, but the dominant color of the horizon is gray or dark gray grading into reddish yellow and, in turn, into yellowish red which is the predominant color of the B horizon.

The material is structureless and single grained, grading from fine sandy loam at the top into very fine sandy loam below.

The B horizon occurs at a depth of about 12 inches below the surface, and it does not show such an abrupt change from the A horizon as in the Crockett and Susquehanna soils. It is composed of yellowish-red very fine sandy loam or sandy clay loam. The material, which contains a moderate amount of moisture, crushes very easily by hand, and it contains sufficient fine clay to present a slightly polished surface when smoothed by pressure between the fingers. When dry, it is hard and brittle, but it can be reduced to a single-grain structure. The weathered material exposed in road cuts dries to a semblance of granulation.

The C horizon, between depths of 24 and 72 inches, consists of yellow or reddish-yellow fine sand or sandy clay, splotched with red, rust brown, and gray. Bordering the root channels, the material is stained with dark organic matter. The dry material is hard to penetrate with a spade, but a small piece can be easily reduced to a single-grain mass. In exposed cuts it breaks naturally into vertical pieces of irregular sizes and shapes. The material underlying it is composed of laminated gray and rust-brown clay and sand.

The Nacogdoches soils are the same as those mapped as Kirvin in the northeastern and southeastern corners of Henderson County, Tex. They are a remnant of the same plain. The gravelly soil is derived from the ortstein layer developed in this old plain from the leaching of the overlying sand. The less gravelly soil is developed on the slopes below the ortstein layer. These soils have the most uniform color profile (red or dull red) of any soil in the county except Norfolk fine sand. The A horizon consists of reddish-brown or brown loose structureless material containing large quantities of ferruginous fragments which are so numerous in many places as to interfere with cultivation. On the more level areas, the surface soil, to a depth of a few inches, contains considerable organic matter.

The B horizon commences at a depth of about 8 or 10 inches. It is very friable on account of the large quantities of ferruginous fragments that are embedded in the material. The finer material of this horizon ranges from very fine sandy loam to clay, which, when moist, crumbles easily with hand pressure.

The C horizon consists of yellow or yellowish-red sandy material splotched with red and rust brown. With increased depth, yellow is the dominant color. Surrounding the stony fragments in the C horizon is greenish-yellow material. A few lumps of greensand marl are seen in cuts at great depths beneath the surface. These geological formations are reported to contain greensand marl at a considerable depth.

Conditions in places in the county have more or less prevented the natural process of soil-profile development, chiefly in the valleys, in poorly drained areas, and in very sandy uplands. In these localities certain soils have been mapped, which are not soils in the true meaning of the term but are really representative of the different kinds of parent materials that have not as yet been altered by weathering.

In the valleys the material is being constantly disturbed, so that any soil development that has been made is destroyed. The soil is derived from alluvium from many sources. The larger streams,

with their numerous branches, penetrate large areas of the county. Some contribute clay, silt, and sand from the timbered sections, and others carry down material from the dark calcareous upland soils of the prairie section. All of this material is reassorted in transit. The silts and clays are deposited along the lower courses of the streams, mainly near the valley sides of the wider flood plains. However, in the latter position sandy colluvial material washed down from the valley sides in places covers the marginal areas. The very fine sands and coarser materials are deposited along the stream channels or left along their upper courses. However, in the process of reassortment, the sands and finer materials, though uniformly deposited in certain parts of the valleys, are in many places mixed with the materials that are carried down by the tributary streams into the valley. Consequently there is in many places a lack of uniformity in the distribution of materials on the valley bottoms.

The alluvium of the smaller stream valleys is derived from materials from the adjacent uplands. Most of it is composed of fine sand from the light-colored timbered soils or preponderantly of clay from the dark calcareous soils of the prairies.

In some valleys materials of different characteristics are deposited on materials of earlier deposition. These may be light-colored sand on heavy clay, heavy silty material on heavy clay, or silt on sand and gravel, or they may represent several such combinations and also, perhaps, three different periods of deposition of different materials. Along the lower part of some of the larger tributaries of Sabine River silt and clay are sometimes deposited by backwater.

In many valley bottoms of Van Zandt County the surface-soil material is brown or grayish brown grading into a slightly darker color. It is fairly uniform in character to a depth of 3 feet or more, and the lower part in places may be mottled with gray and brown. Underneath this, at a depth ranging from 4 to 5 feet, is bluish-gray plastic clay mottled with rust brown and yellow. Drainage is good. This description is representative of the soils included in the Ochlockonee series.

Where drainage in the bottom lands is restricted, a gray surface soil is developed, with a gray mottled subsoil. The material in the lower part of the subsoil appears to be almost representative of the gray clay substratum of the Ochlockonee soils. This soil material represents soils of the Bibb series.

The Trinity soils include the black waxy calcareous valley bottom soils. The subsoils are black or grayish-black sticky clay that extends to a depth of 3 feet or deeper. Both surface soil and subsoil effervesce very actively with acid.

In some valleys the alluvium has been leached of its calcareous material but still retains its dark color and heavy texture. The surface material is mixed with the material brought down by streams from the light-colored upland soils. Consequently the surface soil ranges from light-gray to grayish-brown silt loam or very fine sandy loam, that grades at a depth ranging from about 6 to 12 inches into heavy black clay. This material is representative of the Johnston soils.

Second bottoms are developed in a few of the larger valleys in the county. These second bottoms are composed of much the same ma-

terial as the more sandy sections of the first bottoms, but they have better drainage and the material is more favorably situated for the natural processes of soil development. Where the material has been derived from light sandy timbered upland soils, from colluvial wash from the valley sides, or from alluvium when this part of the valley was subjected to more frequent flooding, the Kalmia soils are developed. These soils are characterized by light-gray surface soils grading, at a depth ranging from 3 to 4 feet, into yellowish-gray sand mottled with gray. Wherever the material is reddish yellow in color but similar in other characteristics to the Kalmia soils, the soils of the Cahaba series have been mapped.

In the poorly drained sandy uplands, the weathering-resistant materials and the excess moisture have allowed very little change in the parent material. The only change that may take place is the leaching of certain elements by excess moisture and transferring them to greater depths. In these localities soils of the Portsmouth and Caddo series are developed. The Portsmouth soils have developed under very excessive moisture. They support a dense growth of vegetation which furnishes an abundance of débris that is only partly decomposed. As a result the surface material is black with decaying organic matter and humus. Underneath, to a depth of a few inches, the material is stained by organic matter, but deeper down it is composed of white sand.

The Caddo series is representative of soils developed under better drainage conditions, and an excess accumulation of undecomposed organic matter does not occur, as vegetal growth is less. Otherwise the soils of this series are similar in character to the Portsmouth soils.

The parent material beneath only a few of the soils of the county is very resistant to weathering. This condition exists in Norfolk fine sand, Ruston fine sand, and Kirvin gravelly fine sandy loam. The parent material underlying these soils is composed mostly of unconsolidated sand, with small ferruginous sandstone fragments and some thin layers of bluish-gray clay. Wherever the material has disintegrated into gray sand several feet deep, Norfolk fine sand is mapped. In some parts of the county the material is red, and here Ruston fine sand has developed. In southeastern Van Zandt County, the material is intermixed with many ironstone fragments on the surface and in the soil mass to a depth of several feet. To a depth ranging from 3 to 4 feet, the material in most places contains much silt and clay, but it is very friable. The material is red or dull red in color, owing, perhaps, to a high concentration of oxidized iron. Soils derived from this kind of parent material are included in the Nacogdoches series. These soils are characterized by brown surface soils and red subsoils.

SUMMARY

Van Zandt County, which has an area of 856 square miles, is in northeastern Texas. The surface relief of the county is, in general, smooth and is gently undulating or moderately sloping. The county is well drained by numerous creeks and their branches.

The population, according to the 1930 census, is 32,315, the greater part of which is native white. Several communities are occupied exclusively by negroes.

Wills Point, Edgewood, Fruitvale, Grand Saline, and Canton are the principal trading centers of the county, and all but the last named are served by the Texas & Pacific Railway which provides connections with the important markets of the country.

The rural communities have good schools, and rural mail delivery is in easy reach of every farm home. Roads, mainly of dirt construction, traverse all parts of the county.

The climate is favorable for growing a large variety of crops. The average annual rainfall is 40 inches, and the average length of the frost-free season is 245 days.

Cotton and oats are the principal crops grown on the prairie lands of the county. Corn does not do so well on the upland soils as in the valleys where more moisture is usually available during the dry periods of the summer. The acre yield of cotton on the prairie soils ranges from one-fifth to three-fourths bale, and on the light-colored timbered soils from one-sixth to one-half bale. Milo and other grain sorghums often fail to develop fully in this section of Texas.

Cowpeas and velvetbeans are grown to some extent, and reports of their beneficial effects on soils indicate that these crops should be grown more extensively for soil improvement. Bermuda grass grows well, but there are few good pastures of this grass in the county.

The growing of truck crops is an important industry in some communities of the sandy-soil sections. These crops are mainly watermelons, potatoes, sweetpotatoes, tomatoes, peas, and beans. Most of these products are trucked to cities and towns outside the county.

Many farmers sell milk and cream locally, and some is shipped to creamery plants outside the county. Poultry products sold amount to a considerable yearly sum.

Farmsteads consist of a house for the family, poultry house, and small buildings for housing livestock. Buildings on farms operated by the owners are usually kept in a good state of repair.

The county lies mainly in the extreme western edge of the region of light-colored sandy timbered soils. A narrow belt along the western side lies in the black-land prairie region. The soils developed in the dark-colored prairie include the Crockett, Wilson, and Durant soils. The Crockett are the most extensive soils of the prairies. They are very productive, and cotton and oats are the chief crops grown on them.

The soils of the light-colored timbered belt include the Susquehanna, Bowie, Norfolk, Ruston, Lufkin, Caddo, and Portsmouth soils.

Large areas of red timbered soils, the Nacogdoches soils, prevail in southeastern Van Zandt County, and they comprise valuable farming land.

The soils of the valley bottoms include the Trinity, Johnston, Ochlockonee, Bibb, and Hannahatchee soils. The soils of the Cahaba and Kalmia series occur on second bottoms slightly above overflow.

Recommendations for improved agriculture in Van Zandt County include rotation of crops, incorporation of green manures, and terracing to prevent erosion.

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