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TEXAS AGRICULTURAL EXPERIMENT STATION

B. YOUNGBLOOD, DIRECTOR

COLLEGE STATION, BRAZOS COUNTY, TEXAS

BULLETIN NO. 375 JANUARY, 1928

DIVISION OF CHEMISTRY

The Soils of Bowie, Denton, Freestone, and Red River Counties

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†As of December 1, 1927.
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SYNOPSIS

This is the eleventh bulletin dealing, by counties, with the chemical composition of Texas soils, and discusses the soils of Bowie, Denton, Freestone, and Red River counties. The upland soils of the forested areas of all these counties are somewhat low, on an average, in active phosphoric acid, nitrogen, and potash, though they are better supplied with potash than with nitrogen or phosphoric acid. The group of forested soils generally respond well to fertilizer and the use of fertilizer on them is usually profitable. Many of them are acid. The prairie upland soils and the first-bottom soils are much better supplied with plant-food material. Detailed descriptions and analyses are given of the various soil types. Methods for maintaining and increasing soil fertility are discussed.

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BULLETIN NO. 375 JANUARY, 1928

THE SOILS OF BOWIE, DENTON, FREESTONE, AND RED RIVER COUNTIES

G. S. FRAPS

This Bulletin deals with the chemical composition and fertility of samples of typical soils from four counties in Texas, and is the eleventh bulletin of a series dealing with the chemical composition of typical Texas soils. The preceding bulletins are Numbers 99, 125, 161, 173, 192, 213, 244, 301, and 337. Most of the samples analyzed were collected by field agents of the Bureau of Soils of the United States Department of Agriculture, in connection with the Texas Agricultural Experiment Station.

Detailed reports of the surveys, with maps showing the location of the various soil types, have been published by the Bureau of Soils, United States Department of Agriculture, and from these reports the descriptions given in this Bulletin are taken:

Soil survey of Bowie County, Texas, by L. R. Schoenmann et al., in cooperation with the Texas Agricultural Experiment Station.

Soil survey of Denton County, Texas, by W. T. Carter, Jr. and M. W. Beck.

Soil survey of Freestone County, Texas, by H. W. Hawker et al., in cooperation with the Texas Agricultural Experiment Station.

Soil survey of Red River County, Texas, by W. T. Carter, Jr. et al., in cooperation with the Texas Agricultural Experiment Station.

Requests for copies of reports of any soil survey should be addressed to the Bureau of Chemistry and Soils, United States Department of Agriculture, Washington, D. C. The Division of Chemistry has no copies of these reports for distribution.

MAINTENANCE OF FERTILITY

The following are some of the essentials to the maintenance of soil fertility:

(1) The supply of nitrogen and vegetable matter in the soil should be maintained by growing legumes in a proper rotation, and by plowing these under or grazing them off.

(2) Any deficiency of phosphoric acid in the soil should be corrected by the proper use of phosphates as a fertilizer.

(3) Any acidity injurious to the crops being grown, if present, should be corrected by the use of ground limestone or other forms of lime. Lime is also used for the improvement of the physical character of the heavy soils poor in lime or for supplying lime for crops which need a quantity of lime. Lime should be used chiefly in connection with a systematic legume rotation.

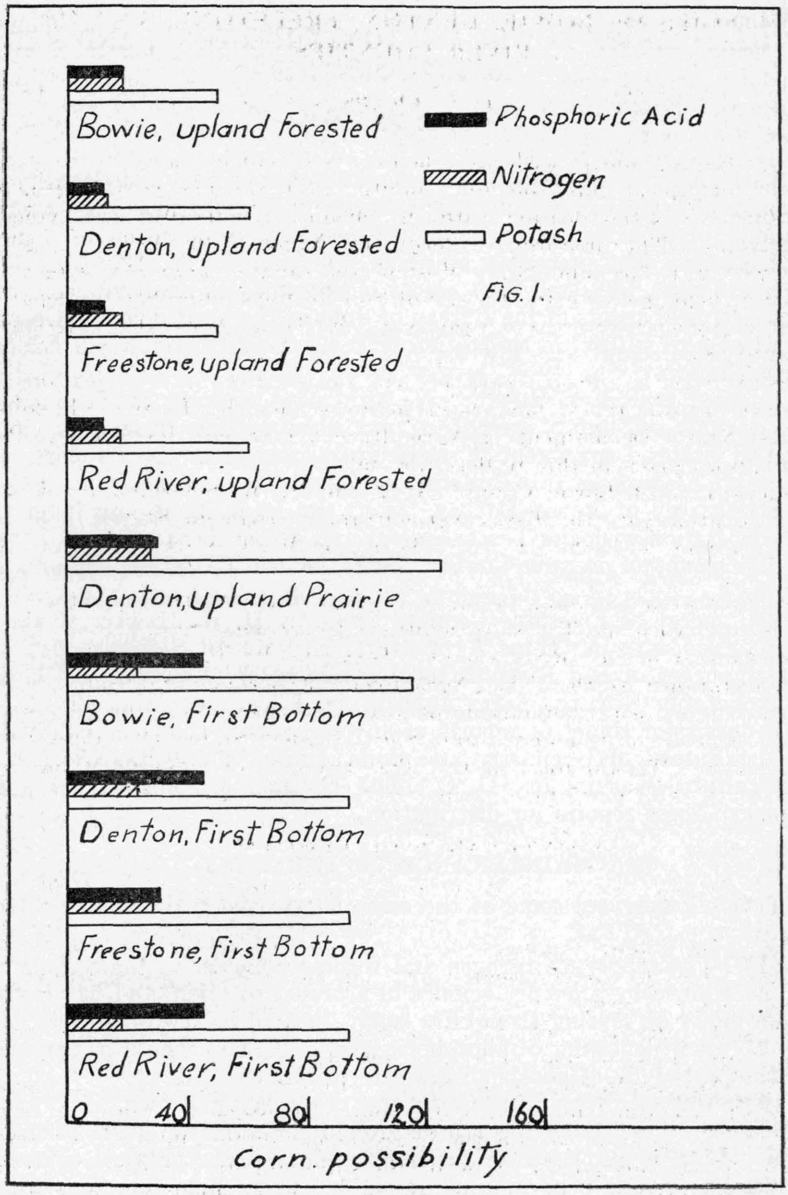
Phosphoric Acid
Nitrogen
Potash
Bowie, upland Forested
Denton, upland Forested
Freestone, upland Forested
Red River, upland Forested
Denton, upland Prairie
Bowie, First Bottom
Denton, First Bottom
Freestone, First Bottom
Red River, First Bottom
0
40
80
120
160
Corn. possibility

FIG. 1.

(4) Any deficiency of potash in the soil should be corrected by the use of potash fertilizers.

Maintenance of Humus and Nitrogen. The maintenance of the humus or vegetable matter in the soil is essential to fertility. Partly decayed vegetable matter, sometimes termed humus, in sufficient quantity, improves the capacity of the soil to hold a favorable amount of water, enables it to break up into a good condition of tilth when plowed or cultivated, and acts in other favorable ways. Humus also contains most of the nitrogen of the soil.

Some soils produce good crops for a long time without additions of vegetable matter, but for permanent productiveness, vegetable matter must be added sooner or later. Vegetable matter may be supplied in barnyard manure, which is excellent when sufficient quantities can be secured, but barnyard manure cannot always be secured in large eonugh quantities. Legume crops, which have power to take nitrogen from the air, may then be grown in rotation with other crops, and either turned under or grazed off. If the crop is heavy, it is best to allow it to become nearly mature before turning it under. To graze off the crop is better than to turn it under, as some of its feeding value is secured when the crop is grazed, while the droppings from the animals, together with the liquid excrement, return to the soil the bulk of the plant food taken up by the crop. To make the crop into hay, and save the manure from the hay, is not as good for the soil as grazing off the crop, since a large part of the plant food in the hay is lost. When the legume is made into hay to be sold, the land probably gains little nitrogen and actually loses phosphoric acid and potash.

Crops other than legumes add vegetable matter to the soil when plowed under or grazed off, or are suitable for cover crops to reduce losses from leaching or washing when the land would otherwise be bare, but legumes are the only plants which can fix the nitrogen of the air and place it in the soil in forms suitable for the use of other crops. For this reason it is best to grow legumes for hay, forage, or renovating crops whenever possible.

The maintenance of the nitrogen content of the soil is more important than the maintenance of the humus content. Nitrogen may be purchased as a fertilizer, but it is expensive when bought in this way, and ordinarily a farmer cannot afford to buy enough of it to keep the nitrogen content of his land from decreasing. The only practical way to maintain the nitrogen content of the soil when ordinary farm crops are grown is to secure nitrogen from the air by growing legumes. The nitrogen fixed by legumes can then be utilized for cotton, corn, kafir, or similar crops. The kind of legume best to grow depends upon the climate and other conditions, which vary with different sections of the State and with different conditions of farming.

Phosphoric Acid. Texas soils are frequently deficient in phosphoric acid. This Bulletin contains statements of the probable deficiencies in phosphoric acid of the soils of the counties described. A discussion of the use of phosphatic fertilizers is given in Bulletin 167. Deficiency of phosphoric acid may be easily and profitably corrected by the use of acid phosphate as a fertilizer.

Acidity. Some soils contain organic or inorganic acids. Some crops such as clover, alfalfa, barley, and rye do not grow well on acid soils. There are other crops, such as cowpeas and watermelons, which do well on acid soils. Acidity may be corrected by the use of hydrated lime, ground oyster shells, air-slaked lime, or ground limestone rock. A number of acid soils are found to occur in the counties described in this Bulletin. The acidity of some of the soils is slight, while that of others is high. Acidity is discussed more fully in Bulletin 243.

Potash. While the soils of Texas as a rule contain enough potash to produce good crops, there is some variation and some soils need potash as a fertilizer. In general, potash is the least often needed of the three plant foods, nitrogen, phosphoric acid, and potash. Plants can take up more potash than they need.

The needs for potash of the various types of soils here studied are indicated by the tables of analyses and interpretation of results given later. Some of the soils described are low in active potash compared with other soils of the State, though they are much better supplied with potash than with phosphoric acid or nitrogen.

How to Use the Analyses

Analyses of the soils are given in connection with the descriptions of the various types of soil. The interpretation of the analyses is also given and there discussed.

If a soil well supplied with plant food does not give good yields it is obvious that some condition other than plant food controls the yields. The physical condition may be poor, either in respect to cultivation, drainage, or otherwise. In some instances it may contain injurious substances, such as alkali. Plant diseases also may be present.

If the soil is well supplied with total plant food, but low in active plant food, attempts may be made to increase the activity of agencies which make the plant food available, by means of additions of manure, of green crops plowed under, or if the soil needs lime, by additions of lime or ground limestone in connection with a legume rotation.

If the crop yields are low and the plant food of the soil is deficient, fertilizer should be used. The depth of the soil, the character of the subsoil, and the season, influence the yield of crops as much as the plant food, which can be seen by observing the variation in yields on the same land from one year to another.

EXPLANATION OF TERMS

Total phosphoric acid is the entire quantity of phosphoric acid contained in the soil. It cannot all be taken up by plants at once, for only a small portion is immediately available.

Active phosphoric acid is the phosphoric acid soluble in 0.2 normal nitric acid. As shown in Bulletins 126 and 276, there is a relation between the active phosphoric acid of the soil and the amount of phosphoric acid which crops are able to take from the soil in pot experiments. There is a closer relation between the active phosphoric acid of the soil and the needs of the soil for phosphoric acid as a fertilizer, than between the total phosphoric acid and the needs of the soil.

Total potash represents the entire amount of potash in the soil. Some of this is locked up in highly insoluble silicates, and may not become available for the use of plants in centuries. The total potash does not show how much may be taken up by plants.

Acid-soluble potash is the amount of potash which is dissolved by strong hydrochloric acid. As pointed out by Hilgard, there is a relation between the acid-soluble potash of the soil, and the wearing qualities of the soil. (Fraps' Principles of Agricultural Chemistry, page 171.)

Active potash is the potash soluble in 0.2 N nitric acid. It represents potash which can be readily taken up by plants, as shown by pot experiments in Bulletins 145 and 325.

Total nitrogen is the entire quantity of nitrogen present in the soil. As shown in Bulletin 151, there is a relation between the total nitrogen of the soil, and the nitrogen which can be taken from it by crops in pot experiments. The total nitrogen is therefore an index as to the needs of the soil for nitrogen, although the nitrogen in worn soils is not as available as that in new soils.

Acid-soluble lime is the lime which is dissolved by strong hydrochloric acid. According to Hilgard, the amount of lime found by this method is a valuable indication as to the fertility of the soil.

Basicity. This term is applied to the bases (chiefly lime) which neutralize the 0.2 N nitric acid in the method for determining active phosphoric acid and active potash. This term is merely used as a convenient one for the determination referred to. If all the acid is neutralized, the basicity is 10 per cent or 200,000 pounds of base (carbonate of lime) to 2,000,000 of the soil.

Acidity here determined is the amount of lime required to neutralize the soil as ascertained by the Veitch method. Acidity is discussed in Bulletin 243.

Corn possibility represents the average amount of plant food which is withdrawn by plants in pot experiments from soils containing similar amounts of active phosphoric acid, active potash, or total nitrogen. It is based on 2,000,000 pounds of the soil.

The corn possibility is not claimed to indicate the possible yield from the soil, as this depends upon other conditions in addition to the fertility of the soil. According to David D. Long, however, there is a close relation between the average yields of corn, oats, wheat, and cotton given by census reports for Southeastern States (also Texas), and the corn possibility as shown by the chemical analysis of some common types of soil, converted into terms of these other crops (The Fertilizer Green Book, December, 1922). The corn possibility is a convenient way of comparing amounts of various foods in the soil. For example, with the Bowie very fine sandy loam of Red River County, the corn possibility for active phosphoric acid is 12, for the active potash 61, and for total nitrogen 13. The soil is probably deficient both in phosphoric acid, and in nitrogen, and it is less likely to be deficient in potash.

The experiments on which this interpretation is based are published in Bulletins 126, 145, 151, 178, 267, and 355, and the method is discussed in Bulletins 213 and 355.

AVERAGE COMPOSITION OF THE SOILS OF THE COUNTIES STUDIED

The average composition of the soils is given in Table 1. The soils are divided into four groups: the upland forested soils, the upland prairie soils, the second-bottom or terrace soils, and the first-bottom or alluvial soils. The term "forested" refers to the original condition of the soils, as they are now largely in cultivation. The upland forested soils studied in this Bulletin are usually low in active phosphoric acid and nitrogen. They are a little better supplied with active potash. A number of them in Bowie, Freestone, and Red River Counties are acid, but they are not acid in Denton County. The subsoils are likewise low in plant food and they are more acid than the surface soils.

The upland prairie soils are better supplied with plant food and with lime than the forested soils. They contain two or three times as much active plant food or total nitrogen as the forested soils. While many of them are limestone soils, a few are acid, especially in Bowie County.

The second-bottom or terrace soils are located above overflow. They are somewhat better supplied with plant food than the upland forested soils but are not as well supplied as the prairie soils. These soils are quite low in nitrogen in Freestone and Denton Counties.

The first-bottom soils are sometimes subject to overflow. They are much better supplied with plant food than the other groups of soils discussed in this Bulletin. While some of them are slightly acid, most of them are well supplied with lime. They contain 4 to 8 times as much active phosphoric acid, 2 to 3 times as much active potash, and 2 to 4 times as much total nitrogen as the upland forested soils.

Table 1.—Average composition of soils by groups.

	Phosphoric Acid		Nitrogen	Potash			Lime, Per Cent		Number
	Total Per Cent	Active Per Million	Nitrogen Per Cent	Total Per Cent	Acid Soluble Per Cent	Active Per Million	Acid Soluble	Basicity	Number Averaged
Upland (Forested) Surface Soils									
Bowie County	.041	23	.054	.55	.14	96	.26	.27	15
Denton County (cross timber)	.064	19	.038	.37	.09	103	.14	.39	3
Freestone County	.039	15	.041	.79	.10	95	.15	.32	15
Red River County	.049	12	.062	.49	.15	115	.39	.86	14
Upland (Forested) Subsoils									
Bowie County	.040	14	.034	.74	.29	116	.18	.40	15
Denton County (cross timber)	.047	7	.038	.52	.30	116	.19	.57	3
Freestone County	.041	11	.038	.92	.20	134	.18	.70	18
Red River County	.044	13	.054	.49	.22	104	.50	1.20	16
Upland (Prairie) Surface Soils									
Bowie County	.054	37	.067	.79	.33	223	1.19	2.08	3
Denton (Grand Prairie)	.060	25	.107	.79	.44	215	.66	1.31	6
Denton (Black Prairie)	.071	57	.086	1.05	.38	256	3.62	3.35	8
Freestone County	.065	79	.112	1.35	.38	208	.55	1.14	5
Red River County	.083	65	.132	.62	.27	124	10.66	5.10	3
Upland (Prairie) Subsoil									
Bowie County	.046	40	.035	1.14	.21	143	1.55	3.53	5
Denton (Grand Prairie)	.053	13	.070	.71	.37	187	2.49	1.98	6
Denton (Black Prairie)	.049	20	.058	1.18	.31	248	3.70	4.60	8
Freestone County	.050	95	.049	.82	.49	155	1.61	3.34	8
Red River County	.086	33	.067	.78	.24	95	12.48	5.6	3
Second Bottom (or terrace) Surface Soils									
Bowie County	.057	34	.063	.66	.13	88	.19	.44	2
Denton County	.044	30	.088	.92	.26	216	.45	.91	4
Freestone County	.023	58	.023	.73	.06	70	.22	.15	3
Red River County	.035	9	.016	.90	.07	89	.14	.10	1
Second Bottom Subsoils									
Bowie County	.041	13	.033	.75	.19	105	.16	.58	3
Denton County	.029	11	.051	1.01	.40	208	.75	1.48	4
Freestone County	.040	22	.040	.88	.24	147	.28	.40	2
First Bottom Surface Soil									
Bowie County	.093	192	.092	1.87	.50	248	1.34	2.79	14
Denton County	.106	173	.135	1.21	.43	230	2.55	4.88	5
Freestone County	.087	72	.128	1.41	.35	316	.44	1.19	6
Red River County	.116	430	.118	1.54	.69	240	2.41	2.30	3
First Bottom Subsoil									
Bowie County	.068	142	.062	1.68	.54	218	.91	2.00	18
Denton County	.092	125	.069	1.09	.49	189	4.09	6.14	5
Freestone County	.069	59	.097	1.38	.37	247	.76	1.67	6
Red River County	.092	165	.059	1.82	.47	190	1.78	2.00	3

CROP-PRODUCTION POWER OF AVERAGE SOILS

Table 2 contains the number of crops of 40 bushels of corn that could be produced by the plant food in an acre to the depth of seven inches (two million pounds), provided all the plant food could be extracted by the plants, in the groups of soils as averaged in Table 1. The total phosphoric acid of the upland forested soils could produce 31 to 51

Table 2.—Number of crops of forty bushels of corn which would be produced by the plant food in two million pounds of soil (an acre 7 inches deep).

	Total Phosphoric Acid	Nitrogen	Acid-Soluble Potash
Upland (Forested) Surface Soil			
Bowie County	33	18	70
Denton County (Cross Timbers)	51	13	45
Freestone County	31	14	50
Red River County	39	21	75
Upland (Prairie) Surface Soil			
Bowie County	43	22	165
Denton County (Grand Prairie)	48	36	220
Denton County (Black Prairie)	57	29	190
Freestone County	52	37	190
Red River County	66	44	135
Second Bottom (or terrace) Surface Soil			
Bowie County	46	21	65
Denton County	35	88	130
Freestone County	18	8	30
Red River County	28	5	35
First Bottom Surface Soil			
Bowie County	74	31	250
Denton County	85	45	215
Freestone County	70	43	175
Red River County	93	39	345

Table 3.—Interpretation of analyses of soils averaged by groups.

	Corn Possibility Two Million Pounds			Phos-phoric Acid	Potash	Lime
	Active Phos-phoric Acid	Nitro-gen	Active Potash			
Upland (Forested) Surface Soils						
Bowie County	18	18	50	good	fair	good
Denton County (Cross Timbers)	12	13	61	fair	fair	fair
Freestone County	12	18	50	fair	fair	fair
Red River County	12	23	61	good	fair	good
Upland Prairie Surface Soil						
Bowie County	24	23	105	good	good	good
Denton County (Grand Prairie)	18	33	105	good	good	good
Denton County (Black Prairie)	30	28	125	good	good	high
Freestone County	35	33	105	good	good	good
Red River County	35	38	61	good	good	high
Second Bottom or Terrace						
Bowie County	24	23	50	fair	fair	fair
Denton County	18	28	105	good	good	good
Freestone County	30	13	38	low	low	good
Red River County	6	8	50	fair	low	low
First Bottom						
Bowie County	45	23	115	good	good	good
Denton County	45	23	94	good	good	high
Freestone County	30	28	94	good	good	good
Red River County	45	18	94	good	good	good

crops of 40 bushels of corn, the acid-soluble potash could produce 13 to 21 crops, and the total nitrogen 45 to 75 crops. The upland prairie soils and the second-bottom soils average much better, as can be seen in the table.

Table 3 contains the corn possibility of the groups, derived from Table 1. The corn possibility of the active phosphoric acid varies from 6 to 45 bushels, the active potash from 38 to 125, and the total nitrogen from 8 to 38 bushels. These figures show the importance of adding nitrogen and phosphoric acid to these soils, and that potash is less important.

POT EXPERIMENTS

The needs for plant food of some of the soils discussed in this Bulletin were studied by growing the plants in pots containing portions of the soils, to which various forms of plant food were added. In making these experiments, 5,000 grams of soil were placed in a galvanized iron pot, and to one or two pots, a complete fertilizer (KPN) was added. To one or two more pots nitrogen and potash (NK) were added, phosphoric acid being omitted. The difference between this pot and the pot with the complete fertilizer shows the need of the soil for phosphoric acid. To one or two more pots, phosphoric acid and potash (PK) were added, nitrogen being omitted. The difference between this pot and that with the complete fertilizer shows the need of the soil for nitrogen. To a third set of one or two pots, nitrogen and phosphoric acid (NP) were added, potash being omitted. The difference between this pot and the pot receiving the complete fertilizer shows the effect of potash. The tables show the weights of the crops secured with the different additions, and also the amounts of phosphoric acid, potash, or nitrogen removed from the pot by the plants grown in the experiments. This is expressed in bushels of corn to the acre. The soil in pot experiments is under favorable conditions, and it is possible for the plants to take up more plant food from the same quantity of soil than would be the case under field conditions. It is also possible for a greater growth to be produced. There might be a considerable difference between the crop receiving the complete fertilizer (KPN), and the crop which had no potash (PN), in the amount of crop produced, and yet the crop produced without potash might be equal to the possibility of production under the climatic conditions prevailing. Thus the soil would appear deficient in the pot experiment, while for all practical purposes it would not be deficient. This is the reason why the plant food withdrawn is expressed in bushels of corn to the acre. It shows the relative possibility of the soil to furnish plant food for crops in pot experiments.

FERTILIZERS FOR THE SOILS STUDIED

The soils studied may be divided into several groups with respect to their relation toward fertilizers.

The upland soils, originally forested, of all these counties, are generally somewhat low in plant food, especially phosphoric acid and nitrogen, and generally respond well to fertilizers under favorable seasonal conditions. The use of fertilizers is generally advisable for field crops, but especially for truck and fruit crops. Fertilizers suggested for use are given in other publications of the Experiment Station. In general, the light soils are likely to need more potash than the heavier soils.

The black calcareous prairie soils, especially the Houston soils, do not respond well to fertilizers, and at present we cannot recommend fertilizers to be used on them, but recommend legume rotation and manure.

The non-calcareous prairie soils will probably respond to fertilizers, though they are at present in less need of them than are the calcareous prairie soils.

The first-bottom soils are well supplied with plant food and generally do not need fertilizers so much as the upland forested soils. Where they produce a heavy growth of stem and leaves but do not fruit well, applications of acid phosphate may correct this condition. Where the productiveness has begun to decrease, due to cultivation over a period of years, fertilizers will probably be of advantage.

USE OF LIME

A number of the soils described in this Bulletin are acid. Acidity can easily be neutralized by means of lime, as described in Bulletin 243.

The use of lime on sandy soils which are well drained, such as Norfolk, Ruston, or Orangeburg soils, is not to be advised except in connection with a legume rotation, for the reason that application of lime is likely to stimulate the production of nitrates and cause loss of the nitrogen of the soils during the winter months. The acidity of these surface soils is usually not high enough to be injurious to crops ordinarily grown.

The use of lime on the heavier, less porous soils, such as the heavier soils of the Lufkin, Crowley, and Susquehanna series, is more likely to be of advantage. It will not only correct the acidity, which is sometimes high, but may also improve the physical character of these soils so that they break up into a better tilth under cultivation. However, it would be better to use the lime in connection with legume rotation on these soils also. The lighter or more sandy soils of these series are less often acid than the heavier soils.

The black prairie soils of the Houston series, and some others, and many of the first-bottom soils, contain an abundance of lime and are not acid.

SOILS OF BOWIE COUNTY

Bowie County is located in the northeastern corner of Texas. The elevation ranges from about 200 to 450 feet above sea level. There are three surface divisions, consisting of (1) broad ridges extending east and west through the central part of the county, (2) somewhat lower land south and north of the central ridge, and (3) alluvial belts along the rivers. The chief crops are cotton, corn, oats, and peanuts. Cowpeas, sweet potatoes, sorghum, and various other vegetables are produced, as well as some live stock.

Table 4 contains the acreage and percentage of the areas occupied by some of the types of soils which occur in Bowie County. Thirty-four types were mapped, divided into seventeen series. A key to the classification of the soils is given below.

The Susquehanna very fine sandy loam occupies 18.0 per cent of the county, the Bowie very fine sandy loam 17.5 per cent, and the Susquehanna silt loam 8.5 per cent. These three are upland soils. The Ochlockonee very fine sandy loam, which is the chief alluvial soil, occupies 4.7 per cent of the county.

The average composition of the groups of soils is given in Table 1. It is seen from the table that the forested uplands contain less plant food than the prairie upland or the bottom lands and on an average are low in both phosphoric acid and nitrogen.

The chemical composition of the various types of soils is contained in Table 5. Table 4 contains the interpretation of the analyses of the various soil types.

An examination of the analyses shows that nitrogen is needed which may be supplied by a legume rotation which also furnishes vegetable matter. Fertilizers containing phosphoric acid and nitrogen are needed on the upland forested soils. The upland forested soils are better supplied with active potash than with nitrogen or phosphoric acid but are still low in active potash. The other groups of soils are better supplied with plant food, but are likely to respond to fertilizers.

These results indicate that one of the first needs of the upland soils of this county is a legume rotation, accompanied by the use of phosphoric acid, nitrogen and potash in fertilizers.

Pot Experiments on Soils of Bowie County

Pot experiments were made on the soil and subsoil of only one type of this county, the deep phase of the Susquehanna very fine sandy loam, for testing need for nitrogen only. The results of these are given in Table 6. The weights of the crops with complete fertilizer are given in the first column and those without nitrogenous fertilizer in the second. The nitrogen withdrawn in the pot experiment expressed in bushels of corn to the acre is given in the next column. This is 18 to 24 bushels for the first crop. The yields fall off rapidly in succeeding crops, showing the importance of nitrogen.

Classification of Soils of Bowie County

Upland soils of the forested area:

- Non-calcareous, gray to brownish-gray surface soils with friable sandy clay subsoils:
  - Subsoil pale yellow—Norfolk soils.
  - Subsoil yellow above, red mottled below—Bowie soils.
  - Subsoil reddish yellow to yellow red—Ruston soils.
  - Subsoil red—Orangeburg soils.

Table 4.—Interpretation of analyses, Bowie County.

Lab. No.	Type Name	Corn Possibility Two Million Pounds			Acid-Soluble			Acidity	Acres	Per Cent of Area
		Active Phosphoric Acid	Total Nitrogen	Active Potash	Phosphoric Acid	Potash	Lime			
14880	Bastrop Clay-surface	18	23	....	good	good	good	0	3136	0.5
14881	Bastrop Clay-surface	35	18	51	good	low	good	230	....	....
14874	Bowie Fine Sandy Loam-surface	6	8	37	low	low	low	0	14144	2.4
14875	Bowie Fine Sandy Loam-subsoil	6	13	37	low	good	low	700	....	....
	Average Bowie Very Fine Sandy Loam-surface	12	18	37	good	good	good	515	102592	17.5
	Average Bowie Very Fine Sandy Loam-subsoil	6	13	37	good	good	good	1250	....	....
14870	Crowley Silt Loam-surface	6	33	37	low	low	good	900	7936	1.4
14871	Crowley Silt Loam-subsoil	6	23	29	low	low	low	900	....	....
14893	Leaf Very Fine Sandy Loam-surface	24	18	37	fair	low	fair	230	5056	0.9
14894	Leaf Very Fine Sandy Loam-subsoil	6	13	37	fair	low	fair	1100	....	....
14899	Lufkin Clay-surface	18	28	120	good	good	good	3800	8128	1.4
14900	Lufkin Clay-subsoil	6	18	51	good	fair	good	400	....	....
14896	Lufkin Silty Clay Loam-surface	12	18	37	low	low	fair	900	43712	7.5
14897	Lufkin Silty Clay Loam-subsoil	12	13	37	fair	low	fair	900	....	....
14890	Lufkin Silt Loam-surface	24	28	51	good	low	good	900	7040	1.2
14891	Lufkin Silt Loam-subsoil	12	18	51	good	low	good	700	....	....
14901	Miller Clay-surface	45	33	157	good	good	good	0	7360	1.3
14902	Miller Clay-subsoil	45	23	120	good	good	high	0	....	....
	Average Miller Very Fine Sand-surface	45	13	51	fair	good	high	0	5440	0.9
	Average Miller Very Fine Sand-subsoil	50	8	51	fair	good	good	0	....	....
14908	Miller Very Fine Sandy Loam-surface	50	23	51	good	good	good	0	2176	0.4
14909	Miller Very Fine Sandy Loam-subsoil	50	23	120	good	good	good	0	....	....
	Average Myatt Silty Clay Loam-surface	18	28	51	good	good	good	450	2432	0.4
	Average Myatt Silty Clay Loam-subsoil	12	13	51	good	good	good	433	....	....
	Average Norfolk Fine Sandy-surface	35	13	37	fair	fair	good	153	4160	0.7
	Average Norfolk Fine sand-subsoil	35	13	37	fair	good	good	153	....	....
14929	Ochlockonee Clay-surface	30	48	157	good	good	good	0	19136	3.3
14930	Ochlockonee Clay-subsoil	30	18	120	good	good	good	0	....	....
14917	Ochlockonee Silty Clay Loam-surface	35	33	....	good	good	good	0	22912	3.9
14918	Ochlockonee Silty Clay Loam-subsoil	24	23	....	fair	good	fair	3200	....	....
14920	Ochlockonee Very Fine Sandy Loam-surface	12	18	29	good	low	good	0	27520	4.7
14921	Ochlockonee Very Fine Sandy Loam-subsoil	6	23	29	low	low	fair	0	....	....
14923	Oktibeha Clay Loam-surface	12	18	120	low	fair	good	2800	5184	0.9
14924	Oktibeha Clay Loam-subsoil	12	13	51	low	fair	good	2100	....	....
14926	Orangeburg Fine Sandy Loam-surface	6	18	37	fair	low	fair	230	1280	0.2
14927	Orangeburg Fine Sandy Loam-subsoil	6	13	80	low	fair	good	0	....	....
14931	Orangeburg Very Fine Sandy Loam-surface	18	13	37	low	low	good	0	2880	0.5
14932	Orangeburg Very Fine Sandy Loam-subsoil	6	13	51	low	good	good	0	....	....
14933	Pledger Clay-surface	24	43	120	good	good	good	0	13568	2.3

14934	Pledger Clay-subsoil	6	28	120	fair	good	fair	0	....	....
14940	Portland Clay-surface	35	38	157	good	good	good	0	19072	3.3
14941	Portland Clay-subsoil	12	18	182	fair	good	fair	230	....	....
14935	Portland Silty Clay Loam-surface	55	28	157	good	good	good	0	2560	0.4
14936	Portland Silty Clay Loam-subsoil	45	23	80	good	good	good	0	....	....
14938	Portland Very Fine Sandy Loam-surface	50	18	120	good	good	good	230	1600	0.3
14939	Portland Very Fine Sandy Loam-subsoil	50	13	120	good	good	good	0	....	....
	Average Ruston Fine Sandy Loam-surface	35	18	80	fair	low	fair	153	9344	1.6
	Average Ruston Fine Sandy Loam-subsoil	24	13	51	low	fair	low	153	....	....
	Average Ruston Very Fine Sandy Loam-surface	6	13	37	low	low	fair	465	30592	5.2
	Average Ruston Very Fine Sandy Loam-subsoil	6	13	37	low	good	fair	1600	....	....
14963	Sumpter Clay-surface	35	23	120	good	good	high	0	576	0.1
14964	Sumpter Clay-subsoil	35	....	51	good	....	....	0	....	....
14956	Susquehanna Clay Loam-surface	12	18	80	fair	good	fair	2800	19840	3.4
14957	Susquehanna Clay Loam-subsoil	6	13	80	low	good	fair	1600	....	....
	Average Susquehanna Silt Loam-surface	6	23	37	low	fair	low	780	49728	8.5
	Average Susquehanna Silt Loam-subsoil	6	13	51	fair	good	fair	1292	....	....
	Average Susquehanna Very Fine Sandy Loam-surface	12	18	37	good	low	good	367	105408	18.0
	Average Susquehanna Very Fine Sandy Loam-subsoil	6	13	51	low	good	fair	1323	....	....
14966	Trinity Clay-surface	45	38	80	good	fair	good	0	9728	1.7
14967	Trinity Clay-subsoil	45	63	182	good	good	good	0	....	....
14975	Yahola Clay-surface	45	28	157	good	good	high	0	4992	0.8
14976	Yahola Clay-subsoil	50	13	37	good	....	high	0	....	....
	Average Yahola Silt Loam-surface	50	28	182	good	good	good	0	2944	0.5
	Average Yahola Silt Loam-subsoil	50	18	120	good	good	good	0	....	....
14973	Yahola Very Fine Sandy Loam-surface	50	13	37	low	good	high	0	7424	1.3
14974	Yahola Very Fine Sandy Loam-subsoil	50	8	51	good	good	high	0	....	....

Table 5.—Analyses of soils of Bowie County.

Lab. No.		Phosphoric Acid Total Per Cent	Phosphoric Acid Active Per Million	Nitrogen Per Cent	Potash Total Per Cent	Potash Acid Soluble Per Cent	Potash Active Per Million	Acid Soluble, Lime, Per Cent	Basicity	Acidity
14880	Bastrop Clay-surface	.081	22	.078	.55	.44	....	.92	1.90	0
14881	Bastrop Clay-subsoil	.072	61	.042	1.36	.09	124	1.36	2.80	230
14874	Bowie Fine Sandy Loam-surface	.022	9	.019	.48	.05	51	.05	.15	0
14875	Bowie Fine Sandy Loam-subsoil	.044	7	.029	.58	.21	90	.06	.15	700
14877	Bowie Very Fine Sandy Loam-surface	.014	11	.055	.28	.07	61	2.23	.25	230
14878	Bowie Very Fine Sandy Loam-subsoil	.026	5	.040	.35	.20	71	.21	.50	1100
14879	Bowie Very Fine Sandy Loam-surface	.029	6	.031	.30	.21	59	.11	.15	1600
14882	Bowie Very Fine Sandy Loam-surface	.073	7	.037	.42	.11	34	.08	.10	0
14883	Bowie Very Fine Sandy Loam-subsoil	.107	5	.037	.54	1.41	58	.14	.15	1100
14876	Bowie Very Fine Sandy Loam-subsoil	.015	5	.031	.45	.16	75	.18	.30	2100
14886	Bowie Very Fine Sandy Loam-surface	.043	27	.041	1.27	.39	130	.22	.30	230
14887	Bowie Very Fine Sandy Loam-subsoil	.061	7	.034	.47	.20	124	.32	.40	700
	Average Bowie Very Fine Sandy Loam-surface	.040	13	.041	.58	.20	71	.66	.20	515
	Average Bowie Very Fine Sandy Loam-subsoil	.050	6	.036	.45	.49	82	.21	.34	1250
14870	Crowley Silt Loam-surface	.029	10	.108	.57	.10	55	.26	.03	900
14871	Crowley Silt Loam-subsoil	.017	7	.063	.56	.15	43	.07	.20	900
14969	Crowley Silt Loam-subsoil (deep)	.084	6	.082	.99	.36	121	.21	.50	0
14893	Leaf Very Fine Sandy Loam-surface	.057	40	.044	.34	.07	74	.14	.45	230
14894	Leaf Very Fine Sandy Loam-subsoil	.032	10	.029	.74	.10	58	.11	.30	1100
14895	Leaf Very Fine Sandy Loam-deep subsoil	.044	11	.032	.80	.21	140	.09	.50	2800
14899	Lufkin Clay-surface	.072	29	.089	.45	.30	214	.43	.90	3800
14900	Lufkin Clay-subsoil	.070	9	.051	.45	.22	149	.46	1.05	400
14896	Lufkin Silty Clay Loam-surface	.028	13	.051	.08	.06	67	.19	.45	900
14897	Lufkin Silty Clay Loam-subsoil	.048	12	.036	.70	.08	73	.18	.60	900
14898	Lufkin Silty Clay Loam-deep subsoil	.021	14	.037	.72	.11	95	.28	.80	700
14890	Lufkin Silt Loam-surface	.035	36	.084	.34	.07	113	.60	.40	900
14891	Lufkin Silt Loam-subsoil	.120	11	.045	.64	.04	134	.30	.65	700
14892	Lufkin Silt Loam-deep subsoil	.013	9	.042	.28	.07	14	.17	.70	900
14901	Miller Clay-surface	.134	159	.103	2.40	.78	353	1.58	3.45	0
14902	Miller Clay-subsoil	.092	183	.077	2.39	1.14	275	2.13	2.95	0
8369	Miller Very Fine Sand-surface	.065	269	.031	.82	.27	58	2.54	5.02	0
14906	Miller Very Fine Sand-surface	.057	24	.023	1.78	.16	171	1.50	3.25	0
14907	Miller Very Fine Sand-subsoil	.082	331	.019	2.08	.15	139	1.63	3.30	0
	Average Miller Very Fine Sand-surface	.061	147	.027	1.30	.22	114	2.02	3.98	0
14908	Miller Very Fine Sandy Loam-surface	.090	355	.073	2.05	.30	113	1.75	3.85	0
14909	Miller Very Fine Sandy Loam-subsoil	.113	234	.072	2.64	.69	261	.96	2.40	0
14903	Myatt Silty Clay Loam-surface	.045	27	.055	.68	.12	53	.14	.40	0
14904	Myatt Silty Clay Loam-subsoil	.030	26	.032	.83	.28	115	.13	.75	230
14905	Myatt Silty Clay Loam-subsoil	.014	19	.028	.94	.24	105	.35	.95	0
14912	Myatt Silty Clay Loam-surface	.067	29	.109	1.26	.23	154	.25	.45	900

14913	Myatt Silty Clay Loam-subsoil	.086	12	.054	.50	.23	118	.29	.83	800
14914	Myatt Silty Clay Loam-subsoil	.058	9	.034	.58	.29	136	.46	1.20	700
	Average Myatt Silty Clay Loam-surface	.056	28	.082	.97	.18	103	.24	.43	450
	Average Myatt Silty Clay Loam-subsoil	.047	17	.037	.71	.26	118	.29	.93	433
14884	Norfolk Fine Sand-surface	.060	83	.032	.66	.14	50	.13	.10	230
14885	Norfolk Fine Sand-subsoil	.076	85	.038	1.11	1.00	54	.18	.25	0
14888	Norfolk Fine Sand-surface	.047	70	.032	1.10	.05	76	.11	.25	230
14889	Norfolk Fine Sand-subsoil	.044	71	.016	1.09	1.00	64	.12	.20	230
14915	Norfolk Fine Sand-surface	.048	81	.030	.47	.05	60	.49	.05	0
14916	Norfolk Fine Sand-subsoil	.026	68	.017	.89	.13	50	.09	.15	230
	Average Norfolk Fine Sand-surface	.052	78	.031	.74	.08	62	.24	.13	153
	Average Norfolk Fine Sand-subsoil	.049	75	.024	1.03	.89	56	.13	.20	153
14929	Ochlockonee Clay-surface	.134	56	.167	.95	.38	356	.94	1.90	0
14930	Ochlockonee Clay-subsoil	.055	45	.052	.80	.34	254	.65	1.25	0
14917	Ochlockonee Silty Clay Loam-surface	.114	79	.118	1.45	.19	......	.42	.90	0
14918	Ochlockonee Silty Clay Loam-subsoil	.075	35	.070	1.43	.29	......	.18	.15	3200
14919	Ochlockonee Silty Clay Loam-subsoil	.057	16	.046	1.22	.23	146	.09	.20	2100
14920	Ochlockonee Very Fine Sandy Loam-surface	.052	12	.046	.59	.08	46	.78	.35	0
14921	Ochlockonee Very Fine Sandy Loam-subsoil	.023	9	.070	.24	.10	35	.17	.20	0
14922	Ochlockonee Very Fine Sandy Loam-subsoil	.027	7	.020	.67	.12	56	.06	.15	700
14923	Oktibbeha Clay Loam-surface	.015	11	.058	.48	.15	210	.33	.95	2800
14924	Oktibbeha Clay Loam-subsoil	.022	11	.034	.51	.12	149	.61	.11	2100
14925	Oktibbeha Clay Loam-subsoil	.037	32	.023	.72	.20	154	.89	1.85	230
14926	Orangeburg Fine Sandy Loam-surface	.071	10	.049	.57	.08	99	.16	.05	230
14927	Orangeburg Fine Sandy Loam-subsoil	.017	6	.023	.78	.15	154	.29	.35	0
14928	Orangeburg Fine Sandy Loam-subsoil	.027	5	.019	.72	.18	151	.08	.65	0
14931	Orangeburg Very Fine Sandy Loam-surface	.024	21	.029	.73	.04	55	.24	.15	0
14932	Orangeburg Very Fine Sandy Loam-subsoil	.022	8	.023	.75	.25	150	.32	.30	0
14933	Pledger Clay-surface	.090	34	.152	2.20	.85	300	.34	1.95	0
14934	Pledger Clay-subsoil	.041	9	.092	2.13	1.01	265	.26	1.85	0
14948	Pledger Clay-subsoil	.033	10	.047	2.03	.76	207	.14	1.55	230
14940	Portland Clay-surface	.101	64	.129	2.76	1.07	387	.89	1.20	0
14941	Portland Clay-subsoil	.048	15	.052	2.54	1.23	417	.30	2.20	230
14935	Portland Silty Clay Loam-surface	.134	537	.086	2.28	.49	328	1.05	2.00	0
14936	Portland Silty Clay Loam-subsoil	.094	120	.077	2.42	.59	199	.51	1.30	0
14937	Portland Silty Clay Loam-subsoil	.100	147	.045	2.30	.76	236	.44	1.20	463
14938	Portland Very Fine Sandy Loam-surface	.076	264	.046	2.16	.24	210	.42	.30	230
14939	Portland Very Fine Sandy Loam-subsoil	.089	312	.039	2.29	.37	218	.26	.40	0
8238	Ruston Fine Sandy Loam-surface	.021	19	.027	.53	......	111	......	0	0
8239	Ruston Fine Sandy Loam-subsoil	.021	6	.025	.37	......	98	......	.05	0
14942	Ruston Fine Sandy Loam-surface	.029	8	.032	1.24	.08	184	.10	.200	230
14943	Ruston Fine Sandy Loam-subsoil	.043	8	.021	.88	.09	178	.06	.40	230
14946	Ruston Fine Sandy Loam-surface	.054	169	.077	1.16	.06	173	.12	.30	230
14947	Ruston Fine Sandy Loam-subsoil	.037	100	.020	1.27	.20	148	.07	.10	230
	Average Ruston Fine Sandy Loam-surface	.035	65	.045	.98	.07	156	.11	.17	153
	Average Ruston Fine Sandy Loam-subsoil	.034	38	.022	.84	.15	141	.07	.18	153
14872	Ruston Very Fine Sandy Loam-surface	.022	6	.049	.36	.07	36	.11	.20	700
14873	Ruston Very Fine Sandy Loam-subsoil	.015	7	.027	.29	.15	54	.11	.25	1600
14944	Ruston Very Fine Sandy Loam-surface	.035	9	.022	.30	.04	124	.10	.20	230
14945	Ruston Very Fine Sandy Loam-subsoil	.045	6	.024	.45	.19	129	......	.20	......
	Average Ruston Very Fine Sandy Loam-subsoil	.029	8	.036	.33	.06	80	.11	.20	465

Table 5.—Analyses of soils of Bowie County—(continued).

Lab. No.		Phosphoric Acid		Nitrogen Per Cent	Potash			Acid Soluble, Lime, Per Cent	Basicity	Acidity
		Total Per Cent	Active Per Million		Total Per Cent	Acid Soluble Per Cent	Active Per Million			
	Average Ruston Very Fine Sandy Loam-subsoil	.030	6	.026	.37	.17	91	.11	.23	800
14963	Sumter Clay-surface	.065	79	.065	1.34	.39	236	2.32	3.40	0
14964	Sumter Clay-subsoil	.062	54	....	1.71	....	145	....	9.35	0
14965	Sumter Clay-subsoil	.039	....	.041	1.42	.43	....	3.33	....	0
14956	Susquehanna Clay Loam-surface	.035	11	.053	.80	.54	166	.17	.40	2800
14957	Susquehanna Clay Loam-subsoil	.024	6	.029	1.24	.62	187	.13	.25	1600
14949	Susquehanna Silt Loam-surface	.036	13	.056	.70	.16	120	.14	.55	1100
14950	Susquehanna Silt Loam-subsoil	.064	5	.038	1.01	.32	64	.14	.40	230
14951	Susquehanna Silt Loam-deep subsoil	.022	7	.031	.77	....	141	.16	.65	230
14952	Susquehanna Silt Loam-subsoil	.122	6	....	1.08	....	145	....	.60	2800
14953	Susquehanna Silt Loam-surface	.088	6	.075	.40	.11	15	.03	.20	460
14954	Susquehanna Silt Loam-subsoil	.032	9	.036	.46	.14	188	.16	.05	1100
14955	Susquehanna Silt Loam-deep subsoil	.043	5	.055	.86	.38	120	.12	.05	2100
	Average Susquehanna Silt Loam-surface	.062	10	.066	.55	.14	68	.09	.38	780
	Average Susquehanna Silt Loam-subsoil	.057	6	.040	.84	.28	132	.15	.35	1292
7619	Susquehanna Very Fine Sandy Loam-surface	.035	20	.059	.41	.08	99	.71	.25	0
7620	Susquehanna Very Fine Sandy Loam-subsoil	.023	16	.034	.41	.06	104	.25	.15	432
14958	Susquehanna Very Fine Sandy Loam-surface	.032	12	.048	.56	.12	139	.14	.15	0
14959	Susquehanna Very Fine Sandy Loam-subsoil	.017	7	.036	.97	.43	154	.07	.35	460
14960	Susquehanna Very Fine Sandy Loam-surface	.056	7	.036	.55	.11	45	.05	.05	1100
14961	Susquehanna Very Fine Sandy Loam-subsoil	.047	5	.030	.60	.14	55	.12	.05	2800
14962	Susquehanna Very Fine Sandy Loam-deep subsoil	.016	5	.031	1.06	.57	135	.07	.40	1600
	Average Susquehanna Very Fine Sandy Loam-surface	.041	13	.048	.51	.10	94	.30	.15	367
	Average Susquehanna Very Fine Sandy Loam-subsoil	.026	8	.033	.76	.30	112	.13	.24	1323
14966	Trinity Clay-surface	.059	120	.129	1.08	.23	198	1.32	2.45	0
14967	Trinity Clay-subsoil	.075	149	.239	.98	.56	491	1.36	2.80	0
14968	Trinity Clay-subsoil	.016	34	....	1.61	.46	259	1.10	1.85	230
14975	Yahola Clay-surface	.106	199	.088	2.36	.96	321	3.66	7.40	0
14976	Yahola Clay-subsoil	.093	297	.029	.38	....	98	3.09	6.25	0
14910	Yahola Silt Loam-surface	.121	349	.094	2.60	.75	455	1.72	3.75	0
14911	Yahola Silt Loam-subsoil	.122	319	.047	2.08	.85	259	2.76	5.85	0
14970	Yahola Silt Loam-surface	.112	350	.069	2.29	.80	384	1.97	5.00	0
14971	Yahola Silt Loam-subsoil	.116	385	.082	1.57	.41	356	2.04	1.40	0
14972	Yahola Silt Loam-deep subsoil	.048	400	.025	2.08	.37	186	1.93	4.15	0
	Average Yahola Silt Loam-surface	.117	350	.082	2.45	.78	419	1.14	4.38	0
	Average Yahola Silt Loam-subsoil	.095	368	.051	1.91	.54	267	....	3.80	0
14973	Yahola Very Fine Sandy Loam-surface	.029	315	.039	2.15	.37	79	2.42	4.95	0
14974	Yahola Very Fine Sandy Loam-subsoil	.078	374	.017	1.80	.30	105	2.30	4.90	0

Table 6.— Pot experiments on soils of Bowie County.

Type—Name	Weight Crops in Grams: With Complete Fertilizer	Weight Crops in Grams: Without Nitrogen	Corn Possibility of Plant Food Withdrawn, in Bushels. Nitrogen
7619 Susquehanna Very Fine Sandy Loam—deep phase			
Surface soil—1st crop—corn, 1915	37.5	17.6	24
Surface soil—2nd crop—sorghum, 1915	20.5	2.8	7
Surface soil—3rd crop—corn, 1916	29.0	8.4	13
Surface soil—4th crop—sorghum, 1916	29.4	1.9	4
7620 Susquehanna Very Fine Sandy Loam—deep phase.			
Subsoil—1st crop—corn, 1915	28.1	13.7	18
Subsoil—2nd crop—sorghum, 1915	11.5	1.2	2
Subsoil—3rd crop—corn, 1916	15.5	2.0	3
Subsoil—4th crop—sorghum, 1916	22.8	1.6	3

Soils with heavy subsoils:

Gray to brownish surface soils with red or mottled red, yellow and gray plastic subsoils—Susquehanna soils.

Brown to brownish-gray surface soils, subsoil mottled red and drab, or red, yellow, and drab stiff heavy subsoils—Crowley soils.

Gray or mottled gray and brownish surface soils with mottled gray or yellow and gray, compact, impervious clay subsoils, poorly drained—Lufkin soils.

Upland calcareous soils of the prairie area:

Gray to brownish surface soils with red or mottled red, yellow and gray plastic subsoils, with underlying calcareous clays or marl—Oktibbeha soils.

Chocolate-brown surface soils, subsoil chocolate-red—Bastrop soils.

Greenish-yellow surface soil, subsoil greenish-yellow and grades into white chalky material—Sumter soils.

Alluvial soils:

First-bottom soils, subject to overflow:

Surface brown to mottled brown and drab with brown or mottled yellow and gray subsoils, non-calcareous—Ochlockonee soils.

Surface black with brown to mottled gray, and yellow subsoils, calcareous—Trinity soils.

Surface and subsoil chocolate-red—Miller soils.

Surface and subsoil chocolate-red, subsoil coarser in texture and lighter in color than subsoil—Yahola soils.

Surface chocolate brown, subsoil chocolate-red—Portland soils.

Surface black, subsoil chocolate-red—Pledger soils.

Second-bottom soils not subject to overflow:

Surface soil gray to brownish, or mottled gray and brownish, subsoils gray to mottled gray and yellow, with a tough red and yellow impervious deep subsoil—Leaf soils.

Surface soil gray to dark gray with impervious subsoil gray to mottled gray and yellow in color, poorly drained—Myatt soils.

Key to Soil Types of Bowie County Arranged Alphabetically

Bastrop clay.—Upland calcareous soils of the prairie area, chocolate-brown surface soils, chocolate-red subsoil.

Bowie series.—Upland, well drained soils of the area originally forested, non-calcareous, gray to brownish-gray surface soil, yellow upper subsoil, red lower subsoil.

Crowley silt loam.—Upland soil of the original forested area non-calcareous with dark gray to brown surface soil and heavy mottled gray and brown subsoil.

Leaf very fine sandy loam.—Second-bottom soil, not subject to overflow, gray to brownish surface soil, with a tough red and yellow impervious subsoil.

Lufkin series.—Upland soil of the forested area, non-calcareous, with heavy subsoils. Gray or mottled gray and brownish surface soils with mottled gray or yellow and gray, compact, imperious clay subsoils, poorly drained.

Miller series.—First-bottom soils, subject to overflow.

Myatt series.—Second-bottom soils, not subject to overflow. Surface soil gray to dark gray with impervious subsoil gray to mottled gray and yellow in color, poorly drained.

Norfolk series.—Upland soils, originally forested area, well drained, non-calcareous with gray to brownish-gray surface soils and pale yellow friable clay subsoil.

Ochlockonee series.—First-bottom soils, subject to overflow. Surface brown to mottled brown and drab with brown or mottled yellow and gray subsoils, non-calcareous.

Oktibbeha series.—Upland calcareous soils of the prairie area. Gray to brownish surface soils with red or mottled red, yellow and gray plastic subsoils, with underlying calcareous clays or marl.

Orangeburg series.—Upland well drained non-calcareous soils of the forested area. Surface soil gray to brownish gray, subsoil friable red sandy clay.

Pledger series.—First-bottom soils, subject to overflow. Surface black, subsoil chocolate red.

Portland series.—First-bottom soils, subject to overflow, surface chocolate brown, subsoil chocolate red.

Ruston series.—Upland soils of the forested area, well drained, non-calcareous. Gray to brownish-gray surface soil with reddish-yellow to yellowish-red friable sandy clay subsoils.

Sumter series.—Upland calcareous soils of the prairie area. Greenish-yellow surface soil, subsoil greenish-yellow and grade into white chalky material.

Susquehanna series.—Upland soils of the forested area, non-calcareous, with heavy subsoils. Gray to brownish surface soil with red or mottled red, yellow and gray plastic subsoils.

Trinity series.—First-bottom soils, subject to overflow. Surface black with brown to mottled gray, and yellow subsoils, calcareous.

Yahola series.—First-bottom soils subject to overflow. Surface and subsoil chocolate-red, subsoil coarser in texture and lighter in color than surface.

SOILS OF DENTON COUNTY

Denton County is located in the north central part of the State. The elevation ranges from 500 to 1000 feet. The eastern part of the county is in the black prairie region, which occupies about one-fourth of the county. Next is the East Cross Timbers section, which likewise occupies about one-fourth of the area. The western half of the county is in the Grand Prairie or the Fort Worth Prairie region. The soils of these three sections have been averaged separately as shown in Table 1.

The number of types mapped is 34, in 23 series.

The San Saba clay occupies 18.6 per cent of the county, Denton clay 13.2, Kirvin fine sandy loam 10.5, Bell clay 6.0, and Frio clay 5.4 per cent. The Houston clay, which is a very important black prairie soil, occupies about 5 per cent of the county.

The average composition of the various groups of soil is given in Table 1. The soils of the East Cross Timbers are not as well supplied with plant food as the other soils of the county and are more likely to need fertilizers. The first bottom soils are the richest in plant food, as is usually the case.

The chemical composition of the various types of soils is contained in Table 7. The interpretation of the analyses of the various soil types is in Table 8. Table 9 contains pot experiments on four of the soils. These tables give detailed information concerning the chemical analyses and the strength of the soil with respect to plant food.

Classification of Soils of Denton County

Upland Prairie soils, Grand Prairie region:

- Black surface soil, black to brown to yellow subsoils, limestone or marl 3 feet below or less—San Saba soils.
- Light-colored to whitish surface, chalky clay or limestone near surface—Brackett soils.
- Brown surface soils, brown subsoils—Denton soil.

Upland timbered soil, Cross Timber section:

- Red to reddish-brown or brown surface soils and red plastic clay subsoils—Kirvin soils.
- Brown to dark-brown surface soils, with a brown or yellowish subsurface, grading into a reddish clay mottled with yellow or brown—Durant soils.
- Gray to brown surface soils with yellow, tough heavy clay sub-soils—Tabor soils.
- Gray surface soils and friable yellow subsoil—Norfolk soils.

Upland prairie soils, Black Prairie region:

- Black to brown surface soils, brown to yellow subsoils, with a substratum of calcareous clay—Houston soils.

Table 7.—Analyses of soils, Denton County.

Lab. No.		Phosphoric Acid Total Per Cent	Phosphoric Acid Active Per Million	Nitrogen Per Cent	Potash Total Per Cent	Potash Acid Soluble Per Cent	Potash Active Per Million	Acid Soluble, Lime, Per Cent	Basicity	Acidity
15976	Cahaba Clay Loam-surface	.053	17	.126	1.04	.38	340	.43	.95	0
15977	Cahaba Clay Loam-subsoil	.034	14	.062	1.43	.67	220	.59	2.75	0
16014	Cahaba Fine Sandy Loam-surface	.033	47	.030	.62	.10	165	.13	.35	0
16015	Cahaba Fine Sandy Loam-subsoil	.036	7	.045	.74	.22	270	.34	.47	0
16012	Catalpa Clay-surface	.080	71	.110	1.61	.62	366	3.64	6.85	0
16013	Catalpa Clay-subsoil	.053	91	.074	1.19	.60	233	4.33	7.55	0
15986	Crockett Clay Loam-surface	.029	16	.072	.61	.14	123	.37	.75	0
15987	Crockett Clay Loam-subsoil	.018	16	.050	.72	.21	134	.50	1.50	0
9175	Denton Clay probably-surface	.075	51	.119	1.00	.57	225	.86	1.90	0
15984	Denton Clay-surface	2.07	30	.152	1.41	.63	225	.65	8.75	0
15985	Denton Clay-subsoil	.067	....	.037	1.07	....	....	....	10.00	0
16037	Denton Clay-surface	.041	6	.077	.98	.48	219	.93	1.40	0
16038	Denton Clay-subsoil	.046	15	.060	1.03	.56	139	1.25	2.45	0
16141	Denton Clay-surface	.052	8	.117	.87	.59	156	8.13	9.40	0
16142	Denton Clay-subsoil	.100	17	.067	.76	.55	145	8.68	9.35	0
16145	Denton Clay-surface	.059	44	.139	.98	.98	150	.94	1.70	0
16146	Denton Clay-subsoil	.048	41	.055	.71	.36	296	.72	1.70	0
16135	Denton Clay shallow phase-surface	.105	7	.180	....	.44	184	15.04	9.80	....
16136	Denton Clay shallow phase-subsoil	.098	5	.085	.84	.49	120	19.65	9.85	0
	Average Denton Clay-surface	.093	19	.133	1.06	.62	187	5.14	6.21	0
	Average Denton Clay-subsoil	.072	20	.061	.88	.49	175	7.58	6.67	0
16016	Durant Clay Loam-surface	.103	15	.144	.95	.35	24	.37	.90	400
16017	Durant Clay Loam-subsoil	.092	12	.100	.83	.34	84	.61	.60	0
16018	Durant Clay Loam-surface	.041	6	.087	.31	.11	95	.21	1.15	700
16019	Durant Clay Loam-subsoil	.056	....	.044	.26	.08	....	.39	....	0
	Average Durant Clay Loam-surface	.074	11	.116	.63	.23	60	.29	1.03	550
	Average Durant Clay Loam-subsoil	.074	12	.072	.55	.21	84	.50	.30	0
3124	Durant Fine Sandy Loam probably-surface	.045	8	.086	....	.87	105	.33	.59	0
3125	Durant Fine Sandy Loam probably-subsoil	.030	7	.069	....	.51	104	.45	.83	0
15980	Durant Fine Sandy Loam-surface	.021	32	.049	.55	.04	63	.37	.50	0
15981	Durant Fine Sandy Loam-subsoil	.037	17	.032	.60	.19	100	.57	1.05	0
16024	Durant Fine Sandy Loam-surface	.061	19	.053	.38	.16	121	.22	.45	0
16025	Durant Fine Sandy Loam-subsoil	.067	6	.082	.65	.29	93	.23	.75	0
16026	Durant Fine Sandy Loam-subsoil	.045	6	.069	.58	....	80	....	.90	0
16029	Durant Fine Sandy Loam-surface	.033	28	.051	.52	.12	106	.26	.50	0
16030	Durant Fine Sandy Loam-subsoil	.037	7	.086	.79	....	106	....	.65	....
	Average Durant Fine Sandy Loam-surface	.040	22	.060	.48	.30	99	.30	.51	0
	Average Durant Fine Sandy Loam-subsoil	.045	9	.067	.52	.20	97	.25	.84	0
3353	Durant Loam, probably-surface	.060	26	.100	....	.50	380	.33	.59	0
3354	Durant Loam, probably-subsoil	.062	11	.079	....	.45	278	.35	.69	0

15996	Ellis Clay-surface	.045	17	.124	2.28	.86	520	.74	1.95	0
15597	Ellis Clay-subsoil	.070	26	.081	2.38	......	537	......	1.80	2100
16031	Frio Clay-surface	.122	7	.122	1.30	.61	176	6.30	9.65	......
16032	Frio Clay-subsoil	.101	10	.072	1.17	.52	53	9.88	9.90	0
16137	Frio Clay-surface	.068	39	.143	......	......	263	......	1.55	0
16138	Frio Clay-subsoil	.053	13	.073	......	.48	225	1.31	1.90	0
	Average Frio Clay-surface	.095	23	.133	.65	.31	220	3.15	5.60	0
	Average Frio Clay-subsoil	.077	12	.072	1.17	.50	139	5.55	5.90	0
16033	Frio Silty Clay Loam-surface	.055	3	.083	1.00	.33	210	.51	1.45	0
16034	Frio Silty Clay Loam-subsoil	.064	33	.055	1.10	.50	443	.73	.70	0
16143	Frio Silty Clay-surface	.076	8	.075	.95	.31	96	4.01	7.80	0
16144	Frio Silty Clay Loam-subsoil	.120	115	.094	......	.52	211	7.20	9.30	0
	Average Frio Silty Clay Loam-surface	.066	6	.079	.98	.32	153	2.26	4.63	0
	Average Frio Silty Clay Loam-subsoil	.092	74	.075	1.10	.51	327	3.97	5.00	0
16008	Houston Black Clay-surface	.054	101	.075	1.10	.53	305	2.22	3.78	0
16009	Houston Black Clay-subsoil	.051	7	.058	.98	.39	146	10.22	9.85	0
16010	Houston Clay-surface	.243	59	.027	1.17	.39	231	19.36	9.90	0
16011	Houston Clay-subsoil	.047	54	.072	1.91	......	119	......	9.85	0
3347	Kirvin Fine Sandy Loam, probably-surface	.340	30	.070	.52	.17	139	.28	.49	0
3348	Kirvin Fine Sandy Loam, probably-subsoil	.056	7	.061	.45	.54	95	.48	......	0
3373	Kirvin Fine Sandy Loam, probably-surface	.023	21	.022	......	.14	89	.13	.20	0
3374	Kirvin Fine Sandy Loam, probably-subsoil	.035	19	.038	......	.42	85	.23	.54	0
9181	Kirvin Fine Sandy Loam, probably-surface	.059	7	.053	.27	.21	163	.10	.47	0
9182	Kirvin Fine Sandy Loam, probably-subsoil	.029	7	.047	.55	.47	280	.22	.55	0
15988	Kirvin Fine Sandy Loam-surface	.052	22	.038	.44	.12	344	.42	.50	0
15989	Kirvin Fine Sandy Loam-subsoil	.089	17	.033	.52	.31	76	.09	.45	0
16000	Kirvin Fine Sandy Loam-surface	.036	14	.079	.51	.10	99	.22	.95	0
16001	Kirvin Fine Sandy Loam-subsoil	.032	5	.033	.69	.24	95	.23	.85	1100
	Average Kirvin Fine Sandy Loam-surface	.102	19	.052	.44	.15	167	.23	.52	0
	Average Kirvin Fine Sandy Loam-subsoil	.048	11	.042	.55	.40	126	.25	.60	220
15998	Lewisville Clay-surface	.049	9	.084	1.14	.42	183	.62	1.40	0
15999	Lewisville Clay-subsoil	.026	11	.053	1.39	.50	276	2.18	1.65	0
16002	Lewisville Clay-surface	.039	28	.082	.57	.16	104	.56	.75	0
16003	Lewisville Clay-subsoil	.022	11	.044	.52	.24	100	.81	1.30	0
	Average Lewisville Clay-surface	.044	19	.083	.86	.29	144	.59	1.08	0
	Average Lewisville Clay-subsoil	.024	11	.049	.96	.37	188	1.50	1.48	0
15994	Norfolk Fine Sand-surface	.017	11	.030	.38	.03	29	.02	.35	0
15995	Norfolk Fine Sand-subsoil	.054	6	.035	.61	.24	124	.09	.60	2100
15992	Ochlockonee Fine Sandy Loam-surface	.071	58	.080	.71	.15	179	.23	.95	0
15993	Ochlockonee Fine Sandy Loam-subsoil	.049	10	.040	.66	.12	48	.28	2.80	0
16006	San Saba Clay-surface	.048	12	.168	1.05	.41	335	.65	1.30	0
16007	San Saba Clay-subsoil	.016	8	.060	1.11	.41	214	.81	1.50	0
16020	San Saba Clay-surface	.093	76	.199	1.02	.72	285	2.12	3.85	0
16021	San Saba Clay-subsoil	.043	18	.076	1.22	.32	316	26.39	9.95	0
16035	San Saba Clay-surface	.073	4	.147	1.18	.65	......	2.57	4.55	0
16036	San Saba Clay-subsoil	.032	4	.067	1.09	.53	58	13.50	9.90	0
16133	San Saba Clay-surface	.063	29	.098	.69	.70	504	1.47	2.30	0
16134	San Saba Clay-subsoil	.059	34	.057	.94	.69	321	2.39	3.35	0
	Average San Saba Clay-surface	.069	30	.153	.99	.62	375	1.70	3.00	0
	Average San Saba Clay-subsoil	.038	16	.065	1.09	.49	227	10.77	6.18	0
16139	San Saba Silty Clay Loam-surface	.041	12	.092	.83	.32	150	.47	.85	0

Table 7.—Analyses of soils, Denton County—(continued).

Lab. No.		Phosphoric Acid		Nitrogen	Potash			Acid Soluble, Lime,	Basicity	Acidity
		Total Per Cent	Active Per Million	Per Cent	Total Per Cent	Acid Soluble Per Cent	Active Per Million	Per Cent		
16140	San Saba Silty Clay Loam-subsoil	.044	18	.068	.66	.48	249	.56	1.90	0
15974	Simmons Clay-surface	.044	37	.111	1.15	.26	215	.65	1.25	0
15975	Simmons Clay-subsoil	.023	12	.049	.90	.32	154	.55	1.20	0
15978	Sumter Clay-surface	.092	173	.110	1.10	.35	221	5.05	8.25	0
15979	Sumter Clay-subsoil	.092	17	.041	1.22	.34	85	9.45	10.05	0
4587	Tabor Fine Sandy Loam, probably-surface	.025	12	.025	....	.09	131	.12	.15	0
4588	Tabor Fine Sandy Loam, probably-subsoil	.035	3	.038	....	.27	119	.19	.50	0
5943	Tabor Fine Sandy Loam, probably-surface	.057	54	.050	....	.08	155	.24	.30	0
5944	Tabor Fine Sandy Loam, probably-subsoil	.050	6	.049	....	.22	126	.13	.35	0
16022	Tabor Fine Sandy Loam-surface	.133	12	.017	.28	....	51	....	.17	0
16023	Tabor Fine Sandy Loam-subsoil	.031	3	.026	.39	.29	50	.36	.65	0
	Average Tabor Fine Sandy Loam-surface	.072	26	.031	.28	.09	112	.18	.31	0
	Average Tabor Fine Sandy Loam-subsoil	.039	4	.038	.39	.26	98	.23	.50	0
16027	Trinity Clay-surface	.218	707	.172	2.12	.74	....	3.48	6.38	0
16028	Trinity Clay-subsoil	.187	436	.086	1.31	.70	....	6.32	9.45	0
16004	Wilson Clay-surface	.038	12	.084	.83	.34	....	.61	1.25	230
16005	Wilson Clay-subsoil	.033	6	.055	.94	.39	....	1.21	2.00	0
3407	Wilson Fine Sandy Loam, probably-surface	....	11	.065	....	....	85	....	.05	0
3408	Wilson Fine Sandy Loam, probably-subsoil	.030	9	.074	....	.28	79	.06	.60	0
3414	Wilson Fine Sandy Loam, probably-surface	.042	47	.063	....	.40	568	.16	.35	0
3415	Wilson Fine Sandy Loam, probably-subsoil	.037	3	.051	....	.43	1561	.19	.32	0
15982	Wilson Fine Sandy Loam-surface	.020	37	.048	.44	.06	119	.26	.36	0
15983	Wilson Fine Sandy Loam-subsoil	.028	26	.035	.53	.18	121	.40	1.25	0
	Average Wilson Fine Sandy Loam-surface	.031	32	.059	.44	.23	257	.21	.25	0
	Average Wilson Fine Sandy Loam-subsoil	.032	13	.053	.53	.30	587	.22	.72	0
15990	Wilson Loam-surface	.038	53	.064	.82	.13	116	.29	.55	0
15991	Wilson Loam-subsoil	.037	32	.039	.75	.20	105	.48	....	0
16039	Wilson Loam-surface	.038	40	.093	.73	.21	155	.44	.70	0
16040	Wilson Loam-subsoil	.061	7	.060	.79	.30	144	.66	1.00	0
	Average Wilson Loam-surface	.038	47	.079	.78	.17	136	.37	.63	0
	Average Wilson Loam-subsoil	.049	20	.050	.77	.25	125	.57	1.00	0

Yellowish brown surface soils and yellow or greenish-yellow subsoils—Sumter soils.

Brown or olive surface soils and grayish-brown brittle clay subsoil—Ellis soils.

Brown to grayish surface soils with mottled red and brownish or yellowish subsoil—calcareous substratum—Crockettt soils.

Black compact surface soils, with dark compact subsoils, non-calcareous—Wilson soils.

Second-bottom or terrace soils:

Black surface with brown subsoil or high stream benches, not calcareous—Simmons soils.

Brown surface with yellow subsoil on high stream terraces, high in lime—Lewisville soils.

Brown to gray surface with light-red or yellow-red subsoil, low in lime—Cahaba soils.

Brown to gray surface, stiff clay subsoils mottled with red, yellow and gray—Leaf soils.

Dark-gray or dark-brown surface with yellow or brown clay subsoils, on high terraces—Bell soils.

First-bottom or alluvial soils:

Brownish surface soils and subsoils, highly calcareous, in western prairie—Frio soils.

Black calcareous soils—Trinity soils.

Brown surface and brown or yellowish brown or mottled subsoil in cross timbers—Ochlockonee soils.

Brown calcareous soils in the black prairie—Catalpa soils.

Alphabetical Key to Soils of Denton County

Brackett series.—Upland prairie soils. Light-colored to whitish surface, chalky clay or limestone near surface.

Bell series.—Second-bottom soils. Dark-gray to dark-brown surface with yellow or brown clay subsoils, on high terraces.

Cahaba series.—Second-bottom or terrace soils with friable subsoils. Brown to gray surface with light-red or yellow-red subsoil, low in lime.

Catalpa series.—First-bottom soils. Brown calcareous soils in the black prairie.

Crockett series.—Soils of the Black Prairie region. Brown to grayish surface soils with mottled red and brownish or yellowish subsoil—calcareous substratum.

Denton series.—Upland calcareous prairie soils of the Grand Prairie region. Brown surface soils, brown subsoils.

Durant series.—Upland soils of the Cross Timbers. Brown to dark-brown surface soils, with a brown or yellowish sub-surface, grading into a reddish clay mottled with yellow or brown.

Ellis series.—Upland soils of the Black Prairie. Brown or olive surface soils and grayish-brown brittle clay subsoil.

Table 8.—Interpretation of analyses, Denton County.

Lab. No.	Type Name	Corn Possibility Two Million Pounds			Acid-Soluble			Acidity	Acres	Per Cent of Area
		Active Phosphoric Acid	Total Nitrogen	Active Potash	Phosphoric Acid	Potash	Lime			
15976	Cahaba Clay Loam-surface	12	38	154	good	good	good	0	2240	.4
15977	Cahaba Clay Loam-subsoil	12	23	105	good	good	good	0		
16014	Cahaba Fine Sandy Loam-surface	30	13	84	good	low	fair	0	9344	1.6
16015	Cahaba Fine Sandy Loam-subsoil	6	23	125	good	good	good	0		
16012	Catalpa Clay-surface	35	33	163	good	good	high	0	15232	2.5
16013	Catalpa Clay-subsoil	40	23	115	good	good	high	0		
15986	Crockett Clay Loam-surface	12	23	61	low	fair	good	0	6144	1.0
15987	Crockett Clay Loam-subsoil	12	18	73	low	good	good	0		
	Average Denton Clay-surface	12	38	94	good	good	high	0	79296	13.2
	Average Denton Clay-subsoil	12	23	84	good	good	high	0		
	Average Durant Clay Loam-surface	12	33	38	good	good	good	550	3328	.6
	Average Durant Clay Loam-subsoil	12	23	61	good	good	good	0		
	Average Durant Fine Sandy Loam-surface	18	18	50	good	good	good	0	16448	2.7
	Average Durant Fine Sandy Loam-subsoil	6	23	50	good	good	good	0		
3353	Durant Loam, probably-surface	18	28	171	good	good	good	0	11840	2.0
3354	Durant Loam, probably-subsoil	12	23	135	good	good	good	0		
15996	Ellis Clay-surface	12	38	211	good	good	good	0	7296	1.2
15997	Ellis Clay-subsoil	18	28	219	good					
	Average Frio Clay-surface	18	38	105	good	good	high	0	32512	5.4
	Average Frio Clay-subsoil	12	23	73	good	good	high	0		
	Average Frio Silty Clay Loam-surface	6	23	84	good	good	high	0	2368	.4
	Average Frio Silty Clay Loam-subsoil	35	23	154	good	good	high	0		
16008	Houston Black Clay-surface	45	38	144	good	good	high	0	5312	.9
16009	Houston Black Clay-subsoil	6	18	73	good	good	high	0		
16010	Houston Clay-surface	30	13	115	good	good	high	0	15744	5.0
16011	Houston Clay-subsoil	30	23	61	good	good		0		
	Average Kirvin Fine Sandy Loam-surface	12	18	84	good	fair	good	0	52288	10.5
	Average Kirvin Fine Sandy Loam-subsoil	12	18	73	good	good	good	0		
	Average Lewisville Clay-surface	12	28	73	good	good	good	0	15936	2.6
	Average Lewisville Clay-subsoil	12	18	94	low	good	good	0		
15994	Norfolk Fine Sand-surface	12	13	26	low	low	low	0	2752	.5
15995	Norfolk Fine Sand-subsoil	6	13	61	low	good	fair	0		
15992	Ochlockonee Fine Sandy Loam-surface	30	23	94	good	fair	good	0	7552	1.2
15993	Ochlockonee Fine Sandy Loam-subsoil	6	13	26	good	fair	good	0		
	Average San Saba Clay-surface	18	43	163	good	good	good	0	112256	18.6
	Average San Saba Clay-subsoil	12	23	115	good	good	high	0		
16139	San Saba Silty Clay Loam-surface	12	28	73	good	good	good	0	5760	1.0
16140	San Saba Silty Clay Loam-subsoil	12	23	115	good	good	good	0		
15974	Simmons Clay-surface	24	33	105	good	good	good	0	11456	1.9

15975	Simmons Clay-surface	12	18	84	low	good	good	0	...	...
15978	Sumter Clay-surface	45	33	105	good	good	high	0	3776	.6
15879	Sumter Clay-subsoil	12	18	50	good	good	high	0	...	...
	Average Tabor Fine Sandy Loam-surface	18	13	61	fair	low	fair	0	24128	4.0
	Average Tabor Fine Sandy Loam-subsoil	6	13	50	fair	good	good	0	...	...
16027	Trinity Clay-surface	60	48	...	good	good	high	0	27136	4.5
16028	Trinity Clay-subsoil	55	28	...	good	good	high	0	...	...
16004	Wilson Clay-surface	12	28	...	good	good	good	230	13376	2.2
16005	Wilson Clay-subsoil	6	18	...	good	good	good	0	...	...
	Average Wilson Fine Sandy Loam-surface	24	18	125	good	good	good	0	15872	2.6
	Average Wilson Fine Sandy Loam-subsoil	12	18	232	good	good	good	0	...	...
	Average Wilson Loam-surface	30	23	73	good	good	good	0	4800	.8
	Average Wilson Loam-subsoil	12	18	61	good	good	good	0	...	...

Table 9.—Pot experiments on soils of Denton County.

Lab. No.	Type Name	Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn, in Bushels		
		With Complete Fertilizer	Without Phosphoric Acid	Without Nitrogen	Without Potash	Phosphoric Acid	Nitrogen	Potash
9175	Denton Clay, probably-surface							
	Corn—1st crop	26.9	...	...	31.5	...	...	331
	Sorghum—2nd crop	35.5	...	...	33.5	...	...	146
9181	Kirvin Fine Sandy Loam, probably-surface							
	Corn—1st crop	32.9	...	10.4	...	...	14	...
	Sorghum—2nd crop	32.0	...	2.7	...	...	4	...
5943	Tabor Fine Sandy Loam, probably-surface							
	Corn—1st crop	50.7	45.4	...	...	67	...	...
	Sorghum—2nd crop	23.9	21.1	...	...	34	...	...
	Corn—3rd crop	47.7	36.7	...	...	31	...	...
	Sorghum—4th crop	27.7	19.4	...	...	22	...	...
5944	Tabor Fine Sandy Loam-subsoil							
	Corn—1st crop	26.6	15.8	...	...	23	...	...
	Sorghum—2nd crop	17.7	14.7	...	...	18	...	...
	Corn—3rd crop	50.2	20.4	...	...	18	...	...
	Sorghum—4th crop	23.5	9.1	...	...	10	...	...

Frio series.—First-bottom soils. Brownish surface soils and subsoils, highly calcareous, in western prairie.

Houston series.—Prairie soils, generally calcareous. Black to brown surface soils, brown to yellow subsoils, with a substratum of calcareous clay.

Kirvin series.—Upland soil, originally forested. Red to reddish-brown or brown surface soils and red plastic clay subsoils.

Leaf series.—Second-bottom or terrace soils. Brown to gray surface, stiff clay subsoils mottled with red, yellow and gray.

Lewisville series.—Second-bottom soils. Brown surface with yellow subsoil on high stream terraces, high in lime.

Norfolk series.—Upland well drained soils, originally forested. Gray surface soils and friable yellow subsoil.

Ochlockonee series.—First-bottom or alluvial soils. Brown surface and brown or yellowish-brown or mottled subsoil in Cross Timbers.

San Saba series.—Upland prairie soils of the Grand Prairie. Black surface soil, black to brown to yellow subsoils, limestone or marl 3 feet below or less.

Simmons series.—Second-bottom soils. Black surface with brown subsoil on high stream benches, not calcareous.

Sumter series.—Upland prairie soils. Yellowish-brown surface soils and yellow or greenish-yellow subsoils.

Tabor series.—Upland soils, originally timbered (Cross Timber Section). Gray to brown surface soils with yellow, tough heavy clay subsoils.

Trinity series.—First-bottom or alluvial soils. Black calcareous soils.

Wilson series.—Black prairie soils. Black compact surface soils, with dark compact subsoils, non-calcareous.

Alkali Spots

There are a number of small alkali spots in Denton County, mostly in the San Saba silty clay loam and San Saba clay, or the Grand Prairie section. They are seldom more than 100 feet across. In most of the areas a very plastic clay lies near the surface. The subsoil contains some small black concretions, and the lower subsoil white particles, probably gypsum. Crops do not do well in these spots.

Table 10.—Salt content in parts per million of soil from an alkali spot, Denton County.

Laboratory Number.	Depth	Calc. Carb.	Calc. Sulph.	Calc. Chlor.	Mag. Carb.	Mag. Sulph.	Mag. Chlor.	Sod. Carb.	Sod. Sulph.	Sod. Chlor.
16303..........	0″— 6″	....	....	....	....	....	....	146	....	371
16304..........	6″—12″	178	....	....	92	167	....	....	158	524
16305..........	12″—18″	178	....	....	....	....	....	103	710	648
16306..........	18″—24″	237	163	....	....	596	....	....	2856	746
16307..........	24″—30″	237	4590	548	....	....	529	....	....	....
16308..........	30″—40″	200	1671	....	....	1490	....	....	4310	945

Table 10 contains the alkali analysis of one of these spots. The alkali present is chiefly sodium sulphate, though other alkali salts are also present.

SOILS OF FREESTONE COUNTY

Freestone County is located in east central Texas. The elevation ranges from 200 to 600 feet. It is in the coastal plain section. The soils are classed in 4 groups: the upland forested soils, the upland prairie soils, the second-bottom or terrace soils, and the first-bottom or alluvial. The soils of these sections are averaged separately in Table 1. The number of types mapped is 31, in 17 series. The Susquehanna fine sandy loam occupies 28.8 per cent of the county, Ruston fine sandy loam 17.0, and Norfolk fine sandy loam 7.2 per cent. The principal alluvial soils are Ochlockonee fine sandy loam 6.9 per cent, and the Trinity clay 6.4 per cent. Both of these are subject to overflows.

The upland forested soils are low in active phosphoric acid and in nitrogen and somewhat better supplied with active potash, although still low. A number of them are acid. The upland prairie soils are much better supplied with plant food and with lime. The second-bottom or terrace soils are quite low in nitrogen, although they are somewhat better supplied with phosphoric acid. The first-bottom soils are lower in active phosphoric acid than the other first-bottom soils of the other counties discussed in this Bulletin. They are better supplied with potash and equally as well supplied with nitrogen.

The chemical composition of the various types of soils is contained in Table 11. The interpretation of the analyses is given in Table 12. Some pot experiments are given in Table 13.

Classification of Soils of Freestone County

Upland soils of the forested area:

- Soils with friable subsoils; surface soils gray to brownish-gray:
  - Subsoil dull red—Ruston soils.
  - Subsoils yellow to brownish-yellow—Norfolk soils.
  - Subsoil yellow mottled with red—Bowie soils.
- Soils with heavy subsoils:
  - Gray soils with mottled red, yellow and gray heavy plastic subsoils—Susquehanna soils.
  - Gray to dark gray soils with yellowish-brown to brown or brown and gray heavy plastic subsoils—Tabor soils.
  - Gray soils with gray to dark-gray heavy plastic subsoils—Lufkin soils.
  - Reddish-brown to red surface soil with mottled red, yellow and gray subsoils, similar to the Susquehanna soils but deeper red subsoils—Kirvin soils.

Upland soils of the prairie area, subsoils heavy:

- Black surface soils with black or gray, but generally olive-colored subsoils, non-calcareous—Wilson soils.

Dark gray surface soils with red upper subsoil, sometimes changing to gray or olive in the lower subsoil, calcareous subsoil—Crockett soils.

Brown surface soil with a heavy calcareous yellowish-brown to greenish-yellow subsoil—Sumter soils.

Dark-gray to grayish-brown calcareous surface soils, with light brown to grayish-brown or greenish-yellow subsoil—Houston soils.

Second-bottom or terrace soils:

Friable subsoils:

Gray to brownish surface soil with red or red mottled with gray or yellow friable subsoils—Cahaba soils.

Gray to brownish surface soils with yellow friable subsoils, not as well drained as Cahaba soils—Kalmia soils.

Heavy subsoils:

Grayish-brown surface soils with heavy plastic subsoil, red in the upper part and mottled red, yellow and gray in the lower part—Leaf soils.

Gray surface soil, with gray to dark-gray mottled with yellow o brown, not as well drained as the leaf soils—Myatt soils.

First-bottom soils:

Grayish-brown to dark-brown surface soils with dark-gray to brown subsoils—Ochlockonee soils.

Black surface soils with black to gray heavy subsoils, calcareous—Trinity soils.

Alphabetical List of Soil Series of Freestone County

Bowie series.—Upland well drained soils of the forested area, friabl subsoils. Gray to brownish-gray sandy surface soils, yellow mottled wit red subsoils.

Cahaba series.—Second-bottom or terrace soils with friable subsoils Gray to brownish surface soil with red or red mottled with gray o yellow friable subsoils.

Crockett series.—Upland prairie soils, with heavy subsoils. Dark gray surface soils with red upper subsoil, sometimes changing to gra or olive in the lower subsoil, calcareous subsoil.

Houston series.—Upland calcareous prairie soils. Gray to grayish brown calcareous surface soils, with light-brown to grayish-brown c greenish-yellow subsoil.

Kalmia series.—Second-bottom or terrace soils with friable subsoil Gray to brownish surface soils with yellow subsoils, not as well draine as Cahaba soils.

Kirvin series.—Upland soils of the forested area with heavy subsoil Reddish-brown to red surface soil with mottled red, yellow and gra subsoils, similar to the Susquehanna soils but deeper red subsoils.

Table 11.—Composition of soils of Freestone County.

Lab. No.		Phosphoric Acid		Nitrogen Per Cent	Potash			Acid Soluble, Lime, Per Cent	Basicity	Acidity
		Total Per Cent	Active Per Million		Total Per Cent	Acid Soluble Per Cent	Active Per Million			
3397	Bowie Fine Sandy Loam-surface	.072	27	.055	.89	.11	113	.11	.15	200
3398	Bowie Fine Sandy Loam-subsoil	.082	9	.041	....	.21	100	.14	.51	1400
16064	Bowie Fine Sandy Loam-surface	.024	11	.044	1.15	.08	78	.11	.25	460
16065	Bowie Fine Sandy Loam-subsoil	.020	4	.027	1.14	.11	81	.04	.25	1100
16066	Bowie Fine Sandy Loam-subsoil	.015	6	....	1.10	.13	70	.20	.20	2210
	Average Bowie Fine Sandy Loam-surface	.048	19	.050	1.02	.10	96	.11	.20	330
	Average Bowie Fine Sandy Loam-subsoil	.039	7	.044	1.12	.15	84	.13	.32	1570
16114	Cahaba Sand-surface	.023	50	.019	.52	.07	31	.12	.20	700
16077	Cahaba Fine Sandy Loam-surface	.025	79	.025	.99	.01	80	.45	.15	0
16078	Cahaba Fine Sandy Loam-subsoil	.027	7	.045	.91	.22	186	.21	.40	460
15024	Crockett Fine Sandy Loam-surface	.040	77	.050	1.08	.18	309	.20	.15	0
15025	Crockett Fine Sandy Loam-subsoil	.043	14	.058	.81	.53	171	.49	1.40	0
15026	Crockett Fine Sandy Loam-subsoil	.041	34	.029	.74	.42	126	1.43	3.05	0
15021	Crockett Loam-surface	.057	27	.131	.61	.38	309	.61	1.25	230
15022	Crockett Loam-subsoil	.023	8	.048	.54	.41	153	.49	1.30	0
15023	Crockett Loam-subsoil	.037	70	.032	1.03	.52	99	1.79	3.90	0
16102	Houston Clay Loam-surface	.062	96	.133	.88	.39	96	.97	1.95	0
16104	Houston Clay Loam-subsoil	.044	51	.039	.94	.47	146	5.22	7.60	0
16079	Kalmia Fine Sandy Loam-surface	.021	45	.024	.69	.11	99	.09	.10	700
16080	Kalmia Fine Sandy Loam-subsoil	.052	37	.034	.74	.25	107	.35	.40	700
15027	Kirvin Gravelly Fine Sandy Loam-surface	.040	22	.043	.84	.13	139	.13	.40	0
15028	Kirvin Gravelly Fine Sandy Loam-subsoil	.057	10	.069	.38	.30	219	.39	1.50	700
15032	Lufkin Fine Sandy Loam-surface	.047	9	.023	.58	.31	174	.50	1.00	2100
15033	Lufkin Fine Sandy Loam-subsoil	.046	82	.083	.75	.12	176	.23	.70	230
15034	Lufkin Fine Sandy Loam-subsoil	.061	17	.055	.28	.16	109	.36	.85	0
15031	Lufkin Fine Sandy Loam-surface	.025	12	.080	.43	.22	125	.29	.85	0
	Average Lufkin Fine Sandy Loam-surface	.036	11	.052	.51	.27	149	.40	.93	1050
	Average Lufkin Fine Sandy Loam-subsoil	.054	50	.069	.52	.14	143	.30	.78	115
15039	Norfolk Fine Sand-surface	.033	21	.015	.98	.06	65	.05	.05	0
15040	Norfolk Fine Sand-subsoil	.040	11	.012	1.43	.10	68	.06	.05	230
15041	Norfolk Fine Sandy Loam-surface	.074	7	.043	.38	.09	56	.09	.20	0
15042	Norfolk Fine Sandy Loam-subsoil	.022	5	.034	.42	.15	50	.09	.30	230
15037	Norfolk Sand-surface	.041	37	.039	....	.14	44	.13	.25	0
15038	Norfolk Sand-subsoil	.037	22	.019	....	.13	40	.10	.15	0
16110	Norfolk Sand-surface	.019	11	.046	.55	.05	23	.05	.49	1100
16111	Norfolk Sand-subsoil	.048	9	.021	.37	.04	21	.04	.05	700
	Average Norfolk Sand-surface	.030	24	.043	.55	.10	34	.09	.32	550
	Average Norfolk Sand-subsoil	.043	16	.020	.37	.09	31	.07	.10	350
16083	Norfolk Sandy Loam-surface	.021	28	.024	.65	.07	31	.07	....	0
16084	Norfolk Sandy Loam-subsoil	.015	11	.015	.70	.21	105	.18	.30	700

Table 11.—Composition of soils of Freestone County—(continued).

Lab. No.		Phosphoric Acid		Nitrogen Per Cent	Potash			Acid Soluble, Lime, Per Cent	Basicity	Acidity
		Total Per Cent	Active Per Million		Total Per Cent	Acid Soluble Per Cent	Active Per Million			
16112	Ochlockonee Clay-surface	.101	99	.144	1.89	.54	510	.64	1.70	0
16113	Ochlockonee Clay-subsoil	.075	107	.105	1.60	.54	371	.70	1.60	0
7250	Ochlockonee Fine Sandy Loam (probably)-surface	.041	17	.045	.89	....	96	.11	.22	0
7251	Ochlockonee Fine Sandy Loam (probably)-subsoil	.028	6	.046	.54	.14	41	.15	.19	0
16108	Ochlockonee Fine Sandy Loam-surface	.033	....	.068	1.28	....	....	....	....	0
16109	Ochlockonee Fine Sandy Loam-subsoil	.028	65	.034	1.30	.18	65	.29	.85	0
	Average Ochlockonee Fine Sandy Loam-surface	.037	17	.057	1.09	....	96	.11	.22	0
	Average Ochlockonee Fine Sandy Loam-subsoil	.028	36	.040	.92	.16	53	.22	.52	0
16075	Ochlockonee Silt Loam-surface	.092	121	.151	1.66	.10	363	.10	.93	0
16076	Ochlockonee Silt Loam-subsoil	.040	38	.081	1.46	.12	165	.12	.80	460
16119	Ochlockonee Silty Clay Loam-surface	.106	103	.200	1.54	.27	345	.50	1.40	700
16120	Ochlockonee Silty Clay Loam-subsoil	.096	56	.144	1.43	.28	289	.52	1.30	0
16067	Ruston Fine Sand-surface	.024	8	.024	.41	.03	38	.04	.45	200
16068	Ruston Fine Sand-subsoil	.032	5	.023	.39	.01	73	.01	.20	0
15035	Ruston Fine Sandy Loam-surface	.050	7	.047	.27	.09	91	.13	.35	0
15036	Ruston Fine Sandy Loam-subsoil	.030	....	.044	.80	.18	....	.14	....	0
16072	Ruston Fine Sandy Loam-surface	.038	11	.037	1.37	.03	76	.16	.20	0
16073	Ruston Fine Sandy Loam-subsoil	.038	6	.050	1.10	.18	139	.13	.65	2800
16074	Ruston Fine Sandy Loam-subsoil	.032	7	.023	1.62	.07	95	.16	.50	2100
16115	Ruston Gravelly Fine Sandy Loam-surface	.016	12	.040	.63	.09	88	.08	.25	1100
16116	Ruston Gravelly Fine Sandy Loam-subsoil	.034	7	.042	.95	.25	146	.20	.35	1100
16081	Sumter Clay Loam-surface	.107	163	.114	2.84	.54	206	.54	1.30	200
16082	Sumter Clay Loam-subsoil	.135	539	.061	.83	.58	140	2.35	5.13	0
16069	Susquehanna Clay Loam-surface	.013	7	.036	1.24	.14	179	.19	.70	2100
16070	Susquehanna Clay Loam-subsoil	.050	7	.047	1.34	.23	153	.15	1.18	1100
16071	Susquehanna Clay Loam-subsoil	.029	7	.025	1.61	.25	155	.07	1.61	2800
3401	Susquehanna Fine Sandy Loam (probably)-surface	.077	18	.049	.74	.09	71	.07	.21	0
3402	Susquehanna Fine Sandy Loam (probably)-subsoil	.090	9	.041	.51	.22	66	.26	.72	1400
16105	Susquehanna Fine Sandy Loam (probably)-surface	.042	12	.049	.87	.09	61	.11	.80	0
16106	Susquehanna Fine Sandy Loam-subsoil	.024	6	.035	1.23	.32	131	.21	1.07	1100
16107	Susquehanna Fine Sandy Loam-subsoil	.030	12	.030	1.27	.34	136	.22	1.20	1100
16117	Susquehanna Fine Sandy Loam-surface	.020	21	.040	1.20	.11	277	.15	.05	700
16118	Susquehanna Fine Sandy Loam-subsoil	.035	3	.033	1.31	.27	29	.37	1.10	1100
	Average Susquehanna Fine Sandy Loam-surface	.046	17	.046	.94	.10	136	.11	.35	233
	Average Susquehanna Fine Sandy Loam-subsoil	.045	8	.035	1.08	.29	91	.27	1.02	1175
16085	Susquehanna Gravelly Fine Sandy Loam-surface	.018	11	.060	1.05	.10	100	.14	.15	1100
16086	Susquehanna Gravelly Fine Sandy Loam-subsoil	.061	4	.054	1.11	....	359	....	1.00	460

16087	Susquehanna Gravelly Fine Sandy Loam-subsoil..	.025	4	.035	1.22	.32	231	.44	1.00	460
15029	Tabor Fine Sandy Loam-surface................	.115	273	.029	.92	.11	275	.20	1.35	0
15030	Tabor Fine Sandy Loam-subsoil................	.093	6	.041	.69	.47	170	.34	1.15	0
7256	Tabor Fine Sandy Loam (probably)-surface......	.029	24	.043	.66	.14	143	.33	.19	0
7257	Tabor Fine Sandy Loam (probably)-subsoil......	.047	42	.035	.59	.20	83	.17	.09	0
16121	Tabor Fine Sandy Loam (probably)-surface......	.012	17	.091	.94	.12	160	.25	.30	0
16122	Tabor Fine Sandy Loam (probably)-subsoil......	.026	10	.050	.64	.24	121	.64	1.20	0
	Average Tabor Fine Sandy Loam-surface........	.021	21	.067	.80	.13	152	.29	.25	0
	Average Tabor Fine Sandy Loam-subsoil........	.037	26	.043	.62	.22	102	.41	.65	0
16101	Trinity Clay-surface........................	.055	20	.074	1.44	.68	268	1.34	2.40	0
16103	Trinity Clay-subsoil........................	.138	107	.195	1.55	.90	478	2.07	3.95	0
16155	Trinity Clay-surface........................	.146	23	.102	.29	.29	240	.40	1.00	0
16156	Trinity Clay-subsoil........................	.072	14	.030	1.47	.59	231	2.37	4.30	0
	Average Trinity Clay-surface.................	.101	22	.088	.87	.49	254	.87	1.70	0
	Average Trinity Clay-subsoil.................	.105	61	.113	1.51	.75	355	2.22	4.13	0
15018	Wilson Silt Loam-surface....................	.059	30	.134	....	.43	119	.43	1.05	230
15019	Wilson Silt Loam-subsoil....................	.033	10	.082	....	.45	174	.59	2.10	0
15020	Wilson Silt Loam-subsoil....................	.040	34	.041	....	.54	231	.54	2.20	0

Table 12.—Interpretation of analyses, Freestone County.

Lab. No.	Type Name	Corn Possibility Two Million Pounds			Acid-Soluble			Acidity	Acres	Per Cent of Area
		Active Phos-phoric Acid	Total Nitro-gen	Active Potash	Phos-phoric Acid	Potash	Lime			
	Average Bowie Fine Sandy Loam-surface	12	18	50	fair	low	fair	330	26752	4.8
	Average Bowie Fine Sandy Loam-subsoil	6	13	50	fair	fair	fair	1570	....	....
16077	Cahaba Fine Sandy Loam-surface	35	13	50	low	low	good	0	1728	.3
16078	Cahaba Fine Sandy Loam-subsoil	6	18	94	low	good	good	460	....	....
16114	Cahaba Sand-surface	30	8	26	low	fair	good	700	....	....
15021	Crockett Loam-surface	18	38	144	good	good	good	230	8512	1.5
15022	Crockett Loam-subsoil	6	18	84	low	good	good	0	....	....
15023	Crockett Loam-subsoil	35	13	50	good	good	good	0	....	....
15024	Crockett Fine Sandy Loam-surface	35	18	144	fair	good	good	0	15680	2.8
15025	Crockett Fine Sandy Loam-subsoil	12	18	84	good	good	good	0	....	....
15026	Crockett Fine Sandy Loam-subsoil	24	13	73	good	good	good	0	....	....
16102	Houston Clay Loam-surface	40	38	50	good	good	good	0	640	.1
16104	Houston Clay Loam-subsoil	30	18	73	good	good	high	0	....	....
16079	Kalmia Fine Sandy Loam-surface	30	13	50	low	fair	low	700	1152	.2
16080	Kalmia Fine Sandy Loam-subsoil	24	13	61	good	good	good	700	....	....
15027	Kirvin Gravelly Fine Sandy Loam-surface	18	18	73	fair	fair	good	0	512	.1
15028	Kirvin Gravelly Fine Sandy Loam-subsoil	12	23	105	good	good	good	700	....	....
	Average Lufkin Fine Sandy Loam-surface	6	18	73	good	good	good	1050	4416	.8
	Average Lufkin Fine Sandy Loam-subsoil	30	23	73	good	fair	good	115	....	....
15039	Norfolk Fine Sand-surface	16	8	38	fair	fair	low	0	59008	10.6
15040	Norfolk Fine Sand-subsoil	12	18	38	fair	fair	fair	230	....	....
15041	Norfolk Fine Sandy Loam-surface	6	18	38	low	low	low	0	40128	7.2
15042	Norfolk Fine Sandy Loam-subsoil	6	13	76	low	fair	low	230	....	....
	Average Norfolk Sand-surface	18	18	26	low	fair	fair	550	9280	1.7
	Average Norfolk Sand-subsoil	12	8	26	fair	fair	fair	350	....	....
16083	Norfolk Sandy Loam-surface	24	13	26	low	low	low	0	1600	.3
16084	Norfolk Sandy Loam-subsoil	12	8	61	low	fair	fair	700	....	....
16112	Ochlockonee Clay-surface	40	43	211	good	good	good	0	6208	1.1
16113	Ochlockonee Clay-subsoil	45	33	163	good	good	good	0	....	....
	Average Ochlockonee Fine Sandy Loam-surface	12	18	50	fair	....	fair	0	38720	6.9
	Average Ochlockonee Fine Sandy Loam-subsoil	24	13	38	low	good	good	0	....	....
16075	Ochlockonee Silt Loam-surface	45	43	163	fair	low	low	0	6976	1.3
16076	Ochlockonee Silt Loam-subsoil	24	28	84	fair	fair	fair	460	....	....
16119	Ochlockonee Silty Clay Loam-surface	45	53	154	good	good	good	700	11136	2.0
16120	Ochlockonee Silty Clay Loam-subsoil	30	43	135	good	good	good	0	....	....
16067	Ruston Fine Sand-surface	6	13	26	low	low	low	200	832	.1
16068	Ruston Fine Sand-subsoil	6	13	38	fair	low	low	0	....	....
15035	Ruston Fine Sandy Loam-surface	6	18	50	fair	low	fair	0	....	....
15036	Ruston Fine Sandy Loam-subsoil	....	18	....	low	good	fair	0	....	....

16072	Ruston Fine Sandy Loam-surface	12	13	50	fair	low	fair	0	94720	17.0
16073	Ruston Fine Sandy Loam-subsoil	6	18	73	fair	good	fair	2800		
16074	Ruston Fine Sandy Loam-subsoil	6	13	50	fair	low	fair	2100		
16115	Ruston Gravelly Fine Sandy Loam-surface	12	13	50	low	low	low	1100	7296	1.3
16116	Ruston Gravelly Fine Sandy Loam-subsoil	6	18	73	fair	good	fair	1100		
16081	Sumter Clay Loam-surface	45	33	105	good	good	good	200		
16083	Sumter Clay Loam-subsoil	55	23	73	good	good	high	0		
16069	Susquehanna Clay Loam-surface	6	13	94	low	fair	fair	2100	576	.1
16070	Susquehanna Clay Loam-subsoil	6	18	84	fair	good	fair	1100		
16071	Susquehanna Clay Loam-subsoil	12	18	84	low	good	low	2800		
	Average Susquehanna Fine Sandy Loam-surface	12	18	73	fair	low	fair	233	160320	28.8
	Average Susquehanna Fine Sandy Loam-subsoil	6	13	50	good	good	good	1175		
16085	Susquehanna Gravelly Fine Sandy Loam-surface	12	18	50	low	low	fair	1100	1920	.3
16086	Susquehanna Gravelly Fine Sandy Loam-subsoil	6	18	163	fair			460		
16087	Susquehanna Gravelly Fine Sandy Loam-subsoil	6	13	115	low	good	good	460		
15029	Tabor Fine Sandy Loam-surface	50	13	125	good	fair	fair	0	13120	2.4
15030	Tabor Fine Sandy Loam-subsoil	6	18	84	good	good	good	0		
	Average Tabor Fine Sandy Loam-surface	12	23	73	low	fair	good	0		
	Average Tabor Fine Sandy Loam-subsoil	18	18	61	good	good	good	0		
	Average Trinity Clay-surface	18	28	125	good	good	high	0	35072	6.4
	Average Trinity Clay-subsoil	30	33	163	good	good	high	0		
15018	Wilson Silt Loam-surface	12	38	61	good	good	good	230	1088	.2
15019	Wilson Silt Loam-subsoil	6	28	84	good	good	good	0		
15020	Wilson Silt Loam-subsoil	24	18	115	good	good	good	0		

Table 13.—Pot experiments on soils of Freestone County.

Lab. No.	Type Name	Weight Crops in Grams			Corn Possibility of Plant Food Withdrawn, in Bushels	
		With Complete Fertilizer	Without Phosphoric Acid	Without Nitrogen	Phosphoric Acid	Nitrogen
7250	Ochlockonee Fine Sandy Loam-surface					
	Corn—1st crop	43.5		34.4		57
	Sorghum—2nd crop	17.9		3.5		9
	Corn—3rd crop	37.7		4.9		8
	Sorghum—4th crop	22.6		1.0		3
7251	Ochlockonee Fine Sandy Loam-subsoil					
	Corn—1st crop	38.7	13.3		15	
	Sorghum—2nd crop	32.5	13.5		16	
	Corn—3rd crop	38.0	7.3		9	
	Sorghum—4th crop	13.5	3.5		34	
7256	Tabor Fine Sandy Loam, probably-surface					
	Corn—1st crop	46.7		38.2		71
	Sorghum—2nd crop	29.0		7.5		14
	Corn—3rd crop	37.4		4.9		8
	Sorghum—4th crop	1.0		3.1		6
7257	Tabor Fine Sandy Loam, probably-subsoil					
	Corn—1st crop	40.2		11.4		16
	Sorghum—2nd crop	29.0		1.9		6
	Corn—3rd crop	27.7		3.1		5
	Sorghum—4th crop	5.7		1.2		3

Lufkin series.—Upland soils of the forested area with heavy subsoils. Gray soils with gray to dark-gray heavy plastic subsoils.

Norfolk series.—Upland soils of the forested area with friable sandy subsoils. Gray to brownish gray sandy surface soils with yellow to brownish-yellow subsoils.

Ochlockonee series.—First-bottom soils. Grayish-brown to dark-brown surface soils with dark-gray to brown subsoils.

Ruston series.—Upland soils of the forested area, with friable subsoils. Gray to brownish gray sandy surface soils with dull-red subsoils.

Sumter series.—Upland soils of the prairie region with heavy subsoils. Brown surface soil with a heavy calcareous yellowish-brown to greenish-yellow subsoil.

Susquehanna series.—Upland soils of the forested area with heavy subsoils. Gray soils with mottled red, yellow and gray heavy plastic subsoils.

Tabor series.—Upland soils of the forested area with heavy subsoils. Gray to dark gray soils with yellowish-brown to brown or brown and gray heavy plastic subsoils.

Trinity series.—First-bottom soils. Black surface soils with black to gray heavy subsoils, calcareous.

Wilson series.—Upland soils of the prairie region, heavy subsoils. Black surface soils with black or gray, but generally olive-colored subsoils, non-calcareous.

SOILS OF RED RIVER COUNTY

Red River County is in the northeastern corner of Texas, next to Bowie County. The elevation is 300 to 500 feet above the sea level. It has a broad central ridge on which border belts of flat land, and has extensive stream bottoms. The soils are divided into four groups consisting of upland forested soils, upland prairie soils, second-bottom or terrace soils, and the first-bottom or alluvial soils.

The number of types mapped is 38, divided into 22 series. The Susquehanna very fine sandy loam occupies 26.9 per cent of the area, the Trinity clay, which is the first-bottom soil, occupies 8.2 per cent of the area, the Lufkin clay occupies 6.9 per cent, Bowie very fine sandy loam 6.8 per cent, Lufkin very fine sandy loam 6.8 per cent, and the Lufkin silty clay loam 6.3 per cent. They are all upland soils. The Houston black clay, which is a black calcareous soil, occupies 5.4 per cent. The Wilson clay, which is a black prairie soil but not calcareous, occupies 5.3 per cent.

Chemical Composition

The average chemical composition of the various groups of soils is given in Table 1. The upland forested soils, like those of the other counties discussed in this Bulletin, are low in active phosphoric acid and in nitrogen, and lower in potash than the other groups of soils, although better supplied with potash than with other forms of plant food. They are also inclined to be acid.

The upland prairie soils are better supplied with plant food, are usually calcareous, and are not acid. The second-bottom or terrace soils of this county are low in nitrogen and phosphoric acid, and comparatively low in active potash.

The first-bottom soils are richer in active phosphoric acid than any of the other groups of soils described in this Bulletin. They average about the same in active potash and in total nitrogen. They are limestone soils and are not acid.

The detailed chemical composition of the various soils is contained in Table 14. The interpretation of the detailed analyses of the various soil types is given in Table 15. Pot experiments are given in Table 16.

Classification of Soils of Red River County

Upland soils of the forested area:

- Surface soils, brown to grayish-brown or gray, with sandy well drained subsoils:
  - Friable sandy clay subsoil, yellowish in upper part of subsoil, mottled red and gray or red, yellow and gray in the lower part—Bowie soils.
  - Yellow or pale-yellow friable sandy subsoil—Norfolk soils.
  - Reddish-yellow, yellowish-red or light-red friable sandy subsoil—Ruston soils.
- Brown to grayish-brown or gray surface soils, with heavy subsoils:
  - Stiff heavy clay, mottled red and gray or red, yellow and gray in the lower part—Susquehanna soils.
  - Gray surface soil and a gray, bluish-gray or mottled gray and yellow heavy clay subsoil, compact and impervious in the lower part—Lufkin soils.

Upland soils of the Prairie area:

- Prairie soils, stiff heavy clay subsoil, mottled red and bluish-gray or yellow and bluish-gray. The lower subsoil is tough and impervious—Crowley soils.
- Dark brown to black prairie soils with brown or bluish-gray subsoil, slightly mottled with yellow—Wilson soils.
- Dark brown to black calcareous prairie soils, with dark to grayish subsoil resting on chalk or chalky clay at a depth of a few inches to several feet—Houston soils.
- Brown to grayish surface soil with mottled red or gray or red, gray and yellow plastic clay subsoil, calcareous in the lower part—Oktibbeha soils.

Second-bottom or terrace soils:

- Grayish to yellow surface soil and a mottled yellow and gray subsoil—Kalmia soils.

Gray surface soils and a gray or mottled gray and yellow heavy clay subsoil, poorly drained—Myatt soils.

Gray to brown surface soils and a heavy mottled gray and red subsoil—Leaf soils.

Black to dark-brown surface soils and a brown to bluish-gray subsoil—Brewer soils.

Brown to grayish surface soil and light-red, yellowish-red or reddish-yellow friable subsoil—Cahaba soils.

Brown to grayish surface soil and yellowish-red friable sandy clay—Teller soils.

Chocolate-brown surface soils and a chocolate-red subsoil, calcareous in surface or subsoil—Bastrop soil.

First-bottom soils, subject to overflow:

Dark-colored to black surface soils and brown to mottled gray and yellow subsoil, calcareous in surface or subsoil—Trinity soils.

Brown surface soils, with a brown, light-brown, or mottled grayish and brownish or yellowish subsoil, non-calcareous—Ochlockonee soils.

Brown surface soils with grayish or mottled gray and yellow subsoil, calcareous—Catalpa soils.

First-bottom Red River soils:

Brownish-red surface and subsoil, clayey subsoil—Miller soils.

Brownish-red surface and subsoil; the lower subsoil more sandy than the upper subsoil—Yahola soils.

Chocolate-brown surface soils, brownish-red subsoils, with poorly drained areas having bluish-gray and brown mottled subsoil—Portland soils.

Black surface soils grading into a brownish-red subsoil—Pledger soils.

Alphabetical List of Soil Series of Red River County

Bowie series.—Upland soils of the forested area with brown to grayish-brown or gray surface soils and sandy well drained subsoils. Friable sandy clay, yellowish in upper part of subsoil, mottled red and gray or red, yellow and gray in the lower part.

Catalpa series.—First-bottom soils, subject to overflow. Brown surface soils with grayish or mottled gray and yellow subsoil, calcareous.

Crowley series.—Upland soils of the prairie region. Prairie soils, stiff heavy clay subsoil, mottled red and bluish-gray or yellow and bluish-gray. The lower subsoil is tough and impervious.

Houston series.—Black calcareous prairie soils. Calcareous upland soils. Dark-brown to black prairie soils, with dark to grayish subsoil resting on chalk or chalky clay at a depth of a few inches to several feet.

Kalmia series.—Second-bottom soils. Non-calcareous second-bottom soils, or terraces. Grayish to yellow surface soil and a mottled yellow and gray subsoil.

Table 14.—Composition of soils of Red River County.

Lab. No.		Phosphoric Acid		Nitrogen Per Cent	Potash			Acid Soluble, Lime, Per Cent	Basicity	Acidity
		Total Per Cent	Active Per Million		Total Per Cent	Acid Soluble Per Cent	Active Per Million			
3389	Bowie Very Fine Sandy Loam-surface	.015	12	.030	.36	.12	114	.13	.2	0
3390	Bowie Very Fine Sandy Loam-subsoil	.017	8	.030	.34	.15	67	.13	.3	200
3403	Bowie Very Fine Sandy Loam-surface	.042	11	.031	.48	.19	57	.06	.2	200
3404	Bowie Very Fine Sandy Loam-subsoil	.022	14	.031	.57	.16	74	.07	.2	200
3611	Bowie Very Fine Sandy Loam-surface	.025	9	.047	.63	.25	83	.27	.1	0
3612	Bowie Very Fine Sandy Loam-subsoil	.123	12	.088	1.17	.85	106	9.98	10.0	0
4583	Bowie Very Fine Sandy Loam-surface	.015	19	.031	.50	.08	83	.07	.1	300
4584	Bowie Very Fine Sandy Loam-subsoil	.020	4	.016	.37	.22	63	.06	.2	1300
7621	Bowie Very Fine Sandy Loam-surface	.033	43	.044	.28	.07	95	.52	.2	0
7622	Bowie Very Fine Sandy Loam-subsoil	.022	18	.052	.36	.11	64	.18	.2	0
17522	Bowie Very Fine Sandy Loam-surface	.031	24	.024	.22	.07	130	.14	.3	0
17523	Bowie Very Fine Sandy Loam-subsoil	.016	13	.019	.41	.08	109	.17	.2	460
17524	Bowie Very Fine Sandy Loam-subsoil	.085	2	.027	.37	.17	104	.11	0	1600
18538	Bowie Very Fine Sandy Loam-surface	.049	16	.035	.48	.08	90	.12	.4	0
18539	Bowie Very Fine Sandy Loam-subsoil	.033	4	.038	.50	.23	49	.21	.9	1100
	Average Bowie Very Fine Sandy Loam-surface	.030	19	.035	.42	.12	93	.19	.2	71
	Average Bowie Very Fine Sandy Loam-subsoil	.042	9	.038	.51	.25	80	1.37	1.5	61
3426	Catalpa Silty Clay Loam-surface	.140	469	.077	1.99	1.32	90	4.24	.6	0
3427	Catalpa Silty Clay Loam-subsoil	.123	271	.100	2.14	.84	271	2.51	0	0
15969	Chalk (Houston Material)-surface	.044	9	.157	.33	.07	59	17.76	10.1	0
15968	Chalk (Houston Material)-subsoil	.114	9	.075	.33	.08	51	17.12	10.0	0
17512	Chalk (Houston Material)-surface	.135	1	.117	.58	.19	38	40.00	10.0	0
17513	Chalk (Houston Material)-subsoil	.059	3	.057	.70	.19	58	40.75	9.8	0
	Average Chalk (Houston Material)-surface	.090	5	.137	.46	.13	49	28.88	10.1	0
	Average Chalk (Houston Material)-subsoil	.087	6	.066	.52	.14	55	28.94	10.0	0
17504	Crowley Silt Loam-surface	.062	6	.108	.64	.17	143	.31	.4	0
17505	Crowley Silt Loam-subsoil	.050	3	.094	.60	.43	140	.60	1.3	0
17506	Crowley Silt Loam-subsoil	.028	9	.071	.82	.36	180	.57	1.7	0
17531	Houston Black Clay-surface	.080	5	.177	.47	.30	188	1.21	.18	0
17532	Houston Black Clay-subsoil	.071	6	.122	.53	.32	156	1.44	2.0	0
17533	Houston Black Clay-subsoil	.170	6	.054	.60	.26	48	18.17	9.8	0
17546	Houston Black Clay-surface	.096	129	.118	.89	.35	130	3.76	6.4	0
17547	Houston Black Clay-subsoil	.101	166	.112	.94	.41	110	4.96	6.8	0
	Average Houston Black Clay-surface	.088	67	.148	.68	.33	159	2.49	4.1	0
	Average Houston Black Clay-subsoil	.114	59	.096	.69	.33	105	8.19	6.2	0
17511	Kalmia Very Fine Sand-surface	.035	9	.016	.90	.07	89	.14	.1	0
17502	Lufkin Clay-surface	.078	24	.090	.47	.22	....	.87	1.6	0
17503	Lufkin Clay-subsoil	.068	12	.031	.29	.20	90	.87	1.5	1100
17525	Lufkin Silt Loam-surface	.051	4	.055	.35	.09	54	.07	2.0	700
17526	Lufkin Silt Loam-subsoil	.029	4	.035	.33	.16	73	.12	1.2	1600

Table 14.—Composition of soils of Red River County—(continued).

Lab. No.		Phosphoric Acid		Nitrogen Per Cent	Potash			Acid Soluble, Lime, Per Cent	Basicity	Acidity
		Total Per Cent	Active Per Million		Total Per Cent	Acid Soluble Per Cent	Active Per Million			
17517	Lufkin Silty Clay Loam-surface	.061	37	.108	.31	.07	164	.34	.9	230
17518	Lufkin Silty Clay Loam-subsoil	.023	9	.030	.26	.08	74	.41	.6	900
17519	Lufkin Silty Clay Loam-subsoil	.065	5	.025	.25	.10	67	.50	....	0
18540	Lufkin Silty Clay Loam-surface	.042	21	.068	.42	.08	98	.38	.9	0
18541	Lufkin Silty Clay Loam-subsoil	.029	8	.025	.40	.09	45	.29	1.0	1100
	Average Lufkin Silty Clay Loam-surface	.052	29	.088	.37	.08	131	.37	.9	115
	Average Lufkin Silty Clay Loam-subsoil	.039	7	.027	.30	.09	62	.40	.8	667
17529	Lufkin Very Fine Sandy Loam-surface	.052	7	.021	.12	.08	73	.18	.1	0
17530	Lufkin Very Fine Sandy Loam-subsoil	.031	7	.030	.33	.12	85	.12	.9	0
17509	Ochlockonee Silty Clay Loam-surface	.071	123	.110	.72	.34	167	.60	1.1	0
17510	Ochlockonee Silty Clay Loam-subsoil	.058	33	.040	1.13	.26	125	.31	.5	700
15963	Oktibbeha Clay Loam-surface	.033	9	.044	.61	.24	106	.42	1.0	2800
15964	Oktibbeha Clay Loam-subsoil	.059	42	.067	.57	.18	76	.56	2.7	0
15967	Oktibbeha Clay Loam-subsoil	.016	7	.030	.59	.26	146	.04	1.2	0
17507	Ruston Very Fine Sandy Loam-surface	.068	4	.035	.46	.12	156	.27	.4	0
17508	Ruston Very Fine Sandy Loam-subsoil	.072	3	.050	.46	.19	76	.28	.5	0
17520	Susquehanna Clay-surface	.070	....	.049	.37	.10	....	.13	.1	460
17521	Susquehanna Clay-subsoil	.086	....	.054	.47	.26	....	.45	....	0
15965	Susquehanna Fine Sandy Loam-surface	.047	12	.039	.39	.08	90	.48	.6	0
15966	Susquehanna Fine Sandy Loam-subsoil	.021	11	.034	.46	.18	129	.41	1.0	2100
17514	Susquehanna Very Fine Sandy Loam-surface	.042	19	.045	.24	.08	149	.17	.2	0
17515	Susquehanna Very Fine Sandy Loam-subsoil	.117	104	.080	.28	.08	104	.12	.7	460
17516	Susquehanna Very Fine Sandy Loam-subsoil	.044	8	.048	....	....	87	....	.4	....
18544	Susquehanna Very Fine Sandy Loam-surface	.027	16	.034	.73	.06	61	.10	.4	0
18545	Susquehanna Very Fine Sandy Loam-surface	.030	3	.045	.68	.27	111	.14	.8	0
	Average Susquehanna Very Fine Sandy Loam-surface	.035	18	.040	.49	.07	105	.14	.3	0
	Average Susquehanna Very Fine Sandy Loam-subsoil	.064	38	.058	.48	.18	101	.13	.6	230
15972	Trinity Clay-surface	.080	....	.211	1.18	.33	382	.49	.3	0
15973	Trinity Clay-subsoil	.076	142	.044	1.34	.19	147	.37	.1	1100
4355	Wilson Clay-surface	.040	17	.079	.50	.40	156	1.08	2.1	0
4356	Wilson Clay-subsoil	.033	7	.103	.53	.25	145	.87	1.7	0
17534	Wilson Clay-surface	.065	7	.162	....	.23	132	.97	1.6	230
17535	Wilson Clay-subsoil	.064	4	.083	.30	.19	98	.95	1.5	0
18542	Wilson Clay-surface	.049	19	.117	.58	.19	121	.69	1.9	0
18543	Wilson Clay-subsoil	.036	10	.072	.46	.16	90	.83	.8	0
18548	Wilson Clay-surface	.050	19	.087	.49	.17	101	1.12	1.8	0
18549	Wilson Clay-subsoil	.037	6	.068	.43	.17	85	1.17	1.2	0
17431	Wilson Clay (probably)-surface	.037	18	....	.48	.23	225	.91	1.9	0

	Average Wilson Clay-surface	.048	16	.111	.51	.24	147	.95	1.9	58
	Average Wilson Clay-subsoil	.043	7	.082	.43	.19	105	.96	1.3	0
15970	Wilson Silt Loam-surface	.033	7	.069	.73	.25	135	.50	1.8	0
15971	Wilson Silt Loam-subsoil	.024	16	.111	.73	.13	109	.26	.8	2100
17527	Wilson Silty Clay Loam-surface	.033	4	.084	.88	.26	144	.51	1.1	0
17528	Wilson Silty Clay Loam-subsoil	.034	...	.045	.53	.35	...	.82	1.6	0
17536	Yahola Very Fine Sandy Loam-surface	.128	407	.030	.65	.36	202	2.80	6.2	0
17721	Yahola Very Fine Sandy Loam-subsoil	.067	342	.030	...	.40	199	2.93	6.7	0
18536	Yahola Very Fine Sandy Loam-surface	.130	372	.101	2.22	.50	291	2.22	5.6	0
18537	Yahola Very Fine Sandy Loam-subsoil	.085	309	.037	1.97	.33	108	1.97	4.8	0
	Average Yahola Very Fine Sandy Loam-surface	.129	390	.066	1.44	.43	247	2.51	5.9	0
	Average Yahola Very Fine Sandy Loam-subsoil	.076	326	.034	1.97	.37	153	2.45	5.8	0

Table 15.—Interpretation of analyses, Red River County.

Lab. No.	Type Name	Corn Possibility Two Million Pounds			Acid-Soluble			Acidity	Acres	Per Cent of Area
		Active Phos-phoric Acid	Total Nitro-gen	Active Potash	Phos-phoric Acid	Potash	Lime			
	Average Bowie Very Fine Sandy Loam-surface	12	13	61	low	fair	fair	71	45184	6.8
	Average Bowie Very Fine Sandy Loam-subsoil	6	13	38	good	good	good	61	...	...
3426	Catalpa Silty Clay Loam-surface	55	13	50	good	good	high	0	9216	1.4
3427	Catalpa Silty Clay Loam-subsoil	50	28	135	fair	good	high	0	...	...
	Average Chalk (Houston Material)-surface	6	38	26	low	fair	high	0	1280	.2
	Average Chalk (Houston Material)-subsoil	6	23	38	low	fair	high	...	...	...
17504	Crowley Silt Loam-surface	6	33	73	good	good	good	0	3968	.6
17505	Crowley Silt Loam-subsoil	6	28	73	good	good	good	0	...	...
17506	Crowley Silt Loam-subsoil	6	23	94	low	good	good	0	...	...
	Average Houston Black Clay-surface	35	43	84	good	good	high	0	35136	54.0
	Average Houston Black Clay-subsoil	30	28	61	good	good	high	0	...	...
17511	Kalmia Very Fine Sand-surface	6	8	50	fair	good	fair	0	704	.1
17502	Lufkin Clay-surface	18	28	...	good	good	good	0	45632	6.9
17503	Lufkin Clay-subsoil	12	13	50	good	good	good	1100	...	...
17525	Lufkin Silt Loam-surface	6	18	38	good	low	fair	700	6656	1.0
17526	Lufkin Silt Loam-subsoil	6	18	38	low	low	fair	1600	...	...
	Average Lufkin Clay Loam-surface	18	28	73	good	good	good	115	42240	6.3
	Average Lufkin Clay Loam-subsoil	6	13	38	good	good	good	667	...	...
17529	Lufkin Very Fine Sandy Loam-surface	6	13	38	low	good	fair	0	18048	6.8
17530	Lufkin Very Fine Sandy Loam-subsoil	6	13	50	good	fair	fair	0	...	...
17509	Ochlockonee Silty Clay Loam-surface	45	33	84	good	good	good	0	16064	2.4
17510	Ochlockonee Silty Clay Loam-subsoil	24	13	73	good	good	good	700	...	...
15963	Oktibbeha Clay Loam-surface	6	18	61	good	good	good	2800	7680	1.1
15964	Oktibbeha Clay Loam-subsoil	30	23	50	good	good	good	0	...	...
15967	Oktibbeha Clay Loam-subsoil	6	13	73	low	low	low	0	...	...

Table 15.—Interpretation of analyses, Red River County—(continued).

Lab. No.	Type Name	Corn Possibility Two Million Pounds			Acid-Soluble			Acidity	Acres	Per Cent of Area
		Active Phosphoric Acid	Total Nitrogen	Active Potash	Phosphoric Acid	Potash	Lime			
17507	Ruston Very Fine Sandy Loam-surface	6	13	84	good	good	good	0	14528	2.2
17508	Ruston Very Fine Sandy Loam-subsoil	6	18	50	good	good	good	0	....	....
17520	Susquehanna Clay-surface	....	18	....	fair	fair	....	460	5376	.8
17521	Susquehanna Clay-subsoil	....	18	....	fair	good	....	0	....	....
15965	Susquehanna Fine Sandy Loam-surface	12	13	50	good	good	good	0	4928	.7
15966	Susquehanna Fine Sandy Loam-subsoil	12	13	73	low	good	good	2100	....	....
	Average Susquehanna Very Fine Sandy Loam-surface	12	13	61	good	fair	fair	0	143872	26.9
	Average Susquehanna Very Fine Sandy Loam-subsoil	24	18	61	good	fair	fair	230	....	....
15972	Trinity Clay-surface	....	58	171	good	good	good	0	54400	8.2
15973	Trinity Clay-subsoil	45	18	73	low	good	good	1100	....	....
	Average Wilson Clay-surface	12	33	73	good	good	good	58	35328	5.3
	Average Wilson Clay-subsoil	6	28	61	low	good	good	0	....	....
15970	Wilson Silt Loam-surface	6	23	73	good	good	good	0	4352	.6
15971	Wilson Silt Loam-subsoil	12	33	61	good	good	good	0	....	....
17527	Wilson Silty Clay Loam-surface	6	28	73	good	good	good	0	9920	1.5
17528	Wilson Silty Clay Loam-subsoil	....	18	....	good	good	good	0	....	....
	Average Yahola Very Fine Sandy Loam-surface	50	23	115	good	good	high	0	17472	2.6
	Average Yahola Very Fine Sandy Loam-subsoil	50	13	84	good	good	high	0	....	....

Table 16.—Pot experiments on soils of Red River County.

Lab. No.	Type Name	Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn, in Bushels		
		With Complete Fertilizer	Without Phosphoric Acid	Without Nitrogen	Without Potash	Phosphoric Acid	Nitrogen	Potash
3611	Bowie Very Fine Sandy Loam-surface							
	Corn—1913	22.5	6.5	....	....	15	....	....
	Sorghum—1913	13.9	4.7	....	....	6	....	....
	Corn—1914	39.9	6.9	....	....	7	....	....
7621	Bowie Very Fine Sandy Loam-surface							
	Corn—1915	40.8	....	23.9	....	....	35	....
	Sorghum—1915	24.0	....	4.5	....	....	9	....
	Corn—1916	26.8	....	9.1	....	....	12	....
7622	Bowie Very Fine Sandy Loam-subsoil							
	Corn—1915	33.2	....	21.0	....	....	31	....
	Sorghum—1915	16.7	....	2.0	....	....	5	....
	Corn—1916	25.8	....	2.7	....	....	4	....
	Sorghum—1916	20.1	....	1.7	....	....	4	....
18538	Bowie Very Fine Sandy Loam-surface							
	Corn—1921	24.8	16.8	13.5	26.5	....	26	142
	Sorghum—1921	34.4	31.1	24.2	28.8	....	67	93
18539	Bowie Very Fine Sandy Loam-surface							
	Corn—1921	24.4	4.3	12.6	17.4	....	25	122
	Sorghum—1921	27.6	6.6	18.8	22.2	....	51	65
18546	Houston Black Clay-surface							
	Corn—1921	18.1	10.7	14.9	21.4	....	41	251
	Sorghum	21.7	17.1	25.5	18.6	....	84	116
18547	Houston Black Clay-subsoil							
	Corn—1921	15.5	8.9	13.8	12.3	....	47	173
	Sorghum—1921	24.3	16.0	22.3	23.1	....	71	161
18540	Lufkin Silty Clay Loam-surface							
	Corn—1921	29.4	15.9	17.3	32.2	....	34	196
	Sorghum—1921	42.6	27.5	34.6	46.1	....	93	168
18541	Lufkin Silty Clay Loam-subsoil							
	Corn—1921	25.9	7.3	13.6	26.8	....	25	108
	Sorghum—1921	20.1	5.6	19.3	22.0	....	55	50
18544	Susquehanna Very Fine Sandy Loam-surface							
	Corn—1921	34.8	12.6	12.2	31.0	....	27	105
	Sorghum—1921	35.5	21.7	27.8	28.2	....	73	81
18545	Susquehanna Very Fine Sandy Loam-subsoil							
	Corn—1921	17.5	2.9	11.9	14.3	....	26	365
18542	Wilson Clay-surface							
	Corn—1921	30.5	13.6	17.7	27.8	....	37	249
	Sorghum—1921	38.2	24.0	26.8	30.6	....	75	107

Table 16.—Pot experiments on soils of Red River County—(continued).

Lab. No.	Type Name	Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn, in Bushels		
		With Complete Fertilizer	Without Phosphoric Acid	Without Nitrogen	Without Potash	Phosphoric Acid	Nitrogen	Potash
18543	Wilson Clay-subsoil							
	Corn—1921	20.5	6.6	17.0	21.2	....	38	187
	Sorghum—1921	40.6	11.2	22.9	30.7	....	67	85
18548	Wilson Clay-surface							
	Corn—1921	23.6	16.8	15.9	23.6	....	34	216
	Sorghum—1921	30.7	27.4	24.1	27.2	....	68	115
18549	Wilson Clay-subsoil							
	Corn—1922	45.2	....	....	36.7	....	....	210
	Sorghum—1922	24.7	....	....	27.2	....	....	16
	Cowpeas—1922	29.0	....	....	33.2	....	....	149
	Rice—1922	59.1	....	....	53.0	....	....	265
18536	Yahola Very Fine Sandy Loam-surface							
	Corn—1921	20.3	19.4	21.4	21.0	....	78	364
	Sorghum—1921	26.5	28.2	26.8	26.8	....	104	267
18537	Yahola Very Fine Sandy Loam-subsoil							
	Corn—1921	18.4	9.7	12.7	18.6	....	31	205
	Sorghum—1921	33.7	26.7	21.1	30.6	....	60	136

Lufkin series.—Upland soils of the forested area, brown to gray surface soils with heavy subsoils. Gray surface soil and a gray, bluish-gray or mottled gray and yellow, heavy clay subsoil, compact and impervious in the lower part.

Ochlockonee series.—First-bottom soils, subject to overflow. Brown surface soils, with a brown, light-brown, or mottled grayish and brownish or yellowish subsoil, non-calcareous.

Oktibbeha series.—Upland soils of the prairie area. Brown to grayish surface soil with mottled red or gray or red, gray and yellow plastic clay subsoil, calcareous in the lower part.

Ruston series.—Upland soils of the forested area, with brown to gray surface soils and sandy well drained subsoils. Reddish-yellow, yellowish-red, or light-red friable sandy subsoil.

Susquehanna series.—Upland soils of the forested area with brown to gray surface soils and heavy subsoils. Brown to grayish-brown or gray surface soils, with heavy subsoils. Stiff heavy clay, mottled red and gray or red, yellow and gray in the lower part.

Trinity series.—First-bottom soils, subject to overflow. Dark-colored to black surface soils and brown to mottled gray and yellow subsoil, calcareous in surface or subsoil.

Wilson series.—Upland soils of the prairie region. Dark brown to black prairie soils with brown or bluish-gray subsoil, slightly mottled with yellow.

Yahola series.—First-bottom soils of the Red River. Brownish-red surface and subsoil; the lower subsoil more sandy than the upper subsoil.

ACKNOWLEDGMENT

Chemical analyses and other work involved in the preparation of this Bulletin have been taken part in by S. E. Asbury, N. J. Volk, T. L. Ogier, W. H. Walker, and other members of the staff.

SUMMARY AND CONCLUSIONS

This Bulletin discusses the chemical composition and fertility of typical soils of Bowie, Denton, Freestone, and Red River Counties.

Methods of maintenance of soil fertility are outlined.

An explanation of terms is given.

The upland forested soils (originally forested) are usually low in active phosphoric acid and nitrogen. They are a little better supplied with active potash but some of them are low in active potash. A number of these soils are acid.

The upland prairie soils are better supplied with plant food and with lime than the forested soils. They contain two or three times as much active plant food or total nitrogen as the forested soils. Most of them are limestone soils but a few are acid.

The second-bottom or terrace soils are usually better supplied with plant food than the upland forested soils but are not as well supplied as the prairie soils. Some of these soils, however, are quite low in nitrogen.

The first-bottom soils are better supplied with plant food than the other groups of soils discussed. They contain four to eight times as much active phosphoric acid, two to three times as much active potash, and two to four times as much total nitrogen as the surface soil of the upland forested soils.

A table is given showing the crop-producing power of the average soils.

The group of forested soils generally respond well to fertilizer and the use of fertilizer is usually profitable, especially on truck crops. The black prairie soils do not respond well to fertilizers. The first-bottom soils do not need fertilizer as much as the upland soils.

While many of the soils in these areas are acid, the acidity in many cases is low and the use of lime on such soils is not recommended except in connection with a legume rotation.

The use of lime in some form would probably be of benefit on the acid heavy upland soils, especially if legume crops are to be grown, as it would not only correct the acidity but would favorably improve the physical character of the soil.

The black prairie soils of the Houston series and many of the bottom soils are well supplied with lime.

A brief tabular classification of the different soil types is given, which should aid in identifying the type of any particular soil. Some small saline spots (alkali spots) are found in Denton County. Analyses of the salts of one of these spots is given.

A brief detailed description is given of the various soil types, with tables showing the chemical composition of samples examined, the interpretation of the analyses, and the results of pot experiments with their interpretations.