



**Soil Survey
Laboratory Data and
Descriptions for
Some Soils of...**

...OKLAHOMA

SOIL CONSERVATION SERVICE • U.S. DEPARTMENT OF AGRICULTURE
In cooperation with
OKLAHOMA AGRICULTURAL EXPERIMENT STATION

Soil Survey Investigations Report No. 11

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Descriptions for
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MAY 1967

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1. SAMPLE COLLECTION AND PREPARATION
 - A. Field sampling
 1. Site selection
 2. Soil sampling
 - a. Stony soils
 - B. Laboratory preparation
 1. Standard (airdry)
 - a. Square-hole 2-mm sieve
 - b. Round-hole 2-mm sieve
 2. Field moist
 3. Carbonate-containing material
 4. Carbonate-indurated material
2. CONVENTIONS
 - A. Size-fraction base for reporting
 1. <2-mm
 2. <size specified
 - B. Data-sheet symbols

tr: trace, not measurable by quantitative procedure used or less than reportable amount

tr(s): trace, detectable only by qualitative procedure more sensitive than quantitative procedure used

- : analysis run but none detected

-(s): none detected by sensitive qualitative test

blank: analysis not run

nd: analysis not run

<: less than reported amount or none present
 3. PARTICLE-SIZE ANALYSES
 - A. <2-mm fraction (pipet method)
 1. Airdry samples
 - a. Carbonate and noncarbonate clay
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 - a. Carbonate and noncarbonate clay
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 - a. Field state
 - b. Airdry
 - c. 30-cm absorption
 - d. 1/3-bar desorption I
 - e. 1/3-bar desorption II
 - f. 1/3-bar desorption III
 - g. 1/10-bar desorption
 - h. Owendry
 2. Paraffin-coated clods
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 3. Cores
 - a. Field moist
 4. Nonpolar-liquid-saturated clods
 - B. Water retention
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 - c. Natural clods
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 - a. Uncorrected
 - b. Corrected (exchangeable)
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 - b. CO_2 evolution, gravimetric
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 - a. Weight loss
 - B. Nitrogen
 1. Kjeldahl digestion
 - a. Ammonia distillation
 2. Semimicro Kjeldahl
 - a. Ammonia distillation
 - C. Iron
 1. Dithionite extraction
 - a. Dichromate titration
 - b. EDTA titration
 2. Dithionite-citrate extraction
 - a. Orthophenanthroline colorimetry
 3. Dithionite-citrate-bicarbonate extraction
 - a. Potassium-thiocyanate colorimetry
 4. Pyrophosphate-dithionite extraction
 - D. Manganese
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 - a. EDTA-alcohol separation
 - b. Oxalate-permanganate I
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 - d. Oxalate-cerate
 3. $\text{NH}_4\text{Cl-EtOH}$ extraction
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 - O. Magnesium
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 - a. EDTA titration
 2. NH_4OAc extraction
 - a. EDTA-alcohol separation
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 - c. Gravimetric, $\text{Mg}_2\text{P}_2\text{O}_7$
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 - a. Methylene blue
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 - B. Optical analysis
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 - C. Total analysis
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 - D. Surface area
 1. Glycerol retention
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 - A. Saturated paste, mixed
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 - B. Saturated paste, capillary rise
 1. Saturation extract
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 - C. pH
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 1. To total clay
 2. To noncarbonate clay
 3. Ca to Mg (extractable)

PREFACE

This publication is one in a new U.S. Department of Agriculture series established to preserve and make available technical information resulting from soil survey investigations. These investigations have been going on for about two decades. Data from them have been distributed in unpublished form to those immediately concerned. Some of the data and descriptions have appeared in technical journals, in regional bulletins, in USDA technical bulletins, and in the text of published soil surveys. But most were not available to all who might use them.

We intend to publish in this series all data from the soil survey laboratories that form reasonably complete characterizations of soils. Already-assembled data and descriptions will be published just as rapidly as they can be prepared for printing. Fragmentary data collected as reference points for specific soil surveys will not be included.

While these data were being assembled, there were many changes in laboratory methods. Some were improved and some new ones were devised. Consequently, laboratory data for different soils cannot always be directly compared without allowance for the method.

The method used is indicated by symbol in the column headings of the data table. These symbols are identified in the code sheet on the opposite page. Each method is described in the first number of this series, "Soil Survey Laboratory Methods and Procedures for Collecting Soil Samples," SSIR No. 1.

Ways of describing soils have also changed. Soil descriptions have become explicit on more and more features. The systems for designating horizons and for classifying soils have been changed.

The soil descriptions published here were prepared as working documents to meet a specific need of a soil survey at the time the soil samples were collected. The soil scientists who wrote them had no idea they would be published. Editing has been limited for the most part to that necessary for conformance to the "Soil Survey Manual." Field textural estimates have been retained, even though some are at variance with the laboratory data, because the field estimates themselves are important data.

There were several reasons for sampling these soils. Some were sampled to study soil genesis, some to facilitate classification, and some to obtain data to permit more useful interpretations. Those sampled for genesis or classification studies do not always fit neatly into our present concepts of soil series. Partly because of these studies, our concepts of some soil series have been modified. As a consequence, the soil series name assigned a soil at the time of sampling is not always the name that would be assigned today. Soil series names in this publication follow 1965 series definitions.

*Soil Survey
Soil Conservation Service*

OKLAHOMA

<u>Soil Series</u>	<u>County</u>	<u>Soil Survey No.</u>	<u>Page</u>	<u>Soil Series</u>	<u>County</u>	<u>Soil Survey No.</u>	<u>Page</u>
Bates	Hughes	S620kla-32-3	3	Norge	Pawnee	S530kla-59-38	55
	Hughes	S620kla-32-4	5		Pawnee	S530kla-59-39	57
Bethany	Oklahoma	S560kla-55-2	7	Okemah	Okmulgee	S620kla-56-1	59
Carey	Custer	S590kla-20-1	9		Okmulgee	S620kla-56-2	61
	Custer	S590kla-20-2	11	Parsons	Mayes	S530kla-49-2	63
Choteau	Wagoner	S530kla-73-21	13		Mayes	S530kla-49-3	65
	Wagoner	S530kla-73-24	15	Renfrow	Pawnee	S530kla-59-36	67
*Cypremort	McCurtain	S620kla-45-1	17	**Rosebloom	McCurtain	S620kla-45-3	69
	McCurtain	S620kla-45-2	19		McCurtain	S620kla-45-4	71
Dennis	Pawnee	S530kla-59-37	21	St. Paul	Woodward	S590kla-77-3	73
	Wagoner	S530kla-73-20	23		Dewey	S590kla-22-1	75
	Wagoner	S530kla-73-23	25	Shellabarger	Kingfisher	S560kla-37-9	77
Dougherty	Payne	S560kla-60-1	27	Stephenville	Lincoln	S620kla-41-1	79
Foard	Comanche	S590kla-16-1	29		Lincoln	S620kla-41-2	81
	Cotton	S590kla-17-2	31	Stidham	Hughes	S620kla-32-1	83
Grant	Alfalfa	S560kla-2-2	33		Hughes	S620kla-32-2	85
	Alfalfa	S560kla-2-20	35	Summit	Osage	S620kla-57-1	87
	Canadian	S560kla-9-1	37		Osage	S620kla-57-2	89
Hartsells	Pittsburg	S620kla-61-1	39	Taloka	Wagoner	S530kla-73-19	91
	Pittsburg	S620kla-61-2	41		Wagoner	S530kla-73-22	93
Lightning	Craig	S600kla-18-1	43	Vanoss	Pawnee	S530kla-59-35	95
	Craig	S600kla-18-2	45		Pawnee	S530kla-59-40	97
Newtonia	Ottawa	S600kla-58-1	47	Verdigris	Rogers	S600kla-66-1	99
	Ottawa	S600kla-58-2	49		Rogers	S600kla-66-2	101
Nobscot	Woodward	S590kla-77-1	51	Waurika	Cotton	S590kla-17-1	103
	Woodward	S590kla-77-2	53		Jefferson	S590kla-34-1	105

*Data are inadequate for firm classification at the series level.

**Soil series name Rosebloom now changed to Arkabutla.

OKLAHOMA

<u>County</u>	<u>Soil Series</u>	<u>Soil Survey No.</u>	<u>Page</u>	<u>County</u>	<u>Soil Series</u>	<u>Soil Survey No.</u>	<u>Page</u>
Alfalfa	Grant	S560kla-2-2	33	Okmulgee	Okemah	S620kla-56-1	59
	Grant	S560kla-2-20	35		Okemah	S620kla-56-2	61
Canadian	Grant	S560kla-9-1	37	Osage	Summit	S620kla-57-1	87
Comanche	Foard	S590kla-16-1	29		Summit	S620kla-57-2	89
Cotton	Foard	S590kla-17-2	31	Ottawa	Newtonia	S600kla-58-1	47
	Waurika	S590kla-17-1	103		Newtonia	S600kla-58-2	49
Craig	Lightning	S600kla-18-1	43	Pawnee	Dennis	S530kla-59-37	21
	Lightning	S600kla-18-2	45		Norge	S530kla-59-38	55
Custer	Carey	S590kla-20-1	9		Norge	S530kla-59-39	57
	Carey	S590kla-20-2	11		Renfrow	S530kla-59-36	67
Dewey	St. Paul	S590kla-22-1	75	Vanoss	S530kla-59-35	95	
Hughes	Bates	S620kla-32-3	3	Vanoss	S530kla-59-40	97	
	Bates	S620kla-32-4	5	Payne	Dougherty	S560kla-60-1	27
	Stidham	S620kla-32-1	83		Pittsburg	Hartsells	S620kla-61-1
	Stidham	S620kla-32-2	85	Hartsells	S620kla-61-2	41	
Jefferson	Waurika	S590kla-34-1	105	Rogers	Verdigris	S600kla-66-1	99
Kingfisher	Shellabarger	S560kla-37-9	77	Verdigris	S600kla-66-2	101	
Lincoln	Stephenville	S620kla-41-1	79	Wagoner	Choteau	S530kla-73-21	13
	Stephenville	S620kla-41-2	81		Choteau	S530kla-73-24	15
McCurtain	*Cypremort	S620kla-45-1	17	Dennis	S530kla-73-20	23	
	*Cypremort	S620kla-45-2	19	Dennis	S530kla-73-23	25	
	**Rosebloom	S620kla-45-3	69	Taloka	S530kla-73-19	91	
	**Rosebloom	S620kla-45-4	71	Taloka	S530kla-73-22	93	
Mayes	Parsons	S530kla-49-2	63	Woodward	Nobscot	S590kla-77-1	51
	Parsons	S530kla-49-3	65		Nobscot	S590kla-77-2	53
Oklahoma	Bethany	S560kla-55-2	7	St. Paul	S590kla-77-3	73	

*Data are inadequate for firm classification at the series level.

**Soil series name Rosebloom now changed to Arkabutla.

SOIL Bates fine sandy loam SOIL Nos. 96201a-32-3 LOCATION Hughes County, Oklahoma

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 17114-17119 February 1967

General Methods: 1A, 1M1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm)											Coarse fragments			
		3A1											2A2 > 2 Pct.	2-19 Pct.	19-76 Pct.	
		Total		Sand					Silt							
		Sand (2-0.05) %	Silt (0.05- 0.002)	Clay (= 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02- 0.002)	Int. II (0.2-0.02)	(2-0.1)			
0-7	A11	58.9	31.2	9.9	0.5	0.7	4.6	26.5	26.6	23.9	7.3	65.7	32.3	-	-	-
7-14	A12	54.2	31.7	14.1	0.2	0.6	4.4	24.2	24.8	24.0	7.7	62.8	29.4	-	-	-
14-23	B1	52.4	31.4	16.2	0.2	0.7	4.3	23.1	24.1	23.6	7.8	61.2	28.3	-	-	-
23-30	B21t	48.9	31.0	20.1	0.8	0.8	4.0	21.1	22.2	22.1	8.9	56.6	26.7	-	-	-
30-40	B22t	46.3	30.8	22.9	0.6	0.6	3.9	19.3	21.9	21.2	9.6	54.3	24.4	-	-	-
40-46+	R	89.5	3.7	6.8	1.1	1.6	31.3	51.7	3.8	2.2	1.5	20.6	85.7	-	-	-
Pct. of < 2 mm																
Pct. of < 76mm																
Depth (in.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.	C/N	Carbonate as CaCO ₃ Pct.	Ext. Iron as Fe Pct.	Bulk density			Water content			pH				
						g/cc	g/cc	g/cc	Pct.	Pct.	Pct.	482 15- Bar	8C1a (1:1) 8D0			
0-7	1.08	0.094	11									4.4	5.9			
7-14	0.76	0.070	11									6.0	5.4			
14-23	0.58	0.054	11									6.3	5.4			
23-30	0.45	0.049	9									7.8	5.4			
30-40	0.33											8.7	5.4			
40-46+	0.62											2.4	6.3			
Depth (in.)	Extractable bases 5B1a				6B1a Ext. Acidity	Cat. Mech. Cap.		8D3 Ca/Mg	Base saturation							
	6M2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	5A3a Sum Cations	5A1a Sum NH ₄ OAc		5C3 Sum Cations	5C1 Sum Cations						
	meq/100 g								Pct.	Pct.						
0-7	3.7	0.8	tr	0.4	4.9	3.2	8.1	7.0	60	70						
7-14	3.6	1.1	tr	0.4	5.1	4.4	9.5	7.7	3.3	54						
14-23	4.0	1.6	tr	0.2	5.8	4.4	10.2	8.3	2.5	57						
23-30	4.3	2.2	tr	0.2	6.7	5.6	12.3	9.3	2.0	54						
30-40	4.7	2.5	tr	0.2	7.4	4.4	11.8	10.1	1.9	63						
40-46+	1.8	0.7	tr	0.1	2.0	2.4	4.4	2.1		45						
<p>a. Fe-Mn nodules: > 50 percent (2-0.5 mm.); 5-25 percent (0.5-0.25 mm.).</p> <p>b. One or more horizons have relatively low cation exchange capacity. As cation exchange capacity decreases, the relative error of base saturation increases. Trace quantities are omitted from the sum of bases. For very low CEC values, this omission contributes significantly to the relative error of base saturation.</p>																
Depth (in.)	Ratios to Clay 8D1		Ext. Iron	15-2hr Water												
	NH ₄ OAc CEC	Ext. Iron														
0-7	0.71		0.44													
7-14	0.55		0.42													
14-23	0.51		0.39													
23-30	0.46		0.39													
30-40	0.44		0.38													
40-46+	0.31		0.35													

Soil Type: Bates fine sandy loam

Soil No.: S62-Okla-32-3

Location: Hughes County, Oklahoma. About 800 feet east and 350 feet south of the half mile line on the north side of Section 15, T7N, R9E.

Vegetation and Use: Tall grass prairie. Used as rangeland.

Slope and Land Form: Two percent slope on erosional upland.

Drainage and Permeability: Moderately permeable. Well drained. Medium runoff.

Parent Material: Noncalcareous sandstones of Pennsylvanian Age.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June, 1962.

Described by: Earl C. Nance and Roscoe Long.

Horizon and

Lincoln

Lab. Number

A11 17114	0 to 7 inches. Dark brown (10YR 3/3) fine sandy loam, dark brown (10YR 4/3) dry; weak medium and fine granular structure; very friable, slightly hard; many earthworm casts; pH 6.0; diffuse boundary.
A12 17115	7 to 14 inches. Dark brown (10YR 3/3) heavy fine sandy loam, brown (10YR 5/3) dry; weak medium granular structure; very friable, slightly hard; many earthworm casts; pH 6.0; diffuse wavy boundary.
B1 17116	14 to 23 inches. Dark brown (7.5YR 3/4) loam, brown (7.5YR 5/4) dry; compound prismatic and moderate medium granular structure; friable, hard; many pores and roots; pH 6.0; diffuse wavy boundary.
B21t 17117	23 to 30 inches. Brown (7.5YR 4/4) heavy loam, brown (7.5YR 5/4) dry; compound prismatic breaking to moderate medium subangular blocky structure; friable, hard; sand grains are coated and bridged with clay films; many pores and roots; pH 6.0; gradual wavy boundary.
B22t 17118	30 to 40 inches. Strong brown (7.5YR 5/6) light clay loam, reddish yellow (7.5YR 6/6) dry; moderate coarse prismatic breaking to moderate medium subangular blocky structure; sand grains are coated and bridged with clay films; friable, hard; pH 6.0; clear wavy boundary.
R 17119	40 to 46 inches plus. Yellowish brown, brown and gray sandstone and sandy shale interbedded with thin strata of siltstone; pH 6.0.

Notes: Colors refer to moist soil unless otherwise stated. The pH was determined in the field by Hellige-Truog kit.

Mineralogy (Method 7B1): Observations on very fine sand.

All and B22t horizons: 95 percent quartz, less than 5 percent feldspar and no ferromagnesian minerals.

R horizon: Iron oxide coated quartz predominates; feldspar is less than 5 percent and reddish brown aggregates are 5-10 percent; no ferromagnesian minerals.

SOIL Rates fine sandy loam SOIL Nos. S6201a-92-4 LOCATION Hughes County, Oklahoma

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 17120-17125 February 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm) <u>3A1</u>											Coarse fragments			
		Total		Sand					Silt				2A2 > 2	2-19	19-76	
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (= 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)				(2-0.1)
Pct. of < 2 mm													Pct. of < 76mm			
0-8	A11	58.6	32.0	9.4	0.7	0.9	2.4	29.2	25.4	24.8	7.2	71.8	33.2	tr		
8-15	A12	55.2	31.2	13.6	0.4	0.8	2.3	28.0	23.7	23.7	7.5	68.6	31.5	tr		
15-21	B1	53.0	31.2	15.8	0.5	1.0	2.4	26.8	22.3	23.0	8.2	65.3	30.7	-		
21-28	B21t	49.5	31.5	19.0	0.7	1.0	2.2	24.5	21.1	22.4	9.1	62.0	28.4	tr		
28-36	B22t	44.6	30.2	25.2	0.4	0.6	1.8	21.9	19.9	20.3	9.9	57.1	24.7	tr		
36-45	B3	41.1	27.4	31.5	0.8	0.6	1.5	20.1	18.1	18.3	9.1	51.7	23.0	2		
Depth (in.)	6A1a	6B1a	C/N	Carbonate as CaCO ₃	6C2a Ext. Iron as Fe	Bulk density			4D1 COLE	Water content				4C1 m./in.	pH	6C1a 1:1 H ₂ O
	Organic carbon b Pct.	Nitrogen Pct.				4A1a Field	4A1c 30-cm	4A1b Air Dry		4B4 Field State	4B3 30-cm	4B1b 1/3-Bar	4B2 15-Bar			
0-8	1.12	0.090	12		0.8	1.52	1.51	1.53	0.003	11.7	16.2	15.6	4.2			5.6
8-15	0.69	0.064	11		1.0	1.5	1.5c					11.4	5.3			5.3
15-21	0.53	0.056	9		1.2	1.57	1.54	1.60	0.014	14.3	18.3	12.2	6.5	0.09		5.3
21-28	0.40	0.052	8		1.7	1.5	1.5c					14.2	8.0			5.4
28-36	0.29				1.7	1.58	1.56	1.65	0.017	17.1	19.9	20.3	9.5	0.17		5.4
36-45	0.21				2.0	1.6	1.6c					19.3	10.6			5.4
Depth (in.)	Extractable bases				6B1a Ext. Acidity	6C1a Ext. Cations	6C1b Ext. Al	5A3b Bases Plus Al mg/100g Clay	8D3 Ca/Mg	Base saturation						
	6B2a Ca	6C2a Mg	6P2a Na	6Q2a K						Sum	5C3 Sum Cations	5C1 Sum Cations				
mg/100 g												Pct.	Pct.			
0-8	3.3	1.0	tr	0.3	4.6	4.0	8.6	6.7	-		3-3	53	69			
8-15	3.0	1.2	tr	0.1	4.3	5.2	9.5	7.1	0.1		2.5	45	60			
15-21	3.5	1.5	tr	0.1	5.1	4.7	9.8	7.8	0.1		2.3	52	65			
21-28	3.9	2.0	0.1	0.2	6.2	5.8	12.0	8.8	0.2		34	52	70			
28-36	4.5	3.2	0.1	0.2	8.0	5.6	13.6	10.7	0.2		33	59	75			
36-45	6.0	4.8	0.1	0.3	11.2	6.1	17.3	13.3	0.2		36	65	84			
Depth (in.)	Ratios to Clay <u>8D1</u>			Ext. Iron	15-Bar Water	a. Fe-Mn nodules: > 50 percent (2-0.5 mm.); 5-25 percent (0.5-0.25 mm.). b. 9.3 kg/m ² to 45 inches (Method 6A). c. Estimated. d. 1/10-Bar (Method 4B1b).										
	NE ₄ OAc CBC	Ext. Iron	15-Bar Water													
0-8	0.71	0.09	0.45													
8-15	0.51	0.074	0.39													
15-21	0.49	0.076	0.41													
21-28	0.46	0.089	0.42													
28-36	0.42	0.067	0.38													
36-45	0.42	0.063	0.34													

Soil Type: Bates fine sandy loam

Soil No.: S62-Okl-32-4

Location: Hughes County, Oklahoma. About 140 feet east and 170 feet south of the northwest corner of Section 35, T8N, R9E.

Vegetation and Use: Tall grass prairie. Used as rangeland.

Slope and Land Form: Two percent slope on erosional upland.

Drainage and Permeability: Moderately permeable. Well drained. Medium runoff.

Parent Material: Noncalcareous sandstone of Pennsylvanian Age.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June 1962.

Described by: Karl C. Nance and Roscoe Long.

Horizon and

Lincoln

Lab. Number

- A11 0 to 8 inches. Dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; weak medium granular structure; very friable, slightly hard; many pores and roots; pH 6.5; diffuse boundary.
17120
- A12 8 to 15 inches. Dark brown (10YR 3/3) fine sandy loam, dark brown (10YR 4/3) dry; weak medium granular structure; very friable, slightly hard; many earthworm casts; pH 6.0; diffuse wavy boundary.
17121
- B1 15 to 21 inches. Dark brown (7.5YR 4/2) heavy fine sandy loam, brown (7.5YR 5/2) dry; moderate medium granular structure; very friable, slightly hard; pH 6.0; diffuse boundary.
17122
- B21t 21 to 28 inches. Brown (7.5YR 4/4) heavy loam, brown (7.5YR 5/4) dry; compound moderate coarse prismatic and moderate medium subangular blocky structure; friable, hard; sand grains are coated and bridged with clay films; pH 6.0; diffuse boundary.
17123
- B22t 28 to 36 inches. Strong brown (7.5YR 4/6) sandy clay loam; few medium prominent red mottles; strong brown (7.5YR 5/6) dry; moderate medium subangular blocky structure; friable, hard; sand grains are coated and bridged with clay films; pH 6.0; gradual boundary.
17124
- B3 36 to 45 inches. Yellowish brown (10YR 5/4) clay loam; common medium prominent red mottles and a few distinct light brownish gray mottles; light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; firm, hard; pH 6.5; clear wavy boundary.
17125
- R 45 to 51 inches. Yellowish red sandstone interbedded with strata of yellowish brown, gray, and reddish brown sandstone, sandy shale, and thin strata of siltstone; pH 6.5. Not sampled.

Notes: Colors refer to moist soil unless otherwise stated. The pH was determined in the field by a Hellige-Truog kit.

Mineralogy (Method 7B1): Observations on very fine sand.

All and B22t horizons: 90-95 percent quartz, less than 5 percent feldspar and less than 5 percent reddish brown aggregates; no ferromagnesian minerals.

SOIL SURVEY LABORATORY Lincoln, Nebr. Aug. 1958

SOIL TYPE Bethany silt loam LOCATION Oklahoma County, Oklahoma

SOIL NOS. S560kla-55-2 LAB. NOS. 5467-5473

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	MOISTURE TENSIONS		2A2 > 2	
0-10	Alp	-	0.1	0.2	1.2	17.6	66.4	14.5	69.7	15.3	-	sil
10-18	Al	-	0.1	0.1	0.9	13.5	64.9	20.5	61.3	17.8	-	sil
18-22	B1	0.1	0.3	0.2	0.9	9.2	58.3	31.0	47.2	21.0	-	sic1
22-40	B2	0.2	0.2	0.2	0.9	7.1	52.2	39.2	36.8	23.2	-	sic1
40-57	B3	0.9	0.7	0.4	1.3	9.6	48.6	38.5	38.9	20.2	-	sic1
57-64	C1	0.3	0.3	0.2	1.3	12.7	45.5	39.7	43.5	15.7	Tr.	sic1
64-76	C2	0.2	0.3	0.1	1.4	13.8	44.8	39.4	45.0	14.8	-	sic1
pH		ORGANIC MATTER				8A2	ELECTRI-CAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM 8A1a	6E1a	MOISTURE TENSIONS			4B2
8C1a	1:5	1:10	6A1a	6B1a	C/N	EST% SALT (BUREAU CUP)	CoCO ₃ equiv- alent	GYPSUM mg./100g. SOIL	1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.	
1:1			%	%			%		%	%	%	
6.2			0.97	0.083	12	<0.20	0.7	-			5.7	
6.5			0.89	0.075	12	<0.20	0.5	-			8.1	
6.9			0.61	0.053	12	<0.20	0.5	-			12.7	
7.5			0.44	0.036	12	<0.20	0.7	-			16.1	
8.1			0.16			<0.20	1.3	2			16.2	
7.9			0.11			<0.20	2.1	1			16.3	
7.6			0.08			<0.20	2.2	1			16.4	
5A1a	EXTRACTABLE CATIONS 5B1a					5D2	SATURATION EXTRACT SOLUBLE			8A		
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6H1a	6P2a	6Q2a	EXCH. Na	6F1a	6Q1a			MOISTURE AT SATURATION	
	Ca	Mg	H	No	K	meq/l	No	K			%	
	← milliequivalents per 100g. soil →						← milliequivalents per liter →					
11.7	7.4	2.6	3.9	0.1	0.4	1	1.2	0.3			39.1	
15.3	9.1	4.1	3.1	0.2	0.3	1	1.4	0.1			48.8	
21.9	11.4	8.3	3.6	0.8	0.4	3	3.0	0.1			53.2	
28.1	14.7	11.9	2.0	1.7	0.4	5	4.4	-			69.0	
26.8				2.4	0.4	7	8.3	-			77.7	
25.2				2.7	0.4	7	12.7	0.1			73.4	
23.0				2.7	0.4	7	13.6	-			77.4	

Soil Type: Bethany silt loam

Soil Nos.: S56Okla-55-2

Location: 330 feet south of farm driveway on quarter mile line in southwest quarter, Sec. 28, T11N, R#W, 25 feet east of road, Oklahoma County.

Site: Terrace of North Canadian River, slope is less than 1/2 percent.

Sampled by: W. E. Baumann, Fred Dries, John Chelf, and Dean McMurtry, May 7, 1956. Samples to 64-inch depth collected from sampling pit; for the 64- to 76-inch depth, a bucket-type auger was used.

Described by: W. E. Baumann and Fred Dries.

Horizon and
Lincoln
lab. No.

- A1p 5467 0 to 10 inches. Dark brown (7.5YR 4/2; 3/2 dry) silt loam; weak, fine granular; friable; roots plentiful; pH 6.5; rests abruptly on tillage shear contact.
- A1 5468 10 to 18 inches. Very dark grayish brown (10YR 3/2; 4/2 dry) heavy silt loam; moderate, medium granular; friable; clear boundary.
- B1 5469 18 to 22 inches. Dark grayish brown (10YR 4/2; 3/2 dry) moderately friable clay; slight gray coating on peds when dry; faint clay skins; moderate amount roots; abrupt boundary.
- B2 5470 22 to 40 inches. Very dark grayish brown (10YR 3/2 moist) clay; strong, medium blocky; plastic, wet; very firm, moist; very hard, dry; thick clay skins; occasional large roots; gradual boundary.
- B3 5471 40 to 57 inches. Dark brown (10YR 4/3 moist) clay; strong, medium blocky structure; very plastic; carbonate and Fe-Mn nodules are numerous; gradual boundary.
- C1 5472 57 to 64 inches. Dark brown (10YR 4/3 moist) clay mottled with reddish brown (5YR 4/4 moist); few pores; very firm; very slowly permeable; Fe-Mn nodules same as horizon above; gradual boundary.
- C2 5473 64 to 76 inches. Yellowish red (5YR 5/6 moist) clay mottling same as horizon above; sticky, wet; very firm, moist; very hard, dry.

OIL SURVEY LABORATORY Lincoln, Nebr. March 1960

OIL TYPE Carey LOCATION Custer County, Oklahoma
silt loam

SOIL NOS. S590k1a-20-1 LAB. NOS. 11458-11464

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND 2.1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02		0.02-0.002	
0-7	A1p	<0.1	0.2	0.2	6.9	34.5	39.4	18.8	68.1	12.2	-	1
7-17	B21	<0.1	0.1	0.2	6.1	29.8	40.9	22.9	60.8	15.6	-	1
17-23	B22	<0.1	0.2 a	0.3 a	8.2 a	35.0	33.6	22.7	63.8	12.4	Tr.	1
23-30	B3	0.2 b	0.4 b	0.4 c	7.4 a	39.1 a	31.5	21.0	66.2	11.2	Tr.	1
30-40	C1	0.6 b	0.4 b	0.3 c	7.2 a	40.4 a	34.2	16.9	69.1	12.3	Tr.	1
40-50	C2	0.2 b	0.3 b	0.2 c	6.6 a	41.1 a	36.6	15.0	70.9	13.1	Tr.	1
50-57	Cca	3.2 b	2.6 b	1.2 b	4.6 c	30.3 c	43.7	14.4	56.0	21.8	Tr.	1

DEPTH INCHES	pH 8C1a		ORGANIC MATTER			Free Iron % Fe ₂ O ₃ 6C1a	ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM @ 25°C	CE1a CaCO ₃ equiv. %	BULK DENSITY		MOISTURE TENSIONS	
	1:5	1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N				4A1h Oven-Dry g/cc	4A1c 30-cm g/cc	4B3 30-cm %	4B2 15-Bar %
	7.8	8.2	8.3	0.65	0.061				11	1.1	0.4	Δ
7.9	8.2	8.3	0.64	0.062	10	1.3	0.4	Δ				9.1
8.0	8.4	8.6	0.41	0.048	8	1.2	0.4	Δ				8.9
8.1	8.5	8.7	0.29	0.035	8	1.2	0.4	1	1.63	1.58	17.4	8.4
8.2	8.7	8.9	0.14			1.2	0.4	2				7.3
8.3	8.8	9.0	0.08			1.2	0.4	2	1.64	1.61	17.1	6.5
8.5	9.0	9.2	0.06			0.9	0.4	21				5.7

5A1a CATION EXCHANGE CAPACITY NH ₄ OAc	EXTRACTABLE CATIONS 5B1a					BASE SAT. % NH ₄ OAc EXCH.	Base Sat. % on Sum Cations	Sum Ext. Bases	Sum Ext. Cations	8D3 Ca/Mg	8A MOISTURE AT SATURATION %
	6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K						
	milliequivalents per 100g. soil										
12.2	9.8	3.4	1.0	<0.1	0.4	111	93	13.6	14.6	2.9	43.0
14.4	10.2	5.2	1.7	0.1	0.3	110	90	15.8	17.5	2.0	49.9
13.6		4.7	0.7	0.1	0.3						45.7
12.4				0.1	0.3						42.7
9.9				<0.1	0.2						42.4
8.8				0.1	0.2						43.7
6.3				0.1	0.2						36.8

a. Trace calcareous aggregates.
b. Many calcareous aggregates.
c. Few calcareous aggregates.

Soil Type: Carey silt loam. Described by: Louis E. Darr and John M. Allen.
 Area: Custer County, Oklahoma.
 Location: 7 miles north of Arapaho, Oklahoma. 950 feet north and 1,000 feet east of southwest corner of Sec. 13, T14N, R17W.
 Physiography: On a 3 1/2 percent south facing, terraced slope; 600 feet northwest of drainageway and 200 feet south of crest of ridge in an area of rolling uplands. Soil from plowed field in wheat stubble.
 Climate: 28 inches average annual precipitation; P-E index 42.
 Drainage: Well drained; runoff, medium; internal drainage, medium.
 Parent Material: Permian silty pack-sand beds.
 Soil Nos.: 59Okla-20-1

Lincoln

Laboratory No. and Horizon

11458	A _{1p}	0-7 inches	Reddish brown (5YR 4/4; 3/3, moist) silt loam; weak fine granular; very friable and soft; plowed boundary.
11459	B ₂₁	7-17 inches	Reddish brown (5YR 4/4; 3/4, moist) light clay loam; moderate medium and fine granular; many worm casts; friable and slightly hard; diffuse boundary.
11460	B ₂₂	17-23 inches	Reddish brown (5YR 4/4; 3/4, moist) light clay loam; moderate medium granular; few worm casts; friable and slightly hard; gradual boundary.
11461	B ₃	23-30 inches	Red (2.5YR 4/6; 3/4, moist) heavy loam; moderate to strong fine granular; friable, moist, and hard, dry; soil mass is calcareous and contains few (less than 1%) hard lime concretions; weak coarse prisms are filmed with dark stains; gradual boundary.
11462	Cl	30-40 inches	Red (2.5YR 4/6; 3/6, moist) loam; large, nearly vertical cleavage faces weakly coated with darker stains and lime films and blotches; few hard lime concretions and limy seams; no discernible boundary.
11463	C ₂	40-50 inches	Same as horizon above; gradual boundary.
11464	C _{ca}	50-57 inches	Red (2.5YR 5/6) loam coarsely mottled with many lime blotches (5YR 7/6); friable moist and sticky when wet; highly calcareous with many (25 percent) large, hard lime concretions.

Note: Dark colored Krotovinas common throughout profile.

SOIL SURVEY LABORATORY Lincoln, Nebr. March 1960

SOIL TYPE Carey LOCATION Custer County, Oklahoma
silt loam

SOIL NOS. S590k1a-20-2 LAB. NOS. 11465-11472

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	> 2			
		2.1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002		
0-7	Alp	0.1	0.2	0.3	2.0	28.8	50.4	18.2	69.6	11.0	-	s11/1
7-13	Al2	<0.1	0.1	0.2	1.8	26.7	52.1	19.1	68.5	11.6	-	s11
13-17	B21	0.1	0.1	0.2	1.9	25.9	52.0	19.8	67.7	11.6	Tr.	s11
17-25	B22	0.2a	0.2a	0.4a	2.2a	25.7 a	49.8	21.5	62.8	14.3	Tr.	1/s11
25-34	B31	0.5b	0.2b	0.3b	2.2b	22.1 a	52.2	22.5	60.0	15.9	Tr.	s11
34-41	B32	0.2b	0.4b	0.4b	1.8b	16.2 a	53.6	27.4	49.5	21.6	Tr.	s1e1/s11
41-48	Cca	0.9c	1.6c	1.2b	3.3b	13.1 b	56.1	23.8	40.4	30.8	Tr.	s11
48-58	C	0.8c	1.3c	1.0c	3.4b	13.8 b	58.5	21.2	42.5	32.0	Tr.	s11
	pH	ORGANIC MATTER				Free Iron	ELECTRICAL CONDUCTIVITY	CaCO ₃ equiv- alent	BULK DENSITY		MOIST. TENSIONS	
	8C1a	6A1a	6B1a		C/N	Fe ₂ O ₃	EC x 10 ³	%	4A1h	4A1c	4B3	4B2
	1:5	1:10	ORGANIC CARBON	NITRO-GEN		6C1a3	MILLIMHOS PER CM		Oven-Dry	30-cm	30-cm	15-Bar
			%	%					g/cc	g/cc	%	%
8.0	8.4	8.6	0.91	0.080	11	1.2	0.5	1	1.35	1.32	23.8	7.5
8.0	8.2	8.4	0.80	0.072	11	1.1	0.6	<1	1.32	1.28	21.9	7.9
8.0	8.2	8.4	0.73	0.071	10	1.2	0.5	<1	1.32	1.28	21.9	8.2
8.1	8.6	8.8	0.60	0.061	10	1.1	0.4	5	1.32	1.28	21.9	8.5
8.2	8.6	8.9	0.52			1.1	0.4	6	1.39	1.34	22.3	9.0
8.2	8.7	8.9	0.43			1.3	0.4	9	1.39	1.34	22.3	10.8
8.3	8.6	9.0	0.31			1.1	0.5	31				7.8
8.4	8.7	9.1	0.10			1.1	0.5	31				6.5
	5A1a	EXTRACTABLE CATIONS				5B1a	BASE SAT. %	Base Sat. %	Sum Ext. Cations	Sum Ext. Cations	Ca/Mg	8A MOISTURE AT SATURATION
	6N2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ OAc EXCH.						%
	Ca	Mg	H	Na	K							
	milliequivalents per 100g. soil					5C1	5C3	5B1a	5A3a	8D3		
14.1		1.8	0.5	<0.1	0.5							42.5
15.1	14.1	2.6	1.2	<0.1	0.4	113	93	17.1	18.3	5.4		47.3
15.3	14.0	3.5	0.7	<0.1	0.3	116	96	17.8	18.5	4.0		47.7
13.4				<0.1	0.3							45.8
13.7				0.1	0.3							48.4
16.4				0.1	0.3							52.0
9.5				0.1	0.2							45.2
7.4				0.1	0.2							39.8

- a. Trace calcareous aggregates.
- b. Few calcareous aggregates.
- c. Many calcareous aggregates.

Soil Type: Carey silt loam.

Described by: Louis E. Derr and John M. Allen.

Area: Custer County, Oklahoma

Location: 2 miles south of Butler, Oklahoma. 362 feet south and 137 feet west of the northeast corner of the southeast quarter of the southeast quarter of Sec. 11, T13N, R19W.

Physiography: On a slightly concave slope of 3 1/2 percent in rolling uplands. Soil is from field of plowed wheat stubble.

Drainage: Well drained; runoff, moderate; internal drainage, medium.

Parent Material: Silty Permian beds.

Climate: 26 inches average annual precipitation; P-E index 41.

Soil Nos.: S59Okla-20-2

Lincoln

Laboratory No. and Horizon

- 11465 A_{1p} 0-7 inches Dark reddish gray (5YR 4/2; 3/2, moist) silt loam; weak fine granular; very friable and soft; numerous fine roots; plowed boundary.
- 11466 A₁₂ 7-13 inches Dark reddish gray (5YR 4/2; 3/2, moist) loam; moderate fine granular with abundant worm casts; very friable and soft; numerous fine roots; gradual boundary.
- 11467 B₂₁ 13-17 inches Reddish brown (5YR 4/3; 3/3, moist) light clay loam; moderate fine granular with abundant worm casts; friable, moist, and slightly hard, dry; many fine roots; diffuse boundary.
- 11468 B₂₂ 17-25 inches Reddish brown (5YR 4/3; 3/3, moist) light clay loam; moderate to strong fine granular with many worm casts; friable, moist, and slightly hard, dry; soil mass is calcareous, segregated lime as faint films and streaks in lower part; many fine roots; gradual boundary.
- 11469 B₃₁ 25-34 inches Reddish brown (10YR 4/4; 3/4, moist) clay loam; weak fine granular with few worm casts; friable, moist, and slightly hard, dry; calcareous with very few, hard lime concretions about 10 mm. diameter, light lime films on few large cleavage planes; few fine roots; diffuse boundary.
- 11470 B₃₂ 34-41 inches Reddish brown (5YR 4/4; 3/4, moist) clay loam; weak fine granular; friable, moist and slightly hard, dry; calcareous with few, small (5 to 8 mm.), hard lime concretions (less than 1% of volume) and prominent lime films and streaks; few fine roots; clear boundary.
- 11471 C_{ca} 41-48 inches Light red (2.5YR 6/6; 4/6, moist) light silty clay loam mottled with lighter colored lime blotches (2.5YR 7/6); nearly structureless with no worm activity; friable, moist, and hard, dry; highly calcareous with few, coarse (1.5 to 2.5 cm) hard lime concretions; very few, fine roots; diffuse boundary.
- 11472 S 48-58 inches Light red (2.5YR 6/6; 4/6, moist) silty clay loam with lighter colored lime blotches; structureless and more dense than horizons above; slightly firm, moist, and hard, dry.

Note: Dark colored Krotovinas are common in horizons above 41 inches.

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Wagoner County, Oklahoma

SOIL TYPE Choteau silt loam

LAB NOS. 54155 - 54163

SOIL NOS. S5301a-73-21

LABORATORY NUMBER	DEPTH INCHES	HORIZON	1B1b PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)									3A1		TEXTURAL CLASS
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	INTERNATIONAL		2A2 > 2		
										II 0.2-0.02	III 0.02-0.002			
54155	0-5	A1p	1.8	1.4	1.0	7.5	17.6	61.7	9.0		11.0	0	sil	
54156	5-13	A11	1.1	1.3	0.9	6.3	15.9	62.3	12.2		13.8	0	sil	
54157	13-20	A12	1.4	1.5	0.9	5.8	15.1	61.9	13.4		14.7	Δ	sil	
54158	20-27	A21	1.2	1.2	0.8	5.6	15.1	60.7	15.4		15.8	Δ	sil	
54159	27-35	A22	1.4	0.8	0.6	4.7	13.7	60.3	18.5		17.4	Δ	sil	
54160	35-45	B21	1.4	1.3	0.6	3.7	10.1	48.8	34.1		14.7	Δ	sic1	
54161	45-62	B31	0.2	0.4	0.3	2.9	8.8	47.6	39.8		15.7	Δ	sic1	
54162	62-90	B32	0.5	0.8	0.5	3.8	9.2	46.7	38.5		16.2	Δ	sic1	
54163	90-100	C	0.4	0.8	0.5	4.9	10.5	44.3	38.6		18.3	0	sic1	

8C1a 1:1	pH		ORGANIC MATTER			EPPA IRON OXIDE Fe ₂ O ₃ %	BULK DENSITY g/cc	MOISTURE RETAINED AT		
			6A1a ORGANIC CARBON %	NITROGEN %	C/N			1/10 ATMOS. %	1/3 ATMOS. %	15 ATMOS. %
54155	6.9		0.87							
54156	5.2		0.78							
54157	4.9		0.43							
54158	4.9		0.28							
54159	5.3		0.15							
54160	6.2		0.17							
54161	6.4		0.09							
54162	6.1		0.08							
54163	5.0		0.04							

CATION EXCHANGE CAPACITY (SUM)	EXTRACTABLE CATIONS					BASE SATURATION % 503 (SUM)
	6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	5B1a H	
	milliequivalents per 100g soil					
54155	6.8	1.0	<0.1	0.2	1.9	81
54156	3.4	1.4	<0.1	0.1	4.8	51
54157	2.7	1.0	0.1	0.1	5.1	43
54158	2.2	1.2	0.3	0.1	5.0	43
54159	2.4	1.6	0.7	0.2	4.6	52
54160	6.1	4.3	2.4	0.2	5.6	70
54161	8.5	5.6	3.3	0.3	3.9	82
54162	9.0	6.2	3.7	0.3	3.9	83
54163	9.0	5.9	3.4	0.4	5.4	78

Choteau silt loam

Soil Nos. 8530la-73-21

Location: Wagoner County, Oklahoma; 5 miles southeast of Wagoner. 1170 feet south of the northwest corner Section 7, T16N; R19E.

Site: The site is in gently rolling, erosional upland on a convex surface with 2-1/2 percent surface gradient. It is in a terraced and cultivated field with no evidence of serious erosion. The surface is little, if any, thinned due to soil losses.

**Horizon, Depth
and Beltsville Lab. No.**

- Alp 0-5 Dark grayish brown (10YR 4.5/2; 4/2 when moist) silt loam; inches weak fine granular; very friable; permeable; pH 7.5; grades Lab No. 54155 shortly to horizon below.
- All 5-13 Dark grayish brown (10YR 4/2; 3.5/2 when moist) silt loam; inches weak medium and fine granular; friable; very porous and permeable; pH 6.0; grades to horizon below. Lab No. 54156
- A12 13-20 Light brownish gray (10YR 6/2; 4/2 when moist) silt loam much inches like the layer above in the upper part but becoming lighter colored below; pH 5.8; grades to layer beneath. Lab No. 54157
- A21 20-27 Pale brown (10YR 6/3; 4.5/3 when moist) silt loam with a few inches distinct coarse red mottles; weak medium and fine granular; very porous and permeable; fine, very dark brown, specks present, increasing in numbers in lower part; pH 5.8; grades to horizon beneath. Lab No. 54158
- A22 27-35 Light yellowish brown (10YR 6/4; 5/4 when moist) loam; porous inches massive; very friable; pin holes, short tubes and root holes numerous; some holes lined with clay films; pH 5.8. Contains Lab No. 54159 numerous tubes about 1/2 inch in diameter with ferruginous fillings, the centers of which are black, surrounded by yellowish red walls about 1/8 inch thick and further surrounded by pale brown loam which appears slightly lower in clay content than the matrix. Grades to horizon beneath.
- B21 35-45 Brownish yellow (10YR 6/8; 5/7 when moist) light silty clay inches with many coarse distinct reddish brown mottles and common Lab No. 54160 medium to coarse nearly black accretions; moderate medium subangular blocky, firm; slowly permeable; fine concretions few; small pores and rootlet holes many. The black accretions are arranged partly in vertical holes and appear as pipe stems. Pale brown dusts coat the peds in the upper 3 inches. Grades to horizon beneath.
- B31 45-62 Brownish yellow (10YR 6/6; 5/7 when moist) light silty clay inches with common, medium, distinct red, yellowish red, reddish Lab No. 54161 brown and light gray mottles and black accretionary iron spots; moderate medium subangular blocky, firm; slowly permeable; sides of peds coated with dark grayish brown films; pH 6.5; grades to horizon beneath.
- B32 62-90 Mottled yellowish brown (10YR 5/8; 4/8 when moist) and light inches gray (10YR 7/1; 6/1 when moist) silty clay with numerous, Lab No. 54162 fine distinct strong brown specks and a few black accretions; material much like the layer above; pH 6.5; grades to horizon beneath.
- C 90-100+ Mottled, strong brown (8YR 5/8; 4/8 when moist) and light- inches gray (2.5Y 7/2; 6/1.5 when moist) silty clay loam with a Lab No. 54163 few very dark brown films and fine black concretions; pH 6.5.

The parent materials appear to be altered Pleistocene loess deposited upon older alluvial materials forming a total thickness of 15 to 20 feet over underlying Pennsylvanian strata. The area occupies the sloping border of a relatively smooth alluvial terrace mantled with loess. The smoother, less dissected portions are occupied by Taloka soils. Profile development of Choteau (as of Taloka) has been affected by continuing accumulations of loess so that thicknesses of A horizons range from 18 to 40 or more inches. This profile represents about the average A horizon thickness as found in this county.

Samples collected by H. M. Galloway, R. W. Simonson and E. H. Templin. November 11, 1953. Described by H. M. Galloway.

Except where specified moist the colors refer to dry soils.

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Wagoner County, Oklahoma

SOIL TYPE Choteau silt loam

LAB NOS. 54181 - 54189

SOIL NOS. S53Okla-73-24

LABORATORY NUMBER	DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mic.) (per cent)									TEXTURAL CLASS	
			1B1b		3A1					2A2			
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002		INTERNATIONAL II III		
54181	0-7	A1p	1.1	1.0	0.8	19.5	26.4	43.3	7.9		9.2	<1	1
54182	7-17	A1	0.8	1.2	0.8	14.9	22.6	46.0	13.7		13.7	0	1
54183	17-26	A21	1.0	1.0	0.6	13.3	20.1	45.0	19.0		14.2	0	1
54184	26-31	A22	0.5	0.9	0.6	13.0	21.1	42.6	21.3		13.3	0	1
54185	31-41	B1	1.7	1.8	0.8	10.9	17.6	34.0	33.2		10.8	0	cl
54186	41-51	B21	0.5	0.6	0.4	11.0	19.5	33.0	34.4		10.0	0	cl
54187	51-68	B22	0.1	0.1	0.3	13.8	23.3	34.7	27.7		8.7	0	cl
54188	68-80	B3C	0.0	0.1	0.3	16.1	23.7	34.9	24.9		8.4	0	1
54189	80-100+		0.0	0.1	0.5	37.6	22.8	21.2	17.8		5.4	0	sl
		pH	ORGANIC MATTER			FREE IRON OXIDE				MOISTURE RETAINED AT			
8C1a			6A1a			Fe ₂ O ₃			BULK DENSITY	1/10	1/3	1c	
1:1			ORGANIC CARBON %	NITROGEN %	C/N	%			g/cc	ATMOS. %	ATMOS. %	ATMOS. %	
54181	5.4		0.40										
54182	5.2		0.39										
54183	5.2		0.24										
54184	5.4		0.18										
54185	6.4		0.20										
54186	6.8		0.15										
54187	7.3		0.10										
54188	7.4		0.07										
54189	7.2		0.05										
		CATION EXCHANGE CAPACITY (SUM)	EXTRACTABLE CATIONS 5B1a					BASE SATURATION % (SUM)					
			6N2b	6O2b	6P2a	6Q2a	6H1a						
			Ca	Mg	Na	K	H						
			milliequivalents per 100g soil										
54181		2.5	0.3	<0.1	0.2	3.7	45						
54182		2.4	0.4	0.2	0.2	5.1	38						
54183		2.9	0.8	0.8	0.2	5.9	44						
54184		2.4	1.1	1.2	0.2	6.2	44						
54185		6.6	5.4	2.8	0.3	6.0	72						
54186		7.5	5.9	3.2	0.3	5.3	76						
54187		6.9	5.1	2.9	0.3	2.3	87						
54188		6.6	4.9	2.5	0.3	2.1	87						
54189		4.7	3.4	1.6	0.2	2.8	78						

Choteau silt loam

Soil Nos. S530k1a-73-24

Location: Wagoner County, Oklahoma; 4 miles southwest of Wagoner. 520 feet west and 1300 feet north of the southeast corner Section 32, T17N; R10E.

Site: Gently rolling, convex sloping erosional upland with surface gradient of 2-1/2 percent. It is in a cultivated field on which corn was grown in 1953. Surface shows no evidence of soil loss due to erosion and is protected by an east-west fence row, roughly paralleling the slope contour nearby.

**Horizon, Depth
and Beltsville Lab. No.**

A1p	0-7 inches	Grayish brown (10YR 5/2; 4/2 when moist) silt loam; weak fine granular; very friable; permeable; pH 6.2; grades shortly to horizon below.
Lab No.	54181	
A1	7-17 inches	Dark grayish brown (10YR 4/2; 3/2 when moist) silt loam; moderate medium and fine granular; friable; permeable; fine pores, pin holes and worm casts numerous; pH 6.5; grades to horizon below.
Lab No.	54182	
A21	17-26 inches	Pale brown (10YR 6/3; 5/3 when moist) silt loam with occasional coarse mottles or splotches of yellowish brown (10YR 5/6; 4/6 when moist) weak medium granular; porous and permeable; pH 6.5 grades to horizon below.
Lab No.	54183	
A22	26-31 inches	Pale brown (10YR 7/3; 6/3 when moist) silt loam with common, coarse distinct yellowish brown and reddish brown mottles; porous massive; slightly hard when dry; permeable; medium and coarse, black concretions with light brown silty coatings numerous; pH 6.5; grades shortly to horizon below.
Lab No.	54184	
B1	31-41 inches	Pale brown (10YR 6/3; 5/3 when moist) silty clay loam with common coarse distinct reddish brown, yellowish brown and light gray mottles; weak medium subangular blocky; firm; slowly permeable; fine pores and black concretions numerous; accretionary iron in streaks from 1/2 to 1 inch wide; roots penetrate mass; pH 6.5; grades to horizon below.
Lab No.	54185	
B21	41-51 inches	Mottled, grayish brown (10YR 5/2; 4/2 when moist) yellowish brown (10YR 5/6; 4/6 when moist) and brown (10YR 5/3; 4/3 when moist) silty clay loam or light silty clay; compound weak medium blocky and moderate fine subangular blocky; firm; slowly permeable; black concretions numerous; streaks of black accretionary iron follow vertical cracks; fine distinct red specks common but scattered; pH 7.0; grades to horizon below.
Lab No.	54186	
B22	51-68 inches	Coarsely mottled, light gray (10YR 7/1; 6/1 when moist) brownish yellow (10YR 6.5/6; 6/6 when moist) brown or pale brown (10YR 4/3; 3/3 when moist) silty clay loam; weak medium subangular blocky; firm; porous and permeable; a few bands of sandy clay loam; pH 7.5; grades to horizon below.
Lab No.	54187	
B3C	68-80 inches	Light gray (10YR 7.5/2; 7/2 when moist) silty clay loam with occasional streaks or mottles of brownish yellow and dark brown; massive; porous and permeable; pH 7.5; grades quickly to horizon below.
Lab No.	54188	
C	80-100 + inches	Strong brown (7.5YR 5/6; 4/6 when moist) light sandy clay loam with streaks or bands of light gray silty clay loam; pH 7.0.
Lab No.	54189	

The parent materials seem to be altered loess of Pleistocene age which is some 10 feet thick over more sandy materials probably of alluvial origin. These are exposed at lower elevation about a quarter mile distant nearer the floodplain of the Verdigris River. Choteau develops on the sloping edges of the wide plain on which the Taloka is the principal soil. The thick A horizons, ranging from 16 to 40 or more inches, are probably due to a deposit of loess occurring as the soil profile formed and the lower part may be light colored because organic remains did not become incorporated into the entire thickness. Impeded drainage at the contact with the clayey subsoils is the likely cause of the pale colors of the lowest portion of the A horizon.

Samples collected by H. M. Galloway and D. J. Polone, December 9, 1953.
Described by H. M. Galloway.

Except where specified moist the colors refer to dry soil.

SOIL Cypressmoot loam (variant)* SOIL Nos. 8620k1a-45-1 LOCATION McGurtain County, Oklahoma

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 17126-17135 February 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1											Coarse fragments			
		Total		Sand					Silt				2A2 > 2	2-19	19-76	
		Sand (2-0.05) a	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)				(2-0.1)
Pct. of < 2 mm											Pct	Pct of < 76mm				
0-3	A1	25.6	65.4	9.0	0.1	0.3	1.0	9.9	14.3	38.7	26.7	60.0	11.3	-	-	-
3-10	A21	24.0	62.8	13.2	0.2	0.2	0.9	9.3	13.4	34.1	28.7	54.1	10.6	tr	-	-
10-16	A22	22.4	61.8	15.8	0.1	0.2	0.9	8.6	12.6	32.3	29.5	51.0	9.8	-	-	-
16-24	B1	21.6	62.3	16.1	0.2	0.3	0.9	8.4	11.8	30.6	31.7	48.4	9.8	tr	-	-
24-33	B21t	20.8	62.4	16.8	tr	0.2	0.9	8.0	11.7	30.5	31.9	48.0	9.1	tr	-	-
33-40	B22tg	21.4	65.0	13.6	tr	0.2	0.9	8.2	12.1	31.8	33.2	49.7	9.3	tr	-	-
40-46	B23tg	22.4	63.2	14.4	0.2	0.3	1.0	8.6	12.3	31.9	33.3	50.2	10.1	tr	-	-
46-56	B31g	21.6	60.2	18.2	0.1	0.3	1.0	8.5	11.7	30.3	29.9	48.0	9.9	tr	-	-
56-66	B32g	20.5	58.7	20.8	tr	0.3	1.0	7.9	11.3	31.5	27.2	48.4	9.2	tr	-	-
66-78	Cg	20.2	53.6	26.2	0.3	0.4	1.0	7.6	10.9	27.1	26.5	43.4	9.3	tr	-	-

Depth (in.)	6A1a Organic carbon b	6B1a Nitrogen	C/N	Carbonate as CaCO ₃	6C2a Ext. Iron as Fe	Bulk density			4D1 COLE	Water content				pH	8C1a (1,1) H ₂ O
						4A1a Field State	4A1c 30-cm.	4A1b Air Dry		4B1 Field State	4B3 30-cm.	4B1b 1/3-Bar	4B2 15-Bar		
	Pct.	Pct		Pct	Pct.	g/cc	g/cc	g/cc		Pct	Pct.	Pct	Pct.	in/in.	
0-3	0.83	0.051	17		0.6	1.50	1.49	1.52	0.007	19.4	19.2	20.6d	4.5		4.6
3-10	0.17	0.020			0.8		1.5c					16.2	5.4		4.6
10-16	0.16	0.025			0.9	1.54	1.50	1.56	0.014	19.5	23.3	22.4	6.4	0.24	4.6
16-24	0.10	0.022			0.9		1.5c					21.7	6.5		4.6
24-33	0.10	0.022			1.0	1.58	1.54	1.64	0.020	21.1	22.8	19.4	6.9	0.19	4.7
33-40	0.21				0.9	1.60	1.56	1.61	0.010	22.2	23.9	21.4	5.8	0.24	4.8
40-46	0.13				1.0	1.65	1.64	1.68	0.007	20.9	21.0	19.2	6.0	0.22	4.9
46-56	0.12				1.0		1.6c					19.9	8.1		5.0
56-66	0.14				1.3		1.7c					22.4	9.9		4.9
66-78	0.06				1.8								12.0		4.8

Depth (in.)	Extractable bases 5B1a				6B1a Ext. Acidity	Cat. Sum	5A3a NH ₄ OAc	5A1a NH ₄ OAc	6C1b Ext. Al	5A3b Bases Plus Al mg/100g Clay	8D3 Ca/Mg	Base saturation	
	6M2a Ca	6O2a Mg	6P2a Na	6Q2a K								Sum	5C3 Sum Cations
					meq/100g							Pct	Pct
0-3	1.2	0.5	tr	0.1	1.8	6.5	8.3	5.4	1.2	33		22	33
3-10	0.5	0.5	tr	0.1	1.1	6.9	8.0	5.8	3.3	33		14	19
10-16	0.3	0.6	0.1	0.1	1.1	8.0	9.1	6.7	4.4	35		12	16
16-24	0.4	0.6	0.1	0.1	1.2	7.8	9.0	6.7	4.1	33		13	18
24-33	0.4	0.5	0.1	0.1	1.1	8.3	9.4	7.0	4.4	33		12	16
33-40	0.4	0.5	0.1	0.1	1.1	6.9	8.0	6.0	3.2	32		14	18
40-46	0.3	0.4	0.2	0.1	1.0	7.0	8.0	6.1	3.6	32		12	16
46-56	0.5	0.5	0.4	0.1	1.5	9.2	10.7	8.0	4.5	33		14	19
56-66	1.3	1.0	0.9	0.1	3.3	9.8	13.1	10.2	4.9	39	1.3	25	32
66-78	3.3	1.7	1.5	0.2	6.7	9.8	16.5	13.2	4.7	44	1.9	41	51

Depth (in.)	Ratios to Clay 8D1			
	NH ₄ OAc CBC	Sum Cations CBC	Ext. Iron	15-Bar Water
0-3	0.60	0.92	0.07	0.50
3-10	0.44	0.61	0.06	0.41
10-16	0.42	0.58	0.06	0.40
16-24	0.42	0.56	0.06	0.40
24-33	0.42	0.56	0.06	0.41
33-40	0.44	0.59	0.07	0.43
40-46	0.42	0.56	0.07	0.42
46-56	0.44	0.59	0.06	0.44
56-66	0.49	0.63	0.06	0.48
66-78	0.50	0.63	0.07	0.46

a. Fe-Mn nodules: > 50 percent (2-0.5 mm.); 5-25 percent (0.5-0.25 mm.).
 b. 4.1 kg/m² to 60 inches (Method 6A).
 c. Estimated.
 d. 1/10-Bar (Method 4B1b).

Soil Type: Cypremort loam (variant)*

Soil No.: S62-Okla-45-1

Location: McCurtain County, Oklahoma. About 100 feet west and 600 feet north of the southeast corner of Section 14, T8S, R25E.

Vegetation and Use: Forest of loblolly pine, shortleaf pine, sweetgum, blackgum and a few water oak. Used as commercial forest.

Slope and Land Form: Slope is 0.5 percent on a nearly level terrace.

Drainage and Permeability: Somewhat poorly drained. Permeability slow. Runoff slow.

Parent Material: Loamy sediments of Pleistocene age.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June 1962.

Described by: Earl C. Nance and Robert Reasoner.

Horizon and

Lincoln

Lab. Number

- 0 About one inch of decaying pine needles and grass. Not sampled.
- A1 0 to 3 inches. Brown (10YR 5/3) loam; few fine distinct yellow brown mottles; very pale brown (10YR 7/3) dry; weak medium platy breaking to weak fine granular structure; very friable, slightly hard; pH 5.6; gradual boundary.
- 17126
- A21 3 to 10 inches. Yellowish brown (10YR 5/4) loam; common fine and medium distinct light brownish gray mottles; light yellowish brown (10YR 6/4) dry; weak medium subangular blocky breaking to granular structure; very friable, slightly hard; pH 5.5; diffuse boundary.
- 17127
- A22 10 to 16 inches. Separated for sampling purposes. This horizon is similar to the A21 horizon.
- 17128
- B1 16 to 24 inches. Yellowish brown (10YR 5/6) light silty clay loam; many medium and coarse distinct light brownish gray mottles; brownish yellow (10YR 6/6) dry; weak medium subangular blocky structure; very friable, hard; few small reddish brown concretions; pH 4.7; diffuse boundary.
- 17129
- B21t 24 to 33 inches. Light brownish gray (10YR 6/2) silty clay loam; many medium and coarse prominent yellowish brown mottles, and a few medium distinct brown mottles; light gray (10YR 7/2) dry; weak medium and coarse subangular blocky structure; friable, very hard; few brown concretions; pH 4.7; diffuse boundary.
- 17130
- B22tg 33 to 40 inches. The same as the B21t horizon except that this horizon also has a few peds that are slightly brittle; the boundary is clear and irregular.
- 17131
- B23tg 40 to 46 inches. The same as the B21t horizon except that this horizon also has a few gray mottles; slightly brittle peds are common (approaching a weak fragipan); subangular blocks have moderate strength; gradual boundary.
- 17132
- B31g 46 to 56 inches. Light gray (10YR 6/1) silty clay loam; many coarse prominent light brownish gray, dark yellowish brown, and strong brown mottles; white (10YR 8/1) dry; moderate medium and coarse subangular blocky structure; friable, very hard; few patchy clay films; sand grains appear coated; pH 4.7; diffuse boundary.
- 17133
- B32g 56 to 66 inches. Same as B31g horizon. Separated for sampling purposes.
- 17134
- Cg 66 to 78 inches. Light gray (10YR 6/1) heavy clay loam; many coarse distinct yellowish brown (10YR 5/4 to 10YR 5/8) mottles; massive structure; firm, very hard; occasional reddish brown small concretions; pH 5.0.
- 17135

Notes: Colors are for moist soil unless otherwise stated. The field determination of pH was made with a Hellige-Truog kit.

Mineralogy (Method 7B1): Observations on very fine sand.

A1, B22tg and Cg horizons: 90-95 percent quartz, less than 5 percent feldspar and a trace of ferromagnesian minerals; iron oxide staining of quartz is common in Cg horizon.

SOIL Cypressport loam (variant)* SOIL No. 862Okla-45-2 LOCATION McCurtain County, Oklahoma

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 17136-17143 February 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm) <u>3A1</u>											Coarse fragments				
		Total											2A2				
		Sand					Silt						> 2	2-19	19-76		
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Vary coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	Pct.	Pct. of < 76mm		
0-5	A1	13.4	76.1	10.5	tr	0.1	0.4	5.2	7.7	33.1	43.0	44.8	5.7	-			
5-12	A21	40.1	50.6	9.3	0.2	0.3	0.8	17.3	21.5	31.0	19.6	66.0	18.6	tr			
12-20	A22	38.8	48.1	13.1	0.1	0.2	0.8	17.0	20.7	28.5	19.6	62.4	18.1	tr			
20-33	B1	36.0	46.9	17.1	0.2	0.2	0.8	15.8	19.0	27.3	19.6	58.5	17.0	tr			
33-47	B21t	34.2	45.5	20.3	0.2	0.3	0.8	14.8	18.1	25.9	19.6	55.5	16.1	tr			
47-61	B22tg	37.1	46.4	16.5	0.3	0.7	1.0	15.8	19.3	26.2	20.2	57.7	17.8	tr			
61-68	B3g	35.8	42.9	21.3	0.6	0.8	1.0	15.4	18.0	24.5	18.4	54.3	17.8	tr			
68-78	Cg	31.7	39.2	29.1	0.3	0.4	0.7	13.3	17.0	22.7	16.5	49.9	14.7	tr			

Depth (in.)	6A1a Organic carbon	6B1a Nitrogen	C/N	Carbonate as CaCO ₃	6C2a Exct. Iron as Fe Pct.	Bulk density			Water content			pH
						g/cc	g/cc	g/cc	Pct.	Pct.	Pct.	
0-5	2.16	0.120	18		0.4						6.1	8C1a (1:1) H ₂ O
5-12	0.21	0.024			0.6						4.1	5.6
12-20	0.16	0.023			0.6						5.3	4.9
20-33	0.10	0.020			0.7						6.3	4.8
33-47	0.06				0.9						8.4	4.7
47-61	0.06				0.9						6.9	4.9
61-68	0.06				1.1						9.1	4.9
68-78	0.06				1.2						12.9	4.7

Depth (in.)	Extractable bases				6B1a Exct. Acidity	6A3a Sum	5A1a NH ₄ OH	6B1b Exct. Al	5A36 Bases Plus Al me/100g Clay	8D3 Ca/Mg	Base saturation	
	6A2a Ca	6A2a Mg	6A2a Na	6A2a K							5C3 Sum Cations	5C1 NH ₄ OH CEC
0-5	5.5	1.1	tr	0.4	7.0	6.8	13.8	9.6	tr	67	5.0	51 73
5-12	0.9	0.8	0.1	0.1	1.9	3.9	5.8	4.0	0.7	28		33 48
12-20	1.2	1.1	0.1	0.1	2.5	4.9	7.4	5.4	1.4	30	1.1	34 46
20-33	1.4	1.5	0.1	0.2	3.2	6.8	10.0	7.0	2.0	30	0.9	32 46
33-47	1.6	1.7	0.1	0.2	3.6	7.1	10.7	8.0	2.5	30	0.9	34 45
47-61	1.0	1.2	0.2	0.2	2.6	5.7	8.3	6.6	2.4	30	0.8	31 39
61-68	1.4	1.8	0.4	0.2	3.8	7.6	11.4	9.3	3.5	34	0.8	33 41
68-78	2.9	3.8	0.8	0.2	7.7	8.2	15.9	13.8	3.6	39	0.8	48 56

Depth (in.)	Ratios to Clay <u>8D1</u>			
	NH ₄ OAc CEC	Sum Cations CEC	Ext. Iron	15-Bar Water
0-5	0.91	1.31	0.04	0.58
5-12	0.43	0.62	0.06	0.44
12-20	0.41	0.56	0.05	0.40
20-33	0.41	0.58	0.04	0.37
33-47	0.39	0.53	0.04	0.41
47-61	0.40	0.50	0.05	0.42
61-68	0.44	0.54	0.05	0.43
68-78	0.47	0.55	0.04	0.44

a. Fe-Mn nodules: > 50 percent (2-0.5 mm.); 5-25 percent (0.5-0.25 mm.).

Soil Type: Cypremort loam (variant)*

Soil No.: S62-Okla-45-2

Location: McCurtain County, Oklahoma. In timber, about 1830 feet east and 60 feet north of the half mile line on the west side of Section 21, T9S, R26E (Horizons A1 through the C were sampled.)

Vegetation and Use: Forest of loblolly pine, shortleaf pine, sweetgum, blackgum and a few water oak. Used as commercial forest.

Slope and Land Form: Slope is 0.5 percent on a nearly level terrace.

Drainage and Permeability: Somewhat poorly drained. Runoff slow. Permeability slow.

Parent Material: Loamy sediments of Pleistocene Age.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June, 1962.

Described by: Earl C. Nance and Robert Reasoner.

Horizon and

Lincoln

Lab. Number

- 0 About one inch of decaying leaves and grass.
- A1 0 to 5 inches. Dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak medium platy breaking to weak fine granular structure; very friable, slightly hard; pH 6.0; clear boundary.
17136
- A21 5 to 12 inches. Brown (10YR 5/3) loam; few fine faint yellowish brown mottles; very pale brown (10YR 7/3) dry; compound weak medium subangular blocky breaking to weak medium granular structure; very friable, slightly hard; pH 5.5; diffuse boundary.
17137
- A22 12 to 20 inches. Separated for sampling purposes. Same as A21.
17138
- B1 20 to 33 inches. Yellowish brown (10YR 5/4) light silty clay loam; many medium and coarse distinct light brownish gray mottles, and a few yellowish brown mottles; very pale brown (10YR 7/4) dry; weak medium subangular blocky structure; very friable, hard; pH 5.2; diffuse boundary.
17139
- B21t 33 to 47 inches. Light brownish gray (10YR 6/2) silty clay loam; many medium and coarse prominent yellowish brown mottles, and a few gray mottles; light gray (10YR 7/2) dry; weak coarse subangular blocky structure; few slightly brittle peds in lower part of horizon; friable, very hard; pH 5.0; diffuse boundary.
17140
- B22tg 47 to 61 inches. Light gray (10YR 6/1) silty clay loam; many coarse prominent yellowish brown mottles; light gray (10YR 7/1) dry; slightly brittle peds are common (approaching a weak fragipan); moderate medium subangular blocky structure; friable, very hard; pH 5.0; diffuse boundary.
17141
- B3g 61 to 68 inches. Light gray (10YR 6/1) silty clay loam; many medium and coarse distinct and prominent yellowish brown and brown mottles; white (10YR 8/1) dry; moderate medium subangular blocky structure; friable, hard; sand grains are coated with clay films; a few brittle peds are present; pH 5.0; diffuse boundary.
17142
- Cg 68 to 78 inches. Coarsely mottled light gray and yellowish brown heavy clay loam; massive structure; firm, hard; pH 5.2.
17143

Notes: Colors refer to moist soil unless otherwise stated. The field determination of pH was made with a Hellige-Truog kit.

Mineralogy (Method 7B1): Observations on very fine sand.

A1, B22tg and Cg horizons: 90-95 percent quartz, less than 5 percent feldspar and a trace of ferromagnesian minerals; iron oxide staining of quartz is common in Cg horizon.

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Pawnee County, Oklahoma

SOIL TYPE Dennis loam

LAB NOS. 54220 - 54227

SOIL NOS. S530k1a-59-37

LABORATORY NUMBER	DEPTH INCHES	HORIZON	1B1b PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)							3A1			TEXTURAL CLASS	
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	INTERNATIONAL		2A2 > 2		
										II 0.2-0.02	III 0.02-0.002			
54220	0-10	A11	0.1	0.5	0.7	13.7	23.1	39.3	22.6		13.1	0	1	
54221	10-16	A12	0.6	0.9	0.7	12.7	21.2	38.2	25.7		13.9	0	1	
54222	16-23	B1	1.1	1.0	0.7	9.6	19.3	39.1	29.2		15.0	0	c1	
54223	23-30	B21	0.8	1.0	0.7	8.3	15.1	42.4	31.7		17.9	0	c1	
54224	30-37	B22	0.1	0.5	0.5	8.2	16.8	41.9	32.0		16.3	0	c1	
54225	37-43	B3	0.1	0.4	0.6	8.9	18.2	41.4	30.4		15.9	0	c1	
54226	43-62	C1	0.1	0.4	0.5	11.0	20.8	37.9	29.3		13.0	0	c1	
54227	62-100+	C2	0.2	0.4	0.4	9.3	21.1	38.6	30.0		12.6	< 1	c1	
			pH		ORGANIC MATTER			FREE IRON OXIDE Fe ₂ O ₃			MOISTURE RETAINED AT			
			8C1a 1:1		6A1a ORGANIC CARBON %	NITROGEN %	C/N			BULK DENSITY g/cc	1/10 ATMOS. %	1/3 ATMOS. %	5 ATMOS. %	
54220	5.2				1.55									
54221	5.2				1.13									
54222	5.4				0.69									
54223	5.6				0.54									
54224	5.7				0.35									
54225	5.9				0.25									
54226	6.1				0.16									
54227	6.5				0.11									
			CATION EXCHANGE CAPACITY (SUM)	EXTRACTABLE CATIONS 5B1a					BASE SATURATION % 5C3 (SUM)					
			6N2b Ca	6O2b Mg	6P2a K	6Q2a Na	6H1a H							
			milliequivalents per 100g soil											
54220			6.7	2.8	0.3	0.1	8.1	55						
54221			7.0	3.0	0.3	0.1	7.1	59						
54222			7.8	3.8	0.3	0.1	7.9	60						
54223			8.5	4.4	0.4	0.4	6.6	67						
54224			8.0	4.3	0.4	0.1	5.8	69						
54225			7.6	4.4	0.4	0.1	4.9	72						
54226			7.2	3.8	0.4	0.2	3.9	75						
54227			9.1	3.3	0.4	0.2	3.1	81						

Dennis loam Soil Nos. 853Okla-59-37

Location: Pawnee County, Oklahoma; 1 mile northeast of Hallett and 7 miles southwest of Cleveland. 800 feet east of the north quarter-corner Section 4, T20N; R7E, 0.4 mile east of Oklahoma Highway 99.

Site: Gently sloping erosional upland with convex surfaces and gradient of about 3 percent. The site is in a native bluestem meadow with a thick, vigorous growth of grasses.

**Horizon, Depth and
Beltsville Lab. No.**

All	0-10 inches Lab No. 54220	Dark grayish brown (10YR 3.5/2; 2/2 when moist) silt loam; moderate medium granular; friable; worm casts and holes few; pH 6.0; grades to horizon below.
A12	10-16 inches Lab No. 54221	Dark grayish brown (10YR 4/2; 3/2 when moist) light clay loam; moderate medium granular; friable; permeable; worm holes and casts numerous and pockets of worm casts fill small former root channels; pH 6.0; grades to horizon below.
B1	16-23 inches Lab No. 54222	Brown (9YR 4/3; 3.5/2 when moist) silty clay loam with common, medium distinct reddish brown and strong brown mottles; compound strong medium granular and weak medium subangular blocky; firm; hard when dry; permeable; fine and medium black concretions and pores numerous; fine roots penetrate mass; pH 6.0; grades to horizon below.
B21	23-30 inches Lab No. 54223	Yellowish brown (9YR 5/5; 4/5 when moist) silty clay with common, medium and coarse distinct brownish yellow and strong-brown mottles; moderate medium subangular blocky; firm; hard when dry; slowly permeable; medium and coarse black concretions numerous; fine rounded siltstone chips few; vertical cracking pronounced; pH 6.0; grades to horizon below.
B22	30-37 inches Lab No. 54224	Brown (7.5YR 5/4; 4/4 when moist) silty clay coarsely mottled with yellowish red and yellowish brown; moderate medium subangular blocky; firm; slowly permeable; black concretions numerous; small chips of reddish brown sandstone few; slightly sandier and more mottled with depth; vertical cracks common; pH 6.0; grades to horizon below.
B3	37-43 inches Lab No. 54225	Coarsely mottled pale brown (10YR 6/3; 5/3 when moist) yellowish red, (5YR 4/6; 3/6 when moist) and reddish brown (5YR 4/4; 3/4 when moist) sandy clay; massive to weak blocky; firm; slowly permeable; black concretions few; coarse streaks of accretionary films 4 to 8 inches long follow vertical cracks; pH 6.0; grades to horizon below.
C1	43-62 inches Lab No. 54226	Coarsely mottled pale brown, (10YR 6/3; 5/3 when moist) brown (10YR 5/3; 4/3 when moist) and yellowish red (5YR 4/6; 3/6 when moist) sandy clay; weak coarse blocky; firm; slowly permeable; chips of soft sandstone and seams of silty clay and sandstone common; pH 6.5; grades to horizon below.
C2	62-100+ inches Lab No. 54227	Red (2.5YR 5/6; 4/6 when moist) silty clay shale with seams of pale brown (10YR 6/3; 5/3 when moist) sandy shale; contains a few chips of harder sandstone and changes little to greatest depth sampled; pH 6.5.

The parent material of this soil is intercalated soft shales and sandy shales of the Buck Creek formation of the Wabunsee group of Pennsylvanian Age. Nearby on sandier materials of the prominent escarpments are areas of Collinsville and Talihina soils. On gentle slopes nearby are small spots of Parsons. Alluvial soils of the nearby drainageway are brown members of the Port series.

Samples collected by H. M. Galloway November 23, 1953. Described by H. M. Galloway.

Except where specified moist, the colors refer to dry soil.

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Wagoner County, Oklahoma

SOIL TYPE Dennis silt loam

LAB NOS. 54147 - 54154

SOIL NOS. S53Okla-73-20

LABORATORY NUMBER	DEPTH INCHES	HORIZON	1.B1b PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)							3A1			TEXTURAL CLASS	
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	INTERNATIONAL		2A2 (> 2 < 76mm)		
									II 0.2-0.02	III 0.02-0.002				
54147	0-12	A11	1.4	2.3	1.7	6.3	12.7	55.8	19.8		18.8	0	sil	
54148	12-16	A3	1.4	2.3	1.3	4.6	11.3	55.6	23.5		18.8	0	sil	
54149	16-26	B1	3.1	2.0	1.0	3.8	9.6	49.1	31.4		19.1	0	sic1	
54150	26-31	B2	1.3	0.9	0.6	2.5	6.9	44.9	42.9		20.3	0	sic	
54151	31-40	B3	1.5	1.4	0.9	2.6	6.5	45.0	42.1		21.2	0	sic	
54152	40-54	C1	0.9	2.0	1.1	3.2	6.8	42.9	43.1		19.4	0	sic	
54153	54-72	C2	1.5	2.1	0.8	2.8	6.4	45.0	41.4		19.8	0	sic	
54154	72-90+	C3	2.2	3.1	1.1	3.2	6.9	46.9	36.6		21.0	0	sic1	
		pH		ORGANIC MATTER			IRON OXIDE				MOISTURE RETAINED AT			
		8C1a 1:1		6A1a ORGANIC CARBON %		NITROGEN %	C/N	Fe ₂ O ₃ %			BULK DENSITY g/cc	1/10 ATMOS. %	1/3 ATMOS. %	15 ATMOS. %
54147	5.4			1.48										
54148	5.4			1.13										
54149	5.6			0.74										
54150	5.8			0.49										
54151	5.9			0.31										
54152	6.3			0.18										
54153	6.6			0.17										
54154	6.6			0.07										
		EXTRACTABLE CATIONS 5B1a					BASE SATURATION							
		CATION EXCHANGE CAPACITY (SUM)	6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	6H1a H	5C3 (SUM)						
		milliequivalents per 100g soil												
54147		7.3	2.7	0.2	0.2	7.8	57							
54148		7.5	2.8	0.4	0.2	7.6	59							
54149		9.0	3.1	0.6	0.3	7.6	63							
54150		11.4	4.6	1.0	0.3	7.9	69							
54151		12.4	5.0	1.1	0.3	7.1	72							
54152		14.5	5.8	1.4	0.4	6.0	79							
54153		14.6	6.6	1.4	0.3	4.5	84							
54154		12.9	6.2	1.3	0.3	3.7	85							

Dennis silt loam

Soil Nos. S53Okla-73-20

Location: Wagoner County, Oklahoma; 3-1/2 miles northwest of Wagoner. 600 feet east and 250 feet north of the southwest corner, Section 29, T18N; R18E. Near right-of-way of the Missouri-Pacific Railroad.

Site: Gently sloping, erosional upland with a convex surface and gradient of 1-1/2 percent. The area is a native bluestem meadow of good vigor and density.

**Horizon, Depth
and Beltsville Lab. No.**

All	0-12 inches	Very dark grayish brown (10YR 3/2; 2/2 when moist) silt loam; moderate fine and medium granular; friable; porous and permeable; pH 6.0; grades to horizon below.
Lab No.	54147	
A3	12-16 inches	Very dark grayish brown (10YR 3/2; 2/2 when moist) heavy silt loam; moderate fine and medium granular; friable porous and permeable; a few fine reddish brown specks occur around root-let channels and fine pores; pH 6.0; grades to horizon below.
Lab No.	54148	
B1	16-26 inches	Grayish brown (10YR 5/2; 4/2 when moist) silty clay loam with common, medium, distinct reddish brown and strong brown mottles; moderate, medium subangular blocky to coarse granular; friable to firm; fine black concretions and rounded siltstone fragments few; pH 6.0; grades to horizon below.
Lab No.	54149	
B2	26-31 inches	Grayish brown (10YR 5/2; 4/2 when moist) silty clay with many medium, distinct reddish brown, strong brown and yellowish brown mottles; moderate medium subangular blocky; firm; slowly permeable; fine black concretions and rounded siltstone fragments few; pH 6.0; grades to horizon below.
Lab No.	54150	
B3	31-40 inches	Grayish brown (10YR 5/2; 4/2 when moist) silty clay with many distinct, coarse yellowish brown and reddish brown mottles; compound weak coarse prismatic and moderate medium subangular blocky; firm; slowly permeable; fine rounded siltstone fragments few; many coarse, prominent very dark brown accretions arranged partly in vertical pattern following the natural cracks; pH 6.0; grades to horizon below.
Lab No.	54151	
C1	40-5 inches	Grayish brown (10YR 5/2; 4/2 when moist) clay with many coarse distinct yellowish brown mottles weak blocky; firm; hard when dry, plastic when wet; fine rounded siltstone fragments few; fine concretions and medium to coarse accretions numerous; pH 6.0; grades to horizon below.
Lab No.	54152	
C2	54-72 inches	Light brownish gray (10YR 6/2; 5/2 when moist) light clay with many coarse, distinct yellowish brown mottles and common, medium to coarse black concretions and accretions forming rounded pockets; weak blocky; firm; hard when dry, plastic when wet; pH 7.0. This is only partially altered shale.
Lab No.	54153	
C3	72-90+ inches	Mottled brownish yellow (10YR 6.7; 5/8 when moist) and gray (10YR 6/1; 5/1 when moist) light clay with a few medium concretions and soft, black accretions forming pockets in the mass. This is weakly blocky, partially altered shale of neutral reaction.
Lab No.	54154	

The parent materials are slightly acid to neutral sandy shales, sandstones and intercalated clayey shales of Pennsylvanian age. Associated with it nearby are small areas of Parsons soils on areas of nearly level relief while the hilly lands to the north and south are occupied by Collinsville and Talihina soils. Dennis develops in materials of intermediate texture averaging about silty clay loam or light clay. Parsons forms in more clayey beds on gentle slopes and flats. Bates soils form in sandier beds on sandy clay loam parent materials.

Samples collected by H. M. Galloway, R. W. Simonson and E. H. Templin November 11, 1953. Described by H. M. Galloway.

Except where specified moist the colors refer to dry soil.

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Wagoner County, Oklahoma

SOIL TYPE Dennis loam

LAB NOS. 54173 - 54180

SOIL NOS. S53Okl-73-23

LABORATORY NUMBER	DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)								3A1			TEXTURAL CLASS
			1B1b		PARTICLE SIZE DISTRIBUTION				INTERNATIONAL		2A2			
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VEPY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	II 0.2-0.02	III 0.02-0.002	> 2 (<76mm)		
54173	0-11	A1	1.5	2.2	1.3	8.8	11.4	50.0	24.8		22.3	0	sil/1	
54174	11-17	A3	6.5	4.6	1.3	6.9	9.4	41.7	29.6		20.3	6	cl	
54175	17-24	B1	4.4	2.4	0.8	5.0	7.9	38.3	41.2		21.6	4	c	
54176	24-32	B21	3.4	2.1	0.8	5.4	7.4	40.8	40.1		24.8	4	sic/c	
54177	32-42	B22	4.8	2.6	0.9	5.4	7.2	38.9	40.2		23.7	3	c	
54178	42-54	B3C	3.6	1.9	0.9	5.5	7.0	36.9	44.2		22.5	4	c	
54179	54-76	C1	2.5	1.9	0.9	4.9	6.5	37.9	45.4		24.6	5	c	
54180	76-90+	C2	7.3	3.7	1.6	5.9	6.4	34.5	40.6		22.2	15	c	

LABORATORY NUMBER	DEPTH INCHES	pH	ORGANIC MATTER			FREE IRON OXIDE Fe ₂ O ₃ %	BULK DENSITY g/cc	MOISTURE RETAINED AT		
			6A1a ORGANIC CARBON %	NITROGEN %	C/N			1/10 ATMOS. %	1/3 ATMOS. %	15 ATMOS. %
54173	5.4		1.73							
54174	5.4		1.03							
54175	5.4		0.65							
54176	5.6		0.35							
54177	5.9		0.28							
54178	6.5		0.20							
54179	7.0		0.17							
54180	7.2		0.16							

LABORATORY NUMBER	CATION EXCHANGE CAPACITY (SUM)	EXTRACTABLE CATIONS 5B1a					BASE SATURATION % (SUM)
		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	6H1a H	
54173	8.0	3.0	<0.1	0.2	8.7	56	
54174	6.9	3.1	0.1	0.2	8.7	54	
54175	7.5	4.2	0.4	0.2	9.9	55	
54176	6.9	4.3	0.5	0.2	7.9	60	
54177	7.4	4.8	0.8	0.2	7.0	65	
54178	10.1	6.4	1.1	0.3	5.3	77	
54179	11.5	7.0	1.2	0.3	3.6	85	
54180	11.6	7.1	1.3	0.3	3.7	84	

Dennis loam

Soil Nos. 8530-1a-73-23

Location: Wagoner County, Oklahoma; 7 miles northwest of Wagoner near right-of-way of Missouri-Pacific Railroad. 930 feet south and 100 feet east of the northwest corner Section 7, T18N; R18E.

Site: In gently sloping, erosional upland with surfaces convex and surface gradient about 2-1/2 percent. It is in a native meadow with a thick, vigorous growth of bluestem.

**Horizon, Depth
and Beltsville Lab. No.**

A1	0-11 inches	Dark grayish brown (10YR 4/2; 3/2 when moist) silt loam; moderate medium granular; friable; permeable; pores and worm casts numerous; pH 6.5; grades to horizon beneath.
Lab No.	54173	
A3	11-17 inches	Dark grayish brown (10YR 4/2; 3/2 when moist) light silty clay loam with a few, faint brown specks or mottles; strong medium granular; friable; slightly hard when dry; permeable; fine black concretions, worm casts and root holes numerous; fine roots well distributed; pH 6.5; grades to horizon beneath.
Lab No.	54174	
B1	17-24 inches	Grayish brown (10YR 5/2; 4/2 when moist) light clay with common medium and fine, distinct yellowish brown, strong brown and reddish brown mottles; strong medium and fine subangular blocky; firm; slowly permeable; fine black concretions abundant; roots well distributed; pH 6.5; grades to horizon beneath.
Lab No.	54175	
B21	24-32 inches	Light yellowish brown (10YR 6/4; 5/4 when moist) light clay with many, medium prominent brownish yellow and strong brown mottles; strong medium and fine subangular blocky; firm; slowly permeable; fine black concretions and chips of weathered siltstone few; sides of peds weak shiny; pH 6.5; grades to horizon beneath.
Lab No.	54176	
B22	32-42' inches	Light brownish gray (10YR 6/2; 5/2 when moist) clay with numerous medium to coarse, prominent yellowish brown and strong brown mottles; compound weak coarse blocky and moderate fine subangular blocky; firm; slowly permeable; medium and coarse black concretions numerous; a few chips of siltstone and sandstone; accretionary iron appears as occasional coarse, dark, vertical streaks; pH 6.5; grades to the horizon beneath.
Lab No.	54177	
B3C	42-54 inches	Light brownish gray (10YR 6/2; 5/2 when moist) clay with many distinct, coarse mottles of yellowish brown and brownish yellow; weak coarse blocky; very firm; very slowly permeable; coarse black vertical streaks of accretionary iron numerous; peds coated with dark grayish brown films; roots follow sides of, and root hairs penetrate the peds; pH 6.5; grades to horizon beneath.
Lab No.	54178	
C1	54-76 inches	Mottled, grayish brown (10YR 5/2; 4/2 when moist) yellowish brown (10YR 5/6; 4/6 when moist) and brownish yellow (10YR 6.5/6; 6/6 when moist) firm clay shale or clay beds; weak blocky; chips of soft, brown sandstone and streaks of light gray shale common; pH 7.0; becomes less firm and slightly sandier in lower part and grades to horizon beneath.
Lab No.	54179	
C2	76-90 + inches	Mottled, grayish brown, yellowish brown and brownish yellow clay much like that above but less compact; occasional thin bands of sandy shale or sandstone; black concretions and rounded chips of soft sandstone common; pH 7.5; little change to the greatest depth sampled. Appears to be only slightly altered clay beds or clayey shales.
Lab No.	54180	

The parent material is of soft clayey shales and subsidiary sandstones of the Winslow formation of early Pennsylvanian age, usually neutral to slightly acid in reaction. This profile occurs in a gently rolling upland in which the most conspicuous features are sandstone-capped escarpments and ridges 50 to 100 feet high occupying the interstream divides. These are occupied by areas of Collinsville and Talihina soils. Dennis develops on broad areas with convex slope and gradients from 1 to 5 or 6 percent and to some extent on colluvium in slightly concave, foot-slope position. In narrow valleys and upland flats usually on the most clayey members of the rocks, Parsons soils develop. Within 200 feet of the sample site on a low knoll a small area of Collinsville soil occurs.

Samples collected by H. M. Galloway and D. J. Polone December 9, 1953.
Described by H. M. Galloway.

Except where specified moist the colors refer to dry soil.

SOIL SURVEY LABORATORY Lincoln, Nebr. Aug. 1958

SOIL TYPE Dougherty LOCATION Payne County, Oklahoma
loamy fine sand

SOIL NOS. S560k1a-60-1 LAB. NOS. 5474-5479

DEPTH INCHES	HORIZON	1B1a PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										2A2 > 2	TEXTURAL CLASS
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	3A1				
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002			
0-6	A1	-	2.1	19.3	41.7	17.5	17.3	2.1	49.2	4.2	-	lfs	
6-22	A2	-	2.5	22.7	45.9	16.2	11.6	1.1	44.5	3.3	-	lfs	
22-30	B2	-	0.9	10.4	39.9	18.9	5.2	24.7	45.3	2.2	-	scl	
30-38	B31	-	1.5	13.1	42.8	24.2	4.6	13.8	51.6	1.5	-	lsl	
38-56	B32	-	2.2	23.3	45.4	17.6	2.9	8.6	39.4	1.2	-	ls	
56-72+	C	-	2.4	29.6	40.9	21.3	4.0	1.8	43.3	0.4	-	s	
pH		ORGANIC MATTER				8A2	ELECTRICAL CONDUCTIVITY	6E1a		MOISTURE TENSIONS			
8C1a		6A1a		6B1a	C/N	EST% SALT (BUREAU CUP)	EC x 10 ³ MILLIMOS PER CM	CoCO ₂ equiv- alent	GYPSUM mg./100g. SOIL	1/10	1/3	4B2	
1:1		1:5	1:10	ORGANIC CARBON %						NITRO-GEN %	ATMOS. %	ATMOS. %	15 ATMOS. %
6.7			0.38	0.031	12	<0.20	0.4	-				1.8	
6.1			0.07	0.008		<0.20	0.4	-				0.6	
4.9			0.15	0.013		<0.20	0.2	-				8.4	
5.0			0.05			<0.20	0.2	-				4.7	
5.0			0.04			<0.20	0.2	-				2.7	
5.6						<0.20	0.3	-				0.6	
5A1a		EXTRACTABLE CATIONS				5B1a	8A1 SATURATION		EXTRACT SOLUBLE			8A	
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6P1a	6P2a	6Q2a	BASE SAT. % NH ₄ Ac EXCH.	6P1a	6Q1a			MOISTURE AT SATURATION		
	Ca	Mg	H	Na	K		Na	K					
← milliequivalents per 100g. soil →						5C1	← milliequivalents per liter →				%		
2.8	1.8	0.2	-	-	0.1	75	0.3	0.3			28.5		
1.2	0.5	0.1	-	-	0.1	58	0.3	0.1			25.8		
10.4	1.6	3.2	6.6	0.1	0.3	50	0.7	0.2			54.4		
6.0	0.2	1.8	4.2	-	0.2	37	0.5	0.2			36.6		
3.7	-	0.8	3.1	-	0.1	24	0.6	0.2			30.8		
1.1	-	0.2	0.8	-	-	18	0.6	0.1			28.3		

Soil Type: Dougherty loamy fine sand

Location: 420' south of north line of SW corner of Sec. 27, T19N, R5E, Payne County, Oklahoma

Sampled: May 11, 1956; description by Haggett and Fred Dries.

Topography: Gradient, rolling topography, 5 to 8 percent slope; aeolian deposits from Cimarron River.

Use: Virgin conditions, woodland; cover of blackjack and postland. Undercover of buck brush and some tall grasses.

Cultivated Crops: Rye and vetch, peanuts and grain sorghums.

Soil Nos: 856Okl-60-1

Lincoln
Laboratory No.

and Horizon			
5474	A ₁	0-6 inches	Grayish brown (10YR 5/2; 3/2 moist) loamy fine sand, structureless, friable, rapidly permeable, pH 6.0, gradual grade to horizon below.
5475	A ₂	6-22 inches	Very pale brown (10YR 7/3; 5/3 moist) loamy fine sand, structureless, friable, rapidly permeable, pH 6.0, abrupt change to horizon below.
5476	B ₂	22-30 inches	Red (2.5YR 4/8; 4/6 moist) heavy silty clay, weak medium granular, moderately permeable, very hard when dry, roots abundant, some clay skins, gradual change to horizon below.
5477	B ₃₁	30-38 inches	Red (2.5YR 5/8; 5/8 moist) light sandy clay loam, weak fine granular, permeable, friable, roots abundant, gradual change to horizon below.
5478	B ₃₂	38-56 inches	Red (2.5YR 5/8; 6/8 moist) fine sandy loam, structureless, friable, permeable, diffuse boundary.
5479	C	56-72 inches	Reddish yellow (7.5YR 6/6) fine sand, structureless, rapidly permeable.

SOIL TYPE Ford LOCATION Comanche County, Oklahoma
silty clay loam

SOIL NOS. 85901a-16-1 LAB. NOS. 11450-11457

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)							3A1		TEXTURAL CLASS	
		1B1a		2A1			SILT	CLAY	2A2	> 2		
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND						
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.07	0.02-0.002		
0-8	Ap	0.2 a	0.8 a	0.6 a	2.7	14.1	60.0	21.6	53.3	23.0	-	sll
8-14	B21	0.2 a	0.5 a	0.4 a	1.7	9.4	45.4	42.4	35.9	20.3	-	sic
14-21	B22	1.3 b	1.4 b	0.7 c	2.5 c	10.9 c	49.6	33.6	39.3	23.2	-	sic1
21-30	Bca1	1.6 b	1.6 b	0.8 c	2.9 c	10.0 c	49.4	33.7	40.3	21.5	Tr.	sic1
30-44	Bca2	1.6 b	1.2 b	0.7 d	3.0 c	10.0 c	48.3	35.2	37.1	23.7	Tr.	sic1
44-54	B3	0.9 d	1.3 d	0.8 d	3.6 c	11.6 c	47.4	34.4	39.1	22.9	Tr.	sic1
54-64	B1	0.7 d	1.3 d	0.7 d	3.8 c	13.0 c	47.4	33.1	41.9	21.7	Tr.	sic1/cl
64-70	C2	0.7 d	1.4 d	0.9 d	4.5 c	14.4 c	46.9	31.2	43.5	21.6	Tr.	cl

pH	ORGANIC MATTER					Free Iron Fe ₂ O ₃ 6C1a	ELECTRI- CAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM 25°C	6E1a CaCO ₃ equiv- alent %	Bulk Density		Moist. Tensions	
	8C1a		6A1a	6E1a	4A1h				4A1c	4B3	4B2	
	1:5	1:10	ORGANIC CARBON %	NITRO- GEN %	C/N				Oven - Dry	30-cm	30-cm	15-Bar
6.6	7.4	7.6	0.59	0.055	11	0.7	0.6	Δ	1.73	1.48	25.6	8.6
7.7	8.6	8.9	0.70	0.067	10	0.9	1.0	Δ				17.5
8.3	9.2	9.4	0.37	0.038	10	0.6	1.9	4				13.8
8.2	8.9	9.4	0.21	0.022		0.6	2.8	3	1.71	1.55	20.9	13.5
8.1	8.9	9.2	0.14			0.6	4.9	3				14.2
7.9	8.6	8.9	0.08			0.8	5.5	Δ				14.0
8.0	8.8	9.1	0.06			0.8	4.6	Δ	1.77			14.0
8.1	9.0	9.4	0.04			0.8	4.5	3				13.5

5B1a CATION EXCHANGE CAPACITY NE ₁ OAc	EXTRACTABLE CATIONS					5D2 EXCH. No %	8A1 SATURATION EXTRACT SOLUBLE					8A MOISTURE SAT- URATION %	
	6N2b	6O2b	6H1a	6P2a	6Q2a		6P1a	6Q1a	6J1a	6K1a	6L1a		
	Ca	Mg	H	Na	K		Na	K	HCO ₃	Cl ⁻	SO ₄		
17.0						7	4.2	0.1					33.2
31.8	8.8	5.6	3.1	1.3	0.4	12	7.9	0.1					63.8
23.9	16.8	13.1	2.4	4.2	0.5	15	14.6	0.1					62.5
24.2				4.5	0.4	18	22.8	0.1					64.6
25.4				5.8	0.4	18	37.6	0.1	2.8	22.0	27.0		67.0
24.6				7.2	0.4	18	42.4	0.1	2.8	24.9	31.0		63.2
22.6				7.1	0.4	24	36.6	0.1	3.5	28.6	15.5		65.8
21.0				7.8	0.4	20	35.5	0.1	1.9	27.8	12.6		69.3

- a. Few (Fe-Mn?) concr.
- b. Few (Fe-Mn?) concr.; many calcareous aggregates.
- c. Trace calcareous aggregates.
- d. Few (Fe-Mn?) concr.; few calcareous aggregates.

Soil Type: Foard silty clay loam - Described by: Louis E. Derr and John M. Allen.
Area: Comanche County, Oklahoma.

Location: 2 miles northeast of Chattanooga, Oklahoma. 67 feet east and 950 feet north of southwest corner of Sec. 23, T1S, R14W.

Physiography: Nearly level, smooth slope of less than 1 percent on large upland.

Drainage entrenched about 15 feet deep is 800 feet to south.

Vegetation: Soil from field of recently plowed wheat stubble.

Climate: 29 inches average annual precipitation; P-E index 43.

Drainage: Moderately well drained; runoff, medium; internal drainage, slow.

Parent Material: Permian beds of fine texture.

Soil Nos.: S59Okla-16-1

Lincoln

Laboratory No.

and Horizon

11450	A _p	0-8 inches	Grayish brown (10YR 5/2; 3/2, moist) light silty clay loam; surface tends to plate and is vesicular; nearly structureless or puddled; friable, moist, and hard, dry; abrupt, plowed boundary.
11451	B ₂₁	8-14 inches	Dark grayish brown (10YR 4/2; 3/2, moist) clay; moderate medium and fine subangular blocky with darkened faces on upper 1 inch; firm and very hard; thin continuous clay films; slickenside faces not prominent; clear wavy boundary; horizon 6 to 12 inches.
11452	B ₂₂	14-21 inches	Dark grayish brown (10YR 4/2; 3/3, moist) clay; weak medium subangular blocky; very firm and very hard; soil mass is calcareous and segregated lime in soft concretions and blotches are about 2 percent of volume; few fine black pellets; gradual boundary.
11453	B _{ca1}	21-30 inches	Dark grayish brown (10YR 4/2; 3/3, moist) silty clay; massive; very firm and very hard; hard and soft lime concretions are 3 percent of volume; diffuse boundary.
11454	B _{ca2}	30-44 inches	Same color, texture, and structure as above; lime content less than above; black pellets and salt seams and blotches are common; diffuse boundary.
11455	B ₃	44-54 inches	Light brown (7.5YR 6/4; 5/4, moist) silty clay loam mottled with gray and black blotches; weak to moderate medium subangular blocky; firm and very hard; many black pellets 2 mm. diameter; gradual boundary.
11456	C ₁	54-64 inches	Light brown (7.5YR 6/4; 5/4, moist) clay loam mottled gray spots and many black blotches; vertical seams of gray clay are 2 to 3 inches wide and extend into horizon below; weak, coarse blocky with few slickenside faces; diffuse boundary.
11457	C ₂	64-70 inches	Same color, texture and structure as above; large lime blotches are common; soil is more compact and appears to be less weathered "red beds" material.

SOIL SURVEY LABORATORY Lincoln, Nebr. March 1960

SOIL TYPE Board LOCATION Cotton County, Oklahoma
silt loam

SOIL NOS. S5901a-17-2 LAB. NOS. 11442-11449

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)								3A1		TEXTURAL CLASS
		1B1a	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)						2A2	> 2		
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	0.2-0.02	0.02-0.002		
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002		
0-9	Ap	1.0a	3.2a	3.1a	3.7	10.9	62.5	15.6	53.9	21.6	-	s1l
9-17	B21	0.6a	2.1a	2.1a	2.5	6.1	42.6	44.0	33.2	16.9	-	s1c
17-22	B22	0.9a	2.2a	2.5a	2.7	6.0	43.7	42.0	31.8	19.4	-	s1c
22-29	Bca1	1.1b	2.5b	2.5b	2.7c	8.0c	47.2	36.0	33.1	23.5	-	s1cl
29-38	Bca2	1.2b	2.4b	1.8b	2.2c	7.6c	48.1	36.7	32.0	24.9	-	s1cl
38-48	B31	1.6b	2.2b	1.3b	1.7c	7.1c	48.2	37.9	30.8	25.5	Tr.	s1cl
48-56	B32	1.2b	2.1b	1.4b	2.0c	7.7c	47.6	38.0	30.9	25.6	Tr.	s1cl
56-66	C	1.5b	2.6b	1.5b	2.1c	7.8c	47.0	37.5	31.0	25.1	-	s1cl

pH	8C1a			ORGANIC MATTER			Free Iron % Fe ₂ O ₃ 6C1a	ELECTRICAL CONDUCTIVITY EC·10 ³ MILLIMHOS PER CM 6A1a	6E1a	BULK DENSITY MOISTURE TISSONS			
	1:5	1:10	ORGANIC CARBON 6A1a	NITROGEN 6B1a	C/N	4A1h				4A1c	4B3	4B2	
			%	%				CoCO ₃ equiv- -ent %	Dry g/cc	g/cc	%	%	
6.4	6.9	7.0	0.59	0.051	12	0.7	0.6		1.70	1.42	26.5	5.6	
7.7	8.4	8.6	0.78	0.074	10	1.2	0.9	Δ	1.83	1.65	19.6	17.5	
7.9	8.7	8.9	0.61	0.059	10	1.2	1.4	Δ	1.83	1.65	19.6	16.8	
8.2	9.1	9.4	0.36	0.032	11	0.9	3.0	4	1.83	1.65	19.6	14.6	
8.2	9.0	9.4	0.21			0.8	4.5	3	1.83	1.65	19.6	14.7	
8.0	8.8	9.1	0.17			0.9	6.0	3	1.87	1.65	20.2	15.0	
8.0	8.8	9.3	0.10			1.1	6.0	4	1.87	1.65	20.2	15.2	
8.1	8.9	9.4	0.05			1.3	5.8	8	1.87	1.65	20.2	14.7	

5A1a CATION EXCHANGE CAPACITY NH ₄ OAc	EXTRACTABLE CATIONS 5B1a					5D2 EXCH. No %	SATURATION EXTRACT SOLUBLE 8A					
	6N2b Ca	6O2b Mg	6H1a N	6P2a Na	6Q2a K		6P1a No	6Q1a K	6J1a HCO ₃ ⁻	6K1a Cl ⁻	6L1a SO ₄ ⁼	MOISTURE AT SATURATION %
	milliequivalents per 100g. soil						milliequivalents per liter					
10.8	6.3	3.1	2.9	0.6	0.4	5	3.3	0.1				28.6
30.3	18.6	10.9	2.5	3.8	0.5	11	6.8	0.1				59.4
30.4	18.2	11.7	1.5	4.5	0.4	12	10.6	0.1				66.1
24.2				5.8	0.4	18	22.2	0.1				65.5
25.1				7.4	0.4	20	35.5	0.1	2.1	28.3	13.9	66.6
25.9				8.0	0.4	19	47.2	0.1	2.1	34.8	28.2	65.6
26.2				8.5	0.4	21	46.1	0.1	2.1	41.1	18.0	66.2
26.1				8.1	0.4	20	44.0	0.1	1.4	39.4	16.3	69.0

a. Common (Fe-Mn?) concr.
b. Few (Fe-Mn?) concr.; few calcareous aggregates.
c. Trace calcareous aggregates.

Soil Type: Foard silt loam Described by: Louis E. Derr and John M. Allen.
 Area: Cotton County, Oklahoma.
 Location: 5 miles west and 2 1/4 miles north of Emmerson, Oklahoma. 100 feet east and 1,320 feet north of southwest corner of Sec. 11, T2S, R13W.
 Physiography: Nearly level upland with a smooth slope of less than 1 percent gradient.
 Vegetation: Soil from field of plowed wheat stubble.
 Climate: 29 inches average annual precipitation, P-E index h3.
 Drainage: Moderately well drained; runoff, medium; internal drainage, slow.
 Parent Material: Permian beds of fine texture.
 Soil Nos.: 859Okl-17-2

Lincoln
 Laboratory No.
 and Horizon

11442	A _p	0-9 inches	Brown (10YR 5/3; 3/3, moist, to 7.5YR 5/2; 3/2, moist) silt loam; weak fine granular; friable and slightly hard; vesicular near surface; plowed boundary.
11443	B ₂₁	9-17 inches	Dark brown (7.5YR 4/2, dry; 2/2, moist) clay; slightly redder with depth; strong, medium angular blocky with darkened faces in upper 2 inches; very firm and very hard; thin clay films are continuous and slickenside faces are common; fine roots predominantly between peds; gradual, wavy boundary; horizon 5 to 11 inches thick.
11444	B ₂₂	17-22 inches	Dark brown (7.5YR 4/2; 3/2, moist) clay; moderate medium subangular blocky; very firm and very hard; thin patchy clay films; slickensides common; a little medium and coarse sand evident; few fine roots between peds; clear, wavy boundary.
11445	B _{ca1}	22-29 inches	Dark brown (7.5YR 4/4; 3/4, moist) clay; weakly blocky; very firm and very hard; slickenside faces less common and weaker than above; segregated lime in soft concretions and blotches about 2 percent of volume of soil mass and soil mass is calcareous. Diffuse boundary.
11446	B _{ca2}	29-38 inches	Brown (10YR 5/3; 4/3, moist) light silty clay; very weakly blocky to massive; very firm and very hard; lime concretions and blotches about as above; fine salt veinlets are common; gradual boundary.
11447	B ₃₁	38-48 inches	Brown (7.5YR 5/2; 4/2, moist) silty clay; very weak coarse subangular blocky with few, weak slickenside faces; firm and very hard; lime concretions and salt veins are less numerous than horizon above; finely mottled with reddish colors around larger sand grains; gradual boundary.
11448	B ₃₂	48-56 inches	Yellowish red (5YR 5/6; 4/6, moist) light silty clay; distinct fine mottles of gray and brown colors; weakly blocky with slickenside faces more common; firm and very hard; medium and coarse sand more common than above; diffuse boundary.
11449	C	56-66 inches	Yellowish red (5YR 4/6 to 4/8) silty clay mottled with gray and black blotches; moderately blocky with slickenside faces common; very firm.

SOIL SURVEY LABORATORY Lincoln, Nebr. Aug. 1958

SOIL TYPE Grant LOCATION Alfalfa County, Oklahoma
silt loam

SOIL NOS. 8560kla-2-2 LAB. NOS. 5442-5446

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						2A2
		VERY COARSE SAND 2.1	COARSE SAND 1.0-5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002 (< 19µm)	> 2		
0-6	Alp	6.4	9.2	5.2	4.6	13.1	50.1	11.4	57.9	7.0	2	sil	
6-20	Al	9.7	10.7	4.4	3.4	10.2	43.5	18.1	46.8	8.0	4	1	
20-28	B1	7.2	10.7	4.3	3.5	12.1	40.1	22.1	45.8	7.6	2	1	
28-34	B2	28.5	16.3	5.2	3.7	7.5	25.0	13.8	29.1	4.6	10	cosl	
34-72	C	29.3	20.0	9.3	5.1	6.8	20.9	8.6	25.1	4.1	13	cosl	
pH		ORGANIC MATTER				8A2	ELECTRI- CAL CONDUCT- IVITY EC=10 ³ MILLIMOS PER CM @ 25°C	6E1a	MOISTURE TENSIONS				
8C1a	1:5	1:10	6A1a ORGANIC CARBON	6B1a NITRO- GEN	C/N	EST% SALT (BUREAU CUP)	CoCO ₂ equiv- alent	GYPSUM mg./100g. SOIL	1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.		
	1:1		%	%			%		%	%	%		
	6.0		0.51	0.045	11	<0.20	0.5	-			4.0		
	7.2		0.54	0.043	12	<0.20	0.5	-			6.8		
	7.9		0.36	0.039	9	<0.20	0.6	-			8.0		
	8.1		0.24			<0.20	0.8	-			5.5		
	8.1		0.14			<0.20	0.9	1			3.9		
5A1a	EXTRACTABLE CATIONS					5B1a	SATURATION		EXTRACT SOLUBLE		8A		
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K	BASE SAT. % NH ₄ Ac EXCH.	6P1a Na	6Q1a K			MOISTURE AT SATU- RATION		
	milliequivalents per 100g. soil					5C1	milliequivalents per liter				%		
7.8	4.3	2.0	1.9	-	0.4	86	0.6	0.4			32.7		
11.9	7.7	3.2	1.2	0.1	0.3	95	0.5	0.1			40.4		
12.9	9.3	3.8	0.4	0.1	0.3		0.7	0.1			39.9		
8.8	6.8	3.1	0.8	0.1	0.2		1.0	0.1			29.3		
5.7	5.9	2.3	0.4	0.1	0.1		1.5	0.1			24.0		

Soil Type: Grant silt loam

Soil Nos.: S560kla-2-2

Location: 0.3 mile east and 100 feet north of the southwest corner of Sec. 15, T26N, R11W, Alfalfa County, Oklahoma. The sample was collected approximately one-half mile east of the Wheatland Experiment Station in Alfalfa County.

Topography: Gently to moderately sloping, erosional upland. The slope gradient in the field from which this sample was collected is approximately 3 percent.

Drainage: Free to excessive from the surface with good internal drainage. Moderately high moisture-holding capacity.

Vegetation: Originally tall prairie grasses (dominantly bluestems, Indiangrass, and switchgrass). A very high percent of this soil is currently used for the production of wheat.

Described by: Louis E. Derr.

Horizon and

Lincoln

Lab. No.

Alp 5442	0 to 6 inches. Dark brown (10YR 4/3; 3/3, moist) silt loam; weak very fine granular structure when moist, platy when dry; pH 6.5; abrupt boundary (tillage or shear line).
Al 5443	6 to 20 inches. Dark brown (7.5YR 4/2; 3/2, moist) silt loam; medium, fine and very fine granular structure; very friable, thoroughly reworked by insects; pH 6.5; gradual boundary.
B1 5444	20 to 28 inches. Dark brown (7.5YR 4/2; 3/2, moist) clay loam; moderate, medium granular structure; friable; no clay skins; neutral; gradual boundary.
B2 5445	28 to 34 inches. Yellowish red (5YR 5/6; 4/6) clay loam; moderate medium granular structure; friable; structure not visible when moisture conditions approximate field capacity; pH 8.
C 5446	34 to 72 inches. Yellowish red (5YR 5/8; 5/6, moist) loam; granular structure; friable; a small percent of fine and medium quartz gravels are present; this is not the weakly consolidated sandstone that makes up the C horizons of many of the Grant soils.

Remarks: The geology of the area is somewhat obscure. The underlying rocks appear to be Cedar Hill sandstone (a soft, weakly consolidated sandstone of the Permian formation) with a thin Pleistocene or younger mantle over most of the landscape. Deep strata in this mantle contain large quantities of medium and coarse gravel, locally used for road gravel. pH by Hellige-Truog test.

SOIL SURVEY LABORATORY Lincoln, Nebr. Aug. 1958

SOIL TYPE Grant silt loam LOCATION Alfalfa County, Oklahoma

SOIL NOS. S56Okla-2-20 LAB. NOS. 5480-5487

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						2A2
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002 (<19mm)	> 2		
0-8	Alp	1.7	2.2	1.3	1.6	15.0	64.8	13.4	68.9	11.8	Tr.	sil	
8-16	A1	0.4	1.8	1.4	1.6	12.8	62.8	19.2	63.3	13.2	Tr.	sil	
16-22	AB	0.9	2.4	1.7	1.8	12.8	58.1	22.3	59.7	12.2	Tr.	sil	
22-32	B2	0.7	3.2	2.2	2.4	12.7	54.7	24.1	56.6	12.1	Tr.	sil	
32-42	B3C	3.8	8.5	4.9	5.5	14.5	37.5	25.3	46.0	8.9	1	1	
42-50	C	4.3	8.7	6.0	6.6	14.4	35.2	24.8	43.7	9.3	1	1	
50-64	B2b	3.4	7.4	4.6	3.9	11.9	41.5	27.3	44.2	11.1	2	cl	
64-78+	Cb	6.0	10.0	4.7	4.0	12.5	39.7	23.1	45.1	8.6	5	1	

8C1a	pH		ORGANIC MATTER			8A2	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM	6E1a	MOISTURE TENSIONS		
	1:5	1:10	6A1a ORGANIC CARBON %	6B1a NITRO-GEN %	C/N	EST% SALT (BUREAU CUP)	CoCo ₃ equiv-ent	GYPSUM mg./100g. SOIL	1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.
							8A1a	%		%	%
6.0			0.89	0.078	11	<0.20	0.4	-			5.4
7.3			0.64	0.054	12	<0.20	0.6	-			7.2
7.6			0.55	0.051	11	<0.20	0.8	-			8.3
7.6			0.48	0.047	10	<0.20	0.6	-			9.0
7.3			0.35			<0.20	0.7	-			9.8
7.2			0.31			<0.20	0.8	-			9.2
7.3			0.30			<0.20	0.6	-			10.8
7.8			0.15			<0.20	0.9	1			9.0

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					5B1a	BASE SAT. % NH ₄ Ac EXCH.		8A1 SATURATION EXTRACT SOLUBLE		8A
	6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K	BASE SAT. % NH ₄ Ac EXCH.	6P1a Na	6Q1a K			MOISTURE AT SATURATION
	milliequivalents per 100g. soil					5C1	milliequivalents per liter				%
9.8	5.0	2.3	3.5	-	0.8	83	0.3	0.8			35.4
13.3	9.0	3.1	2.3	-	0.5	95	0.4	0.3			48.6
14.7	10.7	4.5	1.6	0.1	0.5		0.6	0.2			49.3
15.7	10.6	5.0	1.2	0.1	0.5		0.5	0.2			47.6
16.0	9.6	5.9	1.6	0.1	0.5		0.7	0.2			48.8
15.8	9.2	6.2	2.0	0.1	0.5		1.0	0.2			48.8
17.2	9.7	7.0	1.2	0.2	0.5		0.9	0.2			49.7
13.5	8.3	5.9	1.2	0.2	0.4		1.7	0.2			45.4

Soil Type: Grant silt loam

Described: April 25, 1956 by William Tucker and Harry Galloway

Location: Wheatland Conservation Experiment Station at Cherokee, Alfalfa County, Oklahoma. Sample from east side of NE $\frac{1}{4}$ of Sec. 16, T26N, R11W in "no treatment" gypsum plot series.

Slope and gradient: Slope is weak, concave, gradient about 2 $\frac{1}{2}$ %; terraced.

Remarks: In wheat 1956. Disc-plowed in July 1955 and spring toothed twice in fall of 1955. Sowed in October. A shear zone appears at about 1 inch. There is a second shear zone at about 2 inches and third at about 3 inches, both a result of spring tothing. The lowest shear zone, at about 8 inches, is a result of disc plowing.

Soil Nos.: S56Okla-2-20

Lincoln

Laboratory No.
and Horizon

5480	A _{1p}	0-8 inches	Brown (7.5YR 5/3; 4/3 moist) silt loam; nearly structureless; slightly hard, dry; friable, moist; fibrous wheat roots concentrate in the upper 2 inches and run laterally across faces of compacted zones, which occur roughly at 1, 2, 3 and 8 inches; grades to the layer below; pH 6.2.
5481	A ₁	8-16 inches	Dark brown (7.5YR 4/3; 3/3 moist) coarse silt loam; moderate, medium granular, porous and permeable; many fine pores and tubes; occasional fine pebbles and some micaceous flakes; pH 7.0; grades to the layer below.
5482	AB	16-22 inches	Reddish brown (6YR 4/3; 3/3 moist) light clay loam; weak, medium, subangular blocky; firm to friable; $\frac{1}{2}$ texture grade heavier than A ₁ ; many pin holes, worm holes, and worm casts; weak shine on peds; many fine roots; pH 7.5; grades to the layer below.
5483	B ₂	22-32 inches	Reddish brown (6YR 4/3; 3/2 moist) clay loam; weak, medium prismatic and moderate, medium, subangular blocky; occasional fine pebble of granite and quartz; weak shine on peds; firm but not compact; pH 7.5; grades to the layer below.
5484	B _{3C}	32-42 inches	Reddish brown (5YR 4/4; 3/4 moist) coarse clay loam; with occasional bands of fine gravel which make up not over 10% of mass; less firm than the layer above; weak, medium, subangular blocky; pH 7.0; grades to the layer below.
5485	C	42-50 inches	Reddish brown (5YR 4/3; 3/3 moist) coarse clay loam or sandy clay loam; weak, medium, subangular blocky; firm; many fine pores; many very fine pebbles; pH 7.5; rests with short transition on
5486	B _{2b}	50-64 inches	Dark brown (7.5YR 4/3; 3/3 moist) silty clay loam; moderate, fine, blocky; weak shine on peds; fine roots present in pores and tubes; pH 7.5. This layer is darker than the soil above and seems to be a buried B horizon. It grades to the layer below.
5487	C ₀	64-78 $\frac{1}{2}$ inches	Yellowish red (5YR 4/6; 3/6 moist) coarse clay loam or sandy clay loam, with lenses of fine pebbles stratified with bands 1 to 1 $\frac{1}{2}$ inches thick of dark brown silty clay loam like the material in layer 7; fine roots present in a few pores; those appear to be live and fresh.

Noncalcareous in all layers. The profile has excellent physical properties everywhere below the 8-inch plowed zone. Stability of A₁ below plow depth appears good, and infiltration rate should be desirable for long periods if pores are not clogged. Wheat is drawing most from the upper 8 inches because of compacted zones which restrict the spread of the mass of roots.

SOIL SURVEY LABORATORY Lincoln, Nebr. Aug. 1958

SOIL TYPE Grant LOCATION Canadian County, Oklahoma
silt loam

SOIL NOS. 856Okla-9-1 LAB. NOS. 5461-5466

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						2A2
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002			> 2		
0-5	Alp	0.1	0.1	0.2	7.8	43.5	36.0	12.3	78.8	7.9	-	vfsl	
5-12	Al	-	0.1	0.1	6.6	37.4	36.0	19.8	71.6	8.1	-	l	
12-22	B21	-	0.1	0.1	5.5	38.1	33.4	22.8	68.0	8.8	-	l	
22-35	B22	-	0.1	0.1	5.3	38.6	28.9	27.0	64.3	8.3	-	cl/1	
35-45	B3	-	-	-	11.7	48.4	17.9	22.0	72.7	5.1	-	scl	
45-55	C	-	-	-	34.9	45.9	8.8	10.4	85.9	3.4	-	lfs	
pH		ORGANIC MATTER					8A2	ELECTRICAL CONDUCTIVITY	6E1a		MOISTURE TENSIONS		
8C1a	1:5	1:10	6A1a	6B1a	C/N	EST% SALT (BUREAU CUP)	EC x 10 ³ MILLIMHOS PER CM	CoCO ₃ equiv-alent	GYP SUM mo./100g SOIL	1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.	
lit			%	%			8A1a	%		%	%	%	
6.1			1.05	0.083	13	<0.20	0.4	-				4.6	
5.8			0.92	0.093	10	<0.20	0.4	-				7.3	
5.9			0.73	0.067	11	<0.20	0.4	-				8.0	
6.5			0.50	0.051	10	<0.20	0.4	-				9.7	
6.8			0.27			<0.20	0.5	-				7.5	
6.9			0.10			<0.20	0.5	-				3.7	
5A1a	EXTRACTABLE CATIONS					5B1a	SATURATION EXTRACT SOLUBLE					8A	
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6H1a	6P2a	6Q2a	BASE SAT. % NH ₄ Ac EXCH.	6F1a	6Q1a				MOISTURE AT SATURATION	
	Ca	Mg	H	Na	K		Na	K				%	
	milliequivalents per 100g. soil					5C1	milliequivalents per liter						
8.3	4.4	1.4	4.6	-	0.5	76	0.3	0.5				37.7	
11.6	6.2	2.3	4.7	-	0.6	78	0.3	0.4				44.5	
12.6	7.0	2.7	3.9	-	0.6	82	0.4	0.3				47.5	
15.4	9.3	4.4	3.5	0.1	0.3	92	0.6	0.1				50.6	
12.7	7.6	4.0	2.7	0.1	0.2	94	0.8	0.1				47.5	
6.1	3.5	1.9	0.8	0.1	0.1	92	0.7	0.1				46.0	

Soil Type: Grant silt loam

Soil Nos.: 856Okla-9-1

Location: Eight miles west of Tenth and May Avenue, NW, Oklahoma City, Oklahoma, and one mile south to NE corner of Sec. 3, T11N, R5W, Canadian County, Oklahoma. The sample was collected from a pit that was dug approximately 200 feet west and 200 feet south of the NE corner of Sec. 3.

Topography: Gently to moderately sloping erosional upland, gradient mostly from 2 to 5 percent.

Drainage: Free from surface and good internal drainage with moderately high moisture-holding capacity.

Vegetation: Originally tall prairie grasses (dominantly bluestems, Indiangrass, and switchgrass); present vegetation grass; formerly cultivated field.

Described by: Louis E. Darr.

Horizon and

Lincoln

lab. No.

Alp 5461	0 to 5 inches. Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/3 moist) silt loam; very fine granular structure; clear boundary.
A1 5462	5 to 12 inches. Dark reddish brown (5YR 4/4; 3/4 moist) silt loam; medium, fine and very fine granular structure; very friable; many worm casts; many fine pores; neutral; gradual boundary.
B21 5463	12 to 22 inches. Dark reddish brown (2.5YR 3/5 moist) clay loam; strong, medium granular structure; friable; clay skins occurring along root channels or channels made by insects. (This horizon was divided because of its thickness.)
B22 5464	22 to 35 inches. Dark red (2.5YR 3/6 moist) clay loam; same as horizon above except more red in color; gradual boundary.
B3 5465	35 to 45 inches. Red (2.5YR 4/6, moist) light sandy clay loam; weak, coarse prismatic; grades to
C 5466	45 to 55 inches. Red (2.5YR 5/8, moist) very weakly consolidated fine-grained sandstone or packsand.

Remarks: The Grant soils occur at the highest elevation in the immediate landscape. The site is located on a 2 percent slope about midway between the crest of the ridge and drainage way. The soil appears to have developed from Cedar Hill sandstone which lies immediately above the Hennessey shale. Cedar Hill is a weakly consolidated Permian sandstone.

Hartsells fine sandy loam,
SOIL high base variant SOIL Nos. S62Okla-61-1 LOCATION Pittsburg County, Oklahoma

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 17144-17151 February 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1											Coarse fragments			
		Total			Sand					Silt			2A2 ≥ 2	2-19	19-76	
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (= 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int II (0.2-0.02)				(2-0.1)
Pct. of < 2 mm													Pct	← Pct of → ← 76mm		
0-3	A1	59.6	35.4	5.0	0.2	1.2	7.3	29.2	21.7	24.4	11.0	62.3	37.9			
3-10	A21	61.9	33.4	4.7	0.4	1.4	7.8	30.5	21.8	23.1	10.3	61.3	40.1	tr		
10-17	A22	61.2	31.6	7.2	0.1	1.4	7.9	29.9	21.9	22.4	9.2	60.7	39.3	tr		
17-27	B21t	54.9	29.0	16.1	0.1	1.2	6.5	27.5	19.6	20.0	9.0	54.6	35.3	-		
27-36	B22t	51.6	29.4	19.0	0.1	1.1	6.6	26.3	17.5	19.3	10.1	51.4	34.1	tr		
36-48	B3	51.1	29.4	19.5	0.3	1.2	7.0	26.0	16.6	18.0	11.4	48.9	34.5	tr		
48-66	R1	47.6	29.7	22.7	0.1	1.3	7.3	24.9	14.0	16.6	13.1	43.7	33.6	tr		
66-80	R2	36.4	25.4	38.2	0.1	1.0	6.3	19.5	9.5	11.0	14.4	30.1	26.9	tr		

Depth (in.)	6A1a Organic carbon b Pct	6B1a Nitrogen Pct	C/N	Carbonate as CaCO ₃ Pct	6C2a Ext. Iron as Fe Pct.	Bulk density			4D1 COLE	Water content					pH	
						4A1a Field State g/cc	4A1c 30-cm. g/cc	4A1b Air Dry g/cc		4B4 Field State Pct.	4B3 30-cm. Pct.	4B1b 1/3- Bar Pct.	4B2 15- Bar Pct.	4C1 1/3- to 15-Bar in./in.	8C1a (1) H ₂ O	
0-3	1.35	0.089	15		0.4	1.28	1.29	1.30	0.003	19.7	10.8	16.6d	3.4			6.0
3-10	0.32	0.026	12		0.4	1.5c	1.5c					15.4d	2.0			5.0
10-17	0.13	0.018			0.4	1.54	1.55	1.54	-	12.1	14.4	14.5d	2.7			5.1
17-27	0.10	0.022			0.7	1.6c	1.6c					14.0	6.5			5.5
27-36	0.10				0.8	1.62	1.64	1.66	0.003	16.0	13.3	13.6	7.4	0.10		4.8
36-48	0.10				0.9	1.6	1.6c					14.0	7.5			4.7
48-66	0.10				1.3	1.68	1.65	1.72	0.014	17.6	17.8	14.6	8.6	0.10		4.7
66-80	0.12				3.4								13.8			5.0

Depth (in.)	Extractable bases 5B1a				6H1a Ext. Acidity	Cat. Exch. Cap.		6G1b KCl- Ext. Al	5A3b Bases Fms Al me/100g Clay	8D3 Ca/Mg	Base saturation ^e		
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K		Sum	5A3a Sum NH ₄ OAc Cations				5A1a NH ₄ OAc	5C3 Sum Cations Pct	5C1 NH ₄ OAc CEC Pct.
0-3	4.3	0.7	tr	0.2	5.2	3.5	8.7	6.5				60	80
3-10	0.6	0.3	tr	0.2	0.9	2.6	3.5	2.8				26	32
10-17	1.2	0.3	tr	0.1	1.6	2.2	3.8	3.0				42	53
17-27	3.3	2.0	tr	0.2	5.5	3.3	8.8	7.2				62	76
27-36	1.4	1.9	tr	0.2	3.5	6.2	9.7	7.9			1.6	36	44
36-48	0.9	1.9	tr	0.2	3.0	7.1	10.1	8.0			0.7	30	38
48-66	1.0	1.9	0.1	0.2	3.2	8.6	11.8	9.0			0.5	30	38
66-80	5.7	5.3	0.4	0.3	11.7	7.9	19.6	15.8			1.1	27	36
												60	74

- a. Fe-Mn nodules: > 50 percent (2-1 mm.); 5-25 percent (1-0.5 mm.).
- b. 4.3 kg/m² to 60 inches (Method 6A).
- c. Estimated.
- d. 1/10-Bar (Method 4B1b).
- e. One or more horizons have relatively low cation exchange capacity. As cation exchange capacity decreases, the relative error of base saturation increases. Trace quantities are omitted from the sum of bases. For very low CEC values, this omission contributes significantly to the relative error of base saturation.

Soil Type: Hartsells fine sandy loam, high base variant

Soil No: S62-Okla-61-1

Location: Pittsburg County, Oklahoma. About 800 feet east and 350 feet south of the half mile line on the north side of Section 8, T5N, R13E.

Vegetation and Use: Post oak, blackjack oak, and hickory trees with a tall grass understory. Used for rangeland.

Slope and Land Form: Slope is 2 percent on erosional upland.

Drainage and Permeability: Well drained. Medium runoff. Moderately permeable.

Parent Material: Noncalcareous sandstone of Pennsylvanian age.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June 1962.

Described by: Earl C. Nance and Lyle Shingleton.

Horizon and

Lincoln

Lab. Number

- A1 0 to 3 inches. Dark grayish brown (10YR 4/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable, slightly hard, pH 5.5; clear boundary.
17144
- A21 3 to 10 inches. Grayish brown (10YR 5/2) fine sandy loam; light gray (10YR 7/2) dry, weak fine granular structure; very friable, slightly hard; pH 5.5; diffuse boundary.
17145
- A22 10 to 17 inches. Pale brown (10YR 6/3) fine sandy loam, light gray (10YR 7/2) dry; weak fine granular structure; very friable, slightly hard; pH 5.5; clear boundary.
17146
- B21t 17 to 27 inches. Yellowish brown (10YR 5/6) light sandy clay loam; few grayish brown mottles; light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; friable, hard; sand grains on ped faces are coated with clay films; pH 6.0; diffuse boundary.
17147
- B22t 27 to 36 inches. Brownish yellow (10YR 6/6) sandy clay loam; common medium distinct yellowish red and grayish brown mottles; yellow (10YR 7/6) dry; moderate medium subangular blocky structure; friable, hard; sand grains on ped faces are coated with clay films; pH 5.0; gradual boundary.
17148
- B3 36 to 48 inches. Brownish yellow (10YR 6/6) sandy clay loam; many medium distinct light gray mottles and common medium prominent strong brown mottles; yellow (10YR 7/6) dry; moderate medium subangular blocky structure; friable, hard; a few sandstone fragments are present; pH 5.0; clear wavy boundary.
17149
- R1 48 to 66 inches. Highly weathered, loosely cemented, fine grained sandstone that has thin stratified and mottled layers of grayish brown to yellowish red sandstone; an average color of the horizon would be yellowish brown (10YR 5/6); an average texture would be sandy clay loam; massive structure; friable, hard; about 15 percent of the mass is sandstone fragments; pH 5.0.
17150
- R2 66 to 80 inches. Same as the R1 horizon except color. This horizon is yellowish brown (10YR 5/8) mottled with light brownish gray (10YR 6/2).
17151

Note: Colors are for moist soil unless otherwise stated. Field determination of pH was made by Hellige-Truog kit.

Mineralogy (Method 7B1): Observations on very fine sand.

A1, B22t and R2 horizons: 95 percent iron oxide stained quartz, staining increases with depth; less than 5 percent feldspar; trace of ferromagnesian minerals.

**Hartsells fine sandy loam,
high base variant**

SOIL No. 9620k1a-61-2 LOCATION Pittsburg County, Oklahoma

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 17152-17159 February 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm)											Coarse fragments			
		3A1											2A2 > 2	2-19	19-76	
		Total		Sand					Silt							Pct. of < 75mm
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (= 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02 (0.02-0.002)	Int. III (0.2-0.02)	(2-0.1)				
0-4	A1	61.1a	33.7	5.2	0.6	0.8	2.4	37.4	19.9	23.0	10.7	67.7	41.2			tr
4-10	A21	63.5a	31.4	5.1	0.8	0.9	2.1	38.1	21.6	21.5	9.9	68.9	41.9			tr
10-16	A22	55.9b	30.0	14.1	1.4	1.4	2.1	32.9	18.1	19.8	10.2	60.2	37.8			tr
16-21	B21t	46.6b	29.3	24.1	1.0	0.8	1.7	26.9	16.2	18.1	11.2	52.5	30.4			tr
21-26	B22t	42.7b	30.6	26.7	0.7	0.8	1.6	24.8	14.8	18.0	12.6	49.3	27.9			tr
26-32	B23t	39.6b	25.2	35.2	0.6	0.3	1.4	23.2	14.1	14.9	10.3	44.1	25.5			tr
32-42	B31	41.1b	24.3	34.6	0.5	0.4	1.5	25.6	13.1	15.1	9.2	44.8	28.0			tr
42-52	B32	41.8b	21.6	36.6	1.0	0.8	1.6	26.2	12.2	13.3	8.3	42.0	29.6			tr
Depth (in.)	6A1a Organic carbon	6B1a Nitrogen	C/N	Carbonate as CaCO ₃	6C2a Ext. Iron as Fe	Bulk density			Water content		pH	8C1a (1:1) H ₂ O				
						g/cc	g/cc	g/cc	Pct.	Pct.						
0-4	1.35	0.104	13		0.6					4.2		6.3				
4-10	0.17	0.018			0.8							5.3				
10-16	0.16	0.022			1.6							4.8				
16-21	0.20	0.028			2.1							4.9				
21-26	0.18	0.025			2.1							5.0				
26-32	0.17				2.2							5.0				
32-42	0.10				2.3							5.1				
42-52	0.14				3.2							5.7				
Depth (in.)	Extractable bases				5B1a 6D2a Sum	6E1a Ext. Acidity	Ext. Exch. Cap.		6G1b Ext. Al	5A3b Bases Plus Al mg/100g Clay	8D3 Ca/Mg	Base saturation %				
	6M2a Ca	6O2a Mg	6P2a Na	6Q2a K			5A3a Sum	5A1a NH ₄ OAc				Pct.	5C1 NH ₄ OAc CEC			
0-4	6.2	0.9	tr	0.3	7.4	3.1	10.5	8.3				70	89			
4-10	0.9	0.3	tr	0.1	1.3	1.7	3.0	2.6				43	50			
10-16	0.6	1.2	tr	0.1	1.9	5.7	7.6	6.0		27		25	32			
16-21	0.9	2.4	0.1	0.2	3.6	10.9	14.5	10.2		23		25	35			
21-26	1.0	2.5	0.3	0.2	4.0	11.2	15.2	11.1		31	0.4	26	36			
26-32	2.2	4.2	0.7	0.3	7.4	12.7	20.1	15.5		36	0.5	37	48			
32-42	3.4	5.3	1.1	0.3	10.1	9.8	19.9	15.9		38	0.6	51	64			
42-52	5.5	7.5	1.6	0.3	14.9	7.3	22.2	17.3		41	0.7	67	86			
Depth (in.)	Ratio to Clay 8D1				Sum CEC	Ext. Iron CEC	15-Bar Water	a. Fe-Mn nodules: > 50 percent (2-0.5 mm.).		b. Fe-Mn nodules: > 50 percent (2-0.5 mm.); 5-25 percent (0.5-0.25 mm.).		c. One or more horizons have relatively low cation exchange capacity. As cation exchange capacity decreases, the relative error of base saturation increases. Trace quantities are omitted from the sum of bases. For very low CEC values, this omission contributes significantly to the relative error of base saturation.				
	NH ₄ OAc CEC	Sum CEC	Ext. Iron CEC	15-Bar Water												
0-4	1.6	2.0	0.1	0.77												
4-10	0.51	0.59	0.2	0.43												
10-16	0.42	0.54	0.11	0.37												
16-21	0.42	0.60	0.09	0.39												
21-26	0.42	0.57	0.08	0.40												
26-32	0.44	0.57	0.06	0.38												
32-42	0.46	0.58	0.07	0.39												
42-52	0.47	0.61	0.09	0.38												

Soil Type: Hartsells fine sandy loam, high base variant

Soil No.: S62-Okla-61-2

Location: Pittsburg County, Oklahoma. About 315 feet south and 250 feet west of the half mile line on the north side of Section 15, T6N, R13E.

Vegetation and Use: Post oak, blackjack oak, and hickory trees with a tall grass understory. Used for rangeland.

Slope and Land Form: Slope is 2 percent on erosional upland.

Drainage and Permeability: Well drained. Medium runoff. Moderately permeable.

Parent Material: Noncalcareous sandstone of Pennsylvanian age.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June, 1962.

Described by: Earl C. Nance and Lyle Shingleton.

Horizon and

Lincoln

Lab. Number

A1 17152	0 to 4 inches. Very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak medium granular structure; very friable, slightly hard; pH 5.5; clear boundary.
A21 17153	4 to 10 inches. Light yellowish brown (10YR 6/4) fine sandy loam, very pale brown (10YR 7/3) dry; weak granular structure; very friable, slightly hard; pH 5.5; diffuse boundary.
A22 17154	10 to 16 inches. Same as A21 -- for sampling purposes only; clear wavy boundary.
B21t 17155	16 to 21 inches. Brownish yellow (10YR 6/6) light sandy clay loam; common medium distinct light yellowish brown and yellowish red mottles; yellow (10YR 7/6) dry; weak medium subangular blocky structure; friable, hard; pH 5.5; clear boundary.
B22t 17156	21 to 26 inches. Pale brown (10YR 6/3) sandy clay loam, very pale brown (10YR 7/3) dry; moderate medium subangular blocky structure; friable, hard; pH 5.0; clear boundary.
B23t 17157	26 to 32 inches. Coarsely mottled light gray (10YR 6/1), dark red (2.5YR 3/6) and yellowish brown (10YR 5/6) sandy clay loam; the gray coloring is on the ped faces and appears to be soil material sifted from the A2 horizon; moderate medium subangular blocky structure; firm, very hard, sand grains on ped faces have clay films, pH 5.0; clear boundary.
B31 17158	32 to 42 inches. Coarsely mottled yellowish brown (10YR 5/6), light brownish gray (10YR 6/2) and yellowish red (5YR 5/6) light sandy clay; moderate medium subangular structure; firm, very hard sandgrains on ped faces are coated with clay films; pH 5.0; diffuse boundary.
B32 17159	42 to 52 inches. Same as B31 horizon - separated for sampling purposes.
R	52 to 58 inches. Stratified sandstone too hard to penetrate with spade; pH 5.0; texture of sandstone is sandy clay loam. Not sampled.

Mineralogy (Method 7B1): Observations on very fine sand.

A1, B22t, B23t and B32 horizons: 95 percent iron oxide stained quartz, less than 5 percent feldspar and no ferromagnesian minerals; reddish brown aggregates increase with depth.

SOIL TYPE Lightning LOCATION Craig County, Oklahoma
silty clay loam

SOIL NOS. S60-Okla-18-1 LAB. NOS. 13407-13413

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)									TEXTURAL CLASS	
		1B1a		3A1			2A2		> 2			
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY				
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002		
0-6	A1p	0.6a	0.7a	0.4b	1.0b	1.5b	68.0	27.8	17.9	52.2	-	sic1
6-10	A2	1.1a	1.7a	0.8b	1.3b	1.5b	66.2	27.4	17.5	50.9	Tr.	sic1/sil
10-15	AB	2.7a	2.6a	0.8a	1.2b	1.4c	58.6	32.7	16.8	43.9	Tr.	sic1
15-20	B21	1.2a	2.1a	0.8a	1.4b	1.7c	54.1	38.7	15.7	40.9	Tr.	sic1
20-28	B22	0.8a	1.5a	0.9a	2.0b	1.9c	52.5	40.4	14.8	40.6	Tr.	sic/sic1
28-39	B31	0.4a	0.4a	0.4a	1.7b	2.7c	55.6	38.8	19.1	40.3	Tr.	sic1
39-60	B32	0.8a	0.6a	0.4b	1.8b	2.8a	56.9	36.7	19.3	41.5	Tr.	sic1
8C1b SATURATED PASTE	pH	6F1a ORG. MATTER			6G2a	Free	ELECTRI- CAL CONDUCTI- VITY EC x 10 ³ MILLIMHOS PER CM BA1a	BULK DENSITY		MOISTURE TENSIONS		
	8C1a	6A1a	6B1a	KCL- Ext.	Iron	4A1h		4A1c	4B1b	4B3	4B2	
	1:1	Gypsum me/100g	ORGANIC CARBON %	NITRO- GEN %	me/100g	Fe ₂ O ₃		Oven- Dry	30-cm	1/3-bar Pieces	30-cm	15-bar Sieved
						6C1a		g/cc	g/cc	%	%	%
	5.2	1.58	0.152	0.6	2.5			1.42	1.34	27.0	28.6	12.0
	5.3	0.68	0.075	1.1	2.4			1.60	1.52	22.0	21.0	12.1
	4.2	0.47	0.064	1.5	2.9	0.6		1.59	1.49	20.3	22.0	14.2
	4.3	0.44	0.056	1.6	2.6	1.1		1.66	1.48	23.0	22.8	15.9
	3.9	0.41	0.048	1.8	2.2	5.0		1.68	1.50	22.1	23.6	16.1
	3.9	0.32		1.2	2.6	8.7		1.74	1.52	21.7	23.6	15.9
4.0	0.27		0.6	2.9	8.4	1.78	1.56	22.6	22.2	15.8		
5A1a CATION EXCHANGE CAPACITY NH ₄ OAc	EXTRACTABLE CATIONS					5B1a	5D2	SATURATION EXTRACT SOLUBLE				8A
	6N2b	6O2b	6H1a	6P2a	6Q2a		6F1a	6Q1a	6J1a	6K1a	6L1a	MOISTURE AT SATU- RATION
	Ca	Mg	H	Na	K	EXCH. No %	Na	K	HCO ₃	Cl ⁻	SO ₄	%
	← milliequivalents per 100g. soil →						← milliequivalents per liter →					
	12.5	5.6	3.5	11.4	0.2	0.2						
	13.4	4.6	3.5	9.1	0.6	0.2						
	16.9	4.9	5.9	9.4	1.3	0.2	6	3.4	<0.1			45.5
	19.6	4.4	8.5	10.9	2.1	0.3	9	7.1	<0.1			55.2
20.7	6.9	10.1	10.2	3.4	0.3	9	26.0	0.1	0.9	<0.1	64.7	59.6
19.4	10.5	13.0	9.5	4.9	0.3	11	45.0	0.2	0.9	<0.1	130	61.8
18.3	12.3	11.7	8.4	4.5	0.3	10	40.4	0.2	1.4	0.2	124	65.8

a. Many Fe-Mn? concn.
 b. Common Fe-Mn? concn.
 c. Few Fe-Mn? concn.
 d. 11 Kg/M² to 60 inches (Method 6A).

Soil Type: Lightning silty clay loam

Date: June 7, 1960

Collected by: R. Bain, C. Newland, D. J. Polona,
J. S. Allen, J. M. Downs, and F. J. Dries

Area: Craig County, Oklahoma

Location: 450 feet west and 300 feet south of east quarter corner of

Sec. 5-T25N-R21E (Sturdivant farm).

Slope: Nearly level to slightly depressed

Remarks: Poorly drained alluvial soil subject to rather frequent flooding. Surface and internal drainage poor. Some water standing on surface at time of sampling. Formerly cultivated field now abandoned and at present in annual weeds and grasses. This soil is associated with Osage and Verdigris series.
Described by: Fred J. Dries.

Soil Nos. S60-Okla-18-1

Lincoln Horizon

Lab. No.

13407	A _{1p}	0-6 inches	Light brownish gray (10YR 6/2, dry), very dark grayish brown (10YR 3/2, moist) light silty clay loam; weak fine granular structure; friable; pH 6.0 by Hellige Kit; clear boundary to
13408	A ₂	6-10 inches	Light gray (10YR 7/2, dry), grayish brown (10YR 5/2, moist) mottled with common, fine, faint mottles of dark grayish brown (10YR 4/2, moist) light silty clay loam; friable; little structure; pH 4.5 by Hellige Kit; clear boundary to
13409	AB	10-15 inches	Light brownish gray (10YR 6/2, dry), dark brown (10YR 4/3, moist) silty clay loam; massive structure; slowly permeable; numerous concretions; few roots; pH 5.0 by Hellige Kit.
13410	B ₂₁	15-20 inches	Light brownish gray (10YR 6/2, dry), grayish brown (10YR 5/2, moist) silty clay; mottled with many distinct mottles of dark yellowish brown (10YR 4/4, moist); numerous concretions present; massive to blocky structure; firm when moist and hard when dry; pH 5.0 by Hellige Kit; grades to
13411	B ₂₂	20-28 inches	Light brownish gray (10YR 6/2, dry), gray (10YR 5/1, moist) silty clay mottled with many fine distinct mottles of dark yellowish brown (10YR 4/4, moist) and shades of gray; massive structure; very sticky when wet; very firm when moist and hard when dry; pH 5.0; grades to
13412	B ₃₁	28-39 inches	Light gray (10YR 7/2, dry) 5/1, moist) clay; mottled with many medium distinct mottles of dark yellowish brown (10YR 4/4, moist); weak fine blocky; very firm; very hard when dry; some small chert gravel and many gypsum crystals present; pH 5.0 by Hellige Kit; grades to
13413	B ₃₂	39-60 inches	Light gray (10YR 6/1, dry; 5/1, moist) clay or silty clay, mottled with 20 percent dark brown (10YR 4/3); massive to weak medium blocky; very firm when moist; hard when dry; some concretions and numerous gypsum crystals present.

SOIL TYPE Lightning silt loam LOCATION Craig County, Oklahoma

SOIL NOS. 860-Okla-18-2 LAB. NOS. 13414-13420

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	2A2 > 2	
0-5	A1	0.8a	2.7a	0.9b	1.1c	2.9c	71.3	20.3	28.5	46.3	Tr.	sil
5-9	A2	1.0a	2.4a	0.8a	0.9c	2.2b	67.8	24.9	22.1	48.4	Tr.	sil
9-12	AB	1.3a	3.0a	0.9a	1.1c	2.2b	58.5	33.0	19.2	42.1	-	sic1
12-21	B21	0.2a	0.8a	0.3a	0.5c	1.5b	51.7	45.0	15.4	38.1	Tr.	sic
21-31	B22	<0.1	0.1a	0.1a	0.3b	0.7b	45.4	53.4	10.3	36.0	Tr.	sic
31-42	B31	<0.1	0.2a	0.2a	0.5c	1.0b	46.1	52.0	10.1	37.3	Tr.	sic
42-60	B32	0.1a	0.3a	0.2a	0.5c	1.0b	48.4	49.5	11.2	38.5	Tr.	sic

8C1b SATURATED PASTE	pH 8C1a	6F1a Gypsum me/100g	ORGANIC MATTER				Free Iron % Fe ₂ O ₃ 6C1a	ELECTRI- CAL CONDUCT- IVITY EC-10 ³ MILLIMHOS PER CM 8A1a	BULK DENSITY			MOISTURE TENSIONS		
			6A1a ORGANIC CARBON % d	6B1a NITRO- GEN %	C/N	4A1h Oven- Dry g/cc			4A1c 30-cm g/cc	4B1b 1/3-bar pieces %	4B3 30-cm %	4B2 15-bar sieved %		
5.1	5.4		1.60	0.136	12	3.4	1.52	1.45	21.1	23.6	9.8			
5.3	5.9		0.96	0.093	10	3.1	0.5	1.57	1.50	22.3	11.4			
5.6	6.0		0.73	0.074	10	4.1	0.8	1.63	1.52	24.0	14.8			
6.4	5.5	∇	0.73	0.071	10	2.7	1.8	1.76	1.48	28.9	17.8			
6.9	5.8	∇ 1	0.50	0.045	11	2.5	6.5	1.92		27.6	20.3			
	6.8	∇ 2	0.48			2.6	7.0	1.88		30.5	19.8			
	7.2		0.40			2.7	7.3	1.88		29.8	19.5			

5A1a CATION EXCHANGE CAPACITY NH ₄ OAc	EXTRACTABLE CATIONS					5D2 EXCHL % %	SATURATION EXTRACT SOLUBLE					8A MOISTURE AT SATU- RATION %
	6N2b Ca	6O2b Mg	6H1a N	6P2a Na	6Q2a K		6P1a Na	6Q1a K	6J1a HCO ₃ ⁻	6K1a Cl ⁻	6I1a SO ₄ ⁼	
	milliequivalents per 100g. soil						milliequivalents per liter					
13.4	6.9	2.2	8.6	0.4	0.3							
15.0	7.6	2.5	8.1	1.3	0.2	8	3.0	<0.1			44.7	
19.6	10.6	3.7	8.2	2.2	0.3	10	6.0	<0.1			56.0	
25.8	14.4	4.6	8.9	5.3	0.4	16	13.2	<0.1			82.6	
29.7	19.9	6.6	6.2	9.3	0.5	18	44.4	0.1	1.4	0.5	80.1	
30.3	19.1	7.2	4.1	10.4	0.5	20	51.5	0.1	1.9	<0.1	85.5	
29.0	23.5	7.2	2.6	10.9	0.5	22	52.6	0.1	2.1	0.2	90.4	

a. Many Fe-Mn? concr.
 b. Few Fe-Mn? concr.
 c. Common Fe-Mn? concr.
 d. 15 Kg/M² to 60 inches (Method 6A).

Soil Type: Lightning silt loam

Date: June 7, 1960 Collected by: R. Bain, C. Newland, D. J. Polone, J. S. Allen,

J. M. Downs and F. J. Dries Area: Craig County, Oklahoma

Location: 300' E & 100' S of N $\frac{1}{4}$ Cor of Sec. 25-T25N-R20E, Lee Scott farm.

Slope: Nearly level to slightly depressed

Remarks: Poorly drained alluvial soil subject to frequent flooding. Surface and internal drainage poor. This field was formerly cultivated but is now in tame pasture of Bermuda, rye, and vetch. This soil is associated with Osage and Verdigris series.

Described by: Fred J. Dries.

Soil Nos. S60-Okla-18-2

Lincoln Lab. No.	Horizon		
13414	A ₁	0-5 inches	Light brownish gray (10YR 6/2, dry) dark grayish brown (10YR 4/2, moist) heavy silt loam; weak fine granular structure; friable; permeable; roots abundant; clear boundary to horizon below.
13415	A ₂	5-9 inches	Light brownish gray (10YR 6/2, dry), grayish brown (10YR 5/2, moist) mottled with common, fine, distinct mottles of yellowish brown (10YR 5/6, moist) light silty clay loam; platy structure; friable; abrupt boundary to
13416	AB	9-12 inches	Grayish-brown (10YR 5/2, dry), dark grayish brown (10YR 4/2, moist) mottled with 5 percent yellowish brown (10YR 4/4, moist) silty clay loam; weak subangular blocky structure; coating of light gray on surface of peds; abrupt boundary to
13417	B ₂₁	12-21 inches	Grayish brown (2.5Y 5/2, dry), dark grayish brown (2.5Y 4/2, moist) clay; massive to strong blocky structure; very firm when moist; very hard when dry; grades to
13418	B ₂₂	21-31 inches	Grayish brown (10YR 5/2, dry), dark grayish brown (10YR 4/2, moist) mottled with 10 percent dark yellowish brown (10YR 4/4, moist) clay; massive structure; very firm when moist; very hard when dry; grades to horizon below.
13419	B ₃₁	31-42 inches	Grayish brown (2.5Y 5/2, dry), very dark grayish brown (2.5Y 3/2, moist) mottled with 10 percent olive brown (2.5Y 4/4, moist) clay; massive structure; some concretions and numerous gypsum crystals present; grades to
13420	B ₃₂	42-60 inches	Light gray (2.5Y 7/2, dry), grayish brown (2.5Y 5/2, moist) silty clay; many medium, distinct mottles of olive brown (2.5Y 4/4, moist); massive structure; firm when moist; hard when dry; numerous gypsum crystals and dark concretions present in this horizon.

SOIL SURVEY LABORATORY Lincoln, Nebr. November 1961

SOIL TYPE Newtonia LOCATION Ottawa County, Oklahoma
silt loam

SOIL NOS. 860-Okl-58-1 LAB. NOS. 13393-13399

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						
		VERY COARSE SAND 2-7	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	VERY FINE SAND 0.05-0.002	SILT < 0.002	CLAY 0.2-0.02	CLAY 0.02-0.002	2A2 > 2		
0-6	Alp	<0.1	0.3a	1.2	7.0	9.0	67.1	15.4	49.1	31.9	-	s11	
6-9	Al2	0.1a	0.3b	1.2	7.3	8.7	66.0	16.4	47.8	31.9	-	s11	
9-18	B1	<0.1	0.4b	1.1	5.8	7.3	61.1	24.3	41.6	30.9	-	s11	
18-26	B21	0.2a	0.4b	1.0	5.4	6.7	54.4	31.9	35.5	29.4	Tr.	sic1	
26-40	B22	0.3a	0.5b	1.1	6.1	8.0	41.8	42.2	35.4	18.6	Tr.	sic	
40-51	B31	0.5a	0.8b	1.2	6.7	8.6	40.5	41.7	35.6	18.0	Tr.	sic/c	
51-61	B32?	4.2a	1.3a	1.0	5.6	7.5	38.8	41.6	32.6	17.5	7	c	
pH		ORGANIC MATTER				BULK DENSITY			MOISTURE TENSIONS				
8C1b	8C1a	6C1a Free Iron Fe2O3%	6A1a ORGANIC CARBON % c	6B1a NITRO- GEN %	C/N	4A1a Field State g/cc	4A1c 30-cm g/cc	4A1h Oven- Dry g/cc	4B4 Field State %	4B1b 1/3-bar Pieces %	4B3 30-cm %	4B2 15-bar sieved %	
1:1	1:5												
6.5		1.5	0.87	0.088	10	1.50	1.49	1.54	20.8		21.3	5.7	
6.4		1.4	0.82	0.087	9	1.49	1.48	1.51	18.0		21.4	5.5	
6.2		1.9	0.70	0.089	8	1.50	1.47	1.54	16.6	18.8	21.5	8.3	
5.5		2.4	0.60	0.083	7	1.57	1.52	1.64	15.4	19.9	21.3	11.0	
5.4		3.4	0.40			1.64	1.59	1.70	18.0	21.8	21.4	15.1	
5.4		3.4	0.24			1.62	1.56	1.70	18.8	22.9	22.8	15.4	
5.2		4.7	0.21									16.1	
5A1a		EXTRACTABLE CATIONS					5B1a	BASE	Base	Sum	Sum	6E1c	7D1
CATION EXCHANGE CAPACITY NH4OAc		6M2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K	SAT. % NH4OAc EXCH.	on Sum Cations	Ext. % Bases	Ext. % Cations	Ca/Mg	CaCO3 equiv- alent	CEC. per 100 g. Clay
← milliequivalents per 100g. soil →							5C1	5C3	5B1a	5A3a	8D3	%	
7.3	5.6	0.6	3.2	<0.1	0.5	92	68	6.7	9.9	9.3	<0.1	47	
7.3	5.8	0.7	3.2	<0.1	0.3	93	68	6.8	10.0	8.3	<0.1	44	
8.0	4.8	1.3	4.8	<0.1	0.3	80	57	6.4	11.2	3.7		33	
9.8	4.8	2.4	6.6	<0.1	0.3	76	53	7.5	14.1	2.0		31	
12.4	5.7	3.9	7.9	<0.1	0.3	80	56	9.9	17.8	1.5		29	
13.4	5.4	4.3	7.6	<0.1	0.3	75	57	10.0	17.6	1.2		32	
14.1	5.7	4.6	8.2	<0.1	0.4	76	57	10.7	18.9	1.2		34	

a. Many Fe-Mn? concr.
 b. Few Fe-Mn? concr.
 c. 11 Kg/M² to 60 inches (Method 6A).

Soil Type: Newtonia silt loam

Date: June 6, 1960, R. Bain, C. Newland, D. J. Polone, J. S. Allen, J. M. Downs, and F. J. Dries. Area: Ottawa County, Oklahoma.

Location: Wilson farm, north of Fairland, Oklahoma; 300 feet north and 100 feet east of the west quarter corner of Sec. 21-T27N-R23E. Slope: 0-1 percent.

Remarks: This is a prairie soil having a nearly level to gently sloping topography, sloping to the west and northwest at this particular site. The average slope is from 1 to 2 percent. Drainage good both external and internal.

Erosion none to slight. This is a cropland area cropped to rye, wheat, and barley. This soil is in association with Bates and Dennis series.

Described by: Fred J. Dries.

Soil Nos.: S60-Okls-58-1

Lincoln Lab. No.	Horizon	Thickness	Description
13393	A _{1p}	0-6 inches	Dark brown (7.5YR 4/4, dry; 3/2, moist) silt loam; weak fine granular structure; friable; permeable; roots abundant; pH 6.0 by Hellige Kit; clear boundary to
13394	A ₁₂	6-9 inches	Brown (7.5YR 4/4, dry), dark brown (7.5YR 3/2, moist) silt loam; moderate medium granular structure; porous; friable; permeable; pH 6.0 by Hellige Kit; clear boundary to horizon below.
13395	B ₁	9-18 inches	Reddish brown (5YR 5/4, dry), reddish brown (5YR 4/3, when moist) light silty clay loam; weak medium subangular blocky to coarse granular structure; worm casts are numerous; porous; friable; permeable; roots abundant; pH 6.0 by Hellige Kit; grades to
13396	B ₂₁	18-26 inches	Yellowish red (5YR 5/6, dry), yellowish red (5YR 4/6, when moist) silty clay loam; weak fine subangular blocky structure; friable; permeable; pH 5.8; grades to
13397	B ₂₂	26-40 inches	Red (2.5YR 4/6, dry), dark red (2.5YR 3/6, when moist) silty clay loam; prismatic structure breaking to subangular blocky; a few weak clay films on surface of peds; few roots; pH 5.8 by Hellige Kit; grades to
13398	B ₃₁	40-51 inches	Red (2.5YR 4/6, dry), dark red (2.5YR 3/6, when moist) silty clay loam; weak subangular blocky structure; clay films on surface of peds; some small chert gravel at the lower depth; pH 5.5 by Hellige Kit; grades to
13399	B ₃₂	51-61 inches	Red (2.5YR 5/6, dry; 4/6, moist) silty clay loam or silty clay; weak subangular blocky structure; numerous concretions and small chert gravel present in this zone; pH 5.3 by Hellige Kit.

Mineralogy (Method 7B). Unless otherwise stated the remarks are based on the studies of the very fine sands under a petrographic microscope. The sands are nearly devoid of rock fragments, primary ferromagnesian minerals (such as hornblende, biotite, and augite), or magnetite. Subangular and iron-stained quartz and rounded nodular ferruginous material dominate. As observed under a stereoscopic microscope only a few of larger grains are subrounded to rounded and frosted. Only traces of identifiable minerals are present. Nodular ferruginous material increases from < 5 percent in the surface to 20 percent in the lowermost horizon. Much of the ferruginous material is concretionary, hollow, and sufficiently friable that large quantities appear to have been broken up during particle-size analysis.

SOIL SURVEY LABORATORY Lincoln, Nebr. November 1961

SOIL TYPE Newtonia LOCATION Ottawa County, Oklahoma
silt loam

SOIL NOS. S60-Okla-58-2 LAB. NOS. 13400-13406

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		11LA		3A1						2A2		
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	0.2-0.075	0.075-0.002	> 2	
2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.075	0.075-0.002	< 0.075			
0-5	A1p	0.3 a	0.6 a	0.7	8.8	16.8	59.5	13.3	55.1	27.9	Tr.	sil
5-9	A3	0.1 a	0.3 a	0.6	7.9	16.0	60.2	14.9	52.0	30.3	Tr.	sil
9-17	B1	0.2 b	0.3 b	0.6	6.8	14.2	55.2	22.7	47.1	27.5	Tr.	sil
17-27	B21	0.4 b	0.4 b	0.5	6.0	12.4	50.1	30.2	40.9	26.2	Tr.	sic1/cl
27-34	B22	0.2 b	0.4 b	0.5	5.4	11.4	47.3	34.8	37.4	25.4	Tr.	sic1
34-44	B3	0.3 b	0.6 b	0.5	6.3	13.2	48.1	31.0	42.2	24.1	Tr.	cl
44-50	C	2.4 b	1.7 b	0.7	6.2	12.6	44.7	31.7	40.2	21.9	12	cl

pH	ORGANIC MATTER				BULK DENSITY			MOISTURE TENSIONS			
	6C1a	6A1a	6B1a	C/N	4A1a	4A1c	4A1h	4B4	4B1b	4B3	4B2
	Free Iron	ORGANIC CARBON	NITROGEN		Field State	30-cm	Oven-Dry	Field State	1/3-bar	30-cm	15-bar sieved
	Fe ₂ O ₃ %	%	%	g/cc	g/cc	g/cc	%	%	%	%	
8C1b	1.5										
6.7	1.2	1.71	0.160	11	1.48	1.46	1.50	17.4	15.2	22.2	5.8
7.2	1.4	0.67	0.075	9	1.50	1.48	1.52	15.0	15.9	20.7	5.7
7.2	1.7	0.38	0.062	6	1.58	1.56	1.62	15.5	18.0	19.2	7.9
6.9	2.3	0.32	0.054	6	1.61	1.56	1.66	17.0	20.7	20.8	11.5
5.9	2.6	0.28			1.62	1.58	1.67	16.1	21.3	21.4	12.6
5.4	2.7	0.21			1.64	1.60	1.66	16.8	20.3	20.2	11.4
4.9	3.6	0.16									12.6

5A1a CATION EXCHANGE CAPACITY NH ₄ OAc	EXTRACTABLE CATIONS 5B1a					BASE SAT. % NH ₄ OAc EXCH.	Base Sat. % on Sum Cations 5C3	Sum Ext. Bases 5B1a	Sum Ext. Cations 5A3a	Ca/Mg 8D3	6E1c CaCO ₃ equiv- alent %	8M CEC. per 100 g. Clay
	6N2b	6O2b	6H1a	6P2a	6Q2a							
	Ca	Mg	H	Na	K							
milliequivalents per 100g. soil					5C1							
9.8	10.0	1.0	5.3	<0.1	0.2	114	68	11.2	16.5	10.0	0.1	74
7.3	7.5	0.4	2.0	<0.1	0.2	111	80	8.1	10.1	<0.1	<0.1	49
8.0	6.9	0.8	2.5	<0.1	0.2	99	76	7.9	10.4	<0.1	<0.1	35
10.3	7.9	1.4	3.5	<0.1	0.3	93	73	9.6	13.1	5.6		34
11.7	7.7	2.0	5.6	<0.1	0.3	85	64	10.0	15.6	3.8		34
10.2	5.9	1.7	6.1	0.1	0.2	77	56	7.9	14.0	3.5		33
11.6	5.0	1.5	8.9	<0.1	0.2	58	43	6.7	15.6	3.3		36

a. Few Fe-Mn? concr.
 b. Many Fe-Mn? concr.
 c. 9 kg/M² to 60 inches (Method 6A).

Soil Type: Newtonia silt loam

Date: June 6, 1960, collected by R. Bain, C. Newland, D. J. Polone, J. S. Allen, J. M. Downs, and F. J. Dries Area: Ottawa County, Oklahoma

Location: 600 feet east and 100 feet north of south quarter corner of Sec.

25-T28N-R23E, C. T. Ranch, east of Miami.

Slope: 1-1/2 to 2 percent

Remarks: This is a gently sloping prairie soil. The average slope is from 1 to 3 percent. Drainage good both surface and subsurface. Erosion none to slight. This formerly cultivated field is now in excellent tame pasture of Bermuda and pasture clovers. This soil is in association with Bates, Dennis, and Woodson series.

Described by: Fred J. Dries.

Soil No. S60-Okla-58-2

Lincoln Horizon

Lab. No.

13400	A _{1p}	0-5 inches	Brown (7.5YR 5/4, dry), dark brown (7.5YR 3/2, moist) silt loam; weak medium granular structure; friable; permeable; roots abundant; pH 6.8 by Hellige Kit; clear boundary to
13401	A ₃	5-9 inches	Brown (7.5YR 5/4, dry), brown (7.5YR 4/4, moist) silt loam; weak fine granular structure; friable; permeable; porous; roots abundant; numerous worm casts; pH 6.8 by Hellige Kit; clear boundary to horizon below.
13402	B ₁	9-17 inches	Yellowish-red (5YR 5/6, dry), reddish brown (5YR 4/4, moist) (The upper 3 or 4 inches appears to have had some mixing of dark reddish brown (7.5YR 3/2) from the above horizon due to worm action) light silty clay loam; weak subangular blocky structure to medium strong granular; friable; pH 6.8 by Hellige Kit; gradual boundary to
13403	B ₂₁	17-27 inches	Yellowish red (5YR 5/6, dry; 4/6, moist) silty clay loam; weak fine subangular blocky structure; friable; permeable; porous; few clay films on surface of peds; few small concretions present; pH 5.6 by Hellige Kit; grades to
13404	B ₂₂	27-34 inches	Red (2.5YR 5/6, dry), dark red (2.5YR 3/6, moist) silty clay loam; medium fine subangular blocky structure; clay films on surface of peds; friable; some concretions present; pH 5.6 by Hellige Kit; grades to
13405	B ₃	34-44 inches	Red (2.5YR 5/6, dry; 4/6, moist) clay loam; weak subangular blocky structure; friable; pH 7.0 by Hellige Kit; clear boundary to
13406	C	44-50 inches	Yellowish red (5YR 5/8, moist) clay loam mottled with shades of gray and red; at lower depth 50 percent of mass is small chert gravel; pH 5.0 by Hellige Kit.

Mineralogy (Method 7B). Unless otherwise stated the remarks are based on the studies of the very fine sands under a petrographic microscope. The sands are nearly devoid of rock fragments, primary ferromagnesian minerals (such as hornblende, biotite, and augite), or magnetite. Subangular and iron-stained quartz and rounded nodular ferruginous material dominate. As observed under a stereoscopic microscope only a few of larger grains are subrounded to rounded and frosted. Only traces of identifiable minerals are present. Nodular ferruginous material increases from < 5 percent in the surface to 20 percent in the lowermost horizon. Much of the ferruginous material is concretionary, hollow, and sufficiently friable that large quantities appear to have been broken up during particle-size analysis.

SOIL SURVEY LABORATORY Lincoln, Nebr. March 1960

SOIL TYPE Nobsect LOCATION Woodward County, Oklahoma
fine sand

SOIL NOS. S590ka-77-1 LAB. NOS. 11473-11479

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	2A2 > 2	
1/4-5	A1	0.2	3.7	20.8	57.9	7.5	7.9	2.0	39.4	1.8	-	fs
5-13	A21	<0.1	2.9	21.0	61.5	8.2	4.9	1.5	40.3	0.5	-	fs
13-20	A22	<0.1	2.7	19.8	63.8	8.5	3.3	1.9	38.3	0.5	-	fs
20-32	B21	<0.1	2.1	18.0	60.6	6.5	3.7	9.1	37.5	0.7	-	lfs
32-44	B22	<0.1	2.3	19.8	61.8	6.9	2.1	7.1	34.0	0.5	-	fs
44-54	B3	<0.1	3.3	21.1	62.0	6.0	1.7	5.9	32.1	0.3	-	fs
54-65	C	<0.1	2.5	19.5	61.7	8.6	2.5	5.2	38.6	0.4	-	fs
	pH	8C1a ORGANIC MATTER				Free Iron	ELECTRICAL CONDUCTIVITY	6E1a	BULK DENSITY	MOISTURE TENSIONS		
	1:5	6A1a	6B1a			%	EC - 10 ³ MILLIMHOS PER CM @ 25°C	4A1h	4A1c	4B3	4B2	
	1:1	ORGANIC CARBON %	NITROGEN %	C/N	Fe ₂ O ₃ 6C1a			Oven-Dry g/cc	30-cm g/cc	30-cm %	15-Bar %	
6.6	6.9	7.1	0.86	0.049	18	0.2	0.4	<				2.0
6.1	6.3	6.5	0.18	0.018		0.1	0.2					0.6
5.7	5.9	6.2	0.13	0.008		0.1	0.2					0.8
5.3	5.4	5.6	0.24	0.019		0.4	0.3	1.69				4.3
5.2	5.7	6.2	0.09			0.3	0.3					2.7
5.9	6.1	6.3	0.06			0.2	0.2	1.66				1.9
6.3	6.7	6.6	0.04			0.2	0.3					1.7
5A1a	EXTRACTABLE CATIONS					BASE SAT. %	Base Sat. %	Sum Ext.	Sum Ext.	Ca/Mg	8A MOISTURE AT SATURATION %	
CATION EXCHANGE CAPACITY NH ₄ OAc	6N2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ OAc EXCH.	on Sum Cations	Bases	Cations			
	Ca	Mg	H	No	K		5C1	5B1a	5A3a	8D3		
	milliequivalents per 100g. soil											
4.1	3.3	0.4	1.9	<0.1	0.1	93	67	3.8	5.7			27.8
1.5	1.0	0.2	0.7	<0.1	<0.1	80	63	1.2	1.9			27.9
1.3	0.7	0.1	0.7	<0.1	<0.1	62	53	0.8	1.5			25.2
7.1	3.6	1.5	2.8	<0.1	0.2	75	65	5.3	8.1	2.4		30.1
4.6	2.9	1.0	1.6	<0.1	0.1	87	71	4.0	5.6	2.9		25.0
3.5	2.2	0.8	1.4	<0.1	0.1	88	69	3.1	4.5			28.1
3.0	1.9	0.8	1.2	<0.1	0.1	93	70	2.8	4.0			27.3

Soil Type: Nobscot fine sand. Described by: Louis E. Derr and John M. Allen.
 Area: Woodward County, Oklahoma.
 Location: 16 miles west and 6 miles north of Vici, Oklahoma. 1,630 feet west and 195 feet north of southeast corner of Sec. 5, T20N, R22W.
 Physiography: On a convex slope of 2 percent with east aspect. Under a dense cover of short "shinnery" oak with sparse understory of midgrasses. Area is pastured.
 Climate: 24 inches average annual precipitation; P-E index 38.
 Drainage: Well drained; runoff, slow; internal drainage, rapid.
 Parent Material: Wind-worked sandy alluvial deposits of quaternary age.
 Classification: Unknown. Has some of the features of Red-Yellow Podzolic.
 Soil Nos.: S59Okla-77-1

Lincoln

Laboratory No.

and Horizon

	A ₀₀	0- $\frac{1}{4}$ inch	Partially decomposed leaf mold. Dark gray when dry and black when moist. "Not sampled as separate horizon."
11473	A ₁	$\frac{1}{4}$ -5 inches	Grayish-brown (10YR 5/2; 3/2, moist) fine sand; single grained; very friable and loose; wavy to irregular, clear boundary; horizon 3 to 7 inches thick in pit.
11474	A ₂₁	5-13 inches	Pale brown (10YR 6/3; 5/3, moist) fine sand; single grained; very friable and loose; diffuse boundary.
11475	A ₂₂	13-20 inches	Pale brown (10YR 6/3; 5/3, moist) fine sand with many very fine, strong brown (7.5YR 5/6; 4/6, moist) mottles; massive; very friable and slightly hard; clear, very irregular or wavy boundary; horizon 6 to 14 inches thick.
11476	B ₂₁	20-32 inches	Reddish yellow (5YR 6/8; 5/8, moist) fine sand banded with distinct, very irregular, yellowish red (5YR 5/6; 4/6, moist) loamy sand layers; massive; fine sand is very friable and slightly hard; loamy sand is very friable, moist, and very hard, dry; bands are about 1 1/2 inches thick and 2 inches apart; diffuse boundary.
11477	B ₂₂	32-44 inches	Very similar in texture, structure, consistency, and color to horizon above; bands are 1 inch thick and 2 to 6 inches apart; fine and coarse roots common to 44 inches; diffuse boundary.
11478	B ₃	44-54 inches	Very similar in texture, structure, consistency, and color to horizon above; bands are $\frac{1}{2}$ inch thick and 4 to 8 inches apart; bands are prominent, with abrupt boundaries, and are very irregular to broken; diffuse boundary.
11479	C	54-65 $\frac{1}{2}$ inches	Very similar to horizon above but bands are thinner ($\frac{1}{4}$ inch more widely spaced (6 to 12 inches), and less distinct.

SOIL SURVEY LABORATORY Lincoln, Nebr. March 1960

SOIL TYPE Nobscot LOCATION Woodward County, Oklahoma
fine sand

SOIL NOS. S590k1a-77-2 LAB. NOS. 11480-11486

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY			2A2 > 2	
		2.1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002		
0-5	A1	0.1	2.5	20.4	53.3	9.3	10.8	3.6	38.7	2.3	-	fs
5-13	A21	<0.1	2.9	23.9	54.9	9.4	6.8	2.1	37.5	0.7	-	fs
13-21	A22	<0.1	2.8	24.3	57.6	8.4	5.0	1.9	34.8	0.6	-	fs
21-30	A23	<0.1	2.9	23.4	53.1	8.0	7.1	5.5	34.1	1.1	-	lfs/fs
30-40	B21	<0.1	2.2	19.7	52.3	6.7	7.5	11.6	35.0	0.9	-	fs
40-51	B22	<0.1	2.9	24.6	55.9	6.4	3.9	6.3	31.1	1.5	-	fs
51-56	C	<0.1	2.9	22.3	57.8	7.6	3.3	6.1	34.5	0.5	-	fs
pH		ORGANIC MATTER				Free Iron	ELECTRICAL CONDUCTIVITY	6E1a	BULK DENSITY		MOISTURE TENSIONS	
	8C1a	6A1a	6B1a			Fe ₂ O ₃	EC x 10 ³	CoCO ₃ equiv- alent	4A1h	4A1c	4B3	4B2
	1:5	1:10	ORGANIC CARBON %	NITRO-GEN %	C/N	6C1a	MILLIMHOS PER CM	%	Oven-Dry g/cc	30-cm g/cc	30-cm %	15-Bar %
	1:1											
6.9	7.1	7.0	1.05	0.069	15	0.2	0.4	Δ				2.6
6.6	6.7	6.6	0.12	0.009		0.1	0.3	Δ				0.8
6.7	6.9	6.6	0.06	0.006		0.2	0.2	Δ				0.5
6.2	6.4	6.5	0.09	0.008		0.2	0.3					1.9
5.2	5.6	5.7	0.13			0.4	0.3		1.73			4.6
5.8	6.0	6.2	0.06			0.3	0.3					2.6
5.9	6.2	6.3	0.06			0.2	0.3					2.2
5A1a		EXTRACTABLE CATIONS				5B1a	BASE SAT. %	Base Sat. %	Sum Ext.	Sum Ext.	Ca/Mg	8A
CATION EXCHANGE CAPACITY		6N2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ OAc EXCH.	on Sum Cations	Bases	Cations		MOISTURE AT SATURATION
NH ₄ OAc		Co	Mg	N	Na	K						%
← milliequivalents per 100g. soil →							5C1	5C3	5B1a	5A3a	8D3	
5.8	5.0	0.7	1.4	<0.1	0.2	102	81	5.9	7.3			34.8
1.4	1.2	0.4	0.5	<0.1	0.1	121	77	1.7	2.2			27.2
1.1	0.8	0.1	0.5	<0.1	0.1	91	67	1.0	1.5			25.9
3.3	2.1	0.8	1.2	<0.1	0.1	91	71	3.0	4.2			22.8
7.5	4.3	1.9	3.3	<0.1	0.2	85	66	6.4	9.7	2.3		25.6
4.2	2.7	1.0	1.6	<0.1	0.1	90	70	3.8	5.4	2.7		24.4
3.5	2.1	1.0	1.2	<0.1	0.1	91	73	3.2	4.4	2.1		24.6

Soil Type: Nobscot fine sand Described by: Louis E. Berr and John M. Allen.
 Area: Woodward County, Oklahoma.
 Location: 16 miles west and $10\frac{1}{2}$ miles north of Vici, Oklahoma. 445 feet east and 106 feet south of west $\frac{1}{4}$ Cor of Sec. 20, T 20N, R22W.
 Physiography: Smooth to very slightly concave east facing slope of 3 percent gradient. Under dense stand of short (24") "shinnery" oak with associated midgrasses. Area is pastured.
 Climate: 24 inches average annual precipitation; P-E index 38.
 Drainage: Well drained; runoff, slow; internal drainage, rapid.
 Parent Material: Wind-worked sandy alluvial deposits of quaternary.
 Classification: Unknown. Has some of the features of Red-Yellow Podzolic.
 Soil Nos.: S59Okla-77-2

Lincoln

Laboratory No.

and Horizon

11480	A ₁	0-5 inches	Grayish brown (10YR 5/2; 3/1, moist) fine sand; single grained; loose and very friable; clear wavy boundary; horizon 3 to 8 inches thick.
11481	A ₂₁	5-13 inches	Light gray (10YR 7/2; 5/2, moist) fine sand; massive; very friable and slightly hard; very faint; diffuse boundary.
11482	A ₂₂	13-21 inches	Very pale brown (10YR 8/3; 6/3, moist) fine sand; massive; very friable and slightly hard; weak salt and pepper effect with very fine brownish yellow (10YR 6/6, dry) spots; diffuse boundary.
11483	A ₂₃	21-30 inches	Mottled very pale brown (10YR 7/3, moist and dry) and light brown (7.5YR 6/4, moist and dry) fine sand; massive; very friable, moist and hard, dry; abrupt, very irregular to broken boundary; thickness of entire A ₂ is 20 to 35 inches.
11484	B ₂₁	30-40 inches	Reddish yellow (7.5YR 6/6; 5/6, moist) fine sand coarsely banded with yellowish red (5YR 4/8, moist or dry) loamy sand; bands are 2 to 3 inches thick, 6 inches apart and very irregular to broken, often merging; massive; very friable, moist, and fine sand is slightly hard, dry, while bands are very hard, dry; many fine and coarse roots to 40 inches; diffuse boundary.
11485	B ₂₂	40-51 inches	Similar in texture, structure, consistency, and color to horizon above but bands are thinner (1 to $1\frac{1}{2}$ inches thick) and are 8 to 12 inches apart; diffuse boundary.
11486	C	51-56 inches	Similar to horizon above but bands are thinner ($\frac{1}{2}$ " thick) and less distinct.

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Pawnee County, Oklahoma

SOIL TYPE Norge silt loam

LAB NOS. 54228 - 54235

SOIL NOS. S53Okla-59-38

LABORATORY NUMBER	DEPTH INCHES	HORIZON	1B1b PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)								3A1		TEXTURAL CLASS
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	INTERNATIONAL		2A2 > 2	
										II 0.2-0.02	III 0.02-0.002		
54228	0-8	A11	0.1	0.5	0.7	3.7	15.6	58.5	20.9		12.5	0	sil
54229	8-13	A12	0.0	0.3	0.5	3.5	15.2	56.3	24.2		12.0	0	sil
54230	13-19	B1	0.1	0.3	0.5	3.3	13.7	53.9	28.2		11.8	0	sic1
54231	19-26	B21	0.1	0.2	0.3	1.7	11.2	53.8	32.7		12.9	0	sic1
54232	26-35	B22	0.0	0.2	0.2	1.5	10.8	54.4	32.9		13.1	0	sic1
54233	35-46	B3	0.1	0.2	0.2	1.3	10.5	56.7	31.0		13.6	0	sic1
54234	45-60	C1	0.0	0.2	0.2	1.2	10.5	57.1	30.8		14.2	0	sic1
54235	60-90+	C2	0.2	0.4	0.2	1.3	8.5	53.1	36.3		15.2	0	sic1
			pH		ORGANIC MATTER			FREE IRON OXIDE Fe ₂ O ₃			MOISTURE RETAINED AT		
8C1a 1:1			6A1a ORGANIC CARBON %	NITROGEN %	C/N			BULK DENSITY g/cc	1/10 ATMOS. %	1/3 ATMOS. %	5 ATMOS. %		
54228	5.6		1.80										
54229	5.5		1.51										
54230	5.6		1.12										
54231	5.4		0.77										
54232	5.6		0.45										
54233	5.8		0.26										
54234	6.0		0.14										
54235	6.0		0.09										
CATION EXCHANGE CAPACITY (SUM)			EXTRACTABLE CATIONS 5B1a				BASE SATURATION % (SUM)						
			6N2b Ca	6O2b Mg	6P2a K	6Q2a Na	6H1a H						
			milliequivalents per 100g soil										
54228		7.4	2.2	0.6	< 0.1	6.3	62						
54229		7.2	2.5	0.4	< 0.1	7.0	59						
54230		7.4	3.2	0.4	< 0.1	6.8	62						
54231		8.1	3.6	0.5	< 0.1	7.1	63						
54232		8.1	4.0	0.5	0.1	6.0	68						
54233		8.5	4.0	0.5	0.1	4.2	76						
54234		10.2	4.7	0.5	0.2	4.0	80						
54235		14.0	5.9	0.7	0.3	4.0	84						

Norge silt loam

Soil Nos. S53Okla-59-38

Location: Pawnee County, Oklahoma; 6 miles northeast of Pawnee and 1-1/4 miles north of Skedee. 350 feet south of the east quarter corner, Section 12, T22N; R5E.

Site: Erosional upland with gently sloping convex surfaces and surface gradient of 2-1/2 percent. It is in a native bluestem meadow with a dense and vigorous growth of grasses.

**Horizon, Depth
and Baltsville Lab. No.**

A11	0-8 inches Lab No. 54228	Dark brown (8YR 4/2; 3/2 when moist) silt loam; moderate medium granular; friable; porous and permeable; pin holes and root channels numerous; fine strong brown specks around rootlet holes; pH 6.0; grades to horizon below.
A12	8-13 inches Lab No. 54229	Dark brown (7.5YR 4/3; 3/2 when moist) heavy silt loam; moderate medium granular; friable; porous and permeable; fine pores numerous; occasional specks or splotches of reddish brown; pH 6.0; grades to horizon below.
B1	13-19 inches Lab No. 54230	Brown (7.5YR 4/3; 3.5/2 when moist) silty clay loam; moderate medium granular; friable; porous and permeable; worm holes, worm casts and fine root holes numerous; reddish brown specks few; pH 6.0; grades to horizon below.
B21	19-26 inches Lab No. 54231	Reddish brown (5YR 4/3; 3/3 when moist) heavy silty clay loam with a few medium faint dark red mottles; compound weak medium subangular blocky and moderate medium granular; firm; hard when dry; slowly permeable; weak tendency to prismatic breakage noticeable in dry cuts; pH 6.0; grades to the horizon below.
B22	26-35 inches Lab No. 54232	Reddish-brown (4YR 4/5; 3.5/5 when moist) silty clay; moderate medium subangular blocky; firm; slowly permeable; pinholes and fine roots abundant; medium to coarse black concretions; few; moderate tendency to vertical cracking; pH 6.0; grades to horizon below.
B3	35-46 inches Lab No. 54233	Similar to layer above but contains a number of brownish yellow and yellowish red splotches which increase in frequency with depth; thin clay films still visible on peds in this horizon; pH 6.0; grades to horizon below.
C1	45-60 inches Lab No. 54234	Reddish brown (5YR 4/4; 3/4 when moist) silty clay; weak medium subangular blocky; firm; hard when dry; slowly permeable; sides of weak blocks coated with dark reddish brown films; yellowish red splotches common; some very fine sand noticeable in lower part; pH 6.0; grades to horizon below.
C2	60-90 + inches Lab No. 54235	Mottled yellowish red (5YR 5/6; 4/6 when moist) and light gray (10YR 7/1; 6/1 when moist) heavy silty clay loam; massive to weak subangular blocky; firm; hard when dry; pH 6.5; contains a number of fine pores and changes little, if any, to greatest depth sampled.

The parent material is heavy silty clay loam loess of Pleistocene age forming a mantle here some 8 feet thick over soft shales of Pennsylvanian age. The mottling is atypical of Norge but is probably due to the presence of the shales beneath the profile which are of slower permeability than the loess. Norge are of about medial development and are similar in profile features to the Dennis soils. On the side slope nearby where the mantle thins or is absent Dennis is found. On a flat at the base of the long gentle slope is an area of Parsons in which many slick spots have developed. Associated with Norge in the same section are a few small areas of Vanoss occupying nearly level relief.

Samples collected and described by H. M. Galloway November 24, 1953.

Except where specified moist, the colors refer to dry soils.

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Pawnee County, Oklahoma

SOIL TYPE Norge silt loam

LAB NOS. 54236 - 54243

SOIL NOS. S530k1a-59-39

LABORATORY NUMBER	DEPTH INCHES	HORIZON	1B1b PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)								3A1 INTERNATIONAL		2A2 > 2	TEXTURAL CLASS
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	II 0.2-0.02	III 0.02-0.002			
54236	0-9	A11	0.4	0.7	0.9	3.4	17.4	58.6	18.6		10.0	0	sil	
54237	9-14	A12	0.2	0.4	0.6	1.5	16.4	56.3	24.6		10.2	0	sil	
54238	14-22	B1	0.1	0.4	0.4	2.0	13.1	51.8	32.2		10.5	0	sic1	
54239	22-32	B21	0.0	0.2	0.4	1.5	11.5	54.0	32.4		11.6	0	sic1	
54240	32-40	B22	0.0	0.2	0.4	1.3	11.4	56.6	30.1		11.5	0	sic1	
54241	40-48	B3	0.1	0.2	0.4	1.2	10.7	58.1	29.3		11.8	0	sic1	
54242	48-66	C1	0.1	0.3	0.4	1.2	11.9	57.9	28.2		12.1	0	sic1	
54243	66-94+	C2	0.1	0.4	0.5	1.5	12.7	55.7	29.1		11.9	0	sic1	
			pH		ORGANIC MATTER			FRONT IRON OXIDE Fe ₂ O ₃			MOISTURE RETAINED AT			
			8C1a 1:1		6A1a ORGANIC CARBON %	NITROGEN %	C/N			BULK DENSITY g/cc	1/10 ATMOS. %	1/3 ATMOS. %	1/5 ATMOS. %	
54236	5.6				1.70									
54237	5.4				1.38									
54238	5.4				0.72									
54239	5.6				0.33									
54240	5.8				0.21									
54241	5.8				0.12									
54242	6.0				0.09									
54243	6.2				0.01									
			EXTRACTABLE CATIONS					5B1a	BASE SATURATION					
			6N2b Ca	6Q2b Mg	6P2a K	6Q2a Na	6R1a H	5B3						
			(SUM)	milliequivalents per 100g soil					(SUM)					
54236		7.4	2.2	0.5	< 0.1	5.3	66							
54237		7.7	2.8	0.4	< 0.1	6.3	63							
54238		9.4	4.0	0.5	0.1	6.5	68							
54239		9.6	4.2	0.5	0.2	5.5	72							
54240		9.4	4.0	0.5	0.2	4.5	76							
54241		9.4	4.0	0.5	0.3	4.0	78							
54242		9.7	4.0	0.4	0.2	3.4	81							
54243		11.0	3.8	0.5	0.3	3.1	83							

Norge silt loam

Soil Nos. S530k1a-59-39

Location: Pawnee County, Oklahoma; 8 miles northeast of Pawnee and 2-1/2 miles northeast of Skedee. 600 feet east of the northwest corner Section 9, T22N; R6E.

Site: Undulating erosional upland with convex slopes and surface gradient of 3 percent which ranges nearby from 1 to 5 percent. In a native bluestem meadow with thick and vigorous growth of grasses.

**Horizon, Depth
and Beltsville Lab. No.**

All	0-9 inches	Dark brown (6.5YR 4/2; 3/2 when moist) silt loam; moderate medium and fine granular; friable; porous and permeable; worm casts few; pH 6.2; grades to horizon below.
Lab No.	54236	
A12	9-14 inches	Brown (6.5YR 4/2; 3/2 when moist) light silty clay loam; moderate medium granular; friable; porous and permeable; worm holes and casts and pin holes numerous; reddish brown spots in lower portion; pH 6.0; grades to horizon below.
Lab No.	54237	
B1	14-22 inches	Reddish brown (5YR 4/3; 3/3 when moist) silty clay loam; compound weak medium subangular blocky and moderate medium granular; firm; slowly permeable; sides of peds have dark reddish brown clay films; slight tendency to vertical cracking; worm holes, casts and root holes numerous; red spots occasional; pH 6.0; grades to horizon below.
Lab No.	54238	
B21	22-32 inches	Reddish brown (5YR 5/4; 4/3 when moist) silty clay; compound weak coarse prismatic and moderate medium subangular blocky; firm; very hard when dry; slowly permeable; peds have weakly shiny dark reddish brown films; pH 6.0; grades to horizon below.
Lab No.	54239	
B22	32-40 inches	Similar to the horizon above but has a few coarse distinct yellowish red mottles and a few medium and coarse black concretions; pH 6.0; grades to horizon below.
Lab No.	54240	
B3	40-48 inches	Reddish yellow (5YR 6/6; 5/6 when moist) silty clay; weak medium blocky; firm; slowly permeable; sides of blocks have dark reddish brown faintly shiny films; pH 6.2; becomes less blocky in lower part and grades to horizon below.
Lab No.	54241	
C1	48-66 inches	Yellowish red (4YR 5/6; 4/6 when moist) silty clay loam; compound weak subangular blocky and weak medium granular; firm; slowly permeable; fine pores and rootlets common; pH 6.2; grades to horizon below.
Lab No.	54242	
C2	66-94 + inches	Yellowish red (4YR 5/6; 4/6 when moist) silty clay loam; compound weak medium subangular blocky and moderate medium granular; firm; permeable; fine pores common; black concretions occasional; pH 6.5; changes little with increase in depth to lowest part sampled.
Lab No.	54243	

The parent material is nearly neutral, reddish clay loam loess of Pleistocene age here forming a deposit some 20 to 30 feet in thickness over Pennsylvanian age rocks. The loess is older and contains more clay (34 to 36 percent) than that which underlies the more youthful and weaker developed Teller soils (24-26 percent). Teller are generally similar in appearance but occupy positions usually nearer the Arkansas River where later deposits of more sandy loess have accumulated. On the nearly level benches associated with Norge and with Teller, the Vanoss soils develop and substrata of these usually contain about 28 to 30 percent clay.

Samples collected and described by H. M. Galloway November 25, 1953.

Except where specified moist the colors refer to dry soil.

SOIL Okemah silt loam SOIL No. S62Okla-56-1 LOCATION Okmulgee County, Oklahoma
 SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 17160-17166 February 1967
 General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1											Course fragments			
		Total			Sand					Silt			2A2 > 2	2-19	19-76	
		Sand (2-0.05) %	Silt (0.05-0.002) %	Clay (< 0.002) %	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02) (2-0.1)				
Pct. of < 2 mm																
0-4	A11	26.8	52.8	20.4	0.3	1.0	1.4	10.5	13.6	32.6	20.2	53.6	13.2	-	-	-
4-12	A12	26.3	51.7	22.0	0.4	1.0	1.5	10.2	13.2	31.3	20.4	51.7	13.1	-	-	-
12-21	B1	23.9	49.2	26.9	0.5	0.8	1.2	9.2	12.2	26.6	20.6	47.2	11.7	-	-	-
21-29	B21t	17.6	41.8	40.6	0.4	0.5	0.9	6.7	9.1	22.8	19.0	36.8	8.5	tr	-	-
29-43	B22t	13.5	41.4	45.1	0.1	0.4	0.6	5.1	7.3	21.1	20.3	32.2	6.2	tr	-	-
43-62	B3	12.4	42.5	45.1	0.2	0.4	0.5	4.8	6.5	19.2	23.3	29.3	5.9	-	-	-
62-79	C	11.1	37.7	51.2	0.8	0.7	0.6	4.1	4.9	13.4	24.3	21.3	6.2	-	-	-

Depth (in.)	6A1a Organic carbon b Pct	6B1a Nitrogen Pct	C/N	6E2a Carbonate as CaCO ₃ Pct.	6C2a Ext. Iron as Fe Pct.	Bulk density			4D1 COLE	Water content					pH		
						4A1a Field State	4A1c 30-cm	4A1b Air Dry		4B4 Field State	4B3 30-cm	4B1b 1/3-Bar	4B2 15-Bar	4C1 1/3-to 15-Bar	8C1b Sat. Paste	8C1a 1:1 H ₂ O	8C1a 1:10 H ₂ O
						g/cc	g/cc	g/cc		Pct.	Pct.	Pct.	Pct.	in/in.			
0-4	2.22	0.159	14		1.2	1.33	1.32	1.40	0.020	18.7	19.4	22.3	9.5	0.17		5.5	5.8
4-12	1.71	0.127	13		1.1	1.4	1.4c					20.8	10.0			5.5	5.8
12-21	1.05	0.081	13		1.4	1.48	1.45	1.58	0.028	20.2	21.1	22.4	11.2	0.17		5.7	6.1
21-29	0.73	0.064	11		1.9		1.5c					28.2	15.5		5.3	6.0	6.6
29-43	0.48			(s)	1.8	1.55	1.57	1.93	0.073	23.3	21.6	27.7	18.3	0.15	6.1	6.4	7.0
43-62	0.27			(s)	1.7		1.6c					26.0	18.2		6.9	7.1	7.6
62-79	0.15			(s)	2.2								19.7		7.2	7.3	7.8

Depth (in.)	Extractable bases				6B1a Ext. Acidity	Cat. Meth. Cap.			Water extract from saturated paste 8A1								8A1a Electrical conductivity mmho/cm	
	6N2a Ca	602a Mg	6P2a Na	6Q2a K		5A3a Sum	5A1a NH ₄ OAc	6N1a Ca	6Q1a Mg	6P1a Na	6Q1a K	CO ₃ HCO ₃ Cl SO ₄						
	meq/100 g					meq/liter												
0-4	9.9	3.4	0.2	0.3	13.8	9.2	23.0	17.7										
4-12	9.8	3.4	0.3	0.3	13.8	9.3	23.1	17.4										
12-21	10.0	3.9	0.9	0.3	15.1	8.1	23.2	18.1										
21-29	14.4	6.7	1.7	0.5	23.3	8.7	32.0	25.2			3.3	tr						0.44
29-43	16.9	8.0	2.6	0.5	28.0	5.6	33.6	27.8			5.2	tr						0.73
43-62	17.2d	8.0e	3.6	0.5	29.3	3.0	32.3	29.2	2.2	1.6	11.6	tr						1.64
62-79	20.3d	9.0e	5.3	0.4	35.0	2.3	37.3	33.9	3.3	2.0	16.8	tr						2.40

Depth (in.)	8A Water at Saturation Pct	5D2 Exchangeable Na Pct	5E Sodium Adsorp. Ratio	Gypsum	Base Sat.		Ratios to Clay 8D1		
					5C3 Sum	5C1 NH ₄ OAc	5A3a NH ₄ OAc	5A1a Ext.	15-Bar Iron
					Pct.	Pct.	CEC	CEC	CEC
0-4					60	78	0.87	0.059	0.47
4-12					60	79	0.79	0.050	0.45
12-21					65	83	0.67	0.052	0.42
21-29	51.8	6			73	92	0.62	0.047	0.38
29-43	62.9	8			83	101	0.62	0.040	0.41
43-62	66.1	10	8		91	100	0.65	0.038	0.40
62-79	72.5	12	10		94	103	0.66	0.043	0.38

- a. Fe-Mn nodules: > 50 percent (2-0.5 mm.); 5-25 percent (0.5-0.25 mm.).
- b. 18 kg/m² to 60 inches (Method 6A).
- c. Estimated.
- d. NH₄Cl-EtOH extraction (Method 6N3a).
- e. NH₄Cl-EtOH extraction (Method 6Q3a).

Soil Type: Okemah silt loam

Soil No.: S62-Okla-56-1

Location: Okmulgee County, Oklahoma. About 1,350 feet south and 100 feet west of the northeast corner of Section 31, T15N, R11E.

Vegetation and Use: Tall grass prairie. Used for native hay meadow.

Slope and Land Form: Slope is 1.8 percent on upland.

Drainage and Permeability: Well drained. Runoff medium. Slow permeability.

Parent Material: Clayey, weakly fissile shales of Pennsylvanian Age.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June 1962.

Described by: Earl C. Nance and W. A. Sparwasser.

Horizon and

Lincoln

Lab. Number

- A11 0 to 4 inches. Black (10YR 2/1) silt loam; dark gray (10YR 4/1) dry; strong fine subangular blocky breaking to moderate medium and coarse granular structure; friable, slightly hard; many earthworm castings; pH 6.0; diffuse boundary.
- 17160
- A12 4 to 12 inches. Very dark brown (10YR 2/2) heavy silt loam; dark gray (10YR 4/1) dry; strong fine subangular blocky breaking to moderate medium and coarse granular structure; friable, slightly hard; many earthworm castings; pH 6.0; clear wavy boundary.
- 17161
- B1 12 to 21 inches. Very dark brown (10YR 2/2) silty clay loam; few fine faint grayish brown and yellowish brown mottles; dark gray (10YR 4/1) dry; moderate medium and fine subangular blocky breaking to moderate coarse and medium granular structure; firm, hard; few fine iron concretions; pH 6.0; clear wavy boundary.
- 17162
- B21t 21 to 29 inches. Mottled very dark gray (10YR 3/1), dark yellowish brown (10YR 4/4), reddish brown (5YR 4/4), and olive brown (2.5Y 4/4) silty clay; weak medium subangular and angular blocky structure; very firm, very hard; slickensides have smooth grooved planes, 30 to 40 degrees from horizontal; few fine iron concretions; pH 6.5; gradual boundary.
- 17163
- B22t 29 to 43 inches. Mottled dark gray (10YR 4/1), olive brown (2.5Y 4/4), grayish brown (10YR 5/2), dark reddish brown (2.5YR 3/4), very dark grayish brown (2.5Y 3/2), and yellowish brown (10YR 5/4) clay; weak coarse blocky and subangular blocky structure breaking to fine subangular blocky structure; very firm, very hard; a few iron concretions; roots more numerous on faces of peds than inside peds; pH 7.0; gradual boundary.
- 17164
- B3 43 to 62 inches. Coarsely mottled very dark brown (2.5Y 2/2), olive brown (2.5Y 4/4), yellowish brown (10YR 5/4), dark reddish brown (2.5YR 3/4) and very dark gray (5Y 3/1) clay; mixed crushed color is dark grayish brown (2.5Y 4/2); massive structure; very firm, very hard; pH 8.0; gradual boundary.
- 17165
- C 62 to 79 inches. Olive brown (2.5Y 4/4) clay; few medium distinct gray (N 5/0) and dark yellowish brown (10YR 4/6) mottles; light olive brown (2.5Y 5/4) dry; massive structure; very firm when moist, very hard when dry; pH 8.0; few iron and calcium carbonate concretions.
- 17166

Note: Colors refer to moist colors unless stated otherwise. Field determination of pH was made by Hellige-Truog kit.

Mineralogy (Method 7B1): Observations on very fine sand.

All, B22t and C horizons: 85-90 percent iron oxide stained quartz and 10 percent feldspar; no ferromagnesian minerals; trace of chert and reddish brown aggregates.

SOIL Okemah silt loam SOIL Nos. 862Okla-56-2 LOCATION Okmulgee County, Oklahoma

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 17167-17173 February 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm) <u>3A1</u>											Coarse fragments					
		Total				Sand				Silt			Int III (0.02-0.002)	Int II (0.2-0.02)	(2-0.1)	2A2 ≥ 2	2-19	19-76
		Sand (2-0.05) a	Silt (0.05-0.002)	Clay ($<$ 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Pct of $<$ 2 mm	Pct						
0-5	A11	21.4	58.1	20.5	0.2	0.7	0.9	6.6	13.0	33.7	24.4	51.8	8.4	-	-	-		
5-12	A12	21.8	55.9	22.3	0.1	0.8	1.0	7.0	12.9	31.5	24.4	49.7	8.9	-	-	-		
12-19	B1	19.2	52.2	28.6	0.3	0.6	0.7	6.0	11.6	28.5	23.7	44.6	7.6	-	-	-		
19-27	B21t	15.0	43.2	41.8	0.4	0.5	0.5	4.7	8.9	22.3	20.9	34.7	6.1	-	-	-		
27-42	B22t	13.6	43.3	43.1	0.3	0.4	0.5	4.2	8.2	21.0	22.3	32.4	5.4	-	-	-		
42-62	B3	13.2	42.8	44.0	0.4	0.3	0.4	4.1	8.0	20.6	22.2	31.7	5.2	tr	-	-		
62-80	C	16.8	40.3	42.9	0.7	0.6	0.7	5.1	9.7	20.4	19.9	33.9	7.1	-	-	-		

Depth (in.)	Organic carbon	6B1a Nitrogen	C/N	6E2a Carbonate as CaCO ₃	Bulk density			4D1 COLE	Water content					pH	8C1a (1.1) H ₂ O
					4A1a Field State	4A1c 30-cm	4A1b Air Dry		4B4 Field State	4B3 30-cm	4B1b 1/3-Bar	4B2 15-Bar	4C1 1/3 to 15-Bar		
	Pct.	Pct.		Pct.	g/cc	g/cc	g/cc	Pct	Pct	Pct	Pct.	in/in.			
0-5	2.28	0.143	16								9.9			5.3	
5-12	1.66	0.125	13								10.5			5.5	
12-19	1.22	0.095	13								12.8			5.7	
19-27	0.76	0.068	11								17.3			6.0	
27-42	0.46			-(s)	1.56	1.68	1.92	0.044	23.9	17.0	25.3	18.0	0.12	6.6	
42-62	0.23			-(s)								18.1		7.2	
62-80	0.10			tr(s)								18.7		7.7	

Depth (in.)	Extractable bases				5B1a Sum	6B1a Ext. Acidity	Cat. Baph. Cap.		8D3 Ca/Mg	Base saturation	
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K			5A3a Sum	5A1a NH ₄ OAc		5C3 Sum Cations	5C1 NH ₄ OAc CEC
					meq/100 g					Pct	Pct
0-5	9.3	4.0	0.2	0.3	13.8	9.0	22.8	18.2	2.3	60	76
5-12	9.7	4.2	0.4	0.2	14.5	9.0	23.5	18.9	2.3	62	77
12-19	11.0	5.3	0.8	0.3	17.4	8.7	26.1	20.7	2.1	67	84
19-27	15.1	8.4	1.6	0.5	25.6	8.3	33.9	27.2	1.8	76	94
27-42	16.6	9.2	1.9	0.5	28.2	4.7	32.9	27.4	1.8	86	103
42-62	17.0b	9.3c	2.4	0.5	29.2	2.4	31.6	28.0	1.8	92	104
62-80	17.0b	8.7c	2.8	0.5	29.0	1.8	30.8	28.1	2.0	94	103

Depth (in.)	Ratios to Clay 8D1		15-Bar Water
	NH ₄ OAc CEC		
0-5	0.89		0.48
5-12	0.85		0.47
12-19	0.72		0.45
19-27	0.65		0.41
27-42	0.64		0.42
42-62	0.64		0.41
62-80	0.67		0.44

a. Fe-Mn nodules: > 50 percent (2-0.5 mm.); 5-25 percent (0.5-0.25 mm.).
b. NH₄Cl-EtOH extraction (Method 6N3a).
c. NH₄Cl-EtOH extraction (Method 6O3a).

Soil Type: Okemah silt loam

Soil No.: S62-Okla-56-2

Location: Okmulgee County, Oklahoma. About 50 feet west and 200 feet south of the half mile line on the north side of Section 15, T15N, R11E.

Vegetation and Use: Tall grass prairie. Used for native hay meadow.

Slope and Land Form: Slope 1.5 percent on upland.

Drainage and Permeability: Well drained. Runoff medium. Slow permeability.

Parent Material: Clayey, weakly fissile shales of Pennsylvanian Age.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June, 1962.

Described by: Earl C. Nance and W. A. Sparwasser.

Horizon and

Lincoln

Lab. Number

- A11 0 to 5 inches. Very dark brown (10YR 2/2) heavy silt loam, dark gray (10YR 4/1) dry; strong fine subangular blocky structure, breaking to weak coarse granular structure; friable, slightly hard; pH 6.0; diffuse boundary.
17167
- A12 5 to 12 inches. Very dark brown (10YR 2/2) light silty clay loam, dark gray (10YR 4/1) dry; strong fine subangular blocky structure, breaking to weak coarse granular structure; friable, slightly hard; pH 6.0; diffuse boundary.
17168
- B1 12 to 19 inches. Very dark brown (10YR 2/2) silty clay loam, dark gray (10YR 4/1) dry; strong fine subangular blocky, breaking to coarse granular structure; firm, hard; few fine iron concretions; pH 6.3; gradual boundary.
17169
- B21t 19 to 27 inches. Very dark gray (10YR 3/1) silty clay; many medium distinct yellowish brown, reddish brown and dark grayish brown mottles; gray (10YR 5/1) dry; weak medium subangular blocky structure; very firm, very hard; few iron concretions; pH 7.0; gradual boundary.
17170
- B22t 27 to 42 inches. Mottled gray, olive brown, dark grayish brown and yellowish brown clay; weak coarse subangular blocky structure; very firm; very hard; smooth grooved slickensides on a nearly horizontal plane; few iron concretions; pH 7.5; gradual boundary.
17171
- B3 42 to 62 inches. Coarsely mottled very dark grayish brown (2.5Y 3/2), olive brown (2.5Y 4/4), and yellowish brown (10YR 5/4) clay; massive structure; very firm; very hard; smooth grooved slickensides on a nearly horizontal plane; few iron concretions; pH 8.0; gradual boundary.
17172
- C 62 to 80 inches. Coarsely mottled yellowish brown, grayish brown, light olive brown and gray clay; massive structure; very firm; very hard; pH 8.0; few iron concretions.
17173

Notes: Colors are for moist soil unless otherwise stated. The pH determination in the field was made with a Hellige-Truog kit.

Mineralogy (Method 7B1): Observations on very fine sand.

All, B22t, and C horizons: 80-90 percent iron oxide stained quartz and 10-15 percent feldspar; reddish brown aggregates increase with depth; trace of ferromagnesian minerals.

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Mayes County, Oklahoma

SOIL TYPE Parsons silt loam

LAB NOS. 54190 - 54199

SOIL NOS. 8530k1a-49-2

LABORATORY NUMBER	DEPTH INCHES	HORIZON	1B1b PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)								3A1		TEXTURAL CLASS	
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	INTERNATIONAL		2A2 > 2		
										II 0.2-0.02	III 0.02-0.002			
54190	0-6	A11	0.5	0.6	1.0	8.5	6.8	70.4	12.2		31.8	0	sil	
54191	6-10	A12	1.0	1.2	1.0	8.6	6.6	69.2	12.4		32.4	0	sil	
54192	10-14	A21	2.2	2.3	1.0	7.8	6.2	66.6	13.9		31.1	0	sil	
54193	14-16	A22	3.7	2.7	0.8	6.7	5.0	55.5	25.6		27.0	0	sil	
54194	16-22	B21	0.1	0.4	0.3	3.6	2.8	35.0	57.8		18.0	0	c	
54195	22-28	B22	0.1	0.2	0.3	3.4	2.6	34.1	59.3		18.5	0	c	
54196	28-37	B31	0.4	0.3	0.4	5.3	4.0	40.2	49.4		19.4	0	sic/c	
54197	37-43	B32	0.9	0.9	0.7	7.0	5.3	46.7	38.5		20.9	< 1	sicl	
54198	43-66	C1	1.2	1.9	1.2	7.8	6.1	45.5	36.3		19.2	< 1	cl	
54199	66-84	C2	0.8	0.6	0.8	8.0	6.2	43.3	40.3		18.1	< 1	sic/sicl	
			pH		ORGANIC MATTER			FREF IRON OXIDE Fe ₂ O ₃			MOISTURE RETAINED A'			
		8C1a		6A1a ORGANIC CARBON %	NITROGEN %	C/N				BULK DENSITY g/cc	1/10 ATMOS. %	1/3 ATMOS. %	5 ATMOS. %	
		1:1												
54190	5.7			1.15										
54191	5.2			0.63										
54192	5.5			0.38										
54193	5.6			0.50										
54194	5.4			0.87										
54195	5.3			0.73										
54196	5.3			0.32										
54197	5.4			0.17										
54198	5.4			0.11										
54199	5.6			0.06										
			EXTRACTABLE CATIONS 5B1a					BASE SATURATION % 5C3 (SUM)						
		CATION EXCHANGE CAPACITY (SUM)	6N2b Ca	6O2b Mg	6P2a K	6Q2a Na	6H1a H							
			milliequivalents per 100g soil											
54190		5.8	0.8	< 0.1	0.1	6.3	52							
54191		2.9	0.8	0.1	0.4	7.0	38							
54192		2.4	0.8	0.2	0.5	6.2	39							
54193		4.8	2.3	0.3	1.3	8.6	50							
54194		12.5	5.9	0.5	3.4	16.2	58							
54195		14.1	6.8	0.4	3.8	12.2	67							
54196		12.0	6.2	0.4	3.3	9.6	70							
54197		9.6	4.8	0.4	2.6	5.2	77							
54198		9.7	4.8	0.4	2.3	6.2	74							
54199		12.6	6.1	0.4	2.5	5.8	79							

Location: Hayes County, Oklahoma; 1-1/2 miles west of Adair, 1280 feet west and 100 feet south of the northeast corner, Section 32, T23N; R19E. On aerial photo CMO 2-93.

Site: In nearly level erosional upland with plane to weak convex surfaces and gradient of about 1/2 percent. It is in a native bluestem meadow with a thick, vigorous growth of grass.

Horizon, Depth
and Beltsville, Lab. No.

- A11 0-6 Dark grayish brown (10YR 4.5/2; 3/2 when moist) silt loam; weak inches to moderate medium granular; friable; pH 6.0; grades to horizon Lab No. 54190 below.
- A12 6-10 Dark grayish brown (10YR 4/2; 3/2 when moist) silt loam; weak inches to moderate medium granular; friable; contains a few splotches of light brownish gray and a few fine dark brown specks about the root holes; pH 5.8; grades shortly to horizon below. Lab No. 54191
- A21 10-14 Light brownish gray (10YR 6/2; 5/2 when moist) silt loam with inches many medium distinct dark brown mottles; weak medium granular; friable; permeable; pH 5.8; grades shortly to horizon below. Lab No. 54192
- A22 14-16 Light brownish gray (10YR 6/2; 5/2 when moist) silt loam with inches many medium, distinct dark brown mottles; porous massive; friable; permeable; a few fine balls of dark brown clay in lower one-half inch; pH 5.8; rests on horizon below. Lab No. 54193
- B21 16-22 Very dark grayish brown (10YR 3.5/2; 3/2 when moist) clay with inches common, medium, distinct strong brown mottles; weak coarse blocky; very compact; very slowly permeable; sides of peds strongly coated with light gray films; strong vertical cracks; pH 6.0; grades to horizon below. Lab No. 54194
- B22 22-28 Much like the layer above but dark brown (10YR 3.5/3; inches 3/3 when moist) clay with a few, very fine, distinct strong brown specks and a few, fine black concretions; grades to horizon below. Lab No. 54195
- B31 28-37 Light yellowish brown (10YR 6/4; 5/4 when moist) clay inches with a few, fine distinct strong brown mottles; weak coarse blocky; very compact; very slowly permeable; fine rounded siltstone fragments and small black concretions, few; pH 6.0; grades to horizon below. Lab No. 54196
- B32 37-43 Grayish brown (10YR 5/2; 4/2 when moist) clay with inches common medium faint yellowish brown mottles; weak coarse blocky; very compact; very slowly permeable; fine round black concretions few; slightly less compact than layer above; pH 6.0; grades to horizon below. Lab No. 54197
- C1 43-66 Coarsely mottled light gray (10YR 7/1; 6/1 when moist) strong- inches brown (7.5YR 5/6; 4/6 when moist) and yellowish brown (10YR 5/4; 4/4 when moist) clay; massive; firm; slowly permeable; seams of sandy clay loam common; fine rounded siltstone chips and clusters of white gypsum crystals common; pH 6.5; grades to horizon below. Lab No. 54198
- C2 66-84 + Coarsely mottled yellowish brown (10YR 5/6; 4/6 when moist) inches and gray (10YR 6/1; 5/1 when moist) clay; massive; compact; slowly permeable; rounded chips of siltstone and small pockets of white gypsum crystals, few; pH 6.5. This is only partially altered clay shale but is slightly more compact than the material in the C1 layer above. Lab No. 54199

This soil develops in soft shales or clays of Pennsylvanian age. It has formed on a very gentle slope while nearby the north and east are areas of Cherokee soils on the slightly concave flats with deficient surface drainage. These are lighter-colored soils with thicker A2 horizons. To the west on less clayey material, where surfaces are convex and relief is a bit greater, Dennis soils develop.

This appears to be very representative Parsons silt loam with an A2 horizon here of 6-inch thickness. The thicker A2 horizons seem to be general in the counties of northeast Oklahoma while in Wagoner County few areas of the soil have A2 horizons over 2 to 3 inches thick. In Pawnee county, to the west, few A2 layers are over 2 inches thick and many times they are indistinct. Where the A2 is not distinct the A1 horizons are usually darker in color and the gradation from A to B horizons is slightly less abrupt so that the soils approach Kirkland in appearance but develop in less alkaline materials.

Samples collected by E. M. Galloway, R. W. Simonsen and E. H. Tompkins November 10, 1953. Described by E. M. Galloway, Except where specified moist, colors refer to dry soil.

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Mayes County, Oklahoma

SOIL TYPE Parsons silt loam

LAB NOS. 54200 - 54206

SOIL NOS. S530k1a-49-3

LABORATORY NUMBER	DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)									TEXTURAL CLASS	
			1B1b					3A1					
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	INTERNATIONAL			2A2 > 2
							II 0.2-0.02	III 0.02-0.002					
54200	0-8	A1	0.1	0.5	1.6	10.8	7.7	67.7	11.6		31.1	0	sil
54201	8-15	A2	1.2	0.8	1.4	10.2	7.3	63.9	15.2		30.3	<1	sil
54202	15-22	B21	0.2	0.3	0.7	5.2	4.7	41.7	47.2		21.0	0	sic
54203	22-29	B22	0.4	0.2	0.8	6.7	4.8	44.9	42.2		22.5	0	sic
54204	29-38	B31	0.4	0.6	1.1	9.0	6.5	45.4	37.0		20.0	0	sic1
54205	38-52	C1	0.7	0.7	1.3	9.6	7.2	49.7	30.8		22.6	0	sic1
54206	52-80+	C2	1.1	1.1	1.5	9.8	7.4	43.1	36.0		17.6	<1	cl
			pH		ORGANIC MATTER			FREE IRON OXIDE Fe ₂ O ₃	MOISTURE RETAINED AT				
8C1a 1:1			6A1a ORGANIC CARBON %	NITROGEN %	C/N			BULK DENSITY g/cc	1/10 ATMOS. %	1/3 ATMOS. %	15 ATMOS. %		
54200	5.0		0.85										
54201	5.1		0.42										
54202	5.4		0.50										
54203	6.0		0.34										
54204	6.1		0.22										
54205	5.6		0.11										
54206	5.4		0.08										
			EXTRACTABLE CATIONS 5B1a					BASE SATURATION %					
CATION EXCHANGE CAPACITY (SUM)			6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	6H1a H	5C3 (SUM)					
			milliequivalents per 100g soil										
54200		3.7	1.1	<0.1	0.1	6.5	43						
54201		3.2	1.2	0.4	0.1	5.8	46						
54202		12.3	5.7	2.6	0.3	10.8	66						
54203		12.5	5.7	3.1	0.3	6.3	77						
54204		11.4	5.1	3.2	0.3	5.0	80						
54205		15.3	4.6	3.1	0.2	4.5	84						
54206		12.7	5.9	3.4	0.3	5.3	81						

Location: Mayes County, Oklahoma; 6 miles northwest of Pryor. 950 feet north of the east quarter corner Section 14, T22N, R16E. On aerial photo CMO 16-14.

Site: Nearly level, imperfectly drained, erosional upland with plane slopes and surface gradient of less than 1/2 percent. It is in a pasture which appears to be native and undisturbed but may have been former cropland. Many pioneer grasses occur between the clumps of bluestems.

**Horizon, Depth
and Beltsville Lab. No.**

- A1 0-8 inches Light brownish gray (10YR 6/2; 4/2 when moist) silt loam with a few fine distinct strong brown mottles or specks around root holes; weak medium granular; friable; fine black concretions and accretions few; pH 5.0; grades shortly to horizon below.
Lab No. 54200
- A2 8-15 inches Pale brown (10YR 6/3; 5/2 when moist) silt loam with many medium distinct strong brown mottles and light gray spots; weak medium granular to porous massive; friable; fine black concretions and ferruginous films numerous; pellets of clay with strong, gray coatings in lower one-half inch; pH 5.8; rests abruptly on horizon below.
Lab No. 54201
- B21 15-22 inches Grayish brown (1Y 5/2.5; 3/2 when moist) clay with many strong distinct mottles of yellowish-brown and strong brown; weak coarse blocky; very compact; very slowly permeable; strong coatings of light gray dust on peds in upper 3 inches; faces of peds faintly shiny in lower part; pH 6.2; grades to horizon below.
Lab No. 54202
- B22 22-29 inches Grayish brown (2.5Y 5/2; 4/2 when moist) clay with a few fine distinct dark yellowish brown mottles; weak coarse blocky; very compact; very slowly permeable; pH 6.5; grades to horizon below.
Lab No. 54203
- B31 29-38 inches Light yellowish brown (2.5Y 6/3; 5/3 when moist) clay coarsely mottled or streaked with dark gray (10YR 4/1; 3/1 when moist); weak coarse blocky; very compact; very slowly permeable; vertical cracking strong; medium black concretions and fine reddish brown specks few; pH 6.5; grades to horizon below.
Lab No. 54204
- C1 38-52 inches Light gray (10YR 7/2; 6/1.5 when moist) silty clay coarsely mottled with strong brown and dark yellowish brown; weak coarse blocky; very firm; very slowly permeable; fine black concretions, ferruginous films and flat, rounded siltstone chips common; pH 6.5; grades to horizon below.
Lab No. 54205
- C2 52-80 + inches Coarsely mottled light gray (10YR 7/2; 6/2 when moist) yellowish brown (10YR 5/6; 4/6 when moist) and strong brown (7.5YR 5/6; 4/6 when moist) silty clay intercalated with layers of sandy clay; very dark brown ferruginous films, few; small rounded siltstone chips occasional; pH 6.5. This is only slightly altered soft clay shale.
Lab No. 54206

The parent material of this soil is soft clay shales, probably of the Winslow formation of early Pennsylvanian age. It develops on a nearly level area with plane slope on a broad upland flat and is gradational toward the Cherokee soils which occupy slightly concave parts of the same flat to the south and east. The surface colors are slightly lighter than normal for Parsons and the A2 horizon is somewhat thicker and more mottled than typical for the series.

The soil occurs here in association with Dennis which forms in less clayey rocks on areas of greater relief to the west. To the north and west are rough sandstone areas on which Hector and Pottsville soils develop. Narrow drainage sides in the Parsons area are occupied by Talihina and Collinsville soils.

Samples collected by H. M. Galloway, R. W. Simonson and E. H. Templin, November 10, 1953. Described by H. M. Galloway.

Except where specified moist the colors refer to dry soil.

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Pawnee County, Oklahoma

SOIL TYPE Renfrow silt loam

LAB NOS. 54215 - 54219

SOIL NOS. S53Ok1a-59-36

LABORATORY NUMBER	DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)									TEXTURAL CLASS	
			1B1b					3A1					
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	INTERNATIONAL			2A2 > 2
II 0.2-0.02	III 0.02-0.002												
54215	0-11	A1	0.2	1.2	2.0	7.1	16.5	49.6	23.4		12.8	0	l/sil
54216	11-13	A3	0.1	0.8	1.5	5.0	12.8	45.6	34.2		13.9	0	cl
54217	13-21	B2	0.2	0.9	1.2	3.7	8.3	40.8	44.9		15.7	0	sic
54218	21-30	B3	0.3	1.1	1.2	3.7	8.2	41.9	43.6		20.1	0	sic
54219	30-55	C	1.0	1.7	1.0	2.0	4.4	47.8	42.1		34.7	< 1	sic
		pH		ORGANIC MATTER			FREE IRON OXIDE Fe ₂ O ₃			MOISTURE RETAINED AT			
		8C1a		6A1a ORGANIC CARBON	NITROGEN	C/N	%		BULK DENSITY g/cc	1/10 ATMOS.	1/3 ATMOS.	1/5 ATMOS.	
		1:1		%	%					%	%	%	
54215	5.6			1.52									
54216	5.7			1.14									
54217	6.6			0.70									
54218	8.0			0.38									
54219	7.9			0.13									
		CATION EXCHANGE CAPACITY (SUM)	EXTRACTABLE CATIONS 5B1a					BASE SATURAT-ION					
			6N2b Ca	6O2b Mg	6P2a K	6Q2a Na	6H1a H	% 5C3 (SUM)					
			milliequivalents per 100g soil										
54215		7.0	4.5	0.3	0.2	6.6	64						
54216		8.6	7.5	0.3	0.8	7.8	69						
54217		11.7	12.0	0.4	1.6	5.3	83						
54218			FREE CARBONATES										
54219			"										

Location: Pawnee County, Oklahoma; 1 mile southwest of Watchorn and 12 miles northwest of Pawnee near Oklahoma Highway 15. 1400 feet west of the northeast corner Section 8, T22N; R3E.

Site: Gently sloping, erosional upland with convex surface configuration and gradient of about 2-1/2 percent. In a native bluestem meadow with a thick, vigorous growth of grass.

**Horizon, Depth
and Beltsville Lab. No.**

- | | | |
|----|------------------------------------|--|
| A1 | 0-11
inches
Lab No. 54215 | Dark reddish brown (5YR 3/3; 2.5/2 when moist) silt loam; weak to moderate medium granular; friable; porous and permeable; pH 6.0; grades shortly to horizon below. |
| A3 | 11-13
inches
Lab No. 54216 | Dark reddish brown (5YR 4/3; 3/3 when moist) light clay loam; moderate medium and fine granular; friable; porous and permeable; pH 6.0; rests abruptly on horizon below. |
| B2 | 13-21
inches
Lab No. 54217 | Dark reddish brown (5YR 4/3; 3/3 when moist) clay; compound strong prismatic and weak medium blocky; very firm; very compact; very slowly permeable; roots penetrate largely between peds; rootlets extend partially through peds; sides of peds coated with dark reddish brown (5YR 3/2; 2/2 when moist) clay films; a vertical crack 1/4 to 3/4 inch wide extends from the center of this horizon through the B3 horizon; pH 6.5; grades to the horizon below. |
| B3 | 21-30
inches
Lab No. 54218 | Dark reddish brown (3YR 4/3; 3/3 when moist) clay with a few coarse distinct mottles of reddish yellow; compound, very coarse prismatic and weak coarse blocky; extremely firm and compact; very slowly permeable; coarse and medium black concretions and accretions, few; sides of peds have weakly shiny clay films; roots up to 1/32 inch diameter penetrate the layer but are largely in spaces between peds; pH 7.5; grades to horizon below. |
| C | 30-55 +
inches
Lab No. 54219 | Reddish brown (3.5YR 4/4; 3/4 when moist) clay with many, coarse distinct spots of pink with diffuse borders; weak medium blocky; firm; slowly permeable; coarse calcium carbonate concretions and coarse accretionary films, few; pH 8.0; mildly calcareous in pockets and seams. This layer is appreciably less compact than the B3 layer and continues to the lowest depth sampled where a hard sandstone seam prevents further sampling. |

This soil develops in soft red clay beds of Permian age which are probably of the Doyle shale formation, part of the Chase Group of the upper Permian. The clays are intercalated with sandy beds and with moderately indurated sandy seams, on which rocks the Zaneis and Lucien soils develop. Because these sandy and clayey materials occur in relatively thin bands, the areas of Renfrow and Zaneis occur intimately mixed and transitional profiles are common in this vicinity. On sandstone capped escarpments and along the V-shaped drainageways in Renfrow areas, the thin Vernon soils develop. Red clays, about 1/2 mile east on gentler relief, are occupied by the darker soils of the Kirkland series.

Samples collected by H. M. Galloway, R. W. Simonson and E. H. Templin, November 13, 1953. Described by H. M. Galloway.

Except where specified moist, the colors refer to dry soil.

SOIL Rosebloom silt loam SOIL Nos. S62081a-45-3 LOCATION McCurtain County, Oklahoma
 SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 17099-17106 February 1967
 General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1											Coarse fragments			
		Total		Sand					Silt				2A2 > 2	2 - 19 19 - 76		
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Vary coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Vary fine (0.1-0.05)	0.05-0.02	Int III (0.02-0.002)	Int II (0.2-0.02)		(2-0.1)	Pct. of < 76 mm	
0-3	A1	11.7	64.3	24.0	0.9	1.5	0.6	1.8	6.9	21.7	42.6	29.9	4.8	-	-	-
3-8	B21	12.9	64.6	22.5	0.9	1.6	0.9	1.8	7.7	22.0	42.6	31.0	5.2	-	-	-
8-18	B21	11.8	61.8	26.4	0.8	2.0	1.0	1.9	6.1	19.6	42.2	27.0	5.7	-	-	-
18-30	B22	12.5	59.0	28.5	0.9	2.4	1.2	2.0	6.0	18.3	40.7	25.7	6.5	-	-	-
30-41	C1g	11.8	62.6	25.6	2.3	2.6	0.8	1.2	4.9	20.7	41.9	26.4	6.9	-	-	-
41-52	C1g	8.0	56.0	36.0	1.6	2.6	0.8	1.1	1.9	11.8	44.2	14.3	6.1	-	-	-
52-62	C2g	8.3	56.2	35.5	1.0	2.2	0.9	1.0	3.2	15.7	40.5	19.5	5.1	-	-	-
62-83	C3g	10.0	60.8	29.2	0.4	2.5	1.2	1.3	4.6	18.5	42.3	23.8	5.4	-	-	-

Depth (in.)	6A1a Organic carbon Pct	6B1a Nitrogen Pct	C/N	6G1b KCl-Ext. Al Me/100g	Carbonate as CaCO3 Pct	6C2a Ext. Iron as Fe Pct.	Bulk density			4D1 COLE	Water content				pH			
							4A1a Field g/cc	4A1c 30-cm g/cc	4A1b Air Dry g/cc		4B4 Field State Pct	4B3 30-cm Pct	4B1b 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3 to 15-Bar in/in.	8C1b Sat. Paste	8C1a 1:1 H2O	8C1a 1:10 H2O
0-3	2.24	0.154	14	0.8		1.8	1.24	1.28	1.33	0.014	32.8	27.1	26.7	11.1	0.20		5.0	5.3
3-8	0.49	0.041	12	4.8		1.6	1.44	1.44	1.48	0.010	23.8	24.1	24.0	9.2	0.21		4.8	4.9
8-18	0.25	0.044	6	6.5		1.9	1.44	1.44									4.8	5.0
18-30	0.21	0.043		7.0		1.8	1.44	1.46	1.52	0.014	25.1	24.7	23.8	11.0	0.19		4.9	5.0
30-41	0.14			6.0		1.9	1.71	1.67	1.72	0.010	16.6	20.2	21.9	10.2	0.20		5.0	5.2
41-52	0.17			8.0		2.0		1.66								4.4	5.0	5.6
52-62	0.17			6.2		2.0	1.64	1.60	1.68	0.017	19.6	28.2	29.5	15.1	0.23	4.1	4.6	5.4
62-83	0.17			3.1		1.7										4.1	4.3	5.1

Depth (in.)	Extractable bases 5B1a				Sum	Cat. Mech. Cap.			Water extract from saturated paste 8A1							8A1a Electrical conductivity mmho/cm		
	6M2a Ca	6O2a Mg	6P2a Na	6Q2a K		6H1a Ext. Acidity	5A3a Sum NH4, OAc	5A1a NH4, OAc	6N1a Ca	6O1a Mg	6P1a Na	6Q1a K	CO3	HCO3	Cl		SO4	
0-3	4.5	1.6	tr	0.3	6.4	12.7	19.1	14.5										
3-8	1.0	0.6	tr	0.1	1.7	11.0	12.7	10.5										
8-18	0.3	0.8	0.1	0.1	1.3	12.6	13.9	12.0										
18-30	-	1.1	0.2	0.1	1.4	13.7	15.1	12.4										
30-41	0.2	1.2	0.3	0.1	1.8	11.3	13.1	11.2										
41-52	0.7	2.4	1.5	0.2	4.8	15.1	19.9	15.9										0.60
52-62	1.0	2.8	2.9	0.2	6.9	13.2	20.1	16.4										1.79
62-83	1.1	2.6	4.4	0.2	8.3	9.9	18.2	13.4	0.7	0.7	3.0	42.5	0.1					5.00

Depth (in.)	8A Water at Saturation Pct.	5D2 Exchangeable Na Pct.	5E Sodium Adsorp Ratio	6F1a Gypsum Pct.	Base Sat.		Ratios to Clay		15-Bar Water
					5C3 Sum CEC Pct.	5C1 NH4, OAc CEC Pct.	NH4, OAc CEC	Ext. Iron	
0-3					34	44	0.60	0.075	0.46
3-8					13	16	0.47	0.071	0.41
8-18					9	11	0.45	0.072	0.41
18-30					9	11	0.44	0.063	0.39
30-41					14	16	0.44	0.074	0.40
41-52	40.0	8	-	-	24	30	0.44	0.056	0.40
52-62	45.0	13	25	-	34	42	0.46	0.056	0.43
62-83	40.9	20	31	-	46	62	0.46	0.058	0.41

a. Fe-Mn nodules: > 50 percent (2-0.1 mm.);
 5-25 percent (0.1-0.05 mm.).
 b. 7.6 kg/m² to 60 inches (Method 6A).
 c. Estimated.

Soil Type: ~~*Rosebloom~~ silt loam

Soil No.: S62-Okla-45-3

Location: McCurtain County, Oklahoma. About 600 feet north and 350 feet west of Little River Bridge on Highway 70 in Section 14, T7S, R24E.

Vegetation and Use: Hardwood forest, predominantly water oak, post oak and blackgum. Used for commercial woodland. Slope and Land Form: Nearly level, 0.2 percent slope on a floodplain.

Drainage and Permeability: Poorly drained. Permeability very slow. Runoff slow.

Parent Material: Loamy acid sediments primarily from soils formed from Pennsylvanian Age rocks.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June, 1962.

Described by: Earl C. Nance and Robert Reasoner.

Horizon and

Lincoln

Lab. Number

- A1
17099 0 to 3 inches. Dark grayish brown (10YR 4/2) silt loam; few fine faint mottles of pale brown; light gray (10YR 7/1) dry; moderate medium and fine granular structure; slightly hard, friable; pH 5.0; clear boundary.
- B21
17100 3 to 8 inches. Light gray (10YR 6/1) silt loam; few medium and coarse prominent mottles of yellowish brown (10YR 5/6) and brown (10YR 5/3); white (10YR 8/1) dry; moderate fine subangular blocky structure; hard, friable; occasional very small hard iron concretions; pH 5.0; diffuse boundary.
- B21
17101 8 to 18 inches. Same as horizon above - separated for sampling purposes.
- B22
17102 18 to 30 inches. Brown (10YR 5/3) light silty clay loam; many distinct coarse mottles of gray (10YR 6/1), common thin streaks of yellowish brown (10YR 5/6); very pale brown (10YR 7/3) dry; moderate fine subangular blocky structure; friable, hard; few small hard iron concretions; pH 5.0; clear wavy boundary.
- C1g
17103 30 to 41 inches. Light gray (10YR 6/1) silty clay loam; many distinct medium mottles of yellowish brown (10YR 5/6); light gray (10YR 7/1) dry; moderate medium and fine subangular blocky structure; few brittle peds suggesting a weak fragipan; friable, very hard; soil mass contains about 20 percent soft and hard iron concretions; pH 4.6; diffuse boundary.
- C1g
17104 41 to 52 inches. Same as horizon above - separated for sampling purposes.
- C2g
17105 52 to 62 inches. Coarsely mottled gray (10YR 5/1) and yellowish brown (10YR 5/8) silty clay loam; massive structure; friable to firm, very hard; few fine and medium iron concretions; pH 4.5; gradual boundary.
- C3g
17106 62 to 83 inches. Yellowish brown (10YR 5/4) silty clay loam; many medium and coarse mottles of gray (10YR 5/1) moist; light yellowish brown (10YR 6/4) moist; massive structure; friable to firm, very hard; pH 5.0.

Notes: Colors are for moist soil unless indicated otherwise. The field determination of pH was made with a Hellige-Truog kit.

Mineralogy (Method 7B1): Observations on very fine sand.

A1 and C1g (41-52 inches) horizons: Quartz predominates; reddish-brown aggregates increase from 5 percent in the surface to 40 percent in the C1g horizon; feldspar is relatively constant at about 10 percent; no ferromagnesian minerals.

SOIL ***Rosebloom silt loam** SOIL Nos. **8620Ka-45-4** LOCATION **McCurain County, Oklahoma**

SOIL SURVEY LABORATORY **Lincoln, Nebraska** LAB. Nos. **17107-17113** February 1967

General Methods: **1A, 1B1b, 2A1, 2B**

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1											Coarse fragments			
		Total				Sand				Silt			2A2 ≥ 2	2-19	19-76	
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (= 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int III (0.02-0.002)	Int. II (0.2-0.02)				(2-0.1)
Pct. of < 2 mm													Pct. of < 76mm			
0-5	A1	27.9	55.7	16.4	2.2	1.8	0.5	7.1	16.3	22.2	33.5	44.6	11.6	-	-	-
5-14	B21	27.0	52.1	20.9	2.3	1.6	0.4	6.6	16.1	22.2	29.9	44.1	10.9	-	-	-
14-23	B22	27.5	51.4	21.1	1.9	2.1	0.6	6.8	16.1	21.5	29.9	43.5	11.4	-	-	-
23-30	C1g	28.8	51.8	19.4	2.3	2.3	0.7	7.1	16.4	21.5	30.3	44.0	12.4	-	-	-
30-44	C2g	32.3	48.2	19.5	2.3	2.9	1.0	8.0	18.1	21.3	26.9	46.2	14.2	-	-	-
44-59	C3g	31.8	46.9	21.3	0.8	1.4	0.6	9.1	19.9	21.2	25.7	48.8	11.9	-	-	-
59-81	C4g	18.1	57.2	24.7	0.3	0.9	0.6	3.9	12.4	21.9	35.3	37.5	5.7	-	-	-
Depth (In.)	6A1a Organic carbon	6B1a Nitrogen	C/N	Carbonate as CaCO ₃	6C2a Ext. Iron as Fe Pct.	Bulk density			Water content			pH				
						g/cc	g/cc	g/cc	Pct.	Pct.	Pct.	4B2 15- Bar	8C1a (1:1) H ₂ O			
0-5	1.40	0.098	14		1.5										4.7	
5-14	0.33	0.049	7		1.5										5.0	
14-23	0.21	0.044			1.6										4.9	
23-30	0.18	0.040			1.6										5.2	
30-44	0.13				1.6										5.3	
44-59	0.17				1.3										5.5	
59-81	0.26				1.6							11.6			5.8	
Depth (In.)	Extractable bases 5B1a					6B1a Ext. Acidity	5A3a Sum Cations	5A1a Sum Anions	6G1b KCl- Ext.- Al	5A3b Bases ElusAl mg/100g Clay	8D3 Ca/Mg	Base saturation				
	6B2a Ca	6B2a Mg	6B2a Na	6B2a K	Sum							5C3 Sum Cations	5C1 NH ₄ OAc CEC			
mg/100 g													Pct.	Pct.		
0-5	1.0	0.7	tr	0.2	1.9	11.0	12.9	9.9	1.8	23		15	19			
5-14	1.3	0.8	0.1	0.1	2.3	7.8	10.1	7.8	2.2	22		23	29			
14-23	1.0	0.7	0.1	0.1	1.9	7.9	9.8	7.6	2.3	20		19	25			
23-30	0.5	0.6	0.2	0.1	1.4	8.7	10.1	7.0	2.5	20		14	20			
30-44	0.4	0.8	0.3	0.1	1.6	7.9	9.5	7.4	3.2	25		17	22			
44-59	1.0	2.4	1.0	0.1	4.5	6.0	10.5	8.2	1.2	27	0.4	43	55			
59-81	2.1	3.7	3.2	0.1	9.1	4.3	13.4	10.7			0.6	68	85			
Depth (In.)	Ratios to Clay 8B1			a. Fe-Mn nodules: > 50 percent (2-0.25 mm.); 5-25 percent (0.25-0.1 mm.).												
	8B2a CEC	Ext. Iron	15-Bar Water													
0-5	0.60	0.091	0.48													
5-14	0.37	0.072	0.43													
14-23	0.36	0.076	0.42													
23-30	0.36	0.082	0.41													
30-44	0.38	0.082	0.43													
44-59	0.38	0.061	0.45													
59-81	0.43	0.065	0.47													

Soil Type: *Rosebloom silt loam

Soil No.: S62-Okla-45-4

Location: McCurtain County, Oklahoma. About 800 feet west and 400 feet south of the half mile line on the east side of Section 13, T7S, R26E.

Vegetation and Use: Hardwood forest, predominantly water oak, post oak and blackgum. Used for commercial woodland.

Slope and Land Form: Nearly level, 0.2 percent slope on a floodplain.

Drainage and Permeability: Poorly drained. Permeability very slow. Runoff slow.

Parent Material: Loamy acid sediments primarily from soils formed from Pennsylvanian Age rocks.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June, 1962.

Described by: Earl C. Nance and Robert Reasoner.

Horizon and

Lincoln

Lab. Number

- A1
17107 0 to 5 inches. Dark grayish brown (10YR 4/2) silt loam; few fine faint yellowish brown mottles; light gray (10YR 7/2) dry; moderate medium and fine granular structure; friable, slightly hard; pH 5.2; clear boundary.
- B21
17108 5 to 14 inches. Brown (10YR 5/3) silt loam; few medium distinct light gray mottles; very pale brown (10YR 7/3) dry; weak medium and fine subangular blocky structure; friable, slightly hard; few iron concretions; pH 5.2; diffuse boundary.
- B22
17109 14 to 23 inches. Pale brown (10YR 6/3) light clay loam; common medium distinct yellowish brown mottles and a few light brownish gray mottles; very pale brown (10YR 7/3) dry; weak medium subangular blocky structure; friable, hard; few iron concretions; pH 5.0; gradual boundary.
- C1g
17110 23 to 30 inches. Light gray (10YR 6/1) clay loam; many coarse and medium distinct yellowish brown mottles; light gray (10YR 7/1) dry; weak medium subangular blocky structure; few brittle peds; friable, hard; pH 5.0; clear wavy boundary.
- C2g
17111 30 to 44 inches. Light gray (10YR 6/1) clay loam; many coarse and medium distinct yellowish brown mottles; light gray (10YR 7/1) dry; weak medium and fine subangular blocky structure; few brittle peds suggesting a weak fragipan; soil mass contains approximately 15 percent iron concretions; friable, very hard; pH 4.9; diffuse boundary.
- C3g
17112 44 to 59 inches. Coarsely mottled light gray (10YR 7/1) and yellowish brown (10YR 5/4) to (10YR 5/8) and light brownish gray (10YR 6/2) clay loam; moderate medium subangular blocky structure; friable, very hard; few brittle peds; few iron concretions; pH 5.2; gradual boundary.
- C4g
17113 59 to 81 inches. Yellowish brown (10YR 5/4) clay loam; many medium and coarse distinct light gray and dark grayish brown mottles; light yellowish brown (10YR 6/4) dry; massive; very hard, friable; portions of the horizon are slightly brittle; few iron concretions; pH 5.6.

Notes: Colors are for moist soil unless indicated otherwise. The field determination of pH was made with a Hellige-Truog kit.

Mineralogy (Method 7B1): Observations on very fine sand.

A1 and C4g horizons: 80-85 percent quartz, 10-15 percent feldspar and 5 percent reddish brown aggregates; no ferromagnesian minerals.

SOIL SURVEY LABORATORY

Lincoln, Nebr.

March 1960

SOIL TYPE St. Paul
silt loam

LOCATION Woodward County, Oklahoma

SOIL NOS. 8590kla-77-3

LAB. NOS. 11487-11494

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1E1a					3A1						2A2 > 2
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002			
0-7	Alp	<0.1	0.2	0.8	4.6	29.6	51.3	13.5	72.3	11.8	-	silt	
7-14	Al2	<0.1	0.2	0.9	4.6	25.7	49.8	18.8	66.3	12.4	-	1/silt	
14-20	Al3	<0.1	0.3	1.1	5.5	25.5	46.7	20.9	63.8	12.3	-	1	
20-28	B1	<0.1	0.4	1.4	6.9	25.1	43.2	23.0	60.5	12.5	-	1	
28-34	B21	<0.1	0.2	1.0	6.1	19.7	42.4	30.6	49.2	17.2	-	cl	
34-46	B22	<0.1	0.1	0.6	5.5	20.0	43.9	29.9	46.8	21.2	-	cl	
46-55	B3	<0.1	0.1	1.0	12.3	30.0	35.2	21.4	58.8	15.8	-	1	
55-65	Cca	0.1a	0.1 b	0.7 b	14.8 b	46.1 b	23.7	14.5	73.2	8.9	-	vfsl	

pH	8C1a		ORGANIC MATTER			Free Iron Fe ₂ O ₃ 6C1a.3	ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM 8A1a	6E1a CoCO ₃ equiv. oven-dry %	BULK DENSITY		MOST. TENSIONS	
	1:5	1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N				4A1h Oven-Dry g/cc	4A1c 30-cm g/cc	4B3 30-cm %	4B2 15-Bar %
	6.2	6.6	6.7	0.86	0.068				13	0.7	0.5	<1
6.6	7.0	7.0	0.81	0.068	12	0.9	0.4	<1	1.55	1.49	19.4	7.9
7.0	7.4	7.5	0.64	0.055	12	0.9	0.4	<1	1.66	1.60	15.9	8.5
7.3	7.4	7.7	0.52	0.050	10	0.9	0.4	<1				9.3
7.5	7.7	7.9	0.53			1.0	0.3	<1				12.4
7.5	8.0	8.0	0.47			1.0	0.4	<1				12.1
7.9	8.3	8.5	0.30			0.7	0.5	<1				8.9
8.1	8.8	8.9	0.17			0.6	0.5	1				6.6

5A1a CATION EXCHANGE CAPACITY NH ₄ OAc	EXTRACTABLE CATIONS 5E1a					BASE SAT. % NH ₄ OAc EXCH.	Base Sat. % on Sum Cations	Sum Ert. Bases	Sum Ert. Cations	Ca/Mg	8A MOISTURE AT SATURATION %
	6N2b Ca	6O2b Mg	6H1a H	6P2a No	6Q2a K						
	milliequivalents per 100g. soil										
10.1	6.1	2.5	2.8	<0.1	1.0	95	77	9.6	12.4	2.4	35.9
13.5	9.2	3.9	2.6	<0.1	0.8	103	84	13.9	16.5	2.4	41.2
14.6	10.2	4.3	1.7	<0.1	0.6	103	90	15.1	16.8	2.4	43.3
15.9	11.4	5.2	1.9	<0.1	0.6	108	90	17.2	19.1	2.2	45.2
19.4	13.5	6.7	2.2	0.1	0.9	109	90	21.2	23.4	2.0	51.6
19.8	13.6	7.2	1.7	0.1	0.9	110	93	21.8	23.5	1.9	50.6
15.5	11.3	6.2	1.0	0.1	0.6	117	95	18.2	19.2	1.8	43.7
11.3		5.3	<0.1	0.1	0.5						37.9

- a. Many calcareous aggregates.
- b. Trace calcareous aggregates.

Soil Type: St. Paul silt loam Described by: Louis E. Derr and John M. Allen.
 Area: Woodward County, Oklahoma.
 Location: $3/4$ mile N and $1\frac{1}{4}$ miles E of Mutual, Oklahoma. 1,480 feet W and 1,090 feet N of Center of Sec. 5, T20N, R16W.
 Physiography: On a slightly undulating area of less than 1 percent slope in nearly level uplands. Soil from a field of plowed wheat stubble.
 Drainage: Well drained; runoff, moderate; internal drainage, moderate.
 Parent Material: Silty aeolian and/or alluvial mantle over Permian Red Beds.
 Climate: 25 inches average annual precipitation; P-E index 41.
 Soil Nos.: S59Okla-77-3

Lincoln
 Laboratory No.
 and Horizon

11487	A _{1p}	0-7 inches	Grayish brown (10YR 5/2; 3/2, moist) silt loam; weak fine granular; very friable, moist, and slightly hard, dry; weakly stratified with darker layers in upper 2 inches; plowed boundary.
11488	A ₁₂	7-14 inches	Dark grayish brown (10YR 4/2; 2/2, moist; 3/2, crushed) silt loam; moderate fine granular with abundant worm casts; very friable, moist, and slightly hard, dry; gradual boundary.
11489	A ₁₃	14-20 inches	Brown (7.5YR 4/2; 3/2, moist or crushed) heavy silt loam; moderate fine granular with numerous worm casts; friable, moist, and hard when dry; clear, smooth boundary.
11490	B ₁	20-28 inches	Brown (7.5YR 4/2; 3/2, moist or crushed) light silty clay loam; moderate medium and fine granular with numerous worm casts; friable when moist and hard when dry; few thin clay skins; gradual boundary.
11491	B ₂₁	28-34 inches	Brown (7.5YR 4/2; 3/2, moist or crushed) silty clay loam; moderate medium and fine subangular blocky; clay films are continuous; few worm casts; friable when moist and hard when dry; clear, smooth boundary.
11492	B ₂₂	34-46 inches	Brown (7.5YR 4/2; 2/2, moist, and 3/2, crushed) light silty clay; very weak coarse prisms breaking to strong fine and medium subangular blocky with moderate, continuous clay films; slightly firm, moist, and very hard, dry; gradual boundary.
11493	B ₃	46-55 inches	Brown (7.5YR 4/2; 3/2, moist) silty clay loam; weak coarse prisms breaking to moderate, medium subangular blocks; slightly calcareous with no visible segregated lime; clear boundary.
11494	C _{ca}	55-65 inches	Reddish brown (5YR 4/4; 3/3, moist; 4/6, crushed) loam with high fine sand content; weak coarse prisms with slightly darkened faces; friable, moist, and slightly hard, dry; calcareous with few faint lime blotches.

SOIL SURVEY LABORATORY Lincoln, Nebr. March 1960

SOIL TYPE St. Paul LOCATION Dewey County, Oklahoma
silt loam

SOIL NOS. S590k1a-22-1 LAB. NOS. 11495-11503

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND 2.1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	2A2 > 2	
0-7	Alp	<0.1	0.1	0.3	2.2	28.4	54.3	14.7	72.1	12.3	-	s11
7-14	Al2	0.2	0.1	0.2	1.7	22.8	54.6	20.4	64.9	13.8	-	s11
14-20	Al3	0.1	0.1	0.2	1.8	22.5	53.0	22.3	62.8	14.1	-	s11
20-28	Bl1	<0.1	0.1	0.2	1.9	21.4	52.6	23.8	60.3	15.2	-	s11
28-36	Bl2	<0.1	0.1	0.2	2.0	21.7	51.6	24.4	58.9	16.0	-	s11
36-45	B21	<0.1	0.2	0.4	2.6	16.9	48.8	31.1	48.1	19.6	-	cl/sic1
45-50	B22	<0.1	0.2	0.5	3.3	17.4	41.2	37.4	43.3	17.8	-	cl
50-58	B3	0.3a	0.4a	0.8b	4.7b	23.4b	39.0	31.4	50.8	15.2	-	cl
58-65	C	0.2a	0.4a	0.8b	5.7b	27.7b	37.4	27.8	55.6	13.9	Tr.	cl

pH	8C1a	ORGANIC MATTER			Free Iron % Fe ₂ O ₃ 6C1a	ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM 8A1a	6E1a CaCO ₃ equivalent %	BULK DENSITY		MOIST TENSION		
		6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N				4A1h Oven-Dry	4A1c 30-cm	4B3 30-cm	4B2 15-Bar	
								g/cc	g/cc	%	%	
6.3	6.8	6.9	0.76	0.066	12	0.9	0.4				6.3	
6.8	7.0	7.3	0.84	0.072	12	1.0	0.4				8.5	
7.2	7.4	7.6	0.72	0.065	11	1.0	0.4	Δ	1.43	1.37	22.6	9.3
7.2	7.5	7.7	0.55	0.052	10	1.1	0.4	Δ				10.2
7.3	7.5	7.8	0.45			1.1	0.4	Δ				9.7
7.4	7.7	7.8	0.48			1.2	0.4	Δ	1.70	1.64	17.7	12.5
7.3	7.7	8.0	0.43			1.3	0.4	Δ				15.0
7.9	8.2	8.5	0.25			1.3	0.5	1				12.8
8.1	8.4	8.5	0.24			1.2	0.4	1				11.3

5A1a CATION EXCHANGE CAPACITY NH ₄ OAc	6N2b Ca	EXTRACTABLE CATIONS				5B1a 6Q2a K	BASE SAT. % NH ₄ OAc EXCH.	Base Sat. % on Sum Cations	Sum Ext. Bases	Sum Ext. Cations	Ca/Mg	8A MOISTURE AT SATURATION %
		6O2b Mg	6H1a H	6P2a Na	6Q2a K							
		milliequivalents per 100g. soil										
11.0	7.4	2.6	3.1	<0.1	0.9	99	78	10.9	14.0	2.8	36.8	
14.5	10.9	3.4	2.6	<0.1	0.5	102	85	14.8	17.4	3.2	45.8	
16.0	12.0	4.0	2.2	0.1	0.5	104	88	16.6	18.8	3.0	45.6	
16.7	12.3	4.4	2.2	0.1	0.5	104	89	17.3	19.5	2.8	49.4	
16.9	12.4	4.8	1.7	0.1	0.4	105	91	17.7	19.4	2.6	46.8	
20.7	14.8	6.3	1.9	0.2	0.5	105	92	21.8	23.7	2.3	52.1	
23.8	17.5	7.6	2.0	0.2	0.6	109	93	25.9	27.9	2.3	58.7	
19.5		6.7	0.7	0.1	0.6						51.5	
16.4		6.1	<0.1	0.1	0.5						48.8	

a. Many calcareous aggregates.
b. Trace calcareous aggregates.

Soil Type: St. Paul silt loam. Described by: Louis E. Derr and John M. Allen.
 Area: Dewey County, Oklahoma.
 Location: 2 $\frac{1}{4}$ miles SE of Seiling, Oklahoma. 1,700 feet E and 480 feet S of
 NW Cor of Sec. 15, T19N, R16W.
 Physiography: A terraced 2 percent southwest facing slope in rolling upland
 area. Soil from plowed field.
 Drainage: Well drained; runoff medium; internal drainage medium.
 Parent Material: Silty aeolian and/or alluvial mantle over Permian "red" beds.
 Climate: 26 inches average annual precipitation; P-E index 42.
 Soil Nos.: S59Okla-22-1

Lincoln
 Laboratory No.
 and Horizon

11495	A _{1p}	0-7 inches	Dark brown (10YR 4/3; 3/2, moist or crushed) silt loam; weak fine granular structure; very friable and soft; plowed boundary.
11496	A ₁₂	7-14 inches	Dark grayish brown (10YR 4/2; 2/2, moist, and 3/2, crushed) silt loam; moderate fine granular with numerous worm casts; very friable and soft; no discernible boundary.
11497	A ₁₃	14-20 inches	Dark grayish brown (10YR 4/2; 2/2, moist, and 3/2, crushed) heavy silt loam; strong fine granular with abundant worm casts; very friable and soft; gradual indistinct boundary.
11498	B ₁₁	20-28 inches	Brown (7.5YR 4/2; 3/2, moist or crushed) light silty clay loam; moderate to weak fine granular with many worm casts; friable, moist, and slightly hard when dry; gradual boundary.
11499	B ₁₂	28-36 inches	Brown (7.5YR 4/2; 3/2, moist, and 4/2, crushed) silty clay loam; moderate fine subangular blocks with thin, patchy clay films; slightly firm when moist and hard when dry; clear boundary.
11500	B ₂₁	36-45 inches	Dark brown (7.5YR 4/2; 3/2, moist or crushed) heavy silty clay loam; moderate medium to fine subangular blocks with thin, continuous clay films; slightly firm, moist, and hard, dry; clear boundary.
11501	B ₂₂	45-50 inches	Reddish brown (5YR 4/3; 3/3, moist, and 4/3, crushed) silty clay; strong, fine and medium angular blocks with moderate continuous clay films; firm and very hard; rootlets penetrate peds; clear boundary.
11502	B ₃	50-58 inches	Reddish brown (5YR 4/4; 3/4, moist or crushed) sticky clay loam; moderate to strong medium angular blocks with thin, nearly continuous clay films; friable, moist, and hard, dry; weakly calcareous grading with depth to moderately calcareous with very few soft and hard lime concretions; clear boundary.
11503	C	58-65 inches	Yellowish red (5YR 5/6; 4/5, moist or crushed) light clay loam; very weak medium and fine subangular blocks; friable, moist, and slightly hard, dry; strongly calcareous with many lime veinlets and blotches and a few small, hard lime concretions.

SOIL SURVEY LABORATORY Lincoln, Nebr. Aug. 1958

SOIL TYPE Shellabarger LOCATION Kingfisher County, Oklahoma
fine sandy loam

SOIL NOS. 8560kla-37-9 LAB. NOS. 5447-5454

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY				
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	2A2 > 2	
0-10	A	0.2	5.0	19.3	26.2	13.3	23.6	12.4	44.5	4.6	-	fsl
10-18	B11	0.1	4.0	15.3	23.4	13.5	19.1	24.6	39.3	4.6	-	scl
18-27	B12	0.1	3.0	12.4	24.3	18.9	16.3	25.0	44.4	3.5	-	scl
27-36	B2	0.1	4.0	19.5	37.2	10.6	12.0	16.6	37.3	2.3	-	fsl
36-48	C1	0.1	3.2	26.0	49.0	8.5	4.1	9.1	31.8	1.3	-	ls
48-55	C2	0.2	6.5	21.4	33.8	10.7	11.7	15.7	34.6	3.5	Tr.	fsl
55-64	C3	0.1	5.1	21.6	32.1	12.3	12.0	16.8	36.1	2.8	-	fsl
64-78+	C4	-	4.8	23.1	37.3	13.0	8.8	13.0	37.4	1.3	-	fsl

pH		ORGANIC MATTER			8A2	ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM @ 25°C	6E1a	MOISTURE TENSIONS			
1:1	1:5	1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N	ESTD. SALT (BUREAU CUP)	CoCO ₃ equiv. %	GYPSUM me./100g. SOIL	1/10 ATMOS. %	1/3 ATMOS. %	4B2 15 ATMOS. %
6.5			1.04	0.085	12	<0.20	0.5	-			5.0
6.3			0.70	0.064	11	<0.20	0.5	-			9.3
6.5			0.41	0.039	10	<0.20	0.4	-			8.9
6.5			0.22			<0.20	0.5	-			5.8
6.5			0.08			<0.20	0.5	-			3.0
6.5			0.11			<0.20	0.5	1			6.1
6.7			0.06			<0.20	0.5	-			6.2
6.9			0.05			<0.20	0.5	-			5.0

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS 5B1a					BASE SAT. % NH ₄ Ac EXCH.	BA1 SATURATION EXTRACT SOLUBLE		8A MOISTURE AT SATURATION %
6N2b Co	6O2b Mg	6H1a H	6P2a Na	6Q2a K		6P1a Na	6Q1a K		
← milliequivalents per 100g. soil →					5C1	← milliequivalents per liter →			
8.8	5.1	1.6	1.9	-	0.8	85	0.3	0.9	32.6
14.5	8.0	3.6	3.5	-	0.9	86	0.3	0.5	45.9
14.2	7.8	4.3	3.1	0.1	0.4	89	0.4	0.1	46.8
9.2	5.2	3.1	1.9	0.1	0.3	94	0.6	0.2	34.5
5.2	2.8	1.6	1.2	0.1	0.2	90	0.7	0.2	29.0
8.7	4.4	3.1	1.9	0.1	0.3	91	0.6	0.2	35.9
7.6	4.0	2.6	1.5	0.1	0.2	91	0.7	0.1	39.9
6.3	3.3	2.5	1.2	0.1	0.2	97	1.0	0.1	38.8

Soil Type: Shellabarger fine sandy loam

Soil Nos.: S56Okla-37-9

Location: Kingfisher County, Oklahoma. NW corner of SW1/4 Sec. 5, T18N, R8W, or about 220 feet east and 24 feet north of the south corner of Greenwood cemetery, in pasture. Photo No. OH-6H-130.

Slope: 1 to 3 percent.

Collected by: W. E. Baumann, Fred Dries, and C. Fisher, May 8, 1956.

Described by: Louis E. Derr.

Horizon and

Lincoln

Lab. No.

- A
5447 0 to 10 inches. Dark brown (7.5YR 4/2 dry; 3/2 moist) fine sandy loam; very fine granular structure; friable; porous; plant roots abundant; neutral; clear boundary.
- B11
5448 10 to 18 inches. Dark reddish brown (5YR 3/4 dry; 3/2 moist) light clay loam; medium prismatic, breaking to fine and medium granular structure; friable; porous; clay skins on ped faces; roots plentiful; numerous, moderately firm worm casts; gradual boundary.
- B12
5449 18 to 27 inches. Yellowish red (5YR 4/6 dry) to dark reddish brown (5YR 3/4 moist) clay loam or sandy clay loam; medium prismatic, breaking to fine and medium granular structure; faint clay skins on ped faces; gradual boundary.
- B2
5450 27 to 36 inches. Yellowish red (5YR 4/6 dry) to dark reddish brown (5YR 3/4 moist) sandy clay loam; weak, medium granular structure; friable; porous; abrupt boundary.
- C1
5451 36 to 48 inches. Reddish yellow (7.5YR 6/6 dry) to strong brown (7.5YR 5/6 moist) sharp and gritty, loamy sand; structureless; freely permeable.
- C2
5452 48 to 55 inches. Reddish yellow (7.5YR 6/6 dry) to strong brown (7.5YR 5/6 moist) sandy clay loam; hard when dry; permeable.
- C3
5453 55 to 64 inches. Mottled gray, yellow, orange, and red dense sandy clay; mottling distinct.
- C4
5454 64 to 78 inches. Variably colored fine sand; less gray coloring than horizon above; friable.

Remarks: This is a prairie soil having a gently rolling to undulating topography, sloping to the south and southwest at this particular site. The average slope is from 2 to 3 percent. Drainage good both external and internal. Erosion none to slight due to native grass vegetation. Noticeable wind erosion in cropland areas.

SOIL Stephenville fine sandy loam SOIL Nos. 862Okla-41-1 LOCATION Lincoln County, Oklahoma

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 17174-17179 February 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm)											3A1				
		Total				Sand					Silt		Clay		Coarse fragments		
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	2A2 > 2	2-19	19-76	
Pct. of < 2 mm																	
0-6	A1	82.2a	14.1	3.7	0.2	1.3	18.6	52.7	9.4	10.1	4.0	41.2	72.8	-	-	-	
6-14	A2	85.4a	10.1	4.5	0.3	1.2	20.4	55.0	8.5	6.6	3.5	37.1	76.9	-	-	-	
14-18	B21t	68.4a	6.1	25.5	0.6	1.2	18.5	42.3	5.8	4.2	1.9	26.2	62.6	-	-	-	
18-27	B22t	61.1b	4.3	34.6	-	0.4	17.3	38.9	4.5	2.5	1.8	19.8	56.6	-	-	-	
27-31	B3	70.7b	3.7	25.6	-	0.8	26.5	40.4	3.0	1.5	2.2	16.2	67.7	-	-	-	
31-40+	R	79.0c	5.3	15.7	-	0.6	22.7	47.1	8.6	1.6	3.7	31.2	70.4	-	-	-	

Depth (in.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.	C/N	Carbonate as CaCO ₃ Pct.	6C2a Ext. Iron as Fe Pct.	Bulk density			4D1 COLR	Water content					pH	
						4A1a Field State	4A1c 30-cm	4A1b Air Dry		4B4 Field State	4B3 30-cm	4B1b 1/3-Bar	4B2 15-Bar	4C1 1/3-to 15-Bar	8C1a (1.1) H ₂ O	
						g/cc	g/cc	g/cc		Pct.	Pct.	Pct.	Pct.	in./in.		
0-6	0.92	0.071	13		0.4	1.39d			11.1		9.6e	2.7			5.8	
6-14	0.11	0.015			0.4	1.47d			7.5		7.4e	1.8			5.2	
14-18	0.31	0.034	9		1.6						15.6	8.5			4.9	
18-27	0.31	0.040	8		1.4	1.64	1.62	1.71	0.017	18.5	18.6	15.8	10.3	0.09	4.9	
27-31	0.15				1.3							14.2	8.8		5.1	
31-40+	0.03				0.9							5.0	5.0		5.4	

Depth (in.)	Extractable bases				5B1a Sum meq/100 g	6H1a Ext. Acidity	Cat. Exch. Cap.		6C1b KCl-Ext. Al	5A3b Bases Plus Al me/100g Clay	8D3 Ca/Mg	Base saturation ^f	
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K			5A3a Sum Cations	5A1a NH ₄ OAc				5C3 Sum Cations	5C1 NH ₄ OAc
	Pct.	Pct.	Pct.	Pct.			Pct.	Pct.				Pct.	Pct.
0-6	3.1	0.9	tr	0.2	4.2	3.3	7.5	5.2			56	81	
6-14	0.4	0.4	tr	0.1	0.9	1.5	2.4	1.9	0.1	22	38	47	
14-18	3.9	2.6	tr	0.2	6.7	6.0	12.7	9.9	0.8	29	53	68	
18-27	4.9	3.1	tr	0.3	8.3	7.9	16.2	12.1	1.0	27	51	68	
27-31	3.8	2.8	tr	0.2	6.8	6.2	13.0	9.7	0.5	29	52	70	
31-40+	2.2	2.3	tr	0.2	4.7	2.9	7.6	5.9	tr	30	62	80	

Depth (in.)	Ratios to Clay 8D1				NH ₄ OAc CEC	Sum Cations CEC	Ext. Iron	15-Bar Water
	NH ₄ OAc CEC	Sum Cations CEC	Ext. Iron	15-Bar Water				
0-6	1.4	2.0	0.10	0.73				
6-14	0.42	0.53	0.09	0.40				
14-18	0.39	0.50	0.06	0.33				
18-27	0.35	0.47	0.04	0.30				
27-31	0.38	0.51	0.05	0.34				
31-40+	0.38	0.48	0.06	0.32				

- a. Fe-Mn nodules: > 50 percent (2-0.5 mm.); 5-25 percent (0.5-0.25 mm.).
- b. Fe-Mn nodules: > 50 percent (2-0.5 mm.).
- c. Fe-Mn nodules: 5-25 percent (0.5-0.25 mm.).
- d. Core samples (Method 4A3a).
- e. 1/10-Bar (Method 4B1b).
- f. One or more horizons have relatively low cation exchange capacity. As cation exchange capacity decreases, the relative error of base saturation increases. Trace quantities are omitted from the sum of bases. For very low CEC values, this omission contributes significantly to the relative error of base saturation.

Soil Type: Stephenville fine sandy loam

Soil No.: S62-Okla-41-1

Location: Lincoln County, Oklahoma. 110 feet north and 100 feet west of the southeast corner of the southwest quarter of Section 32, T13N, R3E.

Vegetation and Use: Scrub oak forest of post oak and blackjack oak with an understory of tall grasses. The site has been sprayed for oak control and is used for native range.

Slope and Land Form: Slope 2 percent on erosional upland.

Drainage and Permeability: Well drained. Medium runoff. Moderate permeability.

Parent Material: Noncalcareous sandstone of Permian Age.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June 26, 1962.

Described by: Fred J. Dries and Glen Williams.

Horizon and

Lincoln

Lab. Number

A1 17174	0 to 6 inches. Grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; very friable; roots abundant; pH 6.0; clear boundary.
A2 17175	6 to 14 inches. Light brown (7.5YR 6/3) loamy fine sand, dark brown (7.5YR 4/4) moist; weak very fine granular to massive structure; very friable; pH 5.5; abrupt boundary.
B21t 17176	14 to 18 inches. Yellowish red (5YR 5/6) light sandy clay loam, yellowish red (5YR 4/6) moist; weak medium and fine subangular blocky structure; friable, slightly hard; roots abundant; pH 5.5; gradual wavy boundary.
B22t 17177	18 to 27 inches. Yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; friable, hard; roots present in this horizon; pH 5.0; gradual boundary.
B3 17178	27 to 31 inches. Yellowish red (5YR 5/8) light sandy clay loam, yellowish red (5YR 4/8) moist; weak fine subangular blocky structure; friable, slightly hard; few red sandstone fragments; few roots; pH 5.0; clear wavy boundary.
R 17179	31 to 40 inches plus. Red (2.5YR 4/6) weathered sandstone; dark red (2.5YR 3/6) moist.

Notes: Colors refer to dry soil unless otherwise stated. The pH determination in the field was made with a Hellige-Truog kit.

Mineralogy (Method 7B1): Observations on very fine sand.

A1, B22t and R horizons: 90-95 percent iron oxide stained quartz and less than 5 percent feldspar; staining of grains increases with depth; trace of ferromagnesian minerals.

SOIL Stephenville fine sandy loam SOIL Nos. S6201a-41-2 LOCATION Lincoln County, Oklahoma

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 17180-17185 February 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1											Coarse fragments			
		Total		Clay (≤ 0.002)	Very coarse (2-1)	Sand				Silt		Int. II (0.2-0.02)	(2-0.1)	2A2 > 2	2-19	19-76
		Sand (2-0.05)	Silt (0.05-0.002)			Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02 (0.02-0.002)	Int. III (0.02-0.002)					
0-7	A1	82.4a	12.1	5.5	tr	0.5	5.1	66.6	10.2	8.1	4.0	55.9	72.2	-	-	-
7-14	A2	83.8a	9.4	6.8	tr	0.2	4.6	68.6	10.4	6.0	3.4	55.7	73.4	-	-	-
14-17	B21t	62.6a	8.0	29.4	tr	0.1	2.7	49.1	10.7	3.9	4.1	47.1	51.9	-	-	-
17-28	B22t	60.2a	8.1	31.7	-	0.3	1.4	43.8	14.5	3.5	4.6	52.3	45.7	-	-	-
28-35	B3	64.0a	5.0	31.0	0.2	tr	1.1	51.5	11.4	2.5	2.5	51.2	52.6	-	-	-
35-40+	R	87.8a	2.4	9.8	-	0.1	5.3	79.5	2.9	0.8	1.6	35.8	84.9	-	-	-

Depth (in.)	6A1a	6B1a	C/N	Carbonate as CaCO ₃	6C2a	Bulk density			Water content			pH		
	Organic carbon	Nitrogen			Ext. Iron as Fe	g/cc	g/cc	g/cc	Pct.	Pct.	Pct.	6C1a	6C1b	
	Pct.	Pct.		Pct.	Pct.									
0-7	0.81	0.063	13		0.4									6.3
7-14	0.20	0.020			0.4									6.3
14-17	0.39	0.037	10		1.6									5.8
17-28	0.27	0.027	10		2.0									5.6
28-35	0.15				1.9									5.0
35-40+	0.04				0.6									5.0

Depth (in.)	Extractable bases 5B1a				6H1a	Cat. Exch. Cap.		6G1b	5A3b	Bases	8D3	Base saturation ^b		
	6P2a	6O2a	6P2a	6O2a		Sum	5A3a					5A1a	Sum	5C1
	Ca	Mg	Na	K	Sum <td>Ext. Acidity</td> <td>Sum Cations <td>Ext. Al <td>Sum Al <td>Ext. Al <td>Ca/Mg</td> <td>Sum Cations</td> <td>Sum Cations</td> </td></td></td></td>	Ext. Acidity	Sum Cations <td>Ext. Al <td>Sum Al <td>Ext. Al <td>Ca/Mg</td> <td>Sum Cations</td> <td>Sum Cations</td> </td></td></td>	Ext. Al <td>Sum Al <td>Ext. Al <td>Ca/Mg</td> <td>Sum Cations</td> <td>Sum Cations</td> </td></td>	Sum Al <td>Ext. Al <td>Ca/Mg</td> <td>Sum Cations</td> <td>Sum Cations</td> </td>	Ext. Al <td>Ca/Mg</td> <td>Sum Cations</td> <td>Sum Cations</td>	Ca/Mg	Sum Cations	Sum Cations	
	mg/100 g													
0-7	4.2	0.5	tr	0.2	4.9	2.9	7.8	5.5					63	89
7-14	2.1	0.5	tr	0.1	2.7	1.6	4.3	3.4					63	79
14-17	6.8	4.4	tr	0.3	11.5	5.0	16.5	13.2			1.5		70	87
17-28	5.9	5.0	tr	0.3	11.2	5.9	17.1	13.4	tr		1.2		65	84
28-35	4.2	4.6	tr	0.2	9.0	7.0	16.0	12.5	1.3		0.9		56	72
35-40+	1.0	1.2	tr	0.1	2.3	2.1	4.4	3.5	0.4		0.8		52	66

Depth (in.)	Ratios to Clay 8D1			
	NH ₄ OAc CEC	Sum Cations CEC	Ext. Iron	15-Bar Water
0-7	1.0	1.4	0.07	0.49
7-14	0.50	0.63	0.06	0.35
14-17	0.45	0.56	0.05	0.37
17-28	0.42	0.54	0.06	0.34
28-35	0.40	0.52	0.06	0.34
35-40+	0.36	0.45	0.06	0.35

a. Fe-Mn nodules: > 50 percent (2-0.5 mm.).
 b. One or more horizons have relatively low cation exchange capacity. As cation exchange capacity decreases, the relative error of base saturation increases. Trace quantities are omitted from the sum of bases. For very low CEC values, this omission contributes significantly to the relative error of base saturation.

Soil Type: Stephenville fine sandy loam

Soil No.: S62-Okla-41-2

Location: Lincoln County, Oklahoma. 2,000 feet west and 250 feet south of the northeast corner of Section 1, T12N, R2E.

Vegetation and Use: Scrub oak forest of post oak and blackjack oak with an understory of tall grasses. The site has been sprayed for oak control and is used for native range.

Slope and Land Form: Slope 2 percent on erosional upland.

Drainage and Permeability: Well drained. Medium runoff. Moderate permeability.

Parent Material: Noncalcareous sandstone of Permian Age.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June 26, 1962.

Described by: Fred J. Dries and Glen Williams.

Horizon and

Lincoln

Lab. Number

A1 17180	0 to 7 inches. Grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; very friable; roots abundant; pH 5.6; clear boundary.
A2 17181	7 to 14 inches. Very pale brown (10YR 7/4) loamy fine sand, yellowish brown (10YR 5/4) moist; massive; roots abundant; pH 6.0; abrupt boundary.
B21t 17182	14 to 17 inches. Reddish yellow (5YR 6/6) sandy clay loam, yellowish red (5YR 5/6) moist; weak medium subangular blocky structure; roots abundant; pH 6.0; clear boundary.
B22t 17183	17 to 28 inches. Yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; friable, hard; pH 5.0; gradual wavy boundary.
B3 17184	28 to 35 inches. Red (2.5YR 5/6) sandy clay loam, dark red (2.5YR 3/6) moist; weak medium subangular blocky structure; friable, hard; pH 5.0; gradual boundary.
R 17185	35 to 40 inches plus. Red (2.5YR 4/6) weathered sandstone; dark red (2.5YR 3/6) moist.

Notes: Colors refer to dry soil unless otherwise stated. The field determination of pH was made with a Hellige-Truog kit.

Mineralogy (Method 7B1): Observations on very fine sand.

A1, B22t and R horizons: 90-95 percent iron oxide stained quartz and less than 5 percent feldspar; staining of grains increases with depth; trace of ferromagnesian minerals.

SOIL Stidham loamy fine sand SOIL Nos. S62Okla-32-1 LOCATION Hughes County, Oklahoma

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 17186-17193 February 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1												Coarse fragments		
		Total		Sand						Silt				2A2 > 2	2-19	19-76
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int II (0.2-0.02)	(2-0.1)			
Pct. of < 2 mm														Pct. of < 76mm		
0-6	A1	66.3a	30.2	3.5	0.2	2.7	13.2	36.6	13.6	20.0	10.2	53.1	52.7	-		
6-15	A21	69.4a	27.5	3.1	0.1	2.6	13.5	40.2	13.0	16.9	10.6	51.2	56.4	tr		
15-23	A22	68.7a	27.5	3.8	0.2	2.4	13.8	39.3	13.0	16.3	11.2	50.3	55.7	tr		
23-33	B21t	58.6	24.6	16.8	tr	2.0	10.4	34.0	12.2	14.3	10.3	45.2	46.4	tr		
33-45	B22t	60.8	23.9	15.3	0.1	2.2	11.6	35.1	11.8	13.8	10.1	44.8	49.0	tr		
45-55	B3	69.4	21.1	9.5	0.4	2.8	13.7	40.0	12.5	12.8	8.3	47.1	56.9	tr		
55-69	C1	76.6	16.3	7.1	0.5	3.5	16.3	45.4	10.9	9.0	7.3	43.8	65.7	tr		
69-85	C2	83.6	8.2	8.2	0.1	2.7	15.7	55.2	9.9	4.1	4.1	43.2	73.7	tr		

Depth (in.)	6A1a Organic carbon	6B1a Nitrogen	C/N	Carbonate as CaCO ₃	6C2a Ext. Iron as Fe Pct.	Bulk density			4D1 COLE	Water content					pH	8C1a H ₂ O (1 l)
						4A1a Field State	4A1c 30-cm	4A1b Air Dry		4B4 Field State	4B3 30-cm	4B1b 1/10-Bar	4B2 15-Bar	4C2 1/10-to 15-Bar		
0-6	0.88	0.062	14		0.4	1.51	1.52	1.52		11.5	14.4	14.2	2.0	0.19		5.5
6-15	0.18	0.018			0.2		1.6c					10.9	1.1			6.0
15-23	0.07	0.009			0.2	1.65	1.65	1.65		10.5	11.5	11.5	1.0	0.17		6.0
23-33	0.15	0.026			0.7		1.7c					13.7d	6.4			5.8
33-45	0.11				0.7	1.71	1.66	1.73	0.014	8.1	16.0	12.6d	6.2	0.11e		5.7
45-55	0.04				0.4		1.6c					13.6	4.2			5.6
55-69	0.03				0.4	1.64	1.62	1.64	0.003	7.2	12.3	10.0	2.9	0.12		5.4
69-85	0.02				0.3								3.2			5.2

Depth (in.)	Extractable bases 5B1a				6H1a Ext. Acidity	Oct. Bases 5A3a Sum	Cationic NH ₄ OAc 5A1a	6G1b KCl-Ext. Al	5A3b Bases Plus Al me/100g Clay	8D3 Ca/Mg	Base saturation f	
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K							Sum	5C3 Sum
0-6	2.1	0.6	tr	0.2	2.9	3.1	6.0	4.3			48	67
6-15	1.2	0.1	tr	0.1	1.4	1.2	2.6	1.8			54	78
15-23	0.8	0.1	tr	0.1	1.0	1.1	2.1	1.3			48	77
23-33	3.7	1.5	tr	0.4	5.6	3.3	8.9	7.2		2.5	63	78
33-45	3.5	1.6	tr	0.4	5.5	3.3	8.8	6.9		2.2	62	80
45-55	2.2	1.0	tr	0.2	3.4	2.2	5.6	4.3	tr	2.2	61	79
55-69	1.7	0.9	tr	0.1	2.7	1.6	4.3	3.4	tr	38	63	79
69-85	1.2	0.8	tr	0.1	2.1	1.8	3.9	2.9	tr	26	54	72

Depth (in.)	Ratios to Clay 8D1				NH ₄ OAc CEC	Sum Cations CEC	Ext. Iron	15-Bar Water
	Sum Cations CEC	Ext. Iron	15-Bar Water	Sum Cations CEC				
0-6	1.2	1.7	0.1	0.57				
6-15	0.58	0.84	0.06	0.35				
15-23	0.34	0.55	0.05	0.26				
23-33	0.43	0.53	0.04	0.38				
33-45	0.45	0.58	0.05	0.40				
45-55	0.45	0.59	0.04	0.44				
55-69	0.48	0.60	0.06	0.41				
69-85	0.35	0.48	0.04	0.39				

a. Fe-Mn nodules: > 50 percent (2-1 mm.); 5-25 percent (1-0.5 mm.).
 b. 4.1 kg/m² to 60 inches (Method 6A).
 c. Estimated.
 d. 1/3-Bar (Method 4B1b).
 e. 1/3- to 15-Bar (Method 4C1).
 f. One or more horizons have relatively low cation exchange capacity. As cation exchange capacity decreases, the relative error of base saturation increases. Trace quantities are omitted from the sum of bases. For very low CEC values, this omission contributes significantly to the relative error of base saturation.

Soil Type: Stidham loamy fine sand

Soil No.: S62-OKla-32-1

Location: Hughes County, Oklahoma. About 200 feet south and 700 feet east of the northwest corner of Section 25, T4N, R10E.

Vegetation and Use: Post oak, blackjack oak, red oak and hickory trees with an understory of mainly little bluestem grass. Used for range.

Slope and Land Form: Slope is 0.8 percent on a terrace.

Drainage and Permeability: Well drained, Medium runoff, Moderate permeability.

Parent Material: Sandy Pleistocene alluvium.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June 1962.

Described by: Earl C. Nance and Roscoe Long.

Horizon and
Lincoln
Lab. Number

0	Partly decomposed leaves and plant residues; about one inch thick. Not sampled.
A1 17186	0 to 6 inches. Brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; weak granular structure; very friable, soft; pH 6.0; clear boundary.
A21 17187	6 to 15 inches. Light gray (10YR 7/2) loamy fine sand, brown (10YR 5/3) moist; single grained; very friable, loose; pH 6.0; diffuse boundary.
A22 17188	15 to 23 inches. Pale brown (10YR 6/3) loamy fine sand, yellowish brown (10YR 5/4) moist; single grained; very friable, loose; pH 6.0; clear wavy boundary.
B21t 17189	23 to 33 inches. Light yellowish brown (10YR 6/4) sandy clay loam; dark yellowish brown (10YR 4/4) moist; compound moderate coarse prismatic and weak medium subangular blocky structure; friable, hard; many roots and pores; pH 6.0; diffuse boundary.
B22t 17190	33 to 45 inches. Yellow (10YR 7/6) sandy clay loam; yellowish brown (10YR 5/8) moist; compound moderate coarse prismatic and weak medium subangular blocky structure; friable, hard; pH 6.0; diffuse boundary.
B3 17191	45 to 55 inches. Yellow (10YR 7/6) fine sandy loam; few medium and coarse grayish brown mottles; yellowish brown (10YR 5/6) moist; weak coarse prismatic structure; friable, hard; pH 6.0; diffuse boundary.
C1 17192	55 to 69 inches. Yellow (10YR 7/6) heavy loamy fine sand; few coarse distinct gray, grayish brown, yellowish red and reddish brown mottles; brownish yellow (10YR 6/6) moist; single grained; friable, slightly hard; becoming more sandy with depth; pH 6.0; diffuse boundary.
C2 17193	69 to 85 inches. White (10YR 8/2) fine sand; common distinct yellowish brown and strong brown mottles; light gray (10YR 7/2) moist; single grained; very friable, slightly hard; pH 6.0.

Notes: Colors refer to dry soil unless otherwise stated. Field determination of pH was made by Hellige-Truog kit.

Mineralogy (Method 7B1): Observations on very fine sand.

A1, B22t and C2 horizons: 80 percent quartz and 15 percent feldspar (predominantly orthoclase); iron oxide staining of grains is common; slight decrease in feldspars in B22t horizon; most feldspars show some alteration; trace of ferromagnesian minerals.

SOIL Stidham loamy fine sand SOIL Nos. 8620k1a-32-2 LOCATION Hughes County, Oklahoma

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 17194-17201 February 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in)	Horizon	Size class and particle diameter (mm) <u>3A1</u>											Coarse fragments				
		Total			Sand					Silt			2A2 > 2	2-19		19-76	
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)		(2-0.1)	Pct. of < 2 mm		Pct. of < 76mm
0-6	A1	63.8a	31.2	5.0	1.0	9.4	20.0	26.2	7.2	16.5	14.7	34.3	56.6	tr			
6-14	A21	67.6a	28.2	4.2	0.7	9.2	20.8	29.2	7.7	15.7	12.5	35.2	59.9	tr			
14-20	A22	65.0a	26.8	8.2	0.6	9.1	19.8	28.0	7.5	14.6	12.2	33.3	57.5	-			
20-32	B21t	59.8	25.3	14.9	0.8	8.5	18.7	25.1	6.7	13.3	12.0	30.1	53.1	tr			
32-45	B22t	61.7	19.8	18.5	1.0	9.1	19.6	26.2	5.8	9.9	9.9	25.7	55.9	tr			
45-55	B3	64.9	16.4	18.7	0.9	8.2	19.4	29.4	7.0	8.9	7.5	27.3	57.9	tr			
55-65	C1	68.2	15.3	16.5	0.2	8.9	21.3	31.0	6.8	9.4	5.9	28.2	61.4	l			
65-80	C2	73.4	8.4	18.2	1.0	10.1	27.1	31.6	3.6	4.0	4.4	17.3	69.8	tr			
Depth (in)	6A1a Organic carbon	6B1a Nitrogen	C/N	6E2a Carbonate as CaCO ₃	6C2a Ext. Iron as Fe	Bulk density			Water content			pH					
						g/cc	g/cc	g/cc	Pct.	Pct.	Pct.	8C1a (1:1)	8C1a H ₂ O				
0-6	0.78	0.058	13	- (s)	0.3											7.1	
6-14	0.07	0.011			0.2												6.5
14-20	0.06	0.015			0.3												5.8
20-32	0.09	0.025			0.5												5.2
32-45	0.11				0.8												5.1
45-55	0.06				0.8												5.1
55-65	0.08				0.6												5.1
65-80	0.06				0.6												5.1
Depth (in)	Extractable bases				6B1a Ext. Acidity	Cat. Exch. Cations	5A3a NH ₄ OAc	5A1a NH ₄ OAc	6G1b KCl-Ext. Al	5A3b Bases Plus Al meq/100g Clay	8D3 Ca/Mg	Base saturation ^b					
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K								Sum	5C3 Sum Cations	5C1 NH ₄ OAc CEC			
0-6	5.0	0.5	tr	0.2	5.7	1.3	7.0	5.0					81	114			
6-14	0.6	0.3	tr	0.1	1.0	1.4	2.4	1.4					42	71			
14-20	1.0	0.6	tr	0.2	1.8	1.9	3.7	2.6					49	69			
20-32	2.6	1.0	tr	0.3	3.9	3.4	7.3	5.8	0.2	1.0	28		53	67			
32-45	3.7	2.0	tr	0.3	6.0	4.2	10.2	8.0	0.2	1.0	34		59	75			
45-55	3.1	2.1	tr	0.2	5.4	5.2	10.6	7.3	0.2	1.0	30		51	74			
55-65	2.7	2.0	tr	0.2	4.9	3.2	8.1	6.7	0.2	1.0	31		60	73			
65-80	2.6	2.4	tr	0.2	5.2	3.3	8.5	6.9	0.4	1.0	31		61	75			
Depth (in)	Ratios to Clay 8D1				a. Fe-Mn nodules: 5-25 percent (2-1 mm.). b. One or more horizons have relatively low cation exchange capacity. As cation exchange capacity decreases, the relative error of base saturation increases. Trace quantities are omitted from the sum of bases. For very low CEC values, this omission contributes significantly to the relative error of base saturation.												
	NH ₄ OAc CEC	Sum Cations CEC	Ext. Iron	15-Bar Water													
0-6	1.0	1.4	0.06	0.46													
6-14	0.33	0.57	0.05	0.28													
14-20	0.32	0.45	0.04	0.35													
20-32	0.39	0.49	0.03	0.34													
32-45	0.43	0.55	0.04	0.39													
45-55	0.39	0.57	0.04	0.35													
55-65	0.41	0.49	0.04	0.33													
65-80	0.38	0.47	0.03	0.36													

Soil Type: Stidham loamy fine sand

Soil No.: S62-Okla-32-2

Location: Hughes County, Oklahoma. About 800 feet south and 200 feet west of the half mile line on the east side of Section 25, T4N, R10E.

Vegetation and Use: Post oak, blackjack oak, red oak and hickory trees with an understory of mainly little bluestem grass. Used for range.

Slope and Land Form: Slope is 0.8 percent on a terrace.

Drainage and Permeability: Well drained. Medium runoff. Moderate permeability.

Parent Material: Sandy Pleistocene alluvium.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June, 1962.

Described by: Earl C. Nance and Roscoe Long.

Horizon and

Lincoln

Lab. Number

- O Partly decomposed leaves and plant residue; about one inch thick. Not sampled.
- A1 0 to 6 inches. Grayish brown (10YR 5/2) heavy loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; very friable, soft; pH 6.5; clear boundary.
17194
- A21 6 to 14 inches. Light gray (10YR 7/2) loamy fine sand, brown (10YR 5/3) moist; single grained; very friable, loose; pH 6.0; diffuse boundary.
17195
- A22 14 to 20 inches. Very pale brown (10YR 7/3) loamy fine sand, brown (10YR 5/3) moist; single grained; very friable, loose; pH 5.5; clear wavy boundary.
17196
- B21t 20 to 32 inches. Light yellowish brown (10YR 6/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; compound moderate coarse prismatic and weak medium subangular blocky structure; friable, hard; sand grains on ped faces are coated with clay films; pH 5.5; diffuse boundary.
17197
- B22t 32 to 45 inches. Very pale brown (10YR 7/4) sandy clay loam; few medium distinct strong brown mottles; yellowish brown (10YR 5/4) moist; compound weak prismatic and moderate medium subangular blocky structure; friable, hard; pH 5.5; diffuse boundary.
17198
- B3 45 to 55 inches. Yellow (10YR 7/6) light sandy clay loam, yellowish brown (10YR 5/6) moist; weak coarse prismatic structure; friable, hard; pH 5.5; diffuse boundary.
17199
- C1 55 to 65 inches. Yellow (10YR 7/6) fine sandy loam; common medium distinct strong brown, grayish brown, and yellowish red mottles; yellowish brown (10YR 5/6) moist; single grained; very friable, slightly hard; pH 5.5; diffuse boundary.
17200
- C2 65 to 80 inches. White (10YR 8/2) loamy fine sand becoming more sandy with depth; common distinct yellowish red mottles; light gray (10YR 7/2) moist; single grained; very friable, slightly hard.
17201

Notes: Colors refer to dry soil unless otherwise stated. Field determination of pH was made by Hellige-Truog kit.

Mineralogy (Method 7B1): Observations on very fine sand.

A1, B22t and C2 horizons: 75-80 percent quartz and 15-20 percent feldspar (predominantly orthoclase); iron oxide staining of grains is common; maximum feldspar in surface, decreasing slightly with depth; majority of the feldspars show some alteration; trace of ferromagnesian minerals.

SOIL Summit silty clay loam SOIL Nos. 86201a-57-1 LOCATION Osage County, Oklahoma

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 17202-17209 February 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm)											SAL			Coarse fragments												
		Total				Sand							Silt		Int. II (0.2-0.02)	(2-0.1)	2A2 > 2 (< 19) Pct.	2-19 Pct. of < 76mm	19-76									
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)																	
Pct. of < 2 mm																												
0-5	A11	11.4a	60.2	28.4	0.1	0.3	0.3	1.4	9.3	40.5	19.7	50.8	2.1															
5-11	A12	11.2a	56.7	32.1	0.1	0.2	0.3	1.2	9.4	38.2	18.5	48.4	1.8															
11-15	B1	9.4a	54.6	36.0	0.1	0.3	0.3	1.1	7.6	35.8	18.8	44.2	1.8															
15-20	B21t	8.5a	51.0	40.5	0.1	0.2	0.2	1.1	6.9	32.8	18.2	40.4	1.6															
20-31	B22t	7.0a	47.1	45.9	0.1	0.2	0.2	0.8	5.7	29.5	17.6	35.8	1.3															
31-39	B23t	8.0b	44.4	47.6	0.5	0.4	0.2	0.9	6.0	26.3	18.1	32.9	2.0															
39-52	B3	10.0c	45.3	44.7	2.0	1.3	0.5	1.1	5.1	24.2	21.1	30.0	4.9															
52-64	C	8.4c	45.2	46.4	1.2	0.6	0.4	1.0	5.2	24.9	20.3	30.8	3.2															
Depth (in.)	6A1a Organic carbon d Pct.	6B1a Nitrogen Pct.	C/N	6B2a 6B1b Carbonate as CaCO ₃ Pct.	6C2a Ext. Iron as Fe Pct.	Bulk density			4D1 COLE	Water content					pH	8C1a (1:1) H ₂ O												
						4A1a Field State g/cc	4A1c 30-cm g/cc	4A1b Air Dry g/cc		4B4 Field State Pct.	4B3 30-cm Pct.	4B1b 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3- to 15-Bar in./in.														
0-5	3.59	0.257	14		0.8	1.36	1.31	1.48	0.040	21.1	25.9	27.8	14.5	0.17		5.8												
5-11	2.40	0.169	14		0.9		1.3a					27.6	15.0			5.7												
11-15	1.89	0.137	14		0.9		1.3a					27.8	15.7			5.8												
15-20	1.41	0.103	14	-(s)	1.0		1.4a					29.5	17.3			5.8												
20-31	0.65	0.052	12	-(s)	1.0	1.54	1.44	1.87	0.098	21.5	26.2	29.7	19.4	0.16		6.6												
31-39	0.43			1	1.0		1.4a					29.3	19.4			7.5												
39-52	0.24			2	0.7	1.53	1.46	1.88	0.087	23.2	26.1	29.3	19.4	0.14		7.7												
52-64	0.15			3	0.7		1.5a					20.7	20.7			7.7												
Depth (in.)	Extractable bases 5B1a				6D1a Ext. Acidity	Int. Mech. Cap.		8D3 Ca/Mg	Base saturation																			
	6E2a Ca	6C2a Mg	6P2a Na	6Q2a K		5A3a Sum	5A1a NH ₄ OAc		5C3 Sum	5C1 NH ₄ OAc																		
mg/100 g																												
0-5	18.9	4.2	0.1	1.4	24.6	9.0	33.6	20.7			4.5	73	92															
5-11	19.9	4.1	0.1	0.8	24.9	9.1	34.0	27.2			4.8	73	92															
11-15	21.0	4.2	0.2	0.8	26.2	9.0	35.2	27.1			5.0	74	97															
15-20	24.1	4.4	0.3	0.9	29.7	8.3	38.0	29.1			5.5	78	102															
20-31	26.4t	4.6g	0.4	1.0	32.4	4.7	37.1	31.3			5.7	87	104															
31-39	28.9t	5.0g	0.5	1.1	35.5	2.1	37.6	32.2			5.8	94	110															
39-52	30.7t	5.3g	0.8	1.1	37.9	0.2	38.1	32.2			5.8	99	118															
52-64	31.4t	5.9g	0.8	1.2	39.3	0.3	39.6	33.8			5.3	99	116															
Depth (in.)	Ratios to Clay 8D1			8E1a	a. Fe-Mn nodules: > 50 percent (2-0.5 mm.); 25-50 percent (0.5-0.25 mm.); 5-25 percent (0.25-0.1 mm.).		8E1b	b. Fe-Mn nodules and carbonate grains: 5-25 percent.		8E1c	c. Carbonate grains: 25-50 percent (2-0.25 mm.); 5-25 percent (0.25-0.05 mm.).																	
	NH ₄ OAc CEC	Ext. Iron	15-Bar Water		21 kg/m ² to 60 inches (Method 6A).	d. Estimated.		f. NH ₄ Cl-EtOH extraction (Method 6W3a).	g. NH ₄ Cl-EtOH extraction (Method 6O3a).																			
0-5	0.94	0.03	0.51																									
5-11	0.85	0.03	0.47																									
11-15	0.75	0.02	0.44																									
15-20	0.72	0.02	0.43																									
20-31	0.68	0.02	0.42																									
31-39	0.68	0.02	0.41																									
39-52	0.72	0.02	0.43																									
52-64	0.73	0.02	0.45																									

Soil Type: Summit silty clay loam

Soil No.: S62-Okla-57-1

Location: Osage County, Oklahoma. 2-1/4 east of Foraker, Oklahoma, 1.850 feet east and 150 feet south of the north-west corner of Section 35, T28N, R7E.

Vegetation and Use: Tall grass prairie. Used for range.

Slope and Land Form: Slope 2 percent, slightly convex, east sloping. From near ridge top in erosional upland.

Drainage and Permeability: Well drained. Medium runoff. Slow permeability.

Parent Material: Calcareous clay with subordinant layers of limestone. Permian age near Permian-Pennsylvanian contact.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June 27, 1962.

Described by: Fred J. Dries and Joe D. Nichols.

Horizon and
Lincoln
Lab. Number

A11 17202	0 to 5 inches. Very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; strong medium granular structure; firm, hard; roots abundant; pH 6.0.
A12 17203	5 to 11 inches. As horizon above - separated for sampling purposes; clear boundary.
B1 17204	11 to 15 inches. Very dark gray (10YR 3/1) heavy silty clay loam; black (10YR 2/1) moist; strong medium and coarse granular structure; firm, hard; roots abundant; pH 6.5; clear, smooth boundary.
B21t 17205	15 to 20 inches. Very dark gray (10YR 3/1) silty clay; black (10YR 2/1) moist; compound moderate medium subangular blocky and moderate medium and coarse granular structure; very firm, very hard; clay films on surface of peds; pH 7.2; gradual smooth boundary.
B22t 17206	20 to 31 inches. Grayish brown (2.5Y 5/2) clay; many fine mottles of dark gray and light olive brown; dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; very firm, very hard; thin continuous clay films; pH 7.8; gradual boundary.
B23t 17207	31 to 39 inches. Light yellowish brown (2.5Y 6/4) clay; many fine mottles of gray, olive yellow and dark gray; light olive brown (2.5Y 5/4) moist; moderate medium blocky structure; extremely firm, extremely hard; pH 8.0; gradual boundary.
B3 17208	39 to 52 inches. Light brownish gray (2.5Y 6/2) clay; many mottles of light olive brown, light gray, and olive yellow; grayish brown (2.5Y 5/2) moist; weak blocky structure; extremely firm, extremely hard; few CaCO ₃ concretions and limestone fragments; pH 8.0; gradual boundary.
C 17209	52 to 64 inches. Light olive gray (5Y 6/2) clay; many mottles of olive yellow, light gray, and dark gray; olive gray (5Y 5/2) moist; massive; extremely firm, extremely hard; common medium black concretions; many CaCO ₃ concretions; pH 8.4; abrupt boundary.
R	64 inches plus. Limestone.

Note: Colors refer to dry soil unless otherwise stated. The pH was determined in the field by a Hellige-Truog kit.

Mineralogy (Method 7B1): Observations on very fine sand.

All, B22t and C horizons: 85 percent quartz and 10 percent feldspar; iron oxide staining of grains is common; reddish brown aggregates increase from less than 5 percent in the surface to 5-10 percent in the C horizon.

SOIL Summit silty clay loam SOIL Nos. 862Okla-57-2 LOCATION Osage County, Oklahoma

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 17210-17216 February 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm)											3A1b	Course fragments			
		Total				Sand				Silt				3A1	2A2 > 2 (<19) Pct.	2-19 Pct.	19-75 Pct.
		Sand (2-0.05) %	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Int III (0.05-0.02) (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)					
Pct of < 2 mm																	
0-5	A11	8.3	60.2	31.5	tr	0.3	0.3	0.9	6.8	37.7	22.5	45.1	1.5	20.2	-	-	-
5-12	A12	7.6	57.0	35.4	tr	0.2	0.3	0.9	6.2	34.6	22.4	41.4	1.4	-	-	-	
12-16	B1	7.0	54.8	38.2	tr	0.1	0.2	0.7	6.0	33.1	21.7	39.6	1.0	tr	-	-	
16-21	B21t	6.1	51.8	42.1	0.1	0.1	0.2	0.7	5.0	30.2	21.6	35.7	1.1	-	-	-	
21-26	B22t	5.5	46.1	48.4	0.3	0.2	0.2	0.6	4.2	26.5	19.6	31.1	1.3	34.5	-	-	
26-33	B23t	5.3	44.3	50.4	0.2	0.1	0.1	0.6	4.3	24.1	20.2	28.8	1.0	2	-	-	
33-46	B3	5.2	44.5	50.3	0.1	0.1	0.2	0.6	4.2	24.4	20.1	29.0	1.0	35.1	tr	-	

Depth (in.)	6A1a	6B1a	C/N	6E2a	Bulk density			Water content			pH	
	Organic carbon	Nitrogen		Carbonate as CaCO ₃	g/cc	g/cc	g/cc	Pct	Pct	Pct	6C1a (1:1) H ₂ O	
	Pct	Pct		Pct								
0-5	3.43	0.228	15									5.6
5-12	2.54	0.175	14									5.8
12-16	2.08	0.147	14									5.9
16-21	1.64	0.120	14									5.9
21-26	1.08	0.084	13	-(a)								6.0
26-33	0.71			-(a)								6.5
33-46	0.56			tr(a)								7.0

Depth (in.)	Extractable bases				5B1a	6B1a	Cat. Exch. Cap.		8D3	Base saturation	
	6N2a	6O2a	6P2a	6Q2a	Sum	Ext. Activity	5A3a Sum	5A1a NH ₄ OAc		5C3 Sum Outside	5C1 NH ₄ OAc CEC
	Ca	Mg	Na	K	Sum				Ca/Mg	Pct.	Pct.
meq/100 g											
0-5	21.2	4.0	0.1	1.1	26.4	9.7	36.1	26.6	5.3	73	99
5-12	23.5	3.8	0.1	0.9	28.3	9.1	37.4	28.7	6.2	76	99
12-16	24.9	3.7	0.2	0.9	29.7	8.8	38.5	29.9	6.7	77	99
16-21	26.3	3.8	0.2	1.0	31.3	8.6	39.9	31.9	6.9	78	98
21-26	29.1	4.3	0.2	1.1	34.7	8.2	42.9	34.8	6.8	81	100
26-33	30.5	4.3	0.3	1.2	36.3	6.4	42.7	34.4	7.1	85	106
33-46	31.1 b	4.0c	0.4	1.3	36.8	4.6	41.4	34.4	7.8	89	107

Depth (in.)	Ratios to Clay 8D1	
	NH ₄ OAc CEC	15-Bar Water
0-5	0.84	0.51
5-12	0.81	0.47
12-16	0.78	0.46
16-21	0.76	0.44
21-26	0.72	0.43
26-33	0.68	0.43
33-46	0.68	0.43

a. Fe-Mn nodules: > 50 percent (2-0.25 mm.); 25-50 percent (0.25-0.1 mm.);
5-25 percent (0.1-0.05 mm.).
b. NH₄Cl-EtOH extraction (Method 6N3a).
c. NH₄Cl-EtOH extraction (Method 6O3a).

Soil Type: Summit silty clay loam

Soil No.: S62-Okla-57-2

Location: Osage County, Oklahoma. 165 feet north and 160 feet east of the southwest corner of Section 21, T29N, R7E.

Vegetation and Use: Tall grass prairie. Used for range.

Slope and Land Form: Slope 2 percent, slightly concave. From a relatively long, gently sloping area on erosional upland.

Drainage and Permeability: Well drained. Medium runoff. Slow permeability.

Parent Material: Calcareous clay with subordinate layers of limestone. Permian age near Permian-Pennsylvanian contact.

Sampled by and Date: Robert H. Jordan and J. M. Downs, June 27, 1962.

Described by: Fred J. Dries and Joe D. Nichols.

Horizon and

Lincoln

Lab. Number

- A11 0 to 5 inches. Very dark gray (10YR 3/1) silty clay loam; black (10YR 2/1) moist; strong coarse granular structure; firm, hard; roots abundant; pH 6.0.
17210
- A12 5 to 12 inches. As horizon above - separated for sampling purposes; clear boundary.
17211
- B1 12 to 16 inches. Very dark gray (10YR 3/1) heavy silty clay loam; black (10YR 2/1) moist; compound moderate medium subangular blocky and strong coarse granular structure; firm, hard; pH 6.0; clear boundary.
17212
- B21t 16 to 21 inches. Very dark gray (10YR 3/1) clay; few fine distinct mottles of light olive brown (2.5Y 5/4); black (10YR 2/1) moist; moderate medium and fine subangular blocky structure; very firm, very hard; thin continuous clay films; pH 6.2; gradual boundary.
17213
- B22t 21 to 26 inches. Dark grayish brown (2.5Y 4/2) clay; many fine distinct mottles of black, gray and olive brown; very dark grayish brown (2.5Y 3/2) moist; weak fine blocky structure; extremely firm; extremely hard; pH 7.5; gradual smooth boundary.
17214
- B23t 26 to 33 inches. Grayish brown (2.5Y 5/2) clay; many mottles of gray, olive yellow and light olive brown; dark grayish brown (2.5Y 4/2) moist; weak fine blocky structure; extremely firm, extremely hard; few small chert fragments present in the lower part; pH 8.0; gradual boundary.
17215
- B3 33 to 46 inches. Light brownish gray (2.5Y 6/2) clay; mottled with gray and olive brown; dark grayish brown (2.5Y 4/2) moist; weak blocky structure; extremely firm, extremely hard; smooth grooved surfaces, mostly vertical faces that are weak slickensides; pH 8.2; abrupt boundary.
17216
- R 46 inches plus. Limestone.

Notes: Colors refer to dry soil unless otherwise stated. The pH determination in the field was made with a Hellige-Truog kit.

Mineralogy (Methods 7A1, 7A2).

All, B22t and B3 horizons: The clay throughout the profile contains small amounts of fairly well crystallized kaolinite and mica (or illite). Very poorly organized montmorillonite is present, estimated in small amounts and slightly increasing with depth. The diffraction peaks are extremely diffuse and the amount present may be underestimated. The apparent cation exchange capacity of the clay suggests a higher proportion of montmorillonite. A small amount of quartz is likely present.

Mineralogy (Method 7B1): Observations on very fine sand and coarse silt.

B22t horizon: 80 percent quartz and 10 percent feldspar; the feldspar increases to 15 percent in the coarse silt. Orthoclase is the principal feldspar; some microcline and plagioclase are also present. Reddish brown aggregates decrease from 8 percent in the very fine sand to 3 percent in the coarse silt. Other minerals identified in trace amounts include chert, hornblende, epidote, zircon and opaques.

Micromorphology (Method 4E1): Thin section observations.

B1, B21t, B22t and B23t horizons: The soil fabric examined in thin section with the aid of a petrographic microscope is composed of tightly packed grains of very fine sand and silt with silt-sized grains predominating. Evidence for illuvial clay is not readily apparent. Oriented clay occurs in a random network throughout the soil fabric. It occurs as flecks or stringers or as thin birefringent zones around grains, concretions, and on ped surfaces. The oriented clay appears to have resulted from pressure or stress produced within the soil fabric by expanding or shifting soil. An occasional concentration or pocket of disrupted clay, giving the general appearance of illuvial clay, was observed. It is probable that illuvial clay build-up has been prevented by disruptive pressures within the soil. Several iron oxide accumulations or segregations were observed. Oriented clay, partially masked by iron coatings, occurs within the iron oxide segregations.

Location: Wagoner, County, Oklahoma; 4 miles southeast of Wagoner in NE 1/4 Section 2, T16N; R18E, 275 feet south-southeast of where Oklahoma Highway 2 crosses its north line and 100 feet east of the highway.

Site: Gently undulating, erosional upland with a convex surface and gradient of 1 percent. It is in a native meadow and has a vigorous growth of bluestems and yellow hop clover. It has been limed and phosphated to encourage the clovers.

Horizon, Depth
and Balteville Lab. No.

All	0-8 inches	Grayish-brown (10YR 5.5/2; 4/2 when moist) silt loam; weak medium granular; friable; worm casts few; pH 5.8; grades to horizon beneath.
Lab No.	54137	
A12	8-14 inches	Similar to layer above but contains a number of pale brown spots and a few very fine specks of brown and reddish brown; grades to horizon below.
Lab No.	54138	
A21	14-20 inches	Pale brown (10YR 6/3; 5/3 when moist) silt loam; weak fine granular; friable; powdery when dry; porous and permeable; fine, faint dark brown mottles occasional; pH 5.8; grades to horizon below.
Lab No.	54139	
A22	20-26 inches	Very pale brown (10YR 7/3; 5/3 when moist) silt loam; weak fine granular; friable; very porous and permeable; incipient and hard concretions numerous; slightly more sandy than above layer; pH 5.8; grades to horizon below.
Lab No.	54140	
A3 + B1	26-28 inches	Very pale brown (10YR 7/3; 6/3 when moist) silt loam strongly streaked with dark yellowish brown specked with strong brown and yellowish red; porous massive; hard when dry; permeable; fine black concretions and soft secretions numerous; pH 6.0; rests abruptly on the horizon below.
Lab No.	54141	
B21	28-34 inches	Grayish brown (10YR 5/2; 3.5/2 when moist) clay with many medium to coarse, distinct yellowish brown and reddish brown mottles; compound weak prismatic and moderate medium blocky; very firm and compact; very slowly permeable; sides of blocks have very dark grayish brown silty coatings in upper portion; pH 6.2; grades to horizon below.
Lab No.	54142	
B22	34-44 inches	Brown (10YR 5/3; 4/3 when moist) clay with common, medium, distinct, yellowish brown and strong brown mottles; weak medium blocky; firm; slowly permeable; dark grayish brown coatings on sides of blocks; fine black concretions numerous; fine roots penetrate the mass and between the peds; pH 7.0; grades to horizon below.
Lab No.	54143	
B31	44-60 inches	Brown (10YR 5/3; 4/3 when moist) heavy silty clay loam with a few medium, distinct yellowish brown and strong brown mottles; weak medium blocky; firm; slowly permeable; fine black concretions and white gypsum crystals, few; pH 7.2; grades to horizon below.
Lab No.	54144	
B32	60-78 inches	Coarsely mottled light gray, yellowish brown and strong brown silty clay much like the layer above but contains more numerous gypsum crystals; pH 7.2; grades to horizon below.
Lab No.	54145	
C	78-100+ inches	Coarsely mottled light gray and reddish yellow silty clay loam; nearly massive; hard when dry; slowly permeable; fine pores and tiny roots, few; pH 7.0.
Lab No.	54146	

The parent material seems to represent an altered Pleistocene loess some 10 to 20 feet thick over early or middle Pleistocene alluvium. The locality is on erosional upland of gentle relief and represents a big, smoothly dissected alluvial terrace mantled with loess. A few inliers of hard rock occur in the vicinity. These are largely of sandstones which protrude above the general plain. Drainage valleys have U-shaped cross-section. They cut about 15 to 20 feet into the mantled plain without exposing underlying shales or clays in this vicinity. In other localities of Taloka the loess is thinner over Pennsylvanian rocks. The A horizon ranges from 20 to 40 inches thick. This profile represents the average thickness found in most areas.

Samples collected by H. M. Galloway, R. W. Simmonson and R. H. Templin November 9, 1953. Described by H. M. Galloway.

Except where specified moist the colors refer to dry soil.

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Wagoner County, Oklahoma

SOIL TYPE Taloka Silt loam

LAB NOS. 54164 - 54172

SOIL NOS. S530k1a-73-22

LABORATORY NUMBER	DEPTH INCHES	HORIZON	1B1b PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)							3A1 INTERNATIONAL			TEXTURAL CLASS	
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	II 0.2-0.02	III 0.02-0.002	2A2 > 2		
			II		III		> 2							
54164	0-9	A11	0.9	1.9	2.1	6.9	14.0	61.4	12.8		14.0	0	sil	
54165	9-16	A12	1.4	2.2	2.3	7.2	13.1	61.8	12.0		14.9	0	sil	
54166	16-24	A21	2.2	2.2	2.2	6.9	13.6	59.5	13.4		14.4	0	sil	
54167	24-26	A22	2.0	1.9	2.1	6.4	15.0	58.5	14.1		15.8	0	sil	
54168	26-37	B21	0.2	1.0	1.3	4.6	9.5	42.7	40.7		13.7	0	sic	
54169	37-45	B22	0.8	0.9	1.4	4.9	9.5	43.1	39.4		13.3	0	sic1	
54170	45-54	B3C	1.4	0.9	1.3	4.5	8.8	41.8	41.3		12.6	0	sic	
54171	54-78	C1	0.6	1.0	1.6	5.5	10.0	43.5	37.8		13.0	0	sic1	
54172	78-100	C2	0.7	1.0	1.8	7.0	10.8	44.6	34.1		12.5	0	cl	
		pH		ORGANIC MATTER			IRON OXIDE				MOISTURE RETAINED AT			
8C1a				6A1a			IRON OXIDE			BULK	1/10		1/3	1/6
1:1				ORGANIC CARBON %	NITROGEN %	C/N	Fe ₂ O ₃ %			DENSITY g/cc	ATMOS. %	ATMOS. %	ATMOS. %	ATMOS. %
54164	5.2			1.23										
54165	5.0			0.75										
54166	5.3			0.32										
54167	5.7			0.19										
54168	6.4			0.39										
54169	6.9			0.27										
54170	7.2			0.26										
54171	7.2			0.14										
54172	7.0			0.09										
		EXTRACTABLE CATIONS 5B1a					BASE SATURATION							
CATION EXCHANGE CAPACITY (SUM)		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	6H1a H	ION % (SUM)							
		milliequivalents per 100g soil												
54164		3.8	1.1	0.1	0.1	5.9	46							
54165		2.9	0.9	0.1	0.2	5.6	42							
54166		2.2	0.9	0.3	0.2	5.4	40							
54167		2.3	1.0	0.5	0.1	4.5	46							
54168		9.0	4.6	2.9	0.3	6.8	71							
54169		10.3	5.3	3.3	0.3	4.2	82							
54170		11.9	5.9	3.6	0.4	3.4	86							
54171		10.8	5.3	3.3	0.4	2.9	87							
54172		9.7	4.8	2.9	0.4	2.6	87							

Taloka silt loam

Soil Nos. 85301a-73-22

Location: Wagoner County, Oklahoma; 9 miles southwest of Wagoner and 1/2 mile west of Tullahassee. 700 feet south of the northwest corner Section 30, T16N; R18E.

Site: Gently undulating erosional upland with a convex surface and gradient of about 1-1/2 percent. It is in a bluestem meadow which has never been plowed. Growth of grasses vigorous and stand is thick.

Horizon, Depth
and Beltsville Lab. No.

- A11 0-9 inches Lab No. 54164 Dark grayish brown (10YR 4/2; 3/2 when moist) silt loam, weak to moderate medium granular; friable; permeable; pH 6.0; grades to horizon beneath.
- A12 9-16 inches Lab No. 54165 Dark grayish brown (10YR 4/2; 3/2 when moist) silt loam; weak medium granular; friable; permeable; light brown spots and fine black concretions, few; pH 6.0; grades to horizon beneath.
- A21 16-24 inches Lab No. 54166 Grayish brown (10YR 5/2; 4/2 when moist) silt loam with common, medium distinct dark brown mottles; weak medium granular; friable; permeable; medium black concretions, few; pH 6.0; grades to horizon beneath.
- A22 24-26 inches Lab No. 54167 Light brownish gray (10YR 6/2; 5/2 when moist) silt loam with common, medium, distinct dark brown mottles which are incipient concretions; weak fine granular; friable; slightly hard when dry; porous and permeable; fine black concretions numerous; pH 6.0; rests abruptly on horizon beneath.
- B21 26-37 inches Lab No. 54168 Grayish brown (10YR 5/2; 4/2 when moist) clay with common, coarse distinct reddish brown and yellowish-brown streaks and mottles; compound, weak coarse prismatic and moderate medium blocky; extremely firm; very hard when dry; very slowly permeable; dark gray clay films on ped; fine roots largely concentrated between ped; black concretions numerous; pH 6.5; grades to horizon beneath.
- B22 37-45 inches Lab No. 54169 Grayish brown (10YR 5/2.5; 4/2 when moist) clay with many medium distinct yellowish brown, strong brown, and dark brown mottles; compound weak medium to coarse blocky and moderate subangular blocky; very firm; very slowly permeable; black concretions numerous; vertical cracks lined with dark-gray films common; pH 7.0; grades to horizon beneath.
- B3C 45-54 inches Lab No. 54170 Grayish brown (10YR 5/2; 4/2 when moist) clay with common, medium distinct yellowish brown and dark brown mottles; massive to weak medium blocky; very firm; very slowly permeable; pH 7.0; grades to horizon beneath.
- C1 54-78 inches Lab No. 54171 Grayish brown (10YR 5/2; 4/2 when moist) clay with common, medium distinct strong brown and yellowish brown mottles; weak medium blocky; very firm; very slowly permeable; black concretions occasional; pH 7.0; grades slowly to horizon beneath.
- C2 78-100 + inches Lab No. 54172 Mottled, grayish brown and yellowish brown silty clay containing appreciably more fine sand than the layer above; massive; firm; slowly permeable; pH 7.0; changes little to greatest depth sampled.

The parent material appears to be deeply weathered Pleistocene clay loam loess. This occupies a smoothly dissected plain of alluvial origin and presumably is underlain at some depth by old alluvium. The greatly thickened A horizons are apparently due to a deposit of loess of later age following the partial development of a profile in the original material. These range from 18 to 44 inches and the 26-inch thickness here represents about the modal depth of A horizon in this county. To the south, on the sloping edges of the plain, areas of Choteau soils occur. Near these, on reddish, more sandy loess of later age, overlying this grayish, clayey loess, the Teller soils develop.

Samples collected by H. M. Galloway and D. J. Polone December 8, 1953.
Described by H. M. Galloway.

Except where specified moist, the colors refer to dry soil.

SOIL SURVEY LABORATORY

Beltsville, Maryland

LOCATION Pawnee County, Oklahoma

SOIL TYPE Vanoss silt loam

LAB NOS. 54207 - 54214

SOIL NOS. S53Ok1a-59-35

LABORATORY NUMBER	DEPTH INCHES	HORIZON	1B1b PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)								3A1 INTERNATIONAL		2A2 > 2	TEXTURAL CLASS
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	II 0.2-0.02	III 0.02-0.002			
												II		
54207	0-6	A1p	0.0	0.2	0.4	3.0	15.2	64.8	16.4		16.3	0	sil	
54208	6-20	A1	0.1	0.2	0.4	1.4	8.8	65.9	23.2		22.7	0	sil	
54209	20-27	A3	0.2	0.4	0.4	1.0	6.3	61.6	30.1		25.5	0	sic1	
54210	27-33	B21	0.1	0.5	0.5	1.1	5.1	52.5	40.2		24.2	0	sic	
54211	33-41	B22	0.1	0.4	0.5	1.3	5.7	52.5	39.5		23.1	0	sic1	
54212	41-47	B3	0.2	0.7	0.8	1.6	8.4	55.5	32.8		19.6	0	sic1	
54213	47-60	C1	0.3	0.9	1.0	2.3	9.3	56.0	30.2		18.9	0	sic1	
54214	60-94	C2	0.4	0.7	1.0	2.5	11.2	54.3	29.9		14.7	0	sic1	
			pH		ORGANIC MATTER			FREE IRON OXIDE Fe ₂ O ₃ %	MOISTURE RETAINED AT:					
			8C1a		6A1a ORGANIC CARBON %	NITROGEN %	C/N		BULK DENSITY g/cc	1/10 ATMOS. %	1/3 ATMOS. %	15 ATMOS. %		
			1:1											
54207	5.8				0.82									
54208	5.7				1.19									
54209	5.9				0.72									
54210	5.8				0.52									
54211	5.8				0.38									
54212	6.0				0.32									
54213	6.0				0.21									
54214	6.3				0.10									
			EXTRACTABLE CATIONS					5B1a	BASE SATURATION %					
			6N2b Ca	6O2b Mg	6P2a K	6Q2a Na	6H1a H							
			milliequivalents per 100g soil						5C3 (SUM)					
54207			6.9	1.8	0.6	< 0.1	5.0	65						
54208			9.5	2.3	0.5	< 0.1	6.3	66						
54209			10.1	3.4	0.4	0.1	5.3	72						
54210			13.7	5.6	0.6	0.3	7.1	74						
54211			14.0	5.8	0.6	0.2	6.6	76						
54212			10.9	4.7	0.5	0.2	5.3	75						
54213			9.6	4.0	0.5	0.2	4.9	74						
54214			10.1	4.0	0.5	0.3	3.9	79						

Location: Pawnee County, Oklahoma; 2 miles northwest of Ralston. 1300 feet north of the east quarter-corner Section 27, T24N, R5E.

Site: On a nearly level bench about 20 feet above the bottomland soils in the floodplain of the Arkansas River. Surface is plane and gradient is about 1/2 percent. In a cultivated field here sown to alfalfa in 1953. No apparent loss of soil due to erosion.

**Horizon, Depth
and Beltsville Lab. No.**

Aip	0-6 inches Lab No. 54207	Brown (8.5 YR 5/2; 4/2 when moist) silt loam; weak fine and medium granular; friable; porous and permeable; pH 6.0; grades shortly to horizon below.
A1	6-20 inches Lab No. 54208	Dark brown (8YR 4/2; 3/2 when moist) silt loam; moderate fine and medium granular; porous and permeable; fine root hairs abundant; worm casts, few; pH 6.2; grades to horizon below.
A3	20-27 inches Lab No. 54209	Brown (7.5YR 5/3; 4/2 when moist) heavy silt loam; moderate medium granular; porous and permeable; pin holes, root holes and worm casts abundant; pH 6.2; grades through a short transition to horizon below.
B21	27-33 inches Lab No. 54210	Brown (8YR 5/3; 4/3 when moist) silty clay loam with a few fine distinct yellowish brown mottles; compound moderate medium subangular blocky and weak medium granular; friable; permeable; fine pores numerous; fine black concretions few; pH 6.2; grades to horizon below.
B22	33-41 inches Lab No. 54211	Brown (10YR 4/3; 3.5/3 when moist) silty clay loam with a few fine distinct yellowish brown specks around the fine pores; strong medium blocky; firm; slowly permeable; sides of blocks dark grayish brown and weakly shiny; fine black concretions few; pH 6.5; grades to horizon below.
B3	41-47 inches Lab No. 54212	Brown (7.5YR 5/3; 4/2 when moist) silty clay loam with common coarse distinct strong brown mottles; compound moderate medium granular and weak medium blocky; firm to friable; permeable; faint reddish brown specks and fine black concretions few; faint clay films on side of peds; pH 6.5; grades to horizon below.
C1	47-60 inches Lab No. 54213	Brown (7.5YR 5/2; 4/2 when moist) silty clay loam with common, medium, distinct strong brown and dark brown mottles; moderate medium granular; friable; porous and permeable; some pores as large as 1/32 inch in diameter; occasional spots of light brown; black concretions and accretions few; pH 6.5. Grades through a 6 to 10 inch transition to horizon below.
C2	60-94 + inches Lab No. 54214	Reddish brown (5YR 4/4; 3/4 when moist) silty clay loam; weak medium granular; friable; permeable; fine black concretions and coarse accretions, few; has a few brown streaks from 1/8 to 1/4 inch in thickness. Continues with only a slight increase in reddish hue to greatest depth sampled; pH 6.5.

Parent material is clay loam loess of Pleistocene age deposited upon an alluvial terrace of the Arkansas River. Though not observed here the loess presumably rests upon alluvium, probably below 15 feet. Associated nearby on reddish, slightly more clayey, loess are Norge soils occurring on greater slopes than the Vanoss. On the same bench nearer the river edge of the terrace are Teller soils developing on convex sloping areas on material much like that under the Vanoss. The terrace is bordered to the west by soils of the Sogn and Talihina series on the strongly sloping escarpment of limestone-capped shales. Footslopes below these are occupied by Summit and Dennis soils on colluvium from the limestones and shales respectively.

This profile is atypical in the B22 layer in that hue is less reddish, value is lower, and structure is blocky. At the same depth Vanoss usually exhibits compound granular and subangular blocky structure and less firm consistence.

Samples collected by H. M. Galloway, R. W. Simonson and E. H. Templin November 12, 1953. Described by H. M. Galloway.

Except where specified moist the colors refer to dry soil.

SOIL SURVEY LABORATORY

Beltsville, Maryland

LOCATION Pawnee County, Oklahoma

SOIL TYPE Vancoss silt loam

LAB NOS. 54244 - 54252

SOIL NOS. S53Okla-59-40

LABORATORY NUMBER	DEPTH INCHES	HORIZON	1B1b PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	3A1 INTERNATIONAL		2A2 > 2	
										II 0.2-0.02	III 0.02-0.002		
54244	0-8	A11	0.2	0.4	0.6	1.9	10.7	66.3	19.9		19.2	0	sil
54245	8-14	A12	0.1	0.6	0.6	2.4	15.2	60.6	20.5		14.2	0	sil
54246	14-21	A3	0.1	0.8	0.8	2.9	16.2	57.6	21.6		13.4	0	sil
54247	21-27	B1	0.1	0.6	0.8	1.5	16.8	53.6	26.6		13.1	0	sil
54248	27-34	B21	0.1	0.5	0.6	1.8	15.3	50.3	31.4		13.1	0	sic1
54249	34-40	B22	0.1	0.5	0.6	1.8	13.5	48.7	34.8		15.3	0	sic1
54250	40-50	B3C	0.1	0.6	0.7	2.5	16.1	47.9	32.1		14.5	0	cl
54251	50-70	C1	0.1	0.7	0.8	3.3	17.1	49.8	28.2		13.8	0	cl
54252	70-96+	C2	0.1	0.8	1.0	3.5	20.0	48.5	26.1		10.7	0	1
			pH		ORGANIC MATTER			FREE IRON OXIDE Fe ₂ O ₃ %	MOISTURE RETAINED AT				
8C1a 1:1			6A1a ORGANIC CARBON %	NITROGEN %	C/N				BULK DENSITY g/cc	1/10 ATMOS. %	1/3 ATMOS. %	5 ATMOS. %	
54244	5.4		1.46										
54245	5.3		1.16										
54246	5.4		1.05										
54247	5.1		0.77										
54248	5.2		0.58										
54249	5.4		0.37										
54250	5.4		0.27										
54251	5.6		0.19										
54252	5.8		0.06										
			EXTRACTABLE CATIONS 5B1a					BASE SATURATION % 5C3 (SUM)					
CATION EXCHANGE CAPACITY (SUM)			6N2b Ca	6O2b Mg	6P2a K	6Q2a Na	6H1a H						
			milliequivalents per 100g soil										
54244		6.7	2.1	0.7	< 0.1	7.4	56						
54245		7.2	2.0	0.5	0.1	7.1	58						
54246		7.4	2.4	0.4	0.1	7.0	60						
54247		7.9	2.8	0.5	< 0.1	7.0	62						
54248		8.4	3.4	0.5	< 0.1	6.8	64						
54249		10.0	4.3	0.5	0.1	6.8	69						
54250		9.1	4.2	0.5	0.1	5.5	72						
54251		7.7	3.6	0.5	0.1	5.2	70						
54252		7.7	3.5	0.4	0.1	3.7	76						

Location: Pawnee County, Oklahoma; 9-1/2 miles northeast of Pawnee; 3-1/4 miles northeast of Skedee. 200 feet south of the west quarter-corner Section 3, T22N; R6E.

Site: Nearly level, erosional upland with a weakly convex surface and gradient of about 1 percent which ranges nearby to 2-1/2 percent. In a native bluestem meadow with good grass density and vigor. Prairie hay yields nearly 1-1/2 tons per acre in average years. Across the road this soil is in alfalfa and stand is thrifty.

**Horizon, Depth
and Baltsville Lab. No.**

A11	0-8 inches Lab No. 54244	Dark grayish brown (10YR 4/2; 3/2 when moist) silt loam; moderate medium granular; friable; permeable; very fine root holes and worm casts numerous; pH 6.0; grades to horizon below.
A12	8-14 inches Lab No. 54245	Very similar to horizon above but slightly darker in color; pH 6.0.
A3	14-21 inches Lab No. 54246	Dark grayish brown (10YR 4/2; 3/2 when moist) light silty clay loam; moderate medium granular; porous and permeable; roots, root holes and worm casts numerous; occasional light brown spots; pH 6.0; grades to the horizon below.
B1	21-27 inches Lab No. 54247	Dark brown (7.5YR 4/2; 3/2 when moist) silty clay loam; compound, moderate medium subangular blocky and moderate medium granular; firm; hard when dry; worm holes, casts, pin holes and fine vertical cracks numerous; pH 6.0; grades to horizon below.
B21	27-34 inches Lab No. 54248	Much like the layer above but has a few medium distinct reddish brown mottles; pH 6.0; grades to horizon below.
B22	34-40 inches Lab No. 54249	Reddish brown (5YR 4/3; 3/3 when moist) silty clay loam with a few, coarse, distinct but diffuse yellowish red mottles; compound, weak medium subangular blocky and moderate medium granular; firm to friable; permeable; peds have weakly shiny dark reddish brown clay films; fine pores and larger root channels numerous; living roots abundant; pH 6.2; grades to horizon below.
B3C	40-50 inches Lab No. 54250	Similar to layer above but slightly less dark and has no evidence of clay films on peds; pH 6.2; grades to horizon below.
C1	50-70 inches Lab No. 54251	Yellowish red (5YR 4/6; 3/5 when moist) silty clay loam with many medium distinct splotches or mottles of light reddish brown; compound weak medium granular and weak fine subangular blocky; friable to firm; root holes and pores numerous; clay content appears slightly lower than in layer above; pH 6.2; grades to horizon below.
C2	70-96 + inches Lab No. 54252	Yellowish red (5YR 5/6; 4/6 when moist) silty clay loam much like layer above. Contains occasional bands of light brown color but changes very little to greatest depth sampled; pH 6.2.

The parent material is clay loam loess of Pleistocene age which is possibly 20 to 30 feet thick over bedrock at this location. The site occupies a small upland flat in a broader area of Norge soils. These Norge have more clayey substrata than Teller in the order of about 5 percent, while the reddish Teller soils develop in sandier parent materials on convex areas of greater gradient lying nearer the Arkansas River floodplain. Vanoss has development of high minimal to low medial degree and subsoils are more permeable than those of Norge and Dennis.

Samples collected and described by H. M. Galloway November 27, 1953.

Except where specified moist, colors refer to dry soil.

SOIL TYPE Verdigris LOCATION Rogers County, Oklahoma
silty clay loam

SOIL NOS. S60-Okl-66-1 LAB. NOS. 13427-13433

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a	2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.07	0.02-0.002	
0-6	Ap	0.1a	0.1b	0.1b	0.9	2.9	58.7	37.2	23.4	38.8	Tr.	sic1
6-17	A11	<0.1	<0.1	0.1	0.6	2.6	59.2	37.5	22.9	39.3	Tr.	sic1
17-26	A12	<0.1	<0.1	<0.1	0.3	9.7	66.9	23.1	49.6	27.2	Tr.	sil
26-32	A13	<0.1	<0.1	<0.1	0.3	3.3	69.8	26.6	34.5	38.8	Tr.	sil/sic1
32-44	AC1	<0.1	0.1b	<0.1	2.0	5.5	61.5	30.9	30.0	38.8	Tr.	sic1
44-54	AC2	0.1c	0.3c	0.2c	3.9	11.3	54.8	29.4	40.3	29.2	Tr.	sic1
54-63	AC3	0.1c	0.2c	0.2c	14.2	13.8	46.9	24.6	48.6	21.6	Tr.	1

pH	6C1a ORGANIC MATTER				4A1a BULK DENSITY			4B4 MOISTURE TENSIONS			
	Free Iron	6A1a ORGANIC CARBON	6B1a NITROGEN	C/N	Field State	4A1c 30-cm	Oven-Dry	4B4 Field State	4B1b 1/3-bar	4B3 30-cm	4B2 15-bar sieved
1:1	Fe ₂ O ₃ %	% d	%		g/cc	g/cc	g/cc	%	%	%	%
6.3	1.9	2.63	0.212	12							15.6
6.5	1.9	2.25	0.184	12	1.43	1.38		21.4	26.4	25.8	15.8
6.6	1.5	0.56	0.060	9	1.51	1.47		21.4	24.2	24.6	10.4
6.5	1.7	0.62			1.52	1.46		21.4	25.2	25.2	12.3
6.5	1.8	0.69			1.57	1.52		20.6	24.0	23.6	14.2
6.6	1.8	0.56			1.66	1.60		17.6	20.2	21.1	13.0
6.9	1.5	0.34									10.8

5A1a CATION EXCHANGE CAPACITY NH ₄ OAc	6N2b EXTRACTABLE CATIONS					5B1a	BASE SAT. % NH ₄ OAc EXCH.	Base Sat. % on Sum Cations	Sum Ext. Bases	Sum Ext. Cations	Ca/Mg	8D1 CEC. per 100 g. Clay
	Ca	Mg	H	No	K	6Q2a	5C1	5C3	5B1a	5A3e	8D3	
← milliequivalents per 100g. soil →												
26.8	23.7	3.7	6.9	0.1	1.0	106	106	80	28.5	35.4	6.4	72
27.0	23.9	3.7	6.9	0.1	0.6	105	105	80	28.3	35.2	6.4	72
16.2	14.5	2.2	3.8	0.1	0.3	106	106	82	17.1	20.9	6.6	70
18.9	16.5	2.6	4.3	0.1	0.4	104	104	82	19.6	23.9	6.3	71
21.0	18.4	3.2	5.1	0.2	0.4	106	106	81	22.2	27.3	5.8	68
20.0	17.4	3.4	4.1	0.2	0.4	107	107	84	21.4	25.5	5.1	68
17.5	15.0	3.5	2.8	0.2	0.3	108	108	87	19.0	21.8	4.3	71

- a. Many organic matter fragments.
- b. Few Fe-Mn? concr.
- c. Many Fe-Mn? concr.
- d. 24 Kg/M² to 60 inches (Method 6A).

Soil Type: Verdigris silty clay loam

Date: June 9, 1960. Collected by R. Bain, C. Newland, D. J. Polone, J. S. Allen, J. M. Downs, and R. J. Dries. Area: Rogers County, Oklahoma
 Location: 300 feet N or S of cor of Sec. 9-T20N-R35E, approximately 3/4 mile North of Verdigris River.

Slope: Nearly level

Described by: Fred J. Dries.

Remarks: Nearly level alluvial flood plain soil subject to occasional flooding. Area sampled in rye, vetch, and pecan orchard. Associated with Osage and Lightning series. Silt and silty clay loams are the principal types. Drainage appears to be good with some small depressed areas present.

Soil No.: S60-Okla-66-1

Lincoln Horizon

Eqb. No.

13427	Ap	0-6 inches	Dark gray (10YR 4/1, dry), very dark gray (10YR 3/1, moist) silty clay loam; moderate medium granular structure; friable; permeable; roots abundant; pH 6.0 by Hellige Kit; abrupt boundary to
13428	All	6-17 inches	Dark gray (10YR 4/1, dry), very dark gray (10YR 3/1, moist) silty clay loam; weak irregular blocky; breaking to strong granular structure; friable; permeable; numerous worm casts; pH 6.0 by Hellige Hit; clear boundary to horizon below.
13429	AJ2	17-26 inches	Brown (10YR 5/3, dry), dark brown (10YR 4/3, moist) silty clay loam; weak fine subangular blocky, crushing to coarse granular structure; friable; permeable; worm casts numerous; pH 6.0 by Hellige Kit; clear boundary to
13430	A13	26-32 inches	Dark grayish brown (10YR 4/2, dry), very dark grayish brown (10YR 3/2, moist) silty clay loam; faintly mottled with shades of brown; weak medium subangular blocky, breaking to strong medium granular structure; friable; permeable; pH 6.0 by Hellige Kit; grades to
13431	AC1	32-44 inches	Grayish brown (10YR 5/2, dry), dark grayish brown (10YR 4/2, moist) silty clay loam; mottled with 10 percent dark grayish brown (2.5Y 4/2, moist); weak fine subangular blocky structure; friable; permeable; some small sand pockets present at lower depth; pH 6.5 by Hellige Kit; grades to
13432	AC2	44-54 inches	Grayish brown (2.5Y 5/2, dry), very dark grayish brown (2.5Y 3/2, moist) silty clay; faintly mottled with lighter shades of brown; moderate medium subangular blocky structure; firm when moist, hard when dry; strong shine on surface of peds; pH 6.4 by Hellige Kit; grades clear to
13433	AC3	54-63 inches	Grayish brown (2.5Y 5/2, dry), dark grayish brown (2.5Y 4/2, moist) silty clay loam; mottled with 20 percent olive brown (2.5Y 4/4, moist) and 5 percent light olive brown (2.5Y 5/6, moist); weak fine subangular blocky structure; pH 6.0 by Hellige Kit.

Mineralogy (Method 7B) Unless otherwise stated the remarks are based on the studies of the very fine sands under a petrographic microscope. The sands are nearly devoid of rock fragments, primary ferromagnesian minerals (such as hornblende, biotite, and augite), or magnetite. Subangular to rounded, mostly frosted and iron-stained quartz and rounded nodular ferruginous material dominate. There is about 5 percent identified feldspar (microcline) down to the lowermost horizon in which only a trace is present. Unidentified weathered grains increase from 10 percent in the surface to 30 percent in the lowermost horizon. The majority of the unidentified weathered grains appear to be altered from microcline as they generally have the same low relief, birefringence, and refractive index as microcline, and since grains transitional in degree of weathering are present. Nodular material decreases from 20 percent in the surface horizon to 5 percent in the lowermost horizon. Most of the ferruginous material is concretionary, hollow and sufficiently friable that large quantities appear to have been broken up during particle-size analysis.

SOIL TYPE Verdigris LOCATION Rogers County, Oklahoma
silty clay loam

SOIL NOS. S60-Okl-66-2 LAB. NOS. 13434-13440

DEPTH INCHES	HORIZON	1B1a PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										3A1 2A2 > 2	TEXTURAL CLASS	
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY						
		2.1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002				
0-5	Ap	<0.1	<0.1	<0.1	1.6	6.5	60.6	31.3	33.5	35.0	-	sic1		
5-13	All	<0.1	<0.1	<0.1	0.4	4.4	63.2	32.0	31.7	36.3	-	sic1		
13-21	A12	<0.1	<0.1	<0.1	0.2	7.7	66.7	25.4	47.9	26.7	-	s11		
21-29	AC1	<0.1	<0.1	<0.1	1.6	20.5	59.9	17.9	64.2	17.6	-	s11		
29-35	AC2	<0.1	<0.1	0.1	0.5	11.1	66.5	21.8	54.6	23.4	-	s11		
35-55	AC3	<0.1	<0.1	<0.1	0.2	2.9	72.5	24.4	44.4	31.1	-	s11		
55-62	AC4	<0.1	<0.1	<0.1	0.1	3.9	67.1	28.9	40.6	30.5	-	sic1		
8C1b		pH		ORGANIC MATTER			BULK DENSITY			MOISTURE TENSIONS				
8C1a		6C1a	6A1a		6B1a	4A1a		4A1c	4A1h	4B4	4B1b	4B3	4B2	
1:5		Free Iron	ORGANIC CARBON	NITROGEN	C/N	Field State	30-cm	Oven-Dry	Field State	1/3-bar	30-cm	15-bar	sieved	
1:1		Fe2O3%	%	%		g/gr	g/cc	g/cc	g	%	%	%	%	
6.1		1.7	1.42	0.134	10								12.6	
6.4		1.8	0.89	0.093	10	1.56	1.51	1.68	17.6	21.3	21.3		14.3	
6.6		1.7	0.48	0.052	9	1.50	1.45	1.59	21.2	22.1	24.2		11.3	
6.6		1.4	0.35	0.038	9	1.52	1.48	1.57	22.4	17.5	24.4		8.2	
6.7		1.5	0.39			1.52	1.46	1.56	22.8	22.6	26.0		9.6	
6.7		1.6	0.42			1.58	1.50	1.62	21.5	25.0	25.6		11.2	
6.6		1.8	0.58										13.0	
5A1a		EXTRACTABLE CATIONS					5B1a	BASE SAT.	Base	Sum	Sum			8D1
CATION EXCHANGE CAPACITY		6N2b	6O2b	6H1a	6P2a	6Q2a	NH4OAc EXCH.	Sat. %	Ext.	Ext.	Ca/Mg			CEC. per 100 g. Clay
NH4OAc		Cu	Mg	H	Na	K		on Sum Cations	Bases	Cations				
		milliequivalents per 100g. soil					5C1	5C3	5H1a	5A3a	8D3			
21.2		17.4	3.0	6.3	0.1	0.5	99	77	21.0	27.3	5.8			68
20.7		17.9	3.0	5.1	0.1	0.5	104	81	21.5	26.6	6.0			65
17.3		14.4	2.4	3.8	0.1	0.4	100	82	17.3	21.1	6.0			68
12.3		11.2	2.0	3.3	0.1	0.3	110	80	13.6	16.9	5.6			69
14.2		12.8	2.2	3.3	0.1	0.3	108	82	15.4	18.7	5.8			65
16.4		14.4	2.5	3.8	0.1	0.3	105	82	17.3	21.1	5.8			67
18.8		16.6	3.0	4.6	0.2	0.4	107	81	20.2	24.8	5.5			65

a. 13 Kg/M² to 60 inches (Method 6A).

Soil Type: Verdigris silty clay loam

Date: June 9, 1960 Collected by: R. Bain, C. Newland, D. J. Polone, J. S. Allen, J. M. Downs, and F. J. Dries. Area: Rogers County, Oklahoma.

Location: 600 feet S and 150 feet E of NE Cor of Sec. 19-T20N-R15E

Slope: Nearly level

Described by: Fred J. Dries

Remarks: Nearly level alluvial flood plain soil subject to occasional flooding. Area sampled was seeded to alfalfa in the fall of 1959. Rather poor stand and weedy because of the severe flood after seeding in October, 1959. Associated with Oage and Lightning series. Drainage appears to be adequate for good crop production.

Soil Nos. S60-Okla-66-2

Lincoln Horizon

Lab. No.

13434	Ap	0-5 inches	Dark grayish-brown (10YR 4/2, dry), very dark brown (10YR 2/2, moist) silty clay loam; moderate medium and coarse granular structure; friable; permeable; pH 5.7 by Hellige Kit; clear to abrupt boundary to horizon below.
13435	A11	5-13 inches	Dark grayish-brown (10YR 4/2, dry), very dark grayish brown (10YR 3/2, moist) silty clay loam; faintly mottled with dark brown (10YR 4/3, moist); weak irregular subangular blocky structure, breaking to coarse granular; roots abundant; porous; worm casts numerous; pH 6.0 by Hellige Kit; clear boundary to
13436	A12	13-21 inches	Brown (10YR 5/3, dry), dark brown (10YR 4/3, moist) silty clay loam; mottles of about 5 percent grayish brown (10YR 5/2, moist) and 5 percent yellowish brown (10YR 5/6); weak medium subangular blocky structure; friable; pH 6.4 by Hellige Kit; grades to
13437	AC1	21-29 inches	Grayish brown (10YR 5/2, dry), dark grayish brown (10YR 4/2, moist) heavy silt loam; mottled with common, fine, distinct mottles of dark brown (7.5YR 4/4, moist); weak fine subangular blocky to granular structure; very porous; numerous worm casts; a few black concretions present; pH 5.8 by Hellige Kit; clear boundary to
13438	AC2	29-35 inches	Grayish-brown (10YR 5/2, dry), dark grayish-brown (10YR 4/2, moist) faintly mottled with brown or dark brown (10YR 4/3, moist) silty clay loam; weak fine to medium subangular blocky structure; porous; few worm casts; pH 6.0 by Hellige Kit; clear boundary to
13439	AC3	35-55 inches	Grayish-brown (2.5Y 5/2, dry), dark grayish-brown (2.5Y 4/2, moist) common, medium, distinct mottles of dark brown (7.5YR 4/4, moist) silty clay loam; weak medium subangular blocky structure; porous; few concretions present; pH 6.0 by Hellige Kit; grades to
13440	AC4	55-62 inches	Dark grayish brown (10YR 4/2, dry), very dark grayish-brown (10YR 3/2, moist) faintly mottled with dark brown (10YR 4/3, moist) silty clay loam; weak fine and medium subangular blocky structure; firm when moist; few worm casts present; pH 6.0 by Hellige Kit.

Mineralogy (Method 7B) Unless otherwise stated the remarks are based on the studies of the very fine sands under a petrographic microscope. The sands are nearly devoid of rock fragments, primary ferromagnesian minerals (such as hornblende, biotite, and augite), or magnetite. Subangular to rounded, mostly frosted and iron-stained quartz and rounded nodular ferruginous material dominate. There is about 5 percent identified feldspar (microcline) down to the lowermost horizon in which only a trace is present. Unidentified weathered grains increase from 10 percent in the surface to 30 percent in the lowermost horizon. The majority of the unidentified weathered grains appear to be altered from microcline as they generally have the same low relief, birefringence, and refractive index as microcline, and since grains transitional in degree of weathering are present. There is a maximum of 5 percent ferruginous nodules throughout the profile. Most of the ferruginous material is concretionary, hollow, and sufficiently friable that large quantities appear to have been broken up during particle-size analysis.

SOIL SURVEY LABORATORY Lincoln, Nebr. March 1960

SOIL TYPE Haurika LOCATION Cotton County, Oklahoma
silt loam

SOIL NOS. S590kla-17-1 LAB. NOS. 11433-11441

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						2A2 > 2
		VERY COARSE SAND 2.1	COARSE SAND 1.0-5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002			
0-6	A1p	<0.1	0.1a	0.1a	4.7	17.8	63.0	14.3	66.5	18.2	-	sil	
6-10	A12	0.1a	0.1a	0.1a	4.1	15.3	59.3	21.0	58.3	19.7	-	sil	
10-12	A2	<0.1	0.2a	0.1a	4.4	15.4	57.5	22.4	56.5	20.1	-	sil	
12-24	B21	0.2a	0.1a	0.1a	3.0	9.4	38.2	49.0	34.9	15.2	-	c	
24-32	B22	0.5b	0.4b	0.2c	3.8d	10.4d	42.3	42.4	40.3	15.6	Tr.	sic	
32-39	B3ca	1.6b	0.9b	0.3c	4.4d	10.8d	46.0	36.0	42.9	17.5	Tr.	sic1	
39-50	C1	0.7b	0.5h	0.2c	4.5d	11.9d	45.2	37.0	41.4	19.4	Tr.	sic1	
50-57	C2	0.6e	0.6e	0.2c	5.1d	12.8d	43.8	36.9	42.8	18.1	-	sic1	
57-72	C3	0.3e	0.4e	0.3c	6.9d	16.8d	40.8	34.5	48.7	14.7	-	cl	

pH	8C1a ORGANIC MATTER					Free Iron % Fe ₂ O ₃ 6C1a	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM 8A1a	6E1a BULK DENSITY 4A1h Oven-Dry g/cc 4A1c 30-cm g/cc 4B3 30-cm % 4B2 15-Bar %	MOISTURE TENSIONS			
	1:1	1:5	1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %				C/N	4B3	4B2	
5.9	6.3	6.6	0.74	0.058	13	0.6	0.4	1.42	1.42	22.6	5.0	
6.6	6.8	7.3	0.73	0.064	11	0.8	0.5	<1			7.5	
7.0	7.5	7.7	0.58	0.053	11	0.8	0.7	<1			8.0	
7.3	8.0	8.2	0.66	0.056	12	1.2	2.0	1.84			19.4	
7.8	8.6	8.9	0.44			0.9	4.1	1			15.6	
7.7	8.3	8.6	0.25			0.7	7.9	2			14.2	
7.8	8.6	8.9	0.17			0.7	5.0	2			15.1	
7.9	8.6	8.8	0.11			0.9	4.2	2			15.0	
7.8	8.4	8.6	0.05			1.2	3.6	<1	1.82	1.72	18.5	13.4

5A1a CATION EXCHANGE CAPACITY NH ₄ OAc	6N2b EXTRACTABLE CATIONS					5D2 EXCH. No %	6A1 SATURATION EXTRACT SOLUBLE					8A MOISTURE AT SATURATION %
	6O2b	6H1a	6P2a	6Q2a	6P1a		6Q1a	6J1a	6K1a	6L1a		
	Ca	Mg	H	Na	K		NO ₃ ⁻	K	HCO ₃ ⁻	Cl ⁻	SO ₄ ⁼	
9.4	6.1	2.0	3.1	0.1	0.4	1	0.8	0.2				32.0
12.9	8.6	3.4	3.4	0.5	0.3	3	2.6	0.1				36.3
14.8	8.8	3.6	2.6	0.8	0.2	5	4.0	<0.1				34.5
33.8	22.0	12.0	2.5	4.2	0.5	10	13.5	<0.1				69.6
28.9		10.9	0.2	5.4	0.4	12	28.1	0.1	2.3	27.8	10.3	66.6
25.2		9.9	<0.1	5.8	0.4	12	48.5	0.2	1.9	38.0	55.8	56.0
25.7		9.4	0.2	6.2	0.4	16	36.1	0.1	3.2	34.8	13.3	62.5
24.7		8.8	0.5	6.1	0.4	16	31.5	0.1	1.9	30.7	8.9	64.9
23.1	13.9	7.5	1.2	5.2	0.4	16	26.6	0.1	2.8	27.6	5.8	60.9

a. Common (Fe-Mn?) concr.
b. Few (Fe-Mn?) concr.; many calcareous aggregates.
c. Few (Fe-Mn?) concr.; trace calcareous aggregates.
d. Trace calcareous aggregates.
e. Common (Fe-Mn?) concr.; common calcareous aggregates.

Soil Type: Waurika silt loam Described by: Louis E. Derr and John M. Allen.
 Area: Cotton County, Oklahoma.
 Location: About 3 miles east and 1 mile south of Temple, Oklahoma. 100 feet west and 190 feet south of the northeast corner of Sec. 31, T3S, R9W.
 Physiography: Slightly concave slope of less than 1 percent on large, nearly level upland.
 Vegetation: Soil from field of wheat stubble.
 Climate: 30 inches average annual precipitation; P-E index 40.
 Drainage: Imperfectly drained; runoff, very slow; internal drainage, slow.
 Parent Material: Weathered Permian sediments of clay loam texture.
 Soil Nos.: S59Okla-17-1

Lincoln

Laboratory No.

and Horizon

11433	A _{1p}	0-6 inches	Grayish brown (10YR 5/2; 3/2, moist) silt loam; weakly platy in lower 1 inch; friable and soft; many fine roots; plowed boundary.
11434	A ₁₂	6-10 inches	Dark grayish brown (10YR 4/2; 3/2, moist) silt loam; few worm casts and little granulation; friable and soft; gradual, nearly smooth boundary.
11435	A ₂	10-12 inches	Light brownish gray (10YR 6/2; 4/2, moist) silt loam; structureless; friable and soft; abrupt, wavy boundary with thickness of A ₂ varying from 1 to 5 inches in lateral distance of 16 inches.
11436	B ₂₁	12-24 inches	Dark grayish brown (10YR 4/2; 3/2, moist) clay; moderate medium to coarse angular blocky; very firm and very hard; moderate continuous clay films and many horizontal slickenside faces; clear, wavy boundary.
11437	B ₂₂	24-32 inches	Very dark grayish brown (10YR 3/2, moist) clay; moderate medium angular blocky; very firm and very hard; clay films and slickenside faces less apparent than above; many hard lime concretions (1 percent by volume) up to 1 cm. diameter; soil mass is noncalcareous; fine black pellets of 1 to 2 mm. diameter increase with depth in this horizon; diffuse boundary.
11438	B _{3ca}	32-39 inches	Dark grayish brown (10YR 4/2, moist) clay; weakly blocky that breaks more easily on horizontal plains; lime concretions more numerous (3 percent by volume); soil mass is calcareous; black pellets are less distinct; gradual boundary.
11439	C ₁	39-50 inches	Dark grayish brown (10YR 4/2, moist) heavy clay loam; weak medium to fine subangular blocky; firm and very sticky when wet; segregated lime less than 1 percent by volume and mass is calcareous; diffuse boundary.
11440	C ₂	50-57 inches	Dark grayish brown (10YR 4/2, moist) clay loam; soil mass is calcareous but less than above and segregated lime is less than above; black concretions increase in size and number; gradual boundary.
11441	C ₃	57-72 inches	Light gray (10YR 7/2, moist) clay loam coarsely streaked and mottled with yellowish red (5YR 5/6, moist); structureless; friable; noncalcareous.

SOIL SURVEY LABORATORY Lincoln, Nebr. March 1960

SOIL TYPE Haurika LOCATION Jefferson County, Oklahoma
silt loam

SOIL NOS. S5901a-34-1 LAB. NOS. 11423-11432

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	2A2				
		2.1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	< 0.002		
0-5	Alp	<0.1	0.2a	0.6	12.3	18.5	58.2	10.2	69.3	16.6	-	sil	
5-10	Al2	<0.1	0.1a	0.4	10.1	15.8	57.0	16.6	60.7	19.7	-	sil	
10-14	A2	<0.1	0.4a	0.6a	9.9	14.8	56.0	18.3	56.5	21.6	-	sil	
14-24	B21	<0.1	0.2a	0.4a	8.6	11.2	37.6	42.0	38.3	16.9	-	c	
24-33	B22	0.3a	0.3a	0.5a	10.0	12.2	38.3	38.4	40.2	17.8	-	cl	
33-39	B3	1.4b	0.5c	0.5c	9.2d	12.0d	39.0	37.4	39.2	18.7	-	cl	
39-44	B3ca	0.7e	0.4e	0.5c	12.0d	16.9d	37.2	32.3	48.4	14.5	-	cl	
44-59	C1	0.7b	0.7b	0.7e	14.4d	19.9d	34.6	29.0	54.1	11.0	-	cl	
59-68	C2	0.1b	0.1b	0.2d	5.9d	15.7d	47.9	30.1	50.1	18.2	-	cl	
68-78	C3	5.6f	1.6f	0.4f	5.2d	17.2d	43.5	26.5	44.4	20.7	9	1/c1	
	pH	8C1a ORGANIC MATTER					Free Iron	ELECTRICAL CONDUCTIVITY	6E1a BULK DENSITY		MOIST. TENSILE		
		1:5	1:10	6A1a ORGANIC CARBON	6B1a NITRO-GEN	C/N	Fe ₂ O ₃	EC x 10 ³	4A1h Oven - Dry	4A1c 30-cm	4B3 30-cm	4B2 15-Bar	
				%	%		6C1a	6A1a	g/cc	g/cc	%	%	
6.2	6.6	6.5	0.70	0.058	12	0.5	0.4					4.0	
6.4	6.8	6.8	0.57	0.055	10	0.7	0.4	1.47	1.44	18.0		5.8	
6.5	7.1	7.0	0.42	0.041	10	0.8	0.4					6.8	
6.7	7.4	7.5	0.47	0.044	11	1.3	0.6					16.5	
7.3	7.7	7.9	0.45			1.3	2.6	1.89				15.1	
7.7	8.3	8.6	0.33			1.1	5.5					14.9	
7.8	8.3	8.6	0.20			1.1	5.5					12.9	
7.8	8.3	8.5	0.08			1.5	4.0	1.84	1.71	17.0		11.6	
7.9	8.5	8.7	<0.01			2.0	2.0					12.1	
8.3	9.2	9.4	0.03			1.8	1.7					10.3	
	5A1a CATION EXCHANGE CAPACITY	6N2b 6O2b 6H1a 6P2a 6Q2a					5I2 EXCH. No %	6A1 SATURATION			6A2 EXTRACT SOLUBLE		8A MOISTURE AT SATURATION
		Ca	Mg	H	Na	K		6P1a Na	6Q1a K	6J1a HCO ₃ ⁻	6K1a Cl ⁻	6L1a SO ₄ ²⁻	%
		milliequivalents per 100g. soil						milliequivalents per liter					
7.6	4.4	1.6	2.8	<0.1	0.4	<1	0.5	0.4					28.8
10.2	6.4	2.5	2.8	0.1	0.2	1	1.0	0.1					36.2
11.3	6.4	3.0	3.1	0.2	0.2	2	1.7	0.1					34.1
25.1	15.3	9.3	4.6	1.5	0.5	5	3.8	<0.1					72.0
24.2	15.7	10.0	2.4	2.8	0.4	7	14.8	0.1					68.0
23.9		10.6	0.5	4.5	0.4	10	31.8	0.1	2.3	45.5	6.3		67.7
18.5		8.5	0.2	4.3	0.3	11	33.6	0.1	2.1	44.5	8.1		64.5
15.6		6.7	1.0	3.6	0.3	13	26.6	0.1	3.5	31.2	5.4		60.5
16.8	11.5	6.1	0.5	3.0	0.3	12	15.0	0.1					68.1
15.7			2.6	0.2	0.2	11	12.2	<0.1					66.6

- a. Many (Fe-Mn?) concr.
- b. Few (Fe-Mn?) concr.; common calcareous aggregates.
- c. Few (Fe-Mn?) concr.; trace calcareous aggregates.
- d. Trace calcareous aggregates.
- e. Few (Fe-Mn?) concr.; many calcareous aggregates.
- f. Many calcareous aggregates.

Soil Type: Waurika silt loam Described by: Louis E. Darr and John M. Allen.
 Area: Jefferson County, Oklahoma.
 Location: 2 miles east and 1/2 mile north of intersection of U. S. Highways 70 and 81, east of Waurika, Oklahoma. 127 feet south and 315 feet east of the west quarter corner of Sec. 33, T4S, R7W.
 Physiography: Slightly concave slope of less than 1 percent on large nearly level upland.
 Vegetation: Soil from cultivated field under sudan and Johnson grasses.
 Climate: 32 inches average annual precipitation; P-E index 46.
 Drainage: Imperfectly drained; runoff, very slow; internal drainage, slow.
 Parent Material: Weathered Permian sediments of clay loam texture.
 Soil Nos.: S59Okla-34-1

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and Horizon

- 11423 A_{1p} 0-5 Grayish brown (10YR 5/2; 3/2, moist) silt loam; nearly inches structureless with very weak thin plates in upper 2 inches; very friable and slightly hard; fine grass roots are numerous; plowed boundary.
- 11424 A₁₂ 5-10 Dark grayish brown (10YR 4/2; 2/2, moist) silt loam; inches moderate fine granular containing numerous worm casts; friable and slightly hard; many fine roots; clear, nearly smooth boundary.
- 11425 A₂ 10-14 Light brownish gray (10YR 6/2; 4/2, moist) silt loam; inches porous with moderate number of worm casts; slightly firm (brittle) when moist and slightly hard when dry; few roots; abrupt boundary that is wavy, the thickness of this horizon varies from 5 inches to nearly nothing in a lateral distance of 18 inches. The underlying horizon bulges nearer the surface where this horizon is thin.
- 11426 B₂₁ 14-24 Dark grayish brown (10YR 4/2; 3/3, moist) clay; strong medium inches angular blocky with wider vertical cracks about 12 inches apart; very firm and very hard; tops of blocks adjacent to A₂ not rounded; moderate continuous clay films and many horizontal slickenside faces; many fine roots that penetrate soil mass but more numerous on faces of peds; no discernible boundary.
- 11427 B₂₂ 24-33 Dark brown (10YR 3/3, moist) clay; essentially same as inches horizon above; gradual boundary.
- 11428 B₃ 33-39 Dark brown (10YR 3/3, moist) silty clay loam; weak medium sub- inches angular blocky; firm and very hard; few, hard lime concretions of 1 cm. diameter and few black concretions of 3 to 4 mm. diameter; soil mass is weakly calcareous; gradual boundary.
- 11429 B_{3ca} 39-44 Brown (10YR 4/3, moist) clay loam with distinct fine mottles inches of dark brown (10YR 3/3) and reddish brown (5YR 4/4); moderate to weak medium subangular blocks; friable; black concretions more numerous and slightly larger than above; soil mass is strongly calcareous; clear boundary.

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- 11430 C₁ 44-59 Reddish brown (5YR 4/4, moist; 5/4, dry) clay loam; weak to inches moderate medium subangular blocks; friable to slightly firm; calcium concretions are larger and less numerous than above; soil mass is slightly calcareous; black concretions are softer, larger and more numerous than above.
- 11431 C₂ 59-66 Red and yellowish red (2.5YR 5/6 and 5YR 5/6, moist) coarsely inches mottled clay loam; moderately calcareous.
- 11432 C₃ 66-78 Weathered, soft "red beds" material of clay loam texture inches very similar to above.

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