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Soil Survey
Investigations
Report No. 37

Soil Survey Laboratory Data and Descriptions for Some Soils of Kansas

Soil survey investigations reports already published:

SSIR No. 1 Soil Survey Laboratory Methods and Procedures for Collecting Soil Samples

Soil Survey Laboratory Data and Descriptions for Some Soils of:

SSIR No. 2 North Dakota
SSIR No. 3 Iowa
SSIR No. 4 Kansas
SSIR No. 5 Nebraska
SSIR No. 6 Arkansas, Louisiana, and Missouri
SSIR No. 7 Montana
SSIR No. 8 Wyoming
SSIR No. 9 Minnesota
SSIR No. 10 Colorado
SSIR No. 11 Oklahoma
SSIR No. 12 Puerto Rico and the Virgin Islands
SSIR No. 13 Mississippi
SSIR No. 14 Kentucky
SSIR No. 15 Tennessee
SSIR No. 16 North Carolina, South Carolina, and Georgia
SSIR No. 17 Wisconsin
SSIR No. 18 Indiana
SSIR No. 19 Illinois
SSIR No. 20 New England States
SSIR No. 21 A Toposequence of Soils in Tonalite Grus in the Southern California Peninsular Range

Soil Survey Laboratory Data and Descriptions for Some Soils of:

SSIR No. 22 Alabama and Florida
SSIR No. 23 Nevada
SSIR No. 24 California
SSIR No. 25 New York
SSIR No. 26 New Jersey
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SSIR No. 30 Texas
SSIR No. 31 Iowa
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SSIR No. 36 Michigan

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October 1981

Soil Survey Laboratory Data and Descriptions for Some Soils of Kansas

PREFACE

The Soil Survey Investigations Report (SSIR) series was established to preserve and make available technical information resulting from soil survey investigations. SSIR No. 1 "Soil Survey Laboratory Methods and Procedures for Collecting Soil Samples," revised April 1972, describes in detail the methods used in the soil survey laboratories. One report involves a single specific study. Other reports in the series contain pedon descriptions and data from the individual states, Puerto Rico, and the Virgin Islands. The entire series is listed on the inside front cover.

This report contains descriptions and data obtained in Kansas from 1953 to 1976. The laboratory analyses were conducted at the soil survey laboratories in Lincoln, NE, and Mandan, ND.

Laboratory data for different soils cannot always be compared without allowance for the method. Methods are indexed by code or footnote in data sheet column headings and are identified briefly on the following two pages. A data sheet and a list of expanded column headings are given on three additional pages. Detailed explanations of coded procedures are in SSIR No. 1. A few codes used on data sheets but not listed indicate small changes in method detail; these will be included in the next printing of SSIR No. 1.

Many pedons no longer represent the soil series with which they were originally identified. A few represent series being considered for reclassification. All were checked against series classification as of October 1978. Some pedons are called taxadjuncts to series. All pedons are classified to the family level. Pedons are arranged alphabetically by taxonomic unit.

METHODS CODE SYMBOLS

1. SAMPLE COLLECTION AND PREPARATION
   - A. Field Sampling
     1. Site selection
     2. Soil sampling
        - a. Stony soils
        - b. Marsh and swamp soils
   - B. Laboratory preparation
     1. Standard (airdry)
        - a. Square-hole 2-mm seeve
        - 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

     - : analysis run but not detected

     blank: analysis not run

     nd: analysis not run

     < : less than reported amount or none present
3. PARTICLE-SIZE ANALYSES
   - A. Particles < 2-mm (pipet method)
     1. Airdry samples
        - a. Carbonate and noncarbonate clay
        - b. Fine clay
        - c. Water-dispersible clay
   - B. Particles > 2-mm
     1. Weight estimated
        - a. By field and laboratory weights
        - b. From volume and weight estimates
     2. Volume estimates
4. FABRIC-RELATED ANALYSES
   - A. Bulk density
     1. Saran-coated clods
        - 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. Ovendry
     2. Cores
        - a. Field moist
   - B. Water retention
     1. Pressure-plate extraction (1/3 or 1/10 bar)
        - a. Sieved samples
        - b. Soil pieces
        - c. Natural clods
     2. Pressure-membrane extraction= 15 bars)
        - a. Field-moist samples
     3. Sand-table absorption
     4. Field state
     5. Airdry
   - C. Water-retention difference
     1. 1/3 bar to 15 bars
     2. 1/10 bar to 15 bars
   - D. Linear extensibility
     1. Dry to moist
   - E. Micromorphology
     1. Thin sections
        - a. Preparation
        - b. Interpretation
        - c. Moved-clay percentage
   - F. Plasticity index
     1. Liquid limit
     2. Plastic limit
5. ION-EXCHANGE ANALYSES
   - A. Cation-exchange capacity
     1. NH_4 OAc, pH 7.0
        - a. Direct distillation
     2. NaOAc, pH 8.2
        - a. Centrifuge method
     3. Sum of cations
        - a. Acidity by $BaCl_2$-TEA, pH 8.2; bases by NH_4 OAc, pH 7.0
        - b. Sum of bases plus Al
     6. NH_4 OAc, pH 7.0 leaching tube
        - a. Direct distillation
   - B. Extractable bases
     1. NH_4 OAc extraction
        - a. Uncorrected
        - b. Corrected (exchangeable)
        - c. See 5B4
     2. KCl-TEA extraction, pH 8.2
     3. KCl-TEA, pH 8.2 (revised)
        - a. Uncorrected
        - b. Corrected (exchangeable)
     4. NH_4 OAc, pH 7.0 (modified)
        - a. Uncorrected
        - b. Corrected (exchangeable)
   - C. Base saturation
     1. NH_4 OAc, pH 7.0
     2. NaOAc, pH 8.2
     3. Sum of cations
   - D. Sodium saturation (exchangeable Na pct.)
     1. NaOAc, pH 8.2
     2. NH_4 OAc, pH 7.0
   - E. Sodium-adsorption ratio
   - F. Calcium saturation
     1. NH_4 OAc, pH 7.0
6. CHEMICAL ANALYSES
   - A. Organic carbon
     1. Acid-dichromate digestion
        - a. $FeSO_4$ titration
        - b. CO_2 evolution, gravimetric
     2. Dry combustion
        - a. CO_2 evolution I
        - b. CO_2 evolution II
   - B. Nitrogen
     1. Kjeldahl digestion
        - a. Ammonia distillation
   - C. Iron
     1. Dithionite extraction
        - a. Dichromate titration
        - b. EDTA titration
     2. Dithionite-citrate extraction
        - a. Orthophenanthroline colorimetry
        - b. Atomic absorption
     3. Dithionite-citrate-bicarbonate extraction
        - a. Potassium thiocyanate colorimetry
     4. Pyrophosphate-dithionite extraction
     5. Sodium-pyrophosphate extraction
        - a. Atomic absorption
     6. Ammonium oxalate extraction
        - a. Atomic absorption
   - E. Calcium carbonate
     1. HCl treatment
        - a. Gas volumetric
        - b. Manometric
        - c. Weight loss
        - d. Titrimetric
     2. Sensitive qualitative method
        - a. Visual, gas bubbles

G. Aluminum
  1. KCl extraction 1, 30 min.
    a. Aluminon I
    b. Aluminon II
    c. Aluminon III
    d. Fluoride titration
    e. Atomic absorption
  2. KCl extraction II, overnight
    a. Aluminon I
  3. NH_4 OAc extraction
    a. Aluminon III
  4. NaOAc extraction
    a. Aluminon III
  5. Sodium pyrophosphate extraction
    a. Atomic absorption
  6. Ammonium oxalate extraction
    a. Atomic absorption
  7. Dithionite-citrate extraction
    a. Atomic absorption

H. Extractable acidity
  1. $BaCl_2$-triethanolamine I
    a. Back-titration with HCl
  2. $BaCl_2$-triethanolamine II
    a. Back titration with HCl

I. Carbonate
  1. Saturation extract
    a. Acid titration

J. Bicarbonate
  1. Saturation extract
    a. Acid titration

K. Chloride
  1. Saturation extract
    a. Mohr titration
    b. Potentiometric titration

L. Sulfate
  1. Saturation extract
    a. Gravimetric, $BaSO_4$
    b. EDTA titration
  2. NH_4 OAc extraction
    a. Gravimetric, $BaSO_4$

M. Nitrate
  1. Saturation extract
    a. PDS acid colorimetry
    b. Diphenylamine

N. Calcium
  1. Saturation extract
    a. EDTA titration
    b. Atomic absorption
  2. NH_4 OAc extraction
    a. EDTA-alcohol separation
    b. Oxalate-permanganate I
    c. Oxalate-permanganate II Fe, Al, and Mn removed
    d. Oxalate-cerate
    e. Atomic absorption
  3. NH_4 Cl-EtOH extraction
    a. EDTA titration
  4. KCl-TEA extraction
    a. Oxalate-permanganate
    b. EDTA titration
    c. Atomic absorption

O. Magnesium
  1. Saturation extract
    a. EDTA titration
    b. Atomic absorption
  2. NH_4 OAc extraction
    a. EDTA-alcohol separation
    b. Phosphate titration
    c. Atomic absorption
  3. NH_4 Cl-EtOH extraction
    a. EDTA titration
  4. KCl-TEA extraction
    a. Phosphate titration
    b. EDTA titration
    c. Atomic absorption

P. Sodium
  1. Saturation extract
    a. Flame photometry
    b. Atomic absorption
  2. NH_4 OAc extraction
    a. Flame photometry
    b. Atomic absorption

Q. Potassium
  1. Saturation extract
    a. Flame photometry
    b. Atomic absorption
  2. NH_4 OAc extraction
    a. Flame photometry
    b. Atomic absorption

R. Sulfur
  1. $NaHCO_3$ extract, pH 8.5
    a. Methylene blue
  2. HCl release (sulfide)
    a. Iodine titration

S. Total phosphorus
  1. Perchloric acid digestion
    a. Molybdovanadophosphoric acid colorimetry

T. Available phosphorus

7. MINERALOGY

A. Instrumental analysis
  1. Preparation
    a. Carbonate removal
    b. Organic-matter removal
    c. Iron removal
    d. Particle-size fractionation
    e. PSDA pretreatment
  2. X-ray diffraction
    a. Thin film on glass, solution pretreatment
    b. Thin film on glass, resin pretreatment
    c. Thin film on glass, $NaPO_3$ pretreatment
    g. Powder mount, diffractometer recording
    h. Powder mount, camera recording
  3. Differential thermal analysis

B. Optical analysis
  1. Grain studies
  2. Electron microscopy

C. Total analysis
  1. Chemical
  2. X-ray emission spectrography

D. Surface area
  1. Gylcerol retention

8. MISCELLANEOUS

A. Saturated paste, mixed
  1. Saturation extract
    a. Conductivity
    b. Conductivity, quick test
  2. Bureau of Soils cup, resistance

B. Saturated paste, capillary rise
  1. Saturation extract
    a. Conductivity

C. pH
  1. Soil suspensions
    a. Water dilution
    b. Saturated paste
    c. KCl
    d. NaF
    e. $CaCl_2$

D. Ratios and estimates
  1. To total clay
  2. To noncarbonate clay
  3. Ca to Mg (extractable)
  4. Estimated clay percentage
  5. Estimated total salt

E. Soil resistivity
  1. Saturated paste

SOIL CLASSIFICATION-

SERIES - - - - - - -

SOIL NO- - - - - - -

COUNTY - - -

GENERAL METHODS- - -

SAMPLE NOS.-

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, MRTSC
SOIL SURVEY INVESTIGATIONS UNIT
LINCOLN, NEBRASKA

DEPTH	HORIZON	(- - - - - - - - - - - - - - -PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B- - - - - - - - -)																RATIO
		SAND	SILT	CLAY	FINE CLAY	(- - - - - SAND - - - - -)					(- - -SILT- - -)			FAML TEXT	INTR II	FINE CLAY	NON- CO3-	8D1 15-
		2- .05	.05- .002	LT .002	LT .0002	VCOS 2- 1	CORS 1- .5	MEDS .5- .25	FNES .25- .10	VFNS .10- .05	COSI .05 .02	FNSI .02 .002	VFSI .005- .002	SAND 2-.1	.2- .02	TO CLAY	CLAY	BAR TO
GM		(- PCT LT 2MM -)															PCT	CLAY

Depth (in.)	Horizon	Size class and particle diameter (mm) — Total: Sand 2-0.05	Silt (0.05-0.002)	Clay (<0.002)	Fine clay (<0.0002)	Sand: Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Silt: (0.05-0.02)	Int. III (0.02-0.002)	(0.005-0.002)	Family texture sand (2-0.1	International II (0.02	Ratio fine clay to clay	Non-carbonate clay pct	Ratio 15-bar to clay
		pct of < 2mm																
COLUMN 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)(BULK DENSITY)(- - - -WATER CONTENT- - - -)												CARBONATE	(- -PH - -)		
	VOL. (- - - - - - - - - - WEIGHT - - - - - - - - - -)					4A1O	4A1H	4D1	4B1C	4B1C	4B2	4C1	6E1B	3A1A	8C1A	8C1E
	GT	GT	75-20	20-5	5-2	LT .074	20-2 PCT	1/3- BAR	OVEN DRY	COLE	1/10 BAR	1/3- BAR	15- BAR	WRD CM/	LT 2	LT .002	1/1 H2O	1/2 CACL
GM	PCT	PCT	(- - - PCT LT 75 - - -)				LT20 G/CC		G/CC		PCT	PCT	PCT	CM	PCT	PCT		

Depth (in.)	Size class and particle diameter (mm) — Volume > 2	Weight: > 75	75-20	20-5	5-2	<0.074 Pass 200 mesh	20-2	Bulk density: 1/3-bar	Oven-dry	COLE	Water content: 1/10-bar	1/3-bar	15-bar	1/3-to 15-bar	Carbonate as $CaCO_3$: < 2mm	<0.002 mm	pH: (1:1) H_2O	(1:2) $CaCl_2$
	pct	pct	pct < 75mm				pct < 20	g/cc	g/cc		pct	pct	pct	cm/cm (in./in.)	pct	pct		
COLUMN 1	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38

DEPTH	(ORGANIC MATTER)			IRON	PHOS	(- -EXTRACTABLE BASES 5B4A- -)				ACTY	AL	(CAT EXCH)	RATIO	RATIO	CA	(BASE SAT)	
	6A1A ORGN	6B1A NITG	C/N	6C2A EXT FE	6S1A TOTL	6N2E CA	6O2D MG	6P2A NA	6Q2A K	SUM EXTB	6H1A BACL TEA	6G1D KCL EXT	5A3A EXTB ACTY	5A6A NHAC	8D1 NHAC TO	8D3 CA TO	5F SAT NHAC	5C3 EXTB ACTY	5C1 NHAC
GM	PCT CARB	PCT		PCT	PCT (- - - - - - - - - - -MEQ / 100						G- - - - - - - - - - -)			CLAY	MG	PCT	PCT	PCT

Depth (in.)	Organic matter: Organic carbon	Nitrogen	C/N	Ext. iron as Fe	Total phosphorus	Extractable bases 5B: Ca	Mg	Na	K	Sum extractable bases	Ext. acidity	KCl ext. Al	Cat.exch.cap.: Sum of bases plus acidity	NH_4OAc	Ratio NH_4OAc to clay	Ratio Ca to Mg	Ca saturation NH_4OAc	Base saturation: Extractable acidity	NH_4OAc CEC
	pct	pct		pct	pct	meq/100g											pct	pct	
COLUMN 1	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57

DEPTH	(SATURATED PASTE)			NA	NA	SALT	GYP	(- - - - - - - - - - SATURATION EXTRACT 8A1- - - - - - - - - -)									ATTERBERG	
	8E1 REST OHM-	8C1B PH	8A H2O	5D2 ESP	5E SAR	8D5 TOTL SOLU	6F1A	8A1A EC MMHOS/	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	4F1 LQID LMIT	4F2 PLST INDX
GM	CM		PCT	PCT		PPM	PCT	CM	(- - - - - - - - - - MEQ / LITER - - - - - - - - - - -)									PCT	

Depth (in.)	Saturated paste: Resistivity	pH	Water at sat.	Exch. Na	Sodium adsorption ratio	Total soluble salt	Gypsum	Saturation extract: Electrical conductivity	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	Atterberg: Liquid limit	Plastic index
	ohm-cm		pct	pct		ppm	pct	mmhos/cm	meq/liter									pct	
COLUMN 1	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76

Remarks: EXAMPLE DATA SHEET HEADINGS--This page alternates computer data sheet headings with printed data sheet headings and column numbers. Column numbers refer to more complete column headings on an adjoining page.

COLUMN HEADINGS FOR COMPUTER PRINTED DATA SHEETS

Column	
1	Depth in centimeters
2	Horizon
	Columns 3 through 16 display numbers which are percents of the total weight of particles 2 millimeters or less in size.
3	Total sand (particles range from .05 to 2 millimeters)
4	Total silt (particles range from .002 to .05 millimeter)
5	Total clay (particles are smaller than .002 millimeter)
6	Total fine clay (particles are smaller than .0002 millimeter)
7	Very coarse sand (particles range from 1 to 2 millimeters)
8	Coarse sand (particles range from 0.5 to 1 millimeter)
9	Medium sand (particles range from 0.25 to 0.5 millimeter)
10	Fine sand (particles range from 0.1 to 0.25 millimeter)
11	Very fine sand (particles range from .05 to 0.1 millimeter)
12	Coarse silt (particles range from .02 to .05 millimeter)
13	Fine silt (particles range from .002 to .02 millimeter; these limits also define the range of total silt on the International Soil Science Society Scale.)
14	Very fine silt (particles range from .002 to .005 millimeter)
15	Family texture sand (particles range from 0.1 to 2 millimeters)
16	International II (particles range from .02 to 0.2 millimeter; these limits define the range of the fine sand on the International Soil Science Society Scale.)
17	Fine clay to clay (this is the ratio of fine clay to total clay expressed as percent.)
18	Noncarbonate clay (this is the percentage of total clay, column 5, minus the percentage of carbonate clay, column 36.)
19	Ratio of 15-bar water percentage to total clay percentage
20	Volume of material greater than 2 millimeters given as a percent of total (sample volume)
21	Greater than 75 millimeter material given as a percent of total sample weight
22	Particle size range from 20 to 75 millimeters given as a weight percent of all material 75 millimeters or less in the sample
23	Particle size range from 5 to 20 millimeters given as a weight percent of all material 75 millimeters or less in the sample
24	Particle size range from 2 to 5 millimeters given as a weight percent of all material 75 millimeters or less in the sample
25	Particle size range less than 0.74 millimeter given as a weight percent of all material 75 millimeters or less
26	Particle size range from 2 to 20 millimeters given as a weight percent of all material 20 millimeters or less
27	Bulk density of soil desorbed to 1/3-bar given in grams per cubic centimeter
28	Bulk density of oven dry soil given in grams per cubic centimeter
29	Coefficient of linear extensibility
30	Water content of soil desorbed to 1/10-bar given as a percent of oven dry weight
31	Water content of soil desorbed to 1/3-bar given as a percent of oven dry weight
32	Water content of soil fragments desorbed to 15 bars given as a percent of oven dry weight
33	Water retention difference given in centimeter per centimeter
34	Column used for any water content measurement different from those given in columns 30 through 33
35	Carbonate content of the material 2 millimeters or less given as a percent
36	Carbonate content of the material .002 millimeter or less given as a percent
37	pH of a 1:1 suspension of soil in distilled water
38	pH of a 1:2 suspension of soil in .01 M $CaCl_2$
39	Organic carbon given as a percent
40	Nitrogen given as a percent
41	Organic carbon to nitrogen ratio
42	Extractable iron given as a percent
43	Total phosphorus given as a percent
44	Extractable calcium given in milliequivalents per 100 grams of soil
45	Extractable magnesium given in milliequivalents per 100 grams of soil
46	Extractable sodium given in milliequivalents per 100 grams of soil
47	Extractable potassium given in milliequivalents per 100 grams of soil
48	Sum of the extractable bases given in milliequivalents per 100 grams of soil
49	Acidity - barium chloride with triethanolamine measurement - given in milliequivalents per 100 grams of soil
50	Aluminum - potassium chloride extraction - given in milliequivalents per 100 grams of soil
51	Cation exchange capacity by sum of the extractable bases plus the acidity given in milliequivalents per 100 grams of soil
52	Cation exchange capacity as measured by ammonium acetate given in milliequivalents per 100 grams of soil
53	Ratio of ammonium acetate cation exchange capacity to total clay
54	Ratio of extractable calcium to extractable magnesium
55	Calcium saturation of the ammonium acetate cation exchange capacity given as a percent
56	Base saturation - sum of the extractable bases divided by the acidity plus the sum of the extractable bases - given as a percent

COLUMN HEADINGS FOR COMPUTER PRINTED DATA SHEETS--Continued

Column	
57	Base saturation - sum of the extractable bases divided by the ammonium acetate cation exchange capacity - given as a percent
58	Saturated paste (soil plus water) resistivity given in ohm-cm
59	Saturated paste (soil plus water) pH
60	Saturated paste (soil plus water) water content given as a percent
61	Exchangeable sodium percentage
62	Sodium adsorption ratio
63	Total soluble salt given in parts per million
64	Gypsum given in percent
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66	Calcium content of the saturation extract given in milliequivalents per liter
67	Magnesium content of the saturation extract given in milliequivalents per liter
68	Sodium content of the saturation extract given in milliequivalents per liter
69	Potassium content of the saturation extract given in milliequivalents per liter
70	Carbonate (CO_3) content of the saturation extract given in milliequivalents per liter
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72	Chloride content of the saturation extract given in milliequivalents per liter
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*, 1/, 4/, and 5/. See footnote explanations on last page of index.

1/ County numbers (the number following "KS" in the Soil Survey No.) are as follows:

Projects sampled before 1974

1. Allen
2. Anderson
6. Bourbon
8. Butler
9. Chase
15. Cloud
19. Crawford
23. Douglas
26. Ellis
29. Ford
38. Hamilton
44. Jefferson
50. Labette
55. Logan
69. Norton
71. Osborne
75. Pottawatomie
78. Reno
79. Republic
85. Saline
89. Shawnee
92. Smith
93. Stafford

Projects sampled after 1974

77. Harper
151. Pratt
185. Stafford

2/ This pedon is a taxadjunct to the Bethany series because the clay decrease with depth is greater than that typically observed in pedons of this series.

3/ This pedon is a taxadjunct because the ratio of clay in the subsoil to that in the surface horizons is lower than that typically observed in pedons of this series.

4/ This pedon is a taxadjunct to the Ulysses series because free carbonates occur higher in the profile than is typical for that series.

5/ This pedon is a taxadjunct to the Ulysses series because it contains more sand than is typical for that series.

* Page number refers to SSIR 4 (first volume)

SOIL CLASSIFICATION: Udic Haplustalf; coarse-loamy, mixed, thermic

SOIL Albion sandy loam taxadjunct LOCATION Reno County, Kansas

SOIL NOS. S58Kans-78-2 LAB. NOS. 8055-8062

SOIL SURVEY LABORATORY Lincoln, Nebraska DATE November, 1958

GENERAL METHODS 1A, 1B1a, 2A1, 2B

		PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1										
DEPTH INCHES	HORIZON	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	TEXTURAL CLASS
0-7	Ap	3.7	21.2	22.4	18.1	5.7	21.9	7.0	29.2	4.1	1	sl
7-16	B21t	2.4	18.2	17.7	14.2	5.2	29.2	10.1	31.8	7.2	2	sl
16-23	B22t	8.8	23.5	17.0	12.9	4.0	20.0	13.8	21.6	5.5	6	cosl
23-37	B23t	11.5	25.9	18.1	20.1	2.3	8.7	13.4	13.0	2.9	4	cosl
37-48	C1	18.7	46.5	12.5	8.2	1.8	3.4	8.9	5.3	1.4	5	lcos
48-60	C2	10.4	47.7	20.5	11.1	1.3	1.8	7.2	5.7	0.8	4	cos
60-80	C3	8.8	44.4	23.3	10.9	2.7	3.1	6.8	6.7	1.2	3	cos
80-99	C4	15.8	51.3	21.7	3.7	0.8	1.3	5.4	2.0	0.5	9	cos

8C1a	pH		ORGANIC MATTER 6A1a	6B1a		8A2	ELECTRICAL CONDUCTIVITY EC×10³ MILLIMHOS PER CM 8A1a	6E1a		MOISTURE TENSIONS		4B2
SATURATED PASTE	1:5	1:10	ORGANIC CARBON %	NITROGEN %	C/N	EST% SALT (BUREAU CUP)		$CaCO_3$ equivalent %	GYPSUM me./100g. SOIL	1/10 ATMOS. %	1/3 ATMOS. %	15 ATMOS. %
5.7	6.0	6.0	0.45	0.037	12	<0.20	0.4					2.7
6.4	6.6	6.6	0.68	0.058	12	<0.20	0.4					5.2
6.8	7.0	7.0	0.44	0.034	13	<0.20	0.4	<1				6.2
7.1	7.2	7.0	0.25	0.026	10	<0.20	0.4	<1				6.3
7.4	7.4	7.3	0.09			<0.20	0.4	<1				3.9
7.4	7.4	7.3	0.02			<0.20	0.4	<1				3.3
7.3	7.4	7.2	0.01			<0.20	0.5	<1				3.1
7.3	7.4	7.1	0.04			<0.20	0.4	<1				2.4

5A1a	EXTRACTABLE CATIONS 5B1a					5C1	8A1 SATURATION EXTRACT SOLUBLE				8A
CATION EXCHANGE CAPACITY NH_4OAc	6N2b Ca	6Q2b Mg	6H1a H	6P2a Na	6Q2a K	Base Sat. % NH_4Ac Exch.	6P1a Na	6Q1a K			MOISTURE AT SATURATION %
← milliequivalents per 100g. soil →							← milliequivalents per liter →				
5.0	2.6	0.6	2.7	<0.1	0.3	70	0.5	0.4			22.8
9.1	6.5	1.6	1.8	<0.1	0.3	92	0.4	0.2			32.5
10.8	7.7	2.2	2.7	<0.1	0.2	94	0.5	0.1			32.6
9.5	6.6	2.5	1.4	<0.1	0.2	98	0.4	0.1			32.2
6.6	4.5	1.8	0.9	<0.1	0.2	98	0.6	0.2			26.5
5.6	3.8	1.5	0.4	<0.1	0.2	98	0.6	0.2			27.9
5.4	3.6	1.4	0.4	<0.1	0.2	96	0.8	0.1			25.4
4.3	2.9	1.3	0.4	<0.1	0.1	100	0.8	0.1			27.8

Pedon classification: Udic Haplustalf, coarse-loamy, mixed, thermic
Series classification: Udic Argiustoll, coarse-loamy, mixed, thermic
Soil: Albion sandy loam taxadjunct*
Soil Nos.: S58KS-78-2 (Sample Nos. 8055-8062)
Location: Reno County, KS; 1,900 feet south and 242 feet east of the northwest corner of Sec. 3, T26S, R7W.
Climate: Annual precipitation is about 29 inches. Annual temperature is about 56° F., and summer temperature is about 80° F. Average frost-free season is about 185 days.
Vegetation and land use: Originally tall grasses. Cropland.
Parent material: Sandy and gravelly old alluvium.
Physiography: Undulating erosional upland.
Topography: Convex slope. Slope gradient about 2 percent.
Drainage: Well drained to somewhat excessively drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately rapid.
Described by: J. Rockers, H. Otsuki.

(Colors are for dry soil unless otherwise stated.)

Ap 8055 0 to 18 cm. (0 to 7 inches). Dark grayish brown (10YR 4/2) light sandy loam, very dark grayish brown (10YR 2.5/2) moist; weak fine granular structure; very friable; abrupt smooth boundary.

B21t 8056 18 to 41 cm. (7 to 16 inches). Dark grayish brown (10YR 3.5/2) sandy loam, very dark grayish brown (10YR 2.5/2) moist; weak medium granular structure; friable; porous; gradual smooth boundary.

B22t 8057 41 to 59 cm. (16 to 23 inches). Brown (7.5YR 4/2) light sandy clay loam, dark brown (7.5YR 3/2) moist; weak medium granular structure; friable; porous; sand grains coated with clay; few worm casts; few fine gravels; gradual smooth boundary.

B23t 8058 59 to 94 cm. (23 to 37 inches). Reddish brown (5YR 4/4) light sandy clay loam, dark reddish brown (5YR 3.5/4) moist; weak very coarse prismatic structure and weak medium granular structure; friable; weak patchy clay films and many clay bridges; few worm casts; few fine gravels; diffuse smooth boundary.

C1 8059 94 to 122 cm. (37 to 48 inches). Yellowish red (5YR 5/5) light loamy sand, yellowish red (5YR 4/6) moist; single grained; very friable; porous; diffuse smooth boundary.

C2 8060 122 to 152 cm. (48 to 60 inches). Reddish yellow (7.5YR 6/6) medium and coarse sand, reddish yellow (7.5YR 5.5/6) moist; single grained; very friable; porous.

C3 8061 152 to 203 cm. (60 to 80 inches). Same as above. Separated for sampling purposes.

C4 8062 203 to 252 cm. (80 to 99 inches). Same as above. Separated for sampling purposes.

Remarks: Horizons 0 to 18 cm. (0 to 7 inches); 59 to 94 cm. (23 to 37 inches); and 122 to 152 cm. (48 to 60 inches) were sampled for engineering testing.

* This pedon is a taxadjunct to the Albion series because the dark surface layer is thinner than typical for that series.

SOIL CLASSIFICATION—ENTIC HAPLUSTOLL
FINE-LOAMY, MIXED, MESIC
SERIES - - - - - - - ARMO SILT LOAM

SOIL NO - - - - - - S68KANS-26-7 COUNTY - - - ELLIS

GENERAL METHODS- - - 1A, 1B1B, 2A1, 2B SAMPLE NOS.- 68L328-68L334

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO
					FINE	SAND						SILT				
		SAND 2- .05	SILT .05- .002	CLAY LT .002	CLAY .0002	VCOS 2- 1	CORS 1- .5	MEDS .5- .25	FNES .25- .10	VFNS .10- .05	COSI .05 .02	FNSI .02 .002	VFSI .005- .002	FAML TEXT 2-.1	INTR IT .02	FINE CLAY TO CLAY	NON- CO3- 15- BAR TO CLAY
CM		PCT LT 2MM														PCT	PCT
000-5	A11	21.3	57.5	21.2		0.3	2.2	3.5	5.9	9.4	41.8	15.7		11.9	54.0		21	0.53
005-25	A12	37.2	43.8	19.0		3.3	3.9	5.4	11.2	13.4	32.6	11.2		23.8	51.8		19	0.46
025-38	A3	36.6	41.2	22.2		3.3	4.4	5.1	10.8	13.0	29.3	11.9		23.6	48.0		19	0.39
038-71	B2	38.0	41.3	20.7		0.7	2.6	3.6	11.9	19.2	27.3	14.0		18.8	53.9		20	0.37
071-104	C1ca	35.9	43.6	20.5		3.2	5.8	3.8	7.5	15.6	29.2	14.4		20.2	49.4		20	0.36
104-130	C2	52.5	29.2	18.3		16.4	12.7	5.3	9.3	8.8	16.3	12.9		43.7	30.3		14	0.31
130-152	2C3	40.4	34.8	24.8		10.1	8.6	4.5	8.8	8.4	16.8	18.0		32.0	30.2		21	0.33

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2	WEIGHT GT 75	75-20	20-5	5-2		BULK DENSITY 4A1D	4A1H	4D1	4B1C	WATER CONTENT 4B1C	4B2	4C1	4B2	6E1B	CARBONATE 3A1A	(-PH-) 8C1A	8C1E
						LT .074	1/3-BAR	OVEN DRY	COLE	1/10 BAR	1/3-BAR	15-BAR	WRD CM/	400-BAR	LT 2	.002	1/1 H2O	1/2 CACL
CM	PCT	PCT	(- - - PCT LT 75 - - -)				LT20	G/CC (A)	G/CC	PCT	PCT	PCT	CM	PCT	PCT	PCT		
000-5	TR	0	0	0	TR	86	TR	1.10				11.3			5	0	7.1	
005-25	TR	0	0	0	TR	73	TR	1.36	1.46	0.024	26.3	8.7	0.24	4.5	20	TR	7.4	
025-38	TR	0	0	0	TR	73	TR	1.30	1.40	0.025	27.2	8.6	0.24		28	3	7.4	
038-71	TR	0	0	0	TR	76	TR	1.30	1.38	0.020	26.6	7.6	0.25	5.6	32	1	7.5	
071-104	0	0	0	0	0	76	0	1.30				7.2			36	1	7.5	
104-130	0	0	0	0	0	54	0					5.6		3.3	57	4	8.1	
130-152												8.1			43	4	8.0	

DEPTH	(ORGANIC MATTER) 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2A EXT FE	PHOS 6S1A TOTL	(-EXTRACTABLE BASES 5B4A-) 6N2E CA	6Q2D MG	6P2A NA	6Q2A K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1D KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO	RATIO 8D3 CA TO	CA 5F SAT NHAC	(BASE SAT) 5C3 EXTB ACTY	5C1 NHAC
CM	PCT (B)	PCT		PCT	PCT	(- - - - - - - - - -MEQ / 100 G- - - - - - - - - -) (C)	(C)								CLAY	MG	PCT	PCT	PCT
000-5	4.54	0.367	12	0.6		18.4	1.1	0.3	3.1	22.9				23.7	1.12				
005-25	1.66	0.161	10	0.6		14.7	0.4	0.1	1.0	16.2				14.0	0.74				
025-38	1.14	0.112	10	0.6		13.9	0.3	0.1	0.6	14.9				12.6	0.57				
038-71	0.52	0.057	9	0.6		13.7	0.6	0.1	0.4	14.8				11.5	0.56				
071-104	0.19			0.7		11.7	1.1	0.1	0.4	13.3				10.8	0.53				
104-130	0.04			1.1		9.1	0.9	0.1	0.2	10.3				7.3	0.40				
130-152	0.07			1.1		12.7	1.6	0.2	0.4	14.9				11.9	0.48				

DEPTH	(SATURATED PASTE) 8E1 REST OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	(- - - - - - - - SATURATION EXTRACT 8A1- - - - - - - - -) 8A1A EC	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/CM	(- - - - - - - - - - MEQ / LITER - - - - - - - - - -)									PCT	
C00-5																			
005-25																		31	9
025-38																			
038-71																		28	9
071-104																			
104-130	3700	7.7	27.8			90		0.51										25	7
130-152																			

(A) BULK DENSITY ESTIMATED FOR HORIZONS FROM 0-5 AND 71-104 CM
(B) ORGANIC CARBON IS 12 KG PER SQ M TO A DEPTH OF 1 METER (METHOD 6A1
(C) METHODS 6N4C FOR CA AND 6O4C FOR MG

Pedon classification: Entic Haplustoll, fine-loamy, mixed, mesic
Series classification: (Same)
Soil: Armo silt loam
Soil Nos.: S68KS-26-7 (Sample Nos. 328-334)
Location: Ellis County, KS; 1,400 feet east and 3,500 feet north of the southwest corner of Sec. 28, T11S, R17W.
Climate: Annual precipitation is about 23 inches. Annual temperature is about 54° F., and mean summer temperature is about 78° F. Average frost-free season is about 171 days.
Vegetation and land use: Mid grasses. Rangeland.
Parent material: Loamy sediments derived from limestone and modified by alluvial and eolian material.
Physiography: Sloping erosional upland.
Topography: Slightly concave slope about midway between the ridge top and drainageway. Slope gradient about 5 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderate.
Described by: J. M. Allen, L. D. Zavesky.

(Colors are for dry soil unless otherwise stated.)

A11 328 0 to 5 cm. (0 to 2 inches). Grayish brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) moist; weak thin platy breaking to moderate fine granular structure; soft, very friable; many fine grass roots and rhizomes; strong effervescence; clear smooth boundary.

A12 329 5 to 25 cm. (2 to 10 inches). Dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, friable; many fine grass roots; few fragments of chalk 2 mm. to 2 cm. in diameter; strong effervescence; gradual smooth boundary.

A3 330 25 to 38 cm. (10 to 15 inches). Grayish brown (10YR 5/2) heavy loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky and weak medium granular structure; hard, friable; many fine grass roots; few chalk fragments 2 mm. to 2 cm. in diameter; strong effervescence; gradual smooth boundary.

B2 331 38 to 71 cm. (15 to 28 inches). Pale brown (10YR 6/3) loam, yellowish brown (10YR 5/4) moist; weak fine granular structure; slightly hard, friable; few fine grass roots; violent effervescence; gradual wavy boundary.

C1ca 332 71 to 104 cm. (28 to 41 inches). Pale brown (10YR 6/3) light clay loam, yellowish brown (10YR 5/4) moist; massive; very hard, friable; few fine roots; porous; few nests of worm casts; lenses of lighter colored coarse loamy sand; common soft spherical carbonate accumulation from 5 to 15 mm. in diameter; violent effervescence; gradual wavy boundary.

C2 333 104 to 130 cm. (41 to 51 inches). Pale brown (10YR 6/3) silt loam, yellowish brown (10YR 5/4) moist; massive; hard, friable; interbedded with strata of gravelly loamy sand; sand particles and pebbles are mostly chalk; coarse strata comprise about 40 percent of horizon; few fine roots; violent effervescence; clear wavy boundary.

IIC3 334 130 to 152 cm. (51 to 60 inches). Bed of fine and medium gravel with 30 percent of interstices filled with loam; most pebbles are chalk.

IICr 152 cm. (60 inches). Weathered chalk, presumed to be Niobrara formation.

Remarks: Horizon between 5 to 25 cm. (2 to 10 inches), 38 to 71 cm. (15 to 28 inches), and 71 to 104 cm. (28 to 41 inches) were also sampled for engineering testing.

SOIL CLASSIFICATION-ENTIC HAPLUSTOLL
FINE-SILTY ,MIXED, MESIC (A)
SERIES - - - - - - - ARMO SILT LOAM TAXADJUNCT

SOIL NO - - - - - - S68KANS-26-3 COUNTY - - - ELLIS

GENERAL METHODS- - - 1A,1B1B,2A1,2B

SAMPLE NOS.- 68L321-68L327

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - FINE SAND								SILT		FAML TEXT	INTR II	FINE CLAY TO CLAY	NON-COS- CLAY	RATIO 8D1 15- BAR TO CLAY
		SAND 2- .05	SILT .05- .002	CLAY LT .002	CLAY LT .0002	VCOS 2- 1	CORS 1- .5	MEDS .5- .25	FNES .25- .10	VFNS .10- .05	COSI .05 .02	FNSI .02 .002	VFSI .005- .002	SAND 2-.1	.2- .02			
CM		PCT LT 2MM														PCT	PCT	CLAY
000-003	A11	8.4	65.3	26.3		0.4	0.3	0.3	1.1	6.4	43.1	22.2		2.0	50.4		26	0.60
003-020	A12	11.2	56.8	32.0		0.8	0.9	0.4	1.5	7.5	37.3	19.5		3.6	46.0		25	0.43
020-030	A3ca	10.7	51.2	38.1		1.3	1.5	0.7	1.7	5.5	27.1	24.1		5.2	33.8		23	0.37
030-064	B21ca	8.0	52.0	40.0		1.3	1.0	0.5	1.3	4.0	21.5	30.5		4.0	26.3		25	0.30
064-097	B22CA	7.1	55.7	37.2		0.6	0.5	0.3	1.1	4.7	26.7	29.0		2.4	32.3		33	0.35
097-130	B3CA	5.5	60.4	34.1		0.1	0.2	0.1	0.6	4.5	31.8	28.6		1.0	36.8		30	0.38
130-160	2C	8.0	62.3	29.7		0.1	0.2	0.2	1.0	6.6	37.5	24.8		1.4	44.9		28	0.42

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3H2 VOL. GT 2	WEIGHT GT 75	75-20	20-5	5-2	LT .074	20-2	BULK DENSITY 4A1D 1/3- BAR	4A1H OVEN DRY	4D1 COLE	WATER CONTENT- 4B1C 1/10 BAR	4B1C 1/3- BAR	4B2 15- BAR	4C1 WRD	CARBONATE 6E1B LT 2	3A1A LT .002	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	PCT LT 75				LT20	G/CC (B)	G/CC		PCT	PCT	PCT	CM/ CM	PCT	PCT		
000-003	0	0	0	0	0	97	0	1.10					15.7		1	0	6.8	
003-020	0	0	0	0	0	95	0	1.28	1.44	0.040		29.8	13.8	0.20	11	7	7.2	
020-030	0	0	0	0	0	94	0	1.40					14.0		29	15	7.3	
030-064	TR	0	0	0	TR	95	TR	1.48	1.60	0.026		23.0	11.8	0.17	39	15	7.4	
064-097	TR	0	0	0	TR	97	TR	1.53	1.71	0.038		21.4	13.1	0.13	19	4	7.4	
097-130	0	0	0	0	0	98	0	1.50					12.8		17	4	7.5	
130-160	0	0	0	0	0	98	0	1.38	1.60	0.052		27.4	12.5	0.21	14	2	7.5	

DEPTH	ORGANIC MATTER 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2A EXT FE	PHOS 6S1A TOTL	EXTRACTABLE BASES 584A- 6N2E CA	6Q2D MG	6P2A NA	6Q2A K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1D KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F SAT NHAC	(BASE SAT) 5C3 EXTB ACTY	5C1 NHAC
CM	PCT (C)	PCT		PCT	PCT	MEQ / 100 G (D)	(D)										PCT	PCT	PCT
000-003	4.91					23.9	1.2	0.1	1.8	27.0				31.0	1.18				
003-020	2.16					21.5	0.6	0.1	1.2	23.4				21.8	0.68				
020-030	1.41					18.6	0.4	0.1	0.8	19.9				17.9	0.47				
030-064	0.59					15.3	0.6	0.1	0.6	16.6				14.6	0.37				
064-097	0.17					15.9	1.9	0.2	0.6	18.6				16.9	0.45				
097-130	0.11					15.1	2.6	0.4	0.6	18.7				16.5	0.48				
130-160	0.07					14.6	2.8	1.0	0.6	19.0				16.3	0.55				

DEPTH	SATURATED PASTE 8E1 REST OHM-	8C1B PH	8A H2O	NA ESP	502 SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	EC MMHOS/	8A1A CA	6N1B MG	6O1B NA	SATURATION EXTRACT 8A1- 6P1A K	6Q1A CO3	6I1A HCO3	6J1A CL	6K1A SO4	6L1A NO3	6M1A	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	CM	MEQ / LITER										PCT	
000-003																				
003-020																				
020-030																				
030-064																				
064-097																				
097-130																				
130-160																				

(A) THIS PEDON DOES NOT FIT THE FAMILY TEXTURE PLACEMENT FOR THE SERIES (10/71) AND IS FINE-SILTY.
(B) BULK DENSITY ESTIMATED FOR HORIZONS FROM 0-3, 20-30, AND 97-130 CM.
(C) ORGANIC CARBON IS 12 KG PER SQ M TO A DEPTH OF 1 METER (METHOD 6A).
(D) METHODS 6N4C FOR CA AND 6O4C FOR MG.

Pedon classification: Entic Haplustoll, fine-silty, mixed, mesic
Series classification: Entic Haplustoll, fine-loamy, mixed, mesic
Soil: Armo silt loam taxadjunct*
Soil Nos.: S68KS-26-3 (Sample Nos. 321-327)
Location: Ellis County, KS; 1,000 feet north and 1,100 feet west of the center of Sec. 4, T11S, R16W.
Climate: Annual precipitation is about 23 inches. Annual temperature is about 54° F., and mean summer temperature is about 78° F. Average frost-free season is about 171 days.
Vegetation and land use: Mid grasses. Rangeland.
Parent material: Loamy sediments derived from limestone and modified by alluvial and eolian material.
Physiography: Sloping erosional upland.
Topography: Slightly concave slope about midway between the ridgetop and drainageway. Slope gradient about 5 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderate.
Described by: C. W. McBee, R. F. Harner.

(Colors are for dry soil unless otherwise stated.)

A11 321 0 to 3 cm. (0 to 1 inch). Very dark brown (10YR 2/2) moist, heavy silt loam; weak fine granular structure; slightly hard, friable; common fine grass roots; slight effervescence; clear smooth boundary.

A12 322 3 to 20 cm. (1 to 8 inches). Very dark brown (10YR 2/2) moist, light silty clay loam; moderate fine granular structure; slightly hard, friable; common fine roots; few fine chalk fragments and fewer quartz grains of fine gravel size; strong effervescence; clear smooth boundary.

A3ca 323 20 to 30 cm. (8 to 12 inches). Very dark grayish brown (10 YR 3/2) moist, light silty clay loam; moderate fine subangular blocky structure; slightly hard, friable; common fine roots; few to common fine chalk fragments up to about 13 mm. in diameter; strong effervescence; clear smooth boundary.

B21ca 324 30 to 64 cm. (12 to 25 inches). Pale brown (10YR 6/3) moist, silty clay loam; moderate medium subangular blocky structure; hard, friable; few fine roots; many small pockets or nests of worm cast granules; few filled root channels about 6 mm. in diameter; common fine soft round accumulations and threads of segregated lime becoming more numerous with depth; common fine chalk fragments becoming more numerous with depth; strong effervescence; gradual smooth boundary.

B22ca 325 64 to 97 cm. (25 to 38 inches). Yellowish brown (10YR 5/4) moist, silty clay loam, with brown (10YR 5/3) moist ped coatings; moderate medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm; few fine roots; common to many fine and medium spheriodal soft lime accumulations making up about 7 percent by volume; few fine chalk fragments; strong effervescence; diffuse smooth boundary.

B3ca 326 97 to 130 cm. (38 to 51 inches). Light yellowish brown (10YR 6/4) moist, silty clay loam, yellowish brown (10YR 5/4) moist ped coatings; moderate medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm; few fine roots; common fine to medium spheriodal soft lime accumulations making up about 5 percent by volume; strong effervescence; gradual smooth boundary.

IIC 327 130 to 160 cm. (51 to 63 inches). Yellowish brown (10YR 5.5/4) moist, heavy silt loam; massive; many fine and very fine pores; few fine roots; few fine chalk fragments; strong effervescence.

Remarks: Horizons between 3 to 20 cm. (1 to 8 inches), 30 to 64 cm. (12 to 25 inches), and 97 to 130 cm. (38 to 51 inches) were also sampled for engineering testing.

* This pedon is a taxadjunct to the Armo series because it lacks the sand content typically present in that series.

SOIL CLASSIFICATION-UDIC HAPLUSTALF
COARSE-LOAMY, MIXED, THERMIC
SERIES - - - - - - -ATTICA FINE SANDY LOAM

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, NTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S76KS-185-1 COUNTY - - - STAFFORD

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 76P0066-76P0073

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO	
		SAND 2- .05	SILT .05- .002	CLAY LT .002	FINE CLAY LT .0002	VCOS SAND 2- 1	CORS SAND 1- .5	MEDS SAND .5- .25	FNES SAND .25- .10	VFNS SAND .10- .05	COSI SILT .05 .02	FNSI SILT .02- .002	VFSI SILT .002- .005	SAND 2- .10	INTR SAND .2- .02	FINE CLAY TO CLAY	NON- CO3 CLAY	8D1 15- BAR TO CLAY
CM		PCT LT 2MM														PCT	PCT	
000-018	AP	85.1	9.4	5.5	4.2	.1	2.4	19.3	50.7	12.6	6.1	3.3		72.5		76		.53
018-026	B21T	77.5	10.3	12.2	8.7	TR	1.9	16.4	46.4	12.8	6.6	3.7		64.7		71		.44
026-043	B22T	78.5	7.9	13.6	11.1	.1	1.4	12.5	49.4	15.1	4.4	3.5		63.4		82		.45
043-066	B3	85.5	5.6	8.9		TR	3.4	22.9	50.1	9.1	2.9	2.7		76.4				.48
066-104	C1	84.8	6.3	8.9	7.1	.1	2.2	15.8	52.6	14.1	3.1	3.2		70.7		80		.47
104-107	C2 (B)	82.1	7.9	10.0		.2	3.0	16.2	48.4	14.3	4.5	3.4		67.8				.43
107-173	C3	87.5	4.9	7.6		.1	3.0	23.5	50.0	10.9	2.2	2.7		76.6				.46
173-200	C4	68.2	14.1	17.7		.1	2.3	11.9	37.7	16.2	8.1	6.0		52.0				.44

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2 VOL. WEIGHT					BULK DENSITY				WATER CONTENT				CARBONATE		PH	
	GT 2	GT 75	75-20	20-5	5-2	LT .074	20-2 PCT	4A1D 1/3- BAR	4A1H OVEN DRY	4D1 COLE	4B1C 1/10 BAR	4B1C 1/3- BAR	4B2 15 BAR	4C1 WRD CM/	6E1B LT 2	3A1A LT .002	8C1A 1/1	8C1E 1/2
CM	PCT	PCT	PCT LT 75			LT20	G/CC	G/CC			PCT	PCT	PCT	CM	PCT	PCT	H2O	CACL
000-018	0	0	0	0	0	0	1.54	1.55	.002	10.4	7.6	2.9	.07				6.0	5.0
018-026	0	0	0	0	0	0	1.54	1.66	.025	16.7	13.1	5.4	.12				5.9	5.8
026-043	0	0	0	0	0	0	1.57	1.67	.020	15.7	12.0	6.1	.09				6.1	5.6
043-066	0	0	0	0	0	0	1.52	1.60	.017	12.6	9.6	4.3	.08				6.6	6.0
066-104	TR	0	0	0	TR	TR	1.53	1.61	.018	11.6	9.1	4.2	.08				6.9	6.3
104-107	0	0	0	0	0	0						4.3					7.0	6.4
107-173	TR	0	0	0	TR	TR	1.59	1.64	.011	11.5	9.5	3.5	.10				7.1	6.4
173-200	0	0	0	0	0	0	1.56	1.68	.025	20.3	17.7	7.8	.15				7.2	6.6

DEPTH	ORGANIC MATTER 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2B EXT FE	PHOS TOTL	EXTRACTABLE BASES 5B4A 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6M1A BACL TEA	AL 6G1E KCL EXT	CAT EXCH 5A3A EXTB NHAC ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 $AT NHAC	BASE SAT 5C3 EXTB ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	MEQ / 100 G											PCT	PCT	PCT
000-018	.38	.039	10	.3		2.5	.8	.1	.5	3.9	2.0		5.9	5.1	.93	3.1	49	66	77
018-026	.34	.048	7	.4		5.1	1.5	TR	.5	7.1	2.5		9.6	9.0	.74	3.4	57	74	79
026-043	.36	.040	9	.4		6.6	1.9	TR	.5	9.0	2.4		11.4	10.9	.80	3.5	61	79	83
043-066	.17			.3		4.8	1.4	TR	.2	6.4	1.4		7.8	7.4	.83	3.4	65	82	87
066-104	.12			.4		4.9	1.6	TR	.2	6.7	1.3		8.0	7.6	.85	3.1	65	84	88
104-107	.14			.3		5.3	1.8	TR	.2	7.3	1.1		8.4	7.9	.79	2.9	67	87	92
107-173	.13			.3		4.1	1.4	TR	.2	5.7	.7		6.4	6.1	.80	2.9	67	89	93
173-200	.24			.5		9.3	3.1	.1	.4	12.9	1.5		14.4	13.7	.77	3.0	68	90	94

DEPTH	SATURATED PASTE 8E1 REST OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	SATURATION EXTRACT 8A1 8A1A EC	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/ CM	MEQ / LITER									PCT	
000-018																		NP	NP
018-026																			
026-043	6700	6.0	28.4					.13										21	4 A
043-066	8900	6.4	23.8					.12											
066-104																			
104-107																			
107-173																			
173-200																			

CLAY MINERALOGY (7A2C).
000-018 MI3 MT2 KK2
026-043 MT2 MI2 KK2
066-104 MT3 MI2 KK2
RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MT = MONTMORILLONITE MI = MICA KK = KAOLINITE.

SAND MINERALOGY (7B1) PLACEMENT:MIXED
000-018 FNES - RE81 QZ76 FE4 GN1 FD18 MS1 ZR SP AC HN VFNS - RE62 QZ52 FE4 ZR3 TM1 SP1 FD32 HN3 GN1 MS1 CB1 CL1
026-043 FNES - RE62 QZ59 FE2 SP1 FD35 HN1 MS1 CB1 VFNS - RE58 QZ55 FE2 SP1 FD39 GN1 MS1 HN1 ZR EP
066-104 FNES - RE67 QZ66 FE1 FD31 MS1 HN1 VFNS - RE69 QZ66 FE3 FD27 HN3 MS1 TM ZR SP CL
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: CL = CHLORITE EP = EPIDOTE FD = FELDSPARS HN = HORNBLENDE MS = MUSCOVITE QZ = QUARTZ
TM = TOURMALINE ZR = ZIRCON CB = CARBONATE AGGREGATES SP = SPHENE GN = GARNET AC = ACTINOLITE
FE = IRON OXIDES RE = RESISTANT MINERAL.

(A) BY SOIL MECHANICS LABORATORY, USDA-SCS, LINCOLN, NE.
(B) SIMILAR TO THIN STRATA OF C3.

Pedon classification: Udic Haplustalf, coarse-loamy, mixed, thermic
Series Classification: (Same)
Soil: Attica fine sandy loam
Soil Nos.: S76KS-185-1 (NSSL Nos. 76P0066-76P0073)
Location: Stafford County, KS; 2,490 feet east and 300 feet south of the northwest corner of Sec. 2, T24S, R15W.
Climate: Annual precipitation is about 25 inches. Annual temperature is about 56.4° F., and summer temperature is about 79.8° F. Average frost-free season is about 185 days.
Vegetation and land Use: Wheat stubble. Cropland.
Parent material: Moderately coarse textured eolian sediments.
Physiography: Gently undulating upland.
Topography: Convex slope. Slope gradient about 1½ percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately rapid.
Described by: R. L. Haberman, C. S. Holzhey, M. J. Mausbach, D. A. Dodge.

(Colors are for dry soil unless otherwise stated.)

Ap 76P0066 0 to 18 cm. (0 to 7 inches). Grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; common fine roots; medium acid; abrupt smooth boundary.

B21t 76P0067 18 to 26 cm. (7 to 10 inches). Brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak medium and coarse blocky structure; slightly hard, firm; common fine roots; slightly acid; clear smooth boundary.

B22t 76P0068 26 to 43 cm. (10 to 17 inches). Brown (10YR 5/3) heavy fine sandy loam, dark brown (10YR 3/3) moist; brown (10YR 4/3) rubbed; weak medium subangular blocky structure; slightly hard, friable; clay bridges between sand grains; common fine roots; slightly acid; gradual smooth boundary.

B3 76P0069 43 to 66 cm. (17 to 26 inches). Brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable; common fine roots; slightly acid; gradual smooth boundary.

C1 76P0070 66 to 104 cm. (26 to 41 inches). Light yellowish brown (10YR 6/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable; few fine roots; neutral; abrupt smooth boundary.

C2 76P0071 104 to 107 cm. (41 to 42 inches). Light yellowish brown (10YR 6/4) loamy fine sand, dark yellowish brown (10YR 4/4) moist; single grained; loose; few fine roots; neutral; abrupt smooth boundary.

C3 76P0072 107 to 173 cm. (42 to 68 inches). Brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; massive; slightly hard, friable; three strata 3 cm. (1 inch) wide, spaced about 30 cm. (12 inches) apart of loamy fine sand; few fine roots; neutral; gradual smooth boundary.

C4 76P0073 173 to 200 cm. (68 to 79 inches). Brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to weak medium subangular blocky structure; slightly hard, friable; neutral.

Remarks: Krotovina common in sample area, however not sampled.

SOIL CLASSIFICATION-TYPIC ARGIUDOLL
FINE-LOAMY, SILICEOUS, THERMIC
SERIES - - - - - - -BATES LOAM

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S73KS-19-1 COUNTY - - - CRAWFORD

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 73L1139-73L1144

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - - - - - - - - -															RATIO
		SAND 2- .05	SILT .05- .002	CLAY LT .002	FINE SAND - - - - - - - FINE CLAY LT .0002	VCOS 2- 1	CORS 1- .5	MEDS .5- .25	FNES .25- .10	VFNS .10- .05	COSI .05 .02	FNSI .02 .002	VFSI .005- .002	SILT- - - - SAND 2- .10	INTR II .2- .02	FINE CLAY TO CLAY	NON CO3 CLAY	8D1 15- BAR TO CLAY
CM		PCT LT 2MM													PCT	PCT	
000-23	A1	43.9	37.3	18.8	11.0	.5	.7	.7	25.3	16.7	17.8	19.5		27.2	55.3	59		.48
023-39	B1	41.4	34.9	23.7	15.0	.6	.7	.7	23.6	15.8	15.8	19.1		25.6	51.0	63		.41
039-56	B2T	38.4	31.3	30.3	21.7	1.2	1.1	.8	20.7	14.6	13.6	17.7		23.8	44.4	72		.40
056-84	B3	39.3	24.9	35.8	25.4	1.4	1.2	1.0	21.7	14.0	11.1	13.8		25.3	41.4	71		.38
084-107	Cr1	72.1	16.1	11.8	6.4	6.7	5.7	5.3	40.0	14.4	6.6	9.5		37.7	47.2	54		.63
107-132	Cr2	70.7	14.6	14.7	8.5	1.2	4.9	8.4	41.0	15.2	6.4	8.2		55.5	47.1	58		.49

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. (- - - - - - - WEIGHT - - - - - - -) GT 2	GT 75	75-20	20-5	5-2	LT .074	20-2	(BULK DENSITY 4A1D 1/3- BAR	4A1H OVEN DRY	4B1 COLE	4B1C 1/10 BAR	4B1C 1/3- BAR	4B2 15 BAR	4C1 WRD CM/ CM	(- - - WATER CONTENT- - - -) 6E1B LT 2	CARBONATE 3A1A LT .002	(- -PH - -) 8C1A 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	(- - - PCT LT 75 - - -)			PCT	LT2O	G/CC	G/CC		PCT	PCT	PCT		PCT	PCT		
000-23	0	0	0	0	0	63	0	1.43	1.51	.018	24.5	21.1	9.1	.17	4.1B		6.0	5.7
023-39	TR	0	0	TR	TR	65	TR	1.47	1.56	.021	22.8	20.3	9.6	.16	4.4B		5.5	4.8
039-56	TR	0	0	TR	TR	67	TR	1.40	1.54	.033	23.7	21.7	12.1	.14	3.3B		5.5	4.7
056-84	TR	0	0	TR	TR	66	TR	1.38	1.54	.036	24.5	22.7	13.6	.13	2.8B		5.4	4.6
084-107	0	0	0	0	0	33	0	1.70A					7.4				5.6	4.7
107-132	0	0	0	0	0	36	0	1.81	1.88	.014	16.1	12.8	7.2	.10	2.8B		5.8	4.9

DEPTH	(ORGANIC MATTER 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2B EXT FE	PHOS TOTL	(- -EXTRACTABLE BASES 5B4A- -) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC	(BASE SAT) 5C3 EXTB ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	(- - - - - - - - - - -MEQ / 100 G- - - - - - - - - -)									CLAY	MG	PCT	PCT	PCT
000-23	1.52C	.129	12	1.0		10.0	2.1	.1	.4	12.6	6.7		19.3	14.4	.77	4.8	69	65	88
023-39	1.37	.110	12	1.5		6.3	3.0	.2	.3	9.8	9.2	.2	19.0	15.7	.66	2.1	40	52	62
039-56	1.11	.093	12	2.2		6.3	4.4	.2	.3	11.2	10.5	.7	21.7	17.7	.58	1.4	36	52	63
056-84	.45			2.8		6.1	5.3	.1	.3	11.8	11.1	1.1	22.9	18.3	.51	1.2	33	52	64
084-107	.12			3.3		3.0	2.7	.1	.2	6.0	6.7		12.7	9.1	.77	1.1	33	47	66
107-132	.11			1.4		4.6	4.1	.2	.2	9.1	4.1		13.2	11.1	.76	1.1	41	69	82

DEPTH	(SATURATED PASTE) 8E1 REST OHM- CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP PCT	(- - - - - - - - - SATURATION EXTRACT 8A1- - - - - - - - -) 8A1A EC MMHOS/ CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
									(- - - - - - - - - - MEQ / LITER - - - - - - - - - -)									PCT	
000-23																			
023-39																			
039-56																			
056-84	8000	5.3	45.0	1		20		.10	.3	.3	.2	TR							
084-107																			
107-132																			

CLAY MINERALOGY (7A2C).
039-56 MM2 MI2 MT1 KK2 CL1.
084-107 MI1.
COMMENTS - CLAYS POORLY ORDERED. BY INFERENCE THE CLAYS CONTAIN A LARGE AMORPHOUS COMPONENT, ESPECIALLY IN THE C2.
RELATIVE AMOUNTS - (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE - MT = MONTMORILLONITE MI = MICA KK = KAOLINITE CL = CHLORITE M = MONTMORILLONITE-MICA.
SAND MINERALOGY (7B1). PLACEMENT - SILICEOUS.
039-56 VFNS - NN96 QZ94 FK4 OP1 AG1 MS TM ZR PO. FNES - NN98+(EST) QZ FK OP.
084-107 VFNS - NN90+(EST) QZ FK OP AG MS. FNES - NN98+(EST) QZ FK OP.
COMMENTS - SANDS COMMONLY CONTAINS CLAY COATINGS, ESPECIALLY IN THE C2. FELDSPARS APPEAR WEATHERED.
RELATIVE AMOUNTS - AS PERCENT.
MINERAL CODE - NN = NON-WEATHERABLE AR = AGGREGATES MS = MUSCOVITE OP = OPAQUE PO = PLANT OPAL QZ = QUARTZ
TM = TOURMALINE ZR = ZIRCON FK = POTASSIUM FELDSPAR.

(A) ESTIMATED.
(B) MICRO-PENETRATION RESISTANCE. A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10 BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.
(C) ORGANIC CARBON IS 13 KG/M SQ TO A DEPTH OF 1 M (6A).

Pedon classification: Typic Argiudoll, fine-loamy, siliceous, thermic
Series classification: (Same)
Soil: Bates loam
Soil Nos.: S73KS-19-1 (Sample Nos. 1139-1144)
Location: Crawford County, KS; 3,300 feet west and 1,600 feet south of the northeast corner of Sec. 1, T28S, R23E.
Climate: Annual precipitation is about 41 inches. Annual temperature is about 58° F., and summer temperature is about 79° F. Average frost-free season is about 195 days.
Vegetation and land use: Mid and tall grasses. Native range.
Parent material: Residuum weathered from sandstone
Physiography: Gently sloping erosional upland.
Topography: Slope gradient about 1 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderate.
Described by: E. L. Fleming, J. R. Fortner, R. L. Haberman.

(Colors are for moist soil unless otherwise stated.)

A1 1139 0 to 23 cm. (0 to 9 inches). Very dark brown (10YR 2/2) loam; weak fine and medium granular structure; slightly hard, very friable; many fine roots; medium acid; gradual smooth boundary.

B1 1140 23 to 39 cm. (9 to 15 inches). Very dark grayish brown (10YR 3/2) heavy loam, few fine faint yellowish brown (10YR 5/6) mottles; moderate medium granular structure; slightly hard, friable; common fine roots; medium acid; gradual smooth boundary.

B2t 1141 39 to 56 cm. (15 to 22 inches). Very dark grayish brown (10YR 3/2) light clay loam, dark yellowish brown (10YR 3/4) rubbed; common medium faint yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; hard, firm; common fine roots; thin discontinuous clay films on many ped faces; strongly acid; gradual smooth boundary.

B3 1142 56 to 84 cm. (22 to 33 inches). Dark brown (7.5YR 4/4) light clay loam, common distinct strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; slightly hard, friable; few fine roots; thin discontinuous clay films on some ped faces; common black coatings on faces of peds and soft black masses; strongly acid; diffuse irregular boundary.

Cr1 1143 84 to 107 cm. (33 to 42 inches). Soft fine grained sandstone containing thin beds of silty shale.

Cr2 1144 107 to 132 cm. (42 to 52 inches). Interbedded sandy and silty shales.

SOIL CLASSIFICATION-UDORTHENTIC PELLUSTERT
VERY-FINE, MONTMORILLONITIC, MESIC
SERIES - - - - - - - BOGUE SILTY CLAY

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S68KANS-26-1 COUNTY - - - ELLIS

GENERAL METHODS- - - 1A, 1B1B, 2A1, 2B SAMPLE NOS.- 68L336-68L343

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B													RATIO			
					FINE	SAND					SILT			FAML	INTR	FINE	NON-	8D1
		SAND 2- .05	SILT .05- .002	CLAY LT .002	CLAY LT .0002	VCOS 2- 1	CORS 1- .5	MEDS .5- .25	FNES .25- .10	VFNS .10- .05	COSI .05 .02	FNSI .02 .002	VFSI .002	TEXT SAND 2-.1	.2- .02	CLAY TO CLAY	CO3- CLAY	15- BAR TO CLAY
CM		PCT LT 2MM														PCT	PCT	
000-3	A11	2.7	38.3	59.0	21.5	0.2	0.3	0.3	0.8	1.1	10.1	28.2		1.6	11.7	36	59	0.30
003-15	A12	2.0	32.6	65.4	28.1	0.2	0.3	0.2	0.5	0.8	6.2	26.4		1.2	7.2	43	65	0.30
015-25	B1	1.8	32.1	66.1	25.2	0.1	0.3	0.3	0.6	0.6	4.9	27.2		1.2	5.8	38	66	0.30
025-43	B2	1.9	32.3	65.8	24.8	0.1	0.3	0.3	0.6	0.6	4.3	28.0		1.3	5.2	38	66	0.31
043-58	C1	1.9	32.4	65.7	23.3	0.1	0.4	0.3	0.6	0.6	3.9	28.5		1.3	4.8	35	66	0.31
058-81	C2	1.6	30.1	68.3	20.8	0.0	0.1	0.2	0.5	0.9	2.8	27.3		0.7	4.0	30	68	0.32
081-109	C3	1.0	31.1	67.9		0.0	0.1	0.2	0.3	0.5	2.7	28.4		0.5	3.4		68	0.33
109-145	C4	3.2	29.1	67.7	20.0	0.1	0.1	0.1	0.6	2.2	3.2	25.9		1.0	6.0	30	68	0.34

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2 VOL.		WEIGHT			BULK DENSITY			WATER CONTENT					CARBONATE		PH	
	GT 2	GT 75	75-20	20-5	5-2	LT .074	20-2	1/3- OVEN DRY	COLE	1/10 BAR	1/3- BAR	15- BAR	WRD	100- BAR	LT	LT .002	1/1 H20	1/2 CACL
CM	PCT	PCT	PCT LT 75				LT20	G/CC		PCT	PCT	PCT	CM/CM	PCT	PCT	PCT		
							(A)											
000-3	0	0	0	0	0	98	0	1.10				17.5			TR		7.0	
003-15	0	0	0	0	0	99	0	1.26	1.75	0.12		34.2	19.6	0.18	14.6	TR		7.2	
015-25	0	0	0	0	0	99	0	1.31	1.80	0.12		32.9	19.9	0.17		TR		7.4	
025-43	0	0	0	0	0	99	0	1.34	1.85	0.12		31.4	20.7	0.14	14.6	1	0	7.4	
043-58	0	0	0	0	0	99	0	1.37	1.79	0.093		31.1	20.3	0.15		0	0	5.5	
058-81	0	0	0	0	0	99	0	1.37	1.74	0.083		30.5	21.7	0.12	15.6	0	0	3.9	
081-109	0	0	0	0	0	99	0						22.1			0	0	3.7	
109-145	0	0	0	0	0	98	0						22.8			0	0	3.7	

DEPTH	ORGANIC MATTER 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2A EXT FE	PHOS 6S1A TOTL	EXTRACTABLE BASES 584A- 6N2E CA	6Q2D MG	6P2A NA	6Q2A K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1D KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 6D1 TO	RATIO 8D3 TO	CA 5F NHAC	(BASE SAT) 5C3 EXTB	SAT NHAC 5C1
CM	PCT	PCT		PCT	PCT	MEQ / 100 G									CLAY	MG	PCT	PCT	PCT
	(B)					(C)					(C)								
000-3	2.03	0.182	11	1.6		24.7	5.2	0.2	1.7	31.8				34.5	0.58				
003-15	0.95	0.118	8	1.7		28.1	4.7	0.3	1.3	34.4				35.8	0.55				
015-25	0.76	0.103	7	1.8		29.2	4.5	0.5	1.1	35.3				36.1	0.55				
025-43	0.62	0.091	7	1.8		28.7	4.2	0.7	1.0	34.6				35.1	0.53				
043-58	0.68	0.087	8	1.6		23.9	3.9	0.8	1.0	29.6	7.5		37.1	33.8	0.51				
058-81	0.52			2.5		22.9	5.6	0.7	1.0	30.2	14.8	2.0	45.0	34.7	0.51	4.1	66	67	87
081-109	0.49			1.3		22.9	7.1	0.4	1.0	31.4	14.1	2.9	45.5	33.0	0.49	3.2	69	69	95
109-145	0.42			3.9		25.1	9.7	0.3	1.0	36.1	14.6	2.6	50.7	34.9	0.52	2.6	72	71	103

DEPTH	SATURATED PASTE 8E1 REST OHM-	8C1B PH	8A H20	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	SATURATION EXTRACT 8A1- 8A1A EC	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/ CM	MEQ / LITER									PCT	
																	(D)		
000-3																			
003-15																		65	34
015-25																			
025-43	1200	7.3	70.4			270		0.61										68	38
043-58																			
058-81							TR											61	28
081-109	580	3.7	70.0	TR		1400		2.87			2.0								
109-145							TR												

(A) BULK DENSITY ESTIMATED FOR HORIZON FROM 0-3 CM
(B) ORGANIC CARBON IS 8 KG PER SQ M TO A DEPTH OF 81 CM (METHOD 6A)
(C) METHODS 6N4C FOR CA AND 6O4C FOR MG APPLY TO HORIZONS FROM 0 TO 58 CM
(D) PH 7 NH4OAC EXTRACTABLE SO4 (ME/100G)= 68L339=0.0= 68L341=3.8= 68L343=11.8

Pedon classification: Udorthentic Pellustert, very fine, montmorillonitic, mesic
Series classification: (Same)
Soil: Bogue silty clay
Soil Nos.: S68KS-26-1 (Sample Nos. 336-343)
Location: Ellis County, KS; 1,550 feet east and 450 feet south of the northwest corner of Sec. 17, T12S, R16W.
Climate: Annual precipitation is about 23 inches. Annual temperature is about 54° F., and mean summer temperature is about 78° F. Average frost-free season is about 171 days.
Vegetation and land use: Mid grasses. Rangeland.
Parent material: Acid fissle shale.
Physiography: Rolling erosional upland.
Topography: Slightly concave slope about 25 feet lower than crest of the knob. Slope gradient of about 6 percent.
Drainage: Moderately well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Very slow.
Described by: J. M. Allen, R. F. Harner.

(Colors are for dry soil unless otherwise stated.)

A11 336 0 to 2 cm. (0 to 3/4 inch). Gray (5Y 5/1) silty clay, dark gray (5Y 4/1) moist; strong fine granular structure; hard, firm; common fine grass roots; neutral; abrupt smooth boundary.

A12 337 2 to 15 cm. (3/4 to 6 inches). Gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; weak very thick platy parting to weak medium subangular blocky structure; very hard, very firm; many fine grass roots; few fragments of calcite; moderately alkaline; gradual smooth boundary.

B1 338 15 to 25 cm. (6 to 10 inches). Gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; few fine distinct mottles of very dark gray (5Y 3/1) moist, on vertical faces of peds; weak coarse blocky structure; extremely hard, extremely firm; common fine grass roots; few fine fragments of calcite or chalk; mildly alkaline; gradual wavy boundary.

B2 339 25 to 43 cm. (10 to 17 inches). Gray (5Y 5/1) clay, dark gray (5Y 4/1) and very dark gray (2.5Y 3/1) moist, in equal parts in fine indefinite pattern; few fine distinct mottles of dark yellowish brown (10YR 4/4) moist; weak coarse blocky structure; extremely hard, extremely firm; common fine grass roots; few slickenside faces intersect and incline at 20 to 30 degrees from horizontal; moderately alkaline; gradual wavy boundary.

C1 340 43 to 58 cm. (17 to 23 inches). Gray (5Y 5/1) clay, dark gray (5Y 4/1) and black (5Y 2/1) moist, in equal parts in medium indefinite pattern; moderate thin platy structure; extremely hard, extremely firm; few fine roots; common small shale fragments of yellowish brown (10YR 5/6) moist and few horizontal and oblique strata 5 to 10 mm. thick of yellowish brown (10YR 5/4) moist; very strongly acid; gradual smooth boundary.

C2 341 58 to 81 cm. (23 to 32 inches). Dark gray (5Y 4/1) weathered clay shale with common horizontal strata 1 to 2 cm. thick of yellowish brown (10YR 5/6) and black (5Y 2/1) moist; moderate medium platy structure; extremely hard, extremely firm; very few fine roots; gradual smooth boundary.

C3 342 81 to 109 cm. (32 to 43 inches). Clay shale with same colors as horizon above; no roots observed; few oblique fractures or joints.

C4 343 109 to 145 cm. (43 to 57 inches). Clay shale like horizon above except yellowish brown (10YR 5/7) strata are more dominant comprising 60 to 70 percent of horizon; zone contained horizontal cavity approximately 4 cm. high and 38 cm. long partially filled with pale yellow (5Y 7/4) moist crystals presumed to be gypsum.

Remarks: Horizons between 2 to 15 cm. (3/4 to 6 inches), 25 to 43 cm. (10 to 17 inches), and 58 to 81 cm. (23 to 32 inches) were also sampled for engineering testing.

SOIL CLASSIFICATION-UDORTHENTIC PELLUSTERT
VERY-FINE, MONTMORILLONITIC, MESIC
SERIES - - - - - - - BOGUE SILTY CLAY

SOIL NO - - - - - - S68KANS-26-4 COUNTY - - - ELLIS

GENERAL METHODS- - - 1A, 1B1B, 2A1, 2B SAMPLE NOS.- 68L345-68L349

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B																RATIO
					FINE	SAND					SILT			FAML	INTR	FINE	NON-	8D1
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	II	CLAY	CO3-	15-
		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005-	SAND	.2-	TO	CLAY	BAR
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-.1	.02	CLAY		TO
CM		PCT LT 2MM															PCT	PCT	CLAY
002-10	A12																		
010-25	B1																		
025-43	B2																		
043-61	C1																		
061-81	C2																		

DEPTH	VOL.	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2 WEIGHT					BULK DENSITY			WATER CONTENT				CARBONATE		PH	
	GT	GT					4A1D	4A1H	4D1	4B1C	4B1C	4B2	4C1	6E1B	3A1A	8C1A	8C1E
	2	75				.074	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD	LT	LT	1/1	1/2
							BAR	DRY		BAR	BAR	BAR	CM/	2	.002	H2O	CACL
CM	PCT	PCT	75-20	20-5	5-2	LT	20-2	G/CC	G/CC		PCT	PCT	PCT	CM	PCT	PCT		
002-10								1.26	1.71	0.110		32.8					
010-25								1.33	1.82	0.110		32.1					
025-43								1.36	1.77	0.092		31.1					
043-61								1.38	1.81	0.095		30.1					
061-81								1.39	1.81	0.092		30.2					

Pedon Classification: Udorthentic Pellustert, very fine, montmorillonitic, mesic
Series Classification: (Same)
Soil: Bogue silty clay
Soil Nos.: S68KS-26-4 (Sample Nos. 345-349)
Location: Ellis County, KS; 2,000 feet west and 500 feet south of the northeast corner of Sec. 22, T11S, R17W.
Climate: Annual precipitation is about 23 inches. Annual temperature is about 54° F., and mean summer temperature is about 78° F. Average frost-free season is about 171 days.
Vegetation and land use: Mid grasses. Rangeland.
Parent material: Acid fissle shale.
Physiography: Rolling erosional upland.
Topography: Slightly concave slope of a drainageway. Slope gradient of about 15 percent.
Drainage: Moderately well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Very slow.
Described by: R. F. Harner, J. M. Allen.

(Colors are for dry soil unless otherwise stated.)

A11 0 to 2 cm. (0 to 3/4 inch). Gray (5Y 5/1) silty clay, dark gray (5Y 4/1) moist; strong fine granular structure; hard, firm; abundant fine grass roots; abrupt smooth boundary.

A12 345 2 to 10 cm. (3/4 to 4 inches). Gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; weak thick platy parting to weak medium subangular blocky structure; very hard, very firm; many fine grass roots; few fragments of chalk 2 to 10 mm. in diameter; gradual smooth boundary.

B1 346 10 to 25 cm. (4 to 10 inches). Gray (5Y 5/1) clay, dark gray (5Y 4/1) and very dark gray (2.5Y 3/1) moist; weak coarse blocky structure; extremely hard, extremely firm; common fine grass roots; few fragments of chalk 2 to 10 mm. in diameter; gradual smooth boundary.

B2 347 25 to 43 cm. (10 to 17 inches). Gray (5Y 5/1) clay, dark gray (5Y 4/1) and very dark gray (2.5Y 3/1) moist; weak coarse blocky structure; common fine roots; common slickenside faces intersect and incline at 20 to 30 degrees from horizontal; few seams of dark yellowish brown (10YR 4/4) moist; few chalk fragments as in horizon above but fewer in number; gradual wavy boundary.

C1 348 43 to 61 cm. (17 to 24 inches). Gray (5Y 5/1 and 2.5Y 5/1) clay, dark gray (5Y 4/1) and very dark gray (2.5Y 3/1) moist; moderate thin platy structure; very hard, very firm; common fine roots; very few small fragments of chalk; gradual smooth boundary.

C2 349 61 to 81 cm. (24 to 32 inches). Gray (2.5Y 5/1) and grayish brown (2.5Y 5/2) weathered clay shale, dark grayish brown (2.5Y 4/2) and very dark gray (2.5Y 3/1) moist; common strata of yellowish brown (10YR 5/6) moist; gradual smooth boundary.

C3 81 to 122 cm. (32 to 48 inches). Clay shale with same colors as above horizon but having thicker and more common strata of colors with the higher chroma; thick platy structure; seams of gypsum commonly associated with strata having high chroma colors.

Remarks: Horizons between 2 to 10 cm. (3/4 to 4 inches), 25 to 43 cm. (10 to 17 inches), and 61 to 81 cm. (24 to 32 inches) were also sampled for engineering testing.

SOIL CLASSIFICATION: Typic Haplustoll; fine-silty, mixed, mesic

SOIL Bridgeport very fine sandy loam taxadjunct LOCATION Osborne County, Kansas

SOIL NOS. S53Kans-71-7 LAB. NOS. 1461-1467

SOIL SURVEY LABORATORY Mandan, North Dakota

GENERAL METHODS 1A, 1B1a, 2A1, 2B

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	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	0.02-0.002	0.2-0.02	> 2	
1461	0-6	Ap	-	0.1	0.2	3.2	24.1	57.7	14.7	11.9	72.3	-	sil
1462	6-14	A12	-	-	0.1	2.4	22.6	53.9	21.0	9.7	68.8	-	sil
1463	14-20	B2	-	0.1	0.2	3.2	17.9	61.2	17.4	13.3	68.6	-	sil
1464	20-24	C1	-	-	0.1	1.8	17.4	63.3	17.4	13.8	68.3	-	sil
1465	24-37	C2	-	-	0.1	2.7	19.8	59.1	18.3	15.3	66.0	-	sil
1466	37-45	C3	-	-	0.1	2.5	23.3	59.2	14.9	14.5	70.1	-	sil
1467	45-59	C4	-	-	0.1	1.9	12.5	72.7	12.8	19.2	67.3	-	sil

LABORATORY NUMBER	pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 3 MILLIMHOS PER CM @ 25°C	6E1a CaCO3 equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS		
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					1/10 ATMOS.	(per cent) 1/3 ATMOS.	4B2 15 ATMOS.
1461	6.5	6.6	6.7	0.74	0.072	10							7.0
1462	6.7	6.8	6.8	0.83	0.072	12			-				8.4
1463	7.0	6.9	7.0	0.59	0.060	10			-				8.3
1464	7.7	8.1	8.4	0.46	0.051	9			4				8.6
1465	7.7	8.2	8.5	0.33	0.043	8			7				9.2
1466	7.8	8.2	8.4	0.21	0.029	7			5				7.6
1467	7.8	8.3	8.5	0.12	0.024				5				7.0

LABORATORY NUMBER	5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS 5B1a					5D2 Base Sat. % on NH_4OAc	SATURATION EXTRACT SOLUBLE					PER CENT MOISTURE AT SATURATION	8D3
		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum		K	CO_3	HCO_3	Cl	SO_4		Ca/Mg
	milliequivalents per 100g soil							milliequivalents per liter						
1461	13.9	11.1	2.0	0.1	0.7	13.9	100							5.6
1462	16.7	14.8	1.8	0.1	0.4	17.1	102							8.2
1463	16.8	15.3	2.2	0.1	0.3	17.9	107							7.0
1464	14.6		1.9	0.1	0.3									
1465	14.0		2.3	0.1	0.4									
1466	12.8		2.2	0.1	0.5									
1467	12.2		2.9	0.1	0.7									

AGR-SCS BELTSVILLE MD 2692 JUNE 1953

Pedon classification: Typic Haplustoll, fine-silty, mixed, mesic
Series classification: Fluventic Haplustoll, fine-silty, mixed, mesic
Soil: Bridgeport very fine sandy loam taxadjunct*
Soil Nos.: S53KS-71-7 (Sample Nos. 1461-1467)
Location: Osborne County, KS; 200 feet west and 60 feet south of the northeast corner of Sec. 27, T7S, R12W.
Climate: Annual precipitation is about 23½ inches. Annual temperature is about 54° F., and summer temperature is about 79° F. Average frost-free season is about 171 days.
Vegetation and land use: Fallow. Cropland.
Parent material: Loess overlying alluvium.
Physiography: Nearly level terrace.
Topography: Slope gradient less than 1 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderate.
Described by: W. M. Johnson.

(Colors are for dry soil unless otherwise stated.)

Ap 1461 0 to 15 cm. (0 to 6 inches). Dark grayish brown (10YR 4/2) very fine sandy loam, very dark brown (10YR 2/2) moist; about 1/3 of the sand grains are clean, the rest are stained with brown (10YR 5/3); moderate medium and fine granular structure; soft, friable.

A12 1462 15 to 36 cm. (6 to 14 inches). Dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; sand grains are stained with brown (10YR 5/3); weak medium subangular blocky structure parting to weak fine and very fine granular structure; slightly hard, friable.

B2 1463 36 to 51 cm. (14 to 20 inches). Brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; few fine faint brown (10YR 5/3) mottles; sand grains are stained with brown (10YR 5/3); weak coarse prismatic structure parting to weak medium subangular blocky structure; slightly hard, friable.

C1 1464 51 to 61 cm. (20 to 24 inches). Grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; sand grains are stained with brown (10YR 5/3); weak fine subangular blocky structure; slightly hard, friable; few very fine spots and threads of lime; strong effervescence.

C2 1465 61 to 94 cm. (24 to 37 inches). Light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable; common fine white spots and threads of lime; strong effervescence.

C3 1466 94 to 114 cm. (37 to 45 inches). Light brownish gray (10YR 6/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, friable; common spots of lime; strong effervescence.

C4 1467 114 to 150 cm. (45 to 59 inches). Light brownish gray (10YR 6/2) very fine sandy loam, grayish brown (10YR 5/2) moist; massive; soft, friable; few very fine spots of lime; strong effervescence.

Remarks: These soils were included in the McCook delineations in Osborne County, KS.

*In addition, the pedon is more acid in the upper 20 inches and leached to a greater depth than recognized in the Bridgeport series.

SOIL CLASSIFICATION=TYPIC CALCIUSTOLL
FINE-LOAMY, MIXED, THERMIC
SERIES - - - - - - -CLARK LOAM

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S76KS-155-2 COUNTY - - - RENO

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 76P0074-76P0080

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - PCT LT 2MM: SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	SAND VCOS 2-1	SAND CORS 1-.5	SAND MEDS .5-.25	SAND FNES .25-.10	SAND VFNS .10-.05	SILT COSI .05-.02	SILT FNSI .02-.002	SILT VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY	NON-CO3- CLAY	RATIO 8D1 15-BAR TO CLAY
000-028	AP	48.1	30.6	21.3		.3	3.7	13.6	19.8	10.7	20.8	9.8		37.4				.45
028-040	B2	42.6	30.9	26.5		.9	2.9	9.9	19.7	9.2	16.4	14.5		33.4				.45
040-071	CCA1	36.7	42.8	20.5		2.0	3.5	7.2	16.5	7.5	10.1	32.7		29.2				.45
071-114	CCA2(A)	53.4	29.7	16.9		3.6	4.6	9.1	27.4	8.7	6.9	22.8		44.7				.49
071-114	CCA2(B)	46.4	43.9	9.7		3.5	4.8	7.8	21.3	9.0	6.6	37.3		37.4				.54
114-165	C3	66.9	24.0	9.1		1.4	3.2	9.7	33.0	19.6	10.0	14.0		47.3				.53
165-185	C4	63.0	28.6	8.4		7.6	4.2	2.8	11.9	36.5	20.5	8.1		26.5				.56

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20	20-5	5-2	LT .074 PCT LT 75	BULK DENSITY 4A1D 4A1H OVEN DRY LT20 G/CC	4D1 COLE G/CC	WATER CONTENT 4B1C 1/10 BAR PCT	4B1C 1/3- BAR PCT	4B2 15- BAR PCT	4C1 WRD CM/CM	6E1B 5-20 PCT	6E1B LT 20 PCT	CARBONATE 6E1B LT 2 PCT	3A1A .002 PCT	8C1A 1/1 H2O	8C1E 1/2 CACL
000-028	TR	0	0	0	TR	TR	1.43	1.61	.041		17.9	9.5	.12		TR		7.9	7.4
028-040	TR	0	0			7C	1.44	1.67	.052		19.5	11.8	.11	5	13	9	0	8.0	7.8
040-071	TR	0	0			34C	1.52	1.61	.020		17.3	9.3	.12	25	26	2	0	8.2	7.7
071-114	TR	0	0	0	TR	TR	1.38	1.51	.031		20.1	8.2	.17			40	0	8.3	7.7
071-114	0	0	0	0	0	0	1.69	1.76	.014		15.9	5.2	.18			58	0	8.5	7.8
114-165	TR	0	0	0	TR	TR	1.69	1.75	.012		10.4	4.8	.10			25	0	8.5	7.7
165-185	0	0	0	0	0	0	1.63	1.66	.006		10.9	4.7	.10			23	0	8.5	7.8

DEPTH CM	(ORGANIC MATTER 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	EXTRACTABLE BASES 5B4A 6N2E CA	6Q2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						MEQ / 100 G													
000-028	1.11	.101	11	.4			1.2	.7	.6		1.3		21.3	1.00					
028-040	.80	.058	14	.3			2.0	.6	.5				22.7	.86					
040-071	.55			.2			1.6	.6	.3				15.0	.73					
071-114	.32			.1			3.6	.6	.4				14.5	.86					
071-114	.07			TR			3.1	.4	.2				8.8	.91					
114-165	.07			.1			4.3	.5	.2				8.0	.88					
165-185	.04			.1			4.9	.5	.3				8.6	1.00					

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM- CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	SATURATION EXTRACT 8A1 8A1A EC MMHOS/CM	6N1B CA	6Q1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
									MEQ / LITER										
000-028	2100	7.5	39.7					.46										31	12 D
028-040	1800	7.6	44.9					.46											
040-071	2700	7.7	41.0					.36										35	15 D
071-114	2700	7.5	36.2					.36											
071-114	3900	7.7	28.1					.32											
114-165	4600	8.0	28.7					.32										20	4 D
165-185	4300	8.0	29.6					.34											

CLAY MINERALOGY (7A2C).
000-028 MT3 MI2 KK2
028-040 MT4 KK3 MI2 CA2
114-165 MT4 MI2 KK2 CA2 CL2
165-185 MT4 MI2 KK2 CA2 CL2
RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MT = MONTMORILLONITE MI = MICA KK = KAOLINITE CL = CHLORITE CA = CALCITE.

SAND MINERALOGY (7B1) PLACEMENT: MIXED
000-028 FNES - RE75 QZ73 FE2 FD24 SP MS HN VFNS - RE73 QZ71 FE1 TM1 FD24 MS1 ZR SP HN GN CL GS.
028-040 VFNS - RE70 QZ68 FE1 ZR1 FD24 CB2 MS2 GN1 HN1 SP CL AU COS1 - RE68 QZ66 FE1 TM1 FD26 CB3 HN1 MS1 ZR SP RU AU CL
114-165 FNES - RE71 QZ69 FE2 FD11 CB10 VFNS - RE63 QZ61 FE1 ZR1 FD20 CB16 TM VR MS HN
165-185 FNES - NW56 QZ54 FE2 FD16 CB27 MS1 VFNS - NW52 QZ47 FE2 ZR2 TM1 FD32 CB15 MS1 GN
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: CL = CHLORITE FD = FELDSPARS GS = GLASS HN = HORNBLENDE MS = MUSCOVITE QZ = QUARTZ TM = TOURMALINE ZR = ZIRCON CB = CARBONATE AGGREGATES RU = RUTILE AU = AUGITE SP = SPHENE VR = VERMICULITE GN = GARNET FE = IRON OXIDES.

(A) 76P0077 MATRIX
(B) 76P0078 BODIES OF CACO3 SAMPLE SEPERATLY - THESE MAKE UP 25 PERCENT OF HORIZON.
(C) CACO3 CONRETIONS REPORTED AS COARSE FRAGMENTS.
(D) BY SOIL MECHANICS LABORATORY, USDA-SCS, LINCOLN, NE.

Pedon classification: Typic Calciustoll, fine-loamy, mixed, thermic
Series classification: (Same)
Soil: Clark loam
Soil Nos.: S76KS-155-2 (NSSL Nos. 76P0074-76P0080)
Location: Reno County, KS; 100 feet north and 150 feet west of the southeast corner of Sec. 1, T26S, R8W.
Climate: Annual precipitation is about 29 inches. Annual temperature is about 56.1° F., and summer temperature is about 79.7° F. Average frost-free season is about 185 days.
Vegetation and land use: Wheat stubble. Cropland.
Parent material: Highly calcareous old alluvium.
Physiography: Nearly level upland.
Topography: Slope gradient less than 1 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderate.
Described by: C. S. Holzhey, M. J. Mausbach, R. L. Haberman.

(Colors are for dry soil unless otherwise stated.)

Ap 76P0074 0 to 28 cm. (0 to 11 inches). Very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; common fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

B2 76P0075 28 to 40 cm. (11 to 16 inches). Brown (10YR 5/3) light clay loam, dark brown (10YR 4/3) moist; moderate medium granular structure; slightly hard, friable; few fine roots; few fine CaCO3 concretions; strong effervescence; moderately alkaline; clear wavy boundary.

Cca1 76P0076 40 to 71 cm. (16 to 28 inches). Very pale brown (10YR 7/3) heavy loam, brown (10YR 5/3) moist; moderate medium granular structure; slightly hard, friable; common fine and medium CaCO3 concretions and a few CaCO3 concretions about 5 cm. (2 inches) in diameter and 1½ cm. (½ inch) wide, comprising about 35 percent of the horizon; violent effervescence; moderately alkaline; gradual wavy boundary.

Cca2 76P0077 71 to 114 cm. (28 to 45 inches). Very pale brown (10YR 7/4) loam, light yellowish brown (10YR 6/4) moist; weak medium granular structure; hard, friable; white (10YR 8/1) bodies of CaCO3 (No. 76P0078) about 20 cm. (8 inches) to 61 cm. (24 inches) apart, ranging from 8 cm. (3 inches) to 30 cm. (12 inches) in diameter and extending 33 cm. (13 inches) to 51 cm. (20 inches) vertically comprise about 25 percent of the horizon; many smaller masses of CaCO3; violent effervescence; moderately alkaline; gradual wavy boundary.

C3 76P0079 114 to 165 cm. (45 to 65 inches). Very pale brown (10YR 8/4) sandy loam, very pale brown (10YR 7/4) moist; massive; hard, friable; about 50 percent of the faces of peds are coated with CaCO3; violent effervescence; moderately alkaline; gradual wavy boundary.

C4 76P0080 165 to 185 cm. (65 to 73 inches). Reddish yellow (7.5YR 6/6) loam, strong brown (7.5YR 5/6) moist; massive; hard, friable; about 20 percent of the faces of peds are coated with CaCO3; violent effervescence; moderately alkaline.

SOIL CLASSIFICATION-TYPIC USTOCHREPT
FINE, MIXED, MESIC
SERIES - - - - - - - CORINTH SILTY CLAY LOAM

SOIL NO - - - - - - S68KANS-26-2 COUNTY - - - ELLIS

GENERAL METHODS- - - 1A, 1B1B, 2A1, 2B SAMPLE NOS.- 68L351-68L353

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B															RATIO
					FINE	SAND						SILT			FAML	INTR	FINE	NON- 8U1
		SAND 2- .05	SILT .05- .002	CLAY LT .002	CLAY LT .0002	VCOS 2- 1	CORS 1- .5	MEDS .5- .25	FNES .25- .10	VFNS .10- .05	COSI .05- .02	FNSI .02- .002	VFSI .005- .002	TEXT SAND 2-.1	II .2- .02	CLAY TO CLAY	CO3- 15- BAR
CM		PCT LT 2MM														PCT	PCT TO CLAY
023-41	B21	23.5	32.3	44.2		4.9	5.5	2.4	5.0	5.6	13.2	19.1	10.4	17.8	22.2		37 0.28
041-56	B22	20.3	32.2	47.4		5.3	4.5	1.8	4.1	4.6	11.8	20.5		15.7	19.1		44 0.28
056-76	C1	20.7	32.7	46.6		4.7	5.1	2.1	4.3	4.5	10.8	21.9	12.3	16.2	18.1		45 0.29

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 CM	WEIGHT GT 75 PCT	75-20	20-5	5-2	LT .074	20-2	BULK DENSITY 4A1D 1/3- BAR	4A1H OVEN DRY	4D1 COLE	WATER CONTENT- 4B1C 1/10 BAR	4B1C 1/3- BAR	482 15- BAR	4C1 WRD CM/ CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	(- -PH - -) 8C1A 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	PCT LT 75 - - -				LT20	G/CC	G/CC		PCT	PCT	PCT	CM	PCT	PCT		
023-41	0	0	0	0	0	80	0	1.50	1.70	0.043		22.0	12.5	0.14		7	7.7	
041-56	0	0	0	0	0	82	0	1.47	1.68	0.046		25.5	13.5	0.18		3	7.9	
056-76	0	0	0	0	0	82	0	1.47	1.73	0.056		25.9	13.6	0.18		2	7.9	

DEPTH	(ORGANIC MATTER) 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2A EXT FE	PHOS 6S1A TOTL	(- -EXTRACTABLE BASES 5B4A- -) 6N2E CA	6Q2D MG	6P2A NA	6Q2A K	SUM EXTB	ACTY 6H1A TEA	AL 6G1D KCL	(CAT EXCH) 5A3A EXTB	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA SAT NHAC ACTY PCT	(BASE SAT) 5C3 EXTB PCT	5C1 NHAC PCT
CM	PCT	PCT		PCT	PCT	(- - - - - - - - - - MEQ / 100 G - - - - - - - - - -)													
023-41																			
041-56																			
056-76																			

DEPTH	(SATURATED PASTE) 8E1 REST OHM- CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(- - - - - - - - - - SATURATION EXTRACT 8A1- - - - - - - - - -) 8A1A EC MMHOS/ CM	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM			PCT	PCT		PPM	PCT	CM	(- - - - - - - - - - MEQ / LITER - - - - - - - - - -)									PCT	
023-41																			
041-56																		44	21
056-76																			

Pedon classification: Typic Ustochrept, fine, mixed, mesic
Series classification: (Same)
Soil: Corinth silty clay loam
Soil Nos.: S68KS-26-2 (Sample Nos. 351-353)
Location: Ellis County, KS; 700 feet west and 450 feet north of center of Sec. 10, T12S, R16W.
Climate: Annual precipitation is about 23 inches. Annual temperature is about 54° F. and mean summer temperature is about 78° F. Average frost-free season is about 171 days.
Vegetation and land use: Mid and tall grasses. Rangeland.
Parent material: Calcareous clayey shale.
Physiography: Gently rolling erosional upland.
Topography: Slightly convex slope. Slope gradient about 6 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: C. W. McBee, L. D. Zavesky.

(Colors are for dry soil unless otherwise stated.)

A11 0 to 13 cm. (0 to 5 inches). Grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; hard, firm; many fine roots; few worm casts; few flat pieces of calcite; strong effervescence; clear smooth boundary.

A12 13 to 23 cm. (5 to 9 inches). Grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and very fine subangular blocky structure; hard, firm; many roots; few worm casts; few flat pieces of calcite; strong effervescence; gradual smooth boundary.

B21 351 23 to 41 cm. (9 to 16 inches). Light brownish gray (2.5Y 6/2) heavy silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and very fine subangular blocky structure; very hard, firm; many roots; few worm casts; few flat pieces of calcite; strong effervescence; gradual smooth boundary.

B22 352 41 to 56 cm. (16 to 22 inches). Light yellowish brown (2.5Y 6/3) heavy silty clay loam, olive brown (2.5Y 4/3) moist; moderate fine subangular blocky structure; very hard, firm; few roots; few soft platy fragments of calcareous shale; few flat pieces of calcite; strong effervescence; gradual smooth boundary.

C1 353 56 to 76 cm. (22 to 30 inches). Equal parts of brownish yellow (10YR 6/6) and gray (10YR 5/1) dry weathered shale of Fairport chalky shale member of the Carlile formation; material crushes to silty clay loam texture; color variation is in horizontal bands following shale structure; few roots; gradual smooth boundary.

C2 76 to 119 cm. (30 to 47 inches). Mixed colors of light yellowish brown (10YR 6/4) and brown (10YR 4/3) weathered platy shale; few roots; many thin seams of light gray (N7/1) gypsum.

SOIL CLASSIFICATION: Pachic Argiustoll; fine, montmorillonitic, mesic

SOIL Detroit silt loam LOCATION Osborne County, Kansas

SOIL NOS. S53Kans-71-1 LAB. NOS. 1416-1422

SOIL SURVEY LABORATORY Mandan, North Dakota

GENERAL METHODS 1A, 1B1a, 2A1, 2B

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	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	0.02-0.002	0.2-0.02	> 2	
1416	0-5	Ap1	0.2	0.1	0.2	0.5	6.9	62.9	29.2	22.6	47.5	-	sicl
1417	5-7	Ap2	0.1	-	0.1	0.3	5.8	62.8	30.9	20.4	48.4	-	sicl
1418	7-13	B21t	-	-	0.1	0.2	4.6	54.1	41.0	17.4	41.4	-	sic
1419	13-26	B22t	-	-	-	0.1	3.3	50.9	45.7	20.0	34.3	-	sic
1420	26-31	B3	-	-	0.1	0.2	3.3	59.2	37.2	21.3	41.3	-	sicl
1421	31-47	C1	0.1	-	0.1	0.3	3.8	63.7	32.0	23.7	44.0	-	sicl
1422	47-60	C2	0.4	0.1	0.1	0.5	6.2	63.9	28.8	21.9	48.6	-	sicl

LABORATORY NUMBER	pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 3 MILLIMHOS PER CM @ 25°C	6E1a CaCO3 equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS		
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					1/10 ATMOS.	(per cent) 1/3 ATMOS.	4B2 15 ATMOS.
1416	6.5	6.6	6.8	1.80	0.145	12							12.1
1417	6.4	6.6	6.8	1.64	0.141	12							13.0
1418	6.4	6.6	6.7	1.44	0.134	11							17.2
1419	6.6	6.8	7.0	0.93	0.088	11			-				19.6
1420	7.4	7.8	8.1	0.60	0.068	9			2				16.1
1421	7.6	8.0	8.4	0.34	0.047	7			9				13.8
1422	7.6	8.1	8.4	0.19	0.032				10				12.2

LABORATORY NUMBER	5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS (milliequivalents per 100g soil)				5B1a Sum	5D2 Base Sat. % on NH4OAc	SATURATION EXTRACT SOLUBLE (millequivalents per liter)					PER CENT MOISTURE AT SATURATION	8D3 Ca/Mg
		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K			K	CO_3	HCO_3	Cl	SO_4		
1416	24.2	19.5	3.5	1.3	1.7	26.0	107							5.6
1417	24.3	19.5	3.6	1.2	1.4	25.7	106							5.4
1418	28.9	23.0	4.2	1.3	1.3	29.8	97							5.5
1419	31.9	27.8	4.0	1.2	1.4	34.4	108							7.0
1420	25.1		3.4	1.2	1.3									
1421	20.4		3.5	1.2	1.1									
1422	18.5		4.1	0.4	1.0									

AGR-SCS BELTSVILLE, MD 2682 JUNE 1983

Pedon classification: Pachic Argiustoll, fine, montmorillonitic, mesic
Series classification: (Same)
Soil: Detroit silt loam
Soil Nos.: S53KS-71-1 (Sample Nos. 1416-1422)
Location: Osborne County, KS; 1,900 feet north and 75 feet east of the southwest corner of Sec. 22, T7S, R13W.
Climate: Annual precipitation is about 23½ inches. Annual temperature is about 54° F., and summer temperature is about 79° F. Average frost-free season is about 171 days.
Vegetation and land use: Wheat. Cropland.
Physiography: Nearly level terrace.
Topography: Slope gradient 0.5 to 1 percent.
Drainage: Moderately well drained.
Ground water: Greater than 5 feet.
Erosion: Slight.
Permeability: Slow.
Described by: W. M. Johnson

(Colors are for dry soil unless otherwise stated.)

Ap1 1416 0 to 13 cm. (0 to 5 inches). Dark gray (10YR 4/1) silt loam, very dark brown (10YR 2/2) moist; moderate very fine granular structure; soft, very friable; many fine roots; abrupt smooth boundary.

Ap2 1417 13 to 18 cm. (5 to 7 inches). Dark gray (10YR 4/1) silt loam, very dark brown (10YR 2/2) moist; weak coarse blocky structure parting to weak fine granular structure; slightly hard, friable; many fine roots; abrupt smooth boundary.

B21t 1418 18 to 33 cm. (7 to 13 inches). Dark gray (10YR 4/1) silty clay loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure parting to strong medium and coarse blocky structure; hard, friable; many fine roots; clear smooth boundary.

B22t 1419 33 to 66 cm. (13 to 26 inches). Gray (10YR 5/1) silty clay, very dark brown (10YR 2/2) moist; coarse prismatic structure parting to weak medium and coarse blocky structure; very hard, very firm; 6.4 to 12.7 mm. (¼ to ½ inch) vertical cracks develop on drying; few fine roots; gradual smooth boundary.

B3 1420 66 to 79 cm. (26 to 31 inches). Mixed gray (10YR 5/1) and light brownish gray (10YR 6/2) heavy silty clay loam, dark brown (10YR 4/3) and very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to strong medium and fine blocky structure; slightly hard, friable; very few roots; strong effervescence; diffuse boundary.

C1 1421 79 to 119 cm. (31 to 47 inches). Light brownish gray (10YR 6/2) silty clay loam, dark brown (10YR 4/3) moist; moderate medium and fine subangular blocky structure; slightly hard, friable; common white threads and spots of lime; violent effervescence; diffuse boundary.

C2 1422 119 to 152 cm. (47 to 60 inches). Light brownish gray (10YR 6/2) light silty clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable; common threads and spots of lime; violent effervescence.

SOIL CLASSIFICATION: Pachic Argiustoll; fine, montmorillonitic, mesic

SOIL Detroit silt loam taxadjunct LOCATION Osborne County, Kansas

SOIL NOS. S53Kans-71-2 LAB. NOS. 1423-1430

SOIL SURVEY LABORATORY Mandan, North Dakota

GENERAL METHODS 1A, 1B1a, 2A1, 2B

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	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	0.02-0.002	0.2-0.02	> 2	
1423	0-7	Ap	0.4	0.9	3.3	5.5	13.2	56.5	20.2	16.3	56.4	-	sil
1424	7-11	A12	-	0.2	1.2	2.6	7.5	55.5	33.0	17.5	46.9	-	sicl
1425	11-15	B21t	-	0.1	0.4	0.9	3.6	51.9	43.1	24.2	31.8	-	sic
1426	15-20	B22t	-	-	0.2	0.4	2.9	46.4	50.1	22.7	26.8	-	sic
1427	20-29	B23t	-	-	0.1	0.2	2.7	47.5	49.5	23.8	26.5	-	sic
1428	29-38	B3ca	-	0.1	0.1	0.1	1.7	46.4	51.6	28.3	19.9	-	sic
1429	38-50	C1ca	-	-	-	0.1	1.4	55.5	43.0	21.9	35.1	-	sic
1430	50-60+	C2ca	0.4	0.2	0.1	0.2	2.0	57.0	40.1	26.2	32.9	-	sic

LABORATORY NUMBER	pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 3 MILLIMHOS PER CM @ 25°C	6E1a CaCO3 equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS		4B2 15 ATMOS.
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					1/10 ATMOS.	(per cent) 1/3 ATMOS.	
1423	6.6	6.8	7.0	1.66	0.131	13			-				9.9
1424	6.7	6.9	7.1	1.46	0.135	11			-				14.7
1425	6.8	7.0	7.0	1.36	0.119	11			-				19.8
1426	7.0	7.2	7.0	1.00	0.095	11			-				21.5
1427	7.4	7.8	8.0	0.70	0.070	10			3				21.3
1428	7.6	8.2	8.5	0.60	0.065	9			8				20.3
1429	7.6	8.3	8.5	0.40	0.048	8			4				18.3
1430	7.6	8.3	8.5	0.32	0.048	7			6				17.6

LABORATORY NUMBER	5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS 5B1a					5D2 Base Sat. % on NH4OAc	SATURATION EXTRACT SOLUBLE					PER CENT MOISTURE AT SATURATION	8D3 Ca/Mg
		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum		K	CO_3	HCO_3	Cl	SO_4		
	← milliequivalents per 100g soil →							← milliequivalents per liter →						
1423	20.3	16.0	3.8	0.4	2.0	22.2	109							4.2
1424	27.2	23.8	3.7	0.4	1.1	29.0	107							6.4
1425	32.8	30.2	4.0	0.4	1.1	35.7	109							7.6
1426	36.9	33.8	4.4	0.4	1.1	39.7	108							7.7
1427	33.5		4.4	0.4	1.3									
1428	30.9		4.9	0.5	1.0									
1429	27.7		4.6	0.7	1.2									
1430	26.8		4.9	0.9	1.3									

AGR-SCS-BELTSVILLE MD 2682 JUNE 1953

Pedon classification: Pachic Argiustoll, fine, montmorillonitic, mesic
Series classification: (Same)
Soil: Detroit silt loam taxadjunct*
Soil Nos.: S53KS-71-2 (Sample Nos. 1423-1430)
Location: *Osborne County, KS; NE 1/4 NE 1/4 Sec. 10, T7S, R14W.*
Climate: Annual precipitation is about 23½ inches. Annual temperature is about 54° F., and summer temperature is about 79° F. Average frost-free season is about 171 days.
Vegetation and land use: Alfalfa. Cropland.
Parent material: Loess over alluvium.
Physiography: Nearly level terrace.
Topography: Slope gradient less than 0.5 percent.
Drainage: Well drained.
Ground water: Greater than 5 feet.
Erosion: Slight.
Permeability: Slow.
Described by: W. M. Johnson.

(Colors are for dry soil unless otherwise stated.)

Ap 1423 0 to 18 cm. (0 to 7 inches). Dark gray (10YR 4/1) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; many fine roots; abrupt smooth boundary.

A12 1424 18 to 28 cm. (7 to 11 inches). Dark gray (10YR 4/1) silty clay loam, very dark brown (10YR 2/2) moist; weak medium granular structure with some compacting through cultivation; slightly hard, friable; many fine roots; few worm casts; clear smooth boundary.

B21t 1425 28 to 38 cm. (11 to 15 inches). Dark gray (10YR 4/1) heavy silty clay loam, very dark brown (10YR 2/2) moist; moderate medium and coarse subangular blocky structure; hard, firm; many fine roots; many worm casts; clear smooth boundary.

B22t 1426 38 to 51 cm. (15 to 20 inches). Dark gray (10YR 4/1) silty clay, very dark brown (10YR 2/2) moist; weak coarse and very coarse prismatic structure parting to moderate very fine blocky structure; hard, firm; common fine roots; gradual smooth boundary.

B23t 1427 51 to 74 cm. (20 to 29 inches). Gray (10YR 5/1) silty clay, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate medium and coarse blocky structure; hard, firm; common fine roots; few fine $CaCO_3$ concretions; strong effervescence; diffuse wavy boundary.

B3ca 1428 74 to 97 cm. (29 to 38 inches). Gray (10YR 5/1) silty clay, very dark grayish brown (10YR 3/2) moist; strong medium and coarse blocky structure; hard, firm; few fine roots; few fine $CaCO_3$ concretions; strong effervescence; diffuse wavy boundary.

C1ca 1429 97 to 127 cm. (38 to 50 inches). Grayish brown (10YR 5/2) heavy silty clay loam, very dark grayish brown (10YR 3/2) moist; strong medium and coarse blocky structure; hard, firm; few fine roots; common fine $CaCO_3$ threads and concretions; violent effervescence; diffuse wavy boundary.

C2ca 1430 127 to 153 cm. (50 to 60 inches). Light brownish gray (10YR 6/2) heavy silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine blocky structure; hard, firm; few fine roots; many fine threads of $CaCO_3$; few $CaCO_3$ concretions; violent effervescence.

*Pedon has 45 to 50 percent clay in the argillic horizon, and silty clay texture in the C horizon. These items are outside the range of the Detroit series.

SOIL CLASSIFICATION: Fluventic Hapludoll; coarse-silty, mixed, mesic

SOIL Eudora silt loam LOCATION Shawnee County, Kansas

SOIL NOS. #53Kans-89-3 LAB. NOS. 2016-2023a

SOIL SURVEY LABORATORY Mandan, North Dakota

GENERAL METHODS 1A, 1B1a, 2A1, 2B

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	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	0.02-0.002	0.2-0.02	2A1 > 2	
2016	0-5	Ap	0.1	0.1	0.4	0.6	29.9	57.9	11.0	9.3	78.9	-	sil
2017	5-10	A12	0.1	-	0.2	0.7	31.4	57.1	10.5	9.1	79.8	-	sil
2018	10-21	AC	-	-	-	0.7	22.5	65.4	11.4	9.8	78.8	-	sil
2019	21-29	C1	-	-	-	1.1	14.0	73.0	11.9	15.0	72.3	-	sil
2020	29-34	C2	-	-	-	-	8.7	76.5	14.8	27.5	57.7	-	sil
2021	34-44	C3	-	-	0.9	1.9	24.5	63.1	9.6	11.2	77.1	-	sil
2022	44-48	C4	-	-	-	-	3.6	81.4	15.0	29.0	56.0	-	sil
2023a	48-53	C5	-	0.1	-	0.1	0.7	76.3	22.8	45.6	31.5	-	sil

	pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUC. TIVITY EC x 10 3 MILLIMHOS PER CM @ 25°C	6E1a CaCO3 equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS		
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					1/10 ATMOS.	(per cent) 1/3 ATMOS.	4B2 15 ATMOS.
2016	6.2	6.4	6.4	0.76	0.074	10			-				5.2
2017	7.0	7.0	7.1	0.76	0.069	11			-				5.3
2018	6.2	6.3	6.2	0.43	0.050	9			-				6.2
2019	6.5	6.6	6.7	0.22	0.035				-				6.4
2020	6.6	6.8	7.0	0.26	0.038	7			-				7.7
2021	6.8	6.8	6.6	0.07	0.019				-				5.2
2022	6.8	7.0	7.1	0.13	0.024				-				7.9
2023a	7.4	7.9	8.3	0.23	0.036				1				11.6

	5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS 5B1a					5D2 Base Sat. % on NH_4OAc	SATURATION EXTRACT SOLUBLE					PER CENT MOISTURE AT SATURATION
		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum		K	CO_3	HCO_3	Cl	SO_4	
	milliequivalents per 100g soil							milliequivalents per liter					
2016	10.7	7.8	1.1	0.2	0.8	9.9	93						
2017	10.8	8.8	1.0	0.2	0.7	10.7	99						
2018	11.1	8.2	1.5	0.1	0.3	10.1	91						
2019	11.4	8.7	1.6	0.1	0.4	10.8	95						
2020	13.5	10.4	2.0	0.1	0.6	13.1	97						
2021	9.8	10.7	1.4	0.1	0.4	12.6	129						
2022	14.4	12.0	1.7	0.1	0.7	14.5	101						
2023a	20.5		2.3	0.1	0.9								

AGR-SCS-BELTSVILLE MD 2002 JUNE 1983

Pedon classification: Fluventic Hapludoll, coarse-silty, mixed, mesic
Series classification: (Same)
Soil: Eudora silt loam
Soil Nos.: S53KS-89-3 (Sample Nos. 2016-2023A)
Location: Shawnee County, KS; 750 feet north and 80 feet east of the southwest corner of Sec. 14, T11S, R14E.
Climate: Annual precipitation is about 33 inches. Annual temperature is about 55° F., and summer temperature is about 78° F. Average frost-free season is about 183 days.
Vegetation and land use: Corn. Cropland.
Parent material: Silty alluvium.
Physiography: Nearly level terrace.
Topography: Slope gradient less than 1 percent.
Drainage: Well drained.
Ground water: Greater than 6 feet.
Erosion: Slight.
Permeability: Moderate.
Described by: W. M. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap 2016 0 to 13 cm. (0 to 5 inches). Very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine and medium granular structure; soft, friable; pH 6.0; abrupt smooth boundary.

A12 2017 13 to 25 cm. (5 to 10 inches). Black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak coarse and medium subangular blocky structure parting to weak coarse medium and fine granular structure; soft, friable; pH 6.0; clear smooth boundary.

AC 2018 25 to 53 cm. (10 to 21 inches). Very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak coarse and medium subangular blocky structure; slightly hard, friable; pH 6.0; gradual smooth boundary.

C1 2019 53 to 74 cm. (21 to 29 inches). Dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; weak coarse and medium subangular blocky structure; slightly hard, friable; pH 6.0; gradual smooth boundary.

C2 2020 74 to 86 cm. (29 to 34 inches). Brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak coarse subangular blocky structure; slightly hard, friable; pH 6.0; gradual smooth boundary.

C3 2021 86 to 112 cm. (34 to 44 inches). Brown (10YR 4/3) very fine sandy loam, pale brown (10YR 6/3) dry; massive; slightly hard, friable; pH 6.5; clear smooth boundary.

C4 2022 112 to 122 cm. (44 to 48 inches). Brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; common faint fine and medium brownish yellow (10YR 6/6) mottles; massive; hard, friable; pH 6.5; abrupt smooth boundary.

C5 2023A 122 to 135 cm. (48 to 53 inches). Dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; massive; hard, friable; strong effervescence in the lower 2.5 cm. (1 inch); pH 6.5.

SOIL CLASSIFICATION: Typic Hapludoll; coarse-silty, mixed, mesic

SOIL Eudora silt loam taxadjunct LOCATION Jefferson County, Kansas

SOIL NOS. S53Kans-44-1 LAB. NOS. 2030-2037

SOIL SURVEY LABORATORY Mandan, North Dakota

GENERAL METHODS 1A, 1B1a, 2A1, 2B

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	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	0.02-0.002	0.2-0.02	2A1 > 2	
2030	0-4	Ap	-	0.1	0.1	0.3	17.5	64.9	17.1	21.8	60.8	-	sil
2031	4-9	A12	-	0.1	0.1	0.4	16.8	65.7	16.9	22.6	60.1	-	sil
2032	9-13	A13	-	0.1	0.4	0.9	20.7	58.9	19.0	19.8	60.4	-	sil
2033	13-19	B2	-	-	-	-	19.2	62.6	18.2	19.0	62.8	-	sil
2034	19-30	B31	-	-	-	0.3	18.2	64.5	17.0	18.4	64.6	-	sil
2035	30-44	B32	-	-	-	1.1	21.6	61.5	15.8	16.8	67.4	-	sil
2036	44-55	C1	-	-	-	1.3	25.6	59.7	13.4	12.7	73.0	-	sil
2037	55-62	C2	-	-	-	1.7	26.5	59.6	12.2	12.1	74.3	-	sil

LABORATORY NUMBER	pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 3 MILLIMHOS PER CM @ 25°C	6E1a CaCO3 equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS		
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					1/10 ATMOS.	(per cent) 1/3 ATMOS.	4B2 15 ATMOS.
2030	6.3	6.5	6.5	1.41	0.116	12			-				7.8
2031	6.3	6.5	6.5	1.38	0.120	12			-				8.0
2032	5.9	6.1	6.1	1.30	0.111	12			-				8.9
2033	6.0	6.1	6.1	1.08	0.101	11			-				8.8
2034	6.0	6.2	6.3	0.83	0.080	10			-				8.1
2035	6.1	6.4	6.4	0.44	0.052	9			-				7.0
2036	6.3	6.6	6.6	0.24	0.034				-				6.7
2037	6.7	6.9	6.8	0.19	0.031				-				5.6

LABORATORY NUMBER	5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS (milliequivalents per 100g soil)				5B1a Sum	5D2 Base Sat. % on NH4OAc	SATURATION EXTRACT SOLUBLE (milliequivalents per liter)					PER CENT MOISTURE AT SATURATION
		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K			K	CO_3	HCO_3	Cl	SO_4	
2030	17.2	12.1	2.2	0.1	1.4	15.8	92						
2031	16.8	12.2	2.2	0.1	1.2	15.7	93						
2032	17.7	11.6	2.3	0.1	0.9	14.9	84						
2033	16.5	11.3	2.2	0.1	0.5	14.1	85						
2034	15.4	11.1	2.0	0.1	0.4	13.6	88						
2035	14.2	10.5	1.7	0.1	0.6	12.9	91						
2036	12.6	9.8	1.4	0.1	0.6	11.9	94						
2037	12.4	10.5	1.1	0.1	0.5	12.2	98						

AGR-ECS-BELTSVILLE, MD. 3693 JUNE 1963

Pedon classification: Typic Hapludoll, coarse-silty, mixed, mesic
Series classification: Fluventic Hapludoll, coarse-silty, mixed, mesic
Soil: Eudora silt loam taxadjunct*
Soil Nos.: S53KS-44-1 (Sample Nos. 2030-2037)
Location: Jefferson County, KS; 1,320 feet south and 1,056 feet east of the northwest corner of Sec. 26, T11S, R17E.
Climate: Annual precipitation is about 37 inches. Annual temperature is about 56° F., and summer temperature is about 78° F. Average frost-free season is about 180 days.
Vegetation and land use: Corn. Cropland.
Parent material: Silty alluvium.
Physiography: Very gently undulating terrace.
Topography: Slope gradient about 0.5 percent.
Drainage: Well drained.
Ground water: Greater than 6 feet.
Erosion: Slight.
Permeability: Moderate.
Described by: W. M. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap 2030 0 to 10 cm. (0 to 4 inches). Very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; soft, friable; pH 6.0; abrupt smooth boundary.

A12 2031 10 to 23 cm. (4 to 9 inches). Black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak very coarse platy structure; soft, friable; pH 6.0; abrupt smooth boundary.

A13 2032 23 to 33 cm. (9 to 13 inches). Black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate medium and coarse platy structure; soft, friable; pH 5.0; clear smooth boundary.

B2 2033 33 to 48 cm. (13 to 19 inches). Very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak very coarse prismatic structure parting to weak very fine blocky structure; soft, friable; many fine roots; many worm casts; pH 5.0; gradual smooth boundary.

B31 2034 48 to 76 cm. (19 to 30 inches). Brown (10YR 4/3) silt loam, yellowish brown (10YR 5/4) dry; weak coarse prismatic structure parting to weak very fine blocky structure; soft, friable; common fine roots; many worm casts; few krotovinas; pH 6.0; gradual smooth boundary.

B32 2035 76 to 112 cm. (30 to 44 inches). Yellowish brown (10YR 3/4) silt loam, brown (10YR 5/3) dry; weak coarse prismatic structure parting to weak very fine blocky structure; soft, friable; common fine roots; many worm casts; few krotovinas; pH 6.5; gradual smooth boundary.

C1 2036 112 to 140 cm. (44 to 55 inches). Dark yellowish brown (10YR 3/4) silt loam, brown (10YR 5/3) dry; massive; soft, friable; porous; few fine roots; many worm casts; few krotovinas; pH 6.0; gradual smooth boundary.

C2 2037 140 to 158 cm. (55 to 62 inches). Dark brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; massive; soft, friable; porous; few fine roots; few krotovinas; pH 6.0.

* This is a taxadjunct to the Eudora series because the organic carbon decreases regularly with depth.

SOIL CLASSIFICATION: Typic Hapludoll; coarse-silty, mixed mesic

SOIL Eudora silt loam taxadjunct LOCATION Jefferson County, Kansas

SOIL NOS. S53Kans-44-2 LAB. NOS. 2038-2044

SOIL SURVEY LABORATORY Mandan, North Dakota

GENERAL METHODS 1A, 1B1a, 2A1, 2B

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)								3A1	2A1	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	0.02-0.002	0.2-0.02	> 2	
2038	0-5	Ap1	-	0.1	0.2	2.0	32.4	54.2	11.1	12.1	76.1	-	sil
2039	5-10	Ap2	-	-	0.4	2.0	33.2	52.9	11.5	11.5	76.2	-	sil
2040	10-18	B21	-	-	-	2.3	34.0	52.1	11.6	10.9	77.5	-	sil
2041	18-28	B22	-	-	-	2.2	34.5	52.5	10.8	10.7	78.5	-	sil
2042	28-42	C1	-	0.1	0.5	1.7	32.1	54.7	10.9	12.0	75.9	-	sil
2043	42-51	C2	-	-	0.4	0.8	18.6	67.4	12.8	17.6	68.8	-	sil
2044	51-60	Ab	-	-	0.4	0.5	19.7	57.7	21.7	19.4	58.4	-	sil

LABORATORY NUMBER	pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10³ MILLIMHOS PER CM @ 25°C	6E1a CaCO3 equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS		
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					1/10 ATMOS.	(per cent) 1/3 ATMOS.	4B2 15 ATMOS.
2038	6.4	6.6	6.7	1.04	0.093	11			-				6.1
2039	6.4	6.7	6.7	0.94	0.088	11			-				6.2
2040	5.9	6.1	6.2	0.71	0.070	10			-				5.7
2041	6.2	6.4	6.4	0.41	0.045	9			-				5.8
2042	6.5	6.6	6.6	0.17	0.026				-				6.6
2043	6.5	6.8	6.7	0.14	0.025				-				10.0
2044	6.5	6.8	6.8	0.37	0.048	8			-				4.8

LABORATORY NUMBER	5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS 5B1a (milliequivalents per 100g soil)					5D2 Base Sat. % on NH_4OAc	SATURATION EXTRACT SOLUBLE (milliequivalents per liter)					PER CENT MOISTURE AT SATURATION
		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum		K	CO_3	HCO_3	Cl	SO_4	
2038	12.4	8.7	1.3	-	1.0	11.0	89						
2039	12.6	9.2	1.5	-	1.0	11.7	93						
2040	12.0	8.0	1.6	-	0.4	10.0	83						
2041	10.8	7.5	1.6	-	0.2	9.3	86						
2042	10.5	7.6	1.8	-	0.3	9.7	92						
2043	11.9	12.4	1.8	0.2	0.5	14.9	125						
2044	16.5	12.3	2.2	0.2	0.8	15.5	94						

AGR-SCS BELTSVILLE MD 2682 JUNE 1953

Pedon classification: Cumulic Hapludoll, coarse-silty, mixed, mesic
Series classification: Fluventic Hapludoll, coarse-silty, mixed, mesic
Soil: Eudora silt loam taxadjunct*
Soil Nos.: S53KS-44-2 (Sample Nos. 2038-2044)
Location: Jefferson County, KS; 200 feet south and 60 feet east of the northwest corner of Sec. 19, T11S, R17E.
Climate: Annual precipitation is about 37 inches. Annual temperature is about 56° F., and summer temperature is about 78° F. Average frost-free season is about 180 days.
Vegetation and land use: Corn. Cropland.
Parent material: Silty alluvium.
Physiography: Nearly level terrace.
Topography: Slope gradient less than 1 percent.
Drainage: Well drained.
Ground water: Greater than 6 feet.
Erosion: Slight.
Permeability: Moderate:
Described by: W. M. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap1 2038 0 to 13 cm. (0 to 5 inches). Very dark gray (10YR 3/1) loam, dark gray (10YR 4/1) dry; weak granular structure; soft, friable; many fine roots; pH 6.5; abrupt smooth boundary.

Ap2 2039 13 to 25 cm. (5 to 10 inches). Black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak coarse platy structure; soft, friable; many fine roots; pH 6.5; abrupt smooth boundary.

B21 2040 25 to 46 cm. (10 to 18 inches). Very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; weak very coarse prismatic structure; soft, friable; common fine roots; many worm casts; pH 5.0; gradual smooth boundary.

B22 2041 46 to 71 cm. (18 to 28 inches). Very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak very coarse prismatic structure; soft, friable; porous; common fine roots; many worm casts; few krotovinas; pH 7.0; gradual smooth boundary.

C1 2042 71 to 107 cm. (28 to 42 inches). Dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; massive; soft, friable; porous; few fine roots; many worm casts; few krotovinas; pH 7.0; gradual smooth boundary.

C2 2043 107 to 130 cm. (42 to 51 inches). Brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; massive; soft, friable; porous; few fine roots; few worm casts; few krotovinas; pH 6.0; abrupt wavy boundary.

Ab 2044 130 to 153 cm. (51 to 60 inches). Dark yellowish brown (10YR 3/4) silt loam, dark grayish brown (10YR 4/2) dry; weak coarse prismatic structure parting to weak coarse and medium blocky structure; soft, friable; porous; thin clay films on faces of peds; few fine roots; few worm casts; few krotovinas; pH 6.5.

* This is a taxadjunct to the Eudora series because the organic carbon decreases regularly with depth through the upper sequum.

SOIL CLASSIFICATION: Typic Hapludoll; coarse- silty, mixed, mesic

SOIL Eudora silt loam taxadjunct LOCATION Shawnee County, Kansas

SOIL NOS. S53Kans-89-4 LAB. NOS. 2023b-2029

SOIL SURVEY LABORATORY Mandan, North Dakota

GENERAL METHODS 1A, 1B1a, 2A1, 2B

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	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	0.02-0.002	0.2-0.02	2A1 > 2	
2023b	0-6	Ap	0.1	0.1	0.2	1.1	31.6	56.3	10.6	10.3	78.4	-	sil
2024	6-16	A12	-	-	-	1.5	31.9	54.6	12.0	10.8	77.2	-	sil
2025	16-23	B2	-	-	-	1.5	31.5	54.7	12.3	11.2	75.8	-	sil
2026	23-31	C1	-	-	-	1.3	30.7	56.2	11.8	11.3	76.9	-	sil
2027	31-45	C2	-	-	-	0.8	17.1	66.0	16.1	19.8	64.1	-	sil
2028	45-58	C3	-	-	-	2.4	48.3	41.0	8.3	8.8	82.3	-	l
2029	58-64	C4	-	-	-	1.5	44.5	43.1	10.9	12.6	76.0	-	l

LABORATORY NUMBER	pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 3 MILLIMHOS PER CM @ 25°C	6E1a CaCO3 equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS (per cent)		
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.
2023b	6.7	6.8	6.8	0.96	0.079	12			-				5.1
2024	6.3	6.5	6.6	0.93	0.082	11			-				6.1
2025	6.5	6.5	6.5	0.63	0.062	10			-				6.5
2026	6.6	6.6	6.5	0.46	0.049	9			-				6.4
2027	6.7	6.8	6.7	0.34	0.044	8			-				8.2
2028	6.9	6.8	6.6	0.10	0.016				-				4.6
2029	7.2	7.2	6.9	0.10	0.017				-				5.5

LABORATORY NUMBER	5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS 5B1a					5D2 Base Sat. % on NH_4OAc	SATURATION EXTRACT SOLUBLE					PER CENT MOISTURE AT SATURATION
		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum		K	CO_3	HCO_3	Cl	SO_4	
	milliequivalents per 100g soil							milliequivalents per liter					
2023b	11.5	8.8	1.6	0.1	1.1	11.6	101						
2024	12.7	9.5	1.5	-	0.5	11.5	91						
2025	12.4	9.4	1.7	0.1	0.2	11.4	92						
2026	12.0	9.4	1.8	0.1	0.2	11.5	96						
2027	14.4	11.1	2.0	0.1	0.5	13.7	95						
2028	8.8	7.0	1.3	-	0.3	8.6	98						
2029	10.7	9.4	1.3	0.1	0.5	11.3	106						

AGR-SCS-BELTSVILLE, MD 2662 JUNE 1963

Pedon Classification: Typic Hapludoll, coarse-silty, mixed, mesic
Series classification: Fluventic Hapludoll, coarse-silty, mixed, mesic
Soil: Eudora silt loam taxadjunct*
Soil Nos.: S53KS-89-4 (Sample Nos. 2023B-2029)
Location: Shawnee County, KS; 1,840 feet north and 50 feet west of the SE corner of Sec. 16, T11S, R15E.
Climate: Annual precipitation is about 33 inches. Annual temperature is about 55° F., and summer temperature is about 78° F. Average frost-free season is about 183 days.
Vegetation and land use: Corn. Cropland.
Parent material: Silty alluvium.
Physiography: Nearly level terrace.
Topography: Slope gradient less than 1 percent.
Drainage: Well drained.
Ground water: Greater than 6 feet.
Erosion: Slight.
Permeability: Moderate.
Described by: W. M. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap 2023B 0 to 15 cm. (0 to 6 inches). Black (10YR 2/1) silt loam, grayish brown (10YR 5/2) dry; moderate fine and very fine granular structure; soft, friable; many fine roots; pH 5.0; abrupt smooth boundary.

A12 2024 15 to 41 cm. (6 to 16 inches). Black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; soft, friable; many fine roots; pH 6.5; clear wavy boundary.

B2 2025 41 to 59 cm. (16 to 23 inches). Very dark grayish brown (10YR 3/2) very fine sandy loam, grayish brown (10YR 5/2) dry; weak very fine subangular blocky and very coarse prismatic structure; soft, friable; many fine roots; common worm casts and krotovinas; pH 6.0; clear wavy boundary.

C1 2026 59 to 79 cm. (23 to 31 inches). Very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; massive; soft, friable; common fine roots; many worm casts; common krotovinas; pH 6.5; gradual smooth boundary.

C2 2027 79 to 114 cm. (31 to 45 inches). Brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; soft, friable; porous; few fine roots; many worm casts; many krotovinas; pH 6.5; gradual smooth boundary.

C3 2028 114 to 147 cm. (45 to 58 inches). Dark grayish brown (10YR 4/2) very fine sandy loam, pale brown (10YR 6/3) dry; massive; soft, friable; few fine roots; few worm casts; pH 6.0; gradual smooth boundary.

C4 2029 147 to 163 cm. (58 to 64 inches). Dark grayish brown (10YR 4/2) very fine sandy loam, pale brown (10YR 6/3) dry; massive; soft, friable; porous; few fine roots; common worm casts; pH 7.0.

* This is a taxadjunct to the Eudora series because the organic carbon decreases regularly with depth.

SOIL CLASSIFICATION: Pachic Argiustoll; clayey-skeletal, montmorillonitic, mesic

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Florence cherty silt loam taxadjunct SOIL Nos. S63Kans-9-4 LOCATION Chase County, Kansas

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18441-18445 August, 1967

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

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	Coarse fragments 2A2: 3B2 > 2 Vol. Pct.	3B1 > 2 Wt. Pct	2–19 (Pct of < 76mm)	19–76 (Pct of < 76mm)
		Pct of < 2 mm															
0-3	A11	12.6	68.4	19.0	4.1	2.4	0.8	1.2	4.1	44.6	23.8	49.3	8.5	46	61	23	35
3-16	A12	9.0	68.1	22.9	1.6	1.7	0.7	1.1	3.9	42.5	25.6	47.0	5.1	66	81	14	63
16-24	B1	16.8	52.2	31.0	10.0	2.6	0.8	1.0	2.4	29.0	23.2	31.9	14.4				
24-34	B21t	13.4	34.2	52.4	6.3	2.7	1.0	1.4	2.0	16.7	17.5	19.5	11.4	74	82a	15a	59a
34-54	B22t	5.1	16.6	78.3	1.8	1.1	0.6	0.8	0.8	3.9	12.7	5.2	4.3				

Depth (In.)	Horizon	6A1a Organic carbon b Pct.	6B1a Nitrogen Pct	C/N	Carbonate as $CaCO_3$ Pct.	6C2a Ext. Iron as Fe Pct.	Bulk density g/cc	g/cc	g/cc	Water content Pct.	Pct.	4B2 15-Bar Pct.	Wf/V c g/cc	pH 8C1a 1:1
0-3	A11	4.12	0.285	14		0.7						11.0	0.6	5.8
3-16	A12	2.88				0.8						11.1	0.3	5.4
16-24	B1	1.49				1.2						14.0		5.6
24-34	B21t	1.15				2.1						22.1	0.4a	5.6
34-54	B22t	0.84				3.0						32.8		6.2

Depth (In.)	Extractable bases 5B1a: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	8D3 Ca/Mg	Base saturation: 5C3 Sum Cations Pct	5C1 NH_4OAc Pct
	meq/100 g										
0-3	11.7	2.1	tr	0.8	14.6	8.4	23.0	18.0	5.6	63	81
3-16	11.8	2.2	tr	0.5	14.5	8.1	22.6	17.6	5.4	64	82
16-24	13.2	3.0	tr	0.5	16.7	6.7	23.4	19.1	4.4	71	87
24-34	23.6	4.5	0.1	0.7	28.9	8.4	37.3	30.5	5.2	77	95
34-54	44.1	3.5	0.1	1.0	48.7	9.2	57.9	45.4	13	84	107

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-3	0.95	0.04	0.58
3-16	0.77	0.04	0.48
16-24	0.62	0.04	0.45
24-34	0.58	0.04	0.42
34-54	0.58	0.04	0.42

a. 16-54 inches.
b. 9 kg/m^2 to 54 inches (Method 6A).
c. Weight of fine earth per unit volume of horizon; calculated to include volume but not weight of > 2-mm. material (Method 3B2). Average density of > 2-mm. material was determined at 2.2 g/cc. Used estimate of the bulk density of the fine-earth fabric in interstices between pebbles; adjustment made for incomplete filling by fine earth between pebbles.

USDA-SCS HYATTSVILLE MD 1964

Pedon classification: Pachic Argiustoll, clayey-skeletal, montmorillonitic, mesic
Series classification: Udic Argiustoll, clayey-skeletal, montmorillonitic, mesic
Soil: Florence cherty silt loam taxadjunct *
Soil Nos.: S63KS-9-4 (Sample Nos. 18441-18445)
Location: Chase County, KS; 2,640 feet south and 2,100 feet east of the northwest corner of Sec. 18, T22S, R8E.
Climate: Annual precipitation is about 32 inches. Annual temperature is about 56° F., and mean summer temperature is about 79° F. Average frost-free season is about 185 days.
Vegetation and land use: Tall grasses predominate. Rangeland.
Parent material: Predominantly cherty limestone but in places is chert free limestone or shale.
Physiography: Rolling erosional upland.
Topography: Convex slope. Slope gradient of about 13 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: H. L. Penner.

(Colors are for dry soil unless otherwise stated.)

A11 18441 0 to 8 cm. (0 to 3 inches). Dark gray (10YR 4/1) cherty silt loam, black (10YR 2/1) moist; strong fine granular structure; upper 12 mm. (½ inch) weakly platy; slightly hard, very friable; angular chert fragments, mostly 25 mm. (1 inch) in diameter, occupy about 15 percent of mass; many fine roots; clear smooth boundary.

A12 18442 8 to 41 cm. (3 to 16 inches). Dark gray (10YR 4/1) cherty silty clay loam, black (10YR 2/1) moist; strong fine granular structure; slightly hard, very friable; chert content increases to about 80 percent; numerous worm casts; many fine roots; gradual smooth boundary.

B1 18443 41 to 61 cm. (16 to 24 inches). Dark brown (7.5YR 4/2) cherty clay loam, dark brown (7.5YR 3/2) moist; fine moderate subangular blocky structure; slightly hard, friable; many fine worm casts of darker color; some shiny surfaces on faces of peds; few fine roots; gradual smooth boundary.

B21t 18444 61 to 86 cm. (24 to 34 inches). Dark reddish brown (2.5YR 3/4) coarse cherty clay; dark red (2.5YR 3/5) moist; moderate fine subangular blocky structure; very hard, firm; chert fragments 10 to 20 cm. (4 to 8 inches) in diameter occupy 80 percent of mass; gradual smooth boundary.

B22t 18445 86 to 137 cm. (34 to 54 inches). Dark reddish brown (2.5YR 3/4) coarse cherty clay, dark red (2.5YR 3/5) moist; moderate fine blocky structure; extremely hard, very firm; coarse chert content is about 85 percent of the mass; few scattered worm casts; clear irregular boundary.

R 137 cm. (54 inches). Cherty limestone with vertical fractures filled with dark red clay.

* This is a taxadjunct to the Florence series because the dark surface layer is thicker than is typical for that series.

SOIL CLASSIFICATION: Udic Argiustoll; clayey-skeletal, montmorillonitic, mesic

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Florence cherty silt loam SOIL Nos. S63Kans-9-2 LOCATION Chase County, Kansas

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18431-18434 August, 1967

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

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int III (0.02–0.002)	Silt: Int II (0.2–0.02)	(2–0.1)		Coarse fragments 2A2: 3B2 > 2 Vol. Pct.	3B1 > 2 Wt. Pct.	2 – 19 Pct. of < 76mm	19 – 76 Pct. of < 76mm
		Pct. of < 2 mm																
0-3	A11	9.2	65.0	25.8	2.2	1.8	0.8	1.2	3.2	38.0	27.0	41.8	6.0		33	50	12	38
3-13	A12	7.6	61.2	31.2	1.1	1.2	0.7	1.3	3.3	35.1	26.1	39.1	4.3		69	80	11	61
13-20	B21t	10.9	33.9	55.2	4.6	2.8	0.9	1.0	1.6	14.5	19.4	16.6	9.3					
20-42	B22t	3.8	16.6	79.6	1.5	0.9	0.4	0.5	0.5	3.4	13.2	4.2	3.3		70	77a	6a	51a

Depth (In.)	6A1a Organic carbon [b] Pct	6B1a Nitrogen Pct.	C/N		Carbonate as $CaCO_3$ Pct.	Ext. Iron as Fe Pct.	Bulk density g/cc	g/cc	g/cc		Water content Pct.	Pct.	4B2 15-Bar Pct.		$\frac{Wf}{V}$ [c] g/cc		pH 8C1a 1:1	
0-3	4.35	0.318	14										12.4		0.7		5.7	
3-13	3.61	0.265	14										14.8		0.4		5.5	
13-20	2.30	0.173	13										23.1				5.6	
20-42	1.90												32.6		0.4a		6.4	

Depth (In.)	Extractable bases 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	5E1a Sum	6H1a Ext. Acidity	Cat. Exch. Cap. 5A3a Sum Cations	5A1a NH_4OAc		8D3 Ca/Mg	Base saturation 5C3 Sum Cations	5C1 NH_4OAc
	meq/100 g										Pct.	Pct
0-3	16.1	2.8	tr	0.9	19.8	9.6	29.4	22.6		5.8	67	88
3-13	16.5	3.0	tr	0.5	20.0	10.8	30.8	23.5		5.5	65	85
13-20	25.2	4.3	0.1	0.7	30.3	11.0	41.3	32.8		5.9	73	92
20-42	45.9	3.0	0.1	1.0	50.0	9.8	59.8	45.4		15	84	110

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-3	0.88		0.48
3-13	0.75		0.47
13-20	0.59		0.42
20-42	0.57		0.41

a. 13-42 inches.
b. 12 kg/m^2 to 42 inches (Method 6A).
c. Weight of fine earth per unit volume of horizon; calculated to include volume but not weight of > 2-mm. material (Method 3B2). Average density of > 2-mm. material was determined at 2.2 g/cc. Used estimate of the bulk density of the fine-earth fabric in interstices between pebbles; adjustment made for incomplete filling by fine earth between pebbles.

SCS-HYATTSVILLE MD 1966

Pedon classification: Udic Argiustoll, clayey-skeletal, montmorillonitic, mesic
Series classification: (Same)
Soil: Florence cherty silt loam
Soil Nos.: S63KS-9-2 (Sample Nos. 18431-18434)
Location: Chase County, KS; 3,600 feet east and 900 feet north of the southwest corner of Sec. 6, T22S, R8E.
Climate: Annual precipitation is about 32 inches. Annual temperature is about 56° F., and mean summer temperature is about 79° F. Average frost-free season is about 185 days.
Vegetation and land use: Tall grasses predominate. Rangeland.
Parent material: Predominantly cherty limestone but in places is chert free limestone or shale.
Physiography: Rolling erosional upland.
Topography: Convex side slope about 50 feet below the ridgetop.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: H. L. Penner.

(Colors are for dry soil unless otherwise stated.)

A11 18431 0 to 8 cm. (0 to 3 inches). Very dark grayish brown (10YR 3/2) cherty silt loam, very dark brown (10YR 2/2) moist; strong fine granular structure; upper one inch weak fine platy; slightly hard, friable; chert fragments of 1/4 to 3 inches in diameter occupy about 15 percent of mass; many fine roots; clear smooth boundary.

A12 18432 8 to 33 cm. (3 to 13 inches). Very dark grayish brown (10YR 3/2) cherty clay loam, very dark brown (10YR 2/2) moist; strong fine granular structure; slightly hard, friable; chert content about 80 percent of mass; few fragments up to 7 inches in diameter, but majority less than 3 inches; few worm casts; common fine roots; gradual smooth boundary.

B21t 18433 33 to 51 cm. (13 to 20 inches). Dark grayish brown (10YR 4/2) cherty heavy clay loam, very dark grayish brown (10YR 3/2) moist; strong fine subangular blocky structure; hard, firm; chert content as in A12; shiny faces appear on ped surfaces; pores are open for most part; few worm casts; few fine roots; gradual smooth boundary.

B22t 18434 51 to 107 cm. (20 to 42 inches). Dark reddish brown (2.5YR 3/4) coarse cherty clay; dark red (2.5YR 3/5) moist; strong fine subangular blocky structure; extremely hard, very firm; chert commonly 5 to 8 inches in size and occupies about 80 percent of mass; few open pores; clear wavy boundary.

R 107 cm. (42 inches). Cherty limestone with seams of nearly massive dark red clay occurring laterally and vertically.

SOIL CLASSIFICATION-UDIC ARGIUSTOLL
FINE-SILTY, MIXED, THERMIC
SERIES - - - - - - -GRANT SILT LOAM

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S76KS-77-3 COUNTY - - - HARPER

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 76P0115-76P0123

DEPTH CM	HORIZON	SAND 2- .05	SILT .05- .002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2- 1	CORS 1- .5	MEDS .5- .25	FNES .25- .10	VFNS .10- .05	COSI .05- .02	FNSI .02- .002	VFSI .005- .002	SAND 2- .10	INTR II .2- .02	FINE CLAY TO CLAY	NON- CO3- CLAY	RATIO 8D1 15- 8AR TO CLAY
		(- - - - - - - - - - - - - - - - PCT LT 2MM - - - - - - - - - - - - - - - -)														PCT	PCT	
000-025	AP	25.9	57.3	16.8	11.7	.6	1.1	.7	.6	22.9	48.6	8.7		3.0		70		.39
025-041	B1	23.3	55.5	21.2	14.9	.2	.5	.4	.5	21.7	46.3	9.2		1.6		70		.40
041-058	B21T	23.2	56.2	20.6	13.9	.3	.5	.3	.5	21.6	46.7	9.5		1.6		67		.40
058-079	B22T	25.2	53.9	20.9	13.7	.8	.9	.6	.7	22.2	43.7	10.2		3.0		66		.41
079-107	B23T	26.7	54.4	18.9	12.2	.7	1.2	.7	.8	23.3	42.7	11.7		3.4		65		.40
107-132	C1	26.7	54.4	18.9	13.6	.8	1.2	.7	.7	23.3	44.2	10.2		3.4		72		.41
127-132	C1(A)	31.1	52.4	16.5	11.1	6.6	5.4	1.5	.5	17.1	38.9	13.5		14.0		67		.40
132-157	C2	17.5	69.3	13.2	8.0	.3	.2	.2	.2	16.6	53.4	15.9		.9		61	13	.44
157-236	CR	8.4	77.6	14.0	6.8	.1	.1	.1	.3	7.8	55.3	22.3		.6		49	14	.49

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20	20-5	5-2	LT .074 PCT LT 75	4A1D 20-2 1/3- BAR LT20	4A1M OVEN DRY G/CC	4D1 COLE G/CC	BULK DENSITY 4B1C 1/10 BAR PCT	4B1C 1/3- BAR PCT	WATER CONTENT 4B2 15 BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	8C1A 1/1 H2O	8C1E 1/2 CACL
000-025	TR	0	0	TR	TR		TR	1.40	1.44	.010		14.4	6.5	.11				5.4	4.9
025-041	TR	0	0	TR	TR		TR	1.39	1.51	.028		20.0	8.4	.16				6.0	4.8
041-058	TR	0	0	0	TR		TR	1.41	1.51	.023		17.9	8.2	.14				6.6	6.1
058-079	TR	0	0	TR	TR		TR	1.41	1.51	.023		17.1	8.5	.12				7.1	6.6
079-107	TR	0	0	TR	TR		TR	1.47	1.54	.016		14.7	7.6	.10				7.3	6.7
107-132	TR	0	0	TR	TR		TR	1.55	1.65	.022		17.6	7.8	.16				7.6	6.9
127-132	10	0	0	8	7		15	1.61	1.68	.013		17.2	6.6	.15				7.7	7.0
132-157	TR	0	0	0	TR		TR	1.68	1.76	.016		16.5	5.8	.18		1	0	7.7	7.4
157-236	TR	0	0	1	TR		1	1.7 B					6.8			1	0	7.9	7.3

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA	6Q2D MG	6P2B NA	6Q2B K	SUM EXTB MEQ / 100 G	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
000-025	.68	.070	10	.6		5.7	2.4	.2	.6	8.9	4.7			11.4	.68	2.4	50		78
025-041	.65	.070	9	.7		8.7	3.8	.2	.5	13.2	3.3			14.5	.68	2.3	60		91
041-058	.46	.049	9	.7		8.9	4.4	.3	.4	14.0	1.9			14.4	.70	2.0	62		97
058-079	.35			.7		8.9	5.2	.3	.4	14.8	1.5			14.8	.71	1.7	60		100
079-107	.19			.8		7.9	5.1	.4	.5	13.9	1.0			13.6	.72	1.6	58		102
107-132	.02			.7		7.2	5.4	.4	.5	13.5	1.0			13.1	.69	1.3	55		103
127-132	.09			.8		6.4	4.4	.3	.4	11.5	.5			10.6	.64	1.5	60		108
132-157	.04			1.0			3.6	.3	.3					7.6	.58				
157-236	.01			1.0			5.2	.4	.3					7.9	.56				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM- CM	8C1B PH	8A H2O PCT	NA 5C2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 8A1A EC MMHOS/CM	6N1B CA	6Q1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
									(- - - - - - - - - - MEQ / LITER - - - - - - - - - -)										
000-025																		27	5 C
025-041																			
041-058																			
058-079	3500	7.2	41.0					.26										32	11 C
079-107	3500	7.4	40.6					.27										30	9 C
107-132																			
127-132																			
132-157																			
157-236																			

CLAY MINERALOGY (7A2C).

000-025	MI2	KK2	MT1	QZ1
041-058	MT2	MI2	KK2	
107-132	MT4	MI3	KK3	
127-132	MT3	MI3	KK2	
157-236	MT2	MI2	KK2	

RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MT = MONTMORILLONITE MI = MICA KK = KAOLINITE QZ = QUARTZ.

SAND MINERALOGY (7B1) PLACEMENT: MIXED

000-025	VFNS - RE79	QZ77 FE1 ZR1 FD18 MS1 CL1 SP PO AU HN SO COS1 - RE78 QZ75 FE2 ZR1 FD20 HN1 TM PO RU GS MS AU CL.
041-058	VFNS - RE81	QZ80 FE1 FD16 MS1 TM ZR SP HN CL GN COS1 - RE81 QZ79 FE1 TM1 FD18 MS1 ZR RU HN CL GN.
107-132	VFNS - RE77	QZ76 FE1 FD19 MS1 CL1 HN ZR SP GN COS1 - RE76 QZ74 FE1 ZR1 FD22 MS1 TM SP GN HN EN CL GS DP.
127-132	VFNS - RE75	QZ74 FE1 FD23 MS2 ZR CL DP COS1 - RE76 QZ73 FE2 TM1 FD22 MS1 ZR RU HN CL GN SO EN.
157-236	VFNS - RE68	QZ68 FD15 MS14 CP2 FE CL VR HN DU EP COS1 - RE81 QZ80 FE1 FD14 MS2 CB1 TM ZR RU SP EP CL HN EN.

RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: CL = CHLORITE FD = FELDSPARS GS = GLASS HN = HORNBLENDE MS = MUSCOVITE PO = PLANT OPAL
QZ = QUARTZ TM = TOURMALINE ZR = ZIRCON RU = RUTILE SP = SPHENE AU = AUGITE SO = STAUROLITE
GN = GARNET FE = IRON OXIDES EN = ENSTATITE DP = DIOPSIDE RE = RESISTANT MINERALS
DU = DUMORTIERITE CB = CARBONATE AGGREGATES.

(A) SUBSAMPLE OF GRAVELLY ZONE IN LOWER PART OF C1 HORIZON.
(B) ESTIMATE
(C) BY SOIL MECHANICS LABORATORY, USDA-SCS, LINCOLN, NE.

Pedon classification: Udic Argiustoll, fine-silty, mixed, thermic
Series classification: (Same)
Soil: Grant silt loam
Soil Nos.: S76KS-77-3 (NSSL No. 76P0115 - 76P0123)
Location: Harper County, KS; 400 feet north and 40 feet east of the southwest corner of Sec. 11, T34S, R7W.
Climate: Annual precipitation is about 27.6 inches. Annual temperature is about 58° F., and summer temperature is about 81° F. Average frost-free season is about 198 days.
Vegetation and land use: Wheat stubble. Cropland.
Parent material: Loess over residuum from siltstone.
Physiography: Gently sloping upland.
Topography: Slope gradient about 2 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderate.
Described by: M. J. Mausbach, R. L. Haberman.

(Colors are for dry soil unless otherwise stated.)

Ap 76P0115 0 to 25 cm. (0 to 10 inches). Brown (7.5YR 5/3) silt loam, dark brown (7.5YR 3/3) moist; weak fine granular structure; slightly hard, friable; many fine roots; slightly acid; abrupt smooth boundary.

B1 76P0116 25 to 41 cm. (10 to 16 inches). Brown (7.5YR 5/3) silt loam, dark brown (7.5YR 3/3) moist; weak fine and medium granular structure; slightly hard, friable; many fine roots; krotovinas; slightly acid; gradual smooth boundary.

B21t 76P0117 41 to 58 cm. (16 to 23 inches). Yellowish red (5YR 4/6) silt loam, yellowish red (5YR 3/6) moist; weak medium subangular blocky structure; slightly hard, friable; many fine roots; krotovinas; neutral; gradual smooth boundary.

B22t 76P0118 58 to 79 cm. (23 to 31 inches). Yellowish red (5YR 4/6) silt loam, yellowish red (5YR 3/6) moist; weak coarse prismatic structure parting to moderate medium subangular blocky structure; slightly hard, friable; common fine roots; common worm casts; krotovinas; few medium gravel and coarse sand; neutral; gradual smooth boundary.

B23t 76P0119 79 to 107 cm. (31 to 42 inches). Red (2.5YR 5/7) silt loam, dark red (2.5YR 3/7) moist; weak coarse prismatic structure parting to moderate medium subangular blocky structure; slightly hard, friable; few fine roots; krotovinas; few gravel up to 1 cm. (½ inch) in diameter; few coarse sand grains; neutral; gradual smooth boundary.

C1 76P0120 107 to 132 cm. (42 to 52 inches). Red (2.5YR 5/7) silt loam, dark red (2.5YR 3/7) moist; weak medium granular structure; slightly hard, friable; few fine roots; krotovinas; gravel 6 mm. and smaller in size, in a line 3 cm. (1 inch) to 13 cm. (5 inches) thick in the lower part of horizon; mildly alkaline; gradual smooth boundary.

C2 76P0122 132 to 157 cm. (52 to 62 inches). Red (2.5YR 5/7) weathered siltstone of silt loam texture, dark red (2.5YR 3/7) moist; strata 3 cm. (1 inch) thick of white (10YR 8/2) weathered siltstone of silt loam texture, light gray (10YR 7/2) moist, in the upper part of horizon; weak fine and medium platy structure and massive; slightly hard, friable; few fine roots; mildly alkaline; clear smooth boundary.

Cr 76P0123 157 to 236 cm. (62 to 92 inches). Red (2.5YR 5/7) siltstone.

Remarks: 76P0121 Subsample of gravel taken from base of C1 horizon.

SOIL CLASSIFICATION: Typic Argiustoll; fine, montmorillonitic, mesic

SOIL Harney silt loam LOCATION Osborne County, Kansas

SOIL NOS. S53Kans-71-5 LAB. NOS. 1446-1453

SOIL SURVEY LABORATORY Mandan, North Dakota

GENERAL METHODS 1A, 1B1a, 2A1, 2B

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 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	0.02-0.002	0.2-0.02	> 2	TEXTURAL CLASS
1446	0-6½	Ap	-	0.1	0.1	0.3	8.1	67.4	24.0	19.2	56.5	-	sil
1447	6½-10	B21t	-	-	0.1	0.2	6.3	58.6	34.8	20.0	45.0	-	sicl
1448	10-13	B22t	-	-	-	0.1	3.3	54.8	41.8	21.7	36.5	-	sic
1449	13-21	B23t	-	-	-	-	3.2	62.0	34.8	25.3	39.9	-	sicl
1450	21-28	B3	0.2	0.2	0.1	0.3	3.7	63.4	30.1	25.1	44.2	-	sicl
1451	28-41	C1	0.5	0.2	-	0.2	4.3	67.9	26.9	23.3	47.0	-	sil
1452	41-52	C2	0.2	0.2	0.1	0.4	4.9	68.6	25.6	25.8	48.0	-	sil
1453	52-60+	C3	-	0.1	0.1	0.2	4.8	69.1	25.7	26.0	48.0	-	sil

LABORATORY NUMBER	pH 8C1b SATURATED PASTE	pH 8C1a 1:5	pH 8C1a 1:10	ORGANIC MATTER 6A1a ORGANIC CARBON %	ORGANIC MATTER 6B1a NITROGEN %	ORGANIC MATTER C/N	EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 3 MILLIMHOS PER CM @ 25°C	6E1a CaCO3 equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS (per cent) 1/10 ATMOS.	MOISTURE TENSIONS (per cent) 1/3 ATMOS.	4B2 15 ATMOS.
1446	6.3	6.7	6.8	0.86	0.087	10							10.5
1447	6.5	7.0	7.0	0.85	0.096	9			-				16.7
1448	7.0	7.2	7.4	0.57	0.072	8			-				20.7
1449	7.2	7.6	7.6	0.32	0.048	7			-				17.4
1450	7.7	8.2	8.5	0.15	0.035				1				14.4
1451	7.9	8.6	8.6	0.14	0.030				2				13.4
1452	7.9	8.6	8.9	0.15	0.029				1				13.5
1453	7.8	8.5	8.8	0.18	0.035				1				13.4

LABORATORY NUMBER	5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS 5B1a 6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum	5D2 Base Sat. % on NH_4OAc	SATURATION EXTRACT SOLUBLE K	CO_3	HCO_3	Cl	SO_4	PER CENT MOISTURE AT SATURATION	8D3 Ca/Mg
	milliequivalents per 100g soil							milliequivalents per liter						
1446	18.7	13.0	4.7	0.2	1.1	19.0	102							2.8
1447	25.6	18.6	7.1	0.4	1.1	27.2	106							2.6
1448	31.9	21.9	6.9	0.6	1.2	30.6	96							3.2
1449	26.6		8.1	0.8	1.3									
1450	25.7		7.1	1.3	1.5									
1451	24.5		7.0	2.0	1.8									
1452	24.3		6.2	2.6	1.8									
1453	24.8		5.6	2.9	1.7									

AGR-SCS-BELTSVILLE, MD 2682 JUNE 1963

Pedon classification: Typic Argiustoll, fine, montmorillonitic, mesic
Series classification: (Same)
Soil: Harney silt loam
Soil Nos.: S53KS-71-5 (Sample Nos. 1446-1453)
Location: Osborne County, KS; 200 feet east and 260 feet south of the northwest corner of Sec. 15, T7S, R12W.
Climate: Annual precipitation is about 23½ inches. Annual temperature is about 54° F., and summer temperature is about 79° F. Average frost-free season is about 171 days.
Vegetation and land use: Fallow. Cropland.
Parent material: Loess.
Physiography: Gently sloping high terrace.
Topography: Slope gradient about 2 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: W. M. Johnson.

(Colors are for dry soil unless otherwise stated.)

Ap 1446 0 to 16 cm. (0 to 6½ inches). Grayish brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) moist; sand grains are stained brown (10YR 5/3); moderate very fine granular structure; soft, friable.

B21t 1447 16 to 25 cm. (6½ to 10 inches). Mixed dark grayish brown (10YR 4/2) and brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) and very dark brown (10YR 2/2) moist; sand grains are stained brown (10YR 5/3); moderate medium and coarse granular structure; slightly hard, friable; many roots.

B22t 1448 25 to 33 cm. (10 to 13 inches). Brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; sand grains are stained brown (10YR 5/3); moderate medium prismatic structure parting to weak medium blocky and moderate very fine blocky structure; hard, friable; thin coatings on faces of peds; many roots.

B23t 1449 33 to 53 cm. (13 to 21 inches). Pale brown (10YR 6/3) silty clay loam, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parting to strong medium and fine blocky structure; hard, friable; thin coatings on faces of peds; many roots.

B3 1450 53 to 71 cm. (21 to 28 inches). Pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak medium subangular blocky structure; slightly hard, friable; few roots; few fine white specks of calcium carbonate.

C1 1451 71 to 104 cm. (28 to 41 inches). Pale brown (10YR 6/3) light silty clay loam, brown (10YR 5/3) moist; weak fine blocky structure; slightly hard, friable; few roots; few fine white spots and threads of lime; slight effervescence.

C2 1452 104 to 132 cm. (41 to 52 inches). Pale brown (10YR 6/3) light silty clay loam or light clay loam, brown (10YR 5/3) moist; weak fine blocky structure; slightly hard, friable; few fine white spots and threads of lime; slight effervescence.

C3 1453 132 to 153 cm. (52 to 60 inches). Pale brown (10YR 6/3) light silty clay loam, brown (10YR 5/3) moist; massive; slightly hard, friable; few very fine white spots and threads of lime; slight effervescence.

SOIL CLASSIFICATION-TYPIC ARGIUSTOLL
FINE, MONTMORILLONITIC, MESIC
SERIES - - - - - - - HARNEY SILT LOAM

SOIL NO - - - - - - S68KANS-26-8 COUNTY - - - ELLIS

GENERAL METHODS- - - 1A, 1B1B, 2A1, 2B SAMPLE NOS.- 68L355-68L364

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - FINE SAND									SILT			FAML	INTR	FINE	NON-	RATIO 8D1
		SAND 2-.05	SILT .05-.002	CLAY LT .002	CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	TEXT SAND 2-.1	II .2-.02	CLAY TO CLAY	CO3- CLAY	15-BAR TO CLAY
CM		PCT LT 2MM														PCT	PCT	
000-10	AP	7.3	70.2	22.5		0.1	0.4	0.4	0.4	6.0	49.3	20.9		1.3	55.5		23	0.44
010-15	A12	6.6	65.4	28.0		0.2	0.4	0.4	0.4	5.3	50.1	15.3		1.3	55.6		28	0.43
015-25	A3	6.0	62.5	31.5		0.1	0.4	0.4	0.4	4.8	47.8	14.7		1.2	52.7		32	0.42
025-48	B21T	6.7	60.7	32.6		0.1	0.2	0.2	0.3	5.8	40.3	20.4		0.8	46.4		33	0.44
048-76	B22T	7.7	54.5	37.8		0.1	0.2	0.1	0.3	7.0	35.7	18.8		0.7	42.9		38	0.44
076-102	B3CA	6.3	57.8	35.9		0.5	0.4	0.2	0.3	5.0	45.5	12.3		1.3	50.7		36	0.43
102-122	C1CA	5.8	60.2	34.0		0.4	0.5	0.2	0.4	4.4	37.2	23.0		1.3	41.8		34	0.43
122-150	C2CA	5.5	63.0	31.5		0.3	0.4	0.2	0.5	4.2	37.5	25.5		1.3	41.9		32	0.46
150-188	C3CA	5.3	66.6	28.1		0.3	0.3	0.1	0.4	4.2	40.1	26.5		1.0	44.5		28	0.52
048-53	(A)																	

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2 - VOL. GT 2	WEIGHT GT 75	75-20	20-5	5-2	LT .074	20-2	BULK DENSITY 4A1D 1/3-BAR	4A1H OVEN DRY	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR	4B1C 1/3-BAR	4B2 15-BAR	4C1 WRD	4B2 100-BAR	CARBONATE 6E1B LT 2	3A1A LT .002	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	PCT LT 75				LT2O	G/CC	G/CC		BAR PCT	PCT	PCT	CM/CM	PCT	PCT	PCT			
								(B)												
000-10	TR	0	0	0	TR	98	TR	1.10					9.9			ST		7.4	
010-15	TR	0	0	0	TR	98	TR	1.20					12.0			0		7.2	
015-25	TR	0	0	0	TR	99	TR	1.34	1.47	0.031		27.7	13.3	0.19		0		7.1	
025-48	0	0	0	0	0	99	0	1.41	1.61	0.045		25.0	14.3	0.15		0		7.3	
048-76	0	0	0	0	0	99	0	1.49	1.83	0.071		25.6	16.5	0.14	11.4	0		7.3	
076-102	0	0	0	0	0	98	0	1.48	1.67	0.041		24.6	15.5	0.13		2	0	8.0	
102-122	0	0	0	0	0	98	0	1.50				14.5				2	0	8.2	
122-150	TR	0	0	0	TR	99	TR	1.37	1.48	0.026		26.5	14.5	0.16		1	0	8.2	
150-188	TR	0	0	0	TR	99	TR	1.40					14.6			1	0	8.0	
048-53													18.2					7.6	

DEPTH	ORGANIC MATTER 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2A EXT FE	PHOS 6S1A TOTL	EXTRACTABLE BASES 5B4A- 6N2E CA	6D2D MG	6P2A NA	6Q2A K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1D KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO	RATIO 8D3 CA TO	CA SAT NHAC	(BASE SAT) 5C3 EXTH ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	MEQ / 100 G									CLAY	MG	PCT	PCT	PCT
	(C)					(D)									(D)				
000-10	1.26					15.3	2.3	0.1	1.5	19.2	1.9		21.1	18.8	0.84	6.7	81	91	102
010-15	1.09					15.3	3.1	0.2	1.0	19.6	2.8		22.4	21.0	0.75	4.9	73	88	93
015-25	0.98					16.9	3.6	0.2	1.0	21.7	3.0		24.7	23.1	0.73	4.7	73	88	94
025-48	0.53					17.0	4.8	0.4	1.0	23.2	2.5		25.7	24.0	0.74	3.5	71	90	97
048-76	0.32					19.6	6.2	0.8	1.3	27.9	1.6		29.5	27.5	0.73	3.2	71	95	101
076-102	0.19					19.3	4.9	1.2	1.3					26.7	0.74				
102-122	0.16					19.3	4.6	1.7	1.4					27.3	0.80				
122-150	0.12					19.6	4.6	2.3	1.5					27.9	0.89				
150-188	0.12					19.9	4.6	2.8	1.5					27.5	0.98				
048-53	0.38																		

DEPTH	SATURATED PASTE 8C1 REST OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	SATURATION EXTRACT 8A1- EC 8A1A	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/CM	MEQ / LITER									PCT	
000-10																			
010-15																			
015-25																			
025-48																			
048-76																			
076-102																			
102-122	1600	7.5	57.6			210		0.57											
122-150																			
150-188																			
048-53																			

(A) UPPER B22T HORIZON
(B) BULK DENSITY ESTIMATED FOR HORIZONS FROM 0-15, 102-122, AND 150-188 CM
(C) ORGANIC CARBON IS 7 KG PER SW M TO A DEPTH OF 1 METER (METHOD 6A)
(D) METHODS 6N4C FOR CA AND 6O4C FOR MG APPLY TO HORIZONS BELOW 76 CM

Pedon classification: Typic Argiustoll, fine, montmorillonitic, mesic
Series classification: (Same)
Soil: Harney silt loam
Soil Nos.: S68KS-26-8 (Sample Nos. 355-364)
Location: Ellis County, KS; 1,000 feet west and 150 feet south of the northeast corner of Sec. 34, T12S, R18W.
Climate: Annual precipitation is about 23 inches. Annual temperature is about 54° F., and summer temperature is about 78° F. Average frost-free season is about 171 days.
Vegetation and land use: Wheat stubble. Cropland.
Parent material: Loess.
Physiography: Nearly level upland.
Topography: Nearly plane slope. Slope gradient less than 1 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: R. F. Harner, C. W. McBee.

(Colors are for dry soil unless otherwise stated.)

Ap 355 0 to 10 cm. (0 to 4 inches). Grayish brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) moist; weak granular structure; soft, friable; many fine roots; abrupt smooth boundary.

A12 356 10 to 15 cm. (4 to 6 inches). Dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak thin platy and weak granular structure; slightly hard, friable; many fine roots; few worm casts; clear smooth boundary.

A3 357 15 to 25 cm. (6 to 10 inches). Dark grayish brown (10YR 4/2) light silty clay loam, very dark brown (10YR 2/2) moist; moderate medium and fine subangular blocky structure; hard, friable; few fine roots; few worms casts; clear smooth boundary.

B21t 358 25 to 48 cm. (10 to 19 inches). Grayish brown (10YR 5/2) heavy silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine subangular blocky structure; hard, firm; few fine roots; clear smooth boundary.

B22t 359 48 to 76 cm. (19 to 30 inches). Grayish brown (10YR 5/2) light silty clay, dark grayish brown (10YR 4/2) moist; moderate medium and fine blocky structure; very hard, firm; shiny surfaces on faces of peds; clear smooth boundary.

B3ca 360 76 to 102 cm. (30 to 40 inches). Light brownish gray (10YR 6/2) heavy silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic parting to moderate medium blocky structure; hard, friable; many carbonate concretions; strong effervescence; gradual smooth boundary.

C1ca 361 102 to 122 cm. (40 to 48 inches). Light brownish gray (10YR 6/2) light silty clay loam, grayish brown (10YR 5/2) moist; weak coarse prismatic parting to weak medium blocky structure; slightly hard, friable; many carbonate concretions; strong effervescence; diffuse smooth boundary.

C2ca 362 122 to 150 cm. (48 to 59 inches). Light brownish gray (10YR 6/2) light silty clay loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure; slightly hard, friable; many carbonate concretions; strong effervescence; diffuse smooth boundary.

C3ca 363 150 to 188 cm. (59 to 74 inches). Light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable; thin films of lime and common carbonate concretions.

Remarks: Silty sediments with color of higher chroma and redder hue believed to be loess of Loveland age at 218 cm. (86 inches).
Subsample 364 collected from 48 to 53 cm. (19 to 21 inches).

SOIL CLASSIFICATION-TYPIC ARGIUSTOLL
FINE, MONTMORILLONITIC, MESIC
SERIES - - - - - - - HARNEY SILT LOAM

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S68KANS-26-10 COUNTY - - - ELLIS

GENERAL METHODS- - - 1A, 1B1B, 2A1, 2B SAMPLE NOS.- 68L365-68L372

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B																RATIO
					FINE	SAND					SILT			FAML	INTR	FINE	NON-	8C1
		SAND 2- .05	SILT .05- .002	CLAY LT .002	CLAY LT .0002	VCOS 2- 1	CORS 1- .5	MEDS .5- .25	FNES .25- .10	VFNS .10- .05	COSI .05 .02	FNSI .02 .002	VFSI .005- .002	TEXT SAND 2-.1	II .2- .02	CLAY TO CLAY	CO3- CLAY	15- BAR
CM		PCT LT 2MM														PCT	PCT	TO CLAY
000-13	AP	6.7	66.4	26.9	16.5	0.1	0.4	0.4	0.6	5.3	43.8	22.6		1.4	49.4	61	27	0.40
013-18	A12	5.8	61.9	32.3	22.6	0	0.3	0.3	0.6	4.6	40.0	21.9		1.1	45.0	70	32	0.42
018-30	B21t	5.4	56.6	38.0		0.1	0.2	0.3	0.6	4.2	35.8	20.8		1.2	40.3		38	0.42
030-43	B22t	5.2	52.8	42.0	36.5	0.1	0.2	0.3	0.5	4.2	32.0	20.8		1.0	36.3	87	42	0.41
043-64	B23t	4.6	54.3	41.1	27.6	0.1	0.1	0.2	0.3	3.9	31.8	22.5		0.6	35.8	67	41	0.44
064-91	B3ca	5.3	62.3	32.4	6.1	0.4	0.3	0.2	0.4	4.0	34.6	27.7		1.2	38.7	19	32	0.47
091-135	C1ca	4.5	65.8	29.7	6.7	0.1	0.2	0.1	0.4	3.7	39.2	26.6		0.8	43.2	23	30	0.49
135-183	C2	5.0	69.3	25.7	2.3	0.0	0.2	0.1	0.3	4.4	44.0	25.3		0.6	48.6	9	26	0.55

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2 VOL.	WEIGHT					BULK DENSITY			WATER CONTENT				CARBONATE		PH	
	GT 2	GT 75	75-20	20-5	5-2	LT .074	20-2	4A1D 1/3- BAR	4A1H OVEN DRY	4D1 COLE	4B1C 1/10 BAR	4B1C 1/3- BAR	4B2 15- BAR	4C1 WRO CM/ CM	4B2 100- BAR	6E1B LT 2	3A1A LT .002	8C1A 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	PCT LT 75				LT20 PCT	G/CC	G/CC		PCT	PCT	PCT		PCT	PCT	PCT		
							(A)												
000-13	TR	0	0	0	TR	98	TR	1.20					10.8		7.2	0		6.6	
013-18	TR	0	0	0	TR	99	TR	1.40					13.7			0		6.6	
018-30	TR	0	0	0	TR	99	TR	1.37	1.60	0.053		26.5	15.9	0.15		0		6.5	
030-43	TR	0	0	0	TR	99	TR	1.37	1.74	0.083		28.4	17.3	0.15		0		6.9	
043-64	TR	0	0	0	TR	99	TR	1.45	1.77	0.069		26.5	18.0	0.12	11.5	ST	0	7.1	
064-91	0	0	0	0	0	98	0	1.40					15.2			5	TR	7.9	
091-135	0	0	0	0	0	99	0	1.33	1.43	0.024		25.6	14.6	0.15	10.2	1	0	7.8	
135-183	0	0	0	0	0	99	0	1.30	1.36	0.015		27.3	14.2	0.17	10.0	1	0	7.8	

DEPTH	ORGANIC MATTER 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2A EXT FE	PHOS 6S1A TOTL	EXTRACTABLE BASES 5B4A- 6N2E CA	6O2D MG	6P2A NA	6Q2A K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1D KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA SAT NHAC PCT	(BASE SAT) 5F 5C3 EXTB ACTY PCT	5C1 NHAC PCT
CM	PCT	PCT		PCT	PCT	MEQ / 100 G													
	(B)					(C)	(C)												
000-13	1.41	0.126	11	0.6		15.3	3.3	0.1	1.6	20.3	3.2		23.5	21.0	0.78	4.6	73	86	97
013-18	1.23	0.124	10	0.7		16.9	3.9	0.2	1.2	22.2	3.7		25.9	24.2	0.75	4.3	70	86	92
018-30	0.99	0.109	9	0.8		20.1	5.1	0.3	1.1	26.6	3.6		30.2	27.9	0.73	3.9	72	88	95
030-43	0.76	0.085	9	0.8		21.2	5.6	0.4	1.2	28.4	3.0		31.4	29.6	0.70	3.8	72	90	96
043-64	0.53	0.069	8	1.0		21.7	6.3	0.6	1.4	30.0	1.9		31.9	30.5	0.74	3.4	71	94	98
064-91	0.26			0.7		20.2	5.2	1.1	1.4					26.9	0.83				
091-135	0.19			0.8		19.1	4.6	2.2	1.5					27.0	0.91				
135-183	0.19			0.7		19.1	4.6	2.9	1.6					26.3	1.02				

DEPTH	(SATURATED PASTE) 8E1 REST OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	SATURATION EXTRACT 8A1- 8A1A EC	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/ CM	MEQ / LITER									PCT	
000-13																		33	11
013-18																			
018-30	1900	6.3	58.5			160		0.42											
030-43																			
043-64																		50	17
064-91																			
091-135	1000	7.5	55.0	1		470		1.30			7.6							40	14
135-183																			

(A) BULK DENSITY ESTIMATED FOR HORIZONS FROM 0-18 AND 64-91 CM.
(B) ORGANIC CARBON IS 9 KG PER SQ M TO A DEPTH OF 1 METER (METHOD 6A)
(C) METHODS 6N4C FOR CA AND 6O4C FOR MG APPLY TO HORIZONS BELOW 64 CM

Pedon classification: Typic Argiustoll, fine, montmorillonitic, mesic
Series classification: (Same)
Soil: Harney silt loam
Soil Nos. S68KS-26-10 (Sample Nos. 365-372)
Location: Ellis County, KS; 400 feet south and 1,600 feet west of the northeast corner of Sec. 5, T14S, R17W.
Climate: Annual precipitation is about 23 inches. Annual temperature is about 54° F., and summer temperature is about 78° F. Average frost-free season is about 171 days.
Vegetation and land use: Wheat stubble. Cropland.
Parent material: Loess.
Physiography: Nearly level upland.
Topography: Nearly plane slope. Slope gradient less than 1 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: R. F. Harner, C. W. McBee.

(Colors are for dry soil unless otherwise stated.)

Ap 365 0 to 13 cm. (0 to 5 inches). Grayish brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; many fine roots; abrupt smooth boundary.

A12 366 13 to 18 cm. (5 to 7 inches). Dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak thin platy and weak granular structure; hard, friable; many fine roots; few worm casts; clear smooth boundary.

B21t 367 18 to 30 cm. (7 to 12 inches). Dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; moderate fine and very fine subangular blocky structure; hard, firm; few fine roots; few worm casts; clear smooth boundary.

B22t 368 30 to 43 cm. (12 to 17 inches). Grayish brown (10YR 5/2) light silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine and very fine blocky structure; very hard, firm; few fine roots; shiny surfaces on faces of peds; few pockets of worm casts; clear smooth boundary.

B23t 369 43 to 64 cm. (17 to 25 inches). Grayish brown (10YR 5/2) light silty clay, dark grayish brown (10YR 4/2) moist; weak coarse prismatic parting to moderate fine and medium blocky structure; very hard, firm; few fine roots; shiny surfaces on faces of peds; few pockets of worm casts; clear smooth boundary.

B3ca 370 64 to 91 cm. (25 to 36 inches). Pale brown (10YR 6/3) silty clay loam, grayish brown (10YR 5/2) moist; moderate medium prismatic parting to weak medium blocky structure; hard, friable; very few fine roots; common carbonate concretions and threads; strong effervescence; diffuse smooth boundary.

C1ca 371 91 to 135 cm. (36 to 53 inches). Pale brown (10YR 6/3) light silty clay loam, brown (10YR 5/3) moist; coarse prismatic parting to weak medium blocky structure; slightly hard, friable; very few fine roots; common carbonate concretions and threads and films of carbonates; horizon contains one burrow about 15 cm. (6 inches) in diameter filled with darker colored (10YR 3/2 and 10YR 4/2) moist material; strong effervescence; diffuse smooth boundary.

C2 372 135 to 183 cm. (53 to 72 inches). Very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; segregated lime in form of threads and films oriented vertically following root channels and structural faces; strong effervescence.

Remarks: Few coarse particles in 30 to 64 cm. (12 to 25 inch) zone. Most are less than 3 mm. in diameter. Particles seem to be quartz.

Silty sediments with color of higher chroma and redder hue believed to be Loveland age loess at 208 cm. (82 inches).

SOIL CLASSIFICATION-TYPIC ARGIUSTOLL
FINE, MONTMORILLONITIC, MESIC

SERIES - - - - - - - HARNEY SILT LOAM

SOIL NO - - - - - - S68KANS-26-14 COUNTY - - - ELLIS

GENERAL METHODS- - - 1A, 1B1B, 2A1, 2B SAMPLE NOS.- 68L424-68L431

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO	
		SAND 2- .05	SILT .05- .002	CLAY LT .002	FINE SAND LT CLAY .0002	VCOS 2- 1	CORS 1- .5	MEDS .5- .25	FNES .25- .10	VFNS .10- .05	COSI .05 .02	FNSI .02 .002	VFSI .005- .002	FAML TEXT SAND 2-.1	INTR II .2- .02	FINE CLAY TO CLAY	NON- CO3- CLAY	8D1 15- BAR TO CLAY
CM		PCT LT 2MM														PCT	PCT	
000-15	A1																	
015-23	B1																	
023-33	B21T																	
033-64	B22T																	
064-86	B3CA																	
086-107	C1CA																	
107-122	C2CA																	
122-152	C3CA																	

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2	GT 75	WEIGHT 75-20	20-5	5-2	LT .074	20-2	(BULK DENSITY 4A1D 1/3- BAR	4A1H OVEN DRY	4D1 COLE	(-WATER CONTENT- 4B1C 1/10 BAR	4B1C 1/3- BAR	4B2 15- BAR	4C1 WRD CM/ CM	CARBONATE 6E1B LT 2	3A1A LT .002	(-PH- 8C1A 1/1 H2O	8C1B 1/2 CACL
CM	PCT	PCT	PCT LT 75				LT20	G/CC (A)	G/CC		PCT	PCT	PCT	CM	PCT	PCT		
000-15	0	0	0	0	0		0	1.25	1.38	0.034		30.4	12.0	0.23			7.0	
015-23	0	0	0	0	0		0	1.31	1.50	0.046		27.9	12.0	0.21			6.6	
023-33	0	0	0	0	0		0	1.28	1.51	0.057		30.6	13.8	0.22			6.4	
033-64	0	0	0	0	0		0	1.34	1.59	0.059		26.6	14.4	0.16			7.2	
064-86	0	0	0	0	0		0	1.35	1.55	0.047		25.4	14.0	0.15			7.8	
086-107	0	0	0	0	0		0	1.30	1.42	0.030		24.3	13.4	0.14			8.0	
107-122	TR	0	0	0	TR		TR	1.20					13.3				8.0	
122-152	TR	0	0	0	TR		TR	1.23	1.35	0.032		32.9	13.3	0.24			8.1	

DEPTH	(ORGANIC MATTER 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2A EXT FE	PHOS 6S1A TOTL	(-EXTRACTABLE BASES 5B4A- 6N2E CA	6O2O MG	6P2A NA	6Q2A K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1D KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO	RATIO 8D3 CA TO	CA 5F SAT NHAC	(BASE SAT) 5C3 EXTB ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	MEQ / 100 G									CLAY	MG	PCT	PCT	PCT
000-15																			
015-23																			
023-33																			
033-64																			
064-86																			
086-107																			
107-122																			
122-152																			

DEPTH	(SATURATED PASTE) 8E1 REST OHM-	8C1B PH	8A H2O	NA 5O2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	(-SATURATION EXTRACT 8A1- 8A1A EC	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/ CM	(- - - - - - - - - - MEQ / LITER - - - - - - - - - -)									PCT	
000-15																			
015-23																			
023-33																			
033-64																			
064-86																			
086-107																			
107-122																			
122-152																			

(A) BULK DENSITY ESTIMATED FOR HORIZON FROM 107-122 CM

Pedon classification: Typic Argiustoll, fine, montmorillonitic, mesic
Series classification: (Same)
Soil: Harney silt loam
Soil Nos.: S68KS-26-14 (Sample Nos. 424-431)
Location: Ellis County, KS; 700 feet east and 200 feet south of the northwest corner of Sec. 1, T14S, R19W.
Climate: Annual precipitation is about 23 inches. Annual temperature is about 54° F., and summer temperature is about 78° F. Average frost-free season is about 171 days.
Vegetation and land use: Mid grass. Rangeland.
Parent material: Loess.
Physiography: Gently sloping erosional upland.
Topography: Slightly convex slope. Slope gradient of about 2 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: J. M. Allen, R. K. Glover.

(Colors are for dry soil unless otherwise stated.)

A1 424 0 to 15 cm. (0 to 6 inches). Dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate medium granular structure with strong fine granular in 2 to 4 cm. (1 to 1.5 inch) zone; slightly hard, friable; many fine roots; gradual smooth boundary.

B1 425 15 to 23 cm. (6 to 9 inches). Brown (10YR 4/3) light silty clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; hard, friable; many fine roots; few worm casts; gradual smooth boundary.

B21t 426 23 to 33 cm. (9 to 13 inches). Brown (10YR 5/3) heavy silty clay loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; very hard, firm; common fine roots; gradual smooth boundary.

B22t 427 33 to 64 cm. (13 to 25 inches). Grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium prismatic parting to moderate fine and medium subangular blocky structure; very hard, firm; common fine roots; gradual smooth boundary.

B3ca 428 64 to 86 cm. (25 to 34 inches). Light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; moderate medium prismatic parting to moderate medium blocky structure; very hard, friable; common fine roots and few coarse roots; segregated lime in thin films on faces of peds; strong effervescence; gradual smooth boundary.

C1ca 429 86 to 107 cm. (34 to 42 inches). Pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak very coarse prismatic structure; slightly hard, friable; few very fine and coarse roots; common thin films of segregated lime; violent effervescence; diffuse smooth boundary.

C2ca 430 107 to 122 cm. (42 to 48 inches). Pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak very coarse prismatic structure; soft, very friable; very porous, few fine roots; few thin films of segregated lime; strong effervescence.

C3ca 431 122 to 152 cm. (48 to 60 inches). Continuation of above horizon.

Remarks: This location is one of the sites being used for soil moisture study being conducted by Ft. Hays Kansas State College personnel.

SOIL CLASSIFICATION: Pachic Argiustoll; fine, montmorillonitic, mesic

SOIL Harney silt loam taxadjunct LOCATION Osborne County, Kansas

SOIL NOS. S53Kans-71-3 LAB. NOS. 1431-1438

SOIL SURVEY LABORATORY Mandan, North Dakota

GENERAL METHODS 1A, 1B1a, 2A1, 2B

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	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	0.02-0.002	0.2-0.02	> 2	
1431	0-3½	Ap1	-	0.1	0.2	1.4	8.5	67.0	22.8	15.7	61.0	-	sil
1432	3½-8	Ap2	-	0.1	0.1	1.7	8.9	64.8	24.4	15.5	59.8	-	sil
1433	8-15	A13	-	0.1	0.1	0.9	5.9	66.2	26.8	19.5	53.4	-	sil
1434	15-20	B21t	-	0.1	0.1	0.5	4.9	59.7	34.7	18.2	46.8	-	sicl
1435	20-29	B22t	-	0.2	0.2	1.2	3.4	56.2	38.8	20.2	40.4	-	sicl
1436	29-40	B23t	-	0.4	0.4	1.4	5.0	57.1	35.7	19.9	43.3	-	sicl
1437	40-51	B3	0.2	0.6	0.6	1.1	6.2	56.1	35.2	20.3	42.7	-	sicl
1438	51-60+	Cca	0.1	0.3	0.4	0.8	8.4	54.5	35.5	19.6	43.8	-	sicl

	pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 3 MILLIMHOS PER CM @ 25°C	6E1a CaCO3 equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS		
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					1/10 ATMOS.	(per cent) 1/3 ATMOS.	4B2 15 ATMOS.
1431	7.1	7.4	7.5	0.96	0.091	11			-				9.0
1432	6.6	7.0	7.1	0.96	0.090	11			-				9.8
1433	6.5	7.0	7.0	1.02	0.104	10			-				12.4
1434	6.9	7.3	7.4	0.68	0.077	9			-				15.2
1435	7.0	7.3	7.4	0.49	0.063	8			-				16.6
1436	7.1	7.5	7.5	0.40	0.064	6			-				14.8
1437	7.3	7.5	7.6	0.32	0.054	6			-				14.2
1438	7.5	7.9	8.0	0.19	0.036				-				15.6

	5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS 5B1a					5D2 Base Sat. % on NH_4OAc	SATURATION EXTRACT SOLUBLE					PER CENT MOISTURE AT SATURATION	8D3 Ca/Mg
		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum		K	CO_3	HCO_3	Cl	SO_4		
	← milliequivalents per 100g soil →							← milliequivalents per liter →						
1431	18.2	14.8	3.9	0.2	1.1	20.0	110							3.8
1432	18.2	13.7	3.5	0.1	0.9	18.2	100							3.9
1433	21.1	15.8	4.8	0.4	0.7	21.7	103							3.3
1434	24.3	18.9	5.4	0.2	0.8	25.3	104							3.5
1435	25.6	19.9	6.7	0.4	0.8	27.8	109							3.0
1436	24.1	18.5	6.0	0.4	0.8	25.7	107							3.1
1437	23.6	18.0	6.3	0.4	0.8	25.5	108							2.8
1438	25.1	20.2	7.0	0.4	0.8	28.4	113							2.9

AGR-SCS BELTSVILLE, MD 2662 JUNE 1953

Pedon classification: Pachic Argiustoll, fine, montmorillonitic, mesic
Series classification: Typic Argiustoll, fine, montmorillonitic, mesic
Soil: Harney silt loam taxadjunct*
Soil Nos.: S53KS-71-3 (Sample Nos. 1431-1438)
Location: Osborne County, KS; 450 feet west and 70 feet north of the southeast corner of Sec. 20, T7S, R13W.
Climate: Annual precipitation is about 23½ inches. Annual temperature is about 54° F., and summer temperature is about 79° F. Average frost-free season is about 171 days.
Vegetation and land use: Wheat. Cropland.
Parent material: Loess.
Physiography: Gently sloping high terrace.
Topography: Slope gradient about 2 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: W. M. Johnson.

(Colors are for dry soil unless otherwise stated.)

Ap1 1431 0 to 9 cm. (0 to 3½ inches). Gray (10YR 5/1) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; abrupt clear boundary.

Ap2 1432 9 to 20 cm. (3½ to 8 inches). Dark gray (10YR 4/1) silt loam, very dark grayish brown (10YR 3/2) moist; light gray (10YR 7/2) silt coats and films in lower 3 cm. (1 inch); weak fine granular structure; with some slight compaction through cultivation; slightly hard, friable; abrupt clear boundary.

A13 1433 20 to 38 cm. (8 to 15 inches). Dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; prismatic parting to moderate medium and coarse granular structure; slightly hard, friable; many fine roots; many worm casts; gradual smooth boundary.

B21t 1434 38 to 51 cm. (15 to 20 inches). Dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate fine and very fine blocky structure; slightly hard, friable; many fine roots; gradual smooth boundary.

B22t 1435 51 to 74 cm. (20 to 29 inches). Brown (10YR 5/3) heavy silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to strong medium and fine blocky structure; slightly hard, friable; few fine roots; gradual smooth boundary.

B23t 1436 74 to 102 cm. (29 to 40 inches). Dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; strong medium and fine blocky structure; slightly hard, friable; few fine roots; gradual smooth boundary.

B3 1437 102 to 130 cm. (40 to 51 inches). Dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse blocky structure; slightly hard, friable; few fine roots; diffuse wavy boundary.

Cca 1438 130 to 152 cm. (51 to 60 inches). Brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; yellowish brown (10YR 5/6) films on faces of peds; weak fine and medium subangular blocky structure; few small carbonate concretions; slight effervescence.

*In addition the soils are leached to a depth of over 30 inches.

SOIL CLASSIFICATION: Pachic Argiustoll; fine, montmorillonitic, mesic

SOIL Hastings silt loam taxadjunct LOCATION Cloud County, Kansas

SOIL NOS. S53Kans-15-2 LAB. NOS. 2054-2061

SOIL SURVEY LABORATORY Mandan, North Dakota

GENERAL METHODS 1A, 1B1a, 2A1, 2B

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1									2A1	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	0.02-0.002	0.2-0.02	> 2	
2054	0-6	Ap	0.1	0.1	0.6	1.6	25.4	57.5	14.7	12.1	71.6	-	sil
2055	6-10	A12	-	0.1	0.1	0.4	15.0	61.0	23.4	17.4	58.7	-	sil
2056	10-17	B1	-	-	-	0.4	10.7	59.8	29.1	19.3	51.6	-	sicl
2057	17-23	B21t	-	-	-	0.1	5.1	54.4	40.4	21.9	37.7	-	sic
2058	23-35	B22t	-	-	-	-	5.6	55.1	39.3	22.9	37.8	-	sicl
2059	35-43	B31	-	-	-	-	5.1	59.6	35.3	25.4	39.3	-	sicl
2060	43-56	B32	-	-	-	-	4.3	62.7	33.0	27.0	40.0	-	sicl
2061	56-61	B33	-	-	-	-	5.0	63.8	31.2	27.8	41.0	-	sicl

LABORATORY NUMBER	pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 3 MILLIMHOS PER CM @ 25°C	6E1a CaCO3 equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS		
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					1/10 ATMOS.	(per cent) 1/3 ATMOS.	4B2 15 ATMOS.
2054	6.0	6.2	6.2	0.96	0.089	11			-				6.5
2055	6.1	6.2	6.3	1.09	0.105	10			-				10.1
2056	6.3	6.5	6.5	1.11	0.108	10			-				12.4
2057	6.2	6.4	6.6	0.74	0.083	9			-				17.1
2058	6.4	6.6	6.7	0.38	0.051	7			-				17.0
2059	6.4	7.0	7.0	0.22	0.041				-				16.3
2060	6.9	7.2	7.2	0.16	0.040				-				15.3
2061	7.4	7.9	8.0	0.14	0.032				-				14.8

LABORATORY NUMBER	5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS 5B1a					5D2 Base Sat. % on NH_4OAc	SATURATION EXTRACT SOLUBLE					PER CENT MOISTURE AT SATURATION
		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum		K	CO_3	HCO_3	Cl	SO_4	
	milliequivalents per 100g soil							milliequivalents per liter					
2054	12.7	7.8	2.2	0.1	0.9	11.0	94						
2055	18.2	13.4	3.2	0.1	0.8	17.5	96						
2056	21.5	14.4	3.8	0.2	0.7	19.1	89						
2057	26.9	18.4	5.4	0.2	1.1	25.1	93						
2058	27.4	19.1	6.1	0.2	1.2	26.6	97						
2059	26.4	18.9	6.1	0.4	1.2	26.6	101						
2060	25.8	18.9	5.7	0.4	1.4	26.4	102						
2061	25.8	22.7	5.5	0.4	1.3	29.9	116						

AGR-SCS-BELTSVILLE MD 2682 JUNE 1953

Pedon classification: Pachic Argiustoll, fine, montmorillonitic, mesic
Series classification: Udic Argiustoll, fine, montmorillonitic, mesic
Soil: Hastings silt loam taxadjunct *
Soil Nos.: S53KS-15-2 (Sample Nos. 2054-2061)
Location: Cloud County, KS; 2,040 feet west and 1,000 feet south of the northeast corner of Sec. 16, T5S, R3W.
Climate: Annual precipitation is about 26 inches. Annual temperature is about 54° F., and summer temperature is about 78° F. Average frost-free season is about 177 days.
Vegetation and land use: Recently plowed alfalfa field. Cropland.
Parent material: Loess.
Physiography: Gently sloping high terrace.
Topography: Plane slope. Slope gradient about 1 percent.
Drainage: *Well drained.*
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: W. M. Johnson.

(Colors are for dry soil unless otherwise stated.)

Ap 2054 0 to 15 cm. (0 to 6 inches). Dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, *friable*; many *fine roots*; *pH 5.0*; *abrupt smooth* boundary.

A12 2055 15 to 25 cm. (6 to 10 inches). Dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium platy structure in the upper 2.5 cm. (1 inch) and weak fine granular structure below; soft, friable; many fine roots; few worm casts; pH 6.5; clear smooth boundary.

B1 2056 25 to 43 cm. (10 to 17 inches). Dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate fine granular structure; soft, friable; common fine roots; many worm casts; pH 6.5; clear smooth boundary.

B21t 2057 43 to 58 cm. (17 to 23 inches). Brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate very fine blocky structure; firm; prominent clay films on faces of peds; few fine roots; few worm casts; pH 6.5; clear smooth boundary.

B22t 2058 58 to 89 cm. (23 to 35 inches). Yellowish brown (10YR 5/4) heavy silty clay loam, dark brown (10YR 4/3) moist; strong medium prismatic structure parting to moderate fine and very fine blocky structure; firm; prominent clay films on faces of peds; few fine roots; few worm casts; pH 6.5; gradual smooth boundary.

B31 2059 89 to 109 cm. (35 to 43 inches). Pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to strong medium and fine blocky structure; friable; porous; thick prominent clay films on faces of peds; few fine roots; few worm casts and krotovinas; pH 6.5; gradual smooth boundary.

B32 2060 109 to 142 cm. (43 to 56 inches). Pale brown (10YR 6/3) silty clay loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure; friable; porous; clay films on faces of peds; few fine roots; few krotovinas; pH 7.5; clear wavy boundary.

B33 2061 142 to 155 cm. (56 to 61 inches). Pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak coarse prismatic structure; friable; porous; thin clay films on faces of peds; few fine roots; few fine and medium $CaCO_3$ concretions; pH 8.0.

* This is a taxadjunct to the Hastings series because the dark surface layer is thicker than is typical for that series.

SOIL CLASSIFICATION-TYPIC ARGIUSTOLL
FINE-SILTY, MIXED, MESIC
SERIES - - - - - - - HOLDREGE SILT LOAM

SOIL NO - - - - - - S68KANS-69-1 COUNTY - - - NORTON

GENERAL METHODS- - - 1A, 1B1B, 2A1, 2B

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SAMPLE NOS.- 68L373-68L379

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B															RATIO
					FINE	SAND					SILT			FAML	INTR	FINE	NON-	8D1
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEOS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	II	CLAY	CO3-	15-
		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005-	SAND	.2-	TO	CLAY	BAR
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-.1	.02	CLAY		TO
CM		PCT LT 2MM														PCT	PCT	CLAY
000-15	AP	13.2	64.7	22.1		0.1	0.1	0.1	0.4	12.4	48.6	16.1		0.7	61.4		22	0.43
015-28	A3	9.3	61.3	29.4		TR	TR	0.1	0.3	9.0	42.5	18.8		0.3	51.7		29	0.44
028-38	B21T	8.8	57.0	34.2		0.0	TR	0.1	0.2	8.6	39.0	18.0		0.2	47.7		34	0.45
038-56	B22T	9.4	55.7	34.9		0.0	TR	0.1	0.2	9.1	37.2	18.5		0.3	46.4		35	0.44
056-71	B23T	10.8	58.7	30.5		0.0	TR	0.1	0.3	10.5	38.5	20.2		0.3	49.2		31	0.45
071-107	B3CA	11.8	64.9	23.3		0.0	TR	0.1	0.4	11.4	41.0	23.9		0.3	52.7		21	0.53
107-152	CCA	12.5	68.4	19.1		0.0	0.1	0.1	0.3	12.1	43.2	25.2		0.4	55.5		17	0.59

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2						BULK DENSITY			WATER CONTENT				CARBONATE		PH	
	VOL.	WEIGHT					4A1D	4A1H	4D1	4B1C	4B1C	4B2	4C1	6E1B	3A1A	8C1A	8C1E
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	1/10	1/3-	15-	WRD	LT	LT	1/1	1/2
	2	75				.074	PCT	BAR	DRY	BAR	BAR	BAR	CM/	2	.002	H2O	CACL
CM	PCT	PCT	PCT LT 75				LT20	G/CC	G/CC	PCT	PCT	PCT	CM	PCT	PCT		
000-15	0	0	0	0	0	98	0					9.5				6.2	
015-28	0	0	0	0	0	99	0					12.7				6.2	
028-38	0	0	0	0	0	99	0					15.3				6.7	
038-56	0	0	0	0	0	99	0					15.5				6.8	
056-71	0	0	0	0	0	98	0					13.6		TR		7.4	
071-107	0	0	0	0	0	98	0					12.3		6	2	8.0	
107-152	0	0	0	0	0	98	0					11.2		4	2	8.1	

DEPTH	ORGANIC MATTER			IRON	PHOS	EXTRACTABLE BASES 5B4A-					ACTY	AL	(CAT EXCH)		RATIO	RATIO	CA	(BASE SAT)	
	6A1A	6B1A	C/N	6C2A	6S1A	6N2E	6O2D	6P2A	6Q2A		6H1A	6G1D	5A3A	5A6A	8D1	8D3	5F	5C3	5C1
	ORGN	NITG		EXT	TOTL	CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	CA	SAT	EXTB	NHAC
	CARB			FE						EXTB	TEA	EXT	ACTY		TO	TO	NHAC	ACTY	
CM	PCT	PCT		PCT	PCT	MEQ / 100 G									CLAY	MG	PCT	PCT	PCT
000-15	1.19																		
015-28	1.09																		
028-38	0.75																		
038-56	0.52																		
056-71	0.38																		
071-107	0.26																		
107-152	0.16																		

Pedon classification: Typic Argiustoll, fine-silty, mixed, mesic
Series classification: (Same)
Soil: Holdrege silt loam
Soil Nos. S68KS-69-1 (Sample Nos. 373-379)
Location: Norton County, KS; 2,394 feet west and 432 feet south of the northeast corner of Sec. 34, T2S, R24W.
Climate: Annual precipitation is about 21 inches. Annual temperature is about 53° F., and summer temperature is about 78° F. Average frost-free season is about 167 days.
Vegetation and land use: Wheat stubble. Cropland.
Parent material: Loess.
Physiography: Gently sloping erosional upland.
Topography: Nearly plane slope. Slope gradient of about 2 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderate.
Described by: C. D. Palmer.

(Colors are for dry soil unless otherwise stated.)

Ap 373 0 to 15 cm. (0 to 6 inches). Dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium and fine granular structure; slightly hard, friable; upper 8 cm. has wheat stubble mulch, many fine roots; slightly acid; abrupt smooth boundary.

A3 374 15 to 28 cm. (6 to 11 inches). Dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, friable; many fine roots; neutral; clear smooth boundary.

B21t 375 28 to 38 cm. (11 to 15 inches). Grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine subangular blocky structure; hard, firm; few fine roots and pores; neutral; clear smooth boundary.

B22t 376 38 to 56 cm. (15 to 22 inches). Grayish brown (10YR 5/2) heavy silty clay loam, dark grayish brown (10YR 4/2) moist; moderate fine subangular blocky structure; very hard, firm; few small krotovinas and worm casts; shiny coats on faces of peds; neutral; clear smooth boundary.

B23t 377 56 to 71 cm. (22 to 28 inches). Light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate fine to medium subangular blocky structure; hard, firm; many fine pores; mildly alkaline; clear smooth boundary.

B3ca 378 71 to 107 cm. (28 to 42 inches). Pale brown (10YR 6/3) light silty clay loam, dark brown (10YR 4/3) moist; weak to moderate medium subangular blocky structure; slightly hard, friable; many fine threads and soft accumulations of lime; strong effervescence; diffuse wavy boundary.

Cca 379 107 to 152 cm. (42 to 60 inches). Very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; weak medium prismatic structure; soft, very friable; many fine threads and soft accumulations of lime; strong effervescence.

SOIL CLASSIFICATION-TYPIC ARGIUSTOLL
FINE, MONTMORILLONITIC, MESIC
SERIES - - - - - - - HOLDREGE SILT LOAM TAXADJUNCT

SOIL NO - - - - - - S68KANS-69-2 COUNTY - - - NORTON

GENERAL METHODS- - - 1A, 1B1B, 2B1-2B SAMPLE NOS.- 68L380-68L386

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B															RATIO
		SAND 2- .05	SILT .05- .002	CLAY LT .002	FINE CLAY LT .0002	SAND VCOS 2- 1	SAND CORS 1- .5	SAND MEDS .5- .25	SAND FNES .25- .10	SAND VFNS .10- .05	SILT COSI .05 .02	SILT FNSI .02 .002	SILT VFSI .005- .002	FAML TEXT SAND 2-.1	INTR II .2- .02	FINE CLAY TO CLAY	NON-CO3- CLAY	8D1 15-BAR TO CLAY
CM		PCT LT 2MM												PCT			PCT	
000-15	AP	9.8	65.9	24.3		0	0.1	0.1	0.3	9.3	47.1	18.8		0.5	56.6		24	0.44
015-28	A3	7.9	62.9	24.2		0	0.1	0.1	0.3	7.4	43.2	19.7		0.5	50.8		29	0.45
028-36	B21T	7.6	55.9	36.5		0	TR	0	0.3	7.4	38.4	17.5		0.2	46.0		37	0.46
036-53	B22T	8.7	54.6	36.7		0	TR	0	0.2	8.5	37.6	17.0		0.1	46.2		37	0.47
053-74	B23T	11.1	60.7	28.2		0	TR	0.1	0.3	10.7	41.6	19.1		0.3	52.5		28	0.44
074-107	B3CA	11.1	65.9	23.0		0	0.1	0.1	0.4	10.5	42.3	23.6		0.6	53.0		20	0.52
107-152	CCA	11.7	66.5	21.8		0	0.1	0.1	0.4	11.1	43.7	22.8		0.6	55.1		19	0.47

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2	GT 75	WEIGHT 75-20	20-5	5-2	LT .074	4A1D BULK DENSITY 20-2 1/3-BAR	4A1H 1/3-BAR OVEN DRY	4D1 COLE	4B1C WATER CONTENT 1/10 BAR	4B1C 1/3-BAR	4B2 15-BAR	4C1 WRD	6E1B CARBONATE LT 2	3A1A LT .002	8C1A (-PH-) 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	PCT LT 75				LT20 G/CC	G/CC		BAR PCT	BAR PCT	BAR PCT	CM/CM	PCT	PCT		
000-15	0	0	0	0	0	99	0					10.7				6.5	
015-28	0	0	0	0	0	99	0					13.1				7.1	
028-36	0	0	0	0	0	99	0					16.7				7.4	
036-53	0	0	0	0	0	99	0					17.4				7.4	
053-74	0	0	0	0	0	99	0					12.5		TR		7.7	
074-107	0	0	0	0	0	98	0					11.9		7	3	8.0	
107-152	0	0	0	0	0	98	0					10.4		5	3	8.0	

DEPTH	(ORGANIC MATTER) 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2A EXT FE	PHOS 6S1A TOTL	(-EXTRACTABLE BASES 5B4A-) 6N2E CA	6O2D MG	6P2A NA	6Q2A K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1D KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO	RATIO 8D3 CA TO	CA 5F SAT NHAC	(BASE SAT) 5C3 EXTB ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	(- - - - - - - - - - -MEQ / 100 G- - - - - - - - - - -)									CLAY	MG	PCT	PCT	PCT
000-15	1.19																		
015-28	1.05																		
028-36	0.64																		
036-53	0.49																		
053-74	0.41																		
074-107	0.29																		
107-152	0.21																		

DEPTH	(SATURATED PASTE) 8E1 REST CHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	(- - - - - - - - - SATURATION EXTRACT 8A1- - - - - - - - -) 8A1A EC MMHOS/	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	CM	(- - - - - - - - - - - - - - MEQ / LITER - - - - - - - - - - - - - -)									PCT	
000-15																			
015-28																			
028-36																			
036-53																			
053-74																			
074-107																			
107-152																			

Pedon classification: Typic Argiustoll; fine, montmorillonitic, mesic
Series classification: Typic Argiustoll; fine-silty, mixed, mesic
Soil: Holdrege silt loam taxadjunct*
Soil Nos.: S68KS-69-2 (Sample Nos. 380-386)
Location: Norton County, KS; 1,150 feet east and 600 feet south of the northwest corner of Sec. 31, T2S, R23W.
Climate: Annual precipitation is about 21 inches. Annual temperature is about 53° F., and summer temperature is about 78° F. Average frost-free season is about 167 days.
Vegetation and land use: Summer fallow. Cropland.
Parent material: Loess.
Physiography: Gently sloping erosional upland.
Topography: Nearly plane slope. Slope gradient of about 2 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: C. D. Palmer.

(Colors are for dry soil unless otherwise stated.)

Ap 380 0 to 15 cm. (0 to 6 inches). Dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium granular structure; slightly hard, friable; many fine roots; slightly acid; abrupt smooth boundary.

A3 381 15 to 28 cm. (6 to 11 inches). Dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, friable; many fine roots; neutral; clear smooth boundary.

B21t 382 28 to 36 cm. (11 to 14 inches). Grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; very fine subangular blocky structure; hard, firm; neutral; clear smooth boundary.

B22t 383 36 to 53 cm. (14 to 21 inches). Grayish brown (10YR 5/2) heavy silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic and strong fine subangular blocky structure; very hard, firm; shiny coats and discontinuous clay films on faces of peds; neutral; clear smooth boundary.

B23t 384 53 to 74 cm. (21 to 29 inches). Pale brown (10YR 6/3) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate fine to medium subangular blocky structure; hard, firm; many fine pores; mildly alkaline; clear smooth boundary.

B3ca 385 74 to 107 cm. (29 to 42 inches). Pale brown (10YR 6/3) light silty clay loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable; few fine threads and soft accumulations of lime; strong effervescence; diffuse smooth boundary.

Cca 386 107 to 152 cm. (42 to 60 inches). Very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; weak coarse prismatic structure; soft, very friable; few fine threads and soft accumulations of lime; strong effervescence.

* This pedon is a taxadjunct to the Holdrege series because the subsoil contains more clay than is typical for that series.

SOIL CLASSIFICATION: Pachic Haplustoll; fine-silty, mixed, mesic

SOIL Hord silt loam taxadjunct LOCATION Osborne County, Kansas

SOIL NOS. S53Kans-71-6 LAB. NOS. 1454-1460

SOIL SURVEY LABORATORY Mandan, North Dakota

GENERAL METHODS 1A, 1B1a, 2A1, 2B

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	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	0.02-0.002	0.2-0.02	> 2	
1454	0-6½	Ap	0.1	0.3	0.8	2.6	20.2	63.4	12.6	12.5	72.9	-	sil
1455	6½-16	A12	-	0.3	0.8	2.0	18.8	60.5	17.6	14.0	66.5	-	sil
1456	16-23	B21	-	0.3	1.0	2.5	14.8	63.5	17.9	13.5	66.3	-	sil
1457	23-33	B22	-	0.6	1.5	3.7	14.2	63.1	16.9	14.2	65.3	-	sil
1458	33-45	C1	-	0.2	0.6	1.8	7.4	69.6	20.4	24.9	53.2	-	sil
1459	45-55	C2	-	-	0.1	0.6	7.8	71.7	19.8	20.8	59.1	-	sil
1460	55-65	C3	-	-	0.1	0.8	10.0	71.4	17.7	18.5	63.5	-	sil

LABORATORY NUMBER	pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10³ MILLIMHOS PER CM @ 25°C	6E1a CaCO3 equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS (per cent)		
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.
1454	6.7	6.8	6.9	0.81	0.072	11			-				6.3
1455	6.7	6.7	6.8	0.82	0.078	11			-				8.7
1456	6.9	7.0	7.1	0.66	0.064	10			-				8.9
1457	7.2	7.4	7.3	0.46	0.052	9			-				8.5
1458	7.7	8.2	8.4	0.32	0.041	8			6				10.4
1459	7.8	8.3	8.4	0.30	0.037	8			4				10.1
1460	7.8	8.2	8.5	0.22	0.032	7			4				9.4

LABORATORY NUMBER	5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS 5B1a					5D2 Base Sat. % on NH4OAc	SATURATION EXTRACT SOLUBLE					PER CENT MOISTURE AT SATURATION	8D3 Ca/Mg
		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum		K	CO_3	HCO_3	Cl	SO_4		
	milliequivalents per 100g soil							milliequivalents per liter						
1454	12.6	9.8	1.8	0.1	1.2	12.9	102							5.4
1455	16.2	13.3	2.2	0.1	0.8	16.4	101							6.0
1456	16.7	14.9	1.7	0.1	0.5	17.2	103							8.8
1457	16.3	15.3	1.3	0.1	0.5	17.2	106							11.8
1458	16.0		1.6	0.1	0.7									
1459	15.8		2.1	0.1	0.8									
1460	15.1		2.3	0.1	0.8									

AGR-SCS-BELTSVILLE, MD. 2882 JUNE 1959

Pedon classification: Pachic Haplustoll, fine-silty, mixed, mesic
Series classification: Cumulic Haplustoll, fine-silty, mixed, mesic
Soil: Hord silt loam taxadjunct*
Soil Nos.: S53KS-71-6 (Sample Nos. 1454-1460)
Location: Osborne County, KS; SE 1/4 of Sec. 10, T7S, R14E.
Climate: Annual precipitation is about 23½ inches. Annual temperature is about 54° F., and summer temperature is about 79° F. Average frost-free season is about 171 days.
Vegetation and land use: Fallow. Cropland.
Parent material: Loess over alluvium.
Physiography: Nearly level terrace.
Topography: Slope gradient less than 1 percent.
Drainage: Well drained.
Ground water: Greater than 6 feet.
Erosion: Slight.
Permeability: Moderate.
Described by: W. M. Johnson.

(Colors are for dry soil unless otherwise stated.)

Ap 1454 0 to 16 cm. (0 to 6½ inches). Grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; sand grains are mostly clean quartz, only a few are stained with brown (10YR 5/3); weak fine granular structure; soft, friable; clear smooth boundary.

A12 1455 16 to 41 cm. (6½ to 16 inches). Dark gray (10YR 4/1) silt loam, very dark brown (10YR 2/2) moist; many sand grains are clear, many are stained brown (10YR 5/3); weak coarse prismatic structure parting to weak medium and fine granular structure; soft, friable; 10 to 15 percent of the mass consists of worm casts; gradual smooth boundary.

B21 1456 41 to 59 cm. (16 to 23 inches). Dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak coarse prismatic structure parting to weak very fine subangular blocky structure; slightly hard, friable; 25 percent of the mass consists of worm casts; gradual smooth boundary.

B22 1457 59 to 84 cm. (23 to 33 inches). Dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak very fine subangular blocky structure; slightly hard, friable; common worm casts; gradual smooth boundary.

C1 1458 84 to 114 cm. (33 to 45 inches). Light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak coarse blocky structure; slightly hard, friable; few worm casts; many coarse and fine threads and films of calcium carbonate; gradual smooth boundary.

C2 1459 114 to 140 cm. (45 to 55 inches). Grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; soft, friable; many coarse to fine threads and films of calcium carbonate; diffuse smooth boundary.

C3 1460 140 to 165 cm. (55 to 65 inches). Light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; massive; soft, friable; many threads and spots of calcium carbonate; strong effervescence.

* This pedon is a taxadjunct to the Hord series because the organic carbon decreases regularly with depth.

SOIL CLASSIFICATION: Vertic Argiustoll: fine, mixed, mesic

SOIL Irwin silty clay loam taxadjunct LOCATION Butler County, Kansas

SOIL NOS. S59Kans-8-6 LAB. NOS. 10976-10984

SOIL SURVEY LABORATORY Lincoln, Nebraska DATE December, 1959

GENERAL METHODS 1A1, 1B1a, 2A1, 2B

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1									2A2	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	0.2-0.02	0.02-0.002	> 2	
0-6	Ap	<0.1	<0.1	0.1a	0.4b	3.1c	64.8	31.6	44.7	23.4	Tr.	sicl
6-8	A3	<0.1	<0.1	0.1a	0.4b	2.9c	63.4	33.2	43.1	23.4	Tr.	sicl
8-19	B21t	<0.1	<0.1	<0.1	0.2b	1.3c	51.4	47.1	29.2	23.6	Tr.	sic
19-29	B22t	0.2d	<0.1	<0.1	0.1e	1.5e	53.3	44.9	28.9	26.0	Tr.	sic
29-35	B3	0.5d	0.3d	0.1d	0.3e	1.5e	54.6	42.7	30.4	25.9	Tr.	sic
35-41	C1	0.5d	0.2d	0.1d	0.3e	1.8e	55.2	41.9	32.0	25.2	5.0	sic
41-51	C2	0.1	0.1c	0.1c	0.3c	2.2c	49.8	47.4	33.1	19.1	Tr.	sic
51-61	C3	<0.1	0.1c	0.3c	1.1c	1.8c	43.7	53.0	25.7	20.6	Tr.	sic
61-67	C4	<0.1	<0.1	<0.1	0.3e	0.6e	31.7	67.4	10.3	22.2	Tr.	c

DEPTH INCHES	8C1a pH 1:1	pH 1:5	pH 1:10	ORGANIC MATTER 6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N	Free Iron Fe_2O_3 % 6C1a	ELECTRICAL CONDUCTIVITY EC x 10^3 MILLIMHOS PER CM 8A1a	6E1a $CaCO_3$ equivalent %	6F1a GYPSUM me./100g. SOIL	MOISTURE TENSIONS 4B4 Field State %	4B3 30-cm. %	4B2 15 ATMOS. %
0-6	6.3	6.6	6.7	1.38	0.120	11.5	1.2	0.4		<1			12.4
6-8	6.3	6.7	6.8	1.32	0.114	11.6	1.3	0.4		<1			12.1
8-19	7.1	7.8	7.8	0.91	0.082	11	1.5	0.4	<1	<1	27	26	20.2
19-29	7.8	8.5	8.6	0.63	0.066	10	1.4	0.8	1	<1	23	26	19.3
29-35	8.0	8.6	8.7	0.45			1.4	0.9	1	<1	22	28	18.5
35-41	8.0	8.6	8.7	0.34			1.4	1.2	1	<1	22	29	18.7
41-51	7.8	8.4	8.5	0.36			1.6	1.7	<1	<1	24	33	20.8
51-61	7.7	8.3	8.4	0.28			1.4	1.5	<1	<1			22.4
61-67	7.7	8.4	8.5	0.24			1.0	1.7	<1	<1			26.1

DEPTH INCHES	5A1a CATION EXCHANGE CAPACITY NH_4Ac	EXTRACTABLE CATIONS 5B1a 6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K	5D2 Exch. Na on NH_4OAc CEC %	Saturation Ext. Sol. 8A1c 6P1a Na me/l.	6Q1a K	BULK DENSITY 4A1a Field State g/cc	4A1c 30-cm. g/cc	4A1h Oven-Dry g/cc	8A MOISTURE AT SATURATION %
	←	milliequivalents per 100g. soil				→		← me/l. →					
0-6	15.1	13.9	4.9	6.7	0.3	0.5	1	1.4	0.1				48.2
6-8	14.7	14.1	5.5	7.0	0.7	0.4	4	2.0	<0.1				48.5
8-19	19.8	19.5	9.2	4.6	2.3	0.5	11	2.3	<0.1	1.45	1.42	1.80	77.9
19-29	23.0	20.5	9.5	2.3	2.9	0.5	10	6.3	<0.1	1.54	1.46	1.80	79.3
29-35	27.9	20.7	8.7	1.8	3.2	0.4	9	7.2	<0.1	1.56	1.43	1.79	81.9
35-41	25.4	20.3	8.4	1.8	3.4	0.5	11	9.0	0.1	1.54	1.41	1.77	73.1
41-51	27.6	19.2	8.9	2.0	3.8	0.6	11	11.6	0.1	1.51	1.32	1.77	69.8
51-61	32.0	21.3	10.4	3.0	4.5	0.7	11	10.8	<0.1				92.0
61-67	38.8	28.4	12.4	2.0	5.5	0.8	11	11.6	0.1				113.0

a. Many (Fe-Mn?) concr.
b. Common (Fe-Mn?) concr.
c. Few (Fe-Mn?) concr.
d. Common (Fe-Mn?) concr.; few carbonate concr. ($CaCO_3$?).
e. Few (Fe-Mn?) concr.; few carbonate concr. ($CaCO_3$?).

Pedon classification: Vertic Argiustoll, fine, mixed, mesic
Series classification: Pachic Argiustoll, fine, mixed, mesic
Soil: Irwin silty clay loam taxadjunct*
Soil Nos.: S59KS-8-6 (Sample Nos. 10976-10984)
Location: Butler County, KS; 675 feet south and 2,490 feet west of the northeast corner of Sec. 19, T23S, R5E.
Climate: Annual precipitation is about 32 inches. Annual temperature is about 57° F., and summer temperature is about 80° F. Average frost-free season is about 190 days.
Vegetation and land use: Originally mid and tall grasses. Cropland.
Parent material: Clayey sediments.
Physiography: Gently sloping erosional upland.
Topography: Slightly convex slope. Slope gradient about 2 percent.
Drainage: Moderately well drained to well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Very slow.
Described by: H. L. Penner, M. Stout.

(Colors are for moist soil unless otherwise stated.)

Ap 10976 0 to 15 cm. (0 to 6 inches). Very dark brown (10YR 2.5/2) light silty clay loam; weak fine granular structure; friable; abrupt smooth boundary.

A3 10977 15 to 20 cm. (6 to 8 inches). Very dark brown (10YR 2.5/2) silty clay loam; many fine faint (10YR 5/3) mottles; moderate medium granular structure; firm; clear smooth boundary.

B21t 10978 20 to 48 cm. (8 to 19 inches). Very dark grayish brown (10YR 3/2) clay; many fine faint dark brown (10YR 4/3) mottles; moderate fine and very fine subangular blocky structure; very firm; slickensides are layered about 37 mm. (1½ inches) apart; distinct continuous clay films; few unstained rose and clear quartz grains; few very fine Fe-Mn concretions; gradual smooth boundary.

B22t 10979 48 to 74 cm. (19 to 29 inches). Very dark grayish brown (10YR 3/2) silty clay; common fine vertical very dark gray (10YR 3/1) seams; moderate medium blocky structure parting to fine subangular blocky structure; very firm; common weak slickensides; thin, distinct, continuous clay films; about 5 percent fine $CaCO_3$ concretions; slight effervescence; gradual smooth boundary.

B3 10980 74 to 89 cm. (29 to 35 inches). Dark brown (7.5YR 3/4) heavy silty clay loam; few fine vertical very dark gray (10YR 3/1) seams; weak to moderate medium blocky structure; firm; few weak slickensides; thin continuous clay films; few fine shot concretions; about 10 percent fine $CaCO_3$ concretions; slight effervescence; gradual smooth boundary.

C1 10981 89 to 104 cm. (35 to 41 inches). Dark brown (7.5YR 3/4) heavy silty clay loam; weak medium blocky structure; firm; very thin clay films on unbroken faces of peds; slight effervescence; gradual wavy boundary.

C2 10982 104 to 130 cm. (41 to 51 inches). Dark reddish brown (5YR 3.5/4) light silty clay; common fine faint reddish brown (2.5YR 5/4) and dark reddish gray (2.5YR 3/1) mottles; strong fine blocky structure; very firm; distinct continuous clay films; few fine Fe-Mn concretions; few fine $CaCO_3$ concretions; gradual smooth boundary.

C3 10983 130 to 155 cm. (51 to 61 inches). Reddish brown (5YR 3.5/4) silty clay; few to common medium distinct dark gray (10YR 4/1) and grayish brown (10YR 5/2) mottles; strong medium and fine blocky structure; very firm; few weak slickensides; distinct continuous clay films; few concretions and coatings on faces of peds; clear smooth boundary.

C4 10984 155 to 170 cm. (61 to 67 inches). Olive gray (5Y 5/2) oily clay shale and silty clay; reddish brown (5YR 4/3) coatings on cleavage faces.

C5 170 to 178 cm. (67 to 76 inches). Light gray (10YR 7/1) soft marly silty shale; terminates on indurated bedrock.

Remarks: Horizons 0 to 15 cm. (0 to 6 inches), 20 to 48 cm. (8 to 19 inches), 89 to 104 cm. (35 to 41 inches), and 130 to 155 cm. (51 to 61 inches) sampled for B.P.R.

*Free carbonates and $CaCO_3$ concretions at 48 cm. (19 inches) and mottles in the A3 and B21t horizons. These characteristics are also outside the range of the Irwin series.

SOIL CLASSIFICATION: Pachic Paleustoll; fine, mixed, mesic

SOIL Irwin silty clay loam taxadjunct LOCATION Butler County, Kansas

SOIL NOS. S59Kans-8-8 LAB. NOS. 10992-10999

SOIL SURVEY LABORATORY Lincoln, Nebraska DATE December, 1959

GENERAL METHODS 1A1, 1B1a, 2A1, 2B

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 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	TEXTURAL CLASS
0-6	Ap	<0.1	0.1a	0.2a	0.7a	3.8b	64.6	30.6	45.7	23.1	Tr.	sicl
6-8	AB	<0.1	0.1a	0.2a	0.7a	3.4b	65.2	30.4	45.6	23.4	Tr.	sicl
8-15	B21t	<0.1	0.1a	0.1a	0.3a	1.8b	45.8	51.9	28.1	19.7	Tr.	sic
15-23	B22t	<0.1	<0.1	0.1a	0.4a	1.9b	48.8	48.8	28.6	22.4	Tr.	sic
23-30	B3	0.3c	0.2c	0.1d	0.3d	2.3d	47.7	49.1	28.9	21.3	Tr.	sic
30-41	C1	0.3c	0.2c	0.1d	0.3d	2.1d	44.0	53.0	27.8	18.5	Tr.	sic
41-48	C2	0.2c	0.1c	0.1d	0.3d	1.4d	42.7	55.2	22.5	21.8	Tr.	sic
48-59	C3	0.1c	<0.1	<0.1	0.3d	0.8d	29.6	69.2	9.0	21.6	Tr.	c

8C1a pH 1:1	1:5	1:10	ORGANIC MATTER 6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N	Free Iron Fe_2O_3% 6C1a	ELECTRICAL CONDUCTIVITY EC×10³ MILLIMHOS PER CM 8A1a	6E1a $CaCO_3$ equivalent %	6F1a GYPSUM me./100g. SOIL	MOISTURE TENSIONS 4B4 Field-State %	4B3 30-cm. %	4B2 15 ATMOS. %
5.6	6.0	6.1	1.34	0.105	12.8	1.0	0.4		<1			11.4
5.7	6.1	6.2	1.28	0.102	12.5	1.0	0.4		<1			12.2
7.3	7.8	7.9	1.05	0.082	12.8	1.3	0.5	<1	<1	30	29	20.7
7.8	8.4	8.4	0.78	0.069	11	1.3	0.6	<1	<1	26	26	19.8
8.2	8.7	8.8	0.48	0.049	10	1.4	0.8	1	<1	24	29	20.1
8.0	8.6	8.7	0.31			1.3	1.9	1	<1	25	31	21.6
7.9	8.5	8.6	0.23			1.2	1.4	<1	<1	24	34	22.7
7.7	8.4	8.6	0.16			1.0	1.4	<1	<1			26.4

5A1a CATION EXCHANGE CAPACITY NH_4Ac	EXTRACTABLE CATIONS 6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K	5D2 Exch.Na on NH₄Oac CEC %	Saturation Ext. Sol. 8A1 6P1a Na me/l.	6Q1a K	BULK DENSITY 4A1a Field-State g/cc	4A1c 30-cm. g/cc	4A1h Oven-Dry g/cc	8A MOISTURE AT SATURATION %
← milliequivalents per 100g. soil →												
21.0	10.0	5.6	8.7	0.4	0.7	1	1.6	0.2				46.3
22.8	10.2	6.1	9.5	0.8	0.4	3	2.5	0.1				43.1
34.0	18.8	11.5	6.1	2.6	0.6	7	3.8	<0.1	1.37	1.35	1.73	70.2
31.2	17.5	11.2	2.8	3.2	0.5	9	5.5	<0.1	1.47	1.42	1.72	75.2
28.8	19.1	10.8	1.3	3.7	0.6	11	7.1	<0.1	1.52	1.41	1.75	88.6
29.2	18.9	11.6	1.8	4.5	0.6	10	16.9	0.1	1.49	1.39	1.72	89.1
31.4	17.3	11.6	2.0	5.0	0.7	12	11.4	<0.1	1.51	1.35	1.72	97.7
37.1	20.4	14.0	1.5	5.8	0.8	12	11.2	0.1				119.1

a. Many (Fe-Mn?) concr.
b. Few (Fe-Mn?) concr.
c. Few carbonate concr. ($CaCO_3$?).
d. Few (Fe-Mn?) concr.; few carbonate concr. ($CaCO_3$?).

Pedon classification: Pachic Paleustoll, fine, mixed, mesic
Series classification: Pachic Argiustoll, fine, mixed, mesic
Soil: Irwin silty clay loam taxadjunct*
Soil Nos.: S59KS-8-8 (Sample Nos. 10992-10999)
Location: Butler County, KS; 1,250 feet north and 150 feet west of the southeast corner of Sec. 25, T23S, R4E.
Climate: Annual precipitation is about 32 inches. Annual temperature is about 57° F., and summer temperature is about 80° F. Average frost-free season is about 190 days.
Vegetation and land use: Originally mid and tall grasses. Cropland.
Parent material: Clayey sediments.
Physiography: Gently sloping erosional upland.
Topography: Slight convex slope. Slope gradient about 3 percent.
Drainage: Moderately well drained to well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Very slow.
Described by: H. L. Penner, M. Stout.

(Colors are for moist soil unless otherwise stated.)

Ap 10992 0 to 15 cm. (0 to 6 inches). Very dark gray (10YR 3.5/1) silty clay loam; very fine lenses of grayish silt at 10 cm. (4 inches) and 15 cm. (6 inches); weak fine granular structure; friable; abrupt smooth boundary.

AB 10993 15 to 20 cm. (6 to 8 inches). Very dark gray (10YR 3.5/1) silty clay loam; few very fine faint dark grayish brown (10YR 4/2) mottles; weak fine blocky structure; friable; abrupt smooth boundary.

B21t 10994 20 to 38 cm. (8 to 15 inches). Very dark brown (10YR 2/2) clay; many fine faint dark yellowish brown (10YR 4/4) mottles; moderate fine and very fine subangular blocky structure; very firm; distinct continuous clay films; gradual smooth boundary.

B22t 10995 38 to 59 cm. (15 to 23 inches). Very dark grayish brown (10YR 3/2) clay; few distinct black (10YR 2/1) filled cracks or root channels 6 mm. (1/4 inch) to 25 mm. (1 inch) wide; many vertical and horizontal very dark gray (10YR 3/1) seams; weak to moderate fine subangular blocky structure; very firm; few weak slickensides; thin distinct continuous clay films; few fine soft Fe-Mn accumulations; gradual smooth boundary.

B3 10996 59 to 76 cm. (23 to 30 inches). Dark brown (10YR 3/3) silty clay; few black (10YR 2/1) filled root channels and some less dark fine seams; moderate medium blocky structure; very firm; few weak slickensides in lower half; thin continuous clay films; few to common medium gravels of chert, jasper, and quartzite; few common $CaCO_3$ concretions; gradual smooth boundary.

C1 10997 76 to 104 cm. (30 to 41 inches). Dark brown (7.5YR 3/4) silty clay; common fine faint reddish brown (2.5YR 4/4) and light red (2.5YR 6/6) mottles; weak to moderate medium blocky structure; very firm; very thin continuous clay films; few fine chert gravel; about 5 percent fine $CaCO_3$ concretions; gradual smooth boundary.

C2 10998 104 to 122 cm. (41 to 48 inches). Dark reddish brown (5YR 3/3) silty clay; massive parting to weak to moderate blocky structure; very firm; thin continuous clay films; 5 to 10 percent soft masses of $CaCO_3$ and $CaCO_3$ concretions; slight effervescence; gradual smooth boundary.

C3 10999 122 to 150 cm. (48 to 59 inches). Mixed greenish gray (5GY 5/1) and reddish brown (5YR 3/2) silty clay; moderate medium blocky structure; mostly a horizon of transition or intermixing of the adjacent material.

Cr 150 to 157 cm. (59 to 62 inches). Soft silty and marly silty shale having an indurated bedrock of shale or limestone at 157 cm. (62 inches); violent effervescence.

Remarks: Horizons 0 to 15 cm. (0 to 6 inches), 20 to 38 cm. (8 to 15 inches), and 76 to 104 cm. (30 to 41 inches) were sampled for engineering testing.

* This pedon is a taxadjunct to the Irwin series because the dark surface layer is thicker than is typically present in that series.

SOIL CLASSIFICATION- VERTIC ARGIUDOLL
FINE, MONTMORILLONITIC, THERMIC
SERIES - - - - - - -KENOMA SILT LOAM

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S73KS-1-2 COUNTY - - - ALLEN

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 73L1091-73L1098

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B															RATIO
					FINE	SAND					SILT				INTR	FINE	NON-
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	SAND	II	CLAY	CO3
		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005	2	.2	TO	15-
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	.10	.02	CLAY	BAR
CM		PCT LT 2MM														PCT	TO CLAY
000-21	AP	4.6	69.7	25.7	16.9	.1	.8	.8	.7	2.2	34.6	35.1		2.4	37.2	66	.43
021-38	B21T	3.4	47.5	49.1	36.7	.2	.4	.4	.5	1.9	19.5	28.0		1.5	21.7	75	.41
038-57	B22T	3.7	50.8	45.5	33.8	.2	.4	.4	.5	2.2	21.4	29.4		1.5	23.9	74	.43
057-80	B23T	4.5	56.1	39.4	26.1	.3	.5	.3	.6	2.8	24.7	31.4		1.7	27.8	66	.41
080-108	B31	5.5	54.9	39.6	26.6	.6	.8	.3	.8	3.0	24.5	30.4		2.5	28.0	67	.41
108-140	B32	5.7	49.6	44.7	30.4	.7	.6	.4	.7	3.3	23.8	25.8		2.4	27.6	68	.42
140-180	B33	7.9	42.4	49.7	31.9	2.3	1.6	.5	.8	2.7	20.3	22.1		5.2	23.5	64	.43
180-230	B34	12.1	36.3	51.6	25.2	3.3	2.8	1.2	1.6	3.2	9.1	27.2		8.9	13.2	49	.39

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)					BULK DENSITY				WATER CONTENT			CARBONATE		PH	
	VOL.	WEIGHT														
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN		1/10	1/3-	15	WRD		LT	LT	1/1	1/2
	2	75				.074	PCT	BAR	DRY		BAR	BAR	BAR	CM/		2	.002	H2O	CACL
CM	PCT	PCT	PCT LT 75				LT20	G/CC	G/CC		PCT	PCT	PCT	CM		PCT	PCT		
000-21	TR	0	0	TR	TR	97	TR	1.39	1.53	.033	30.2	28.6	11.1	.25	3.6B			6.7	6.2
021-38	TR	0	0	0	TR	98	TR	1.42	1.82	.088	30.4	28.7	20.3	.12	2.6B			6.3	5.8
038-57	TR	0	0	TR	TR	98	TR	1.33	1.80	.109	35.1	33.1	19.4	.19	2.3B			6.2	5.8
057-80	TR	0	0	TR	TR	97	TR	1.30A					16.1					6.8	6.3
080-108	TR	0	0	TR	TR	97	TR	1.55	1.71	.034	25.1	23.6	16.2	.12	3.6B			7.3	6.8
108-140	TR	0		TR	TR	97	TR	1.56	1.76	.042	25.3	24.3	18.6	.09	3.6B			7.5	7.1
140-180	TR	0	0	TR	TR	94	TR	1.51	1.78	.056	28.0	27.0	21.6	.08	3.3B	TR		7.7	7.2
180-230	TR	0	0	TR	TR	90	TR						20.3			13	0	7.8	7.6

DEPTH	(ORGANIC MATTER			IRON	PHOS	EXTRACTABLE BASES 5B4A					ACTY	AL	(CAT EXCH)		RATIO	RATIO	CA	(BASE SAT)	
	6A1A	6B1A	C/N	6C2B		6N2E	6Q2D	6P2B	6Q2B		6H1A	6G1E	5A3A	5A6A	8D1	8D3	5F1	5C3	5C1
	ORGN	NITG		EXT	TOTL	CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	CA	SAT	EXTB	NHAC
	CARB			FE						EXTB	TEA	EXT	ACTY		TO	TO	NHAC	ACTY	
CM	PCT	PCT		PCT	PCT	MEQ / 100 G									CLAY	MG	PCT	PCT	PCT
000-21	1.58C	.135	12	1.1		17.3	3.1	.2	.5	21.1	4.3		25.4	20.4	.79	5.6	85	83	1.05
021-38	.98	.103	10	1.4		20.1	8.1	.6	.6	29.4	8.8		38.2	32.7	.67	2.5	61	77	90
038-57	.69	.083	8	1.5		18.6	8.8	.6	.6	28.6	7.4		36.0	30.9	.68	2.1	60	79	93
057-80	.45			1.4		16.2	7.6	.7	.5	25.0	4.7		29.7	25.3	.64	2.1	64	84	99
080-108	.24			1.4		18.9	7.9	.9	.4	28.1	3.5		31.6	25.4	.64	2.4	74	89	111
108-140	.19			1.5		18.6	9.2	1.5	.5	29.8	2.8		32.6	28.6	.64	2.0	65	91	104
140-180	.10			2.0			11.6	2.1	.5					34.3	.69				
180-230	.09			1.8			11.0	2.4	.4					31.9	.62				

DEPTH	(SATURATED PASTE)			NA	NA	SALT	GYP	SATURATION EXTRACT 8A1-								ATTERBERG	
	8E1	8C1B	8A	5D2	5E	8D5	6F1A	8A1A	6N1B	6Q1B	6P1B	6Q1B	6I1A	6J1A	6K1A	6L1A	6M1A	4F1	4F2
	REST	PH	H2O	ESP	SAR	TOTL		EC	CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3	LQID	PLST
	OHM-					SOLU		MMHOS/										LMIT	INDX
CM	CM		PCT	PCT		PPM	PCT	CM	(- - - - - - - - - - MEQ / LITER - - - - - - - - - -)									PCT	
000-21																			
021-38																			
038-57																			
057-80																			
080-108																			
108-140	1300	7.2	58.6	4	4	260		.73	1.7	1.0	4.3	TR							
140-180																			
180-230																			

CLAY MINERALOGY (7A2C). PLACEMENT - MONTMORILLONITIC.
038-57 MT3 KK2 MI2.
080-108 MT4 KK2 MI1.
180-230 VR3 KK3 MT2 MI2.
COMMENTS - MONTMORILLONITE POORLY ORDERED, CONTAINS SOME INTERLAYER MATERIAL.
RELATIVE AMOUNTS - (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE - MT = MONTMORILLONITE MI = MICA KK = KAOLINITE VR = VERMICULITE

(A) ESTIMATED.

(B) MICRO-PENETRATION RESISTANCE. A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10-BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.

(C) ORGANIC CARBON IS 11 KG/M SQ TO A DEPTH OF 1 M (6A).

Pedon classification: Vertic Argiudoll, fine, montmorillonitic, thermic
Series classification: (Same).
Soil: Kenoma silt loam
Soil Nos.: S73KS-1-2 (Sample Nos. 1091-1098)
Location: Allen County, KS; 3,200 feet south and 200 feet west of the northeast corner of Sec. 1, T25S, R19E.
Climate: Annual precipitation is about 37 inches. Annual temperature is about 57° F., and summer temperature is about 78° F. Average frost-free season is about 195 days.
Vegetation and land use: Tall fescue. Pasture.
Parent material: Sediments high in silt and clay.
Physiography: Slightly convex, gently sloping erosional upland.
Topography: Slope gradient about 1 percent.
Drainage: Moderately well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Very slow.
Described by: E. L. Fleming, J. R. Fortner, R. L. Haberman.

(Colors are for moist soil unless otherwise stated.)

Ap 1091 0 to 21 cm. (0 to 8 inches). Very dark gray (10YR 3/1) silt loam; weak fine and medium granular structure; slightly hard, friable; many fine roots; mildly alkaline; abrupt smooth boundary.

B21t 1092 21 to 38 cm. (8 to 15 inches). Very dark grayish brown (10YR 3/2) light silty clay, few vertical streaks of very dark brown (10YR 2/2) silt loam, few fine distinct strong brown (7.5YR 5/6) mottles; weak fine and very fine subangular blocky and blocky structure; hard, firm; common fine roots; neutral; gradual wavy boundary.

B22t 1093 38 to 57 cm. (15 to 22 inches). Very dark grayish brown (10YR 3/2) silty clay, few vertical streaks of very dark brown (10YR 2/2) silt loam, few fine distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; very hard, very firm; common fine roots; medium acid; gradual smooth boundary.

B23t 1094 57 to 80 cm. (22 to 32 inches). Mixed brown (10YR 4/3) and dark grayish brown (10YR 4/2) silty clay, few vertical streaks of very dark brown (10YR 2/2) silt loam, few fine distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky and blocky structure; very hard, very firm; common fine roots; few black concretions; neutral; gradual wavy boundary.

B31 1095 80 to 108 cm. (32 to 42 inches). Mixed strong brown (7.5YR 5/6) and gray (5Y 5/1) light silty clay, few vertical streaks of very dark brown (10YR 2/2) silt loam; weak fine blocky structure; very hard, very firm; few fine ropts; moderately alkaline; gradual wavy boundary.

B32 1096 108 to 140 cm. (42 to 55 inches). Mixed strong brown (7.5YR 5/6) and gray (5Y 5/1) silty clay; moderate fine and very fine blocky structure; extremely hard, extremely firm; few fine roots; moderately alkaline; gradual wavy boundary.

B33 1097 140 to 180 cm. (55 to 71 inches). Mixed strong brown (7.5YR 5/6) and gray (5Y 5/1) silty clay; stone line at upper boundary containing rounded pebbles ½ inch to 3 inches in size; moderate fine and very fine blocky structure; extremely hard, extremely firm; few fine roots; few black concretions; common black streaks; few rounded pebbles less than ½ inch in size; moderately alkaline; gradual wavy boundary.

B34 1098 180 to 230 cm. (71 to 91 inches). Mixed yellowish brown (10YR 5/6) and gray (5Y 5/1) weathered shale of silty clay texture; moderate coarse blocky structure; extremely hard, extremely firm; few slickensides, few fine roots; few scattered fossiles and soft lime masses; moderately alkaline; gradual wavy boundary.

R 230 cm. (91 inches). Limestone.

SOIL CLASSIFICATION-VERTIC ARGIUDOLL
FINE, MONTMORILLONITIC, THERMIC
SERIES - - - - - - -KENCMA SILT LOAM

SOIL NC - - - - - - S73KS-2-2 COUNTY - - - ANDERSON

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 73L1118-73L1128

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO
					FINE	SAND					SILT			INTR	FINE	NON-	8D1
		SAND 2- .05	SILT .05- .002	CLAY LT .002	CLAY LT .0002	VCOS 2- 1	CORS 1- .5	MEDS .5- .25	FNES .25- .10	VFNS .10- .05	COSI .05 .02	FNSI .02 .002	VFSI .005- .002	SAND 2- .10	II .2- .02	CLAY TO CLAY	CO3	15- BAR TO
CM		PCT LT 2MM														PCT	PCT	CLAY
000-12	A11	6.6	74.6	18.8	11.8	.2	.8	1.0	1.3	3.3	41.7	32.9		3.3	45.7	63		.54
012-18	A12	7.1	75.0	17.9	10.9	.5	1.1	1.1	1.3	3.1	39.8	35.2		4.0	43.6	61		.46
018-28	B21T	6.1	58.4	35.5	27.0	.7	1.1	.8	1.1	2.4	28.9	29.5		3.7	31.9	76		.45
028-43	B22T	3.6	47.2	49.2	39.3	.3	.4	.4	.6	1.9	21.5	25.7		1.7	23.7	80		.44
043-66	B23T	3.1	47.8	49.1	38.1	.2	.4	.3	.5	1.7	20.9	26.9		1.4	22.9	78		.43
066-97	B31	3.9	48.3	47.8	33.7	.7	.7	.3	.6	1.6	19.3	29.0		2.3	21.2	71		.43
097-122	B32	5.1	35.3	59.6	40.4	1.3	.9	.5	.8	1.6	14.1	21.2		3.5	16.1	68		.43
122-153	C1	3.0	26.7	70.3	43.7	.8	.5	.2	.5	1.0	9.1	17.6		2.0	10.4	62		.43
153-160	C2																	
160-165	R																	
C00-15	AP (A)	8.9	65.7	25.4	16.9	.8	1.5	1.3	1.5	3.8	36.0	29.7		5.1	40.5	67		.41

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2					BULK DENSITY				WATER CONTENT				CARBONATE		PH	
	VOL. GT 2	WEIGHT GT 75	75-20	20-5	5-2	LT .074	20-2	4A1D 1/3- BAR	4A1H OVEN DRY	4D1 COLE	4B1C 1/10 BAR	4B1C 1/3- BAR	4B2 15 BAR	4C1 WRD CM/ CM	6E1B LT 2	3A1A LT .002	8C1A 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	PCT LT 75				LT20	G/CC	G/CC		PCT	PCT	PCT		PCT	PCT		
000-12	TR	0	0	0	TR	96	TR	1.26	1.34	.021	36.2	32.1	10.2	.28	3.8C		5.5	5.1
012-18	TR	0	0	0	TR	95	TR	1.34	1.41	.018	32.5	27.7	8.2	.27	3.1C		5.7	4.7
018-28	TR	0	0	TR	TR	96	TR	1.30B					16.0				5.9	5.0
028-43	TR	0	0	TR	TR	98	TR	1.32	1.81	.114	35.5	33.1	21.6	.16	1.3C		6.5	5.8
043-66	TR	0	0	TR	TR	98	TR	1.32	1.73	.097	36.5	33.8	21.1	.17	1.4C		7.1	6.7
066-97	TR	0	0	TR	TR	97	TR	1.30B					20.4			TR	0	7.7	7.3
097-122	TR	0	0	TR	TR	96	TR	1.20	1.60	.103	45.3	41.1	25.8	.19	.7C	1	0	7.9	7.6
122-153	TR	0	0	TR	TR	98	TR	1.20B					30.5			1	0	7.8	7.4
153-160		0	0	8	4		12												
160-165	C	0	0	0	0		0												
000-15	TR	0	0	TR	TR	94	TR	1.40	1.48	.019	27.9	20.5	10.4	.14	1.6C			7.0	6.7

DEPTH	ORGANIC MATTER			IRON	PHOS	EXTRACTABLE BASES 5B4A-					ACTY	AL	CAT EXCH		RATIO	RATIO	CA	BASE SAT	
	6A1A ORGN CARB	6B1A NITG	C/N	6C2B EXT FE	TOTL	6N2E CA	6Q2D MG	6P2B NA	6Q2B K	SUM EXTB	6H1A BACL TEA	6G1E KCL EXT	5A3A EXTB ACTY	5A6A NHAC	8D1 NHAC TO CLAY	8D3 CA TO MG	5F1 SAT NHAC	5C3 EXTB ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	MEQ / 100 G											PCT	PCT	PCT
C00-12	2.97D	.222	13	1.2		10.0	1.9	.4	.2	12.5	10.4		22.9	17.7	.94	5.3	56	55	71
012-18	1.56	.130	12	1.5		6.0	1.4	.7	.1	8.2	10.3		18.5	14.2	.79	4.3	42	44	58
018-28	1.45	.127	11	1.8		11.9	3.5	2.2	.3	17.9	12.7		30.6	24.2	.68	3.4	49	58	74
028-43	1.36			2.0		18.9	5.9	3.8	.5	29.1	9.0		38.1	32.7	.66	3.2	58	76	89
043-66	1.23			1.9		21.5	6.7	4.7	.5	33.4	5.2		38.6	32.6	.66	3.2	66	87	102
066-97	.54			1.9			6.8	5.0	.5					30.5	.64				
097-122	.19			2.7			9.2	6.7	.6					39.8	.67				
122-153	.13			3.2			11.4	7.2	.7					48.2	.69				
153-160																			
160-165																			
C00-15	1.02			1.6		14.1	2.6	.4	.4	17.5	4.4		21.9	18.2	.72	5.4	77	80	96

DEPTH	SATURATED PASTE			NA	NA	SALT	GYP	SATURATION EXTRACT 8A1-								ATTERBERG		
	8E1 REST OHM-	8C1B PH	8A H2O	5D2 ESP	5E SAR	8D5 TOTL SOLU	6F1A	8A1A EC	6N1B CA	6Q1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/ CM	MEQ / LITER									PCT	
C00-12																			
012-18																			
018-28																			
028-43																			
043-66																			
C66-97																			
097-122	810	7.5	96.1	14	11	1000		1.69	2.4	.8	13.4	TR							
122-153																			
153-160																			
160-165																			
000-15																			

CLAY MINERALOGY (7A2C). PLACEMENT - MONTMORILLONITIC.
043-66 MT3 KK2 MI1.
153-160 MT5 KK1 MI1.
160-165 CA4.
COMMENTS - MONTMORILLONITE POORLY ORDERED.
RELATIVE AMOUNTS - (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE - MT = MONTMORILLONITE MI = MICA KK = KAOLINITE CA = CALCITE.

(A) SAMPLE FROM CULTIVATED FIELD NEAR S73KS-2-2. SEE REMARKS SECTION OF DESCRIPTION.
(B) ESTIMATED.
(C) MICRO-PENETRATION RESISTANCE. A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10-BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.
(D) ORGANIC CARBON IS 16 KG/M SQ TO A DEPTH OF 1 M (6A).

Pedon classification: Vertic Argiudoll, fine, montmorillonitic, thermic
Series classification: (Same)
Soil: Kenoma silt loam
Soil Nos.: S73KS-2-2 (Sample Nos. 1118-1128)
Location: Anderson County, KS; Samples 1118 through 1127--1,750 feet east and 550 feet north of the southwest corner of Sec. 32, T22S, R20E. Sample 1128--1,600 feet east and 550 feet north of the southwest corner of Sec. 32, T22S, R20E.
Climate: Annual precipitation is about 42 inches. Annual temperature is about 58° F., and summer temperature is about 80° F. Average frost-free season is about 195 days.
Vegetation and land use: Sample Nos.1118 through 1127--Mid and tall grasses. Native range. Sample No. 1128--Sorghum stubble. Cropland.
Parent material: Sediments high in silt and clay.
Physiography: Slightly convex, gently sloping erosional upland.
Topography: Slope gradient about 2 percent.
Drainage: Moderately well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Very slow.
Described by: E. L. Fleming, R. L. Haberman.

(Colors are for moist soil unless otherwise stated.)

A11 1118 0 to 12 cm. (0 to 5 inches). Very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; slightly hard, friable; many fine roots; many worm casts; few fine chert fragments; medium acid.

A12 1119 12 to 18 cm. (5 to 7 inches). Continuation of above horizon; abrupt wavy boundary.

B21t 1120 18 to 28 cm. (7 to 11 inches). Very dark grayish brown (10YR 3/2) silty clay, light gray (10YR 7/1) silt coatings on peds in upper 1½ inches, many vertical streaks of very dark brown (10YR 2/2) silt loam; common fine faint mottles of brown (10YR 5/3) and dark yellowish brown (10YR 4/4); weak fine prismatic structure parting to weak very fine blocky structure; very hard, very firm; common fine roots; few fine pores; few worm casts; few black concretions; medium acid; clear irregular boundary.

B22t 1121 28 to 43 cm. (11 to 17 inches). Dark brown (10YR 3/3) silty clay, few fine vertical streaks of very dark brown (10YR 2/2) silt loam; common faint dark yellowish brown (10YR 4/4) mottles; weak very fine subangular blocky structure; very hard, very firm; common fine roots; few fine pores; few black concretions; few fine chert fragments; slightly acid; clear irregular boundary.

B23t 1122 43 to 66 cm. (17 to 26 inches). Brown (10YR 4/3) silty clay, few fine vertical streaks of very dark brown (10YR 2/2) silt loam, common very fine faint yellowish brown (10YR 5/4 and 5/6) mottles; weak very fine subangular blocky structure; very hard, very firm; few fine roots; few very fine pores; common black concretions; few fine chert fragments; neutral; gradual irregular boundary.

B31 1123 66 to 97 cm. (26 to 38 inches). Dark yellowish brown (10YR 4/4) silty clay, common very faint yellowish brown (10YR 5/4) mottles; weak very fine subangular blocky structure; hard, firm; few fine roots; few black concretions; few fine chert fragments; few lime concretions; moderately alkaline; diffuse boundary.

B32 1124 97 to 122 cm. (38 to 48 inches). Brown (7.5YR 4/4) silty clay, common fine faint yellowish brown (10YR 5/4) mottles; weak fine and medium subangular blocky structure; hard, firm; common black concretions; few fine chert fragments; few lime concretions up to 1½ inches in diameter; moderately alkaline; diffuse boundary.

C1 1125 122 to 153 cm. (48 to 60 inches). Mottled reddish brown (5YR 4/4), light brownish gray (2.5Y 6/2), pale olive (5Y 6/3), and yellowish brown (10YR 5/6) stony silty clay loam; massive; hard, firm; many black films and stains; few small lime concretions; small fragments of decomposed shale; moderately alkaline; clear smooth boundary.

C2 1126 153 to 160 cm. (60 to 63 inches). Mottled yellowish brown (10YR 5/6), very pale brown (10YR 7/4), and light olive gray (5Y 6/2) weathered shale of silty clay loam texture; weak platy and weak fine blocky structure; hard, firm; strong effervescence; moderately alkaline; abrupt smooth boundary.

R 1127 160 to 165 cm. (63 to 65 inches). Limestone.

See Location
Ap 1128 0 to 15 cm. (0 to 6 inches). Very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; slightly hard, friable; few fine chert fragments; slightly acid.

SOIL CLASSIFICATION: Vertic Argiustoll; fine, montmorillonitic, mesic

SOIL Ladysmith silty clay loam taxadjunct LOCATION Butler County, Kansas

SOIL NOS. S59Kans-8-5 LAB. NOS. 10966-10975

SOIL SURVEY LABORATORY Lincoln, Nebraska DATE December, 1959

GENERAL METHODS 1A1, 1B1a, 2A1, 2B

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 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	TEXTURAL CLASS
0-6	Ap	<0.1	0.1	0.1a	0.3a	1.6a	63.8	34.1	37.2	28.4	-	sicl
6-15	B21t	<0.1	<0.1	<0.1	0.1a	0.8a	50.4	48.7	24.5	26.8	-	sic
15-24	B22t	<0.1	0.1b	0.1b	0.2b	1.0b	54.1	44.5	26.4	28.8	-	sic
24-32	B3	<0.1	0.1a	0.1a	0.3a	1.7a	58.7	39.1	33.2	27.4	-	sicl
32-42	C1	<0.1	0.1c	0.1c	0.2c	2.8c	59.5	37.3	37.5	24.9	-	sicl
42-52	C2	0.1d	0.1d	0.1d	0.3d	3.4d	56.2	39.8	38.6	21.2	Tr.	sicl/sic
52-69	C3	0.1d	0.1d	0.1d	0.2d	2.7d	49.3	47.5	34.3	17.8	Tr.	sic
69-83	C4	<0.1	0.1a	0.1a	0.2c	2.9c	51.4	45.3	35.4	19.0	Tr.	sic
83-99	C5	<0.1	0.1a	0.1a	0.2c	2.9c	54.3	42.4	37.8	19.5	Tr.	sic
99-111	C6	<0.1	0.1a	0.1a	0.2c	3.0c	54.5	42.1	37.9	19.7	Tr.	sic

DEPTH INCHES	HORIZON	8C1a pH 1:1	1:5	1:10	ORGANIC MATTER 6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N	Free Iron Fe_2O_3 % 6C1a	ELECTRICAL CONDUCTIVITY EC x 10^3 MILLIMHOS PER CM 8A1a	6E1a $CaCO_3$ equivalent %	6F1a GYPSUM me./100g. SOIL	MOISTURE TENSIONS 4B4 Field-State %	4B3 30-cm. %	4B2 15 ATMOS. %
0-6	Ap	5.4	5.9	5.9	1.80	0.139	12.9	0.8	0.3		<1			13.9
6-15	B21t	6.3	6.8	6.9	0.92	0.083	11	0.8	0.4		<1	29		21.1
15-24	B22t	6.8	7.4	7.4	0.80	0.071	11	0.8	0.4	<1	<1	26		19.8
24-32	B3	7.4	7.8	7.8	0.50	0.053	9	1.0	0.5	<1	<1	23		17.6
32-42	C1	7.7	8.2	8.2	0.22			0.8	0.6	<1	<1	20		16.9
42-52	C2	7.9	8.4	8.4	0.15			0.8	0.6	<1	<1	20	29	17.8
52-69	C3	7.9	8.5	8.5	0.13			0.9	0.6	1	<1	23	30	21.0
69-83	C4	7.7	8.4	8.4	0.07			0.9	0.6	<1	<1			20.5
83-99	C5	7.6	8.2	8.4	0.02			0.9	0.7	<1	<1			19.0
99-111	C6	7.5	8.2	8.4	0.01			0.8	0.8	<1	<1			19.0

DEPTH INCHES	HORIZON	5A1a CATION EXCHANGE CAPACITY NH_4Ac	EXTRACTABLE CATIONS (milliequivalents per 100g. soil) 6N2b Ca	6O2b Mg	6H1a H	6P2a Na	5B1a 6Q2a K	5D2 Exch. Na on NH_4OAc CEC %	Saturation Ext. Sol. 8A1 6P1a Na me/l.	6Q1a K	BULK DENSITY 4A1a Field-State g/cc	4A1c 30-cm. g/cc	4A1h Oven-Dry g/cc	8A MOISTURE AT SATURATION %
0-6	Ap	26.6	17.3	5.6	10.3	0.3	0.5	1	0.9	0.1				50.8
6-15	B21t	36.1	25.7	9.1	8.2	1.0	0.5	2	1.7	0.1	1.42		1.85	76.1
15-24	B22t	33.0	24.1	8.1	3.8	1.6	0.5	4	2.2	<0.1	1.46		1.81	77.2
24-32	B3	28.0	20.9	7.1	3.0	1.5	0.4	5	3.1	0.1	1.54		1.79	64.7
32-42	C1	25.6	19.8	6.3	4.7	1.5	0.4	5	4.1	<0.1	1.60		1.76	56.8
42-52	C2	22.5	20.8	6.5	1.8	1.7	0.4	7	4.3	<0.1	1.62	1.44	1.78	57.9
52-69	C3	24.7	23.6	8.1	3.0	2.4	0.5	8	4.3	<0.1	1.59	1.41	1.78	65.2
69-83	C4	25.1	22.3	7.9	2.0	2.3	0.5	8	4.3	<0.1				71.6
83-99	C5	21.8	22.0	7.9	1.8	2.4	0.6	10	4.6	0.1				74.7
99-111	C6	23.6	22.6	8.0	2.0	2.2	0.5	8	4.7	0.1				78.3

a. Common (Fe-Mn?) concr.
b. Many (Fe-Mn?) concr.
c. Few (Fe-Mn?) concr.
d. Few (Fe-Mn?) concr.; few carbonate concr. ($CaCO_3$?).

Pedon classification: Vertic Argiustoll, fine, montmorillonitic, mesic
Series classification: Pachic Argiustoll, fine, montmorillonitic, mesic
Soil: Ladysmith silty clay loam taxadjunct*
Soil Nos.: S59KS-8-5 (Sample Nos. 10966-10975)
Location: Butler County, KS; 150 feet west and 150 feet north of the southeast corner of Sec. 35, T23S, R4E.
Climate: Annual precipitation is about 32 inches. Annual temperature is about 57° F., and summer temperature is about 80° F. Average frost-free season is about 190 days.
Vegetation and land use: Originally mid and tall grasses. Cropland.
Parent material: Old clayey alluvium.
Physiography: Nearly level upland.
Topography: Plane slope. Slope gradient less than 1 percent.
Drainage: Moderately well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Very slow.
Described by: H. L. Penner; M. Stout.

(Colors are for moist soil unless otherwise stated.)

Ap 10966 0 to 15 cm. (0 to 6 inches). Black (10YR 2.5/1) silty clay loam; weak fine granular structure; friable; clear smooth boundary.

B21t 10967 15 to 38 cm. (6 to 15 inches). Black (10YR 2/1.5) clay; few distinct vertical and horizontal dark filled cracks or seams; common faint dark grayish brown (10YR 4/2) mottles; weak to moderate medium fine and very fine blocky structure; very firm; very thin continuous clay films; gradual smooth boundary.

B22t 10968 38 to 61 cm. (15 to 24 inches). Dark gray (10YR 4/1) clay; many distinct vertical and horizontal very dark gray (10YR 3/1) seams or filled cracks; many faint grayish brown (10YR 4/2) mottles; moderate fine and very fine subangular blocky structure; very firm; thin continuous clay films; weak slickensides spaced 13 mm. (½ inch) to 37 mm. (1½ inches) apart; few fine dark soft masses of Fe-Mn; clear smooth boundary.

B3 10969 61 to 81 cm. (24 to 32 inches). Gray (10YR 4.5/1) light silty clay; few dark seams or filled cracks or root channels; many faint medium grayish brown (10YR 5/2) and dark gray (10YR 4/1) mottles; weak to moderate medium blocky structure; very firm; few slickensides; thin continuous clay films; few fine $CaCO_3$ concretions; gradual smooth boundary.

C1 10970 81 to 107 cm. (32 to 42 inches). Dark gray (10YR 4/1) heavy silty clay loam; many faint fine and medium grayish brown (10YR 5/2) and dark brown (10YR 4/3) mottles; massive parting to weak medium and coarse blocky structure; firm; few slickensides; abrupt wavy boundary.

C2 10971 107 to 132 cm. (42 to 52 inches). Dark grayish brown (10YR 4/1.5) silty clay loam; many distinct fine and medium dark brown (10YR 4/3), grayish brown (10YR 5/2), and dark reddish brown (5YR 3/3) mottles; weak medium blocky structure parting to fine and very fine subangular blocky structure; firm; thin, distinct, continuous clay films; common fine Fe-Mn concretions; few to common chert gravels less than 25 mm. (1 inch) in diameter; few $CaCO_3$ concretions; gradual smooth boundary.

C3 10972 132 to 175 cm. (52 to 69 inches). Mottled grayish brown (2.5Y 5/2), dark brown (7.5YR 3/2), and dark brown (7.5YR 4/4) heavy silty clay loam; strong fine and very fine angular and subangular blocky structure; firm; distinct continuous clay films; fine chert gravel mostly in the upper half of horizon making up about 5 percent of the mass; slight effervescence; gradual smooth boundary.

C4 10973 175 to 211 cm. (69 to 83 inches). Reddish brown (5YR 4/3) clay; few medium yellowish red (5YR 5/6) and yellowish brown (10YR 5/6) mottles; moderate medium blocky structure; very firm; few fine $CaCO_3$ and Fe-Mn concretions; augered.

C5 10974 211 to 252 cm. (83 to 99 inches). Reddish brown (5YR 4/4) clay; many medium distinct yellowish brown (10YR 5/6) mottles; many very dark gray (10YR 3/1) streaks; moderate medium blocky structure; very firm; augered.

C6 10975 252 to 282 cm. (99 to 111 inches). Yellowish red (5YR 5/6) silty clay; many medium distinct yellowish brown (10YR 5/6) mottles; many very dark gray (10YR 3/1) streaks; moderate medium blocky structure; very firm; mildly alkaline; augered.

Remarks: Horizons 0 to 15 cm. (0 to 6 inches), 15 to 38 cm. (6 to 15 inches), 81 to 107 cm. (32 to 42 inches), and 132 to 175 cm. (52 to 69 inches) sampled for B.P.R.

*In addition, the pedon has thinner solum, lime concretions at 24 inches, and has a mollic epipedon 15 inches thick. These characteristics are also outside the range of the Ladysmith series.

SOIL CLASSIFICATION: Vertic Paleustoll; fine, montmorillonitic, mesic

SOIL Ladysmith silty clay loam taxadjunct LOCATION Butler County, Kansas

SOIL NOS. S59Kans-8-4 LAB. NOS. 10955-10965

SOIL SURVEY LABORATORY Lincoln, Nebraska DATE December, 1959

GENERAL METHODS 1A1, 1B1a, 2A1, 2B

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 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	TEXTURAL CLASS
0-6	Ap	0.1	0.5	0.8a	1.2a	2.8a	66.5	28.1	42.3	27.6	-	sicl
6-8	AB	<0.1	0.4	0.6a	0.9a	1.7a	54.2	42.2	31.2	25.1	-	sic
8-21	B21t	<0.1	0.3	0.4a	0.6a	1.2a	48.3	49.2	25.1	24.7	-	sic
21-26	B22t	<0.1	0.4	0.4a	0.5a	1.4a	49.9	47.4	24.7	26.8	-	sic
26-38	B3	0.3	1.1	1.0a	1.2a	1.8a	50.1	44.5	25.5	26.9	-	sic
38-47	C1	0.2b	1.7b	1.7b	2.1b	3.2b	48.7	42.4	29.1	23.7	-	sic
47-57	C2	0.2c	2.2c	2.2c	3.6c	4.1c	44.5	43.2	31.1	19.3	-	sic
57-76	C3	0.3a	3.0a	2.2a	2.6a	3.5a	45.0	43.4	29.3	20.4	-	sic
76-89	C4	0.4	3.4	2.5	2.3	3.7	42.3	45.4	28.8	18.1	Tr.	sic
89-98	C5	0.1	1.8	1.4	1.2	2.8	49.1	43.6	29.0	23.4	Tr.	sic
98-114	C6	0.2d	1.0d	1.0d	1.6d	2.6d	47.9	45.7	22.1	29.2	Tr.	sic

8C1a pH 1:1	pH 1:5	pH 1:10	ORGANIC MATTER 6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N	Free Iron Fe_2O_3% 6C1a	ELECTRICAL CONDUCTIVITY EC x 10^3 MILLIMHOS PER CM 8A1a	6E1a $CaCO_3$ equivalent %	6F1a GYPSUM me./100g. SOIL	MOISTURE TENSIONS 4B4 Field State %	4B3 30-cm. %	4B2 15 ATMOS. %
5.8	6.2	6.3	2.12	0.172	12.3	0.7	0.8		◁			12.0
5.8	6.1	6.2	1.46	0.116	12.6	0.8	0.5		◁			16.8
6.8	7.5	7.6	1.00	0.082	12.2	0.7	0.4	◁	◁	32	31	20.7
7.3	8.0	8.2	0.71	0.064	11	0.6	0.5	◁	◁	25	30e	19.8
7.9	8.6	8.7	0.40			0.7	0.8	1	◁	21		18.7
7.9	8.6	8.7	0.23			0.8	0.9	1	◁	20		18.2
7.8	8.4	8.5	0.18			3.2	0.9	◁	◁	20		19.3
7.6	8.4	8.5	0.18			1.8	0.8	◁	◁	20		20.2
7.7	8.4	8.4	0.18			1.2	0.7	◁	◁			20.0
7.6	8.2	8.4	0.09			1.4	0.7	◁	◁			18.9
7.7	8.6	8.8	0.06			1.0	0.9	7	◁			22.0

5A1a CATION EXCHANGE CAPACITY NH_4Ac	EXTRACTABLE CATIONS 5B1a 6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K	5D2 Exch. Na on NH_4OAc CEC %	Saturation Ext. Sol. 8A1 6P1a Na	6Q1a K	BULK DENSITY 4A1a Field-State g/cc	4A1c 30-cm. g/cc	4A1h Oven-Dry g/cc	8A MOISTURE AT SATURATION %
←	milliequivalents per 100g. soil →						← me/L. →					
22.7	15.9	4.8	7.5	0.2	1.3	1	0.9	0.8				51.5
29.5	24.5	6.7	8.8	0.4	0.5	1	1.1	0.1				58.2
34.7	27.7	8.5	4.8	1.2	0.6	3	2.1	0.1	1.33	1.33	1.78	79.8
34.2	26.8	7.8	2.8	2.0	0.6	5	3.5	<0.1	1.50	1.36e	1.82	75.6
29.5	28.9	7.3	1.0	2.3	0.6	6	5.2	0.1	1.59		1.85	77.2
27.0	25.0	6.3	1.5	2.3	0.5	7	5.7	0.1	1.59		1.80	79.4
26.5	21.3	5.9	3.0	2.4	0.5	7	5.8	0.1	1.57		1.72	80.3
28.8	23.4	6.2	3.0	2.5	0.6	7	4.8	0.1	1.57		1.69	78.6
29.5	24.5	6.4	2.6	2.3	0.6	7	4.3	0.1				80.0
30.1	25.7	6.5	1.8	2.4	0.5	7	4.4	0.1				82.9
34.2	42.4	7.4	0.8	2.6	0.6	6	5.4	<0.1				87.2

a. Few (Fe-Mn?) concr.
b. Few (Fe-Mn?) concr.; few carbonate concr. ($CaCO_3$?).
c. Common (Fe-Mn?) concr.; few carbonate concr. ($CaCO_3$?).
d. Few carbonate concr. ($CaCO_3$?).
e. One clod only.

Pedon classification: Vertic Paleustoll, fine, montmorillonitic, mesic
Series classification: Pachic Argiustoll, fine, montmorillonitic, mesic
Soil: Ladysmith silty clay loam taxadjunct*
Soil Nos.: S59KS-8-4 (Sample Nos. 10955-10965)
Location: Butler County, KS; 1,200 feet west and 300 feet north of the southeast corner of Sec. 28, T23S, R3E.
Climate: Annual precipitation is about 32 inches. Annual temperature is about 57° F., and summer temperature is about 80° F. Average frost-free season is about 190 days.
Vegetation and land use: Originally mid and tall grasses. Cropland.
Parent material: Old clayey alluvium.
Physiography: Nearly level upland.
Topography: Plane slopes. Slope gradient less than 1 percent.
Drainage: Moderately well drained.
Ground water: Deep.
Erosion: Slope.
Permeability: Very slow.
Described by: H. L. Penner, M. Stout.

(Colors are for moist soil unless otherwise stated.)

Ap 10955 0 to 15 cm. (0 to 6 inches). Black (10YR 2/1.5) light silty clay loam; weak fine granular structure; friable; clear smooth boundary.

AB 10956 15 to 20 cm. (6 to 8 inches). Black (10YR 2/1) silty clay loam; weak medium blocky structure; friable; horizon is variable in thickness ranging from less than 1 inch to about 2 inches; abrupt smooth boundary.

B21t 10957 20 to 57 cm. (8 to 21 inches). Black (10YR 2.5/1) clay; weak to moderate medium and fine subangular blocky structure; very firm; very thin continuous clay films; gradual smooth boundary.

B22t 10958 57 to 66 cm. (21 to 26 inches). Very dark gray (10YR 3/1) clay; few to common vertical and horizontal cracks or seams of black (10YR 2/1); many fine faint grayish brown (10YR 5/2) mottles; moderate to weak medium blocky structure; very firm; thin distinct continuous clay films; few to common weak slickensides; few unstained quartz grains with some rose quartz; gradual smooth boundary.

B3 10959 66 to 97 cm. (26 to 38 inches). Dark grayish brown (10YR 4/2) silty clay; weak medium blocky structure; very firm; very thin continuous clay films; many strong slickensides in upper half of horizon about 1 to 1½ inches apart, getting weaker with depth; few filled root channels or nearly black seams; common unstained quartz grains; few fine $CaCO_3$ concretions in lower half; gradual smooth boundary.

C1 10960 97 to 120 cm. (38 to 47 inches). Dark grayish brown (10YR 4/1.5) light silty clay; common fine faint brown (10YR 5/3) and dark yellowish brown (10YR 4/4) mottles; massive parting to weak coarse blocky structure; very firm; very thin films on faces of peds; common fine unstained quartz grains; few to common fine $CaCO_3$ concretions; abrupt wavy boundary.

C2 10961 120 to 145 cm. (47 to 57 inches). Mixed reddish brown (5YR 3.5/4) and yellowish red (5YR 4/6) silty clay loam; few distinct dark gray (10YR 4/1) mottles and streaks; massive parting to moderate medium blocky structure; firm; very thin, mostly continuous clay films; many unstained quartz grains; clear smooth boundary.

C3 10962 145 to 193 cm. (57 to 76 inches). Dark brown (7.5YR 4/2) silty clay loam; many fine faint dark brown (7.5YR 4/4) mottles; moderate medium and coarse blocky structure; firm; very thin, mostly continuous clay films; few Fe-Mn coatings on some peds; common coarse quartz grains; many coarse quartz gravels forming a so-called stone line at 145 cm. (57 inches); gradual smooth boundary.

C4 10963 193 to 226 cm. (76 to 89 inches). Dark brown (7.5YR 4/2) silty clay loam; many fine distinct yellowish red (5YR 5/6), black (10YR 2/1), and dark gray (10YR 4/1) mottles; moderate medium and coarse blocky structure; very firm; augered.

C5 10964 226 to 246 cm. (89 to 98 inches). Reddish brown (5YR 4/4) silty clay; distinct, continuous clay films with fine yellowish red (5YR 5/6), reddish brown (5YR 4/3), very dark gray (10YR 3/1), and pale yellow (10YR 6/3) mottles; strong medium blocky and subangular blocky structure; very firm; few Fe-Mn coatings on faces of peds; augered.

C6 10965 246 to 287 cm. (98 to 114 inches). Red (2.5YR 4/6) heavy silty clay loam or silty clay; many light red (2.5YR 6/6), light brownish gray (10YR 6/2), and pale yellow (10YR 6/3) mottles; weak medium blocky and subangular blocky structure; firm; violent effervescence; augered.

Remarks: Horizons 0 to 15 cm. (0 to 6 inches), 20 to 57 cm. (8 to 21 inches), 97 to 120 cm. (38 to 47 inches), and 145 to 193 cm. (57 to 76 inches) were sampled for B.P.R.

*In addition, pedon has hue of 5YR at depths of 120 cm. (47 inches) and lime concretions at 66 cm. (26 inches). These characteristics are also outside the range of the Ladysmith series.

SOIL CLASSIFICATION-AQUIC ARGIUDOLL
FINE, MONTMORILLONITIC, MESIC
SERIES - - - - - - -MARTIN SILTY CLAY LOAM

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE MRTSC
SOIL SURVEY INVESTIGATIONS UNIT
LINCOLN, NEBRASKA

SOIL NO - - - - - - S71KS-23-1 COUNTY - - - DOUGLAS

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 71L1279-71L1286

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO		
		SAND 2- .05	SILT .05- .002	CLAY LT .002	FINE CLAY LT .0002	VCOS SAND 2- 1	CORS SAND 1- .5	MEDS SAND .5- .25	FNES SAND .25- .10	VFNS SAND .10- .05	COSI SILT .05- .02	FNSI SILT .02- .002	VFSI SILT .005- .002	FAML TEXT SAND 2-.1	INTR TI .2- .02	FINE CLAY TO CLAY	NON- CO3- CLAY	8D1 15- BAR TO CLAY
CM		PCT LT 2MM														PCT	PCT	
000-25	A1	4.8	67.0	28.2	16.5	.1	.3	.3	.7	3.4	30.9	36.1	5.5	1.4	34.7	59		.42
025-39	AB	3.2	63.5	33.3	19.6	.3	.5	.3	.5	1.6	24.0	39.5	9.1	1.6	25.8	59		.43
039-55	B21T	3.0	55.1	41.9	26.8	.2	.7	.4	.5	1.2	19.6	35.5	9.1	1.8	21.0	64		.44
055-75	B22T	2.2	51.0	46.8	31.1	.1	.4	.3	.4	1.0	18.0	33.0	8.2	1.2	19.2	66		.46
075-107	B3	2.4	54.7	42.9	25.7	.1	.3	.2	.4	1.4	20.8	33.9	8.3	1.0	22.4	60		.45
107-132	C1	3.6	57.0	39.4	22.8	TR	.4	.3	.7	2.2	20.8	36.2	9.0	1.4	23.5	58		.45
132-164	B 21b	6.6	50.7	42.7	25.4	.2	.5	.5	1.3	4.1	19.1	31.6	8.2	2.5	24.0	59		.43
164-200	B 22b	6.6	43.7	49.7	33.1	.5	.5	.3	.9	4.4	16.2	27.5	7.3	2.2	21.2	67		.41

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2	WEIGHT GT 75	75-20	20-5	5-2	LT .074	20-2 LT20	BULK DENSITY 4A1D 1/3- BAR	4A1H OVEN DRY	4D1 COLE	WATER CONTENT- 4B1C 1/10 BAR	4B1C 1/3- BAR	4B2 15- BAR	4C1 WRD CM/CM	CARBONATE 6E1B LT 2	3A1A LT .002	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	PCT LT 75				PCT	G/CC	G/CC		PCT	PCT	PCT		PCT	PCT		
000-25	0	0	0	0	0	98	0	1.39	1.49	.020	27.2	25.0	11.9	.18	2.7A		5.8	5.4
025-39	0	0	0	0	0	98	0	1.34	1.45	.027	25.6	24.7	14.3	.14	4.8A		5.9	5.2
039-55	0	0	0	0	0	98	0	1.39	1.69	.067	30.2	28.4	18.6	.14	4.3A		5.8	5.5
055-75	0	0	0	0	0	99	0	1.39	1.83	.096	32.2	30.6	21.4	.13	2.8A		6.3	5.9
075-107	0	0	0	0	0	99	0	1.43	1.80	.080	29.2	27.7	19.2	.12	3.8A		6.9	6.5
107-132	0	0	0	0	0	98	0	1.50	1.84	.071	28.0	25.6	17.9	.12	4.1A		7.2	6.7
132-164	0	0	0	0	0	96	0						18.3				6.7	6.7
164-200	0	0	0	0	0	96	0						20.3				7.1	6.8

DEPTH	(ORGANIC MATTER) 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2A EXT FE	PHOS 6S1A TOTL	(EXTRACTABLE BASES 5B4A- 6N2E CA	6O2D MG	6P2A NA	6Q2A K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1D KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
CM	PCT	PCT		PCT	PCT	MEQ / 100 G													
000-25	1.76B	.143	12			15.9	3.4	.1	.4	19.8	8.1		27.9	23.1	.82	4.7	69	71	86
025-39	1.42	.129	11			13.4	3.9	.1	.4	17.8	8.8		26.6	22.6	.68	3.4	59	67	79
039-55	.92	.073	13			16.3	5.5	.3	.6	22.7	8.3		31.0	27.0	.64	3.0	60	73	84
055-75	.52					18.9	6.9	.4	.7	26.9	7.0		33.9	29.3	.63	2.7	65	79	92
075-107	.29					18.8	6.4	.4	.7	26.3	5.6		31.9	26.7	.62	2.9	70	82	99
107-132	.20					18.1	5.9	.4	.6	25.0	3.6		28.6	25.2	.64	3.1	72	87	99
132-164	.35																		
164-200	.44																		

DEPTH	(SATURATED PASTE) 8E1 REST OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	(SATURATION EXTRACT 8A1- 8A1A EC	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/CM	MEQ / LITER									PCT	
000-25																		38C	13
025-39																			
039-55																			
055-75	2100	6.3	71.8	1	1	130		.30	1.4	.6	.8	.1						65C	35
075-107																			
107-132																			
132-164																			
164-200																			

CLAY MINERALOGY (7A2C). PLACEMENT (S71KS-23-1) MONTMORILLONITIC.
055-75 MT4 MI3 KK3
COMMENTS - MT PEAK BROAD, INTERLAYERS LIKELY.
RELATIVE AMOUNTS - (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE - MT = MONTMORILLONITE MI = MICA KK = KAOLINITE

(A) MICRO-PENETRATION RESISTANCE - A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10-BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.

(B) ORGANIC CARBON IS 13 KG/M SQ TO A DEPTH OF 1 M (6A).

(C) DETERMINED BY SOIL MECHANICS LAB - SCS, LINCOLN, NE.

Pedon classification: Aquic Argiudoll, fine, montmorillonitic, mesic
Series classification: (Same)
Soil: Martin silty clay loam
Soil Nos.: S71KS-23-1 (Sample Nos. 1279-1286)
Location: Douglas County, KS; 1,840 feet north and 750 feet west of the southeast corner of Sec. 31, T13S, R18E.
Climate: Annual precipitation is about 37 inches. Annual temperature is about 56° F., and mean summer temperature is about 78° F. Average frost-free season is about 185 days.
Vegetation and land use: Sorghum stubble. Cropland.
Parent material: Interbedded silty and clayey shales and clay beds.
Physiography: Sloping erosional upland.
Topography: Slightly concave foot slope position below limestone outcrops. Slope gradient of about 2 percent.
Drainage: Moderately well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Slow.
Described by: R. L. Haberman, R. W. Fenwick, W. Abmeyer, J. L. Zimmerman.

(Colors are for moist soil unless otherwise stated.)

A1 1279 0 to 25 cm. (0 to 10 inches). Black (10YR 2/1) silty clay loam; weak fine granular structure, with weak very fine thin platy structure in lower 2 inches; slightly hard, friable; slightly acid; clear smooth boundary.

AB 1280 25 to 39 cm. (10 to 15 inches). Very dark brown (10YR 2/2) silty clay loam; moderate medium granular structure; slightly hard, friable; slightly acid; clear smooth boundary.

B21t 1281 39 to 55 cm. (15 to 22 inches). Very dark grayish brown (10YR 3/2) silty clay; few fine distinct mottles of yellowish red (5YR 4/6); moderate fine and medium subangular blocky and blocky structure; very hard, very firm; few fine black concretions; slightly acid; gradual smooth boundary.

B22t 1282 55 to 75 cm. (22 to 30 inches). Very dark grayish brown (10YR 3/2) silty clay; common fine faint mottles of yellowish brown (10YR 5/6); stains of very dark gray (10YR 3/1) in root channels; moderate fine and medium blocky structure; very hard, very firm; fine black concretions, more numerous than above horizon; neutral; gradual smooth boundary.

B3 1283 75 to 107 cm. (30 to 42 inches). Grayish brown (2.5Y 5/2) silty clay; common fine faint mottles of strong brown (7.5YR 5/6); stains of very dark gray (10YR 3/1) in root channels; weak medium blocky structure; very hard, very firm; thin discontinuous clay films on some faces of peds; few fine black concretions; neutral; diffuse smooth boundary.

C1 1284 107 to 132 cm. (42 to 52 inches). Mixed dark grayish brown (10YR 4/2), yellowish brown (10YR 5/6), grayish brown (10YR 5/2), light brownish gray (2.5Y 6/2) silty clay; stains of very dark gray (10YR 3/1) not associated with root channels; massive; very hard, very firm; neutral; gradual smooth boundary.

B21b 1285 132 to 164 cm. (52 to 65 inches). Mixed grayish brown (2.5Y 5/2), dark brown (10YR 3/3) silty clay; few fine faint mottles of yellowish brown (10YR 5/6) and distinct mottles of strong brown (7.5YR 5/6); weak medium subangular blocky structure; hard, firm; neutral; gradual smooth boundary.

B22b 1286 164 to 200 cm. (65 to 79 inches). Dark grayish brown (10YR 4/2) silty clay; few fine faint mottles of yellowish brown (10YR 5/6); very dark gray (10YR 3/1) stains on some faces of peds; weak medium subangular blocky structure; hard, firm; neutral.

Remarks: Water table at depth of about 70 inches, which moved up to within 60 inches of the surface in a period of a few hours.
Horizons between 0 to 25 cm. (0 to 10 inches), 55 to 75 cm. (22 to 30 inches), and 107 to 132 cm. (42 to 52 inches) were sampled for engineering testing.)

SOIL CLASSIFICATION: Pachic Paleustoll; clayey-skeletal, montmorillonitic, mesic

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Matfield cherty silt loam SOIL Nos. S63Kans-9-1 LOCATION Chase County, Kansas

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18425-18430 August, 1967

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

Depth (In)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Sand: Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	Silt: 0.05–0.02	Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	Coarse fragments 2A2: 3B2 > 2 Vol. Pct.	3B1 > 2 Wt. Pct.	2–19 Pct. of < 76mm	19–76 Pct. of < 76mm
		Pct. of < 2 mm															
0-3	A11	11.2	68.3	20.5	2.4	1.4	0.5	3.0	3.9	43.4	24.9	49.9	7.3	22	32	26	6
3-10	A12	6.9	71.5	21.6	1.5	0.7	0.4	0.6	3.7	45.6	25.9	49.6	3.2	80	89	30	59
10-22	A13	6.9	70.5	22.6	1.6	1.0	0.4	0.6	3.3	41.7	28.8	45.3	3.6				
22-33	A21	10.5	67.3	22.2	4.4	1.9	0.6	0.8	2.8	37.7	29.6	40.9	7.7	82	91a	12a	76a
33-42	A22	14.7	69.9	15.4	5.0	2.2	0.9	1.2	5.4	41.2	28.7	47.3	9.3				
42-62	B2t	5.7	21.5	72.8	1.5	1.3	0.6	0.8	1.5	10.4	11.1	12.4	4.2	61	68	10	45

Depth (In)	6A1a Organic carbon b Pct.	6B1a Nitrogen Pct.	C/N	6E2a Carbonate as $CaCO_3$ Pct.	Ext. Iron as Fe Pct.	Bulk density: g/cc	g/cc	g/cc	Water content: Pct.	Pct.	4B2 15-Bar Pct.	Wf/V c g/cc	pH 8C1a 1:1
0-3	4.16	0.340	12								10.8	1.0	5.8
3-10	2.43	0.201	12								9.2	0.2	6.2
10-22	1.72	0.151	11								9.3		6.6
22-33	0.78	0.085	9								9.2	0.2a	6.6
33-42	0.21										7.0		6.6
42-62	0.41			-(s)							30.7	0.6	6.8

Depth (In)	Extractable bases 5B1a: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap: 5A3a Sum Cations	5A1a NH_4OAc	8D3 Ca/Mg	Base saturation: 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g										
0-3	12.7	2.7	tr	1.7	17.1	7.7	24.8	18.9	4.7	69	90
3-10	10.3	2.5	tr	1.8	14.6	5.6	20.2	16.5	4.1	72	88
10-22	9.1	2.2	tr	1.9	13.2	4.5	17.7	14.5	4.1	74	91
22-33	7.4	2.2	0.1	1.0	10.7	3.1	13.8	11.6	3.4	78	92
33-42	5.6	2.0	0.1	0.2	7.9	2.2	10.1	8.3	2.8	78	95
42-62	33.2	11.9	0.4	0.9	46.4	5.0	51.4	42.2	2.8	90	110

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-3	0.92		0.53
3-10	0.76		0.42
10-22	0.64		0.41
22-33	0.52		0.41
33-42	0.54		0.45
42-62	0.58		0.42

a. 10-42 inches.

b. 7 kg/m^2 to 60 inches (Method 6A).

c. Weight of fine earth per unit volume of horizon; calculated to include volume but not weight of > 2-mm. material (Method 3B2). Average density of > 2-mm. material was determined at 2.2 g/cc. Used estimate of the bulk density of the fine-earth fabric in interstices between pebbles; adjustment made for incomplete filling by fine earth between pebbles.

Mineralogy (Method 7B1). A13 horizon: Bulk of coarse sands are chert fragments. Finer sands have more clear quartz. The very fine sands are approximately 50 percent quartz, 20 percent chert, 30 percent feldspar, plus a few percent unidentified aggregates.

Pedon classification: Pachic Paleustoll, clayey-skeletal, montmorillonitic, mesic
Series classification: (Same)
Soil: Matfield cherty silt loam
Soil Nos.: S63KS-9-1 (Sample Nos. 18425-18430)
Location: Chase County, KS; 4,200 feet east and 850 feet north of the southwest corner of Sec. 6, T22S, R8E.
Climate: Annual precipitation is about 32 inches. Annual temperature is about 56° F., and mean summer temperature is about 79° F. Average frost free season is about 185 days.
Vegetation and land use: Mid grasses predominate with a few tall grasses and a considerable component of short grasses. Rangeland.
Parent material: Cherty limestone.
Physiography: Nearly level erosional upland.
Topography: Slightly convex, narrow ridgetop. Slope gradient less than 1 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Very slow.
Described by: H. L. Penner.

(Colors are for dry soil unless otherwise stated.)

A11 18425 0 to 8 cm. (0 to 3 inches). Grayish brown (10YR 5/2) cherty silt loam, very dark brown (10YR 2/2) moist; strong fine granular structure; slightly hard, very friable; angular chert from 6 mm. to 6 cm. (¼ to 2½ inches) in longest dimension comprises 15 percent of soil mass; many fine roots; clear smooth boundary.

A12 18426 8 to 15 cm. (3 to 10 inches). Grayish brown (10YR 5/2) very cherty silt loam, very dark brown (10YR 2/2) moist; strong fine granular structure; slightly hard, very friable; angular chert averaging about 6 cm. (2½ inches) in longest dimension comprises about 75 percent of soil mass; many clusters of fine worm casts; many fine roots; gradual smooth boundary.

A13 18427 15 to 56 cm. (10 to 22 inches). Dark grayish brown (10YR 4/2) very cherty silt loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; slightly hard, very friable; chert content as in A12 horizon; many fine worm casts; many fine roots; gradual smooth boundary.

A21 18428 56 to 84 cm. (22 to 33 inches). Brown (7.5YR 5/3) very cherty silt loam, dark brown (7.5YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, very friable; chert content as in A12 horizon; few voids up to 12 mm. (½ inch) in diameter; many open pores, many fine worm casts; common fine roots; gradual smooth boundary.

A22 18429 84 to 107 cm. (33 to 42 inches). Light brown (7.5YR 6/4) very cherty silt loam, brown (7.5YR 5/4) moist; massive; soft, very friable; angular chert fragments comprise about 80 percent of soil mass; very porous; few fine roots; abrupt wavy boundary.

B2t 18430 107 to 158 cm. (42 to 62 inches). Dark red (2.5YR 3/6) dry or moist, coarse cherty clay; moderate fine blocky structure; extremely hard, very firm; angular chert fragments averaging about 13 cm. (5 inches) in longest dimension comprise about 75 percent of soil mass; clear wavy boundary.

R 158 cm. (62 inches). Cherty limestone with common vertical fractures containing clay as that of B2t horizon.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Pachic Paleustoll; clayey-skeletal, montmorillonitic, mesic.

SOIL Matfield cherty silt loam SOIL Nos. S63Kans-9-3 LOCATION Chase County, Kansas

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18435-18440 August, 1967

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

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Sand: Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	Silt: 0.05–0.02	Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)		Coarse fragments 2A2: 3B2 > 2 Vol. Pct.	3B1 > 2 Wt. Pct.	2–19 (Pct. of < 76mm)	19–76 (Pct. of < 76mm)
		Pct. of < 2 mm																
0-3	A11	7.4	73.5	19.1	1.5	1.3	0.5	0.7	3.4	48.1	25.4	51.9	4.0		18	27	15	12
3-12	A12	6.4	73.6	20.0	1.1	0.7	0.4	0.6	3.6	46.4	27.2	50.3	2.8		71	82	12	70
12-21	A13	6.0	71.6	22.4	1.4	0.7	0.4	0.6	2.9	43.9	27.7	47.1	3.1					
21-37	A21	13.6	66.4	20.0	6.4	2.7	0.8	1.0	2.7	37.0	29.4	40.2	10.9		66	86a	16a	65a
37-41	A22	15.6	70.8	13.6	6.1	2.7	1.0	1.4	4.4	40.3	30.5	45.4	11.2					
41-56	B2t	7.9	29.7	62.4	1.6	1.7	0.8	1.1	2.7	17.0	12.7	20.3	5.2		52	60	10	37

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: g/cc	g/cc	g/cc		Water content: Pct.	Pct.	4B2 15-Bar Pct.		Wf/V [c] g/cc		pH 8C1a 1:1	
0-3	3.69	0.270	14			0.8							9.2		1.1		5.8	
3-12	2.62					0.7							8.9		0.3		5.7	
12-21	1.73					0.8							9.2				5.8	
21-37	0.68					0.9							8.8		0.2a		5.8	
37-41	0.20					0.8							6.5				5.7	
41-56	0.29					2.3							23.9		0.8		6.3	

Depth (In.)	Extractable bases: 6N2a Ca	6O2a Mg	6P2a Na	5B1a 6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	8D3 Ca/Mg	Base saturation: 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g										
0-3	10.8	2.1	tr	1.2	14.1	6.3	20.4	16.2	5.1	69	87
3-12	9.4	1.8	tr	1.2	12.4	6.7	19.1	15.2	5.2	65	82
12-21	8.7	2.0	tr	1.1	11.8	5.4	17.2	14.2	4.4	69	83
21-37	6.5	2.0	tr	0.4	8.9	4.0	12.9	10.6	3.2	69	84
37-41	5.0	1.6	0.1	0.2	6.9	1.7	8.6	7.7	3.1	80	90
41-56	28.8	8.4	0.4	0.7	38.3	6.0	44.3	36.2	3.4	86	106

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-3	0.85	0.04	0.48
3-12	0.76	0.04	0.44
12-21	0.63	0.04	0.41
21-37	0.53	0.05	0.44
37-41	0.57	0.06	0.48
41-56	0.58	0.04	0.38

a. 20-32 inches.

b. .7 kg/m² to 56 inches (Method 6A).

c. Weight of fine earth per unit volume of horizon; calculated to include volume but not weight of > 2-mm. material (Method 3B2). Average density of > 2-mm. material was determined at 2.2 g/cc.
Used estimate of the bulk density of the fine-earth fabric in interstices between pebbles; adjustment made for incomplete filling by fine earth between pebbles.

Mineralogy (Methods 7A2, 7A3). B2t horizon: Fine clay (< 0.2μ), slightly more than half of total clay is dominated by poorly ordered montmorillonite. The coarse clay contains abundant montmorillonite, moderate amounts of quartz and mica, and a small amount of kaolinite. Differential thermal analysis indicates the montmorillonite is a nontronite. Clay mineralogy is montmorillonitic.

USDA-SCS HYATTSVILLE MD 1964

Pedon classification: Pachic Paleustoll, clayey-skeletal, montmorillonitic, mesic
Series classification: (Same)
Soil: Matfield cherty silt loam
Soil Nos.: S63KS-9-3 (Sample Nos. 18435-18440)
Location: Chase County, KS; 2,100 feet east and 2,460 feet north of the southwest corner of Sec. 18, T22S, R8E.
Climate: Annual precipitation is about 32 inches. Annual temperature is about 56° F., and mean summer temperature is about 79° F. Average frost-free season is about 185 days.
Vegetation and land use: Mid grasses predominate with a few tall grasses and a considerable component of short grasses. Rangeland.
Parent material: Cherty limestone.
Physiography: Nearly level erosional upland.
Topography: Slightly convex, narrow ridgetop. Slope gradient less than 1 percent.
Drainage: Well drained.
Erosion: Slight.
Permeability: Very slow.
Described by: H. L. Penner.

(Colors are for dry soil unless otherwise stated.)

A11 18435 0 to 8 cm. (0 to 3 inches). Dark grayish brown (10YR 4.5/2) cherty silt loam, very dark brown (10YR 2.5/2) moist; strong fine granular structure; slightly hard, very friable; weak platy in upper ½ inch; angular chert fragments mostly less than 2 inches in size occupy about 15 percent of soil mass; many fine roots; clear smooth boundary.

A12 18436 8 to 30 cm. (3 to 12 inches). Dark grayish brown (10YR 4.5/2) very cherty silt loam, very dark brown (10YR 2.5/2) moist; strong fine granular structure; slightly hard, very friable; angular chert fragments occupy about 75 percent of soil mass; many worm casts; many fine roots; clear smooth boundary.

A13 18437 30 to 53 cm. (12 to 21 inches). Grayish brown (10YR 4.5/2) very cherty silt loam, very dark grayish brown (10YR 3.5/2) moist; strong very fine granular structure; slightly hard, very friable; chert content as in A12 horizon; worm castings comprise about 40 percent of the horizon; many fine roots; gradual smooth boundary.

A21 18438 53 to 94 cm. (21 to 37 inches). Brown (7.5YR 5.5/4) very cherty silt loam, dark brown (7.5YR 3/4) moist; moderate fine subangular blocky structure; slightly hard, very friable; chert content as in A12 horizon; worm castings comprise about 40 percent of the horizon; many open pores; few voids occurring as tunnels and cracks up to ½ inch in diameter; common fine roots; gradual smooth boundary.

A22 18439 94 to 104 cm. (37 to 41 inches). Light brown (7.5YR 6.5/4) very cherty silt loam, brown (7.5YR 5/4) moist; faintly mottled with browner colors; massive; slightly hard, very friable; chert content as in A12; many fine open pores; contains few voids up to ½ inch in diameter; few fine roots; abrupt wavy boundary.

B2t 18440 104 to 142 cm. (41 to 56 inches). Dark red (2.5YR 3/6) both dry and moist, coarse cherty clay; moderate fine blocky structure; extremely hard, extremely firm; angular chert fragments make up about 75 percent of soil mass; gradual wavy boundary.

R 142 cm. (56 inches). Cherty limestone with vertical fractures filled with dark red clays that are nearly massive.

Remarks: From 30 to 36 inches, the A22 and B2t horizons seem to occur in alternating bands. In the chert fragment, vugs would be dark red clay yet the surface of the same chert fragment would be light brown silt loam. This occurred erratically in sample pit.

SOIL CLASSIFICATION-TYPIC ARGIUSTOLL
FINE, MONTMORILLONITIC, MESIC
SERIES - - - - - - - - MENTO SILT LOAM

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S68KANS-26-13 COUNTY - - - ELLIS

GENERAL METHODS- - - 1A, 1B1B, 2A1, 2B SAMPLE NOS.- 68L387-68L390

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B															RATIO
					FINE	SAND					SILT			FAML	INTR	FINE	NON-
		SAND 2- .05	SILT .05- .002	CLAY LT .002	CLAY LT .0002	VCOS 2- 1	CORS 1- .5	MEDS .5- .25	FNES .25- .10	VFNS .10- .05	COSI .05- .02	FNSI .02- .002	VFSI .002- .005	TEXT SAND 2-.1	II .2- .02	CLAY TO CLAY	CO3- CLAY
CM		PCT LT 2MM															
000-15	AP	6.4	72.1	21.5	14.0	0	0.2	0.2	0.3	5.6	52.5	19.6		0.7	58.4	65	0.39
015-23	A12	5.0	71.4	23.6	15.3	0	0.1	0.1	0.2	4.6	49.9	21.5		0.4	54.5	65	0.41
023-36	B21T	3.5	58.9	37.6	29.9	0.1	0.1	0.1	0.2	3.1	39.6	19.3		0.4	42.8	80	0.46
079-104	C1CA																

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2						BULK DENSITY			WATER CONTENT			CARBONATE		PH	
	VOL. WEIGHT 6A1D GT 2	6A1H GT 75	75-20	20-5	5-2	LT .074	2-.2 PCT	4D1 1/3-BAR	4B1C OVEN DRY	4B1C COLE	4B2 1/10 BAR	4C1 1/3-BAR	15- BAR	WRD CM/	6E1B LT 2	3A1A LT .002	8C1A 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	PCT LT 75				LT 20	G/CC	G/CC		PCT	PCT	PCT	CM	PCT	PCT		
000-15	TR	0	0	0	TR	99	TR						8.4		ST		7.1	
015-23	0	0	0	0	0	99	0						9.7		ST		7.6	
023-36	0	0	0	0	0	99	0						17.4		0		7.6	
079-104	TR	0	0	0	TR		TR						15.1		6		7.9	

DEPTH	ORGANIC MATTER 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6G2A EXT FE	PHOS 6S1A TOTL	EXTRACTABLE BASES 5B4A- 6N2E CA	6Q2D MG	6P2A NA	6Q2A K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1D KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 TO CLAY	RATIO 8D3 TO MG	CA 5F SAT NHAC	(BASE SAT) 5C3 EXTB ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	MEQ / 100 G									CLAY	MG	PCT	PCT	PCT
000-15	1.08																		
015-23	0.86																		
023-36	0.79					16.4	7.3	3.5	1.3	28.5				26.7	0.71	2.2	61		107
079-104	0.30							7.4	1.1					21.9					

DEPTH	SATURATED PASTE 8C1 RESI OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	SATURATION EXTRACT 8A1- 8A1A EC	6N1B CA	6Q1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/ CM	MEQ / LITER									PCT	
000-15																		30	7
015-23																			
023-36	1300	7.3	58.1	12		260		0.70			6.0							49	25
079-104	330	7.8	57.7	18		3500		7.64			59.5								

Pedon classification: Typic Argiustoll, fine, montmorillonitic, mesic
Series classification: (Same)
Soil: Mento silt loam
Soil Nos.: S68KS-26-13 (Sample Nos. 387-390)
Location: Ellis County, KS; 200 feet east and 600 feet north of the southwest corner of Sec. 16, T13S, R20W.
Climate: Annual precipitation is about 23 inches. Annual temperature is about 54° F., and summer temperature is about 78° F. Average frost-free season is about 171 days.
Vegetation and land use: Summer fallow. Cropland.
Parent material: Loess over chalk or limestone.
Physiography: Nearly level upland.
Topography: Very slightly concave slope. Slope gradient less than 1 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Slow.
Described by: R. F. Harner, J. M. Allen.

(Colors are for dry soil unless otherwise stated.)

Ap 387 0 to 15 cm.(0 to 6 inches). Dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium platy structure parting to weak fine granular structure; slightly hard, friable; few fine roots; abrupt smooth boundary.

A12 388 15 to 23 cm.(6 to 9 inches). Gray (10YR 5/1) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; hard, friable; common fine roots; abrupt smooth boundary.

B21t 389 23 to 36 cm.(9 to 14 inches). Grayish brown (10YR 5/2) heavy silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium blocky structure; very hard, very firm; few fine roots; clear smooth boundary.

B22t 36 to 43 cm.(14 to 17 inches). Grayish brown (10YR 5/2) heavy silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium blocky structure; hard, firm; few fine roots; clear wavy boundary.

B31ca 43 to 58 cm.(17 to 23 inches). Brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, firm; few fine roots; many soft medium sized carbonate accumulations; strong effervescence; gradual smooth boundary.

B32ca 58 to 79 cm.(23 to 31 inches). Pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, firm; few very fine roots; few coarse root channels filled with darker colored soil material; soft carbonate accumulations common but fewer and smaller than horizon above; strong effervescence; gradual smooth boundary.

C1ca 390 79 to 104 cm.(31 to 41 inches). Pale brown (10YR 6/3) light silty clay loam, brown (10YR 5/3) moist; massive; hard, friable; few very fine roots; 1 quartz pebble; common threads and films of segregated lime; violent effervescence; gradual wavy boundary.

IIC2 104 to 150 cm.(41 to 59 inches). White (10YR 8/2) clay loam, light gray (10YR 7/2) moist; massive; porous; hard, friable; violent effervescence; gradual wavy boundary.

IIC3 150 to 170 cm.(59 to 67 inches). Very pale brown (10YR 8/3) gravelly clay loam, very pale brown (10YR 7/3) moist; pebbles are mostly chalk or limestone; massive; porous; hard, friable; violent effervescence; abrupt smooth boundary.

IIR 170 cm.(67 inches). Chalk, level bedded, few joints, believed to be of the Niobrara formation.

SOIL CLASSIFICATION: Typic Ustifluvent; coarse-loamy, mixed,(calcareous), mesic

SOIL Munjor very fine sandy loam LOCATION Osborne County, Kansas

SOIL NOS. S53Kans-71-4 LAB. NOS. 1439-1445

SOIL SURVEY LABORATORY Mandan, North Dakota

GENERAL METHODS 1A, 1B1a, 2A1, 2B

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	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	0.02-0.002	0.2-0.02	> 2	
1439	0-5	Ap	0.1	1.1	3.5	19.2	26.5	41.9	7.7	8.3	73.3	-	l
1440	5-9	C1	-	0.1	0.7	21.1	20.5	47.1	10.5	12.0	72.8	-	l
1441	9-22	C2	-	0.2	0.9	39.7	27.0	25.0	7.2	8.2	76.5	-	fsl
1442	22-27	C3	-	-	0.1	14.6	40.9	38.2	6.2	7.9	84.2	-	vfsl
1443	27-35	C4	-	-	0.4	1.3	27.7	62.2	8.4	11.6	79.4	-	sil
1444	35-48	C5	-	-	0.1	9.6	32.1	49.8	8.4	11.7	78.9	-	l
1445	48-57	C6	-	-	0.3	4.0	19.5	63.6	12.6	18.1	68.0	-	sil

LABORATORY NUMBER	pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUC-TIVITY EC x 10 3 MILLIMHOS PER CM @ 25°C	6E1a CaCO3 equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS (per cent)		
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					1/10 ATMOS. 4B1a	1/3 ATMOS. 4B1a	15 ATMOS. 4B2
1439	7.9	8.3	8.6	0.29	0.032	9			6		27.5	12.9	4.6
1440	7.9	8.4	8.6	0.28	0.035	8			9		30.0	17.1	6.2
1441	7.9	8.5	8.6	0.16	0.021				10		22.0	10.8	4.1
1442	7.9	8.4	8.6	0.11	0.014				7		29.0	11.2	4.0
1443	8.0	8.5	8.6	0.16	0.021				5		36.1	15.1	5.2
1444	7.9	8.5	8.6	0.13	0.016				7		32.3	13.6	4.9
1445	7.9	8.5	8.6	0.24	0.028	9			7		34.8	19.6	6.5

LABORATORY NUMBER	5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS 5B1a					Base Sat. % on NH_4OAc	SATURATION EXTRACT SOLUBLE					PER CENT MOISTURE AT SATURATION	Ca/Mg
		Ca	6O2b Mg	6P2a Na	6Q2a K	Sum		K	CO_3	HCO_3	Cl	SO_4		
	milliequivalents per 100g soil							milliequivalents per liter						
1439	7.6		1.4	0.1	0.4									
1440	8.8		1.6	0.2	0.3									
1441	6.6		1.2	0.2	0.3									
1442	6.6		2.1	0.2	0.4									
1443	8.9		2.1	0.1	0.9									
1444	8.3		2.8	0.1	1.1									
1445	11.3		2.3	0.2	1.4									

AGR BCB BELTSVILLE MD 2682 JUNE 1953

Pedon classification: Typic Ustifluvent, coarse-loamy, mixed (calcareous), mesic
Series classification: (Same)
Soil: Munjor very fine sandy loam
Soil Nos.: S53KS-71-4 (Sample Nos. 1439-1445)
Location: Osborne County, KS; 700 feet west and 300 feet south of the center of Sec. 16, T7S, R13W.
Climate: Annual precipitation is about 23½ inches. Annual temperature is about 54° F., and summer temperature is about 79° F. Average frost-free season is about 171 days.
Vegetation and land use: Fallow. Cropland.
Parent material: Calcareous, moderately coarse textured alluvium.
Physiography: Nearly level terrace.
Topography: Slope gradient less than 1 percent.
Drainage: Well drained.
Ground water: Greater than 5 feet.
Erosion: Slight.
Permeability: Moderately rapid.
Described by: W. M. Johnson.

(Colors are for dry soil unless otherwise stated.)

Ap 1439 0 to 13 cm. (0 to 5 inches). Light brownish gray (10YR 6/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; strong effervescence.

C1 1440 13 to 23 cm. (5 to 9 inches). Light brownish gray (10YR 6/2) indistinctly stratified very fine loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; strong effervescence.

C2 1441 23 to 56 cm. (9 to 22 inches). Light brownish gray (10YR 6/2) stratified fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; strong effervescence.

C3 1442 56 to 69 cm. (22 to 27 inches). Light brownish gray (10YR 6/2) stratified loamy very fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; strong effervescence.

C4 1443 69 to 89 cm. (27 to 35 inches). Light brownish gray (10YR 6/2) stratified very fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, friable; strong effervescence.

C5 1444 89 to 122 cm. (35 to 48 inches). Stratified light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) stratified very fine sandy loam, light brownish gray (10YR 6/2) and dark grayish brown (10YR 4/2) moist; massive; soft, friable; strong effervescence.

C6 1445 122 to 145 cm. (48 to 57 inches). Light brownish gray (10YR 6/2) stratified very fine sandy loam and silt loam, dark grayish brown (10YR 4/2) moist; massive; soft, friable; strong effervescence.

Ab 145 to 155 cm. (57 to 61 inches). Grayish brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) moist; light brownish gray (10YR 6/2) streaks and mottles; weak medium granular structure; soft, friable; strong effervescence.

SOIL CLASSIFICATION: Typic Ustifluvent; coarse-loamy, mixed,(calcareous), mesic

SOIL Munjor very fine sandy loam LOCATION Osborne County, Kansas

SOIL NOS. S53Kans-71-8 LAB. NOS. 1468-1474

SOIL SURVEY LABORATORY Mandan, North Dakota

GENERAL METHODS 1A, 1B1a, 2A1, 2B

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	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	0.02-0.002	0.2-0.02	> 2	
1468	0-6½	Ap	0.2	2.6	5.7	12.5	27.8	42.7	8.5	6.5	69.8	-	l
1469	6½-20	C1	-	0.1	0.2	4.0	21.6	64.2	9.9	12.2	77.0	-	sil
1470	20-25	C2	-	-	0.1	1.6	26.7	61.5	10.1	12.2	77.2	-	sil
1471	25-30	C3	-	-	0.9	28.1	27.0	35.7	8.3	6.7	77.0	-	vfsl
1472	30-37	C4	-	0.3	6.4	40.6	15.0	31.3	6.4	6.4	62.5	-	fsl
1473	37-48	C5	-	-	0.2	18.9	23.6	48.1	9.2	10.3	78.0	-	l
1474	48-59	C6	-	-	0.1	4.4	30.6	53.6	11.3	12.9	75.2	-	sil

	pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10^3 MILLIMHOS PER CM @ 25°C	6E1a CaCO3 equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS		
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					1/10 ATMOS. 4B1a	(per cent) 1/3 ATMOS. 4B1a	15 ATMOS. 4B2
1468	7.9	8.2	8.4	0.46	0.047	10			4		28.5	12.8	4.6
1469	8.0	8.3	8.6	0.23	0.031	7			6		34.7	18.3	5.6
1470	8.0	8.3	8.5	0.21	0.025	8			5		35.5	18.1	5.5
1471	7.9	8.4	8.5	0.15	0.021				8		28.6	12.0	4.3
1472	7.9	8.4	8.6	0.08	0.012				7		20.7	7.2	2.6
1473	7.9	8.4	8.5	0.15	0.019				7		32.5	14.2	4.9
1474	7.9	8.3	8.6	0.20	0.024	8			6		33.5	18.3	5.8

	5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS 5B1a					Base Sat. % on NH_4OAc	SATURATION EXTRACT SOLUBLE					PER CENT MOISTURE AT SATURATION	Ca/Mg
		Ca	6O2b Mg	6P2a Na	6Q2a K	Sum		K	CO_3	HCO_3	Cl	SO_4		
	← milliequivalents per 100g soil →							← milliequivalents per liter →						
1468	8.5		1.0	0.1	0.5									
1469	9.3		1.8	0.1	0.3									
1470	9.5		1.2	0.1	0.3									
1471	7.3		1.4	0.1	0.3									
1472	5.0		1.6	0.1	0.3									
1473	7.8		2.4	0.1	0.5									
1474	10.0		2.6	0.1	0.8									

AGR-SCS-BELTSVILLE, MD 2882 JUNE 1953

Pedon classification: Typic Ustifluvent, coarse-loamy, mixed (calcareous), mesic
Series classification: (Same)
Soil: Munjor very fine sandy loam.
Soil Nos.: S53KS-71-8 (Sample Nos. 1468-1474)
Location: Osborne County, KS; 50 feet west and 60 feet north of the southeast corner of Sec. 21, T7S, R12W.
Climate: Annual precipitation is about 23½ inches. Annual temperature is about 54° F., and summer temperature is about 79° F. Average frost-free season is about 171 days.
Vegetation and land use: Fallow. Cropland.
Parent material: Calcareous, moderately coarse textured alluvium.
Physiography: Nearly level terrace.
Topography: Slope gradient less than 1 percent.
Drainage: Well drained.
Ground water: Greater than 6 feet.
Erosion: Slight.
Permeability: Moderately rapid.
Described by: W. M. Johnson.

(Colors are for dry soil unless otherwise stated.)

Ap 1468 0 to 16 cm. (0 to 6½ inches). Grayish brown (10YR 5/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse medium and fine blocky structure; soft, very friable; strong effervescence; clear smooth boundary.

C1 1469 16 to 51 cm. (6½ to 20 inches). Light brownish gray (10YR 6/2) loam or very fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; few fragments of snail shells; strong effervescence; gradual smooth boundary.

C2 1470 51 to 64 cm. (20 to 25 inches). Light brownish gray (10YR 6/2) loam or very fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; strong effervescence; clear smooth boundary.

C3 1471 64 to 76 cm. (25 to 30 inches). Light brownish gray (10YR 6/2) stratified fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; common fragments of snail shells; strong effervescence; clear smooth boundary.

C4 1472 76 to 94 cm. (30 to 37 inches). Light brownish gray (10YR 6/2) stratified loamy fine sand, grayish brown (10YR 5/2) moist; massive; soft, very friable; few fragments of snail shells; strong effervescence; abrupt smooth boundary.

C5 1473 94 to 122 cm. (37 to 48 inches). Light gray (10YR 7/1) stratified fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; many fragments of snail shells; slightly darker, finer textured material in upper part of horizon; strong effervescence; abrupt smooth boundary.

C6 1474 122 to 150 cm. (48 to 59 inches). Light brownish gray (10YR 6/2) stratified very fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; few fragments of snail shells; thin layers of darker colored material throughout the horizon; strong effervescence; abrupt smooth boundary.

Ab 150 to 178 cm. (59 to 70 inches). Light brownish gray (2.5Y 6/2) stratified silt loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, friable; few fragments of snail shells; strong effervescence.

SOIL CLASSIFICATION- MOLLIC NATRUSTALF,
FINE-SILTY, MIXED, MESIC
SERIES - - - - - - -NOT DESIGNATED

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NC - - - - - - S73KS-92-1 COUNTY - - - SMITH

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 73L487-73L491

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B															RATIO
		SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	SAND VCOS 2- 1	SAND CORS 1- .5	SAND MEDS .5- .25	SAND FNES .25-.10	SAND VFNS .10-.05	SILT COSI .05-.02	SILT FNSI .02-.002	SILT VFSI .005-.002	SAND 2- .10	INTR SAND .2-.02	FINE CLAY TO CLAY	NON CO3 CLAY PCT	8D1 15-BAR TO CLAY
CM		PCT LT 2MM																
C00-8	A1	11.1	75.9	13.0	7.2	.1	.2	.1	.6	10.1	55.5	20.4		1.0	66.1	55	13	.55
008-22	B2T	8.9	57.1	34.0	26.7	.1	.2	.2	.5	7.9	39.5	17.6		1.0	47.7	79	34	.54
022-57	B31	10.8	59.0	30.2	17.3	.1	.2	.2	.5	9.8	41.2	17.8		1.0	51.3	57	30	.48
C57-100	B32	13.2	49.2	37.6		.8	.9	1.0	2.4	8.1	29.8	19.4		5.1	39.2		26	.40
100-107	C	18.4	39.3	42.3		1.9	2.2	2.3	6.0	6.0	7.5	31.8		12.4	16.7		18	.27

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2	WEIGHT GT 75	WEIGHT 75-20	WEIGHT 20-5	WEIGHT 5-2	LT .074	BULK DENSITY 4A1D LT20	4A1H OVEN DRY	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR	4B1C 1/3 BAR	4B2 15 BAR	4C1 WRD	CARBONATE 6E1B LT 2	3A1A LT .002	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	PCT LT 75				LT20 G/CC	BAR G/CC		PCT	PCT	PCT	CM/CM	PCT	PCT		
C00-8	0	0	0	0	0	98	0					7.1			0	6.8	6.3
008-22	0	0	0	0	0	98	0					18.2			0	8.0	7.5
C22-570	0	0	0	0	0	98	0					14.5		5	TR	8.3	8.2
C57-100		0	0	TR	TR	94	TR					15.2		31	12	8.7	8.4
100-107		0	0	TR	TR	86	TR					11.6		79	24	8.7	8.5

DEPTH	ORGANIC MATTER 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2B EXT FE	PHOS TOTL	EXTRACTABLE BASES 5B4A- 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	CAT EXCH 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC	BASE SAT 5C3 EXTB	5C1 NHAC
CM	PCT	PCT		PCT	PCT	MEQ / 100 G											PCT	PCT	PCT
C00-8	1.76											1.76							
008-22	1.29					12.7	9.4	7.0	.9	30.0				28.0	.82A	1.4	45		107
C22-570	0.21																		
057-100	0.16						9.4	9.0	.4					16.5	.63A				
100-107							5.7	5.7	.1					7.0	.39A				

DEPTH	(SATURATED PASTE) 8E1 REST OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	SATURATION EXTRACT 8A1A EC MMHOS/	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	CM	MEQ / LITER									PCT	
C00-8																			
008-22	840	7.5	62.0	20	20	1000		2.46	1.4	1.2	22.5	.1							
022-570																			
057-100	430	8.4	68.1	35	28	2400		5.20	2.0	4.0	49.0	.1							
100-107	460	8.4	51.4	34	27	2500		6.65	3.9	7.8	65.1	.1							

(A) NONCARBONATE CLAY 8D2.

IHC900I EXECUTION TERMINATING DUE TO ERROR COUNT FOR ERROR NUMBER 217

IHC217I FICCS - END OF DATA SET ON UNIT 5

TRACEBACK ROUTINE CALLED FROM ISN REG. 14 REG. 15 REG. 0 REG. 1

I8COM 0007D0CC 0007E108 0000003F 0007D080

MAIN 000198F2 0107ACE0 000C308C 0009F7F8

ENTRY POINT= 0107ACE0

Pedon classification: Mollic Natrustalf, fine-silty, mixed, mesic
Series classification: Not designated
Soil: Series not designated
Soil Nos.: S73KS-92-1 (Sample Nos. 487-492)
Location: Smith County, KS; 2,000 feet south and 550 feet east of the northwest corner of Sec. 17, T4S, R11W.
Climate: Annual precipitation is about 24 inches. Annual temperature is about 54.5° F., and summer temperature is about 77.5° F. Average frost-free season is about 162 days.
Vegetation and land use: Short and mid grasses. Native range.
Parent material: Loess with some mixing of loess and chalk in the lower part.
Physiography: Sloping upland.
Topography: About 6 percent slope gradient.
Drainage: Moderately well drained.
Ground water: Greater than 5 feet.
Erosion: Slight.
Permeability: Slow.
Described by: V. L. Hamilton.

(Colors are for dry soil unless otherwise stated.)

A1 487 0 to 8 cm. (0 to 3 inches). Gray (10YR 5/1) silt loam, dark gray (10YR 4/1) moist; moderate fine granular structure; hard, friable; common fine roots; neutral; abrupt smooth boundary.

B2t 488 8 to 22 cm. (3 to 9 inches). Dark grayish brown (10YR 4/2) heavy silty clay loam, very dark grayish brown (10YR 3/2) moist; strong medium columnar structure; extremely hard, very firm; common fine roots; mildly alkaline; gradual smooth boundary.

B31 489 22 to 57 cm. (9 to 23 inches). Light yellowish brown (10YR 6/4) light silty clay loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; very hard, firm; few fine roots; common fine and medium masses of carbonates; strong effervescence; strongly alkaline; gradual smooth boundary.

B32 490 57 to 100 cm. (23 to 39 inches). Very pale brown (10YR 7/3) light silty clay loam, brown (10YR 5/3) moist; weak fine granular and subangular blocky structure; hard, firm; few fine roots; common soft masses of carbonates; violent effervescence; strongly alkaline; abrupt smooth boundary.

C 491 100 to 107 cm. (39 to 42 inches). White (10YR 8/2) light silty clay loam, very pale brown (10YR 7/3) moist; massive; slightly hard, friable; few roots; violent effervescence; strongly alkaline; abrupt smooth boundary.

R 492 107 cm. (42 inches). White chalky limestone.

SOIL CLASSIFICATION-AQUIC HAPLUDOLL
FINE, MIXED, MESIC
SERIES - - - - - - -NOT DESIGNATED

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE NRTSC
SOIL SURVEY INVESTIGATIONS UNIT
LINCOLN, NEBRASKA

SOIL NO - - - - - - S71KS-44-2 COUNTY - - - JEFFERSON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 71L1245-71L1250

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO
		SAND 2- .05	SILT .05- .002	CLAY LT .002	FINE CLAY LT .0002	SAND VCOS 2- 1	SAND CORS 1- .5	SAND MEDS .5- .25	SAND FNES .25- .10	SAND VFNS .10- .05	SILT COSI .05 .02	SILT FNSI .02 .002	SILT VFSI .005- .002	FAML TEXT SAND 2-.1	INTR II .2- .02	FINE CLAY TO CLAY	NON- CO3- CLAY	8D1 15- BAR TO CLAY
CM		PCT LT 2MM														PCT	PCT	
000-18	AP	8.3	54.4	37.3		.4	.4	.4	1.1	6.0	27.2	27.2		2.3	33.9			.41
018-38	B21t	7.5	49.0	43.5		.5	.3	.3	1.0	5.4	21.9	27.1		2.1	28.0			.41
038-56	B22t	6.9	48.6	44.5		.8	.6	.3	.9	4.3	19.7	28.9		2.6	24.6			.41
056-74	B3	5.7	59.3	35.0		.4	.5	.3	.7	3.8	21.9	37.4		1.9	26.2			.42
074-114	Cr1	10.6	69.3	20.1		2.3	2.1	1.0	1.5	3.7	22.2	47.1		6.9	26.7			.54
114-160	Cr2	4.4	78.6	17.0		.9	.7	.2	.5	2.1	24.1	54.5		2.3	26.5			.64

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20	20-5	5-2	LT .074 PCT	BULK DENSITY 4A1D 20-2 1/3- OVEN DRY BAR	4A1H 1/3- COLE G/CC	4D1 1/10 BAR	WATER CONTENT- 4B1C 1/10 BAR PCT	4B1C 1/3- BAR PCT	4B2 15- BAR PCT	4C1 WRD CM/ CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
CM			PCT LT 75			LT20	G/CC										
000-18	TR	0	0	TR	TR	96	1	1.30A				15.3		TR		6.9	6.6
018-38	TR	0	0	TR	TR	97	TR	1.33	1.67	.081	31.5	30.1	18.0	.16	6.28	0	7.0	6.4
038-56	TR	0	0	1	TR	96	1	1.50A					18.4			0	7.1	6.6
056-74	TR	0	0	TR	TR	97	TR	1.60A					14.8			0	7.4	6.8
074-114	1	0	0	1	1	90	2	1.70A					10.8			3	8.2	7.7
114-160	TR	0	0	TR	TR	97	TR	1.83	1.98	.027	18.2	17.7	10.8	.13	6.08	TR	8.1	7.5

DEPTH	(ORGANIC MATTER 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2A EXT TOTL FE PCT	PHOS 6S1A PCT	(-EXTRACTABLE BASES 5B4A- 6N2E CA	6O2D MG	6P2A NA	6Q2A K	SUM EXTB MEQ / 100 G	ACTY 6H1A BACL TEA	AL 6G1D KCL EXT	(CAT EXCH) 5A3A EXTB NHAC ACTY	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
CM						MEQ / 100 G												
000-18	2.25C																	
018-38	2.01																	
038-56	1.19																	
056-74	.71																	
074-114	.28																	
114-160	.08																	

DEPTH	(SATURATED PASTE) 8E1 REST OHM- CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(- - - - - - - - - SATURATION EXTRACT 8A1- 8A1A EC MMHOS/ CM	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX PCT
CM									MEQ / LITER										
000-18																			
018-38																		52D	21
038-56																			
056-74																			
074-114																			
114-160	3800	7.6	52.9			90		.28	2.3	.1	.4	TR						42D	14

CLAY MINERALOGY (7A2C). PLACEMENT (S71KS-44-2) MIXED.
018-38 MI3 KK3 MM2
114-160 MI3 KK2 MM2
COMMENTS - MM POORLY ORDERED.
RELATIVE AMOUNTS - (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE - MI = MICA KK = KAOLINITE MM = MONTMORILLONITE-MICA.

(A) ESTIMATED.
(B) MICRO-PENETRATION RESISTANCE - A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10-BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.
(C) ORGANIC CARBON IS 17 KG/M SQ TO A DEPTH OF 1 M (6A).
(D) DETERMINED BY SOIL MECHANICS LAB - SCS, LINCOLN, NE.

Pedon classification: Aquic Hapludoll, fine, mixed, mesic
Series classification: Not designated
Soil: Series not designated
Soil Nos.: S71KS-44-2 (Sample Nos. 1245-1250)
Location: Jefferson County, KS; 1,100 feet south and 650 feet east of the northwest corner of Sec. 33, T9S, R18E.
Climate: Annual precipitation is about 37 inches. Annual temperature is about 56° F., and mean summer temperature is about 78° F. Average frost-free season is about 180 days.
Vegetation and land use: Sorghum stubble. Cropland.
Parent material: Interbedded silty and clayey shales and clay beds.
Physiography: Sloping erosional upland.
Topography: Convex backslope position below limestone outcrops.
Drainage: Moderately well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Slow.
Described by: R.L. Haberman, L.D. Zavesky.

(Colors are for moist soil unless otherwise stated.)

Ap 1245 0 to 18 cm. (0 to 7 inches). Very dark brown (10YR 2/2) silty clay loam; weak fine granular structure; slightly hard, friable; few worm casts; common fine roots; few limestone and shale fragments and gravel; abrupt smooth boundary.

B21t 1246 18 to 38 cm. (7 to 15 inches). Black (10YR 2/1) heavy silty clay loam, very dark grayish brown (10YR 3/2) rubbed; few fine faint mottles of yellowish brown (10YR 5/6); moderate fine and very fine subangular blocky structure; hard, firm; few worm casts; few fine roots; few shale fragments and gravel; clear smooth boundary.

B22t 1247 38 to 56 cm. (15 to 22 inches). Mixed dark brown (10YR 3/3) and dark yellowish brown (10YR 4/4) heavy silty clay loam; common fine distinct mottles of strong brown (7.5YR 5/6); moderate fine subangular blocky structure; hard, firm; few worm casts; few fine roots; few shale fragments; few fine black concretions; clear wavy boundary.

B3 1248 56 to 74 cm. (22 to 29 inches). Dark grayish brown (2.5Y 4/2) silty clay loam; common fine distinct mottles of strong brown (7.5YR 5/6); weak fine subangular blocky structure; hard, firm; few worm casts; few fine roots; common shale and sandstone fragments ½ inch to 1 inch in size; gradual wavy boundary.

Cr1 1249 74 to 114 cm. (29 to 45 inches). Grayish brown (2.5Y 5/2) partially weathered interbedded shale; common fine distinct mottles of yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6); few fine roots; gradual smooth boundary.

Cr2 1250 114 to 160 cm. (45 to 63 inches). Interbedded shale.

SOIL CLASSIFICATION-AQUIC HAPLUDOLL
FINE, MONTMORILLONITIC, MESIC
SERIES - - - - - - -NOT DESIGNATED

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE MRTSC
SOIL SURVEY INVESTIGATIONS UNIT
LINCOLN, NEBRASKA

SOIL NO - - - - - - S71KS-44-1 COUNTY - - - JEFFERSON

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 71L1234-71L1244

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B															RATIO
		FINE			SAND						SILT			FAML	INTR	FINE	NON-	8D1
		SAND 2- .05	SILT .05- .002	CLAY LT .002	CLAY LT .0002	VCOS 2- 1	CORS 1- .5	MEDS .5- .25	FNES .25- .10	VFNS .10- .05	COSI .05 .02	FNSI .02 .002	VFSI .005- .002	TEXT SAND 2-.1	II .2- .02	CLAY TO CLAY	CO3- 15- BAR
CM		PCT LT 2MM														PCT	PCT	CLAY
000-23	AP	8.6	55.0	36.4	21.1	.1	.2	.3	1.1	6.9	26.9	28.1	5.1	1.7	34.8	58		.43
023-30	A12	8.1	55.1	36.8	22.1	.1	.2	.2	1.0	6.6	25.2	29.9	6.3	1.5	32.7	60		.43
030-43	B21T	8.1	53.1	38.8	24.9	.1	.2	.2	1.1	6.5	23.9	29.2	5.5	1.6	31.4	64		.45
043-66	B22T	9.2	51.6	39.2	24.5	.2	.3	.2	1.3	7.2	23.7	27.9	5.4	2.0	32.0	63		.44
066-99	B31	10.9	51.3	37.8	23.1	.5	.6	.4	1.7	7.7	23.2	28.1	5.7	3.2	32.2	61		.43
099-152	B32	8.9	53.0	38.1	22.9	.2	.4	.4	1.4	6.5	23.0	30.0	6.1	2.4	30.6	60		.41
152-180	C1	9.6	54.5	35.9	19.7	.1	.5	.5	1.9	6.6	24.4	30.1	7.1	3.0	32.5	55		.43
180-210	C2	9.4	56.8	33.8	18.3	.2	.5	.5	1.7	6.5	24.9	31.9	7.0	2.9	32.7	54		.41
210-255	C3	10.9	54.9	34.2		.8	1.0	.6	2.2	6.3	23.2	31.7	8.0	4.6	31.0			.44
255-335	C4	10.6	56.2	33.2		.5	.7	.6	2.1	6.7	23.6	32.6	7.4	3.9	31.9			.45
335-405	C5	6.8	60.9	32.3		.1	.2	.2	1.3	5.0	28.6	32.3	6.3	1.8	34.6			.46

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. WEIGHT						BULK DENSITY			WATER CONTENT			CARBONATE		PH	
	GT 2	GT 75	75-20	20-5	5-2	LT .074	20-2	4A1D 1/3- BAR	4A1H OVEN DRY	4D1 COLE	4B1C 1/10 BAR	4B1C 1/3- BAR	4B2 15- BAR	4C1 WRD CM/	6E1B LT 2	3A1A LT .002	8C1A 1/1	8C1E 1/2
CM	PCT	PCT	PCT LT 75				LT2O	G/CC	G/CC		PCT	PCT	PCT	CM	PCT	PCT	H2O	CACL
000-23	TR	0	0	0	TR	96	TR	1.31	1.55	.059	32.0	29.6	15.6	.19	2.3A		6.9	6.6
023-30	0	0	0	0	0	97	0	1.39	1.73	.076	29.8	28.1	15.7	.17	2.6A		6.7	6.2
030-43	0	0	0	0	0	97	0	1.37	1.73	.081	31.0	29.5	17.6	.16	2.8A		6.8	6.3
043-66	0	0	0	0	0	96	0	1.46	1.85	.082	28.0	26.8	17.1	.14	3.1A		6.9	6.5
066-99	0	0	0	0	0	95	0	1.50	1.76	.055	26.5	25.3	16.2	.14	3.6A		7.2	6.6
099-152	TR	0	0	0	TR	96	TR	1.54	1.80	.055	25.3	24.3	15.6	.14	4.3A		7.4	6.8
152-180	0	0	0	0	0	95	0	1.54	1.78	.050	24.6	23.5	15.4	.12	3.6A		7.5	6.9
180-210	0	0	0	0	0	95	0						13.9				7.3	6.8
210-255		0	0	2	TR	92	2						15.0				7.2	6.8
255-335	TR	0	0	TR	TR	94	TR						14.9				7.3	6.8
335-405	0	0	0	0	0	97	0						14.9				7.3	6.8

DEPTH	(ORGANIC MATTER) 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2A EXT FE	PHOS 6S1A TOTL	(EXTRACTABLE BASES 5B4A) 6N2E CA	6O2D MG	6P2A NA	6Q2A K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1D KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA SAT EXTB NHAC	(BASE SAT) 5C3 EXTB ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	MEQ / 100 G											PCT	PCT	PCT
000-23	2.43B	.169	14			29.2	3.4	.1	.7	33.4	4.6		38.0	33.8	.93	8.6	86	88	99
023-30	2.32	.168	14			28.8	3.3	TR	.6	32.7	5.4		38.1	34.1	.93	8.7	84	86	96
030-43	1.66	.129	13			27.8	3.3	.1	.6	31.8	4.8		36.6	32.6	.84	8.4	85	87	98
043-66	1.14	.090	13			25.1	2.9	.1	.6	28.7	3.9		32.6	29.6	.76	8.7	85	88	97
066-99	.55					21.0	2.5	.1	.6	24.2	3.6		27.8	24.5	.65	8.4	86	87	99
099-152	.39					20.1	2.5	.2	.6	23.4	3.2		26.6	23.3	.61	8.0	86	88	100
152-180	.24					18.9	2.4	.2	.6	22.1	2.9		25.0	21.9	.61	7.9	86	88	101
180-210	.19					18.2	2.4	.2	.5	21.3	2.7		24.0	21.1	.62	7.6	86	89	101
210-255	.27					19.5	2.5	.2	.6	22.8	3.6		26.4	22.9	.67	7.8	85	86	100
255-335	.25					19.1	2.4	.2	.6	22.3	2.9		25.2	22.7	.68	8.0	84	88	98
335-405	.21					19.5	2.5	.2	.6	22.8	2.7		25.5	22.8	.71	7.8	86	89	100

DEPTH	(SATURATED PASTE) 8E1 REST OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	(SATURATION EXTRACT 8A1) EC 8A1A	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/ CM	MEQ / LITER									PCT	
000-23																		45C	19
023-30																			
030-43																		52C	26
043-66																			
066-99																			
099-152	2500	7.0	57.7	1		90		.21	1.7	.3	.3	.1							
152-180																			
180-210																		43C	22
210-255																			
255-335																			
335-405																			

CLAY MINERALOGY (7A2C). PLACEMENT (S71KS-44-1) MONTMORILLONITIC.
030-43 MT4 MI3 KK3 QZ1
180-210 MT3 MI2 KK2
COMMENTS - MT MODERATELY WELL ORDERED, OTHERS WELL ORDERED.
RELATIVE AMOUNTS - (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE - MT = MONTMORILLONITE MI = MICA KK = KAOLINITE QZ = QUARTZ

(A) MICRO-PENETRATION RESISTANCE - A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10-BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.
(B) ORGANIC CARBON IS 19 KG/M SQ TO A DEPTH OF 1 M (6A).
(C) DETERMINED BY SOIL MECHANICS LAB - SCS, LINCOLN, NE.

Pedon classification: Aquic Hapludoll, fine, montmorillonitic, mesic
Series classification: Not designated
Soil: Series not designated
Soil Nos.: S71KS-44-1 (Sample Nos. 1234-1244)
Location: *Jefferson County, KS;* 1,390 feet south and 200 feet east of the northwest corner of Sec. 33, T9S, R18E.
Climate: Annual precipitation is about 37 inches. Annual temperature is about 56° F., and mean summer temperature is about 78° F. Average frost-free season is about 180 days.
Vegetation and land use: Sorghum stubble. Cropland.
Parent material: Interbedded silty and clayey shales and clay beds.
Physiography: Sloping erosional upland.
Topography: Slight concave foot slope position below limestone outcrops.
Drainage: Moderately well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: R. L. Haberman, H. V. Campbell, W. Abmeyer.

(Colors are for moist soil unless otherwise stated.)

Ap 1234 0 to 23 cm. (0 to 9 inches). Black (10YR 2/1) silty clay loam; weak fine granular structure; slightly hard, friable; many fine roots; clear smooth boundary.

A12 1235 23 to 30 cm. (9 to 12 inches). Black (10YR 2/1) silty clay loam; moderate medium blocky structure; hard, very firm; common worm casts; clear smooth boundary.

B21t 1236 30 to 43 cm. (12 to 17 inches). Black (10YR 2/1) silty clay; few fine distinct mottles of strong brown (7.5YR 5/6); moderate fine and medium subangular blocky structure and fine blocky structure; very hard, very firm; few fine black concretions; few worm casts; few fine roots; gradual smooth boundary.

B22t 1237 43 to 66 cm. (17 to 26 inches). Very dark brown (10YR 2/2) silty clay; few fine faint mottles of yellowish brown (10YR 5/6) and few fine distinct mottles of olive brown (2.5Y 4/4); moderate fine and medium blocky structure; very hard, very firm; few fine black concretions; gradual smooth boundary.

B31 1238 66 to 99 cm. (26 to 39 inches). Dark grayish brown (2.5Y 4/2) silty clay; common fine distinct mottles of strong brown (7.5YR 5/6); moderate to weak fine and medium blocky structure; very hard, very firm; few limestone fragments; few fine black concretions; gradual smooth boundary.

B32 1239 99 to 152 cm. (39 to 60 inches). Dark grayish brown (2.5Y 4/2) silty clay; common fine distinct mottles of strong brown (7.5YR 5/6); moderate medium prismatic structure parting to weak fine and medium blocky structure; very hard, very firm; few fine black concretions; gradual smooth boundary.

C1 1240 152 to 180 cm. (60 to 71 inches). Grayish brown (2.5Y 5/2) silty clay; common fine distinct mottles of strong brown (7.5YR 5/6); massive; very hard, very firm; few black stains on faces of peds; gradual smooth boundary.

C2 1241 180 to 210 cm. (71 to 83 inches). Mixed grayish brown (2.5Y 5/2), dark brown (7.5YR 4/4), and strong brown (7.5YR 5/6) silty clay; massive; very hard, very firm; gradual smooth boundary.

C3 1242 210 to 255 cm. (83 to 101 inches). Mixed dark grayish brown (2.5Y 4/2), dark brown (7.5YR 4/4) silty clay; augered; very hard, very firm; gradual smooth boundary.

C4 1243 255 to 335 cm. (101 to 132 inches). Mixed dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), dark brown (7.5YR 4/2), and strong brown (7.5YR 5/6) silty clay; augered; hard, firm; gradual smooth boundary.

C5 1244 335 to 405 cm. (132 to 160 inches). Mixed grayish brown (10YR 5/2), dark brown (7.5YR 4/2), and strong brown (7.5YR 5/6) silty clay; augered; very hard, very firm; common shale fragments up to ½ inch in size.

SOIL CLASSIFICATION: Lithic Haplustoll; clayey, mixed, mesic

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Series not designated SOIL Nos. S63Kans-8-1 LOCATION Butler County, Kansas

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18446-18447 August, 1967

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

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Sand: Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	Silt: 0.05–0.02	Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	Coarse fragments 2A2: 3B1 > 2 Pct.	2–19 Pct. of < 76mm	19–76 Pct. of < 76mm
		Pct. of < 2 mm														
0–5	A1	7.5	57.4	35.1	-	0.2	0.1	0.3	6.9	39.7	17.7	46.8	0.6	tr		
5–10	Bt	6.2	49.7	44.1	-	0.1	0.1	0.3	5.7	33.2	16.5	39.1	0.5	tr		

Depth (In.)	Horizon	6A1a Organic carbon (a) Pct	6B1a Nitrogen Pct	C/N	6E2a Carbonate as $CaCO_3$ Pct.	6C2a Ext. Iron as Fe Pct.	Bulk density: 4A1a Field-State g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in./in.	pH 8C1a: 1:1	1:10
0–5		3.61	0.267	14		1.1	1.28	1.20	1.37	0.044	16.8	31.0	16.6	0.17	6.2	6.6
5–10		3.06	0.241	13	tr(s)	1.4	1.27	1.20	1.47	0.068	20.8	33.4	19.3	0.17	7.0	7.5

Depth (In.)	Extractable bases 5B1a: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	8D3 Ca/Mg	Base saturation: 5C3 Sum Cations Pct	5C1 NH_4OAc Pct
	meq/100 g										
0–5	24.9	2.2	0.1	0.7	27.9	7.0	34.9	29.2	11	80	96
5–10	33.9	1.8	0.1	0.6	36.4	5.1	41.5	33.8	19	88	108

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0–5	0.83	0.031	0.47
5–10	0.77	0.032	0.44

a. 10 kg/m^2 to 10 inches (Method 6A).

USDA SCS HYATTSVILLE MD 1964

Pedon classification: Lithic Haplustoll, clayey, mixed, mesic
Series classification: Not designated
Soil: Series not designated
Soil Nos.: S63KS-8-1 (Sample Nos. 18446-18447)
Location: Butler County, KS; 980 feet east and 300 feet south of the northwest corner of Sec. 14, T26S, R6E.
Climate: Annual precipitation is about 32 inches. Annual temperature is about 57° F., and mean summer temperature is about 80° F. Average frost-free season is about 190 days.
Vegetation and land use: Mid and short grasses. Rangeland.
Parent material: Limestone.
Physiography: Nearly level erosional upland.
Topography: Convex slope near center of ridgetop. Slope gradient of about 2 percent.
Drainage: Somewhat excessively drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: H. L. Penner.

(Colors are for dry soil unless otherwise stated.)

A1 18446 0 to 13 cm. (0 to 5 inches). Very dark gray (10YR 3/1.5) silty clay loam, black (10YR 2/1) moist; strong medium and fine granular structure; upper 1 inch weak very fine platy structure; slightly hard, friable; gradual smooth boundary.

Bt 18447 13 to 26 cm. (5 to 10 inches). Very dark gray (10RY 3/1.5) silty clay loam, black (10YR 2/1) moist; strong medium granular structure; hard, friable; few open pores; lower part contains few weathered limestone rocks; abrupt irregular boundary.

R 26cm. (10 inches). Somewhat weathered, level-bedded earthy limestone of the Fort Riley formation.

Remarks: In sample pit the depth to limestone ranges from 8 to 12 inches within a horizontal distance of 3 feet.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Lithic Haplustoll; clayey, mixed, mesic

SOIL Series not designated SOIL Nos. S63Kans-8-2 LOCATION Butler County, Kansas

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18448-18449 August, 1967

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

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)			Coarse fragments 3A2 — 3B1 ≥ 2 Pct.	2 – 19 Pct. of < 76mm	19–76 Pct. of < 76mm
		Pct. of < 2 mm																
0-5	A1	6.4	60.7	32.9	tr	0.2	0.2	0.5	5.5	41.8	18.9	47.6	0.9			-		
5-10	Bt	5.5	54.9	39.6	tr	0.1	0.1	0.3	5.0	36.3	18.6	41.5	0.5			tr		

Depth (In.)	Horizon	6A1a Organic carbon a Pct.	Nitrogen Pct.	C/N		6E2a Carbonate as $CaCO_3$ Pct.	Ext. Iron as Fe Pct.	Bulk density: 4A1a Field-State g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in./in.		pH 8C1a: 1:1	1:10
0-5		4.39				tr(s)		1.18	1.15	1.30	0.044	20.5	31.0	16.3	0.17		6.4	6.6
5-10		3.59						1.22	1.17	1.38	0.056	22.4	32.9	18.8	0.16		7.0	7.1

Depth (In.)	Extractable bases 5B1a: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	8D3 Ca/Mg	Base saturation: 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct
	meq/100 g										
0-5	26.5	2.0	tr	0.8	29.3	5.9	35.2	29.7	11	83	99
5-10	33.5	1.6	tr	0.7	35.8	6.2	42.0	33.8	21	85	106

Depth (In.)	Ratios to Clay 8B1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-5	0.90		0.50
5-10	0.85		0.47

a. 12 kg/m² to 10 inches (Method 6A).

SUDA-SCS HYATTSVILLE, MD 1964

Pedon Classification: Lithic Haplustoll, clayey, mixed, mesic
Series Classification: Not designated
Soil: Series not designated
Soil Nos.: S63KS-8-2 (Sample Nos. 18448-18449)
Location: Butler County, KS; 900 feet north and 300 feet west of the southeast corner of Sec. 5, T26S, R6E.
Climate: Annual precipitation is about 32 inches. Annual temperature is about 57° F., and mean summer temperature is about 80° F. Average frost-free season is about 190 days.
Vegetation and land use: Mid and short grasses. Rangeland.
Parent material: Limestone.
Physiography: Gently sloping erosional upland.
Topography: Convex slope below a short limestone escarpment. Slope gradient of about 3 percent.
Drainage: Somewhat excessively drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: H. L. Penner.

(Colors are for dry soil unless otherwise stated.)

A1 18448 0 to 13 cm. (0 to 5 inches). Very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; strong fine granular structure; upper ½ inch slightly bleached and grade of structure somewhat weaker; slightly hard, friable; gradual smooth boundary.

Bt 18449 13 to 26 cm. (5 to 10 inches). Very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; strong fine and medium granular structure; hard, friable; few limestone rocks 4 to 7 inches in diameter occur as loose rock; roots concentrated on contact surface limestone; abrupt irregular boundary.

R 26 cm. (10 inches). Somewhat weathered, level-bedded earthy limestone of the Fort Riley formation.

Remarks: In sample pit the depth to limestone ranges from 5 to 11 inches in a horizontal distance of 30 inches.

SOIL CLASSIFICATION-LEPTIC NATRUSTOLL
FINE-LOAMY,MIXED,THERMIC
SERIES - - - - - - -NOT DESIGNATED

SOIL NO - - - - - - S73KS-93-1 COUNTY - - -

GENERAL METHODS- - -1A,1B1B,2A1,2B

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SAMPLE NOS. 73L396 - 73L397

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO	
					FINE	SAND						SILT			INTR	FINE	NON-	8D1
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	SAND	II	CLAY	CO3-	15-
		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005-	2-	.2-	TO	CLAY	BAR
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	.10	.02	CLAY		TO
CM		PCT LT 2MM														PCT	PCT	CLAY
15-30	B2T																	
30-76	C1																	

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)						(BULK DENSITY)			(WATER CONTENT				CARBONATE		(PH)	
	VOL.	(WEIGHT					4A1D	4A1H	4D1	4B1C	4B1C	4B2	4C1	6E1B	3A1A	8C1A	8C1E
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	1/10	1/3-	15-	MRD	LT	LT	1/1	1/2
	2	75				.074	PCT	BAR	DRY		BAR	BAR	BAR	CM/	2	.002	H2O	CACL
CM	PCT	PCT	(PCT LT 75)				LT20	G/CC	G/CC		PCT	PCT	PCT	CM	PCT	PCT		
15-30	0	0	0	0	0		0	1.68	1.87	.036	22.4	20.0	8.1	.20	1.3	A	10.2	9.9
30-76	0	0	0	0	0		0	1.81	1.87	.010	14.5	10.2	5.2	.09	2.2	A	8.2	7.7

DEPTH	(SATURATED PASTE)			NA	NA	SALT	GYP	(SATURATION EXTRACT 8A1)									ATTERBERG		
	8E1	8C1B	8A	5D2	5E	8D5	6F1A	8A1A	6N1B	6O1B	6P1B	6Q1B	6I1A	6J1A	6K1A	6L1A	6M1A	4F1	4F2
	REST					TOTL		EC	CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3	LQID	PLST
	OHM-	PH	H2O	ESP	SAR	SOLU		MMHOS/										LMIT	INDX
CM	CM		PCT	PCT		PPM	PCT	CM	(MEQ / LITER)									PCT	
15-30	280	10.0	48.4		298	4400		11.4	.2	.3	149$$	.5							
30-76	4500	7.9	29.6		1	90		.48	2.3	.3	1.6	.1							

(A) MICRO-PENETRATION RESISTANCE. A ROD 0.6 DIAMETER IS ONLY SLOWLY PUSHED INTO BULK DENSITY CLOD A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH

Pedon classification: Leptic Natrustoll, fine-loamy, mixed, thermic
Series classification: Not designated
Soil: Series not designated
Soil Nos.: S73KS-93-1 (Sample Nos. 396-397)
Location: Stafford County, KS; 1,400 feet north and 1,360 feet west of the southeast of Sec. 14, T24S, R14W.
Climate: Annual precipitation is about 24½ inches. Annual temperature is about 57° F., and summer temperature is about 80° F. Average frost-free season is about 182 days.
Vegetation and land use: Vegetation is dominantly prairie cordgrass, alkali sacaton, switchgrass, and inland saltgrass. Native range.
Parent material: Alluvium.
Physiography: Nearly level low terrace.
Topography: Slope gradient less than 1 percent.
Drainage: Somewhat poorly drained.
Ground water: Greater than 5 feet.
Erosion: Slight.
Permeability: Slow.
Described by: B. R. Hoffman.

(Colors are for dry soil unless otherwise stated.)

A1 0 to 15 cm. (0 to 6 inches). Grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; hard, friable; many fine roots; moderately alkaline; clear smooth boundary.

B2t 396 15 to 30 cm. (6 to 12 inches). Grayish brown (10YR 5/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak medium columnar structure; hard, firm; many fine roots; many nests of salts and carbonates; violent effervescence; moderately alkaline; clear smooth boundary.

C1 397 30 to 76 cm. (12 to 30 inches). Pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; common medium distinct strong brown (7.5YR 5/6) mottles; massive; slightly hard, friable; violent effervescence; moderately alkaline; gradual smooth boundary.

C2 76 to 152 cm. (30 to 60 inches). Very pale brown (10YR 7/3) loamy fine sand, brown (10YR 5/3) moist; common coarse distinct reddish yellow (7.5YR 6/8) mottles; single grained; loose; slight effervescence; neutral.

SOIL CLASSIFICATION-VERTIC HAPLAQUOLL
FINE, MONTMORILLONITIC, THERMIC
SERIES - - - - - - -OSAGE SILTY CLAY TAXADJUNCT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S73KS-1-4 COUNTY - - - ALLEN

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 73L1110-73L1117

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO
		SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	SAND VCOS 2- 1	SAND CORS 1- .5	SAND MEDS .5- .25	SAND FNES .25- .10	SAND VFNS .10- .05	SILT COSI .05 .02	SILT FNSI .02 .002	SILT VFSI .005- .002	SAND 2- .10	INTR II .2- .02	FINE CLAY TO CLAY	NON- CO3 CLAY	8D1 15- BAR TO
CM		PCT LT 2MM														PCT	PCT	CLAY
000-16	A11	2.6	54.9	42.5	29.1	.3	.3	.4	.6	1.0	18.8	36.1		1.6	20.1	68		.50
016-36	A12	2.6	51.0	46.4	31.7	.2	.2	.5	.7	1.0	15.7	35.3		1.6	17.1	68		.44
036-72	A13	3.4	51.3	45.3	31.2	.1	.4	.6	1.0	1.3	16.1	35.2		2.1	17.9	69		.43
072-103	B21G	5.5	51.0	43.5	30.2	1.5	.7	.8	1.1	1.4	16.2	34.8		4.1	18.1	69		.43
103-145	B22G	5.4	53.4	41.2	28.1	1.4	.7	.8	1.2	1.3	16.4	37.0		4.1	18.3	68		.45
145-180	B23G	4.5	52.9	42.6	28.8	1.0	.6	.8	1.0	1.1	14.1	38.8		3.4	15.7	68		.48
180-220	B31G	4.4	48.9	46.7	29.4	.3	.4	.8	1.4	1.5	16.5	32.4		2.9	18.7	63		.42
220-240	B32G	5.9	49.0	45.1	25.0	.3	.5	.7	1.7	2.7	20.3	28.7		3.2	24.1	55		.43

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VCL	GT 2	GT 75	75-20	20-5	5-2	LT .074	20-2	(BULK DENSITY 4A1D 1/3-BAR	4A1H OVEN DRY	4D1 COLE	4B1C 1/10 BAR	4B1C 1/3-BAR	4B2 15 BAR	WATER CONTENT- 4C1 WRD	6E1B LT 2	CARBONATE 3A1A LT .002	(-PH- 8C1A H2O	8C1E CACL
CM	PCT	PCT	PCT	PCT LT 75				LT20	G/CC	G/CC		PCT	PCT	PCT	CM/CM	PCT	PCT		
000-16	TR	0	0	TR	TR	TR	98	TR	1.44	1.85	.089	30.0	29.1	21.4	.11	3.8B	1		7.6	7.4
016-36	TR	0	0	TR	TR	TR	98	TR	1.32	1.88	.128	35.3	33.8	20.5	.18	1.9B	1		7.7	7.4
036-72	TR	0	0	TR	TR	TR	97	TR	1.34	1.89	.125	34.3	32.3	19.5	.18	1.4B	1		7.7	7.5
072-103	TR	0	0	TR	TR	TR	95	TR	1.37	1.92	.122	34.3	31.5	18.5	.18	1.1B	3		7.9	7.5
103-145	TR	0	0	TR	TR	TR	95	TR	1.44	1.94	.107	29.4	27.8	18.7	.13	1.2B	1		7.8	7.5
145-180	TR	0	0	TR	TR	TR	96	TR	1.40A					20.3			2	0	7.8	7.5
180-220	1	0	0	2	TR	TR	95	2	1.39	1.91	.110	32.6	30.4	19.8	.15	1.6B	1	0	7.8	7.5
220-240	2	0	0	3	TR	TR	93	3	1.43	1.97	.110	31.7	30.0	19.5	.15	1.2B	2	0	7.8	7.5

DEPTH	(ORGANIC MATTER 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2B EXT FE	PHOS TOTL	(EXTRACTABLE BASES 5B4A 6N2E CA	6Q2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC	(BASE SAT) 5C3 EXTB ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	MEQ / 100 G												PCT	PCT	PCT
000-16	1.75C	.161	11	.5			7.2	.6	.9					37.5	.88					
016-36	1.58	.152	10	.4			7.7	.8	.8					40.9	.88					
036-72	1.16	.104	11	.4			8.0	.8	.7					38.9	.86					
072-103	.77	.069	11	.4			7.5	.7	.7					35.5	.82					
103-145	.56			.3			6.5	.6	.7					33.1	.80					
145-180	.45			.4			6.1	.6	.7					33.1	.78					
180-220	.37			.5			6.2	.5	.7					37.4	.80					
220-240	.22			.4			6.0	.5	.8					35.5	.79					

DEPTH	(SATURATED PASTE) 8E1 REST OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	(SATURATION EXTRACT 8A1 8A1A EC	6N1B CA	6Q1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/CM	(MEQ / LITER									PCT	
000-16																			
016-36																			
036-72																			
072-103																			
103-145	1500	7.2	66.0	2	1	200		.47	2.5	.7	1.6	TR							
145-180																			
180-220																			
220-240																			

CLAY MINERALOGY (7A2C). PLACEMENT - MONTMORILLONITIC.
036-72 MT5 KK2 MI1.
COMMENTS - MONTMORILLONITE WELL-ORDERED.
RELATIVE AMOUNTS - (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE - MT = MONTMORILLONITE MI = MICA KK = KAOLINITE

(A) ESTIMATED.
(B) MICRO-PENETRATION RESISTANCE. A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10-BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.
(C) ORGANIC CARBON IS 17 KG/M SQ TO A DEPTH OF 1 M (6A).

Pedon classification: Vertic Haplaquoll, fine, montmorillonitic, thermic
Series classification: (Same)
Soil: Osage silty clay taxadjunct*
Soil Nos.: S73KS-1-4 (Sample Nos. 1110-1117)
Location: Allen County, KS; 1,700 feet south and 250 feet west of the northeast corner of Sec. 7, T24S, R18E.
Climate: Annual precipitation is about 37 inches. Annual temperature is about 57° F., and summer temperature is about 79° F. Average frost-free season is about 195 days.
Vegetation and land use: Bermuda grass. Pasture.
Parent material: Clayey alluvium.
Physiography: Nearly level flood plain.
Topography: Slope gradient less than 1 percent.
Drainage: Poorly drained.
Ground water: Greater than 6 feet.
Erosion: Slight.
Permeability: Very slow.
Described by: E. L. Fleming, J. R. Fortner, R. L. Haberman.

(Colors are for moist soil unless otherwise stated.)

A11 1110 0 to 16 cm. (0 to 6 inches). Black (10YR 2/1) silty clay; weak very fine blocky and subangular blocky structure; very hard, very firm; common fine roots; common very fine lime concretions; moderately alkaline; clear smooth boundary.

A12 1111 16 to 36 cm. (6 to 14 inches). Black (10YR 2/1) silty clay; weak platy and weak fine granular structure; very hard, very firm; common fine roots; common very fine to medium lime concretions; moderately alkaline; gradual smooth boundary.

A13 1112 36 to 72 cm. (14 to 28 inches). Black (10YR 2/1) silty clay; weak fine and very fine subangular blocky and blocky structure; very hard, very firm; few fine roots; common very fine to medium lime concretions; moderately alkaline; gradual smooth boundary.

B21g 1113 72 to 103 cm. (28 to 41 inches). Very dark gray (10YR 3/1) silty clay; few medium dark gray (5Y 4/1) mottles; weak fine subangular blocky and blocky structure; very hard, very firm; few fine roots; common very fine to medium lime concretions; moderately alkaline; gradual wavy boundary.

B22g 1114 103 to 145 cm. (41 to 57 inches). Very dark gray (10YR 3/1) clay; common medium faint dark gray (5Y 4/1) mottles; weak medium and coarse blocky structure; extremely hard, extremely firm; few slickensides; few pebbles; common very fine to medium lime concretions; moderately alkaline; gradual wavy boundary.

B23g 1115 145 to 180 cm. (57 to 71 inches). Very dark gray (10YR 3/1) clay; common medium faint dark gray (5Y 4/1) and few fine distinct strong brown (7.5YR 5/6) mottles; weak medium and coarse blocky structure; extremely hard, extremely firm; few slickensides; few pebbles; common very fine to medium lime concretions; moderately alkaline; gradual wavy boundary.

B31g 1116 180 to 220 cm. (71 to 87 inches). Mixed very dark gray (10YR 3/1) and dark gray (5Y 4/1) clay; few fine distinct pale olive (5Y 6/4) and yellowish brown (10YR 5/6) mottles; weak medium and coarse blocky structure; extremely hard, extremely firm; few slickensides; common very fine to medium lime concretions; moderately alkaline; gradual smooth boundary.

B32g 1117 220 to 240 cm. (87 to 95 inches). Mixed gray (5Y 5/1), very dark gray (10YR 3/1), and olive (5Y 4/3) clay; weak fine and medium blocky structure; extremely hard, extremely firm; few to common fine to coarse lime concretions; moderately alkaline.

Horizons between 0 to 16 cm. (0 to 6 inches), 16 to 36 cm. (6 to 14 inches), 72 to 103 cm. (28 to 41 inches), and 145 to 180 cm. (57 to 71 inches) were sampled for engineering testing.

*Pedon is more alkaline in upper 103 cm. (41 inches) than recognized in the series and contains lime concretions throughout.

SOIL CLASSIFICATION-MOLLIC ALBAQUALF
FINE, MONTMORILLONITIC, THERMIC
SERIES - - - - - - -PARSONS SILT LOAM TAXADJUNCT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S73KS-6-1 COUNTY - - - BOURBON

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 73L1129-73L1138

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B															RATIO
		SAND	SILT	CLAY	FINE CLAY	VCOS SAND	COS SAND	MEDS SAND	FNES SAND	VFNS SAND	COSI SILT	FNSI SILT	VFSI SILT	SAND	INTR II	FINE CLAY	NON-CO3 CLAY	8D1 15 BAR
		2- .05	.05- .002	.002 LT	LT .0002	2- 1	1- .5	.5- .25	.25- .10	.10- .05	.05 .02	.02 .002	.002 .005-	2- .10	.2- .02	TO CLAY		TO CLAY
CM		PCT LT 2MM														PCT	PCT	
000-18	AP	6.3	77.1	16.6	9.0	.2	.4	.4	2.4	2.9	32.7	44.4		3.4	37.3	54		.52
018-28	A21	6.3	77.0	16.7	8.2	.1	.7	.5	2.4	2.6	31.8	45.2		3.7	36.1	49		.43
028-38	A22	6.6	75.7	17.7	9.2	.2	1.0	.4	2.5	2.5	30.4	45.3		4.1	34.6	52		.42
038-51	B21T	4.3	52.9	42.8	32.3	.2	.4	.2	1.7	1.8	20.6	32.3		2.5	23.7	75		.41
051-69	B22T	3.3	46.0	50.7	39.1	TR	TR	.1	1.5	1.7	16.4	29.6		1.6	19.2	77		.40
069-100	B3	8.4	48.4	43.2	31.8	.5	.6	.3	3.5	3.5	20.7	27.7		4.9	26.9	74		.43
100-131	C1	11.0	51.0	36.0	26.0	.8	.9	.6	4.4	4.3	22.6	28.4		6.7	30.1	68		.42
131-161	C2	13.0	51.9	35.1	22.8	1.6	1.3	.6	4.7	4.8	22.9	29.0		8.2	31.1	65		.42
161-186	C3	14.8	50.8	34.4	23.8	2.1	1.6	.8	5.1	5.2	23.2	27.6		9.6	32.1	69		.45
186-216	C4	13.3	46.3	40.4	28.7	2.3	1.3	.6	4.5	4.6	21.2	25.1		8.7	29.1	71		.45

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2	GT 75	WEIGHT 75-20	20-5	5-2	LT .074	4A1D 20-2	BULK DENSITY 4A1H 1/3- BAR	4D1 OVEN DRY	4B1C COLE	WATER CONTENT- 4B1C 1/10 BAR	4B1C 1/3- BAR	4B2 15- BAR	4C1 WRD CM/CM	CARBONATE 6E1B LT 2	3A1A LT .002	PH 8C1A 1/1	8C1E 1/2
CM	PCT	PCT	PCT LT 75				LT20	G/CC	G/CC		PCT	PCT	PCT		PCT	PCT	H2O	CACL
000-18	TR	0	0	TR	TR	95	TR	1.37	1.44	.017	32.1	29.1	8.6	.29	3.3B		5.4	5.2
018-28	TR	0	0	0	TR	95	TR	1.35	1.39	.010	31.1	26.6	7.1	.27	3.1B		5.4	4.7
028-38	TR	0	0	0	TR	95	TR	1.49	1.52	.007	25.3	23.0	7.4	.24	2.8B		5.4	4.6
038-51	TR	0	0	0	TR	97	TR	1.38	1.63	.058	29.4	27.6	17.6	.14	2.3B		5.0	4.4
051-69	TR	0	0	0	TR	98	TR	1.38	1.75	.084	32.2	30.4	20.5	.14	2.3B		5.1	4.6
069-100	TR	0	0	TR	TR	94	TR	1.40A					18.4				5.5	4.9
100-131	TR	0	0	TR	TR	92	TR	1.55	1.72	.036	24.7	23.3	16.1	.11	3.3B		6.0	5.6
131-161	TR	0	0	TR	TR	90	TR	1.54	1.72	.038	25.6	24.0	14.9	.14	2.3B		6.6	6.1
161-186	TR	0	0	TR	TR	88	TR	1.50A					15.6				6.8	6.4
186-216	TR	0	0	TR	TR	90	TR	1.52	1.81	.061	26.9	25.8	18.0	.12	2.1B		7.0	6.6

DEPTH	(ORGANIC MATTER 6A1A ORGN CARB	6B1A NITG	C/N	IRCN 6C2B EXT FE	PHOS TOTL	(EXTRACTABLE BASES 5B4A- 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC ACTY	(BASE SAT) 5C3 EXTB	5C1 NHAC
CM	PCT	PCT		PCT	PCT	MEQ / 100 G											PCT	PCT	PCT
000-18	1.95C	.173	11	.5		10.3	1.6	.1	.4	12.4	6.8	.0	19.2	15.3	.92	6.4	67	65	81
018-28	.89	.082	11	.5		5.9	1.4	.1	.2	7.6	6.8	.2	14.4	11.8	.71	4.2	50	53	64
028-38	.50	.051	10	.6		5.2	1.7	.2	.2	7.3	6.1	.5	13.4	11.3	.64	3.1	46	54	65
038-51	.82	.099	8	.8		12.8	4.8	.8	.5	18.9	13.6	1.7	32.5	27.8	.65	2.7	46	58	68
051-69	.80			.8		16.1	5.9	1.4	.6	24.0	13.4	1.5	37.4	32.6	.64	2.7	49	64	74
069-100	.49			1.6		15.1	5.5	1.4	.5	22.5	8.5	.4	31.0	26.2	.61	2.7	58	73	86
100-131	.23			2.2		13.4	5.0	1.6	.4	20.4	5.6		26.0	22.6	.59	2.7	59	78	90
131-161	.20			2.5		12.9	4.8	2.2	.4	20.3	4.6		24.9	20.7	.59	2.7	62	82	98
161-186	.14			3.0		13.8	5.3	1.7	.4	21.2	4.0		25.2	21.3	.62	2.6	65	84	100
186-216	.07			3.0		16.9	6.4	2.0	.5	25.8	3.7		29.5	25.4	.63	2.6	67	87	102

DEPTH	(SATURATED PASTE) 8E1 REST OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	(SATURATION EXTRACT 8A1- 8A1A EC MMHOS/	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	CM	MEQ / LITER									PCT	
000-18																			
018-28																			
028-38																			
038-51																			
051-69																			
069-100																			
100-131	2000	5.9	52.8	6	5	190		.62	1.0	.5	4.1	TR							
131-161																			
161-186																			
186-216																			

CLAY MINERALOGY (7A2C). PLACEMENT - MONTMORILLONITIC.
038-51 MT3 KK2 MI1.
COMMENTS - MONTMORILLONITE NOT WELL-ORDERED.
RELATIVE AMOUNTS - (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE - MT = MONTMORILLONITE MI = MICA KK = KAOLINITE

(A) ESTIMATED.

(B) MICRO-PENETRATION RESISTANCE. A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10-BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.

(C) ORGANIC CARBON IS 12 KG/M SQ TO A DEPTH OF 1 M (6A).

Pedon classification: Mollic Albaqualf, fine, montmorillonitic, thermic
Series classification: Mollic Albaqualf, fine, mixed, thermic
Soil: Parsons silt loam taxadjunct *
Soil Nos.: S73KS-6-1 (Sample Nos. 1129-1138)
Location: Bourbon County, KS; 570 feet north and 50 feet west of the southeast corner of Sec. 20, T24S, R25E.
Climate: Annual precipitation is about 40 inches. Annual temperature is about 57° F., and summer temperature is about 80° F. Average frost-free season is about 195 days.
Vegetation and land use: Smooth bromegrass. Pasture.
Parent material: Fine textured material from old alluvium or clay shale.
Physiography: Nearly level upland.
Topography: Slope gradient less than 1 percent.
Drainage: Somewhat poorly drained.
Ground water: Greater than 5 feet.
Erosion: Slight.
Permeability: Very slow.
Described by: E. L. Fleming, J. R. Fortner, R. L. Haberman.

(Colors are for moist soil unless otherwise stated.)

Ap 1129 0 to 18 cm. (0 to 7 inches). Very dark gray (10YR 3/1) silt loam; weak very fine granular structure; slightly hard, very friable; many fine roots and worm casts; slightly acid; clear smooth boundary.

A21 1130 18 to 28 cm. (7 to 11 inches). Mixed dark gray (10YR 4/1) and gray (10YR 5/1) silt loam; weak fine and very fine granular structure; slightly hard, very friable; many fine roots; strongly acid; clear smooth boundary.

A22 1131 28 to 38 cm. (11 to 15 inches). Gray (10YR 6/1) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak fine granular structure; slightly hard, very friable; many fine roots; strongly acid; abrupt smooth boundary.

B21t 1132 38 to 51 cm. (15 to 20 inches). Dark gray (10YR 4/1) silty clay, light gray (10YR 7/1) silt coatings on peds; common fine and medium distinct strong brown (7.5YR 5/6) mottles; moderate fine and medium blocky structure; very hard, very firm; many fine roots, but less than above horizon; strongly acid; gradual smooth boundary.

B22t 1133 51 to 69 cm. (20 to 27 inches). Dark gray (10YR 4/1) silty clay; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak fine and medium blocky and subangular blocky structure; very hard, very firm; clay films on ped faces; few fine roots; black coatings through old root channels; few fine black concretions and stains; neutral; gradual smooth boundary.

B3 1134 69 to 100 cm. (27 to 39 inches). Mixed dark gray (5Y 4/1) and gray (5Y 5/1) silty clay; common fine and medium distinct brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; very hard, very firm; clay films on ped faces; few fine roots; black coatings through old root channels; few fine black concretions and stains; neutral; gradual smooth boundary.

C1 1135 100 to 131 cm. (39 to 52 inches). Coarsely mottled strong brown (7.5YR 5/6), gray (5Y 6/1), and reddish brown (5YR 4/4) silty clay; massive; hard, firm; black coatings through old root channels; common soft black masses; neutral; gradual smooth boundary.

C2 1136 131 to 161 cm. (52 to 63 inches). Coarsely mottled strong brown (7.5YR 5/6), gray (5Y 6/1), and reddish brown (5YR 4/4) silty clay; massive; hard, firm; black coatings through old root channels; common soft black masses; moderately alkaline.

C3 1137 161 to 186 cm. (63 to 73 inches). Continuation of above horizon; diffuse wavy boundary.

C4 1138 186 to 216 cm. (73 to 85 inches). Coarsely mottled gray (5Y 6/1) and strong brown (7.5YR 5/6) silty clay; weak subangular blocky and blocky structure; extremely hard, very firm; few black concretions and common black stains; few rounded pebbles less than 1/4 inch in size; moderately alkaline.

* This pedon is a taxadjunct to the Parsons series because the clay contains more montmorillonite than is typical for the series.

SOIL CLASSIFICATION-AQUIC ARGIUDOLL
FINE, MONTMORILLONITIC, MESIC
SERIES - - - - - - -PAWNEE CLAY LOAM

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE MRTSC
SOIL SURVEY INVESTIGATIONS UNIT
LINCOLN, NEBRASKA

SOIL NO - - - - - - S71KS-44-3 COUNTY - - - JEFFERSON

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 71L1251-71L1260

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B															RATIO
		SAND	SILT	CLAY	FINE CLAY	VCOS SAND	CORS SAND	MEDS SAND	FNES SAND	VFNS SAND	COSI SILT	FNSI SILT	VFSI SILT	TEXT SAND	FAML II	INTR CLAY	FINE NON-CLAY	8D1 15-BAR
		2- .05	.05- .002	LT .002	LT .0002	2- 1	1- .5	.5- .25	.25- .10	.10- .05	.05 .02	.02 .002	.002- .005	2-.1	.2- .02	TO CLAY	CO3- CLAY	TO CLAY
CM		PCT LT 2MM														PCT	PCT	
000-25	A1	32.6	37.0	30.4	21.9	2.4	4.6	6.3	10.6	8.7	20.0	17.0	3.5	23.9	34.0	72	30	.41
025-34	B1	29.3	33.5	37.2	27.0	2.6	4.6	5.3	9.2	7.6	16.3	17.2	3.9	21.7	28.6	73	37	.42
034-48	B21T	27.0	28.7	44.3	33.0	3.1	4.6	4.8	8.1	6.4	13.1	15.6	4.1	20.6	23.7	74	44	.40
048-75	B22T	29.1	30.9	40.0	27.7	2.0	4.3	5.5	9.5	7.8	13.3	17.6	4.5	21.3	26.0	69	40	.41
075-111	B3	32.3	33.7	34.0	19.6	2.1	5.1	6.1	10.4	8.6	14.0	19.7	4.8	23.7	27.9	58	34	.44
111-142	C1	31.8	39.7	28.5	11.7	2.3	4.6	5.9	10.5	8.5	16.0	23.7	7.3	23.3	29.8	41	29	.46
142-167	C2	30.7	42.0	27.3	10.1	1.9	4.7	5.5	10.2	8.4	15.8	26.2	7.1	22.3	29.5	37	25	.47
167-200	C3	32.5	39.6	27.9	9.8	2.4	4.8	5.8	10.7	8.8	15.7	23.9	7.9	23.7	30.1	35	28	.47
200-260	C4	32.2	39.6	28.2	10.5	2.0	4.6	6.0	10.7	8.9	15.6	24.0	7.2	23.3	30.1	37	28	.48
260-310	C5	33.3	38.4	28.3	9.4	2.3	4.9	6.1	11.0	9.0	15.6	22.8	6.9	24.3	30.3	33	28	.46

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)						BULK DENSITY					WATER CONTENT			CARBONATE		(PH)	
	VOL. GT 2	WEIGHT GT 75	75-20	20-5	5-2	LT .074	4A1D 20-2 1/3-	4A1H 1/3- OVEN	4D1 COLE	4B1C 1/10	4B1C 1/3-	482 15-	4C1 WRD		6E1B LT 2	3A1A LT .002	8C1A 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	PCT LT 75				PCT LT20	BAR G/CC	DRY G/CC	BAR PCT	BAR PCT	BAR PCT	CM/ CM		PCT	PCT		
000-25	TR	0	0	TR	TR	73	TR	1.49	1.65	.035	22.3	20.4	12.5	.12	5.8B		5.8	5.5
025-34	1	0	0	1	1	74	2	1.40A					15.5				5.6	5.2
034-48	3	0	0	3	3	73	6	1.36	1.69	.073	30.2	28.4	17.8	.14	2.6B		5.8	5.3
048-75	1	0	0	1	2	74	3	1.48	1.87	.080	27.1	25.7	16.5	.13	1.8B		5.8	5.4
075-111	1	0	0	TR	1	72	1	1.55	1.84	.058	25.2	23.8	14.9	.14	1.8B	0	7.1	6.8
111-142	1	0	0	1	1	72	2	1.70A					13.2			9 TR	8.0	7.6
142-167	3	0	0	2	2	72	4	1.70A					12.9			14 2	8.1	7.6
167-200	2	0	0	1	2	71	3	1.70	1.88	.033	20.6	19.7	13.2	.11	2.6B	9 TR	8.0	7.6
200-260	3	0	0	2	2	71	4						13.6			9 TR	8.0	7.5
260-310	2	0	0	1	2	70	3						13.1			9 0	8.0	7.6

DEPTH	ORGANIC MATTER			IRON	PHOS	EXTRACTABLE BASES 5B4A-					ACTY	AL	(CAT EXCH)		RATIO	RATIO	CA	(BASE SAT)	
	6A1A ORGN CARB	6B1A NITG	C/N	6C2A EXT FE	6S1A TOTL	6N2E CA	6O2D MG	6P2A NA	6Q2A K	SUM EXTB	6H1A BACL TEA	6G1D KCL EXT	5A3A EXTB ACTY	5A6A NHAC	8D1 NHAC TO	8D3 CA TO	5F NHAC SAT	5C3 EXTB ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	MEQ / 100 G									CLAY	MG	PCT	PCT	PCT
000-25	1.60C	.139	12			18.0	3.0	.2	.3	21.5	7.2		28.7	24.2	.80	6.0	74	75	89
025-34	1.35	.116	12			19.1	3.6	.1	.4	23.2	8.3		31.5	27.9	.75	5.3	68	74	83
034-48	.87	.086	10			22.1	4.1	.2	.4	26.8	7.9		34.7	30.4	.69	5.4	73	77	88
048-75	.47					20.6	3.6	.1	.4	24.7	5.7		30.4	27.6	.69	5.7	75	81	89
075-111	.19						2.6	.2	.3					23.4	.69				
111-142	.08						1.8	.2	.3					18.3	.64				
142-167	.04						1.7	.2	.2					15.6	.57				
167-200	.03						1.8	.2	.3					16.2	.58				
200-260	.03						2.1	.1	.3					15.8	.56				
260-310	.01						2.3	.1	.3					15.0	.53				

DEPTH	(SATURATED PASTE)			NA	NA	SALT	GYP	(- - - - - - - - - SATURATION EXTRACT 8A1- - - - - - - - -)									ATTERBERG	
	8E1 REST OHM-	8C1B PH	8A H2O	5D2 ESP	5E SAR	8D5 TOTL SOLU	6F1A	8A1A EC MMHOS/	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	4F1 LQID	4F2 PLST
CM	CM		PCT	PCT		PPM	PCT	CM 1	MEQ / LITER									LMIT PCT	INDX
000-25																		40D	17
025-34																			
034-48																			
048-75																		52D	29
075-111	1700	7.1	55.3	1		180		.67	4.0	.6	.5	TR							
111-142																			
142-167																			
167-200																		40D	22
200-260																			
260-310																			

CLAY MINERALOGY (7A2C). PLACEMENT (S71KS-44-3) MONTMORILLONITIC.
048-75 MT5 KK3 MI2
167-200 MT5 KK3 MI2
COMMENTS - MINERALS WELL ORDERED.
RELATIVE AMOUNTS - (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE - MT = MONTMORILLONITE MI = MICA KK = KAOLINITE

(A) ESTIMATED.
(B) MICRO-PENETRATION RESISTANCE - A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10-BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.
(C) ORGANIC CARBON IS 12 KG/M SQ TO A DEPTH OF 1 M (6A).
(D) DETERMINED BY SOIL MECHANICS LAB - SCS, LINCOLN, NE.

Pedon classification: Aquic Argiudoll, fine, montmorillonitic, mesic
Series classification: (Same)
Soil: Pawnee clay loam
Soil Nos.: S71KS-44-3 (Sample Nos. 1251-1260)
Location: Jefferson County, KS; 2,540 feet west and 100 feet south of the northeast corner of Sec. 5, T10S, R20E.
Climate: Annual precipitation is about 37 inches. Annual temperature is about 56° F., and mean summer temperature is about 78° F. Average frost-free season is about 180 days.
Vegetation and land use: Smooth bromegrass. Pasture.
Parent material: Glacial till.
Physiography: Gently sloping erosional upland.
Topography: Convex apex of a summit. Slope gradient about 1 percent.
Drainage: Moderately well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Slow.
Described by: R. L. Haberman, W. Abmeyer, H. T. Rowland.

(Colors are for moist soil unless otherwise stated.)

A1 1251 0 to 25 cm. (0 to 10 inches). Very dark brown (10YR 2/2) clay loam; weak fine and medium granular structure; slightly hard, friable; common fine roots; few gravel; moderately alkaline; clear smooth boundary.

B1 1252 25 to 34 cm. (10 to 13 inches). Very dark grayish brown (10YR 3/2) heavy clay loam; few fine distinct mottles of strong brown (7.5YR 5/6); moderate fine and medium subangular blocky structure; hard, firm; common fine roots; few gravel; neutral; gradual smooth boundary.

B21t 1253 34 to 48 cm. (13 to 19 inches). Dark brown (10YR 4/3) clay; common fine distinct mottles of strong brown (7.5YR 5/6); moderate fine blocky structure; very hard, very firm; common fine roots; few gravel which are larger in size than above horizons; slightly acid; gradual smooth boundary.

B22t 1254 48 to 75 cm. (19 to 30 inches). Dark brown (10YR 4/3) clay; common fine distinct mottles of strong brown (7.5YR 5/6) and few fine distinct mottles of grayish brown (2.5Y 5/2); films of very dark gray (10YR 3/1) in root channels and cracks; moderate fine and medium blocky structure; very hard, very firm; common fine roots; slightly acid; gradual smooth boundary.

B3 1255 75 to 111 cm. (30 to 44 inches). Light olive brown (2.5Y 5/4) clay; common fine mottles of yellowish brown (10YR 5/6); common films of dark grayish brown (2.5Y 5/2) in root channels and on faces of peds; weak coarse blocky structure; very hard, very firm; few fine roots; neutral; gradual smooth boundary.

C1 1256 111 to 142 cm. (44 to 56 inches). Mixed dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) clay, with vertical streaks of light brownish gray (2.5Y 6/2) that extend into the C2 and C3 horizons; few films of very dark gray (10YR 3/1) in root channels; massive; very hard, very firm; few fine roots; few $CaCO_3$ concretions and soft $CaCO_3$ in vertical channels that extend into the C2 horizon; moderately alkaline; gradual smooth boundary.

C2 1257 142 to 167 cm. (56 to 66 inches). Mixed dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/6), and strong brown (7.5YR 4/6) clay, with vertical streaks of light brownish gray (2.5Y 6/2); stains of very dark gray (10YR 3/1) on some faces of peds; massive; very hard, very firm; few $CaCO_3$ concretions and soft $CaCO_3$ in vertical channels; strong effervescence; moderately alkaline; gradual smooth boundary.

C3 1258 167 to 200 cm. (66 to 79 inches). Mixed light yellowish brown (2.5Y 6/5) and yellowish brown (10YR 5/6) light clay, with vertical streaks of light brownish gray (2.5Y 6/2); stains of very dark gray (10YR 3/1) on some faces of peds; massive; very hard, very firm; common soft $CaCO_3$ and few $CaCO_3$ concretions; strong effervescence; moderately alkaline; gradual smooth boundary.

C4 1259 200 to 260 cm. (79 to 102 inches). Mixed yellowish brown (10YR 5/6), very dark gray (10YR 3/1), and light brownish gray (2.5Y 6/2) light clay; massive; very hard, very firm; some soft $CaCO_3$ and few $CaCO_3$ concretions; strong effervescence; moderately alkaline; gradual smooth boundary.

C5 1260 260 to 310 cm. (102 to 122 inches). Light yellowish brown (2.5Y 6/3) light clay; few fine distinct mottles of strong brown (10YR 5/6); massive; very hard, very firm; some soft $CaCO_3$ and few $CaCO_3$ concretions; strong effervescence; moderately alkaline.

SOIL CLASSIFICATION-PACHIC ARGIUSTOLL
FINE, MIXED, THERMIC
SERIES - - - - - - -POND CREEK TAXADJUNCT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S76KS-77-2 COUNTY - - - HARPER

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 76P0106-76P0114

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B															RATIO
					FINE	SAND					SILT				INTR	FINE	NON-	8D1
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	SAND	II	CLAY	CO3-	15-
		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005-	2-	.2-	TO	CLAY	BAR
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	.10	.02	CLAY		TO
CM		PCT LT 2MM														PCT	PCT	CLAY
000-019	AP	20.9	56.9	22.2	15.8	.5	2.4	2.1	1.5	14.4	43.1	13.8		6.5		71		.41
019-033	B1	12.9	50.5	37.2	27.6	.4	1.3	1.1	.9	8.6	33.6	16.9		3.7		74		.41
033-051	B21T	9.2	48.5	42.3	30.2	.2	1.1	.9	.8	6.2	28.3	20.2		3.0		71		.39
051-073	B22T	8.5	52.0	39.5	27.7	.2	1.0	.8	.8	5.7	29.1	22.9		2.8		70		.39
073-101	B23T	10.1	51.6	38.3	28.6	TR	.9	1.1	.9	7.2	30.8	20.8		2.9		75		.40
101-130	C1	15.2	48.6	36.2	25.6	.7	1.6	1.4	1.4	10.1	33.0	15.6		5.1		71		.41
130-167	C2	17.2	46.1	36.7	24.5	.8	2.1	1.6	1.4	11.3	32.9	13.2		5.9		67		.42
167-200	C3	17.7	52.2	30.1	20.3	.5	1.8	1.7	1.5	12.2	39.5	12.7		5.5		67		.44
200-243	C4	19.2	54.4	26.4	16.7	1.1	2.5	2.4	2.0	11.2	38.3	16.1		8.0		63		.45

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)						(BULK DENSITY)				(- - - -WATER CONTENT- - - -)			CARBONATE		(- -PH - -)	
	VOL.	(- - - - - - - WEIGHT - - - - - - -)					4A1D	4A1H	4D1	4B1C	4B1C	4B2	4C1	6E1B	3A1A	8C1A	8C1E
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-		1/10	1/3-	15-	WRD	LT	LT	1/1	1/2
	2	75				.074	PCT	BAR		BAR	BAR	BAR	CM/	2	.002	H2O	CACL
CM	PCT	PCT	(- - - PCT LT 75 - - -)				LT20	G/CC		BAR	PCT	PCT	CM	PCT	PCT		
000-019	TR	0	0	0	TR		TR	1.46	1.56	.025		18.2	9.0	.13			5.5	4.9
019-033	TR	0	0	0	TR		TR	1.41	1.68	.062		25.9	15.2	.15			6.4	6.0
033-051	TR	0	0	0	TR		TR	1.41	1.70	.066		28.7	16.3	.18			6.9	6.6
051-073	TR	0	0	0	TR		TR	1.45	1.75	.066		28.1	15.3	.19			7.0	6.8
073-101	TR	0	0	0	TR		TR	1.52	1.73	.048		23.9	15.3	.13			7.3	7.0
101-130	TR	0	0	0	TR		TR	1.50	1.64	.031		22.6	14.7	.12		TR	7.8	7.5
130-167	2	0	0	2	1		3	1.47	1.63	.034		23.6	15.3	.12		TR	7.7	7.4
167-200	TR	0	0	TR	TR		TR	1.47	1.64	.038		23.1	13.1	.15		TR	7.9	7.7
200-243	TR	0	0	TR	TR		TR	1.48	1.63	.033		23.0	11.8	.17		TR	7.9	7.5

DEPTH	(ORGANIC MATTER)			IRON	PHOS	(- -EXTRACTABLE BASES 5B4A- -)					ACTY	AL	(CAT EXCH)	RATIO	RATIO	CA	(BASE SATI	
	6A1A	6B1A	C/N	6C2B		6N2E	6O2D	6P2B	6Q2B		6H1A	6G1E	5A3A	8D1	8D3	5F1	5C3	5C1
	ORGN	NITG		EXT		CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC		SAT	EXTB	NHAC
	CARB			FE	TOTL					EXTB	TEA	EXT	ACTY	TO	TO	NHAC	ACTY	
CM	PCT	PCT		PCT	PCT	(- - - - - - - - - - -MEQ / 100 G- - - - - - - - - -)								CLAY	MG	PCT	PCT	PCT
000-019	1.01	.086	12	.7		7.0	3.2	.4	.8	11.4	5.4		16.8	15.0	.68	2.2	47	68	76
019-033	.94	.101	9	1.0		13.4	6.5	.4	.8	21.1	4.6		25.7	23.5	.63	2.1	57	82	90
033-051	.83	.091	9	1.2		15.8	8.0	.5	.8	25.1	4.0		29.1	26.1	.62	2.0	61	86	96
051-073	.62	.081	8	1.1		14.9	7.7	.6	.7	23.9	3.2		27.1	24.7	.63	1.9	60	88	97
073-101	.46			1.1		14.5	7.1	.6	.7	22.9	2.9		25.8	23.2	.61	2.0	63	89	99
101-130	.28			1.0			6.6	.7	.7					20.4	.56				
130-167	.18			1.0			7.0	.6	.8					20.7	.56				
167-200	.12			.9			6.6	.7	.7					18.8	.62				
200-243	.04			.7			6.0	.8	.6					17.4	.66				

DEPTH	(SATURATED PASTE)			NA	NA	SALT	GYP	(- - - - - - - - - SATURATION EXTRACT 8A1- - - - - - - - -)									ATTERBERG	
	8E1	8C1B	8A	5D2	5E	8D5	6F1A	8A1A	6N1B	6O1B	6P1B	6Q1B	6I1A	6J1A	6K1A	6L1A	6M1A	4F1	4F2
	RESI	PH	H2O	ESP	SAR	TOTL		EC	CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3	LQID	PLST
	OHM-					SOLU		MMHOS/										LMIT	INDX
CM	CM		PCT	PCT		PPM	PCT	CM	(- - - - - - - - - - MEQ / LITER - - - - - - - - - -)									PCT	
000-019																		30	10 A
019-033																			
033-051																			
051-073	2200	6.9	50.1					.29										46	24 A
073-101	2300	7.1	47.9					.32											
101-130																			
130-167																			
167-200																		38	19 A
200-243																			

CLAY MINERALOGY (7A2G) PLACEMENT=MIXED.
000-019 MI2 KK2 MT1 QZ1
033-051 MT2 MI2 KK2 QZ1
051-073 MT2 MI2 KK2 QZ1
101-130 MI3 KK2 MT1 QZ1
167-200 MI3 KK2 MT1 QZ1
RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MT = MONTMORILLONITE MI = MICA KK = KAOLINITE QZ = QUARTZ.

SAND MINERALOGY (7B1)
000-019 VFNS - RE75 QZ73 FE1 ZR1 TM PO SP FD25 COS1 - RE78 QZ75 FE1 ZR1 PO1 FD20 TM SP RU MS SL EN HN AU GN CL.
033-051 VFNS - RE77 QZ74 FE1 TM1 ZR1 FD21 CB1 MS1 SP1 PO GN GS COS1 - RE75 QZ74 FE1 FD23 HN1 TM ZR RU MS CL GN.
101-130 VFNS - RE78 QZ77 FE1 FD19 MS1 TM ZR GN CB BT GS HN SO COS1 - RE81 QZ79 FE3 FD17 TM1 ZR SP MS HN GN CL SL.
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: CL = CHLORITE FD = FELDSPARS HN = HORNBLENDE MS = MUSCOVITE PO = PLANT OPAL QZ = QUARTZ TM = TOURMALINE ZR = ZIRCON CB = CARBONATE AGGREGATES RU = RUTILE GS = GLASS SP = SPHENE SL = SILLIMANITE GN = GARNET FE = IRON OXIDES EN = ENSTATITE RE = RESISTANT MINERALS.

(A) BY SOIL MECHANICS LABORATORY, USDA-SCS, LINCOLN, NE.

Pedon classification: Pachic Argiustoll, fine, mixed, thermic
Series classification: Pachic Argiustoll, fine-silty, mixed, thermic
Soil: Pond Creek taxadjunct*
Soil Nos.: S76KS-77-2 (NSSL No. 76P0106-76P0114)
Location: Harper County, KS; 1,500 feet west and 60 feet south of the northeast corner of Sec. 8, T34S, R5W.
Climate: Annual precipitation is about 27.6 inches. Annual temperature is about 58° F., and summer temperature is about 81° F. Average frost-free season is about 198 days.
Vegetation and land use: Wheat stubble. Cropland.
Parent material: Loess.
Physiography: Nearly level upland.
Topography: Slope gradient less than 1 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: C. S. Holzhey, M. J. Mausbach, R. L. Haberman.

(Colors are for dry soil unless otherwise stated.)

Ap 76P0106 0 to 19 cm. (0 to 7 inches). Brown (7.5YR 5/3) silt loam, dark brown (7.5YR 3/3) moist; weak fine granular structure; slightly hard, friable; many fine roots; medium acid; abrupt smooth boundary.

B1 76P0107 19 to 33 cm. (7 to 13 inches). Brown (7.5YR 5/2) light silty clay loam, dark brown (7.5YR 3/2) moist; moderate medium granular structure; slightly hard, friable; common fine roots; slightly acid; gradual smooth boundary.

B21t 76P0108 33 to 51 cm. (13 to 20 inches). Brown (7.5YR 5/3) silty clay loam, dark brown (7.5YR 3/3) moist; weak medium blocky structure parting to moderate medium subangular blocky structure; hard, firm; common fine roots; neutral; gradual smooth boundary.

B22t 76P0109 51 to 73 cm. (20 to 29 inches). Brown (7.5YR 5/3) silty clay loam, dark brown (7.5YR 3/3) moist; moderate and strong medium subangular blocky structure; hard, very firm; few fine roots; neutral; gradual smooth boundary.

B23t 76P0110 73 to 101 cm. (29 to 40 inches). Reddish brown (5YR 4/4) silty clay loam, dark reddish brown (5YR 3/4) moist; moderate and strong coarse blocky structure parting to moderate medium subangular blocky structure; hard, firm; few fine roots; neutral; gradual smooth boundary.

C1 76P0111 101 to 130 cm. (40 to 51 inches). Reddish brown (5YR 5/4) silty clay loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; hard, firm; few concretions and soft masses of $CaCO_3$; mildly alkaline; gradual smooth boundary.

C2 76P0112 130 to 167 cm. (51 to 66 inches). Red (2.5YR 5/6) silty clay loam, dark red (2.5YR 3/6) moist; massive; hard, firm; few coarse sand grains; few to common insect holes 5 mm. in diameter; evidence of krotovinas; few fine $CaCO_3$ concretions; mildly alkaline; gradual smooth boundary.

C3 76P0113 167 to 200 cm. (66 to 79 inches). Red (2.5YR 5/6) silty clay loam, dark red (2.5YR 3/6) moist; massive; slightly hard, friable; few coarse sand grains; common worm casts; common insect holes 5 mm. in diameter; evidence of krotovinas; few films of $CaCO_3$; mildly alkaline; gradual smooth boundary.

C4 76P0114 200 to 243 cm. (79 to 96 inches). Red (2.5YR 5/6) silty clay loam, red (2.5YR 4/6) moist; massive; slightly hard, friable; few coarse sand grains; few worm casts; evidence of krotovinas; few films of $CaCO_3$; mildly alkaline.

*This pedon is a taxadjunct to the Pond Creek series because the B2t horizons have more clay than allowed in the series.

SOIL CLASSIFICATION-TYPIC ARGIUDOLL
FINE-SILTY, MIXED, MESIC
SERIES - - - - - - -READING SILTY CLAY LOAM

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE MRTSC
SOIL SURVEY INVESTIGATIONS UNIT
LINCOLN, NEBRASKA

SOIL NO - - - - - - S71KS-23-2 COUNTY - - - DOUGLAS

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 71L1287-71L1291

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO	
		SAND 2- .05	SILT .05- .002	CLAY LT .002	FINE CLAY LT .0002	SAND VCOS 2- 1	SAND CORS 1- .5	SAND MEDS .5- .25	SAND FNES .25- .10	SAND VFNS .10- .05	SILT COSI .05 .02	SILT FNSI .02 .002	SILT VFSI .005- .002	FAML TEXT SAND 2-.1	INTR II .2- .02	FINE CLAY TO CLAY	NON- CO3- CLAY	8D1 15- BAR TO CLAY
CM		(- - - - - - - - - - - - - - - - PCT LT 2MM - - - - - - - - - - - - - - - -)														PCT	PCT	
000-24	AP	7.4	67.4	25.2	14.5	TR	.1	.1	.7	6.5	39.4	28.0	4.0	.9	46.5	58		.45
024-48	B1	6.6	63.6	29.8	17.7	TR	TR	.1	.6	5.9	34.5	29.1	4.8	.7	41.0	59		.46
048-85	B21T	6.1	61.2	32.7	19.7	.0	.0	.1	.6	5.4	30.7	30.5	5.3	.7	36.6	60		.46
085-118	B22T	6.4	63.3	30.3	17.9	.0	.0	.1	.7	5.6	33.2	30.1	4.9	.8	39.3	59		.44
118-163	B1Lb	8.9	55.7	35.4	21.2	.1	.5	.7	2.1	5.5	25.0	30.7	6.2	3.4	31.9	60		.45

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2	WEIGHT GT 75	75-20	20-5	5-2	LT .074	20-2	BULK DENSITY 4A1D 1/3- BAR	4A1H OVEN DRY	4D1 COLE	WATER CONTENT- 4B1C 1/10 BAR	4B1C 1/3- BAR	4B2 15- BAR	4C1 WRD CM/	CARBONATE 6E1B LT 2	3A1A .002	-PH 8C1A 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	(- - - PCT LT 75 - - -)			LT2D	PCT	G/CC	G/CC		PCT	PCT	PCT	CM	PCT	PCT		
000-24	TR	0	0	TR	TR	98	TR	1.39	1.50	.026	29.8	25.9	11.4	.21	1.6A		7.0	6.5
024-48	TR	0	0	TR	TR	98	TR	1.42	1.59	.039	26.9	25.0	13.8	.16	5.3A		6.8	6.2
048-85	0	0	0	0	0	98	0	1.43	1.63	.045	26.5	24.8	15.0	.14	4.3A		6.8	6.2
085-118	0	0	0	0	0	98	0	1.46	1.65	.037	25.7	23.6	13.3	.15	2.8A		6.8	6.3
118-163	TR	0	0	0	TR	95	TR	1.37	1.58	.050	28.8	26.7	16.0	.15	3.1A		6.8	6.2

DEPTH	(ORGANIC MATTER) 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2A EXT FE	PHOS 6S1A TOTL	(-EXTRACTABLE BASES 5B4A-) 6N2E CA	6O2D MG	6P2A NA	6Q2A K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1D KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA SF SAT NHAC	(BASE SAT) 5C3 EXTB ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	(- - - - - - - - - - MEQ / 100					G- - - - - - - - - -)						PCT	PCT	PCT
000-24	1.928	.163	12			19.8	2.2	.1	.7	22.8	4.2		27.0	22.4	.89	9.0	88	84	102
024-48	1.44	.127	11			20.5	2.5	.2	.6	23.8	4.8		28.6	23.8	.80	8.2	86	83	100
048-85	1.37					21.1	2.5	.1	.7	24.4	4.5		28.9	24.5	.75	8.4	86	84	100
085-118	.78					18.6	2.0	.1	.7	21.4	3.9		25.3	21.6	.71	9.3	86	85	99
118-163	1.14					22.8	2.1	.1	.8	25.8	4.8		30.6	26.2	.74	11.0	87	84	95

DEPTH	(SATURATED PASTE) 8E1 REST OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	(- - - - - - - - - SATURATION EXTRACT 8A1- 8A1A EC MMHOS/	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	CM	(- - - - - - - - - - MEQ / LITER - - - - - - - - - -)									PCT	
000-24																		38C	13
024-48																			
048-85																		44C	20
085-118	2700	6.5	50.0			80		.23	1.9	.3	.1	.1							
118-163																			

CLAY MINERALOGY (7A2C). PLACEMENT (S71KS-23-2) MIXED.
048-85 MT3 MI3 KK3
COMMENTS - MI HARD TO ASSESS, MAY BORDER MONTMORILLONITIC.
RELATIVE AMOUNTS - (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE - MT = MONTMORILLONITE MI = MICA KK = KAOLINITE

MICROMORPHOLOGY - OBSERVATIONS USING THE REFLECTED LIGHT MICROSCOPE OF THE B21T HORIZON INDICATE THE PRESENCE OF PATCHY OR OCCASIONAL MODERATELY THICK CLAY SKINS WITH BROKEN THIN OR VERY THIN CLAY SKINS.

(A) MICRO-PENETRATION RESISTANCE - A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10-BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.

(B) ORGANIC CARBON IS 20 KG/M SQ TO A DEPTH OF 1 M (6A).

(C) DETERMINED BY SOIL MECHANICS LAB - SCS, LINCOLN, NE.

Pedon classification: Typic Argiudoll, fine-silty, mixed, mesic
Series classification: (Same)
Soil: Reading silty clay loam
Soil Nos.: S71KS-23-2 (Sample Nos. 1287-1291)
Location: Douglas County, KS; 2,200 feet south and 100 feet east of the northwest corner of Sec. 8, T14S, R18E.
Climate: Annual precipitation is about 37 inches. Annual temperature is about 56° F., and mean summer temperature is about 78° F. Average frost-free season is about 185 days.
Vegetation and land use: Sorghum stubble. Cropland.
Parent material: Silty alluvium.
Physiography: Nearly level terrace.
Topography: Narrow terrace. Slope gradient less than 1 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderate to moderately slow.
Described by: R. L. Haberman, R. W. Fenwick, W. Abmeyer, J. L. Zimmerman.

(Colors are for moist soil unless otherwise stated.)

Ap 1287 0 to 24 cm. (0 to 9 inches). Very dark brown (10YR 2/2) silty clay loam, weak fine granular structure, with weak very fine thin platy structure in lower 2 inches; slightly hard, friable; many fine roots; common worm casts; neutral; clear smooth boundary.

B1 1288 24 to 48 cm. (9 to 19 inches). Very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) rubbed; moderate fine and medium subangular blocky structure; hard, firm; many fine roots; common worm casts; neutral; gradual smooth boundary.

B21t 1289 48 to 85 cm. (19 to 33 inches). Very dark brown (10YR 2/2) heavy silty clay loam, very dark grayish brown (10YR 3/2) rubbed; moderate fine and medium subangular blocky structure; hard, firm; few fine roots; few worm casts; neutral; gradual smooth boundary.

B22t 1290 85 to 118 cm. (33 to 46 inches). Dark grayish brown (10YR 4/2) light silty clay; few fine faint mottles of yellowish brown (10YR 5/6) in lower part of horizon; moderate fine subangular blocky structure; hard, firm; few fine roots; few worm casts; neutral; gradual smooth boundary.

B11b 1291 118 to 163 cm. (46 to 64 inches). Very dark brown (10YR 2/2) light silty clay; few fine faint mottles of yellowish brown (10YR 5/6); weak fine and medium subangular blocky structure; hard, firm; few fine roots; few worm casts; few charcoal fragments; neutral; gradual smooth boundary.

B12b 163 to 200 cm. (64 to 79 inches). Dark brown (10YR 3/3) clay loam; few fine distinct mottles of strong brown (7.5YR 5/6); weak fine subangular blocky and weak medium granular structure; slightly hard, friable; charcoal fragments, gravel, chert, and limestone fragments throughout; slightly acid.

Remarks: Horizons between 0 to 24 cm. (0 to 9 inches), 48 to 85 cm. (19 to 33 inches), and 118 to 163 cm. (46 to 64 inches) were sampled for engineering testing.

SOIL CLASSIFICATION-CUMULIC HAPLUSTOLL
FINE-SILTY, MIXED, MESIC
SERIES - - - - - - - ROXBURY SILT LOAM

SOIL NO - - - - - - S68KANS-26-9 COUNTY - - - ELLIS

GENERAL METHODS- - - 1A, 1B1B, 2A1, 2B SAMPLE NOS.- 68L391-68L397

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - PCT LT 2MM														RATIO
		SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	SAND VCOS 2- 1	SAND CORS 1-.5	SAND MEDS .5-.25	SAND FNES .25-.10	SAND VFNS .10-.05	SILT COSI .05-.02	SILT FNSI .02-.002	SILT VFSI .005-.002	FAML TEXT SAND 2-.1	INTR II .2-.02	FINE CLAY TO CLAY	NON-CO3-CLAY	8D1 15-BAR TO CLAY
CM																	PCT	
000-13	AP	17.9	61.9	20.2		0.4	0.4	0.6	3.5	12.9	44.7	17.2		4.9	60.0		20	0.52
013-33	A12	13.6	59.9	26.5		0.1	0.4	0.6	2.5	10.1	39.8	20.1		3.5	51.6		27	0.47
033-48	A13	12.9	60.4	26.7		0.1	0.4	0.6	1.9	9.7	41.5	18.9		3.2	52.3		27	0.46
048-71	AC1	16.6	61.3	22.1		0.2	0.6	1.0	2.5	12.3	45.1	16.2		4.3	58.8		22	0.46
071-104	AC2	11.0	63.4	25.6		0.1	0.3	0.5	1.6	8.5	41.1	22.3		2.5	50.6		24	0.45
104-152	C1	17.8	62.9	19.3		TR	0.1	0.7	3.2	13.8	44.4	18.5		4.0	60.1		17	0.46
152-183	C2	17.9	61.3	20.8		0	0.5	3.2	5.1	9.0	31.7	29.6		8.8	42.8		19	0.46

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2	GT 75	75-20	20-5	5-2	LT .074	20-2	BULK DENSITY 4A1D 1/3-BAR	4A1H OVEN DRY	4D1 COLE	WATER CONTENT- 4B1C 1/10 BAR	4B1C 1/3-BAR	4B2 15-BAR	4C1 WRD	4B2 100-	CARBONATE 6C1B LT 2	3A1A LT .002	(-PH- 8C1A 1/1 H2O	8C1B 1/2 CACL
CM	PCT	PCT	PCT LT 75				LT20	G/CC (A)	G/CC		PCT	PCT	PCT	CM	PCT	PCT	PCT		
000-13	TR	0	0	0	TR	93	TR	1.20					10.6			1	0	7.6	
013-33	TR	0	0	0	TR	95	TR	1.30	1.42	0.030		26.8	12.5	0.19	8.2	3	TR	7.8	
033-48	TR	0	0	0	TR	96	TR	1.26	1.38	0.031		24.4	12.4	0.15		3	TR	7.8	
048-71	TR	0	0	0	TR	94	TR	1.28	1.37	0.023		24.3	10.2	0.18		2	TR	7.8	
071-104	TR	0	0	0	TR	96	TR	1.33	1.43	0.024		23.1	11.5	0.15	7.3	6	2	8.0	
104-152	TR	0	0	0	TR	94	TR	1.45	1.52	0.016		20.2	8.9	0.16	5.6	7	2	7.9	
152-183	TR	0	0	0	TR	90	TR	1.40	1.45	0.012		20.7	9.5	0.16		7	2	7.9	

DEPTH	(ORGANIC MATTER) 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2A EXT FE	PHOS 6S1A TOTL	(-EXTRACTABLE BASES 5B4A- MEQ / 100 G) 6N2E CA (C)	6Q2D MG (C)	6P2A NA	6Q2A K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1D KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
CM	PCT (B)	PCT		PCT	PCT														
000-13	2.04	0.190	11	0.5		16.8	1.2	0.1	1.9	20.0			20.8	1.03					
013-33	1.35	0.128	11	0.5		20.9	0.9	0.2	1.3	23.3			22.1	0.83					
033-48	1.19	0.105	11	0.6		21.7	0.7	0.3	1.0	23.7			21.5	0.81					
048-71	0.85	0.077	11	0.5		18.3	0.6	0.4	0.7	20.0			17.9	0.81					
071-104	0.71	0.068	10	0.6		18.3	0.9	0.8	0.8	20.8			18.2	0.71					
104-152	0.40			0.4		14.7	1.0	0.5	0.7	16.9			14.0	0.73					
152-183	0.37			0.4		15.6	1.5	0.3	0.9	18.3			15.6	0.75					

DEPTH	(SATURATED PASTE) 8E1 REST OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	(-SATURATION EXTRACT 8A1- MEQ / LITER) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	CM										PCT	
000-13																			
013-33																		39	15
033-48	1700	7.3	51.9			240		0.73											
048-71																			
071-104																		36	14
104-152	1800	7.5	43.8		230		0.83												
152-183																		30	10

(A) BULK DENSITY ESTIMATED FOR HORIZON FROM 0-13 CM
(B) ORGANIC CARBON IS 14 KG PER SQ M TO A DEPTH OF 1 METER (METHOD 6A)
(C) METHODS 6N4C FOR CA AND 6O4C FOR MG

Pedon classification: Cumulic Haplustoll, fine-silty, mixed, mesic
Series classification: (Same)
Soil: Roxbury silt loam
Soil Nos.: S68KS-26-9 (Sample Nos. 391-397)
Location: Ellis County, KS; 1,800 feet east and 1,800 feet north of the southwest corner of Sec. 10, T14S, R18W.
Climate: Annual precipitation is about 23 inches. Annual temperature is about 54° F., and summer temperature is about 78° F. Average frost-free season is about 171 days.
Vegetation and land use: Switchgrass. Cultivated--grass seed production.
Parent material: Calcareous alluvium.
Physiography: Nearly level flood plain for Big Creek.
Topography: Slope gradient less than 1 percent.
Drainage: Well drained, occasionally flooded.
Ground water: Greater than 6 feet.
Erosion: Slight.
Permeability: Moderate.
Described by: J. M. Allen, L. D. Zavesky.

(Colors are for dry soil unless otherwise stated.)

Ap 391 0 to 13 cm. (0 to 5 inches). Dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak thin platy parting to moderate fine granular structure; slightly hard, friable; many fine and medium grass roots; slight effervescence; clear smooth boundary.

A12 392 13 to 33 cm. (5 to 13 inches). Dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, friable; many fine and medium grass roots; many worm casts; slight effervescence; gradual smooth boundary.

A13 393 33 to 48 cm. (13 to 19 inches). Dark grayish brown (10YR 4/2) heavy silt loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, friable; many fine and medium roots; many worm casts; strong effervescence; gradual smooth boundary.

AC1 394 48 to 71 cm. (19 to 28 inches). Dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; hard, friable; common fine and medium roots; common worm casts; strong effervescence; gradual wavy boundary.

AC2 395 71 to 104 cm. (28 to 41 inches). Grayish brown (10YR 5/2) heavy silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; hard, friable; common fine and medium roots; few worm casts; segregated lime in films and threads; strong effervescence; gradual smooth boundary.

C1 396 104 to 152 cm. (41 to 60 inches). Grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 5/2) moist; massive; slightly hard, friable; few fine roots; finely stratified with slightly darker and slightly more clayey horizontal strata; strong effervescence; clear smooth boundary.

C2 397 152 to 183 cm. (60 to 72 inches). Grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable; few fine roots, few thin sandier strata; strong effervescence.

Remarks: Horizons between 13 to 33 cm. (5 to 13 inches), 71 to 104 cm. (28 to 41 inches), and 104 to 152 cm. (41 to 60 inches) were sampled for engineering testing.

SOIL CLASSIFICATION-CUMULIC HAPLUSTOLL
FINE-SILTY, MIXED, MESIC
SERIES - - - - - - - ROXBURY SILT LOAM

SOIL NO - - - - - - S68KANS-26-11 COUNTY - - - ELLIS

GENERAL METHODS- - - 1A, 1B1B, 2A1, 2B

SAMPLE NOS.- 68L396-68L405

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO
					FINE	SAND						SILT		FAML	INTR	FINE	NON-	8D1
		SAND	SILT	CLAY	CLAY	VCOS	COAS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	II	CLAY	CO3-	15-
		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005-	SAND	.2-	TO	CLAY	BAR
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-.1	.02	CLAY		TO
CM		PCT LT 2MM														PCT	PCT	CLAY
000-18	AP1	7.4	72.0	20.6		0.3	0.3	0.3	0.8	5.8	44.4	27.6		1.6	50.7		21	0.52
018-28	AP2	7.5	69.9	22.6		TR	0.3	0.3	0.7	6.1	43.1	26.8		1.3	49.7		23	0.50
028-41	A13	4.3	71.1	24.6		0	0.1	0.2	0.5	3.5	42.2	28.9		0.7	46.0		23	0.46
041-61	A14	7.8	72.5	19.7		0	0.2	0.4	0.9	6.2	48.2	24.3		1.5	55.0		18	0.46
061-91	A15	18.6	61.1	20.3		TR	1.0	2.4	4.4	10.8	43.6	17.5		7.8	56.4		20	0.44
091-127	B2	11.1	62.4	26.5		0.1	0.2	0.8	1.2	8.7	42.6	19.8		2.3	51.9		25	0.45
127-173	C1	6.5	64.8	28.7		TR	0.1	0.2	0.5	5.6	40.5	24.3		0.8	46.5		26	0.47
173-193	C2	3.6	67.7	28.7		0	0.1	0.1	0.3	3.2	41.9	25.8		0.4	45.3		26	0.47

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2						BULK DENSITY			WATER CONTENT				CARBONATE		PH	
	VOL.	GT	WEIGHT				4A1D	4A1H	4D1	4B1C	4B1C	4B2	4C1	6E1B	3A1A	8C1A	8C1E
	GT	75-				LT	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD	LT	LT	1/1	1/2
	2	20	20-5	5-2		.074	BAR	DRY		BAR	BAR	BAR	CM/	2	.002	H2O	CACL
CM	PCT	PCT	PCT LT 75			LT20	G/CC	G/CC		PCT	PCT	PCT	CM	PCT	PCT		
							(A)										
000-18	TR	0	0	0	TR	98	TR	1.20				10.7		1	0	7.9	
018-28	TR	0	0	0	TR	98	TR	1.20	1.36	0.043	26.8	11.3	0.19	1	0	7.9	
028-41	TR	0	0	0	TR	99	TR	1.27	1.43	0.040	28.8	11.4	0.22	6	2	7.8	
041-61	0	0	0	0	0	98	0	1.27	1.37	0.026	27.9	9.0	0.24	5	2	7.8	
061-91	TR	0	0	0	TR	91	TR	1.28	1.38	0.025	22.8	9.0	0.17	3	TR	7.7	
091-127	TR	0	0	0	TR	97	TR	1.51	1.67	0.034	22.2	11.8	0.16	4	2	8.2	
127-173	0	0	0	0	0	99	0	1.56	1.69	0.027	18.8	13.5	0.08	5	3	8.2	
173-193	0	0	0	0	0	99	0	1.53	1.66	0.028	18.5	13.5	0.08	5	3	8.1	

DEPTH	ORGANIC MATTER			IRON	PHOS	EXTRACTABLE BASES 5B4A-					ACTY	AL	CAT EXCH		RATIO	RATIO	CA	BASE SAT
	6A1A	6B1A	C/N	6C2A	6S1A	6N2E	6Q2D	6P2A	6Q2A		6H1A	6G1D	5A3A	5A6A	8D1	8D3	5F	5C3
	ORGN	NITG		EXT	TOTL	CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	TO	SAT	EXTB
	CARB			FE						EXTB	TEA	EXT	ACTY		TO	NHAC	ACTY	NHAC
CM	PCT	PCT		PCT	PCT	MEQ / 100 G									CLAY	MG	PCT	PCT	PCT
	(B)					(C)	(C)												
000-18	1.68					19.4	0.7	0.1	2.5	22.7				22.4	1.09				
018-28	1.52					20.4	0.7	0.1	1.6	22.8				22.9	1.01				
028-41	0.90					19.6	0.9	0.1	1.1	21.7				19.6	0.80				
041-61	0.60					16.3	0.8	0.1	0.7	17.9				15.8	0.80				
061-91	0.70					15.7	1.1	0.2	0.7	17.7				15.9	0.78				
091-127	0.56					15.8	2.9	1.4	1.3	21.4				18.5	0.70				
127-173	0.30					14.8	3.9	3.2	1.8	23.7				19.3	0.67				
173-193	0.18					14.8	4.2	3.9	2.0	24.9				18.7	0.65				

DEPTH	SATURATED PASTE			NA	NA	SALT	GYP	SATURATION EXTRACT 8A1-									ATTERBERG	
	8E1	8C1B	PH	8A	5D2	5E	8D5	6F1A	8A1A	6N1B	6Q1B	6P1A	6Q1A	6I1A	6J1A	6K1A	6L1A	6M1A	4F1	4F2
	REST			H2O	ESP	SAR	TOTL		EC	CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3	LQID	PLST
	OHM-						SOLU		MMHOS/										LMIT	INDX
CM	CM			PCT	PCT		PPM	PCT	CM	MEQ / LITER									PCT	
000-18																				
018-28																				
028-41																				
041-61																				
061-91																				
091-127																				
127-173																				
173-193																				

(A) BULK DENSITY ESTIMATED FOR HORIZON FROM 0-18 CM
(B) ORGANIC CARBON IS 12 KG PER SQ METER TO A DEPTH OF 1 METER (METHOD 6A)
(C) METHODS 6N4C FOR CA AND 6O4C FOR MG

Pedon classification: Cumulic Haplustoll, fine-silty, mixed, mesic
Series classification: (Same)
Soil: Roxbury silt loam
Soil Nos.: S68KS-26-11 (Sample Nos. 398-405)
Location: Ellis County, KS; 2,300 feet west and 1,400 feet south of the northeast corner of Sec. 23, T13S, R19W.
Climate: Annual precipitation is about 23 inches. Annual temperature is about 54° F., and summer temperature is about 78° F. Average frost-free season is about 171 days.
Vegetation and land use: Wheat. Cropland.
Parent material: Calcareous alluvium.
Physiography: Nearly level flood plain of Big Creek.
Topography: Slope gradient less than 1 percent.
Drainage: Well drained. Occasionally flooded.
Ground water: Greater than 6 feet.
Erosion: Slight.
Permeability: Moderate.
Described by: J. M. Allen, R. F. Harner.

(Colors are for dry soil unless otherwise stated.)

Ap1 398 0 to 18 cm. (0 to 7 inches). Grayish brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) moist; weak medium platy parting to moderate fine granular structure; slightly hard, friable; many fine roots; slight effervescence; clear smooth boundary.

Ap2 399 18 to 28 cm. (7 to 11 inches). Grayish brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) moist; weak coarse platy parting to weak medium granular structure; few fine roots; slight effervescence; clear smooth boundary.

A13 400 28 to 41 cm. (11 to 16 inches). Grayish brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, friable; few fine roots; many worm casts; slight effervescence; gradual smooth boundary.

A14 401 41 to 61 cm. (16 to 24 inches). Grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable; few very fine roots; common worm casts; few thin films of segregated lime; strong effervescence; gradual wavy boundary.

A15 402 61 to 91 cm. (24 to 36 inches). Dark gray (10YR 4/1) silt loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, friable; few fine roots; common worm casts; common fine threads of segregated lime; strong effervescence; gradual smooth boundary.

B2 403 91 to 127 cm. (36 to 50 inches). Grayish brown (10YR 5/2) light silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; hard, firm; few fine roots; common fine threads of segregated lime; strong effervescence; gradual smooth boundary.

C1 404 127 to 173 cm. (50 to 68 inches). Light brownish gray (10YR 6/2) light silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, firm; films and threads of lime are thicker and more common than in B2 horizon; strong effervescence; diffuse wavy boundary.

C2 405 173 to 193 cm. (68 to 76 inches). Light gray (10YR 7/2) light silty clay loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable; dark films on some faces of peds; few films and threads of segregated lime; strong effervescence.

Remarks: Horizons between 28 to 41 cm. (11 to 16 inches), 61 to 91 cm. (24 to 36 inches), and 91 to 127 cm. (36 to 50 inches) were also sampled for engineering testing.

SOIL CLASSIFICATION-TYPIC ARGIUDOLL
FINE-LOAMY, MIXED, MESIC
SERIES - - - - - - - -SHELBY LOAM

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE MRTSC
SOIL SURVEY INVESTIGATIONS UNIT
LINCOLN, NEBRASKA

SOIL NO - - - - - - S71KS-44-4   COUNTY - - - JEFFERSON

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B   SAMPLE NOS. 71L1261-71L1268

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B																RATIO
					FINE	(- - SAND - -)					(- -SILT- - -)			FAML	INTR	FINE	NON-	8D1
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	II	CLAY	CO3-	15-
		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005-	SAND	.2-	TO	CLAY	BAR
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-.1	.02	CLAY		TO
CM		(- - -	PCT LT 2MM												- - -)	PCT	PCT	CLAY
000-23	A1	41.1	35.3	23.6	15.3	1.8	6.3	8.9	14.6	9.5	19.4	15.9	3.8	31.6	36.1	65	24	.42
023-36	A3	36.8	34.9	28.3	19.4	2.5	6.1	7.5	12.3	8.4	17.1	17.8	3.9	28.4	31.7	69	28	.41
036-51	B21T	34.5	33.1	32.4	21.9	4.0	5.8	6.1	10.7	7.9	14.0	17.0	2.9	26.6	29.4	68	32	.41
051-86	B22T	32.4	31.8	35.8	23.2	2.3	4.9	6.3	10.5	8.4	14.3	17.5	3.1	24.0	28.0	65	36	.40
086-122	B3	32.9	34.7	32.4	18.4	2.3	5.4	6.2	10.3	8.7	14.8	19.9	5.0	24.2	28.8	57	32	.41
122-170	C1	33.3	37.7	29.0	12.3	2.5	4.9	6.2	10.9	8.8	15.8	21.9	4.8	24.5	30.2	42	29	.46
170-240	C2	33.7	38.4	27.9	10.0	2.7	5.1	6.3	10.7	8.9	16.0	22.4	5.4	24.8	30.3	36	28	.47
240-305	C3	33.8	37.9	28.3	10.7	2.4	5.1	6.4	10.9	9.0	16.8	21.1	4.2	24.8	31.3	38	28	.46

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)							(BULK DENSITY		)	(- - -WATER CONTENT- - - -)					CARBONATE		(- -PH - -)	
	VOL.	(- - WEIGHT					- -)	4A1D	4A1H	4D1	4B1C	4B1C	4B2	4C1		6E1B	3A1A	8C1A	8C1E
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD		LT	LT	1/1	1/2
	2	75				.074	PCT	BAR	DRY		BAR	BAR	BAR	CM/		2	.002	H2O	CACL
CM	PCT	PCT	(- - - PCT LT 75		- - -)		LT20	G/CC	G/CC		PCT	PCT	PCT	CM		PCT	PCT		
000-23	TR	0	0	TR	TR	65	TR	1.48	1.56	.018	19.1	17.8	10.0	.12	4.88			5.1	4.8
023-36	TR	0	0	TR	TR	68	TR	1.50A					11.7					5.4	4.9
036-51	5	0	0	5	2	TR	7	1.50A					13.3					5.4	4.9
051-86	2	0	0	2	1	71	3	1.56	1.86	.059	22.6	21.6	14.3	.11	3.38			5.7	5.1
086-122	1	0	0	1	1	71	2	1.60A					13.4			0		6.4	5.7
122-170	2	0	0	2	1	70	3	1.67	1.90	.043	21.6	20.3	13.2	.12	2.68	4	0	7.9	7.5
170-240	3	0	0	3	1	69	4						13.0			8	TR	8.1	7.6
240-305	4	0	0	6	1	67	7						12.9			8	TR	8.0	7.6

DEPTH	(ORGANIC MATTER	)		IRON	PHOS	(- -EXTRACTABLE BASES 5B4A- -)					ACTY	AL	(CAT EXCH)		RATIO	RATIO	CA	(BASE SAT)	
	6A1A	6B1A	C/N	6C2A	6S1A	6N2E	6O2D	6P2A	6Q2A		6H1A	6G1D	5A3A	5A6A	8D1	8D3	5F	5C3	5C1
	ORGN	NITG		EXT	TOTL	CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	CA	SAT	EXTB	NHAC
	CARB			FE						EXTB	TEA	EXT	ACTY		TO	TO	NHAC	ACTY	
CM	PCT	PCT		PCT	PCT	(- - -				-MEQ / 100 G-				- - -)	CLAY	MG	PCT	PCT	PCT
000-23	1.71C																		
023-36	1.52																		
036-51	1.17																		
051-86	.56																		
086-122	.20																		
122-170	.08																		
170-240	.04																		
240-305	.01																		

DEPTH	(SATURATED PASTE)			NA	NA	SALT	GYP	(- - - SATURATION EXTRACT 8A1-									- - -)	ATTERBERG	
	8E1	8C1B	8A	5D2	5E	8D5	6F1A	8A1A	6N1B	6O1B	6P1A	6Q1A	6I1A	6J1A	6K1A	6L1A	6M1A	4F1	4F2
	REST	PH	H2O	ESP	SAR	TOTL		EC	CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3	LQID	PLST
	OHM-					SOLU		MMHOS/										LMIT	INDX
CM	CM		PCT	PCT		PPM	PCT	CM	(- - -			MEQ / LITER					- - -)	PCT	
000-23																			
023-36																			
036-51																			
051-86																		49D	26
086-122	3400	6.2	54.8			50		.15	1.	.1	.3	.1							
122-170																		45D	26
170-240																			
240-305																			

CLAY MINERALOGY (7A2C).   PLACEMENT (S71KS-44-4) MONTMORILLONITIC.
051-86   MT5 KK3 MI1
122-170   MT5 KK3 MI2
COMMENTS - MINERALS WELL ORDERED.
RELATIVE AMOUNTS - (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE - MT = MONTMORILLONITE MI = MICA KK = KAOLINITE.

(A) ESTIMATED.
(B) MICRO-PENETRATION RESISTANCE - A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10-BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.
(C) ORGANIC CARBON IS 15 KG/M SQ TO A DEPTH OF 1 M (6A).
(D) DETERMINED BY SOIL MECHANICS LAB - SCS, LINCOLN, NE.

Pedon classification: Typic Argiudoll, fine-loamy, mixed, mesic
Series classification: (Same)
Soil: Shelby loam
Soil Nos.: S71KS-44-4 (Sample Nos. 1261-1268)
Location: Jefferson County, KS; 1,940 feet west and 450 feet south of the northeast corner of Sec. 5, T10S, R20E.
Climate: Annual precipitation is about 37 inches. Annual temperature is about 56° F., and mean summer temperature is about 78° F. Average frost-free season is about 180 days.
Vegetation and land use: Smooth bromegrass. Pasture.
Parent material: Clay loam till.
Physiography: Sloping erosional upland.
Topography: Slightly convex side slope of drainageway below summit. Slope gradient of about 6 percent.
Drainage: Moderately well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: R. L. Haberman, R. W. Fenwick, W. Abmeyer.

(Colors are for moist soil unless otherwise stated.)

A1 1261 0 to 23 cm. (0 to 9 inches). Black (10YR 2/1) loam; weak and moderate fine granular structure; slightly hard, friable; common fine roots; medium acid; gradual smooth boundary.

A3 1262 23 to 36 cm. (9 to 14 inches). Black (10YR 2/1) clay loam, very dark brown (10YR 2/2) rubbed; moderate medium granular structure; slightly hard, friable; few worm casts; common fine roots; few gravel; medium acid; gradual smooth boundary.

B21t 1263 36 to 51 cm. (14 to 20 inches). Mixed very dark brown (10YR 2/2) and dark brown (10YR 4/3) clay loam; moderate fine subangular blocky structure; hard, firm; common fine roots; more gravel than above horizon; medium acid; gradual smooth boundary.

B22t 1264 51 to 86 cm. (20 to 34 inches). Mixed dark brown (10YR 4/3), yellowish brown (10YR 5/6), and grayish brown (2.5Y 5/2) light clay; common fine distinct mottles of strong brown (7.5YR 5/6); dark gray stains on some ped faces; moderate fine and medium subangular blocky structure; very hard, very firm; thin continuous clay films; common fine roots; common gravel; medium acid; gradual smooth boundary.

B3 1265 86 to 122 cm. (34 to 48 inches). Mixed dark brown (10YR 4/3), yellowish brown (10YR 5/6), grayish brown (2.5Y 5/2), and light brownish gray (2.5Y 6/2) light clay; weak medium and coarse blocky structure; very hard, very firm; thin discontinuous clay films; few fine roots; common gravel; medium acid; gradual smooth boundary.

C1 1266 122 to 170 cm. (48 to 67 inches). Dark yellowish brown (10YR 4/4) clay loam, with streaks of dark brown (7.5YR 4/4), light brownish gray (2.5Y 6/2), and dark gray (10YR 4/1); few fine faint mottles of yellowish brown (10YR 5/6); medium blocky structure; hard, firm; common gravel; few $CaCO_3$ concretions and some soft $CaCO_3$; moderately alkaline; gradual smooth boundary.

C2 1267 170 to 240 cm. (67 to 95 inches). Yellowish brown (10YR 5/5) clay loam, with streaks of light brownish gray (2.5Y 6/2); few fine distinct mottles of strong brown (7.5YR 5/6); massive; hard, firm; few soft brown fragments; common gravel; few $CaCO_3$ concretions and some soft $CaCO_3$; strong effervescence; moderately alkaline; gradual smooth boundary.

C3 1268 240 to 305 cm. (95 to 121 inches). Yellowish brown (10YR 5/5) clay loam, with streaks of light brownish gray (2.5Y 6/2) and strong brown (7.5YR 5/6); massive; hard, firm; common gravel; few to common $CaCO_3$ concretions up to 2 inches in width; strong effervescence; moderately alkaline.

SOIL CLASSIFICATION-TYPIC ARGIUDOLL
FINE-LOAMY, MIXED, MESIC
SERIES - - - - - - -SHELBY CLAY LOAM

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE MRTSC
SOIL SURVEY INVESTIGATIONS UNIT
LINCOLN, NEBRASKA

SOIL NO - - - - - - S71KS-44-5 COUNTY - - - JEFFERSON

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 71L1269-71L1278

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B															RATIO
					FINE	SAND						SILT			FAML	INTR	FINE	NON-	8D1
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	II	CLAY	CO3-	15-
		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005-	SAND	.2-	TO	CLAY	BAR
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-.1	.02	CLAY		TO
CM		PCT LT 2MM														PCT	PCT	CLAY
000-18	A1	43.6	28.3	28.1	19.1	4.4	7.1	8.7	14.3	9.1	15.3	13.0	1.4	34.5	31.4	68	28	.41
018-32	A3	40.7	26.5	32.8	23.0	5.9	7.5	8.1	11.9	7.3	13.0	13.5	2.2	33.4	26.0	70	33	.41
032-45	B21T	34.1	29.8	36.1	25.0	2.8	5.7	6.7	10.9	8.0	13.5	16.3	3.4	26.1	27.0	69	36	.40
045-63	B22T	32.5	32.7	34.8	22.4	2.3	5.0	6.2	10.6	8.4	14.2	18.5	3.6	24.1	28.0	64	34	.39
063-102	B3	33.7	35.1	31.2	17.4	2.1	4.9	6.4	11.2	9.1	15.7	19.4	3.6	24.6	30.5	56	31	.42
102-140	C1	34.0	37.9	28.1	9.4	2.1	5.0	6.3	11.4	9.2	15.7	22.2	5.1	24.8	30.7	33	28	.46
140-180	C2	34.0	38.5	27.5	8.9	2.5	5.2	6.3	11.0	9.0	15.9	22.6	5.9	25.0	30.6	32	28	.47
180-210	C3	34.0	38.8	27.2	9.1	2.0	5.3	6.3	11.3	9.1	15.7	23.1	5.5	24.9	30.7	33	27	.48
210-275	C4	34.4	39.1	26.5	8.8	3.2	4.9	6.3	11.0	9.0	15.2	23.9	5.7	25.4	29.9	33	27	.49
275-315	C5	33.8	39.7	26.5	8.7	2.7	5.2	6.1	10.8	9.0	16.7	23.0	5.4	24.8	31.3	33	27	.49

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)					BULK DENSITY					WATER CONTENT				CARBONATE		PH	
	VOL.	GT	WEIGHT				4A1D	4A1H	4D1	4B1C	4B1C	4B2	4C1		6E1B	3A1A	8C1A	8C1E
	GT	75				LT	20-2	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD	LT	LT	1/1	1/2
	2		75-20	20-5	5-2	.074	PCT	BAR	DRY		BAR	BAR	BAR	CM/	2	.002	H2O	CACL
CM	PCT	PCT	PCT LT 75			LT20		G/CC	G/CC		PCT	PCT	PCT	CM	PCT	PCT		
000-18	5	0	0	5	6	55	11	1.40A					11.6				5.2	5.0
018-32	20	0	0	14	17	44	31	1.40A					13.3				5.7	5.2
032-45	5	0	0	5	4	64	9	1.50A					14.3				5.8	5.3
045-63	1	0	0	1	1	72	2	1.52	1.74	.046	22.9	21.5	13.4	.12	3.58	TR	6.4	5.8
063-102	1	0	0	2	1	71	3	1.58	1.82	.048	24.8	23.5	13.2	.16	2.58	TR	7.3	6.8
102-140	2	0	0	2	3	69	5	1.60A					12.9			5	8.0	7.6
140-180	3	0	0	2	3	69	5	1.70A					12.9			8	8.1	7.6
180-210	3	0	0	2	2	69	4	1.69	1.84	.028	19.2	17.8	13.0	.08	2.08	9	8.0	7.6
210-275	3	0	0	2	3	69	5						13.1			10	8.0	7.7
275-315	3	0	0	2	2	69	4						13.0			10	8.1	7.7

DEPTH	ORGANIC MATTER			IRON	PHOS	EXTRACTABLE BASES 5B4A-					ACTY	AL	(CAT EXCH)		RATIO	RATIO	CA	(BASE SAT)	
	6A1A	6B1A	C/N	6C2A	6S1A	6N2E	6O2D	6P2A	6Q2A		6H1A	6G1D	5A3A	5A6A	8D1	8D3	5F	5C3	5C1
	ORGN	NITG		EXT	TOTL	CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	CA	SAT	EXTB	NHAC
	CARB			FE						EXTB	TEA	EXT	ACTY		TO	TO	NHAC	ACTY	
CM	PCT	PCT		PCT	PCT	MEQ / 100					G-				CLAY	MG	PCT	PCT	PCT
000-18	1.81C																		
018-32	1.15																		
032-45	.78																		
045-63	.47																		
063-102	.28																		
102-140	.08																		
140-180	.05																		
180-210	.03																		
210-275	.05																		
275-315	.04																		

DEPTH	(SATURATED PASTE)			NA	NA	SALT	GYP	SATURATION EXTRACT 8A1-										ATTERBERG	
	8E1	8C1B		8A	5O2	8D5	6F1A	8A1A	6N1B	6O1B	6P1A	6Q1A	6I1A	6J1A	6K1A	6L1A	6M1A	4F1	4F2
	REST	PH		H2O	ESP	SAR	TOTL		EC	CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3	LQID	PLST
	OHM-						SOLU		MMHOS/										LMIT	INDX
CM	CM			PCT	PCT		PPM	PCT	CM	MEQ / LITER									PCT	
000-18																			
018-32																			
032-45																		49D	24
045-63																			
063-102																			
102-140	2500	7.4		49.3			110		.34	3.	.1	.4	.1						
140-180																			
180-210																		39D	20
210-275																			
275-315																			

(A) ESTIMATED.
(B) MICRO-PENETRATION RESISTANCE - A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10-BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.
(C) ORGANIC CARBON IS 10 KG/M SQ TO A DEPTH OF 1 M (6A).
(D) DETERMINED BY SOIL MECHANICS LAB - SCS, LINCOLN, NE.

Pedon classification: Typic Argiudoll, fine-loamy, mixed, mesic
Series classification: (Same)
Soil: Shelby clay loam
Soil Nos.: S71KS-44-5 (Sample Nos. 1269-1278)
Location: Jefferson County, KS; 1,740 feet south and 550 feet west of the northeast corner of Sec. 17, T10S, R20E.
Climate: Annual precipitation is about 37 inches. Annual temperature is about 56° F., and mean summer temperature is about 78° F. Average frost-free season is about 180 days.
Vegetation and land use: Smooth bromegrass. Pasture.
Parent material: Clay loam till.
Physiography: Sloping erosional upland.
Topography: Slightly convex side slope of drainageway below summit. Slope gradient about 6 percent.
Drainage: Moderately well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderately slow.
Described by: R. L. Haberman, W. Abmeyer, H. T. Rowland.

(Colors are for moist soil unless otherwise stated.)

A1 1269 0 to 18 cm. (0 to 7 inches). Very dark brown (10YR 2/2) light clay loam, weak fine granular structure with some weak very fine platy structure in lower 2 inches; slightly hard, friable; common fine roots; few gravels; neutral; clear smooth boundary.

A3 1270 18 to 32 cm. (7 to 13 inches). Mixed very dark brown (10YR 2/2) and dark brown (10YR 3/3) clay loam; moderate fine and medium granular structure; slightly hard, friable; common fine roots; common gravel mostly less than ½ inch in diameter and generally occupying lower half of horizon; slightly acid; clear smooth boundary.

B21t 1271 32 to 45 cm. (13 to 18 inches). Dark brown (10YR 3/3) heavy clay loam, with stains of very dark gray (10YR 3/1); few fine distinct mottles of strong brown (7.5YR 5/6); moderate fine and medium subangular blocky structure; hard, firm; common fine roots; few gravel mostly less than ½ inch in diameter in upper 2 inches; slightly acid; clear smooth boundary.

B22t 1272 45 to 63 cm. (18 to 25 inches). Yellowish brown (10YR 5/4) clay loam, with a few stains of very dark gray (10YR 3/1); common fine distinct mottles of strong brown (7.5YR 5/6) and few fine distinct mottles of grayish brown (2.5Y 5/2); weak moderate blocky and subangular blocky structure; hard, firm; thin continuous clay films; common fine roots; slightly acid; gradual smooth boundary.

B3 1273 63 to 102 cm. (25 to 40 inches). Light olive brown (2.5Y 5/3) clay loam, with a few stains of very dark gray (10YR 3/1); few fine faint mottles of light brownish gray (2.5Y 6/2) and common fine distinct mottles of yellowish brown (10YR 5/6); weak coarse blocky structure; very hard, very firm; thin continuous clay films; few fine roots; neutral; gradual smooth boundary.

C1 1274 102 to 140 cm. (40 to 55 inches). Yellowish brown (10YR 5/4) clay loam, few fine distinct mottles of light brownish gray (2.5Y 6/2) and common coarse distinct mottles of strong brown (7.5YR 5/6) massive; very hard, very firm; few fine roots; common $CaCO_3$ concretions and some soft $CaCO_3$; slight effervescence; moderately alkaline; gradual smooth boundary.

C2 1275 140 to 180 cm. (55 to 71 inches). Yellowish brown (10YR 5/4) clay loam, with vertical streaks of light brownish gray (2.5Y 6/2), and stains of dark yellowish brown (10YR 4/4); few fine faint mottles of yellowish brown (10YR 5/6); massive; very hard, very firm; common $CaCO_3$ concretions and some soft $CaCO_3$; strong effervescence; moderately alkaline; gradual smooth boundary.

C3 1276 180 to 210 cm. (71 to 83 inches). Yellowish brown (10YR 5/4) clay loam, with vertical streaks of light brownish gray (2.5Y 6/2) and stains of dark yellowish brown (10YR 4/4); few faint mottles of yellowish brown (10YR 5/6); massive; very hard, very firm; common $CaCO_3$ concretions; strong effervescence; moderately alkaline; gradual smooth boundary.

C4 1277 210 to 275 cm. (83 to 104 inches). Mixed light yellowish brown (10YR 6/4), gray (2.5Y N6/), and strong brown (7.5YR 5/6) loam; massive; hard, firm; few $CaCO_3$ concretions; strong effervescence; moderately alkaline; diffuse wavy boundary.

C5 1278 275 to 315 cm. (104 to 124 inches). Mixed gray (2.5Y N6/), light yellowish brown (10YR 6/4), and strong brown (7.5YR 5/6) loam; massive; hard, firm; few $CaCO_3$ concretions; strong effervescence; moderately alkaline.

SOIL CLASSIFICATION—UDIC ARGIUSTOLL
FINE-LOAMY, MIXED, THERMIC
SERIES - - - - - - -SHELLABARGER SANDY LOAM

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S76KS-77-1 COUNTY - - - HARPER

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 76P0098-76P0105

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B — SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY .0002 LT	VCOS SAND 2-1	CORS SAND 1-.5	MEDS SAND .5-.25	FNES SAND .25-.10	VFNS SAND .10-.05	COSI SILT .05-.02	FNSI SILT .02-.002	VFSI SILT .002-.002	INTR SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY	NON-CO3 CLAY	RATIO 8D1 15-BAR TO CLAY
		PCT LT 2MM														PCT	PCT	
000-025	AP	62.3	27.1	10.6	9.1	1.7	12.7	17.5	18.6	11.8	20.3	6.8		50.5		86		.46
025-043	B1	58.2	25.9	15.9	12.8	3.6	13.8	17.6	15.4	7.8	18.7	7.2		50.4		81		.42
043-061	B21T	58.9	22.5	18.6	14.7	4.8	14.3	16.8	16.3	6.7	15.1	7.4		52.2		79		.42
061-092	B22T	56.7	20.1	23.2	18.5	7.5	11.8	15.0	17.3	5.1	10.9	9.2		51.6		80		.39
092-145	C1	77.9	10.1	12.0	8.3	8.6	16.4	22.1	24.8	6.0	5.9	4.2		71.9		69		.45
092-145	C1(A)	76.7	9.9	13.4		7.1	16.2	19.0	25.5	8.9	6.5	3.4		67.8				.47
145-203	C2	93.0	2.8	4.2	2.1	16.2	38.5	25.3	11.6	1.4	1.6	1.2		91.6		50		.55
145-203	C2(B)	95.7	2.0	2.3		18.4	42.1	25.5	8.9	.8	.9	1.1		94.9				.70

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20 PCT LT 75	20-5 PCT LT 75	5-2 PCT LT 75	BULK DENSITY 4A1D LT .074 PCT	4A1H 1/3-20 BAR PCT LT20	4D1 OVEN DRY G/CC	4B1C COLE G/CC	WATER CONTENT 4B1C 1/10 BAR PCT	4B2 1/3-BAR PCT	4C1 15-BAR PCT	WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
000-025	TR	0	0	TR	TR	TR	1.37				11.9	4.9	.10			5.4	4.7
025-043	1	0	0	TR	1	2	1.54	1.64	.021		13.8	1.1	.19			6.3	5.8
043-061	1	0	0	TR	2	0	1.57	1.71	.028		15.8	7.8	.13			6.7	6.1
061-092	2	0	0	1	2	3	1.64	1.79	.031		15.3	9.0	.10			7.0	6.5
092-145	2	0	0	1	2	3	1.64	1.71	.013		9.5	5.4	.07			6.9	6.4
092-145	3	0	0	1	3	4	1.72	1.79	.013		13.2	6.3	.12			7.2	6.5
145-203	4	0	0	1	5	7	1.6 A					2.3				7.0	6.2
145-203	6	0	0	2	7	9	1.6 C					1.6				6.7	5.8

DEPTH CM	(ORGANIC MATTER 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRCN 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA	6Q2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						MEQ / 100 G													
000-025	.55	.050	11	.6		4.9	1.7	.3	.2	7.1	3.9		11.0	9.4	.89	2.9	52	65	76
025-043	.62	.054	11	.7		7.1	2.3	.3	.3	10.0	2.6		12.6	11.1	.70	3.1	64	79	90
043-061	.54	.052	10	.8		7.7	2.7	.3	.3	11.0	2.5		13.5	12.2	.66	2.9	63	81	90
061-092	.43			.9		10.0	3.8	.4	.3	14.5	2.4		16.9	15.6	.67	2.6	64	86	93
092-145	.20			.6		5.7	2.4	.3	.2	8.6	1.1		9.7	8.8	.73	2.4	65	89	98
092-145	.12			.6		7.6	3.5	.4	.3	11.8	.6		12.4	11.7	.87	2.2	65	95	101
145-203	.03			.5		2.6	1.3	.4	.1	4.4	.1		4.5	3.8	.90	2.0	68	98	116
145-203	.01			.6		1.6	.8	.4	.1	2.9	.0		2.9	2.4	1.00	2.0	67	100	121

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
									MEQ / LITER										
000-025																		20	3 D
025-043																			
043-061	3600	6.4	35.1					.51										35	15 D
061-092	3700	6.6	35.5					.25										37	17 D
092-145																			
092-145																			
145-203																			
145-203																			

CLAY MINERALOGY (7A2C).
000-025 MT2 KK2 MI2
043-061 MT2 KK2 MI2
061-092 MT2 KK2 MI2
092-145 MT3 KK2 MI2
RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MT = MONTMORILLONITE MI = MICA KK = KAOLINITE.

SAND MINERALOGY (7B1) PLACEMENT: MIXED.
043-061 FNES - RE70 QZ67 FE3 FD29 CB MS COS1 - RE66 QZ65 FE1 FD31 MS1 TM ZR PO CL HN GS GN BT EP.
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: BT = BIOTITE CL = CHLORITE FD = FELDSPARS GS = GLASS HN = HORNBLENDE MS = MUSCOVITE
PO = PLANT OPAL QZ = QUARTZ TM = TOURMALINE ZR = ZIRCON CB = CARBONATE AGGREGATES GN = GARNET
EP = EPIDOTE FE = IRON OXIDES RE = RESISTANT MINERALS

(A) POCKET OF MATERIAL IN C1 HORIZON - SEE DISCRIPTION.
(B) BANDS OF LIGHTER COLORED MATERIAL IN C2 HORIZON - SEE DISCRIPTION.
(C) ESTIMATE.
(D) BY SOIL MECHANICS LABORATORY, USDA-SCS, LINCOLN, NE.

Pedon classification: Udic Argiustoll, fine-loamy, mixed, thermic
Series classification: (Same)
Soil: Shellabarger sandy loam
Soil Nos.: S76KS-77-1 (NSSL No. 76P0098-76P0105)
Location: Harper County, KS; 2,000 feet south and 40 feet west of the northeast corner of Sec. 21, T31S, R8W.
Climate: Annual precipitation is about 27.6 inches. Annual temperature is about 58° F., and summer temperature is about 81° F. Average frost-free season is about 198 days.
Vegetation and land use: Wheat stubble. Cropland.
Parent material: Old alluvium.
Physiography: Gently sloping upland.
Topography: Slope gradient about 2 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderate.
Described by: C. S. Holzhey, M. J. Mausbach, R. L. Haberman.

(Colors are for dry soil unless otherwise stated.)

Ap 76P0098 0 to 25 cm. (0 to 10 inches). Brown (7.5YR 5/3) sandy loam, dark brown (7.5YR 3/3) moist; weak fine granular structure; slightly hard, friable; slightly acid; common fine roots; clear smooth boundary.

B1 76P0099 25 to 43 cm. (10 to 17 inches). Brown (7.5YR 4/3) light sandy clay loam, dark brown (7.5YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable; common fine roots; common worm casts; common fine pores; slightly acid; clear smooth boundary.

B21t 76P0100 43 to 61 cm. (17 to 24 inches). Reddish brown (5YR 4/4) sandy clay loam, dark grayish brown (5YR 3/4) moist; weak medium subangular blocky structure; hard, firm; few fine roots; common fine pores; slightly acid; gradual smooth boundary.

B22t 76P0101 61 to 92 cm. (24 to 36 inches). Yellowish red (5YR 5/5) sandy clay loam, yellowish red (5YR 4/5) moist; weak medium subangular blocky structure; hard, firm; few fine roots; common fine pores; few gravel 1½ cm. (½ inch) to 2½ cm. (1 inch) in size in a line of variable thickness in lower part of the horizon; slightly acid; gradual smooth boundary.

C1 76P0102 92 to 145 cm. (36 to 57 inches). Reddish yellow (5YR 6/6) coarse sandy loam, yellowish red (5YR 4/6) moist; massive; soft, friable; few fine roots; dark colored stains in old channels 5 cm. (2 inches) to 8 cm. (3 inches) in width in the upper part of the horizon; pocket (No. 76P0103--see remarks) comprising about one half of the lower 18 cm. (7 inches) of the horizon; slightly acid; gradual smooth boundary.

C2 145 to 203 cm. (57 to 80 inches). Stratified strong brown (7.5YR 5/5) sand (No. 76P0104) strong brown (7.5YR 4/5) moist; comprising about 75 percent of the horizon; and very pale brown (10YR 7/3) sand and coarse sand (No. 76P0105) yellowish brown (10YR 5/4) moist; concentrated in the upper 38 cm. (15 inches) of the horizon in bands about 2½ cm. (1 inch) wide; single grained; loose; slightly acid.

Remarks: No. 76P0103 (See C1 horizon)--Pocket of mixed brownish yellow (10YR 6/6) and pale brown (2.5Y 7/4) sandy clay loam, yellowish brown (10YR 5/6) and olive yellow (2.5Y 6/4) moist; massive; slightly hard, firm; slightly acid.

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Argiustoll; fine, montmorillonitic, mesic

SOIL Spearville silty clay loam SOIL Nos. S63Kans-29-1 LOCATION Ford County, Kansas

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18450-18462 August, 1967

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

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)		3A1a Non-Carbonate Clay	Coarse fragments 2A2: 3B1 ≥ 2	2 – 19	19 – 76
		Pct. of < 2 mm														Pct.	Pct. of < 76mm	
0-6	Ap	9.9	56.9	33.2	tr	0.1	0.2	1.4	8.2	35.3	21.6	44.6	1.7			-		
6-12	B21t	5.2	48.3	46.5	-	0.1	0.2	0.8	4.1	28.4	19.9	33.1	1.1			-		
12-18	B22t	4.5	52.8	42.7	tr	0.1	0.1	0.4	3.9	28.7	24.1	32.9	0.6			-		
18-30	B3ca	4.7a	61.2	34.1	tr	0.1	0.1	0.3	4.2	33.8	27.4	38.2	0.5			-		
30-45	C1ca	5.7a	65.1	29.2	tr	tr	0.1	0.4	5.2	36.2	28.9	41.7	0.5		29	-		
45-58	C2ca	6.9a	65.2	27.9	tr	tr	0.1	0.5	6.3	35.9	29.3	42.6	0.6		25	-		
58-72	C3ca	8.9a	62.9	28.2	-	tr	0.1	0.9	7.9	35.7	27.2	44.4	1.0		27	-		
72-87	A11b	18.2a	52.3	29.5	tr	0.1	0.2	3.5	14.4	29.9	22.4	47.4	3.8		30	-		
87-108	A12b	44.3a	29.9	25.8	tr	0.3	0.4	9.9	33.7	18.1	11.8	60.8	10.6		26	-		
108-120	C4ca	37.2a	35.5	27.3	tr	0.1	0.2	1.5	35.4	23.2	12.3	59.9	1.8		25	-		
120-142	B2b	22.7a	40.9	36.4	0.2	0.5	0.5	4.0	17.5	25.8	15.1	46.7	5.2		36	-		
142-162	C5ca	19.5a	42.2	38.3	0.2	0.6	0.4	3.3	15.0	21.5	20.7	39.3	4.5		24	tr		
162-184	C6ca	22.0a	41.1	36.9	0.3	0.7	0.5	3.7	16.8	21.2	19.9	41.1	5.2		27	tr		

Depth (In.)	6A1a Organic carbon b Pct.	6B1a Nitrogen Pct.	C/N	Carbonate as $CaCO_3$: 6E1b 6E2a < 2mm Pct.	Carbonate as $CaCO_3$: 3A1a <0.002 mm. Pct.	6C2a Ext. Iron as Fe Pct.	Bulk density: 4A1a Field-State g/cc	Bulk density: 4A1d 1/3-Bar g/cc	Bulk density: 4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	Water content: 4B1c 1/3-Bar Pct.	Water content: 4B2 15-Bar Pct	4C1 1/3- to 15-Bar in./in.		pH: 8C1b Sat. Paste	pH: 8C1a 1:1	pH: 8C1a 1:10
0-6	1.17	0.118	10			0.7	1.11c				24.4g		14.6				6.1	6.6
6-12	0.83	0.084	10	-(s)		0.8	1.38	1.29	1.78	0.12	27.0	32.2	20.5	0.15			6.9	7.1
12-18	0.54	0.066	8	tr(s)	-	0.7	1.49	1.37	1.76	0.087	21.8	29.6	19.9	0.13			7.8	8.2
18-30	0.35			3	tr	0.7	1.42d	1.31	1.54f	0.056	17.9	28.4	16.8	0.15			8.1	8.8
30-45	0.27			4	tr	0.7	1.24	1.17	1.28	0.032	13.2	31.5	15.6	0.19			7.9	8.6
45-58	0.24			7	3	0.6		1.2 e					16.0			7.5	7.9	8.4
58-72	0.28			3	1	0.8	1.31	1.20	1.34	0.036	13.7	31.6	16.2	0.18			7.9	8.6
72-87	0.23			2	tr	0.8							13.6				7.8	8.5
87-108	0.19			1	tr								10.9					
108-120	0.16			8	2								10.7					
120-142	0.50			2	tr								15.6					
142-162	0.16			28	14								12.9					
162-184	0.08			25	10								12.8					

Depth (In.)	Extractable bases 5B1a: 6N3a Ca	6O3a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	8E1 Resistivity ohms-cm.	8B1a Elec. Cond. mmhos/cm.	8B Water at Sat. Pct.	8D3 Ca/Mg	Base saturation: 5C3 Sum Cations Pct	5C1 NH_4OAc Pct.
	meq/100 g													
0-6	14.7h	1.61	0.1	1.9	18.3	5.5	23.8	22.6				9.2	77	81
6-12	23.4h	7.31	0.3	1.8	32.8	3.8	36.6	30.7				3.2	90	107
12-18	22.7	6.2	0.6	1.7	31.2	1.5	32.7	29.6				3.7		
18-30	20.8	5.9	1.2	1.6	29.5			25.7				3.5		
30-45	21.4	5.3	2.2	1.7	30.6			24.1				4.0		
45-58	22.6	4.2	2.7	1.7	31.2			22.4	500	4.90	51.0	5.4		
58-72	20.5	3.5	2.2	1.7	27.9			22.5				5.9		
72-87	18.5	2.7	1.6	1.4	24.2			20.1				6.9		
87-108														
108-120														
120-142														
142-162														
162-184														

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water		
0-6	0.68	0.02	0.44		
6-12	0.66	0.02	0.44		
12-18	0.69	0.02	0.47		
18-30	0.75	0.02	0.49		
30-45	0.83	0.02	0.53		
45-58	0.80	0.02	0.57		
58-72	0.80	0.03	0.57		
72-87	0.68	0.03	0.46		
87-108			0.42		
108-120			0.39		
120-142			0.43		
142-162			0.34		
162-184			0.35		

a. Carbonate nodules: > 50 percent (2-0.25 mm.); 5-25 percent (0.25-0.05 mm).
b. 8.5 kg/m² to 60 inches (Method 6A).
c. Core sample (Method 4A3a).
d. Range between duplicate clods is 0.11 g/cc.
e. Estimated.
f. Range between duplicate clods is 0.15 g/cc.
g. Core sample (Method 4B1d).
h. KCl-TEA extraction (Method 6N2a).
i. KCl-TEA extraction (Method 6O2a).

Mineralogy (Method 7A2). Clay of the B22t is dominated by a fairly well ordered montmorillonite. Small to moderate amounts of mica (or illite) and kaolinite are present. Family mineralogy is montmorillonitic.

USDA-SCS FAYETTEVILLE, AR 1964

Pedon classification: Typic Argiustoll, fine, montmorillonitic, mesic
Series classification: (Same)
Soil: Spearville silty clay loam
Soil Nos.: S63KS-29-1 (Sample Nos. 18450-18462)
Location: Ford County, KS; 880 feet south and 315 feet west of the northeast corner of Sec. 23, T25S, R26W.
Climate: Annual precipitation is about 20 inches. Annual temperature is about 55° F., and mean summer temperature is about 78° F. Average frost-free season is about 184 days.
Vegetation and land use: Summer fallow. Cropland.
Parent material: Loess.
Physiography: Nearly level summit of High Plains.
Topography: Tableland. Slope gradient less than 1/2 percent.
Drainage: Well drained and moderately well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Slow.
Described by: D. A. Dodge and C. W. McBee.

(Colors are for dry soil unless otherwise stated.)

Ap 18450 0 to 15 cm. (0 to 6 inches). Dark grayish brown (10YR 4.5/2) silty clay loam, very dark grayish brown (10YR 2.5/2) moist; moderate fine granular structure; hard, friable; clear smooth boundary.

B21t 18451 15 to 30 cm. (6 to 12 inches). Dark grayish brown (10YR 4.5/2) silty clay, very dark grayish brown (10YR 2.5/2) moist; weak fine blocky structure; very hard, very firm; shiny surfaces on ped faces; few visible pores; many fine roots; gradual smooth boundary.

B22t 18452 30 to 46 cm. (12 to 18 inches). Grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium to coarse blocky structure; very hard, very firm; peds have shiny surfaces on ped faces; gradual smooth boundary.

B3ca 18453 46 to 76 cm. (18 to 30 inches). Light brownish gray (10YR 6.5/2) silty clay loam, grayish brown (10YR 5/2) moist; moderate medium blocky structure changing to weak medium blocky in lower 4 inches; hard, firm; few discontinuous clay films; many fine roots; old root channel apparently open; many thin films, fine thread-like seams and small soft masses of segregated $CaCO_3$ making up about 2 to 5 percent of the volume; strong effervescence; diffuse smooth boundary.

C1ca 18454 76 to 114 cm. (30 to 45 inches). Light gray (10YR 7/2) light silty clay loam, light brownish gray (10YR 6/2) moist; massive to weak fine subangular blocky structure; hard, friable; many fine pores; many fine rootlets; many thin films and fine thread-like seams of $CaCO_3$; strong effervescence; diffuse smooth boundary.

C2ca 18455 114 to 147 cm. (45 to 58 inches). Very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable; many fine pores; many thin films and fine thread-like seams of $CaCO_3$; strong effervescence; diffuse smooth boundary.

C3ca 18456 147 to 183 cm. (58 to 72 inches). Pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; many very fine pores; many thin films and fine threads of $CaCO_3$; strong effervescence; gradual smooth boundary.

A11b 18457 183 to 221 cm. (72 to 87 inches). Brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable; many fine open pores; few (less than 1 percent) fine soft masses of $CaCO_3$; strong effervescence; augered sample.

A12b 18458 221 to 274 cm. (87 to 108 inches). Same as A11b, but subdivided for sampling. Augered sample.

C4ca 18459 274 to 305 cm. (108 to 120 inches). Pale brown (10YR 6/3) heavy silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; about 5 percent by volume of films, seams and fine soft masses of $CaCO_3$; strong effervescence; augered sample.

B2b 18460 305 to 361 cm. (120 to 142 inches). Grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak to moderate fine subangular blocky structure; hard, friable; some peds quite durable and difficult to wet; common thin films and fine threads of $CaCO_3$ but constituting less than 1 percent of mass (by volume); strong effervescence; augered sample.

C5ca 18461 361 to 412 cm. (142 to 162 inches). Very pale brown (10YR 8/3) light silty clay loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable; about 5 percent by volume of fine soft concretions of $CaCO_3$; violent effervescence; augered sample.

C6ca 18462 412 to 468 cm. (162 to 184 inches). Very pale brown (10YR 7/3) silty clay loam, brown (10YR 5/3) moist; massive; hard, friable; about 10 to 15 percent by volume of soft masses of $CaCO_3$; augered sample.

Remarks: Soil temperature at 12.5 foot depth was 13° C., at 14 feet 12° C., at 16 feet 13° C., at 17 feet 13.3° C., and at 18 feet 12.5° C.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Argiustoll; fine, montmorillonitic, mesic

SOIL Spearville silty clay loam SOIL Nos. S63Kans-29-2 LOCATION Ford County, Kansas

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18463-18470 August, 1967

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

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Sand: Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	Silt: 0.05–0.02	Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	Coarse fragments 2A2: 3B1 > 2 Pct	2–19 Pct. of < 76mm	19–76 Pct. of < 76mm
		Pct. of < 2 mm														
0-6	Ap	9.4	60.2	30.4	tr	0.1	0.2	1.0	8.1	39.0	21.2	47.8	1.3	-		
6-13	B21t	6.0	49.5	44.5	-	tr	0.1	0.5	5.4	27.8	21.7	33.4	0.6	-		
13-21	B22t	4.7	53.3	42.0	-	tr	0.1	0.3	4.3	29.2	24.1	33.7	0.4	-		
21-32	B3ca	5.1a	61.3	33.6	0.2	0.2	0.1	0.3	4.3	32.5	28.8	37.0	0.8	-		
32-44	C1ca	6.6a	67.4	26.0	tr	tr	0.1	0.4	6.1	38.5	28.9	44.9	0.5	-		
44-58	C2ca	7.5a	65.4	27.1	-	0.1	0.1	0.5	6.8	38.4	27.0	45.6	0.7	-		
58-72	C3ca	8.0a	61.1	30.9	-	0.1	0.1	0.8	7.0	35.3	25.8	42.9	1.0	-		
72-105	A1b	15.6	52.2	32.2	0.1	0.2	0.2	2.1	13.0	34.0	18.2	48.7	2.6	tr		

Depth (In.)	6A1a Organic carbon b Pct.	6B1a Nitrogen Pct	C/N	Carbonate as $CaCO_3$: 6E1b 6E2a < 2mm. Pct.	3A1a <0.002 mm. Pct.	Ext. Iron as Fe Pct.	Bulk density: 4A1a Field-State g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in_3/in_3	pH: 8C1b Sat. Paste	8C1a 1:1	8C1a 1:10
0-6	1.14	0.108	11				1.05c				23.4g		12.4			6.4	6.8
6-13	0.83			-(s)			1.39	1.30	1.69	0.092	25.3	31.6	20.5	0.14		6.8	7.2
13-21	0.55			tr(s)	-		1.50	1.36	1.72	0.082	19.8	30.3	19.2	0.15		7.6	8.4
21-32	0.28			3	tr		1.44d	1.28f	1.50e	0.056	13.6	30.8	15.6	0.19		8.2	8.8
32-44	0.19			1	-		1.28	1.18	1.30	0.032	11.9	32.8	13.2	0.23		7.7	8.2
44-58	0.27			1	-		1.14e	1.16	1.26	0.028	20.8	31.7	13.0	0.22	7.3	7.8	8.5
58-72	0.23			1	-								15.6			7.9	8.6
72-105	0.28			tr(s)	-								12.9			7.8	8.2

Depth (In.)	Extractable bases 5B1a: 6N3a Ca	6O3a Mg	6P2a Na	6Q2a K	Sum (meq/100 g)	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	8E1 Resistivity ohms-cm.	8B1a Elec. Cond. mmhos/cm.	8B Water at Sat. Pct.	8D3 Ca/Mg	Base saturation: 5C3 Sum Cations Pct	5C1 NH_4OAc Pct.
0-6	13.1h	4.1i	0.1	1.9	19.2	4.9	24.1	19.6				3.2	80	98
6-13	20.0	6.2	0.5	1.6	28.3	4.3	32.6	29.0				3.2	87	98
13-21	21.9	6.7	0.9	1.5	31.0			29.5				3.3		
21-32	19.8	6.3	1.5	1.5	29.1			25.7				3.1		
32-44	23.5	5.3	2.1	1.6	32.5			22.9				4.4		
44-58	19.6	4.4	2.2	1.6	27.8			24.5	700	2.94	52.3	4.5		
58-72	18.9	4.1	2.1	1.5	26.6			23.0				4.6		
72-105	17.3	2.9	1.5	1.1	22.8			20.8				6.0		

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-6	0.64		0.41
6-13	0.65		0.46
13-21	0.70		0.46
21-32	0.76		0.46
32-44	0.88		0.51
44-58	0.90		0.48
58-72	0.74		0.50
72-105	0.65		0.40

a. Carbonate: > 50 percent (2-0.25 mm.); 5-25 percent (0.25-0.05 mm.).
b. 8.1 kg/m^2 to 58 inches (Method 6A).
c. Core sample (Method 4A3a).
d. Range between duplicate clods is 0.12 g/cc.
e. Range between duplicate clods is 0.16 g/cc.
f. Range between duplicate clods is 0.11 g/cc.
g. Core sample (Method 4B1d).
h. KCl-TEA extraction (Method 6N2a).
i. KCl-TEA extraction (Method 602a).

Mineralogy (Method 7A2). Clay of the B22t is dominated by a somewhat poorly ordered montmorillonite. Small to moderate amounts of mica (or illite) and kaolinite, and a trace of vermiculite are present. Family mineralogy is montmorillonitic.

USDA-SCS-BELTSVILLE, MD 1968

Pedon classification: Typic Argiustoll, fine, montmorillonitic, mesic
Series classification: (Same)
Soil: Spearville silty clay loam
Soil Nos.: S63KS-29-2 (Sample Nos. 18463-18470)
Location: Ford County, KS; 680 feet south and 160 feet east of the northwest corner of Sec. 18, T25S, R25W.
Climate: Annual precipitation is about 20 inches. Annual temperature is about 55° F., and mean summer temperature is about 78° F. Average frost-free season is about 184 days.
Vegetation and land use: Summer fallow. Cropland.
Parent material: Loess.
Physiography: Nearly level summit of High Plains.
Topography: Tableland. Slope gradient less than 1/2 percent.
Drainage: Well drained and moderately well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Slow.
Described by: D. A. Dodge.

(Colors are for dry soil unless otherwise stated.)

Ap 18463 0 to 15 cm. (0 to 6 inches). Dark grayish brown (10YR 4.5/2) silty clay loam, very dark grayish brown (10YR 2.5/2) moist; moderate fine granular structure; hard, friable; clear smooth boundary.

B21t 18464 15 to 33 cm. (6 to 13 inches). Dark grayish brown (10YR 4.5/2) silty clay, very dark grayish brown (10YR 3/2) moist; weak fine blocky structure; very hard, very firm; shiny surfaces on ped faces; few visible pores; many roots; gradual smooth boundary.

B22t 18465 33 to 53 cm. (13 to 21 inches). Grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3.5/2) moist; moderate medium to coarse blocky structure; very hard, very firm; shiny surfaces on faces of peds; gradual smooth boundary.

B3ca 18466 53 to 81 cm. (21 to 32 inches). Light brownish gray (10YR 6.5/2.5) silty clay loam, grayish brown (10YR 5/2.5) moist; moderate medium blocky structure; hard, firm; few discontinuous clay films on faces of peds and in old root channels; many thin films, fine thread-like seams and many fine concretions of segregated $CaCO_3$ making up about 2 to 5 percent of the volume; many fine roots; old root channels open; strong effervescence; diffuse smooth boundary.

C1ca 18467 81 to 112 cm. (32 to 44 inches). Light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2.5) moist; massive to weak fine subangular blocky structure; hard, friable; many fine pores; many fine rootlets; many thin films and fine thread-like seams of $CaCO_3$; strong effervescence; diffuse smooth boundary.

C2ca 18468 112 to 147 cm. (44 to 58 inches). Very pale brown (10YR 7/2.5) silt loam, brown (10YR 5/2.5) moist; massive; slightly hard, friable; many fine pores; many thin films and fine thread-like seams of $CaCO_3$; strong effervescence; diffuse smooth boundary.

C3ca 18469 147 to 183 cm. (58 to 72 inches). Very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; many fine pores; many thin films and fine seams of $CaCO_3$; strong effervescence; gradual smooth boundary.

A1b 18470 183 to 267 cm. (72 to 105 inches). Brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable; many fine pores; augered sample; strong effervescence.

SOIL CLASSIFICATION-TYPIC HAPLUSTOLL
CLAYEY, MONTMORILLONITIC, MESIC, SHALLOW
SERIES - - - - - - - TIMKEN SILTY CLAY TAXADJUNCT

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S68KANS-26-5 COUNTY - - - ELLIS

GENERAL METHODS- - - 1A, 1B1B, 2A1, 2B SAMPLE NOS.- 68L406-68L407

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B																RATIO
					FINE	SAND						SILT			FAML	INTR	FINE	NON-	8D1
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	II	CLAY	CO3-	15-
		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.002	SAND	.2-	TO	CLAY	BAR
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-.1	.02	CLAY		TO
CM		PCT LT 2MM														PCT	PCT	CLAY
001-13	A12	1.7	31.4	66.9	33.2	0.2	0.4	0.2	0.5	0.4	4.9	26.5		1.3	5.6	50	67	0.30
013-23	AC	1.6	30.0	68.4	20.7	0.1	0.3	0.2	0.5	0.4	3.4	26.6		1.1	4.2	30	68	0.29

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2							BULK DENSITY			WATER CONTENT					CARBONATE		PH	
	VOL.	WEIGHT																	
	GT	GT	75-20	20-5	5-2	LT	20-2	4A1D	4A1H	4D1	4B1C	4B1C	4B2	4C1	4B2	6E1B	3A1A	8C1A	8C1E
	2	75				.074	PCT	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD	100-	LT	LT	1/1	1/2
								BAR	DRY		BAR	BAR	BAR	CM/	BAR	2	.002	H2O	CACL
CM	PCT	PCT	PCT LT 75				LT20	G/CC	G/CC		PCT	PCT	PCT	CM	PCT	PCT	PCT		
001-13	0	0	0	0	0	99	0	1.31	1.64	0.078		25.2	19.9	0.07	13.9			5.8	
013-23	0	0	0	0	0	99	0	1.28	1.60	0.077		29.3	19.7	0.12	13.8			4.4	

DEPTH	ORGANIC MATTER			IRON	PHOS	EXTRACTABLE BASES 5B4A					ACTY	AL	CAT EXCH		RATIO	RATIO	CA	BASE SAT	
	6A1A	6B1A	C/N	6C2A	6S1A	6N2E	6O2D	6P2A	6Q2A		6H1A	6G1D	5A3A	5A6A	8D1	8D3	5F	5C3	5C1
	ORGN	NITG		EXT	TOTL	CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	CA	SAT	EXTB	NHAC
	CARB			FE						EXTB	TEA	EXT	ACTY		TO	TO	NHAC	ACTY	
CM	PCT	PCT		PCT	PCT	MEQ / 100 G									CLAY	MG	PCT	PCT	PCT
001-13	0.99			1.6		25.3	2.8	0.1	1.3	29.5	9.0	0.1	38.5	34.4	0.51	9.0	74	77	66
013-23	0.87			1.7		19.2	2.3	0.1	1.1	22.7	17.4	4.3	40.1	34.3	0.50	8.3	56	57	66

DEPTH	SATURATED PASTE			NA	NA	SALT	GYP	SATURATION EXTRACT 8A1										ATTERBERG	
	8E1	8C1B	8A	5D2	5E	8D5	6F1A	8A1A	6N1B	6O1B	6P1A	6Q1A	6I1A	6J1A	6K1A	6L1A	6M1A	4F1	4F2
	REST	PH	H2O	ESP	SAR	TOTL		EC	CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3	LQID	PLST
	OHM-					SOLU		MMHOS/										LMIT	INDX
CM	CM		PCT	PCT		PPM	PCT	CM	MEQ / LITER									PCT	
001-13																		67	34
013-23																			

Pedon classification: Typic Haplustoll; clayey, montmorillonitic, mesic, shallow
Series classification: Typic Ustorthent; clayey, montmorillonitic, nonacid, mesic
Soil: Timken silty clay taxadjunct *
Soil Nos.: S68KS-26-5 (Sample Nos. 406-407)
Location: Ellis County, KS; 2,500 feet west and 650 feet south of the northeast corner of Sec. 22, T11S, R17W.
Climate: Annual precipitation is about 23 inches. Annual temperature is about 54° F., and mean summer temperature is about 78° F. Average frost-free season is about 171 days.
Vegetation and land use: Tall and mid grasses. Rangeland.
Parent material: Acid fissle shale.
Physiography: Rolling erosional upland.
Topography: Slightly convex slope near crest of ridge. Slope gradient about 3 percent.
Drainage: Moderately well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Very slow.
Described by: L. D. Zavesky, R. F. Harner.

(Colors are for dry soil unless otherwise stated.)

A11 0 to 1 cm. (0 to ½ inch). Gray (2.5Y 5/1) silty clay, very dark gray (2.5Y 3/1) moist; moderate fine granular structure; hard, firm; many fine roots; abrupt smooth boundary.

A12 406 1 to 13 cm. (½ to 5 inches). Gray (2.5Y 5/1) clay, very dark gray (2.5Y 3/1) moist; moderate fine subangular blocky structure; very hard, very firm; many fine and medium roots; few open pores; gradual smooth boundary.

AC 407 13 to 23 cm. (5 to 9 inches). Gray (2.5Y 5/1) clay, very dark gray (2.5Y 3/1) moist; weak medium blocky structure; very hard, very firm; many fine roots; gradual smooth boundary.

C 23 to 41 cm. (9 to 16 inches). Very dark gray (N3/0) moist clay; moderate medium platy structure; very hard, firm; many medium and fine roots following bedding planes; horizontal streaks of strong brown (7.5YR 5/6) moist; gradual smooth boundary.

Cr 41 cm. (16 inches). Coarse platy clay shale of Blue Hill member of Carlile formation.

* This pedon is a taxadjunct to the Timken series because the surface layer is harder and firmer than is typical for the series.

SOIL CLASSIFICATION: Typic Ustipsamment; mixed, thermic

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Tivoli fine sand SOIL Nos. S63Kans-29-4 LOCATION Ford County, Kansas

SOIL SURVEY LABORATORY Lincoln, Nebraska. LAB. Nos. 18476-18480 August, 1967

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

Depth (In)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)			Coarse fragments 2A2: 3B1 > 2	2 – 19	19 – 76
		Pct. of < 2 mm														Pct.	Pct. of < 76mm	
0-5	A1	94.0	3.1	2.9	0.2	8.4	28.1	52.2	5.1	1.5	1.6	31.0	88.9			tr		
5-10	AC	96.8	0.5	2.7	0.2	7.6	23.9	58.3	6.8	0.2	0.3	36.5	90.0			tr		
10-24	C1	97.0	0.2	2.8	0.1	3.8	22.1	64.7	6.3	-	0.2	37.3	90.7			tr		
24-42	C2	96.9	1.2	1.9	tr	1.6	18.1	71.1	6.1	0.3	0.9	41.7	90.8			tr		
42-60	C3	97.2	1.1	1.7	0.9	11.5	24.2	54.4	6.2	0.5	0.6	33.6	91.0			tr		

Depth (In.)	6A1a Organic carbon	6B1a Nitrogen	C/N		Carbonate as $CaCO_3$	Ext. Iron as Fe	Bulk density				Water content		4B2 15-Bar			pH 8C1a	
	Pct.	Pct.			Pct.	Pct.	g/cc	g/cc	g/cc		Pct	Pct.	Pct.			1:1	
0-5	0.26	0.026	10										1.6			6.5	
5-10	0.11												1.1			6.4	
10-24	0.06												1.3			6.4	
24-42	0.03												1.2			6.3	
42-60	0.02												1.1			6.2	

Depth (In)	Extractable bases 5B1a: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Cat. Exch. Cap. Ext. Acidity	5A3a Sum Cations	5A1a NH_4OAc			Ca/Mg		Base saturation a: 5C3 Sum Cations	5C1 NH_4OAc
	meq/100 g												Pct.	Pct
0-5	1.7	0.6	tr	0.2	2.5	1.3	3.8	2.6					66	96
5-10	1.5	0.6	-	0.2	2.3	1.0	3.3	2.3					70	100
10-24	1.5	0.6	-	0.1	2.2	1.2	3.4	2.2					65	100
24-42	1.3	0.5	tr	0.1	1.9	1.3	3.2	2.1					59	90
42-60	1.2	0.5	tr	0.1	1.8	0.6	2.4	1.8					75	100

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC		15-Bar Water	
0-5	0.90		0.55	
5-10	0.85		0.41	
10-24	0.79		0.46	
24-42	1.11		0.63	
42-60	1.06		0.65	

a. Cation exchange capacity is low. As cation exchange capacity depreases, 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.

BDDA SCS HYATTSVILLE MD 1964

Pedon classification: Ustipsamment, mixed, thermic
Series classification: (Same)
Soil: Tivoli fine sand
Soil Nos.: S63KS-29-4 (Sample Nos. 18476-18480)
Location: Ford County, KS; 440 yards north and 440 yards west of the southeast corner of Sec. 26, T27S, R21W.
Climate: Annual precipitation is about 20 inches. Annual temperature is about 55° F., and mean summer temperature is about 78° F. Average frost-free season is about 184 days.
Vegetation and land use: Sand bluestem, little bluestem, blue grama, sand paspalum, native legumes, sand plum. Rangeland.
Parent material: Sandy aeolian sediments.
Physiography: Rolling upland sandhills.
Topography: Convex slope. Slope gradient of about 6 percent.
Drainage: Excessively drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Rapid.
Described by: D. A. Dodge.

(Colors are for dry soil unless otherwise stated.)

A1 18476 0 to 13 cm. (0 to 5 inches). Grayish brown (10YR 4.5/2) fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose, dry or moist; mass held together by grass roots; gradual smooth boundary.

AC 18477 13 to 26 cm. (5 to 10 inches). Brown (10YR 5.5/3) fine sand, brown (10YR 4/3) moist; single grained; loose, dry or moist; many roots; diffuse smooth boundary.

C1 18478 26 to 61 cm. (10 to 24 inches). Light yellowish brown (10YR 6.5/3.5) fine sand, yellowish brown (10YR 5/3.5) moist; single grained; loose, dry or moist; many fine roots that become less abundant with increasing depth.

C2 18479 61 to 107 cm. (24 to 42 inches). Same as C1 except contains a few thin lenses of medium sand ranging in thickness from 1/4 to 1 inch and a few very thin lenses or bands of fine sand with slightly darker color but no apparent increase of fines.

C3 18480 107 to 153 cm. (42 to 60 inches). Same as C2 but subdivided for sampling purposes.

SOIL CLASSIFICATION: Typic Ustipsamment; mixed, thermic

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Tivoli sand taxadjunct SOIL Nos. S63Kans-29-3 LOCATION Ford County, Kansas

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18471-18475 August, 1967

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

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Sand: Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	Silt: 0.05–0.02	Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)			Coarse fragments 2A2: 3B1 > 2 Pct.	2 – 19 Pct. of < 76mm	19 – 76 Pct. of < 76mm
		Pct. of < 2 mm																
0-5	A1	91.5	5.9	2.6	0.9	14.2	32.5	40.1	3.8	4.0	1.9	24.5	87.7			tr		
5-10	AC	96.0	1.6	2.4	1.1	13.5	35.7	42.8	2.9	0.4	1.2	20.3	93.1			tr		
10-24	C1	96.8	0.8	2.4	0.6	12.2	33.3	46.9	3.8	0.1	0.7	23.5	93.0			tr		
24-42	C2	97.3	0.6	2.1	2.6	21.3	34.0	36.4	3.0	-	0.6	17.4	94.3			tr		
42-60	C3	97.0	0.7	2.3	0.8	16.7	35.2	41.1	3.2	0.1	0.6	20.0	93.8			tr		

Depth (In.)	6A1a Organic carbon [a] Pct.	6B1a Nitrogen Pct.	C/N		Carbonate as $CaCO_3$ Pct.	6C2a Ext. Iron as Fe Pct.	Bulk density: 4A3a Field-State g/cc			Water content: 4B1d Field-State Pct.		4B2 15-Bar Pct.			pH: 8C1b Sat. Paste	8C1a 1:1	
0-5	0.30	0.030	10			0.3	1.44b			2.2		1.9				6.6	
5-10	0.11					0.2	1.53b			1.5		1.6				6.3	
10-24	0.07					0.2	1.54b			2.5		1.1				6.3	
24-42	0.04					0.3	1.58b			2.8		1.1			6.4	6.2	
42-60	0.03					0.3	1.6 c					1.0				6.4	

Depth (In.)	Extractable bases 5B1a: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Cat.Exch.Cap. Ext. Acidity	5A3a Sum Cations	5A1a NH_4OAc	8E1 Resistivity ohms-cm.	8B1a Elec Cond mmhos/cm.	8B Water at Sat. Pct.	8D3 Ca/Mg	Base saturation d: 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g													
0-5	1.9	1.2	tr	0.3	3.4	1.8	5.2	2.9				1.6	65	117
5-10	1.7	0.6	tr	0.1	2.4	1.0	3.4	2.4	22,000				71	100
10-24	1.4	0.4	tr	0.1	1.9	1.0	2.9	2.1					66	90
24-42	1.3	0.5	tr	0.1	1.9	0.9	2.8	2.0	18,200	0.23	22.5		68	95
42-60	1.2	0.5	tr	0.1	1.8	0.9	2.7	1.8					67	100

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	15-Bar Water
0-5	1.12	0.73
5-10	1.00	0.67
10-24	0.88	0.45
24-42	0.95	0.52
42-60	0.78	0.43

a. 1.7 kg/m² to 60 inches (Method 6A).
b. Core samples.
c. Estimated.
d. Cation exchange capacity is low. 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.

USDA-SCS HYATTSVILLE, MD. 1964

Pedon classification: Typic Ustipsamment, mixed, thermic
Series classification: (Same)
Soil: Tivoli sand taxadjunct*
Soil Nos.: S63KS-29-3 (Sample Nos. 18471-18475)
Location: Ford County, KS; 1,100 yards north and 87 yards east of the southwest corner of Sec. 2, T28S, R21W.
Climate: Annual precipitation is about 20 inches. Annual temperature is about 55° F., and mean summer temperature is about 78° F. Average frost-free season is about 184 days.
Vegetation and land use: Sand bluestem, sand paspalum, native legumes, sand plum. Rangeland.
Parent material: Sandy aeolian sediments.
Physiography: Rolling upland sandhills.
Topography: Convex slope. Slope gradient of about 10 percent.
Drainage: Excessively drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Rapid.
Described by: D. A. Dodge.

(Colors are for dry soil unless otherwise stated.)

A1 18471 0 to 13 cm. (0 to 5 inches). Grayish brown (10YR 5/2) sand, dark grayish brown (10YR 4/2) moist; single grained; loose dry or moist; mass somewhat held together by grass roots; diffuse smooth boundary.

AC 18472 13 to 26 cm. (5 to 10 inches). Brown (10YR 5/3) fine sand, brown (10YR 4/3) moist; single grained; loose dry or moist; many roots; diffuse smooth boundary.

C1 18473 26 to 61 cm. (10 to 24 inches). Light yellowish brown (10YR 6/4) fine sand, yellowish brown (10YR 5/3.5) moist; single grained; loose dry or moist; many fine roots but becoming less abundant with increasing depth; few thin lenses of medium sand ranging in thickness from 1/4 to 1 inch; few very thin (less than 1/4 inch) discontinuous lenses or bands of fine sand with slightly darker color but no apparent increase of fines.

C2 18474 61 to 107 cm. (24 to 42 inches). Same as C1 but subdivided for sampling purposes.

C3 18475 107 to 153 cm. (42 to 60 inches). Same as C1 and C2 but subdivided for sampling.

Remarks: Bucket auger examination to a depth of 220 inches revealed the material to be fine sand, moist, and noncalcareous throughout. Soil temperature at 12 feet was 15.5° C., at 16 feet 14° C., and at 20 feet 13.8° C.

*The upper 10 inches is sand, which is outside the range of the Tivoli series.

SOIL CLASSIFICATION-VERTIC HAPLAQUOLL
FINE, MONTMORILLONITIC, MESIC
SERIES - - - - - - -WABASH SILTY CLAY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE MRTSC
SOIL SURVEY INVESTIGATIONS UNIT
LINCOLN, NEBRASKA

SOIL NO - - - - - - S71KS-23-4 COUNTY - - - DOUGLAS

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 71L1300-71L1302

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B																RATIO
		FINE				SAND						SILT			FAML	INTR	FINE	NON-	8D1
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	II	CLAY	CO3-	15-
		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005-	SAND	.2-	TO	CLAY	BAR
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-.1	.02	CLAY		TO
CM		PCT LT 2MM															PCT	CLAY
026-41	A12	2.3	48.4	49.3	28.6	TR	.2	.4	.8	.9	5.6	42.8		1.4	7.0	58		.43
041-71	B1G	1.7	40.7	57.6	35.2	.1	.1	.2	.5	.8	3.5	37.2		.9	4.6	61		.40
131-175	CG	2.2	41.6	56.2	33.9	TR	.3	.4	.7	.8	6.2	35.4		1.4	7.4	60		.44

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)							BULK DENSITY			WATER CONTENT				CARBONATE		PH	
	VOL.	WEIGHT						4A1D	4A1H	4D1	4B1C	4B1C	4B2	4C1	6E1B	3A1A	8C1A	8C1E
	GT 2	GT 75	75-20	20-5	5-2	LT .074	20-2	1/3- BAR	OVEN DRY	COLE	1/10 BAR	1/3- BAR	15- BAR	WRD CM/	LT 2	LT .002	1/1 H2O	1/2 CACL
CM	PCT	PCT	PCT LT 75				LT20	G/CC	G/CC		PCT	PCT	PCT	CM	PCT	PCT		
026-41	0	0	0	0	0	98	0	1.32	1.73	.094	33.3	31.6	21.3	.14	4.3A		5.8	5.3
041-71	0	0	0	0	0	99	0	1.32	1.83	.115	35.3	34.3	23.2	.15	3.1A		6.0	5.6
131-175	0	0	0	0	0	98	0	1.35	1.85	.111	34.8	33.2	24.5	.12	2.6A		7.0	6.5

DEPTH	(ORGANIC MATTER)			IRON	PHOS	(EXTRACTABLE BASES 5B4A)					ACTY	AL	(CAT EXCH)		RATIO	RATIO	CA	(BASE SAT)	
	6A1A ORGN CARB	6B1A NITG	C/N	6C2A EXT FE	6S1A TOTL	6N2E CA	6O2D MG	6P2A NA	6Q2A K	SUM EXTB	6H1A BACL TEA	6G1D KCL EXT	5A3A EXTB ACTY	5A6A NHAC	8D1 NHAC TO	8D3 CA TO	5F SAT NHAC	5C3 EXTB ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	MEQ / 100 G									CLAY	MG	PCT	PCT	PCT
026-41	1.54																		
041-71	1.27																		
131-175	.96																		

DEPTH	(SATURATED PASTE)			NA	NA	SALT	GYP	SATURATION EXTRACT 8A1									ATTERBERG	
	8E1 REST OHM-	8C1B PH	8A H2O	5D2 ESP	5E SAR	8D5 TOTL SOLU	6F1A	8A1A EC	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/ CM	MEQ / LITER									PCT	
026-41																			
041-71																			
131-175																			

(A) MICRO-PENETRATION RESISTANCE - A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10-BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.

Pedon classification: Vertic Haplaquoll, fine, montmorillonitic, mesic
Series classification: (Same)
Soil: Wabash silty clay
Soil Nos.: S71KS-23-4 (Sample Nos. 1300-1302)
Location: Douglas County, KS; 1,175 feet west and 2,020 feet north of the southeast corner of Sec. 18, T13S, R20E.
Climate: Annual precipitation is about 37 inches. Annual temperature is about 56° F., and mean summer temperature is about 78° F. Average frost-free season is about 185 days.
Vegetation and land use: Water tolerant grasses and other annual weeds. Cropland.
Parent material: Clayey alluvium.
Physiography: Nearly level flood plain.
Topography: High flood plain. Slope gradient less than 1 percent.
Drainage: Very poorly drained.
Ground water: Greater than 6 feet.
Erosion: Slight.
Permeability: Very slow.
Described by: J. L. Zimmerman, R. O. Plinsky.

(Colors are for moist soil unless otherwise stated.)

Ap 0 to 12 cm. (0 to 5 inches). Black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; weak fine granular structure; hard, firm; common roots; slightly acid; clear smooth boundary.

A11 12 to 26 cm. (5 to 10 inches). Black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; strong fine and medium blocky structure; extremely hard, very firm; numerous roots; slightly acid; clear smooth boundary.

A12 1300 26 to 41 cm. (10 to 16 inches). Black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; weak medium and coarse prismatic parting to moderate fine and medium subangular blocky structure; extremely hard, very firm; numerous roots; few fine black concretions; slightly acid; gradual smooth boundary.

B1g 1301 41 to 71 cm. (16 to 28 inches). Black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; few fine faint mottles of very dark grayish brown (10YR 3/2); weak coarse prismatic structure parting to moderate medium subangular blocky structure; extremely hard, very firm; few fine roots; few fine black concretions; neutral; gradual smooth boundary.

B2g 71 to 131 cm. (28 to 52 inches). Black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; few fine faint mottles of very dark grayish brown (10YR 3/2); weak coarse prismatic structure parting to weak medium subangular blocky structure; extremely hard, very firm; few fine roots; few fine black concretions; neutral; diffuse wavy boundary.

Cg 1302 131 to 175 cm. (52 to 70 inches). Very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; common fine faint mottles of dark yellowish brown (10YR 3/4); massive; very hard, very firm; few fine black concretions; slightly acid.

Remarks: Horizons between 26 to 41 cm. (10 to 16 inches), 41 to 71 cm. (16 to 28 inches), and 131 to 175 cm. (52 to 70 inches) were sampled for engineering testing.

SOIL CLASSIFICATION: Vertic Haplaquoll; fine, montmorillonitic, mesic

SOIL Wabash silty clay taxadjunct LOCATION Pottawatomie County, Kansas

SOIL NOS. S53Kans-75-2 LAB. NOS. 1994-2000

SOIL SURVEY LABORATORY Mandan, North Dakota

GENERAL METHODS 1A, 1B1a, 2A1, 2B

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	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	0.02-0.002	0.2-0.02	2A1 > 2	
1994	0-6	Ap	0.1	0.2	0.1	0.2	1.9	51.7	45.8	31.8	21.9	-	sic
1995	6-11	A12	0.1	0.1	0.1	0.2	1.8	46.5	51.2	29.1	19.3	-	sic
1996	11-19	B21g	-	0.1	0.1	0.2	1.0	42.5	56.1	27.3	16.3	-	sic
1997	19-27	B22g	-	0.1	0.1	0.2	0.7	42.5	56.4	28.9	14.4	-	sic
1998	27-42	B31g	1.5	0.6	0.2	0.2	0.7	39.0	57.8	27.7	12.1	-	c
1999	42-55	B32g	1.1	0.4	0.2	0.3	0.7	41.0	56.3	29.7	12.2	-	sic
2000	55-63	B33g	0.3	0.2	0.1	0.2	0.8	41.4	57.0	30.4	11.9	-	sic

LABORATORY NUMBER	pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 3 MILLIMHOS PER CM @ 25°C	6E1a CaCO3 equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS		
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					1/10 ATMOS.	(per cent) 1/3 ATMOS.	4B2 15 ATMOS.
1994	6.5	6.6	6.6	1.66	0.137	12			-				17.2
1995	6.5	6.7	7.1	1.17	0.102	12			-				22.0
1996	6.7	7.0	6.9	0.75	0.068	11			-				23.5
1997	7.0	7.5	7.4	0.56	0.049	11			-				23.1
1998	7.4	7.9	8.1	0.39	0.043	9			2				22.9
1999	7.6	8.0	8.4	0.36	0.036	10			2				23.9
2000	7.5	8.2	8.3	0.38	0.035	11			1				23.1

LABORATORY NUMBER	5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS 5B1a					5D2 Base Sat. % on NH_4OAc	SATURATION EXTRACT SOLUBLE					PER CENT MOISTURE AT SATURATION
		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum		K	CO_3	HCO_3	Cl	SO_4	
	milliequivalents per 100g soil							milliequivalents per liter					
1994	33.3	27.2	6.0	-	1.3	34.5	104						
1995	38.1	29.6	7.3	0.4	1.2	38.5	101						
1996	39.2	31.1	8.1	0.5	1.1	40.8	104						
1997	38.6	34.9	7.7	0.7	1.1	44.4	115						
1998	39.8		9.4	1.3	1.1								
1999	38.3		9.7	2.1	1.0								
2000	40.0		9.2	2.5	1.0								

AGR-SCS BELTSVILLE, MD 2602 JUNE 1983

Pedon classification: Vertic Haplaquoll, fine, montmorillonitic, mesic
Series classification: (Same)
Soil: Wabash silty clay taxadjunct*
Soil Nos.: S53KS-75-2 (Sample Nos. 1994-2000)
Location: Pottawatomie County, KS; 1,320 feet west and 80 feet south of the northeast corner of Sec. 29, T9S, R11E.
Climate: Annual precipitation is about 32 inches. Annual temperature is about 55° F., and summer temperature is about 79° F. Average frost-free season is about 183 days.
Vegetation and land use: Seeded to winter wheat. Cropland.
Parent material: Clayey calcareous alluvium.
Physiography: Nearly level terrace.
Topography: Slope less than 1 percent.
Drainage: Very poorly drained.
Ground water: Greater than 6 feet.
Erosion: Slight.
Permeability: Very slow.
Described by: W. M. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap 1994 0 to 15 cm. (0 to 6 inches). Black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; weak very fine, fine, and medium granular structure; hard, friable; pH 6.5; abrupt smooth boundary.

A12 1995 15 to 28 cm. (6 to 11 inches). Black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; moderate coarse and medium prismatic structure parting to moderate medium and fine blocky structure; firm, plastic; pH 6.5; clear wavy boundary.

B21g 1996 28 to 58 cm. (11 to 19 inches). Very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; moderate coarse and medium prismatic structure parting to moderate coarse and medium blocky structure; firm, plastic; pH 7.5; gradual wavy boundary.

B22g 1997 58 to 69 cm. (19 to 27 inches). Very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; moderate coarse prismatic structure parting to moderate coarse and medium blocky structure; firm, plastic; common slickensides; pH 8.0; clear wavy boundary.

B31g 1998 69 to 107 cm. (27 to 42 inches). Dark grayish brown (10YR 4/2) clay, gray (10YR 5/1) dry; weak coarse and medium prismatic structure parting to weak coarse and medium blocky structure; firm, plastic; common slickensides; common fine black concretions; many $CaCO_3$ concretions; pH 8.0; diffuse wavy boundary.

B32g 1999 107 to 140 cm. (42 to 55 inches). Dark grayish brown (10YR 4/2) clay, dark gray (10YR 4/1) dry; weak coarse and medium prismatic structure parting to weak coarse and medium blocky structure; firm, plastic; many slickensides; common fine black concretions; many $CaCO_3$ concretions; pH 8.0; gradual wavy boundary.

B33g 2000 140 to 160 cm. (55 to 63 inches). Very dark grayish brown (10YR 3/2) clay, dark gray (10YR 4/1) dry; weak coarse prismatic structure parting to weak coarse and medium blocky structure; firm, plastic; many slickensides; common fine black concretions; few $CaCO_3$ concretions; pH 8.0.

*Pedon is more alkaline below 19 inches than recognized in the series range.

SOIL CLASSIFICATION: Vertic Haplaquoll; very-fine, montmorillonitic, mesic

SOIL Wabash silty clay taxadjunct LOCATION Pottawatomie County, Kansas

SOIL NOS. S53Kans-75-1 LAB. NOS. 1987-1993

SOIL SURVEY LABORATORY Mandan, North Dakota

GENERAL METHODS 1A, 1B1a, 2A1, 2B

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1								3A1	2A1	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	0.02-0.002	0.2-0.02	> 2	
1987	0-6	Ap	0.2	0.2	0.1	0.3	3.3	47.7	48.2	30.8	20.4	-	sic
1988	6-16	A12	-	0.1	0.1	0.3	1.1	35.8	62.6	26.1	11.0	-	c
1989	16-26	A13	-	0.1	0.1	0.3	1.1	39.1	59.3	28.7	11.7	-	c
1990	26-35	B2g	-	0.1	0.1	0.2	0.8	38.3	60.5	30.2	9.0	-	c
1991	35-42	B3g	-	0.2	0.1	0.2	0.7	37.4	61.4	29.7	8.5	-	c
1992	42-53	C1	1.0	0.2	0.1	0.2	0.6	41.3	56.6	34.8	7.2	-	sic
1993	53-63	C2	0.4	0.2	0.1	0.2	0.6	40.9	57.6	34.6	7.0	-	sic

	pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUC-TIVITY EC x 10 3 MILLIMHOS PER CM @ 25°C	6E1a CaCO3 equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS		
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					1/10 ATMOS. (per cent)	1/3 ATMOS.	4B2 15 ATMOS.
1987	6.6	7.0	7.3	1.79	0.133	13			-				19.0
1988	5.9	6.3	6.3	1.11	0.085	13			-				25.9
1989	6.3	6.8	6.6	0.80	0.063	13			-				24.6
1990	6.5	6.9	6.9	0.61	0.049	12			-				24.5
1991	6.8	7.2	7.1	0.48	0.042	11			-				24.5
1992	7.3	7.9	8.2	0.25	0.030	8			-				22.8
1993	7.5	8.0	8.1	0.20	0.027				2				23.1

	5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS 5B1a					5D2 Base Sat. % on NH_4OAc	SATURATION EXTRACT SOLUBLE					PER CENT MOISTURE AT SATURATION	Ca/Mg
		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum		K	CO_3	HCO_3	Cl	SO_4		
	milliequivalents per 100g soil							milliequivalents per liter						
1987	34.9	27.6	6.5	-	1.4	35.5	102							
1988	42.8	31.1	10.0	0.1	1.2	42.4	99							
1989	41.8	30.3	9.9	0.2	1.2	41.6	100							
1990	44.3	31.1	10.1	0.4	1.2	42.8	97							
1991	42.0	32.1	10.6	0.4	1.1	44.2	105							
1992	38.8	33.7	9.7	0.6	0.9	44.9	116							
1993	37.8		9.6	0.6	0.9									

AGR-SCS-BELTSVILLE, MD 2662 JUNE 1953

Pedon classification: Vertic Haplaquoll, very-fine, montmorillonitic, mesic
Series classification: Vertic Haplaquoll, fine, montmorillonitic, mesic
Soil: Wabash silty clay taxadjunct*
Soil Nos.: S53KS-75-1 (Sample Nos. 1987-1993)
Location: Pottawatomie County, KS; 2,110 feet north and 40 feet west of the southeast corner of Sec. 34, T9S, R10E.
Climate: Annual precipitation is about 32 inches. Annual temperature is about 55° F., and summer temperature is about 79° F. Average frost-free season is about 183 days.
Vegetation and land use: Seeded to winter wheat. Cropland.
Parent material: Clayey calcareous alluvium.
Physiography: Nearly level terrace.
Topography: Slope less than 1 percent.
Drainage: Very poorly drained.
Ground water: Greater than 6 feet.
Erosion: Slight.
Permeability: Very slow.
Described by: W. M. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap 1987 0 to 15 cm. (0 to 6 inches). Black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; weak coarse medium and fine granular structure; hard, friable; pH 7.5; abrupt smooth boundary.

A12 1988 15 to 41 cm. (6 to 16 inches). Black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; moderate coarse and medium prismatic structure parting to moderate medium and fine blocky structure; firm, plastic; prominent films on faces of peds; few small slickensides; few fine black concretions; pH 7.5; diffuse wavy boundary.

A13 1989 41 to 66 cm. (16 to 26 inches). Black (10YR 2/1) clay, dark gray (10YR 4/1) dry; moderate coarse and medium prismatic structure parting to moderate coarse and medium blocky structure; firm, plastic; prominent films on faces of peds; common slickensides; common fine black concretions; pH 7.5; gradual irregular boundary.

B2g 1990 66 to 89 cm. (26 to 35 inches). Very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; black (10YR 2/1) vertical streaks; moderate coarse prismatic structure parting to moderate coarse and medium blocky structure; firm, plastic; prominent films on faces of peds; common slickensides; common fine black concretions; pH 7.5; gradual irregular boundary.

B3g 1991 89 to 107 cm. (35 to 42 inches). Dark grayish brown (10YR 4/2) clay, dark gray (10YR 4/1) dry; black (10YR 2/1) vertical streaks; moderate coarse and medium prismatic structure parting to weak medium blocky structure; firm, plastic; prominent films on faces of peds; common slickensides; many fine black concretions; pH 7.5; gradual wavy boundary.

C1 1992 107 to 135 cm. (42 to 53 inches). Dark brown (10YR 3/3) clay, dark grayish brown (10YR 4/2) dry; black (10YR 2/1) vertical streaks; moderate medium and coarse prismatic structure parting to weak medium blocky structure; firm, plastic, prominent films on faces of peds; many horizontal slickensides; many $CaCO_3$ concretions; pH 8.0; gradual wavy boundary.

C2 1993 135 to 160 cm. (53 to 63 inches). Dark grayish brown (10YR 4/2) clay, grayish brown (10YR 5/2) dry; black (10YR 2/1) vertical streaks; weak medium and coarse prismatic structure parting to weak medium blocky structure; firm, plastic; prominent films on faces of peds; many horizontal slickensides; many fine and medium $CaCO_3$ concretions; pH 8.0.

*In addition to being very fine, the pedon has higher chroma and is more alkaline below depths of 42 inches than is recognized in the range for the Wabash series.

SOIL CLASSIFICATION- ENTIC HAPLUSTOLL
FINE-SILTY, CARBONATIC, MESIC
SERIES - - - - - - - - WAKEEN SILT LOAM
SOIL NO - - - - - - S68KANS-26-6 COUNTY - - - ELLIS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

GENERAL METHODS- - - 1A, 1B1B, 2A1, 2B SAMPLE NOS.- 68L408-68L414

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B: SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 1	CORS .5	MEDS .25	FNES .10	VFNS .05	COSI .02	FNSI .002	VFSI .005	TEXT FAML SAND 2-.1	INTR SAND .2- .02	FINE CLAY TO CLAY	NON-CO3 CLAY PCT	RATIO 8D1 1/3 BAR TO CLAY
CM		PCT LT 2MM														PCT	PCT	
000-6	AP1	16.4	58.7	24.9	3.4	0.8	3.8	2.8	2.5	6.4	42.3	16.4		10.0	49.9	14	25	0.42
006-13	AP2	16.0	59.8	24.2	6.3	0.7	3.8	2.6	2.4	6.6	43.0	16.8		9.4	50.7	26	24	0.45
013-25	A13	10.9	54.6	34.5	9.2	0.8	2.1	1.5	1.5	5.0	35.2	19.4		5.9	41.0	27	27	0.38
025-43	B2	9.9	47.8	42.3	13.0	0.9	1.6	1.0	1.9	4.5	21.8	26.0		5.4	26.4	31	27	0.32
043-74	B3	5.8	41.7	52.5		0.4	0.3	0.3	2.0	2.9	5.4	36.3		2.9	9.8		33	0.27
074-91	Cr1	4.2	39.6	56.2	13.9	0.1	0.1	0.1	1.4	2.6	4.1	35.5		1.6	7.8	25	38	0.30
091-117	Cr2	11.4	41.5	47.1		0.4	0.3	0.8	6.0	3.8	5.1	36.4		7.6	13.1		27	0.29
000-6	(A)	17.2	57.0	25.8		0.9	4.3	3.0	2.4	6.5	39.6	17.4		10.6	47.2			0.41
006-13	(A)	16.0	58.2	25.8		0.7	3.9	2.6	2.3	6.5	40.6	17.6		9.5	48.0			0.43
013-25	(A)	10.8	58.1	31.1		0.5	2.2	1.5	1.2	5.3	38.3	19.8		5.5	44.2			0.42
025-43	(A)	8.3	52.7	39.0		0.6	2.2	1.3	1.0	3.2	31.3	21.4		5.0	35.0			0.34
043-74	(A)	1.3	27.0	71.7		0.1	0.3	0.2	0.2	0.4	3.7	23.3		0.8	4.3			0.20
074-91	(A)	0.2	23.3	76.5		0	0	0	0	0.2	2.3	21.0		0	2.5			0.22
091-117	(A)	0.8	25.5	73.7		0	0	0	0.2	0.6	1.0	24.5		0.2	1.7			0.18

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2: VOL. GT 2	WEIGHT GT 75	75-20	20-5	5-2	LT .074	BULK DENSITY 4A1D 20-2 PCT	4A1H 1/3-BAR OVEN DRY	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR	4B1C 1/3-BAR	4B2 15-BAR	4C1 WRD CM/CM	CARBONATE 4B2 100-BAR	6E1B LT 2	3A1A LT .002	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	PCT LT 75			LT 2	G/CC	G/CC		PCT	PCT	PCT		PCT	PCT	PCT		
							(B)											
000-6	TR	0	0	0	TR	89	TR	1.20				10.5		7.0	10	TR	7.6	
006-13	TR	0	0	0	TR	90	TR	1.42	1.54	0.027	25.6	11.0	0.21		9	TR	7.8	
013-25	TR	0	0	0	TR	93	TR	1.35	1.52	0.040	25.5	13.2	0.17	8.9	16	8	7.7	
025-43	0	0	0	0	0	94	0	1.40				13.4			34	15	7.7	
043-74	0	0	0	0	0	96	0	1.41	1.55	0.032	27.6	14.2	0.19	7.1	56	20	8.4	
074-91	0	0	0	0	0	97	0	1.38	1.58	0.046	30.6	16.9	0.19		50	18	8.5	
091-117						91						13.5			64	20	8.9	

DEPTH	ORGANIC MATTER 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2A EXT FE	PHOS 6S1A TOTL	EXTRACTABLE BASES 6N2E CA	6O2D MG	6P2A NA	6Q2A K	SUM EXTB	5B4A- ACTY 6H1A BACL TEA	AL 6G1D KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA SAT NHAC	(BASE SAT) 5C3 EXTB ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	MEQ / 100 G											PCT	PCT	PCT
	(C)					(D)	(D)												
000-6	1.76	0.170	10	0.6		17.8	1.2	0.1	2.1	21.2				19.3	0.78				
006-13	1.69	0.168	10	0.7		18.8	0.9	0.1	1.3	21.1				19.6	0.81				
013-25	1.43	0.149	10	0.6		20.4	1.0	0.1	1.0	22.5				20.2	0.59				
025-43	0.86	0.095	9	0.7		17.3	1.3	0.3	0.6	19.5				16.9	0.40				
043-74	0.30			1.1		11.2	4.3	1.8	0.4	17.7				14.4	0.27				
074-91	0.15			1.4		8.9	7.1	3.3	0.4	19.7				15.1	0.27				
091-117	0.11			1.2		6.3	4.5	3.4	0.3	14.5				10.3	0.22				

DEPTH	SATURATED PASTE 8E1 REST OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	SATURATION EXTRACT 8A1- EC 8A1A	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/CM	MEQ / LITER									PCT	
000-6																		34	10
006-13																			
013-25																			
025-43																			
043-74																		50	24
074-91	1500	8.2	74.1	18		500		1.05			10.0								
091-117																		52	26

(A) METHOD 3A3-CARBONATE REMOVED BEFORE PARTICLE SIZE ANALYSIS
(B) BULK DENSITY ESTIMATED FOR HORIZONS FROM 0-8 AND 2K-43 CM
(C) ORGANIC CARBON IS 9 KG PER SQ M TO A DEPTH OF 91 CM (METHOD 6A)
(D) METHODS 6N4C FOR CA AND 6O4C FOR MG

Pedon classification: Entic Haplustoll, fine-silty, carbonatic, mesic
Series classification: (Same)
Soil: Wakeen silt loam
Soil Nos.: S68KS-26-6 (Sample Nos. 408-414)
Location: Ellis County, KS; 150 feet west and 1,200 feet north of the southeast corner of Sec. 29, T12S, R20W.
Climate: Annual precipitation is about 23 inches. Annual temperature is about 54° F., and summer temperature is about 78° F. Average frost-free season is about 171 days.
Vegetation and land use: Tall grasses. Formerly cropland; seeded to native grass in fall 1966.
Parent material: Chalky limestone and shale.
Physiography: Gently sloping erosional upland.
Topography: Nearly plane slope. Slope gradient about 1 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderate.
Described by: J. M. Allen, R. F. Harner.

(Colors are for dry soil unless otherwise stated.)

Ap1 408 0 to 6 cm. (0 to 2½ inches). Grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak thin platy parting to moderate fine and very fine granular structure; soft, very friable; common fine roots; few very fine chalk fragments; strong effervescence; abrupt smooth boundary.

Ap2 409 6 to 13 cm. (2½ to 5 inches). Dark grayish brown (10YR 4/2) light silty clay loam, very dark brown (10YR 2/2) moist; weak medium granular structure; hard, friable; common fine roots; strong effervescence; clear smooth boundary.

A13 410 13 to 25 cm. (5 to 10 inches). Grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; strong medium granular structure; slightly hard, friable; many worm casts; common fine roots; few chalk fragments up to 2 cm. in diameter; strong effervescence; gradual smooth boundary.

B2 411 25 to 43 cm. (10 to 17 inches). Grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; strong medium and coarse granular structure; hard, friable; common worm cast granules of pale brown (10YR 6/3), brown (10YR 5/3) moist; few fine roots; few fragments of chalk up to 5 cm. in diameter; violent effervescence; gradual smooth boundary.

B3 412 43 to 74 cm. (17 to 29 inches). Pale yellow (2.5Y 8/4) silty clay loam, light yellowish brown (2.5Y 6/5) moist; moderate medium subangular blocky structure; very hard, friable; few very fine roots; few coarse root channels filled with darker colored soil material; violent effervescence; gradual smooth boundary.

Cr1 74 to 91 cm. (29 to 36 inches). Very pale brown (10YR 8/4) weathered thinly bedded chalk, crushes to silty clay loam texture, light yellowish brown (10YR 6/5) moist; weak coarse subangular blocky structure parting to weak fine platy structure; very hard, brittle; few very fine roots; gradual wavy boundary.

Cr2 414 91 to 117 cm. (36 to 46 inches). Brownish yellow (10YR 6/6) thinly bedded chalk, no roots observed.

SOIL CLASSIFICATION- ENTIC HAPLUSTOLL
COARSE-LOAMY , CARBONATIC, MESIC (A)
SERIES - - - - - - - WAKEEN SILT LOAM TAXADJUNCT

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - - S68KANS-26-12 COUNTY - - - ELLIS

GENERAL METHODS- - - 1A, 1B1B, 2A1, 2B SAMPLE NOS.- 68L415-68L422

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B															RATIO
		SAND	SILT	CLAY	FINE CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	FAML	INTR	FINE	NON-	8D1
		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005-	SAND	.2-	TO	CLAY	CO3-	15-
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-.1	.02	CLAY		CLAY	BAR
CM		PCT LT 2MM															PCT	PCT	CLAY
000-10	AP	10.5	60.7	28.8		0.5	1.7	1.3	1.1	5.9	42.3	18.4		4.6	48.7			29	0.43
010-26	A12	9.8	54.5	35.7		0.5	1.9	1.5	1.2	4.7	36.2	18.3		5.1	41.4			33	0.40
028-41	B2	10.5	48.7	40.8		0.9	2.6	1.6	1.5	3.9	28.9	19.8		6.6	33.5			29	0.35
041-48	B3	13.1	41.6	45.3		2.1	3.1	1.9	2.3	3.7	20.9	20.7		9.4	25.8			21	0.29
048-79	C1	25.8	37.5	36.7		1.6	4.5	4.1	7.9	7.6	12.0	25.5		18.1	24.2			13	0.21
079-117	C2	26.7	36.5	36.8		7.0	6.5	3.7	5.7	3.8	6.6	29.9		22.9	13.7			13	0.19
117-142	Cr	16.8	45.9	37.3		0.5	0.6	1.2	7.6	7.0	5.2	40.7		9.8	17.6			17	0.24
064-76	(B)	13.1	50.2	36.7	14.8	1.0	2.1	1.8	2.9	5.3	28.2	22.0		7.8	35.1	40		27	0.38

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2						BULK DENSITY				WATER CONTENT			CARBONATE		PH	
	VOL.	GT	75-20	20-5	5-2	LT	4A1D	4A1H	4D1	4B1C	4B1C	4B2	4C1	6E1B	3A1A	8C1A	8C1E
	GT 2	75				.074	20-2	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD	LT	LT	1/1	1/2
								BAR	DRY		BAR	BAR	BAR	CM/	2	.002	H2O	CACL
CM	PCT	PCT	PCT LT 75				LT2D	G/CC	G/CC		PCT	PCT	PCT	CM	PCT	PCT		
								(C)										
000-10	TR	0	0	0	TR	95	TR	1.20					12.4		3	0	7.7	
010-28	TR	0	0	0	TR	94	TR	1.35	1.54	0.045		27.4	14.4	0.18	7	3	7.7	
028-41	TR	0	0	0	TR	93	TR	1.41	1.59	0.041		24.1	14.4	0.14	18	12	7.8	
041-48	TR	0	0	0	TR	90	TR	1.40					13.1		41	24	8.0	
048-79	0	0	0	0	0	79	0	1.52	1.56	0.009		20.4	7.8	0.19	67	24	8.2	
079-117	0	0	0	0	0	75	0	1.50					7.0		73	24	8.3	
117-142	0	0	0	0	0	87	0						9.0		78	20	8.6	
064-76	0	0	0	0	0	91	0						13.8		27	10	8.1	

DEPTH	ORGANIC MATTER			IRON	PHOS	EXTRACTABLE BASES 5B4A-					ACTY	AL	(CAT EXCH)		RATIO	RATIO	CA	(BASE SAT)	
	6A1A	6B1A	C/N	6C2A	6S1A	6N2E	6D2D	6P2A	6Q2A		6H1A	6G1D	5A3A	5A6A	8D1	8D3	5F	5C3	5C1
	ORGN CARB	NITG		EXT FE	TOTL	CA	MG	NA	K	SUM EXTB	BACL TEA	KCL EXT	EXTB ACTY	NHAC	NHAC TO	CA TO	SAT NHAC	EXTB ACTY	NHAC
CM	PCT	PCT		PCT	PCT	(- - - - - - - - - - MEQ / 100 G- - - - - - - - - -)									CLAY	MG	PCT	PCT	PCT
	(D)					(E)		(E)											
000-10	1.88			0.7		23.3	1.3	0.1	1.4	26.1				25.8	0.90				
010-28	1.32			0.6		25.1	1.8	0.2	0.8	27.9				25.5	0.71				
028-41	0.83			0.4		22.5	3.0	0.3	0.7	26.5				23.0	0.56				
041-48	0.56			0.3		15.8	2.9	0.4	0.4	19.5				16.0	0.35				
048-79	0.16			0.5		8.6	2.2	0.4	0.2	11.4				6.8	0.19				
079-117	0.01			0.5		7.1	2.5	0.7	0.2	10.5				6.0	0.16				
117-142	0.04			0.6		7.0	2.9	1.4	0.2	11.5				6.3	0.17				
064-76				0.4															

DEPTH	SATURATED PASTE			NA	NA	SALT	GYP	SATURATION EXTRACT 8A1-									ATTERBERG	
	8E1 REST OHM-	8C1B PH	8A H2O	5D2 FSP	5E SAR	8D5 TOTL SOLU	6F1A	8A1A EC	6N1B CA	6Q1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/ CM	(- - - - - - - - - - MEQ / LITER - - - - - - - - - -)								PCT	
000-10																			
010-28																			
028-41																			
041-48																			
048-79																			
079-117	2600	8.1	37.1			220		0.91											
117-142																			
064-76																			

(A) THIS PEDON DOES NOT FIT THE FAMILY TEXTURE PLACEMENT FOR THE SERIES (10/71) AND IS COARSE-SILTY
(B) RED ZONE BELOW CHALK FRAGMENT
(C) BULK DENSITY ESTIMATED FOR HORIZONS FROM 0-10, 41-48, AND 79-117 CM
(D) ORGANIC CARBON IS 8 KG PER SQ M TO A DEPTH OF 1 METER (METHOD 6A)
(E) METHODS 6N4C FOR CA AND 6Q4C FOR MG

Pedon classification: Entic Haplustoll, coarse-loamy, carbonatic, mesic
Series classification: Entic Haplustoll, fine-silty, carbonatic, mesic
Soil: Wakeen silt loam taxadjunct *
Soil Nos.: S68KS-26-12 (Sample Nos. 415-422)
Location: Ellis County, KS; 200 feet east and 1,700 feet north of the southwest corner of Sec. 27, T12S, R20W.
Climate: Annual precipitation is about 23 inches. Annual temperature is about 54° F., and summer temperature is about 78° F. Average frost-free season is about 171 days.
Vegetation and land use: Summer fallow. Cropland.
Parent material: Chalky limestone and shale.
Physiography: Gently sloping erosional upland.
Topography: Slightly convex slope. Slope gradient about 2 percent.
Drainage: Well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Moderate.
Described by: R. F. Harner, L. D. Zavesky.

(Colors are for dry soil unless otherwise stated.)

Ap 415 0 to 10 cm. (0 to 4 inches). Dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; hard, friable; few fine and medium roots; strong effervescence; abrupt smooth boundary.

A12 416 10 to 28 cm. (4 to 11 inches). Grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; many worm cast granules; hard, friable; many roots; strong effervescence; clear smooth boundary.

B2 417 28 to 41 cm. (11 to 16 inches). Light brownish gray (10YR 6/2) silty clay loam, brown (10YR 5/3) moist; moderate fine granular structure; fewer worm cast granules than A12 horizon; hard, friable; few fine roots; common small fragments of chalk; strong effervescence; clear smooth boundary.

B3 418 41 to 48 cm. (16 to 19 inches). Pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak fine granular structure; slightly hard, friable; few fine roots; common small fragments of chalk; strong effervescence; clear smooth boundary.

C1 419 48 to 79 cm. (19 to 31 inches). White (10YR 8/2) silty clay loam, very pale brown (10YR 8/4) moist; massive; porous; hard, friable; few fine roots; many platy fragments of chalk mostly less than 5 cm. (2 inches) in longest dimension, a few as large as 13 cm. (5 inches); violent effervescence; between 64 and 67 cm. (25 and 30 inches), below a larger chalk fragment, was channel about 10 cm. (4 inches) in diameter filled with brown (7.5YR 5/4) moist light silty clay loam, this material sampled separately (422); clear smooth boundary.

C2 420 79 to 117 cm. (31 to 46 inches). Yellow (10YR 7/6), brownish yellow (10YR 6/6) moist, bed of subrounded chalk fragments with soil material like that of C1 horizon filling most space between fragments; very few roots; the 79- to 91-cm. (31- to 36-inch) zone contains about 60 percent by volume of fragments coarser than 2 mm., about 45 percent of volume are fragments from 2 to 19 mm. in diameter, and about 15 percent are fragments from 19 to 75 mm. in diameter, very few fragments larger than 75 mm.; 91- to 117-cm. (36- to 46-inch) zone is 70 to 75 percent chalk fragments coarser than 2 mm., about 35 percent of volume are fragments from 19 to 75 mm. in diameter, and about 40 percent are fragments larger than 75 mm. in diameter; clear smooth boundary.

Cr 421 117 to 142 cm. (46 to 56 inches). Brownish yellow (10YR 6/6) moist, thinly bedded chalk, no roots observed.

* This pedon is a taxadjunct to the Wakeen series because it contains more clay and less sand than is typical for the series.

SOIL CLASSIFICATION=FLUVAQUENTIC HAPLUSTOLL
SANDY, MIXED, THERMIC
SERIES - - - - - - -WALDECK TAXADJUNCT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S76KS-151-1 COUNTY - - - PRATT

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 76P0081-76P0089

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B															RATIO
		SAND	SILT	CLAY	FINE CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	SAND	INTR II	FINE CLAY	NON-CO3-CLAY	8D1 15-BAR
		2-.05	.05-.002	LT .002	LT .0002	2-1	1-.5	.5-.25	.25-.10	.10-.05	.05-.02	.02-.002	.005-.002	2-.10	.2-.02	TO CLAY		TO
CM		PCT LT 2MM														PCT	PCT	CLAY
000-020	AP	75.4	16.0	8.6		1.3	10.3	23.5	30.0	10.3	11.5	4.5		65.1				.50
020-028	A12	70.4	19.6	10.0		.9	5.7	19.0	28.6	16.2	15.3	4.3		54.2			10	.52
028-053	AC	70.4	18.6	11.0		.6	6.7	18.2	26.4	18.5	13.3	5.3		51.9			11	.48
053-076	C1	84.0	9.6	6.4		.6	8.2	23.2	39.9	12.1	6.3	3.3		71.9				.52
076-096	C2	95.6	3.0	1.4		1.1	15.7	36.0	37.8	5.0	2.2	.8		90.6				.71
096-107	C3	80.0	10.8	9.2		.2	5.2	18.0	36.8	19.8	7.9	2.9		60.2				.52
107-135	C4	67.7	21.9	10.4		1.1	4.4	12.7	31.6	17.9	15.8	6.1		49.8				.51
135-142	C5	66.3	17.7	16.0		1.2	11.7	24.2	22.8	6.4	9.6	8.1		59.9				.51
142-165	C6	89.9	7.2	2.9		2.2	16.6	35.7	31.9	3.5	4.9	2.3		86.4				.66

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL.		WEIGHT				(BULK DENSITY)				(WATER CONTENT)				CARBONATE		(PH)	
	GT 2	GT 75	75-20	20-5	5-2	LT .074	20-2 PCT	4A1D 1/3-BAR	4A1H OVEN DRY	4D1 COLE	4B1C 1/10 BAR	4B1C 1/3-BAR	4B2 15-BAR	4C1 WRD CM/CM	6E1B LT 2	3A1A LT .002	8C1A 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	PCT LT 75				LT20	G/CC	G/CC		PCT	PCT	PCT		PCT	PCT		
000-020	TR	0	0	TR	TR		TR	1.61	1.68	.015	16.8	12.0	4.3	.13	TR		8.1	7.5
020-028	TR	0	0	0	TR		TR	1.56	1.63	.015	19.8	14.1	5.2	.14	1	0	8.0	7.5
028-053	TR	0	0	TR	TR		TR	1.49	1.57	.017	19.7	16.6	5.3	.17	5	0	8.2	7.7
053-076	TR	0	0	TR	TR		TR	1.55	1.62	.015		11.6	3.3	.13	3		8.3	7.8
076-096	TR	0	0	0	TR		TR	1.60	1.64	.009	7.2	5.9	1.0	.08	1		8.5	7.8
096-107	TR	0	0	TR	TR		TR	1.64	1.70	.012	18.6	14.9	4.8	.17	1		8.3	7.8
107-135	TR	0	0	0	TR		TR	1.65	1.69	.008	16.7	11.6	5.3	.11	7		8.4	7.9
135-142	0	0	0	0	0		0	1.53	1.57	.009	21.3	17.4	8.1	.14	17		8.3	7.9
142-165	TR	0	0	TR	TR		TR						1.9		2		8.4	8.0

DEPTH	(ORGANIC MATTER) 6A1A ORGN CARB	6B1A NITG	C/N	IRCN 6C2B EXT FE	PHOS TOTL	(EXTRACTABLE BASES 5B4A) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC	(BASE SAT) 5C3 EXTB ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	(- - - - - - - - - - - -MEQ / 100 G- - - - - - - - - - -)									CLAY		PCT	PCT	PCT
000-020	.62	.055	11	.3		.9	.5	.3		.6			9.7	1.10					
020-028	.42	.045	9	.3		1.0	.5	.2					9.7	.97					
028-053	.31	.035	9	.2		1.3	.4	.2					8.6	.78					
053-076	.15			.2		1.3	.4	.2					5.3	.83					
076-096	.05			.3		.6	.4	.1					2.0	1.40					
096-107	.14			.3		2.2	.4	.2					8.7	.95					
107-135	.18			.3		2.5	.4	.2					7.1	.68					
135-142	.32			.3		2.2	.4	.2					6.0	.38					
142-165	.08			.3		.8	.4	.1					2.3	.79					

DEPTH	(SATURATED PASTE) 8E1 REST OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	(SATURATION EXTRACT 8A1) 8A1A EC	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/CM	(- - - - - - - - - - MEQ / LITER - - - - - - - - - -)									PCT	
000-020																		17	1 A
020-028																			
028-053																			
053-076	5800	7.8	21.7				0	.46										NP	NP
076-096	12000	8.2	22.3				0	.35											
096-107	4000	7.6	24.9				0	.53										NP	NP
107-135																			
135-142																			
142-165																			

CLAY MINERALOGY (7A2C).
000-020 MT3 MI3 KK2 QZ1
053-076 MT3 MI2 KK2 CA2
RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MT = MONTMORILLONITE MI = MICA KK = KAOLINITE CA = CALCITE QZ = QUARTZ.

SAND MINERALOGY (7B1) PLACEMENT: MIXED
000-020 FNES - RE62 QZ60 FE1 ZR1 FD35 MS1 NR1 HN1 SP VFNS - RE68 QZ65 FE1 ZR1 PO1 FD29 HN1 CL1 MS1 TM SP GN
053-076 FNES - RE66 QZ65 FE1 FD33 ZR HN MS CB GN VFNS - RE72 QZ69 FE2 SP1 FD25 GN1 CB1 HN1 TM ZR GS MS AU
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: CL = CHLORITE FD = FELDSPARS GS = GLASS HN = HORNBLENDE MS = MUSCOVITE PO = PLANT OPAL QZ = QUARTZ TM = TOURMALINE ZR = ZIRCON CB = CARBONATE AGGREGATES GN = GARNET AU = AUGITE SP = SPHENE FE = IRON OXIDES. RE = RESISTANT MINERALS.

(A) BY SOIL MECHANICS LABORATORY, USDA-SCS, LINCOLN, NE.

Pedon classification: Fluvaquentic Haplustoll; sandy, mixed, thermic
Series classification: Fluvaquentic Haplustoll, coarse-loamy, mixed, thermic
Soil: Waldeck taxadjunct*
Soil Nos.: S76KS-151-1 (NSSL Nos. 76P0081-76P0089)
Location: Pratt County, KS; 150 feet south and 150 feet west of the northeast corner of Sec. 34, T27S, R11W.
Climate: Annual precipitation is about 24.5 inches. Annual temperature is about 57° F., and summer temperature is about 80.4° F. Average frost-free season is about 185 days.
Vegetation and land use: Wheat stubble. Cropland.
Parent material: Moderately coarse textured alluvium.
Physiography: Nearly level flood plain.
Topography: Slope gradient less than 1 percent.
Drainage: Somewhat poorly drained.
Ground water: 2 to 6 feet.
Erosion: Slight.
Permeability: Moderately rapid.
Described by: C. S. Holzhey, D. A. Dodge, R. L. Haberman.

(Colors are for dry soil unless otherwise stated.)

Ap 76P0081 0 to 20 cm. (0 to 8 inches). Grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, friable; many fine roots; slight effervescence; mildly alkaline; clear smooth boundary.

A12 76P0082 20 to 28 cm. (8 to 11 inches). Grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; moderate medium granular structure; slightly hard, friable; many fine roots; many worm casts; many fine and very fine tubular pores; slight effervescence; mildly alkaline; clear smooth boundary.

AC 76P0083 28 to 53 cm. (11 to 21 inches). Light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; few faint yellowish brown (10YR 5/6) and olive brown (2.5Y 4/4) mottles in lower part of horizon; moderate medium granular structure; slightly hard, friable; common fine roots in upper part of horizon, few fine roots in lower part; many worm casts; many fine and very fine tubular pores; few fine $CaCO_3$ concretions; strong effervescence; moderately alkaline; gradual smooth boundary.

C1 76P0084 53 to 76 cm. (21 to 30 inches). Light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; common distinct strong brown (7.5YR 5/6) and dark yellowish brown (10YR 4/4) mottles; massive; slightly hard, friable; few fine roots; many fine and very fine tubular pores; few fine $CaCO_3$ concretions; strong effervescence; moderately alkaline; abrupt smooth boundary.

C2 76P0085 76 to 96 cm. (30 to 38 inches). Light gray (10YR 7/2) loamy fine sand, brown (10YR 5/3) moist; many distinct strong brown (7.5YR 5/6) mottles; single grained; loose; few fine roots; few fine $CaCO_3$ concretions; strong effervescence; moderately alkaline; abrupt smooth boundary.

C3 76P0086 96 to 107 cm. (38 to 42 inches). Mixed light brownish gray (10YR 6/2) and reddish yellow (7.5YR 7/6) fine sandy loam, brown (10YR 5/3) and strong brown (7.5YR 5/6) moist; massive; slightly hard, friable; few thin stratified layers of coarse textured material; few fine roots; many fine and very fine tubular pores; strong effervescence; moderately alkaline; clear smooth boundary.

C4 76P0087 107 to 135 cm. (42 to 53 inches). Mixed light brownish gray (10YR 6/2), reddish yellow (7.5YR 7/6), and very pale brown (10YR 7/4) fine sandy loam, brown (10YR 5/3), strong brown (7.5YR 5/6), and yellowish brown (10YR 5/4) moist; massive; slightly hard, friable; few fine roots and few to common coarse roots; many fine and very fine tubular pores; strong effervescence; moderately alkaline; gradual smooth boundary.

C5 76P0088 135 to 142 cm. (53 to 56 inches). Mixed light gray (10YR 6/1) and gray (10YR 5/1) fine sandy loam, very dark gray (10YR 3/1) and gray (10YR 5/1) moist; common distinct yellowish brown (10YR 5/6) mottles; massive; slightly hard, friable; few fine roots and few to common coarse roots; many fine and very fine tubular pores; strong effervescence; moderately alkaline; clear wavy boundary.

C6 76P0089 142 to 165 cm. (56 to 65 inches). Mixed brownish yellow (10YR 6/6) and light brownish gray (10YR 6/2) sand, yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) moist; single grained; loose; strong effervescence; moderately alkaline.

Remarks: Water table at 142 cm. (56 inches).

*This pedon is a taxadjunct to the Waldeck series because it has more sand in the C1 and C2 horizons than is allowed.

SOIL CLASSIFICATION-ABRUPTIC ARGIAQUOLL
FINE, MONTMORILLONITIC, THERMIC
SERIES - - - - - - -WOODSON SILT LOAM

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE MRTSC
SOIL SURVEY INVESTIGATIONS UNIT
LINCOLN, NEBRASKA

SOIL NO - - - - - - S71KS-23-3 COUNTY - - - DOUGLAS

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 71L1292-71L1299

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B													RATIO		
		SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	SAND VCOS 2-1	SAND CORS 1-.5	SAND MEDS .5-.25	SAND FNES .25-.10	SAND VFNS .10-.05	SILT COSI .05-.02	SILT FNSI .02-.002	SILT VFSI .002-.05	FAML TEXT SAND 2-.1	INTR II .2-.02	FINE CLAY TO CLAY	NON-CO3-CLAY	8D1 15-BAR TO CLAY
CM		PCT LT 2MM														PCT	PCT	
000-20	AP	7.2	74.3	18.5	11.0	.1	.9	1.2	2.8	2.2	32.7	41.6		5.0	36.5	59		.45
020-27	A1	7.3	64.9	27.8	20.4	.1	1.0	1.2	3.1	1.9	27.0	37.9		5.4	30.6	73		.48
027-52	B21T	3.9	51.1	45.0	34.8	.1	.4	.4	1.8	1.2	19.1	32.0		2.7	21.5	77		.46
052-84	B22T	3.2	52.7	44.1	31.0	TR	.2	.3	1.6	1.1	17.0	35.7		2.1	19.1	70		.47
084-114	B3	3.4	56.0	40.6	26.3	TR	.1	.2	1.8	1.3	17.5	38.5		2.1	20.0	65		.51
114-147	C1	22.2	49.4	28.4	18.7	.1	.1	1.2	15.0	5.8	16.6	32.8		16.4	31.9	66		.48
147-199	C2	33.1	35.5	31.4	22.4	.2	.2	1.7	22.5	8.5	13.6	21.9		24.6	36.1	71		.45
199-245	C3	33.9	28.0	38.1	27.8	.2	.3	2.1	23.1	8.2	10.7	17.3		25.7	32.8	73		.44

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B1, 3B2 VOL. GT 2	WEIGHT GT 2	75-20	20-5	5-2	LT .074	BULK DENSITY 4A1D 20-2 BAR	4A1H OVEN DRY	4D1 COLE 1/3-BAR	WATER CONTENT 4B1C 1/10 BAR	4B1C 1/3-BAR	4B2 15-BAR	4C1 WRD CM/CM	CARBONATE 6E1B LT 2	3A1A LT .002	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	PCT LT 75				LT20 G/CC	G/CC		PCT	PCT	PCT		PCT	PCT		
000-20	0	0	0	0	0	94	0	1.00A				8.3				5.3	5.0
020-27	0	0	0	0	0	94	0	1.30A				13.3				5.5	4.9
027-52	0	0	0	0	0	97	0	1.37	1.83	.101	32.1	30.0	20.9	.12	3.6B	5.8	5.1
052-84	0	0	0	0	0	98	0	1.42	1.89	.100	30.2	28.6	20.5	.12	3.3B	6.3	5.5
084-114	0	0	0	0	0	98	0	1.42	1.83	.088	31.5	29.4	20.8	.12	2.3B	6.8	6.0
114-147	TR	0	0	0	TR	81	TR	1.50A					13.5			7.2	6.0
147-199	TR	0	0	0	TR	71	TR	1.57	1.72	.032	21.8	19.9	14.2	.09	2.6B	7.2	6.2
199-245	TR	0	0	TR	TR	70	TR						16.8			7.0	6.0

DEPTH	ORGANIC MATTER 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2A EXT FE	PHOS 6S1A TOTL	EXTRACTABLE BASES 5B4A- 6N2E CA	6O2D MG	6P2A NA	6Q2A K	SUM EXTB	ACTY 6H1A BACL TEA	6G1D KCL EXT	AL 5A3A EXTB ACTY	(CAT EXCH) 5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	5F SAT NHAC PCT	CA (BASE SAT) 5C3 EXTB ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	MEQ / 100 G												PCT	PCT
000-20	1.43C	.136	11			12.0	2.1	.3	.3	14.7	6.9		21.6	17.5	.95	5.7	69	68	84
020-27	1.18	.110	11			13.7	3.9	1.0	.2	18.8	8.6		27.4	23.3	.84	3.5	59	69	81
027-52	1.22	.112	11			20.5	7.8	2.2	.4	30.9	10.3		41.2	36.0	.80	2.6	57	75	86
052-84	.86					20.5	8.2	3.0	.5	32.2	7.6		39.8	34.7	.79	2.5	59	81	93
084-114	.35					18.6	8.0	3.4	.5	30.5	4.9		35.4	31.9	.79	2.3	58	86	96
114-147	.20					11.9	5.0	2.2	.3	19.4	3.3		22.7	20.3	.72	2.4	59	85	96
147-199	.15					10.9	4.5	1.9	.2	17.5	4.1		21.6	18.7	.60	2.4	58	81	94
199-245	.17					11.5	4.9	2.2	.2	18.8	5.1		23.9	21.1	.55	2.3	55	79	89

DEPTH	SATURATED PASTE 8E1 REST OHM-CM	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A	SATURATION EXTRACT 8A1- 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1A NA	6Q1A K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM			PCT	PCT			PCT		MEQ / LITER									PCT	
000-20																		33D	8
020-27																			
027-52																			
052-84																		61D	33
084-114	1400	6.1	60.6	10	7	160		.47	.3	.2	3.7	TR							
114-147																			
147-199																			
199-245																			

CLAY MINERALOGY (7A2C). PLACEMENT (S71KS-23-3) MONTMORILLONITIC.
052-84 MT5 KK3 MI2
COMMENTS - MINERALS WELL ORDERED.
RELATIVE AMOUNTS - (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE - MT = MONTMORILLONITE MI = MICA KK = KAOLINITE.

(A) ESTIMATED.
(B) MICRO-PENETRATION RESISTANCE - A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10-BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.
(C) ORGANIC CARBON IS 13 KG/M SQ TO A DEPTH OF 1 M (6A).
(D) DETERMINED BY SOIL MECHANICS LAB - SCS, LINCOLN, NE.

Pedon classification: Abruptic Argiaquoll, fine, montmorillonitic, thermic
Series classification: (Same)
Soil: Woodson silt loam
Soil Nos.: S71KS-23-3 (Sample Nos. 1292-1299)
Location: Douglas County, KS; 750 feet west and 820 feet south of the northeast corner of Sec. 7, T15S, R21E.
Climate: Annual precipitation is about 37 inches. Annual temperature is about 56° F., and summer temperature is about 78° F. Average frost-free season is about 185 days.
Vegetation and land use: Recently plowed alfalfa. Cropland.
Parent material: Sediments presumed to be old alluvium.
Physiography: Nearly level erosional upland.
Topography: Slightly convex ridgetop. Slope gradient less than 1 percent.
Drainage: Moderately well drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Very slow.
Described by: J. L. Zimmerman, R. O. Plinsky.

(Colors are for moist soil unless otherwise stated.)

Ap 1292 0 to 20 cm. (0 to 8 inches). Very dark gray (10YR 3/1) heavy silt loam, gray (10YR 5/1) dry; weak to moderate fine granular structure; slightly hard, friable; common fine roots; slightly acid; clear smooth boundary.

A1 1293 20 to 29 cm. (8 to 11 inches). Very dark gray (10YR 3/1) light silty clay loam, gray (10YR 5/1) dry; weak to moderate fine platy structure in upper part and moderate fine subangular blocky structure in lower part; slightly hard, friable; few fine black concretions; common fine roots; slightly acid; abrupt smooth boundary.

B21t 1294 29 to 52 cm. (11 to 20 inches). Very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; few fine faint mottles of dark brown (10YR 3/3); gray silt coatings on ped faces; moderate medium and coarse prismatic structure parting to moderate fine and medium blocky structure; extremely hard, very firm; few fine black concretions; common fine roots; slightly acid; gradual smooth boundary.

B22t 1295 52 to 84 cm. (20 to 33 inches). Very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; few fine faint mottles of dark yellowish brown (10YR 3/4); gray silt coatings on ped faces; moderate coarse prismatic structure parting to moderate fine blocky structure; extremely hard, very firm; few fine black concretions; common fine roots; slightly acid; gradual smooth boundary.

B3 1296 84 to 114 cm. (33 to 45 inches). Coarsely mottled dark brown (10YR 4/3) and grayish brown (10YR 5/2) light silty clay, yellowish brown (10YR 5/5) and light brownish gray (10YR 6/2) dry, with about 30 percent of vertical fillings about 1.5 inches wide of black (10YR 2/1) silty clay; moderate coarse prismatic structure parting to weak fine and medium blocky structure; very hard, very firm; common fine black concretions; few fine roots; neutral; gradual smooth boundary.

C1 1297 114 to 147 cm. (45 to 58 inches). Grayish brown (10YR 5/2) light clay loam, light brownish gray (10YR 6/2) dry, with about 30 percent of vertical fillings about 1.5 inches wide of very dark gray (10YR 3/1) silty clay; many fine and medium faint mottles of dark yellowish brown (10YR 4/4); massive; slightly hard, friable; few fine black concretions; few fine roots; neutral; gradual smooth boundary.

C2 1298 147 to 199 cm. (58 to 78 inches). Coarsely mottled dark brown (10YR 4/3) and grayish brown (10YR 5/2) heavy clay loam, yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) dry, with a few vertical fillings, less wide and less numerous than above horizon of very dark grayish brown (10YR 3/2) silty clay; massive; slightly hard, friable; few fine black concretions; many yellowish red stains; few fine roots; neutral; gradual wavy boundary.

C3 1299 199 to 245 cm. (78 to 96 inches). Coarsely mottled dark brown (10YR 4/3) and grayish brown (10YR 5/2) heavy clay loam, yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) dry, with a few vertical fillings, less wide and less numerous than the above horizon, of very dark grayish brown (10YR 3/2) silty clay; massive; slightly hard, friable; few fine black concretions; many yellowish red stains; neutral; gradual smooth boundary.

C4 245 to 260 cm. (96 to 102 inches). Dark yellowish brown (10YR 4/4) heavy clay loam; many medium faint mottles of very dark gray (10YR 3/1) and grayish brown (10YR 5/2); massive; hard, firm; many fine black concretions; many yellowish red stains; neutral; clear smooth boundary.

Cr 260 to 280 cm. (102 to 110 inches). Weathered sandstone mixed with clay shale; gradual smooth boundary.

R 280 to 300 cm. (110 to 118 inches). Sandstone.

Remarks: Horizons between 29 to 52 cm. (11 to 20 inches), 52 to 84 cm. (20 to 33 inches), and 147 to 199 cm. (58 to 78 inches) were sampled for engineering testing.

SOIL CLASSIFICATION-ABRUPTIC ARGIAQUOLL
FINE, MONTMORILLONITIC, THERMIC
SERIES - - - - - - -WOODSON SILT LOAM

SOIL NO - - - - - - S73KS-1-3 COUNTY - - - ALLEN

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 73L1099-73L1109

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - SAND	SILT	CLAY	FINE CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	SAND	INTR II	FINE CLAY	NON-CO3 CLAY	RATIO 8D1 15-BAR TO CLAY
		2- .05	.05- .002	LT .002	LT .0002	2- 1	1- .5	.5- .25	.25- .10	.10- .05	.05 .10	.02 .002	.005- .002	2- .10	.2- .02	TO CLAY		
CM		PCT LT 2MM														PCT	PCT	
000-20	A1	2.2	72.6	25.2	15.1	.1	.4	.4	.3	1.0	27.2	45.4		1.2	28.4	60		.49
020-32	B21T	1.2	52.7	46.1	35.9	TR	.3	.2	.1	.6	18.8	33.9		.6	19.5	78		.45
032-49	B22T	.7	43.0	56.3	44.5	.0	.2	.1	TR	.4	13.8	29.2		.3	14.2	79		.43
049-80	B23T	1.0	46.5	52.5	39.7	.1	.1	.1	.1	.6	14.5	32.0		.4	15.2	76		.43
080-97	B31	3.0	51.5	45.5	34.4	TR	.1	.1	.5	2.3	22.1	29.4		.7	24.7	76		.43
097-133	B32	2.9	51.2	45.9	35.4	.0	.1	.1	.4	2.3	22.0	29.2		.6	24.6	77		.44
133-159	B33	2.9	49.3	47.8	36.8	.0	TR	.1	.4	2.4	21.5	27.8		.5	24.2	77		.44
159-188	B34	3.5	47.4	49.1	33.9	.0	.1	.2	.8	2.4	20.4	27.0		1.1	23.4	69		.45
188-228	B35	4.2	49.6	46.2	33.9	.2	.3	.2	.8	2.7	23.1	26.5		1.5	26.2	73		.46
228-318	B36	3.3	46.1	50.6	32.6	.3	.3	.2	.5	2.0	19.7	26.4		1.3	22.1	64		.43
000-15	AP (A)	2.3	77.6	20.1	13.1	.1	.4	.3	.3	1.2	32.5	45.1		1.1	33.9	65		.44

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2 VOL. GT 2	WEIGHT GT 75	75-20	20-5	5-2	LT .074	4A1D 20-2 PCT	4A1H 1/3-BAR	4D1 OVEN DRY	4B1C COLE	BULK DENSITY 4B1C 1/10 BAR	4B1C 1/3-BAR	4B2 15-BAR	4C1 WRD	WATER CONTENT	CARBONATE 6E1B LT 2	3A1A LT .002	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
CM	PCT	PCT	PCT LT 75				LT20	G/CC	G/CC		PCT	PCT	PCT	CM/CM		PCT	PCT		
000-20	0	0	0	0	0	99	0	1.29	1.42	.033	35.6	33.2	12.3	.27	3.3C			5.9	5.4
020-32	0	0	0	0	0	99	0	1.31	1.76	.104	35.6	33.4	20.6	.17	2.3C			5.2	4.8
032-49	0	0	0	0	0	100	0	1.29	1.90	.138	36.1	34.9	24.4	.14	1.6C			5.4	5.1
049-80	0	0	0	0	0	100	0	1.41	1.87	.099	31.2	29.8	22.4	.10	2.6C			5.6	5.3
080-97	TR	0	0	0	TR	99	TR	1.40B					19.4					5.3	5.3
097-133	0	0	0	0	0	99	0	1.44	1.79	.075	28.4	26.9	20.1	.10	1.9C			5.7	5.7
133-159	TR	0	0	TR	TR	99	TR	1.38	1.77	.089	31.5	30.2	21.1	.13	2.4C			6.3	6.2
159-188	TR	0	0	TR	TR	98	TR	1.40B					22.1					6.6	6.5
188-228	TR	0	0	TR	TR	98	TR	1.40	1.85	.100	31.4	30.1	21.1	.13	2.4C			6.8	6.8
228-318	TR	0	0	TR	TR	98	TR	1.40B					21.7			TR		7.2	7.1
000-15	TR	0	0	0	TR	99	TR	1.43	1.52	.021	28.9	26.9	8.9	.26	2.1C	TR		7.6	7.2

DEPTH	ORGANIC MATTER 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2B EXT FE	PHOS TOTL	EXTRACTABLE BASES 5B4A 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	CAT EXCH 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA SAT NHAC	BASE SAT 5C3 EXTB ACTY	5C1 NHAC
CM	PCT	PCT		PCT	PCT	MEQ / 100 G											PCT	PCT	PCT
000-20	2.490	.194	13	.5		12.5	3.4	.4	.3	16.6	8.0		24.6	20.7	.82	3.7	60	67	80
020-32	1.50	.141	11	.5		16.4	8.0	1.3	.6	26.3	12.2	.5	38.5	33.0	.72	2.1	50	68	80
032-49	1.27	.122	10	.5		20.8	11.2	1.9	.7	34.6	11.2	.1	45.8	39.6	.70	1.9	53	76	87
049-80	.96			.5		20.3	11.2	2.2	.7	34.4	9.2		43.6	36.7	.70	1.8	55	79	94
080-97	.48			.5			10.4	2.2	.5		6.5	TR		31.2	.69				
097-133	.20			.4			11.8	2.4	.6		5.3			32.2	.70				
133-159	.15			.4			13.3	2.5	.6		4.7			34.1	.71				
159-188	.14			.9			14.9	2.6	.6		4.5			36.3	.74				
188-228	.08			1.4			14.9	2.4	.7		3.5			33.7	.73				
228-318	.07			.9			19.1	2.6	.8					37.1	.73				
000-15	1.25	.115	11	.5			2.5	.2	.3					17.5	.87				

DEPTH	SATURATED PASTE 8E1 REST OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	SATURATION EXTRACT 8A1- 8A1A EC	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/CM	MEQ / LITER									PCT	
000-20																			
020-32																			
032-49																			
049-80																			
080-97							TR												
097-133	450	5.6	65.4	4	3	2300	TR	3.06	24.2	15.5	15.1	.1							
133-159							TR												
159-188							TR												
188-228																			
228-318																			
000-15																			

CLAY MINERALOGY (7A2C). PLACEMENT = MONTMORILLONITIC.

000-20	MM2	KK2	MI1.
032-49	MT3	KK2	MI1.
097-133	MT4	KK2	MI1.
159-188	MT4	KK2	MI1.
228-318	MT4	KK2	MI1.

COMMENTS - MONTMORILLONITE WELL-ORDERED EXCEPT IN SURFACE WHERE DEGRADED AND CONTAINS INTERLAYER MATERIAL.
RELATIVE AMOUNTS - (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE - MT = MONTMORILLONITE MI = MICA KK = KAOLINITE MM = MONTMORILLONITE-MICA.

(A) SAMPLE FROM CULTIVATED FIELD NEAR S73KS-1-3. SEE REMARKS SECTION OF DESCRIPTION.
(B) ESTIMATED.
(C) MICRO-PENETRATION RESISTANCE. A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10-BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.
(D) ORGANIC CARBON IS 17 KG/M SQ TO A DEPTH OF 1 M (6A).

Pedon classification: Abruptic Argiaquoll, fine, montmorillonitic, thermic
Series classification: (Same)
Soil: Woodson silt loam
Soil Nos.: S73KS-1-3 (Sample Nos. 1099-1109)
Location: Allen County, KS; Samples 1099-1108--100 feet south and 1,420 feet east of the northwest corner of Sec. 23, T25S, R19E. Sample 1109--100 feet north and 1,420 feet east of the southwest corner of Sec. 14, T25S, R19E.
Climate: Annual precipitation is about 37 inches. Annual temperature is about 57° F., and summer temperature is about 79° F. Average frost-free season is about 195 days.
Vegetation and land use: Samples 1099-1108--Mid and tall grasses. Native range.
Sample 1109--Sorghum stubble. Cultivated.
Parent material: Sediments high in clay.
Physiography: Nearly level upland.
Topography: Slope gradient less than 1 percent.
Drainage: Somewhat poorly drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Very slow.
Described by: E. L. Fleming, J. R. Fortner, R. L. Haberman.

(Colors are for moist soil unless otherwise stated.)

A1 1099 0 to 20 cm. (0 to 8 inches). Very dark gray (10YR 3/1) silt loam; weak fine granular structure; slightly hard, friable; many fine roots; medium acid; abrupt smooth boundary.

B21t 1100 20 to 32 cm. (8 to 13 inches). Very dark gray (10YR 3/1) silty clay; few fine faint dark brown (10YR 3/3) mottles; moderate fine blocky structure; extremely hard, extremely firm; common fine roots; medium acid.

B22t 1101 32 to 49 cm. (13 to 19 inches). Continuation of above horizon; gradual smooth boundary.

B23t 1102 49 to 80 cm. (19 to 31 inches). Very dark gray (10YR 3/1) silty clay; many medium distinct strong brown (7.5YR 5/6) and few medium distinct olive brown (2.5Y 4/3) mottles; moderate to weak fine and medium blocky structure; extremely hard, extremely firm; common fine roots; however less than above horizon; slightly acid; gradual smooth boundary.

B31 1103 80 to 97 cm. (31 to 38 inches). Gray (5Y 5/1) silty clay; few medium distinct dark reddish brown (5YR 3/4) mottles; weak medium blocky structure; extremely hard, extremely firm; few fine roots; few to common fine gypsum particles; slightly acid; diffuse wavy boundary.

B32 1104 97 to 133 cm. (38 to 52 inches). Gray (10YR 5/1) silty clay; many fine distinct olive (5Y 4/6) mottles; moderate fine and very fine blocky structure; extremely hard, extremely firm; few slickensides; common black stains; few fine gypsum particles; neutral.

B33 1105 133 to 159 cm. (52 to 63 inches). Continuation of above horizon; gradual wavy boundary.

B34 1106 159 to 188 cm. (63 to 74 inches). Coarsely mottled gray (10YR 5/1), strong brown (7.5YR 5/6), dark reddish brown (5YR 3/4), and yellowish red (5YR 4/6) silty clay; moderate medium prismatic structure parting to moderate fine and medium blocky structure; extremely hard, extremely firm; many black stains; mildly alkaline; gradual wavy boundary.

B35 1107 188 to 228 cm. (74 to 90 inches). Coarsely mottled gray (10YR 5/1) and olive (5Y 4/6) silty clay; moderate medium prismatic structure parting to moderate fine and medium blocky structure; extremely hard, extremely firm; few black stains; moderately alkaline; gradual wavy boundary.

B36 1108 228 to 318 cm. (90 to 125 inches). Coarsely mottled gray (10YR 5/1) and olive (5Y 4/6) silty clay; weak fine and medium blocky structure; extremely hard, extremely firm; few black stains; few brown masses; moderately alkaline.

See Location
Ap 1109 0 to 15 cm. (0 to 6 inches). Very dark gray (10YR 3/1) silt loam; weak fine granular structure; slightly hard, friable; medium acid.

SOIL CLASSIFICATION-VERTIC HAPLUDOLL
FINE, MONTMORILLONITIC, THERMIC
SERIES - - - - - - -ZAAR SILTY CLAY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, NTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S73KS-19-2 COUNTY - - - CRAWFORD

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 73L1145-73L1151

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO
					FINE	SAND						SILT			INTR	FINE	NON-	8D1
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	SAND	II	CLAY	COB.	15-
		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005-	2	.2	TO	CLAY	BAR
CM		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	.10	.02	CLAY		TO
		PCT LT 2MM														PCT	PCT	CLAY
C00-18	A11	5.4	53.0	41.6	30.5	.1	.3	.3	1.5	3.2	21.6	31.4		2.2	25.8	73		.48
018-47	A12	5.0	52.1	42.9	30.7	.1	.2	.2	1.3	3.2	20.7	31.4		1.8	24.8	72		.47
047-76	B21	3.2	51.5	43.3	31.2	.2	.4	.3	1.3	3.0	20.6	30.9		2.2	24.5	72		.46
076-103	B22	6.1	48.5	45.4	32.9	.7	.7	.4	1.4	2.9	18.3	30.2		3.2	22.2	72		.46
103-129	B23	5.6	46.5	47.9	33.8	.9	.6	.3	1.2	2.6	19.6	26.9		3.0	23.1	71		.43
129-165	B31	8.6	42.0	49.4	31.9	.9	.9	.5	2.0	4.3	16.7	25.3		4.3	22.5	65		.43
165-195	B32	7.5	42.7	49.8	31.8	.2	.3	.3	2.0	4.7	18.2	24.5		2.8	24.5	64		.42
000-15	AP (A)	8.9	55.2	35.9	25.7	.1	.6	.8	2.5	4.9	21.5	33.7		4.0	28.1	72		.45

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)					(BULK DENSITY				(WATER CONTENT				CARBONATE		(PH	
	VOL.	(WEIGHT				4A1D	4A1H	4D1	4B1C	4B1C	4B2	4C1		6E1B	3A1A	8C1A	8C1E
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	1/10	1/3-	15	WRD		LT	LT	1/1	1/2
	2	75				.074	PCT	BAR	DRY		BAR	BAR	BAR	CM/		2	.002	H2O	CACL
CM	PCT	PCT	PCT LT 75			LT20		G/CC	G/CC		PCT	PCT	PCT	CM		PCT	PCT		
C00-18	0	0	0	0	0	97	0	1.22	1.65	.106	38.8	35.7	20.1	.19	2.1C			6.6	6.5
018-47	TR	0	0	0	TR	97	TR	1.28	1.82	.126	35.7	34.6	20.3	.18	2.8C			6.7	6.4
047-76	TR	0	0	TR	0	97	TR	1.44	1.81	.078	28.5	26.4	19.7	.10	2.3C			6.9	6.6
C76-103	0	0	0	0	0	96	0	1.50B					20.7					7.2	6.9
103-129	TR	0	0	0	TR	96	TR	1.45	1.84	.085	30.0	28.7	20.4	.12	1.8C			7.4	7.1
129-165	TR	0	0	TR	TR	94	TR	1.41	1.80	.087	32.6	30.9	21.3	.14	1.6C			7.5	7.2
165-195	TR	0	0	TR	TR	96	TR	1.44	1.85	.089	31.8	30.2	21.1	.13	2.8C			7.6	7.3
C00-15	0	0	0	0	0	95	0	1.46	1.76	.064	28.3	26.0	16.0	.15				6.2	5.8

DEPTH	(ORGANIC MATTER			IRON	PHOS	(EXTRACTABLE BASES 5B4A-					ACTY	AL	(CAT EXCH)		RATIO	RATIO	CA	(BASE SAT)	
	6A1A	6B1A	C/N	6C2B		6N2E	6Q2D	6P2B	6Q2B		6H1A	6G1E	5A3A	5A6A	8D1	8D3	5F1	5C3	5C1
	ORGN	NITG		EXT		CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	CA	SAT	EXTB	NHAC
	CARB			FE	TOTL					EXTB	TEA	EXT	ACTY		TO	TO	NHAC	ACTY	
CM	PCT	PCT		PCT	PCT	MEQ / 100 G									CLAY	MG	PCT	PCT	PCT
000-18	3.430	.292	12	1.7		37.8	4.1	.2	.6	42.7	6.8		49.5	42.5	1.02	9.2	89	86	100
018-47	2.86	.203	14	1.7		40.0	2.7	.3	.5	43.5	6.5		50.0	42.6	.99	15.0	94	87	102
047-76	1.60	.120	13	1.9		34.9	2.3	.3	.6	38.1	5.3		43.4	37.0	.85	15.0	94	88	103
076-103	.86	.069	12	2.3		31.9	2.9	.4	.6	35.8	4.0		39.8	34.2	.75	11.0	93	90	105
103-129	.46			2.2		30.2	3.8	.7	.6	35.3	3.3		38.6	33.1	.69	7.9	91	91	107
129-165	.23			2.9		31.1	5.2	.7	.6	37.6	3.1		40.7	34.5	.70	6.0	90	92	109
165-195	.22			2.1		29.6	6.2	.7	.6	37.1	2.8		39.9	34.4	.69	4.8	86	93	108
000-15																			

DEPTH	(SATURATED PASTE)			NA	NA	SALT	GYP	(SATURATION EXTRACT 8A1-								ATTERBERG		
	8E1	8C1B	8A	5D2	5E	8D5	6F1A	8A1A	6N1B	6O1B	6P1B	6Q1B	6I1A	6J1A	6K1A	6L1A	6M1A	4F1	4F2
	REST	PH	H2O	ESP	SAR	TOTL		EC	CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3	LQID	PLST
	OHM-					SOLU		MMHOS/										LMIT	INDX
CM	CM		PCT	PCT		PPM	PCT	CM	MEQ / LITER									PCT	
C00-18																			
018-47																			
C47-76																			
076-103																			
103-129	1400	6.8	70.9	2	1	230		.52	3.2	.5	1.4	TR							
129-165																			
165-195																			
C00-15																			

CLAY MINERALOGY (7A2C). PLACEMENT - MONTMORILLONITIC.
047-76 MT4 KK2 MI1.
COMMENTS - CLAYS FAIRLY WELL ORDERED.
RELATIVE AMOUNTS - (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE - MT = MONTMORILLONITE MI = MICA KK = KAOLINITE.

(A) SAMPLE (74L331) FROM CULTIVATED FIELD 200 FEET SOUTH OF S73KS-19-2.
(B) ESTIMATED.
(C) MICRO-PENETRATION RESISTANCE. A ROD 0.6 CM DIA IS SLOWLY PUSHED INTO BULK DENSITY CLOD, EQUILIBRATED AT 1/10-BAR, A DISTANCE OF 0.6 CM USING A POCKET PENETROMETER. UNITS ARE FORCE (KG) AND NOT ESTIMATES OF UNCONFINED COMPRESSIVE STRENGTH.
(D) ORGANIC CARBON IS 28 KG/M SQ TO A DEPTH OF 1 M (6A).

Pedon classification: Vertic Hapludoll, fine, montmorillonitic, thermic
Series classification: (Same)
Soil: Zaar silty clay
Soil Nos.: S73KS-19-2 (Sample Nos. 1145-1151)
Location: Crawford County, KS; 1,150 feet east and 50 feet north of the southwest corner of Sec. 12, T29S, R23E.
Climate: Annual precipitation is about 41 inches. Annual temperature is about 58° F., and summer temperature is about 80° F. Average frost-free season is about 195 days.
Vegetation and land use: Mid and tall grasses. Native range.
Parent material: Clayey residuum weathered from shale.
Physiography: Gently sloping erosional upland on foot slope position.
Topography: Slope gradient about 3 percent.
Drainage: Somewhat poorly drained.
Ground water: Deep.
Erosion: Slight.
Permeability: Very slow.
Described by: E. L. Bell, J. W. Frie, R. L. Haberman.

(Colors are for moist soil unless otherwise stated.)

A11 1145 0 to 18 cm. (0 to 7 inches). Black (10YR 2/1) silty clay; weak fine and medium granular structure; very hard, very firm; many fine roots; mildly alkaline; gradual smooth boundary.

A12 1146 18 to 47 cm. (7 to 18 inches). Black (10YR 2/1) silty clay; weak fine granular and very fine subangular blocky structure; very hard, very firm; few to common fine roots; mildly alkaline; gradual wavy boundary.

B21 1147 47 to 76 cm. (18 to 30 inches). Black (10YR 2/1) clay, few fine faint very dark grayish brown (2.5Y 3/2) mottles; weak medium blocky structure parting to moderate fine and very fine subangular blocky structure; extremely hard, extremely firm; few slickensides; few fine roots; few brown concretions; mildly alkaline; gradual wavy boundary.

B22 1148 76 to 103 cm. (30 to 41 inches). Very dark gray (10YR 3/1) clay, common medium distinct yellowish brown (10YR 5/6) and olive brown (2.5Y 4/4) mottles; weak fine and medium blocky structure; extremely hard, extremely firm; few slickensides; common brown concretions; mildly alkaline; diffuse wavy boundary.

B23 1149 103 to 129 cm. (41 to 51 inches). Dark gray (10YR 4/1) clay, common medium strong brown (7.5YR 5/6) mottles; weak fine and medium blocky structure; extremely hard, extremely firm; few slickensides; common brown concretions; moderately alkaline; diffuse wavy boundary.

B31 1150 129 to 165 cm. (51 to 65 inches). Coarsely mottled yellowish brown (10YR 5/6) and gray (5Y 5/1) clay; weak medium blocky structure; very hard, very firm; few to common slickensides; many soft brown masses; common fine black concretions; moderately alkaline; diffuse wavy boundary.

B32 1151 165 to 195 cm. (65 to 77 inches). Coarsely mottled yellowish brown (10YR 5/6) and gray (5Y 5/1) clay; weak medium blocky and subangular blocky structure; very hard, very firm; common slickensides; few lime concretions; moderately alkaline.

SOIL CLASSIFICATION-FLUVAQUENTIC HAPLUSTOLL
FINE-LOAMY, MIXED, THERMIC
SERIES - - - - - - -ZENDA TAXADJUNCT

SOIL NO - - - - - - S76KS-151-2 COUNTY - - - PRATT

GENERAL METHODS- - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 76P0090-76P0097

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO
		SAND	SILT	CLAY	FINE CLAY	SAND VCOS	SAND CORS	SAND MEDS	SAND FNES	SAND VFNS	SILT COSI	SILT FNSI	SILT VFSI	SAND	INTR II	FINE CLAY	NON-CO3-CLAY	8D1 15-BAR
		2-.05	.05-.002	.002 LT	.0002 LT	2-1	1-.5	.5-.25	.25-.10	.10-.05	.05-.02	.02-.002	.002-.005	.05-.10	.2-.02	TO CLAY		TO CLAY
CM		PCT LT 2MM														PCT	PCT	
000-018	A11	58.8	27.3	13.9		.7	7.6	13.6	20.2	16.7	20.3	7.0		42.1				.48
018-038	A12	45.8	32.1	22.1		1.2	5.6	9.0	15.1	14.9	21.4	10.7		30.9				.42
038-061	C1	44.0	32.1	23.9		2.0	4.0	8.5	16.0	13.5	19.2	12.9		30.5				.38
061-086	C2	49.6	25.8	24.6		1.8	4.9	10.3	19.4	13.2	15.5	10.3		36.4				.37
086-117	C3	47.2	33.0	19.8		3.4	4.7	9.1	14.0	16.0	17.3	15.7		31.2				.47
117-124	C4	57.7	24.3	18.0		.8	5.8	17.4	24.9	8.8	12.5	11.8		48.9				.48
124-140	C5	42.9	27.1	30.0		.4	4.6	12.6	17.6	7.7	16.0	11.1		35.2				.48
140-168	C6	59.7	21.5	18.8		1.5	9.0	18.3	23.0	7.9	13.3	8.2		51.8				.49

DEPTH	VOL. GT 2	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2 WEIGHT GT 75	75-20	20-5	5-2	LT .074	BULK DENSITY 4A1D 1/3-BAR	4A1H OVEN DRY	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR	4B1C 1/3-BAR	4B2 15-BAR	4C1 WRD	CARBONATE 6E1B LT 2	3A1A LT .002	PH 8C1A 1/1	8C1E 1/2
CM	PCT	PCT	PCT LT 75				LT20 G/CC	G/CC		PCT	PCT	PCT	CM/CM	PCT	PCT	H2O	CACL
000-018	TR	0	0	TR	TR		TR	1.68	1.89	.041		14.6	6.7	.14	4		8.0	7.6
018-038	TR	0	0	TR	1		1	1.51	1.88	.078		21.9	9.2	.20	11		8.0	7.8
038-061	1	0	0	TR	2		0	1.57	1.74	.035		17.9	9.0	.14	17		8.4	8.0
061-086	2	0	0	TR	4		2	1.59	1.77	.036		18.3	9.1	.14	18		8.6	8.2
086-117	6	0	0	2	8		10	1.55	1.67	.024		18.1	9.3	.13	19		8.4	7.9
117-124	TR	0	0	0	TR		TR	1.46	1.58	.027		18.4	8.6	.15	8		8.3	7.9
124-140	TR	0	0	0	TR		TR	1.45	1.54	.021		19.8	14.3	.08	TR		7.7	7.6
140-168	TR	0	0	TR	1		1	1.52	1.58	.013		16.2	9.2	.11	TR		8.0	7.6

DEPTH	ORGANIC MATTER 6A1A ORGN CARB	6B1A NITG	C/N	IRON 6C2B EXT FE	PHOS TOTL	EXTRACTABLE BASES 5B4A 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	CAT EXCH 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC	BASE SAT 5C3 EXTB PCT	5C1 NHAC PCT
CM	PCT	PCT		PCT	PCT	MEQ / 100 G				EXTB							PCT		
000-018	.95	.080	12	.2			2.0	.3	.3					10.9	.78				
018-038	.66	.055	12	.3			3.8	.3	.3					12.8	.58				
038-061	.37			.2			5.0	1.0	.3					11.9	.50				
061-086	.27			.2			4.2	2.0	.3					12.2	.50				
086-117	.17			.3			2.7	1.2	.3					14.1	.71				
117-124	.15			.4			1.8	1.0	.3					13.7	.76				
124-140	.27			.9		22.0	2.2	.9	.5	25.6	1.4		27.0	23.8	.79	10.0	92	95	108
140-168	.11			.2		14.2	1.5	.6	.4	16.7	.9		17.6	15.7	.84	9.5	90	95	106

DEPTH	SATURATED PASTE 8E1 REST OHM-	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU	GYP 6F1A	SATURATION EXTRACT 8A1- EC 6N1B	CA	6Q1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
CM	CM		PCT	PCT		PPM	PCT	MMHOS/CM	MEQ / LITER									PCT	
000-018	3000	7.4	35.7	3		100	0	.59	3.3	.8	.2	.2	0	5.9	.0	.1	.0	27	10 A
018-038	2600	7.6	42.2	2	1	60	0	.55	1.3	.4	.5	.1	0	4.7	.0	.1	.0		
038-061	2900	7.9	41.2	7	4	170		.56	1.3	.8	4.4	.1	0	4.4	.0	.4	.0	34	18 A
061-086	2200	8.6	38.6	14	11	220		.80	.7	.3	8.0	TR	0	4.7	.0	1.7	.0		
086-117	2200	7.8	40.9	7	6	190		.69	1.5	.3	5.5	TR	0	3.4	TR	2.1	.0	34	20 A
117-124	2400	7.7	38.3	7	3	150	0	.58	2.3	.3	3.5	.1	0	2.6	.0	1.6	TR		
124-140	1800	7.4	59.3	3	2	190	0	.48	2.2	.3	2.4	.1	0	2.8	.0	.9	.0		
140-168	2500	7.4	41.1	3	2	120	0	.45	2.3	.3	1.9	.1	0	2.3	.0	.8	.0		

CLAY MINERALOGY (7A2C).
000-018 MT3 MI2 KK2 CA2
038-061 MT2 KK2 MI2 CA3
RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MT = MONTMORILLONITE MI = MICA KK = KAOLINITE CA = CALCITE.

SAND MINERALOGY (7B1) PLACEMENT: MIXED.
038-061 FNES - RE58 QZ52 FE4 ZR1 SP1 FD38 CB3 GN1 MS HN EN. VFNS - RE68 QZ65 FE2 ZR1 FD25 CB5 MS1 BT GN
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: FD = FELDSPARS HN = HORNBLENDE MS = MUSCOVITE QZ = QUARTZ ZR = ZIRCON CB = CARBONATE AGGREGATES
SP = SPHENE GN = GARNET BT = BIOTITE EN = ENSTATITE FE = IRON OXIDES RE = RESISTANT MINERALS

(A) BY SOIL MECHANICS LABORATORY, USDA-SCS, LINCOLN, NE.

Pedon classification: Fluvaquentic Haplustoll, fine-loamy, mixed, thermic
Series classification: (Same)
Soil: Zenda taxadjunct*
Soil Nos.: S76KS-151-2 (NSSL Nos. 76P0090-76P0097)
Location: Pratt County, KS; 3,450 feet north and 2,700 feet east of the southwest corner of Sec. 36, T27S, R12W.
Climate: Annual precipitation is about 24.5 inches. Annual temperature is about 57° F., and summer temperature is about 80.4° F. Average frost-free season is about 185 days.
Vegetation and land use: Tall and mid grasses. Native meadow.
Parent material: Medium textured alluvium.
Physiography: Nearly level flood plain.
Topography: Slope gradient less than 1 percent.
Drainage: Somewhat poorly drained.
Ground water: 2 to 6 feet.
Erosion: Slight.
Permeability: Moderate.
Described by: C. S. Holzhey, D. A. Dodge, R. L. Haberman.

(Colors are for dry soil unless otherwise stated.)

A11 76P0090 0 to 18 cm. (0 to 7 inches). Grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; many fine roots; many fine pores; slight effervescence; mildly alkaline; clear smooth boundary.

A12 76P0091 18 to 38 cm. (7 to 15 inches). Grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable; many fine roots; many fine pores; strong effervescence; moderately alkaline; gradual smooth boundary.

C1 76P0092 38 to 61 cm. (15 to 24 inches). Light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; few faint yellowish brown (10YR 4/4) and light gray (10YR 7/2) mottles; weak fine granular structure; hard, friable; many fine roots; many fine pores; common fine CaCO3 concretions; violent effervescence; moderately alkaline; gradual smooth boundary.

C2 76P0093 61 to 86 cm. (24 to 34 inches). Light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; common distinct strong brown (7.5YR 5/6) mottles; weak fine granular structure; hard, friable; common fine roots; many fine pores; common fine and medium CaCO3 concretions; violent effervescence; moderately alkaline; gradual smooth boundary.

C3 76P0094 86 to 117 cm. (34 to 46 inches). Light gray (10YR 7/1) clay loam, light gray (10YR 6/1) moist; common coarse distinct yellowish brown (10YR 5/6) mottles; weak coarse granular structure; hard, friable; common fine roots; many fine pores; many fine and medium CaCO3 concretions; violent effervescence; moderately alkaline; clear smooth boundary.

C4 76P0095 117 to 127 cm. (46 to 50 inches). Mixed light gray (10YR 7/1) and yellowish brown (10YR 5/6) clay loam, gray (10YR 6/1) and yellowish brown (10YR 5/6) moist; massive; hard, friable; common fine roots; many fine pores; few gypsum crystals; few fine CaCO3 concretions; violent effervescence; moderately alkaline; clear smooth boundary.

C5 76P0096 127 to 140 cm. (50 to 55 inches). Gray (N5) heavy clay loam, dark gray (N4) moist; common medium and coarse yellowish brown (10YR 5/6) mottles; massive; hard, firm; many fine CaCO3 concretions; slight effervescence; moderately alkaline; gradual smooth boundary.

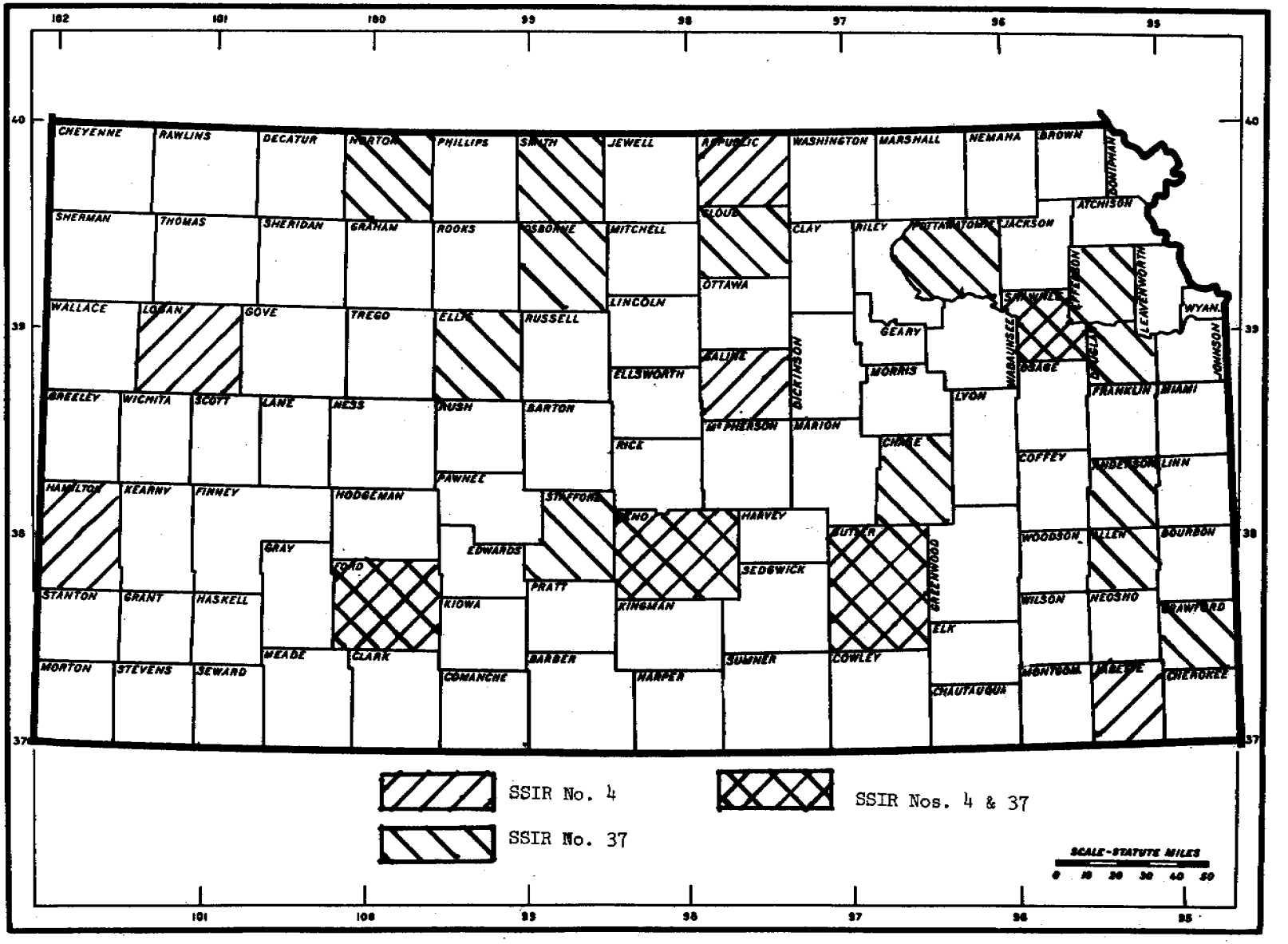
C6 76P0097 140 to 168 cm. (55 to 66 inches). Light yellowish gray (7.5Y 7/1) clay loam, gray (10Y 5/1) moist; common faint light yellowish brown (2.5Y 6/4) mottles; massive; hard, firm; few fine gravel; common highly decomposed vertical roots resembling roots of marsh plants; mildly alkaline.

Remarks: Water table at 168 cm. (66 inches).

*This pedon is a taxadjunct of the Zenda series because of sandy clay loam texture in the C horizon.

*U.S. GOVERNMENT PRINTING OFFICE : 1981 0-731-396/2446

KANSAS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CHEYENNE
RAWLINS
DECATUR
NORTON
PHILLIPS
SMITH
JEWELL
REPUBLIC
WASHINGTON
MARSHALL
NEMAHA
BROWN
DONIPHAN
ATCHISON
SHERMAN
THOMAS
SHERIDAN
GRAHAM
ROOKS
OSBORNE
MITCHELL
CLOUD
CLAY
RILEY
POTTAWATOMIE
JACKSON
WALLACE
LOGAN
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TREGO
ELLIS
RUSSELL
LINCOLN
OTTAWA
GEARY
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JEFFERSON
LEAVENWORTH
WYAN.
JOHNSON
GREELEY
WICHITA
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LANE
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RUSH
BARTON
ELLSWORTH
SALINE
DICKINSON
MORRIS
WABAUNSEE
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MIAMI
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MARION
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COFFEY
ANDERSON
LINN
HAMILTON
KEARNY
FINNEY
HODGEMAN
PAWNEE
STAFFORD
RENO
HARVEY
BUTLER
GREENWOOD
WOODSON
ALLEN
BOURBON
GRAY
EDWARDS
SEDGWICK
FORD
PRATT
STANTON
GRANT
HASKELL
KIOWA
KINGMAN
ELK
WILSON
NEOSHO
CRAWFORD
MEADE
CLARK
BARBER
SUMNER
COWLEY
MONTGOM.
LABETTE
CHEROKEE
MORTON
STEVENS
SEWARD
COMANCHE
HARPER
CHAUTAUQUA
SSIR No. 4
SSIR Nos. 4 & 37
SSIR No. 37
SCALE-STATUTE MILES
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