

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

...KANSAS

Soil Survey Investigations Report No. 4

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

...KANSAS

August 1966

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

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

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

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

: analysis run but none detected

-(s): none detected by sensitive qualitative test

blank: analysis not run

nd: analysis not run

<: less than reported amount or none present
 3. PARTICLE-SIZE ANALYSES
 - A. <2-mm fraction (pipet method)
 1. Airdry samples
 - a. Carbonate and noncarbonate clay
 2. Moist samples
 - a. Carbonate and noncarbonate clay
 - B. >2-mm fraction
 1. 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. Paraffin-coated clods
 - a. Ovendry
 3. Cores
 - a. Field moist
 4. Nonpolar-liquid-saturated clods
 - B. Water retention
 1. Pressure-plate extraction (1/3 or 1/10 bar)
 - a. Sieved samples
 - b. Soil pieces
 - c. Natural clods
 - d. Cores
 2. Pressure-membrane extraction (15 bars)
 3. Sand table absorption
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 - C. Water-retention difference
 1. 1/3 bar to 15 bars
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 - D. Coefficient of linear extensibility
 1. Dry to moist
 - E. Micromorphology
 1. Thin sections
 - a. Preparation
 - b. Interpretation
 - c. Moved-clay percentage
 5. ION-EXCHANGE PROPERTIES
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 - a. Direct distillation
 - b. Displacement, distillation
 - 5A. Cation-exchange capacity (cont.)
 2. NaOAc , pH 8.2
 - a. Centrifuge method
 3. Sum of cations
 - a. Acidity by $\text{BaCl}_2\text{-TEA}$, pH 8.2; bases by NH_4OAc , pH 7.0
 4. KOAc , pH 7.0
 5. BaCl_2 , pH 8.2
 - a. Barium by flame photometry
 - B. Extractable bases
 1. NH_4OAc extraction
 - a. Uncorrected
 - b. Corrected (exchangeable)
 2. KCl-TEA extraction, pH 8.2
 - C. Base saturation
 1. NH_4OAc , 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_4OAc , pH 7.0
 - E. Sodium adsorption ratio
 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
 3. Peroxide digestion
 - a. Weight loss
 - B. Nitrogen
 1. Kjeldahl digestion
 - a. Ammonia distillation
 2. Semimicro Kjeldahl
 - a. Ammonia distillation
 - C. Iron
 1. Dithionite extraction
 - a. Dichromate titration
 - b. EDTA titration
 2. Dithionite-citrate extraction
 - a. Orthophenanthroline colorimetry
 3. Dithionite-citrate-bicarbonate extraction
 - a. Potassium-thiocyanate colorimetry
 4. Pyrophosphate-dithionite extraction
 - D. Manganese
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 - a. Permanganate colorimetry
 - E. Calcium carbonate
 1. HCl treatment
 - a. Gas volumetric
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 - c. Weight loss
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 - a. Visual, gas bubbles
 - F. Gypsum
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 - a. Precipitation in acetone
 - G. Aluminum
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 - a. Aluminon I
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 - d. Fluoride titration
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 - a. Aluminon III
 4. NaOAc extraction
 - a. Aluminon III
 - H. Extractable acidity
 1. $\text{BaCl}_2\text{-triethanolamine I}$
 - a. Back-titration with HCl
 2. $\text{BaCl}_2\text{-triethanolamine II}$
 - a. Back-titration with HCl
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 - a. Back-titration with NaOH
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 - K. Chloride
 1. Saturation extract
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 - a. Gravimetric, BaSO_4
 - M. Nitrate
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 - N. Calcium
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 - a. EDTA titration
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 - a. EDTA-alcohol separation
 - b. Oxalate-permanganate I
 - c. Oxalate-permanganate II
 - d. Oxalate-cerate
 3. $\text{NH}_4\text{Cl-EtOH}$ extraction
 - a. EDTA titration
 4. KCl-TEA extraction
 - a. Oxalate-permanganate
 - O. Magnesium
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 - a. EDTA titration
 2. NH_4OAc extraction
 - a. EDTA-alcohol separation
 - b. Phosphate titration
 - c. Gravimetric, $\text{Mg}_2\text{P}_2\text{O}_7$
 3. $\text{NH}_4\text{Cl-EtOH}$ extraction
 - a. EDTA titration
 - P. Sodium
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 - a. Flame photometry
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 - a. Flame photometry
 - Q. Potassium
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 - a. Flame photometry
 2. NH_4OAc extraction
 - a. Flame photometry
 - R. Sulfur
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 - S. Total phosphorus
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 - b. Organic-matter removal
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 - d. Particle-size fractionation
 2. X-ray diffraction
 3. Differential thermal analysis
 - B. Optical analysis
 1. Grain studies
 - C. Total analysis
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 2. X-ray emission spectrography
 - D. Surface area
 1. Glycerol retention
 8. MISCELLANEOUS
 - A. Saturated paste, mixed
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 2. Conductivity, saturated paste
 - B. Saturated paste, capillary rise
 1. Saturation extract
 - a. Conductivity
 - C. pH
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 - b. Saturated paste
 - c. KCl
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 2. To noncarbonate clay
 3. Ca to Mg (extractable)

PREFACE

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

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

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

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

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

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

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

*Soil Survey
Soil Conservation Service*

KANSAS

<u>Soil Series</u>	<u>County</u>	<u>Soil Survey No.</u>	<u>Page</u>	<u>Soil Series</u>	<u>County</u>	<u>Soil Survey No.</u>	<u>Page</u>
Bethany	Reno	S58Kans-78-3	3	Lockhard	Saline	S53Kans-85-1	43
	Reno	S58Kans-78-4	5		Saline	S53Kans-85-2	45
Carwile	Reno	S58Kans-78-10	7	Muir	Republic	S53Kans-79-2	47
	Reno	S58Kans-78-11	9		Republic	S53Kans-79-4	49
Colby	Hamilton	S57Kans-38-1	11		Shawnee	S53Kans-89-1	51
	Hamilton	S57Kans-38-2	13		Shawnee	S53Kans-89-2	53
Dwight	Butler	S59Kans-8-3	15	Newtonia	LaBette	S55Kans-50-1	55
	Butler	S59Kans-8-7	17	Pratt	Reno	S58Kans-78-6	57
Ebenezer	Saline	S53Kans-85-3	19		Reno	S58Kans-78-12	59
	Saline	S53Kans-85-4	21	Richfield	Hamilton	S57Kans-38-3	61
Farnum	Reno	S58Kans-78-5	23		Hamilton	S57Kans-38-4	63
	Reno	S58Kans-78-9	25	Shellabarger	Reno	S58Kans-78-1	65
Goessel	Butler	S59Kans-8-1	27	Tabler	Reno	S58Kans-78-7	67
	Butler	S59Kans-8-2	29		Reno	S58Kans-78-8	69
Harney	Ford	S57Kans-29-1	31	Tivoli	Reno	S59Kans-78-1	71
	Ford	S57Kans-29-2	33		Reno	S59Kans-78-2	73
Keith	Logan	S57Kans-55-1	35	Ulysses	Hamilton	S57Kans-38-5	75
	Logan	S57Kans-55-2	37		Hamilton	S57Kans-38-6	77
Lancaster	Saline	S53Kans-85-5	39		Logan	S57Kans-55-3	79
	Saline	S53Kans-85-6	41		Logan	S57Kans-55-4	81

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<u>County</u>	<u>Soil Series</u>	<u>Soil Survey No.</u>	<u>Page</u>
Butler	Dwight	S59Kans-8-3	15
	Dwight	S59Kans-8-7	17
	Goessel	S59Kans-8-1	27
	Goessel	S59Kans-8-2	29
Ford	Harney	S57Kans-29-1	31
	Harney	S57Kans-29-2	33
Hamilton	Colby	S57Kans-38-1	11
	Colby	S57Kans-38-2	13
	Richfield	S57Kans-38-3	61
	Richfield	S57Kans-38-4	63
	Ulysses	S57Kans-38-5	75
	Ulysses	S57Kans-38-6	77
LaBette	Newtonia	S55Kans-50-1	55
Logan	Keith	S57Kans-55-1	35
	Keith	S57Kans-55-2	37
	Ulysses	S57Kans-55-3	79
	Ulysses	S57Kans-55-4	81
Reno	Bethany	S58Kans-78-3	3
	Bethany	S58Kans-78-4	5
	Carwile	S58Kans-78-10	7
	Carwile	S58Kans-78-11	9
	Tivoli	S59Kans-78-1	71
	Tivoli	S59Kans-78-2	73
	Farnum	S58Kans-78-5	23
	Farnum	S58Kans-78-9	25
	Pratt	S58Kans-78-6	57
	Pratt	S58Kans-78-12	59
	Shellabarger	S58Kans-78-1	65
	Tabler	S58Kans-78-7	67
	Tabler	S58Kans-78-8	69
	Republic	Muir	S53Kans-79-2
Muir		S53Kans-79-4	49
Saline	Ebenezer	S53Kans-85-3	19
	Ebenezer	S53Kans-85-4	21
	Lancaster	S53Kans-85-5	39
	Lancaster	S53Kans-85-6	41
	Lockhard	S53Kans-85-1	43
	Lockhard	S53Kans-85-2	45
Shawnee	Muir	S53Kans-89-1	51
	Muir	S53Kans-89-2	53

SOIL SURVEY LABORATORY

Lincoln, Nebr.

November 1958

SOIL TYPE Bethany
silt loam

LOCATION Reno County, Kansas

SOIL NOS. S58kans-78-3

LAB. NOS. 8063-8071

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)								3A1		2A2		TEXTURAL CLASS
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY			> 2			
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	< 19mm			
0-7	Ap	0.3	3.3a	3.4a	4.5a	10.5a	54.1	23.9	50.8	15.6	Tr.	sil		
7-11	A3	0.6	3.3a	3.2a	3.3a	9.1a	47.2	33.3	41.9	14.8	-	sic1		
11-16	B1	1.4	4.4a	3.0a	4.6a	6.8a	41.8	38.0	35.0	15.6	Tr.	cl		
16-27	B21t	1.8	3.2a	1.8a	3.1a	7.2a	45.3	37.6	37.5	16.5	Tr.	sic1		
27-36	B22t	0.3	1.7a	1.7a	3.5a	9.4a	47.1	36.3	42.0	16.3	Tr.	sic1		
36-45	B23t	1.4b	1.5b	1.5b	1.5b	9.7b	49.9	34.5	42.2	17.5	Tr.	sic1		
45-60	B31ca	1.6c	1.1c	1.2b	1.4b	7.4b	57.8	29.5	38.6	26.9	6.5	sic1		
60-76	B32ca	0.7c	1.0d	1.1d	2.2d	6.8d	57.9	30.3	43.5	22.3	3.9	sic1		
76-99	Cca	0.3c	0.6d	0.6d	1.2d	5.1d	68.8	23.4	39.5	35.0	2.0	sil		
PH		8C1a ORGANIC MATTER				8A2 ELECTRICAL CONDUCTIVITY		6E1a CaCO ₃ equivalent		MOISTURE TENSIONS				
		6A1a ORGANIC CARBON		6B1a NITROGEN		EST. SALT (BUREAU CUP)		GYPSUM (me./100g. SOIL)		1/10 ATMOS. 1/3 ATMOS. 15 ATMOS.		4B2		
1:1		1:5	1:10	%	%	C/N	MILLIMHOS PER CM	%	%	%	%	%		
5.4	5.3	5.9	1.54	0.115	13.4	<0.20	0.3					8.6		
6.3	6.6	6.7	1.33	0.106	12.5	<0.20	0.4					13.2		
6.4	6.9	6.9	0.91	0.073	12	<0.20	0.4					14.9		
6.6	7.0	7.0	0.54	0.045	12	<0.20	0.5	Δ				14.9		
6.7	7.2	7.3	0.39			<0.20	0.5	Δ				14.6		
7.7	8.3	8.4	0.26			<0.20	0.6	2				14.3		
8.1	8.5	8.7	0.06			<0.20	0.6	18				12.7		
8.1	8.6	8.7	0.04			<0.20	0.6	12				13.6		
8.2	8.7	8.9	0.01			<0.20	0.6	24				10.9		
5A1a		EXTRACTABLE CATIONS 5B1a					BASE SAT. %		SATURATION EXTRACT SOLUBLE			8A		
CATION EXCHANGE CAPACITY NH ₄ Ac		6N2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ Ac EXCH.	6P1a	6Q1a			MOISTURE AT SATURATION		
		Ca	Mg	H	Na	K		No	K			%		
		milliequivalents per 100g. soil					5C1	milliequivalents per liter						
16.8	10.0	3.0	6.9	<0.1	0.7	82	0.3	0.2				43.3		
22.8	15.8	5.5	5.1	<0.1	0.6	96	0.4	0.1				57.2		
26.6	18.6	6.9	4.7	0.1	0.5	98	0.4	0.1				58.9		
24.3	19.2	7.4	3.8	0.1	0.5	112	0.5	0.1				62.5		
26.0	19.7	7.2	3.3	0.1	0.5	106	0.6	<0.1				64.8		
24.9				0.2	0.5		0.8	<0.1				59.8		
20.3				0.2	0.4		1.2	0.1				55.4		
21.4				0.4	0.5		2.0	0.1				60.0		
16.7				0.6	0.4		2.9	0.1				56.2		

- a. Few dark brown to black coner. (Mn-Fe?)
- b. Few CaCO₃ coner.
- c. Many CaCO₃ coner.
- d. Common CaCO₃ coner.

Soil Type: Bethany silt loam.

Location: Reno County, Kansas. 330' W and 1320' N of S $\frac{1}{2}$ Corner of Sec. 14, T25S, R5W. About 12 miles SE of Hutchinson.

Date of Sampling: May 5, 1958.

Collectors: Jordan, Rockers, and Otsuki.

Physiographic Position: Upland on Pleistocene mantle presumably old alluvium of loamy and clayey sediments. Elevation approximately 1500'.

Climate: Average annual precipitation about 28".

Topography: Nearly level; gradient about .5 percent.

Drainage: Runoff slow; permeability slow. Well drained.

Vegetation: Originally tall grass prairie.

Use: Cropland.

Description by: J. J. Rockers and H. T. Otsuki.

Soil No.: S58Kans-78-3.

Lincoln

Lab. No.

- | | | | |
|------|-------|--------|---|
| 8063 | Ap | 0-7" | Dark grayish brown (10YR 3.5/2 dry; 2.5/2 moist) heavy silt loam; weak granular; friable; noncalcareous; grades shortly to |
| 8064 | A3 | 7-11" | Very dark grayish brown (10YR 3/2 dry; 2/2 moist) light silty clay loam; strong moderate fine and medium granular with very thin patchy clayskins; moderately friable; few worm casts; noncalcareous; grades through 3" to |
| 8065 | B1 | 11-16" | Dark grayish brown (10YR 3.5/2 dry; 2.5/2 moist; 3/3 moist crushed) light clay; moderately strong fine subangular blocky with thin continuous clayskins; very firm; few fine open rootlet channels; noncalcareous; grades through 3" to |
| 8066 | B21t | 16-27" | Dark grayish brown (10YR 4/2 dry; 3/3 moist crushed) clay; moderate fine and very fine irregular blocky with distinct continuous clayskins; very firm; few weak slickensides; noncalcareous; grades through 4" to |
| 8067 | B22t | 27-36" | Dark grayish brown (10YR 4/2.5 dry; 3/3 moist crushed) clay; moderate fine irregular blocky with distinct continuous clayskins; very firm; few weak slickensides up to 1 sq. inch area; few rootlets in peds; noncalcareous; grades through 6" to |
| 8068 | B23t | 36-45" | Brown (10YR 4.5/3 dry; 4/3 moist) clay; moderate medium and fine irregular blocky with distinct continuous clayskins; very firm; few fine faint mottles of strong brown; mass noncalcareous; less than 1% of fine hard concretions of CaCO ₃ ; grades through 6" to |
| 8069 | B31ca | 45-60" | Brown (7.5YR 5/4 dry; 4/4 moist; 5/6 moist crushed) clay; moderate fine subangular and irregular blocky with weak patchy clayskins; very firm; vertical veins of dark material believed to be old rootlet channels; calcareous with 20% of mass being fine and very coarse, hard and soft concretions of CaCO ₃ ; grades through 7" to |
| 8070 | B32ca | 60-76" | Brown (7.5YR 5.5/4 dry; 5/6 moist crushed) light clay; moderate fine subangular and irregular blocky with weak patchy clayskins; firm; calcareous with 10% of mass being fine and very coarse, hard and soft concretions of CaCO ₃ ; grades through 6" to |
| 8071 | Cca | 76-99" | Reddish yellow (5YR 6/6 dry; 5/6 moist) silty clay loam; moderate medium subangular and irregular blocky with weak patchy clayskins; firm; calcareous with large seams and concretions of CaCO ₃ . |

Remarks: Horizons 0-7"; 27-36"; and 45-60" were sampled for Bureau of Public Roads. Soil was moist to depth sampled. Except where specified moist, the colors refer to dry soil.

Bethany silt loam. Profiles S58Kans-78-3 and -4 are typical of the soil as represented in Reno County, Kansas and well within the range of the Bethany series. E. H. Templin, January 11, 1960.

SOIL TYPE Bethany LOCATION Reno County, Kansas
silt loam

SOIL NOS. S58Kans-78-4 LAB. NOS. 8072-8079

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	3A1 0.2-0.02	2A2 0.02-0.002 (<19mm)	> 2	
0-6	Ap	0.6a	1.8a	1.6a	3.5a	10.3a	58.2	24.0	53.1	17.1	Tr.	sil
6-12	A3	0.6a	2.0a	1.4a	1.6a	9.8a	54.6	30.0	48.8	15.9	Tr.	sic1
12-17	B1	1.8a	2.3a	1.1a	1.2a	7.2a	49.4	37.0	41.0	15.9	Tr.	sic1
17-23	B21t	2.8a	2.9a	1.4a	1.7a	6.6a	43.0	41.6	35.8	14.6	Tr.	sic
23-38	B22t	1.8a	2.8a	1.2a	1.2a	7.0a	45.2	40.8	37.2	15.4	Tr.	sic
38-49	B23t	1.4b	3.1b	1.2b	1.6b	7.9b	46.4	38.4	39.6	15.4	Tr.	sic1
49-73	B31ca	0.8b	2.4b	1.4b	1.4b	7.6b	52.7	33.7	41.1	19.7	Tr.	sic1
73-96	B32ca	0.2b	1.2b	1.0b	1.0b	9.8b	53.4	33.4	44.4	18.9	Tr.	sic1

pH	ORGANIC MATTER			EST% SALT (BUUREAU CUP)	ELECTRI-CAL CONDUCTIVITY EC x 10 ³ MILLIMHRS PER CM 6A1a	MOISTURE TENSIONS					
	6C1a 1:5	6A1a 1:10	6B1a ORGANIC CARBON %			6B1a NITRO-GEN %	6C/N	6E1a CoCO ₃ equiv-alent %	GYP SUM ms./100g. SOIL	4B2 1/10 ATMOS. %	1/3 ATMOS. %
6.0	6.4	6.4	1.83	0.139	13.2	<0.20	0.4				9.9
6.1	6.4	6.5	1.73	0.134	12.9	<0.20	0.4				12.3
6.4	6.8	6.9	1.23	0.097	12.7	<0.20	0.4				14.8
6.5	7.1	7.2	0.75	0.061	12	<0.20	0.4	<1			17.2
7.0	7.6	7.7	0.46	0.042	11	<0.20	0.5	<1			17.5
7.9	8.5	8.6	0.21			<0.20	0.6	1			17.0
8.0	8.6	8.7	0.04			<0.20	0.5	4			15.4
8.0	8.8	8.9	0.01			<0.20	0.5	2			15.4

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					BASE SAT. % NH ₄ Ac EXCH.	SATURATION EXTRACT SOLUBLE		8A MOISTURE AT SATURATION %
	6N2b Ca	6O2b Mg	6H1a H	6P2a No	6Q2a K		6P1a Na	6Q1a K	
18.9	12.1	3.3	7.4	0.1	0.9	87	0.8	0.3	42.4
22.4	15.1	4.2	6.5	0.1	0.6	89	0.5	0.2	52.4
25.7	18.6	5.5	5.7	0.1	0.5	96	0.6	0.1	56.9
29.7	22.2	7.4	4.3	0.2	0.5	102	0.8	0.1	63.5
28.7	22.5	7.7	2.8	0.4	0.5	108	1.3	<0.1	68.2
27.1				0.6	0.5		2.3	0.1	64.7
23.4				0.8	0.5		2.6	0.1	92.5
21.8				0.9	0.6		2.7	0.1	77.8

a. Few smooth dark brown to black concr. (Mn-Fe?)
b. Few CaCO₃ concr.

Soil Type: Bethany silt loam.

Location: Reno County, Kansas. 1020' S and 206' E of NW $\frac{1}{4}$ Corner, Sec. 4, T25S, R5W, about 10 miles SSE of Hutchinson.

Date of Sampling: May 6, 1958.

Collectors: Jordan, Rockers, and Otsuki.

Physiographic Position: Upland on Pleistocene mantle presumably old alluvium of loamy and clayey sediments. Elevation approximately 1500'.

Climate: Average annual precipitation about 28".

Topography: Nearly level; gradient about .5 percent.

Drainage: Runoff slow; permeability slow. Well-drained.

Vegetation: Originally tall grass prairie.

Use: Cropland, now in wheat.

Described by: J. J. Rockers and H. T. Otsuki.

Soil No.: S58Kans-78-4.

Lincoln

Lab. No.

- | | | | |
|------|-------|--------|--|
| 8072 | Ap | 0-6" | Dark grayish brown (10YR 4/2 dry; 2.5/2 moist) silt loam or loam; weak granular; friable; noncalcareous; grades shortly to |
| 8073 | A3 | 6-12" | Dark grayish brown (10YR 3.5/2 dry; 2/2 moist) light silty clay loam; strong moderate fine granular; moderately friable; few worm casts; noncalcareous, grades through 3" to |
| 8074 | B1 | 12-17" | Dark grayish brown (10YR 4/2 dry; 2.5/2.5 moist) heavy silty clay loam; moderately strong fine and very fine subangular blocky with weak patchy clayskins; firm; few wormcasts; few fine and very fine sand grains; noncalcareous; grades through 3" to |
| 8075 | B21t | 17-23" | Dark grayish brown (10YR 4/2 dry; 3/2 moist; 3/3 moist crushed) light clay; moderate medium and coarse blocky breaking to weak fine blocky with distinct continuous clay skins; very firm; few open rootlet channels; few fine concretions of iron; noncalcareous; grades through 4" to |
| 8076 | B22t | 23-38" | Brown (10YR 5/3 dry; 3/2.5 moist) with fine vertical old cracks filled with darker material from above; clay; moderate coarse and fine irregular blocky with distinct continuous clayskins; few weak slickensides with area up to 2 sq. inches; very firm; few rootlets in peds; noncalcareous; grades through 6" to |
| 8077 | B23t | 38-49" | Yellowish brown (10YR 5/4 dry; 4.5/3 moist) light clay, weak moderate fine irregular blocky with weak continuous clayskins; few weak slickensides with area up to 1 sq. inch; very firm; mass noncalcareous; few fine (1-3%) hard concretions of CaCO ₃ ; grades through 6" to |
| 8078 | B31ca | 49-73" | Light brown (7.5YR 5.5/4 dry; 5/4 moist) heavy silty clay loam; weak moderate fine subangular and irregular blocky with weak patchy clayskins; firm; mass noncalcareous; contains about 10% of fine to very coarse, soft and hard concretions of CaCO ₃ ; grades through 8" to |
| 8079 | B32ca | 73-96" | Reddish yellow (7.5YR 6/6 dry; 5.5/6 moist) heavy silty clay loam; about 5% of soft fine to coarse concretions of CaCO ₃ ; augered. |

Remarks: Horizons 0-6"; 23-38"; and 49-73" were sampled for Bureau of Public Roads. Soil was moist to depth sampled.

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

SOIL TYPE Carwile LOCATION Reno County, Kansas
fine sandy loam

SOIL NOS. S58Kans-78-10 LAB. NOS. 8124-8133

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent, 3A1)									TEXTURAL CLASS		
		1B1a		2A2			3A1						
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	0.2-0.075	0.075-0.0075	> 2 (19mm)		
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.0075	< 0.002	0.2-0.075	0.075-0.0075			
0-7	Ap	0.2	6.5	20.9	42.1	13.3	12.2	4.8	40.3	3.1	-	ls	
7-11	A11	<0.1	4.1	16.1	30.2	14.7	16.9	10.0	43.2	5.0	-	fs1	
11-19	A12	<0.1	4.4	16.2	40.5	14.2a	13.6	11.1	41.7	4.3	-	fs1	
19-23	B21t	0.3	5.2	13.8	36.5	10.5a	16.4	17.3	37.7	6.6	-	fs1	
23-29	B22t	<0.1	1.8	4.5	5.5	8.8a	39.3	40.1	30.3	17.9	-	c	
29-46	B23t	<0.1	0.8	2.2	5.5	3.3a	51.9	36.3	33.8	24.1	-	sic1	
46-55	B3	0.2	4.3	9.4	11.6	17.2a	36.4	20.9	40.7	13.8	-	l	
55-68	B3C1	0.5	8.4	15.5	30.5	10.2a	19.4	15.5	36.2	7.4	-	fs1	
63-84	B3C2	0.7	9.1	17.5	35.7	12.5a	12.5	12.0	37.9	4.4	Tr.	sl	
84-104	B3C3	0.4	6.2	13.6	34.0	14.7a	17.7	13.4	44.2	5.1	Tr.	fs1	
	pH	8C1a	ORGANIC MATTER		8A2	ELECTRICAL CONDUCTIVITY	6E1a	MOISTURE TENSIONS					
		1:5	6A1a	6B1a	EST. SALT (MUREAU CUP)	EL-103 MILLIMOS PER CM	CaCO ₃ equivalent	GYP SUM mg./100g SOIL	4B1a 1/10 ATMOS.	4B1a 1/3 ATMOS.	4B2 15 ATMOS.		
		1:10	ORGANIC CARBON %	NITROGEN %	C/N				%	%	%		
6.5	6.7	6.9	0.43	0.042	10	<0.20	0.5	<	11.3	6.6	2.1		
6.3	6.6	6.8	0.57	0.060	10	<0.20	0.4		18.3	11.0	4.3		
6.2	6.5	6.6	0.48	0.049	10	<0.20	0.4		21.1	11.6	4.6		
6.4	6.6	6.7	0.48	0.048	10	<0.20	0.4				7.0		
6.4	6.9	6.9	0.50	0.052	10	<0.20	0.4				16.1		
6.5	7.1	7.1	0.23			<0.20	0.3	<			15.5		
7.0	7.3	7.3	0.10			<0.20	0.4	<			8.9		
7.0	7.3	7.2	0.06			<0.20	0.4	<			6.7		
6.7	7.0	7.0	0.05			<0.20	0.4	<			5.2		
7.1	7.4	7.4	0.02			<0.20	0.5	<			6.3		
	5A1a	EXTRACTABLE CATIONS				5B1a	SATURATION EXTRACT SOLUBLE					8A1	8A
	CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6H1a	6P2a	6Q2a	BASE SAT. % NH ₄ Ac EXCH.	6P1a	6Q1a				MOISTURE AT SATURATION %
		Ca	Mg	H	Na	K		Na	K				
		milliequivalents per 100g. soil					5C1	milliequivalents per liter					
4.1	2.5	0.5	1.4	<0.1	0.4	83	1.4	0.7				25.4	
7.4	4.4	1.1	2.7	0.1	0.6	84	1.5	0.7				28.8	
7.5	4.7	1.2	2.3	<0.1	0.4	84	0.8	0.4				30.6	
11.9	8.1	2.2	3.7	<0.1	0.4	90	0.5	0.2				41.0	
28.9	20.8	6.0	5.2	0.1	0.7	96	0.4	0.1				71.0	
25.9	18.8	5.6	3.8	0.1	0.6	97	0.4	0.1				82.3	
16.1	11.9	3.3	1.8	0.1	0.3	97	0.6	0.1				48.4	
12.1	9.0	2.6	1.4	0.1	0.3	99	0.6	0.1				38.3	
9.2	6.7	1.9	0.9	<0.1	0.2	96	0.6	0.1				36.9	
10.5	8.6	2.1	1.4	<0.1	0.3	105	0.6	0.1				40.2	

a. Few smooth black cond. (Mn?).

Soil Type: Carwile fine sandy loam.
 Location: Reno County, Kansas. 270' N and 305' W of SE Corner of Sec. 21,
 T23S, R9W. About 1 1/4 miles west of Hutchinson.
 Date of Sampling: May 8, 1958.
 Collectors: Jordan, Rockers, and Otsuki.
 Physiographic Position: Upland. Elevation approximately 1775'.
 Climate: Average annual precipitation about 27".
 Topography: Nearly level, concave, slightly depressional, eolian mantled, billow
 upland.
 Drainage: Water collects; very slow internally; water table is generally within
 10', 90 inches to water table on date sampled.
 Vegetation: Originally prairie grasses.
 Use: Cropland. Now in sorghum stubble.
 Described by: J. J. Rockers and H. T. Otsuki.
 Soil No.: S58Kans-78-10.

Lincoln
 Lab. No.

- 8124 Ap 0-7" Grayish brown (10YR 5/2 dry; 3/2 moist) light fine sandy loam; structure destroyed by cultivation; very friable; grades shortly to
- 8125 A11 7-11" Dark grayish brown (10YR 4/1.5 dry; 2/1.5 moist; 2/2 when crushed) fine sandy loam; porous massive; very friable; grades through 2" to
- 8126 A12 11-19" Dark grayish brown (10YR 4/2 dry; 3/2 moist) heavy sandy loam; faintly mottled with brown; porous massive; friable; grades through 2" to
- 8127 B21t 19-23" Brown (10YR 4.5/2.5 dry; 4/3 moist) light sandy clay loam; common faint brown mottles of 1/4" diameter; weak subangular blocky; moderately friable; grades through 1" to
- 8128 IIB22t 23-29" Grayish brown (2.5Y 5/2 dry; 3.5/2.5 moist) sandy clay; few fine faint, brown mottles; moderate medium irregular blocky with thick continuous clayskins; very firm; many open rootlet channels; grades through 4" to
- 8129 IIB23t 29-46" Light olive gray (5Y 6/2 dry; 5/2 moist) sandy clay; moderate medium irregular blocky with thick continuous clayskins; very firm; few old cracks about 1/8 to 1/4" wide filled with material similar to the A₃ horizon; grades through 6" to
- 8130 IIB3 46-55" Pale olive (5Y 6/3 dry; 5/3 moist) heavy sandy clay loam; weak coarse subangular blocky with vertical faces coated with clayskins; firm; many fine rootlet channels and old crevices filled with material similar to the A₃ horizon; common fine distinct brown mottles; grades through 5" to
- 8131 IIIC1 55-68" Light yellowish brown (2.5Y 6/3 dry; 5/3 moist) sandy clay loam; nearly massive; moderately firm; few vertical faces with distinct clayskins; few fine and medium distinct brown mottles; few fine open rootlet channels; grades through 2" to
- 8132 IIIC2 68-84" Light yellowish brown (1Y 6/4 dry; 5.5/4 moist) sandy loam; massive; very friable; common medium and coarse brown mottles; augered.
- 8133 IIIC3 84-104" Same as above; water table at 90"; augered.

Remarks: Moist to water table. Entire profile noncalcareous.
 Except where specified moist; the colors refer to dry soil.
 Horizons 0-7"; 11-19"; and 29-46" were sampled for Bureau of Public Roads.

Carwile fine sandy loam. Profile S58Kans-78-10 is an excellent representative of this soil type as extensively represented in south-central Kansas. Profile S58Kans-78-11 is likewise good Carwile; the A horizon is a bit sandy for the fine sandy loam type. Note the lower content fines in the Alp than in the undisturbed A₁ beneath, presumably mostly a result of winnowing.
 E. H. Templin, January 11, 1960.

SOIL TYPE Carwile LOCATION Reno County, Kansas
 fine sandy loam

SOIL NOS. S58Kans-78-11 LAB. NOS. 8134-8142

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)									TEXTURAL CLASS	
		1B1a		3A1					2A2			
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	> 2	(19mm)		
	2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002			
0-7	Ap	1.9	11.0	18.1	39.5	14.1a	11.0	4.4	41.2	2.7	-	1s
7-13	All	0.7	7.5	16.5	45.3	14.6a	8.9	5.0	43.8	2.9	Tr.	lfs
13-17	Al2	1.5	12.0	19.1	40.7a	8.8a	8.7	9.2	34.1	2.8	Tr.	1s
17-21	B2lt	2.7	10.4	13.9	24.8a	7.6a	20.2	20.4	31.1	7.9	Tr.	scl
21-33	IIB23t	0.1	0.9a	1.5a	2.4a	3.4a	49.7	42.0	30.4	23.4	Tr.	sic
33-43	IIB23t	<0.1	1.6a	3.9a	8.7a	6.8a	50.0	29.0	41.2	19.3	Tr.	cl
43-62	IIB31	0.1	0.4a	1.2a	2.9a	3.8a	56.6	35.0	35.0	26.6	Tr.	sic1
62-75	IIB32	<0.1	0.4a	1.1a	2.7a	6.8a	59.8	29.2	44.7	23.1	Tr.	sic1
75-103	IIC	0.1	1.8a	4.5a	12.9a	15.5a	34.3	30.9	45.0	11.0	Tr.	cl
	pH	8C1a ORGANIC MATTER				8A2	ELECTRICITY	6E1a	MOISTURE TENSIONS			
		6A1a		6B1a		EST% SILT (BUREAU COP)	CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM	CaCO ₃ equivalent	GYPSUM mb. 100g. SOIL	4B1a	4B1a	4B2
	1:1	1:5	1:10	ORGANIC CARBON	NITROGEN	C/N		%		1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.
				%	%					%	%	%
	5.7	6.1	6.2	0.71	0.077	9	<0.20	0.6		9.4	5.8	2.0
	6.2	6.5	6.5	0.34	0.043	8	<0.20	0.5		10.2	6.2	2.4
	6.1	6.3	6.4	0.29	0.033	9	<0.20	0.4		14.3	9.2	3.9
	5.9	6.4	6.6	0.37	0.043	9	<0.20	0.4				8.2
	6.4	7.0	7.0	0.30	0.051	6	<0.20	0.4				17.3
	6.9	7.5	7.5	0.10			<0.20	0.4	∇			13.4
	7.0	7.8	7.9	0.17			<0.20	0.4	∇			16.8
	7.6	8.3	8.5	0.06			<0.20	0.6	∇			14.1
	7.9	8.6	8.7	0.04			<0.20	0.8	∇			13.4
	5A1a	EXTRACTABLE CATIONS				5B1a	BASE SAT. %	SATURATION EXTRACT SOLUBLE		8A1		8A
	CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ Ac EXCA.	6P1a	6Q1a			MOISTURE AT SATURATION
		Ca	Mg	H	Na	K		Na	K			%
		milliequivalents per 100g. soil					5C1	milliequivalents per liter				
	4.0	2.7	0.4	3.6	<0.1	0.3	85	0.7	1.0			28.4
	4.4	2.6	0.8	1.8	<0.1	0.3	84	0.6	0.6			25.8
	6.8	4.4	1.0	3.2	<0.1	0.2	82	0.5	0.2			27.1
	14.3	10.0	3.3	3.7	0.1	0.4	96	0.5	0.2			42.1
	29.3	22.9	6.8	4.3	0.3	0.6	104	0.7	0.1			86.2
	20.9	16.4	4.1	2.3	0.3	0.5	102	1.2	0.1			64.4
	25.9	20.9	4.7	2.8	0.6	0.5	103	1.5	0.1			68.8
	21.7	18.3	4.5	0.9	0.7	0.4	110	2.4	0.1			57.1
	21.5	18.3	4.6	0.9	1.1	0.5	114	3.8	0.1			58.1

a. Few smooth black concr. (Mn?).

Soil Type: Carville fine sandy loam.

Location: Reno County, Kansas. 406' N and 267' W of east quarter corner of Sec. 18, T22, R9W. About 25 miles West NW of Hutchinson.

Date of Sampling: May 8, 1958.

Collectors: Jordan, Rockers and Otsuki.

Physiographic position: Upland. Elevation approximately 1750'.

Climate: Average annual precipitation about 27".

Topography: Nearly level, concave, slightly depressional, eolian mantled, billowy upland.

Drainage: Water collects; very slow internally; water table is generally within 15'. Water table was not found within 120" when sampled.

Vegetation: Originally prairie grasses.

Use: Alfalfa.

Described by: J. J. Rockers and H. T. Otsuki.

Soil No.: 550Kans-70-11.

Lincoln
Lab. No.

- | | | | |
|------|--------|---------|--|
| 8134 | Ap | 0-7" | Grayish brown (10YR 5/2 dry; 3.5/2 moist) light fine sandy loam; weakly granular; very friable; grades shortly to |
| 8135 | A11 | 7-13" | Dark grayish brown (10YR 4/2 dry; 3/2.5 moist) fine sandy loam; porous massive; very friable; grades through 2" to |
| 8136 | A12 | 13-17" | Brown (9YR 4/3 dry; 3.5/4 moist) fine sandy loam; few faint mottles of strong brown; porous massive; very friable; grades through 2" to |
| 8137 | B21t | 17-21" | Brown (9YR 4/3 dry; 3.5/4 moist) sandy clay loam; common fine distinct mottles of strong brown; weak moderate medium sub-angular blocky; moderately friable; weak patchy clayskins; grades through 1" to |
| 8138 | IIB22t | 21-33" | Dark grayish brown (2.5Y 4/2 dry; 4/2 moist; 4.5/2 moist crushed) sandy clay; common fine distinct mottles of strong brown; moderate fine irregular blocky with thick continuous clayskins; very firm; old cracks filled with material from above; common fine black mottles or streaks; many fine open rootlet channels; some partially clogged; grades through 3" to |
| 8139 | IIB23t | 33-48" | Light olive gray (5Y 6.5/2 dry; 5.5/2 moist) sandy clay; common medium distinct mottles of olive; weak medium and coarse irregular blocky with distinct patchy clayskins; very firm; old cracks filled with material from above; vertical black streaks; few fine open rootlet channels; grades through 4" to |
| 8140 | IIB31 | 48-62" | Light gray (5Y 7/2 dry; 5.5/2 moist) sandy clay; common medium and coarse distinct mottles of olive yellow and strong brown; weak coarse irregular blocky with distinct patchy clayskins; very firm; fine black spots; old cracks filled with material from above; very few fine open rootlet channels; grades through 4" to |
| 8141 | IIB32 | 62-75" | Light gray (5Y 7/2 dry; 6/2 moist) sandy clay; common fine and medium distinct mottles of strong brown; moderate coarse irregular blocky and subangular blocky with weak patchy clayskins; very firm; seams and common fine concretions of CaCO ₃ ; mass noncalcareous; grades through 6" to |
| 8142 | IIC | 75-103" | Pale yellow (5Y 7/3 dry; 6/3 moist) light sandy clay with common fine distinct mottles of strong brown; moderate fine and coarse blocky with weak patchy clayskins; firm; mass noncalcareous; seams and fine concretions of CaCO ₃ . |

Remarks: Horizons 0-7"; 13-17; and 33-48" were sampled for Bureau of Public Roads. Moist to depth sampled.

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

SOIL SURVEY LABORATORY

Lincoln, Nebr.

5/20/58

SOIL TYPE Colby
silt loam

LOCATION Hamilton County, Kansas

SOIL NOS. S57Kans-38-1

LAB. NOS. 5917-5922

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent.)								3A1		TEXTURAL CLASS
		1B1a		PARTICLE SIZE DISTRIBUTION (in mm.) (per cent.)				3A1		2A2		
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY			> 2 (19mm)	
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002		
0-2	Ap	2.2a	6.4a	2.7	10.8	18.7	44.5	14.7	62.3	9.5	Tr.	1
2-6	Al	1.0b	2.0b	1.2b	10.7b	17.5b	47.6	20.0	61.3	12.9	1.3	1
6-15	AC	0.5b	1.7b	1.1b	8.2b	14.9b	48.0	25.6	52.8	17.0	Tr.	1
15-26	ACca	2.4b	1.9b	0.9b	5.8b	12.9b	51.8	24.3	50.0	19.7	2.2	sil
26-37	Cca	0.1b	0.4b	0.2b	5.1b	13.4b	59.6	21.2	57.0	20.6	Tr.	sil
37-60	C	0.1	0.5b	0.3b	5.1b	14.8b	59.3	19.9	51.1	22.2	Tr.	sil

pH	8C1a			ORGANIC MATTER			6E1a		MOISTURE TENSIONS		
	1:5	1:10	ORGANIC CARBON	NITROGEN	C/N	CaCO ₃ equiv- oient	GYP SUM ma./100g. SOIL	1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.	
			%	%		%		%	%	%	
8.2	8.7	8.8	1.04	.098	10.6	3				7.4	
8.3	8.7	9.0	0.98	.105	9	4				9.3	
8.2	8.8	9.0	0.78	.090	9	9				11.6	
8.5	9.2	9.4	0.37	.040	9	10				10.6	
8.9	9.7	9.8	0.19			8				10.6	
8.9	9.7	9.9	0.14			9				9.9	

5A1a	EXTRACTABLE CATIONS					BASE SAT. NH ₄ Ac EXCH.	Base Sat. % on Sum Cations	Sum Bases	Sum Cations	Ca/Mg	4A3a Vol. Wt. c/g/cc
	Ca	Mg	H	Na	K						
CATION EXCHANGE CAPACITY NH ₄ Ac	milliequivalents per 100g. soil										
15.1					1.5						
18.4					1.6						1.20
18.5				0.1	0.7						
17.9				0.8	1.0						1.24
19.1				2.4	1.5						
18.5				4.2	1.7						

a. Some organic matter.
b. Few CaCO₃ concr.
c. Based on consistence terminology in the profile descriptions, the horizons were drier than midway between air-dry and field capacity.

Soil Type: Colby silt loam.

Location: Hamilton County, Kansas. 100' E of WL/4 corner Sec. 19, T23S, R41W.

Date of Sampling: July 9, 1957.

Collectors: J. S. Allen, C. W. McBee, H. T. Otsuki.

Physiographic Position: Upland. Elevation approximately 3300'.

Climate: Average annual precipitation about 17". Annual temperature about 54°.

Topography: Gently sloping erosional upland below the summit of the High Plains.

Loess mantled. Gradient of 2 percent.

Drainage: Well drained.

Vegetation: Blue grama, buffalograss, sand dropseed, annual weeds and grasses.

Use: Native pasture.

Soil No.: S57Kans-38-1.

Depth, Lincoln Lab.

No., and Horizon

0-2" 5917	Ap	Grayish brown (10YR 5/2 dry; 4/2 moist) silt loam; moderate fine platy; slightly hard; friable; calcareous; abrupt smooth boundary to
2-6" 5918	A1	Grayish brown (10YR 5/2 dry; 4/2 moist) silt loam; weak fine granular; slightly hard; friable; calcareous; grades to
6-15" 5919	AC	Grayish brown (10YR 5.5/2 dry; 4.5/2 moist) heavy silt loam; weak coarse prismatic and weak to moderate medium granular; common worm casts which are a mixture of material from above and below; slightly hard; friable; calcareous; grades to
15-26" 5920	ACca	Pale brown (10YR 6.5/3 dry; 5/3 moist) silt loam; weak coarse prismatic and weak coarse subangular blocky; slightly hard; friable; calcareous with 2% of small soft concretions of CaCO ₃ ; grades to
26-37" 5921	Cca	Very pale brown (10YR 7/3 dry; 5/3 moist) silt loam; very weak coarse subangular blocky; soft; very friable; calcareous with 1% of small soft concretions of CaCO ₃ ; grades to
37-60"+ 5922	C	Very pale brown (10YR 7/3 dry; 5/3 moist) silt loam; massive; soft; very friable; calcareous.

Profiles described by Henry T. Otsuki.

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

SOIL SURVEY LABORATORY Lincoln, Nebr. 5/21/58

SOIL TYPE Colby LOCATION Hamilton County, Kansas
silt loam

SOIL NOS. S57Kans-38-2 LAB. NOS. 5923-5928

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in microns) (per cent)										TEXTURAL CLASS
		1B1a		3A1						2A2		
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	> 2			
	2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	(19mm)		
0-2	Ap	4.9a	4.5a	1.7	4.8	15.5	50.6	18.0	55.9	14.0	3.1	sil
2-7	Al	0.9	1.9b	1.2b	4.7b	14.0b	49.9	27.4	51.5	16.3	Tr.	cl
7-18	AC	0.5	0.9b	0.5b	2.9b	10.1b	57.1	28.0	47.2	22.4	Tr.	sic1
18-30	ACca	0.1	0.3b	0.1b	2.8b	10.2b	64.2	22.3	50.8	26.1	Tr.	sil
30-44	AC	0.1	0.2b	0.1b	3.7b	12.9b	64.3	18.7	55.5	24.6	-	sil
44-65+	C	-	0.1b	0.1b	2.1b	16.8b	66.7	14.2	64.6	20.9	-	sil

pH	8C1a ORGANIC MATTER					6E1a MOISTURE TENSIONS				
	1:5	1:10	6A1a	6B1a	C/N	CaCO ₃ equiv. percent	GYPSUM me./100g. SOIL	1/10 ATMOS.	1/3 ATMOS.	4B2
			ORGANIC CARBON %	NITRO-GEN %						15 ATMOS.
8.1	8.6	8.8	1.20	.097	12.4	-				8.4
8.2	8.7	8.9	1.23	.128	9.6	14				12.0
8.1	8.7	8.9	0.71	.075	9	12				12.9
8.5	9.2	9.4	0.28	.030	9	10				11.3
8.8	9.5	9.6	0.20			9				10.1
8.8	9.5	9.7	0.14			9				9.6

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS 5B1a					BASE SAT. EXCH. NH ₄ Ac	5C3 Base Sat. % on Sum Cations	5B1a Sum Bases	5A3a Sum Cations	8D3 Ca/Mg	4A3a Vol. Wt. g/cc
	6N2b Co	6O2b Mg	6H1a H	6P2a Na	6Q2a K						
	milliequivalents per 100g. soil										
18.5	21.2	2.0	-	-	1.4	100	100	24.6	24.6	10.6	
20.9					0.1						1.20
19.9					0.1						1.16
20.0					0.9						1.16
18.5					1.7						1.16
17.0					2.0						1.16

a. Some organic matter.
b. Few CaCO₃ concn.
c. Based on consistence terminology in the profile descriptions, the horizons were drier than midway between air-dry and field capacity.

Soil Type: Colby silt loam.

Location: Hamilton County, Kansas. 135' E and 20' N of N1/4 corner Sec. 12, T23S, R43W. 2 miles N of Coolidge.

Date of Sampling: July 10, 1957.

Collectors: James Allen, C. W. McBee, Henry Otsuki.

Physiographic Position: Upland. Elevation approximately 3350'.

Climate: Average annual precipitation about 17". Annual temperature about 54°.

Topography: Gently sloping erosional upland below the summit of the High Plains.

Loess mantled. Gradient of 2 percent.

Drainage: Well drained.

Vegetation: Blue grama, buffalograss, sand dropseed, annual weeds and grasses.

Use: Native pasture.

Soil No.: S57Kans-38-2.

Depth, Lincoln Lab.

No., and Horizon

0-2" 5923	Ap	Grayish brown (10YR 5/2 dry; 3.5/2 moist) silt loam; moderate fine platy; slightly hard; friable; calcareous; abrupt smooth boundary to
2-7" 5924	A1	Grayish brown (10YR 5.5/2 dry; 4/2 moist) silt loam; weak fine granular; slightly hard; friable; calcareous; grades to
7-18" 5925	AC	Grayish brown (10YR 5.5/2.5 dry; 4.5/3 moist) heavy silt loam; weak coarse prismatic and weak medium subangular blocky breaking to moderate medium granular; many worm casts which are a mixture of material from above and below; slightly hard; friable; calcareous; grades to
18-30" 5926	ACca	Pale brown (10YR 6/2.5 dry; 5/3 moist) silt loam; weak coarse prismatic and weak coarse prismatic and weak coarse subangular blocky; slightly hard; friable; calcareous with less than 1% of small soft concretions of CaCO ₃ ; grades to
30-44" 5927	AC	Pale brown (10YR 6/2.5 dry; 5/3 moist) silt loam; weak coarse prismatic and weak coarse subangular blocky; slightly hard; friable; calcareous; grades to
44-65"+ 5928	C	Pale brown (10YR 6/3 dry; 5/3 moist) silt loam; massive; soft; very friable; calcareous.

Profiles described by Henry T. Otsuki.

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

SOIL TYPE Dwight LOCATION Butler County, Kansas
silt loam

SOIL NOS. 859Kans-8-3 LAB. NOS. 10949-10954

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a 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	2A2 > 2 (0.075-0.002)	2A1 0.075-0.002	2A2 < 0.075	
0-5	A1	0.1	0.1	0.1	0.5a	2.8a	73.7	22.7	47.9	28.9	-	sil
5-14	B21	<0.1	0.1	0.1	0.2a	1.1a	48.9	49.6	26.9	23.2	-	sic
14-18	B22	<0.1	<0.1	<0.1	0.1a	1.0a	50.5	48.4	26.5	25.1	Tr.	sic
18-28	B3	0.7b	0.6b	0.4b	0.5c	1.2c	49.5	47.1	24.5	26.5	Tr.	sic
28-35	Clca	0.4b	0.4b	0.3b	0.5c	1.5c	46.1	50.8	23.6	24.3	Tr.	sic
35-43	Cl2	0.1d	0.1d	0.1e	0.3e	1.2e	44.5	53.7	21.3	24.6	-	sic

pH	ORGANIC MATTER			Free Iron Fe ₂ O ₃ %	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM 8A1a	6E1a CaCO ₃ equiv. amount %	6F1a GYPSUM mg./100g. SOIL	MOISTURE TENSIONS 4B2			
	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					1/10 ATMOS. %	1/3 ATMOS. %	15 ATMOS. %	
1:1	1:5	1:10		6C1a							
6.0	6.4	6.4	3.27	0.218	15.0	0.9	0.4				10.7
6.7	7.5	7.5	1.43	0.113	12.6	1.3	0.6	Δ	Δ		21.9
7.7	8.7	8.8	1.04	0.081	12.8	1.2	1.1	Δ	Δ		21.1
8.2	9.1	9.3	0.69	0.056	12	1.1	1.7	4	Δ		20.4
8.0	8.7	9.0	0.53			1.3	4.2	2	Δ		22.1
7.8	8.4	8.7	0.43			1.4	6.0	Δ	Δ		23.9

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS 5B1a					5D2 Exch. Na on NH ₄ Ac CEC %	SATURATION EXT. SOL 8A1		BULK DENSITY			8A MOISTURE AT SATURATION %
	6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K		6P1a Na	6Q1a K	30-Cm. 4B3	O.D. 4A1c	4A1h	
	milliequivalents per 100g. soil						<me. per liter>		%H ₂ O	g/cc	g/cc	
19.2	10.5	5.0	8.7	0.4	0.5	2	1.8	0.2	28	1.19	1.27	61.6
34.8	15.2	16.6	5.6	4.3	0.5	11	5.2	<0.1			1.75	97.5
34.1	17.1	17.7	2.0	5.4	0.5	13	9.4	0.1				97.3
31.0		18.1	<0.1	7.5	0.5	19	14.4	<0.1	31f	1.34f	1.82	108.6
34.5		19.9	<0.1	10.7	0.5	21	31.2	0.1	32	1.34	1.73	106.2
34.6	15.8	20.4	1.2	12.2	0.6	21	46.1	0.1				105.1

a. Few (Fe-Mn?) concr.
 b. Many carbonate concr.
 c. Few (Fe-Mn?) concr.; common carbonate concr.
 d. Few carbonate concr.
 e. Few (Fe-Mn?) concr.; few carbonate concr.
 f. Average of two clods.

Soil Type: Dwight silt loam.

Location: Butler County, Kansas: 125 yards south and 50 yards east of NW corner Section 20 T26S R6E.

Date of Sampling: May 12, 1959.

Collectors: Jordan, Post, Penner, and Stout.

Physiographic Position: Nearly level to gently undulating erosional upland having plane and slightly convex surfaces.

Climate: Annual precipitation about 31"; Annual P-E of 53.

Slope: Nearly level, very slightly convex surface having less than 1 percent gradient.

Drainage: Runoff slow to very slow; permeability very slow.

Vegetation: Originally short and mid grass prairie.

Use: Native meadow.

Described by: H. L. Penner and M. Stout, Jr.

Soil No.: S59Kans-8-3.

Lincoln Lab. No.		(Sample moist)
10949 A1	0-5"	Very dark gray (10YR 2.5/1 moist) silt loam; moderate fine and medium granular structure; upper 1" weakly platy; very friable; noncalcareous; boundary smooth and abrupt to
10950 B21	5-14"	Very dark grayish brown and very dark brown (10YR 3/2 and 2/2 moist) clay; weak coarse prismatic structure breaking to weak coarse blocky; distinct, continuous clay films; peds adhere strongly to one another; prisms have very weak, grayish, silty coating that extend about 1 inch into horizon; very firm; noncalcareous; boundary clear and wavy, dipping from 14" to 17" and back to 13" in a 30 inch horizontal width.
10951 B22	14-18"	Very dark grayish brown (10YR 3/2 moist) clay; moderate fine and medium blocky structure; distinct, continuous clay films; peds less adherent than above; few, fine soft CaCO ₃ concretions; soil mass slightly calcareous in spots; very firm; boundary clear and echoes the wave of the above horizon.
10952 B3	18-28"	Dark brown (10YR 3/2.5 moist) lighter clay; moderate medium blocky structure; distinct, continuous clay films; few vertical seams of very dark gray; many strong slickensides at 35 degrees orientation and layered 1 to 1½ inches apart; few soft CaCO ₃ concretions and nests; very firm; boundary clear and mostly smooth to
10953 C1ca	28-35"	Same as above horizon; weak blocky, increased CaCO ₃ masses and concretion; few to common strong and large slickensides at 35 degrees; no grayish seams.
10954 C12	35-43"	Very dark grayish brown (10YR 3/2 moist) heavy silty clay loam; weak medium blocky structure; strong slickenside encountered about 2" above boundary and about 7" long; very firm; boundary is abrupt and slightly wavy, ranging from 40 to 43 inches.
Dr	43"⁄	Bedrock, limestone.

Remarks: Soil Profile moist throughout.
Horizons 0-5", 5-14", and 28-35" sampled for Bureau of Public Roads.
Correlation subsamples collected.

SOIL TYPE Dwight LOCATION Butler County, Kansas
silt loam

SOIL NOS. S59Kans-8-7 LAB. NOS. 10985-10991

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1										TEXTURAL CLASS
		1B1a									2A2	
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY			> 2 (9mm)	
	2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002			
0-5	A1	0.3	0.4	0.3a	0.6a	2.3b	72.7	23.4	48.1	27.2	Tr.	sil
5-13	B21t	0.1	0.3	0.2a	0.3a	1.2b	49.1	48.8	28.9	21.6	Tr.	sic
13-22	B22t	0.3	0.3	0.1c	0.1c	1.0c	46.3	51.9	24.5	22.9	Tr.	sic
22-28	B3	0.3	0.2	0.1c	0.2c	0.6c	45.5	53.1	21.8	24.4	Tr.	sic
28-33	C1	0.7d	0.6d	0.3e	0.4e	1.1e	48.8	48.1	24.9	25.3	Tr.	sic
33-39	C2	0.6d	0.6d	0.3c	0.4c	1.5c	44.7	51.9	24.6	21.8	Tr.	sic
39-42	C3	1.0d	0.8d	0.4c	0.6c	1.9c	38.6	56.7	24.5	16.3	14.0	c

pH	6C1a	ORGANIC MATTER			Free Iron Fe ₂ O ₃ %	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHGS PER CM 6A1a	6E1a	6F1a	MOISTURE TENSIONS			
		6A1a	6B1a						4B2			
		ORGANIC CARBON	NITRO-GEN	C/N					1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.	
1:1	1:10	%	%		%	%	%	%	%			
5.7	6.1	6.2	2.85	0.223	12.8	1.3	0.4	Δ	Δ			9.8
7.3	8.0	8.1	1.90	0.156	12.2	1.9	0.8	Δ	Δ			21.3
8.2	8.6	8.8	1.17	0.100	11.7	2.0	1.7	Δ	Δ			22.6
8.0	8.6	8.8	0.62	0.061	10	2.0	2.0	1	Δ	Δ		22.6
8.0	8.8	9.0	0.40			1.9	1.8	2	Δ	Δ		21.2
8.1	8.7	8.9	0.44			1.8	1.6	1	Δ	Δ		22.4
8.0	8.7	8.8	0.56			2.6	1.4	Δ	Δ			24.4

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS 5B1a					5D2 Exch. Na NH ₄ Ac CEC %	SATURATION		BULK DENSITY			8A MOISTURE AT SATURATION %
	6N2b	6O2b	6H1a	6P2a	6Q2a		EXT. SOL. 8A1	30-Cm.	O.D.			
	Ca	Mg	H	Na	K		6P1a Na	6Q1a K	4B3	4A1c	4A1h	
milliequivalents per 100g. soil						<me. per liter>		%H ₂ O		g/cc		
18.3	7.8	3.2	11.4	0.8	0.5	4	2.4	0.1	26	1.38	1.47	54.1
31.9	17.6	8.8	5.3	5.4	0.4	15	7.6	<0.1	25	1.41	1.75	74.7
32.5	19.9	10.4	2.0	8.0	0.4	20	14.6	<0.1	30	1.34	1.75	92.7
32.4	18.1	10.4	1.8	9.6	0.5	24	16.7	<0.1	32	1.32	1.75	112.1
27.7		9.0	1.3	7.9	0.4	23	15.1	<0.1	32	1.32	1.70	103.0
27.6	16.7	8.3	2.3	7.5	0.4	23	14.8	<0.1	33	1.33	1.70	84.5
29.6	16.8	9.0	3.0	7.4	0.5	22	11.9	<0.1				85.1

a. Common (Fe-Mn?) concn.
 b. Few (Fe-Mn?) concn.
 c. Few (Fe-Mn?) concn.; few carbonate concn.
 d. Few carbonate concn.
 e. Few (Fe-Mn?) concn.; common carbonate concn.

Soil Type: Dwight silt loam.

Location: Butler County, Kansas; 700 yards north and 225 yards west of the S
1/4 corner Section 14 T24S R7E.

Date of Sampling: May 15, 1959.

Collectors: Jordan, Post, Penner, and Stout.

Physiographic Position: Nearly level to gently undulating erosional upland having
plane and slightly convex surfaces.

Climate: Annual precipitation about 31"; Annual P-E of 53.

Slope: Nearly level, slightly convex surface of about 1 percent gradient.

Drainage: Runoff slow; permeability very slow to slow.

Vegetation: Originally short and mid grass prairie.

Use: Native pasture having western wheatgrass, switchgrass and prickly pear.

Described by: H. L. Penner and M. Stout, Jr.

Soil No.: S59Kans-8-7.

Lincoln (sampled at less than moist conditions)
Lab. No.

10985	A1	0-5"	Very dark brown (10YR 2/1.5 moist) silt loam; weak fine granular structure; upper 1" weakly platy; friable; boundary smooth and abrupt to
10986	B21t	5-13"	Very dark brown (10YR 2/2 moist - 10YR 3/2 crushed color); clay; weak coarse prismatic structure breaking to weak coarse blocky (somewhat dry); distinct, continuous clay films; peds adhere strongly to one another; prisms have very weak silty caps coating the tips and extending about 1" into this horizon along vertical faces; few fine cherty flakes; few rootlet channels which are mostly clogged; noncalcareous; very to extremely firm; boundary smooth and gradual to
10987	B22t	13-22"	Dark brown (7.5YR 3/2 moist) clay; weak medium blocky structure; thin, continuous clay films peds less adherent than above; few, fine, chert fragments and fine Fe-Mn concretions; noncalcareous; very firm; boundary smooth and gradual to
10988	B3	22-28"	Dark brown (7.5YR 3/4 moist) silty clay; weak medium blocky structure; thin, mostly continuous clay films; few, faint, mottles of strong brown; few, fine Fe-Mn concretions and chert chips; noncalcareous; very firm; boundary smooth and clear to
10989	C1	28-33"	Dark reddish brown (5YR 3/4 moist) clay; weak medium blocky structure; thin, seemingly continuous clay films; few, fine Fe-Mn concretions and angular chert chips; many fine and medium, soft CaCO ₃ nests; soil mass slightly calcareous; very firm; boundary smooth and gradual to
10990	C2	33-39"	Dark reddish brown (4YR 3/4 moist) light silty clay; moderate medium and fine blocky structure; thin, continuous clay films; noncalcareous; very firm; boundary smooth and clear to
10991	C3	39-42"	Same as preceding horizon; contains common chert fragments, both rounded and angular and few fine gravels of other rocks.
	IIR	42"±	Bedrock of fractured cherty limestone seemingly in sites; cracks are filled with reddish brown interstitial clay; not sampled.

Remarks: Horizons 0-5", 5-13" and 22-28" sampled for Bureau of Public Roads. Bedrock of this profile different from duplicate and is not incorrect. Profile relatively dry in upper portion and more moist in lower portion. Correlation subsamples collected.

SOIL SURVEY LABORATORY

SOIL TYPE Ebenezer silt loam

(Field No. 644C/B-1)

Mandan, North Dakota

SOIL NO. S-53-Kans-35-3

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS			
			1E1a 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	2A2 > 2				
1385	0-2	A11	0.3	0.3	0.5	1.6	6.5	67.4	23.4	22.5	52.5	-	sil			
1386	2-6	A12	0.1	0.1	0.5	0.6	7.5	62.3	28.9	21.2	48.7	-	sic1			
1387	6-9 1/2	AB	0.1	0.1	0.4	1.4	5.2	54.6	38.2	20.3	40.4	-	sic1			
1388	9 1/2-17	B21t	-	-	0.1	0.3	2.0	48.2	49.4	23.5	20.9	-	sic			
1389	17-24	B22t	0.2	0.2	0.1	0.2	1.5	55.8	42.0	30.0	27.4	-	sic			
1390	24-32	B3ca	0.7	0.5	0.4	0.5	2.0	50.2	35.7	32.5	30.0	-	sic1			
1391	32-41	Cca	0.1	0.4	0.7	2.0	3.6	64.9	28.3	33.2	30.5	-	sic1			
1392	41-51	C1	0.2	0.6	1.4	4.2	5.8	63.0	24.8	31.2	40.1	-	sic1			
1393	51-60	C2	0.4	0.6	1.5	4.5	6.2	57.0	29.8	23.2	37.8	-	sic1			
		pH		ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM @ 25°C	CaCO ₃ equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS					
		8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	% ORGANIC CARBON 6A1a	% NITROGEN 6B1a	C/N				1/10 ATMOS.	(per cent) 1/3 ATMOS.	4B2 15 ATMOS.			
1385	5.7	5.9	5.9	2.71	.240	11.3							12.3			
1386	5.6	5.9	6.0	1.85	.176	10.5							14.3			
1387	5.6	6.0	6.2	1.42	.146	9.7							18.5			
1388	6.3	6.7	7.0	0.92	.086	10.7							25.0			
1389	7.4	7.3	8.1	0.56	.067	8.4			1				24.5			
1390	7.5	8.4	8.5	0.42	.057	7.4			1				20.1			
1391	7.5	8.2	8.4	0.25	.043				1				15.0			
1392	7.6	8.1	8.2	0.13	.030				1				11.2			
1393	7.4	7.9	7.9	0.10	.031				-				12.4			
		5A1a CATION EXCHANGE CAPACITY 1N4Ac	Extractable CATIONS 5B1a				EXCHANGEABLE SODIUM PERCENTAGE ESP	SATURATION EXTRACT SOLUBLE						PER CENT MOISTURE AT SATURATION	8D3 Ca/Mg	
			6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Na	K	CO ₃	HCO ₃	Cl	SO ₄				
			milliequivalents per 100g soil				milliequivalents per liter									
1385	22.5	12.7	4.6	0.1	1.1									2.0		
1386	23.0	11.1	5.6	0.1	0.3									2.0		
1387	27.9	18.0	8.1	0.3	0.7									2.2		
1388	35.3	22.3	11.0	2.2	0.8									2.0		
1389	30.8		10.7	3.2	0.7											
1390	28.8		10.4	4.6	0.5											
1391	23.4		8.2	5.7	0.3											
1392	17.9		6.2	4.5	0.2											
1393	18.4		6.0	4.3	0.2											

EEENEZER SILT LOAM
(Field No. 644C/B-1)

Date: May 19, 1953

County: Saline County, Kansas

Location: Near center of Section 23, T. 13 S., R. 4 W. 150' W and 90' N of the center of the section. Old abandoned school yard.

Vegetation: Almost pure stand of western wheatgrass, with a few plants of dropseed and annual weeds; probably virgin; at least has not been plowed for many years.

Slope: $2\frac{1}{2}$ percent plane slope toward the west. Well drained.

Parent Material: Peoria loess.

Soil No.: 553Kans-85-3.

Described by: W. M. Johnson.

Temperatures: (10:00-10:30 A.M.; partly cloudy). air, 68° F.; one-inch depth, 66°; 6-inch depth, 56°; 12-inch depth, 62°; 24-inch depth, 60°; 60-inch depth, 62°.

Horizon
and Mandan
Lab. No.

A11 1385	0-2"	Dark grayish brown to very dark brown (10YR 4/2 dry; 2/2 moist) soft, friable, moderate fine and medium granular silt loam. Numerous small earthworm casts. Matted with grass roots. Clear lower boundary.
A12 1386	2-6"	Dark grayish brown to very dark brown (10YR 4/1.5 dry; 2/2 moist) soft, friable, moderate coarse and medium granular heavy silt loam. Roots very numerous. Clear lower boundary.
AB 1387	6-9 $\frac{1}{2}$ "	Dark grayish brown to very dark brown (10YR 4/2 dry; 2.5/2.5 moist) friable, moderate coarse and medium granular, heavy silty clay loam. Hard when dry. Roots very numerous. Clear lower boundary.
B21t 1333	9 $\frac{1}{2}$ -17"	Dark grayish brown to very dark brown (10YR 4/2 dry; 2.5/2.5 moist) moderate coarse prismatic, very hard, firm silty clay. Breaks to weak coarse and medium blocks. Roots numerous. Contains a very few tiny iron-manganese "shot" concretions from 1/4 to 1/10 millimeter in diameter. Gradual lower boundary.
B22t 1399	17-24"	Very dark grayish brown (10YR 3/2.5 moist) firm, very hard, weak coarse prismatic silty clay that breaks to strong medium and coarse blocks. Numerous tiny, hard, round calcium-carbonate concretions, especially in the lower 4 inches. Root numerous. Somewhat wavy, gradual lower boundary.
B3ca 1390	24-32"	Very dark grayish brown (10YR 3/2.5 moist), with common inconspicuous fine and medium mottles of brown (moist). Hard, carbonate concretions 1/4 - 1/16 inch in diameter are numerous. Firm, very hard, strong medium and coarse blocky silty clay. Horizontal surfaces of aggregates have very dark brown "skins"; contains an occasional charcoal chip. Roots are numerous, especially in cracks. Diffuse wavy lower boundary.
Cca 1391	32-41"	Very dark grayish brown (10YR 3/2.5 moist), with common to abundant fine and medium mottles of very light gray, white, strong brown and black (moist). Contains numerous hard, rounded, carbonate concretions, from 1/16 to 5/8 inches in diameter. Moderate medium and coarse blocky, firm, heavy silty clay loam. Contains numerous bits of charcoal. Roots are few. This may be weathered Cretaceous shale. Diffuse, wavy lower boundary.
C1 1392	41-51"	Dark brown (10YR 3/3 moist), with numerous fine and medium light gray mottles in the form of films. Threads and spots. Roots very few. Friable, weak fine and medium irregular blocky silty clay loam. Slightly calcareous. Diffuse lower boundary.
C2 1393	51-60"	Variegated light yellowish brown, brown, dark brown and black (10YR 6/4, 7.5YR 4/2, 4/4, and 2/1, moist), moderate medium and fine irregular blocky, friable silty clay loam. There are light gray films on a few of the aggregates. Very few fine roots. Occasional chip of sandstone. Slightly calcareous. Abrupt lower boundary.
IIR	60 $\frac{1}{4}$ "	Cretaceous sandstone. Not sampled.

NOTES: Wide cracks (1/4' to 1/2 inch) are in the B2 horizon, spaced about 12" apart, even though the soil is not air dry.

SOIL SURVEY LABORATORY

SOIL TYPE Ebenezer silt loam

(Field No. 34/B-1)

Mandan, North Dakota

SOIL NO. S-53-Kans-85-4

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm) (per cent)										TEXTURAL CLASS			
			1B1a		3A1					2A2						
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY <0.002	0.2-0.02	> 2					
1394	0-2	A11	0.1	0.2	0.9	4.3	8.0	63.6	22.9	20.7	53.5	-	sil			
1395	2-5	A12	0.2	0.3	1.2	5.4	8.3	61.1	23.5	21.2	51.6	-	sil			
1396	5-8 ¹ / ₂	A3	0.2	0.3	1.1	5.0	6.4	58.6	28.4	19.5	48.4	-	sic1			
1397	8 ¹ / ₂ -11	B1	-	0.2	0.7	3.1	4.8	56.2	35.0	21.9	40.9	-	sic1			
1398	11-21	B21t	-	0.1	0.3	0.9	2.1	50.0	46.6	23.7	28.9	-	sic			
1399	21-26	B22t	0.9	0.5	0.4	0.8	2.1	55.0	40.3	27.5	30.1	-	sic			
1400	26-30	B3ca	1.3	0.4	0.4	1.3	2.4	58.1	36.1	29.7	31.7	-	sic1			
1401	30-37	Cca	0.3	0.3	0.6	4.0	4.7	60.2	29.9	29.8	30.1	-	sic1			
1402	37-43	Ccs	-	0.2	0.9	7.5	7.7	56.3	27.4	26.9	42.8	-	sic1			
1403	43-60+	C	0.3	0.3	1.3	11.8	11.0	47.3	28.0	18.5	48.8	-	cl			
			pH			ORGANIC MATTER			EST. x SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM @ 25°C	CaCO ₃ equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS (per cent)		4B2	
			8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	x ORGANIC CARBON 6A1a	x NITROGEN 6B1a	C/N			6E1a		1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.	
1394	5.9	6.2	6.3	3.14	.260	12.1										13.1
1395	5.7	5.9	6.0	2.36	.212	11.1										11.9
1396	5.9	6.1	6.3	1.67	.163	10.2										13.8
1397	6.0	6.3	6.4	1.27	.150	8.5										18.1
1398	6.4	6.9	7.0	0.74	.088	8.4										23.1
1399	7.7	8.6	8.8	0.51	.078	6.5				4						20.2
1400	7.9	8.6	8.7	0.36	.050	7.2				2						19.4
1401	7.6	8.5	8.6	0.21	.041					1						16.3
1402	7.3	7.4	7.3	0.13	.032					-						13.1
1403	7.2	7.6	7.6	0.14	.034					-						12.3
	5A1a CATION EXCHANGE CAPACITY	Extractable CATIONS 5B1a				SATURATION EXTRACT SOLUBLE						PER CENT MOISTURE AT SATURATION		8D3		
	Ca	6N2b Mg	6O2b Na	6P2a K	EXCHANGE-ABLE SODIUM PERCENTAGE ESP	Na	K	CO ₃	HCO ₃	Cl	SO ₄			Ca	Mg	
	milliequivalents per 100g soil	milliequivalents per liter				milliequivalents per liter										
1394	22.5	13.1	4.7	0.1	1.5									2.8	2.8	
1395	22.1	12.8	4.5	0.1	1.1									2.4	1.9	
1396	22.2	12.7	5.3	0.2	1.0									1.9	1.6	
1397	25.7	14.8	7.7	1.0	1.1											
1398	32.3	20.2	12.5	2.2	0.9											
1399	30.3		12.0	3.6	0.6											
1400	29.2		11.5	5.0	0.5											
1401	24.5		8.9	4.7	0.4											
1402	19.8		6.1	3.7	0.3											
1403	17.6		5.6	3.4	0.2											

EBENEZER SILT LOAM
(Field No. 34/B-1)

Date: May 19, 1953 Described by: W. M. Johnson.
 County: Saline County, Kansas
 Location: 2/10 miles east and 50 feet south of the NW corner of Section 27,
 T. 14 S., R. 5 W.
 Vegetation: Virgin pasture. Cheatgrass, dropseed, western wheat, big bluestem,
 annual weeds.
 Slope: 4- to 5-percent slightly convex slope toward the southwest. Well drained.
 Parent Material: Peoria loess.
 Soil No.: S53Kans-85-4.
 Temperatures: (2:00-3:00 P.M.; sunny) Air: 73° F; 1-inch depth. 76°; 6-inch
 depth, 65°; 12-inch depth, 66°; 24-inch depth, 66°; 36-inch depth,
 66°; 48-inch depth, 64°; 60-inch depth; 62°.

Horizon
and Mandan

Lab. No.		
A11 1394	0-2"	Dark gray to very dark brown (10YR 4.5/1, dry; 2/2, moist) weak medium platy, friable silt loam that crushes easily to weak fine granules. Matted with roots. Few wormholes and worm casts. Clear lower boundary.
A12 1395	2-5"	Dark gray to very dark brown (10YR 4.5/1.5, dry; 2/2, moist) weak medium subangular blocky, friable silt loam that crushes easily to weak fine granules. Few worm casts and wormholes. Roots very numerous. Clear lower boundary.
A3 1396	5-8½"	Dark gray to very dark brown (10YR 4/1.5, dry; 2.5/2.5, moist) with inconspicuous gray films on aggregates when dry. Weak subangular blocks of friable silt loam break easily to weak medium and fine granules. Few wormholes and worm casts. Roots very numerous. Clear lower boundary.
B1 1397	8½-11"	Dark grayish brown to very dark grayish brown (10YR 4/2.5, dry; 3/2.5, moist) with inconspicuous gray films on aggregates when dry. Moderate fine and very fine subangular blocky, friable silty clay loam. Roots very numerous. Few wormholes and worm casts. Clear lower boundary.
B21t 1398	11-21"	Dark grayish brown to very dark grayish brown (10YR 4/2, dry; 3/2.5, moist) firm, plastic, sticky, weak coarse prismatic silty clay that breaks to moderate coarse and medium blocks. Roots numerous. Contains an occasional very tiny iron-manganese "shot" concretion. Diffuse, slightly wavy lower boundary.
B22t 1399	21-26"	Grayish brown to very dark grayish brown (10YR 5.5/2.5, dry; 3.5/2, moist) moderate medium and coarse blocky firm silty clay with many hard, rounded, calcium-carbonate concretions 1/32 to 1/8 inch in diameter. Matrix of soil noncalcareous. Roots numerous. Clear lower boundary.
B3ca 1400	26-30"	Grayish brown to very dark grayish brown (10YR 5.5/2.5, dry; 3.5/2, moist), with a few fine and medium inconspicuous mottles of dark brown. Moderate coarse and medium blocky, firm silty clay with many hard, rounded, carbonate concretions from 1/8 to 3/8 inches in diameter. Matrix of soil non-calcareous. Few roots. Diffuse, wavy lower boundary.
Cca 1401	30-37"	Light brownish gray to dark grayish brown (10YR 6/2, dry; 4/2, moist), with a few fine and medium mottles of reddish brown (moist). Very weak coarse-blocky, friable silty clay loam containing many hard rounded carbonate concretions from 1/8 to 1/2 inch in diameter. Matrix of soil mildly calcareous. Few roots. Clear lower boundary.
Ccs 1402	37-43"	Light brownish gray to dark grayish brown (10YR 6/2.5, dry; 4/2, moist), with a few fine and medium mottles of dark reddish brown and abundant large white mottles of gypsum crystals. Slightly calcareous. Weak irregular fine and medium blocky silty clay loam. Few roots. Diffuse, wavy lower boundary.
C 1403	43-60½"	Variegated dark brown, yellowish red, and light brownish gray (moist), weak irregular blocky, friable silty clay loam. Contains an occasional chip of sandstone. Very slightly calcareous. Very few tiny roots.

SOIL TYPE Farnum LOAM LOCATION Reno County, Kansas

SOIL NOS. S58Kans-78-5 LAB. NOS. 8080-8088

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a		COARSE SAND		MEDIUM SAND		FINE SAND		VERY FINE SAND			SILT
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	< 0.075mm	> 2	
0-9	Ap	0.3a	11.6a	17.3a	10.0a	8.4a	37.9	14.5	39.1	9.8	Tr.	1	
9-16	A3	0.3a	11.0a	15.3a	8.9a	6.1a	40.2	18.2	36.8	12.2	-	1	
16-22	B1	0.7a	13.9a	17.7a	9.2a	5.2a	29.9	23.4	26.7	10.6	-	1	
22-32	B21t	0.1a	10.7a	17.8a	8.9a	8.7a	23.8	30.0	21.8	10.8	-	scl	
32-44	B22t	0.4a	6.7a	10.5a	10.2a	7.2a	37.9	27.1	32.6	16.3	Tr.	cl	
44-53	B23t	0.3a	2.6a	3.0a	2.2a	8.6a	49.4	33.9	38.2	19.9	Tr.	sicl	
53-60	B3	0.6b	5.3b	5.9b	4.0b	13.0b	44.6	26.6	41.9	15.8	Tr.	1	
60-76	B3ca	0.5b	7.0b	7.3b	6.1b	16.3b	37.8	25.0	43.9	11.3	0.9	1	
76-101	C	1.4b	4.8b	5.3b	9.5b	14.7b	37.5	26.8	47.4	9.9	1.3	1	

pH	ORGANIC MATTER				EST% SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM @ 25°C	MOISTURE TENSIONS				
	1:5	1:10	ORGANIC CARBON %	NITROGEN %			C/N	CaCO ₃ equivalent	GYPSUM me./100g. SOIL	1/10 ATMOS. %	1/3 ATMOS. %
5.7	6.0	6.1	0.99	0.082	12	<0.20	0.4				5.7
6.2	6.5	6.7	0.97	0.080	12	<0.20	0.4				7.5
6.8	7.2	7.2	0.65	0.056	12	<0.20	0.5	Δ			9.2
6.9	7.4	7.3	0.39	0.040	10	<0.20	0.4	Δ			11.4
7.1	7.5	7.5	0.25			<0.20	0.4	Δ			10.7
7.2	7.7	7.7	0.24			<0.20	0.3	Δ			14.0
7.6	8.0	8.1	0.17			<0.20	0.5	Δ			10.9
8.0	8.5	8.5	0.13			<0.20	0.5	6			10.0
8.1	8.7	8.7	0.05			<0.20	0.5	Δ			11.7

CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					BASE SAT. % NH ₄ Ac EXCH.	SATURATION EXTRACT SOLUBLE		MOISTURE AT SATURATION %
	Ca	Mg	H	Na	K		6P1a	6Q1a	
9.9	5.5	1.4	5.5	<0.1	0.7	77	0.4	0.5	29.0
12.8	9.2	2.6	4.1	<0.1	0.7	98	0.4	0.4	42.7
15.5	11.1	3.6	2.8	<0.1	0.5	98	0.5	0.2	47.0
20.0	14.4	5.6	2.8	0.1	0.5	103	0.5	0.1	54.6
18.1	12.8	4.9	2.3	0.1	0.5	101	0.7	0.1	52.0
23.2	16.5	6.2	2.4	0.3	0.7	102	1.0	0.1	69.2
18.7	15.0	4.7	1.9	0.3	0.5	110	1.5	0.1	54.6
16.8				0.4	0.4		2.0	0.1	51.0
19.1				0.8	0.5		2.8	0.1	58.4

a. Few smooth black conpr. (Mn?)
 b. Few smooth black conpr. (Mn?) Also, few CaCO₃ conpr.

Soil Type: Farnum loam.

Location: Reno County, Kansas. 825' W and 660' S of E $\frac{1}{4}$ Corner of Sec. 5, T24S, R6W. About 6 miles SW of Hutchinson.

Collectors: Jordan, Rockers and Otsuki.

Date of Sampling: May 6, 1958.

Physiographic Position: Upland on Pleistocene mantle presumably old alluvium of sandy to clayey sediments. Elevation approximately 1500'.

Climate: Average annual precipitation about 28".

Topography: Nearly level to weakly billowy; weak convex slope of less than 1 percent.

Drainage: Runoff slow; permeability slow. Moderately well-drained.

Vegetation: Originally tall grass prairie.

Use: Cropland. Now in alfalfa.

Described by: H. T. Otsuki and J. J. Rockers.

Soil No.: S58Kans-78-5.

Lincoln

Lab. No.

- | | | | |
|------|------|---------|--|
| 8080 | Ap | 0-9" | Dark grayish brown (10YR 4/1.5 dry; 2/2 moist) loam; weak granular; friable; noncalcareous; grades shortly to |
| 8081 | A3 | 9-16" | Dark grayish brown (10YR 3.5/2 dry; 2.5/2 moist) sandy clay loam; weak granular; moderately friable; many worm casts; noncalcareous; grades through 4" to |
| 8082 | B1 | 16-22" | Dark grayish brown (10YR 4.5/2 dry; 2.5/2 moist; 3/2 moist crushed) heavy sandy loam; weak granular with weak patchy clayskins; moderately firm; many worm casts; grades through 2" to |
| 8083 | B21t | 22-32" | Dark grayish brown (10YR 4/2 dry; 3/2 moist crushed; with 1Y 3/1.5 coatings on peds) sandy clay with common fine distinct strong brown mottles; moderate medium prismatic breaking to moderate strong medium blocky; prominent continuous clayskins; very firm; few rootlets in peds; most rootlet channels plugged, few open; noncalcareous; grades through 4" to |
| 8084 | B22t | 32-44" | Grayish brown (10YR 5/2 dry; 3/1.5 moist; 4/2 moist crushed) light sandy clay; moderate medium prismatic breaking to moderately strong medium and coarse blocky with distinct continuous clayskins; firm; common fine distinct strong brown mottles; few rootlet channels in peds; noncalcareous; grades through 2" to |
| 8085 | B23t | 44-53" | Grayish brown (2.5Y 5/2 dry; 3.5/2 moist; 4/1.5 moist crushed) clay; moderate fine and very fine irregular blocky with distinct continuous clayskins; extremely firm; many rootlet channels penetrate peds; noncalcareous; grades through 4" to |
| 8086 | B3 | 53-60" | Grayish brown (10YR 5/2.5 dry; 3.5/2 moist; 4/3 moist crushed) heavy clay loam; weak moderate medium and coarse irregular and subangular blocky with distinct continuous clayskins; firm; common medium strong brown mottles; few rootlet channels; noncalcareous; grades through 4" to |
| 8087 | B3ca | 60-76" | Brown (7.5YR 5/4 dry; 4/4 moist; 5/6 moist crushed) heavy sandy clay loam; weak moderate medium irregular blocky; firm; many fine faint strong brown mottles; few fine hard concretions of CaCO ₃ and many fine to very coarse seams of soft CaCO ₃ ; grades to |
| 8088 | C | 76-101" | Light brown (7.5YR 6/5 dry; 5/3 crushed moist) light sandy clay with many fine reddish yellow mottles; very firm; calcareous; augered. |

Remarks: Horizons 0-9"; 44-53" and 60-76" were sampled for Bureau of Public Roads. Soil was moist to depth sampled. Except where specified moist, the colors refer to dry soil.

Farnum fine sandy loam. Profiles S58Kans-78-5 and -9 are good representatives of this soil type. The statement of texture of the B2 in the Farnum series description needs slight modification in the light of the information afforded by these analyses. E. H. Templin, January 11, 1960.

SOIL SURVEY LABORATORY

Lincoln, Nebr.

November 1958

SOIL TYPE Farmum
Loam

LOCATION Reno County, Kansas

SOIL NOS. S58-Kans-73-9

LAB NOS. 8115-8123

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a											2A2
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	3A1		> 2		
		2.1	1.05	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	(19mm)		
0-5	Ap	0.5	11.0	10.4	8.9a	10.3a	44.4	14.5	46.7	11.7	Tr.	1	
5-10	A1	0.2	11.2	10.3	8.1a	9.3a	44.7	16.2	45.9	11.5	Tr.	1	
10-21	B1	0.6	13.6	11.5	7.9a	8.0a	36.7	21.7	37.8	10.1	Tr.	1	
21-29	B21t	0.9a	9.7a	7.4a	5.3a	6.5a	40.5	29.7	34.4	14.8	Tr.	cl	
29-38	B22t	0.1a	2.8a	3.0a	2.6a	11.8a	47.7	32.0	43.8	16.0	Tr.	cl	
38-56	B23t	0.1a	3.5a	4.3a	6.6a	11.4a	42.9	31.2	44.0	13.6	Tr.	cl	
56-78	B3	0.7b	4.0b	5.0b	7.5b	9.6c	41.4	31.0	39.7	14.2	Tr.	cl	
78-98	Cca	3.0b	5.9b	6.7b	12.9b	11.3c	40.1	20.1	35.0	21.8	3.9	1	
98-108	C	0.5b	5.5b	8.3b	21.2b	13.7c	29.0	21.8	43.6	10.3	Tr.	1	

pH	8C1a ORGANIC MATTER				8A2 ESTD SALT (BUDEAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM 8A1a	6E1a MOISTURE TENSIONS				
	6A1a		6B1a				6B2				
	ORGANIC CARBON %	NITROGEN %	C/N	ESTD SALT (BUDEAU CUP)			1/10 ATMOS. %	1/3 ATMOS. %	15 ATMOS. %		
1.1	1.5	1.10									
5.2	5.6	5.8	1.12	0.106	10.6	<0.20	0.5				5.3
5.3	5.6	5.7	1.00	0.096	11.2	<0.20	0.4				6.2
6.4	6.7	6.7	0.89	0.082	11	<0.20	0.4				8.3
7.0	7.3	7.2	0.49	0.043	10	<0.20	0.4	<1			11.5
7.2	7.5	7.5	0.38			<0.20	0.4	<1			12.3
7.1	7.4	7.4	0.26			<0.20	0.5	<1			12.1
8.1	8.5	8.7	0.18			<0.20	0.6	2			12.6
8.2	8.7	8.9	0.04			<0.20	0.9	23			9.0
8.1	8.6	8.8	0.01			<0.01	0.8	2			10.1

CATION EXCHANGE CAPACITY NH ₄ Ac	5A1a EXTRACTABLE CATIONS					5B1a BASE SAT. NH ₄ Ac EXCH.	SATURATION EXTRACT SOLUBLE		8A1 MOISTURE AT SATURATION %	
	6N2b		6B1a		6P1a		6Q1a			
	Ca	Mg	H	Na	K		Na	K		
	milliequivalents per 100g. soil					5C1	milliequivalents per liter			
10.4	3.8	0.9	7.3	<0.1	1.2	57	0.5	1.2	33.2	
11.5	5.5	1.4	7.3	<0.1	0.8	67	0.3	0.6	35.9	
15.1	10.5	2.8	3.7	<0.1	0.4	91	0.4	0.1	45.6	
22.1	16.5	5.0	3.3	0.1	0.4	100	0.4	0.1	43.7	
23.2	18.6	5.3	2.8	0.1	0.4	105	0.5	<0.1	56.1	
22.8	18.0	4.9	2.3	0.1	0.4	103	0.7	<0.1	54.4	
24.3				0.2	0.4		1.1	<0.1	61.7	
15.7				0.3	0.3		2.0	0.1	51.3	
17.6				0.4	0.4		2.5	0.1	52.9	

a. Few smooth black coner. (Mn?).
 b. Common CaCO₃ coner.
 c. Common CaCO₃ coner. Also, few smooth black coner. (Mn?).

Soil Type: Farnum loam.

Location: Reno County, Kansas. 1668' E and 20' N of W $\frac{1}{2}$ Corner of Sec. 17, T24S, R6W. About 9 miles SW of Hutchinson.

Date of sampling: May 8, 1958.

Collectors: Jordan, Rockers and Otsuki.

Physiographic Position: Upland on Pleistocene mantle presumably old alluvium of sandy to clayey sediments. Elevation approximately 1500'.

Climate: Average annual precipitation about 28".

Topography: Nearly level; gradient about .5 percent.

Drainage: Runoff slow; permeability slow. Moderately well drained.

Vegetation: Originally tall grass prairie.

Use: Cropland.

Described by: J. J. Rockers and H. T. Otsuki.

Soil No.: S58Kans-78-9.

Lincoln

Lab. No.

8115	Ap	0-5"	Grayish brown (10YR 5/2 dry; 2.5/2 moist) light loam; weak granular; very friable; noncalcareous; grades shortly to
8116	A1	5-10"	Very dark grayish brown (10YR 3/2 dry; 2/2 moist) loam; moderate medium platy breaking to weak granular; friable; noncalcareous; grades through 2" to
8117	B1	10-21"	Dark grayish brown (10YR 4/2.5 dry; 2.5/2 moist) sandy clay loam; weak granular with weak patchy clayskins; porous; friable; many wormcasts; noncalcareous; grades through 4" to
8118	B21t	21-29"	Brown (10YR 5/3 dry; 3/3 moist) light sandy clay; moderate fine subangular and angular blocky with distinct continuous clayskins; very firm; many open rootlet channels; many wormcasts; noncalcareous; grades through 4" to
8119	B22t	29-38"	Dark grayish brown (10YR 4/2 dry; 3/2 moist; 4/3 moist crushed) clay; moderate strong medium blocky with distinct continuous clayskins; extremely firm; few faint fine strong brown mottles; few open rootlet channels; noncalcareous grades through 4" to
8120	B23t	38-56"	Brown (10YR 5/3 dry; 4.5/2 moist) light clay; moderate strong medium blocky with distinct continuous clayskins; very firm; many distinct medium strong brown mottles; many open rootlet channels; few scattered wormcasts; noncalcareous; grades through 4" to
8121	B3	56-78"	Grayish brown (1Y 5/2 dry; 4/2 moist; 4/3 moist crushed) light clay; moderate medium subangular and angular blocky with distinct patchy clayskins; very firm; common distinct medium strong brown mottles; mass noncalcareous; many seams and fine soft concretions of CaCO ₃ ; many open rootlet channels; grades to
8122	Cca	78-98"	Brownish yellow (10YR 6.5/6 dry; 5.5/6 moist) heavy sandy clay loam, firm; mass calcareous with many large (up to 2") soft concretions of CaCO ₃ ; few hard medium concretions of CaCO ₃ ; augered; grades to
8123	C	98-108"	Brownish yellow (10YR 6/6 dry; 5/6 moist) sandy clay loam; moderately friable; mass noncalcareous; few fine soft and hard concretions of CaCO ₃ ; augered.

Remarks: Horizons 0-5"; 21-29"; and 56-78" were sampled for Bureau of Public Roads. Soil was moist to depth sampled. Except where specified moist, the colors refer to dry soil.

SOIL TYPE Goessel LOCATION Butler County, Kansas
 silty clay

SOIL NOS. S59Kans-8-1 LAB. NOS. 10928-10938

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (p. cent)										TEXTURAL CLASS	
		1B1a					3A1						2A2
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY					> 2 (<19mm)
0-6	Ap	0.2	1.2	1.5	2.0	3.1	53.7	38.3	34.5	23.2	-	sic1	
6-15	Al	<0.1	0.6	1.1	1.5	2.8	48.7	45.3	29.4	22.8	-	sic	
15-24	AC1	0.1	1.0	1.3	1.8	3.6	49.5	42.7	31.1	22.8	-	sic	
24-33	AC2	0.1	1.4	1.8	2.4	4.1	50.1	40.1	34.7	20.5	-	sic/sic1	
33-44	C1	0.4a	2.5a	2.2a	2.9a	5.5a	50.8	35.7	39.0	18.6	Tr.	sic1	
44-50	C1cs	0.5a	1.6a	2.3a	2.9a	6.2a	50.6	35.9	37.6	20.5	Tr.	sic1	
50-55	C2cs	0.2a	0.8a	1.5a	3.4a	7.5a	51.5	35.1	40.4	20.2	Tr.	sic1	
55-64	C3cs	0.3a	0.7a	1.3a	2.8a	6.2a	57.3	31.4	45.9	19.0	Tr.	sic1	
64-72	C4cs	0.2a	0.6a	1.2a	3.4a	7.9a	57.7	29.0	49.0	18.6	-	sic1	
72-92	C5cs	0.2a	0.5a	0.9a	4.1a	11.1a	59.6	23.6	56.4	17.0	-	sil	
92-104	C2	0.1	0.4	0.8	3.9	11.7	59.7	23.4	57.9	16.1	-	sil	
	pH	8C1a ORGANIC MATTER				Free Iron	ELECTRICAL CONDUCTIVITY	6E1a	6F1a	MOISTURE TENSIONS			
	1:5	1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N	Fe ₂ O ₃ %	EC x 10 ³ MILLIMHOS PER CM	CoCO ₃ equiv-atom %	GYP SUM mg./100g. SOIL	1/10 ATMOS. %	1/3 ATMOS. %	4B2 15 ATMOS. %	
	6.3	6.9	7.0	1.65	0.133	12.4	0.6	0.6	Δ			16.7	
	6.4	7.0	7.1	0.74	0.074	10	0.5	0.4	Δ			19.9	
	7.0	7.6	7.7	0.51	0.046	11	0.4	0.4	Δ			19.2	
	7.5	7.9	8.0	0.32			0.4	0.5	Δ			18.7	
	8.0	8.6	8.7	0.10			0.4	0.8	Δ			16.6	
	7.8	8.3	8.5	0.06			0.3	1.9	Δ			16.4	
	7.4	7.7	7.8	0.05			0.3	3.9	Δ			15.7	
	7.4	7.7	7.9	0.05			0.3	3.9	Δ			14.5	
	7.3	7.5	7.7	0.06			0.2	3.6	Δ			13.8	
	7.4	7.7	7.8	0.09			0.3	3.3	Δ			11.5	
	7.4	7.8	7.9	0.03			0.3	1.8	Δ			11.0	
	5A1a	EXTRACTABLE CATIONS					5B1a	5D2	SATURATION		BULK DENSITY		8A
	6N2b	6O2b	6H1a	6P2a	6Q2a	Exch. Na on NH ₄ Ac		EXT. SOL. 8A1	30-Cm.	O. D.	MOISTURE AT SATURATION		
	Ca	Mg	H	Na	K	CEC		6P1a Na 6Q1a K	4B3 4A1c	4A1h	%		
	NH ₄ Ac milliequivalents per 100g. soil					%	<me. per liter>	%H ₂ O	g/cc	g/cc	%		
	30.8	23.6	7.1	5.8	0.2	0.9	<1	1.1	0.2		60.5		
	37.1	27.2	8.6	5.9	0.8	0.5	2	1.6	<0.1	30	1.33	1.77	74.2
	34.0	26.6	8.4	4.1	1.5	0.5	4	2.4	<0.1				78.7
	32.8	25.1	8.4	2.6	1.8	0.4	5	3.2	<0.1	28	1.41	1.85	79.1
	27.7		8.1	1.3	1.9	0.4	5	5.5	<0.1				78.8
	26.7		7.9	1.0	2.1	0.4	5	11.0	0.1				70.3
	24.2		7.7	1.0	2.0	0.5	4	14.0	0.2				66.5
	20.4		6.6	0.8	2.0	0.4	6	13.6	0.2	27	1.44	1.72	61.7
	18.6		5.2	1.0	1.5	0.4	5	10.4	0.2				59.3
	16.6		4.0	0.8	1.1	0.3	4	8.5	0.2				53.0
	18.0		4.0	1.0	0.8	0.3	3	5.5	0.1				53.5

a. Few carbonate concr.

Soil Type: Goessel silty clay
Date: May 11, 1959 by Jordan, Post, Penner and Stout.
Area: Butler County, Kansas.
Location: 375 yards E and 50 yards S of NW Cor Sec. 32, T24S, R3E.
Physiographic Position: Nearly level upland on old clayey alluvial sediments.
Climate: Annual precipitation about 31", annual P-E of 53.
Slope: Nearly level to very gently sloping, plane and very slightly convex surface; less than 2 percent gradient.
Drainage: Runoff very slow.
Permeability: Very slow to slow.
Vegetation: Originally tall grass prairie.
Use: Cropland, seeded to alfalfa.
Described by: H. L. Penner and M. Stout, Jr.
Soil No.: S59Kans-8-1.

Lincoln Lab. No.		(sampled wet)	
10928	Ap	0-6"	Black (10YR 2/1 moist) light silty clay; weak fine granular structure; firm; noncalcareous; boundary is smooth and abrupt to
10929	A1	6-15"	Very dark gray (10YR 3.5/1 moist) silty clay, moderate fine irregular blocky structure; very thin, continuous clay films; few, fine, unstained quartz grains adhering to ped faces; many black cracks or seams, both horizontal and vertical; noncalcareous; very firm; boundary smooth and gradual to
10930	AC1	15-24"	Dark gray (2.5Y 4/1 moist) clay; moderate medium irregular angular blocky structure breaking to fine and very fine blocky thin; distinct clay films; weakly expressed slickensides are common, oriented at 45 degrees; less dark gray seams and filled cracks than above; few to common, fine unstained quartz grains on ped surfaces; noncalcareous, boundary smooth and gradual to
10931	AC2	24-33"	Dark grayish brown (2.5Y 4/2 moist) silty clay; moderate medium blocky structure; distinct, continuous clay films; common, weak to moderately expressed slickensides; common very faint grayish brown mottles and very dark gray ped coatings; very firm; noncalcareous; boundary gradual and slightly wavy to
10932	C1	33-44"	Grayish brown (2.5Y 5/2 moist) silty clay; weak medium and coarse blocky structure; thin, continuous clay films; some nearly horizontal planes having thick films on faces, not slickensides; common, fine, faint pale yellowish brown and gray mottles; an occasional dark seam in upper half; common unstained quartz grains; slightly calcareous; very firm; boundary smooth and gradual to
10933	C1cs	44-50"	Grayish brown (2.5Y 5/2 moist) light silty clay; weak medium and coarse blocky structure; thin, mostly continuous clay films; common distinct medium mottles of dark yellowish brown and grayish brown; common gypsum as crystals and very fine white coatings and soft nests; few, soft CaCO ₃ concretions; few, very dark gray filled root channels; slightly calcareous; very firm; boundary smooth and clear to
10934	C2cs	50-55"	Same color, texture, and structure as preceding horizon; mottled finely with yellowish brown; many prominent gypsum nests and coatings; horizon is discontinuous and pinches out on right side of working face; continuous on left wall of pit; very firm; boundary is otherwise smooth and clear to
10935	C3cs	55-64"	Light brownish gray (2.5Y 6/2 moist) heavy silty clay loam; weak medium and coarse blocky structure; common fine distinct mottles of yellowish brown; gypsum same; firm to very firm; boundary smooth and gradual to
10936	C4cs	64-72"	Gray (10YR 5/1 moist) silty clay loam or clay loam; common, distinct, medium mottles of dark brown (7.5YR 4/4 moist); gypsum content about same; firm; augered.
10937	C5cs	72-92"	Dark gray (10YR 4/1 moist) clay loam grading to grayish brown (10YR 5/2 moist) in lower portion; gypsum common but less than above; common, distinct; medium brown mottles (7.5YR 4/4 moist); augered.
10938	C2	92-104"	Grayish brown (2.5Y 5/2 moist) clay loam having few to common distinct medium yellowish red mottles; no apparent gypsum; firm; augered; continuous.

Remarks: Soil profile wet in upper portion and very moist in lower half. Horizons 0-6 inches, 15-24 inches, and 55-64 inches sampled for Bureau of Public Roads. Field in which site occurs has spots where lime is close to surface indicating a wavy lime zone. Soil is considered as belonging to the Grumusols; subsamples for correlation were collected.

SOIL TYPE Goessel LOCATION Butler County, Kansas
 silty clay

SOIL NOS. S59Kans-8-2 LAB. NOS. 10939-10948

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a		3A1						2A2			
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	> 2				
2.1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	(19mm)				
0-6	Ap	0.2	1.6	1.4	1.4	2.0	52.3	41.1	30.9	24.0	-	sic	
6-13	A1	0.4	1.4	1.0	1.0	1.5	47.0	47.7	25.7	23.2	-	sic	
13-21	AC1	0.2	1.3	0.8	0.8	1.2	47.1	48.6	25.3	23.4	-	sic	
21-31	AC2	0.1	1.2	1.0	0.9	1.4	48.2	47.2	24.9	25.1	-	sic	
31-44	C1	0.4a	4.0a	2.7a	2.1a	3.0a	46.7	41.1	30.2	20.3	Tr.	sic	
44-54	C2	1.4a	7.1a	3.5a	2.5a	3.9a	44.6	37.0	33.1	16.4	Tr.	sicl	
54-63	C3	1.6a	9.7a	4.9a	3.4a	4.4a	42.6	33.4	34.1	14.2	Tr.	cl	
63-82	C4	0.8	9.0	5.2	3.5	4.2	42.5	34.8	33.6	14.4	Tr.	cl	
82-96	C1ca	0.6a	7.4a	4.2a	2.8a	3.4a	46.7	34.9	32.4	18.8	Tr.	sicl	
96-106+	C2ca	1.7a	5.5a	3.0a	2.2a	4.0a	51.7	31.9	28.1	28.5	Tr.	sicl	
pH		8C1a ORGANIC MATTER				Free Iron	ELECTRICAL CONDUCTIVITY		6E1a	6F1a	MOISTURE TENSIONS		
1:5		6A1a	6B1a	NITROGEN		Fe ₂ O ₃	EC x 10 ³	CaCO ₃ equiv. percent	GYP SUM mg./100g. SOIL	1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.	
1:1		ORGANIC CARBON %	C/N	C/N		6C1a	6A1a	%	%	%	%	%	
6.7	7.1	7.2	1.92	0.136	14.1	0.6	0.4	<1	<1			17.8	
6.2	6.8	6.9	1.45	0.113	12.8	0.7	0.3	<1	<1			21.8	
6.3	7.0	7.0	0.98	0.076	13	0.7	0.4	<1	<1			21.3	
6.7	7.4	7.4	0.71	0.057	12	0.6	0.4	<1	<1			20.4	
7.9	8.6	8.8	0.23			0.4	0.5	2	<1	<1		17.8	
8.0	8.6	8.7	0.12			0.4	0.6	1	<1	<1		17.0	
8.0	8.6	8.6	0.06			0.3	0.6	<1	<1	<1		15.2	
8.0	8.5	8.6	0.06			0.3	0.5	<1	<1	<1		16.1	
7.9	8.6	8.8	0.05			0.3	0.6	4	<1	<1		16.6	
7.9	8.6	8.8	0.02			0.2	0.7	16	<1	<1		15.4	
5A1a		EXTRACTABLE CATIONS				5B1a	5D2	SATURATION		BULK DENSITY			8A
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6H1a	6P2a	6Q2a	Exch. Na	EXT. SOL. 8A1		30-Cm.		O.D.	MOISTURE AT SATURATION	
	Ca	Mg	H	No	K	cn NH ₄ Ac	6P1a	6Q1a	4B3	4A1c	4A1h		
milliequivalents per 100g. soil						CEC	Na K		g/cc		g/cc	%	
31.1	29.5	4.9	7.7	0.1	0.7	<1	0.4	0.1				64.0	
34.3	30.4	5.4	7.5	0.2	0.6	<1	0.6	0.1	28	1.35	1.79	81.2	
34.6	30.4	5.5	6.4	0.4	0.7	1	0.9	0.1				81.1	
33.2	30.7	5.4	4.1	0.5	0.7	1	1.1	0.1	27b	1.39b	1.84b	84.5	
31.2		5.6	<0.1	0.7	0.5	2	1.9	<0.1				67.0	
27.3		5.0	0.5	0.8	0.4	2	2.3	<0.1				64.6	
25.4		4.6	1.3	0.8	0.4	2	2.6	<0.1	27	1.46	1.85	65.1	
26.8		4.7	0.8	0.8	0.5	2	2.2	0.1				87.6	
26.6		4.8	<0.1	0.9	0.5	3	2.4	<0.1				82.1	
24.3		4.0	<0.1	0.7	0.5	2	2.6	0.1				70.9	

a. Few carbonate coner.
 b. Average of two clods.

Soil Type: Goessel silty clay
 Date: May 11, 1959 by Jordan, Post, Penner, and Stout.
 Area: Butler County, Kansas.
 Location: 100 yards N and 50 yards W of E $\frac{1}{2}$ Cor, Sec. 18, T 24S, R 3E.
 Physiographic Position: Nearly level upland on old clayey alluvial sediments.
 Climate: Annual precipitation about 31"; annual P-E of 53.
 Slope: Nearly level plane surface having a gradient of less than 1 percent.
 Vegetation: Originally tall grass prairie.
 Use: Cropland.
 Described by: H. L. Penner and M. Stout, Jr.
 Soil No.: S59Kans-8-2.

Lincoln Lab. No.		(sampled wet)	
10939	Ap	0-6"	Black (10YR 2/1 moist) light silty clay; weak fine granular structure; firm; boundary smooth and abrupt to
10940	A1	6-13"	Black (10YR 2.5/1 moist) silty clay; moderate fine irregular angular blocky structure; thin, continuous clay films; few to common weak slickensides oriented about 45 degrees; very firm; noncalcareous; boundary smooth and gradual to
10941	AC1	13-21"	Very dark gray (10YR 2.5/1 moist) clay; moderate fine irregular angular blocky structure; distinct, continuous clay films; common medium to large, strong slickensides having a 45 degree angle; very firm; noncalcareous; boundary smooth and gradual to
10942	AC2	21-31"	Dark gray (10YR 3.5/1 moist) clay; moderate medium irregular angular blocky structure; distinct, continuous clay films; many strong medium to large slickensides; very faint, fine mottles of light olive brown; common dark gray, fine vertical and horizontal seams or filled cracks; few unstained quartz gravels on peds; very firm; very slightly calcareous in spots; boundary smooth and gradual to
10943	C1	31-44"	Dark gray (3.5Y 4/1 moist) light clay; moderate medium blocky structure; thin, continuous clay films; common, faint, fine light olive brown and gray mottles; few vertical seams of dark gray, about 1/4 inch wide; common, hard, fine CaCO ₃ concretions and few, fine soft Fe-Mn masses; very firm; slightly calcareous; boundary smooth and gradual to
10944	C2	44-54"	Grayish brown (2.5Y 5/2 moist) light clay; weak medium and coarse blocky structure; thin, mostly continuous clay films; many fine, faint light olive brown and gray mottles; many unstained quartz grains on ped surfaces; very firm; slightly calcareous; boundary smooth and gradual to
10945	C3	54-63"	Grayish brown (2.5Y 5/2 moist) light clay; weak medium and coarse blocky structure; many fine mottles of reddish brown and gray; many, coarser, unstained quartz grains; very firm; slightly calcareous; boundary smooth and gradual to
10946	C4	63-82"	Grayish brown (2.5Y 5/2 moist) silty clay; few to common distinct dark yellowish brown mottles; CaCO ₃ concretions few to common; calcareous; very firm; augered.
10947	C1ca	82-96"	Olive gray (5Y 5.5/2 moist) light silty clay; common to few, distinct dark yellowish brown mottles; many CaCO ₃ concretions and soft lime nests and coating; strongly calcareous; very firm; augered.
10948	C2ca	96-106"	Light olive gray (5Y 6.5/2 moist) light silty clay; common, distinct yellowish red mottles; many CaCO ₃ concretions and limy nests and coatings; violently effervescent, more than above horizon; augered; continuous.

Remarks: Soil profile wet in upper portion and very moist in lower. Horizons 0-6 inches, 13-21 inches, and 54-63 inches sampled for Bureau of Public Roads. Thickness of A1, AC horizons and depth to lime variable, ranging from 12 inches to over 31 inches in 8-foot length of pit; limy spots are observed in field. Soil is considered as a Grumusol having an undulating horizonation and gilgai microrelief (which is evident in adjacent native pasture, but not in this cultivated field). Correlation subsamples collected.

SOIL SURVEY LABORATORY Lincoln, Nebr. 5/21/58

SOIL TYPE Harney LOCATION Ford County, Kansas
silt loam

SOIL NOS. S57Kans-29-1 LAB. NOS. 5959-5966

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent.)										TEXTURAL CLASS
		1B1a		3A1						2A2		
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	< 0.002	0.2-0.02	0.02-0.002	
2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	> 2			
0-6	Ap	-	0.1	0.1	0.7	8.8	66.8	23.5	56.2	19.9	-	sil
6-12	B1	-	-	-	0.4	4.7	60.6	34.3	44.5	21.1	-	sic1
12-17	B21t	-	-	-	-	2.6	55.7	41.7	37.6	20.7	-	sic
17-25	B22t	-	-	-	-	2.5	53.6	43.9	30.7	25.4	-	sic
25-30	B2ca	0.2	0.2	0.1a	0.3a	3.0a	61.5	34.7	38.0	26.7	-	sic1
30-38	B3ca	0.2b	0.1b	-	0.4b	4.6b	63.7	31.0	43.0	25.6	-	sic1
38-57	Cca	0.1a	0.1a	0.1a	0.7a	7.6a	63.4	28.0	47.1	24.5	-	sic1
57-69	Ab	-	0.1a	0.1a	1.3a	10.5a	58.3	29.7	47.7	22.3	-	sic1

pH	3C1a					6E1a				
	ORGANIC MATTER					MOISTURE TENSIONS				
	1:5	1:10	6A1a	6B1a	C/N	CaCO ₃ equiv- alent	GYPSUM me./100g. SOIL	1/15 ATMOS.	1/3 ATMOS.	15 ATMOS.
1:1		ORGANIC CARBON %	NITRO- GEN %	C/N		%	%	%	%	
5.7	6.2	6.4	1.34	.121	11.1	-	-	-	-	9.6
6.6	7.0	7.2	1.13	.111	10.2	-	-	-	-	15.1
7.0	7.5	7.5	0.82	.081	10	-	-	-	-	18.1
7.3	7.7	7.9	0.57	.066	9	-	-	-	-	17.8
8.0	8.5	8.7	0.36			2				15.1
8.1	8.7	8.9	0.25			3				13.4
8.2	8.9	9.1	0.28			1				12.9
8.3	9.0	9.2	0.29			1				12.4

5A1a	EXTRACTABLE CATIONS					BASE SAT. % NH ₄ Ac EXCT.	5C3	5B1a	5A3a	8D3	4A3a
	6M2b	6O2b	6N1a	6P2a	6Q2a						
	Ca	Mg	H	Na	K						
CATION EXCHANGE CAPACITY NH ₄ Ac	milliequivalents per 100g. soil					5C1	Cations <me/100 g->		Ca/Mg	Vol. Wt. $\frac{c}{cc}$	
17.4	10.3	2.8	5.9	-	1.9	86	72	15.0	20.9	3.7	
24.8	18.5	5.1	4.4	0.1	1.4	100	85	25.1	29.5	3.6	1.36
30.6	23.2	7.2	2.0	0.2	1.3	100	94	31.9	33.9	3.2	
29.7	22.6	7.4	1.2	0.3	1.3	100	96	31.6	32.8	3.0	1.42
27.3				0.6	1.4						
23.7				0.9	1.5						1.26
22.6				1.6	1.6						
21.7				1.7	1.5						

a. Common CaCO₃ concr.
 b. Many CaCO₃ concr.
 c. Based on consistence terminology in the profile descriptions, the horizons were drier than midway between air-dry and field capacity.

Soil Type: Harney silt loam

Location: Ford County, Kansas. 1020' E and 180' S of NW corner Sec. 9, T28S, R24W. About 8 miles SE of Dodge City.

Date of Sampling: July 12, 1957.

Collectors: James Allen, Darold Dodge, Henry Otsuki.

Physiographic Position: Upland. Elevation approximately 2600'.

Climate: Average annual precipitation about 20". Annual temperature about 54°.

Topography: Nearly level summit of High Plains, mantled with loess. Plane surface with gradient less than 1/2 percent.

Drainage: Well drained.

Vegetation: Bare fallow,

Use: Cropland.

Soil No.: S57Kans-29-1.

Depth, Lincoln Lab.

No., and Horizon

0-6" 5959	Ap	Dark grayish brown (10YR 4/2 dry; 2.5/2 moist) heavy silt loam; weak to moderate fine and medium granular; slightly hard; friable; noncalcareous; abrupt smooth boundary to
6-12" 5960	B1	Dark grayish brown (10YR 4/2 dry; 2.5/2 moist) silty clay loam; weak coarse subangular blocky and moderate medium granular; hard, firm, weak patchy clayskins; noncalcareous; grades to
12-17" 5961	B2lt	Dark grayish brown (10YR 4.5/2 dry; 3/2 moist) heavy silty clay loam; weak to moderate coarse prismatic and moderate to strong medium subangular blocky; very hard; firm; distinct continuous clayskins; noncalcareous; grades to
17-25" 5962	B22t	Grayish brown (10YR 5/2 dry; 4/2 moist) heavy silty clay loam; weak to moderate coarse prismatic and moderate to strong medium subangular blocky; very hard; firm; distinct continuous clayskins; noncalcareous; grades to
25-30" 5963	B2ca	Grayish brown (10YR 5.5/2 dry; 4/2 moist) heavy silty clay loam; moderate coarse prismatic and moderate medium and coarse blocky; very hard; firm; weak patchy clayskins; calcareous with few fine soft and hard concretions of CaCO ₃ ; grades to
30-38" 5964	B3ca	Pale brown (10YR 6/3 dry; 4.5/3 moist) silty clay loam; moderate medium and coarse prismatic and weak coarse subangular blocky; hard; firm; very weak patchy clayskins; calcareous with coatings of CaCO ₃ on surface of peds; few fine soft concretions of CaCO ₃ ; grades to
38-57" 5965	Cca	Pale brown (10YR 6/3 dry; 4.5/3 moist) light silty clay loam; weak to moderate coarse prismatic and weak coarse subangular blocky, slightly hard; moderately friable; calcareous with coatings of CaCO ₃ on surface of peds; grades to
57-69" 5966	Ab	Brown (9YR 5.5/3 dry; 4/3.5 moist) light silty clay loam; weak coarse prismatic and weak coarse subangular blocky; slightly hard; moderately friable; calcareous with few fine concretions of CaCO ₃ ; diffuse smooth boundary to
69-80" Not sampled	Bb •	Brown (8YR 5/3 dry; 4/3 moist) light silty clay loam; weak medium subangular blocky; slightly hard; moderately friable; very weak patchy clayskins; calcareous with few fine soft concretions of CaCO ₃ .

Profiles described by Henry T. Otsuki.

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

SOIL SURVEY LABORATORY Lincoln, Nebr. 5/21/58

SOIL TYPE Harney LOCATION Ford County, Kansas
silt loam

SOIL NOS. S57Kans-29-2 LAB. NOS. 5967-5974

DEPTH INCHES	HORIZON	1B1a PARTICLE SIZE DISTRIBUTION (in mm.) (per con. 3A1)										TEXTURAL CLASS	
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	2A2				
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.2-3.002	> 2		
0-5	Ap	0.1	0.3	0.2	0.6	6.3	68.4	24.1	56.4	18.7	-	sil	
5-13	B1	-	0.1	0.1	0.4	5.2	64.7	29.5	53.1	17.1	-	sic1	
13-22	B21t	-	0.1	0.1	0.1	3.3	58.7	37.7	43.6	18.5	-	sic1	
22-28	B22t	0.1	0.1a	0.1a	0.3a	2.3a	53.6	43.5	32.5	23.6	Tr.	sic	
28-37	B2ca	0.4a	0.4a	0.1a	0.3a	2.4a	55.9	40.5	33.6	24.9	Tr.	sic	
37-50	B3ca	0.7a	0.4a	0.1a	0.3a	2.8a	60.5	35.2	34.3	29.2	-	sic1	
50-58	C1ca	0.1a	0.1a	0.1a	0.2a	3.2a	66.6	29.7	41.5	28.4	-	sic1	
58-68+	C2ca	-	-	-	0.3a	4.1a	70.0	25.6	44.8	29.5	-	sil	
pH		8C1a ORGANIC MATTER					6E1a			MOISTURE TENSIONS			
1:1		1:10		6A1a	6B1a			CaCO ₃ equiv- alent	GYPSUM me. 1.0g. SOIL	1-10 ATMOS.	1/3 ATMOS.	15 ATMOS.	
				ORGANIC CARBON %	NITRO- GEN %	C/N	%		%		%		
6.2	6.5	7.2	1.12	.105	10.7			-			9.8		
7.0	7.4	7.4	0.89	.089	10			-			12.7		
7.5	8.1	8.0	0.53	.059	9			-			16.1		
8.0	8.6	8.8	0.40	.046	9			-			17.5		
8.1	8.7	8.9	0.32					2			16.9		
8.1	8.8	9.0	0.25					2			15.2		
7.9	8.6	8.8	0.17					2			14.1		
7.7	8.4	8.5	0.20					1			13.4		
5A1a		EXTRACTABLE CATIONS. 5B1a					BASE SAT.	5C3	5B1a	5A3a	8D3	4A3a	
CATION EXCHANGE CAPACITY NH ₄ Ac		6N2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ ⁺ Ac EXCH.	Base Sat. %	Sum Bases	Sum Cations	Ca/Mg	Vol. Wt. g/cc	
		milliequivalents per 100g. soil					5C1	Cations <me/100 g>					
17.7	11.9	3.5	4.4	-	1.6	96	79	17.0	21.4	3.4			
21.5	16.6	4.6	2.4	0.2	0.8	100	90	22.2	24.6	3.6	1.35		
26.6	20.1	6.8	2.0	0.7	1.0	100	93	28.6	30.6	3.0	1.52		
28.6				1.1	1.4								
28.6				1.4	1.5								
27.3				2.0	1.4								
26.8				2.5	1.5								
26.0				2.6	1.5								

a. Common CaCO₃ concn.
b. Based on consistence terminology in the profile descriptions, the horizons were drier than midway between air-dry and field capacity.

Soil Type: Harney silt loam

Location: Ford County, Kansas. 1390' E and 1400' S of the NW corner Sec. 1, T26S, R24W. About 7 miles NE of Dodge City.

Date of Sampling: July 12, 1957.

Collectors: James Allen, Darold Dodge, Henry Otsuki.

Physiographic Position: Upland. Elevation approximately 2600'.

Climate: Average annual precipitation about 20". Annual temperature about 54°.

Topography: Nearly level summit of High Plains, mantled with loess. Plane surface with gradient less than 1/2 percent.

Drainage: Well drained.

Vegetation: Bare fallow.

Use: Cropland.

Soil No.: S57Kans-29-2.

Depth, Lincoln Lab.

No., and Horizon

0-5" 5967	Ap	Dark grayish brown (10YR 4/2 dry; 2.5/2 moist) heavy silt loam; weak to moderate medium and fine granular; slightly hard; friable; noncalcareous; abrupt smooth boundary to
5-13" 5968	B1	Dark grayish brown (10YR 4.5/2 dry; 2.5/2 moist) silty clay loam; weak coarse subangular blocky and moderate medium granular; hard; firm; weak patchy clayskins; noncalcareous; grades to
13-22" 5969	B2lt	Dark grayish brown (10YR 4.5/2 dry; 3.5/2 moist) heavy silty clay loam; weak coarse prismatic and moderate to strong medium subangular blocky; very hard; firm; distinct continuous clayskins; noncalcareous; grades to
22-28" 5970	B22t	Grayish brown (10YR 5/2 dry; 4/2 moist) heavy silty clay loam; weak coarse prismatic and strong medium blocky; very hard; firm; distinct continuous clayskins; calcareous; grades to
28-37" 5971	B2ca	Grayish brown (10YR 5/2 dry; 4/2 moist) heavy silty clay loam; weak to moderate medium prismatic and strong medium blocky; very hard; firm; distinct patchy clayskins; calcareous with common fine soft concretions of CaCO ₃ ; grades to
37-50" 5972	B3ca	Grayish brown (10YR 5.5/2 dry; 4/2 moist) silty clay loam; weak medium prismatic and moderate medium subangular blocky; hard; moderately firm; weak patchy clayskins; calcareous with coatings of CaCO ₃ on surface of peds; grades to
50-58" 5973	Clca	Pale brown (10YR 6/3 dry; 4.5/3 moist) light silty clay loam; weak coarse prismatic and weak coarse subangular blocky; slightly hard; friable; calcareous with fine threads and coatings of CaCO ₃ on surface of peds; grades slowly to
58-68"+ 5974	C2ca	Pale brown (10YR 6/3 dry; 4.5/3 moist) light silty clay loam; weak coarse prismatic and weak coarse subangular blocky; slightly hard; friable; calcareous with few fine threads of CaCO ₃ .

Profiles described by Henry T. Otsuki.

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

SOIL SURVEY LABORATORY Lincoln, Nebr. 5/20/58

SOIL TYPE Keith LOCATION Logan County, Kansas
silt loam

SOIL NOS. S57Kans-55-1 LAB. NOS. 5885-5893

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1										TEXTURAL CLASS			
		1B1a		COARSE SAND		MEDIUM SAND		FINE SAND		VERY FINE SAND			SILT	CLAY	2A2
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	> ?				
0-4	Ap1	0.2a	0.2a	0.1a	0.3a	10.4a	58.6	30.2	50.0	19.2	-	sic1			
4-6	Ap2	0.2a	0.2a	0.1a	0.2a	10.3a	62.4	26.6	53.4	19.4	-	sil			
6-10	A1	-	-	-	0.1a	8.6a	62.5	28.8	52.0	19.2	-	sic1			
10-16	A3	-	-	-	1.6	8.2	59.4	30.8	51.0	18.2	-	sic1			
16-22	B21t	-	0.3	0.1	0.4	7.0	62.1	30.1	51.1	18.3	-	sic1			
22-36	B22t	-	-	-	0.1	6.0	60.5	33.4	47.2	19.4	-	sic1			
36-46	B3ca	-	0.1	-	0.1b	7.8b	57.6	34.4	42.8	22.7	-	sic1			
46-57	Cca	-	-	-	0.1b	9.7b	66.6	23.6	52.9	23.5	-	sil			
57-70+	C	-	-	-	0.1b	11.1b	70.4	18.4	56.1	25.5	-	sil			

pH	8C1a ORGANIC MATTER					6E1a MOISTURE TENSIONS				
	1:5		1:10		C/N	CaCO ₃ equiv- alent	GYPSUM me./100g. SOIL	1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.
	6A1a	6B1a	ORGANIC CARBON	NITRO- GEN						
6.9	7.4	7.5	2.05	.179	11.4	1				13.1
6.1	6.6	6.7	2.12	.185	11.4	-				12.6
6.7	7.1	7.2	1.36	.117	11.6	-				13.1
7.0	7.3	7.3	0.91	.083	11	-				13.7
7.7	8.2	8.3	0.74	.080	9	1				13.9
8.1	8.7	8.9	0.51	.058	9	4				14.9
8.3	8.8	9.1	0.36			12				15.2
8.2	8.9	9.1	0.22			10				11.8
8.3	8.9	9.2	0.15			7				10.9

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS 5B1a					BASE SAT. % NH ₄ Ac EXCH.	5C3 Base Sat. % on Sum Cations	5B1a Sum Bases < me/100 g >	5A3a Sum Cations	8D3 Ca/Mg	4A3a Vol. Wt. g/cc
	6N2b	6O2b	6H1a	6P2a	6Q2a						
	Ca	Mg	H	Na	K						
24.7		4.2	3.2	-	3.6						
23.1	14.3	3.6	4.4	-	3.1	91	83	21.0	25.4	4.0	
24.7	17.3	4.1	3.2	-	2.3	96	88	23.7	26.9	4.2 1.21	
25.5	19.0	4.9	2.0	-	1.8	100	93	25.7	27.7	3.9	
25.5		4.8	0.4	-	1.7						
23.7				-	2.3					1.33	
23.6				0.1	2.9						
21.6				0.2	2.8					1.17	
21.2				0.4	2.7						

a. Few smooth black concr. (Mn?).
 b. Common CaCO₃ concr.
 c. Based on consistence terminology in the profile descriptions, the horizons were drier than midway between air-dry and field capacity.

Soil Type: Keith silt loam.

Location: Logan County, Kansas. 507' N and 317' W of SE corner Sec. 14, T12S, R34W; 14 miles SW of Oakley.

Date of Sampling: July 8, 1957.

Collectors: James Allen, Elbert Bell, Henry Otsuki.

Physiographic Position: Upland. Elevation approximately 3300'.

Climate: Average annual precipitation about 19". Annual temperature about 53°.

Topography: Nearly level summit of High Plains mantled with loess. Plane surface with gradient less than 1/2 percent.

Drainage: Well drained.

Vegetation: Clean fallow.

Use: Cultivated land. Broken from virgin sod in 1951.

Soil No.: S57Kans-55-1.

Depth, Lincoln Lab.

No. and Horizon

0-4" 5885	Ap1	Dark grayish brown (10YR 3.5/1.5 dry; 2.5/2 moist) silt loam; weak very fine and fine granular; slightly hard; friable; noncalcareous; abrupt smooth boundary to
4-6" 5886	Ap2	Dark grayish brown (10YR 4/1.5 dry; 3/2 moist) silt loam; weak coarse platy and weak very fine and fine granular; slightly hard; friable; noncalcareous; abrupt smooth boundary to
6-10" 5887	A1	Dark grayish brown (10YR 3.5/1.5 dry; 3/2 moist) heavy silt loam; moderate medium and fine granular; slightly hard; friable; noncalcareous; grades to
10-16" 5888	A3	Dark grayish brown (10YR 4/1.5 dry; 3/2 moist) light silty clay loam; moderate medium and fine granular; hard; friable; noncalcareous; grades to
16-22" 5889	B21t	Grayish brown (10YR 4.5/2 dry; 3/2 moist) light silty clay loam heavier than above horizon; moderate medium subangular blocky; clayskins weak and patchy; hard; firm; noncalcareous; grades to
22-36" 5890	B22t	Grayish brown (10YR 5/2 dry; 3.5/2 moist) silty clay loam about the same as above; moderate medium subangular blocky; clayskins weak and patchy; hard; firm; calcareous; grades to
36-46" 5891	B3ca	Light brownish gray (10YR 6.5/2 dry; 6/3 moist) light silty clay loam; weak medium prismatic and moderate medium and coarse subangular blocky; clayskins very weak and patchy; hard; moderately firm; calcareous with about 5% of small soft concretions of CaCO ₃ ; grades to
46-57" 5892	Cca	Light gray (10YR 7/2 dry; 5.5/3 moist) heavy silt loam; weak coarse prismatic and weak medium subangular blocky; slightly hard; friable; calcareous with about 1% of small soft concretions of CaCO ₃ ; grades to
57-70"+ 5893	C	Light gray (10YR 7/2 dry; 5.5/3 moist) silt loam; massive; soft; very friable; calcareous.

Profiles described by Henry T. Otsuki.

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

SOIL SURVEY LABORATORY Lincoln, Nebr. 5/20/58

SOIL TYPE Keith LOCATION Logan County, Kansas
silt loam

SOIL NOS. S57Kans-55-2 LAB. NOS. 5894-5901

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a		3A1					2A2			
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	> 2			
2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002				
0-4	Ap1	0.2a	0.1	-	0.3	7.5	67.1	24.8	55.0	19.8	-	sil
4-6	Ap2	0.1	0.1	-	0.1	8.9	64.0	26.3	52.3	20.7	-	sil
6-11	A1	0.1	0.1	-	0.2	9.6	60.4	29.6	51.3	18.8	-	sic1
11-17	A3	-	-	-	0.1	9.1	61.5	29.3	53.0	17.7	-	sic1
17-21	B21t	-	-	-	0.1	9.1	63.6	27.2	54.5	18.3	-	sic1
21-33	B22t	-	-	-	0.1	8.3	61.9	29.7	50.2	20.1	-	sic1
33-41	B2ca	-	-	-	0.2	9.3	60.1	30.4	48.4	21.2	-	sic1
41-57	Cca	-	-	-	0.1b	11.4b	65.7	22.8	53.7	23.5	-	sil

pH	8C1a ORGANIC MATTER					6E1a MOISTURE TENSIONS					
	6A1a		6B1a		C/N	CaCO ₃ equiv. acid		4B2			
	ORGANIC CARBON	NITROGEN	%	%		%	%	1/15 ATMOS.	1/3 ATMOS.	15 ATMOS.	
1:1	1:5	1:10									
7.3	7.8	8.0	1.54	.143	10.8	-	-	-	-	-	11.4
7.0	7.5	7.6	1.50	.134	11.2	-	-	-	-	-	12.3
6.8	7.3	7.4	1.16	.102	11.4	-	-	-	-	-	13.4
7.0	7.5	7.6	0.76	.075	10	-	-	-	-	-	13.3
7.8	8.4	8.7	0.59	.067	9	1	-	-	-	-	12.8
8.2	8.8	9.0	0.39	.047	8	8	-	-	-	-	13.9
8.2	8.8	9.0	0.32			8	-	-	-	-	13.6
8.2	8.9	9.1	0.21			8	-	-	-	-	12.0

CATION EXCHANGE CAPACITY NH ₄ Ac	5A1a EXTRACTABLE CATIONS					5C1 Cations	5C3 Base Sat. % on Sum	5B1a Sum Bases	5A3a Sum Cations	8D3 Ca/Mg	4A3a Vol. Wt. c/g/cc
	6N2b		6P2a		6Q2a						
	Ca	Mg	H	Na	K						
23.2	19.3	3.4	1.2	-	3.3	100	96	26.0	27.2	5.7	
23.6	18.4	3.4	2.0	-	2.7	100	92	24.5	26.5	5.4	
24.6	18.6	4.2	2.0	-	1.8	100	92	24.6	26.6	4.4	1.30
24.7	19.4	4.6	1.2	-	1.4	100	95	25.4	26.6	4.2	
23.8											
22.1				0.1	2.1						1.35
23.5				0.2	2.7						
21.7				0.3	2.9						1.20

a. Some organic matter.
 b. Common CaCO₃ concn.
 c. Based on consistence terminology in the profile descriptions, the horizons were drier than midway between air-dry and field capacity.

Soil Type: Keith silt loam.

Location: Logan County, Kansas. 557' S and 278' E of NW corner Sec. 36, T11S, R35W; 4 miles E of Winona.

Date of Sampling: July 8, 1957.

Collectors: James Allen, Elbert Bell, Henry Otsuki.

Physiographic Position: Upland, elevation approximately 3300'.

Climate: Average annual precipitation about 19". Annual temperature about 53°.

Topography: Nearly level summit of High Plains mantled with loess. Plane surface with gradient less than 1/2 percent.

Drainage: Well drained.

Vegetation: Clean fallow.

Use: Cultivated land. Broken from virgin sod about 1924.

Soil No.: S57Kans-55-2.

Depth, Lincoln Lab.

No., and Horizon

0-4" 5894	Apl	Dark grayish brown (10YR 4/2 dry; 2.5/2 moist) silt loam; weak very fine and fine granular; slightly hard; friable; noncalcareous; abrupt smooth boundary to
4-6" 5895	Ap2	Dark grayish brown (10YR 4/1.5 dry; 2/2 moist) silt loam; weak coarse platy breaking to fine and medium granular; slightly hard; friable; noncalcareous; abrupt smooth boundary to
6-11" 5896	A1	Very dark grayish brown (10YR 3/1.5 dry; 2/2 moist) heavy silt loam; moderate medium granular; slightly hard; friable; noncalcareous; grades to
11-17" 5897	A3	Very dark grayish brown (10YR 3/1.5 dry; 2.5/2 moist) light silty clay loam; moderate medium granular; hard; friable; noncalcareous; grades to
17-21" 5898	B21t	Dark grayish brown (10YR 4/2 dry; 3/2 moist) light silty clay loam heavier than above horizon; moderate medium subangular blocky; clayskins weak and patchy; hard; firm; noncalcareous; grades to
21-33" 5899	B22t	Grayish brown (10YR 5.5/2 dry; 4/2 moist) light silty clay loam about same as above; moderate medium subangular blocky; clayskins weak and patchy; hard; firm; calcareous; grades to
33-41" 5900	B2ca	Grayish brown (10YR 5.5/2 dry) light silty clay loam; moderate medium subangular blocky; clayskins weak and patchy; hard; moderately firm; calcareous with about 2% of small soft concretions of CaCO ₃ ; grades to
41-57" 5901	Cca	Light brownish gray (10YR 6/2.5 dry; 5/3 moist) heavy silt loam; weak coarse prismatic breaking to weak medium and coarse subangular blocky; slightly hard; friable; calcareous with few small soft concretions and fine threads of CaCO ₃ ; grades to
57-70"+ Not sampled	C	Very pale brown (10YR 7/2.5 dry; 5/3 moist) silt loam; massive; soft; very friable; calcareous.

Profiles described by Henry T. Otsuki.

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

SOIL SURVEY LABORATORY
Mandan, North Dakota

SOIL TYPE Lancaster loam
(Field No. 25/B-1)
SOIL NO. S-53-Kans-85-5

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm) (per cent) 3A1										TEXTURAL CLASS										
			1B1a 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	2A2 > 2												
1404	0-1	A11	0.3	0.5	2.0	8.6	11.6	58.1	18.9	18.4	57.1	-	sil										
1405	1-5½	A12	0.4	0.5	2.4	20.9	1.7	53.7	20.4	16.7	56.2	-	sil										
1406	5½-10	AB	0.6	0.6	2.2	9.6	11.9	49.6	25.5	14.0	53.9	-	l										
1407	10-16	B21t	0.2	0.4	2.0	9.8	15.3	43.4	28.9	11.5	54.1	-	c1										
1408	16-23	B22t	0.4	0.6	2.2	8.9	11.2	48.3	28.4	14.4	51.0	-	c1										
1409	23-34	B3	1.2	0.6	2.0	8.7	11.0	48.7	27.8	12.8	52.7	-	c1										
		PH		ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM @ 25°C	CaCO ₃ equivalent per cent	GYPSUM me /100g SOIL	MOISTURE TENSIONS			4B2 15 ATMOS.									
8C1b SATURATED PASTE		8C1a 1:5	8C1a 1:10	% ORGANIC CARBON 6A1a	% NITROGEN 6B1a	C/N					1/10 ATMOS.	(per cent) 1/3 ATMOS.											
1404	6.7	6.8	6.9	3.93	.318	12.4							13.2										
1405	5.8	5.9	6.1	2.04	.181	11.3							10.1										
1406	5.8	6.0	6.1	1.47	.129	11.4							11.0										
1407	5.9	5.9	6.1	1.15	.107	10.7							11.2										
1408	5.8	6.0	6.0	0.77	.074	10.4							11.5										
1409	6.0	6.1	6.2	0.43	.050	8.6							11.3										
		5A1a CATION EXCHANGE CAPACITY	Extractable CATIONS 5B1a				SATURATION EXTRACT SOLUBLE					PER CENT MOISTURE AT SATURATION											
← 1B4 Ac		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	EXCHANGEABLE SODIUM PERCENTAGE ESP	Na	K	CO ₃	HCO ₃	Cl		SO ₄	→									
		← milliequivalents per 100g soil →											← milliequivalents per liter →										
1404	21.8	14.4	5.2	-	1.9																		
1405	17.1	9.3	3.6	0.1	0.8																		
1406	17.1	9.1	4.2	0.1	0.5																		
1407	17.2	9.0	4.8	0.1	0.3																		
1408	17.7	9.2	5.6	0.1	0.2																		
1409	17.1	8.7	5.9	0.1	0.2																		

LANCASTER LOAM
(Field No. 25/B-1)
(Description by Erick B. Nilson)

Date: May 20, 1953

County: Saline County, Kansas

Location: 175 feet north and 45 feet west of the SE corner of Sec. 17, T. 14 S.,
R. 4 W.

Vegetation: Virgin pasture. Vegetation is mainly western wheatgrass, sand
dropseed, cheatgrass, and annual weeds.

Slope: 3- to 4-percent convex slope toward the SE. Well drained.

Soil No.: 853Kans-85-5.

Temperatures: (10:15 A.M., partly cloudy) Air: 72° F; 1-inch depth, 67°; 6-inch
depth, 62°; 12-inch depth, 62°; 24-inch depth, 60°; 36-inch depth, 62°;
48-inch depth, 58°.

Horizon
and Mandan
Lab. No.

A11 1404	0-1"	Dark grayish brown to very dark brown (10YR 4/1.5, dry; 2/1.5, moist) weak fine and very fine granular loam. Soft, friable. Matted with roots. Clear lower boundary.
A12 1405	1-5½"	Dark grayish brown to very dark brown (10YR 4/1.5, dry; 2/1.5, moist) slightly hard, friable, weak subangular blocky silt loam that breaks easily to moderate fine and very fine granules. Roots are very numerous. Clear lower boundary.
AB 1406	5½-10"	Brown to very dark brown (7.5YR 4/2, dry; 2/2, moist) moderate medium prismatic sandy clay loam that breaks to weak medium irregular blocks. Very porous. Contains a sprinkling of small sandstone fragments. Roots are numerous. Clear lower boundary.
B21t 1407	10-16"	Brown to very dark brown (7.5YR 4/4, dry; 3/3.5, moist) moderate medium prismatic, friable silty clay loam or sandy clay loam. Prisms break to weak medium and very fine blocks. Contains many sandstone fragments 1/4 to 3/8 inch in diameter. Very porous. Roots are numerous. Gradual lower boundary.
B22t 1408	16-23"	Brown to dark brown (7.5YR 5/5, dry; 3.5/4, moist) friable, weak-prismatic sandy clay loam. Prisms break to irregular blocks and very fine blocks. Contains a moderate number of small sandstone fragments. Roots are numerous. Gradual lower boundary.
B3 1409	23-34"	Mottled strong brown and brown to dark brown (7.5YR 5/6 and 5/4, dry; 4/6 and 4/4, moist) weak medium prismatic sandy clay loam. Prisms break to weak irregular blocks. Roots are numerous. Clear lower boundary.
R	34-41+"	Variegated strong brown and reddish yellow (7.5YR 5/8 and 6/8, dry) with common black spots and seams. Massive layered sandstone and ironstone. Roots are very few.

SOIL SURVEY LABORATORY
Mandan, North Dakota

SOIL TYPE Lancaster loam
(Field No. 25/B-1)
SOIL NO. S-53-Kans-85-6

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
			1B1a	2A2	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
1410	0-4	A11	0.2	0.6	8.1	23.3	8.3	41.0	18.5	13.1	46.1	-	1	
1411	4-9	A12	0.1	0.5	8.5	24.4	8.6	39.6	18.3	14.8	43.8	-	1	
1412	9-13	AB	0.1	0.5	8.3	23.1	8.7	38.9	20.4	16.8	40.7	-	1	
1413	13-19	B2	0.6	0.6	8.7	23.9	9.1	36.1	21.0	15.2	39.7	-	1	
1414	19-27	B3	0.5	0.7	9.9	27.8	10.8	35.1	15.2	16.8	40.1	-	1	
1415	27-37	C1	0.4	0.8	10.5	29.9	11.8	31.9	14.7	12.3	43.0	-	fs1	
		pH		ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ⁻³ MILLIMHOS PER CM @ 25°C	CaCO ₃ equivalent per cent	GYPSUM me /100g SOIL	MOISTURE TENSIONS (per cent)			4B2
		8C1b SATURATED PASTE	8C1a 1 5	8C1a 1:10	% ORGANIC CARBON 6A1a	% NITROGEN 6B1a	C/N				1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.	
1410	6.0	6.0	6.0	1.81	.157	11.5								8.8
1411	5.8	5.9	5.9	1.23	.118	10.4								8.7
1412	5.8	6.0	6.0	1.09	.093	11.7								8.9
1413	5.9	6.0	6.1	0.70	.065	10.8								8.0
1414	6.3	6.4	6.4	0.33	.037	8.9								6.2
1415	6.8	6.7	6.8	0.18	.025									5.2
		5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	Extractable CATIONS 5B1a				EXCHANGE-ABLE SODIUM PERCENTAGE ESP	SATURATION EXTRACT SOLUBLE						PER CENT MOISTURE AT SATURATION
		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Na		K	CO ₃	HCO ₃	Cl	SO ₄		
		milliequivalents per 100g soil				milliequivalents per liter								
1410	14.4	8.6	2.6	0.1	0.5									
1411	14.2	8.1	3.2	0.1	0.2									
1412	14.6	9.0	3.5	0.1	0.2									
1413	13.1	8.1	2.8	0.1	0.2									
1414	9.4	6.7	2.2	0.1	0.1									
1415	7.1	4.8	2.7	0.1	0.1									

LANCASTER LOAM
(Field No. 25/B-1)

Date: May 20, 1953 Described by: W. M. Johnson.
County: Saline County, Kansas
Location: 2/10 mile west and 300 feet south of the NE corner of Sec. 27., T. 14 S.,
R. 5 W.

Vegetation: Virgin pasture. Principal plants are sand dropseed, little bluestem, cheatgrass, blue grama grass, and annual weeds.

Slope: About 4 percent convex slope toward the north. Well drained.

Parent Material: Weathered Cretaceous sandstone and shale with a little colluvium on the top.

Soil No.: S53Kans-85-6-

Temperatures: (1:00 P.M.; sunny, windy) Air: 84° F.; 1-inch depth, 71°; 6-inch depth, 68°; 12-inch depth, 66°; 24-inch depth, 67°; 36-inch depth, 65°.

Horizon and
Mandan Lab.No.

A11 1410	0-4"	Dark grayish brown to very dark brown (10YR 4/2, dry; 2.5/2.5, moist) weak medium, fine, and very fine granular, very friable loam. Matted with roots. Clear lower boundary.
A12 1411	4-9"	Dark grayish brown to very dark brown (10YR 4/2, dry; 2.5/2.5., moist) soft, friable loam. Weak coarse prisms break to weak medium and fine granules. Roots very numerous. Clear lower boundary.
AB 1412	9-13"	Brown to dark brown (10YR 4.5/3, dry; 3/3, moist) moderate coarse prismatic, friable, heavy loam or light clay loam. Prisms break to weak very fine subangular blocks. Roots are numerous. Gradual lower boundary.
B2 1413	13-19"	Mottled brown and dark grayish brown (10YR 5/3 and 4.5/2.5, dry; 4/4 and 3.5/3, moist) moderate coarse prismatic, friable sandy clay loam. Roots are numerous. Very porous. Gradual lower boundary.
B3 1414	19-27"	Light yellowish brown to yellowish brown (10YR 6/4, dry; 5/4, moist), with a few black spots and common fine and medium mottled of strong brown (moist), weak coarse and medium prismatic, friable sandy clay loam. Very porous. Roots are numerous. Gradual lower boundary.
C1 1415	27-37"	Light yellowish brown to yellowish brown (10YR 6/4, dry; 5/4, moist), with many coarse prominent mottles of light gray, black, and yellowish red. Weak coarse irregular blocky, friable sandy clay loam. Few roots. Abrupt lower boundary.
R	37-42 1/2"	(Not sampled). Stratified gray clay shale and yellowish red sandstone.

SOIL SURVEY LABORATORY
Mandan, North Dakota

SOIL TYPE Lockhard silt loam
(Field No. 364/A-1)
SOIL NO. 3-53-Kans-35-1

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS												
			1B1a		3A1						2A2 > 2														
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY <0.002		0.02-0.002	0.02													
1367	0-4	Ap	0.1	0.1	0.2	1.3	8.1	68.0	22.2	22.9	54.0	-	sil												
1368	4-7	A1	-	-	0.2	0.8	4.7	67.3	27.0	25.0	47.6	-	sil												
1369	7-12	B21t	-	0.1	0.2	0.5	2.6	46.7	49.9	22.1	27.5	-	sic												
1370	12-24	B22t	-	-	0.1	0.3	2.3	47.7	49.6	24.1	26.1	-	sic												
1371	24-29	B23t	-	0.1	0.1	0.3	2.3	50.4	46.8	26.2	26.7	-	sic												
1372	29-35	B3ca	1.0	0.4	0.3	0.4	1.8	52.8	43.3	30.3	24.5	-	sic												
1373	35-43	Cca	0.2	0.6	0.4	0.6	2.3	63.6	32.3	35.0	31.2	-	sic1												
1374	43-49	C1	0.1	0.4	0.4	0.5	2.1	63.4	33.1	37.2	28.6	-	sic1												
1375	49-52	A11b	0.1	0.2	0.2	0.4	2.1	62.9	34.1	36.1	29.2	-	sic1												
1376	52-62+	A12b	-	-	0.2	1.2	3.9	60.4	34.3	31.4	33.8	-	sic1												
		pH		ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM @ 25°C	CaCO ₃ equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS														
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	% ORGANIC CARBON 6A1a	% NITROGEN 6B1a	C/N				1/10 ATMOS.	(per cent) 1/3 ATMOS.	4B2 15 ATMOS.													
1367	5.7	5.8	6.0	1.02	.091	11.2						9.1													
1368	5.5	5.8	5.9	1.07	.089	12.0						12.1													
1369	6.0	6.2	6.4	0.94	.089	10.6						24.3													
1370	6.7	7.1	7.2	0.66	.070	9.4		1				24.6													
1371	7.5	7.9	8.1	0.45	.052	8.6		1				23.9													
1372	7.6	8.0	8.3	0.26	.038	6.8		4				22.2													
1373	7.4	7.9	8.2	0.08	.025			1				18.4													
1374	7.3	7.8	7.8	0.10	.028			-				20.4													
1375	7.3	7.6	7.6	0.13	.030			1				19.5													
1376	7.1	7.5	7.5	0.22	.050			-				17.7													
5A1a CATION		Extractable CATIONS 5B1a				SATURATION EXTRACT SOLUBLE						PER CENT MOISTURE AT SATURATION	8D3 Ca/Mg												
EXCHANGE CAPACITY NH ₄ Ac		6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	EXCHANGEABLE SODIUM PERCENTAGE ESP	Na	K	CO ₃	HCO ₃	Cl			SO ₄											
		milliequivalents per 100g soil												milliequivalents per liter											
1367	16.9	10.1	4.0	0.1	0.8													2.5							
1368	20.9	12.4	4.7	0.4	0.5													2.6							
1369	36.0	23.5	10.2	1.0	0.8													2.3							
1370	35.0			1.5	0.7																				
1371	32.2			2.0	0.8																				
1372	30.6			2.3	0.8																				
1373	29.0			2.5	0.7																				
1374	29.8			2.5	0.7																				
1375	29.0			2.6	0.7																				
1376	26.6	16.8	7.4	2.2	0.5													2.3							

LOCKHARD SILT LOAM
(Field No. 364/A-1)

43

Date: May 18, 1953
 County: Saline County, Kansas
 Location: 3/10 mi. W and 75' N of SE corner Sec. 5, T. 15 S., R. 3 W.
 Vegetation: Cultivated. Last year's cornfield, not plowed this year.
 Slope: 1/4 to 1/2 percent, plane.
 Parent Material: Eolian silt of early Wisconsin age, probably deposited in shallow water (Peoria age?).
 Temperatures: (10:45 A.M.; sunny). Air, 66° F.; 1-inch depth, 67-74°; 6-inch depth, 58°; 12-inch depth, 60°; 24-inch depth, 62°; 36-inch depth, 64°; 48-inch depth, 64°; 60-inch depth, 60°.
 Soil No.: S53Kans-85-1.
 Described by: W. M. Johnson

Horizon and Mandan Lab No.	Depth	Description
Ap 1367	0-4"	Grayish brown to very dark grayish brown (10YR 5/1.5 dry; 3.5/1.5 moist) soft, friable, weak fine-granular silt loam. Has a few small and medium indistinct mottles of darker color. Lower boundary is clear.
A1 1363	4-7"	Dark gray to very dark brown (10YR 4/1 dry; 2/2 moist) weak coarse and medium granular, friable, heavy silt loam. Lower boundary is gradual and indistinct.
B21t 1369	7-12"	Dark grayish brown to very dark brown (10YR 3.5/1.5 dry; 2.5/2.5 moist) weak coarse prismatic, heavy silty clay loam or light silty clay that breaks into weak coarse irregular blocks and finally to moderate fine granules. Lower boundary is gradual and indistinct.
B22t 1370	12-24"	Dark gray to very dark brown (10YR 4/1.5 dry; 2.5/1.5 moist) weak coarse prismatic silty clay that breaks to moderate medium and coarse blocks and finally to weak fine blocks. Firm. Surfaces of cracks have gray, bleached silt films. Surfaces of aggregates are very slightly darker and slightly shiny. Lower boundary diffuse.
B23t 1371	24-29"	Dark gray to very dark brown (10YR 4/1.5 dry; 2.5/2.5 moist) moderate medium and coarse blocky, firm silty clay. Breaks with difficulty to weak fine blocks and very fine blocks. Aggregates along cracks have darker colored surfaces. Coarsely wavy, diffuse, indistinct lower boundary.
B3cn 1372	29-35"	Grayish brown to very dark grayish brown (10YR 5/2 dry; 3/2.5 moist) with surface "skins" of 10YR 4.5/2 dry; 2.5/1.5 moist. Firm, moderate medium and coarse blocky silty clay. Contains many hard, rounded, calcium-carbonate concretions from 1/16 to 3/16 inches in diameter and a few rounded iron-manganese "shot" concretions about 1/16 inch in diameter. Lower boundary is indistinct and wavy.
Cca 1373	35-43"	Light gray to grayish brown (10YR 7/1.5 dry; 5/2 moist), with common fine and medium distinct mottles of light yellowish brown and gray (dry). Weak irregular blocky friable silty clay loam. Contains many hard rounded calcium carbonate concretions about 1/8 inch in diameter, and a few tiny iron-manganese "shot" concretions. Indistinct, gradual lower boundary.
Cl 1374	43-49"	Light gray to grayish brown (2.5Y 7/2 dry; 5/2 moist), with common prominent fine and medium mottles of reddish yellow and very dark gray (dry). Friable silty clay loam that is massive or weak medium and coarse irregular blocky. Very slightly calcareous. No concretions. Clear lower boundary.
A11b 1375	49-52"	Light gray to grayish brown (2.5Y 7/2 dry; 5/2 moist) with few to common fine distinct mottles of dark brown and very dark gray (both dry). Moderate medium blocky friable silty clay loam. The mottles consist mainly of vertical streaks. Noncalcareous. Diffuse lower boundary.
A12b 1376	52-62 1/4"	Gray to very dark gray (10YR 5/1 dry; 3/1 moist) with common small and medium mottles of brown (dry) and conspicuous light gray and very light gray films over the aggregates. Non-calcareous. Friable moderate fine granular silty clay loam. The mottles consist mainly of vertical streaks.

NOTES: Some tendency toward Grumusolic character may be seen. E_{ca} Horizon is very wavy. At either side of the exposure the carbonate concretions lie within 22 inches of the surface, dropping down to 29 inches at the center of the cut.

SOIL SURVEY LABORATORY

SOIL TYPE Lockhard silt loam
(Field No. 304/A-1)

Mandan, North Dakota

SOIL NO. S-53-Kans-85-2

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1										TEXTURAL CLASS		
			1B1a												
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY <0.002	3A1		2A2	CLASS		
			0.1	0.2	0.4	0.8	7.0	68.1	23.4	23.3	52.3	-		sil	
1377	0-6	Ap	0.1	0.2	0.4	0.8	7.0	68.1	23.4	23.3	52.3	-	sil		
1378	6-10	A1	-	0.2	0.2	0.4	5.2	60.8	33.2	23.4	42.0	-	sic1		
1379	10-14	B21t	-	0.1	0.1	0.3	2.9	49.9	46.7	22.1	30.9	-	sic		
1380	14-19	B22t	-	0.1	0.1	0.2	2.0	52.0	45.6	27.7	26.4	-	sic		
1381	19-28	B23t	-	0.1	0.1	0.2	1.8	49.4	48.4	24.6	26.7	-	sic		
1382	28-40	B3ca	1.1	0.4	0.2	0.3	1.6	50.2	46.2	27.7	24.3	-	sic		
1383	40-45	Cca	0.1	0.3	0.2	0.2	1.2	55.5	42.0	28.7	28.1	-	sic		
1384	45-60+	C	-	-	-	-	2.0	64.1	33.9	32.3	33.8	-	sic1		
			pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM @ 25 °C	CaCO ₃ equivalent per cent 6E1a	GYPSUM me /100g SOIL	MOISTURE TENSIONS		
			8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	% ORGANIC CARBON 6A1c	% NITROGEN 6B1c	C/N					(per cent) 4B2	1/10 ATMOS.	1/3 ATMOS.
1377	5.6	5.8	5.9	1.16	.100	11.6							9.6		
1378	5.8	6.0	6.1	1.11	.111	10.0							15.0		
1379	6.0	6.4	6.6	0.84	.087	9.6							22.1		
1380	6.3	6.7	7.0	0.61	.066	9.2							26.4		
1381	7.0	7.4	7.5	0.49	.055	8.9			1				23.0		
1382	7.5	8.3	8.4	0.27	.040	6.8			3				22.6		
1383	7.6	8.4	8.5	0.17	.034				2				20.1		
1384	7.5	8.2	8.1	0.09	.030				1				19.4		
			5A1a EXTRACTABLE CATIONS 5E1a				SATURATION EXTRACT SOLUBLE					PER CENT MOISTURE AT SATURATION			
			6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	EXCHANGEABLE SODIUM PERCENTAGE ESP	Na	K	CO ₃	HCO ₃		Cl	SO ₄	
17H4 Ac			milliequivalents per 100g soil				milliequivalents per liter								
1377	17.5	10.2	3.3	0.1	0.8								3.1		
1378	23.9	14.7	4.9	0.5	0.6								3.0		
1379	31.9	21.4	7.7	1.1	0.7								2.8		
1380	33.1	23.4	8.2	1.3	0.8								2.8		
1381	33.1		9.1	1.9	0.8										
1382	31.6		9.2	2.3	0.8										
1383	30.7		8.7	2.6	0.7										
1384	28.4		8.2	2.3	0.6										

LOCKHARD SILT LOAM
(Field No. 364/A-1)

Date: May 18, 1953

County: Saline County, Kansas

Location: 1/8 mi. E and 100' N of the SW corner Sec. 2, T. 15 S., R. 3 W.

Vegetation: Cultivated. Sorghum field that has been recently tilled.

Slope: About 1 percent plane slope toward the east. Moderately well drained.

Parent Material: Eolian silt of Peoria age.

Soil No.: S53Kans-85-2.

Described by: W. M. Johnson.

Temperatures: (3:15 P.M.; soil moist; sunny). Air, 72° F.; one-inch depth, 75°;
6-inch depth, 64°; 12-inch depth 68°; 24-inch depth, 65°; 36-inch depth
65°; 48-inch depth, 65°; 60-inch depth, 61°.

Horizon and Mandan lab. No.	Thickness	Description
Ap 1377	0-6"	Dark gray to very dark brown (10YR 4/1.5 dry; 2/2.5 moist) soft, friable, weak fine-granular silt loam. Abrupt lower boundary.
A1 1378	6-10"	Very dark gray to very dark brown (10YR 3.5/1.5 dry; 2/2 moist) weak fine-granular, friable, heavy silt loam or light silty clay loam. Slightly hard when dry. Gradual lower boundary.
B21t 1379	10-14"	Dark grayish brown to very dark grayish brown (10YR 3.5/2 dry; 3/2.5 moist) moderate coarse-granular, friable, plastic, light silty clay. Very hard when dry. Clear lower boundary.
B22t 1380	14-19"	Dark grayish brown to very dark grayish brown (10YR 3.5/2 dry; 3/2.5 moist) weak coarse prismatic, firm, plastic and sticky silty clay. Prisms break to weak coarse and medium blocks and finally to moderate fine and very fine blocks. No concretions. Very hard when dry. Diffuse lower boundary.
B23t 1381	19-28"	Dark grayish brown to very dark grayish brown (10YR 4/2 dry; 3/2.5 moist) moderate medium and coarse blocky, extremely hard, firm silty clay. Contains a very few tiny iron-manganese "shot" concretions. No evidence of colloidal films on aggregates. Slightly wavy, clear lower boundary.
B3ca 1382	28-40"	Grayish brown to very dark grayish brown (10YR 4.5/1.5 dry; 3/2 moist), with a few fine conspicuous reddish yellow mottles. Firm, very hard, moderate medium and coarse blocky silty clay containing numerous hard, rounded, calcium-carbonate concretions from 1/16 to 3/8 inches in diameter. Matrix of soil is also slightly calcareous. Contains a few tiny iron-manganese "shot" concretions. Diffuse lower boundary.
Cca 1383	40-45"	Grayish brown to dark grayish brown (2.5Y 5.5/2 dry; 4/2 moist), with few to common, fine, inconspicuous mottles of strong brown and brown (moist). Weak, irregular, coarse and medium blocky, friable, heavy silty clay loam or light silty clay; very hard when dry. Contains numerous hard, rounded, calcium-carbonate concretions from 1/8 to 3/8 inches in diameter. Diffuse lower boundary.
C 1384	45-60"	Light gray to olive gray (5Y 7/2 dry; 5/2 moist), with common conspicuous fine and medium mottles of yellowish red and brown (both dry). Friable, very hard, weak irregular blocky silty clay loam. Noncalcareous.

SOIL SURVEY LABORATORY
Mandan, North Dakota

SOIL TYPE Muir silt loam

SOIL NO. S-53-Kans-79-2

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
			1B1a		3A1						2A2			
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY <0.002	0.02-0.002	0.2-0.02	> 2		
2070	0-6	Ap	-	-	0.4	0.6	25.0	61.9	12.1	10.7	76.6	-	sil	
2071	6-10	A1	-	-	-	-	15.3	65.0	19.7	17.3	63.0	-	sil	
2072	10-17	B2	-	-	-	0.9	16.3	62.7	20.1	17.5	62.4	-	sil	
2073	17-29	B3	-	-	-	0.9	17.3	63.2	18.6	15.4	66.0	-	sil	
2074	29-40	C1	-	-	-	0.8	19.5	61.6	18.1	13.2	68.7	-	sil	
2075	40-56	C2	-	-	1.0	2.4	16.3	61.9	18.4	14.9	64.1	-	sil	
2076	56-63	C3	-	-	-	2.3	20.1	61.5	16.1	11.7	70.4	-	sil	
		pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM @ 25°C	CaCO ₃ equivalent per cent	GYPSUM me./100g SOIL	MOISTURE TENSIONS (per cent)		
		8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	% ORGANIC CARBON 6A1a	% NITROGEN 6B1a	C/N					1/10 ATMOS	1/3 ATMOS.	4B2 15 ATMOS.
2070	6.6	6.9	7.1	0.78	.071	11.0			-					5.6
2071	6.3	6.6	6.8	0.94	.081	11.6			-					8.9
2072	6.5	6.8	7.0	0.72	.072	10.0			-					9.1
2073	6.6	6.9	7.0	0.45	.049	9.2			-					8.5
2074	7.0	7.3	7.4	0.29	.038	7.6			-					8.0
2075	7.2	7.4	7.6	0.24	.033				-					8.0
2076	7.5	7.8	8.0	0.22	.029				-					6.9
		5A1a CATION EXCHANGE CAPACITY	Extractable CATIONS				5B1a EXCHANGEABLE SODIUM PERCENTAGE ESP	SATURATION EXTRACT SOLUBLE						PER CENT MOISTURE AT SATURATION
		meq/100g soil	6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Na	K	CO ₃	HCO ₃	Cl	SO ₄		
		←	milliequivalents per 100g soil				→	milliequivalents per liter						←
2070	11.6	8.8	2.4	-	0.7									
2071	17.5	13.2	2.4	-	0.5									
2072	17.4	13.1	2.4	-	0.4									
2073	15.3	11.8	2.2	-	0.8									
2074	14.5	11.6	2.0	-	0.8									
2075	14.6	11.8	2.1	-	1.6									
2076	13.2	11.6	1.8	-	1.2									

MUIR SILT LOAM
(By W. M. Johnson)

Date: October 23, 1953

Location: Republic County, Kansas. 1/4 mile south and 230 feet west of NE $\frac{1}{4}$ corner, Section 9, Township 4 South, Range 4 West.

Physiography: Middle terrace of Republican River Valley. Smooth, gently undulating.

Slope: About 1/2 percent plane slope, facing southeast.

Drainage: Well drained.

Vegetation: Cultivated; corn stubble, with wheat planted in it.

Parent material: Assumed to be Peoria loess.

Classification: Chernozemic Alluvial soil.

Soil No.: S53Kans-79-2.

Mandan

Lab. No.

2070	Ap	0-6"	Dark grayish brown to very dark gray (10YR 4/2, dry; 3/1, moist) soft friable loam or silt loam. Mixed single grain and weak medium and fine subangular blocky ("Cloddy") Roots very numerous. pH 5.0. Abrupt, smooth lower boundary.
2071	A1	6-10"	Very dark grayish brown to black (10YR 3/2, dry; 2/1, moist) soft friable silt loam. Weak very fine granular structure, containing many worm casts. Roots numerous. pH 6.0. Clear smooth lower boundary.
2072	B2	10-17"	Brown to very dark brown (10YR 4/3, dry; 2/2, moist) soft friable silt loam. Weak coarse prismatic structure. Very numerous worm casts. Common fine roots. pH 6.5. Gradual, smooth lower boundary.
2073	B3	17-29"	Brown to dark brown (10YR 4/3, dry; 3/3, moist) soft friable silt loam. Very weak, very coarse prismatic structure, breaking to weak, very fine blocks. No clay "skins" observed. Numerous worm casts. pH 5.0. Gradual smooth lower boundary.
2074	C1	29-40"	Brown to dark brown (10YR 5/3, dry; 3/3, moist) soft, friable silt loam. Weak, very coarse prismatic structure. Few fine roots. Worm casts are common. pH 6.5. Gradual, smooth lower boundary.
2075	C2	40-56"	Grayish brown to very dark grayish brown (10YR 5/2, dry; 3/2, moist) soft, friable massive silt loam. Few worm casts. Few fine roots. Porous. pH 6.5. Gradual, smooth lower boundary.
2076	C3	56-63" ⁴	Light brownish gray to dark grayish brown (10YR 6/2, dry; 4/2, moist) soft, friable, coarse silt or silt loam. Massive. Very few fine roots. Noncalcareous. pH 8.0.

SOIL SURVEY LABORATORY

SOIL TYPE Muir loam

Mandan, North Dakota

SOIL NO. S-53-Kans-79-4

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
			1B1a		3A1					2A2			
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY <0.002	0.2-0.02	> 2		
2084	0-7	Ap	-	0.8	1.3	1.9	31.0	54.6	10.4	7.8	73.8	-	sil
2085	7-17	A1	-	1.1	1.3	1.9	26.2	53.8	15.7	10.3	70.7	-	sil
2086	17-28	B2	-	0.8	0.9	0.9	19.5	57.7	20.2	12.6	65.2	-	sil
2087	28-43	B3	-	-	0.5	0.5	15.4	62.5	21.1	16.8	61.4	-	sil
2088	43-53	C1	-	-	-	0.9	10.4	67.4	21.3	22.6	56.1	-	sil
2089	53-61	C2	-	-	-	-	9.5	67.9	22.6	23.4	54.0	-	sil
2090	61-66	Cca	-	-	-	-	8.4	69.6	22.0	24.6	53.4	-	sil

LABORATORY NUMBER	pH			ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM @ 25°C	CaCO ₃ equivalent per cent 6E1a	GYPSUM me./100g SOIL	MOISTURE TENSIONS		
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	% ORGANIC CARBON 6A1a	% NITROGEN 6B1a	C/N					1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.
2084	5.8	6.0	6.3	0.71	.067	10.6		-			5.0		
2085	5.8	6.1	6.3	0.72	.071	10.1		-			7.0		
2086	6.4	6.8	6.9	0.60	.066	9.1		-			9.2		
2087	6.9	7.0	7.0	0.37	.045	8.2		-			9.4		
2088	7.1	7.4	7.5	0.22	.032			-			9.5		
2089	7.3	7.5	7.7	0.20	.032			-			10.1		
2090	7.6	8.4	8.5	0.16	.029			4			10.2		

LABORATORY NUMBER	5A1a CATION EXCHANGE CAPACITY (mmol/c)	Extractable CATIONS 5B1a				EXCHANGE-ABLE SODIUM PERCENTAGE ESP	SATURATION EXTRACT SOLUBLE						PER CENT MOISTURE AT SATURATION
		6N2b		6P2a			Na	K	CO ₃	HCO ₃	Cl	SO ₄	
		Ca	Mg	Na	K								
2084	9.8	6.3	1.3	-	0.9								
2085	13.5	8.9	2.1	-	0.6								
2086	15.7	11.6	2.3	-	0.5								
2087	15.7	11.8	2.6	-	0.7								
2088	16.6	12.6	3.1	-	0.8								
2089	17.2	13.0	3.7	-	1.1								
2090	17.2			0.2	1.1								

MUIR LOAM
(By W. M. Johnson)

Date: October 23, 1953

Location: Republic County, Kansas. 600 feet south and 100 feet west of N $\frac{1}{4}$ corner, Section 33, Township 3 South, Range 4 West.

Physiography: Middle terrace of Republican River; loess mantled.

Parent Material: Calcareous Peoria loess (?).

Slope: About 1/2 percent plane slope toward the west.

Drainage: Well drained. Runoff, slow; permeability, medium.

Vegetation: Cultivated; corn field.

Classification: Chernozemic Alluvial soil.

Soil No.: S53Kans-79-4.

Mandan Lab. No.

- | | | | |
|------|-----|--------|--|
| 2084 | Ap | 0-7" | Dark grayish brown to very dark brown (10YR 4/2, dry; 2/2, moist) soft very friable loam or very fine sandy loam. Mixed single grain and very weak coarse sub-angular blocks (clods) due to tillage. Lower two inches have very weak coarse cleavage. Roots are numerous. pH 5.0. Abrupt smooth lower boundary. |
| 2085 | A1 | 7-17" | Dark grayish brown to very dark gray (10YR 4/2, dry; 3/1, moist) soft friable silt loam. Very weak coarse and very coarse prisms break to very weak fine granules. Worm casts very numerous. Roots numerous. pH 5.0. Clear, smooth lower boundary. |
| 2086 | B2 | 17-28" | Dark grayish brown to very dark grayish brown (10YR 4/2, dry; 3/2, moist) hard friable silt loam. Weak coarse prisms break to weak very fine blocks. Worm casts very numerous. Roots common. Noncalcareous. Very weak, patchy, thin clay "skins". pH 7.0. Gradual, smooth lower boundary. |
| 2087 | B3 | 28-43" | Brown to dark brown (10YR 5/3, dry; 3/3, moist) hard friable heavy silt loam. Weak coarse prisms break to very weak fine irregular blocks. Peds have a very few thin patches of clay "skins." Worm casts common. Few roots. pH 6.5. Gradual, smooth lower boundary. |
| 2088 | C1 | 43-53" | Brown to dark brown (10YR 4/3, dry; 3/3, moist) soft friable silty loam. Weak coarse prisms break to weak very fine irregular blocks. Few roots. Noncalcareous. Worm casts common. Rather prominent clay "skins" on larger surface peds. pH 8.0. Gradual, smooth lower boundary. |
| 2089 | C2 | 53-61" | Brown to dark brown (10YR 5/3, dry; 3/3, moist) soft friable silt loam. Very weak very fine blocky structure. Very few roots. Worm casts common. Noncalcareous. Peds show a few patches of thin clay "skins". pH 7.0. Clear, wavy lower boundary. |
| 2090 | Cca | 61-66" | Brown to dark grayish brown (10YR 5/3, dry; 4/2, moist) with common medium and fine mottles of white (dry). Soft friable silt loam. Very weak irregular fine blocky structure. There are threads and films of white lime and a few hard round carbonate concretions about 1/2" in diameter. Very few fine roots. Porous. pH 8.0. |

SOIL SURVEY LABORATORY

SOIL TYPE Muir silt loam

Mandan, North Dakota

SOIL NO. S-53-Kans-89-1

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 341										TEXTURAL CLASS	
			1B1a 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	2A2 > 2		
2001	0-6	Ap	-	0.3	0.3	0.6	10.1	68.5	20.2	24.1	54.9	-	s11	
2002	6-12	A1	-	0.1	0.2	0.6	7.8	70.8	20.5	24.5	54.5	-	s11	
2003	12-23	B2	-	-	-	0.6	7.8	68.3	23.3	25.2	51.5	-	s11	
2004	23-30	B3	0.1	-	0.1	0.7	8.1	66.3	24.7	25.0	50.0	-	s11	
2005	30-44	B2b	-	-	-	1.8	7.0	62.1	29.1	25.5	45.0	-	s1cl	
2006	44-52	B3b	-	-	-	3.8	13.4	61.9	20.9	21.3	56.7	-	s11	
2007	52-62	C	-	-	-	2.8	18.2	60.5	18.5	18.7	62.0	-	s11	
			pH		ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM @ 25 °C	CaCO ₃ equivalent per cent 0.01a	GYPSUM me./100g SOIL	MOISTURE TENSIONS (per cent) ATMOS.		4B2 15 ATMOS
			8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	% ORGANIC CARRON 6A1a	% NITROGEN 6B1a	C/N				1/10	1/3	
2001	5.3	5.8	5.8	1.29	.110	11.7			-					8.5
2002	5.4	5.8	6.1	1.33	.110	12.1			-					9.0
2003	6.0	6.2	6.2	1.00	.094	10.6			-					11.2
2004	6.2	6.4	6.4	0.62	.067	9.2			-					11.5
2005	6.2	6.5	6.8	0.46	.057	8.1			-					13.7
2006	6.2	6.4	6.7	0.21	.033				-					9.5
2007	6.3	6.6	6.8	0.14	.024				-					7.6
		5A1a CATION EXCHANGE CAPACITY 1M+4Ac	Extractable CATIONS 5B1a				EXCHANGEABLE SODIUM PERCENTAGE ESP	SATURATION EXTRACT SOLUBLE						PER CENT MOISTURE AT SATURATION
			6N2b Ca	6O2b Mg	6P2a Na	6Q2a K		Na	K	CO ₃	HCO ₃	Cl	SO ₄	
			milliequivalents per 100g soil					milliequivalents per liter						
2001	17.1	11.2	1.7	-	0.8									
2002	17.3	10.6	1.6	-	0.9									
2003	19.0	13.2	2.0	-	0.6									
2004	18.4	13.3	1.8	-	0.6									
2005	20.4	15.0	2.0	-	0.8									
2006	15.1	11.3	1.2	-	0.6									
2007	13.8	11.2	1.0	-	0.5									

MUIR SILT LOAM
(By W. M. Johnson)

Date: October 20, 1953

Location: Shawnee County, Kansas. 6 1/4 miles East, 60 feet South of W 1/4 corner,
Sec. 8, T. 11S., R. 14 E.

Physiography: Nearly level terrace of Kansas River (The Newman Terrace level).

Parent Material: Silt loam alluvium deposited by the Kansas River.

Slope: Nearly level.

Drainage: Moderately well drained. Runoff very slow or lacking; permeability,
moderate.

Vegetation: Cultivated corn field. Was green manured with rye last spring and
had granular nitrogen fertilizer applied for corn. This is the second
year of corn following wheat.

Classification: Minimal Brunizem.

Soil No.: S53Kans-89-1.

Mandan
Lab. No.

2001	Ap	0-6"	Dark gray to black (10YR 4/1, dry; 2/1, moist) soft, friable silt loam. Many clods due to tillage; breaks to mixture of single-grain and weak very fine, fine and medium granules. Some pseudoplatiness at 3" to 5" depth. Roots very numerous. pH 6.0. Abrupt, slightly wavy lower boundary.
2002	A1	6-12"	Dark gray to black (10YR 4/1, dry; 2/1, moist) soft, friable silt loam. Nearly massive, some weak coarse pseudoplates, some tendency toward weak coarse prismatic structure. Roots are numerous. pH 6.0. This and the horizon above probably represent fairly recent flood deposit. Abrupt, smooth lower boundary.
2003	B2	12-23"	Dark grayish brown to very dark brown (10YR 4/2, dry; 2/2, moist) friable, light silty clay loam. Weak, very coarse prisms break to moderate very fine blocks. Aggregates have moderate clay "skins". Worm casts are numerous. Moderate number of fine roots. pH 6.0. Gradual, smooth lower boundary.
2004	B3	23-30"	Brown to very dark grayish brown (10YR 4/3, dry; 3/2, moist) friable silty clay loam. Moderate coarse prisms break to weak very fine blocks with prominent clay "skins". Many worm casts. Few fine roots. There are weak (thin) gray silt films on the vertical cleavage planes. pH 7.0. Gradual, smooth lower boundary.
2005	B2b	30-44"	Dark grayish brown to very dark grayish brown (10YR 4/2 dry; 3/2 moist) friable silty clay loam. Moderate coarse prisms break to weak medium and fine blocks. Aggregates have prominent clay "skins". Worm casts are numerous; porous; few fine roots. pH 7.0. Gradual, smooth lower boundary.
2006	B3b	44-52"	Pale brown to brown (10YR 6/3, dry; 4/3, moist) soft, friable heavy silt loam or light silty clay loam. Weak coarse and very coarse prismatic structure. Noncalcareous Aggregates have moderate clay "skins". Porous due to root holes. Very few fine roots. pH 7.5. Gradual, smooth lower boundary.
2007	C	52-62"4	Pale brown to brown (10YR 6/3, dry; 4/3, moist) friable, soft, heavy silt loam or light silty clay loam. Very weak coarse prismatic structure that has few weak clay "skins". Noncalcareous. Very porous due to root holes. Contains very few fine roots and a few worm casts. pH 7.5.

SOIL SURVEY LABORATORY
Mandan, North Dakota

SOIL TYPE Muir silt loam

SOIL NO. S-53-Kans-89-2.

LABORATORY NUMBER	DEPTH IN INCHES	HORIZON	1B1a PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1										TEXTURAL CLASS
			VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY		0.2- > 2	2A2	
			2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	<0.002	0.02-0.002	0.02		
2008	0-4 1/2	Ap	0.1	0.1	0.1	0.7	23.8	59.1	16.1	18.7	64.8	-	sil
2009	4 1/2-8	A11	-	0.1	0.1	0.8	23.2	59.3	16.5	18.9	64.2	-	sil
2010	8-12	A12	-	-	-	0.7	22.4	58.4	18.5	19.8	61.7	-	sil
2011	12-25	B2	-	-	-	0.4	16.6	61.1	21.9	22.4	55.6	-	sil
2012	25-33	B3	-	-	-	0.4	12.1	62.6	24.9	23.7	51.3	-	sil
2013	33-44	B2b	-	-	-	0.5	9.8	64.0	25.7	23.0	51.3	-	sil
2014	44-55	B3b	-	-	-	0.2	7.1	69.5	23.2	23.0	53.8	-	sil
2015	55-63	C	-	-	-	0.2	11.6	69.8	18.4	22.4	59.2	-	sil

	pH			ORGANIC MATTER			EST % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM @ 25°C	CaCO ₃ equivalent per cent 6E1a	GYPSUM me./100g SOIL	MOISTURE TENSIONS		
	8C1b SATURATED PASTE	8C1a 1:5	8C1a 1:10	% ORGANIC CARBON 6A1a	% NITROGEN 6B1a	C/N					1/10 ATMOS	(per cent) 1/3 ATMOS.	4B2 15 ATMOS
2008	5.7	6.0	6.1	1.23	.107	11.5		-					8.2
2009	5.7	6.2	6.3	1.17	.105	11.1		-					7.0
2010	5.6	6.0	6.2	1.17	.106	11.0		-					8.6
2011	5.9	6.3	6.3	0.90	.083	10.8		-					10.5
2012	6.0	6.4	6.6	0.58	.064	9.1		-					11.6
2013	6.1	6.4	6.4	0.47	.058	8.1		-					12.0
2014	6.3	6.6	6.6	0.31	.045	6.9		-					10.7
2015	7.0	7.1	7.0	0.17	.030			-					8.6

5A1a CATION EXCHANGE CAPACITY ← NH ₄ Ac milliequivalents per 100g soil →	Extractable CATIONS 5B1a					EXCHANGEABLE SODIUM PERCENTAGE ESP	SATURATION EXTRACT SOLUBLE						PER CENT MOISTURE AT SATURATION
	6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Na		K	CO ₃	HCO ₃	Cl	SO ₄		
	← NH ₄ Ac milliequivalents per 100g soil →						milliequivalents per liter						
2008	15.2	10.5	1.1	-	0.9								
2009	15.4	11.2	1.2	-	0.8								
2010	16.6	11.5	1.4	-	0.6								
2011	18.3	13.3	1.9	-	0.5								
2012	18.6	13.9	1.8	-	0.7								
2013	18.1	14.0	1.4	-	0.7								
2014	16.2	13.3	1.0	0.2	0.6								
2015	13.7	12.4	0.6	0.2	0.5								

MUIR SILT LOAM
(By W. M. Johnson)

Date: October 20, 1953

Location: Shawnee County, Kansas. 300 feet South, 40 feet East of NW $\frac{1}{4}$ corner of Sec. 19, T. 11S., R. 15E.

Physiography: Level or nearly level terrace of the Kansas River (Newman terrace).

Slope: Nearly level.

Drainage: Moderately well drained; runoff very slow or lacking; permeability moderate.

Vegetation: Cultivated; corn field. Has been fertilized with ammonium nitrate.

Classification: Minimal Brunizem

Soil No.: S53Kans-89-2.

Mandan

Lab. No.

2008	Ap	0-4 $\frac{1}{2}$ "	Dark gray to very dark gray (10YR 4/1, dry; 3/1, moist) soft, friable loam or silt loam. Cloddy due to tillage; breaks to mixed single grain and very fine, fine and medium granular structure. Roots very numerous. pH 8.0. Abrupt, smooth lower boundary.
2009	A11	4 $\frac{1}{2}$ -8"	Dark grayish brown to black (10YR 4/2, dry; 2/1, moist) soft, friable loam or silt loam. Irregularly stratified and cloddy. Some light and dark mottles due to stratification and earthworm activities. Roots numerous. pH 6.0. This is part of the most recent flood deposit. Abrupt, smooth lower boundary.
2010	A12	8-12"	Dark gray to black (10YR 4/1, dry; 2/1, moist) soft friable, heavy silt loam. Essentially massive; weak tendency to coarse platiness and to coarse prisms. Many worm holes and worm casts. Roots numerous. pH 6.0. Abrupt, smooth lower boundary.
2011	B2	12-25"	Dark grayish brown to very dark grayish brown (10YR 4/2, dry; 3/2, moist) hard, friable, light silty clay loam. Weak very coarse and coarse prisms break to moderate very fine blocks with moderate clay "skins". Very numerous worm casts. Moderate number of roots. pH 6.0. Gradual, smooth lower boundary.
2012	B3	25-33"	Dark grayish brown to very dark brown (10YR 4/2, dry; 2/2 moist) friable, plastic, nonsticky silty clay loam. Weak very coarse and coarse prisms break to moderate very fine blocks. Aggregates have moderate clay "skins". Moderate number of roots. Very numerous worm casts. Moderately porous. pH 6.0. Gradual, smooth lower boundary.
2013	B2b	33-44"	Dark grayish brown to very dark grayish brown (10YR 4/2, dry; 3/2, moist) friable, plastic, nonsticky silty clay loam. Weak very coarse prisms break to moderate very fine blocks with moderate clay "skins". Worm casts very numerous. Roots are few. Porous. pH 6.0. Gradual, smooth lower boundary.
2014	B3b	44-55"	Brown to dark brown (10YR 5/3, dry; 4/3, moist) soft, friable, light silty clay loam. Weak coarse and very coarse prismatic structure with moderate clay "skins". Worm casts very numerous. Porous. Few roots. pH 6.0. Gradual, irregular lower boundary.
2015	C	55-63"	Pale brown to dark brown (10YR 6/3, dry; 4/3, moist) soft, friable, heavy silt loam or light silty clay loam. Massive, with coarse vertical cleavage. No clay "skins", on surfaces. Occasional worm casts. Very few fine roots. Porous. Some spots are slightly calcareous. There are a few white films and an occasional carbonate concretion. pH 8.0. Abrupt, smooth lower boundary.
	Cca	63" $\frac{1}{4}$	(Not sampled for analysis). About the same as horizon above, with few white lime threads and an occasional hard, round carbonate concretion.

SOIL SURVEY LABORATORY Beltsville, Maryland

SOIL TYPE Newtonia LOCATION Labette County, Kansas
 silt loam

SOIL NOS. S55Kans-50-1T LAB. NOS. 57124-57130

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1b VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	3A1 0.2-0.02	3A1 0.02-0.002	2A2 > 2		
0-8	A1	0.2	0.6	0.6	3.5	7.1	65.6	22.4	42.8	32.6	-	sil	
8-14	A3	0.2	0.7	0.6	3.1	6.6	62.1	26.7	38.1	33.0	-	sil/cl	
14-22	B1	0.2	0.9	0.7	3.1	5.3	59.0	30.8	34.5	32.2	-	sicl	
22-33	B21	0.4	0.7	0.6	3.0	6.4	53.0	35.9	32.4	29.4	-	sicl	
33-54	B22	0.3	0.4	0.4	3.1	6.5	49.1	40.2	33.7	24.5	-	sic/sicl	
54-70	B23	0.4	0.8	0.5	3.0	7.2	44.7	43.4	33.4	21.0	-	sic	
70-84	B3u?	1.6	1.1	0.6	2.8	5.8	41.8	46.3	29.5	20.3	-	sic	
pH		ORGANIC MATTER				Free	4A3a						
8C1a		6A1a		6B1a		Iron	Bulk		CoCO ₃ equiv-				
H ₂ O		ORGANIC CARBON		NITRO-GEN	C/N	Fe ₂ O ₃ %	Density		g/cc				
1:1		%		%			g/cc		%				
6.6		1.78		0.176	10		1.39						
5.6		1.08		0.120	11								
5.1		0.74		0.094	13								
5.2		0.52		0.076	15		1.47						
5.4		0.30		0.051			1.56						
5.5		0.18		0.041									
5.9		0.16		0.040									
5A3a		EXTRACTABLE CATIONS					5B1a	BASE SAT. %	Base Sat. %	Sum Ext. Bases	Sum Ext. Cations	Ca/Mg	
CATION EXCHANGE CAPACITY (Sum)		6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K	5C3	on Sum Cations					
		milliequivalents per 100g. soil					(Sum)						
19.1	11.1	1.8	5.5	0.1	0.6	71							
17.1	6.5	2.0	7.8	0.1	0.7	54							
20.9	6.1	4.4	9.5	0.1	0.8	54							
16.0	7.6	2.3	5.5	0.1	0.5	66							
20.7	8.7	2.4	9.1	0.1	0.4	56							
23.5	12.6	2.2	8.1	0.2	0.4	66							
24.4	13.8	2.2	7.7	0.2	0.5	68							

a. Collected with Uhlen sampling tube by Templin and Ruhe in March, 1956. Samples were in upper half of available moisture range when collected.

Sampled from pit 54 inches deep for laboratory characterization, November 8, 1955, by E. H. Templin, J. T. Neill, R. L. Googins, and D. E. Rott. Described by E. H. Templin, November, 1955.

Location: 1.5 miles west of Labette, Labette County, Kansas; 1,350 feet south and 50 feet east of NW corner of section 27-T32S-R.20E. Freely drained, broadly convex surface of 1 to 2% grade in undulating erosional upland on Pennsylvanian limestone. Site is from a pasture that appears to have never been in cultivation; but only 50 feet from a county road surfaced with limestone gravel. Native vegetation was tall grass prairie with perhaps a few scattered oak trees. The pasture contains scattered Osage-orange, blackjack-oak, and other trees and has a savannah aspect.

Beltsville Lab. No.		(Colors refer to dry soil except where stated moist.)
57124	A1	0-8" (Sample S55Kans-50-1T-1) Dark brown (7.5YR 4/2; 2.5/2, moist) silt loam; moderate medium granular; friable; pH 6.5*
57125	A3	8-14" (Sample S55Kans-50-1T-2) Brown (7.5YR 4/3; 3/3 when moist) silty clay loam; moderately strong medium granular; friable; no clay skins; pH 5.5*; gradual boundary.
57126	B1	14-22" (Sample S55Kans-50-1T-3) Reddish brown (5YR 4/4; 3/4 moist) heavy silty clay loam; strong medium to coarse granular; moderate friable; patchy weak clay skins present; pH 5.2*; gradual boundary.
57127	B21	22-33" (Sample S55Kans-50-1T-4) Reddish brown (5YR 4/4; 3/4, moist) light silty clay; slightly mottled with red (2.5YR 4/5); strong coarse granular; clay skins distinct; moderate friable; fine tubes (rootlet channels) numerous; contains numerous (5%) soft black iron concretions; pH 5.2*; diffuse boundary.
57128	B22	33-54" (Sample S55Kans-50-1T-5) Red (3YR 4+5; 4/6, moist) silty clay coarsely mottled with yellowish red (6YR 5/5; 4/5 moist); moderate very coarse granular with distinct clay skins; moderate firm; soft black iron concretions up to a centimeter in diameter are very abundant and constitute an estimated 10% of volume; pH 5.2*; diffuse boundary.
57129	B23	54-70" (Sample S55Kans-50-1T-6) Red (3YR 4+5; 4/6, moist) silty clay, much and coarsely mottled with strong brown (7.5YR 5/6, moist); collected with auger and structure not evident; firm; some clay skins apparent in auger core but appear less pronounced than in B22; soft black iron concretions very abundant; moderate firm; pH 6.0*; clear boundary.
57130	B3u(?)	70-84+ (Sample S55Kans-50-1T-7*) Red (3YR 4/6; 3.5/6, moist) clay streaked with light reddish brown (5YR 6/4) and containing a few fine spots of very pale brown (7.5YR 7/4); firm or very firm; contains some 10% of soft black ferruginous concretions; pH 6.0*. This horizon is interpreted as developed in a clay or marl that underlaid the limestone that weathered to give the overlying horizons.

A few fragments of marine limestone up to two inches in diameter were found at various depths between 24 and 70 inches. None were found below 70 inches.

*pH by Hellige-Truog soil reaction kit

Comments: Apart from the absence of limestone substrata, this profile is believed to be an excellent representative of Newtonia as developed in southeastern Kansas and northeastern Oklahoma.

This profile is slightly less friable in the lower B and less red in the A than the profile near center of section 23-25N-30W, Newton County, Missouri, about midway between Stark City and Newtonia; across road from a school house, that E. D. Fowler showed a field party in June, 1947 as the type location of the Newtonia series. In the latter the A1 is reddish brown (5YR 5/4 dry; 3/4 moist); the B horizon is yellowish red at 20 to 30 inches, changing to red (2.5YR 5/6; 4/6, moist) at 30 inches; few iron concretions are present in the lower layers (or elsewhere); depth to limestone is about 45 inches. However, I regard the two profiles as well within the appropriate range for one soil series.

E. H. Templin - 11/21/55

Comments: This profile is underlain at 8 feet by limestone bedrock. It is developed in the Fort Scott limestone formation. The limestone found at 8 feet below this profile is the Blackjack Creek limestone member; the solum seems developed mainly in the Little Osage shale member with its upper portion probably in residuum from the Rigginsville limestone member, plus some possible loess in the A horizon.

E. H. Templin - 10/23/57

SOIL TYPE Pratt LOCATION Reno County, Kansas
loamy fine sand

SOIL NOS. S58Kans-78-6 LAB. NOS. 8089-8096

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						2A2
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY			> 2 (<19mm)		
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002			
0-7	Ap	0.8	13.0	20.4	38.9	16.7	6.9	3.3	39.4	1.9	-	s	
7-19	Al	0.6	11.0	18.9	33.1	21.0	9.1	6.3	41.8	2.2	-	ls	
19-29	B21t	1.3	13.0	18.0	32.2	17.3	8.6	9.6	38.3	2.7	-	ls	
29-38	B22t	0.1	5.9	21.7	37.3	21.0	5.7	8.3	36.8	2.3	-	ls	
38-53	C1	0.2	6.2	19.4	45.3	15.6	5.1	8.2	40.3	1.6	-	ls	
53-69	C1	0.1	6.8	28.3	42.7	11.8	3.8	6.5	31.4	1.5	-	s	
69-76	C	0.2	8.2	24.4	31.4	25.6	3.8	6.4	32.5	1.5	-	s	
76-113	C	0.7	7.9	13.6	22.4	29.6	13.2	12.6	48.3	3.2	Tr.	fs1	

pH	8C1a			ORGANIC MATTER			8A2	6E1a		MOISTURE TENSIONS		
	1:1	6A1a		C/N	EST. SALT (PUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHO/cm		CaCO ₃ equivalent	GYPSUM mg./100g. SOIL	4B1a	4B1a	4B2
		1:10	ORGANIC CARBON %							NITROGEN %	1/10 ATMOS.	1/2 ATMOS.
6.8	7.0	6.9	0.47	0.053	8	<0.20	0.8	<1		7.2	4.2	1.7
6.4	6.7	6.7	0.32	0.033	10	<0.20	0.4			9.6	6.3	2.5
5.8	6.1	6.2	0.28	0.028	10	<0.20	0.4			16.7	9.8	4.0
6.2	6.4	6.4	0.20			<0.20	0.4			12.6	7.9	3.5
6.3	6.6	6.5	0.13			<0.20	0.4			11.8	7.7	3.3
6.4	6.6	6.6	0.09			<0.20	0.5			9.3	6.3	2.5
6.7	6.8	6.8	0.06			<0.20	0.4	<1		9.1	7.4	2.5
6.8	7.0	7.1	0.06			<0.20	0.4	<1		19.7	13.4	5.2

5A1a	EXTRACTABLE CATIONS					5B1a	SATURATION EXTRACT SOLUBLE		8A	
	6N2b		6H1a	6P2a	6Q2a		6P1a	6Q1a		MOISTURE AT SATURATION
	Ca	Mg	H	Ni	K		Na	K		
	← milliequivalents per 100g. soil →					5C1	← milliequivalents per liter →		%	
3.1	2.2	0.4	0.9	<0.1	0.4	97	0.7	2.0	28.8	
4.1	2.8	0.6	1.8	<0.1	0.2	83	0.6	0.4	26.2	
7.0	4.3	0.2	2.3	<0.1	0.2	67	0.5	0.2	27.4	
6.1	4.0	<0.1	1.8	<0.1	0.2	69	0.5	0.1	27.5	
5.7	3.8	1.1	1.4	<0.1	0.2	89	0.6	0.1	29.4	
4.5	3.0	0.8	1.4	<0.1	0.1	87	0.7	0.2	27.4	
4.6	3.3	0.8	0.9	<0.1	0.1	91	0.8	0.1	28.5	
8.4	6.6	1.0	1.4	0.1	0.2	94	0.7	0.1	30.2	

Soil Type: Pratt loamy fine sand.

Location: Reno County, Kansas. 650' W and 700' N of the SE Corner of Sec. 10, T24S, R10W. About 1 mile north of Sylvia.

Date of Sampling: April 7, 1958.

Collectors: Jordan, Rockers, and Otsuki.

Physiographic Position: Undulating upland on comparatively recent sandy eolian deposits. Elevation approximately 1750'.

Climate: Average annual precipitation about 27".

Topography: Gently undulating, convex slope of about 3 percent.

Drainage: Runoff low; permeability rapid.

Vegetation: Originally tall grass prairie.

Use: Cropland.

Description by: J. J. Rockers and H. T. Otsuki.

Soil No.: S58Kans-78-6.

Lincoln
Lab. No.

- | | | | |
|------|------|---------|--|
| 8089 | Ap | 0-7" | Grayish brown (10YR 5.5/2 dry; 4/2 moist) light loamy fine sand; single grain; loose; noncalcareous; grades through 1" to |
| 8090 | A1 | 7-19" | Grayish brown (10YR 5/2 dry; 3/2 moist) loamy fine sand; very weak granular to porous massive; very friable; noncalcareous; grades through 4" to |
| 8091 | B21t | 19-29" | Brown (10YR 5.5/3 dry; 3/3 moist) fine sandy loam; very weak granular to porous massive; very friable; clay coatings and bridges across sand grains; horizontal bands $\frac{1}{2}$ to 1" thick of slightly darker and more clayey material; noncalcareous; grades through 5" to |
| 8092 | B22t | 29-38" | Brown (10YR 5/3.5 dry; 3.5/4 moist) light fine sandy loamy; very weak granular; very friable; clay coatings and bridges across sand grains; horizontal bands similar to above; grades through 4" to |
| 8093 | C1 | 38-53" | Strong brown (7.5YR 5/6 dry; 4/6 moist) loamy fine sand; porous massive; loose; noncalcareous. |
| 8094 | C1 | 53-69" | Same as above. Horizon was divided for sampling purposes; grades to |
| 8095 | C | 69-76" | Reddish yellow (7.5YR 6/6 dry; 5/7 moist) fine sand; loose; noncalcareous; augered; grades to |
| 8096 | C | 76-113" | Same color as above. Fine sand with lenses of heavy sandy clay loam; noncalcareous; augered. |

Remarks: Horizons 0-7"; 19-29"; and 53-69" were sampled for Bureau of Public Roads. Soil was moist to depth sampled. Except where specified moist, colors refer to dry soil.

Pratt loamy fine sand. Reno County is near the eastern, most humid occurrence of the Pratt series. Accordingly, the base saturation may be lower than average for the series as a whole. Profiles S58Kans-78-6 and -12 seem good representatives of Pratt loamy fine sand as developed in Reno County. E. H. Templin, January 11, 1960.

Soil Type: Pratt loamy fine sand.

Location: Reno County, Kansas. 600' S and 280' E of W $\frac{1}{2}$ Corner of Sec. 35, T23S, R10W. About 3 miles NE of Sylvania.

Date of Sampling: May 9, 1958.

Collectors: Jordan, Rockers, and Otsuki.

Physiographic position: Undulating upland on comparatively recent sandy eolian deposits. Elevation approximately 1750'.

Climate: Average annual precipitation about 27".

Topography: Gently undulating, convex slope of about 4 percent.

Drainage: Runoff low; permeability rapid.

Vegetation: Originally tall grass prairie.

Use: Cropland.

Described by: J. J. Rockers and H. T. Otsuki.

Soil No.: S58Kans-78-12.

Lincoln
Lab. No.

- | | | | |
|------|------|--------|---|
| 8143 | Ap | 0-7" | Pale brown (10YR 6/3 dry; 4.5/3 moist) loamy fine sand; single grain; loose; noncalcareous; grades through 1" to |
| 8144 | A1 | 7-12" | Grayish brown (10YR 5/2 dry; 3/2 moist) loamy fine sand; very weak granular to porous massive; very friable; noncalcareous; grades through 2" to |
| 8145 | B21t | 12-18" | Brown (10YR 5/3 dry; 3.5/4 moist) light fine sandy loam; very weak granular to porous massive; very friable; clay coatings and bridges across sand grains; horizontal bands $\frac{1}{4}$ to $\frac{1}{2}$ " thick of slightly darker and more clayey material; many fine rootlet channels; noncalcareous; grades through 4" to |
| 8146 | B22t | 18-28" | Brown (7.5YR 5/5 dry; 4/6 moist) light fine sandy loam; very weak granular; very friable; clay coatings and bridges across sand grains; horizontal bands similar to above but $\frac{1}{3}$ to $\frac{3}{4}$ " thick; many fine rootlet channels; noncalcareous; grades through 3" to |
| 8147 | C1 | 28-41" | Light brown (8YR 6/5 dry; 4/6 moist) loamy fine sand; porous massive; loose; horizontal bands similar to above up to $\frac{1}{3}$ " thick; horizontal bands up to 1" thick of medium sand; noncalcareous; grades through 4" to |
| 8148 | C2 | 41-50" | Reddish yellow (8YR 6/6 dry; 5/6 moist) fine sand, porous massive; loose; faint thin stratifications with colors 7.5YR 5/8 and 4/4 moist; noncalcareous; grades through 6" to |
| 8149 | C3 | 50-66" | Reddish yellow (8YR 7/6 dry; 5/7 moist) fine sand; porous massive; loose; bandings similar to above; noncalcareous; grades through 6" to |
| 8150 | C4 | 66-98" | Pink (8YR 7/4 dry; 5/6 moist) fine sand; porous massive; loose; noncalcareous; augered. |

Remarks: Horizons 0-7"; 18-28"; and 50-66" were sampled for Bureau of Public Roads. Soil was moist to depth sampled.

Except where specified moist, colors refer to dry soil.

SOIL SURVEY LABORATORY Lincoln, Nebr. 5/21/58

SOIL TYPE Richfield LOCATION Hamilton County, Kansas
silt loam

SOIL NOS. S57Kans-38-3 LAB. NOS. 5929-5935

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a		3A1					2A2			
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	> 2			
2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002				
0-4	Ap	0.2	0.3	0.2	1.9	14.5	53.9	29.0	55.8	14.2	-	sic1
4-8	B21t	0.1	0.1	0.1	1.0	9.0	52.3	37.4	45.8	16.3	-	sic1
8-11	B22t	0.1	0.2	0.1	1.7	10.1	49.7	38.1	45.7	15.5	-	sic1
11-24	B2ca	0.1	0.1	-	0.6	6.4	58.9	33.9	40.8	25.0	-	sic1
24-36	Cca	0.1	0.1	-	0.6a	6.0a	66.4	26.8	50.2	22.7	-	sil
36-50	C1	-	0.1	0.1a	0.7a	6.8a	67.7	24.6	48.1	27.0	-	sil
50-72+	C2	-	-	-	0.8a	7.0a	67.6	24.6	48.6	26.7	-	sil

pH	ORGANIC MATTER					MOISTURE TENSIONS						
	8C1a		6A1a			6B1a		6E1a			4B2	
	1:5	1:10	ORGANIC CARBON	NITRO-GEN	C/N	CaCO ₃ equiv-alent	GYPSUM me./100g. SOIL	1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.		
		%	%	C/N		%		%	%	%		
7.5	8.0	8.1	1.17	.109	10.7	-				12.8		
7.1	7.6	7.9	1.02	.101	10.1	1				16.7		
7.8	8.5	8.7	0.94	.105	9	1				17.3		
8.2	8.7	8.9	0.55	.064	9	18				15.3		
8.3	9.1	9.3	0.31			10				13.1		
8.6	9.3	9.5	0.23			8				12.3		
8.5	9.2	9.4	0.23			8				12.0		

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS 5B1a					BASE SAT. % NH ₄ Ac EXCH.	5C3 Base Sat. % on Sum Cations	5B1a Sum Bases	5A3a Sum Cations	8D3 Ca/Mg	4A3a Vol. Wt. ^b g/cc
	6N2b	6O2b	6H1a	6P2a	6Q2a						
	Ca	Mg	H	Na	K						
← milliequivalents per 100g. soil →											
22.8	17.1	3.9	1.6	-	2.4	100	94	23.4	25.0	4.4	
29.4			2.0	0.1	1.9						1.26
28.9				0.1	1.6						
21.7				0.1	1.3						1.14
22.5				0.8	2.4						
22.9				1.7	2.4						
22.8				2.0	2.4						

a. Few CaCO₃ concn.
b. Based on consistence terminology in the profile descriptions, the horizons were drier than midway between air-dry and field capacity.

Soil Type: Richfield silt loam.

Location: Hamilton County, Kansas. 150' E and 165' N of the S1/4 corner Sec. 36,
T21S, R41W. 13 miles N of Syracuse.

Date of Sampling: July 10, 1957.

Collectors: James Allen, C. W. McBee, Henry Otsuki.

Physiographic Position: Upland. High Plains table. Elevation approximately 3700'.

Climate: Average annual precipitation about 17". Annual temperature about 54°.

Topography: Nearly level table on the High Plains. Loess mantled. Gradient
less than 1/2 percent.

Drainage: Well drained.

Vegetation: Fallow.

Use: Cropland.

Soil No. : S57Kans-38-3.

Depth, Lincoln Lab.

No., and Horizon

0-4" 5929	Ap	Dark grayish brown (10YR 4.5/2 dry; 3/2 moist) heavy silt loam; weak fine granular; slightly hard; friable; noncalcareous; clear smooth boundary to
4-8" 5930	B2lt	Dark grayish brown (10YR 4/2 dry; 3/2 moist) silty clay loam; moderate fine subangular blocky; hard; moderately friable to firm; weak patchy clayskins; noncalcareous; grades to
8-11" 5931	B22t	Dark grayish brown (10YR 4/2 dry; 3/2 moist) silty clay loam; weak medium prismatic and moderate to strong medium subangular blocky; hard; firm; distinct continuous clayskins; noncalcareous; grades to
11-24" 5932	B2ca	Grayish brown (10YR 5.5/2 dry; 4/2 moist) silty clay loam; weak medium prismatic and moderate medium subangular blocky; hard; firm; weak patchy clayskins; calcareous with less than 5% of small soft concretions of CaCO ₃ ; grades to
24-36" 5933	Cca	Pale brown (10YR 6/3 dry; 4.5/3 moist) light silty clay loam; weak coarse subangular blocky; slightly hard; friable; calcareous with less than 1% of small soft concretions of CaCO ₃ ; grades to
36-50" 5934	C1	Pale brown (10YR 6/3 dry; 5/3 moist) silt loam; massive; soft; very friable; calcareous.
50-72"+ 5935	C2	Pale brown (10YR 6/3 dry; 5/3 moist) silt loam; massive; soft; very friable; calcareous.

Profiles described by Henry T. Otsuki.

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

SOIL SURVEY LABORATORY Lincoln, Nebr. 5/21/58

SOIL TYPE Richfield LOCATION Hamilton County, Kansas
silt loam

SOIL NOS. S57Kans-38-4 LAB. NOS. 5936-5942

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a	2-1	1-0.5	0.25-0.25	0.25-0.10	0.10-0.03	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	
0-4	Ap	0.2	0.3	0.2	1.4	10.4	59.1	28.4	54.6	16.1	-	sic1
4-8	B21t	-	0.1	0.1	0.5	5.2	60.5	33.6	50.6	15.5	-	sic1
8-13	B22t	-	0.1	-	0.4	6.3	61.2	32.0	50.4	17.4	-	sic1
13-25	B2ca	-	0.1	-	0.5a	5.3a	52.0	42.1	40.6	17.1	-	sic
25-37	Cca	-	-	-	0.6a	6.2a	65.9	27.3	46.6	26.0	-	sic1
37-50	C1	-	0.1	-	0.4a	6.2a	67.6	25.7	50.9	23.2	-	sil
50-62+	C2	-	-	-	0.8a	6.6a	66.9	25.7	47.8	26.4	-	sil

pH	ORGANIC MATTER			MOISTURE TENSIONS						
	6C1a	6A1a	6B1a	4B2	15 ATMOS.					
1:1	1:5	1:10	ORGANIC CARBON %	NITROGEN %	C/N	CaCO ₃ equiv. %	GYP SUM me./100g. SOIL	1/10 ATMOS. %	1/3 ATMOS. %	15 ATMOS. %
7.4	7.9	8.0	1.21	.117	10.3	2				12.2
7.1	7.7	7.8	0.68	.079	9	-				14.4
7.2	7.8	8.0	0.56	.065	9	-				14.1
8.2	8.7	8.9	0.40	.046	9	17				14.5
8.2	8.9	9.1	0.27			11				12.6
8.5	9.1	9.3	0.22			9				12.4
8.5	9.2	9.4	0.24			7				12.2

CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					BASE SAT. NH ₄ Ac EXCH.	5C3 Base Sat. % on Sum Cations	5B1a Sum Bases	5A3a Sum Cations	8D3 Ca/Mg
	6N2b Co	6O2b Mg	6H1a H	6P2a Na	6Q2a K					
22.7		4.0	1.2	-	2.8					
25.1	17.6	5.5	1.2	-	1.9	100	95	25.0	26.2	3.2
25.2	17.9	7.3	2.0	-	1.5	100	93	26.7	28.7	2.4
21.4				0.1	1.7					
21.8				0.4	2.6					
22.2				1.4	3.0					
21.6				1.8	2.7					

a. Few CaCO₃ concr.

Soil Type: Richfield silt loam.

Location: Hamilton County, Kansas. 280' E and 90' N of the SW corner of Sec. 14, T22S, R40W. 11 miles NE of Syracuse.

Date of Sampling: July 10, 1957.

Collectors: James Allen, C. W. McBee, Henry Otsuki.

Physiographic Position: Upland. High Plains table. Elevation approximately 3650'.

Climate: Average annual precipitation about 17". Annual temperature about 54°.

Topography: Nearly level table on the High Plains. Loess mantled. Gradient less than 1/2 percent.

Drainage: Well drained.

Vegetation: Fallow.

Use: Cropland.

Soil No.: S57Kans-38-4.

Depth, Lincoln Lab.

No., and Horizon

0-4" 5936	Ap	Dark grayish brown (10YR 4.5/2 dry; 3/2 moist) heavy silt loam; weak fine granular; slightly hard; friable; noncalcareous; clear smooth boundary to
4-8" 5937	B2lt	Dark grayish brown (10YR 4/2 dry; 3/2 moist) silty clay loam; moderate medium subangular blocky; hard; firm; weak continuous clayskins; noncalcareous; grades to
8-13" 5938	B22t	Dark grayish brown (10YR 4/2 dry; 3/2.5 moist) silty clay loam; weak medium prismatic and moderate to strong medium subangular blocky; hard; firm; distinct continuous clayskins; noncalcareous; grades to
13-25" 5939	B2ca	Light brownish gray (10YR 6.5/2 dry; 5/2.5 moist) silty clay loam; weak medium prismatic and moderate coarse subangular blocky; hard; firm; weak patchy clayskins; calcareous with 5% of small soft concretions of CaCO ₃ ; grades to
25-37" 5940	Cca	Light gray (10YR 7/2 dry; 5/2.5 moist) heavy silt loam; weak coarse prismatic and weak coarse subangular blocky; slightly hard; friable; calcareous with less than 1% of small soft concretions of CaCO ₃ ; grades to
37-50" 5941	C1	Light gray (10YR 7/2.5 dry; 5/2 moist) silt loam; massive; soft; very friable; calcareous.
50-62"+ 5942	C2	Light gray (10YR 7/2.5 dry; 5/3 moist) silt loam; massive; soft; very friable; calcareous.

Profiles described by Henry T. Otsuki.

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

SOIL SURVEY LABORATORY Lincoln, Nebr. November 1958

SOIL TYPE Shellabarger LOCATION Reno County, Kansas
fine sandy loam

SOIL NOS. S58Kans-78-1 LAB. NOS. 8047-8054

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a		3A1						2A2		
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY			> 2	
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002 (< 19mm)		
0-7	Ap	1.4	19.1	19.0	14.4	7.3	29.2	9.6	33.9	6.4	Tr.	sl
7-11	A1	2.7	14.7	15.9	10.5	8.2	29.1	18.9	30.9	7.5	1.9	1/s1
11-19	B21t	19.4	19.5	12.5	9.4	3.0	17.2	19.0	18.1	5.1	9.5	cos1
19-33	B22t	13.3	30.9	18.1	9.0	1.6	7.3	19.8	8.5	3.0	7.2	cos1
33-47	B3	11.3	30.9	22.3	10.8	1.4	7.1	16.2	9.1	1.9	16.2	cos1
47-57	C1	25.6	37.2	16.5	10.7	0.7	1.3	8.0	4.1	0.4	6.8	cos
57-76	C2	44.8	33.9	8.7	3.7	0.4	1.2	7.3	1.7	0.7	22.3	cos
76-100	C3	12.9	42.9	25.7	11.2	1.2	1.2	4.9	4.3	0.5	4.6	cos
pH		8C1a: ORGANIC MATTER				8A2		6E1a		MOISTURE TENSIONS		
		6A1a		6B1a		EST% SALT (BURBAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM @ 25°C	CaCO ₃ equivalent	GYPSUM mg./100g. SOIL	4B2		
1:1		1:10	ORGANIC CARBON %	NITROGEN %	C/N					1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.
5.7	5.9	6.2	0.59	0.043	14	<0.20	0.3					3.8
6.4	6.6	6.7	0.82	0.065	13	<0.20	0.4					6.7
6.9	7.1	7.1	0.63	0.044	14	<0.20	0.4	Δ				6.8
7.4	7.5	7.5	0.36	0.027	13	<0.20	0.4	Δ				8.1
7.3	7.4	7.3	0.09			<0.20	0.3	Δ				6.5
7.1	7.3	7.1	0.05			<0.20	0.4	Δ				3.5
7.1	7.2	7.0	0.03			<0.20	0.4	Δ				3.8
7.1	7.3	7.0	0.01			<0.20	0.4	Δ				2.2
5A1a		EXTRACTABLE CATIONS 5B1a					BASE SAT. % NH ₄ Ac EXCH.		SATURATION EXTRACT SOLUBLE 5A1		6A	
CATION EXCHANGE CAPACITY (NH ₄ Ac)		6N2b	6O2b	6H1a	6P2a	6Q2a	6P1a		6Q1a		MOISTURE AT SATURATION	
		Ca	Mg	H	Na	K	No		K		%	
		milliequivalents per 100g. soil					5C1		milliequivalents per liter			
6.3	2.9	0.7	3.2	<0.1	0.5	65	0.4		0.6		22.8	
10.4	6.5	2.0	3.2	<0.1	0.5	86	0.4		0.3		33.3	
12.5	7.9	2.7	2.3	<0.1	0.4	88	0.4		0.1		33.1	
12.9	8.4	3.9	2.3	<0.1	0.3	98	0.4		0.1		35.2	
10.7	6.7	3.4	2.3	<0.1	0.3	97	0.5		0.1		35.4	
6.1	3.7	1.9	0.9	<0.1	0.2	95	0.6		0.1		26.2	
5.1	3.0	1.5	0.4	<0.1	0.1	90	0.7		0.1		26.8	
3.3	2.0	0.9	0.4	<0.1	0.1	91	1.0		0.2		27.3	

Soil Type: Shellabarger fine sandy loam.

Location: Reno County, Kansas. 900' South and 175' West of the NE Corner of Sec. 11, T26S, R6W. About 17 miles south of Hutchinson.

Date of Sampling: May 5, 1958.

Collectors: Jordan, Rockers and Otsuki.

Physiographic Position: Undulating erosional upland on moderately sandy Pleistocene beds. Elevation approximately 1550'.

Climate: Average annual precipitation about 28".

Topography: Convex slope of about 1.5 percent.

Drainage: Runoff medium; permeability moderate. Well-drained.

Vegetation: Originally tall grass prairie.

Use: Cropland. Now in volunteer wheat.

Described by: J. J. Rockers and H. T. Otsuki.

Soil No.: S58Kans-78-1.

Lincoln

Lab. No.

8047	Ap	0-7"	Dark grayish brown (10YR 4/2 dry; 2.5/2 moist) fine or medium sandy loam; weakly granular; very friable; non-calcareous; pH 5.8; grades shortly to
8048	A1	7-11"	Dark brown (7.5YR 4/2 dry; 3/2 moist) heavy sandy loam; weakly granular to porous massive; friable; few worm casts; noncalcareous; grades through 3" to
8049	B21t	11-19"	Brown (7.5YR 4/3 dry; 3/3 moist; 4/4 moist crushed) sandy clay loam the sand being coarse and very coarse; weak very coarse prismatic and weakly granular; weak patchy clayskins and many clay bridges; moderately firm; few worm casts; noncalcareous; pH 6.5; grades through 5" to
8050	B22t	19-33"	Reddish brown (5YR 4.5/4 dry; 4/4 moist) sandy clay loam; weak very coarse prismatic and weakly granular; weak patchy clay skins and many clay bridges; moderately firm; few pores; noncalcareous; pH 6.5; grades through 8" to
8051	B3	33-47"	Yellowish red (5YR 4/5 dry; 4/6 moist) light sandy clay loam; weak granular; sand grains coated with clay and clay bridges; moderately friable; few scattered fragments of red siltstone; noncalcareous; pH 6.5; grades within 4" to
8052	C1	47-57"	Strong brown (7.5YR 5/6 dry; 5/6 moist) light coarse sandy loam; porous massive; sand grains clay coated; very friable; few rootlet channels; noncalcareous; grades through 10" to
8053	C2	57-76"	Strong brown (7.5YR 5/6 dry; 5/6 moist) coarse loamy sand or sticky sand; porous massive.
8054	C3	76-100"	Same as above. Augered. This horizon was divided for sampling purposes.

Remarks: Horizons 0-7"; 19-33"; and 57-76" were sampled for Bureau of Public Roads. Soil was moist to depth sampled.

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

SOIL TYPE Tabler LOCATION Reno County, Kansas
 clay loam

SOIL NOS. 856 Kans-73-7 LAB. NOS. 8097-8105

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)									TEXTURAL CLASS	
		1B1a					3A1					2A2
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	MOISTURE TENSIONS			
2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	> 2			
0-8	Ap	0.6a	5.3a	4.4b	3.3b	7.1b	51.0	28.3	43.5	15.8	Tr.	sic1
8-16	B21t	0.8a	6.3a	4.8b	3.3b	2.9b	38.5	43.3	24.4	18.3	-	c
16-25	B22t	0.9a	5.7a	4.2b	2.6b	2.4b	42.1	42.1	24.7	20.8	Tr.	sic
25-34	B23ta	1.0a	2.4a	1.7b	1.4b	1.9b	51.0	40.6	27.1	26.4	-	sic
34-39	B31ca	0.4a	0.8a	0.5b	0.6b	2.5b	60.3	34.9	33.3	29.8	-	sic1
39-59	B32ca	0.8a	1.8a	1.4b	2.9b	6.8b	50.0	36.3	35.6	22.8	Tr.	sic1
59-81	B33ca	1.1a	2.6a	2.3b	5.0b	8.7b	42.1	38.2	34.4	19.3	Tr.	sic1
81-97	C1	1.0a	1.9a	2.9b	10.2b	15.7b	46.0	22.3	39.9	28.1	Tr.	1
97-108	C2	1.0c	1.8c	1.7c	5.6c	21.1c	48.4	20.4	45.9	27.1	2.8	1

pH	8C1a ORGANIC MATTER					8A2 EST. SALT (BIUREAU CUP)	ELECTRICAL CONDUCTIVITY EC-103 MILLIMHOS PER CM 8A1a	6E1a CaCO ₃ equiv. percent	GYPSUM me./100g. SOIL	MOISTURE TENSIONS		
	6A1a ORGANIC CARBON		6B1a NITRO-GEN		C/N					1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.
	1:5	1:10	%	%								
7.8	8.3	8.4	1.36	0.115	11.8	<0.20	0.7	1				11.8
8.0	8.6	8.6	0.99	0.072	14	<0.20	0.6	<1				18.2
8.1	8.9	9.2	0.54	0.044	12	<0.20	0.7	9				17.7
8.3	9.1	9.3	0.30			<0.20	0.8	4				17.9
8.4	9.1	9.3	0.18			<0.20	0.9	8				17.1
8.5	9.2	9.4	0.10			<0.20	1.1	16				14.7
8.3	9.1	9.4	0.06			<0.20	2.3	15				15.2
8.3	9.1	9.3	0.04			<0.20	2.7	29				10.1
8.3	9.0	9.3	0.02			<0.20	2.2	24				9.8

CATION EXCHANGE CAPACITY NH ₄ Ac	5A1a EXTRACTABLE CATIONS					5B1a EXCH. No %	SATURATION		8A1 MOISTURE AT SATURATION %
	6P2a		6Q2a		6P1a		6Q1a		
	Ca	Mg	H	No				K	
24.2				0.2	0.9	1	1.0	0.3	54.6
26.5				1.1	0.6	3	2.8	0.1	80.2
32.2				2.8	0.5	8	4.0	<0.1	86.6
30.8				4.1	0.5	11	5.9	<0.1	96.6
28.0				4.8	0.4	15	7.0	<0.1	93.9
21.9				4.6	0.3	18	8.6	<0.1	84.8
23.7				5.8	0.3	18	17.6	<0.1	81.0
15.9				3.8	0.2	16	19.8	<0.1	59.1
15.7				3.1	0.2	13	15.4	0.1	65.0

a. Few CaCO₃ coner.
 b. Few smooth black coner. (Mn?). Also, few CaCO₃ coner.
 c. Many CaCO₃ coner.

Soil Type: Tabler clay loam.

Location: Reno County, Kansas. 1000' E and 400' N of W $\frac{1}{2}$ Corner, Sec. 16, T24S, R6W. About 8 miles SW of Hutchinson.

Date of Sampling: May 7, 1958.

Collectors: Jordan, Rockers, and Otsuki.

Physiographic Position: Upland on clayey old alluvial sediments. Elevation approximately 1550'.

Climate: Average annual precipitation about 28".

Topography: Nearly level; gradient about .5 percent.

Drainage: Runoff slow; permeability slow. Moderately well drained.

Vegetation: Originally tall grass prairie.

Use: Cropland.

Description by: J. J. Rockers and H. T. Otsuki.

Soil No.: S58Kans-78-7.

Lincoln

Lab. No.

- | | | | |
|------|--------|---------|---|
| 8097 | Ap | 0-8" | Dark gray (10YR 4/1 dry; 2/1.5 moist) clay loam; weak granular; firm; noncalcareous; grades shortly to |
| 8098 | B21t | 8-16" | Very dark gray (10YR 3/1 dry; 2/1.5 moist) clay; weak very fine irregular blocky with weak patchy clayskins; very firm; few rootlet channels; noncalcareous; grades through 2" to |
| 8099 | B22t | 16-25" | Very dark gray (10YR 3/1 dry; 2.5/1.5 moist) clay; weak fine irregular blocky with distinct continuous clayskins; extremely firm; rootlet channels partially plugged; few faint mottles of 2.5Y 4/2 moist; mass noncalcareous; few fine soft concretions of CaCO ₃ ; grades through 4" to |
| 8100 | B23tca | 25-34" | Light brownish gray (2.5Y 6/2 dry; 4/2 moist) clay; weak blocky to nearly massive with weak patchy clayskins; extremely firm; common distinct fine light olive brown mottles; fine vertical old cracks filled with very dark brown clay loam; calcareous with less than 10% fine and medium concretions of CaCO ₃ ; grades through 2" to |
| 8101 | B31ca | 34-39" | Pale olive (5Y 6/3 dry; 5/3 moist) light clay; weak moderate fine irregular blocky with weak patchy clayskins; very firm; Many open rootlet channels; many distinct fine light olive brown mottles; mass calcareous with many fine concretions of CaCO ₃ ; grades through 1" to |
| 8102 | B32ca | 39-59" | Light brownish gray (2.5Y 6/2 dry and moist; 50% mottled with 2.5Y 5/6 and 6/4 moist) clay; moderate fine subangular and irregular blocky with weak continuous clayskins; very firm; many open rootlet channels; calcareous with many fine concretions of CaCO ₃ ; grades through 4" to |
| 8103 | B33ca | 59-81" | Light brownish gray (2.5Y 6/2 dry; 5/2 moist) clay; weak fine subangular and irregular blocky; very firm; many fine mottles of 2.5Y 6/4 and 6/6 moist; common very fine black spots; calcareous with many fine hard concretions of CaCO ₃ ; grades to |
| 8104 | C1 | 81-97" | Very pale brown (10YR 7/5 dry; 7/4 moist) heavy clay loam; firm; calcareous; augered. |
| 8105 | C2 | 97-108" | Very pale brown (10YR 7/4 dry; 6/4 moist) clay loam; firm; calcareous; augered. |

Remarks: Horizons 0-8"; 8-16"; and 59-81" were sampled for Bureau of Public Roads. Soil was moist to depth sampled. Except where specified moist, colors refer to dry soil. Horizon 34-39" appears to be gleyed. Horizons below 34" could be a buried soil.

Tabler clay loam. Profiles S58Kans-78-7 and -8 are believed modal for this soil type as represented in Reno County. They seem well within the appropriate range for the Tabler series; however, the lower part of the B2 horizon and the B3 are slightly brighter colored (higher chroma) than generally obtained in Tabler profiles having relatively impervious clayey substrata to depths of more than 10 feet. E. H. Templin, January 11, 1960.

SOIL TYPE Tabler LOCATION Reno County, Kansas
 clay loam

SOIL NOS. S58Kans-78-8 LAB. NOS. 8106-8114

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		3A1										
		1B1a	2A2		3A1		4A2		5A1		6A1a	
VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	> 2		< 1.9mm			
2.1	1.0-5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002				
0-5	Ap	0.8	16.2	17.6	11.0a	7.9a	31.1	15.4	31.4	10.2	-	sl
5-8	A1	1.0	9.8	9.3	4.5a	4.5a	34.1	36.8	23.8	15.2	Tr.	cl
8-20	B21t	0.2	5.0	4.8	3.3a	2.2a	38.6	45.9	22.2	19.7	Tr.	c
20-32	B22t	0.4	2.4	2.1	1.0a	2.1a	51.2	40.8	28.1	25.3	Tr.	sic
32-40	B23ca	0.6c	0.7c	0.3c	0.4b	2.7b	62.6	32.7	36.4	29.1	Tr.	sic1
40-61	B31ca	0.6c	2.6c	2.6c	2.2b	7.6b	49.3	35.1	38.6	18.8	Tr.	sic1
61-83	B32ca	1.3	4.7	4.2	6.6a	8.4a	40.1	34.7	38.1	13.4	Tr.	cl
83-97	C1	1.0	5.2	5.1	8.8a	10.4a	34.0	35.5	36.7	12.2	Tr.	cl
97-110	C2	1.6	4.2	3.9	3.0a	11.9a	38.6	36.8	34.9	15.6	Tr.	cl

pH	ORGANIC MATTER					EST% SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM 6A1a	MOISTURE TENSIONS			
	6C1a		6B1a		4B2						
	1:5	1:10	ORGANIC CARBON %	NITROGEN %	C/N			CaCO ₃ equiv. %	GYPSUM me./100g. SOIL	1/15 ATMOS. %	1/3 ATMOS. %
6.3	6.6	6.7	1.02	0.091	11.2	<0.20	0.5				6.0
6.7	7.1	7.2	0.97	0.053	18	<0.20	0.5	Δ			14.1
7.2	7.9	8.0	0.59	0.037	16	<0.20	0.5	Δ			18.5
8.0	8.6	8.8	0.33	0.022	15	<0.20	0.7	1			17.0
8.0	8.6	8.8	0.17			<0.20	1.4	2			14.7
8.2	8.8	8.9	0.18			<0.20	1.2	1			14.0
8.2	8.8	8.8	0.10			<0.20	0.8	1			14.2
8.1	8.7	8.8	0.03			<0.20	0.6	4			16.5
7.7	8.5	8.7	0.02			<0.20	0.6	8			16.4

CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					EXCH. No %	SATURATION EXTRACT SOLUBLE		MOISTURE AT SATURATION %	
	6N2b		6H1a		6P2a		6Q1a			
	Ca	Mg	H	Na	K		No	K		
12.7	9.1	1.9	3.2	<0.1	0.5	<1	0.6	0.4	31.7	
27.1	19.8	5.2	3.8	0.4	0.5	1	1.5	0.1	56.6	
34.3	25.9	6.9	2.9	1.0	0.6	2	2.1	0.1	79.1	
29.4				1.7	0.5	5	3.9	0.1	80.7	
25.9				2.4	0.4	8	6.8	0.1	67.1	
29.5				2.4	0.3	7	6.9	<0.1	60.5	
28.2				2.1	0.4	6	4.9	<0.1	57.8	
27.4				1.4	0.5	4	3.5	<0.1	78.2	
26.8				1.5	0.6	5	3.3	0.1	69.0	

a. Few smooth black concr. (Mn?).
 b. Few smooth black concr. (Mn?). Also, common CaCO₃ concr.
 c. Common CaCO₃ concr.

Soil Type: Tabler clay loam.

Location: Reno County, Kansas. 1420' E and 167' N of SW Corner of Sec. 14,
T24S, R6W. About 5 miles south of Hutchinson.

Date of Sampling: May 7, 1958.

Collectors: Jordan, Rockers, and Otsuki.

Physiographic Position: Upland on clayey old alluvial sediments. Elevation
approximately 1550'.

Climate: Average annual precipitation about 28".

Topography: Nearly level; gradient about .5 percent.

Drainage: Runoff slow; permeability slow. Moderately well-drained.

Use: Cropland Vegetation: Originally tall grass prairie.

Described by: J. J. Rockers and H. T. Otsuki.

Soil No.: S58Kans-78-8.

Lincoln

Lab. No.

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|------|-------|---------|---|
| 8106 | Ap | 0-5" | Very dark gray (10YR 3/1.5 dry; 2/1.5 moist) sandy clay loam; weak granular; friable; noncalcareous; grades shortly to |
| 8107 | A1 | 5-8" | Very dark gray (10YR 3/1 dry; 2/1.5 moist) clay loam; weak granular; firm; noncalcareous; grades through 2" to |
| 8108 | B21t | 8-20" | Very dark gray (10YR 3/1 dry; 2.5/1.5 moist) clay; weak very fine irregular blocky with weak nearly continuous clayskins; very firm; few open rootlet channels; noncalcareous; grades through 4" to |
| 8109 | B22t | 20-32" | Light brownish gray (2.5Y 6/2 dry; 5/2 moist) clay; moderate fine irregular blocky with distinct continuous clayskins; extremely firm; rootlet channels partially plugged; fine vertical old cracks filled with very dark brown clay loam; mass noncalcareous; few fine concretions of CaCO ₃ ; grades through 8" to |
| 8110 | B23ca | 32-40" | Light olive gray (5Y 6/2 dry; 5/2 moist) clay; nearly massive; extremely firm; rootlet channels partially plugged; fine vertical old cracks filled with very dark brown clay loam; 10% fine mottles of strong brown and light olive brown; mass calcareous with few fine and medium concretions of CaCO ₃ ; grades through 6" to |
| 8111 | B31ca | 40-61" | Light brownish gray (2.5Y 6/2 dry; 5/2 moist) clay; weak moderate medium subangular and irregular blocky with weak patchy clayskins; very firm; 20 to 30% fine mottles of strong brown and light olive brown; many open rootlet channels; calcareous with common seams and medium concretions of CaCO ₃ ; grades through 8" to |
| 8112 | B32ca | 61-83" | Same as above, excepting strong brown mottles predominate; grades through 6" to |
| 8113 | C1 | 83-97" | Pale olive (5Y 6/3 dry; 5/4 moist) heavy clay loam; firm; calcareous with many fine concretions of CaCO ₃ ; many fine strong brown mottles; augered; grades to |
| 8114 | C2 | 97-110" | Pale yellow (5Y 7/3 dry; 6/4 moist) heavy clay loam; firm; calcareous; few fine strong brown mottles; augered. |

Remarks: Horizons 0-5"; 8-20"; and 40-61" were sampled for Bureau of Public Roads. Soil was moist to depth sampled. Except where specified moist, colors refer to dry soil. Horizon 32-40" appears to be gleyed. Horizons below 32" could be a buried soil.

SOIL TYPE Tivoli fine sand LOCATION Reno County, Kansas

SOIL NOS S59Kans-78-1 LAB. NOS. 9952-9957

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent, 3A1)										TEXTURAL CLASS	
		1B1a											2A2
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	> 2 ($\leq 19\mu$)		
0-9	A1	0.1	5.7	22.5	57.1	9.3	3.2	2.1	35.7	1.4	-	fs	
9-15	AC	0.4	6.7	23.3	57.4	8.4	1.8	2.0	34.0	1.2	-	fs	
15-28	C1	0.1	4.7	21.8	60.0	9.6	1.1	2.7	37.8	0.8	-	fs	
28-48	C2	<0.1	3.7	20.1	61.5	10.7	0.9	3.1	40.4	0.6	-	fs	
48-68	C3	<0.1	0.4	3.4	71.3	19.8	1.3	3.8	69.8	0.8	-	fs	
68-96	C4	0.1	3.6	17.0	57.2	14.7	2.0	5.4	44.0	0.7	-	fs	
pH		ORGANIC MATTER				EST% SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC $\cdot 10^3$ MILLIMHOS PER CM @25°C.	C-CO ₂ equiv. element %	GYPSUM me./100g. SOIL	MOISTURE TENSIONS			
8C1a	1.5	1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N					4B1a 1:10 ATMOS. %	4B1a 1/3 ATMOS. %	4B2 15 ATMOS. %	
1:1													
6.5			0.27	0.026	10				4.4	2.7	1.1		
6.2			0.14	0.017					3.2	2.3	1.2		
5.8			0.09	0.008					3.5	2.9	1.3		
6.1			0.05						3.6	2.7	1.2		
6.3			0.03						5.5	3.6	1.7		
6.3			0.04						6.7	4.8	1.8		
5A1a	EXTRACTABLE CATIONS					5B1a	BASE SAT. %	5C3	5B1a	5A3a	MOISTURE AT SATURATION %		
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K	NH ₄ Ac EXCH.	Base Sat. % on Sum Cations	Sum Bases	Sum cations				
	milliequivalents per 100g. soil					5C1	< me/100 g >						
2.3	1.7	0.4	0.8	<0.1	0.2	100	74	2.3	3.1				
2.0	1.2	0.6	2.0	<0.1	0.2	100	50	2.0	4.0				
2.1	1.3	0.4	1.2	<0.1	0.1	86	60	1.8	3.0				
2.1	1.4	0.6	1.2	<0.1	0.1	100	64	2.1	3.3				
2.6	1.7	0.7	1.2	<0.1	0.1	96	68	2.5	3.7				
3.3	2.1	1.1	1.2	<0.1	0.1	100	73	3.3	4.5				

Soil Type: Tivoli fine sand.

Location: Reno County, Kansas. 800 feet south and 225 feet east of the northwest corner of section 9, T 22S, R10W.

Date of Sampling: January 19, 1959.

Collectors: Ratcliff and Bouse.

Physiographic Position: Undulating upland on recent sandy aeolian deposits.

Climate: Average annual precipitation is approximately 27".

Topography: Hummocky topography with hummocks ranging from 4-30 feet in height.

Drainage: Runoff very slow; permeability very rapid.

Vegetation: The native vegetation on this soil is Big Bluestem, Little Bluestem, Indiangrass, and Switchgrass.

Use: Grassland.

Description by: J. J. Rockers and I. W. Ratcliff, Jr.

Soil No. : S59Kans-78-1.

Lincoln

Lab. No.

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|------|----|--------|---|
| 9952 | A1 | 0-9" | Yellowish brown (10YR 5/3 moist; 5/4 dry); fine sand; loose; single grain to very weak fine granular; many fine roots; noncalcareous; grades within 5 inches - |
| 9953 | AC | 9-15" | Yellowish brown (10YR 5/4, moist; 5/4, dry); fine sand; single grain; many fine roots; noncalcareous; wavy boundary to |
| 9954 | C1 | 15-28" | Light yellowish brown (10YR 6/4, moist; 6/4, dry); fine sand; single grain; fewer roots than above; noncalcareous; grades within 6" to |
| 9955 | C2 | 28-48" | Light yellowish brown (10YR 6/4 moist; 6/4, dry); fine sand; very porous and massive breaking to single grain with the least amount of pressure; irregular horizontal bands 1/4 to 1/2 inch wide and approximately 6 inches apart which are of slightly higher clay content. These bands are of about two chips less value in color than the matrix; noncalcareous, grades within 6" to |
| 9956 | C3 | 48-68" | Light yellowish brown (10YR 6/4, dry); fine sand, single grain; few roots and few horizontal bands; noncalcareous; grades to |
| 9957 | C4 | 68-96" | Light yellowish brown (10YR 6/4, dry); same as horizon above except for fewer roots and fewer horizontal bands. Augered. |

Remarks: The series name of profile S59Kans-78-1 and profile S59Kans-78-2 was changed from "Derby" fine sand to "Tivoli" fine sand in the final correlation. The soil concerned closely resembles Tivoli but of more humid environment and more acid than representative of that series throughout its area of occurrence. The true Derby series is less sandy throughout than as represented in these profiles. Its usual occurrence is no more than a mile from rivers, such as the Cimarron and Arkansas, with braided sand-choked channels from which loess continues to originate. E. H. Templin, January 11, 1960.

SOIL SURVEY LABORATORY Lincoln, Nebr. May 1959

SOIL TYPE Tivoli LOCATION Reno County, Kansas
fine sand

SOIL NOS. S59Kans-78-2 LAB. NOS. 9958-9962

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a	3A1					2A2					
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY				> 2	
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	< 0.075		
0-6	A1	2.2	22.4	27.1	35.6	5.9	4.1	2.7	22.9	1.3	-	S	
6-12	AC	1.1	14.4	26.8	46.4	7.8	0.9	2.6	27.6	0.5	-	S	
12-32	C1	0.7	11.4	28.1	49.3	6.4	0.6	3.5	26.3	0.4	-	S	
32-52	C2	0.5	10.8	24.6	48.9	9.4	1.9	3.9	31.9	0.5	-	S	
52-90	C3	0.9	18.5	27.3	41.3	7.7	1.3	3.0	24.9	0.5	-	S	
pH		ORGANIC MATTER				EST% SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM @ 25°C	CaCO ₃ equiv-olent	GYPSUM me./100g. SOIL	MOISTURE TENSIONS			
8C1a	1:5	1:10	6A1a ORGANIC CARBON	6B1a NITROGEN	C/N					4B1a 1/10 ATMOS.	4B1a 1/3 ATMOS.	4B2 15 ATMOS.	
	1:1		%	%			%		%	%			
5.9			0.34	0.032	11				4.9	3.3	1.4		
6.3			0.09	0.013					2.9	1.5	1.0		
6.5			0.09	0.010					3.6	2.7	1.1		
6.3			0.06						5.2	4.4	1.4		
5.7			0.05						3.3	3.6	1.1		
5A1a		EXTRACTABLE CATIONS				5B1a	5C3	5B1a	5A3a				
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6H1a	6P2a	6Q2a	BASE SAT. % NH ₄ Ac EXCH.	Base Sat. % on Sum Cations	Sum Bases	Sum Cations	MOISTURE AT SATURATION %			
	Ca	Mg	H	No	K			< me/100 g >					
	millequivalents per 100g. soil												
2.5	1.8	0.5	1.2	<0.1	0.2	100	68	2.5	3.7				
1.8	1.1	0.5	1.2	<0.1	0.2	100	60	1.8	3.0				
2.1	1.4	0.3	1.6	<0.1	0.1	86	53	1.8	3.4				
2.3	1.4	0.7	1.2	<0.1	0.2	100	66	2.3	3.5				
1.8	1.1	0.4	1.2	<0.1	0.1	89	57	1.6	2.8				

Soil Type: Tivoli fine sand.

Location: Reno County, Kansas. 200 feet north and 100 feet west of the southeast corner of section 28, T22S, R10W.

Date of Sampling: January 19, 1959.

Collectors: Ratcliff and Bouse.

Physiographic Position: Undulating upland on recent sandy aeolian deposits.

Climate: Average annual precipitation is approximately 27".

Topography: Hummocky topography with hummocks ranging from 4 to 30 feet in height.

Drainage: Runoff very slow; permeability very rapid.

Vegetation: The native vegetation on this soil is Big Bluestem, Little Bluestem, Indiangrass, and Switchgrass.

Use: Grassland.

Description by: J. J. Rockers

Soil No.: S59Kans-78-2.

Lincoln

Lab. No.

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|------|----|--------|---|
| 9958 | Al | 0-6" | Brown (10YR 4/3, moist; 5/3, dry); fine sand; loose; single grain to very weak granular; many roots; noncalcareous; wavy boundary to |
| 9959 | AC | 6-12" | Light yellowish brown (10YR 5/4, moist; 6/4, dry); loose fine sand; single grain; many roots; noncalcareous; 30% of this horizon is the same color as the above horizon; grades within 6" to |
| 9960 | C1 | 12-32" | Light yellowish brown (10YR 5/4, moist; 6/4, dry); loose fine sand; single grain; roots are fewer than in horizon above and decrease with depth; few irregular horizontal bands about 1/4 inch wide of slightly higher clay content; noncalcareous; grades within 6" to |
| 9961 | C2 | 32-52" | Light yellowish brown (10YR 5/4, moist; 6/4 dry); fine sand; very porous and massive breaking to single grain with the least amount of pressure; horizontal "layers" of fine sand some 1/2 inch thick containing less clay and of about 1 chip more in value than the mass. This horizon also has some wavy horizontal bands some 1/4 inch wide which approach a loamy sand texture. Noncalcareous; grades within about 6" to |
| 9962 | C3 | 52-90" | Yellowish brown (10YR 5/4 moist; 5/4 dry); fine sand; loose; single grain; "wetting planes" are less pronounced than in horizon above; noncalcareous; not augered. |

Remarks: The series name of profiles S59Kans-78-1 and -2 was changed from "Derby" fine sand to Tivoli fine sand in the final correlation. The soil concerned closely resembles Tivoli but of more humid environment and more acid than representative of that series throughout its area of occurrence. The true Derby series is less sandy throughout than as represented in these profiles. Its usual occurrence is no more than a mile from rivers, such as the Cimarron and Arkansas, with braided sand-choked channels from which loess continues to originate. E. H. Templin, January 11, 1960.

SOIL TYPE Ulysses loam LOCATION Hamilton County, Kansas

SOIL NOS. 857Kans-38-5 LAB. NOS. 5943-5950

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a		3A1						2A2		
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	> 2			
2-1	1.0-5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002				
0-3	Ap1	-	0.2	1.0	28.6	23.1	32.3	14.8	68.1	7.6	-	fsl
3-5	Ap2	0.1	0.1	0.6	20.1	18.4	39.6	21.1	62.3	10.4	-	1
5-10	B21	0.1	0.1	0.5	18.7	16.6	41.9	22.1	60.8	11.7	-	1
10-16	B22	-	0.1	0.5	14.5	17.1	42.2	25.5	56.0	13.5	-	1
16-24	B3ca	-	-	0.6a	16.5a	13.4a	42.6	26.9	52.0	15.7	-	1
24-37	B3	0.1	0.1	0.6a	16.5a	15.0a	44.2	23.5	53.8	16.8	-	1
37-49	C1	-	0.1	0.4a	15.6a	11.8a	51.1	21.0	56.8	18.9	-	sil
49-65+	C2	-	0.1	0.4a	19.4a	13.7a	48.2	18.2	60.0	17.9	-	1

pH	8C1a ORGANIC MATTER					6E1a MOISTURE TENSIONS					
	6A1a		6B1a		C/N	CaCO ₃ equiv. cent	GYPSIUM me./100g SOIL	4B2			
	ORGANIC CARBON %	NITRO-GEN %	1/10 ATMOS. %	1/3 ATMOS. %				15 ATMOS. %			
1.1	1.5	1.10									
7.7	8.0	8.2	0.63	.058	11	-					6.5
7.5	7.9	8.0	0.71	.071	10	-					9.1
7.9	8.4	8.6	0.64	.067	10	1					10.3
8.0	8.6	8.7	0.52	.056	9	6					10.9
8.0	8.6	8.8	0.44	.050	9	10					11.7
8.1	8.7	8.8	0.28			13					10.2
8.2	8.8	8.9	0.18			10					9.8
8.2	8.9	9.1	0.16			7					8.7

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					BASE SAT. % NH ₄ Ac EXCH.	5C3 Base Sat. % on Sum Cations	5B1a Sum Bases <me/100 g.>	5A3a Sum Cations	8D3 Ca/Mg
	6N2b Ca	6O2b Mg	6H1a H	6P2a No	6Q2a K					
	milliequivalents per 100g. soil									
12.5	10.4	3.4	0.4	-	1.4	100	97	15.2	15.6	3.0
16.8	14.7	3.0	0.4	-	1.3	100	98	19.0	19.4	4.9
18.5				-	0.9					
17.8				-	0.7					
17.1				-	0.7					
14.8				-	0.8					
16.1				0.2	1.5					
15.0				0.4	1.3					

a. Few CaCO₃ concr.

Soil Type: Ulysses loam.

Location: Hamilton County, Kansas. 1000' N and 225' W of SE corner Sec. 27, T25S, R39W. 7 miles SSW of Kendall.

Date of Sampling: July 11, 1957.

Collectors: James Allen, C. W. McBee, Henry Otsuki.

Physiographic Position: Upland. Elevation approximately 3400'.

Climate: Average annual precipitation about 17".

Topography: Gently sloping erosional upland. Gradient of 2 percent facing northeast.

Drainage: Well drained.

Vegetation: Sorghums.

Use: Cropland.

Soil No.: S57Kans-38-5.

Depth, Lincoln Lab.

No., and Horizon

0-3" 5943	Ap1	Grayish brown (10YR 5/2 dry; 3/2 moist) heavy fine sandy loam; weak fine granular; soft; very friable; noncalcareous; abrupt smooth boundary to
3-5" 5944	Ap2	Grayish brown (10YR 4.5/2 dry; 3/2 moist) loam; weak coarse platy and weak medium granular; slightly hard; friable; non-calcareous; grades to
5-10" 5945	B21	Grayish brown (10YR 4.5/2 dry; 3/2 moist) light clay loam; weak to moderate medium and fine granular; hard; moderately firm; weak patchy clayskins; calcareous; numerous worm casts which are a mixture of material from above and below; grades to
10-16" 5946	B22	Grayish brown (10YR 5/2 dry; 4/2 moist) light clay loam; weak to moderate medium and fine granular; hard; moderately firm; weak patchy clayskins; calcareous; numerous worm casts which are a mixture of material from above and below; grades to
16-24" 5947	B3ca	Light brownish gray (10YR 5.5/2 dry; 4/2 moist) light clay loam; weak coarse prismatic and moderate medium subangular blocky; hard; moderately friable; weak patchy clayskins; calcareous with few fine soft concretions of CaCO ₃ ; grades to
24-37" 5948	B3	Light brownish gray (10YR 6/2 dry; 4.5/2.5 moist) loam; weak coarse prismatic and weak coarse subangular blocky; slightly hard; friable; calcareous; grades to
37-49" 5949	C1	Very pale brown (10YR 7/2.5 dry; 5.5/3 moist) loam; massive; soft; friable; calcareous.
49-65"+ 5950	C2	Very pale brown (10YR 7/2.5 dry; 5.5/3 moist) loam; massive; soft; friable; calcareous.

Profiles described by Henry T. Otsuki.

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

SOIL SURVEY LABORATORY Lincoln, Nebr. 5/21/58

SOIL TYPE Ulysses loam LOCATION Hamilton County, Kansas

SOIL NOS. S57Kans-38-6 LAB. NOS. 5951-5958

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)									TEXTURAL CLASS	
		1B1a		3A1					2A2			
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	> 2			
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002		
0-4	Ap1	-	0.3	1.5	40.6	24.3	21.7	11.6	73.5	3.7	-	fs1
4-6	Ap2	0.1	0.2	1.0	26.4	18.8	34.4	19.1	65.1	8.6	-	1
6-9	B21	-	0.1	0.9	24.7	17.6	36.3	20.4	64.3	9.2	-	1
9-14	B22	-	0.1	0.9	23.8	15.6	35.7	23.9	59.8	10.1	-	1
14-23	B31ca	-	0.1	0.8a	20.5a	12.5a	39.1	27.0	52.5	15.0	-	cl/1
23-32	B32ca	-	0.1	0.6b	17.0b	12.0b	44.4	25.9	51.7	18.1	-	1
32-49	C1	-	0.1c	0.5c	17.8c	14.8c	44.7	22.1	55.7	16.4	-	1
49-66+	C2	-	-	0.3d	16.7d	19.5d	46.8	16.7	62.3	17.0	-	1

pH	3C1a ORGANIC MATTER					6E1a MOISTURE TENSIONS				
	6A1a		6B1a		C/N	CoCO ₂ equivalent		GYPSUM mg./100g SOIL		
	ORGANIC CARBON	NITRO-GEN	1/10 ATMOS.	1/3 ATMOS.		15 ATMOS.				
1:1	1:5	1:10	%	%		%	%	%	%	%
8.0	8.6	8.7	0.43	.041	10	1				5.0
7.9	8.4	8.6	0.58	.061	10	-				7.9
7.9	8.5	8.7	0.56	.059	10	1				8.9
8.0	8.6	8.8	0.49	.054	9	4				10.2
8.1	8.6	8.5	0.43	.046	9	11				11.4
8.1	8.7	8.9	0.31	.034	9	11				10.7
8.3	8.8	9.0	0.26			7				10.0
8.4	8.9	9.1	0.16			7				7.8

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					5B1a BASE SAT. % NH ₄ Ac EXCH.	5C3 Sat. % on Sum Cations	5B1a Sum Bases	5A3a Sum Cations	8D3 Ca/Mg
	6N2b	6O2b	6H1a	6P2a	6Q2a					
	Ca	Mg	H	Na	K					
	milliequivalents per 100g. soil									
10.2		1.6	0.4	-	1.0					
14.5	14.1	2.2	0.4	-	1.1	100	98	17.4	17.8	6.4
15.6				-	0.9					
14.9				-	0.7					
16.2				-	0.8					
15.8				-	1.0					
16.0				0.1	1.3					
14.2				0.3	1.1					

- a. Few CaCO₃ concr.
- b. Common CaCO₃ concr.
- c. Common CaCO₃ concr., also few smooth black concr. (Mn?)
- d. Few CaCO₃ concr., also few smooth black concr. (Mn?)

Soil Type: Ulysses loam.

Location: Hamilton County, Kansas. 1100' E and 225' N of S1/4 corner Sec. 20, T25S, R39W. 7 miles SW of Kendall.

Date of Sampling: July 11, 1957.

Collectors: James Allen, C. W. McBee, Henry Otsuki.

Physiographic Position: Upland. Elevation approximately 3400'.

Climate: Average annual precipitation about 17". Annual temperature about 54°.

Topography: Gently sloping erosional upland. Gradient of 2 percent facing east.

Drainage: Well drained.

Vegetation: Sorghums.

Use: Cropland.

Soil No.: S57Kans-38-6.

Depth, Lincoln Lab.

No., and Horizon

0-4" 5951	Ap1	Grayish brown (10YR 4.5/2 dry; 3/2 moist) heavy fine sandy loam; weak fine granular; soft; very friable; noncalcareous; abrupt smooth boundary to
4-6" 5952	Ap2	Dark grayish brown (10YR 4/2 dry; 3/2 moist) loam; weak coarse platy to nearly massive; slightly hard; friable; noncalcareous; grades to
6-9" 5953	B21	Grayish brown (10YR 4.5/2 dry; 3/2 moist) light clay loam; moderate medium and fine granular; hard; moderately firm; weak patchy clayskins; noncalcareous; grades to
9-14" 5954	B22	Grayish brown (10YR 5/2 dry; 4/2 moist) light clay loam; weak medium subangular blocky and moderate medium granular; hard; moderately firm; weak patchy clayskins; calcareous; grades to
14-23" 5955	B31ca	Grayish brown (10YR 5.5/2 dry; 4.5/2.5 moist) light clay loam; weak coarse prismatic and weak coarse subangular blocky; hard; moderately friable; calcareous with few fine soft concretions of CaCO ₃ ; grades to
23-32" 5956	B32ca	Pale brown (10YR 6/3 dry; 4.5/3 moist) loam; weak coarse prismatic and weak coarse subangular blocky; slightly hard; friable; calcareous with few to common fine soft concretions of CaCO ₃ ; grades to
32-49" 5957	C1	Pale brown (10YR 6.5/3 dry; 5/3 moist) loam; weak coarse subangular blocky to nearly massive; soft; friable; calcareous; grades to
49-66"+ 5958	C2	Very pale brown (10YR 7/3 dry; 5/3 moist) loam; massive; soft; friable; calcareous.

Profiles described by Henry T. Otsuki.

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

SOIL SURVEY LABORATORY Lincoln, Nebr. 5/20/58

SOIL TYPE Ullyses LOCATION Logan County, Kansas
silt loam

SOIL NOS. S57Kans-55-3 LAB. NOS. 5902-5908

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a		3A1						2A2		
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	> 2			
	2.0	0.85	0.25-0.075	0.075-0.025	0.025-0.0075	0.0075-0.002	< 0.002	0.2-0.075	0.075-0.002			
0-5	Ap	0.2	0.4	0.3	0.6	10.7	62.7	25.1	55.7	18.0	-	sil
5-7	A1	0.1	0.2	0.1	0.5	9.3	61.9	27.9	52.6	18.9	-	sic1
7-14	B2	0.1	0.1	0.1	0.3	8.3	61.3	29.8	50.6	19.2	-	sic1
14-25	B2ca	0.1	0.1	0.1a	0.1a	8.9a	64.8	25.9	49.8	24.0	-	sil
25-36	B3	-	0.1	0.1a	0.1a	9.7a	68.1	21.9	52.6	25.3	-	sil
36-48	C1	-	0.1	-	0.1a	11.4a	71.3	17.1	58.7	24.1	-	sil
48-63+	C2	-	0.1	-	0.1a	11.0a	69.9	18.9	56.7	24.3	-	sil

pH	8C1a ORGANIC MATTER				6E1a			MOISTURE TENSIONS		
	6A1a		6B1a		CaCO ₃ equiv. percent	GYPSUM mm./100g. SOIL	1/10 ATMOS. %	1/3 ATMOS. %	15 ATMOS. %	
	ORGANIC CARBON %	NITROGEN %	C/N							
1:1	1:5	1:10								
7.4	8.0	8.1	1.35	.136	9.9	-			11.2	
8.0	8.5	8.7	1.03	.104	9.9	2			13.1	
8.0	8.6	8.7	0.79	.083	10	3			13.6	
8.1	8.7	8.9	0.52	.056	9	10			14.0	
8.1	8.8	9.1	0.25			10			11.9	
8.3	8.9	9.2	0.18			7			10.2	
8.2	8.9	9.1	0.18			7			10.6	

CATION EXCHANGE CAPACITY NH ₄ Ac	5A1a EXTRACTABLE CATIONS					BASE SAT. % NH ₄ Ac EXCH.	5C1 Cations	5C3 Base Sat. % on Sum	5B1a Sum Bases	5A3a Sum Cations	6D3 Ca/Mg	4A3a Vol. Wt. g/cc
	6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K							
	milliequivalents per 100g. soil											
23.2	21.4	3.4	0.8	-	3.2	100	97	28.0	28.8	6.3		
24.0				-	1.6							
24.7				-	1.2						1.16	
23.1				0.1	1.7						1.24	
22.0				0.2	2.2							
20.9				0.3	2.2							
21.0				0.4	2.4							

a. Few CaCO₃ concn.
b. Based on consistence terminology in the profile descriptions, the horizons were drier than midway between air-dry and field capacity.

Soil Type: Ulysses silt loam.

Location: Logan County, Kansas. 653' E and 233' S of W1/4 corner Sec. 36, T12S, R35W. 7 miles SE of Winona.

Date of Sampling: July 8, 1957.

Collectors: James Allen, Elbert Bell, Henry Otsuki.

Physiographic Position: Upland. Elevation approximately 3200'.

Climate: Average annual precipitation about 18". Annual temperature about 53°.

Topography: Nearly level table below the summit of the High Plains mantled with loess. Gradient less than 1 percent.

Drainage: Well drained.

Vegetation: Clean fallow.

Use: Cultivated land. Broken from virgin sod in 1929.

Soil No.: S57Kans-55-3.

Depth, Lincoln Lab.

No., and Horizon

0-5" 5902	Ap	Dark grayish brown (10YR 4/1.5 dry; 3/2 moist) silt loam; weak fine and very fine granular; slightly hard; friable; noncalcareous; abrupt smooth boundary to
5-7" 5903	A1	Dark grayish brown (10YR 4/2 dry; 2.5/2 moist) heavy silt loam; moderate fine granular; slightly hard; friable; weakly calcareous; grades to
7-14" 5904	B2	Grayish brown (10YR 5/2 dry; 3.5/2 moist) light silty clay loam; weak medium subangular blocky and moderate fine granular; clay-skins weak and patchy; hard; moderately firm; calcareous; grades to
14-25" 5905	B2ca	Light gray (10YR 7/2 dry; 5.5/2.5 moist) heavy silt loam; weak coarse prismatic and weak coarse subangular blocky; slightly hard; friable; calcareous with fine threads of CaCO_3 on surface of peds; grades to
25-36" 5906	B3	Light gray (10YR 7/2.5 dry; 5/3 moist) silt loam; weak coarse prismatic and weak coarse subangular blocky; soft; very friable; calcareous;
36-48" 5907	C1	Light gray (10YR 7/2.5 dry; 5/3 moist) silt loam; weak coarse prismatic and weak coarse subangular blocky; soft; very friable; calcareous; diffuse smooth boundary to
48-63"+ 5908	C2	Light gray (10YR 7/2.5 dry; 5/3 moist) silt loam; massive; soft; very friable; calcareous.

Profiles described by Henry T. Otsuki.

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

SOIL SURVEY LABORATORY Lincoln, Nebr. 5/20/58

SOIL TYPE Ulysses LOCATION Logan County, Kansas
 silt loam

SOIL NOS. S57Kans-55-4 LAB. NOS. 5909-5916

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)									3A1		TEXTURAL CLASS
		1B1a	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)					3A1		2A2			
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY			> 2		
		2.1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002			
0-3	Ap	0.2	1.2	1.6	1.6	14.3	55.6	25.5	57.1	13.5	-	sil	
3-5	A1	0.2	1.2	1.7	1.4	13.2	54.5	27.8	54.8	13.3	-	sic1	
5-9	B21	0.1	1.3	1.9a	1.4a	11.8a	53.2	30.3	54.4	14.0	-	sic1	
9-13	B22	0.1	1.1	1.6	1.4	10.6	48.3	36.9	44.9	14.6	-	sic1	
13-25	B2ca	0.1	0.1	0.2	0.3b	9.5b	61.4	28.4	48.7	22.4	-	sic1	
25-38	B3	0.1b	0.1b	-	0.2b	11.2b	65.5	22.9	54.2	22.7	-	sil	
38-50	C1	-	0.1	0.1b	0.1b	12.4b	66.5	20.8	55.7	23.3	-	sil	
50-63	C2	-	-	-	0.1b	11.1b	67.5	21.3	54.6	24.1	-	sil	

pH	8C1a			ORGANIC MATTER			6E1a		MOISTURE TENSIONS			
	1:5	1:10	6A1a	6B1a	ORGANIC CARBON	NITRO-GEN	C/N	CoCO ₃ equiv-olent	GYPSSUM me./100g. SOIL	1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.
1:1			%	%				%		%	%	%
7.5	7.9	8.1	1.23	.114	10.8			-				11.1
7.4	7.8	7.9	1.15	.110	10.4			-				12.5
7.8	8.3	8.7	0.91	.094	10			2				14.0
8.1	8.7	8.9	0.71	.082	9			9				14.2
8.2	8.8	9.0	0.39	.052	8			14				13.3
8.2	8.9	9.1	0.26					11				11.8
8.5	9.3	9.4	0.18					8				10.8
8.6	9.4	9.5	0.17					8				11.1

5A1a	EXTRACTABLE CATIONS					5B1a	BASE SAT. % NH ₄ Ac EXCH.	5C3	5B1a	5A3a	8D3	4A3a
	6N2b	6O2b	3H1a	6P2a	6Q2a							
CATION EXCHANGE CAPACITY NH ₄ Ac	Ca	Mg	H	Na	K			Base Sat. % on Sum	Sum Bases	Sum Cations	Ca/Mg	Vol. Wt. c/g/cc
	milliequivalents per 100g. soil							5C1Cations	<me/100 g->			
23.2	18.7	3.1	1.2	-	1.8	100	95	23.6	24.8	6.0		
25.1	20.1	3.6	1.6	-	1.6	100	94	25.3	26.9	5.6		
24.9					1.3							
23.4					1.4							1.24
21.9					2.1							
22.1				0.2	2.7							1.21
20.7				1.0	3.1							
21.6				1.2	3.1							

a. Rew smooth black concr. (Mn?).
 b. Rew CaCO₃ concr.
 c. Based on consistence terminology in the profile descriptions, the horizons were drier than midway between air-dry and field capacity.

Soil Type: Ulysses silt loam. 81
 Location: Logan County, Kansas. 292' N and 151' W of E1/4 corner Sec. 13, T13S, R36W. 4 miles W of Russell Springs.
 Date of Sampling: July 9, 1957.
 Collectors: James Allen, Elbert Bell, Henry Otsuki.
 Physiographic Position: Upland. Elevation approximately 3200'.
 Climate: Average annual precipitation about 18". Annual temperature about 53°.
 Topography: Nearly level table below the summit of the High Plains mantled with loess. Gradient less than 1 percent.
 Drainage: Well drained.
 Vegetation: Sorghums.
 Use: Cultivated land. Broken from virgin sod about 1947.
 Soil No.: S57Kans-55-4.
 Depth, Lincoln Lab.
 No., and Horizon

0-3" 5909	Ap	Dark grayish brown (10YR 4.5/2 dry; 3/2 moist) silt loam; weak fine and very fine granular; slightly hard; friable; noncalcareous; abrupt smooth boundary to
3-5" 5910	A1	Dark grayish brown (10YR 4.5/2 dry; 3/2 moist) silt loam; weak to moderate medium subangular blocky and granular; slightly hard; friable; noncalcareous; grades to
5-9" 5911	B21	Dark grayish brown (10YR 4.5/2 dry; 3/2 moist) light silty clay loam; weak medium subangular blocky and moderate medium granular; clayskins weak and patchy; hard; moderately firm; noncalcareous; grades to
9-13" 5912	B22	Grayish brown (10YR 5.5/2 dry; 4/2 moist) light silty clay loam; weak medium subangular blocky and moderate medium granular; clayskins weak and patchy; hard; moderately firm; calcareous; grades to
13-25" 5913	B2ca	Light brownish gray (10YR 6.5/2 dry; 5.2/5 moist) silt loam; weak coarse prismatic and weak coarse subangular blocky; soft; very friable; calcareous with common fine threads of CaCO_3 ; grades to
25-38" 5914	B3	Light brownish gray (10YR 6.5/2 dry; 5/3 moist) silt loam; weak coarse prismatic and weak coarse subangular blocky; soft; very friable; calcareous;
38-50" 5915	C1	Light brownish gray (10YR 6.5/2 dry; 5/3 moist) silt loam; weak coarse prismatic and weak coarse subangular blocky; soft; very friable; calcareous;
50-63" 5916	C2	Light brownish gray (10YR 6.5/2 dry; 5/3 moist) silt loam; weak coarse prismatic and weak coarse subangular blocky; soft; very friable; calcareous; grades slowly to
63-70"+ Not sampled	C3	Very pale brown (10YR 7/3 dry; 5/3.5 moist) silt loam; massive; soft; very friable; calcareous.

Profiles described by Henry T. Otsuki.
 Except where specified moist, the colors refer to dry soil.