

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

...COLORADO

Soil Survey Investigations Report No. 10

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

...COLORADO

August 1967

SOIL CONSERVATION SERVICE U.S. DEPARTMENT OF AGRICULTURE
In cooperation with
COLORADO 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
 4. Field state
 5. Airdry
 - C. Water-retention difference
 1. 1/3 bar to 15 bars
 2. 1/10 bar to 15 bars
 - 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
 - A. Cation-exchange capacity
 1. NH_4OAc , pH 7.0
 - 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 8.2
 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
 1. Dithionite extraction
 - a. Permanganate colorimetry
 - E. Calcium carbonate
 1. HCl treatment
 - a. Gas volumetric
 - b. Manometric
 - c. Weight loss
 - d. Weight gain
 - e. Titrimetric
 2. Sensitive qualitative method
 - a. Visual, gas bubbles
 - F. Gypsum
 1. Water extract
 - a. Precipitation in acetone
 - G. Aluminum
 1. KCl extraction I, 30 min
 - a. Aluminon I
 - b. Aluminon II
 - c. Aluminon III
 - d. Fluoride titration
 2. KCl extraction II, overnight
 - a. Aluminon I
 3. NH_4OAc extraction
 - 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
 3. $\text{KCl-triethanolamine}$
 - a. Back-titration with NaOH
 - I. Carbonate
 1. Saturation extract
 - a. Acid titration
6. CHEMICAL ANALYSES (cont.)
 - J. Bicarbonate
 1. Saturation extract
 - a. Acid titration
 - K. Chloride
 1. Saturation extract
 - a. Mohr titration
 - b. Potentiometric titration
 - L. Sulfate
 1. Saturation extract
 - a. Gravimetric, BaSO_4
 2. NH_4OAc extraction
 - a. Gravimetric, BaSO_4
 - M. Nitrate
 1. Saturation extract
 - a. PDS acid colorimetry
 - N. Calcium
 1. Saturation extract
 - a. EDTA titration
 2. NH_4OAc extraction
 - 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
 1. Saturation extract
 - 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
 1. Saturation extract
 - a. Flame photometry
 2. NH_4OAc extraction
 - a. Flame photometry
 - Q. Potassium
 1. Saturation extract
 - a. Flame photometry
 2. NH_4OAc extraction
 - a. Flame photometry
 - R. Sulfur
 1. NaHCO_3 extraction, pH 8.5
 - a. Methylene blue
 5. Total phosphorus
 1. Perchloric-acid digestion
 - a. Molybdovanadophosphoric-acid colorimetry
7. MINERALOGY
 - A. Instrumental analysis
 1. Preparation
 - a. Carbonate removal
 - b. Organic-matter removal
 - c. Iron removal
 - d. Particle-size fractionation
 2. X-ray diffraction
 3. Differential thermal analysis
 - B. Optical analysis
 1. Grain studies
 - C. Total analysis
 1. Chemical
 2. X-ray emission spectrography
 - D. Surface area
 1. Glycerol retention
8. MISCELLANEOUS
 - A. Saturated paste, mixed
 1. Saturation extract
 - a. Conductivity
 2. Conductivity, saturated paste
 - B. Saturated paste, capillary rise
 1. Saturation extract
 - a. Conductivity
 - C. pH
 1. Soil suspensions
 - a. Water dilution
 - b. Saturated paste
 - c. KCl
 - D. Ratios
 1. To total clay
 2. To noncarbonate clay
 3. Ca to Mg (extractable)

PREFACE

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

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

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

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

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

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

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

*Soil Survey
Soil Conservation Service*

COLORADO

<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>
Ascalon	Morgan	S59Colo-44-1	3	Kuma	Sedgwick	S63Colo-58-7	129
	Morgan	S59Colo-44-2	5		Sedgwick	S63Colo-58-10	131
Baca	Baca	S55Colo-5-3	7	Laporte	Chaffee	S58Colo-8-9	133
	Baca	S55Colo-5-4	9	Leal	Grand	S55Colo-25-3	135
	Prowers	S58Colo-50-1	11		Grand	S55Colo-25-4	137
	Prowers	S58Colo-50-10	13	Little	Arapahoe	S61Colo-3-1	139
*Bancroft	Douglas	S63Colo-18-7	15		Arapahoe	S61Colo-3-2	141
	Douglas	S63Colo-18-8	17	*Lucky	Gunnison	S59Colo-26-2	143
Bassel	Chaffee	S58Colo-8-3	19	Grand	Grand	S55Colo-25-7	145
	Chaffee	S58Colo-8-12	21	Grand	Grand	S55Colo-25-8	147
*Bijou	Morgan	S59Colo-44-3	23	Nathrop	Chaffee	S58Colo-8-5	149
	Morgan	S59Colo-44-4	25	Nepesta	Prowers	S60Colo-50-9	151
Bobtail	Grand		27	Prowers	Prowers	S60Colo-50-10	153
	Grand		29	Nystrom	Clear Creek	S55Colo-10-1	155
	Grand		31	*Parlin	Gunnison	S59Colo-26-1	157
	Grand		33	*Penitente	Boulder	S57Colo-7-1	159
	Grand		35	Boulder	Boulder	S57Colo-7-2	161
	Grand		37	*Peyton	Douglas	S63Colo-18-5	163
Bottle	Grand		39	Douglas	Douglas	S63Colo-18-6	165
	Grand		41	Morgan	Morgan	S59Colo-44-9	167
	Grand		43	Morgan	Morgan	S59Colo-44-10	169
	Grand	S55Colo-25-2	45	Ptarmigan	Boulder	S57Colo-7-3	171
Bresser	Arapahoe	S61Colo-3-9	47	Boulder	Boulder	S57Colo-7-4	173
	Arapahoe	S61Colo-3-10	49	Boulder	Boulder	S57Colo-7-5	175
Buena Vista	Chaffee	S58Colo-8-7	51	Boulder	Boulder	S57Colo-7-6	177
	Chaffee	S58Colo-8-10	53	Grand	Grand	S55Colo-25-1	179
*Buick	Arapahoe	S61Colo-3-5	55	Grand	Kit Carson	S54Colo-32-3	183
	Arapahoe	S62Colo-3-6	57	Rago	Kit Carson	S54Colo-32-4	185
	Arapahoe	S61Colo-3-8	59	Richfield	Sedgwick	S63Colo-58-8	187
*Cabin	Gunnison	S59Colo-26-4	61	Sedgwick	Sedgwick	S63Colo-58-9	189
	Gunnison	S59Colo-26-5	63	Prowers	Prowers	S58Colo-50-6	191
Campo	Baca	S55Colo-5-1	65	Prowers	Prowers	S58Colo-50-7	193
	Baca	S55Colo-5-2	67	Prowers	Prowers	S60Colo-50-3	195
Chubbs	Chaffee	S58Colo-8-6	69	Rocky Ford	Prowers	S60Colo-50-4	197
	Chaffee	S58Colo-8-8	71	Prowers	Prowers	S60Colo-50-7	199
Colby	Prowers	S58Colo-50-2	73	Prowers	Prowers	S60Colo-50-8	201
	Prowers	S58Colo-50-3	75	Stecum	Chaffee	S57Colo-8-4	203
	Prowers	S60Colo-50-1	77	Chaffee	Chaffee	S57Colo-8-5	205
	Prowers	S60Colo-50-2	79	Chaffee	Chaffee	S57Colo-8-6	207
	Prowers	S60Colo-50-5	81	Tabernash	Grand	S55Colo-25-5	209
	Prowers	S60Colo-50-6	83	Grand	Grand	S55Colo-25-6	211
Darling	Grand		85	*Tex	Gunnison	S59Colo-26-3	213
	Grand		87	Gunnison	Gunnison	S59Colo-26-6	215
	Grand		89	Chaffee	Chaffee	S58Colo-8-1	217
	Grand		91	Chaffee	Chaffee	S58Colo-8-11	219
*Deertrail	Arapahoe	S61Colo-3-4	93	Trout Creek	Elbert	S61Colo-20-1	221
	Arapahoe	S61Colo-3-6	95	Truckton	Morgan	S59Colo-44-7	223
Edloe	Chaffee	S57Colo-8-1	97	Morgan	Morgan	S59Colo-44-8	225
	Chaffee	S57Colo-8-2	99	Morgan	Clear Creek	S55Colo-10-2	227
	Chaffee	S57Colo-8-3	101	Vasquez	Grand		229
*Fondis	Douglas	S63Colo-18-3	103	Bent	S61Colo-6-1	231	
	Douglas	S63Colo-18-4	105	Morgan	S61Colo-44-1	233	
Haxtun	Sedgwick	S63Colo-58-3	107	Vona	Arapahoe	S61Colo-3-3	235
	Sedgwick	S63Colo-58-5	109	Wald	Arapahoe	S61Colo-3-7	237
	Sedgwick	S63Colo-58-6	111	Arapahoe	Kit Carson	S54Colo-32-1	239
Heath	Chaffee	S58Colo-8-2	113	Kit Carson	Kit Carson	S54Colo-32-2	241
	Chaffee	S58Colo-8-4	115	Morgan	Morgan	S59Colo-44-5	243
*Julesburg	Sedgwick	S63Colo-58-2	117	Morgan	Morgan	S59Colo-44-6	245
	Sedgwick	S63Colo-58-4	119	Morgan	Prowers	S58Colo-50-8	247
Keith	Sedgwick	S63Colo-58-11	121	Prowers	Prowers	S58Colo-50-9	249
*Kettle	Douglas	S63Colo-18-1	123	Wiley			
	Douglas	S63Colo-18-2	125				
	Douglas	S63Colo-18-9	127				

*Soil series names preceded by an asterisk are names of tentative series.

COLORADO

<u>County</u>	<u>Soil Series</u>	<u>Soil Survey No.</u>	<u>Page</u>	<u>County</u>	<u>Soil Series</u>	<u>Soil Survey No.</u>	<u>Page</u>		
Arapahoe	Bresser	S61Colo-3-9	47	Grand	Darling		87		
	Bresser	S61Colo-3-10	49		Darling		89		
	*Buick	S61Colo-3-5	55		Darling		91		
	*Buick	S62Colo-3-6	57		Leal	S55Colo-25-3	135		
	*Buick	S61Colo-3-8	59		Leal	S55Colo-25-4	137		
	*Deertrail	S61Colo-3-4	93		Mine	S55Colo-25-7	145		
	*Deertrail	S61Colo-3-6	95		Mine	S55Colo-25-8	147		
	Litle	S61Colo-3-1	139		Ptarmigan		179		
	Litle	S61Colo-3-2	141		Ptarmigan	S55Colo-25-1	181		
	Weld	S61Colo-3-3	235		Tabernash	S55Colo-25-5	209		
	Weld	S61Colo-3-7	237		Tabernash	S55Colo-25-6	211		
	Baca	Baca	S55Colo-5-3		7	Vasquez		229	
		Baca	S55Colo-5-4		9	Gunnison	*Cabin	S59Colo-26-4	61
		Campo	S55Colo-5-1		65		*Cabin	S59Colo-26-5	63
Campo		S55Colo-5-2	67	*Lucky	S59Colo-26-2		143		
Vona	S61Colo-6-1	231	*Parlin	S59Colo-26-1	157				
Bent	*Penitente	S57Colo-7-1	159	*Tex	S59Colo-26-3	213			
	*Penitente	S57Colo-7-2	161	*Tex	S59Colo-26-6	215			
Boulder	Ptarmigan	S57Colo-7-3	171	Kit Carson	Rago	S54Colo-32-3	183		
	Ptarmigan	S57Colo-7-4	173		Rago	S54Colo-32-4	185		
	Ptarmigan	S57Colo-7-5	175		Weld	S54Colo-32-1	239		
	Ptarmigan	S57Colo-7-6	177		Weld	S54Colo-32-2	241		
Chaffee	Bassel	S58Colo-8-3	19	Morgan	Ascalon	S59Colo-44-1	3		
	Bassel	S58Colo-8-12	21		Ascalon	S59Colo-44-2	5		
	Buena Vista	S58Colo-8-7	51		*Bijou	S59Colo-44-3	23		
	Buena Vista	S58Colo-8-10	53		*Bijou	S59Colo-44-4	25		
	Chubbs	S58Colo-8-6	69		Platner	S59Colo-44-9	167		
	Chubbs	S58Colo-8-8	71		Platner	S59Colo-44-10	169		
	Edloe	S57Colo-8-1	97		Truckton	S59Colo-44-7	223		
	Edloe	S57Colo-8-2	99		Truckton	S59Colo-44-8	225		
	Edloe	S57Colo-8-3	101		Vona	S61Colo-44-1	233		
	Heath	S58Colo-8-2	113		*Weldona	S59Colo-44-5	243		
	Heath	S58Colo-8-4	115		*Weldona	S59Colo-44-6	245		
	Laporte	S58Colo-8-9	133		Prowers	Baca	S58Colo-50-1	11	
	Nathrop	S58Colo-8-5	149			Baca	S58Colo-50-10	13	
	Stecum	S57Colo-8-4	203			Colby	S58Colo-50-2	73	
	Stecum	S57Colo-8-5	205			Colby	S58Colo-50-3	75	
	Stecum	S57Colo-8-6	207			Colby	S60Colo-50-1	77	
	Trout Creek	S58Colo-8-1	217			Colby	S60Colo-50-2	79	
	Clear Creek	Trout Creek	S58Colo-8-11		219	Colby	S60Colo-50-5	81	
Nystrom		S55Colo-10-1	155	Colby	S60Colo-50-6	83			
Douglas	Vasquez	S55Colo-10-2	227	Nepesta	S60Colo-50-9	151			
	*Bancroft	S63Colo-18-7	15	Nepesta	S60Colo-50-10	153			
	*Bancroft	S63Colo-18-8	17	Richfield	S58Colo-50-6	191			
	*Fondis	S63Colo-18-3	103	Richfield	S58Colo-50-7	193			
	*Fondis	S63Colo-18-4	105	Rocky Ford	S60Colo-50-3	195			
	*Kettle	S63Colo-18-1	123	Rocky Ford	S60Colo-50-4	197			
	*Kettle	S63Colo-18-2	125	Rocky Ford	S60Colo-50-7	199			
	*Kettle	S63Colo-18-9	127	Rocky Ford	S60Colo-50-8	201			
	*Peyton	S63Colo-18-5	163	Wiley	S58Colo-50-8	247			
	*Peyton	S63Colo-18-6	165	Wiley	S58Colo-50-9	249			
	Truckton	S61Colo-20-1	221	Sedgwick	Haxtun	S63Colo-58-3	107		
	Elbert	Bobtail			27	Haxtun	S63Colo-58-5	109	
Bobtail			29		Haxtun	S63Colo-58-6	111		
Bobtail			31		*Julesburg	S63Colo-58-2	117		
Bobtail			33		*Julesburg	S63Colo-58-4	119		
Bobtail			35		Keith	S63Colo-58-11	121		
Bobtail			37		Kuma	S63Colo-58-7	129		
Bottle			39		Kuma	S63Colo-58-10	131		
Bottle			41		Richfield	S63Colo-58-8	187		
Bottle			43		Richfield	S63Colo-58-9	189		
Bottle		S55Colo-25-2	45						
Darling			85						

SOIL TYPE Ascalon LOCATION Morgan County, Colorado
 fine sandy loam

SOIL NOS. S59Colo-44-1 LAB. NOS. 10825-10833

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B ₁ 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 (≤ 9 mm)	3A1 0.2-0.02	0.02-0.002	
0-4	A1	2.8	10.0	10.9	21.9	24.4	20.1	9.9	51.0	6.1	Tr.	fsl
4-7	A3	2.3	9.2	11.6	24.3	23.1	16.8	12.7	47.7	5.8	Tr.	fsl
7-11	B ₁ t	1.5	8.0	10.3	22.7	23.7	16.4	17.4	47.9	5.2	Tr.	fsl
11-16	B ₂ t	2.3	7.3	8.9	20.0	25.6	17.6	18.3	48.6	5.8	Tr.	fsl
16-19	B3	2.5	7.9	9.4a	19.5a	23.0a	19.6	18.1	47.2	6.5	Tr.	fsl
19-23	B3ca	3.6	10.3a	10.1a	17.5a	17.6a	17.7	23.2	38.5	6.6	Tr.	scl
23-30	Cca1	6.3	11.1b	9.2b	16.5b	17.1b	14.3	25.5	33.6	6.6	16	scl
30-36	Cca2	5.6a	13.8b	11.2b	18.3b	17.3b	13.1	20.7	32.7	7.3	14	scl
36-52	C1	8.4a	20.9a	14.9a	19.8a	15.3a	7.8	12.9	29.7	3.1	Tr.	cosl
pH		ORGANIC MATTER				8A2	ELECTRI-CAL CONDUCTIVITY EC x 10 ³ MILLIMOS PER CM @ 25°C	6E1a	6F1a	MOISTURE TENSIONS		
8C1a	1:5	1:10	6A1a ORGANIC CARBON	6H1a NITRO-GEN	C/N	EST% SALT (BUREAU CUP)	CaCO ₃ equiv-alent	GYPSUM me./100g SOIL	1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.	
1:1			%	%			%		%	%	%	
7.0			0.88	0.076	12	0.20	0.5	Δ	Δ		5.2	
7.6			0.58	0.060	10	0.20	0.5	Δ	Δ		5.6	
7.7			0.50	0.060	8	0.20	0.5	Δ	Δ		8.2	
7.9			0.41	0.052	8	0.20	0.5	Δ	Δ		8.2	
8.0			0.52	0.063	8	0.20	0.5	1	Δ		8.8	
8.2			0.54	0.067	8	0.20	0.5	10	Δ		9.8	
8.4			0.31	0.038	8	0.20	0.6	19	Δ		8.4	
8.6			0.14			0.20	0.5	13	Δ		6.2	
8.6			0.02			0.20	0.5	6	Δ		4.6	
5A1a	EXTRACTABLE CATIONS					5B1a	5B2	SATURATION EXTRACT SOL.		4A1h	8A	
CATION EXCHANGE CAPACITY NH ₄ Ac	6B2b	6C2b	6H1a	6P2a	6Q2a	EXCH. No %	6P1a	6Q1a		O. D. Bulk Density g/cc	MOISTURE AT SATU-RATION %	
	Ca	Mg	H	Na	K		Na	K				
	milliequivalents per 100g. soil →						← milliequivalents per liter →					
8.9	7.1	1.2	0.5	<0.1	0.8	Δ	0.4	0.9			30.5	
10.5	9.0	1.5	0.2	<0.1	0.6	Δ	0.3	0.4		1.61	31.3	
14.2	11.9	2.1	0.2	<0.1	0.8	Δ	0.3	0.3			41.5	
14.8	12.3	3.0	1.0	0.1	1.0	1	0.3	0.4		1.62	39.4	
14.8		3.2	<0.1	<0.1	1.0	Δ	0.4	0.4			41.4	
13.2				<0.1	1.0	Δ	0.4	0.7			42.2	
8.7				0.1	0.9	1	0.7	0.8		1.66	40.9	
7.8				0.1	1.0	1	0.6	0.9			36.7	
7.1				0.1	1.1	1	1.0	1.1			29.7	

a. Trace carbonate concn. (CaCO₃?).
 b. Few carbonate concn. (CaCO₃?).

Soil Type: Ascalon fine sandy loam
 Soil Nos.: 859Colo-44-1
 Field classification: Chestnut-Brown Intergrade.
 Location: 975 feet west, 825 feet south of north quarter corner, Sec. 1, T6N, R58W, Morgan County, Colorado.
 Photo: YE-1F-39.
 Climate: Continental, average annual precipitation 13-15 inches. Elevation 4,700 feet. Frost-free season 146 days.
 Mean annual temperature 48° F.
 Vegetation: Blue grama, pricklypear cacti, western wheatgrass, few annual weeds.
 Parent material: Tertiary outwash.
 Physiographic position: Upland.
 Relief: Gently sloping 3 percent slope.
 Aspect: Southeast-facing.
 Drainage: External drainage medium, internal drainage medium.
 Moisture: Moist to 30 inches at time of sampling, near saturation at surface.
 Water table: None encountered.
 Stoniness: Few small outwash gravels All through Cca.
 Salt or alkali: None observed other than calcium carbonate.
 Erosion: Slight wind and water.
 Described by: Clayton F. Spears, May 4, 1959.
 Remarks: Site sampled located about 300 feet below crest of short southeast-facing, 3 percent slope. Many krotovinas of insects and worms AB through Cca horizons.

Horizon and
 Lincoln
 Lab. No.

A1
 10825 0 to 4 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist and crushed) fine sandy loam; weak fine granular structure; soft when dry, very friable when moist; noncalcareous; lower boundary clear and smooth.

AB
 10826 4 to 7 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2.5 moist and crushed) sandy loam; weak medium prismatic structure breaking to weak medium subangular blocks; slightly hard when dry, friable moist; noncalcareous; lower boundary clear and smooth.

B21t
 10827 7 to 11 inches. Brown (10YR 5/3 dry) to dark brown (10YR 3.5/3 moist and crushed) light sandy clay loam; weak to moderate medium prismatic structure breaking to weak to moderate medium subangular blocks; slightly hard to hard dry, friable moist; very thin patchy clay skins on both horizontal and vertical faces of soil aggregates; noncalcareous; lower boundary clear and smooth.

B22t
 10828 11 to 16 inches. Brown (10YR 4.5/3 dry) to very dark grayish brown (10YR 3/2.5 moist) dark grayish brown (10YR 4/2 crushed) sandy clay loam; moderate medium prismatic structure breaking to moderate medium subangular blocks; a few fine subangular blocks; hard when dry, friable moist; thin continuous clay skins on both horizontal and vertical faces of soil aggregates; noncalcareous; lower boundary clear and smooth.

B3
 10829 16 to 19 inches. Pale brown (10YR 5.5/3 dry) to brown (10YR 4/3 moist) sandy clay loam; weak medium prismatic structure breaking to weak medium subangular blocks; slightly hard dry, friable moist; very thin patchy clay skins on vertical faces and in root channels; very slightly calcareous; lower boundary clear and wavy.

B3ca
 10830 19 to 23 inches. Very pale brown (10YR 7.5/3 dry) to brown (10YR 5/3 moist) (1.25Y 5/3 crushed) sandy loam, very weak coarse subangular blocky structure; slightly hard when dry, friable moist, strongly calcareous; visible line in seams and streaks and in small soft concretions; moderate horizon of accumulation of calcium carbonate; lower boundary clear and wavy.

Cca1
 10831 23 to 30 inches. Very pale brown to nearly white (10YR 8/3 to 8/2 dry) to pale brown (10YR 6/3 moist and crushed) sandy loam; massive, very hard to extremely hard when dry, firm moist; very strongly calcareous; moderate to prominent horizon of accumulated calcium carbonate; lower boundary clear and wavy.

Cca2
 10832 30 to 36 inches. Very pale brown (10YR 8/3 dry, 10YR 7/3 moist) light sandy loam; massive; dry hard, moist friable; very strongly calcareous, few medium soft lime concretions; lower boundary clear and wavy.

C1
 10833 36 to 52 inches. Very pale brown (10YR 7/3.5 dry) to yellowish brown (10YR 5/3.5 moist) sandy loam; massive; hard dry, friable moist, strongly calcareous, lime well disseminated; lower boundary gradual and wavy.

C2
 52 to 87 inches. Light yellowish brown (10YR 6/3.5 dry) to yellowish brown (10YR 5/3.5 moist) sandy loam with strata of loamy sand; massive; slightly hard dry, friable moist; strongly calcareous; lower boundary clear and smooth.

Dr
 87 inches plus. Pale olive (5Y 6/3 dry) to olive (5Y 5/3 moist) sandstone shale interbedded, Laramie formation.

Bureau of Public Road samples:

A1 0-4 inches
 B22t 11-16 inches
 C1 36-52 inches

SOIL TYPE Ascalon LOCATION Morgan County, Colorado
fine sandy loam

SOIL NOS. S59Colo-44-2 LAB. NOS. 10834-10840

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	2A2 > 2	
0-4	All	0.9	7.1	10.5	22.2	23.6	22.5	13.2	49.4	8.8	-	fs1
4-8	AB	1.4	8.4	11.0	23.2	21.2	19.2	15.6	44.4	8.7	-	fs1
8-15	B2 t	1.0	6.2	8.1	17.3	18.6	20.4	28.4	39.8	8.7	-	scl
15-21	B3ca	1.9b	6.4b	6.7b	15.7b	21.0b	21.6	26.7	41.1	10.7	-	scl
21-28	Cca	1.8a	7.9a	7.7a	20.7a	24.2a	14.7	23.0	44.5	7.2	-	scl
28-38	C1	2.2a	9.3a	8.4a	20.7a	27.6a	11.8	20.0	45.8	6.3	-	scl/fs1
38-45	C2	3.8a	7.7a	8.1a	21.4a	18.4a	12.5	28.1	35.1	8.8	-	scl

8C1a	pH		ORGANIC MATTER			8A2	ELECTRICAL CONDUCTIVITY	6E1a	6F1a	MOISTURE TENSIONS		
	1:5	1:10	6A1a	6B1a	C/N	EST% SALT (BUREAU CUP)	EC-10 ³ MILLIMHOS PER CM B1a	CaCO ₃ equivalent	GYP SUM mg./100g SOIL	1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.
			ORGANIC CARBON %	NITROGEN %				%			%	%
7.2			1.01	0.088	12	0.20	0.5	Δ	Δ			6.5
7.8			0.63	0.063	10	0.20	0.6	Δ	Δ			7.0
8.0			0.48	0.061	8	0.20	0.5	Δ	Δ			12.9
8.3			0.45	0.060	8	0.20	0.5	Δ	Δ			12.1
8.4			0.22	0.030		0.20	0.5	Δ	Δ			9.1
8.6			0.10			0.20	0.6	Δ	Δ			7.5
8.7			0.08			0.20	0.7	Δ	Δ			10.4

5A1a	EXTRACTABLE CATIONS 5B1a					5D2	8A1 SATURATION EXTRACT SOL.		8A
	6N2b	6O2b	6H1a	6P2a	6Q2a	EXCH. No %	6P1a	6Q1a	
	Ca	Mg	H	Na	K		Na	K	
11.8	8.7	1.8	0.7	<0.1	1.2	Δ	0.3	1.0	34.4
12.1	10.4	1.9	0.2	<0.1	1.1	Δ	0.3	0.8	35.5
20.7	17.0	4.4	0.2	<0.1	2.0	Δ	0.2	0.7	52.9
17.2				<0.1	1.7	Δ	0.3	0.9	50.5
13.8				0.1	1.8	1	0.4	1.2	40.6
12.8				0.3	2.0	2	1.6	1.5	38.1
18.8				1.0	3.2	4	3.3	1.3	52.0

← milliequivalents per 100g. soil → ← milliequivalents per liter →

a. Few carbonate concn. (CaCO₃?).
 b. Trace carbonate concn. (CaCO₃?).

Soil Type: Ascalon fine sandy loam
 Soil Nos.: S59Colo-44-2
 Field classification: Chestnut-Brown Intergrade.
 Location: 240 feet south, 1,560 feet west, northeast corner, Sec. 14, T6N, R68W, Morgan County, Colorado.
 Photo: YE-1F-50.
 Climate: Continental, average annual precipitation 13-15 inches, elevation 4,750 feet. Frost-free season 146 days.
 Mean annual temperature 48° F.
 Vegetation: Grams, western wheatgrass, annual weeds.
 Parent material: Tertiary outwash.
 Physiographic position: Upland.
 Relief: Gently sloping 3 percent slope.
 Drainage: External drainage medium, internal drainage medium.
 Moisture: Moist to 40 inches at time of sampling.
 Water table: None encountered.
 Stoniness: Few small outwash gravels All through Cca.
 Salt or alkali: None observed other than calcium carbonate.
 Erosion: Slight.
 Described by: Clayton F. Spears, May 4, 1959.
 Remarks: Numerous small krotovinas in the B2 and B3ca horizons. Sample site located on the lower part of a long 1,000 foot to 1,200 foot northwest-facing slope.

Horizon and
 Lincoln
 Lab. No.

All 0 to 4 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist and crushed) fine sandy loam; weak coarse crumb structure breaking to weak medium crumbs; soft when dry, very friable moist; noncalcareous; clear smooth boundary.

AB 4 to 8 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2.5 moist and crushed) sandy loam; weak medium prismatic structure breaking to weak medium subangular blocks; noncalcareous; lower boundary clear and smooth.

B2 8 to 15 inches. Brown (10YR 4.5/3 dry) to dark brown (10YR 3.5/3 moist) or dark grayish brown (10YR 4/2 crushed) sandy clay loam; moderate medium prismatic structure breaking to moderate medium subangular blocks; hard when dry, firm moist; moderate continuous clay skins on both horizontal and vertical faces of soil aggregates; noncalcareous; lower boundary clear and smooth.

B3ca 15 to 21 inches. Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist and crushed) sandy clay loam; weak coarse prismatic structure breaking to weak medium and coarse subangular blocks; slightly hard dry, friable moist; very thin patchy clay skins on vertical faces of soil aggregates; strongly calcareous, visible lime in seams and streaks; lower boundary clear and smooth.

Cca 21 to 28 inches. Pale brown (10YR 6.5/3 dry) to yellowish-brown (10YR 5/4 moist) or light olive brown (1.25Y 5/3 moist and crushed) light sandy clay loam; very weak coarse prismatic structure breaking to weak coarse subangular blocks; very strongly calcareous; moderate horizon of lime accumulation with visible calcium carbonate in streaks and in soft concretions. Lower boundary gradual and smooth.

C1 28 to 38 inches. Light yellowish brown (1.25Y 6.5/3 dry) to yellowish brown (1.25Y 5/3 moist and crushed) sandy loam; massive; strongly calcareous, visible calcium carbonate in thin seams and streaks; lower boundary clear and smooth.

C2 38 to 45 inches. Light yellowish brown (1.25Y 6.5/3 dry) to light olive brown (1.25Y 5/4 moist) sandy clay loam; massive; slightly hard dry; very strongly calcareous; visible calcium carbonate in thin seams and streaks. Lower boundary clear and smooth.

C3 45 to 60 inches. Pale brown (10YR 6/3 dry) to brown (10YR 4.5/3 moist) yellowish brown (1.25Y 5/3 crushed) sandy loam; massive; slightly hard dry; strongly calcareous, few thin seams visible calcium carbonate. Lower boundary gradual and smooth.

C4 60 to 94 inches. Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) loamy sand; massive; slightly hard dry; strongly calcareous, few thin seams visible calcium carbonate; some stratification with sandy loam material. Lower boundary abrupt and smooth.

94 inches plus. Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) shale; distinct mottles of bright yellowish brown (10YR 5/6 5/8).

Bureau of Public Roads Samples:

All 0-4 inches
 B2t 8-15 inches
 C1 28-38 inches

Soil Type: Baca clay loam
 Location: 230 feet east of the northwest corner of Sec. 5, T32S; R48W; Baca County, Colorado.
 Date of Sampling: October 4, 1955
 Collector: A. J. Cline Described by: A. J. Cline
 Physiographic Position: Upland
 Topography: Gentle convex slope of approximately 3 percent facing south.
 Drainage: Well drained
 Vegetation: Blue grama, Buffalo grass, and Russian thistle
 Use: Pasture
 Soil Nos.: 855Colo-5-3 Lincoln Laboratory Nos.: 3527-3534

- 0-5 inches
 A₁
 LSL 3527 Grayish brown (10YR 5/2.5 dry) to very dark grayish brown (10YR 3.5/2.5 moist) light silty clay loam; soft when dry, very friable when moist; moderate, fine granular structure; noncalcareous; lower boundary clear and smooth.
- 5-8 inches
 B_{21t}
 LSL 3528 Brown (10YR 5/3 dry) to dark grayish brown (10YR 4/2.5 moist) silty clay loam; slightly hard when dry, friable when moist; weak to moderate, medium and fine prismatic structure breaking to moderate, fine, angular and subangular blocks; noncalcareous; moderate continuous tonhautchen; lower boundary clear and smooth.
- 8-15 inches
 B_{22t}
 LSL 3529 Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist) silty clay loam; slightly hard to hard when dry, friable when moist; moderate to strong, medium prismatic structure breaking to moderate to strong, fine and very fine, angular and subangular blocks; weakly calcareous; thin nearly continuous tonhautchen; lower boundary gradual and smooth.
- 15-24 inches
 B_{31ca}
 LSL 3530 Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist) silty clay loam; hard when dry, friable when moist; moderate to strong, medium prismatic structure breaking to moderate to strong, medium and fine, subangular blocks; strongly calcareous; this is a moderate lime horizon containing moderate numbers of large soft calcium carbonate concretions 1/4 to 1/8 inch in diameter; there are a few thin patchy tonhautchen on vertical and horizontal faces; lower boundary gradual and smooth.
- 24-31 inches
 B_{32ca}
 LSL 3531 Pale brown (10YR 5.5/3.5 dry) to yellowish brown (10YR 4.5/4 moist) silty clay loam; very hard when dry, friable when moist; moderate, coarse subangular blocky structure; strongly calcareous; this is a moderate lime horizon and contains moderate numbers of large soft calcium carbonate concretions 1/4 to 1/8 inch in diameter; there are a few thin patchy tonhautchen; lower boundary gradual and smooth.
- 31-44 inches
 C_{ca}
 LSL 3532 Pale brown (10YR 5.5/3 dry) to brown (10YR 4.5/3 moist) light silty clay loam; hard when dry, friable when moist; weak, coarse subangular blocky structure; violently calcareous; this is a moderate to strong lime horizon with lime finely disseminated. Lower boundary gradual and smooth.
- 44-54 inches
 C
 LSL 3533 Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist) light silty clay loam or heavy silt loam; slightly hard when dry, friable when moist; massive; strongly calcareous; this is a weak lime horizon and contains a few visible lime mycelia and threads; lower boundary gradual and smooth.
- 54-60 - inches
 D
 LSL 3534 Very pale brown (10YR 7/3 dry) to light yellowish brown (10YR 6/4 moist) clay loam; hard when dry, friable when moist; massive; violently calcareous; this is a moderate to strong lime horizon and contains both calcium carbonate concretions and much finely disseminated lime. This last horizon is probably the upper portion of the underlying tertiary outwash beds.

SOIL TYPE Baca LOCATION Baca Co., Colorado
 clay loam

SOIL NOS. S-55-Colo-5-4 LAB. NOS. 3535-3541

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		
0-5	Ap	1.1	1.7	0.8	1.2	8.9	51.9	34.4	40.1	21.4	-	sic1
5-10	B21t	0.4	0.5	0.3	0.5	6.6	50.3	41.4	36.1	21.1	-	sic
10-15	B22t	0.2	0.2	0.2	0.5	4.7	56.4	37.8	33.1	28.3	-	sic1
16-30	B3ca	0.2	0.2	0.2	0.4	4.8	61.1	33.1	35.6	30.6	-	sic1
30-42	Cca	0.3	0.3	0.2	0.3	5.3	64.8	28.8	38.5	31.8	-	sic1
42-56	ABb	0.6	1.0	0.8	0.9	6.0	58.7	32.0	30.2	27.0	-	sic1
56-64+	B2b	1.0	2.2	1.5	1.7	7.2	48.6	37.8	34.0	21.9	-	sic1
	pH	8C1a ORGANIC MATTER				EST% SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM 25-C.	6E1a MOISTURE TENSIONS			4B2 15 ATMOS.	
		1:5	1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %			C/N	CaCO ₃ equiv. of am %	GYPSUM me./100g. SOIL		1/10 ATMOS. %
	1:1											
7.8	8.2	8.5	0.88	.101	9			1			15.5	
7.3	7.7	7.8	0.87	.096	9			-			19.5	
7.7	8.4	8.6	0.74	.061	9			13			16.8	
8.4	8.9	9.0	0.42	.045	9			11			15.4	
8.3	8.9	9.2	0.27	.030	9			8			15.3	
8.1	8.7	9.0	0.20	.028				6			15.0	
8.0	8.6	8.8	0.18	.027				4			15.8	
	5A1a CATION EXCHANGE CAPACITY	5B1a EXTRACTABLE CATIONS				SATURATION EXTRACT SOLUBLE					MOISTURE AT SATURATION %	
	6M2b Ca	6O2b Mg	N	6P2a Na	6Q2a K	Na	K					
	NE4Ac	← milliequivalents per 100g. soil →				← milliequivalents per liter →						
27.1		6.1		0.1	1.5							
32.3	22.6	7.9		0.2	1.1							
25.2				0.4	0.9							
23.0				1.4	1.0							
23.7				3.1	1.0							
22.5				3.4	0.9							
23.3				4.1	0.9							

Soil Type: Baca clay loam
 Location: 650 feet west of the northeast corner of Sec. 3; T29S, R48W, Baca County,
 Colorado.

Date of Sampling: October 4, 1955

Collector: A. J. Cline

Described by: A. J. Cline

Physiographic Position: Upland

Topography: Very gently sloping slightly convex surface facing east;
 approximately 1-2 percent slope.

Drainage: Well drained

Vegetation: Winter wheat

Use: Tilled field

Soil Nos.: 855Colo-5-4

Lincoln Laboratory Nos.: 3535-3541

- 0-5 inches
 Ap
 LSL 3535
 Light brownish gray (10YR 6/2.5 dry) to dark grayish brown (10YR 4/2.5 moist) light silty clay loam; soft when dry. very friable when moist; moderate, fine granular structure; noncalcareous; lower boundary abrupt and smooth.
- 5-10 inches
 B_{2t}
 LSL 3536
 Grayish brown (10YR 5/2.5 dry) to dark grayish brown (10YR 4/2.5 moist) silty clay loam; slightly hard when dry, friable when moist; moderate, fine prismatic structure breaking to moderate to strong, fine and very fine, angular and subangular blocks; noncalcareous; moderate continuous tonhatchen; lower boundary clear and smooth.
- 10-16 inches
 B_{2t}
 LSL 3537
 Light brownish gray (10YR 6/2.5 dry) to grayish brown (10YR 4.5/2.5 moist) silty clay loam; slightly hard when dry, very friable when moist; moderate, fine prismatic structure breaking to moderate to strong, fine, angular and subangular blocks; weakly calcareous; thin patchy tonhatchen on vertical and horizontal faces; lower boundary gradual and smooth.
- 16-30 inches
 B_{3ca}
 LSL 3538
 Very pale brown (10YR 7/2.5 dry) to brown (10YR 5/2.5 moist) light silty clay loam; slightly hard when dry, very friable when moist; moderate, medium prismatic, breaking to moderate, fine, angular and subangular blocks; strongly calcareous; this is a moderate to weak lime horizon, and contains moderate numbers of large soft calcium carbonate concretions 1/8 to 1/4 inch in diameter; a few very thin very patchy tonhatchen; lower boundary gradual and smooth.
- 30-42 inches
 C_{ca}
 LSL 3539
 Very pale brown (10YR 7/3 dry) to brown (10YR 5.5/2.5 moist) silt loam; slightly hard when dry, very friable when moist; weak, medium and coarse, subangular blocky structure; strongly calcareous; this is a moderate lime horizon containing many calcium carbonate concretions and moderate amounts of disseminated lime chiefly in mycelia; lower boundary gradual and smooth.
- 42-56 inches
 A_B
 LSL 3540
 Very pale brown (10YR 7/3.5 dry) to pale brown (10YR 6/3.5 moist) silty clay loam; slightly hard when dry, friable when moist; weak, coarse and medium, subangular blocky structure; strongly calcareous; the horizon contains a few small calcium carbonate concretions but much less than the horizon above; lower boundary gradual and smooth.
- 56-64 inches
 B_{2b}
 LSL 3541
 Light yellowish brown (10YR 6/3.5 dry) to yellowish brown (9YR 5/4 moist) silty clay loam; slightly hard to hard when dry, friable when moist; weak to moderate, medium, subangular blocky structure; strongly calcareous; the horizon contains moderate numbers of medium-sized calcium carbonate concretions; there are a few very thin patchy tonhatchen.

SOIL TYPE Baca LOCATION Prowers County, Colorado
loam

SOIL NOS. S58Colo-50-1 LAB. NOS. 9667-9674

DEPTH INCHES	HORIZON	1B1a PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)									2A2 > 2	TEXTURAL CLASS
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002		
0-2	Alp	0.3	1.4	1.4	4.5	26.3	37.8	28.3	54.6	12.7	-	cl
2-6	B2t	<0.1	0.5	0.6	2.2	16.0	41.3	39.4	45.1	13.9	-	sic1
6-11	B2ca	<0.1	0.3	0.4	1.2	9.1	52.8	36.2	38.9	23.9	-	sic1
11-18	B3ca	0.1	0.1a	0.2a	0.5a	8.0a	59.7	31.4	42.0	26.1	-	sic1
18-26	Cca	<0.1	<0.1	<0.1	0.4a	7.6a	64.0	28.0	45.8	26.1	-	sic1
26-33	C1	<0.1	<0.1	<0.1	0.4a	8.4a	70.3	20.9	47.9	31.1	-	s11
33-44	C2	<0.1	<0.1	<0.1	0.4a	9.3a	73.3	17.0	53.3	29.6	-	s11
44-60	C3	<0.1	<0.1	<0.1	0.4a	8.8a	73.7	17.1	52.5	30.3	-	s11

8C1a	pH		ORGANIC MATTER			8A2 EST% SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM 8A1a	6E1a CaCO ₃ equiv- alent	6F1a GYPSUM mg./100g. SOIL	MOISTURE TENSIONS		
	1:5	1:10	6A1a ORGANIC CARBON %	6B1a NITRO-GEN %	C/N					1/10 ATMOS. %	1/3 ATMOS. %	15 ATMOS. %
7.9			0.96	0.098	10	<0.20	0.7	1				11.7
7.7			0.83	0.097	8	<0.20	0.5	1				16.2
7.9			0.65	0.075	9	<0.20	0.5	6				16.0
8.1			0.42	0.052	8	<0.20	0.5	11				13.9
8.2			0.31	0.038	8	<0.20	0.5	12				12.7
8.4			0.24			<0.20	0.7	10				11.8
8.3			0.19			<0.20	1.3	8				10.8
7.8			0.19			0.46	6.7	6				10.7

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS 5B1a					5D2 EXCH. No %	SATURATION EXTRACT SOLUBLE					8A MOISTURE AT SATURATION %
	6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K		6P1a Na	6Q1a K	6J1a HCO ₃	6K1a Cl ⁻	6I1a SO ₄	
17.7		3.2	<0.1	<0.1	1.8	<1	0.4	1.0				52.1
22.7	20.8	5.6	0.8	0.1	1.2	<1	0.4	0.3				64.8
20.2				0.1	0.9	<1	0.6	0.2				64.9
17.2				0.3	0.8	1	1.2	0.3				61.0
16.1				0.7	0.9	4	2.6	0.3				57.2
16.3				1.4	1.1	7	4.3	0.3				51.8
16.0				2.1	1.1	11	8.1	0.4				52.8
16.8				3.4	1.1	10	32.0	1.3	1.6	47.9	20.4	53.9

a. Trace CaCO₃ concr.

Soil Type: Baca Loam
 Classification: Brown
 Location: 3 mile E., 0.5 mile S., NW corner of Section 5, T21S., R16W,
 Prowers County, Colorado.
 Date Sampled: November 4, 1958
 Climate: Continental climate, average annual precipitation 13.00 inches,
 elevation 3,860 feet. Frost-free season 160 days.
 Vegetation: Dryland, wheat. Parent Material: Loess.
 Physiographic position: Upland. Relief: Nearly level, 0-1%. Drainage: Well
 Moisture: Dry, slightly moist below four feet. Watertable: None encountered.
 Stoniness: None. Salt or Alkali: None observed other than calcium carbonate.
 Erosion: Slight to moderate wind erosion.
 Soil Nos. S-58-Colo-50-1
 Described by: E. Milton Payne
 Lincoln Horizon
 Lab. No.

9667	A _{1p}	0-2 inches	Brown (10YR 5/3, dry) to dark grayish brown (10YR 4/2.5 moist) (10YR 4/2 moist crushed) loam; weak coarse platy breaking to weak fine granular structure; soft when dry, very friable moist; slightly calcareous; clear wavy boundary.
9668	B _{2t}	2-6 inches	Brown (10YR 4/3 dry) to dark brown (10YR 3.5/3 moist) and crushed silty clay loam; moderate medium prismatic structure breaking to moderate medium to fine subangular blocky structure hard when dry, friable moist; thin continuous clay skins; noncalcareous; in the pit there was some disturbance of the upper portion of the horizon and platiness or a plow pan from cultivation was in evidence; gradual smooth boundary.
9669	B _{2ca}	6-11 inches	Brown (10YR 5/3 dry) to dark brown (10YR 4/3 moist) dark grayish brown (10YR 4/2.5 moist crushed) silty clay loam; moderate fine prismatic structure breaking to moderate medium subangular blocky structure; hard when dry, firm moist; thin continuous clay skins; strongly calcareous with a very few small lime nodules in evidence, otherwise the lime was well disseminated; clear smooth boundary.
9670	B _{3ca}	11-18 inches	Pale brown (10YR 6.5/3 dry) to grayish brown (10YR 5/2.5 moist) brown (10YR 5/3 moist crushed) light silty clay loam; moderate medium prismatic structure breaking to moderate medium subangular blocky structure; hard when dry, friable moist; thin patchy clay skins; violently calcareous with prominent lime mottles 1/4 to 1/2 inch in diameter; gradual smooth boundary.
9671	C _{ca}	18-26 inches	Very pale brown (10YR 7/3 dry) to pale brown (10YR 6/3 moist and crushed) light silty clay loam; weak medium to coarse subangular blocky structure; slightly hard when dry, very friable moist; violently calcareous with prominent lime mottles, a few less than horizon above, gradual smooth boundary.
9672	C ₁	26-33 inches	Very pale brown (10YR 7/3 dry) to pale brown (10YR 6/3 moist and crushed) silt loam; very weak coarse subangular blocky structure; slightly hard when dry, very friable moist; violently calcareous with a few scattering lime nodules; gradual smooth boundary.
9673	C ₂	33-44 inches	Very pale brown (10YR 7/3 dry) to pale brown (10YR 5.5/3 moist and crushed) loam; massive; slightly hard when dry very friable moist; violently calcareous; gradual smooth boundary.
9674	C ₃	44-84 inches (Sampled to 60 inches)	Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) loam; massive; soft when dry, very friable moist; violently calcareous.

Bureau of Public Roads Samples:

A₁ - 0 - 2 inches
 B₂₂ - 6 - 11 inches
 C - 33 - 44 inches

SOIL TYPE Baca Loam LOCATION Prowers County, Colorado

SOIL NOS. 558 Colo-50-10 LAB. NOS. 9718-9725

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						2A2
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002			> 2		
0-3	Ap	0.1	0.9	1.0	2.7	22.1	42.8	30.4	53.9	12.9	-	cl	
3-6	B2t	0.1	1.1	1.1	2.5	17.6	41.2	36.4	47.0	13.6	-	cl	
6-13	B2ca	0.2	0.5	0.6a	1.3a	9.6a	50.3	37.5	40.3	20.5	-	sic1	
13-18	B3ca	0.1	0.1	0.1a	0.5a	7.9a	57.9	33.4	42.3	23.9	-	sic1	
18-25	Cca	<0.1	0.1	0.1a	0.5a	8.1a	60.6	30.6	45.2	23.9	-	sic1	
25-36	C1	0.1	0.1	0.1b	0.6b	8.5b	65.3	25.3	67.7	26.6	-	sil	
36-45	C2	<0.1	<0.1	0.1a	0.5a	9.1a	69.9	20.4	51.5	27.9	-	sil	
45-60+	C3	<0.1	<0.1	<0.1	0.5a	9.6a	72.1	17.8	52.7	29.4	-	sil	

8C1a	pH	ORGANIC MATTER			8A2 EST% SALT (BUREAU CUP)	ELECTRI- CAL CONDUCTI- VITY EC x 10 ³ MILLIMHOS PER CM 8A1a	6E1a CaCO ₃ equiv- alent %	GYPSUM mg./100g. SOIL	MOISTURE TENSIONS		
		6A1a ORGANIC CARBON %	6B1a NITRO- GEN %	C/N					1/10 ATMOS. %	1/3 ATMOS. %	4B2 15 ATMOS. %
1:1	1.5	1:10									
7.9			0.96	0.108	9	<0.20	1.0	1			11.4
7.9			0.94	0.104	9	<0.20	0.7	1			14.2
7.9			0.84	0.096	9	<0.20	0.7	5			15.4
8.0			0.48	0.061	8	<0.20	0.7	10			13.9
8.1			0.38	0.044	9	<0.20	0.7	12			12.7
8.3			0.26			<0.20	0.8	10			11.8
8.5			0.19			<0.20	0.8	9			11.1
8.2			0.16			<0.20	1.5	6			10.3

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS				5D2 EXCH. No %	8A1a SATURATION		8A MOISTURE AT SATU- RATION %
	6C2b Ca	6E1a Mg	6F2a M	6G2a Na K		6F1a Na	6Q1a K	
20.8	4.0	<0.1	<0.1	2.0	4	0.4	1.0	57.5
25.2	6.1	0.4	<0.1	1.5	4	0.4	0.4	62.9
25.1			<0.1	1.2	4	0.5	0.4	68.0
22.1			0.3	1.0	1	1.2	0.3	67.8
20.7			0.8	1.0	3	2.4	0.3	63.0
21.1			1.6	1.1	7	4.2	0.3	57.0
20.8			2.0	1.1	8	5.1	0.2	52.5
21.5			2.0	1.1	7	7.8	0.4	54.4

a. Trace CaCO₃ concn.
b. Few CaCO₃ concn.

Soil Type: Baca loam
 Soil Nos.: S58Colo-50-10
 Classification: Brown.
 Location: 330 feet east, 100 feet south of N 1/4 corner, Sec. 10, T21S, R46W, Prowers County, Colorado.
 Climate: Continental climate, average annual precipitation 14 to 15 inches, elevation 3,840 feet. Frost-free season 160 days.
 Vegetation: Fallow.
 Physiographic Position: Upland.
 Relief: Nearly level, 0 to 1 percent slope.
 Drainage: Well.
 Moisture: Dry.
 Water Table: None encountered.
 Stoniness: None
 Salt or Alkali: None observed.
 Erosion: Slight to moderate, principally by wind.
 Described by: E. Milton Payne, November 7, 1958.

Horizon and
 Lincoln
 Lab. No.

Ap 0 to 3 inches. Brown (10YR 4.5/3 dry) to dark brown (10YR 3.5/3 moist) loam; weak fine granular structure; slightly hard when dry, friable when moist; slightly effervescent; abrupt smooth boundary caused by tillage implements.

E2t 3 to 6 inches. Brown (10YR 4.5/3 dry) to dark brown (10YR 3.5/3 moist) silty clay loam; moderate medium prismatic breaking to moderate medium subangular blocky structure; hard when dry, friable when moist; thin nearly continuous clay skins; noncalcareous; clear smooth boundary.

E2ca 6 to 13 inches. Brown (10YR 5/3 dry) to dark brown (10YR 4/3 moist) silty clay loam; moderate medium prismatic breaking to moderate fine subangular blocky structure; hard when dry, firm when moist; thin nearly continuous clay skins; strongly effervescent with a scattering of lime spots; clear smooth boundary.

E3ca 13 to 18 inches. Light brownish gray (10YR 6/2.5 dry) to grayish brown (10YR 4.5/2 moist) silty clay loam; weak coarse prismatic structure breaking to moderate medium subangular blocky structure; hard when dry, firm when moist; thin patchy clay skins; violently effervescent with prominent lime mottles; gradual smooth boundary.

Oca 18 to 25 inches. Pale brown (10YR 6/3 dry) to grayish brown (10YR 5/2.5 moist) light silty clay loam; weak coarse prismatic breaking to moderate medium subangular blocky structure; hard when dry, firm when moist; violently effervescent with prominent lime mottles; gradual smooth boundary.

C1 25 to 36 inches. Very pale brown (10YR 6.5/3 dry) to brown (10YR 5/3 moist) silt loam; very weak very coarse prismatic structure breaking to weak coarse subangular blocky structure; slightly hard when dry, friable when moist; violently effervescent with a few lime streaks and mottles; gradual smooth boundary.

C2 36 to 45 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) loam; very weak coarse subangular blocky structure; slightly hard when dry, friable when moist; violently effervescent; gradual smooth boundary.

C3 45 to 60 inches plus. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) loam; massive; slightly hard when dry, very friable when moist; violently effervescent; this layer continued without change to 10 feet.

Bureau of Public Roads Samples:

Ap 0 to 3 inches
 E2ca 6 to 13 inches
 C2 36 to 45 inches.

SOIL *Bancroft silt loam SOIL Nos. 863Colo-18-7 LOCATION Douglas County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18679-18687 March 1967

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

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1													3A1b	3A1a Noncarbonate Clay <0.002	Coarse fragments 2A2		
		Total			Sand					Silt							> 2	2-19	19-76
		Sand (2-0.05) %	Silt (0.05-0.002)	Clay (+ 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	Pct.					
Pct. of < 2 mm																			
0-6	A1	28.1	52.3	19.6	0.4	2.1	2.4	6.0	17.2	29.7	22.6	50.7	10.9		20	tr			
6-9	B1	28.3	43.4	28.3	0.5	2.3	2.5	6.1	16.9	24.8	18.6	45.5	11.4		28	tr			
9-13	B21t	25.5	40.0	34.5	0.3	1.6	1.8	4.8	17.0	22.2	17.8	42.4	8.5		35	tr			
13-19	B22t	25.2	41.2	33.6	0.2	1.3	1.6	4.4	17.7	23.4	17.8	44.1	7.5	21.8	34	tr			
19-26	B23t	28.0	43.0	29.0	0.5	2.4	2.6	5.6	17.0	24.4	18.6	44.9	11.0		29	tr			
26-39	B3	31.7	42.0	26.3	0.5	3.3	3.4	7.0	17.5	25.2	16.8	46.9	14.2		26	tr			
39-51	B3ca	27.9	44.8	27.3	0.4	2.8	3.0	6.0	15.7	24.9	19.9	44.2	12.2		27	tr			
51-69	TTCca1	52.2	26.2	21.6	2.0	13.1	12.2	14.6	10.3	14.7	11.5	31.8	41.9	6.5	21	tr			
69-80	TTCca2	60.4	21.5	18.1	2.3	15.5	15.5	18.4	8.7	12.0	9.5	29.0	51.7		17	tr			
Depth (in.)	Organic carbon b	6B1a Nitrogen	C/N	Carbonate as CaCO ₃		Bulk density			4D1 COLE	Water content				pH					
				6E1b 6E2a <2 mm. Pct.	3A1a <0.002 mm. Pct.	6C2a Ext. Iron Fe Pct.	4A1a Field State g/cc	4A1d 1/3- Bar g/cc		4A1b Air Dry g/cc	4B4 Field State Pct.	4B1c 1/3- Bar Pct.	4B2 15- Bar Pct.	4C1 1/3- Bar 1n./in.	8C1a (1:1)				
0-6	3.12	0.241	13			0.7	1.23	1.21	1.24	0.007	18.3	26.5	9.5	0.21		5.6			
6-9	1.33	0.139	10			0.7	1.49	1.36	1.44	0.020	7.8	19.8	11.0	0.12		6.5			
9-13	0.87	0.093	9			0.8	1.57	1.42	1.57	0.036	8.6	21.3	14.0	0.10		6.7			
13-19	0.76	0.071	11			0.8	1.62	1.47	1.63	0.036	8.9	21.2	13.0	0.12		6.7			
19-26	0.52	0.051	10			0.8	1.62	1.49	1.62	0.028	7.7	20.6	12.1	0.13		6.9			
26-39	0.43			-(s)		0.6	1.41	1.30	1.41	0.028	7.5	21.6	10.7	0.14		7.2			
39-51	0.45			3	tr	0.6	1.33		1.33	0.024	7.7		11.4			8.2			
51-69	0.27			4	1	0.4	1.55	1.50	1.55	0.010	4.7	17.5	8.6	0.13		8.5			
69-80	0.31			2	1	0.5	1.54	1.49	1.51	0.003	4.4	14.9	6.5	0.13		8.5			
Depth (in.)	Extractable bases 5B1a				6B1a Ext. Acidity	Cat. Exch. Cap.		8D3 Ca/Mg	Base saturation										
	6M2a Ca	6O2a Mg	6P2a Na	6Q2a K		Sum	5A3a Sum Cations		5A1a NH ₄ OAc	5C3 Sum Cations	5C1 NH ₄ OAc								
	meq/100 g								Pct.	Pct.									
0-6	10.2	2.3	tr	1.0	13.5	7.7	21.2	16.6		4.4	64	81							
6-9	12.4	3.9	0.1	1.0	17.4	4.2	21.6	18.0		3.2	81	97							
9-13	16.3	5.1	0.1	0.8	22.3	3.8	26.1	22.4		3.2	85	100							
13-19	16.9	5.4	0.1	0.6	23.0	3.1	26.1	23.0		3.1	88	100							
19-26	15.9	5.2	0.2	0.5	21.8	2.5	24.3	20.6		3.1	90	106							
26-39	14.8	4.7	0.2	0.4	20.1	1.5	21.6	18.7		3.1	93	107							
39-51	14.5c	4.3d	0.5	0.5	19.8			17.9		3.4									
51-69	9.7e	3.2d	0.8	0.3	14.0			11.6		3.0									
69-80	8.3c	2.4d	1.0	0.4	12.1			9.4		3.5									
Depth (in.)	Ratios to Clay			8D1 Iron Water															
	8D2 NH ₄ OAc CEC	8D2 Ext.	8D1 15-Bar																
0-6	0.85	0.04	0.48																
6-9	0.64	0.02	0.39																
9-13	0.65	0.02	0.41																
13-19	0.68	0.02	0.39																
19-26	0.71	0.03	0.42																
26-39	0.71	0.02	0.41																
39-51	0.66	0.02	0.42																
51-69	0.55	0.02	0.40																
69-80	0.55	0.03	0.36																

- a. Few grains of carbonate below 39 inches.
- b. 16 kg/m² to 60 inches (Method 6A).
- c. NH₄Cl-EtOH extraction (Method 6N3a).
- d. NH₄Cl-EtOH extraction (Method 6O3a).

Soil Type : *Bancroft silt loam
 Soil Nos. : S63Colo-18-7
 Location : 1200 feet west, 600 feet north of the southeast corner of Section 21, T10S, R65W, Douglas County, Colorado
 Climate : Continental; average annual precipitation 20 inches. Mean annual temperature 44 degrees F. Growing season 120 days. Elevation 7200 feet.
 Vegetation : Native grass; blue grama, western wheatgrass, fringed sage and snakeweed
 Parent Material : Aeolian silts and sands, probably local in origin
 Physiographic Position : Upland
 Relief : Nearly level, 2 percent north facing slope. Slope about 400 feet long, grading toward a small drainageway. Pit about 100 feet below the crest of the ridge
 Drainage : Surface drainage slow; internal drainage medium; moderate intake rate
 Moisture : Moist to 7 inches and below 4 feet. Usually moist throughout
 Waterable : None
 Stoniness : None
 Salt or Alkali : None observed, other than calcium carbonate
 Erosion : Slight water and wind
 Sampled by : R. K. Dansdill, J. B. Brown, R. H. Jordan, and L. G. Shields; August 15, 1963
 Described by : J. B. Brown

Horizon and
 Lincoln
 Lab. No.

A1
18679 0 to 6 inches. Very dark brown (10YR 2/2 moist) silt loam; dark grayish brown (10YR 4/2 dry); weak medium subangular blocky structure breaking to moderate fine granules; soft when dry, very friable when moist; noncalcareous; clear smooth boundary.

B1
18680 6 to 9 inches. Very dark brown (10YR 2.5/2 moist) silt loam; dark grayish brown (10YR 4/2 dry) weak coarse subangular blocky structure; slightly hard when dry, very friable when moist; few thin patchy clay films on vertical ped faces; noncalcareous; clear smooth boundary.

B21t
18681 9 to 13 inches. Very dark grayish brown (10YR 3/2 moist) clay loam; grayish brown (10YR 4.5/2 dry); moderate medium and fine prisms breaking to strong fine subangular blocks; very hard when dry, firm when moist; thin nearly continuous clay films on ped surfaces; few bleached sand grains on ped surfaces; noncalcareous; clear smooth boundary.

B22t
18682 13 to 19 inches. Brown (10YR 4/3 moist) clay loam; brown (10YR 5/3 dry); moderate medium and fine prisms breaking to strong medium and fine angular and subangular blocks; very hard when dry, firm when moist; thin nearly continuous clay films; few bleached sand grains on ped surfaces; noncalcareous; gradual smooth boundary.

B23t
18683 19 to 26 inches. Brown (4/3 moist) clay loams; brown (10YR 5/3 dry); moderate medium and fine prisms breaking to moderate medium angular and subangular blocks; very hard when dry, firm when moist; thin nearly continuous clay films; noncalcareous; gradual smooth boundary.

B3
18684 26 to 39 inches. Brown (10YR 5/3 moist) loam; pale brown (10YR 6/3 dry); moderate medium prisms breaking to moderate medium subangular blocks; hard when dry, friable when moist; thin patchy clay films on ped surfaces; noncalcareous; clear slightly wavy boundary.

B3ca
18685 39 to 51 inches. Brown (10YR 5/3 moist) loam; very pale brown (10YR 7/3 dry); weak coarse prisms breaking to weak medium subangular blocks; slightly hard when dry, very friable when moist; very highly calcareous; few lime mycelia; few patchy clay films on vertical faces; clear smooth boundary.

IICca1
18686 51 to 69 inches. Yellowish brown (10YR 5/4 moist) loam; light yellowish brown (10YR 6.5/4 dry); weak coarse prisms; slightly hard when dry, very friable when moist; very highly calcareous; many lime mycelia and lime coatings on ped surfaces; diffuse boundary.

IICca2
18687 69 to 80 inches. Yellowish brown (10YR 5.5/4 moist) sandy loam; very pale brown (10YR 8/4 cry); massive structure; slightly hard when dry, very friable when moist; very highly calcareous; few lime mycelia; lime pockets 6 inches across; reddish brown structured clay occurring at 10 feet.

Remarks: The Bancroft series is evidently developing from aeolian silts and sands that contain at least small amounts of lime. Buried soils of clay loam texture with high chroma, developing in out-wash material, are not uncommon in this soil unit below a depth of 4 to 5 feet. This soil unit gradually grades into the Fondis Series as one goes from south to north in the County, and the outwash material of the Fondis Series may be a source of the parent material for this series. Soil temperature at 11.0 feet was 11.5 degrees C.

Bureau of Public Roads Samples: B22t and IICca1 horizons.

Mineralogy:

Observations on very fine sand (Method 7B1): A1, B22t, and IICca2 horizons. Approximately 70 to 75 percent feldspar, 20 to 25 percent quartz, and 5 to 10 percent accessory minerals. Orthoclase is the predominant feldspar; microcline and low-calcium plagioclase are also present in lesser amounts. Most grains show some etching and pitting; minute inclusions occur in a number of the grains. Compound grains that appear as altered feldspar are common in the horizons examined. Biotite, hornblende, opaques, and zircon are the predominant accessory minerals. Biotite increases slightly with depth. Other minerals identified in trace amounts include epidote, zoisite, and pyroxene (diopside); volcanic glass is absent. Mineralogy of the IICca2 horizon is similar to that of the A1 and B22t horizons.

Clay mineralogy (Method 7A1, 7A2): B22t and IICca1 horizons. The B22t contains moderate amounts of montmorillonite, kaolinite, and mica (or illite) in about equal proportions. The crystalline quality of the kaolinite and mica is very good, the montmorillonite is of fair quality. The IICca1 has the same suite of minerals in nearly the same proportions. The montmorillonite is of poorer crystalline quality. Clay mineralogy is mixed.

SOIL Franciscan silt loam SOIL Nos. S63Colo-18-8 LOCATION Douglas County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18688-18696 March 1967

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

Depth (in.)	Horizon	Size class and particle diameter (mm) <u>3A1</u>													3A1b	Coarse fragments <u>2A2</u>			
		Total			Sand					Silt						3A1b	> 2	2-19	19-76
		Sand (2-0.05) <u>a</u>	Silt (0.05-0.002)	Clay (= 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	Pct.					
Pct. of < 2 mm																			
0-5	A1	50.5	30.6	18.9	1.8	2.2	2.7	16.8	27.0	18.5	12.1	58.1	23.5	11.8		tr			
5-8	B1	41.4	31.2	27.4	0.5	1.4	2.0	13.4	24.1	17.6	13.6	51.8	17.3		tr				
8-12	B21t	36.0	32.5	31.5	0.1	1.0	1.6	11.2	22.2	18.1	14.4	48.9	13.8		tr				
12-18	B22t	37.1	32.6	30.3	0.2	0.7	1.4	11.3	23.5	16.9	15.7	49.2	13.6		tr				
18-26	B23t	37.7	34.3	28.0	0.3	1.1	1.6	11.4	23.3	18.7	15.6	50.6	14.4	16.4	tr				
26-34	B24t	36.7	35.5	27.8	0.5	1.1	1.5	10.0	23.6	19.9	15.6	51.0	13.1		tr				
34-40	B3ca	41.3	32.4	26.3	1.2	1.9	2.2	12.0	24.0	18.2	14.2	51.1	17.3		tr				
40-56	Cca	41.6	32.6	25.8	1.9	2.2	2.3	11.8	23.4	18.2	14.4	50.1	18.2		tr				
56-70	TTC	39.1	35.5	25.4	1.2	1.3	1.5	10.3	24.8	20.5	15.0	53.1	14.3	14.2	2				

Depth (in.)	6A1a			6B1a			6E2a			4D1			Water content				pH	
	Organic carbon	Nitrogen	C/N	Carbonate as CaCO ₃	Bulk density			4D1	4B4	4B1c	4B2	4C1	4B4	4B1c	4B2	4C1	8C1b	8C1a
	b	Pct.	Pct.	Pct.	4A1a	4A1d	4A1b	COLE	Field State	1/3-Bar	15-Bar	Field State	1/3-Bar	15-Bar	1/3-to 15-Bar	Sat. Paste	(1:1)	
0-5	1.90	0.147	13		1.37	1.37	1.39	0.003	16.7	17.4	7.6	16.7	17.4	7.6	0.13		5.7	
5-8	1.23	0.120	10		1.36	1.36	1.41	0.014	16.9	19.5	9.9	16.9	19.5	9.9	0.13		6.2	
8-12	0.91	0.092	10		1.55	1.43	1.56	0.028	8.4	20.9	11.5	8.4	20.9	11.5	0.13		6.5	
12-18	0.65	0.061	11	(s)	1.62	1.50	1.62	0.024	7.6	19.1	11.6	7.6	19.1	11.6	0.11		6.8	
18-26	0.43	0.041	10	(s)	1.62	1.49	1.62	0.028	7.3	20.2	11.4	7.3	20.2	11.4	0.13		7.3	
26-34	0.31			(s)	1.54	1.42	1.53	0.024	6.7	20.3	11.0	6.7	20.3	11.0	0.13		7.7	
34-40	0.30			tr(s)	1.53	1.43	1.54	0.024	6.8	20.3	10.4	6.8	20.3	10.4	0.14		8.4	
40-56	0.24			tr(s)	1.53	1.42	1.53	0.024	7.0	19.9	10.4	7.0	19.9	10.4	0.13	7.5	8.3	
56-70	0.28			tr(s)	1.45	1.35	1.44	0.020	7.5	19.9	9.6	7.5	19.9	9.6	0.14		8.1	

Depth (in.)	Extractable bases <u>5B1a</u>				6B1a		Cat. Exch. Cap.		8A	8A1a	8D3	Base saturation	
	6E2a	6O2a	6P2a	6Q2a	Ext. Acidity	5A3a	5A1a	5C3				5C1	
	Ca	Mg	Na	K	Sum	Sum	MEq/100g	Sum				MEq/100g	
0-5	7.9	2.1	0.1	0.6	10.7	5.1	15.8	11.9			3.8	68	90
5-8	12.3	3.6	0.1	0.4	16.4	4.2	20.6	15.9			3.4	80	103
8-12	15.2	4.0	0.1	0.4	19.7	3.4	23.1	19.0			3.8	85	104
12-18	15.2	4.4	0.2	0.4	20.2	3.0	23.2	19.2			3.5	87	105
18-26	13.8c	3.4d	0.4	0.4	18.0	1.6	19.6	18.0			4.1	92	100
26-34	14.1c	3.4d	0.7	0.4	18.6			17.9			4.1		
34-40	14.2c	3.3d	1.2	0.4	19.1			17.0			4.3		
40-56	14.1c	3.2d	1.7	0.3	19.3			16.9	40.7	1.55	4.4		
56-70	14.0c	2.8d	2.1	0.4	19.3			17.4			5.0		

Depth (in.)	Ratios to Clay	
	8D1 NH ₄ OAc CEC	8D1 15-Bar Water
0-5	0.63	0.40
5-8	0.58	0.36
8-12	0.60	0.37
12-18	0.63	0.38
18-26	0.64	0.41
26-34	0.64	0.40
34-40	0.65	0.40
40-56	0.66	0.40
56-70	0.69	0.38

- a. Few grains of carbonate below 40 inches.
- b. 12 kg/m² to 60 inches (Method 6A).
- c. NH₄Cl-StOH extraction (Method 6N3a).
- d. NH₄Cl-StOH extraction (Method 6O3a).

Soil Type : *Bancroft silt loam
 Soil Nos. : S63Colo-18-8
 Location : 650 feet west, 300 feet south of the northeast corner of Section 19, T10S, R66W, Douglas County, Colorado
 Climate : Continental; average annual precipitation 18 to 20 inches. Mean annual temperature 44 degrees F. Growing season 120 days. Elevation 7200 feet.
 Vegetation : Native grass; blue grama, Junegrass, western wheatgrass, mountain muhly and fringed sage
 Parent Material : Aeolian silts and sands, probably local in origin
 Physiographic Position : Upland
 Relief : Sloping, 5 percent east facing slope. Slope is about 800 feet in length; pit located about midway on the slope
 Drainage : Surface drainage rapid; internal drainage medium; moderate intake rates
 Moisture : Moist to 8 inches and below 4 feet. Generally moist throughout
 Watertable : None
 Stoniness : Very few fine water worn gravels throughout
 Salt or Alkali : None other than calcium carbonate observed
 Erosion : Slight water erosion
 Sampled by : R. K. Dansdill, J. B. Brown, R. H. Jordan, and L. G. Shields; August 15, 1963
 Described by : J. B. Brown

Horizon and
 Lincoln
 Lab. No.

A1
 18688 0 to 5 inches. Very dark brown (10YR 2/2 moist) loam; dark grayish brown (10YR 4/2 dry); weak medium subangular blocky structure breaking to moderate fine granules; soft when dry, very friable when moist; noncalcareous; clear smooth boundary.

B1
 18689 5 to 8 inches. Very dark brown (10YR 2.5/2 moist) loam; dark grayish brown (10YR 4/2 dry); weak medium subangular blocky structure; soft when dry, very friable when moist; few thin patchy clay films in the lower part of this horizon on vertical faces; slightly more clay than horizon above; noncalcareous; clear smooth boundary.

B21t
 18690 8 to 12 inches. Dark brown (10YR 3/3 moist) clay loam; moderate medium and fine prisms breaking to strong fine subangular blocks; very hard when dry, firm when moist; thin nearly continuous clay films with some bleached sand grains on ped surfaces; noncalcareous; clear smooth boundary.

B22t
 18691 12 to 18 inches. Brown (10YR 4/3 moist) clay loam; brown (10YR 5/3 dry); moderate medium to fine prisms breaking to strong medium to fine angular and subangular blocks; very hard when dry, firm when moist; dark streaks are common in this horizon, some of which are krotovinas; thin nearly continuous clay film; noncalcareous; clear smooth boundary.

B23t
 18692 18 to 26 inches. Brown (10YR 5/3 moist) light clay loam; pale brown (10YR 6/3 dry); moderate medium prisms breaking to moderate medium subangular and angular blocks; very hard when dry, firm when moist; thin nearly continuous clay films with dark streaks and spots; noncalcareous; clear smooth boundary.

B24t
 18693 26 to 34 inches. Brown (10YR 5/3 moist) loam; pale brown (10YR 6/3 dry); moderate medium prisms breaking to moderate medium angular and subangular blocks; hard when dry, friable when moist; thin patchy clay films, noncalcareous; clear smooth boundary.

B3ca
 18694 34 to 40 inches. Brown (10YR 5/3 moist) sandy clay loam; pale brown (10YR 6/3 dry); moderate coarse prisms breaking to moderate coarse subangular blocks; hard when dry, friable when moist; highly calcareous; few lime mycelia; thin patchy clay films on some vertical faces; clear smooth boundary.

Cca
 18695 40 to 56 inches. Brown (10YR 5/3 moist) sandy loam; pale brown (10YR 6/3 dry); moderate coarse prismatic structure; hard when dry, friable when moist; very highly calcareous; lime coated on vertical ped faces; much rodent activity and rodent holes in the bottom part of this pedon; gradual boundary.

IIC
 18696 56 to 70 inches. Brown (7.5YR 5/4 moist) sandy clay loam; light brown (7.5YR 6/4 dry); weak coarse prisms; hard when dry, friable when moist; highly calcareous.

Remarks: Worm and rodent activity is evident throughout this soil profile; lime horizons are generally quite vesicular; plant roots occur at 5 feet or more. This soil is common on the table lands and slopes in Douglas County at elevations of 6600 to 8000 feet.

Bureau of Public Roads Samples: B23t and Cca horizons.

Mineralogy:

Observations on very fine sand (Method 7B1): A1, B22t, and IIC horizons. About 75 percent feldspar, 15 to 20 percent quartz, and about 10 percent accessory minerals. Orthoclase is the principal feldspar; small amounts of microcline and low-calcium plagioclase are also present. Etching and pitting of the feldspar grains are common. Compound grains that appear as altered feldspar are common in the horizons examined. Biotite, zircon, opaques, and hornblende are the most prevalent accessory minerals. Other minerals identified in trace amounts include epidote, zoisite, pyroxene (diopside?), sphene, and garnet; volcanic glass is absent. Mineralogy of the IIC horizon is similar to that of the A1 and B22t horizons.

Clay mineralogy (Method 7A1, 7A2): A1, B23t, and IIC horizons. The profile is generally characterized by well-crystallized clay minerals, particularly in the coarse clay. Moderate to abundant amounts of kaolinite are present, decreasing slightly with depth. Mica (or illite) decreases from a moderate to abundant amount in the surface to small to moderate amounts in the B23t and IIC. Montmorillonite increases from a trace in the surface to a moderate to abundant amount in the B23t, then decreases to a moderate amount in the IIC. Feldspar is present in the surface in moderate amounts and in the IIC horizon in trace amounts. The fine clay in the surface is poorly crystallized; mica (illite) and kaolinite are present. The clay mineralogy is mixed.

SOIL TYPE Bassel LOCATION Chaffee County, Colorado
 sandy loam

SOIL NOS. S58Colo-8-3 LAB. NOS. 9056-9061

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a		3A1						2A2		
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.002	0.02-0.002	> 2 ($\leq 19\mu$)	
0-2	A1	23.1a	18.2a	8.0a	8.1a	7.0a	25.5	10.1	25.5	11.1	10	cosl
2-4	B21t	23.7a	19.1a	8.1a	7.5a	5.4a	23.7	12.5	21.6	11.1	10	cosl
4-8	B22t	17.3a	20.6a	11.2a	10.9a	6.2a	20.6	13.2	22.9	9.3	23	cosl
8-21	B3	21.0a	20.1a	12.0a	12.9a	7.6a	15.2	11.2	23.7	5.7	24	cosl
21-42	C	16.0	20.1	11.8	17.0	9.1	16.0	10.0	27.3	5.8	24	cosl
42-50+	Cca	17.3	20.0	11.4	16.5	9.3	15.2	9.3	26.7	6.4	24	cosl

8C1a		ORGANIC MATTER			Free Iron %Fe ₂ O ₃	6E1a	MOISTURE TENSIONS		
pH		6A1a	6B1a			CaCO ₃ equiv- alent	1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.
1:1	1:5	ORGANIC CARBON %	NITRO- GEN %	C/N	6C1a	%	%	%	4B2
5.5		2.75	0.195	14	1.2				6.3
6.1		1.48	0.130	11	1.1				5.8
6.6		0.93	0.094	10	1.4	<1			5.6
7.2		0.30	0.035	8	0.8	<1			4.0
7.8		0.10	0.013		0.8	<1			3.3
8.2		0.03			0.9	<1			3.7

5A1a	EXTRACTABLE CATIONS					5B1a	BASE SAT. %	5C3	Sum Bases	Sum Cations	Ca/Mg
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ Ac EXCH.	NH ₄ Ac EXCH.	Base Sat. % on Sum Cations	5E1a	5A3a	8D3
	Ca	Mg	H	Na	K		5C1		me/100g		
10.4	5.2	1.2	8.8	<0.1	0.7	68	45	7.1	15.9	4.3	
11.8	7.6	1.7	4.4	<0.1	0.2	80	68	9.5	13.9	4.5	
10.9	8.3	1.8	2.4	<0.1	0.2	94	81	10.3	12.7	4.6	
8.0	6.0	1.6	1.2	<0.1	0.3	99	87	7.9	9.1	3.8	
7.0	5.4	1.5	0.4	<0.1	0.5	106	95	7.4	7.8	3.6	
6.8		1.5	<0.1	0.1	0.4						

a. Few smooth light brown to black concr. (Fe-Mn?)

Soil Type: Bassel sandy loam. Described by: A. J. Cline
 Location: SW $\frac{1}{4}$ of Sec. 23, T14S, R77W, Chaffee County, Colorado.
 Date of Sampling: September 1957
 Collectors: J. Retzer, E. M. Payne, R. Dansdill, A. J. Cline.
 Physiographic Position: Side slope of a high mountain valley at an elevation of approximately 9,300 feet.
 Topography: A moderate convex slope of approximately 4 percent facing west.
 Drainage: Well drained. Vegetation: Ring muhly, blue grama, sage, and fescue.
 Use: National Forest Service land.
 Soil Nos.: S58Colo-8-3

Lincoln Horizon

Lab. No.			
9056	A ₁	0-2 inches	Brown (10YR 5/3 dry) to dark brown (10YR 3/3 moist) sandy loam; soft when dry, very friable when moist; moderate fine granular structure; noncalcareous; approximately 15 percent of this horizon is gravel; lower boundary clear and smooth.
9057	B _{21t}	2-4 inches	Brown or dark brown (7.5YR 4/4 dry) to dark brown (7.5YR 3/4 moist) gravelly sandy clay loam; hard when dry, very friable when moist; weak medium prismatic structure breaking to weak to moderate medium subangular blocks; noncalcareous; there are thin patchy clay skins on both the horizontal and vertical faces of most of the soil aggregates; approximately 15 percent of this horizon is gravel; lower boundary clear and smooth.
9058	B _{22t}	4-8 inches	Brown (7.5YR 5/4 dry) to dark brown (7.5YR 3.5/4 moist) gravelly sandy clay loam; hard when dry, very friable when moist; weak medium prismatic structure breaking to weak to moderate medium subangular blocks; noncalcareous; there are thin patchy clay skins on both the horizontal and vertical faces of the soil aggregates; approximately 15 percent of this horizon is gravel; lower boundary gradual and smooth.
9059	B ₃	8-21 inches	Light brown (7.5YR 6/3 dry) to dark brown (7.5YR 4/3 moist) gravelly heavy sandy loam; hard when dry, very friable when moist; weak medium subangular blocky structure; noncalcareous; there are a few thin patchy clay skins principally on the vertical faces of the soil aggregates; approximately 15 percent of this horizon is gravel; lower boundary gradual and smooth.
9060	C	21-42 inches	Light brown (8.75YR 6/3 dry) to brown or dark brown (8.75YR 4/3 moist) gravelly sandy loam; hard when dry, very friable when moist; weak medium subangular blocky structure noncalcareous; approximately 25 percent of this horizon is gravel; lower boundary is diffuse and irregular.
9061	Cca	42-50 / inches	Pale brown (10YR 6/3 dry) to brown or dark brown (10YR 4/3 moist) gravelly sandy loam; hard when dry, very friable when moist; massive; violently effervescent; this is a weak horizon of lime accumulation with some visible lime occurring as concretions and in finely divided forms; approximately 25 percent of this horizon is gravel.

SOIL SURVEY LABORATORY Lincoln, Nebr. February 1959

SOIL TYPE Bassel sandy loam LOCATION Chaffee County, Colorado

SOIL NOS. 858Colo-8-12 LAB. NOS. 9095-9100

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)									TEXTURAL CLASS	
		1B1a					3A1					2A2
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002		> 2 ($< 19\mu$)
0-3	A1	22.1	15.5	7.9	13.7	11.6	20.9	8.3	30.8	8.6	14	cosl
3-6	AB	13.6	13.7	10.9	18.7	11.0	16.1	16.0	28.6	7.4	12	cosl
6-14	B2t	16.0	14.9	12.0	16.6	10.7	12.8	17.0	27.0	5.5	11	cosl
14-21	B3ca	18.5	16.2	10.6	16.5	11.5	12.5	14.2	27.7	5.5	22	cosl
21-32	Cca	28.8	17.5	7.4	9.1	4.4	11.8	21.0	12.7	8.0	36	scl
32-46+	C	29.9	25.8	9.7	8.9	3.2	9.7	12.8	9.8	7.1	25	cosl

pH		ORGANIC MATTER			Free Iron $\frac{\%}{\text{Fe}_2\text{O}_3}$	6E1a CaCO ₃ equiv- alent	MOISTURE TENSIONS		
8C1a	1:5	6A1a ORGANIC CARBON	6B1a NITRO- GEN	C/N	6C1a		1/10 ATMOS.	1/3 ATMOS.	4E2 15 ATMOS.
	1:1	%	%			%	%	%	%
5.9		0.92	0.090	10	1.5				3.9
6.9		0.89	0.070	13	1.9	< 1			6.2
7.4		0.54	0.047	11	1.9	< 1			7.4
8.2		0.26	0.020	13	1.8	2			6.0
8.5		0.32	0.026	12	0.8	12			9.1
8.3		0.05			1.5	3			6.3

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					BASE SAT. % NH ₄ Ac EXCH.	5C3 Base Sat. % on Sum Cations	Sum Bases 5B1a ← me/100g →	Sum Cations 5A3a	Ca/Mg 8D3
	6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K					
8.0	4.8	1.2	4.0	<0.1	0.5	81	62	6.5	10.5	4.0
13.6	10.7	3.0	2.0	<0.1	0.6	105	88	14.3	16.3	3.6
15.9	12.8	3.8	1.6	<0.1	0.6	108	91	17.2	18.8	3.4
13.6		4.1	0.8	0.1	0.6					
16.5		5.2	<0.1	0.6	0.6					
11.9		5.9	<0.1	0.9	0.4					

Soil Type: Bassel Sandy Loam. Described by: A. J. Cline.
 Location: SW $\frac{1}{4}$ of Sec. 23, T14W, R78W, Chaffee County, Colorado.
 Date of Sampling: September 1957
 Collectors: J. Retzer, E. M. Payne, R. Dansdill, A. J. Cline.
 Physiographic Position: Side slope of a mountain valley at elevation of approximate 9,200 feet.
 Topography: A moderate convex slope of approximately 5 percent facing south.
 Drainage: Well drained.
 Vegetation: Blue grama, rabbit brush, sage, winterfat and scattered pinon.
 Use: National Forest Service lands.
 Soil Nos.: 958Colo-8-12

Lincoln Horizon

Lab. No.

9095	A ₁	0-3 inches	Brown (10YR 5/3 dry) to dark brown (10YR 3/3 moist) gravelly sandy loam; soft when dry, very friable when moist; moderate fine granular structure; noncalcareous; lower boundary clear and smooth. Approximately 10 percent of this horizon is gravel.
9096	AB	3-6 inches	Dark grayish brown (10YR 4/2 dry) to very dark grayish brown (10YR 3/2 moist) sandy loam; slightly hard when dry, very friable when moist; moderate medium prismatic structure breaking to moderate medium subangular blocks; noncalcareous; there are thin patchy clay skins on both the horizontal and vertical faces of the soil aggregates in this horizon; approximately 15 percent of the horizon is gravel; lower boundary gradual and smooth.
9097	B _{2t}	6-14 inches	Brown (10YR 5/3 dry) to brown or dark brown (10YR 4/3 moist) sandy clay loam; hard when dry, friable when moist; moderate medium prismatic structure breaking to moderate medium subangular blocks; noncalcareous; there are thin continuous clay skins on the surfaces of the soil aggregates; approximately 15 percent of this horizon is gravel; lower boundary gradual and smooth.
9098	B _{3ca}	14-21 inches	Brown or pale brown (10YR 5.5/3 dry) to brown (10YR 4.5/3 moist) gravelly light sandy clay loam; hard when dry, friable when moist; weak medium prismatic structure breaking to weak medium subangular blocks; strongly effervescent; this is a weak horizon of lime accumulation with visible lime occurring as concretions; there are thin patchy clay skins on both the horizontal and vertical faces of the soil aggregates; approximately 25 percent of this horizon is gravel, lower boundary gradual and smooth.
9099	C _{ca}	21-32 inches	Very pale brown (10YR 7/3 dry) to pale brown (10YR 6/3 moist) gravelly sandy loam slightly hard when dry, very friable when moist; massive violently effervescent; this is a strong horizon of lime accumulation with visible lime occurring in finely divided forms and as concretions; approximately 30 percent of this horizon is gravel; lower boundary diffuse and smooth.
9100	C	32-46 inches	Pale brown (10YR 6/3 dry) to yellowish brown (10YR 5/4 moist) gravelly sand; slightly hard when dry, very friable when moist; massive; violently effervescent; this is a weak horizon of lime accumulation with some visible lime occurring in concretions usually about 1/4 inch in diameter, and with some visible lime in finely divided forms and some in thin seams and streaks; approximately 40 or 50 percent of this horizon is gravel.

SOIL TYPE *Bijou LOCATION Morgan County, Colorado
 loamy sand

SOIL NOS. 859Colo-44-3 LAB. NOS. 10841-10848

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND 2.1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	2A2 > 2 (19mm)	
0-4	A11	3.1	13.0	18.0	32.9	12.6	14.4	6.0	37.7	3.8	Tr.	ls
4-10	A12	3.9	12.0	19.0	40.3	10.8	7.7	6.3	34.2	3.0	Tr.	ls
10-15	A13	3.3	10.4	16.0	39.3	11.9	10.1	9.0	37.3	2.8	Tr.	ls
15-19	B1	5.5	11.9	14.6	30.5	10.7	14.7	12.1	34.7	4.7	Tr.	fsl
19-28	B2t	8.8	17.6	13.5	22.6	8.7	13.2	15.6	26.8	5.4	Tr.	cosl
28-33	B3	13.2	24.9	13.1	20.1	8.0	6.6	14.1	20.9	3.1	Tr.	cosl
33-39	C1	22.2	27.5	14.3	16.5	4.3	5.5	9.7	13.7	2.9	Tr.	lcos
39-60	C2	15.0	22.3	16.0	22.6	7.0	6.9	10.2	20.6	3.3	ll	lcos

8C1a	pH	ORGANIC MATTER				EST% SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM	6E1a CaCO ₃ equiv- alent %	GYPSUM me./100g. SOIL	MOISTURE TENSIONS		
		6A1a ORGANIC CARBON	6B1a NITRO-GEN	C/N	4B2 15 ATMOS.							
		1:10	%							%		
1:1	1.5											
6.8		0.67	0.060	11			Δ				2.8	
6.7		0.34	0.035	10			Δ				2.5	
6.9		0.33	0.041	8			Δ				3.5	
7.0		0.37	0.040	9			Δ				4.9	
7.4		0.30	0.035	8			Δ				6.2	
7.5		0.17					Δ				4.9	
7.8		0.08					Δ				3.9	
8.2		0.08					Δ				3.5	

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					5B1a BASE SAT. NH ₄ Ac EXCH.	Base Sat. % on Sum Cations	Sum Ext. Bases	Sum Ext. Cations	Ca/Mg	4A1h O. D. Bulk Density g/cc	MOISTURE AT SATURATION %
	6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K							
	milliequivalents per 100g. soil											
5.2	3.4	1.0	1.0	0.2	0.6	100	84	5.2	6.2	3.4		
4.6	3.2	0.8	0.5	<0.1	0.3	93	90	4.3	4.8			
5.9	4.3	1.3	0.7	<0.1	0.3	100	89	5.9	6.6	3.3		
8.1	6.0	1.8	0.7	<0.1	0.3	100	92	8.1	8.8	3.3		
11.0	8.3	2.6	1.7	0.1	0.4	104	87	11.4	13.1	3.2	1.78	
9.0	7.0	2.0	<0.1	0.1	0.3	104	100	9.4	9.4	3.5		
7.4	6.0	2.0	2.7	0.1	0.2	112	75	8.3	11.0	3.0		
7.0	6.3	1.7	1.9	<0.1	0.2	117	81	8.2	10.1	3.7	1.80	

Soil Type: *Rijou loamy sand
 Soil Nos.: 859Colo-44-3
 Field classification: Brown.
 Location: 190 feet west, 175 feet north of southeast corner, Sec. 25, T4N, R59W, Morgan County, Colorado.
 Photo: YE-1F-149.
 Climate: Continental, average annual precipitation 13-15 inches. Elevation 4,450 feet. Frost-free season 146 days.
 Mean annual temperature 48° F.
 Vegetation: Sand dropseed, sand sage, blue grama, few annual weeds.
 Parent material: Arkosic alluvium.
 Physiographic position: Terrace.
 Relief: Nearly level 0-1 percent slope.
 Drainage: External slow, internal rapid.
 Moisture: Moist to 35 inches at time of sampling.
 Water table: None
 Stoniness: Few small gravels throughout profile.
 Salt or alkali: None observed other than calcium carbonate at the 88- to 91-inch level.
 Erosion: Slight.
 Described by: Clayton F. Spears, May 5, 1959.
 Remarks: Krotovinas of worms and insects AB to C1 horizon. Few streaks lime 88-91 inches.

Horizon and
 Lincoln
 Lab. No.

A11
 10841 0 to 4 inches. Light brownish gray (10YR 5.5/2 dry) to dark brown (10YR 3.5/3 moist and crushed) loamy sand; weak fine crumb structure; soft when dry, very friable moist; noncalcareous; lower boundary clear and smooth.

A12
 10842 4 to 10 inches. Brown (10YR 5/3 dry) to dark brown (10YR 3.5/3 moist and crushed) loamy sand; weak medium crumb structure; soft when dry, very friable moist; noncalcareous; lower boundary gradual, smooth.

A13
 10843 10 to 15 inches. Brown (10YR 5/3 dry) to brown (10YR 4/3 moist and crushed) loamy sand; weak medium subangular blocky structure; soft when dry, friable moist; noncalcareous; lower boundary clear and smooth.

B1
 10844 15 to 19 inches. Brown (10YR 5/3 dry) to brown (10YR 4/3 moist and crushed) sandy loam; weak medium subangular blocky structure; slightly hard when dry, friable moist; very thin patchy clay skins on vertical faces of soil aggregates; noncalcareous; lower boundary clear and smooth.

B2t
 10845 19 to 28 inches. Brown (10YR 4.5/3 dry) to dark brown (10YR 3/2.5 moist) brown (10YR 4/3 crushed) sandy loam; weak coarse prismatic structure breaking to weak coarse and few medium subangular blocks; very hard when dry, friable moist; thin patchy clay skins on both horizontal and vertical faces of the soil aggregates; noncalcareous; lower boundary clear and wavy.

B3
 10846 28 to 33 inches. Light olive brown (1.25Y 5.5/4 dry) to olive brown (1.25Y 4/3 moist) (1.25Y 4.5/3 crushed) coarse loamy sand; very weak coarse subangular blocky structure; very hard when dry, friable moist; very thin patchy clay skins horizontal and vertical faces of soil aggregates; noncalcareous; lower boundary clear and smooth.

C1
 10847 33 to 39 inches. Light yellowish brown (2.5Y 5.5/3 dry) to light olive brown (2.5Y 4.5/3 moist and crushed) coarse loamy sand; massive; hard when dry, friable moist; noncalcareous; lower boundary clear and smooth.

C2
 10848 39 to 60 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist and crushed) coarse loamy sand; massive; hard when dry, friable moist; noncalcareous; lower boundary gradual and smooth.

C3 60 to 88 inches. Light yellowish brown (2.5Y 6.5/3 dry, 2.5Y 6/3 moist and crushed) gravelly sand; massive; slightly hard dry, friable moist; noncalcareous; lower boundary clear and smooth.

C4 88 to 105 inches. Pale yellow (2.5Y 7/3 dry) to light yellowish-brown (2.5Y 6/3 moist) sandy loam; massive; slightly hard dry, friable moist; noncalcareous, except for 2 thin seams of slightly calcareous material at 88-91 inch level. Lower boundary clear and smooth.

105 inches plus. Pale yellow (2.5Y 7/3 dry) to light yellowish brown (2.5Y 6/3 moist) coarse loamy sand.

Bureau of Public Roads samples:

A12 4-10 inches
 B2t 19-28 inches
 C1 39-60 inches

SOIL TYPE * R11ou LOCATION Morgan County, Colorado
loamy sand

SOIL NOS. S59Colo-44-4 LAB. NOS. 10849-10857

DEPTH 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	0.02-0.002 (< 19mm)	2A2 > 2	
0-3	A11	4.0	11.6	20.5	42.5	11.7	6.5	3.2	35.7	2.8	Tr.	s
3-13	A12	2.9	11.5	19.6	44.4	12.5	4.8	4.3	36.8	1.9	Tr.	s
13-17	B1	5.2	12.4	16.3	33.2	12.2	12.0	8.7	33.6	5.5	Tr.	ls
17-20	B21t	6.3	14.8	16.2	27.0	9.8	12.5	13.4	28.7	5.6	Tr.	sl
20-29	B22t	8.2	19.9	17.2	22.7	6.8	9.0	16.2	20.9	4.5	Tr.	cosl
29-34	B3	6.5	20.3	19.5	27.1	7.3	7.7	11.6	21.9	4.2	Tr.	cosl
34-44	C1	16.2	23.4	16.6	21.4	6.1	6.5	9.8	17.2	4.5	8	leos
44-52	C2	15.2	22.9	18.2	23.4	5.8	6.5	8.0	17.6	4.1	9	leos
52-60	C3	17.3	25.1	16.9	20.5	5.2	6.3	8.7	16.4	3.5	6	leos

8C1a	pH	ORGANIC MATTER			EST% SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM	6E1a CaCO ₃ equiv- alent	GYPSUM ma./100g. SOIL	MOISTURE TENSIONS		
		6A1a ORGANIC CARBON	6B1a NITRO-GEN	C/N					1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.
1:1	1.5	1.10	%	%				%	%	%	
7.0			0.27	0.026	10					1.6	
7.5			0.22	0.023	10					1.9	
7.7			0.31	0.037	8					3.9	
7.4			0.34	0.036	9					6.1	
7.2			0.27	0.035	8					6.8	
7.4			0.15							4.5	
7.5			0.09							3.6	
7.5			0.05							2.8	
7.7			0.04							3.3	

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS 5B1a					BASE SAT. % NH ₄ Ac EXCH.	Base Sat. % on Sum Cations	Sum Ext. Bases	Sum Ext. Cations	Ca/Mg	4A1h O. D. Bulk Density	MOISTURE AT SATURATION
	6N2b Ca	6O2b Mg	6H1a H	6P2a No	6Q2a K							
	← milliequivalents per 100g. soil →					5C1	5C3	5E1a	5A3a	8D3		%
3.3	2.3	0.7	1.2	<0.1	0.3	100	73	3.3	4.5			
3.6	2.7	0.9	0.5	<0.1	0.3	108	89	3.9	4.4			
6.9	5.3	1.4	1.0	<0.1	0.4	103	88	7.1	8.1	3.8		
9.9	7.7	2.3	1.4	<0.1	0.5	106	88	10.5	11.9	3.3		
11.7	9.0	2.7	1.0	0.1	0.5	105	92	12.3	13.3	3.3	1.81	
8.5	6.3	2.0	1.0	<0.1	0.3	101	90	8.6	9.6	3.2		
8.1	6.3	2.1	0.7	<0.1	0.2	106	92	8.6	9.3	3.0		
6.4	5.2	1.5	0.7	<0.1	0.2	108	91	6.9	7.6	3.5		
6.4	5.7	1.7	0.5	0.2	0.2	122	94	7.8	8.3	3.4		

Soil Type: *Bijou loamy sand
 Soil Nos.: S59Colo-44-4
 Field classification: Brown.
 Location: 700 feet east, 550 feet south of west quarter corner, Sec. 16, T4N, R59W, Morgan County, Colorado.
 Photo: YE-4F-196.
 Climate: Continental, average annual precipitation 13-15 inches. Elevation 4,470 feet. Frost-free season 146 days.
 Mean annual temperature 48° F.
 Vegetation: Blue grama, sand dropseed, sand sage, few annual weeds.
 Parent material: Arkosic alluvium.
 Physiographic position: Terrace.
 Relief: Nearly level 0-1 percent slope.
 Drainage: Slow external, rapid internal.
 Moisture: Moist to 41 inches at time of sampling. Water table: None.
 Stoniness: Few small gravels throughout profile. Salt or alkali: None observed.
 Erosion: Slight to none. Described by: Clayton F. Spears, May 5, 1959.
 Remarks: Approximately same distance from Bijou Creek or source of alluvium as S59Colo-44-3. Many krotovinas of insects in E2, E3, C1 horizons. Both E2t and E2t have slight olive tinge when dry.

Horizon and
 Lincoln
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A11 10849 0 to 3 inches. Brown (10YR 5/3 dry) to dark brown (10YR 3.5/3 moist and crushed) loamy sand, very weak fine crumb structure; soft when dry, very friable moist; noncalcareous; slightly more organic material or organic stain and more plentiful roots than horizon below; lower boundary clear and smooth.

A12 10850 3 to 13 inches. Pale brown (10YR 5.5/3 dry) to brown (10YR 4/3 moist and crushed) loamy sand; very weak fine crumb structure; soft when dry, very friable moist; noncalcareous; lower boundary clear and smooth.

E1 10851 13 to 17 inches. Brown (10YR 5/3 dry) to dark brown (10YR 3.5/3 moist) dark grayish brown (10YR 4/2 crushed) loamy sand; weak medium subangular blocky structure, soft when dry, very friable moist; noncalcareous; lower boundary clear and smooth.

E2t 10852 17 to 20 inches. Brown (10YR 4.5/3 dry) to dark brown (10YR 3/3 moist) (10YR 3.5/3 crushed) sandy loam; weak coarse prismatic structure breaking to weak medium and coarse subangular blocks; hard when dry, friable moist; thin patchy clay skins on vertical and horizontal faces of soil aggregates; noncalcareous; lower boundary clear and smooth.

E2t 10853 20 to 29 inches. Brown (10YR 4.5/3 dry) to dark brown (10YR 3/3 moist) few streaks dark grayish brown (10YR 4/2 moist) sandy loam; weak coarse prismatic breaking to weak medium and coarse subangular blocks; very hard when dry, friable moist; thin nearly continuous clay skins on both vertical and horizontal faces of soil aggregates; noncalcareous; lower boundary clear and wavy.

E3 10854 29 to 34 inches. Brown (10YR 5/3 dry, 10YR 4/3 moist) dark grayish brown (10YR 4/2 crushed) coarse sandy loam; weak coarse subangular blocky structure; hard when dry, friable moist; very thin patchy clay skins on vertical and horizontal faces of soil aggregates; noncalcareous; lower boundary clear and smooth.

C1 10855 34 to 44 inches. Light yellowish brown (2.5Y 6/3 dry) to olive brown (2.5Y 4/3 moist and crushed) coarse sandy loam; massive; slightly hard dry, friable when moist; noncalcareous; this horizon contains a few thin seams of clayey material and few small clay balls. Lower boundary clear and smooth.

C2 10856 44 to 52 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist) loamy coarse sand; massive; slightly hard when dry, friable moist; noncalcareous; lower boundary clear and smooth.

C3 10857 52 to 82 inches. Sampled 52 to 60 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist) coarse sand; massive; slightly hard dry, friable moist; noncalcareous; lower boundary clear and smooth.

C4 82 to 114 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist) coarse and very coarse sand with some small gravels; noncalcareous.

Bureau of Public Roads samples:

A12 3-13 inches
 E2t 20-29 inches
 C2 44-52 inches

SOIL SURVEY LABORATORY

Lincoln, Nebr.

6/26/58

SOIL TYPE

Bobtail
gravelly loam

LOCATION

Grand County, Colorado

SOIL NOS.

LAB. NOS. 2749-2754

DEPTH INCHES	HORIZON	1B1a PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	3A1		> 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			
2-0	A0-A00												
0-4	A2	14.9	15.4	7.0	12.1	7.6	35.0	8.0	28.7	20.0		cosl	
4-14	B2	21.8	17.3	7.5	13.9	8.8	24.2	6.5	25.6	14.6		cosl	
14-33	B3	27.9	18.9	7.4	13.1	7.8	19.8	5.1	22.4	12.0		leos	
33-56	C	25.8	21.1	8.8	14.6	7.4	18.1	4.2	21.6	11.3		leos	
56-118	D	30.4	17.8	6.0	11.4	6.7	19.7	8.0	20.1	12.3		cosl	
pH		ORGANIC MATTER											
8C1a		6A1a	6B1a										
	1:5	1:10	ORGANIC CARBON	NITROGEN	C:N								
	1:1		%	%									
4.8			2.44	.061	40								
5.3			0.47	.030	16								
5.4			0.27	.013	21								
5.8			0.22										
6.0			0.18										
5A1a		EXTRACTABLE CATIONS					5B1a	BASE SAT. NH ₄ Ac	5C3 Base	5D1a	5A3a	8D3	
CATION EXCHANGE CAPACITY NE ₁ , Ac		6N2b	6O2b	6H1a	6P2a	6Q2a	EXCH.	Sat. % on Sum Cations	Sum Bases	Sum Cations	Ca/Mg		
		Ca	Mg	N	Na	K	5C1	me/100g	me/100g	me/100g			
← milliequivalents per 100g. soil →													
13.1	4.9	1.2	6.9	0.1	0.3	50	48	6.5	13.4		4.1		
16.5	8.5	2.9	3.8	0.2	0.4	73	76	12.0	15.8		2.9		
10.0	6.0	1.5	2.7	0.1	0.3	79	74	7.9	10.6		4.0		
8.4	6.4	1.3	1.1	0.1	0.1	94	88	7.9	9.0		4.9		
16.0	12.6	2.5	1.4	0.1	0.2	96	92	15.4	16.8		5.0		

Soil Type: Bobtail gravelly loam
 Location: NW 1/4 of Sec. 8, T2S, R76W, Grand County, Colorado. West St. Louis Creek.
 Physiographic Position: Upland.
 Topography: Steeply sloping mountain side facing south.
 Drainage: Well drained.
 Vegetation: Lodgepole pine.
 Use: National Forest Service land.
 Collected and Described by: John L. Retzer, September 11, 1955.

Horizon and
 Lincoln
 Lab. No.

A _o - A _{oo} 2749	2 to 0 inch. An organic layer made up of partially decomposed or undecomposed organic debris, mainly needles, twigs, bark.
A ₂ 2750	0 to 4 inches. Light brownish gray (10YR 6/2 dry) to grayish brown (10YR 5/2 moist) gravelly loam; soft when dry, very friable when moist; weak to moderate medium platy structure; very strongly acid; approximate pH 4.7; lower boundary gradual and smooth.
B ₂ 2751	4 to 14 inches. Pale brown (10YR 6/3 dry) to brown or dark brown (10YR 4/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; weak medium subangular blocky structure; very strongly acid, approximate pH 4.9; lower boundary gradual and smooth.
B ₃ 2752	14 to 33 inches. Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; massive; strongly acid, approximate pH 5.3; lower boundary diffuse and smooth.
C 2753	33 to 56 inches. Very pale brown (10YR 7/3 dry) to pale brown (10YR 6/3 moist) partially weathered gneiss and schist bedrocks with the cracks between the stone filled with a gravelly loamy sand or sandy loam. Medium acid, approximate pH 5.8.
D 2754	56 to 118 inches. Only slightly weathered fractured bedrock. Cracks between the rocks are filled with gravelly sandy loam weathered from the rocks themselves.

SOIL SURVEY LABORATORY Lincoln, Nebr. 6/26/58

SOIL TYPE Bobtail LOCATION Grand County, Colorado
 gravelly loam

SOIL NOS. LAB. NOS. 2755-2760

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)									TEXTURAL CLASS
		1B1a					3A1				
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	> 2		
2-0	Ac-Ac3										
0-3	A2	12.0	14.7	7.6	13.2	8.4	35.4	8.7	30.2	20.6	cosl
3-18	B2	12.4	16.3	8.2	14.9	9.6	31.5	7.1	30.8	18.2	cosl
18-42	B3	46.7	20.6	5.8	8.3	4.4	11.0	3.2	13.0	6.6	lcos
42-54	C	19.5	19.0	10.0	15.8	9.2	17.7	8.8	26.4	9.4	cosl
54-118	D	24.0	19.7	8.4	12.7	8.4	19.6	7.2	23.2	11.9	cosl
pH		ORGANIC MATTER									
8C1a		6A1a	6B1a	C:N							
	1:5	1:10	ORGANIC CARBON %	NITROGEN %							
	1:1										
4.9			1.78	.056	32						
5.1			0.84	.037	23						
5.9			0.09	.006							
6.1			0.10								
6.3			0.18								
5A1a	EXTRACTABLE CATIONS 5B1a					BASE SAT. NH ₄ ⁺ Ac	5C3 Base Sat. % on Sum Cations	5B1a Sum Bases me/100g	5A3a Sum Cations me/100g	8D3 Ca/Mg	
	6M2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K	EXCH. 5C1					
← milliequivalents per 100g. soil →											
15.0	4.3	1.1	6.9	0.1	0.5	40	46	6.0	12.9	3.9	
13.0	4.4	1.0	7.9	0.1	0.4	45	43	5.9	13.8	4.4	
6.9	4.7	0.6	2.1	0.1	0.2	81	73	5.6	7.7		
19.5	12.0	1.6	2.2	0.1	0.3	72	86	14.0	16.2	7.5	
11.5	10.3	1.3	2.6	0.2	0.2	100	82	12.0	14.6	7.9	

Soil Type: Bobtail gravelly loam
 Location: NW 1/4 of Sec. 8, T2S, R76W, Grand County, Colorado. West St. Louis Creek.
 Physiographic Position: Upland, mountain slope.
 Topography: Steeply sloping mountain side having a gradient of approximately 30 percent facing south.
 Drainage: Well drained.
 Vegetation: Principally lodgepole pine.
 Use: National Forest Service land.
 Collected and Described by: John L. Retzer, September 11, 1952.

Horizon and
 Lincoln
 Lab. No.

- Ao - Aoo
 2755 2 to 0 inches. An organic mat made up of partially decomposed or undecomposed forest litter mainly of pine needles, bark and twigs. Very strongly acid, approximate pH 5.0.
- A2
 2756 0 to 3 inches. Grayish brown or light brownish gray (10YR 5.5/2 dry) to dark grayish brown or grayish-brown (10YR 4.5/2 moist) gravelly sandy loam; soft when dry, very friable when moist; very weak medium platy structure breaking to weak to moderate medium granules; very strongly acid, approximate pH 4.7; lower boundary clear and smooth.
- B2
 2757 3 to 18 inches. Brown (10YR 5/3 dry) to brown to dark brown (10YR 4/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; weak medium subangular blocky structure; very strongly acid, approximate pH 4.8; lower boundary gradual and smooth.
- B3
 2758 18 to 42 inches. Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) gravelly loamy sand; slightly hard when dry, friable when moist; massive; medium acid, approximate pH 5.5; lower boundary diffuse and smooth.
- C
 2759 42 to 54 inches. Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) gravelly sandy loam; slightly hard when dry, friable when moist; massive; medium acid, approximate pH 5.7; lower boundary diffuse and smooth. This horizon contains a large amount of partially weathered bedrock fragments.
- D
 2760 54 to 118 inches. Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) gravelly loamy sand; this is a horizon of only partially weathered bedrock, gneiss, and schist, with some finer textured material in the cracks between the stones.

SOIL SURVEY LABORATORY Lincoln, Nebr. 6/26/58

SOIL TYPE Bobtail LOCATION Grand County, Colorado
 gravelly sandy loam

SOIL NOS.

LAB. NOS. 2773-2777

DEPTH 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			> 2	
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.07	0.07-0.002		
0-5	A2	15.8	10.8	5.8	14.3	10.6	36.1	6.6	34.3	20.3		cosl
5-16	B2	6.4	10.0	8.5	23.4	16.6	28.3	6.8	42.9	15.4		fsl
16-24	B3	8.3	12.7	8.8	23.3	15.6	24.0	7.3	40.1	12.6		sl
24-45	C	13.6	18.5	10.3	22.4	13.8	16.6	4.8	35.5	7.2		lcos
45-71	D	15.1	18.0	10.1	23.3	13.9	15.6	4.0	36.3	5.8		lcos
pH		ORGANIC MATTER										
8C1a		6A1a		6B1a								
	1:5	1:10	ORGANIC CARBON	NITROGEN	C/N							
	1:1		%	%								
	4.9		1.06	.034	31							
	5.2		0.36	.016	22							
	5.3		0.14	.010								
	5.7		0.08									
	5.8		0.11									
5A1a	EXTRACTABLE CATIONS 5B1a					BASE SAT. %	Base Sat. %	5B1a	5A3a	8D3		
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ Ac EXCH.	on Sum	Sum Bases	Sum Cations	Ca/Mg		
	Co	Mg	H	No	K	5C1	503	me/100g	me/100g			
	milliequivalents per 100g. soil											
13.3	4.0	0.8	7.6	0.2	0.3	40	41	5.3	12.9			
10.8	3.8	1.0	5.0	0.1	0.4	49	51	5.3	10.3	3.8		
9.3	3.3	1.2	3.7	0.1	0.3	53	57	4.9	8.6	2.8		
7.4	3.5	1.1	2.7	0.1	0.2	66	64	4.9	7.6	3.2		
9.4	4.8	2.2		0.1	0.2	78		7.3		2.2		

Soil Type: Bobtail gravelly sandy loam
 Location: Along road 3 in the NE 1/4 of Sec. 10, T2S, R76W, Grand County, Colorado. Fool Creek.
 Physiographic Position: Upland.
 Topography: Steeply sloping mountain side facing west.
 Drainage: Well drained.
 Vegetation: Lodgepole pine.
 Use: National Forest Service land.
 Collected and Described by: John L. Retzer, July 24, 1952.

Horizon and
 Lincoln
 Lab. No.

Ao - Aoo	1½ to 0 inch. An organic mat made up of partially decomposed and fresh needles, roots, bark and twigs.
A2 2773	0 to 5 inches. Grayish brown or light brownish gray (10YR 5.5/2 dry) to dark grayish brown or grayish brown (10YR 4.5/2 moist) gravelly sandy loam; soft when dry, very friable when moist; weak fine platy structure breaking to weak moderate fine granules; very strongly acid, approximate pH 4.7; lower boundary gradual and smooth.
B2 2774	5 to 16 inches. Brown (10YR 5/3 dry) to brown or dark brown (10YR 5/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; weak medium subangular blocky structure; strongly acid, approximate pH 5.2; lower boundary gradual and smooth.
B3 2775	16 to 24 inches. Light olive brown (2.5Y 5/4 dry) to olive brown (2.5Y 4/4 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; massive; strongly acid, approximate pH 5.1; lower boundary diffuse and smooth.
C 2776	24 to 45 inches. Light olive brown (2.5Y 5/4 dry) to olive brown (2.5Y 4/4 moist) very gravelly sandy loam; slightly hard when dry, very friable when moist; massive; strongly acid, approximate pH 5.5; lower boundary diffuse and smooth.
D 2777	45 to 71 inches. Light olive brown (2.5Y 5/4 dry) to olive brown (2.5Y 4/4 moist) gravelly sandy loam; strongly to medium acid; approximate pH 5.6; this is partly weathered bedrock.

SOIL SURVEY LABORATORY Lincoln, Nebr. 6/26/58

SOIL TYPE Bobtail LOCATION Grand County, Colorado
 gravelly sandy loam

SOIL NOS. LAB. NOS. 2778-2781

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)								> 2	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 0.02-0.002			
0-5	A2	24.1	12.7	6.3	10.4	8.0	32.5	6.0	28.4	17.9	cosl	
5-16	B2	29.5	13.2	5.9	12.0	8.7	25.2	5.5	27.7	13.0	cosl	
16-43	C1	30.2	18.9	7.7	16.1	8.6	13.8	4.7	22.7	8.1	leos	
43-69	C2	25.9	15.6	6.5	14.2	9.2	19.9	8.7	26.1	10.6	leos	
pH		ORGANIC MATTER										
8C1a	1:5	1:10	6A1a ORGANIC CARBON	6B1a NITROGEN	C/N							
1:1			%	%								
4.9			1.72	.046	37							
5.2			0.33	.021	16							
5.8			0.18	.009								
6.0			0.15									
5A1a	EXTRACTABLE CATIONS					BASE SAT. NH ₄ Ac EXCH.	5C3 Base Sat. % on Sum Cations	5B1a Sum Bases	5A3a Sum Cations	8D3 Ca/Mg		
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b Ca	6O2b Mg	6H1a H	6P2a No	6Q2a K	5C1	me/100g					
	← milliequivalents per 100g. soil →											
11.9	4.3	0.9	6.9	0.1	0.4	48	45	5.7	12.6			
11.1	3.4	0.8	5.8	0.1	0.5	43	45	4.8	10.6			
8.5	4.0	0.9	3.3	0.1	0.4	64	62	5.4	8.7			
9.7	6.9	2.1	2.5	0.1	0.3	97	79	9.4	11.9		3.3	

Soil Type: Bobtail gravelly sandy loam
 Location: NW 1/4 of Sec. 10, T2S, R76W, Grand County, Colorado. Fool Creek.
 Physiographic Position: Upland.
 Topography: Steeply sloping mountain side facing west.
 Drainage: Well drained.
 Vegetation: Lodgepole pine.
 Use: National Forest Service land.
 Collected and Described by: John L. Retzer, July 31, 1952.

Horizon and
 Lincoln
 Lab. No.

Ao - Aoo	1 to 0 inch. An organic mat made up of undecomposed and partially decomposed needles, bark, twigs, and roots.
A2 2778	0 to 5 inches. Light brownish gray (10YR 6/2 dry) to grayish brown (10YR 5/2 moist) gravelly sandy loam; soft when dry, very friable when moist; very weak medium platy structure breaking to weak to moderate fine granules; very strongly acid, approximate pH 4.6; lower boundary gradual and smooth.
B2 2779	5 to 16 inches. Brown (10YR 5.5/3 dry and 10YR 4.5/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; weak medium subangular blocky structure; very strongly acid, approximate pH 4.9; lower boundary gradual and smooth.
C1 2780	16 to 43 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; massive; strongly acid, approximate pH 5.1; lower boundary gradual and smooth.
C2 2781	43 to 69 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; massive; strongly acid, approximate pH 5.5. This profile had a water table at 69 inches.

SOIL SURVEY LABORATORY Lincoln, Nebr. 6/26/58

SOIL TYPE Bobtail LOCATION Grand County, Colorado
gravelly sandy loam

SOIL NOS.

LAB. NOS. 2782-2786

DEPTH 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			> 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		
0-6	A2	10.6	8.3	5.0	12.3	13.3	42.0	8.5	40.6	22.3		1
6-16	B2	10.5	9.4	6.7	15.8	15.0	36.0	6.6	42.1	18.6		fsl
16-27	B3	13.7	12.2	8.3	18.6	15.0	26.9	5.3	37.7	15.7		cosl
27-35	C1	6.1	11.4	10.0	23.0	15.7	27.6	6.2	40.6	16.6		fsl
35-59	D	13.6	16.0	8.3	15.3	11.2	30.2	5.4	30.9	19.4		cosl
pH		ORGANIC MATTER										
8C1a		1:5	1:10	6A1a	6B1a							
				ORGANIC CARBON	NITROGEN	C/N						
				%	%							
1:1												
4.7				1.25	.042	30						
5.2				0.38	.025	15						
5.5				0.22	.019							
5.9				0.12								
6.5				0.09								
5A1a		EXTRACTABLE CATIONS					5B1a	BASE SAT. NET Ac	5C1 Base Sat. % on Sum	5B1a Sum Bases	5A3a Sum Cations	8D3 Ca/Mg
CATION EXCHANGE CAPACITY NH ₄ Ac		6N2b Ca	6O2b Mg	6H1a H	6P2a No	6Q2a K						
		← milliequivalents per 100g. soil →										
15.0	3.3	0.7	7.4	0.1	0.4	30	38	4.5	11.9			
12.7	3.6	0.8	5.5	0.1	0.4	38	47	4.9	10.4			
13.0	5.9	1.3	4.7	0.1	0.4	59	62	7.7	12.4	4.5		
13.9	9.3	1.7	3.5	0.1	0.3	82	76	11.4	14.9	5.5		
18.1	13.7	2.4	2.2	0.2	0.3	92	88	16.6	18.8	5.7		

Soil Type: Bobtail gravelly sandy loam
 Location: NW 1/4 of Sec. 10, T2S, R76W, Grand County, Colorado. Fool Creek.
 Physiographic Position: Upland.
 Topography: Steeply sloping mountain side facing east.
 Drainage: Well drained.
 Vegetation: Lodgepole pine.
 Use: National Forest Service land.
 Collected and Described by: John L. Retzer, July 21, 1952.

Horizon and
 Lincoln
 Lab. No.

- Ao - Aoo 1½ to 0 inch. An organic mat made up of undecomposed and partially decomposed forest refuse mainly needles, bark, twigs.
- A2 2782 0 to 6 inches. Light brownish gray (10YR 6/2 dry) to grayish brown (10YR 5/2 moist) gravelly loam; soft when dry, very friable when moist; weak medium platy structure; very strongly acid, approximate pH 4.7; lower boundary gradual and smooth.
- B2 2783 6 to 16 inches. Brown (10YR 5.5/3 dry and 10YR 4.5/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; weak to moderate subangular blocky structure; strongly acid, approximate pH 5.2; lower boundary gradual and smooth.
- B3 2784 16 to 27 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist) gravelly sandy loam; loose when dry or moist; massive; medium acid, approximate pH 5.6; lower boundary clear and smooth.
- C1 2785 27 to 35 inches. Light yellowish brown (2.5Y 6/4 dry) to light olive brown (2.5Y 5/4 moist) gravelly sandy loam; very hard when dry, very firm when moist; massive; medium acid, approximate pH 5.8; this is a horizon of partially weathered bedrock.
- D 2786 35 to 59 inches. Light yellowish brown (2.5Y 6/4 dry) to light olive brown (2.5Y 5/4 moist) very weakly weathered gneiss and schist bedrock.

SOIL SURVEY LABORATORY Lincoln, Nebr. 6/26/58

SOIL TYPE Bobtail LOCATION Grand County, Colorado
 gravelly sandy loam

SOIL NOS. LAB. NOS. 2787-2790

DEPTH INCHES	HORIZON	1B1a PARTICLE-SIZE DISTRIBUTION (in ma.) (per cent) 3A1										TEXTURAL CLASS
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VEPY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	> 2			
0-5	A2	10.0	7.9	6.6	13.6	11.9	42.0	8.0	37.1	24.5	1	
5-18	B2	12.0	11.3	7.3	16.2	14.9	34.5	3.8	39.4	19.8	fsl	
18-26	C1	9.6	12.3	8.9	20.6	16.0	30.2	2.4	41.0	17.2	fsl	
25-58	Dr	13.4	15.4	10.7	23.8	14.1	20.6	2.0	36.5	11.6	lcos	
pH		ORGANIC MATTER										
8C1a	1:5	1:10	6A1a ORGANIC CARBON %	6B1a NITRO-GEN %	C/N							
4.7			1.04	.038	27							
5.0			0.26	.014	18							
5.1			0.15	.008								
5.4			0.12									
5A1a CATION EXCHANGE CAPACITY NH ₄ Ac		EXTRACTABLE CATIONS					5B1a BASE SAT. % NH ₄ Ac EXCH. 5C1	Base Sat. % on Sum	5B1a Sum Bases	5A3a Sum Cations	Ca/Mg	
		6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K						
		milliequivalents per 100g. soil										
13.1		2.4	0.6	6.8	0.1	0.3	26	33	3.4	10.2		
11.3		3.0	0.7	5.9	0.1	0.2	35	40	4.0	9.9		
10.8		3.6	0.9	5.5	0.1	0.1	44	46	4.7	10.2		
12.4		5.9	0.8	4.1	0.1	0.2	56	63	7.0	11.1		

Soil Type: Bobtail gravelly sandy loam
 Location: NW 1/4 of Sec. 10, T2S, R76W, Grand County, Colorado. Fool Creek.
 Physiographic Position: Upland.
 Topography: Steeply sloping mountain side, facing east.
 Drainage: Well drained.
 Vegetation: Lodgepole pine.
 Use: National Forest Service land.
 Collected and Described by: John L. Retzer, July 21, 1952.

Horizon and
 Lincoln
 Lab. No.

- Ao - Aoo 2 to 0 inch. An organic mat made up of pine needles, bark and roots.
- A2
 2787 0 to 5 inches. Grayish brown or light brownish gray (10YR 5.5/2 dry) to dark grayish brown or grayish brown (10YR 4.5/2 moist) gravelly loam; soft when dry, very friable when moist; weak fine platy breaking to moderate fine granular structure; very strongly acid, approximate pH 4.9; lower boundary gradual and smooth.
- B2
 2788 5 to 18 inches. Brown (10YR 5/3 dry) to brown or dark brown (10YR 4/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; massive; strongly acid, approximate pH 5.2; lower boundary gradual and smooth.
- C1
 2789 18 to 26 inches. Light yellowish brown (2.5Y 6/4 dry) to light olive brown (2.5Y 5/4 moist) gravelly sandy loam; very hard when dry, very firm when moist; massive; strongly acid, approximate pH 5.1; this horizon is the upper part of the bedrock and is mainly weathered rock; lower boundary diffuse and smooth.
- D_r
 2790 26 to 58 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/4 moist) fractured bedrock with gravelly sandy loam in the fractures.

SOIL SURVEY LABORATORY Lincoln, Nebr. 6/26/58

SOIL TYPE Bottle LOCATION Grand County, Colorado
 gravelly sandy loam

SOIL NOS. LAB. NOS. 2761-2763

DEPTH 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			> 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					
2-0	A ₀														
0-7	A ₂	5.2	4.8	9.2	28.9	18.4	30.5	3.0	51.7	14.6				fsl	
7-28	B ₂	5.4	5.5	14.6	33.1	14.4	23.2	3.8	41.2	9.5				fsl	
pH		ORGANIC MATTER													
8C1a	1.5	1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N										
1.3															
4.8			0.87	.027	32										
5.1			0.36	.019	19										
5A1a CATION EXCHANGE CAPACITY NH ₄ Ac		EXTRACTABLE CATIONS					BASE SAT. % NH ₄ Ac EXCH.	Base Sat. % on Sum Cations	5B1a Sum Bases	5A3a Sum Cations	Ca/Mg				
		6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K	5C1	5C3	me/100g	me/100g					
		milliequivalents per 100g. soil													
52.1	21.9	0.1	0.3	2.8	48			25.1							
4.9	1.4	0.1	3.0	0.1	0.2	37	38	1.8	4.8						
3.4	0.9	0.1	2.4	0.1	0.1	35	33	1.2	3.6						

Soil Type: Bottle gravelly sandy loam
 Location: SW 1/4 of Sec. 3, T2S, R76W, Grand County, Colorado. Fool Creek Watershed.
 Physiographic Position: Upland.
 Topography: Steeply sloping mountain side facing north.
 Drainage: Well drained.
 Vegetation: Lodgepole pine.
 Use: National Forest Service lands.
 Collected and Described by: John L. Retzer, September 2, 1949.

Horizon and
 Lincoln
 Lab. No.

Aoo	4 to 2 inches. Mat of undecomposed pine needles, twigs, bark, roots and branches.
Ao 2761	2 to 0 inch. Very dark gray (10YR 3/1 dry) to black (10YR 2/1 moist) fibrous mat of partially decayed organic matter mixed with a small amount of mineral soil; very strongly acid, approximate pH 4.8.
A2 2762	0 to 7 inches. White (10YR 8/1 dry) to light gray (10YR 6/1 moist) gravelly sandy loam; soft when dry, very friable when moist; moderate fine platy structure; extremely acid, approximate pH 4.4; lower boundary clear and smooth.
B2 2763	7 to 28 inches. Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; weak fine subangular blocky structure breaking to weak coarse granules; very strongly acid, approximate pH 4.6. This horizon grades downward into only weakly weathered Dakota sandstone.

SOIL SURVEY LABORATORY Lincoln, Nebr. 6/26/58

SOIL TYPE Bottle LOCATION Grand County, Colorado
gravelly sandy loam

SOIL NOS. LAB. NOS. 2764-2767

DEPTH INCHES	HORIZON	1B1a PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	3A1		> 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			
2-0	A0-A0p												
0-3	A2	13.2	10.2	8.0	18.2	8.0	32.9	9.5	35.9	15.6		sl	
3-13	B2	9.8	8.8	10.2	25.8	8.5	28.0	8.9	36.3	15.1		fs1	
13-19	B3	10.7	11.6	12.2	27.1	7.8	17.6	13.0	31.1	9.4		sl	
pH		ORGANIC MATTER											
8C1a		6A1a	6B1a	C/N									
	1:5	1:10	ORGANIC CARBON %	NITROGEN %									
	1:1												
			3.56	.113	32								
			1.02	.046	22								
			1.35	.048	28								
5A1a		EXTRACTABLE CATIONS				BASE SAT.	Base Sat. %	5B1a	5A3a	8D3			
CATION EXCHANGE CAPACITY NH ₄ Ac		6N2b	6O2b	6H1a	6P2a	6Q2a	on Sum	Sum	Sum	Ca/Mg			
		Ca	Mg	H	No	K	Cations	Bases	Cations				
		milliequivalents per 100g. soil				5C1	5C3	me/100g me/100g					
19.1	5.8	1.4	14.9	0.2	0.3	40	34	7.7	22.6	4.1			
10.5	2.0	-	9.0	0.1	0.2	22	20	2.3	11.3				
12.4	1.4	0.1	12.3	0.2	0.2	15	13	1.9	14.2				

Soil Type: Bottle gravelly sandy loam
 Location: SW 1/4 of Sec. 3, T2S, R76W, Grand County, Colorado. West St. Louis Watershed.
 Physiographic Position: Upland.
 Topography: Steeply sloping mountain side facing north.
 Drainage: Well drained.
 Vegetation: Spruce and fir.
 Use: National Forest Service lands.
 Collected and Described by: John L. Retzer, August 31, 1959.

Horizon and
 Lincoln
 Lab. No.

Ao - Aoo 2 to 0 inch. A forest litter made up of undecomposed and partially decomposed forest refuse, principally needles, twigs and roots.
 2764

A2 0 to 3 inches. Light gray (10YR 7/2 dry) to light brownish gray (10YR 6/2 moist) gravelly sandy loam; soft when dry, very friable when moist; moderate fine platy structure; very strongly acid, approximate pH 4.6; lower boundary clear and smooth.
 2765

B2 3 to 13 inches. Brown (10YR 5/3 dry) to brown or dark brown (10YR 4/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; weak fine subangular blocky structure; very strongly acid, approximate pH 4.6; lower boundary clear and smooth. Approximately 20 percent of this horizon is stone.
 2766

B3 13 to 19 inches. Light yellowish brown (10YR 6/4 dry) to dark yellowish brown (10YR 4/4 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; massive; very strongly acid, approximate pH 4.9; approximately 20 percent of this horizon is stone, and the horizon grades downward into only slightly weathered Dakota sandstone.
 2767

SOIL TYPE Bottle LOCATION Grand County, Colorado
 gravelly sandy loam

SOIL NOS. LAB. NOS. 2768-2772

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	0.2-0.02	0.02-0.002	> 2		
2-0	A ₀												
0-6	A ₂	10.5	9.1	6.2	14.0	6.9	40.1	13.2	31.0	24.2		1	
6-24	B ₂	4.6	6.0	11.3	38.0	9.9	23.7	6.5	41.0	12.9		fsl	
24-34	B ₃	3.7	5.8	8.5	25.9	13.0	34.2	8.9	42.3	18.8		fsl	
34-48	C	0.6	3.7	18.8	66.4	5.2	4.1	1.2	40.4	2.2		fs	
pH		ORGANIC MATTER											
8C1a	1:5	1:10	6A1a ORGANIC CARBON	6B1a NITROGEN	C/N								
1:1			%	%									
4.6			13.10	.551	24								
4.8			1.88	.071	26								
4.9			0.49	.028	18								
5.9			0.62										
5A1a CATION EXCHANGE CAPACITY NH ₄ Ac		EXTRACTABLE CATIONS 5B1a					BASE SAT. NH ₄ Ac	Base Sat. % on Sum	5B1a Sum	5A3a Sum	8D3 Ca/Mg		
		6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K	5C1	5C3 Cations	me/100g	me/100g			
		milliequivalents per 100g. soil											
47.5	26.4	3.7	25.5	0.2	1.2	66	55	31.5	57.0	7.1			
16.9	3.7	0.7	13.1	0.2	0.2	28	27	4.8	17.9				
6.9	0.8	-	6.3	0.1	0.1	14	14	1.0	7.3				
8.4	0.5	-	10.1	0.2	0.1	10	7	0.8	10.9				
0.7	0.1	-	0.6	0.1	-	28	25	0.2	0.8				

Soil Type: Bottle gravelly sandy loam
 Location: SW 1/4 of Sec. 3, T28, R76W, Grand County, Colorado. West St. Louis Creek Watershed.
 Physiographic Position: Upland.
 Topography: Steeply sloping mountain side facing north.
 Drainage: Well drained.
 Vegetation: Spruce and fir.
 Use: National Forest Service land.
 Collected and Described by: John L. Retzer, August 31, 1949.

Horizon and
 Lincoln
 Lab. No.

Aoo	4 to 2 inches. Undecomposed forest litter made up of needles, twigs, roots, and bark.
Ao 2768	2 to 0 inch. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) fibrous organic mat made up of partially weathered forest debris mixed with a small amount of mineral matter. Very strongly acid, approximate pH 4.9.
A2 2769	0 to 6 inches. Light gray (10YR 7/1 dry) to gray or light gray (10YR 6/1 moist) gravelly loam; soft when dry, very friable when moist; moderate fine platy structure; very strongly acid, approximate pH 4.5; approximately 5 percent of this horizon is rock; lower boundary clear and smooth.
B2 2770	6 to 24 inches. Brown (10YR 5/3 dry) to brown or dark brown (10YR 4/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; weak to moderate medium subangular blocky structure; very strongly acid, approximate pH 4.6; approximately 30 percent of this horizon is rock; lower boundary gradual and smooth.
B3 2771	24 to 34 inches. Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; massive; very strongly acid, approximate pH 4.8; approximately 40 percent of this horizon is rock; lower boundary gradual and smooth.
C 2772	34 to 48 inches. Light brownish-gray (10YR 6/2 dry) to grayish brown (10YR 5/2 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; massive; strongly acid, approximate pH 5.2; approximately 50 percent of this horizon is rock and the horizon grades downward into unweathered sandstone bedrock.

SOIL SURVEY LABORATORY Lincoln, Nebr. 3/17/58

SOIL TYPE Bottle LOCATION Grand County, Colorado
fine sand

SOIL NOS. S55Colo-25-2 LAB. NOS. 2873-2876

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1A1a	2A1	3A1	4A1	5A1	6A1	7A1	8A1	9A1	10A1	
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY				
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-1000	< 19mm	> 2
1 1/2-0	Ao											
0-6	A2	1.1	4.3	13.7	42.8	9.3	25.1	3.7	43.1	12.8	6	fs1
6-11	B2ir	2.4	4.4	10.1	54.8	11.8	12.7	3.8	50.7	6.6	13	lfs
11-33	C	3.1	3.6	10.1	67.7	9.1	4.6	1.8	51.0	2.4	16	fs
pH		ORGANIC MATTER					MOISTURE TENSIONS					
8C1a		6A1a	6B1a	6C1a	6D1a	6E1a	4B1a	4B1a	4B2			
	1:5	1:10	ORGANIC CARBON	NITRO-GEN	C/N	Free Iron Fe2O3	1/10 ATMOS.	1:3 ATMOS.	1:5 ATMOS.			
	1:1		%	%		%	%	%	%			
4.8			0.97	.029	33	0.4	14.8	9.4	2.5			
4.8			0.25	.010	25	0.5	8.6	5.0	1.4			
4.9			0.23	.007		0.3	5.0	2.6	1.0			
5A1a		EXTRACTABLE CATIONS					5B1a	5C1	5D1a	5A3a		
CATION EXCHANGE CAPACITY NH4Ac		6N2b	6O2b	6H1a	6P2a	6Q2a	BASE SAT. % NH4Ac EXCH.	Base Sat. % on Sum Cations	Sum Bases	Sum Cations	Ca/Mg	
		milliequivalents per 100g. soil										
6.5	2.5	0.6	4.7	0.2	0.2	54	43	3.5	8.2			
3.4	1.1	0.2	2.9	0.1	0.1	44	34	1.5	4.4			
1.7	0.5	-	2.0	0.1	-	35	23	0.6	2.6			

Soil Type: Bottle fine sand

Soil Nos.: S55Colo-25-2

Location: Approximately the SE quarter of the SW quarter of Sec. 3, T2S; R76W; Grand County, Colorado.

Physiographic Position: Steeply sloping mountain side.

Topography: Strongly sloping convex side hill of approximately 35 percent gradient facing north.

Drainage: Well drained.

Vegetation: Lodgepole pine and weak undercover of brush and sedge.

Collected by: James Allen, A. Aandahl, J. Retzer, E. M. Payne, A. J. Cline, and H. Bindschadler, October 9, 1955.

Horizon and

Lincoln

Lab. No.

- Aoo 2 to 1½ inches. Undecomposed needle mat.
- Ao 1½ to 0 inch. Very dark gray to very dark grayish brown (10YR 3/1.5 dry) to black or very dark brown (10YR 2/1.5 moist) partially decomposed organic material ranging in thickness from 3 to 6 inches; lower boundary clear and smooth.
- A2 0 to 6 inches. Light gray (10YR 7/1.5 dry) to light gray or light brownish gray (10YR 6/1.5 moist) fine sands; soft when dry, very friable when moist; weak very coarse platy structure breaking to weak to moderate fine and medium crumb structure; strongly acid; lower boundary abrupt and wavy.
- B2ir 6 to 11 inches. Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) loamy fine sand; soft when dry, very friable when moist; weak fine and medium subangular blocky structure breaking to weak, medium or coarse granules; the horizon contains many medium-sized distinct 7.5YR 4/4 mottles; the horizon ranges in thickness from 5 to 8 inches; lower boundary clear and wavy.
- C1 11 to 33 inches. Very pale brown (10YR 7/3 dry) to pale brown (10YR 6/3 moist) partially weathered sandstone base rock; about 85 percent of the entire mass is made up of unweathered rock fragments.

SOIL Bresser sandy loam SOIL Nos. S61Colo-3-9 LOCATION Arapahoe County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 15550-15556 February 1965

Depth (in.)	Horizon	1B1a Size class and particle diameter (mm) 3A1											Clay			Coarse fragments 2A2		
		Total		Sand					Silt				Carbonate	Noncarbonate	> 2	2-19	19-76	
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)						(2-0.1)
0-6	A1	70.9	21.4	7.7	9.0	26.6	14.0	15.7	5.6	16.1	5.3	28.0	65.3			Tr.		
6-10	B1	70.8	14.4	14.8	7.4	20.2	14.8	22.0	6.4	9.8	4.6	25.7	64.4			Tr.		
10-18	B2t	65.4	14.8	19.8	6.1	19.7	13.9	19.9	5.8	9.1	5.7	23.1	59.6			Tr.		
18-29	B3	75.8	11.0	13.2	4.0	16.7	16.9	29.9	8.3	7.6	3.4	28.7	67.5			Tr.		
29-40	C1	88.8	4.1	7.1	7.5	32.8	21.5	21.6	5.4	2.5	1.6	15.9	83.4			Tr.		
40-52	C2	89.7	3.5	6.8	8.3	32.3	20.4	24.2	4.5	2.1	1.4	16.0	85.2			Tr.		
52-62	C3	90.0	3.7	6.3	8.7	28.3	22.3	25.9	4.8	2.1	1.6	16.9	85.2			Tr.		

Depth (in.)	6A1a Organic carbon		6E1a Nitrogen	C/N	6E1c Carbonate as CaCO ₃	6C1a Ext. Iron as Fe	Bulk density			Water content			pH	
	a	Pct.					g/cc	4A1c 30-Cm.	4A1b Air-Dry	4D1 COLE b	4B3 30-Cm.	4B2 1/3-Bar	5-Bar	1:10
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.		
0-6	1.01	0.073	14		0.4		1.62				3.5		6.7	6.3
6-10	0.62	0.066	9		0.5		1.50	1.58	0.07	14.4	6.0		6.7	6.4
10-18	0.50	0.048	10		0.6		1.57	1.69	0.19	15.4	8.1		7.0	6.8
18-29	0.20	0.026			0.4						4.8		7.1	7.1
29-40	0.05				0.2		1.70	1.78	0.15	11.2	2.5		7.1	7.1
40-52	0.03				0.3			1.72			3.0		7.2	7.2
52-62	0.01				0.3						2.8		7.4	7.5

Depth (in.)	Extractable bases 5B1a					6H1a Ext. Acidity	Cat. Exch. Cap.		8D3 Ca/Mg	Base saturation	
	6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum		5A3a Sum	5A1a Sum		5C3 Sum	5C1 Sum
	meq/100 g	meq/100 g	meq/100 g	meq/100 g	meq/100 g	meq/100 g	meq/100 g	meq/100 g	Pct.	Pct.	
0-6	3.6	1.1	Tr.	0.6	5.3	2.5	7.8	6.3	3.3	68	84
6-10	6.5	2.0	Tr.	0.5	9.0	2.3	11.3	9.4	3.2	80	96
10-18	9.6	3.2	Tr.	0.5	13.3	2.3	15.6	13.3	3.0	85	100
18-29	5.5	2.0	Tr.	0.2	7.7	0.7	8.4	7.7	2.8	92	100
29-40	3.8	1.2	Tr.	0.2	5.2	0.5	5.7	5.2	3.2	91	100
40-52	4.1	1.2	Tr.	0.2	5.5	0.2	5.7	5.4	3.4	96	102
52-62	3.3	1.0	Tr.	0.1	4.4	0.5	4.9	4.5	3.3	90	98

Depth (in.)	Ratios to Clay 8D1		
	NH ₄ OAc CEC	Ext. Iron	15-Bar Water
0-6	0.82	0.05	0.45
6-10	0.64	0.03	0.40
10-18	0.67	0.03	0.41
18-29	0.58	0.03	0.36
29-40	0.73	0.03	0.35
40-52	0.79	0.04	0.44
52-62	0.71	0.05	0.44

a. 5.9 kg/m² to 40 inches.
b. Coefficient of linear extensibility.

Soil Type: Bresser sandy loam
 Soil Nos.: 8510b10-3-9
 Classification: Brown.
 Location: 1,321 feet north, 44 feet west of the south quarter corner of Sec. 23, T4S, R61W, Arapahoe County, Colorado.
 Climate: Continental, average annual precipitation 14 inches. Mean annual temperature 49° F.
 Growing season 150 days. Elevation 5,250 feet.
 Vegetation: Native pasture. Blue grama, green needlegrass, threeawn, little buckwheat, some sixweeks fescue.
 Parent Material: Aeolian sands from the Dawson Arkose formation primarily.
 Physiographic position: Upland.
 Relief: Gently rolling. 8 percent north-facing slope. This pit is about 75 feet below the crest of an aeolian ridge, and about 200 feet up from the base. The ridge crest is about 30 feet higher than the trough and extends from northwest to southeast.
 Drainage: Surface runoff rapid, internal drainage medium to rapid. Intake rate moderately rapid under grass, moderate where cultivated.
 Moisture: Slightly moist throughout, usually dry.
 Water table: None. Stoniness: None.
 Erosion: None to slight wind.
 Described by: J. B. Brown, June 29, 1961.

Horizon and
 Lincoln
 Lab. No.

A1 0 to 6 inches. Very dark grayish brown (10YR 3/2, moist) sandy loam; dark grayish brown (10YR 4/2, dry) very weak medium subangular blocks to weak medium granules; slightly hard when dry, loose when moist; many roots; clear smooth boundary.
 15550

B1 6 to 10 inches. Dark brown (10YR 3.5/3, moist and crushed) sandy loam; dark brown (10YR 4/3, dry) weak medium prisms breaking to weak medium subangular blocks; hard when dry, very friable when moist; thin patchy clay films on some ped surfaces; many roots; clear wavy boundary.
 15551

B2 10 to 18 inches. Dark brown (7.5YR 4/3, moist) sandy clay loam; brown (7.5YR 4.5/3, dry) moderate medium prisms breaking to moderate medium angular blocks; very hard when dry, friable when moist; thin nearly continuous clay skins on ped surfaces; some clay nodules or spots where there is a definite increase in clay, are present; many roots penetrating soil aggregates; clear wavy boundary.
 15552

B3 18 to 29 inches. Brown (7.5YR 4.5/3, moist) sandy loam; brown (7.5YR 5.5/3, dry) weak coarse prismatic breaking to weak coarse subangular blocks; very hard when dry, very friable when moist; thin patchy clay films on ped surfaces; clay nodules 5 to 15 millimeters in diameter are present; roots and root channels are plentiful; tongues of B2 horizon reach to 24 inches; clear wavy boundary.
 15553

C1 29 to 40 inches. Brown (10YR 5/3, moist) loamy sand; pale brown (10YR 6/3, dry) massive; hard when dry, loose when moist; few clay balls at 5 to 15 millimeters in diameter are present; some roots and root channels; streaks of B3 reach to 40 inches, but no clay skins observed; some roots and root channels; clear smooth boundary.
 15554

C2 40 to 52 inches. Brown (10YR 5/3, moist) sand; pale brown (10YR 6/3, dry) massive or single grain; slightly hard when dry, loose when moist; occasional clay ball 5 to 10 millimeters in diameter present; few roots and channels present; diffuse boundary.
 15555

C3 52 to 62 inches. Brown (10YR 5/3, moist) sand; pale brown (10YR 6/3, dry) massive to single grain; slightly hard when dry, loose when moist; very few clay balls.
 15556

Remarks: This soil is noncalcareous throughout. At this location lime was found in horizontal streaks at 48 to 68 inches in a distance of 3 feet; lime streaks were violently calcareous, but only slightly calcareous below the streaks; lime depth is highly variable in this series in Arapahoe County. Many of the sand grains throughout the profile are feldspar.

Bureau of Public Roads Samples:

A1 0-6 inches
 B2 10-18 inches
 C1 29-40 inches

SOIL Bresser sandy loam SOIL Nos. 861Colo-3-10 LOCATION Arapahoe County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 15557-15562 February 1965

Depth (In.)	Horizon	Size class and particle diameter (mm)											Coarse fragments <u>2A2</u>					
		1B1a			Sand					Silt			3A1			2A2		
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	> 2	2-19	19-76	Pct.	Pct. of < 76mm
0-5	A1	74.8	17.9	7.3	8.0	28.9	16.9	16.0	5.0	12.0	5.9	22.7	69.8	-	-	-	-	-
5-9	B1	73.4	12.7	13.9	5.6	25.3	17.7	19.8	5.0	8.1	4.6	20.4	68.4	-	-	-	-	-
9-16	B2t	69.3	12.0	18.7	9.2	31.2	14.0	11.5	3.4	7.7	4.3	14.9	65.9	-	-	-	-	-
16-28	B3	83.6	6.1	10.0	10.8	36.6	18.3	15.7	2.5	3.6	2.5	8.6	81.4	-	-	-	-	-
28-40	C1	86.8	5.0	8.2	12.5	31.3	18.0	20.6	4.4	3.0	2.0	15.4	82.4	Tr.	-	-	-	-
40-50	C2	86.8	5.4	7.8	9.6	31.2	19.2	21.5	5.3	2.6	2.8	16.5	81.5	Tr.	-	-	-	-

Depth (In.)	6A1a		C/N	6E1c	Bulk density			4d	Water content			pH 8C1a		
	Organic carbon Pct.	Nitrogen Pct.			4A1g 1/10-Bar	4A1c 30-Cm	4A1b Air-Dry		4B3 30-Cm	4B1b 1/3-Bar	4B2 15-Bar	1:10	(1:1)	
0-5	0.86	0.073	12	-	1.60	-	1.63	0.04	7.4a	-	3.4	-	6.2	6.2
5-9	0.75	0.077	10	-	-	-	1.62	-	-	9.6	5.4	-	6.6	6.3
9-16	0.66	0.050	11	-	-	-	1.58	0.19	16.2	14.3	7.9	-	6.8	6.6
16-28	0.21	0.020	-	-	-	-	1.75c	-	-	7.4	4.1	-	6.9	6.6
28-40	0.05	-	-	-	-	-	-	-	-	5.6	3.1	-	6.9	6.8
40-50	0.02	-	-	-	-	-	-	-	-	-	2.2	-	7.0	6.9

Depth (In.)	Extractable bases 5B1a				6H1a	Cat. Exch. Cap.		8D3	Base saturation		
	6M2b Ca	6O2b Mg	6P2a Na	6Q2a K		Ext. Activity	5A3a 5A1a		Ca/Mg	5C3 Sum	5C1 Sum
0-5	3.8	1.0	Tr.	0.5	5.3	2.3	7.6	6.4	3.8	70	83
5-9	5.9	1.6	Tr.	0.4	7.9	2.3	10.2	8.8	3.7	77	90
9-16	9.3	2.8	Tr.	0.5	12.6	2.1	14.7	13.8	3.3	86	91
16-28	5.3	1.7	Tr.	0.3	7.3	1.4	8.7	7.5	3.1	84	97
28-40	4.0	1.2	Tr.	0.2	5.4	0.7	6.1	5.3	3.3	88	102
40-50	3.6	1.0	Tr.	0.2	4.8	0.5	5.3	4.8	3.6	90	100

Depth (In.)	Ratios to Clay 8D1		
	NH4OAc CEC	Ext. Iron	15-Bar Water
0-5	0.88	-	0.46
5-9	0.63	-	0.39
9-16	0.74	-	0.42
16-28	0.75	-	0.41
28-40	0.65	-	0.38
40-50	0.62	-	0.28

a. Described at 1/10-Bar.
b. 1/3 minus 15-Bar water retention probably underestimates available water.
c. One clod.
d. Coefficient of linear extensibility.

Soil Type: Bresser sandy loam
 Soil Nos.: S61Colo-3-10
 Classification: Brown
 Location: 612 feet west, 108 feet south of the northeast corner of Sec. 21, T58, R61W, Arapahoe County, Colorado.
 Climate: Continental, average annual precipitation 15 inches. Mean annual temperature 48° F.
 Growing season 145 days, (estimated). Elevation 5,400 feet.
 Vegetation: Native pasture. Blue grass, needleandthread, western wheatgrass, threeawn, little buckwheat, wild alfalfa.
 Parent material: Aeolian sands from the Dawson Arkose formation primarily.
 Physiographic position: Upland.
 Relief: Gently rolling. 7 percent east-facing slope. This pit is about 30 feet below the crest of an aeolian ridge and about 150 feet up from the base. The ridge crest is about 20 feet higher than the trough and extends from north to south.
 Drainage: Surface runoff rapid, internal drainage medium to rapid, intake rate moderately rapid under grass, moderate under cultivation.
 Moisture: Slightly moist throughout, usually dry.
 Water table: None. Stoniness: None.
 Erosion: None to slight wind. Probably more deposition than removal.
 Described by: J. B. Brown, June 30, 1961.

Horizon and
 Lincoln
 Lab No.

A1 0 to 5 inches. Very dark grayish brown (10YR 3/2, moist) light sandy loam; dark grayish brown (10YR 4.5/2, dry) very weak medium blocks breaking to weak fine granules; slightly hard when dry, loose when moist; many roots; field pH 6.6; clear smooth boundary.

B1 5 to 9 inches. Dark brown (10YR 3/3, moist) sandy loam; dark brown (10YR 4/3, dry) weak medium prisms breaking to weak medium subangular blocks; hard when dry, very friable when moist; thin very patchy clay films on some peds; field pH 6.8; clear wavy boundary.

B2t 9 to 16 inches. Dark brown (7.5YR 3.5/3, moist) sandy clay loam; brown (7.5YR 4/3, dry) brown (7.5YR 4/3, moist and crushed) moderate medium and fine prisms breaking to moderate medium angular blocks; very hard when dry, firm when moist; thin nearly continuous clay films on all peds; clay nodules or heavy spots present; many roots penetrating the peds; field pH 6.8; clear wavy boundary.

B3 16 to 28 inches. Brown (7.5YR 4.5/3, moist) sandy loam; light brown (7.5YR 6/3, dry) weak to moderate coarse prismatic breaking to weak to moderate coarse angular blocks; very hard when dry, very friable when moist; thin patchy clay films on ped surfaces; many roots and root channels; clay balls 5 to 15 millimeters in diameter are present; field pH 7.0; gradual wavy boundary.

C1 28 to 40 inches. Yellowish brown (10YR 5/4, moist) light loamy sand; light yellowish brown (10YR 6/4, dry) weak coarse prismatic; hard when dry, loose when moist; some clay balls 5 to 15 millimeters in diameter; tongues of B3 reach to 40 inches; field pH 7.0; clear smooth boundary.

C2 40 to 50 inches. Yellowish brown (10YR 5/4, moist) sand or coarse sand; light yellowish brown (10YR 6/4, dry) massive to single grain; slightly hard when dry, loose when moist; very few roots; few clay balls 5 to 10 millimeters in diameter; field pH 7.0.

Remarks: The top one inch of the A horizon is slightly platy at this location, and may be recent wind deposit. This soil is noncalcareous. Lime is found in this pit, at 50 to 66 inches in horizontal lenses. Lenses were strongly calcareous, but only slightly calcareous below. The B3 horizon varies from a light sandy loam to a light sandy clay loam from top to bottom. A 4-inch horizon of B2t could have been separated out of the B3. With the tonguing causing wavy boundaries of these soils, more horizon breaks are possible than those made. Many of the sand grains throughout the profile are feldspar.

Bureau of Public Roads Samples:

A1 0-5 inches
 B2 9-16 inches
 C2 40-50 inches

SOIL SURVEY LABORATORY Lincoln, Nebr. February 1959

SOIL TYPE Buena Vista LOCATION Chaffee County, Colorado
very stony sandy loam

SOIL NOS. 858 Colo-8-7 LAB. NOS. 9075-9077

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND 2.1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002 (< 0.075mm)	2A2 > 2	
0-2	Al	8.1	13.8	8.1	13.1	12.1	31.8	13.0	35.6	15.0	Tr.	sl
2-5	AB	10.2	13.3	7.2	10.8	10.0	32.2	16.3	30.8	16.9	16	l
5-30	B ₂ ^c	6.7	11.4	7.5	13.4	14.0	25.0	22.0	35.0	11.2	17	scl
pH		ORGANIC MATTER				Free Iron	6E1a		MOISTURE TENSIONS			
8C1a		6A1a		6B1a		Fe ₂ O ₃	CoCO ₃ equiv- alent		1/10	1/3	15	
1:1		ORGANIC CARBON		NITRO-GEN	C/N	6C1a	%		ATMOS.	ATMOS.	ATMOS.	
1:5		%		%			%		%	%	%	
1:10		%		%			%		%	%	%	
6.1		1.90		0.156	12	1.6					8.2	
6.6		1.81		0.172	10	1.6	< 1				9.1	
7.6		1.07		0.094	11	1.6	< 1				10.9	
5A1a		EXTRACTABLE CATIONS					5B1a	BASE SAT. %	5C3	Sum Bases	Sum Cations	Ca/Mg
CATION EXCHANGE CAPACITY NH ₄ , Ac		6N2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ Ac EXCH.	Base Sat. % on Sum Cations	5E1a	5A3a		
4		Ca	Mg	H	Na	K	5C1		← mg/100g →		8B3	
←		milliequivalents per 100g. soil					→					
12.5		7.6	1.7	4.8	<0.1	0.9	82	68	10.2	15.0	4.5	
15.2		11.2	2.5	3.2	<0.1	0.9	96	82	14.6	17.8	4.5	
18.5		16.0	3.8	1.6	0.1	1.4	115	93	21.3	22.9	4.2	

Soil Type: Buena Vista very stony sandy loam. Described by: A. J. Cline
 Location: SE $\frac{1}{4}$ of Sec. 2, T15S, R77W, Chaffee County, Colorado.
 Date of Sampling: September 1957
 Collectors: J. Retzer, E. M. Payne, R. Dansdill, A. J. Cline
 Physiographic Position: Upland side slope at an elevation of approximately
 9,775 feet.
 Topography: Moderately sloping convex area facing southwest.
 Drainage: Well Drained. Vegetation: Ring muhly, fescue, and sage.
 Use: National Forest Service land.
 Soil Nos.: S58Colo-8-7

Lincoln Horizon

Lab. No.

9075	A ₁	0-2 inches	Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) sandy loam; soft when dry, very friable when moist; moderate fine granular structure; noncalcareous; lower boundary clear and smooth.
9076	AB	2-5 inches	Grayish brown (10YR 5/2 dry) to dark brown (10YR 3/3 moist) stony sandy loam; slightly hard when dry, very friable when moist; moderate fine subangular blocky structure breaking to moderate fine granules; noncalcareous; there are a few thin patchy clay skins principally on the horizontal faces of the soil aggregates; approximately 25 to 50 percent of this horizon is stone; lower boundary clear and smooth.
9077	B _{2t}	5-30 inches	Brown or pale brown (10YR 5.5/3 dry) to dark brown (10YR 4/3 moist) stony sandy clay loam; slightly hard when dry, very friable when moist; massive; noncalcareous; approximately 90 percent of this horizon is stone; it is difficult to get whole soil aggregates from this horizon, however, there appears to be thin nearly continuous clay skins on those aggregates which we were able to observe, and the surface of the stone has a dark coating interpreted to be a clay film.

SOIL SURVEY LABORATORY Lincoln, Nebr. February 1959

SOIL TYPE Buena Vista LOCATION Chaffee County, Colorado
 very stony sandy loam

SOIL NOS. 858Colo-8-10

LAB. NOS. 9086-9090

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002					2A2 > 2 (< 19mm)
0-3	A1	22.6	18.5	9.0	11.7	9.2	20.0	9.0	26.9	8.7	7	cosl	
3-10	AB	20.5	15.4	8.0	10.6	8.7	22.2	14.6	26.7	10.2	19	cosl	
10-16	B2	20.0	16.7	7.5	9.5	9.3	21.5	15.5	25.7	10.6	27	cosl	
16-20	B3ca	18.1	17.9	7.2	11.0	9.0	24.1	12.7	26.0	12.9	22	cosl	
20-35+	Cca	8.5	16.3	10.1	15.8	10.6	24.3	14.4	28.4	14.3	35	sl	
pH		ORGANIC MATTER				Free Iron $\% \text{Fe}_2\text{O}_3$	6E1a CoCO ₃ equiv- alent		MOISTURE TENSIONS			4B2 15 ATMOS.	
8C1a		1:5	1:10	6A1a ORGANIC CARBON	6B1a NITRO- GEN	C/N	6C1a		1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.		
				%	%				%	%	%		
1:1													
6.1				1.83	0.124	15	1.1					6.6	
6.4				1.71	0.160	11	1.2					9.3	
7.5				0.87	0.072	12	1.1		< 1			8.5	
8.2				0.39	0.043	9	1.0		2			8.0	
8.3				0.12	0.009		1.2		2			11.9	
5A1a CATION EXCHANGE CAPACITY NH ₄ Ac		EXTRACTABLE CATIONS					5B1a BASE SAT. %	5C3 Base Sat. % on Sum	Sum Bases 5B1a	Sum Cations 5A3a	Ca/Mg		
6N2b Ca		6O2b Mg		6H1a H	6P2a Na	6Q2a K	5C1 Cations	me/100g		8D3			
		milliequivalents per 100g. soil											
10.2		5.8	1.4	4.0	<0.1	1.1	81	67	8.3	12.3	4.1		
14.0		9.4	2.1	3.2	<0.1	1.5	93	80	13.0	16.2	4.5		
15.4		11.8	2.8	1.6	0.2	2.5	112	92	17.3	18.9	4.2		
14.7			2.9	<0.1	0.6	3.4							
22.2			4.1	<0.1	1.5	5.0							

Soil Type: Buena Vista very stony sandy loam. Described by: A. J. Cline
 Location: NW $\frac{1}{4}$ of Sec. 26, T14S, R77W, Chaffee County, Colorado.
 Date of Sampling: September 1957
 Collectors: J. Retzer, E. M. Payne, R. Dansdill, A. J. Cline
 Physiographic Position: Upland ridge at an elevation of approximately 9,300 feet.
 Topography: A moderate convex slope of approximately 7 percent facing east.
 Drainage: Well drained.
 Vegetation: Ring Muhly, blue grama, sage, and scattered weeds.
 Use: National Forest Service land.
 Soil Nos.: 858 Colo-8-10

Lincoln Horizon

Lab. No.			
9086	A ₁	0-3 inches	Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) stony sandy loam; soft when dry, very friable when moist; strong very fine granular structure; noncalcareous; approximately 20 percent of this horizon is small stone and gravel; lower boundary clear and smooth.
9087	AB	3-10 inches	Brown (10YR 5/3 dry) to dark brown (10YR 3/3 moist) stony sandy loam; slightly hard when dry, very friable when moist; weak to moderate medium subangular blocky structure breaking to moderate medium granules; noncalcareous; approximately 50 percent of this horizon is stone; lower boundary clear and smooth.
9088	B _{2t}	10-16 inches	Brown or pale brown (10YR 5.5/3 dry) to dark brown (10YR 3.5/3 moist) stony sandy clay loam; slightly hard when dry, very friable when moist; moderate fine subangular blocky structure; noncalcareous; there are thin patchy clay skins on both the horizontal and vertical faces of most of the soil aggregates, and there is a thin nearly continuous coating of clay on the rock fragments; approximately 50 percent of this horizon is stone; lower boundary gradual and smooth.
9089	B _{3ca}	16-20 inches	Pale brown (10YR 6/3 dry) to brown or dark brown (10YR 4/3 moist) stony sandy loam; slightly hard when dry, very friable when moist; weak medium subangular blocky structure; violently effervescent; this is a weak horizon of lime accumulation with some visible lime occurring as concretions; approximately 50 percent of this horizon is rock and there is some lime coating on their surfaces; lower boundary gradual and smooth.
9090	C _{ca}	20-35 $\frac{1}{2}$ inches	Light gray (2.5Y 7/1 dry) to gray or grayish brown (2.5Y 5/1.5 moist) stony sandy loam; slightly hard when dry, very friable when moist; massive; violently effervescent; this is a prominent horizon of lime accumulation with visible lime occurring in finely divided forms and as small concretions; approximately 70 percent of this horizon is stone and the surfaces of most of the stones are coated with lime. This horizon grades downward into only slightly fractured trachyte rocks.

SOIL: Quick loam SOIL Nos. S61Colo-3-5 LOCATION Arapahoe County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 15517-15524 February 1965

Depth (in.)	Horizon	1B1a Size class and particle diameter (mm)											3A1		3A1a Clay			Coarse fragments 2A2		
		Total																		
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	Carbonate	Noncarbonate	> 2	2-19	19-76		
Pct. of < 2 mm																				
0-3	A1	31.3	53.0	15.7	1.8	1.1	1.2	6.7	20.5	38.2	14.8	63.0	10.8		16	Tr.				
3-6	B1	30.9	43.1	26.0	2.1	1.1	1.2	7.3	19.2	31.2	11.9	55.1	11.7		26	Tr.				
6-11	B2t	31.9	37.7	30.4	2.7	1.5	1.5	8.4	17.8	27.1	10.6	50.3	14.1		30	Tr.				
11-19	II B21ca	25.6	31.2	43.2	1.6a	1.2a	1.5a	8.9a	12.4a	15.2	16.0	33.3	13.2	20	23	Tr.				
19-24	II B22ca	23.5	34.1	42.4	1.2a	0.7a	1.1a	8.2a	12.3a	15.3	18.8	33.1	11.2	18	24	Tr.				
24-31	III B21ca	25.4	36.6	38.0	0.8a	0.8a	1.1a	8.5a	14.2a	18.0	18.6	37.9	11.2	14	24	Tr.				
31-49	III B22ca	31.5	36.0	32.5	2.1a	1.2a	1.5a	10.7a	16.0a	21.4	14.6	44.3	15.5	7	25	Tr.				
49-64	III B23ca	35.0	35.0	30.0	1.8a	1.5a	1.8a	12.6a	17.3a	21.3	13.7	46.8	17.7	3	27	Tr.				
11-19b	II B21ca	36.0	32.4	31.6	2.6	1.4	1.9	12.6	17.5	20.3	12.1	45.8	18.5							
19-24b	II B22ca	33.8	34.1	32.1	1.2	1.1	1.7	11.8	18.0	20.9	13.2	46.5	15.8							
31-49b	III B22ca	36.4	34.2	29.4	1.4	1.1	1.8	12.7	19.4	20.9	13.3	48.6	17.0							
Depth (in.)	6A1a	6B1a	6E1c		6C1a		Bulk density			Water content			pH 8C1a							
	Organic carbon Pct.	Nitrogen Pct.	C/N	Carbonate as CaCO ₃ Pct.	Ext. Iron as Fe Pct.	g/cc	4A1c 30-Cm. g/cc	4A1b Air-Dry g/cc	4E1 COLE f	4B3 30-Cm. Pct.	4B2 15-Bar Pct.	1:10	(1:1)							
0-3	1.41	0.103	14	-	0.8			1.44			6.8		7.2	6.9						
3-6	1.08	0.109	10	-	0.9						10.2		7.1	6.8						
6-11	0.98	0.097	10	Tr.	1.1		1.32c	1.49	0.21	21.4c	12.4		7.5	7.3						
11-19	0.74	0.079	9		0.8						12.1		8.4	7.9						
19-24	0.42	0.045	9		0.6			1.64			12.0		8.5	8.0						
24-31	0.22				0.7			1.74			11.4		8.6	8.1						
31-49	0.08				0.8		1.47	1.69	0.81	26.3	11.0		8.6	8.1						
49-64	0.07				0.8						11.3		8.5	8.1						
Depth (in.)	Extractable bases 5B1a				6B1a Ext. Acidity	Cat. Exch. Cap.		8D3 Ca/Mg	Base saturation											
	6N2b Ca	6O2b Mg	6P2a Na	6Q2a K		5A3a Sum	5A1a Cations NH ₄ OAc		5C3 Sum	5C1 Cations NH ₄ OAc										
0-3	9.2	2.4	Tr.	0.8	12.4	2.8	15.2	12.0		3.8	82	103								
3-6	14.5	3.7	Tr.	0.8	19.0	4.3	23.3	18.6		3.9	82	102								
6-11			0.1	1.0				22.9												
11-19			0.1	0.6				17.6												
19-24			0.2	0.6				17.5												
24-31			0.3	0.5				18.3												
31-49			0.4	0.6				19.2												
49-64			0.5	0.6				19.1												
Depth (in.)	Ratios to Clay 8D1				a. 5-25% carbonate.	b. Analysis after carbonate removal (See method 1B3).	c. One clod.	d. Noncarbonate clay.	e. Total clay.	f. Coefficient of linear extensibility.										
	d NH ₄ OAc CEC	e NH ₄ OAc CEC	e Ext. Iron	e 15-Bar Water																
0-3	0.76	0.76	0.05	0.43																
3-6	0.72	0.72	0.04	0.39																
6-11	0.75	0.75	0.04	0.41																
11-19	0.76	0.41	0.02	0.28																
19-24	0.73	0.41	0.01	0.28																
24-31	0.76	0.48	0.02	0.30																
31-49	0.77	0.59	0.02	0.34																
49-64	0.71	0.64	0.03	0.38																

Micromorphology (Method 4E1). E2 has a very few clay films around pores; none on planar surfaces. Much sparser than in Ws1d E2. No clay films observed in the II B21ca. Fabric of the II B21ca much denser than the E2. Apparently fine-grain carbonate (20 percent clay-size carbonate) has filled every nook and cranny. All sand grains have surrounding fines. Have the sand grains been pushed apart by carbonate? Have about 1.1g./cc. of noncarbonate material. (This value was calculated by subtracting from the interpolated bulk density of 1.57g./cc., the product of the bulk density and the weight fraction of carbonate--1.57 x 30%.) The low weight per unit volume of noncalcareous material indicates that either the noncalcareous fabric has been pushed apart or the parent material was strongly calcareous.

Soil Type: *Buick loam
 Soil Nos.: S61Colo-3-5
 Classification: Brown.
 Location: 2,100 feet east, 970 feet north of the southwest corner of Sec. 22, T5S, R59W, Arapahoe County, Colorado.
 Climate: Continental, average annual precipitation 14 inches. Mean annual temperature 49° F.
 Growing season 150 days. Elevation 5,400 feet.
 Vegetation: Native pasture. Blue grama, buffalograss, pricklypear, some western wheatgrass, sixweeks fescue, and wild alfalfa.
 Parent material: Outwash, probably quarternary age. Solum probably mixed local aeolian material and outwash.
 Physiographic position: Upland.
 Relief: Sloping. 8 percent facing south. Slope about 500 feet long, grades toward small drainage way and out by small subdrainage. Pit about 250 feet from crest of slope.
 Drainage: Surface drainage rapid, internal drainage medium in buried soils but slower than in the loess soils. Moderate intake rate.
 Moisture: Moist to 14 inches. Usually dry. Water table: None
 Stoniness: Few fine water-worn gravel of quartz and feldspar on the surface and throughout the profile. Some increase with depth. Estimated 5 percent by volume.
 Salt or alkali: None observed other than calcium carbonate. Erosion: Slight water and wind erosion.
 Described by: J. B. Brown, June 28, 1961.

Horizon and
 Lincoln Lab. No.

- Al
 15517 0 to 3 inches. Very dark grayish brown (10YR 3.5/2, moist) loam; grayish brown (10YR 5/2, dry) weak medium subangular blocks breaking to weak fine granules; soft when dry, very friable when moist; few fine water-worn gravels; clear smooth boundary.
- B1
 15518 3 to 6 inches. Very dark grayish brown (10YR 3.5/2, moist and crushed) loam; dark grayish brown (10YR 4/2, dry) moderate medium prisms breaking to weak medium angular blocks; slightly hard when dry, very friable when moist; few thin patchy clay films on some vertical faces; few water-worn gravels; clear smooth boundary.
- B2t
 15519 6 to 11 inches. Dark brown (10YR 4/3, moist) clay loam; brown (10YR 4.5/3, dry) dark grayish brown (10YR 4/2, moist and crushed) moderate medium prisms breaking to moderate to strong fine angular blocks; slightly hard when dry, friable when moist; thin nearly continuous clay films on all ped surfaces; many roots and root channels penetrating peds; few water-worn pebbles, with definite stone line of fine gravel at the base; abrupt slightly wavy boundary.
- II B21ca
 15520 11 to 19 inches. Very pale brown (10YR 7/3, moist) heavy loam; very pale brown (10YR 7.5/3, dry) weak medium prismatic breaking to moderate fine subangular blocks; hard when dry, friable when moist; thin patchy clay skins on ped surfaces; roots are plentiful; few small water-worn pebbles; violent effervescence; clear smooth boundary.
- II B22ca
 15521 19 to 24 inches. Pale brown (10YR 6/3, moist) light clay loam; very pale brown (10YR 7/3, dry) weak medium prisms breaking to moderate fine subangular blocks; hard when dry, friable when moist; thin patchy clay films on all ped surfaces; roots and channels plentiful; few small water-worn pebbles present; violent effervescence; clear smooth boundary.
- III B21ca
 15522 24 to 31 inches. Light yellowish brown (10YR 6/4, moist) clay loam; very pale brown (10YR 7/3, dry) moderate coarse prismatic breaking to moderate medium subangular blocks; hard when dry, firm when moist; thin patchy clay films on ped surfaces, with dark streaks on outside of peds; some roots; more fine gravel in this horizon than the ones above; violent effervescence; gradual smooth boundary.
- III B22ca
 15523 31 to 49 inches. Yellowish brown (10YR 5/4, moist) clay loam; light yellowish brown (10YR 6/4, dry) moderate coarse prismatic; very hard when dry, firm when moist; thin nearly continuous clay films; dark stains on peds continue; lime concretions are common medium and distinct; few pebbles and more coarse sand; strongly calcareous between lime concretions; lime concretions violently effervescent; gradual smooth boundary.
- III B23ca
 15524 49 to 64 inches. Yellowish brown (10YR 5/4, moist) heavy loam; light yellowish brown (10YR 6/4, dry) weak to moderate coarse prismatic; hard when dry, friable when moist; thin patchy clay skins on vertical faces; many small holes less than one millimeter in diameter; lime concretions are few medium and distinct; strong to violent effervescence.

Remarks: This soil is found on the side slopes beneath the Aeolian Loess caps, and above residual soils on shale at the foot of slopes. The buried soils are quite distinctive; although it is hard to distinguish a difference between them and the modern soil. Dark staining of ped surfaces and clay films are the distinguishing characteristics. The stone line, as found in this profile, is not normally seen. This is the type location of the Buick series.

Bureau of Public Roads Samples: Al, 0-3 inches; B2, 6-11 inches; III B22ca, 31-49 inches.

SELECTED PARTICLE-SIZE DATA

L&L No.	Horizon	Total Sand %	Percent of Total Sand					Ratio Coarse Over Fine Silt
			Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	
15517	Al	31.3	5.8	3.5	3.8	21.4	65.5	2.6
15518	B1	30.9	6.8	3.6	3.9	23.6	62.1	2.6
15519	B2t	31.9	8.5	4.7	4.7	26.3	55.8	2.6
15520	II B21ca	36.0*	7.2*	3.9*	5.3*	35.0*	48.6*	1.7*
15521	II B22ca	33.8*	3.6*	3.2*	5.0*	34.9*	53.3*	1.6*
15522	III B21ca							
15523	III B22ca	36.4*	3.8*	3.0*	4.9*	34.9*	53.4*	1.6*
15524	III B23ca							

*Carbonate removed with pH-5 NaOAc buffer.

Observations of fabric with stereoscopic microscope: B2 may have a very few clay films. Peds appear denser and shinier than 3-8.

SOIL *Brick loam SOIL Nos. 962CoLo-3-6 LOCATION Arapahoe County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 16991-16998 February 1965

Depth (in.)	Horizon	Size class and particle diameter (mm)											3A1		3A1aClay			Coarse fragments 2A2		
		1B1b Total				Sand							Silt		Carbonate	Concarbonate	> 2 Pct.	2-19 Pct.	19-76 Pct.	
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Course (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)							
Pct. of < 2 mm																				
0-4	A1	32.8	51.2	16.0	0.1a	0.5a	0.7a	3.6	27.9	38.7	12.5	69.0	4.9		16	Tr.				
4-7	B1	34.0	40.8	25.2	0.1a	0.3a	0.7a	3.7	29.2	29.5	11.3	61.2	4.8		25	Tr.				
7-15	B2	27.8	43.5	28.7	0.2a	0.3a	0.6a	3.0	23.7	29.7	13.8	55.4	4.1		29	Tr.				
15-25	B31ca	16.2	54.4	29.4	0.1b	0.1b	0.3c	1.3c	14.4c	32.9	21.5	48.2	1.8	3	26	Tr.				
25-36	B32ca	14.8	56.8	28.4	-	0.1b	0.3c	1.2c	13.2c	34.4	22.4	48.4	1.6	3	25	Tr.				
36-43	11B21ca	16.4	55.2	28.4	-	0.2c	0.6c	2.0c	13.6c	32.9	22.3	47.7	2.8	2	26	Tr.				
43-50	11B22ca	22.4	47.9	29.7	0.2c	0.6c	1.6c	4.6c	15.4c	30.7	17.2	48.7	7.0	2	28	Tr.				
50-60+	11B23ca	26.6	41.1	32.3	0.6c	1.2c	2.8c	7.3c	14.7c	26.6	14.5	45.0	11.9	1	31	Tr.				
7-15d	B2	27.5	44.0	28.5	-	0.2	0.6	2.7	24.0	31.3	12.7	56.1	3.5							
15-25d	B31ca	18.8	51.0	30.2	-	0.1	0.2	1.0	17.5	31.3	19.7	49.5	1.3							
25-36d	B32ca	16.6	52.5	30.9	-	0.1	0.2	1.0	15.3	32.3	20.2	48.3	1.3							
36-43d	11B21ca	18.0	51.5	30.5	-	0.2	0.5	1.9	15.4	31.2	20.3	47.8	2.6							
43-50d	11B22ca	24.5	45.7	29.8	0.2	0.7	1.6	5.0	17.0	31.1	14.6	50.9	7.5							
50-60+d	11B23ca	28.7	41.3	30.0	0.7	1.2	2.9	7.6	16.3	26.7	14.6	46.9	12.4							
Depth (in.)	Organic carbon	Nitrogen	C/N	6B1b Carbonate as CaCO ₃	Bulk density			Water content			pH									
					Pct.	Pct.	Pct.	g/cc	g/cc	g/cc	Pct.	Pct.	Pct.			(1:1)				
0-4				-																
4-7				-																
7-15				-																
15-25				9																
25-36				9																
36-43				6																
43-50				3																
50-60+				4																
Depth (in.)	Extractable bases				Base saturation															
	Ca	Mg	Na	K																
meq/100 g					Pct.	Pct.														

- a. 25-50% organic matter.
- b. > 50% mica-like. 5-25% carbonate.
- c. < 5% mica-like. 5-25% carbonate.
- d. Analysis after carbonate removal (see method 1B3).

Soil Type: *Buick loam

Soil Nos. S62Colo-3-6

Classification: Brown.

Location: 2,300 feet south, 200 feet east of the northwest corner of Sec. 2, T4S, R60W, Arapahoe County, Colorado.

Climate: Continental, average annual precipitation 14 inches. Mean annual temperature 49°F.

Growing season 150 days. Elevation 5,200 feet.

Vegetation: Native pasture. Blue grass, buffalograss, pricklypear, some western wheatgrass, sixweeks fescue, and wild alfalfa.

Parent material: Outwash, quarternary age. Modern solon probably mixed local aeolian material and outwash.

Physiographic position: Upland

Relief: Sloping 7 percent facing south. Slope about 400 feet long, grades toward small drainage way, and cut by smaller subdrainages. Pit about 100 feet from crest of slope.

Drainage: Surface drainage rapid, internal drainage medium in buried soil, but slower than in the modern soil. Moderate intake rate.

Moisture: Dry. Water table: None.

Stoniness: Few fine water-worn gravel of quartz and feldspar on the surface and throughout the profile.

Salt or alkali: None observed other than calcium carbonate. Erosion: Slight water and wind.

Described by: J. B. Brown, May 15, 1962.

Horizon and

lineoln

lab. No.

- A1 16991 0 to 4 inches. Dark grayish brown (10YR 4/2, moist) loam; light brownish gray (10YR 6/2, dry) weak medium subangular blocks breaking to weak very fine granules; soft when dry, very friable when moist; few fine water-worn gravels; clear smooth boundary.
- E1 16992 4 to 7 inches. Dark grayish brown (10YR 4/2, moist) loam; brown (10YR 5/3, dry) moderate medium prisms breaking to moderate medium subangular blocks; slightly hard when dry, very friable when moist; thin very patchy clay films on some vertical faces in the lower part; bleached sand grains common; few water-worn gravel; many roots; clear smooth boundary.
- E2t 16993 7 to 15 inches. Dark brown (10YR 4/3, moist and crushed) clay loam; brown (10YR 5/3, dry) moderate medium prisms breaking to strong fine angular and subangular blocks; hard when dry, friable when moist; thin patchy clay films on ped surfaces; bleached sand grains common in the upper part; dark staining on ped surfaces.
- B31ca 16994 15 to 25 inches. Brown (10YR 5/3, moist) light silty clay loam; pale brown (10YR 6/3, dry) moderate medium prisms breaking to strong fine subangular blocks; very hard when dry, friable when moist; violent effervescence; thin patchy clay films on peds; clear smooth boundary.
- B32ca 16995 25 to 30 inches. Brown (10YR 5/3, moist) light silty clay loam; pale brown (10YR 6/3, dry) moderate medium prisms breaking to moderate fine subangular blocks; very hard when dry, friable when moist; violent effervescence; common medium distinct lime concretions; thin patchy clay films on vertical faces; gradual smooth boundary.
- II B21ca 16996 36 to 43 inches. Yellowish brown (10YR 5/4, moist) silty clay loam; light yellowish brown (10YR 6/4, dry) moderate medium prisms breaking to moderate medium and fine subangular blocks; slightly hard when dry, friable when moist; strong effervescence; few thin patchy clay films present; many very fine pores; clear smooth boundary.
- II B22ca 16997 43 to 50 inches. Brown (7.5YR 5/5, moist) clay loam; light brown (7.5YR 6/5, dry) moderate coarse prisms; slightly hard when dry, friable when moist; violent effervescence; common medium distinct lime concretions; thin patchy clay films; many fine pores; clear smooth boundary.
- II B23ca 16998 50 to 60 inches plus. Brown (7.5YR 5/5, moist) clay loam; light brown (7.5YR 6/5, dry) moderate medium to coarse prisms breaking to weak medium subangular blocks; slightly hard when dry, friable when moist; violent effervescence; very few thin patchy clay films on vertical faces; many fine pores.

Remarks: This profile was collected about 100 feet from soil Nos. S61Colo-3-8. It is very similar with more development in the E2 horizon. Texture change between E2 and B3ca indicates changes in parent material, also increase in hardness. II B21ca may be an old buried A horizon. This layer had several large burrow holes in it.

Micromorphology (Method 4E1). In thin section the E2 shows more evidence of clay films than does 61-3-8 and about the same as 61-3-5. Under the stereoscopic microscope a very occasional thin clay film is observable. But there is considerable question that the expression is sufficient for reliable field identification. Although the E2 tends toward Class 2, it probably would still fall within Class 1.

SOIL *Buick loam SOIL Nos. 961Colo-3-8 LOCATION Arapahoe County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 15541-15549 February 1965

Depth (in.)	Horizon	1B1a Size class and particle diameter (mm) 5A1											6A1a Clay		Coarse fragments 2A2			
		Total			Sand					Silt			Carbonate	Noncarbonate	> 2	2-19	19-76	
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)						(2-0.1)
0-3	A1	42.1	47.1	10.8	0.8	1.6	3.3	9.3	27.1	36.7	10.4	68.6	15.0		11	Tr.		
3-6	B1	40.4	37.4	22.2	1.0	1.5	3.5	10.1	24.3	28.6	8.8	58.1	16.1		22	Tr.		
6-10	B2t	32.8	40.9	26.3	0.5	1.1	2.5	7.0	21.7	30.9	10.0	56.3	11.1		26	Tr.		
10-12	B2ca	32.2	42.7	25.1	0.6a	1.1a	2.4a	6.8a	21.3a	31.7	11.0	56.6	10.9	Tr.	25	Tr.		
12-24	11B21ca	32.3	41.9	25.8	0.8a	1.3a	2.4a	6.9a	20.9a	29.0	12.9	53.5	11.4	4	22	Tr.		
24-32	11B22ca	32.4	41.4	26.2	1.4a	1.0a	2.3a	6.8a	20.9a	29.1	12.3	53.8	11.5	4	22	Tr.		
32-42	11B21ca	35.4	33.2	31.4	1.6a	1.5a	3.0a	13.5a	15.8a	19.0	14.2	42.3	19.6	3	28	Tr.		
42-55	11B22ca	24.8	41.3	33.9	1.0a	0.7a	1.6a	7.8a	13.7a	23.5	17.8	41.9	11.1	3	31	Tr.		
55-72	11B23ca	37.3	31.8	30.9	1.5a	1.6a	2.8a	14.1a	17.3a	18.5	13.3	44.3	20.0	1	30	Tr.		
10-12b	B2ca	33.0	41.6	25.4	0.6	1.0	2.4	7.1	21.9	31.0	10.6	56.5	11.1					
12-24b	11B21ca	35.9	37.8	26.3	0.7	1.2	2.8	7.7	23.5	27.0	10.8	54.5	12.4					
24-32b	11B22ca	35.0	38.0	27.0	0.8	1.0	2.2	7.7	23.3	26.5	11.5	53.9	11.7					
42-55b	11B22ca	27.3	36.3	36.4	1.0	0.7	1.7	8.7	15.2	19.1	17.2	39.3	12.1					
55-72b	11B23ca	38.9	31.5	29.6	1.6	1.7	3.0	14.3	18.3	17.8	13.7	44.5	20.6					
Depth (in.)	6A1a	6B1a	C/N	6E1c	6C1a	Bulk density			4M COLE	Water content				pH	8C1a			
	Organic carbon	Nitrogen		Carbonate as CaCO ₃	Ext. Iron as Fe	4A1c	4A1b Air-Dry	30-Cm.		4B3	4B1b	4B2	4C1 1/3- to 15-Bar in. per horizon		1:10	(1:1)		
	Pct.	Pct.		Pct.	Pct.	g/cc	g/cc	g/cc		Pct.	Pct.	Pct.						
0-3	1.32	0.097	14	-	0.6			1.38			11.1	5.3		6.8	6.6			
3-6	0.92	0.096	10	-	0.8						19.0	9.2		6.8	6.4			
6-10	0.76	0.087	9	Tr.	0.8			1.36	1.50	0.12	24.0	20.6	11.0	0.5	7.8	7.4		
10-12	0.55	0.086	6		0.6							10.9		8.3	7.8			
12-24	0.41	0.053	8		0.6			1.68				20.7		8.5	8.1			
24-32	0.29				0.7							18.8		8.6	8.2			
32-42	0.16				0.7			1.90				22.0		8.8	8.3			
42-55	0.07				0.7							22.0		8.7	8.2			
55-72	0.03				0.3							12.2		8.7	8.2			
Depth (in.)	Extractable bases 5E1a				6H1a	Cat. Exch. Cap.		Ratios to Clay				8D3	Base saturation					
	6N2b	6O2b	6P2a	6Q2a	Ext. Acidity	5A3a Sum	5A1a Cations NH ₄ OAc	8D2 NH ₄ OAc	8D1 NH ₄ OAc	8D1 Ext. Iron	8D1 15-Bar Water		Ca/Mg	5C3 Sum	5C1 NH ₄ OAc			
								c	d	d	d		Pct.	Pct.				
0-3	6.7	1.7	Tr.	0.7	9.1	2.6	11.7	9.9	0.92	0.92	0.06	0.49	3.9	78	92			
3-6	12.1	3.0	Tr.	0.8	15.9	2.8	18.7	16.4	0.74	0.74	0.04	0.41	4.0	85	97			
6-10			Tr.	0.9				20.6	0.78	0.78	0.03	0.42						
10-12			Tr.	0.7				18.5	0.74	0.74	0.02	0.43						
12-24			Tr.	0.1				16.4	0.74	0.64	0.02	0.40						
24-32			Tr.	0.2				17.1	0.78	0.65	0.03	0.40						
32-42			Tr.	0.7				20.0	0.71	0.64	0.02	0.38						
42-55			Tr.	1.0				23.1	0.74	0.68	0.02	0.41						
55-72			Tr.	1.0				20.6	0.69	0.67	0.03	0.39						

- a. 5-25% carbonate.
- b. Analysis after carbonate removal (see method 1B3).
- c. Noncarbonate clay.
- d. Total clay.
- e. Coefficient of linear extensibility.

Observations of fabric with stereoscopic microscope: No clay films observed in the E1, E2, or E3. E2 has smooth planar surfaces; sand grains protrude. Classify three horizons as 0 or 1, probably 0.

Micromorphology (Method 4E1). Essentially no clay films observed in E2. Perhaps here and there a very small one is tucked away in an out-of-the-way spot. But they are extremely sparse and small.

Soil Type: *Buick loam
 Soil Nos.: S61Colo-3-8
 Classification: Brown.
 Location: 2,300 feet south, 89 feet east of the northwest corner of Sec. 2, T4S, R60W, Arapahoe County, Colorado.
 Climate: Continental, average annual precipitation of 14 inches. Mean annual temperature 49° F.
 Growing season 150 days. Elevation 5,200 feet.
 Vegetation: Native pasture. Blue grama, buffalograss, pricklypear, some western wheatgrass, sixweeks fescue, and wild alfalfa.
 Parent material: Outwash, probably quarternary age. Modern solum: probably mixed local aeolian material and outwash.
 Physiographic position: Upland.
 Relief: Sloping 7 percent facing south. Slope about 400 feet long, grades toward small drainage way, and out by smaller subdrainage. Pit about 100 feet from crest of slope.
 Drainage: Surface drainage rapid, internal drainage medium in buried soil, but slower than in the loess soils. Moderate intake rate. Moisture: Moist to 12 inches. Usually dry. Water table: None.
 Stoniness: Few fine water-worn gravel of quartz and feldspar on the surface and throughout the profile. Estimated less than 5 percent by volume.
 Salt or Alkali: None observed other than calcium carbonate. Erosion: Slight water and wind erosion.
 Described by: J. B. Brown, June 29, 1961.
 Horizon and
 Lincoln
 Lab. No.

- Al
 15541 0 to 3 inches. Very dark grayish brown (10YR 3.5/2, moist) loam; grayish brown (10YR 5/2, dry) weak medium subangular blocks breaking to weak very fine granules; soft when dry, very friable when moist; few fine water-worn gravels; clear smooth boundary.
- B1
 15542 3 to 6 inches. Very dark grayish brown (10YR 3.5/2, moist) loam; dark grayish brown (10YR 4/2, dry) moderate medium prisms breaking to weak medium angular blocks; slightly hard when dry, very friable when moist; thin very patchy clay films on some vertical faces; few fine water-worn gravels, and many roots; clear smooth boundary.
- B2t
 15543 6 to 10 inches. Dark brown (10YR 4/3 moist and crushed) light clay loam; brown (10YR 4.5/3, dry) moderate medium to fine prisms breaking to moderate fine angular blocks; slightly hard when dry, friable when moist; thin patchy clay films on all ped surfaces; some dark stains on ped surfaces; few fine water-worn gravels; many roots penetrating ped; abrupt slightly wavy boundary.
- B2ca
 15544 10 to 12 inches. Brown (10YR 4.5/3, moist and crushed) heavy loam; brown (10YR 5.5/3, dry) moderate fine angular blocks; slightly hard when dry, friable when moist; thin patchy clay films on all ped surfaces; few fine water-worn gravels; many roots and pores; strong to violent effervescence; abrupt smooth boundary.
- II B21ca
 15545 12 to 24 inches. Brown (10YR 5/3, moist) light clay loam; pale brown (10YR 6/3, dry) weak to moderate medium prisms breaking to moderate medium and fine subangular blocks; hard when dry, friable when moist; thin patchy clay films on ped surfaces; roots and pores plentiful in this horizon; few fine water-worn gravel present; lime concretions are common medium and distinct; violent effervescence; gradual smooth boundary.
- II B22ca
 15546 24 to 32 inches. Brown (10YR 5/3, moist) clay loam; pale brown (10YR 6/3, dry) weak medium prisms breaking to moderate medium subangular blocks; hard when dry, firm when moist; thin very patchy clay films on some vertical faces; some roots and channels; few fine gravels present; lime concretions are common fine and distinct; violent effervescence; clear smooth boundary.
- III B21ca
 15547 32 to 42 inches. Yellowish brown (10YR 5/3.5, moist) clay loam; light yellowish brown (10YR 6.5/3.5, dry) strong coarse to very coarse prisms; very hard when dry, firm when moist; thin nearly continuous clay films; dark stains on ped surfaces; few roots; few fine water-worn gravels present; lime concretions are common medium to coarse and distinct; strongly effervescent between concretions; concretions are violently effervescent; gradual smooth boundary.
- III B22ca
 15548 42 to 55 inches. Yellowish brown (10YR 5/3.5, moist) clay loam; light yellowish brown (10YR 6.5/3.5, dry) moderate to strong coarse and very coarse prismatic; very hard when dry, firm when moist; thin nearly continuous clay films and some dark stains on ped; few fine water-worn gravels present; lime concretions are common medium to coarse and distinct; strongly effervescent between concretions; violently effervescent in concretions; gradual boundary.
- III B23ca
 15549 55 to 72 inches. Yellowish brown (10YR 5/3.5, moist) clay loam; light yellowish brown (10YR 6/3.5, dry) moderate coarse to very coarse prisms; very hard when dry, firm when moist; thin patchy clay films; few fine water-worn gravels present; lime concretions are common medium and distinct; strongly effervescent between concretions; concretions are violently effervescent.

Remarks: This soil is found on the side slopes beneath the Aeolian Loess caps, and above residual soils on shale at the foot of slopes. The buried soils are quite distinctive; although it is hard to distinguish a difference between them and the modern soil. Dark staining of ped surfaces and clay films are the distinguishing characteristics. The II B2ca horizon was separated as a buried horizon on consistence. It may be a B3ca horizon rather than a buried

Bureau of Public Roads Samples: Al, 0-3 inches; B2, 6-10 inches; III B22ca, 42-55 inches. horizon.

SELECTED PARTICLE-SIZE DATA

L&L No.	Horizon	Total Sand %	Percent of Total Sand					Ratio Coarse Over Fine Silt
			Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	
15541	Al	42.1	1.9	3.8	7.8	22.1	64.4	3.5
15542	B1	40.4	2.5	3.7	8.7	25.0	60.1	3.3
15543	B2t	32.8	1.5	3.4	7.6	21.3	66.2	3.9
15544	B2ca	33.0*	1.8*	3.0*	7.3*	21.5*	66.4*	2.9
15545	II B21ca	35.9*	1.9*	3.3*	7.8*	21.4*	65.4*	2.5
15546	II B22ca	35.0*	2.3*	2.8*	6.3*	22.0*	66.6*	2.3
15548	III B22ca	27.3*	3.7*	2.6*	6.2*	31.9*	55.7*	1.1
15549	III B23ca	38.9*	4.1*	4.4*	7.7*	36.8*	47.0*	1.3

* Carbonate removed with pH-5 NaOAc buffer.

SOIL SURVEY LABORATORY Lincoln, Nebr. June 1961

SOIL TYPE *Cabin LOCATION Gunnison County, Colorado
fine sandy loam

SOIL NOS. 859Colo-26-4 LAB. NOS. 12004-12009

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY				> 2
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	(< 0.075mm)	
0-3 1/2	A11	21.6	18.7	6.4	7.7	5.4	27.7	12.5	24.5	12.3	Tr.	cosl
3 1/2-8	A12	30.5	17.5	4.0	7.4	5.0	22.7	12.9	20.9	10.3	25	cosl
8-14	B1	16.0	19.6	9.0	12.6	7.8	21.0	14.0	25.7	9.4	20	cosl
14-22	B2	20.3	23.7	9.4	11.8	6.0	17.1	11.7	20.0	8.7	25	cosl
22-32	B3	20.9	23.9	9.9	12.0	5.3	16.3	11.7	19.6	7.6	26	cosl
32-41	C	20.1	26.1	12.2	15.9	6.2	12.7	6.8	20.0	6.5	34	lcos
8C1a		pH		ORGANIC MATTER			6C1a		MOISTURE TENSIONS			
		1:5	1:10	6A1a	6B1a		Free Iron	CaCO3 equiv. cent	1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.	4B2
				ORGANIC CARBON	NITROGEN	C/N	Fe2O3 %	%	%	%	%	%
				%	%							
				3.40	0.245	14	1.3					8.5
				1.10	0.110	10	1.2					6.1
				0.55	0.046	12	1.3					5.3
				0.24	0.026		1.0					4.8
				0.12			1.2					4.8
				0.09			0.9					3.6
5A1a		EXTRACTABLE CATIONS 5B1a					BASE SAT. %	Base Sat. %	Sum Ext.	Sum Ext.	Ca/Mg	4A1h
CATION EXCHANGE CAPACITY	6N2b	6O2b	6H1a	6P2a	6Q2a	NH4OAc EXCH. 5C1	on Sum Cations 5C3	Bases	Cations 5A3a	8D3	O. D. Bulk Density g/cc	
	Co	Mg	H	Na	K							
μmolequivalents per 100g. soil												
15.5	9.7	1.9	6.9	< 0.1	0.9	81	64	12.5	19.4	5.1	1.42	
12.1	7.6	1.7	4.8	< 0.1	0.8	83	68	10.1	14.9	4.5		
10.1	7.0	1.9	3.3	< 0.1	0.4	92	74	9.3	12.6	3.7		
9.7	7.5	1.8	3.1	< 0.1	0.2	98	75	9.5	12.6	4.2	1.72	
9.1	7.8	1.7	2.8	< 0.1	0.1	105	77	9.6	12.4	4.6	1.78	
6.9	6.2	1.5	1.4	0.1	0.1	114	85	7.9	9.3	4.1		

Soil Type: *Cabin fine sandy loam.

Date: Sept. 1959, by W. Goddard, J. S. Allen, L. Juve, C. J. Fox

Area: Gunnison County, Colorado

Location: SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 16, T. 14 S., R. 82 W. Near east edge of photo 2719

Parent Material: Granitic glacial outwash

Physiographic position: Glacial outwash at elevation of 9,475 feet.

Topography: Surface of very gently sloping benchlike area with 2 percent gradient.

Drainage: Well drained

Vegetation: Big sagebrush (*Artemisia tridentata*), ring muhly (*Mullenbergia torreyi*), fescue, cacti, Jacob's ladder. About 70% of ground surface has vegetative cover.

Use: Rangeland Described by: Charles J. Fox.

Soil Nos.: S-59-Colo-26-4

Remarks: Gravel up to 1 inch in diameter occupy approximately 10 percent of surface area.

Lincoln Horizon
Lab. No.

- | | | | |
|-------|-----------------|---------------------------|--|
| 12004 | A ₁₁ | 0-3 $\frac{1}{2}$ inches | Brown (10YR 4/3 dry) to dark brown (10YR 3/3 moist) fine sandy loam; weak very fine granular structure; soft when dry, very friable when moist, nonplastic when wet; sand grains stained; approximate pH 6.5; roots plentiful; lower boundary clear and wavy. |
| 12005 | A ₁₂ | 3 $\frac{1}{2}$ -8 inches | Brown (10YR 4/3 dry) to dark brown (10YR 3/3 moist) fine sandy loam; weak medium angular blocky structure breaking to moderate fine granules; slightly hard when dry, very friable when moist, nonplastic when wet; sand grains stained; about 5 percent of horizon is gravel; approximate pH 6.5; roots plentiful; lower boundary clear and wavy. |
| 12006 | B ₁ | 8-14 inches | Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) gravelly sandy clay loam; weak medium angular blocky structure breaking to medium fine granules; hard when dry, firm when moist, slightly plastic when wet; sandy grains stained; very thin discontinuous clay films; approximate pH 6.5; about 2 percent of horizon is rounded granitic gravel 2 or 3" in diameter; roots plentiful; lower boundary clear and smooth. |
| 12007 | B ₂ | 14-22 inches | Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) gravelly clay loam; moderate medium angular blocky structure breaking to moderate fine granules; very hard when dry, firm when moist, plastic when wet; thin continuous clay skins; sand grains stained; approximate pH 6.0; rounded granitic gravel up to 3" in diameter occupy about 5 percent of horizon; roots few; lower boundary gradual and wavy. |
| 12008 | B ₃ | 22-32 inches | Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) gravelly sandy clay loam; weak medium angular blocky structure structure breaking to weak fine granules; hard when dry, firm when moist slightly plastic when wet; very thin discontinuous clay films; sand grains stained; approximate pH 6.0; rounded granitic stones up to 4" in diameter are stained on under sides and occupy about 8 percent of horizon; roots few; lower boundary gradual and wavy. |
| 12009 | C | 32-41 inches | Yellowish brown (10YR 5/4 dry) to dark yellowish brown (10YR 4/4 moist) gravelly loamy sand; single grain structure; sand grains clean; rounded granitic stones up to 10" in diameter occupy 50 percent of volume; approximate pH 6.0; no roots. |

SOIL TYPE *Cabin LOCATION Gunnison County, Colorado
fine sandy loam

SOIL NOS. S59Colo-26-5 LAB. NOS. 12010-12015

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002 (< 0.001)	2A2 > 2	
0-4	A11	11.4	12.2	6.6	10.2	9.4	35.8	14.4	34.6	15.8	Tr.	1
4-8	A12	9.3	11.2	7.0	11.8	11.3	34.1	15.3	36.5	14.9	Tr.	1
8-11	B1	10.3	11.8	7.7	13.4	11.9	29.5	15.4	36.2	12.2	Tr.	fs/sl
11-22	B2	16.1	16.1	9.9	15.4	8.5	18.0	16.0	26.5	7.4	27	cosl
22-34	B3	9.0	16.7	9.5	15.3	11.1	24.6	13.8	33.2	10.2	45	cosl
34-41	C	14.1	22.8	11.6	17.6	10.0	16.6	7.3	27.6	7.7	31	cosl
pH		ORGANIC MATTER				6C1a	6E1c		MOISTURE TENSIONS			
8C1a	1:5	6A1a	6B1a		6C1a						4B2	
	1:10	ORGANIC CARBON	NITROGEN	C/N	Free Iron	CoCO ₃ equivalent	1/10 ATMOS.	1/3 ATMOS.	15		ATMOS.	
		%	%		Fe ₂ O ₃ %	%	%	%	%		%	
6.4		2.56	0.208	12	1.6						7.9	
6.3		1.13	0.107	11	1.8						6.6	
6.1		0.54	0.061	9	1.7						6.5	
6.2		0.34	0.028	12	1.5						6.2	
6.5		0.19	0.019		1.4	< 0.1					5.6	
6.7		0.05			0.9	< 0.1					3.6	
5A1a		EXTRACTABLE CATIONS				5B1a	BASE SAT. * NH ₄ CAc EXCH.	Base Sat. % on Sum Cations	Sum Ext. Bases	Sum Ext. Cations	Ca/Mg	4A1h
CATION EXCHANGE CAPACITY NH ₄ OAc		6N2b	6O2b	6H1a	6P2a	6Q2a						O. D. Bulk Density g/cc
		Co	Mg	H	Na	K						
		milliequivalents per 100g. soil					5C1	5C3	5B1a	5A3a	8D3	
14.8	10.4	1.9	7.9	< 0.1	1.0	90	63	13.3	21.2	5.5		1.37
11.6	7.6	1.9	5.5	< 0.1	0.6	87	65	10.1	15.6	4.0		
11.4	7.8	2.0	4.3	< 0.1	0.4	89	70	10.2	14.5	3.9		
12.5	9.8	2.6	3.6	0.1	0.2	102	78	12.7	16.3	3.8		1.71
11.2	10.9	2.5	3.1	0.1	0.1	121	81	13.6	16.7	4.4		
8.0		1.5	1.9	0.1	0.1							

Soil Type: *Cabin fine sandy loam.

Date: Sept. 1959, by W. Goddard, J. S. Allen, L. Juve, C. J. Fox

Area: Gunnison County, Colorado

Location: SW $\frac{1}{4}$ of NE $\frac{1}{4}$ of Sec. 22, T. 14 S., R. 82 W. Photo 2664. Directly north of Holt's Guest Ranch on benchlike area.

Parent material: Granitic glacial outwash

Physiographic position: Glacial outwash at an elevation of 9475 feet.

Topography: Very gently sloping benchlike area with 2 percent gradient.

Drainage: Well-drained.

Vegetation: Dominantly big sagebrush (*Artemisia Tridentata*), ring muhly (*Muhlenbergia torreyi*), Arizona fescue. Some Junegrass (*Koeleria cristata*) and stonecrop (*Sedum* spp.) about 70 percent vegetative ground cover.

Use: Rangeland Described by: Charles J. Fox.

Soil Nos. S-59-Colo-26-5

Remarks: Gravel and a few small stones cover about 10 percent of surface area.

Lincoln Horizon

Lab. No.

- | | | | |
|-------|-----------------|-----------------|---|
| 12010 | A ₁₁ | 0-4
inches | Brown (10YR 4/3 dry) to dark brown (10YR 3/3 moist) fine sandy loam; weak very fine granular structure; soft when dry, very friable when moist, nonplastic when wet; sand grains stained; approximate pH 6.5; roots plentiful; lower boundary abrupt and smooth. |
| 12011 | A ₁₂ | 4-8
inches | Brown (10YR 4/3 dry) to dark brown (10YR 3/3 moist) fine sandy loam; weak medium angular blocky structure breaking to moderate fine granules; a few small gravel; slightly hard when dry, very friable when moist, nonplastic when wet; sand grains stained; approximate pH 6.0; roots plentiful; lower boundary clear and wavy. |
| 12012 | B ₁ | 8-11
inches | Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) gravelly sandy clay loam; weak coarse porous platy structure breaking to weak medium angular blocky aggregates that in turn break to moderate fine granules; faint broken clay films; sand grains stained; hard when dry, firm when moist, plastic when wet; approximate pH 6.0; about 2 percent of volume of horizon made up of small stones; roots plentiful lower boundary clear and smooth. |
| 12013 | B ₂ | 11-22
inches | Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) gravelly clay loam; weak coarse prismatic structure breaking to weak medium angular blocky peds that crush to moderate fine granules; faint complete clay films; very hard when dry, very firm when moist, plastic when wet; sand grains stained; approximate pH 5.5; about 3 percent of this layer is rounded stones; roots plentiful; lower boundary gradual and wavy. |
| 12014 | B ₃ | 22-34
inches | Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) gravelly sandy clay loam; weak medium angular blocky structure breaking to moderate fine granules; extremely hard when dry, very firm when moist, plastic when wet; sand grains stained; about 8 percent rounded stones; roots few; approximate pH 6.0; lower boundary gradual and wavy. |
| 12015 | C | 34-41
inches | Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) gravelly loamy sand; single grain structure; sand grains stained; approximate pH 6.0; rounded glacial stones occupy about 40 percent of this layer; no roots. |

Bureau of Public Roads Samples: 0-8 inches, 8-32 inches, 32-41 inches.

SOIL SURVEY LABORATORY Lincoln, Nebr. 12/21/56

SOIL TYPE Campo LOCATION Baca Co., Colorado
 clay loam

SOIL NOS. S-55-Colo-5-1

LAB. NOS. 3512-3519

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						2A2 > 2
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002			
0-4	A1	0.2	1.9	5.4	6.1	10.0	56.7	19.7	46.2	23.1	-	sil	
4-6	B1	-	1.0	3.0	3.9	5.9	45.3	40.9	32.7	20.3	-	sic	
6-14	B21t	-	0.7	2.1	2.5	4.3	38.4	52.0	25.9	18.0	-	c	
14-18	B22t	-	0.6	1.5	1.9	4.1	49.2	42.7	29.6	24.6	-	sic	
18-29	B31ca	-	0.2	0.5	0.9	4.0	56.6	37.8	31.0	30.1	-	sic1	
29-40	B32ca	-	0.1	0.4	0.9	4.8	59.7	34.1	35.3	29.7	-	sic1	
40-52	Cca	-	0.4	1.0	1.5	4.7	58.5	33.9	35.8	28.2	-	sic1	
52-60+	C	0.5	1.6	2.7	3.6	5.5	54.9	31.2	37.4	24.8	-	sic1	

pH	ORGANIC MATTER					ESTIM. SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC-103 MILLIMHOS PER CM @ 25 C.	6E1a		MOISTURE TENSIONS		4B2 15 ATMOS.
	8C1a		6A1a	6B1a	C/N			CaCO ₃ equivalent	GYPSUM mg./100g. SOIL	1/10 ATMOS.	1/3 ATMOS.	
	1:5	1:10	ORGANIC CARBON %	NITROGEN %								
7.6	7.9	7.9	0.96	.094	10			1			7.3	
6.4	7.0	7.0	1.06	.107	10			-			15.6	
7.1	7.6	7.7	0.80	.081	10			1			20.0	
8.0	8.5	8.7	0.55	.053	9			5			17.5	
8.1	8.7	8.9	0.44	.050	9			13			15.9	
8.3	8.9	9.0	0.34					12			15.0	
8.4	8.9	9.0	0.26					7			14.7	
8.3	8.8	8.9	0.19					6			13.1	

5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS 5B1a					SATURATION EXTRACT SOLUBLE		MOISTURE AT SATURATION %
	6N2b	6O2b	6P2a		6Q2a	Na	K	
	Ca	Mg	N	Na	K	milliequivalents per liter		
NH ₄ Ac	milliequivalents per 100g. soil					← milliequivalents per liter →		
15.2	10.9	3.5		0.1	1.1			
26.6	14.0	9.7		0.5	1.4			
33.1	17.6	13.7		1.0	1.9			
26.9				1.7	1.7			
23.4				2.1	1.2			
21.8				1.6	1.2			
22.4				1.4	1.2			
19.3				1.0	1.2			

Soil Type: Campo clay loam
 Location: 650 feet west and 20 feet south of the northeast corner of Sec. 10, T338;

R47W; Baca County, Colorado.

Date of Sampling: October 6, 1955

Collector: A. J. Cline.

Described by: A. J. Cline

Physiographic Position: Upland.

Topography: Nearly level to slightly concave area of less than 1 percent slope.

Drainage: Moderately well drained

Vegetation: Blue grama, Buffalo grass, Russian thistle

Use: Pasture

Soil Nos.: S55Colo-5-1

Lincoln Laboratory Nos.: 3512-3519

0-4 inches A ₁ LSL 3512	Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 3.6/2 moist) light silty clay loam; soft when dry, very friable when moist; moderate, fine crumb structure; noncalcareous; lower boundary clear and smooth.
4-6 inches B ₁ LSL 3513	Grayish-brown (10YR 5/2 dry) to dark grayish brown (10YR 4/2 moist) heavy silty clay loam; slightly hard to hard when dry, friable when moist; moderate to strong, very fine subangular blocky structure; non-calcareous; thin continuous tonhauthchen; the soil aggregates in this horizon are weakly coated with light gray; lower boundary abrupt and smooth.
6-14 inches B _{21t} LSL 3514	Grayish brown (10YR 5/2.5 dry) to dark grayish brown (10YR 4/2.5 moist) silty clay; extremely hard when dry, very firm when moist; moderate to strong, medium prismatic structure breaking to strong, fine, angular blocks; noncalcareous; moderate continuous tonhauthchen; lower boundary clear and smooth.
14-18 inches B _{22t} LSL 3515	Light brownish gray (10YR 6/2.5 dry) to grayish brown (10YR 5/2.5 moist) silty clay; extremely hard when dry, very firm when moist; moderate to strong, medium and fine, prismatic structure breaking to strong, fine angular blocks; calcareous; there is no visible segregation of lime; thin continuous tonhauthchen; lower boundary gradual and smooth.
18-29 inches B _{31ca} LSL 3516	Very pale brown (10YR 7/2.5 dry) to pale brown (10YR 6/2.5 moist) heavy silty clay loam; very hard when dry, friable when moist; weak to moderate, medium and prismatic breaking to moderate, fine subangular blocks; strongly calcareous; this is a moderate lime horizon containing many large soft calcium carbonate concretions 1/4 to 1/8 inch in diameter; few very thin very patchy tonhauthchen; lower boundary gradual and smooth.
29-40 inches B _{32ca} LSL 3517	Very pale brown (10YR 7/3 dry) to pale brown (10YR 6/3 moist) silty clay loam; hard when dry, friable when moist; weak, medium prismatic breaking to weak, medium and fine, subangular block; violently calcareous; this is a moderate lime horizon containing moderate numbers of small concretions and some finely disseminated lime; lower boundary gradual and smooth.
40-52 inches C _{ca} LSL 3518	Very pale brown (10YR 7/3 dry) to pale brown (10YR 6/3 moist) silt loam; hard when dry, friable when moist; massive, to very weak, coarse subangular blocky structure; violently calcareous; this is a weak to moderate lime horizon containing very few of the concretions of the above two horizons but with some finely disseminated lime; lower boundary gradual and smooth.
52-60 plus inches C LSL 3519	Light yellowish brown (10YR 6/3.5 dry) to yellowish brown (10YR 5/4 moist) silt loam; hard when dry, friable when moist; massive; strongly calcareous; this is a weak to moderate lime horizon but contains noticeably less lime than the horizon above.

SOIL SURVEY LABORATORY Lincoln, Nebr. 12/21/56

SOIL TYPE Campo LOCATION Baca Co., Colorado
clay loam

SOIL NOS. S-55-Colo-5-2 LAB. NOS. 3520-3525

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY				
2.1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002				
0-7	Ap	0.2	3.2	4.7	6.0	13.1	45.5	27.3	44.8	16.8	-	cl
7-15	B21	0.1	3.0	4.0	5.2	9.4	35.5	42.8	33.3	14.2	-	c
15-24	B22	0.1	1.5	2.3	3.4	10.0	41.8	40.9	35.5	18.1	-	sic
24-32	B31ca	0.1	0.8	1.4	2.5	8.5	47.1	39.8	35.7	21.3	-	sic1
32-41	B32ca	0.1	0.2	0.3	0.8	4.3	57.2	37.1	32.9	29.1	-	sic1
41-50	Cca	-	0.1	0.2	0.5	5.2	60.9	33.1	37.4	29.0	-	sic1
50-64	C	-	-	0.1	0.4	5.3	63.7	30.5	39.5	29.4	-	sic1
pH		8C1a ORGANIC MATTER				EST. SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMOS PER CM @ 25°C.	6E1a		MOISTURE TENSIONS		4B2 1/8 ATMOS.
1:1	1:5	1:10	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N			CaCO ₃ equiv. %	GYP SUM mg./100g. SOIL	1/10 ATMOS. %	1/3 ATMOS. %	
7.9	8.3	8.4	0.91	.093	10		1				10.8	
7.2	7.5	7.7	0.73	.079	10		-				17.5	
7.8	8.3	8.4	0.52	.065	8		5				16.0	
8.0	8.1	8.6	0.42	.051	8		8				16.1	
8.0	8.6	8.7	0.35				13				15.6	
8.1	8.6	8.8	0.28				15				14.4	
8.3	8.9	9.0	0.22				11				14.2	
5A1a CATION EXCHANGE CAPACITY		EXTRACTABLE CATIONS 5B1a					SATURATION EXTRACT SOLUBLE					MOISTURE AT SATURATION %
NH ₄ Ac		6M2b Ca	6O2b Mg	6P2a H	6Q2a Na	6Q2a K	Na	K				
		milliequivalents per 100g. soil					← milliequivalents per liter →					
22.0			3.3		0.1	2.0						
29.3	19.9		8.7		0.1	1.6						
25.8					0.1	1.5						
24.8					0.1	1.5						
24.0					0.2	1.3						
21.4					0.6	1.2						
22.4					1.1	1.3						

Soil Type: Campo clay loam

Location: 115 feet west and 40 feet north of the southeast corner of Sec. 33, T31S; R43W; Baca County, Colo.

Date of Sampling: October 6, 1955

Collector: A. J. Cline

Described by: A. J. Cline.

Physiographic Position: Upland

Topography: A nearly level to slightly concave area having a slope of less than 1 percent.

Drainage: Moderately well drained

Vegetation: Winter wheat

Use: Cultivated land

Soil Nos.: S55Colo-5-2

Lincoln Laboratory Nos.: 3520-3526

- 0-7 inches
(A_p) Grayish brown (10YR 5.5/2 dry) to dark grayish brown (10YR 4/2 moist) silty clay loam; soft when dry, very friable when moist; moderate, fine crumb structure; noncalcareous; lower boundary clear and smooth.
LSL 3520
- 7-16 inches
B₂₁ Dark grayish brown (10YR 4.5/2 dry) to very dark grayish brown (10YR 3.5/2 moist) silty clay; extremely hard when dry, firm when moist; moderate to strong, medium prismatic structure breaking to strong, fine, angular block; noncalcareous; moderate continuous tonhauthchen; lower boundary clear and smooth.
LSL 3521
- 16-24 inches
B₂₂ Grayish brown (10YR 5.5/2.5 dry) to dark grayish brown (10YR 4.5/2.5 moist) silty clay; extremely hard when dry, firm when moist; moderate to strong, medium prismatic structure breaking to strong, fine, angular block; calcareous; there is no visible lime in this horizon; thin continuous tonhauthchen; lower boundary gradual and smooth.
LSL 3522
- 24-32 inches
B_{31ca} Light brownish gray (10YR 6/2.5 dry) to grayish brown (10YR 5/2.5 moist) heavy silty clay loam; very hard when dry, firm when moist; weak to moderate, medium prismatic structure breaking to moderate, medium, angular and subangular blocks; strongly calcareous; this is a weak to moderate lime horizon containing common number of soft calcium carbonate concretions 1/8 to 1/4 inch in diameter; thin continuous tonhauthchen; lower boundary gradual and smooth.
LSL 3523
- 32-41 inches
B_{32ca} Light brownish gray (10YR 6.5/2.5 dry) to grayish brown (10YR 5.5/2.5 moist) silty clay loam; hard when dry, friable when moist; weak, medium prismatic structure breaking to weak, medium subangular block; violently calcareous; this is a moderate lime horizon containing moderate numbers of calcium carbonate concretions and much finely disseminated lime flour; lower boundary gradual and smooth.
LSL 3524
- 41-50 inches
C_{ca} Very pale brown (10YR 7/3 dry) to pale brown (10YR 6/3 moist) silt loam; hard when dry, friable when moist; massive, to very weak, coarse subangular blocky structure; violently calcareous; this is a moderate lime horizon containing a few calcium carbonate concretions and much finely disseminated lime flour; lower boundary gradual and smooth.
LSL 3525
- 50-64 inches
C Very pale brown (10YR 7.5/3 dry) to pale brown (10YR 6/3 moist) silt loam; slightly hard when dry, very friable when moist; massive; strongly calcareous; this is a weak lime horizon containing much less lime than the horizon above.
LSL 3526

SOIL SURVEY LABORATORY Lincoln, Nebr. February 1959

SOIL TYPE Chubbs LOCATION Chaffee County, Colorado
 clay loam

SOIL NOS. S58Colo-8-6 LAB. NOS. 9071-9074

DEPTH INCHES	HORIZON	1E1a PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										3A1 2A2 > 2 (<u><19mm.</u>)	TEXTURAL CLASS
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY					
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002			
0-2	A2	2.8a	3.0a	2.3a	6.2a	17.8a	50.0	17.9	51.0	21.3	24	s11/1	
2-9	B2t	2.9a	2.5a	2.0a	4.6a	12.3a	33.3	42.4	31.8	17.2	36	c	
9-13	B3ca	10.2b	4.8b	2.7b	8.3b	17.2b	33.6	23.2	41.8	14.4	52	1	
13-17	Cca	7.1c	6.2c	3.8c	10.2c	17.4c	34.3	21.0	40.8	17.3	56	1	
pH		ORGANIC MATTER					Free Iron	6E1a		MOISTURE TENSIONS			
8C1a	1.5	1:10	6A1a	6E1a	C/N	Fe ₂ O ₃	CaCO ₃ equivalent		1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.	4B2	
1:1			%	%	%	6C1a	%	%	%	%	%	%	
6.6			2.61	0.116	22	1.6						8.3	
6.4			1.42	0.087	16	2.2						16.4	
7.9			2.46	0.138	18	1.1	23					13.6	
8.0			3.14	0.154	20	0.7	40					15.0	
5A1a		EXTRACTABLE CATIONS					5B1a	BASE SAT.	5C3	Sum	Sum	Ca/Mg	
CATION EXCHANGE CAPACITY		6N2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ Ac EXCH.	Base Sat. %	Bases	Cations			
me/100g		Ca	Mg	H	Na	K	5C1	on Sum	5H1a	5A3a			
		← milliequivalents per 100g. soil →							Cations	← me/100g →		8D3	
18.6	14.5	3.5	5.2	<0.1	0.8	101	78	18.8	18.8	24.0	4.1		
34.3	24.9	8.4	5.4	<0.1	0.8	99	86	34.1	34.1	39.5	3.0		
23.1		5.1	<0.1	<0.1	0.3								
20.7		5.6	<0.1	<0.1	0.2								
a.		Few smooth black coner. (Mn-Fe?)											
b.		Few smooth black coner. (Mn-Fe?) Common CaCO ₃ coner.											
c.		Few smooth black coner. (Mn-Fe?) Many CaCO ₃ coner.											

Soil Type: Chubb's clay loam. Described by: A. J. Cline
 Location: The SW¹ of Sec. 33, T13S, R77W, Chaffee County, Colorado.
 Date of Sampling: September 1957.
 Collectors: J. Retzer, E. M. Payne, R. Dansdill, A. J. Cline.
 Physiographic Position: Upland mountain side at an elevation of approximately 9,500 feet.
 Topography: Moderate convex slope of approximately 8 percent facing north.
 Drainage: Well drained. Vegetation: Spruce, fir, aspen.
 Use: National Forest Service land
 Soil Nos.: 858 Colo-8-6

Lincoln Horizon

Lab. No.

	A	1½-0	An organic mat made up mostly of undecomposed pine needles.
	oo	inches	Horizon not sampled.
9071	A ₂	0-2	Light brownish gray or light gray (10YR 6.5/2 dry) to grayish brown (10YR 5/2 moist) loam; soft when dry, very friable when moist; weak to moderate fine platy structure breaking to moderate fine granules; noncalcareous; lower boundary abrupt and smooth.
9072	B _{2t}	2-9	Brown (7.5YR 5/4 dry) to brown or dark brown (7.5YR 4/4 moist) gravelly clay loam; hard when dry, friable when moist; moderate medium subangular blocky structure, breaking to moderate to strong very fine subangular blocks; noncalcareous; there are thick continuous clay skins on the surfaces of most of the soil aggregates; approximately 20 percent of this horizon is gravel; lower boundary gradual and smooth.
9073	B _{3ca}	9-13	Grayish brown or light brownish gray (10YR 5.5/2 dry) to brown (10YR 4.5/3 moist) gravelly loam; slightly hard when dry, very friable when moist; weak medium subangular blocky structure, breaking to moderate fine crumb; violently effervescent; this is a weak horizon of lime accumulation with some visible lime occurring as concretions and as coatings on the gravel; approximately 30 percent of this horizon is gravel; lower boundary gradual and smooth.
9074	C _{ca}	13-17	White (10YR 8/2 dry) to light brownish gray (10YR 6/2 moist) stony loam; slightly hard when dry, very friable when moist; massive; violently effervescent; this is a prominent horizon of lime accumulation with visible lime occurring in finely divided forms; approximately 50 percent of this horizon is stone; lower boundary gradual and smooth.
	D	17-23	Partially weathered and fractured bedrock limestone of Pennsylvanian age. This horizon was not sampled.
		inches	

SOIL SURVEY LABORATORY Lincoln, Nebr. February 1959

SOIL TYPE Chubbbs LOCATION Chaffee County, Colorado
 clay loam

SOIL NOS. S58Co1o-8-8 LAB. NOS. 9078-9081

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND 2.1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	2A2 > 2 (19mm)	
0-2	A1	1.8a	1.5a	1.0a	4.8a	14.2a	52.3	24.4	43.3	26.6	Tr.	sil
2-6	B2t	1.1a	1.1a	0.6a	2.8a	11.0a	44.0	39.4	33.2	23.9	10	sic1
6-11	B3	5.2b	2.5b	1.2b	4.4b	14.4b	42.2	30.1	36.7	23.0	35	cl
11-19	Cca	4.2b	4.8b	3.0b	6.5b	11.0b	40.8	29.7	29.0	26.9	35	cl
pH		ORGANIC MATTER				Free Iron $\frac{1}{2}Fe_2O_3$	6E1a CaCO ₃ equivalent		MOISTURE TENSIONS			4B2
8C1a	1:5	1:10	6A1a ORGANIC CARBON %	6H1a NITRO-GEN %	C/N	6C1a	%	1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.	%	
1:1												
6.7			9.12	0.460	20	1.9	<1				17.2	
7.3			1.65	0.097	17	2.6	2				13.9	
7.7			1.74	0.117	15	2.2	13				11.6	
7.7			5.46	0.259	21	1.2	52				21.8	
5A1a	EXTRACTABLE CATIONS 5B1a					BASE SAT. % NH ₄ Ac EXCH.	5C3 Base Sat. % on Sum	Sum Bases 5B1a	Sum Cations 5A3a	Ca/Mg		
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b Co	6O2b Mg	6H1a H	6P2a Na	6Q2a K	5C1	Cations	← me/100g →	8D3			
	← milliequivalents per 100g. soil →											
35.9	34.8	2.7	8.6	<0.1	1.6	109	82	39.1	47.7	12.9		
25.8		1.8	3.3	<0.1	1.1							
23.2		1.7	0.4	<0.1	0.5							
25.4		1.5	<0.1	<0.1	0.2							
a. Few irregular dark brown to black coner. (Fe+Mn?) Also, common CaCO ₃ coner. b. Few irregular dark brown to black coner. (Fe+Mn?) Also, many CaCO ₃ coner.												

Soil Type: Gubbs clay loam.

Described by: A. J. Gline

71

Location: The SW $\frac{1}{4}$ of Sec. 23, T13S, R77W, Chaffee County, Colorado.

Date of Sampling: September 1957

Collectors: J. Retzer, E. M. Payne, R. Danscill, A. J. Gline

Physiographic Position: Upland mountainous area at an elevation of approximately 9,500 feet.

Topography: Moderately steep convex slope of approximately 20 percent facing west.

Drainage: Well drained. Vegetation: Spruce, fir, aspen, with a moderate to thin understory of grasses and sedges.

Use: National Forest Service land.

Soil Nos.: S58Colo-8-8

Lincoln Horizon

Lab. No.

9078	A ₁	0-2 inches	Dark gray (10YR 4/1 dry) to very dark grayish brown (10YR 3/2 moist) loam; soft when dry, very friable when moist; moderate fine crumb structure; noncalcareous; lower boundary abrupt and smooth. The surface 1/4" of this horizon is an organic mat made up of partially decomposed and undecomposed forest refuse.
	A ₂	2-2 $\frac{1}{2}$ inches	Pink (7.5YR 7/4 dry) to brown (7.5YR 5/3 moist) gravelly loam; soft when dry, very friable when moist; weak to moderate fine platy structure; noncalcareous; this is a thin, but in places distinct horizon, however, it may be absent in some parts of the area. Because of its inconsistency and thinness it was not sampled; lower boundary abrupt and smooth.
9079	B _{2t}	2 $\frac{1}{2}$ -6 inches	Brown (7.5YR 5/4 dry) to brown or dark brown (7.5YR 4/4 moist) stony clay loam; hard when dry, very friable when moist; moderate, medium and fine subangular blocky structure; noncalcareous; there are moderate continuous clay skins on the surfaces of the soil aggregates and coating the rock surfaces: approximately 40 percent of this horizon is stone; lower boundary gradual and irregular.
9080	B ₃	6-11 inches	Brown (10YR 5/3 dry) to dark brown or brown (10YR 4/3 moist) stony light clay loam; hard when dry, very friable when moist; weak to moderate fine subangular blocky structure breaking to moderate fine granules; strongly effervescent; there are thin patchy clay skins on both the horizontal and vertical faces of the soil aggregates; approximately 40 percent of this horizon is stone; lower boundary gradual and smooth.
9081	C _{ca}	11-19 inches	Gray (10YR 5.5/1 dry) to dark grayish brown or grayish brown (10YR 4.5/2 moist) stony silt loam; slightly hard when dry, very friable when moist; weak to moderate fine crumb structure; violently effervescent; this is a moderate to strong horizon of lime accumulation with lime occurring mostly in finely divided forms; approximately 50 percent of this horizon is stone; lower boundary gradual and smooth. This horizon feels like a silt loam in the field but is probably a loam on a lime-free basis.
	D	19-25 inches	Fractured limestone of Pennsylvanian age. Not sampled.

SOIL TYPE Colby silt loam LOCATION Provera County, Colorado

SOIL NOS. 858010-50-2 LAB. NOS. 9675-9681

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002				
0-2	Ap1	0.2	0.4	0.6a	11.1a	33.6a	38.2	15.9	70.3	11.1	-	1
2-4	Ap2	<0.1	0.1	0.2a	8.1a	25.2a	47.7	18.7	64.5	15.4	-	1
4-11	AC	<0.1	0.1	0.2a	5.6a	21.8a	54.7	17.6	62.5	18.9	-	s11
11-18	C1	<0.1	0.1	0.1a	3.5a	18.8a	59.6	17.9	60.7	20.8	Tr.	s11
18-27	C2	<0.1	0.1	0.1b	5.5b	21.2b	56.2	16.9	63.8	18.5	-	s11
27-44	C3	<0.1	0.1	0.2b	7.6b	23.1b	55.6	13.4	68.1	17.2	-	s11
44-60+	C4	<0.1	0.1	0.1b	6.2b	25.5b	56.2	11.9	69.8	17.4	-	s11

8C1a	pH	ORGANIC MATTER			8A2 EST% SALT (BUREAU CUP)	ELECTRI- CAL CONDUCTI- VITY EC x 10 ⁴ MILLIMHOS PER CM 8A1a	6E1a CaCO ₃ equiv- alent %	6F1a GYPSUM mg./100g. SOIL	MOISTURE TENSIONS			4B2 15 ATMOS. %
		6A1a ORGANIC CARBON %	6B1a NITRO- GEN %	C/N					1/10 ATMOS. %	1/3 ATMOS. %		
		1:5	1:10									
7.9		0.72	0.082	9	<0.20	0.7	5				7.3	
7.8		0.72	0.081	9	<0.20	0.5	8				9.5	
7.9		0.51	0.057	9	<0.20	0.5	9				8.6	
8.0		0.34	0.043	8	<0.20	0.5	8				8.4	
8.0		0.34	0.039	9	<0.20	0.7	7				7.6	
8.2		0.16			<0.20	1.0	6				6.7	
8.5		0.14			<0.20	0.9	6				6.5	

5A1a CATION EXCHANGE CAPACITY MEQ/AC	EXTRACTABLE CATIONS 5B1a					5D2 EXCH. No %	SATURATION EXTRACT SOLUBLE			8A MOISTURE AT SATU- RATION %	
	6P2a		6Q2a		6F1a		6Q1a				
	Ca	Mg	H	No	K		No	K			
	milliequivalents per 100g. soil						milliequivalents per liter				
11.2				<0.1	1.0	<1	0.4	1.0			44.4
11.6				<0.1	0.7	<1	0.3	0.5			51.2
12.0				<0.1	0.5	<1	0.3	0.3			51.2
15.5				0.1	0.7	1	0.4	0.3			49.2
14.4				0.1	0.7	1	0.8	0.3			45.9
13.0				0.8	0.8	5	4.1	0.4			43.6
13.2				1.6	0.8	10	5.9	0.3			44.0

a. Trace CaCO₃ concr.
b. Few CaCO₃ concr.

Soil Type: Colby silt loam.
 Classification: Sierozem.
 Location: 540 ft. S and 50 ft. E of W $\frac{1}{4}$ corner, Section 26, T23S, R47W, Prowers
 County, Colorado.

Date Sampled: November 4, 1958

Climate: Continental type climate, average annual precipitation 13 inches,
 elevation 3,810 feet. Frost free season 165 days.

Vegetation: Dryland, wheat-fallow; wheat, 1958. Parent Material: Loess or aeolian

Physiographic position: Upland. Relief: Gently rolling, 2% slope.

Drainage: Good. Moisture: Dry. Watertable: None encountered. Stoniness: None.

Salt or Alkali: None observed other than calcium carbonate. Erosion: Moderate
 wind erosion. Soil Nos.: S-58-Colo-50-2

Described by: E. Milton Payne.

Lincoln Horizon

Lab. No.

9675	Ap ₁	0-2 inches	Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist) silt loam; weak fine subangular blocky structure breaking to weak fine granular; soft when dry, very friable moist; strongly calcareous; clear smooth boundary.
9676	Ap ₂	2-4 inches	Pale brown (10YR 6/3 dry) to brown (10YR 4.5/3 moist) loam; massive to weak coarse platy; very hard when dry, friable moist; this is a tillage pan with light colored streaks (10YR 7/3 dry), strongly calcareous; clear smooth boundary; appears to be abrupt due to plow depth.
9677	AC	4-11 inches	Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist and crushed) loam; very weak coarse prismatic breaking to very weak coarse subangular blocky structure; hard when dry, very friable moist; violently calcareous; gradual smooth boundary.
9678	C ₁	11-18 inches	Very pale brown (10YR 6.5/3 dry) to brown (10YR 5/3 moist) (10YR 5.5/3 crushed moist) loam; weak coarse prismatic breaking to very weak medium to coarse subangular blocky structure; slightly hard when dry, very friable moist; violently calcareous, containing a few lime nodules; gradual smooth boundary.
9679	C ₂	18-27 inches	Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist) (10YR 5/2.5 crushed) very fine sandy loam; massive to a very weak coarse subangular blocky structure; slightly hard when dry, very friable moist, contains many krotovinas; violently calcareous; gradual smooth boundary.
9680	C ₃	27-44 inches	Very pale brown (10YR 7/3 dry) to brown (10YR 5.5/3 moist and crushed) very fine sandy loam; massive to very weak coarse subangular blocky structure; slightly hard when dry, very friable moist; violently calcareous; gradual smooth boundary.
9681	C ₄	44-60 inches	Very pale brown (10YR 7/3 dry) to brown (10YR 5.5/3 moist and crushed) very fine sandy loam; massive; slightly hard when dry, very friable moist; violently calcareous.

Bureau of Public Roads Sample:

C - 27 - 44 inches

SOIL SURVEY LABORATORY Lincoln, Nebr. May 1959

SOIL TYPE Colby LOCATION Prowers County, Colorado
silt loam

SOIL NOS. S58Colo-50-3 LAB. NOS. 9682-9687

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						2A2 > 2
		VERY COARSE SAND 2.1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002			
0-3	Alp	0.2	0.3	0.5a	9.2a	41.3a	32.6	15.9	72.6	9.2	-	1	
3-6	Al2	<0.1	<0.1	0.1a	4.0a	22.5a	50.4	23.0	58.1	18.4	-	sil/1	
6-11	AC	<0.1	0.1	0.1a	3.0a	19.2a	55.8	21.8	57.3	20.4	-	sil	
11-23	C1	<0.1	0.1	0.1a	2.8a	18.3a	58.8	19.9	59.1	20.5	-	sil	
23-31	C2	<0.1	0.1	0.1a	2.9a	18.7a	59.9	18.3	61.3	19.9	-	sil	
31-60+	C3	<0.1	0.1	0.1a	2.6a	18.6a	62.1	16.5	63.1	19.9	-	sil	

8C1a	PH		ORGANIC MATTER			8A2 EST. % SALT (BUREAU CUP)	ELECTRI- CAL CONDUCTI- VITY EC-10 ³ MILLIMHOS PER CM. 8A1a	6E1a CaCO ₃ equiv- alent	MOISTURE TENSIONS			4B2 15 ATMOS. %
	1:5	1:10	6A1a ORGANIC CARBON %	6E1a NITRO- GEN %	C/N				CaCO ₃ me./100g. SOIL	1/10 ATMOS. %	1/3 ATMOS. %	
	1:1											
7.9			0.73	0.080	9	<0.20	0.9	5				7.8
7.9			0.66	0.078	8	<0.20	0.5	12				11.2
7.9			0.52	0.062	8	<0.20	0.5	11				10.2
8.0			0.36	0.043	8	<0.20	0.5	8				8.9
8.0			0.24	0.030	8	<0.20	0.6	7				8.3
8.1			0.18			<0.20	0.6	6				7.9

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					5B1a 5D2 EXCH. No %	8A1 SATURATION EXTRACT SOLUBLE		8A MOISTURE AT SATU- RATION %	
	Ca	Mg	H	6F2a Na	6Q2a K		6P1a Na	6Q1a K		
	← milliequivalents per 100g. soil →						← milliequivalents per liter →			
12.5				<0.1	1.5	<1	0.3	1.4		44.7
14.9				<0.1	1.0	<1	0.3	0.6		52.6
15.4				0.1	0.7	1	0.4	0.3		50.4
15.9				0.1	0.6	1	0.4	0.2		49.8
15.1				0.1	0.6	1	0.5	0.2		50.5
15.1				0.4	0.7	2	1.5	0.2		47.4

a. Trace CaCO₃ concn.

Soil Type: Colby silt loam.

Classification: Sierozem (Regosol)

Location: 150 ft. S, 450 ft. E of NW corner, Section 34, T23S., R47W., Prowers County, Colorado.

Date Sampled: November 4, 1958

Climate: Continental climate, average annual precipitation 13.00 inches, elevation 3,850 feet. Frost free season 160 days.

Vegetation: Wheat-fallow, wheat, 1958. Parent Material: Loess.

Physiographic position: Upland. Relief: Nearly level, 2% slope. Drainage: well

Moisture: Slightly moist throughout profile. Watertable: None encountered.

Salt or Alkali: None observed. Erosion: Moderate erosion, primarily wind.

Soil Nos. S-58-Colo-50-3

Stoniness: None.

Described by: E. Milton Payne.

Lincoln Horizon

Lab. No.

- | | | | |
|------|-----------------|----------------|---|
| 9682 | A _{1p} | 0-3 inches | Light brownish gray (10YR 6/2.5 dry) to dark grayish brown (10YR 4/2.5 moist) silt loam; very weak fine subangular blocky structure breaking to weak fine granular; slightly hard dry, very friable moist; violently calcareous; abrupt smooth boundary, caused by tillage implements. |
| 9683 | A ₁₂ | 3-6 inches | Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 4/2 moist) mottled with lighter colored material, light gray (10YR 7/2 dry) to pale brown (10YR 6/3 moist) loam; weak very coarse platy; very hard when dry, friable moist; violently calcareous; this is a tillage pan; abrupt smooth boundary. |
| 9684 | AC | 6-11 inches | Light gray to light brownish gray (10YR 6.5/2 dry) to brown (5.5/3 moist) silt loam; very weak coarse prismatic breaking to very weak coarse subangular blocky structure; hard when dry, very friable moist; few thin patchy clay skins on vertical faces of peds; violently calcareous with few small lime concretions; gradual smooth boundary. |
| 9685 | C ₁ | 11-23 inches | Light gray to light brownish gray (10YR 6.5/2 dry) to grayish brown (10YR 5/2.5 moist) loam; very weak coarse prismatic breaking to very weak medium subangular blocky structure; slightly hard when dry, very friable moist; violently calcareous with numerous lime spots; gradual smooth boundary. |
| 9686 | C ₂ | 23-31 inches | Light gray (10YR 7/2 dry) to grayish brown (10YR 5/2.5 moist) very fine sandy loam; massive; slightly hard when dry, very friable moist; violently calcareous with few lime spots; gradual smooth boundary. |
| 9687 | C ₃ | 31-60 / inches | Very pale brown (10YR 7/2.5 dry) to brown (10YR 5.5/3 moist) very fine sandy loam; massive; slightly hard when dry; very friable moist; violently calcareous with many fine pores. |

Bureau of Public Roads Sample:

C - 31 - 60 /

SOIL Colby silt loam SOIL Nos. 86001a-50.1 LOCATION Prowers County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14653-14655 January 1966

Depth (in.)	Horizon	Size class and particle diameter (mm)															
		1B1a		Sand							Silt			3A1	Coarse fragments		
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	int. III (0.02-0.002)	int. II (0.2-0.02)	(2-0.1)	Clay	3A1a	2-19	19-76
0-4	A1	21.5	59.0	19.5	-	0.3a	0.4b	1.8b	19.0c	39.4	19.6	59.7	2.5	1	19	-	-
4-13	AC	14.2	60.0	25.8	0.1c	0.2b	0.3b	1.4b	12.2b	35.9	24.7	49.1	2.0	5	21	-	-
13-30	Cl	12.6	64.5	22.9	0.1b	0.1b	0.2b	0.8b	11.4b	41.0	23.5	53.0	1.2	3	20	-	-

Depth (in.)	6A1a Organic carbon d/Pct	6B1a Nitrogen Pct	C/N	6K1a Carbonate as CaCO ₃ Pct	Bulk density			4M1 COLE e/	Water content					pH		
					4A1a 30-cm g/cc	4A1b Air-Dry g/cc	4M1 g/cc		4B3 30-cm Pct	4B1b 1/3-Bar Pct	4B2 2-Bar Pct	4B2 15-Bar Pct	4C1 15-Bar in/in	8C1b Sat. Paste	8C1a 1:1	8C1a 1:10
0-4	1.33	0.124	11	5	1.22	1.32	0.928	23.9	22.4	17.6	10.9	0.14	7.6	7.7	8.5	
4-13	0.89	0.095	9	11	1.24	1.34	0.928	24.3	22.4	16.9	12.6	0.12	7.6	7.6	8.5	
13-30	0.36	0.035	10	9							10.9		7.5	7.8	8.6	

Depth (in.)	Extractable bases 5M1a				Cat. No.	8A1	Water extract from saturated paste							8A1a Electrical conductivity mmho/cm		
	Ca	Mg	Na	K			5A1a NH ₄ OAc	Ca	Mg	Na	K	CO ₃	HCO ₃		Cl	SO ₄
0-4			Tr.	1.4			17.9			0.4	0.8					0.8
4-13			0.1	1.1			18.6			0.7	0.5					0.8
13-30			0.1	1.2			18.1			0.7	0.6					0.7

Depth (in.)	8A Water at Saturation Pct	5D2 Exchangeable Na Pct	Gypsum Pct	Ratios to Clay		
				8M1 NH ₄ OAc CEC	8D2 NH ₄ OAc CEC	8M1 15-Bar Water
0-4	53.1	<		0.92	0.94	0.56
4-13	55.9	<		0.72	0.88	0.49
13-30	50.6	<		0.79	0.90	0.48

- a. 5-25% carbonate. 25-50% organic matter.
- b. 5-25% carbonate.
- c. 25-50% organic matter.
- d. 5.0 kg/m² to 20 inches.
- e. Coefficient of Linear Extensibility.
- f. Noncarbonate clay.

Soil Type: Colby silt loam
 Soil No.: S60Colo-50-1
 Location: 200 feet south and 300 feet west of the northeast corner, Sec. 7, T22S, R44W, Prowers County, Colorado.
 Climate: Continental climate, average annual precipitation 13 to 15 inches, frost-free season 165 days.
 Elevation: 3,550 feet.
 Parent Material: Loess.
 Physiographic Position: Upland.
 Relief: Nearly level, 0-1 percent slopes.
 Drainage: Good.
 Moisture: Moist to 10 inches, dry below.
 Water Table: None.
 Stoniness: None.
 Salt or Alkali: None.
 Erosion: None.
 Present Use: Native range.
 Described by: James F. Farnell, November 14, 1960.

Harrison and
 Lincoln
 Lab. No.

- A1
 1A653 0 to 4 inches. Light grayish brown (10YR 5.5/2 dry) to brown (10YR 4/3 moist and 4/2.5 moist crushed) silt loam; weak very fine granular structure; dry soft, moist very friable; strongly effervescent; clear smooth boundary.
- AC
 1A654 4 to 13 inches. Light grayish brown (10YR 5.5/2 dry) to dark grayish brown (10YR 4/2 moist and 4/2.5 moist crushed) silt loam; very weak coarse prismatic structure breaking to very weak medium subangular blocky; dry slightly hard, moist friable; violently effervescent; clear smooth boundary.
- C1
 1A655 13 to 30 inches. Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist and crushed) silt loam; weak coarse subangular blocky structure breaking to very weak medium subangular blocky; dry slightly hard, moist very friable; violently effervescent with a very few lime mottles in the upper part; clear smooth boundary.
- C2
 30 to 60 inches plus. Very pale brown (10YR 7/3 dry) to yellowish brown (10YR 5/4 moist and crushed) silt loam; massive; dry soft, moist very friable; violently effervescent.

SOIL Colby silt loam SOIL Nos. 8500olo-50-2 LOCATION Frontier County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14676-14678 January 1966

Depth (In.)	Horizon	Size class and particle diameter (mm)											3A1				Coarse fragments		
		1B1a			Sand					Silt			Clay		3A1a		2A2		
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	Carbonate	Non-carbonate	> 2	19-76	19-76	
Pct. of < 2 mm																			
0-3	A1	19.0	64.8	16.2	0.1a	0.6a	0.6	2.3	15.4	43.4	21.4	60.5	3.6	-	16	Tr.			
3-15	AC	20.0	57.9	22.1	0.1a	0.5b	0.6b	3.1b	15.7b	35.3	22.6	53.3	4.3	4	18	Tr.			
15-42	CL	20.1	63.5	16.4	-	0.2b	0.4b	2.9b	16.6b	41.9	21.6	60.8	3.5	2	14	Tr.			

Depth (In.)	6A1a Organic carbon g/Pct.	6B1a Nitrogen Pct.	C/N	6K1a Carbonate as CaCO ₃ Pct.	Bulk density				Water content				pH		
					4A1a 30-cm. g/cc	4A1b Air-Dry g/cc	4B1 OOLE g/cc	4B3 30-cm. Pct.	4B1b 1/3-Bar Pct.	4B2 2-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-Bar to 15-Bar in./in.	8C1b Sat. Paste 1:1	8C1a 1:1	8C1a 1:10
0-3	1.30	0.118	11	2	1.30	1.30	0.920	22.3	20.6	16.3	9.9	0.14	7.5	7.7	8.4
3-15	0.89	0.093	10	8	1.27	1.37	0.904	23.9	20.2	15.1	11.0	0.12	7.5	7.7	8.5
15-42	0.25	0.026	10	7							8.5		7.6	8.0	8.9

Depth (In.)	Extractable bases				Cat. Noob. Cap. 5A1a NH ₄ OAc	8A1				Water extract from saturated paste						8A1a Electrical conductivity mmho/cm
	Ca	Mg	Na	K		Ca	Mg	Na	K	CO ₃	HCO ₃	Cl	SO ₄			
0-3			Tr.	1.5					0.3	0.8						0.6
3-15			0.1	1.2					0.5	0.7						0.6
15-42			0.8	1.2					4.8	0.8						1.2

Depth (In.)	8A Water at Saturation Pct.	5B2 Exchangeable Na Pct.	Gypsum Pct.	Ratios to Clay		
				8H1 NH ₄ OAc CBC	8H2 NH ₄ OAc CBC	8H1 15-Bar Water g/g
0-3	51.7	<1		1.15	1.16	0.61
3-15	53.3	<1		0.77	0.94	0.50
15-42	49.7	4		0.90	1.06	0.52

a. 25-30% organic matter.
 b. 5-25% carbonate.
 c. 7.0 kg/m² to 42 inches.
 d. Coefficient of Linear Extensibility.
 e. Noncarbonate clay.

Soil Type: Colby silt loam
 Soil Nos.: 860Colo-50-2
 Location: 0.2 mile north and 385 feet west of south quarter corner, Sec. 34, T22S, R43W. Prowers County, Colorado.
 Climate: Continental climate, average annual precipitation 13 to 15 inches, frost-free season 165 days.
 Elevation: 3,550 feet.
 Parent Material: Loess.
 Physiographic Position: Upland.
 Relief: Nearly level, 0-1 percent slopes.
 Drainage: Good.
 Moisture: Moist.
 Water Table: None.
 Stoniness: None.
 Salt or Alkali: None.
 Erosion: None.
 Present Use: Native range.
 Described by: James P. Pannell, November 18, 1960.

Horizon and
 Lincoln
 Lab. No.

A1
 14656 0 to 3 inches. Light grayish brown (10YR 5.5/2.5 dry) to dark grayish brown (10YR 4/2 moist and crushed) silt loam; weak very fine granular structure; dry soft, moist very friable; strongly effervescent; clear smooth boundary.

AC
 14657 3 to 15 inches. Pale brown (10YR 6/3 dry) to brown (10YR 4/3 moist) dark grayish brown (10YR 4/2 moist crushed) silt loam; very weak medium subangular blocky structure breaking to weak fine granular; dry slightly hard, moist very friable; violently effervescent; gradual smooth boundary.

C1
 14658 15 to 42 inches. Pale brown (10YR 6.5/3 dry) to brown (10YR 5/3 moist and crushed) silt loam; very weak coarse subangular blocky to massive structure; dry soft, moist very friable; violently effervescent; clear smooth boundary.

C2
 42 to 60 inches plus. Very pale brown (10YR 7/3 dry) to yellowish brown (10YR 5/4 moist and 5/3.5 moist crushed) silt loam; massive; dry soft, moist very friable; violently effervescent.

SOIL Calby silt loam SOIL Nos. 860Colo-90-5 LOCATION Prosser County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14665-14669 January 1966

Depth (in.)	Horizon	3A1													Clay 3A1a		Coarse fragments		
		Size class and particle diameter (mm)													Carbonate	Non-carbonate	2-19	19-76	
		Total		Sand					Silt										
Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	Carbonate	Non-carbonate	2-19	19-76				
Pct. of < 2 mm																			
0-2	A11	25.6	53.9	20.5	0.7a	1.6a	2.5a	6.1a	14.7a	38.7	15.2	56.7	10.9	-	20	Tr.			
2-7	A12	28.3	48.3	23.4	0.7a	2.9a	4.7a	9.9a	10.1a	30.3	18.0	45.1	18.2	Tr.	23	Tr.			
7-14	AC	17.8	56.9	25.3	0.3a	0.9a	1.3a	4.8a	10.5a	35.9	21.0	49.6	7.3	3	22	Tr.			
14-36	C1	16.1	62.8	27.1	0.1a	0.4a	0.7a	1.9a	7.0a	35.0	27.8	43.2	3.1	3	24	Tr.			
36-60	C2	22.4	53.2	24.4	1.2a	2.5a	2.7a	6.2a	9.8a	32.9	20.3	46.3	12.6	3	21	Tr.			

Depth (in.)	6A1a Organic carbon	6B1a Nitrogen	C/N	6K1c Carbonate as CaCO ₃	Soil density				Water content								pH	
					4A1c 30-cm	4A1b Air-Dry	4B1c	4B1b 1/3-Bar	4B2 2-Bar	4B2 15-Bar	4C1 1/3-Bar to Paste	8C1b Sat.	8C1a 1:1	8C1a 1:10				
Pct.	Pct.		Pct.	g/cc	g/cc	g/cc	g/cc	Pct.	Pct.	Pct.	Pct.	In./in.						
0-2	1.45	0.143	10	12								9.0		7.6	7.9	8.5		
2-7	1.31	0.119	11	19			1.30	1.40	0.024	24.1	20.4	19.8	9.4	0.14	7.6	7.8	8.5	
7-14	0.79	0.071	11	27			1.39	1.48	0.020	19.7	19.4	14.6	9.7	0.13	7.5	7.7	8.5	
14-36	0.92	0.080	12	18								11.1		7.4	7.6	8.3		
36-60	0.52			15								9.6		7.5	7.7	8.5		

Depth (in.)	Extractable bases				5B1a	Cat. Mech. Cpd.	Water extract from saturated paste								8A1a Electrical conductivity	
	Ca	Mg	Na	K			5A1a NH ₄ OAc	Ca	Mg	Na	K	CO ₃	HCO ₃	Cl		SO ₄
	meq/100 g						meq/liter								mmho/cm	
0-2			Tr.	2.5			16.3			0.7	2.4					0.9
2-7			Tr.	1.7			16.0			0.4	1.5					0.8
7-14			Tr.	1.3			15.0			0.9	1.2					1.1
14-36			0.1	0.8			17.6			0.7	0.5					1.5
36-60			0.1	0.6			14.9			0.8	0.3					1.3

Depth (in.)	8A Water at Saturation	5B2 Exchangeable Na	Gypsum	Ratios to Clay		
				5B1 NH ₄ OAc	5B2 NH ₄ OAc	5B1 15-Bar Water
Pct.	Pct.	Pct.		d/		
0-2	48.0	<1		0.20	0.22	0.44
2-7	43.7	<1		0.28	0.70	0.40
7-14	46.8	<1		0.29	0.68	0.38
14-36	40.8	<1		0.25	0.73	0.41
36-60	44.4	1		0.61	0.71	0.39

a. 5-27% carbonate.
b. 13 kg/m² to 36 inches.
c. Coefficient of Linear Extensibility.
d. Noncarbonate clay.

Soil Type: Colby silt loam
 Soil Nos.: S600olo-50-5
 Location: 300 feet north of center of Sec. 21, T26S, R47W, Prowers County, Colorado.
 Climate: Continental climate, average annual precipitation 13 to 15 inches, frost-free season 165 days.
 Elevation: 4,100 feet.
 Parent Material: Alluvium.
 Physiographic Position: Stream terrace.
 Relief: Nearly level, 0-1 percent slopes.
 Drainage: Good.
 Moisture: Moist to 15 inches, dry below.
 Water Table: None.
 Stoniness: None.
 Salt or Alkali: None.
 Erosion: None.
 Present Use: Native range.
 Described by: James P. Fannell, October, 1960.

Horizon and
 Lincoln
 Lab. No.

- A11 0 to 2 inches. Light grayish brown (10YR 5.5/2 dry) to dark grayish brown (10YR 4/2 moist and crushed) silt loam; very weak very fine granular structure; dry soft, moist very friable; strongly effervescent; abrupt smooth boundary.
- A12 2 to 7 inches. Pale brown (10YR 5.5/3 dry) to brown (10YR 4/3 moist) dark grayish-brown (10YR 4/2 moist crushed) silt loam; weak medium subangular blocky structure breaking to weak fine granular; dry slightly hard, moist very friable; strongly effervescent; clear smooth boundary.
- AC 7 to 14 inches. Pale brown (10YR 6/3 dry) to brown (10YR 4/3 moist and 4.5/3 moist crushed) silt loam; weak medium subangular blocky structure breaking to weak fine granular; dry slightly hard, moist very friable; violently effervescent; clear smooth boundary.
- C1 14 to 36 inches. Pale brown (10YR 5.5/3 dry) to brown (10YR 4.5/3 moist and 5/3 moist crushed) silt loam; very weak medium subangular blocky to massive structure; dry slightly hard, moist very friable; violently effervescent; clear smooth boundary.
- C2 36 to 60 inches. Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist and crushed) silt loam stratified with fine sandy loam; massive; dry soft, moist very friable; violently effervescent.

Soil Type: Colby silt loam
 Soil Nos.: S50Colo-50-6
 Location: 0.2 mile north and 0.25 mile east of the southwest corner, Sec. 12, T26S, R47W, Frowers County, Colorado.
 Climate: Continental climate, average annual precipitation 13 to 15 inches, frost-free season 165 days.
 Elevation: 4,000 feet.
 Parent Material: Alluvium.
 Physiographic Position: Stream terrace.
 Relief: Nearly level 0-1 percent slopes.
 Drainage: Good.
 Moisture: Dry.
 Water Table: None.
 Stoniness: None.
 Salt or Alkali: None.
 Erosion: None.
 Present Use: Native range.
 Described by: James F. Pannell, October, 1960.

Horizon and
 Lincoln
 Lab. No.

A11 14670	0 to 1 inch. Light grayish brown (10YR 5.5/2 dry) to dark grayish brown (10YR 3.5/2 moist and crushed) loam; weak fine platy structure breaking to weak very fine granular; dry soft, moist very friable; strongly effervescent; clear smooth boundary.
A12 14671	1 to 7 inches. Pale brown (10YR 5.5/3 dry) to dark brown (10YR 3.5/3 moist and 4/3 moist crushed) silt loam; moderate fine granular structure; dry slightly hard, moist very friable; strongly effervescent; clear smooth boundary.
AC 14672	7 to 14 inches. Pale brown (10YR 6/3 dry) to brown (10YR 4.5/3 moist and crushed) silt loam; weak medium subangular blocky structure breaking to weak fine granular; dry slightly hard, moist very friable; violently effervescent; gradual smooth boundary.
C1 14673	14 to 30 inches. Pale brown (10YR 6/3 dry) to brown (10YR 4.5/3 moist and crushed) silt loam; very weak medium subangular blocky structure; dry slightly hard, moist very friable; violently effervescent with a few small lime nodules; gradual smooth boundary.
C2 14674	30 to 40 inches. Pale brown (10YR 6/3 dry) to brown (10YR 4/3 moist and 4.5/3 moist crushed) silt loam; massive; dry slightly hard, moist very friable; violently effervescent; gradual smooth boundary.
C3 14675	40 to 60 inches plus. Pale brown (10YR 6/3 dry) to brown (10YR 4.5/3 moist and 5/3 moist crushed) stratified silt loam, fine sandy loam and very fine sandy loam; massive; dry soft, moist very friable; violently effervescent.

SOIL SURVEY LABORATORY Lincoln, Nebr. 6/26/58

SOIL TYPE Darling LOCATION Grand County, Colorado
 gravelly sandy loam

SOIL NOS. LAB. NOS. 2735-2741

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	> 2			
4-0	A0-A00											
0-4	A2	14.3	12.8	5.0	8.2	6.1	43.8	9.8	28.6	25.3		1
4-14	P2	19.9	14.9	6.2	11.8	8.4	31.0	7.8	29.4	16.2		cosl
14-30	P3	22.9	19.2	8.1	15.0	8.9	19.4	6.5	25.2	11.1		cosl
30-52	C1	15.9	16.8	7.5	15.2	11.2	26.2	7.2	31.5	14.3		cosl
52-74	C2	16.9	20.8	8.8	16.7	9.8	22.3	4.7	27.2	13.5		cosl
74-94	Dr	20.6	19.5	7.6	12.9	8.4	20.8	10.2	24.2	11.8		cosl
pH		ORGANIC MATTER										
8C1a	1:5	1:10	6A1a ORGANIC CARBON %	6B1a NITRO-GEN %	C/N							
4.4			1.39	.056	25							
4.7			0.92	.037	25							
5.2			0.40	.019	21							
5.3			0.26									
5.4			0.25									
5.6			0.22									
5A1a CATION EXCHANGE CAPACITY NE ₁ , Ac		EXTRACTABLE CATIONS					5B1a	BASE SAT. NH ₄ Ac EXCH.	5C3 Base Sat. % on Sum Cations	5B1a Sum Bases me/100g	5A3a Sum Cations me/100g	5D3 Ca/Mg
		6M2b Ca	6O2b Mg	6H1a H	6P2a No	6Q2a K						
		milliequivalents per 100g. soil										
16.8	2.4	1.0	14.6	0.1	0.4	23	21	3.9	18.5		2.4	
16.6	3.2	1.4	12.0	0.1	0.3	30	29	5.0	17.0		2.2	
14.3	6.4	1.9	6.1	0.1	0.3	61	59	8.7	14.8		3.4	
19.4	13.5	3.4	3.7	0.1	0.3	89	82	17.3	21.0		4.0	
24.0	17.3	4.1	4.1	0.2	0.3	91	84	21.9	26.0		4.2	
18.0	12.9	3.4	2.7	0.1	0.3	93	86	16.7	19.4		3.8	

Soil Type: Darling gravelly sandy loam
 Location: NW 1/4 of Sec. 8, T2S, R76W; Grand County, Colorado. West St. Louis Creek.
 Physiographic Position: Upland
 Topography: Steeply sloping mountain side facing north.
 Drainage: Well drained.
 Vegetation: Spruce - fir.
 Use: Presently in National Forest Service lands.
 Collected and Described by: John L. Retzer, September 5, 1952.

Horizon and
 Lincoln
 Lab. No.

Ao - Aoo 4 to 0 inch. Grayish brown (10YR 5/2 dry) to very dark gray (10YR 3/1 moist); a horizon of undecomposed and partially decayed forest litter made up of vaccinium roots, needles, twigs, and a few scattered leafy plants. The upper 1 inch is predominantly the undecomposed forest litter.
 2735

A2 0 to 4 inches. Light gray (10YR 7/2 dry) to grayish brown or light brownish gray (10YR 5.5/2 moist) gravelly loam; soft when dry, very friable when moist; weak to moderate fine platy structure breaking to moderate fine granules; extremely acid, approximate pH 4.2; lower boundary clear and smooth.
 2736

B2 4 to 14 inches. Brown (10YR 5/3 dry) to brown to dark brown (10YR 4/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; weak medium subangular blocky structure breaking to moderate very fine subangular blocks; extremely acid, approximate pH 4.2; lower boundary gradual and smooth.
 2737

B3 14 to 30 inches. Yellowish brown (10YR 5/4 dry) to dark yellowish brown (10YR 4/4 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; massive or very weak medium subangular blocky structure; very strongly acid, approximate pH 4.8; lower boundary gradual and smooth.
 2738

C1 30 to 52 inches. Light brownish gray (2.5Y 6/2 dry) to grayish brown (2.5Y 5/2 moist) gravelly sandy loam; hard when dry, friable when moist; massive; strongly acid, approximate pH 5.3; lower boundary gradual and smooth.
 2739

C2 52 to 74 inches. Light yellowish brown (2.5Y 6/4 dry) to light olive brown (2.5Y 5/3 moist) very gravelly sandy loam; loose when dry or moist; single grain; very strongly or strongly acid, approximate pH 5.0; this horizon is partially weathered bedrock.
 2740

Dr 74 to 94 inches. Fractured gneiss and schist only slightly altered by weathering.
 2741

Soil Type: Darling gravelly sandy loam
 Location: NW 1/4 of Sec. 8, T2S, R76W, Grand County, Colorado. West St. Louis Creek.
 Physiographic Position: Upland steep mountain slope.
 Topography: Steeply sloping area of approximately 35 percent gradient facing north.
 Drainage: Well drained.
 Vegetation: Spruce - fir.
 Use: National Forest Service land.
 Collected and Described by: John L. Retzer, September 8, 1955.

Horizon and
 Lincoln
 Lab. No.

Ao - Aoo 2742	4 to 0 inch. Dark-colored organic mat made up of undecomposed and partially decomposed forest litter, primarily vaccinium roots, needles, bark, and twigs.
A2 2743	0 to 3 inches. Light brownish gray (10YR 6/2 dry) to grayish-brown (10YR 5/2 moist) gravelly loam; soft when dry, very friable when moist; weak to moderate medium platy structure; extremely acid, approximate pH 4.4; lower boundary abrupt and smooth.
B2 2744	3 to 23 inches. Brown (7.5YR 5/4 dry) to brown to dark brown (7.5YR 4/4 moist) very gravelly sandy loam; loose when dry and moist; single grained; very strongly acid, approximate pH 4.7; approximately 75 percent of this horizon is gravel; lower boundary gradual and smooth.
B2 2745	23 to 38 inches. Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) gravelly sandy loam; very hard when dry, firm when moist; massive; strongly acid, approximate pH 5.2; this horizon is weakly cemented in some places, but the degree of cementation is not great and is variable from place to place; lower boundary gradual and smooth.
C1 2746	38 to 48 inches. Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) very gravelly sandy loam; slightly hard when dry, very friable when moist; massive; strongly acid, approximate pH 5.5; lower boundary diffuse and smooth.
C2 2747	48 to 81 inches. Light olive brown (2.5Y 5/3 dry) to olive brown (2.5Y 4/3 moist) partially weathered gneiss and schist bedrock. Approximately 70 percent of the horizon is coarse stones and boulders with the remainder of the horizon being a very gravelly sandy loam occurring between the boulders. Lower boundary diffuse and smooth.
D 2748	81 to 116 inches plus. Light olive brown (2.5Y 5/3 dry) to olive brown (2.5Y 4/3 moist) unweathered fresh gneiss and schist bedrock.

SOIL SURVEY LABORATORY Lincoln, Nebr. 6/26/58

SOIL TYPE Darling LOCATION Grand County, Colorado
 gravelly sandy loam

SOIL NOS. LAB. NOS. 2791-2794

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a		3A1					> 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	0.3-0.02	0.02-0.002		
0-6	A ₀ &A ₂											
6-21	B ₂	49.7	15.9	3.4	4.9	5.1	16.0	5.0	14.4	9.6	lcos	
21-34	B ₃	28.4	13.5	5.3	10.1	13.8	27.2	1.7	34.6	12.6	cosl	
34-47	C	17.4	14.1	8.5	14.7	15.1	27.2	3.0	41.8	9.3	cosl	
pH		ORGANIC MATTER										
8C1a		6A1a		6B1a								
	1:5	1:10	ORGANIC CARBON %	NITROGEN %	C/N							
1:1												
4.9			0.62	.015	41							
5.0			0.60	.031	19							
5.3			0.21	.015								
5A1a		EXTRACTABLE CATIONS				5B1a	BASE SAT.	Base	5B1a	5A3a	8D3	
CATION EXCHANGE CAPACITY	6N2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ Ac EXCH. SCI	Sat. % on Sum Cations	Sum Bases	Sum Cations	Ca/Mg		
MH ₄ Ac	Ca	Mg	H	Na	K		5C3	me/100g	me/100g			
	← milliequivalents per 100g. soil →											
10.9	5.1	1.7	11.3	0.1	0.1	64	38	7.0	18.3	3.0		
11.8	0.6	0.2	12.2	0.1	0.1	8	8	1.0	13.2			
16.2	4.6	1.2	9.1	0.1	0.2	38	40	6.1	15.2	3.8		

Soil Type: Darling gravelly sandy loam
 Location: SW 1/4 of Sec. 10, T2S, R76W, Grand County, Colorado, along Road 9, Fool Creek Watershed.
 Physiographic Position: Upland.
 Topography: Steeply sloping slightly concave mountain slope, facing north.
 Drainage: Well or moderately well drained.
 Vegetation: Spruce and fir.
 Use: National Forest Service land.
 Collected and Described by: John L. Retzer, October 3, 1952.

Horizon and
 Lincoln
 Lab. No.

- Ao & A2
 2791 0 to 6 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) gravelly sandy loam; soft when dry, very friable when moist; weak to moderate fine granular structure; extremely acid, approximate pH 4.2; this horizon appears to be a mixture of Ao and A2. At the site sampled, portions of the pit indicated a weak A2 in the lower inch while other portions seemed to indicate that the A2 had been mixed throughout the entire horizon since small fragments of mineral matter approximately 10YR 7/2 dry and 10YR 5/2 moist occurred heterogeneously throughout the mass.
- B2
 2792 6 to 21 inches. Brown (7.5YR 5/3 dry) to brown or dark brown (7.5YR 4/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; weak to moderate subangular blocky structure; strongly acid, approximate pH 5.1; lower boundary gradual and smooth.
- B3
 2793 21 to 34 inches. Light yellowish brown (10YR 6/4 dry) to dark yellowish brown (10YR 4/4 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; massive; strongly acid, approximate pH 5.2; lower boundary gradual and smooth.
- C
 2794 34 to 47 inches. Light yellowish brown (2.5Y 6/4 dry) to light olive brown (2.5Y 5/4 moist) gravelly sandy loam; very hard when dry, very firm when moist; massive; strongly acid, approximate pH 5.5; 80 to 90 percent of this horizon is gravel and rock, and the horizon appears to be weakly cemented; lower boundary is diffuse and smooth.
- D 47 to 55 inches. Partially weathered gneiss and schist bedrocks.

Remarks: This profile is thought to be a Darling soil occurring in a slightly concave area where it has received some mixture and truncation, so that the distinct A2 of the Darling soils occurs indefinitely or may be absent entirely. These areas in the Fraser Unit were of small acreage and were combined as an inclusion in the Darling series. It is possible that soils of this character will need series status if they are found to occur frequently and in large areas.

SOIL SURVEY LABORATORY Lincoln, Nebr. 6/26/58

SOIL TYPE Darling LOCATION Grand County, Colorado
 gravelly sandy loam

SOIL NOS. LAB. NOS. 2795-2799

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a		3A1								
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	> 2	
3-0	Aoo											
0-10	Ac&A2	9.4	6.6	3.8	9.0	10.9	41.5	18.8	34.5	23.5		1
10-22	B2	18.8	11.0	6.0	12.1	13.5	32.2	6.4	37.5	15.6		cosl
22-42	B3	22.9	12.7	6.8	11.8	11.5	27.8	6.5	34.3	12.1		cosl
42-54	C1	38.0	17.4	7.9	10.5	7.0	14.0	5.2	20.4	6.2		lcos
pH		ORGANIC MATTER										
8C1a		6A1a		6B1a								
	1:5	1:10	ORGANIC CARBON	NITROGEN	C/N							
1:1			%	%								
4.9			7.22	.398	18							
5.6			0.54	.046	12							
5.8			0.28	.020	14							
5.9			0.23									
5A1a		EXTRACTABLE CATIONS				5B1a	BASE SAT. %	Base Sat. %	5B1a	5A3a	8D3	
CATION EXCHANGE CAPACITY NH ₄ Ac		6N2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ Ac EXCH. 5C1	on Sum Cations	Sum Bases	Sum Cations	Ca/Mg	
		milliequivalents per 100g. soil						5C3	me/100g	me/100g		
35.9	17.0	4.7	28.4	0.1	0.4	62	44	22.2	50.6		3.6	
11.1	6.7	1.5	4.6	0.1	0.1	76	65	8.4	13.0		4.5	
8.2	4.9	1.2	4.4	0.1	0.1	77	59	6.3	10.7		4.1	
7.3	4.3	1.2	2.8	0.1	0.1	78	67	5.7	8.5		3.6	

Soil Type: Darling gravelly sandy loam
 Location: SW 1/4 of Sec. 10, T2S, R76W, Grand County, Colorado, along Road 9, Fool Creek Watershed.
 Physiographic Position: Upland.
 Topography: Steeply sloping slightly concave mountain side, facing north.
 Drainage: Moderately or well drained.
 Vegetation: Spruce and fir.
 Use: National Forest Service land.
 Collected and Described by: John L. Retzer, October 3, 1952.

Horizon and
 Lincoln
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Aoo 3 to 0 inch. A forest mat of undecomposed moss, vaccinium, needles, bark and twigs.
 2795

Ao & A2 0 to 10 inches. Dark gray (10YR 4/1 dry) to very dark gray (10YR 3/1 moist) gravelly loam; soft when
 2796 dry, very friable when moist; moderate fine granular structure; very strongly acid, approximate pH
 5.0; this horizon appears to be a mixture of Ao and A2. In places a thin A2 horizon in (10YR 7/2 dry)
 and (10YR 5/2 moist) occurs intermittently in the lower 2 inches of the horizon described. In other
 areas flecks and nodules of A2-like material (10YR 7/2 dry) and (10YR 5/2 moist) occur throughout
 the entire horizon.

E2 10 to 22 inches. Brown (7.5YR 5/4 dry) to brown or dark brown (7.5YR 4/4 moist) gravelly loam; slightly
 2797 hard when dry, very friable when moist; weak medium subangular blocky structure; medium acid, approxi-
 mate pH 5.6; lower boundary gradual and smooth.

B3 22 to 42 inches. Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) gravelly
 2798 sandy loam; slightly hard when dry, very friable when moist; massive; medium acid, approximate pH 5.8;
 lower boundary gradual and smooth.

C1 42 to 54 inches. Light yellowish brown (2.5Y 6/3 dry) to olive brown (2.5Y 4/4 moist) gravelly sandy
 2799 loam; hard when dry, firm when moist; massive; medium acid, approximate pH 5.8; lower boundary gradual
 and smooth.

C2 54 to 57 inches. This is a stratified layer and contains a large amount of coarse gravel and rock.

D 57 inches plus. Light brownish gray (2.5Y 6/2 dry) to grayish brown (2.5Y 5/2 moist) partially weathered
 gneiss and schist bedrock.

Soil Type: *Deertrail silt loam

Soil Nos.: 8610olo-3-4

Classification: Brown.

Location: 521 feet east, 252 feet north of the southwest corner of Sec. 23, T58, R99W, Arapahoe County, Colorado.

Climate: Continental, average annual precipitation 14 inches. Mean annual temperature 49° F.

Frost-free period 150 days. Elevation 5,400 feet.

Vegetation: Native pasture. Barren. Buffalograss and western wheatgrass on the edge. Associated with Weld silt loam growing blue grass and pricklypear.

Parent material: Aolian silty material - loess.

Physiographic position: Upland.

Relief: Small depression, about 10 feet in diameter, and 4 inches lower than surrounding ground. Overall slope is nearly level, 1 percent facing north and east.

Drainage: Slow surface drainage. Water will stand in these spots a day or more. Medium to slow internal drainage in E2, medium in other horizons. Slow intake rate.

Moisture: Moist to 1 1/4 inches, dry below. Usually dry. Water table: None. Stoniness: None.

Salt or alkali: Typical for E3ca to have a pH of over 8.5, but pH of 7.5 or lower in A2 and E2. Calcium carbonate present below E2 horizon.

Erosion: Slight wind. May be removal or deposition.

Described by: J. B. Brown, June 27, 1961.

Horizon and

Lincoln

Lab. Nos.

A2 15508	0 to 2 inches. Dark grayish brown (10YR 4/2, moist) heavy silt loam; light brownish gray (10YR 6/2, dry) strong fine granular structure; soft when dry, very friable when moist; texture grades from silt loam to silty clay loam; the bottom 1/4 to 3/8 inch of this horizon has strong, very fine platy structure; this material coats the tops of the columns of E2 horizon; boundary is abrupt and smooth.
E2t 15509	2 to 9 inches. Dark brown (10YR 3.5/3, moist) clay; dark brown (10YR 4/3, dry) dark brown (10YR 4/3, moist and crushed); moderate medium prisms breaking to strong fine angular blocks; very hard when dry, very firm when moist; thin nearly continuous clay skins on all ped surfaces; columns are coated with fine bleached sand grains; roots are plentiful in this horizon, with as many penetrating the peds as following the structural faces; top two inches of this horizon has a little darker staining on the outside of the peds than the lower part of the horizon; abrupt slightly wavy boundary.
E2ca 15510	9 to 12 inches. Brown (10YR 4.5/3, moist) silty clay; pale brown (10YR 6/3, dry) moderate medium prisms breaking to moderate fine angular blocks; hard when dry, firm when moist; thin patchy clay films on all ped faces; roots and root channels are numerous in this horizon; strong effervescence; clear smooth boundary.
E31ca 15511	12 to 23 inches. Brown (10YR 5/3, moist) silty clay loam; pale brown (10YR 6.5/3, dry) moderate medium prisms breaking to moderate fine angular and subangular blocks; hard when dry, firm when moist; thin patchy clay films on ped surfaces; roots are numerous with many fine pores one millimeter in diameter; lime concretions are common medium and faint; violent effervescence; clear smooth boundary.
E32ca 15512	23 to 32 inches. Brown (10YR 5/3, moist) light silty clay loam; pale brown (10YR 6/3, dry) weak medium prisms breaking to weak to moderate medium subangular blocks; slightly hard when dry, friable when moist; thin patchy clay films on some ped faces; lime concretions are few medium and faint; some roots and many small pores less than one millimeter in diameter; violent effervescence; gradual smooth boundary.
G1 15513	32 to 44 inches. Brown (10YR 5/3, moist) silt loam; pale brown (10YR 6/3, dry) weak coarse prismatic to massive structure; soft when dry, very friable when moist; few roots with many small holes less than one millimeter in diameter; violent effervescence; arbitrary boundary.
G2 15514	44 to 55 inches. Brown (10YR 5/3, moist) silt loam; pale brown (10YR 6/3, dry) weak coarse prismatic to massive structure; soft when dry, very friable when moist; very few roots but pores continue; violent effervescence; clear slightly wavy boundary.
C3cs 15515	55 to 69 inches. Brown (10YR 5.5/3, moist) silt loam; pale brown (10YR 6.5/3, dry) massive structure; soft when dry, very friable when moist; no roots, but small holes continue; salt concretions that appear to be gypsum are common medium and faint; violent effervescence.

Remarks: This soil is associated with the Weld series and grades from this to the Weld. These spots are usually small, less than 100 feet in diameter. They are common on slopes of 0 to 3 percent, and are found at the heads of drainages on slopes of 3 to 5 percent. Where cultivated, the crops are lower in height and lower in yields, where these spots have been. They will show as slicked-over areas in cultivated fields. They seldom cover more than 30 percent of the area, with yields being 5 to 20 percent less where these spots are present, as compared to the Weld series alone. Columns in the E2 often lean 10 to 30 degrees, but none have been found that are horizontal. They may lean in any direction.

Bureau of Public Roads Samples: E2, 2-9 inches; E31ca, 12-23 inches; G1, 32-44 inches.

Observations of fabric with stereoscopic microscope: E2 has weaker planar surface coatings than does Weld E2. May have a few thin clay films around pores in ped interiors. The E2ca has a very few clay films (?) around pores in ped interiors. Structure weaker than E2 of Weld.

Micromorphology (Method 4E1): Examined one thin section of E2. Clay orientation weaker and fewer clay films than in E2 of 3-6.

Sand Mineralogy (Method 7E1): Deertrail has an increase in mica with depth.

SOIL *Deertrail silt loam SOIL Nos. S61Colo-3-6 LOCATION Arapahoe County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 15525-15532 February 1965

Depth (in.)	Horizon	Size class and particle diameter (mm)											3A1			8A1a Clay		Coarse fragments 2A2		
		1B1a Total			Sand					Silt			Int. II (0.2-0.02)	(2-0.1)	Carbonate	Noncarbonate	> 2	2 - 19	19-76	
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)									
Pct. of < 2 mm																				
0-3	A2	19.3	52.9	27.8	0.1a	0.2a	0.3	2.1	16.6	35.2	17.7	53.3	2.7	-	28	-	Tr.	-	-	
3-10	B2t	13.1	42.7	14.2	-	0.2	0.2	1.7	11.0	24.6	18.1	36.9	2.1	4	44	-	Tr.	-	-	
10-13	B2ca	14.3	46.5	39.2	-	0.1b	0.1b	1.6b	12.5b	27.3	19.2	41.1	1.8	4	35	-	Tr.	-	-	
13-20	B31ca	17.4	50.3	32.3	-	0.2c	0.2c	1.5b	15.5b	31.2	19.1	47.9	1.9	6	26	-	-	-	-	
20-29	B32ca	16.9	53.9	29.2	-	0.1c	0.2c	1.2a	15.4a	32.9	21.0	49.2	1.5	4	25	-	-	-	-	
29-40	C1	16.2	57.7	26.1	-	0.1c	0.1c	1.1d	14.9d	35.0	22.7	50.7	1.3	3	23	-	-	-	-	
40-55	C2	16.1	61.7	22.2	-	0.1c	0.2c	1.3d	14.5d	35.9	25.8	51.4	1.5	Tr.	22	-	Tr.	-	-	
55-68	C3	17.2	64.6	18.2	-	-	0.1c	1.0d	16.1d	38.6	26.0	55.5	1.1	Tr.	18	-	-	-	-	
Depth (in.)	6A1a Organic carbon	6B1a Nitrogen	C/N	6E1c Carbonate as CaCO ₃	Bulk density			4M1 Water content			8D1 pH									
					4A1c 30-Cm. g/cc	4A1b Air-Dry g/cc	4M1e COLE g/cc	4E3 30-Cm. Pct.	4E1b 1/3-Bar Pct.	4E2 15-Bar Pct.	4C1 1/3 to 15-Bar in. per horizon	8D1 15-Bar to Paste Ratio	8C1b Sat. Paste	8C1a 1:10	8C1a (1:1)					
0-3	1.92	0.151	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3-10	0.78	0.089	9	1	-	-	1.34	1.64	0.45	30.8	23.5	12.6	0.45	6.2	6.6	6.3	-	-	-	
10-13	0.64	0.075	8	9	-	-	-	1.47	-	-	31.7	17.8	0.40	7.1	7.8	7.3	-	-	-	
13-20	0.50	0.055	9	12	-	-	-	-	-	-	27.7	16.4	0.42	7.8	8.5	8.0	-	-	-	
20-29	0.30	0.032	9	10	-	-	-	1.48	-	-	26.4	13.2	0.41	7.8	9.0	8.4	-	-	-	
29-40	0.20	-	9	9	-	-	-	1.32	-	-	27.9	12.7	0.43	8.1	9.3	8.7	-	-	-	
40-55	0.19	-	6	6	-	-	-	-	-	-	27.0	12.0	0.46	7.7	9.0	8.3	-	-	-	
55-68	0.16	-	6	6	-	-	-	1.26	-	-	24.2	11.8	0.53	7.7	8.9	8.2	-	-	-	
55-68	0.16	-	6	6	-	-	-	-	-	-	25.0	11.0	0.60	7.9	9.0	8.3	-	-	-	
Depth (in.)	Extractable bases 5B1a				6F1a Sum	Cat. Exch. Cap.			Water extract from saturated paste 8A1											
	6N2b Ca	6O2b Mg	6P2a Na	6Q2a K		6R1a Ext. Acidity	5A3a Sum	5A1a NH ₄ OAc	5A2a NaOAc	6N1a Ca	6O1a Mg	6P1a Na	6Q1a K	6T1a CO ₃	6U1a HCO ₃	6V1a Cl	6W1a SO ₄	8A1a Electrical conductivity		
meq/100 g																			mmho/cm	
0-3	11.6	5.8	0.1	1.7	19.2	4.7	23.9	20.3	20.6	-	-	-	0.5	0.6	-	-	-	0.46		
3-10	24.2	9.9	0.4	2.0	36.5	-	36.5	28.2	28.6	-	-	-	1.3	0.5	-	-	-	0.70		
10-13	-	-	0.9	1.5	-	-	-	24.0	25.2	-	-	-	2.6	0.4	-	-	-	0.64		
13-20	-	-	1.9	1.0	-	-	-	20.0	21.6	-	-	-	5.3	0.2	-	-	-	0.67		
20-29	-	-	3.8	1.0	-	-	-	20.0	21.1	0.1	0.2	8.6	0.2	-	11.1	-	0.5	1.00		
29-40	-	-	4.8	1.1	-	-	-	20.6	21.4	6.3	5.0	32.2	0.6	-	8.4	9.1	34.2	4.20		
40-55	-	-	5.6	1.3	-	-	-	21.6	22.7	13.3	9.9	51.9	0.9	-	6.8	35.8	37.4	5.70		
55-68	-	-	5.0	1.1	-	-	-	21.1	21.4	4.6	3.0	30.3	1.3	-	6.8	15.9	20.7	3.80		
Depth (in.)	8A Water at Saturation	5D1 Exchangeable Na NaOAc CEC	5E Sodium Adsorption Ratio	6F1a Gypsum	8D1 NH ₄ OAc to Clay Ratio	a. > 50% organic matter. b. 5-25% carbonate. c. 25-50% mica-like. d. 5-25% carbonate. < 5% mica-like. e. Coefficient of linear extensibility.														
	Pct.	Pct.	Ratio	Pct.	Ratio															
0-3	54.6	-	-	-	0.73															
3-10	68.8	1	-	-	0.64															
10-13	66.9	3	-	-	0.61															
13-20	45.0	8	-	-	0.62															
20-29	44.9	16	-	-	0.68															
29-40	42.9	16	14	-	0.79															
40-55	41.2	15	15	-	0.97															
55-68	41.2	18	16	-	1.16															

Soil Type: *Deertrail silt loam

Soil Nos.: S61Colo-3-6

Classification: Brown

Location: 144 feet west, 303 feet south of the northeast corner of Sec. 16, T4S, R59W, Arapahoe County, Colorado.

Climate: Continental, average annual precipitation 14 inches. Mean annual temperature 49° F.

Frost-free period 150 days. Elevation 5,100 feet.

Vegetation: Native pasture. Buffalograss associated with blue grama, western wheatgrass and pricklypear.

Parent material: Aeolian silty material. Physiographic position: Upland.

Relief: Small depression about 7 feet in diameter, and 4 inches lower than surrounding area. Over-all slope is nearly level, 1 percent facing northeast.

Drainage: Surface drainage slow to none. Water will stand in these spots a day or more. Slow to medium internal in the B₂, medium in other horizons. Slow intake rate.

Moisture: Moist to 12 inches. Dry below. Usually dry. Water table: None. Stoniness: None.

Salt or alkali: Typical for B₃ca to have a pH of over 8.5, with pH of 7.5 or lower in A₂ and B₂. Calcium carbonate present below B₂ horizon.

Erosion: Slight wind. May be removal or deposition. Described by: J. B. Brown, June 28, 1961.

Horizon and

Lincoln
Lab. No.

A ₂ 15525	0 to 3 inches. Dark grayish brown (10YR 4/2, moist) heavy silt loam; light brownish gray (10YR 6/2, dry) strong very fine granular structure; soft when dry, very friable when moist; this horizon grades from a silt loam to a silty clay loam; the bottom 1/4 to 1/2 inch has strong very fine platy structure coating the tops of the columns of the B ₂ ; field pH 6.8; boundary abrupt and smooth.
B ₂ t 15526	3 to 10 inches. Dark brown (10YR 3.5/3, moist) clay; dark brown (10YR 4/3, dry, moist and crushed) moderate medium columns breaking to strong fine angular blocks; very hard when dry, very firm when moist; thin continuous clay films on ped surfaces; top 2 inches have darker staining on outside of peds; columns are coated with bleached fine sand grains; roots are numerous and readily penetrate the peds; field pH 7.6; abrupt slightly wavy boundary.
B ₂ ca 15527	10 to 13 inches. Brown (10YR 4.5/3, moist) silty clay; brown (10YR 5/3, dry) moderate medium prisms breaking to moderate to strong fine angular blocks; hard when dry, firm when moist; thin patchy clay skins on all peds; many roots readily penetrate the peds; strong effervescence; with field pH of 8.6; clear smooth boundary.
B ₃ 1ca 15528	13 to 20 inches. Light olive brown (1Y 5/3, moist) silty clay loam; light yellowish brown (1Y 6/3, dry) moderate medium prisms breaking to moderate medium subangular and angular blocks; hard when dry, friable when moist; thin patchy clay films on vertical faces; many roots readily penetrate peds; small holes less than one millimeter in diameter are common; lime concretions are common medium and faint; violent effervescence; field pH 9.0; gradual smooth boundary.
B ₃ 2ca 15529	20 to 29 inches. Light olive brown (1Y 5/3, moist) light silty clay loam; light yellowish brown (1Y 6/3, dry) weak medium prismatic breaking to weak medium subangular blocks; hard when dry, friable when moist; few thin clay skins on some vertical faces; roots are plentiful, with many fine pores less than one millimeter in diameter; lime concretions are few medium and faint; violent effervescence; gradual smooth boundary.
C ₁ 15530	29 to 40 inches. Light olive brown (1Y 5/3, moist) heavy silt loam; light yellowish brown (1Y 6/3, dry) weak coarse prismatic structure; slightly hard when dry, friable when moist; some roots and many small holes less than one millimeter in diameter; some lime mycelia; violent effervescence; diffuse boundary.
C ₂ 15531	40 to 55 inches. Light olive brown (1Y 5/3, moist) silt loam; light yellowish brown (1Y 6/3, dry) massive; soft when dry, very friable when moist; very few roots, but many holes less than one millimeter in diameter; violent effervescence; arbitrary boundary.
C ₃ 15532	55 to 68 inches. Light olive brown (1Y 5/3, moist) silty loam; light yellowish brown (1Y 6/3, dry) massive; soft when dry, very friable when moist; no roots, but small holes continuous; violent effervescence.

Remarks: This soil is associated with the Weld series and grades from this to the Weld. These spots are usually small, less than 100 feet in diameter. They are common on slopes of 0 to 3 percent and are found at the heads of drainages on slopes of 3 to 5 percent. Where cultivated, the crops are lower in height and lower in yields where these spots have been. They will show as slicked-over areas in cultivated fields. They seldom cover more than 30 percent of the area, with yields being 5 to 20 percent less where these spots are present, as compared to the Weld series alone. Columns in the B₂ often lean 10 to 30 degrees, but none have been found that are horizontal. They may lean in any direction.

Bureau of Public Roads Samples: B₂, 3-10 inches; B₃2ca, 20-29 inches; C₂, 40-55 inches.

Identification		EXCHANGE CAPACITY OF NONCLAY				Total me./100 g.
		Silt (50-4μ)		Sand		
		me./100 g.	Per 100 g./<2-mm.	me./100 g.	Per 100 g./<2-mm.	
15526	B ₂	7.2	3.1	2.1	0.3	3.4
15531	C ₂	4.0	2.5	4.7	0.8	3.3

Observations of fabric with stereoscopic microscope: B₂ has very weak coatings on planar surfaces. A few clay films associated with pores of ped interiors. Slightly denser and shinier planar surfaces than B₂ of 3-4. Structure weaker than B₂ of Weld.

Micromorphology (Method 4E1): Examined B₂ and B₂ca. Most macro surfaces have little or no associated preferred orientation. A very few clay films occur. The B₂ has slightly weaker clay orientation than B₂ca. Markedly fewer clay and pressure films than in the B₂ of Weld 3-3.

Clay Mineralogy (Method 7A): The dominant mineral in the clay fraction in all horizons is montmorillonite. In the A horizon and noncalcareous B horizon this mineral is somewhat disordered, partly weathered, or contains interlayered mineral as indicated by diffuse, broadened X-ray reflections. These horizons also contain slightly more mica and kaolin than the calcareous horizons. The montmorillonite in the calcareous B and C horizons gives very strong sharp X-ray reflections indicating regular crystallinity as well as large amounts.

Sand mineralogy (Method 7B1): Deertrail has an increase in mica with depth.

SOIL SURVEY LABORATORY Lincoln, Nebr. November 1958

SOIL TYPE Edloe LOCATION Trout Creek Watershed, Chaffee County, Colorado
 gravelly sandy loam

SOIL NOS. S57Colo-8-1

LAB. NOS. 8172-8178

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	($< 19\mu$)	
1/2-0	A ^o , A ^{oo}										29	
0-1 1/2	A1	16.4	15.5	8.8	13.8a	9.8a	29.6	6.1	34.4	11.8	40.	cosl
1 1/2-8	A2	19.9	17.6	10.0	14.9a	11.4a	20.9	5.3	30.9	8.7	35.	cosl
8-19	B1	24.7	18.8	9.5	13.7a	9.5a	15.1	8.7	25.8	5.3	61.	cosl
19-29	B2t	17.3	18.3	9.2	14.4a	11.4a	16.1	13.3	29.1	5.6	38	cosl
29-33	B3	17.0	31.0	12.7	17.9a	6.5a	5.3	9.6	17.2	2.4	52	lcos
33-45+	C	9.2	31.7	13.6	22.4a	8.2a	5.0	9.9	21.4	2.0	57	lcos
pH		ORGANIC MATTER				6C1a	6E1a		MOISTURE TENSIONS			
8C1a	1:5	1:10	6A1a	6B1a		Free Iron Fe ₂ O ₃ %			4B1a 1/10	4B1a 1/3	4P2 15	
			ORGANIC CARBON %	NITRO-GEN %	C/N				ATMOS.	ATMOS.	ATMOS.	
	1:1								%	%	%	
6.7			2.16	0.098	22	1.0		<	24.5	12.1	3.9	
6.3			0.91	0.042	22	1.0		<	19.3	9.3	3.1	
6.6			0.25	0.014	18	1.1		<	13.9	7.4	3.6	
6.4			0.17	0.011		1.2		<	17.2	10.0	4.8	
6.8			0.10			1.2		<	10.8	7.2	3.8	
6.7			0.09			1.1		<	8.9	7.6	4.1	
5A1a		EXTRACTABLE CATIONS				5B1a	BASE SAT. %	5C3	Sum Bases	Sum Cations	Ca/Mg	
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6H1a	6P2a	6Q2a		NH ₄ Ac EXCH.	Base Sat. % on Sum Cations	5B1a	5A3a		
	Ca	Mg	H	Na	K				me/100g			
	milliequivalents per 100g. soil						5C1				8D3	
12.6	10.7	1.1	3.6	<0.1	0.6		98	78	12.4	16.0	9.7	
7.8	5.9	0.8	3.2	<0.1	0.3		90	69	7.0	10.2		
7.3	5.2	1.2	2.3	<0.1	0.3		92	74	6.7	9.0	4.3	
9.2	6.6	1.8	5.0	<0.1	0.3		94	64	8.7	13.7	3.7	
7.2	5.6	1.3	2.3	<0.1	0.2		99	76	7.1	9.4	4.3	
7.0	5.5	1.2	2.7	<0.1	0.2		98	72	6.9	9.6	4.6	
a.		Common flakes of mica.										

Soil Type: **Edloe gravelly sandy loam**
 Soil Nos.: **857Colo-8-1**
 Location: **Trout Creek Watershed, Chaffee County, Colorado.**
 Physiographic Position: **Mountain side. Elevation 9,730 feet.**
 Topography: **Steeply sloping north face approximately 40 percent gradient.**
 Drainage: **Well drained.**
 Vegetation: **Spruce, fir, with only a small amount of understory brush and grass.**
 Use: **National Forest lands.**
 Collected by: **John Retzer, A. J. Cline, E. M. Payne, T. Baber, W. Hunter and P. Wesswick, September 18, 1957.**
 Described by: **A. J. Cline.**

**Horizon and
 Lincoln
 Lab. No.**

- Ao, Aoo** 1/2 to 0 inch. Organic horizons too thin to be sampled separately, consisting mainly of undecomposed forest debris of branches, bark, and evergreen needles, but with a very thin partially decomposed horizon at its base.
- A1** 0 to 1 1/2 inches. Gray (10YR 5/1 dry) to very dark grayish brown (10YR 3/2 moist) gravelly sandy loam; soft when dry, very friable when moist; weak very fine platy structure, breaking to moderate fine crumb; noncalcareous, approximate pH 6.8; lower boundary clear and wavy.
- A2** 1 1/2 to 8 inches. Light brownish gray (10YR 6.5/2 dry) to grayish brown (10YR 5.5/2 moist) gravelly loamy sand; soft when dry, very friable when moist; weak fine platy structure, breaking to moderate medium crumb; noncalcareous, approximate pH 6.8; this horizon is very vesicular and contains many medium-sized pores; about 40 percent of the horizon is gravel; lower boundary gradual and wavy.
- B1** 8 to 19 inches. Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist) stony sandy loam; soft when dry, very friable when moist; weak to moderate fine subangular blocky structure; noncalcareous, approximate pH 6.6; this horizon contains aggregates of material similar to those of the underlying horizon but which are completely enclosed and surrounded by light-colored material similar to that of the overlying horizon. Some of the aggregates in this horizon have thick continuous clay skins and in some parts of the horizon thick gelatinous seams of bright-colored clay-like material occur between the rocks and in natural cleavage planes; about 50 percent of this horizon is stone and gravel; lower boundary gradual and wavy.
- B2t** 19 to 29 inches. Light brown (7.5YR 5.5/3 dry) to brown (7.5YR 5/4 moist) stony sandy clay loam; hard when dry, friable when moist; moderate medium subangular blocky structure; noncalcareous, approximate pH 6.6; there are thick continuous clay skins on the surfaces of the soil aggregates; 40 percent of this horizon is gravel and stone; lower boundary gradual and smooth.
- B3** 29 to 33 inches. Brown (10YR 5/3 dry) to brown or dark brown (10YR 4/3 moist) stony loamy sand; slightly hard when dry, very friable when moist; weak medium granular structure to single grain; noncalcareous, approximate pH 6.6; there are a few thin clay skins on the soil aggregates and coating the surfaces of the rock fragments; about 40 percent of this horizon is gravel and stone; lower boundary gradual and smooth.
- C** 33 to 45 inches plus. Brown (10YR 5/3 dry) to dark brown (10YR 3/3 moist) stony sand and gravel. This horizon is principally disintegrated granite and biotite schist; its pH is approximately 6.6.

Remarks: Profile downslope in position from Edloe, Soil Nos. 857Colo-8-2.

SOIL SURVEY LABORATORY Lincoln, Nebr. November 1958

SOIL TYPE Edloe LOCATION Trout Creek Watershed, Chaffee County, Colorado
 gravelly sandy loam

SOIL NOS. S57Colo-8-2 LAB. NOS. 8179-8183

DEPTH 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		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	> 2		
0-2	A1	22.2	15.5	6.0	5.2a	10.1a	32.5	8.5	28.5	14.9	47	cosl	
2-8	A2	25.9	20.4	8.8	11.3a	7.7a	20.6	5.3	25.0	8.6	49	cosl	
8-13	B1	30.1	24.5	9.7	11.9a	5.7a	12.4	5.7	17.9	5.7	47	lcos	
13-18	B2t	27.8	23.7	9.4	10.6a	7.7a	14.2	6.6	19.3	6.6	54	lcos	
18-34+	Cr	15.0	28.7	13.0	20.8a	7.6a	8.6	6.3	21.8	4.6	58	lcos	
pH		ORGANIC MATTER				6C1a	6E1a		MOISTURE TENSIONS				
8C1a		6A1a		6B1a	Free Iron		CaCO ₃ equivalent		4B1a	1/3	4B2		
1:5		ORGANIC CARBON		NITRO-GEN	C/N		%		ATMOS.	ATMOS.	15		
1:10		%		%	%		%		%	%	%		
6.5		4.47		0.183	24		0.9		<			6.1	
5.9		1.25		0.045	28		0.9			19.0	10.6	3.8	
6.2		0.44		0.022	20		0.8			10.3	7.6	2.8	
6.4		0.37		0.016	23		0.9			12.7	8.3	3.0	
6.7		0.17		0.007			0.6		<	11.1	7.3	2.4	
5A1a		EXTRACTABLE CATIONS				5B1a	BASE SAT. %	5C3	Sum	Sum	Ca/Mg		
CATION EXCHANGE CAPACITY NH ₄ Ac		6M2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ Ac EXCH.	Base Sat. % on Sum	Bases	Cations			
		Ca	Mg	H	Na	K			5B1a	5A3a			
		milliequivalents per 100g. soil					5C1	Cations	me/100g.	8D3			
18.2	15.0	1.4	8.3	<0.1	0.8	94	67	17.2	25.5	10.7			
8.2	5.6	0.6	4.1	<0.1	0.4	80	62	6.6	10.7				
5.4	4.0	0.6	2.7	<0.1	0.4	85	63	4.6	7.3				
5.4	3.9	0.6	1.8	<0.1	0.4	91	73	4.9	6.7				
4.1	2.9	0.4	1.4	<0.1	0.3	88	72	3.6	5.0				
a.		Common flakes of mica.											

Soil Type: *Biloe gravelly sandy loam*

Soil Nos.: S57Colo-8-2

Location: Trout Creek Watershed, Chaffee County, Colorado.

Physiographic Position: Mountain side. Elevation 9,855 feet.

Topography: Steeply sloping north-facing mountain slope, approximate gradient 42 percent.

Drainage: Well drained.

Vegetation: Aspen, fir, spruce and Kinikinnick.

Use: National Forest Service lands.

Collected by: John Retzer, A. J. Cline, E. M. Payne, T. Baber, W. Hunter, and E. Wesswick, September 18, 1957.

Described by: A. J. Cline.

Horizon and

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- Ao, Aoo 1 to 0 inch. This is a thin organic mat made up mostly of undecomposed pine needles, leaves, and grass remains, but having its lower portion moderately well decomposed. It rests abruptly on the horizon below.
- A1 0 to 2 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) gravelly sandy loam; soft when dry, very friable when moist; moderate fine crumb structure; noncalcareous; about 25 percent of this horizon is gravel; lower boundary abrupt and smooth.
- A2 2 to 8 inches. Light gray (10YR 7/2 dry) to grayish brown (10YR 5/2 moist) gravelly loamy sand; soft when dry, very friable when moist; weak fine platy structure breaking to moderate fine crumbs; noncalcareous; there are common numbers of small distinct 10YR 5/4 mottles; about 40 percent of this horizon is gravel; lower boundary gradual and wavy.
- B1 8 to 13 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) gravelly loamy sand or gravelly sandy loam; soft when dry, very friable when moist; weak medium subangular blocky structure, breaking to moderate fine granular; noncalcareous; this horizon contains some aggregates similar in character to those of the horizon below but these are imbedded in light-colored material similar to that of the overlying horizon; there are a few thin continuous clay skins on some of the soil aggregates, and in some portions of the horizon seams of clay-like material are visible; about 40 percent of the horizon is gravel; lower boundary gradual and wavy.
- Bt 13 to 18 inches. Pale brown (10YR 6/3 dry) to brown or dark brown (10YR 4/3 moist) stony sandy clay loam; hard when dry, friable when moist; moderate medium subangular blocky structure; noncalcareous; there are thin nearly continuous clay skins on the surfaces of the soil aggregates in this horizon; approximately 65 percent of the horizon is stone and gravel; the lower is diffuse and irregular; some gray coating material occurs on the surface of the soil aggregates in this horizon.
- Cr 18 to 34 inches plus. This horizon is mainly weathered granite and biotite schist. The material is partially indurated but usually can be broken between the thumb and finger. Its consistence increases with depth.

Remarks: Profile intermediate in position on slope between Biloe profiles, Soil Nos. S57Colo-8-1 and S57Colo-8-3.

SOIL SURVEY LABORATORY Lincoln, Nebr. November 1958

SOIL TYPE Edloe LOCATION Trout Creek Watershed,
gravelly sandy loam Chaffee County, Colorado

SOIL NOS. S57Colo-8-3

LAB. NOS. 8184-8188

DEPTH INCHES	HORIZON	1E1a PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										2A2 > 2 (< 9mm)	TEXTURAL CLASS
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	3A1		
0-1	A1	20.3	14.6	6.8	10.5a	8.3a	31.5	8.0	30.1	14.7	40	cosl	
1-3	A21	18.6	16.4	7.9	9.9a	10.6a	29.2	7.4	28.9	14.5	40	cosl	
3-10	A22	26.3	19.1	8.9	12.7b	7.8b	20.2	5.0	24.1	10.0	53	cosl	
10-18	B1	18.3	16.6	9.2	15.5b	11.5b	21.6	7.3	31.0	9.9	53	cosl	
18-31+	B2t	15.9	21.3	10.1	19.3b	10.7b	16.0	6.7	28.7	8.0	58	lcos	
pH		ORGANIC MATTER				6C1a	6E1a		MOISTURE TENSIONS				
8C1a		6A1a	6B1a		Free Iron	CoCO ₃ equiv- alent	4E1a 1/10 ATMOS.	4E1a 1/3 ATMOS.	4E2 1/3 ATMOS.				
	1:5	1:10	ORGANIC CARBON %	NITRO-GEN %	C/N	Fe ₂ O ₃ %	%	%	%	%			
6.5			2.08	0.127	16	1.1	< 1	25.8	15.7	4.6			
5.7			1.26	0.048	26	1.1	< 1	19.4	12.4	3.9			
6.1			0.74	0.037	20	0.9	< 1	16.5	10.0	3.3			
6.5			0.44	0.024	18	1.1	< 1	16.8	10.9	3.8			
6.5			0.33	0.016	21	1.4	< 1	18.1	10.4	4.0			
5A1a	EXTRACTABLE CATIONS					5E1a	BASE SAT. %	5C3	Sum	Sum	Ca/Mg		
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6H1a	6P2a	6Q2a		NH ₄ Ac EXCH.	Base Sat. % on Sum	Bases	Cations			
	Ca	Mg	H	No	K			5E1a	5A3a				
	milliequivalents per 100g. soil					5C1		Cations	me/100g	8D3			
14.6	11.3	1.4	4.6	< 0.1	0.8	92	74	13.5	18.1	8.1			
9.2	5.5	0.6	4.6	< 0.1	0.6	73	59	6.7	11.3				
8.7	6.5	0.6	3.6	< 0.1	0.4	86	68	7.5	11.1				
8.9	7.3	0.6	3.2	< 0.1	0.4	93	72	8.3	11.5				
8.8	6.8	1.2	2.7	< 0.1	0.4	95	76	8.4	11.1				

- a. Common flakes of mica.
- b. Many flakes of mica.

Soil Type: *Blloe* gravelly sandy loam

Soil Nos.: S57Colo-8-3

Location: Trout Creek Watershed, Chaffee County, Colorado.

Physiographic Position: Mountain side. Elevation 9,955 feet.

Topography: North-facing mountain slope of about 45 percent gradient.

Drainage: Well drained.

Vegetation: Spruce, fir, and some understory grasses and shrubs.

Use: National Forest Service lands.

Collected by: John Retzer, A. J. Cline, E. M. Payne, T. Baber, W. Hunter and E. Weswick, September 8, 1957.

Described by: A. J. Cline.

Horizon and

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Lab. No.

- Ao, Aoo 1/4 to 0 inch. This horizon is a very thin mat of organic material in both decomposed and undecomposed forms. The undecomposed portions are mainly spruce and fir needles.
- A1 0 to 1 inch. Gray (10YR 5/1 dry) to very dark gray (10YR 3/1 moist) gravelly sandy loam; soft when dry, very friable when moist; moderate fine crumb structure; noncalcareous, approximate pH 6.8; about 25 percent of this horizon is gravel; lower boundary abrupt and smooth.
- A21 1 to 3 inches. Pale brown (10YR 6/3 dry) to brown or dark brown (10YR 4/3 moist) gravelly sandy loam; soft when dry, very friable when moist; weak fine platy structure, breaking to moderate fine crumbs; noncalcareous, approximate pH 6.6; there are a few small faint 10YR 5/6 mottles; about 20 percent of this horizon is gravel; lower boundary clear and wavy.
- A22 3 to 10 inches. Light brownish gray or pale brown (10YR 6/2.5 dry) to dark grayish brown or grayish brown (10YR 4.5/2 moist) gravelly loamy sand; soft when dry, very friable when moist; moderate fine granular structure; noncalcareous, approximate pH 6.6; there are a few small faint 10YR 5/6 mottles; approximately 50 percent of this horizon is gravel; lower boundary diffuse and wavy.
- B1 10 to 18 inches. Pale brown or very pale brown (10YR 6.5/3 dry) to brown (10YR 5/3 moist) stony heavy sandy loam; soft when dry, very friable when moist; moderate fine granular structure; noncalcareous; approximate pH 6.6; some of the aggregates in this horizon appear to be similar to that of the horizon below but are imbedded in a light-colored material similar to that of the horizon above; some of the soil aggregates have thin continuous clay skins and in some parts of the horizon thin seams of clay-like material are clearly visible; approximately 60 percent of the horizon is stone and gravel; lower boundary gradual and wavy.
- B2t 18 to 31 inches plus. Pale brown to light yellowish brown (10YR 6/3.5 dry) to brown or dark yellowish brown (10YR 4/3.5 moist) very stony sandy clay loam; the texture as given is that of the fine-textured material which occurs between the rocks and gravel fragments; this horizon is mainly well-weathered granite and biotite schist with about 90 percent of the horizon being rock fragments. The cracks and channels between the rocks are filled with seams of fine-textured material approximately 7.5YR 5/4 in color and approximately a sandy clay loam in texture. The faces of many of the rocks are thickly coated with clay skins as are the aggregates of the fine-textured material; the horizon is hard when dry, friable when moist; the fine-textured portions of the horizon have a weak medium subangular blocky structure; the horizon is noncalcareous, approximate pH 6.6. It is believed that this horizon represents the B2 horizon of this soil that is forming in the cracks between the rocks and may continue for some depth. It was impossible at this location to penetrate below 31 inches without an excessive amount of labor; however, at 31 inches the fine-textured, somewhat brighter material, still continued between the rock fragments. It seems probable that in view of the nature of this horizon the mechanical analysis which will be obtained will probably not represent the fine-textured seams described since much of the rock is well-weathered and on treatment is apt to shatter into sand-sized particles.

Remarks: Profile upslope in position from *Blloe*, Soil Nos. S57Colo-8-2.

SOIL *Fondis clay loam SOIL Nos. 863Cole-18-3 LOCATION Douglas County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18622-18629 March 1967

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

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1													3A1b <0.002	3A1a Non-carbonate Clay <0.002	Coarse fragments 2A2			
		Total				Sand				Silt				3A1b <0.002			3A1a Non-carbonate Clay <0.002	Pct.	2-19	19-76
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (= 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)							
0-5	Ap1	19.1	46.0	34.9	0.8	2.0	1.8	3.7	10.8	26.4	19.6	39.5	8.3	22.0	35	tr				
5-8	Ap2	17.5	44.1	38.4	0.8	2.0	1.6	3.3	9.8	24.5	19.6	36.3	7.7		38	tr				
8-13	B21t	13.2	40.9	45.9	1.0	1.3	1.0	2.1	7.8	21.5	19.4	30.6	5.4		46	tr				
13-19	B22t	15.9	42.6	41.5	1.0	1.8	1.5	2.9	8.7	22.1	20.5	32.5	7.2	30.0	42	tr				
19-24	B3ca	20.9	40.1	39.0	2.3	3.0	2.3	4.4	8.9	20.5	19.6	31.9	12.0		39	tr				
24-35	IB21bca	25.6	35.5	38.9	2.2	4.3	3.6	6.5	9.0	18.8	16.7	31.5	16.6		38	2				
35-55	IB22bca	27.8	33.4	38.8	2.4	4.6	4.1	7.5	9.2	16.7	16.7	30.1	18.6		39	tr				
55-72	IB3bca	27.4	32.4	40.2	2.3	6.0	4.2	7.0	7.9	16.0	16.4	27.7	19.5	13.4	40	tr				

Depth (in.)	6A1a Organic carbon b Pct.	6R1a Nitrogen Pct.	C/N	Carbonate as CaCO ₃		6C2a Ext. Iron as Fe Pct.	Bulk density			4D1 COLE	Water content				Field Capacity c Pct.	pH	
				6E1b <2 mm. Pct.	3A1a <0.002 Pct.		4A1a Field State g/cc	4A1b 1/3- Air Dry g/cc	4B4 Field State Pct.		4B1c 1/3- Bar Pct.	4B2 15- Bar Pct.	4C1 1/3-to 15-Bar in/in.	8C1b Sat. Paste (1:1)		8C1c (1:1)	
0-5	0.97	0.092	11			0.8	1.30	1.28	1.46	0.044	21.7	24.5	14.6	0.13	32.8		6.4
5-8	0.90	0.091	10			0.8	1.66	1.44	1.80	0.078	14.2	25.7	16.2	0.14	27.6		6.2
8-13	0.75	0.074	10			1.0	1.60	1.36	1.79	0.096	16.5	30.9	20.0	0.15	29.4		6.9
13-19	0.64	0.065	10			0.8	1.63	1.38	1.82	0.096	15.7	28.7	18.6	0.14	25.9		7.2
19-24	0.47	0.053	9			0.7	1.66	1.42	1.81	0.087	14.1	27.1	17.4	0.14			7.9
24-35	0.37		6			0.6	1.57	1.40	1.69	0.064	17.0	26.2	17.0	0.13			8.2
35-55	0.32		4			0.6	1.57	1.40	1.72	0.073	18.4	27.7	16.9	0.15			8.2
55-72	0.32		3			0.6	1.54	1.36	1.66	0.068	19.6	28.9	17.0	0.16			8.1

Depth (in.)	Extractable bases 5B1a				6H1a Ext. Acidity	Cat. Exch. Cap.		8A Water at Saturation Pct.	8A1a Elec. Cond. mmho/ cm	8D3 Ca/Mg	Base saturation		
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K		Sum	5A3a Sum Cations				5A1a NH ₄ OAc	5C3 Sum Cations	5C1 NH ₄ OAc
	mg/100 g					%					Pct.	Pct.	
0-5	14.7	5.9	0.1	1.1	21.8	5.0	26.8	22.9			2.5	81	95
5-8	17.3	6.9	0.2	0.9	25.3	5.2	30.5	25.6			2.5	83	99
8-13	23.3	9.2	0.4	0.8	33.7	4.1	37.8	31.9			2.5	89	106
13-19	23.4	9.2	0.6	0.6	33.8	2.6	36.4	30.0			2.5	93	113
19-24	21.6 d	7.1e	0.8	0.6	30.1			26.5			3.0		
24-35	19.7 d	6.9e	1.1	0.6	28.3			25.0			2.9		
35-55	20.3 d	7.0e	1.6	0.7	29.6			26.0		52.9	0.68		
55-72	21.6 d	6.8e	1.6	0.7	30.7			27.5			3.2		

Depth (in.)	Ratios to Clay		
	8D2 NH ₄ OAc GEC	8D2 Ext. Iron	8D1 15-Bar Water
0-5	0.66	0.02	0.42
5-8	0.67	0.02	0.42
8-13	0.69	0.02	0.44
13-19	0.72	0.02	0.45
19-24	0.68	0.02	0.45
24-35	0.66	0.02	0.44
35-55	0.67	0.02	0.44
55-72	0.68	0.01	0.42

- a. Few grains of carbonate below 19 inches.
- b. 10 kg/m² to 60 inches (Method 6A).
- c. Field capacity estimates: A spade-width ditch about 12 inches deep was dug around a 3x3 foot square and the soil banked up to the outside to form a dam. About 200 gallons of water were applied the morning of 8/13/63. On 8/16/63 a pit was dug that cut across the interior square; the horizons were delimited as they were for the above profile, and moisture samples were taken. The horizons sampled appeared to be at field capacity.
- d. NH₄Cl-EtOH extraction (Method 6N3a).
- e. NH₄Cl-EtOH extraction (Method 6O3a).

Soil Type : *Fondis clay loam
 Soil Nos. : 863Colo-18-3
 Location : 285 feet west, 360 feet south of northeast corner of Section 5, T9S, R65W, Douglas County, Colorado
 Climate : Continental, average annual precipitation 17 inches, mean annual temperature 46 degrees F. Growing season 130 days. Elevation 6,750 feet
 Vegetation : Wheat
 Parent Material : Outwash and Aeolian, probably Quaternary age
 Physiographic Position : Upland
 Relief : Nearly level, 2 percent east facing slope. Slope about 800 feet long, Pit located approximately 300 feet from crest of ridge
 Drainage : Internal drainage is slow to very slow, intake is moderate
 Moisture : Moist in the top 8 inches and below 4 feet. Dry in between
 Stoniness : Few fine water worn gravels throughout
 Salt or Alkali : None other than calcium carbonate observed
 Erosion : Slight, primarily water
 Sampled by : R. K. Dansill, J. B. Brown, R. E. Jordan, and L. G. Shields; August 13, 1963.
 Described by : J. B. Brown

Horizon and
 Lincoln
 Lab. No.

Apl
 18622 0 to 5 inches. Very dark grayish brown (10YR 3/2 moist) silty clay loam; grayish brown (10YR 4.5/2 dry); weak to moderate fine granular structure; soft when dry, firm when moist; abrupt smooth boundary.

Ap2
 18623 5 to 8 inches. Very dark grayish brown (10YR 3/2 moist) clay loam; dark grayish brown (10YR 4.5/2 dry); moderate medium to coarse platy structure; very hard when dry, firm when moist; some bleached sand grains; few water worn gravels; abrupt smooth boundary.

B21t
 18624 8 to 13 inches. Very dark grayish brown (10YR 3/2 moist) clay; dark grayish brown (10YR 4/2 dry) and very dark grayish brown (10YR 3.5/2 moist and crushed); moderate medium prisms breaking to strong medium and fine angular blocks; very hard when dry, very firm when moist; thin continuous clay films on ped surfaces; clear smooth boundary.

B22t
 18625 13 to 19 inches. Brown (10YR 4/3 moist) clay; brown (10YR 4.5/3 dry); weak medium to coarse prisms breaking to strong medium and fine angular blocks; very hard when dry, very firm when moist; thin continuous clay films; slickensides; abrupt slightly wavy boundary.

B3ca
 18626 19 to 24 inches. Brown (10YR 4.5/3 moist) clay loam; pale brown (10YR 6/3 dry); moderate medium prisms breaking to moderate medium angular blocks; very hard when dry, firm when moist; highly calcareous; thin patchy clay films; slickensides evident; clear smooth boundary.

IIB21bca
 18627 24 to 35 inches. Yellowish brown (10YR 5/4 moist) clay loam; light yellowish brown (10YR 6.5/4 dry); moderate medium prisms breaking to moderate medium subangular blocks; very hard when dry, firm when moist; very highly calcareous with streaks of lime within and coating the peds; some slickensides evident; thin patchy clay films; gradual smooth boundary.

IIB22bca
 18628 35 to 55 inches. Dark brown (7.5YR 4/4 moist) clay loam; brown (7.5YR 5/4 dry); moderate medium prisms breaking to moderate medium to coarse subangular blocks; very hard when dry, firm when moist; very highly calcareous; streaks of lime continue in this horizon; thin patchy clay films; gradual smooth boundary.

IIB3bca
 18629 55 to 72 inches. Dark brown (7.5YR 4/4 moist) sandy clay loam; brown (7.5YR 5.5/4 dry); weak coarse prismatic structure breaking to weak coarse subangular blocks; hard when dry, firm when moist; highly calcareous with a few fine lime spots; a few slickensides are evident; perhaps some clay films; pale olive sandstone that is partially decomposed occurs at 72 to 96 inches; could still be dug at 96 inches.

Remarks: This soil is extensive in Douglas County on the mesa tops and side slopes, over the top of the Dawson formation. The buried soils are distinctive in this series although the contact between the buried soils and the modern soil is usually difficult to determine. Clay film and organic staining often extend to a depth of 5 to 15 feet. Stone lines are sometimes present. This pedon is near the southern extremity for the Fondis series in Douglas County and is near the highest elevation that this series has been mapped in this area.

Bureau of Public Roads Samples: B22t, IIB21bca, IIB3bca horizons.

Mineralogy: Apl, B22t, and IIB3bca horizons.

Observations on very fine sand (Method 7B1): Quartz and feldspar are present in approximately equal amounts; accessory minerals are 10 to 20 percent. The feldspar is predominantly orthoclase with some microcline and low-calcium plagioclase also present. Biotite and hornblende are the most abundant accessory minerals. Other minerals identified include epidote, pyroxene, chert, zircon, and opaques; volcanic glass is absent. The mineralogy is similar for all three horizons and no lithologic discontinuity is detected at the level of examination.

Clay mineralogy (Methods 7A1, 7A2): The profile is generally characterized by well-crystallized montmorillonite, mica (or illite) and kaolinite. Montmorillonite increases with depth (both in the amount and in crystalline quality) from a small amount in the surface to an abundant amount in the B22t. It is dominant in the IIB3bca. The solum contains moderate amounts of mica (or illite) and kaolinite. The amount drops slightly in the IIB3bca. No striking change in mineralogical composition coincides with the lithic contact. The ratio of fine to coarse clay does increase from 1.7 in the surface to 2.6 in the B22t, then drops to 0.5 in the IIB3bca. The fine clay (< 0.0002) in the IIB3bca is more poorly ordered than fine clay in the B22t. The mineralogy is montmorillonitic.

SOIL Fondis clay loam SOIL Nos. 863Colo-18-4 LOCATION Douglas County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18630-18637 March 1967

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

Depth (in.)	Horizon	Size class and particle diameter (mm)											3A1a Noncar- bonate Clay <0.002	Coarse fragments 2A2			
		Total		Sand					Silt					3A1a Pct.	> 2 Pct.	2-19 Pct. of < 76mm	19-76
		Sand (2-0.05)	Silt (0.05- 0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02- 0.002)	Int. II (0.2-0.02)					
0-5	Apl	27.0	45.6	27.4	1.4	1.6	1.4	6.4	16.2	27.3	18.3	48.1	10.8	27	2		
5-7	Ap2	26.7	45.9	27.4	1.4	1.6	1.5	6.3	15.9	26.8	19.1	47.2	10.8	27	1		
7-12	B21t	14.7	36.9	48.4	0.1	0.4	0.5	3.4	10.3	19.4	17.5	32.3	4.4	48	tr		
12-24	B22t	19.3	40.5	40.2	0.2	0.7	0.8	5.0	12.6	20.8	19.7	37.1	6.7	40	tr		
24-28	B3ca	24.0a	39.8	36.2	1.6	1.9	1.8	6.5	12.2	20.1	19.7	36.6	11.8	34	tr		
28-45	1B2bca	27.5a	33.2	39.3	4.0	4.2	3.2	6.7	9.4	16.2	17.0	29.5	18.1	35	h		
45-57	1B3bca	28.9a	29.8	41.3	4.4	5.4	3.9	7.1	8.1	13.9	15.9	26.0	20.8	37	3		
57-70	1Cca	25.2a	26.3	48.5	4.6	4.8	3.3	5.9	6.6	12.2	14.1	22.1	18.6	30	3		
Pct. of < 2 mm																	
Depth (in.)	6A1a Organic carbon b Pct.	6B1a Nitrogen Pct.	C/N	Carbonate as CaCO ₃		Ext. Iron as Fe Pct.	Bulk density			4D1 COLE	Water content				pH		
				6E1b 3A1a 6E2a < 0.002 Pct.	6E1a 3A1a < 0.002 Pct.		4A1a Field State g/cc	4A1d 1/3- Bar g/cc	4A1b Air Dry g/cc		4B4 Field State Pct.	4B1c 1/3- Bar Pct.	4B2 15- Bar Pct.	4C1 1/3 to 15-Bar In./in.	6C1b Sat. Paste	6C1a (1:1)	
0-5	1.07	0.097	11				1.48	1.43	1.55	0.028	15.2	18.9	10.2	0.12			6.4
5-7	0.97	0.094	10				1.59	1.50	1.64	0.032	12.4	20.3	10.6	0.15			6.2
7-12	0.82	0.077	11	(s)			1.36	1.36	1.82	0.10	17.6	29.6	19.9	0.13			6.7
12-24	0.59	0.062	10	tr(s)			1.67	1.46	1.80	0.073	13.2	25.8	17.5	0.12			7.5
24-28	0.42			2			1.56c	1.40	1.62c	0.052	12.0	25.4	15.4	0.14			8.2
28-45	0.39			9	4		1.48	1.32	1.52	0.047	12.3	26.8	16.7	0.13			8.2
45-57	0.32			10	4		1.54	1.36	1.60	0.056	12.9	25.7	16.2	0.13		7.7	8.3
57-70	0.28			25	19		1.48c	1.35	1.53d	0.044	13.7	23.3	18.1	0.07			8.0
Extractable bases 5B1a																	
Depth (in.)	6M2a				6H1a Ext. Acidity	Cat. Exch. Cap.		8A Water at Satu- ration Pct.	8A1a Elec. Cond. µmho/ cm	8D3 Ca/Mg	Base saturation						
	Ca	Mg	Na	K		5A3a Sum	5A1a NH ₄ OAc				5C3 Sum	5C1 NH ₄ OAc					
	meq/100g														Pct.	Pct.	
0-5	12.2	3.9	0.1	0.9	4.0	21.1	17.6			3.1	81	97					
5-7	12.0	3.9	0.2	0.7	4.4	21.2	16.8			3.1	79	100					
7-12	22.8	9.5	0.6	0.7	4.7	38.3	30.4			2.4	88	111					
12-24	20.1	8.8f	0.9	0.6			28.1			2.3							
24-28	17.6	7.4f	1.1	0.6			23.5			2.4							
28-45	17.3	7.5f	1.6	0.6			23.7			2.3							
45-57	17.2	7.2f	1.8	0.6			24.0		49.4	2.4							
57-70	16.0	6.3f	1.7	0.5			20.8			2.5							
Depth (in.)	Ratios to Clay			8D1 15-Bar Water	a. Few grains of carbonate below 24 inches.												
	8D2 NH ₄ OAc CBC	Ext. Iron			b. 11 kg/m ² to 60 inches (Method 6A).												
0-5	0.64		0.37														
5-7	0.61		0.39														
7-12	0.63		0.41														
12-24	0.70		0.44														
24-28	0.69		0.43														
28-45	0.68		0.42														
45-57	0.65		0.39														
57-70	0.69		0.37														
<p>c. Range in duplicate clods is 0.12 g/cc. d. Range in duplicate clods is 0.13 g/cc. e. NH₄Cl-EtOH extraction (Method 6M3a). f. NH₄Cl-EtOH extraction (Method 6O3a).</p>																	

Soil Type : #Fondle clay loam
 Soil Nos. : 863Colo-18-4
 Location : 122 feet west of the southeast corner of Section 19, T6S, R66W, Douglas County, Colorado
 Climate : Continental, average annual precipitation 17 inches, mean annual temperature 46 degrees F. Growing season 140 days. Elevation 6,700 feet
 Vegetation : Wheat
 Parent Material : Outwash and aeolian, probably Quaternary age
 Physiographic Position : Upland
 Relief : Nearly level, 2 percent northeast facing slope. Slope about 800 feet in length. Pit about 400 feet below ridge
 Drainage : Internal drainage medium to slow; moderate intake rate
 Moisture : Moist to 6 feet plus. This field summer fallowed, summer 1963
 Stoniness : Few fine water worn gravels throughout the pedon
 Salt or Alkali : None observed, other than calcium carbonate
 Erosion : Slight, primarily water
 Sampled by : R. K. Danadill, J. B. Brown, R. H. Jordan, and L. G. Shields; August 13, 1963
 Described by : J. B. Brown

Horizon and
 Lincoln
 Lab. No.

Apl
 18630 0 to 5 inches. Very dark grayish brown (10YR 3/2 moist) light silty clay loam; dark grayish brown (10YR 4.5/2 dry); moderate fine granular structure; soft when dry, friable when moist; abrupt smooth boundary.

Ap2
 18631 5 to 7 inches. Very dark grayish brown (10YR 3/2 moist) clay loam; dark grayish brown (10YR 4/2 dry); moderate medium subangular blocky structure; hard when dry, firm when moist; cultivation marks are present; abrupt smooth boundary.

B21t
 18632 7 to 12 inches. Dark brown (10YR 3/3 moist) clay; brown (10YR 4/3 dry); moderate medium prismatic structure breaking to strong fine angular blocks; very hard when dry, very firm when moist; thin continuous clay films on ped surfaces; few slickensides; clear smooth boundary.

B22t
 18633 12 to 24 inches. Dark grayish brown (10YR 4/2 moist) clay; grayish brown (10YR 4.5/2 dry); moderate medium to fine prisms breaking to strong fine angular blocks; very hard when dry, very firm when moist; thin nearly continuous clay films; many slickensides; abrupt smooth boundary.

B3ca
 18634 24 to 28 inches. Yellowish brown (10YR 5/4 moist) heavy sandy clay loam; light yellowish brown (10YR 6/4 dry) and brown (10YR 5/3 moist and rubbed); moderate medium prisms breaking to moderate medium angular blocks; very hard when dry, very firm when moist; very highly calcareous; some dark streaks 1/4 to 1/2 inches wide are present in this horizon along with lime mycelia; thin patchy clay films; clear smooth boundary.

IIB2bca
 18635 28 to 45 inches. Dark brown (7.5YR 4/4 moist) sandy clay loam; brown (7.5YR 5.5/4 dry); moderate medium to coarse subangular blocky structure; hard when dry, firm when moist; very highly calcareous; few thin patchy clay films; some lime mycelia; fine gravel estimated at 5 percent; gradual boundary.

IIB3bca
 18636 45 to 57 inches. Strong brown (7.5YR 5/6 moist) sandy clay loam; reddish yellow (7.5YR 6/6 dry); weak coarse prismatic structure; hard when dry, firm when moist; very highly calcareous; few patchy clay films on vertical faces; lime streaks 2 to 6 inches wide; gradual boundary.

IICca
 18637 57 to 70 inches. Light brown (7.5YR 6/4 moist) light sandy clay loam; pink (7.5YR 7/4 dry); weak coarse prismatic structure; hard when dry, friable when moist; very highly calcareous; lime appears to increase with depth.

Remarks: This soil is common to the tablelands in Douglas County and on side slopes overlying the Dawson formation. The buried soils are typical but the break between the older soils and the modern soil is somewhat obscure. This is close to the southern extremity of the colder part of the area where this soil has been mapped in Douglas County. Slickensides are not evident in this soil in the buried horizons. Although 1963 was a much drier year than normal, this soil is moist throughout where it had been summer fallowed during 1963. Under native sod this soil generally has a loam surface 3 to 4 inches thick with a clay loam B1 horizon. Where cultivated the surface is mixed and is generally a light clay loam in texture.

Bureau of Public Roads Samples: B22t, IIB2bca, and IICca horizons.

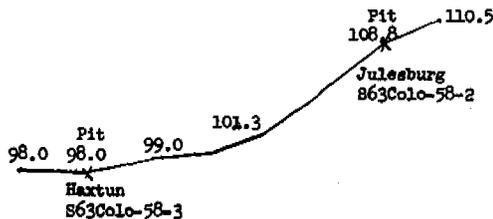
Mineralogy (Method 7B1): Apl, B22t, and IIB3bca horizons. Observations on very fine sand: Feldspar and quartz are present in approximately equal amounts; accessory minerals are 10 to 20 percent. Orthoclase is the principal feldspar; microcline and low-calcium plagioclase are present in lesser amounts. Biotite and hornblende are the most abundant accessory minerals. Other minerals identified include epidote, zoisite, hypersthene, zircon, chert, garnet and opaques; volcanic glass is absent. The number of ferromagnesian minerals appears to increase slightly in the IIB3bca horizon; otherwise, the mineralogy is similar.

Soil Type: Haxtum loamy sand
 Soil Nos.: 863Colo-58-3
 Location: 726 feet north, 80 feet west of southeast corner, Sec. 18, T9N, R46W, Sedgwick County, Colorado
 Climate: Continental climate, average annual precipitation of 17.5 inches, frost-free season of 147 days, mean annual temperature of 49.6 degrees F.
 Elevation: 3,900 feet
 Vegetation: Cultivated
 Parent Material: Aeolian sand over loess-like material
 Physiographic Position: Upland
 Relief: Slightly concave, 1 percent slope
 Drainage: Well drained
 Moisture: Moist to 26 inches, nearly dry below
 Salt or Alkali: None
 Erosion: Slight, primarily wind
 Sampled by: R. C. Accola, J. I. Brubacher, R. B. Grossman, R. Moreland, E. M. Payne, and J. L. Walker; July 8, 1963
 Described by: J. I. Brubacher

Horizon and
 Lincoln
 Lab. No.

- Ap 18524 0 to 6 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) loamy sand; weak fine granules breaking to single grain structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
 - B2 18525 6 to 14 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) sandy loam; weak medium prismatic breaking to weak medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
 - B21tb 18526 14 to 18 inches. Grayish brown (10YR 5/2 dry) to very dark brown (10YR 2/2 moist) sandy clay loam; weak moderate medium prismatic breaking to weak moderate medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; very thin patchy clay skins; clear smooth boundary.
 - B22tb 18527 18 to 26 inches. Gray (10YR 5/1 dry) to very dark gray (10YR 3/1 moist) sandy clay loam; weak moderate medium prismatic breaking to weak moderate subangular blocky structure; very friable moist; noncalcareous; thin continuous clay skins; streaks of 10YR 2/1 when moist; clear smooth boundary.
 - B3b 18528 26 to 33 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) sandy loam; weak medium prismatic breaking to weak, medium subangular blocky structure; slightly hard dry, very friable when moist; noncalcareous; very thin patchy clay skins; clear smooth boundary.
 - C1b 18529 33 to 42 inches. Pale brown (10YR 6/3 dry) to dark brown (10YR 4/3 moist) loam; weak medium prismatic breaking to weak medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
 - C2b 18530 42 to 59 inches. Pale brown (10YR 6/3 dry) to dark brown (10YR 4/3 moist) loamy sand; massive; soft dry, very friable when moist; noncalcareous; abrupt wavy boundary.
 - IIC3b 18531 59 to 65 inches. Pink (7.5YR 7/4 dry) to brown (7.5YR 5/4 moist) heavy sandy loam; massive; slightly hard dry, very friable when moist; noncalcareous.
 - IIC4cab 18532 65 to 80 inches. Pink (7.5YR 7/4 dry) to brown (7.5YR 5/4 moist) heavy sandy loam; massive; soft dry and very friable when moist; highly calcareous; clear and wavy boundary.
 - IIC5cab 18533 80 to 134 inches. Pink (7.5YR 7/4 dry) to brown (7.5YR 5/4 moist) heavy sandy loam; weak coarse platy structure; soft dry and very friable when moist; highly calcareous; clear wavy boundary.
 - IIC6b 18534 134 to 216 inches. Pink (7.5YR 7/4 dry) to brown (7.5YR 5/4 moist) heavy sandy loam; massive; soft dry and very friable when moist; noncalcareous.
- Note: 15 feet, soil temperature was 10.5° C
 18 feet, soil temperature was 10.6° C

Landscape Profile:



Horizontal scale 200 feet
 Vertical scale 10 feet

Bureau of Public Roads Samples:

- Ap - 0-6 inches
- B21tb - 18-26 inches
- C2b - 42-59 inches
- IIC4cab - 65-80 inches

SOIL Hartun loamy sand SOIL Nos. 8630Colo-58-5 LOCATION Sedgewick County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18535-18545 March 1967

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

Depth (in.)	Horizon	Size class and particle diameter (mm)											3A1			Coarse fragments 2A2		
		Total		Sand					Silt				3A1b <0.002	3A1a Non-carbonate Clay <0.002	Coarse fragments 2A2			
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)			(2-0.1)	> 2 Pct.	2-19 Pct.	19-76 Pct.
Pct. of < 2 mm																		
0-6	Ap	78.7	13.6	7.7	1.5	14.5	24.9	27.8	10.0	9.0	4.6	30.8	68.7	4.5	8	tr		
6-14	B21	78.2	12.0	9.8	1.5	14.4	25.0	28.5	8.8	7.6	4.4	28.8	69.4	10	tr			
14-19	B22	68.5	17.6	13.9	0.5	8.9	19.9	28.2	11.0	10.6	7.0	35.1	57.5	9.0	14	tr		
19-25	B21tb	66.6	17.3	16.1	0.7	7.4	17.6	28.7	12.2	10.7	6.6	37.1	54.4	16	tr			
25-33	B22tb	56.7	21.5	21.8	0.2	4.2	10.8	24.5	17.0	13.4	8.1	44.4	39.7	15.7	22	tr		
33-41	B3b	58.6	23.1	18.3	0.2	2.4	6.8	24.0	25.2	15.5	7.6	56.3	33.4	18	tr			
41-59	C1b	78.3	12.9	8.8	1.6	7.6	17.2	33.4	18.5	9.1	3.8	45.7	59.8	4.9	9	tr		
59-80	IIC2cab	73.9a	16.9	9.2	4.0	14.1	16.8	24.6	14.4	8.2	8.7	34.7	59.5	1.2	9	2		
80-112	IIC3cab	83.6a	9.7	6.7	9.4	18.9	17.6	25.5	12.2	5.4	4.3	30.0	71.4	7	10			
112-134	IIC4cab	45.2a	10.5	44.3	5.1	9.3	8.7	12.2	9.9	5.2	5.3	21.2	35.3	44	10			
134-144	IIC5cab	29.7b	46.9	23.4	3.9	5.9	5.3	7.8	6.8	4.6	42.3	15.2	22.9	11	6			
Depth (in.)	6A1a Organic carbon C Pct.	6B1a Nitrogen N Pct.	C/N	Carbonate as CaCO ₃		6C2a Ext. Iron as Fe Pct.	Bulk density			4D1 COLE	Water content				Field Capacity g Pct.	pH	8C1a (1:1)	
				6E1b <2mm Pct.	3A1a <0.002 Pct.		4A1a Field State g/cc	4A1d Bar g/cc	4A1b Air Dry g/cc		4B4 Field State Pct.	4B1c 1/3- Bar Pct.	4B2 15- Bar Pct.	4C1 1/3- to 15-Bar in./in.				
				tr(s)	tr		tr	tr	tr		tr	tr	tr	tr				
0-6	0.45	0.055	8		0.2	1.75	1.71d	1.75	0.007	9.7	10.8e	3.6	0.12f	14.0		6.4		
6-14	0.37	0.047	8		0.3	1.60	1.54d	1.61	0.014	11.4	13.0e	4.5	0.13f	11.7		6.9		
14-19	0.36	0.046	8		0.3	1.59	1.52	1.62	0.020	13.7	13.1	6.6	0.10	13.0		7.0		
19-25	0.36	0.045	8		0.3	1.71	1.63	1.75	0.024	12.3	14.5	7.5	0.11	13.7		7.0		
25-33	0.41	0.049	8	-(s)	0.3	1.67	1.58	1.72	0.028	12.2	17.1	9.4	0.12	15.3		7.1		
33-41	0.24	0.036		-(s)	0.3	1.64	1.56	1.66	0.020	10.5	15.4	9.0	0.10	16.3		7.3		
41-59	0.04		tr(s)	-	0.2	1.66	1.62d	1.64	0.003	4.8	12.9e	4.1	0.14f	10.2		8.1		
59-80	0.02		10	tr	0.2	1.58	1.53d	1.55	0.003	9.0	16.0e	4.5	0.18f			8.4		
80-112	0.02		2	tr	0.2							3.0				8.4		
112-134	0.01		2	-	0.4							18.7				8.0		
134-144	0.04		56	12	0.2							7.4				8.3		
Depth (in.)	Extractable bases 5B1a					6H1a Ext. Acidity	Cat. Mech. Cap.		8D3 Ca/Mg	Base saturation								
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum		5A3a Sum	5A1a NH ₄ OAc		5C3 Sum	5C1 NH ₄ OAc							
	meq/100 g										Pct.	Pct.						
0-6	4.2	0.9	tr	0.7	5.8	2.4	8.2	6.3			71	92						
6-14	6.1	1.3	tr	0.5	7.9	2.0	9.9	8.0			80	99						
14-19	8.0	1.7	tr	0.6	10.3	2.4	12.7	10.2		4.7	81	101						
19-25	10.3	2.2	tr	0.7	13.2	2.2	15.4	13.0		4.7	86	102						
25-33	12.7	2.7	tr	1.0	16.4	2.4	18.8	15.8		4.7	87	104						
33-41	12.0	2.7	0.1	1.0	15.8	1.8	17.6	14.8		4.4	90	107						
41-59	6.9 h	1.41	tr	0.6	8.9			8.4			4.9							
59-80	6.6 h	1.31	0.1	0.7	8.7			7.6			5.1							
80-112	4.9 h	1.21	0.1	0.6	6.8			5.8			4.1							
112-134	21.2 h	7.81	0.7	3.7	32.8			30.8			2.9							
134-144	6.0 h	1.71	0.2	1.0	8.0			7.5			3.5							
Depth (in.)	Ratios to Clay			8D2 Ext. Iron	8D1 Water	Notes												
	NH ₄ OAc C/EC	8D2	8D1															
0-6	0.79	0.03	0.47			a. Carbonate grains: < 5 percent. b. Carbonate grains: 5-25 percent.												
6-14	0.80	0.03	0.46			c. 6.3 kg/m ² to 60 inches (Method 6A). d. 1/10-Bar (Method 4Alg).												
14-19	0.73	0.02	0.47			e. 1/10-Bar (Method 4B1c). f. 1/10- to 15-Bar in./in. (Method 4C2).												
19-25	0.81	0.02	0.47			g. Field capacity estimates: A spade-width ditch about 6 inches deep was dug around a 3x3 foot square and the soil banked up to the outside to form a dam. About 200 gallons of water was applied the morning of 7/9/63. On 7/12/63 a pit was dug that cut across the interior square; the horizons were delimited as they were for the above profile, and moisture samples were taken. The horizons sampled appeared to be at field capacity.												
25-33	0.72	0.01	0.43			h. NH ₄ Cl-EtOH extraction (Method 6N3a).												
33-41	0.82	0.02	0.49			i. NH ₄ Cl-EtOH extraction (Method 6O3a).												
41-59	0.93	0.02	0.47															
59-80	0.84	0.02	0.49															
80-112	0.83	0.03	0.45															
112-134	0.70	0.01	0.42															
134-144	0.68	0.02	0.32															

Soil Type: Haxtum loamy sand
 Soil Nos.: 863Colo-58-5
 Location: 488 feet south, 110 feet east of northwest corner, Sec. 35, T10N, R47W, Sedgwick County, Colorado.
 Climate: Continental climate, average annual precipitation of 17.5 inches, frost-free season of 147 days, mean annual temperature of 49.6 degrees F.
 Elevation: 3,900 feet
 Vegetation: Cultivated
 Parent Material: Aeolian sand over loess-like material
 Physiographic Position: Upland
 Relief: Slightly concave, 1 percent slope
 Drainage: Well drained
 Moisture: Moist to 26 inches nearly dry below
 Salt or Alkali: None
 Erosion: Slight, primarily wind
 Sampled by: R. C. Accola, J. I. Brubacher, R. B. Grossman, R. Moreland, E. M. Payne, and J. L. Walker: July 9, 1963
 Described by: J. I. Brubacher

Horizon and
 Lincoln
 Lab. No.

Ap
 18535 0 to 6 inches. Grayish brown (10YR 5/2 dry) to very dark brown (10YR 2/2 moist) loamy sand; weak fine granular structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.

B21
 18536 6 to 14 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) sandy loam; weak medium prismatic breaking to weak medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.

B22
 18537 14 to 19 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) sandy loam; weak medium prismatic breaking to weak medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.

B21tb
 18538 19 to 25 inches. Grayish brown (10YR 5/2 dry) to very dark brown (10YR 2/2 moist) sandy clay loam; weak moderate medium prismatic breaking to weak moderate medium subangular blocky structure; slightly hard dry, very friable moist; noncalcareous; thin continuous clay skins; streaks of (10YR 2/1 moist) colors; clear smooth boundary.

B22tb
 18539 25 to 33 inches. Dark grayish brown (10YR 4/2 dry) to very dark brown (10YR 2/2 moist) sandy clay loam; weak moderate medium prismatic breaking to weak moderate medium subangular blocky structure; slightly hard dry, very friable when moist; noncalcareous; 40 percent of horizon has streaks of dark brown (10YR 4/3 moist) color; thin continuous clay skins; streaks of black (10YR 2/1 moist) colors; clear smooth boundary.

B3b
 18540 33 to 41 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) fine sandy clay loam; weak medium prismatic breaking to weak medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.

Clb
 18541 41 to 59 inches. Very pale brown (10YR 7/3 dry) to brown (7.5YR 5/3 moist) loamy sand; massive breaking to weak medium prismatic structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.

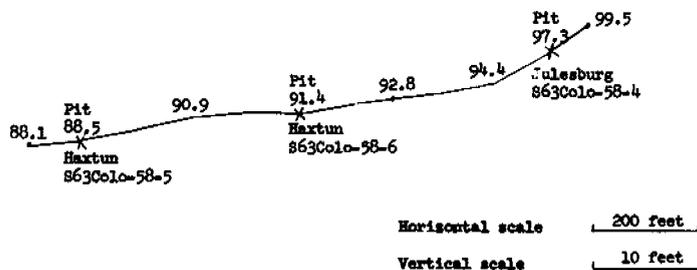
IIC2cab
 18542 59 to 80 inches. Pink (7.5YR 7/3 dry) to brown (7.5YR 5/3 moist) sandy loam; massive structure; slightly hard dry, very friable when moist; highly calcareous; clear wavy boundary.

IIC3cab
 18543 80 to 112 inches. Pink (7.5YR 7/3 dry) to brown (7.5YR 5/3 moist) loamy sand; massive structure; very friable when moist; highly calcareous; clear and wavy boundary.

IIC4cab
 18544 112 to 134 inches. Pink (7.5YR 7/4 dry) to brown (7.5YR 5/4 moist) clay loam; massive structure; very friable when moist; highly calcareous; clear wavy boundary.

IIC5cab
 18545 134 to 144 inches. Pink (7.5YR 8/3 dry) to pink (7.5YR 7/3 moist) clay loam; massive; soft dry, very friable when moist; very highly calcareous.

Landscape Profile:



Bureau of Public Roads Samples: Ap, B22tb, and Clb horizons.

Mineralogy (Methods 7A1, 7A2): Ap, B22, B22tb, Clb, and IIC2cab horizons. A definite break in mineralogy occurs at the lithic contact. Only poorly crystallized montmorillonite and mica (or illite), almost entirely coarse clay (0.2 to 2 microns), occur below the contact. Above the contact, the coarse clay contains small amounts of well-crystallized kaolinite and mica (or illite). Montmorillonite in the coarse and fine fractions increases steadily from a trace in the surface to a moderate amount in the Clb and is of fair crystalline quality. Trace amounts of mica (or illite) are present in the fine clay. Crystalline quality is poor. The X-ray diffraction patterns suggest the presence of a large proportion of X-ray amorphous material, especially in the fine clay. In part, this may be very poorly organized montmorillonite.

Count on very fine sand (Method 7B1): Clb horizon. 40 percent quartz; 35 percent feldspar; 15 percent compound grains; 10 percent glass shards; accessories include green hornblende, epidote, mica group, pyroxene group, listed in descending order. Orthoclase and albite are common feldspars; oligoclase-andesine is appreciable. The compound grains are mostly altered feldspar.

Soil Type: Hartun loamy sand

Soil Nos.: S63Colo-58-6

Location: 430 feet east, 310 feet south of northwest corner, Sec. 35, T10N, R47W, Sedgwick County, Colorado.

Climate: Continental climate, average annual precipitation of 17.5 inches, frost-free season of 147 days, mean annual temperature of 49.6 degrees F.

Elevation: 3,900 feet

Vegetation: Cultivated

Parent Material: Aeolian sand over loess-like material.

Physiographic Position: Upland

Relief: 1 percent slope

Drainage: Well drained

Moisture: Moist to 18 inches, nearly dry below

Salt or Alkali: None

Erosion: Slight, primarily wind

Sampled by: R. C. Accola, J. I. Brubacher, R. B. Grossman, R. Moreland, E. M. Payne, and J. L. Walker: July 9, 1963

Described by: J. I. Brubacher

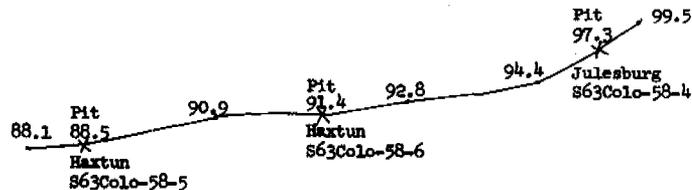
Horizon and

Lincoln

Lab. No.

- Ap
18546 0 to 7 inches. Grayish brown (10YR 5/2 dry) to very dark brown (10YR 2/2 moist) loamy sand; weak fine granular structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
- B21
18547 7 to 18 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) sandy loam; weak medium prismatic breaking to weak medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
- B22
18548 18 to 24 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) sandy loam; weak medium prismatic breaking to weak medium subangular blocky structure; slightly hard dry, very friable when moist; noncalcareous; clear smooth boundary.
- B21tb
18549 24 to 29 inches. Dark grayish brown (10YR 4/2 dry) to very dark brown (10YR 2/2 moist) fine sandy clay loam; weak moderate medium prismatic breaking to weak moderate medium subangular blocky structure; slightly hard dry, very friable when moist; noncalcareous; thin continuous clay skins; clear smooth boundary
- B22tb
18550 29 to 39 inches. Dark grayish brown (10YR 4/2 dry) to very dark brown (10YR 2/2 moist) and black (10YR 2/1 crushed) fine sandy clay loam; weak moderate medium prismatic breaking to weak medium subangular blocky structure; slightly hard dry, very friable when moist; noncalcareous; thin continuous clay skins; clear smooth boundary.
- B3b
18551 39 to 47 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) and dark grayish brown (10YR 4/2 crushed) loam; weak medium prismatic breaking to weak medium subangular blocky structure; slightly hard dry, very friable when moist; noncalcareous; 40 percent of horizon has streaks of brown (10YR 5/3 moist) color; clear smooth boundary.
- C1b
18552 47 to 54 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) sandy loam; weak medium prismatic breaking to weak medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; clear wavy boundary.
- IIC2cab 54 to 66 inches. Pink (7.5YR 7/4 dry) to brown (7.5YR 5/4 moist) gravelly sandy clay loam; massive structure; soft dry, very friable when moist; highly calcareous.

Landscape Profile:



Horizontal Scale 200 feet

Vertical Scale 10 feet

SOIL SURVEY LABORATORY Lincoln, Nebr. February 1959

SOIL TYPE Heath LOCATION Chaffee County, Colorado
 clay loam

SOIL NOS. 858 Colo-8-2 LAB. NOS. 9050-9055

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	($< 19\mu$)	
0-2	A1	8.6a	6.1a	3.3a	6.2a	8.0a	40.8	27.0	28.7	23.5	19	cl/1
2-5	AB	4.6a	4.6a	2.8a	6.0a	7.3a	35.8	38.9	25.3	21.1	3	cl
5-9	B2t	2.6b	3.9b	2.9b	5.4b	6.4b	34.5	44.3	22.0	22.2	7	c
9-13	B3ca	6.5b	5.0b	3.0b	4.2b	4.9b	35.2	41.2	16.8	25.9	24	c
13-28	Cca	10.4c	6.5c	3.3c	4.5c	5.2c	36.7	33.4	16.4	28.2	35	cl
28-39	C	9.7c	7.4c	3.4c	4.3c	4.0c	40.7	30.5	13.9	33.2	50	cl

pH	ORGANIC MATTER			Free Iron %Fe ₂ O ₃	6E1a CoCO ₃ equiv- alent	MOISTURE TENSIONS		
	6A1a ORGANIC CARBON	6B1a NITRO- GEN	C/N			1/10 ATMOS.	1/3 ATMOS.	4E2 15 ATMOS.
1:1	%	%	%	%	%	%	%	
7.4	3.24	0.294	11	2.9	<1		12.9	
7.5	3.09	0.266	12	3.2	<1		14.5	
7.7	3.09	0.287	11	3.3	2		16.4	
7.9	2.47	0.237	10	2.7	14		17.4	
8.1	0.99	0.123	8	2.5	28		12.9	
8.2	0.74			2.6	20		11.4	

5A1a CATION EXCHANGE CAPACITY NE ₁ Ac	EXTRACTABLE CATIONS					5B1a BASE SAT. % NH ₄ Ac EXCH. 5C1	5C3 Base Sat. % on Sum Cations	Sum Bases 5B1a	Sum Cations 5A3a	Ca/Mg
	6N2b Ca	6O2b Mg	6H1a H	6P2a No	6Q2a K					
	milliequivalents per 100g. soil									
26.2	24.8	3.1	2.0	<0.1	2.4	116	94	30.3	32.3	8.0
30.0	28.2	3.3	2.4	<0.1	1.8	111	93	33.3	35.7	8.5
30.2		3.7	1.2	<0.1	1.2					
21.9		3.4	<0.1	<0.1	0.6					
15.0		5.0	<0.1	0.1	0.3					
14.8		7.3	<0.1	0.1	0.3					

a. Few smooth light brown to black concr. (Fe-Mn?)
 b. Common smooth light brown to black concr. (Fe-Mn?)
 c. Common smooth light brown to black concr. (Fe-Mn?) Also, common CaCO₃ concr.

Soil Type: Heath clay loam. Described by: A. J. Cline

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Location: SE¹ of Sec. 17, T13S, R77W, Chaffee County, Colorado.

Date of Sampling: September 1957.

Collectors: J. Retzer, E. M. Payne, R. Dansdill, A. J. Cline

Physiographic Position: Side slope of a high mountain valley at an elevation of approximately 9,000 feet.

Topography: A moderate convex slope of approximately 4 percent facing east.

Drainage: Well drained. Vegetation: Spakweed, ring muhly, with some blue grama.

Use: National Forest Service land.

Soil Nos.: S53Colo-8-2

Lincoln Horizon

Lab. No.

- | | | | |
|------|------------------|-------------------|---|
| 9050 | A ₁ | 0-2
inches | Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/1.5 moist) loam; soft when dry, very friable when moist; moderate very fine granular structure; noncalcareous; lower boundary clear and smooth. |
| 9051 | AB | 2-5
inches | Very dark grayish brown or dark grayish brown (10YR 3.5/2 dry) to very dark brown (10YR 2/2 moist) heavy loam or light clay loam; slightly hard when dry, very friable when moist; weak to moderate fine subangular blocky structure breaking to moderate fine granules; noncalcareous; there are a few thin patchy clay skins principally on the vertical faces of the soil aggregates; lower boundary clear and smooth. |
| 9052 | B _{2t} | 5-9
inches | Very dark grayish brown or dark grayish brown (10YR 3.5/2 dry) to very dark brown or very dark grayish brown (10YR 2.5/2 moist) clay loam; hard when dry, very friable when moist; weak to moderate fine prismatic structure breaking to moderate fine subangular blocks; noncalcareous; there are thin to medium patchy clay skins on both the horizontal and vertical faces of most of the soil aggregates; lower boundary gradual and smooth. |
| 9053 | B _{3ca} | 9-13
inches | Grayish brown (2.5Y 5/2 dry) to dark grayish brown (2.5Y 4/2 moist) heavy loam or light clay loam; hard when dry, very friable when moist; weak to moderate fine prismatic structure breaking to moderate fine subangular blocks; violently effervescent; this is a weak horizon of lime accumulation with some visible lime occurring as concretions; there are thin patchy clay skins principally on the vertical faces of some of the soil aggregates; lower boundary gradual and smooth. |
| 9054 | Cca | 13-28
inches | Light brownish gray (2.5Y 6/2 dry) to dark grayish brown or grayish brown (2.5Y 4.5/2 moist) gravelly loam; hard when dry, very friable when moist; massive or very weak fine subangular blocky structure; violently effervescent; this is a moderate horizon of lime accumulation with visible lime occurring as concretions, as thin seams and streaks or as coatings on the surfaces of the rock and gravel; approximately 25 percent of this horizon is cobble and gravel; lower boundary diffuse and smooth. |
| 9055 | C | 28-39 /
inches | Light olive brown (2.5Y 5/3 dry) to olive brown (2.5Y 4/3 moist) gravelly clay loam; hard when dry, very friable when moist; massive; violently calcareous; this horizon contains some accumulated calcium carbonate but less than the horizon above; approximately 15% of this horizon is gravel and stone. |

SOIL SURVEY LABORATORY Lincoln, Nebr. February 1959

SOIL TYPE Heath LOAN LOCATION Chaffee County, Colorado

SOIL NOS. S58 Colo-8-4 LAB. NOS. 9062-9066

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	3A1				2A2
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	< 0.002	> 2	
0-3	Al	4.1a	3.5a	2.6b	6.0b	6.1b	42.9	34.8	21.6	30.6	11	c1	
3-7	AB	2.1a	2.3a	1.4b	3.6b	4.2b	45.0	41.4	15.7	35.6	14	sic	
7-18	B2t	1.9a	2.1a	1.2b	3.2b	4.2b	48.4	39.0	15.6	38.9	6	sic1	
18-26	B3ca	2.2b	2.4b	1.6b	3.2b	4.0b	48.7	37.9	15.9	38.8	8	sic1	
26-58	Cca	1.4c	1.9c	1.4c	4.6c	7.5c	56.2	27.0	24.6	42.2	Tr.	sic1	
	pH	ORGANIC MATTER				Free Iron	6E1a		MOISTURE TENSIONS				
8C1a	1.5	1:10	6A1a	6B1a	C/N	% Fe ₂ O ₃	CaCO ₃ equiv- alent	1/10 ATMOS.	1/3 ATMOS.	4E2 15 ATMOS.			
			%	%		6C1a	%	%	%	%			
			1.65	0.171	10	2.6	18			13.7			
			1.45	0.154	9	2.5	20			14.1			
			1.10	0.120	9	2.5	21			13.4			
			1.10	0.113	9	2.5	22			13.6			
			1.12	0.108	10	3.0	19			13.4			
		EXTRACTABLE CATIONS				5B1a	BASE SAT. %	Sum	Sum	Ca/Mg			
		5A1a	6O2b	6H1a	6P2a	6Q2a	NH ₄ Ac	Base Sat. %	Bases	Cations			
		Ca	Mg	H	Na	K	EXCH.	on Sum					
		milliequivalents per 100g. soil											
		18.0	2.1	<0.1	<0.1	1.3							
		18.8	2.3	<0.1	<0.1	0.7							
		18.3	2.9	<0.1	0.1	0.4							
		18.3	4.3	<0.1	0.1	0.4							
		19.1	5.0	<0.1	0.2	0.4							
	a.	Common	CaCO ₃	concr.									
	b.	Common	CaCO ₃	concr. Also, common smooth black concr. (Mn?)									
	c.	Common	CaCO ₃	concr. Also, few smooth black concr. (Mn?)									

Soil Type: Heath loam. Described by: A. J. Cline
 Location: NE¹/₄ of Sec. 28, T13S, R77W, Chaffee County, Colorado.
 Date of Sampling: September 1957
 Collectors: J. Retzer, E. M. Payne, R. Dansdill, A. J. Cline
 Physiographic Position: Side slope of a high mountain valley at an elevation of approximately 9,000.
 Topography: A moderate convex slope of approximately 4 percent facing east.
 Drainage: Well drained.
 Vegetation: Sage, western wheat grass, and ring muhly.
 Use: National Forest Service land.
 Soil Nos.: S58Colo-8-4

Lincoln Horizon

Lab. No.

9062	A ₁	0-3 inches	Dark grayish brown or grayish brown (2.5Y 4.5/2 dry) to very dark grayish brown (2.5Y 3/2 moist) light clay loam; slightly hard when dry, very friable when moist; moderate very fine granular structure; strongly effervescent; lower boundary clear and smooth.
9063	AB	3-7 inches	Dark gray (2.5Y 4/1 dry) to black or very dark grayish brown (2.5Y 2.5/2 moist) clay loam; slightly hard when dry, very friable when moist; strong medium granular structure; strongly calcareous; there are a few thin patchy clay skins on the vertical faces of some of the soil aggregates; lower boundary clear and smooth.
9064	B _{2t}	7-18 inches	Gray (2.5Y 5/1 dry) to very dark grayish brown (2.5Y 3/2 moist) heavy clay loam; hard when dry, friable when moist; weak to moderate medium prismatic structure breaking to moderate medium subangular blocks; strongly calcareous; there are thin patchy clay skins on both the horizontal and vertical faces of the soil aggregates; lower boundary gradual and smooth.
9065	B _{3ca}	18-26 inches	Gray (2.5Y 5/1 dry) to very dark grayish brown (2.5Y 3/2 moist) hard when dry, friable when moist; weak medium prismatic structure breaking to weak to moderate medium subangular blocks; violently effervescent; this is a weak horizon of lime accumulation with some visible lime occurring in thin seams and streaks; there are thin patchy clay skins on both the horizontal and vertical faces of the soil aggregates; lower boundary gradual and smooth.
9066	Cca	26-58 inches	Dark gray (2.5Y 4/1 dry) to very dark grayish brown (2.5Y 3/2 moist) clay loam; hard when dry, friable when moist; massive; to very weak medium subangular blocky structure; violently calcareous; this is a weak to moderate horizon of lime accumulation with visible lime occurring as concretion and in thin seams and streaks; lower boundary gradual and smooth.
	D	58-60 / inches	Partially weathered calcareous Pennsylvanian shale. This horizon was not sampled.

SOIL Wilesburg loamy sand SOIL No. 863Colo-58-2 LOCATION Sedgwick County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. No. 18497-18504 March 1967

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

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1												Coarse fragments 2A2			
		Total		Sand						Silt				> 2 Pct.	2 - 19 Pct.	19 - 76 Pct.	
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)				
Pct. of < 2 mm																	
0-7	Ap	86.9	6.2	6.9	0.4	10.6	25.1	40.6	10.2	4.6	1.6	33.7	76.7				2
7-13	B21t	83.1	5.1	11.8	0.1	9.2	22.2	21.1	10.5	3.3	1.8	33.4	72.6				tr
13-19	B22t	84.8	5.6	9.6	0.1	8.7	23.1	41.2	11.6	4.4	1.2	35.7	73.2				tr
19-33	B3	81.7	9.2	9.1	0.2	9.0	23.1	37.2	12.2	6.3	2.9	36.1	69.5				tr
33-47	C1	89.4	5.0	5.6	0.4	11.8	24.1	42.5	10.6	3.4	1.6	34.5	78.8				tr
47-60	C2	90.6	4.5	4.9	0.4	8.8	21.8	45.9	13.7	3.2	1.3	40.4	76.9				tr
60-65	IIIC3	81.7	6.3	12.0	9.0	21.5	20.0	22.3	8.9	4.3	2.0	23.4	72.8				10
65-77	IIIC4b	91.9	3.3	4.8	27.0	35.0	16.3	9.9	3.7	2.4	0.9	9.9	88.2				37
Depth (in.)	6A1a Organic carbon a	6B1a Nitrogen	C/N	Carbonate as CaCO ₃		Ext. Iron as Fe	Bulk density			4D1 COLE	Water content				pH	6C1a (1:1)	
				6E2a <2 mm.	<0.002 mm.		4A1a Field State	4A1g 1/10-Bar	4A1b Air Dry		4B4 Field State	4B1c 1/10-Bar	4B2 15-Bar	4C2 1/10 to 15-Bar			
				Pct.	Pct.		Pct.	g/cc	g/cc		g/cc	Pct.	Pct.	Pct.			in./in.
0-7	0.29	0.036	8				1.62b	1.6c									6.7
7-13	0.28	0.043	7				1.61	1.56d	1.63	0.014	13.3	13.9e	5.4	0.13f			6.7
13-19	0.21	0.028						1.6c					4.2				6.9
19-33	0.13	0.019					1.64	1.58	1.64	0.014	11.3	13.3	3.9	0.15			7.0
33-47	0.04						1.70	1.66	1.67	0.003	4.5	11.3	2.5	0.15			7.2
47-60	0.03							1.7c					2.2				7.3
60-65	0.05												5.5				7.2
65-77													2.5				
Depth (in.)	Extractable bases 5B1a				6H1a Ext. Acidity	Cat. Exch. Cap.			8D3 Ca/Mg	Base saturation							
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K		Sum	5A3a Sum	5A1a NH ₄ OAc		5C3 Sum	5C1 NH ₄ OAc						
	meq/100 g									Pct.	Pct.						
0-7	4.3	1.1	tr	0.4	5.8	2.0	7.8	6.0			3.9	74	97				
7-13	6.7	1.7	tr	0.4	8.8	3.2	12.0	9.0			3.9	73	98				
13-19	5.7	1.4	tr	0.3	7.4	2.0	9.4	7.7			4.1	79	96				
19-33	5.5	1.5	tr	0.4	7.4	2.1	9.5	7.5			3.7	78	99				
33-47	3.7	1.1	tr	0.3	5.1	0.6	5.7	4.8			3.4	89	106				
47-60	3.3	1.0	tr	0.3	4.6	0.7	5.3	4.8			3.3	87	96				
60-65	7.6	2.2	tr	0.6	10.4	1.2	11.6	10.2			3.5	90	102				
65-77																	
Depth (in.)	Ratios to Clay 8D1			15-Bar Water													
	NH ₄ OAc	CBC															
0-7	0.87			0.45													
7-13	0.76			0.46													
13-19	0.80			0.44													
19-33	0.82			0.43													
33-47	0.86			0.45													
47-60	0.98			0.45													
60-65	0.85			0.46													
65-77				0.52													

- a. 3.1 kg/m² to 60 inches (Method 6A).
- b. Core sample (Method 4A3a).
- c. Estimated.
- d. 1/3-Bar (Method 4A1d).
- e. 1/3-Bar (Method 4B1c).
- f. 1/3- to 15-Bar in./in. (Method 4C1).

Soil Type: Julesburg loamy sand

Soil Nos.: 863Colo-58-2

Location: 1,043 feet north, 165 feet east of west quarter corner, Sec. 17, T9N, R46W, Sedgwick County, Colorado.

Climate: Continental climate, average annual precipitation of 17.5 inches, frost-free season of 147 days, mean annual temperature of 49.6 degrees F.

Elevation: 3,900 feet

Vegetation: Cultivated

Parent Material: Aeolian sands

Physiographic Position: Upland

Relief: Convex 4 percent southwest facing slopes

Drainage: Well drained

Moisture: Nearly dry

Salt or Alkali: None

Erosion: Slight, primarily wind

Sampled by: R. C. Accola, J. I. Brubacher, R. B. Grossman, R. Moreland, E. M. Payne, and J. L. Walker: July 8, 1963

Described by: J. I. Brubacher

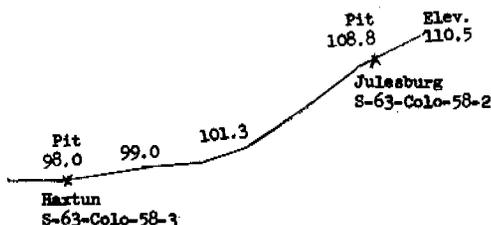
Horizon and

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Ap 18497	0 to 7 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) loamy sand; weak fine granular structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
B2t 18498	7 to 13 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) sandy loam; weak medium prismatic breaking to weak medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; thin nearly continuous clay skins; clear smooth boundary.
B2bt 18499	13 to 19 inches. Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 4/2 moist) sandy loam; weak medium prismatic breaking to weak medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
B3 18500	19 to 33 inches. Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 4/2 moist and crushed) sandy loam; massive breaking to weak medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
C1 18501	33 to 47 inches. Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 4/2 moist) loamy sand; massive; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
C2 18502	47 to 60 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) sand; massive; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
IIC3 18503	60 to 65 inches. Light brown (7.5YR 6/4 dry) to dark brown (7.5YR 4/4 moist) sandy clay loam; slightly hard dry, friable when moist; noncalcareous; very thin patchy clay skins; gradual smooth boundary.
IIC4b 18504	65 to 77 inches. Light brown (7.5YR 6/4 dry) to dark brown (7.5YR 4/4 moist) sand and gravel.

Landscape Profile:



Horizontal scale 200 feet

Vertical scale 10 feet

Bureau of Public Roads Samples:

Ap - 0-7 inches
 B2t - 7-13 inches
 C1 - 33-47 inches
 IIC4b - 65-77 inches

SOIL Julesburg loamy sand SOIL Nos. 863Colo-58-4 LOCATION Sedgwick County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18505-18511 March 1967

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

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1													Coarse fragments 2A2		
		Total			Sand						Silt				> 2	2-19	19-76
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)				
Pct. of < 2 mm																	
0-6	Ap1	87.8	6.6	5.6	9.4	22.8	23.0	26.3	6.3	5.2	1.4	22.8	81.5				1
6-10	Ap2	84.0	5.7	10.3	6.8	18.4	20.8	31.1	6.9	3.6	2.1	25.1	77.1				1
10-18	B2t	85.8	4.8	9.4	9.0	20.0	19.5	30.5	6.8	2.9	1.9	24.3	79.0				tr
18-32	B3	86.3	5.5	8.2	5.5	17.6	21.7	33.5	8.0	3.5	2.0	27.7	78.3				tr
32-46	C1	90.8	3.8	5.4	3.7	16.4	24.9	38.2	7.6	2.4	1.4	27.7	83.2				tr
46-61	C2	90.6	4.3	5.1	4.4	16.4	21.7	37.0	11.1	2.8	1.5	32.9	79.5				tr
61-76	C3	93.6	1.8	4.6	3.2	23.5	26.2	32.6	8.1	1.2	0.6	24.7	85.5				tr
Depth (In.)	6A1a Organic carbon %	6B1a Nitrogen %	C/N	6E2a Carbonate as CaCO ₃ %	6C2a Ext. Iron as Fe %	Bulk density			4DL COLE	Water content				pH			
						4A1a Field State g/cc	4A1g 1/10- Bar g/cc	4A1b Air Dry g/cc		4B4 Field State Pct.	4B1c 1/10- Bar Pct.	4B2 15- Bar Pct.	4C2 1/10 to 15-Bar ln/in.	8C1a (1:1)			
0-6	0.28	0.030	9		0.2	1.63	1.58	1.60	0.003	5.2	8.5	2.5	0.09		6.5		
6-10	0.34	0.038	9		0.3	1.80	1.76	1.80	0.007	8.5	10.9	3.7	0.13		6.5		
10-18	0.21	0.028			0.3	1.73	1.69	1.74	0.010	7.1	9.3	3.7	0.08		6.6		
18-32	0.13	0.017			0.2	1.82	1.73	1.80	0.014	4.9	12.7	3.2	0.16		6.9		
32-46	0.04			-(s)	0.2	1.80	1.75	1.76	0.003	3.3	12.6	2.2	0.18		7.2		
46-61	0.02			-(s)	0.2	1.78b	1.74b	1.74b		4.7b	9.3	2.1	0.12		7.2		
61-76	0.02			-(s)	0.2							1.9			7.1		
Depth (In.)	Extractable bases 5B1a				6H1a Ext. Acidity	5A3a Sum		5A1a NH ₄ OAc		8D3 Ca/Mg	Base saturation						
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K		Sum	Cations	NH ₄ OAc	5C3 Sum		5C1 NH ₄ OAc						
	meq/100 g										Pct.	Pct.					
0-6	3.0	0.9	tr	0.3	4.2	1.9	6.1	4.6			69	91					
6-10	5.5	1.3	tr	0.3	7.1	2.9	10.0	7.7		4.2	71	92					
10-18	5.8	1.4	tr	0.3	7.5	1.9	9.4	7.8		4.1	80	96					
18-32	4.7	1.5	tr	0.3	6.5	1.8	8.3	6.3		3.1	78	103					
32-46	3.2	0.9	-	0.2	4.3	0.8	5.1	4.2			84	102					
46-61	3.0	0.9	-	0.2	4.1	0.8	4.9	4.0			84	103					
61-76	2.6	0.8	-	0.2	3.6	1.1	4.7	3.5			77	103					
Depth (In.)	Ratios to Clay 8D1																
	NH ₄ OAc CEC	Ext. Iron	15-Bar Water														
0-6	0.82	0.04	0.45														
6-10	0.75	0.03	0.36														
10-18	0.83	0.03	0.39														
18-32	0.77	0.02	0.39														
32-46	0.78	0.04	0.41														
46-61	0.78	0.04	0.41														
61-76	0.76	0.04	0.41														
a. 3.2 kg/m ² to 60 inches (Method 6A). b. One clod.																	

Soil Type: Julesburg loamy sand

Soil Nos.: 863Colo-58-4

Location: 858 feet east, 50 feet south of northwest corner, Sec. 35, T10N, R47W, Sedgwick County, Colorado.

Climate: Continental climate, average annual precipitation of 17.5 inches, frost-free season of 147 days, mean annual temperature of 49.6 degrees F.

Elevation: 3,900 feet

Vegetation: Cultivated

Parent Material: Aeolian sands

Physiographic Position: Upland

Relief: Convex, 3 percent southwest facing slope

Drainage: Well drained

Moisture: Moist to 10 inches, dry below

Salt or Alkali: None

Erosion: Slight, primarily wind

Sampled by: R. C. Accolla, J. I. Brubacher, R. B. Grossman, R. Moreland, E. M. Payne, and J. L. Walker; July 9, 1963

Described by: J. I. Brubacher

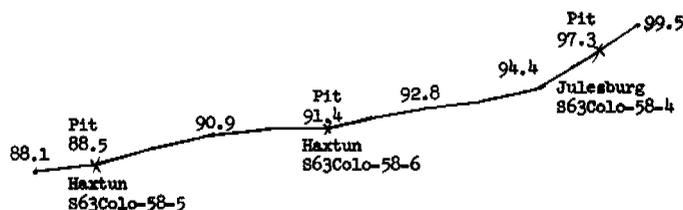
Horizon and

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- Apl 0 to 6 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) loamy sand; weak fine granular; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
18505
- Ap2 6 to 10 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) sandy loam; weak medium prismatic breaking to weak medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; thin nearly continuous clay skins; clear smooth boundary.
18506
- B2t 10 to 18 inches. Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 4/2 moist) sandy loam; weak medium prismatic breaking to weak medium subangular blocky structure; slightly hard dry, friable when moist; noncalcareous; clear smooth boundary.
18507
- B3 18 to 32 inches. Pale brown (10YR 6/3 dry) to dark brown (10YR 4/3 moist) sandy loam; massive breaking to weak medium subangular blocky structure; slightly hard dry, friable when moist; noncalcareous; clear smooth boundary.
18508
- C1 32 to 46 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) loamy sand; massive; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
18509
- C2 46 to 61 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) loamy sand; massive; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
18510
- C3 61 to 76 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) loamy sand; massive; soft dry, very friable when moist; noncalcareous.
18511

Landscape Profile:



Horizontal scale | 200 feet |

Vertical scale | 10 feet |

Bureau of Public Roads Samples: Apl, B2t, and C2 horizons.

Mineralogy (Method 7E1): C2 horizon. Count on very fine sand: 40 percent quartz; 40 percent feldspar; 10 percent compound grains; 5 percent glass shards; accessories include green hornblende, epidote, pyroxene group, garnet, chert, apatite, zircon, in approximate order of abundance. Orthoclase and albite are the most common feldspars, with considerable microcline, oligoclase-andesine.

SOIL Keith silt loam SOIL Nos. 863Colo-58-11 LOCATION Sedgewick County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18553-18561 March 1967

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

Depth (in.)	Horizon	Size class and particle diameter (mm)											3A1			Coarse fragment 2A2		
		Total		Sand					Silt				3Alb	3Ala	Non-carbonate Clay <0.002	≥ 2	2-19	19-76
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)						
0-5	Apl	48.6	36.2	15.2	1.9	6.7	5.8	10.2	24.0	23.1	13.1	52.9	24.6	9.5	15	tr		
5-7	Ap2	50.8	32.1	17.1	1.6	7.0	6.2	10.8	25.2	21.4	10.7	52.9	25.6		17	tr		
7-11	AB	51.5	30.8	17.7	1.8	6.8	6.2	11.1	25.6	21.5	9.3	53.4	25.9		18	tr		
11-16	B21t	51.6	31.2	17.2	1.4	6.8	6.0	11.3	26.1	21.0	10.2	53.6	25.5		17	tr		
16-23	B22t	50.2	31.7	18.1	1.1	6.4	6.0	10.8	25.9	21.6	10.1	53.8	24.3	12.0	18	tr		
23-27	B3ca	48.4	33.9	17.7	1.4	5.6	5.7	10.4	25.3	23.1	10.8	54.3	23.1	10.0	18	tr		
27-38	C1ca	50.8	33.0	16.2	1.1	6.0	6.4	11.2	26.1	20.6	12.4	52.9	24.7		12	tr		
38-54	IIC2ca	66.1	23.7	10.2	1.9	7.9	7.9	15.0	33.4	16.4	7.3	58.4	32.7	3.2	9	tr		
54-72	IIC3ca	66.5	24.3	9.2	1.3	7.4	7.5	13.3	37.0	17.7	6.6	62.4	29.5		9	tr		

Depth (in.)	6A1a		6B1a		Carbonate as CaCO3		Bulk density			Water content			pH	
	Organic carbon	Nitrogen	C/N	6E1b	3A1a	6C2a Ext.	g/cc	g/cc	g/cc	4B2	15-Bar	8C1b Sat. Paste	8C1a (1:1)	
	Pct.	Pct.		< 2 mm. Pct.	< 0.002 mm. Pct.	Pct.				Pct.	Pct.			
0-5	1.07	0.090	12			0.4					8.1		6.6	
5-7	0.94	0.081	12			0.4					8.0		6.7	
7-11	0.73	0.068	11			0.4					8.4		7.1	
11-16	0.57	0.060	10			0.3					8.2		7.5	
16-23	0.45	0.057	8			0.4					10.3		7.8	
23-27	0.35	0.052	7			0.3					9.7		7.9	
27-38	0.24					8					9.2	7.6	8.3	
38-54	0.08					4					5.7		8.4	
54-72	0.04					4					5.3		8.4	

Depth (in.)	Extractable bases 5B1a				6H1a		Cation Exchange Cap.		BA Water at Saturation Pct.	BAla Elec. Cond.	8D3 Ca/Mg	Base saturation	
	6M2a	6O2a	6P2a	6Q2a	Ext.	5A3a Sum	5A1a NH4OAc	5C3 Sum Cations				5C1 NH4OAc	
	Ca	Mg	Na	K	Sum	meq/100 g	meq/100 g	Pct.				Pct.	
0-5	9.5	2.0	tr	1.8	13.3	4.0	17.3	13.8			4.8	77	96
5-7	10.8	2.0	tr	1.5	14.3	3.6	17.9	14.2			5.4	80	101
7-11	12.9	2.0	tr	1.3	16.2	2.4	18.6	15.1			6.5	87	107
11-16	12.6 b	1.8c	tr	1.1	17.2			15.0			7.0		
16-23	12.8 b	2.5c	tr	1.1	18.1			15.6			5.1		
23-27	13.6 b	3.5c	tr	1.4	18.5			15.9			3.9		
27-38	10.9 b	3.6c	tr	1.5	16.0			13.2		33.8	0.73	3.0	
38-54	7.3 b	3.1c	tr	1.3	11.7			10.0			2.4		
54-72	6.5 b	3.5c	0.1	1.4	11.5			9.9			1.9		

Depth (in.)	Ratios to Clay		
	8D2 NH4OAc CEC	8D2 Ext. Iron	8D1 15-Bar Water
0-5	0.92	0.03	0.53
5-7	0.84	0.02	0.47
7-11	0.84	0.02	0.47
11-16	0.88	0.02	0.48
16-23	0.87	0.02	0.57
23-27	0.88	0.02	0.55
27-38	1.10	0.02	0.57
38-54	1.11	0.03	0.56
54-72	1.10	0.03	0.58

- a. Few grains of carbonate below 23 inches.
- b. NH4Cl-EtOH extraction (Method 6N3a).
- c. NH4Cl-EtOH extraction (Method 6O3a).

Soil Type: Keith silt loam
 Soil Nos.: S63Colo-58-11
 Location: 940 feet north, 528 feet west of southeast corner, Sec. 11, T10N, R45W, Sedgwick County, Colorado
 Climate: Continental climate, average annual precipitation of 17.5 inches, frost-free season of 147 days, mean annual temperature of 49.6 degrees F.

Elevation: 3,800 feet
 Vegetation: Cultivated
 Parent Material: Loess
 Physiographic Position: Upland
 Relief: Concave, 1.5 percent slope
 Drainage: Well drained
 Moisture: Moist to 23 inches, nearly dry below
 Salt or Alkali: None
 Erosion: Slight

Sampled by: R. C. Accola, J. I. Brubacher, R. B. Grossman, R. Moreland, E. M. Payne, and J. L. Walker: July 11, 1963
 Described by: J. I. Brubacher

Horizon and
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Apl
 18553 0 to 5 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) loam; weak fine granular structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.

Ap2
 18554 5 to 7 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) loam; moderate coarse platy structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.

AB
 18555 7 to 11 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) loam; weak coarse prismatic breaking to weak coarse subangular blocky structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.

B21t
 18556 11 to 16 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) loam; weak medium prismatic structure breaking to weak medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; very thin patchy clay skins; clear smooth boundary.

B22t
 18557 16 to 23 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) heavy loam; moderate medium prismatic breaking to moderate medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; thin continuous clay skins; clear smooth boundary.

B3ca
 18558 23 to 27 inches. Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 4/2 moist) loam; weak medium prismatic structure breaking to weak medium subangular blocky structure; soft dry, very friable when moist; slightly calcareous; clear smooth boundary.

C1ca
 18559 27 to 38 inches. Light gray (10YR 7/2 dry) to grayish brown (10YR 5/2 moist) loam; massive to weak coarse prismatic structure; soft dry, very friable when moist; highly calcareous; clear smooth boundary.

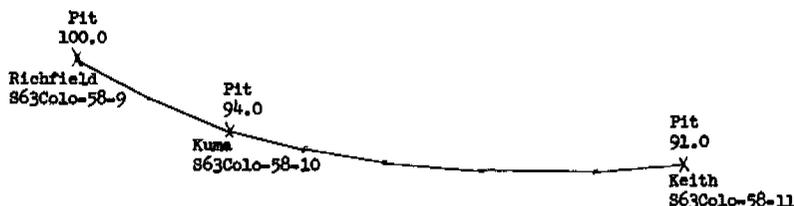
IIC2ca
 18560 38 to 54 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) very fine sandy loam; massive; soft dry, very friable when moist; highly calcareous; clear smooth boundary.

IIC3ca
 18561 54 to 72 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) very fine sandy loam; massive; soft dry, very friable when moist; highly calcareous; clear smooth boundary.

Landscape Profile:

Horizontal Scale: 200 feet

Vertical Scale: 10 feet



Bureau of Public Roads Samples: Apl, B22t, and C1ca horizons.

Mineralogy (Methods 7A1, 7A2): Apl, B22t, B3ca, and IIC2ca horizons. Small amounts of kaolinite and mica (or illite) are present in the coarse clay (0.2-2 μ) throughout the profiles. The crystalline quality decreases in the lower lithic zone. Montmorillonite increases steadily from a small amount in the surface to an abundant amount in the B3ca, then decreases to a moderate amount in the IIC2ca. The fine clay is X-ray amorphous in the surface and below the lithic contact. A small amount of montmorillonite is present in the B22t and a little more in the B3ca. The crystalline quality is poor. A large proportion of X-ray amorphous material is present, especially in the fine clay. Some of this may be closely associated with montmorillonite.

Mineralogy (Method 7B1): AB horizon. Count on very fine sand: 40 percent quartz; 40 percent feldspar; 10 percent compound grains; 10 percent glass shards; accessories include green hornblende; mica group; epidote, garnet, pyroxene group. Orthoclase and albite are common feldspars with a lesser proportion of oligoclase-andesine and some microcline. Compound grains include both altered microcrystalline feldspar and highly altered glass shards.

IIC2ca horizon: 30 percent quartz; 35 percent feldspar; 15 percent compound grains; 15 percent glass shards; accessories include as described for AB plus occasional grains of primary carbonate, and a very few apatite grains. Many of the glass shards show alteration, perhaps a higher proportion than in AB.

SOIL *Kettle sandy loam SOIL Nos. 863Colo-18-1 LOCATION Douglas County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18638-18646 March 1967

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

Depth (in.)	Horizon	Size class and particle diameter (mm)													3A1b	2A2 Coarse fragments g		
		Total				Sand				Silt						3A1b	3B1 > 2 (< 19) Pct.	3B2 > 2 (< 19) Pct.
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)						
Pct. of < 2 mm																		
2-0	O1	71.0	22.2	6.8	18.0	18.2	10.5	15.7	8.6	11.9	10.3	28.4	62.4		7			
0-3	A1	75.0	18.8	6.2	21.9	20.1	10.5	15.1	7.4	9.5	9.3	24.3	67.6		27	17		
3-8	A21	75.0	18.8	6.2	21.9	20.1	10.5	15.1	7.4	9.5	9.3	24.3	67.6		32	20		
8-20	A22	84.0	11.8	4.2	24.0	23.5	12.8	17.4	6.3	6.7	5.1	21.1	77.7		35	23		
20-38	B21t	64.8	16.2	19.0	16.0	11.9	7.0	16.8	13.1	8.7	7.5	31.9	51.7		23	14		
38-46	B22t	48.4	25.7	25.9	6.1	6.6	4.4	14.2	17.1	14.0	11.7	40.5	31.3		7	4		
46-60	C	77.7	10.4	11.9	14.4	14.2	10.7	25.0	13.4	6.8	3.6	34.8	64.3	7.1	41	28		
20-38	a	74.8	12.0	13.2	21.3	15.8	9.0	17.9	10.8	6.9	5.1	27.6	64.0	6.5	35			
20-38	b	42.4	26.0	31.6	6.9	5.4	3.8	13.1	13.2	12.6	13.4	34.1	29.2	17.3	3			
Depth (in.)	6A1a Organic carbon d Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as CaCO3 Pct.	4A1a Field State g/cc	4A1g 1/10-Bar g/cc	4A1g 1/10-Bar g/cc	4A1b Air Dry g/cc	4D1 COLE	4B4 Field State Pct.	4B1c 1/10-Bar Pct.	4B2 15-Bar Pct.	4C2 1/10-to 15-Bar in.	pH	8C1a (1:1)		
2-0	19.4	1.20	16	0.2		1.48	1.21	1.46	1.47	0.002	11.2	18.1	5.0	0.16		5.5		
0-3	1.66	0.117	14	0.2		1.43	1.13	1.41	1.42	0.002	9.3	16.6	3.7	0.14		6.0		
3-8	0.68	0.050	14	0.2		1.55	1.16	1.50	1.51	0.002	4.1	10.1	2.4	0.09		6.3		
8-20	0.23	0.020		0.2		1.57	1.27	1.48	1.55	0.015	6.7	18.3	6.9	0.15		6.3		
20-38	0.20			0.2		1.56	1.32	1.45	1.57	0.027	7.7	20.3	10.0	0.14		6.0		
38-46	0.20			0.2		1.54	1.07	1.48	1.53	0.007	4.3	18.7	4.6	0.15		6.0		
46-60	0.08			0.1									4.7			6.1		
20-38	0.17			0.1									10.3			6.1		
20-38	0.28			0.3												6.1		
Depth (in.)	6B2a Ca	6C2a Mg	6P2a Na	6Q2a K	Sum	6R1a Ext. Acidity	Ext. Sum	5A3a Cations	5A1a NH4OAc	5D3 Ca/Mg	Base saturation 5C3 Sum Cations Pct.	5C1 NH4OAc Pct.						
meg/100 g																		
2-0																		
0-3	5.9	1.4	tr	0.4	7.7	5.1	12.8	9.4			4.2	60						
3-8	4.3	1.0	tr	0.4	5.7	2.1	7.8	6.0			4.3	73						
8-20	2.3	0.6	tr	0.2	3.1	1.3	4.4	3.0				70						
20-38	9.2	2.9	0.1	0.2	12.4	1.4	13.8	11.7			3.2	90						
38-46	13.1	4.7	0.2	0.3	18.3	1.8	20.1	16.9			2.8	91						
46-60	6.2	2.5	0.1	0.1	8.9	1.0	9.9	7.8			2.5	90						
20-38	6.2	2.3	0.1	0.2	8.8	0.8	9.6	8.1			2.7	92						
20-38	15.3	4.5	0.1	0.3	20.2	2.4	22.6	19.3			3.4	89						
2-0																		
Depth (in.)	Ratios to Clay 8D1																	
	NH4OAc CEC	Ext. Iron	15-Bar Water															
2-0																		
0-3	1.38	0.03	0.74															
3-8	0.97	0.03	0.60															
8-20	0.71	0.02	0.57															
20-38	0.62	0.01	0.36															
38-46	0.65	0.01	0.39															
46-60	0.66	0.01	0.39															
20-38	0.61	0.01	0.36															
20-38	0.61	0.01	0.33															
<p>a. Sandy interband material, see description. b. Clayey interband material, see description. c. Estimated less than 10 percent by volume of coarse fragments greater than 19 mm. d. 5 kg/m² from 0 to 60 inches (Method 6A). e. Calculated to include volume but not weight of 2-19 mm. material (Method 3B2). f. 1/3-Bar (Method 4A1d). g. 1/3-Bar. h. 1/3- to 15-Bar (Method 4C1).</p>																		

Soil Type : *Kettle sandy loam
 Soil Nos. : 8639, 18641
 Location : 425 feet north, 650 feet west of the southeast corner, Section 14, T10S, R67W, Douglas County, Colorado
 Climate : Continental, average annual precipitation 20 inches, mean annual temperature 44 degrees F. Growing season 120 days. Elevation 7,200 feet.
 Vegetation : Ponderosa pine with site index of 48, scrub oak, blue grama, wild rose, some mountain mahogany and annuals
 Parent Material : Dawson arkose or outwash from Dawson.
 Physiographic Position : Upland
 Relief : Sloping 5 to 6 percent north facing. Slope about 900 feet in length. Pit dug approximately midway on the slope
 Drainage : Surface and internal drainage gradual. Rapid intake rate
 Moisture : Dry throughout, usually moist
 Stoniness : 5 to 15 percent very fine gravel throughout the profile
 Salt or Alkali : None observed
 Erosion : Slight to none
 Sampled by : R. K. Densdill, J. B. Brown, L. G. Shields, and R. H. Jordan; August 12, 1963
 Described by : J. B. Brown

Horizon and
 Lincoln
 Lab. No.

O1
 18638 2 to 0 inches. Pine needles and cones, partially decomposed; abrupt smooth boundary.

A1
 18639 0 to 3 inches. Black (10YR 2/1 moist) light coarse sandy loam; very dark gray (10YR 3.5/1 dry); weak medium subangular blocky structure; slightly hard when dry, loose when moist; few fine water washed gravels; noncalcareous; clear wavy boundary.

A21
 18640 3 to 8 inches. Dark grayish brown (10YR 4/2 moist) loamy coarse sand; light brownish gray (10YR 6/2 dry); massive structure; slightly hard when dry, loose when moist; noncalcareous; few fine water worn gravels; clear wavy boundary.

A22
 18641 8 to 20 inches. Pale brown (10YR 6/3 moist) coarse sand; light gray (10YR 7/2 dry); massive structure; loose when dry or moist; noncalcareous; few fine water worn gravels; abrupt wavy boundary.

B21t
 18642 20 to 38 inches. Brown (10YR 5/3 moist and crushed) sandy loam; pale brown (10YR 6/3 dry); extremely hard when dry, friable when moist; this horizon consists of horizontal bands of clay loam or sandy clay loam 1/2 to 1-1/2 inches in width that have a moderate fine angular blocky structure; the finer textured bands are separated by layers of sand 1/4 to 8 inches thick that are massive; the finer textured bands have clay films and organic staining; some fine gravel is mixed with the sand; noncalcareous; clear slightly wavy boundary.

B22t
 18643 38 to 46 inches. Grayish brown (2.5Y 5/2 moist and crushed) coarse sandy loam; light brownish-gray (2.5Y 6/2 dry); very hard when dry, friable when moist; this horizon is similar to the one above; sandy clay loam bands are 1/2 to 1 inch in width and 6 to 12 inches apart; structure is less pronounced but clay films are evident; sand coatings on the bands are not as thick in this horizon; areas between the bands are coarse loamy sand or sand; noncalcareous; gradual boundary.

C
 18644 46 to 60 inches. Pale yellow (2.5Y 7/4 moist) coarse sand; pale yellow (2.5Y 8/4 dry); single grain; loose when dry or moist; noncalcareous; a few bands 1/4 inch wide of sandy clay loam materials are present in this layer; the bands may be considered part of the B horizon rather than a C horizon.

B21t
 18645 20 to 38 inches. Coarse textured bands. Pale brown (10YR 6/3, moist) coarse loamy sand, very pale brown (10YR 7/3, dry); this is sandier material between the heavy streaks of the B21 horizon; it was sampled separately; structure is massive; hard when dry, loose when moist.

B21t
 18646 20 to 38 inches. Fine textured bands. Dark brown (10YR 4/3, dry or moist) sandy clay loam; this is the heavier streaks in the B21 horizon; it is moderate to fine angular blocky with definite clay films and what appears to be organic staining; the heavier material was sampled separately for laboratory analysis.

Remarks: This soil unit is extensive in Douglas County. The parent material may be cut-wash off of the Dawson formation or may be part of the Dawson. The banding as described in this profile is very typical of this soil unit. The coarse sandy material is often cemented and is extremely hard when dry but loose when moist. This soil unit occurs at elevations of 6,400 to 7,800 feet in the survey area. Soil temperatures at this location were 15 degrees centigrade at one foot, 14 degrees centigrade at 3 feet, 12.4 degrees centigrade at 5 feet, 9 degrees centigrade at 13 feet. Very hard Dawson formation was encountered at 13 feet; could not dig deeper.

Bureau of Public Roads Samples: A22 and B21t horizons.

Mineralogy:

Observations on very fine sand (Method 7B1)--A1, B22t, and C horizons: 80 to 90 percent feldspar, 10 percent quartz, and 5 percent accessory minerals. Orthoclase is the dominant feldspar; microcline and low-calcium plagioclase are present in much lesser amounts. All degrees of alteration are in evidence; etching and pitting of grains are common. Biotite is the principal accessory mineral and increases slightly with depth. Other minerals identified include zircon, opague, hornblende, and epidote; plant opal is present in the A1 horizon. No volcanic glass was observed.

Clay mineralogy (Method 7A1, 7A2)--B21t (coarse textured bands), B21t (fine textured bands), and C horizons: The clay mineralogy of the C horizon and the coarse textured bands in the B21t is very similar. They contain moderate amounts of kaolinite, montmorillonite, and mica (or illite) in decreasing order of abundance. Traces of feldspar are present. The fine textured bands contain the same minerals with montmorillonite more abundant than kaolinite. The minerals are well crystallized in both cases.

The fine to coarse clay ratios follow a different pattern. The ratio is 1.2 in the fine textured B21t bands and 1.0 in the coarse textured bands. In the C horizon the ratio rises to 1.5.

The fine clay has more montmorillonite and less mica (illite) than the coarse clay. The fine clay in the fine textured bands is well crystallized. It is not so well crystallized in the coarser textured samples.

The clay mineralogy of the C horizon and the fine textured bands in the B21t is montmorillonitic. The coarse textured bands in the B21t have mixed clay mineralogy.

SOIL: *Kettle sandy loam SOIL Nos. 963Colo-18-2 LOCATION Douglas County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18647-18652 March 1967

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

Depth (in.)	Horizon	Size class and particle diameter (mm)											3A1		2A2 Coarse fragments a		
		Total				Sand					Silt		Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	3B1 (< 19) Pct.	3B2 (> 2) (Vol. Pct.)
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	0.02-0.002						
Pct. of < 2 mm																	
0-3	A1	69.6	23.9	6.5	18.9	15.1	9.0	15.9	10.7	12.4	11.5	31.8	58.9			27	13
3-9	A21	75.8	20.0	4.2	21.1	18.5	9.8	16.3	10.1	10.3	9.7	29.3	65.7			25	15
9-17	A22	78.6	14.3	7.1	23.7	18.5	10.0	17.2	9.2	8.0	6.3	26.5	69.4			34	22
17-26	B21t	75.8	9.7	14.5	17.3	18.1	11.4	20.1	8.9	6.0	3.7	25.7	66.9			32	22
26-36	B22t	76.9	8.5	14.6	23.5	18.6	10.2	17.7	6.9	4.8	3.7	21.1	70.0			28	26
36-60	B3	81.6	8.6	9.8	18.3	24.2	14.6	18.1	6.4	4.6	4.0	19.7	75.2			40	27

Depth (in.)	6A1a	6B1a	C/N	Ext. Iron as Fe Pct.	Carbonate as CaCO ₃ Pct.	Bulk density				4D1 COLE	Water content				pH	8C1a (1:1)
	Organic carbon b Pot.	Nitrogen Pct.				4A1a	4A1g	4A1c	4A1b		4B4	4B1c	4B2	4C2		
						Field State	1/10-Bar	1/10-Bar	Air Dry		Field State	1/10-Bar	15-Bar	1/10-to 15-Bar		
0-3	3.48	0.159	22			1.13	0.97	1.12	1.14	0.006	19.4	30.1	5.1	0.24	5.8	
3-9	0.95	0.047	20			1.37	1.16	1.36	1.36	-	5.9	12.4	2.2	0.12	5.8	
9-17	0.10					1.59	1.21	1.55	1.56	0.002	4.9	8.6	2.2	0.08	6.0	
17-26	0.16					1.63	1.22	1.57	1.61	0.005	6.2	11.4	4.8	0.08	6.0	
26-36	0.08					1.56	1.12d	1.51d	1.59	0.013	7.7	11.0e	6.0	0.06f	6.0	
36-60	0.12					1.53	1.09	1.49	1.49	-	9.7	12.4	4.4	0.09	6.0	

Depth (in.)	Extractable bases				5B1a	6H1a	Cat. Exch. Cap.		8D3 Ca/Mg	Base saturation	
	6N2a	6O2a	6P2a	6Q2a	Sum	5A3a	5A1a	5C3 Sum		5C1	
	Ca	Mg	Na	K	Sum	Ext. Acidity	Cations	NEq		OCe	Pct.
0-3	10.3	1.6	-	0.4	12.3	8.0	20.3	14.7	6.4	61	84
3-9	3.8	0.7	-	0.2	4.7	3.0	7.7	5.4		61	87
9-17	2.1	0.7	tr	0.3	3.1	1.0	4.1	3.1		76	100
17-26	4.5	1.7	-	tr	6.2	2.0	8.2	6.5	2.6	76	95
26-36	5.5	2.2	tr	0.3	8.0	1.8	9.8	8.0	2.5	82	100
36-60	4.0	1.6	tr	0.2	5.8	1.4	7.2	5.7	2.5	81	102

Depth (in.)	Ratios to Clay	
	8D1 NEq/OCe	8D1 15-Bar Water
0-3	2.26	0.78
3-9	1.29	0.52
9-17	0.44	0.31
17-26	0.45	0.33
26-36	0.55	0.41
36-60	0.58	0.45

- a. Estimated less than 10 percent by volume of coarse fragments greater than 19 mm.
- b. 6 kg/m² from 0-60 inches (Method 6A).
- c. Calculated to include volume but not weight of 2-19 mm. material (Method 3B2).
- d. 1/3-Bar (Method 4A1d).
- e. 1/3-Bar.
- f. 1/3- to 15-Bar (Method 4C1).

Soil Type : Kettle sandy loam
 Soil Nos. : S63Colo-18-2
 Location : 550 feet west, 150 feet north of the southeast corner of Section 34, T10S, R66W, Douglas County, Colorado
 Climate : Continental, average annual precipitation 20 inches, mean annual temperature 44 degrees R Growing season 120 days. Elevation 7,250 feet
 Vegetation : Ponderosa pine, with a site index of 62; older stand with under-story of some mountain mahly, mountain mahogany, Arizona fescue, blue grama, Kentucky bluegrass, and western wheatgrass.
 Parent Material : Dawson arkose or outwash from Dawson
 Physiographic Position : Upland
 Relief : Sloping, 5 percent northwest facing slope. Slope about 300 feet in length; pit dug near the base of the slope
 Drainage : Surface and internal drainage gradual; rapid intake rate
 Moisture : Dry throughout, usually moist
 Stoniness : 5 to 15 percent fine gravel throughout this profile
 Salt or Alkali : None observed
 Erosion : Slight to none
 Sampled by : R. K. Danadill, J. B. Brown, R. H. Jordan, and L. G. Shields; August 12, 1963
 Described by : J. B. Brown

Horizon and
 Lincoln
 Lab. No.

- O1 1 to 0 inches. Pine needles and cones, partially decomposed; abrupt smooth boundary.
- A1 0 to 3 inches. Black (10YR 2/1 moist) coarse loamy sand; dark gray (10YR 4/1 dry); weak coarse subangular blocky structure; loose when dry or moist; noncalcareous; few fine water worn gravels; clear wavy boundary.
 18647
- A21 3 to 9 inches. Dark gray (10YR 4/1 moist) loamy sand; gray (10YR 6/1 dry); massive structure; loose when dry or moist; noncalcareous; few fine water worn gravels; clear slightly wavy boundary.
 18648
- A22 9 to 17 inches. Light gray (10YR 7/2 moist) sand; white (10YR 8/1 dry); massive structure; loose when dry or moist; noncalcareous; some fine gravels; abrupt wavy boundary.
 18649
- B21t 17 to 26 inches. Pale brown (10YR 6/3 moist) coarse loamy sand; very pale brown (10YR 7/3 dry); moderate medium to coarse angular and subangular blocks; extremely hard when dry, loose when moist; noncalcareous; thin nearly continuous clay films; bands of coarse sandy loam 1/4 to 1 inch thick with structure and clay films are common; massive coarse sand or gravelly sand 1 to 2 inches thick separate the finer textured bands; color of the coarse sandy loam layer is brown (10YR 5/3 moist or dry); gradual smooth boundary.
 18650
- B22t 26 to 36 inches. Pale brown (10YR 6/3 moist) coarse sandy loam; very pale brown (10YR 7/3 dry); moderate medium angular and subangular blocky structure; extremely hard when dry, very friable when moist; noncalcareous; thin patchy clay films; coarse sandy clay loam bands 1/2 to 2 inches thick and 2 to 4 inches apart are common; between these layers are coarse sand or gravelly sand materials; color of the sandy clay loam material is brown (10YR 5/3 moist or dry).
 18651
- B3 36 to 60 inches. Pale brown (10YR 6/3 moist) coarse loamy sand; very pale brown (10YR 7/3 dry); structure is massive to weak coarse angular blocky; very hard when dry, loose when moist; noncalcareous; coarse sandy loam bands 1/4 to 3/4 inches thick are separated by 3 to 8 inches of gravelly sand or coarse sand; the bands have some patchy clay films and structure; color of the bands are pale brown (10YR 6/3 moist or dry).
 18652

Remarks: The parent material of this soil may be outwash material, probably from the Dawson formation, which is gravelly, arkosic, noncalcareous material. The banding described in this profile is very typical of the soil unit; also the coarse sand or fine gravel that is described here is typical. In places it is cemented and becomes very hard when dry but is usually loose when moist. In places it grades into a hard conglomerate. Soil temperature at 13 feet was 49 degrees F. and at 5 feet was 56 degrees F.

Bureau of Public Roads Samples: B22t and B3 horizons.

Mineralogy (Method 7B1): A1, B22t, and B3 horizons. Observations on very fine sand: About 85 percent feldspar; 10 percent quartz, and less than 5 percent accessory minerals. Orthoclase is the dominant feldspar, with small amounts of microcline and low-calcium plagioclase also present. Numerous grains show evidence of abrasion and chemical alteration; etching and pitting are common. Accessory minerals include zircon, biotite, and opaques. Amphibole, pyroxene, and epidote group minerals are essentially absent. No volcanic glass was observed.

*Kettle sandy loam,
thick surface phase SOIL Nos. 863Colo-18-9 LOCATION Douglas County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18653-18661 March 1967

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

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1											3A1b	2A2 Coarse fragments b		
		Total			Sand					Silt				3B1 > 2 (< 19) Pct.	3B2 > 2 (< 19) Vol. Pct.	
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Vary coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Vary fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)				(2-0.1)
Pct. of < 2 mm																
0-6	A1	57.3	31.4	11.3	16.0	12.9	7.1	11.6	9.7	17.4	14.0	33.5	47.6	6.4	15	8
6-11	A1&A2	65.5	25.9	8.6	15.0	14.3	9.3	16.0	10.9	13.7	12.2	33.5	54.6		22	13
11-16	A2	66.1	19.3	14.6	15.4	15.0	9.4	16.3	10.0	10.1	9.2	29.0	56.1		22	14
16-19	B2&A2	61.0	14.3	24.7	14.2	16.5	9.0	13.9	7.4	6.3	8.0	21.1	53.6		27	18
19-24	B2t	55.0	11.1	33.9	14.9	14.0	8.1	11.9	6.1	4.7	6.4	17.0	48.9		24	16
24-32	B2t	60.7	9.5	29.8	14.7	15.4	9.8	14.2	6.6	4.4	5.1	18.4	54.1	19.5	23	14
32-43	C1	66.8	4.7	28.5	18.3	19.1	11.8	13.4	4.2	2.0	2.7	12.4	62.6		51	40
43-60	C2	67.8	7.7	24.5	24.5	19.8	8.5	10.8	4.2	3.8	3.9	13.2	63.6	7.8	37	29
43-60	a	48.5	24.6	26.9	7.3	11.3	7.8	13.3	8.8	10.5	14.1	26.5	39.7		9	

Depth (in.)	6A1a Organic carbon		6B1a Nitrogen		6C2a C/N		6C2a Ext. Iron as Fe		Carbonate as CaCO ₃	Bulk density				4D1 COLE	Water content				pH	
	Pct.	Pct.	Pct.	Pct.	Pct.	4A1a Field State	4A1d 1/3-Bar	4A1d 1/3-Bar		4A1b Air Dry	4B4 Field State	4B1c 1/3-Bar	4B2 15-Bar		4C1 1/3 to 15-Bar	8C1b Sat. Paste	8C1a (1:1)			
	g/cc	g/cc	g/cc	g/cc	g/cc	g/cc	g/cc	g/cc		Pct.	Pct.	Pct.	in/in.							
0-6	2.44	0.181	15	0.3		1.34	1.28	1.39	1.39	-	18.7	19.6	6.0	0.17		6.1				
6-11	0.42	0.034	12	0.2		1.46	1.27e	1.46e	1.46	-	12.4	13.2h	3.1	0.13i		5.9				
11-16	0.27	0.025	11	0.2		1.56	1.33	1.55	1.55	-	9.8	12.3	6.0	0.09		5.6				
16-19	0.27	0.026	10	0.3			1.3	1.6f					10.2			5.4				
19-24	0.31			0.4		1.66	1.30	1.55	1.67	0.020	8.4	20.4	13.8	0.08		5.4				
24-32	0.50			0.3		1.58	1.29	1.50	1.58	0.015	13.8	20.8	12.2	0.11		5.6				
32-43	0.13			1.3		1.76	1.0	1.7g	1.73		12.0		15.5			5.4				
43-60	0.08			0.4		1.88	1.3	1.8g	1.86		10.0		11.8		5.1	5.3				
43-60	0.18			4.0									13.0			5.2				

Depth (in.)	Extractable bases 5B1a				6B1a Ext. Acidity	5A3a Sum Cations		5A1a Sum NH ₄ OAc		8A Water at Saturation Pct.	8A1a Elec. Cond. mmho/cm	8D3 Ca/Mg	Base saturation	
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K		Sum	Sum	NH ₄ OAc	5C3 Sum Pct.				5C1 Sum NH ₄ OAc Pct.	
	meq/100 g	meq/100 g	meq/100 g	meq/100 g		meq/100 g	meq/100 g	meq/100 g	Pct.				Pct.	
0-6	7.8	1.6	tr	0.6	10.0	4.6	14.6	11.0			4.9	68	91	
6-11	3.9	0.9	tr	0.2	5.0	2.6	7.6	5.4			4.9	66	93	
11-16	4.9	1.0	0.1	0.2	6.2	2.4	8.6	6.8				72	91	
16-19	8.9	2.4	0.1	0.2	11.6	3.4	15.0	11.3				3.7	77	103
19-24	14.1	3.9	0.2	0.3	18.5	3.7	22.2	17.6				3.6	83	105
24-32	11.6	2.6	0.3	0.3	14.8	2.9	17.7	14.8				4.5	84	100
32-43	12.9	3.4	0.4	0.2	16.9	2.9	19.8	16.4				3.8	85	103
43-60	12.0	2.9	0.5	0.2	15.6	2.5	18.1	14.6	35.2	1.66		4.1	86	107
43-60	13.0	3.2	0.7	0.2	17.1	2.9	20.0	15.7				4.1	86	109

- a. Sample of iron band, see description.
- b. Estimated less than 10 percent by volume of coarse fragments greater than 19 mm. to a depth of 32 inches.
- c. 9 kg/m² to 60 inches (Method 6A).
- d. Calculated to include volume but not weight of 2-19 mm. material (Method 3B2).
- e. 1/10-Bar (Method 4A1g).
- f. Estimated.
- g. Estimated. (Incomplete wetting at 5-cm. tension, clods would not adsorb additional moisture on standing in shallow water.)
- h. 1/10-Bar.
 - 1. 1/10- to 15-Bar (Method 4C2).

Soil Type : *Kettle sandy loam, thick surface phase
 Soil No. : S63C60-18-9
 Location : 1,320 feet west, 85 feet north of the east quarter corner of Section 28, T10S, R66W, Douglas County, Colorado
 Climate : Continental, average annual precipitation 20 inches, mean annual temperature 44 degrees F. Growing season 120 days. Elevation 7,200 feet
 Vegetation : Native pasture; mountain mahogany, blue grama, western wheat grass, gamble oak and mountain mahogany
 Parent Material : Dawson arkose or outwash from the Dawson
 Physiographic Position : Upland
 Relief : Sloping, 8 percent west facing slope. Slope about 200 feet long; grades toward small drainage-way with pit near the base of the slope
 Drainage : Surface drainage rapid; internal drainage rapid to 3 feet, extremely slow below 3 feet. Intake rate rapid
 Moisture : Moist to 16 inches, dry below; usually moist throughout
 Stoniness : Fine gravel throughout, increasing below 16 inches; mainly feldspar and quartz that have been rounded
 Salt or Alkali : None observed.
 Erosion : Slight to none
 Sampled by : R. K. Danadill, J. B. Brown, R. H. Jordan, and L. G. Shields; August 16, 1963
 Described by : J. B. Brown

Horizon and
 Lincoln
 Lab. No.

A1
 18653 0 to 6 inches. Black (10YR 2/1 moist) light sandy loam; dark grayish brown (10YR 4/2 dry); weak fine granular structure; slightly hard when dry, very friable to loose when moist; noncalcareous; few fine water worn gravels; clear wavy boundary.

A1&A2
 18654 6 to 11 inches. Very dark gray (10YR 3/1 moist and mixed) loamy sand; this horizon is a mixture of light and dark bands 2 to 6 inches wide; the dark bands are (10YR 2/1 moist) and (10YR 4/1 dry); the light bands are (10YR 6/2 dry) and (10YR 4/2 moist); massive structure; loose when dry or moist; noncalcareous; few fine water worn gravels; clear smooth boundary.

A2
 18655 11 to 16 inches. Grayish brown (10YR 5/2 moist) loamy sand; light gray (10YR 7/2 dry); massive structure; loose when dry or moist; noncalcareous; some fine water worn gravel; abrupt smooth boundary.

B2&A2
 18656 16 to 19 inches. Light brownish gray (10YR 6/2 moist and crushed) gravelly sandy loam; light gray (10YR 7/2 dry); moderate medium to fine subangular blocky structure; very hard when dry, firm when moist; noncalcareous; thin patchy clay films on ped surfaces; this horizon consists of sandy clay loam nodules with coats of sand from the A2 horizon on the outside; colors in the pit indicate this may be a B2ir horizon; clear smooth boundary.

B2t
 18657 19 to 24 inches. Light brownish gray (10YR 6/2 moist and crushed) gravelly clay loam; dark grayish brown (10YR 4/2 dry uncrushed); weak coarse prismatic structure breaking to weak coarse angular blocks; extremely hard when dry, firm when moist; noncalcareous; thin continuous clay films on vertical faces; clear smooth boundary.

B2t
 18658 24 to 32 inches. Light brownish gray (2.5Y 6/2 moist and crushed) gravelly sandy clay loam; dark grayish brown (10YR 4/2 dry uncrushed); weak coarse prismatic structure; extremely hard when dry, firm when moist; noncalcareous; thin patchy clay films; gradual boundary.

C1
 18659 32 to 43 inches. Light gray (2.5Y 7/1 moist) gravelly sandy loam; white (2.5Y 8/1 dry); massive; extremely hard when dry, friable when moist; noncalcareous; some vertical streaks 1 to 3 feet apart show organic staining; bands up to one foot thick with colors of strong brown when dry and reddish yellow when moist are present; gradual boundary.

C2
 18660 43 to 60 inches. White (2.5Y 8/2 moist) coarse sand, white (2.5Y 8/2 dry) massive structure; extremely hard when dry, loose when moist; strong brown (7.5YR 5/8 moist) gravelly loamy sand bands continue; some organic stains in vertical cracks and a few roots.

18661 Bands from the C2 horizon, sampled separately.

Remarks: This soil occurs on slopes ranging from 1 to 25 percent in open park grassland areas and in brush covered areas of Douglas County at elevations of 6,500 to 8,000 feet. There is no evidence that these soils were timbered during the previous 100 years; written history and memories go back to about 1860. No charred pieces of trees have been found with any consistency in most of these areas. In places the A2 is not distinguishable by color; in other places the A2 may be as much as 20 inches thick.

Bureau of Public Roads Samples: B2t and C1 horizons.

Mineralogy: A1, B2t, and C2 horizons.

Observations on fine and very fine sand (Method 7B1): Feldspar predominates; compound grains increase with depth; quartz amounts to about 10 percent and accessory minerals less than 5 percent. Orthoclase is the principal feldspar; lesser amounts of microcline and low-calcium plagioclase are also present. The feldspar shows evidence of abrasion and chemical alteration; etching and pitting of the grains are common; minute inclusions within the grains are also common. Compound grains increase from a trace in the surface to 15 percent in the B2t to 25 percent in the C2 horizon. Generally, the grains are subrounded plates with smooth edges and appear mica-like. They are light brownish in color under plain polarized light and exhibit a uniform microgranular structure; the index of refraction is around 1.54. The grains are biaxial negative. The 2V angle is less than 25 degrees. Extinction is patchy to undulatory under crossed polarized light. The interference colors are first-order gray to light yellow. This material has been identified as the cementing agent in the C2 horizon. Zircon and opaques are the principal accessory minerals. Other minerals identified in trace amounts include biotite, hornblende, sphene, and epidote.

Clay mineralogy (Method 7A1, 7A2): The clay minerals are well crystallized throughout the profile. Montmorillonite increases with depth from nil in the surface to moderate to abundant amounts in the B2t and C2. Kaolinite increases from a small amount in the surface to a moderate to abundant amount in the B2t, then decreases to a small amount in the C2. Mica (or illite) decreases with depth from a small amount in the surface to a trace in the C2. The fine clay from the surface is nearly X-ray amorphous. A trace of kaolinite is present. The B2t fine clay is dominated by well-crystallized montmorillonite with a moderate amount of kaolinite present. The C2 is similar to the B2t but the absolute amounts are less. The clay mineralogy is montmorillonitic. The cementing agent from the C2 horizon was picked out by hand from a crushed sample, ground and X-rayed. A moderate amount of feldspar and a small amount of quartz are present, probably from crushed silt and sand. Poorly defined kaolinite and a trace of cristobalite are present. An interlayer mineral involving 2:1 lattice clays, not very well ordered, is present and may be the cementing agent. X-ray spacings suggest a complex, but regularly interstratified mineral. Judging by clays that disaggregate, the interstratified mineral includes montmorillonoid components.

SOIL Runa loam SOIL Nos. 863Colo-58-7 LOCATION Sedgewick County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18562-18570 March 1967

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

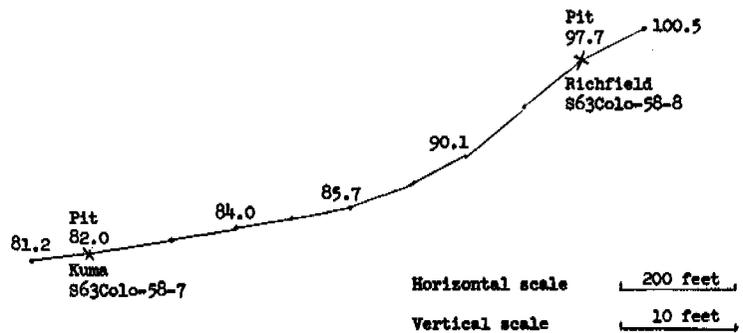
Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1													Coarse fragments 2A2			
		Total													> 2 (<u>< 19</u>) Pct.	2-19 Pct.	19-76 Pct.	
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (= 0.002)	Vary coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Silt (0.05-0.02)		Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)				
0-6	Ap	25.6	54.8	19.6	0.6	2.9	2.6	3.7	15.8	32.4	22.4	50.2	9.8					
6-11	B21t	25.0	50.7	24.3	1.0	3.3	2.7	3.7	14.3	31.3	19.4	47.6	10.7					
11-16	B22t	24.3	49.0	26.7	1.3	4.5	3.3	3.9	11.3	30.1	18.9	43.4	13.0					
16-22	B21tb	27.5	44.7	27.8	1.7	6.1	4.4	4.3	11.0	25.6	19.1	38.8	16.5					
22-29	B22tb	25.1	45.9	29.0	1.5	4.7	3.3	3.6	12.0	26.9	19.0	40.8	13.1					
29-34	B3b	21.8	50.0	28.2	1.2	3.0	2.1	2.1	13.4	30.2	19.8	44.8	8.4					
34-44	U1cab	31.4a	51.3	17.3	1.4	3.9	3.0	3.8	19.3	30.6	20.7	52.0	12.1					
44-52	U2cab	89.4	4.3	6.3	13.4	33.5	24.8	13.3	4.4	2.7	1.6	11.6	85.0					
52-84	U3cab	54.8a	8.0	37.2	10.8	12.7	9.2	12.8	9.3	4.7	3.3	20.3	45.5					
Depth (in.)	6A1a Organic carbon b	6B1a Nitrogen	C/N	Carbonate as CaCO ₃		Ext. Iron as Fe	Bulk density			4D1 COLE	Water content				Field Capacity d Fct.	pH	8C1b Sat. Paste	8C1c (1:1)
				6E1b <2mm. Pct.	3A1a <0.002 mm. Pct.		4A1a g/cc	4A1d 1/3- Bar g/cc	4A1b Air Dry g/cc		4B4 Field State Pct.	4E1c 1/3- Bar Pct.	4E2 15- Bar Pct.	4C1 1/3 to 15-Bar in./in.				
0-6	1.40	0.134	10				1.24	1.24	1.28	0.010	23.8	23.1	10.2	0.16	26.4			6.4
6-11	0.74	0.089	8				1.30	1.26	1.36	0.024	20.2	24.8	11.4	0.17	26.1			6.7
11-16	0.74	0.080	9	(s)				1.3c					12.9		24.6			7.0
16-22	0.90	0.089	10	(s)			1.45	1.33	1.47	0.036	10.2	23.7	12.8	0.14	23.2			7.1
22-29	0.98	0.094	10	(s)				1.3c					13.5		22.8			7.3
29-34	0.60	0.070	9	(s)			1.39	1.30	1.40	0.024	10.8	24.6	13.0	0.15	25.3			7.7
34-44	0.34			3	tr								10.1	0.16	26.0			8.3
44-52	0.03			tr	-		1.39	1.34	1.39	0.014	8.5	21.9	3.1					8.5
52-84	0.02			2	tr								17.2					8.0
Depth (in.)	Extractable bases 5B1a				6H1a Ext. Acidity	Org. Exam. Cap.		8A Water at Saturation Pct.	8A1a Elec. Cond. microhm/cm	8D3 Ca/Mg	Base saturation							
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K		Sum	5A3a Sum				5A1a NH ₄ OAc	5C3 Sum	5C1 NH ₄ OAc					
0-6	9.8	2.6	tr	2.5	14.9	5.7	20.6	15.7			3.8	72	95					
6-11	12.1	3.4	0.1	1.6	17.2	4.4	21.6	17.5			3.6	80	98					
11-16	13.7	4.4	0.1	1.7	19.9	3.9	23.8	19.3			3.1	84	103					
16-22	16.0	4.9	0.1	1.9	22.9	2.9	25.8	20.9			3.3	89	110					
22-29	16.8	5.5	0.1	2.3	24.7	2.2	26.9	22.3			3.1	92	111					
29-34	16.4 e	6.3f	0.2	2.7	25.6			23.1			2.6							
34-44	13.5 e	5.6f	0.5	2.6	22.2			18.8			2.4							
44-52	3.8 e	1.3f	0.2	0.6	5.9			5.1			2.9							
52-84	20.0 e	6.6f	1.5	2.7	30.8			26.0			3.0							
Depth (in.)	Ratios to Clay 8D1			Ext. Iron	15-Bar Water	Notes												
	NH ₄ OAc CEC	Ext. Iron	15-Bar Water															
0-6	0.80		0.52			a. Trace of carbonate grains (1-0.05 mm.).												
6-11	0.72		0.47			b. 11 kg/m ² to 44 inches (Method 6A).												
11-16	0.72		0.48			c. Estimated.												
16-22	0.75		0.46			d. Field capacity estimates: A spade-width ditch about 6 inches deep was dug around a 3x3 foot square and the soil banked up to the outside to form a dam. About 200 gallons of water were applied the morning of 7/10/63. On 7/12/63 a pit was dug that cut across the interior square; the horizons were delimited as they were for the above profile, and moisture samples were taken. The horizons sampled appeared to be at field capacity.												
22-29	0.77		0.47			e. NH ₄ Cl-EtOH extraction (Method 6N3a).												
29-34	0.82		0.46			f. NH ₄ Cl-EtOH extraction (Method 6O3a).												
34-44	1.09		0.58															
44-52	0.81		0.49															
52-84	0.70		0.46															

Soil Type: Kuma loam
 Soil Nos.: 863Colo-58-7
 Location: 680 feet east, 135 feet north of south quarter corner, Sec. 19, T10N, R44W, Sedgwick County, Colorado
 Climate: Continental climate, average annual precipitation of 17.5 inches, frost-free season of 147 days, mean annual temperature of 49.6 degrees F.
 Elevation: 3,800 feet
 Vegetation: Grass
 Parent Material: Loess
 Physiographic Position: Upland
 Relief: 1 percent slope
 Drainage: Well drained
 Moisture: Moist to 20 inches, nearly dry below
 Salt or Alkali: None
 Erosion: Slight
 Sampled by: R. C. Accola, J. I. Brubacher, R. B. Grossman, R. Moreland, E. M. Payne, and J. L. Walker: July 10, 1963
 Described by: J. I. Brubacher

Horizon and
 Lincoln
 Lab. No.

- Ap 18562 0 to 6 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) and very dark brown (10YR 2/2 crushed) loam; weak fine granular structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary. Weak fine platy structure in lower 2 inches.
- B21t 18563 6 to 11 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) loam; weak coarse prismatic breaking to weak medium subangular blocky structure; hard dry, friable when moist; noncalcareous; clear smooth boundary.
- B22t 18564 11 to 16 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) and very dark brown (10YR 2/2 crushed) clay loam; moderate medium prismatic breaking to moderate fine subangular blocky structure; slightly hard dry, friable when moist; noncalcareous; thin patchy clay skins; clear smooth boundary; streaks of very dark brown (10YR 2/2 moist) color; clear smooth boundary.
- B21tb 18565 16 to 22 inches. Dark gray (10YR 4/1 dry) to black (10YR 2/1 moist) clay loam; strong medium prismatic breaking to strong fine subangular blocky structure; slightly hard dry, friable when moist; noncalcareous; thin continuous clay skins; clear smooth boundary.
- B22tb 18566 22 to 29 inches. Dark gray (10YR 4/1 dry) to black (10YR 2/1 moist) clay loam; strong medium prismatic breaking to strong fine subangular blocky structure; slightly hard dry, friable when moist; noncalcareous; clear smooth boundary.
- E3b 18567 29 to 34 inches. Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 4/2 moist) loam; moderate medium prismatic breaking to moderate medium subangular blocky structure; slightly hard dry, very friable when moist; noncalcareous; 10 percent of horizon has streaks of very dark grayish brown (10YR 3/2 moist) color; clear smooth boundary.
- Clcab 18568 34 to 44 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) loam; weak medium prismatic breaking to weak medium subangular blocky structure; slightly hard dry, very friable when moist; highly calcareous; clear smooth boundary.
- IIC2cab 18569 44 to 52 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) coarse sand and gravel; single grain structure; loose dry and moist; slightly calcareous; 30 percent fine gravels; clear wavy boundary.
- IIIB2cab 18570 52 to 84 inches. Dark brown (7.5YR 4/4 dry) to brown (7.5YR 5/4 moist) sandy clay loam; weak coarse prismatic breaking to weak coarse subangular blocky structure; slightly hard dry, friable when moist; slightly calcareous with a horizontal 2-inch line streak at 66 inches; clear wavy boundary.
- IIIB3b 84 to 124 inches. Dark brown (7.5YR 4/4 dry) to brown (7.5YR 5/4 moist) sandy loam; massive; slightly hard dry, friable when moist; noncalcareous.

Landscape Profile:



Bureau of Public Roads Samples: Ap, B22tb, Clcab, IIIB2cab horizons.
 Mineralogy (Method 7B1): B22t horizon. Count on very fine sand: 35 percent quartz; 30 percent feldspar, 15 percent compound grains; 15 percent glass shards; accessories include chert, green (and some brown) hornblende, mica group (biotite), magnetite(?), pyroxene (diopside?), epidote, garnet, apatite, zircon.
 Clcab horizon: 30 percent quartz; 25 percent feldspar; 20 percent compound grains; 25 percent glass shards; accessories include as in B22t with perhaps more mica group. Orthoclase is the principal feldspar, with appreciable albite, and oligoclase-andesine. Most of the compound grains are altered feldspar; a subordinate part is highly altered glass shards.

SOIL Kuma loam SOIL Nos. S63Colo-58-10 LOCATION Sedgwick County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18571-18580 March 1967

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

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1											3A1b <0.002	3A1a Noncarbonate Clay <0.002	Coarse fragments 2A2		
		Total				Sand				Silt					> 2 (< 19)	2-19	19-76
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)					
0-5	Ap1	35.9	44.4	19.7	1.4	4.9	4.9	8.0	16.7	27.6	16.8	48.6	19.2	20	tr		
5-7	Ap2	33.4	44.0	22.6	1.2	4.8	4.5	7.0	15.9	28.8	15.2	48.4	17.5	23	tr		
7-13	B2t	24.5	46.8	28.7	0.7	2.9	2.8	5.0	13.1	27.1	19.7	42.9	11.4	19.9	tr		
13-24	B21tb	20.8	47.8	31.4	0.6	2.0	2.2	3.7	12.3	26.0	21.8	40.2	8.5	31	tr		
24-31	B22tb	21.7	50.2	28.1	0.6	2.0	1.9	3.2	14.0	28.3	21.9	44.1	7.7	9.2	tr		
31-40	B3cab	22.9	55.4	21.7	0.5	1.5	1.7	3.0	16.2	32.0	23.4	49.7	6.7	22	tr		
40-47	C1cab	36.9	46.7	16.4	1.6	4.3	4.2	6.8	20.0	28.6	18.1	52.2	16.9	16	1		
47-51	C2cab	46.7	36.9	16.4	2.1	6.8	6.9	11.4	19.5	23.1	13.8	48.5	27.2	16	5		
51-69	TTC3cab	66.7	14.1	19.2	4.4	10.6	12.6	22.4	16.7	6.7	7.4	35.3	50.0	9.4	17	6	
69-85	TTC4cab	69.8	14.3	15.9	4.3	13.5	13.9	22.3	15.8	6.5	7.8	34.0	54.0	15	4		

Depth (In.)	Organic carbon b	6A1a Nitrogen	C/N	Carbonate as CaCO3		6C2a Iron as Fe	Bulk density			4D1 COLE	Water content				pH		
				6K1b < 2mm.	3A1a <0.002		4A1a Field State	4A1d 1/3- Bar	4A1b Air Dry		4B4 Field State	4B1c 1/3- Bar	4B2 15- Bar	4C1 1/3-to 15-Bar	8C1b Sat. Paste	8C1a (1:1)	
				Pct.	Pct.		Pct.	g/cc	g/cc		g/cc	Pct.	Pct.	Pct.	in./in.		
0-5	1.20	0.115	10			0.5	1.12c	1.0d									
5-7	0.93	0.105	9			0.5	1.40	1.36	1.47	0.028	17.4	21.1	10.2	0.15			6.1
7-13	0.66	0.092	8			0.5	1.34	1.28	1.42	0.036	16.2	22.4	12.7	0.12			6.4
13-24	1.14	0.108	11			0.5	1.33	1.26	1.38	0.032	15.1	24.3	14.6	0.12			6.9
24-31	0.83	0.086	10			0.5	1.34	1.3d	1.36				13.6				7.3
31-40	0.53					0.4	1.34	1.32	1.36	0.010	13.6	21.6	12.3	0.12			7.8
40-47	0.32					0.4	1.34	1.33	1.36	0.007	11.9	18.8	9.6	0.12	7.6		8.1
47-51	0.28					0.3	1.34	1.34					8.6				8.2
51-69	0.04					0.2	1.55	1.52	1.56	0.010	12.1	14.3	9.3	0.08			8.2
69-85	0.04					0.2							7.5				8.4

Depth (In.)	Extractable bases				5B1a Sum	6A1a Ext. Acidity	Org. Subst. Cap.		8A Water at Saturation Pct.	8A1a Elec. Cond.	8D3 Ca/Mg	Base saturation	
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K			5A3a Sum	5A1a NH4OAc				5C3 Sum	5C1 NH4OAc
	meq/100 g											Pct.	meq/cm
0-5	9.9	2.5	tr	1.9	14.3	5.0	19.3	15.1			4.0	74	95
5-7	11.5	3.1	tr	1.9	16.5	3.9	20.4	16.3			3.7	81	101
7-13	15.2	4.4	0.1	1.8	21.5	3.0	24.5	21.0			3.5	88	102
13-24	20.0	5.9	0.1	2.3	28.3	2.2	30.5	25.9			3.4	93	109
24-31	18.4 e	6.7f	0.1	2.7	27.9			26.2			2.7		
31-40	15.7 e	6.3f	0.3	2.8	25.1			21.9			2.5		
40-47	12.4 e	5.0f	0.4	2.4	20.2			17.7			2.5		
47-51	11.3 e	4.4f	0.5	2.1	18.3			15.4			2.6		
51-69	9.1 e	3.6f	0.7	1.6	15.0			13.3			2.5		
69-85	7.8 e	2.9f	0.7	1.3	12.7			11.1			2.7		

Depth (In.)	Ratios to Clay		
	8D2 NH4OAc CEC	8D2 Ext. Iron	8D1 15-Bar Water
0-5	0.76	0.03	0.48
5-7	0.71	0.02	0.45
7-13	0.72	0.02	0.44
13-24	0.84	0.02	0.46
24-31	0.94	0.02	0.48
31-40	1.00	0.02	0.57
40-47	1.11	0.03	0.59
47-51	0.96	0.02	0.52
51-69	0.78	0.01	0.48
69-85	0.74	0.01	0.47

- a. Few carbonate grains below 31 inches.
- b. 12 kg/m² to 60 inches (Method 6A).
- c. One clod.
- d. Estimated.
- e. NH₄Cl-EtOH extraction (Method 6N3a).
- f. NH₄Cl-EtOH extraction (Method 6O3a).

Soil Type: Kuma loam
 Soil Nos.: 863Colo-58-10
 Location: 1,320 feet west, 792 feet north of southeast corner, Sec. 11, T10N, R45W, Sedgwick County, Colorado
 Climate: Continental climate, average annual precipitation of 17.5 inches, frost-free season of 147 days, mean annual temperature of 49.6 degrees F.

Elevation: 3,800 feet
 Vegetation: Cultivated
 Parent Material: Loess
 Physiographic Position: Upland
 Relief: 2 percent slope
 Drainage: Well drained
 Moisture: Moist to 20 inches, dry below
 Salt or Alkali: None
 Erosion: Slight

Sampled by: R. C. Acoola, J. I. Brubacher, R. B. Grossman, R. Moreland, E. M. Payne, and J. L. Walker: July 11, 1963
 Described by: J. I. Brubacher

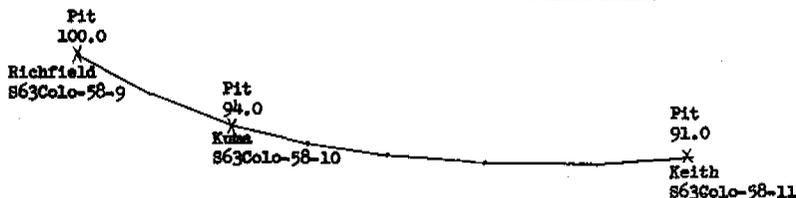
Horizon and
 Lincoln
 Lab. No.

Apl 18571	0 to 5 inches. Grayish brown (10YR 5/2 dry) to very dark brown (10YR 2/2 moist) loam; weak fine granular structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
Ap2 18572	5 to 7 inches. Dark grayish brown (10YR 4/2 dry) to very dark brown (10YR 2/2 moist) loam; weak coarse platy structure; hard dry, friable when moist; noncalcareous; clear smooth boundary.
B2t 18573	7 to 13 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) clay loam; moderate medium prismatic breaking to moderate medium subangular blocky structure; slightly hard dry, friable when moist; noncalcareous; very thin patchy clay skins; clear smooth boundary.
B2ltb 18574	13 to 24 inches. Dark gray (10YR 4/1 dry) to black (10YR 2/1 moist) silty clay loam; moderate medium prismatic breaking to moderate, medium subangular blocky structure; slightly hard dry, very friable when moist; noncalcareous; thin continuous clay skins; clear smooth boundary.
B22tb 18575	24 to 31 inches. Dark gray (10YR 4/1 dry) to black (10YR 2/1 moist) loam; moderate medium prismatic breaking to weak moderate medium subangular blocky structure; slightly hard dry, very friable when moist; noncalcareous; streaks of dark grayish brown (10YR 4/2 moist) colors in 10 percent of horizon; clear smooth boundary.
B3cab 18576	31 to 40 inches. Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 4/2 moist) loam; weak moderate medium prismatic breaking to weak, moderate medium subangular blocky structure; slightly hard dry, very friable when moist; highly calcareous; clear smooth boundary.
C1cab 18577	40 to 47 inches. Pale brown (10YR 6/3 dry) to dark grayish brown (10YR 4/2 moist) loam; massive; slightly hard dry, very friable when moist; highly calcareous; clear smooth boundary.
C2cab 18578	47 to 51 inches. Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 4/2 moist) loam; massive; slightly hard dry, very friable when moist; highly calcareous; streaks of very dark grayish brown (10YR 3/2 moist) colors; clear wavy boundary.
IIC3cab 18579	51 to 69 inches. Pink (7.5YR 7/4 dry) to brown (7.5YR 5/4 moist) coarse sandy clay loam; massive; slightly hard dry, friable when moist; highly calcareous; 7 percent gravel in horizon; clear wavy boundary.
IIC4cab 18580	69 to 85 inches. Pink (7.5YR 7/4 dry) to brown (7.5YR 5/4 moist) sandy clay loam; massive; slightly hard dry, friable when moist; highly calcareous.

Landscape Profile:

Horizontal Scale: 200 feet

Vertical Scale: 10 feet



Bureau of Public Roads Samples: Apl, B2t, B2ltb, and C1cab horizons.

Mineralogy (Methods 7A1, 7A2): B2t, B22tb, and IIC3cab horizons. The profile contains small to moderate amounts of well-crystallized kaolinite and mica. The amount and crystalline quality drop in the lower lithic zone. Montmorillonite increases from a small amount (poorly organized) in the B2t to an abundant amount (well crystallized) in the B22tb. A moderate amount is present in the lower lithic zone.

SOIL TYPE Laporte LOCATION Chaffee County, Colorado
sandy loam

SOIL NOS. 958 Colo-8-9 LAB. NOS. 9082-9085

DEPTH 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			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	> 2	
0-3	A11	7.8a	7.4a	7.2a	12.2a	12.1a	33.5	19.8	34.6	18.4	31	1
3-7	A12	7.5a	6.5a	5.9a	10.7a	11.6a	36.1	21.7	33.7	20.6	28	1
7-12	AC	4.9a	5.4a	5.2a	10.8a	13.8a	36.0	23.9	37.2	19.5	27	1
12-21	Cca	5.6b	6.2b	5.3b	12.7b	17.9b	31.6	20.7	42.3	15.4	35	1
pH		ORGANIC MATTER				Free Iron	6E1a		MOISTURE TENSIONS			
8C1a	1:5	1:10	6A1a ORGANIC CARBON	6B1a NITRO-GEN	C/N	%Fe ₂ O ₃	CaCO ₃ equiv- alent		1/10 ATMOS.	1/3 ATMOS.	4E2 15 ATMOS.	
1:1			%	%		6C1a	%		%	%	%	
7.9			3.32	0.207	15	0.8	26					11.7
7.9			3.50	0.213	16	0.8	20					13.6
7.9			3.72	0.222	17	0.7	33					18.4
7.9			4.34	0.218	20	0.5	47					22.3
5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS				5E1a	BASE SAT. % NH ₄ Ac EXCH.	Base Sat. % on Sum Cations	Sum Bases	Sum Ca/Mg Cations			
	Ca	6O2b Mg	6H1a H	6P2a No	6Q2a K	milliequivalents per 100g. soil						
20.6		3.7	<0.1	<0.1	1.0							
23.8		5.5	<0.1	<0.1	0.6							
22.8		7.4	<0.1	<0.1	0.4							
22.6		9.7	<0.1	<0.1	0.2							
a.	Few irregular light brown to black concr. (Fe-Mn?)								Also, few CaCO ₃ concr.			
b.	Common CaCO ₃ concr.											

Soil Type: Laporte sandy loam. Described by: A. J. Cline
 Location: SW¹ of Sec. 33, T13S, R77W, Chaffee County, Colorado.
 Date of Sampling: September 1957
 Collectors: J. Retzer, E. M. Payne, R. Dansdill, A. J. Cline
 Physiographic Position: Mountain slope at an elevation of approximately 9,000 feet.
 Topography: Steep convex slope of approximately 30 percent facing south.
 Drainage: Well drained.
 Vegetation: Mountain fescue, ring muhly, pine, and spruce with a scattered tree cover. Use: National Forest Service land.
 Soil Nos.: S58Colo-8-9

Lincoln Horizon

Lab. No.

9082	A ₁₁	0-3 inches	Gray or grayish brown (10YR 5/1.5 dry) to very dark grayish brown (10YR 3/2 moist) gravelly sandy loam; soft when dry, very friable when moist; moderate fine granular structure; violently effervescent; approximately 25 percent of this horizon is limestone gravel fragments; lower boundary clear and smooth.
9083	A ₁₂	3-7 inches	Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) gravelly sandy loam; soft when dry, very friable when moist; weak fine subangular blocky structure breaking to moderate fine crumb; violently effervescent; approximately 25 percent of this horizon is limestone gravel and rock fragments; lower boundary gradual and smooth.
9084	AC	7-12 inches	Gray (10YR 5.5/1 dry) to very dark grayish brown (10YR 3/2 moist) gravelly heavy sandy loam or gravelly light loam; soft when dry, very friable when moist; weak fine subangular blocky structure breaking to moderate fine crumbs; this is a weak horizon of lime accumulation with some visible lime occurring as concretions; approximately 50 percent of the horizon is limestone gravel and rock fragments; lower boundary gradual and smooth.
9085	C ca	12-21 inches	Light gray (10YR 6/1 dry) to dark grayish brown (10YR 4.5/2 moist) stony sandy loam; soft when dry, very friable when moist; massive; violently effervescent; this is a strong horizon of lime accumulation with visible lime in divided forms; approximately 50 percent of the horizon is limestone rock fragments; lower boundary gravel and smooth.
	D	21 - inches	Fractured and weakly weathered Pennsylvanian limestone bedrock. This horizon was not sampled.

SOIL SURVEY LABORATORY Lincoln, Nebr. 3/17/58

SOIL TYPE Lepl sandy loam LOCATION Grand County, Colorado

SOIL NOS. S55Colo-25-3 LAB. NOS. 2877-2880

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)									TEXTURAL CLASS	
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	3A1			
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.001	2A2 > 2 (19mm.)	
2-0	Ao											
0-2	A2	9.7	6.6	5.0	10.3	11.3	46.8	10.3	39.8	24.3	10	1
2-10	B2ir	11.1	10.0	6.2	11.6	11.8	40.1	9.2	35.4	23.3	13	1
10-23+	C	13.0	12.9	8.8	15.8	13.3	30.6	5.6	36.9	16.1	18	cosl
		pH		ORGANIC MATTER			6C1a Free Iron Fe ₂ O ₃ %	MOISTURE TENSIONS			4B2 15 ATMOS. %	
	8C1a	1:5	1:10	6A1a ORGANIC CARBON %	6B1a NITRO- GEN %	C/N		1:10 ATMOS. %	1/3 ATMOS. %			
4.1				3.42	.110	31	1.2					
5.0				0.65	.030	23	1.6				5.8	
5.3				0.22	.008		1.0				3.4	
	5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					5B1a BASE SAT. % NH ₄ Ac EXCH. 5C1	Base Sat. % on Sum Cations 5C3	5B1a Sum Bases me/100g	5A3a Sum Cations me/100g	8D3 Ca/Mg	
		6M2b Ca	6O2b Mg	6H1a H	6P2a No	6Q2a K						
		milliequivalents per 100g. soil										
19.6		3.4	1.0	14.0	0.2	0.6	26	27	5.2	19.2	3.4	
11.9		2.5	1.1	8.7	0.1	0.2	33	31	3.9	12.6	2.3	
6.0		2.2	0.6	3.7	-	0.1	48	44	2.9	6.6		

Soil Type: Leal sandy loam

Soil Nos.: S55Colo-25-3

Location: Approximately the SE 1/4 of the SE 1/4, Sec. 4, T2S, R76W, Grand County, Colorado.

Physiographic Position: Lateral moraine along St. Louis Creek.

Topography: Convex slopes of approximately 10 percent facing east.

Drainage: Well drained.

Vegetation: Lodgepole pine with a moderate ground cover of brush and sedges.

Collected by: James Allen, A. R. Aandahl, John Retzer, E. M. Payne, H. Bindschadler, and A. J. Cline, October 9, 1955.

Horizon and
Lincoln
Lab. No.

Aoo 3 to 2 inches. Undecomposed needle mat.

Ao 2 to 0 inch. Very dark gray (10YR 3/1 dry) to black (10YR 2/1 moist) partially decayed organic material; rests abruptly on the horizon below.
2877

A2 0 to 2 inches. Light gray (10YR 7/2 dry) to grayish brown (10YR 5/2 moist) light loam; soft when dry, very friable when moist; very weak very coarse platy structure breaking to weak fine crumbs; strongly acid; lower boundary abrupt and wavy.
2878

B2ir 2 to 10 inches. Light yellowish brown to brownish yellow (10YR 6/5 dry) to yellowish brown (10YR 5/5 moist) gravelly loam; slightly hard when dry, friable when moist; weak to moderate fine subangular blocky structure breaking to weak to moderate very fine subangular blocks; moderately acid; lower boundary gradual and wavy.
2879

C 10 to 23 inches plus. Light gray to pale yellow (2.5Y 7/3 dry) to grayish brown or light olive brown (2.5Y 5/3 moist) gravelly sandy loam; slightly hard when dry, friable when moist; massive; slightly acid to neutral.
2880

SOIL SURVEY LABORATORY

Lincoln, Nebr.

3/17/58

SOIL TYPE leal

LOCATION Grand County, Colorado

sandy loam

SOIL NOS. S55Colo-25-4

LAB. NOS. 2881-2885

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)									TEXTURAL CLASS	
		1B1a					3A1					2A2
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002 (<u>< 19 μm.</u>)		> 2
2-0	Ao	18.0	10.7	6.8	11.5	10.0	34.7	8.3	33.9	17.2	16	cosl
0-2 1/2	A2	17.7	13.0	7.3	11.4	10.2	30.9	9.5	31.5	16.0	18	cosl
2 1/2-11	B21r	24.7	15.5	7.8	11.5	10.0	23.9	6.6	28.4	11.9	25	cosl
11-16	B3	21.6	16.6	9.4	13.7	10.9	23.2	4.6	30.2	11.5	16	cosl
16-34+	C											
pH		ORGANIC MATTER					Fe ₂ O ₃		MOISTURE TENSIONS			
8C1a	1:5	1:10	6A1a ORGANIC CARBON %	6B1a NITRO-GEN %	C/N	Iron Fe ₂ O ₃ %		4B1a 1/10 ATMOS. %	4B1a 1/3 ATMOS. %	4B2 15 ATMOS. %		
4.4			2.52	.076	33	1.0						
5.1			0.66	.031	21	1.2					5.7	
5.3			0.17	.012		0.8		15.6	10.5		3.9	
5.4			0.09	.009		0.7		14.3	9.2		3.0	
5A1a	EXTRACTABLE CATIONS					5B1a	BASE SAT. %	Base Sat. %	5B1a Sum Bases	5A3a Sum Cations	Ca/Mg	
CATION EXCHANGE CAPACITY NE _{1/2} Ac	6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K	5C1 NH ₄ Ac EXCH.	on Sum Cations	me/100g	me/100g			
	milliequivalents per 100g. soil											
12.7	2.6	0.8	10.8	0.1	0.6	32	28	4.1	14.9			
10.9	2.7	0.8	8.8	0.1	0.3	36	31	3.9	12.7			
7.3	2.5	0.6	4.4	0.1	0.2	46	44	3.4	7.8			
5.7	2.2	0.6	3.1	0.1	0.1	53	49	3.0	6.1			

Soil Type: *Leal sandy loam*

Soil Nos.: 855Colo-25-4

Location: Near the center of Sec. 9, T28, R76W, Grand County, Colorado.

Physiographic Position: Upland, small terminal moraine.

Topography: Moderately sloping convex area of about 4 percent gradient, facing east.

Drainage: Well drained.

Vegetation: Principally lodgepole pine.

Use: Forested land.

Collected by: J. Allen, H. Bindschadler, E. M. Payne, J. Retzer, A. J. Cline, August 1955.

Horizon and
Lincoln
Lab. No.

Aoo	2½ to 2 inches. A massive undecomposed mat of pine needles and other organic debris.
Ao 2881	2 to 0 inch. Very dark gray (10YR 3/1 dry) to black (10YR 2/1 moist) massive partly decomposed organic material; very strongly acid. The horizon rests abruptly on the horizon below.
A2 2882	0 to 2½ inches. Light gray (10YR 7/2 dry) to grayish brown (10YR 5/2 moist) sandy loam; soft when dry, very friable when moist; weak very coarse platy structure breaking to weak to moderate fine crumbs; strongly acid; lower boundary clear and wavy.
B21r 2883	2½ to 11 inches. Light yellowish brown (10YR 6/4 dry) to dark yellowish brown (10YR 4/4 moist) gravelly sandy loam; soft when dry, very friable when moist; weak to moderate fine subangular blocky structure; strongly acid; lower boundary gradual and smooth.
B3 2884	11 to 16 inches. Light yellowish brown (2.5Y 6/4 dry) to olive brown (2.5Y 4/4 moist) gravelly sandy loam; soft when dry, very friable when moist; very weak medium subangular blocky structure; slightly acid; the horizon contains common numbers of medium-sized distinct 10YR 5/4 mottles; lower boundary gradual and smooth.
C 2885	16 to 23 inches. Pale yellow (2.5Y 7/3 dry) to light olive brown (2.5Y 5/3 moist) gravelly coarse sandy loam; soft when dry, very friable when moist; massive; approximately neutral.

SOIL Title silt loam SOIL Nos. 96101a-2-1 LOCATION Archstone County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 16485-16491 February 1965

Depth (in.)	Horizon	1B1a Size class and particle diameter (mm) 2A1																
		Total			Sand					Silt			Clay		Coarse fragments 2A2			
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	Carbonate	Noncarbonate	> 2	2 - 19	19 - 76
Pct. of < 2 mm																		
0-3	A1	14.3	57.5	28.2	0.1a	0.4a	0.2	1.2	12.4	28.7	18.9	51.8	1.9	-	28	Tr.		
3-6	B1	9.5	48.5	42.0	-	0.2a	0.2	0.9	8.2	23.1	25.4	31.9	1.3	-	42	Tr.		
6-13	B2	4.5	52.2	43.3	-	0.1a	0.1	0.4	2.0	18.7	32.5	22.9	0.6	1	42	Tr.		
13-23	B3cs	3.8	53.4	42.8	0.1b	0.7b	0.5b	1.0b	1.5b	13.4	40.0	15.4	2.3	Tr.	43	Tr.		
23-31	B1	5.3	54.8	39.9	0.2b	1.1b	1.1b	1.6b	1.3b	14.5	40.3	16.5	4.0	-	40	Tr.		
31-43	B2	0.9	57.8	41.3	0.1b	0.1b	0.1b	0.2c	0.4c	14.3	43.5	14.8	0.5	-	41	Tr.		
43-55	B3	1.4	58.7	39.9	0.3b	0.3b	0.1b	0.2c	0.5c	17.2	41.5	17.8	0.0	-	40	Tr.		
Depth (in.)	6A1a Organic carbon	6B1a Nitrogen	C/N	6E1c Carbonate as CaCO ₃	6C1a Iron as Fe	Bulk density			4M COLE d	Water content			8D1 15-Bar Water to Clay Ratio	DH				
						6A1c 30-Cm.	6A1b Air-Dry	g/cc		4B2 15-Bar	4E1b 15-Bar	4E2 15-Bar		8C1b 15-Bar	8C1a 1:10	8C1a (1:1)		
						Pct.	Pct.	Pct.		Pct.	Pct.	Pct.		Pct.	Pct.			
0-3	1.78	0.148	12	Tr.	1.0				22.8	11.5		0.41	7.2	7.5	7.3			
3-6	1.06	0.107	10	4	1.1				25.1	14.8		0.35	7.8	8.3	7.9			
6-13	0.64	0.072	9	9	1.0			1.42	1.66	0.34	25.0	24.9	14.6	1.0	0.34	8.0	8.5	8.1
13-23	0.32	0.043	7	8	1.0				1.68			24.4	14.8		0.34	7.9	8.0	7.8
23-31	0.17	0.034		5	1.2							33.1	18.5		0.46	8.0	8.0	7.8
31-43	0.13			6	1.1			1.54	1.82	0.64	27.0	33.9	18.8	2.8	0.46	7.9	8.0	7.8
43-55	0.13			5	1.1							33.1	17.6		0.44	7.9	8.0	7.8
Depth (in.)	Extractable bases 5B1a				Cat. Exch. Cap.		Water extract from saturated paste 8A1											
	Ca	Mg	Na	K	5A1a NH ₄ OAc	5A2a NaOAc	6M1a Co	6O1a Mg	6M1a Na	6O1a K	6M1a CO ₃	6O1a HCO ₃	6M1a Cl	6O1a SO ₄	8A1a Electrical conductivity			
	meq/100 g				meq/100 g		meq/liter										mmho/cm	
0-3			Tr.	1.3	20.9	21.8				0.3	0.4				0.65			
3-6			0.1	1.1	24.2	25.8				0.5	0.2				0.58			
6-13			0.5	0.6	22.4	24.8				1.4	0.2				0.52			
13-23			3.5	0.5	21.8	22.5	23.0	43.2	29.5	0.5			8.4	-	97.7			
23-31			12.2	0.4	21.6	22.3	21.6	162	127	0.6			6.8	1.0	312			
31-43			13.6	0.5	21.4	22.7	21.3	152	127	0.7			4.3	1.5	311			
43-55			13.4	0.5	21.6	22.2	21.5	146	126	0.7			6.1	1.7	302			
Depth (in.)	8A Water at Saturation	5D1 Exchangeable Na NaOAc	5E Sodium Adsorption Ratio	6F1a Gypsum	8D1 NH ₄ OAc CEC to Clay Ratio													
	Pct.	Pct.	Ratio	Pct.	Ratio													
0-3	59.7			-	0.74													
3-6	73.8			-	0.58													
6-13	73.6	2		-	0.52													
13-23	65.0	7	5	4.6	0.51													
23-31	72.0	13	13	4.7	0.54													
31-43	76.7	17	14	1.4	0.52													
43-55	78.5	16	14	1.2	0.54													

- a. > 50% organic matter.
- b. > 50% gypsum. < 5% carbonate.
- c. 5-25% gypsum. < 5% carbonate.
- d. Coefficient of linear extensibility.

Soil Type: Little silt loam

Soil Nos.: S61Colo-3-1

Classification: Brown.

Location: 220 feet north, 2,820 feet east of the southwest corner of Sec. 23, T5S, R57W, Arapahoe County, Colorado.

Climate: Continental, average annual precipitation 13 inches. Mean annual temperature 49° F.

Frost-free period 150 days. Elevation 5,000 feet.

Vegetation: Native pasture. Blue grama, western wheatgrass, buffalograss, sixweeks fescue, snakeweed, pricklypear.

Parent material: Partially consolidated silty shale - Pierre formation.

Physiographic position: Upland. Relief: Gently sloping, smooth 5 percent west-facing slope.

Drainage: Very slow internal in D horizon. Moderate internal in solum. Intake rate is moderate.

Moisture: Moist throughout, but usually dry.

Water table: None. Stoniness: None.

Salt or alkali: Gyp horizon typical below 12 inches. Calcareous at 0 to 6 inches, less with depth.

Erosion: Slight water erosion. Catsteps or slips occur on slopes over 8 percent.

Described by: J. B. Brown, June 26, 1961.

Horizon and

Lincoln

Lab. No.

- A1
15485 0 to 3 inches. Dark grayish brown (2.5Y 4/2, moist) silt loam; grayish brown (2.5Y 5.5/2, dry) weak medium subangular blocks breaking to moderate very fine granules; soft when dry, very friable when moist; surface 1 inch has fine platy structure; clear smooth boundary.
- B1
15486 3 to 6 inches. Dark grayish brown (2.5Y 4/2, moist) silty clay loam; grayish brown (2.5Y 5.5/2, dry) olive brown (2.5Y 4/3, moist and crushed) weak fine prismatic breaking to moderate fine angular blocks; slightly hard when dry, friable when moist; many roots and pore spaces; thin clay skins on some vertical faces, and some root channels; strong effervescence; clear slightly wavy boundary.
- B2
15487 6 to 13 inches. Olive brown (2.5Y 4.5/3, moist) light silty clay; light yellowish brown (2.5Y 6/4, dry) moderate medium prisms breaking to moderate medium angular blocks; hard when dry, firm when moist; many roots penetrating peds; thin patchy clay skins on all ped surfaces; strong effervescence; clear slightly wavy boundary.
- B3cs
15488 13 to 23 inches. Olive 5Y 5/3, moist) silty clay; pale olive (5Y 6.5/3, dry) weak medium prisms breaking to weak medium subangular blocks; hard when dry, firm when moist; fewer roots and channels than horizons above, but still in evidence; thin patchy clay films along some channels; gyp concretions are common medium and faint; strong effervescence; gradual boundary.
- B1
15489 23 to 31 inches. Light olive brown (2.5Y 5/3, moist) silty clay; light yellowish brown (2.5Y 6/3, dry) very weak coarse prismatic structure; hard when dry, firm when moist; few roots and channels in this horizon; slightly effervescent in spots; gradual boundary.
- B2
15490 31 to 43 inches. Light olive brown (2.5Y 5/3, moist) silty clay; light yellowish brown (2.5Y 6/3, dry) moderate very coarse plates or massive structure; very hard when dry, firm when moist; a few fine roots may be found; fine iron stains running horizontally in the shale; arbitrary boundary.
- B3
15491 43 to 55 inches. Light olive brown (2.5Y 5/3, moist) silty clay; light yellowish brown (2.5Y 6/3, dry) moderate very coarse platy or massive structure; very hard when dry, firm when moist.

Remarks: This soil has been mapped as both Winifred and Pierre in the past. Less than 5 percent cultivated in this county. Some slick spots approximately 100 feet in diameter, are commonly associated with this soil. pH may be 9.0 or more in the top 3 inches of the slick spots, with no B1 horizon present.

Bureau of Public Roads Samples: A1, 0-3 inches; B2, 6-13 inches; B2, 31-43 inches.

Observations of fabric with stereoscopic microscope: The B1 and B2 horizons appear to have no clay films on planar surfaces and probably none around circular pores or channels. No clay films observed in the B3cs.

Micromorphology (Method 4E1): Examined thin sections of the B2. A very few small clay films; no really clear-cut clay films along planar surfaces; a number of pressure faces occur. Cannot conclude clay films are absent, but they are extremely scarce and small. Clay films should be better expressed to designate an argillic B.

Sand Mineralogy (Method 7E1): The A1, B1, and B2 of this profile were examined. The A1 and B1 contain a trace of hornblende. No hornblende was observed in the B2.

Soil Type: **Little silt loam**

Soil Nos.: **851Colo-3-2**

Classification: **Brown.**

Location: **2,900 feet east, 90 feet south of the northwest corner of Sec. 31, T58, R57W, Arapahoe County, Colorado.**

Climate: **Continental, average annual precipitation 13 inches. Average annual temperature 49° F.**

Frost-free period 150 days. Elevation 5,000 feet.

Vegetation: **Native pasture. Blue grama, western wheatgrass, alkali sacaton, buffalograss, sixweeks fescue, cheat, pricklypear.**

Parent material: **Partially consolidated silty shale. Pierre formation.**

Physiographic position: **Upland.**

Relief: **Gently sloping, smooth 5 percent slope facing west.**

Drainage: **External, excessive; internal, very slow in D horizon, well-drained in solum. Intake rate is moderate.**

Moisture: **Moist throughout when sampled, usually dry.**

Water table: **None. Stoniness: None.**

Salt or alkali: **Gyp horizon typical below 12 inches. Calcareous at 0 to 6 inches, less with depth.**

Erosion: **Slight water. Catsteps or slips occur on slopes over 8 percent.**

Described by: **J. B. Brown, June 26, 1961.**

Horizon and

Lincoln

Lab. No.

- A1**
15492 0 to 3 inches. Dark grayish brown (2.5Y 4/2, moist) silty loam; grayish brown (2.5Y 5/2, dry) weak medium subangular blocky breaking to moderate fine granules; soft when dry, very friable when moist; top one inch is moderate fine granular, or platy structure, and was sampled separately at this location; clear smooth boundary.
- E1**
15493 3 to 6 inches. Dark grayish brown (2.5Y 4.5/2, moist) silty clay loam; grayish brown (2.5Y 5/2, dry) olive brown (2.5Y 4/3, moist and crushed) weak fine prisms breaking to moderate fine angular blocks; slightly hard when dry, firm when moist; many roots and channels, with thin patchy clay film on some faces and along some channels; strong effervescence; clear smooth boundary.
- E2**
15494 6 to 13 inches. Light olive brown (2.5Y 5/3, moist) silty clay; light yellowish brown (2.5Y 6/3, dry) moderate medium prismatic breaking to moderate fine angular blocks; hard when dry, firm when moist; many roots penetrating peds; thin patchy clay films on ped surfaces; strong effervescence; clear smooth boundary.
- E3cs**
15495 13 to 20 inches. Olive 5Y 5.5/3, moist) silty clay; pale yellow (5Y 7/3, dry) weak medium prisms breaking to weak medium subangular blocks; hard when dry, firm when moist; some roots with patchy clay film in some root channels and on some ped faces; gyp concretions are common medium and faint; strong effervescence; gradual smooth boundary.
- E1**
15496 20 to 30 inches. Olive (5Y 5/3, moist) silty clay; pale yellow (5Y 7/3, dry) light olive brown (2.5Y 5/3, moist and crushed) very weak coarse prismatic or massive structure; hard when dry, firm when moist; few roots and channels; fine horizontal iron stains, giving a change in color when the soil is moist and crushed; in this horizon and below, pockets of clear gyp crystals one inch or more square are present, with an average of two per square foot of surface; slightly effervescent in spots; gradual smooth boundary.
- E2**
15497 30 to 42 inches. Olive (5Y 5/3, moist) silty clay; light olive gray (5Y 6/2, dry) moderate very coarse plates or massive; very hard when dry, firm when moist; fine iron stains common on surface of plates; noncalcareous; arbitrary boundary.
- E3**
15498 42 to 54 inches. Olive (5Y 5/3, moist) silty clay; light olive gray (5Y 6/2, dry) moderate very coarse platy or massive; very hard when dry, firm when moist; iron stains on the surface of plates.

Remarks: This soil has been mapped as Winifred and Pierre. The vegetation at this site is somewhat different in that 30 percent or more is alkali sacaton. The only visible difference in the soil itself, is the increase in the amount of gypsum in the parent shale. A larger percentage of slick spots are associated with this soil than with Little silt loam, 851Colo-3-1.

Bureau of Public Roads Samples: **A1, 0-3 inches; E2, 6-13 inches; Dr2, 30-42 inches.**

Observations of fabric with stereoscopic microscope: The E1 has a few weak lips of clay along longitudinal pore axes. May have a few thin clay films. The E2 has a few possible thin clay films as lips around pores; no clay films on planar surfaces. The E3cs may have a few patches of reddish-brown mottled clay.

Micromorphology (Method 4E1): Examined thin sections of the E2. A very few small clay films; no really clear-cut clay films along planar surfaces; a number of pressure faces occur. Cannot conclude clay films are absent, but they are extremely scarce and small. Clay films should be better expressed to designate an argillic B.

Sand Mineralogy (Method 7E1): The A1, E1, and Dr2 were examined. The A1 and E1 contain a trace of hornblende. No hornblende was observed in the Dr2.

SOIL TYPE *Lucky LOCATION Gunnison County, Colorado
 gravelly sandy loam

SOIL NOS. S59Colo-26-2 LAB. NOS. 11994-11997

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 (<u>19mm</u>)	TEXTURAL CLASS		
0-6	A11	23.0	19.1	6.6	8.7	6.0	28.6	8.0	26.0	12.8	27	cosl
6-13	A12	30.4	19.8	6.3	7.3	4.7	24.3	7.2	20.0	12.3	32	cosl
13-20	B2t	23.6	16.4	6.0	8.2	6.0	27.5	12.3	24.6	12.9	41	cosl
20-37	B3	21.2	18.1	6.6	9.4	6.9	27.4	10.4	25.7	13.2	39	cosl
pH		ORGANIC MATTER			6C1a Free Iron Fe ₂ O ₃ %	6E1c CaCO ₃ equiv- alent %		MOISTURE TENSIONS				
8C1a	1:5	1:10	6A1a ORGANIC CARBON %	6B1a NITRO- GEN %	C/N			1/10 ATMOS. %	1/3 ATMOS. %	15 ATMOS. %	4B2	
6.9			1.62	0.120	14	1.5		< 0.1				4.6
7.0			0.70	0.058	12	1.6		< 0.1				4.2
7.1			0.35	0.032	11	1.6		< 0.1				6.2
7.4			0.20	0.018		1.8		< 0.1				6.1
5A1a CATION EXCHANGE CAPACITY NH ₄ OAc	EXTRACTABLE CATIONS 5B1a					BASE SAT. NH ₄ OAc EXCH.	Base Sat. % on Sum Cations	Sum Ext. Bases	Sum Ext. Cat- ions	Ca/Mg	O. D. Bulk Density g/cc	
6N2b Co	6O2b Mo	6H1a H	6P2a No	6Q2a K	5C1	5C3	5B1a	5A3a	8D3			
← milliequivalents per 100g. soil →												
10.3	8.6	1.2	2.4	< 0.1	0.6	101	81	10.4	12.8	7.2		
8.7	7.0	1.6	1.4	< 0.1	0.4	103	86	9.0	10.4	4.4		
11.3	9.1	2.4	2.1	< 0.1	0.4	105	85	11.9	14.0	3.8		
11.9		2.6	1.7	0.1	0.2							

Soil Type: *Lucky gravelly sandy loam

Date: September 1959, by J. Nishimura, D. Boyer, E. Kleven, W. Goddard,
E. M. Payne, J. S. Allen, L. Juve, C. J. Fox

Parent Material: Residual and partly colluvial from gneiss and schist.

Physiographic Position: Smooth rounded hilly to low mountainous upland slope
at an elevation of 9150 feet.

Topography: Steep, uniform slope of 25 percent with westerly exposure.

Drainage: Well-drained

Location: NE $\frac{1}{4}$ of Sec. 10, T. 48N., R. 1 E. photo 3020, Gunnison County, Colorado.

Vegetation: Dominantly big sagebrush (*Artemisia tridentata*), bitterbrush
(*Purshia tridentata*), very sparse grasses. About 60 percent vegetative
ground cover.

Use: Rangeland

Soil Nos.: S-59-Colo-26-2

Described by: Charles F. Fox.

Lincoln Horizon

Lab. No.

- | | | | |
|-------|-----------------|-----------------|--|
| 11994 | A ₁₁ | 0-6
inches | Rocks and angular gravel occupy about 5 percent of surface. Dark yellowish brown (10YR 3/4 dry) to (10YR 2/4 moist) gravelly sandy loam; weak very fine granular structure; soft when dry, very friable when moist, nonplastic when wet; approximate pH 6.5; approximately 15 percent of this horizon is angular gravel; roots plentiful; lower boundary clear and smooth. |
| 11995 | A ₁₂ | 6-13
inches | Yellowish brown (10YR 5/4 dry) to dark yellowish brown (10YR 4/4 moist) gravelly sandy loam; weak medium subangular blocky structure that crushes to moderate fine granules; slightly hard when dry, very friable when moist; slightly sticky when wet; approximate pH 6.0; roots plentiful; lower boundary clear and smooth. |
| 11996 | B _{2t} | 13-20
inches | Yellowish brown (10YR 5/4 dry) or dark yellowish brown (10YR 4/4 moist) gravelly clay loam; moderate medium subangular blocky structure that crushes to moderate fine granules; very hard when dry, firm when moist, plastic when wet; thin continuous clay films; approximate pH 6.5; occasional angular gneiss and schist rocks; roots few; lower boundary clear and wavy. |
| 11997 | B ₃ | 20-37
inches | Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) gravelly sandy clay loam; weak medium angular blocky structure breaking to strong fine granules; subangular blocky aggregates are somewhat vesicular; thin clay films; an occasional angular rock; roots very few; approximate pH 6.5; lower boundary abrupt and wavy. 37" plus. Gneiss and schist bedrock. |

Remarks: Thickness of the A horizon varies widely depending upon proximity to sagebrush. The A horizon is deeper immediately under sagebrush.

Bureau of Public Roads Samples: 0-6 inches, 20-37 inches.

SOIL SURVEY LABORATORY Lincoln, Nebr. 3/18/58

SOIL TYPE Mine LOCATION Grand County, Colorado
gravelly loam

SOIL NOS. S55Colo-25-7 LAB. NOS. 2899-2902

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						2A2
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	> 2		
0-3	A1	8.4	9.4	7.1	13.7	11.6	40.4	9.4	40.2	19.7	6	1	
3-6	A3	8.5	9.7	6.8	14.4	13.9	39.1	7.6	44.0	17.6	8	sl	
6-13	C1	7.8	10.9	10.1	19.5	15.7	30.6	5.4	43.9	13.8	12	sl	
13-20+	C2	9.8	14.4	10.0	17.2	14.2	28.6	5.8	39.9	12.9	16	sl	
pH		ORGANIC MATTER					GCIa Free Iron Fe ₂ O ₃		MOISTURE TENSIONS				
8C1a	1:5	1:10	6A1a ORGANIC CARBON	6B1a NITRO-GEN	C/N	%	%	1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.	4B2		
1:1			%	%		%	%	%	%	%	%		
6.1			1.82	.088	21	1.4					6.8		
5.8			0.70	.044	16	1.4					5.2		
5.9			0.33	.018	18	1.3					4.3		
5.8			0.20	.012		1.2					4.1		
5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS 5B1a					BASE SAT. % NH ₄ Ac EXCH.	Base Sat. % on Sum Cations	5B1a Sum Bases	5A3a Sum Cations	8D3 Ca/Mg			
6B2b Co	6B2b Mg	6B1a H	6B2a Na	6B2a K		5C1	5C3	me/100g	me/100g				
← milliequivalents per 100g. soil →													
18.1	11.2	2.0	9.2	0.1	0.7	77	60	14.0	23.2		5.6		
11.9	5.6	2.0	5.8	0.1	0.5	69	58	8.2	14.0		2.8		
9.4	4.1	1.6	3.5	0.1	0.4	66	64	6.2	9.7		2.6		
8.2	4.4	1.3	2.9	0.1	0.4	76	68	6.2	9.1		3.4		

Soil Type: Mine gravelly loam

Soil Nos.: S55Colo-25-7

Location: Approximately the NE 1/4 of the NE 1/4, Sec. 4, T2S, R76W, Grand County, Colorado. About 0.1 mile north and 50 feet west of the Forest Service headquarters building on the road to Fraser.

Physiographic Position: Outwash terrace.

Topography: Gently sloping convex area having a gradient of approximately 3 percent facing northwest.

Drainage: Well drained.

Vegetation: Lodgepole pine, understory of vaccinium brush and grass.

Use: Forest land.

Collected by: James Allen and A. J. Cline, August, 1955.

Horizon and

Lincoln

Lab. No.

- Ao 1 to 0 inch. Very dark gray (10YR 3/1 dry) to black (10YR 2/0 moist) partially decomposed organic material. A thin surface cover of last year's needle fall overlies this horizon. This horizon rests abruptly on the horizon below.
- A1 0 to 3 inches. Dark grayish brown (10YR 4/2 dry) to very dark brown (10YR 2/2 moist) gravelly loam; soft when dry, very friable when moist; moderate medium and fine crumb structure; approximately neutral; the horizon contains many plant roots; lower boundary gradual and wavy.
- A3 3 to 6 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) gravelly loam; slightly hard when dry, very friable when moist; very weak medium subangular blocky structure breaking to weak to moderate fine granules; approximately neutral, lower boundary gradual and wavy.
- C1 6 to 13 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist) gravelly sandy loam; soft when dry, very friable when moist; very weak coarse and medium subangular blocky structure; approximately neutral; lower boundary gradual and wavy.
- C2 13 to 20 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist) gravelly sandy loam; loose when dry, very friable when moist; massive; approximately neutral in reaction.

SOIL SURVEY LABORATORY Lincoln, Nebr. 3/18/58

SOIL TYPE Mine LOCATION Grand County, Colorado
 gravelly loam

SOIL NOS. 855Colo-25-8 LAB. NOS. 2914-2916

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	(< 19)	
0-3	A1	13.9	7.8	4.6	8.7	9.9	45.5	9.6	38.4	22.1	10	1
3-9	C1	16.5	11.3	5.8	11.3	12.5	34.8	7.8	36.6	17.6	23	cos1
9-18	C2	28.0	16.0	7.4	11.7	10.3	20.1	6.5	27.2	10.1	33	cos1
pH		ORGANIC MATTER					6C1a		MOISTURE TENSIONS			
8C1a		6A1a	6B1a	6C1a		Iron	Fe ₂ O ₃		1/10	1/3	4B2	
	1.5	ORGANIC CARBON	NITRO-GEN	C/N		%	%		ATMOS.	ATMOS.	15	ATMOS.
1:1		%	%			%			%	%	%	%
5.2		4.49	.144	31		1.4					8.0	
5.2		0.44	.021	21		1.2					4.5	
5.1		0.31	.010	31		1.0					4.0	
5A1a	EXTRACTABLE CATIONS					5B1a	BASE SAT. %	Base Sat. %	5B1a	5A3a	8D3	
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6M1a	6P2a	6Q2a	NH ₄ Ac EXCH.	%	on Sum	Sum Bases	Sum Cations	Ca/Mg	
	Co	Mg	H	Na	K				me/100g	me/100g		
	← milliequivalents per 100g. soil →											
17.3	6.4	1.2	13.8	-	0.6	47	37	37	8.2	22.0		5.3
9.6	3.5	0.1	6.4	0.1	0.3	42	38	38	4.0	10.4		
8.1	3.3	0.3	3.8	0.2	0.2	49	51	51	4.0	7.8		

Soil Type: Mine gravelly loam

Soil Nos.: S55Colo-25-8

Location: In the NW 1/4 of Sec. 3, T2S, R76W, Grand County, Colorado, just east of the Forest Service headquarters building on the first terrace level across St. Louis Creek.

Physiographic Position: Outwash terrace.

Topography: Gently sloping convex area of approximately 3 percent gradient.

Drainage: Well drained.

Vegetation: Principally lodgepole pine with a thin understory cover.

Use: Forest lands.

Collected by: H. Bindschadler, J. Allen, J. Retzer, and A. Cline, August, 1955.

Horizon and

Lincoln

Lab. No.

Ao - Aoo 1 to 0 inch. The upper part of this horizon is a nearly undecomposed mat of pine needles. The lower part is partially decomposed. This horizon rests abruptly on the horizon below.

A1 0 to 3 inches. Very dark grayish brown (10YR 3/2 dry) to very dark brown (10YR 2/2 moist) gravelly loam; soft when dry, very friable when moist; weak to moderate fine crumb structure; slightly acid in reaction; lower boundary clear and wavy.

C1 3 to 9 inches. Pale brown (10YR 6/3 dry) to dark brown (10YR 4/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; very weak medium subangular blocky structure breaking to medium to coarse crumb; approximately neutral in reaction; about 30 percent of this horizon is gravel; lower boundary gradual and smooth.

C2 9 to 18 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist) gravelly sandy loam; loose when dry and moist; massive; approximately neutral in reaction; about 70 percent of this horizon is gravel and rock fragments.

SOIL SURVEY LABORATORY Lincoln, Nebr. February 1959

SOIL TYPE Natrop LOCATION Chaffee County, Colorado
loan

SOIL NOS. 858Colo-8-5 LAB. NOS. 9067-9070

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY			2A2	
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	> 2	(19mm)
0-4	A1	4.2a	2.9a	1.9a	3.8a	7.9a	47.6	31.7	27.6	30.5	12	c1
4-9	B2t	3.6a	3.1a	2.1a	4.3a	7.5a	41.8	37.6	23.8	28.4	16	c1
9-13	B3ca	3.8b	3.9b	2.6b	5.5b	8.9b	39.4	35.9	26.0	25.9	26	c1
13-19	Cca	4.6b	4.9b	3.3b	7.3b	11.2b	36.5	32.2	29.5	23.0	30	c1

pH	ORGANIC MATTER			Free Iron %Fe ₂ O ₃	6E1a CaCO ₃ equiv- alent	MOISTURE TENSIONS		
	1:5	1:10	6A1a ORGANIC CARBON			6E1a NITRO- GEN	C/N	1/10 ATMOS.
			%	%		%	%	%
1:1					6C1a			
7.8			4.91	0.289	17	2.9	9	14.9
7.9			2.02	0.147	14	3.1	9	14.1
8.0			1.70	0.125	14	2.8	17	14.7
8.0			1.56	0.122	13	2.2	33	14.9

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					BASE SAT. % NH ₄ Ac EXCM.	Base Sat. % on Sum Cations	Sum Bases	Sum Cations	Ca/Mg
	602b Ca	6E1a Mg	6E2a H	602a No	602a K					
	← milliequivalents per 100g. soil →									
30.0	3.1	1.2	<0.1		2.1					
29.0	2.6	<0.1	<0.1		0.7					
25.6	2.4	<0.1	<0.1		0.4					
19.8	2.3	<0.1	<0.1		0.3					

a. Few CaCO₃ concr.
b. Common CaCO₃ concr.

Soil Type: Nathrop loam. Described by: A. J. Cline
 Location: NE $\frac{1}{4}$ of Sec. 33, T13S, R77W, Chaffee County, Colorado
 Date of Sampling: September 1957
 Collectors: A. J. Retzer, E. M. Payne, R. Dansdill, A. J. Cline
 Physiographic Position: Upland mountain slope at an elevation of approximately 9,300 feet.
 Topography: A moderately steep convex slope of approximately 8 percent facing south.
 Drainage: Well drained. Vegetation: Ring muhly, mountain fescue, scattered blue grama. Use: National Forest Service land.
 Soil Nos.: S58Colo-8-5

Lincoln Horizon

9067	A ₁	0-4 inches	Grayish brown or brown (8.75YR 5/2 dry) to very dark grayish brown or dark brown (8.75YR 3/2 moist) loam; soft when dry, very friable when moist; weak fine subangular blocky structure, breaking to moderate fine granules; strongly effervescent; lower boundary clear and smooth.
9068	B _{2t}	4-9 inches	Brown (7.5YR 5/3 dry) to dark brown (7.5YR 3.3/3 moist) clay loam; slightly hard when dry, very friable when moist; weak medium prismatic structure breaking to weak to moderate medium subangular blocks; strongly effervescent; there are thin patchy clay skins on both the horizontal and vertical faces of the soil aggregates; approximately 10 percent of this horizon is gravel; lower boundary clear and smooth.
9069	B _{3ca}	9-13 inches	Brown (7.5YR 5/3 dry) to dark brown (7.5YR 4/3 moist) gravelly loam; slightly hard when dry, very friable when moist; weak fine subangular blocky structure; breaking to moderate fine granules; violently effervescent; this is a weak horizon of lime accumulation with visible lime occurring as concretions and as coating on the gravel; approximately 40 percent of this horizon is gravel; there are a few thin patchy clay skins principally on the vertical faces of the soil aggregates; lower boundary gradual and smooth.
9070	C _{ca}	13-19 inches	White (10YR 8/2 dry) to light brownish gray or pale brown (10YR 6/2.5 moist) gravelly loam; slightly hard when dry, very friable when moist; massive or very weak granular structure; violently effervescent; this is a prominent horizon of lime accumulation with visible lime occurring mostly in finely divided forms; approximately 50 percent of this horizon is gravel; lower boundary gradual and smooth.
	D	19-26 inches	Fractured and partially weathered Pennsylvanian limestone bedrock. This horizon was not sampled.

SOIL Repeats silty clay loam 2/ SOIL Nos. 850Colo-50-9 LOCATION Prowers County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14682-14685 January 1966

Depth (in.)	Horizon	Size class and particle diameter (mm)											Clay 3A1a	Non-carbonate	Coarse fragments			
		1A1a		Sand					Silt		Int. II (0.2-0.02)	(2-0.1)			2A2 > 2 (19)	2-19	19-76	
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02								Int. III (0.02-0.002)
0-7	Ap1	13.1	45.5	41.4	1.0b	1.1c	0.6c	1.6c	8.8c	22.3	23.2	32.2	4.3	Tr.	41	Tr.		
7-11	Ap2	15.6	43.4	41.0	0.7	1.2c	0.8c	2.0c	10.9c	22.6	20.8	34.9	4.7	Tr.	41	Tr.		
11-16	B21	23.5	41.5	35.0	1.2	2.1c	1.3c	3.0c	15.9c	26.1	15.4	44.0	7.6	1	34	Tr.		
16-26	B22	23.3	43.7	33.0	3.2	2.7c	1.2c	2.5c	13.7c	30.1	13.6	45.4	9.6	4	29	Tr.		

Depth (in.)	6A1a Organic carbon	6B1a Nitrogen	C/N	6E1c Carbonate as CaCO ₃	Bulk density			Water content					pH			
					4A1c 30-cm	4A1b Air-Dry	4E1 COLE	4B3 30-cm	4B1b 1/3-2-Bar	4B2 15-Bar	4C1 1/3-Bar to Paste	8C1b Sat.	8C1c 1:1	8C1a 1:10		
	Pct.	Pct.		Pct.	g/cc	g/cc	g/cc	Pct.	Pct.	Pct.	Pct.	In./in.				
0-7	2.06	0.180	11	4				26.7	28.4	28.3	22.6	16.7	7.6	7.8	8.4	
7-11	1.43	0.142	10	4		1.40	1.68	0.064	26.4	26.4	22.1	15.5	0.15	7.7	7.9	8.5
11-16	1.11	0.118	9	3		1.40	1.66	0.059	26.3	26.4	22.1	15.5	0.15	7.6	7.8	8.4
16-26	0.69	0.080	9	7								14.3		7.6	7.8	8.5

Depth (in.)	Extractable bases				Cat. Exch. Cap. 5A1a NH ₄ OAc	Water extract from saturated paste								8A1a Electrical conductivity		
	Ca	Mg	6P2a Na	6Q2a K		8A1 Ca	Mg	6P1a Na	6Q1a K	CO ₃	HCO ₃	Cl	SO ₄			
	meq/100 g					meq/liter								mmho/cm		
0-7			0.6	1.8		24.9			2.9	0.8						1.0
7-11			0.9	1.4		24.6			3.8	0.4						0.9
11-16			0.9	1.1		23.0			4.5	0.4						1.2
16-26			0.9	0.9		20.3			5.2	0.3						1.5

Depth (in.)	8A Water at Saturation	5D2 Exchangeable Na	Ratios to Clay			
			Gypsum	8B1 NH ₄ OAc	8D2 NH ₄ OAc	8B1 15-Bar Water
	Pct.	Pct.	Pct.	CEC	CEC	a/
0-7	65.0	2		0.60	0.61	0.40
7-11	67.1	3		0.60	0.60	0.42
11-16	62.2	3		0.66	0.68	0.44
16-26	60.7	3		0.62	0.70	0.43

- This soil was sampled to study the effects of irrigation for about 50 years on certain soil characteristics. Only the upper horizons were sampled. The soil should be compared with Race 858Colo-50-1 and 858Colo-50-10, which were not irrigated.
- 25-50% organic matter.
- 5-25% carbonate.
- Coefficient of Linear Extensibility.
- Noncarbonate clay.

Soil Type: Nepesta silty clay loam
 Soil Nos.: S600olo-50-9
 Location: 150 feet north and 66 feet west of south quarter corner, Sec. 22, T22S, R43W, Prowers County, Colorado.
 Elevation: 3,540 feet. Climate: Continental climate, average annual precipitation 13 to 15 inches, frost-free season 165 days.
 Physiographic Position: Upland.
 Relief: Nearly level, 0-1 percent slopes.
 Drainage: Good.
 Moisture: Moist.
 Water Table: None.
 Stoniness: None.
 Salt or Alkali: Possible slight salinity.
 Erosion: Siltation.
 Present Use: Irrigated cropland - corn.
 Parent Material: Loess.
 Described by: James P. Fannell, November, 1960.

Horizon and
 Lincoln
 Lab. No.

- Apl 0 to 7 inches. Grayish brown (10YR 5/2 dry) to dark grayish brown (10YR 3.5/2 moist and crushed) silty clay loam; moderate medium granular structure; dry hard, moist firm; strongly effervescent; clear smooth boundary.
 14682
- Ap2 7 to 11 inches. Grayish brown (10YR 5/2 dry) to dark grayish brown (10YR 3.5/2 moist and crushed) silty clay loam; moderate medium angular and subangular blocky structure to moderate medium granular; dry hard, moist firm; strongly effervescent; clear smooth boundary.
 14683
- B21 11 to 16 inches. Grayish brown (10YR 5/2 dry) to dark grayish brown (10YR 3.5/2 moist and 4/2.5 moist crushed) silty clay loam; moderate medium prismatic and subangular blocky structure to moderate fine subangular blocky; dry hard, moist friable; slightly effervescent; thin nearly continuous clay skins; clear smooth boundary.
 14684
- B22 16 to 26 inches. Grayish brown (10YR 5.5/2 dry) to dark grayish brown (10YR 4/2 moist and 4/2.5 moist crushed) silty clay loam; weak to moderate fine subangular blocky structure; dry hard, moist friable; strongly effervescent; thin nearly continuous clay skins; clear smooth boundary.
 14685
- B3ca 26 to 39 inches. Light grayish brown (10YR 6/2 dry) to dark grayish brown (10YR 4/2 moist and crushed) silty clay loam; weak fine subangular blocky structure; dry slightly hard, moist very friable; violently effervescent; thin patchy clay skins and few lime spots; gradual smooth boundary.
- Cca 39 to 50 inches. Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist and crushed) silt loam; massive; dry soft, moist very friable; violently effervescent; few lime spots; gradual smooth boundary.
- C 50 to 60 inches plus. Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist and crushed) silt loam; massive; dry soft, moist very friable; violently effervescent.

SOIL Nepesta silty clay loam a/ SOIL Nos. 850Colo-50-10 LOCATION Frowers County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14686-14689 January 1966

Depth (in.)	Horizon	1B1a Size class and particle diameter (mm)											3A1				
		Total		Sand					Silt				Clay Carbonate	3A1a Non-carbonate	Coarse fragments		
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. II (0.2-0.02)	Int. III (0.02-0.002)			(2-0.1)	2A2 > 2 (< 19) Pct.	2-19
Pct. of < 2 mm																	
0-5	Apl	9.0	36.6	54.4	0.2b	0.3a	0.3a	1.5a	6.7a	14.4	22.2	22.2	2.3	2	52	-	
5-8	Ap2	9.5	38.7	51.8	-	0.3a	0.4a	1.4a	7.4a	16.2	22.5	24.5	2.1	2	50	Tr.	
8-13	AB	7.7	37.5	54.8	0.1	0.2a	0.2a	1.1a	6.1a	13.9	23.6	20.8	1.6	2	53	Tr.	
13-21	B21	13.4	47.6	39.0	-	0.3a	0.4a	1.5a	11.2a	28.5	19.1	40.7	2.2	2	37	Tr.	

Depth (in.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.	C/N	6X1c Carbonate as CaCO ₃ Pct.	Bulk density			Water content						pH			
					4A1c 30-cm g/cc	4A1b Air-Dry g/cc	4X1c 30-cm g/cc	4B3 30-cm Pct.	4X1b 1/3-Bar Pct.	4X2 2-Bar Pct.	4X2 15-Bar Pct.	4C1 1/3-Bar to 15-Bar in./in	8C1b Sat. Paste	8C1a 1:1	8C1a 1:10		
0-5	1.79	0.152	12	7									18.6		7.7	7.8	8.4
5-8	1.44	0.134	11	5		1.34	1.73	0.092	33.0	32.5	25.2	19.3	0.18	7.7	7.8	8.4	
8-13	1.58	0.154	10	6		1.36	1.69	0.078	29.8	30.7	25.1	20.6	0.14	7.7	7.7	8.3	
13-21	0.91	0.109	8	5									17.0		7.6	7.7	8.3

Depth (in.)	Extractable bases 5B1a				Cat. Exch. Cap. 5A1a meq/100 g	8A1 Water extract from saturated paste						8A1a Electrical conductivity mmho/cm					
	Ca	Mg	Na	K		Ca	Mg	Na	K	CO ₃	HCO ₃		Cl	SO ₄			
0-5			0.8	1.5													0.8
5-8			0.7	1.4													0.8
8-13			0.7	1.5													0.7
13-21			0.6	1.2													1.0

Depth (in.)	8A Water at Saturation Pct.	5B2 Exchangeable Na Pct.	Gypsum Pct.	Ratios to Clay		
				8B1 HR, Ca ₂ CEC a/	8B2 HR, Ca ₂ CEC a/	8B1 HR, Ca ₂ 15-Bar Water
0-5	69.3	2		0.56	0.58	0.34
5-8	78.0	2		0.58	0.60	0.37
8-13	89.2	2		0.54	0.56	0.38
13-21	71.5	2		0.64	0.67	0.44

- This soil was sampled to study the effects of irrigation for about 50 years on certain soil characteristics. Only the upper horizons were sampled. The soil should be compared with Basos 858Colo-50-1 and 858Colo-50-10, which were not irrigated.
- 25-50% organic matter.
- 5-25% carbonate.
- Coefficient of Linear Extensibility.
- Noncarbonate clay.

Soil Type: **Nepesta silty clay loam**
 Soil No.: **SS0610-70-10**
 Location: **0.45 mile east and 0.15 mile north of southwest corner, Sec. 19, T21S, R47W, Prowers County, Colorado.**
 Climate: **Continental climate, average annual precipitation 13 to 15 inches, frost-free season 165 days.**
 Elevation: **3,825 feet.**
 Parent Material: **Loess.**
 Physiographic Position: **Upland.**
 Relief: **Nearly level, 0-1 percent slopes.**
 Drainage: **Good.**
 Moisture: **Moist.**
 Water Table: **None.**
 Stoniness: **None.**
 Salt or Alkali: **Possible slight salinity.**
 Erosion: **Eltation.**
 Present Use: **Irrigated cropland.**
 Described by: **James F. Fannell, August, 1960.**

**Horizon and
 Inocla
 Lab. No.**

- Ap1** 0 to 5 inches. Grayish brown (10YR 5/2 dry) to dark grayish brown (10YR 3.5/2 moist and crushed) silty clay loam; moderate fine granular structure; dry hard, moist firm; strongly effervescent; clear smooth boundary.
- 1A686**
- Ap2** 5 to 8 inches. Grayish-brown (10YR 5/2 dry) to dark grayish brown (10YR 3.5/2 moist and crushed) silty clay loam; weak to moderate medium subangular blocky structure to moderate medium granular; dry hard, moist firm; violently effervescent; thin patchy clay skins; clear smooth boundary.
- 1A687**
- AB** 8 to 13 inches. Grayish brown (10YR 5/2 dry) to dark brown (10YR 3/2.5 moist) dark grayish-brown (10YR 3.5/2 moist crushed) silty clay loam; weak to moderate fine subangular blocky structure to weak fine granular; dry hard, moist friable; violently effervescent; thin patchy clay skins; clear smooth boundary.
- 1A688**
- R21** 13 to 21 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist and 3.5/2 moist crushed) silty clay loam; moderate medium and fine prismatic structure to moderate medium subangular blocky; dry hard, moist firm; violently effervescent; thin nearly continuous clay skins; clear smooth boundary.
- 1A689**
- R22** 21 to 25 inches. Grayish brown (10YR 5/2.5 dry) to dark grayish brown (10YR 4/2.5 moist and 4/2 moist crushed) silty clay loam; moderate medium subangular blocky structure; dry hard, moist firm; violently effervescent; thin nearly continuous clay skins; clear smooth boundary.
- B3ca** 25 to 37 inches. Pale brown (10YR 6/3 dry) to brown (10YR 4.5/3 moist and 5/3 moist crushed) silty clay loam; weak to medium moderate subangular blocky structure; dry slightly hard, moist friable; violently effervescent; thin patchy clay skins; few lime spots; clear smooth boundary.
- Cca** 37 to 54 inches. Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist and crushed) light silty clay loam; weak medium subangular blocky structure; dry soft, moist friable; violently effervescent; many lime spots; clear smooth boundary.
- C** 54 to 60 inches plus. Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) brown (10YR 5/3 moist crushed) silt loam; massive; dry soft, moist very friable; violently effervescent.

SOIL SURVEY LABORATORY Lincoln, Nebr. 3/18/58

SOIL TYPE Hystron peat LOCATION Clear Creek County, Colorado

SOIL NOS. S55Colo-10-1 LAB. NOS. 2903-2908

DEPTH INCHES	HORIZON	1B1a PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	3A1		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	0.2-0.006	< 19mm.)	> 2	
0-3		47.1	13.1	2.6	2.7	1.5	12.9	20.1	1.0	14.8	5	scl	
3-14		12.9	8.6	2.9	4.2	2.8	40.5	28.1	23.7	22.0	5	cl	
14-17	D1	43.5	18.6	4.6	5.3	3.1	11.8	13.1	10.3	7.4	8	cosl	
17-23	D2	51.0	10.2	3.9	6.5	2.0	11.7	14.7	8.8	8.1	25	cosl	
23-29	D3	69.7	9.2	1.3	1.5	1.0	8.1	9.2	3.8	6.1	52	lcos	
29-34	D4	40.1	14.2	5.2	7.2	5.2	17.9	10.2	15.7	11.5	33	cosl	
pH		ORGANIC MATTER				5C1a	MOISTURE TENSIONS						
8C1a	8C1a	6A1a	6B1a	Iron	4B2								
1:1	1:5	1:10	ORGANIC CARBON %	NITRO-GEN %	C/N	Fe ₂ O ₃ %	1:10 ATMOS. %	1/3 ATMOS. %	15 ATMOS. %				
4.3			27.8	1.66	17					50.9			
4.5			23.5	1.10	21					26.0			
4.6			1.54	.097	16	1.8				7.0			
4.7			0.73	.048	15	3.1				6.6			
4.9			0.51	.026	20	2.2				4.8			
4.9			0.32	.018	18	2.5				4.5			
5A1a	EXTRACTABLE CATIONS					5B1a	BASE SAT. %	Base Sat. %	5B1a	5A3a	8D3		
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6H1a	6P2a	6Q2a	Ca	NH ₄ Ac EXCH.	on Sum Cations	Sum Bases	Sum Cations	Ca/Mg		
	Ca	Mg	H	Na	K		5C1	5C3	me/100g	me/100g			
48.7	12.1	1.7	44.7	0.2	0.6	30	25	14.6	59.3		7.1		
40.8	6.3	0.2	54.6	0.1	0.1	16	11	6.7	61.3				
14.0	1.4	0.4	16.9	0.1	0.1	14	10	2.0	18.9				
7.5	0.9	0.4	14.9	0.1	0.1	20	9	1.5	16.4				
7.9	1.0	0.4	8.5	0.1	0.2	22	17	1.7	10.2				
6.8	1.0	0.1	6.9	0.1	0.1	19	16	1.3	8.2				

a. Not dried prior to dispersing

Soil Type: Mystem peat
 Soil Nos.: S550olo-10-1
 Location: Approximately the NW 1/4 of the NW 1/4 of Sec. 22, T3S, R76W, Clear Creek County, Colorado, approximately 1 mile east of the pass on the Jones Pass road.
 Physiographic Position: Alpine areas on mountain crest.
 Topography: Nearly level to slightly depressed basin.
 Drainage: Poorly drained.
 Vegetation: Willow, water-loving sedges, tufted hair grass.
 Use: Grazing land.
 Collected by: A. Aandahl, J. Retzer, H. Bindschadler, E. M. Payne, August, 1955.

Horizon and
 Lincoln
 Lab. No.

- 2903 0 to 3 inches. Very dark gray (10YR 3/1 dry) to black (10YR 2/0 moist) fibrous grass and sedge peat. The outline of individual plant remains are clearly visible in this horizon. Extremely acid in reaction. Lower boundary gradual and smooth.
- 2904 3 to 14 inches. Very dark gray (10YR 3/1.5 dry) to black (10YR 2/1 moist) fibrous grass and sedge peat; the outline of individual plant remains are clearly visible in this horizon; extremely acid; lower boundary clear and wavy.
- III
 2905 14 to 17 inches. Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 4/2 moist) fine gravelly sandy loam; slightly hard when dry, very friable when moist; weak coarse granular structure; extremely acid in reaction; lower boundary clear and wavy.
- II
 2906 17 to 23 inches. Very pale brown (10YR 7/4 dry) to yellowish brown (10YR 5/4 moist) gravelly sandy clay loam; hard when dry, friable when moist; very weak medium subangular blocky structure; extremely acid; the horizon contains common numbers of medium-sized distinct 10YR 3.5/4 and 10YR 5/6 mottles and stains; lower boundary clear and wavy.
- II
 2907 23 to 29 inches. Very pale brown (10YR 7/3 dry) to yellowish brown (10YR 5/4 moist) gravelly loam; slightly hard when dry, very friable when moist; massive; strongly acid in reaction; lower boundary clear and smooth.
- II
 2908 29 to 34 inches. Very pale brown (10YR 7/5 dry) to yellowish brown (10YR 5/5 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; massive; medium acid in reaction.

SOIL SURVEY LABORATORY

Lincoln, Nebr.

June 1961

SOIL TYPE

* Parlin

LOCATION

Gunnison County, Colorado

channery loam

SOIL NOS.

S59Colo-26-1

LAB. NOS.

11987-11993

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	0.2-0.02	0.02-0.002	3A1 2A2 > 2 ($< 19\mu$)	
0-4	All	6.1	5.6	3.2	6.3	13.6	50.6	14.6	46.8	20.9	32	s11
4-10	A12	4.4	4.3	2.7	5.6	12.1	49.1	21.8	45.1	19.2	44	1
10-19	B1	4.6	3.7	2.0	4.5	11.4	40.8	33.0	39.3	15.5	58	c1
19-27	B2t	4.3	5.0	3.0	6.0	12.2	38.5	31.0	39.3	14.7	44	c1
27-32	B3	3.8	4.5	3.0	5.8	11.6	41.5	29.8	38.9	17.4	28	c1
32-39	C	5.0	5.0	3.4	7.2	12.7	40.5	26.2	39.8	17.4	33	1
39-53	B2b	3.0	3.7	2.6	5.8	11.8	43.1	30.0	38.8	19.4	25	c1
pH		ORGANIC MATTER				6C1a	6E1c		MOISTURE TENSIONS			
8C1a	1:5	1:10	6A1a ORGANIC CARBON	6B1a NITROGEN	C/N	Free Iron $Fe_2O_3\%$	CaCO ₃ equiv- alent	1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.	4B2	
1:1			%	%			%	%	%	%		
7.0			1.98	0.151	13	1.2	< 0.1				7.2	
7.0			1.20	0.107	11	1.2	< 0.1				8.9	
7.0			0.60	0.060	10	1.4	< 0.1				13.7	
7.7			0.23	0.032		1.4	< 0.1				13.4	
8.0			0.16			1.4	0.2				12.7	
8.2			0.19			1.3	0.3				12.0	
8.2			0.08			1.3	0.4				13.3	
5A1a CATION EXCHANGE CAPACITY NH ₄ OAc	EXTRACTABLE CATIONS 5B1a					BASE SAT. % NH ₄ OAc EXCH.	Base Sat. % on Sum Cations	Sum Ext. Bases	Sum Ext. Cations	Ca/Mg	O. D. Bulk Density g/cc	
6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K		5C1	5C3	5B1a	5A3a	8D3		
milliequivalents per 100g. soil												
14.0	11.7	2.1	3.1	< 0.1	1.2	107	83	15.0	18.1	5.6		
15.8	13.1	2.8	2.9	< 0.1	0.6	104	85	16.5	19.4	4.7		
23.1	18.5	4.2	2.7	0.1	0.6	101	90	23.4	26.1	4.4		
23.1	20.6	4.3	1.7	0.2	0.4	110	94	25.5	27.2	4.8		
20.4		4.0	1.0	0.2	0.4							
19.6		3.7	0.2	0.4	0.5							
21.7		4.3	0.2	0.6	0.6							

Soil Type: *Parlin channery loam

Date: Sept. 1959, by J. Nishimura, D. Boyer, E. Kleven, W. Goddard, J.S. Allen,
L. Juve, and C. J. Fox

Area: Gunnison County, Colorado

Location: NW $\frac{1}{4}$ - SE $\frac{1}{4}$ of Sec. 22, T. 49 N., R. 2 E. photo 2991

Parent material: Residual and partly colluvial from felsitic (rhyolite) rocks.

Physiography: Side slope of smoothly rounded mountain at an elevation of
approximately 8500 feet.

Topography: Northeast exposure with 26 percent slope.

Drainage: Excessive

Vegetation: Big sagebrush (*Artemisia tridentata*), serviceberry, occasional
cacti, very sparse grasses consisting mainly of needle and thread (*Stipa
Comata*)

Use: Rangeland

Described by: Charles J. Fox.

Soil Nos.: S-59-Colo-26-1

Lincoln Horizon

Lab. No.

- | | | | |
|-------|-----------------|-----------------|--|
| 11987 | A ₁₁ | 0-4
inches | Brown (10YR 4/3 dry) to dark brown (10YR 3/3 moist) weak very fine granular loam; soft when dry, very friable when moist; about 5 percent angular gravel; approximate pH 6.5; roots plentiful; lower boundary clear and smooth. |
| 11988 | A ₁₂ | 4-10
inches | Dark grayish brown (10YR 4/2 dry) to very dark grayish brown (10YR 3/2 moist) loam; weak medium angular blocky structure crushing to moderate fine granules; slightly hard when dry, drible when moist, slightly sticky when wet; about 3 percent of angular gravel; approximate pH 6.0; roots plentiful; lower boundary clear and wavy. |
| 11989 | B ₁ | 10-19
inches | Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) gravelly clay loam; moderate medium subangular blocky structure crushing to moderate fine granules; hard when dry, firm when moist, and plastic when wet; thin clay films; approximate pH 6.5; roots few; about 15 percent of volume consists of gravel; lower boundary gradual and smooth. |
| 11990 | B _{2t} | 19-27
inches | Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) clay loam; moderate medium subangular blocky structure crushing to strong fine granules; very hard when dry, very firm when moist, and very plastic when wet; thin continuous clay films; approximate pH 6.0; about 3 percent angular gravel; roots few; lower boundary gradual and smooth. |
| 11991 | B ₃ | 27-32
inches | Light brown (7.5YR 6/4 dry) to brown (7.5YR 5/4 moist) clay loam; moderate medium angular blocky structure crushing to moderate fine granules; thin discontinuous clay films; hard when dry, firm when moist; plastic when wet; about 3 percent angular gravel; approximate pH 6.5; matrix of soil noncalcareous but weakly calcareous in spots and seams; roots few; lower boundary clear and smooth. |
| 11992 | C | 32-39
inches | Light brown (7.5YR 6/4 dry) to brown (7.5YR 5/4 moist) light clay loam; weak medium angular blocky structure that crushes to moderate fine granules; slightly hard when dry, friable when moist, plastic when wet; approximately 3 percent of this horizon is angular gravel; calcareous in spots and seams; approximate pH 8.0; roots few; lower boundary gradual and smooth. |
| 11993 | B _{2b} | 39-53
inches | Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) clay loam; moderate medium angular blocky structure crushing to moderate medium granules; hard when dry, firm when moist, plastic when wet; thin discontinuous clay films; some tiny black iron or manganese concretions; calcareous in spots and seams; no roots; approximately pH 8.0; lower boundary gradual and smooth. |
| | B _{3b} | 53-59
inches | Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) heavy loam; weak medium angular blocky structure crushing to weak medium granules; slightly hard when dry, friable when moist, slightly sticky when wet; about 3 percent of this horizon is lime coated gravel; calcareous in spots and seams; approximate pH 8.0; a few black concretions; some old roots and root channels. |

Bureau of Public Roads Samples: 4-10 inches, 10-19 inches, 32-39 inches.

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	2A2		> 2	
		2.1	1.0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	($< 9\mu$)	
1 1/2-0	A ₀ A ₀₀											
0-4 1/2	All	2.1a	3.6a	3.2a	8.3a	6.5a	51.3	25.0	36.4	25.9	1	sil
4 1/2-8	A12	15.6a	14.9a	8.1a	16.0a	9.8a	27.3	8.3	31.5	14.0	26	cosl
8-13	B1r	11.8a	13.6a	7.9a	15.9a	11.0a	35.6	4.2	35.4	20.0	36	cosl
13-18	B3	4.5a	8.9a	6.4a	13.9a	10.5a	50.2	5.6	38.2	30.4	35	sil
18-24+	C	19.2a	14.7a	8.4a	16.1a	9.7a	26.2	5.7	29.1	15.5	42	cosl
	pH	8C1a					ORGANIC MATTER			MOISTURE TENSIONS		
	1:5	1:10	6A1a	6B1a	Free Iron	CoCO ₃ equiv- alent			1/10	1/3	15	4B2
	1:1		ORGANIC CARBON	NITRO-GEN	Fe ₂ O ₃				ATMOS.	ATMOS.	ATMOS.	
			%	%	C/N				%	%	%	
4.8	5.7		17.42	1.186	15							34.5
4.8			4.67	0.333	14							8.6
4.6			1.50	0.135	11							4.0
4.7			1.26	0.093	14							3.7
			0.51	0.041	12							2.9
	5A1a	EXTRACTABLE CATIONS					BASE SAT.	5C3	Sum	Sum	Ca/Mg	
	6N2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ Ac	Base Sat. %	5B1a	5A3a			
	Ca	Mg	H	Na	K	EXCH.	on Sum	Cations	me/100g	8D3		
	← milliequivalents per 100g. soil →					5C1						
50.4	40.3	7.0	44.2	0.2	0.5	95	52	48.0	92.2	5.8		
25.3	6.6	1.7	27.3	0.1	0.2	34	24	8.6	35.9	3.9		
12.4	1.9	0.6	14.3	0.1	0.1	22	16	2.7	17.0			
12.3	1.2	0.4	14.7	0.1	0.1	15	11	1.8	16.5			
7.9	1.0	0.4	8.1	0.1	0.1	20	16	1.6	9.7			

a. Few flakes of mica and few black minerals.

Soil Type: *Penitente loam
 Location: Niwot Ridge, approximately 200' west of the Tundra Laboratory,
 Boulder County, Colorado
 Date of Sampling: July 1, 1957
 Collectors: W. Osburn, A. J. Cline Described by: A. J. Cline
 Physiographic Position: Alpine Ridge
 Topography: Gently undulating ridge top having approximately 5 percent gradient.
 Drainage: Well drained
 Vegetation: Thick Kobresia bellardi sod with some Carex drummondii.
 Use: National forest land. (Alpine Experimental Fields)
 Soil Nos.: S-57-Colo-7-1 Lincoln Laboratory Nos.: 7568-7573

1½-0 inches This is an organic horizon made up of undecomposed and partially
 A₀, A₀₀ decomposed plant refuse principally Kobresia roots and plant remains.
 LSI 7568

0-4½ inches Very dark gray (10YR 3/1 dry) to black (10YR 2/1 moist) loam;
 A₁₁ slightly hard when dry, very friable when moist; weak to moderate
 LSI coarse crumb structure; noncalcareous; lower boundary clear and
 7569 smooth. Temperature 50° F.

4½-8 inches Very dark grayish brown (10YR 3/2 dry) to very dark brown (10YR
 A₁₂ 2/2 moist) loam; slightly hard when dry, very friable when moist;
 LSI weak fine subangular blocky structure breaking to moderate coarse
 7570 crumbs; noncalcareous, approximate pH 5.6; lower boundary gradual
 and wavy. Temperature 45° F.

8-13 inches Brown (10YR 5/3 dry) to dark brown (10YR 3/3 moist) stony loam;
 B_{1r} hard when dry, very friable when moist; weak to moderate medium and
 LSI fine subangular blocky structure; noncalcareous, approximate pH 4.6;
 7571 there are a few very thin and patchy clay skins visible only on a
 few surfaces; lower boundary gradual and smooth. Approximately 25%
 of this horizon is stone; the underside of the stone fragments are
 thickly coated with a dark brown (10YR 3/3 and 10YR 2/2 coating).
 Temperature 35° F.

13-18 inches Pale brown (10YR 6/3 dry) to brown or dark brown (10YR 4/3 moist)
 B₃ stony loam; hard when dry, very friable when moist; weak to moderate
 LSI medium and fine subangular blocky structure; noncalcareous, approxi-
 7572 mate pH 4.4; there are a few very thin and patchy clay skins visible
 on some of the aggregate faces; the temperature of this horizon on
 the day sampled was approximately 32°; approximately 40% of the
 horizon is stone; the underside of the stones is coated with a
 (10YR 3/3 coating); lower boundary diffuse and wavy.

18-24 / Light yellowish brown (2.5Y 6/3 dry) to olive brown (2.5Y 4/3 moist)
 C inches stony sandy loam; hard when dry, very friable when moist; very weak
 LSI medium subangular blocky structure or massive; noncalcareous,
 7573 approximate pH 4.8; about 75% of this horizon is stone; there is
 some coating of (10YR 3/3) materials on the underside of the rocks
 but somewhat less than in the horizon above. Temperature 27° F.

SOIL SURVEY LABORATORY Lincoln, Nebr. December 1958

SOIL TYPE *Penitente loam LOCATION Boulder County, Colorado

SOIL NOS. S57Colo-7-2 LAB. NOS. 7574-7578

DEPTH INCHES	HORIZON	1B1a PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	3A1		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	> 2		
1-0	A ₀ A ₀₀												
0-5	Al	6.2a	7.5a	4.7a	7.9a	5.7a	47.2	20.8	30.9	26.0	Tr.	1	
5-9	B _{1r}	7.5a	10.3a	7.0a	16.4a	11.4a	38.5	8.9	35.5	23.5	16	fs1/1	
9-14	BC	6.7a	9.8a	3.1a	19.4a	11.8a	41.4	7.8	36.7	25.7	20	1	
14+	C	10.9a	11.5a	6.7a	14.6a	10.4a	39.7	6.2	34.4	23.7	22	s1	
pH 8C1a		ORGANIC MATTER				Free Iron				MOISTURE TENSIONS			
	1:5	1:10	6A1a	6B1a	C/N	Fe ₂ O ₃	CoCO ₃ equiv- alent		1/10 ATMOS.	1/3 ATMOS.	4B2	15 ATMOS.	
	1:1		%	%	%	6C1a	%	%	%	%	%	%	
4.6	5.1		16.13	1.201	13	1.3						32.8	
4.7			2.06	0.162	13	1.2						5.6	
4.8			0.72	0.065	11	1.1						3.5	
			0.34	0.024	14	0.9						3.0	
5A1a		EXTRACTABLE CATIONS 5B1a				BASE SAT. & NH ₄ Ac EXCH.	5C3	Sum Bases	Sum Cations	Ca/Mg			
CATION EXCHANGE CAPACITY NH ₄ Ac		6N2b	6O2b	6H1a	6P2a	6Q2a	Base Sat. % on Sum Cations	5B1a	5A3a	8D2			
		Ca	Mg	H	Na	K		me/100g					
		milliequivalents per 100g. soil					5C1						
50.4	23.6	4.2	50.6	0.2	0.7	57	36	28.7	79.3	5.6			
16.4	1.6	0.5	19.3	0.1	0.2	15	11	2.4	21.7				
10.5	0.6	0.5	11.4	<0.1	0.1	11	10	1.2	12.6				
8.3	1.4	0.2	9.0	<0.1	0.1	20	16	1.7	10.7				

a. Few flakes of mica and few black minerals.

Soil Type: ~~Penitente~~ loam
 Location: Niwot Ridge, approximately 500 yards east of the Lundra Laboratory,
 Boulder County, Colorado
 Date of Sampling: July 1, 1957
 Collectors: W. Osburn, A. J. Cline Described by: A. J. Cline
 Physiographic Position: Alpine Ridge
 Topography: Moderately steeply sloping ridge crest of about 8 percent gradient.
 Drainage: Moderately well drained.
 Vegetation: Thick Kobresia bellardi sod and a few small sedges
 Use: National Forest lands (Alpine Experimental Fields)
 Soil Nos.: S-57-Colo-7-2 Lincoln Laboratory Nos.: 7574-7578

1-0 inches Organic material consisting of undecomposed and partially decom-
 A₀, A_{oo} posed Kobresia roots and plant remains.
 LSL 7574

0-5 inches Very dark gray (10YR 3/1 dry) to black (10YR 2/1 moist) loam;
 A₁ soft when dry, very friable when moist; weak to moderate coarse
 crumb structure; noncalcareous, approximate pH 5.8; lower boundary
 LSL clear and wavy. On the date sampled the temperature of this
 7575 horizon was 50° F.

5-9 inches Pale brown (10YR 6/3 dry) to brown or dark brown (10YR 4/3 moist)
 B_{1r} loam; slightly hard when dry, very friable when moist; weak medium
 subangular blocky structure, breaking to weak to moderate very fine
 LSL subangular blocks; noncalcareous, approximate pH 4.6; on the date
 7576 of sampling the temperature of this horizon was 42° F; lower bound-
 ary clear and smooth.

9-14 inches Pale yellow (2.5Y 7/3 dry) to olive brown (2.5Y 4.5/4 moist) loam;
 BC slightly hard when dry, very friable when moist; weak medium sub-
 angular blocky structure, breaking to weak to moderate very fine
 LSL subangular blocks; noncalcareous, approximate pH 4.4; on the date
 7577 of sampling the temperature of this horizon was 30° F; about 15%
 of this horizon was stone; the underside of the rocks had a dark
 brown (10YR 3/3 coating); lower boundary gradual and wavy.

14 1/2 inches Pale yellow (2.5Y 7/3 dry) to olive brown or light olive brown
 C (2.5Y 4.5/4 moist) stony loam or very fine sandy loam; hard when
 dry, very friable when moist; massive; noncalcareous, approximate
 LSL pH 4.4; on the date of sampling the temperature of this horizon
 7578 was 28° F; approximately 50% of this horizon is stone; the under-
 side of the rocks is coated with a dark brown (10YR 3/3 coating).

SOIL Pepton sandy loam SOIL Nos. S63Colo-18-5 LOCATION Douglas County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18662-18669 March 1967

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

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1													3A1b		2A2 Coarse fragments a												
		Total			Sand					Silt			Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	< 0.0002	3B1 > 2 (< 19) Pct.	3B2 > 2 (< 19) Pct.	a			
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)															(2-0.1)	< 0.0002	
0-7	A11	70.9	15.7	13.4	7.6	15.2	11.5	22.5	14.1	9.5	6.2	35.8	56.8												5	3			
7-15	A12	73.4	12.9	13.7	11.2	18.1	12.3	20.8	11.0	7.6	5.3	29.7	62.4												5	3			
15-20	A3	72.3	15.8	11.9	12.5	18.2	11.4	19.1	11.1	8.8	7.0	30.2	61.2											4	2				
20-24	B21t	64.0	16.2	19.8	15.9	16.9	8.2	13.0	10.0	9.0	7.2	26.2	54.0											10	7				
24-34	B22t	58.0	15.6	26.4	9.6	13.9	8.0	14.4	12.1	8.8	6.8	29.1	45.9											8	5				
34-41	B3	69.0	12.4	18.6	12.4	17.4	10.1	17.4	11.7	7.4	5.0	28.8	57.3											8	5				
41-48	C1	88.7	3.7	7.6	36.8	30.1	7.7	10.5	3.6	1.9	1.8	10.8	85.1											19	13				
48-68	C2	90.3	3.1	6.6	19.6	47.8	11.2	9.1	2.6	1.7	1.4	8.3	87.7	5.3															

Depth (in.)	6A1a		6B1a		6C2a		6E2a		Bulk density				4D1 COLE	Water content				8C1a (1:1)	pH
	Organic carbon b Pct.	Pct.	Nitrogen Pct.	C/N	Ext. Iron as Fe Pct.	Carbonate as CaCO3 Pct.	4A1a	4A1d	4A1d	4A1b	4B4 Field State Pct.	4B1c		4B2	4C1				
							Field State g/cc	1/3-Bar g/cc	1/3-Bar g/cc	Air Dry g/cc		1/3-Bar Pct.		15-Bar Pct.	1/3-to 15-Bar in./in.				
0-7	1.07	0.097	11	0.3			1.57	1.51	1.56	1.58	0.003	11.1	10.3	5.3	0.08			6.0	
7-15	0.80	0.074	11	0.3			1.56	1.46	1.50d	1.54	0.010	4.4	9.8e	4.8	0.08f			6.3	
15-20	0.36	0.034	11	0.3			1.69	1.59	1.62d	1.66	0.007	3.7	9.2e	4.1	0.08f			6.4	
20-24	0.36	0.036	10	0.4			1.77	1.55	1.67	1.76	0.016	5.2	12.9	7.3	0.08			6.6	
24-34	0.35			0.5	-(s)		1.80	1.63	1.72	1.83	0.019	6.9	13.3	8.9	0.08			6.7	
34-41	0.16			0.3	-(s)		1.86	1.65	1.74	1.84	0.016	5.5	13.4	7.3	0.10			7.1	
41-48	0.06			0.1	-(s)		1.77	1.48d	1.70d	1.74	0.006	3.2	6.1e	3.4	0.04f			7.0	
48-68	0.03			0.1	-(s)		1.80		1.75d	1.75	-	3.5	4.2e	2.1	0.04f			7.0	

Depth (in.)	Extractable bases 5B1a				6B1a Ext. Acidity	Out. Exch. Cap.		8D3 Ca/Mg	Base saturation			
	6M2a	6O2a	6P2a	6Q2a		5A3a Sum	5A1a NH4OAc		5C3 Sum	5C1 NH4OAc		
	Ca	Mg	Na	K		Cations	NH4OAc		Pct.	Pct.		
0-7	5.7	1.8	tr	0.4		7.9	3.6	11.5	8.5	3.2	69	93
7-15	5.9	2.1	tr	0.3		8.3	2.8	11.1	9.4	2.8	75	88
15-20	4.6	1.7	tr	0.2		6.5	1.7	8.2	6.6	2.7	79	98
20-24	8.2	3.2	0.1	0.3		11.8	2.1	13.9	11.1	2.6	85	106
24-34	11.4	4.5	0.2	0.4		16.5	2.3	18.8	15.1	2.5	88	109
34-41	8.8	3.6	0.2	0.3		12.9	1.4	14.3	11.7	2.4	90	110
41-48	3.3	1.4	0.1	0.1		4.9		4.5		2.4	109	
48-68	2.7	1.2	0.1	0.1		4.1	0.6	4.7	3.8	2.3	87	108

Depth (in.)	Ratios to Clay 8D1		
	NH4OAc CEC	Ext. Iron	15-Bar Water
0-7	0.63	0.02	0.40
7-15	0.69	0.02	0.35
15-20	0.55	0.03	0.34
20-24	0.56	0.02	0.37
24-34	0.57	0.02	0.34
34-41	0.63	0.02	0.39
41-48	0.59	0.01	0.45
48-68	0.58	0.02	0.32

a. Estimated less than 10 percent by volume of coarse fragments greater than 19 mm.
b. 9 kg/m² to 48 inches (Method 6A).
c. Calculated to include volume but not weight of 2-19 mm. material (Method 3B2).
d. 1/10-Bar (Method 4A1g).
e. 1/10-Bar.
f. 1/10- to 15-Bar (Method 4C2).

Soil Type : *Peyton sandy loam
 Soil Nos. : S63Colo-18-5
 Location : 400 feet south, 1200 feet east of the northwest corner of Section 21, T10S, R66W, Douglas County, Colorado
 Climate : Continental, average annual precipitation 20 inches. Mean annual temperature 44 degrees F. Growing season 120 days. Elevation 7200 feet.
 Vegetation : Native pasture; blue grama, needleandthread, western wheatgrass, mountain mahly, Junegrass
 Parent Material : Dawson arkose or outwash material from the Dawson
 Physiographic Position : Upland
 Relief : Sloping, 12 percent west facing slope; slope about 300 feet in length, pit near the center of the slope
 Drainage : Surface drainage is rapid; internal drainage is moderate; intake rates are moderate to rapid
 Moisture : Moist to 7 inches and below 4 feet; usually moist throughout
 Watertable : None
 Stoniness : Few fine water worn gravels throughout, mainly feldspar and quartz
 Salt or Alkali : None observed
 Erosion : Slight water erosion
 Sampled by : R. K. Danadill, J. B. Brown, R. H. Jordan, and L. G. Shields; August 14, 1963
 Described by : J. B. Brown

Horizon and
 Lincoln
 Lab. No.

A11 0 to 7 inches. Very dark brown (10YR 2/2, moist) sandy loam; dark grayish brown (10YR 4/2, dry); weak coarse subangular blocky structure; hard when dry, loose when moist; noncalcareous; gradual smooth boundary.
 18662
 A12 7 to 15 inches. Very dark brown (10YR 2/2 moist) sandy loam; dark grayish brown (10YR 4/2 dry); weak coarse subangular blocky structure; hard when dry, loose when moist; noncalcareous; clear smooth boundary.
 18663
 A3 15 to 20 inches. Brown (10YR 4/3 moist) sandy loam; pale brown (10YR 5/3 dry); weak coarse subangular blocky structure; hard when dry, loose when moist; noncalcareous; clear smooth boundary.
 18664
 B21t 20 to 24 inches. Brown (10YR 4/3 moist) and brown (10YR 5/3 dry); heavy coarse sandy loam; moderate medium prisms breaking to moderate medium subangular blocks; very hard when dry, friable when moist; noncalcareous; thin nearly continuous clay films; clear smooth boundary.
 18665
 B22t 24 to 34 inches. Dark yellowish brown (10YR 4/4 moist) sandy clay loam; yellowish brown (10YR 5/4 dry); moderate coarse prisms breaking to moderate medium and coarse angular blocks; extremely hard when dry, firm when moist; noncalcareous; thin nearly continuous clay films; clear smooth boundary.
 18666
 B3 34 to 41 inches. Yellowish brown (10YR 5/4 moist) coarse sandy loam; pale brown (10YR 6/3 dry); weak coarse subangular blocky structure; extremely hard when dry, very friable when moist; noncalcareous; thin patchy clay films on vertical faces; few weakly cemented sandy bands 1/2 inch thick; gradual smooth boundary.
 18667
 C1 41 to 48 inches. Pale brown (10YR 6/3 moist) coarse sand; very pale brown (10YR 7/3 dry); massive structure; hard when dry, loose when moist; noncalcareous; clear smooth boundary.
 18668
 C2 48 to 68 inches. Light brownish gray (2 1/2Y 6/2 moist) coarse sand; light gray (2 1/2Y 7/2 dry); massive structure; hard when dry, loose when moist; noncalcareous; weakly cemented sandy bands 1/4 to 1 1/2 inches thick and 1 to 2 inches apart are present throughout the C horizon.
 18669

Remarks: The light colored layer at 15 to 20 inches may be an A2 rather than an A3 horizon; it is seldom visible when the sandy loam A horizon is less than 12 inches thick. Feldspar sands and gravels are numerous throughout the profile. These soils are extensive in Douglas County at elevations of more than 6700 feet.

Bureau of Public Roads Samples: A12, B22t, and C2 horizons.

Mineralogy:

Observations on fine sand (Method 7B1): All, B22t, and C1 horizons. 65 to 70 percent feldspar, 20 to 25 percent quartz, and 5 to 10 percent accessory minerals. Potassium feldspar (orthoclase) predominates; a few plagioclase were observed. Accessory minerals identified: mica, amphibole (hornblende), zircon, opesque, chert, and plant opal (All horizon).

Clay mineralogy (Method 7A1, 7A2): C2 horizon. The C2 horizon contains a moderate amount of kaolinite and small amounts of montmorillonite and mica (or illite). The mica and kaolinite are well crystallized; the montmorillonite is of fair crystalline quality. The fine clay is poorly crystallized montmorillonite and kaolinite. The clay mineralogy is mixed.

SOIL *Peyton sandy loam SOIL Nos. S63Colo-18-6 LOCATION Douglas County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18670-18678 March 1967

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

Depth (in.)	Horizon	Size class and particle diameter (mm)											3Alb	3A1		3A2 Coarse fragments &	
		Total												3Alb	3B1 > 2 (< 19) Pct.	3B2 > 2 (< 19) Vol. Pct.	
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Vary coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)					(2-0.1)
Pct. of < 2 mm																	
0-4	A11	70.0	19.3	10.7	1.7	8.6	12.3	26.8	20.6	12.9	6.4	48.8	49.4		2	1	
4-11	A12	71.9	16.9	11.2	1.8	8.8	12.9	27.3	21.1	10.5	6.4	47.7	50.8		3	2	
11-14	A3	66.8	17.8	15.4	2.3	8.3	11.0	24.9	20.3	11.3	6.5	46.0	46.5		3	2	
14-18	B21t	63.0	18.1	18.9	1.9	6.9	10.0	23.2	21.0	12.7	5.4	47.3	42.0		1		
18-30	B22t	47.5	27.2	25.3	1.0	4.9	5.8	14.4	21.4	15.6	11.6	45.7	26.1		tr		
30-41	B23t	52.6	26.1	21.3	1.2	6.2	6.9	15.8	22.5	16.2	9.9	48.5	30.1		tr		
41-53	B24t	44.9	32.7	22.4	2.0	6.0	4.4	10.4	22.1	19.3	13.4	48.0	22.8		tr		
53-64	I11c2	69.4	15.2	15.4	16.4	14.4	8.8	16.2	13.6	9.2	6.0	32.2	55.8	8.7	20	12	
64-72	I11c	52.3	25.8	21.9	4.2	8.7	7.0	15.6	16.8	13.1	12.7	39.2	35.5		6	3	

Depth (in.)	6A1a		6B1a		Ext. Iron as Fe Pct.	6E2a Carbonate as CaCO ₃ Pct.	Bulk density				4D1 COLE	Water content				8C1a (1:1)	
	Organic carbon %	Nitrogen %	C/N	4A1a Field State g/cc			4A1d 1/3-Bar g/cc	4A1d 1/3-Bar g/cc	4A1b Air Dry g/cc	4B4 Field State Pct.		4B1c 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-to-15-Bar	pH		
0-4	1.93	0.141	14				1.43	1.44	1.45	1.45	-	13.4	13.8	5.4	0.12		5.8
4-11	0.99	0.090	11				1.46	1.39	1.42	1.44	0.003	4.0	13.1	5.0	0.12		6.2
11-14	0.55	0.062	9				1.52	1.43	1.46	1.50	0.010	4.4	14.4	5.6	0.13		6.4
14-18	0.51	0.052	10				1.56		1.50	1.55	0.010	4.8	13.8	7.2	0.10		6.7
18-30	0.37	0.039	9				1.73		1.60	1.74	0.028	8.1	17.5	10.0	0.12		6.5
30-41	0.21						1.60		1.52	1.60	0.017	6.6	16.4	8.5	0.12		6.6
41-53	0.18				(s)		1.62		1.52	1.62	0.020	7.6	16.3	9.1	0.11		6.8
53-64	0.10				(s)		1.66	1.38	1.59	1.66	0.014	7.7	14.3	6.3	0.13		7.0
64-72	0.06				(s)		1.56	1.44	1.48	1.59	0.024	11.8	19.6	9.0	0.16		7.1

Depth (in.)	Extractable bases				5B1a Sum	6B1a Ext. Acidity	5A3a Cations		5A1a NH ₄ OAc	8D3 Ca/Mg	Base saturation	
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K			5A3a Sum	5A1a			5C3 Sum	5C1 Cations
	mg/100 g										Pct.	Pct.
0-4	5.5	1.2	tr	0.5	7.2	4.7	11.9	9.0		4.6	61	80
4-11	6.2	1.6	tr	0.3	8.1	2.9	11.0	8.6		3.9	74	94
11-14	6.8	2.3	tr	0.3	9.4	2.2	11.6	9.5		3.0	81	99
14-18	7.7	4.4	tr	0.3	12.4	2.5	14.9	10.9		1.8	83	114
18-30	10.5	3.8	0.1	0.4	14.8	2.9	17.7	16.2		2.8	84	91
30-41	12.0	4.3	0.1	0.3	16.7	1.9	18.6	13.8		2.8	90	121
41-53	11.2	4.1	0.2	0.4	15.9			15.0		2.7		106
53-64	7.4	2.6	0.1	0.2	10.3			9.8		2.8		105
64-72	11.1	3.4	0.2	0.3	15.0			13.9		3.3		108

Depth (in.)	Ratios to Clay 8D1	
	NH ₄ OAc CEC	15-Bar Water
0-4	0.84	0.50
4-11	0.77	0.45
11-14	0.62	0.36
14-18	0.58	0.38
18-30	0.64	0.40
30-41	0.65	0.40
41-53	0.67	0.41
53-64	0.64	0.41
64-72	0.63	0.41

a. No greater than 19-mm. material to 53 inches, less than 10 percent by volume from 53-72 inches.
b. 10 kg/m² to 60 inches (Method 6A).
c. Calculated to include volume but not weight of 2-19 mm. material (Method 3B2).

Soil Type : *Peyton sandy loam
 Soil Nos. : 963Colo-18-6
 Location : 1270 feet north, 1620 feet west of the east quarter corner of Section 33, T10S, R65W, Douglas County, Colorado
 Climate : Continental, average annual precipitation 20 inches. Mean annual temperature 44 degrees F. Growing season 120 days. Elevation 7200 feet.
 Vegetation : Native pasture; blue grama, western wheatgrass, fringed sage and snakeweed
 Parent Material : Aeolian, probably local, from the Dawson arkose formation
 Physiographic Position : Upland
 Relief : Sloping, 10 percent southeast facing slope. Slope about 100 feet in length; pit dug near the base of the slope
 Drainage : Surface drainage rapid; internal drainage moderate; moderate to rapid intake rate
 Moisture : Moist to 10 inches and below 36 inches. Usually moist throughout
 Watertable : None
 Stoniness : None
 Salt or Alkali : None
 Erosion : Slight water erosion
 Sampled by : R. K. Dansgill, J. B. Brown, R. H. Jordan, and L. G. Shields; August 14, 1963
 Described by : J. B. Brown

Horizon and
 Lincoln
 Lab. No.

All 18670 0 to 4 inches. Very dark brown (10YR 2/2 moist) sandy loam; dark grayish brown (10YR 4/2 dry); weak fine granular structure; hard when dry, very friable when moist; noncalcareous; much rodent and ant activity in this horizon; clear smooth boundary.

A12 18671 4 to 11 inches. Very dark brown (10YR 2/2 moist) sandy loam; dark grayish brown (10YR 4/2 dry); very weak coarse subangular blocky structure; hard when dry, very friable when moist; rodent and ant activity evident; clear smooth boundary.

A3 18672 11 to 14 inches. Dark gray (10YR 4/1 moist and crushed) sandy loam; grayish brown (10YR 5/2 dry); very weak coarse subangular blocky structure; hard when dry, very friable when moist; clear smooth boundary.

B21t 18673 14 to 18 inches. Brown (10YR 4/3 moist) heavy sandy loam; brown (10YR 5/3 dry); weak to moderate coarse subangular blocky structure; very hard when dry, firm when moist; thin patchy clay films with some sand grains on ped surfaces; clear smooth boundary.

B22t 18674 18 to 30 inches. Brown (10YR 4/3 moist and crushed) and light yellowish brown (10YR 6/4 dry) sandy clay loam; moderate to medium prisms breaking to moderate to medium angular blocks; extremely hard when dry, very firm when moist; noncalcareous; thin nearly continuous clay films; few sandy loam pockets; gradual smooth boundary.

B23t 18675 30 to 41 inches. Brown (10YR 5/3 moist) sandy clay loam; pale brown (10YR 6/3 dry); moderate medium to coarse prisms breaking to moderate medium to coarse angular blocks; very hard when dry, firm when moist; noncalcareous; thin patchy clay films; few bands about 1/4 inch wide of sandy loam material; gradual smooth boundary.

B24t 18676 41 to 53 inches. Brown (10YR 5/3 moist) sandy clay loam; pale brown (10YR 6/3 dry); weak coarse prisms breaking to weak to moderate coarse subangular blocks; hard when dry, firm when moist; noncalcareous; a few thin patchy clay films; thin sandy bands; gradual smooth boundary.

IIB2 18677 53 to 64 inches. Light brownish gray (2.5Y 6/2 moist) loamy coarse sand; light gray (2.5Y 7/2 dry); weak coarse subangular blocky structure; hard when dry, loose when moist; noncalcareous; few thin patchy clay films; bands of sandy loam and coarse sand or gravelly sand are common; clear smooth boundary.

IIIC 18678 64 to 72 inches. Light brownish gray (2.5Y 6/2 moist) sandy loam; light gray (2.5Y 7/2 dry); massive structure; hard when dry, very friable when moist; noncalcareous; iron bands 1/2 to 2 inches wide with colors of reddish yellow to strong brown are present.

Remarks: This soil is primarily from aeolian material underlain by either the Dawson formation or outwash material from the Dawson formation. This pedon is thought to be within the Peyton series as it occurs at elevations over 6700 feet.

Bureau of Public Roads Samples: B22t and IIB2 horizons.

Mineralogy:

Observations on very fine sand (Method 7B1): All, B22t, and IIIC horizons. 75 to 80 percent feldspar, 15 to 20 percent quartz, and 1 to 5 percent accessory minerals. Potassium feldspar (orthoclase) predominates; a few plagioclase were observed. Accessory minerals identified: mica, amphibole (hornblende), zircon, opaques, chert, pyroxene, and plant opal.

Clay mineralogy (Method 7A1, 7A2): IIB2 horizon. The clay contains moderate to abundant amounts of montmorillonite and kaolinite, and a small to moderate amount of mica (or illite). All are well-crystallized. Traces of feldspar are present. The fine clay is rather poorly-crystallized montmorillonite and kaolinite. The clay mineralogy is montmorillonitic.

SOIL TYPE Platner LOCATION Morgan County, Colorado
 fine sandy loam

SOIL NOS. S59Colo-44-9 LAB. NOS. 10887-10897

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)									2A2 > 2 (19mm)	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	0.02-0.002		
0-3 1/2	A11	2.8	7.2	6.9	16.5	21.4	30.4	14.8	49.7	11.5	Tr.	fsl
3 1/2-7	A12	3.7	6.8	6.8	15.7	17.9	30.0	19.1	43.6	13.4	3	l
7-8 1/2	A2B	2.4	6.0	7.4	17.6	18.0	26.0	22.6	45.6	8.7	Tr.	scl
8 1/2-14	B21t	3.8	7.7	7.4	17.7	16.4	21.8	25.2	40.1	8.4	4	scl
14-20	B22t	1.4	4.2	5.1	12.1	12.8	29.9	34.5	37.6	12.1	3	cl
20-23	B3	3.9	5.3	5.2	12.7	13.2	30.8	28.9	38.7	12.9	5	cl
23-27	B3ca	0.3a	1.3a	1.7a	5.7a	10.9a	50.6	29.5	38.9	26.3	Tr.	sicl/cl
27-36	Cca	0.2a	1.0a	2.4a	8.9a	17.2a	49.3	21.0	47.4	24.9	-	l
36-43	C1	0.2a	2.2a	7.6a	45.0a	27.0a	7.0	11.0	60.1	3.7	Tr.	lfs
43-52	C2	0.2a	2.7a	5.8a	19.9a	27.9a	24.7	18.8	55.3	10.4	Tr.	vfsl
52-64	C3	2.5a	4.2a	5.8a	24.0a	29.3a	19.6	14.6	56.2	8.9	Tr.	vfsl
pH		ORGANIC MATTER				8A2	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM	6E1a	6F1a	MOISTURE TENSIONS		
8C1a	1:5	1:10	6A1a ORGANIC CARBON	6B1a NITROGEN	C/N	EST. SALT (BUREAU CUP)	8A1a	CaCO ₃ equiv- alent	GYP SUM me./100g SOIL	1/20 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.
1:1			%	%				%		%	%	%
6.8			1.15	0.100	12	0.20	0.4	4	4			6.7
6.8			0.81	0.079	10	0.20	0.4	4	4			7.9
6.9			0.79	0.082	10	0.20	0.4	4	4			9.3
7.0			0.58	0.064	9	0.20	0.4	4	4			11.5
7.2			0.61	0.070	9	0.20	0.4	4	4			15.6
7.6			0.51	0.059	9	0.20	0.7	4	4			13.0
8.1			0.59	0.058	10	0.20	0.8	15	4			16.0
8.5			0.30			0.20	0.6	14	4			12.8
8.7			0.06			0.20	0.8	4	4			4.6
8.6			0.06			0.20	1.0	6	4			7.7
8.5			0.06			0.20	1.4	4	4			6.5
5A1a	EXTRACTABLE CATIONS					5B1a	5D2	8A1 SATURATION EXTRACT SOL.		4A1h	8A	
CATION EXCHANGE CAPACITY MEQ/AC	6N2b Ca	6O2b Mg	6H1a H	6F2a No	6O2a K	EXCH. No %	6P1a No	6Q1a K		O. D. Bulk Density g/cc	MOISTURE AT SATURATION %	
	milliequivalents per 100g. soil						milliequivalents per liter					
11.7	7.2	2.0	3.0	<0.1	1.5	4	0.3	1.0			39.5	
13.6	8.7	2.6	3.2	<0.1	1.6	4	0.3	1.1			36.8	
15.5	9.8	3.5	3.0	<0.1	1.7	4	0.3	0.9			40.0	
18.4	11.6	4.5	2.7	<0.1	2.0	4	0.3	0.4			47.4	
25.9	16.6	7.0	2.5	0.1	3.0	4	0.4	1.6			59.1	
23.5	18.3	6.8	1.2	0.2	3.0	1	0.8	1.8			52.7	
24.8				0.4	3.6	1	1.4	1.4			60.0	
21.5				0.6	3.4	2	2.0	1.2		1.37	52.1	
9.6				0.5	1.5	4	3.4	1.1			32.0	
16.2				1.5	2.4	8	4.8	1.2			37.1	
13.8				1.2	2.1	6	7.0	1.5			38.1	

a. Trace carbonate concn. (CaCO₃?)

Soil Type: Flatner fine sandy loam

Soil Nos.: S59Colo-44-9

Field classification: Chestnut.

Location: 75 feet north, 1,350 feet east, west quarter corner, Sec. 3, 16N, R58W, Morgan County, Colorado.

Photo: YB-1F-48.

Climate: Continental, average annual precipitation 13-15 inches. Elevation 4,750 feet. Frost-free season 146 days.

Mean annual temperature 48° F.

Vegetation: Blue grass, buffalograss, cacti.

Parent material: Tertiary outwash.

Physiographic position: Upland.

Relief: Gently sloping 1-2 percent slope.

Aspect: Southeast-facing.

Drainage: Slow external, slow to medium internal.

Moisture: Moist to 27 inches at time of sampling.

Stoniness: Outwash gravels to 40 inches.

Water table: None observed.

Erosion: Slight.

Salt or alkali: None observed except calcium carbonate.

Described by: Clayton F. Spears, May 7, 1959.

Remarks: Many krotovinas of insects and worms from B2E through the Cca.

Horizon and

Lincoln

Lab. Nos.

- A11 0 to 3½ inches. Grayish brown (10YR 5/2 dry) to dark brown (10YR 3/2.5 moist and crushed) fine sandy loam; weak to moderate medium crumb structure breaking to weak to moderate fine crumbs; soft when dry, very friable when moist; noncalcareous; lower boundary clear and smooth.
- A12 3½ to 7 inches. Grayish brown (10YR 5/2 dry) to dark brown (10YR 3/2.5 moist and crushed) fine sandy loam; weak coarse subangular blocky structure breaking to moderate medium crumbs; soft when dry, very friable when moist; noncalcareous; lower boundary clear and smooth.
- A2B 7 to 8½ inches. Gray to light brownish gray (10YR 6/1.5 dry) to dark brown (10YR 3.5/3 moist and crushed) fine sandy loam; weak medium subangular blocky structure; slightly hard when dry, very friable when moist; very thin patchy clay skins on vertical face of soil aggregates; the aggregates in this horizon have coatings on their surface of gray (10YR 6/1 dry) bleached sand and silt particles; this graying is most evident when dry; noncalcareous; lower boundary abrupt and smooth.
- B21t 8½ to 14 inches. Brown (10YR 4.5/3 dry) to dark brown (10YR 3/3 moist, 10YR 3.5/3 crushed) clay loam; moderate to strong fine prismatic structure breaking to moderate to strong medium and fine subangular blocks, hard when dry, firm when moist; moderate continuous clay skins on vertical and horizontal faces of soil aggregates; noncalcareous; lower boundary clear and wavy.
- B22t 14 to 20 inches. Dark grayish brown (10YR 4/2 dry, streaks of 10YR 3.5/2 dry) to very dark grayish brown (10YR 3/2 moist and crushed) clay loam; strong fine prismatic structure breaking to strong fine subangular blocks; hard when dry, firm when moist; moderate continuous clay skins on vertical and horizontal faces of soil aggregates; noncalcareous; lower boundary clear and wavy.
- B3 20 to 23 inches. Pale brown to brown (10YR 5.5/3 dry) to dark brown (10YR 4/3 moist and crushed) clay loam; moderate medium prismatic structure breaking to weak to moderate medium subangular blocks; slightly hard when dry, friable when moist; very thin patchy clay skins on vertical face of soil aggregates; slightly calcareous; lower boundary clear and wavy.
- B3ca 23 to 27 inches. Very pale brown (10YR 7.5/3 dry) to pale brown (10YR 5.5/3 moist, 1.25Y 5/3 crushed) loam; weak coarse prismatic structure breaking to weak medium and coarse subangular blocks; soft when dry, very friable when moist; very strongly calcareous; visible line in form of seams and small soft concretions; lower boundary clear and wavy.
- Cca 27 to 36 inches. Very pale brown (10YR 8/3 dry) to pale brown (10YR 6/3 moist and crushed) loam; massive; hard when dry, firm when moist; very strongly calcareous; a moderate horizon of lime accumulation; lower boundary clear and smooth.
- C1 36 to 43 inches. Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) light loamy sand; massive; slightly hard when dry, friable when moist; strongly calcareous; lower boundary clear and smooth.
- C2 43 to 52 inches. Very pale brown (10YR 7/3 dry) to pale brown (10YR 5.5/3 moist) fine sandy loam; massive; soft when dry, friable when moist; strongly calcareous; lower boundary clear and smooth.
- C3 52 to 64 inches. Very pale brown to light yellowish brown (10YR 6.5/4 dry) to yellowish brown (10YR 5/4 moist and crushed) fine sandy loam; massive; slightly hard when dry, friable when moist; strongly calcareous; lower boundary clear and smooth.
- C4 64 to 74 inches. Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) sand; massive; slightly hard when dry, friable when moist; strongly calcareous; lower boundary gradual and smooth.
- C5 74 to 84 inches. Brownish yellow (10YR 6/5 dry) to yellowish brown (10YR 5/5 moist) loamy coarse sand; massive; slightly hard when dry, friable when moist; strongly calcareous; lower boundary clear and smooth.
- C6 84 to 90 inches. Yellowish brown (10YR 5/5 dry) to dark yellowish brown (10YR 4/5 moist) coarse sand; massive; slightly hard when dry, friable when moist; strongly calcareous; lower boundary clear and smooth.
- C7 90 to 95 inches. Very pale brown (10YR 6.5/4 dry and moist) coarse sand; massive; slightly hard when dry, friable when moist; very strongly calcareous; lower boundary clear and smooth.
- C8 95 to 105 inches. Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) sand; massive; slightly hard when dry, friable when moist; slightly calcareous.

Bureau of Public Roads Samples:

- A12 3½-7 inches
 B22t 14-20 inches
 Cca 27-36 inches

SOIL SURVEY LABORATORY Lincoln, Nebr. January 1960

SOIL TYPE Platner LOCATION Morgan County, Colorado
 fine sandy loam

SOIL NOS. 8590Colo-44-10 LAB. NOS. 10898-10907

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm. (per cent))								2A2 > 2 ($< 19\mu$)	TEXTURAL CLASS	
		1B1a VERY COARSE SAND 2.1	COARSE SAND 1.0-5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.075	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02 0.02-0.002			
0-4 $\frac{1}{2}$	A11	5.6	13.8	13.7	22.6	19.2	17.5	7.6	40.7	7.0	5	sl
4 $\frac{1}{2}$ -8 $\frac{1}{2}$	A12	4.5	10.4	11.0	20.5	19.9	21.6	12.1	43.8	8.3	6	fs1
8 $\frac{1}{2}$ -11	A2B	3.3	9.0	9.7	20.1	19.2	21.0	17.7	42.5	8.2	4	fs1
11-14	B21t	1.3	5.8	6.9	15.3	15.7	21.8	33.2	37.0	8.9	Tr.	scl/cl
14-19	B22t	0.2	1.9	2.9	8.3	13.4	32.9	40.4	38.3	13.2	Tr.	c/cl
19-21	B3	0.3	1.5	2.2	7.9	16.7	37.4	34.0	43.0	16.4	Tr.	cl
21-25	B3ca	0.2a	1.2a	2.0a	9.5a	20.8a	41.0	25.3	49.8	18.6	Tr.	l
25-34	Cca	0.4a	2.2a	4.1a	18.9a	28.7a	28.7	17.0	56.2	13.5	Tr.	vfsl
34-43	C1	4.8a	8.8a	10.3a	27.6a	28.3a	10.0	10.2	50.5	3.7	Tr.	fs1/lf
43-60	C2	1.8b	2.4b	2.8b	5.0b	20.2b	48.5	19.3	53.8	17.6	Tr.	l
pH		ORGANIC MATTER				8A2	ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM	6E1a	6F1a	MOISTURE TENSIONS		4B2
8C1a	1:5	1:10	ORGANIC CARBON	NITROGEN	C/N	EST% SALT (BUREAU CLIP)	CoCO ₃ equivalent	GYP SUM mo./100g. SOIL	1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.	
1:1			%	%			%		%	%	%	
7.2			0.56	0.054	10	<0.20	0.5	Δ	Δ		3.7	
7.1			0.44	0.048	9	<0.20	0.5	Δ	Δ		5.0	
7.3			0.43	0.048	9	<0.20	0.5	Δ	Δ		8.4	
7.6			0.60	0.075	8	<0.20	0.7	Δ	Δ		15.6	
8.0			0.57	0.075	8	<0.20	0.7	Δ	Δ		17.9	
8.2			0.52	0.064	8	<0.20	1.1	1	Δ	Δ	15.0	
8.4			0.43	0.049	9	<0.20	1.6	3	Δ	Δ	12.8	
8.4			0.22			<0.20	2.6	10	Δ	Δ	9.1	
8.4			0.06			<0.20	4.0	3	Δ	Δ	4.2	
7.8			0.08			0.59	7.5	13	Δ	Δ	9.1	
5A1a		EXTRACTABLE CATIONS				5B1a	5D2	SATURATION EXTRACT SOL.		8A		
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6H1a	6P2a	6Q2a	EXCH. No %	6P1a	6Q1a	O. D. Bulk Density g/cc		MOISTURE AT SATURATION %	
	Ca	Mg	H	No	K		Na	K				
	milliequivalents per 100g. soil						milliequivalents per liter					
6.6	4.7	1.1	1.5	<0.1	0.8	<1	0.3	0.9			25.6	
8.0	5.2	1.8	2.0	0.1	1.0	1	1.1	0.8			27.6	
11.8	7.2	2.6	1.7	0.5	1.4	3	2.5	0.6			33.9	
24.1	14.2	6.4	2.0	1.6	2.5	6	4.0	0.6			54.8	
31.8	19.1	9.2	1.5	2.5	3.4	7	4.6	0.6			72.9	
28.6	22.5	8.7	0.2	2.6	3.2	8	6.7	0.8			60.5	
24.5				2.8	2.9	9	10.2	1.1			53.9	
14.4				2.3	1.9	11	16.0	1.5			43.7	
8.0				1.6	1.1	12	20.5	2.1			29.0	
14.9				2.9	2.3	11	32.5	3.6			38.9	

a. Trace carbonate concn. (CaCO₃?).
 b. Few carbonate concn. (CaCO₃?).

Soil Type: Flatner fine sandy loam
 Soil Nos.: 8590016-44-10
 Field classification: Chestnut.
 Location: 800 feet south, 80 feet east of northwest corner, Sec. 17, T5N, R55W, Morgan County, Colorado.
 Photo: YE-67-53.
 Climate: Continental, average annual precipitation 13-15 inches. Elevation 4,550 feet. Frost-free season 146 days.
 Mean annual temperature 48° F.
 Vegetation: Grass, threecorn, buffalograss, few annual weeds.
 Parent material: Tertiary outwash.
 Physiographic position: Upland.
 Relief: Gently sloping, 1-2 percent slope.
 Aspect: Southeast.
 Drainage: External drainage slow, internal drainage moderate to slow.
 Moisture: Moist to 25 inches at time of sampling.
 Water table: None observed.
 Stoniness: Few small outwash gravels All through Cca.
 Salt or alkali: None observed other than calcium carbonate.
 Erosion: Slight wind and water.
 Described by: Clayton F. Spears, May 7, 1959.
 Remarks: Many medium and small krotovinas of insects and worms from B21 through the Cca.

Horizon and
 Lincoln
 Lab. No.

- A11
10898 0 to 4½ inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2.5 moist and crushed) fine sandy loam; weak medium crumb structure; soft when dry, very friable when moist; noncalcareous; lower boundary clear and smooth.
- A12
10899 4½ to 8½ inches. Grayish brown (10YR 5/2 dry) to dark brown (10YR 3/3 moist and crushed) sandy loam; very weak coarse subangular blocky structure breaking to weak medium crumbs; soft when dry, very friable when moist; noncalcareous; lower boundary clear and smooth.
- A2B
10900 8½ to 11 inches. Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 4/2.5 moist, 10YR 4/2 crushed) sandy loam; weak medium subangular blocky structure; slightly hard when dry, friable when moist; very thin patchy clay skins on vertical faces of soil aggregates; the aggregates in this horizon have gray coatings on their surface of gray (10YR 6/1 dry) bleached sand and silt particles which are most evident when dry; noncalcareous; lower boundary abrupt and smooth.
- B21t
10901 11 to 14 inches. Dark grayish brown (10YR 4/2.5 dry) to very dark grayish brown (10YR 3/2 moist and crushed) clay loam; strong fine prismatic structure breaking to strong fine subangular blocks; hard when dry, firm when moist; moderate continuous clay skins on both vertical and horizontal faces of soil aggregates; some graying on tops of prisms; noncalcareous; lower boundary clear and smooth.
- B22t
10902 14 to 19 inches. Brown (10YR 4.5/3 dry) to dark brown (10YR 3/3 moist, 10YR 3.5/3 crushed) clay loam; strong fine prismatic structure breaking to strong fine subangular blocks; very hard when dry, firm when moist; moderate continuous clay skins on both vertical and horizontal faces of soil aggregates; noncalcareous; lower boundary clear and wavy; this horizon shows some streaks of brown (10YR 5/3 dry).
- B3
10903 19 to 21 inches. Brown (10YR 5/3 dry) to dark brown (10YR 4/2.5 moist) (10YR 4/2 crushed) light clay loam; moderate medium prismatic structure breaking to moderate medium subangular blocks; hard when dry, friable when moist; thin nearly continuous clay skins on both vertical and horizontal faces of soil aggregates; very slightly calcareous; lower boundary clear and wavy; this horizon shows streaks of dark grayish brown (10YR 4/2 dry) and some patches of lime.
- B3ca
10904 21 to 25 inches. Pale brown (10YR 6.5/3 dry) to brown (10YR 5/3 moist, 10YR 4.5/3 crushed) very fine sandy loam; weak coarse prismatic structure breaking to weak coarse subangular blocks; slightly hard when dry, friable when moist; very strongly calcareous; visible lime in forms of streaks and medium soft concretions; lower boundary clear and smooth; this horizon shows some streaks of very pale brown (10YR 8/3 dry).
- Cca
10905 25 to 34 inches. Very pale brown (10YR 8/3 dry) to pale brown (10YR 6/3 moist, 10YR 5.5/3 crushed) loam; massive; hard when dry, friable when moist; very strongly calcareous; lower boundary clear and smooth.
- C1
10906 34 to 43 inches. Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist and crushed) light sandy loam; massive; slightly hard when dry, friable when moist; strongly calcareous; lower boundary clear and smooth.
- C2
10907 43 to 60 inches. Very pale brown (10YR 7/3 dry) to pale brown (10YR 5.5/3 moist and crushed) loam; massive; very strongly calcareous; lower boundary gradual and smooth.
- C3
60 to 92 inches. Very pale brown (10YR 7/3 dry) to pale brown (10YR 6/3 moist and crushed) sandy loam; massive; very strongly calcareous; lower boundary diffuse and smooth.
- C4
92 to 110 inches. Pale brown (10YR 6.5/3 dry) to brown (10YR 5.5/3 moist and crushed) sand and coarse sand; massive; strongly calcareous.

Bureau of Public Roads Samples:

- A12 4½-8½ inches
 B22t 14-19 inches
 Cca 25-34 inches

SOIL SURVEY LABORATORY Lincoln, Nebr. December 1958

SOIL TYPE Ptarmigan LOCATION Boulder County, Colorado
 gravelly sandy loam

SOIL NOS. 8570610-7-3

LAB. NOS. 7579-7584

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm) (wt. cent)									TEXTURAL CLASS	
		1B1a	2A2	3A1								> 2
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY			($< 19\mu$)	
		7-1	1-0.5	0.25-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002		
1 1/2-0	AoAoo										6	
0-4 1/2	A11	35.9a	16.7a	5.7a	8.8a	4.7a	20.0	8.2	17.3	11.6	40	cosl
4 1/2-10	A12	31.2a	17.6a	5.8a	9.3a	6.2a	21.7	8.2	20.4	12.3	36	cosl
10-14	B1r1	17.6a	13.6a	6.7a	16.7a	13.2a	27.9	4.3	36.5	14.0	26	cosl
14-21	B1r2	15.7a	11.3a	5.1a	12.4a	11.7a	33.5	5.3	36.2	21.3	16	cosl
21-28+	Cir	29.0a	19.9a	10.5a	19.6a	5.4a	11.7	4.0	19.8	6.0	69	lcos
pH 8C1a		ORGANIC MATTER				Free Iron	MOISTURE TENSIONS				4B2	
	1:5	1:10	6A1a	6B1a	C/N	Fe ₂ O ₃ ^{5p}	CoCO ₃ equiv- alent	1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.		
	1:1		%	%		6C1a	%	%	%	%		
5.4			4.74	0.349	14	0.8					12.0	
5.3			2.48	0.220	11	0.9					6.2	
5.2			1.02	0.093	11	1.2					4.2	
5.1			0.92	0.073	13	1.2					4.3	
5.1			0.33	0.015	22	0.8					2.9	
5A1a		EXTRACTABLE CATIONS				5B1a	BASE SAT. %	5C3	Sum	Sum	Ca/Mg	
	6N2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ Ac	Base Sat. %	Bases	Cations			
	Ca	Mg	H	Na	K	EACH.	on Sum	5B1a	5A3a			
	milliequivalents per 100g. soil					5C1	Cations	me/100g		8D3		
21.6	11.8	2.0	16.0	<0.1	0.4	66	47	14.2	30.2	5.9		
12.2	5.0	1.0	14.3	<0.1	0.2	51	30	6.2	20.5	5.0		
11.2	2.6	0.9	13.4	<0.1	0.2	33	22	3.7	17.1			
10.9	1.5	0.6	16.4	<0.1	0.2	21	12	2.3	18.7			
6.1	1.3	0.4	7.3	<0.1	0.2	31	21	1.9	9.2			

a. Few flakes of mica and few black minerals.

Soil Type: Ptarmigan gravelly sandy loam

Location: Niwot Ridge, approximately 300 yards south by west (approximately 260° bearing) from the first permanent rock monument east of the Tundra Laboratory, Boulder County, Colorado

Date of Sampling: July 2, 1957

Collectors: W. Osburn, A. J. Cline

Described by: A. J. Cline

Physiographic Position: Alpine ridge

Topography: Convex ridge side approximately 8 percent gradient.

Drainage: Well drained

Vegetation: Thick Kobresia bellardi sod, some Carex illinoides, and Geum rossii.

Use: National Forest land. (Alpine Experimental Fields)

Soil Nos.: S-57-Colo-7-3

Lincoln Laboratory Nos.: 7579-7584

1½-0 inches Organic horizon consisting of undecomposed and partially decomposed
A₀, A₀₀ Kobresia roots and plant remains.

LSI 7579

0-4½ inches Very dark gray (10YR 3/1 dry) to black (10YR 2/1 moist) gravelly
A₁₁ sandy loam; soft when dry, very friable when moist; moderate coarse
crumb structure; noncalcareous, approximate pH 6.0; lower boundary
clear and wavy; the temperature of this horizon on the day of
LSL sampling was approximately 42° F.
7580

4½-10 inches Very dark grayish brown (10YR 3/2 dry) to very dark brown (10YR
A₁₂ 2/2 moist) gravelly sandy loam; slightly hard when dry, very friable
when moist; moderate fine subangular blocky structure, breaking to
weak to moderate medium granules; noncalcareous, approximate pH
LSL 6.0; lower boundary gradual and smooth. The temperature of this
7581 horizon on the date of sampling was approximately 38° F.

10-14 inches Light yellowish brown (10YR 6/4 dry) to dark yellowish brown (10YR
B_{1r1} 4/4 moist) gravelly loam; slightly hard when dry, very friable when
moist; weak to moderate fine subangular blocky structure; noncal-
careous, approximate pH 4.6; there are a few indistinct thin patchy
LSL clay skins on some of the soil aggregates; the temperature on the
7582 date of sampling was approximately 32° F. Approximately 30% of this
horizon is gravel; lower boundary diffuse and smooth. The gravel
and rock fragments are coated on their underside with a very dark
brown (10YR 2/2 coating.)

14-21 inches Light yellowish brown or very pale brown (10YR 6.5/4 dry) to dark
B_{1r2} yellowish brown or yellowish brown (10YR 4.5/4 moist) stony loam;
slightly hard when dry, very friable when moist; weak to moderate
LSL medium subangular blocky structure, breaking to weak to moderate
7583 fine subangular blocks; noncalcareous, approximate pH 4.4; there are
a few indistinct thin patchy clay skins on some of the soil aggre-
gates; approximately 60% of this horizon is stone; the underside
of the stone fragments is coated with a dark brown (10YR 3/3 coating)
the temperature of the horizon on the date of sampling was approx-
imately 30° F; lower boundary diffuse and smooth.

21-28 / inches Pale brown (10YR 6/3 dry) to brown (10YR 4/3 moist). This horizon
C is principally weakly weathered Monzonite bedrock which may be
crushed in some places between the fingers and other places are
relatively indurated. The temperature of this horizon on the date
LSL of sampling is approximately 28° F.
7584

SOIL TYPE Pharmigan loam LOCATION Boulder County, Colorado

SOIL NOS. 957Colo-7-4

LAB. NOS. 7585-7590

DEPTH INCHES	HORIZON	1B1a PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	3A1		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	> 2		
2-0	A ₀ A ₀ c												
0-4	A1	13.4a	11.0a	6.8a	11.5b	6.5b	36.3	14.5	26.7	21.6	7	1	
4-10	AB	33.1a	16.1a	5.3a	8.6b	6.6b	21.2	9.1	19.7	12.7	32	cosl	
10-15	B1r1	18.9a	14.6a	7.1a	13.6b	10.3b	27.9	7.6	30.2	15.6	28	cosl	
15-26	B1r2	14.2a	11.8a	6.2a	13.8b	11.5b	34.3	8.2	34.7	19.1	18	cosl	
26-32+	C	27.8a	16.2a	6.4a	12.3b	9.9b	21.2	6.2	26.3	11.7	34	cosl	
pH		8C1a ORGANIC MATTER				Free Iron	MOISTURE TENSIONS						
1.1		1.10	6A1a ORGANIC CARBON	6B1a NITRO-GEN	C/N	Fe ₂ O ₃ ²⁺	CaCO ₃ equiv. alent	1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.			
5.5			%	%		6C1a	%	%	%	%			
4.8			11.60	0.733	16	1.5				20.1			
4.9			1.04	0.068	15	2.7				4.5			
4.7			1.06	0.095	11	2.5				5.6			
4.4			0.63	0.055	11	2.5				5.4			
			0.11			2.4				5.5			
5A1a CATION EXCHANGE CAPACITY (NH ₄ Ac)		EXTRACTABLE CATIONS					BASE SAT. * NH ₄ Ac EXCH.	5C3 Base Sat. % on Sum Cations	Sum Bases	Sum Cations	Ca/kg		
6N2b Ca		6O2b Mg	6H1a H	6P2a Na	6Q2a K			5H1a	5A3a				
		milliequivalents per 100g. soil					5C1	me/100g.		8D3			
11.2	2.2	1.0	32.2	<0.1	0.2	30	10	3.4	35.7	2.2			
12.2	2.7	0.8	14.3	<0.1	0.3	31	21	3.8	18.1				
14.0	1.1	0.4	17.6	<0.1	0.2	11	8	1.5	19.1				
13.3	0.7	0.2	18.0	<0.1	0.1	10	7	1.4	19.4				
14.1	1.4	0.8	14.4	<0.1	0.2	9	8	1.3	15.7				

a. Few flakes of mica and few black minerals.
 b. Common flakes of mica and few black minerals.

Soil Type: Ptarmigan loam

Location: Niwot Ridge, approximately 600 yards northwest (bearing 340°) from the Alpine Van. Locally the area is known as the northeast shoulder of the Van Knoll, Boulder County, Colorado.

Date of sampling: July 3, 1957

Collectors: W. Osburn, A. J. Cline Described by: A. J. Cline

Physiographic Position: Alpine Ridge

Topography: Convex shoulder of an Alpine Ridge having approximately 8 percent gradient.

Drainage: Well drained

Vegetation: Principally Kobresia bellardi

Use: National Forest land (Alpine Experimental Fields)

Soil Nos.: S-57-Colo-7-4 Lincoln Laboratory Nos.: 7585-7590

2-0 inches Organic horizon of undecomposed and partially decomposed Kobresia roots and plant remains.

LSL 7585

0-4 inches Very dark gray (10YR 3/1 dry) to black (10YR 2/1 moist) moderate coarse crumb structure; noncalcareous; on the date of sampling the temperature of this horizon was approximately 40° F; lower boundary gradual and wavy.

A₁
LSL
7586

4-10 inches Brown (10YR 5/3 dry) to dark brown (10YR 3.5/3 moist) loam; slightly hard when dry, very friable when moist; weak medium subangular blocky structure, breaking to moderate medium granules; noncalcareous, approximate pH 4.6; there are a few indistinct thin patchy clay skins on a few of the soil aggregates; in the date of sampling the temperature of this horizon was approximately 36° F; lower boundary gradual and smooth.

AB
LSL
7587

10-15 inches Light yellowish brown (10YR 6/4 dry) to dark yellowish brown (10YR 4/4 moist) loam; slightly hard when dry, very friable when moist; weak medium subangular blocky structure, breaking to moderate very fine subangular blocks; noncalcareous, approximate pH 4.6; there are a few indistinct patchy clay skins on a few of the aggregate faces; on the date of sampling the temperature of this horizon was approximately 30° F; lower boundary gradual and smooth. There are a few rock and gravel fragments in this horizon and their undersides are coated with a dark brown (10YR 3/3 coating).

Bir₁
LSL
7588

15-26 inches Light yellowish brown (10YR 6/4 dry) to dark yellowish brown (10YR 4/4 moist) stony sandy loam; slightly hard when dry, very friable when moist; weak medium subangular blocky structure; noncalcareous, approximate pH 4.4; on the date of sampling the temperature of this horizon was approximately 28° F; approximately 30% of the horizon is rock; the underside of the rock fragments is coated with dark brown (10YR 3/3 material); lower boundary gradual and smooth.

Bir₂
LSL
7589

26-32 inches Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist) stony loamy sand or sand; slightly hard when dry, very friable when moist; massive; noncalcareous; this horizon is mainly decomposed Monzonite; the temperature on the date of sampling was approximately 28° F.

C
LSL
7590

SOIL TYPE Ptarmigan LOAM LOCATION Boulder County, Colorado

SOIL NOS. S57CoLo-7-5

LAB. NOS. 7591-7596

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	0.2-0.02	0.02-0.002		3A1 2A2 > 2 < 19mm
2-0	A ₀ A ₀₀											
0-5	A1	11.4a	11.2a	5.3a	9.5a	6.0a	33.3	17.8	27.5	21.8	11	1
5-8	AB	17.7a	20.3a	7.4a	8.8a	5.8a	30.0	10.0	22.3	17.9	33	cos1
8-14	B1r1	8.5b	13.5b	7.0b	9.5b	7.4b	46.4	7.3	29.2	29.7	16	1
14-21	B1r2	7.5b	13.6b	6.9b	10.0b	7.5b	48.6	5.9	30.1	31.3	20	s1
21+	C	12.1b	12.5b	6.6b	10.5b	7.8b	44.3	6.2	29.2	28.5	22	s1
pH		ORGANIC MATTER				Free Iron	MOISTURE TENSIONS					
8C1a		6A1a	6B1a	C/N		Fe ₂ O ₃	CoCO ₃ equiv- alent	1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.		
1:1		1:10	ORGANIC CARBON %	NITRO-GEN %		6C1a	%	%	%	%		
4.9	5.1		12.27	0.809	15	1.8				23.1		
4.9			1.52	0.113	13	1.6				5.3		
5.0			1.18	0.087	14	3.9				5.3		
5.0			0.58	0.038	15	3.3				4.5		
5.0			0.16	0.017		3.6				3.3		
5A1a		EXTRACTABLE CATIONS				5B1a	BASE SAT.	5C3	Sum	Sum	Co/lb	
CATION EXCHANGE CAPACITY NH ₄ Ac		6N2b	6O2b	6H1a	6P2a	6Q2a	NH ₄ Ac EXCH.	Base Sat. % on Sum	Bases 5B1a	Cations 5A3a		
←		Ca	Mg	H	Na	K						
→		milliequivalents per 100g. soil					5C1	Cations	me/100g	8D3		
34.6	15.5	3.4	36.0	0.1	0.5	56	35	19.5	55.5	4.6		
14.2	4.0	1.1	15.1	<0.1	0.1	37	26	5.2	20.3	3.6		
13.1	1.7	0.5	19.3	<0.1	0.1	18	11	2.3	21.6			
9.8	1.1	0.3	14.3	<0.1	0.1	15	9	1.5	15.8			
6.7	0.9	0.6	7.3	<0.1	0.1	24	13	1.6	8.9			
a.		Few flakes of mica; few black minerals.										
b.		Few flakes of mica; few black minerals; few smooth light brown to dark brown concn. (Fe?)										

Soil Type: Ptarmigan loam

Location: About $\frac{1}{2}$ mile northeast (bearing 45°) from the Van Camp, Niwot Ridge, Boulder County, Colorado

Date of Sampling: July 3, 1957

Collectors: W. Osburn, A. J. Cline Described by: A. J. Cline

Physiographic Position: Alpine Ridge

Topography: South facing shoulder of Alpine Ridge having a gradient of approximately 5 percent.

Drainage: Well drained

Vegetation: Principally *Kobresia bellardi*

Use: National Forest Lands. (Alpine Experimental Field)

Soil Nos.: S-57-Colo-7-5 Lincoln Laboratory Nos.: 7591-7596

- 2-0 inches Organic horizon made up of undecomposed and partly decomposed
 A₀, A₀₀ Kobresia roots and plant remains; the temperature of this horizon
 LSL 7591 on the date of sampling was approximately 62° F.
- 0-5 inches Very dark gray (10YR 3/1 dry) to black (10YR 2/1 moist) loam; soft
 A₁ when dry, very friable when moist; moderate coarse crumb structure;
 LSL noncalcareous, approximate pH 5.8; the temperature of this horizon
 7592 on the date of sampling was approximately 58° F; lower boundary clear
 and wavy.
- 5-8 inches Dark grayish brown (10YR 4/2 dry) to very dark grayish brown (10YR 3/2
 AB moist) sandy clay loam; slightly hard when dry, very friable when
 moist; weak to moderate medium subangular blocky structure, breaking
 LSL to moderate very fine subangular blocks; noncalcareous, approximate
 7593 pH 4.8; there are a few indistinct clay skins on the surfaces of
 a few of the soil aggregates; the temperature of this horizon on the
 date of sampling was approximately 50° F; lower boundary clear and
 wavy.
- 8-14 inches Light yellowish brown (10YR 6/4 dry) to dark yellowish brown (10YR
 Bir₁ 4/4 moist) gravelly sandy clay loam; slightly hard when dry, very
 friable when moist; the upper one-inch of this horizon has a
 LSL moderate to strong fine platy structure, whereas the rest of this
 7594 horizon is weak medium subangular blocky breaking to moderate very
 fine subangular blocks; noncalcareous, approximate pH 4.4; there are
 a few indistinct clay skins on the surfaces of some of the soil
 aggregates; on the date of sampling the temperature of this horizon
 was approximately 42° F; lower boundary gradual and smooth. Approx-
 imately 20% of this horizon is gravel.
- 14-21 inches Light yellowish brown (10YR 6/4 dry) to dark yellowish brown (10YR
 Bir₂ 4/4 moist) gravelly sandy clay loam; approximately 40% of this
 horizon is gravel and stone; the underside of the stone and gravel
 LSL fragments are coated with a very dark brown (10YR 2/2 coating);
 7595 on the date of sampling the temperature of this horizon was approx-
 imately 38° F; lower boundary gradual and wavy.
- 21 / inches Pale brown (10YR 6.5/3 dry) to brown (10YR 5/3 moist) stony sandy
 C loam; slightly hard when dry, very friable when moist; massive;
 noncalcareous, approximate pH 5.8; approximately 70% of this horizon
 LSL is stone; the underside of the stone fragments is coated with very
 7596 dark brown (10YR 2/2 materials); on the date of sampling the
 temperature of this horizon was approximately 34° F.

SOIL SURVEY LABORATORY Lincoln, Nebr. December 1958

SOIL TYPE Ptarmigan loam LOCATION Boulder County, Colorado

SOIL NOS. S57Colo-7-6 LAB. NOS. 7597-7601

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						2A2
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	> 2 ($< 19\mu$)		
0-4 1/2	A1	2.6a	10.5a	8.5a	12.9a	6.4a	44.5	14.6	31.7	25.3	2	1	
4 1/2-7	AB	12.8a	15.7a	7.6a	10.6a	6.7a	34.0	12.6	25.2	20.9	14	cos1	
7-18	B1r	14.4a	17.0a	7.7a	11.3a	7.7a	37.5	4.4	30.0	21.0	27	cos1	
18-24	BC	16.7a	20.9a	9.2a	12.1a	7.7a	30.4	3.0	28.3	15.8	40	cos1	
24-30+	C	23.4a	25.9a	10.8a	11.6a	6.7a	18.9	2.7	21.9	9.2	45	lcos	
pH 8C1a		ORGANIC MATTER					Free Iron Fe ₂ O ₃ ^s	MOISTURE TENSIONS					
	1:5	1:10	6A1a ORGANIC CARBON	6B1a NITROGEN	C/N	6C1a	CoCO ₃ equiv- alent	1/10 ATMOS.	1/3 ATMOS.	1/2 ATMOS.			
			%	%		%	%	%	%	%		%	
	5.7		18.33	1.166	16	1.4						38.1	
	5.4		3.04	0.233	13	2.3						8.8	
	5.5		1.85	0.145	13	2.0						5.2	
	5.7		0.59	0.044	13	1.4						3.3	
	5.3		0.28			1.6						2.5	
5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6H1a	6P2a	6Q2a	BASE SAT. % NH ₄ Ac EXCH.	5C3 Base Sat. % on Sum	Sum Bases 5B1a	Sum Cations 5A3a	Ca/Mg			
	milliequivalents per 100g. soil					5C1	Cations	me/100g	8DB				
46.9	30.7	6.2	34.8	<0.1	1.2	81	52	38.1	72.9	5.0			
21.6	10.3	2.5	16.9	<0.1	0.2	60	43	13.0	29.9	4.1			
15.0	4.2	0.9	16.8	<0.1	0.1	35	24	5.2	22.0				
8.9	1.5	0.2	10.6	<0.1	<0.1	19	14	1.7	12.3				
6.7	0.6	0.3	8.6	<0.1	0.2	16	11	1.1	9.7				

a. Few flakes of mica. Also, few black minerals.

Soil Type: Ptarmigan loam
 Location: Niwot Ridge, approximately 3/4 mile north of the Alpine Van Camp,
 Boulder County, Colorado
 Date of Sampling: August 12, 1957
 Collectors: W. Osburn, A. J. Cline Described by: A. J. Cline
 Physiographic Position: Alpine Ridge
 Topography: Moderately sloping ridge side facing northwest and having a
 gradient of about 8 to 9 percent.
 Drainage: Well drained
 Vegetation: Chiefly Kobresia bellardi
 Use: National Forest lands. (Alpine Experimental Fields)
 Soil Nos.: S-57-Colo-7-6 Lincoln Laboratory Nos.: 7597-7601

- 1-0 inch A_0, A_{00} This is an organic horizon made up of undecomposed and partially decomposed Kobresia roots and plant remains. On the date of sampling the temperature of this horizon was approximately 72° F. Not sampled.
- 0-4 1/2 inches A_1 Very dark gray (10YR 3/1 dry) to black (10YR 2/1 moist) loam; soft when dry, very friable when moist; strong, coarse crumbs structure; noncalcareous; on the date of sampling the temperature of this horizon was approximately 60° F; lower boundary clear and smooth.
 LSL
 7597
- 4 1/2-7 inches AB Dark grayish brown (10YR 4/2 dry) to very dark grayish brown (10YR 3/2 moist) stony loam; soft when dry, very friable when moist; strong coarse crumb structure; noncalcareous, approximate pH 5.0; approximately 40% of this horizon is stone fragments; the lower sides of the stones are coated with a dark brown (10YR 3/2 and 2/2 substance); on the date of sampling the temperature of this horizon was approximately 54° ; lower boundary clear and wavy.
 LSL
 7598
- 7-18 inches Bir Yellowish brown (10YR 5/4 dry) to dark yellowish brown (10YR 3/4 moist) stony loam; slightly hard when dry, very friable when moist; weak medium subangular blocky structure, breaking to moderate medium granules; noncalcareous, approximate pH 4.8; there are a few thin patchy clay skins on the faces of some of the soil aggregates; approximately 50% of this horizon is stone fragments; the underside of the stone is coated with dark brown (10YR 3/3 material); on the date of sampling the temperature of this horizon was 52° F at 11" and 50° F at 15"; lower boundary gradual and irregular.
 LSL
 7599
- 18-24 inches BC Pale brown (10YR 6/3 dry) to brown or dark brown (10YR 4/3 moist) stony sandy loam; slightly hard when dry, very friable when moist; weak, fine subangular blocky structure, breaking to weak fine granules; noncalcareous, approximate pH 5.4; approximately 60% of this horizon is stone; the underside of the rock fragments is coated with dark brown (10YR 3/3 materials); on the date of sampling the temperature of this horizon at 23" was approximately 50° F; lower boundary gradual and wavy.
 LSL
 7600
- 24-30 inches C Pale brown (10YR 6/3 dry) to brown or dark brown (10YR 4/3 moist) stony loamy sand; slightly hard when dry, very friable when moist; massive to single grained; noncalcareous, approximate pH 5.8; approximately 80% of this horizon is stone; the temperature of this horizon on the date of sampling was 42° F at 30".
 LSL
 7601

SOIL SURVEY LABORATORY Lincoln, Nebr. (Revised 11/21/58)

SOIL TYPE Pteranigan LOCATION Grand County, Colorado
gravelly sandy loam

SOIL NOS.

LAB. NOS. 2800-2805

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a	2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.075	0.075-0.002	
0-5	A11	8.9	14.3	7.7	13.5	7.6	33.6	14.4	30.2	18.0	sl/1	
5-21	A12	16.5	12.1	7.3	15.3	12.2	25.5	11.1	34.5	12.6	co sl	
21-40	B2	10.1	9.3	6.9	18.7	17.2	34.7	3.1	44.4	19.1	fs l	
40-55	C1	11.1	15.4	9.6	20.7	13.8	20.1	9.3	34.0	12.0	co sl	
55-72	C2	6.8	9.4	7.0	18.3	16.2	26.5	15.8	38.5	15.4	fs l	
72-82	Cgf	14.8	13.2	8.6	21.4	14.6	20.4	7.0	36.3	11.5	co sl	
pH		ORGANIC MATTER				6C1a	MOISTURE TENSIONS					
8C1a	1.5	1:10	6A1a	6B1a	C/N	Free Iron	CaCO ₃ equiv- alent	GYPSUM mg./100g. SOIL	1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.	
1:1		%	%	%	% Fe ₂ O ₃	%	%	%	%	%	%	
5.1		11.10	0.798	14	1.1							
4.6		2.17	0.165	13	1.6							
4.8		0.38	0.032	12	1.1							
4.8		0.10	0.007		1.2							
4.8		0.08			1.7							
a		0.11			1.2							
5A1a	EXTRACTABLE CATIONS					5B1a	5C1	Base Sat.	Sum	Sum	Ca/Mg	
CATION EXCHANGE CAPACITY	5N2b	6O2b	6H1a	6P2a	6Q2a	Base Sat.	on Sum	on Sum	Bases	Cations	MOISTURE AT SATURATION	
NH ₄ Ac	Co	Mg	H	No	K	% NH ₄ Ac Exch.	Cations	me/100g	me/100g	me/100g	%	
	milliequivalents per 100g. soil						5C3	5H1a	5A3a	8D3		
33.6	19.4	4.1	28.3	0.1	0.7	72	46	24.2	52.5	4.7		
20.2	2.2	0.4	20.6	0.1	0.1	14	12	2.8	23.4			
10.3	0.2	0.3	10.3	0.1	0.1	7	6	0.7	11.0			
13.9	4.1	1.2	8.2	0.2	0.3	42	41	5.8	14.0	3.4		
15.3	8.0	2.6	5.6	0.2	0.4	73	67	11.2	16.8	3.1		
a	a	a	a	a	a							

a. Insufficient sample

Soil Type: Ptarmigan gravelly sandy loam
 Location: SW 1/4 of Sec. 26, T2S, R76W, Grand County, Colorado. Alpine turf, East St. Louis Alpine Area.
 Physiographic Position: Upland.
 Topography: Convex Alpine ridge crest.
 Drainage: Well drained above the permafrost layers.
 Vegetation: Sedges, mainly Kabresia.
 Use: National Forest Service lands.
 Collected and Described by: John L. Retzer, September 6, 1952.

Horizon and
 Lincoln
 Lab. No.

A11 0 to 5 inches. Black (10YR 2/1 dry to 10YR 2/0 moist) gravelly sandy loam; soft when dry, very friable when moist; moderate to strong fine granular structure; strongly acid, approximate pH 5.2; lower boundary clear and smooth.
 2800

A12 5 to 21 inches. Very dark gray (10YR 3/1 dry) to very dark brown (10YR 2/2 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; moderate to strong granular structure; very strongly acid, approximate pH 4.6; lower boundary clear and wavy.
 2801

B2 21 to 40 inches. Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; moderate to strong fine and very fine subangular blocky structure; very strongly acid, approximate pH 5.0; lower boundary clear and wavy.
 2802

C1 40 to 55 inches. Light yellowish brown (2.5Y 6/3 dry) to olive brown (2.5Y 4/4 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; very weak coarse subangular blocky structure or massive; very strongly acid, approximate pH 4.6; horizon contains many medium-sized distinct 5Y 5/6 and 10YR 5/4 mottles; lower boundary gradual and smooth. This horizon is believed to be the top of the frost zone. Rocks are well weathered and soft.
 2803

Cf 55 to 72 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/4 moist) gravelly sandy loam; extremely hard when frozen and in place but slightly hard when dry and very friable when moist if unfrozen; massive; very strongly acid, approximate pH 4.5; this horizon contains many large distinct 5Y 5/6 and 10YR 5/8 mottles. Lower boundary diffuse and smooth. It is thought that this horizon is frozen most of the year and may be a perpetual zone of permafrost in some areas.
 2804

Cgf 72 to 82 inches. Pale olive (5Y 6/3 dry) to olive (5Y 4/3 moist) gravelly sandy loam; extremely hard when frozen but slightly hard when dry and very friable when moist if unfrozen; massive; very strongly acid, approximate pH 4.5. It is thought that this represents a permanently frozen horizon.
 2805

SOIL SURVEY LABORATORY Lincoln, Nebr. 3/17/58

SOIL TYPE Ptarmigan LOAM LOCATION Grand County, Colorado

SOIL NOS. S55Colo-25-1 LAB. NOS. 2868-2872

DEPTH 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	2A2 > 2 19-75			
0-1 1/2	A11	13.3	6.4	2.9	5.4	6.0	47.8	18.2	29.8	27.2	7	1
1 1/2-6	A12	15.4	9.2	4.0	6.6	7.1	38.7	19.0	27.9	21.8	19	1
6-10	B1	36.2	11.9	3.6	5.1	6.3	25.0	11.9	20.3	14.1	29	cosl
10-23	B2	26.1	11.5	4.3	8.1	9.9	27.4	12.7	25.9	16.5	18	cosl
23-35+	C	76.9	8.2	0.7	0.8	1.0	7.4	5.0	3.9	5.0	71	lcos

pH		ORGANIC MATTER			Free Iron Fe ₂ O ₃	MOISTURE TENSIONS		
8C1a	8C1a	6A1a ORGANIC CARBON	6B1a NITRO-GEN	C/N	6C1a	1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.
	1.5	%	%			%	%	%
1.1	6.0	16.53	1.137	14				39.7
	5.8	12.96	.978	13	1.6			29.4
5.6		3.41	.300	11	2.0			10.7
5.4		0.58	.048	12	3.1			7.7
5.5		0.25	.016	16	1.3			3.9

5A1a CATION EXCHANGE CAPACITY NH ₄ AC	EXTRACTABLE CATIONS					5B1a BASE SAT. % NH ₄ AC EXCH.	Base Sat. % on Sum Cations	5B1a Sum Bases	5A3a Sum Cations	8D3 Ca/Mg
	6N2b Ca	6O2b Mg	6M1a N	6P2a Na	6Q2a K	5C1	5C3	me/100g	me/100g	
	milliequivalents per 100g. soil									
58.0	39.1	6.9	22.5	0.3	1.0	82	68	47.3	69.8	5.7
42.0	30.6	5.4	22.6	0.3	1.0	89	62	37.3	59.9	5.7
22.6	12.4	2.8	13.7	0.1	0.4	69	53	15.7	29.4	4.4
18.6	7.4	1.6	7.2	0.2	0.2	50	57	9.4	16.6	4.6
4.3	2.7	0.7	2.0	0.2	0.1	86	65	3.7	5.7	

Soil Type: Ptarmigan loam

Soil Nos.: S550olo-25-1

Location: Near the southwest corner of Sec. 2, T3S; R77W; Grand County, Colorado.

Physiographic Position: Upland, Alpine crest of mountain.

Topography: A moderately sloping to undulating plain. Sample was taken on a convex sloping area of approximately 8 percent, facing south. Elevation approximately 12,435 feet.

Drainage: Well drained.

Vegetation: Thick ground cover of Alpine grasses and sedges.

Use: Grazing land.

Collected and Described by: James Allen, A. Aandahl, J. Retzer, E. M. Payne, A. J. Cline, August 10, 1955.

Horizon and

Lincoln

Lab. No.

- A11 0 to 1½ inches. Very dark gray (10YR 3/1 moist or dry) to black (10YR 2/1 moist) loam; soft when dry, very friable when moist; moderate to strong fine and medium crumb structure; strongly acid; the horizon is thickly matted with grass and sedge roots; lower boundary clear and smooth.
2868
- A12 1½ to 6 inches. Very dark gray (10YR 3/1 dry) to black or very dark brown (10YR 2/1.5 moist) loam; soft when dry very friable when moist; moderate to strong, medium and coarse crumb and granular structure; strongly acid; the horizon is thickly matted with grass roots; lower boundary clear and wavy.
2869
- B1 6 to 10 inches. Yellowish brown (10YR 5.5/4 dry) to dark yellowish brown (10YR 4.5/4 moist) heavy gravelly loam; soft when dry, very friable when moist; moderate to strong fine and very fine subangular blocky structure breaking to fine and medium granules; strongly acid; the horizon has a very few very thin patchy tonhauthchen on both horizontal and vertical faces; lower boundary clear and wavy.
2870
- B2 10 to 23 inches. Light yellowish brown and yellowish brown (10YR 6/4 and 10YR 5/4 dry) to yellowish brown (10YR 5/4 moist) gravelly sandy clay loam; slightly hard when dry, friable when moist; moderate to strong very fine subangular blocky structure; very strongly acid; the horizon has a few thin patchy tonhauthchen on both horizontal and vertical faces of peds; lower boundary gradual and smooth.
2871
- C 23 to 35 inches plus. Fractured and weakly weathered gneiss and schist rocks.
2872

SOIL TYPE Rago LOCATION KIT CARSON CO., WYO.
 silt loam

SOIL NOS. S-54-Colo-32-3 LAB. NOS. 2570-2578

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY				
2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002				
0-3 1/2	Ap	0.2	0.5	0.2	0.6	21.4	55.6	21.5	55.8	21.6	-	sil
3 1/2-8	A3	0.1	0.5	0.3	0.6	20.5	54.6	23.4	58.9	16.6	-	sil
8-12 1/2	B21	-	0.2	0.1	0.3	12.4	47.7	39.3	45.6	14.7	-	sic1
12 1/2-19	B21b	-	0.2	0.1	0.3	11.5	47.7	40.2	39.8	19.6	-	sic
19-22	B22b	-	0.1	-	0.4	14.3	49.0	36.2	43.1	20.5	-	sic1
22-25	B3cab	-	0.1	0.2	0.8	19.9	49.7	29.3	50.2	19.9	-	cl
25-27	B3cab	0.1	0.3	0.2	1.1	22.0	52.1	24.2	54.2	20.6	-	sil
27-35	B3cab	-	-	0.1	0.6	23.1	54.3	21.9	55.1	21.7	-	sil
35-46	C	-	0.1	0.1	0.5	24.5	57.9	16.9	60.7	22.0	-	sil
pH		ORGANIC MATTER				8A2	ELECTRICAL CONDUCTIVITY	6E1a		MOISTURE TENSIONS		
8C1b SATURATED PASTE	8C1a	8C1a	6A1a	6B1a	C/N	ESTR. SALT (BUREAU CUP)	EC = 10 ⁴ MILLIMHOS PER CM @ 25°C.	CoCO ₃ equiv. elem.	GYP SUM mg./100g. SOIL	1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.
1.5	1.10		ORGANIC CARBON %	NITRO-GEN %				%		%	%	%
6.8	7.4	7.6	1.59	.140	11	-	-	-	-	-	-	9.5
6.4	7.2	7.3	1.02	.105	10	-	-	-	-	-	-	10.0
6.4	7.5	7.6	0.86	.103	8	-	-	-	-	-	-	17.6
7.5	8.6	8.8	0.93	.099	9	-	-	-	-	-	-	17.5
7.8	9.1	9.2	0.64	.066	10	-	-	4	-	-	-	16.2
7.9	9.2	9.3	0.46	.050	9	-	-	4	-	-	-	14.2
8.1	9.4	9.5	0.38	.042	9	-	-	6	-	-	-	12.7
8.2	9.4	9.5	0.27	.031	9	-	-	11	-	-	-	12.4
8.0	9.3	9.4	0.14			-	-	10	-	-	-	11.0
5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS					5B1a	BASE SAT. %			8D3	MOISTURE AT SATURATION %	
	6N2b	6O2b		6P2a	6Q2a		5D1			Ce/Mg		
	Ca	Mg	H	Na	K							
5N1aC	milliequivalents per 100g. soil											
19.0	13.3	3.6		0.1	2.4					3.7		
17.8	11.6	3.6		0.2	1.3	94				3.2		
28.8	18.7	7.5		0.3	2.0	99				2.5		
32.3	26.4	9.0		0.7	2.6					2.9		
28.9				1.0	2.7							
26.1				1.2	2.6							
24.3				1.5	2.6							
21.5				1.6	2.4							
19.8				1.7	2.3							

Soil Type: Rago silt loam
 Soil Nos.: 854 Colo-32-3
 Location: 200 feet west, 75 feet north of southeast corner Sec. 34, T10S, R44W, Kit Carson County, Colorado.
 Physiographic Position: Upland.
 Topography: Nearly level to very gently concave slope of approximately 1 percent.
 Drainage: Moderately well drained.
 Vegetation: Wheat stubble and a thin growth of weeds.
 Use: Cultivated field used for wheat during current season.
 Sampled by: James Allen, Dale Romaine, E. M. Payne, and A. J. Cline, September 2, 1954.
 Described by: E. M. Payne.

Horizon and
 Lincoln
 Lab. No.

- A_p
 2570 0 to 3½ inches. Pale brown (10YR 6/3 dry) to dark grayish brown (10YR 4/2 moist) silt loam; soft when dry, very friable when moist; weak very fine granular structure; noncalcareous; lower boundary clear and smooth.
- A₃
 2571 Brown (10YR 5/3 dry) to dark brown (10YR 3.3 moist); silt loam; slightly hard when dry, friable when moist; very weak coarse subangular blocky structure; noncalcareous; moderate numbers of medium sized-distinct 10YR 5/6 mottles; the structure in this horizon may be influenced by tillage; where observed in the cut of the pit, this horizon had an indefinite and irregular zone near its base that had characteristics of an E (or A₂) horizon. The color graded in these areas to 10YR 7/3 to 6/3 dry but when moist was about the same color as is described above. It had a vesicular appearance and was slightly lighter in texture. In other places no definite zone of lighter color or vesicular nature could be seen but aggregates frequently were flecked with spots of 10YR 8/2. Lower boundary is abrupt and wavy.
- B₂₁
 2572 8 to 12½ inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) heavy silty clay loam; hard when dry, firm when moist; moderate to strong fine prismatic, breaking to moderate to strong fine angular blocky; noncalcareous; the horizon had a few thin patchy Tonhauthchen; lower boundary is clear and smooth.
- B_{21b}
 2573 12½ to 19 inches. Gray (10YR 5/1 dry) to very dark gray (10YR 3/1.5 moist) light silty clay; very hard when dry, firm when moist; moderate medium prismatic, breaking to strong medium angular blocky; noncalcareous; the horizon has thick prominent Tonhauthchen; the structural cracks between the peds in this horizon are filled with lighter colored materials washed from the horizon above; lower boundary abrupt and smooth.
- B_{22b}
 2574 19 to 22 inches. Grayish brown (10YR 5/2 dry) to dark grayish brown (10YR 4/2 moist) silty clay loam; hard when dry, friable when moist; weak coarse prismatic, breaking to moderate coarse angular blocky; calcareous; the horizon has a few small calcium carbonate concretions and mycelia; Tonhauthchen are moderately prominent; common numbers of medium-sized faint 10YR 4/4 mottles; lower boundary gradual and smooth.
- B_{3cab}
 2575 22 to 25 inches. Pale brown (10YR 6/3 dry) to brown (10YR 5/2.5 moist) heavy silt loam; hard when dry, friable when moist; weak coarse prismatic, breaking to moderate coarse angular blocky; calcareous; the horizon contains moderate amounts of accumulated lime both as lime flour and in concretions; this horizon has been thoroughly reworked by worms and dark channels containing material of the horizons above occur prominently in it. There are some channel fillings between the peds of dark material apparently washed down from the preceding horizons. Lower boundary is gradual and smooth.
- B_{3cab}
 2576 25 to 27 inches. Light gray (10YR 7/2 dry) to light brownish gray (10YR 6/2.5 moist) silt loam; slightly hard when dry, very friable when moist; weak coarse prismatic, breaking to weak coarse subangular blocky; calcareous; this horizon contains some accumulated lime but less than the horizon above or the horizon below; this horizon has been thoroughly reworked by worms, and worm casts and channels filled with darker materials from the horizons above are plentiful; some of the aggregate faces are coated with darker material apparently washed from the horizons above. Lower boundary is gradual and smooth.
- B_{3cab}
 2577 27 to 35 inches. Light gray (10YR 7/2 dry) to pale brown (10YR 6/3 moist) silt loam; hard when dry, friable when moist; a very weak coarse subangular blocky structure; calcareous; the horizon contains moderate amounts of accumulated lime chiefly as lime flour but with some calcium carbonate concretions. The amount of lime is greater than in the horizon above or in the horizon below; there are a few worm casts and worm channel fillings in the horizon; lower boundary gradual and smooth.
- C
 2578 35 to 46 inches. Very pale brown (10YR 8/3 dry) to pale brown (10YR 6/3 moist) coarse silt loam or very fine sandy loam; slightly hard when dry, very friable when moist; massive; calcareous; the horizon contains moderate amounts of accumulated calcium carbonate as lime flour and as concretions and mycelia, but there is less than in the horizon above.

SOIL SURVEY LABORATORY MANDAN, NORTH DAKOTA 9-7-55

SOIL TYPE Rago LOCATION KIT CARSON CO., COLO
silt loam

SOIL NOS. S-54-Co10-32-4 LAB. NOS. 2579-2587

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002				
0-3	Ap	0.1a	0.4	0.5	1.1	23.7	56.1	18.1	60.7	19.8	-	sil
3-6	B1	0.1a	0.4	0.4	1.0	21.3	53.1	23.7	57.2	17.8	-	sil
6-11	B2l	-	0.1	0.2	0.5	17.8	50.5	30.9	52.4	16.2	-	sic1
11-16 ¹	B2b	-	0.1	0.1	0.4	14.3	48.5	36.6	44.6	18.5	-	sic1
16 ¹ -19 ²	B2cab	-	0.1a	0.1	0.4	15.8	48.3	35.3	44.8	19.6	-	sic1
19 ² -26	B3cab	0.1a	0.1	0.1	0.6	19.7	50.5	28.9	49.5	21.1	-	cl
26-34	B3cab	-	-	0.1	0.4	21.8	55.0	22.7	54.5	22.6	-	sil
34-42	Ceal	-	0.1	0.2	0.9	30.3	49.3	19.2	61.7	18.5	-	l
42-50	Cea2	-	0.2	0.3	1.0	31.1	49.5	17.9	63.1	18.1	-	l
pH		ORGANIC MATTER					8A2	ELECTRI- CAL CONDUC- TIVITY EC x 10 ³ MILLIMOS PER CM @ 25°C	6K1a	MOISTURE TENSIONS		
SOIL SATURATED PASTE	8C1a	8C1a	6A1a	6B1a		ESTR SALT (BUREAU CUP)		CaCO ₃ equiv- alent	GYPSUM mg./100g. SOIL	1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.
	1.5	1.10	ORGANIC CARBON %	NITRO- GEN %	C/N			%		%	%	%
6.3	7.0	7.2	1.40	.125	11	-	-	-	-	-	-	8.5
5.9	6.5	6.7	1.14	.119	10	-	-	-	-	-	-	10.1
6.4	7.2	7.3	0.91	.102	9	-	-	-	-	-	-	13.5
7.2	8.2	8.3	0.91	.096	10	-	-	-	-	-	-	16.1
7.7	8.7	8.9	0.71	.078	9	-	-	2	-	-	-	16.0
7.8	8.8	9.0	0.46	.056	8	-	-	7	-	-	-	14.8
7.9	9.0	9.1	0.29	.040	7	-	-	13	-	-	-	12.9
8.0	9.0	9.2	0.16	.		-	-	10	-	-	-	10.5
7.8	9.0	9.1	0.16	.		-	-	6	-	-	-	10.0
5A1a	EXTRACTABLE CATIONS					5B1a	BASE SAT. %			8D3		MOISTURE AT SATU- RATION %
CATION EXCHANGE CAPACITY	6N2b	6O2b		6P2a	6Q2a		5D1			Ca/Mg		
	Ca	Mg	H	Na	K							
← NH ₄ →	milliequivalents per 100g. soil →											
16.1	10.1	2.9		0.1	2.6	98				3.5		
18.7	11.9	3.4		0.2	1.4	90				3.5		
23.5	16.7	4.9		0.1	1.4	98				3.4		
28.7	22.9	6.7		0.2	2.0					3.4		
28.3				0.2	2.3							
24.8				0.2	2.3							
20.7				0.3	2.3							
18.9				0.4	2.3							
19.4				0.5	2.3							

a Organic Matter in Sand Fractions

Soil Type: Rago silt loam
 Soil Nos.: S54 Colo-32-4
 Location: 50 feet north, 3/10 mile west of southeast corner Sec. 8, T10S, R44W, Kit Carson County, Colorado.
 Physiographic Position: Broad flat in the uplands.
 Topography: Nearly level to very gently undulating slopes of $\frac{1}{2}$ to 1 percent.
 Drainage: Moderately well drained.
 Vegetation: Wheat stubble and seasonal weeds.
 Use: Cultivated to wheat during the current season.
 Sampled by: James Allen and A. J. Cline, September 3, 1954.
 Described by: A. J. Cline.

Horizon and
 Lincoln
 Lab. No.

- Ap 0 to 3 inches. Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 4/2 moist) silt loam; soft when dry, very friable moist; weak very fine granular structure; noncalcareous; lower boundary clear and smooth.
- B1 3 to 6 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3.5/2 moist) light silty clay loam; very hard (dry) firm (moist); weak coarse prismatic breaking to moderate coarse sub-angular blocky; noncalcareous; the peds in this horizon have some white and gray flecking on their surfaces, particularly in the lower inch of this horizon; lower boundary clear and smooth.
- B21 6 to 11 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) heavy silty clay loam; hard (dry), friable (moist); strong fine prismatic structure breaking to strong medium angular blocky; noncalcareous; the horizon has a few thin patchy Tonhauthen; lower boundary clear and smooth.
- B2b 11 to 16 $\frac{1}{2}$ inches. Gray (10YR 5/1 dry) to very dark gray (10YR 3/1 moist) heavy silty clay loam; hard (dry), friable (moist); moderate medium prismatic breaking to strong fine angular blocky; noncalcareous; the horizon contains moderately thick, relatively prominent Tonhauthen; lower boundary is abrupt and smooth.
- B2cab 16 $\frac{1}{2}$ to 19 $\frac{1}{2}$ inches. Variegated light brownish gray (10YR 6/2 dry) and pale brown (10YR 6/3 dry) to very dark grayish brown (10YR 3/2 moist) and grayish-brown (10YR 5/2.5 moist) light silty clay loam; hard (dry), friable (moist); moderate medium prismatic, breaking to strong fine angular blocky; calcareous; the horizon contains moderate amounts of small calcium carbonate concretions; Tonhauthen are moderately thick and relatively prominent; variation in color is due to the intense worm working in which materials from the horizons above have been thoroughly worked into this horizon. In addition it appears that some of the material from the above horizon have been washed down into structural cracks and now coat the surfaces of the aggregates there. Lower boundary gradual and smooth.
- B3cab 19 $\frac{1}{2}$ to 26 inches. Light brownish gray (10YR 6/2.5 dry) to grayish brown (10YR 5/2.5 moist) light silty clay loam; hard (dry), friable (moist); weak coarse prismatic structure, breaking to moderate medium angular blocky; calcareous; the horizon contains moderate amounts of accumulated lime chiefly as lime flour and as concretions; Tonhauthen are moderately prominent; this horizon is also thoroughly reworked by worms and contains casts and channels filled with darker materials from the horizons above.
- B3cab 26 to 34 inches. Light gray (10YR 7/2 dry) to light brownish gray (10YR 6/2 moist) silt loam; hard (dry), friable (moist); weak coarse subangular blocky structure; calcareous; the horizon contains much accumulated lime chiefly as lime flour but with some concretions and mycelia; Tonhauthen are very thin and patchy; the horizon has been partially reworked by worms and dark channel fillings and worm casts occur throughout it; lower boundary gradual and smooth.
- Caal 34 to 42 inches. Very pale brown (10YR 7/3 dry) to pale brown (10YR 6/3 moist) silt loam; slightly hard when dry, very friable when moist; massive to very weak coarse subangular blocky structure; calcareous; the horizon contains moderate amounts of concretionary and myceliated lime but somewhat less than the horizon above; lower boundary gradual and smooth.
- Caal 42 to 50 inches. Very pale brown (10YR 7/3 dry) to pale brown (10YR 6/3 moist) coarse silt loam or very fine sandy loam; slightly hard (dry), very friable (moist); massive; calcareous; the horizon contains moderate amounts of accumulated lime chiefly as lime flour.

SOIL Richfield loam SOIL Nos. 963Colo-58-8 LOCATION Sedgwick County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18512-18517, 18581-18582 March 1967

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

Depth (in.)	Horizon	Size class and particle diameter (mm) <u>3A1</u>											3A1a Noncar- bonate Clay <0.002	Coarse fragments <u>2A2</u>			
		Total				Sand				Silt				(> 2 < 19) Pct.	> 2 (Vol. < 19) Pct.		
		Sand (2-0.05) b	Silt (0.05- 0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02 (0.02- 0.002)	Int. III (0.2-0.02)	Int. II (2-0.1)					
0-6	Ap	41.6	36.8	21.6	2.4	5.8	5.7	9.0	18.7	25.8	11.0	49.3	22.9	22	2		
6-14	B2t	30.0	38.4	31.6	1.6	4.3	3.7	5.4	15.0	25.2	13.2	43.1	15.0	32	3		
14-21	B3	25.4	51.0	23.6	0.3	1.5	1.5	2.6	19.5	32.2	18.8	53.2	5.9	24	1		
21-33	C1ca	40.1	44.7	15.2	2.7	5.0	4.1	6.2	22.1	27.4	17.3	52.8	18.0	14	5		
33-52	IIC2ca	70.6	18.8	10.6	3.9	10.8	10.7	18.2	27.0	12.7	6.1	49.6	43.6	10	11	6	
52-78	IIC3ca	80.4	10.2	9.4	12.3	15.4	12.0	22.6	18.1	6.0	4.2	36.2	62.3	9	27		
6-8	a	33.6	37.6	28.8	1.4	4.8	4.5	7.0	15.9	24.1	13.5	43.8	17.7				
8-13	a	29.1	40.4	30.5	1.6	3.6	3.3	5.4	15.2	25.7	14.7	43.9	13.9				
Depth (in.)	6A1a Organic carbon c Pct.	6B1a Nitrogen Pct.	C/N	Carbonate as CaCO ₃ 6E1b 3A1a 6E2a <0.002 <2 mm. mm. Pct. Pct.		Ext. Iron as Fe Pct.	Bulk density 4A1a 4A1d 4A1b Field 1/3- Air State Bar Dry g/cc g/cc g/cc			4D1 COLE	Water content 4B4 4B1c 4B2 4C1 Field 1/3- 15- 1/3 to State Bar Bar 15-Bar Pct. Pct. Pct. in./in.				pH 8C1b Sat. Paste (1:1)		8C1a (1:1)
0-6	0.74	0.080	9	-(s)			1.35	1.33	1.39	0.014	18.4	22.4	9.6	0.17			6.7
6-14	0.65	0.072	9	-(s)			1.36	1.28	1.49	0.052	19.8	25.5	14.8	0.14			7.2
14-21	0.54	0.072	8	tr(s)			1.38d	1.23d	1.40d	0.04d	10.7d	34.0d	12.0	0.27			7.8
21-33	0.33	0.042	8	8	1		1.50	1.48	1.50	0.003	6.6	17.4	9.8	0.11			8.4
33-52	0.12			4	1		1.44	1.43e	1.44	0.003	7.5	17.6	5.5	0.16		7.9	8.5
52-78	0.03			3	-								4.7				9.1
6-8	0.66												13.1				
8-13	0.74												12.8				
Depth (in.)	Extractable bases 6N2a 6O2a 6P2a 6Q2a Ca Mg Na K meq/100 g				6R1a Ext. Acidity	Cat. Exch. Cap. 5A3a 5A1a Sum NH ₄ OH		8A Water at Saturation Pct.	8A1a Elec. Cond. mmho/cm	8D3 Ca/Mg	Base saturation 5C3 Sum Cations Pct.		5C1 NH ₄ OH Pct.				
0-6	10.7	3.5	0.1	2.0	16.3	2.9	19.2	16.0					3.1	16.0	85	102	
6-14	10.6	3.7	tr	2.0	16.3	3.2	19.5	16.0					2.9	16.0	84	102	
14-21	16.8 f	0.1	2.2					24.0									
21-33	12.0 f	5.2g	0.1	2.1	19.4			16.0					2.3				
33-52	6.6 f	3.6g	0.4	1.8	12.4			10.5			26.5	0.72	1.8				
52-78	5.0 f	2.6g	1.0	1.4	10.0			7.7					1.9				
6-8																	
8-13																	
Depth (in.)	Ratios to Clay 8D2 NH ₄ OAc CEC		8D1 15-Bar Water	<p>a. Upper and lower portions of the B2t horizon were sampled separately for partial analysis; laboratory numbers are 18581 and 18582, respectively.</p> <p>b. Few grains of carbonate below 21 inches.</p> <p>c. 6.6 kg/m² to 52 inches (Method 6A).</p> <p>d. One clod.</p> <p>e. 1.34 g/cc. calculated to include volume but not weight of > 2 mm. material (Method 4A).</p> <p>f. NH₄Cl-EtOH extraction (Method 6N3a).</p> <p>g. NH₄Cl-EtOH extraction (Method 6O3a).</p>													
0-6	0.73		0.44														
6-14	0.50		0.47														
14-21	1.00		0.51														
21-33	1.14		0.64														
33-52	1.05		0.52														
52-78	0.86		0.50														
6-8			0.45														
8-13			0.42														

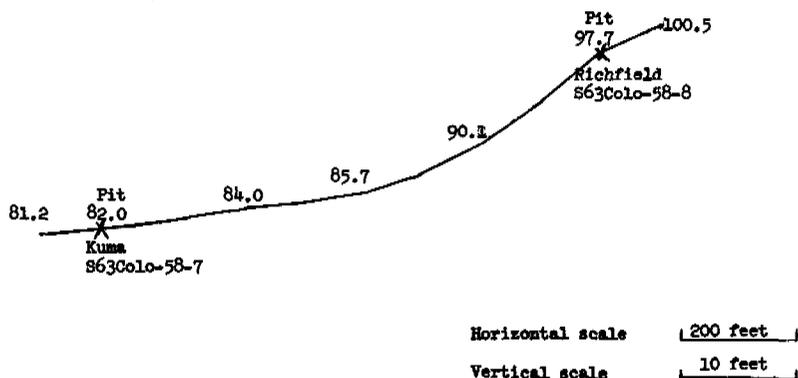
Soil Type: Richfield loam
 Soil Nos.: S63Colo-58-8
 Location: 250 feet east, 140 feet north of south quarter corner, Sec. 19, T10N, R44W, Sedgwick County, Colorado.
 Climate: Continental climate, average annual precipitation 17.5 inches, frost-free season of 147 days, mean annual temperature of 49.6 degrees F.

Elevation: 3,800 feet
 Vegetation: Seeded to western wheat, blue grama
 Parent Material: Loess
 Physiographic Position: Upland
 Relief: Convex 4 percent east facing slope
 Drainage: Well drained
 Moisture: Nearly dry
 Stoniness: Few small gravels throughout
 Salt or Alkali: None
 Erosion: Slight, primarily water
 Sampled by: R. C. Accola, J. I. Erubacher, R. B. Grossman, R. Moreland, E. M. Payne, and J. L. Walker: July 10, 1963
 Described by: J. I. Erubacher

Horizon and
 Lincoln
 Lab. No.

Ap 18512	0 to 6 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) loam; weak fine granular structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
B2t 18513	6 to 14 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) clay loam; strong medium prismatic breaking to strong medium subangular blocky structure; slightly hard dry, very friable when moist; noncalcareous; thick continuous clay skins; clear smooth boundary.
B3 18514	14 to 21 inches. Pale brown (10YR 6/3 dry) to dark brown (10YR 4/3 moist) and dark grayish brown (10YR 4/2 crushed) loam; moderate medium prismatic breaking to moderate medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; thin patchy clay skins; clear smooth boundary.
Clca 18515	21 to 33 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) loam; weak medium prismatic breaking to weak medium subangular blocky structure; soft dry, very friable when moist; very highly calcareous; free lime visible along cleavage lines; clear smooth boundary.
IIIC2ca 18516	33 to 52 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) fine sandy loam; weak medium structure breaking to weak medium subangular blocky structure; slightly hard dry, very friable when moist; very highly calcareous; visible stone line; pockets of loam and sand; clear wavy boundary.
IIIC3ca 18517	52 to 78 inches. Pink (7.5YR 7/4 dry) to brown (7.5YR 5/4 moist) coarse sandy loam; massive; slightly hard dry, very friable when moist; very highly calcareous; clear wavy boundary.
IIIC4	78 to 138 inches. Pink (7.5YR 7/3 dry) to brown (7.5YR 5/3 moist) sand and gravel; single grain; loose when dry and moist; slightly calcareous; clear wavy boundary.
IIIC5	138 to 172 inches. Pink (7.5YR 7/4 dry) to brown (7.5YR 5/4 moist) sandy loam; massive; slightly hard dry, very friable when moist; slightly calcareous.

Landscape Profile:



Bureau of Public Roads Samples: Ap, B2t, and Clca horizons.

Mineralogy (Method 7B1): B2t horizon. Count on very fine sand: 40 percent quartz; 30 percent feldspar; 15 percent compound grains; 10 percent glass shards; accessories include green hornblende, epidote, mica group, primary carbonate, zircon, in approximate order of abundance. Orthoclase is the most common feldspar, with substantial albite, appreciable oligoclase-andesine, and some microcline. The compound grains appear to be mostly altered feldspar but with some altered volcanic glass.

Clca horizon. Count on very fine sand: 30 percent quartz; 25 percent feldspar; 20 percent compound grains; 25 percent glass shards; accessories include the same as for B2t. Other remarks for B2t pertain.

SOIL Richfield loam SOIL Nos. 863Colo-58-9 LOCATION Sedgwick County, Colorado

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18518-18523 March 1967

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

Depth (in.)	Horizon	Size class and particle diameter (mm)													3A1b		3A1a		Coarse fragments 2A2	
		Total			Sand					Silt					3A1b <0.002	3A1a Noncarbonate Clay <0.002	Coarse fragments 2A2			
		Sand (2-0.05) %	Silt (0.05- 0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Vary fine (0.1-0.05)	Int. III (0.05-0.02)	Int. II (0.02- 0.002)	(2-0.1)	> 2 (< 19) Pct.	> 2 (< 19) Pct.						
Pct. of < 2 mm																				
0-6	Ap	43.8	39.1	17.1	2.9	6.9	6.7	9.7	17.6	27.1	12.0	49.7	26.2	10.8	17	8				
6-14	B2t	28.7	37.1	34.2	1.4	4.2	4.0	5.8	13.3	24.7	12.4	41.0	15.4	25.3	34	3				
14-19	B3	29.6	47.4	23.0	0.8	3.0	3.1	4.7	18.0	30.3	17.1	50.8	11.6	23	2					
19-29	C1ca	31.1	55.3	13.6	1.1	2.4	2.6	4.1	20.9	32.2	23.1	55.4	10.2	14	3					
29-39	C2ca	59.2	16.1	24.7	8.8	10.2	10.4	18.2	11.6	5.3	10.8	26.4	47.6	8.6	16	21				
39-70	C3ca	77.3	8.6	14.1	7.8	14.1	15.8	25.0	14.6	5.5	3.1	33.1	62.7	14	18					
pH																				
Depth (in.)	6A1a Organic carbon b Pct.	6R1a Nitrogen Pct.	C/N	Carbonate as CaCO ₃		6C2a Ext. Iron Fe Pct.	Bulk density			4D1 COLE	Water content				pH					
				6R1b <2 mm Pct.	3A1a <0.002 mm. Pct.		4A1a Field State g/cc	4A1d Air Bar g/cc	4A1b Air Dry g/cc		4B4 Field State Pct.	4B1c 1/3- Bar Pct.	4B2 15- Bar Pct.	4C1 1/3-to 15-Bar in/in.	8C1b Sat. Paste (1:1)	8C1a (1:1)				
0-6	0.86	0.090	10			0.4	1.32	1.30c	1.35	0.013	13.9	17.7	7.8	0.12			6.2			
6-14	0.65	0.074	9			0.7	1.47	1.35	1.61	0.059	19.7	25.9	15.3	0.14			7.0			
14-19	0.53	0.069	8			0.4	1.30	1.24	1.34	0.028	12.6	24.1	11.1	0.16			7.9			
19-29	0.36	0.049	7			0.3	1.28	1.25	1.30	0.014	13.6	23.3	11.0	0.15			8.3			
29-39	0.16					0.2							9.7				8.7			
39-70	0.02					0.3							6.7				9.1			
Base saturation																				
Depth (in.)	Extractable bases 5R1a				6H1a Ext. Acidity	Cat. Exch. Cap.		8A Water at Satu- ration Pct.	8A1a Elec. Cond. µmhos/cm	8D3 Ca/Mg	Base saturation									
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K		Sum	5A3a Sum Cations				5A1a NH ₄ OC	5C3 Sum Cations Pct.	5C1 NH ₄ OC Pct.							
0-6	7.8	2.7	tr	1.7	12.2	4.2	16.4	12.9			2.9									
6-14	17.3	6.3	0.1	2.4	26.1	2.6	28.7	25.0			2.7									
14-19	15.3 d	5.7e	0.1	2.2	23.3			22.7			2.7									
19-29	12.4 d	5.6e	0.2	2.6	20.8			18.9			2.2									
29-39	6.3 d	4.6e	1.2	1.8	13.9			11.3			1.4									
39-70	5.2 d	3.9e	1.8	1.7	12.6			10.1			1.3									
Ratios to Clay																				
Depth (in.)	Ratios to Clay			8D1 Ext. Iron	8D2 15-Bar Water															
	8D2 NH ₄ OAc CEC	8D2 Ext. Iron	8D1 15-Bar Water																	
0-6	0.76	0.02	0.46																	
6-14	0.74	0.02	0.45																	
14-19	0.99	0.02	0.48																	
19-29	1.35	0.02	0.81																	
29-39	0.71	0.01	0.39																	
39-70	0.72	0.02	0.48																	

- a. Few grains of carbonate below 19 inches.
- b. 5.5 kg/m² to 29 inches (Method 6A).
- c. 1.25 g/cc when calculated to include volume but not weight of > 2 mm. material (Method 4A).
- d. NH₄Cl-EtOH extraction (Method 6N3a).
- e. NH₄Cl-EtOH extraction (Method 6O3a).

Soil Type: Richfield loam

Soil Nos.: 863Colo-58-9

Location: 1,584 feet west, 528 feet north of southeast corner, Sec. 11, T10N, R45W, Sedgwick County, Colorado

Climate: Continental climate, average annual precipitation of 17.5 inches, frost-free season of 147 days, mean annual temperature of 49.6 degrees F.

Elevation: 3,800 feet

Vegetation: Cultivated

Parent Material: Loess

Physiographic Position: Upland

Relief: Convex 3 percent southeast facing slope

Drainage: Well drained

Moisture: Moist to 12 inches, nearly dry below

Stoniness: Few small gravels throughout

Salt or Alkali: None

Erosion: Slight, primarily water

Sampled by: R. C. Accola, J. I. Brubacher, R. B. Grossman, R. Moreland, E. M. Payne, and J. L. Walker: July 10, 1963

Described by: J. I. Brubacher

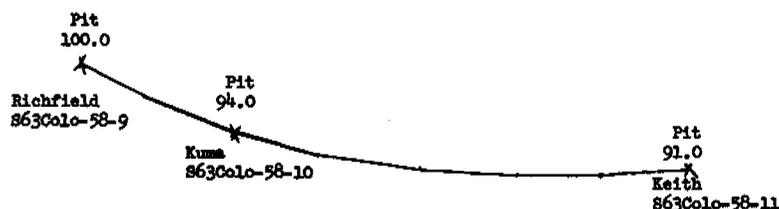
Horizon and

Lincoln

Lab. No.

Ap 18518	0 to 6 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) loam; weak fine granular structure; soft dry, very friable when moist; noncalcareous; clear smooth boundary.
B2t 18519	6 to 14 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) clay loam; strong medium prismatic breaking to strong fine subangular blocky structure; slightly hard dry, very friable when moist; noncalcareous; thin continuous clay skins; clear smooth boundary.
B3 18520	14 to 19 inches. Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 4/2 moist) loam; moderate medium prismatic breaking to moderate medium subangular blocky structure; soft dry, very friable when moist; noncalcareous; thin patchy clay skins; clear smooth boundary.
C1ca 18521	19 to 29 inches. Very pale brown (10YR 8/3 dry) to pale brown (10YR 6/3 moist) and very pale brown (10YR 7/3 crushed) loam; weak medium prismatic breaking to weak medium subangular blocky structure; soft dry, very friable when moist; very highly calcareous; clear smooth boundary.
C2ca 18522	29 to 39 inches. Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 4/2 moist) sandy loam; weak medium prismatic breaking to weak medium subangular blocky structure; soft dry, very friable when moist; horizon is 10 percent gravel; highly calcareous; clear smooth boundary.
C3ca 18523	39 to 70 inches. Pink (7.5YR 7/4 dry) to brown (7.5YR 5/4 moist) gravelly sandy loam; thin discontinuous stone line at top of horizon; massive; slightly hard dry, friable when moist; 40 percent gravel; strongly calcareous; very highly calcareous on lime coated gravel; clear wavy boundary.
C4	70 to 132 inches. Pink (7.5YR 8.4 dry) to light brown (7.5YR 6/4 moist) sand and gravel; single grain structure; loose when dry and moist; noncalcareous; 50-60 percent fine gravel.

Landscape Profile:



Horizontal scale | 200 feet |

Vertical scale | 10 feet |

Bureau of Public Roads Samples: Ap, B2t, and C1ca horizons.

Mineralogy (Methods 7A1, 7A2): Ap1, B2t, and C2ca horizons. Small to moderate amounts of well-crystallized mica (or illite) and kaolinite are present in the solum. Montmorillonite, poorly organized throughout the profile, increases from a trace in the surface to a moderate amount in the B2t. The C2ca has a moderate amount of montmorillonite and traces of mica (or illite) and kaolinite. The clays are more poorly ordered. Some calcite is present. The fine clay contains only montmorillonite and it is poorly crystallized.

Soil Type: Richfield silt loam

191

Classification: Chestnut

Location: 700 ft. W and 90 ft. N of S $\frac{1}{4}$ corner, Sec. 32, T26S., R42W.,
Prowers County, Colorado.

Date Sampled: November 6, 1958

Climate: Continental climate, average annual precipitation 15 to 16 inches,
elevation 3,700 feet. Frost-free season 166 days.

Vegetation: Sorghum. Parent Material: Loess. Physiographic position: Upland.

Relief: Nearly level to slightly concave position, less than 1% slope.

Drainage: Well. Moisture: Dry. Watertable: None encountered. Stouiness: None.

Salt or Alkali: None observed. Erosion: Moderate Erosion, primarily wind.

Soil Nos.: S-58-Colo-50-6

Described by: E. Milton Payne.

Lincoln Horizon

Lab. No.

9688	Ap	0-4 inches	Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) silt loam; weak fine granular structure; loose when dry, very friable moist; non-calcareous; abrupt smooth boundary caused by tillage.
9689	AB	4-7 inches	Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) light silty clay loam; moderate coarse platy, very hard when dry, friable moist; thin nearly continuous clay skins on horizontal faces of peds; non-calcareous; clear smooth boundary.
9690	B _{21t}	7-12 inches	Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2.5 moist) silty clay loam; moderate medium prismatic structure breaking to strong fine angular and subangular blocky structure; very hard when dry, firm when moist; moderately, nearly continuous clay skins; non-calcareous; clear smooth boundary.
9691	B _{22t}	12-18 inches	Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2.5 moist) silty clay loam; moderate medium prismatic breaking to moderate fine subangular blocky structure; very hard when dry, firm moist; thin nearly continuous clay skins; noncalcareous; clear smooth boundary.
9692	B _{3ca}	18-26 inches	Light brownish gray (10YR 5.5/2 dry) to dark grayish brown (10YR 3.5/2 moist) silty clay loam; moderate medium prismatic breaking to moderate fine subangular blocky structure; hard when dry, firm moist; very thin patchy clay skins; slightly calcareous in matrix with numerous small lime spots; clear smooth boundary.
9693	C _{1ca1}	26-34 inches	Grayish brown (1Y 5/2 dry) to dark grayish brown (1Y 4/2 moist) silty clay loam; very weak coarse prismatic structure breaking to weak coarse subangular blocky; hard when dry, firm moist; strongly calcareous with prominent lime nodules about 1/4 inch in diameter; clear smooth boundary.
9694	C _{1ca2}	34-42 inches	Pale brown (1Y 6/3 dry) to grayish brown (1Y 5/2.5 moist) light silty clay loam, very weak coarse prismatic breaking to moderate fine subangular blocky structure; hard when dry, friable moist; many krotovins; violently calcareous with numerous large lime spots; clear smooth boundary.
9695	C ₂	42-49 inches	Light gray (1Y 7/2 dry) to grayish brown (1Y 5/2.5 moist) silt loam; very weak medium prismatic breaking to very weak medium subangular blocky structure; hard when dry, friable moist; considerable mixing of the horizon with krotovins and worm casts, the larger ones being (10YR 3/2 moist) violently calcareous.
9696	C ₃	49-70 inches	Light gray (10YR 6.5/2 dry) to grayish brown (10YR 5/2.5 moist) silt loam; massive; slightly hard when dry, very friable moist; violently calcareous.
	C ₄	70-90 inches	Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) silt loam; massive; slightly hard when dry, friable moist; violently calcareous.
	D ₁	90-110 inches	Pink (7.5YR 7/4 dry) to brown (7.5YR 5/4 moist) silt loam; massive; slightly hard when dry, very friable moist; violently calcareous.
	D ₂	110-132 inches	Pink to reddish yellow (7.5YR 7/5 dry) to brown (7.5YR 4/5 moist) silt loam; massive; slightly hard when dry, very friable moist; strongly calcareous with large white lime spots.

Bureau of Public Roads Samples

Ap 0 to 4 inches
B₂₁ 7 to 12 inches
C₃ 49 to 70 inches

SOIL SURVEY LABORATORY

Lincoln, Nebr.

May 1959

SOIL TYPE Richfield
silt loam

LOCATION Prowers County, Colorado

SOIL NOS. S58Colo-50-7

LAB. NOS. 9697-9705

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)									2A2 > ?	TEXTURAL CLASS
		1B1a		3A1								
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002		
0-3	Ap	0.1	0.2	0.1	0.5	15.2	57.3	26.6	58.8	14.0	-	sil/sicl
3-6	ABp	<0.1	0.2	0.2	0.5	14.0	57.3	27.8	56.0	15.6	-	sicl
6-15	B2it	<0.1	0.2	0.2	0.8	14.2	55.2	29.4	56.1	13.9	-	sicl
15-21	B2ca	<0.1	0.2	0.2a	1.2a	13.3a	53.7	31.4	51.9	16.0	-	sicl
21-32	B3ca	<0.1	0.2	0.2a	1.2a	13.0a	52.9	32.5	48.0	18.9	-	sicl
32-38	C1ca1	0.1	0.6	0.6a	1.2a	6.8a	57.8	32.9	41.0	24.4	-	sicl
38-48	C1ca2	0.1	0.5	0.4a	0.9a	6.5a	60.7	30.9	42.3	25.5	-	sicl
48-57	C2	0.1	0.3	0.3a	0.8a	6.8a	64.6	27.1	45.1	26.9	-	sicl/sil
57-72	C3	0.1	0.3	0.2a	0.8a	7.9a	66.7	24.0	48.4	26.8	-	sil
pH		ORGANIC MATTER				8A2	ELECTRI-	6E1a	MOISTURE TENSIONS			
8C1a		6A1a	6H1a		8A2	EST. %	CONDUC-	CaCO ₃	GYP-SUM	1/10	1/3	4B2
	1:5	1:10	ORGANIC CARBON	NITRO-GEN	C/N	(BUREAU CUP)	TIVITY EC x 10 ³	equiv- alent	me./100g. SOIL	ATMOS.	ATMOS.	15 ATMOS.
	1:1		%	%			MILLIMHOS PER CM 6A1a	%		%	%	%
			1.04	0.103	10	<0.20	0.7	<1				9.9
			0.91	0.090	10	<0.20	0.5	<1				10.6
			0.47	0.058	8	<0.20	0.5	<1				12.0
			0.39	0.050	8	<0.20	0.4	5				13.4
			0.35	0.044	8	<0.20	0.4	8				12.9
			0.31			<0.20	0.4	13				13.2
			0.26			<0.20	0.5	11				12.6
			0.22			<0.20	0.5	9				12.2
			0.22			<0.20	0.6	6				11.3
5A1a	EXTRACTABLE CATIONS					5B1a	SATURATION EXTRACT SOLUBLE					8A
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6H1a	6P2a	6Q2a	5D2	6P1a	6Q1a			MOISTURE AT SATURATION	
	Ca	Mg	H	No	K	EXCH. No %	No	K			%	
	← milliequivalents per 100g. soil →						← milliequivalents per 100g. →					
20.6	20.4	3.5	1.2	<0.1	2.4	<1	0.2	1.5			54.3	
21.5	18.0	3.8	1.2	<0.1	1.5	<1	0.2	0.6			54.7	
21.4	17.7	5.2	1.2	<0.1	1.1	<1	0.3	0.3			59.7	
20.5				0.1	1.3	<1	0.3	0.3			61.1	
20.6				0.1	1.4	<1	0.3	0.4			60.2	
19.5				0.1	1.4	<1	0.4	0.5			60.6	
19.8				0.2	1.5	1	0.7	0.6			67.4	
20.2				0.3	1.6	1	1.1	0.6			56.7	
20.1				0.6	1.5	2	1.9	0.5			53.6	

a. Trace CaCO₃ concn.

Soil Type: Richfield silt loam

193

Classification: Chestnut

Location: 100 ft. S and 50 ft. W of N $\frac{1}{4}$ corner, Sec. 21, T26S, R42W,
Prowers County, Colorado.

Date Sampled: November 6, 1958

Climate: Continental climate, average annual precipitation 15 to 16 inches,
elevation 3,700 ft. Frost free season 166 days.

Vegetation: Wheat-fallow, wheat in 1958. Parent Material: Loess.

Physiographic position: Upland. Relief: Nearly level to slightly concave position.

Drainage: Well. Moisture: Moist. Water table: None encountered. Stoniness: None.

Salt or Alkali: None observed. Erosion: Slight erosion, principally wind.

Soil Nos.: S-58-Colo-50-7

Described by: E. Milton Payne.

Lincoln Horizon

Lab. No.

9697	Ap	0-3 inches	Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) silt loam; weak fine granular becoming platy in lower part, slightly hard when dry, very friable moist; noncalcareous; abrupt smooth boundary caused by tillage implements.
9698	ABp	3-6 inches	Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) light silty clay loam; weak coarse platy breaking to moderate fine granular; very hard when dry, firm moist; thin very patchy clay skins; noncalcareous; clear smooth boundary.
9699	B _{21t}	6-15 inches	Grayish brown (10YR 5/2.5 dry) to dark brown (10YR 3/3 moist) silty clay loam; moderate medium prismatic structure; breaking to strong fine angular and subangular blocky structure, hard when dry, firm moist; moderate nearly continuous clay skins; noncalcareous; clear smooth boundary.
9700	B _{2ca}	15-21 inches	Grayish brown (10YR 5.5/2 dry) to dark grayish brown (10YR 4/2.5 moist) silty clay loam; moderate medium prismatic structure breaking to moderate fine subangular blocky; hard when dry, firm moist; thin to moderate nearly continuous clay skins; strongly calcareous; clear smooth boundary.
9701	B _{3ca}	21-32 inches	Grayish brown (10YR 5/2.5 dry) to brown (10YR 4.5/3 moist) silty clay loam; weak coarse prismatic breaking to moderate medium subangular blocky structure; hard when dry firm moist; thin nearly continuous clay skins; violently calcareous with numerous small lime spots; clear smooth boundary.
9702	C _{1cal}	32-38 inches	Pale brown (1Y 6/2.5 dry) to brown (1Y 5/3 moist) silty clay loam; very weak coarse prismatic breaking to moderate medium subangular blocky structure; hard when dry friable when moist; thin patchy clay skins on vertical faces of peds; violently calcareous with numerous lime spots; gradual smooth boundary.
9703	C _{1ca2}	38-48 inches	Light brownish gray (10YR 6.5/2 dry) to grayish brown (10YR 5/2.5 moist) light silty clay loam; weak medium to coarse subangular blocky structure; hard when dry, friable moist; few thin patchy clay skins; violently calcareous with a few lime spots; gradual smooth boundary.
9704	C ₂	48-57 inches	Light gray (10YR 7/2 dry) to brown (10YR 5/3 moist) silt loam; very weak medium subangular blocky structure; slightly hard when dry, very friable moist; violently calcareous.
9705	C ₃	57-116 inches	Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) silt loam; massive; slightly hard when dry, very friable moist; violently calcareous.
	D	(Sampled to 72 inches) 116-132 inches	Pink (7.5YR 7/4 dry) to brown (7.5YR 5/4 moist) silt loam; massive; slightly hard when dry, very friable moist; violently calcareous.

Bureau of Public Roads Samples

Ap 0 to 3 inches
B₂₁ 6 to 15 inches
C₃ 57 to 116 inches

SOIL Rocky Ford silty clay loam s/ SOIL Nos. 860Colo-50-3 LOCATION Prowers County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14659-14661 January, 1966

Depth (in.)	Horizon	1B1a Size class and particle diameter (mm)											3A1					
		Total			Sand					Silt			Clay 3A1a (2-0.1)	Coarse fragments				
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Int. III (0.05-0.02)	Int. II (0.02-0.002)	Carbonate (19)		Non-carbonate (<19)	2-19 Pct.	19-76 Pct. of < 76 mm		
0-5	Ap1	12.5	53.7	33.8	0.1b	0.4c	0.4c	1.3c	10.3c	30.2	23.5	41.4	2.2	Tr.	34	Tr.		
5-11	Ap2	12.0	54.1	33.9	0.1b	0.3c	0.4c	1.2c	10.0c	28.4	25.7	39.2	2.0	2	32	Tr.		
11-16	AC	13.5	60.7	25.8	0.3c	0.2c	0.3c	1.1c	11.6c	38.2	22.5	50.6	1.9	4	22	Tr.		

Depth (in.)	6A1a Organic carbon g/ Pct.	6B1a Nitrogen Pct.	C/N	6E1c Carbonate as CaCO ₃ Pct.	Bulk density			Water content				pH			
					4A1a 30-cm g/cc	4A1b Air-Dry g/cc	4D1 COLE e/	4B3 30-cm Pct.	4B1b 1/3- Bar Pct.	4B2 2-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3- Bar to 15-Bar in./in.	8C1b Sat. Paste	8C1a 1:1	8C1a 1:10
0-5	1.22	0.117	10	6	1.29	1.49	0.052	28.5	25.0	19.0	14.9	0.13	7.7	7.8	8.4
5-11	1.25	0.119	10	6	1.39	1.64	0.050	29.2	25.5	20.5	16.1	0.13	7.6	7.8	8.5
11-16	0.55	0.065	8	9							12.5		7.6	7.9	8.6

Depth (in.)	Extractable bases 5B1a				Cat. Exch. Cap. 5A1a NH ₄ OAc	8A1 Water extract from saturated paste								
	Ca	Mg	Na	K		Cu	Mg	Na	K	CO ₃	HCO ₃	Cl	SO ₄	8A1a Electrical conductivity mmho/cm
0-5			1.5	1.1				8.9	0.5					2.0
5-11			1.3	1.3				6.4	0.6					1.4
11-16			1.2	0.8				6.8	0.4					1.6

Depth (in.)	8A Water at Saturation Pct.	5B2 Exchangeable Na Pct.	Gypsum Pct.	Ratios to Clay		
				8D1 NH ₄ OAc CBC	8D2 NH ₄ OAc CBC	8D1 15-Bar Water
0-5	61.5	5		0.59	0.59	0.44
5-11	61.4	4		0.62	0.65	0.47
11-16	58.9	4		0.72	0.84	0.48

- This soil was sampled to study the effects of irrigation for about 50 years on certain soil characteristics. Only the upper horizons were sampled. The soil should be compared with Colby 860Colo-50-1 and 860Colo-50-2 which were not irrigated.
- 25-30% organic matter.
- 5-25% carbonate.
- 5.6 kg/m² to 16 inches.
- Coefficient of Linear Extensibility.
- Noncarbonate clay.

Soil Type: Rocky Ford silty clay loam
 Soil No.: 850 Colo-50-3
 Location: 750 feet west and 750 feet south of the east quarter corner, Sec. 13, T22S, R45W, Prowers County, Colorado.
 Climate: Continental climate, average annual precipitation 13 to 15 inches, frost-free season 165 days.
 Elevation: 3,550 feet.
 Parent Material: Loess.
 Physiographic Position: Upland.
 Relief: Nearly level, 0-1 percent slopes.
 Drainage: Good.
 Moisture: Moist.
 Water Table: None.
 Stoniness: None.
 Salt or Alkali: Possible slight salinity.
 Erosion: Siltation.
 Present Use: Irrigated cropland - sorghum.
 Described by: James P. Fennell, November 15, 1960.

Horizon and
 Munsell
 Lab. No.

- Ap1 0 to 5 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist), dark grayish brown (10YR 3.5/2 moist crushed) silty clay loam; weak fine granular structure; dry hard, moist firm; strongly effervescent; clear smooth boundary.
- Ap2 5 to 11 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) dark grayish brown (10YR 3.5/2 moist crushed) silty clay loam; weak to moderate medium subangular blocky structure breaking to moderate fine granular; dry hard, moist firm; strongly effervescent; many worm casts; abrupt smooth boundary.
- AC 11 to 16 inches. Brown (10YR 5/3 dry) to dark brown (10YR 4/3 moist) brown (10YR 4.5/3 moist crushed) silt loam; weak medium subangular blocky structure to weak fine subangular blocky; dry slightly hard, moist friable; violently effervescent; some mixing of upper horizons in worm and root holes; clear smooth boundary.
- C1 16 to 36 inches. Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist) yellowish brown (10YR 5/4 moist crushed) silt loam; very weak medium subangular blocky structure breaking to very weak fine subangular blocky; dry soft, moist very friable; violently effervescent with a very few lime mottles and worm casts; clear smooth boundary.
- CR 36 to 60 inches plus. Very pale brown (10YR 7/3 dry) to yellowish brown (10YR 5/4 moist and crushed) silt loam; massive; dry soft, moist very friable; violently effervescent.

SOIL Rocky Ford silty clay loam g/ SOIL Nos. 850Colo-50-1 LOCATION Pratt County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14662-14664 January 1966

Depth (in.)	Horizon	1B1a Size class and particle diameter (mm)										3A1					
		Total			Sand			Silt				Clay Carbonate	3A1a Non-carbonate	Coarse fragments			
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (= 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)			Int. II (0.2-0.02)	(2-0.1)	2A2 (<19)	2-19
Pct. of < 2 mm																	
0-4	Ap1	18.0	76.5	33.5	0.3b	0.5c	0.4d	1.4d	7.4d	22.4	34.1	39.8	2.6	1	33	Tr.	
4-9	Ap2	8.4	54.8	36.8	0.2b	0.3d	0.3d	1.1d	6.5d	21.3	33.5	28.6	1.9	Tr.	37	Tr.	
9-18	AC	20.0	55.8	24.2	0.2d	0.4d	0.6d	2.8d	16.0d	34.1	21.7	52.2	4.0	5	19	Tr.	

Depth (in.)	6A1a Organic carbon	6B1a Nitrogen	C/N	6E1a Carbonate as CaCO ₃	Bulk density			Water content					pH				
					4A1a 30-cm	4A1b Air Dry	4M1 COLE	4H3 30-cm	4H1b 1/3-Bar	4H2 2-Bar	4H2 15-Bar	4C1 1/3-Bar to 15-Bar in/in	8C1b Sat.	8C1a 1:1	8C1a 1:10		
0-4	1.66	0.140	12	7	g/cc	g/cc	g/cc	g/cc	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
4-9	1.53	0.132	12	7	1.22	1.43	0.056	30.3	27.8	21.8	15.0	0.16	7.7	7.9	8.4		
9-18	0.69	0.087	8	11	1.38	1.62	0.076	28.2	27.8	21.8	15.7	0.17	7.8	7.9	8.5		

Depth (in.)	Extractable bases				Cat. Exch. Cap.	8A1 Water extract from saturated paste									
	Ca	Mg	6P2a Na	6Q2a K		Ca	Mg	6P1a Na	6Q1a K	CO ₃	HCO ₃	Cl	SO ₄	8A1a Electrical conductivity	
0-4			0.8	1.5				4.6	0.8						1.2
4-9			0.6	1.2				2.8	0.4						0.8
9-18			0.6	0.9				3.3	0.4						0.9

Depth (in.)	8A Water at Saturation	5B2 Exchangeable Na	Gypsum	Ratios to Clay		
				8B1 NH ₄ OAc	8B2 NH ₄ OAc	8B1 15-Bar Water
				CNC	CNC	g/
0-4	58.7	2		0.67	0.68	0.45
4-9	61.4	2		0.62	0.62	0.43
9-18	53.5	2		0.70	0.29	0.50

- This soil was sampled to study the effects of irrigation for about 50 years on certain soil characteristics. Only the upper horizons were sampled. The soil should be compared with Co. 850Colo-50-1 and 850Colo-50-2 which were not irrigated.
- 25-50% organic matter.
- 5-25% carbonate; 25-50% organic matter.
- 5-25% carbonate.
- 7.3 kg/m² to 18 inches.
- Coefficient of Linear Extensibility.
- Noncarbonate clay.

Soil Type: Rocky Ford silty clay loam
 Soil Nos.: 8500alo-30-4
 Location: 0.3 mile north and 100 feet east of the south quarter corner, Sec. 34, T22S, R43W, Frowers County, Colorado.
 Climate: Continental climate, average annual precipitation 13 to 15 inches, frost-free season 165 days.
 Elevation: 3,590 feet.
 Parent Material: Loess.
 Physiographic Position: Upland.
 Relief: Nearly level, 0-1 percent slopes.
 Drainage: Good.
 Moisture: Moist.
 Water Table: None.
 Stoniness: None.
 Salt or Alkali: Possible slight salinity.
 Erosion: Eutiation.
 Present Use: Irrigated cropland - sorghum.
 Described by: James P. Hannell, November 18, 1960.

Horizon and
 Lincoln
 Lab. No.

- A₁
 14662 0 to 4 inches. Grayish brown (10YR 5/2 dry) to dark grayish brown (10YR 3.5/2 moist and crushed) silty clay loam; weak very fine granular structure; dry slightly hard, moist friable; violently effervescent; abrupt smooth boundary.
- A₂
 14663 4 to 9 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) dark grayish-brown (10YR 4/2 moist crushed) silty clay loam; weak to moderate medium subangular blocky structure to moderate fine granular; dry hard, moist firm; violently effervescent; abrupt smooth boundary.
- AC
 14664 9 to 18 inches. Brown (10YR 5/3 dry) to brown (10YR 4.5/3 moist and crushed) silt loam; weak medium subangular blocky structure to very weak very fine granular; dry slightly hard, moist very friable; violently effervescent; few worm casts; clear smooth boundary.
- C₁
 18 to 30 inches. Pale brown (10YR 6/3 dry) to brown (10YR 5/3.5 moist and crushed) silt loam; very weak medium subangular blocky to massive structure; dry soft, moist very friable; violently effervescent with some mycelial line; clear smooth boundary.
- C₂
 30 to 60 inches plus. Very pale brown (10YR 7/3 dry) to yellowish brown (10YR 5/3.5 moist and crushed) silt loam; massive; dry soft, moist very friable; violently effervescent.

SOIL Rocky Ford silty clay loam a/ SOIL Nos. 86001a-50-7 LOCATION Pratt County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14676-14678 January, 1966

Depth (In.)	Horizon	Size class and particle diameter (mm)											3A1					
		1E1a		Sand							Silt		Clay 3A1a	Course fragments				
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (= 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)		(2-0.1)	Carbonate	Non-carbonate	2A2 > 2 (< 19) Pct.	2-19
Pct. of < 2 mm																		
0-6	Ap1	17.2	41.5	41.3	0.2	0.9	1.6	5.9	8.6	22.6	19.5	33.9	8.6	1	40	-		
6-13	Ap2	18.1	40.1	41.8	0.1	1.0	1.8	6.6	8.6	18.0	22.1	30.4	9.5	1	41	-		
13-18	AC	37.0	39.2	23.8	0.2	1.1	3.0	12.7	20.0	27.5	11.7	55.0	17.0	2	22	Tr.		

Depth (In.)	6A1a Organic carbon / Pct.	6M1a Nitrogen Pct.	C/N	6K1a Carbonate as CaCO ₃ Pct.	Bulk density			Water content						pH		
					4A1c 30-cm g/cc	4A1b Air-Dry g/cc	4M1 001a g/cc	4B3 30-cm Pct.	4M1b 1/3-Bar Pct.	4M2 2-Bar Pct.	4M2 15-Bar Pct.	4C1 1/3-Bar to 15-Bar Pct.	8C1b Sat. 1:1	8C1a 1:1	8C1a 1:10	
0-6	1.70	0.155	11	6		1.36	1.66	0.068	30.0	26.4	21.1	17.5	0.19	7.8	7.8	8.5
6-13	1.39	0.127	10	6		1.39	1.68	0.064	28.9	26.2	21.8	18.6	0.18	7.7	7.9	8.6
13-18	0.52	0.062	8	6		1.51	1.68	0.038	23.2	21.6	16.9	10.7	0.16	7.7	7.9	8.5

Depth (In.)	Extractable bases 5M1a				Cat. Brsh. Cap. 5A1a NH ₄ OAc	8A1		Water extract from saturated paste						8A1a Electrical conductivity mmho/cm		
	Ca	Mg	Na	K		Ca	Mg	6P1a Na	6Q1a K	CO ₃	HCO ₃	Cl	SO ₄			
0-6			1.4	1.3		23.6		6.6	0.5							1.5
6-13			1.4	1.2		23.4		7.6	0.5							1.6
13-18			1.0	0.8		14.4		8.3	0.4							2.0

Depth (In.)	8A Water at Saturation Pct.	5B2 Exchangeable Na Pct.	Gypsum Pct.	Ratios to Clay		
				8M1 NH ₄ OAc CEC	8M2 NH ₄ OAc CEC	8M1 15-Bar Water
0-6	72.8	4		0.57	0.59	0.42
6-13	63.4	4		0.56	0.57	0.44
13-18	50.0	4		0.60	0.65	0.45

a. This soil was sampled to study the effects of irrigation for about 50 years on certain soil characteristics. Only the upper horizons were sampled. The soil should be compared with Colby 86001a-50-5 and 86001a-50-6 which were not irrigated.
 b. 5-25% carbonate.
 c. 7.7 kg/m² to 18 inches.
 d. Coefficient of Linear Extensibility.
 e. Noncarbonate clay.

Soil Type: Rocky Ford silty clay loam

Soil Nos.: 860Colo-50-7

Location: 100 feet north and 50 feet west of Junction of Highway 50 and east section line, Sec. 16, T23S, R43W, Prowers County, Colorado.

Climate: Continental climate, average annual precipitation 13 to 15 inches, frost-free season 165 days.

Elevation: 3,450 feet.

Parent Material: Alluvium.

Physiographic Position: Stream terrace.

Relief: Nearly level, 0-1 percent slopes.

Drainage: Good.

Moisture: Moist.

Water Table: None.

Stoniness: None.

Salt or Alkali: Possible slight salinity.

Erosion: Siltation.

Present Use: Irrigated cropland - alfalfa.

Described by: James P. Pannell, September, 1960.

Horizon and

Lincoln

Lab. No.

- A₁
14676 0 to 6 inches. Grayish brown (10YR 5/2 dry) to dark grayish brown (10YR 3.5/2 moist and crushed) silty clay loam; moderate fine granular structure; dry hard, moist firm; violently effervescent; clear smooth boundary.
- A₂
14677 6 to 13 inches. Grayish brown (10YR 5/2 dry) to dark grayish brown (10YR 3.5/2 moist and crushed) silty clay loam; weak coarse subangular blocky structure to weak fine subangular blocky; dry hard, moist firm; violently effervescent; clear smooth boundary.
- AC
14678 13 to 18 inches. Brown (10YR 5/3 moist) to dark brown (10YR 3.5/3 moist and 4/3 moist crushed) loam; weak coarse subangular blocky structure to weak fine granular; dry slightly hard, moist friable; violently effervescent; gradual smooth boundary.
- C₁ 18 to 30 inches. Brown (10YR 5/3 dry and 4/3 moist and crushed) stratified silt loam and loam; very weak coarse subangular blocky structure to massive; dry soft, moist very friable; violently effervescent; clear smooth boundary.
- C₂ 30 to 60 inches. Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist and crushed) stratified loam, silt loam and very fine sandy loam; massive; dry soft, moist very friable; violently effervescent; a very few small salt spots.

SOIL Rocky Ford silty clay loam # SOIL Nos. S60Cals-70-8 LOCATION Frontier County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14679-14681 January, 1966

Depth (in.)	Horizon	1B1a Size class and particle diameter (mm)											3A1				
		Total		Sand					Silt				Clay Carbonate	3A1a Non-carbonate	Coarse fragments		
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (= 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)			(2-0.1)	2AE > 2 (-19)	19-76
Pct. of < 2 mm																	
0-8	Ap1	19.5	47.2	33.3	0.1	0.8b	1.3b	6.7b	10.6b	23.1	24.1	38.1	8.9	1	32	Tr.	
8-12	Ap2	19.7	46.5	33.8	0.1	0.7b	1.3b	7.0b	10.6b	22.8	23.7	38.4	9.1	1	33	-	
12-16	AC	34.2	39.4	26.4	0.1	0.9b	2.2b	13.5b	17.9b	25.7	13.7	52.1	16.7	3	23	-	

Depth (in.)	6A1a Organic carbon g/Pct.	6B1a Nitrogen Pct.	C/N	6C1a Carbonate as CaCO ₃ Pct.	Bulk density		Water content					pH			
					4A1a 30-cm g/cc	4A1b Air-dry g/cc	4B1 0.05-0.02 g/cc	4E3 30-cm Pct.	4E1b 1/3-Bar Pct.	4E2 2-Bar Pct.	4E1 15-Bar Pct.	4C1 1/3-Bar to 15-Bar in./in.	8C1b Sat. Paste	8C1a 1:1	8C1a 1:10
0-8	1.38	0.121	11	6	1.33	1.49	0.046	25.4	23.3	16.1	13.9	0.12	7.9	8.0	8.6
8-12	1.20	0.114	10	6	1.39	1.57	0.044	25.5	23.1	18.4	14.6	0.12	7.8	7.8	8.4
12-16	0.60	0.067	9	6	1.46	1.60	0.038	22.9	19.5	14.9	10.5	0.13	7.6	7.8	8.5

Depth (in.)	Extractable bases				5B1a	6F1a	6G1a	8A1a Electrical conductivity mmho/cm
	Ca	Mg	Na	K				
0-8			1.6	0.9				1.4
8-12			1.5	0.8				1.8
12-16			0.9	0.6				1.8

Depth (in.)	8A Water at Saturation Pct.	5B2 Exchangeable Na Pct.	Gypsum Pct.	Ratios to Clay		
				5B1 5B1a/5B2	5B1 5B1a/5B1	5B1 5B1a/15-Bar Water
0-8	64.2	6		0.59	0.61	0.42
8-12	63.2	4		0.58	0.59	0.43
12-16	49.5	3		0.54	0.63	0.46

- This soil was sampled to study the effects of irrigation for about 50 years on certain soil characteristics. Only the upper horizons were sampled. The soil should be compared with Colby S60Cals-70-5 and S60Cals-70-6 which were not irrigated.
- 5-25% carbonate.
- 6.1 kg/m² to 16 inches.
- Coefficient of linear extensibility.
- Noncarbonate clay.

Soil type: Rocky Ford silty clay loam
 Soil Nos.: S60Colo-50-8
 Location: 0.3 mile north and 100 feet east of the west quarter corner, Sec. 33, T22S, R45W, Prowers County, Colorado.
 Climate: Continental climate, average annual precipitation 13 to 15 inches, frost-free season 165 days.
 Elevation: 3,585 feet.
 Parent Material: Alluvium.
 Physiographic Position: Stream terrace.
 Relief: Nearly level, 0-1 percent slopes.
 Drainage: Good.
 Moisture: Moist.
 Water Table: None.
 Stoniness: None.
 Salt or Alkali: Possible slight salinity.
 Erosion: Siltation.
 Present Use: Irrigated cropland - corn.
 Described by: James F. Pannell, September, 1960.

Horizon and
 Lincoln
 Lab. No.

- A₁
 14679 0 to 8 inches. Grayish brown (10YR 5/2 dry) to dark grayish brown (10YR 3.5/2 moist and 4/2 moist crushed) silty clay loam; weak fine granular structure; dry hard, moist firm; violently effervescent; clear smooth boundary.
- A₂
 14680 8 to 12 inches. Grayish brown (10YR 5/2 dry) to dark grayish brown (10YR 3.5/2 moist and 4/2 moist crushed) silty clay loam; weak coarse subangular blocky structure breaking to weak fine subangular blocky; dry hard, moist firm, violently effervescent; clear smooth boundary.
- A₃
 14681 12 to 16 inches. Brown (10YR 5/3 dry) to brown (10YR 4/3 moist and 4/2.5 moist crushed) silty clay loam; weak coarse subangular blocky structure breaking to weak to medium fine subangular blocky; dry hard, moist firm; violently effervescent; clear smooth boundary.
- C₁ 16 to 37 inches. Light yellowish brown (10YR 6/4 dry) to brown (10YR 5/3 moist and crushed) silt loam; very weak coarse subangular blocky to massive structure; dry soft, moist very friable; violently effervescent; clear smooth boundary.
- C₂ 37 to 45 inches. Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist and crushed) very fine sandy loam; massive; dry soft, moist very friable; violently effervescent; clear smooth boundary.
- C₃ 45 to 60 inches plus. Light yellowish brown (10YR 6/4 dry) to brown (10YR 5/3 moist and crushed) silt loam weakly stratified; massive; dry soft, moist very friable; violently effervescent with a few lime nodules.

SOIL SURVEY LABORATORY Lincoln, Nebr. November 1958

SOIL TYPE Stecum LOCATION Trout Creek Watershed,
gravelly sandy loam Chaffee County, Colorado

SOIL NOS. S57Colo-8-4

LAB. NOS. 8189-8192

DEPTH INCHES	HORIZON	1B1a PARTICLE SIZE DISTRIBUTION (in mm.) (pct cent)									3A1		TEXTURAL CLASS
		VERY COARSE SAND 2-7	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	2A2 > 2 ($< 19\mu$)		
0-3	A1	24.3	18.9	7.1	7.7a	6.4a	26.3	9.3	20.6	14.8	50	cosl	
3-9	AB	24.1	19.8	8.0	11.2a	6.4a	21.6	8.9	20.6	12.8	50	cosl	
9-13	C1	29.4	20.5	7.4	11.4b	5.8b	14.5	11.0	17.3	8.7	56	ccsl	
13-21	C2	20.4	26.8	8.4	16.6b	7.2b	12.3	8.3	20.4	7.3	64	lcos	
pH		ORGANIC MATTER				6C1a	6E1a		MOISTURE TENSIONS				
8C1a	1.5	1:10	6A1a	6B1a		Free Iron Fe ₂ O ₃ %	CaCO ₃ equiv- alent	4B1a	1/3	15	4B2		
1:1			ORGANIC CARBON %	NITROGEN %	C/N		%	1/10 ATMOS.	1/3 ATMOS.		15 ATMOS.		
6.5			3.48	0.163	21	1.5	<1				6.0		
7.0			0.71	0.048	15	1.6	<1				4.0		
7.3			0.48	0.030	16	1.8	<1				5.6		
7.5			0.21	0.012		1.2	<1				4.8		
5A1a	EXTRACTABLE CATIONS					5B1a	BASE SAT. %	5C3	Sum	Sum	Ca/Vg		
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6P1a	6P2a	6Q2a		NH ₄ Ac EXCH.	Base Sat. %	5B1a	5A3a			
	Cu	Mg	H	Na	K			on Sum					
	milliequivalents per 100g. soil					5C1		Cations	me/100g	8D3			
12.6	12.5	1.6	3.2	<0.1	0.8	118	82	14.9	18.1	7.8			
8.0	6.6	1.2	1.8	<0.1	0.3	101	82	8.1	9.9	5.5			
10.2	8.3	1.4	1.8	<0.1	0.4	99	85	10.1	11.9	5.9			
9.9	8.3	1.7	1.4	<0.1	0.4	105	83	10.4	11.8	4.9			
a.	Common flakes of mica												
b.	Many flakes of mica												

Soil Type: Stecum gravelly sandy loam
 Soil Nos.: S57Colo-8-4
 Location: Trout Creek Watershed, Chaffee County, Colorado.
 Physiographic Position: Mountain side. Elevation 9,905 feet.
 Topography: Steeply sloping convex south-facing mountain slope of about 35 percent gradient.
 Drainage: Well drained.
 Vegetation: Mountain mahogany, sage, spike muhly, fescue, and grama grass.
 Use: National Forest lands.
 Collected by: John Retzer, A. J. Cline, E. M. Payne, T. Baber, W. Hunter, E. Wesswick, September 18, 1957.
 Described by: A. J. Cline.

Horizon and
 Lincoln
 Lab. No.

- A1 0 to 3 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) gravelly sandy loam; soft when dry, very friable when moist; moderate fine granular structure; noncalcareous, approximate pH 6.8; about 25 percent of this horizon is gravel with some accumulation of gravel due to differential erosion on the surface of the soil; lower boundary clear and smooth.
- AB 3 to 9 inches. Grayish brown or light brownish gray (10YR 5.5/2 dry) to dark grayish brown (10YR 4/2 moist) gravelly light sandy loam; slightly hard when dry, very friable when moist; weak medium subangular blocky structure, breaking to moderate medium granules; noncalcareous, approximate pH 7.0; there are a very few thin patchy clay skins on some of the soil aggregates; about 40 percent of the horizon is gravel; lower boundary gradual and smooth.
- C1 9 to 13 inches. Brown or pale brown (10YR 5.5/3 dry) to brown or dark brown (10YR 4/3 moist) gravelly sand; slightly hard when dry, very friable when moist; single grained; noncalcareous, approximate pH 7.2; about 75 percent of this horizon is gravel and stone; lower boundary gradual and smooth.
- C2 13 to 21 inches. This horizon is partially disintegrated granite and biotite schist rocks.

Remarks: Profile upslope in position from Stecum, Soil Nos. S57Colo-8-5.

SOIL SURVEY LABORATORY Lincoln, Nebr. November 1958

SOIL TYPE Stecum LOCATION Trout Creek Watershed,
gravelly sandy loam Chaffee County, Colorado

SOIL NOS. S57Colo-8-5 LAB. NOS. 8193-8195

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a		2A1		3A1		2A2		3A1		
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY				
		2.1	1.0-5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	< 0.002	
0-4	A1	24.4	28.0	10.8	8.3a	9.5a	13.7	5.3	17.1	7.1	23	lcos
4-9	AC	24.6	24.5	10.0	11.2a	5.3a	17.6	6.8	17.5	10.2	45	cosl
9-20	Cl	25.2	24.6	9.9	13.1a	6.5a	15.5	5.2	19.2	8.8	49	lcos
pH		ORGANIC MATTER				6C1a	6E1a		MOISTURE TENSIONS			
8C1a		1:5	1:10	6A1a ORGANIC CARBON	6B1a NITROGEN	Free Iron Fe ₂ O ₃ %		CaCO ₃ equiv- alent	4B1a 1/10 ATMOS.	4B1a 1/3 ATMOS.	4B2 15 ATMOS.	
				%	%	C/N		%	%	%	%	
6.8				1.58	0.100	16		Δ	17.0	9.6	3.4	
7.0				0.74	0.039	19		Δ	13.8	9.6	3.5	
7.3				0.51	0.029	18		Δ	13.8	9.2	2.8	
5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b	6O2b	6H1a	6P2a	6Q2a	BASE SAT. % NH ₄ Ac EXCH.	5C3 Base Sat. % on Sum Cations	Sum Bases	Sum Cations	Ca/Mg		
	Co	Mg	H	Na	K			5B1a	5A3a			
	milliequivalents per 100g. soil					5C1		me/100g		8D3		
6.8	5.6	0.6	2.7	<0.1	0.4	97	71	6.6	9.3	9.3		
7.1	5.6	1.2	1.8	<0.1	0.2	98	80	7.0	8.8	4.7		
5.9	5.0	0.8	1.8	<0.1	0.2	102	77	6.0	7.8			
a. Common		flakes of mica										

Soil Type: Stecum gravelly sandy loam

Soil Nos.: 857Colo-8-5

Location: Trout Creek Watershed, Chaffee County, Colorado.

Physiographic Position: Mountain side. Elevation 9,805 feet.

Topography: Steeply sloping convex south-facing mountain slope of about 35 percent gradient.

Drainage: Well drained.

Vegetation: Blue grama, sage, fescue, and scattered aspen and mountain mahogany.

Use: National Forest lands.

Collected by: John Retzer, A. J. Cline, E. M. Payne, T. Haber, W. Hunter and E. Wesswick, September 18, 1957.

Described by: A. J. Cline.

Horizon and

Lincoln

Lab. No.

- A1 0 to 4 inches. Dark gray (10YR 4/1 dry) to black or very dark gray (10YR 2.5/1 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; moderate fine granular structure; noncalcareous; about 15 percent of this horizon is gravel; lower boundary clear and smooth.
- 8193
- AC 4 to 9 inches. Brown (10YR 5/3 dry) to dark brown (10YR 3/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; very weak fine subangular blocky structure; breaking to moderate fine granules; noncalcareous; there are a few thin patchy clay skins on the surfaces of the soil aggregates in this horizon; lower boundary gradual and smooth; about 20 percent of this horizon is gravel.
- 8194
- Cl 9 to 20 inches. Pale brown (10YR 6/3 dry) to brown (10YR 4.5/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; very weak medium subangular blocky structure, breaking to single grains; noncalcareous; about 40 to 50 percent of this horizon is gravel and fractured rock fragments; lower boundary gradual and smooth.
- 8195
- Cr 20 inches plus. Partially weathered granite bedrock.

Remarks: Profile intermediate in position on slope between Stecum Soil Nos. 857Colo-8-4 and 857Colo-8-6.

SOIL SURVEY LABORATORY Lincoln, Nebr. November 1958

SOIL TYPE Stecum LOCATION Trout Creek Watershed, Chaffee County, Colorado
gravelly sandy loam

SOIL NOS. S57Colo-8-6 LAB. NOS. 8196-8199

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	0.25-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002	($< 19\mu$)		
0-2½	A1	29.0	24.4	8.0	9.4	5.0	17.3	6.9	17.0	9.5	27	cscl	
2½-5	AB	25.1	20.4	7.0	9.5a	4.8a	22.9	10.3	19.8	12.5	39	cosl	
5-8	C1	18.5	22.8	9.5	14.4a	6.3a	16.7	11.8	21.1	8.9	54	cosl	
8-17+	C2	24.7	29.9	10.1	15.0a	5.1a	7.6	7.6	15.2	4.7	68	leos	
pH		ORGANIC MATTER					6C1a	6E1a		MOISTURE TENSIONS			
8C1a		6A1a		6B1a		Free Iron	CaCO ₃ equiv- alent		1/10	1/3	4P		
1:1		ORGANIC CARBON		NITRO-GEN		Fe ₂ O ₃ %	%		ATMOS.	ATMOS.	ATMOS.		
7.0		%		%			%		%	%	%	5.0	
7.1		3.70		0.131		20	1.4		Δ			5.0	
7.3		1.15		0.076		15	1.7		Δ			4.5	
7.4		0.84		0.035		24	1.9		Δ			5.2	
		0.34		0.011		31	1.5		Δ			5.0	
5A1a		EXTRACTABLE CATIONS					5B1a	BASE SAT. %	5C3	Sum	Sum	Ca/Mg	
CATION EXCHANGE CAPACITY		6N2b	6O2b	6H1a	6P2a	6Q2a	Na ⁺ Ac EXCH.	Base Sat. % on Sum	Bases 5B1a	Cations 5A3a			
NH ₄ Ac		Co	Mg	H	Na	K			me/100g				
		milliequivalents per 100g. soil					5C1					8D3	
11.8		9.6	1.6	3.6	<0.1	0.6	100	77	11.8	15.4	6.0		
11.0		8.6	1.6	2.3	<0.1	0.6	98	82	10.8	13.1	5.4		
11.3		9.6	2.1	2.3	<0.1	0.4	107	84	12.1	14.4	4.6		
11.0		11.4	2.4	1.8	<0.1	0.3	128	89	14.1	15.9	4.8		
a. Common flakes of mica													

Soil Type: Stecum gravelly sandy loam
 Soil Nos.: S57Colo-8-6
 Location: Trout Creek Watershed, Chaffee County, Colorado.
 Physiographic Position: Mountain slope. Elevation 9,680 feet.
 Topography: Steeply sloping south-facing mountain side having about 30 percent gradient.
 Drainage: Well drained.
 Vegetation: Blue grama, sage, fescue, and scattered growth of aspen.
 Use: National Forest lands.
 Collected by: John Retzer, A. J. Cline, E. M. Payne, T. Baber, W. Hunter, and E. Wesswick, September 18, 1957.
 Described by: A. J. Cline.

Horizon and
 Lincoln
 Lab. No.

- A1 0 to 2½ inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) sandy loam; soft when dry, very friable when moist; moderate fine granular structure; noncalcareous, approximate pH 6.8; approximately 15 percent of this horizon is gravel; lower boundary clear and smooth.
- AB 2½ to 5 inches. Brown (10YR 5/3 dry) to dark brown (10YR 3/3 moist) gravelly sandy loam; slightly hard when dry, friable when moist; moderate fine granular structure; noncalcareous, approximate pH 6.8; this horizon is bordering on a textural B horizon and contains thin patchy clay skins on both the horizontal and vertical faces of some aggregates; lower boundary gradual and smooth; approximately 30 percent of this horizon is gravel.
- C1 5 to 8 inches. Brown or yellowish brown (10YR 5/3.5 dry) to dark brown or dark yellowish brown (10YR 4/3.5 moist) gravelly loamy sand; slightly hard when dry, friable when moist; weak coarse granular structure; noncalcareous, approximate pH 7.2; there are some patchy clayskins principally on the surface of the gravel in this horizon; about 75 percent of this horizon is gravel; lower boundary gradual and smooth.
- C2 8 to 17 inches. Yellowish-brown (10YR 5/4 dry) to dark yellowish brown (10YR 4/4 moist) gravelly sand; slightly hard when dry, friable when moist; massive; noncalcareous, approximate pH 7.4; this is a horizon of partially weathered granitic bedrock and the consistence of the rock increases with depth. Approximately 90 percent of the horizon delineated is weathered rock and gravel.

Remarks: Profile downslope in position from Stecum, Soil Nos. S57Colo-8-5.

SOIL SURVEY LABORATORY

Lincoln, Nebr.

3/17/58

SOIL TYPE Tabernash
Loam

LOCATION Grand County, Colorado

SOIL NOS. S55Colo-25-5

LAB. NOS. 2886-2892

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	0.2-0.075	0.075-0.002 (<19mm.)	> 2									
		2:1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.075	0.075-0.002 (<19mm.)										
0-1 1/2	A1	7.2	7.2	3.6	6.3	11.3	54.2	10.2	42.5	26.8	3	s11								
1 1/2-5 1/2	A2	7.3	7.8	3.9	6.8	11.8	50.6	11.8	40.9	25.5	4	s11								
5 1/2-8	B1	7.9	7.6	3.7	6.5	9.2	35.6	29.5	30.1	18.5	2	cl								
8-15	B21	5.9	4.7	3.0	6.4	9.5	37.1	33.4	31.2	19.2	2	cl								
15-23	B22	3.0	3.9	2.9	6.4	9.4	39.4	35.0	32.0	20.6	1	cl								
23-27	B3	16.1	10.6	6.0	8.9	9.1	28.9	20.4	28.7	14.2	10	l								
27-36	D	22.9	14.6	8.2	12.9	9.1	16.0	14.3	24.9	9.1	30	cosl								
pH		ORGANIC MATTER				6C1a Free Iron Fe ₂ O ₃		MOISTURE TENSIONS												
8C1a		6A1a		6B1a		%		1/10 ATMOS.		1/3 ATMOS.		4B2 15 ATMOS.								
1:5		1:10		ORGANIC CARBON		NITRO-GEN		%		%		%								
1:1				%		C/N		%		%		%								
6.2				2.25		.108		21		1.4		6.3								
5.9				0.47		.029		16		1.3		4.6								
6.0				0.51		.029		18		1.6		10.5								
6.1				0.34		.024		14		1.8		13.4								
6.2				0.27		.017		16		1.6		14.8								
5.9				0.19		.013				1.4		8.2								
5.7				0.19		.010				1.1		7.3								
5A1a		EXTRACTABLE CATIONS 5B1a				BASE SAT. % NH ₄ Ac EXCH.		5C3 Base Sat. % on Sum Cations		5B1a Sum Bases		5A3a Sum Cations		8D3 Ca/Mg						
CATION EXCHANGE CAPACITY NH ₄ Ac		6E2b Ca		6O2b Mg		6H1a H		6P2a Na		6Q2a K										
		milliequivalents per 100g. soil																		
15.8		10.3		1.7		7.5		0.1		1.0		83		64	13.1		20.6		6.0	
8.7		5.0		1.3		4.2		0.1		0.4		78		62		6.8		11.0		3.8
20.1		13.4		4.3		5.3		0.1		0.5		91		78		18.3		23.6		3.1
24.6		18.1		5.7		5.1		0.1		0.4		99		83		24.3		29.4		3.2
27.4		22.1		6.5		5.6		0.2		0.3				84		29.1		34.7		3.4
15.9		10.9		3.1		3.8		0.1		0.2		90		79		14.3		18.1		3.5
15.9		11.4		3.1		4.0		0.1		0.1		92		79		14.7		18.7		3.7

Soil Type: Tabernash loam

Soil Nos.: S55Colo-25-5

Location: Approximately the NE 1/4 of the SE 1/4, Sec. 27, T1S, R76W, Grand County, Colorado, approximately 1.8 mile north and 380 feet west of the Forest Service headquarters building on the road to Fraser.

Physiographic Position: Outwash terrace.

Topography: Gently sloping convex area of about 4 percent gradient facing east.

Drainage: Well drained.

Vegetation: Forest cover of lodgepole pine with thin understory of vaccinium.

Use: Forest land or grazing land.

Collected by: James Allen and A. J. Cline, August, 1955.

Horizon and

Lincoln

lab. No.

- Ao - Aoo 1 to 0 inch. Gray (10YR 5/1 dry) to black (10YR 2/1 moist) thin mat of undecomposed and partially decomposed organic materials. The surface one-fourth inch consists almost entirely of last year's fall of pine needles; the horizon rests abruptly on the horizon below.
- A1 2886 0 to 1½ inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) loam; soft when dry, very friable when moist; weak to moderate medium and coarse crumb structure; slightly acid; the color of this horizon is not uniform and contains streaks and mottles of 10YR 2/1 and 10YR 4/2 materials; lower boundary clear and smooth.
- A2 2887 1½ to 5½ inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) loam; soft when dry, very friable when moist; weak coarse platy structure breaking to weak to moderate coarse and medium crumb; approximately neutral in reaction; lower boundary gradual and wavy.
- E1 2888 5½ to 8 inches. Pale brown (10YR 6/3 dry) to dark brown (10YR 4/3 moist) clay loam; slightly hard when dry, friable when moist; weak to moderate fine subangular blocky structure; approximately neutral in reaction; this horizon has thin nearly continuous tonhautchen; the surfaces of the soil aggregates are coated with 10YR 7/2 colored materials probably from the horizon above; lower boundary clear and wavy.
- E21 2889 8 to 15 inches. Light brown (7.5YR 6/4 dry) to dark brown (7.5YR 4/4 moist) heavy clay loam or light clay; very hard when dry, firm when moist; moderate to strong fine subangular blocky structure; approximately neutral in reaction; moderate continuous tonhautchen; the surfaces of the soil aggregates are thinly coated with 10YR 7/2 colored materials; lower boundary clear and smooth.
- E22 2890 15 to 23 inches. Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) heavy clay loam or light clay; very hard when dry, firm when moist; moderate coarse prismatic structure breaking to strong medium angular blocks; approximately neutral in reaction; strong continuous tonhautchen; the surfaces of the soil aggregates are coated with 10YR 7/2 colored materials principally on vertical faces; lower boundary gradual and smooth.
- E3 2891 23 to 27 inches. Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) gravelly clay loam in texture; hard when dry, friable when moist; weak coarse and medium subangular blocky structure; approximately neutral in reaction; this horizon contains thin patchy tonhautchen; about 30 percent of this horizon is cobble and gravel; lower boundary gradual and smooth.
- D 2892 27 to 36 inches. Pale brown (10YR 6/3 dry) to dark brown (10YR 4/3 moist) cobbly sandy loam; hard when dry, firm when moist; massive; about 70 percent of this horizon is cobble and gravel but the horizon appears to be weakly cemented.

SOIL SURVEY LABORATORY Lincoln, Nebr. 3/17/58

SOIL TYPE Tabernash loam LOCATION Grand County, Colorado

SOIL NOS. S55Colo-25-6 LAB. NOS. 2893-2898

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in num.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	2A2 > 2 (19mm)	
0-7	A2	16.9	15.0	2.8	5.3	2.3	45.3	12.4	27.0	23.6	8	1
7-12	B1	6.7	5.4	3.9	7.8	9.3	39.1	27.8	32.8	20.2	4	cl
12-22	B21	3.6	4.5	4.0	8.3	9.3	34.2	36.1	30.3	18.2	2	cl
22-32	B22	3.7	4.5	4.0	8.6	9.4	35.3	34.5	31.7	18.2	1	cl
32-38	B3	5.0	6.1	4.8	9.4	9.3	32.9	32.5	30.8	16.8	2	cl
38-48+	C	10.1	7.6	4.6	8.4	8.3	30.5	30.5	28.1	15.5	4	cl

pH	ORGANIC MATTER					MOISTURE TENSIONS			
	8C1a		6A1a	6B1a	5C1a	4B2			
	1:5	1:10	ORGANIC CARBON %	NITRO-GEN %	C/N	Fe ₂ O ₃ %	1/10 ATMOS. %	1/3 ATMOS. %	15 ATMOS. %
5.9			0.84	.042	20	1.2			5.6
5.4			0.35	.025	14	1.4			10.4
5.2			0.26	.018	14	1.5			14.8
5.1			0.20	.020		1.4			14.9
5.5			0.22	.015		1.4			13.7
5.9			0.17	.015		1.6			12.8

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					5B1a BASE SAT. % NH ₄ Ac EXCH. 5C1	Base Sat. % on Sum Cations	5E1a Sum Bases	5A3a Sum Cations	8D3 Ca/Mg
	6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K					
	milliequivalents per 100g. soil									
11.0	6.1	1.8	4.8	-	0.6	77	64	8.5	13.3	3.4
19.7	12.6	4.2	4.2	0.1	0.6	89	81	17.5	21.7	3.0
27.7	19.4	5.9	5.4	0.1	0.7	94	83	26.1	31.5	3.3
27.6	19.1	6.1	4.3	0.2	0.5	94	86	25.9	30.2	3.1
26.8	19.4	6.1	3.9	0.2	0.4	97	87	26.1	30.0	3.2
26.1	18.6	5.6	3.7	0.2	0.3	95	87	24.7	28.4	3.3

Soil Type: Tabernash loam

Soil Nos.: S55Colo-25-6

Location: Approximately the SW 1/4 of the NE 1/4, Sec. 34, T15, R76W, Grand County, Colorado. About 1.1 miles north and 190 feet west of the Forest Service headquarters building on the road to Fraser.

Physiographic Position: Outwash terrace.

Topography: Gently sloping convex area of approximately 4 percent gradient facing east.

Drainage: Well drained.

Vegetation: Principally lodgepole pine with a thin understory of vaccinium and grasses.

Use: Timberland and limited grazing.

Collected by: James Allen and A. J. Cline, August 1955.

Horizon and

Lincoln

Lab. No.

- A₀ 1 to 0 inch. Gray (10YR 5/1 dry) to very dark gray (10YR 3/1 moist) partially decomposed organic material; the horizon rests abruptly on the horizon below.
- A₂ 0 to 7 inches. Light gray (10YR 7/2 dry) to grayish brown (10YR 5/2 moist) loam; soft when dry, very friable when moist; weak coarse and medium platy structure breaking to weak to moderate fine crumb; approximately neutral; lower boundary gradual and wavy.
- B₁ 7 to 12 inches. Pale brown (10YR 6/3 dry) to dark brown (10YR 4/3 moist) clay loam; slightly hard when dry, friable when moist; moderate fine angular and subangular blocky structure; approximately neutral in reaction; thin continuous tonhauthchen; the surfaces of the soil aggregates of this horizon have a strong coating of 10YR 7/2 materials; lower boundary gradual and wavy.
- B₂₁ 12 to 22 inches. Light brown (7.5YR 6/4 dry) to brown (7.5YR 5/4 moist) silty clay; extremely hard when dry, very firm when moist; weak to moderate very coarse prismatic structure breaking to strong medium angular blocks; approximately neutral in reaction; thick continuous tonhauthchen; the faces of the soil aggregates of this horizon have a moderate coating of 10YR 7/2 materials; lower boundary gradual and smooth.
- B₂₂ 22 to 32 inches. Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) silty clay; extremely hard when dry, very firm when moist; weak to moderate very coarse prismatic breaking to moderate to strong coarse and medium angular blocks; approximately neutral in reaction; thick continuous tonhauthchen; the surfaces of the soil aggregates of this horizon have a thin coating of 10YR 7/2 colored materials and some dark organic staining; lower boundary gradual and smooth.
- B₃ 32 to 38 inches. Brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) sandy clay; hard when dry, friable when moist; weak coarse subangular blocky structure; approximately neutral in reaction; thin nearly continuous tonhauthchen; the surfaces of the soil aggregates in this horizon have a very thin indistinct coating of 10YR 7/2 materials; lower boundary gradual and smooth.
- C 38 to 48 inches plus. Yellowish brown (10YR 5/4 dry) to dark yellowish brown (10YR 4/4 moist) gravelly sandy clay loam; hard when dry, friable when moist; massive; approximately neutral in reaction; this horizon grades into waterwashed cobble and gravel strata.

SOIL TYPE *Tex sandy loam LOCATION Gunnison County, Colorado

SOIL NOS. S59Colo-26-3 LAB. NOS. 11998-12003

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1R1a					3A1					
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	2A2 > 2 (19µm)	
0-2	A1	14.4	17.5	7.6	11.8	8.7	27.3	12.7	28.0	14.0	38	cosl
2-10	A2	15.3	16.7	9.7	15.7	8.4	27.7	6.5	30.6	13.3	33	cosl
10-14	A2&B1	16.6	17.9	9.7	17.3	9.4	22.3	6.8	30.8	9.7	41	cosl
14-24	A2&B2	20.9	21.7	11.2	16.6	8.1	16.2	5.3	23.6	8.8	39	lcos
24-45	B3C	20.8	19.5	10.5	17.6	9.4	16.1	6.1	26.1	8.3	39	lcos
45-58	C	30.0	24.4	11.6	15.9	5.6	8.3	4.2	16.7	4.4	45	cos/lcos
pH		ORGANIC MATTER				6C1a	6E1c		MOISTURE TENSIONS			
8C1a	1:5	1:10	6A1a ORGANIC CARBON	6B1a NITRO-GEN	C/N	Free Iron Fe ₂ O ₃	CaCO ₃ equiv- alent	4B1a 1/10 ATMOS.	4B1a 1/3 ATMOS.	4B2 15 ATMOS.		
1:1			%	%		%	%	%	%	%		
5.9			2.95	0.118	25	1.0				5.5		
5.8			0.51	0.022	23	1.0		14.8	9.0	3.1		
5.9			0.15	0.007		0.9		11.1	6.6	2.5		
6.0			0.09	0.007		1.0		10.2	6.4	2.2		
6.3			0.04			0.9		10.6	6.7	2.2		
6.7			0.02			0.9	< 0.1	7.2	4.6	1.6		
5A1a CATION EXCHANGE CAPACITY NH ₄ OAc	EXTRACTABLE CATIONS					5E1a	BASE SAT. % NH ₄ OAc EXCH.	Base Sat. % on Sum Cations	Sum Ext. Bases	Sum Ext. Cations	Ca/Mg	O. D. Bulk Density g/cc
	6N2b Co	6O2b Mg	6H1a H	6P2a No	6Q2a K		5C1	5C3	5B1a	5A3a	8D3	
	milliequivalents per 100g. soil											
12.5	7.1	1.1	8.8	< 0.1	0.4	69	49	8.6	17.4	6.4		
5.9	3.3	0.7	3.5	< 0.1	0.2	71	54	4.2	7.7			
4.1	2.2	0.4	2.4	< 0.1	0.1	66	53	2.7	5.1			
3.4	2.0	0.7	1.6	< 0.1	0.1	82	64	2.8	4.4			
3.3	2.1	0.8	1.4	< 0.1	0.1	91	68	3.0	4.4			
2.5	1.6	0.7	0.9	< 0.1	0.1	96	73	2.4	3.3			

Soil Type: *Tex sandy loam

Date: Sept. 1959, by J. Y. Nishimura, W. Goddard, J. S. Allen, L. Juve, C.J. Fox

Area: Gunnison County, Colorado

Location: NE $\frac{1}{4}$ of Sec. 14, T. 13 S., R. 83 W. Forest Hill road-immediately east of fork in trail. photo 2717.

Parent Material: Glacial moraine dominantly of granitic origin.

Physiographic position: Upland moraine position about 1/3 down slope. Elevation about 9900 feet.

Topography: Hummocky. SW exposure with 32 percent gradient.

Drainage: Well-drained

Vegetation: Lodgepole pine with a 5 percent ground cover of Kinnikinick.

Mosses and lichens on rocks.

Use: National Forest land. Described by: Charles J. Fox.

Soil No.: S-59-Colo-26-3

Lincoln Horizon

Lab. No.

- | | | |
|---------------------------------------|----------------------------|--|
| A ₀₀ | 1- $\frac{1}{2}$
inches | Loose pine needles; approximate pH 4.8. |
| A ₀ | $\frac{1}{2}$ -0
inch | Partially decayed pine needles mixed with some mineral matter. Approximate pH 5.2. |
| 11998 A ₁ | 0-2
inches | Dark grayish brown (10YR 4/2 dry) to very dark grayish brown (10YR 3/2 moist) gravelly sandy loam; single grain and weak very fine granular structure; soft when dry, very friable when moist; nonplastic when wet; about 2 percent of horizon consists of rounded glacial stones; approximate pH 5.5; roots plentiful; lower boundary abrupt and smooth. |
| 11999 A ₂ | 2-10
inches | Pale brown (10YR 6/3 dry) to dark brown (10YR 4/3 moist) gravelly sandy loam; weak very fine granular structure; soft when dry, very friable when moist, nonplastic when wet; a very few hair-line discontinuous bands that are higher in chroma; clean sand grains; approximate pH 5.2; roots plentiful; lower boundary clear and wavy. |
| 12000 A ₂ & B ₁ | 10-14
inches | Pale brown (10YR 6/3 dry) to dark brown (10YR 4/3 moist) gravelly loamy sand; weak medium subangular blocky structure breaking to single grains and weak very fine granules; loose when dry or moist, nonplastic when wet; three $\frac{1}{4}$ to $\frac{1}{2}$ " bands in this horizon that are light brown (7.5YR 6/4 dry) to brown (7.5YR 5/4 moist); bands are gravelly sandy loam and break to weak fine granules; sand grains in bands are lightly stained; approximate pH 5.0; roots plentiful; lower boundary clear and wavy. |
| 12001 A ₂ & B ₂ | 14-24
inches | Very pale brown (10YR 7/4 dry) to yellowish brown (10YR 5/4 moist) gravelly loamy sand; weak medium subangular blocky structure breaking to single grains and weak very fine granules; soft when dry, very friable when moist, nonplastic when wet; sand grains lightly stained; approximate pH 5.0. Three or four $\frac{1}{4}$ to $\frac{1}{2}$ " bands in this horizon that are of gravelly clay loam texture; light brown (7.5YR 6/4 dry) to dark brown (7.5YR 4/4 moist); angular blocky structure breaking to moderate fine granules; hard when dry, very firm when moist, plastic when wet; sand grains stained, approximate pH of bands 6.0. Roots in this horizon plentiful; lower boundary clear and wavy. |
| 12002 B ₃ | 24-45
inches | Very pale brown (10YR 7/4 dry) to yellowish brown (10YR 5/4 moist) gravelly loamy sand; single grain structure; loose when dry or moist, nonplastic when wet; sand grains lightly stained; approximate pH 5.0. Five $\frac{1}{4}$ to 1" bands in this horizon are light brown (7.5YR 6/4 dry) to dark brown (7.5YR 4/4 moist) gravelly clay loam; angular blocky structure breaking to moderate fine granules; hard when dry, very firm when moist, plastic when wet; approximate pH of sands 6.0. Rounded rocks make up 10 percent of the volume of this horizon; roots few; lower boundary gradual and wavy. |
| 12003 C | 45-58
inches | Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) gravelly loamy sand; single grain structure; loose when dry or moist, nonplastic when wet; approximate pH 6.0; few rounded stones; roots none. |

Remarks: Samples of horizons below 10" depth were collected excluding the band materials; i.e., samples represent the inter-band materials. Rounded glacial boulders occupy about 10 percent of surface area.

SOIL SURVEY LABORATORY

Lincoln, Nebr.

June 1961

SOIL TYPE *Tex

LOCATION

Gunnison County, Colorado

sandy loam

SOIL NOS. S59Colo-26-6

LAB. NOS. 12016-12021

DEPTH INCHES	HORIZON	1B1a PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										2A2 > 2 ($< 9\mu$)	TEXTURAL CLASS
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	3A1				
		2.1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002			
1-4	A2	22.3	13.3	5.9	9.9	8.2	35.4	5.0	31.1	17.6	39	cosl	
4-8	A2&B1	19.5	13.1	6.0	11.0	10.2	33.3	6.9	34.7	14.8	49	cosl	
8-14	A2&B2	12.7	18.3	11.7	22.1	12.7	16.8	5.7	33.2	7.8	36	lcos	
14-19	B3C	15.5	18.2	10.8	20.0	12.7	18.8	4.0	33.5	8.7	37	lcos	
19-32	C1	13.6	18.5	11.8	21.2	12.4	18.6	3.9	32.2	9.5	38	lcos	
32-42	C2	14.2	19.7	12.2	21.3	12.0	17.4	3.2	32.0	8.1	41	lcos	
pH		ORGANIC MATTER				6C1a		6E1c	MOISTURE TENSIONS				
8C1a		1:5	1:10	6A1a ORGANIC CARBON	6B1a NITROGEN	C/N	Free Iron $Fe_2O_3\%$	CaCO ₃ equivalent	4B1a 1/10 ATMOS.	4B1a 1/3 ATMOS.	4B2 15 ATMOS.		
1:1				%	%			%	%	%	%		
5.7				0.69	0.031	22	0.8			22.4	11.4	3.9	
5.4				0.37	0.017	22	0.9			18.7	9.3	3.5	
5.6				0.08	0.007		0.8			10.9	5.6	2.4	
6.0				0.06	0.003		0.6			11.1	4.8	1.6	
6.3				0.02	0.001		0.5			9.9	4.6	1.4	
6.5				0.04			0.6	< 0.1		9.7	4.4	1.3	
5A1a CATION EXCHANGE CAPACITY NH_4OAc	EXTRACTABLE CATIONS					5B1a	BASE SAT. * NH_4OAc EXCH.	Base Sat. % on Sum Cations	Sum Ext. Bases	Sum Ext. Cations	Ca/Mg	O. D. Bulk Density g/cc	
	6N2b Co	6O2b Mg	6H1a H	6P2a Na	6Q2a K	5C1	5C3	5B1a	5A3a	8D3			
	milliequivalents per 100g. soil												
6.7	3.4	0.8	1.6	< 0.1	0.3	67	74	4.5	6.1				
6.8	2.8	1.0	4.0	< 0.1	0.2	59	50	4.0	8.0	2.8			
4.9	1.8	0.7	2.6	< 0.1	0.2	55	51	2.7	5.3				
3.4	1.6	0.4	2.1	< 0.1	0.1	62	50	2.1	4.2				
2.2	1.3	0.4	0.9	< 0.1	0.1	82	67	1.8	2.7				
2.2	1.5	0.4	0.9	< 0.1	0.1	91	69	2.0	2.9				

Soil Type: *Tex sandy loam.
 Date: Sept. 1959, by W. Goddard, J. S. Allen, L. Juve, C. J. Fox
 Area: Gunnison County, Colorado
 Location: SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 16, T. 13 S., R. 82 W. Southeast corner of photo
 2717. North of Pieplant Cow Camp along Pieplant trail.
 Parent Material: Granitic glacial moraine
 Physiographic position: Upland moraine at an elevation of approximately 9800 ft.
 Topography: Very hummocky. Slope gradient 35 percent.
 Drainage: Well-drained
 Vegetation: Lodgepole Pine. No understory except kinnikinnick covering about
 2 percent of ground surface
 Use: National Forest Described by: Charles J. Fox.
 Soil Nos. S-59-Colo-26-6

Lincoln Lab. No.	Horizon	
	A ₀₀	1- $\frac{1}{2}$ inch Loose pine needles.
	A ₀	$\frac{1}{2}$ -0 inch Decomposed pine needles.
	A ₁	0- $\frac{1}{2}$ inch Black (10YR 2/1 moist) sandy loam very high in charcoal from past fires; roots plentiful; lower boundary abrupt and smooth.
12016	A ₂	$\frac{1}{2}$ -1 inches Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist) gravelly sandy loam; weak very fine granular structure; soft when dry, very friable when moist, nonplastic when wet; clean sand grains; occasional rounded pebbles stained dark brown (7.5YR 4/4 dry) on under sides; approximate pH 6.0; roots plentiful; lower boundary clear and wavy.
12017	A & B ₁	$\frac{1}{2}$ -8 inches Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) when crushed gravelly sandy loam; removes in weak medium subangular blocky aggregates coated very pale brown (10YR 7/3 dry) and breaks to weak very fine granules; soft when dry, very friable when moist, nonplastic when wet; both clean and lightly stained sand grains; occasional rounded granitic gravels 2 $\frac{1}{2}$ inches in diameter; approximate pH 6.0; roots plentiful; lower boundary clear and wavy.
12018	A & B ₂	8-14 inches Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) gravelly loamy sand; weak medium subangular blocky structure breaking to weak very fine granules and single grains; sand grains lightly stained; soft when dry, very friable when moist, nonplastic when wet; approximate pH 6.0; approximately 10 percent of horizon is rounded cobbles whose upper surfaces are coated with clean very fine sand grains forming a smooth surface. There are two wavy $\frac{1}{2}$ - inch bands in this horizon that are light brown (7.5YR 6/4 dry) to dark brown (7.5YR 4/4 moist) heavy clay loam breaking to moderate fine granular structure; extremely hard when dry, very firm when moist; very plastic when wet; sand grains heavily stained; upper surfaces of bands thinly coated with very clean, very fine sand grains. Roots plentiful in this horizon; lower boundary gradual and wavy.
12019	B ₂ C	14-19 inches Variegated brown (7.5YR 5/4 dry) to dark brown (7.5YR 4/4 moist) and yellowish brown (10YR 5/4 dry) gravelly loamy sand; crushed colors are pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist); compact in place and removes in hard angular fragments with upper surfaces coated with very fine, clean sand grains (or silica) forming a light gray (10YR 7/2 dry) to light brownish gray (10YR 6/2 moist) surface; very hard when dry, friable when moist; nonplastic when wet; approximate pH 6.0; cobbles up to 8 inches in diameter occupy about 30 percent of this layer; roots few; lower boundary gradual and wavy.
12020	C ₁	19-32 inches Very pale brown (10YR 7/3 dry) to pale brown (10YR 6/3 moist) gravelly loamy fine sand; compact in place; removes in angular fragments that break to single grains; approximate pH 6.0; approximately 60 percent of this layer consists of rounded rocks with smooth, light gray coatings of very fine sand (or silica) on upper surfaces; an occasional root; lower boundary gradual and wavy.
12021	C ₂	32-42 inches Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist) gravelly sand; single grain structure; loose when dry, loose when moist; nonplastic when wet; sand grains clean; approximately 45 percent of this layer is rocks; approximate pH 6.0; no roots.

Bureau of Public Roads Samples: 0-8 inches, 8-19 inches, 32-42 inches.

Remarks: Samples of horizons below 8" depth were collected excluding the band
materials; i.e., samples represent the inter-band materials. Special samples of
the band materials were taken separately for special analyses. Approximately 20
percent of ground surface covered by granitic stones and boulders.

SOIL SURVEY LABORATORY Lincoln, Nebr. February 1959

SOIL TYPE Trout Creek LOCATION Chaffee County, Colorado
 clay loam

SOIL NOS. S58Colo-8-1 LAB. NOS. 9044-9049

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	0.2-0.02 (0.02-0.002) (<19µm)		> 2		
0-2	A1	7.7a	4.1a	2.1a	5.1a	6.8a	43.4	30.8	26.3	26.9	16	cl	
2-6	AB	4.0a	3.2a	1.6a	4.3a	6.7a	46.1	34.1	25.8	29.7	12	sic1	
6-10	B2t	3.7b	3.0b	1.6b	3.7c	4.3c	36.8	46.9	17.6	25.7	20	c	
10-16	B3ca	5.3d	4.1d	2.3d	4.7e	5.1e	32.1	46.4	16.3	23.5	16	c	
16-22	Bca	9.0f	5.3f	2.2f	4.1g	4.4g	42.4	32.6	14.3	34.7	49	cl	
22-25	Cr	13.7f	8.1f	3.3f	6.0g	6.2g	38.2	24.5	18.7	29.1	58	1	

pH	ORGANIC MATTER				6C1a Free Iron Fe ₂ O ₃ %	6E1a CaCO ₃ equiv- alent %	MOISTURE TENSIONS		
	8C1a	6A1a	6B1a	4B2					
	1:5	ORGANIC CARBON %	NITRO-GEN %	1/10 ATMOS. %			1/3 ATMOS. %	15 ATMOS. %	
7.6	1.1	4.04	0.235	17	2.8	<1			13.4
7.6		2.22	0.158	14	3.1	<1			13.2
7.7		1.52	0.093	16	3.4	<1			16.5
7.9		1.86	0.131	14	2.8	11			16.0
8.0		1.20	0.110	11	2.2	29			12.6
8.2		0.52	0.065	8	2.2	32			9.2

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					5B1a BASE SAT. % NH ₄ Ac EXTR	5C3 Base Sat. % on Sum Cations	5B1a Sum Bases	5A3a Sum Cations	8D3 Ca/Mg
	6N2b	6O2b	6H1a	6P2a	6Q2a					
	Ca	Mg	H	Na	K					
28.5		2.1	1.6	<0.1	2.4					
27.8	27.6	1.7	2.4	<0.1	1.2	110	93	30.5	32.9	16.2
30.9	30.4	2.7	2.5	<0.1	1.1	111	93	34.2	36.7	11.2
25.7		2.9	<0.1	<0.1	0.8					
17.8		2.0	<0.1	<0.1	0.4					
12.9		1.8	<0.1	<0.1	0.3					

milliequivalents per 100g. soil →

a. Few smooth dark brown concr. (Fe-Mn?)
 b. Many smooth light brown to black concr. (Fe-Mn?)
 c. Few smooth light brown to black concr. (Fe-Mn?)
 d. Many smooth light brown to black concr. (Fe-Mn?) Also, few CaCO₃ concr.
 e. Few smooth light brown to black concr. (Fe-Mn?) Also, few CaCO₃ concr.
 f. Many smooth light brown to black concr. (Fe-Mn?) Also, common CaCO₃ concr.
 g. Few smooth light brown to black concr. (Fe-Mn?) Also, common CaCO₃ concr.

Soil Type: Trout Creek clay loam Described by: A. J. Cline
 Location: The SW $\frac{1}{4}$ of Sec. 21, T13S, R77W, Chaffee County, Colorado.
 Date of Sampling: September 1957. (Aerial photograph 2-105).
 Collectors: J. Retzer, E. M. Payne, R. Dansdill, A. J. Cline.
 Physiographic Position: Side slope of high mountain valley at elevation of approximately 9,220 feet.
 Topography: Moderately steep convex slope facing east.
 Drainage: Well drained.
 Vegetation: Scattered growth of spruce, poplar, and some Ponderosa pine with thick understory of grasses and sedges. Use: National Forest Service land.
 Soil Nos.: 658Colo-8-1

Lincoln Horizon

Lab. No.

- | | | | |
|------|------------------|-----------------|--|
| 9044 | A ₁ | 0-2
inches | Brown (7.5YR 4/2 dry) to very dark gray (7.5YR 3/1 moist) clay loam; soft when dry; very friable when moist; moderate fine granular structure; noncalcareous; lower boundary clear and smooth. |
| 9045 | AB | 2-6
inches | A partially mixed horizon with colors strongly variegated. Includes colors of (2.5YR 5/3 dry) (5YR 5/3 dry) (7.5YR 5/4 dry) and (10YR 4/2 dry) with moist colors of (10YR 4/3) (5YR 2/2) (7.5YR 3/4) 10YR 3/2. The crushed colors average approximately 5YR 3/3 moist; clay loam; slightly hard when dry, very friable when moist; strong; very fine granular structure; noncalcareous; approximately 5 percent of this horizon is channery and gravel; lower boundary clear and smooth. |
| 9046 | B _{2t} | 6-10
inches | Brown (7.5YR 5/3 dry) to brown or dark brown (7.5YR 4/3 moist) clay; hard when dry, very friable when moist; strong very fine subangular blocky structure; noncalcareous; there are thin nearly continuous clay skins on the surfaces of the soil aggregates; the horizon contains a few medium-sized distinct 2.5Y 6/4 mottles; approximately 5 percent of this horizon is channery; lower boundary clear and smooth. |
| 9047 | B _{3ca} | 10-16
inches | Grayish brown (2.5Y 5/2 dry) to dark grayish brown (2.5Y 4/2 moist) clay loam; hard when dry, very friable when moist; moderate fine subangular blocky structure; calcareous; there are a few thin patchy clay skins on both the horizontal and vertical faces of the soil aggregates; this is a very weak horizon of lime accumulation and contains a few small lime concretions; lower boundary gradual and smooth. |
| 9048 | B _{ca} | 16-22
inches | Light gray (2.5Y 7/1 dry) to dark grayish brown (2.5Y 4/2 moist) clay loam; hard when dry, very friable when moist; moderate fine subangular blocky structure; calcareous; this is a prominent horizon of lime accumulation containing much accumulated lime in nodular and finely divided forms; lower boundary gradual and smooth. |
| 9049 | Cr | 22-25
inches | Light yellowish brown (2.5Y 6/3 dry) to olive brown or light olive brown (2.5Y 4.5/3 moist) partly weathered shale and interbedded sandstone; strongly calcareous. |

SOIL SURVEY LABORATORY Lincoln, Nebr. February 1959

SOIL TYPE Trout Creek LOAM LOCATION Chaffee County, Colorado

SOIL NOS. 858Colo-8-11 LAB. NOS. 9091-9094

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)									2A2 > 2 ($< 19\mu$)	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	0.02-0.002		
0-3	AL	4.6a	4.3a	2.9a	6.2a	6.2a	46.2	29.6	23.9	31.8	6	cl
3-6	AB	2.1a	2.2a	1.5a	3.7a	5.5a	53.0	32.0	23.6	37.0	11	sicl
6-12	B2t	1.7a	2.5a	1.8a	3.7a	4.9a	50.1	35.3	20.3	36.7	10	sicl
12-20	B3	0.4a	0.8a	0.6a	1.4a	1.5a	27.4	67.9	5.8	23.9	4	c
pH		ORGANIC MATTER				Free Iron Fe_2O_3	6E1a CaCO ₃ equiv- alent		MOISTURE TENSIONS			
8C1a	1.5	1:10	6A1a ORGANIC CARBON	6E1a NITRO-GEN	C/N	6C1a	%	1:10 ATMOS.	1/3 ATMOS.	4E2 15 ATMOS.	%	
1:1			%	%				%	%	%	%	
7.2			4.57	0.276	17	4.4	Δ				13.4	
7.4			2.76	0.183	15	4.5	Δ				12.8	
7.4			1.38	0.116	12	4.7	Δ				12.7	
7.2			1.28	0.110	12	4.4	Δ				19.3	
5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					BASE SAT. % NH ₄ Ac EXCH.	5C3 Base Sat. % on Sum	Sum Bases 5B1a	Sum Cations 5A3a	Ca/Mg		
6N2b Co	6O2b Mg	6H1a H	6P2a No	6Q2a K		5C1	Cations	← me/100g →	8D3			
← milliequivalents per 100g. soil →												
29.2	25.8	4.0	4.1	<0.1	2.4	110	89	32.2	36.3	6.4		
28.0	26.4	4.3	3.7	<0.1	0.7	112	89	31.4	35.1	6.1		
25.3	21.6	4.3	4.5	0.1	0.5	105	85	26.5	31.0	5.0		
36.4	30.6	6.2	4.6	0.1	0.6	103	89	37.5	42.1	4.9		

a. Common irregular brown concr. (Fe?) Also, few smooth black concr. (Mn?)

Soil Type: Trout Creek loam. Described by: A. J. Cline
 Location: NW $\frac{1}{4}$ of Sec. 21, T13S, R77W, Chaffee County, Colorado.
 Date of Sampling: September 1957
 Collectors: J. Retzer, E. M. Payne, R. Dansdill, A. J. Cline.
 Physiographic Position: Mountain slope at an elevation of approximately 9,400 feet. Topography: Moderately steeply sloping but slightly concave area of approximately 12 percent gradient facing east. Drainage: Well drained.
 Vegetation: Ring muhly, mountain fescue, June grass, mountain broom grass.
 Use: National Forest Service lands.
 Soil Nos.: S58Colo-8-11

Lincoln Horizon

Lab. No.

9091	A ₁	0-3 inches	Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) loam; soft when dry, very friable when moist; moderate to strong fine granular structure; non-calcareous; this horizon has a color of 7.5YR 3/2 when crushed; lower boundary clear and smooth.
9092	AB	3-6 inches	Brown (7.5YR 5/3 dry) to brown or dark brown (7.5YR 4/3 moist) loam; slightly hard when dry, very friable when moist; strong very fine subangular blocky structure; non-calcareous; there are thin patchy clay skins on both the horizontal and vertical faces of the soil aggregates; lower boundary clear and smooth.
9093	B 2t	6-12 inches	Brown or reddish brown (6.75YR 5/4 dry) to reddish brown or dark brown (6.75YR 4/4 moist) clay loam; hard when dry, friable when moist; strong fine subangular blocky structure noncalcareous; there are thin continuous clay skins on the surfaces of the soil aggregates; lower boundary abrupt and wavy.
9094	B ₃	12-20 inches	Dark gray (2.5Y 4/1 dry) to very dark gray (2.5Y 3/1 moist) clay; very hard when dry, firm when moist; moderate medium prismatic structure breaking to moderate to strong medium angular blocks; noncalcareous; lower boundary gradual and wavy. There is some partially weathered shale chips in this horizon.
	C	20-25 / inches	Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist) clay; very hard when dry, firm when moist; massive or weak medium angular blocky structure; violently effervescent; this is a horizon of partially weathered Pennsylvanian shale with interbedded limestone strata. Scattered limestone and sandstone rock occur throughout the profile above horizon 12-20 inches. This horizon was not sampled.

SOIL TYPE Truckton LOCATION Elbert County, Colorado
coarse sandy loam

SOIL NOS. S61Colo-20-1

LAB. NOS. 16628-16634

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						2A2 > 2
		VERY COARSE SAND 2.1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002			
0-2	A11	13.6	28.3	14.4	12.8	4.8	20.0	6.1	22.8	7.2	Tr.		
2-9	A12	13.4	24.6	15.8	15.8	4.6	16.6	9.2	20.8	7.2	Tr.		
9-13	B21t	6.2	20.1	17.2	19.8	5.6	15.8	15.3	23.0	7.1	Tr.		
13-19	B22t	14.0	26.0	16.2	15.5	3.7	10.5	14.1	15.5	5.1	Tr.		
19-25	B3	14.9	29.9	18.9	18.3	3.6	5.6	8.8	14.5	2.6	Tr.		
25-33	C	23.6	24.6	14.8	20.6	5.6	4.2	6.6	18.1	2.1	Tr.		
33-60	C	12.5	26.5	21.4	24.3	5.4	3.8	6.1	18.2	2.0	Tr.		

8C1b SATURATED PASTE	pH 8C1a	ORGANIC MATTER				6C1a Ext. Iron as Fe %	Bulk Density			Water Retention		
		8C1a	6A1a	6B1a	C/N		30 Cm.		4B1b 1/10 ATMOS. Pieces %	4B1b 1/3 ATMOS. Pieces %	4B2 15 ATMOS. Sieved %	
		1:1	ORGANIC CARBON %	NITROGEN %			4B3 % W.	4A1c g/cc				4A1b g/cc
5.8	5.9	6.2	1.01	0.074	14	0.3						3.0
6.1	6.2	6.2	0.78	0.069	11	0.4	14.7	1.61a	1.64	12.2	7.4	3.8
6.0	6.2	6.3	0.49	0.055	9	0.4						5.3
6.2	6.4	6.5	0.38	0.045	8	0.4	16.8	1.68	1.70	15.5	12.0	5.4
6.4	6.6	6.1	0.14	0.023		0.2						4.1
6.3	6.4	6.2	0.16			0.2						2.6
6.6	6.6	6.2	0.03			0.1				5.3		2.2

5A1a CATION EXCHANGE CAPACITY NH ₄ OAc	EXTRACTABLE CATIONS					5B1a Sum	8A1a Elec. Cond. EC x 10 ³ umhos.	Sat. Ext. Sol. 8A1		8A Saturation Moist. %	Carbonate as CaCO ₃	
	6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K			6P1a Na	6Q1a K		6E1b <2-mm. Clay %	6E1b %
	milliequivalents per 100g. soil							<me/liter>				
5.8	3.3	0.8	3.5	0.1	0.4	3.1	0.46	0.2	0.8	20.6		
6.9	4.7	1.0	1.6	Tr.	0.3	7.6	0.36	0.2	0.4	21.3		
9.6	6.6	1.8	2.6	Tr.	0.5	11.5	0.42	0.2	0.4	22.8		
9.6	6.6	1.9	1.6	Tr.	0.5	10.6	0.38	0.2	0.4	24.2		
6.3	4.5	1.3	0.7	Tr.	0.3	6.8	0.34	0.2	0.4	20.9	-	
4.9	3.5	1.0	0.5	Tr.	0.2	5.2	0.43	0.4	0.4	18.8	-	
4.4	3.1	0.9	0.5	Tr.	0.1	4.6	0.31	0.3	0.2	21.4	-	

a. One clod.

Soil Type: Truckton coarse sandy loam

221

Date Sampled: May 1961 Collectors: A. J. Cline and R. C. Accola

Area: Elbert County, Colorado

Location: 415 feet north and 425 feet east of the southwest corner of Sec. 2,
T6S, R63W

Physiographic Position: Upland slope of approximately 5 percent facing southwest.

Drainage: Well drained

Vegetation: Yucca and blue grama grass

Use: Pasture land

Soil No.: S61-Colo-20-1

Described by: A. J. Cline.

Lincoln Lab. No.

and Horizon

- | | | | |
|--------------------|------|-------------------|--|
| 16628 | All | 0-2
inches | Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) coarse sandy loam; soft when dry, very friable when moist; weak fine platy structure breaking to moderate very fine granules; noncalcareous; lower boundary clear and smooth. |
| 16629 | A12 | 2-9
inches | Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) coarse sandy loam; hard when dry, very friable when moist; weak coarse and very coarse subangular blocky structure breaking to moderate fine granules; noncalcareous; lower boundary clear and smooth. |
| 16630 | B21t | 9-13
inches | Brown (10YR 5/3 dry) to dark brown (10YR 3/3 moist) coarse sandy loam; very hard when dry, very friable when moist; weak coarse prismatic structure breaking to moderate medium subangular blocks; noncalcareous; there are a few thin patchy clay films on the surfaces of the soil aggregates and there is coating and bridging between sand grains; lower boundary clear and smooth. |
| 16631 | B22t | 13-19
inches | Brown (10YR 5/3 dry) to brown or dark brown (10YR 4/3 moist) heavy coarse sandy loam; extremely hard when dry, friable when moist; moderate coarse prismatic structure breaking to moderate medium subangular blocks; noncalcareous; there are thin nearly continuous clay films on the surfaces of the soil aggregates and coatings and bridgings between sand grains; lower boundary clear and smooth. |
| 16632 | B3 | 19-25
inches | Light yellowish brown (10YR 6/4 dry) to yellowish brown (10YR 5/4 moist) coarse loamy sand; extremely hard when dry, friable when moist; very weak coarse prismatic structure breaking to weak medium subangular blocks; noncalcareous; there are a few thin patchy clay films and some coating and bridging between sand grains; lower boundary clear and smooth. |
| 16633 & C
16634 | | 25-60 +
inches | Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist) coarse sand; hard when dry, very friable when moist; massive; noncalcareous; lower boundary clear and smooth. |

SOIL SURVEY LABORATORY Lincoln, Nebr.

January 1960
(Revised October 1963)

SOIL TYPE Truckton
loamy sand

LOCATION Morgan County, Colorado

SOIL NOS. S59Colo-44-7
S59(61)Colo-44-7

LAB. NOS. 10872-10879
16635-16637^a.

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)								3A1		2A2 > 2	TEXTURAL CLASS
		VEEY COARSE SAND 2.1	COARSE SAND 1.0-5	MEDIUM SAND 0.5-0.25	FINE SAND 0.15-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002			
0-5	A11	1.3	5.9	9.2	45.4	19.0	12.9	6.3	56.2	3.4	Tr.		
5-11	A12	1.8	6.8	9.4	45.5	18.3	9.8	8.4	52.3	2.9	Tr.		
11-15	AB	1.9	8.6	11.9	45.6	11.3	6.0	14.7	40.2	2.0	Tr.		
15-20	B11t	0.9	5.8	10.7	47.7	12.5	6.4	15.9	43.2	2.0	Tr.		
20-26	B22t	0.6	4.5	9.6	45.1	13.4	9.8	17.0	44.8	4.0	Tr.		
26-32	B3	0.3	3.4	8.4	47.8	17.5	7.6	15.0	50.9	3.1	Tr.		
32-38	C1	0.3	2.9	10.3	62.9	13.3	2.2	8.1	50.6	0.9	Tr.		
38-60	C2	1.5	8.6	15.6	52.1	13.7	1.4	7.1	41.9	0.3	Tr.		
pH		ORGANIC MATTER					Bulk Density a.			Water Retention			
SATURATED PASTE	b.	6A1a		6B1a	C/N	30 Cm.		A. D.	1/10		1/3	4B2	
		1:1	1:10	ORGANIC CARBON %		NITRO-GEN %	4B3 % W.	4A1c g/cc	4A1b g/cc	ATMCS. Sieved %	ATMCS. Sieved %	15 ATMOS. Sieved %	
	8C1a												
	6.0		0.76	0.064	12		17.0	1.59	1.62			2.9	
	6.6		0.46	0.049	9							3.3	
	6.7		0.46	0.051	9							6.3	
	6.9		0.39	0.043	9		16.3	1.67	1.74			6.5	
	7.0		0.32	0.038	8		18.9	1.65	1.78			6.8	
	7.0		0.19									6.0	
	7.1		0.07									3.2	
	7.2		0.05									2.4	
5A1a CATION EXCHANGE CAPACITY NH ₄ OAc		EXTRACTABLE CATIONS					5B1a	8D3	8M	Carbonate as CaCO ₃			
	6N2b	6O2b	6H1a	6P2a	6Q2a	5A3a	Ca/Mg	NH ₄ AC CEC to Clay Ratio			6E1a		
	Co	Mg	H	Na	K	Sum					<2-mm. Clay %	Clay %	
	milliequivalents per 100g. soil												
	5.4	3.1	1.6	2.4	Tr.	0.6	7.7	1.9	.86				
	5.9	4.1	1.8	1.7	Tr.	0.4	8.0	2.3	.70				
	10.2	7.2	2.2	2.2	Tr.	0.7	12.3	3.3	.69				
	10.8	7.6	2.4	1.7	Tr.	0.8	12.5	3.2	.68				
	11.7	8.3	2.8	1.7	Tr.	0.8	13.6	3.0	.69				
	10.1	7.1	2.6	1.5	Tr.	0.6	11.8	2.7	.67				
	6.0	4.4	1.6	0.5	Tr.	0.3	6.8	2.8	.74				
	5.2	3.9	1.5	1.0	Tr.	0.2	6.6	2.6	.73				

a. Resampled for bulk density in 1961.

b. pH rerun on original samples in October, 1963.

Soil Type: Truckton loamy sand
 Soil Nos.: S59Colo-44-7
 Field classification: Chestnut-Brown Intergrade
 Location: 360 feet west, 235 feet south of northeast corner, Sec. 34, T1N, R59W, Morgan County, Colorado.
 Photo: YB-4F-166.
 Climate: Continental, average annual precipitation 13-15 inches. Elevation 4,700 feet. Frost-free season 146 days.
 Mean annual temperature 43° F.
 Vegetation: Grams, sandreed, sand bluestem, sand sage.
 Parent material: Arkosic aeolian sands.
 Physiographic position: Upland. Relief: Gently sloping, 1 to 2 percent slope.
 Drainage: External slow, Internal rapid.
 Moisture: Moist to 40 inches at time of sampling.
 Water table: None encountered. Stoniness: None
 Salt or alkali: None observed. Erosion: Slight wind.
 Described by: Clayton F. Spears, May 6, 1959.

Horizon and
 Lincoln
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A11 0 to 5 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist, 10YR 3/2.5
 10872 crushed) loamy sand; weak medium crumb breaking to weak fine crumb structure; soft when dry, very friable
 moist; noncalcareous; lower boundary clear and smooth.

A12 5 to 11 inches. Brown (10YR 5/2.5 dry) to dark brown (10YR 3/2.5 moist and crushed) loamy sand; very
 10873 weak coarse subangular blocky structure, breaking to weak medium crumbs; soft when dry, very friable
 when moist; noncalcareous; lower boundary clear and smooth.

AB 11 to 15 inches. Brown (10YR 4.5/3 dry) to dark brown (10YR 3/3 moist and crushed) light sandy loam;
 10874 weak coarse subangular blocky structure; slightly hard when dry, friable when moist; very thin patchy
 clay skins on vertical faces of soil aggregates; noncalcareous; lower boundary clear and smooth.

B21t 15 to 20 inches. Brown (10YR 4.5/3 dry) to dark brown (10YR 3/3 moist, 10YR 3.5/3 crushed) sandy loam;
 10875 weak coarse prismatic structure breaking to weak coarse subangular blocks; hard when dry, friable when
 moist; thin patchy clay skins on both vertical and horizontal faces of soil aggregates; noncalcareous;
 lower boundary clear and smooth.

B22t 20 to 26 inches. Brown (10YR 4.5/3 dry) to dark brown (10YR 3.5/3 moist, 10YR 4/3 crushed) sandy loam;
 10876 weak to moderate coarse prismatic structure breaking to weak to moderate coarse subangular blocks; very
 hard when dry, friable when moist; thin nearly continuous clay skins on both vertical and horizontal faces
 of soil aggregates; noncalcareous; lower boundary clear and wavy.

B3 26 to 32 inches. Light yellowish brown (1.25Y 5.5/3 dry) to olive brown (1.25Y 4/3 moist, 1.25Y 4.5/3
 10877 crushed) heavy loamy sand; weak coarse subangular blocky structure; hard when dry, friable when moist;
 very thin patchy clay skins in root channels; noncalcareous; lower boundary clear and wavy.

C1 32 to 38 inches. Light olive brown (2.5Y 5.5/4 dry) to olive brown (2.5Y 4.5/4 moist and crushed) sand;
 10878 massive; slightly hard when dry, friable when moist; noncalcareous; lower boundary clear and smooth.

C2 38 to 79 inches. 38 to 60 inches sampled. Light yellowish brown (2.5Y 6/3 dry) to light olive brown
 10879 (2.5Y 5/4 moist and crushed) fine sand and sand; massive; slightly hard when dry, friable when moist;
 noncalcareous; lower boundary diffuse and smooth.

C3 79 to 94 inches. Light yellowish brown (2.5Y 6/4 dry) to light olive brown (2.5Y 5/4 moist) loamy sand;
 massive; soft when dry, friable when moist; noncalcareous; lower boundary diffuse and smooth.

C4 94 to 108 inches. Light yellowish brown (2.5Y 6/4 dry) to olive brown (2.5Y 4.5/4 moist) noncalcareous
 sand.

Remarks: Associated soil Truckton loamy sand, 5 to 9 percent slopes.

Bureau of Public Road Samples: A12, 5-11 inches; B22, 20-26 inches; C2, 38-60 inches.

SOIL SURVEY LABORATORY Lincoln, Nebr. January 1960

SOIL TYPE Truckton Loamy sand LOCATION Morgan County, Colorado

SOIL NOS. 859Colo-44-8 LAB. NOS. 10880-10886

DEPTH INCHES	HORIZONE	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			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	> 2	
0-7	All	0.2	7.4	18.1	39.1	17.8	11.8	5.6	43.5	3.1	Tr.	ls
7-17	Al2	0.4	11.0	22.3	37.8	13.5	8.1	6.9	34.2	3.0	Tr.	ls
17-21	AB	0.4	11.0	23.3	36.0	9.3	7.6	12.4	27.3	3.3	Tr.	fs1
21-26	B2t	0.3	8.1	20.8	38.1	7.3	7.5	17.9	25.4	3.1	Tr.	fs1
26-31	B3	0.2	6.6	20.6	50.2	7.2	4.2	11.0	29.3	1.7	Tr.	lfs
31-37	C1	0.4	9.1	27.8	46.7	6.2	2.7	7.1	22.8	1.7	-	s
37-60	C2	0.2	7.4	21.1	45.6	15.8	2.3	7.6	38.0	1.0	-	s

8C1a	pH		ORGANIC MATTER			EST% SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM	6E1a CaCO ₃ equiv. olein %	GYPSUM mg./100g. SOIL	MOISTURE TENSIONS		
	1:5	1:10	6A1a ORGANIC CARBON %	6B1a NITRO-GEN %	C/N					1/10 ATMOS. %	1/3 ATMOS. %	4/15 ATMOS. %
			%	%								
6.6			0.59	0.042	14							2.3
7.2			0.35	0.032	11							3.0
7.3			0.37	0.023	16							4.9
7.1			0.39	0.026	15							7.3
7.4			0.19									4.2
7.5			0.14									2.9
7.8			0.06									2.7

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS 5B1a					BASE SAT. % NH ₄ Ac EXCH.	Base Sat. % on Sum Cations	Sum Ext. Bases	Sum Ext. Cations	Ca/Mg	O.D. Bulk Density g/cc	MOISTURE AT SATURATION %
	6N2b Co	6O2b Mg	6H1a H	6P2a Na	6Q2a K							
	milliequivalents per 100g. soil											
4.5	3.0	0.8	1.5	<0.1	0.4	93	74	4.2	5.7			
5.1	3.9	0.8	1.2	<0.1	0.4	100	81	5.1	6.3			
8.4	6.0	1.6	1.5	<0.1	0.6	98	84	8.2	9.7	3.8		
12.5	8.7	2.5	2.2	<0.1	0.7	95	84	11.9	14.1	3.5		
7.7	5.8	1.6	1.5	<0.1	0.4	101	84	7.8	9.3	3.6		
5.6	4.1	1.2	1.0	<0.1	0.3	100	85	5.6	6.6	3.4		
5.3	3.9	1.4	1.0	<0.1	0.2	104	85	5.5	6.5	2.8		

Soil Type: Truckton loamy sand
 Soil Nos.: 8590olo-44-8
 Field classification: Chestnut-Brown Intergrade.
 Location: 800 feet north, 800 feet east of the south quarter corner, Sec. 3, T1N, R99W, Morgan County, Colorado.
 Photo: YB-4F-162.
 Climate: Continental average annual precipitation 13-15 inches. Elevation 4,750 feet. Frost-free season 146 days.
 Mean annual temperature 48° F.
 Vegetation: Blue grama, sand bluestem, sand reed, sand sage.
 Parent material: Arkosic aeolian sands.
 Physiographic position: Upland.
 Relief: Gently sloping 1-2 percent.
 Aspect: Southwest-facing.
 Drainage: Slow external, rapid internal.
 Moisture: Moist to 40 inches at time of sampling.
 Water table: None.
 Stoniness: None.
 Salt or alkali: None observed.
 Erosion: Slight.
 Described by: Clayton F. Spears, May 6, 1959.
 Remarks: Associated soil in this area is Truckton loamy sand on slopes of 5-9 percent. Small areas of Bresser soils are found in depressional areas but compose less than 10 percent of delineated types.

Horizon and
 Lincoln
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A11 0 to 7 inches. Grayish brown (10YR 4.5/2 dry) to very dark grayish brown (10YR 3/2 moist and crushed) loamy sand; weak medium crumb structure breaking to weak fine crumbs; soft when dry, very friable moist; noncalcareous; lower boundary clear and smooth.

A12 7 to 17 inches. Grayish brown to dark grayish brown (10YR 4.5/2 dry) to dark brown (10YR 3/2.5 moist) (10YR 3.5/2 crushed) loamy sand; weak medium crumb structure breaking to weak fine crumbs; soft when dry, very friable when moist, noncalcareous; lower boundary clear and smooth.

AB 17 to 21 inches. Brown (10YR 4.5/3 dry) to dark brown (10YR 3/3 moist, 10YR 3.5/3 crushed) heavy loamy sand; weak coarse subangular blocky structure breaking to weak medium subangular blocks; slightly hard when dry, very friable when moist; very thin patchy clay skins on vertical and horizontal faces of soil aggregates; noncalcareous; lower boundary clear and smooth.

B2t 21 to 26 inches. Dark grayish brown (10YR 4/2.5 dry) to dark brown (10YR 3/3 moist) (10YR 4/2 crushed) sandy loam; weak coarse prismatic structure breaking to weak coarse subangular blocks; hard when dry, friable when moist; thin nearly continuous clay skins on vertical and horizontal faces of soil aggregates; noncalcareous; lower boundary clear and smooth.

B3 26 to 31 inches. Light olive brown (1.25Y 5/3 dry) to olive brown (1.25Y 4/3 moist) (1Y 5/4 crushed) loamy sand; very weak coarse subangular blocky structure; slightly hard when dry, friable when moist; very thin patchy clay skins on vertical faces of soil aggregates; noncalcareous; lower boundary clear and wavy.

C1 31 to 37 inches. Light yellowish brown (2.5Y 5.5/4 dry) to light olive brown (2.5Y 4.5/4 moist, 2.5Y 5/3 crushed) sand; massive; slightly hard when dry, friable when moist; few thin patchy clay skins in root channels; noncalcareous; lower boundary clear and smooth.

C2 37 to 65 inches. Sampled 37 to 60 inches. Pale yellow (2.5Y 6.5/4 dry) to light olive brown (2.5Y 5/4 moist and crushed) sand; massive; slightly hard when dry, friable when moist; noncalcareous; lower boundary clear and smooth.

B2b 65 to 73 inches. Light yellowish brown (1.25Y 6/4 dry) to light olive brown (1.25Y 5.5/4 moist) fine sandy loam; weak coarse prismatic structure breaking to weak coarse subangular blocks; hard when dry, friable when moist; thin patchy clay skins on vertical and horizontal faces of soil aggregates; noncalcareous; lower boundary clear and smooth.

Ccab 73 to 81 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist and crushed) fine sandy loam; massive; slightly hard when dry, friable when moist; common medium distinct mottles of yellowish brown (10YR 5/6); strongly calcareous; lower boundary clear and smooth.

C1b 81 to 115 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist and crushed) sand; massive; soft when dry; friable when moist; slightly calcareous.

Bureau of Public Road samples:

A12 7-17 inches
 B2t 21-26 inches
 C2 37-60 inches

SOIL SURVEY LABORATORY Lincoln, Nebr. 3/18/58

SOIL TYPE Vasquez LOAN LOCATION Clear Creek County, Colorado

SOIL NOS. S55Colo-10-2 LAB. NOS. 2909-2913

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		131a					3A1					
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	2A2 > 2 (<u>< 19mm</u>)	
0-1 1/2	A11	10.6	8.0	3.8	5.2	3.0	37.8	31.6	18.2	25.4	3	cl
1 1/2-4	A12	23.0	14.0	5.7	7.9	4.1	26.3	19.0	17.7	16.8	11	cosl
4-11	A3	36.4	14.4	4.6	6.1	3.7	18.5	16.3	14.6	10.9	18	cosl
11-21	C1	19.0	15.1	7.9	13.6	9.9	20.9	13.6	26.6	12.0	29	cosl
21-31+	C2	24.9	17.6	7.2	11.2	8.9	21.4	8.8	23.5	13.2	19	cosl

pH		ORGANIC MATTER			5C1a Free Iron Fe ₂ O ₃ %	MOISTURE TENSIONS		
8C1a	8C1a	6A1a ORGANIC CARBON	6B1a NITRO- GEN	C/N		1/10 ATMOS.	1/3 ATMOS.	1/32 ATMOS.
	1:1	%	%			%	%	%
	4.8	15.8	.971	16				37.6
4.6		5.94	.365	16	2.0			15.7
4.8		3.02	.238	13	2.2			11.5
4.9		0.56	.050	11	2.4			6.4
5.5		0.20	.015		1.8			3.0

5A1a CATION EXCHANGE CAPACITY NH ₄ Ac	EXTRACTABLE CATIONS					5B1a BASE SAT. % NH ₄ Ac EXCH.	Base Sat. % on Sum Cations	5B1a Sum Bases	5A3a Sum Cations	8D3 Ca/Mg
6N2b Co	6O2b Mg	6H1a H	6P2a No	6Q2a K		5C1	me/100g	me/100g		
milliequivalents per 100g. soil										
37.6	12.1	2.4	35.2	0.3	1.0	42	31	15.8	51.0	5.0
23.2	4.0	0.2	21.7	0.2	0.3	20	18	4.7	26.4	
16.6	2.4	0.2	19.3	0.1	0.2	17	13	2.9	22.2	
10.6	2.2	0.1	8.7	0.1	0.1	24	22	2.5	11.2	
3.3	1.2	0.2	1.6	0.1	0.1	48	50	1.6	3.2	

a. Not dried prior to dispensing

Soil Type: Vasquez loam
 Soil Nos.: S55Colo-10-2
 Location: The SW 1/4 of the NW 1/4, Sec. 22, T3S, R76W, Clear Creek County, Colorado, on the Jones Pass road about 1/2 mile above timberline.
 Physiographic Position: Cirque basin.
 Topography: Concave moderately steeply sloping area.
 Drainage: Imperfect to poorly drained; water table fluctuating and moving.
 Vegetation: Grasses, willows, tufted hairgrass.
 Use: Grazing land.
 Collected by: A. Aandahl, J. Retzer, H. Bindschadler, and E. M. Payne, August, 1955.

Horizon and
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A11 0 to 1½ inches. Dark gray (10YR 4/1 dry) to very dark brown (10YR 2/2 moist) loam; soft when dry, very friable when moist; weak to moderate coarse granular structure; extremely acid in reaction; lower boundary clear and smooth.
 2909

A12 1½ to 4 inches. Gray (10YR 5/1 dry) to very dark grayish brown (10YR 3/2 moist) stony loam; soft when dry, very friable when moist; weak coarse granular structure; extremely acid in reaction; lower boundary clear and smooth.
 2910

A3 4 to 11 inches. Grayish brown (10YR 5/2 dry) to dark brown (10YR 3/3 moist) stony sandy loam; slightly hard when dry, friable when moist; weak fine and medium subangular blocky structure breaking to weak coarse granules; extremely acid in reaction; approximately 15 percent of this horizon is stone; lower boundary abrupt but wavy.
 2911

C1 11 to 21 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) cobbly sandy clay loam; slightly hard when dry, friable when moist; massive; extremely acid in reaction; a few medium-sized distinct 10YR 5/6 mottles; approximately 20 percent of this horizon is stone; lower boundary gradual and smooth.
 2912

C2 21 to 31 inches plus. Very pale brown (10YR 7/4 dry) to light yellowish brown (10YR 6/4 moist) very fine sandy loam stratified with lenses of coarse sand; slightly hard when dry, very friable when moist; massive; extremely acid in reaction; horizon contains a few medium-sized distinct 10YR 5/4 mottles; approximately 50 percent of this horizon is rock and stone; ground water at the time of sampling occurred at 24 inches.
 2913

SOIL SURVEY LABORATORY Lincoln, Nebr. 6/26/58

SOIL TYPE Vasquez LOCATION Grand County, Colorado
gravelly loam

SOIL NOS.

LAB. NOS. 2806-2811

DEPTH INCHES	HORIZON	1B1a PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)									3A1	> 2	TEXTURAL CLASS
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY					
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002			
0-9	A11	6.3	9.6	7.2	16.3	11.6	34.3	14.7	33.6	21.8		fsl	
9-23	A12	4.6	11.1	8.2	18.1	12.3	31.0	14.7	33.8	20.0		fsl	
23-43	C1	11.0	14.8	9.5	19.6	14.2	24.6	6.3	33.2	17.0		cosl	
43-48	C2	5.8	16.5	14.2	26.1	15.6	16.6	5.2	37.9	8.8		ls	
48-84	Cg	16.5	14.4	7.6	20.7	15.6	19.4	5.8	37.1	10.6		lcos	
84-108	D	3.4	10.3	11.6	33.0	21.0	17.6	3.1	51.2	7.5		lfs	
pH		ORGANIC MATTER											
8C1a		6A1a	6B1a										
	1:5	1:10	ORGANIC CARBON	NITROGEN	C/N								
			%	%									
1:1													
4.2			5.57	.360	16								
4.4			1.86	.160	12								
4.9			0.23	.019									
4.9			0.12										
5.0			0.10										
5.1			0.08										
5A1a	EXTRACTABLE CATIONS					5B1a	BASE SAT. %	Base Sat. %	5B1a Sum	5A3a Sum	8D3 Ca/Mg		
CATION EXCHANGE CAPACITY NH ₄ Ac	6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K	NR4Ac EXCH. 5C1	on Sum	on Sum	Bases	Cations			
	← milliequivalents per 100g. soil →								me/100g	me/100g			
28.5	4.2	0.9	23.9	0.1	0.2	19	18	5.4	29.3				
22.7	2.6	0.3	17.7	0.1	-	13	14	3.0	20.7				
9.7	2.8	0.4	5.8	0.1	0.1	35	37	3.4	9.2				
16.6	7.4	1.6	6.7	0.2	0.2	57	58	9.4	16.1		4.6		
10.6	5.5	1.4	4.4	0.1	0.1	67	62	7.1	11.5		3.9		
26.4	18.1	3.5	8.5	0.3	0.2	84	72	22.1	30.6		5.2		

Soil Type: Vasquez gravelly loam
 Location: SW 1/4 of Sec. 26, T2S, R76W, Grand County, Colorado. Alpine meadow, East St. Louis Alpine Area.
 Physiographic Position: Alpine basin.
 Topography: Concave Alpine basin receiving drainage from higher lying Alpine areas.
 Drainage: Poorly drained.
 Vegetation: Tufted hairgrass, willows.
 Use: National Forest Service lands.
 Collected and Described by: John L. Retzer, September 6, 1952.

Horizon and
 Lincoln
 Lab. No.

- A11 0 to 9 inches. Dark gray (10YR 4/1 dry) to black (10YR 2/1 moist) gravelly loam; soft when dry, very friable when moist; strong fine granular structure; strongly acid, approximate pH 5.1; lower boundary clear and smooth.
 2806
- A12 9 to 23 inches. Brown (10YR 5/3 dry) to dark brown (10YR 3/3 moist) gravelly loam; slightly hard when dry, very friable when moist; moderate fine subangular blocky structure breaking to moderate fine granules; extremely acid, approximate pH 4.3; lower boundary clear and smooth.
 2807
- C1 23 to 43 inches. Light yellowish brown (2.5Y 6/3 dry) to olive brown (2.5Y 4/3 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; massive or very weak subangular blocky structure; extremely acid, approximate pH 4.5; lower boundary clear and smooth.
 2808
- C2 43 to 48 inches. Light yellowish brown (2.5Y 6/4 dry) to light olive brown (2.5Y 5/4 moist) gravelly loamy sand; loose when dry or moist; single grained; very strongly acid, approximate pH 4.9; this horizon has many large prominent 10YR 5/6 mottles and bands making up approximately 50 percent of the ground mass; the soil temperature of this horizon on date of sampling was 37 degrees F., and it is thought that it represents the horizon of alternate freezing and thawing; lower boundary clear and smooth.
 2809
- Cg 48 to 84 inches. Pale olive (5Y 6/4 dry) to olive (5Y 5/4 moist) gravelly sandy loam; slightly hard when dry, very friable when moist; massive; very strongly acid, approximate pH 4.7; the horizon has many large prominent 10YR 5/2 and 2.5Y 5/8 mottles; the temperature of this horizon at date of sampling was approximately 32 degrees F., but the soil was not hard frozen on removal; lower boundary gradual and smooth.
 2810
- D 84 to 108 inches. Yellowish brown (10YR 5/4 dry) to dark yellowish brown (10YR 4/4 moist) gravelly sandy loam; this is a horizon of partially weathered schist rock with a gravelly sandy loam material between the individual rocks. Temperature of this horizon at the date of sampling was approximately 32 degrees F.
 2811

SOIL TYPE Vona sandy loam LOCATION Bent County, Colorado

SOIL NOS. S61Colo-6-1 LAB. NOS. 16639-16645

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	3A1		2A2 > 2		
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002			
0-4	A1	5.6	22.9	13.1	17.0	9.6	18.8	8.0	31.6	4.2	Tr.		
4-7	A3	4.8	24.1	21.2	20.3	8.2	14.7	6.7	28.0	3.7	Tr.		
7-15	B21t	4.5	23.1	20.9	20.9	6.7	11.0	12.9	23.6	3.0	Tr.		
15-19	B22t	3.1	20.7	22.1	24.3	7.4	11.3	10.6	27.1	2.8	Tr.		
19-25	B3ca	2.7	19.5a	22.0a	25.1a	7.8a	12.3	10.5	28.1	3.3	Tr.		
25-34	Cca	5.9	23.5a	20.8a	20.8a	7.2a	10.7	11.1	23.5	3.4	Tr.		
34-50+	C	7.0	28.3a	20.4a	20.5a	6.6a	8.1	9.1	20.9	2.9	Tr.		
pH		ORGANIC MATTER				Bulk Density			Water Retention				
8C1b SATURATED PASTE	8C1a	8C1a	6A1a ORGANIC CARBON %	6B1a NITROGEN %	6C1a Ext. Iron as Fe %	30 Cm. Bulk Density		A.D. Bulk Density		4B1b 1/10 ATMOS. Pieces	4B1b 1/3 ATMOS. Pieces	4B2 15 ATMOS. Sieved %	
	1:1	1:10		C/N		4B3 % W.	4A1c g/cc	4A1b g/cc					
7.4	7.5	8.0	0.50	0.065	8	0.5	15.0	1.72	1.76			3.2	
7.5	7.6	7.4	0.30	0.045	7	0.5						2.8	
7.2	7.6	7.4	0.37	0.061	6	0.6	21.1	1.52	1.72	15.1	10.3	5.8	
7.4	7.7	7.5	0.26	0.046	6	0.5						4.5	
7.4	8.1	8.6	0.18	0.032		0.5						4.2	
7.6	8.3	8.8	0.18			0.4						4.1	
7.7	8.1	9.0	0.02			0.4	15.6	1.72 b	1.83 c	9.1	7.0	3.0	
5A1a CATION EXCHANGE CAPACITY NH ₄ OAc		EXTRACTABLE CATIONS					5B1a	8A1a Elec. Cond. EC x 10 ³ mmhos	Sat. Ext. Sol. 8A1		8A Saturation Moist %	Carbonate as CaCO ₃	
	6N2b Co	6O2b Mg	6H1a H	6P2a No	6Q2a K	5A3a Sum		6P1a Na	6Q1a K		6E1b <2-mm. %	6E1c Clay %	
	milliequivalents per 100g. soil						-<me./liter->						
6.6	7.2	1.0	-	Tr.	0.7	8.9	0.73	0.1	1.3	20.0	-		
5.0	4.4	0.6	0.7	Tr.	0.5	6.2	0.46	0.1	0.9	17.9	-		
10.1	8.6	1.2	0.9	Tr.	0.5	11.2	0.49	0.2	0.4	22.5	-		
7.9	7.0	1.0	0.5	Tr.	0.3	8.8	0.44	0.4	0.3	20.9	-		
6.5				Tr.	0.3		0.53	0.2	0.3	20.4	2	-	
5.5				Tr.	0.3		0.51	0.2	0.3	20.2	4	2	
5.0				Tr.	0.3		0.42	0.3	0.2	17.8	2	Tr.	

a. Trace carbonate nodules.
 b. Range is 0.14 g/ec. (range usually <0.10g/cc)
 c. Range is 0.12 g/ec. (range usually <0.10g/cc)

Soil Type: Vona sandy loam
 Date Sampled: November 1961 Collectors: A. J. Cline and R. C. Accola
 Area: Bent County, Colorado
 Location: 190' N & 0.15 mile W of the SE Cor of Sec. 3, T21S, R51W
 Physiographic position: Upland slope of approximately 4 percent facing southeast.
 Drainage: Well drained
 Vegetation: Grama grass, yucca, and cactus
 Use: Pasture land.
 Soil Nos.: S61-Colo-6-1 Described by: A. J. Cline.

Lincoln Lab. No.

and Horizon

- | | | | |
|-------|-------|-------------------|--|
| 16639 | A1 | 0-4
inches | Pale brown (10YR 6/3 dry) to dark grayish brown (10YR 4/2 moist) light sandy loam; soft when dry, very friable when moist; moderate fine granular structure; noncalcareous; lower boundary clear and smooth. |
| 16640 | A3 | 4-7
inches | Brown (10YR 5/3 dry) to brown or dark brown (10YR 4/3 moist) sandy loam; slightly hard when dry, very friable when moist; weak medium subangular blocky structure breaking to moderate medium granules; noncalcareous; lower boundary clear and smooth. |
| 16641 | B21t | 7-15
inches | Brown (10YR 5/3 dry) to brown or dark brown (10YR 4/3 moist) heavy sandy loam; slightly hard when dry, very friable when moist; weak very coarse prismatic structure breaking to moderate coarse subangular blocks; noncalcareous; there are a few thin patchy clay films on both the horizontal and vertical faces of the soil aggregates and bridges between sand grains; lower boundary gradual and smooth. |
| 16642 | B22 t | 15-19
inches | Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist) sandy loam; slightly hard when dry, very friable when moist; weak very coarse prismatic structure breaking to moderate very coarse subangular blocks; noncalcareous; there are thin patchy clay films on both the horizontal and vertical faces of the soil aggregates and there are clay bridges between sand grains; lower boundary clear and smooth. |
| 16643 | B3ca | 19-25
inches | Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist) sandy loam; slightly hard when dry, very friable when moist; weak to moderate coarse subangular blocky structure; calcareous; this is a weak Ca horizon with a small amount of visible calcium carbonate occurring as concretions; there are a few thin patchy clay films principally on the vertical faces of the soil aggregates; lower boundary gradual and wavy. |
| 16644 | Cca | 25-34
inches | Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) light sandy loam; slightly hard when dry, very friable when moist; massive; calcareous; this is a moderate Ca horizon with some visible calcium carbonate occurring as concretions and thin seams and streaks; lower boundary gradual and wavy. |
| 16645 | C | 34-50 +
inches | Pale brown (10YR 6/3 dry) to yellowish brown (10YR 5/4 moist) loamy sand; slightly hard when dry, very friable when moist; massive; calcareous; there are a few large calcium carbonate concretions in this horizon but less than in the horizon above. |

SOIL TYPE Vona LOCATION Morgan County, Colorado
sandy loam

SOIL NOS. S61Colo-44-1

LAB. NOS. 16646-16651

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY			> 2	
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002		
0-2	A1	0.3	7.9	14.6	28.3	29.3	11.7	7.9	55.4	2.9	-	
2-4	A3	0.4	7.9	14.4	28.3	28.8	9.3	10.9	52.9	2.4	-	
4-10	B2t	0.4	7.8	14.8	28.5	24.9	5.6	18.0	45.4	2.0	-	
10-15	B3	0.4	6.1	11.8	31.8	32.0	4.9	13.0	56.1	1.8	Tr.	
15-31	Coa1	0.1	3.3a	7.0a	25.0a	41.6a	8.7	13.5	66.5	2.4	-	
31-60	Coa2	0.2	3.0a	6.7a	33.9a	40.7a	4.6	10.9	68.8	1.7	Tr.	
pH		ORGANIC MATTER					Bulk Density			Water Retention		
SATURATED PASTE	8C1a	6A1a		6B1a		30 Cm.		A. D.	4E1b	4E1b	4E2	
	1:1	1:10	ORGANIC CARBON	NITRO-GEN	C/N	% W.	g/cc	g/cc	ATMOS. Pieces	ATMOS. Pieces	ATMOS. Sieved	
	7.1		0.74	0.066	11	16.8	1.60b	1.64b	15.4	7.6	3.5	
	6.9		0.57	0.060	10						3.9	
	6.7		0.55	0.083	7	23.6	1.44	1.60	22.0	15.5	6.5	
	7.3		0.31	0.049	6				19.1	9.4	5.8	
	8.0		0.22	0.030							5.5	
	8.3		0.02								4.2	
5A1a CATION EXCHANGE CAPACITY NH ₄ OAC		EXTRACTABLE CATIONS					8D3	8D1	Carbonate as CaCO ₃			
	6N2b	6O2b	6H1a	6P2a	6Q2a	5A3a	Ca/Mg	NH ₄ Ac CEC to Clay Ratio	6E1b	6E1c		
	Ca	Mg	H	Na	K	Sum			< 2-mm. %	Clay %		
	milliequivalents per 100g. soil											
	6.7	5.2	1.4	0.8	Tr.	0.8	3.7	.85	-	-		
	7.9	5.8	1.5	1.0	Tr.	0.8	3.9	.72	-	-		
	14.0	10.5	2.9	1.4	Tr.	0.9	3.6	.78	-	-		
	11.1	9.9	2.5	0.5	Tr.	0.5	4.0	.85	-	-		
	8.9				Tr.	0.5		.66	4	Tr.		
	7.5				0.3	0.6		.69	2	-		

- a. Trace carbonate nodules.
- b. One clod.

Soil Type: Vona sandy loam
 Date Sampled: April 1961 Collectors: A. J. Cline and R. C. Accola
 Area: Morgan County, Colorado
 Location: 1,700 feet south and 1,000 feet east of the northwest corner of
 Sec. 22, T5N, R59W
 Physiographic Position: Upland slope of 3 to 4 percent facing southeast
 Drainage: Well drained.
 Vegetation: Blue grama grass, cactus, and yucca.
 Use: Pasture land
 Soil Nos.: S61-Colo=44-1 Described by: A. J. Cline.

Lincoln Lab. No.

and Horizon

- | | | | |
|-------|------|-----------------|--|
| 16646 | Al | 0-2
inches | Light brownish gray (10YR 6/2 dry) to dark grayish brown (10YR 4/2 moist) loamy sand; soft when dry, very friable when moist; moderate very fine granular structure; noncalcareous; lower boundary abrupt and smooth. |
| 16647 | A3 | 2-4
inches | Brown (10YR 5/3 dry) to brown or dark brown (10YR 4/3 moist) fine sandy loam; slightly hard when dry, very friable when moist; weak to moderate fine granules; noncalcareous; lower boundary clear and smooth. |
| 16648 | B2t | 4-10
inches | Brown (10YR 5/3 dry) to brown or dark brown (10YR 4/3 moist) heavy fine sandy loam; hard when dry, very friable when moist; weak to moderate coarse prismatic structure breaking to moderate medium subangular blocks; noncalcareous; there are many thin patchy clay films on both the horizontal and vertical faces of the soil aggregates and there are gray coatings and bridgings between sand grains; lower boundary clear and smooth. |
| 16649 | B3 | 10-15
inches | Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist) fine sandy loam; slightly hard when dry, very friable when moist; weak coarse prismatic structure breaking to weak to moderate medium subangular blocks; noncalcareous; there are a few thin patchy clay films principally on the vertical faces of the soil aggregates and there is some coating and bridging between sand grains; lower boundary gradual and smooth. |
| 16650 | Cca1 | 15-31
inches | Pale brown (slightly lighter than 10YR 6/3 dry) to brown (slightly lighter than 10YR 5/3 moist) light fine sandy loam; soft when dry, very friable when moist; massive or very weak coarse subangular blocky structure; calcareous; this is a weak Ca horizon with some visible calcium carbonate occurring as concretions and as thin seams and streaks; lower boundary gradual and wavy. |
| 16651 | Cca2 | 31-60
inches | Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist) loamy fine sand; soft when dry, very friable when moist; massive or single grained; calcareous; there is a small amount of accumulated calcium carbonate in this horizon but less than in the horizon above. |

SOIL Weld silt loam SOIL Nos. 961CoLo-3-3 LOCATION Arapahoe County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 15500-15507 February 1965

Depth (in.)	Horizon	1B1a Size class and particle diameter (mm)											3A1			3A1a Clay		Coarse fragments 2A2		
		Total			Sand					Silt			Int. II (0.2-0.02)	(2-0.1)	Carbonate	Noncarbonate	> 2 Pct.	2 - 19 Pct. of < 75 mm		
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	2-19						19-75		
0-3	A1	21.6	61.8	15.6	0.2a	0.4a	0.4	2.8	17.8	42.2	19.6	62.1	2.8	17	Tr.					
3-6	E1	19.1	52.0	28.9	0.1a	0.2a	0.2	2.3	16.3	35.3	16.7	53.4	2.8	29	Tr.					
6-12	E2t	12.5	46.7	40.8	-	0.1a	0.1	1.2	11.1	29.5	17.2	41.4	1.4	41	Tr.					
12-15	E2ca	12.1	53.9	34.0	-	0.1b	0.1b	1.2c	10.7c	30.3	23.6	41.9	1.4	4	Tr.					
15-22	E31ca	12.0	55.4	32.6	-	0.1b	0.1b	1.1c	10.7c	31.0	24.4	42.5	1.3	7	Tr.					
22-32	E22ca	11.3	58.5	30.2	0.1b	0.1b	0.1b	1.0c	10.0c	32.4	26.1	43.1	1.3	5	Tr.					
32-48	C1ca	12.7	62.5	24.2	-	0.1b	0.1b	0.8c	11.7c	35.2	27.3	47.5	1.0	3	Tr.					
48-63	C2	13.5	62.4	24.1	-	0.1b	0.2b	0.9c	12.3c	36.0	24.4	50.9	1.2	1	Tr.					
Depth (in.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.	C/N	6E1c Carbonate as CaCO ₃ Pct.	6C1a Ext. Iron as Fe Pct.	Bulk density			4D1 COLE d	Water content				8D1 15-Per to Clay Ratio	pH					
						1A1c 30-Cm. g/cc	1A1b 15-Cm. g/cc	1A1a 5-Cm. g/cc		4B3 30-Cm. Pct.	4B1b 15-Bar. Pct.	4B2 15-Bar. Pct.	4C1 1/3-to-15-Bar. horizon Pct.		8C1b Sat. Paste	8C1a 1:10	8C1a (1:1)			
0-3	1.72	0.126	14	-	0.8			1.35		16.9	7.8		0.47	6.3	6.7	6.3				
3-6	1.33	0.133	10	-	0.8					20.3	11.5		0.40	6.2	6.5	6.3				
6-12	1.17	0.112	10	Tr.	0.2			1.25	1.42	22.4	15.6	0.8	0.40	7.0	7.5	7.2				
12-15	0.93	0.097	10		0.6					23.8	14.2		0.42	7.4	8.2	7.8				
15-22	0.59	0.066	9		0.6			1.51		25.8	13.1		0.40	7.8	8.7	8.2				
22-32	0.44	0.040	8		0.6			1.46		27.5	12.7		0.42	8.0	9.0	8.4				
32-48	0.22				0.6			1.38		27.0	11.6		0.47	7.0	8.1	8.4				
48-63	0.17				0.6			1.32		25.9	11.5		0.48	7.9	9.1	8.3				
Depth (in.)	Extractable bases 5B1a				5D1a Sum	5E1a Acidity	Cation Exch. Cap.			Water extract from saturated paste 8A1										
	4D2b Ca	4D2b Mg	4D2a Na	4D2a K			5A3a Sum	5A1a NH ₄	5A2a OAc	5A2a NaOAc	6D1a Ca	6D1a Mg	6D1a Na	6D1a K	6D1a CO ₃	6D1a HCO ₃	6D1a Cl	6D1a SO ₄	8A1a Electrical conductivity mmho/cm	
0-3	8.6	2.7	Tr.	1.2	12.5	3.5	16.0	13.7	14.5				0.2	0.7				0.36		
3-6	13.8	4.5	0.1	1.0	19.4	3.6	23.0	20.3	21.4				0.4	0.3				0.25		
6-12			0.2	1.3				20.7	26.2				0.8	0.4				0.63		
12-15			0.4	1.0				23.7	26.2				1.6	0.4				0.81		
15-22			1.2	1.0				21.3	22.8	1.4	0.8		3.8	0.3	-	6.6	0.6	1.66		
22-32			3.0	1.0				21.4	22.8	0.6	0.4		7.7	0.2	-	9.6	3.2	0.92		
32-48			5.0	1.1				21.5	22.2	2.2	2.0		24.6	0.4	-	6.8	21.6	5.7		
48-63			6.3	1.0				21.4	22.7	5.8	4.5		41.0	0.5	-	4.0	24.5	18.5		
Depth (in.)	8A Water at Saturation Pct.	5D1 Exchangeable Na NaOAc CEC Pct.	5E Sodium Adsorption Ratio	6D1a Gypsum Pct.	8D1 NH ₄ OAc to Clay Ratio	Base Sat.														
						5C3 Sum Cations	5C1 NH ₄ OAc													
0-3	38.0				0.82	78	91	a. > 50% organic matter.												
3-6	44.0				0.70	84	96	b. 25-50% mica.												
6-12	56.4	1			0.73			c. 5-25% carbonate.												
12-15	49.9	1			0.70			d. Coefficient of linear extensibility.												
15-22	47.2	4	4		0.65			Sand Mineralogy (Method 7B1). Weld has an increase in mica with depth.												
22-32	46.2	11	11	-	0.71															
32-48	45.3	18	17	-	0.87															
48-63	42.4	20	18	-	0.89															

Soil Type: Weld silt loam
 Soil Nos.: S61Colo-3-3
 Classification: Brown.
 Location: 3,400 feet east, 328 feet north of the southwest corner of Sec. 23, T58, R59W, Arapahoe County, Colorado.
 Climate: Continental, average annual precipitation 14 inches. Mean annual temperature 49° F.
 Frost-free period 150 days. Elevation 5,400 feet.
 Vegetation: Native pasture. Blue grama, sixweeks fescue, pricklypear, some buffalograss and western wheatgrass.
 Parent material: Aeolian silty material. Loess.
 Physiographic position: Upland.
 Relief: Nearly level, 1 to 2 percent slope facing east.
 Drainage: Well drained, surface and internal. Intake rate is moderate.
 Moisture: Slightly moist to 20 inches. Usually dry.
 Water table: None. Stoniness: None.
 Salt or alkali: Typical for E3ca to have a pH over 8.5, but no visible salts other than calcium carbonate.
 Erosion: Slight water erosion. Moderate wind erosion on west and north-facing slopes and crest of ridges.
 Described by: J. B. Brown, June 27, 1961.

Horizon and
 Lincoln
 Lab. Nos.

A1 0 to 3 inches. Very dark grayish brown (10YR 3.5/2, moist) silt loam; grayish brown (10YR 5.5/2, dry) weak medium subangular blocks breaking to moderate fine granules; soft when dry, very friable when moist; many roots; field pH 6.8; clear smooth boundary.

B1 3 to 6 inches. Dark brown (10YR 3.5/3, moist) heavy silt loam; brown (10YR 5/3, dry) weak to moderate medium prisms breaking to weak to moderate subangular blocks; slightly hard when dry, very friable when moist; many roots with thin patchy clay films along channels, and on lower part of ped surfaces; field pH 6.8; clear smooth boundary.

B2t 6 to 12 inches. Dark brown (10YR 3.5/3, moist) silty clay loam; brown (10YR 4.5/3, dry) brown (10YR 4.3, moist and crushed) moderate fine prisms breaking to strong fine and very fine angular blocks; hard when dry, firm when moist; thin nearly continuous clay films on peds; top ½ inch of B2 has no macro structure, but the fine and very fine angular blocks are distinctive; many roots and root channels, with roots penetrating peds; field pH 7.0; abrupt slightly wavy boundary.

B2ca 12 to 15 inches. Brown (10YR 5/3, moist) silty clay loam; brown (10YR 5.5/3, dry) moderate fine and medium prisms breaking to strong fine angular and subangular blocks; hard when dry, friable when moist; thin patchy clay film on all peds, with dark stains on ped surfaces; many roots and root channels penetrating peds; violent effervescence, with field pH 8.4; clear smooth boundary.

B31ca 15 to 22 inches. Light olive brown (1Y 5.5/3, moist) light silty clay loam; light yellowish brown (1Y 6.5/3, dry) moderate medium prisms breaking to moderate medium angular and subangular blocks; hard when dry, friable when moist; lime concretions are few medium and faint; this horizon contains some roots and many holes less than one millimeter in diameter; thin clay films on vertical ped surfaces; violent effervescence, with field pH of 9.0; gradual smooth boundary.

B32ca 22 to 32 inches. Light olive brown (1Y 5.5/3, moist) heavy silt loam; light yellowish brown (1Y 6.5/3, dry) weak to moderate medium prisms breaking to weak to moderate medium subangular blocks; slightly hard when dry, friable when moist; few roots but many pores less than one millimeter in diameter; very few thin clay skins on some ped surfaces; lime concretions are few, fine and faint; violent effervescence, with field pH of 8.8; gradual smooth boundary.

C1ca 32 to 48 inches. Light olive brown (1Y 5/3, moist) silt loam; light yellowish brown (1Y 6/3, dry) weak coarse prisms; slightly hard when dry, very friable when moist; very few roots, fine pores continue through this horizon; some lime mycelia present; violent effervescence, with field pH of 8.8; diffuse boundary.

C2 48 to 63 inches. Yellowish brown (10YR 5/4, moist) silt loam; pale brown (10YR 6/3, dry) massive; soft when dry, very friable when moist; violent effervescence; fine pores continue in this horizon.

Remarks: This soil is associated with the Deertrail series as sampled in this county. They often grade from one to the other within a distance of 50 feet, and occur as a true complex. About 60 percent of this soil in Arapahoe County is being cultivated to small grain with summer fallow. Under sod, the top part of the B2 horizon is very distinctive as the small blocks will be hanging on the roots of the plates. This is not typical for Weld Series, but is typical for the Weld in Arapahoe County. Where cultivated, the B1 horizon is destroyed, and an abrupt A B boundary is present. The B3ca, and especially the C horizons, could be described as vesicular, due to the many fine pores. Cause unknown.

Bureau of Public Roads Samples: A1, 0-3 inches; B2, 6-12 inches; C1ca, 32-48 inches.

Observations of fabric with stereoscopic microscope: All planar surfaces in the B2 horizon are shiny. Comparison of natural surface with fracture surface strongly suggests thin coating on all natural surfaces. A few definite clay films observed as lips around pores in ped interiors. Most of the macro surfaces associated with pores in the ped interior have coatings that are too thin to identify as clay films. The B2ca has slightly lighter and probably thinner planar surface coatings than the B2. Clay films associated with pores inside the peds about same abundance and expression as in the B2.

Micromorphology (Method 4E1): Something between clay films and pressure faces occurs along most of the macro surfaces. Some definite clay films occur. Quite a few stringers of oriented clay in matrix. Weathered mica flakes common. Edges of mica flakes have golden brown interference color suggestive of clay material. B2ca has weaker clay orientation than B2; no definite clay films observed in the one thin section examined.

Clay Mineralogy (Method 7A): The dominant mineral in the clay fraction in all horizons is montmorillonite. In the A horizons and noncalcareous B horizons this mineral is somewhat disordered, partly weathered, or contains inter-layered mineral as indicated by diffuse, broadened X-ray reflections. These horizons also contain slightly more mica and kaolin than the calcareous horizons. The montmorillonite in the calcareous B and C horizons gives very strong sharp X-ray reflections indicating regular crystallinity as well as large amounts.

SOIL Weld silt loam SOIL Nos. S61Colo-3-7 LOCATION Arapahoe County, Colorado
SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 15533-15540 February 1965

Depth (in.)	Horizon	1B1a											3A1										
		Total				Sand							Silt		Clay		Coarse fragments 2A2						
		Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	Carbonate	Noncarbonate	> 2	2 - 19	19 - 76					
Pct. of < 2 mm																			Pct.		Pct. of < 76 mm		
0-3	A1	27.1	58.8	14.1	0.2a	0.5a	0.7a	4.0	21.7	40.3	18.5	64.8	5.4	14	Tr.								
3-6	B1	21.0	53.2	25.8	0.1a	0.2a	0.4	2.9	17.4	35.1	18.1	54.5	3.6	26	Tr.								
6-12	B2t	14.8	45.4	39.8	0.1a	0.1a	0.2	1.2	13.2	29.0	16.4	43.1	1.6	40	-								
12-21	B31ca	15.3	54.0	30.7	-	-	0.1b	1.0c	14.2c	31.0	23.0	46.0	1.1	6	25	-							
21-31	B32ca	14.3	57.6	28.1	-	-	0.1b	0.9d	13.3d	32.7	24.9	46.7	1.0	3	25	-							
31-43	C1ca	14.5	61.1	24.4	-	0.1b	0.1b	1.1d	13.2d	35.1	26.0	49.1	1.2	2	22	-							
43-56	C2	16.0	62.9	21.1	-	0.1b	0.1b	1.1d	14.7d	37.1	25.8	52.6	1.3	1	20	-							
56-68	C3	17.1	63.7	19.2	-	0.1b	0.1b	1.0d	15.9d	38.9	24.8	55.5	1.2	Tr.	19	-							
Bulk density																							
Depth (in.)	Organic carbon	6B1a Nitrogen	C/N	6B1c Carbonate as CaCO ₃	4A1c			4M COLE		Water content			8D1 15-Bar Water to Clay Ratio	pH									
					30-Cm. g/cc	4A1b Air-Dry g/cc	4M e	4B3 30-Cm. Pct.	4B2 15-Bar Pct.	8C1b Sat. Paste	8C1a 1:10	8C1a (1:1)											
0-3	1.58	0.124	13	-							7.3	0.52	6.9	7.2	6.9								
3-6	1.13	0.113	10	-		1.30	1.41	0.08	27.1		9.7	0.38	6.4	6.8	6.6								
6-12	1.10	0.114	10	2							16.6	0.42	7.0	8.0	7.5								
12-21	0.72	0.074	10	14			1.44				12.9	0.42	7.6	8.5	8.0								
21-31	0.42	0.046	9	11				1.39			12.5	0.44	7.7	8.7	8.2								
31-43	0.24			9							11.9	0.49	7.9	8.9	8.4								
43-56	0.17			7							11.2	0.53	7.9	9.0	8.4								
56-68	0.12			6				1.41			10.8	0.56	7.9	8.9	8.3								
Extractable bases 5E1a																							
Depth (in.)	6M2b				6M2c Sum	6H1a Ext. Acidity	Cat. Exch. Cap.			Water extract from saturated paste 8A1						8A1a Electrical conductivity mmho/cm							
	Ca	Mg	Na	K			5A3a Sum	5A1a	5A2a	Ca	Mg	Na	K	CO ₃	HCO ₃		Cl	SO ₄					
0-3	8.6	2.8	Tr.	1.7	13.1	2.3	15.4	13.1	13.5			0.2	1.3				0.44						
3-6	12.6	4.0	Tr.	0.9	17.5	3.0	20.5	18.0	18.2			0.3	0.3				0.37						
6-12			0.1	1.4				29.2	29.6			0.6	0.5				0.72						
12-21			0.3	0.9				20.3	21.6			1.3	0.4				0.51						
21-31			1.0	1.1				20.8	21.6			3.4	0.4				0.60						
31-43			2.1	1.3				21.0	21.6			7.5	0.5				1.16						
43-56			2.9	1.3				21.0	21.4			13.4	0.5				2.00						
56-68			3.4	1.1				20.7	21.2			18.9	0.5				2.80						
Base Sat.																							
Depth (in.)	8A Water at Saturation Pct.	5D1 Exchangeable Na+OAc to CaCl ₂ Pct.	6F1a Gypsum Pct.	8D1 NH ₄ OAc CEC to Clay Ratio	5C3 Sum Cation		5C1 NH ₄ OAc																
					85	100	85	97															
0-3	40.1			0.93	85	100																	
3-6	39.1			0.70	85	97																	
6-12	55.9			0.73																			
12-21	45.9	1		0.66																			
21-31	43.0	4		0.74																			
31-43	42.1	8		0.86																			
43-56	39.3	11		1.00																			
56-68	37.8	13		1.08																			

- a. > 50% organic matter.
- b. 25-50% mica-like.
- c. 5-25% carbonate.
- d. 5-25% carbonate. < 5% mica-like.
- e. Coefficient of linear extensibility.

Soil Type: Weld silt loam
 Soil No.: 851Colo-3-7
 Classification: Brown.
 Location: 2,162 feet south, 184 feet east of northwest corner, Sec. 16, T4S, R59W, Arapahoe County, Colorado.
 Climate: Continental, average annual precipitation 14 inches. Mean annual temperature 49° F.
 Frost-free period 150 days. Elevation 5,100 feet.
 Vegetation: Native pasture. Blue grama, sixweeks fescue, pricklypear. Some buffalograss and western wheatgrass.
 Parent material: Aeolian silty material - loess.
 Physiographic position: Upland.
 Relief: Nearly level, 2 percent slope facing east.
 Drainage: Well drained, surface and internal. Intake rate is moderate.
 Moisture: Slightly moist to 18 inches, usually dry.
 Water table: None. Stoniness: None.
 Salt or alkali: Typical for B3ca to have a pH over 8.5, but no visible salts other than calcium carbonate.
 Erosion: Slight water erosion. Moderate wind erosion on west and north-facing slopes and crests of ridges.
 Described by: J. B. Brown, June 28, 1961.

Horizon and
 Lincoln
 Lab. No.

- A1
 15533 0 to 3 inches. Very dark grayish brown (10YR 3.5/2, moist) silt loam; grayish brown (10YR 5/2, dry) weak medium subangular blocks breaking to moderate fine granules; soft when dry, very friable when moist; field pH of 6.8; clear smooth boundary.
- B1
 15534 3 to 6 inches. Very dark grayish brown (10YR 3.5/2, moist) silt loam; grayish brown (10YR 4.5/2, dry) moderate medium prisms breaking to moderate medium subangular blocks; slightly hard when dry, very friable when moist; many roots with thin patchy clay films in channels, and on lower part of ped surfaces; field pH 6.8; clear smooth boundary.
- B2t
 15535 6 to 12 inches. Very dark grayish brown (10YR 3.5/2, moist) silty clay loam; dark grayish brown (10YR 4/2, dry) dark brown (10YR 4/3, moist and crushed) moderate fine prisms breaking to strong fine and very fine angular blocks; hard when dry, firm when moist; thin nearly continuous clay film on all peds; top 1/2 inch of B2 horizon does not have prismatic structure, but the strong grade of very fine angular blocks; this is distinctive for this soil; many roots along prism faces and through blocks; field pH 7.0; abrupt slightly wavy boundary.
- B31ca
 15536 12 to 21 inches. Grayish brown (1Y 5/2, moist) light silty clay loam; light brownish gray (1Y 6/2, dry) moderate medium prisms breaking to moderate medium fine angular and subangular blocks; hard when dry, friable when moist; thin patchy clay skins on peds; many roots and root holes, with many fine pores less than one millimeter in diameter; lime concretions are common medium and faint; violent effervescence, with a field pH of 8.6; gradual smooth boundary.
- B32ca
 15537 21 to 31 inches. Gray brown (1Y 5/2, moist) heavy silt loam; light brownish gray (1Y 6/2, dry) weak medium to coarse prismatic breaking to weak to moderate medium subangular blocks; hard when dry, friable when moist; some roots with thin very patchy clay films in channels, and some ped surfaces; many fine pores one millimeter in diameter; few fine faint lime concretions; violent effervescence, with a field pH of 8.6; gradual smooth boundary.
- C1ca
 15538 31 to 43 inches. Brown (10YR 5/3, moist) silt loam; pale brown (10YR 6/3, dry) weak coarse prismatic structure breaking to weak coarse subangular blocks; slightly hard when dry, very friable when moist; some roots and many fine pores, like horizon above; some lime mycelia present; violent effervescence; gradual smooth boundary.
- C2
 15539 43 to 56 inches. Brown (10YR 5/3, moist) silt loam; pale brown (10YR 6/3, dry) massive; soft when dry, very friable when moist; very few roots with many fine pores; violent effervescence; arbitrary boundary.
- C3
 15540 56 to 68 inches. Brown (10YR 5/3, moist) silt loam; pale brown (10YR 6/3, dry) massive; soft when dry, very friable when moist; fine pores continue; violent effervescence.

Remarks: This soil is associated with the Deertrail series as sampled in this county. They often grade from one to the other within a distance of 50 feet, and occur as a true complex. About 60 percent of this soil in Arapahoe County is being cultivated to small grain with summer fallow. Under sod, the top part of the B2 horizon is very distinctive as the small blocks will be hanging on the roots of the plates. This is not typical for Weld Series, but is typical for the Weld in Arapahoe County. Where cultivated the B1 horizon is destroyed and an abrupt A B boundary is present. The B3ca, and especially the C horizons, could be described as vesicular, due to the many fine pores. Cause unknown.

Bureau of Public Roads Samples: A1, 0-3 inches; B2, 6-12 inches; C2, 43-56 inches.

Observations of fabric with stereoscopic microscope: B2 has slightly lighter and thinner planar surface coatings than B2 of 3-3.

Micromorphology (Method 4E1): B2 has a few clay films. General clay orientation and the abundance of clay films less than in B2 of 3-3. Stronger than in B2 of either Deertrail.

Sand Mineralogy (Method 7E1): Weld has an increase in mica with depth.

SOIL TYPE Weld LOCATION KIT CARSON CO., COLO.

silt loam

SOIL NOS. S-54-Colo-32-1 LAB. NOS. 2554-2561

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)									TEXTURAL CLASS	
		1B1a					3A1					2A2 > 2
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002		
0-1 1/2	A11	0.2 a	0.6	0.6	2.1	24.3	52.2	20.0	61.6	16.2	-	sil
1 1/2-3	A12	0.1 a	0.7	0.5	0.9	23.5	54.5	19.8	58.0	20.6	-	sil
3-5	A2B1	0.1	0.9	0.7	1.1	25.3	53.3	18.6	60.9	13.4	-	sil
5-11	B21	0.2	0.5	0.5	0.6	25.4	47.4	25.4	53.8	14.4	-	1
11-17	B3ca1	-	0.5	0.5	1.5	26.1	44.4	27.0	55.0	15.5	-	1/cl
17-23	B3ca2	-	0.5	0.3	1.2	28.4	43.1	26.5	55.5	16.6	-	1
23-33	Cca1	-	0.3	0.2	0.5	26.3	49.8	22.9	58.6	17.8	-	1
33-45	Cca2	-	0.1	0.2	0.8	28.1	51.8	19.0	61.9	18.5	-	sil

8C1b SATURATED PASTE	pH		ORGANIC MATTER			8A2 ESTR SALT (BUREAU CUP)	ELECTRI- CAL CONDUCTI- VITY EC x 10 ³ MILLIMOS PER CM @25-C.	6E1a CaCO ₃ equiv- gram	MOISTURE TENSIONS		
	8C1a 1:5	8C1a 1:10	6A1a ORGANIC CARBON %	6B1a NITRO- GEN %	C/N				1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS. %
	7.1	7.7	7.9	2.26	.185				12	-	-
6.8	7.3	7.4	2.20	.176	12	-	-	-	11.3		
6.4	7.0	7.1	1.33	.117	11	-	1	-	9.4		
7.4	8.3	8.5	1.06	.112	10	-	2	-	12.0		
7.8	8.7	8.9	0.82	.092	9	-	7	-	13.3		
7.9	8.8	9.0	0.65	.071	9	-	11	-	13.3		
7.9	8.9	9.1	0.38			-	11	-	11.8		
7.9	8.9	9.0	0.23			-	9	-	10.6		

5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS					5B1a BASE SAT. %	5D1	8D3 Ca/Mg	MOISTURE AT SATU- RATION %
	6N2b Ca	6O2b Mg	6P2a K						
	milliequivalents per 100g. soil								
21.2	18.2	3.2		0.1	2.1			5.7	
22.1	15.9	2.8		0.1	2.0	94		5.7	
18.1	12.8	2.3		0.1	1.2	91		5.6	
22.5		3.5		0.1	0.7				
21.6				0.2	1.0				
20.7				0.2	1.1				
20.1				0.2	1.6				
19.8				0.2	2.1				

a. Organic Matter in Sand Fractions

Soil Type: Weld silt loam
 Soil Nos.: 554 Colo-32-1
 Location: 100 feet east, and 25 feet west of southwest corner Sec. 13, T10S, R43W, Kit Carson County, Colorado.
 Physiographic Position: Upland.
 Topography: A very gentle convex slope of approximately 2 percent facing northeast.
 Drainage: Well drained.
 Vegetation: Chiefly blue grama, western wheat and buffalograss.
 Use: Pasture.
 Sampled by: James Allen, E. M. Payne, Dale Romine, A. J. Cline, September 2, 1954.
 Described by: E. M. Payne.

Horizon and
 Lincoln
 Lab. Number

A11 2554	0 to 1½ inches. Grayish brown (10YR 5/2.5 dry) to very dark grayish brown (10YR 3/2 moist) silt loam; soft when dry, very friable when moist; moderate fine platy, breaking to moderate fine crumb structure; noncalcareous; lower boundary clear and smooth.
A12 2555	1½ to 3 inches. Gray (10YR 5/1 dry) to very dark gray (10YR 3/1 moist) silt loam; slightly hard (dry), very friable (moist); weak very coarse platy, breaking to moderate coarse granular; noncalcareous; lower boundary clear and smooth.
A2B1 2556	3 to 5 inches. Pale brown (10YR 6/2.5 dry) to dark grayish brown (10YR 3.5/2 moist) silt loam; hard (dry), friable (moist); weak coarse subangular blocky structure; noncalcareous; lower boundary abrupt and smooth; there is some gray flecking on the sides of the aggregates in this horizon.
B21 2557	5 to 11 inches. Grayish brown (10YR 5/2 dry) to very dark grayish brown (10YR 3/2 moist) light silty clay loam; hard (dry), friable (moist); strong medium prismatic; breaking to strong medium angular blocky; noncalcareous; a few thin but distinct Tonhautchen; lower boundary is abrupt and smooth.
B3ca1 2558	11 to 17 inches. Light gray (10YR 7/2 dry) to grayish brown (10YR 5/2.5 moist) light silty clay loam; hard (dry), friable (moist); moderate coarse prismatic, breaking to moderate coarse subangular blocky; calcareous; the horizon contains a few small lime mycelia; the lower boundary is gradual and smooth.
B3ca2 2559	17 to 23 inches. Very pale brown (10YR 7/3 dry) to pale brown (10YR 6/3 moist) silt loam; hard (dry), friable (moist); weak coarse prismatic to weak coarse subangular blocky; calcareous; the horizon contains slight to moderate amounts of accumulated lime chiefly as lime flour but segregated into a few lime mycelia; lower boundary gradual and smooth.
Cca1 2560	23 to 33 inches. Very pale brown (10YR 8/3 dry) to pale brown (10YR 6/3 moist) silt loam; hard (dry), very friable (moist); massive; calcareous; the horizon contains moderate amounts of accumulated lime chiefly as lime flour; lower boundary is gradual and smooth.
Cca2 2561	33 to 45 inches. Very pale brown (10YR 8/3 dry) to pale brown (10YR 6/3 moist) silt loam; slightly hard (dry), very friable (moist); massive; calcareous; the horizon contains moderate amounts of accumulated lime chiefly as lime flour.

SOIL SURVEY LABORATORY MANDAN, NORTH DAKOTA

9-7-55

SOIL TYPE Weld LOCATION KIT CARSON CO., COLO.
silt loam

SOIL NOS. S-54-Colo-32-2

LAB. NOS. 2562-2569

DEPTH INCHES	HORIZON	1B1a PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										2A2 > 2	TEXTURAL CLASS
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	3A1				
		2-1	1-0.5	0.5-0.25	0.25-0.10	0.10-0.05	0.05-0.002	< 0.002	0.2-0.02	0.02-0.002			
0-2 1/2	A1	0.3a	0.9	0.9	2.0	35.6	39.2	21.1	63.5	12.6	-	1	
2 1/2-5	A2	-	1.0	0.7	1.8	31.1	49.7	15.7	65.8	16.2	-	1	
5-9 1/2	B21	-	0.5	0.4	1.0	19.9	37.2	41.0	45.5	12.3	-	c	
9 1/2-14	B22	-	0.5	0.4	1.0	21.9	36.6	39.6	47.2	12.0	-	cl	
14-18	B3ca1	-	0.1	0.1	1.1	31.1	40.1	27.5	56.9	15.2	-	cl	
18-25	B3ca2	-	0.1	0.1	0.6	30.9	49.0	19.3	61.0	19.4	-	1	
25-33	Cca1	-	0.1	0.1	0.5	37.1	46.2	16.0	67.8	15.9	-	1	
33-43	Cca2	-	0.9	0.6	0.8	45.2	36.9	15.6	71.6	11.1	-	1	
pH		ORGANIC MATTER				8A2	ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM @25-C.	6E1a	MOISTURE TENSIONS				
8C1b SATURATED PASTE	8C1a	8C1a	6A1a ORGANIC CARBON %	6B1a NITROGEN %	C/N	EST% SALT (BUREAU CUP)	EC-10 ³ MILLIMHOS PER CM @25-C.	CaCO ₃ equiv-alent %	GYP SUM me./100g. SOIL	1/10 ATMOS. %	1/3 ATMOS. %	4B2 15 ATMOS. %	
	1:5	1:10											
6.9	7.5	7.6	1.22	.128	10	-	-	-	-	-	-	9.7	
6.7	7.5	7.6	1.13	.096	12	-	-	-	-	-	-	7.1	
6.3	7.2	7.3	1.11	.098	11	-	-	-	-	-	-	16.8	
7.3	8.2	8.4	0.77	.097	8	-	-	-	-	-	-	17.1	
8.0	9.1	9.2	0.57	.048	12	-	-	8	-	-	-	13.4	
8.2	9.3	9.5	0.32	.036	9	-	-	12	-	-	-	11.4	
8.2	9.3	9.5	0.18			-	-	10	-	-	-	9.5	
8.1	9.3	9.5	0.12			-	-	7	-	-	-	7.8	
5A1a CATION EXCHANGE CAPACITY	EXTRACTABLE CATIONS 5H1a					BASE SAT. % 5D1				8D3 Ca/Mg		MOISTURE AT SATURATION %	
	6N2b Ca	6O2b Mg	H	6P2a Na	6Q2a K								
4 NH4Ac	milliequivalents per 100g. soil												
19.2	13.9	4.0		0.1	2.0					3.5			
13.8	9.2	2.8		0.1	1.4	98				3.3			
29.2	17.9	7.4		0.2	2.1	94				2.4			
30.1	19.3	9.2		0.6	2.2					2.1			
22.3				0.7	1.7								
19.0				1.2	2.0								
21.0				1.6	2.0								
15.3				1.8	1.8								

a Organic Matter in Sand Fractions

Soil Type: Weld silt loam.
 Soil Nos.: S54Colo-32-2
 Location: 1/4 mile west, 125 feet south of northeast corner of Sec. 32, T8S, R46W, Kit Carson County, Colorado.
 Physiographic Position: Upland.
 Topography: Gentle convex slope of approximately 2 percent facing east.
 Drainage: Well drained.
 Vegetation: Predominantly blue grama with some buffalo, western wheat, threadgrass.
 Use: Pasture.
 Sampled by: James Allen, Dale Romine, E. M. Payne, and A. J. Cline, September 1, 1954.
 Described by: E. M. Payne.

Horizon and
 Lincoln
 Lab. Number

- A1
 2562 0 to 2½ inches. Grayish brown (10YR 5/2.5 dry) to dark grayish brown (10YR 4/2 moist) silt loam; soft (dry), very friable (moist); moderate coarse platy, breaking to moderate coarse crumb structure; non-calcareous; lower boundary clear and smooth.
- A2
 2563 2½ to 5 inches. Light brownish gray (10YR 6/2.5 dry) to dark grayish brown (10YR 3.5/2 moist) silt loam; slightly hard (dry), very friable (moist); weak coarse columnar, breaking to weak medium sub-angular blocky; noncalcareous; tops of the columns are slightly rounded and have an indistinct platy structure that is confined to the top 1/4 to 1/2 inch; lower boundary abrupt and smooth.
- B21
 2564 5 to 9½ inches. Brown (10YR 4.5/3 dry) to dark brown (10YR 3.5/3 moist) heavy silty clay loam; very hard (dry) firm (moist); strong fine prismatic structure, breaking to strong fine angular blocky; non-calcareous; moderately thick distinct Tonhauthchen; lower boundary clear and smooth.
- B22
 2565 9½ to 14 inches. Dark grayish brown (10YR 4/2 dry) to very dark grayish brown (10YR 3/2 moist) heavy silty clay loam; very hard (dry), firm (moist); strong medium prismatic, breaking to strong medium angular blocky; noncalcareous; moderately thick distinct Tonhauthchen; lower boundary abrupt and smooth.
- B3ca1
 2566 14 to 18 inches. Pale brown (10YR 6/3 dry) to brown (10YR 5/3 moist); light silty clay loam; very hard (dry), firm (moist); moderate coarse prismatic, breaking to moderate coarse angular blocky; calcareous; the horizon contains a few small calcium carbonate concretions and mycelia; Tonhauthchen are faintly visible under a hand lens, but are very thin and patchy; lower boundary is gradual and smooth.
- B3ca2
 2567 18 to 25 inches. White (10YR 8/2 dry) to light yellowish brown (10YR 6/3.5 moist) silt loam; hard (dry), friable (moist); weak coarse subangular blocky structure; calcareous; the horizon contains moderate amounts of accumulated lime both as lime flour and as mycelia; lower boundary gradual and smooth.
- Coa1
 2568 25 to 33 inches. Very pale brown (10YR 8/3 dry) to pale brown (10YR 6/3 moist) silt loam; hard (dry), friable (moist); massive; calcareous; the horizons contain much accumulated lime chiefly as lime flour; lower boundary is gradual and smooth.
- Coa2
 2569 33 to 43 inches. Very pale brown (10YR 8/3 dry) to pale brown (10YR 6/3 moist) silt loam; slightly hard (dry), very friable (moist); massive; calcareous; the horizon contains moderate amounts of accumulated calcium carbonate chiefly as lime flour.

SOIL TYPE * Weldona

LOCATION

Morgan County, Colorado

sandy loam

SOIL NOS. S59Colo-44-5

LAB. NOS. 10858-10863

DEPTH INCHES	HORIZON	PARTICLE-SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002					2A2 > 2 (<19mm)
0-6	Ap	7.3	13.8	11.8	16.4	12.1	28.7	9.9	37.7	10.5	Tr.	sl	
6-15	B2t	14.8	20.7	11.8	14.6	6.2	12.3	19.6	19.0	6.1	Tr.	cosl/scs	
15-21	B3	17.7	25.5	15.1	17.1	4.3	7.7	12.6	13.7	5.2	Tr.	cosl	
21-31	C1	6.0	24.5	20.5	23.4	6.0	8.0	11.6	18.3	5.1	Tr.	cosl	
31-45	C2	6.2	22.4	23.5	26.6	6.1	6.6	8.6	19.3	4.1	Tr.	lcos	
45-62	C3	14.0	26.9	17.8	20.9	5.3	6.3	8.8	16.0	4.1	6	lcos	
pH		ORGANIC MATTER					ELECTRICAL CONDUCTIVITY	6B1a		MOISTURE TENSIONS			
8C1a	1:5	1:10	6A1a ORGANIC CARBON	6B1a NITROGEN	C/N	EST% SALT (BUREAU CUP)	EC - 10 ³ MILLIMOS PER CM	CaCO ₃ equiv. cent	GYPSUM me./100g SOIL	1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.	
1:1			%	%				%		%	%	%	
7.2			0.55	0.052	10			Δ				4.3	
6.9			0.38	0.043	9			Δ				7.6	
7.2			0.22	0.028				Δ				4.7	
7.6			0.14	0.014				Δ				4.5	
8.5			0.05					Δ				3.2	
8.5			0.03					Δ				3.2	
5A1a	EXTRACTABLE CATIONS					5B1a	BASE SAT. % AC EXCH.	Base Sat. % on Sum Cations	Sum Ext. Bases	Sum Ext. Cations	Ca/Mg	O. D. Bulk Density	MOISTURE AT SATURATION
	6N2b Ca	6O2b Mg	6H1a H	6P2a Na	6Q2a K								
	← milliequivalents per 100g. soil →					5Q1		5Q3	5H1a	5A3a	8D3	g/cc	%
7.1	4.7	1.4	1.4	<0.1	1.3	104	84	7.4	8.8	3.4			
12.7	10.1	3.2	1.7	<0.1	0.5	109	89	13.8	15.5	3.2			
9.2	7.5	2.5	1.0	<0.1	0.2	111	91	10.2	11.2	3.0			
9.2	7.6	2.6	0.7	<0.1	0.2	113	94	10.4	11.1	2.9			
7.0	9.8	2.2	<0.1	<0.1	0.2	174	100	12.2	12.2	4.4			
6.7	8.6	2.1	<0.1	0.1	0.2	164	100	11.0	11.0	4.1			

Soil Type: *Weldona sandy loam
 Soil Nos.: S59Colo-44-5
 Field classification: Chestnut.
 Location: 250 feet east, 1,050 feet north of southwest corner, Sec. 31, T3N, R59W, Morgan County, Colorado.
 Photo: YE-7F-10.
 Climate: Continental, average annual precipitation 15-17 inches; frost-free season 146 days, mean annual temperature 48° F. Elevation 4,630 feet.
 Vegetation: Dry cropland fallow.
 Parent material: Arkosic alluvium.
 Physiographic position: Terrace.
 Relief: Nearly level 0-1 percent slope.
 Drainage: Slow external, medium internal.
 Moisture: Moist to 56 inches at time of sampling.
 Water table: None or very deep.
 Stoniness: Few small gravels.
 Salt or alkali: None observed.
 Erosion: Slight to moderate wind, estimate 2 to 3 inches surface horizon lost. Has been under cultivation 12 to 15 years, 2 years idle because of drought.
 Described by: Clayton F. Spears, May 5, 1959.
 Remarks: Numerous small krotovinas in E2, E3, and C1 horizons. Two dark brown charcoal strips about 1/4 inch thick at 33 inches and 42 inches which ran in smooth continuous lines across pit areas.

Horizon and
 Lincoln
 Lab. No.

Ap 10858	0 to 6 inches. Grayish brown (10YR 5.5/2 dry) to dark brown (10YR 3/3 moist) very dark grayish brown (10YR 3/2 crushed) sandy loam; weak fine granular structure; slightly hard when dry, friable moist; noncalcareous; the 5- to 6-inch layer shows some weak fine platy structure probably due to tillage; lower boundary clear and smooth.
E2t 10859	6 to 15 inches. Brown (8.75YR 5/3 dry) to dark brown (7.5YR 3/2 moist) brown (7.5YR 4/3 crushed) sandy clay loam; moderate medium prismatic structure breaking to moderate medium subangular blocks; hard to very hard dry, friable when moist; moderate nearly continuous clay skins on vertical and horizontal faces of soil aggregates; noncalcareous; lower boundary clear and smooth.
E3 10860	15 to 21 inches. Light olive brown (1.25Y 5/4 dry) to olive brown (1.25Y 4/3 moist and crushed) coarse sandy loam; weak coarse subangular blocky structure; hard when dry, friable moist; very thin patchy clay skins on vertical faces of soil aggregates; noncalcareous; lower boundary clear and wavy.
C1 10861	21 to 31 inches. Light olive brown (2.5Y 5.5/4 dry) to olive brown (2.5Y 4.5/3 moist and crushed) loamy coarse sand; massive; slightly hard when dry, friable moist; noncalcareous; lower boundary clear and wavy.
C2 10862	31 to 45 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist and crushed) coarse sand; massive; noncalcareous; very dark brown (10YR 2/2) charcoal strips approximately 1/4 inch thick at 33 inches and 42 inches in this horizon. Lower boundary gradual and smooth.
C3 10863	45 to 62 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist and crushed) sand, massive; noncalcareous; lower boundary clear and smooth.
C4	62 to 70 inches. Light yellowish brown (2.5Y 6/4 dry) to light olive brown (2.5Y 5/4 moist) sandy clay loam; massive; hard dry, friable moist; noncalcareous; lower boundary clear and smooth.
C5	70 to 108 inches. Pale yellow to light yellowish brown (2.5Y 6.5/3 dry) to light olive brown (2.5Y 5/3 moist) coarse sand and sand stratified; massive, soft dry, friable moist; noncalcareous.

Bureau of Public Roads samples:

Ap	0-6 inches
E2t	6-15 inches
C2	31-45 inches

ADDITIONAL NOTES: There are a few thin seams of clayey material and a few small clay balls in the C3 and C4 horizons.

SOIL SURVEY LABORATORY Lincoln, Nebr. January, 1960

SOIL TYPE *Weldona sandy loam LOCATION Morgan County, Colorado

SOIL NOS. S59Colo-44-6 LAB. NOS. 10864-10871

DEPTH INCHES	HORIZON	1B1a PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	3A1		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	> 2		
0-8	Ap	7.5	9.1	6.2	12.6	15.4	36.0	13.2	44.9	13.0	Tr.	1	
8-12	B21t	9.2	11.5	7.6	13.8	11.5	28.0	18.4	37.1	9.1	2	fsl	
12-18	B22t	10.2	12.2	7.6	12.6	10.1	23.0	24.3	30.8	8.1	Tr.	scl	
18-25	B3	19.2	27.3	13.3	16.4	6.2	7.4	10.2	17.5	3.3	10	lcos	
25-31	C1	8.0	14.7	14.6	28.8	12.0	10.4	11.5	32.1	4.6	Tr.	sl	
31-35	C2	15.5	24.3	15.7	19.0	7.0	8.0	10.5	19.9	3.5	Tr.	lcos	
35-40	C3	9.9	30.0	18.0	19.5	5.9	7.2	9.5	18.2	2.9	Tr.	lcos	
40-57	C4	13.4	22.6	15.3	21.4	8.7	9.6	9.0	23.4	4.6	6	lcos	
pH		ORGANIC MATTER					EST% SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM	MOISTURE TENSIONS				
8C1a	1:5	1:10	6A1a ORGANIC CARBON	6B1a NITROGEN	C/N	6E1a CaCO ₃ equivalent			GYP SUM me./100g. SOIL	1/10 ATMOS.	1/3 ATMOS.	4 to 15 ATMOS.	
1:1			%	%			%	%	%	%			
7.1			0.54	0.058	9		Δ			5.5			
7.3			0.43	0.051	8		Δ			8.2			
7.5			0.41	0.053	8		Δ			10.5			
7.8			0.14	0.018			Δ			3.9			
7.8			0.20				Δ			4.8			
8.2			0.13				Δ			3.9			
8.4			0.08				1			3.4			
8.5			0.05				1			2.6			
5A1a CATION EXCHANGE CAPACITY NH ₄ Ac		EXTRACTABLE CATIONS					BASE SAT. % NH ₄ Ac EXCH.	Base Sat. % on Sum Cations	Sum Ext. Bases	Sum Ext. Cations	Ca/Mg	O. D. Bulk Density g/cc	MOISTURE AT SATURATION %
	6N2b Co	6O2b Mg	6H1a H	6P2a Na	6Q2a K	5C1	5C3	5B1a	5A3a	8D3			
	milliequivalents per 100g. soil												
8.9	6.9	1.8	1.9	0.1	0.7	107	83	9.5	11.4	3.8			
11.9	9.8	2.8	1.7	0.5	0.6	115	89	13.7	15.4	3.5			
16.3	12.7	4.0	1.5	0.8	0.6	111	92	18.1	19.6	3.2			
8.1	6.1	2.2	0.2	0.4	0.2	110	98	8.9	9.1	2.8			
10.2	8.1	2.3	0.7	0.5	0.3	110	94	11.2	11.9	3.5			
9.0		2.5	1.9	0.4	0.2								
7.8		2.7	<0.1	0.3	0.2								
7.0				0.2	0.2								

Soil Type: *Weldona sandy loam
 Soil Nos.: 55900lo-44-6
 Field Classification: Chestnut.
 Location: 75 feet east, 170 feet south of the north quarter corner, Sec. 23, T1N, R60W, Morgan County, Colorado.
 Photo: YE-5F-38.
 Climate: Continental, average annual precipitation 15-17 inches, frost-free season 146 days, mean annual temperature 48° F, elevation 4,730 feet.
 Vegetation: Dry cropland fallow.
 Parent material: Arkosic alluvium.
 Physiographic position: Terrace.
 Relief: Nearly level 0-1 percent slope.
 Drainage: Slow external, moderate or medium internal.
 Moisture: Moist to 56 inches at time of sampling.
 Water table: None or very deep.
 Stoniness: Few small water-worn gravels throughout profile.
 Erosion: Slight to moderate wind.
 Described by: Clayton F. Spears, May 6, 1959.
 Remarks: Has been under cultivation less than 10 years. Numerous small krotovinas in E2, E3 horizons.

Horizon and
 Lincoln
 Lab. No.

Ap
 10864 0 to 8 inches. Grayish brown to brown (10YR 5/2.5 dry) to dark brown (10YR 3/3 moist and crushed) sandy loam; weak fine crumb structure; soft when dry, very friable moist; noncalcareous; lower boundary clear and smooth.

E21t
 10865 8 to 12 inches. Brown (10YR 5/3 dry) to dark brown (8.75YR 3/3 moist) (10YR 3/3 crushed) sandy clay loam; moderate medium prismatic structure breaking to moderate medium subangular blocks; hard when dry, friable when moist; moderate nearly continuous clay skins on both vertical and horizontal faces of soil aggregates; noncalcareous; lower boundary clear and wavy.

E22t
 10866 12 to 18 inches. Dark grayish brown (10YR 4/2 dry) to very dark grayish brown (10YR 3/2 moist) (10YR 3.5/2 crushed) sandy clay loam; moderate medium prismatic structure breaking to moderate medium subangular blocks; hard to very hard when dry, friable moist; moderate continuous clay skins on both vertical and horizontal faces of soil aggregates; noncalcareous; lower boundary clear and wavy.

E3
 10867 18 to 25 inches. Light yellowish brown (1.25Y 6/3 dry) to olive brown (1.25Y 4/3 moist and crushed) coarse loamy sand; weak coarse subangular blocky structure; hard when dry, friable when moist; very thin patchy clay skins on vertical faces of soil aggregates and in root channels; noncalcareous; lower boundary clear and smooth.

C1
 10868 25 to 31 inches. Light yellowish brown (1.25Y 6/3 dry) to light olive brown (1.25Y 5/3 moist) sandy loam; massive; slightly hard dry, friable moist; noncalcareous; lower boundary clear and smooth.

C2
 10869 31 to 35 inches.

C21
 31 to 32½ inches. Light yellowish brown (1.25Y 6/3 dry) to light olive brown (1.25Y 5.5/3 moist) coarse sand, massive; strongly calcareous.

C22
 32 to 33½ inches. Grayish brown (2.5Y 5/2 dry) to dark grayish brown (2.5Y 4/2 moist) sandy clay loam; massive; slightly hard dry, friable moist; this horizon contains a charcoal strip 1/4 inch wide which is very dark brown (10YR 2/2 moist); strongly calcareous.

C23
 33½ to 35 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist) loamy coarse sand; massive; slightly hard dry, very friable moist; slightly calcareous; lower boundary clear and wavy.

C3
 10870 35 to 40 inches. Pale yellow (2.5Y 6.5/3 dry) to light olive brown (2.5Y 5.5/3 moist) loamy sand; massive, slightly hard dry, friable moist; this horizon is calcareous with calcium carbonate occurring in the form of thin seams and small soft concretions but at least 50 percent of material in this horizon is noncalcareous. It is not a horizon of lime accumulation; lower boundary clear and smooth.

C4
 10871 40 to 57 inches. Pale yellow (2.5Y 6.5/3 dry) to light olive brown (2.5Y 5.5/3 moist) coarse sand; massive, soft dry, friable moist; very slightly calcareous in places, but no visible seams or concretions of calcium carbonate can be noted; lower boundary clear and smooth.

C5
 57 to 61 inches. Light brownish gray (10YR 6.5/2 dry) to grayish brown (10YR 4.5/2 moist) sandy loam; massive; soft dry, friable moist; very slightly calcareous in spots; lower boundary gradual and smooth.

C6
 61 to 83 inches. Pale yellow to light yellowish brown (2.5Y 6.5/3 dry) to light olive brown (2.5Y 5.5/3 moist) coarse sand; massive; dry soft, moist friable; noncalcareous; lower boundary clear and smooth.

C7
 83 to 90 inches. Pale yellow to light yellowish brown (2.5Y 6.5/3 dry) to light olive brown (2.5Y 5/3 moist) stratified loamy sand, sand, and sandy loam; massive; soft dry, friable moist; few medium distinct mottles of bright yellowish brown (10YR 5/6 5/8 moist or dry); noncalcareous; lower boundary gradual and smooth.

C8
 90 to 108 inches. Light yellowish brown (2.5Y 6/3 dry) to light olive brown (2.5Y 5/3 moist) loamy coarse sand, massive; noncalcareous; few medium mottles of bright yellowish brown (10YR 5/6 5/8 moist or dry).

Bureau of Public Roads Samples: Ap 0-8 inches; E22t 12-18 inches; C4 40-57 inches.

ADDITIONAL NOTES: Both the C3 (35-40 inches) and the C4 (40-57 inches) horizons contained a few thin seams of olive clayey material and a few small clay balls.

SOIL SURVEY LABORATORY Lincoln, Nebr. May, 1959

SOIL TYPE Wiley LOCATION Prowers County, Colorado
 silt loam

SOIL NOS. S58Colo-50-8 LAB. NOS. 9706-9711

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS	
		1B1a					3A1						2A2 > 2
		VERY COARSE SAND 2.1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002			
0-4	Ap	<0.1	0.2	0.3	1.5	19.9	55.5	22.6	60.8	15.7	-	sil	
4-10	B21t	0.1	0.1	0.2a	1.1a	14.4a	57.5	26.6	53.5	19.3	-	sil/sicl	
10-17	B22t	0.1	0.1	0.1a	0.8a	9.7a	62.2	27.0	51.0	21.5	-	sicl/sil	
17-29	B3ca	<0.1	0.1	0.1a	0.5a	8.4a	65.8	25.1	50.0	24.6	-	sil	
29-41	C1	<0.1	0.1	0.1a	0.6a	9.8a	66.1	23.3	52.0	24.4	-	sil	
41-60	C2	<0.1	0.1	0.1a	0.8a	10.9a	67.3	20.8	54.5	24.3	-	sil	

8C1a	pH	ORGANIC MATTER			8A2 EST% SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM DATA	6E1a CaCO ₃ equivalent %	6F1a GYPSUM ma./100g. SOIL	MOISTURE TENSIONS		
		6A1a ORGANIC CARBON	6B1a NITROGEN	C/N					1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.
		%	%						%	%	%
1:1	1:5	1:10									
7.8			0.98	0.108	9	<0.20	0.7	2			10.1
7.9			0.78	0.088	9	<0.20	0.6	7			11.6
7.9			0.52	0.062	8	<0.20	0.7	9			11.5
8.2			0.33	0.040	8	<0.20	1.0	9			10.9
8.6			0.22			<0.20	0.9	8			11.3
8.5			0.18			<0.20	2.2	6	<		10.8

5A1a CATION EXCHANGE CAPACITY MEq/100g. soil	EXTRACTABLE CATIONS					5B1a 5D2 EXCH. Na %	8A1 SATURATION EXTRACT SOLUBLE		8A MOISTURE AT SATURATION %
	Ca	Mg	H	6F2a Na	6Q2a K		6P1a Na	6Q1a K	
	milliequivalents per 100g. soil						milliequivalents per liter		
18.7				<0.1	1.4	<	0.4	0.7	53.2
18.7				0.1	0.8	<	0.5	0.3	58.9
18.6				0.3	0.7	1	1.4	0.3	58.3
18.8				1.6	0.7	7	5.4	0.2	58.0
18.7				3.1	0.7	14	6.8	0.1	55.9
19.2				4.5	0.6	19	16.6	0.1	54.1

a. Trace CaCO₃ concn.

Soil Type: Wiley silt loam
 Soil Nos.: S58Colo-50-8
 Classification: Sterozem.
 Location: 800 feet east, 700 feet south of northwest corner, Sec, 8, T24S, R45W, Prowers County, Colorado.
 Climate: Continental climate, average annual precipitation 13 to 14 inches, elevation 3,840 feet. Frost-free season 166 days.
 Vegetation: Sorghum.
 Parent Material: Loess.
 Physiographic Position: Upland.
 Stoniness: None.
 Water Table: None encountered.
 Salt or Alkali: None observed.
 Relief: Gently sloping, 2 to 3 percent slope.
 Drainage: Well.
 Moisture: Dry.
 Erosion: Slight to moderate, principally wind.
 Described by: E. Milton Payne, November 6, 1958.

Horizon and
 Lincoln
 Lab. No.

Ap 0 to 4 inches. Grayish brown (10YR 5.5/2 dry) to dark grayish brown (10YR 3.5/2 moist) silt loam; weak coarse platy breaking to weak fine granular; hard when dry, friable when moist; slightly effervescent; clear smooth boundary.

B21t 4 to 10 inches. Grayish brown (10YR 5.5/2 dry) to dark grayish brown (10YR 4/2 moist) silty clay loam; weak coarse prismatic breaking to moderate medium subangular blocky structure; hard when dry, friable when moist; thin patchy clay skins; strongly effervescent; gradual smooth boundary.

B22t 10 to 17 inches. Pale brown (10YR 6/3 dry) to brown (10YR 4.5/2.5 moist) silty clay loam; weak medium prismatic breaking to moderate medium subangular blocky structure; hard when dry to firm when moist; very thin nearly continuous clay skins; violently effervescent with a few scattered lime spots; gradual smooth boundary.

B3ca 17 to 29 inches. Pale brown (10YR 6/3 dry) to brown (10YR 4.5/3 moist) silty clay loam; weak medium prismatic breaking to weak medium to coarse subangular blocky structure; hard when dry, firm when moist; thin patchy clay skins; violently effervescent with numerous lime spots; clear smooth boundary.

C1 29 to 41 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) light silty clay loam; weak coarse subangular blocky structure; hard when dry, friable when moist; violently effervescent; gradual smooth boundary.

C2 41 to 60 inches. Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) silt loam; very weak coarse subangular blocky structure; slightly hard when dry, very friable when moist; violently effervescent; gradual smooth boundary.

C3 60 to 90 inches. Very pale brown (10YR 7/3.5 dry) to yellowish brown (10YR 5/3.5 moist) silt loam; massive; slightly hard when dry, very friable when moist; violently effervescent.

D1 90 to 105 inches. Light brown (7.5YR 6.5/4 dry) to brown (7.5YR 5/4 moist) silt loam; massive; slightly hard when dry, very friable when moist; violently effervescent.

D2 105 inches plus. Pink (7.5YR 7/5 dry) to brown (7.5YR 5/5 moist) light silty clay loam; massive; slightly hard when dry, very friable when moist; violently effervescent with some salt and lime spots.

Bureau of Public Roads Samples:

Ap 0 to 4 inches
 B22 10 to 17 inches
 C2 41 to 60 inches.

SOIL SURVEY LABORATORY

Lincoln, Nebr.

May, 1959

SOIL TYPE Wiley
silt loam

LOCATION Prowers County, Colorado

SOIL NOS. 958 Colo-50-9

LAB. NOS. 9712-9717

DEPTH INCHES	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		1B1a					3A1					
		VEPY 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				
0-5	Ap	<0.1	0.1	0.1a	1.0a	20.3a	55.5	23.0	60.3	16.3	-	sil
5-13	B2lt	0.1	0.1	0.1a	0.6a	13.7a	60.6	24.8	52.9	21.8	-	sil
13-23	B22t	<0.1	0.1	0.1a	0.4a	9.3a	63.4	26.7	47.2	25.8	-	sil/sicl
23-33	B3ca	0.1	<0.1	<0.1	0.5a	8.2a	65.7	25.5	47.8	26.5	-	sil
33-43	C1	<0.1	0.1	0.1b	0.6b	8.9b	68.6	21.7	51.8	26.2	-	sil
43-61	C2	<0.1	<0.1	<0.1	0.5b	8.9b	72.6	18.0	54.1	27.8	-	sil
pH		ORGANIC MATTER				8A2	ELECTRI-CAL CONDUCTIVITY	6E1a	MOISTURE TENSIONS			
8C1a	1:5	1:10	6A1a	6E1a	C/N	EST% SALT (BUREAU COP)	EC - 10 ³ MILLIMHOS PER CM	CaCO ₃ equiv-alent	GYP-SUM me./100g SOIL	1/10 ATMOS.	1/3 ATMOS.	4B2 15 ATMOS.
	1:1		%	%			6A1a	%		%	%	%
	7.8		1.10	0.124	9	<0.20	0.9	4				10.7
	7.9		0.75	0.085	9	<0.20	0.6	7				11.6
	8.0		0.47	0.058	8	<0.20	0.6	9				11.6
	8.0		0.30	0.039	8	<0.20	0.8	8				11.2
	8.3		0.18			<0.20	0.9	8				10.4
	8.7		0.17			<0.20	0.8	6				10.2
5A1a	EXTRACTABLE CATIONS				5B1a	5D2	8A1 SATURATION		EXTRACT SOLUBLE		8A	
CATION EXCHANGE CAPACITY NH ₄ Ac	Ca	Mg	H	6P2a	6Q2a	EXCH. No %	6F1a	6Q1a			MOISTURE AT SATURATION	
	milliequivalents per 100g. soil						milliequivalents per liter				%	
19.2				<0.1	0.7	Δ	0.4	1.0			56.5	
19.7				0.1	0.7	Δ	0.4	0.2			58.3	
19.8				0.1	0.7	Δ	0.6	0.2			57.2	
19.7				0.5	0.7	2	1.9	0.2			58.9	
18.8				1.6	0.8	7	4.9	0.2			56.4	
19.6				2.8	0.9	13	6.2	0.2			51.9	

a. Trace CaCO₃ coner.
b. Few CaCO₃ coner

Soil Type: **Wilay silt loam**
 Classification: **Sierozem**
 Location: 50 ft. E, 600 ft. N of center of Sec. 17, T24S, R45W, Prowers County, Colorado.
 Date Sampled: November 6, 1958
 Climate: Continental climate, average annual precipitation 13 - 14 inches, elevation 3,860 feet. Frost free season 166 days.
 Vegetation: Fallow. Parent Material: Loess. Physiographic position: Upland.
 Relief: Gently sloping, 2% north facing slope. Drainage: **Well**
 Moisture: Slightly moist. Watertable: **None encountered.** Stoniness: **None.**
 Salt or alkali: None observed. Erosion: Moderate, primarily wind.
 Soil Nos. S-58-Colo-50-9
 Described by: E. Milton Payne.

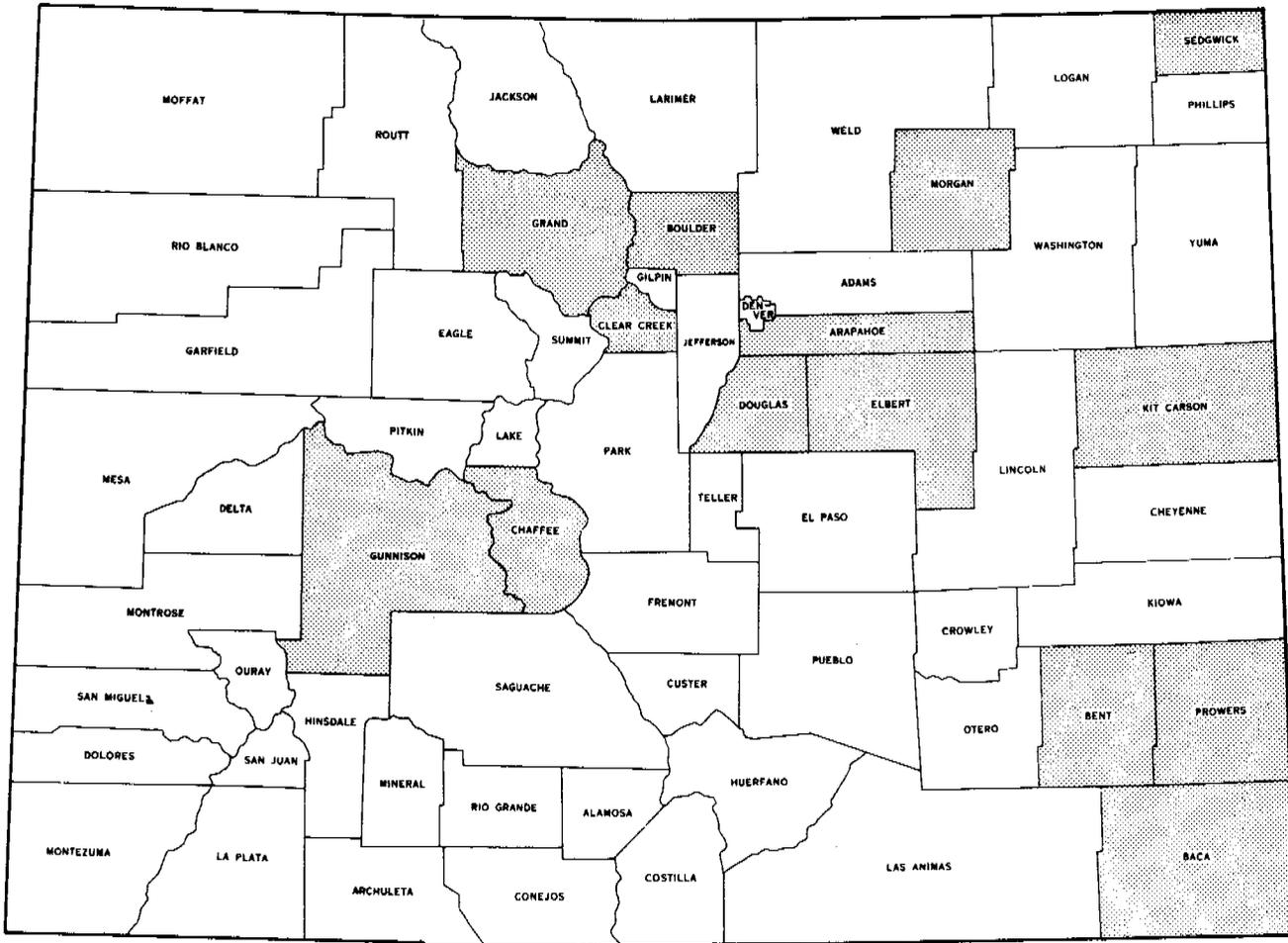
Lincoln Horizon**Lab. No.**

9712	Ap	0-5 inches	Grayish brown (10YR 5.5/2 dry) to dark grayish brown (10YR 3.5/2 moist) silt loam; weak coarse platy structure breaking to weak medium granular; slightly hard dry, friable moist; strongly calcareous; clear smooth boundary.
9713	B _{21t}	5-13 inches	Light grayish brown (10YR 6.5/2 dry) to dark grayish brown (10YR 4.5/2 moist) silty clay loam; weak coarse prismatic breaking to weak medium subangular blocky structure; hard when dry, friable moist; thin nearly continuous clay skins, strongly calcareous; gradual wavy boundary.
9714	B _{22t}	13-23 inches	Light grayish brown (10YR 6.5/2 dry) to grayish brown (10YR 5/2.5 moist) silty clay loam; weak coarse prismatic structure; breaking to weak medium subangular blocky; thin patchy clay skins; violently calcareous with a few scattered lime spots; gradual wavy boundary.
9715	B _{3ca}	23-33 inches	Pale brown (10YR 6.5/3 dry) to brown (10YR 5/3 moist) silty clay loam; very weak coarse subangular blocky structure; hard when dry, friable moist; clay skins found in worm and root channels; violently calcareous with very few lime spots; clear smooth boundary.
9716	C ₁	33-43 inches	Pale brown (10YR 6.5/3 dry) to brown (10YR 5/3 moist) light silty clay loam; very weak coarse subangular blocky structure; slightly hard when dry, friable moist; violently calcareous; clear smooth boundary.
9717	C ₂	43-61 inches	Very pale brown (10YR 7/2.5 dry) to brown (10YR 5/3 moist) silt loam; massive; slightly hard when dry, very friable moist; violently calcareous; gradual smooth boundary.
	C ₃	61-97 inches	Very pale brown (10YR 7/3 dry) to brown (10YR 5/3 moist) silt loam; massive; slightly hard when dry, very friable moist; violently calcareous.
	D	97-116 inches	Very pale brown to pink (8YR 7/4 dry) to yellowish brown (8YR 5/4 moist) light silty clay loam; massive; slightly hard when dry, friable moist; violently calcareous.

Bureau of Public Roads Samples

Ap 0-5 inches; B₂₁ 5-13 inches; C₂ 43-61 inches.

COLORADO



SCALE
0 10 20 30 40 50 MILES