

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

... **WYOMING**

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

Soil survey investigations reports already published:

- SSIR No. 1 Soil Survey Laboratory Methods and Procedures for  
Collecting Soil Samples
- SSIR No. 21 A Toposequence of Soils in Tonalite Grus in the  
Southern California Peninsular Range

Soil Survey Laboratory Data and Descriptions for  
Some Soils of:

- SSIR No. 2 North Dakota
- SSIR No. 3 Iowa
- SSIR No. 4 Kansas
- SSIR No. 5 Nebraska
- SSIR No. 6 Arkansas, Louisiana, and Missouri
- SSIR No. 7 Montana
- SSIR No. 8 Wyoming
- SSIR No. 9 Minnesota
- SSIR No. 10 Colorado
- SSIR No. 11 Oklahoma
- SSIR No. 12 Puerto Rico and the Virgin Islands
- SSIR No. 13 Mississippi
- SSIR No. 14 Kentucky
- SSIR No. 15 Tennessee
- SSIR No. 16 North Carolina, South Carolina, and Georgia
- SSIR No. 17 Wisconsin
- SSIR No. 18 Indiana
- SSIR No. 19 Illinois
- SSIR No. 20 New England States
- SSIR No. 22 Alabama and Florida
- SSIR No. 23 Nevada
- SSIR No. 24 California
- SSIR No. 25 New York
- SSIR No. 26 New Jersey
- SSIR No. 27 Pennsylvania
- SSIR No. 28 Arizona
- SSIR No. 29 Hawaii
- SSIR No. 30 Texas
- SSIR No. 31 Iowa

Soil Survey Investigations Report No. 32

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

... WYOMING

August 1978

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

## PREFACE

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

This report contains pedon descriptions and data obtained in Wyoming from 1952 to 1969. The majority of laboratory analyses were conducted at the Soil Survey Laboratory Unit, Lincoln, Nebraska.

Laboratory data for different soils cannot always be compared without allowance for the method. Methods are indexed by code or footnote in data sheet column headings and are identified briefly on the following two pages. Detailed explanations of coded procedures are in SSIR No. 1.

Many of the soil descriptions were prepared as working documents, not necessarily for publication. Some contain unusually detailed information pertinent to specific soil survey investigations. Such information, including older concepts of soil series, relationships among pedons, and field estimates of properties, is useful in a publication of this type. Editing is, therefore, minimal with emphasis toward preservation of descriptive data.

Many pedons no longer represent the soil series with which they were originally identified; a few represent series being considered for reclassification. All were checked against series classification as of April 1977. Some pedons are called taxadjuncts to series. All pedons are classified to the family level. In the taxonomic and geographic indexes pedons are arranged by taxonomic unit.

METHODS CODE SYMBOLS

1. SAMPLE COLLECTION AND PREPARATION

- A. Field sampling
1. Site selection
  2. Soil sampling
    - a. Stony soils
    - b. Marsh and swamp soils
- B. Laboratory preparation
1. Standard (air-dry)
    - a. Square-hole 2 mm sieve
    - b. Round-hole 2 mm sieve
  2. Field moist
  3. Carbonate-containing material
  4. Carbonate-indurated material
  5. See appended section for Iowa State University samples

2. CONVENTIONS

- A. Size-fraction base for reporting
1. <2 mm
  2. <size specified
- B. Data sheet symbols
- tr: trace, not measurable by quantitative procedure used or less than reportable amount
- : analysis run but not detected
- blank: analysis not run
- nd: Analysis not run
- <: less than reported amount or none present

3. PARTICLE-SIZE ANALYSES

- A. Particles <2 mm (pipet method)
1. Air dry samples
    - a. Carbonate and noncarbonate clay
    - b. Fine clay
    - c. Water-dispersible clay
- B. Particles >2 mm
1. Weight estimates
    - a. By field and laboratory weights
    - b. From volume and weight estimates
  2. Volume estimates

4. FABRIC-RELATED ANALYSES

- A. Bulk density
1. Saran-coated clods
    - a. Field state
    - b. Air-dry
    - 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. Oven-dry
  3. Cores
    - a. Field moist
- B. Water retention
1. Pressure-plate extraction (1/3 or 1/10 bar)
    - a. Sieved samples
    - b. Soil pieces
    - c. Natural clods
  2. Pressure-membrane extraction (15 bars)
    - a. Field-moist samples
  3. Sand-table absorption
  4. Field state
  5. Air dry
- C. Water-retention difference
1. 1/3-bar to 15 bars
  2. 1/10-bar to 15 bars
- D. Linear extensibility
1. Dry to moist
- E. Micromorphology
1. Thin sections
    - a. Preparation
    - b. Interpretation
    - c. Moved-clay percentage
- F. Plasticity index
1. Liquid limit
  2. Upper plastic limit

5. ION-EXCHANGE ANALYSES

- A. Cation-exchange capacity
1.  $\text{NH}_4\text{OAc}$ , pH 7.0
    - a. Direct distillation
  2.  $\text{NaOAc}$ , pH 8.2
    - a. Centrifuge method
  3. Sum of cations
    - a. Acidity by  $\text{BaCl}_2$ -TEA, pH 8.2; bases by  $\text{NH}_4\text{OAc}$ , pH 7.0
    - b. Sum of bases plus Al
  6.  $\text{NH}_4\text{OAc}$ , pH 7.0 leaching tube
    - a. Direct distillation
- B. Extractable bases
1.  $\text{NH}_4\text{OAc}$  extraction
    - a. Uncorrected
    - b. Corrected (exchangeable)
    - c. See 5B4
  2.  $\text{KCl}$ -TEA extraction, pH 8.2
  3.  $\text{KCl}$ -TEA, pH 8.2 (revised)
    - a. Uncorrected
    - b. Corrected (exchangeable)
  4.  $\text{NH}_4\text{OAc}$ , pH 7.0 (modified)
    - a. Uncorrected
    - b. Corrected (exchangeable)
- C. Base saturation
1.  $\text{NH}_4\text{OAc}$ , pH 7.0
  2.  $\text{NaOAc}$ , pH 8.2
  3. Sum of cations
- D. Sodium saturation (exchangeable Na pct.)
1.  $\text{NaOAc}$ , pH 8.2
  2.  $\text{NH}_4\text{OAc}$ , pH 7.0
- E. Sodium-adsorption ratio
- F. Calcium saturation
1.  $\text{NH}_4\text{OAc}$ , pH 7.0

6. CHEMICAL ANALYSES

- A. Organic carbon
1. Acid-dichromate digestion
    - a.  $\text{FeSO}_4$  titration
    - b.  $\text{CO}_2$  evolution, gravimetric
  2. Dry combustion
    - a.  $\text{CO}_2$  evolution I
    - b.  $\text{CO}_2$  evolution II
- B. Nitrogen
1. Kjeldahl digestion
    - a. Ammonia distillation
- C. Iron
1. Dithionite extraction
    - a. Dichromate titration
    - b. EDTA titration
  2. Dithionite-citrate extraction
    - a. Orthophenanthroline colorimetry
    - b. Atomic absorption
  3. Dithionite-citrate-bicarbonate extraction
    - a. Potassium thiocyanate colorimetry
  4. Pyrophosphate-dithionate extraction
  5. Sodium-pyrophosphate extraction
    - a. Atomic absorption
  6. Ammonium oxalate extraction
    - a. Atomic absorption
- E. Calcium carbonate
1.  $\text{HCl}$  treatment
    - a. Gas volumetric
    - b. Manometric
    - c. Weight loss
    - d. Titrimetric
  2. Sensitive qualitative method
    - a. Visual, gas bubbles
- G. Aluminum
1.  $\text{KCl}$  extraction I, 30 min.
    - a. Aluminon I
    - b. Aluminon II
    - c. Aluminon III
    - d. Fluoride titration
    - e. Atomic absorption
  2.  $\text{KCl}$  extraction II, overnight
    - a. Aluminon I

## METHODS CODE SYMBOLS--continued

## 6. CHEMICAL ANALYSES (cont.)

3.  $\text{NH}_4\text{OAc}$  extraction
  - a.  $\text{Al}_2\text{O}_3$  Aluminon III
4.  $\text{NaOAc}$  extraction
  - a.  $\text{Al}_2\text{O}_3$  Aluminon III
5. Sodium pyrophosphate extraction
  - a. Atomic absorption
6. Ammonium oxalate extraction
  - a. Atomic absorption
7. Dithionite-citrate extraction
  - a. Atomic absorption
- H. Extractable acidity
  1.  $\text{BaCl}_2$ -triethanolamine I
    - a. Back-titration with  $\text{HCl}$
  2.  $\text{BaCl}_2$ -triethanolamine II
    - a. Back-titration with  $\text{HCl}$
- I. Carbonate
  1. Saturation extract
    - a. Acid titration
- J. Bicarbonate
  1. Saturation extract
    - a. Acid titration
- K. Chloride
  1. Saturation extract
    - a. Mohr titration
    - b. Potentiometric titration
- L. Sulfate
  1. Saturation extract
    - a. Gravimetric,  $\text{BaSO}_4$
    - b. EDTA titration
  2.  $\text{NH}_4\text{OAc}$  extraction
    - a. Gravimetric,  $\text{BaSO}_4$
- M. Nitrate
  1. Saturation extract
    - a. PDS acid colorimetry
    - b. Diphenylamine
- N. Calcium
  1. Saturation extract
    - a. EDTA titration
    - b. Atomic absorption
  2.  $\text{NH}_4\text{OAc}$  extraction
    - a. EDTA-alcohol separation
    - b. Oxalate-permanganate I
    - c. Oxalate-permanganate II  
Fe, Al, and Mn removed
    - d. Oxalate-cerate
    - e. Atomic absorption
  3.  $\text{NH}_4\text{Cl-EtOH}$  extraction
    - a. EDTA titration
  4.  $\text{KCl-TEA}$  extraction
    - a. Oxalate-permanganate
    - b. EDTA titration
    - c. Atomic absorption
- O. Magnesium
  1. Saturation extract
    - a. EDTA titration
    - b. Atomic absorption
  2.  $\text{NH}_4\text{OAc}$  extraction
    - a.  $\text{EDTA-alcohol}$  separation
    - b. Phosphate titration
    - c. Atomic absorption
  3.  $\text{NH}_4\text{Cl-EtOH}$  extraction
    - a. EDTA titration
  4.  $\text{KCl-TEA}$  extraction
    - a. Phosphate titration
    - b. EDTA titration
    - c. Atomic absorption
- P. Sodium
  1. Saturation extract
    - a. Flame photometry
    - b. Atomic absorption

## 6. CHEMICAL ANALYSES (cont.)

2.  $\text{NH}_4\text{OAc}$  extraction
    - a. Flame photometry
    - b. Atomic absorption
  - Q. Potassium
    1. Saturation extract
      - a. Flame photometry
      - b. Atomic absorption
    2.  $\text{NH}_4\text{OAc}$  extraction
      - a. Flame photometry
      - b. Atomic absorption
  - R. Sulfur
    1.  $\text{NaHCO}_3$  extract, pH 8.5
      - a. Methylene blue
    2.  $\text{HCl}$  release (sulfide)
      - a. Iodine titration
  - S. Total phosphorus
    1. Perchloric acid digestion
      - a. Molybdovanadophosphoric acid colorimetry
  - T. Available phosphorus
    1. See appended section for Iowa State University samples
7. MINERALOGY
- A. Instrumental analysis
    1. Preparation
      - a. Carbonate removal
      - b. Organic-matter removal
      - c. Iron removal
      - d. Particle-size fractionation
      - e. PSDA pretreatment
    2. X-ray diffraction
      - a. Thin film on glass, solution pretreatment
      - b. Thin film on glass, resin pretreatment
      - c. Thin film on glass,  $\text{NaPO}_3$  pretreatment
      - d. Powder mount, diffractometer recording
      - e. Powder mount, camera recording
    3. Differential thermal analysis
  - B. Optical analysis
    1. Grain studies
    2. Electron microscopy
  - C. Total analysis
    1. Chemical
    2. X-ray emission spectrography
  - D. Surface area
    1. Glycerol retention
8. MISCELLANEOUS
- A. Saturated paste, mixed
    1. Saturation extract
      - a. Conductivity
      - b. Conductivity, quick test
    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.  $\text{KCl}$
      - e.  $\text{CaCl}_2$
  - D. Ratios and estimates
    1. To total clay
    2. To noncarbonate clay
    3. Ca to Mg (extractable)
    4. Estimated clay percentage
    5. Estimated total salt
  - E. Soil resistivity
    1. Saturated paste



COLUMN HEADINGS FOR COMPUTER PRINTED DATA SHEETS

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

Column

57	Base saturation - sum of the extractable bases divided by the ammonium acetate cation exchange capacity - given as a percent
58	Saturated paste (soil plus water) resistivity given in ohm-cm
59	Saturated paste (soil plus water) pH
60	Saturated paste (soil plus water) water content given as a percent
61	Exchangeable sodium percentage
62	Sodium adsorption ratio
63	Total soluble salt given in parts per million
64	Gypsum given in percent
65	Electrical conductivity of the saturation extract given in mmhos per centimeter
66	Calcium content of the saturation extract given in milliequivalents per liter
67	Magnesium content of the saturation extract given in milliequivalents per liter
68	Sodium content of the saturation extract given in milliequivalents per liter
69	Potassium content of the saturation extract given in milliequivalents per liter
70	Carbonate ( $\text{CO}_3$ ) content of the saturation extract given in milliequivalents per liter
71	Bicarbonate ( $\text{HCO}_3$ ) content of the saturation extract given in milliequivalents per liter
72	Chloride content of the saturation extract given in milliequivalents per liter
73	Sulfate ( $\text{SO}_4$ ) content of the saturation extract given in milliequivalents per liter
74	Nitrate ( $\text{NO}_3$ ) content of the saturation extract given in milliequivalents per liter
75	Liquid limit given as percent water - percentage basis is soil material less than 0.4 millimeter
76	Plastic index

CLASSIFICATION INDEX

ALFISOL	Page		Page
<u>BORALF</u>			
CRYOBORALF		NATRARGID	
<u>Typic Cryoboralf</u>		<u>Haplustollic Natrargid</u>	
Fine-loamy, mixed		Fine-loamy, mixed, mesic	
Indart silt loam taxadjunct	55	Series not designated	93
Fine, montmorillonitic		Fine, montmorillonitic, mesic	
Cowdrey clay loam taxadjunct	21	Absted very fine sandy loam	3
Fine-loamy over sandy or sandy-skeletal, mixed		<u>Ustollic Natrargid</u>	
Mathers loam	65	Fine-loamy, mixed, mesic	
<u>Mollic Cryoboralf</u>		Keyner taxadjunct	63
Loamy-skeletal, mixed		Fine, montmorillonitic, mesic	
Series not designated	99	Arvada very fine sandy loam	3*
Fine, montmorillonitic		PALEARGID	
Dell loam taxadjunct	27	<u>Ustollic Paleargid</u>	
ARIDISOL		Fine, montmorillonitic, mesic	
		Big Horn loam	13
<u>ARGID</u>		Briggsdale clay loam	73*
		Briggsdale fine sandy loam taxadjunct	15
HAPLARGID		<u>ORTHID</u>	
<u>Typic Haplargid</u>		CALCIORTHID	
Coarse-loamy, mixed, mesic		<u>Ustollic Calciorthid</u>	
Enos loamy sand	31	Fine-loamy, mixed, mesic	
Enos fine sandy loam	33	Haverson fine sandy loam taxadjunct	37*
Fine-loamy, mixed, mesic		Coarse-silty, mixed	
Ethete taxadjunct	35	Series not designated	65*
Griffy sandy clay loam	33*	Fine-silty, mixed, mesic	
Griffy loam taxadjunct	35*	Series not designated	49*
<u>Ustollic Haplargid</u>		CAMBORTHID	
Loamy, mixed, mesic, shallow		<u>Ustertic Camborthid</u>	
Worf loam	129	Fine, montmorillonitic, mesic	
Coarse-loamy, mixed, mesic		Heldt silty clay loam	47
Stoneham fine sandy loam taxadjunct	109	Very-fine, montmorillonitic, mesic	
Vona very fine sandy loam taxadjunct	85*	Kyle clay	61
Fine-loamy, mixed, mesic		<u>Ustollic Camborthid</u>	
Fort Collins fine sandy loam	17*	Sandy, mixed, mesic	
Fort Collins fine sandy loam	19*	Series not designated	13*
Fort Collins fine sandy loam	21*	Coarse-loamy, mixed, mesic	
Fort Collins sandy clay loam	25*	Series not designated	87*
Fort Collins sandy clay loam	27*		
Fort Collins loam taxadjunct	91*		
Fort Collins fine sandy loam	39	ENTISOL	
Stoneham fine sandy loam	107		
Stoneham very fine sandy loam	83*		
Stoneham loam	111	<u>FLUVENT</u>	
Stoneham loam	113	TORRIFLUVENT	
Fine-silty, mixed, mesic		<u>Typic Torrifluvent</u>	
Fort Collins fine sandy loam taxadjunct	23*	Coarse-loamy, mixed (calcareous), mesic	
Fort Collins very fine sandy loam taxadjunct	29*	Glenton fine sandy loam	41
Renohill loam taxadjunct	81	Glenton clay loam	43
Fine, montmorillonitic, mesic		Fine-silty, mixed (calcareous), mesic	
Renohill clay loam	75*	Fivemile clay loam	37
Ulm loam	89*	<u>Ustic Torrifluvent</u>	
Fine-loamy over sandy or sandy-skeletal, mixed, mesic		Coarse-loamy, mixed, nonacid, mesic	
Larimer fine sandy loam	51*	Glenberg very fine sandy loam	31*
Larimer very fine sandy loam	53*	Coarse-silty, mixed (calcareous), mesic	
Larimer sandy loam	55*	Mitchell loam taxadjunct	57*

CLASSIFICATION INDEX

ENTISOL--Continued	Page		Page
<u>ORTHEENT</u>			
TORRIORTHEENT		Coarse-loamy, mixed Sawcreek loam	89
<u>Typic Torriorthent</u>			
Coarse-loamy, mixed (calcareous), mesic		Sandy, mixed	
Apron fine sandy loam	7	Sawcreek taxadjunct	87
Apron fine sandy loam	9		
<u>Ustic Torriorthent</u>		Fine-loamy, mixed	
Loamy, mixed (calcareous), mesic, shallow		Huffine, silt loam taxadjunct	53
Shingle loam	103		
		<u>Argic Cryoboroll</u>	
Coarse-loamy, mixed (calcareous), mesic		Fine-loamy, mixed	
Otero fine sandy loam taxadjunct	61*	Woolsley loam taxadjunct	127
Otero fine sandy loam taxadjunct	63*		
Otero fine sandy loam	67*	Fine, illitic	
		Turk clay taxadjunct	121
Fine-loamy, mixed (calcareous), mesic			
Kim loam	59	Very-fine, illitic	
		Turk silty clay loam	117
		Turk clay taxadjunct	119
Coarse-silty, mixed (calcareous), mesic			
Keota silt loam	41*	<u>Argic Pachic Cryoboroll</u>	
Keota loam	43*	Fine-loamy, mixed	
Keota loam	45*	Bachus loam	11
Mitchell loam	5*		
Mitchell loam	59*	Fine-silty, mixed	
		Decross loam taxadjunct	25
Fine-silty, mixed (calcareous), mesic		Robana silt loam	83
Colby loam	7*		
Kim loam taxadjunct	57*	<u>Calcic Pachic Cryoboroll</u>	
		Fine, montmorillonitic	
Clayey, mixed (calcareous), mesic, shallow		Series not designated	101
Orella silty clay	75		
		<u>Lithic Cryoboroll</u>	
Clayey, montmorillonitic (calcareous), mesic shallow		Loamy, mixed	
Orella clay taxadjunct	77	Splitro sandy loam taxadjunct	105
Fine, montmorillonitic (calcareous), mesic		<u>Pachic Cryoboroll</u>	
Series not designated	47*	Loamy-skeletal, mixed	
Series not designated	91	Hobacker gravelly loam	49
		Hobacker gravelly loam	51
<u>PSAMMENT</u>			
TORRIPSAMMENT		Coarse-loamy, mixed	
		Mundos gravelly loam taxadjunct	67
<u>Ustic Torripsamment</u>			
Mixed, mesic		Fine-loamy, mixed	
Dwyer loamy fine sand	15*	Mundos gravelly loam taxadjunct	69
Dwyer loamy fine sand	29		
Valent loamy fine sand	93*	Coarse-silty, mixed	
Valent fine sand	123	Tetonia taxadjunct	115
Valent loamy fine sand variant	125		
		Fine-silty, mixed	
		Decross taxadjunct	97
		<u>Typic Cryoboroll</u>	
		Fine-loamy, mixed	
		Amsden clay loam taxadjunct	5
		<u>PALEBOROLL</u>	
<u>CRYAQUEPT</u>			
<u>Pergelic Cryaquept</u>		<u>Cryic Pachic Paleboroll</u>	
Coarse-loamy, mixed, nonacid		Fine, montmorillonitic	
Series not designated	95*	Paulson taxadjunct	79
<u>UMBREPT</u>		<u>USTOLL</u>	
<u>Pergelic Cryumbrept</u>		<u>ARGIUSTOLL</u>	
Coarse-loamy, mixed			
Series not designated	69*	<u>Aridic Argiustoll</u>	
Series not designated	71*	Coarse-loamy, mixed, mesic	
		Creighton loamy fine sand	11*
		Fine-loamy, mixed, mesic	
		Hargreave fine sandy loam taxadjunct	77*
		Satanta loam	85
<u>BOROLL</u>			
<u>CRYBOROLL</u>			
<u>Typic Cryoboroll</u>			
Loamy-skeletal, carbonatic			
Greyback gravelly loam taxadjunct	45		

## MOLLISOL--Continued

PageUSTOLL--Continued

## ARGIUSTOLL--Continued

Aridic Arguistoll--Continued

Fine-silty, mixed, mesic	
Keith very fine sandy loam	39*
Keith variant	79*
Keith loamy very fine sand	81*
Norka loam	71
Fine, montmorillonitic, mesic	
Nunn loam	73

## HAPLUSTOLL

Aridic Haplustoll

Coarse-loamy, mixed, mesic	
Creighton very fine sandy loam	9*
Creighton fine sandy loam	23

Coarse-silty, mixed, mesic	
Series not designated	95

Torrorthentic Haplustoll

Coarse-loamy, mixed, mesic	
Busher loamy very fine sand	17

Fine-loamy, mixed, mesic	
Connerton	19

## SPODOSOL

ORTHOD

## CRYORTHOD

Pergelic Cryorthod

Coarse-loamy, mixed	
Series not designated	97*

## CLASSIFICATION INDEX

	<u>Page</u>		<u>Page</u>
Aridisol		Entisol (Continued)	
Argid		Orthent	
Typic Haplargid		Ustic Torriorthent	
fine-loamy, mixed, mesic		coarse-loamy, mixed (calcareous), mesic	
Griffy sandy clay loam	33	Otero fine sandy loam	
Griffy loam taxadjunct	35	taxadjunct	61
Ustollic Haplargid		Otero fine sandy loam	
coarse-loamy, mixed, mesic		taxadjunct	63
Vona very fine sandy loam		Otero fine sandy loam	67
taxadjunct	85	coarse-silty, mixed (calcareous), mesic	
fine-loamy, mixed, mesic		Keota silt loam	41
Fort Collins fine sandy loam	17	Keota loam	43
Fort Collins fine sandy loam	19	Keota loam	45
Fort Collins fine sandy loam	21	Mitchell loam	5
Fort Collins sandy clay loam	25	Mitchell loam	59
Fort Collins sandy clay loam	27	fine-silty, mixed (calcareous), mesic	
Fort Collins loam taxadjunct	91	Colby loam taxadjunct	7
Stoneham very fine sandy loam	83	fine, montmorillonitic (calcareous), mesic	
fine-silty, mixed, mesic		Series not designated	47
Fort Collins fine sandy loam		Psamment	
taxadjunct	23	Ustic Torripsamment	
Fort Collins very fine sandy loam		mixed, mesic	
loam taxadjunct	29	Dwyer loamy fine sand	15
fine, montmorillonitic, mesic		Valent loamy fine sand	93
Renohill clay loam	75	Inceptisol	
Ulm loam taxadjunct	89	Aquept	
fine-loamy over sandy or sandy-skeletal, mixed, mesic		Pergelic Cryaquept	
Larimer fine sandy loam	51	coarse-loamy, mixed, nonacid	
Larimer very fine sandy loam		Series not designated	95
taxadjunct	53	Umbrept	
Larimer sandy loam taxadjunct	55	Pergelic Cryumbrept	
Ustollic Natrargid		coarse-loamy, mixed	
fine, montmorillonitic, mesic		Series not designated	69
Arvada very fine sandy loam		Series not designated	71
taxadjunct	3	Mollisol	
Ustollic Paleargid		Ustoli	
fine, montmorillonitic, mesic		Aridic Argiustoll	
Briggsdale clay loam	73	coarse-loamy, mixed, mesic	
Orthid		Creighton loamy fine sand	
Ustollic Calciorthid		taxadjunct	11
fine-loamy, mixed, mesic		fine-loamy, mixed, mesic	
Haverson fine sandy loam		Hargreave fine sandy loam	
taxadjunct	37	taxadjunct	77
coarse-silty, mixed		fine-silty, mixed, mesic	
Series not designated	65	Keith very fine sandy loam	39
fine-silty, mixed, mesic		Keith very fine sandy loam	
Series not designated	49	taxadjunct	79
Ustollic Camborthid		Keith loamy very fine sand	81
sandy, mixed, mesic		Aridic Haplustoll	
Series not designated	13	coarse-loamy, mixed, mesic	
coarse-loamy, mixed, mesic		Creighton very fine sandy loam	9
Series not designated	87	Spodosol	
Entisol		Orthod	
Fluvent		Pergelic Cryorthod	
Ustic Torrifluvent		coarse-loamy, mixed	
coarse-loamy, mixed, nonacid, mesic		Series not designated	97
Glenberg very fine sandy loam			
taxadjunct	31		
coarse-silty, mixed (calcareous), mesic			
Mitchell loam taxadjunct	57		

- Page 3 - Arvada very fine sandy loam taxadjunct S54Wyo-13-1. Solum is thinner than that required for Arvada.
- Page 7 - Colby loam taxadjunct S50Wyo-8-3. Carbonates are leached beyond the depth allowable for the Colby series.
- Page 11 - Creighton loamy fine sand taxadjunct S54Wyo-8-5. Creighton lacks an argillic horizon.
- Pages 17 and 21 - Fort Collins fine sandy loam S58Wyo-16-1 and S58Wyo-16-3. Calcium carbonate by horizons exceeds the limits in the range of series characteristics; a weighted average of horizons allows series placement.
- Page 23 - Fort Collins fine sandy loam taxadjunct S58Wyo-16-5. Family texture is fine-silty rather than fine-loamy.
- Page 25 - Fort Collins sandy clay loam S58Wyo-16-6. This is a truncated pedon. Calcium carbonate by horizons exceeds the limits in the range of series characteristics; a weighted average of horizons allows series placement.
- Page 27 - Fort Collins sandy clay loam S58Wyo-16-7. This is a truncated pedon.
- Page 29 - Fort Collins very fine sandy loam taxadjunct S58Wyo-16-10. Family texture is fine-silty rather than fine-loamy; this pedon also has a calcic horizon.
- Page 91 - Fort Collins loam taxadjunct S54Wyo-3-4. Hues in lower horizons are too yellow for the Fort Collins series.
- Page 31 - Glenberg very fine sandy loam taxadjunct S52Wyo-8-2. Carbonates are leached deeper than allowed in the range of series characteristics for Glenberg.
- Page 35 - Griffy loam taxadjunct S54Wyo-7-4. Griffy soils have more than 35 percent fine sand or coarser in the control section.
- Page 77 - Hargreave fine sandy loam taxadjunct S53Wyo-8-7. Hargreave soils have more than 35 percent fine sand or coarser in the control section.
- Page 37 - Haverson fine sandy loam taxadjunct S50Wyo-8-7. This pedon has a calcic horizon <1 meter from the surface and thus is a Calciorthid rather than a Torrifuvent.
- Page 79 - Keith very fine sandy loam variant. Aridic Argiustoll, fine-silty, mixed, mesic. Keith soils lack bedrock within 60 inches of the soil surface. This pedon has hard bedrock at 23 inches.
- Page 53 - Larimer very fine sandy loam taxadjunct S58Wyo-16-8. This pedon has more calcium carbonate than allowed for Larimer soils.
- Page 55 - Larimer sandy loam taxadjunct S58Wyo-16-9. Larimer soils have less than 35 percent fine sand and coarser in the argillic horizon.
- Page 57 - Mitchell loam taxadjunct S50Wyo-8-4. This pedon has an erratic decrease in organic carbon with depth which is not allowed in Orthents.
- Pages 61 and 63 - Otero fine sandy loam taxadjunct S52Wyo-8-4 and S52Wyo-8-6. Otero soils have more than 35 percent fine sand and coarser in the control section.
- Page 75 - Renohill clay loam S54Wyo-3-2. This is a truncated pedon.
- Page 89 - Ulm loam taxadjunct S54Wyo-3-3. The Ulm soils have more than 15 percent fine sand and coarser in the control section.
- Page 85 - Vona very fine sandy loam taxadjunct S53Wyo-8-8. Vona soils have secondary calcium carbonate.

## GEOGRAPHICAL INDEX

<u>Classification</u>	<u>Soil Series</u>	<u>Page</u>	<u>Classification</u>	<u>Soil Series</u>	<u>Page</u>
<u>CAMPBELL COUNTY</u>					
Aridisol			Mollisol		
Argid			Ustoll		
Haplargid	Fort Collins loam taxadjunct	91*	Argiustoll	Creighton loamy fine sand taxadjunct	11*
	Renohill clay loam	75*		Hargreave fine sandy loam taxadjunct	77*
	Ulm loam taxadjunct	89*		Keith very fine sandy loam Keith variant	39* 79*
Paleargid	Briggsdale clay loam	73*		Keith loamy very fine sand	81*
<u>FREMONT COUNTY</u>				Norka loam	71
Aridisol				Nunn loam	73
Argid				Satanta loam	85
Haplargid	Enos loamy sand	31	Haplustoll	Busher loamy very fine sand	17
	Enos fine sandy loam	33		Creighton very fine sandy loam	9*
	Ethete taxadjunct	35		Creighton fine sandy loam	23
	Griffy sandy clay loam	33*		Series not designated	95
	Griffy loam taxadjunct	35*	<u>JOHNSON COUNTY</u>		
	Stoneham fine sandy loam	107	Alfisol		
	Stoneham fine sandy loam taxadjunct	109	Boralf		
Entisol			Cryoboralf	Dell loam taxadjunct	27
Fluvent				Indart silt loam taxadjunct	55
Torrifluvent	Fivemile clay loam	37		Mathers loam	65
	Glenton fine sandy loam	41		Series not designated	99
	Glenton clay loam	43	Aridisol		
Torriorthent	Apron fine sandy loam	7	Argid		
	Apron fine sandy loam	9	Haplargid	Fort Collins fine sandy loam	39
<u>GOSHEN COUNTY</u>				Renohill loam taxadjunct	81
Aridisol				Stoneham loam	111
Argid				Stoneham loam	113
Haplargid	Stoneham very fine sandy loam	83*		Warf loam	129
	Vona very fine sandy loam taxadjunct	85*	Natrargid	Absted very fine sandy loam	3
Orthid				Keyner taxadjunct	63
Calciorthid	Haverson fine sandy loam taxadjunct	37*	Paleargid	Big Horn loam	13
	Series not designated	49*		Briggsdale fine sandy loam taxadjunct	15
	Series not designated	65*	Entisol		
Camborthid	Heldt silty clay loam	47	Orthent		
	Kyle clay	61	Torriorthent	Kim loam taxadjunct	57
	Series not designated	13*		Kim loam	59
	Series not designated	87*		Shingle loam	103
Entisol			Psamment		
Fluvent			Torripsamment	Valent fine sand	123
Torrifluvent	Glenberg very fine sandy loam	31*		Valent loamy fine sand variant	125
	Mitchell loam	57*	Mollisol		
Orthent			Boroll		
Torriorthent	Colby loam	7*	Cryoboroll	Amsden clay loam taxadjunct	5
	Keota silt loam	41*		Bachus loam	11
	Keota loam	43*		Decross loam taxadjunct	25
	Keota loam	45*		Decross taxadjunct	97
	Mitchell loam	5*		Sawcreek taxadjunct	87
	Mitchell loam	59*		Sawcreek loam	89
	Orella silty clay	75		Splitro sandy loam taxadjunct	105
	Orella clay taxadjunct	77		Turk silty clay loam	117
	Otero fine sandy loam taxadjunct	61*		Turk clay taxadjunct	119
	Otero fine sandy loam taxadjunct	63*		Turk clay taxadjunct	121
	Otero fine sandy loam	67*		Woodsley loam taxadjunct	127
	Series not designated	47*	Ustoll		
	Series not designated	91	Haplustoll	Connerton	19
Psamment					
Torripsamment	Dwyer loamy fine sand	15*			
	Dwyer loamy fine sand	29			
	Valent loamy fine sand	93*			

## GEOGRAPHICAL INDEX

<u>Classification</u>	<u>Soil Series</u>	<u>Page</u>
<u>L I N C O L N C O U N T Y</u>		
Alfisol		
Boralf		
Cryoboralf	Cowdrey clay loam taxadjunct	21
Mollisol		
Boroll		
Cryoboroll	Greyback gravelly loam taxadjunct	45
	Hobacker gravelly loam	49
	Hobacker gravelly loam	51
	Huffine silt loam taxadjunct	53
	Mundos gravelly loam taxadjunct	67
	Mundos gravelly loam taxadjunct	69
	Robana silt loam	83
	Series not designated	101
	Tetonia taxadjunct	115
Paleboroll	Paulson taxadjunct	79
<u>N A T R O N A C O U N T Y</u>		
Aridisol		
Argid		
Natrargid	Arvada very fine sandy loam taxadjunct	3*
	Series not designated	93
<u>P A R K C O U N T Y</u>		
Inceptisol		
Aquept		
Cryaquept	Series not designated	95*
Umbrept		
Cryumbrept	Series not designated	69*
	Series not designated	71*
Spodosol		
Orthod		
Cryorthod	Series not designated	97*
<u>P L A T T E C O U N T Y</u>		
Aridisol		
Argid		
Haplargid	Fort Collins fine sandy loam	17*
	Fort Collins fine sandy loam	19*
	Fort Collins fine sandy loam	21*
	Fort Collins fine sandy loam taxadjunct	23*
	Fort Collins sandy clay loam	25*
	Fort Collins sandy clay loam	27*
	Fort Collins very fine sandy loam taxadjunct	29*
	Larimer fine sandy loam	51*
	Larimer very fine sandy loam taxadjunct	53*
	Larimer sandy loam taxadjunct	55*

\*Pedon published in SSIR No. 8 on indicated page.

## SOIL SERIES INDEX

<u>Series</u>	<u>Soil Survey No. #</u>	<u>Classification</u>	<u>Page</u>
Absted very fine sandy loam	S66Wyo-10-12	Natrargid	3
Amsden clay loam taxadjunct	S67Wyo-10-4	Cryoboroll	5
Apron fine sandy loam	S65Wyo-7-11	Torriorthent	7
Apron fine sandy loam	S65Wyo-7-12	Torriorthent	9
Arvada very fine sandy loam	S54Wyo-13-1	Natrargid	3*
Bachus loam	S67Wyo-10-8	Cryoboroll	11
Big Horn loam	S66Wyo-10-9	Paleargid	13
Briggsdale clay loam	S54Wyo-3-1	Paleargid	73*
Briggsdale fine sandy loam taxadjunct	S66Wyo-10-11	Paleargid	15
Busher loamy very fine sand	S64Wyo-8-8	Haplustoll	17
Connerton		Haplustoll	19
Colby loam	S50Wyo-8-3	Torriorthent	7*
Cowdrey clay loam taxadjunct	S69Wyo-12-10	Cryoboralf	21
Creighton very fine sandy loam	S54Wyo-8-4	Haplustoll	9*
Creighton loamy fine sand	S54Wyo-8-5	Argiustoll	11*
Creighton fine sandy loam	S64Wyo-8-10	Haplustoll	23
Decross loam taxadjunct	S66Wyo-10-2	Cryoboroll	25
Decross taxadjunct	S67Wyo-10-5	Cryoboroll	97
Dell loam taxadjunct	S66Wyo-10-5	Cryoborolf	27
Dwyer loamy fine sand	S53Wyo-8-6	Torripsament	15*
Dwyer loamy fine sand	S64Wyo-8-7	Torripsament	29
Enos loamy sand	S65Wyo-7-14	Haplargid	31
Enos fine sandy loam	S65Wyo-7-15	Haplargid	33
Ethete taxadjunct	S65Wyo-7-13	Haplargid	35
Fivemile clay loam	S65Wyo-7-16	Torrifluvent	37
Fort Collins fine sandy loam	S58Wyo-16-1	Haplargid	17*
Fort Collins fine sandy loam	S58Wyo-16-2	Haplargid	19*
Fort Collins fine sandy loam	S58Wyo-16-3	Haplargid	21*
Fort Collins fine sandy loam	S58Wyo-16-5	Haplargid	23*
Fort Collins sandy clay loam	S58Wyo-16-6	Haplargid	25*
Fort Collins sandy clay loam	S58Wyo-16-7	Haplargid	27*
Fort Collins very fine sandy loam	S58Wyo-16-10	Haplargid	29*
Fort Collins loam taxadjunct	S54Wyo-3-4	Haplargid	91*
Fort Collins fine sandy loam	S66Wyo-10-10	Haplargid	39
Glenberg very fine sandy loam	S52Wyo-8-2	Torrifluvent	31*
Glenton fine sandy loam	S65Wyo-7-10	Torrifluvent	41
Glenton clay loam	S65Wyo-7-17	Torrifluvent	43
Greyback gravelly loam taxadjunct	S69Wyo-12-2	Cryoboroll	45
Griffy sandy clay loam	S54Wyo-7-3	Haplargid	33*
Griffy loam	S54Wyo-7-4	Haplargid	35*
Hargreave fine sandy loam taxadjunct	S53Wyo-8-7	Argiustoll	77*
Haverson fine sandy loam taxadjunct	S50Wyo-8-7	Calciorthid	37*
Heldt silty clay loam	S64Wyo-8-1	Camborthid	47
Hobacker gravelly loam	S69Wyo-12-5	Cryoboroll	49
Hobacker gravelly loam	S69Wyo-12-6	Cryoboroll	51
Huffine silt loam taxadjunct	S69Wyo-12-3	Cryoboroll	53
Indert silt loam taxadjunct	S67Wyo-10-3	Cryoboralf	55
Keith very fine sandy loam	S53Wyo-8-3	Argiustoll	39*
Keith variant	S54Wyo-8-2	Argiustoll	79*
Keith loamy very fine sand	S54Wyo-8-3	Argiustoll	81*
Keota silt loam	S50Wyo-8-1	Torriorthent	41*
Keota loam	S53Wyo-8-1	Torriorthent	43*
Keota loam	S53Wyo-8-2	Torriorthent	45*
Keyner taxadjunct	S69Wyo-10-3	Natrargid	63
Kim loam taxadjunct	S69Wyo-10-1	Torriorthent	57
Kim loam	S69Wyo-10-8	Torriorthent	59
Kyle clay	S64Wyo-8-2	Camborthid	61
Larimer fine sandy loam	S58Wyo-16-4	Haplargid	51*
Larimer very fine sandy loam	S58Wyo-16-8	Haplargid	53*
Larimer sandy loam	S58Wyo-16-9	Haplargid	55*
Mathers loam	S67Wyo-10-1	Cryoboralf	65
Mitchell loam	S50Wyo-8-2	Torriorthent	5*
Mitchell loam	S50Wyo-8-4	Torrifluvent	57*
Mitchell loam	S52Wyo-8-1	Torriorthent	59*
Mundos gravelly loam taxadjunct	S69Wyo-12-4	Cryoboroll	67
Mundos gravelly loam taxadjunct	S69Wyo-12-11	Cryoboroll	69

## SOIL SERIES INDEX

Series	Soil Survey No. <sup>1/</sup>	Classification	Page
Norka loam	S64Wyo-8-11	Argiustoll	71
Nunn loam	S64Wyo-8-3	Argiustoll	73
Orella silty clay	S64Wyo-8-4	Torriorthent	75
Orella clay taxadjunct	S64Wyo-8-6	Torriorthent	77
Otero fine sandy loam taxadjunct	S52Wyo-8-4	Torriorthent	61*
Otero fine sandy loam taxadjunct	S52Wyo-8-6	Torriorthent	63*
Otero fine sandy loam	S53Wyo-8-5	Torriorthent	67*
Paulson taxadjunct	S69Wyo-12-7	Paleborell	79
Renhill clay loam	S54Wyo-3-2	Haplargid	75*
Renhill loam taxadjunct	S69Wyo-10-6	Haplargid	81
Robana silt loam	S69Wyo-12-9	Cryoborell	83
Satanta loam	S64Wyo-8-5	Argiustoll	85
Sawcreek taxadjunct	S67Wyo-10-2	Cryoborell	87
Sawcreek loam	S67Wyo-10-7	Cryoborell	89
Series not designated	S50Wyo-8-5	Torriorthent	47*
Series not designated	S52Wyo-8-3	Calciorthid	49*
Series not designated	S52Wyo-8-5	Torriorthent	91
Series not designated	S52Wyo-8-7	Calciorthid	65*
Series not designated	S53Wyo-8-4	Camborthid	13*
Series not designated	S53Wyo-8-9	Camborthid	87*
Series not designated	S54Wyo-13-2	Natrargid	93
Series not designated	S61Wyo-15-1	Cryumbrept	69*
Series not designated	S61Wyo-15-2	Cryumbrept	71*
Series not designated	S61Wyo-15-3	Cryaquept	95*
Series not designated	S61Wyo-15-4	Cryorthod	97*
Series not designated	S64Wyo-8-9	Haplustoll	95
Series not designated	S67Wyo-10-10	Cryoborealf	99
Series not designated	S69Wyo-12-8	Cryoborell	101
Shingle loam	S69Wyo-10-5	Torriorthent	103
Splitro sandy loam taxadjunct	S67Wyo-10-9	Cryoborell	105
Stoneham fine sandy loam	S54Wyo-7-1	Haplargid	107
Stoneham fine sandy loam taxadjunct	S54Wyo-7-2	Haplargid	109
Stoneham very fine sandy loam	S54Wyo-8-1	Haplargid	83*
Stoneham loam	S69Wyo-10-7	Haplargid	111
Stoneham loam		Haplargid	113
Tetonia taxadjunct	S69Wyo-12-1	Cryoborell	115
Turk silty clay loam	S67Wyo-10-6	Cryoborell	117
Turk clay taxadjunct	S67Wyo-10-11	Cryoborell	119
Turk clay taxadjunct	S67Wyo-10-12	Cryoborell	121
Ulm loam taxadjunct	S54Wyo-3-3	Haplargid	89*
Valent loamy fine sand	S50Wyo-8-6	Torripsamment	93*
Valent fine sand	S66Wyo-10-13	Torripsamment	123
Valent loamy fine sand variant	S69Wyo-10-2	Torripsamment	125
Vona very fine sandy loam taxadjunct	S53Wyo-8-8	Haplargid	85*
Woosley loam taxadjunct	S67Wyo-10-13	Cryoborell	127
Worf loam	S69Wyo-10-4	Haplargid	129
SOIL MOISTURE STUDY (Johnson County)			131
Big Horn			133
Briggsdale			135
Connerton			137
Decross			139
Indart			141
Mathers			143
Stoneham			145

\*Pedon published in SSIR No. 8 on indicated page.

<sup>1/</sup>County numbers (the number following Wyo in the Soil Survey No.) are as follows:

3. Campbell	12. Lincoln
7. Fremont	13. Natrona
8. Goshen	15. Park
10. Johnson	16. Platte



Soil classification: Haplustolic Natrargid; fine, montmorillonitic, mesic.

Soil series: Absted very fine sandy loam.

Pedon No.: S66Wyo-10-12.

Location: Johnson County, Wyoming;  $NW\frac{1}{4}$ ,  $SW\frac{1}{4}$  of Sec. 4, T44N, R80W; about 55 feet north and 450 feet east of the gate, about one-fourth mile east of Dan Koch's homestead buildings on Fourmile Creek.

Climate: Average annual precipitation is about 12 inches. Mean annual soil temperature is about 52°F.

Frost-free season is 105 to 110 days. Elevation is about 4,800 feet.

Vegetation and land use: Sandberg bluegrass, blue gramagrass, slender wheatgrass, bluestem wheatgrass, cactus, woolly plantain, big sagebrush, birdsfoot sagebrush, and needleandthread grass. Rangeland and wildlife habitat.

Parent material: Very strongly alkaline, calcareous clayey disintegrates from mudstones.

Physiography: Alluvial fan.

Topography: Gradient is 3 percent.

Drainage: Well drained.

Moisture: Dry throughout at time of sampling.

Ground water: Deep.

Erosion: Slight to moderate.

Permeability: Very slow.

Sampled by: C. J. Fowkes, James Stephens, R. C. Kronenberger, Harold Bindschadler, and Robert B. Grossman.

Described by: Harold Bindschadler - June 23, 1966.

(Colors are for air-dry soil unless otherwise stated)

A1 0 to 10 cm (0 to 4 inches). Light gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) moist; vesicular crust; weak fine granular structure; soft, very friable, nonsticky, nonplastic; mildly alkaline (pH 7.4); abrupt smooth boundary.

B2t 66L236 10 to 20 cm (4 to 8 inches). Pale brown (10YR 6/3) clay, brown (10YR 4/3) moist; moderate coarse prismatic that parts to weak medium and coarse subangular blocky structure; hard, very firm, very sticky, plastic; continuous glossy coatings on all faces of peds; moderately alkaline (pH 8.4); abrupt wavy boundary.

B31 66L237 20 to 33 cm (8 to 13 inches). Pale brown (10YR 6/3) clay, brown (10YR 4/3) moist; weak coarse prismatic that parts to weak medium subangular blocky structure; very hard, very firm, very sticky, plastic; patchy glossy coatings on vertical faces of peds; strongly effervescent; strongly alkaline (pH 8.9); clear wavy boundary.

B32ca 33 to 58 cm (13 to 22 inches). Light gray (2.5Y 7/3) clay loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; hard, friable, sticky, plastic; few patchy glossy coatings on vertical faces of peds; strongly effervescent; fine faint streaks of secondary lime; strongly alkaline (pH 8.9); abrupt wavy boundary.

Clcs 56 to 71 cm (22 to 28 inches). Light gray (2.5Y 7/3) clay loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, firm, sticky, plastic; strongly effervescent; many fine and medium soft rounded masses of secondary lime and crystalline salts; mildly alkaline (pH 7.6); diffuse wavy boundary.

C2 66L238 71 to 152 cm (28 to 60 inches). Light gray (2.5Y 7/3) clay loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, sticky, plastic; strongly effervescent; strongly alkaline (pH 8.9);

SOIL Amsden clay loam taxadjunct SOIL Nos. S67Wyo-10-4 LOCATION Johnson County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 67L288-67L295

GENERAL METHODS: 1A, 1B1b, 2A1, 2B

Depth (cm)	Horizon	Size class and particle diameter (mm)													Coarse fragments 2A2														
		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)	<0.074	3B2 Vol. 250-2	3B1 Wt.		
		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)	<0.074													75-2	20-5	5-2
0-8	A11	22.3	48.5	29.2	0.4	0.8	0.7	4.4	16.0	26.3	22.2	45.6	6.3	88.2	5	10	4	1											
8-25	A12	22.3	47.6	30.1	0.3	0.4	0.5	4.3	16.9	27.4	20.2	47.7	5.4	88.5	5	10	3	1											
25-36	B1	21.9	48.5	29.6	0.4	0.3	0.5	4.2	16.6	27.0	21.5	46.9	5.3	89.2	5	10	1	1											
36-56	B2t	22.1	46.0	31.9	0.4	0.3	0.5	4.2	16.7	25.9	20.1	45.9	5.4	88.9	5	10	1	1											
56-74	B3ca	26.1	47.2	26.7	0.5	0.5	0.6	4.7	19.8	25.1	22.1	48.6	6.3	86.7	25	20	3	1											
74-109	C1ca	22.2	42.2	29.6	0.7	1.1	1.3	6.4	18.7	18.6	23.6	42.3	9.5	82.0	10	10	3	2											
109-150	C2ca	30.7	40.4	28.9	0.5	0.7	0.9	6.3	22.4	16.5	23.9	44.0	8.3	81.4	25	20	1	1											
150-193	C3ca	31.4	34.6	34.0	0.5	0.8	0.8	7.3	22.1	11.5	23.1	39.6	9.3	79.4	25	20	2	2											

Depth (cm)	6A1a Organic carbon a/ Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as CaCO3		Bulk density			4D1 Water content			pH	
					6E1b <2mm Pct.	3A1a <0.002 mm Pct.	4A1d 1/3-Bar g/cc	4A1b Oven-Dry g/cc	COLE	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 WRD in./in.	8C1b Sat. Paste	8C1a (1:1)
					0-8	8.35	0.714	12	0.8			0.91	1.14	0.078
8-25	3.46	0.332	10	0.9			1.12	1.24	0.036	26.8	14.3	0.13		6.4
25-36	1.44	0.198	7	1.0			1.3b				12.3			6.7
36-56	0.83	0.095	9	1.0	tr		1.45	1.59	0.031	20.9	13.1	0.10		6.8
56-74	0.70	0.109	6	0.7	17	tr	1.42	1.58	0.027	21.4	12.4	0.10		7.9
74-109	0.33			0.3	45	7	1.38	1.48	0.022	24.7	16.1	0.11		8.5
109-150	0.11			0.5	41	4	1.4b				17.1			8.5
150-193	0.03			0.6	23	1	1.37	1.53	0.028	28.4	20.4	0.08		8.2

Depth (cm)	Extractable bases 5B4a					6H1a Ext. Acidity	Cat. Exch. Cap.		8E1 Resistivity ohms/cm	8A1a Elec. Cond. mmhos/cm	8D5 Total Sol. Salts ppm	8A1 Water at Sat. Pct.	8D3 Ca/Mg	Base saturation	
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum		5A3a Sum Cations	5A6 NH4OAc						5C3 Sum Cations	5C1 NH4OAc Pct
	0-8	35.3	6.5	0.1	2.1		44.0	7.2						51.2	42.9
8-25	25.9	5.8	0.1	1.1	32.9	6.6	39.5	33.8					4.5	83	97
25-36	21.3	5.5	0.1	0.9	27.8	4.5	32.3	28.5					3.9	86	98
36-56	22.4	7.7	0.1	0.5	30.7	3.5	34.2	30.5					2.9	90	101
56-74	18.7c	9.6d	0.2	0.4	28.9			27.8					1.9		
74-109	10.5c	19.8d	0.3	0.3	30.9			25.0	1600	0.59	180	48.5	0.5		
109-150	12.2c	26.0d	0.2	0.4	38.8			36.4					0.5		
150-193	17.5c	29.0d	0.2	0.5	47.2			43.5					0.6		

Depth (cm)	Ratios to Clay 8D1		
	Ext. Iron	15-Bar Water	NH4OAc CEC
0-8	0.02	0.66	1.5
8-25	0.03	0.48	1.1
25-36	0.03	0.42	0.96
36-56	0.03	0.41	0.96
56-74	0.03	0.46	1.0
74-109	0.01	0.54	0.84
109-150	0.02	0.59	1.3
150-193	0.02	0.60	1.3

a/ Organic carbon: 20 kg/m<sup>2</sup> to a depth of one meter (Method 6A).

Soil classification: Typic Cryoboroll; fine-loamy, mixed.

Soil series: Amsden clay loam taxadjunct<sup>1/</sup>.

Pedon No.: S67Wyo-10-4.

Location: Johnson County, Wyoming; SE $\frac{1}{4}$ , NW $\frac{1}{4}$  of Sec. 12, T46N, R85W. Proceed south on main gravel road which approaches U.S. Highway 16, 2.3 miles west of Caribou Lodge for 16.8 miles, then turn left at fence corner. Proceed east on trail parallel to fenced gate No. 1. Follow trail north gate to ridgetop; thence northeasterly to gate on north-south fence. From gate follow trail northeasterly to flat area, then turn left on trail going north. Proceed on this trail to small dam approximately 3/4 mile. (Site is 75 yards southwest of dam.)

Climate: Average annual precipitation is about 20 inches; average annual soil temperature at 20 inches is about 39° F. Mean summer soil temperature is about 49° F. Snow cover period extends from late October to mid-June. Elevation is about 8,100 feet.

Vegetation and land use: Fescue spp.; lupine, alpine bistort; Poa spp.; milkvetch, flowering plants. Summer sheep range and wildlife habitat.

Parent material: Calcareous, reddish, loamy alluvium or residuum containing small amounts of limestone from the Amsden formation.

Physiography: Mountain sideslopes.

Topography: Uniform to slightly undulating slopes. Gradient is 5 percent.

Drainage: Well drained.

Moisture: Moisture conditions at sampling time were above normal because of the unusually high precipitation during the winter, spring, and early summer prior to sampling. Recording stations showed as much as +10 inches deviation of precipitation during that period.

Ground water: Deep.

Erosion: None to slight.

Permeability: Moderate.

Sampled by: Robert B. Grossman, Warren Lynn, Paul Lupcho, James R. Stephens, Jr., Ki Hak Han, and C. J. Fowkes - July 18, 1967.

Described by: C. J. Fowkes - July 18, 1967.

(Colors are for air-dry soil unless otherwise stated)

A11 67L288 0 to 8 cm (0 to 3 inches). Dark brown (7.5YR 4/2) clay loam, very dark brown (7.5YR 2/2) moist; weak very fine crumb structure; soft, very friable, slightly sticky, slightly plastic; neutral (pH 6.8); clear smooth boundary.

A12 67L289 8 to 25 cm (3 to 10 inches). Dark brown (7.5YR 4/2) clay loam, very dark brown (7.5YR 2/2) moist; weak medium and fine prismatic that parts to weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; neutral (pH 6.8); clear smooth boundary.

B1 67L290 25 to 36 cm (10 to 14 inches). Reddish gray (5YR 5/2) with dark reddish gray (5YR 4/2) coatings on peds, clay loam, dark reddish brown (5YR 3/2) moist; weak medium subangular blocky structure; hard, friable, sticky, plastic; neutral (pH 6.6); clear wavy boundary.

B2t 67L291 36 to 56 cm (14 to 22 inches). Light reddish brown (5YR 6/3) clay loam with reddish brown (5YR 5/3) coatings on faces of peds, reddish brown (5YR 4/3) moist; medium fine subangular blocky structure; hard, firm, sticky, plastic; neutral (pH 6.6); gradual wavy boundary.

B3ca 67L292 56 to 74 cm (22 to 29 inches). Light reddish brown (5YR 6/4) loam with reddish brown (5YR 5/4) coatings on faces of peds, reddish brown (5YR 4/4) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; about 10 percent coarse reddish limestone fragments 20 mm to 75 mm (3/4 inch to 3 inches in size). About 15 percent from 75 mm to 250 mm (3 to 10 inches). Strongly effervescent; few fine soft masses of secondary lime; mildly alkaline (pH 7.6); gradual wavy boundary.

C1ca 67L293 74 to 109 cm (29 to 43 inches). Light reddish brown (5YR 6/4) and reddish brown to (5YR 5/4) loam, reddish brown (5YR 5/4) moist; and reddish brown (2.5YR 4/4) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; 5 percent coarse fragments 20 mm to 75 mm (3/4 inch to 3 inches), 5 percent larger than 75 cm (3 inches); violently effervescent; many medium and fine soft rounded masses of secondary lime; strongly alkaline (pH 8.8); gradual wavy boundary.

C2ca 67L294 109 to 150 cm (43 to 59 inches). Light reddish brown (5YR 6/4) and reddish brown (2.5YR 5/4) clay loam, reddish brown (2.5YR 4/4) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; 10 percent coarse reddish limestone fragments 20 mm to 75 mm (3/4 inch to 3 inches), 15 percent between 75 mm and 250 mm (3 and 10 inches); violently effervescent; common fine soft rounded masses of secondary lime; strongly alkaline (pH 8.8); gradual wavy boundary.

C3ca 67L295 150 to 193 cm. (59 to 76 inches). Light reddish brown (2.5YR 6/4) clay loam, reddish brown (2.5YR 5/4) moist; massive; slightly hard, friable, sticky, plastic; 10 percent reddish limestone fragments 20 to 75 mm (3/4 to 3 inches), 15 percent between 75 mm and 250 mm (3 and 10 inches); violently effervescent; many fine soft rounded masses of secondary lime; strongly alkaline (pH 8.5).

Remarks: Samples of horizons 3 to 10 inches, 14 to 22 inches, and 29 to 43 inches were taken for analysis by Wyoming Highway Department Engineering Lab.

<sup>1/</sup>Amsden soils are in a fine-loamy, mixed family of Argic Cryoborolls. This pedon is a taxadjunct because it lacks an argillic horizon and has a calcic horizon.

SOIL CLASSIFICATION-TYPIC TERRIORTMENT  
 COARSE-LOAMY, MIXED (CALCAREOUS), MESIC  
 SERIES - - - - -APRCN

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE, MTSC  
 NATIONAL SOIL SURVEY LABORATORY  
 LINCOLN, NEBRASKA  
 JUNE 1977

SOIL NO - - - - - S65WYC-7-11 CCUNTY - - - FREMONT

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 20884-20891  
 20952-20955

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B													FAMLI INTR		FINE NON-		RATIO			
		SAND	SILT	CLAY	CLAY	VCOS	CDRS	MEDS	FNES	VFNS	COSE	FNSI	VFSI	TEXT	II	CLAY	CO3-	15-				
CM		2-	.05-	LT	LT	1	2-	1-	.5-	.25-	.10-	.05	.02	.005-	SAND	2-	TO	CLAY	BAR	TO	CLAY	
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	.002	2-.1	.02	CLAY	PCT	PCT	PCT	PCT	CLAY
000-015	AP1	64.5	21.3	14.2	.7	4.3	11.4	31.2	16.9	11.1	10.2			47.6	44.6			14				.42
015-025	AP2	64.2	21.9	13.9	1.2	6.1	12.8	29.1	15.0	9.8	12.1			49.2	39.6			14				.47
025-051	C1	59.2	25.9	14.9	1.1	5.5	9.9	26.0	16.7	12.9	13.0			42.5	43.7			14				.48
051-069	C2	69.4	18.3	12.3	1.3	7.8	14.6	30.9	14.8	9.1	9.2			54.6	39.7			12				.45
069-099	C3	71.2	17.9	10.9	.7	6.6	14.7	33.4	15.8	8.2	9.7			55.4	41.1			11				.54
099-137	C4	69.6	17.8	12.4	1.7	7.8	14.6	31.1	14.8	8.6	9.2			55.2	38.5			12				.52
137-170	C5	70.8	17.7	11.5	2.0	10.6	16.7	29.3	12.2	8.4	9.3			58.6	34.2			12				.52
170-203	C6	66.3	22.5	11.2	3.0	11.9	15.8	25.0	10.6	8.9	13.6			55.7	31.0			11				.48

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2										BULK DENSITY				WATER CONTENT				CARBONATE			
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	4A1D	4A1H	4D1	4B1C	4B1C	4B2	4C1	6E1B	3A1A	8C1A	8C1E	
CM	2	75	PCT	PCT	(- - - PCT LT 75 - - -)	LT20	G/CC	BAR	DRY	BAR	BAR	BAR	BAR	BAR	BAR	CM/	2	.002	H2O	CACL		
	PCT	PCT	(- - - PCT LT 75 - - -)				G/CC	G/CC		PCT	PCT	PCT	PCT	PCT	PCT	CM	PCT	PCT	PCT	PCT		
000-015						2	1.37	1.42	.012				16.8	6.0	.15		3				7.9	
015-025						3	1.48	1.59	.024				19.3	6.6	.19		6				8.1	
025-051						6	1.37	1.44	.017				24.7	7.2	.24		4	1			8.2	
051-069						14								5.5			4				8.4	
069-099						3	1.51	1.56	.011				21.2	5.9	.23		3				8.4	
099-137						2	1.49	1.54	.011				22.1	6.4	.23		4				8.4	
137-170						4								6.0			5				8.3	
170-203						18								5.4			6				8.4	

DEPTH	ORGANIC MATTER			IRON	PHOS	EXTRACTABLE BASES				ACTY	AL	CAT	EXCH	RATIO	RATIO	CA	(BASE SAT)
	6A1A	6B1A	C/N			6C2B	6N2E	6O4B	6P2B								
CM	PCT	PCT	PCT	PCT	TOTL	CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	CA	SAT
										EXTB	TEA	EXT	ACTY		TO	NHAC	ACTY
										MEQ / 100	G-				CLAY	MG	PCT
000-015	.48	.054	9			2.4	.1	.8									13.5
015-025	.40	.044	9			2.4	.2	.6									14.3
025-051	.28					2.0	.3	.5									15.1
051-069	.16					1.2	.2	.4									11.5
069-099	.11					1.3	.3	.4									11.4
099-137	.13					1.2	.3	.4									11.8
137-170	.13					1.6	.2	.4									11.7
170-203	.09					1.6	.3	.3									11.8

DEPTH	SATURATED PASTE					SALT	GYP	SATURATION EXTRACT										ATTERBERG	
	8E1	8C1B	8A	5D2	5E			8D5	6F1A	8A1A	6N1B	6Q1B	6P1B	6Q1B	6I1A	6J1A	6K1A	6L1A	6M1A
CM	REST	PH	H2O	ESP	SAR	TOTL	SOLU	EC	CA	MG	NA	K	CO3	CO3	CL	SO4	NO3	LQID	PLST
	OHM-	CM	PCT	PCT		PPM	PCT	MMHOS/		CM								LIMIT	INDX
										MEQ / LITER								PCT	
000-015																			
015-025																			
025-051																			
051-069																			
069-099	2700	7.8	25.0			110		.69											
099-137																			
137-170																			
170-203																			

DEPTH	WATER
CM	FIELD STATE PCT
000-8	13.9
008-38	13.7
038-69	13.4
069-99	12.2

Soil classification: Typic Torriorthent; coarse-loamy, mixed (calcareous), mesic.

Soil series: Apron fine sandy loam.

Pedon No.: S65Wyo-7-11.

Location: Fremont County, Wyoming; NE $\frac{1}{4}$ , NE $\frac{1}{4}$  of SW $\frac{1}{4}$  of Sec. 30, T2N, R5E. Start at center of section 30 which is a fence corner, proceed 264 feet west and 129 feet south. See TLI on photo CCK-14N-183.

Climate: Average annual precipitation is about 9 inches. Average annual soil temperature is 51° F. Frost-free period is 120 to 140 days. Elevation is about 5,000 feet.

Vegetation and land use: Oats, irrigated cropland.

Parent material: Calcareous local sandy alluvium wasted from interbedded sandstones and shales and surrounding soils.

Physiography: Alluvial fan.

Topography: Southeast facing slope. Gradient is 3 percent.

Drainage: Well drained.

Moisture: Moist throughout due to recent irrigation.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderately rapid.

Sampled by: C. J. Fowkes, J. F. Young, Robert B. Grossman, Dean McMurtry, and Harold Bindschadler - October 25, 1965.

Described by: Harold Bindschadler - October 25, 1965.

(Colors are for air-dry soil unless otherwise stated)

Ap1 20884 0 to 15 cm (0 to 6 inches). Light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 4/2) moist; weak fine subangular blocky that parts to weak fine crumb structure; soft, very friable, nonsticky, nonplastic; few fine sandstone channers and pebbles throughout; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Ap2 20885 15 to 25 cm (6 to 10 inches). Light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 4/2) moist; weak fine subangular blocky that parts to weak fine crumb structure; soft, very friable, nonsticky, slightly plastic; fine channers and pebbles scattered throughout; strongly effervescent; moderately alkaline (pH 8.4); clear wavy boundary.

C1 20886 25 to 51 cm (10 to 20 inches). Light brownish gray (2.5Y 6/2) fine sandy loam, light brownish gray (2.5Y 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; few fine channers and pebbles; strongly effervescent; moderately alkaline (pH 8.4); clear wavy boundary.

C2 20887 51 to 69 cm (20 to 27 inches). Light brownish gray (2.5Y 6/3) fine sandy loam, grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; 15 percent sandstone channers and pebbles less than 3/4 inch in size, 5 percent larger than 3/4 inch; strongly effervescent; moderately alkaline (pH 8.4); clear wavy boundary.

C3 20888 69 to 99 cm (27 to 39 inches). Light brownish gray (2.5Y 6/2) channery fine sandy loam, grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; 25 percent sandstone channers and pebbles; strongly effervescent; moderately alkaline (pH 8.4); clear wavy boundary.

C4 20889 99 to 137 cm (39 to 54 inches). Light brownish gray (2.5Y 6/2) fine sandy loam, olive brown (2.5Y 4/4) moist; massive; soft, very friable, nonsticky, nonplastic; few fine channers and pebbles; strongly effervescent; moderately alkaline (pH 8.4); clear wavy boundary.

C5 20890 137 to 170 cm (54 to 67 inches). Light brownish gray (2.5Y 6/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; few fine channers and pebbles throughout; strongly effervescent; strongly alkaline (pH 8.5); abrupt smooth boundary.

C6 20891 170 to 203 cm (67 to 80 inches). Light grayish brown (2.5Y 7/3) channery sandy loam, light olive brown (2.5Y 5/3) moist; massive; soft, very friable, nonsticky, nonplastic; 15 percent sandstone and shale channers; strongly effervescent; encrustations of lime carbonate on all faces of channers; strongly alkaline (pH 8.5); abrupt smooth boundary.

C7 203 to 210 cm (80 to 83 inches). Calcareous sandstone.

Remarks: The following soil temperature information was acquired from a nearby pit in an uncultivated area. Three feet beneath the surface the soil was moist. Presumably, the moisture originates as seepage from a nearby irrigation canal.

20 inches - 53° F.	80 inches - 58° F.
40 inches - 56° F.	128 inches - 60° F.
60 inches - 56° F.	138 inches - 60° F.

An area about 8 x 8 feet adjacent to the sampling pit was dyked and wetted by applying about 12 inches of water. Samples from moisture determination were collected approximately 48 hours after the wetting. The wetting front terminated in a dry zone. The results for the moisture samples were reported on the accompanying data sheet.

SOIL CLASSIFICATION-TYPIC TORRIORTHENT  
COARSE-LOAMY, MIXED (CALAREOUS), MESIC  
SERIES - - - - - APRCN

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE, MTSC  
NATIONAL SOIL SURVEY LABORATORY  
LINCOLN, NEBRASKA  
JUNE 1977

SOIL NO - - - - - S65NYO-7-12 COUNTY - - - FREMONT

GENERAL METHODS - - - 1A, 1B1B, 2A1, 2B SAMPLE NOS. 20935-20941

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B													IRATIO			
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	FAML	INTR	FINE	NON-	8D1
		2-	.05-	.002	LT	2-	1-	.5-	.25-	.10-	.05	.02	.002	2-.1	.02	CLAY	CO3-	15-
		PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT
000-028	AP	60.3	22.4	17.3		.4	3.6	9.7	27.9	18.7	10.3	12.1		41.6	45.0		17	.52
028-041	C1	67.6	19.6	12.8		.1	3.2	11.7	34.5	18.1	9.3	10.3		49.5	46.4		13	.51
041-048	C2	30.8	47.9	21.3		TR	1.0	2.7	12.1	15.0	22.2	25.7		15.8	44.7		21	.57
048-071	C3	55.1	28.0	16.9	6.2	.1	1.0	4.6	29.8	19.6	11.8	16.2		35.5	50.7	37	17	.49
071-091	C4	68.5	17.8	13.7		.7	5.7	12.3	34.1	15.7	7.2	10.6		52.8	41.5		14	.46
091-142	C5	76.4	12.4	11.2		.5	5.8	16.4	39.6	14.1	5.6	6.8		62.3	40.1		11	.48
142-188	C6	89.6	4.8	5.6		1.2	21.2	35.7	27.9	3.6	1.8	3.0		86.0	14.6		6	.48

DEPTH CM	PARTICLE SIZE ANALYSIS, MP, 3B, 3B1, 3B2										BULK DENSITY				WATER CONTENT				CARBONATE			
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD	LT	LT	1/1	1/2				
	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT				
000-028						TR	1.53	1.68	.032		20.9	9.0	.18		3	TR	7.9					
028-041						TR	1.54	1.60	.013		15.9	6.5	.14		3	TR	8.1					
041-048						0	1.28	1.40	.030		27.9	12.1	.20		5	TR	8.1					
048-071						TR	1.42	1.50	.018		21.5	8.2	.19		4	TR	8.1					
071-091						1	1.52	1.58	.013		15.4	6.3	.14		2	0	8.1					
091-142						TR	1.55	1.58	.006		11.3	5.4	.09		3	0	8.3					
142-188						TR					2.7				2	TR	8.4					

DEPTH CM	ORGANIC MATTER		IRON PHOS		EXTRACTABLE BASES				ACTY		AL		CAT EXCH		RATIO		CA	
	6A1A	6B1A	6C2B	6N2E	6N2E	6N2E	6P2B	6Q2B	6M1A	6G1E	5A3A	5A6A	8D1	8D3	5F1	5C3	5C1	
	PCT	PCT	PCT	PCT	MEQ	MEQ	MEQ	MEQ	MEQ	MEQ	MEQ	MEQ	MEQ	MEQ	MEQ	MEQ	MEQ	
000-028	.56	.067	.8		2.6	.3	.6							16.1	.93			
028-041	.17				1.6	.1	.3							14.7	1.15			
041-048	.21				2.8	.3	.5							24.5	1.15			
048-071	.10				2.2	.2	.5							18.7	1.11			
071-091	.06				2.0	.1	.4							14.4	1.05			
091-142	.02				1.3	.2	.3							11.5	1.03			
142-188					.7	.1	.2							5.5	.98			

DEPTH CM	SATURATED PASTE				NA		SALT		GYP		SATURATION EXTRACT								ATTERBERG			
	8E1	8C1B	8A	5D2	5E	8D5	6F1A	8A1A	6N1B	6O1B	6P1B	6Q1B	6I1A	6J1A	6K1A	6L1A	6M1A	4F1	4F2			
	PH	H2O	ESP	SAR	TOTL	SOLU	MMHOS/	EC	CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3	LMIT	PLST			
	CM	PCT	PCT	PCT	PPM	PCT	CM	MEQ	MEQ	MEQ	MEQ	MEQ	MEQ	MEQ	MEQ	MEQ	MEQ	PCT	PCT			
000-028																						
028-041																						
041-048																						
048-071	1800	7.3	33.6		140		.66															
071-091																						
091-142																						
142-188																						

CLAY MINERALOGY (7A2C).  
48-71 C3 MODERATE AMOUNT OF WELL-ORDERED MONTMORILLONITE. SMALL AMOUNT OF MICA. SOME INTERLAYER MATERIAL PRESENT IN THE MONTMORILLONITE. CLAY MINERALOGY IS MONTMORILLONITIC.

Soil classification: Typic Torriorthent; coarse-loamy, mixed (calcareous), mesic.

Soil series: Apron fine sandy loam.

Pedon No.: S65Wyo-7-12.

Location: Fremont County, Wyoming; NW $\frac{1}{4}$ , NE $\frac{1}{4}$ , NE $\frac{1}{4}$  of Sec. 15, T1N, R4E. Start at intersection of U.S. 26 right-of-way fence on the west side and the east-west section line. Proceed west from this intersection 804 feet and south 306 feet. TL1 photo 14N-124.

Climate: Average annual precipitation is about 9 inches. Average annual soil temperature is about 51° F. Frost-free period is 120 to 140 days. Elevation is about 4,956 feet.

Vegetation and land use: Sugar beets. Irrigated cropland.

Parent material: Calcareous sandy and loamy alluvium wasted from interbedded sandstones and shales.

Physiography: Alluvial fan.

Topography: East facing smooth surface slope. Gradient is 1 percent.

Drainage: Well drained.

Moisture: Moist from irrigation.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderately rapid.

Sampled by: J. E. Hams, C. J. Fowkes, J. F. Young, Robert B. Grossman, Dean McMurtry, and Harold Bindschadler - October 26, 1965.

Described by: Harold Bindschadler - October 26, 1965.

(Colors are for air dry-soil unless otherwise stated)

Ap 20935 0 to 28 cm (0 to 11 inches). Light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; many wormcasts; moderately effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C1 20936 28 to 41 cm (11 to 16 inches). Pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; moderately effervescent; moderately alkaline (pH 8.3); abrupt smooth boundary.

C2 20937 41 to 48 cm (16 to 19 inches). Varicolored light brownish gray (2.5Y 6/2) and pale olive (5Y 6/3) loam, grayish brown (2.5Y 5/2) moist; soft, very friable, slightly sticky, slightly plastic; moderately effervescent; moderately alkaline (pH 8.3). The horizon appears to be discontinuous.

C3 20938 48 to 71 cm (19 to 28 inches). Light gray (10YR 7/2) sandy loam, grayish brown (10YR 5/2) moist; soft, very friable, slightly sticky, slightly plastic; moderately effervescent; moderately alkaline (pH 8.3); abrupt smooth boundary.

C4 20939 71 to 91 cm (28 to 36 inches). Very pale brown (10YR 7/3) sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, slightly sticky, slightly plastic; strongly effervescent; moderately alkaline (pH 8.4); abrupt smooth boundary.

C5 20940 91 to 142 cm (36 to 56 inches). Very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; single grained; soft, very friable, nonsticky, nonplastic; strongly effervescent; moderately alkaline (pH 8.4); abrupt smooth boundary.

C6 20941 142 to 188 cm (56 to 74 inches). Very pale brown (10YR 7/3) medium and fine sand, brown (10YR 6/3) moist; single grained; loose, nonsticky, nonplastic; strongly effervescent; moderately alkaline (pH 8.4); abrupt smooth boundary.

C7 188 to 201 cm (74 to 79 inches). Very pale brown (10YR 7/3) gravel and sand, pale brown (10YR 6/3) moist; single grained; loose, nonsticky, nonplastic; moderately effervescent; secondary lime encrustations on undersides of gravel; moderately alkaline (pH 8.2).

Remarks: Soil temperatures were taken at three levels--at 20 inches 48° F., at 40 inches 40° F., at 60 inches 50° F. Worm channels and casts were abundant in the Ap horizon. The quantity diminishes with depth; however, a few were observed at a depth of 36 inches.

Mineralogy from a neighboring pedon, 8 to 17 inch horizon, LSL 20533. Methods 7A1 and 7B1. About 300 grains of very fine sand were counted. The sample contained 20 percent quartz, 45 percent feldspar, 20 percent aggregates, 10 percent mica, and 5 percent others. About one-third of the feldspar grains are plagioclase of intermediate calcium content. Volcanic glass and its alteration products are scarce.

SOIL Bachus loam SOIL Nos. S67Wyo-10-8 LOCATION Johnson County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 67L296-67L301

GENERAL METHODS: 1A, 1E1b, 2A1, 2B

Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1													Coarse fragments 2A2			
		Total			Sand						Silt				3B2 Vol. 250-2 %	3B1 Wt.		
		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)	<0.074		75-2	20-5	5-2
Pct of <= 2 mm																		
0-8	A11	38.3	43.5	18.2	0.6	5.1	8.5	15.7	8.4	23.3	20.2	38.9	29.9	67.1	5	10	3	1
8-15	A12	34.1	47.2	18.7	0.6	4.4	7.0	13.2	8.9	25.5	21.7	40.6	25.2	72.1	5	10	4	1
15-31	B1	33.5	47.6	18.9	0.6	4.5	6.7	12.3	9.4	26.0	21.6	41.2	24.1	73.2	5	10	5	2
31-41	B21t	37.0	43.3	19.7	0.9	5.0	7.5	13.6	10.0	23.8	19.5	40.2	27.0	70.0	5	10	6	3
41-66	B22t	39.7	38.1	22.2	0.9	5.9	8.2	14.4	10.3	21.8	16.9	37.9	29.4	67.5	10	15	8	3
66-76	R																	

Depth (cm)	6A1a Organic carbon a/ Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as CaCO3 Pct.	Bulk density			4D1 COLE	Water content			pH	
						4A1d 1/3-Bar g/cc	4A1b Oven-Dry g/cc	4B1c 1/3-Bar Pct.		4B2 15-Bar Pct.	4C1 WRD in./in.	8C1b Sat. Paste	8C1a (1:1)	
0-8	5.08	0.403	13	1.0			1.20	1.28	0.028	23.1	10.4	0.14		
8-15	2.21	0.204	11	1.0			1.21	1.27	0.015	23.9	8.6	0.18		5.4
15-31	1.14	0.117	10	1.0			1.19	1.24	0.013	16.8	7.9	0.10		5.2
31-41	0.93	0.095	10	1.0			1.4b							5.0
41-66	0.64	0.071	9	1.0			1.38	1.43	0.011	18.3	9.4	0.11	4.6	4.9
66-76														

Depth (cm)	Extractable bases 5B4a					6H1a Ext. Acidity	Cat. Exch. Cap.		6G1d KCl-Ext. Al	8E1 Resistivity ohms-cm	8A1a Elec. Cond. mmhos/cm	8D5 Total Sol. Salts ppm	8A1 Water at Sat. Pct.	8D3 Ca/Mg	Base saturation	
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum		5A3a Sum Cations	5A6 NH4OAc							5C3 Sum Cations	5C1 NH4OAc
0-8	13.9	2.6	0.1	1.3	17.9	13.6	31.5	24.0	0.3					5.3	57	75
8-15	9.0	2.2	0.1	1.0	12.3	11.7	24.0	18.3	0.3					4.1	51	67
15-31	6.2	2.1	0.1	0.6	9.0	10.3	19.3	14.6	0.7					3.0	47	62
31-41	5.7	2.0	0.1	0.4	8.2	10.6	18.8	14.4	1.3					2.9	44	57
41-66	6.8	2.5	0.1	0.3	9.7	12.6	22.3	17.0	2.4	5700	0.23	50	34.8	2.7	43	57
66-76																

Depth (cm)	Ratios to Clay 8D1		
	Ext. Iron	15-Bar Water	NH4OAc
0-8	0.05	0.57	1.3
8-15	0.05	0.46	0.98
15-31	0.05	0.42	0.77
31-41	0.05	0.41	0.73
41-66	0.05	0.42	0.76
66-76			

a/ Organic carbon: 12 kg/m<sup>2</sup> to a depth of 66 cm (26 inches). Method 6A.  
b/ Estimated.

Soil classification: Argic Pachic Cryoboroll; fine-loamy, mixed.

Soil series: Bachus loam.

Pedon No.: S67Wyo-10-8.

Location: Johnson County, Wyoming; NE $\frac{1}{4}$ , NE $\frac{1}{4}$  of Sec. 39, T45N, R85W. Proceed south on main gravel road which approaches U.S. Highway 16 2.3 miles west of Caribou Lodge for 19.8 miles to junction. Proceed on right fork for another 7.7 miles to stone monument on left or east side of the road. (Site is 100 feet east of the stone monument.)

Climate: Average annual precipitation is about 18 inches; mean annual soil temperature at 20 inches is about 43° F.; mean summer soil temperature at 20 inches is about 53° F. Snow cover period extends from late November to early June. Elevation is 8,200 feet.

Vegetation and land use: Fescue spp.; prairie junegrass; Poa spp.; green needlegrass, thickspike wheatgrass, needleleaf sedge. Summer sheep range and wildlife habitat.

Parent material: Residium weathered from noncalcareous, fine grained, reddish sandstone of the Flathead formation.

Physiography: Moderately rolling summit of a mountain range.

Topography: East facing slope. Gradient is 8 percent. The surface is microundulating.

Drainage: Well drained.

Moisture: Moisture conditions at sampling time were above normal because of unusually high precipitation during the winter, spring, and early summer prior to sampling. Deviations for that period were around +10 inches precipitation.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderately rapid.

Sampled by: Robert B. Grossman, Warren Lynn, Ki Hak Han, James R. Stephens, Jr., and C. J. Fowkes - July 19, 1967.

Described by: C. J. Fowkes - July 19, 1967.

(Colors are for air-dry soil unless otherwise stated)

A11 67L296 0 to 8 cm (0 to 3 inches). Dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky that parts to weak fine crumb structure; soft, very friable, slightly sticky, non-plastic; 5 percent sandstone fragments larger than 20 mm (3/4 inch); slightly acid (pH 6.2); clear smooth boundary.

A12 67L297 8 to 15 cm (3 to 6 inches). Dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak coarse and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; 5 percent sandstone fragments between 20 mm and 250 mm (3/4 inch and 10 inches); slightly acid (pH 6.2); clear smooth boundary.

B1 67L298 15 to 31 cm (6 to 12 inches). Brown (7.5YR 5/2) loam, dark brown (7.5YR 3/2) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few thin patchy glossy coatings on faces of peds, some clay bridging between sand grains; 5 percent sandstone fragments 20 mm to 250 mm (3/4 to 10 inches); medium acid (pH 5.8); clear wavy boundary.

B21t 67L299 31 to 41 cm (12 to 16 inches). Reddish brown (5YR 5/3) loam, dark reddish brown (5YR 3/3) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; pockets of dark material from the A horizon caused by churning by rodents; thin nearly continuous glossy coatings on all faces of peds; medium acid (pH 5.7); clear broken boundary.

B22t 67L300 41 to 66 cm (16 to 26 inches). Light reddish brown (5YR 6/4) loam, reddish brown (5YR 4/4) moist; weak coarse and medium subangular blocky structure; hard, firm, sticky, plastic; thin continuous glossy coatings on all faces of peds; 10 percent sandstone fragments 20 mm to 250 mm (3/4 inch to 10 inches); medium acid (pH 5.6); clear wavy boundary.

R 67L301 66 to 76 cm (26 to 30 inches). Very hard reddish noncalcareous sandstone.

Soil classification: Ustollic Paleargid, fine, montmorillonitic, mesic.

Soil series: Big Horn loam<sup>1/</sup>.

Pedon No.: S66WYO-10-9

Location: Johnson County, Wyoming; NE 1/4, SW 1/4, Sec. 4, T45N, R82W.

Climate: Average annual precipitation is about 12 inches. Mean annual soil temperature is about 52° F.

Frost-free season is 105 to 110 days. Elevation is about 5,400 feet.

Vegetation and land use: Bluestem wheatgrass, blue gramagrass, Gardner saltbush, prairie junegrass, and green needlegrass. Rangeland and wildlife habitat.

Parent material: Calcareous clayey local alluvium which mantles a gravelly piedmont surface.

Physiography: Piedmont.

Topography: Gradient is 1 percent.

Drainage: Well drained.

Moisture: Dry throughout at time of sampling.

Ground water: Deep.

Erosion: Slight.

Permeability: Slow.

Sampled by: C. J. Fowkes, James Stephens, R. C. Kronenberger, Harold Bindschadler, and Robert B. Grossman.

Described by: Harold Bindschadler - June 23, 1966.

(Colors are for air-dry soil unless otherwise stated)

A1 66L242 0 to 10 cm (0 to 4 inches). Grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate to strong fine granular structure; soft, very friable, nonsticky, plastic; neutral (pH 7.2); abrupt smooth boundary.

B21t 66L243 10 to 23 cm (4 to 9 inches). Grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; strong coarse and medium prismatic that parts to strong fine angular blocky structure; extremely hard, firm, sticky, plastic; thick continuous waxy coatings on all faces of peds; bleached sand and silt on faces of peds in upper inch of horizon; mildly alkaline (pH 7.4); gradual smooth boundary.

B22t 66L244 23 to 56 cm (9 to 22 inches). Grayish brown (10YR 5/2) clay, dark grayish brown (10YR 5/2) moist; strong coarse and medium prismatic that parts to strong medium angular blocky structure; extremely hard, firm, sticky, plastic; continuous waxy coatings on all faces of peds; 5 percent gravel sized coarse fragments; mildly alkaline (pH 7.6); gradual smooth boundary.

B3ca 56 to 66 cm (22 to 26 inches). Light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic that parts to moderate coarse angular blocky structure; very hard, very firm, sticky, plastic; patchy glossy coatings on all faces of peds; 10 percent gravel sized coarse fragments; violently effervescent; soft rounded masses and thin seams and threads of secondary lime; moderately alkaline (pH 8.2); clear wavy boundary.

C1ca 66 to 102 cm (26 to 40 inches). Light gray (2.5Y 7/2) gravelly clay loam, light brownish gray (2.5Y 6/2) moist; massive; very hard, friable, sticky, plastic; 25 percent gravel sized coarse fragments; violently effervescent; soft rounded masses thin streaks and fine seams of secondary lime; moderately alkaline (pH 8.2); gradual wavy boundary.

C2ca 102 to 152 cm (40 to 60 inches). Grayish brown (2.5Y 5/2) gravelly clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, very friable, sticky, plastic; 25 percent gravel sized coarse fragments; violently effervescent; soft rounded masses thin streaks and fine seams of secondary lime; moderately alkaline (pH 8.4).

<sup>1/</sup>This is the site description for the moisture data on page 133.

SOIL CLASSIFICATION-USTCLLIC PALEARGID  
 FINE, MCNTMORILLONITIC, MESC  
 SERIES - - - - -BRIGGSDALE

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE, MTSC  
 NATIONAL SOIL SURVEY LABORATORY  
 LINCOLN, NEBRASKA  
 JUNE 1977

SOIL NO - - - - - S66NYC-10-11 COUNTY - - - JOHNSON

GENERAL METHODS - - -1A, 1B1B, 2A1, 2B SAMPLE NOS. 66L245-66L246

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO	
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	CO5I	FNSI	VFSI	TEXT	II		CLAY
CM		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-1	.02	CLAY	TO
		PCT LT 2MM														PCT	
020-030	B21T	40.5	24.5	35.0	27.5		.2	.7	12.4	27.2	14.2	10.3		13.3	51.8	79	.37
066-081	CCA																

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2					BULK DENSITY			WATER CONTENT				CARBONATE			
	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	CDLE	1/10	1/3-	15-	WRD	6E1B	3A1A	8C1A	8C1E
CM	PCT	PCT	PCT	LT 75	LT20	G/CC	G/CC	PCT	PCT	PCT	CM	PCT	PCT	PCT	PCT	PCT
020-030	0	0	0	0	0						13.1		TR		7.4	
066-081	0	0	0	0	0						12.6		3		8.3	

DEPTH	ORGANIC MATTER		IRON	PHOS	EXTRACTABLE BASES 5B4A				ACTY	AL	CAT EXCH		RATIO	RATIO	CA	(BASE SAT)		
	6A1A	6B1A			6N2E	6O4B	6P2B	6Q2B			6H1A	6G1E				5A3A	5A6A	8D1
CM	PCT	PCT	PCT	PCT	CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	SAT	EXTB	NHAC	
									MEQ / 100	EXTB	TEA	EXT	ACTY	TO	TO	NHAC	ACTY	
020-030	.69					8.7	.3	.7					25.5	.73				
066-081						11.4	2.9	.5					22.9					

Soil classification: Ustollic Paleargid; fine, montmorillonitic, mesic.

Soil: Briggsdale fine sandy loam taxadjunct<sup>1/</sup>.

Pedon No.: S66Wyo-10-11.

Location: Johnson County, Wyoming; 1,150 feet east and 25 feet north of the SW corner of Sec. 29, T45N, R80W.

Climate: Average annual precipitation is about 12 inches. Mean annual soil temperature is about 52° F. Frost-free season is 105 to 110 days. Elevation is about 4,800 feet.

Vegetation and land use: Sandberg bluegrass, blue gramagrass, needleandthread, bluestem wheatgrass, six weeks fescue, prairie junegrass, big sagebrush, winterfat, woolly plantain. Rangeland and wildlife habitat.

Parent material: Residuum weathered from calcareous fine grained sandstone.

Physiography: Hillside in rolling upland landscape.

Topography: Gradient is 5 percent.

Drainage: Well drained.

Moisture: Dry at time of sampling.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderately slow.

Sampled by: C. J. Fowkes, James Stephens, R. C. Kronenberger, Harold Bindschadler, and Robert B. Grossman.

Described by: Harold Bindschadler - June 23, 1966.

(Colors are for air-dry soil unless otherwise stated)

A11 0 to 5 cm (0 to 2 inches). Light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine crumb structure; soft, very friable, nonsticky, nonplastic; medium acid (pH 5.8); abrupt smooth boundary.

A12 5 to 13 cm (2 to 5 inches). Light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine platy structure; soft, very friable, nonsticky, nonplastic; bleached sand and silt grains arranged in reticulated vein pattern; medium acid (pH 5.8); abrupt smooth boundary.

B1 13 to 20 cm (5 to 8 inches). Light brownish gray (10YR 6/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; medium acid (pH 6.0); abrupt smooth boundary.

B2t 66L245 20 to 31 cm (8 to 12 inches). Pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; strong medium prismatic that parts to strong fine and medium angular blocky structure; hard, friable, sticky, plastic; continuous glossy coatings on all faces of peds; streaks of organic stains particularly on vertical faces of peds; medium acid (pH 6.0); clear wavy boundary.

B22t 31 to 43 cm (12 to 17 inches). Light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; strong medium prismatic that parts to strong fine and medium angular blocky structure; hard, friable, sticky, plastic; continuous glossy coatings on all faces of peds; medium acid (pH 6.0); abrupt wavy boundary.

B31 43 to 56 cm (17 to 22 inches). Pale olive (5Y 6/3) loamy very fine sand, olive (5Y 4/3) moist; single grained; loose, nonsticky, nonplastic; mildly alkaline (pH 7.8); diffuse wavy boundary.

B32 56 to 66 cm (22 to 26 inches). Pale olive (5Y 6/3) loamy very fine sand, olive (5Y 4/3) moist; single grained; loose, nonsticky, nonplastic; 25 percent partially weathered small angular sandstone; moderately alkaline (pH 8.2); diffuse wavy boundary.

Cca 66L246 66 to 81 cm (26 to 32 inches). Light gray (5Y 7/2) platy sandy shale that has secondary lime in cleavages and channels.

<sup>1/</sup>Briggsdale soils have more than 15 percent fine sand or coarser in the control section.

SOIL Busher loamy very fine sand SOIL Nos. S64Wyo-8-8 LOCATION Goshen County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19436-19443 January 1968

GENERAL METHODS: 1A, 1Blb, 2A1, 2B

Depth (cm)	Horizon	Size class and particle diameter (mm)											Coarse fragments 2A2				
		Total				Sand				Silt			Int. II (0.2-0.02)	(2-0.1)	> 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)	Int. III (0.05-0.02)	Int. III (0.02-0.002)						
Pct of < 2 mm																	
0-18	A11	80.9	10.3	8.8	tr	1.5	2.4	19.5	57.5	7.5	2.8	81.4	23.4	tr			
18-36	A12	82.4	9.1	8.5	0.1	2.0	2.9	22.0	55.4	6.7	2.4	80.7	27.0	tr			
36-48	A13	80.9	6.8	12.3	0.4	4.7	6.6	25.7	43.5	4.9	1.9	68.5	37.4	tr			
48-86	AC	85.1	5.7	9.2	0.4	6.1	8.8	29.4	40.4	3.9	1.8	66.1	44.7	tr			
86-132	C1ca	87.3	5.9	6.8	0.4	5.8	9.4	30.6	41.1	4.2	1.7	67.7	46.2	tr			
132-168	C2ca	87.8	6.0	6.2	0.2	5.6	9.9	31.5	40.6	3.0	3.0	66.1	47.2	tr			
168-244	C3ca													tr			
244-320	C4ca													3			

Depth (cm)	6A1a Organic carbon a/ Pct	Nitrogen Pct	C/N	Ext. Iron as Fe Pct.	Carbonate as CaCO <sub>3</sub>		Bulk density			4D1 COLE	Water content				pH	
					6E1b < 2mm Pct.	3A1a < 0.002mm Pct.	4A1g 1/10-Bar g/cc	4A1b Air-Dry g/cc	4B1c 1/10-Bar Pct		4B2 15-Bar Pct	4C2 1/10-to 15-Bar in./in.	8C1b Sat. Paste	8C1a (1:1)		
0-18	0.73				-	-	1.37	1.41	0.010		27.2	5.0	0.30			6.8
18-36	0.41				-	-	1.41	1.43	0.003		25.1	4.8	0.29			7.6
36-48	0.50				-	-	1.41	1.48	0.017		21.3	5.5	0.22			7.7
48-86	0.20				-	-	1.50	1.55	0.010		15.8	5.1	0.16			7.8
86-132	0.05			tr	-	-	1.58	1.60	0.003		16.8	4.0	0.20		7.7	8.2
132-168	0.08			2	tr	-	1.56	1.58	0.003		17.9	4.2	0.21			8.4
168-244				2												8.6
244-320				2												8.6

Depth (cm)	Extractable bases 5B1a				6H1a Ext. Acidity	Cat. Exch. Cap. 5A3a Sum Cations	5A1a NH <sub>4</sub> OAc	8E1 Resistivity ohms/cm	8B1a Elec. Cond. mmhos/cm	8B Water at Sat. Pct.	8D5 Est. Total Salt in Soil ppm.	8D3 Ca/Mg	Base saturation	
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K									5C3 Sum Cations	5C1 NH <sub>4</sub> OAc
													Pct	Pct.
0-18	8.2	2.0	tr	1.3	11.5	1.5	13.0	10.9				4.1	88	106
18-36	8.6	1.6	tr	1.0	11.2			10.5				5.4		107
36-48	10.7	1.7	tr	1.0	13.4			12.8				6.3		105
48-86	9.0	1.6	tr	0.9	11.5			11.1				5.6		104
86-132	7.2 b/	2.2 c/	tr	0.9	10.3			9.5	4200	0.34	33.2	72	3.3	108
132-168	8.0 b/	2.0 c/	tr	0.9	10.9			8.6				4.0		
168-244	7.8 b/	2.0 g/	tr	0.9	10.7			7.8				3.9		
244-320	7.4 b/	2.1 g/	0.1	0.9	10.5			7.3				3.5		

Depth (cm)	Ratios to Clay 8D2			6F1a Gypsum Pct.
	NH <sub>4</sub> OAc CEC	Ext. Iron	15-Bar Water	
0-18	1.24		0.57	
18-36	1.24		0.56	
36-48	1.04		0.45	
48-86	1.21		0.55	
86-132	1.40		0.59	-
132-168	1.39		0.68	
168-244				
244-320				

a/ 5 kg/m<sup>2</sup> to 60 inches (Method 6A).  
b/ KCl-TEA extraction (Method 6N4b).  
c/ KCl-TEA extraction (Method 6O4b).

Soil classification: Torriorthentic Haplustoll; coarse-loamy, mixed, mesic.

Soil series: Busher loamy very fine sand.

Pedon No: S64Wyo-8-8.

Location: Goshen County, Wyoming; Sec. 4, T25N, R64W. Starting at the W $\frac{1}{4}$  corner of Sec. 4, thence south 291 feet to the second telephone pole on the west side of the county road, thence 429 feet east.

Climate: Average annual precipitation is about 15 inches; average annual air temperature is about 49<sup>o</sup> F. Average summer air temperature is about 69<sup>o</sup> F. Frost-free season is 120 to 150 days.

Vegetation and land use: Western wheatgrass, blue gramagrass, prairie sandreed grass, needleandthread grass, Sandberg bluegrass. Rangeland and wildlife habitat.

Parent material: Mixed sand modified by wind action.

Physiography: Sand fall area on leeward side of a hill.

Topography: West facing slope. Gradient is 5 percent.

Drainage: Well drained.

Moisture: Soil moist when sampled.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderately rapid.

Sampled by: Fraser Stephens, R. C. Kronenberger, E. Rivers, Robert B. Grossman, Arvad J. Cline, and Harold Bindschadler - May 21, 1964.

Described by: Arvad J. Cline.

(Colors are for air-dry soil unless otherwise stated)

A11 19436 0 to 18 cm (0 to 7 inches). Grayish brown (10YR 5/2) loamy very fine sand, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable; mildly alkaline (pH 7.4); gradual smooth boundary.

A12 19437 18 to 36 cm (7 to 14 inches). Grayish brown (10YR 5/2) loamy very fine sand, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable; mildly alkaline (pH 7.4) clear wavy boundary.

A13 19438 36 to 48 cm (14 to 19 inches). Grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky that parts to moderate fine granular structure; soft, very friable; mildly alkaline (pH 7.4); clear wavy boundary.

AC 19439 48 to 86 cm (19 to 34 inches). Light brownish gray (10YR 6/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; soft, very friable; mildly alkaline (pH 7.4); gradual wavy boundary.

C1ca 19440 86 to 132 cm (34 to 52 inches). Light brownish gray (10YR 6/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; calcareous; secondary calcium carbonate as soft concretions and coatings on sand grains; moderately alkaline (pH 8.4); diffuse wavy boundary.

C2ca 19441 132 to 168 cm (52 to 66 inches). Light brownish gray (10YR 6/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; calcareous; secondary calcium carbonate occurring as soft rounded masses and thin seams and streaks; moderately alkaline (pH 8.4); diffuse wavy boundary.

C3ca 19442 168 to 244 cm (66 to 96 inches). Light brownish gray (10YR 6/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; calcareous; secondary calcium carbonate occurring as soft rounded masses and as coatings on sand grains; moderately alkaline (pH 8.4); diffuse wavy boundary.

C4ca 19443 244 to 320 cm (96 to 126 inches). Light brownish gray (10YR 6/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; calcareous; calcium carbonate occurring as thin seams and streaks and as coatings on sand grains; moderately alkaline (pH 8.4).

Soil Classification: Torriorthentic Haplustoll, fine-loamy, mixed, mesic  
Series: Connerton1/  
Area: Johnson County, Wyoming.  
Location: SE 1/4, SW 1/4, Sec. 29, T45N, R83W.

19

A1 0 to 22 cm (0 to 9 inches). Reddish brown (5YR 5/3 dry), dark reddish brown (5YR 3/3 moist) loam, weak medium crumb structure, soft, very friable, slightly sticky and slightly plastic; moderate effervescence, pH 8.2; clear and smooth boundary.

C1 23 to 61 cm (9 to 24 inches). Reddish brown (5YR 5/3 dry) silt loam, reddish brown (5YR 4/3 moist); weak coarse angular blocky structure; soft, very friable, slightly sticky and slightly plastic; strong effervescence; pH 8.5; few fine threads of  $\text{CaCO}_3$  and  $\text{CaSO}_4$ ; clear and smooth lower boundary.

C2cacs 61 to 130 cm (24 to 51 inches). Reddish brown (5YR 5/3 dry) silt loam, reddish brown (5YR 4/3 moist); massive structure breaking to weak coarse angular blocks; soft, very friable, sticky and plastic; strong effervescence, pH 8.5, many fine and medium threads of  $\text{CaCO}_3$  and  $\text{CaSO}_4$ , and few large nodules of  $\text{CaCO}_3$  and  $\text{CaSO}_4$ ; gradual and irregular boundary.

C2cacs 130 to 170 cm (51 to 61 inches). Same as above with thin lenses of channery loam 5 to 8 cm thick, and many coarse spots (nodules)  $\text{CaCO}_3$  and  $\text{CaSO}_4$ .

Profile is moist from 61 to 170 cm plus, approximately from water table below. No water table found in deeper borings, but lower part of profile observed to be moist most of the time during the past 4 years.

1/This is the site description for the moisture data on page 137.



**Location:** Lincoln County, Wyoming. 2½ kilometers (1½ miles) west of Thayne, Wyoming. 152 meters (500 feet) south and 6 meters (20 feet) west of the northeast corner of section 21, T. 34 N., R. 119 W. Site located on photo BBL-1EE-120. **Date of Sampling:** October 3, 1969.

**Description by:** C. J. Fowkes. **Collectors:** W. D. Nettleton, W. R. Glenn, C. J. Fowkes, H. B. Ravenholt.

**Classification:** Typic Cryoboralf; fine, montmorillonitic.

**Vegetation:** Aspen grove with understory of grass. Some scattered pines. **Use:** Range. **Climate:** Precipitation is 457 mm (18 inches). Mean annual temperature is 3° C. Average annual soil temperature at 50 cm is 7° C. Average summer soil temperature is 14° C without an 0 horizon.

**Parent Material:** Silty loess materials mantling moderately fine textured sediments wasted from reddish brown sandstone and shale.

**Topography:** Moderately steep mountain sideslope. Slope of 10 percent facing north. Sample site is near the base of the slope.

**Elevation:** 1,890 meters (6,200 feet) above sea level. **Drainage:** Well drained. Runoff is medium. Permeability is moderately slow to slow. **Soil moisture:** Moist at time sampling.

**Remarks:** Field pH determinations by brom cresol purple and brom thymol blue. This sample was not paired.

**HORIZON**

**DESCRIPTION**

0 69658	2 to 0 cm (1 to 0 inch). Pine needles, cones, twigs, and grass litter.
A1 69659	0 to 3 cm (0 to 1 inch). Dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; slightly acid (pH 6.5); abrupt smooth boundary.
A2 69660	3 to 17 cm (1 to 7 inches) light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate medium and fine subangular blocky structure; soft, very friable, non-sticky, nonplastic; slightly acid (pH 6.4); clear smooth boundary.
A & B 69661	17 to 36 cm (7 to 14 inches). Brown (7.5YR 5/2) silt loam, dark brown (7.5YR 4/2) moist; weak very coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; more than half of the ped faces have gray coatings; neutral (pH 6.8); clear smooth boundary.
B & A 69662	36 to 51 cm (14 to 20 inches). Brown (7.5YR 5/2) clay loam, dark brown (7.5YR 4/2) moist; moderate medium subangular blocky structure; hard, friable, very sticky, plastic, thin patchy glassy coatings on ped faces; less than half of the ped faces have gray coatings; neutral (pH 6.6); clear smooth boundary.
B21t 69663	51 to 79 cm (20 to 31 inches). Reddish gray (5YR 5/2) clay, dark reddish gray (5YR 4/2) moist; moderate coarse prismatic structure that parts to moderate coarse angular blocks; extremely hard, extremely firm, very sticky, plastic; thin continuous glassy coatings on all ped faces; some slickensides; very few scattered coarse fragments; neutral (pH 6.8); gradual smooth boundary.
B22t 69664	79 to 106 cm (31 to 42 inches). Reddish gray (5YR 5/2) clay, dark reddish gray (5YR 4/2) moist; moderate medium prismatic structure that parts to strong medium angular blocks; extremely hard, extremely firm, very sticky, plastic; thin continuous glassy coatings on all ped faces; some slickensides; very few scattered coarse fragments; neutral (pH 6.8); gradual smooth boundary.
B31 69665	106 to 152 cm (42 to 60 inches). Reddish gray (5YR 5/2) clay, dark reddish gray (5YR 4/2) moist; weak very coarse prismatic structure that parts to moderate coarse angular blocks; extremely hard, extremely firm, very sticky, plastic; thin continuous glassy coatings on all ped faces; very few scattered coarse fragments; neutral (pH 7.2); gradual smooth boundary.
B32 69666	152 to 188 cm (60 to 74 inches). Same as B31 horizon above. This horizon was subdivided for sampling purposes.
B33 69667	188 to 207 cm (74 to 82 inches). Reddish gray (5YR 5/2) clay, dark reddish gray (5YR 4/2) moist, moderate coarse and medium angular blocky structure; extremely hard, extremely firm, very sticky, plastic; thin continuous glassy coatings on all ped faces; very few scattered coarse fragments; neutral (pH 6.8); gradual wavy boundary.
C 69668	207 to 220 cm (82 to 87 inches). Mixed colors of reddish brown (5YR 5/3) and pale brown (10YR 6/3) clay loam, reddish brown (5YR 4/3) moist and brown (10YR 5/3) moist; massive; hard, firm, sticky, plastic; thin patchy glassy coatings on most ped faces; 35 percent coarse weathered limestone fragments that crush easily between the fingers; medium acid (pH 5.8).

<sup>1/</sup>The Cowdrey series is in a fine, montmorillonitic, family of Typic Cryoboralfs. This pedon is in the same family but has less sand coarser than very fine sand than is typical of the series (Cowdrey has >15 percent fine sand +).

SOIL Creighton fine sandy loam SOIL Nos. S64Wyo-8-10 LOCATION Goshen County, Wyoming  
 SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19444-19451 January 1968  
 GENERAL METHODS: 1A, 1B1b, 2A1, 2B 19514-19519

Depth (cm)	Horizon	Size class and particle diameter (mm)											3A1 Non-Carbonate Clay	Coarse fragments 2A2			
		Total		Sand					Silt					3A1 Non-Carbonate Clay	> 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)					
Pct of < 2 mm																	
0-13	A1	62.8	25.1	12.1	0.5	3.1	3.9	14.3	41.0	18.4	6.7	69.9	21.8	12	tr		
13-36	B2t	68.2	19.0	12.8	0.8	5.6	7.1	21.1	33.6	13.4	5.6	61.9	34.6	13	tr		
36-58	B3	71.6	16.3	12.1	0.8	5.3	8.1	25.3	32.1	11.0	5.3	60.7	39.5	12	tr		
58-86	C1ca	51.1	38.9	10.0	0.4	2.8	3.8	12.5	31.6	23.1	15.8	63.7	19.5	7	tr		
86-132	C2ca	50.3	44.0	5.7	tr	0.6	0.9	8.1	40.7	29.7	14.3	77.5	9.6	6	tr		
132-163	C3ca	72.8	19.6	7.6	0.8	7.0	8.4	25.1	31.5	12.0	7.6	61.5	41.3	8	tr		
163-254	C4ca														tr		
254-406	C5ca														tr		

Depth (cm)	6A1a Organic carbon g/l Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as CaCO3 6B1b 3A1a <0.002 mm Pct.	Bulk density			4D1 COLE	Water content				pH			
						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.	8C1b Sat. Paste	8C1a (1:1)		
0-13	1.18	0.096	12	0.5	-	1.33	1.28	1.32	0.010	8.8	29.0	6.9	0.28			7.3	
13-36	0.59	0.062	10	0.4	tr	1.48	1.43	1.50	0.017	10.1	22.8	6.5	0.23			7.7	
36-58	0.39	0.057	7	0.4	tr	1.43	1.41	1.44	0.007	11.1	20.6	5.8	0.21			7.9	
58-86	0.39			0.3	14	3	1.38	1.36	1.40	0.010	18.5	27.5	10.4	0.22			8.2
86-132	0.13			0.3	9	tr		1.36	1.39	0.007		29.8	8.1	0.30		7.9	8.2
132-163	0.05			0.3	5	tr		1.51	1.52	0.003		20.0	4.3	0.24			8.5
163-254				0.4	5												8.7
254-406				0.3	3												9.1

Depth (cm)	Extractable bases				6H1a Ext. Acidity	CatExch.Cap.		8E1 Resis- tivity ohm-cm	8B1a Elec. Cond. mmhos/cm	8B Water at Sat. Pct.	8D5 Est. Total Salt in Soil ppm	8D3 Ca/Mg	Base saturation		
	6N4b Ca	6O4b Mg	6P2a Na	6Q2a K		Sum	5A3a Sum Cations						5A1a NH4OAc	5C3 Sum Cations	5C1 NH4OAc
	meq/100 g														Pct
0-13	10.9b	2.1c	tr	1.3	14.3	0.9	15.2	13.2				5.2	94	108	
13-36	11.8b	1.9c	tr	1.1	14.8			13.1				6.2		113	
36-58	11.9	2.1	tr	0.8	14.8			12.7				5.7			
58-86	15.4	3.2	0.1	1.0	19.7			14.9				4.8			
86-132	14.5	3.9	0.1	1.0	19.5			15.2	3600	0.40	43.6	112	3.7		
132-163	8.1	4.2	0.2	0.9	13.4			9.1				1.9			
163-254	7.6	5.3	1.2	1.7	17.2			12.9				1.4			
254-406	5.4	2.8	1.7	0.8	10.7			7.7				1.9			

Depth (cm)	Ratios to Clay 8D2			6F1a Gypsum Pct.
	NH4OAc CEC	Ext. Iron	15-Bar Water	
0-13	1.09	0.04	0.57	
13-36	1.02	0.03	0.51	
36-58	1.05	0.03	0.48	
58-86	2.13	0.03	1.04	
86-132	2.67	0.05	1.42	
132-163	1.20	0.04	0.57	
163-254				
254-406				

a/ 8 kg/m<sup>2</sup> to 60 inches (Method 6A).  
 b/ NH4OAc extraction (Method 6N2a).  
 c/ NH4OAc extraction (Method 6O2a).

Field capacity estimates: water was added adjacent to the sampling pit during a period from 12:30 PM, May 21, 1964, to 11:30 AM, May 22, 1964. Samples were collected at 11:00 AM, May 22, 1964. Dry at 57 inches.

LSL No.	Depth (cm)	Percent Water	Field Capacity
19514	0-20	14.6	
19515	20-41	13.4	
19516	41-61	10.5	
19517	81-94	19.7	
<del>19518</del>	109-119	<del>19.6</del>	
19519	132-142	14.8	

Soil classification: Aridic Haplustoll; coarse-loamy, mixed mesic.

Soil series: Creighton fine sandy loam.

Pedon No.: S64Wyo-8-10.

Location: Goshen County, Wyoming; Sec. 17, T21N, R61W; 1,220 feet east and 66 feet south of the NW corner of Sec. 17.

Climate: Average annual precipitation is about 15 inches. Mean annual soil temperature is about 49° F.; mean summer air temperature is about 69° F. Frost-free season is 120 to 150 days.

Vegetation and land use: Needleandthread, western wheatgrass, blue gramagrass, prairie junegrass, Sandberg bluegrass, prairie sandreed grass, and yucca. Rangeland and wildlife habitat.

Parent material: Calcareous, wind-modified sand.

Physiography: Knoll in undulating upland.

Topography: Southwest facing slope. Gradient is 3 percent. Surface is convex.

Drainage: Well to somewhat excessively drained.

Moisture: Moist at time of sampling.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderately rapid.

Sampled by: Fraser Stephens, R. C. Kronenberger, E. Rivers, Robert B. Grossman, Arvad J. Cline, Harold Bindschadler, and Halvor Ravenholt - May 22, 1964.

Described by: Arvad J. Cline.

(Colors are for air-dry soil unless otherwise stated)

A1 19444 0 to 13 cm (0 to 5 inches). Grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable; mildly alkaline (pH 7.6); clear smooth boundary.

B2t 19445 13 to 36 cm (5 to 14 inches). Grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak to moderate coarse prismatic that parts to moderate coarse and medium subangular blocky structure; slightly hard, very friable; thin patchy glossy coatings on horizontal and vertical faces of peds; clay bridging between sand grains and clay coatings on sand grains; mildly alkaline (pH 7.6); gradual smooth boundary.

B3 19446 36 to 58 cm (14 to 23 inches). Grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable; mildly alkaline (pH 7.6); clear wavy boundary.

C1ca 19447 58 to 86 cm (23 to 34 inches). Light gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) moist; weak coarse platy that parts to weak moderate fine subangular blocky structure; slightly hard, very friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; moderately alkaline (pH 8.0); gradual smooth boundary.

C2ca 19448 86 to 132 cm (34 to 52 inches). Light gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; moderately alkaline (pH 8.4); clear smooth boundary.

C3ca 19449 132 to 163 cm (52 to 64 inches). Light gray (10YR 7/2) loamy fine sand, grayish brown (10YR 5/2) moist; massive; soft, very friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; moderately alkaline (pH 8.4); clear smooth boundary.

C4ca 19450 163 to 254 cm (64 to 100 inches). Light gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; moderately alkaline (pH 8.4); clear smooth boundary.

C5ca 19451 254 to 406 cm (100 to 160 inches). Light gray (10YR 7/2) loamy fine sand grayish brown (10YR 5/2) moist; massive; soft, very friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; moderately alkaline (pH 8.4).



Soil classification: Argic Pachic Cryoboroll; fine-silty, mixed.

Series: Decross loam taxadjunct<sup>1</sup>/.

Sample numbers: S66 WYU-10-2 66L247 A1 0-4" P.S.D., mineralogy of sand  
66L248 B2t 10-22" P.S.D., micromineralogy of sand

Area: Johnson County, Wyoming.

Location: SE 1/4 SE 1/4 of Sec. 22, T46N, R85W.

Climate: Average annual precipitation about 20 inches; average annual soil temperature at 20 inches about 38° F.; mean summer soil temperature about 48° F. Snow cover period extends from late November to early June. Soil moisture content approaches wilting point in early August and the soil remains intermittently dry until September 1.

Vegetation: Lupine, big sagebrush, king's fescue, Idaho fescue, columbia needlegrass, cussick's fescue, Alpine bistort and milkvetch.

Parent material: Calcareous, loamy alluvium from soils developing on limestone.

Physiography: Footslopes below steep hillsides. Use - summer sheep range.

Topography: Moderate slope with gradient of about 6 percent and southwest facing. Elevation - 7,900 feet.

Drainage: Well drained; intake and permeability moderate to moderately rapid. Runoff escapes without topographic barriers.

Water table: None evident.

Erosion: None evident.

Moisture: These soils are considered to be moist most of the time when not frozen. They are moist well below 40 inches, and some moisture escapes into the ground water system some years.

Sampled by: C. J. Fowkes, James R. Stephens, R. C. Kroneneberger, Harold Bindschalter and Robert Grossman on June 20, 1966.

A1 66L247 0 to 10 cm (0 to 4 inches). Dark grayish brown (10YR 4/2) when dry; loam; dark brown (10YR 2/2) when moist crushed or broken; strong, very fine, granular structure; soft when dry, very friable when moist, non-sticky and plastic when wet; no effervescence; pH 6.6 (brom thymol blue); clear, smooth boundary.

B1 10 to 23 cm (4 to 9 inches). Dark gray (10YR 4/2) when dry; loam; dark grayish brown (10YR 3/2) when moist crushed or broken; weak to moderate, medium granular structure; slightly hard when dry, very friable when moist, nonsticky and slightly plastic when wet; thin, patchy clay films on all faces of peds; no effervescence; pH 6.8 (brom thymol blue); clear, smooth boundary.

B2t 66L248 23 to 46 cm (9 to 18 inches). Dark grayish brown (10YR 4/2) when dry; clay loam; very dark brown (10YR 2/2) when moist crushed or broken; moderate, medium, prismatic structure disjoints to moderate, medium, subangular blocks; hard when dry, very friable when moist; sticky and plastic when wet; many thin, patchy clay films on all faces of peds; clear, smooth boundary.

B22t 66L248 46 to 76 cm (18 to 30 inches). Dark grayish brown (10YR 4/2) when dry; clay loam; very dark grayish brown (10YR 3/2) when moist crushed or broken; moderate, medium prismatic structure disjoints to moderate, medium, subangular blocks; hard when dry, very friable when moist, sticky and plastic when wet; no effervescence; pH 7.2 (phenol red); clear, wavy boundary.

B3ca 76 to 94 cm (30 to 37 inches). Grayish brown (10YR 5/2) when dry; loam; very dark grayish brown (10YR 3/2) when moist crushed or broken; weak, medium, prismatic structure crumbles to weak and medium, subangular blocks; slightly hard when dry, very friable when moist, slightly sticky and plastic when wet; few thin, patchy clay films on all faces of peds; this is a weak ca horizon with some small lime carbonate concretions; strong effervescence; pH 8.2 (thymol blue); gradual, wavy boundary.

Clca 94 to 152 cm (37 to 60 inches). Light brownish gray (2.5Y 6/2) when dry; loam; dark grayish brown (2.5Y 5/2) when moist crushed or broken; structureless; slightly hard when dry, very friable when moist, nonsticky and slightly plastic when wet; coarse fragments of limestone occupy, by volume, about 5 to 10 percent of soil mass; this is a weak ca horizon with some secondary lime carbonate as soft concretions, thin seams and streaks and as coatings on undersides of rock fragments; strong effervescence; pH 8.2 (thymol blue).

<sup>1</sup>/ The Decross soils are in a fine-loamy, mixed, family of Argic Pachic Cryoborolls. This pedon is a taxadjunct because it has a control section containing less than 15 percent fine and coarse sand.

SOIL CLASSIFICATION-MOLLIC CRYBORALF  
 FINE, MONTMORILLONITIC  
 SERIES - - - - -DELL

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE, MTSC  
 NATIONAL SOIL SURVEY LABORATORY  
 LINCOLN, NEBRASKA  
 JUNE 1977

SOIL NO - - - - - 566WYO-10-5 COUNTY - - - JOHNSON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 66L251-66L252

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO		
		SAND	SILT	CLAY	CLAY	VCOS	QORS	MEDS	FNES	VFNS	CO5I	FNSI	VFSI	TEXT	INTR		FINE	NON-
CM		(.05	.05	.002	.0002	1	.5	.25	.10	.05	.02	.005	SAND	.2	TO	CLAY	TO	CLAY
013-020	A2																	
028-043	B2T	14.9	45.1	40.0	30.6	.1	.2	.3	1.6	12.7	24.9	20.2		2.2	38.9			.42

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2										BULK DENSITY				WATER CONTENT				CARBONATE			
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3	OVEN	COLE	1/10	1/3	15	WRD	6E1B	3A1A	8C1A	8C1E				
CM	PCT	PCT	PCT	PCT	LT 75	PCT	BAR	DRY	G/CC	PCT	PCT	PCT	CM	PCT	PCT	H2O	CACL					
013-020														9.1								
028-043														16.9				6.9				

DEPTH	ORGANIC MATTER		IRON	PHCS	EXTRACTABLE BASES 5B4A				ACTY	AL	CAT EXCH				RATIO	RATIO	CA	BASE SAT		
	6A1A	6B1A			C/N	6C2B	6N2A	6O2A			6P2B	6Q2B	6H1A	6G1E				5A3A	5A6A	8D1
CM	PCT	PCT	PCT	PCT	TOTL	CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	CA	SAT	EXTB	NHAC	
013-020																				
028-043					18.0	9.4	.1	.8	28.3					28.7	.72					99

Soil classification: Mollic Cryoboralf; fine, montmorillonitic.

Soil series: Dell loam taxadjunct<sup>1</sup>/<sub>1</sub>.

27

Pedon No.: S66Wyo-10-5.

Location: Johnson County, Wyoming; SW<sup>1</sup>/<sub>4</sub>, NW<sup>1</sup>/<sub>4</sub> of Sec. 23, T45N, R85W; up trail from Flagle sawmill. Site marked by planted post.

Climate: Average annual precipitation is about 20 inches; average annual soil temperature is about 38° F. Mean summer soil temperature is about 48° F. Snow cover period extends from late October to mid-June. Elevation is about 8,510 feet.

Vegetation and land use: Lodgepole pine, white fir, gooseberry, lupine, and fescue species. The understory is unusually dense for a forest-covered area. Used for summer sheep ranch, recreation, and wildlife habitat.

Parent material: Calcareous loamy slope creep material from limestone.

Physiography: Rather steep, rolling mountain slope.

Topography: Northeast facing slope. Gradient is 15 percent.

Drainage: Well drained.

Moisture: Moist at time of sampling.

Ground water: Deep.

Erosion: None to slight.

Permeability: Moderate.

Sampled by: C. J. Fowkes, James Stephens, R. C. Kronenberger, Harold Bindschadler, and Robert Grossman.

Described by: Harold Bindschadler - June 21, 1966.

(Colors are for air-dry soil unless otherwise stated)

O1 3 to 0 cm (1 to 0 inch). Forest duff and decomposed plant materials.

A1 0 to 13 cm (0 to 5 inches). Grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky, plastic; 5 percent partially weathered coarse fragments of limestone; slightly acid (pH 6.4); abrupt smooth boundary.

A2 66L251 13 to 20 cm (5 to 8 inches). Very pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium platy structure; soft, very friable, nonsticky, plastic; 5 percent coarse limestone fragments; neutral (pH 6.6); abrupt smooth boundary.

B & A 20 to 28 cm (8 to 11 inches). Brown (7.5YR 5/2) clay loam, dark brown (7.5YR 3/2) moist; moderate medium and fine subangular blocky structure; slightly hard, very friable, sticky, plastic; 5 percent coarse limestone fragments; 50 percent of ped faces have mottlings of bleached sand and silt; neutral (pH 6.6); clear wavy boundary.

B2t 66L252 28 to 43 cm (11 to 17 inches). Light brown (7.5YR 6/4) clay loam, brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky, plastic; continuous glossy coatings on all faces of peds; streaks of organic stains; 5 percent coarse fragments of limestone; neutral (pH 6.8); clear wavy boundary.

B3l 43 to 61 cm (17 to 24 inches). Light brown (10YR 6/3) gravelly clay loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, sticky, plastic; 50 percent coarse limestone fragments; patchy glossy coatings on all faces of peds; organic streaks on vertical faces of peds; mildly alkaline (pH 7.4); clear wavy boundary.

B32 61 to 81 cm (24 to 32 inches). Light brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, plastic; 25 percent coarse limestone fragments; mildly alkaline (pH 7.4); clear wavy boundary.

C1 81 to 117 cm (32 to 46 inches). Light brown (10YR 6/4) gravelly loam, brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, sticky, plastic; 30 percent coarse limestone fragments; strongly effervescent; moderately alkaline (pH 8.2);

<sup>1</sup>/<sub>1</sub> Dell soils has higher color values or chromas in the surface horizons than this pedon. Dell soils are Typic Cryoboralfs.

SOIL Dwyer loamy fine sand SOIL Nos. S64Wyo-8-7 LOCATION Goshen County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19430-19435 January 1968  
GENERAL METHODS: 1A, 1B1b, 2A1, 2B 19507-19512

Depth cm	Horizon	Size class and particle diameter (mm)											Coarse fragments <u>2A2</u>					
		Total		Sand					Silt				Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	> 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	0.02-0.002	Pct.						
0-23	A11	84.4	7.8	7.8	0.1	1.2	3.3	27.6	52.2	5.8	2.0	80.8	32.2					tr
23-43	A12	85.5	6.8	7.7	0.4	2.8	5.8	30.0	46.5	4.9	1.9	75.5	39.0					tr
43-61	AC	85.7	6.7	7.6	0.3	2.2	5.0	30.7	47.5	4.8	1.9	77.2	38.2					tr
61-94	C1	87.8	6.0	6.2	0.5	2.9	5.7	30.2	48.5	4.1	1.9	77.0	39.3					tr
94-145	C2ca	86.6	7.8	5.6	0.9	3.6	4.9	26.3	50.9	5.2	2.6	77.9	35.7					3
145-175	C3ca	88.1	6.3	5.6	1.0	4.7	7.0	30.3	45.1	4.2	2.1	73.3	43.0					3

Depth cm	6A1a Organic carbon a/ Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as CaCO <sub>3</sub>			Bulk density			4D1 COLE	Water content				pH	
					6E1b Pct.	3A1a Field State	3A1b 1/10- Bar	4A1a g/cc	4A1g g/cc	4A1b Air- Dry g/cc		4B4 Field State Pct	4B1c 1/10- Bar Pct	4B2 15- Bar Pct	4C2 1/10- 15- Bar in/in.	8C1b Sat. Paste	8C1a (11)
0-23	0.50	0.049	10	0.2	-			1.48	1.45	1.48	0.007	5.9	26.5	4.1	0.32		7.2
23-43	0.31	0.037	8	0.3	tr			1.46	1.45	1.47	0.003	7.7	20.6	4.0	0.24		7.9
43-61	0.27			0.2	tr			1.45	1.45					4.7			8.2
61-94	0.20			0.2	1			1.45	1.45			8.3		4.2			8.2
94-145	0.16			0.2	3	tr		1.47	1.45	1.46	0.003	5.6	23.7	5.3	0.27	7.8	8.3
145-175	0.08			0.2	3	tr								4.3			8.5

Depth cm	Extractable bases 5B1a					6H1a Ext. Acidity	CatExch. Cap.		8E1 Resis- tivity ohms- cm.	8B1a Elec. Cond. mmhos/ cm.	8B Water at Sat.	8D5 Est. Total Salt in Soil ppm.	8D3 Ca/Mg	Base saturation	
	6N4b Ca	6O4b Mg	6P2a Na	6Q2a K	Sum		5A3a Sum Cations	5A1a NH <sub>4</sub> OAc						5C3 Sum Cations	5C1 NH <sub>4</sub> OAc
0-23	7.1	1.6	0.1	0.8	9.6	0.9	10.5	9.8					4.4	91	98
23-43	7.7	1.4	0.1	0.9	10.1			9.7					5.5		104
43-61	9.9	1.6	tr	0.8	12.3			10.7					6.2		115
61-94	9.5	1.7	tr	1.0	12.2			10.3					5.6		
94-145	10.7	2.6	tr	0.9	14.2			10.9		4100	0.44	35.5	100	4.1	
145-175	9.7	1.5	tr	0.7	11.9			9.0					6.5		

Depth cm	Ratios to Clay 8D2			6F1a Gypsum Pct.
	NH <sub>4</sub> OAc CEC	Ext. Iron	15-Bar Water	
0-23	1.26	0.03	0.53	
23-43	1.26	0.04	0.52	
43-61	1.41	0.03	0.62	
61-94	1.66	0.03	0.68	
94-145	1.95	0.04	0.95	-(s)
145-175	1.61	0.04	0.77	

<sup>a</sup>/5 kg/m<sup>2</sup> to 57 inches (Method 6A).  
<sup>b</sup>/ Estimated.

Field capacity Estimates: Water was added adjacent to the sampling pit during a period from 1:00 PM, May 20, 1964, to about 2:00 PM, May 22, 1964. Samples were collected at 1:30 PM, May 25, 1964.

LSL No.	Depth cm	Percent Water Field Capacity
19507	0-20	10.7
19508	20-41	10.2
19509	41-61	11.2
19510	81-99	11.5
19511	112-127	13.4
19512	142-155	11.7

Soil classification: Ustic Torripsamment; mixed, mesic.

Soil series: Dwyer loamy fine sand.

Pedon No.: S64Wyo-8-7.

Location: Goshen County, Wyoming; Sec. 33, T26N, R64W. Start at the southwest corner of Sec. 33, thence 1,232 feet on northwest angling fence to the intersection of the northeast angling fence, thence 380 feet along northeastern tending fence, thence 248 feet east.

Climate: Average annual precipitation is about 15 inches. Mean annual air temperature is about 49° F., mean summer air temperature is about 69° F. Frost-free season is 120 to 150 days.

Vegetation and land use: Western wheatgrass, blue gramagrass, prairie sandreedgrass, needleandthread grass, Sandberg bluegrass, and sagebrush. Rangeland and wildlife habitat.

Parent material: Mixed sand modified by wind action.

Physiography: Sand fall area on leeward side of a hill.

Topography: West facing slope. Gradient is 4 percent. Surface is concave.

Drainage: Well drained.

Moisture: Soil moist when sampled.

Ground water: Deep.

Erosion: Slight.

Permeability: Rapid.

Sampled by: Fraser Stephens, R. C. Kronenberger, E. Rivers, Robert B. Grossman, Arvad J. Cline, and Harold Bindschadler - May 20, 1964.

Described by: Arvad J. Cline.

(Colors are for air-dry soil unless otherwise stated)

A12 19430 0 to 23 cm (0 to 9 inches). Grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable; mildly alkaline (pH 7.4); gradual smooth boundary.

A12 19431 23 to 43 cm (9 to 17 inches). Grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; soft, very friable; weakly calcareous; mildly alkaline (pH 7.6); gradual smooth boundary.

AC 19432 43 to 61 cm (17 to 24 inches). Grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; weakly calcareous; mildly alkaline (pH 7.6); gradual wavy boundary.

C1 19433 61 to 94 cm (24 to 37 inches). Grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; weakly calcareous; mildly alkaline (pH 7.8); gradual smooth boundary.

C2ca 19434 94 to 145 cm (37 to 57 inches). Light gray (2.5Y 7/2) loamy fine sand, grayish brown (2.5Y 5/2) moist; massive; soft, very friable; a few sandstone fragments; calcareous; secondary calcium carbonate occurs as soft concretions and in thin seams and streaks; moderately alkaline (pH 8.0); diffuse wavy boundary.

C3ca 19435 145 to 175 cm (57 to 69 inches). Light gray (2.5Y 7/2) loamy fine sand, grayish brown (2.5Y 5/2) moist; massive; soft, very friable; a few sandstone fragments; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; calcareous; moderately alkaline (pH 8.2);

SOIL CLASSIFICATION-TYPIC HAPLARGID  
COARSE-LOAMY, MIXED, MESIC  
SERIES - - - - - EMO

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE, MISC  
NATIONAL SOIL SURVEY LABORATORY  
LINCOLN, NEBRASKA  
JUNE 1977

SOIL NO - - - - - S65WYO-7-14 COUNTY - - - FREMONT

GENERAL METHODS - - 1A, 1B1, 2A1, 2B SAMPLE NOS. 20872-20896  
20972-20978

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, L <sub>1</sub> 2MM, 3A1, 3A1A, 3A1B												RATIO						
		SAND	SILT	CLAY	CLAY	CLAY	VCOS	CORS	NEDS	FNES	VFWS	COSI	FNSI	VPSI	TEXT	FI	FINE	NON-	SD1	
CM		2-	.05-	L <sub>1</sub>	L <sub>1</sub>	2-	1-	.5-	.25-	.10-	.05	.02	.005-	SAND	.2-	.02	CLAY	CO3-	15-	
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-.1	.02	CLAY	CLAY	CLAY	BAR	
		PCT																		
000-010	A1	87.4	7.8	4.8		.8	14.3	28.2	34.8	9.3	5.7	2.1		78.1	28.7				5	.50
010-025	B1	85.5	5.9	8.6		.8	12.8	27.7	35.4	8.8	3.4	2.5		76.7	26.3				9	.47
025-041	B21 <sub>A</sub>	85.7	5.5	8.8		2.3	14.1	26.9	34.5	7.9	3.1	2.4		77.8	24.7				9	.50
041-058	B22 <sub>A</sub>	67.7	14.0	18.3		1.5	8.9	17.6	27.2	12.5	5.9	8.1		55.2	30.8				18	.52
058-079	C1CA	64.8	18.1	17.1		.4	8.6	15.6	27.0	13.2	5.8	12.3		51.6	32.0				16	.63
079-107	C2CA	71.1	16.2	12.7		.5	14.8	18.7	25.7	11.4	6.2	10.0		59.7	29.9				13	.58
107-152	C3CA	71.3	15.4	13.3		.3	14.0	24.3	23.6	9.1	6.5	8.9		62.2	25.5				13	.62

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2												BULK DENSITY				WATER CONTENT				CARBONATE								
	VOL.		WEIGHT		L <sub>1</sub>		20-2		1/3-		OVEN		COLE		1/10		1/3-		WRD		6B1B		3A1A		8C1A		8C1E		
CM	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	
000-010																													
010-025																													
025-041																													
041-058																													
058-079																													
079-107																													
107-152																													

DEPTH	ORGANIC MATTER			IRON	PHOS	EXTRACTABLE BASES 5B4A				ACTY	AL	CAT EXCH		RATIO	RATIO	CA	BASE SAT												
	6A1A	6B1A	C/N			6C2B	6N2A	6O2A	6P2B			6Q2B	6H1A				6G1E	5A3A	5A6A	8D1	8D3	5P1	5C3	5C1					
CM	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>	PC <sub>A</sub>						
000-010	.43	.034	13																										
010-025	.28	.030	9																										
025-041	.21																												
041-058	.30																												
058-079	.18																												
079-107	.04																												
107-152	.04																												

DEPTH	SATURATED PASTE				NA	NA	SALT	GYP	SATURATION EXTRACT 8A1								ATTERBERG												
	8E1	8C1B	8A	5D2					5E	8D5	6F1A	8A1A	6N1B	6O1B	6P1B	6Q1B	6I1A	6J1A	6K1A	6L1A	6M1A	4P1	4P2						
CM	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
000-010																													
010-025																													
025-041																													
041-058	2100	7.5	37.7				120		.50																				
058-079																													
079-107																													
107-152	2600	8.4	33.7		29	150			.68																				

DEPTH	WATER
CM	PCT
000-13	10.4
013-28	9.0
028-51	8.4
051-76	8.7
076-102	8.1
102-130	8.7
130-152	10.4

(A) 1/10-BAR (METHOD 4A1G).

SOIL NO - - - - - S65W0-7-13 COUNTY - - - - - FREMONT

GENERAL METHODS - - - - - IA, 1B1B, 2A1, 2B SAMPLE NOS. 20899-20907

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO			
		SAND 2- .05	SILT .05- .002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2- 1	CORS 1- .5	MEDS .5- .25	FNES .25- .10	VFNS .10- .05	COSI .05 .02	FNSI .02 .002	VFSI .002 .002	FAML 2- .1	INTR .02	FINE CLAY TO CLAY	NON- CO3- TO CLAY	8D1 15- BAR TO CLAY	
000-005	A1	40.5	39.0	20.5	5.7	.9	3.6	4.2	11.0	20.8	19.2	19.9	19.7	46.8	28	21	.46		
005-010	B11	36.3	32.3	31.4		.9	2.5	3.6	10.7	18.6	16.1	16.2	17.7	41.4		31	.41		
010-015	B12	39.1	33.1	27.8		1.6	4.1	4.6	11.5	17.3	16.1	17.0	21.8	40.3		28	.45		
015-028	B21T	39.3	32.9	27.8	6.9	1.7	5.0	5.2	11.7	15.7	15.6	17.3	23.6	38.1	25	26	.45		
028-036	B22T	42.8	28.6	28.6		1.3	4.8	6.4	15.4	14.9	12.4	16.2	27.9	36.3		27	.43		
036-053	B3CA	54.2	19.5	26.3		4.1	8.3	10.2	20.5	11.1	7.4	12.1	43.1	29.6		21	.46		
053-099	C1CA	68.6	16.4	15.0		15.9	17.6	9.5	15.8	9.8	7.4	9.0	58.8	25.8		7	.47		
099-135	C2CA	92.6	5.2	2.2		23.6	45.3	12.3	8.4	3.0	2.6	2.6	89.6	9.2		2			
135-165	C3CA	95.6	3.1	1.3		16.7	47.6	17.2	11.2	2.9	1.8	1.3	92.7	9.3		1			

DEPTH CM	PARTICLE SIZE ANALYSIS, MM, 38, 3B1, 3B2										BULK DENSITY				WATER CONTENT				CARBONATE			
	GT 75	20-75	20-5	5-2	LT .074	20-2 PCT	1/3- BAR	OVEN DRY	COLE G/CC	4A1D G/CC	4A1H G/CC	401 G/CC	4B1C PCT	4B1C PCT	4B2 PCT	4C1 CM	6E1B PCT	3A1A PCT	8C1A H2O	8C1E CACL		
000-005						14								9.4		TR				7.5		
005-010						7	1.22	1.43	.053				38.0	13.0	.30		TR			7.7		
010-015						7	1.23	1.45	.055				33.0	12.6	.25		4			8.0		
015-028						4	1.32	1.48	.039				26.9	12.5	.19		6	2		8.1		
028-036						7	1.38	1.56	.041				25.1	12.3	.17		7	2		8.2		
036-053						22								12.0			20	5		8.3		
053-099						52								7.0			30	8		8.6		
099-135						57								2.4			7	TR		8.0		
135-165						54								2.2			4			8.7		

DEPTH CM	IRON		PHGS TOTL	EXTRACTABLE BASES 5B4A- -)				ACTY		AL KCL	CAT EXCH		RATIO NHAC	RATIO NHAC	CA SAT	(BASE SAT)		
	6A1A PCT	6B1A PCT		6M1B CA	6O1B MG	6P2B NA	6Q2B K	SUM EXTB	6H1A TEA		6G1E EXT	5A3A EXTB				5A6A ACTY	8D1 TO	8D3 TO
000-005	1.04	.094	11			12.5	5.6	TR	1.6	19.7	1.5	21.2	19.8	.94			93	99
005-010	.95	.098	10			17.4	6.7	.1	1.5	25.7	1.5	27.2	24.3	.78			94	106
010-015	.76	.086	9				6.4	.1	1.0				21.8	.78				
015-028	.59	.064	9				6.6	.2	.7				20.5	.79				
028-036	.54	.057	9	.3			6.7	.3	.7				21.4	.79				
036-053	.58	.057	10				5.6	.6	.5				17.0	.81				
053-099	.29						2.2	1.1	.2				7.2	1.03				
099-135	.07						1.1	1.4	.1				5.0	2.50				
135-165	.03						1.4	.8	.1				4.0	4.00				

DEPTH CM	(SATURATED PASTE)			NA 5D2	SE SAR	SALT TOTL SOLU	GYP 6F1A	SATURATION EXTRACT				ATTERBERG						
	8E1 PH	8C1B H2O	8A ESP					8A1A EC	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	4F1 LQID
000-005																		
005-010																		
010-015																		
015-028																		
028-036	1800	7.6	44.4			170	.59											
036-053																		
053-099																		
099-135																		
135-165																		

DEPTH CM	(COARSE FRAGMENTS 3B1)				DEPTH CM	WATER 4B4 FIELD STATE PCT
	8E1 PCT	8C1B PCT	8A PCT	5D2 PCT		
076-91	6	40	28	32	000-10	21.4
112-142	27	42	25	29	010-25	23.6
191-229	11	41	22	37	025-38	21.4
					038-51	20.2
					051-76	19.4
					076-109	19.7
					109-124	15.9

CLAY MINERALOGY (7A2C).  
 000-5 CM A1 A1 CONTAINS A SMALL AMOUNT OF MONTMORILLONITE AND A SMALL AMOUNT OF A VERMICULITE-LIKE MINERAL, BOTH POORLY ORDERED. B21T CONTAINS A SMALL TO MODERATE AMOUNT OF FAIRLY WELL-ORDERED MONTMORILLONITE. TRACE TO SMALL AMOUNTS OF WELL-ORDERED MICA AND KAOLINITE IN BOTH HORIZONS. CLAY MINERALOGY IS MONTMORILLONITIC.

Soil classification: Typic Haplargid; coarse-loamy, mixed, mesic.

31

Soil series: Enos loamy sand.

Pedon No.: S65Wyo-7-14.

Location: Fremont County, Wyoming; SE $\frac{1}{4}$ , NE $\frac{1}{4}$  of Sec. 28, T3N, R1E. Start at intersection of Pilot Butte Power Plant access and county road. Proceed 693 feet in northwest traverse to top of ridge with outcroppings of sandstone. TL2 photo CCK-13N-82.

Climate: Average annual precipitation is about 9 inches. Average annual soil temperature is about 51° F. Frost-free period is 120 to 140 days. Elevation is about 5,450 feet.

Vegetation and land use: Big sagebrush, blue gramagrass, bluestem wheatgrass, Indian ricegrass, needleand-thread grass, and Sandberg bluegrass. Rangeland and wildlife habitat.

Parent material: Residuum weathered from calcareous sandstone.

Physiography: Ridge crest.

Topography: Gradient is 2 percent.

Drainage: Well drained.

Moisture: Dry at time of sampling.

Ground water: Deep.

Erosion: Surface winnowed by actions of wind and water.

Permeability: Moderately rapid.

Sampled by: C. J. Fowkes, J. F. Young, Robert B. Grossman, Dean McMurtry, and Harold Bindschadler - Oct. 27, 1965.

Described by: Harold Bindschadler - October 27, 1965.

(Colors are for air-dry soil unless otherwise stated)

A1 20892 0 to 10 cm (0 to 4 inches). Pale brown (10YR 6/3) fine sand, brown (10YR 4/3) moist; single grained; loose, nonsticky, nonplastic; neutral (pH 7.0); abrupt wavy boundary.

B1 20893 10 to 25 cm (4 to 10 inches). Light yellowish brown (10YR 6/4) loamy sand, dark yellowish brown (10YR 4/4) moist; single grained; soft, very friable, nonsticky, nonplastic; neutral (pH 7.1); abrupt wavy boundary.

B2t 20894 25 to 41 cm (10 to 16 inches). Pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; moderate coarse prismatic that parts to weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; clay bridging between sand grains; neutral (pH 7.2); abrupt wavy boundary.

B22t 20895 41 to 58 cm (16 to 23 inches). Light brownish gray (5Y 6/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; strong coarse prismatic that parts to weak coarse and medium subangular blocky structure; hard, very friable, slightly sticky, slightly plastic; glossy coatings on vertical faces of peds; mildly alkaline (pH 7.4); abrupt wavy boundary.

C1ca 20896 58 to 79 cm (23 to 31 inches). Varicolored light gray (5Y 7/1) and greenish yellow (5GY 6/1) loam, gray (5Y 5/1) moist; massive; hard, very friable, slightly sticky, plastic; some thin soft flakes of limestone; strongly effervescent; secondary lime in reticulate form; strongly alkaline (pH 8.8); abrupt smooth boundary.

C2ca 20897 79 to 107 cm (31 to 42 inches). Varicolored light gray (5Y 7/1) and greenish yellow (5GY 7/1) limestone, gray (5Y 6/1) moist; strong medium platy structure; hard, friable; strongly effervescent; fissures filled with secondary lime and gypsum; strongly alkaline (pH 8.8); abrupt smooth boundary.

C3ca 20898 107 to 152 cm (42 to 60 inches). Gray, noncalcareous medium grained sandstone; fissures and cracks filled with hard secondary carbonates.

Remarks: Hues of 5Y and 5GY are judged to be relict and not indicative of current active reduction conditions. Soil temperature at 20 inches was 51° F. In view of the similarities and morphologies of the Enos and Wall soils, samples for moisture tension evaluation were taken from a profile of the Wall series. Samples of soils for moisture tension evaluation were taken from the pedogenic horizons at the following depths from the Wall profile:

A1 - 0 to 5 inches	C1ca - 20 to 51 inches (This horizon was
B2t - 5 to 11 inches	subdivided into three separate but not
B3 - 11 to 20 inches	composite subsamples.)
	C3ca - 51 to 60 inches

The moisture study samples were taken from a Wall series profile located in the SW $\frac{1}{4}$ , NE $\frac{1}{4}$  of Sec. 20, T3N, R1E, Fremont County, Wyoming.

SOIL CLASSIFICATION-TYPIC HAPLARGID  
COARSE-LOAMY, MIXED, MESIC  
SERIES - - - - -ENOS

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE, MTSC  
NATIONAL SOIL SURVEY LABORATORY  
LINCOLN, NEBRASKA  
JUNE 1977

SOIL NO - - - - - S65WYO-7-15 COUNTY - - - - - FREMONT

GENERAL METHODS- - - - - 1A,1B1B,2A1,2B SAMPLE NOS. 20942-20948

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B													RATIO			
		SAND	SILT	CLAY	FINE	SAND	SILT	FAM	INTR	FINE	NON-	801						
CM		2-	.05-	.002	1	2-	1-	.5-	.25-	.10-	.05	.02	.002	2-1	.02	TO	TO	TO
		PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT
000-005	A1	72.1	17.2	10.7	1.8	10.8	14.7	26.9	17.9	11.0	6.2	54.2	42.7			11	.46	
005-015	B1	71.1	12.8	16.1	1.9	10.6	15.0	27.6	16.0	7.5	5.3	55.1	37.6			16	.42	
015-025	B2T	70.2	13.2	16.6	2.0	11.0	15.1	25.8	16.3	7.6	5.6	53.9	37.0			17	.43	
025-046	B3CA	67.3	16.5	16.2	3.0	12.5	15.2	22.9	13.7	9.6	6.9	53.6	34.8			16	.45	
046-061	C1CA	63.7	18.7	17.6	4.1	10.8	15.3	23.3	12.2	9.0	9.7	51.5	32.9			16	.49	
061-102	C2CA																	
102-140	C3CA																	

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2										BULK DENSITY			WATER CONTENT			CARBONATE		
	4A1D	4A1H	4D1	4B1C	4B1C	4B2	4C1	6E1B	3A1A	8C1A	8C1E								
CM	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT		
000-005	TR																7.3		
005-015	TR	1.54	1.63	.019			18.9	6.7	.19			0					7.3		
015-025	TR	1.45	1.52	.016			19.6	7.2	.18			TR					7.9		
025-046	1	1.44	1.52	.018			22.0	7.5	.21			3	TR				8.2		
046-061	3	1.55	1.66	.023			19.1	8.6	.16			5	2				8.3		
061-102								7.5				4					9.0		
102-140								13.0				1					8.5		

DEPTH	ORGANIC MATTER		IRON	PHOS	EXTRACTABLE BASES				ACTY	AL	CAT EXCH		RATIO	RATIO	CA	BASE SAT	
	6A1A	6B1A			6C2B	6N2A	6O4B	6P2B			6Q2B	6H1A				6G1E	5A3A
CM	PCT	PCT	PCT	PCT	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	PCT	PCT
000-005	.44	.044	10		5.7	2.7	TR	.6	9.0	1.3	10.3	9.3	.87			97	97
005-015	.44	.051	9		9.9	3.7	.1	.5	14.2	1.3	15.5	14.4	.89			92	99
015-025	.40	.046	9	.3	11.1	4.1	.1	.5	15.8	1.0	16.8	15.9	.96			94	99
025-046	.36				4.2	.2	.4					14.1	.87				
046-061	.33				5.0	.4	.4					15.0	.85				
061-102					4.0	4.4	.5					18.5					
102-140					7.9	6.8	.9					33.2					

DEPTH	SATURATED PASTE			NA	SE	SALT	GYP	SATURATION EXTRACT								ATTERBERG			
	8E1	8C1B	8A					502	5E	8D5	8A1A	8N1B	8O1B	8P1B	8Q1B		8I1A	8J1A	8K1A
CM	PH	H2C	ESP	SAR	TOTL	SOLU	PPM	CM	CM	CM	CM	CM	CM	CM	CM	CM	CM	CM	CM
000-005																			
005-015																			
015-025																			
025-046	2800	7.7	31.9			120		.57											
046-061																			
061-102																			
102-140	810	7.9	43.7	18		750		2.50		18.0									

DEPTH	WATER
CM	FIELD STATE PCT
000-5	14.0
005-25	16.0
025-41	16.6
041-58	17.9

Soil classification: Typic Haplargid; coarse-loamy, mixed, mesic.

Soil series: Enos fine sandy loam.

Pedon No.: S65 Wyo-7-15.

Location: Fremont County, Wyoming; NW $\frac{1}{4}$ , NE $\frac{1}{4}$ , NE $\frac{1}{4}$  of Sec. 20, T3N, R1E. Start at the intersection of two roads at the northeast corner of Sec. 20. Proceed west 906 feet, thence 87 feet south. TL4 photo CCK-24N-138.

Climate: Average annual precipitation is about 9 inches. Average annual soil temperature is about 51° F. Frost-free period is 120 to 140 days. Elevation is about 5,450 feet.

Vegetation and land use: Big sagebrush, blue gramagrass, Sandberg bluegrass, bluestem wheatgrass, needleand-thread grass, Indian ricegrass. Rangeland and wildlife habitat.

Parent material: Residuum weathered from calcareous interbedded sandstones and shales.

Physiography: Gently undulating upland.

Topography: South facing slope. Gradient is 3 percent.

Drainage: Well drained.

Moisture: Dry at time of sampling.

Ground water: Deep.

Erosion: Surface winnowed by actions of wind and water.

Permeability: Moderately rapid.

Sampled by: C. J. Fowkes, J.F. Young, Robert B. Grossman, Dean McMurtry, and Harold Bindschadler - Oct. 27, 1965.

Described by: Harold Bindschadler - October 27, 1965.

(Colors are for air dry soil unless otherwise stated.)

A1 20942 0 to 5 cm (0 to 2 inches). Pale brown (10YR 6/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine crumb structure; soft crust at surface; soft, very friable, nonsticky, nonplastic; neutral (pH 7.0); abrupt smooth boundary.

B1 20943 5 to 15 cm (2 to 6 inches). Light yellowish brown (10YR 6/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic that parts to weak medium platy structure; hard, friable, slightly sticky, plastic; patchy glossy coatings on faces of peds; neutral (pH 7.0); abrupt wavy boundary.

B2t 20944 15 to 25 cm (6 to 10 inches). Light yellowish brown (10YR 6/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; strong coarse prismatic that parts to moderate coarse subangular blocky structure; hard, friable, sticky, plastic; continuous glossy and patchy waxy coatings on all faces of peds, organic stains on vertical faces of peds; neutral (pH 7.3); abrupt wavy boundary.

B3ca 20945 25 to 46 cm (10 to 18 inches). Pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; strong coarse prismatic that parts to moderate coarse subangular blocky structure; hard, very friable, slightly sticky, plastic; patchy glossy coatings on vertical faces of peds; few pebbles with lime encrustations on undersides; few krotovina; strongly effervescent, lime mainly disseminated; strongly alkaline (pH 8.5); clear wavy boundary.

C1ca 20946 46 to 61 cm (18 to 24 inches). Very pale brown (10YR 7/3) sandy loam, brown (10YR 5/3) moist; weak coarse prismatic structure; hard, very friable, slightly sticky, plastic; few partially disintegrated sandstone pebbles; few krotovina; violently effervescent; many fine soft rounded masses of secondary lime; strongly alkaline (pH 8.7); abrupt smooth boundary.

C2ca 20947 61 to 102 cm (24 to 40 inches). Greenish yellow (5GY 7/1) medium green sandstone with secondary carbonate in seams and fissures; abrupt smooth boundary.

C3ca 20948 102 to 140 cm (40 to 55 inches). Thin platy structured bedrock sandstone.

R 140 to 152 cm (55 to 60 inches). Hard, fine grained sandstone.

Remarks: Rodent tunnels were observed in the C1ca and the C3ca horizons. Soil temperatures at 20 inches were 51° F. at 40 inches 53° F. An area about 8 x 8 adjacent to the sampling pit was dyked and wetted by applying about 12 inches of water. Samples for moisture determination were collected approximately 48 hours after wetting. The moist dry interface occurred at 25 inches. The results for the moisture samples were reported on the accompanying data sheet.

Soil classification: Typic Haplargid; fine-loamy, mixed, mesic.

Soil series: Ethete taxadjunct.

Pedon No.: S65Wyo-7-13.

Location: Fremont County, Wyoming; SW $\frac{1}{4}$ , SW $\frac{1}{4}$  of Sec. 29, T3N, R1E. Start at auto gate on U.S. 26 northeast of Morton, Wyoming. Travel westward 723 feet along fence line, thence 54 feet north. TLI photo CCK-24N-139.

Climate: Average annual precipitation is about 9 inches. Average annual soil temperature is 51° F. Frost-free period is 120 to 140 days. Elevation is about 5,450 feet.

Vegetation and land use: Big sagebrush, bluestem wheatgrass, Sandberg bluegrass, Indian ricegrass, and bird-foot sagebrush. Rangeland and wildlife habitat.

Parent material: Calcareous, mixed loamy alluvium which contains a small amount of gravel.

Physiography: Intermediate river terrace.

Topography: Microundulating surface. Gradient is less than 1 percent.

Drainage: Well drained.

Moisture: Dry at time of sampling.

Ground water: Deep.

Erosion: Surface winnowed by action of wind and water.

Permeability: Moderate.

Sampled by: J. E. Hams, C. J. Fowkes, J. F. Young, Robert B. Grossman, Dean McMurtry, and Harold Bindschadler - October 26, 1965.

Described by: Harold Bindschadler - October 26, 1965.

(Colors are for air-dry soil unless otherwise stated)

A1 20899 0 to 5 cm (0 to 2 inches). Light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine platy that parts to weak fine crumb structure; thin soft vesicular crust; soft, very friable, nonsticky, slightly plastic; 10 percent pebbles; mildly alkaline (pH 7.5); abrupt smooth boundary.

B11 20900 5 to 10 cm (2 to 4 inches). Brown (7.5YR 5/3) clay loam, dark brown (7.5YR 4/3) moist; moderate fine granular structure; loose, very friable, sticky, plastic; 8 percent pebbles; moderately alkaline (pH 7.9); abrupt wavy boundary.

B12 20901 10 to 15 cm (4 to 6 inches). Brown (7.5YR 5/3) clay loam, dark brown (7.5YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky, plastic; 10 percent pebbles; moderately effervescent; thin encrustations of lime carbonate on undersides of pebbles; strongly alkaline (pH 8.5); abrupt wavy boundary.

B21t 20902 15 to 28 cm (6 to 11 inches). Light brown (7.5YR 6/3) clay loam, dark brown (7.5YR 4/3) moist; moderate medium prismatic that parts to weak fine and medium subangular blocky structure; hard, friable, sticky, plastic; patchy glossy coatings particularly on vertical faces of peds; 10 percent pebbles and gravel; strongly effervescent; thin encrustations of lime on undersides of coarse fragments; strongly alkaline (pH 8.5); clear wavy boundary.

B22t 20903 28 to 36 cm (11 to 14 inches). Light brown (7.5YR 6/3) clay loam, dark brown (7.5YR 4/3) moist; moderate medium prismatic that parts to moderate fine and medium subangular blocky structure; hard, friable, sticky, plastic; patchy waxy coatings on vertical faces of peds; 10 percent pebbles and gravel; strongly effervescent; thin encrustations of lime on undersides of coarse fragments; strongly alkaline (pH 8.6); clear wavy boundary.

B3ca 20904 36 to 53 cm (14 to 21 inches). Pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate medium and very fine subangular blocky structure; hard, friable, sticky, plastic; patchy glossy coatings on vertical faces of peds; 10 percent pebbles and gravel; violently effervescent; secondary lime in form of streaks and soft rounded masses and as thin encrustations on gravel; strongly alkaline (pH 8.7); abrupt wavy boundary.

C1ca 20905 53 to 99 cm (21 to 39 inches). White (10YR 8/2) gravelly clay loam, light gray (10YR 7/2) moist; massive; hard, very friable, sticky, plastic; 25 percent gravel; violently effervescent; secondary lime is disseminated and as coatings on the coarse fragments; very strongly alkaline (pH 9.2); clear wavy boundary.

C2ca 20906 99 to 135 cm (39 to 53 inches). Light brownish gray (10YR 6/2) gravel and sand, dark grayish brown (10YR 4/2) moist; single grained; loose, nonsticky, nonplastic; violently effervescent; moderately thick pendants of lime on undersides of gravel; moderately alkaline (pH 8.4); clear wavy boundary.

C3ca 20907 135 to 165 cm (53 to 65 inches). Light brownish gray (10YR 6/2) gravel and sand, dark grayish brown (10YR 4/2) moist; single grained; loose nonsticky, nonplastic, violently effervescent; thin pendants of secondary lime on undersides of cobble and gravel; moderately alkaline (pH 8.4).

Remarks: Soil temperature was 55° F<sub>s</sub> at 20 inches. An area about 8 x 8 feet about 70 feet north of the sampling pit was dyked and wetted by applying 12 inches of water. Samples for moisture determination were collected approximately 48 hours after wetting. The wetting front terminated in a dry zone. The results of the moisture samples are reported on the accompanying data sheet.

Optical observations from a neighboring pedon, 4 to 8 inch horizon, LSL 20530. Methods 7A1 and 7B. Microscopic examination of a thin section showed several patches of possibly illuviated clay. No clay films on planar surfaces or around pores were observed.

<sup>1/</sup>The Ethete soils are in a fine-loamy over sandy or sandy-skeletal, mixed, mesic family of Typic Haplargids. This pedon is in a fine-loamy family.

SOIL CLASSIFICATION-TYPIC TORRIFLUVENT  
 FINE-SILTY, MIXED (CALCAREOUS), MESIC  
 SERIES - - - - - FIVEMILE

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE, MTSC  
 NATIONAL SOIL SURVEY LABORATORY  
 LINCOLN, NEBRASKA  
 JUNE 1977

SOIL NO - - - - - S65WYO-7-16 COUNTY - - - - - FREMONT

GENERAL METHODS - - - - - 1A, 1B1B, 2A1, 2B SAMPLE NOS. 20908-2091e

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B											FAML INTR		FINE NON-		IRATIO		
		SAND 2- .05	SILT .05- .002	CLAY 1LT .002	CLAY LT .0002	VCOS 1	CORS 1-	MEDS .25	FNES 10	VFNS .10-	COSI .05	FNSI .02	VFSI .005-	TEXT SAND	II .2-	CLAY TO	NON- CLAY	8D1 15-	8D2 BAR TO
000-005	A1	31.6	32.0	36.4		.1	.7	1.4	10.7	18.7	10.2	21.8		12.9	36.7			36	.34
005-023	C1	25.9	36.6	37.5	8.3	.0	.3	1.1	8.9	15.6	10.0	26.6		10.3	32.1	22		38	.38
023-036	C2CACS	18.8	50.1	31.1		.0	.1	.3	5.4	13.0	16.5	33.6		5.8	33.8			31	.39
036-061	C3	31.2	51.8	17.0		.0	.1	.2	6.8	24.1	29.4	22.4		7.1	59.1			17	.45
061-076	C4	53.9	37.8	8.3		.0	.1	.2	14.3	39.3	26.9	10.9		14.6	79.0			8	.47
076-122	C5	17.0	57.9	25.1		.0	.2	.4	3.6	12.8	26.1	31.8		4.2	41.7			25	.41
122-158	C6	61.1	19.5	19.4		.1	2.8	8.5	28.9	20.8	8.8	10.7		40.3	46.7			19	.39
000-010	(A)	28.6	32.1	39.3		.2	.6	1.2	9.7	16.9	10.6	21.5		11.7	34.5			39	.34
000-005	(B)																		
000-001	(C)																		
000-010	(D)	34.6	29.8	35.6		.1	.8	1.7	12.3	19.7	10.6	19.2		14.9	38.8				.37

DEPTH CM	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2					BULK DENSITY			WATER CONTENT				CARBONATE		PH	
	GT 2	GT 75	75-20 PCT	20-5 PCT	5-2 PCT	4A1D G/CC	4A1H G/CC	4D1 G/CC	4B1C PCT	4B1E PCT	4B2 PCT	4C1 CM	6E1B PCT	3A1A PCT	8C1A 1/2	8C1E 1/2
000-005	0	0	0	0	0	0	1.32	1.55	.055		12.5		28.7	8	TR	8.5
005-023	0	0	0	0	0	0	1.26	1.43	.043		14.3	.25	23.4	9	TR	8.5
023-036	0	0	0	0	0	0	1.26	1.43	.043		14.3	.25	23.4	9	TR	8.5
036-061	0	0	0	0	0	0	1.29	1.39	.025		7.6	.29	9.5	10	TR	7.9
061-076	0	0	0	0	0	0	1.38	1.41	.007	25.3	3.9	.30		10	TR	8.1
076-122	0	0	0	0	0	0	1.33	1.44	.027		3.9	.31		8	TR	8.1
122-158	0	0	0	0	0	0	1.44	1.54	.023		10.4	.19		9	TR	8.3
000-010	TR	0	0	0	TR	TR					13.3			8	TR	8.4
000-005	TR	0	0	0	TR	TR					15.3			8	TR	
000-001	TR	0	0	0	TR	TR					13.7			7	TR	
000-010	TR	0	0	0	TR	TR					13.3			8	TR	8.5

DEPTH CM	ORGANIC MATTER		IRON C/N	PHOS 6C2B	EXTRACTABLE BASES 5B4A-				ACTY SUM	AL EXTB	CAT EXT	EXCH NHAC	RATIO NHAC	RATIO TO	CA PCT	BASE SAT PCT
	6A1A ORGN CARB	6B1A NITG			6N2E CA	6O4B MG	6P2B NA	6Q2B K								
000-005	.55	.059	9		4.5	3.4	1.0					20.3	.56			
005-023	.41	.051	8		3.9	6.3	.7					20.2	.54			
023-036	.37	.046	8		4.8	8.0	.4					17.9	.58			
036-061	.30				2.7	6.5	.3					12.4	.73			
061-076	.24				3.0	4.0	.1					5.2	.63			
076-122	.33				6.4	12.5	.4					14.9	.59			
122-158	.18				4.2	12.0	.4					11.1	.57			
000-010	.58				8.4	5.2	.8					20.9	.53			
000-005	.58				2.9	13.0	.8					22.2				
000-001	.44				4.3	0.6	1.0					24.0				
000-010	1.02				4.0	11.6	1.0					19.4	.54			

DEPTH CM	SATURATED PASTE				SALT 805 PPM	GYP 6F1A PCT	SATURATION						EXTRACT				ATTERBERG	
	8E1 REST OHM- CM	8C1B PH CM	8A H2O PCT	5D2 ESP PCT			6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	4F1 LQID	4F2 PLST	LMIT INDX
000-005	880	7.3	45.0	13	580		1.93											
005-023	660	8.0	47.5	24	1120		3.35											
023-036	330	7.8	46.3	24	3400	4.0	9.70											
036-061	400	7.9	35.9	29	2650	TR	9.70											
061-076	970	8.1	30.2	36	2090		9.00											
076-122	240	8.2	42.1	41	5390	TR	15.70											
122-158	360	8.2	30.4	75	3330		13.50											
000-010	670	7.9	46.0	19	1150		3.57											
000-005	310	7.7	50.7	39	3830		9.70											
000-001	1000	7.5	47.1	2	250		.82											
000-010	360	7.5	49.7	39	3500		9.00											

CLAY MINERALOGY (7A2C).

005-23 CM C1 MODERATE AMOUNTS OF KAOLINITE AND MONTMORILLONITE, SMALL AMOUNT OF MICA. KAOLINITE AND MICA WELL-ORDERED; MONTMORILLONITE POORLY ORDERED. MINERALOGY BORDERS BETWEEN MIXED AND MONTMORILLONITIC.

- (A) COMPOSITE OF (B), (C), AND (D).
- (B) SLICK SPOT SURROUNDING MOUND.
- (C) INTERMOUND BASIN.
- (D) UNDER COPPIC MOUND.

Soil series: Fivemile clay loam.

Pedon No.: S65Wyo-7-16.

Location: Fremont County, Wyoming; NE $\frac{1}{4}$ , SE $\frac{1}{4}$  of NE $\frac{1}{4}$  of Sec. 25, T4N, R1E. Start at center of Fivemile Creek bridge. Proceed 760 feet northeastward on road paralleling canal, thence 180 feet east. TL1 photo CCK-13N-194

Climate: Average annual precipitation is about 9 inches. Average annual soil temperature is about 51 $^{\circ}$ F. Frost-free season is 120 to 140 days. Elevation is about 5,500 feet.

Vegetation and land use: Gardner saltbush, bottlebrush squirreltail, Indian ricegrass, cottonthorn horsebrush, bluestem wheatgrass. Rangeland and wildlife habitat.

Parent material: Calcareous, texturally stratified alluvium.

Physiography: Old high floodplain.

Topography: The microrelief is unique in that coppice mounds of about 6 to 8 inches in height populate the surface. Gradient is one-fourth percent.

Drainage: Well drained.

Moisture: Dry at time of sampling.

Ground water: Deep.

Erosion: Character of the surface reflects considerable shifting of the surface by action of the wind. High degree of dispersibility makes this soil very mobile.

Permeability: Slow to very slow.

Sampled by: C. J. Fowkes, J. F. Young, Robert B. Grossman, Dean McMurtry, and Harold Bindschadler - Oct. 28, 1965.

Described by: Harold Bindschadler - October 28, 1965.

(Colors are for air-dry soil unless otherwise stated)

A1 20908 0 to 5 cm (0 to 2 inches). Very pale brown (10YR 7/3) clay loam, brown (10YR 5/3) moist; moderate very fine granular structure; thin soft crust; loose, very friable, sticky, plastic; strongly effervescent; strongly alkaline (pH 8.5); abrupt wavy boundary.

C1 20909 5 to 23 cm (2 to 9 inches). Pale brown (10YR 6/3) clay loam, dark brown (10YR 4/3) moist; weak fine and medium angular blocky structure; very hard, firm, very sticky, very plastic; strongly effervescent; very strongly alkaline (pH 9.1); abrupt smooth boundary.

C2cacs 20910 23 to 36 cm (9 to 14 inches). Pale brown (10YR 6/3) silty clay loam, pale brown (10YR 6/3) moist; hard, very friable, sticky, plastic; strongly effervescent; soft rounded masses of secondary lime and gypsum; abrupt smooth boundary.

C3 20911 36 to 61 cm (14 to 24 inches). Pale brown (10YR 6/3) very fine sandy loam, brown (10YR 4/3) moist; lamellae with silt partings, lamellae range in thickness from one-fourth to one inch; very thin one-eighth to one inch lenses of silty clay loam with decomposed plant residues; soft, very friable, nonsticky, nonplastic; moderately effervescent; lower part contains many fine faint threads of crystalline gypsum; strongly alkaline (pH 8.6); abrupt smooth boundary.

C4 20912 61 to 76 cm (24 to 30 inches). Light gray (2.5Y 7/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; very fine lamellae with silt partings; soft, friable, nonsticky, nonplastic; moderately effervescent; strongly alkaline (pH 8.8); abrupt smooth boundary.

C5 20913 76 to 122 cm (30 to 48 inches). Pale brown (10YR 6/3) silty clay loam stratified with thin lenses of silty clay, silt loams, and very fine sandy loam; brown (10YR 4/3) moist; massive or thin platy; hard to soft, very friable to firm, sticky to nonsticky, plastic to slightly plastic; moderately effervescent; some lamellae contain partially decomposed plant residues and many fine faint threads of crystalline gypsum; strongly alkaline; abrupt smooth boundary.

C6 20914 122 to 158 cm (48 to 62 inches). Pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak coarse prismatic parting to very weak fine and medium subangular blocky structure; hard, very friable, slightly sticky, slightly plastic; strongly effervescent; threads and soft rounded masses of secondary lime and gypsum; very strongly alkaline (pH 9.4).

Remarks: The Fivemile series includes three dissimilar epipedons, each sampled separately. Under coppice mounds (24 percent of the area) LSL20918, in slick spots surrounding bases of the mounds (21 percent of the area) LSL20916, and in small innermound bases (54 percent of the area) LSL20917. A composite sample containing equal volumes of the three epipedons was also taken (LSL20915). Epipedons under coppice mounds range from 4 to 8 inches thick, contain numerous plant roots, have low bulk densities, and are moderately stable with moderate fine subangular blocky structure. A thin soft surface crust is highly alkaline. The slick spots have a crust 3/4 to 1-1/2 inches thick that generally remains intact when it dries. The crust has a moderate salt content, but it's very alkaline, ranging from pH 9.0 to 9.6. Miniature transitory prisms or columns about one inch long are often found immediately beneath the crust. The crust and columns slump when saturated with water, reducing intake of water to nil. Beneath the columns is a granular soil material moderately high in soluble salts. Innermound epipedon described in A1 horizon above. The one-fourth inch thick crust and the granular material slump immediately when wetted. Granular structure restored when dried if wet soil not disturbed mechanically. Chroma of granular material generally stronger than crust. The C2cs horizon was discontinuous. It was observed in about two-thirds of the pedon. Soil moisture samples could not be taken. The upper 9 inches of the soil appeared to be saturated 66 hours after application of water.

SOIL CLASSIFICATION-USTCLLIC HAPLARGID  
 FINE-LOAMY, MIXED, MESIC  
 SERIES - - - - -FORT COLLINS

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE, MISC  
 NATIONAL SOIL SURVEY LABORATORY  
 LINCOLN, NEBRASKA  
 JUN 1977

SOIL NO - - - - - SWYC-10-10 COUNTY - - - JOHNSON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 66L249-66L250

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO				
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	FAML	INTR		FINE	NON-	BD1	
CM		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005-	SAND	.2-	TO	CLAY	CO3-	15-	
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-.1	.02	CLAY	TO	CLAY	TO	
		PCT LT 2MM														PCT				
010-023	B21T	53.6	23.4	23.0	18.4		.2	1.1	30.1	22.2	12.0	11.4		31.4	55.6					.41
064-127	C1CA																			

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2										BULK DENSITY				WATER CONTENT				CARBONATE				PH	
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD	6E1B	3A1A	8C1A	8C1E	1/1	1/2				
CM	2	75	PCT	PCT	(- - - PCT LT 75 - - -)	LT20	BAR	DRY	G/CC	BAR	BAR	BAR	CM/	PCT	PCT	PCT	PCT	PCT	PCT	PCT				
010-023	TR	0	0	0	TR	5B	TR						9.5		TR					7.4				
064-127													10.1		6					8.6				

DEPTH	ORGANIC MATTER		IRON	PHOS	EXTRACTABLE BASES 5B4A				ACTY	AL	CAT EXCH		RATIO	RATIO	CA	BASE SAT			
	6A1A	6B1A			C/N	6C2B	6N4A	6O4A			6P2B	6Q2B				6H1A	6G1E	5A3A	5A6A
CM	PCT	PCT	PCT	PCT	TOTL	CA	MG	NA	K	SUM	8ACL	KCL	EXTB	NHAC	CA	SAT	EXTB	NHAC	
010-023	.68				14.6	6.7	TR	.6	21.9				22.1	.96	2.2				99
064-127					13.1	.8	.4					18.8							

Soil classification: Ustollic Haplargid; fine-loamy, mixed, mesic.

39

Soil series: Fort Collins fine sandy loam.

Pedon No.: S66Wyo-10-10.

Location: Johnson County, Wyoming; NW $\frac{1}{4}$  of SE $\frac{1}{4}$  of Sec. 25, T45N, R82W.

Climate: Average annual precipitation is about 12 inches; mean annual soil temperature is about 52° F. Frost-free season is 105 to 110 days. Elevation is about 5,100 feet.

Vegetation and land use: Threadleaf sedge, needleandthread, blue gramagrass, prairie junegrass, slender wheatgrass, fringed sagewort, broom snakeweed, and green needlegrass. Rangeland and wild-life habitat.

Parent material: Calcareous, local, silty alluvium which mantles a gravelly piedmont surface.

Physiographic position: Piedmont.

Topography: Gradient is 1 percent.

Drainage: Well drained.

Moisture: Moist at time of sampling.

Ground water: Deep.

Erosion: None to slight.

Permeability: Moderate.

Sampled by: C. J. Fowkes, James Stephens, R. C. Kronenberger, Harold Bindschadler, and Robert Grossman.

Described by: Harold Bindschadler - June 23, 1966.

(Colors are for air-dry soil unless otherwise stated)

A1 0 to 5 cm (0 to 2 inches). Light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; very weak fine platy structure; soft, very friable, nonsticky, nonplastic; few fine gravels scattered throughout; neutral (pH 7.0); abrupt smooth boundary.

B1 5 to 10 cm (2 to 4 inches). Grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine subangular blocky structure; hard, friable, sticky, plastic; patchy glossy coatings on all faces of peds; few fine gravels throughout; neutral (pH 7.2) abrupt smooth boundary.

B2lt 66L249 10 to 23 cm (4 to 9 inches). Light brownish gray (10YR 6/2) sandy clay loam, brown (10YR 4/3) moist; strong medium prismatic that parts to strong medium angular blocky structure; hard, friable, sticky, plastic; continuous glossy coatings and organic stains on all faces of peds; few fine gravels scattered throughout; mildly alkaline (pH 7.4); clear wavy boundary.

B22t 23 to 36 cm (9 to 14 inches). Pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; strong medium prismatic that parts to strong medium angular blocky structure; hard, friable, sticky, plastic; few scattered gravels throughout; mildly alkaline (pH 7.4); abrupt wavy boundary.

B3ca 36 to 64 cm (14 to 25 inches). Varicolored, white (10YR 8/2) and light gray (10YR 7/2) fine sandy loam, light brownish gray (10YR 6/2) moist crushed; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, plastic; patchy glossy coatings on some faces of peds; few fine gravels scattered throughout; violently effervescent; secondary lime in reticulate form; moderately alkaline (pH 8.3); clear wavy boundary.

C1ca 66L250 64 to 127 cm (25 to 50 inches). Varicolored, white (10YR 8/2) and light gray (10YR 7/2) loam, light brownish gray (10YR 6/2) moist crushed; weak medium subangular blocky structure; friable, sticky, plastic; few fine scattered gravels throughout; violently effervescent; soft rounded masses threads and seams of secondary lime; strongly alkaline (pH 8.8); diffuse wavy boundary.

C2 127 to 152 cm (50 to 60 inches). Light gray (2.5Y 7/2) very fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; soft, very friable, slightly sticky, plastic; few fine gravels scattered throughout; strongly alkaline (pH 8.8).

SOIL CLASSIFICATION-TYPIC TORRIFLUVENT  
COARSE-LOAMY, MIXED (CALCAREOUS), MESIC  
SERIES - - - - -GLENTON

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE, NTSC  
NATIONAL SOIL SURVEY LABORATORY  
LINCOLN, NEBRASKA  
JUNE 1977

SOIL NO - - - - -S65WYO-7-10 COUNTY - - - FREMONT

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

SAMPLE NOS. 20926-20934

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B										RATIO					
		SAND 2- .05	SILT .05- LT .002	CLAY LT .0002	FINE CLAY VCOS 2- 1	COSS 1- .5	MEDS -25- .10	FNES -10- .05	VFNS -10- .05	CSO1 -02 .002	FNS1 -005- .002	VFS1 TEXT 2-1	FAML TEXT -1	INTR II .02	FINE CLAY TD CLAY	NON- CO3- CLAY	801 15- BAR TO CLAY
000-010	A1	60.6	24.5	14.9	7.0	1.0	5.7	11.1	21.6	21.2	15.3	9.2	39.4	47.7	47	15	.44
010-018	C1	62.7	20.0	17.3	8.0	.8	5.7	14.3	25.8	16.1	10.3	9.7	46.6	38.4	46	17	.45
018-036	C2	57.0	25.1	17.9		.4	9.9	10.4	22.0	20.3	14.3	10.8	36.7	45.9		17	.45
036-056	C3	53.1	28.1	18.8		.5	4.1	10.6	21.6	16.3	15.2	12.9	36.8	42.2		19	.45
056-091	C4	61.2	24.6	14.2		.2	4.1	11.8	27.9	17.2	13.5	11.1	44.0	44.8		14	.46
091-117	C5	37.1	37.8	25.1		.8	3.3	5.1	12.2	15.7	20.3	17.5	21.4	43.0		25	.41
117-158	C6C5	45.5	28.3	26.2		2.6	5.3	8.3	16.4	12.9	15.3	13.0	32.6	36.9		26	.42
158-180	C7	55.9	22.8	21.3		4.5	9.8	11.7	18.7	11.2	12.9	9.9	44.7	33.3		21	.38
180-216	C8	83.2	7.3	9.5		2.0	12.5	20.5	36.0	12.2	3.0	4.3	71.0	33.3		10	.43

DEPTH CM	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2	VOL. (%)		WEIGHT		BULK DENSITY		WATER CONTENT			CARBONATE		PH				
		GT 2	GT 75	75-20 PCT	20-5 PCT	5-2 PCT	LT .074	20-2 PCT	1/3- BAR	OVEN DRY	4B1C BAR	4B2 BAR	4C1 BAR	WRD CM	6E1B PCT	3A1A PCT	8C1A 1/1
000-010	TR	0	0	TR	TR	53	TR	1.48	1.56	.018	21.5	6.6	.22	1		8.0	
010-018	TR	0	0	TR	TR	47	TR	1.43	1.53	.023	20.3	7.8	.18	4	TR	8.1	
018-036	TR	0	0	TR	TR	56	TR	1.44	1.52	.018	18.1	8.1	.14	4	1	8.3	
036-056	TR	0	0	TR	TR	57	TR	1.45	1.57	.027	19.9	8.5	.17	4	TR	8.4	
056-091	TR	0	0	TR	TR	49	TR	1.42	1.49	.016	23.8	6.6	.24	2	TR	8.5	
091-117	TR	0	0	TR	TR	74	TR	1.32	1.46	.034	26.6	10.3	.22	4	TR	8.2	
117-158	TR	0	0	TR	1	62	1	1.37	1.52	.035				5	TR	7.8	
158-180	2	0	0	TR	3	49	3							5	TR	7.9	
180-216	1	0	0	TR	2	21	2	1.73	1.77	.008	12.2			1		8.3	

DEPTH CM	ORGANIC MATTER		IRON C/N	PHOS 6C2B EXT	EXTRACTABLE BASES 5B4A				ACTY SUM EXTB	AL 6G1A KCL	CAT EXCH		RATIO 8D1 NHAC	RATIO 8D3 CA	BASE SAT	
	6A1A ORGN	6B1A NITG			6N2E CA	6O4B MG	6P2B NA	6Q2B K			5A3A EXTB	5A6A NHAC			5F1 SAT	5C3 EXTB
000-010	.60	.046	13		2.4	.4	.6				12.7	.85				
010-018	.49	.043	11		2.3	.1	.4				15.4	.89				
018-036	.32	.030	11	.3	2.1	.5	.4				15.9	.89				
036-056	.21				2.4	1.0	.4				16.3	.87				
056-091	.17				1.6	1.5	.4				14.2	1.00				
091-117	.24				5.2	2.8	.7				21.5	.86				
117-158	.26				4.6	2.8	.7				23.5	.90				
158-180	.24				3.0	1.9	.4				17.8	.84				
180-216	.05				1.6	.8	.2				8.5	.89				

DEPTH CM	SATURATED PASTE		NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL	GYP 6F1A PPM	SATURATION EXTRACT						ATTERBERG			
	8E1 REST	8C18 PH					8A H2O	8B1A EC	8N1B CA	8O1B MG	8P1B NA	8Q1B K	8I1A CO3	8J1A HCO3	8K1A CL	8L1A SO4
000-010																
010-018																
018-036																
036-056																
056-091																
091-117	780	7.6	37.6	10	690	2.64				15.8						
117-158																
158-180																
180-216																

DEPTH CM	WATER 484 FIELD STATE PCT
000-8	16.8
008-28	16.5
028-48	17.1
048-74	18.2
074-86	17.0

(CLAY MINERALOGY (7A2C).  
000-10 CM A1 A1 SMALL AMOUNT OF MONTMORILLONITE, POORLY ORDERED. B1 MODERATE AMOUNT OF WELL-ORDERED MONT-  
010-18 CM B21 MORILLONITE. BOTH CONTAIN TRACES OF KAOLINITE AND MICA. CLAY MINERALOGY IS MONTMORILLONITIC.

Soil classification: Typic Torrifuvent; coarse-loamy, mixed (calcareous), mesic.

Soil series: Glenton fine sandy loam.

Pedon No.: S65Wyo-7-10.

Location: Fremont County, Wyoming; NE $\frac{1}{4}$ , NE $\frac{1}{4}$  of Sec. 24, T2N, R5E. Start at intersection of two roads, travel 1,665 feet on road having northeasterly direction, thence 165 feet north. Photo No. CCK-14N-181.

Climate: Average annual precipitation is about 9 inches. Average annual soil temperature is about 51°F.

Frost-free period is 120 to 140 days. Elevation is about 5,200 feet.

Vegetation and land use: Big sagebrush, bluestem wheatgrass, blue gramagrass, Sandberg bluegrass, and Indian ricegrass. Rangeland and wildlife habitat.

Parent material: Calcareous sandy local alluvium wasted from sandstone.

Physiography: Alluvial fan.

Topography: North facing slope. Gradient is 4 percent.

Drainage: Well drained.

Moisture: Dry at time of sampling.

Ground water: Deep.

Erosion: Surface winnowed by actions of wind and water.

Permeability: Moderately rapid.

Sampled by: C. J. Fowkes, J. F. Young, Robert B. Grossman, Dean McMurtry, and Harold Bindschadler - Oct. 25, 1965.

Described by: Harold Bindschadler - October 25, 1965.

(Colors are for air-dry soil unless otherwise stated).

A1 20926 0 to 10 cm (0 to 4 inches). Pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak fine crumb structure; soft, very friable, nonsticky, nonplastic; few scattered pebbles throughout; slightly effervescent; moderately alkaline (pH 8.3); abrupt wavy boundary.

C1 20927 10 to 18 cm (4 to 7 inches). Light brownish gray (2.5Y 6/3) fine sandy loam, grayish brown (2.5Y 4/3) moist; weak coarse prismatic that parts to weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; strongly effervescent; few scattered pebbles throughout; moderately alkaline (pH 8.3); clear wavy boundary.

C2 20928 18 to 36 cm (7 to 14 inches). Pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak coarse prismatic that parts to weak medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; strongly effervescent; strongly alkaline (pH 8.5); clear wavy boundary.

C3 20929 36 to 56 cm (14 to 22 inches). Pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few pebbles throughout; strongly effervescent; few fine faint threads of secondary lime; strongly alkaline (pH 8.5); clear wavy boundary.

C4 20930 56 to 91 cm (22 to 36 inches). Light brownish gray (2.5Y 6/3) fine sandy loam, grayish brown (2.5Y 4/3) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few pebbles throughout with thin encrustations of lime, few unweathered flakes of greenish colored shale; strongly effervescent; strongly alkaline (pH 8.5); clear wavy boundary.

C5 20931 91 to 117 cm (36 to 46 inches). Pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky, plastic; few pebbles throughout with very thin lime carbonate encrustations; strongly effervescent; few fine faint threads and soft rounded masses of secondary lime; strongly alkaline (pH 8.6); clear wavy boundary.

C6cs 20932 117 to 158 cm (46 to 62 inches). Pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; very weak medium subangular blocky structure; hard, very friable, slightly sticky, plastic; strongly effervescent; secondary gypsum and lime in reticulate form; moderately alkaline (pH 8.2); clear wavy boundary.

C7 20933 158 to 180 cm (62 to 71 inches). Pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium and coarse subangular blocky structure; hard, very friable, slightly sticky, plastic; few lime coated pebbles; strongly effervescent; moderately alkaline (pH 8.4); clear wavy boundary.

C8 20934 180 to 216 cm (71 to 85 inches). Pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; single grained; loose, nonsticky, nonplastic; moderately effervescent; strongly alkaline (pH 8.9); abrupt wavy boundary.

C9 216 to 229 cm (85 to 90 inches). Yellowish calcareous sandy shale.

Remarks: An area about 8 x 8 feet adjacent to the sampling pit was dyked and wetted by applying about 12 inches of water. Samples of moisture determination were collected approximately 48 hours after wetting. The wetting front terminated in a dry zone. The results for the moisture samples are reported on the accompanying data sheet. Soil temperatures in the characterization site were 50° F. at 20 inches, 53° F. at 40 inches, and 55° F. at 60 inches.

SOIL CLASSIFICATION-TYPIC TORRIFLUVENT  
 COARSE-LOAMY, MIXED (CALCAREOUS), MESC  
 SERIES - - - - - GLENTON

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE, MTSC  
 NATIONAL SOIL SURVEY LABORATORY  
 LINCOLN, NEBRASKA  
 JUNE 1977

SOIL NO - - - - - S65WYO-7-17 COUNTY - - - FREMONT

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

SAMPLE NOS. 20919-20925

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B											INTR	FINE CLAY	NON- TO CLAY	RATIO 8D1 15- BAR TD		
		SAND 2- .05	SILT .05- .002	CLAY LT .002	CLAY LT .0002	VCDS 1	CORDS 1- .5	MEDS -25 -25	FNES .10- .10	VFNS .05 .05	COSI .02 .02	FNSI .005- .002					VFSI TEXT 2-1	
000-005	A1	43.5	30.7	25.8		.4	2.0	4.3	14.5	22.3	13.4	17.3		21.2	44.9		26	.35
005-025	C1	26.9	35.7	37.4	5.5	.1	.9	2.2	8.3	15.4	11.0	24.7		11.5	31.9	15	35	.37
025-036	C2	23.5	38.5	38.0		.1	1.2	2.9	8.5	10.8	9.6	28.9		12.7	25.4		37	.37
036-064	C3CS	70.1	13.3	16.6		.4	7.7	14.7	32.2	15.1	6.1	7.2		55.0	37.8		17	.37
064-104	C4	87.3	6.1	6.6		.5	11.2	32.3	36.3	7.0	2.8	3.3		80.3	22.7		7	.45
104-150	C5	87.7	6.7	5.6		.2	8.3	23.7	45.5	10.0	4.0	2.7		77.7	33.5		6	.39

DEPTH CM	VOL. GT	GT	75-20 PCT	20-5 PCT	5-2 PCT	LT PCT	20-2 PCT	1/3- PCT	OVEN BAR	COLE G/CC	WATER CONTENT				CARBONATE		PH		
											4B1C	4B1	4B2	4C1	6E1B	3A1A	8C1A	8C1E	
000-005	TR	0	0	0	TR	70	TR							9.1	6	FR	8.4		
005-025	0	0	0	0	0	83	0	1.39	1.64	.057				24.7	14.0	.15	8	2	8.5
025-036	0	0	0	0	0	83	0	1.37	1.62	.057				27.2	14.0	.18	8	1	7.9
036-064	TR	0	0	0	TR	37	TR	1.47	1.56	.020				19.2	6.2	.19	5	0	7.9
036-064	TR	0	0	0	TR		TR								8.1		4	0	
064-104	TR	0	0	0	TR	16	TR	1.64	1.64						3.0	.15	5	0	8.4
104-150	0	0	0	0	16	0									2.2		5	0	8.2

DEPTH CM	ORGANIC MATTER		IRON C/N	PHOS EXT	EXTRACTABLE BASES			ACTY SUM	AL KCL	CAT EXCH		RATIO 8D1	RATIO 8D3	CA SAT	BASE SAT	
	6A1A	6B1A			6NZE	6P2B	6Q2B			5A3A	5A6A				5F1	5C3
000-005	.72				3.3	.6	1.4				17.7	.69				
005-025	.41				4.5	5.2	.7				23.6	.63				
025-036	.40				5.9	7.9	.7				23.6	.62				
036-064	.24				2.0	4.1	.3				12.0	.72				
036-064	.27				3.3	5.6	.4				14.2					
064-104	.06				1.2	1.1	.2				5.0	.76				
104-150	.02				1.1	.6	.1				4.3	.77				

DEPTH CM	SATURATED PASTE		NA 5D2	NA 5E	SALT 8D5	GYP 6F1A	SATURATION				EXTRACT				ATTERBERG	
	8E1	8C1B					8A	8D5	6N1B	6D1B	6P1B	6Q1B	6I1A	6J1A	6K1A	6L1A
000-005	1800	7.7	36.4	2	230		1.00			4.1						
005-025	970	7.6	46.3	19	550		1.80			16.4						
025-036	370	7.5	50.0	22	2840		7.40			54.5						
036-064	540	7.6	23.8	22	1570	0	8.40			62.3						
036-064	590	7.6	30.5	25	2010	1	8.40			65.0						
064-104	1400	7.8	21.5	12	660		3.86			22.6						
104-150	1800	7.6	19.2	7	470		3.48			15.5						

CLAY MINERALOGY (7A2C).

005-25 CM C1 MODERATE AMOUNT OF FAIRLY WELL-ORDERED MONTMORILLONITE. SMALL TO MODERATE AMOUNTS OF WELL-ORDERED MICA AND KAOLINITE. CLAY MINERALOGY IS MONTMORILLONITIC.

Soil classification: Typic Torrifuvent; coarse-loamy, mixed (calcareous), mesic.

Soil series: Glenton clay loam.

Pedon No.: S65Wyo-7-17.

Location: Fremont County, Wyoming; NE $\frac{1}{4}$ , NE $\frac{1}{4}$ , NE $\frac{1}{4}$  of Sec. 25, T3N, R3E. Start at auto gate located near northeast corner of Sec. 25. Proceed along fence upstream 465 feet, thence 57 feet south, southwest. TL3 photo CCK-5N-108.

Climate: Average annual precipitation is about 9 inches. Average annual soil temperature is about 51° F. Frost-free period is 120 to 140 days. Elevation is about 5,100 feet.

Vegetation and land use: Gardner saltbush, bottlebrush squirreltail, Indian ricegrass, cottonthorn horsebrush, and bluestem wheatgrass. Rangeland and wildlife habitat.

Parent material: Calcareous, texturally stratified alluvium.

Physiography: Old high floodplain.

Topography: Gradient is 1 percent.

Drainage: Well drained.

Moisture: Dry when sampled.

Ground water: Deep.

Erosion: Severe.

Permeability: Slow or very slow in upper part, moderately rapid in lower part.

Sampled by: C. J. Fowkes, J. F. Young, Robert B. Grossman, Dean McMurry, and Harold Bindschadler - Oct. 28, 1965.

Described by: Harold Bindschadler - October 28, 1965.

(Colors are for air-dry soil unless otherwise stated)

A1 20919 0 to 5 cm (0 to 2 inches). Very pale brown (10YR 7/3) clay loam, brown (10YR 4/3) moist; thin crust underlain by moderate very fine granular structure; soft, friable, sticky, plastic; strongly effervescent; strongly alkaline (pH 8.6); abrupt smooth boundary.

C1 20920 5 to 25 cm (2 to 10 inches). Pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; very hard, firm, very sticky, very plastic; strongly effervescent; very strongly alkaline (pH 9.2); clear wavy boundary.

C2 20921 25 to 36 cm (10 to 14 inches). Pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; very hard, firm, very sticky, very plastic; strongly effervescent; very strongly alkaline (pH 9.1); abrupt wavy boundary.

C3cs 20922 36 to 64 cm (14 to 25 inches). Very pale brown (10YR 7/3) sandy loam, brown (10YR 5/3) moist; massive; hard, very friable, slightly sticky, slightly plastic; strongly effervescent; horizon discontinuous with one-half pedon having enrichment of gypsum in this horizon and one-half pedon without enrichment of gypsum at this depth; strongly alkaline (pH 8.5); abrupt smooth boundary.

C4 20924 64 to 104 cm (25 to 41 inches). Very pale brown (10YR 7/3) fine and medium sand, brown (10YR 5/3) moist; single grained; loose, nonsticky, nonplastic; moderately effervescent; strongly alkaline (pH 8.6); abrupt smooth boundary.

C5 20925 104 to 150 cm (41 to 59 inches). Very pale brown (10YR 7/3) medium and coarse sand, brown (10YR 5/3) moist; single grained; loose, nonsticky, nonplastic; moderately effervescent; strongly alkaline (pH 8.9); abrupt smooth boundary.

C6 150 to 165 cm (59 to 65 inches). Light gray (10YR 7/2) fine sand and loamy fine sand, brown (10YR 5/3) moist; single grained; loose, nonsticky, nonplastic; slightly effervescent; strongly alkaline (pH 8.8).

Remarks: It is judged that at least two-thirds of the profiles representing the series have horizons of gypsum enrichment within 15 inches of the surface and the remaining one-third do not have this kind of horizon. Two additional samples, No.'s 20922 and 20923, were taken to characterize the horizon. Soil temperatures were acquired at three depths. In a pit from which samples were taken at 20 inches the temperature was 50° F, at 40 inches 60° F., and at 60 inches 54° F.

CONSECUTIVE PEDON NUMBER C 69115 CHARACTERIZATION DATA

SOIL SERIES GREYBACK TAXADJUNCT SOIL NO. S69 WYD . 12- 2 SAMPLE NO. 9 612-9 615 STAR VALLEY AREA

SOIL FAMILY: TYPIC CRYOBOROLL, LOAMY-SKELETAL, CARBONATIC RIVERSIDE SOIL SURVEY LABORATORY

SAMPLE NO.	DEPTH CM.	HORIZ.	SIZE, CLASS AND PARTICLE DIAMETER (MM) 1B1B, 3A1														LA2A							
			TOTAL FRACTION			SANDS							SILTS				CLAYS			FINE CARBO		COARSE FRAGMENTS		
			SAND	SILT	CLAY	VCS	CS	MS	FS	VFS	CSI	FSI	CO.	LT	NATE	II	PCT.	I	II	III				
9 612	0-17	AP	14.5	56.7	28.8	1.4	2.3	1.8	4.1	4.9	22.7	34.0			30.0	23A	9	14						
9 613	17-28	C 1	17.7	54.0	28.3	1.8	2.2	1.7	4.7	7.3	21.3	32.7		1	31.6	27A	18V	8	1					
9 614	28-51	C 2	52.5	36.2	11.3	10.6	11.2	6.0	11.8	12.9	17.8	18.4		1	37.9	76*	23V	41	8					
9 615	51-150	C 3	80.4	13.3	6.3	39.9	28.8	6.4	3.3	2.0	4.0	9.3		1	7.4	79*	34V	29	13					

SAMPLE NO.	DEPTH CM.	ORG. MATTER		CARBONATE		SESQUIOXIDES				ATTERBERG				BULK DENSITY CM			WATER CONTENT			EXTNSBLTY	
		CAR	NITRO	AS	CACO3	DI-CIT	EXT	PYROP	EXT	L	M	I	EST.	1/3	DRY	1/10	1/3	15	LEF	LE	
		6A1A	6B1A	6E1B	6E1B	6C2B	6G7A	6C5A	6G5A	4F1	4F2	4A1F	4A1F	4A1H	3B2	4B1C	4B1C	4B2	4D1	4D1	
9 612	0-17	2.81	0.276						37	28			1.36	1.52	0.87	29.1	13.1	3.8	3.3		
9 613	17-28	1.96	0.188	14					35	25			1.31	1.46	0.85	26.9	11.7	3.7	3.1		
9 614	28-51	1.07	0.119	63									1.31		0.39			5.2			
9 615	51-150	0.07		82									1.31		0.34			2.1			

SAMPLE NO.	DEPTH CM.	EXTRACTABLE BASES				SUM	EXT.	KCL	C.E.C.	BASE SATURATION			PH		
		CA	MG	NA	K					SUM NH4-	SUM+	NH4-	NAF	H2O	CA-
		5B4A	5B4A	5B4A	5B4A					DITY	AL	OAC	ACI-	AL	OAC
9 612	0-17	22.1	6.1	0.1	1.5	29.8		29.8	23.7	100+	100+		7.6	7.4	
9 613	17-28	24.3	5.4	0.1	0.9	30.7		30.7	20.5	100+	100+		7.6	7.3	
9 614	28-51	21.3	2.0	0.1	0.2	23.6		23.6	6.7	100+	100+		7.8	7.3	
9 615	51-150	17.0	0.9	0.1	TR	18.0		18.0	1.5	100+	100+		8.2	7.5	

SAMPLE NO.	DEPTH CM.	CLAY MINERALOGY										RELATIVE AMOUNT		
		LESS THAN 0.002 MM					L.T. 0.0002 MM							
		X RAY		DTA			X RAY		CODE					
9 612	0-17	MI	3	KK	1						MI	MICA	1	TRACE
9 613	17-28	MI	3	KK	1						KK	KADLINIT	2	SMALL
9 614	28-51	MI	3	KK	1						MT	MONTMORT	3	MODERATE
9 615	51-150	MT	2	MI	2	KK	2						4	ABUNDANT
													5	DOMINANT
													6	INDETER.

SAMPLE PREPARATION CODES

- A=STANDARD PREPARATION.
- V=NOT WEIGHED, VALUE CALCULATED FROM A VOLUME ESTIMATE.
- \*\*THE 75-250MM FRACTION IS INCLUDED.

**Location:** Lincoln County, Wyoming. About 805 meters ( $\frac{1}{2}$  mile) east of Etna, Wyoming, at town dump pit. 128 meters (420 feet) east and 119 meters (390 feet) south of the northeast corner of the SW $\frac{1}{4}$  of section 11, T. 35 N., R. 119 W. Sample site located on photo BBL-1EE-90. **Date of Sampling:** September 30, 1969.

**Description by:** C. J. Fowkes. **Collectors:** W. D. Nettleton, W. R. Glenn, H. B. Ravenholt, C. J. Fowkes.

**Classification:** Typic Cryoboroll; loamy-skeletal, carbonatic.

**Vegetation:** Cultivated. Alfalfa and grass. **Use:** Irrigated pasture. **Climate:** Average annual precipitation is 457 mm (18 inches). Mean annual temperature is 3<sup>o</sup>C (38<sup>o</sup>F). Average annual soil temperature at 50 cm is 7<sup>o</sup>C. Average summer soil temperature is 14<sup>o</sup>C. without an O horizon.

**Parent Material:** Very gravelly and cobbly calcareous alluvial sediments derived from mixed sources.

**Topography:** Nearly level alluvial fan. Convex slope of 1 percent, west facing.

**Elevation:** 1,806 meters (5,925 feet) above sea level. **Drainage:** Well drained. Runoff is slow.

Permeability is moderately rapid. **Soil Moisture:** Dry at time of sampling.

**Remarks:** Field pH determinations by phenol red and thymol blue. These samples were not paired.

**HORIZON**

**DESCRIPTION**

- |                |   |
|----------------|---|
| Ap<br>69612    | 0 to 17 cm (0 to 7 inches). Brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; weak fine and very fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common micro to medium roots; 15 percent rounded fragments less than 19 mm diam.; noncalcareous, mildly alkaline (pH 7.6); abrupt smooth boundary.  |
| C1<br>69613    | 17 to 28 cm (7 to 11 inches). Pale brown (10YR 6/3) gravelly loam, dark brown (10YR 4/3) moist; moderate fine and very fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common micro to medium few coarse roots; 15 percent rounded fragments less than 19 mm diam., 10 percent between 19 mm and 76 mm diam.; some fragments have lime coatings; calcareous, moderately alkaline (pH 8.0); gradual wavy boundary.   |
| 11C2<br>69614  | 28 to 51 cm (11 to 20 inches). Pale brown (10YR 6/3) very gravelly loam, dark brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky, nonplastic; few fine to coarse roots; 35 percent rounded fragments less than 19 mm diam., 15 percent between 19 mm and 76 mm diam.; 5 percent larger than 76 mm diam.; most of the fragments are coated with lime; calcareous, moderately alkaline (pH 8.2); gradual wavy boundary.   |
| 111C3<br>69615 | 51 to 150 cm (20 to 60 inches). Mixed colors of light brownish gray (10YR 6/2) and light yellowish brown (10YR 6/4) very gravelly sandy loam; dark grayish brown (10YR 4/2) moist and yellowish brown (10YR 5/4) moist; single grained; loose, nonsticky, nonplastic; very few roots; 50 percent rounded fragments less than 19 mm diam., 25 percent between 19 mm and 76 mm diam., 10 percent larger than 76 mm diam.; the fragments are mainly derived from sandstone and limestone; concretions of secondary lime occur as pendants on most of the fragments in the upper part and decreases with depth; calcareous, moderately alkaline (pH 8.2). |

<sup>1/</sup>The Greyback series is in a loamy-skeletal, mixed, family of Typic Cryoborolls. This pedon has a control section with more than 40 percent calcium carbonate equivalent.

SOIL Heldt silty clay loam SOIL Nos. S64Wyo-8-1 LOCATION Goshen County, Wyoming  
 SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19415-19422; 19501-19506 January 1968  
 General Methods: 1A, 1B1b, 2A1, 2B

Depth cm	Horizon	Size class and particle diameter (mm) 3A1														Coarse fragments 2A2				
		Total			Sand					Silt						3A1b	3A1a Non-carbonate 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)	< 0.002	> 2			2 - 19	19 - 76	
Pct. of < 2 mm																				
0-15	A1	3.6	44.9	51.5	-	0.1	0.1	0.5	2.9	7.6	37.3	10.9	0.7		51	-				
15-41	B21	2.0	48.7	49.3	-	0.1	0.1	0.3	1.5	8.3	40.4	10.0	0.5		48	-				
41-61	B22	5.9	53.1	41.0	-	0.1	0.1	0.6	5.1	15.8	37.3	21.4	0.8		41	-				
61-84	B23	2.8	53.8	43.4	-	tr	0.1	0.3	2.4	9.8	44.0	12.3	0.5	7.9	42	-				
84-104	B24	2.3	40.8	56.9	-	tr	0.1	0.4	1.8	7.7	33.1	9.8	0.5		56	-				
104-122	B3cacs	4.8	40.8	54.4	-	0.1	0.2	0.7	3.8	9.9	30.9	14.2	1.0		54	-				
122-145	C1cacs	7.3	59.1	33.6	-	tr	0.1	0.6	6.6	22.5	36.6	29.6	0.7		34	-				
145-178	C2ca	5.7	58.8	35.5	-	tr	0.1	0.5	5.1	20.5	38.3	25.9	0.6		35	-				

Depth cm	6A1a Organic carbon a/Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as CaCO <sub>3</sub>		Bulk density			4D1 COLE	Water content				pH		
					6E1b < 2 mm Pct.	3A1a < 0.002 mm 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	8C1b Sat. Paste	8C1a 1:1	8C1a 1:10
					g/cc	g/cc	g/cc	Pct.	Pct.		Pct.	in/in					
0-15	1.83	0.159	12	0.3	6	1	1.07	0.99	1.24	0.078	27.7	43.1	25.6	0.17	7.4	7.7	8.3
15-41	0.62	0.063	10	0.2	10	1	1.23	1.07	1.49	0.12	27.9	42.4	25.6	0.18	7.4	8.2	8.5
41-61	0.48	0.050	10	0.2	10	tr	1.42	1.16	1.50	0.092	17.3	37.9	21.6	0.19	7.4	8.0	8.6
61-84	0.47			0.3	10	1	1.44	1.11	1.55	0.12	18.6	42.0	25.3	0.19	7.5	8.5	8.8
84-104	0.41			0.3	8	1	1.46	1.07	1.66	0.16	22.2	45.8	28.3	0.19	7.5	8.0	8.9
104-122	0.46			0.3	7	tr						28.0			7.5	7.9	8.8
122-145	0.45			0.2	8	tr						39.9	22.9	0.19	7.6	8.0	8.7
145-178	0.34			0.3	8	1	1.09	1.29	1.30	0.068		41.1	23.9	0.18	7.3	8.0	8.7

Depth cm	Extractable bases 5B1a				Ext. Acid-ity	Cat. Exch. Cap.		Water extract from saturated paste 8E1										Electrical conductivity mmho/cm
	6N4b Ca	6O4b Mg	6P2a Na	6Q2a K		Sum	5A1a Sum Cations NH <sub>4</sub> OAc	6N1a Ca	6O1a Mg	6P1a Na	6Q1a K	6I1a CO <sub>3</sub>	6J1a HCO <sub>3</sub>	6K1a Cl	6L1a SO <sub>4</sub>	8E1a		
	meq/100 g					meq/liter												
0-15	7.0	0.5	4.0			43.8										0.9		0.83
15-41	6.4	1.2	3.3			42.5										2.4	0.5	0.65
41-61	6.8	1.7	2.6			36.2										4.4	0.5	1.02
61-84	7.7	3.8	2.9			39.6										8.2	0.4	1.30
84-104	7.9	6.3	3.3			44.0	5.3	1.6	15.2	0.5				4.5	6.1	12.3	2.10	
104-122	8.6	7.4	3.4			44.3	11.3	3.7	22.5	0.6				2.8	7.8	27.9	3.40	
122-145	5.5	6.3	3.0			36.2	12.9	2.8	24.4	0.8				2.0	7.6	31.5	3.62	
145-178	6.4	4.6	3.1			40.2	7.0	1.5	13.4	0.6				5.5	4.8	12.3	2.06	

Depth cm	8B Water at Saturation Pct.	5D2 Exchange-able Na Pct.	5E Sodium Adsorption Ratio	6F1a Gypsum Pct.	Ratios to Clay 8D2		15-bar water	4B4 Field Capacity		
					NH <sub>4</sub> OAc CEC	Ext. Iron		LSL No.	Depth cm	Percent Water
0-15	75.5	1			0.86		0.50	19501	0-15	40.5
15-41	70.3	2			0.89		0.52	19502	24-35	40.3
41-61	66.7	4			0.88		0.53	19503	46-61	34.8
61-84	72.8	8			0.94		0.58	19504	71-84	35.1
84-104	79.5	12	8	-	0.79		0.50	19505	91-99	36.3
104-122	84.4	12	8	tr	0.82		0.51	19506	109-117	26.4
122-145	65.9	13	9	tr	1.06		0.68			
145-178	64.5	9	7	-	1.15		0.67			

a/ 10 kg/m<sup>2</sup> to 60 inches (Method 6A).  
 Field capacity estimates: Water was added adjacent to the sampling pit during a period from about 9:00 AM, 5/19/64, to 7:00 PM, 5/19/64. Samples were collected at 7:30 AM, 5/22/64. Dry at 46 inches.

Soil classification: Ustertic Camborthid; fine, montmorillonitic, mesic.

Soil series: Heldt silty clay loam.

Pedon No.: S64Wyo-8-1.

Location: Goshen County, Wyoming; SW $\frac{1}{4}$ , SE $\frac{1}{4}$  of SW $\frac{1}{4}$  of Sec. 25, T24N, R82W; 517 feet east and 187 feet north of the east abutment of the bridge over Cherry Creek.

Climate: Average annual precipitation is about 15 inches. Mean annual air temperature is about 49<sup>o</sup> F., and mean summer air temperature is about 69<sup>o</sup> F. Frost-free season is 120 to 150 days.

Vegetation and land use: Western wheatgrass, blue gramagrass, inland saltgrass, and alkali sacaton. Rangeland and wildlife habitat.

Parent material: Calcareous clay alluvium.

Physiography: Valley fill bordering drainageway.

Topography: Flat surface. Gradient is 0.5 percent.

Drainage: Well drained.

Moisture: Near 15 bar when sampled.

Ground water: At depths of more than 9 feet.

Erosion: Slight.

Permeability: Slow.

Sampled by: Fraser Stephens, R. C. Kronenberger, E. Rivers, Robert B. Grossman, Arvad J. Cline, and Harold Bindschadler - May 19, 1964.

Described by: Arvad J. Cline.

(Colors are for air-dry soil unless otherwise stated)

A1 19415 0 to 15 cm (0 to 6 inches). Light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; strong very fine granular structure; slightly hard, very friable; calcareous; moderately alkaline (pH 8.2); clear smooth boundary.

B21 19416 15 to 41 cm (6 to 16 inches). Light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate medium prismatic that parts to moderate medium angular blocky structure; very hard, friable; few thin patchy glossy coatings on faces of peds; calcareous; moderately alkaline (pH 8.3); gradual smooth boundary.

B22 19417 41 to 61 cm (16 to 24 inches). Light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic that parts to moderate fine and medium angular blocky structure; very hard, friable, very sticky, plastic; a few glossy patchy coatings on faces of peds; calcareous; moderately alkaline (pH 8.3); gradual smooth boundary.

B23 19418 61 to 84 cm (24 to 33 inches). Light gray (2.5Y 7/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic that parts to moderate coarse angular blocky structure; extremely hard, very firm, very sticky, plastic; a few thin glossy patchy coatings on faces of peds; calcareous; strongly alkaline (pH 8.5); gradual smooth boundary.

B24 19419 84 to 104 cm (33 to 41 inches). Light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic that parts to moderate coarse angular blocky structure; extremely hard, very firm, very sticky, plastic; a few glossy patchy coatings on vertical faces of peds; calcareous; strongly alkaline (pH 8.5); gradual smooth boundary.

B3cacs 19420 104 to 122 cm (41 to 48 inches). Light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak medium angular blocky that parts to moderate fine angular blocky structure; very hard, friable, very sticky, plastic; calcareous; secondary calcium carbonate and secondary calcium sulfate occur as crystals and small soft rounded masses and in thin seams and streaks; moderately alkaline (pH 8.3); gradual smooth boundary.

C1cacs 19421 122 to 145 cm (48 to 57 inches). Light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, sticky, plastic; calcareous; secondary calcium carbonate and calcium sulfate accumulated as crystals and small soft rounded masses and in thin seams and streaks; moderately alkaline (pH 8.2); gradual smooth boundary.

C2ca 19422 145 to 178 cm (57 to 70 inches). Light gray (2.5Y 7.2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, sticky, plastic; secondary calcium carbonate occurs mostly as small seams and streaks; calcareous; moderately alkaline (pH 8.2).

Remarks: B23 horizon, 24 to 33 inches, LSL 19418. Methods 7A1, 7A2a, and 7B1.

The clay contains a moderate to abundant amount of montmorillonite and a small to moderate amount of mica. The minerals are fairly well ordered. The fine silt contains a moderate amount of calcite, a small to moderate amount of quartz, small amounts of feldspar and mica, and a trace of montmorillonite. The family mineralogy is montmorillonitic.

SOIL SERIES HOBACKER SOIL NO. S69 WYD . 12- 5 SAMPLE NO. 9 629-9 632 STAR VALLEY AREA

SOIL FAMILY: PACIFIC CRYOBOLL, LOAMY-SKELETAL, MIXED RIVERSIDE SOIL SURVEY LABORATORY

SAMPLE NO.	DEPTH CM.	HORZ.	SIZE, CLASS AND PARTICLE DIAMETER (MM) 1B18,3A1 1A2A																			
			TOTAL FRACTION			SANDS					SILTS			CLAYS		INT. COARSE FRAGMENTS						
			SAND	SILT	CLAY	VCS	CS	MS	FS	VFS	CSI	FSI	CO.	FINE	CARBO	II	PCT.	I	II	III		
			2-	.05-	LT	2-1	1-	.5-	.25-	.10	.05	.02	.002	2-	LT	NATE	2-	OF	75-	20-5	5-2	
			.05	.002	.002									.20	.20	3A1A.02	WHOLE	20				
			PERCENT OF LESS THAN 2MM																			
			SOIL PCT. OF LT 75																			
9 629	0- 22	AP	34.4	46.7	18.9	7.8	5.4	3.1	9.5	8.6	23.0	23.7				37.4	37A	13	19	5		
9 630	22- 58	A12	35.5	48.5	16.0	6.5	4.7	3.4	11.8	9.1	25.2	23.3				41.7	76A	62	10	4		
9 631	58-100	2C 1	73.0	21.0	6.0	27.3	21.3	8.5	11.0	4.9	9.0	12.0				19.1	88A	61	20	7		
9 632	100-170	2C 2	62.5	25.5	12.0	26.8	22.3	8.5	7.6	3.5	7.2	18.3				14.0	90A	66	20	4		

SAMPLE NO.	DEPTH CM.	ORG. MATTER		CARBONATE		SESQUIOXIDES				ATTERBERG				BULK DENSITY CM	WATER CONTENT			EXTNSBLTY				
		CAR	NITRO	AS	CACO3	DI-CIT	EXT	PYROP	EXT	LL	PL	1/3	BAR		1/10	1/3	15	LEF	LE			
		6A1A	6B1A	6E1B	6F1B	6C2B	6G7A	6C5A	6G5A	4F1	4F2	4A1F	4A1F		4A1H	3B2	4B1C	4B1C	4B2	4D1	4D1	
9 629	0- 22	3.50	0.303	TR																		
9 630	22- 58	1.96	0.196	2																		
9 631	58-100	0.40	0.042	40																		
9 632	100-170	0.21		38																		

SAMPLE NO.	DEPTH CM.	EXTRACTABLE BASES				EXT. ACI	KCL	SUM NH4	SUM+ NH4	BASE SATURATION			PH									
		CA	MG	NA	K					AL	UAC	AL	UAC	AL	UAC	NAF	H2O	CA				
		5B4A	5B4A	5B4A	5B4A					DITY	AL	UAC	AL	UAC	DITY	5C1	Z	HIN	1/1	CC2		
9 629	0- 22	22.1	4.8	0.1	0.5	27.5				27.5	23.9	100+	100+									
9 630	22- 58	21.3	4.2	0.1	0.3	25.9				25.9	18.9	100+	100+									
9 631	58-100	18.7	1.1	0.1	0.1	20.0				20.0	4.2	100+	100+									
9 632	100-170	21.5	1.5	TR	0.1	23.1				23.1	5.8	100+	100+									

SAMPLE NO.	DEPTH CM.	CLAY MINERALOGY								RELATIVE AMOUNT
		LESS THAN 0.002 MM				L.T. 0.0002 MM				
		X RAY				DTA				
9 629	0- 22	MI	4	MT	3	KK	1			MI MICA 1 TRACE
9 630	22- 58									MT MONTMORT 2 SMALL
9 631	58-100	MI	3	CL	3					KK KAOLINIT 3 MODERATE
9 632	100-170									4 ABUNDANT
										CL CHLORITE 5 DOMINANT
										6 INDETR.

SAMPLE PREPARATION CODES  
A=STANDARD PREPARATION.

69Wyo-12-5

Location: Lincoln County, Wyoming. Northwest edge of Afton, Wyoming, near creamery. 274 meters (900 feet) west and 6 meters (20 feet) north of southeast corner of NE $\frac{1}{4}$  of section 25, T. 32 N., R. 119 W.

Site located on photo BBL-1EE-268. Date of Sampling: October 2, 1969.

Description by: C. J. Fowkes. Collectors: W. D. Nettleton, H. B. Ravenholt, W. R. Glenn, C. J. Fowkes.

Classification: Pachic Cryoboroll; loamy-skeletal, mixed.

Vegetation: Cultivated. Alfalfa and grass. Use: Irrigated cropland. Climate: Average annual precipitation is 457 mm (18 inches). Mean annual temperature at 50 cm is 3 $^{\circ}$  C. Average annual soil temperature is 7 $^{\circ}$  C. Average summer soil temperature is 14 $^{\circ}$  C without an O horizon.

Parent Material: Very gravelly, cobbly and stony calcareous alluvial sediments.

Topography: Nearly level alluvial fan. Convex slope of 1 percent, facing west. Sample site at mid-slope.

Elevation: 1,902 meters (6,239 feet) above sea level. Drainage: Well to somewhat excessively drained. Runoff is slow. Permeability is moderate to rapid. Soil moisture: Dry at time of sampling.

Remarks: Field pH determinations by phenol red and thymol blue. The 11C horizons were paired with those of sample S69Wyo-12-6.

HORIZONDESCRIPTION

- |               |   |
|---------------|---|
| Ap<br>69629   | 0 to 22 cm (0 to 9 inches). Brown (7.5YR 5/2) gravelly loam, dark brown (7.5YR 3/2) moist; moderate very fine subangular blocky; soft, very friable, slightly sticky, slightly plastic; many micro to medium few coarse roots; 15 percent rounded fragments less than 19 mm diam., 5 percent between 19 mm and 76 mm diam.; noncalcareous, mildly alkaline (pH 7.6; abrupt smooth boundary.   |
| A12<br>69630  | 22 to 58 cm (9 to 23 inches). Brown (7.5YR 5/3) gravelly loam, dark brown (7.5YR 3/2) moist; weak very fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many micro to fine common medium few coarse roots; 25 percent rounded fragments less than 19 mm diam., 15 percent between 19 mm and 76 mm diam., 5 percent greater than 76 mm diam.; lime coatings on undersides of some of the fragments; calcareous, mildly alkaline (pH 7.6); clear wavy boundary. |
| 11C1<br>69631 | 58 to 100 cm (23 to 39 inches). Light brown (7.5YR 6/3) very gravelly sandy loam, dark brown (7.5YR 4/3) moist; massive; loose, nonsticky, nonplastic; common fine roots; 50 percent rounded fragments less than 19 mm diam., 20 percent between 19 mm and 76 mm diam., 10 percent between 76 mm and 254 mm diam., 5 percent greater than 254 mm diam.; concretions of secondary lime on undersides of most of the fragments; calcareous, moderately alkaline (pH 8.2); gradual wavy boundary.        |
| 11C2<br>69632 | 100 to 170 cm (39 to 67 inches). Brown (7.5YR 5/3) very gravelly loam, dark brown (7.5YR 4/4) moist; massive; loose, nonsticky, nonplastic; 35 percent rounded fragments less than 19 mm diam., 35 percent between 19 mm and 76 mm diam., 10 percent between 76 mm and 254 mm diam., 5 percent larger than 254 mm diam.; lime coatings on undersides of fragments; calcareous, moderately alkaline (pH 8.2).  |

CONSECUTIVE PEDON NUMBER 6 69119 CHARACTERIZATION DATA

SOIL SERIES HOBACKER SOIL NO. S69 WYO - 12- 6 SAMPLE NO. 9 633-9 635 STAR VALLEY AREA

SOIL FAMILY: PACIFIC CRYOBORCEL, LOAMY-SKELETAL, MIXED RIVERSIDE SOIL SURVEY LABORATORY

SAMPLE NO.	DEPTH CM.	HORIZ.	SIZE CLASS AND PARTICLE DIAMETER (MM) 1B1B, 3A1													1A2A							
			TOTAL FRACTION			SANDS			SILTS			CLAYS			INT. COARSE FRAGMENTS								
			SAND	SILT	CLAY	VCS	CS	MS	FS	VFS	CSI	FSI	CO.	FINE	CARBO	II	PCT.	I	II	III			
			2-	.05-	.002	2-1	1-	.5	.25	.10	.05	.02	.002	2U	2U	3A1A	.02	WHOLE	20				
			PERCENT OF LESS THAN 2MM																SOIL PCT. OF LT 75				
9 633	35-	S22C 1	41.3	39.9	18.8	8.5	7.5	3.5	11.1	10.7	21.2	18.7						39.3	76A	53	19	4	
9 634	52-	932C 2CA	64.6	23.4	12.0	33.6	17.4	4.6	6.1	2.9	7.9	15.5						1	14.0	91*	49	29	10
9 635	93-	1572C 3CA	60.8	25.6	13.6	31.6	15.5	4.5	5.2	4.0	8.5	17.1						1	15.0	93*	57	23	10

SAMPLE NO.	DEPTH CM.	ORG. MATTER		CARBONATE		SESQUIOXIDES		ATTERBERG		BULK DENSITY		CM		WATER CONTENT		EXTNSOLTY				
		CAR	NITRO	AS	CACO3	DI-CIT	EXT	PYROP	EXT	L I M I T	EST.	1/3	DRY	1/10	1/3	15	LEF	LE		
		BON	GEN	LT	2	2-20	FE	AL	FE	AL	LL	PL	1/3	BAR	BAR	BAR	BAR			
		6A1A	6B1A	6E1B	6E1B	6C2B	6G2A	6C5A	6G5A	4F1	4F2	4A1F	4A1F	4A1H	3B2	4B1C	4B1C	4B2	4D1	4D1
		PERCENT																		
9 633	35- 52										1.15		0.40					9.0		
9 634	52- 93										1.15		0.18					5.1		
9 635	93-157										1.15		0.15					5.3		

SAMPLE NO.	DEPTH CM.	EXTRACTABLE BASES				EXT. KCL		C E C		BASE SATURATION		PH				
		CA	MG	NA	K	SUM	ACI- EXT.	SUM NH4-	SUM+	SUM+ NH4-	NAF	H2O	CA-			
		5B4A	5B4A	5B4A	5B4A	DITY	AL	OAC	ACI-	AL	OAC	2	4YN	1/1	CL2	
		6N2E	6O2D	6P2A	6Q2A	6H2A	6G1E	5A3A	5A6A	DITY	5C1			8C1D	8C1A	8C1E
		MEQ/100G										PERCENT				
9 633	35- 52															
9 634	52- 93															
9 635	93-157															

SAMPLE NO.	DEPTH CM.	CLAY MINERALOGY												RELATIVE AMOUNT
		LESS THAN 0.002 MM			L.T. 0.0002 MM			MINERAL			CODE			
		X RAY			DTA			X RAY			CODE			
		7A2E	7A2E	7A2E	7A3	7A3	7A2E	7A2E	7A2E					
		I	II	III	IV					I	II	III		
9 633	35- 52												1	TRACE
9 634	52- 93												2	SMALL
9 635	93-157												3	MODERATE
													4	ABUNDANT
													5	DOMINANT
													6	INDETER.

SAMPLE PREPARATION CODES  
 \*STANDARD PREPARATION.  
 \*\*THE 75-250MM FRACTION IS INCLUDED.

Location: Lincoln County, Wyoming. 248 meters (815 feet) north, 30 meters (100 feet) west of south-east corner of SW $\frac{1}{4}$  of section 25, T. 31 N., R. 119 W. Site located on photo BBL-1EE-264. Date of sampling: October 2, 1969.

Description by: H. B. Ravenholt, C. J. Fowkes. Collectors: W. D. Nettleton, H. B. Ravenholt, W. R. Glenn, C. J. Fowkes.

Classification: Pachic Cryoboroll; loamy-skeletal, mixed.

Vegetation: Cultivated. Alfalfa and grain stubble. Use: Irrigated cropland. Climate: Average annual precipitation is 457 mm (18 inches). Mean annual temperature is 3° C. Average annual soil temperature at 50 cm is 7° C. Average summer soil temperature is 14° C without an O horizon.

Parent material: Very gravelly, cobbly and stony calcareous alluvial sediments.

Topography: Nearly level alluvial fan. Convex slope of 2 percent facing west. Sample site at mid-slope.

Elevation: 1,890 meters (6,200 feet) above sea level. Drainage: Well drained. Runoff is slow.

Permeability is moderate to rapid. Soil moisture: Dry at time of sampling.

Remarks: Field pH determinations by phenol red and thymol blue. The IIC horizons were sampled for a comparison with the IIC horizons of sample 69Wyo-12-5.

HORIZON

DESCRIPTION

- Ap 0 to 17 cm (0 to 7 inches). Brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure that parts to weak fine granules; slightly hard, friable, slightly sticky, plastic; many micro to medium roots; 30 percent rounded coarse fragments; noncalcareous, mildly alkaline (pH 7.6); abrupt smooth boundary.
- A12 17 to 35 cm (7 to 14 inches). Brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/2) moist; weak fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky, plastic; many very fine to coarse roots; 35 percent rounded coarse fragments; noncalcareous, mildly alkaline (pH 7.6); clear wavy boundary.
- IIC1 35 to 52 cm (14 to 20 inches). Dark brown (7.5YR 4/3) very gravelly loam, dark brown (7.5YR 3/3) moist; weak to moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky, plastic; common fine to coarse roots; 40 percent rounded fragments less than 76 mm diam., 20 percent between 76 mm and 254 mm diam.; noncalcareous, mildly alkaline (pH 7.6); clear wavy boundary.
- IIC2ca 52 to 93 cm (20 to 37 inches). Brown (7.5YR 5/3) very gravelly loam, dark brown (7.5YR 4/3) moist; massive; hard, friable, slightly sticky, nonplastic; common medium to coarse roots; 50 percent rounded fragments less than 76 mm diam., 25 percent between 76 mm and 254 mm diam., 10 percent greater than 254 mm diam., lime coatings on coarse fragments; calcareous, strongly alkaline (pH 8.4); gradual wavy boundary.
- IIC3ca 93 to 157 cm (37 to 62 inches). Brown (7.5YR 5/3) very gravelly loam, dark brown (7.5YR 4/3) moist; massive; soft, friable, slightly sticky, nonplastic; very few very fine roots; 50 percent rounded fragments less than 76 mm diam., 25 percent between 76 mm and 254 mm diam., 10 percent greater than 254 mm diam., lime coatings on coarse fragments; calcareous, moderately alkaline (pH 8.2).

SOIL SERIES HUFFINE TAXADJUNCT SOIL NO. 569 MYO . 12- 3 SAMPLE NO. 9 616-9 622 STAR VALLEY AREA

SOIL FAMILY: TYPIC CRYOBOROLL, FINE-LOAMY, MIXED RIVERSIDE SOIL SURVEY LABORATORY

SAMPLE NO.	DEPTH CM.	HORZ.	SIZE CLASS AND PARTICLE DIAMETER (MM) 1B1B,3A1										IA2A								
			TOTAL FRACTION			SANDS			SILTS			CLAYS			INT. COARSE FRAGMENTS-						
			SAND	SILT	CLAY	VCS	CS	MS	FS	VFS	CSI	FSI	CO.	FINE	CARBD	II	PCT. OF	I	II	III	
			2-	.05-	LT	2-1	1-	.5-	.25-	.1-	.05-	.02-	2-	LT	NATE	.2-	OF	75-	20-5	5-2	
			.05	.002	.002								.2U	.2U	3A1A.02	WHOLE	20				
											PERCENT OF LESS THAN 2MM										
											SOIL PCT. OF LT 75										
9 616	0-18	AP	10.6	67.4	22.0	0.4	0.4	0.3	2.2	7.3	40.5	26.9					49.1	--A	--	--	
9 617	18-36	B21T	9.1	66.7	24.2	0.1	0.2	0.1	1.4	7.3	39.5	27.2					47.5	--A	--	--	
9 618	36-50	B22T	7.1	66.8	26.1	0.1	0.2	0.2	0.9	5.7	41.8	25.0					48.0	--A	--	--	
9 619	50-69	B23T	10.4	64.5	25.1	0.1	0.3	0.3	1.4	8.3	37.6	26.9					46.7	--A	--	--	
9 620	69-76	A1 8	33.6	48.9	17.5	3.9	4.1	3.3	9.3	12.8	28.8	20.1					1 47.3	74*	41V	24 5	
9 621	76-98	C 18	64.3	28.9	6.8	11.5	12.4	10.0	18.3	12.1	15.8	13.1					TR	37.2	63*	47V	3 6
9 622	98-125	C 2B	73.5	19.2	7.3	23.0	27.0	9.9	6.8	6.8	8.6	10.6					1 18.5	76*	40V	25 8	

SAMPLE NO.	DEPTH CM.	ORG. MATTER		CARBONATE		SESQUIOXIDES		ATTERBERG		BULK DENSITY CM	WATER CONTENT		EXTNSBLTY							
		CAR	NITRO	AS	CaCO3	DI-CIT	EXT	PYROP	EXT		C	M	I	EST.	1/3	DRY	1/10	1/3	15	LEF
		80N	GEN	LT	2	2-20	FE	AL	FE	AL	LL	PL	1/3	BAR	1/3	BAR	1/3	BAR	BAR	BAR
		6A1A	6B1A	6E1B	6E1B	6C2B	6G7A	6C5A	6G5A	4F1	4F2	4A1F	4A1F	4A1H	3B2	4B1C	4B1C	4B2	4D1	4D1
											PERCENT									
											PCT. NO. 40 GRAMS PER CC									
9 616	0-18	2.41	0.232			0.9	0.1			36	27	1.28	1.42	1.00		25.5	10.7	3.5	3.5	
9 617	18-36	1.35	0.147			0.9	0.1					1.38	1.54	1.00		24.7	10.3	3.7	3.7	
9 618	36-50	0.86	0.093			0.8	0.1			31	22	1.22	1.38	1.00		23.3	11.4	4.2	4.2	
9 619	50-69	0.68	0.077	TR		0.9	0.1					1.32	1.47	1.00		23.0	11.1	3.7	3.7	
9 620	69-76	0.91			37	1.0	0.1					1.04	1.15	0.48		21.5	7.8	3.4	1.6	
9 621	76-98	0.48			67							1.04		0.60					3.6	
9 622	98-125	0.24			77							1.04		0.44					3.0	

SAMPLE NO.	DEPTH CM.	EXTRACTABLE BASES				EXT. ACI	KCL	SUM NH4	BASE SATURATION		PH					
		CA	MG	NA	K				SUM	AL	AL	AL	AL	NAF	H2O	CA-
		5B4A	5B4A	5B4A	5B4A	DITY	AL	OAC	ACI-	AL	OAC	5C1	2	MIN	1/1	CL2
		6N2E	6O2D	6P2A	6Q2A	6H2A	6G1E	5A3A	5A6A	DITY			8C1D	8C1A	8C1E	
											MEQ/100G					
											PERCENT					
9 616	0-18	17.2	5.1	0.1	0.9	23.3		23.3	21.1	100+	100+		7.0	6.8		
9 617	18-36	15.4	5.1	0.1	0.5	21.1		21.1	20.3	100+	100+		7.0	6.6		
9 618	36-50	15.9	5.8	0.1	0.5	22.3		22.3	21.6	100+	100+		7.0	6.6		
9 619	50-69	16.5	5.8	0.1	0.4	22.8		22.8	22.2	100+	100+		7.0	6.6		
9 620	69-76	20.6	3.7	0.1	0.3	24.7		24.7	12.7	100+	100+		7.7	7.2		
9 621	76-98	18.2	1.5	0.1	0.1	19.9		19.9	4.8	100+	100+		7.9	7.3		
9 622	98-125	17.8	1.1	0.1	0.1	19.1		19.1	2.9	100+	100+		8.1	7.6		

SAMPLE NO.	DEPTH CM.	CLAY MINERALOGY							RELATIVE AMOUNT
		LESS THAN 0.002 MM			L.T. 0.0002 MM MINERAL				
		X RAY			DTA				
		7A2E	7A2E	7A2E	7A3	7A3	7A2E	7A2E	
		I	II	III	IV	-PERCENT-	I	II	III
9 616	0-18	MI	3	MT	1	KK	1		
9 617	18-36							MI	NICA
9 618	36-50	MT	4	MI	3	KK	1		1 TRACE
9 619	50-69	MT	2	MI	2	KK	2		2 SMALL
9 620	69-76	MI	5						3 MODERATE
9 621	76-98	MT	2	MI	2	KK	2		4 ABUNDANT
9 622	98-125	MT	2	MI	2	KK	2		5 DOMINANT
									6 INDETER.

SAMPLE PREPARATION CODES

- A=STANDARD PREPARATION.
- \*\*THE 75-250MM FRACTION IS INCLUDED.
- V=NOT WEIGHED. VALUE CALCULATED FROM A VOLUME ESTIMATE.

HUFFINE SILT LOAM (taxadjunct) <sup>1/</sup>  
569Wyo-12-3

**Location:** Lincoln County, Wyoming. This site is located about 4 kilometers (2½ miles) east and 805 meters (½ mile) north of Thayne, Wyoming; 6 meters (20 feet) south and 98 meters (300 feet) west of the northeast corner of section 19, T. 34 N., R. 119 W. The sample site is located on photo BBL-2EE-6. **Date of sampling:** September 30, 1969.

**Description by:** C. J. Fowkes. **Collectors:** W. D. Nettleton, W. R. Glenn, H. B. Ravenholt, C. J. Fowkes.

**Classification:** Typic Cryoboroll; fine-loamy, mixed.

**Vegetation:** Cultivated. Alfalfa and grass. **Use:** Irrigated cropland. **Climate:** Average annual precipitation is 457 mm (18 inches). Mean annual temperature is 3° C. Average annual soil temperature at 50 cm is 7° C. Average summer soil temperature is 14° C without an O horizon.

**Parent material:** Silty alluvium from loess deposits that has mantled old very gravelly alluvium.

**Topography:** Nearly level to gently sloping fan terrace. Convex slope of 2 percent, northwest facing. Sample site at midslope.

**Elevation:** 1,828 meters (6,000 feet) above sea level. **Drainage:** Well drained. Runoff is slow.

**Permeability:** is moderately slow. **Soil moisture:** Dry at time of sampling.

**Remarks:** Field pH determinations by phenol red and thymol blue. These samples were not paired.

HORIZONDESCRIPTION

Ap 69616	0 to 18 cm (0 to 7 inches). Brown (7.5YR 5/2) silt loam, dark brown (7.5YR 3/2) moist; weak medium and fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many micro to medium roots; noncalcareous, mildly alkaline (pH 7.4); abrupt smooth boundary.
B21t 69617	18 to 36 cm (7 to 14 inches). Brown (7.5YR 5/2) silt loam, dark brown (7.5YR 3/2) moist; moderate medium and fine subangular blocky structure; slightly hard, very friable, sticky, plastic; common micro to medium few coarse roots; thin patchy glassy coatings on faces of peds; noncalcareous, mildly alkaline (pH 7.4); gradual smooth boundary.
B22t 69618	36 to 50 cm (14 to 20 inches). Brown (7.5YR 5/3) silty clay loam, dark brown (7.5YR 4/3) moist; moderate fine and very fine subangular blocky structure; slightly hard, very friable, sticky, plastic; few fine to medium roots; thin patchy glassy coatings on ped faces; noncalcareous, mildly alkaline (pH 7.6); gradual smooth boundary.
B23t 69619	50 to 69 cm (20 to 27 inches). This horizon is the same as the B22t horizon but was subdivided for sampling purposes.
11A1b 69620	69 to 76 cm (27 to 30 inches). Brown (10YR 5/2) very gravelly loam, dark brown (10YR 4/2) moist; massive; soft, loose, nonsticky, nonplastic; many fine roots; 35 percent rounded fragments less than 19 mm diam., 25 percent between 19 mm and 76 mm diam.; concretions of lime on some of the fragments; calcareous, moderately alkaline (pH 8.0); clear wavy boundary.
11C1b 69621	76 to 98 cm (30 to 39 inches). Light brownish gray (10YR 6/2) very gravelly loam, grayish brown (10YR 5/2) moist; massive; soft, loose, nonsticky, nonplastic; many fine roots; 35 percent rounded fragments less than 19 mm diam., 25 percent fragments between 19 mm and 76 mm diam.; concretions of lime on many of the fragments; calcareous, strongly alkaline (pH 8.4); gradual wavy boundary.
11C2b 69622	98 to 125 cm (39 to 49 inches). Mixed colors of light brownish gray (10YR 6/3) and light yellowish brown (10YR 6/4) very gravelly sandy loam; dark grayish brown (10YR 4/2) moist and yellowish brown (10YR 5/4) moist; single grained; loose, nonsticky, nonplastic; few fine roots; 50 percent rounded fragments less than 19 mm diam., 25 percent fragments between 19 mm and 76 mm diam.; the fragments are mainly derived from sandstone and limestone; concretions of lime occur as pendants on most of the fragments in the upper part that decreases with depth; calcareous, moderately alkaline (pH 8.2).

<sup>1/</sup> The Huffine series is in a fine-silty over sandy or sandy-skeletal, mixed family. This pedon lacks an argillic horizon and is in a fine-loamy family.

SOIL Indart silt loam taxadunjet SOIL Nos. 867Wyo-10-3 LOCATION Johnson County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 67L324-67L331

GENERAL METHODS: 1A, 1B1b, 2A1, 2B

Depth (cm)	Horizon	Size class and particle diameter (mm)											3A1				2A2			Coarse fragments	
		Total		Sand					Silt				Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<0.074	3B2 Vol. 250-2	3B1 Wt.			
		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	20-5	10-5						5-2			
Pct. of < 2 mm																					
0-3	A11	33.1	57.9	9.0	1.4	1.5	0.7	7.1	22.3	33.0	24.9	61.5	10.7	77.5	10	20	10	3			
3-13	A12	35.8	56.2	8.0	1.3	1.5	0.7	8.2	24.0	31.7	24.5	62.7	11.7	74.7	10	20	7	3			
13-20	A2	39.3	44.3	16.4	0.8	0.7	0.7	10.5	26.5	24.6	19.7	60.0	12.7	71.7	10	20	15	5			
20-31	B&A	38.2	33.1	28.7	0.6	0.5	0.7	11.2	25.1	18.3	14.8	53.0	13.1	71.8	5	10	7	5			
31-53	B21t	36.2	30.5	33.3	0.5	0.3	0.5	9.0	25.9	16.9	13.6	50.5	10.3	73.6	10	5	1	1			
53-79	B22t	53.9	18.3	27.8	0.2	0.1	0.4	15.2	37.9	10.0	8.3	61.1	16.0	57.1	10	10	tr	tr			
79-99	C	79.8	9.2	11.0	0.0	0.0	0.2	19.0	60.5	5.5	3.7	83.4	19.2	38.2			-	-			
99-124	R	82.5	11.3	6.2	0.4	1.1	1.6	28.7	50.8	6.7	4.6	82.3	31.7	26.7			-	-			

Depth (cm)	6A1a Organic carbon a/ Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as CaCO <sub>3</sub> Pct.	Bulk density			4D1 COLE	Water content			pH		
						4A1d 1/3- Bar g/cc	4A1b Oven Dry g/cc	4B1c 1/3- Bar Pct.		4B2 15- Bar Pct.	4C1 WRD in./in.	8C1b Sat. Paste	8C1a (1:1)		
0-3	2.24	0.113	20	0.9				1.26			8.7				5.9
3-13	0.48	0.035	14	0.8				1.43	1.45	0.004	19.1	6.3	0.16		5.7
13-20	0.36	0.033	11	0.8				1.44			9.1				5.5
20-31	0.51	0.040	13	1.0				1.44			15.6				5.4
31-53	0.36			1.0				1.59	1.75	0.029	21.5	17.5	0.05		4.9
53-79	0.20			0.6				1.57	1.78	0.038	21.9	15.6	0.09		4.9
79-99	0.04			0.2				1.77	1.80	0.006	9.1	4.6	0.07		5.1
99-124	0.04			0.2											6.7

Depth (cm)	Extractable bases					6H1a Ext. Acidity	5B4a Cat.Exch.Cap.		6G1d KCl- Ext. Al	8E1 Resis- tivity ohms- cm	8A1a Elec. Cond. mmhos/ cm	8D5 Total Sol. Salts ppm	8A1 Water at Sat. Pct.	8D3 Ca/Mg	Base saturation	
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum		5A3a Sum Cations	5A6 NH <sub>4</sub> OAc							5C3 Sum Cations	5C1 NH <sub>4</sub> OA Pct.
0-3	7.1	1.6	0.1	0.7	9.5	8.3	17.8	13.8	0.1					4.4	53	69
3-13	3.6	1.1	0.1	0.4	5.2	4.6	9.8	7.6	0.2					3.3	53	68
13-20	6.1	2.2	0.1	0.4	8.8	4.4	13.2	11.0	0.4					2.8	67	80
20-31	13.1	5.0	0.1	0.6	18.8	7.9	26.7	22.9	0.6					2.6	70	82
31-53	16.6	6.3	0.1	0.8	23.8	7.6	31.4	28.2	0.6					2.6	76	84
53-79	15.9	6.0	0.1	0.8	22.8	5.4	28.2	26.1	0.7					2.7	81	87
79-99	4.7	1.8	0.1	0.3	6.9	1.3	8.2	7.4	0.1	7300	0.19	40		28.7	2.6	84
99-124	4.0	1.6	0.1	0.3	6.0	0.9	6.9	5.8						2.5	87	103

Depth (cm)	Ratios to Clay 8D1		
	Ext. Iron	15-Bar NH <sub>4</sub> OAc Water	CEC
0-3	0.10	1.0	1.5
3-13	0.10	0.79	0.95
13-20	0.05	0.55	0.67
20-31	0.03	0.54	0.80
31-53	0.03	0.52	0.85
53-79	0.02	0.56	0.94
79-99	0.02	0.42	0.67
99-124	0.03	0.60	0.94

a/ Organic carbon 5 kg/m<sup>2</sup> to a depth of one meter (Method 6A).  
b/ Estimated.

Soil classification: Typic Cryoboralf; fine-loamy, mixed.

Soil: Indart silt loam taxadjunct<sup>1/</sup>.

Pedon No.: S67Wyo-10-3.

Location: Johnson County, Wyoming; near center of Sec. 3, T46N, R85W. Proceed south on main gravel road which approaches U.S. Highway 16 2.3 miles west of Caribou Lodge for 14.7 miles. Turn left and go through gate about 100 yards from road.

Climate: Average annual precipitation is about 20 inches; average annual soil temperature at 20 inches is about 39° F.; mean annual soil temperature is about 49° F. Snow cover period extends from late October to mid-June. Elevation is 8,600 feet.

Vegetation and land use: Lodgepole forest with understory of viola, Fescue spp., and heartleaf arnica. Used mainly as forest.

Parent material: Residuum weathered from noncalcareous fine grained sandstone containing large quantities of weatherable minerals.

Physiography: Mountain sideslopes.

Topography: Rolling, north and east facing. Gradient is 5 percent.

Drainage: Well drained.

Moisture: Moisture conditions at sampling time were above normal because of the unusually high precipitation during the winter, spring, and early summer prior to sampling. Recording stations showed as much as +10 inches deviation of precipitation during that period.

Ground water: Deep.

Erosion: None to slight.

Permeability: Moderate.

Sampled by: Robert B. Grossman, Warren Lynn, Paul Lupcho, James R. Stephens, Jr., Ki Hak Han, and C. J. Fowkes - July 18, 1967.

Described by: C. J. Fowkes - July 18, 1967.

(Colors are for air-dry soil unless otherwise stated)

O1 3 to 0 cm (1 to 0 inch). Forest litter of partially decomposed pine needles, branches, and cones. Surface contains 10 percent coarse sandstone fragments 75 mm to 250 mm (3 to 10 inches).

A11 67L324 0 to 3 cm (0 to 1 inch). Dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak fine crumb structure; soft, very friable, nonsticky, nonplastic; slightly acid (pH 6.2); abrupt smooth boundary.

A12 67L325 3 to 13 cm (1 to 5 inches). Grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak very fine subangular blocky that parts to weak very fine crumb structure; soft, very friable, nonsticky, nonplastic; slightly acid (pH 6.4); clear smooth boundary.

A2 67L326 13 to 20 cm (5 to 8 inches). Light gray (10YR 7/2) loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; medium acid (pH 5.8); clear wavy boundary.

B & A 67L327 20 to 31 cm (8 to 12 inches). Light gray (10YR 7/2) and light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; moderate medium and fine subangular structure; hard, firm, sticky, plastic; (A2 skeletons are on 50 percent of the faces of peds); medium acid (pH 5.6); gradual wavy boundary.

B21t 67L328 31 to 53 cm (12 to 21 inches). Light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; moderate ( — ) medium and fine angular blocky structure; hard, firm, sticky, plastic; thin continuous glossy coatings and thick patchy waxy coatings on all faces of peds; 5 percent coarse sandstone fragments 20 mm to 75 mm (3/4 to 3 inches), 5 percent larger than 75 mm (3 inches); strongly acid (pH 5.4); clear wavy boundary.

B22t 67L329 53 to 79 cm (21 to 31 inches). Pink (7.5YR 7/4) and light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/5) moist; weak medium and fine angular blocky structure; hard, firm, slightly sticky, plastic; thick patchy waxy coatings on all faces of peds; 5 percent coarse sandstone fragments 20 mm to 75 mm (3/4 to 3 inches); medium acid (pH 5.5); gradual wavy boundary.

C 67L330 79 to 99 cm (31 to 39 inches). White (10YR 8/2) loamy very fine sand, light gray (10YR 7/2) moist; massive; slightly indurated and hardness increases with depth to the R; medium acid (pH 5.5); abrupt smooth boundary.

R 67L331 99 to 124 cm (39 to 49 inches). Hard, fine grained, noncalcareous sandstone.

<sup>1/</sup>Indart soils have more than 35 percent fine sand or coarser in the argillic horizon.



Soil classification: Ustic Torriorthent; fine-silty, mixed (calcareous), mesic.

Soil series: Kim loam taxadjunct<sub>1</sub>/.

Pedon No.: S69Wyo-10-1.

Location: Johnson County, Wyoming; NE $\frac{1}{4}$ , SW $\frac{1}{4}$  of Sec. 10, T43N, R78W, one-half mile south of center of field sheet 3N-82.

Climate: Average annual precipitation is about 12 inches. Mean annual soil temperature is about 52° F.

Frost-free season is 105 to 110 days. Elevation is approximately 4,650 feet.

Vegetation and land use: Western wheatgrass, blue gramagrass, big sagebrush, cactus. Rangeland and wildlife habitat.

Parent material: Medium textured, calcareous sediments wasted from interbedded shales and sandstones.

Physiography: Alluvial fan.

Topography: Gradient is 6 percent.

Drainage: Well drained.

Moisture: Dry throughout at time of sampling.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderate.

Sampled by: R. B. Grossman, Leo Shields, Paul Lupcho, James Stephens, C. J. Fowkes - August 6, 1969.

Described by: C. J. Fowkes.

(Colors are for air-dry soil unless otherwise stated)

A1 69L590 0 to 7 cm (0 to 3 inches). Light yellowish brown (2.5Y 6/3) loam, light olive brown (2.5Y 5/3) moist; weak fine crumb structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine roots; calcareous; moderately alkaline (pH 8.2); clear smooth boundary.

C1 69L591 7 to 26 cm (3 to 10 inches). Light yellowish brown (2.5Y 6/3) loam, light olive brown (2.5Y 5/3) moist; weak medium and fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine roots; calcareous; moderately alkaline (pH 8.2); gradual smooth boundary.

C2 69L592 26 to 54 cm (10 to 21 inches). Light yellowish brown (2.5Y 6/3) loam, light olive brown (2.5Y 5/3) moist; weak coarse and medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine roots; calcareous; moderately alkaline (pH 8.3); gradual smooth boundary.

C3ca 69L593 54 to 86 cm (21 to 34 inches). Light yellowish brown (2.5Y 6/3) loam, light olive brown (2.5Y 5/3) moist; weak coarse and medium subangular blocky structure; very hard, friable, slightly sticky, slightly plastic; few fine roots; calcareous; very few fine threads and seams of secondary lime; strongly alkaline (pH 8.6); gradual smooth boundary.

C4ca 69L594 86 to 115 cm (34 to 45 inches). Light yellowish brown (2.5Y 6/3) loam, light olive brown (2.5Y 5/3) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky, slightly plastic; calcareous; few fine threads and seams of secondary lime; strongly alkaline (pH 8.6).

<sup>1</sup>Kim soils are in the fine-loamy family.

SOIL CLASSIFICATION-USTIC TORRIORTHENT  
 FINE-LOAMY, MIXED (CALCAREOUS), MESIC  
 SERIES - - - - -KIM

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE, NTSC  
 NATIONAL SOIL SURVEY LABORATORY  
 LINCOLN, NEBRASKA  
 JUNE 1977

SOIL NO - - - - - S69WYO-10-8 COUNTY - - - JOHNSON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 69L611-69L612

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO	
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	INTR	FINE	NON-
CM		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-.1	.02	CLAY	TO
005-025	C1CA	47.1	30.9	22.0	8.6	.1	.3	1.5	24.3	20.8	16.9	14.0	26.2	54.4	39		.41
046-066	C3CA	44.8	34.3	20.9	8.6	TR	.1	1.2	20.8	22.6	19.8	14.5	22.2	56.9	41		.39

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2										WATER CONTENT				CARBONATE			
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	4B1C	4B1C	4B2	4C1	6E1B	3A1A	8C1A	8C1E
CM	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT
005-025	0	0	0	0	0	64	0						9.1	8	3	8.1		
046-066	0	0	0	0	0	67	0						8.2	7	2	8.5		

DEPTH	ORGANIC MATTER		IRON	PHCS	EXTRACTABLE BASES 5B4A-				ACTY	AL	CAT EXCH		RATIO	RATIO	CA	(BASE SAT)		
	6A1A	6B1A			C/N	6C2B	6N2E	6O4B			6P2B	6Q2B				6H1A	6G1E	5A3A
CM	PCT	PCT	PCT	PCT	CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	CA	SAT	EXTB	NHAC
005-025	.58					5.6	.1	.4					18.2	.83				
046-066	.27					12.8	.2	.4					17.8	.85				

CLAY MINERALOGY (7A2C).  
 005-25 CM CCA1 ABUNDANT WELL-ORDERED MONTMORILLONITE AND SMALL AMOUNTS OF KAOLINITE AND MICA. LITTLE DIFFERENCE  
 046-66 CM CCA3 BETWEEN HORIZONS. CCA3 HAS BIT MORE MONTMORILLONITE. CLAY MINERALOGY IS MONTMORILLONITIC.

Soil classification: Ustic Torriorthent; fine-loamy, mixed (calcareous), mesic.

Soil series: Kim loam.

Pedon No.: 569Wyo-10-8.

Location: Johnson County, Wyoming; NW $\frac{1}{4}$ , SE $\frac{1}{4}$  of Sec. 25, T45N, R82W, 1 mile southeast of north east corner of field sheet 13N-33.

Climate: Average annual precipitation is about 12 inches. Mean annual soil temperature is about 52° F.

Frost-free season is 105 to 110 days. Elevation is approximately 5,100 feet.

Vegetation and land use: Western wheatgrass, blue gramagrass, big sagebrush, and cactus. Rangeland and wildlife habitat.

Physiography: Alluvial fan.

Drainage: Well drained.

Moisture: Dry throughout at time of sampling.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderate.

Sampled by: R. B. Grossman, Leo Shields, James Stephens - August 8, 1969.

Described by: James Stephens.

(Colors are for air-dry soil unless otherwise stated)

A1 0 to 5 cm (0 to 2 inches). Brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak fine platy that parts to weak coarse crumb structure; soft, friable, slightly sticky, slightly plastic; many roots; calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

C1ca 69L611 5 to 25 cm (2 to 10 inches). Brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak medium angular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few roots; calcareous; many fine and coarse soft rounded masses of secondary lime; moderately alkaline (pH 8.4); clear smooth boundary.

C2ca 25 to 46 cm (10 to 18 inches). Brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak medium and coarse angular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; calcareous; many fine and medium threads and soft rounded masses of secondary lime; moderately alkaline (pH 8.4); gradual wavy boundary.

C3ca 69L612 46 to 66 cm (18 to 26 inches). Light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; calcareous; few fine soft rounded masses of secondary lime; moderately alkaline (pH 8.4); clear wavy boundary.

C4 66 to 150 cm (26 to 60 inches). Light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; calcareous; strongly alkaline (pH 8.6).

SOIL Kyle clay SOIL Nos. S64Wyo-8-2 LOCATION Goshen County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19423-19429 January 1968

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

Depth cm	Horizon	Size class and particle diameter (mm) 3A1											3A1b	3A1a Non-carbonate Clay	Coarse fragments 2A2				
		Total			Sand					Silt					3A1b	3A1a	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	2 - 19
0-13	A1	20.8	28.1	51.1	-	0.4	0.9	4.5	15.0	9.6	18.5	34.5	5.8		51	-	-	-	
13-25	B21	15.9	27.5	56.6	-	0.3	0.7	3.6	11.3	7.2	20.3	21.1	4.6		55	-	-	-	
25-48	B22	13.1	26.4	60.5	-	0.2	0.4	2.1	10.4	8.1	18.3	20.1	2.7		59	-	-	-	
48-69	B23	13.2	25.7	61.1	tr	0.2	0.4	2.4	10.2	8.0	17.7	20.0	3.0	16.3	59	-	-	-	
69-92	B3cacs	13.2	22.2	64.6	-	0.3	0.4	2.4	10.1	6.3	15.9	18.2	3.1		64	-	-	-	
92-117	C1cacs	12.7	21.0	66.3	tr	0.2	0.4	2.3	9.8	6.4	14.6	17.9	2.9		65	-	-	-	
117-178	C2	11.9	21.5	66.6	tr	0.1	0.4	2.0	9.4	6.5	15.0	17.4	2.5		67	-	-	-	

Depth cm	6A1a Organic carbon a/ Pct.	6B1a Nitrogen Pct.	C/N	Ext. Iron as Fe Pct.	Carbonate as CaCO <sub>3</sub>		Bulk density			4D1 COLE	Water content				pH		
					6E1b < 2 mm Pct.	3A1a < 0.002 mm Pct.	4A1a Field 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 Pct.	8C1b Sat. Paste	8C1a 1:1	8C1a 1:10
					mm	mm	g/cc	g/cc	g/cc		Pct.	Pct.	Pct.	Pct.			
0-13	1.22	0.116	11		7	tr	1.27	1.13	1.45	0.087	24.1	40.5	22.3	0.21	7.5	8.1	8.4
13-25	0.61	0.062	10		9	2	1.33	1.10	1.58	0.13	25.5	43.0	24.3	0.21	7.5	8.2	8.7
25-48	0.50	0.053	9		8	2	1.38	1.10	1.61	0.14	24.2	42.7	26.3	0.18	7.5	8.0	8.9
48-69	0.52				7	2	1.39	1.11	1.63	0.14	23.9	43.9	28.3	0.17	7.6	7.9	8.9
69-92	0.42				6	1	1.33	1.10	1.64	0.14	28.2	45.4	28.9	0.18	7.7	7.9	8.9
92-117	0.37				5	1	1.22	1.02	1.59	0.16	34.9	51.4	30.9	0.21	7.7	7.9	8.8
117-178	0.32				5	tr	1.19	1.02	1.56	0.16	41.0	53.1	29.9	0.24	7.9	7.9	8.9

Depth cm	Extractable bases 5B1a					Ext. Acidity	Cat. Exch. Cap.		Water extract from saturated paste								8B1a Electrical conductivity mmho/cm		
	6N4b Ca	6O4b Mg	6P2a Na	6Q2a K	Sum		Sum Cations	5A1a NH <sub>4</sub> OAc	6A1a				6B1a						
	meq/100 g	meq/100 g	meq/100 g	meq/100 g	meq/100 g		meq/100 g	meq/100 g	Ca	Mg	Na	K	CO <sub>3</sub>	HCO <sub>3</sub>	Cl	SO <sub>4</sub>			
0-13		7.9	1.4	3.2				36.7					4.3	0.6				0.77	
13-25		7.9	3.7	3.0				38.2					7.4	0.4				1.02	
25-48		7.5	8.8	3.0				37.9	6.0	1.8			27.8	0.6	-	5.0	21.5	9.4	3.70
48-69		7.9	18.8	3.4				38.8	13.3	4.2			79.0	1.0	-	5.5	65.1	27.9	9.3
69-92		7.9	29.6	3.5				40.4	21.1	6.8			150	1.4	-	6.3	84.5	88.1	15.2
92-117		8.9	41.6	4.1				40.8	24.2	9.9			213	1.6	-	5.3	101	143	18.8
117-178		9.8	30.3	4.2				40.9	28.7	10.6			174	1.6	-	6.3	48.1	167	16.0

Depth cm	8B	5D2	5E	6F1a	Ratios to Clay 8D2		
	Water at Saturation	Exchangeable Na	Sodium Adsorption Ratio	Gypsum	NH <sub>4</sub> OAc CEC	Ext. Iron	15-bar water
	Pct.	Pct.		Pct.			
0-13	63.9	3			0.72		0.44
13-25	68.1	8			0.69		0.43
25-48	75.9	18	14	-	0.64		0.43
48-69	87.6	31	27	tr	0.66		0.46
69-92	92.4	39	40	tr	0.63		0.45
92-117	92.8	54	52	tr	0.63		0.47
117-178	90.9	35	39	1	0.61		0.45

a/ 8 kg/m<sup>2</sup> to 60 inches (Method 6A).

Soil classification: Ustertic Camborthid; very-fine, montmorillonitic, mesic.

61

Soil series: Kyle clay.

Pedon No.: S64Wyo-8-2.

Location: Goshen County, Wyoming; SW $\frac{1}{4}$ , SW $\frac{1}{4}$ , SE $\frac{1}{4}$  of Sec. 6, T23N, R62W; 60 feet west and 242 feet north of the west abutment of the bridge over Cherry Creek on the county road.

Climate: Average annual precipitation is about 15 inches. Mean annual air temperature is about 49° F., and mean summer air temperature is about 69° F. Frost-free season is 120 to 150 days.

Vegetation and land use: Western wheatgrass, blue gramagrass, greasewood, inland saltgrass, and alkali sacaton. Rangeland and wildlife habitat.

Parent material: Calcareous clay alluvium.

Physiography: Valley fill bordering a drainage way.

Topography: Flat surface. Gradient is 0 to 1 percent.

Drainage: Well drained.

Moisture: Near 15 bar when sampled.

Ground water: At depths of more than 9 feet.

Erosion: Slight.

Permeability: Slow.

Sampled by: Fraser Stephens, R. C. Kronenberger, Arvad J. Cline, E. Rivers, Robert B. Grossman, and Harold Bindschadler - May 19, 1964.

Described by: Arvad J. Cline.

(Colors are for air-dry soil unless otherwise stated)

A1 19423 0 to 13 cm (0 to 5 inches). Gray (2.5Y 6/1) clay, dark grayish brown (2.5Y 4/2) moist; moderate very fine granular structure; slightly hard, very friable, very sticky, very plastic; calcareous; moderately alkaline (pH 8.0); clear smooth boundary.

B21 19424 13 to 25 cm (5 to 10 inches). Gray (2.5Y 6/1) clay, dark grayish brown (2.5Y 5/2) moist; weak medium angular blocky structure; very hard, friable, very sticky, plastic; a few glossy patchy coatings on vertical faces of peds; calcareous; strongly alkaline (pH 8.6); gradual smooth boundary.

B22 19425 25 to 48 cm (10 to 19 inches). Gray (2.5Y 6/1) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic that parts to moderate medium angular blocky structure; extremely hard, very firm, very sticky, plastic; a few glossy patchy coatings on vertical faces of peds; calcareous; strongly alkaline (pH 8.6); gradual smooth boundary.

B23 19426 48 to 69 cm (19 to 27 inches). Gray (2.5Y 6/1) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic that parts to moderate medium angular blocky structure; extremely hard, very firm, very sticky, plastic; a few glossy patchy coatings on vertical faces of peds; calcareous; strongly alkaline (pH 8.5); gradual wavy boundary.

B3cacs 19427 69 to 92 cm (27 to 36 inches). Gray (2.5Y 6/1) clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic that parts to weak medium and coarse angular blocky structure; extremely hard, very firm, very sticky, plastic; common (10YR 5/4) mottles; calcareous; secondary calcium carbonate and calcium sulfate that accumulates as crystals and small soft rounded masses and in thin seams and streaks; strongly alkaline (pH 8.5); gradual wavy boundary.

C1cacs 19428 92 to 117 cm (36 to 46 inches). Gray (2.5Y 6/1) clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, very sticky, plastic; many medium sized (10YR 3/4) mottles; calcareous; secondary calcium carbonate and calcium sulfate occurs as crystals in thin seams and streaks and as soft rounded masses; strongly alkaline (pH 8.7); gradual wavy boundary.

C2 19429 117 to 178 cm (46 to 70 inches). Light clay; massive; extremely hard, firm, very sticky, plastic; many medium sized (2.5Y 4/4) mottles; calcareous; strongly alkaline (pH 8.8).

Remarks: B23 horizon, 19 to 27 inches, LSL 19426. Methods 7A1, 7A2a, 7B1, and 7B2.

The clay contains a moderate amount of montmorillonite and mica and a small amount of kaolinite. The minerals are fairly well ordered. The fine silt contains a moderate amount of calcite, a small to moderate amount of quartz, small amounts of mica and feldspar and a trace of montmorillonite. The family mineralogy borders between mixed and montmorillonitic. It is considered montmorillonitic, based partly on pedon S64Wyo-8-1.

SOIL CLASSIFICATION-USTCLLIC Natrargid  
 FINE-LOAMY, MIXED, MESIC  
 SERIES - - - - - KEYNER TAXADJUNCT

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE, MTSC  
 NATIONAL SOIL SURVEY LABORATORY  
 LINCOLN, NEBRASKA  
 JUNE 1977

SOIL NO - - - - - S69WYC-10-3 COUNTY - - - JOHNSON

GENERAL METHODS- - 1A, 1B1B, 2A1, 2B SAMPLE NOS. 69L598-69L599

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO	
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	II		FINE
CM		(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)
026-039	B2T	53.8	21.7	24.5	18.3	.1	.5	2.1	24.4	26.7	13.6	8.0	27.1	59.1	75		.40
039-064	B3CA	48.1	29.4	22.5		.1	.3	1.4	16.1	30.2	17.1	12.3	17.9	59.8			.41

DEPTH	PARTICLE SIZE ANALYSIS, MP, 3B, 3B1, 3B2										BULK DENSITY				WATER CONTENT				CARBONATE			
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD	6E1B	3A1A	8C1A	8C1E				
CM	PCT	PCT	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)	(- - - - -)				
026-039	TR	0	0	0	TR	58	TR							9.9		3		8.4				
039-064	TR	0	0	0	TR	67	TR							9.3		2		8.5				

DEPTH	ORGANIC MATTER			IRON	PHOS	EXTRACTABLE BASES 5B4A-				ACTY	AL	CAT EXCH		RATIO	RATIO	CA	BASE SAT	
	6A1A	6B1A	C/N			6C2B	6N2E	6O4B	6P2B			6Q2B	6H1A				6G1E	5A3A
CM	PCT	PCT	PCT	PCT	TOTL	CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	CA	SAT	EXTB
026-039							6.9	3.5	.6					17.7	.72			
039-064							6.3	4.2	.5					16.3	.72			

DEPTH	SATURATED PASTE				NA	SALT	GYP	SATURATION EXTRACT				8A1-	ATTERBERG					
	8E1	8C1B	8A	5D2				5E	8D5	6F1A	8A1A		6N1B	6O1B	6P1B	6Q1B	6I1A	6J1A
CM	REST	PH	H2O	ESP	SAR	TOTL	SOLU	EC	CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3	4F1
026-039	1200					520												
039-064																		

CLAY MINERALOGY (7A2C).  
 026-39 CM B2T SMALL AMOUNTS OF MONTMORILLONITE, MICA, AND KAOLINITE. MICA AND KAOLINITE WELL-ORDERED. MONTMORILLONITE IS MODERATELY WELL ORDERED. CLAY MINERALOGY IS JUDGED MONTMORILLONITIC.

Soil classification: Ustollic Natrargid; fine-loamy, mixed, mesic.

63

Soil: Keyner taxadjunct<sup>1/</sup>

Pedon No.: S69Wyo-10-3.

Location: Johnson County, Wyoming; NE $\frac{1}{4}$ , SE $\frac{1}{4}$  of Sec. 18, T43N, R73W, on oiled road (Wyo. 1002) one-fourth mile east of west joined line and one-fourth mile north of field sheet 1N-45.

Climate: Average annual precipitation is about 12 inches. Mean annual soil temperature is about 52° F. Frost-free season is 105 to 110 days. Elevation is approximately 4,400 feet.

Vegetation and land use: Western wheatgrass, blue gramagrass, big sagebrush, cactus. Rangeland and wildlife habitat.  
Parent material: Residuum weathered from calcareous, very strongly alkaline interbedded clay shales and sandy shales.

Physiography: Rolling upland.

Topography: Gradient is 5 percent.

Drainage: Well drained.

Moisture: Dry throughout at time of sampling.

Ground water: Deep.

Erosion: Slight.

Permeability: Slow.

Sampled by: R. B. Grossman, Leo Shields, James Stephens, Paul Lupcho, and C. J. Fowkes - August 6, 1969.

Described by: C. J. Fowkes.

(Colors are for air-dry soil unless otherwise stated)

A11 0 to 9 cm (0 to 4 inches). Light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; weak medium and fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; mildly alkaline (pH 7.6); clear smooth boundary.

A12 9 to 26 cm (4 to 10 inches). Pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky, slightly plastic; mildly alkaline (pH 7.7); clear smooth boundary.

B2t 69L598 26 to 39 cm (10 to 15 inches). Pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; strong, medium columnar structure; extremely hard, extremely firm, very sticky, plastic; thin patchy glossy coatings on faces of peds; strongly alkaline (pH 8.5); clear smooth boundary.

B3ca 69L599 39 to 64 cm (15 to 25 inches). Pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate coarse prismatic that parts to moderate medium angular blocky structure; very hard, very firm, very sticky, plastic; few thin patches of glossy coatings on most faces of peds; many coarse soft rounded masses and fine threads of secondary lime; calcareous; strongly alkaline (pH 9.0); gradual wavy boundary.

C 64 to 94 cm (25 to 37 inches). Light gray (5Y 7/2) fine sandy shale; upper 10 cm have secondary lime as seams in the shale fractures.

<sup>1/</sup>The Keyner soils are in a fine-loamy, mixed, mesic family of Haplustollic Natrargids. Keyner soils are deep soils. This pedon contains a slightly higher sodium content and has a paralithic contact at 25 inches.

SOIL Mathers loam SOIL Nos. S67Wyo-10-1 LOCATION Johnson County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 67L358-67L367

GENERAL METHODS: 1A, 1B1b, 2A1, 2B

Depth (cm)	Horizon	Size class and particle diameter (mm)											3A1				2A2 Coarse fragments		
		Total			Sand					Silt			Int. II (0.2-0.02)	(2-0.1)	0.074	3B2 Vol.-% 250-2	3B1 Wt. %		
		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)	75-2					20-5	5-2	
Pct. of < 2 mm																			
0-8	A11	43.2	46.2	10.6	11.9	12.9	5.3	6.6	6.6	24.0	22.2	33.8	36.5	61.4	5	10	tr	5	
8-15	A12	51.6	40.3	8.1	16.8	15.1	5.9	7.1	6.6	20.9	19.4	30.9	45.0	52.9	10	15	3	7	
15-23	A2	60.2	32.7	7.1	16.8	19.0	8.1	9.5	6.8	15.8	16.8	27.2	53.4	44.1	15	25	10	13	
23-31	B8A	63.2	17.4	19.4	11.5	20.6	10.8	12.9	7.4	7.9	9.5	21.5	55.8	41.2	15	25	11	14	
31-51	B21t	64.5	8.1	27.4	13.0	21.9	10.8	12.4	6.5	3.3	4.8	15.8	58.0	38.9	15	20	6	11	
51-66	B22t	81.4	6.3	12.3	25.8	27.1	11.1	12.7	4.6	2.4	3.9	13.1	76.7	20.9			13	15	
66-99	B3	82.9	6.0	11.1	28.1	26.6	10.4	12.8	5.0	1.8	4.2	12.8	77.9	19.6			12	18	
99-124	C1	89.1	5.1	5.8	36.1	29.4	9.5	10.5	3.5	1.7	3.4	10.2	85.5	12.6			7	20	
124-155	C2	82.4	6.5	11.1	29.5	26.7	9.9	11.3	5.0	1.9	4.6	12.2	77.4	20.2			10	19	
155-183	C3	85.8	6.6	7.6	25.0	26.2	12.2	16.0	6.5	2.9	3.7	17.2	79.3	17.3			15	19	

Depth (cm)	6A1a Organic carbon a/ Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as CaCO <sub>3</sub> Pct.	Bulk density			4D1 COLE	Water content			pH	
						4A1d 1/3-Bar g/cc	4A1b Oven-Dry g/cc	4D1		4B1c 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 WRD in./in.	8C1b Sat. Paste	8C1a (1:1)
0-8	3.67	0.130	28	0.9		1.16	1.23	0.019	24.0	6.2	0.20			5.3
8-15	0.69	0.037	19	0.8		1.55b	1.61	0.012	22.4b	4.3	0.25b			5.5
15-23	0.28			0.7		1.53b	1.58	0.009	19.1b	3.2	0.20b			5.4
23-31	0.27			0.7		1.5 c				7.3				5.2
31-51	0.36			0.6		1.56	1.64	0.005	18.3	12.3	0.08			5.3
51-66	0.24			0.5						4.6				5.1
66-99	0.12			0.5						6.6				5.3
99-124	0.07			0.5						3.6			5.2	5.3
124-155	0.05			0.4						5.4				5.6
155-183	0.08			0.4						2.8				5.6

Depth (cm)	Extractable bases 5B4a					6H1a Ext. Acid-ity	Cat. Exch. Cap.		6G1d KCl-Ext. Al	8E1 Resis-tivity ohms-cm	8A1a Elec. Cond. mmhos/cm	8D5 Total Sol. Salts ppm	8A1 Water at Sat. Pot.	8D3 Ca/Mg Cations	Base saturation	
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum		5A3a Sum Cations	5A6 NH <sub>4</sub> OAc							5C3 Sum Cations	5C1 NH <sub>4</sub> OAc
0-8	7.3	1.3	0.1	0.7	9.4	15.6	25.0	16.9	0.4					5.6	38	56
8-15	4.3	0.9	0.1	0.4	5.7	5.8	11.5	9.0	0.2					4.8	50	63
15-23	3.4	1.0	0.1	0.2	4.7	4.2	8.9	6.7						3.4	53	70
23-31	8.3	2.9	0.1	0.4	11.7	4.8	16.5	14.4	0.5					2.9	71	81
31-51	18.3	7.0	0.1	0.7	26.1	5.4	31.5	29.3						2.6	83	89
51-66	9.3	3.4	0.1	0.4	13.2	4.3	17.5	15.3	0.5					2.7	75	86
66-99	10.1	3.5	0.1	0.4	14.1	2.8	16.9	15.6						2.9	83	90
99-124	7.7	2.7	0.1	0.3	10.8	2.3	13.1	11.3	0.3	7000	0.35	50	20.2	2.9	82	96
124-155	10.9	3.8	0.1	0.3	15.1	3.0	18.1	15.8						2.9	83	96
155-183	7.0	2.3	0.1	0.3	9.7	2.4	12.1	10.0	0.1					3.0	80	97

Depth (cm)	Ratios to Clay 8D1		
	Ext. Iron	15-Bar Water	NH <sub>4</sub> OAc CEC
0-8	0.08	0.58	1.6
8-15	0.10	0.53	1.1
15-23	0.10	0.45	0.94
23-31	0.04	0.38	0.74
31-51	0.02	0.45	1.1
51-66	0.04	0.37	1.2
66-99	0.05	0.59	1.4
99-124	0.09	0.62	1.9
124-155	0.04	0.49	1.4
155-183	0.05	0.37	1.3

a/ Organic carbon: 6 kg/m<sup>2</sup> to a depth of 51 cm (20 in.) (Method 6A).  
b/ Desorbed at 1/10-bar.  
c/ Estimated.

Soil classification: Typic Cryoboralf; fine-loamy over sandy or sandy-skeletal, mixed.

Soil series: Mathers loam.

Pedon No.: S67Wyo-10-1.

Location: Johnson County, Wyoming; SW $\frac{1}{4}$ , SW $\frac{1}{2}$  of Sec. 24, T47N, R85W. Proceed south on main gravel road which approaches U.S. Highway 16 2.3 miles west of Caribou Lodge for 9.9 miles. Turn left or east at fence gate, proceed 1.5 miles on trail, thence 50 feet north on trail in timber. Site marked by planted post.

Climate: Average annual precipitation is about 20 inches; average annual soil temperature at 20 inches is about 39° F.; mean summer soil temperature is about 48° F. Snow cover period extends from late October to mid-June. Elevation is 8,460 feet.

Vegetation and land use: Lodgepole pine, creeping juniper, sparse grass cover of fescue spp., stipas spp., agrostas spp. Used mainly as forest.

Parent material: Noncalcareous till or outwash from granitic sources.

Physiography: Piedmont.

Topography: Gently sloping east facing slope. Gradient is 3 percent.

Drainage: Well drained.

Moisture: Moisture conditions at sampling time were above normal because of the unusually high precipitation during the winter, spring, and early summer prior to sampling. Deviation for that period was around +10 inches of precipitation.

Ground water: At a depth of 178 cm (70 inches).

Erosion: None.

Permeability: Moderately rapid.

Sampled by: Robert B. Grossman, Warren Lynn, Paul Lupcho, James R. Stephens, Jr., Ki Hak Han, and C. J. Fowkes - July 17, 1967.

Described by: C. J. Fowkes - July 17, 1967.

(Colors are for air-dry soil unless otherwise stated)

O1 3 to 0 cm (1 to 0 inches). Litter from conifers, needles, cones, bark, and twigs.

A11 67L358 0 to 8 cm (0 to 3 inches). Dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky, nonplastic; 5 percent fine granitic gravel; strongly acid (pH 5.2); clear smooth boundary.

A12 67L359 8 to 15 cm (3 to 6 inches). Grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine crumb structure; soft, very friable, slightly sticky, nonplastic; 10 percent fine granitic gravel; strongly acid (pH 5.2); clear wavy boundary.

A2 67L360 15 to 23 cm (6 to 9 inches). Light gray (10YR 7/2) gravelly coarse sandy loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; 15 percent fine granitic gravel; strongly acid (pH 5.4); clear wavy boundary.

B & A 67L361 23 to 31 cm (9 to 12 inches). Light brown (7.5YR 6/4) and very pale brown (10YR 7/3) gravelly sandy loam, brown (7.5YR 5/4) moist and brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; 15 percent fine granitic gravel. (A2 skeletons on 50 percent of the faces of peds; few coarse pockets of dark minerals; medium acid (pH 5.5); clear wavy boundary.

B21t 67L362 31 to 51 cm (12 to 20 inches). Light brown (7.5YR 6/4) and light yellowish brown (10YR 6/4) gravelly sandy clay loam, dark brown (7.5YR 4/4) moist and dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; thin continuous glossy coatings on all faces of peds; clay bridging between sand grains; streaks of dark organic staining; 15 percent fine granitic gravel; medium acid (pH 5.6); gradual wavy boundary.

B22t 67L363 51 to 66 cm (20 to 26 inches). Light brown (7.5YR 6/4) gravelly coarse sandy loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; thin continuous glossy coatings on all faces of peds; 15 percent fine granitic gravel; medium acid (pH 5.6); gradual wavy boundary.

B3 67L364 66 to 99 cm (26 to 39 inches). Pale brown (10YR 6/3) gravelly loamy coarse sand, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; some clay bridging between sand grains; 20 percent fine granitic gravel; medium acid (pH 5.7); gradual wavy boundary.

C1 67L365 99 to 124 cm (39 to 49 inches). Very pale brown (10YR 7/3) coarse sand and fine gravel, pale brown (10YR 6/3) moist; single grained; loose, nonsticky, nonplastic; there are erratic bands of dark minerals 5 to 15 cm (2 to 6 inches) in thickness and as much as 30 to 100 cm (1 to 3 feet in length); medium acid (pH 5.8); gradual wavy boundary.

C2 67L366 124 to 155 cm (49 to 61 inches). Light gray (10YR 7/2) gravelly loamy coarse sand, pale brown (10YR 6/3) moist; single grained; loose, nonsticky, nonplastic; there are erratic bands of dark minerals 5 to 15 cm (2 to 6 inches) thick and as much as 30 to 100 cm (1 to 3 feet) in length; 20 percent fine granitic gravel; medium acid (pH 5.8); gradual wavy boundary.

C3 67L367 155 to 183 cm (61 to 72 inches). Light gray (2.5Y 7/2) gravelly loamy coarse sand, light yellowish brown (2.5Y 6/4) moist; single grained; loose, nonsticky, nonplastic; 25 percent fine granitic gravel; medium acid (pH 5.8); ground water at 178 cm (70 inches).

Remarks: Samples of horizons 6 to 9 inches, 12 to 20 inches, 39 to 49 inches were taken for analysis by the Wyoming Highway Department Engineering Lab.

CONSECUTIVE PEDON NUMBER C 69117 CHARACTERIZATION DATA

SOIL SERIES MUNDOS TAXADJUNCT SOIL NO. 569 WYO . 12- 4 SAMPLE NO. 9 623-9 628 STAR VALLEY AREA

SOIL FAMILY: PACIFIC CRYOBOROLL, COARSE-LOAMY, MIXED RIVERSIDE SOIL SURVEY LABORATORY

SAMPLE NO.	DEPTH CM.	HORZ.	SIZE, CLASS AND PARTICLE DIAMETER (MM) 1818,3A1														1A2A			
			TOTAL FRACTION			SANDS					SILTS				CLAYS		INT. COARSE FRAGMENTS-			
			SAND	SILT	CLAY	VC5	CS	MS	FS	VFS	CSI	FSI	CO.	FINE	CARBO	II	PCT. I	II	III	
9 623	0-19	AP	32.2	47.4	20.4	2.3	3.0	3.7	11.2	12.0	25.1	22.3			44.0	34A	11	19	4	
9 624	19-32	B21	32.8	46.5	20.7	2.6	3.2	3.2	10.8	13.0	25.2	21.3			45.5	39A	7	26	6	
9 625	32-49	B22	35.6	44.7	19.7	4.3	4.0	3.2	10.5	13.6	23.5	21.2			44.0	40A	8V	25	7	
9 626	49-74	B3	35.6	46.2	18.2	3.6	3.2	2.8	12.2	13.8	25.1	21.1			47.3	44A	17	21	6	
9 627	74-118	C 1CA	45.4	43.3	11.3	6.7	6.3	4.3	13.7	14.4	20.2	23.1			2 44.0	54A	22V	25	7	
9 628	118-170	C 2	59.3	29.5	11.2	24.2	14.7	6.8	8.1	5.5	10.0	19.5			2 19.9	81*	43V	24	12	

SAMPLE NO.	DEPTH CM.	ORG. MATTER		CARBONATE		SESQUIOXIDES				ATTERBERG				BULK DENSITY CM	WATER CONTENT			EXTNSBLTY					
		CAR	NITRO	AS	CACO3	DI	CIT	EXT	PYROP	EXT	L	I	M		T	EST.	1/3	DRY	17/10	17/3	15	LEF	LE
		BON	GEN	LT 2	2-20	FE	AL	FE	AL	LL	PL	1/3	BAR		BAR	BAR	BAR	BAR	BAR	BAR	BAR	BAR	BAR
9 623	0-19	3.42	0.294											1.17	1.26	0.81	20.1	13.1	2.5	2.0			
9 624	19-32	1.21	0.119											1.22		0.77				9.3			
9 625	32-49	0.82	0.087											26	19	1.26	1.35	0.75	18.8	8.7	2.3	1.7	
9 626	49-74	0.81	0.122		1									1.26		0.73				8.5			
9 627	74-118	0.59	0.068		29									1.26		0.65				5.8			
9 628	118-170	0.12			28									1.26		0.33				4.8			

SAMPLE NO.	DEPTH CM.	EXTRACTABLE BASES						EXT. KCL		C E C		BASE SATURATION				PH		
		CA	MG	NA	K	SUM	ACI-	EXT.	SUM	NH4-	SUM+	SUM+	NH4-	2	MIN	17/1	CL2	
		5B4A	5B4A	5B4A	5B4A	DITY	AL	OAC	ACT-	AL	OAC	DITY	5C1	8C1D	8C1A	8C1E		
9 623	0-19	19.0	4.2	0.1	1.0	24.3			24.3	23.6	100+	100+				6.8	6.6	
9 624	19-32	12.8	3.1	0.1	0.4	16.4			16.4	16.2	100+	100+				6.6	6.1	
9 625	32-49	12.3	3.0	0.1	0.3	15.7			15.7	15.1	100+	100+				6.8	6.3	
9 626	49-74	19.7	3.1	0.1	0.2	23.1			23.1	15.3	100+	100+				7.4	6.9	
9 627	74-118	22.2	1.3	0.1	0.1	23.7			23.7	8.0	100+	100+				7.9	7.1	
9 628	118-170	19.7	1.0	0.1	0.1	20.9			20.9	6.4	100+	100+				8.1	7.4	

SAMPLE NO.	DEPTH CM.	CLAY MINERALOGY										RELATIVE AMOUNT		
		LESS THAN 0.002 MM					L.T. 0.0002 MM MINERAL							
		X RAY					X RAY							
9 623	0-19	MI 4	MT 3	KK 1								MI MICA	1	TRACE
9 624	19-32	MI 3	MI 2									MT MONTMORT	2	SMALL
9 625	32-49	MT 3	MI 3	KK 1								KK KAOLINIT	3	MODERATE
9 626	49-74	MT 3	MI 1										4	ABUNDANT
9 627	74-118	MT 4	KK 3	MI 2									5	DOMINANT
9 628	118-170	MT 3	MI 3	KK 2									6	INDETER.

SAMPLE PREPARATION CODES  
 A=STANDARD PREPARATION.  
 V=NOT WEIGHED, VALUE CALCULATED FROM A VOLUME ESTIMATE.  
 \* =THE 75-250MM FRACTION IS INCLUDED.

Location: Lincoln County, Wyoming. This site is located about 5 kilometers (3 miles) north of Afton, Wyoming. 107 meters (350 feet) south and 46 meters (150 feet) west of the northeast corner of the NW<sup>1</sup>/<sub>4</sub> of the SW<sup>1</sup>/<sub>4</sub> of section 7, T. 32 N., R. 118 W. Site located on photo BBL-2EE-59. Date of sampling: October 2, 1969.

Description by: C. J. Fowkes. Collectors: W. D. Nettleton, W. R. Glenn, H. B. Ravenholt, C. J. Fowkes.

Classification: Pachic Cryoboroll; coarse-loamy, mixed.

Vegetation: Cultivated. Alfalfa. Use: Irrigated cropland. Climate: Average annual precipitation is 457 mm (18 inches). Mean annual temperature is 3<sup>o</sup> C. Average annual soil temperature at 50 cm is 7<sup>o</sup> C. Average summer soil temperature is 14<sup>o</sup> C without an O horizon.

Parent material: Calcareous gravelly alluvial fan sediments derived principally from crystalline rocks.

Topography: Gently sloping alluvial fan. Convex slope of 3 percent, west facing. Sample site at midslope.

Elevation: 1,890 meters (6,200 feet) above sea level. Drainage: Well drained. Runoff is slow. Permeability is medium. Soil moisture: Dry at time of sampling.

Remarks: This site was intended as a central concept of the Osmund. This pedon has borderline values for a pachic epipedon. There is also a question of whether there is an argillic horizon present. Field pH determinations by phenol red and thymol blue. Another site nearby was sampled for the Osmund series.

#### HORIZON

#### DESCRIPTION

- Ap  
69623 0 to 19 cm (0 to 7 inches). Dark brown (7.5YR 4/2) gravelly loam, very dark brown (7.5YR 2/2) moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many micro to fine common medium few coarse roots; 15 percent rounded fragments less than 19 mm diam.; noncalcareous, mildly alkaline (pH 7.5); abrupt smooth boundary.
- B21  
69624 19 to 32 cm (7 to 13 inches). Brown (7.5YR 5/3) gravelly loam, dark brown (7.5YR 3/3) moist; moderate fine and very fine subangular blocky structure; slightly hard, friable, sticky, plastic; many micro to fine common medium few coarse roots; 15 percent rounded fragments less than 19 mm diam., 5 percent between 19 mm and 76 mm diam.; noncalcareous, mildly alkaline (pH 7.5); clear smooth boundary.
- B22  
69625 32 to 49 cm (13 to 19 inches). This horizon is the same as the B21 horizon but was subdivided for sampling purposes.
- B3  
69626 49 to 74 cm (19 to 29 inches). Reddish brown (5YR 5/4) gravelly loam, reddish brown (5YR 4/4) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky, plastic; common fine few medium roots; thin patchy glassy coatings on ped faces; 20 percent rounded fragments less than 19 mm diam., 5 percent between 19 mm and 76 mm diam.; noncalcareous, mildly alkaline (pH 7.6); gradual wavy boundary.
- Clca  
69627 74 to 118 cm (29 to 46 inches). Light brown (7.5YR 6/4) very gravelly loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few fine roots; 30 percent rounded fragments less than 19 mm diam., 15 percent between 19 mm and 76 mm diam., 5 percent larger than 76 mm diam.; many fine threads and spots of secondary lime, lime coatings on coarse fragments; calcareous, moderately alkaline (pH 8.4); gradual wavy boundary.
- C2  
69628 118 to 170 cm (46 to 67 inches). Light brown (7.5YR 6/4) very gravelly sandy loam, brown (7.5YR 5/4) moist; massive; loose, nonsticky, nonplastic; 45 percent rounded fragments less than 19 mm diam., 30 percent between 19 mm and 76 mm diam., 5 percent greater than 76 mm diam.; calcareous, moderately alkaline (pH 8.2).

<sup>1/</sup>The Mundos series is in a fine-loamy, mixed family of Pachic Cryoborolls. This pedon is in a coarse-loamy family.



MUNDOS GRAVELLY LOAM (taxadjunct) <sup>1/</sup>  
S69Wyo-12-11

Location: Lincoln County, Wyoming. 5 kilometers (3 miles) north of Afton, Wyoming. 59 meters (195 feet) south and 9 meters (95 feet) west of the northeast corner of the NW<sup>1</sup>/<sub>4</sub> of SW<sup>1</sup>/<sub>4</sub> of section 7, T. 32 N., R. 118 W. Site located on photo BBL-2EE-59. Date of sampling: October 3, 1969.

Description by: C. J. Fowkes. Collectors: W. D. Nettleton, W. R. Glenn, H. B. Ravenholt, C. J. Fowkes.

Classification: Pachic Cryoboroll; fine-loamy, mixed.

Vegetation: Cultivated. Alfalfa. Use: Irrigated cropland. Climate: Average annual precipitation is 457 mm (18 inches). Mean annual temperature is 3° C. Average annual soil temperature at 50 cm is 7° C. Average summer soil temperature is 14° C without an O horizon.

Parent material: Calcareous gravelly alluvial fan sediments derived principally from crystalline rocks.

Topography: Gently sloping alluvial fan. Convex slope of 3 percent west facing. Sample site at midslope.

Elevation: 1,890 meters (6,200 feet) above sea level. Drainage: Well drained. Runoff is slow.

Permeability is medium. Soil moisture: Dry at time of sampling.

Remarks: This site was determined as a better location than that of S69Wyo-12-4 for characterization. These two sites occur in the same field and on the same fan, about 76 meters (250 feet apart). Field pH determinations by phenol red and thymol blue.

HORIZONDESCRIPTION

Ap 69669	0 to 23 cm (0 to 9 inches). Dark brown (7.5YR 4/2) gravelly loam, very dark brown (7.5YR 2/2) moist; weak very fine subangular blocky structure; soft, friable, sticky, plastic; many micro to fine common medium few coarse roots; 15 percent rounded fragments less than 19 mm diam.; noncalcareous, neutral (pH 7.2); clear smooth boundary.
A3 69670	23 to 52 cm (9 to 20 inches). Brown (7.5YR 5/2) gravelly loam, dark brown (7.5YR 3/2) moist; weak medium and fine subangular blocky structure; slightly hard, friable, sticky, plastic; many micro to fine common medium few coarse roots; 15 percent rounded fragments less than 19 mm diam., 5 percent between 19 mm and 76 mm diam.; noncalcareous, neutral (pH 7.2); gradual wavy boundary.
B2 69671	52 to 70 cm (20 to 28 inches). Brown (7.5YR 5/3) gravelly clay loam, dark brown (7.5YR 3/3) moist; weak medium and fine subangular blocky structure; slightly hard, friable, sticky, plastic; common very fine to few medium to coarse roots; 20 percent rounded fragments less than 19 mm diam., 5 percent between 19 mm and 76 mm diam.; noncalcareous, mildly alkaline (pH 7.4); gradual wavy boundary.
B3ca 69672	70 to 94 cm (28 to 37 inches). Brown (7.5YR 5/4) very gravelly clay loam, dark brown (7.5YR 3/4) moist; weak fine subangular blocky structure; slightly hard, friable, sticky, plastic; 30 percent rounded fragments less than 19 mm diam., 20 percent between 19 mm and 76 mm diam.; lime coatings on some fragments; calcareous, moderately alkaline (pH 8.2); gradual wavy boundary.
C1ca 69673	94 to 165 cm (37 to 65 inches). Light brown (5YR 6/3) very gravelly loam, brown (5YR 5/3) moist; massive; loose, nonsticky, nonplastic; 45 percent rounded fragments less than 19 mm diam., 20 percent between 19 mm and 76 mm diam., 5 percent greater than 76 mm diam.; lime coatings on most of the fragments; calcareous; moderately alkaline (pH 8.4); gradual wavy boundary.
C2 69674	165 to 195 cm (65 to 77 inches). Pinkish gray (5YR 6/2) gravelly loam, dark reddish gray (5YR 4/2) moist; weak fine subangular blocky structure; soft, friable, slightly sticky, slightly plastic; 30 percent rounded fragments less than 19 mm diam.; calcareous, moderately alkaline (pH 8.2).

<sup>1/</sup>The Mundos series is in a fine-loamy, mixed, family of Pachic Cryoborolls. This pedon is in the same family but has slightly more than 50 percent gravel (by weight) in the control section whereas the Mundos series has less than 50 percent.

SOIL Norka loam

SOIL Nos. S64Wyo-8-11

LOCATION Goshen County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska

LAB. Nos. 19462-19471

January 1968

GENERAL METHODS: 1A, 1Blb, 2A1, 2B

19520-19526

Depth cm	Horizon	Size class and particle diameter (mm)											3A1			Coarse fragments 2A2		
		Total			Sand						Silt		3Alb	3Ala Non- Carbon- ate Clay	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)	<0.0002	> 2	2-19
Pct. of < 2 mm																		
0-8	A1	47.0	36.3	16.7	-	0.2	0.4	5.5	40.9	24.9	11.4	70.4	6.1		17	tr		
8-18	B2lt	42.0	30.1	27.9	0.1	0.2	0.3	3.9	37.5	20.6	9.5	61.5	4.5		28	tr		
18-30	B22t	29.1	43.8	27.1	-	0.2	0.2	2.3	26.4	29.3	14.5	57.7	2.7		27	tr		
30-48	B3ca	35.5	54.5	10.0	tr	0.2	0.5	3.9	30.9	31.9	22.6	65.9	4.6		8	tr		
48-76	C1ca	37.2	54.7	8.1	-	0.1	0.2	2.3	34.6	36.1	18.6	72.8	2.6		6	tr		
76-102	C2ca	34.8	53.2	12.0	-	0.1	0.2	2.1	32.4	35.6	17.6	69.9	2.4		11	tr		
102-127	C3ca	35.5	53.0	11.5	-	0.1	0.2	2.3	32.9	36.2	16.8	71.2	2.6	2.7	12	-		
127-158	C4ca	37.2	51.6	11.2	-	0.1	0.1	2.7	34.3	35.8	15.8	72.6	2.9		11	-		
158-361	C5ca															-		
361-594	TIC6ca															tr		

Depth cm	6A1a Organic carbon a/ Pct.	Nitrogen Pct.	C/N	Ext. Iron as Fe Pct.	Carbonate as CaCO <sub>3</sub> 6E1b <0.002 Pct.	Bulk density			4D1 COLE	Water content				pH		
						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)	
						g/cc	g/cc	g/cc		Pct.	Pct.	Pct.	in./in.			
0-8	2.17			-		1.25	1.20	1.26	0.017	8.8	30.2	9.5	0.25			6.8
8-18	1.32			tr		1.25	1.17	1.31	0.040	13.9	35.3	11.6	0.28			7.4
18-30	1.06			1		1.30	1.23	1.38	0.040	16.8	31.6	13.2	0.23			7.7
30-48	0.70			16	2	1.28	1.26	1.30	0.010	17.9	33.1	13.3	0.25			8.2
48-76	0.18			9	2		1.32	1.35	0.007		26.2	9.5	0.22			8.5
76-102	0.18			8	1		1.31	1.35	0.010		30.6	9.4	0.28	8.0		8.5
102-127	0.14			7	tr		1.27	1.30	0.007		26.5	9.2	0.22			8.8
127-158	0.11			6	tr		1.22	1.25	0.007		32.5	8.7	0.29	8.1		8.9
158-361	0.11			5												
361-594	0.08			5												

Depth cm	Extractable bases				5B1a Sum	6H1a Ext. Addity	Cat. Exch. Cap.		8E1 Resis- tivity ohms- cm	8B1a Elec. Cond. mmhos/ cm	6P1a Sol. Na me/l.	5D2 Exch. Na Pct.	8B Water at Sat. Pct.	8D5 Est. Total Salt in Soil ppm.	8D3 Ca/Mg	Base saturation	
	6N2a Ca	6O4b Mg	6P2a Na	6Q2a K			5A3a Sum Cations	5A1a NH <sub>4</sub> OAc								5C3 Sum Cations	5C1 NH <sub>4</sub> OAc Cations
	meq/100 g															Pct.	Pct.
0-8	16.0	2.7	tr	1.5	20.2	2.6	22.8	18.8							5.9	89	107
8-18		3.3	tr	1.8				23.5							6.7		
18-30		5.4	0.1	2.2				28.6							4.1		
30-48		5.9	0.1	2.1				19.9							2.8		
48-76		6.6	0.1	2.3				18.2							2.1		
76-102		8.1	0.4	2.6				17.9	2500	0.49	1.6	2	42.2	132	1.4		
102-127		7.9	1.3	2.8				18.2							1.3		
127-158		7.2	2.0	2.6				18.2	0.76	5.5	10	48.9	238		1.4		
158-361		4.9	2.4	1.7				17.4							2.4		
361-594		4.4	1.9	1.1				16.3							3.0		

Depth cm	Ratios to Clay 8D2			6F1a Gypsum Pct.	a/g kg/m <sup>2</sup> to 60 inches (Method 6A).
	NH <sub>4</sub> OAc CEC	Ext. Iron	15-Bar Water		
0-8	1.13		0.57		
8-18	0.84		0.42		
18-30	1.06		0.49		
30-48	2.49		1.33		
48-76	3.03		1.58		
76-102	1.63		0.85		
102-127	1.58		0.80		
127-158	1.63		0.78		
158-361					
361-594					

Field capacity estimates: Water was added adjacent to sampling pit during a period from 4:00 PM, May 21, 1964, to about 1:30 PM, May 22, 1964. Samples were collected at 9:30 AM, May 25, 1964. Dry at 58 inches.

LS# No.	Depth cm	Percent Water 4B4 Field Capacity
19520	0-8	24.4
19521	8-18	21.2
19522	18-30	22.6
19523	30-48	24.8
19524	48-76	24.0
19525	94-112	23.9
19526	127-142	21.3

Soil classification: Aridic Argiustoll; fine-silty, mixed, mesic.

71

Soil series: Norka loam.

Pedon No.: 564Wyo-8-11.

Location: Goshen County, Wyoming; Sec. 29, T19N, R61W; 185 feet west and 140 feet south of the northeast corner of Sec. 29.

Climate: Average annual precipitation is about 15 inches. Mean annual air temperature is about 49° F., mean summer air temperature is about 60° F. Frost-free season is 120 to 150 days.

Vegetation and land use: Western wheatgrass, blue gramagrass, prairie junegrass, Sandberg bluegrass, needle-andthread, and cactus. Rangeland and wildlife.

Parent material: Calcareous aeolian silt and very fine sand.

Physiography: Table land.

Topography: No particular direction of exposure. Gradient is less than 1 percent.

Drainage: Well drained.

Moisture: Moist in solum when sampled.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderate.

Sampled by: Fraser Stephens, R. C. Kronenberger, E. Rivers, Arvad J. Cline, Halvor Ravenholt, Harold Bindschadler, Robert B. Grossman - May 22, 1964.

Described by: Arvad J. Cline.

(Colors are for air-dry soil unless otherwise stated)

A1 19462 0 to 8 cm (0 to 3 inches). Grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; strong very fine granular structure; soft, very friable; mildly alkaline (pH 7.4); clear smooth boundary.

B21t 19463 8 to 18 cm (3 to 7 inches). Grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic that parts to moderate medium subangular blocky structure; hard, very friable; thin patchy glossy coatings on all faces of peds; mildly alkaline (pH 7.6); clear smooth boundary.

B22t 19464 18 to 30 cm (7 to 12 inches). Brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic that parts to moderate medium subangular blocky structure; hard, very friable; many patchy glossy coatings on faces of peds; mildly alkaline (pH 7.8); gradual smooth boundary.

B3ca 19465 30 to 48 cm (12 to 19 inches). Pale yellow (2.5Y 7/3) loam, light olive brown (2.5Y 5/3) moist; weak medium subangular blocky structure; slightly hard, very friable; few thin patchy glossy coatings on vertical faces of peds; calcareous; secondary calcium carbonate occurs as thin seams and streaks; moderately alkaline (pH 8.2); gradual smooth boundary.

C1ca 19466 48 to 76 cm (19 to 30 inches). Pale yellow (2.5Y 7/3) loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, very friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; strongly alkaline (pH 8.5); gradual smooth boundary.

C2ca 19467 76 to 102 cm (30 to 40 inches). Light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, very friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; strongly alkaline (pH 8.6); gradual smooth boundary.

C3ca 19468 102 to 127 cm (40 to 50 inches). Light gray (2.5Y 7/2) very fine sandy loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, very friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; strongly alkaline (pH 9.0); gradual smooth boundary.

C4ca 19469 127 to 158 cm (50 to 62 inches). Light gray (2.5Y 7/2) very fine sandy loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, very friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; very strongly alkaline (pH 9.2); gradual smooth boundary.

C5ca 19470 158 to 361 cm (62 to 142 inches). Light gray (2.5Y 7/2) very fine sandy loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, very friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; strongly alkaline (pH 9.0); gradual smooth boundary.

11C6ca 19471 361 to 594 cm (142 to 234 inches). Light gray (2.5Y 7/2) loamy very fine sand, light olive brown (2.5Y 5/3) moist; massive; soft, very friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; strongly alkaline (pH 8.6).

Remarks: C3ca horizon, 40 to 50 inches, LSL 19468. Methods 7A1, 7A2a, and 7B1.

The clay contains a moderate amount of montmorillonite and trace to small amounts of mica and kaolinite. The minerals are fairly well ordered. The clay mineralogy is montmorillonitic. A count of 400 grains of the very fine sand yielded 46 percent glass, 30 percent feldspar, 13 percent quartz, 2 percent mica, 2 percent carbonate, 1 percent hornblende, and 6 percent other. The glass takes one of two general shapes - a rounded to angular, tabular shape with smooth edges or lath-shaped with jagged, rough edges. Both exhibit weathering, but the lath-shaped particles are generally more weathered. Much of the feldspar is weathered and grains are often difficult to distinguish from weathered glass. Both muscovite and weathered biotite-mica are present. Other grains are mostly opaques and composite grains that could not be identified. The coarse silt had about the same amount of glass, perhaps slightly less than in the very fine sand. Quartz is slightly less abundant and hornblende slightly more abundant. The carbonate is about double. Feldspar is somewhat more abundant; again, it is often difficult to distinguish weathered glass and weathered feldspar. Examination by X-ray diffraction shows abundant quartz, a moderate amount of feldspar, small amounts of calcite and dolomite, and traces of montmorillonite and mica. The glass is not registered. Family mineralogy is mixed, though the large proportion of glass is worthy of note.

SOIL Nunn loam SOIL Nos. S64Wyo-8-3 LOCATION Goshen County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19472-19482 January 1968

GENERAL METHODS: 1A, 1B1b, 2A1, 2B

Depth cm	Horizon	Size class and particle diameter (mm)											3A1 Non- Carbon- ate Clay	Coarse fragments <sup>2</sup> A2			
		Total				Sand					Silt			3A1 > 2	2-19	19-76	
		Sand (2-0.05)	Silt (0.05- 0.002)	Clay (= 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02- 0.002)	Int. II (0.2-0.02)					(2-0.1)
Pct. of < 2 mm														Pct. of < 76mm			
0-13	A11	47.0	27.7	25.3	2.0	4.4	4.0	10.3	26.3	16.6	11.1	49.7	20.7	25	tr		
13-25	A12	45.8	26.2	28.0	1.8	3.8	3.5	9.3	27.4	15.5	10.7	49.0	18.4	28	tr		
25-41	B2t	33.3	28.2	38.5	1.8	4.1	3.9	7.3	16.2	14.5	13.7	35.1	17.1	39	tr		
41-66	B3ca	20.9	36.3	42.8	1.0	2.6	2.2	4.1	11.0	13.2	23.1	26.6	9.9	38	tr		
66-89	C1ca	20.0	41.1	38.9	0.3	2.6	2.4	4.1	10.6	15.9	25.2	28.9	9.4	36	tr		
89-117	C2ca	21.0	44.0	35.0	0.7	2.2	1.9	3.7	12.5	18.1	25.9	32.8	8.5	32	tr		
117-142	A1cab	20.8	41.5	37.7	0.4	2.2	2.2	4.7	11.3	17.1	24.4	31.2	9.5	35	tr		
142-163	C3cab	24.2	41.1	34.7	0.9	3.1	3.0	6.0	11.2	16.7	24.4	31.4	13.0	30	tr		
163-184	C4cab	24.9	47.8	27.3	2.1	3.8	2.6	5.2	11.2	21.6	26.2	35.9	13.7	23	3		
184-203	C5cacsmb	50.2	31.6	18.2	9.0	10.8	6.9	13.4	10.1	12.7	18.9	30.6	40.1	14	tr		
203-214	C6cacsmb														-		

Depth cm	6A1a Organic carbon a/ Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as CaCO <sub>3</sub> 6A1a 3A1a mm. Pct.	Bulk density			4D1 COLE	Water content				pH		
						4A1a Field- 1/3- Bar	4A1d 1/3- Air- Dry	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		Pct.	Pct.	Pct.	in./in.			
0-13	1.66	0.174	10	0.3	tr	1.29	1.23	1.33	0.028	12.8	29.6	11.2	0.23			7.4
13-25	1.36	0.129	11	0.4	tr	1.30	1.22	1.36	0.036	16.9	32.2	12.3	0.24			7.7
25-41	1.13	0.126	9	0.4	5	1.24	1.16	1.35	0.052	20.6	33.4	16.1	0.20			7.8
41-66	0.78	0.089	9	0.2	12	1.33	1.18	1.40	0.059	18.9	37.5	19.1	0.22			8.0
66-89	0.49			0.2	14		1.23	1.46	0.059		33.7	18.2	0.19			8.1
89-117	0.38			0.2	10		1.14	1.32	0.052		32.5	17.6	0.17		7.7	8.1
117-142	0.42			0.2	11							18.6				8.3
142-163	0.27			0.2	17							17.8			7.7	8.1
163-184	0.26			0.2	26							16.0				8.1
184-203					25							12.3				
203-214					73											

Depth cm	Extractable bases				6H1a Ext. Acidity	Cat. Exch. Cap.		8E1 Resis- tivity ohm-cm	8B1a Elec. Cond. mmhos/ cm	6F1a Sol. Na me/l.	5D2 Exch. Na Pct.	8B Water at Sat. Pct.	8D5 Est. Total Salt in Soil ppm.	8D3 Ca/Mg Cations	Base saturation		
	6N4b Ca	6O4b Mg	6P2a Na	6Q2a K		Sum	5A3a Sum								5A1a NH <sub>4</sub> OAc Cations	5C3 Sum Pct.	5C1 NH <sub>4</sub> OAc Pct.
	meq/100 g																
0-13	18.8	2.5	tr	1.6	22.9	2.1	25.0	24.1						7.5	92	95	
13-25	20.6	2.3	tr	1.6	24.5		24.0	24.0						9.0	.	102	
25-41		3.6	0.1	2.0			28.6	28.6						7.4			
41-66		4.7	0.4	2.3			29.9	29.9						5.6			
66-89		6.8	1.3	2.9			29.5	29.5						3.4			
89-117		6.7	2.3	3.3			29.7	29.7	1100	1.21	6.4	7	53.2	412	3.4		
117-142		7.0	2.8	2.7			30.4	30.4						3.3			
142-163		7.3	2.7	2.1			28.7	28.7	1.57	9.3	8	54.1	544	3.0			
163-184		6.1	2.5	1.8			26.3	26.3						3.2			
184-203																	
203-214																	

Depth cm	Ratios to Clay 8D2			6F1a Gypsum Pct.
	NH <sub>4</sub> OAc CEC	Ext. Iron	15-Bar Water	
0-13	0.95	0.01	0.44	
13-25	0.86	0.01	0.44	
25-41	0.74	0.01	0.42	
41-66	0.79	0.01	0.50	
66-89	0.82	0.01	0.51	
89-117	0.93	0.01	0.55	-
117-142	0.87	0.01	0.53	
142-163	0.96	0.01	0.59	-
163-184	1.14	0.01	0.70	
184-203			0.88	tr
203-214				tr

a/ 12 kg/m<sup>2</sup> to 46 inches (Method 6A).

Soil classification: Aridic Argiustoll; fine, montmorillonitic, mesic.

Soil series: Nunn loam.

Pedon No.: S64Wyo-8-3.

Location: Goshen County, Wyoming; Sec. 31, T23N, R63W; 1,905 feet north and 315 feet west of the southeast corner of Sec. 31.

Climate: Average annual precipitation is about 15 inches. Mean annual air temperature is about 49° F., mean summer air temperature is about 60° F. Frost-free season is 120 to 150 days.

Vegetation and land use: Blue gramagrass, western wheatgrass, Sandberg bluegrass, prairie junegrass, silver-leaf sagebrush, and shadscale. Rangeland and wildlife habitat.

Parent material: Calcareous, aeolian material.

Physiography: Gently rolling upland.

Topography: East facing slope. Gradient is 1 percent.

Drainage: Well drained.

Moisture: Moist when sampled.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderate.

Sampled by: Fraser Stephens, R. C. Kronenberger, E. Rivers, Robert B. Grossman, Arvad J. Cline, and Harold Bindschadler - May 19, 1964.

Described by: Arvad J. Cline.

(Colors are for air-dry soil unless otherwise stated)

A11 19472 0 to 13 cm (0 to 5 inches). Grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate, very fine granular structure; soft, very friable; mildly alkaline (pH 7.6); clear smooth boundary.

A12 19473 13 to 25 cm (5 to 10 inches). Grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky that parts to moderate medium granular structure; slightly hard, very friable; weakly calcareous; mildly alkaline (pH 7.8); clear smooth boundary.

B2t 19474 25 to 41 cm (10 to 16 inches). Grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic that parts to moderate medium subangular blocky structure; slightly hard, very friable; many thin patchy glossy coatings on faces of peds; calcareous; mildly alkaline (pH 7.8); gradual smooth boundary.

B3ca 19475 41 to 66 cm (16 to 26 inches). Light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic that parts to moderate medium subangular blocky structure; hard, friable; few thin patchy glossy coatings on faces of peds; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; mildly alkaline (pH 7.8); gradual smooth boundary.

C1ca 19476 66 to 89 cm (26 to 35 inches). Light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; moderately alkaline (pH 8.0); gradual smooth boundary.

C2ca 19477 89 to 117 cm (35 to 46 inches). Light gray (2.5Y 7/2) clay loam, light olive brown (2.5Y 5/3) moist; massive; hard, friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; moderately alkaline (pH 8.0); abrupt smooth boundary.

Alcab 19478 117 to 142 cm (46 to 56 inches). Gray (5Y 6/1) loam, dark gray (2.5Y 4/1) moist; moderate medium and fine subangular blocky structure; hard, friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; moderately alkaline (pH 8.0); clear smooth boundary.

C3cab 19479 142 to 163 cm (56 to 64 inches). Light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/3) moist; massive; hard, friable; calcareous; secondary calcium carbonate occurs as soft rounded masses in thin seams and streaks and in finely divided forms; moderately alkaline (pH 8.2); gradual smooth boundary.

C4cab 19480 163 to 184 cm (64 to 73 inches). Light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/3) moist; massive; hard, friable; calcareous; secondary calcium carbonate occurs in finely divided forms as small soft rounded masses and in thin seams and streaks; moderately alkaline (pH 8.2); clear wavy boundary.

C5cacsmb 19481 184 to 203 cm (73 to 80 inches). White (2.5Y 9/2) indurated accumulation of calcium carbonate and calcium sulfate. The horizon can be cut with a spade or a knife with difficulty.

C6cacsmb 19482 203 to 214 cm (80 to 85 inches). White (2.5Y 9/2) indurated accumulation of calcium carbonate and calcium sulfate. The horizon can be cut with a spade or a knife with difficulty.

SOIL Orella silty clay SOIL Nos. S64Wyo-8-4 LOCATION Goshen County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19491-19493 January 1968

GENERAL METHODS: 1A, 1B1b, 2A1, 2B

Depth cm	Horizon	Size class and particle diameter (mm) 3A1											3A1a Non-Carbonate Clay	Coarse fragments 2A2					
		Total			Sand				Silt					Int. II (0.2-0.02)	(2-0.1)	<0.0002	> 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							
0-13 13-33 33-61	A1 Clca C2	19.3 15.0 12.4	40.0 48.8 57.6	40.7 36.2 30.0	0.9 0.6 0.2	0.9 0.9 1.1	1.2 1.4 1.8	3.8 4.4 4.3	12.5 7.7 5.0	14.9 10.8 11.3	25.1 38.0 46.3	29.8 21.3 18.9	6.8 7.3 7.4	39 36 30	tr tr tr				
Depth cm	Organic carbon	Nitrogen	C/N	6C2a Ext. Iron as Fe	Carbonate as CaCO <sub>3</sub>	Bulk density			4D1 COLE	Water content				pH					
						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	8C1a 1:10			
						g/cc	g/cc	g/cc		Pct.	Pct.	Pct.	in./in.						
0-13 13-33 33-61	0.74 0.37 0.07	0.080 0.043	9 9	0.2 0.1 0.1	10 12 18	2 tr tr	1.25 1.19	1.09 1.02	1.42 1.54	0.092 0.15	24.0 34.0	40.7 49.6	22.4 30.5 30.1	0.20 0.19	7.7 7.4 7.5	8.2 8.1 7.7	9.1 9.3 8.4		
Depth cm	Extractable bases				5B1a Ext. Acidity	Cat. Exch. Cap.			Water extract from saturated paste						8B1 Electrical conductivity				
	6N4b Ca	6O4b Mg	6P2a Na	6Q2a K		Sum	5A1a Sum Cations	6N1a Ca	6O1a Mg	6P1a Na	6Q1a K	6I1a CO <sub>3</sub>	6J1a HCO <sub>3</sub>	6K1a Cl		6L1a SO <sub>4</sub>	8B1a		
	meq/100 g					meq/liter						mmho/cm							
0-13 13-33 33-61	5.3 6.7 8.6	5.4 12.8 18.8	2.4 2.5 2.8			41.4 51.8 53.5	22.5 6.3	8.2 15.5 69.8	0.2 0.2 0.8			5.0		94.9	7.2	0.77 1.50 7.2			
Depth cm	8B Water at Saturation	5D2 Exchangeable Na	5E Sodium Adsorption Ratio	6F1a Gypsum		Ratios to Clay 8DP		Ext. Iron	15-Bar Water										
				NH <sub>4</sub> OAc	CEC														
				Pct.	Pct.	Pct.													
0-13 13-33 33-61	64.0 78.3 77.4	12 22 25	- - 18	1.06 1.43 1.78	0.57 0.84 1.00														

a/ 2 kg/m<sup>2</sup> to 13 inches (Method 6A).

Soil classification: Ustic Torriorthent; clayey, mixed, calcareous, mesic, shallow.

75

Soil series: Orella silty clay.

Pedon No.: S64Wyo-8-4.

Location: Goshen County, Wyoming; Sec. 16, T23N, R62W; 735 feet south and 125 feet west of a large dark colored post on the crest of a small hill and on the west side of the county road in Sec. 16. The large dark colored post is approximately at the east quarter corner of the section.

Climate: Average annual precipitation is about 15 inches. Mean annual air temperature is about 49° F., mean summer air temperature is about 69° F. Frost-free season is 120 to 150 days.

Vegetation and land use: Western wheatgrass, inland saltgrass, alkali sacaton, and shadscale. Rangeland and wildlife habitat.

Parent material: Residuum weathered from calcareous strongly alkaline silty clay mudstone.

Physiography: Gently rolling upland.

Topography: North facing slope. Gradient is 2 percent.

Drainage: Well to moderately well drained.

Moisture: Soil moisture near 15 bar when sampled.

Ground water: Deep.

Erosion: Slight.

Permeability: Very slow.

Sampled by: Fraser Stephens, R. C. Kronenberger, E. Rivers, Robert B. Grossman, Arvad J. Cline, Harold Bindschadler - May 19, 1964.

Described by: Arvad J. Cline.

(Colors are for air-dry soil unless otherwise stated)

A1 19491 0 to 13 cm (0 to 5 inches). Light gray (2.5Y 7/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate very fine granular structure; slightly hard, very friable; calcareous; strongly alkaline (pH 8.8); clear smooth boundary.

C1ca 19492 13 to 33 cm (5 to 13 inches). Light gray (2.5Y 7/2) silty clay, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; hard, firm, very sticky, plastic; calcareous; contains seams and large soft masses 2 to 3 inches in diameter of secondary calcium carbonate, calcium sulfate, and possibly other salts; very strongly alkaline (pH 9.2); gradual wavy boundary.

C2 19493 33 to 61 cm (13 to 24 inches). Gray and olive partially weathered shale bedrock which breaks out in hard chip-like fragments; calcareous; very strongly alkaline (pH 9.1); diffuse wavy boundary.

C3 61 to 71 cm (24 to 28 inches). Olive and gray unweathered or only weakly weathered shale bedrock.

SOIL Orella clay taxadjunct SOIL Nos. S64Wyo-8-6 LOCATION Goshen County, Wyoming  
 SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19494-19497 January 1968  
 GENERAL METHODS: 1A, 1Blb, 2A1, 2B

Depth cm	Horizon	Size class and particle diameter (mm)											3A1			Coarse fragments 2A2						
		Total			Sand					Silt			3A1b <0.002	3A1c Non-Carbonate 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)	> 2	2 - 19	19 - 76				
Pct. of < 2 mm															Pct. of < 76 mm							
0-10	A1	22.4	36.7	40.9	1.9	2.7	2.6	5.9	9.3	12.9	23.8	25.8	13.1									
10-32	C1	12.5	46.8	40.7	0.8	1.3	1.3	3.5	5.6	10.5	36.3	18.3	6.9									
32-43	C2	5.2	49.4	45.4	tr	0.3	0.4	2.0	2.5	9.6	39.8	13.5	2.7									
43-74	C3	7.9	48.8	43.3	0.2	0.6	0.7	2.5	3.9	9.0	39.8	14.6	4.0									
Depth cm	6A1a Organic carbon a/ Pct.	Nitrogen Pct.	C/N	Ext. Iron as Fe Pct.	Carbonate as CaCO <sub>3</sub>		Bulk density			4D1 COLE	Water content				pH							
					6E1b mm Pct.	3A1a <0.002 mm Pct.	4A1a Field- State g/cc	4A1b 1/3- Air- Dry g/cc	4B1 Field- State Pct.		4B1c 1/3- Bar Pct.	4B2 15- Bar Pct.	4C1 1/3-to 15-Bar in./in.	8C1b Sat. Paste	8C1a 1:1	8C1a 1:10						
0-10	0.70			8	tr	1.25	1.12	1.48	0.10	27.8	39.2	19.6	0.22				7.8	8.3	9.2			
10-32	0.35			6	tr	1.29	1.14	1.56	0.11	28.1	40.3	26.9	0.15				8.0	8.3	9.4			
32-43	0.21			1	tr	1.38	1.18	1.58	0.10	24.7	38.7	29.1	0.11				7.9	8.1	9.2			
43-74	0.02			tr	-							27.6					7.7	7.8	9.0			
Depth cm	Extractable bases				5B1a Sum	Ext. Acidity	Cat. Exch. Cap.			Water extract from saturated paste								8B1a Electrical conductivity mmho/cm				
	6N4b Ca	6O4b Mg	6P2a Na	6Q2a K			5A1a Sum NH <sub>4</sub> OAc Cations	6N1a Ca	6O1a Mg	6P1a Na	6Q1a K	6I1a CO <sub>3</sub>	6J1a HCO <sub>3</sub>	6K1a Cl	6L1a SO <sub>4</sub>							
0-10		2.9	7.8	2.7			35.4		11.2	0.2											1.16	
10-32		3.9	14.9	2.6			42.4		18.0	0.3											1.73	
32-43		4.7	19.2	3.2			49.4	7.1	42.8	0.6											4.36	
43-74		5.7	20.6	4.2			46.3	6.8	52.1	0.7											5.33	
Depth cm	8B Water at Saturation Pct.	5D2 Exchangeable Na Pct.	5E Sodium Adsorption Ratio	6F1a Gypsum Pct.	Ratios to Clay 8D2																	
					NH <sub>4</sub> OAc CEC	Ext. Iron	15-Bar Water															
0-10	56.8	20		-	0.87		0.48															
10-32	71.3	32		-	1.04		0.66															
32-43	76.6	32	21	tr	1.10		0.65															
43-74	75.4	36	24	tr	1.07		0.64															

a/ 2 kg/m<sup>2</sup> to 17 inches (Method 6A).

Soil classification: Ustic Torriorthent; clayey, montmorillonitic (calcareous), mesic, shallow.

77

Soil series: Orella clay taxadjunct<sup>1</sup>/.

Pedon No.: S64Wyo-8-6.

Location: Goshen County, Wyoming; Sec. 20, T23N, R61W; 319 feet east and 105 feet north of the southwest corner of Sec. 20.

Climate: Average annual precipitation is about 15 inches. Mean annual air temperature is about 49° F., mean summer air temperature is about 69° F. Frost-free season is 120 to 150 days.

Vegetation and land use: Crested wheatgrass, Rangeland and wildlife habitat.

Parent material: Residuum weathered from calcareous strongly alkaline silty clay mudstone.

Physiography: Gently rolling upland.

Topography: Gradient is about 2 percent.

Drainage: Well to moderately well drained.

Moisture: Soil moisture near 15 bar when sampled.

Ground water: Deep.

Erosion: Slight.

Permeability: Very slow.

Sampled by: Fraser Stephens, R. C. Kronenberger, E. Rivers, Robert B. Grossman, Arvad J. Cline, Harold Bindschadler - May 19, 1964.

Described by: Arvad J. Cline.

(Colors are for air-dry soil unless otherwise stated)

A1 19494 0 to 10 cm (0 to 4 inches). Light gray (2.5Y 7/2) clay, grayish brown (2.5Y 5/2) moderate to strong very fine granular structure; hard, firm; a vesicular crust in the uppermost quarter inch; calcareous; strongly alkaline (pH 9.0); clear smooth boundary.

C1 19495 10 to 32 cm (4 to 12 inches). Light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; weak coarse angular blocky parts to weak fine angular blocky structure; extremely hard, firm, very sticky, plastic; calcareous; very strongly alkaline (pH 9.4); gradual wavy boundary.

C2 19496 32 to 43 cm (12 to 17 inches). Light gray (2.5Y 7/2) partly weathered clay shale, grayish brown (2.5Y 5/2) moist; approximately 90 percent shale chips; weak accumulation of secondary calcium carbonate and calcium sulfate occurring as crystals and seams; calcareous; very strongly alkaline (pH 9.2); diffuse wavy boundary.

C3 19497 43 to 74 cm (17 to 29 inches). Weakly weathered shale beds.

Remarks: C1 horizon, 4 to 12 inches, LSL 19495. Methods 7A1, 7A2a, and 7B1.

The clay contains an abundant to dominant amount of montmorillonite and a moderate amount of mica. Both minerals are rather well ordered. The fine silt contains a moderate amount of montmorillonite, a small to moderate amount of quartz, small amounts of mica, feldspar and calcite, and a trace of talc. Family mineralogy is montmorillonitic.

<sup>a</sup>/Orella soils have mixed mineralogy.

CONSECUTIVE PEDON NUMBER C 69120 CHARACTERIZATION DATA

SOIL SERIES PAULSON TAXADJUNCT SOIL NO. S69 HYD. 12- 7 SAMPLE NO. 9 636-9 643 STAR VALLEY AREA

SOIL FAMILY: CRYIC PACIFIC PALERBOLL, FINE, MONTMORTILLONITIC RIVERSIDE SOIL SURVEY LABORATORY

SAMPLE NO.	DEPTH CM.	HORIZ.	SIZE CLASS AND PARTICLE DIAMETER (MM) 1B13,3A1											1A2A				
			TOTAL FRACTION			SANDS			SILTS			CLAYS		INT. COARSE FRAGMENTS				
			SAND	SILT	CLAY	VCS	CS	MS	FS	VFS	CSI	FSI	CO.	FINE	CARBO	II	PCT. I	II
9 636	0-27	AP	15.7	51.9	32.4	0.4	0.8	0.3	6.4	7.6	23.1	28.8	19.6	12.8	33.8	--A	--	--
9 637	27-46	A12	9.1	57.7	33.2	--	0.2	0.1	2.2	6.6	26.5	31.2	--	--	34.8	--A	--	--
9 638	46-78	B1	13.1	51.4	35.5	--	0.2	0.2	3.0	9.7	23.8	27.6	--	--	35.7	--A	--	--
9 639	78-98	B21T	12.7	41.8	45.5	0.2	0.4	0.6	3.2	8.3	18.6	23.2	23.5	22.0	29.3	--A	--	--
9 640	98-137	B22T	13.5	42.1	44.4	0.1	0.4	0.7	4.2	8.1	18.1	24.0	--	--	29.2	--A	--	--
9 641	137-163	B3	31.0	44.6	24.4	1.1	1.6	1.7	9.9	16.7	20.8	23.8	16.0	8.4	1 44.9	5A	--	2 3
9 642	163-195	C 1CA	15.3	57.7	27.0	0.2	2.1	2.2	4.2	6.6	16.8	40.9	--	--	2 26.0	--A	--	--
9 643	195-225	C 2CA	24.5	55.3	20.2	0.2	1.1	1.5	6.3	15.4	27.8	27.5	--	--	1 47.7	--A	--	--

SAMPLE NO.	DEPTH CM.	ORG. MATTER CARBONATE										SESQUIOXIDES				ATTERBERG				BULK DENSITY CM	WATER CONTENT				EXTNSBLTY											
		CAR-		NITRO		AS		CACO3		DI-CIT		EXT		PYROP		EXT		LIMIT			EST.		I/3		DRY		1/10		1/3		15		LEF		LE	
		6A1A	6B1A	6E1B	6E1B	6C2B	6G7A	6C5A	6G5A	4F1	4F2	4A1F	4A1F	4A1H	3B2	4B1C	4B1C	4B2	4D1		4D1															
9 636	0-27	3.82	0.312	1	0.8	0.1	45	30	1.17	1.41	1.00	34.2	16.5	6.4	6.4																					
9 637	27-46	3.34	0.292	2	0.7	0.1	1.22	1.46	1.00	30.0	17.7	6.2	6.2																							
9 638	46-78	1.98	0.175	TR	0.7	0.1	1.45	1.68	1.00	20.6	14.6	5.0	5.0																							
9 639	78-98	0.74	0.072	TR	1.0	0.1	1.57	1.90	1.00	22.1	15.3	6.6	6.6																							
9 640	98-137	0.70	TR	1.0	0.1	1.53	1.89	1.00	24.8	15.4	7.3	7.3																								
9 641	137-163	0.29	8	0.7	0.1	1.38	1.53	0.98	21.9	9.5	3.5	3.4																								
9 642	163-195	0.28	34	0.5	TR	1.44	1.63	1.00	24.6	11.3	4.2	4.2																								
9 643	195-225	21	27	19	1.53	1.65	1.00	20.8	9.1	2.5	2.5																									

SAMPLE NO.	DEPTH CM.	EXTRACTABLE BASES										EXT. KCL				C E C				BASE SATURATION				PH					
		CA		MG		NA		K		SUM		ACT		EXT.		SUM		NHA		SUM		NH4		NAF		H2O		CA	
		5B4A	5B4A	5B4A	5B4A	6N2E	6O2D	6P2A	6Q2A	6H2A	6G1E	5A3A	5A6A	DITY	AL	OAC	ACT	AL	OAC	5C1	2	MIN	1/1	CL2	8C1D	8C1A	8C1E		
9 636	0-27	34.9	4.4	0.2	1.7	41.2	29.0	100+	100+	7.4	7.2																		
9 637	27-46	36.0	5.9	0.3	0.6	42.8	30.2	100+	100+	7.5	7.2																		
9 638	46-78	26.1	5.5	0.3	0.8	32.7	29.0	100+	100+	7.5	7.1																		
9 639	78-98	23.6	6.7	0.4	0.6	31.3	28.6	100+	100+	7.6	7.1																		
9 640	98-137	25.3	6.9	0.4	0.6	33.2	29.5	100+	100+	7.6	7.1																		
9 641	137-163	27.5	4.6	0.2	0.3	32.6	16.9	100+	100+	7.9	7.4																		
9 642	163-195	30.7	4.5	0.3	0.3	35.8	18.7	100+	100+	8.0	7.6																		
9 643	195-225	29.3	4.0	0.2	0.3	33.8	15.3	100+	100+	8.0	7.4																		

SAMPLE NO.	DEPTH CM.	CLAY MINERALOGY										RELATIVE AMOUNT					
		LESS THAN 0.002 MM					L.T. 0.0002 MM										
		X RAY					DTA										
9 636	0-27	MI	4	MT	2	KK	1	MI	3	KK	1	MI	MICA	1	TRACE		
9 637	27-46											MT	MONTMORT	2	SMALL		
9 638	46-78	MT	4	MI	4							KK	KAOLINIT	3	MODERATE		
9 639	78-98											MT	4	MI	4	4	ABUNDANT
9 640	98-137	MT	4	MI	3	KK	1								5	DOMINANT	
9 641	137-163											MT	4	MI	4	6	INDETER.
9 642	163-195																
9 643	195-225	MT	4	MI	2	KK	1										

SAMPLE PREPARATION CODES  
A=STANDARD PREPARATION.

Soil classification: Cryic Pachic Paleboroll; fine, montmorillonitic.

Soil Type: Paulson taxadjunct<sup>1/</sup>

Pedon No.: S69Wyo-12-7

Location: Lincoln County, Wyoming. 5 kilometers (3 miles) west of Afton, Wyoming. 216 meters (710 feet) south and 88 meters (290 feet) east of the northwest corner of NE<sub>1/4</sub> of NE<sub>1/4</sub> of section 33, T. 32 N., R. 119 W. Site located on photo BBL-1EE-69. Date of sampling: October 2, 1969.

Description by: H. B. Ravenholt. Collectors: W. D. Nettleton, H. B. Ravenholt, W. R. Glenn, C. J. Fowkes.

Classification: Argic Pachic Cryoboroll; fine, montmorillonitic.

Vegetation: Cultivated. Alfalfa. Use: Irrigated cropland. Climate: Average annual precipitation is 457 mm (18 inches). Mean annual temperature is 3° C. Average annual soil temperature at 50 cm is 7° C. Average summer soil temperature is 14° C without an O horizon.

Parent material: Moderately fine texture. Calcareous alluvial fan sediments derived principally from reddish brown sandstone, siltstone and shale. May have had some loess influence.

Topography: Gently sloping alluvial fan. Convex slope of 3 percent facing southeast. Site at mid-slope.

Elevation: 1,860 meters (6,100 feet) above sea level. Drainage: Well drained. Runoff is moderate.

Permeability is slow. Soil moisture: Moist at time of sampling.

Remarks: Field pH determinations by phenol red and thymol blue. This sample was paired with sample S69Wyo-12-8.

#### HORIZON

#### DESCRIPTION

Ap 69636	0 to 27 cm (0 to 11 inches). Dark reddish gray (5YR 4/2) silty clay loam, dark reddish brown (5YR 2/2) moist; moderate medium granular structure; hard, friable, very sticky, plastic; many micro to coarse roots; noncalcareous, mildly alkaline (pH 7.6); abrupt smooth boundary.
A12 69637	27 to 46 cm (11 to 18 inches). Dark reddish gray (5YR 4/2) silty clay loam, dark reddish brown (5YR 2/2) moist; weak medium subangular blocky structure that parts to moderate very fine subangular blocks; hard, friable, very sticky, plastic; many micro to coarse roots; common very fine tubular pores; many earthworm castings; noncalcareous, mildly alkaline (pH 7.6); gradual wavy boundary.
B1 69638	46 to 78 cm (18 to 31 inches). Dark reddish gray (5YR 4/2) silty clay, dark reddish brown (5YR 2/2) moist; weak fine prismatic structure that parts to moderate fine and very fine subangular blocks; very hard, very firm, very sticky, plastic; common micro to coarse roots; common very fine tubular pores; noncalcareous, mildly alkaline (pH 7.6); clear wavy boundary.
B21t 69639	78 to 98 cm (31 to 39 inches). Reddish gray (5YR 5/2) clay, dark reddish brown (5YR 3/3) moist; weak medium prismatic structure that parts to moderate medium and fine subangular blocks; very hard, very firm, very sticky, plastic; few very fine to coarse roots; many very fine to medium tubular pores; common thin clay films on ped faces; noncalcareous, mildly alkaline (pH 7.6); gradual wavy boundary.
B22t 69640	98 to 137 cm (39 to 54 inches). Reddish gray (5YR 5/2) clay, dark reddish brown (5YR 3/3) moist; weak medium prismatic structure that parts to moderate medium and fine subangular blocks; very hard, very firm, very sticky, plastic; few very fine to coarse roots; many very fine to medium tubular pores; many thin clay films on ped faces; noncalcareous, mildly alkaline (pH 7.6); clear wavy boundary.
B3 69641	137 to 163 cm (54 to 64 inches). Reddish brown (2.5YR 5/4) silty clay loam, dark red (2.5YR 3/6) moist; weak medium prismatic structure that parts to weak fine and very fine subangular blocks; hard, friable, very sticky, plastic; very few very fine roots; many very fine to medium tubular pores; noncalcareous, mildly alkaline (pH 7.6); clear wavy boundary.
Clca 69642	163 to 195 cm (64 to 77 inches). Pale red (2.5YR 6/2) silty clay loam, reddish brown (2.5Y 4/4) moist; weak very fine subangular blocky structure; hard, friable, very sticky, plastic; common very fine to medium tubular pores; secondary lime disseminated; calcareous, moderately alkaline (pH 8.2); gradual wavy boundary.
C2ca 69643	195 to 225 cm (77 to 89 inches). Pale red (2.5YR 6/2) silty clay loam, reddish brown (2.5Y 4/4) moist; massive; hard, friable, sticky, plastic; common very fine to medium tubular pores; secondary lime disseminated; calcareous, moderately alkaline (pH 8.2).

<sup>1/</sup>The Paulson soils are in a fine, montmorillonitic family of Argic Pachic Cryoborolls. This pedon is a taxadjunct because its argillic horizon has an upper boundary at a depth of more than 60 cm below the soil surface.

SOIL CLASSIFICATION-USTOLLIC HAPLARGID  
 FINE-SILTY, MIXED, MESIC  
 SERIES - - - - -RENOHILL TAXADJUNCT

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE, MTSC  
 NATIONAL SOIL SURVEY LABORATORY  
 LINCOLN, NEBRASKA  
 JUNE 1977

SOIL NO - - - - - S69WYO-10-6 COUNTY - - - JOHNSON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 69L606-69L607

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B													RATIO		
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COFI	FNSI	VFSI	TEXT		INTR	FINE
CM		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005-	SAND	.2-	TO	CLAY
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-1	.02	CLAY	TO
		PCT LT 2MM															
013-028	B2T	31.7	34.0	34.3	22.7	.1	.1	.5	8.8	22.2	19.5	14.5		9.5	49.3		.34
047-070	C2CA	20.5	58.0	21.5		.1	.2	.2	1.7	18.4	31.8	26.2		2.0	51.5		.43

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2										BULK DENSITY				WATER CONTENT				CARBONATE											
	4A1D	4A1H	4D1	4D1C	4B1C	4B2	4C1	6E1B	3A1A	8C1A	8C1E	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD	LT	LT	1/1	1/2	
CM	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	
013-028	0	0	0	0	0	81	0																							
047-070	0	0	0	0	0	93	0																							

DEPTH	ORGANIC MATTER			IRON	PHOS	EXTRACTABLE BASES 5B4A-				ACTY	AL	CAT EXCH				RATIO	RATIO	CA	(BASE SAT)			
	6A1A	6B1A	C/N			6C2B	6N2E	6O4E	6P2B			6Q2B	6H1A	6G1E	5A3A				5A6A	8D1	8D3	5F1
CM	PCT	PCT	PCT	PCT	PCT	CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	TO	TO	NHAC	ACTY	PCT	PCT	PCT
013-028	.99						6.7	.1	.9							24.2	.71					
047-070	.27						8.1	1.0	.5							16.6	.77					

CLAY MINERALOGY (7A2C).  
 006-14 CM B2T SMALL TO MODERATE AMOUNTS OF MONTMORILLONITE, MICA, AND KAOLINITE; MODERATELY WELL-ORDERED. MONTMORILLONITE CONTAINS A CHLORITE-LIKE INTERLAYER COMPONENT. CLAY MINERALOGY IS MONTMORILLONITIC.

Soil classification: Ustollic Haplargid; fine-silty, mixed, mesic.

Soil: Renohill loam <sup>1</sup>/<sub>1</sub>.

Pedon No.: S69Wyo-10-6.

Location: Johnson County, Wyoming; NE<sup>1</sup>/<sub>4</sub>, NE<sup>1</sup>/<sub>4</sub> of Sec. 20, T45N, R85W, 3/4 mile north of southeast corner of 4N-194 and 50 yards west of east joined line.

Climate: Average annual precipitation is about 12 inches. Mean annual soil temperature is about 52°F.

Frost-free season is 105 to 110 days. Elevation is approximately 4,850 feet.

Vegetation and land use: Western wheatgrass, green needlegrass, big sagebrush. Rangeland and wildlife habitat.

Parent material: Residium weathered from calcareous interbedded clay shales and sandy shales.

Physiography: Side slope of rolling upland.

Drainage: Well drained.

Moisture: Dry throughout at time of sampling.

Ground water: Dry.

Erosion: Slight.

Permeability: Moderate to moderately slow.

Sampled by: R. B. Grossman, Leo Shields, James Stephens, Paul Lupcho, and C. J. Fowkes - August 7, 1969.

Described by: C. J. Fowkes.

(Colors are for air-dry soil unless otherwise stated)

A1 0 to 7 cm (0 to 3 inches). Light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky that parts to moderate very fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; mildly alkaline (pH 7.4); clear smooth boundary.

B1 7 to 13 cm (3 to 5 inches). Light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and very fine subangular blocky structure; slightly hard, friable, sticky, plastic; few patches of glossy coatings on some faces of peds; mildly alkaline (pH 7.6); clear smooth boundary.

B2t 69L606 13 to 28 cm (5 to 11 inches). Light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate fine prismatic that parts to moderate medium and fine angular blocky structure; hard, firm, very sticky, plastic; patches of glossy coatings on all faces of peds; mildly alkaline (pH 7.8); clear smooth boundary.

C1ca 28 to 47 cm (11 to 19 inches). Light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak medium and fine subangular blocky structure; slightly hard, friable, sticky, slightly plastic; calcareous; common medium and fine threads, soft rounded masses and seams of secondary lime; moderately alkaline (pH 8.4). Note: This horizon is an erratic and discontinuous one. It probably developed in the thin sandstone lands above the shale. It occupies the position that would normally be a B3ca in this series.

C2ca 69L607 47 to 70 cm (19 to 28 inches). Pale yellow (2.5Y 7/3) shaly loam, light olive brown (2.5Y 5/3) moist; massive; hard, friable, sticky, slightly plastic; 35 percent shale fragments that crush easily between the fingers; calcareous; fine threads and seams of secondary lime; strongly alkaline (pH 8.6); gradual wavy boundary.

C3 70 to 85 cm (28 to 34 inches). Light gray, partially weathered calcareous shale.

<sup>1</sup>/<sub>1</sub>/Renohill soils are in the fine, montmorillonitic family.

CONSECUTIVE PEDON NUMBER C 69122 CHARACTERIZATION DATA

SOIL SERIES ROBANA SOIL NO. S69 WYO . 12- 9 SAMPLE NO. 9 651-9 657 STAR VALLEY AREA

SOIL FAMILY: ARGIC PACIFIC CRYSOBOLL, FINE-SILTY, MIXED RIVERSIDE SOIL SURVEY LABORATORY

SAMPLE NO.	DEPTH CM.	HORZ.	SIZE, CLASS AND PARTICLE DIAMETER (MM) 1818,3A1															1A2A		
			TOTAL FRACTION			SANDS					SILTS			CLAYS				INT. COARSE FRAGMENTS		
			SAND	SILT	CLAY	VCS	CS	MS	FS	VFS	CSI	FSI	CO.	FINE	CARBO	II	PCT. OF	I	II	III
			2-	.05-	LT	2-1	1-	.5-	.25-	.1-	.05-	.02-	2-	LT	NATE	2-	OF	75-	20-5	5-2
			.05	.002	.002	.5	.25	.10	.05	.02	.002	.20	.20	3A1A	.02	WHOLE	20			
			PERCENT OF LESS THAN 2MM															SOIL PCT. OF LT 75		
9 651	0-	13	AP	12.1	66.3	21.8	0.2	0.3	0.1	1.6	9.9	38.3	28.0				49.2	---	---	---
9 652	13-	41	A12	8.5	70.2	21.3	0.1	0.1	0.1	1.2	7.0	44.4	25.8				52.1	---	---	---
9 653	41-	68	B21T	11.6	67.3	21.1		0.1	0.1	0.9	10.5	42.3	25.0				53.4	---	---	---
9 654	68-	87	B22T	11.7	65.3	23.0		0.1		0.8	10.8	41.5	23.8				52.8	---	---	---
9 655	87-	142	B3	10.2	66.0	23.8	0.1	0.1	0.3	0.9	8.8	40.3	25.7				49.7	---	---	---
9 656	142-	193	C	11.5	66.9	21.6		0.3	0.5	1.7	9.0	38.2	28.7				48.2	---	---	---
9 657	193-	225	B21T	18.3	47.8	33.9	0.3	2.7	3.1	5.5	6.7	21.6	26.2				31.3	---	---	---

SAMPLE NO.	DEPTH CM.	ORG. MATTER		CARBONATE		SESQUIOXIDES				ATTERBERG		BULK DENSITY CM	WATER CONTENT			EXTNSBLTY							
		CAR-	NIYRO	AS	CACO3	DI-	CIY	EXT	PYROP	EXT	L		M	I	Y	EST.	1/3	DRY	17/10	1/3	15	LEF	LE
		80N	GEN	LT	2-20	FE	AL	FE	AL	LL	PL		1/3	BAR	BAR	BAR	BAR	BAR	BAR	BAR	BAR	BAR	BAR
		6A1A	6B1A	6E1B	6E1B	6C2B	6G7A	6C5A	6G5A	4F1	4F2	4A1F	4A1F	4A1H	3B2	4B1C	4B1C	4B2	4D1	4D1			
		PERCENT		PERCENT		PERCENT				PCT. NO. 40		GRAMS PER CC			PERCENT		PERCENT						
9 651	0-	13	2.25	0.213		0.8	0.1			31	26	1.13	1.23	1.00	23.3	10.2	2.9	2.9					
9 652	13-	41	1.45	0.151		0.8	0.1					1.24	1.35	1.00	22.8	9.9	2.9	2.9					
9 653	41-	68	0.73	0.089		0.7	0.1			26	21	1.19	1.28	1.00	13.9	9.5	2.5	2.5					
9 654	68-	87	0.51	0.065		0.7	0.1					1.34	1.50	1.00	20.3	10.3	3.8	3.8					
9 655	87-	142	0.33			0.8	0.1					1.34	1.53	1.00	25.5	10.4	4.5	4.5					
9 656	142-	193	0.16			0.9	0.1			25	19	1.28	1.46	1.00	26.3	9.5	4.5	4.5					
9 657	193-	225				1.5	0.1			34	18	1.43	1.69	1.00	25.9	14.0	5.7	5.7					

SAMPLE NO.	DEPTH CM.	EXTRACTABLE BASES						EXT. KCL		C E C		BASE SATURATION				PH		
		CA	MG	NA	K	SUM	ACI-	EXT.	SUM	NH4-	SUM+	SUM+ NH4-	NAF	H2O	CA-			
		5B4A	5B4A	5B4A	5B4A	5B4A	DITY	AL	OAC	ACI-	AL	OAC	8	MIN	171	CL2		
		6N2E	6O2D	6P2A	6Q2A		6H2A	6G1E	5A3A	5A6A	DITY	5C1						
		MEQ/100G										PERCENT						
9 651	0-	13	13.5	2.3	0.1	1.3	17.2		17.2	19.4	100+	89			6.2	5.7		
9 652	13-	41	12.2	2.5	0.1	0.9	15.7		15.7	17.9	100+	88			6.0	5.5		
9 653	41-	68	10.8	3.0	0.1	1.1	15.0		15.0	16.2	100+	93			6.2	5.6		
9 654	68-	87	12.9	4.0	0.1	1.1	18.1		18.1	18.7	100+	97			6.3	5.7		
9 655	87-	142	12.7	4.0	0.1	0.6	17.4		17.4	17.8	100+	98			6.5	6.0		
9 656	142-	193	11.7	3.4	0.2	0.3	15.6		15.6	15.1	100+	100+			7.1	6.4		
9 657	193-	225	16.7	4.2	0.2	0.6	21.7		21.7	21.8	100+	100+			7.1	6.6		

SAMPLE NO.	DEPTH CM.	CLAY MINERALOGY											RELATIVE AMOUNT	
		LESS THAN 0.002 MM				L.T. 0.0002 MM			MINERAL					
		X RAY				DTA			X RAY					
		7A2E	7A2E	7A2E	7A3	7A3	7A2E	7A2E	7A2E					
		I	II	III	IV	-PERCENT-	I	II	III					
9 651	0-	13										1	TRACE	
9 652	13-	41										MI	MICA	
9 653	41-	68	MI	3	MT	2	KK	2				MT	MONTMORT	
9 654	68-	87										KK	KADLINIT	
9 655	87-	142											4	ABUNDANT
9 656	142-	193	MT	3	MI	3							5	DOMINANT
9 657	193-	225	MI	4	MT	3	KK	1					6	INDETER.

SAMPLE PREPARATION CODES

A=STANDARD PREPARATION

ROBANA SILT LOAM<sup>1/</sup>  
S69Wyo-12-9

Location: Lincoln County, Wyoming. 4 kilometers (2½ miles) east of Freedom, Wyoming; 256 meters (840 feet) south and 21 meters (70 feet) east of the northwest corner of section 36, T35N, R119W.

Site located on photo BBL-1EE-86. Date of sampling: October 3, 1969.

Description by: C. J. Fowkes. Collectors: W. D. Nettleton, H. B. Ravenholt, W. R. Glenn, C. J. Fowkes.

Classification: Argic Pachic Cryoboroll; fine-silty, mixed.

Vegetation: Cultivated. Tame hay. Use: Dryfarm and irrigated cropland. Climate: Precipitation is 457 mm (18 inches). Mean annual temperature is 3° C. Average annual soil temperature at 50 cm is 7° C. Average summer soil temperature is 14° C without an O horizon.

Parent material: Silty loess derived from mixed alluvial sources.

Topography: Moderately rolling upland. Slope of 4 percent facing west.

Elevation: 1,814 meters (5,950 feet) above sea level. Drainage: Well drained. Runoff is medium.

Permeability is moderate. Soil moisture: Dry at time of sampling.

Remarks: Field pH determinations by brom thymol blue, phenol red, and thymol blue. This sample was not paired.

HORIZONDESCRIPTION

Ap 69651	0 to 13 cm (0 to 5 inches). Grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine to medium roots; noncalcareous, neutral (pH 7.2); abrupt smooth boundary.
A12 69652	13 to 41 cm (5 to 16 inches). Brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, very friable, sticky, slightly plastic; many to common very fine to medium roots; noncalcareous, neutral (pH 7.0); clear wavy boundary.
B21t 69653	41 to 68 cm (16 to 27 inches). Brown (7.5YR 5/2) silty clay loam, dark brown (7.5YR 4/2) moist; weak fine prismatic structure that parts to strong medium and fine subangular blocks; hard, firm, sticky, plastic; few very fine to fine roots; few thin patchy clay films on ped faces; some gray coatings on peds; noncalcareous, neutral (pH 7.0); gradual wavy boundary.
B22t 69654	68 to 87 cm (27 to 34 inches). Brown (7.5YR 5/3) silty clay loam, dark brown (7.5YR 4/3) moist; weak medium prismatic structure that parts to strong medium and fine angular blocks; hard, firm, very sticky, plastic; few very fine to fine roots; thin patchy clay films on all ped faces; gray coatings on peds; noncalcareous, neutral (pH 7.0); clear smooth boundary.
B3 69655	87 to 142 cm (34 to 56 inches). Light brown (7.5YR 6/3) silty clay loam, dark brown (7.5YR 4/3) moist; weak coarse angular blocky structure that parts to moderate fine angular blocks; hard, friable, sticky, plastic; few patchy clay films on some ped faces; few gray coatings on peds; noncalcareous, neutral (pH 7.2); gradual wavy boundary.
C 69656	142 to 193 cm (56 to 76 inches). Light brown (7.5YR 6/4) silty clay loam, dark brown (7.5YR 4/4) moist; weak coarse to fine angular blocky structure; slightly hard, friable, very sticky, plastic; noncalcareous, mildly alkaline (pH 7.3); clear wavy boundary.
IIB2tb* 69657	193 to 264 cm (76 to 104 inches). Brown (7.5YR 5/4) silty clay, dark brown (7.5YR 4/4) moist; weak coarse prismatic structure that parts to weak coarse angular blocks; hard, firm, very sticky, plastic; thin nearly continuous clay films; noncalcareous, mildly alkaline (pH 7.4); abrupt wavy boundary.
I11Cb	264 to 279 cm (104 to 110 inches). Light yellowish brown (10YR 6/4) very gravelly loam, yellowish brown (10YR 5/4) moist; massive; loose, nonsticky, nonplastic; 70 percent coarse subrounded to angular limestone fragments; calcareous, strongly alkaline (pH 8.4).

\* Only the upper part (193-225 cm) was sampled for laboratory characterization.

<sup>1/</sup>Horizons B21t and B22t were judged to be argillic when examined in the field. Micro-morphology confirms sufficient oriented clay below 68 cm for an argillic horizon. The lack of adequate clay increase is recognized but not considered diagnostic for this pedon.

SOIL Sabanta loam SOIL Nos. S64Wyo-8-5 LOCATION Goshen County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19483-19490 January 1968  
GENERAL METHODS: 1A, 1B1b, 2A1, 2B 19527-19531

Depth cm	Horizon	Size class and particle diameter (mm)											3A1a Non- Carbonate Clay	Coarse fragments 2A2			
		Total			Sand					Silt				3A1a Non- Carbonate Clay	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																	
0-13	A1	52.0	25.1	22.9	0.4	4.2	6.9	16.0	24.5	16.9	8.2	50.8	27.5	23	tr		
13-23	B21t	54.1	18.3	27.6	0.2	4.9	8.3	17.8	22.9	12.3	6.0	45.3	31.2	28	tr		
23-48	B22t	47.4	26.8	25.8	0.2	2.8	5.1	13.9	25.4	16.1	10.7	50.3	22.0	24	tr		
48-81	B23t	48.3	29.5	22.2	tr	0.8	2.8	12.0	32.7	17.1	12.4	57.9	15.6	19	tr		
81-112	B3ca	54.9	24.6	20.5	tr	1.2	5.1	18.9	29.7	13.3	11.3	54.9	25.2	19	-		
112-145	C1ca	60.9	18.7	20.4	0.3	5.1	9.6	20.9	25.0	9.6	9.1	47.1	35.9	17	tr		
145-178	C2ca	67.3	15.6	17.1	0.9	9.4	13.7	22.7	20.6	8.3	7.3	41.6	46.7	16	tr		
178-229	C3ca	71.9	12.0	16.1	3.1	15.5	13.3	22.8	17.2	6.0	6.0	36.2	54.7	14	tr		
Depth cm	6A1a Organic carbon a/ Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as CaCO <sub>3</sub>			Bulk density			4D1 COLE	Water content				pH	
					6E1b mm Pct.	3A1a mm Pct.	Field- State	4A1a g/cc	4A1d g/cc	4A1b g/cc		4B4 Field- State Pct.	4B1c 1/3- Bar Pct.	4B2 15- Bar Pct.	4C1 1/3- 15-Bar in/in	8C1b Sat. Paste	8C1c (1:1)
0-13	1.52	0.154	10	tr	-	1.32	1.24	1.33	0.024	10.0	31.3	10.0	0.26				7.7
13-23	1.04	0.114	9	1	-	1.36	1.28	1.45	0.044	15.7	28.2	11.6	0.21				8.0
23-48	0.67	0.086	8	11	2	1.41	1.34	1.46	0.028	15.9	25.7	11.9	0.18				8.0
48-81	0.29			11	3	1.52	1.43	1.53	0.024	9.1	20.7	10.6	0.14				8.7
81-112	0.12			10	2		1.50	1.62	0.024		18.9	9.1	0.15			7.8	8.9
112-145	0.05			9	3		1.39	1.54	0.036		25.7	8.4	0.24				8.8
145-178	0.02			7	1		1.46	1.56	0.020		23.0	6.9	0.24				9.1
173-229	0.01			6	2						6.6						9.0
Depth cm	Extractable bases 5B1a				Ext. Acidity	Cat. Exch. Cap.		8E1 Resis- tivity ohms- cm	8B1a Elec. Cond. mmhos/ cm	6F1a Sol. Na me/l	5D2 Exch. Na Pct.	8B Water at Sat. Pct.	8D5 Est. Total Salt in Soil ppm.	8D3 Ca/Mg	Base saturation		
	6N4b Ca	6O4b Mg	6P2a Na	6Q2a K		Sum	5A1a NH <sub>4</sub> OAc								Sum	5C1 NH <sub>4</sub> OAc Cations	Pct.
0-13	16.9	2.0	tr	1.9	20.8		21.3							8.5		98	
13-23	19.2	2.7	tr	2.3	24.2		23.1							7.1			
23-48	18.2	3.5	0.2	2.0	23.9		20.8							5.2			
48-81	15.6	4.7	1.1	1.9	23.3		19.0							3.3			
81-112	12.4	5.1	2.7	1.8	22.0		17.9	1700	1.02	8.7	13	34.7	227	2.4			
112-145	10.4	5.1	3.8	1.7	21.0		17.5							2.0			
145-178	8.7	3.7	4.2	1.4	18.0		15.6							2.4			
178-229	7.9	3.1	4.5	1.0	16.5		13.8			2.76	26.6	27	27.6	488	2.5		
Depth cm	Ratios to Clay 8D2			6F1a Gypsum Pct.	a/ 8 kg/m <sup>2</sup> to 60 inches (Method 6A).												
	NH <sub>4</sub> OAc CEC	Ext. Iron	15-Bar Water		Field capacity estimates: Water was added adjacent to sampling pit during a period from 1:00 PM, May 19, 1964, to 11:00 AM, May 20, 1964. Samples were collected at 11:00 AM, May 22, 1964. Dry at 46 inches.	LSL No.	Depth cm	Percent Water Field Capacity 4B4									
0-13	0.93		0.44		19527	0-13	24.4										
13-23	0.84		0.42		19528	13-23	20.9										
23-48	0.87		0.50		19529	23-48	21.4										
48-81	1.00		0.56		19530	48-81	21.5										
81-112	0.94		0.48		19531	81-112	17.8										
112-145	1.04		0.49														
145-178	0.97		0.43														
178-229	0.99		0.47														

Soil classification: Aridic Argiustoll; fine-loamy, mixed, mesic.

Soil series: Satanta loam.

Pedon No.: S64Wyo-8-5.

Location: Goshen County, Wyoming; Sec. 1, T22N, R63W; 143 feet south and 583 feet east of the northwest corner of Sec. 1.

Climate: Average annual precipitation is about 15 inches. Mean annual air temperature is about 49° F, average summer air temperature is about 69° F. Frost-free season is 120 to 150 days.

Vegetation and land use: Western wheatgrass, blue gramagrass, Sandberg bluegrass, prairie junegrass, silver-leaf sagebrush, and shadscale. Rangeland and wildlife habitat.

Parent material: Calcareous, aeolian material.

Physiography: Gently rolling upland.

Topography: South facing slope. Gradient is 1 percent. Slightly undulating surface.

Drainage: Well drained.

Moisture: Moist when sampled.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderate.

Sampled by: Fraser Stephens, R. C. Kronenberger, E. Rivers, Robert B. Grossman, Arvad J. Cline, and Harold Bindschadler - May 20, 1964.

Described by: Arvad J. Cline.

(Colors are for air-dry soil unless otherwise stated)

A1 19483 0 to 13 cm (0 to 5 inches). Grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable; mildly alkaline (pH 7.8); gradual smooth boundary.

B2t 19484 13 to 23 cm (5 to 9 inches). Grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic that parts to moderate medium subangular blocky structure; slightly hard, very friable; thin patchy glossy coatings on faces of peds; moderately alkaline (pH 8.0); clear smooth boundary.

B22t 19485 23 to 48 cm (9 to 19 inches). Light brown (7.5YR 6/3) clay loam, brown (7.5YR 5/3) moist; weak medium and fine prismatic that parts to moderate medium subangular blocky structure; hard, friable; thin patchy glossy coatings on faces of peds; calcareous; strongly alkaline (pH 8.5); gradual smooth boundary.

B23t 19486 48 to 81 cm (19 to 32 inches). Light brown (7.5YR 6/3) clay loam, brown (7.5YR 5/3) moist; weak medium prismatic that parts to moderate medium subangular blocky structure; hard, friable; thin patchy glossy coatings on faces of peds; calcareous; strongly alkaline (pH 8.6); gradual smooth boundary.

B3ca 19487 81 to 112 cm (32 to 44 inches). Light brown (7.5YR 6/3) loam, brown (7.5YR 5/3) moist; weak medium and coarse subangular blocky structure; hard, friable; few thin patchy glossy coatings on vertical faces of peds; a weak ca horizon with visible secondary calcium carbonate occurring as soft rounded masses and in thin seams and streaks; calcareous; strongly alkaline (pH 8.8); gradual smooth boundary.

C1ca 19488 112 to 145 cm (44 to 57 inches). Light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable; a weak ca horizon with visible calcium carbonate occurring as soft rounded masses and in thin seams and streaks; calcareous; very strongly alkaline (pH 9.2); gradual smooth boundary.

C2ca 19489 145 to 178 cm (57 to 70 inches). Light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable; a weak ca horizon with visible secondary calcium carbonate occurring as soft rounded masses and in thin seams and streaks; calcareous; very strongly alkaline (pH 9.2); gradual smooth boundary.

C3ca 19490 178 to 229 cm (70 to 90 inches). Light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable; a very weak ca horizon with some visible secondary calcium carbonate occurring as soft rounded masses; calcareous; very strongly alkaline (pH 9.2).

SOIL Sawcreek taxadjunct SOIL Nos. S67Wvc-10-2 LOCATION Johnson County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 67L302-67L308

GENERAL METHODS: 1A, 1B1b, 2A1, 2B

Depth (cm)	Horizon	Size class and particle diameter (mm)													3A1				Coarse fragments 2A2			
		Total			Sand						Silt				3B2 Vol. 250-2	3B1 Wt.						
		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)	Int. I (2-0.1)	<0.074	75-2		20-5	5-2					
Pct. of < 2 mm															%	% <75	% <20	% <2				
0-5	A11	52.7	33.4	13.9	10.4	13.9	7.8	11.4	9.2	17.1	16.3	32.2	43.5	53.0	5	10	5	6				
5-15	A12	59.7	27.3	13.0	10.5	17.5	9.7	13.3	8.7	14.6	12.7	30.1	51.0	45.4	10	20	11	11				
15-25	B21t	59.0	25.4	15.6	12.3	15.9	9.0	12.6	9.2	13.9	11.5	29.8	49.8	46.5	25	40	23	15				
25-36	B22t	64.1	20.8	15.1	8.6	15.2	10.9	17.3	12.1	11.4	9.4	32.6	52.0	42.9	25	35	18	17				
36-58	C1	80.0	11.7	8.3	7.0	18.5	15.4	26.1	13.0	6.0	5.7	32.6	67.0	26.4			16	15				
58-99	C2	84.4	11.5	4.1	5.9	21.0	15.7	27.1	14.7	6.4	5.1	35.7	69.7	22.9			17	12				
99-127	C3	82.3	13.3	4.4	10.5	18.4	13.8	24.2	15.5	6.7	6.6	35.2	66.8	25.8			19	15				

Depth (cm)	6A1a Organic carbon a/ Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as CaCO <sub>3</sub> Pct.	Bulk density			4D1 COLE	Water content			pH	
						4A1d 1/3-Bar g/cc	4A1b Oven-Dry g/cc	4B1c 1/3-Bar Pct.		4B2 15-Bar Pct.	4C1 WRD in./in.	8C1b Sat. Paste (1:1)	8C1a (1:1)	
0-5	5.65	0.429	13	0.7			1.04	1.14	0.030	30.8	11.0	0.20		5.8
5-15	1.60	0.145	11	0.7			1.39	1.45	0.010	15.7	5.8	0.12		6.0
15-25	1.21	0.115	11	0.8			1.39	1.46	0.012	14.4	7.2	0.08		5.9
25-36	0.75	0.069	11	0.6			1.52	1.58	0.011	13.0	6.4	0.08		5.8
36-58	0.35			0.4							3.9			5.6
58-99	0.16			0.3							2.9			5.6
99-127	0.12			0.4							3.3			5.4

Depth (cm)	Extractable bases 5B4a				6H1a Ext. Acidity	Cat. Exch. Cap.			8E1 Resistivity ohm-cm	8A1a Elec. Cond. mmhos/cm	8D5 Total Sol. Salts ppm	8A1 Water at Sat. Pct.	8D3 Ca/Mg	Base saturation	
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K		Sum	5A3a Sum Cations	5A6 NH <sub>4</sub> OAc						5C3 Sum Cations	5C1 NH <sub>4</sub> OAc
0-5	13.7	2.7	0.1	1.4	17.9	8.1	26.0	20.8					5.1	69	86
5-15	8.8	1.9	0.1	0.6	11.4	6.5	17.9	13.9					4.6	64	82
15-25	8.9	2.3	0.1	0.4	11.7	7.1	18.8	14.7					3.9	62	80
25-36	9.8	2.7	0.1	0.4	13.0	5.4	18.4	15.7					3.6	71	83
36-58	6.6	1.9	0.1	0.2	8.8	4.8	13.6	10.2					3.5	65	86
58-99	5.9	2.0	0.1	0.1	8.1	2.2	10.3	8.8					3.0	79	92
99-127	8.5	2.7	0.1	0.1	11.4	2.6	14.0	11.3	7000	0.25	30	64.0	3.1	81	101

Depth (cm)	Ratios to Clay 8D1		
	Ext. Iron	15-Bar Water	NH <sub>4</sub> OAc CEC
0-5	0.05	0.79	1.5
5-15	0.05	0.45	1.1
15-25	0.05	0.46	0.94
25-36	0.04	0.42	1.0
36-58	0.05	0.47	1.2
58-99	0.07	0.70	2.1
99-127	0.09	0.75	2.6

a/ Organic carbon: 8 kg/m<sup>2</sup> to a depth of 36 cm (14 inches). Method 6A.

Soil classification: Typic Cryoboroll; sandy, mixed.

Soil series: Sawcreek taxadjunct<sup>1/</sup>.

Pedon No.: S67Wyo-10-2.

Location: Johnson County, Wyoming; SW<sup>1/4</sup>, NW<sup>1/4</sup> of Sec. 11, T48N, R84W. Proceed south on gravel road which approaches U.S. Highway 16 2.3 miles west of Caribou Lodge for 0.5 mile; thence, turn left and proceed easterly for approximately  $\frac{1}{4}$  mile to the site.

Climate: Average annual precipitation is about 20 inches; average annual soil temperature at 20 inches is about 39° F.; mean summer soil temperature is about 48° F. Snow cover period extends from late October to mid-June. Elevation is 8,135 feet.

Vegetation and land use: Fescue spp.; Poa spp.; flowering plants. Summer sheep range and wildlife habitat.

Parent material: Alluvial noncalcareous sediments from granitic sources.

Physiography: Piedmont remnant.

Topography: West facing slope. Gradient is 3 percent.

Drainage: Well drained.

Moisture: Moisture conditions at sampling time were above normal because of the unusually high precipitation during the winter, spring, and early summer prior to sampling. Deviation for that period was around +10 inches of precipitation.

Ground water: Deep.

Erosion: Nonevident.

Permeability: Moderately rapid.

Sampled by: Robert B. Grossman, Warren Lynn, Paul Lupcho, James R. Stephens, Jr., Kl Hak Han, and C. J. Fowkes - July 17, 1967.

Described by: C. J. Fowkes - July 17, 1967.

(Colors are for air-dry soil unless otherwise stated)

A11 67L302 0 to 5 cm (0 to 2 inches). Dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine crumb structure; soft, very friable, slightly sticky, nonplastic; neutral (pH 6.6); clear smooth boundary.

A12 67L303 5 to 15 cm (2 to 6 inches). Grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium crumb structure; soft, very friable, slightly sticky, nonplastic; 10 percent fine granitic gravel; slightly acid (pH 6.4); clear smooth boundary.

B21t 67L304 15 to 25 cm (6 to 10 inches). Light brown (7.5YR 6/3) gravelly sandy loam, dark brown (7.5YR 4/3) moist; weak fine and medium subangular blocky structure; neutral (pH 6.6); clear smooth boundary.

B22t 67L305 25 to 36 cm (10 to 14 inches). Light brown (7.5YR 6/3) gravelly sandy loam, dark brown (7.5YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; thin patchy glossy coatings on all faces of peds; medium acid (pH 5.6); gradual wavy boundary.

C1 67L306 36 to 58 cm (14 to 23 inches). Pale brown (10YR 6/3) gravelly loamy coarse sand, dark brown (10YR 4/3) moist; single grained; loose, nonsticky, nonplastic; 15 percent granitic gravel 20 mm to 75 mm (3/4 to 3 inches), 5 percent 75 mm to 250 mm (3 to 10 inches); slightly acid (pH 6.0); gradual wavy boundary.

C2 67L307 58 to 99 cm (23 to 39 inches). Pale brown (10YR 6/3) gravelly loamy coarse sand, dark brown (10YR 4/3) moist; single grained; loose, nonsticky, nonplastic; 20 percent granitic gravel 20 mm to 75 mm (3/4 inch to 3 inches), 5 percent 75 mm to 250 mm (3 inches to 10 inches); slightly acid (pH 6.0); gradual wavy boundary.

C3 67L308 99 to 127 cm (39 to 50 inches). Pale brown (10YR 6/3) loamy coarse sand, dark brown (10YR 4/3) moist; single grained; loose, nonsticky, nonplastic; 60 percent coarse granite fragments larger than 75 mm (3 inches).

<sup>1/</sup>The Sawcreek soils are in a coarse-loamy, mixed family of Typic Cryoborolls and have bedrock at a depth of 20 to 40 inches. This pedon has a sandy control section and fails to have bedrock at a depth of 20 to 40 inches.

SOIL Sawcreek loam SOIL Nos. S67Wyo-10-7 LOCATION Johnson County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 67L332-67L338

GENERAL METHODS: 1A, 1B1b, 2A1, 2B

Depth (cm)	Horizon	Size class and particle diameter (mm)													3A1			
		Total													2A2		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)	<0.074	3B2 Vol. %	3B1 Wt. %	20-5	5-2
Pct. of < 2 mm																		
0-10	A1	49.7	31.8	18.5	1.0	8.0	11.8	22.3	6.6	16.1	15.7	32.3	43.1	54.3	5	10	1	1
10-25	B1	52.5	30.5	17.0	0.5	7.4	12.1	25.5	7.0	17.2	13.3	35.9	45.5	51.3	5	10	1	1
25-43	B21	56.7	27.5	15.8	0.7	8.0	13.2	27.8	6.9	15.2	12.3	34.2	49.8	47.2	5	10	1	1
43-61	B22	75.3	13.5	11.2	1.0	7.9	16.8	41.8	7.8	7.8	5.7	33.5	67.5	28.7			6	4
61-86	R1	93.5	1.8	4.7	0.2	9.1	30.4	49.3	4.5	1.3	0.5	23.6	89.0	8.4			18	5
86-91	R2																	
43-61	a/	62.0	23.4	14.6	1.9	12.3	13.4	26.2	8.3	13.4	10.0	33.8	53.7	42.7			8	4

Depth (cm)	6A1a Organic carbon a/ Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as CaCO <sub>3</sub> Pct.	Bulk density			4D1 COLE	Water content			pH	
						4A1d 1/3-Bar g/cc	4A1b Oven-Dry g/cc	4B1c 1/3-Bar Pct.		4B2 15-Bar Pct.	4C1 WRD in./in.	8C1b Sat. Paste (1:1)	8C1a (1:1)	
0-10	4.93	0.374	13	0.8		1.02	1.14	0.036	35.3	15.2	0.20			
10-25	1.95	0.167	12	0.8		1.27	1.33	0.015	21.3	10.6	0.13			
25-43	0.94	0.091	10	0.8		1.34	1.39	0.012	78.1	8.9	0.11			
43-61	0.51	0.049	10	0.7						5.7			4.9	
61-86	0.09			0.3						1.8			5.0	
86-91													4.9	
43-61	0.44			0.7						7.6			4.9	

Depth (cm)	Extractable bases 5B4a					6H1a Ext. Acidity	Cat. Exch. Cap.			6G1d Ext. Al	8E1 Resis- tivity ohms-cm	8A1a Elec. Cond. mmhos/cm	8D5 Total Sol. Salts ppm	8A1 Water at Sat. Pct.	8D3 Ca/Mg	Base saturation	
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum meq/100 g		5A3a Sum Cations	5A6 NH <sub>4</sub> OAc	Sum NH <sub>4</sub> OAc							5C3 Sum Cations	5C1 NH <sub>4</sub> OAc
0-10	12.7	2.5	0.1	1.0	16.3	12.9	29.2	23.1	0.3						5.1	56	71
10-25	7.3	1.9	0.1	0.6	9.9	10.6	20.5	15.5	0.3						3.8	48	64
25-43	5.6	1.8	0.1	0.3	7.8	8.6	16.4	12.8	0.7						3.1	48	61
43-61	3.8	1.3	0.1	0.3	5.5	6.4	11.9	8.8	0.9	8700	0.30	50		24.2	2.9	46	63
61-86	1.3	0.6	0.1	0.1	2.1	1.4	3.5	2.9	0.4						2.9	60	72
86-91																	
43-61	4.6	1.8	0.1	0.3	6.8	7.1	13.9	10.9	1.0						2.6	49	62

Depth (cm)	Ratios to Clay 8D1		
	Ext. Iron	15-Bar Water	NH <sub>4</sub> OAc CEC
0-10	0.04	0.82	1.2
10-25	0.05	0.62	0.91
25-43	0.05	0.56	0.81
43-61	0.06	0.51	0.79
61-86			
86-91			
43-61	0.05	0.52	0.75

a/ Organic carbon 11 kg/m<sup>2</sup> to a depth of 43 cm (17 in.) (Method 6A).

Soil classification: Typic Cryoboroll; coarse-loamy, mixed.

Soil series: Sawcreek loam.

Pedon No. S67Wyo-10-7.

Location: Johnson County, Wyoming; NW $\frac{1}{4}$ , NW $\frac{1}{4}$  of Sec. 29, T45N, R85W. Proceed south on main gravel road which approaches U.S. Highway 16 2.3 miles west of Caribou Lodge for 19.8 miles to junction. Proceed on right fork for another 7.7 miles to stone monument on left or east side of road. Site is 200 yards east of stone monument.

Climate: Average annual precipitation is about 20 inches; average annual soil temperature at 20 inches is about 40° F.; mean summer soil temperature at 20 inches is about 53° F. Snow cover period extends from late November to early June. Elevation is 8,200 feet.

Vegetation and land use: Fescue spp.: prairie junegrass; Poa spp.: green needlegrass, thickspike wheatgrass, needleleaf sedge. Summer sheep range and wildlife habitat.

Parent material: Residuum weathered from noncalcareous fine grained reddish Flathead sandstone.

Physiography: Summit of a mountain range.

Topography: Moderately rolling, east facing. Gradient is 6 percent. The surface is microundulating.

Drainage: Well drained.

Moisture: Moisture conditions at sampling time were above normal because of unusually high precipitation during the winter, spring, and early summer prior to sampling. Deviation for that period was around +10 inches of precipitation.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderately rapid.

Sampled by: Robert B. Grossman, Warren Lynn, Ki Hak Han, James R. Stephens, Jr., and C. J. Fowkes - July 19, 1967.

Described by: C. J. Fowkes - July 19, 1967.

(Colors are for air-dry soil unless otherwise stated)

A1 67L332 0 to 10 cm (0 to 4 inches). Dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine crumb structure; soft, very friable, slightly sticky, nonplastic; slightly acid (pH 6.4); clear smooth boundary.

B1 67L333 10 to 25 cm (4 to 10 inches). Grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/3) moist; weak medium prismatic that parts to weak medium and fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; few thin patchy glossy coatings and some bridging of clay between sand grains; slightly acid (pH 6.2); clear wavy boundary.

B21 67L334 25 to 43 cm (10 to 17 inches). Brown (7.5YR 5/2) sandy loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; thin nearly continuous glossy coatings on faces of peds and bridging of clay between sand grains; strongly acid (pH 5.4); clear wavy boundary.

B22 67L335 and 67L338 43 to 61 cm (17 to 24 inches). Reddish brown (5YR 5/3) sandy loam, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; thin nearly continuous glossy coatings on faces of peds and bridging of clay between sand grains; strongly acid (pH 5.4); clear broken boundary.

R1 67L336 61 to 86 cm (24 to 34 inches). Dark reddish brown (5YR 3/4) and reddish brown (5YR 5/4) partially disintegrated and indurated fine grained noncalcareous reddish brown sandstone.

R2 67L337 86 to 91 cm (34 to 36 inches). Hard reddish brown fine grained noncalcareous sandstone.

LABORATORY NUMBER	DEPTH cm	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
			VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY <0.002		0.2-0.02 <0.005	> 2	
1260	0-20	Ap	0.5	5.4	6.0	10.7	13.6	26.8	37.0	15.8	30.9	-	cl
1261	20-31	AC	0.6	7.6	6.3	9.8	11.2	26.7	37.8	16.7	26.9	-	cl
1262	31-51	C1	0.2	4.1	5.2	10.1	15.5	26.7	38.2	16.2	32.1	-	cl
1263	51-76	C2	1.0	4.3	3.7	7.8	15.6	29.1	38.5	17.2	32.4	-	cl
1264	76-97	Alb	0.9	5.8	4.1	8.5	16.1	27.3	37.3	14.4	34.5	-	cl
1265	97-124	C1b	0.1	3.0	3.6	8.2	17.9	30.0	37.2	16.9	36.4	-	cl
1266	124-168	C2b	0.4	4.4	5.5	10.4	16.7	27.5	35.1	15.1	34.3	-	cl

LABORATORY NUMBER	pH		ORGANIC MATTER			EST. % SALT (BUREAU CUP)	ELECTRICAL CONDUCTIVITY ECx10 <sup>3</sup> MILLIMHOS PER CM @ 25°C	CaCO <sub>3</sub> equivalent per cent SOIL	GYPSUM me./100g SOIL	MOISTURE TENSIONS (per cent)		
	SATURATED PASTE	1:5	1:10	% ORGANIC CARBON	% NITROGEN					C/N	1/10 ATMOS.	1/3 ATMOS.
1260	7.5	8.4	8.6	0.69		-	1.1	10	-	45.8	32.8	19.8
1261	7.5	8.5	8.7	0.34		-	0.8	10	-	45.2	31.9	19.1
1262	7.5	8.6	8.8	0.35		-	0.7	10	-	43.8	32.3	18.8
1263	7.5	8.6	8.7	0.42		-	1.0	9	-	45.5	33.6	19.5
1264	7.5	8.6	8.6	0.64		-	1.0	9	-	44.7	34.4	20.1
1265	7.4	9.0	9.1	0.43		-	1.1	10	-	45.0	34.8	19.4
1266	7.7	9.2	9.3	0.42		-	1.3	9	-	44.2	33.9	18.8

LABORATORY NUMBER	CATION EXCHANGE CAPACITY	EXCHANGEABLE CATIONS					EXCHANGEABLE SODIUM PERCENTAGE ESP	SATURATION EXTRACT SOLUBLE					PER CENT MOISTURE AT SATURATION
		Ca	Mg	Na	K			Na	K	CO <sub>3</sub>	HCO <sub>3</sub>	Cl	
1260	32.2			0.6	2.1	2	3.0	0.6					59.0
1261	31.6			0.6	1.5	2	2.8	0.2					57.9
1262	31.0			0.8	1.2	2	2.8	0.2					57.7
1263	33.1			1.0	1.4	3	4.1	0.2					58.9
1264	31.8			1.3	1.5	4	5.0	0.2					59.7
1265	32.2			2.4	1.8	7	7.8	0.2					58.6
1266	29.8			3.6	1.9	12	11.3	0.2					54.6

Soil classification: Ustic Torriorthent; fine, montmorillonitic (calcareous), mesic.

Soil: Series not designated.

Pedon No.: S52Wyo-8-5.

Location: Goshen County, Wyoming; southwest corner of the NE $\frac{1}{4}$  of the NW $\frac{1}{4}$  of Sec. 3, T23N, R62W; 125 feet east of north and south road and about 38 rods south of the road intersection; photo 10-38.

Climate: Average annual precipitation is about 15 inches. Mean annual air temperature is about 49° F., and the mean summer air temperature is about 69° F. Frost-free season is 120 to 150 days.

Vegetation and land use: Irrigated cropland.

Parent material: Calcareous silty alluvium.

Physiography: Alluvial fans.

Topography: North facing slope. Gradient is 2 percent.

Drainage: Well drained.

Ground water: Deep.

Erosion: Slight.

Permeability: Slow.

Described by: C. J. Fox - October 1952.

(Colors are for air-dry soil unless otherwise stated)

Ap 1260 0 to 20 cm (0 to 8 inches). Very pale brown (10YR 7/3) silty clay loam, pale brown (10YR 6/3) moist; moderate medium granular structure; hard, friable; many fine roots; strongly calcareous; clear smooth boundary.

A<sub>c</sub> 1261 20 to 31 cm (8 to 12 inches). Very pale brown (10YR 7/4) silty clay, light yellowish brown (10YR 6/4) moist; moderate medium granular structure; very hard, friable; many fine roots; strongly calcareous; clear smooth boundary.

C1 1262 31 to 51 cm (12 to 20 inches). Very pale brown (10YR 7/4) silty clay, light yellowish brown (10YR 6/4) moist; moderate medium prismatic that parts to moderate medium granular structure; very hard, friable; common fine roots; strongly calcareous; gradual smooth boundary.

C2 1263 51 to 76 cm (20 to 30 inches). Light yellowish brown (10YR 6/4) silty clay, yellowish brown (10YR 5/4) moist; weak medium granular structure; very hard, firm; few fine roots; strongly calcareous; gradual smooth boundary.

Alb 1264 76 to 97 cm (30 to 38 inches). Pale brown (10YR 6/3) silty clay, yellowish brown (10YR 5/4) moist; weak medium granular structure; very hard, firm; strongly calcareous; gradual smooth boundary.

Clb 1265 97 to 124 cm (38 to 49 inches). Pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate fine granular structure; hard, friable; strongly calcareous; gradual smooth boundary.

C2b 1266 124 to 168 cm (49 to 66 inches). Very pale brown (10YR 7/3) clay loam, pale brown (10YR 6/3) moist; moderate medium granular structure; hard, friable; strongly calcareous.

DEPTH cm	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	0.05-0.002	SILT < 0.002	CLAY 0.2-0.07	0.02-0.002	> 2	
0-8	A1	1.9	12.4	10.3	19.0	24.1	22.5	9.8	48.6	9.4	1.1	fsl
8-17	B2t	0.4	5.4	6.5	15.4	22.9	21.4	28.0	45.2	8.2	-	scl
17-25	B3ca	0.4	3.2	3.9	10.4	26.4	29.7	26.0	51.1	11.6	-	1
25-50	C1ca	0.3	2.5	3.4	10.6	28.8	32.4	22.0	55.4	12.6	-	1
50-69	C2ca	0.3	3.3	4.7	12.4	26.9	31.4	21.0	53.6	12.5	-	1
69-107	C3	0.2	4.3	7.6	20.9	28.8	21.9	16.3	54.8	8.6	-	vfsl
107-117	C4	1.0	6.5	8.3	24.2	27.1	18.2	14.7	52.3	7.5	2.3	fsl
pH		ORGANIC MATTER				ESTR SALT (BUREAU CUP)	ELECTRI- CAL CONDUCT- IVITY EC x 10 <sup>3</sup> MILLIMHOS PER CM (25°C)	CaCO <sub>3</sub> equiv- alent %	GYPSUM mg./100g. SOIL	MOISTURE TENSIONS		
SATU- RATED PASTE	1:5	1:10	ORGANIC CARBON %	NITRO- GEN %	C/N					1/10 ATMOS.	1/3 ATMOS.	15 ATMOS.
7.2	7.6	7.4	0.50	.070	8.6	-	0.5	1	20.7	14.0	3.6	
7.5	8.1	8.2	0.69	.072	9.6	-	0.6	1	26.3	21.5	10.1	
7.8	8.6	8.7	0.71	.078	9.1	-	0.6	10	27.1	22.5	9.4	
8.3	9.3	9.3	0.40			-	0.9	12	28.9	22.2	7.8	
8.4	9.5	9.5	0.22			-	2.0	11	28.8	21.8	7.5	
8.5	9.6	9.5	0.16			-	3.0	6	25.9	16.6	5.7	
8.4	9.4	9.4	0.16			-	3.8	3	23.4	14.1	5.0	
CATION EXCHANGE CAPACITY (NH <sub>4</sub> Ac)	EXTRACTABLE CATIONS					EXCH. No %	SATURATION EXTRACT SOLUBLE				MOISTURE AT SATU- RATION %	
	Ca	Mg	N	Na	K		Na	K				
	milliequivalents per 100g. soil						milliequivalents per liter					
7.4	5.0	2.0		0.1	0.6	1	0.7	0.7				27.8
20.6	22.2	6.2		0.2	0.8	1	0.6	0.2				45.2
15.2				0.2	0.4	1	1.1	0.1				43.1
11.5				1.2	0.3	9	6.5	0.1				39.6
10.3				2.2	0.3	16	16.6	0.1				39.5
8.9				2.4	0.3	19	20.0	0.2				36.0
8.7				2.6	0.4	20	26.0	0.4				35.3

Soil classification: Haplustollic Natrargid; fine-loamy, mixed, mesic.

Soil: Series not designated.

Pedon No.: S54Wyo-13-2.

Location: Natrona County, Wyoming; in the NE $\frac{1}{4}$  of the NE $\frac{1}{4}$  of Sec. 29, T33N, R81W; approximately 400 feet west and 300 feet south of the NE corner of Sec. 29.

Climate: Average annual precipitation is about 13 inches. Mean annual air temperature is about 45° F., and mean summer air temperature is about 68° F. Frost-free season is 120 to 140 days.

Vegetation and land use: Western wheatgrass, blue gramagrass, threadleaf sedge, big sagebrush, and cactus. Rangeland and wildlife habitat.

Parent material: Strongly alkaline alluvium.

Physiography: Sloping face of high terrace.

Topography: Convex slope. Northeast facing. Gradient is approximately 4 percent.

Drainage: Well drained.

Ground water: Deep.

Erosion: Slight to moderate.

Permeability: Slow.

Sampled by: Lyle T. Alexander, James Allen, Harold Bindschadler, Arvad J. Cline, and Clarence Fowkes - August 17, 1954.

Described by: Arvad J. Cline.

(Colors are for air-dry soil unless otherwise stated)

A1 2485 0 to 8 cm (0 to 3 inches). Light gray (10YR 7/2) fine sandy loam, brown (10YR 5/3) moist; weak medium platy that parts to very fine granular structure; soft, very friable; noncalcareous; abrupt smooth boundary.

B2t 2486 8 to 17 cm (3 to 6 $\frac{1}{2}$  inches). Brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate coarse columnar that parts to moderate medium angular blocky structure; extremely hard, very firm; tops of the structural aggregates are somewhat rounded and in places appear to have a medium platy structure in the upper one-fourth to one-half inch; noncalcareous; abrupt smooth boundary.

B3ca 2487 17 to 25 cm (6 $\frac{1}{2}$  to 10 inches). White (2.5Y 8/2) loam, light yellowish brown (2.5Y 6/3) moist; weak medium angular blocky structure; very hard, very firm; calcareous; horizon contains much accumulated lime chiefly as lime flour; gradual irregular boundary.

C1ca 2488 25 to 50 cm (10 to 20 inches). White (2.5Y 8/2) loam, light yellowish brown (2.5Y 6/3) moist; massive; very hard, firm; large insect casts are plentiful; calcareous; horizon contains much calcium carbonate chiefly as lime flour; gradual smooth boundary.

C2ca 2489 50 to 69 cm (20 to 27 inches). Light gray (2.5Y 7/2) sandy clay loam, light yellowish brown (2.5Y 6/3) moist; massive; extremely hard, very firm; calcareous; horizon contains much accumulated lime chiefly as lime flour; gradual smooth boundary.

C3 2490 69 to 107 cm (27 to 42 inches). Light gray (2.5Y 7/2) sandy clay loam, light yellowish brown (2.5Y 6/3) moist; massive; extremely hard, firm; calcareous; horizon contains much accumulated lime chiefly as lime flour but there is somewhat less than in the two horizons above; gradual smooth boundary.

C4 2491 107 to 117 cm (42 to 46 inches). Pale yellow (5Y 7/3) fine sandy loam, olive (5Y 5/3) moist; massive; hard, friable; calcareous.

SOIL Series not designated      SOIL Nos. 564Wyo-8-9      LOCATION Goshen County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska      LAB. Nos. 19452-19461      January 1968

GENERAL METHODS: 1A, 1B1b, 2A1, 2B

Depth cm	Horizon	Size class and particle diameter (mm)													3A1a Non- Carbon- ate Clay	Coarse fragments 2A2			
		Total			Sand					Silt						3A1a Non- Carbon- ate Clay	> 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)	Int. I (0.05-0.02)	Int. II (0.02- 0.002)	Int. III (0.02-0.01)	Int. IV (0.02-0.01)	Pct.					
0-13	A1	41.4	40.0	18.6	-	0.4	0.7	6.0	34.3	27.7	12.5	66.9	7.1	19	tr				
13-23	B2t	42.7	36.4	20.9	-	0.4	1.0	8.0	33.3	24.9	11.5	64.8	9.4	21	-				
23-41	B3	43.4	44.9	11.7	-	0.4	0.9	8.3	33.8	27.5	17.4	68.1	9.6	10	tr				
41-58	C1ca	45.0	45.5	9.5	-	0.3	0.7	9.1	34.9	28.9	16.6	71.5	10.1	9	-				
58-81	C2ca	45.2	44.4	10.4	-	0.4	0.8	9.6	34.4	29.8	14.6	72.2	10.8	9	-				
81-107	C3ca	45.4	42.4	12.2	-	0.4	1.1	10.9	33.0	27.8	14.6	69.9	12.4	11	-				
107-145	C4ca	69.1	21.2	9.7	0.1	2.3	6.2	29.4	31.1	13.5	7.7	66.2	38.0	10	tr				
145-175	IIC5ca	72.8	18.3	8.9	0.1	2.4	8.0	32.2	30.1	11.6	6.7	63.7	42.7	9	tr				
175-297	IIC6ca														tr				
297-419	IIC7ca														tr				
13-23	B2c a/	43.7	33.9	22.4	tr	0.5	1.1	10.0	32.1	22.9	11.0	63.0	11.6						
58-81	C2ca a/	44.8	38.2	17.0	tr	0.3	0.8	9.7	34.0	24.0	14.2	66.1	10.8						

Depth cm	6A1a Organic carbon a/ Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as CaCO <sub>3</sub>			Bulk density			4D1 COLE	Water content					pH		
					6E1b Pct.	3A1a Pct.	6F1b Pct.	4A1a Field State	4A1d 1/3- Bar	4A1b Air- Dry		4B4 Pct.	4B1c Pct.	4B2 Pct.	4C1 in./in.	8C1b Sat. Paste	8C1a (1:1)		
					g/cc	g/cc	g/cc	g/cc	g/cc	g/cc		g/cc	g/cc	g/cc	g/cc	g/cc	g/cc	g/cc	
0-13	1.47	0.148	10	0.4	-	-	1.34	1.27	1.36	0.024	9.9	30.4	9.1	0.27			7.0		
13-23	1.25	0.135	9	0.5	1	-	1.24	1.18	1.31	0.036	14.1	37.6	10.7	0.32			7.6		
23-41	0.92	0.105	9	0.3	10	2	1.21	1.20	1.24	0.010	16.0	33.7	11.7	0.26			8.1		
41-58	0.55	0.065	8	0.4	10	1	1.22	1.20	1.23	0.007	12.4	29.5	10.3	0.23			8.3		
58-81	0.31			0.3	9	1	1.31	1.34	1.34	0.007		28.1	8.7	0.25			8.5		
81-107	0.17			0.3	9	1	1.37	1.40	1.40	0.007		28.9	7.7	0.29			8.8		
107-145	0.06			0.2	6	tr	1.46	1.49	1.49	0.007		24.6	5.7	0.28			9.2		
145-175	0.05			0.3	4	tr	1.48	1.50	1.50	0.003		17.9	5.0	0.19			9.1		
175-297				0.3	4														
297-419				0.2	5														

Depth cm	Extractable bases				6B1a Sum	6H1a Ext. Acidity	Cat. Exch. Cap.		8E1 Resis- tivity	8B1a Elec. Cond.	6P1a Sol. Na	5D2 Exch. Na	8B Water at Sat.	8D5 Est. Total Salt in Soil	8D3 Ca/Mg	Base saturation	
	6N2a Ca	6O4b Mg	6P2a Na	6Q2a K			5A3a Sum	5A1a NH <sub>4</sub> OAc Cations								5C3 Sum	5C1 NH <sub>4</sub> OAc
	meq/100 g	meq/100 g	meq/100 g	meq/100 g			meq/100 g	meq/100 g								Pct.	Pct.
0-13	2.84	tr	1.5		19.9	2.3	22.2	18.6						5.6	90	107	
13-23	2.3	0.1	1.6					21.9						8.7			
23-41	3.4	tr	1.5					19.6						5.3			
41-58	4.5	0.1	2.1					18.7						3.3			
58-81	6.1	0.4	3.1					18.1						2.0			
81-107	6.3	1.6	3.7					17.0						1.5			
107-145	4.6	2.5	2.7					11.9						1.4			
145-175	3.1	3.0	2.3					11.2						2.1			
175-297	2.9	3.3	1.7					11.8		2.74	24.3	21	27.7	486			
297-419	2.2	2.7	0.8					10.7						4.5			

Depth cm	Ratios to Clay 8D2			6F1a Gypsum Pct.
	NH <sub>4</sub> OAc CEC	Ext. Iron	15-Bar Water	
0-13	1.00	0.02	0.49	
13-23	1.05	0.02	0.51	
23-41	1.96	0.03	1.00	
41-58	2.08	0.04	1.14	
58-81	2.01	0.03	0.97	
81-107	1.55	0.02	0.70	-
107-145	1.23	0.02	0.59	
145-175	1.26	0.03	0.56	-

a/ Allowed to stand overnight in 250 ml. 0.5N NaOH before regular pre-treatment. About 5 percent weight loss for all pretreatment steps. The treatment with NaOH does not increase the weight loss appreciably.

Soil classification: Aridic Haplustoll; coarse-silty, mixed, mesic.

Soil series: Series not designated.

Padon No.: S64Wyo-8-9.

Location: Goshen County, Wyoming; NE $\frac{1}{4}$ , SE $\frac{1}{4}$  of Sec. 16, T22N, R60W.

Climate: Average annual precipitation is about 15 inches. Mean annual air temperature is about 49° F., mean summer air temperature is about 69° F. Frost-free season is 120 to 150 days.

Vegetation and land use: Western wheatgrass, blue gramgrass, prairie junegrass, Sandberg bluegrass, needle-andthread, and cactus. Rangeland and wildlife habitat.

Parent material: Calcareous aeolian silt and very fine sand.

Physiography: Rolling upland.

Topography: Southeast facing slope. Gradient is 1 percent.

Drainage: Well drained.

Moisture: Moist when sampled.

Groundwater: Deep.

Erosion: Slight.

Permeability: Moderate.

Sampled by: Fraser Stephens, R. C. Kronenberger, E. Rivers, Robert B. Grossman, Arvad J. Cline, and Harold Bindschadler - May 21, 1964.

Described by: Arvad J. Cline.

(Colors are for air-dry soil unless otherwise stated)

A1 19452 0 to 13 cm (0 to 5 inches). Grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; soft, very friable; mildly alkaline (pH 7.4); clear smooth boundary.

B2t 19453 13 to 23 cm (5 to 9 inches). Grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic that parts to moderate medium subangular blocky structure; hard, very friable; thin patchy glossy coatings on faces of peds; mildly alkaline (pH 7.4); clear smooth boundary.

B3 19454 23 to 41 cm (9 to 16 inches). Pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium prismatic that parts to weak medium subangular blocky structure; slightly hard, very friable; few thin patchy glossy coatings mainly on vertical faces of peds; calcareous; moderately alkaline (pH 8.4); gradual smooth boundary.

C1ca 19455 41 to 58 cm (16 to 23 inches). Pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; calcareous; secondary calcium carbonates occur as mycelia and as coatings on sand grains and soil peds; moderately alkaline (pH 8.4); gradual smooth boundary.

C2ca 19456 58 to 81 cm (23 to 32 inches). Light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, very friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; strongly alkaline (pH 8.7); gradual smooth boundary.

C3ca 19457 81 to 107 cm (32 to 42 inches). Light gray (2.5Y 7/2) very fine sandy loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, very friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; strongly alkaline (pH 8.9); clear smooth boundary.

C4ca 19458 107 to 145 cm (42 to 57 inches). Light gray (2.5Y 7/2) very fine sandy loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, very friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and in thin seams and streaks; strongly alkaline (pH 8.9); gradual smooth boundary.

11C5ca 19459 145 to 175 cm (57 to 69 inches). Light gray (2.5Y 7/2) sandy loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, very friable; secondary calcium carbonate occurs as soft rounded masses and as coatings on sand grains; strongly alkaline (pH 8.7); gradual smooth boundary.

11C6ca 19460 175 to 297 cm (69 to 117 inches). Light gray (2.5Y 7/2) sandy loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, very friable; secondary calcium carbonate occurs as soft rounded masses and as coatings on sand grains; calcareous; strongly alkaline (pH 8.7); gradual smooth boundary.

11C7ca 19461 297 to 419 cm (117 to 165 inches). Light gray (2.5Y 7/2) sandy loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, very friable; calcareous; secondary calcium carbonate occurs as soft rounded masses and as coatings on sand grains; strongly alkaline (pH 8.7).

SOIL Decross taxadjunct SOIL Nos. S67Wyo-10-5 LOCATION Johnson County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 67L309-67L315

GENERAL METHODS: 1A, 1B1b, 2A1, 2B

Depth (cm)	Horizon	Size class and particle diameter (mm)													3A1			
		Total			Sand					Silt					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)	<0.074	3B2 Vol. 250-2	3B1 75-2	20-5	5-2
Pct. of < 2 mm													%					
0-13	A11	16.1	51.7	32.2	tr	0.8	0.9	3.3	11.1	28.1	23.6	41.3	5.0	92.3	tr	tr	tr	tr
13-31	A12	12.9	58.1	29.0	0.0	0.2	0.2	0.8	11.6	32.2	25.9	44.5	1.3	96.6	tr	tr	tr	tr
31-46	B21t	11.7	55.9	32.4	0.1	0.3	0.2	0.8	10.3	30.4	25.5	41.4	1.3	96.6	tr	tr	tr	tr
46-64	B22t	12.5	57.5	30.0	tr	0.2	0.2	0.9	11.2	32.8	24.7	44.7	1.3	96.7	tr	tr	tr	tr
64-102	C1	22.9	53.9	23.2	0.4	0.5	0.4	2.0	19.5	30.7	23.2	51.9	3.3	92.3	35	45	6	1
102-142	C2ca	23.5	59.0	17.5	3.1	4.8	2.7	4.5	8.3	19.7	39.3	30.7	15.1	82.3	15	20	-	tr
142-150	C3ca	32.9	63.1	4.0	1.2	3.3	2.4	5.7	20.4	34.5	28.6	58.4	12.4	81.5	45	65	24	9

Depth (cm)	6A1a Organic carbon a/	6B1a Nitrogen	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as CaCO <sub>3</sub>		Bulk density			4D1 COLE	Water content			pH	
					6E1b < 2mm Pct.	3A1a < 0.002 mm Pct.	4A1d 1/3-Bar g/cc	4A1b Oven-Dry g/cc	4B1c 1/3-Bar Pct.		4B2 15-Bar Pct.	4C1 WRD in./in.	8C1b Sat. Paste	8C1c (1:1)	
0-13	7.64	0.595	13	0.9			0.94	1.12	0.059	47.9	20.2	0.26			5.9
13-31	2.74	0.309	9	1.0			1.04	1.19	0.046	34.0	16.3	0.18			6.2
31-46	1.67	0.168	10	1.0			1.22	1.33	0.029	24.2	13.5	0.13			6.3
46-64	1.07	0.114	9	1.0	tr	-	1.27	1.40	0.033	24.5	13.2	0.14			6.8
64-102	0.57			0.8	16	tr	1.2b			10.3					7.8
102-142	0.13			0.4	18	3	1.05	1.15	0.026	45.2	33.6	0.10		7.5	7.8
142-150	0.11			0.3	8	tr	1.18	1.23	0.008	38.7	14.7	0.15			8.0

Depth (cm)	Extractable bases				6H1a Ext. Acidity	Cat. Exch. Cap.			8E1 Resistivity cm	8A1a Elec. Cond. cm	8D5 Total Salts Soil ppm	8A1 Water at Sat. Pct.	8D3 Ca/Mg	Base saturation	
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K		Sum	5A3a Sum Cations	5A6 NH <sub>4</sub> OAc						5C3 Sum Cations	5C1 NH <sub>4</sub> OAc
	mg/100 g													Pct.	Pct.
0-13	27.0	7.1	tr	2.0	36.1	12.7	48.8	41.9					3.8	74	86
13-31	23.6	6.6	0.1	1.6	31.9	8.7	40.6	35.7					3.6	79	89
31-46	17.6	5.4	0.1	1.1	24.2	6.4	30.6	26.6					3.3	79	91
46-64	17.0	6.5	0.1	0.8	24.4	4.4	28.8	26.0					2.6	85	94
64-102		5.8	0.1	0.5				19.7					2.4		
102-142		13.5	0.1	1.0				45.5	1160	0.46	190		2.3		
142-150		9.9	0.2	0.6				31.9					2.2		

Depth (cm)	Ratios to Clay 8D1		
	Ext. Iron	15-Bar Water	NH <sub>4</sub> OAc CEC
0-13	0.03	0.63	1.3
13-31	0.03	0.56	1.2
31-46	0.03	0.41	0.82
46-64	0.03	0.44	0.87
64-102	0.03	0.44	0.85
102-142	0.02	1.9	2.6
142-150			

a/ Organic carbon 22 kg/m<sup>2</sup> to a depth of one meter (Method 6A).  
b/ Estimated.

Soil classification: Pachic Cryoboroll; fine-silty, mixed.

Soil: Decross taxadjunct<sup>1/</sup>.

Pedon No.: S67Wyo-10-5.

Location: Johnson County, Wyoming; NW<sup>1</sup>/<sub>4</sub>, SE<sup>1</sup>/<sub>4</sub> of Sec. 22, T46N, R85W. Proceed south on main gravel road which approaches U.S. Highway 16 2.3 miles west of Caribou Lodge for 18.0 miles. Turn right, go through gate in west fence line. (Site is 100 feet north of gate and 50 feet west of fence.)

Climate: Average annual precipitation is about 20 inches; average annual soil temperature at 20 inches is about 38° F.; mean summer soil temperature is about 48° F. Snow cover period extends from November to early June. Elevation is 8,000 feet.

Vegetation and land use: Fescue spp.: lupine, milk vetch, Columbia needlegrass; Poa spp.: thickspike wheatgrass, flowering plants. Summer sheep range and wildlife habitat.

Parent material: Calcareous loamy alluvium from limestone.

Physiography: Foot slopes of steep hillsides.

Topography: East facing slope. Gradient is 7 percent.

Drainage: Well drained.

Moisture: Moisture conditions at sampling time were above normal because of the unusually high precipitation during the winter, spring, and early summer prior to sampling. The recording stations showed as much as +10 inches deviation of precipitation during that period.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderate.

Sampled by: Robert B. Grossman, Warren Lynn, Paul Lupcho, James R. Stephens, Jr., Ki Hak Han, and C. J. Fowkes - July 18, 1967.

Described by: C. J. Fowkes - July 18, 1967.

(Colors are for air-dry soil unless otherwise stated)

A11 67L309 0 to 13 cm (0 to 5 inches). Grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak fine crumb structure; soft, very friable, slightly sticky, slightly plastic; neutral (pH 6.5); clear smooth boundary.

A12 67L310 13 to 31 cm (5 to 12 inches). Gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium and fine subangular blocky that parts to weak fine crumb structure; soft, very friable, slightly sticky, slightly plastic; neutral (pH 6.6); clear smooth boundary.

B21t 67L311 31 to 46 cm (12 to 18 inches). Grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic that parts to moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky, plastic; thin continuous glossy coatings on all faces of peds; neutral (pH 6.6); clear smooth boundary.

B22t 67L312 46 to 64 cm (18 to 25 inches). Brown (7.5YR 5/3) silty clay loam, dark brown (7.5YR 4/3) moist; moderate medium and fine subangular blocky structure; hard, firm, sticky, plastic; thin continuous glossy coatings on all faces of peds; neutral (pH 6.5); clear wavy boundary.

C1 67L313 64 to 102 cm (25 to 40 inches). Light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; 25 percent angular limestone fragments 20 mm to 75 mm (3/4 to 3 inches), 10 percent larger than 75 mm (3 inches); noneffervescent; moderately alkaline (pH 8.2); gradual wavy boundary.

C2ca 67L314 102 to 142 cm (40 to 56 inches). Very pale brown (10YR 7/3) silt loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, very friable, slightly sticky, nonplastic; 10 percent coarse angular limestone fragments 20 mm to 75 mm (3/4 to 3 inches), 5 percent larger than 75 mm (3 inches); violently effervescent; many fine and medium soft rounded masses of secondary lime; moderately alkaline (pH 8.4); gradual wavy boundary.

C3ca 67L315 142 to 150 cm (56 to 59 inches). Very pale brown (10YR 7/4) silt loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, nonsticky, nonplastic; 30 percent coarse angular limestone fragments 20 mm to 75 mm (3/4 to 3 inches), 15 percent larger than 75 mm (3 inches); violently effervescent; few fine threads and soft rounded masses of secondary lime; moderately alkaline (pH 8.4).

Remarks: Samples of horizons 5 to 12 inches, 12 to 18 inches, 25 to 40 inches were taken for analysis by the Wyoming Highway Department Engineering Lab.

<sup>1/</sup>The Decross soils are in a fine-loamy, mixed family of Argic Pachic Cryoborolls. This pedon is a taxadjunct because it lacks an argillic horizon and has a control section which contains less than 15 percent fine or coarse sand.

SOIL Series not designated SOIL Nos. S67Wyo-10-10 LOCATION Johnson County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 67L316-67L322

GENERAL METHODS: 1A, 1B1b, 2A1, 2B

Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1													Coarse fragments 2A2			
		Total					Sand					Silt			3B2 Vol. 250-2	3B1 Wt.		
		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)	< 0.074		75-2	20-5	5-2
		Pct. of < 2 mm													%	% < 75	% < 20	
0-3	A11	14.4	64.3	21.3	0.2	0.3	0.5	1.5	11.8	34.5	29.7	47.6	2.5	94.8	tr	tr	tr	tr
3-8	A12	14.6	65.7	19.7	0.2	0.3	0.3	1.6	12.2	36.6	29.1	50.0	2.4	94.6	tr	tr	tr	tr
8-13	A2	16.5	66.1	17.4	0.1	0.3	0.4	1.6	14.1	36.0	30.0	51.4	2.4	94.3	tr	tr	tr	tr
13-20	B&A	14.8	55.9	29.3	0.1	0.3	0.3	1.6	12.4	30.1	25.8	43.9	2.3	94.8	tr	1	1	tr
20-33	B21t	15.7	45.5	38.8	0.4	0.4	0.3	1.6	13.0	25.1	20.4	39.4	2.7	94.1	1	3	3	tr
33-51	TIB22t	25.0	46.5	28.5	1.0	0.6	0.4	2.6	20.4	28.5	18.0	51.0	4.6	90.1	50	55	10	1
51-84	TIB3	26.6	49.3	24.1	1.4	1.1	0.7	4.4	19.0	30.0	19.3	52.5	7.6	85.3	50	55	10	3
														Coarse Fragments a/				
														Vol. 250-2	-----Wt.----->			
33-84	a/													48	9	44	7	2

Depth (cm)	6A1a Organic carbon b/	6B1a Nitrogen	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as CaCO <sub>3</sub>		Bulk density			4DL COLE	Water content			pH			
					6E1b < 2mm	3A1a < 0.002 mm	4A1d 1/3-Bar	4A1b Oven-Dry	4B1c 1/3-Bar		4B2 15-Bar	4C1 WRD	8C1b Sat. Paste	8C1a (1:1)			
					Pct.	Pct.	g/cc	g/cc	g/cc		Pct.	Pct.	in./in.				
0-3	19.5	0.978	20	0.7					0.4c								5.6
3-8	4.59	0.238	19	1.1					1.25	1.33	0.021	28.0	18.2	0.12			5.9
8-13	1.29	0.086	15	1.0					1.36	1.43	0.014	25.2	12.0	0.18			6.0
13-20	1.11	0.097	11	1.3					1.25	1.35	0.026	26.2	17.5	0.11			6.2
20-33	1.35	0.116	12	1.5	tr	-			1.27	1.49	0.055	28.2	22.1	0.08			7.0
33-51	1.27	0.099	13	1.0	15	-			1.5c				17.3			7.3	7.4
51-84	1.10	0.088	13	0.7	23	-			1.5c				15.6				7.5

Depth (cm)	Extractable bases				6H1a Ext. Acidity	Cat. Exch. Cap.		8E1 Resistivity	8A1a Elec. Cond.	8D5 Total Sol. Salts	8A1 Water at Sat.	8D3 Ca/Mg	Base saturation		
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K		5A3a Sum Cations	5A6 NH <sub>4</sub> OAc						5C3 Sum Cations	5C1 NH <sub>4</sub> OAc	
	meq/100 g												Pct.	Pct.	
0-3	43.1	8.7	0.1	1.6	53.5	25.5	79.0	60.0					5.0	68	89
3-8	20.9	4.6	0.1	0.8	26.4	12.6	39.0	29.9					4.5	68	88
8-13	9.7	3.4	0.1	0.5	13.7	7.2	20.9	15.9					2.9	66	86
13-20	13.0	6.6	0.1	0.7	20.4	6.4	26.8	22.3					2.0	76	91
20-33	19.5	11.7	0.1	0.9	32.2	5.7	37.9	31.7					1.7	85	102
33-51		8.5	0.1	0.6				26.7					1.8		
51-84		8.4	0.1	0.5				24.9		1810	0.65	200	48.4	1.8	

Depth (cm)	Ratios to Clay 8D1		
	Ext. Iron	15-Bar Water	NH <sub>4</sub> OAc CEC
0-3	0.03	2.3	2.8
3-8	0.06	0.92	1.5
8-13	0.06	0.69	0.91
13-20	0.04	0.60	0.76
20-33	0.04	0.57	0.82
33-51	0.04	0.60	0.94
51-84	0.03	0.65	1.0

a/ Coarse fragment percentages determined in the field by sieving and weighing 284 kg (623 lbs.) of material.

b/ Organic carbon: 18 kg/m<sup>2</sup> to a depth of 84 cm (33 in.) (Method 6A).

c/ Estimated.

Soil classification: Mollic Cryoboralf; loamy-skeletal, mixed.

99

Soil: Series not designated

Pedon No.: S67Wyo-10-10.

Location: Johnson County, Wyoming; SW $\frac{1}{4}$ , SW $\frac{1}{4}$  of Sec. 23, T45N, R85W. Proceed south on main gravel road which approaches U.S. Highway 16 2.3 miles west of Caribou Lodge for 19.8 miles to junction. Proceed on right or west fork for another 1.4 miles. Turn left and follow trail to sawmill. Site is up the trail from the sawmill.

Climate: Average annual precipitation is about 20 inches; average annual soil temperature at 20 inches is about 38° F.; mean summer soil temperature is about 48° F. Snow cover period extends from late October to mid-June. Elevation is 8,510 feet.

Vegetation and land use: Lodgepole pine, white fir, gooseberry, lupine, and Fescue spp. The understory is unusually dense for forest-covered area. Used mainly as forest.

Parent material: Calcareous, loamy, slope creep material weathered from limestones.

Physiography: Mountain sideslopes.

Topography: East and north facing slope. Gradient is 20 percent.

Drainage: Well drained.

Moisture: Moisture conditions at time of sampling were above normal because of unusually high precipitation during the winter, spring, and early summer prior to sampling. Deviations for that period were around +10 inches precipitation.

Ground water: Deep.

Erosion: Nonevident.

Permeability: Moderate.

Sampled by: Robert B. Grossman, Warren Lynn, Kl Hak Han, James R. Stephens, Jr., and C. J. Fowkes - July 20, 1967.

Described by: C. J. Fowkes - July 20, 1967.

(Colors are for air-dry soil unless otherwise stated)

A11 67L316 0 to 3 cm (0 to 1 inch). Dark grayish brown (10YR 4/2) silt loam mixed with decomposed plant materials; very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; slightly acid (pH 6.4); abrupt smooth boundary.

A12 67L317 3 to 8 cm (1 to 3 inches). Grayish brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; slightly acid (pH 6.4); abrupt smooth boundary.

A2 67L318 8 to 13 cm (3 to 5 inches). Pale brown (10YR 6/3) silt loam, dark brown (10YR 3/3) moist; weak medium platy structure; soft, very friable, nonsticky, nonplastic; slightly acid (pH 6.0); abrupt smooth boundary.

B & A 67L319 13 to 20 cm (5 to 8 inches). Brown (7.5YR 5/2) clay loam, dark brown (7.5YR 3/2) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; thin patchy glossy coatings on some faces of peds (A2 skeletons cover approximately 50 percent of the faces of peds); slightly acid (pH 6.2); clear wavy boundary.

B2t 67L320 20 to 33 cm (8 to 13 inches). Light brown (7.5YR 6/3) with brown (7.5YR 4/3) coatings on peds, clay loam, dark brown (7.5YR 3/2) moist; moderate medium and fine subangular blocky structure; hard, firm, sticky, plastic; thin continuous glossy and thick patchy waxy coatings on all faces of peds; neutral (pH 6.6); clear wavy boundary.

11B22t 67L321 33 to 51 cm (13 to 20 inches). Pale brown (10YR 6/3) gravelly clay loam, dark brown (10YR 4/3) moist; weak medium and fine subangular blocky structure; hard, firm, sticky, plastic; thin nearly continuous glossy coatings and thick patchy waxy coatings on all faces of peds; patchy dark organic staining; 48 percent coarse limestone fragments 2 mm to 250 mm; noneffervescent in the soil matrix; neutral (pH 7.0); earth fills break the continuity of the gravel or stony horizon.

11B3 67L322 51 to 84 cm (20 to 33 inches). Pale brown (10YR 6/3) gravelly loam, dark brown (10YR 4/3) moist; weak medium and fine subangular blocky structure; slightly hard, firm, sticky, slightly plastic; 48 percent coarse limestone fragments 2 mm to 250 mm; noneffervescent in the soil matrix; neutral (pH 7.0); earth fills break the continuity of the gravel or stony horizon.

11C1 67L323 84 to 117 cm (33 to 46 inches). Light yellowish brown (10YR 6/4) gravelly loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, sticky, slightly plastic; 30 percent coarse angular limestone fragments from 2 mm to 75 mm, 10 percent between 75 mm and 250 mm (3 to 10 inches); effervescent; moderately alkaline (pH 8.2).

Remarks: Samples of horizons 8 to 13 inches, 13 to 20 inches, 20 to 33 inches were taken for analysis by the Wyoming Highway Department Engineering Lab.

CONSECUTIVE PEDON NUMBER C 69121 CHARACTERIZATION DATA

SOIL SERIES UNNAMED SOIL NO. S69 WYO . 12- 8 SAMPLE NO. 9 644-9 650 STAR VALLEY AREA

SOIL FAMILY: CALCIC PACIFIC CRYOBOROLL, FINE, MONT RIVERSIDE SOIL SURVEY LABORATORY

SAMPLE NO.	DEPTH CM.	HORIZ.	SIZE, CLASS AND PARTICLE DIAMETER (MM) 1B18,3A1													1A2A					
			TOTAL FRACTION			SANDS			SILTS			CLAYS			INT. COARSE FRAGMENTS-						
			SAND	SILT	CLAY	VCS	CS	MS	FS	VFS	CSI	FSI	CO.	FINE	CARBO	II	PCT.	I	II	III	
			2-	.05-	LT	2-1	1-	.5-	.25-	.1-	.05-	.02-	2-	LT	NATE	2-	OF	75-	20-5	5-2	
			.08	.002	.002	.5	.25	.10	.05	.02	.002	.20	.20	3A1A.02	WHOLE	20					
			PERCENT OF LESS THAN 2MM													SDII PCT. OF LT 75					
9 644	0-	19	AP	7.6	48.9	43.5	0.8	0.6	0.4	1.7	4.1	17.3	31.6			22.5	--A	--	--	--	--
9 645	19-	37	A12	6.8	48.2	45.0	0.2	0.2	0.2	1.4	4.8	17.0	31.2			22.8	--A	--	--	--	--
9 646	37-	68	B2 T	10.2	45.3	44.5	0.1	0.3	0.5	2.8	6.5	17.4	27.9			26.0	--A	--	--	--	--
9 647	68-	83	83 CA	17.6	46.9	35.5	1.1	2.4	1.6	5.0	7.5	16.3	30.6			1 26.9	--A	--	--	--	--
9 648	83-	114	B2CAB	5.5	53.0	41.5	--	0.4	0.8	2.1	2.4	10.6	42.4			3 14.2	--A	--	--	--	--
9 649	114-	180	83 CA	6.7	47.1	46.2	0.8	0.7	0.3	1.6	3.3	10.4	36.7			2 14.7	--A	--	--	--	--
9 650	180-	217	C B	46.3	41.2	12.5	0.3	1.5	1.3	15.6	27.6	25.0	16.2			66.2	--A	--	--	--	--

SAMPLE NO.	DEPTH CM.	ORG. MATTER		CARBONATE		SESQUIOXIDES				ATTERBERG				BULK DENSITY CM	WATER CONTENT				EXTNSBLTY			
		CAR	NITRO	AS	CACO3	DI-CIT	EXT	PYROP	EXT	L	M	I	T		EST.	I/3	DRY	I/10	I/3	15	LEF	LE
		80N	GEN	LT	2-20	FE	AL	FE	AL	LL	PL	I/3	BAR		BAR	BAR	BAR	BAR	BAR	BAR	BAR	BAR
		6A1A	6B1A	6E1B	6E1B	6C2B	6G7A	6C5A	6G5A	4F1	4F2	4A1F	4A1F	4A1H	3B2	4B1C	4B1C	4B2	4D1	4D1		
		PERCENT		PERCENT		PERCENT				PCT. NO. 40 GRAMS PER CC					PERCENT				PERCENT			
9 644	0-	19	4.57	0.387		1.0	0.1			54	33			1.22	1.95	1.00	31.8	19.6	8.3	8.3		
9 645	19-	37	2.82	0.249		1.0	0.1							1.25	1.52	1.00	27.6	18.5	6.7	6.7		
9 646	37-	68	1.07	0.110		1.1	0.1			41	24			1.37	1.70	1.00	28.1	16.4	7.5	7.5		
9 647	68-	83	0.90	0.106	14	0.9	0.1							1.33	1.53	1.00	24.9	12.9	4.8	4.8		
9 648	83-	114	0.68	0.078	26	0.8	0.1							1.29	1.48	1.00	22.8	14.2	4.7	4.7		
9 649	114-	180	0.66	0.072	17	0.9	0.1							1.29		1.00				15.8		
9 650	180-	217	0.19		18	0.5	TR									1.00				6.3		

SAMPLE NO.	DEPTH CM.	EXTRACTABLE BASES						EXT. KCL		C E C		BASE SATURATION			PH		
		CA	MG	NA	K	SUM	ACI-	EXT.	SUM	NH4-	SUM+	SUM+	NH4-	NAF	H2O	CA-	
		5B4A	5B4A	5B4A	5B4A	5B4A	DITY	AL	OAC	ACI-	AL	OAC	5C1	2 MIN	I/1	CL2	
		6N2E	6O2D	6P2A	6Q2A	6H2A	6G1E	5A3A	5A6A	DITY	5C1						
		MEQ/100G						PERCENT		PERCENT			PERCENT				
9 644	0-	19	37.4	5.1	0.1	1.8	44.4			44.4	32.0	100+	100+			7.2	7.0
9 645	19-	37	33.7	5.1	0.1	0.9	39.8			39.8	33.4	100+	100+			7.2	6.9
9 646	37-	68	28.2	6.0	0.1	0.6	34.9			34.9	29.5	100+	100+			7.4	6.9
9 647	68-	83	34.1	4.6	0.1	0.4	39.2			39.2	21.2	100+	100+			7.7	7.3
9 648	83-	114	34.6	5.5	0.1	0.4	40.6			40.6	22.7	100+	100+			7.8	7.5
9 649	114-	180	32.4	5.5	0.1	0.5	38.5			38.5	24.9	100+	100+			7.9	7.5
9 650	180-	217	20.6	2.4	0.1	0.2	23.3			23.3	8.4	100+	100+			8.1	7.6

SAMPLE NO.	DEPTH CM.	CLAY MINERALOGY									RELATIVE AMOUNT
		LESS THAN 0.002 MM			L.T. 0.0002 MM			MINERAL			
		X RAY	DTA	X RAY	DTA	X RAY	DTA	DTA	X RAY	DTA	
		YA2E	YA2E	YA2E	YA3	YA3	YA2E	YA2E	YA2E		
		I	II	III	IV	-PERCENT-	I	II	III		
9 644	0-	19	MT	4	MT	3	KK	1			MI MICA 1 TRACE
9 645	19-	37									MT MONTMORT-2 SMALL
9 646	37-	68	MT	4	MI	4	KK	1			KK KAOLINIT 3 MODERATE
9 647	68-	83									4 ABUNDANT
9 648	83-	114									5 DOMINANT
9 649	114-	180									6 INDETER.
9 650	180-	217									

SAMPLE PREPARATION CODES  
A=STANDARD PREPARATION.

SERIES NOT DESIGNATED  
S69Wyo-12-8

Location: Lincoln County, Wyoming. 2 kilometers (1 mile) west and 402 meters (1,370 feet) north of Thayne, Wyoming. 38 meters (125 feet) west and 91 meters (300 feet) north of the southeast corner of NE $\frac{1}{4}$  of SW $\frac{1}{4}$  of section 15, T34N, R119W. Site located on photo BBL-1EE-119. Date of sampling: October 2, 1969.

Description by: C. J. Fowkes. Collectors: W. D. Nettleton, H. B. Ravenholt, W. R. Glenn, C. J. Fowkes.

Classification: Calcic Pachic Cryoboroll; fine, montmorillonitic.

Vegetation: Cultivated. Oat stubble. Use: Irrigated cropland. Climate: Precipitation is 457 mm (18 inches). Mean annual temperature is 3° C. Average annual soil temperature at 50 cm is 7° C. Average summer soil temperature is 14° C without an O horizon.

Parent material: Moderately fine textured calcareous alluvial fan sediments derived principally from reddish brown sandstone, siltstone, and shale. May have had some loess influence.

Topography: Nearly level alluvial fan. Convex slope of 1 percent east facing. Sample site at mid-slope.

Elevation: 1,798 meters (5,900 feet) above sea level. Drainage: Well drained. Runoff is slow. Permeability is slow. Soil moisture: Dry at time of sampling.

Remarks: Field pH determinations by phenol red and thymol blue. This sample was paired with sample S69Wyo-12-7.

<u>HORIZON</u>	<u>DESCRIPTION</u>
Ap 69644	0 to 19 cm (0 to 7 inches). Dark brown (7.5YR 4/2) silty clay loam, very dark brown (7.5YR 2/2) moist; moderate medium and fine granular structure; hard, friable, sticky, plastic; non-calcareous, mildly alkaline (pH 7.6); abrupt smooth boundary.
A12 69645	19 to 37 cm (7 to 15 inches). Dark reddish gray (5YR 4/2), silty clay, dark reddish brown (5YR 3/2) moist; moderate fine angular blocky structure; hard, firm, sticky, plastic; noncalcareous, mildly alkaline (pH 7.6); clear smooth boundary.
B2t 69646	37 to 68 cm (15 to 27 inches). Reddish brown (5YR 5/3) silty clay, dark reddish brown (5YR 3/3) moist; moderate medium prismatic structure that parts to strong medium and fine angular blocks; very hard, very firm, very sticky, plastic; thin patchy clay films on all ped faces; noncalcareous, mildly alkaline (pH 7.6); clear smooth boundary.
B3ca 69647	68 to 83 cm (27 to 33 inches). Reddish brown (5YR 5/3) silty clay, reddish brown (5YR 4/3) moist; weak medium prismatic structure that parts to moderate medium and fine angular blocks; hard, firm, sticky, plastic; thin patchy glassy coatings on many ped faces; few fine nests of secondary lime; calcareous, moderately alkaline (pH 8.0); clear smooth boundary.
B2tcab 69648	83 to 114 cm (33 to 45 inches). Reddish brown (5YR 4/3) silty clay, dark reddish brown (5YR 3/3) moist; weak fine prismatic structure that parts to moderate medium and fine angular blocks; very hard, very firm, sticky, plastic; thin patchy clay films on all ped faces; common fine threads and seams of secondary lime; calcareous, moderately alkaline (pH 8.2); clear smooth boundary.
83cab 69649	114 to 180 cm (45 to 71 inches). Reddish brown (5YR 5/3) silty clay, reddish brown (5YR 4/3) moist; moderate fine and very fine angular blocky structure; very hard, very firm, sticky, plastic; few patchy glassy coatings on some ped faces; many fine and medium nests, threads, and seams of secondary lime; calcareous, moderately alkaline (pH 8.2); clear smooth boundary.
Cb 69650	180 to 217 cm (71 to 86 inches). Reddish brown (5YR 5/3) silt loam, reddish brown (5YR 4/3) moist; soft, very friable, slightly sticky, slightly plastic; calcareous, moderately alkaline (pH 8.2).

SOIL CLASSIFICATION-USTIC TORRIORTHENT  
 LOAMY, MIXED (CALCAREOUS), MESTO, SHALLOW  
 SERIES - - - - -SHINGLE

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE, MTSC  
 NATIONAL SOIL SURVEY LABORATORY  
 LINCOLN, NEBRASKA  
 JUNE 1977

SOIL NO - - - - - S69WYO-10-5 COUNTY - - - JOHNSON

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

SAMPLE NOS. 69L604-69L605

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO	
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	INTR		FINE
CM		2-	.05-	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-.1	.02	TO	CLAY
006-014	C1CA	41.6	36.8	21.6	9.7	.1	.2	.4	10.2	30.7	24.6	12.2		10.8	64.4	45	.43
014-024	C2CA	36.0	41.5	22.5		.0	.1	.2	8.0	27.7	26.0	15.5		8.3	61.0		.44

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2										BULK DENSITY				WATER CONTENT				CARBONATE			
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD	LT	LT	1/1	1/2				
CM	PCT	PCT	PCT	PCT	PCT	LT 75	LT20	G/CC	G/CC	PCT	PCT	PCT	CM	PCT	PCT	PCT	PCT					
006-014	0	0	0	0	0	76	0							2			7.9					
014-024	0	0	0	0	0	80	0	1.46	1.57	.024			19.3	9.9	.14		8.1					

DEPTH	ORGANIC MATTER			IRON	PHOS	EXTRACTABLE BASES 5B4A-					ACTY	AL	CAT EXCH				RATIO	RATIO	CA	(BASE SAT)		
	6A1A	6B1A	C/N			6C2B	6N2E	6O4B	6P2B	6Q2B			SUM	6H1A	6G1E	5A3A				5A6A	8D1	8D3
CM	PCT	PCT	PCT	PCT	TOTL	CA	MG	NA	K	EXTB	TEA	EXT	ACTY	TO	TO	NHAC	CA	SAT	EXTB	NHAC		
006-014	1.43						2.2	.1	.5					17.3	.80							
014-024	.95						3.1	.4	.4					16.6	.74							

CLAY MINERALOGY (7A2C).

006-14 CM C1CA SMALL TO MODERATE AMOUNT OF MONTMORILLONITE, AND SMALL AMOUNTS OF MICA AND KAOLINITE. ALL ARE MODERATELY WELL-ORDERED. CLAY MINERALOGY IS MONTMORILLONITIC.

Soil classification: Ustic Torriorthent; loamy, mixed (calcareous), mesic, shallow.

Soil series: Shingle loam.

Pedon No.: S69Wyo-10-5.

Location: Johnson County, Wyoming; NW $\frac{1}{4}$ , NW $\frac{1}{4}$  of Sec. 21, T45N, R80W, 7/8 mile north from southwest corner of field sheet 4N-195.

Climate: Average annual precipitation is about 12 inches. Mean annual soil temperature is about 52° F

Frost-free season is 105 to 110 days. Elevation is approximately 4,850 feet.

Vegetation and land use: Threadleaf sedge and blue gramagrass, Rangeland and wildlife habitat.

Parent material: Residuum weathered from calcareous interbedded clay shales and sandy shales.

Physiography: Ridgecrest.

Topography: Gradient is 6 percent.

Drainage: Well drained.

Moisture: Dry throughout at time of sampling.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderate.

Sampled by: R. B. Grossman, Leo Shields, James Stephens, Paul Lupcho, and C. J. Fowkes - August 7, 1969.

Described by: C. J. Fowkes.

(Colors are for air-dry soil unless otherwise stated)

A1 0 to 6 cm (0 to 2 inches). Light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak fine crumb structure; soft, very friable, slightly sticky, slightly plastic; many fine roots; calcareous; moderately alkaline (pH 8.2); abrupt smooth boundary.

C1ca 69L604 6 to 14 cm (2 to 6 inches). Light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic that parts to weak medium and fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine roots; strongly calcareous; common fine threads of secondary lime; moderately alkaline (pH 8.2); gradual wavy boundary.

C2ca 69L605 14 to 24 cm (6 to 9 inches). Light gray (2.5Y 7/2) clay loam, light olive brown (2.5Y 5/3) moist; weak coarse prismatic that parts to moderate fine angular blocky structure; hard, friable, sticky, plastic; few fine roots; 25 percent weathered shale fragments that easily crushes between the fingers; calcareous; many medium seams and fine threads of secondary lime; strongly alkaline (pH 8.4); gradual wavy boundary.

C3 24 to 37 cm (9 to 15 inches). Pale yellow (5Y 7/3) clay loam, olive (5Y 5/3) moist; massive; hard, friable, sticky, plastic; very few fine roots; 30 percent shale fragments most of which crush easily between the fingers; calcareous; secondary lime appears as seams on the faces of the shale fragments; strongly alkaline (pH 8.6); gradual wavy boundary.

C4 37 to 47 cm (15 to 19 inches). Light gray calcareous soft shale.



Soil classification: Lithic Cryoboroll; loamy, mixed.

Soil: Splitro sandy loam taxadjunct<sup>1</sup>/<sub>1</sub>.

Pedon No.: S67Wyo-10-9.

Location: Johnson County, Wyoming; NE<sup>1</sup>/<sub>4</sub>, NE<sup>1</sup>/<sub>4</sub> of Sec. 30, T45N, R85W. Proceed south on main gravel road which approaches U.S. Highway 16 2.3 miles west of Caribou Lodge for 19.8 miles to junction. Proceed on right fork for another 7.7 miles to stone monument on left or east side of road. Site is 75 yards west of stone monument.

Climate: Average annual precipitation is about 18 inches; mean annual soil temperature at 20 inches is about 43° F.; mean summer soil temperature at 20 inches is about 53° F. Snow cover period extends from late November to early June. Elevation is 8,200 feet.

Vegetation and land use: Fescue spp.; prairie junegrass; Poa spp.; green needlegrass, thickspike wheatgrass, needleleaf sedge. Summer sheep range and wildlife habitat.

Parent material: Residium weathered from noncalcareous fine grained reddish Flathead sandstone.

Physiography: Summit of a mountain range.

Topography: Moderately rolling, east facing. Gradient is 5 percent. Surface is microundulating.

Drainage: Well drained.

Moisture: Moisture conditions at sampling time were above normal because of the unusually high precipitation during the winter, spring, and early summer prior to sampling. Deviation for that period is around +10 inches precipitation.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderately rapid.

Sampled by: Robert B. Grossman, Warren Lynn, Ki Hak Han, James R. Stephens, Jr., and C. J. Fowkes - July 19, 1967.

Described by: C. J. Fowkes - July 19, 1967.

(Colors are for air-dry soil unless otherwise stated)

A11 67L339 0 to 10 cm (0 to 4 inches). Brown (7.5YR 5/2) sandy loam, dark brown (7.5YR 3/2) moist; weak very fine crumb structure; soft, very friable, nonsticky, nonplastic; 5 percent coarse sandstone fragments 20 mm to 75 mm (3/4 to 3 inches), 10 percent between 75 mm and 250 mm (3 to 10 inches); medium acid (pH 5.6); clear smooth boundary.

A12 67L340 10 to 25 cm (4 to 10 inches). Brown (7.5YR 5/2) loam, dark brown (7.5YR 3/2) moist; weak medium and fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; 5 percent coarse sandstone fragments 20 mm to 75 mm (3/4 to 3 inches), 10 percent from 75 mm to 250 mm (3 to 10 inches); medium acid (pH 5.6); clear smooth boundary.

C 67L341 25 to 43 cm (10 to 17 inches). Reddish brown (5YR 5/4) sandy loam, dark reddish brown 5YR 3/4) moist; massive; soft, very friable, slightly sticky, nonplastic; 5 percent coarse sandstone fragments from 20 mm to 75 mm (3/4 to 3 inches), 10 percent from 75 mm to 250 mm (3 to 10 inches); medium acid (pH 5.6); abrupt, wavy boundary.

R 67L342 43 to 51 cm (17 to 20 inches). Hard, reddish, noncalcareous sandstone.

<sup>1</sup>/<sub>1</sub> Splitro soils have cambic horizons.

SOIL SURVEY LABORATORY

Mandan, North Dakota 9/19/55

SOIL TYPE Stoneham  
fine sandy loam

LOCATION Fremont Co., Wyo.

SURVEY NOS. S-54-Wyc-7-1

LAB. NOS. 2492-2498

DEPTH cm	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										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		
0-5	A1	3.6	10.8	11.5	21.8	18.3	25.2	8.8	46.4	9.5	-	fsl
5-15	B21t	2.3	9.5	13.0	21.6	10.5	17.1	26.0	30.0	8.5	-	scl
15-25	B22t	2.2	9.0	12.2	24.1	13.3	19.6	19.6	35.4	10.5	-	fsl
25-41	B3ca	2.4	9.4	11.9	24.1	13.7	20.6	17.9	35.6	11.7	-	fsl
41-53	C1ca	0.7	2.7	4.5	22.4	20.3	26.8	22.6	47.0	15.5	-	scl
53-69	C2ca	2.3	12.0	14.4	22.9	11.0	19.9	17.5	30.7	11.9	-	fsl
69-102	C3	1.3	7.3	11.0	22.7	14.8	23.5	19.4	38.6	11.8	-	fsl
pH		ORGANIC MATTER				EST% SALT (BUREAU CUP)	ELECTRI- CAL CONDUCTI- VITY EC x 10 <sup>3</sup> MILLIMOS PER CM @ 25°C.	CaCO <sub>3</sub> equiv- alent %	GYPSUM mg./100g. SOIL	MOISTURE TENSIONS		
SATU- RATED PASTE	1:5	1:10	ORGANIC CARBON %	NITRO- GEN %	C/N					1/10 ATMOS. %	1/3 ATMOS. %	15 ATMOS. %
6.9	7.4	7.1	0.52	.047	11.1	-	0.5	-	19.7	12.6	3.7	
7.2	7.6	7.2	0.61	.059	10.3	-	0.6	-	24.7	20.0	9.9	
7.8	8.6	8.5	0.52	.044	11.8	-	0.7	-	23.7	18.5	8.4	
8.0	9.0	9.0	0.34	.032	10.6	-	0.8	1	22.2	16.5	7.2	
8.1	9.2	9.2	0.27			-	1.0	2	27.9	22.3	9.4	
8.2	9.4	9.3	0.16			-	1.6	2	21.1	16.6	6.9	
8.0	9.2	9.2	0.18			-	2.6	2	27.0	18.7	7.5	
CATION EXCHANGE CAPACITY (NH <sub>4</sub> Ac)	EXTRACTABLE CATIONS					EXCH. No %	SATURATION EXTRACT SOLUBLE			MOISTUR- AT SATU- RATION %		
	Ca	Mg	H	No	K		No	K				
	milliequivalents per 100g. soil						milliequivalents per liter					
7.9	4.8	2.7		0.1	0.6	1	1.1	0.6			24.2	
23.3	16.8	6.0		0.7	0.5	2	2.8	0.1			43.8	
19.3	26.0	5.0		1.0	0.3	4	4.2	-			38.9	
16.6	33.2	4.8		1.5	0.3	8	6.5	0.1			35.7	
21.9				3.0	0.4	12	8.7	0.1			42.7	
15.6				2.7	0.3	14	13.4	0.1			36.2	
17.4				3.5	0.3	16	20.0	0.1			38.8	

Soil classification: Ustollic Haplargid; fine-loamy, mixed, mesic.

107

Soil series: Stoneham fine sandy loam.

Pedon No.: S54Wyo-7-1.

Location: Fremont County, Wyoming; SW $\frac{1}{4}$ , SW $\frac{1}{4}$  of Sec. 29, T37N, R89W.

Climate: Average annual precipitation is about 11 inches. Average annual soil temperature is about 51° F.

Frost-free period is 110 to 130 days. Elevation is about 5,100 feet.

Vegetation and land use: Bluegrama grass, threadleaf sedge, western wheatgrass, needleandthread grass, big sagebrush, and cacti. Rangeland and wildlife habitat.

Parent material: Calcareous local alluvium wasted from interbedded sandstone.

Physiography: Alluvial fan

Topography: Simple convex south facing slope. Gradient is 4 percent.

Drainage: Well drained.

Moisture: Dry at time of sampling.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderate.

Sampled by: Dr. Lyle T. Alexander, James Allan, Harold Bindschadler, A. J. Cline, and Clarence Fowkes - August 18, 1954.

Described by: A. J. Cline - August 18, 1954.

(Colors are for air-dry soil unless otherwise stated)

A1 2492 0 to 5 cm (0 to 2 inches). Light gray (2.5Y 7/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; weak medium platy that parts to moderate very fine granular structure; soft, very friable; noncalcareous; abrupt smooth boundary.

B21t 2493 5 to 15 cm (2 to 6 inches). Brown (7.5YR 5/4) sandy clay loam, dark grayish brown (10YR 4/3) moist; moderate coarse columnar that parts to moderate coarse angular blocky structure; hard, firm; moderately thick distinct tonhatchen; some gray coatings on faces of peds; noncalcareous; gradual smooth boundary.

B22t 2494 15 to 25 cm (6 to 10 inches). Pale brown (10YR 6/3) light sandy clay loam, brown (10YR 5/3) moist; moderate coarse prismatic that parts to moderate coarse angular blocky structure; hard, firm; patchy tonhatchen; noncalcareous; abrupt smooth boundary.

B3ca 2495 25 to 41 cm (10 to 16 inches). Pale yellow (2.5Y 7/3) light sandy clay loam, light olive brown (2.5Y 5/3) moist; weak coarse subangular blocky structure; slightly hard, friable; calcareous; moderate amounts of accumulated lime as soft rounded masses and flour; gradual smooth boundary.

C1ca 2496 41 to 53 cm (16 to 21 inches). Pale yellow (5Y 7/3) light sandy clay loam, olive (5Y 5/3) moist; massive; slightly hard, friable; calcareous; moderate amounts of accumulated lime chiefly as lime flour; gradual smooth boundary.

C2ca 2497 53 to 69 cm (21 to 27 inches). Pale yellow (5Y 7/3) sandy loam, olive (5Y 5/3) moist; massive; slightly hard, friable; calcareous; moderate amounts of accumulated lime chiefly as lime flour; gradual smooth boundary.

C3 2498 69 to 102 cm (27 to 40 inches). Pale yellow (5Y 7/3) sandy loam, olive (5Y 5/3) moist; massive; slightly hard, friable; calcareous.

SOIL TYPE Stoneham LOCATION Fremont Co., Wyo.

fine sandy loam taxadjunct

SURVEY NOS. S-54-Wyo-7-2 LAB. NOS. 2499-2505

DEPTH cm	HORIZON	PARTICLE SIZE DISTRIBUTION (in mm.) (per cent)										TEXTURAL CLASS
		VERY COARSE SAND 2-1	COARSE SAND 1-0.5	MEDIUM SAND 0.5-0.25	FINE SAND 0.25-0.10	VERY FINE SAND 0.10-0.05	SILT 0.05-0.002	CLAY < 0.002	0.2-0.02	0.02-0.002	> 2	
0-5	A1	3.9	9.9	11.9	25.6	17.3	22.4	9.0	45.5	8.1	-	fsl
5-14	B2lt	2.5	9.8	14.3	27.2	11.6	13.7	20.9	32.5	6.3	-	scl
14-25	B22t	2.4	8.8	14.7	31.7	14.2	13.3	14.9	37.8	6.2	-	fsl
25-36	B3ca	0.7	6.6	15.4	36.1	14.7	12.6	13.9	40.0	6.7	-	fsl
36-61	C1ca	1.0	6.4	13.0	35.0	15.2	14.6	14.8	41.1	8.0	-	fsl
61-84	C2ca	1.1	5.4	5.8	17.9	19.3	34.7	15.8	55.2	10.0	-	l
84-104	C3	1.7	8.3	11.4	27.8	16.3	14.7	19.8	28.9	17.1	-	fsl
pH		ORGANIC MATTER					ELECTRI- CAL CONDUC- TIVITY EC x 10 <sup>3</sup> μLLI:HO: PER CM @ 25-C	CoCO <sub>2</sub> equiv- o/cent	GYPSUM mg./100g SOIL	MOISTURE TENSIONS		
SATU- RATED PASTE	1:5	1:10	ORGANIC CARBON %	NITRO- GEN %	C/N	EST% SALT (BUREAU CUP)				CoCO <sub>2</sub> equiv- o/cent	GYPSUM mg./100g SOIL	1/10 ATMOS.
6.7	7.2	6.9	0.56	.054	10.4	-	0.5	-	21.2	13.1	4.0	
7.2	7.5	7.3	0.66	.059	11.2	-	0.5	1	20.8	16.8	8.1	
7.7	8.2	8.4	0.49	.042	11.7	-	0.5	2	18.0	13.7	6.0	
7.9	8.5	8.6	0.35	.035	10.0	-	0.6	5	15.9	12.8	5.8	
8.0	9.0	8.9	0.22			-	0.7	3	17.8	13.1	6.0	
8.1	9.4	9.4	0.14			-	1.2	4	23.2	17.9	6.5	
8.1	9.4	9.6	0.15			-	1.8	4	30.9	24.2	9.0	
CATION EXCHANGE CAPACITY (NH <sub>4</sub> Ac)	EXTRACTABLE CATIONS					EXCH. No %	SATURATION EXTRACT SOLUBLE			MOISTURE AT SATU- RATION %		
	Ca	Mg	H	Na	K		Na	K				
	milliequivalents per 100g. soil →						← milliequivalents per liter					
8.5	5.6	2.5		0.2	0.6	2	0.6	0.4			26.6	
18.2	14.0	4.2		0.2	0.7	1	0.4	0.2			38.9	
13.9	24.2	3.3		0.1	0.3	1	0.6	0.1			35.7	
11.8				0.4	0.2	3	1.2	0.1			36.4	
12.6				0.9	0.2	6	4.0	0.1			35.5	
13.9				2.0	0.3	12	8.9	0.1			36.8	
19.6				3.5	0.5	15	13.9	0.1			42.4	

Soil classification: Ustollic Haplargid, coarse-loamy, mixed, mesic.

Soil: Stoneham fine sandy loam taxadjunct<sup>1/</sup>.

Pedon No.: 554Wyo-7-2.

Location: Fremont County, Wyoming; SE<sup>1/4</sup>, SE<sup>1/4</sup> of sec. 27, T37N, R90W.

Climate: Average annual precipitation is about 11 inches. Average annual soil temperature is about 51° F.

Frost-free period is about 110 to 130 days. Elevation is about 5,100 feet.

Vegetation and land use: Blue gramagrass, needleandthread grass, threadleaf sedge, western wheatgrass, cacti, and big sagebrush. Rangeland and wildlife habitat.

Parent material: Calcareous local alluvium wasted from interbedded sandstone and shales.

Physiography: Alluvial fan.

Topography: Gentle convex south facing slope.

Drainage: Well drained.

Moisture: Dry at time of sampling.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderate.

Sampled by: Dr. Lyle T. Alexander, James Allan, Harold Bindschadler, Clarence Fowkes, and A. J. Cline-

August 18, 1954.

Described by: A. J. Cline - August 18, 1954.

(Colors are for air-dry soil unless otherwise stated)

A1 2499 0 to 5 cm (0 to 2 inches). Light gray (2.5Y 7/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; weak medium platy that parts to moderate very fine granular structure; soft, very friable; noncalcareous; abrupt smooth boundary.

B21t 2500 5 to 14 cm (2 to 5½ inches). Brown (10YR 5/3) fine sandy clay loam, dark grayish brown (10YR 4/3) moist; moderate coarse columnar that parts to moderate coarse angular blocky structure; very hard, firm; a few thin patchy tonhauthchen; some gray coatings on faces of peds; noncalcareous; clear smooth boundary.

B22t 2501 14 to 25 cm (5½ to 10 inches). Pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate coarse prismatic that parts to moderate coarse angular blocky structure; very hard, firm; a few thin patchy tonhauthchen; noncalcareous; abrupt smooth boundary.

B3ca 2502 25 to 36 cm (10 to 14 inches). Pale yellow (2.5Y 7/3) light fine sandy clay loam, light olive brown (2.5Y 5/3) moist; weak coarse subangular blocky structure; hard, friable; calcareous; few small soft rounded masses of secondary lime; gradual smooth boundary.

G1ca 2503 36 to 61 cm (14 to 24 inches). Pale yellow (5Y 7/3) fine sandy loam, olive (5Y 5/3) moist; massive; slightly hard, very friable; calcareous; much accumulated lime principally as lime flour; gradual smooth boundary.

C2ca 2504 61 to 84 cm (24 to 33 inches). Light gray (5Y 7/2) fine sandy loam, olive gray (5Y 5/3) moist; massive; slightly hard, very friable; calcareous; contains much calcium carbonate chiefly as lime flour; gradual smooth boundary.

C3 2505 84 to 104 cm (33 to 41 inches). Pale yellow loam, olive (5Y 5/3) moist; massive; calcareous.

<sup>1/</sup> Stoneham soils are in the fine-loamy family.

SOIL CLASSIFICATION-USTCLLC HAPLARGID  
 FINE-LOAMY, MIXED, MESSIC  
 SERIES - - - - -STCNEHAM

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE, MTSC  
 NATIONAL SOIL SURVEY LABORATORY  
 LINCOLN, NEBRASKA  
 JUNE 1977

SOIL NO - - - - - S69WYO-10-7 COUNTY - - - JOHNSON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 69L608-69L610

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO			
		SAND	SILT	CLAY	FINE	VCOS	CDRS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	INTR		FINE	NON-	8D1
CM		(.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-.1	.02	CLAY	PCT	CLAY	
011-023	B2T	46.0	28.7	25.3	15.6	.0	.2	1.5	25.1	19.3	16.1	12.6		26.7	52.6	62		.40	
038-052	C1CA																		
100-132	C3																		

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2										BULK DENSITY				WATER CONTENT				CARBONATE				PH		
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD	LT	LT	1/1	1/2	6E1B	3A1A	8C1A	8C1E	5F1	5C3	5C1
CM	PCT	PCT	(---	PCT	LT	75	---	LT20	BAR	DRY	BAR	BAR	BAR	CM/	CM/	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT
011-023	0	0	0	0	0	64	0							10.2				TR							7.8
038-052	0	0	0	0	0	0	0							10.1				11							8.2
100-132	0	0	0	0	0	0	0							8.2				6							8.7

DEPTH	ORGANIC MATTER		IRON		PHCS		EXTRACTABLE BASES 5B4A-				ACTY		AL		CAT EXCH		RATIO		RATIO		CA		(BASE SAT)		
	6A1A	6B1A	8A	5D2	6C2B	5E	8D5	6F1A	8A1A	6N1B	6O1B	6P1B	6Q1B	6H1A	6G1E	5A3A	5A6A	8D1	8D3	5F1	5C3	5C1	5F1	5C3	5C1
CM	PCT	PCT	PCT	PCT	PCT	PCT	(---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
011-023	.81							8.3	.1	.6								23.8	.94						
038-052								8.9	.1	.4								18.0							
100-132								10.4	1.5	.4								17.6							

DEPTH	SATURATED PASTE			NA		SALT		GYP		SATURATION EXTRACT				8A1-				ATTERBERG							
	8E1	8C1B	8A	5D2	5E	8D5	6F1A	8A1A	6N1B	6O1B	6P1B	6Q1B	6I1A	6J1A	6K1A	6L1A	6M1A	4F1	4F2	8E1	8C1B	8A	5D2	5E	
CM	CM	PCT	PCT	PCT	PCT	PPM	PCT	CM	MMHOS/	CM	(---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
011-023																									
038-052																									
100-132	1800	8.3	37.1			260		1.16																	

CLAY MINERALOGY (7A2C).  
 011-23 CM B2T MODERATE AMOUNT OF MONTMORILLONITE, SMALL AMOUNTS OF KAOLINITE AND MICA; ALL ARE WELL-ORDERED.  
 CLAY MINERALOGY IS MONTMORILLONITIC.

Soil classification: Ustollic Haplargid; fine-loamy, mixed, mesic.

Soil series: Stoneham loam.

Pedon No.: S69Wyo-10-7.

Location: Johnson County, Wyoming; NW $\frac{1}{4}$ , SE $\frac{1}{4}$  of Sec. 25, T45N, R82W, one mile southeast of the northwest corner of field sheet 13N-33.

Climate: Average annual precipitation is about 12 inches. Mean annual soil temperature is about 52° F. Frost-free season is 105 to 110 days. Elevation is approximately 5,100 feet.

Vegetation and land use: Western wheatgrass, blue gramgrass, and big sagebrush. Rangeland and wildlife habitat.

Parent material: Calcareous alluvium from siltstones and sandstones.

Physiography: Alluvial fan,

Drainage: Well drained.

Moisture: Dry throughout at time of sampling.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderate.

Sampled by: R. B. Grossman, Leo Shields, James Stephens - August 8, 1969.

Described by: James Stephens.

(Colors are for air-dry soil unless otherwise stated)

A1 0 to 5 cm (0 to 2 inches). Brown (10YR 5/3) loam, brown (10YR 4/3) moist; moderate fine crumb structure; soft, friable, slightly sticky, slightly plastic; many roots; neutral (pH 7.2); clear smooth boundary.

B1 5 to 11 cm (2 to 4 inches). Brown (10YR 5/3) loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; many roots; mildly alkaline (pH 7.4); clear wavy boundary.

B2t 69L608 11 to 23 cm (4 to 9 inches). Brown (10YR 5/3) loam, brown (10YR 4/3) moist; moderate coarse and medium prismatic that parts to moderate medium angular blocky structure; hard, firm, sticky, plastic; continuous glossy coatings on all faces of peds; few roots; mildly alkaline (pH 7.6); clear smooth boundary.

B3ca 23 to 38 cm (9 to 15 inches). Light gray (10YR 7/2) loam, brown (10YR 5/3) moist; weak medium angular blocky structure; hard, friable, slightly sticky, slightly plastic; few patchy glossy coatings on faces of peds; very few roots; calcareous; many fine and medium threads and soft rounded masses of secondary lime; moderately alkaline (pH 8.4); clear wavy boundary.

C1ca 69L609 38 to 52 cm (15 to 20 inches). Light brownish gray (2.5Y 6/2) loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; calcareous; many medium and few coarse threads and soft rounded masses of secondary lime; moderately alkaline (pH 8.4); clear wavy boundary.

C2ca 52 to 100 cm (20 to 40 inches). Light brownish gray (10YR 6/2) loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; many medium and few coarse threads and soft rounded masses of secondary lime; moderately alkaline (pH 8.4); gradual wavy boundary.

C3 69L610 100 to 132 cm (40 to 52 inches). Pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky, nonplastic; calcareous; strongly alkaline (pH 8.6).

Soil classification: Ustollic Haplargid, fine-loamy, mixed, mesic.

Soil: Stoneham loam, 1/.

Pedon No.:

Location: Johnson County, Wyoming; NW 1/4, SE 1/4 of Sec. 12, T45N, R82W.

Climate: Average annual precipitation is about 12 inches. Mean annual soil temperature is about 49° F. Frost-free season is 105 to 110 days. Elevation is 5,127 feet.

Vegetation and land use: Big sagebrush, blue gramagrass, and western wheatgrass.

Parent material: Calcareous, mixed, medium textured alluvium.

Physiography: Alluvial fan.

Drainage: Well drained.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderate.

Sampled by: James Stephens (moisture samples).

Described by: James Stephens.

(Colors are for air-dry soil unless otherwise stated)

A1 0 to 5 cm (0 to 2 inches). Dark brown (1OYR 4/3) loam, dark brown (1OYR 3/3) moist; moderate fine and medium crumb structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; neutral (pH 7.0); clear smooth boundary.

B2t 5 to 13 cm (2 to 5 inches). Brown (1OYR 5/3) clay loam, dark brown (1OYR 4/3) moist; moderate medium prismatic that parts to moderate fine angular blocky structure; hard, firm, sticky, and plastic; thick nearly continuous waxy coatings on faces of peds; many fine, few very fine roots; neutral (pH 7.2); clear smooth boundary.

B22t 13 to 25 cm (5 to 10 inches). Brown (1OYR 5/3) clay loam, dark brown (1OYR 4/3) moist; weak medium prismatic that parts to weak medium angular blocky structure; slightly hard, friable, sticky, plastic; thin discontinuous waxy coatings on faces of peds; many fine, few very fine roots, neutral (pH 7.2); clear smooth boundary.

B3ca 25 to 36 cm (10 to 14 inches). Yellowish brown (1OYR 5/4) loam, dark yellowish brown (1OYR 4/4) moist; weak medium angular blocky structure; slightly hard, friable, sticky, plastic; few fine roots; calcareous; few medium distinct spots of secondary calcium carbonate; strongly alkaline (pH 8.4); clear smooth boundary.

C1ca 36 to 76 cm (14 to 30 inches). Yellowish brown (1OYR 5/4) loam, dark yellowish brown (1OYR 4/4) moist; massive; slightly hard, friable, sticky, plastic; few coarse roots; calcareous; many fine and medium threads and spots of secondary calcium carbonate; strongly alkaline (pH 8.5); gradual wavy boundary.

C2ca 76 to 152 cm (30 to 60 inches). Pale brown (1OYR 6/3) loam, brown (1OYR 5/3) moist; massive; slightly hard, friable, sticky, plastic; 10 percent fine gravel coated with lime; calcareous; many fine and medium specks and threads of secondary calcium carbonate.

1/This is the site description for the moisture data on page 145.

CONSECUTIVE PEDON NUMBER C 69114

CHARACTERIZATION DATA

SOIL SERIES TETONIA TAXADJUNCT SOIL NO. 569 WYO. 12- 1 SAMPLE NO. 9 607-9 611 STAR VALLEY AREA

SOIL FAMILY: PACIFIC CRYOBOROLL, COARSE-SILTY, MIXED

RIVERSIDE SOIL SURVEY LABORATORY

SAMPLE NO.	DEPTH CM.	HORZ.	SIZE, CLASS AND PARTICLE DIAMETER (MM) 1B1B, 3A1											IA2A					
			TOTAL FRACTION			SANDS					SILTS			CLAYS		INT. COARSE FRAGMENTS			
			SAND	SILT	CLAY	VCS	CS	MS	FS	VFS	CSI	FSI	CO.	FINE CARBO	II	PCT. I	II	III	
			2-	.05-	LT	2-1	1-	.5-	.25-	.1-	.05-	.02-	2-	LT	NATE	.2-	OF 75-	20-5	5-2
			.05	.002	.002		.5	.25	.10	.05	.02	.002	.20	.20	3A1A-02	WHOLE 20	SOIL	PCT. OF	LT 75
9 607	0-18	AP	17.1	65.3	17.6	0.2	0.1	0.2	1.2	15.4	45.7	19.6	17.3	0.3	62.0	--A	--	--	--
9 608	18-33	B21Y	17.4	64.6	18.0	--	--	0.2	1.2	16.0	47.0	17.6			63.8	--A	--	--	--
9 609	33-48	B22T	19.7	63.7	16.6	--	--	0.1	1.0	18.6	47.7	16.0			67.0	--A	--	--	--
9 610	48-84	B3	20.8	64.1	15.1	0.1	--	0.2	1.2	19.3	47.9	16.2			68.0	--A	--	--	--
9 611	84-114	C CA	22.7	64.4	12.9	0.1	0.2	0.6	2.4	19.4	46.6	17.8			2 67.6	--A	--	--	--

SAMPLE NO.	DEPTH CM.	ORG. MATTER		CARBONATE		SESQUIOXIDES				ATTERBERG				BULK DENSITY		CM		WATER CONTENT				EXTNSBLTY	
		CAR-	NITRO	AS	CACD3	DI-CIT	EXT	PYROP	EXT	L	M	T	EST.	1/3	DRY	17/10	1/3	15	LEF	LE			
		BON	GEN	LT 2	2-20	FE	AL	FE	AL	LL	PL	1/3	BAR	1/3	DRY	BAR	BAR	BAR	4D1	4D1			
		6A1A	6B1A	6E1B	6E1B	6C2B	6G7A	6C5A	6G5A	4F1	4F2	4A1F	4A1F	4A1H	3B2	4B1C	4B1C	4B2	4D1	4D1			
		--PERCENT--		--PERCENT--		--PERCENT--				PCT. NO. 40				GRAMS PER CC		--PERCENT--				--PERCENT--			
9 607	0-18	1.68	0.172			0.8	0.1					29	25		1.30	1.40	1.00	24.2	7.9	2.5	2.5		
9 608	18-33	1.07	0.116			0.8	0.1								1.39	1.51	1.00	23.1	7.8	2.8	2.8		
9 609	33-48	0.50	0.061			0.8	0.1				26	24			1.25	1.33	1.00	19.2	7.2	2.1	2.1		
9 610	48-84	0.44		2		0.7	0.1								1.19	1.26	1.00	26.8	6.6	1.9	1.9		
9 611	84-114	0.33		25		0.4	TR				25	25			1.33	1.38	1.00	26.1	5.7	1.2	1.2		

SAMPLE NO.	DEPTH CM.	--EXTRACTABLE BASES--					EXT. KCL		--C E C--		BASE SATURATION				--PH--		
		CA	MG	NA	K	SUM	AC1-	EXT.	SUM	NH4-	SUM+	SUM+	NH4-	NAF	H2O	CA-	
		5B4A	5B4A	5B4A	5B4A	5B4A	DITY	AL	DAC	ACT-	AL	OAC	2	MIN	1/I	CL2	
		6N2E	6O2D	6P2A	6Q2A	6H2A	6G1E	5A3A	5A6A	DITY <td></td> <td></td> <td>5C1 <td>8C1D</td> <td>8C1A</td> <td>8C1E </td></td>			5C1 <td>8C1D</td> <td>8C1A</td> <td>8C1E </td>	8C1D	8C1A	8C1E	
		--MEQ/100G--					--PERCENT--				--PERCENT--						
9 607	0-18	14.8	3.6	0.1	0.7	19.2		19.2	17.5	100+		100+		7.1	6.7		
9 608	18-33	13.1	3.7	0.1	0.5	17.4		17.4	15.8	100+		100+		7.1	6.7		
9 609	33-48	10.6	4.0	0.1	0.4	15.1		15.1	14.2	100+		100+		7.0	6.4		
9 610	48-84	14.4	4.0	0.1	0.4	18.9		18.9	12.0	100+		100+		7.5	7.0		
9 611	84-114	22.9	2.2	0.1	0.3	25.5		25.5	8.0	100+		100+		8.0	7.5		

SAMPLE NO.	DEPTH CM.	CLAY MINERALOGY										RELATIVE AMOUNT	
		--LESS THAN 0.002 MM--					L.T. 0.0002 MM MINERAL						
		X RAY					X RAY						CODE
		7A2E	7A2E	7A2E	7A3	7A3	7A2E	7A2E	7A2E				
		I	II	III	IV	--PERCENT--	I	II	III				
9 607	0-18	MI	4	KK	2	MT	1					MI MICA	1 TRACE
9 608	18-33	KK	3	VR	1							KK KAOLINIT	2 SMALL
9 609	33-48	MT	4	MI	3	KK	1					MT MONTMORT	3 MODERATE
9 610	48-84	MI	5									VR VERMICLT	4 ABUNDANT
9 611	84-114	MT	3	MI	1	KK	1						5 DOMINANT
													6 INDETER.

SAMPLE PREPARATION CODES  
A=STANDARD PREPARATION.

Soil classification: Pachic Cryoboroll; coarse-silty, mixed.

115

Soil Type: Tetonia taxadjunct<sup>1</sup>/

Pedon No.: S69Wyo-12-1

Location: Lincoln County, Wyoming. The site is located about 1 1/2 miles east of Freedom, Wyoming; 265 meters (870 feet) south and 82 meters (270 feet) west of the northeast corner of section 34, T35N, R115W. Photo BBL-1EE-116. Date of sampling: September 30, 1969.

Description by: C. J. Fowkes. Collectors: W. D. Nettleton, H. B. Ravenholt, W. R. Glenn, C. J. Fowkes.

Classification: Pachic Cryoboroll; coarse-silty, mixed.

Vegetation: Cultivated. Wheat stubble. Use: Irrigated cropland. Climate: Precipitation 460 mm. Mean annual temperature 3° C. Mean annual soil temperature at 50 cm is 8° C. Average summer soil temperature 14° C without an O horizon.

Parent material: Calcareous aeolian silts derived from mixed alluvial sources.

Topography: Moderately sloping valley sideslope, convex. Slope 3 percent west facing. Site near toe of slope.

Elevation: 1,840 meters (5,950 feet) above sea level. Drainage: Well drained. Runoff is slow.

Permeability is moderate. Soil moisture: Dry at time of sampling.

Remarks: Field pH determinations by phenol red and thymol blue indicators. These samples were not paired.

#### HORIZON

#### DESCRIPTION

Ap 69607	0 to 18 cm (0 to 7 inches). Dark brown (10YR 4/3) silt loam, dark brown (10YR 3/3) moist; weak medium and fine subangular blocky structure that parts to weak very fine crumbs; soft, very friable, nonsticky, nonplastic; many fine roots; noncalcareous, mildly alkaline (pH 7.4); abrupt smooth boundary.
B21t 69608	18 to 33 cm (7 to 13 inches). Brown (7.5YR 5/3) silt loam, dark brown (7.5YR 3/2) moist; weak coarse to fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine roots; thin patchy glassy coatings on all ped faces; some mixing of darker materials from above horizon by rodents; noncalcareous, mildly alkaline (pH 7.6); clear smooth boundary.
B22t 69609	33 to 48 cm (13 to 19 inches). Brown (7.5YR 5/3) silt loam, dark brown (7.5YR 3/2) moist; moderate medium prismatic structure that parts to moderate medium subangular blocks; hard, friable, slightly sticky, slightly plastic; common fine roots; thin patchy glassy coatings on all ped faces; some mixing of darker materials from above horizons by rodents; noncalcareous, mildly alkaline (pH 7.6); gradual wavy boundary.
B3 69610	48 to 84 cm (19 to 33 inches). Brown (7.5YR 5/4) silt loam, dark brown (7.5YR 4/3) moist; weak medium prismatic structure that parts to weak medium subangular blocks; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; few thin patchy glassy coatings on some ped faces; noncalcareous, mildly alkaline (pH 7.6); gradual wavy boundary.
Cca 69611	84 to 114 cm (33 to 45 inches). Light brown (7.5YR 6/3) silt loam, brown (7.5YR 5/3) moist; weak coarse subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common fine threads and fine concretions of secondary lime; calcareous, moderately alkaline (pH 8.2).

<sup>1</sup>/ The Tetonia soils are in a coarse-silty, mixed family of Pachic Cryoborolls and have a calcic horizon immediately under the mollic epipedon. This pedon has a cambic horizon.

SOIL CLASSIFICATION-ARGIC CRYOBORCLL  
 VERY-FINE, ILLITIC  
 SERIES - - - - -TURK

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE, MTSC  
 NATIONAL SOIL SURVEY LABORATORY  
 LINCOLN, NEBRASKA  
 JUNR 1977

SOIL NO - - - - - S67HYO-10-6 COUNTY - - - JOHNSON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 67L348-67L355

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B													RATIO			
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	INTR	FINE	NON-	8D1
CM		(.05	.005	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-.1	.02	CLAY	TO	CLAY
000-008	A1	17.1	46.9	36.0		1.3	1.4	.9	3.6	9.9	19.3	27.6		7.2	31.8		36	.48
008-018	B1	9.2	30.5	60.3		.9	.8	.4	1.7	5.3	9.7	20.8		3.8	16.4		60	.34
018-031	B2T	7.0	25.4	67.6		.7	.6	.4	1.7	3.6	7.2	18.2		3.4	12.1		68	.33
031-046	B31CA	10.7	28.1	61.2		.8	1.7	1.0	3.0	4.1	7.6	20.5		6.5	13.7		57	.32
046-081	B32CA	11.9	38.7	49.4		.5	1.3	1.1	3.9	5.0	12.6	26.1		6.8	20.2		46	.34
081-094	C1CA	9.2	58.9	31.9		.6	.5	.2	.7	7.1	30.7	28.2		2.0	38.4		32	.39
094-104	C2	13.5	54.1	32.4		.6	.5	.4	2.6	9.3	20.3	33.8		4.1	31.7		32	.40
104-119	C3	18.8	47.2	34.0	13.8	.5	.7	.7	6.5	10.3	15.3	31.8		8.4	30.4	41	34	.38

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2										BULK DENSITY				WATER CONTENT				CARBONATE			
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	4B1C	4B1C	4B2	4C1	WRD	6E1B	3A1A	8C1A	8C1E			
CM	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	CM/	PCT	PCT	PCT	PCT	PCT			
000-008	4	0	TR	3	3	84	6	1.01	1.16	.047					37.9	17.2	.20		6.9			
008-018	3	0	TR	3	2	89	5	1.33	1.48	.036					23.9	20.3	.05	0	6.8			
018-031	2	0	TR	1	2	92	3	1.38	1.68	.068					27.0	22.2	.07	0	7.5			
031-046	2	0	TR	1	2	89	3	1.49	1.78	.061					24.6	19.5	.08	18	4 8.0			
046-081	2	0	TR	1	2	88	3	1.57	1.83	.052					21.3	17.0	.07	24	3 8.2			
081-094	5	0	TR	1	6	90										12.4		37	TR 8.3			
094-104																13.0		13	TR 7.9			
104-119																12.9		9	8.0			

DEPTH	ORGANIC MATTER			IRON	PHOS	EXTRACTABLE BASES 5B4A-				ACTY	AL	CAT EXCH		RATIO	RATIO	CA	BASE SAT			
	6A1A	6B1A	C/N			6N2A	6O2A	6P2B	6Q2B			6M1A	6G1E				5A3A	5A6A	8D1	8D3
CM	PCT	PCT	PCT	PCT	PCT	CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	CA	SAT	EXTB	NHAC	
000-008	5.66	.428	13	1.0		19.4	4.7	.1	2.9	27.1	5.1			32.2	25.7	.71	4.1	75	84	105
008-018	2.03	.200	10	1.0		15.8	7.9	.1	3.1	25.9	4.6			31.5	27.7	.46	2.0	57	85	97
018-031	1.38	.154	9	1.0		13.4	10.1	.2	3.1	26.8	1.3			28.1	27.8	.41	1.3	48	95	96
031-046	.75	.090	8	.7			9.9	.4	2.2						20.2	.35				
046-081	.39			.7			10.9	1.1	1.4						17.4	.38				
081-094	.27			1.0			7.9	1.1	.9						10.9	.34				
094-104	.20			.8			10.7	1.9	1.0						14.8	.46				
104-119	.16			.8			10.9	1.9	1.0						15.8	.46				

DEPTH	SATURATED PASTE		NA	5D2	5E	SALT	GYP	SATURATION EXTRACT								ATTERBERG					
	BE1	8C1B						8A	5D2	5E	8D5	6F1A	8A1A	6N1B	6O1B	6P1B	6Q1B	6I1A	6J1A	6K1A	6L1A
CM	REST	PH	H2O	ESP	SAR	TOTL	SOLU	MMHDS/	CM	CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3	LMIT	PLST	INDX
000-008																					
008-018																					
018-031																					
031-046																					
046-081																					
081-094																					
094-104	450	7.7	46.3	7		2100		6.04													
104-119																					

CLAY MINERALOGY (7A2C).  
 018-30 CM B2T B2T CONTAINS DOMINANT TO ABUNDANT MICA WITH SMALL COMPONENT OF EXPANDING 2:1 LAYER SILICATES AND  
 104-119 CM R2 CHLORITE INTERLAYER MATERIAL. A SMALL AMOUNT OF KAOLINITE IS PRESENT. R2 HORIZON HAS ESSENTIALLY  
 SAME COMPOSITION. CLAY MINERALOGY IS ILLITIC.

Soil classification: Argic Cryoboroll; very-fine, illitic.

Soil series: Turk silty clay loam.

Pedon No.: 567Wyo-10-6.

Location: Johnson County, Wyoming; NE $\frac{1}{4}$ , NE $\frac{1}{4}$  of Sec. 28, T45N, R85W. Proceed south on main gravel road which approaches U.S. Highway 16 2.3 miles west of Caribou Lodge for 19.8 miles. Take right fork at junction and proceed another 6.0 miles, then turn left off road to Turk site.

Climate: Average annual precipitation is about 20 inches; average annual soil temperature at 20 inches is about 40° F.; mean annual soil temperature at 20 inches is about 53° F. Snow cover period extends from late November to early June. Elevation is 8,200 feet.

Vegetation and land use: Poa spp., Fescue spp., aster spp., sedges, and slender wheatgrass. Summer sheep range and wildlife habitat.

Parent material: Residuum weathered from calcareous olive clay shale.

Physiography: Hill slope.

Topography: Moderately rolling southeast facing slope. Gradient is 10 percent.

Drainage: Well drained.

Moisture: Moisture conditions at sampling time were above normal because of unusually high precipitation during the winter, spring, and early summer prior to sampling. Deviation for that period was around +10 inches of precipitation.

Erosion: Slight.

Permeability: Slow.

Sampled by: Robert B. Grossman, Warren Lynn, Ki Hak Han, Paul Lupcho, James R. Stephens, Jr., and C. J. Fowkes - July 18, 1967.

Described by: C. J. Fowkes - July 18, 1967.

(Colors are for air-dry soil unless otherwise stated)

A1 67L348 0 to 8 cm (0 to 3 inches). Grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak very fine crumb structure; slightly hard, very friable, slightly sticky, slightly plastic; neutral (pH 7.2); clear smooth boundary.

B1 67L349 8 to 18 cm (3 to 7 inches). Grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium and fine angular blocky structure; hard, firm, sticky, plastic; thin nearly continuous glossy coatings on all faces of peds; neutral (pH 7.2); clear smooth boundary.

B2t 67L350 18 to 31 cm (7 to 12 inches). Grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic that parts to strong medium angular blocks; very hard, very firm, very sticky, plastic; thin continuous glossy coatings on all faces of peds; slightly effervescent; mildly alkaline (pH 7.8); clear wavy boundary.

B3lca 67L351 31 to 46 cm (12 to 18 inches). Light brownish gray (2.5Y 6/2) clay, brownish gray (2.5Y 4/2) moist; weak medium prismatic that parts to moderate medium angular blocky structure; extremely hard, extremely firm, sticky, plastic; thin nearly continuous glossy coatings on all faces of peds; some slickensides; slightly effervescent; few medium and fine soft rounded masses of secondary lime; mildly alkaline (pH 7.8); gradual wavy boundary.

B32ca 67L352 46 to 81 cm (18 to 32 inches). Pale olive (5Y 6/3) clay, olive (5Y 4/3) moist; weak coarse and medium angular blocky structure; extremely hard, extremely firm, sticky, plastic; patchy glossy coatings on some faces of peds; some slickensides; strongly effervescent; few medium and fine soft rounded masses of secondary lime; strongly alkaline (pH 8.8); gradual wavy boundary.

Clca 67L353 81 to 94 cm (32 to 37 inches). Light yellowish brown (2.5Y 6/4) and pale olive (5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist and olive (5Y 5/4) moist; massive; very hard, very firm, very sticky, plastic; strongly effervescent; few medium and fine soft rounded masses of secondary lime; strongly alkaline (pH 8.6); gradual wavy boundary.

C2 67L354 94 to 104 cm (37 to 41 inches). Olive gray (5Y 5/2) calcareous soft weathered clay shale.

C3 67L355 104 to 119 cm. (41 to 47 inches). Olive gray (5Y 5/2) calcareous platy clay shale.

Remarks: Samples of horizons 7 to 12 inches, 18 to 32 inches, and 41 to 47 inches were taken for analysis by the Wyoming Highway Department Engineering Lab.

SOIL CLASSIFICATION-ARGIC CRYOBOROLL  
 VERY FINE, ILLITIC  
 SERIES - - - - -TURK

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE, NTSC  
 NATIONAL SOIL SURVEY LABORATORY  
 LINCOLN, NEBRASKA  
 JUNE 1977

SOIL NO - - - - - S67MYD-10-11 COUNTY - - - JOHNSON

GENERAL METHODS - - -1A,1B10,2A1,2B SAMPLE NOS. 67L343-67L347

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO				
		SAND	SILT	CLAY	FINE	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	INTR		FINE	NON-	8D1	
CM		2-	.05-	.002	CLAY	LT	2-	1-	.5-	.25-	.10-	.05	.02	.002	2-.1	.02	CLAY	CO3-	15-	
		PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT
005-018	B21T	10.7	25.4	63.9			.1	1.0	1.6	4.2	3.8	10.1	15.3		6.9	16.4		64	.55	
018-033	B22T	9.8	29.3	60.9	37.7		.1	.7	1.3	3.8	3.9	5.3	24.0		5.9	11.6	62	61	.61	
058-091	B33CA	10.6	34.5	54.9			.2	.6	1.3	4.6	3.9	6.6	27.9		6.7	13.5		48	.70	
091-132	CCA																			
132-152	R	17.4	56.6	26.0	7.3		.1	.9	2.5	8.3	5.6	9.6	47.0		11.8	20.1	28	26	1.4	

DEPTH	PARTICLE SIZE ANALYSIS, MP, 3B, 3B1, 3B2										BULK DENSITY				WATER CONTENT				CARBONATE		PH	
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	4B1C	4B1C	4B2	4C1	6E1B	3A1A	8C1A	8C1E				
CM	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT			
005-018	TR	0	0	TR	TR	92	TR	1.03	1.57	.15		45.0	34.9	.10					6.0			
018-033	1	0	0	1	TR	92	1	1.01	1.57	.16		48.2	37.3	.11			TR		7.2			
058-091	TR	0	0	TR	TR	92	TR										11	7	8.2			
091-132																						
132-152	1	0	0	1	TR	85	1					36.0					1		7.8			

DEPTH	ORGANIC MATTER			IRON	PHOS	EXTRACTABLE BASES 5B4A-				ACTY	AL	CAT EXCH		RATIO	RATIO	CA	BASE SAT		
	6A1A	6B1A	C/N			6N2E	6O4B	6P2B	6Q2B			6H1A	6G1E				5A3A	5A6A	8D1
CM	PCT	PCT	PCT	PCT	PCT	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	MEQ / 100	
005-018	2.33			.4		39.7	25.6	.2	1.6	67.1	7.1		74.2	68.2	1.1	1.6	58	90	98
018-033	1.90			.4			28.5	.2	1.4					72.8	1.2				
058-091	.62			.1			38.7	.5	1.1					68.9	1.4				
091-132																			
132-152	.17			.3			45.8	1.0	1.3					74.1	2.9				

DEPTH	SATURATED PASTE				SALT	GYP	SATURATION				EXTRACT				ATTERBERG				
	8E1	8C1B	8A	5D2			8D5	6F1A	8A1A	8N1B	6D1B	6P1B	6Q1B	6I1A	6J1A	6K1A	6L1A	6M1A	4F1
CM	CM	PCT	PCT	PPM	PCT	CM	MEQ / LITER												
005-018																			
018-033																			
058-091	1020	7.7	116.0		360		.48												
091-132																			
132-152																			

CLAY MINERALOGY (7A2C). PLACEMENT IS MONTMORILLONITIC.  
 018-33 CM B22T B22T HORIZON DOMINATED BY WELL-ORDERED MONTMORILLONITE. R HORIZON CONTAINS ABUNDANT MONTMORILLONITE. BOTH HORIZONS CONTAIN SMALL AMOUNT OF MICA. B22T HAS TRACE OF KAOLINITE. DIFFRACTION PATTERNS FOR THE TWO HORIZONS ARE VERY SIMILAR.

Soil classification: Argic Cryoboroll; very fine, illitic.

Soil series: Turk clay taxadjunct<sup>2</sup>.

Pedon No.: S67Wyo-10-11.

Location: Johnson County, Wyoming; center of Sec. 11, T45N, R85W. Proceed south on main gravel road which approaches U.S. Highway 16 2.3 miles west of Caribou Lodge for 19.8 miles to junction. Proceed on right or west fork for another 1.4 miles. Turn left and follow trail to center of Sec. 11.

Climate: Average annual precipitation is about 18 inches; mean annual soil temperature at 20 inches is about 39° F.; mean summer soil temperature at 20 inches is about 50° F. Snow cover period extends from late November to early June. Elevation is 8,000 feet.

Vegetation and land use: Big sagebrush, Poa spp., Fescue spp., and flowering plants. Summer sheep range and wildlife habitat.

Parent material: Residuum weathered from clay stones.

Physiography: Mountain side slope.

Topography: East facing slope. Gradient is 20 percent.

Drainage: Well drained.

Moisture: The moisture conditions at time of sampling were above normal because of unusually high precipitation during the winter, spring, and early summer prior to sampling. Deviation for that period was around +10 inches precipitation.

Ground water: Deep.

Erosion: Slight.

Permeability: Very slow.

Sampled by: Robert B. Grossman, Warren Lynn, Ki Hak Han, James R. Stephens, Jr., and C. J. Fowkes - July 20, 1967.

Described by: C. J. Fowkes - July 20, 1967.

(Colors are for air-dry soil unless otherwise stated)

A1 0 to 5 cm (0 to 2 inches). Dark grayish brown (10YR 4/2) clay, very dark brown (10YR 2/2) moist; weak medium and fine subangular blocky structure; very hard, very firm, very sticky, plastic; slightly acid (pH 6.2); abrupt smooth boundary.

B21t 67L343 5 to 18 cm (2 to 7 inches). Grayish brown (10YR 5/2) very fine clay, very dark grayish brown (10YR 3/2) moist; strong medium and fine angular blocky structure; extremely hard, extremely firm, very sticky, plastic; thin continuous glossy coatings on all faces of peds, some patchy waxy coatings; slickensides; neutral (pH 6.6); clear wavy boundary.

B22t 67L344 18 to 33 cm (7 to 13 inches). Grayish brown (10YR 5/2) very fine clay, very dark grayish brown (10YR 3/2) moist; weak medium prismatic that parts to moderate medium and fine angular blocky structure; extremely hard, extremely firm, very sticky, plastic; thin nearly continuous glossy coatings and patchy waxy coatings on faces of peds; slickensides; neutral (pH 7.2); clear wavy boundary.

B31ca 33 to 46 cm (13 to 18 inches). Light gray (10YR 7/2) clay, brown (10YR 5/3) moist; weak medium and fine angular blocky structure; very hard, very firm, sticky, plastic; some tonguing of dark organic stains; patchy glossy coatings on faces of peds; strongly effervescent; secondary lime is disseminated and in fine soft rounded masses; moderately alkaline (pH 8.2); clear wavy boundary.

B32ca 46 to 58 cm (18 to 23 inches). White (10YR 8/2) clay, light brownish gray (10YR 6/2) moist; weak medium and fine angular blocky structure; very hard, very firm, very sticky, plastic; some dark organic stains; thin patchy glossy coatings on faces of peds; violently effervescent; secondary lime is mainly disseminated and in fine rounded soft masses and threads; moderately alkaline (pH 8.2); clear wavy boundary.

B33ca 67L345 58 to 91 cm (23 to 36 inches). White (10YR 8/2) clay, light brownish gray (10YR 6/2) moist; weak coarse and medium angular blocky structure; very hard, very firm, very sticky, plastic; few thin patches of glossy coatings on faces of peds; violently effervescent; secondary lime mainly disseminated and in fine soft rounded masses and threads; strongly alkaline (pH 8.4); gradual wavy boundary.

Cca 67L346 91 to 132 cm (36 to 52 inches). White (10YR 8/2) clay, light gray (10YR 7/2) moist; weak coarse and medium angular blocky structure; very hard, very firm, very sticky, plastic; violently effervescent; secondary lime mainly disseminated and in fine soft rounded masses and threads; strongly alkaline (pH 8.4); gradual wavy boundary.

R 67L347 132 to 152 cm (52 to 60 inches). Very pale brown (10YR 7/3) hard clay stone, freshly broken faces do not effervesce but the weathered or disintegrated material effervesces.

<sup>1</sup>/Turk soils have bedrock within 40 inches of the surface.

SOIL CLASSIFICATION-ARGIC CRYOBOROLL  
FINE, ILLITIC  
SERIES - - - - -TURK TAXADJUNCT

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE, MISC  
NATIONAL SOIL SURVEY LABORATORY  
LINCOLN, NEBRASKA  
JUNE 1977

SOIL NO - - - - - 567MYG-10-12 COUNTY - - - JOHNSON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 67L356-67L357

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														FAM1	INTR	FINE	NON-	RATIO
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MECS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	II					
005-018	B21T	6.1	35.5	58.4	33.0	.9	.4	.3	1.1	3.4	12.2	23.3				16.9	57	.33		
031-053	B31CA	5.6	34.6	59.8	27.8	.6	.7	.4	1.0	2.9	10.8	23.8				14.4	46	.32		

DEPTH CM	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2							BULK DENSITY				WATER CONTENT				CARBONATE				PH	
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD	6E1B	3A1A	8C1A	8C1E	1/1	1/2	
005-018	0	0	2	1	94	3							19.4						6.3		
031-053	0	0	2	1	94	3							19.2		6	1			7.7		

DEPTH CM	ORGANIC MATTER		IRON	PHCS	EXTRACTABLE BASES 5B4A-				ACTY	AL	CAT EXCH		RATIO	RATIO	CA	BASE SAT	
	6A1A	6B1A			C/N	6C2B	6B2A	6O2A			6P2B	6O2B				6H1A	6G1E
005-018	2.51		1.2		14.8	6.6	.1	2.5	24.0	7.3		31.3	30.7	.53		77	78
031-053	1.30		1.1		8.0	.1	1.6					25.5	.43				

CLAY MINERALOGY (7A2C).

005-18 CM B21T CLAY MINERAL SUITES IN THE TWO HORIZONS ARE SIMILAR. MODERATE AMOUNTS OF MICA (OR ILLITE), SMALL AMOUNTS OF KAOLINITE AND AN EXPANDABLE 2:1 LAYER SILICATE, AND TRACES OF FELDSPAR ARE PRESENT. THE MICA IS WELL ORDERED. OTHER MINERALS ARE POORLY ORDERED. THE COMPLEX IS MOSTLY VERMICULITE-MICA WITH A FEW CHLORITE INTERLAYERS. CLAY MINERALOGY IS JUDGED ILLITIC.

Soil classification: Argic Cryoboroll; fine, illitic.

121

Soil series: Turk clay taxadjunct<sup>1</sup>.

Pedon No.: S67Wyo-10-12.

Location: Johnson County, Wyoming; SW $\frac{1}{4}$ , NW $\frac{1}{4}$  of Sec. 34. T45N, R85W. Proceed south on main gravel road which approaches U.S. Highway 16 2.3 miles west of Caribou Lodge for 19.8 miles to junction. Proceed on right or west fork for another 8.9 miles, then turn left or east and proceed on trail to site near Mark Davis Camp 110 yards northeast of east gate of Fisher Lane.

Climate: Average annual precipitation is about 18 inches; mean soil temperature at 20 inches is about 43° F.; mean summer soil temperature at 20 inches is about 53° F. Snow cover period extends from late November to early June. Elevation is 8,200 feet.

Vegetation and land use: Idaho fescue, mountain bluegrass, flowering plants. Summer sheep range and wildlife habitat.

Parent material: Residuum weathered from calcareous olive clay shale.

Physiography: Hill slope.

Topography: Moderately rolling northeast facing slope. Gradient is 10 percent.

Drainage: Well drained.

Moisture: Moisture conditions at sampling time were above normal because of unusually high precipitation during the winter, spring, and early summer prior to sampling. Deviation for that period was around +10 inches of precipitation.

Ground water: Deep.

Erosion: Slight.

Permeability: Slow.

Sampled by: Robert B. Grossman and James R. Stephens Jr. - July 20, 1967.

Described by: James R. Stephens, Jr. - July 20, 1967.

(Colors are for air-dry soil unless otherwise stated)

A1 0 to 5 cm (0 to 2 inches). Grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine crumb structure; slightly hard, firm, sticky, plastic; neutral (pH 7.0); clear smooth boundary.

B21t 67L356 5 to 18 cm (2 to 7 inches). Light olive brown (2.5Y 5/3) clay, very dark grayish brown (2.5Y 3/3) moist; weak medium prismatic that parts to moderate fine and medium subangular blocky structure; hard, very firm, sticky, plastic; thick continuous waxy coatings on all faces of peds; neutral (pH 7.0); clear smooth boundary.

B22t 18 to 31 cm (7 to 12 inches). Olive (5Y 5/3) clay, dark olive (5Y 3/3) moist; moderate, medium prismatic that parts to strong fine and medium angular blocky structure; very hard, firm, sticky, plastic; patchy waxy coatings on faces of peds; mildly alkaline (pH 7.4); clear smooth boundary.

B31ca 67L357 31 to 53 cm (12 to 21 inches). Olive (5Y 5/3) clay, dark olive (5Y 4/3) moist; moderate medium and fine angular blocky structure; extremely hard, very firm, very sticky, plastic; patchy waxy coatings on faces of peds; slightly effervescent; few fine soft rounded masses of secondary lime; moderately alkaline (pH 8.2); clear smooth boundary.

B32ca 53 to 71 cm (21 to 28 inches). Pale olive (5Y 6/3) clay, olive (5Y 4/3) moist; pockets 3 to 7 inches in diameter of dark grayish brown (10YR 4/2) moist; clay loam; weak medium angular blocky structure; very hard, very firm, very sticky, plastic; patchy glossy coatings on faces of peds; violently effervescent; few medium and fine soft rounded masses of secondary lime; moderately alkaline (pH 8.2); gradual wavy boundary.

C 71 cm to 1 m (28 to 40 inches). Soft, olive, calcareous shale with lenses of hard, platy shale.

<sup>1</sup>/ Turk soils are in the very fine family.

SOIL CLASSIFICATION-USTIC TORRIPSAMMENT  
 MIXED, MESIC  
 SERIES - - - - -VALENT

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE, MTSC  
 NATIONAL SOIL SURVEY LABORATORY  
 LINCOLN, NEBRASKA  
 JUNE 1977

SOIL NO - - - - - S66WYO-10-13 COUNTY - - - JOHNSON

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

SAMPLE NOS. 66L259

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO		
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	II		FINE	NON-
CM		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005-	SAND	.2-	TO	CLAY	BAR
028-058	C1	84.3	8.8	6.9		.1	3.0	19.0	46.2	16.0	5.2	3.6		68.3	45.0			

DEPTH	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2										BULK DENSITY				WATER CONTENT				CARBONATE			
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD	LT	LT	1/1	1/2				
CM	PCT	PCT	(- - - PCT	LT 75	- - - )	LT20	G/CC	G/CC		PCT	PCT	PCT	CM		PCT	PCT						
028-058	0	0	0	0	0	23	0			9.8	17.6											

Soil classification: Ustic Torrripsamment; mixed, mesic.

Soil series: Valent fine sand.

Pedon No.: S66Wyo-10-13.

Location: Johnson County, Wyoming; SE $\frac{1}{4}$ , NW $\frac{1}{2}$  of Sec. 16, T45N, R78W. Blow-out area near headquarters of the Recluse Ranch.

Climate: Average annual precipitation is about 12 inches; mean annual soil temperature is about 52° F. Frost-free season is 105 to 120 days. Elevation is about 4,400 feet.

Vegetation and land use: Indian ricegrass, needleleaf sedge, blue gramagrass, threadleaf sedge, skeleton weed, needleandthread, six weeks fescue, and prairie sandreed. Rangeland and wildlife habitat.

Parent material: Wind-laid sands.

Physiography: Sand dunes.

Topography: Gradient is about 10 percent.

Drainage: Well drained.

Moisture: Dry at time of sampling.

Ground water: Deep.

Erosion: Moderate.

Permeability: Rapid.

Sampled by: C. J. Fowkes, James Stephens, R. C. Kronenberger, Harold Bindschadler, and Robert Grossman.

Described by: Harold Bindschadler - June 23, 1966.

(Colors are for air-dry soil unless otherwise stated)

A11 0 to 13 cm (0 to 5 inches). Pale brown (10YR 6/3) fine sand, brown (10YR 4/3) moist; single grained; loose, nonsticky, nonplastic; neutral (pH 7.2); clear wavy boundary.

A12 13 to 28 cm (5 to 11 inches). Light grayish brown (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2 moist); single grained; loose, nonsticky, nonplastic; neutral (pH 7.2); clear wavy boundary.

C1 66L259 28 to 58 cm (11 to 23 inches). Light yellowish brown (2.5Y 6/4) fine sand, light olive brown (2.5Y 5/4) moist; single grained; loose, nonsticky, nonplastic; mildly alkaline (pH 7.4); clear wavy boundary.

C2 58 to 117 cm (23 to 46 inches). Light brownish gray (2.5Y 6/2) fine sand, dark grayish brown (2.5Y 4/2) moist; single grained; loose, nonsticky, nonplastic; mildly alkaline (pH 7.4); clear wavy boundary.

C3 117 to 152 cm (46 to 60 inches). Pale yellow, very weakly cemented, noncalcareous, fine grained sandstone.



Soil classification: Ustic Torrripsamment; mixed, mesic.

Soil series: Valent loamy fine sand, reddish brown variant.

Pedon No.: 569Wyo-10-2.

Location: Johnson County, Wyoming; unsectionized portion. Sample site located on field sheet 14N-77.

Climate: Average annual precipitation is about 12 inches. Mean annual soil temperature is about 52° F.

Frost-free season is 105 to 110 days. Elevation is approximately 4,600 feet.

Vegetation and land use: Indian ricegrass and prairie sandreed grass. Rangeland and wildlife habitat.

Parent material: Wind-laid reddish sands from nearby red sandstone.

Physiography: Sand fall area on leeward slope of an upland.

Topography: Northeast facing slope. Gradient is 6 percent.

Drainage: Well drained.

Moisture: Dry throughout at time of sampling.

Ground water: Deep.

Erosion: Slight to moderate.

Permeability: Rapid.

Sampled by: R. B. Grossman, Leo Shields, James Stephens, Paul Lupcho, and C. J. Fowkes - August 6, 1969.

Described by: C. J. Fowkes.

(Colors are for air-dry soil unless otherwise stated)

A1 69L595 0 to 10 cm (0 to 4 inches). Reddish brown (5YR 5/3) loamy fine sand, reddish brown (5YR 4/3) moist; very weak medium and fine subangular blocky structure that parts to single grained; soft, very friable, nonsticky, nonplastic; many medium and fine roots; neutral (pH 7.2); clear smooth boundary.

C1 69L596 10 to 48 cm (4 to 19 inches). Reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4) moist; single grained; loose, nonsticky, nonplastic; common fine and medium roots; mildly alkaline (pH 7.5); gradual smooth boundary.

C2 69L597 48 to 108 cm (19 to 43 inches). Reddish brown (5YR 5/3) loamy fine sand, reddish brown (5YR 4/4) moist; single grained; loose, nonsticky, nonplastic; few fine roots; mildly alkaline (pH 7.6); gradual smooth boundary.

C3 108 to 152 cm (43 to 60 inches). Yellowish red (5YR 5/3) loamy fine sand, reddish brown (5YR 4/4) moist; single grained; loose, nonsticky, nonplastic; calcareous; very few fine threads and soft rounded masses of secondary lime; moderately alkaline (pH 8.3); gradual smooth boundary.

C4 152 to 172 cm (60 to 68 inches). Light reddish brown (5YR 6/4) coarse sandy loam, reddish brown (5YR 4/4) moist; single grained; loose, nonsticky, nonplastic; calcareous; very few fine threads and soft rounded masses of secondary lime; moderately alkaline (pH 8.3).

SOIL Woosley loam taxadjunct SOIL Nos. S67Wyc-10-13 LOCATION Johnson County, Wyoming

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 67L368-67L374

GENERAL METHODS: 1A, 1B1b, 2A1, 2B

Depth (cm)	Horizon	Size class and particle diameter (mm)													3A1			2A2 Coarse fragments		
		Total		Clay (< 0.002)	Very coarse (2-1)	Sand				Silt				Int. II (0.2-0.02)	(2-0.1)	<0.074	3B2 Vol. 250-2 %	3B1 Wt.		
		Sand (2-0.05)	Silt (0.05-0.002)			Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0.02	Int. III (0.02-0.002)	75-2 %	20-5 %					5-2 %		
0-5	A11	23.1	51.4	25.5	0.2	1.0	1.9	6.8	13.2	27.2	24.2	44.5	9.9	86.6	5	10	2	1		
5-15	A12	19.6	52.9	27.5	0.3	0.4	1.2	5.3	12.4	29.4	24.3	44.3	7.2	89.8	5	10	5	1		
15-25	B1	20.1	49.8	30.1	0.4	0.5	1.1	4.6	13.5	27.1	22.7	43.5	6.6	90.6	5	10	4	1		
25-43	B2t	19.2	53.8	27.0	0.3	0.2	0.8	3.3	14.6	31.5	22.3	48.2	4.6	92.3	5	10	4	1		
43-64	B3ca	22.5	52.8	24.7	0.9	1.1	1.0	3.5	16.0	30.7	22.1	48.9	6.5	90.5	5	10	3	2		
64-102	C1ca	24.8	46.5	28.7	1.2	1.6	2.0	6.9	13.1	23.9	22.6	41.2	11.7	85.0			7	2		
102-140	T102	25.7	36.9	37.4	1.5	2.7	3.7	11.1	6.7	12.1	24.8	25.2	19.0	78.2			8	5		

Depth (cm)	6A1a Organic carbon a/	6B1a Nitrogen	C/N	6C2a Ext. Iron as Fe	Carbonate as CaCO <sub>3</sub>		Bulk density			4D1			Water content			pH	
					6E1b <2mm	3A1a <0.002 mm	4A1d 1/3-Bar	4A1b Oven-Dry	COLE	4B1c 1/3-Bar	4B2 15-Bar	4C1 WRD	8C1b Sat. Paste	8C1a (1:1)			
					Pct.	Pct.	g/cc	g/cc	g/cc	Pct.	Pct.	in./in.					
0-5	8.73	0.757	12	0.8			0.83	0.98	0.054	53.8	23.4	0.24			5.9a		
5-15	3.56	0.348	10	1.0			1.04	1.17	0.037	36.1	13.5	0.23			6.2		
15-25	2.23			1.0	tr	-	1.14	1.29	0.039	30.3	13.1	0.19			6.5		
25-43	1.65			1.0	1	-	1.21	1.33	0.030	29.5	11.8	0.20			6.9		
43-64	1.01			0.6	16	1	1.30	1.40	0.024	25.8	10.0	0.21			7.7		
64-102	0.57			0.5	52	8	1.28	1.34	0.022	27.5	12.0	0.20		7.8	8.1		
102-140	0.25			0.5	37	16	1.55	1.63	0.016	20.4	14.6	0.09			8.5		

Depth (cm)	Extractable bases 5B4a				6H1a Ext. Acidity	Cat. Exch. Cap.			8E1 Resistivity ohm-cm	8A1a Elec. Cond. mmhos/cm	8D5 Total Sol. Salts ppm	8A1 Water at Sat. Pct.	8D3 Ca/Mg	Base saturation	
	6N2a Ca	6O2a Mg	6P2a Na	6Q2a K		Sum	5A3a Sum Cations	5A6 NH <sub>4</sub> OAc						5C3 Sum Cations	5C1 NH <sub>4</sub> OAc
	meq/100 g													Pct.	Pct.
0-5	27.6	5.6	0.1	1.7	35.0	13.6	48.6	38.2				4.9	72	92	
5-15	23.2	6.0	0.1	0.9	30.2	7.9	38.1	31.4				3.9	79	96	
15-25	22.0	7.6	0.1	0.7	30.4	6.0	36.4	30.4				2.9	84	100	
25-43			0.1	0.6	24.8	3.6		29.2				2.5			
43-64			0.1	0.5	23.4	0.3		21.3				3.0			
64-102			0.1	0.4	21.1			18.0	1800	0.71	210	46.4	1.6		
102-140			0.1	0.4	18.5			13.7				0.9			

Depth (cm)	Ratios to Clay 8D1		
	Ext. Iron	15-Bar Water	NH <sub>4</sub> OAc CEC
0-5	0.03	0.92	1.5
5-15	0.04	0.49	1.1
15-25	0.03	0.44	1.0
25-43	0.04	0.44	1.1
43-64	0.02	0.40	0.86
64-102	0.02	0.42	0.63
102-140	0.01	0.39	0.37

<sup>a</sup>/ Organic carbon: 19 kg/m<sup>2</sup> to a depth of 64 cm (25 in.). Method 6A.

Soil classification: Argic Cryoboroll; fine-loamy, mixed.

Soil: Woosley loam taxadjunct<sup>1/</sup>.

Pedon No: S67Wyo-10-13

Location: Johnson County, Wyoming; 45 feet east of N $\frac{1}{2}$  corner of Sec. 6, T45N, R84W.

Climate: Average annual precipitation is about 18 inches; mean annual soil temperature at 20 inches is about 39° F.; mean summer soil temperature at 20 inches is about 50° F. Snow cover period extends from late November to early June. Elevation is 8,000 feet.

Vegetation and land use: Fescue spp., Poa spp., Columbia needlegrass, thickspike wheatgrass, and flowering plants. Summer sheep range and wildlife habitat.

Parent material: Residium weathered from limestone.

Physiography: Hillside.

Topography: Moderately rolling east facing slope. Gradient is 7 percent.

Drainage: Well drained.

Moisture: Moisture conditions at sampling time were above normal because of the unusually high precipitation during the winter, spring, and early summer prior to sampling. Deviation for that period was around +10 inches of precipitation.

Ground water: Deep.

Erosion: None to slight.

Permeability: Moderate.

Sampled by: Robert B. Grossman, Warren Lynn, Paul Lupcho, James R. Stephens, Jr., Ki Hak Han, and C. J. Fowkes - July 21, 1967.

Described by: C. J. Fowkes - July 21, 1967.

(Colors are for air-dry soil unless otherwise stated)

A1 67L368 0 to 5 cm (0 to 2 inches). Dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine crumb structure; soft, very friable, slightly sticky, slightly plastic; neutral (pH 7.0); abrupt smooth boundary.

A2 67L369 5 to 15 cm (2 to 6 inches). Dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium prismatic that parts to moderate medium and fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; neutral (pH 7.2); abrupt smooth boundary.

B1 67L370 15 to 25 cm (6 to 10 inches). Brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic that parts to moderate medium and fine subangular blocky structure; slightly hard, friable, sticky, slightly plastic; patchy glossy coatings on faces of peds; mildly alkaline (pH 7.4); clear wavy boundary.

B2t 67L371 25 to 43 cm (10 to 17 inches). Brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic that parts to moderate medium and fine angular blocky structure; hard, firm, sticky, plastic; nearly continuous glossy coatings on faces of peds; mildly alkaline (pH 7.4); clear wavy boundary.

B3ca 67L372 43 to 64 cm (17 to 25 inches). Pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak medium and fine subangular blocky structure; slightly hard, friable, sticky, slightly plastic; patchy glossy coatings on faces of peds; strongly effervescent; few fine soft rounded masses of secondary lime; moderately alkaline (pH 8.2); gradual wavy boundary.

C1ca 67L373 64 to 102 cm (25 to 40 inches). Light gray (10YR 7/2) loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable, sticky, slightly plastic; violently effervescent; many fine and medium soft rounded masses and threads of secondary lime; strongly alkaline (pH 8.6); gradual wavy boundary.

11C2 67L374 102 to 140 cm (40 to 55 inches). Reddish yellow (5YR 6/6) and reddish yellow (7.5YR 6/8) clay loam, reddish yellow (7.5YR 6/6) moist; massive; hard, firm, sticky, plastic; violently effervescent; strongly alkaline (pH 8.4); clear wavy boundary.

R 140 to 147 cm (55 to 58 inches). Hard limestone bedrock.

<sup>1/</sup> Woosley soils have limestone bedrock above 40 inches.

SOIL CLASSIFICATION-USTCLLC HAPLARGID  
 LGAMY, MIXED, MESIC, SHALLOW  
 SERIES - - - - -WDRF

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE, MTSC  
 NATIONAL SOIL SURVEY LABORATORY  
 LINCOLN, NEBRASKA  
 JUNE 1977

SOIL NO - - - - -S69WYO-10-4 COUNTY - - - JOHNSON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 69L600-690603

DEPTH	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B														RATIO		
		SAND	SILT	CLAY	FINE	VCOS	CORS	MEDS	FNES	VFNS	COFI	FNSI	VFSI	TEXT	FAML		INTR	FINE
CM		2-	.05-	.002	.0002	1	.5	.25	.10	.05	.02	.005	SAND	.2-	TO	CLAY	CO3-	15-
		PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT
000-006	A1	44.1	39.6	16.3		.1	.2	.9	11.7	31.2	26.8	12.8		12.9	67.5			.40
006-018	B2T	32.5	39.6	27.9	15.1	.2	.2	.3	7.0	24.8	26.5	13.1		7.7	57.4	54		.38
018-042	B3CA	19.1	54.4	26.5		.0	.1	.2	2.8	16.0	31.7	22.7		3.1	50.2			.39
051-062	C2	16.2	63.3	20.5		.1	.4	.3	1.1	14.3	39.1	24.2		1.7	54.2			.46

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)	VOL.	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	BULK DENSITY				WATER CONTENT				CARBONATE			
												4A1D	4A1M	4D1	4B1C	4B1C	4B2	4C1	6E1B	3A1A	8C1A	8C1E	
CM		PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	PCT	BAR	BAR	BAR	BAR	CM/	CM	PCT	PCT	PCT	PCT		
000-006	TR	0	0	0	TR	73	TR															7.1	
006-018	TR	0	0	0	TR	82	TR	1.39	1.54	.036				16.6	10.7	.08						7.6	
018-042	0	0	0	0	0	91	0															8.4	
051-062	0	0	0	0	0	95	0															8.7	

DEPTH	ORGANIC MATTER		IRON	PHCS	EXTRACTABLE BASES 5B4A-				ACTY	AL	CAT EXCH		RATIO	RATIO	CA	BASE SAT			
	6A1A	6B1A			C/N	6C2B	6N2A	6O2A			6P2B	6Q2B				6H1A	6G1E	5A3A	5A6A
CM	PCT	PCT	PCT	PCT	CA	Mg	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	CA	SAT	EXTB	NHAC	
000-006	1.28				9.6	3.1	.1	.8	13.6				13.2	.81	3.1	73			103
006-018	1.22					4.6	.2	.9					21.2	.76					
018-042	.72					5.1	.9	.6					17.8	.67					
051-062						5.3	3.6	.5					16.0	.78					

CLAY MINERALOGY (7A2C).

006-18 CM B2T SMALL AMOUNTS OF MONTMORILLONITE, MICA, AND KAOLINITE. THE MICA AND KAOLINITE ARE WELL-ORDERED; MONTMORILLONITE IS POORLY ORDERED. SOME CHLORITIC INTERLAYER MATERIAL IS PRESENT. CLAY MINERALOGY IS MONTMORILLONITIC.

Soil classification: Ustollic Haplargid; loamy, mixed, mesic, shallow.

Soil series: Worf loam.

Pedon No.: S69Wyo-10-4.

Location: Johnson County, Wyoming; NW $\frac{1}{4}$ , NW $\frac{1}{4}$  of Sec. 21, T45N, R80W, 7/8 mile north from southwest corner of field sheet 4N-195.

Climate: Average annual precipitation is about 12 inches. Mean annual soil temperature is about 52° F. Frost-free season is 105 to 110 days. Elevation is approximately 4,850 feet.

Vegetation and land use: Blue grama, western wheatgrass, cactus, and big sage. Rangeland and wildlife habitat.

Parent material: Residuum weathered from calcareous interbedded clay shales and sandy shale.

Physiography: Ridgecrest.

Topography: Gradient is 6 percent.

Drainage: Well drained.

Moisture: Dry throughout at time of sampling.

Ground water: Deep.

Erosion: Slight.

Permeability: Moderate.

Sampled by: R. B. Grossman, Leo Shields, James Stephens, Paul Lupcho, and C. J. Fowkes - August 7, 1969.

Described by: C. J. Fowkes.

(Colors are for air-dry soil unless otherwise stated)

A1 69L600 0 to 6 cm (0 to 2 inches). Pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky that parts to weak fine crumb structure; soft, very friable, nonsticky, nonplastic; many fine roots; mildly alkaline (pH 7.4); abrupt smooth boundary.

B2t 69L601 6 to 18 cm (2 to 7 inches). Brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, sticky, plastic; thin patchy glossy coatings on some faces of peds; many fine roots; mildly alkaline (pH 7.6); clear wavy boundary.

B3ca 69L602 18 to 42 cm (7 to 17 inches). Pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; few coarse and fine mottles of yellowish brown (10YR 5/6); weak medium subangular blocky structure; slightly hard, friable, sticky, plastic; few patches of glossy coatings on some faces of peds; few fine roots; calcareous; common threads and seams of secondary lime; strongly alkaline (pH 8.6); gradual wavy boundary.

C1 42 to 51 cm (17 to 20 inches). Light gray (5Y 7/2) loam, olive (5YR 5/3) moist; weak medium and fine angular blocky structure; soft, very friable, slightly sticky, slightly plastic; contains much weathered shale material that crushes readily between the fingers; calcareous; strongly alkaline (pH 8.6); gradual wavy boundary.

C2 69L603 51 to 62 cm (20 to 24 inches). Light gray (5Y 7/2) calcareous sandy shale with some seams of secondary lime and mottles of yellowish brown (10YR 5/6).

The purpose of the soil moisture study in southern Johnson County was to collect actual data to confirm the soil moisture regime in which the soils were classified. This study was carried out simultaneously with a soil temperature study which confirmed the soil temperature regimes in which the soils were classified. Part of this data is listed with the soil moisture data for each site.

Four of the soil moisture sites are in the Aridic (Torric) soil moisture regime which, as defined, must be moist less than one-half the time and moist more than one-fourth the time in some part of the moisture control section when the soil temperature at 50 cm (20 inches) is 41° F. (5° C.) or above. Also, the soils are moist in some part of the moisture control section for not more than 90 consecutive days when the soil temperature at 50 cm (20 inches) is 47° F. (8° C.) or above.

Three of the sites studied are in the Big Horn Mountains, in the Cryic regime, and are usually moist. The total number of days when the soil temperature is 41° F. (5° C.) or above at 50 cm (20 inches) depth for the Aridic (Torric) soils was determined from 10 years measured soil temperature data at the sites. This period runs from about April 5 to about November 10, or 220 days. The period when the soil temperature is 47° F. (8° C.) or above at 50 cm (20 inches) depth is from about April 25 to November 1.

The seven soil moisture sites were sampled at 5, 10, 20, and 30 inch depths. The sites were sampled from an undisturbed profile within a few feet of the original site on each sampling date. Samples from each of the depths at each site were sealed in individual soil moisture cans and shipped to the Soil Survey Investigations Unit at Lincoln, Nebraska. Determinations were made at the laboratory for field-state moisture on each sample, and the 15-bar moisture percent was also determined.

Five of the sites were sampled January 15, April 15, June 15, July 15, August 15, and October 15 for the period 1967 through 1974. Two of the sites, DeCross and Wetterhorn, were inaccessible during most years during January and April, and occasionally during October.

The field-state moisture data and the moisture percent at 15 atmospheres (15-bar) were plotted, and determinations made for the percent that the samples were above or below 15-bar percent. Data for the total days that the soil at 50 cm (20 inches) was 41° F. (5° C.) or above was determined as was the cumulative and consecutive days moist during the period. The 10-inch sampling data of the soils in the Aridic (Torric) moisture regime were selected as representative of the moisture control section of the sites having an average 15-bar moisture of 7 percent or above. The sites are Big Horn, Briggsdale, Connerton and Forsyth. Data for the DeCross and Wetterhorn sites were also selected on the same basis, but the cumulative and consecutive days moist do not affect soils of the Cryic subgroups. The Mathers site is also in the Cryic subgroup. The Mathers site has an average 15-bar moisture of 7 percent or less, and the largest value of the 10- and 20-inch depths was plotted.

Big Horn Soil Moisture Site

Elevation: 1,670 m (5,480 ft)

Location: NE 1/4 SW 1/4, Sec. 4, T45N, R82W

Year	Depth cm	WATER CONTENT										Days Moist at 25 cm		Annual 1/				
		Jan. 15		April 15		June 15		July 15		Aug. 15		Oct. 15		Cumulative	Consecutive	Precipitation		
		Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar			Raycece	Buffalo	
		Percent Moisture										Days Moist at 25 cm		Precipitation				
		----->										----->		----->				
1967	12																428	526
	25																	
	50	10.6		11.8	13.0	22.3	14.1	16.8	15.3	11.6	13	12.4	13	95	91	(16.84 in)	(20.70 in)	
	75	9.8	12.4	9.0		20.9	13.3	16.1	14.3	11.0	13	9.5	13					
TEMP AT 50 CM		33° F.		44° F.		56° F.		68° F.		71° F.		55° F.						
1968	12	20.5		24.5	15.9	23.0	16.2	16.1	15.5	19.5	16.9	14.3	15.9				391	439
	25	11.8		23.4	15.5	21.4	14.7	14.6	14.5	14.4	16.6	12.8	14.8	103	83	(15.41 in)	(17.27 in)	
	50	11.3		20.1	13.3	19.1	13.6	13.6	12.6	12.8	14.6	11.8	13.3					
	75	10.7		11.8	12.3	19.3	14.3	15.7	13.8	13.1	14.3	10.9	11.6					
TEMP AT 50 CM		32° F.		43° F.		58° F.		68° F.		66° F.		52° F.						
1969	12	14.2	15.3	24.3	17.2	14.4	15.5	9.5	13.7	11.0	14.0	11.2	15.3				229	266
	25	13.4	14.1	22.5	16.6	11.9	13.4	11.2	12.2	10.4	13.3	10.5	14.0	57	37	(9.00 in)	(10.49 in)	
	50	13.0	14.2	20.7	13.8	11.5	13.3	10.1	12.3	9.5	12.6	10.0	13.4					
	75	13.7	14.3	13.3	13.3	11.3	13.5	10.9	13.2	9.1	11.3	9.7	12.9					
TEMP AT 50 CM		32° F.		46° F.		57° F.		69° F.		73° F.		49° F.						
1970	12	12.1	14.5	14.4	14.2	15.7	15	11.9	15	8.6	15	11.0	15				267	320
	25	11.1	13.7	12.2	13.7	14.5	13	10.8	13	11.8	13	11.8	13	40	40	(10.5 in)	(12.59 in)	
	50	10.2	12.8	12.3	13.3	12.4	13	10.2	13	10.3	13	9.8	13					
	75	10.7	13.6	11.1	12.9	10.2	13	8.9	13	9.9	13	9.6	13					
TEMP AT 50 CM		32° F.		40° F.		60° F.		69° F.		74° F.		49° F.						
1971	12	11.5	15	14.2	15	21.9	15	9.6	15	10.3	15	23.9	15				318	379*
	25	9.8	13	13.9	13	21.8	13	13.4	13	13.1	13	11.7	13	128	113	(12.51 in)	(14.91 in*)	
	50	9.7	13	10.1	13	21.0	13	12.5	13	12.4	13	9.4	13					
	75	10.1	13	10.2	13	20.3	13	13.3	13	11.3	13	8.2	13					
TEMP AT 50 CM		32° F.		44° F.		60° F.		73° F.		73° F.		48° F.						
1972	12	25.2	15	23.7	15	12.6	15	8.1	15	8.7	15	15.7	15				358	398*
	25	22.0	13	24.4	13	15.8	13	12.3	13	11.7	13	12.5	13	92	72	(14.09 in)	(15.65 in*)	
	50	9.9	13	20.7	13	14.9	13	13.5	13	11.1	13	11.3	13					
	75	8.7	13	11.5	13	14.8	13	11.8	13	10.1	13	9.8	13					
TEMP AT 50 CM		30° F.		42° F.		68° F.		68° F.		73° F.		53° F.						
1973	12	12.9	15	22.2	15	13.8	17.1	12.2	15.9	12.8	17.0	23.6	17				379	362*
	25	13.0	13	13.4	13	14.6	16.0	13.4	15.4	15.5	15.6	24.6	16	103	73	(14.92 in)	(14.26 in**)	
	50	11.0	13	10.9	13	14.2	13.7	11.5	13.3	10.4	12.9	10.4	13					
	75	11.1	13	9.5	13	14.4	13.4	10.3	12.2	9.8	12.5	9.8	13					
TEMP AT 50 CM		31° F.		40° F.		64° F.		77° F.		73° F.		50° F.						
1974	12	21.9	17	24.2	17	14.3	17	9.8	17	20.4	17	21.5	17				315	257
	25	23.5	16	24.9	16	15.1	16	10.4	16	10.2	16	10.2	16	65	45	(12.42 in)	(10.13 in)	
	50	13.9	13	18.4	13	13.0	13	9.2	13	8.5	13	8.8	13					
	75	11.1	13	10.1	13	11.1	13	8.4	13	7.9	13	8.5	13					
TEMP AT 50 CM		32° F.		40° F.		59° F.		72° F.		67° F.		52° F.						
1966-1974																		
Average at 25 cm	14.9	14	18.3	14	17.2	14	12.9	14	12.3	14	13.3	14	85	70			336	369
Long-term average (30 years)																	(13.21 in)	(14.52 in)
																	312	321
																	(12.27 in)	(12.63 in)

\*Estimated.

1/National Oceanic and Atmospheric Administration data.

The Big Horn site occurs in the southern part of Johnson County, in an area that receives about 12 to 14 inches of annual precipitation. The measured mean annual soil temperature at 50 cm (20 inches) is 49° F. (10 years data). The soil occupies a nearly level to gently sloping Piedmont Mountain outwash landscape. The landscape extends eastward from the flank of the Big Horn Mountains for several miles, and varies in width from 1/4 to 3/4 of a mile. The site is located near the center of the area on a nearly level surface.

Vegetation consists of big sagebrush, western wheatgrass, green needlegrass, blue grass and prairie junegrass.

The pedon description is similar to the site sampled. Some variation exists as it is necessary to move out from the original site on each sampling, to sample undisturbed pedons.

#### Conclusions

The measured mean annual soil temperature of this site ranged from 48° F. to 52° F. with an average for the 10-year soil temperature study of 49° F. The measured mean summer soil temperature at this site ranged from 66° F. to 71° F., with an average of the 10-year soil temperature study of 68° F.

The soil was moist for more than 1/4 of the time (55 days) and less than 1/2 of the time (110 days) in 7 out of 8 years. The soil was moist for less than 90 consecutive days in 7 out of the 8 years (using plus or minus 5 days). The average cumulative days moist for the period 1967 through 1974 was 85, and the average consecutive days moist was 70.

Only 40 cumulative and consecutive days in 1970 when the soil was moist, which is borne out by below normal precipitation data. 1971 exceeded the cumulative days moist criteria of Aridic (Torric) soils, having 128 days. The annual precipitation was near normal for the year. Plotting of soil data shows that the field moisture was only .1 to .4 percent above the 15-bar percent during July and August at the 10-inch depth. Periods of rainfall just prior to the sampling date may explain this variation.

Briggsdale Soil Moisture Site

Elevation: 1,460 m (4,800 ft)  
 Location: SW 1/4 SW 1/4, Sec. 29, T45N, R80W

Year	Depth cm	WATER CONTENT										Days Moist at 25 cm		Annual 1/					
		Jan. 15		April 15		June 15		July 15		Aug. 15		Oct. 15		Cumulative	Consecutive	Kaycee	Buffalo		
		Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar						
		Percent Moisture												mm					
1967	12									6.9	8.9	10.6	9.3	94	89	428	526*		
	25			11.8		25.1	15.6	22.1	15.7	11.9	14.7	11.6	15.4						
	50	9.2		8.7		20.9	13.0	20.1	15.6	10.5	12.4	9.8	13.3						
	75	8.1	10.6	8.2		10.3	11.5	12.9	13.0	9.8	11.9	9.4	13.1						
TEMP AT 50 CM		31° F.		45° F.		59° F.		69° F.		75° F.		58° F.							
1968	12	12.1	12.5	16.6	10.4	23.9	15.3	15.5	16.2	22.7	14.7	14.5	14.6	98	78	391	439		
	25	13.2	16.2	24.7	16.8	24.5	15.8	15.0	15.5	13.6	14.8	15.0	16.3						
	50	11.2	14.6	20.2	14.0	21.9	14.9	14.2	13.4	12.5	13.5	11.7	12.9						
	75	10.1	13.6	11.7	12.7	19.6	13.7	15.6	13.7	12.1	13.7	11.1	12.7						
TEMP AT 50 CM		30° F.		44° F.		59° F.		71° F.		68° F.		54° F.							
1969	12	14.3	15.1	23.7	15.5	9.4	8.0	12.5	14.3	10.9	14.4	9.8	15.5	67	47	229	266		
	25	13.2	14.2	25.3	16.5	15.9	16.7	12.0	14.3	10.7	14.2	11.2	16.4						
	50	12.2	13.4	19.3	14.5	13.2	13.5	11.1	12.9	9.9	12.5	9.9	13.9						
	75	11.3	12.8	12.5	14.3	11.8	13.2	10.5	13.2	9.3	12.4	9.9	13.7						
TEMP AT 50 CM		31° F.		48° F.		59° F.		73° F.		76° F.		53° F.							
1970	12	9.8	9.1	11.3	11.0	12.0	12	10.5	12	3.4	12	9.2	12	0	0	267	320		
	25	10.5	12.1	13.1	16.0	13.0	15	11.8	15	10.9	15	12.1	15						
	50	9.7	13.0	10.3	12.9	11.4	13	9.8	13	9.5	13	9.3	13						
	75	9.3	12.3	9.9	12.8	9.6	13	9.5	13	8.9	13	9.1	13						
TEMP AT 50 CM		32° F.		40° F.		60° F.		73° F.		78° F.		51° F.							
1971	12	13.7	12	12.2	12	13.2	12	4.4	12	9.3	12	19.0	12	110	63	318	379*		
	25	10.6	15	13.0	15	16.3	15	11.3	15	14.2	15	18.6	15						
	50	9.6	13	10.3	13	23.6	13	14.0	13	13.8	13	9.5	13						
	75	9.1	13	9.2	13	19.5	13	14.4	13	11.0	13	9.1	13						
TEMP AT 50 CM		31° F.		46° F.		61° F.		73° F.		75° F.		47° F.							
1972	12	19.1	12	18.9	12	6.9	12	2.4	12	4.8	12	14.3	12	79	59	358	398*		
	25	29.7	15	25.3	15	15.8	15	12.7	15	13.1	15	11.7	15						
	50	12.2	13	19.8	13	14.1	13	9.7	13	9.3	13	10.6	13						
	75	11.6	13	17.1	13	10.0	13	9.3	13	8.7	13	9.6	13						
TEMP AT 50 CM		31° F.		43° F.		70° F.		72° F.		77° F.		55° F.							
1973	12	7.6	12	17.6	12	6.4	7.7	6.0	10.4	6.0	7.6	16.0	9	57	47	379	362*		
	25	10.4	15	14.7	15	15.6	18.3	9.9	12.7	14.6	18.0	21.2	17						
	50	11.6	13	11.8	13	15.0	15.6	10.8	14.1	10.1	14.3	11.3	15						
	75	9.9	13	9.8	13	9.7	13.8	9.9	13.3	9.5	14.1	10.3	14						
TEMP AT 50 CM		30° F.		40° F.		65° F.		78° F.		73° F.		52° F.							
1974	12	14.0	9	18.3	9	5.7	9	3.9	7	14.1	9	8.2	9	44	24	315	257		
	25	14.4	17	20.9	17	14.3	17	7.9	9	10.8	17	11.1	17						
	50	11.1	15	12.1	15	14.8	15	8.2	10	9.5	15	9.7	15						
	75	10.0	14	9.9	14	9.4	14	8.4	7	8.4	14	8.9	14						
TEMP AT 50 CM		30° F.		40° F.		60° F.		79° F.		64° F.		52° F.							
1967-1974		Average at 25 cm		14.6	15	18.6	16	17.6	16	12.8	14	12.5	16	14.1	16	69	51	336	369
																		(13.21 in)	(14.52 in)
																		312	321
																		(12.27 in)	(12.63 in)

Long-term average (30 years)

\*Estimated.

1/National Oceanic and Atmospheric Administration data.

The Briggsdale site occurs in the eastern part of southern Johnson County, in an area of about 12 to 13 inches of annual precipitation. The measured soil temperature at 50 centimeters (20 inches) is 50° F., based on 10 years data. The Briggsdale soils occur on rolling upland landscapes of about 4 to 15 percent slope. The site is located on an east facing hillside, about midway between a rounded ridge at the upper part, and a narrow drainage at the lower end. The slope gradient at the site is about 5 percent.

Vegetation consists of big sagebrush, western wheatgrass, needleandthread, cactus, blue grama, and prairie June-grass.

The attached pedon description is similar to the site sampled. Some variation exists as it is necessary to move out from the original site on each sampling to sample undisturbed pedons.

#### Conclusions

The measured mean annual soil temperature of this site ranged from 49° F. to 52° F. with an average of 50° F. for the 10-year soil temperature study. The measured mean summer soil temperature at this site ranged from 66° F. to 73° F., with an average for the 10-year period of 70° F.

The soil was moist for more than 1/4 of the time (55 days) and less than 1/2 of the time (110 days) in 6 out of the 8 years of the soil moisture study. The soil was moist for less than 90 consecutive days in 8 out of 8 years (plus or minus 5 days). The average cumulative days moist for the period 1967 through 1974 was 69, and the average consecutive days moist was 51. In 1970 and 1974 the soil was moist for less than 1/4 of the time. The 1970 moisture data for the 5-inch soil depth indicates that about 60 days were moist, but 0 days were moist at the 10-inch depth. During 1974 the precipitation came in the spring and early summer with no appreciable moisture during the summer. Considerable fall moisture was received after the soil moisture samples were checked.

Year	Depth cm	WATER CONTENT										Annual 1/						
		Jan. 15		April 15		June 15		July 15		Aug. 15		Oct. 15		Days Moist at 25 cm Cumulative	Consecutive	Precipitation		
		Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar			Kaycee	Buffalo	
		-----Percent Moisture-----										-----mm-----						
1967	12																	
	25																	
	50	8.2																
	75	14.8	10.6															
TEMP AT 50 CM		31° F.		45° F.		57° F.		69° F.		70° F.		56° F.						
1968	12	8.9		13.6	8.5	19.4	10.1	12.4	8.3	13.2	6.9	9.5	8.6					
	25	7.5		11.5	7.3	20.0	9.4	13.1	9.0	10.5	7.5	8.0	7.3	205	185	391	439	
	50	12.4		8.7	6.7	18.4	9.0	11.5	7.2	10.0	7.3	7.0	6.4			(15.41 in)	(17.27 in)	
	75	15.1		11.7	7.7	18.0	11.3	15.3	9.0	11.7	7.5	8.9	6.7					
TEMP AT 50 CM		30° F.		43° F.		58° F.		69° F.		68° F.		51° F.						
1969	12	12.1	8.7	17.1	10.5	12.2	7.1	6.8	7.3	8.3	7.4	7.6	9.0					
	25	11.8	7.2	16.8	9.2	12.9	9.9	10.6	10.4	8.8	9.2	6.4	7.9	109	89	229	266	
	50	11.6	8.4	13.0	7.7	15.6	9.6	14.3	9.5	11.9	7.3	7.1	7.8			(9.00 in)	(10.49 in)	
	75	17.6	8.4	10.9	7.9	15.4	9.6	13.8	9.2	12.6	9.1	11.2	9.4					
TEMP AT 50 CM		31° F.		44° F.		57° F.		73° F.		72° F.		48° F.						
1970	12	10.9	7.9	12.2	5.8	13.7	8	7.5	8	7.4	8	9.3	8					
	25	8.9	7.3	12.2	6.9	13.4	9	7.0	9	6.4	9	7.7	9	90	70	267	320	
	50	8.4	6.8	9.5	8.9	15.5	9	8.8	9	7.6	9	6.8	9			(10.5 in)	(12.59 in)	
	75	13.1	8.4	12.1	9.8	14.8	9	11.5	9	12.4	9	11.0	9					
TEMP AT 50 CM		29° F.		39° F.		59° F.		70° F.		74° F.		46° F.						
1971	12	7.3	8	9.9	8	16.2	8	7.3	8	5.3	8	13.0	8					
	25	6.6	9	7.7	9	17.1	9	12.1	9	7.0	9	6.1	9	96	96	318	379*	
	50	9.6	9	6.4	9	15.5	9	11.6	9	7.0	9	6.6	9			(12.51 in)	(14.91 in*)	
	75	11.6	9	13.6	9	15.0	9	13.7	9	10.1	9	10.7	9					
TEMP AT 50 CM		30° F.		43° F.		61° F.		70° F.		74° F.		49° F.						
1972	12	15.8	8	15.5	8	9.8	8	5.4	8	5.7	8	6.8	8					
	25	10.7	9	15.8	9	8.6	9	7.6	9	7.2	9	8.0	9	68	48	358	398*	
	50	12.5	9	13.1	9	11.5	9	6.9	9	7.7	9	7.7	9			(14.09 in)	(15.65 in*)	
	75	14.3	9	13.2	9	10.2	9	7.7	9	10.5	9	11.1	9					
TEMP AT 50 CM		31° F.		44° F.		70° F.		69° F.		73° F.		51° F.						
1973	12	9.8	8	13.9	8	7.2	7.9	7.4	8.3	7.4	7.4	16.3	8					
	25	8.7	9	10.3	9	9.3	9.5	7.6	7.2	8.3	6.6	18.2	8	185	117	379	362*	
	50	7.7	9	8.1	9	14.5	10.6	7.6	7.2	10.5	8.5	10.5	9			(14.92 in)	(14.26 in*)	
	75	11.0	9	11.7	9	14.1	9.2	8.6	8.4	11.7	9.8	9.8	9					
TEMP AT 50 CM		31° F.		39° F.		60° F.		72° F.		70° F.		48° F.						
1974	12	15.2	8	17.1	8	10.3	8	5.2	3	9.5	8	9.2	8					
	25	13.4	8	18.2	8	11.8	8	7.6	11	6.4	8	5.5	8	85	65	315	257	
	50	11.0	9	16.3	9	11.7	9	7.4	13	6.8	9	5.8	9			(12.42 in)	(10.13 in)	
	75	12.1	9	12.7	9	13.8	9	11.1	12	9.3	9	8.1	9					
TEMP AT 50 CM		32° F.		41° F.		60° F.		71° F.		65° F.		52° F.						
1966-1974	Average at 25 cm	9.7	8	12.6	8	14.0	9	9.9	9	7.8	8	8.5	8	124	101	336	369	
	Long-term average (30 years)															(13.21 in)	(14.52 in)	
																312	321	
																(12.27 in)	(12.63 in)	

\*Estimated.  
 1/ National Oceanic and Atmospheric Administration data.

The Connerton site occurs in the southern part of Johnson County, along the east flank of the Big Horn Mountains. The soils and landscapes of the area are primarily formed in reddish colored bedrocks and material of the REDBEDS. The area has an annual precipitation of about 30 or 33 centimeters (12 or 13 inches), and a measured mean annual soil temperature at 50 centimeters (20 inches) of 49°F., based on 10 years data. The soil occurs on a gently sloping valley filling alluvial fan on an east facing slope. This site is influenced by subsurface moisture which affects the soil moisture central section.

Vegetation consists of western wheatgrass, bluegrama, needleandthread, cactus, and scattered big sagebrush.

The attached pedon description is similar to the site sampled. Some variation exists as it is necessary to move out from the original site on each sampling to sample undisturbed pedons.

#### Conclusions

The measured mean annual soil temperature of this site ranged from 46° F. to 50° F., for the 10-year soil temperature study. The average is 49° F. The measured mean summer soil temperature at this site ranged from 65° F. to 68° F., with an average of 67° F.

The soil was moist for more than 1/4 of the time, and less than 1/2 of the time in 5 out of the 8 years studied. During 4 of the 8 years the soil was moist more than 90 consecutive days. The results are that the soil met the criteria established for the aridic soil moisture regime only 3 out of 8 years. The average cumulative days that the soil was moist for the study period was 124, which is more than 1/2 of the time. The soil also was moist for 101 consecutive days. The data confirms that this pedon is influenced by subsurface moisture, which was suspected early in the study. The data places the soil at this site in the Ustic moisture regime. The subsurface moisture of this site is not typical of the Connerton series.

Decross Soil Moisture Site

Elevation: 2,410 m (7,900 ft)  
 Location: SE 1/4 SE 1/4, Sec. 22, T46N, R85W

Year	Depth cm	WATER CONTENT								Annual 1/					
		Jan. 15		April 15		June 15		July 15		Aug. 15		Oct. 15		Days Moist at 25 cm Cumulative Consecutive	Precipitation Buffalo 15 SW -----mm----->
		Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar		
-----Percent Moisture----->															
1967	12														
	25			31.3	13.8	23.5	13.4	14.6	12.5	24.0	13.7			Moist above 15-bar at	
	50			25.3	13.3	24.5	13.5	16.5	13.0	14.4	14.0			all times soil was	713
	75			24.3	11.9	22.8	11.0	20.2	12.9	13.7	13.3			above 41° F.	(28.07 in)
	TEMP AT 50 CM			48° F.		56° F.		58° F.		44° F.					
1968	12			30.0	14.5	17.4	13.9	14.6	14.1	22.3	14.3			Moist above 15-bar at	
	25			28.3	13.8	19.6	13.6	13.9	13.5	19.3	13.2			all times soil was	599
	50			27.0	13.5	21.2	13.7	14.1	13.4	14.3	13.0			above 41° F.	(23.60 in)
	75			25.0	12.5	21.5	12.7	15.6	12.4	15.8	13.4				
	TEMP AT 50 CM			48° F.		56° F.		56° F.		44° F.					
1969	12			20.2	14.1	22.9	13.1	12.9	13.2					Soil moisture fell	
	25			22.3	13.3	24.0	13.1	13.0	13.0					below 15-bar about	315
	50			24.2	12.8	23.8	11.6	13.6	12.7					Aug. 15.	(12.42 in)
	75			22.0	13.6	23.5	12.0	16.6	12.4						
	TEMP AT 50 CM			50° F.		56° F.		58° F.							
1970	12			31.0	14	14.2	14	12.3	14	21.5	14			Soil moisture fell	
	25			30.7	13	14.6	13	11.1	13	12.8	13			below 15-bar about	435
	50			26.6	12	15.3	12	10.4	12	12.6	12			Aug. 1.	(17.11 in)
	75			26.0	13	17.6	13	11.5	13	11.1	13				
	TEMP AT 50 CM			45° F.		53° F.		59° F.		41° F.					
1971	12			26.1	14	12.7	14	12.3	14					Soil moisture fell	
	25			27.0	13	11.6	13	12.2	13					below 15-bar about	606
	50			24.7	12	13.1	12	12.5	12					July 12.	(23.86 in)
	75			25.1	13	15.3	13	10.5	13						
	TEMP AT 50 CM			46° F.		57° F.		60° F.							
1972	12			20.8	14	13.5	14	12.8	14	17.7	14			Soil moisture fell	
	25			23.4	13	13.5	13	12.3	13	16.9	13			below 15-bar July 21	531
	50			25.0	12	13.2	12	14.0	12	13.1	12			& again increased	(20.91 in)
	75			25.3	13	15.1	13	13.9	13	13.5	13			above 15-bar about Sept. 5.	
	TEMP AT 50 CM			52° F.		57° F.		59° F.		43° F.					
1973	12			23.2	15.4	14.5	14.8	18.9	16.7					Moist above 15-bar	
	25			26.8	15.2	14.4	14.3	18.3	14.8					at all times soil was	No data
	50			23.7	15.3	15.2	14.1	14.6	14.5					above 41° F.	
	75			23.6	15.0	15.9	11.2	14.1	13.4						
	TEMP AT 50 CM			50° F.		56° F.		59° F.							
1974	12			25.8	16	10.9	16	24.6	16	28.6	16			Soil fell below 15-bar	
	25			21.6	15	11.8	15	12.3	15	12.6	15			about July 6.	No data
	50			17.5	15	12.1	15	12.9	15	12.1	15				
	75			14.6	13	10.1	13	11.3	13	13.0	13				
	TEMP AT 50 CM			51° F.		59° F.		56° F.		41° F.					
1966-1974															
	Average at 25 cm			26.4	14	16.6	14	13.5	14	17.1	14				533 (20.99 in)
	Long-term average (all period of record through 1970)														382 (15.05 in)

1/National Oceanic and Atmospheric Administration data.

The Decross site occurs in the Big Horn Mountains at an elevation of about 7,900 feet, in an area that receives about 18 or 19 inches of annual precipitation. The measured mean summer soil temperature at 50 cm (20 inches) is 54° F. based on 10 years data. Mean annual soil temperature is judged to be about 40° F., using the measured data from the Mathers site and other soil moisture sites in the Big Horn Mountains as a basis. The Decross site occupies a gently sloping, west facing, alluvial fan or footslope, of about 5 percent gradient. The landscape extends from the base of a moderately steep hillside into a valley slope. The site is located well below the hillside, below any deep snowpack areas.

Vegetation consists of big sagebrush, Idaho fescue, columbia needlegrass, king's fescue, lupine, and Alpine bistort.

The attached description is similar to the pedon at the soil moisture site. In sampling, it is necessary to move out from the site location to sample undisturbed pedons.

#### Conclusions

The measured mean summer temperature ranged from 52° to 56° F., with an average of 54° F. for the 10-year soil temperature study. The site is snowed in during the winter months, consequently soil temperature and moisture data were not determined.

The soil moisture data indicates that the soil was moist above 15-bar at all times when the soil temperature was above 41° F., in 3 out of the 8 years studied.

In other years the data showed that the soil moisture fell below 15-bar during July or August. In some years the moisture increases to above 15-bar in September.

Indart Taxadjunct Soil Moisture Site<sup>1/</sup>

Elevation: 2,590 m (8,500 ft)  
Location: Center Sec. 3, T46N, R85W

Year	Depth cm	WATER CONTENT								Annual <sup>2/</sup> Precipitation Buffalo 15 SW --mm-->				
		Jan. 15		April 15		June 15		July 15			Aug. 15		Oct. 15	
		Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar		Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar
1966	50					19.6	12.5	15.1	12.5	16.8	12.5			
1967	12							7.1		22.0				
	25			25.5	4.0	22.0	13.9	15.4		18.4		713		
	50			24.0	12.8	21.5	14.3	17.8		17.9		(28.07 in)		
	75			19.8	4.5	15.9	3.2	19.0		9.5				
TEMP AT 50 CM				46° F.		55° F.		55° F.		42° F.				
1968	12			16.5	4.6	16.7	8.9	14.8	7.2	14.3	6.7			
	25			23.5	11.1	14.4	9.2	18.0	12.4	17.4	10.3	599		
	50			23.6	12.7	20.7	11.1	20.7	13.9	17.8	9.5	(23.60 in)		
	75			19.2	12.3	17.7	7.5	17.2	11.6	12.2	5.0			
TEMP AT 50 CM				47° F.		52° F.		53° F.		41° F.				
1969	12			13.4	3.1	10.2	2.6	5.7	3.3					
	25			22.0	9.9	19.6	9.8	11.2	6.7			315		
	50			20.0	12.6	20.8	10.9	14.7	8.4			(12.42 in)		
	75			21.1	13.5	20.7	12.6	18.1	12.9					
TEMP AT 50 CM				41° F.		56° F.		57° F.						
1970	12			18.5	3	10.3	3	14.2	3	10.6	3			
	25			17.6	9	19.4	9	15.6	9	14.7	9	435		
	50			20.9	11	19.2	11	16.9	11	15.6	11	(17.11 in)		
	75			20.0	13	17.9	13	17.2	13	12.7	13			
TEMP AT 50 CM				42° F.		54° F.		59° F.		41° F.				
1971	12			15.6	3	14.8	3	9.8	3					
	25			24.4	9	18.3	9	10.5	9			606		
	50			22.4	11	21.4	11	18.4	11			(23.86 in)		
	75			22.7	13	19.3	13	19.9	13					
TEMP AT 50 CM				47° F.		56° F.		57° F.						
1972	12			19.8	3	12.6	3	5.9	3	10.1	3			
	25			22.8	9	18.1	9	18.3	9	15.2	9	531		
	50			24.3	11	21.7	11	20.0	11	14.8	11	(20.91 in)		
	75			23.9	13	20.5	13	20.6	13	16.1	13			
TEMP AT 50 CM				49° F.		51° F.		59° F.		41° F.				
1973	12			18.1	4.0	11.6	3.2	12.2	3.1					
	25			19.0	7.9	19.4	12.2	18.3	13.0			No data		
	50			21.9	12.8	20.4	12.8	20.1	13.2					
	75			19.8	13.2	21.0	11.7	19.2	12.2					
TEMP AT 50 CM				48° F.		49° F.		52° F.						
1974	12			36.4	3	11.3	3	10.6	3	18.5	3			
	25			23.5	11	17.3	11	10.6	11	12.8	11	No data		
	50			23.4	13	19.7	13	16.2	13	16.5	13			
	75			20.5	12	21.1	12	17.2	12	18.9	12			
TEMP AT 50 CM				41° F.		52° F.		49° F.		40° F.				
1966-1974	Average at 25 cm			22.3	9	18.6	10	14.7	10	15.7	10	533		
												(20.99 in)		
												382		
												(15.05 in)		

Long-term average (all period of record through 1970)

<sup>1/</sup>Moist above 15-bar at all times soil was above 41° F. Soil moisture was below 15-bar for only a few days around August 15.  
<sup>2/</sup>National Oceanic and Atmospheric Administration data.

The Indart taxadjunct site occurs in the Big Horn Mountains at an elevation of about 8,500 feet. The area receives upwards of 18 inches mean annual precipitation. The measured mean summer soil temperature is 51° F. at 50 cm (20 inches) based on 9 years data. Mean annual soil temperature is estimated to be 39° F. using the measured data of the Mathers site as a basis. The Indart taxadjunct site occupies a nearly level to gently rolling forested landscape. The landscapes in the area range from the gently rolling to steeply sloping. The landscape is east facing, and is a snowpack area.

Vegetation consists primarily of lodgepole pine with an understory of viola and fescue spruces.

The attached pedon description is similar to the pedon at the sampling site. Some variation exists as it is necessary to move out from the original site on each sampling to sample undisturbed pedons.

#### Conclusions

The measured mean summer temperature of the site ranged from 47° F. to 53° F., with an average of 51° F. for the 9 years studied. This site is snowed in during the winter months, consequently only summer soil temperature and soil moisture data are available.

The soil moisture data indicates that the soil at this site is moist all of the time with the exception of one year. In 1974 the field state moisture dropped below 15-bar percent for a few days. There may be short periods in between sampling dates when the soil moisture drops below 15-bar percentage.

Year	Depth cm	WATER CONTENT												Annual 2/ Precipitation Buffalo 15 SW <---mm-->
		Jan. 15		April 15		June 15		July 15		Aug. 15		Oct. 15		
		Field	15-bar	Field	15-bar	Field	15-bar	Field	15-bar	Field	15-bar	Field	15-bar	
1966	50							9.8	8.4	8.2	8.4	10.0	8.4	
1967	12									11.7	3.6	8.7	3.6	
	25									10.5	4.3	10.0	5.3	
	50	10.3		9.9		16.1	3.8	16.0	3.3	12.6	5.5	10.5	7.7	713
	75			6.7		16.7	6.7	18.7	9.0	14.5	8.3	11.9	7.3	(28.07 in)
TEMP AT 50 CM		29° F.		36° F.		46° F.		50° F.		52° F.		44° F.		
1968	12	9.0	3.7	12.9	3.9	13.7	2.7	9.0	3.7	10.2	2.7	7.7	2.8	
	25	8.9	5.5	7.6	2.7	26.3	5.5	11.1	4.2	8.0	3.0	7.2	2.7	
	50	9.8	9.7	8.0	4.8	19.7	7.4	17.5	9.3	9.5	4.5	10.3	6.7	599
	75	7.7	7.5	12.2	9.2	8.4	3.8	12.9	7.5	12.4	8.1	9.7	6.0	(23.60 in)
TEMP AT 50 CM		31° F.		32° F.		40° F.		48° F.		49° F.		41° F.		
1969	12	9.5	3.0	17.7	3.5	8.2	2.6	5.9	2.8	3.6	2.3	4.7	2.5	
	25	11.8	3.3	17.7	5.5	12.3	4.0	5.8	2.4	4.4	2.7	3.4	2.8	
	50	11.5	6.5	17.1	8.7	11.3	6.7	9.5	3.1	9.4	7.3	4.7	3.8	315
	75	10.3	5.9	8.8	6.0	8.0	6.3	12.0	6.8	9.8	8.4		6.5	(12.42 in)
TEMP AT 50 CM		32° F.		32° F.		41° F.		51° F.		58° F.		40° F.		
1970	12	6.4	2.6	2.8	2.3	14.6	3	3.9	3	3.3	3	5.2	3	435
	25	6.8	2.5	3.3	2.5	14.8	3	7.2	3	4.1	3	3.6	3	(17.11 in)
	50	4.0	3.0	4.5	3.9	13.4	5	14.6	5	9.7	5	9.2	5	
	75	5.2	3.6	6.8	6.4	10.7	6	9.2	6	7.7	6	4.8	6	
TEMP AT 50 CM		30° F.		32° F.		40° F.		50° F.		57° F.		40° F.		
1971	12	4.3	3	15.9	3	15.5	3	5.9	3	4.0	3	15.0	3	
	25	3.6	3	4.1	3	13.8	3	5.2	3	5.2	3	11.8	3	606
	50	9.2	5	4.3	5	19.7	5	11.6	5	6.0	5	6.4	5	(23.86 in)
	75	10.0	6	4.4	6	17.4	6	14.9	6	11.8	6	6.1	6	
TEMP AT 50 CM		32° F.		32° F.		46° F.		51° F.		52° F.		40° F.		
1972	12			19.6	3	14.9	3	10.1	3	5.8	3	6.5	3	
	25			14.9	3	17.1	3	13.0	3	7.7	3	5.9	3	531
	50			18.4	5	17.3	5	25.6	5	12.3	5	9.6	5	(20.91 in)
	75			20.4	6	18.2	6	16.6	6	14.4	6	9.5	6	
TEMP AT 50 CM		31° F.		33° F.		47° F.		50° F.		52° F.		44° F.		
1973	12	4.3	3	4.5	3	13.7	3.4	6.3	3.0	8.1	3.3	19.2	3	
	25	5.1	3	5.1	3	13.3	3.0	6.9	3.3	8.8	3.3	8.5	3	No data
	50	11.0	5	9.8	5	11.6	9.2	13.0	6.4	14.5	8.2	10.7	8	
	75	13.2	6	12.0	6	9.1	6.7	10.1	4.6	10.4	6.6	12.4	6	
TEMP AT 50 CM		30° F.		33° F.		44° F.		51° F.		52° F.		40° F.		
1974	12	15.3	3	22.6	3	14.2	3	5.1	3	18.7	3	24.8	3	
	25	20.4	3	17.5	3	14.5	3	5.3	3	19.4	3	7.7	3	
	50	10.8	8	21.1	8	17.3	8	14.0	8	16.3	8	9.3	8	No data
	75	11.0	6	14.2	6	14.7	6	13.3	6	13.3	6	8.3	6	
TEMP AT 50 CM		30° F.		31° F.		42° F.		49° F.		46° F.		43° F.		
1967-1974														
Average at 25 cm		9.4	3	10.0	3	16.0	4	8.8	3	8.5	3	7.3	3	533 (20.99 in)
Long-term average (all period of record through 1970)														382 (15.05 in)

<sup>1</sup>Moisture at 25 cm depth was above 15-bar at all times soil was above 41° F.<sup>2</sup>National Oceanic and Atmospheric Administration data.

The Mathers site occurs on forested hillsides in the Big Horn Mountains at an elevation of 8,000 feet. The area receives upwards of 18 inches of annual precipitation. The measured mean summer soil temperature at 50 cm (20 inches) is 49° F., and the measured mean annual temperature is 39° F. based on 10 years data. The Mathers site is situated on an east facing, moderately steep hillside, near the lower end of the landscape. The landscape is a snowpack area.

Vegetation is Douglas fir, Engleman spruce, and some lodgepole pine. The understory is sparse, consisting primarily of creeping juniper.

The attached pedon description is similar to the pedon at the sampling site.

#### Conclusions

The measured mean annual soil temperature of the site ranged from 38° F. to 40° F., with an average of 39° F. during the 10 years of the soil temperature study. The mean summer soil temperature ranged from 52° F. to 57° F. with an average of 54° F. of the years studied.

The soil moisture data indicates that the soil is moist during the entire year.

Stoneham (Forsyth) Soil Moisture Site/

Elevation: 1,563 m (5,127 ft)  
 Location: NW 1/4 SE 1/4, Sec. 12, T45N, R62W

Year	Depth cm	WATER CONTENT										Days Moist at 25 cm		Annual 2/			
		Jan. 15		April 15		June 15		July 15		Aug. 15		Oct. 15		Cumulative	Consecutive	Keysee	Buffalo
		Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar	Field 15-bar				
-----Percent Moisture----->																	
1967	12																
	25																
	50	7.1															
	75	5.4	6.8	7.1	7.1	21.3	9.4	11.3	9.8	6.4							
TEMP AT 50 CM		30° F.		46° F.		57° F.		70° F.		78° F.		56° F.					
1968	12	8.4															
	25	9.0															
	50	6.9															
	75	5.9															
TEMP AT 50 CM		31° F.		44° F.		59° F.		71° F.		68° F.		54° F.					
1969	12	6.7	5.7	15.1	7.3	11.7	6.0	4.3	4.7	5.6	6.6	5.6	8.0				
	25	7.8	7.4	13.9	6.3	8.1	7.0	5.6	6.1	7.0	8.7	7.8	10.7				
	50	6.6	6.2	14.3	7.4	10.7	8.6	7.9	9.6	7.7	9.1	6.7	8.4				
	75	6.1	4.7	7.6	8.4	10.8	8.0	5.2	5.3	6.3	7.4	6.5	8.3				
TEMP AT 50 CM		32° F.		46° F.		59° F.		71° F.		75° F.		50° F.					
1970	12	8.4	9.7	15.0	11.1	11.1	8	4.4	8	8.5	8	7.9	8				
	25	8.5	9.6	8.0	8.6	11.3	9	4.3	9	6.5	9	5.1	9				
	50	5.2	6.9	6.7	7.7	12.1	8	5.4	8	6.0	8	6.3	8				
	75	7.1	8.0	6.3	7.2	10.3	7	6.8	7	5.8	7	5.6	7				
TEMP AT 50 CM		32° F.		40° F.		59° F.		71° F.		76° F.		50° F.					
1971	12	7.3	8	15.8	8	13.1	8	3.2	8	7.2	8	18.4	8				
	25	6.9	9	13.9	9	16.8	9	5.8	9	8.1	9	13.9	9				
	50	6.0	8	5.4	8	15.2	8	6.0	8	6.4	8	4.8	8				
	75	5.1	7	5.5	7	15.1	7	8.6	7	5.2	7	8.3	7				
TEMP AT 50 CM		32° F.		44° F.		61° F.		72° F.		73° F.		48° F.					
1972	12	15.5	8	15.8	8	6.9	8	3.7	8	8.4	8	14.1	8				
	25	13.2	9	16.8	9	10.3	9	7.6	9	15.0	9	9.3	9				
	50	6.4	8	13.2	8	8.8	8	5.7	8	6.2	8	7.0	8				
	75	4.7	7	16.2	7	8.9	7	7.0	7	5.4	7	5.9	7				
TEMP AT 50 CM		30° F.		42° F.		69° F.		71° F.		76° F.		53° F.					
1973	12	6.2	8	11.2	8	7.5	8.1	4.9	6.6	4.2	5.1	17.0	7				
	25	5.4	9	11.1	9	9.5	9.6	6.0	7.8	9.0	10.7	8.6	9				
	50	9.8	8	7.0	8	9.4	8.2	9.1	11.7	7.0	8.7	9.3	10				
	75	7.9	7	5.9	7	9.8	7.6	6.7	8.2	4.6	6.5	6.7	7				
TEMP AT 50 CM		29° F.		39° F.		63° F.		74° F.		71° F.		50° F.					
1974	12	15.2	7	16.7	7	4.2	7	3.0	7	12.7	7	15.0	7				
	25	14.0	9	17.7	9	5.2	9	8.2	9	7.4	9	4.6	9				
	50	6.8	10	8.0	10	9.7	10	4.9	10	5.1	10	7.3	10				
	75	6.6	7	6.0	7	6.2	7	5.9	7	6.2	7	5.8	7				
TEMP AT 50 CM		31° F.		40° F.		60° F.		77° F.		68° F.		51° F.					
1967-1974	Average at 25 cm	9.3	9	13.8	8	12.3	9	7.1	8	8.7	9	8.0	9	100	64	336	369
Long-term average (30 years)																312	321
																(12.27 in)	(12.63 in)

\*Estimated.

1/Identified as Forsyth on laboratory data sheets. Correlated as Stoneham series.  
 2/National Oceanic and Atmospheric Administration data.

The Stoneham site occurs in the southern part of Johnson County, several miles east of the Big Horn Mountains. It occurs about 1/4 mile east of the Piedmont outwash occupied by the Big Horn site. The annual precipitation is about 12 or 13 inches, and the measured mean annual soil temperature at 50 cm (20 inches) is 49° F. based on 9 years data. The Stoneham site occurs on a north facing alluvial fan of about 4 percent slope. The alluvial fan extends from the base of gravel capped terrace margins to a narrow drainage, and the site is on the lower portion of the landscape. There is no indication of surface moisture run-in.

Vegetation consists of big sagebrush, needleandthread, western wheatgrass, blue grama, cactus, and prairie Junegrass.

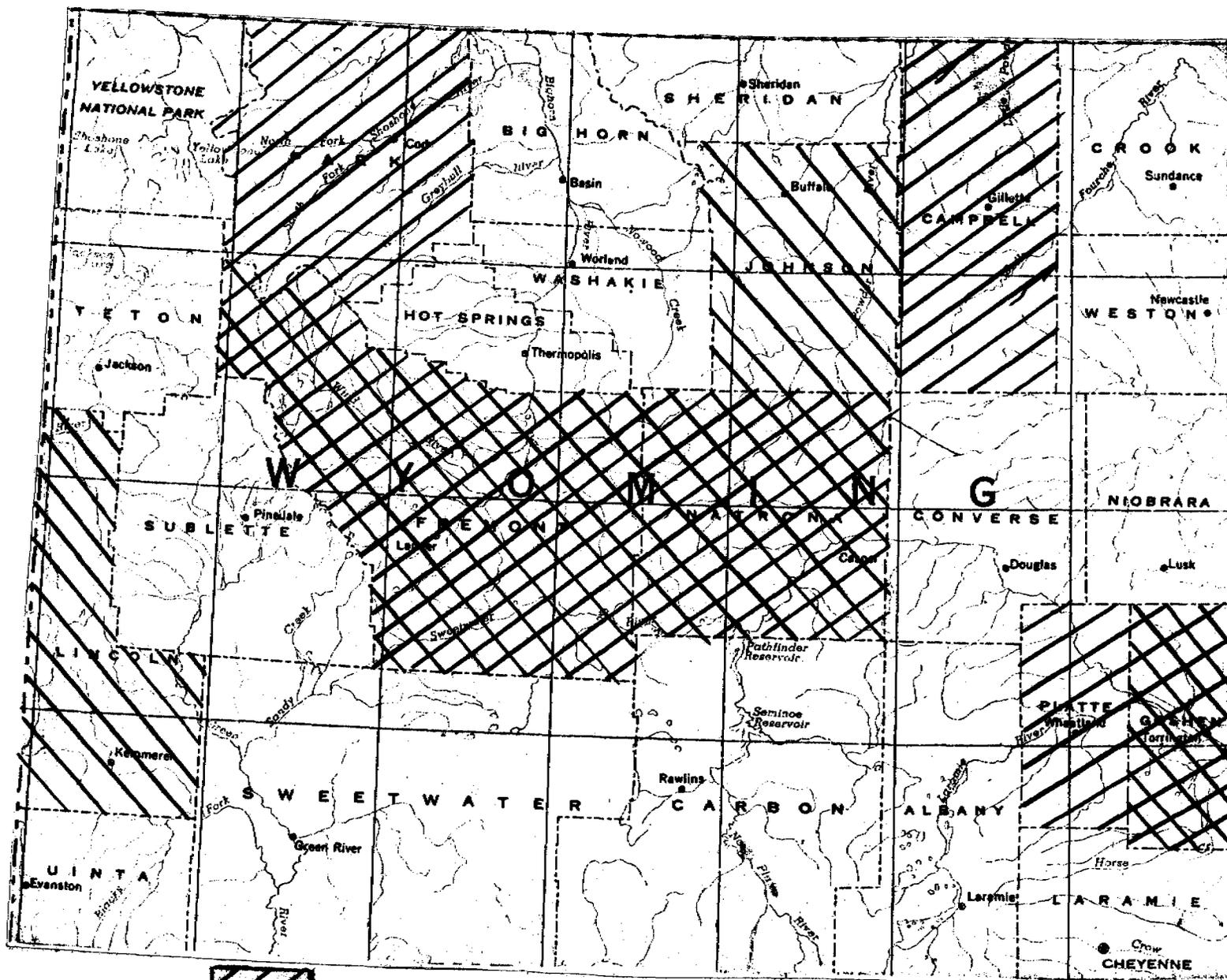
The attached pedon description is similar to the pedon at the soil moisture site.

#### Conclusions

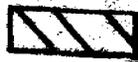
The measured mean annual soil temperature of this site ranged from 48° F. to 51° F. with an average of 49° F. for the 9 years of the soil temperature story. The measured mean summer soil temperature at this site ranged from 66° F. to 72° F. with an average from the 9 years studied of 68° F.

The soil was moist for more than 1/4 of the time (55 days) and less than 1/2 of the time (110 days) in 6 of the 8 years (plus or minus 5 days). Two of the 8 years were moist more than 1/2 of the time (110 days). In 1971 and 1972 the soils were moist in the spring, dry in July, and were moist again in late July or August.

The average cumulative days when the soil was moist was 100, and the average consecutive days when the soil was moist was 64.



Volume I



Volume II



Volumes I and II