

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

...IOWA

Soil Survey Investigations Report No. 3

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

... IOWA

August 1966

SOIL CONSERVATION SERVICE • U.S. DEPARTMENT OF AGRICULTURE
In cooperation with
IOWA AGRICULTURE AND HOME ECONOMICS EXPERIMENT STATION

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

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

tr(s): trace, detectable only by qualitative procedure more sensitive than quantitative procedure used analysis run but none detected

-(s): none detected by sensitive qualitative test

blank: analysis not run

nd: analysis not run

<: less than reported amount or none present
3. PARTICLE-SIZE ANALYSES
 - A. <2-mm fraction (pipet method)
 1. Airdry samples
 - a. Carbonate and noncarbonate clay
 2. Moist samples
 - a. Carbonate and noncarbonate clay
 - B. >2-mm fraction
 1. Weight estimates
 2. Volume estimates
4. FABRIC-RELATED ANALYSES
 - A. Bulk density
 1. Saran-coated clods
 - a. Field state
 - b. Airdry
 - c. 30-cm absorption
 - d. 1/3-bar desorption I
 - e. 1/3-bar desorption II
 - f. 1/3-bar desorption III
 - g. 1/10-bar desorption
 - h. Ovendry
 2. Paraffin-coated clods
 - a. Ovendry
 3. Cores
 - a. Field moist
 4. Nonpolar-liquid-saturated clods
 - B. Water retention
 1. Pressure-plate extraction (1/3 or 1/10 bar)
 - a. Sieved samples
 - b. Soil pieces
 - c. Natural clods
 - d. Cores
 2. Pressure-membrane extraction (15 bars)
 3. Sand table absorption
 4. Field state
 5. Airdry
 - C. Water-retention difference
 1. 1/3 bar to 15 bars
 2. 1/10 bar to 15 bars
 - D. Coefficient of linear extensibility
 1. Dry to moist
 - E. Micromorphology
 1. Thin sections
 - a. Preparation
 - b. Interpretation
 - c. Moved-clay percentage
5. ION-EXCHANGE PROPERTIES
 - A. Cation-exchange capacity
 1. NH_4OAc , pH 7.0
 - a. Direct distillation
 - b. Displacement, distillation
- 5A. Cation-exchange capacity (cont.)
 2. NaOAc , pH 8.2
 - a. Centrifuge method
 3. Sum of cations
 - a. Acidity by BaCl_2 -TEA, pH 8.2; bases by NH_4OAc , pH 7.0
 4. KOAc , pH 7.0
 5. BaCl_2 , pH 8.2
 - a. Barium by flame photometry
 - B. Extractable bases
 1. NH_4OAc extraction
 - a. Uncorrected
 - b. Corrected (exchangeable)
 2. KCl -TEA extraction, pH 8.2
 - C. Base saturation
 1. NH_4OAc , pH 7.0
 2. NaOAc , pH 8.2
 3. Sum of cations
 - D. Sodium saturation (exchangeable Na pct.)
 1. NaOAc , pH 8.2
 2. NH_4OAc , pH 7.0
 - E. Sodium adsorption ratio
6. CHEMICAL ANALYSES
 - A. Organic carbon
 1. Acid-dichromate digestion
 - a. FeSO_4 titration
 - b. CO_2 evolution, gravimetric
 2. Dry combustion
 - a. CO_2 evolution I
 - b. CO_2 evolution II
 3. Peroxide digestion
 - a. Weight loss
 - B. Nitrogen
 1. Kjeldahl digestion
 - a. Ammonia distillation
 2. Semimicro Kjeldahl
 - a. Ammonia distillation
 - C. Iron
 1. Dithionite extraction
 - a. Dichromate titration
 - b. EDTA titration
 2. Dithionite-citrate extraction
 - a. Orthophenanthroline colorimetry
 3. Dithionite-citrate-bicarbonate extraction
 - a. Potassium-thiocyanate colorimetry
 4. Pyrophosphate-dithionite extraction
 - D. Manganese
 1. Dithionite extraction
 - a. Permanganate colorimetry
 - E. Calcium carbonate
 1. HCl treatment
 - a. Gas volumetric
 - b. Manometric
 - c. Weight loss
 - d. Weight gain
 - e. Titrimetric
 2. Sensitive qualitative method
 - a. Visual, gas bubbles
 - F. Gypsum
 1. Water extract
 - a. Precipitation in acetone
 - G. Aluminum
 1. KCl extraction I, 30 min
 - a. Aluminon I
 - b. Aluminon II
 - c. Aluminon III
 - d. Fluoride titration
 2. KCl extraction II, overnight
 - a. Aluminon I
 3. NH_4OAc extraction
 - a. Aluminon III
 4. NaOAc extraction
 - a. Aluminon III
 - H. Extractable acidity
 1. BaCl_2 -triethanolamine I
 - a. Back-titration with HCl
 2. BaCl_2 -triethanolamine II
 - a. Back-titration with HCl
 3. KCl -triethanolamine
 - a. Back-titration with NaOH
 - I. Carbonate
 1. Saturation extract
 - a. Acid titration
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 - J. Bicarbonate
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 - a. Acid titration
 - K. Chloride
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 - b. Potentiometric titration
 - L. Sulfate
 1. Saturation extract
 - a. Gravimetric, BaSO_4
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 - a. Gravimetric, BaSO_4
 - M. Nitrate
 1. Saturation extract
 - a. PDS acid colorimetry
 - N. Calcium
 1. Saturation extract
 - a. EDTA titration
 2. NH_4OAc extraction
 - a. EDTA-alcohol separation
 - b. Oxalate-permanganate I
 - c. Oxalate-permanganate II
 - d. Oxalate-cerate
 3. NH_4Cl - EtOH extraction
 - a. EDTA titration
 4. KCl -TEA extraction
 - a. Oxalate-permanganate
 - O. Magnesium
 1. Saturation extract
 - a. EDTA titration
 2. NH_4OAc extraction
 - a. EDTA-alcohol separation
 - b. Phosphate titration
 - c. Gravimetric, $\text{Mg}_2\text{P}_2\text{O}_7$
 3. NH_4Cl - EtOH extraction
 - a. EDTA titration
 - P. Sodium
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 - a. Flame photometry
 2. NH_4OAc extraction
 - a. Flame photometry
 - Q. Potassium
 1. Saturation extract
 - a. Flame photometry
 2. NH_4OAc extraction
 - a. Flame photometry
 - R. Sulfur
 1. NaHCO_3 extraction, pH 8.5
 - a. Methylene blue
 - S. Total phosphorus
 1. Perchloric-acid digestion
 - a. Molybdovanadophosphoric-acid colorimetry
7. MINERALOGY
 - A. Instrumental analysis
 1. Preparation
 - a. Carbonate removal
 - b. Organic-matter removal
 - c. Iron removal
 - d. Particle-size fractionation
 2. X-ray diffraction
 3. Differential thermal analysis
 - B. Optical analysis
 1. Grain studies
 - C. Total analysis
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 2. X-ray emission spectrography
 - D. Surface area
 1. Glycerol retention
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 - A. Saturated paste, mixed
 1. Saturation extract
 - a. Conductivity
 2. Conductivity, saturated paste
 - B. Saturated paste, capillary rise
 1. Saturation extract
 - a. Conductivity
 - C. pH
 1. Soil suspensions
 - a. Water dilution
 - b. Saturated paste
 - c. KCl
 - D. Ratios
 1. To total clay
 2. To noncarbonate clay
 3. Ca to Mg (extractable)

PREFACE

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

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

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

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

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

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

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

*Soil Survey
Soil Conservation Service*

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| <u>Soil Series</u> | <u>County</u> | <u>Soil Survey No.</u> | <u>Page</u> | <u>Soil Series</u> | <u>County</u> | <u>Soil Survey No.</u> | <u>Page</u> |
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| Arbor | Adair | S56Iowa-1-1 | 7 | | Harrison | S59Iowa-43-2 | 97 |
| | Adair | S56Iowa-1-2 | 9 | | Harrison | S59Iowa-43-3 | 99 |
| Bonair | Howard | S56Iowa-45-11 | 11 | | Harrison | S59Iowa-43-4 | 101 |
| | Howard | S56Iowa-45-12 | 13 | | Harrison | S59Iowa-43-5 | 103 |
| Clarinda | Shelby | S53Iowa-83-4 | 15 | | Harrison | S59Iowa-43-6 | 105 |
| | Shelby | S55Iowa-83-1 | 17 | | Harrison | S59Iowa-43-8 | 107 |
| Clinton | Washington | | 19 | Muscatine | Benton | S60Iowa-6-1 | 109 |
| | Washington | | 21 | | Grundy | S60Iowa-38-1 | 111 |
| Clyde | Howard | S56Iowa-45-4 | 23 | Napier | Harrison | S58Iowa-43-6 | 113 |
| | Howard | S56Iowa-45-10 | 25 | | Harrison | S58Iowa-43-9 | 115 |
| Cresco | Howard | S56Iowa-45-1 | 27 | Olmitz | Adair | S56Iowa-1-3 | 117 |
| | Howard | S56Iowa-45-9 | 29 | | Adair | S56Iowa-1-4 | 119 |
| Dinsdale | Black Hawk | S60Iowa-7-1 | 31 | Otley | Keokuk | S61Iowa-54-2 | 121 |
| | Grundy | S60Iowa-38-2 | 33 | | Washington | S61Iowa-92-1 | 123 |
| Edina | Wayne | S59Iowa-93-1 | 35 | Primghar | Clay | S59Iowa-21-4 | 125 |
| Everly | Clay | S59Iowa-21-7 | 37 | | O'Brien | S59Iowa-71-2 | 127 |
| | Clay | S59Iowa-21-8 | 39 | Protivin | Howard | S56Iowa-45-2 | 129 |
| Fayette | Clayton | S59Iowa-22-1 | 41 | | Howard | S56Iowa-45-3 | 131 |
| | Jackson | | 43 | Readlyn | Bremer | S60Iowa-9-2 | 133 |
| | Linn | | 45 | | Bremer | S60Iowa-9-4 | 135 |
| Hamburg | Fremont | S61Iowa-36-1 | 47 | Riceville | Howard | S56Iowa-45-6 | 137 |
| Ida | Fremont | S61Iowa-36-2 | 49 | | Howard | S56Iowa-45-8 | 139 |
| | Harrison | S58Iowa-43-5 | 51 | Sac | Clay | S59Iowa-21-5 | 141 |
| | Harrison | S59Iowa-43-7 | 53 | | Clay | S59Iowa-21-6 | 143 |
| Kenyon | Bremer | S60Iowa-9-1 | 55 | Sharpsburg | Adair | S55Iowa-1-3 | 145 |
| | Bremer | S60Iowa-9-3 | 57 | | Adair | S55Iowa-1-4 | 147 |
| Klinger | Bremer | S60Iowa-9-5 | 59 | | Adair | S55Iowa-1-5 | 149 |
| | Bremer | S60Iowa-9-6 | 61 | | Adair | S55Iowa-1-6 | 151 |
| Lourdes | Howard | S56Iowa-45-5 | 63 | | Adair | S56Iowa-1-11 | 153 |
| | Howard | S56Iowa-45-7 | 65 | | Polk | S51Iowa-77-7 | 155 |
| Macksburg | Adair | S61Iowa-1-1 | 67 | Shelby | Adair | S56Iowa-1-5 | 157 |
| | Adair | S55Iowa-1-1 | 69 | | Adair | S56Iowa-1-6 | 159 |
| | Adair | S55Iowa-1-2 | 71 | | Adair | S56Iowa-1-7 | 161 |
| | Madison | S61Iowa-61-1 | 73 | | Adair | S56Iowa-1-8 | 163 |
| Mahaska | Keokuk | S61Iowa-54-1 | 75 | | Adair | S56Iowa-1-9 | 165 |
| | Washington | S61Iowa-92-2 | 77 | | Adair | S56Iowa-1-10 | 167 |
| Marcus | Clay | S59Iowa-21-3 | 79 | | Shelby | S55Iowa-83-3 | 169 |
| | O'Brien | S59Iowa-71-1 | 81 | | Shelby | S53Iowa-83-3 | 171 |
| Monona | Harrison | S58Iowa-43-1 | 83 | Taintor | Keokuk | S61Iowa-54-3 | 173 |
| | Harrison | S58Iowa-43-2 | 85 | | Washington | S61Iowa-92-3 | 175 |
| | Harrison | S58Iowa-43-3 | 87 | Tama | Tama | S59Iowa-86-1 | 177 |
| | Harrison | S58Iowa-43-4 | 89 | Winterset | Madison | S61Iowa-61-2 | 179 |
| | Harrison | S58Iowa-43-7 | 91 | | Madison | S61Iowa-61-3 | 181 |

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| County | Soil Series | Soil Survey No. | Page | County | Soil Series | Soil Survey No. | Page | |
|----------|-------------|-----------------|---------------|---------|--------------|-----------------|--------------|-----|
| Adair | Arbor | S56Iowa-1-1 | 7 | Keokuk | Mahaska | S61Iowa-54-1 | 75 | |
| | Arbor | S56Iowa-1-2 | 9 | | Otley | S61Iowa-54-2 | 121 | |
| | Macksburg | S61Iowa-1-1 | 67 | | Taintor | S61Iowa-54-3 | 173 | |
| | Macksburg | S55Iowa-1-1 | 69 | | Linn | Fayette | | 45 |
| | Macksburg | S55Iowa-1-2 | 71 | | Madison | Macksburg | S61Iowa-61-1 | 73 |
| | Olmitz | S56Iowa-1-3 | 117 | | Winterset | S61Iowa-61-2 | 179 | |
| | Olmitz | S56Iowa-1-4 | 119 | | Winterset | S61Iowa-61-3 | 181 | |
| | Sharpsburg | S55Iowa-1-3 | 145 | | O'Brien | Marcus | S59Iowa-71-1 | 81 |
| | Sharpsburg | S55Iowa-1-4 | 147 | | Pringhar | S59Iowa-71-2 | 127 | |
| | Sharpsburg | S55Iowa-1-5 | 149 | | Polk | Sharpsburg | S51Iowa-77-7 | 155 |
| | Sharpsburg | S55Iowa-1-6 | 151 | | Shelby | Adair | S53Iowa-83-2 | 3 |
| | Sharpsburg | S56Iowa-1-11 | 153 | | Adair | S55Iowa-83-2 | 5 | |
| | Shelby | S56Iowa-1-5 | 157 | | Clarinda | S53Iowa-83-4 | 15 | |
| | Shelby | S56Iowa-1-6 | 159 | | Clarinda | S55Iowa-83-1 | 17 | |
| | Shelby | S56Iowa-1-7 | 161 | | Shelby | S55Iowa-83-3 | 169 | |
| | Shelby | S56Iowa-1-8 | 163 | | Shelby | S53Iowa-83-3 | 171 | |
| | Shelby | S56Iowa-1-9 | 165 | | Tama | S59Iowa-86-1 | 177 | |
| | Shelby | S56Iowa-1-10 | 167 | | Washington | Clinton | | 19 |
| | Benton | Muscatine | S60Iowa-6-1 | | 109 | Clinton | | 21 |
| | Black Hawk | Dinsdale | S60Iowa-7-1 | | 31 | Mahaska | S61Iowa-92-2 | 77 |
| Bremer | Kenyon | S60Iowa-9-1 | 55 | Otley | S61Iowa-92-1 | 123 | | |
| | Kenyon | S60Iowa-9-3 | 57 | Taintor | S61Iowa-92-3 | 175 | | |
| Clay | Klinger | S60Iowa-9-5 | 59 | Wayne | Edina | S59Iowa-93-1 | 35 | |
| | Klinger | S60Iowa-9-6 | 61 | | | | | |
| | Readlyn | S60Iowa-9-2 | 133 | | | | | |
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| | Everly | S59Iowa-21-7 | 37 | | | | | |
| | Everly | S59Iowa-21-8 | 39 | | | | | |
| | Marcus | S59Iowa-21-3 | 79 | | | | | |
| | Pringhar | S59Iowa-21-4 | 125 | | | | | |
| | Sac | S59Iowa-21-5 | 141 | | | | | |
| | Sac | S59Iowa-21-6 | 143 | | | | | |
| Clayton | Fayette | S59Iowa-22-1 | 41 | | | | | |
| Fremont | Hamburg | S61Iowa-36-1 | 47 | | | | | |
| | Ida | S61Iowa-36-2 | 49 | | | | | |
| Grundy | Dinsdale | S60Iowa-38-2 | 33 | | | | | |
| | Muscatine | S60Iowa-38-1 | 111 | | | | | |
| Harrison | Ida | S58Iowa-43-5 | 51 | | | | | |
| | Ida | S59Iowa-43-7 | 53 | | | | | |
| | Monona | S58Iowa-43-1 | 83 | | | | | |
| | Monona | S58Iowa-43-2 | 85 | | | | | |
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| | Monona | S58Iowa-43-4 | 89 | | | | | |
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| | Monona | S58Iowa-43-8 | 93 | | | | | |
| | Monona | S59Iowa-43-1 | 95 | | | | | |
| | Monona | S59Iowa-43-2 | 97 | | | | | |
| | Monona | S59Iowa-43-3 | 99 | | | | | |
| | Monona | S59Iowa-43-4 | 101 | | | | | |
| | Monona | S59Iowa-43-5 | 103 | | | | | |
| | Monona | S59Iowa-43-6 | 105 | | | | | |
| | Monona | S59Iowa-43-8 | 107 | | | | | |
| | Napier | S58Iowa-43-6 | 113 | | | | | |
| | Napier | S58Iowa-43-9 | 115 | | | | | |
| | Howard | Bonair | S56Iowa-45-11 | 11 | | | | |
| | | Bonair | S56Iowa-45-12 | 13 | | | | |
| | | Clyde | S56Iowa-45-4 | 23 | | | | |
| Clyde | | S56Iowa-45-10 | 25 | | | | | |
| Cresco | | S56Iowa-45-1 | 27 | | | | | |
| Cresco | | S56Iowa-45-9 | 29 | | | | | |
| Lourdes | | S56Iowa-45-5 | 63 | | | | | |
| Lourdes | | S56Iowa-45-7 | 65 | | | | | |
| Protivin | | S56Iowa-45-2 | 129 | | | | | |
| Protivin | | S56Iowa-45-3 | 131 | | | | | |
| Jackson | Riceville | S56Iowa-45-6 | 137 | | | | | |
| | Riceville | S56Iowa-45-8 | 139 | | | | | |
| | Fayette | | 43 | | | | | |

SOIL TYPE Adair LOCATION Shelby County, Iowa
 silty clay loam, silty variant

SOIL NOS. S53Iowa-83-2 LAB. NOS. 5383-5388

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|---|---------|--|-------------|-------------------|-----------|----------------|--|--------------------------------|----------|------------|------|----------------|--------------------------|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | | | > 2 ($< 19\mu$) |
| | | 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | | |
| 0-7 | Ap | 0.1 | 0.3 | 0.5 | 1.2 | 2.3 | 64.0 | 31.6 | 41.6 | 25.3 | - | sic1 | |
| 7-16 | AB | 0.2 | 0.5 | 0.6 | 1.8 | 2.5 | 57.3 | 37.1 | 37.3 | 23.7 | - | sic1 | |
| 16-22 | B21 | 0.1 | 0.5 | 0.7 | 2.0 | 3.0 | 52.1 | 41.6 | 33.3 | 22.9 | - | sic | |
| 22-29 | B22 | - | 0.6 | 0.9 | 2.6 | 3.7 | 49.3 | 42.9 | 32.0 | 22.5 | - | sic | |
| 29-36 | B3 | 0.1 | 0.9 | 1.5 | 3.9 | 4.2 | 48.1 | 41.3 | 31.0 | 23.4 | - | sic | |
| 36-45 | C | 0.2 | 1.4 | 2.0 | 5.2 | 4.8 | 47.1 | 39.3 | 30.5 | 24.2 | - | sic1 | |
| pH: 8C1a | | ORGANIC MATTER | | | | | ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHS PER CM | MOISTURE TENSIONS | | | | | |
| 1:5 | | 6A1a ORGANIC CARBON | | 6E1a NITROGEN C/N | | 6E1a | | 1/10 ATMOS. | | 1/3 ATMOS. | | 4B2 15 ATMOS. | |
| 6.1 | 6.4 | 6.5 | 1.92 | .174 | 11.0 | | | | | | 13.7 | | |
| 6.0 | 6.3 | 6.4 | 1.09 | .103 | 10.6 | | | | | | 15.0 | | |
| 5.9 | 6.2 | 6.4 | 0.88 | .084 | 10.5 | | | | | | 16.7 | | |
| 5.8 | 6.2 | 6.3 | 0.48 | .052 | 9.2 | | | | | | 17.1 | | |
| 6.0 | 6.3 | 6.5 | 0.34 | | | | | | | | 16.6 | | |
| 5.4 | 6.8 | 6.9 | 0.23 | | | | | | | | 16.1 | | |
| 5A1a | | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % NH ₄ Ac EXCH. | SATURATION EXTRACT SOLUBLE | | | | | |
| CATION EXCHANGE CAPACITY NH ₄ Ac | | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | | Na | K | | | | MOISTURE AT SATURATION % |
| | | ← milliequivalents per 100g. soil → | | | | | 5C1 | ← milliequivalents per liter → | | | | | |
| 24.8 | 17.1 | 6.3 | 6.3 | 0.1 | 0.5 | 97 | | | | | | | |
| 25.1 | 16.6 | 7.6 | 6.3 | 0.1 | 0.6 | 99 | | | | | | | |
| 29.6 | 17.4 | 8.8 | 6.3 | 0.2 | 0.6 | 91 | | | | | | | |
| 27.2 | 17.5 | 9.0 | 5.9 | 0.2 | 0.7 | | | | | | | | |
| 25.3 | 16.8 | 9.2 | 4.6 | 0.3 | 0.7 | | | | | | | | |
| 24.4 | 16.9 | 8.4 | 3.8 | 0.3 | 0.6 | | | | | | | | |

Soil type: Adair silty clay loam, silty variant
 Soil No.: S53Iowa-83-2
 Location: Northwest corner of NE1/4 of Sec. 13, T80N, R38W, Shelby County, Iowa.
 Site: 12 percent slope.
 Collected by and date: O. D. Friedrich, October 30, 1953.

Horizon and
 Lincoln
 Lab. Number

Ap
 5383 0 to 7 inches. Very dark brown (10YR 2/2) heavy silt loam or light silty clay loam with weak medium granular structure; few, very fine, faint, yellowish red mottles; some thin gray coatings on ped; abrupt boundary.

AB
 5384 7 to 16 inches. Dark brown (10YR 3.5/3) slightly gritty medium to heavy silty clay loam; moderate very fine subangular blocky structure; some dark material from A horizon in worm channels; clear boundary.

B21
 5385 16 to 22 inches. Variegated very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) to brown (10YR 4/3); crushed color dark brown (10YR 3.5/3); gritty silty clay or clay; moderate very fine subangular blocky structure with moderate vertical cleavage; some dark coatings on ped and a few fine yellowish red mottles; clear boundary.

B22
 5386 22 to 29 inches. Brown (10YR 4.5/3) gritty silty clay or clay; moderate very fine subangular blocky structure with strong vertical cleavage; many very fine faint yellowish red mottles and some dark oxide concretions; clear boundary.

B3
 5387 29 to 36 inches. 10YR 5/3 gritty silty clay or clay; weak very fine subangular blocky with weak vertical cleavage; many 5YR 4/6 mottles and some dark mottles; clear boundary.

C
 5388 36 to 45 inches. Mottled dark brown (10YR 4/2) and dark brown to brown (10YR 4/3 to 5/3); gritty light silty clay with numerous distinct yellowish red (5YR 4/6) mottles, crushed color 10YR 4/3; weak very fine subangular blocky structure approaching massive; compact and prismatic when dry; many dark oxide concretions.

OIL TYPE Adair

LOCATION Shelby County, Iowa

silt loam

SOIL NOS. S55Iowa-83-2

LAB. NOS. 5360-5369

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|---|-------------------------------------|--|-----------------|-------------|------------------------|--|--------------------------------------|------------------------|---------------|--------------|-----------------------------|----------------|-----|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | 0.2-0.02 | 0.02-0.002 | > 2 (< 9mm) | | |
| 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | | | | |
| 0-6 | Ap | 0.6 | 1.4 | 1.8 | 4.0 | 3.6 | 61.9 | 26.7 | 41.0 | 26.9 | - | sil | |
| 6-12 | A1 | 0.7 | 1.8 | 2.3 | 4.8 | 4.2 | 57.0 | 29.2 | 35.7 | 28.4 | Tr. | sic1 | |
| 12-19 | A3B1 | 1.0 | 3.6 | 2.8 | 6.7 | 4.9 | 50.2 | 30.8 | 34.3 | 25.0 | Tr. | sic1 | |
| 19-25 | B1 | 1.7 | 2.5 | 2.9 | 6.8 | 5.6 | 44.7 | 35.8 | 31.8 | 22.5 | Tr. | sic1 | |
| 25-31 | B21 | 2.5 | 2.6 | 2.9 | 6.5 | 5.5 | 39.0 | 41.0 | 28.6 | 19.8 | Tr. | c | |
| 31-37 | B22 | 1.4 | 2.8 | 3.3 | 7.6 | 6.2 | 41.1 | 37.6 | 31.2 | 20.7 | 1 | cl | |
| 37-42 | B3 | 4.6 | 3.7 | 3.9 | 9.6 | 7.2 | 33.2 | 37.8 | 28.7 | 16.8 | 5 | cl | |
| 42-46 | C1 | 2.3 | 3.6 | 4.1 | 10.5 | 8.2 | 33.8 | 37.5 | 29.9 | 17.7 | 3 | cl | |
| 46-55 | C2 | 2.1 | 4.3 | 4.7 | 11.8 | 9.1 | 33.6 | 34.4 | 32.1 | 16.8 | 2 | cl | |
| 55-62 | Cca | 2.0 | 4.2 | 4.7 | 11.5 | 9.0 | 36.0 | 32.6 | 31.7 | 19.2 | 1 | cl | |
| pH | 8C1a | ORGANIC MATTER | | | EST. SALT (BUREAU CUP) | ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM 8A1a | MOISTURE TENSIONS | | | | 4B2 IS ATMOS. % | | |
| | | 6A1a ORGANIC CARBON % | 6B1a NITROGEN % | C/N | | | 6E1a CoCO ₂ equiv-olent % | GYPSSUM mg./100g. SOIL | 1/10 ATMOS. % | 1/3 ATMOS. % | | | |
| 7.2 | 7.4 | 7.6 | 1.12 | .106 | 10.6 | 0.6 | | | | | | 11.2 | |
| 7.1 | 7.3 | 7.4 | 0.44 | .056 | 7.8 | 0.5 | | | | | | 10.5 | |
| 7.1 | 7.4 | 7.4 | 0.31 | .047 | 6.6 | 0.5 | | | | | | 11.0 | |
| 7.1 | 7.3 | 7.4 | 0.23 | .036 | 6.4 | 0.5 | | | | | | 12.8 | |
| 7.2 | 7.5 | 7.5 | 0.22 | | | 0.4 | | | | | | 14.5 | |
| 7.3 | 7.5 | 7.5 | 0.17 | | | 0.4 | | | | | | 13.4 | |
| 7.4 | 7.6 | 7.6 | 0.12 | | | 0.4 | | | | | | 13.7 | |
| 7.5 | 7.7 | 7.8 | 0.12 | | | 0.5 | | | | | | 13.4 | |
| 7.4 | 7.7 | 7.8 | 0.09 | | | 0.4 | | | | | | 12.8 | |
| 7.3 | 8.4 | 8.6 | 0.05 | | | 0.5 | | | | | | 12.0 | |
| 5A1a | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % NH ₄ & EXCH. | SATURATION EXTRACT SOLUBLE 8A1 | | | | 8A MOISTURE AT SATURATION % | | |
| CATION EXCHANGE CAPACITY NH ₄ Ac | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | | 6F1a Na | 6Q1a K | 6N1a Ca | 6O1a Mg | | | |
| | ← milliequivalents per 100g. soil → | | | | | | ← milliequivalents per liter → | | | | | | |
| 21.7 | 16.4 | 5.5 | 2.1 | - | 0.4 | 0.4 | 0.1 | 4.2 | 1.6 | | | 48.9 | |
| 20.7 | 15.6 | 5.3 | 2.5 | 0.1 | 0.3 | 0.6 | 0.1 | 3.3 | 1.4 | | | 47.0 | |
| 20.9 | 16.2 | 5.5 | 2.5 | 0.1 | 0.4 | 0.6 | - | 2.7 | 1.3 | | | 50.2 | |
| 23.4 | 18.2 | 5.7 | 2.5 | 0.1 | 0.4 | 0.7 | 0.1 | 3.2 | 1.6 | | | 50.1 | |
| 27.2 | 21.3 | 7.1 | 2.9 | 0.2 | 0.5 | 0.6 | - | 2.0 | 0.7 | | | 57.7 | |
| 25.2 | 19.5 | 6.4 | 2.1 | 0.1 | 0.5 | 0.7 | - | 2.2 | 1.1 | | | 54.8 | |
| 25.5 | 19.9 | 6.6 | 1.7 | 0.2 | 0.5 | 0.7 | - | 2.2 | 1.2 | | | 55.2 | |
| 23.9 | 18.9 | 6.2 | 1.3 | 0.1 | 0.5 | 0.8 | 0.1 | 2.5 | 1.2 | | | 58.2 | |
| 21.3 | 16.8 | 5.7 | 1.2 | 0.1 | 0.4 | 0.6 | - | 2.0 | 1.1 | | | 58.9 | |
| 18.3 | | 4.8 | 0.4 | 0.1 | 0.4 | 0.7 | 0.1 | 2.9 | 1.2 | | | 55.7 | |

Soil type: Adair silt loam

Soil No.: 855Iowa-83-2

Location: 30 yards south and 130 yards east of northwest corner of NW1/4 of NW1/4 of Sec. 30, Monroe Township, T78N, R38W, Shelby County, Iowa.

Slope: West-facing.

Collected by and date: R. Prill, W. Jury, and M. Koppen, September, 1955.

Horizon and

Lincoln

Lab. Number

Ap
5360 0 to 6 inches. Dark brown to brown (10YR 4/3) silt loam with fine granular structure; friable; (mixture from loess on slope above in till-like material--pedi-sediment?)

A1
5361 6 to 12 inches. Dark brown to brown (10YR 4/3) heavy silt loam with moderate medium subangular blocky structure; slightly hard; abundant pinholes; boundary abrupt.

A3B1
5362 12 to 19 inches. Dark brown to brown (10YR 4/3) medium silty clay loam with common, coarse, very dark grayish brown (10YR 3/2) mottles; moderate medium subangular blocky structure; slightly hard; pinholes abundant; diffuse boundary.

B1
5363 19 to 25 inches. Dark reddish brown (5YR 3/4) heavy silty clay loam; moderate medium subangular blocky; slightly hard to hard; boundary diffuse; pinholes present.

B21
5364 25 to 31 inches. Dark reddish brown (5YR 3/4) clay, 45 to 50 percent estimate, with few fine yellowish brown (10YR 5/4) mottles; strong fine subangular blocky structure; very firm; gradual boundary.

B22
5365 31 to 37 inches. Same description as B21 except boundary diffuse.

B3
5366 37 to 42 inches. Yellowish brown (10YR 5/6) medium clay loam with common, fine, dark reddish brown (5YR 3/4) mottles; weak medium subangular blocky structure; firm; few iron and manganese concretions; clear boundary.

C1
5367 42 to 46 inches. Yellowish brown (10YR 5/6) light clay loam with few dark reddish brown (5YR 3/4) mottles; firm; massive; diffuse boundary.

C2
5368 46 to 55 inches. Yellowish brown (10YR 5/6) light clay loam with few fine, dark reddish brown (5YR 4/3) and few very dark grayish brown (2.5Y 3/2) mottles; massive; firm; diffuse boundary.

Oca
5369 55 to 62 inches. Yellowish brown (10YR 5/6) light clay loam with fine common very dark grayish brown (2.5Y 3/2) mottles; massive; firm; calcareous; clear boundary.

Note: Colors are for moist conditions.

Soil type: Arbor silty clay loam

Soil No.: 856Iowa-1-1

Location: Greenfield Quadrangle; 130 feet west and 66 feet north of southeast corner of northwest quarter of northeast quarter of southeast quarter of Section 18, T76N, R31W, Adair County, Iowa, on lower 1/3 of 12 percent slope.

Slope: 12 percent.

Vegetation: Bluegrass.

Collected by and date: R. B. Daniels, July 10, 1956.

Horizon and

Beltsville

Lab. Number

| | |
|-----------------------------|--|
| A11 5704 | 0 to 5 inches. Very dark brown (10YR 2/2) friable gritty light to medium silty clay loam; moderate to strong, fine and very fine granular structure; gradual boundary to A12. |
| A12 5705 | 5 to 15 inches. Very dark brown (10YR 2/2) friable gritty medium silty clay loam; strong fine and medium granular structure; gradual boundary to AB. |
| AB 5706 | 15 to 19 inches. Very dark gray brown (10YR 3/2) friable gritty medium silty clay loam to clay loam with more sand than A12; moderate to strong fine subangular blocky structure; clear boundary to B21. |
| B21 5707 | 19 to 22 inches. Mixed dark brown and very dark gray brown (10YR 4/3 and 3/2) friable medium clay loam; moderate to strong fine subangular blocky structure with thin continuous clay skins; abrupt boundary to B22 (stone line). |
| B22 (stone line) 5708 | 22 to 24 inches. Dark brown (10YR 4/3) firm medium clay loam with some mixing of very dark gray brown (10YR 3/2); moderate fine subangular blocky structure with thin continuous clay skins; this horizon has a concentration of gravel and occasional cobbles up to 5 inches in diameter; abrupt boundary to IIB23 and Kansan till. |
| IIB23 5709 | 24 to 34 inches. Dark brown (10YR 4/3) firm medium clay loam; weak to moderate fine and medium subangular blocky structure with medium continuous clay skins; gradual boundary to IIB31. |
| IIB31 5710 | 34 to 45 inches. Dark brown (10YR 4/3) firm medium clay loam; few fine gray brown and strong brown (2.5Y 5/2 and 7.5YR 5/6) mottles; weak medium blocky structure with thin continuous clay skins; clear boundary to B32. |
| IIB32 5711 | 45 to 55 inches. Dark yellowish brown (10YR 4/4) medium to light calcareous clay loam; few fine gray brown, yellowish red and strong brown (2.5Y 5/2, 5YR 4/6 and 7.5YR 5/6) mottles; weak to very weak medium to coarse blocky structure with thin discontinuous clay skins; few carbonate concretions less than 1/8-inch in diameter at the boundary of the IIB31 and IIB32; gradual to diffuse boundary to IIC. |
| IIC 5712 | 55 to 72 inches. Dark yellowish brown (10YR 4/4) firm calcareous medium to light clay loam; common fine to coarse strong brown (7.5YR 5/6), few to common fine to medium gray brown (2.5Y 5/2), and few fine and medium yellowish red (5YR 4/6) mottles and few fine dark oxides; massive with thin discontinuous clay skins along vertical cleavage planes. |

Note: Roman II parent material is Kansan till; above is waterway sediment.

SOIL SURVEY LABORATORY Baltimore, Maryland

SOIL TYPE Arbor loam **LOCATION** Adair County, Iowa

SOIL NOS. 856Iowa-1-2 **LAB. NOS.** 5713-5721

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|------------------------------|---------------------------------|--|-------------|-------------|----------------|-------------------------|---|----------------------------|-------------------|------------------------------|-----------------------|--------------------------|
| | | 1B1b | | 3A1 | | | | | 2A2 | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | > 2 ($< 76\mu$) | | | |
| 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | | | |
| 0-6 | A1p | 1.4 | 5.4 | 8.2 | 15.7 | 8.6 | 34.9 | 25.8 | 35.8 | 16.2 | <1 | 1 |
| 6-12 | A12 | 1.2 | 5.0 | 7.7 | 14.7 | 8.5 | 35.9 | 27.0 | 35.1 | 17.3 | <1 | 1/cl |
| 12-16 | AB | 1.6 | 5.1 | 7.1 | 13.2 | 8.3 | 36.7 | 28.0 | 34.0 | 18.1 | 1 | cl |
| 16-21 | B21 | 2.4 | 5.3 | 7.2 | 13.4 | 9.1 | 35.6 | 27.0 | 33.8 | 18.1 | 3 | 1/cl |
| 21-23 | B22 | 3.7 | 5.8 | 7.4 | 14.3 | 10.0 | 33.4 | 25.4 | 34.2 | 17.1 | 23 | 1 |
| 23-30 | ITB23 | 2.9 | 5.8 | 7.8 | 15.0 | 11.4 | 32.8 | 24.3 | 35.6 | 17.1 | 3 | 1 |
| 30-40 | ITB31 | 2.5 | 6.0 | 8.0 | 15.8 | 10.7 | 32.4 | 24.6 | 35.7 | 16.5 | 2 | 1 |
| 40-50 | ITB32 | 1.8 | 4.2 | 6.0 | 12.4 | 9.6 | 34.8 | 31.2 | 32.5 | 18.8 | <1 | cl |
| 50-61 | IIC | 2.1 | 4.8 | 6.0 | 12.4 | 9.2 | 37.6 | 27.9 | 33.0 | 20.9 | 4 | cl/1 |
| pH | | ORGANIC MATTER | | | | ESTR. SALT (BUREAU CUP) | ELECTRICAL CONDUCTIVITY EC $\cdot 10^3$ MILLIMHOS PER CM @25-C. | 6E1e | | MOISTURE TENSIONS | | |
| 8C1a | 1:5 | 1:10 | 6A1a | 6B1a | ORGANIC CARBON | | | NITROGEN | C/N | CaCO ₃ equivalent | GYPSUM mg./100g. SOIL | 1/10 ATMOS. |
| 1:1 | | | % | % | | | | % | | % | % | % |
| 5.4 | | | 1.77 | 0.166 | 10.7 | | | | | | | |
| 5.4 | | | 1.41 | 0.133 | 10.6 | | | | | | | |
| 5.3 | | | 0.97 | 0.096 | 10.1 | | | | | | | |
| 5.4 | | | 0.70 | 0.072 | 9.7 | | | | | | | |
| 5.4 | | | 0.51 | 0.056 | 9.1 | | | | | | | |
| 5.6 | | | 0.31 | 0.040 | 7.8 | | | | | | | |
| 5.8 | | | 0.22 | 0.030 | | | | | | | | |
| 6.3 | | | 0.20 | 0.031 | | | | | | | | |
| 7.6 | | | 0.10 | | | | | 10 | | | | |
| 5A3a | | EXTRACTABLE CATIONS | | | | 5B1a | BASE SAT. % | SATURATION EXTRACT SOLUBLE | | | | MOISTURE AT SATURATION % |
| CATION EXCHANGE CAPACITY Sum | 6N2d | 6O2b | 6H1a | 6P2a | 6Q2a | No | | K | | | | |
| | Ca | Mg | H | Na | K | | | | | | | |
| | milliequivalents per 100g. soil | | | | | 5C3 | milliequivalents per liter | | | | | |
| 22.1 | 10.0 | 2.8 | 8.9 | <0.1 | 0.4 | 60 | | | | | | |
| 21.7 | 9.9 | 2.8 | 8.7 | <0.1 | 0.3 | 60 | | | | | | |
| 20.3 | 10.3 | 2.8 | 6.9 | <0.1 | 0.3 | 66 | | | | | | |
| 18.7 | 10.5 | 2.8 | 5.1 | <0.1 | 0.3 | 73 | | | | | | |
| 16.9 | 10.2 | 2.1 | 4.2 | 0.1 | 0.3 | 75 | | | | | | |
| 16.5 | 10.0 | 2.7 | 3.4 | 0.1 | 0.3 | 79 | | | | | | |
| 14.4 | 10.2 | 1.4 | 2.4 | 0.1 | 0.3 | 83 | | | | | | |
| 18.1 | 13.2 | 2.4 | 2.2 | <0.1 | 0.3 | 88 | | | | | | |
| | calcareous | | | | | | | | | | | |

Soil type: Arbor loam
 Soil No.: S56Iowa-1-2
 Location: Greenfield Quadrangle; 490 feet east and 100 feet south of northwest corner of northwest quarter of southeast quarter of northwest quarter of Section 18, T76N, R31W, Adair County, Iowa.
 Slope: 14 percent, slightly concave.
 Vegetation: Cultivated field.
 Collected by and date: R. B. Daniels, F. J. Carlisle, and G. H. Simonson, July 26, 1956.

Horizon and
 Beltsville
 Lab. Number

- Alp
 5713 0 to 6 inches. Very dark brown to very dark gray brown (10YR 2.5/2) very friable heavy loam; cloddy, which breaks to weak fine granular; very dark brown to very dark gray brown (10YR 2.5/2) crushed and dark gray brown (10YR 4/2) dry; clear boundary to A12.
- A12
 5714 6 to 12 inches. Very dark brown (10YR 2/2) very friable heavy loam; weak fine and very fine granular structure; very dark brown to very dark gray brown (10YR 2.5/2) crushed and dark gray brown (10YR 4/2) dry; clear boundary to AB.
- AB
 5715 12 to 16 inches. Very dark gray brown (10YR 3/2) very friable heavy loam to light clay loam with some mixing of very dark brown (10YR 2/2) along channels; weak to moderate fine and very fine subangular blocky structure; very dark gray brown to dark gray brown (10YR 3.5/2) crushed and brown (10YR 5/3) dry; clear boundary to B21.
- B21
 5716 16 to 21 inches. Dark brown (10YR 4/3) friable light clay loam with some mixing of very dark brown and very dark gray brown (10YR 2/2 and 3/2) along vertical channels; weak fine subangular blocky structure with thin discontinuous coatings but identification as clay skins doubtful; dark brown (10YR 4/3) and brown (10YR 5/3) dry; abrupt boundary to B22.
- B22
 (stone line)
 5717 21 to 23 inches. Dark brown (10YR 4/5) friable light clay loam with some mixing of very dark brown and very dark gray brown (10YR 2/2 and 3/2) along vertical channels; weak fine subangular blocky structure with thin discontinuous coatings; material greater than 2-mm. ranges up to 7 inches in diameter, but is dominantly less than 2 inches in diameter; abrupt boundary to IIB23 and Kansan till.
- IIB23
 5718 23 to 30 inches. Dark brown to brown (10YR 4.5/3) friable light to medium clay loam with an increase in coarse sand over the B21; weak fine subangular blocky structure with thin discontinuous clay skins; dark yellowish brown (10YR 4/4) crushed and yellowish brown to light yellowish brown (10YR 5.5/4) dry; clear boundary to IIB31.
- IIB31
 5719 30 to 40 inches. Dark brown to dark yellowish brown (10YR 4/3.5) slightly firm light clay loam; common fine to medium faint to distinct gray brown (2.5Y 5/2) and strong brown mottles which have a tendency to be arranged in indistinct horizontal bands; weak medium blocky structure with few smooth surfaces which cannot be identified with certainty as clay skins; gradual boundary to IIB32.
- IIB32
 5720 40 to 50 inches. Dark brown (1Y 4/3) slightly firm light clay loam; fine distinct strong brown to dark brown and gray brown (2.5Y 5/2) mottles; distinct strong brown (7.5YR 5/6) which grades to dark brown (7.5YR 4/4), horizontal bands which range in width from 1/4 to 1-1/2 inches; bands are continuous across the face of the pit; very weak medium to coarse blocky with a few smooth coatings; clear boundary to IIC.
- IIC
 5721 50 to 61 inches. Dark brown (1Y 4/3) firm massive calcareous light clay loam; many medium distinct light olive gray (5Y 6/2) and dark yellowish brown to strong brown mottles; common white carbonate concretions less than 1/4-inch in diameter; abrupt boundary to D1.
- D1
 61 to 65 inches. Gray to light olive gray (5Y 6/1 to 6/2) friable massive calcareous light clay loam to sandy clay loam; common medium dark yellowish brown and strong brown; gradual boundary to D2.
- D2
 65 to 88 inches. Stratified yellowish brown to gray brown calcareous medium to coarse sands; clear boundary to D3.
- D3
 88 inches plus. Gray to light olive gray (5Y 6/1 to 6/2) calcareous light clay loam to sandy clay loam.

Note: Roman II parent material is Kansan till; above is waterway sediment.

SOIL SURVEY LABORATORY Lincoln, Nebr. 1/27/58

SOIL TYPE *Bonair loam LOCATION Howard County, Iowa

SOIL NOS. S56Iowa-45-11-(1-10) LAB. NOS. 4944-4953

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------------------|---------|--|----------------------|-------------------------|------------------------|-----------------------------|--|--------------------------------|--------------------------------|------------|--------------------------|--------------------------|-----|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND 2-7 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 ($\leq 9\mu m$) | | |
| 0-8 | Ap | 1.0 | 8.4 | 8.7 | 11.1 | 3.6 | 52.3 | 14.9 | 30.6 | 29.4 | - | sil | |
| 8-12 | A21 | 1.2 | 8.3 | 9.6 | 12.8 | 3.6 | 47.8 | 16.7 | 29.1 | 26.9 | - | 1 | |
| 12-15 | A22 | 2.7 | 9.9 | 11.5 | 15.9 | 4.1 | 37.1 | 18.8 | 26.5 | 20.6 | Tr. | 1 | |
| 15-19 | IIB1 | 2.5 | 11.2 | 12.6 | 18.6 | 5.9 | 26.6 | 22.6 | 25.4 | 14.4 | 2 | scl | |
| 19-23 | IIB21 | 3.9 | 6.1 | 5.8 | 11.3 | 8.3 | 30.7 | 33.9 | 27.2 | 17.2 | 2 | cl | |
| 23-28 | IIB22 | 2.6 | 6.8 | 6.7 | 12.1 | 8.8 | 28.7 | 34.3 | 27.3 | 16.0 | - | cl | |
| 28-33 | IIB23 | 3.2 | 6.7 | 5.8 | 11.0 | 8.6 | 29.9 | 34.8 | 27.1 | 16.8 | 2 | cl | |
| 33-38 | IIB24 | 3.4 | 6.0 | 6.4 | 11.2 | 8.8 | 30.6 | 33.6 | 28.9 | 16.9 | 2 | cl | |
| 38-46 | IIB3 | 2.7 | 5.8 | 6.5 | 11.1 | 9.2 | 32.1 | 32.6 | 29.7 | 17.9 | Tr. | cl | |
| 46-55 | ITC1 | 4.2 | 5.9 | 6.0 | 10.7 | 9.1 | 33.7 | 30.4 | 29.1 | 20.0 | 2 | cl | |
| pH 8C1a | | ORGANIC MATTER | | | | | ELECTRICAL CONDUCTIVITY EC $\times 10^3$ MILLIMHOS PER CM @ 25°C | | 6E1a 4A3a | | MOISTURE TENSIONS | | |
| 1:1 | | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITROGEN % | C/N | | CoCO ₃ equivalent % | Vol. Wt. g/cc | | 15 ATMOS. % | | |
| 5.6 | 5.8 | 5.9 | 1.78 | .154 | 11.6 | | 0.5 | | | | 7.2 | | |
| 5.2 | 5.4 | 5.5 | 0.35 | .045 | 7.8 | | 0.3 | 1.46 | | | 6.1 | | |
| 5.1 | 5.4 | 5.5 | 0.24 | .033 | 7.3 | | 0.2 | | | | 6.8 | | |
| 4.9 | 5.3 | 5.4 | 0.23 | .029 | 7.9 | | 0.2 | | | | 7.5 | | |
| 4.8 | 5.2 | 5.3 | 0.28 | .030 | 9.3 | | 0.2 | | | | 10.8 | | |
| 4.7 | 5.2 | 5.3 | 0.27 | .027 | 10.0 | | 0.2 | 1.58 | | | 12.4 | | |
| 4.6 | 5.3 | 5.3 | 0.27 | | | | 0.2 | | | | 12.6 | | |
| 5.2 | 5.5 | 5.6 | 0.20 | | | | 0.2 | | | | 11.9 | | |
| 6.6 | 7.1 | 7.2 | 0.15 | | | | 0.3 | | | | 11.9 | | |
| 8.0 | 8.5 | 8.7 | 0.15 | | | | 0.5 | 5 | 1.80 | | 11.7 | | |
| 5A1a | | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % NH ₄ Ac EXCH. | | SATURATION EXTRACT SOLUBLE 6A1 | | | | |
| CATION EXCHANGE CAPACITY | | 6N2b Co | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | | 6P1a Na | 6Q1a K | 6N1a Ca | 6O1a Mg | MOISTURE AT SATURATION % | |
| ← NH ₄ Ac | | milliequivalents per 100g. soil → | | | | | 5C1 | ← milliequivalents per liter → | | | | | |
| 13.4 | 6.6 | 1.3 | 9.9 | - | 0.2 | 60 | 0.5 | 0.2 | 3.2 | 1.4 | 36.0 | | |
| 10.2 | 5.1 | 1.2 | 6.2 | - | 0.1 | 63 | 0.4 | 0.1 | 1.3 | 1.0 | 34.3 | | |
| 11.3 | 5.3 | 1.0 | 6.6 | - | 0.1 | 57 | 0.4 | 0.1 | 1.0 | 0.8 | 35.2 | | |
| 12.8 | 6.4 | 1.6 | 7.5 | - | 0.1 | 63 | 0.3 | 0.1 | 0.9 | 0.6 | 39.5 | | |
| 17.1 | 8.3 | 2.1 | 7.1 | - | 0.2 | 62 | 0.3 | 0.1 | 0.8 | 0.1 | 51.2 | | |
| 19.4 | 10.0 | 2.8 | 10.0 | 0.1 | 0.2 | 68 | 0.3 | 0.1 | 0.6 | 0.5 | 54.1 | | |
| 20.2 | 11.1 | 2.9 | 9.6 | 0.1 | 0.2 | 71 | 0.4 | 0.1 | 0.6 | 0.8 | 57.7 | | |
| 19.0 | 11.6 | 3.2 | 6.7 | 0.1 | 0.2 | 79 | 0.5 | 0.1 | 0.9 | 0.6 | 55.3 | | |
| 17.4 | 14.0 | 4.1 | 2.9 | 0.1 | 0.2 | | 0.6 | - | 1.6 | 0.9 | 54.3 | | |
| 14.3 | | 3.3 | - | 0.1 | 0.2 | | 0.7 | - | 2.8 | 1.1 | 51.4 | | |

Soil type: *Bonair loam
 Soil No.: 856Iowa-45-11-(1-10)
 Location: Approximately 615 feet west and 195 feet north of southeast corner of NW1/4 of Sec. 3, T98N, R13W,
 Howard County, Iowa.
 Vegetation or crop: Corn.
 Parent material: Firm Iowan till with silty overburden.
 Physiographic position: Ridge crest on upland about 1 mile from stream.
 Topography: Gently sloping to undulating.
 Slope: 3 percent.
 Drainage: Moderately well drained.
 Ground water: None observed within 55 inches.
 Permeability: Very slow for the firm till and moderate for the overburden.
 Moisture: Slightly moist.
 Described by: L. E. Tyler, October 17, 1956.

Horizon and
 Lincoln
 Lab. Number

Ap 0 to 8 inches. Very dark gray (10YR 3/1 moist) gritty silt loam; friable; moderate fine granular structure with a little weak platy; some A2 incorporated in Ap; boundary abrupt.
 4944

A21 8 to 12 inches. Mixed colors, approximately 80 percent brown (10YR 5/3 moist) and 20 percent dark gray brown (10YR 4/2 moist); crushed color dark gray brown (10YR 4/2 moist); gritty silt loam; friable; weak fine to very fine platy structure breaking to weak very fine subangular blocky; some mixing by worms; boundary gradual.
 4945

A22 12 to 15 inches. Brown (10YR 5/3 moist) heavy loam; crushed color brown (10YR 4.5/3 moist); friable; moderate very fine subangular blocky structure; boundary clear to gradual.
 4946

IIB1 15 to 19 inches. Dark gray brown (10YR 4/2 moist) with many medium faint dark brown to dark yellowish brown (10YR 4/3 to 4/4 moist) mottles; crushed color yellowish brown (10YR 5/4 moist); heavy loam to light clay loam; friable; moderate fine and very fine subangular blocky structure; pebble band (pebbles 1/2- to 1-inch diameter) occurs in this horizon; also much more grit in this horizon than in those above; boundary clear.
 4947

IIB21 19 to 23 inches. Prism faces light gray (10YR 7/1 dry); ped faces gray to light gray (5Y 6/1 moist) with common fine distinct yellowish brown (10YR 5/4 moist) mottles; ped interiors mixed gray (5Y 5/1 moist) and strong brown (7.5YR 5/6 moist); crushed color yellowish brown (10YR 5/6 moist); medium clay loam; firm; weak medium prismatic structure breaking to strong fine subangular blocky; a light gray coating present on vertical (prism) faces which carries to a limited degree into the horizon below; boundary clear.
 4948

IIB22 23 to 28 inches. Ped faces mixed dark gray to gray (N 4/0 to 5/0 moist) with common medium distinct dark brown (7.5YR 4/2 to 10YR 4/3 moist) mottles; interiors mixed, approximately 65 percent strong brown (7.5YR 4/6 moist) and 35 percent gray (5Y 5/1 moist); crushed color dark yellowish brown to yellowish brown (10YR 4.5/4 moist); medium clay loam; firm to very firm; moderate fine to medium prismatic breaking to strong medium angular blocky; faces become much darker in this horizon and old root channels are filled with very dark gray (N 3/0 moist) transported clay; boundary diffuse.
 4949

IIB23 28 to 33 inches. Ped faces gray (2.5Y 5/1 moist) with some dark gray to very dark gray (N 3/0 to 4/0 moist) transported clay streaks; also common medium distinct yellowish brown (10YR 5/4 moist) mottles; ped interiors mixed, approximately 40 percent gray (5Y 5/1 moist) and 60 percent dark yellowish brown (10YR 4/4 moist); crushed color yellowish brown (10YR 5/4 moist); medium clay loam; firm to very firm; moderate medium prismatic structure breaking to moderate medium to coarse blocky; dark-colored faces and clay in old root channels persist in this horizon; boundary diffuse.
 4950

IIB24 33 to 38 inches. Color, texture, and consistence as in above horizon; weak to moderate medium prismatic structure breaking to moderate coarse blocky; less of dark color on ped faces than in above horizon; boundary diffuse.
 4951

IIB3 38 to 46 inches. Ped faces gray (5Y 5/1 moist) with common medium distinct yellowish brown (10YR 5/4 moist) mottles; interiors mixed gray (5Y 5/1 moist) and dark yellowish brown to yellowish brown (10YR 4/4 to 5/6 moist); crushed color yellowish brown to light olive brown (10YR 5/4 to 2.5Y 5/4 moist); medium clay loam; firm; weak coarse prismatic breaking to weak coarse blocky; less of dark color on ped faces than in horizon above; this horizon and all above it are leached; boundary clear.
 4952

IIC1 46 to 55 inches. Ped faces mixed gray (5Y 5/1 moist), yellowish brown (10YR 5/4 moist) and brown (10YR 4/3 moist); interiors mixed, approximately 75 percent dark yellowish brown (10YR 4/4 moist) and 25 percent gray (5Y 5/1 moist); crushed color yellowish brown to light olive brown (10YR 5/4 to 2.5Y 5/4 moist); light to medium clay loam; firm; principally massive but with some vertical cleavage faces having streaks of transported clay on them; unleached.
 4953

Notes: Crevices filled with sand, ranging to sandy clay loam, were found in firm till beneath overburden and varied in width from 1-5 inches; sometimes widened into pockets. Although these were avoided on face described, at least 1 was present in area covered by each pit (2 by 5 feet). Prismatic structure described may not be evident under wet conditions; soil much dryer than normal due to long dry weather period. Textures are field estimates.

SOIL SURVEY LABORATORY Lincoln, Nebr. 1/27/58

SOIL TYPE *Bonair Loam LOCATION Howard County, Iowa

SOIL NOS. S56Iowa-45-12-(1-11) LAB. NOS. 4954-4964

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------------------|---------------------------------|--|-----------------------|-----------------|------------|--------------------------------------|--|--------------------------------|---------------|---------|--------------------------|-------------------|--|
| | | 1B1a | | 3A1 | | | | | 2A2 | | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | > 2 | < 0.002 | 0.02-0.002 (< 0.075mm) | | |
| 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.07 | 0.02-0.002 (< 0.075mm) | > 2 | | | | |
| 0-5 | Ap | 2.4 | 7.2 | 7.5 | 9.3 | 4.4 | 55.4 | 13.8 | 35.3 | 29.2 | - | sil | |
| 5-9 | A21 | 2.4 | 5.8 | 6.0 | 7.8 | 4.2 | 57.2 | 16.6 | 31.7 | 33.7 | Tr. | sil | |
| 9-12 | A22 | 3.8 | 6.1 | 5.9 | 8.8 | 6.1 | 47.1 | 22.2 | 30.4 | 27.6 | 3 | l | |
| 12-15 | B21 | 3.2 | 5.2 | 5.5 | 9.8 | 8.3 | 36.2 | 31.8 | 30.4 | 19.9 | Tr. | cl | |
| 15-19 | IIIB22 | 2.1 | 5.2 | 5.3 | 11.3 | 9.1 | 31.2 | 35.8 | 29.2 | 16.9 | Tr. | cl | |
| 19-23 | IIIB23 | 2.3 | 5.1 | 5.3 | 10.8 | 8.7 | 29.9 | 37.9 | 28.0 | 16.0 | 2 | cl | |
| 23-28 | IIIB24 | 2.6 | 5.2 | 5.0 | 10.4 | 8.5 | 31.1 | 37.2 | 27.7 | 17.1 | 1 | cl | |
| 28-36 | IIIB31 | 2.6 | 5.6 | 5.7 | 11.5 | 9.1 | 31.4 | 34.1 | 28.2 | 18.1 | 2 | cl | |
| 36-44 | IIIB32 | 3.2 | 6.8 | 7.3 | 12.3 | 9.4 | 30.8 | 30.2 | 31.0 | 16.4 | 3 | cl | |
| 44-51 | IIIC1 | 3.6 | 6.6 | 6.0 | 11.6 | 9.6 | 33.2 | 29.4 | 30.7 | 17.9 | 2 | cl | |
| 51-60 | IIIC2 | 3.2 | 5.8 | 5.2 | 11.1 | 9.4 | 35.6 | 29.7 | 31.0 | 19.0 | 4 | cl | |
| pH | 8C1a | | ORGANIC MATTER | | | EST. SALT (BUREAU CUP) | ELECTRIC CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM 6A1a | 6E1a | | 4A3a | | MOISTURE TENSIONS | |
| | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITROGEN % | C/N | | | CaCO ₃ equivalent % | Vol. Wt. g/cc | % | % | 15 ATMOS. % | |
| 6.0 | 6.1 | 6.2 | 1.34 | .120 | 11.2 | | 0.5 | | | | | 6.1 | |
| 5.0 | 5.3 | 5.3 | 0.38 | .042 | 9.0 | | 0.4 | | 1.56 | | | 6.1 | |
| 4.8 | 5.1 | 5.1 | 0.27 | .035 | 7.7 | | 0.4 | | | | | 7.5 | |
| 4.7 | 5.0 | 5.1 | 0.29 | .033 | 8.8 | | 0.3 | | | | | 10.2 | |
| 4.6 | 5.0 | 5.0 | 0.27 | .030 | 9.0 | | 0.2 | | | | | 11.9 | |
| 4.7 | 5.0 | 5.2 | 0.30 | .028 | 10.7 | | 0.3 | | | | | 13.2 | |
| 4.8 | 5.2 | 5.4 | 0.28 | .026 | 10.8 | | 0.2 | | 1.60 | | | 12.9 | |
| 6.1 | 6.4 | 6.5 | 0.17 | | | | 0.3 | | | | | 12.0 | |
| 7.4 | 7.7 | 7.7 | 0.12 | | | | 0.4 | | | | | 11.4 | |
| 8.1 | 8.5 | 8.8 | 0.10 | | | | 0.5 | 5 | | | | 11.2 | |
| 8.2 | 8.5 | 8.8 | 0.10 | | | | 0.4 | 7 | 1.73 | | | 11.2 | |
| CATION EXCHANGE CAPACITY | 5A1a EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % NH ₄ Ac EXCH. | SATURATION EXTRACT SOLUBLE 8A1 | | | | MOISTURE AT SATURATION % | | |
| | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | | 6P1a Na | 6Q1a K | 6N1a Ca | 6O1a Mg | | | |
| NH ₄ Ac | milliequivalents per 100g. soil | | | | | 5C1 | milliequivalents per liter | | | | % | | |
| 12.4 | 7.4 | 2.1 | 6.6 | - | 0.1 | 77 | 0.5 | - | 2.6 | 1.6 | | 37.5 | |
| 9.9 | 5.0 | 1.6 | 6.2 | - | 0.1 | 68 | 0.5 | - | 1.6 | 1.0 | | 34.3 | |
| 12.3 | 6.0 | 1.8 | 7.9 | - | 0.1 | 64 | 0.5 | 0.1 | 1.7 | 0.8 | | 38.5 | |
| 17.5 | 8.7 | 2.9 | 9.6 | - | 0.2 | 67 | 0.4 | 0.1 | 1.2 | 0.9 | | 46.3 | |
| 20.0 | 10.0 | 3.0 | 10.1 | 0.1 | 0.2 | 66 | 0.4 | 0.1 | 1.0 | 0.6 | | 62.1 | |
| 21.6 | 11.7 | 3.8 | 9.7 | 0.1 | 0.2 | 73 | 0.5 | 0.1 | 1.0 | 0.6 | | 57.3 | |
| 21.0 | 12.6 | 3.6 | 8.4 | 0.1 | 0.2 | 78 | 0.5 | 0.1 | 1.1 | 0.3 | | 64.8 | |
| 19.0 | 14.1 | 3.8 | 3.3 | 0.1 | 0.2 | 96 | 0.7 | - | 1.5 | 1.0 | | 55.4 | |
| 16.3 | 13.6 | 3.6 | 1.7 | 0.1 | 0.2 | | 0.7 | - | 1.9 | 0.6 | | 53.0 | |
| 14.2 | | 3.7 | - | 0.1 | 0.2 | | 0.7 | - | 2.7 | 1.1 | | 55.4 | |
| 13.7 | | 3.3 | - | 0.1 | 0.2 | | 0.7 | - | 2.6 | 1.0 | | 55.6 | |

Soil type: *Bonair loam
 Soil No.: S56Iowa-45-12-(1-11)
 Location: Approximately 1325 feet north and 1360 feet west of southeast corner of Sec. 33, T99N, R13W, Howard County, Iowa.
 Vegetation or crop: Red clover and timothy seeding.
 Parent material: Firm Iowan till with silty overburden.
 Physiographic position: Ridge crest on upland about 1/2 mile from stream.
 Topography: Gently sloping to undulating.
 Slope: 3 percent.
 Drainage: Moderately well drained.
 Ground water: None observed within 60 inches.
 Permeability: Very slow for the firm till and moderate for the overburden.
 Moisture: Slightly moist.
 Described by: L. E. Tyler, October 17, 1956.

Horizon and
 Lincoln
 Lab. Number

Ap 0 to 5 inches. Very dark gray (10YR 3/1 moist) gritty silt loam; friable; moderate fine granular structure; some A2 mixed in Ap; boundary abrupt.
 4954

A21 5 to 9 inches. Brown (10YR 5/3 moist) to light gray (10YR 7/2 dry) gritty silt loam; crushed color dark gray brown (10YR 4/2 moist); friable; weak very fine platy structure; boundary gradual.
 4955

A22 9 to 12 inches. Gray brown to brown (10YR 5/2.5 moist) with common fine faint yellowish brown (10YR 5/4 moist) mottles; crushed color dark yellowish brown to yellowish brown (10YR 4.5/4 moist); heavy loam to light clay loam; friable to very slightly firm; moderate fine to very fine subangular blocky structure; boundary gradual.
 4956

B21 12 to 15 inches. Ped surfaces gray brown to brown (10YR 5/2 to 5/3 moist); light gray (10YR 7/2 dry); ped interiors dark yellowish brown (10YR 4/4 moist) with few fine faint yellowish brown (10YR 5/4 moist) mottles; crushed color dark yellowish brown (10YR 4/6 moist); medium clay loam; moderately firm; strong fine subangular blocky structure; pebble band in this horizon and extending into the horizon directly above and the one below; boundary clear.
 4957

IIB22 15 to 19 inches. Block faces dark gray (N 4/0 moist) with many fine distinct dark brown to brown (7.5YR 4/4) mottles; prism faces principally gray (5Y 5/1 moist); ped interiors mixed, approximately 50 percent dark gray (N 4/0 moist) and 50 percent dark yellowish brown (10YR 4/4 moist); crushed color dark yellowish brown to yellowish brown (10YR 4.5/4 moist); medium clay loam; firm; weak fine to medium prismatic structure breaking to strong fine to medium subangular blocky; dark color on peds that is so evident in the two horizons directly below is masked to quite an extent by light gray in this horizon; boundary gradual.
 4958

IIB23 19 to 23 inches. Prism faces gray (2.5Y 5/1 moist) with common medium distinct yellowish brown (10YR 5/4, moist) mottles; block faces very dark gray to dark gray (N 3/0 to 4/0 moist) with many medium distinct dark yellowish brown (10YR 4/4 moist) mottles; interiors mixed, approximately 60 percent strong brown (7.5YR 4/6 moist) and 40 percent dark gray (N 4/0 moist); crushed color yellowish brown to light olive brown (10YR 5/4 to 2.5Y 5/4 moist); medium clay loam; firm to very firm; moderate to strong medium prismatic structure breaking to moderate medium blocky; relatively dark ped surfaces in this horizon; boundary diffuse.
 4959

IIB24 23 to 28 inches. Prism faces dark gray (N 4/0 moist) with few medium distinct yellowish brown (10YR 5/4 moist) mottles; block faces mixed, approximately 50 percent dark gray (2.5Y 4/1 moist) and 50 percent dark yellowish brown (10YR 4/4 moist); ped interiors dark yellowish brown (10YR 4/4 moist) with very fine gray mottles and soft iron-manganese concretions; crushed color dark yellowish brown to yellowish brown (10YR 4.5/4); medium clay loam; very firm to firm; moderate to strong medium prismatic structure breaking to strong medium to coarse blocky; transported clay tends to be more concentrated in old root channels than in above horizon; boundary diffuse.
 4960

IIB31 28 to 36 inches. Ped surfaces mixed, approximately 60 percent dark brown to brown (10YR 4/3 moist) and 40 percent gray (5Y 5/1 moist); ped interiors mixed, approximately 65 percent dark yellowish brown to yellowish brown (10YR 4/4 to 5/6 moist) and 35 percent gray (5Y 5/1 moist); crushed color dark yellowish brown to yellowish brown (10YR 4.5/4 moist); medium clay loam; firm to very firm; moderate medium to coarse prismatic structure breaking to moderate coarse blocky; cleavage faces as a whole not covered with dark coatings but some 1/4-inch diameter root channels filled with very dark gray (N 3/0 moist) transported clay; boundary diffuse.
 4961

IIB32 36 to 44 inches. Ped faces mixed, approximately 1/3 yellowish brown (10YR 5/4 moist), 1/3 dark gray (2.5Y 4/1 moist) and 1/3 gray brown (2.5Y 5/2 moist) ped interiors mixed, approximately 75 percent yellowish brown (10YR 5/6 moist) and 25 percent gray (5Y 5/1 moist); crushed color yellowish brown to dark yellowish brown (10YR 4.5/4 moist); medium clay loam; firm to very firm; weak coarse prismatic structure breaking to weak coarse blocky; less of dark coatings on faces than in above horizon but many tiny root channels containing transported clay; this horizon and all above leached; boundary clear.
 4962

IIC1 44 to 51 inches. Ped surfaces mixed gray (5Y 5/1 moist), dark brown to brown (10YR 4/3 moist), and yellowish brown (10YR 5/4 moist); ped interiors mixed, approximately 50 percent dark yellowish brown (10YR 4/4 moist) and 50 percent gray (5Y 5/1 moist); crushed color yellowish brown (10YR 5/4 moist); light to medium clay loam; firm; principally massive but with few large weak vertical faces; discontinuous 1-inch band of iron accumulation at upper boundary of horizon; unleached; boundary diffuse.
 4963

IIC2 51 to 60 inches. Cleavage surfaces mixed dark gray brown (10YR 4/2 moist) and gray (5Y 5/1 moist); interiors mixed, about 50 percent 10YR 4/6 moist and 50 percent 5Y 5/1 moist; some concretions 10YR 5/8, moist which crush to 10YR 5/4, moist. Texture, consistence and structure as in above horizon.
 4964

Notes: See notes on Profile No. S56Iowa-45-11.

SOIL TYPE Clarinda LOCATION Shelby County, Iowa
 silty clay

SOIL NOS. S53Iowa-83-4 LAB. NOS. 5389-5395

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|---|---------|--|-------------|--------------|------------|--------------------------------------|--|----------------------------|---------|------------|--------------------------|----------------|------|
| | | 1B1a | | 3A1 | | | | | | 2A2 | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | > 2 | < 0.002 | | | |
| 2.1 | 1.0-0.5 | 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 | (0.9mm) | | | | |
| 0-6 | Ap | 0.3 | 0.6 | 0.9 | 2.0 | 1.7 | 58.9 | 35.6 | 33.7 | 27.9 | - | sic1 | |
| 6-11 | B1 | 0.3 | 0.6 | 0.9 | 1.8 | 1.6 | 51.6 | 43.2 | 28.6 | 25.7 | - | sic | |
| 11-16 | B2 | 0.4 | 0.6 | 0.7 | 1.8 | 1.7 | 50.1 | 44.7 | 25.5 | 27.4 | - | sic | |
| 16-23 | B3 | 0.4 | 0.9 | 1.1 | 2.3 | 2.2 | 51.3 | 41.8 | 28.2 | 26.7 | Tr. | sic | |
| 23-33 | C1 | 0.5 | 0.9 | 1.3 | 2.7 | 2.2 | 53.4 | 39.0 | 28.8 | 28.4 | Tr. | sic1 | |
| 33-40 | C2 | 0.4 | 1.8 | 2.6 | 4.6 | 3.1 | 48.8 | 38.7 | 31.2 | 23.3 | Tr. | sic1 | |
| 40-46 | C3 a/ | 0.4 | 1.4 | 2.1 | 3.9 | 3.3 | 43.8 | 45.1 | 29.7 | 19.7 | Tr. | sic | |
| pH | | ORGANIC MATTER | | | | EST'S SALT (BUREAU CUP) | ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHS PER CM | MOISTURE TENSIONS | | | | | |
| 8C1a | | 6A1a | | 6B1a | | | | 6E1a | | 4B2 | | | |
| 1:5 | | ORGANIC CARBON % | | NITROGEN C/N | | CaCO ₃ equiv- alent | | 1/10 ATMOS. | | 1/3 ATMOS. | | 15 ATMOS. | |
| 1:10 | | | | | | | | | | | | | |
| 5.5 | 5.8 | 5.9 | 2.63 | .230 | 11.4 | | | | | | | | 15.0 |
| 5.6 | 5.8 | 6.0 | 1.06 | .093 | 11.4 | | | | | | | | 16.4 |
| 5.5 | 5.6 | 5.7 | 0.81 | .073 | 11.1 | | | | | | | | 17.0 |
| 5.4 | 5.7 | 5.8 | 0.43 | .040 | 10.8 | | | | | | | | 16.3 |
| 5.8 | 6.0 | 6.1 | 0.25 | .030 | 8.3 | | | | | | | | 15.1 |
| 6.2 | 6.5 | 6.5 | 0.18 | | | | | | | | | | 16.0 |
| 6.4 | 6.8 | 6.9 | 0.13 | | | | | | | | | | 19.0 |
| 5A1a | | EXTRACTABLE CATIONS | | | | BASE SAT. % NH ₄ Ac EXCH. | SATURATION EXTRACT SOLUBLE | | | | MOISTURE AT SATURATION % | | |
| CATION EXCHANGE CAPACITY NH ₄ Ac | | 6N2b | 6O2b | 6H1a | 6P2a | | 6Q2a | Na | K | | | | |
| | | milliequivalents per 100g. soil | | | | 5C1 | | milliequivalents per liter | | | | | |
| 28.9 | 16.4 | 6.3 | 10.5 | 0.1 | 0.6 | 81 | | | | | | | |
| 28.5 | 18.1 | 8.4 | 8.0 | 0.2 | 0.6 | 96 | | | | | | | |
| 27.5 | 17.9 | 8.9 | 8.5 | 0.2 | 0.6 | | | | | | | | |
| 26.4 | 16.6 | 8.6 | 6.3 | 0.3 | 0.6 | | | | | | | | |
| 23.9 | 16.0 | 8.2 | 4.6 | 0.3 | 0.6 | | | | | | | | |
| 24.5 | 16.8 | 8.5 | 3.4 | 0.4 | 0.6 | | | | | | | | |
| 30.3 | 19.9 | 9.5 | 3.8 | 0.4 | 0.6 | | | | | | | | |

a/ Shot (Mn) present in sand fraction.

Soil type: Clarinda silty clay
 Soil No.: S53Iowa-83-4
 Location: Northwest corner of NW1/4 of NW1/4 of Sec. 1, T78N, R37W, Shelby County, Iowa.
 Site: 9 percent slope.
 Collected by and date: O. D. Friedrich, 1953.

Horizon and
 Lincoln
 Lab. Number

Ap
 5389 0 to 6 inches. Very dark brown (10YR 2/2) light silty clay which contains some gray streaks; granular structure; abrupt boundary.

B1
 5390 6 to 11 inches. Very dark grayish brown (10YR 3/2) gritty light silty clay with some darker ped coatings; very fine subangular blocky structure with weak vertical cleavage.

B2
 5391 11 to 16 inches. Dark gray to dark grayish brown (10YR 4/1.5) gritty silty clay or clay; very fine subangular blocky structure with coarse vertical cleavage; few dark-colored and yellowish red oxide concretions; dark coatings on some peds; crushed color dark grayish brown (10YR 4/2).

B3
 5392 16 to 23 inches. Dark grayish brown (2.5Y 4/2) gritty silty clay or clay with very fine subangular blocky structure with coarse strong vertical cleavage; numerous fine dark oxide concretions and few fine yellowish red concretions; glossy coatings on peds.

C1
 5393 23 to 33 inches. Grayish brown (2.5Y 5/2) gritty silty clay with weak very fine subangular blocky structure approaching massive; common distinct strong brown (7.5YR 5/6) and black (10YR 2/1) mottles; some dark oxide concretions.

C2
 5394 33 to 40 inches. Similar to layer above.

C3
 5395 40 to 46 inches. Mottled strong brown (7.5YR 5/6) and grayish brown (2.5Y 5/2) silty clay to clay loam; very slightly calcareous.

SOIL TYPE Clarinda LOCATION Shelby County, Iowa
 silty clay loam

SOIL NOS. S55Iowa-83-1 LAB. NOS. 5352-5359

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|---|---------------------------------|--|-------------|-------------|---------------------------------|--------------------------------------|--|------------------------|---------------|-------------------|-------------|--------------------------|-----|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | > 2 | | |
| 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | (19mm) | | | | |
| 0-4 | Ap | 0.2 | 0.5 | 0.7 | 1.9 | 2.4 | 52.9 | 41.4 | 32.7 | 23.6 | - | sic | |
| 4-7 | B21 | 0.2 | 0.6 | 0.8 | 2.4 | 2.8 | 47.4 | 45.8 | 29.8 | 21.8 | - | sic | |
| 7-11 | B22 | 0.5 | 1.0 | 1.3 | 3.6 | 3.3 | 43.2 | 47.1 | 27.2 | 21.3 | - | sic | |
| 11-17 | B23 | 0.5 | 1.7 | 1.9 | 4.9 | 4.0 | 40.9 | 46.1 | 26.4 | 21.1 | - | sic | |
| 17-23 | B24 | 1.0 | 2.3 | 2.4 | 6.3 | 5.1 | 38.9 | 44.0 | 27.8 | 19.6 | - | c | |
| 23-31 | B25 | 1.2 | 2.3 | 2.8 | 7.3 | 5.9 | 37.3 | 43.2 | 28.4 | 18.7 | Tr. | c | |
| 31-42 | B26 | 1.8 | 3.4 | 4.2 | 9.0 | 7.4 | 35.8 | 38.4 | 30.9 | 17.7 | Tr. | cl | |
| 42-60 | B31 a/ | 2.8 | 3.4 | 3.8 | 8.4 | 6.7 | 44.4 | 30.5 | 25.2 | 31.0 | 3 | cl | |
| pH 8C1a | | ORGANIC MATTER | | | | EST. SALT (BUREAU CUP) | ELECTRICAL CONDUCTIVITY EC-103 MILLIMHOS PER CM 6A1a | 6E1a | | MOISTURE TENSIONS | | | |
| 1:5 | 1:10 | ORGANIC CARBON % | NITROGEN % | C/N | CoCO ₂ equiv-olent % | | | GYPSSUM no./100g. SOIL | 1/10 ATMOS. % | 1/3 ATMOS. % | 15 ATMOS. % | | |
| 5.8 | 6.3 | 6.3 | 1.86 | .171 | 10.9 | 0.6 | | | | | | 18.1 | |
| 6.0 | 6.4 | 6.5 | 0.70 | .062 | 11.3 | 0.3 | | | | | | 19.4 | |
| 6.1 | 6.7 | 6.7 | 0.32 | .026 | 12.3 | 0.3 | | | | | | 19.5 | |
| 6.2 | 6.9 | 6.9 | 0.21 | .018 | | 0.3 | | | | | | 19.3 | |
| 6.4 | 7.0 | 7.1 | 0.16 | .011 | | 0.4 | | | | | | 17.6 | |
| 6.7 | 7.2 | 7.2 | 0.10 | .007 | | 0.4 | | | | | | 16.7 | |
| 6.8 | 7.2 | 7.3 | 0.06 | | | 0.4 | - | | | | | 15.0 | |
| 8.0 | 8.6 | 8.8 | 0.03 | | | 0.6 | 26 | | | | | 10.3 | |
| 5A1a | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % NH ₄ Ac EXCH. | SATURATION EXTRACT SOLUBLE 8A1 | | | | 8A | | |
| CATION EXCHANGE CAPACITY NH ₄ Ac | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | | 6P1a | 6Q1a | 6N1a | 6O1a | | MOISTURE AT SATURATION % | |
| | milliequivalents per 100g. soil | | | | | | milliequivalents per liter | | | | | | |
| 31.5 | 20.4 | 10.0 | 6.8 | 0.1 | 1.1 | 0.5 | 0.3 | 3.7 | 2.6 | | 66.5 | | |
| 35.3 | 22.2 | 11.0 | 5.1 | 0.2 | 0.7 | 0.4 | 0.1 | 1.8 | 1.4 | | 69.7 | | |
| 35.8 | 23.9 | 12.4 | 6.4 | 0.2 | 0.7 | 0.5 | 0.1 | 1.6 | 1.4 | | 72.7 | | |
| 35.8 | 22.9 | 11.4 | 4.3 | 0.2 | 0.7 | 0.5 | - | 1.5 | 0.9 | | 76.2 | | |
| 33.6 | 23.0 | 11.0 | 3.0 | 0.2 | 0.6 | 0.7 | 0.1 | 1.7 | 1.1 | | 66.0 | | |
| 32.7 | 23.0 | 10.7 | 2.1 | 0.2 | 0.6 | 0.6 | - | 1.4 | 1.3 | | 66.2 | | |
| 29.0 | 21.7 | 8.5 | 1.7 | 0.2 | 0.5 | 0.6 | - | 1.8 | 1.0 | | 65.0 | | |
| 16.0 | | 4.1 | 0.8 | 0.1 | 0.3 | 0.7 | 0.1 | 3.6 | 1.4 | | 47.7 | | |

a/ CaCO₃ present in sand fraction.

Soil type: Clarinda silty clay loam

Soil No.: 855Iowa-83-1

Location: 200 feet north and 180 feet east of southwest corner of SE1/4 of SE1/4 of Sec. 16, Monroe Township, T78N, R38W, Shelby County, Iowa.

Slope: North-facing.

Collected by and date: W. Jury, R. Prill, and J. Phillips, September 1955.

Horizon and

Lincoln

Lab. Number

- Ap
5352 0 to 4 inches. Dark gray (10YR 4/1) silty clay loam with weak subangular blocky structure; friable to firm; some mixing of loess from slope above.
- B21
5353 4 to 7 inches. Grayish brown (2.5Y 5/2) silty clay with numerous root channels of dark grayish brown (10YR 4/2) silty clay; massive with tendency to very weak subangular blocky structure; plastic; numerous roots; very few quartz pebbles; boundary clear.
- B22
5354 7 to 11 inches. Grayish brown (2.5Y 5/2) silty clay with a few root channels of very dark grayish brown (10YR 3/2); a very few faint olive yellow (2.5Y 6/6) mottles; massive with tendency to very weak subangular blocky structure; plastic; very few iron-manganese fine concretions; very few quartz pebbles; boundary very diffuse.
- B23
5355 11 to 17 inches. Grayish brown (2.5Y 5/2) clay with few cracks and root channels of very dark grayish brown (10YR 3/2); a few faint olive yellow (2.5Y 6/6) mottles; massive; plastic; a few iron-manganese concretions; few fine quartz pebbles; boundary diffuse.
- B24
5356 17 to 23 inches. Same as previous horizon except very few root channels present.
- B25
5357 23 to 31 inches. Grayish brown (2.5Y 5/2) clay with cracks and root channels of very dark grayish brown (10YR 3/2); a few faint olive yellow (2.5Y 6/6) mottles; plastic; few iron-manganese concretions; few to common quartz pebbles.
- B26
5358 31 to 42 inches. Grayish brown (2.5Y 5/2) to strong brown (7.5YR 5/6) clay loam with very dark gray (5Y 3/1) clay skins in seams; massive; very firm; few fine roots present; boundary clear.
- B31
5359 42 to 60 inches. Strong brown (7.5YR 5/6) light clay loam with common grayish brown (2.5Y 5/2) clay skins in seams; massive; numerous, medium iron-manganese concretions; very firm; calcareous; numerous pockets of calcium carbonates; boundary diffuse.

Note: Colors are for the moist condition.

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Washington County, Iowa

SOIL TYPE Clinton silt loam

LAB NOS. D3875-D3893

Project and
Field Nos. Z-1-2-8-(245-254)

| LABORATORY NUMBER | DEPTH INCHES | HORIZON <u>a</u> | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) <u>3A1</u> | | | | | | | | | | | TEXTURAL CLASS | |
|--------------------------------|--------------|------------------|---|-------------------|----------------------|---------------------|--------------------------------|--------------------|--------------|-------------|----------------|-----|----------------------|----------------|--|
| | | | 1B1b | | | | | INTERNATIONAL | | | | | 2A2 | | |
| | | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | II 0.2-0.02 | III 0.02-0.002 | > 2 | | | |
| D3875 | 0-10 | Ap | 0.1 | 0.2 | 0.2 | 0.5 | 2.2 | 78.3 | 18.5 | 41.1 | 39.7 | Tr. | | | |
| D3876 | 10-13 | A2 | 0.0 | 0.2 | 0.2 | 0.4 | 1.7 | 74.4 | 23.1 | 36.1 | 40.3 | 0 | | | |
| D3877 | 13-16 | B1 | 0.0 | 0.2 | 0.2 | 0.3 | 1.4 | 68.3 | 29.6 | 32.3 | 37.6 | 0 | | | |
| D3878 | 16-19 | B21 | 0.0 | 0.1 | 0.1 | 0.2 | 1.1 | 63.9 | 34.6 | 28.3 | 36.8 | 0 | | | |
| D3879 | 19-22 | B22 | 0.0 | 0.1 | 0.1 | 0.2 | 1.0 | 61.2 | 37.4 | 27.0 | 35.4 | 0 | | | |
| D3880 | 22-25 | B22 | 0.0 | 0.1 | 0.1 | 0.2 | 0.9 | 60.7 | 38.0 | 26.8 | 35.0 | 0 | | | |
| D3881 | 25-28 | B22 | 0.0 | 0.0 | 0.1 | 0.2 | 0.9 | 61.1 | 37.7 | 27.4 | 34.7 | 0 | | | |
| D3882 | 28-30 | B23 | 0.0 | 0.0 | 0.1 | 0.2 | 1.0 | 62.2 | 36.5 | 29.3 | 34.0 | 0 | | | |
| D3883 | 30-33 | B23 | 0.0 | 0.1 | 0.1 | 0.2 | 1.1 | 61.5 | 37.0 | 29.9 | 32.9 | 0 | | | |
| D3884 | 33-36 | B31 | 0.0 | 0.0 | 0.1 | 0.2 | 1.1 | 63.5 | 35.1 | 30.9 | 33.8 | 0 | | | |
| D3885 | 36-39 | B31 | 0.0 | 0.0 | 0.1 | 0.2 | 1.3 | 63.9 | 34.5 | 31.6 | 33.7 | 0 | | | |
| D3886 | 39-42 | B31 | 0.0 | 0.0 | 0.1 | 0.1 | 1.3 | 65.0 | 33.5 | 30.6 | 35.8 | 0 | | | |
| D3887 | 42-45 | B32 | 0.0 | 0.0 | 0.1 | 0.2 | 1.3 | 66.3 | 32.1 | 32.6 | 35.1 | 0 | | | |
| D3888 | 45-48 | B32 | 0.0 | 0.0 | 0.1 | 0.2 | 1.5 | 66.7 | 31.5 | 34.2 | 34.1 | 0 | | | |
| D3889 | 48-52 | B32 | 0.0 | 0.0 | 0.1 | 0.2 | 1.6 | 68.1 | 30.0 | 36.3 | 33.5 | 0 | | | |
| D3890 | 52-56 | B33 | 0.0 | 0.0 | 0.1 | 0.2 | 1.3 | 69.3 | 29.1 | 35.6 | 35.1 | 0 | | | |
| D3891 | 56-60 | B33 | 0.0 | 0.1 | 0.1 | 0.3 | 1.0 | 69.4 | 29.1 | 31.7 | 38.9 | 0 | | | |
| D3892 | 60-65 | B33 | 0.0 | 0.1 | 0.2 | 0.3 | 0.8 | 70.2 | 28.4 | 28.4 | 42.8 | 0 | | | |
| D3893 | 65-70 | B33 | 0.0 | 0.1 | 0.2 | 0.5 | 0.7 | 70.7 | 27.8 | 26.5 | 45.1 | 0 | | | |
| | | | pH | | | | | ORGANIC MATTER | | | | | MOISTURE RETAINED AT | | |
| | | | 8C1a | 6A3a | | | FREE IRON OXIDE | BULK DENSITY | | | 1/10 | 1/3 | 15 | | |
| | | | H ₂ O | Organic Matter | NITROGEN | C/N | Fe ₂ O ₃ | DENSITY | ATMOS. | ATMOS. | ATMOS. | | | | |
| | | | 1.1 | % | % | | % | g/cc | % | % | % | | | | |
| D3875 | 6.2 | | | 1.7 | | | | | | | | | | | |
| D3876 | 5.9 | | | 1.0 | | | | | | | | | | | |
| D3877 | 5.6 | | | 0.6 | | | | | | | | | | | |
| D3878 | 5.4 | | | 0.4 | | | | | | | | | | | |
| D3879 | 5.1 | | | 0.1 | | | | | | | | | | | |
| D3880 | 5.0 | | | 0.5 | | | | | | | | | | | |
| D3881 | 4.9 | | | 0.5 | | | | | | | | | | | |
| D3882 | 4.9 | | | 0.5 | | | | | | | | | | | |
| D3883 | 4.9 | | | 0.4 | | | | | | | | | | | |
| D3884 | 4.9 | | | 0.4 | | | | | | | | | | | |
| D3885 | 4.9 | | | 0.4 | | | | | | | | | | | |
| D3886 | 5.0 | | | 0.4 | | | | | | | | | | | |
| D3887 | 5.0 | | | 0.3 | | | | | | | | | | | |
| D3888 | 5.1 | | | 0.2 | | | | | | | | | | | |
| D3889 | 5.2 | | | 0.2 | | | | | | | | | | | |
| D3890 | 5.3 | | | 0.2 | | | | | | | | | | | |
| D3891 | 5.5 | | | 0.2 | | | | | | | | | | | |
| D3892 | 5.6 | | | 0.0 | | | | | | | | | | | |
| D3893 | 5.7 | | | 0.2 | | | | | | | | | | | |
| | | | EXTRACTABLE CATIONS <u>5B2</u> | | | | | BASE SATURATION | | | | | | | |
| CATION EXCHANGE CAPACITY (SUM) | | | 6N4a | 6O4a | Na | K | 6H3a | SATURATION % (SUM) | | | | | | | |
| | | | Ca | Mg | | | H | | | | | | | | |
| | | | milliequivalents per 100g soil | | | | | | | | | | | | |
| D3875 | | | 7.4 | 2.3 | | | 4.2 | | | | | | | | |
| D3876 | | | 7.3 | 3.2 | | | 4.9 | | | | | | | | |
| D3877 | | | 9.6 | 5.1 | | | 5.1 | | | | | | | | |
| D3878 | | | | | | | | | | | | | | | |
| D3879 | | | 11.3 | 7.0 | | | 7.8 | | | | | | | | |
| D3880 | | | 10.8 | 7.1 | | | 8.8 | | | | | | | | |
| D3881 | | | 10.7 | 7.2 | | | 9.5 | | | | | | | | |
| D3882 | | | 10.6 | 7.4 | | | 9.1 | | | | | | | | |
| D3883 | | | 10.9 | 7.6 | | | 9.4 | | | | | | | | |
| D3884 | | | 10.6 | 7.3 | | | 8.7 | | | | | | | | |
| D3885 | | | | | | | | | | | | | | | |
| D3886 | | | 11.1 | 7.8 | | | 7.0 | | | | | | | | |
| D3887 | | | | | | | | | | | | | | | |
| D3888 | | | 10.9 | 7.8 | | | 5.5 | | | | | | | | |
| D3889 | | | | | | | | | | | | | | | |
| D3890 | | | 10.9 | 7.6 | | | 4.3 | | | | | | | | |
| D3891 | | | 11.9 | 7.4 | | | 2.9 | | | | | | | | |
| D3892 | | | | | | | | | | | | | | | |
| D3893 | | | 11.7 | 8.0 | | | 2.7 | | | | | | | | |

a. Horizonation nomenclature added in 1965 by R. I. Dideriksen.

Soil type: Clinton silt loam

Location: SW corner SE1/4 SW1/4 Sec. 11, T74N, R8W, Washington County, Iowa. Sample taken on east side of fence on divide between two large drainage ways about 240 feet north of east-west blacktop road on east side of fence row in bluegrass sod at edge of clover field. Slope: 5.5 percent. Apparently loess to 70 inches, silty material with sand from 70 to 100 and compact clayey material with small pebbles 110 to 120.

Sampled by: R. J. Muckenhirn, F. F. Riecken, L. T. Alexander, and A. M. O'Neal, October 5, 1944.

Horizon and Beltsville Lab. Number

| | |
|-------|---|
| Ap | 0 to 10 inches. Weak brown silt loam; fine granular structure; faintly platy in lower part; aggregates crushing easily without color change; worm casts and fibrous roots abundant. |
| D3875 | |
| A2 | 10 to 13 inches. Moderate yellowish brown silt loam; very fine granular structure; aggregates crushing easily to dark to moderate yellowish brown; worm casts abundant, particularly in upper half of layer, many consisting of weak brown material from above; roots abundant. |
| D3876 | |
| B1 | 13 to 16 inches. Moderate yellowish brown heavy silt loam; medium granular to fine nut structure; aggregates slightly vesicular, lightly sprinkled with gray, crushing easily without color change, penetrated by fibrous roots; worm casts and roots abundant. |
| D3877 | |
| B21 | 16 to 19 inches. Moderate to dark yellowish brown silty clay; fine blocky structure; aggregates slightly vesicular, very angular and firm, sprinkled with gray and occasional dark brown specks, and crushing with strong resistance to moderate yellowish brown; few worm burrows, roots fairly abundant. |
| D3878 | |
| B22 | 19 to 22 inches. Same as 16- to 19-inch layer except that aggregates are somewhat larger. |
| D3879 | |
| B22 | 22 to 25 inches. Moderate yellowish brown silty clay; medium blocky structure; aggregates slightly vesicular, angular, thinly coated with gray, occasionally spotted with black, and crushing with strong resistance without color change to plastic silty clay; worm burrows fairly abundant, roots abundant. |
| D3880 | |
| B22 | 25 to 28 inches. Dark yellowish brown silty clay; medium to coarse blocky structure; aggregates slightly vesicular, well coated with gray, specked with dark brown and black, and crushing with moderate difficulty to moderate yellowish brown; few worm casts and roots. |
| D3881 | |
| B23 | 28 to 30 inches. Same as 25- to 28-inch layer except that blocks are coarser. |
| D3882 | |
| B23 | 30 to 33 inches. Dark yellowish brown heavy silty clay loam or silty clay; coarse blocky structure, coarser than in 28- to 30-inch layer; aggregates slightly vesicular, some coated with gray, all crushing with moderate resistance to moderate yellowish brown; a few worm casts and a few roots in crevices. |
| D3883 | |
| B31 | 33 to 36 inches. Moderate to dark yellowish brown heavy silty clay loam; coarse blocky structure; aggregates slightly vesicular, specked with brown and black, and crushing with moderate resistance to moderate yellowish brown; a few roots in crevices. |
| D3884 | |
| B31 | 36 to 39 inches. Dark to moderate yellowish brown silty clay loam; otherwise same as 33- to 36-inch layer. |
| D3885 | |
| B31 | 39 to 42 inches. Dark yellowish brown silty clay loam; coarse blocky structure; aggregates coarser than in 33- to 36-inch layer and some gray-coated; otherwise the same. |
| D3886 | |
| B32 | 42 to 45 inches. Moderate yellowish brown silty clay loam; coarse blocky structure; aggregates slightly vesicular, irregularly sprinkled with gray, specked and spotted with black, and crushing with slight resistance to light yellowish brown; very few roots. |
| D3887 | |
| B32 | 45 to 48 inches. Moderate yellowish brown light silty clay loam; aggregates similar to those in 42- to 45-inch layer but larger and a few coated with dark yellowish brown. |
| D3888 | |
| B32 | 48 to 52 inches. Moderate yellowish brown heavy silt loam; weakly developed very coarse blocky structure; aggregates moderately vesicular, irregularly coated with dark yellowish brown, spotted and streaked with light brownish gray along root channels and occasionally on structure faces, and crushing with slight resistance to light yellowish-brown; very few roots. |
| D3889 | |
| B33 | 52 to 56 inches. Same as 48- to 52-inch layer except that light brownish gray streaks and spots are more abundant. |
| D3890 | |
| B33 | 56 to 60 inches. Same as 48- to 52-inch layer except with some dark yellowish brown coatings. |
| D3891 | |
| B33 | 60 to 65 inches. Light to moderate yellowish brown heavy silt loam; otherwise same as 56- to 60-inch layer. |
| D3892 | |
| B33 | 65 to 70 inches. Mixed light yellowish brown and light brownish gray silt loam; weakly developed coarse blocky structure; aggregates specked with orange and brown. |
| D3893 | |

Note: Horizonation nomenclature added in 1965 by R. I. Dideriksen.

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Washington County, Iowa

SOIL TYPE Clinton silt loam

LAB NOS. D3894-D3913

Project and
Field Nos. 2-1-2-8-(264-273)

| LABORATORY NUMBER | DEPTH INCHES | HORIZON <u>a</u> | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) <u>3A1</u> | | | | | | | | | | TEXTURAL CLASS | | |
|-------------------|--------------|------------------|---|-------------------|----------------------|---------------------|--------------------------------|-----------------|----------------------|-------------|----------------|------|----------------|------------|--|
| | | | <u>1E1b</u> | | VERY FINE SAND | | | | | SILT | | CLAY | | <u>2A2</u> | |
| | | | 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 | < 0.002 | II 0.2-0.02 | III 0.02-0.002 | > 2 | | | |
| D3894 | 0-5 | A1 | 0.0 | 0.4 | 0.6 | 1.0 | 1.9 | 77.1 | 19.0 | 36.9 | 42.7 | Tr. | | | |
| D3895 | 5-9 | A2 | 0.0 | 0.3 | 0.4 | 0.6 | 1.5 | 77.4 | 19.8 | 34.8 | 44.5 | 0 | | | |
| D3896 | 9-12 | A2 | 0.0 | 0.2 | 0.3 | 0.6 | 1.5 | 75.3 | 22.1 | 33.6 | 43.6 | Tr. | | | |
| D3897 | 12-15 | A3 | 0.0 | 0.2 | 0.3 | 0.5 | 1.3 | 72.0 | 25.7 | 32.0 | 41.6 | 0 | | | |
| D3898 | 15-18 | B1 | 0.0 | 0.2 | 0.3 | 0.4 | 1.3 | 68.3 | 29.5 | 30.1 | 39.8 | 0 | | | |
| D3899 | 18-21 | B21 | 0.0 | 0.1 | 0.2 | 0.4 | 1.1 | 64.9 | 33.3 | 28.3 | 38.0 | 0 | | | |
| D3900 | 21-24 | B22 | 0.0 | 0.1 | 0.2 | 0.3 | 1.2 | 60.7 | 37.5 | 26.8 | 35.2 | 0 | | | |
| D3901 | 24-27 | B22 | 0.0 | 0.1 | 0.1 | 0.3 | 1.0 | 60.7 | 37.8 | 26.6 | 35.3 | 0 | | | |
| D3902 | 27-30 | B22 | 0.0 | 0.1 | 0.1 | 0.3 | 1.1 | 61.0 | 37.4 | 27.2 | 35.1 | 0 | | | |
| D3903 | 30-33 | B23 | 0.0 | 0.0 | 0.1 | 0.3 | 1.1 | 61.9 | 36.6 | 29.0 | 34.1 | 0 | | | |
| D3904 | 33-35 | B23 | 0.0 | 0.0 | 0.1 | 0.3 | 1.3 | 62.5 | 35.8 | 28.9 | 35.0 | 0 | | | |
| D3905 | 35-37 | B23 | 0.0 | 0.0 | 0.1 | 0.3 | 1.5 | 62.7 | 35.4 | 29.1 | 35.2 | 0 | | | |
| D3906 | 37-40 | B31 | 0.0 | 0.0 | 0.1 | 0.2 | 1.3 | 63.4 | 35.0 | 31.4 | 33.4 | 0 | | | |
| D3907 | 40-43 | B31 | 0.0 | 0.0 | 0.1 | 0.3 | 1.7 | 63.4 | 34.5 | 33.0 | 32.3 | 0 | | | |
| D3908 | 43-46 | B31 | 0.0 | 0.0 | 0.1 | 0.2 | 1.5 | 65.2 | 33.0 | 33.9 | 33.0 | 0 | | | |
| D3909 | 46-49 | B32 | 0.0 | 0.0 | 0.1 | 0.2 | 1.8 | 66.3 | 31.6 | 33.8 | 34.4 | 0 | | | |
| D3910 | 49-53 | B32 | 0.0 | 0.0 | 0.1 | 0.2 | 1.7 | 66.4 | 31.6 | 34.7 | 33.5 | 0 | | | |
| D3911 | 53-57 | B33 | 0.1 | 0.3 | 0.3 | 1.0 | 3.6 | 66.6 | 28.1 | 39.0 | 31.8 | 0 | | | |
| D3912 | 57-63 | B33 | 0.0 | 0.0 | 0.0 | 0.3 | 2.0 | 68.9 | 28.8 | 36.0 | 35.0 | 0 | | | |
| D3913 | 63-70 | B33 | 0.0 | 0.0 | 0.0 | 0.3 | 2.5 | 69.0 | 28.2 | 35.8 | 35.8 | 0 | | | |
| | | | pH | | ORGANIC MATTER | | FREE IRON OXIDE | | MOISTURE RETAINED AT | | | | | | |
| | | | <u>8C1a</u> | <u>6A3a</u> | NITROGEN | C/N | Fe ₂ O ₃ | BULK DENSITY | 1/10 | 1/3 | 15 | | | | |
| | | | H ₂ O 1:1 | Organic Matter % | % | | % | g/cc | ATMOS. % | ATMOS. % | ATMOS. % | | | | |
| D3894 | 6.9 | | | 2.8 | | | | | | | | | | | |
| D3895 | 5.9 | | | 1.7 | | | | | | | | | | | |
| D3896 | 5.8 | | | 0.9 | | | | | | | | | | | |
| D3897 | 5.9 | | | 0.6 | | | | | | | | | | | |
| D3898 | 5.6 | | | 0.5 | | | | | | | | | | | |
| D3899 | 5.4 | | | 0.5 | | | | | | | | | | | |
| D3900 | 5.2 | | | 0.5 | | | | | | | | | | | |
| D3901 | 5.1 | | | 0.4 | | | | | | | | | | | |
| D3902 | 5.1 | | | 0.3 | | | | | | | | | | | |
| D3903 | 5.2 | | | 0.3 | | | | | | | | | | | |
| D3904 | 5.2 | | | 0.4 | | | | | | | | | | | |
| D3905 | 5.3 | | | 0.4 | | | | | | | | | | | |
| D3906 | 5.3 | | | 0.3 | | | | | | | | | | | |
| D3907 | 5.3 | | | 0.3 | | | | | | | | | | | |
| D3908 | 5.4 | | | 0.1 | | | | | | | | | | | |
| D3909 | 5.4 | | | 0.1 | | | | | | | | | | | |
| D3910 | 5.5 | | | 0.1 | | | | | | | | | | | |
| D3911 | 5.5 | | | 0.1 | | | | | | | | | | | |
| D3912 | 5.6 | | | 0.2 | | | | | | | | | | | |
| D3913 | 5.6 | | | 0.1 | | | | | | | | | | | |
| | | | EXTRACTABLE CATIONS <u>5B2</u> | | | | | BASE SATURATION | | | | | | | |
| | | | <u>6N4a</u> | <u>6O4a</u> | Na | K | <u>6H3a</u> | SATURATION % | | | | | | | |
| | | | Ca | Mg | | | H | (SUM) | | | | | | | |
| | | | milliequivalents per 100g soil | | | | | | | | | | | | |
| D3894 | 8.9 | 1.9 | | | | | 3.8 | | | | | | | | |
| D3895 | 5.9 | 2.0 | | | | | 5.2 | | | | | | | | |
| D3896 | 5.9 | 2.3 | | | | | 5.3 | | | | | | | | |
| D3897 | | | | | | | | | | | | | | | |
| D3898 | 8.4 | 4.6 | | | | | 5.2 | | | | | | | | |
| D3899 | | | | | | | | | | | | | | | |
| D3900 | 10.9 | 6.7 | | | | | 8.2 | | | | | | | | |
| D3901 | 11.8 | 7.2 | | | | | 8.2 | | | | | | | | |
| D3902 | | | | | | | | | | | | | | | |
| D3903 | 12.5 | 7.8 | | | | | 7.7 | | | | | | | | |
| D3904 | | | | | | | | | | | | | | | |
| D3905 | 12.4 | 7.7 | | | | | 7.0 | | | | | | | | |
| D3906 | | | | | | | | | | | | | | | |
| D3907 | 12.8 | 7.7 | | | | | 6.2 | | | | | | | | |
| D3908 | | | | | | | | | | | | | | | |
| D3909 | | | | | | | | | | | | | | | |
| D3910 | 12.6 | 7.7 | | | | | 5.2 | | | | | | | | |
| D3911 | 11.6 | 7.0 | | | | | 4.7 | | | | | | | | |
| D3912 | 11.6 | 7.1 | | | | | 4.5 | | | | | | | | |
| D3913 | 10.9 | 6.8 | | | | | 4.2 | | | | | | | | |

a. Horizonation nomenclature added in 1965 by R. I. Mderiksen.

Soil type: Clinton silt loam

Location: SW1/4 NW1/4 SW1/4 Sec. 9, T77N, R7W, Washington County, Iowa. Sample taken in bluegrass pasture about 15 feet from fence on east side of gravel road, 7 rods north of north gatepost of Kaloma golf course.

Slope: 7 percent.

Sampled by: R. J. Muckenhirn, F. F. Riecken, L. T. Alexander, and A. M. O'Neal, October 5, 1944.

Horizon and Beltsville Lab. Number

| | |
|--------------|--|
| A1 D3894 | 0 to 5 inches. Light brownish gray silt loam; fine granular structure; fibrous roots abundant. |
| A2 D3895 | 5 to 9 inches. Mixed light brownish gray and moderate yellowish brown silt loam; weakly developed fine platy structure; roots abundant. |
| A2 D3896 | 9 to 12 inches. Moderate yellowish brown silt loam; medium granular structure; fibrous roots fairly abundant. |
| A3 D3897 | 12 to 15 inches. Moderate yellowish brown silt loam; medium nut structure; aggregates lightly sprinkled with gray, crushing easily. |
| B1 D3898 | 15 to 18 inches. Moderate yellowish brown heavy silt loam; medium nut structure. |
| B21 D3899 | 18 to 21 inches. Moderate yellowish brown light silty clay loam; medium blocky structure; aggregates angular, lightly coated with gray. |
| B22 D3900 | 21 to 24 inches. Moderate brown to dark yellowish brown silty clay loam; medium blocky structure. |
| B22 D3901 | 24 to 27 inches. Same as 21- to 24-inch layer except that blocks are slightly larger. |
| B22 D3902 | 27 to 30 inches. Moderate yellowish brown heavy silty clay loam; medium blocky structure. |
| B23 D3903 | 30 to 33 inches. Moderate yellowish brown silty clay loam; medium blocky structure. |
| B23 D3904 | 33 to 35 inches. Dark to moderate yellowish brown silty clay loam; coarse blocky structure; aggregates slightly to moderately resistant to crushing. |
| B23 D3905 | 35 to 37 inches. Dark yellowish brown silty clay loam; coarse blocky structure; aggregates slightly resistant to crushing. |
| B31 D3906 | 37 to 40 inches. Dark to moderate yellowish brown silty clay loam; coarse blocky structure. |
| B31 D3907 | 40 to 43 inches. Moderate yellowish brown silty clay loam; coarse blocky structure; specked with brown and black and with a little gray mottling. |
| B31 D3908 | 43 to 46 inches. Moderate yellowish brown silty clay loam; very coarse blocky structure. |
| B32 D3909 | 46 to 49 inches. Light to moderate yellowish brown light silty clay loam; slightly mottled with brown and gray. |
| B32 D3910 | 49 to 53 inches. Moderate yellowish brown heavy silt loam; coarse blocky structure, mottled with gray and strong brown. |
| B33 D3911 | 53 to 57 inches. Same as 49- to 53-inch layer except that coarse blocky aggregates are weakly developed. |
| B33 D3912 | 57 to 63 inches. Moderate yellowish brown silt loam; coarse blocky structure, mottled with strong brown and gray. |
| B33 D3913 | 63 to 70 inches. Same as 57- to 63-inch layer. |

Note: Horizonation nomenclature added in 1965 by R. I. Dideriksen.

SOIL TYPE Clyde
silt loam

LOCATION Howard County, Iowa

SOIL NOS. S56Iowa-45-4-(1-9)

LAB. NOS. 4874-4882

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------|---------|--|----------------------|-------------------------|------------------------|-----------------------------|--------------------|-----------------|------|------|----|----------------|---------------|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | | | | | > 2 (19mm) |
| 0-7 | A1p | 0.2 | 1.0 | 1.2 | 3.7 | 3.1 | 54.7 | 36.1 | 25.8 | 34.1 | - | sic1 | |
| 7-12 | A12 | 0.8 | 2.6 | 2.8 | 6.0 | 5.2 | 50.6 | 32.0 | 26.8 | 32.7 | - | sic1 | |
| 12-16 | A13 | 1.3 | 4.0 | 3.9 | 8.7 | 9.9 | 44.8 | 27.4 | 32.1 | 28.4 | 1 | cl | |
| 16-20 | 11B11g | 2.0 | 7.6 | 7.4 | 13.5 | 12.1 | 36.4 | 21.0 | 36.2 | 20.5 | 6 | l | |
| 20-25 | 11B12g | 3.4 | 6.5 | 6.3 | 9.9 | 6.1 | 42.4 | 25.4 | 28.3 | 25.7 | 6 | l | |
| 25-30 | 11B2g | 2.1 | 3.1 | 2.7 | 3.9 | 2.7 | 54.4 | 31.1 | 25.9 | 33.3 | 7 | sic1 | |
| 30-37 | 11C1g | 1.1 | 1.2 | 1.0 | 2.7 | 4.2 | 61.1 | 28.7 | 33.9 | 33.3 | | sic1 | |
| 37-44 | 11C2g | 7.9 | 16.1 | 16.0 | 24.5 | 8.4 | 16.5 | 10.6 | 29.7 | 7.1 | 22 | sl | |
| 44-55 | 11C3g | 9.9 | 19.2 | 22.0 | 28.0 | 6.2 | 9.3 | 5.4 | 24.2 | 4.2 | 24 | lcos | |

| DEPTH INCHES | pH 8C1a | | ORGANIC MATTER | | | EST% SALT (BUREAU CUP) | ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM 8A1a | 6E1a CaCO ₃ equiv-alemt % | MOISTURE TENSIONS | |
|--------------|---------|------|-----------------------|------------------|------|------------------------|--|--------------------------------------|-------------------|-----|
| | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITRO-GEN % | C/N | | | | 4B2 15 ATMOS. % | |
| | 6.0 | 6.4 | 6.5 | 7.40 | .601 | | | | 12.3 | 0.5 |
| 6.1 | 6.4 | 6.5 | 6.78 | .589 | 11.5 | 0.5 | | | 23.0 | |
| 5.9 | 6.3 | 6.4 | 6.31 | .561 | 11.2 | 0.6 | | | 22.0 | |
| 6.4 | 6.7 | 6.7 | 1.19 | .109 | 10.9 | 0.5 | | | 9.9 | |
| 6.6 | 6.8 | 6.9 | 0.62 | .059 | 10.5 | 0.4 | | | 10.8 | |
| 6.6 | 6.9 | 7.0 | 0.36 | | | 0.4 | | | 13.4 | |
| 6.7 | 7.2 | 7.2 | 0.26 | | | 0.3 | - | | 12.8 | |
| 6.7 | 7.2 | 7.2 | 0.09 | | | 0.5 | - | | 4.5 | |
| 7.0 | 7.2 | 7.2 | 0.04 | | | 0.5 | - | | 2.6 | |

| 5A1a CATION EXCHANGE CAPACITY NH ₄ Ac | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % NH ₄ Ac EXCH. 5C1 | SATURATION EXTRACT SOLUBLE 8A1 | | | | 8A MOISTURE AT SATURATION % |
|--|---------------------------------|---------|--------|---------|--------|--|--------------------------------|--------|---------|---------|-----------------------------|
| | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a No | 6Q2a K | | 6P1a No | 6Q1a K | 6N1a Ca | 6O1a Mg | |
| | milliequivalents per 100g. soil | | | | | | milliequivalents per liter | | | | |
| 45.7 | 34.9 | 7.5 | 14.1 | 0.1 | 0.4 | 94 | 0.4 | - | 2.3 | 1.8 | 81.2 |
| 44.9 | 34.4 | 6.9 | 13.3 | 0.1 | 0.2 | 93 | 0.4 | - | 2.7 | 2.1 | 80.8 |
| 40.3 | 31.5 | 6.2 | 12.8 | 0.1 | 0.2 | 94 | 0.4 | - | 3.3 | 2.2 | 78.7 |
| 22.1 | 17.4 | 4.3 | 4.1 | 0.1 | 0.2 | | 0.4 | - | 2.0 | 1.9 | 43.2 |
| 22.6 | 17.7 | 4.9 | 3.3 | 0.1 | 0.2 | | 0.4 | - | 1.1 | 2.1 | 47.3 |
| 25.5 | 19.7 | 6.0 | 3.3 | 0.1 | 0.2 | | 0.4 | - | 2.1 | 1.3 | 61.9 |
| 23.5 | 20.6 | 5.4 | 2.9 | 0.1 | 0.3 | | 0.4 | - | 1.9 | 0.9 | 62.3 |
| 7.0 | 5.2 | 1.4 | 1.6 | - | 0.1 | | 0.6 | - | 2.5 | 1.4 | 26.2 |
| 4.5 | 3.3 | 0.9 | 1.2 | - | 0.1 | | 0.6 | 0.1 | 2.5 | 1.4 | 24.2 |

Soil type: Clyde silt loam
 Soil No.: S56Iowa-45-4-(1-9)
 Location: Approximately 630 feet south and 65 feet east of northwest corner of NE1/4 of Sec. 9, T99N, R13W, Howard County, Iowa.
 Vegetation or crop: Red clover meadow.
 Parent material: Silty overburden over glacial valley fill of Iowan age.
 Physiographic position: Low, wide upland drainage way, nearly level from side to side.
 Topography: Nearly level.
 Slope: 0 to 1 percent.
 Drainage: Poor.
 Ground water: At 55 inches due to long period of dry weather.
 Permeability: Moderate except in horizons of sand and gravel where it becomes rapid.
 Moisture: Moist.
 Stoniness: Silty overburden (0 to 16 inches) free of pebbles, clay loam drift (16 to 37 inches plus) contains some pebbles or small rocks, sandy and gravelly area (37 to 55 inches) contains many pebbles and rocks.
 Described by: L. E. Tyler, October 11, 1956.

Horizon and
 Lincoln
 Lab. Number

| | |
|----------------|--|
| Alp 4874 | 0 to 7 inches. Black (N 2/0 moist) heavy silt loam or loam; friable; weak very fine granular structure; boundary clear. |
| Al2 4875 | 7 to 12 inches. Black (N 2/0 moist) with few fine faint very dark brown (10YR 2/2 moist) organic mottles; heavy silt loam to loam; friable; weak fine granular structure; boundary gradual. |
| Al3 4876 | 12 to 16 inches. Black (N 2/0 moist) with common fine prominent dark reddish brown (2.5YR 3/4) mottles around small roots; heavy silt loam or loam; friable; weak fine subangular blocky structure; boundary clear. |
| IIB11g 4877 | 16 to 20 inches. Black to very dark gray (N 2.5/0 moist) light clay loam; crushed color black (2.5Y 2.5/1 moist); slightly firm; weak medium platy structure breaking to fine granular; boundary gradual. |
| IIB12g 4878 | 20 to 25 inches. This horizon appears to be mechanically mixed; colors are very dark gray to gray (2.5Y 3.5/1 moist) and black to very dark gray (N 2.5/0 moist); crushed color is very dark gray to gray; light clay loam; slightly firm; weak very fine granular structure; boundary clear. |
| IIB2g 4879 | 25 to 30 inches. Dark gray brown to gray brown (2.5Y 4.5/2 moist) with few fine distinct olive brown (2.5Y 4/4 moist) mottles; crushed color olive brown to light olive brown (2.5Y 4.5/3 moist); light silty clay loam; slightly firm; weak very fine subangular blocky structure; contains some pebbles 1 to 2 inches in diameter; boundary gradual. |
| IIC1g 4880 | 30 to 37 inches. Gray brown (2.5Y 5/2 moist) with many fine distinct yellowish brown (10YR 5/6 moist) mottles; crushed color light olive brown (2.5Y 5/4 moist); heavy silt loam; friable; weak very fine subangular blocky structure; boundary gradual. |
| IIC2g 4881 | 37 to 44 inches. Gray brown (2.5Y 5/2 moist) with many medium distinct dark yellowish brown (10YR 4/6 moist) mottles; crushed color light olive brown (2.5Y 5/5 moist); heavy loam except has small sand lenses or pockets; slightly firm; contains many pebbles 1/2 to 1-1/2 inches in diameter; boundary diffuse. |
| IIC3g 4882 | 44 to 55 inches. Gray (5Y 5/1 moist) sand and gravel; loose single grain; contains scattered pebbles up to 2 inches in diameter; entire profile leached. |

Notes: Sand and gravel lenses are often present in this drainage way or valley fill position. The material apparently becomes progressively thinner and then disappears as one follows a waterway to the watershed crest.

SOIL SURVEY LABORATORY Lincoln, Nebr. 1/27/58

SOIL TYPE Clyde LOCATION Howard County, Iowa
silt loam

SOIL NOS. S56Iowa-45-10-(1-9) LAB. NOS. 4935-4943

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in n.m.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------|---------|---|-------------|-------------|------------|----------------|----------|------------|---------|--------|---|----------------|-----|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | | | > 2 |
| 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | < 0.002 | (19mm) | | | |
| 0-6 | A1p | 0.8 | 6.2 | 6.0 | 7.9 | 3.0 | 46.5 | 29.6 | 25.1 | 27.6 | - | cl | |
| 6-10 | A12 | 1.0 | 4.8 | 5.0 | 7.6 | 3.2 | 48.6 | 29.8 | 26.4 | 28.6 | - | cl | |
| 10-15 | A13 | 1.0 | 3.4 | 3.4 | 5.2 | 2.2 | 51.5 | 33.3 | 25.3 | 30.6 | - | sicl | |
| 15-19 | A3g | 1.7 | 2.1 | 1.9 | 2.3 | 1.1 | 58.4 | 32.5 | 24.0 | 36.7 | - | sicl | |
| 19-27 | B2g(?) | 1.7 | 2.5 | 2.1 | 2.9 | 1.9 | 60.8 | 28.1 | 30.1 | 34.1 | - | sicl | |
| 27-33 | IC1g(?) | 5.0 | 9.7 | 10.2 | 15.5 | 9.0 | 31.4 | 19.2 | 33.8 | 15.0 | 4 | l | |
| 33-44 | IC2g(?) | 4.7 | 10.3 | 10.5 | 15.8 | 9.2 | 30.7 | 18.8 | 33.4 | 15.2 | 4 | l | |
| 44-51 | IC3g(?) | 5.9 | 10.2 | 11.0 | 17.2 | 10.1 | 28.2 | 17.4 | 34.2 | 13.6 | 3 | fsl | |
| 51-60 | IC4g(?) | 6.9 | 9.9 | 9.4 | 16.7 | 9.3 | 31.1 | 16.7 | 32.8 | 15.4 | 5 | fsl | |

| pH | ORGANIC MATTER | | | | | ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMOS DEPT CM | CO ₂ EQUIV-ALENT | MOISTURE TENSIONS |
|-----|----------------|----------|------|------|------|---|-----------------------------|-------------------|
| | 6A1a | | 6B1a | | C/N | | | |
| | ORGANIC CARBON | NITROGEN | | | | | | |
| 1:5 | 1:10 | % | % | | 8A1a | % | 15 ATMCS. | |
| 6.8 | 7.1 | 7.2 | 5.99 | .504 | 11.9 | 0.7 | | 19.7 |
| 7.0 | 7.2 | 7.4 | 4.61 | .407 | 11.3 | 0.5 | | 18.5 |
| 7.2 | 7.5 | 7.5 | 1.33 | .120 | 11.1 | 0.4 | | 14.6 |
| 7.3 | 7.6 | 7.7 | 0.64 | .065 | 9.8 | 0.3 | | 13.7 |
| 7.3 | 7.7 | 7.8 | 0.32 | .029 | 11.0 | 0.4 | | 12.4 |
| 7.7 | 7.9 | 7.9 | 0.13 | | | 0.4 | | 7.8 |
| 7.8 | 8.0 | 8.0 | 0.09 | | | 0.4 | | 7.8 |
| 8.3 | 8.7 | 8.8 | 0.05 | | | 0.5 | 3 | 7.3 |
| 8.3 | 8.7 | 9.0 | 0.06 | | | 0.4 | 11 | 6.6 |

| CATION EXCHANGE CAPACITY | EXTRACTABLE CATIONS | | | | | BASE SAT. NI Ac EXCH. | SATURATION EXTRACT SOLUBLE | | | | MOISTURE AT SATURATION |
|--------------------------|---------------------------------|-----|------|-----|------|----------------------------|----------------------------|------|------|------|------------------------|
| | 6N2b | | 6H1a | | 6P2a | | 6P1a | 6Q1a | 6N1a | 6O1a | |
| | Ca | Mg | H | No | K | | No | K | Ca | Mg | |
| NH ₄ Ac | milliequivalents per 100g. soil | | | | | milliequivalents per liter | | | | | % |
| 41.4 | 34.5 | 6.5 | 7.6 | 0.2 | 0.3 | 0.5 | - | 1.7 | 1.6 | | 73.1 |
| 39.9 | 34.4 | 5.9 | 6.7 | 0.2 | 0.3 | 0.4 | - | 3.8 | 1.2 | | 66.1 |
| 32.2 | 27.7 | 5.7 | 4.2 | 0.1 | 0.3 | 0.4 | - | 2.5 | 1.0 | | 55.4 |
| 28.7 | 24.0 | 5.5 | 2.6 | 0.1 | 0.1 | 0.3 | - | 2.0 | 0.6 | | 61.8 |
| 24.2 | 20.3 | 5.3 | 1.7 | 0.1 | 0.2 | 0.4 | - | 2.4 | 1.0 | | 60.1 |
| 11.5 | 9.8 | 2.2 | 2.1 | - | 0.1 | 0.4 | - | 2.0 | 1.2 | | 40.2 |
| 11.0 | 9.2 | 2.4 | 1.2 | - | 0.2 | 0.4 | - | 2.3 | 1.2 | | 40.6 |
| 8.6 | | 2.2 | - | - | 0.1 | 0.4 | - | 3.1 | 1.3 | | 37.8 |
| 7.9 | | 1.8 | - | - | 0.2 | 0.4 | 0.1 | 2.7 | 0.8 | | 37.3 |

Soil type: Clyde silt loam
 Soil No.: 856Iowa-45-10-(1-9)
 Location: Approximately 815 feet east and 85 feet north of southwest corner of NW1/4 of Sec. 35, T99N, R13W, Howard County, Iowa.

Vegetation or crop: Timothy meadow.

Parent material: Silty overburden over glacial valley fill of Iowan age.

Physiographic position: Low, wide upland drainage way, nearly level from side to side.

Topography: Gently sloping to undulating.

Slope: 0 to 1 percent.

Drainage: Poor.

Ground water: At approximately 60 inches.

Permeability: Moderate to moderately slow.

Moisture: Moist.

Described by: L. E. Tyler, October 16, 1956.

Horizon and
 Lincoln
 Lab. Number

- A1p 0 to 6 inches. Black (N 2/0 moist) silt loam; friable; moderate fine granular structure; boundary clear.
 4935
- A12 6 to 10 inches. Black (N 2/0 moist) silt loam with high organic matter content; very friable; weak fine granular structure; boundary clear.
 4936
- A13 10 to 15 inches. Black to very dark gray (N 2.5/0 moist) light silty clay loam; crushed color black (10YR 2/1 to 2.5Y 2/1 moist); friable to very slightly firm; weak very fine granular structure; boundary gradual.
 4937
- A3g 15 to 19 inches. Very dark gray (2.5Y 3/1 moist) light to medium silty clay loam; friable to very slightly firm; weak fine granular to weak very fine subangular blocky structure; boundary gradual.
 4938
- B2g(?) 19 to 27 inches. Olive gray (5Y 5/2 moist) with common fine faint olive brown (2.5Y 4/4 moist) mottles; crushed color olive gray (5Y 5/2 moist); heavy silt loam to light silty clay loam; friable to slightly firm; very weak and very fine subangular blocky structure; boundary clear but wavy.
 4939
- IIc1g(?) 27 to 33 inches. Mixed colors, approximately 45 percent gray (5Y 5/1 moist) and 55 percent dark yellowish brown to yellowish brown (10YR 4/6, 5/6, 5/8 moist). Crushed color yellowish brown (10YR 5/4 moist); medium loam to sandy clay loam; friable; weak very fine subangular blocky to massive; boundary diffuse.
 4940
- IIc2g(?) 33 to 44 inches. Mixed gray (5Y 5/1 moist) and strong brown (7.5YR 5/8 moist) medium loam to sandy clay loam; crushed color yellowish brown (10YR 5/6 moist); friable; very weak and very fine subangular blocky to massive. This horizon and those above are leached; boundary clear but wavy.
 4941
- IIc3g(?) 44 to 51 inches. Mixed colors, approximately 50 percent gray to light gray (5Y 6/1 moist) and 50 percent dark yellowish brown to yellowish brown (10YR 4/4 to 5/6 moist); crushed color yellowish brown (10YR 5/5 moist); medium loam; friable; massive. This horizon and those below are unleached; boundary diffuse.
 4942
- IIc4g(?) 51 to 60 inches. Mixed colors, approximately 50 percent yellowish brown (10YR 5/6 moist) and 50 percent gray to light gray (5Y 6/1 moist); these colors occur individually in large spots, some 12 inches in diameter. Texture, consistence, and structure as in above horizon.
 4943

Notes: No clay skins evident. Deoxidized conditions prevail around root channels. Pebble band sometimes present on the uppermost of the horizons designated with a Roman numeral II. Although the face described did not contain layers or pockets of coarse sand and gravel in the II material, some were observed in the side of the pit and this condition is common to the unit.

SOIL SURVEY LABORATORY Lincoln, Nebr. 1/24/58

SOIL TYPE *Cresco loam LOCATION Howard County, Iowa

SOIL NOS. S56Iowa-45-1-(1-11) LAB. NOS. 4843-4853

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|---|---------------------------------|--|------------------|-------------|------------|--|--------------------------------|---|-------------|------------|--------------------------|-----------------------|
| | | 1B1a | | | | | | | | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | 2A2 | | | |
| 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 | | | |
| | | 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | < 19mm | |
| 0-7 | Alp | 1.1 | 6.8 | 7.2 | 9.0 | 3.4 | 45.9 | 26.6 | 26.0 | 26.8 | - | 1 |
| 7-10 | Al2 | 0.8 | 5.1 | 6.0 | 8.0 | 3.4 | 48.3 | 28.4 | 26.4 | 28.5 | - | cl |
| 10-13 | A3 | 1.1 | 5.6 | 5.8 | 8.1 | 3.8 | 47.6 | 28.0 | 26.5 | 28.1 | - | cl |
| 13-18 | B1 | 1.6 | 5.4 | 6.7 | 9.7 | 5.9 | 41.6 | 29.1 | 28.3 | 24.5 | Tr. | cl |
| 18-22 | IIB21 | 1.9 | 6.4 | 7.5 | 12.0 | 8.2 | 30.2 | 33.8 | 28.2 | 17.0 | Tr. | cl |
| 22-30 | IIB22 | 1.7 | 6.1 | 7.1 | 12.0 | 9.2 | 29.4 | 34.5 | 29.2 | 16.4 | Tr. | cl |
| 30-40 | IIB23 | 2.6 | 5.9 | 6.9 | 12.3 | 9.1 | 30.4 | 32.8 | 29.0 | 17.3 | Tr. | cl |
| 40-49 | IIB3 | 2.4 | 6.3 | 7.2 | 12.5 | 9.5 | 30.5 | 31.6 | 29.8 | 17.4 | 4 | cl |
| 49-58 | IIB3 | 4.0 | 6.2 | 6.5 | 11.3 | 9.0 | 31.5 | 31.5 | 29.0 | 18.1 | 3 | cl |
| 58-66 | IIC1 | 3.0 | 6.5 | 6.5 | 12.6 | 9.2 | 30.9 | 31.3 | 28.8 | 17.5 | 2 | cl |
| 66-70 | IIC2 | 2.9 | 6.0 | 6.5 | 11.5 | 9.2 | 33.1 | 30.8 | 29.8 | 19.1 | 4 | cl |
| pH | | ORGANIC MATTER | | | | | EST% SALT (BUREAU CUP) | ELECTRI-CAL CONDUCTIVITY EC-10 ³ PER CM 6A1a | 4A3a | | | MOISTURE TENSIONS 4B2 |
| 1:1 | 1:5 | 1:10 | ORGANIC CARBON % | NITRO-GEN % | C/N | Vol. Wt. | | | 1B ATMOS. % | | | |
| 5.3 | 5.5 | 5.7 | 3.23 | .284 | 11.4 | | 0.4 | | | | 12.5 | |
| 5.1 | 5.4 | 5.5 | 2.64 | .230 | 11.5 | | 0.4 | | | | 12.9 | |
| 5.0 | 5.3 | 5.4 | 1.61 | .153 | 10.5 | | 0.4 | 1.22 | | | 11.2 | |
| 4.9 | 5.3 | 5.4 | 0.93 | .090 | 10.3 | | 0.4 | | | | 10.8 | |
| 4.9 | 5.3 | 5.4 | 0.54 | .050 | 10.8 | | 0.3 | | | | 11.4 | |
| 4.9 | 5.4 | 5.5 | 0.36 | .029 | 12.4 | | 0.2 | 1.52 | | | 11.2 | |
| 5.3 | 5.9 | 5.9 | 0.27 | | | | 0.3 | 1.66 | | | 11.0 | |
| 6.5 | 7.0 | 7.0 | 0.22 | | | | 0.3 | | | | 11.2 | |
| 7.6 | 7.7 | 7.9 | 0.20 | | | | 0.3 | | | | 11.7 | |
| 7.8 | 8.1 | 8.3 | 0.18 | | | | 0.4 | | 1.76 | | 12.6 | |
| 7.9 | 8.5 | 8.7 | 0.19 | | | | 0.4 | 5 | | | 12.5 | |
| CATION EXCHANGE CAPACITY NH ₄ Ac | 5A1a EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % NH ₄ Ac EXCH. 5C1 | SATURATION EXTRACT SOLUBLE 8A1 | | | | MOISTURE AT SATURATION % | |
| | 6N2b Co | 6O2b Mg | 6H1a H | 6P2a No | 6Q2a K | | 6P1a Na | 6Q1a K | 6N1a Ca | 6O1a Mg | | |
| | milliequivalents per 100g. soil | | | | | | milliequivalents per liter | | | | | |
| 25.1 | 13.0 | 2.8 | 14.6 | 0.1 | 0.4 | 65 | 0.4 | 0.1 | 2.6 | 1.0 | 55.3 | |
| 22.6 | 11.0 | 2.3 | 15.9 | 0.1 | 0.2 | 60 | 0.4 | - | 2.3 | 0.8 | 55.8 | |
| 19.2 | 8.7 | 2.0 | 14.6 | 0.1 | 0.2 | 57 | 0.4 | - | 2.1 | 0.8 | 49.6 | |
| 17.8 | 8.4 | 2.3 | 10.1 | 0.1 | 0.2 | 62 | 0.5 | 0.1 | 1.8 | 0.7 | 46.7 | |
| 19.4 | 10.1 | 2.8 | 9.7 | 0.1 | 0.2 | 68 | 0.5 | 0.1 | 1.4 | 0.5 | 50.2 | |
| 18.7 | 11.0 | 2.6 | 8.2 | 0.1 | 0.2 | 74 | 0.5 | 0.1 | 1.1 | 0.2 | 54.2 | |
| 17.4 | 12.2 | 2.9 | 5.3 | 0.1 | 0.2 | 88 | 0.5 | 0.1 | 1.2 | 0.4 | 47.5 | |
| 16.0 | 12.8 | 2.8 | 2.9 | 0.1 | 0.2 | 99 | 0.4 | - | 1.3 | 0.5 | 57.5 | |
| 14.9 | 12.8 | 3.0 | 1.6 | 0.1 | 0.2 | | 0.4 | - | 1.6 | 0.8 | 55.5 | |
| 14.8 | 13.8 | 3.2 | 0.8 | 0.1 | 0.2 | | 0.4 | - | 2.2 | 0.8 | 59.6 | |
| 13.5 | | 3.2 | 0.4 | 0.1 | 0.2 | | 0.5 | 0.1 | 2.6 | 0.2 | 57.2 | |

Soil type: *Cresco loam
 Soil No.: S56Iowa-45-1-(1-11)
 Location: Approximately 590 feet east and 24 feet north of southwest corner SE1/4 of Sec. 15, T99N, R13W, Howard County, Iowa.
 Vegetation or crop: Soybeans.
 Parent material: Firm Iowan till with silty overburden.
 Physiographic position: Crest of ridge on upland.
 Topography: Gently sloping to undulating.
 Slope: 2 to 3 percent.
 Drainage: Moderately well drained.
 Ground water: None observed within 70 inches. During wet periods there appears to be a perched water table above the firm till (22 inches in this profile).
 Permeability: Very slow for the firm till and moderate for the overburden.
 Moisture: Slightly moist.
 Stoniness: Some pebbles occur through the firm till; a band of pebbles is concentrated just above the firm till and the silty material above this is usually pebble free.
 Described by: L. E. Tyler, October 10, 1956.

Horizon and
 Lincoln
 Lab. Number

Alp
 4843 0 to 7 inches. Black (10YR 2/1 moist) gritty silt loam; friable; moderate fine granular structure; boundary clear.

Al2
 4844 7 to 10 inches. Black (10YR 2/1 moist) gritty silt loam; crushed moist color 10YR 2.5/1; friable; moderate fine granular structure; boundary clear.

A3
 4845 10 to 13 inches. Mixed colors, approximately 60 percent dark brown to brown (10YR 4/3 moist), 30 percent very dark gray brown (10YR 3/2 moist), and 10 percent black (10YR 2/1 moist) gritty silt loam or clay loam; crushed color very dark gray brown (10YR 3/2 moist); friable; weak, very fine subangular blocky and moderate fine granular structure; boundary clear.

Bl
 4846 13 to 18 inches. Dark brown or brown (10YR 4/3 moist) to olive brown (2.5Y 4/3 moist) light clay loam; friable to slightly firm; moderate very fine subangular blocky structure; pebble band enters lower part of this horizon; boundary gradual.

IIB21
 4847 18 to 22 inches. Olive brown (2.5Y 4/3 moist) light to medium clay loam; common fine distinct mottlings of strong brown (7.5YR 5/6 moist); slightly firm; moderate very fine subangular blocky structure; faint indication of clay skins; pebble band occurs in upper part of this horizon; boundary gradual.

IIB22
 4848 22 to 30 inches. Prominent continuous ped coatings of gray (5Y 5/1 moist) with some discontinuous coatings of very dark gray (10YR 3/1 moist) that appear to be illuviated clay; ped interiors are yellowish brown (10YR 5/6 moist) and strong brown (7.5YR 5/6 moist); crushed color is brown to yellowish brown (10YR 5/3 to 5/4 moist). Light to medium clay loam; firm; strong fine blocky structure; clay skins on all ped faces; boundary gradual.

IIB23
 4849 30 to 40 inches. Ped coatings and interiors as in horizon above except fewer very dark gray (10YR 3/1 moist) coatings; crushed color is olive brown (2.5Y 4/3 moist), medium clay loam; firm; moderate medium prismatic structure breaking to strong fine subangular blocky; clay skins on all ped faces; boundary gradual.

IIB3
 4850 40 to 49 inches. Distinct discontinuous gray (5Y 5/1 moist) ped coatings with common fine prominent strong brown (7.5YR 5/6 moist) mottles; strong brown (7.5YR 5/6 moist) ped interiors; crushed color olive brown (2.5Y 4/3 moist), medium clay loam; firm; moderate coarse prismatic structure breaking to moderate medium subangular blocky; continuous clay skins on vertical prism faces but discontinuous clay skins on subangular blocks; boundary gradual.

IIB3
 4851 49 to 58 inches. Colors as in above horizon although ped coatings appear to be thinner; medium clay loam; firm; weak coarse prismatic structure tending to break to weak medium subangular blocky; continuous coats on vertical prism faces but discontinuous coats on subangular blocks; boundary diffuse.

IIC1
 4852 58 to 66 inches. Gray (5Y 5/1 moist) and strong brown (7.5YR 5/6 moist) but olive brown (2.5Y 4/3 moist) when crushed; medium clay loam; firm; massive structure tending to break to weak medium subangular blocky; few discontinuous clay skins in old root channels; this horizon and all above horizons leached; boundary clear and wavy.

IIC2
 4853 66 to 70 inches. Mixed colors, approximately 60 percent olive brown (2.5Y 4/3 moist), 30 percent gray (5Y 5/1 moist), and 10 percent strong brown (7.5YR 5/6 moist); crushed color olive brown (2.5Y 4/3 moist); light clay loam; firm; massive structure; unleached; the thickness of leached soil is normally about 46 inches. Near more porous areas (sand cracks) the carbonate line dips.

Notes: In all firm till profiles, crevices filled with sand, ranging to sandy clay loam, were found in the firm till beneath the overburden. These crevices varied in width from 1 to 5 inches and sometimes widened into pockets. Although these were avoided on the face described, at least one was present in the area covered by each pit (2 by 5 feet). Prismatic structure described may not be evident under wet conditions. The soil was much drier than normal due to long period of dry weather. Textures are field estimates.

SOIL SURVEY LABORATORY

Lincoln, Nebr.

1/27/58

SOIL TYPE *Cresco
loam

LOCATION Howard County, Iowa

SOIL NOS.

856 Iowa-45-9-(1-10)

LAB. NOS.

4925-4934

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1 | | | | | | | | | | TEXTURAL CLASS | |
|--------------------------|---------------------------------|--|-------|------------------|-------------|--|--------------------------------|--------------------------------------|----------|--------------------|-----------------------------|-----------------------------------|--|
| | | 1B1a | 2A2 | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | > 2 (9mm) | | |
| | | 2.1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | | |
| 0-7 | A1p | 1.6 | 7.8 | 9.8 | 11.6 | 4.6 | 40.3 | 24.3 | 27.4 | 23.1 | - | 1 | |
| 7-12 | A12 | 1.4 | 6.4 | 8.2 | 10.7 | 4.9 | 42.5 | 25.9 | 28.6 | 24.0 | Tr. | 1 | |
| 12-16 | AB | 3.2 | 6.2 | 6.8 | 11.0 | 7.2 | 36.7 | 28.9 | 28.8 | 21.0 | 4 | cl | |
| 16-20 | B21 | 2.8 | 5.6 | 6.6 | 12.3 | 9.2 | 30.1 | 33.4 | 29.3 | 17.0 | - | cl | |
| 20-25 | B22 | 2.7 | 6.1 | 7.4 | 12.9 | 9.5 | 28.9 | 32.5 | 30.0 | 15.9 | - | cl | |
| 25-33 | 11B23 | 3.5 | 6.6 | 6.4 | 12.9 | 9.5 | 29.3 | 31.8 | 29.2 | 16.1 | 5 | cl | |
| 33-43 | 11B31 | 2.5 | 6.8 | 6.8 | 13.7 | 9.9 | 30.3 | 30.0 | 32.2 | 14.8 | 3 | cl | |
| 43-49 | 11B32 | 3.4 | 6.7 | 6.6 | 13.2 | 9.6 | 33.0 | 27.5 | 30.8 | 18.4 | 6 | cl | |
| 49-60 | 11C1 | 4.0 | 6.2 | 6.2 | 12.5 | 9.7 | 33.9 | 27.5 | 30.6 | 19.2 | 7 | cl | |
| 60-70 | 11C2 | 3.2 | 6.7 | 6.2 | 12.4 | 9.3 | 33.6 | 28.6 | 30.3 | 18.9 | 5 | cl | |
| pH 8C1a | | ORGANIC MATTER | | | | ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM 8A1a | | 6E1a CaCO ₃ equiv-olent % | | 4A3a Vol. Wt. g/cc | | MOISTURE TENSIONS 1B2 15 ATMOS. % | |
| | 1:1 | 1:5 | 1:10 | ORGANIC CARBON % | NITROGEN % | C/N | | | | | | | |
| 5.5 | 5.9 | 6.0 | 3.27 | .272 | 12.0 | | 0.4 | | | | | 11.6 | |
| 5.4 | 5.7 | 5.7 | 1.95 | .161 | 12.1 | | 0.4 | | | | | 11.2 | |
| 5.2 | 5.6 | 5.7 | 0.83 | .076 | 10.9 | | 0.3 | | 1.44 | | | 10.5 | |
| 5.0 | 5.5 | 5.6 | 0.56 | .051 | 11.0 | | 0.2 | | | | | 11.4 | |
| 5.0 | 5.5 | 5.6 | 0.41 | .036 | 11.4 | | 0.2 | | | | | 11.5 | |
| 5.2 | 5.7 | 5.8 | 0.28 | | | | 0.2 | | 1.62 | | | 10.9 | |
| 5.8 | 6.3 | 6.3 | 0.24 | | | | 0.2 | | 1.65 | | | 11.0 | |
| 8.2 | 8.6 | 8.8 | 0.16 | | | | 0.4 | - | | | | 10.4 | |
| 8.2 | 8.7 | 8.8 | 0.15 | | | | 0.4 | 7 | | | | 11.0 | |
| 8.2 | 8.7 | 8.9 | 0.15 | | | | 0.3 | 9 | 1.77 | | | 12.0 | |
| 5A1a | | EXTRACTABLE CATIONS 5B1a | | | | BASE SAT. % NH ₄ Ac EXCH. | SATURATION EXTRACT SOLUBLE 8A1 | | | | 8A MOISTURE AT SATURATION % | | |
| CATION EXCHANGE CAPACITY | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | | 6P1a | 6Q1a | 6N1a | 6O1a | | | |
| NH ₄ Ac | Co | Mg | H | Na | K | | Na | K | Ca | Mg | | | |
| | milliequivalents per 100g. soil | | | | | 5C1 | milliequivalents per liter | | | | | | |
| 23.6 | 12.2 | 3.4 | 13.1 | 0.1 | 0.6 | 69 | 0.3 | 0.2 | 2.5 | 1.6 | | 47.8 | |
| 20.3 | 9.7 | 2.0 | 13.1 | - | 0.1 | 58 | 0.3 | - | 2.0 | 0.9 | | 44.6 | |
| 18.4 | 9.2 | 1.9 | 10.1 | - | 0.1 | 61 | 0.3 | 0.1 | 1.2 | 0.4 | | 45.5 | |
| 19.3 | 11.2 | 2.2 | 8.8 | - | 0.2 | 70 | 0.3 | 0.1 | 1.1 | 0.4 | | 50.1 | |
| 18.7 | 11.6 | 2.0 | 8.8 | - | 0.2 | 74 | 0.4 | 0.1 | 1.0 | 0.4 | | 53.2 | |
| 17.4 | 11.6 | 2.2 | 5.8 | 0.1 | 0.2 | 81 | 0.3 | 0.1 | 0.8 | 0.3 | | 54.1 | |
| 16.0 | 12.2 | 1.8 | 5.4 | 0.1 | 0.2 | 89 | 0.4 | - | 1.0 | 0.2 | | 56.7 | |
| 12.8 | | 1.8 | - | - | 0.2 | | 0.5 | - | 2.6 | 0.7 | | 53.4 | |
| 11.6 | | 2.2 | - | - | 0.2 | | 0.5 | 0.1 | 2.5 | 0.8 | | 51.7 | |
| 12.3 | | 2.7 | - | - | 0.2 | | 0.4 | 0.1 | 2.5 | 0.7 | | 57.7 | |

Soil type: *Cresco loam
 Soil No.: S56Iowa-45-9-(1-10)
 Location: Approximately 835 feet west and 15 feet north of southeast corner of NW1/4 of Sec. 35, T99N, R13W, Howard County, Iowa.
 Vegetation or crop: Corn.
 Parent material: Firm Iowan till with silty overburden.
 Physiographic position: Crest of ridge on upland.
 Topography: Gently sloping to undulating.
 Slope: 3 percent.
 Drainage: Moderately well drained.
 Ground water: None observed within 70 inches.
 Permeability: Very slow for the firm till and moderate for the overburden.
 Moisture: Slightly moist.
 Described by: L. E. Tyler, October 16, 1956.

Horizon and
 Lincoln
 Lab. Number

- Alp
4925 0 to 7 inches. Black (10YR 2/1 moist) gritty silt loam; friable; moderate fine granular structure; evidence of much worm activity; boundary abrupt.
- Al2
4926 7 to 12 inches. Mixed colors, black to very dark gray (10YR 2.5/1 moist) and very dark gray brown to dark gray brown (10YR 3.5/2 moist); crushed color black to very dark gray (10YR 2.5/1 moist); gritty silt loam; friable; weak very fine subangular blocky and weak very fine granular structure; much worm activity; boundary gradual.
- AB
4927 12 to 16 inches. Mixed colors, approximately 50 percent very dark gray (10YR 3/1 moist) and 50 percent very dark gray brown to dark gray brown (10YR 3.5/2 moist); crushed color 10YR 3.5/2 moist to 2.5Y 3.5/2 moist; gritty silt loam; friable to slightly firm; weak very fine subangular blocky structure; part of pebble band in this horizon; boundary gradual.
- E21
4928 16 to 20 inches. Dark gray brown to brown (10YR 4/2.5 moist) with few fine faint yellowish brown (10YR 5/6 moist) mottles; crushed color yellowish brown to dark yellowish brown (10YR 4.5/4 moist); light clay loam; slightly firm; moderate very fine subangular blocky structure; pebble band in this horizon; boundary gradual.
- E22
4929 20 to 25 inches. Ped surfaces gray brown (2.5Y 5/2 moist) with common fine distinct yellowish brown to dark yellowish brown (10YR 4.5/4 moist) mottles; ped interiors are yellowish brown (10YR 5/5 moist) and crushed color is same; light to medium clay loam; moderately firm; moderate to strong, fine to very fine subangular blocky structure; boundary gradual.
- IIB23
4930 25 to 33 inches. Ped surfaces gray (5Y 5/1 moist) with common fine faint brown (10YR 5/3 moist) mottles; ped interiors mixed gray (5Y 5/1 moist) and dark yellowish brown (10YR 4/4 moist) with common fine distinct strong brown (7.5YR 5/6 moist) mottles; medium clay loam; firm; weak medium prismatic structure breaking to strong medium subangular blocky; large vertical faces present but difficult to pick out with a knife--quite noticeable when working with the spade; boundary diffuse.
- IIB31
4931 33 to 43 inches. Ped surfaces gray (5Y 5/1 moist) with common fine distinct yellowish brown (10YR 5/4 moist) mottles; ped interiors mixed gray (5Y 5/1 moist) and dark yellowish-brown to yellowish brown (10YR 4/4 to 5/6 moist); crushed color yellowish brown to light olive brown (10YR 5/4 to 2.5Y 5/4 moist); medium clay loam; firm to very firm; weak coarse prismatic structure breaking to moderate to weak coarse subangular blocky; this horizon and those above it leached; boundary clear.
- IIB32
4932 43 to 49 inches. Mixed colors, approximately 50 percent gray (5Y 5.5/1 moist) and 50 percent dark yellowish brown to yellowish brown (10YR 4/4 to 5/6 moist); some ped faces gray (5Y 5.5/1 moist); crushed color yellowish brown to light olive brown (10YR 5/4 to 2.5Y 5/4 moist); light to medium clay loam; firm; weak coarse prismatic structure breaking to weak coarse subangular blocky; this horizon and those below unleached; boundary diffuse.
- IIC1
4933 49 to 60 inches. Mixed colors, approximately 50 percent dark yellowish brown (10YR 4/6 moist) and 50 percent gray (N 5.5/0 moist); crushed color yellowish brown to light olive brown (10YR 5/4 to 2.5Y 5/4 moist); light to medium clay loam; firm; principally massive but some large vertical cleavage faces present; boundary diffuse.
- IIC2
4934 60 to 70 inches. Mixed colors, approximately 65 percent dark yellowish brown (10YR 4/4 moist) and 35 percent gray to light gray (N 6.0 moist); crushed color brown to olive brown (10YR 4.5/3 to 2.5Y 4.5/3 moist); texture, consistence and structure as in above horizon.

Notes: No transported clay accumulations on vertical faces in upper part of till. Crevices filled with sand, ranging to sandy clay loam, were found in firm till beneath overburden and varied in width from 1-5 inches; sometimes widened into pockets. Although these were avoided on face described, at least one was present in area covered by each pit (2 by 5 feet). Prismatic structure described may not be evident under wet conditions; soil much dryer than normal due to long dry weather period. Textures are field estimates.

SOIL TYPE *Dinsdale LOCATION Black Hawk County, Iowa
silty clay loam

SOIL NOS. S60Iowa-7-1-(1-11) LAB. NOS. 14194-14204

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------|--------------------------|--|----------------------|-------------------------|------------------------|-----------------------------|--------------------|------------------------|----------|------------|---------------|--------------------------------|-------------|
| | | 1E1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 (19mm) | | |
| 0-7 | A1p | 0.1 | 0.8 | 0.8 | 1.1 | 2.1 | 66.3 | 28.8 | 35.9 | 33.0 | tr. | | |
| 7-11 | A12 | - | 0.6 | 0.6 | 1.0 | 1.9 | 64.7 | 31.2 | 35.4 | 31.7 | - | | |
| 11-15 | A3 | - | 0.4 | 0.4 | 0.7 | 2.5 | 63.3 | 32.7 | 36.3 | 29.8 | - | | |
| 15-21 | B1 | - | 0.3 | 0.4 | 0.8 | 2.7 | 62.9 | 32.9 | 38.6 | 27.4 | - | | |
| 21-29 | B2 | - | 0.5 | 0.6 | 1.1 | 3.5 | 62.6 | 31.7 | 40.3 | 26.3 | - | | |
| 29-36 | B31 | 0.1 | 1.0 | 1.2 | 2.3 | 4.3 | 61.4 | 29.7 | 44.2 | 22.6 | - | | |
| 36-43 | IIB32 | 4.2 | 8.0 | 8.1 | 15.2 | 9.9 | 31.0 | 23.6 | 30.9 | 17.1 | 3 | | |
| 43-50 | IIB33 | 3.9 | 8.2 | 8.6 | 16.0 | 10.5 | 31.1 | 21.7 | 32.0 | 17.3 | 3 | | |
| 50-56 | IIC1 | 2.8 | 8.1 | 8.6 | 16.0 | 10.7 | 30.7 | 23.1 | 32.8 | 16.4 | 3 | | |
| 56-62 | IIC2 | 3.8 | 8.0 | 8.5 | 16.7 | 11.1 | 32.4 | 19.5 | 34.0 | 17.4 | 4 | | |
| 62-73 | IIC3 | 3.8 | 8.4 | 8.0 | 15.7 | 11.2a | 34.2 | 18.7 | 34.4 | 18.7 | 4 | | |
| 8C1a | 6C1a | ORGANIC MATTER | | | | | Bulk Density | | | | | Moist. Reten. | |
| pH | Ect. | 6A1a | 6B1a | ORGANIC NITRO-GEN | | Field Moist. | | 30 Cm. | | O.D. | 1/3 | 4B2 | |
| 1:1 | Iron as Fe | ORGANIC CARBON | % | % | C/N | 4B4 | 4A1a | 4B3 | 4A1c | 4A1h | ATMOS. Pieces | 15 | |
| 5.7 | % | % | % | % | % | % M. | g/cc | % M. | g/cc | g/cc | % | ATMOS. Sieved | |
| 5.3 | | | | | | | | | | | | % | |
| 5.3 | | | | | | | | | | | | | |
| 5.4 | | | | | | 27.0 | 1.34 | 27.8 | 1.35 | 1.46 | | 13.0 | |
| 5.4 | | | | | | 26.0 | 1.34 | 27.2 | 1.34 | 1.46 | | 13.2 | |
| 5.3 | | | | | | | | | | | | 13.2 | |
| 5.6 | | | | | | | | | | | | 13.9 | |
| 5.8 | | | | | | | | | | | | 13.6 | |
| 6.8 | | | | | | | | | | | | 13.1 | |
| 7.9 | | | | | | | | | | | | 9.4 | |
| | | | | | | | | | | | | 9.9 | |
| | | | | | | | | | | | | 9.8 | |
| | | | | | | | | | | | | 8.9 | |
| 7.9 | 5A1a | 1.3 | 0.03 | | | 14.8 | 1.82 | 15.8 | 1.80 | 1.88 | | 8.5 | |
| | | EXTRACTABLE CATIONS | | | | | 5B1a | Base Sat. | | 8D1 | 8D3 | Carbonate as CaCO ₃ | |
| | CATION EXCHANGE CAPACITY | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | 5A3a | 5C1 | 5C3 | Ratio | | 6E1c | |
| | NH ₄ OAc | Ca | Mg | H | Na | K | Sum | on NH ₄ OAc | on Sum | to Clay | Ca/Mg | | |
| | | milliequivalents per 100g. soil | | | | | | | CEC % | CEC % | CEC % | | <2-mm. Clay |
| | | | | | | | | | | | | | % |
| 21.4 | | 13.9 | 4.4 | 10.2 | 0.1 | 0.3 | 28.9 | 87 | 65 | .74 | 3.2 | | % |
| 20.7 | | 12.2 | 4.2 | 11.2 | 0.1 | 0.3 | 28.0 | 81 | 60 | .66 | 2.9 | | % |
| 21.2 | | 12.7 | 5.2 | 10.0 | 0.1 | 0.4 | 28.4 | 87 | 65 | .65 | 2.4 | | % |
| 21.3 | | 13.3 | 5.2 | 8.6 | 0.1 | 0.4 | 27.6 | 89 | 69 | .65 | 2.6 | | % |
| 21.0 | | 13.5 | 5.3 | 7.7 | 0.1 | 0.4 | 27.0 | 92 | 71 | .66 | 2.5 | | % |
| 19.8 | | 13.4 | 5.3 | 6.2 | 0.1 | 0.4 | 25.4 | 97 | 76 | .67 | 2.5 | | % |
| 11.2 | | 7.8 | 2.7 | 3.1 | 0.1 | 0.2 | 13.9 | 96 | 78 | .47 | 2.9 | | % |
| 11.2 | | 7.9 | 2.8 | 2.6 | 0.1 | 0.2 | 13.6 | 98 | 81 | .52 | 2.8 | | % |
| 11.2 | | | | | 0.1 | 0.2 | | | | .48 | | tr. | |
| 9.2 | | | | | 0.1 | 0.2 | | | | .47 | | 9 | tr. |
| 8.7 | | | | | 0.1 | 0.2 | | | | .46 | | 12 | 1 |

a. 15 Kg/M² to 60 inches.

Soil type: *Dinsdale silty clay loam
 Soil No.: 850Iowa-7-1-(1-11)
 Location: 1840 feet north and 210 feet west of SE corner of SW1/4 SE1/4 of Sec. 25, T87N, R13W, Black Hawk Co., Iowa.
 Vegetation: Alfalfa and bromegrass. Parent material: Wisconsin loess over Iowan till.
 Physiographic position: Upland till plain on convex north-facing ridge top with 3 to 5 percent side slopes.
 Slope: 2 percent. Drainage: Well drained.
 Permeability: Moderate in loess; moderately slow in till.
 Ground water: None within 73 inches. Moisture: Slightly moist.
 Described by: D. F. Slusher, October 13, 1960.

Horizon and
 Lincoln Lab. No

- Alp 0 to 7 inches. Black (10YR 2/1)¹ light silty clay loam; cloddy breaking to weak fine granular structure; slightly firm; clear boundary.
- Al2 7 to 11 inches. Very dark brown (10YR 2/2) light silty clay loam; weak very fine subangular blocky and moderate fine granular structure; friable; few fine faint very dark grayish brown (10YR 3/2) worm casts and mixings; kneaded color very dark grayish brown (10YR 3/2); common fine tubular pores and wormholes; gradual boundary.
- A3 11 to 15 inches. Very dark grayish brown (10YR 3/2) light silty clay loam; moderate very fine subangular blocky structure; friable; common fine faint very dark brown (10YR 2/2) and dark brown (10YR 3/3) worm casts and mixings; kneaded color dark brown (10YR 3/3); common fine tubular pores in ped; gradual boundary.
- B1 15 to 21 inches. Dark brown (10YR 3/3) light silty clay loam; moderate fine and very fine subangular blocky structure; friable; few fine faint very dark grayish brown (10YR 3/3) worm casts; kneaded color brown (10YR 4/3); common fine tubular pores in ped; gradual boundary.
- B2 21 to 29 inches. Dark brown (10YR 4/3) medium silty clay loam; weak medium prismatic breaking to moderate fine subangular blocks; friable; few fine faint dark brown (10YR 3/3) worm casts; kneaded color dark brown (10YR 4/3); common fine tubular pores in ped; a very few iron-manganese concretions; a very few indistinct patchy clay films on vertical ped faces; gradual boundary.
- B31 29 to 36 inches. Dark brown (10YR 4/3) light silty clay loam; weak medium prismatic structure breaking to weak medium subangular blocks; friable; very few fine faint grayish brown (10YR 5/2) mottles; few fine distinct yellowish brown (10YR 5/6) worm casts and mixings from horizon below; common fine tubular pores in ped; very few fine iron-manganese concretions; few medium sand grains in lower part that seem to have been mixed from till below; clear boundary.
- IIB32 36 to 43 inches. Brown (10YR 5/3) and yellowish brown (10YR 5/6) heavy loam; weak medium prismatic structure; slightly firm; brown (10YR 5/3) on prism faces, yellowish brown (10YR 5/6) with common fine distinct light gray (10YR 6/4) mottles and streaks inside prisms; common to many medium and fine pores; numerous stones with 1/2 to 3-inch diameters in a discontinuous layer at contact between B31, IIB32; gradual boundary.
- IIB33 43 to 50 inches. Same as above.
- IIC1 50 to 56 inches. Yellowish brown (10YR 5/4) and (10YR 5/8) heavy loam; weak medium prismatic structure; slightly firm; yellowish brown (10YR 5/4) on prism faces, yellowish brown (10YR 5/8) with common fine distinct light gray (10YR 6/1) elongated vertical streaks and a few fine faint dark brown (7.5YR 4/4) mottles inside prisms; kneaded color yellowish brown (10YR 5/6); common medium and fine pores; few distinct clay accumulations along root channels and few large dark grayish brown (10YR 4/2) clay films on some prism faces; clear boundary.
- IIC2 56 to 62 inches. Yellowish brown (10YR 5/6) heavy loam; massive with distinct horizontal cleavage; slightly firm; distinct continuous vertical veins of light gray (10YR 6/1) 3/16-inch wide and 1-1/2 inches apart in a concentric pattern; kneaded color yellowish brown (10YR 5/6); calcareous; a few soft white lime accumulations and a few soft yellowish red oxide accumulations; gradual boundary.
- IIC3 62 to 73 inches. Same as above.

Notes: A few clear uncoated quartz grains are on ped faces from 0 to 36 inches and prism faces are distinctly coated from 36 to 50 inches. Roots are plentiful from 0 to 11 inches, common from 11 to 21, few from 21 to 50, and none to scarce from 50 to 73 inches. A vertical sand vein about 2 inches wide occurs from 36 to 73 inches. Horizons Alp, B2, and IIC3 were sampled for the Bureau of Public Roads.

¹/ Munsell colors for moist soil.

SOIL TYPE * Dinsdale LOCATION Grundy County, Iowa
silty clay loam

SOIL NOS. S60Iowa-38-2-(1-11) LAB. NOS. 14205-14215

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------|---------|--|--------------------|-------------|-----------|------------------|--------------|----------------------------|--------------------|--------------------------------|---------------|----------------|--------|
| | | 1B1a | 2A2 | 3A1 | 4A1 | 5A1 | 6A1 | 7A1 | 8A1 | 9A1 | 10A1 | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | | | |
| | | 2.1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | < 0.075mm | | |
| 0-6 | Alp | 0.1 | 1.0 | 1.6 | 2.3 | 3.1 | 62.7 | 29.2 | 38.0 | 28.8 | tr. | | |
| 6-12 | A3 | 0.2 | 0.9 | 1.3 | 1.8 | 3.2 | 59.5 | 33.1 | 36.6 | 26.9 | tr. | | |
| 12-16 | B1 | 0.1 | 0.7 | 0.9 | 1.5 | 3.4 | 60.0 | 33.4 | 36.9 | 27.2 | tr. | | |
| 16-21 | B21 | - | 0.5 | 1.0 | 1.9 | 4.8 | 58.9 | 32.9 | 42.6 | 22.0 | tr. | | |
| 21-26 | B22 | 0.1 | 1.4 | 2.2 | 4.0 | 5.9 | 57.2 | 29.2 | 44.6 | 20.2 | tr. | | |
| 26-30 | B23 | 1.6 | 5.4 | 6.4 | 10.8 | 7.6 | 44.3 | 23.9 | 40.1 | 16.3 | 6 | | |
| 30-37 | IIB31 | 3.3 | 7.7 | 8.3 | 16.1 | 11.1 | 31.2 | 22.3 | 33.3 | 16.7 | 3 | | |
| 37-44 | IIB32 | 2.9 | 6.2 | 6.6 | 16.0 | 11.5 | 31.6 | 25.2 | 35.0 | 16.3 | 4 | | |
| 44-48 | IIB33 | 1.9 | 6.8 | 7.1 | 15.8 | 11.8 | 33.9 | 22.7 | 36.5 | 17.2 | 12 | | |
| 48-58 | IIC1 | 2.7 | 5.2 | 5.7 | 14.6 | 11.6 | 39.2 | 21.0 | 37.3 | 21.2 | 4 | | |
| 58-66 | IIC2 | 2.8 | 5.6 | 6.0 | 15.5 | 11.5 | 37.8 | 20.8 | 36.5 | 20.9 | 11 | | |
| 66-79 | 8C1a | 6C1a | ORGANIC MATTER | | | | Bulk Density | | | | Moist. Reten. | | |
| | | Ext. | 6A1a | 6B1a | | | | | | | 4B2 | | |
| pH | | Iron as Fe | ORGANIC CARBON % a | NITROGEN % | C/N | Field Moist % M. | 30 Cm. g/cc | O.D. g/cc | 1/3 ATMOS. Pieces | 15 ATMOS. Sieved | | | |
| 1:1 | | | | | | 4B4 | 4A1a | 4B3 | 4A1c | 4A1h | | | |
| 5.9 | | 1.0 | 2.15 | 0.191 | 11 | 21.5 | 1.45 | 26.5 | 1.42 | 1.56 | | 12.5 | |
| 5.5 | | 1.1 | 1.22 | 0.113 | 11 | | | | | | | 13.8 | |
| 5.4 | | 1.1 | 0.88 | 0.087 | 10 | 25.1 | 1.38 | 25.4 | 1.38 | 1.50 | | 14.0 | |
| 5.3 | | 1.1 | 0.60 | 0.061 | 10 | 25.5 | 1.40 | 26.9 | 1.40 | 1.54 | | 13.8 | |
| 5.4 | | 1.0 | 0.39 | 0.046 | 8 | 23.7 | 1.40 | 25.7 | 1.39 | 1.50 | | 12.6 | |
| 5.5 | | 1.2 | 0.23 | | | | | | | | | 9.6 | |
| 5.8 | | 1.3 | 0.13 | | | | | | | | | 8.6 | |
| 6.7 | | 1.1 | 0.09 | | | 12.4 | 1.66 | 17.4 | 1.59 | 1.72 | | 9.9 | |
| 7.7 | | 1.0 | 0.07 | | | | | | | | | 9.2 | |
| 7.9 | | 1.0 | 0.03 | | | 11.6 | 1.91 | 13.6 | 1.86 | 1.96 | | 8.6 | |
| 7.9 | 5A1a | 0.9 | 0.02 | | | 10.4 | 1.91 | 12.0 | 1.88 | 1.94 | | 8.0 | |
| | | EXTRACTABLE CATIONS | | | | Base Sat. | | | | Carbonate as CaCO ₃ | | | |
| | | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | 5A3a Sum | 5O1 on NH ₄ OAc | 5O3 on Sum to Clay | 5O1 Ratio NH ₄ OAc | Ca/Mg | 6E1c | |
| | | Ca | Mg | H | Na | K | | | | | | | |
| | | milliequivalents per 100g. soil | | | | | | CEC % | % | CEC | | <2-mm. % | Clay % |
| 20.5 | | 14.6 | 4.2 | 9.3 | - | 0.4 | 28.5 | 94 | 67 | .70 | 3.5 | | |
| 21.7 | | 13.4 | 5.8 | 9.6 | 0.1 | 0.4 | 29.3 | 91 | 67 | .66 | 2.3 | | |
| 22.2 | | 13.9 | 5.6 | 9.1 | 0.1 | 0.4 | 29.1 | 90 | 69 | .66 | 2.5 | | |
| 22.5 | | 14.3 | 6.0 | 7.9 | 0.1 | 0.5 | 28.8 | 93 | 72 | .68 | 2.4 | | |
| 20.2 | | 13.5 | 5.6 | 6.4 | 0.1 | 0.4 | 26.0 | 97 | 75 | .69 | 2.4 | | |
| 15.4 | | 10.5 | 4.3 | 4.5 | 0.1 | 0.3 | 19.7 | 99 | 77 | .64 | 2.4 | | |
| 12.2 | | 8.7 | 3.3 | 2.6 | 0.1 | 0.3 | 15.0 | 102 | 83 | .55 | 2.6 | | |
| 14.2 | | 10.8 | 3.9 | 1.6 | 0.1 | 0.3 | 16.7 | 106 | 90 | .56 | 2.8 | | |
| 12.5 | | | | | 0.1 | 0.3 | | | | .55 | | tr. | |
| 10.6 | | | | | 0.1 | 0.2 | | | | .50 | | 1 | |
| 10.0 | | | | | tr. | 0.2 | | | | .48 | | 2 | |

a. 12 Kg/M² to 60 inches.

Soil type: *Dinsdale silty clay loam
 Soil No.: 860Iowa-38-2-(1-11)
 Location: 437 feet east and 639 feet south of NW corner of NE1/4 Sec. 20, T88N, R15W, Grundy County, Iowa.
 Vegetation: Alfalfa hay field. Parent material: Wisconsin loess over Iowan till.
 Physiographic position: Upland till plain on a convex south-facing ridge with 3 to 4 percent side slopes.
 Slope: 2 percent. Drainage: Well drained.
 Permeability: Moderate in loess; moderately slow in till.
 Ground water: None within 70 inches. Moisture: Slightly moist.
 Described by: R. I. Turner, October 14, 1960.

Horizon and
 Lincoln Lab. No.

| | |
|----------------|--|
| Alp 14205 | 0 to 6 inches. Black (10YR 2/1) ¹ light silty clay loam; cloddy breaking to weak fine subangular blocky structure and then to weak fine granules; slightly firm; common fine tubular pores; gradual boundary. |
| A3 14206 | 6 to 12 inches. Very dark brown (10YR 2/2) light silty clay loam; moderate very fine subangular blocky and moderate fine granular structure; friable; a great deal of black (10YR 2/1) mixing as ped coats and worm casts; kneaded color very dark brown (10YR 2/2); abundant fine tubular inped pores; gradual boundary. |
| B1 14207 | 12 to 16 inches. Dark brown (10YR 3/3) light silty clay loam; moderate fine and very fine subangular blocky structure; friable; few fine black (10YR 2/1) stains on peds; abundant fine tubular inped pores; gradual boundary. |
| B21 14208 | 16 to 21 inches. Dark brown (10YR 4/3) medium silty clay loam; moderate fine subangular blocky structure; friable; kneaded color dark brown (10YR 4/3); abundant fine tubular inped pores; a few faint discontinuous clay films on ped faces; a very few fine soft dark oxide concretions; gradual boundary. |
| B22 14209 | 21 to 26 inches. Dark brown (10YR 4/3) medium silty clay loam; weak medium prismatic structure breaking to medium fine subangular blocks; friable; ped interiors are dark brown (10YR 4/3) and ped surfaces 1/4 to 1/2 unit lower in chroma; kneaded color dark brown (10YR 4/3); abundant fine tubular inped pores; a few faint discontinuous clay films on ped faces; a very few fine soft dark oxide concretions; gradual boundary. |
| B23 14210 | 26 to 30 inches. Dark brown (10YR 4/3) light silty clay loam; weak medium prismatic structure breaking to weak to moderate fine subangular blocks; friable; kneaded color dark brown (10YR 4/3); abundant fine tubular inped pores; a very few very faint clay flows in some root channels; a very few soft dark oxide concretions; fine sand content increases with depth; clear boundary. |
| IIB31 14211 | 30 to 37 inches. Brown (10YR 5/3) and yellowish brown (10YR 5/4) heavy loam; weak medium prismatic structure breaking to weak medium and coarse subangular blocks; slightly firm; brown (10YR 5/3) on ped exteriors and yellowish brown (10YR 5/4) interiors with a few fine faint yellowish brown (10YR 5/6) and a few fine distinct strong brown (7.5YR 5/8) mottles; common fine tubular inped pores; a slight concentration of stones 1 to 3 inches in diameter in the upper 3 inches of this horizon; gradual boundary. |
| IIB32 14212 | 37 to 44 inches. Dark brown (10YR 4/3) and yellowish brown (10YR 5/4) heavy loam; weak medium to coarse prismatic structure breaking to very weak coarse subangular blocks; slightly firm; dark brown (10YR 4/3) on exteriors of peds and yellowish brown (10YR 5/4) ped interiors with a few fine distinct strong brown (7.5YR 5/8) mottles; common fine tubular inped pores; gradual boundary. |
| IIB33 14213 | 44 to 48 inches. Same as above. |
| IIC1 14214 | 48 to 58 inches. Yellowish brown (10YR 5/6) medium loam; massive with discontinuous vertical cleavage; slightly firm; few fine distinct grayish brown (2.5Y 5/2) and strong brown (7.5YR 5/6) mottles; common medium dark reddish brown (5YR 3/2) stains on cleavage faces; common fine tubular inped pores; calcareous; common white lime filaments; gradual boundary. |
| IIC2 14215 | 58 to 66 inches. Yellowish brown (10YR 5/6) loam; massive with faint discontinuous vertical cleavage; friable; common fine distinct grayish brown (2.5Y 5/2) and a few fine distinct strong brown (7.5YR 5/8) mottles; common medium distinct very dark gray (10YR 3/1) stains on cleavage faces; gradual boundary. |
| IIC3 | 66 to 70 inches. Same as above. |

Notes: A few clear uncoated quartz grains are on ped faces from 0 to 30 inches. Roots plentiful 0 to 12 inches, common from 12 to 21, few from 21 to 48, and practically absent below 48 inches. Horizons A1, B21-B22, IIB32, and IIC1 were sampled for the Bureau of Public Roads.

¹/ Munsell color for moist soil.

SOIL SURVEY LABORATORY Lincoln, Nebr.

SOIL TYPE Minia LOCATION Wayne County, Iowa
silt loam

SOIL NOS. 859Iowa-93-1 LAB. NOS. 11538-11549

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1 | | | | | | | | | | TEXTURAL CLASS |
|----------------------------------|---------------------------------|--|--------------------------|---------------------|------------|--------------------------------------|---|-----------------------------------|-----------------------|-------------------|--------------------------|----------------|
| | | 1B1a | | | | | | | | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | 2A2 | | | |
| 2.1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 (< 19mm) | | | |
| 0-7 | A1 | 0.2a | 0.3a | 0.2a | 0.2a | 0.3a | 77.5 | 21.3 | 33.2 | 44.7 | - | s11 |
| 7-12 | A21 | 0.1a | 0.5a | 0.3a | 0.3a | 0.3a | 78.2 | 20.3 | 32.5 | 46.1 | - | s11 |
| 12-18 | A22 | 0.6a | 1.1a | 0.5a | 0.4a | 0.5a | 76.5 | 20.4 | 31.4 | 45.8 | - | s11 |
| 18-21 | B1 | 0.3a | 1.0a | 0.6a | 0.6a | 0.5a | 69.2 | 27.8 | 28.0 | 42.0 | - | sic1 |
| 21-26 | B21 | 1.3a | 1.1a | 0.5a | 0.5a | 0.4a | 54.2 | 42.0 | 20.9 | 33.9 | - | sic |
| 26-30 | B22 | 0.1a | 0.4a | 0.3a | 0.4a | 0.5a | 44.4 | 53.9 | 17.4 | 27.7 | - | sic |
| 30-32 | B23 | <0.1 | 0.2a | 0.2a | 0.4a | 0.7a | 44.0 | 54.5 | 17.3 | 27.6 | - | sic |
| 32-38 | B24 | 0.1a | 0.3a | 0.3a | 0.5a | 0.6a | 45.4 | 52.8 | 17.6 | 28.7 | - | sic |
| 38-48 | B3 | <0.1 | 0.2a | 0.2a | 0.4a | 0.4a | 50.9 | 47.9 | 19.0 | 32.5 | - | sic |
| 48-53 | C1 | 0.1a | 0.2a | 0.2a | 0.3a | 0.4a | 57.9 | 40.9 | 21.7 | 36.8 | - | sic |
| 53-61 | C21 | <0.1 | 0.1a | 0.1a | 0.2a | 0.4a | 60.1 | 39.1 | 23.2 | 37.4 | - | sic1 |
| 61-68 | C22 | <0.1 | 0.1a | 0.1a | 0.2a | 0.2a | 63.6 | 35.8 | 24.5 | 39.4 | - | sic1 |
| pH | | ORGANIC MATTER | | | | Free Iron | ELECTRIC CONDUCTIVITY EC-10 ³ MILLIMOS PER CM @ 25°C | CaCO ₃ equiv- alent | GYPSUM me./100g. SOIL | MOISTURE TENSIONS | | |
| 8C1a | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITRO-GEN % | C/N | Fe ₂ O ₃ % | 6C1a | % | | 4B2 | | |
| 1:1 | | | % | % | | | | | | 15 Atmos. | | |
| 5.6 | | | 2.69 | 0.227 | 11.8 | 0.9 | 0.4 | | | 10.3 | | |
| 5.7 | | | 1.62 | 0.129 | 12.6 | 0.9 | 0.4 | | | 8.7 | | |
| 6.0 | | | 0.83 | 0.067 | 12 | 1.2 | 0.4 | | | 7.7 | | |
| 5.9 | | | 0.64 | 0.059 | 11 | 1.2 | 0.4 | | | 11.5 | | |
| 5.8 | | | 0.76 | 0.069 | 11 | 1.8 | 0.4 | | | 17.7 | | |
| 5.6 | | | 0.74 | 0.064 | 12 | 1.6 | 0.4 | | | 22.9 | | |
| 5.7 | | | 0.64 | 0.062 | 10 | 1.6 | 0.4 | | | 24.0 | | |
| 5.7 | | | 0.52 | 0.051 | 10 | 1.6 | 0.3 | | | 23.4 | | |
| 6.2 | | | 0.28 | 0.037 | 8 | 1.2 | 0.3 | | | 21.7 | | |
| 6.4 | | | 0.16 | 0.029 | | 1.7 | 0.3 | | | 20.0 | | |
| 6.6 | | | 0.16 | 0.024 | 7 | 1.9 | 0.3 | <1 | | 19.6 | | |
| 6.6 | | | 0.10 | 0.022 | 4 | 1.3 | 0.4 | <1 | | 17.8 | | |
| 5A1a | EXTRACTABLE CATIONS 5B1a | | | | | 5C1 | 5C3 | 5B1a | 5A3a | 8D3 | 8A | |
| CATION EXCHANGE CAPACITY MEQ./Ac | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | Base Sat. % NH ₄ Ac Arch. | Base Sat. % on Sum Cations | Sum Bases me./100g. | Sum Cations | Ca/Mg | MOISTURE AT SATURATION % | |
| | milliequivalents per 100g. soil | | | | | | | | | | | |
| 18.4 | 11.8 | 3.3 | 9.9 | 0.1 | 0.2 | 84 | 61 | 15.4 | 25.3 | 3.6 | 59.0 | |
| 15.5 | 9.8 | 2.5 | 7.9 | 0.2 | 0.2 | 82 | 62 | 12.7 | 20.6 | 3.9 | 49.5 | |
| 13.5 | 8.0 | 2.8 | 6.0 | 0.4 | 0.1 | 84 | 65 | 11.3 | 17.3 | 2.8 | 45.0 | |
| 19.0 | 10.6 | 4.7 | 7.2 | 0.7 | 0.2 | 85 | 69 | 16.2 | 23.4 | 2.2 | 51.4 | |
| 28.5 | 16.3 | 8.1 | 10.4 | 1.4 | 0.4 | 92 | 72 | 26.2 | 36.6 | 2.0 | 72.5 | |
| 35.6 | 22.0 | 11.5 | 12.4 | 2.0 | 0.5 | 101 | 74 | 36.0 | 48.4 | 1.9 | 100.8 | |
| 38.4 | 23.2 | 12.2 | 10.7 | 2.1 | 0.6 | 99 | 78 | 38.1 | 48.8 | 1.9 | 104.0 | |
| 37.7 | 22.8 | 12.2 | 10.0 | 2.1 | 0.5 | 100 | 79 | 37.6 | 47.6 | 1.9 | 99.2 | |
| 33.5 | 21.8 | 11.5 | 6.7 | 2.0 | 0.5 | 107 | 84 | 35.8 | 42.5 | 1.9 | 88.4 | |
| 30.8 | 20.0 | 10.6 | 5.2 | 1.7 | 0.4 | 106 | 86 | 32.7 | 37.9 | 1.9 | 84.7 | |
| 29.6 | 19.8 | 10.6 | 6.4 | 1.7 | 0.4 | 110 | 84 | 32.5 | 38.9 | 1.9 | 75.5 | |
| 28.6 | 18.3 | 9.5 | 3.7 | 1.6 | 0.4 | 104 | 89 | 29.8 | 33.5 | 1.9 | 70.2 | |

a. Many (Fe-Mn) concr.

Soil type: **Mina silt loam**
 Soil No.: **S59Iowa-93-1**
 Location: **680 feet east and 150 feet north of southwest corner of NW1/4 of Sec. 15, T68N, R21W, Wayne County, Iowa; near northeast corner of schoolyard of abandoned country school at Harvard, Iowa.**
 Vegetation: **Bluegrass sod with some weeds (horse nettles).**
 Parent material: **Loess of Wisconsin age; the loess is approximately 8 feet thick and is deposited over Kansan till.**
 Physiographic position: **Broad flat uplands of the undissected Kansan till plain.**
 Drainage: **Poorly drained.**
 Sampled by and date: **F. F. Riecken, W. P. Dietz, and E. C. A. Ruge, July 17, 1959.**

**Horizon and
 Lincoln
 Lab. Number**

- A1** 0 to 7 inches. Very dark gray (10YR 3/1 moist) friable silt loam with some light gray (10YR 7/1 dry) ped coatings; dry color gray (10YR 5/1); moderate, medium granular to weak fine platy structure; clear boundary.
 11538
- A21** 7 to 12 inches. Mixed gray and very dark gray (10YR 6/1 and 3/1 moist) friable medium silt loam with light gray (10YR 7/1 dry) ped coatings; dry color light gray (10YR 7/1); ped coatings more distinct than in above horizon; moderate fine platy breaking to very fine subangular blocky structure; gradual boundary.
 11539
- A22** 12 to 18 inches. Mixed gray and very dark gray (10YR 5/1 and 3/1 moist) friable medium silt loam; upper ped surfaces (top) covered with gray and dark gray (10YR 5/1 and 4/1 moist) coatings; lower ped surfaces are very dark gray (10YR 3/1 moist); dry colors gray and light gray (10YR 5/1 and 7/1); few fine faint yellowish brown (10YR 5/6 to 5/8 moist) mottles; moderate to strong medium platy structure; clear boundary.
 11540
- E1** 18 to 21 inches. Mixed gray and very dark gray (10YR 5/1 and 2.5/1 moist) friable to slightly firm, light silty clay loam; grainy, gray (10YR 5/1 moist) particles on peds; dry color dark gray and light gray (10YR 4/1 and 7/1); moderate fine subangular blocky structure; some thick, discontinuous clay skins on peds; abrupt boundary.
 11541
- E21** 21 to 26 inches. Very dark gray and black (10YR 3/1 and 2/1 moist) very firm medium silty clay; common medium distinct yellowish brown (10YR 5/6 and 5/8 moist) mottles mostly on ped interiors; weak medium subangular blocky structure; peds cohere when soil is moist; thick continuous clay skins; many fine medium-hard iron-manganese concretions; gradual boundary.
 11542
- E22** 26 to 30 inches. Same as above horizon except clear boundary.
 11543
- E23** 30 to 32 inches. Dark grayish brown to grayish brown (10YR 4/1 and 2.5Y 5/1 moist) firm to very firm, light to medium silty clay; common medium distinct yellowish brown (10YR 5/6 moist) mottles and common black (10YR 2/1 moist) clay fills; weak medium subangular blocky structure; peds cohere when moist; continuous clay skins, thinner than above; few fine pores present; fine moderately hard iron-manganese concretions, fewer than above horizon; gradual boundary.
 11544
- E24** 32 to 38 inches. Dark gray to olive gray (2.5Y 4/1 to 5Y 5/2 moist) firm, light silty clay; common fine distinct brownish yellow (10YR 6/6 moist) mottles and some black (10YR 2/1 moist) clay fills; weak medium subangular blocky structure; continuous clay skins, most prominent on big slickensided horizontal ped surfaces; few fine iron-manganese concretions; gradual boundary.
 11545
- E3** 38 to 48 inches. Olive gray (5Y 5/2 moist) firm medium silty clay loam; common coarse distinct yellowish red and yellowish brown (5YR 4/8 and 10YR 5/8 moist) mottles and some black (10YR 2/1 moist) clay fills; weak medium prismatic breaking to weak medium subangular blocky structure; thin clay skins on vertical ped faces; clear boundary.
 11546
- C1** 48 to 53 inches. Olive gray (5Y 5/2 moist) firm light silty clay loam; common coarse distinct yellowish red and strong brown (5YR 4/8 and 7.5YR 5/8 moist) mottles and a few coarse pencil-size black (10YR 2/1 moist) clay fills; weak coarse prismatic to very weak medium subangular blocky structure; thin clay skins on vertical ped faces; boundary gradual.
 11547
- C21** 53 to 61 inches. Olive gray (5Y 5/2 moist) slightly firm light silty clay loam; common very coarse distinct yellowish red (5YR 4/8 to 5/8 moist) mottles; few fine black (10YR 2/1 moist) clay fills; very weak medium subangular blocky structure; few clay skins.
 11548
- C22** 61 to 68 inches. Same as horizon above.
 11549

SOIL TYPE #Everly LOCATION Clay County, Iowa
silt loam

SOIL NOS. S59Iowa-21-7-(1-8) LAB. NOS. 11186-11193

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|---|-------------------------------------|--|----------------------|-------------------------|------------------------|----------------------------------|--------------------|--------------------|----------------|---------------------|------------|--------------------------------|--------------------------|
| | | 1B1a 3A1 | | | | | | | | | | | |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 (< 19mm) | 2A2 > 2 | | |
| 0-7 | Alp | 0.6 | 6.5 | 9.2 | 10.5 | 6.2 | 41.3 | 25.7 | 32.1 | 19.9 | Tr. | 1 | |
| 7-11 | A3 | 0.3 | 4.0 | 6.8 | 8.6 | 6.2 | 44.6 | 29.5 | 34.0 | 20.7 | - | cl | |
| 11-16 | B1 | 0.3 | 3.8 | 6.0 | 8.0 | 6.3 | 45.3 | 30.3 | 33.3 | 21.9 | - | cl | |
| 16-22 | B21 | 0.9 | 3.4 | 4.8 | 7.3 | 6.9 | 45.3 | 31.4 | 34.5 | 21.2 | Tr. | cl | |
| 22-31 | IIB22 | 2.7 | 4.6 | 4.3 | 8.2 | 6.0 | 36.9 | 37.3 | 26.6 | 20.7 | Tr. | cl | |
| 31-40 | IIB3 | 3.7a | 4.6a | 4.2a | 8.1a | 6.4a | 41.5 | 31.5 | 25.7 | 26.7 | 7 | cl | |
| 40-50 | IIC1 | 4.2a | 4.8a | 3.9a | 7.7a | 6.2a | 42.0 | 31.2 | 25.5 | 26.9 | 7 | cl | |
| 50-60+ | IIC2 | 3.8a | 4.7a | 4.0a | 7.8a | 6.3a | 41.6 | 31.8 | 25.4 | 26.9 | 7 | cl | |
| pH | | ORGANIC MATTER | | | | 6C1a | Bulk Density | | | Water Content | | | |
| 8C1a | | 6A1a | 6B1a | | Free Iron | 4A1a | 4A1c | 4A1h | 4B1 | 4B3 | 4B2 | | |
| 1:1 | 1:5 | 1:10 | ORGANIC CARBON % | NITROGEN % | C/N | Fe ₂ O ₃ % | Field-Moist g/cc | 30-Cm. g/cc | O.D. g/cc | Field-Moist % | 30-Cm. % | 15-Bar % | |
| 6.3 | | | 2.55 | 0.219 | 11.6 | 1.3 | | | | | | 11.5 | |
| 6.5 | | | 1.99 | 0.174 | 11.4 | 1.4 | 1.37 | 1.32 | 1.43 | 20 | 28 | 12.7 | |
| 6.7 | | | 1.59 | 0.142 | 11.2 | 1.6 | | | | | | 12.4 | |
| 6.7 | | | 0.88 | 0.086 | 10 | 1.7 | 1.46 | 1.43 | 1.54 | 18 | 23 | 12.0 | |
| 7.0 | | | 0.43 | 0.052 | 8 | 2.3 | 1.45 | 1.41 | 1.50 | 18 | 21 | 13.6 | |
| 8.0 | | | 0.20 | | | 1.9 | | | | | | 13.1 | |
| 8.0 | | | 0.14 | | | 1.8 | 1.72 | 1.66 | 1.74 | 13 | 18 | 13.3 | |
| 7.9 | | | 0.10 | | | 1.9 | | | | | | 13.9 | |
| 5A1a | EXTRACTABLE CATIONS | | | | | 5B1a | BASE SAT. % | 5C3 | 5B1a | 5A3a | 8D3 | 6E1a | MOISTURE AT SATURATION % |
| CATION EXCHANGE CAPACITY NH ₄ Ac | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | NH ₄ Ac EXCH. | Base Sat. % | Sum on Sum Cations | Sum Ext. Bases | Sum Ext. Cations | Ca/Mg | CoCO ₃ equiv-alem % | |
| | ← milliequivalents per 100g. soil → | | | | | 5C1 | | | | | | | |
| 24.0 | 17.8 | 4.4 | 6.7 | 0.1 | 0.5 | 95 | 77 | 22.8 | 29.5 | 4.0 | | | |
| 23.3 | 18.4 | 4.2 | 6.5 | 0.1 | 0.3 | 99 | 78 | 23.0 | 29.5 | 4.4 | | | |
| 22.5 | 17.5 | 5.0 | 6.0 | 0.1 | 0.3 | 102 | 79 | 22.9 | 28.9 | 3.5 | | | |
| 21.0 | 15.9 | 5.6 | 4.5 | 0.1 | 0.3 | 104 | 83 | 21.9 | 26.4 | 3.5 | | | |
| 21.5 | 17.2 | 5.4 | 2.8 | 0.1 | 0.3 | 107 | 89 | 23.0 | 25.8 | 3.2 | | | |
| 15.2 | | | | 0.1 | 0.2 | | | | | | | | 19 |
| 14.4 | | | | 0.2 | 0.2 | | | | | | | | 23 |
| 14.0 | | | | 0.2 | 0.3 | | | | | | | | 21 |
| a. Few carbonate concr. (CaCO ₃ ?) | | | | | | | | | | | | | |

Soil type: *Everly silt loam
 Soil No.: 859Iowa-21-7-(1-8)
 Location: 340 feet south of road center and 200 feet west of the northeast corner of the NW1/4 of NW1/4 of Sec. 20, T96N, R37W, Clay County, Iowa.
 Vegetation and use: Corn; cropland.
 Slope and land form: Tagewell till plain. Gently convex low ridge that rises slightly to a nearly level area to the west. Slope gradient at sample site is about 2 percent to the north, south, and east.
 Drainage: Well drained.
 Parent material: About 22 inches of gritty poorly sorted loess or similar sediment overlying calcareous clay loam glacial till.
 Collected by: R. H. Jordan and R. L. Juve.
 Described by: F. J. Carlisle and R. I. Turner, June 12, 1959.

Horizon and
 Lincoln
 Lab. Number

Alp 0 to 7 inches. Very dark brown (10YR 2/1.6, 4/1 dry) heavy gritty silt loam; massive breaking to weak fine granular and weak fine subangular blocky; friable; much visible fine sand, most of which is clear and uncoated but some has patchy dark brown coatings; clear boundary.
 11186

A3 7 to 11 inches. Very dark brown (10YR 2.3/2) ped surfaces over very dark grayish brown (10YR 3/2) ped interiors (10YR 4/1.5 dry), light gritty silty clay loam, estimated 28 percent clay; moderate fine granular and fine subangular blocky; friable; many fine sand grains are partially coated with dark brown and other grains are uncoated; common fine tubular pores; gradual boundary.
 11187

B1 11 to 16 inches. Very dark grayish brown (10YR 3/2) and very dark brown (10YR 2/1.6) in about equal proportions (4/1 and 4/2 dry) with darkest color mostly in narrow tongues that appear to be old root and wormholes, gritty light silty clay loam, estimated 30 percent clay; weak fine subangular blocky; friable; a few fine dark brown spots; many fine and few medium tubular pores; gradual boundary.
 11188

B21 16 to 22 inches. Dark brown (10YR 3.5/3, 5/3 dry) gritty silty clay loam, estimated 31 percent clay, containing noticeably more fine sand than horizon above; moderate fine subangular blocky; friable; many fine tubular pores; clear boundary.
 11189

IIB22 22 to 31 inches. Dark brown (10YR 3.5/3, 5/3 dry) medium clay loam, estimated 34 percent clay; compound weak medium prismatic and moderate fine subangular blocky; few smooth shiny dark brown patches on ped faces; slightly firm under weak pressure and firm and plastic under strong pressure; few fine faint gray mottles in the lower part; common fine and few medium and coarse tubular pores; some fine gravel; gradual boundary.
 11190

IIB3 31 to 40 inches. Dark brown (10YR 4/3) clay loam, estimated 32 percent clay; compound weak medium to coarse prisms and weak medium subangular blocky; firm; calcareous matrix; many firm carbonate concretions; common fine distinct grayish brown mottles and a few browner mottles; many dark oxide dendrites; shiny smooth dark brown patches on ped faces; many pebbles have thin coating of carbonate on their lower surfaces; common fine tubular pores; gradual boundary.
 11191

IIC1 40 to 50 inches. Similar to horizon above but lacks weak subangular blocky structure and carbonate concretions are less numerous; gradual boundary.
 11192

IIC2 50 to 60 inches plus. Yellowish brown (10YR 5/4) clay loam; very weak prismatic; firm; common faint dark yellowish brown and medium distinct gray (10YR 5/1 to 5/1) mottles; many dark oxide dendrites; carbonate concretions similar to layer above; calcareous matrix; common fine and occasional medium tubular pores.
 11193

Notes: Colors are for fully moist soil unless indicated otherwise. Roots decrease in numbers gradually with depth. Only a few roots present and these are mostly above 16-inch depth.

SOIL TYPE *Everly LOCATION Clay County, Iowa
 silt loam

SOIL NOS. S59Iowa-21-8-(1-8) LAB. NOS. 11194-11201

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1 | | | | | | | | | | TEXTURAL CLASS |
|---|-------------------------------------|--|------------------|-------------|------------|----------------------------------|----------------------------|----------------|------------------|---------------|--------------------------------|--------------------------|
| | | 1B1a | | | | | | | | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | 2A2 | | | |
| 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | < 9mm | | > 2 | |
| 0-8 | Alp | 1.8 | 6.0 | 6.5 | 9.7 | 5.5 | 41.5 | 29.0 | 30.5 | 21.2 | - | c1 |
| 8-12 | A3 | 1.2 | 4.2 | 4.8 | 8.1 | 5.2 | 42.8 | 33.7 | 29.4 | 22.7 | Tr. | c1 |
| 12-16 | B1 | 1.0 | 3.6 | 4.4 | 8.1 | 5.7 | 42.6 | 34.6 | 30.3 | 22.3 | Tr. | c1 |
| 16-20 | B21 | 2.5 | 4.3 | 4.6 | 8.5 | 6.2 | 40.9 | 33.0 | 28.8 | 22.8 | Tr. | c1 |
| 20-26 | B22 | 2.3 | 4.2 | 4.5 | 8.9 | 7.8 | 39.1 | 33.2 | 30.2 | 21.4 | Tr. | c1 |
| 26-36 | IIB3 | 7.0a | 5.4a | 4.3a | 8.5a | 7.9a | 41.4 | 25.5 | 29.8 | 24.0 | 7 | 1 |
| 36-50 | IIC1 | 4.4a | 4.8a | 4.0a | 8.2a | 8.5a | 44.9 | 25.2 | 31.3 | 26.6 | 7 | 1 |
| 50-60+ | IIC2 | 4.1a | 4.5a | 3.9a | 8.1a | 8.4a | 45.1 | 25.9 | 31.5 | 26.5 | 6 | 1 |
| pH | | ORGANIC MATTER | | | | 6C1a | Bulk Density | | | Water Content | | |
| 8C1a | | 6A1a | 6B1a | | Free Iron | 4A1a | 4A1c | 4A1d | 4B1 | 4B3 | 4B2 | |
| 1:1 | 1:5 | 1:10 | ORGANIC CARBON % | NITROGEN % | C/N | Fe ₂ O ₃ % | Field-Moist g/cc | 30-Cm. g/cc | 0. D. Moist % | 30-Cm. % | 15-Bar % | |
| 5.7 | | | 2.72 | 0.232 | 11.7 | 1.8 | | | | | 11.9 | |
| 5.8 | | | 2.15 | 0.189 | 11.4 | 2.1 | 1.48 | 1.42 | 1.53 | 19 | 25 | 13.1 |
| 6.0 | | | 1.57 | 0.144 | 10.9 | 2.4 | | | | | | 16.6 |
| 6.1 | | | 1.15 | 0.113 | 10.2 | 2.8 | 1.53 | 1.48 | 1.58 | 17 | 22 | 12.5 |
| 6.6 | | | 0.72 | 0.070 | 10 | 3.3 | 1.58 | 1.53 | 1.63 | 14 | 19 | 12.1 |
| 8.0 | | | 0.32 | | | 2.5 | | | | | | 10.6 |
| 8.1 | | | 0.17 | | | 2.6 | 1.74 | 1.68 | 1.74 | 11 | 16 | 11.2 |
| 8.0 | | | 0.11 | | | 1.9 | | | | | | 11.2 |
| 5A1a | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % | 5C3 | 5B1a | 5A3a | 8D3 | 6E1a | MOISTURE AT SATURATION % |
| CATION EXCHANGE CAPACITY NH ₄ Ac | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | NH ₄ Ac EXCH. | Base Sat. % on Sum Cations | Sum Ext. Bases | Sum Ext. Cations | Ca/Mg | CaCO ₃ equivalent % | |
| | ← milliequivalents per 100g. soil → | | | | | 5C1 | | | | | | |
| 23.9 | 17.0 | 4.4 | 9.7 | <0.1 | 0.5 | 92 | 69 | 21.9 | 31.6 | 3.9 | | |
| 24.0 | 16.9 | 4.7 | 8.3 | <0.1 | 0.3 | 91 | 72 | 21.9 | 30.2 | 3.6 | | |
| 22.3 | 16.1 | 4.9 | 6.8 | <0.1 | 0.3 | 96 | 76 | 21.3 | 28.1 | 3.3 | | |
| 20.7 | 15.1 | 5.1 | 5.5 | <0.1 | 0.3 | 99 | 79 | 20.5 | 26.0 | 3.0 | | |
| 18.5 | 14.6 | 5.0 | 3.8 | <0.1 | 0.3 | 108 | 84 | 19.9 | 23.7 | 2.9 | | |
| 13.0 | | | | 0.1 | 0.2 | | | | | | <1 | |
| 11.6 | | | | 0.1 | 0.2 | | | | | | 16 | |
| 11.7 | | | | 0.1 | 0.2 | | | | | | 21 | |
| | | | | | | | | | | | 20 | |

a. Few carbonate concr. (CaCO₃?).

Soil type: *Everly silt loam
 Soil No.: S59Iowa-21-8-(1-8)
 Location: 340 feet east of road center and 880 feet south of the northwest corner of SW1/4 of Sec. 13, T97N, R37W, Clay County, Iowa.
 Vegetation and use: Corn; cropland.
 Slope and land form: Tazewell till plain. Gently convex 2 percent slope.
 Drainage: Well drained.
 Parent material: About 2 feet of gritty poorly sorted loess or similar sediment overlying calcareous clay loam glacial till.
 Collected by: R. H. Jordan and R. L. Juve.
 Described by: F. J. Carlisle and R. I. Turner, June 12, 1959.

Horizon and
 Lincoln
 Lab. Number

Alp 0 to 8 inches. Black (10YR 2.3/1, 3.5/1 dry) heavy gritty silt loam, estimated 27 percent clay; massive in place but breaking to weak fine subangular blocky; friable; most fine sand grains are clear and uncoated but a few have patchy brown surface stains; clear boundary.
 11194

A3 8 to 12 inches. Black (10YR 2.3/1) gritty light silty clay loam, estimated 28 percent clay; moderate fine granular and subangular blocky; friable; contains a few small spots of very dark grayish brown (10YR 3/2); dry colors are 10YR 3/1 and 4/2, rubbed color about 2.5/1.5; common fine and very fine tubular pores; gradual boundary.
 11195

B1 12 to 16 inches. Mixed black (10YR 2.3/1) and very dark grayish brown (10YR 3/2) in about equal proportions, gritty silty clay loam, estimated 32 percent clay; moderate fine and very fine subangular blocky; friable; common fine and very fine tubular pores; gradual boundary.
 11196

B21 16 to 20 inches. Dark brown (10YR 4/3) clay loam, estimated 34 percent clay; about 50 percent of exposed vertical surface consists of very dark gray and very dark grayish brown material predominantly in vertical worm and root channels; moderate fine subangular blocky; friable; an occasional pebble; common fine tubular pores; gradual boundary.
 11197

B22 20 to 26 inches. Dark brown (10YR 4/3) clay loam approaching silty clay loam, estimated 34 percent clay; about 15 percent of exposed vertical surface is very dark gray material in vertical channels as above; weak fine subangular blocky; slightly firm; many pebbles; common fine and a few medium tubular pores; clear boundary.
 11198

IIB3 26 to 36 inches. Dark yellowish brown (10YR 4/4) clay loam, estimated 32 percent clay; weak fine subangular blocky; slightly firm; calcareous matrix; a few firm white carbonate concretions in lower part; pebbles larger than 1/2 inch in diameter have thin carbonate coating on lower surface; common fine and few medium tubular pores; some fine faint gray mottles in lower part; gradual boundary.
 11199

IIC1 36 to 50 inches. Yellowish brown (10YR 5/4) clay loam; massive; slightly firm; calcareous matrix; common carbonate concretions of irregular shapes up to 1-1/2 cm. in diameter; common fine and few medium to coarse tubular pores; few fine faint grayish brown (10YR 5/2) mottles; gradual boundary.
 11200

IIC2 50 to 60 inches plus. Yellowish brown (10YR 5/4) clay loam; massive; very firm; common medium distinct dark yellowish brown (10YR 4/4) and grayish brown (10YR 5/2) mottles; carbonate concretions and pores similar to layer above.
 11201

Notes: Colors are for fully moist soil unless indicated otherwise. A narrow seam of yellowish brown sand extends from bottom of sampling pit up through horizons IIC2 and IIC1.

SOIL SURVEY LABORATORY Lincoln, Nebr.

SOIL TYPE Fayette LOCATION Clayton County, Iowa
silt loam

SOIL NOS. S59Iowa-22-1 LAB. NOS. 11520-11527

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|--------------|---------|--|-------------|-------------|-----------|----------------|------------|---------|----------|------------|-----|----------------|
| | | 1B1a | | | | | | | | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | 3A1 | | 2A2 | |
| | | 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 | |
| | | (< 19mm) | | | | | | | | | | |
| 0-2 | A1 | 0.1a | 0.3a | 0.2a | 0.3a | 1.5a | 84.6 | 13.0 | 41.1 | 45.2 | - | s11 |
| 2-9 | A2 | <0.1 | 0.2b | 0.1b | 0.3b | 1.5a | 84.4 | 13.5 | 40.0 | 46.1 | - | s11 |
| 9-17 | B1 | <0.1 | 0.1b | 0.2b | 0.3b | 1.3a | 81.2 | 16.9 | 37.7 | 45.0 | - | s11 |
| 17-24 | B21 | <0.1 | 0.1b | 0.1b | 0.2b | 3.0a | 72.8 | 23.8 | 38.7 | 37.2 | - | s11 |
| 24-35 | B22 | 0.1b | <0.1 | <0.1 | 0.3b | 3.2a | 68.7 | 27.7 | 44.0 | 28.1 | - | siel |
| 35-42 | B23 | <0.1 | <0.1 | <0.1 | 0.3b | 3.2a | 65.8 | 30.7 | 43.3 | 25.9 | - | siel |
| 42-48 | B3 | <0.1 | <0.1 | <0.1 | 0.3b | 2.8a | 67.3 | 29.6 | 43.5 | 26.8 | - | siel |
| 48+ | C1 | <0.1 | <0.1 | <0.1 | 0.3a | 3.0a | 70.4 | 26.3 | 46.1 | 27.5 | - | s11 |

| pH | | ORGANIC MATTER | | | Free Iron | ELECTRICAL CONDUCTIVITY | MOISTURE TENSIONS | | |
|------|--|----------------|----------|------|----------------------------------|-------------------------|--------------------------------|-----------------------|-----------|
| 8C1a | | 6A1a | 6B1a | | Fe ₂ O ₃ % | EC x 10 ³ | CaCO ₃ equiv. alent | GYPSUM me./100g. SOIL | 4B2 |
| 1:5 | | ORGANIC CARBON | NITROGEN | C/N | 6C1a | MILLIMHOS PER CM 5A1a | % | | 15 Atmos. |
| 1:1 | | % | % | | | | | | % |
| 5.6 | | 5.63 | 0.343 | 16.4 | 0.9 | 0.6 | | | 12.0 |
| 5.0 | | 0.66 | 0.079 | 8. | 1.0 | 0.2 | | | 5.3 |
| 5.0 | | 0.30 | 0.047 | 6. | 1.2 | 0.2 | | | 6.4 |
| 5.0 | | 0.20 | 0.040 | | 1.6 | 0.1 | | | 9.5 |
| 4.9 | | 0.16 | 0.031 | | 1.7 | 0.1 | | | 11.9 |
| 5.0 | | 0.17 | 0.030 | | 1.8 | 0.1 | | | 13.9 |
| 5.2 | | 0.14 | 0.028 | | 1.8 | 0.1 | | | 13.7 |
| 5.1 | | 0.12 | 0.026 | | 1.8 | 0.2 | | | 12.2 |

| 5A1a | EXTRACTABLE CATIONS | | | | | 5B1a | 5C1 | 5C3 | 5B1a | 5A3a | 8D3 | 8A |
|---|---------------------|------|------|------|------|--------------------------|----------------------------|-----------|-------------|-------|-----|--------------------------|
| CATION EXCHANGE CAPACITY NH ₄ Ac | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | Base Sat. % | Base Sat. % on Sum Cations | Sum Bases | Sum Cations | Ca/Mg | | MOISTURE AT SATURATION % |
| | Ca | Mg | H | Na | K | NH ₄ Ac Exch. | | me/100g | me/100g | | | |
| ← milliequivalents per 100g. soil → | | | | | | | | | | | | |
| 21.1 | 12.3 | 4.3 | 13.5 | <0.1 | 0.6 | 82 | 56 | 17.2 | 30.7 | 2.9 | | 85.3 |
| 7.3 | 1.2 | 0.7 | 8.4 | <0.1 | 0.2 | 29 | 20 | 2.1 | 10.5 | 1.7 | | 43.8 |
| 8.4 | 2.0 | 1.7 | 7.6 | <0.1 | 0.2 | 46 | 34 | 3.9 | 11.5 | 1.2 | | 40.4 |
| 13.0 | 4.9 | 2.9 | 9.2 | <0.1 | 0.3 | 62 | 47 | 8.1 | 17.3 | 1.7 | | 50.9 |
| 17.1 | 6.9 | 3.6 | 10.3 | 0.1 | 0.3 | 64 | 51 | 10.9 | 21.2 | 1.9 | | 55.3 |
| 19.9 | 10.2 | 5.0 | 9.0 | 0.1 | 0.4 | 79 | 64 | 15.7 | 24.7 | 2.0 | | 60.9 |
| 19.1 | 10.8 | 5.1 | 8.8 | 0.1 | 0.3 | 85 | 65 | 16.3 | 25.1 | 2.1 | | 61.4 |
| 17.5 | 10.0 | 4.5 | 7.8 | 0.1 | 0.3 | 85 | 66 | 14.9 | 22.7 | 2.2 | | 62.2 |

a. Few (Fe-Mn?) concn.
b. Many (Fe-Mn?) concn.

Soil type: Fayette silt loam
 Soil No.: S59Iowa-22-1
 Location: NE1/4 of SW1/4 of Sec. 35, T95N, R3W, Mendon Township, Clayton County, Iowa; approximately 75 feet inside the entrance to Pike's Peak State Park and 25 feet to the right.
 Vegetation: Oak-hickory forest.
 Parent material: Gray brown Podzolic soils developed on post Iowan-post Tazewell loess; Fayette soils are the forested members of a bio sequence which includes the Tama series, a Brunizem, and the Downs series, a transition.
 Slope: 2 percent convex.
 Drainage: Well drained.
 Described by and date: Roger B. Parsons, July 22, 1959.

Horizon and
 Lincoln
 Lab. Number

Ao 1/2 to 1 inch thick. Partly decomposed forest litter from white and red oak and shagbark hickory.

A1 0 to 2 inches. Very dark gray (10YR 3/1 moist) silt loam; strong very fine granular structure; very friable when moist; abundant fine roots; abrupt and wavy horizon boundary.
 11520

A2 2 to 9 inches. Pale brown (10YR 6/3 moist) silt loam; moderate to strong very thin platy structure; friable when moist; clear and wavy horizon boundary.
 11521

B1 9 to 17 inches. Brown (10YR 4/3 moist) fine silt loam; moderate very fine subangular blocky structure; slightly firm when moist; vesicular; prominent very pale brown (10YR 7/3 moist) grainy coatings on ped faces; common thin discontinuous clay skins on horizontal and vertical ped faces; clear and wavy horizon boundary.
 11522

B21 17 to 24 inches. Brown (10YR 4/3 moist) silty clay loam; strong fine subangular blocky structure; slightly firm to firm when moist; few grainy gray coatings on peds; abundant discontinuous clay skins; clear and wavy horizon boundary.
 11523

B22 24 to 35 inches. Brown (10YR 4/3 moist) silty clay loam; strong fine subangular blocky structure; slightly firm to firm when moist; prominent continuous dark yellowish brown (10YR 4/4 moist) clay skins on horizontal and vertical ped faces; some black (2.5Y 2/4) manganese concretions; diffuse and wavy horizon boundary.
 11524

B23 35 to 42 inches. Brown (10YR 4/3 moist) silty clay loam; strong fine subangular blocky structure; slightly firm to firm when moist; prominent nearly continuous clay skins on ped faces; clear and wavy horizon boundary.
 11525

B3 42 to 48 inches. Yellowish brown (10YR 5/4 moist) silty clay loam; moderate fine subangular blocky structure to massive; slightly firm when moist; discontinuous dark yellowish brown (10YR 4/4 moist) clay skins mostly on vertical ped faces; clear and wavy horizon boundary.
 11526

C1 48 inches plus. Yellowish brown (10YR 5/6 moist) fine silt loam; massive; slightly firm when moist; some clay skins prominent along vertical fracture planes.
 11527

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Jackson County, Iowa

SOIL TYPE Fayette silt loam

LAB NOS. D3853-D3874

Project and
Field Nos. Z-1-2-8-(223-233)

| LABORATORY NUMBER | DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (In mm) (per cent) | | | | | | | | | | TEXTURAL CLASS | | | | | |
|-------------------|--------------|---------|---|----------------------|-------------------------|-------------------------|----------------------------|--------------------------------|---------|--------------|------------|-----------|----------------|------|--|------|--|-----|
| | | | 181b | | COARSE SAND | | | | | FINE SAND | | | | SILT | | CLAY | | 2A2 |
| | | | VERY COARSE SAND 2-1 | COARSE SAND 7-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.100 | VERY FINE SAND 10-0.050 | 0.05-0.002 | < 0.002 | II | III | > 2 | | | | | | |
| D3853 | 0-3 | A1 | 0.1 | 0.4 | 0.3 | 1.2 | 6.0 | 76.3 | 15.7 | 46.0 | 37.1 | 0 | | | | | | |
| D3854 | 3-6 | A21 | 0.0 | 0.4 | 0.3 | 0.7 | 5.9 | 77.5 | 15.2 | 46.0 | 37.8 | Tr. | | | | | | |
| D3855 | 6-9 | A22 | 0.1 | 0.3 | 0.3 | 0.7 | 6.0 | 77.2 | 15.4 | 46.0 | 37.6 | 0 | | | | | | |
| D3856 | 9-12 | A22 | 0.0 | 0.2 | 0.2 | 0.3 | 5.5 | 78.4 | 15.4 | 45.2 | 38.9 | 0 | | | | | | |
| D3857 | 12-16 | A3 | 0.0 | 0.2 | 0.2 | 0.3 | 5.3 | 76.8 | 17.2 | 44.8 | 37.5 | 0 | | | | | | |
| D3858 | 16-19 | B1 | 0.0 | 0.2 | 0.1 | 0.3 | 5.4 | 73.9 | 20.1 | 44.4 | 35.1 | 0 | | | | | | |
| D3859 | 19-22 | B1 | 0.0 | 0.1 | 0.1 | 0.3 | 5.0 | 71.8 | 22.7 | 43.6 | 33.4 | 0 | | | | | | |
| D3860 | 22-26 | B21 | 0.0 | 0.1 | 0.1 | 0.3 | 5.2 | 68.3 | 26.0 | 43.0 | 30.7 | 0 | | | | | | |
| D3861 | 26-29 | B21 | 0.0 | 0.0 | 0.1 | 0.2 | 5.1 | 65.5 | 29.1 | 42.3 | 28.4 | 0 | | | | | | |
| D3862 | 29-33 | B22 | 0.0 | 0.1 | 0.1 | 0.2 | 5.9 | 64.9 | 28.8 | 43.0 | 28.0 | 0 | | | | | | |
| D3863 | 33-35 | B22 | 0.0 | 0.0 | 0.1 | 0.2 | 5.5 | 65.0 | 29.2 | 42.5 | 28.1 | 0 | | | | | | |
| D3864 | 35-38 | B22 | 0.0 | 0.1 | 0.1 | 0.4 | 6.2 | 63.9 | 29.3 | 44.2 | 26.2 | 0 | | | | | | |
| D3865 | 38-42 | B23 | 0.0 | 0.0 | 0.0 | 0.2 | 5.4 | 63.4 | 31.0 | 42.3 | 26.5 | 0 | | | | | | |
| D3866 | 42-46 | B23 | 0.0 | 0.1 | 0.1 | 0.3 | 5.2 | 63.3 | 31.0 | 42.0 | 26.7 | 0 | | | | | | |
| D3867 | 46-50 | B31 | 0.0 | 0.1 | 0.1 | 0.3 | 5.4 | 64.3 | 29.8 | 43.2 | 26.7 | 0 | | | | | | |
| D3868 | 50-54 | B31 | 0.0 | 0.1 | 0.1 | 0.4 | 5.8 | 65.5 | 28.1 | 44.0 | 27.4 | 0 | | | | | | |
| D3869 | 54-58 | B32 | 0.0 | 0.0 | 0.0 | 0.2 | 5.4 | 67.7 | 26.7 | 46.0 | 27.1 | 0 | | | | | | |
| D3870 | 58-62 | B32 | 0.0 | 0.1 | 0.1 | 0.3 | 4.8 | 68.0 | 26.7 | 45.4 | 27.6 | 0 | | | | | | |
| D3871 | 62-68 | B33 | 0.0 | 0.1 | 0.1 | 0.5 | 4.5 | 68.8 | 26.0 | 44.6 | 28.9 | 0 | | | | | | |
| D3872 | 68-74 | C1 | 0.0 | 0.0 | 0.0 | 0.1 | 3.5 | 71.5 | 24.9 | 44.1 | 30.9 | 0 | | | | | | |
| D3873 | 74-80 | C2 | 0.0 | 0.0 | 0.0 | 0.2 | 4.1 | 73.5 | 22.2 | 46.9 | 30.8 | 0 | | | | | | |
| D3874 | 120-130 | C3 | 0.0 | 0.0 | 0.0 | 0.1 | 4.0 | 79.8 | 16.1 | 52.2 | 31.6 | 0 | | | | | | |
| | | | PH | | ORGANIC MATTER | | FREE IRON OXIDE | MOISTURE RETAINED AT | | | | | | | | | | |
| | | | 8C1a | | 6A3a | | | | | | | | | | | | | |
| | | | H ₂ O | | Organic Matter | NITROGEN | C/N | Fe ₂ O ₃ | | BULK DENSITY | 1/10 ATMOS | 1/3 ATMOS | 15 ATMOS | | | | | |
| | | | 1.1 | | % | % | | % | g/cc | % | % | % | | | | | | |
| D3853 | 6.6 | | | | 4.4 | | | | | | | | | | | | | |
| D3854 | 5.0 | | | | 1.5 | | | | | | | | | | | | | |
| D3855 | 4.6 | | | | 0.9 | | | | | | | | | | | | | |
| D3856 | 4.7 | | | | 0.7 | | | | | | | | | | | | | |
| D3857 | 4.7 | | | | 0.5 | | | | | | | | | | | | | |
| D3858 | 4.7 | | | | 0.4 | | | | | | | | | | | | | |
| D3859 | 4.7 | | | | 0.3 | | | | | | | | | | | | | |
| D3860 | 4.8 | | | | 0.2 | | | | | | | | | | | | | |
| D3861 | 4.9 | | | | 0.3 | | | | | | | | | | | | | |
| D3862 | 4.9 | | | | 0.3 | | | | | | | | | | | | | |
| D3863 | 5.0 | | | | 0.3 | | | | | | | | | | | | | |
| D3864 | 5.1 | | | | 0.3 | | | | | | | | | | | | | |
| D3865 | 5.1 | | | | 0.4 | | | | | | | | | | | | | |
| D3866 | 5.1 | | | | 0.2 | | | | | | | | | | | | | |
| D3867 | 5.1 | | | | 0.1 | | | | | | | | | | | | | |
| D3868 | 5.2 | | | | 0.2 | | | | | | | | | | | | | |
| D3869 | 5.2 | | | | 0.2 | | | | | | | | | | | | | |
| D3870 | 5.3 | | | | 0.1 | | | | | | | | | | | | | |
| D3871 | 5.4 | | | | 0.0 | | | | | | | | | | | | | |
| D3872 | 5.6 | | | | 0.0 | | | | | | | | | | | | | |
| D3873 | 5.7 | | | | 0.0 | | | | | | | | | | | | | |
| D3874 | 7.9 | | | | 0.0 | | | | | | | | | | | | | |
| | | | EXTRACTABLE CATIONS | | BASE SATURATION | | | | | | | | | | | | | |
| | | | 6N4a | 6O4a | 6H3a | | | | | | | | | | | | | |
| | | | Ca | Mg | Na | K | H | | | | | | | | | | | |
| | | | milliequivalents per 100g soil | | | | | (SUM) | | | | | | | | | | |
| D3853 | | | 8.2 | 4.1 | | | 4.5 | | | | | | | | | | | |
| D3854 | | | 1.9 | 1.8 | | | 6.5 | | | | | | | | | | | |
| D3855 | | | | | | | | | | | | | | | | | | |
| D3856 | | | 1.5 | 1.3 | | | 6.5 | | | | | | | | | | | |
| D3857 | | | 2.1 | 1.4 | | | 6.7 | | | | | | | | | | | |
| D3858 | | | | | | | | | | | | | | | | | | |
| D3859 | | | | | | | | | | | | | | | | | | |
| D3860 | | | 6.8 | 3.3 | | | 7.6 | | | | | | | | | | | |
| D3861 | | | 8.3 | 3.8 | | | 8.0 | | | | | | | | | | | |
| D3862 | | | 8.7 | 4.0 | | | 7.9 | | | | | | | | | | | |
| D3863 | | | | | | | | | | | | | | | | | | |
| D3864 | | | 10.1 | 4.5 | | | 6.7 | | | | | | | | | | | |
| D3865 | | | 11.3 | 5.1 | | | 6.8 | | | | | | | | | | | |
| D3866 | | | | | | | | | | | | | | | | | | |
| D3867 | | | 11.6 | 5.4 | | | 6.1 | | | | | | | | | | | |
| D3868 | | | | | | | | | | | | | | | | | | |
| D3869 | | | 10.5 | 5.1 | | | 5.1 | | | | | | | | | | | |
| D3870 | | | 10.7 | 5.0 | | | 4.8 | | | | | | | | | | | |
| D3871 | | | | | | | | | | | | | | | | | | |
| D3872 | | | | | | | | | | | | | | | | | | |
| D3873 | | | 9.8 | 5.0 | | | 3.9 | | | | | | | | | | | |
| D3874 | | | 9.8 | 5.0 | | | 0.0 | | | | | | | | | | | |

a. Horizonation nomenclature added in 1965 by R. I. Dideriksen.

Soil type: Fayette silt loam

Location: NE1/4 NE1/4 NE1/4 Sec. 11, T85N, R3E, Jackson County, Iowa. Pit dug 8 rods east center gravel road, 7 rods south edge of woodlot, and about 1 rod southeast abandoned road in woods in ungrazed woodlot.

Vegetation: Chiefly oak with some hickory, poplar, elm, red cedar, wild cherry, and shrubs; also a little grass.

Slope: 6 percent southwest.

Loess 183 inches deep, calcareous at 110 inches.

Sampled by: R. J. Muckenhirn, L. T. Alexander, and A. M. O'Neal, October 3, 1944.

Horizon and Beltsville Lab. Number

| | |
|--------------|---|
| A1 D3853 | 0 to 3 inches. Brownish black (when moist) silt loam; fine granular structure; organic matter and worm casts abundant; roots very abundant. |
| A21 D3854 | 3 to 6 inches. Light brownish gray silt loam; very fine platy and fine granular structure; aggregates flattened, crushing easily to light yellowish brown; worm burrows and casts fairly abundant; roots abundant. |
| A22 D3855 | 6 to 9 inches. Light yellowish brown silt loam; fine platy and granular structure; aggregates moderately vesicular, flattened, thinly coated with gray and crushing easily to light yellowish brown; worm burrows and casts and roots fairly abundant. |
| A22 D3856 | 9 to 12 inches. Texture and color same as in 6- to 9-inch layer. Coarse granular structure; aggregates moderately to highly vesicular, lightly sprinkled with gray and crushing easily to moderate yellowish brown; roots generally fibrous, worm burrows, and casts fairly abundant. |
| A3 D3857 | 12 to 16 inches. Moderate yellowish brown silt loam; medium nut structure, faintly platy; aggregates moderately vesicular, irregularly shaped, noncompact, lightly sprinkled with gray, and crushing easily without color change; worm burrows, casts, and roots fairly abundant. |
| B1 D3858 | 16 to 19 inches. Moderate yellowish brown silt loam; weakly developed medium nut structure; aggregates slightly vesicular, lightly sprinkled with gray, and crushing easily without color change; worm burrows and casts few, roots fairly abundant. |
| B1 D3859 | 19 to 22 inches. Moderate yellowish brown heavy silt loam; medium blocky structure; aggregates slightly vesicular, very lightly sprinkled with gray, specked with dark brown, and crushing easily to bright moderate yellowish brown; worm burrows few, roots fairly abundant. |
| B21 D3860 | 22 to 26 inches. Moderate yellowish brown silty clay loam; medium blocky structure; aggregates slightly vesicular, lightly sprinkled with gray, specked with dark brown, and crushing very easily without color change; worm burrows few, roots fairly abundant. |
| B21 D3861 | 26 to 29 inches. Dark yellowish brown to moderate brown silty clay loam; compact, medium blocky structure; aggregates slightly vesicular, lightly coated with gray, and crushing with moderate resistance to moderate yellowish brown; a few fibrous roots in crevices. |
| B22 D3862 | 29 to 33 inches. Moderate brown silty clay loam; compact, medium to coarse blocky structure; aggregates slightly vesicular, well coated with gray, and crushing with moderate resistance to moderate yellowish brown; roots few. |
| B22 D3863 | 33 to 35 inches. Moderate to dark yellowish brown silty clay loam; medium blocky structure; aggregates slightly vesicular, well coated with gray, and crushing with light to moderate resistance to moderate yellowish brown; roots fairly abundant. |
| B22 D3864 | 35 to 38 inches. Dark yellowish brown light silty clay loam; coarse blocky structure; aggregates very slightly vesicular, well coated with gray, and crushing with moderate resistance to moderate yellowish brown; roots fairly abundant. |
| B23 D3865 | 38 to 42 inches. Dark yellowish brown silty clay loam; compact, coarse to very coarse blocky structure; aggregates moderately coated with gray, specked with dark brown, and crushing with moderate to strong resistance to moderate yellowish brown; roots fairly abundant. |
| B23 D3866 | 42 to 46 inches. Dark yellowish brown heavy silty clay loam; coarse blocky structure; aggregates slightly vesicular, sprinkled with gray, and crushing with moderate resistance to moderate yellowish brown; roots fairly abundant, following crevices. |
| B31 D3867 | 46 to 50 inches. Moderate yellowish brown silty clay loam; very coarse blocky structure; aggregates slightly vesicular, lightly sprinkled with gray, thinly coated with brown, and crushing easily without color change; roots few. |
| B31 D3868 | 50 to 54 inches. Same as 46- to 50-inch layer except a little lighter in texture and with aggregates more uniformly brown-coated. |
| B32 D3869 | 54 to 58 inches. Same as 46- to 50-inch layer except that this is a heavy silt loam and a little more vesicular; a few roots in the crevices. |
| B32 D3870 | 58 to 62 inches. Same as 54- to 58-inch layer. |
| B33 D3871 | 62 to 68 inches. Light to moderate yellowish brown heavy silt loam; otherwise same as 58- to 62-inch layer. |
| C1 D3872 | 68 to 74 inches. Light to moderate yellowish brown silt loam; very coarse, weakly developed blocky structure; roots few. |
| C2 D3873 | 74 to 80 inches. Same as 68- to 74-inch layer except this is light yellowish brown and has no roots. |
| C3 D3874 | 120 to 130 inches. Calcareous light gray silt loam mottled with light yellowish brown. |

Note: Horizonation nomenclature added in 1965 by R. I. Dideriksen.

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Linn County, Iowa

SOIL TYPE Fayette silt loam

LAB NOS. D3938-D3959

Project and
Field Nos. Z-1-2-8-(285-295)

| LABORATORY NUMBER | DEPTH INCHES | HORIZON <u>a</u> | PARTICLE SIZE DISTRIBUTION (in mm) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|-------------------|--------------|------------------|---|----------------------|-------------------------|---------------------|---------------------------|--|---------------|---------------------------|----------------------|------------------------------|----------------|
| | | | 1B1b | | 3A1 | | | | | | 2A2 | | |
| | | | VERY COARSE SAND 2-1 | COARSE SAND 0.5-0.25 | MEDIUM SAND 0.25-0.10 | FINE SAND 0.10-0.05 | VERY FINE SAND 0.05-0.002 | SILT <0.002 | CLAY 0.2-0.02 | INTERNATIONAL II 0.2-0.02 | | INTERNATIONAL III 0.02-0.002 | |
| D3938 | 0-3 | A1 | 0.2 | 0.7 | 0.4 | 0.9 | 5.6 | 79.2 | 13.0 | 43.2 | 42.2 | Tr. | |
| D3939 | 3-6 | A21 | 0.1 | 0.4 | 0.4 | 0.8 | 5.7 | 80.9 | 11.7 | 44.1 | 43.0 | Tr. | |
| D3940 | 6-9 | A21 | 0.1 | 0.5 | 0.4 | 1.0 | 5.9 | 80.0 | 12.1 | 44.7 | 41.9 | Tr. | |
| D3941 | 9-12 | A22 | 0.1 | 0.4 | 0.3 | 0.6 | 5.1 | 77.4 | 16.1 | 41.8 | 41.1 | Tr. | |
| D3942 | 12-15 | A3 | 0.1 | 0.2 | 0.2 | 0.5 | 5.3 | 72.8 | 20.9 | 37.4 | 41.0 | 0 | |
| D3943 | 15-19 | B1 | 0.0 | 0.1 | 0.1 | 0.3 | 5.3 | 69.0 | 25.2 | 38.5 | 35.9 | 0 | |
| D3944 | 19-23 | B21 | 0.0 | 0.1 | 0.1 | 0.5 | 8.2 | 63.0 | 28.1 | 41.7 | 29.7 | 0 | |
| D3945 | 23-26 | B21 | 0.0 | 0.1 | 0.1 | 0.5 | 9.5 | 60.4 | 29.4 | 43.0 | 27.2 | 0 | |
| D3946 | 26-29 | B22 | 0.0 | 0.1 | 0.1 | 0.6 | 10.4 | 58.8 | 30.0 | 44.0 | 25.6 | 0 | |
| D3947 | 29-33 | B22 | 0.0 | 0.1 | 0.1 | 0.6 | 11.3 | 58.7 | 29.2 | 45.9 | 24.6 | 0 | |
| D3948 | 33-36 | B22 | 0.0 | 0.1 | 0.1 | 0.6 | 11.1 | 57.8 | 30.3 | 46.4 | 22.9 | 0 | |
| D3949 | 36-39 | B22 | 0.0 | 0.1 | 0.1 | 0.4 | 10.4 | 59.7 | 29.3 | 46.1 | 22.3 | 0 | |
| D3950 | 39-41 | B23 | 0.0 | 0.1 | 0.1 | 0.4 | 9.9 | 61.1 | 28.4 | 47.9 | 23.4 | 0 | |
| D3951 | 41-44 | B23 | 0.0 | 0.1 | 0.1 | 0.4 | 9.9 | 61.3 | 28.2 | 47.3 | 24.2 | 0 | |
| D3952 | 44-47 | B23 | 0.0 | 0.1 | 0.1 | 0.4 | 10.0 | 61.4 | 28.0 | 48.5 | 23.2 | 0 | |
| D3953 | 47-50 | B31 | 0.0 | 0.1 | 0.1 | 0.4 | 11.2 | 59.8 | 28.4 | 49.4 | 21.9 | 0 | |
| D3954 | 50-53 | B31 | 0.0 | 0.1 | 0.1 | 0.5 | 12.3 | 60.2 | 26.8 | 53.2 | 19.8 | 0 | |
| D3955 | 53-56 | B31 | 0.0 | 0.1 | 0.1 | 0.6 | 13.4 | 58.7 | 27.1 | 52.3 | 20.2 | 0 | |
| D3956 | 56-60 | B32 | 0.0 | 0.1 | 0.1 | 0.5 | 13.5 | 59.1 | 26.7 | 52.0 | 20.9 | 0 | |
| D3957 | 60-65 | B32 | 0.0 | 0.1 | 0.1 | 0.5 | 11.8 | 61.5 | 26.0 | 52.5 | 21.1 | 0 | |
| D3958 | 65-75 | B33 | 0.0 | 0.1 | 0.1 | 0.4 | 10.6 | 62.0 | 26.8 | 50.2 | 22.7 | 0 | |
| D3959 | 180-234 | C | 0.0 | 0.1 | 0.1 | 0.3 | 11.7 | 70.0 | 17.8 | 60.2 | 21.7 | 0 | |
| | | | pH | | ORGANIC MATTER | | | FREE IRON OXIDE Fe ₂ O ₃ % | | | MOISTURE RETAINED AT | | |
| | | | 8C1a H ₂ O 1.1 | | 6A3a Organic Matter % | NITROGEN % | C/N | | | BULK DENSITY g/cc | 1/10 ATMOS. % | 1/3 ATMOS. % | 15 ATMOS. % |
| D3938 | 5-7 | | | | 3.6 | | | | | | | | |
| D3939 | 5-0 | | | | 1.3 | | | | | | | | |
| D3940 | 5-0 | | | | 0.6 | | | | | | | | |
| D3941 | 5-1 | | | | 0.4 | | | | | | | | |
| D3942 | 4-9 | | | | 0.3 | | | | | | | | |
| D3943 | 4-8 | | | | 0.3 | | | | | | | | |
| D3944 | 4-9 | | | | 0.3 | | | | | | | | |
| D3945 | 5-0 | | | | 0.4 | | | | | | | | |
| D3946 | 5-0 | | | | 0.4 | | | | | | | | |
| D3947 | 5-1 | | | | 0.3 | | | | | | | | |
| D3948 | 5-1 | | | | 0.1 | | | | | | | | |
| | | | CATION EXCHANGE CAPACITY (SUM) | | EXTRACTABLE CATIONS 5B2 | | | BASE SATURATION % (SUM) | | | | | |
| | | | 6N4a Ca | 6O4a Mg | Na | K | 6H3a H | | | | | | |
| | | | milliequivalents per 100g soil | | | | | | | | | | |
| D3938 | | | 5.5 | 1.3 | | | 7.6 | | | | | | |
| D3939 | | | 1.4 | 0.7 | | | 7.3 | | | | | | |
| D3940 | | | | | | | | | | | | | |
| D3941 | | | 3.1 | 1.2 | | | 5.0 | | | | | | |
| D3942 | | | | | | | | | | | | | |
| D3943 | | | | | | | | | | | | | |
| D3944 | | | 7.4 | 3.2 | | | 8.3 | | | | | | |
| D3945 | | | | | | | | | | | | | |
| D3946 | | | 9.9 | 4.2 | | | 8.0 | | | | | | |
| D3947 | | | 10.0 | 4.1 | | | 7.5 | | | | | | |
| D3948 | | | 10.9 | 4.6 | | | 7.3 | | | | | | |
| D3949 | | | | | | | | | | | | | |
| D3950 | | | 10.8 | 4.7 | | | 6.9 | | | | | | |
| D3951 | | | | | | | | | | | | | |
| D3952 | | | 11.0 | 4.7 | | | 6.6 | | | | | | |
| D3953 | | | | | | | | | | | | | |
| D3954 | | | 10.8 | 4.6 | | | 5.4 | | | | | | |
| D3955 | | | | | | | | | | | | | |
| D3956 | | | 11.0 | 4.9 | | | 5.0 | | | | | | |
| D3957 | | | | | | | | | | | | | |
| D3958 | | | 11.2 | 5.0 | | | 4.8 | | | | | | |
| D3959 | | | 11.5 | 4.2 | | | 0.0 | | | | | | |

a. Horizonation nomenclature added in 1965 by R. I. Dideriksen.

Soil type: Fayette silt loam
 Location: NE1/4 SE1/4 NE1/4 Sec. 13, T83N, R7W, Linn County, Iowa. Sample taken 260 paces south and 5 paces west of northeast corner in ungrazed woods, oak-hickory association with basswood and ironwood as minor species.
 Slope: 5 percent. Deep boring to 232 inches revealed loess throughout with calcareous loess occurring below 180; from 80 to 200 inches moderate yellowish brown, at 200 inches light gray.
 Sampled by: R. J. Muckenhirn, F. F. Riecken, L. T. Alexander, and A. M. O'Neal, October 6, 1944.

Horizon and Beltsville Lab. Number

| | |
|--------------|--|
| A1 D3938 | 0 to 3 inches. Brownish black silt loam; very fine granular structure; numerous roots up to 1/4-inch in diameter. |
| A21 D3939 | 3 to 6 inches. Light yellowish brown to pale brown silt loam; fine platy and medium granular structure; crushes easily to very weak brown; worm casts, burrows, and roots abundant. |
| A21 D3940 | 6 to 9 inches. Pale brown silt loam; medium granular and fine platy structure; aggregates flattened, crushing easily to light yellowish brown; worm burrows and casts abundant. |
| A22 D3941 | 9 to 12 inches. Light to moderate yellowish brown silt loam; weakly developed medium platy and medium to coarse granular structure; aggregates moderately vesicular, very lightly sprinkled with gray, crushing easily to light yellowish brown; worm and insect burrows, worm casts, roots, and root channels up to 3/4-inch in diameter fairly abundant. |
| A3 D3942 | 12 to 15 inches. Moderate yellowish brown silt loam; medium nut structure, faintly medium platy particularly in upper part; aggregates moderately vesicular, lightly sprinkled with gray, and crushing easily to light yellowish brown; few worm burrows; roots fairly abundant; this layer grades into the one above and the one below. |
| B1 D3943 | 15 to 19 inches. Moderate brown to moderate yellowish brown silty clay loam; medium blocky structure; aggregates slightly vesicular, lightly coated with gray, and crushing easily to moderate yellowish brown; roots few, generally 1/8- to 1/2-inch in diameter. |
| B21 D3944 | 19 to 23 inches. Moderate yellowish brown silty clay loam; medium blocky structure; aggregates slightly vesicular, angular, coated with gray, crushing easily to moderate yellowish brown; roots few. |
| B21 D3945 | 23 to 26 inches. Moderate brown silty clay loam; medium to coarse blocky structure; otherwise same as 19- to 23-inch layer. |
| B22 D3946 | 26 to 29 inches. Moderate brown heavy silty clay loam; coarse blocky structure; aggregates slightly vesicular, well coated with gray, and crushing with moderate resistance to moderate yellowish brown; roots very few, present only in crevices. |
| B22 D3947 | 29 to 33 inches. Moderate brown silty clay loam; otherwise similar to 26- to 29-inch layer but with less gray coating. |
| B22 D3948 | 33 to 36 inches. Dark yellowish brown silty clay loam; coarse blocky structure; aggregates slightly vesicular, irregularly gray-coated, crushing easily to light yellowish brown; roots very few. |
| B22 D3949 | 36 to 39 inches. Moderate to dark yellowish brown silty clay loam; coarse blocky structure; aggregates slightly vesicular, irregularly gray-coated, crushing easily to moderate yellowish brown; a few roots in crevices. |
| B23 D3950 | 39 to 41 inches. Dark yellowish brown light silty clay loam; coarse blocky structure; aggregates moderately vesicular with some black specks and gray mottling, irregularly coated with gray and dark yellowish brown, and crushing easily to light yellowish brown. |
| B23 D3951 | 41 to 44 inches. Moderate to dark yellowish brown light silty clay loam; coarse blocky structure; aggregates similar to those in 39- to 41-inch layer; gray coating and gray mottling more pronounced and some orange mottling. |
| B23 D3952 | 44 to 47 inches. Moderate yellowish brown silty clay loam; coarse blocky structure; aggregates slightly vesicular, coated with dark yellowish brown and some gray, specked with brown and black, and crushing easily to moderate yellowish brown. |
| B31 D3953 | 47 to 50 inches. Same as 44- to 47-inch layer except for very coarse blocky structure and larger aggregates. |
| B31 D3954 | 50 to 53 inches. Same as 47- to 50-inch layer. |
| B31 D3955 | 53 to 56 inches. Moderate yellowish brown heavy silt loam; very coarse blocky structure; aggregates moderately vesicular, generally coated with gray, crushing easily to moderate yellowish brown. |
| B32 D3956 | 56 to 60 inches. Same as 53- to 56-inch layer. |
| B32 D3957 | 60 to 65 inches. Moderate yellowish brown silt loam; very coarse blocky structure; aggregates moderately vesicular, irregularly coated with gray, and crushing easily to light yellowish brown. |
| B33 D3958 | 65 to 75 inches. Light, moderate yellowish brown silt loam; weakly developed very coarse blocky structure. |
| C D3959 | 180 to 234 inches. Light yellowish brown and light brownish gray silt loam; calcareous, somewhat mottled. |

Note: Horizonation nomenclature added in 1965 by R. I. Dideriksen.

SOIL TYPE Hamburg
silt loam

LOCATION Fremont County, Iowa

SOIL NOS. S61Iowa-36-1

LAB. NOS. 15658-15662

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|---|---------|--|----------------------|-------------------------|------------------------|----------------------------------|--|--------------------------------|------------------------|-----------------------------|------|--------------------------|-----|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 (19mm) | > 2 | | |
| 0-2 | AC | 0.1 | 0.1a | 0.2 | 0.8 | 13.2 | 72.4 | 13.3 | 72.5 | 13.6 | - | s11 | |
| 2-10 | C1 | 0.1b | 0.1 | 0.1c | 0.6c | 11.9c | 75.2 | 12.1 | 73.3 | 14.2 | - | s11 | |
| 10-24 | C2 | 0.1b | 0.1b | 0.1c | 0.5c | 11.8c | 76.4 | 11.0 | 73.7 | 14.8 | - | s11 | |
| 24-38 | C3 | 0.1 | 0.1 | 0.1b | 0.5c | 9.1c | 80.0 | 10.3 | 72.8 | 16.5 | - | si-s11 | |
| 38-54 | C4 | 0.1 | 0.1b | 0.2b | 0.5c | 11.6c | 77.7 | 9.9 | 75.1 | 14.5 | - | s11 | |
| pH | | ORGANIC MATTER | | | | | Free Iron | ELECTRICAL CONDUCTIVITY | 6E1c | 6E1c | 6E1c | | |
| 8C1a | | 6A1a | | NITROGEN | | Fe ₂ O ₃ % | EC x 10 ³ MILLIMHOS PER CM @25°C. | CaCO ₃ equivalent % | GYP SUM me./100g. SOIL | Clay Size CO ₃ % | | | |
| 1:1 | | ORGANIC CARBON % | | C/N | | | | | | | | | |
| 7.7 | | 1.16 | | | | | | 10 | | | | | |
| 7.8 | | 0.68 | | | | | | 12 | | | | | |
| 7.9 | | 0.29 | | | | | | 12 | | | | | |
| 8.1 | | 0.17 | | | | | | 12 | | | | | |
| 8.1 | | 0.11 | | | | | | 12 | | | | | |
| 5A1a | | EXTRACTABLE CATIONS | | | | | BASE SAT. % | 8m | | | | | |
| CATION EXCHANGE CAPACITY NH ₄ OAc | | Ca | Mg | H | Na | K | EXCH. No % | Exch. Cap. 100 g. clay | | | | MOISTURE AT SATURATION % | |
| | | ← milliequivalents per 100g. soil → | | | | | | | | | | | |
| 13.6 | | | | | | | | 102 | | | | | |
| 12.0 | | | | | | | | 99 | | | | | |
| 10.8 | | | | | | | | 98 | | | | | |
| 10.8 | | | | | | | | 105 | | | | | |
| 10.7 | | | | | | | | 108 | | | | | |
| <p>a. Many organic matter fragments. b. Many carbonate concr. CaCO₃? c. Few carbonate concr. CaCO₃?</p> | | | | | | | | | | | | | |

Soil type: Hamburg silt loam

Soil No.: S61Iowa-36-1

Location: 60 feet north and 120 feet east of center of T intersection, extreme side of Sec. 30, T68N, R42W, Fremont County, Iowa; approximately 5½ miles northwest of Hamburg on county road K.

Native vegetation: Grass, little bluestem, and some scattered scrub oak trees and few scattered cedar.

Physiographic position: Steep slope, 70 percent, facing southwest off of ridge extending west from uplands. Catsteps are well defined.

Parent material: Calcareous coarse loess, Wisconsin in age.

Collected by and date: Raymond I. Dideriksen, and John R. Nixon, March 23, 1961.

Horizon and

Lincoln

Lab. Number

| | |
|-------------|---|
| AC 15658 | 0 to 2 inches. Dark grayish brown (10YR 4/2) coarse silt loam; weak very fine granular; very friable moist or dry; abundant fine roots; very porous; numerous casts; calcareous; boundary gradual. |
| C1 15659 | 2 to 10 inches. Dark brown (10YR 4/3) and yellowish brown (10YR 5/4) coarse silt loam; weak very fine granular to massive; very friable moist or dry; abundant very fine roots; numerous fine and medium pores; numerous worm casts; dark brown color seems to extend down along cleavage planes; calcareous; boundary diffuse. |
| C2 15660 | 10 to 24 inches. Yellowish brown (10YR 5/4) and pale brown (10YR 6/3) coarse silt loam; weak very fine granular to massive; very friable moist or dry; few very fine roots; numerous fine and medium pores; few brown (10YR 5/3) worm casts; calcareous; boundary diffuse. |
| C3 15661 | 24 to 38 inches. Yellowish brown (10YR 5/4) and pale brown (10YR 6/3) coarse silt loam; few fine faint light brownish gray (2.5Y 6/2) mottles; weak very fine granular to massive; very friable moist or dry; very few fine roots; numerous very fine pores, some light-colored filament lime present; calcareous; boundary diffuse. |
| C4 15662 | 38 to 54 inches. Yellowish brown (10YR 5/4) and pale brown (10YR 6/3) coarse silt loam; few fine faint light brownish gray (2.5Y 6/2) mottles; weak very fine granular to massive; very friable moist or dry; very few fine roots; numerous very fine pores; some very fine soft dark oxides; some light-colored filament lime present; calcareous. |

Notes: All colors are moist. Horizons AC, C1, C3 and C4 were sampled for Bureau of Public Roads.

SOIL TYPE Ida LOCATION Fremont County, Iowa
 silt loam

SOIL NOS. 861Iowa-36-2 LAB. NOS. 15663-15667

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|--|---------|--|----------------------|-------------------------|------------------------|----------------------------------|--|--|-----------------------|-------------------------------------|----------------------|--------------------------|
| | | 1B1a VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | 2A2 > 2 (19mm) | |
| 0-7 | ApC | 0.1a | 0.1a | 0.1b | 0.2b | 6.3b | 70.8 | 22.4 | 55.4 | 21.8 | - | sil |
| 7-13 | C1 | 0.2a | 0.1a | 0.1a | 0.4a | 4.7b | 73.3 | 21.2 | 54.3 | 23.9 | - | sil |
| 13-22 | C2 | 0.3a | 0.2a | 0.2a | 0.4a | 4.9b | 73.9 | 20.1 | 53.1 | 25.9 | - | sil |
| 22-32 | C3 | 0.1 | 0.3a | 0.2a | 0.4a | 4.3b | 75.6 | 19.2 | 54.1 | 26.0 | Tr. | sil |
| 32-48 | C4 | 0.2a | 0.4a | 0.2a | 0.4a | 5.5b | 75.8 | 17.5 | 56.6 | 24.9 | Tr. | sil |
| pH | | ORGANIC MATTER | | | | Free Iron | ELECTRICAL CONDUCTIVITY EC-10 ³ PER CM @25°C. | 6E1c CaCO ₃ equivalent % | GYPSUM mg./100g. SOIL | 6E1c Clay Size CO ₃ % | | |
| 8C1a | 1.5 | 1:10 | ORGANIC CARBON % | NITROGEN % | C/N | Fe ₂ O ₃ % | | | | | | |
| 1:1 | | | | | | | | | | | | |
| 7.6 | | | 0.84 | | | | | 4 | | | | |
| 7.8 | | | 0.67 | | | | | 7 | | | | |
| 7.7 | | | 0.49 | | | | | 8 | | | | |
| 7.8 | | | 0.25 | | | | | 8 | | | | |
| 7.8 | | | 0.13 | | | | | 8 | | | | |
| 5A1a | | EXTRACTABLE CATIONS | | | | | BASE SAT. % | 8D1 Exch. Cap. 100 g. Clay | | | | MOISTURE AT SATURATION % |
| CATION EXCHANGE CAPACITY NH ₄ OAc | | Ca | Mg | H | Na | K | EXCH. Na % | | | | | |
| | | ← millequivalents per 100g. soil → | | | | | | | | | | |
| 18.9 | | | | | | | | 84 | | | | |
| 18.1 | | | | | | | | 85 | | | | |
| 17.5 | | | | | | | | 87 | | | | |
| 17.0 | | | | | | | | 88 | | | | |
| 16.2 | | | | | | | | 92 | | | | |
| a. Many carbonate concn. CaCO ₃ ? | | | | | | | | | | | | |
| b. Few carbonate concn. CaCO ₃ ? | | | | | | | | | | | | |

Soil type: Ida silt loam
 Soil No.: 861Iowa-36-2
 Location: 300 feet south of center of blacktop road, 100 feet west of lane, NE1/4 SW1/4 of Sec. 33, T69N, R42W, Fremont County, Iowa; approximately 1.8 miles from Sidney, Iowa on county road L.
 Vegetation: Alfalfa hay.
 Physiographic position: Slope is 15 percent, south-facing.
 Parent material: Calcareous loess of Wisconsin age.
 Collected by and date: Raymond I. Dideriksen and John R. Nixon, March 23, 1961.

Horizon and
 Lincoln
 Lab. Number

ApC 0 to 7 inches. Dark brown (10YR 4/3) and dark grayish brown (10YR 4/2) heavy silt loam; weak fine platy breaking to very fine granular; very friable moist or dry; common fine roots; platiness seems to be due to compaction; many fine pores; many worm casts; calcareous; boundary gradual and wavy.
 15663

C1 7 to 13 inches. Yellowish brown (10YR 5/4) medium silt loam; weak very fine granular; very friable wet or dry; few very fine roots; numerous very fine pores; many dark brown (10YR 4/3) and few dark brown (10YR 3/3) worm casts; calcareous; boundary diffuse.
 15664

C2 13 to 22 inches. Yellowish brown (10YR 5/4) silt loam and few fine light brownish gray (2.5Y 6/2) mottles; weak medium prismatic breaking to very fine granular; very friable moist or dry; few very fine roots; many fine and very fine pores; few 1/4- to 1/2-inch hard lime concretions; numerous worm casts; calcareous; boundary diffuse.
 15665

C3 22 to 32 inches. Yellowish brown (10YR 5/4) coarse silt loam with few fine light brownish gray (2.5Y 6/2) mottles; weak medium prismatic breaking to very fine granular; very friable; abundant very fine and fine pores; very few fine roots; lime concretions as in above horizon; few distinct dark soft oxides; few worm casts; calcareous; boundary diffuse.
 15666

C4 32 to 48 inches. Yellowish brown (10YR 5/6) coarse silt loam; few fine light brownish gray (2.5Y 6/2) mottles; weak fine granular to massive; very friable; abundant very fine and fine pores; very few fine roots; lime concretions as in above horizon; few distinct dark soft oxides; worm casts appear to be absent; calcareous.
 15667

Notes: All colors are moist. Pit description, profile very wet; about 75 feet downslope from Monona ridgetop.

SOIL TYPE Ida LOCATION Harrison County, Iowa
silt loam

SOIL NOS. 858Iowa-43-5 LAB. NOS. 9590-9592

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--|---------------------------------|--|------------------------|-------------------------|------------------------|----------------------------------|--|-----------------------------------|-----------------------------|-------------------|----------------|--------------------------|-----|
| | | 1B1a | | | | | | 3A1 | | | | | 2A2 |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 (< 9mm) | | |
| 0-8 | A1 | <0.1 | 0.1 | <0.1 | 0.2a | 3.2a | 71.8 | 24.7 | 50.7 | 24.4 | - | s11 | |
| 8-14 | B(?) | 0.2b | 0.2b | 0.1c | 0.2d | 3.5d | 74.8 | 21.0 | 51.6 | 26.8 | Tr. | s11 | |
| 14-28 | C1 | 0.1b | 0.2b | 0.1c | 0.4d | 4.3d | 76.9 | 18.0 | 56.0 | 25.4 | Tr. | s11 | |
| pH | | ORGANIC MATTER | | | | Free Iron | ELECTRI-CAL CONDUCTIVITY | 6E1a | | MOISTURE TENSIONS | | | |
| 8C1a | 1:5 | 1:10 | 6A1a ORGANIC CARBON | 6B1a NITRO-GEN | C/N | Fe ₂ O ₃ % | EC x 10 ³ MILLIMHOS PER CM | CaCO ₃ equiv- alent | GYPSUM mg./100g. SOIL | 1/10 ATMOS. | 1/3 ATMOS. | 15 ATMOS. | |
| | 1:1 | | % | % | | 6C1a | | % | | % | % | % | |
| | 6.6 | | 2.40 | 0.226 | 10.6 | 1.4 | | 4 | | | | 13.0 | |
| | 7.8 | | 1.12 | 0.106 | 10.4 | 1.3 | | 6 | | | | 9.9 | |
| | 8.0 | | 0.49 | 0.055 | 9 | 1.2 | | 9 | | | | 8.8 | |
| 5A1a | EXTRACTABLE CATIONS | | | | | 5B1a | BASE SAT. % | 5C3 | 5B1a | 5A3a | 8D3 | MOISTURE AT SATURATION % | |
| CATION EXCHANGE CAPACITY NH ₄ Ac | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | NH ₄ Ac EXCH. | Base Sat. % on Sum Cations | Sum Bases | Sum Cations | Ca/Mg | | | |
| | milliequivalents per 100g. soil | | | | | 5C1 | | <-me/100 g> | | | | | |
| | 22.4 | 16.9 | 5.3 | 4.5 | <0.1 | 0.7 | 102 | 84 | 22.9 | 27.4 | 3.2 | | |
| | 18.0 | | 5.0 | <0.1 | <0.1 | 0.4 | | | | | | | |
| | 16.2 | | 4.9 | <0.1 | 0.1 | 0.4 | | | | | | | |

a. Trace smooth dark brown to black coner. (Fe-Mn?)
 b. Almost all CaCO₃ coner.
 c. Common CaCO₃ coner.
 d. Same as "a" plus few CaCO₃ coner.

Soil type: Ida silt loam

Soil No.: 858Iowa-43-5

Location: 450 feet south and 320 feet west of the northeast corner of the SW1/4 of the SW1/4 of Sec. 7, T80N, R42W, Harrison County, Iowa.

Slope: 15 percent convex, western exposure.

Vegetation: Big and little bluestem, bluegrass, native legumes, and sparse weeds.

Geomorphic surface: Recent.

Collected by and date: G. H. Simonson and R. B. Daniels, August 6, 1958.

Horizon and

Lincoln

Lab. Number

| | |
|--------------|--|
| Al 9590 | 0 to 8 inches. Very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and very fine subangular blocky and medium and fine granular; friable; leached post-Farmdale loess; abrupt to the B(?). |
| B(?) 9591 | 8 to 14 inches. Brown to dark brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; common dark brown (10YR 3/3) and brown to dark brown (10YR 4/3) worm casts; weak medium subangular blocky breaking to fine granular; friable; calcareous; gradual to the C1. |
| C1 9592 | 14 to 28 inches. Brown to dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; sparse gray and browner mottles; massive; friable; calcareous loess; common brown to dark brown (10YR 4/3) worm casts. |

SOIL SURVEY LABORATORY Lincoln, Nebr. August 1961

SOIL TYPE Ida LOCATION Harrison County, Iowa
silt loam

SOIL NOS. S59Iowa-43-7 LAB. NOS. 12388-12391

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--|---------|--|----------------------|-------------------------|------------------------|-----------------------------|----------------------------------|---|----------------------------|----------------|----------------------|------------------|--------------------------|
| | | 1B1a | | | | | 3A1 | | | | | | |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.19 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | | | 2A2 > 2 (19mm) | | |
| 0-6 | A1 | 0.3a | 0.1b | 0.1b | 0.2c | 3.9c | 76.0 | 19.4 | 55.5 | 24.5 | Tr. | s11 | |
| 6-12 | AC | <0.1 | 0.1b | 0.1b | 0.5c | 4.6c | 78.0 | 16.7 | 58.1 | 24.7 | Tr. | s11 | |
| 12-20 | C1 | <0.1 | 0.1b | 0.1b | 0.4c | 5.1c | 77.3 | 17.0 | 57.4 | 25.1 | Tr. | s11 | |
| 30-40 | C2 | <0.1 | <0.1 | 0.1b | 0.5c | 5.1c | 80.7 | 13.6 | 61.4 | 24.7 | Tr. | s11 | |
| 8C1a | | pH | | ORGANIC MATTER | | | Free Iron | ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM | 6E1a | | MOISTURE TENSIONS | | |
| 1:1 | | 1:5 | 1:10 | ORGANIC CARBON % | NITROGEN % | C/N | Fe ₂ O ₃ % | CaCO ₃ equivalent % | GYPSSUM me./100g. SOIL | 1/10 ATMOS. | 1/3 ATMOS. | 4B2 15 ATMOS. | |
| 7.7 | | | | 1.64 | 0.141 | 12 | 1.2 | 6 | | | | 10.4 | |
| 7.9 | | | | 0.58 | 0.055 | 10 | 1.3 | 8 | | | | 9.5 | |
| 8.0 | | | | 0.33 | 0.033 | 10 | 1.3 | 9 | | | | 9.1 | |
| 8.0 | | | | 0.14 | | | 1.3 | 10 | | | | 8.3 | |
| 5A1a | | EXTRACTABLE CATIONS | | | | | 5B1a | BASE SAT. % NH ₄ OAc EXCH. | Base Sat. % on Sum Cations | Sum Ext. Bases | Sum Ext. Cations | Ca/Mg | MOISTURE AT SATURATION % |
| CATION EXCHANGE CAPACITY NH ₄ OAc | | 6O2b | 6H1a | 6P2a | 6Q2a | | | | | | | | |
| | | Co | Mg | H | Na | K | | | | | | | |
| | | ← milliequivalents per 100g. soil → | | | | | | | | | | | |
| 18.6 | | 2.8 | <0.1 | <0.1 | 0.6 | | | | | | | | |
| 16.9 | | 2.8 | <0.1 | <0.1 | 0.4 | | | | | | | | |
| 16.5 | | 3.0 | <0.1 | 0.1 | 0.4 | | | | | | | | |
| 14.6 | | 3.2 | <0.1 | 0.1 | 0.4 | | | | | | | | |

- a. Many organic matter residues.
- b. Common carbonate coner. CaCO₃?
- c. Few carbonate coner. CaCO₃?

Soil type: Ida silt loam

Soil No.: S59Iowa-43-7

Location: 460 feet north and 495 feet west of the southeast corner of the SW1/4 of the SW1/4 of Sec. 7, T80N, R42W, Harrison County, Iowa.

Slope: 25 percent west, slightly convex.

Site: Profile is located in a virgin area on a small, 10-foot wide shelf between steps ("catsteps") ranging from 6 to 18 inches in height.

Vegetation: Native grasses, primarily big and little bluestem.

Geomorphic surface: Recent.

Collected by and date: G. H. Simonson and R. B. Daniels, October 19, 1959.

Horizon and

Lincoln

Lab. Number

| | |
|-------------|--|
| A1 12388 | 0 to 6 inches. Very dark grayish brown (10YR 3.5/2) silt loam; dark grayish brown (10YR 4/2) crushed; grayish brown (10YR 5/2) dry; moderate fine granular; friable; very abundant worm casts; abundant roots; calcareous post-Farmdale loess; clear lower boundary. |
| AC 12389 | 6 to 12 inches. Brown (10YR 4/3) silt loam; common mixing of dark grayish brown (10YR 3.5/2) worm casts; sparse to common fine gray and browner mottles; very weak medium subangular blocky, breaking to granular; very friable; abundant worm casts; gradual lower boundary. |
| C1 12390 | 12 to 20 inches. Brown (10YR 5/3) silt loam; common brown (10YR 4/3) worm casts; common fine grayish brown (2.5Y 5/2) and strong brown (7.5YR 5/6) mottles; massive; very friable; gradual lower boundary. |
| C2 12391 | 20 to 40 inches (sampled 30 to 40 inches). Brown (10YR 5/3) silt loam; sparse fine indistinct gray and browner mottles and sparse fine dark manganese concentrations; massive; friable; sparse to common worm casts; sparse small carbonate aggregates; few roots; calcareous post-Farmdale loess. |

SOIL TYPE Kenyon
loam

LOCATION Bremer County, Iowa

SOIL NOS. S60Iowa-9-1-(1-11)

LAB. NOS. 14105-14115

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------------------|---------|--|------------------------------------|------------------|-----------|----------------|---------------------------|---------------------------|---------------|------------|---------------------|-------------------------------------|-----|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | 0.2-0.02 | 0.02-0.002 | <0.002 | | |
| | | 2.1 | 1.0-5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | <0.002 | > 2 | |
| 0-5 | A1p | 1.9 | 11.8 | 12.8 | 19.4 | 7.4 | 28.5 | 18.2 | 28.4 | 16.0 | tr. | | |
| 5-10 | A12 | 1.8 | 10.2 | 10.3 | 16.4 | 7.3 | 31.5 | 22.5 | 27.2 | 18.6 | tr. | | |
| 10-14 | A3 | 3.2 | 9.4 | 9.7 | 15.8 | 7.7 | 30.2 | 24.0 | 27.2 | 17.6 | 4 | | |
| 14-19 | B1 | 3.2 | 7.4 | 8.3 | 15.5 | 9.1 | 31.0 | 25.5 | 29.3 | 18.0 | 3 | | |
| 19-25 | B21 | 2.7 | 6.3 | 8.7 | 17.9 | 10.8 | 28.3 | 25.3 | 32.3 | 15.2 | 3 | | |
| 25-33 | B22 | 3.5 | 6.8 | 8.3 | 17.6 | 11.1 | 29.3 | 23.4 | 33.2 | 15.4 | 3 | | |
| 33-40 | B23 | 3.5 | 6.4 | 8.3 | 18.0 | 11.0 | 30.6 | 22.2 | 33.3 | 16.7 | 3 | | |
| 40-47 | B31 | 2.2 | 5.6 | 7.6 | 16.3 | 10.1 | 33.5 | 24.7 | 33.0 | 18.2 | tr. | | |
| 47-54 | B32 | 2.9 | 6.4 | 7.8 | 15.2 | 9.2 | 33.2 | 25.3 | 32.8 | 17.0 | 2 | | |
| 54-62 | C1 | 3.4 | 5.8 | 7.1 | 16.4 | 10.2 | 36.0 | 21.1 | 34.5 | 19.4 | 3 | | |
| 62-76 | C2 | 3.1 | 5.9 | 6.8 | 15.3 | 10.0 | 37.0 | 21.9 | 34.7 | 19.7 | 3 | | |
| 8C1a | | 6C1a ORGANIC MATTER | | | | | Bulk Density | | | | Moist. Reten. | | |
| pH | Ext. | Iron as Fe % | 6A1a ORGANIC CARBON % ^a | 6B1a NITRO-GEN % | C/N | Field Moist | | 30 Cm | | O.D. g/cc | 1/3 ATMOS. Pieces % | 15 ATMOS. Sieved % | |
| | | | | | | 4B4 % M. | 4A1a g/cc | 4B3 % M. | 4A1c g/cc | | | | |
| 6.3 | | 1.0 | 1.99 | 0.170 | 12 | 15.0 | 1.46 | 18.2 | 1.45 | 1.52 | | 8.6 | |
| 5.8 | | 1.2 | 1.77 | 0.132 | 13 | 17.2 | 1.52 | 21.2 | 1.50 | 1.58 | | 9.6 | |
| 5.4 | | 1.3 | 1.01 | 0.089 | 11 | | | | | | | 9.2 | |
| 5.2 | | 1.4 | 0.66 | 0.066 | 10 | | | | | | | 9.0 | |
| 5.2 | | 1.4 | 0.40 | 0.040 | 10 | 13.6 | 1.60 | 16.5 | 1.58 | 1.66 | | 8.5 | |
| 5.2 | | 1.5 | 0.28 | | | 10.1 | 1.65 | 15.1 | 1.61 | 1.69 | | 8.5 | |
| 5.7 | | 1.4 | 0.23 | | | | | | | | | 8.9 | |
| 6.0 | | 1.7 | 0.20 | | | 11.0 | 1.72 | 14.3 | 1.67 | 1.76 | | 10.0 | |
| 7.0 | | 1.5 | 0.18 | | | 13.2 | 1.63 | 18.5 | 1.58 | 1.70 | | 10.7 | |
| 7.8 | | 1.4 | 0.13 | | | 14.1 | 1.77 | 16.3 | 1.74 | 1.84 | | 9.4 | |
| 7.9 | | 1.3 | 0.13 | | | 15.9 | 1.74 | 17.9 | 1.70 | 1.81 | | 4.6 | |
| 5A1a | | EXTRACTABLE CATIONS 5B1a | | | | | Base Sat. | | | 8M | 8D3 | Carbonate as CaCO ₃ 6E1c | |
| CATION EXCHANGE CAPACITY | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | 5A3a Sum | 5C1 on | 5O3 Cations | Ratio to Clay | Ca/Mg | <2-mm. % | Clay % | |
| | | | | | | | NH ₄ OAc CEC % | NH ₄ OAc CEC % | | | | | |
| | | | | | | | | | | | | | |
| 15.1 | 10.4 | 3.6 | 5.9 | 0.1 | 0.2 | 20.2 | 95 | 71 | .83 | 2.9 | | | |
| 15.5 | 9.9 | 3.0 | 8.3 | 0.1 | 0.2 | 21.5 | 85 | 61 | .69 | 3.3 | | | |
| 14.5 | 9.5 | 2.7 | 8.1 | 0.1 | 0.2 | 20.6 | 86 | 61 | .60 | 3.5 | | | |
| 13.7 | 8.4 | 2.6 | 7.1 | 0.1 | 0.2 | 18.4 | 82 | 61 | .54 | 3.2 | | | |
| 12.2 | 8.3 | 2.5 | 5.9 | 0.1 | 0.2 | 17.0 | 91 | 65 | .48 | 3.3 | | | |
| 11.7 | 8.1 | 2.3 | 4.2 | 0.1 | 0.2 | 14.9 | 91 | 72 | .50 | 3.5 | | | |
| 11.9 | 8.8 | 2.4 | 3.5 | 0.1 | 0.2 | 15.0 | 97 | 77 | .54 | 3.7 | | | |
| 12.9 | 10.2 | 2.7 | 2.8 | 0.1 | 0.2 | 16.0 | 102 | 82 | .52 | 3.8 | | | |
| 13.6 | | | | 0.1 | 0.2 | | | | .54 | | tr. | - | |
| 10.8 | | | | 0.1 | 0.2 | | | | .51 | | 10 | tr. | |
| 10.6 | | | | 0.1 | 0.2 | | | | .48 | | 11 | tr. | |

a. 14 Kg/M² to 60 inches.

Soil type: Kenyon loam

Soil No.: 860Iowa-9-1-(1-11)

Location: 553 feet north and 310 feet east of the SW corner of Sec. 31, T93N, R13W, Bremer County, Iowa.

Vegetation: Oak stubble.

Parent material: Gritty overburden over Iowan till.

Physiographic position: Upland till plain on a convex north-sloping ridge top; side slopes of 3 to 5 percent.

Slope: 2 percent.

Drainage: Moderately well drained.

Permeability: Moderate in gritty overburden; moderately slow in Iowan till.

Ground water: None within 84 inches.

Moisture: Slightly moist.

Described by: D. F. Slusher and R. L. Buckner, October 10, 1960.

Horizon and
Lincoln Lab No.

- Alp 0 to 5 inches. Black (10YR 2/1)¹ loam; cloddy, breaking to weak fine granular structure; friable; gradual boundary.
14105
- A12 5 to 10 inches. Very dark brown (10YR 2/2) heavy loam; weak fine subangular blocky structure breaking to weak fine granules; friable; clear boundary.
14106
- A3 10 to 14 inches. Very dark grayish brown (10YR 3/2) heavy loam; moderate fine and very fine subangular blocky structure; friable; common fine distinct very dark gray (10YR 3/1) and brown (10YR 4/3) worm casts and mixings; kneaded color very dark grayish brown (10YR 3/2); clear boundary.
14107
- B1 14 to 19 inches. Very dark grayish brown (10YR 3/2) and brown (10YR 4/3) heavy loam; moderate fine subangular blocky structure; friable; very dark grayish brown (10YR 3/2) and brown (10YR 4/3) ped surfaces; dark brown (10YR 4/3) inside peds; a few very dark gray (10YR 3/1) worm casts; common fine tubular pores in peds; a discontinuous stone line consisting of rounded stones 1 to 6 inches in diameter (5 to 10 percent of this horizon) occurs throughout the horizon; the peds have a few clear uncoated quartz grains (fine-sand size) on the surfaces; clear boundary.
14108
- B21 19 to 25 inches. Brown (10YR 4/3) and dark yellowish brown (10YR 4/4) heavy loam; weak medium prismatic structure breaking to moderate fine subangular blocks; friable; brown (10YR 4/3) on ped surfaces; dark yellowish brown (10YR 4/4) inside peds; a few very dark grayish brown worm casts; kneaded color dark yellowish brown (10YR 4/4); common fine and a few medium tubular pores in peds; a few fine faint soft reddish brown iron-manganese oxide accumulations; a few clear uncoated quartz grains on ped surfaces; gradual boundary.
14109
- B22 25 to 33 inches. Yellowish brown (10YR 5/4 and 10YR 5/6) heavy loam; weak medium prismatic structure breaking to moderate fine subangular blocks; friable; yellowish brown (10YR 5/4) with a few fine faint brown (10YR 4/3) streaks on ped surfaces; yellowish brown (10YR 5/6) inside peds; kneaded color yellowish brown (10YR 5/6); common fine tubular pores in peds; a few fine faint black and reddish brown soft iron-manganese oxide accumulations; gradual boundary.
14110
- B23 33 to 40 inches. Brown (10YR 5/3) and yellowish brown (10YR 5/6) heavy loam; weak medium prismatic structure breaking to moderate fine and medium subangular blocks; slightly firm; brown (10YR 5/3) with common fine faint brown (10YR 4/3) mottles on ped surfaces; yellowish brown (10YR 5/6) with common fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles inside peds; common fine tubular pores in peds; a few soft distinct iron-manganese oxide concretions; gradual boundary.
14111
- B31 40 to 47 inches. Grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) light clay loam; weak medium prismatic structure breaking to moderate medium angular blocks; firm; grayish brown (10YR 5/2) with common fine distinct dark brown (7.5YR 4/4) mottles on ped surfaces; yellowish brown (10YR 5/6 and 5/8) with common fine distinct dark brown (10YR 4/3) mottles inside peds; common fine tubular pores in peds; a few soft black iron-manganese oxide concretions; a very few faint clay films in fine pores; gradual boundary.
14112
- B32 47 to 54 inches. Same as above except for a clear boundary.
14113
- C1 54 to 62 inches. Mixed yellowish brown (10YR 5/6), dark yellowish brown (10YR 4/4), and gray (5Y 6/1) heavy loam; massive with some distinct vertical cleavage; firm; common fine distinct dark brown (7.5YR 4/4) mottles; calcareous; common fine light gray (10YR 7/1) and yellow (10YR 7/8) lime concretions; gradual wavy boundary, i.e., material adjacent to sand pocket leached more deeply.
14114
- C2 62 to 76 inches. Dark brown (10YR 4/3) and gray (5Y 6/1) heavy loam; massive with some vertical cleavage; firm; a few fine faint yellowish brown (10YR 5/6) mottles; a few soft black iron-manganese oxide concretions; calcareous; some lime concretions but fewer than in horizon above.
14115

Notes: An oval-shaped sand pocket, about 12 to 18 inches in diameter, crossed the pit diagonally between 32 and 84 inches. The border portion, 1 to 2 inches, of the sand pocket had a slightly higher clay content than the middle. The sand was noncalcareous and the till adjacent to the pocket was leached more deeply than in other parts of the pit. The profile was sampled beside the sand pocket but no closer than about 8 inches. Roots are plentiful above 5 inches, common from 5 to 10, few from 10 to 54, and scarce from 62 to 76 inches. The glacial till below the B1 (stone line horizon) contained 3 to 7 percent of stones, 3/4-inch to 4 inches in diameter. Horizons Alp, B22, and C1 were sampled for the Bureau of Public Roads. Field pH with colorimetric kit as follows:

| | | | | | |
|--------------|-----|--------------|-----|--------------|-----|
| 0-5 inches | 6.6 | 14-19 inches | 5.8 | 33-40 inches | 6.0 |
| 5-10 inches | 6.2 | 19-25 inches | 5.8 | 40-47 inches | 6.2 |
| 10-14 inches | 5.9 | 25-33 inches | 5.8 | | |

^{1/} Munsell colors for moist soil unless indicated otherwise.

SOIL TYPE Kenyon LOCATION Bremer County, Iowa
loam

SOIL NOS. S60Iowa-9-3-(1-13) LAB. NOS. 14125-14137

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1 | | | | | | | | | | TEXTURAL CLASS |
|---------------------------------|---------------------------|--|------------------|-------------|-------------|-----------|---------------------|-----------------------------|-------------------|-------------------------|------------------|----------------|
| | | 1B1b | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | 2A2 | | |
| | | 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 | |
| | | | | | | | | | | | (19mm) | |
| 0-5 | Alp1 | 0.8 | 8.6 | 12.8 | 17.9 | 5.6 | 35.9 | 18.4 | 30.1 | 18.4 | tr. | |
| 5-9 | Alp2 | 0.8 | 7.3 | 9.7 | 11.9 | 4.3 | 41.6 | 24.4 | 26.3 | 24.3 | tr. | |
| 9-13 | A3 | 1.0 | 8.0 | 10.0 | 13.5 | 4.8 | 38.1 | 24.6 | 26.2 | 22.1 | 1 | |
| 13-18 | B1 | 2.7 | 8.6 | 10.7 | 16.8 | 6.3 | 30.4 | 24.5 | 26.5 | 17.1 | 4 | |
| 18-24 | B21 | 2.6 | 6.7 | 8.9 | 18.3 | 8.7 | 26.3 | 28.5 | 28.6 | 14.6 | 6 | |
| 24-30 | B22 | 2.6 | 6.0 | 8.6 | 18.6 | 9.0 | 26.4 | 28.8 | 29.5 | 14.5 | 2 | |
| 30-37 | B23 | 2.0 | 6.5 | 8.6 | 18.7 | 9.1 | 26.6 | 28.5 | 29.3 | 15.0 | 2 | |
| 37-45 | B31 | 3.2 | 6.5 | 8.5 | 18.4 | 9.0 | 27.0 | 27.4 | 29.1 | 15.4 | 2 | |
| 45-55 | B32 | 3.0 | 6.6 | 8.1 | 18.8 | 3.7 | 27.5 | 27.3 | 29.6 | 15.2 | 1 | |
| 55-65 | C1 | 2.8 | 7.3 | 8.4 | 19.3 | 3.9 | 28.1 | 25.2 | 28.6 | 17.2 | 3 | |
| 65-74 | C2 | 2.5 | 6.9 | 8.0 | 19.2 | 9.1 | 28.5 | 25.8 | 29.7 | 16.5 | 3 | |
| 74-84 | C3 | 2.9 | 7.5 | 8.1 | 19.0 | 8.8 | 27.2 | 26.5 | 29.1 | 15.5 | 1 | |
| 84-90 | C4 | 3.0 | 6.9 | 8.3 | 19.2 | 9.0 | 28.8 | 24.8 | 29.9 | 16.5 | 2 | |
| 8Cl1a | 6Cl1a | ORGANIC MATTER | | | | | Bulk Density | | | | Moist. Reten. | |
| | Ext. | 6Ala | 6Bl1a | | | | | | | | 4B2 | |
| pH | Iron as Fe | ORGANIC CARBON % | NITRO-GEN % | C/N | Field Moist | | 30 Cm. | | O.D. | 1/3 ATMOS. Pieces | 15 ATMOS. Sieved | |
| 1:1 | % | % | % | | 4B1 % M. | 4Ala g/cc | 4B3 % M. | 4Alc g/cc | 4Alh g/cc | | % | |
| 5.9 | 0.9 | 1.62 | 0.144 | 11 | 16.5 | 1.52 | 18.9 | 1.50 | 1.57 | | 8.3 | |
| 5.3 | 0.8 | 1.32 | 0.126 | 10 | | | | | | | 10.6 | |
| 5.2 | 1.0 | 0.82 | 0.086 | 10 | 19.4 | 1.46 | 20.8 | 1.46 | 1.52 | | 9.9 | |
| 5.2 | 1.2 | 0.48 | 0.052 | 9 | | | | | | | 9.4 | |
| 5.3 | 1.4 | 0.29 | 0.030 | 10 | 14.8 | 1.58 | 15.3 | 1.58 | 1.66 | | 10.0 | |
| 5.6 | 1.3 | 0.21 | | | 14.8 | 1.65 | 15.2 | 1.64 | 1.76 | | 9.9 | |
| 5.9 | 1.8 | 0.15 | | | 12.9 | 1.74 | 13.3 | 1.73 | 1.86 | | 10.2 | |
| 6.4 | 1.4 | 0.10 | | | | | | | | | 10.2 | |
| 6.7 | 1.5 | 0.07 | | | 13.2 | 1.84 | 13.8 | 1.82 | 1.96 | | 10.2 | |
| 7.0 | 1.4 | 0.05 | | | | | | | | | 10.2 | |
| 7.3 | 1.5 | 0.04 | | | 15.7 | 1.80 | 15.4 | 1.79 | 1.92 | 16.3 | 10.3 | |
| 7.5 | 2.0 | 0.06 | | | | | | | | | 10.4 | |
| 7.9 | 0.9 | 0.10 | | | | | | | | | 9.6 | |
| 5Ala | EXTRACTABLE CATIONS 5Bl1a | | | | | Base Sat. | | 8Bl | 8D3 | Carbonate as CaCO3 6Blc | | |
| CATION EXCHANGE CAPACITY NH4OAc | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | 5A3a Sum | 5Cl on NH4OAc CEC % | 5C3 on Sum to Clay NH4OAc % | Ratio to Clay CEC | Ca/Mg | <2-mm. Clay % | |
| | Co | Mg | H | No | K | | | | | | | |
| 14.0 | 8.5 | 2.6 | 9.2 | 0.1 | 0.2 | 20.6 | 81 | 55 | .76 | 3.3 | | |
| 15.9 | 8.9 | 2.1 | 11.2 | 0.1 | 0.2 | 22.5 | 71 | 50 | .65 | 4.2 | | |
| 14.5 | 9.4 | 1.7 | 8.8 | tr. | 0.2 | 20.1 | 78 | 56 | .59 | 5.5 | | |
| 13.1 | 9.5 | 1.6 | 6.2 | 0.1 | 0.2 | 17.6 | 87 | 65 | .53 | 5.9 | | |
| 14.8 | 12.0 | 1.7 | 4.5 | 0.1 | 0.2 | 18.5 | 94 | 76 | .52 | 7.0 | | |
| 14.0 | 12.2 | 1.7 | 3.1 | 0.1 | 0.2 | 17.3 | 101 | 82 | .49 | 7.2 | | |
| 13.4 | 12.0 | 1.5 | 3.1 | 0.1 | 0.2 | 16.9 | 103 | 82 | .47 | 8.0 | | |
| 13.3 | 12.1 | 1.6 | 2.1 | 0.1 | 0.2 | 16.1 | 105 | 87 | .48 | 7.6 | tr. | |
| 13.0 | 11.7 | 1.6 | 1.9 | 0.1 | 0.2 | 15.5 | 105 | 88 | .48 | 7.3 | tr. | |
| 12.0 | 11.5 | 1.3 | 1.2 | 0.1 | 0.2 | 14.3 | 109 | 92 | .48 | 8.8 | tr. | |
| 11.8 | 11.5 | 1.4 | 1.2 | 0.1 | 0.2 | 14.4 | 112 | 92 | .46 | 8.2 | tr. | |
| 11.4 | | | | 0.1 | 0.2 | | | | .43 | | tr. | |
| 10.8 | | | | 0.1 | 0.3 | | | | .44 | | tr. | |

a. 10 Kg/M² to 60 inches.

Soil type: Kenyon loam
 Soil No.: S60Iowa-9-3-(1-13)
 Location: Approximately 514 feet east and 508 feet south of NW corner SW1/4 Sec. 6, T93N, R13W, Bremer County, Iowa.
 Vegetation: Small grain stubble. Parent material: Gritty overburden over Iowan till.
 Physiographic position: Upland till plain on a convex north-facing ridge about 100 feet below crest; side slopes of 5 to 7 percent.
 Slope: 4 percent. Drainage: Moderately well drained.
 Permeability: Moderate in gritty overburden; moderately slow in Iowan till.
 Ground water: Water table at 74 inches. Moisture: Slightly moist.
 Described by: D. F. Slusher, October 11, 1960.

Horizon and
 Lincoln Lab. No.

- Alp1 0 to 5 inches. Very dark brown (10YR 2/2)¹ loam; cloddy breaking to weak fine granular structure; friable; gradual boundary.
 14125
- Alp2 5 to 9 inches. Very dark brown (10YR 2/2) loam; cloddy breaking to weak fine granular structure; common fine faint very dark grayish brown (10YR 3/2) mixing; clear boundary.
 14126
- A3 9 to 13 inches. Very dark grayish brown (10YR 3/2) loam; weak fine subangular blocky structure breaking to moderate fine granules; friable; common fine faint very dark brown (10YR 2/2) and dark brown (10YR 4/3) mixing and a few fine distinct dark brown (10YR 4/3) worm casts; kneaded color very dark grayish brown (10YR 3/2); common fine tubular pores in peds; gradual boundary.
 14127
- B1 13 to 18 inches. Mixed dark brown (10YR 4/3) and very dark grayish brown (10YR 3/2) heavy loam; weak fine subangular blocky structure; friable; kneaded color dark grayish brown (10YR 4/2); numerous fine tubular pores in peds; gradual boundary.
 14128
- B21 18 to 24 inches. Dark brown (10YR 4/3) to yellowish brown (10YR 5/4) heavy loam; weak fine subangular blocky structure; friable; kneaded color yellowish brown (10YR 5/4); numerous fine tubular pores in peds; numerous 1/2- to 3-inch diameter stones concentrated in upper 3 inches of horizon; gradual boundary.
 14129
- B22 24 to 30 inches. Brown (10YR 5/3) and yellowish brown (10YR 5/6) heavy loam; weak medium prismatic structure breaking to moderate fine subangular blocks; slightly firm; brown (10YR 5/3) on ped surfaces; yellowish brown (10YR 5/6) with a few fine faint yellowish brown (10YR 5/8) mottles inside peds; kneaded color yellowish brown (10YR 5/6); common fine tubular pores in peds; a very few distinct very dark gray (10YR 3/1) clay streaks in root channels; a few soft iron-manganese concretions; gradual boundary.
 14130
- B23 30 to 37 inches. Grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) heavy loam; moderate coarse prismatic structure breaking to moderate fine subangular blocks; slightly firm; grayish brown (10YR 5/2) with common fine distinct brown (10YR 5/3) mottles on ped surfaces; yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) with a few fine faint yellowish brown (10YR 5/8) mottles inside peds; a few distinct very dark gray (10YR 3/1) vertical clay streaks that are principally on prism faces; a few iron-manganese concretions; gradual boundary.
 14131
- B31 37 to 45 inches. Grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) heavy loam to light clay loam; weak coarse prismatic structure breaking to moderate fine and medium angular blocks; firm; grayish brown (2.5Y 5/2) with common fine distinct brown (10YR 5/3) mottles on prism faces; yellowish brown (10YR 5/6) and grayish brown (2.5Y 5/2) inside peds; a very few distinct very dark gray (10YR 3/1) vertical clay streaks on ped faces; a few iron-manganese concretions; gradual boundary.
 14132
- B32 45 to 55 inches. Yellowish brown (10YR 5/6) light clay loam to heavy loam; weak coarse prismatic structure; firm; common fine prominent light gray (10YR 6/1) mottles in most of horizon but in a few places are areas 6 to 12 inches in diameter that are dominantly light gray (10YR 6/1); a few dark gray (10YR 4/1) clay streaks on prism faces; gradual boundary.
 14133
- C1 55 to 65 inches. Dark brown (7.5YR 4/4) to strong brown (7.5YR 5/6) heavy loam to light clay loam; massive with distinct vertical cleavage to weak medium subangular blocky structure; slightly firm; common medium prominent light gray (10YR 6/1) mottles that are mainly elongated (3 to 4 inches) but a few areas in horizon 6 to 12 inches in diameter are dominantly light gray (10YR 6/1); a few faint dark gray (10YR 4/1) clay streaks in root channels; gradual boundary.
 14134
- C2 65 to 74 inches. Yellowish brown (10YR 5/4) heavy loam; weak medium subangular blocky structure to massive with some vertical cleavage; slightly firm; common medium prominent light gray (10YR 6/1) mottles; a few soft iron-manganese concretions; gradual boundary.
 14135
- C3 74 to 84 inches. Yellowish brown (10YR 5/6) heavy loam; massive with some vertical cleavage; slightly firm; common medium prominent elongated (3 to 4 inches) streaks of light gray (10YR 6/1) with random orientation; clear boundary.
 14136
- O4 84 to 90 inches. As above but calcareous.
 14137

Notes: A few clear uncoated quartz grains are on ped faces from 0 to 24 inches. Roots are common from 0 to 9 inches, few from 9 to 37, and none to scarce from 37 to 90 inches. A vertical vein of sand about 1-inch wide was present from 29 to 43 inches. Horizons Alp1, B22, and B32 were sampled for the Bureau of Public Roads.

^{1/} Munsell color for moist soil.

SOIL TYPE #Cinger LOCATION Bremer County, Iowa
silty clay loam

SOIL NOS. S60 Iowa 9-5- (1-10) LAB. NOS. 14149-14158

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | 2A2 > 2 (19mm) | TEXTURAL CLASS |
|--------------------------|---------------------------------|--|----------------------|-------------------------|------------------------|-----------------------------|------------------------|-----------------|-----------------|---------------|-----------------------------------|----------------|
| | | 1B1a VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 3A1 0.2-0.02 | 0.02-0.002 | | |
| 0-9 | A1 | 0.3a | 1.3a | 1.5a | 2.4a | 3.1 | 62.5 | 28.9 | 36.1 | 30.6 | tr. | |
| 9-13 | A3 | 0.4b | 1.6b | 1.8a | 2.9a | 3.3 | 61.9 | 28.1 | 35.9 | 30.6 | tr. | |
| 13-19 | B1 | 0.2b | 1.1b | 1.1a | 1.8a | 3.6 | 61.1 | 31.1 | 38.0 | 27.5 | tr. | |
| 19-26 | B21 | 0.2b | 0.9b | 1.2a | 1.9a | 5.8 | 59.4 | 30.6 | 44.5 | 21.6 | tr. | |
| 26-31 | B22 | 0.3b | 1.9b | 2.4a | 3.9a | 7.1 | 57.6 | 26.8 | 46.5 | 19.9 | tr. | |
| 31-36 | IIB31 | 3.0 | 10.9 | 12.7 | 18.6 | 8.3 | 25.6 | 20.9 | 27.6 | 14.3 | 1 | |
| 36-40 | IIB32 | 3.4 | 9.1 | 9.7 | 15.5 | 8.8 | 27.9 | 25.6 | 26.8 | 17.0 | tr. | |
| 40-46 | IIB33 | 2.9 | 7.0 | 6.8 | 13.6 | 9.7 | 31.9 | 28.1 | 27.7 | 20.5 | 2 | |
| 46-52 | IIC1 | 2.9 | 6.6 | 7.4 | 14.4 | 10.0 | 30.8 | 27.9 | 29.9 | 18.0 | tr. | |
| 52-64 | IIC2 | 3.6c | 6.7c | 7.2c | 13.8c | 9.7c | 32.1 | 26.9 | 28.7 | 19.9 | 1 | |
| 8C1a | 6C1a | ORGANIC MATTER | | | | | Bulk Density | | | Moist. Reten. | | |
| pH | Ext. | 6A1a | 6B1a | Field Moist | | 30 Cm. | O.D. | 1/3 | | 15 | | |
| | Iron | ORGANIC | NITRO- | C/N | 4B4 | 4A1a | 4B3 | 4A1c | 4A1b | ATMOS. | 15 | |
| | as Fe | CARBON | GEN | | % M. | g/cc. | % M. | g/cc | g/cc | Pieces | ATMOS. | |
| | % | % | % | | | | | | | Sieved | % | |
| 5.6 | 0.8 | 3.03 | 0.260 | 12 | 26.5 | 1.28 | 30.1 | 1.27 | 1.39 | | 14.3 | |
| 5.4 | 0.9 | 1.24 | 0.124 | 10 | | | | | | | 12.2 | |
| 5.5 | 1.0 | 0.68 | 0.081 | 8 | 24.2 | 1.32 | 27.3 | 1.32 | 1.44 | | 12.9 | |
| 6.2 | 1.0 | 0.38 | 0.052 | 7 | 21.3 | 1.37 | 26.2 | 1.36 | 1.50 | | 13.1 | |
| 6.4 | 1.0 | 0.27 | | | 14.4 | 1.44 | 24.3 | 1.38 | 1.52 | | 12.2 | |
| 6.6 | 1.4 | 0.12 | | | | | | | | | 8.0 | |
| 6.9 | 1.7 | 0.08 | | | 11.6 | 1.79 | 15.0 | 1.72 | 1.84 | | 9.9 | |
| 7.1 | 2.2 | 0.08 | | | 12.8 | 1.80 | 16.6 | 1.72 | 1.86 | | 11.6 | |
| 7.4 | 2.0 | 0.06 | | | 12.9 | 1.78 | 16.6 | 1.72 | 1.84 | | 11.4 | |
| 7.7 | 2.0 | 0.04 | | | 13.3 | 1.76 | 17.9 | 1.70 | 1.83 | | 11.6 | |
| 5A1a | EXTRACTABLE CATIONS 5B1a | | | | | Base Sat. | | | 8D1 | 8D3 | Carbonate as CaCO ₃ | |
| CATION EXCHANGE CAPACITY | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | 5A3a | 5C1 | 5C3 | Ratio | Ca/Mg | 6E1d | |
| NH ₄ OAc | Ca | Mg | H | Na | K | Sum | on NH ₄ OAc | on Cations | to Clay | | 2-mm. | Clay |
| | milliequivalents per 100g. soil | | | | | | CFC % | % | CFC | | % | % |
| 24.8 | 15.5 | 5.0 | 12.7 | 0.2 | 0.2 | 33.6 | 84 | 62 | .86 | 3.1 | | |
| 20.2 | 12.8 | 3.6 | 10.0 | 0.1 | 0.3 | 26.8 | 83 | 63 | .72 | 3.6 | | |
| 20.9 | 14.7 | 4.4 | 7.9 | 0.1 | 0.4 | 27.5 | 94 | 71 | .67 | 3.3 | | |
| 21.5 | 17.4 | 5.2 | 4.5 | 0.1 | 0.4 | 27.6 | 107 | 84 | .70 | 3.3 | | |
| 19.9 | 16.3 | 4.8 | 3.6 | 0.1 | 0.4 | 25.2 | 108 | 86 | .74 | 3.4 | | |
| 11.4 | 9.5 | 2.8 | 1.6 | 0.1 | 0.2 | 14.2 | 110 | 89 | .54 | 3.4 | | |
| 13.1 | 11.1 | 3.1 | 1.6 | 0.1 | 0.2 | 16.1 | 111 | 90 | .51 | 3.6 | tr. | |
| 13.9 | 12.0 | 3.3 | 1.6 | 0.1 | 0.2 | 17.2 | 112 | 91 | .49 | 3.6 | tr. | |
| 13.4 | 11.4 | 3.2 | 1.2 | 0.1 | 0.2 | 16.1 | 111 | 92 | .48 | 3.6 | tr. | |
| 12.6 | | | | 0.1 | 0.2 | | | | .47 | | 2 | tr. |

- a. Few Fe/Mn nodules.
- b. Common Fe/Mn nodules.
- c. Few carbonate nodules.
- d. 14 kg/M² to 60 inches.

Soil type: *Klinger silty clay loam
 Soil No.: 860Iowa-9-5-(1-10)
 Location: 284 feet north and 387 feet east of SW corner of NE1/4 SE1/4 of Sec. 26, T91N, R12W, Bremer County, Iowa.
 Vegetation: Alfalfa-orchardgrass meadow. Parent material: Wisconsin loess over Iowan till.
 Physiographic position: Upland level till plain, slope convex to the north; near crest.
 Slope: 1-1/2 percent. Drainage: Imperfectly drained.
 Permeability: Moderate in Wisconsin loess; moderately slow in Iowan till.
 Ground water: None within 64 inches. Moisture: Slightly moist.
 Described by: R. I. Turner, October 12, 1960.

Horizon and
 Lincoln Lab. No.

- A1
 14149 0 to 9 inches. Black (10YR 2/1 to N 2/)¹ light silty clay loam; slightly cloddy breaking to weak fine subangular blocky and moderate fine granular structure; slightly firm; gradual boundary.
- A3
 14150 9 to 13 inches. Black (10YR 2/1) light silty clay loam; moderate fine granular structure; friable; some dark gray (10YR 3/1) mixing by earthworms; kneaded color black (10YR 2/1) to very dark gray (10YR 3/1); common to abundant fine impeded tubular pores; many earthworm casts; gradual boundary.
- B1
 14151 13 to 19 inches. Very dark grayish brown (2.5Y 3/2) light silty clay loam; moderate fine and very fine subangular blocky structure; friable; very dark gray (10YR 3/1) stains on ped surfaces that decrease with depth; few fine faint olive brown (2.5Y 4/4) mottles; kneaded color very dark grayish brown (2.5Y 3/2); abundant fine and common medium impeded tubular pores; common small moderately hard dark oxide concretions; gradual boundary.
- B21
 14152 19 to 26 inches. Dark grayish brown (2.5Y 4/2) medium silty clay loam; weak to moderate fine subangular blocky structure; slightly firm; ped exteriors dark grayish brown (2.5Y 4/2) with common fine faint olive brown (2.5Y 4/4) mottles; ped interiors are dark grayish brown (2.5Y 4/2) to light olive brown (2.5Y 5/4); kneaded color 2.5Y 4/2; abundant fine and medium impeded tubular pores; a few thin discontinuous clay films on some concave ped surfaces; common small moderately hard dark oxide concretions; gradual boundary.
- B22
 14153 26 to 31 inches. Dark grayish brown (2.5Y 4/2) medium silty clay loam; very weak medium prismatic structure breaking to moderate fine subangular blocks; slightly firm; common fine faint olive brown, light olive brown, and grayish brown mottles; kneaded color dark grayish brown (2.5Y 4/2) to light olive brown (2.5Y 5/4); abundant fine and common medium pores; a few very dark gray clay films on some concave ped surfaces and in root channels; common small moderately hard dark oxide concretions; a slight increase in content of sand with depth in this horizon is observed; abrupt boundary.
- IIB31
 14154 31 to 36 inches. Grayish brown (2.5Y 5/2) to light brownish gray (2.5Y 6/2) light clay loam; moderate coarse prismatic structure breaking to weak medium subangular blocks; firm; few medium distinct yellowish brown (10YR 5/4) mottles on ped interiors; common fine impeded tubular pores; evidence of a few thin gray clay films on concave ped surfaces and some root channels; numerous rounded stones 1/2 to 2-1/2 inches in diameter concentrated in upper 3 inches of this horizon; gradual boundary.
- IIB32
 14155 36 to 40 inches. Same as above except for lack of concentration of stones in upper part.
- IIB33
 14156 40 to 46 inches. Grayish brown (2.5Y 5/2) to light brownish gray (2.5Y 6/2) heavy loam; weak coarse prismatic structure breaking to very weak medium subangular blocks; slightly firm; common medium distinct yellowish brown (10YR 5/4) mottles on ped exteriors and yellowish brown (10YR 5/6) mottles on ped interiors; common fine impeded tubular pores; a very few dark gray clay films on root channels; clear irregular boundary to carbonates.
- IIC1
 14157 46 to 52 inches. Yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) heavy loam; massive with distinct vertical cleavage; slightly firm; common fine faint yellowish brown (10YR 5/8) mottles; a very few dark gray clay films in root channels; slightly calcareous with carbonates along prism faces and in common white soft carbonate filaments; the matrix may not be calcareous; gradual boundary.
- IIC2
 14158 52 to 64 inches. Mixed light brownish gray (2.5Y 6/2), 30 percent, and yellowish brown (10YR 5/6), 70 percent, loam; massive; slightly firm; a very slight amount of clay has moved into a few root channels; calcareous; a few small soft white carbonate concretions.

Notes: A few clear uncoated quartz grains are present on ped surfaces from 0 to 26 inches and nearly absent below 26 inches. Roots plentiful 0 to 13 inches, common from 13 to 19, few from 19 to 40, and practically absent below 38 inches. Horizons A1, B21, and IIB31-IIB32 were sampled for the Bureau of Public Roads.

¹/ Munsell colors for moist soil.

SOIL TYPE *Klinger LOCATION Bremer County, Iowa
silt loam

SOIL NOS. S60Iowa-9-6-(1-9) LAB. NOS. 14159-14167

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|--|---------------------|--|-------------|-------------|-------------|----------------|----------------------------------|----------------------|---------------------|-------|--------------------------------|------------------|
| | | 1B1a | | | | | | | | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | 2A2 | | | |
| 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 | < 9mm | | |
| 0-7 | Alp | 0.6a | 1.8b | 2.1c | 2.9c | 5.7c | 59.4 | 27.5 | 39.8 | 26.5 | - | |
| 7-13 | Al2 | 0.4a | 1.4a | 1.7c | 2.3c | 5.5c | 59.5 | 29.2 | 39.4 | 26.6 | - | |
| 13-18 | A3 | 0.4a | 0.9a | 0.9b | 1.3b | 5.6c | 61.1 | 29.8 | 40.5 | 26.9 | - | |
| 18-23 | B1 | 0.8a | 0.7a | 0.6b | 0.9b | 6.6c | 60.6 | 29.8 | 41.7 | 25.9 | - | |
| 23-28 | B21 | 0.4a | 0.6a | 0.7b | 1.3b | 9.6c | 63.2 | 24.2 | 51.2 | 22.2 | - | |
| 28-33 | B22 | 0.1a | 1.3a | 2.2 | 3.2 | 12.3 | 59.8 | 21.1 | 54.4 | 19.1 | - | |
| 33-40 | LIB3 | 2.6 | 8.0 | 11.5 | 18.7 | 10.4 | 28.7 | 20.1 | 32.7 | 14.2 | 1 | |
| 40-50 | IIC1 | 2.7d | 7.2d | 6.9d | 14.6d | 10.1d | 38.9 | 19.6 | 30.7 | 25.2 | 1 | |
| 50-68 | IIC2 | 3.8d | 7.4d | 7.6d | 15.8d | 10.8d | 34.7 | 19.9 | 33.3 | 19.7 | 1 | |
| 8C1a | 0C1a | ORGANIC MATTER | | | | | Bulk Density | | | | Moist. Reten. | |
| pH | Ext. Iron as Fe | 6A1a | 6B1a | C/N | Field Moist | | 30 Cn. | | O.D. | | 1/3 ATMOS. Pieces | 15 ATMOS. Sieved |
| | | ORGANIC CARBON % | NITRO-GEN % | | 4B4 % M. | 4A1a g/cc | 4B3 % M. | 4A1c g/cc | 4A1h g/cc | 4B2 % | | |
| 5.8 | 0.8 | 3.16 | 0.248 | 13 | 23.3 | 1.32 | 29.6 | 1.29 | 1.42 | - | 14.0 | |
| 5.6 | 0.7 | 2.20 | 0.172 | 13 | 25.2 | 1.30 | 27.6 | 1.32 | 1.42 | - | 13.9 | |
| 5.8 | 0.8 | 1.16 | 0.107 | 11 | 23.0 | 1.37 | 26.8 | 1.37 | 1.48 | - | 13.0 | |
| 6.1 | 1.0 | 0.59 | 0.061 | 10 | 14.8 | 1.42 | 26.0 | 1.38 | 1.49 | - | 12.8 | |
| 6.8 | 0.8 | 0.30 | 0.033 | 9 | 12.7 | 1.69 | 15.9 | 1.66 | 1.77 | - | 10.7 | |
| 6.9 | 0.9 | 0.23 | | | 12.8 | 1.87 | 14.5 | 1.84 | 1.92 | - | 9.5 | |
| 7.4 | 1.7 | 0.12 | | | | | | | | - | 8.1 | |
| 7.9 | 1.7 | 0.06 | | | | | | | | - | 8.5 | |
| 7.9 | 1.1 | 0.04 | | | | | | | | - | 8.0 | |
| 5A1a | EXTRACTABLE CATIONS | | | | | 5B1a | Base Sat. | | 8D1 | 8D3 | Carbonate as CaCO ₃ | |
| CATION EXCHANGE CAPACITY NH ₄ OAc | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | 5A3a Sum | 5C1 on NH ₄ OAc CEC % | 5C3 on Sum Cations % | Ratio to Clay Ca/Mg | | <2-mm. % | Clay % |
| | Ca | Mg | H | No | K | | | | | | | |
| 26.2 | 20.0 | 5.2 | 11.5 | 0.1 | 0.2 | 37.0 | 97 | 69 | .95 | 3.8 | - | - |
| 25.2 | 18.9 | 4.6 | 11.0 | 0.1 | 0.3 | 34.9 | 95 | 68 | .86 | 4.1 | - | - |
| 23.0 | 18.0 | 5.0 | 7.4 | 0.1 | 0.4 | 30.9 | 102 | 76 | .77 | 3.6 | - | - |
| 21.6 | 18.0 | 5.0 | 4.3 | 0.1 | 0.4 | 27.8 | 109 | 84 | .72 | 3.6 | - | - |
| 18.0 | 16.1 | 4.4 | 2.4 | 0.1 | 0.4 | 23.4 | 117 | 90 | .74 | 3.6 | - | - |
| 16.3 | 14.0 | 3.8 | 1.9 | 0.1 | 0.3 | 20.1 | 112 | 90 | .77 | 3.7 | - | - |
| 10.5 | | | | 0.1 | 0.2 | | | | .52 | | tr. | - |
| 9.3 | | | | 0.1 | 0.2 | | | | .47 | | 15 | tr. |
| 9.2 | | | | 0.1 | 0.2 | | | | .46 | | 11 | tr. |

- a. Many Fe/Mn nodules.
- b. Common Fe/Mn nodules.
- c. Few Fe/Mn nodules.
- d. Few carbonate nodules.
- e. 16 kg/M² to 60 inches.

Soil type: *Klinger silt loam
 Soil No.: S60Iowa-9-6-(1-9)
 Location: 760 feet north and 486 feet east of SW corner of Sec. 33, T91N, R12W, Bremer County, Iowa.
 Vegetation: Small grain stubble. Parent material: Wisconsin loess over Iowan till.
 Physiographic position: Nearly level upland till plain on a very slightly convex slope.
 Slope: About 3/4 percent. Drainage: Imperfectly drained.
 Permeability: Moderate in loess; moderately slow in till.
 Ground water: None within 68 inches. Moisture: Moist.
 Described by: D. F. Slusher, October 12, 1960.

Horizon and
 Lincoln Lab. No.

Alp 0 to 7 inches. Black (10YR 2/1)¹ heavy silt loam; somewhat cloddy breaking to weak fine granular structure; friable; gradual boundary.
 14159

Al2 7 to 13 inches. Black (10YR 2/1) heavy silt loam; moderate fine granular structure with distinct horizontal cleavage in upper part; friable; gradual boundary.
 14160

A3 13 to 18 inches. Very dark gray (10YR 3/1) light silty clay loam; moderate fine granular and moderate very fine subangular blocky structure; friable; common fine faint very dark grayish brown (2.5Y 3/2) mottles; kneaded color very dark brown (10YR 2/2); a few soft iron-manganese concretions; gradual boundary.
 14161

B1 18 to 23 inches. Very dark grayish brown (2.5Y 3/2) medium silty clay loam; weak to moderate very fine subangular blocky structure; friable; common fine faint dark grayish brown (2.5Y 4/2) and very dark gray (10YR 3/1) mottles; kneaded color very dark grayish brown (2.5Y 3/2); common fine tubular pores in ped; a few soft iron-manganese concretions; gradual boundary.
 14162

B21 23 to 28 inches. Dark grayish brown (2.5Y 4/2) to olive brown (2.5Y 4/4) light silty clay loam; weak medium prismatic structure breaking to moderate fine and very fine subangular blocks; friable; few fine faint dark grayish brown (2.5Y 4/2) and olive brown (2.5Y 4/4) mottles; kneaded color dark grayish brown (2.5Y 4/2) to olive brown (2.5Y 4/4); common fine and medium tubular pores in ped; common soft iron-manganese concretions; gradual boundary.
 14163

B22 28 to 33 inches. Olive brown (2.5Y 4/4) to light olive brown (2.5Y 5/4) heavy silt loam; weak medium prismatic structure breaking to weak medium subangular blocks; friable; common fine faint light olive brown (2.5Y 5/4 to 5/6) mottles and a few very dark gray (10YR 3/1) worm casts; kneaded color light olive brown (2.5Y 5/4); common soft iron-manganese concretions; this horizon contains more fine sand than the overlying horizons; abrupt wavy boundary varying from 33 inches to 35 inches in depth as the lower limit.
 14164

IIB3 33 to 40 inches. Grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) light clay loam; moderate medium prismatic structure; slightly firm; grayish brown (10YR 5/2) on prism faces; yellowish brown (10YR 5/6) with common fine distinct grayish brown (10YR 5/2) mottles inside prisms; common fine and medium tubular pores in ped; a layer of stones 1/2 to 2 inches in diameter occurs between this and the overlying horizon; a few soft iron-manganese concretions; a few faint clay films along fine root channels; clear wavy boundary.
 14165

IIC1 40 to 50 inches. Yellowish brown (10YR 5/6) heavy loam; massive with some vertical cleavage; firm; common fine distinct light gray (10YR 6/1) mottles and also as streaks along pores; some of the vertical cleavage faces are grayish brown (10YR 5/2); common fine and medium tubular pores in ped; common fine very pale brown (10YR 7/3) soft lime accumulations and a few soft lime concretions 1 to 3 inches in diameter; calcareous; gradual boundary.
 14166

IIC2 50 to 68 inches. Same as above but with less distinct vertical cleavage and large lime concretions become less frequent with increasing depth.
 14167

Notes: Roots are plentiful from 0 to 7 inches, common from 7 to 18, few from 18 to 33, and scarce below 33 inches. A few clear uncoated quartz grains are present on ped surfaces from 0 to 23 inches, but are very few and faint to absent below 23 inches. In the 4-foot diameter pit are 5 or 6 black vertical krotovinas about 1-1/2 inches in diameter that extend to about the 4-foot depth. A yellowish brown sand pocket about 15 inches in diameter and containing a few gravel occurred between 42 and 57 inches in one side of pit. A light gray sand pocket free of gravel but about the same size occurred at 65 inches. Between the loess and the till there is an almost continuous layer of rounded stones about 1/2 to 2 inches in diameter and about one stone in thickness. Horizons Alp, B21, and IIC1 were sampled for the Bureau of Public Roads.

¹/ Munsell colors for moist soil.

SOIL SURVEY LABORATORY Lincoln, Nebr. 1/24/58

SOIL TYPE *Lourdes loam LOCATION Howard County, Iowa

SOIL NOS. 856Iowa-45-5-(1-11) LAB. NOS. 4883-4893

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|--------------------------|---------|--|-------------|-----------------------|------------------|----------------|--------------------------------------|---|-------------------------------------|--------------------|-------------------|-----------------------------|
| | | 1B1a | | 3A1 | | | | | | 2A2 | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | 0.2-0.02 | 0.02-0.002 | > 2 (19mm) | |
| 0-7 | Ap | 2.2 | 8.5 | 8.3 | 10.8 | 4.2 | 50.8 | 15.2 | 33.0 | 26.2 | - | s11 |
| 7-11 | A21 | 2.1 | 7.1 | 7.3 | 10.1 | 4.5 | 53.5 | 15.4 | 30.2 | 31.8 | - | s11 |
| 11-15 | A22 | 2.8 | 6.6 | 6.9 | 10.4 | 5.1 | 48.8 | 19.4 | 29.9 | 28.4 | 4 | 1 |
| 15-19 | B21 | 2.2 | 7.0 | 7.4 | 12.6 | 7.5 | 38.0 | 25.3 | 29.6 | 21.6 | 2 | 1 |
| 19-23 | 11B22 | 2.8 | 6.6 | 6.3 | 11.6 | 8.7 | 31.0 | 33.0 | 27.2 | 18.0 | Tr. | cl |
| 23-31 | 11B23 | 2.4 | 5.2 | 5.5 | 11.6 | 9.1 | 29.7 | 36.5 | 27.5 | 17.1 | Tr. | cl |
| 31-35 | 11B24 | 1.8 | 5.2 | 6.0 | 10.9 | 9.1 | 31.9 | 35.1 | 29.4 | 18.0 | - | cl |
| 35-38 | 11B3 | 3.0 | 5.7 | 5.7 | 12.0 | 9.1 | 30.9 | 33.6 | 28.2 | 17.8 | - | cl |
| 38-45 | 11C11 | 2.6 | 5.3 | 6.3 | 11.1 | 9.5 | 34.3 | 30.9 | 31.2 | 19.0 | 3 | cl |
| 45-55 | 11C12 | 3.3 | 5.8 | 6.2 | 11.2 | 9.2 | 35.0 | 29.3 | 30.7 | 20.0 | 3 | cl |
| 55-65 | 11C13 | 2.6 | 5.7 | 6.1 | 11.3 | 9.5 | 34.8 | 30.0 | 30.7 | 20.2 | 3 | cl |
| pH 8C1a | | ORGANIC MATTER | | | | | EST% SALT (BUREAU CUP) | ELECTRI-CAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM 6A1a | 6E1a CaCO ₃ equivalent % | 4A3a Vol. Wt. g/cc | MOISTURE TENSIONS | |
| 1:1 | | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITRO-GEN % | C/N | | | | | 15 ATMOS. % | 4B2 |
| 6.3 | 6.6 | 6.7 | 2.11 | .168 | 12.6 | | 0.6 | | | | 8.2 | |
| 5.8 | 6.1 | 6.2 | 0.74 | .072 | 10.3 | | 0.4 | 1.48 | | | 6.4 | |
| 5.6 | 6.0 | 6.0 | 0.39 | .044 | 8.9 | | 0.5 | | | | 7.3 | |
| 5.2 | 5.6 | 5.6 | 0.31 | .034 | 9.1 | | 0.4 | 1.48 | | | 9.2 | |
| 4.8 | 5.3 | 5.4 | 0.35 | .033 | 10.6 | | 0.3 | | | | 11.6 | |
| 4.9 | 5.4 | 5.5 | 0.32 | .028 | 11.4 | | 0.3 | 1.62 | | | 13.0 | |
| 6.3 | 6.7 | 6.8 | 0.24 | | | | 0.4 | | | | 12.7 | |
| 7.3 | 7.6 | 7.7 | 0.20 | | | | 0.5 | 1.68 | | | 13.0 | |
| 8.0 | 8.5 | 8.8 | 0.16 | | | | 0.5 | 8 | | | 11.6 | |
| 8.1 | 8.6 | 8.8 | 0.14 | | | | 0.5 | 11 | 1.79 | | 11.3 | |
| 8.1 | 8.6 | 8.8 | 0.12 | | | | 0.5 | 9 | | | 11.8 | |
| 5A1a | | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % NH ₄ Ac EXCH. | SATURATION EXTRACT SOLUBLE SAL | | | | 8A MOISTURE AT SATURATION % |
| CATION EXCHANGE CAPACITY | | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a No | 6Q2a K | | 6P1a Na | 6Q1a K | 6N1a Ca | 6O1a Mg | |
| NH ₄ Ac | | milliequivalents per 100g. soil | | | | | 5C1 | milliequivalents per liter | | | | |
| 16.6 | 12.2 | 2.0 | 6.9 | 0.1 | 0.1 | 87 | 0.8 | - | 3.9 | 1.6 | 41.1 | |
| 11.5 | 8.0 | 1.2 | 5.3 | - | 0.1 | 81 | 0.5 | - | 2.9 | 0.8 | 34.7 | |
| 12.5 | 8.8 | 1.4 | 4.9 | - | 0.1 | 82 | 0.6 | 0.1 | 2.7 | 1.0 | 37.2 | |
| 14.8 | 9.8 | 1.8 | 5.7 | - | 0.2 | 80 | 0.5 | 0.1 | 1.9 | 0.5 | 42.3 | |
| 18.6 | 11.2 | 2.5 | 8.6 | - | 0.2 | 82 | 0.4 | 0.1 | 1.4 | 0.4 | 51.5 | |
| 20.9 | 13.5 | 3.2 | 7.8 | 0.1 | 0.3 | | 0.4 | 0.1 | 1.3 | 0.6 | 53.3 | |
| 19.7 | 15.6 | 3.8 | 3.3 | 0.1 | 0.2 | | 0.5 | - | 2.3 | 0.8 | 55.2 | |
| 19.8 | 16.8 | 3.8 | 2.5 | 0.1 | 0.2 | | 0.6 | - | 2.7 | 1.2 | 51.8 | |
| 15.3 | | 3.3 | - | 0.1 | 0.2 | | 0.6 | - | 4.0 | 1.1 | 47.9 | |
| 13.8 | | 3.2 | - | 0.1 | 0.2 | | 0.6 | - | 3.6 | 1.4 | 52.1 | |
| 13.5 | | 3.0 | - | 0.1 | 0.2 | | 0.6 | 0.1 | 3.8 | 1.5 | 47.1 | |

Soil type: *Lourdes loam
 Soil No.: 856Iowa-45-5-(1-11)
 Location: Approximately 450 feet south and 150 feet west of west side of field gate which is approximately 975 feet west of northeast corner of NW1/4 of Sec. 33, T99N, R13W, Howard County, Iowa.
 Vegetation or crop: Red clover and timothy meadow.
 Parent material: Firm Iowan till with silty overburden.
 Physiographic position: Crest of low convex ridge on upland about 1/4 mile from stream.
 Topography: Gently undulating.
 Slope: 3 percent.
 Drainage: Moderately well drained.
 Ground water: None observed within 65 inches. During wet periods there appears to be a perched water table above the firm till.
 Permeability: Very slow for the firm till and moderate for the overburden.
 Moisture: Slightly moist.
 Stoniness: Some pebbles occur through the firm till, a band of pebbles is concentrated just above the firm till, and the silty material above this is usually pebble free.
 Described by: L. E. Tyler, October 12, 1956.

Horizon and
 Lincoln
 Lab. Number

Ap
 4883 0 to 7 inches. Black (10YR 2/1 moist) gritty silt loam; friable; fine granular to cloddy; boundary abrupt.

A21
 4884 7 to 11 inches. Mixed colors, approximately 85 percent dark gray brown (10YR 4/2 moist) and 15 percent very dark gray (10YR 3/1 moist); crushed color very dark gray (10YR 3/1 moist); gritty silt loam; friable; moderate fine platy structure; contains many prominent worm casts; boundary gradual.

A22
 4885 11 to 15 inches. Dark gray brown (10YR 4/2 moist) with few fine faint dark brown (10YR 4/3 moist) mottles; crushed color olive brown (2.5Y 4/3 moist); heavy loam to light clay loam; friable to slightly firm; weak fine subangular blocky structure; few worm casts; boundary gradual.

B21
 4886 15 to 19 inches. Dark gray brown to brown (10YR 4/2 to 5/3 moist) with common fine distinct dark yellowish brown (10YR 4/6 moist) mottles; ped surfaces are light gray (10YR 7/2 dry); crushed color dark yellowish brown (10YR 4/6 moist); light to medium clay loam; slightly firm to firm; moderate fine subangular blocky structure; few worm casts; boundary gradual.

IIB22
 4887 19 to 23 inches. Gray brown (2.5Y 5/2 moist) ped surfaces with some very dark gray (10YR 3/1 moist) illuviated clay; interiors of peds are strong brown (7.5YR 5/6 moist) and gray brown (2.5Y 5/2 moist); crushed color dark yellowish brown (10YR 4/4 to 4/6 moist); ped coats are light gray (10YR 7/2 dry); light to medium clay loam; firm; strong fine to medium subangular blocky structure; boundary gradual.

IIB23
 4888 23 to 31 inches. Dark gray (10YR 4/1 moist) ped surfaces with common fine distinct dark yellowish brown (10YR 4/4 moist) mottles and some very dark gray (10YR 3/1 moist) illuviated clay in old root channels. Ped interiors are dark yellowish brown (10YR 4/4 moist) with gray mottles; crushed color dark yellowish brown (10YR 4/6 moist); medium clay loam; firm to very firm; moderate medium prismatic structure breaking to strong fine to medium angular blocky; the streaks of translocated clay associated with old root channels are more prominent in the lower part of this horizon; clay skins are rather continuous on block faces but appear to be less continuous on prisms; boundary gradual.

IIB24
 4889 31 to 35 inches. Dark gray to gray (5Y 4.5/1 moist) ped surfaces with common medium distinct yellowish brown (10YR 5/4 to 5/6 moist) mottles and streaks of very dark gray (2.5Y 3/1 to 3/0 moist) illuviated clay. Illuviated clay appears principally on vertical faces; ped interiors are mixed dark yellowish brown to yellowish brown (10YR 4/6 to 5/8 moist) and dark gray to gray (5Y 4.5/1 moist); crushed color dark yellowish brown to olive brown (10YR 4/4 to 2.5Y 4/4 moist); medium clay loam; firm; moderate coarse prismatic breaking to moderate coarse angular blocky structure; tubules of illuviated clay present in old root or worm channels; clay skins appear to be very thick as streaks but thin and discontinuous elsewhere; boundary gradual.

IIB3
 4890 35 to 38 inches. Color as in above horizon; medium clay loam; firm; blocky structure slightly less evident than in above horizon; clay skins as in above horizon; this horizon is transitional to carbonates. All above horizons are leached; those below unleached; boundary gradual.

IIC11
 4891 38 to 45 inches. Mixed yellowish brown (10YR 5/6 moist) and gray (5Y 5/1 moist); the few cleavage faces present are gray (5Y 5/1 moist) with common medium distinct yellowish brown (10YR 4/4 moist) mottles; crushed color yellowish brown (10YR 5/5 moist); light clay loam; firm; principally massive but with a few vertical cleavage faces; occasional old root channels containing translocated clay--fewer than in above horizon; boundary gradual.

IIC12
 4892 45 to 55 inches. Mixed dark yellowish brown to yellowish brown (10YR 4/6 to 5/6 moist) and gray (5Y 5/1 moist); a few gray (5Y 5/1 to 6/1 moist) cleavage faces with many medium distinct yellowish brown (10YR 4/4 moist) mottles; crushed color yellowish brown (10YR 5/4 moist) to light olive brown (2.5Y 5/4 moist); light clay loam; firm; principally massive; few dark clay streaks still noticeable on faces; boundary gradual.

IIC13
 4893 55 to 65 inches. Same as above except dark clay streaks gradually fade out.

Notes: This profile had much dark-colored translocated clay plastered on vertical (prism?) faces in upper portion of firm till, particularly in the 23- to 31-inch horizon. Crevices filled with sand, ranging to sandy clay loam, were found in firm till beneath overburden and varied in width from 1-5 inches; sometimes widened into pockets. Although these were avoided on face described, at least 1 was present in area covered by each pit (2 by 5 feet). Prismatic structure described may not be evident under wet conditions; soil much dryer than normal due to long dry weather period. Textures are field estimates.

SOIL SURVEY LABORATORY Lincoln, Nebr. 1/27/58

SOIL TYPE *Lourdes loam LOCATION Howard County, Iowa

SOIL NOS. S56Iowa-45-7-(1-10) LAB. NOS. 4905-4914

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1 | | | | | | | | | | TEXTURAL CLASS |
|--------------|---------------------------------|--|-----------------------|--|------------|----------------|--|--------------------------------|---------------|------------|-------------------|--------------------------|
| | | 1B1a | | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1 | | | | | 2A2 | | > 2 | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | 0.2-0.02 | 0.02-0.002 | | |
| 2.1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | < 19mm | | | |
| 0-7 | Ap | 1.3 | 6.6 | 7.1 | 10.2 | 4.4 | 50.7 | 19.7 | 30.9 | 28.4 | - | s11 |
| 7-11 | A21 | 1.5 | 5.2 | 5.5 | 7.6 | 4.2 | 54.3 | 21.7 | 30.4 | 31.9 | - | s11 |
| 11-15 | A22 | 1.6 | 5.6 | 6.2 | 9.7 | 6.7 | 43.2 | 27.0 | 29.4 | 25.8 | - | cl |
| 15-20 | IIB21 | 2.3 | 5.0 | 5.7 | 10.7 | 8.7 | 32.2 | 35.4 | 27.9 | 19.1 | 2 | cl |
| 20-26 | IIB22 | 1.9 | 4.9 | 6.1 | 11.0 | 9.0 | 29.9 | 37.2 | 28.1 | 17.3 | Tr. | cl |
| 26-33 | IIB23 | 2.3 | 5.5 | 6.4 | 11.5 | 9.3 | 30.3 | 34.7 | 28.9 | 17.5 | Tr. | cl |
| 33-38 | IIB3 | 1.8 | 5.6 | 6.7 | 12.0 | 9.6 | 31.5 | 32.8 | 29.9 | 18.1 | 3 | cl |
| 38-46 | IIC11 | 2.4 | 5.8 | 6.2 | 11.6 | 9.5 | 34.3 | 30.2 | 30.7 | 19.9 | 2 | cl |
| 46-56 | IIC12 | 2.6 | 5.8 | 6.4 | 11.4 | 9.5 | 35.2 | 29.1 | 30.7 | 20.6 | 3 | cl |
| 56-66 | IIC13 | 2.7 | 5.6 | 5.9 | 11.2 | 9.6 | 35.7 | 29.3 | 30.6 | 21.3 | 3 | cl |
| | pH 8C1a | ORGANIC MATTER | | | | | ELECTRICAL CONDUCTIVITY EC-103 MILLIMHOS PER CM 5A1a | | 6E1a | 4A3a | MOISTURE TENSIONS | |
| | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITROGEN % | C/N | | | CoCO ₂ equivalent % | Vol. Wt. g/cc | | 15 ATMOS. % | |
| 5.6 | 5.8 | 5.9 | 2.45 | .195 | 12.6 | | 0.5 | | | | 9.6 | |
| 5.0 | 5.1 | 5.2 | 0.47 | .060 | 7.8 | | 0.4 | | 1.50 | | 8.0 | |
| 4.7 | 5.0 | 5.1 | 0.46 | .052 | 8.8 | | 0.3 | | | | 10.1 | |
| 4.7 | 5.0 | 5.2 | 0.41 | .042 | 9.7 | | 0.3 | | | | 12.3 | |
| 4.8 | 5.2 | 5.4 | 0.35 | .030 | 11.7 | | 0.3 | | | | 13.0 | |
| 5.8 | 6.2 | 6.2 | 0.27 | | | | 0.3 | | 1.62 | | 12.6 | |
| 7.8 | 8.2 | 8.4 | 0.16 | | | | 0.5 | - | | | 12.3 | |
| 8.2 | 8.6 | 8.8 | 0.15 | | | | 0.5 | 6 | | | 11.6 | |
| 8.2 | 8.6 | 8.9 | 0.15 | | | | 0.5 | 10 | 1.73 | | 11.3 | |
| 8.1 | 8.6 | 8.8 | 0.18 | | | | 0.5 | 9 | | | 11.8 | |
| | 5A1a | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % NH ₄ Ac Exch. | SATURATION EXTRACT SOLUBLE 8A1 | | | | 8A |
| | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | | 6P1a | 6Q1a | 6N1a | 6O1a | | MOISTURE AT SATURATION % |
| | Ca | Mg | H | No | K | | No | K | Ca | Mg | | |
| | milliequivalents per 100g. soil | | | | | 5C1 | milliequivalents per liter | | | | | |
| 19.0 | 10.8 | 2.0 | 10.8 | 0.1 | 0.2 | 69 | 0.5 | 0.1 | 3.4 | 1.5 | | 46.6 |
| 12.3 | 5.5 | 1.0 | 8.2 | - | 0.2 | 54 | 0.5 | 0.1 | 1.8 | 0.9 | | 39.8 |
| 15.0 | 7.1 | 1.5 | 9.9 | 0.1 | 0.2 | 59 | 0.4 | 0.1 | 1.4 | 1.7 | | 47.9 |
| 18.5 | 9.4 | 2.4 | 9.8 | 0.1 | 0.3 | 66 | 0.5 | 0.1 | 1.6 | 0.4 | | 51.8 |
| 20.0 | 11.4 | 2.9 | 8.4 | 0.1 | 0.4 | 74 | 0.4 | 0.1 | 1.3 | 0.6 | | 62.2 |
| 19.2 | 13.9 | 3.6 | 3.3 | 0.2 | 0.4 | 94 | 0.5 | - | 1.7 | 0.8 | | 62.0 |
| 17.2 | 15.9 | 3.7 | 0.8 | 0.2 | 0.2 | | 0.7 | - | 3.3 | 1.4 | | 59.9 |
| 13.6 | | 3.0 | - | 0.2 | 0.3 | | 0.7 | - | 3.3 | 1.9 | | 53.5 |
| 12.7 | | 2.8 | - | 0.1 | 0.3 | | 0.7 | - | 3.1 | 1.2 | | 50.3 |
| 12.3 | | 2.8 | - | 0.1 | 0.2 | | 0.6 | 0.1 | 2.7 | 1.1 | | 55.1 |

Soil type: *Lourdes loam
 Soil No.: S56Iowa-45-7-(1-10)
 Location: Approximately 410 feet north and 195 feet west of southeast corner of Sec. 33, T99N, R13W, Howard County, Iowa.
 Vegetation or crop: Red clover and timothy seeding.
 Parent material: Firm Iowan till with silty overburden.
 Physiographic position: Crest of low convex ridge on upland about 3/4 to 1 mile from stream.
 Topography: Gently undulating.
 Slope: 3 percent.
 Drainage: Moderately well drained.
 Ground water: None observed within 66 inches; during wet periods there appears to be a perched water table above the firm till.
 Permeability: Very slow for the firm till and moderate for the overburden.
 Moisture: Slightly moist.
 Stoniness: Some pebbles occur through the firm till, a band of pebbles is concentrated just above the firm till and the silty material above this is usually pebble free.
 Described by: L. E. Tyler, October 15, 1956.

Horizon and
 Lincoln
 Lab. Number

Ap 0 to 7 inches. Black (10YR 2/1 moist) gritty silt loam; crushed color black to very dark gray (10YR 4/905 2.5/1 moist); friable; moderate fine granular structure; boundary abrupt.

A21 7 to 11 inches. Mixed very dark gray (10YR 3/1 moist) and dark gray brown (10YR 4/2 moist) with common 4/906 medium distinct yellowish brown (10YR 5/6 moist) mottles; crushed color dark gray brown (10YR 4/2 moist); gritty silty loam; friable; weak, very fine platy structure; worm casts present; boundary gradual.

A22 11 to 15 inches. Dark gray brown (10YR 4/2 moist) with common fine distinct yellowish brown (10YR 5/6 4/907 moist) mottles; crushed color dark brown to brown (10YR 4/3 moist); light clay loam; friable; moderate very fine to fine subangular blocky structure; worm casts present; pebble band commences at base of this horizon; boundary gradual.

IIB21 15 to 20 inches. Ped surfaces dark gray (10YR 4/1 moist) with many medium prominent strong brown (7.5YR 4/908 5/6 moist) mottles; crushed color dark yellowish brown to yellowish brown (10YR 4/6 to 5/6 moist); light to medium clay loam; slightly firm to firm; moderate to strong very fine subangular blocky structure; pebble band through this horizon; boundary clear.

IIB22 20 to 26 inches. Prism surfaces dark gray (2.5Y 4/1 moist) with few medium faint dark brown to brown 4/909 (10YR 4/3 moist) mottles; block coatings same base color with common medium distinct dark brown to brown (7.5YR 4/2 to 4/4 moist) mottles; ped interiors mixed strong brown (7.5YR 5/6 moist) and dark gray (2.5Y 4/1 moist); crushed color yellowish brown (10YR 5/6 moist); medium clay loam; firm to very firm; moderate medium prismatic structure breaking to strong medium angular blocky; very dark gray (N 3/0 moist) coats of transported clay; boundary gradual.

IIB23 26 to 33 inches. Ped surfaces dark gray (2.5Y 4/1 moist) with common medium distinct dark brown to brown 4/910 (10YR 4/3 moist) mottles; ped interiors are mixed dark gray (2.5Y 4/1 moist) and yellowish brown (10YR 5/6 moist); crushed color yellowish brown (10YR 5/5 moist); medium clay loam; firm to very firm; moderate medium to coarse prismatic structure breaking to moderate coarse angular blocky; very dark gray (N 3/0 moist) transported clay present in root channels and as network on peds; boundary diffuse.

IIB3 33 to 38 inches. Ped surfaces dark gray to gray (5Y 4.5/1 moist) with common medium distinct yellowish 4/911 brown (10YR 5/4 moist) mottles; ped interiors mixed yellowish brown (10YR 5/6 moist) and gray (2.5Y 5/1 moist); crushed color yellowish brown (10YR 5/4 moist); medium clay loam; firm to very firm; weak medium to coarse prismatic structure breaking to weak coarse blocky; very dark gray (N 3/0 moist) transported clay in streaks on ped surfaces and in root channels; root channels generally smaller than in above horizon; this horizon and all above are leached; boundary clear.

IIC11 38 to 46 inches. Gray (5Y 5/1 to 6/0 moist) vertical cleavage faces with transported clay streaks dark 4/912 gray (N 3/0 to 4/0 moist) color; interiors mixed dark yellowish brown (10YR 4/4 to 4/6 moist) and dark gray (2.5Y 4/1); crushed color yellowish brown (10YR 5/5 moist); light to medium clay loam; firm; weak coarse prismatic structure; a few large root channels filled with very dark gray (N 3/0 moist) transported clay; unleached horizon; boundary diffuse.

IIC12 46 to 56 inches. Mixed colors, approximately 60 percent dark brown to brown (10YR 4/3 moist) and 40 4/913 percent gray (5Y 5/1 moist); crushed color dark yellowish brown to yellowish brown (10YR 4.5/4 moist); light to medium clay loam; firm; mostly massive but some vertical faces of the same color as those in above horizon; transported clay as in above horizon but less of it; unleached; boundary diffuse.

IIC13 56 to 66 inches. Colors same as in above horizon; light to medium clay loam; firm; massive; few large 4/914 root channels filled with transported clay; unleached.

Notes: Dark coats on vertical faces in upper firm till not quite as continuous as in S56Iowa-45-5. Crevices filled with sand, ranging to sandy clay loam, were found in the firm till beneath the overburden and varied in width from 1-5 inches; sometimes widened into pockets. Although these were avoided on the face described, at least one was present in area covered by each pit (2 by 5 feet). Prismatic structure described may not be evident under wet conditions; the soil was much dryer than normal due to long period of dry weather. Textures are field estimates.

SOIL SURVEY LABORATORY Lincoln, Nebr. Sept., 1963

SOIL TYPE Macksburg LOCATION Adair County, Iowa
silty clay loam

SOIL NOS. S61Iowa-1-1 LAB. NOS. 16379-16390

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | 2A2 > 2 | TEXTURAL CLASS | |
|--------------------------|---------------------------------|--|----------------------|-------------------------|------------------------|-----------------------------|--------------------|------------------------|----------|---------------------|-------|----------------------|----------------|--|
| | | 3A1 | | | | | | | | | | | | |
| | | 1B1b VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | | | | |
| 0-7 | Alp | 0.2a | 0.2a | 0.2a | 0.5a | 0.9 | 67.1 | 30.9 | 31.4 | 36.9 | - | | | |
| 7-14 | A12 | 0.1a | 0.3a | 0.3a | 0.5a | 0.7a | 63.9 | 34.2 | 28.7 | 36.2 | - | | | |
| 14-20 | A3 | 0.1a | 0.5a | 0.4a | 0.5a | 0.7a | 62.4 | 35.4 | 27.7 | 35.7 | - | | | |
| 20-25 | B1 | 0.3a | 0.6a | 0.4a | 0.5a | 0.8a | 61.2 | 36.2 | 27.4 | 34.9 | - | | | |
| 25-30 | B21 | 0.1a | 0.6a | 0.3a | 0.4a | 0.8a | 59.7 | 38.1 | 27.2 | 33.5 | - | | | |
| 30-36 | B22 | 0.1a | 0.4a | 0.2a | 0.3a | 1.0a | 60.4 | 37.6 | 26.6 | 35.0 | - | | | |
| 36-43 | B23 | 0.1a | 0.4a | 0.3a | 0.4a | 1.0a | 61.5 | 36.3 | 29.7 | 33.0 | - | | | |
| 43-51 | B3 | 0.1a | 0.3a | 0.3a | 0.4a | 0.7a | 65.0 | 33.2 | 30.0 | 35.9 | - | | | |
| 51-60 | C1 | 0.1a | 0.3a | 0.3a | 0.4a | 0.8b | 64.9 | 33.2 | 28.5 | 37.4 | - | | | |
| 60-69 | C2 | - | 0.2a | 0.2a | 0.4a | 1.1b | 65.4 | 32.7 | 30.8 | 35.9 | - | | | |
| 69-77 | C3 | - | 0.3a | 0.2a | 0.4a | 1.2b | 66.8 | 31.1 | 34.1 | 34.1 | - | | | |
| 77-87 | C4 | - | 0.1a | 0.1a | 0.3a | 1.0b | 67.7 | 30.8 | 34.4 | 34.5 | - | | | |
| 8Cl _a | | Organic Matter | | | Bulk Density | | | Moisture Retention | | | | | | |
| pH | CaCO ₃ Equiv- 1:1 | 6Ala O.C. | 6Bla N | C/N | Field Moist | | 30 Cm. | | A.D. | | | 4B2 15-Bar Sieved | | |
| | % | % | % | | % M. | s/cc. | % M. | g/cc. | g/cc. | | | % | | |
| 5.9 | | 3.06 | 0.232 | 13 | | | | | | | | 14.1 | | |
| 5.5 | | 2.14 | 0.178 | 12 | | | | | | | | 14.6 | | |
| 5.4 | | 1.57 | 0.142 | 11 | | | | | | | | 15.0 | | |
| 5.5 | | 1.12 | 0.103 | 11 | | | | | | | | 15.9 | | |
| 5.6 | | 0.71 | | | | | | | | | | 17.4 | | |
| 5.8 | | 0.44 | | | | | | | | | | 17.9 | | |
| 5.0 | | 0.29 | | | | | | | | | | 17.3 | | |
| 5.0 | | 0.22 | | | | | | | | | | 16.5 | | |
| 5.1 | | 0.18 | | | | | | | | | | 16.5 | | |
| 5.3 | | 0.12 | | | | | | | | | | 16.0 | | |
| 5.5 | | 0.10 | | | | | | | | | | 16.1 | | |
| 6.0 | | 0.10 | | | | | | | | | | 16.0 | | |
| 5Al _a | | EXTRACTABLE CATIONS 5Bla | | | | | Base Sat. | | 8D1 | 8D3 | | | | |
| CATION EXCHANGE CAPACITY | | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | 5A3a | 5C1 | 5C3 | Ratio on Clay | Ca/Mg | Ext. Iron as Fe | A1 KCl-Ext. | |
| NH ₄ OAc | | Ca | Mg | H | Na | K | Sum | on NH ₄ OAc | on Sum | NH ₄ OAc | | % | ms/100g | |
| | | milliequivalents per 100g. soil | | | | | | | CEC % | % | CEC | | | |
| 24.7 | 16.4 | 3.9 | 10.5 | Tr. | 1.1 | 31.9 | | 87 | 67 | .80 | 4.2 | | | |
| 24.0 | 14.1 | 4.6 | 11.5 | Tr. | 0.6 | 30.8 | | 80 | 63 | .70 | 3.1 | | | |
| 24.3 | 14.0 | 5.3 | 10.1 | 0.1 | 0.6 | 30.1 | | 82 | 66 | .69 | 2.6 | | | |
| 25.8 | 14.5 | 6.0 | 9.3 | 0.1 | 0.6 | 30.5 | | 82 | 70 | .71 | 2.4 | | | |
| 27.7 | 16.6 | 7.8 | 8.1 | 0.1 | 0.7 | 33.3 | | 91 | 76 | .73 | 2.1 | | | |
| 29.3 | 17.6 | 8.3 | 7.6 | 0.1 | 0.7 | 34.3 | | 91 | 78 | .78 | 2.1 | | | |
| 29.9 | 17.9 | 8.9 | 6.9 | 0.1 | 0.7 | 34.5 | | 92 | 80 | .82 | 2.0 | | | |
| 27.5 | 17.0 | 8.4 | 6.3 | 0.2 | 0.6 | 32.5 | | 95 | 81 | .83 | 2.0 | | | |
| 27.3 | 17.1 | 8.6 | 5.9 | 0.2 | 0.7 | 32.5 | | 97 | 82 | .82 | 2.0 | | | |
| 26.2 | 17.3 | 9.0 | 5.4 | 0.2 | 0.7 | 32.6 | | 104 | 83 | .80 | 1.9 | | | |
| 26.8 | 16.9 | 9.2 | 4.0 | 0.2 | 0.7 | 31.0 | | 101 | 87 | .86 | 1.8 | | | |
| 25.1 | 16.7 | 9.0 | 4.0 | 0.2 | 0.6 | 30.5 | | 106 | 87 | .81 | 1.8 | | | |
| a. | Many Fe/Mn nodules | | | | | | | | | | | | | |
| b. | Common Fe/Mn nodules | | | | | | | | | | | | | |

Soil type: Macksburg silty clay loam

Soil No.: S611lowa-1-1

Location: 663 feet south and 678 feet east of NW corner of NE1/4 Sec. 22, T74N, R31W, Adair County, Iowa.

Vegetation: Clover field.

Parent material: Wisconsin loess.

Physiographic position: Moderately wide upland divide. Appears to be highest elevation within the watershed.

Slope: About 1 percent.

Drainage: Imperfectly drained.

Permeability: Moderately slow.

Ground water: Water table at 24 inches.

Moisture: Very moist.

Described by: R. I. Ederiksen, October 12, 1961.

Horizon and

Lincoln Lab. No.

- A1p 0 to 7 inches. Black (10YR 2/1)¹ light silty clay loam, dark gray (10YR 4/1) when dry; weak medium subangular blocky breaking to weak fine granular structure; friable to firm²; kneaded color approaches very dark brown (10YR 2/2) in color; common wormholes and casts; abrupt smooth boundary.
- A12 7 to 14 inches. Mixed black (10YR 2/1) and very dark brown (10YR 2/2) light silty clay loam, dark gray (10YR 4/1) when dry; moderate very fine granular structure; friable; majority of peds are black (10YR 2/1) with very few very dark brown (10YR 2/2) peds; moist color value slightly lower and dry chroma slightly lower than above horizon; very few very fine hard concretions of an oxide; common wormholes and casts; gradual smooth boundary.
- A3 14 to 20 inches. Very dark brown (10YR 2/2) medium silty clay loam, gray (10YR 5/1) when dry; weak fine subangular blocky structure breaking to moderate fine granular; friable; kneaded color is very dark brown (10YR 2/2) to very dark grayish brown (10YR 3/2); many fine and very fine impeded tubular pores; few to common fine hard concretions of an oxide; common wormholes and few very dark grayish brown (10YR 3/2) worm casts; gradual smooth boundary.
- B1 20 to 25 inches. Mixed very dark brown (10YR 2/2) and very dark grayish brown (10YR 3/2) medium silty clay loam; grayish brown (10YR 5/2) when dry; moderate very fine subangular blocky structure; friable to firm; kneaded color is very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2); many fine and very fine impeded tubular pores; few very fine hard concretions of an oxide; few wormholes and dark grayish brown (10YR 4/2) worm casts; clear smooth boundary.
- B2 25 to 30 inches. Dark grayish brown (10YR 4/2) and brown (10YR 5/3) to light olive brown (2.5Y 5/3) medium to heavy silty clay loam; weak medium prismatic breaking to moderate fine subangular blocky structure; firm; ped exteriors are dark grayish brown (10YR 4/2); ped interiors are brown (10YR 5/3) to light olive brown (2.5Y 5/3) with few fine faint yellowish brown (10YR 5/4) mottles; few very dark gray (10YR 3/1) coatings on prism faces; common fine and very fine impeded tubular pores; thin continuous clay films on ped surfaces; few fine hard and few fine soft concretions of an oxide; gradual smooth boundary.
- B22 30 to 36 inches. Mixed dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) medium to heavy silty clay loam; weak medium prismatic breaking to moderate fine subangular blocky structure; firm; few very dark gray (10YR 3/1) stains on some ped exteriors; common fine faint dark yellowish brown (10YR 4/4) grading to distinct yellowish brown (10YR 5/4) mottles; kneaded color is grayish brown to light olive brown (2.5Y 5/3); common fine and very fine impeded tubular pores; thin continuous clay films on peds, very few fine vertical orientated clay fills in pores; common fine soft and few fine hard concretions of an oxide; gradual wavy boundary.
- B23 36 to 43 inches. Olive gray (5Y 5/2) medium silty clay loam; weak medium to coarse prismatic breaking to moderate medium subangular blocky structure; firm; common fine distinct dark brown (10YR 3/3) and yellowish brown (10YR 5/4) mottles; faint horizontal band of strong brown (7.5YR 5/6) color; kneaded color is grayish brown to light olive brown (2.5Y 5/3); common fine and very fine impeded tubular pores; very thin continuous clay films on prism faces but discontinuous on ped faces; few very fine very dark gray (10YR 3/1) vertical orientated clay fills in pores; many fine hard and few fine soft concretions of an oxide; gradual smooth boundary.
- B3 43 to 51 inches. Olive gray (5Y 5/2) medium to light silty clay loam; weak coarse prismatic breaking to weak medium to coarse subangular blocky structure; firm; few fine distinct dark brown (10YR 3/3) mottles, faint vertical streaks of strong brown (7.5YR 5/6); kneaded color is light olive brown (2.5Y 5/4); many fine and very fine pores; thin discontinuous clay films on prism faces; large open voids and pores free of clay; many very fine hard and few fine soft concretions of an oxide; diffuse wavy boundary.
- C1 51 to 60 inches. Olive gray (5Y 5/2) light silty clay loam; massive with distinct vertical cleavage; firm; many fine and medium distinct yellowish brown (10YR 5/4) grading to dark yellowish brown (10YR 4/4) mottles; faint vertical streaks of strong brown (7.5YR 5/6) extending from above horizon; kneaded color is light olive brown (2.5Y 5/4); many fine and medium impeded tubular pores and common open spherical and tubular-shaped voids 5 to 10 mm. in diameter; very thin discontinuous clay films on some prism faces, pores and open voids free of clay flows; many fine soft and very few hard concretions of an oxide; diffuse wavy boundary.
- C2 60 to 69 inches. Same as above horizon except for few fine distinct dark brown (10YR 3/3) mottles and absence of clay films on cleavage faces.
- C3 69 to 77 inches. Olive gray (5Y 5/2) light silty clay loam; massive with some vertical cleavage; firm; many medium to coarse prominent strong brown (7.5YR 5/6) segregations and common fine distinct yellowish brown (10YR 5/6) mottles; kneaded color is light olive brown (2.5Y 5/4); many fine and very fine impeded tubular pores; no clay flows or clay films on cleavage faces; horizon lacks open voids that are present in above horizons; many fine soft and few very fine hard concretions of an oxide; clear smooth boundary.
- C4 77 to 87 inches. Light olive gray (5Y 6/2) silt loam; massive with some vertical cleavage; firm; few to common fine distinct yellowish brown (10YR 5/4) mottles; few fine segregations of strong brown (7.5YR 5/6) grading to reddish brown (5YR 4/4) in places; many fine and very fine impeded tubular pores; few very dark gray (10YR 3/1) clay fills in pores; common coarse soft concretions of an oxide.

Notes: Roots plentiful at 0 to 14 inches; common from 14 to 25, few from 25 to 51 and nearly absent below 51 inches. Clay fills in pores absent from 51 to 77 inches. Distinct open voids from 5 to 10 mm. in diameter from 51 to 77 inches. Increase in oxides below 43 inches. Oxides are spherical in shape, dark brown to black in color, and considered to be predominantly composed of iron-manganese. Strong brown (7.5YR 5/6 to 5/8) which occurs as segregations, horizontal bands, and vertical streaks, is considered to be higher in iron oxide than the associated matrix.

¹/Munsell color for moist soil.

²/Consistence at moist field conditions.

SOIL SURVEY LABORATORY Beltsville, Md.

SOIL TYPE Macksburg LOCATION Adair County, Iowa
 silty clay loam

SOIL NOS. S55Iowa-1-1 LAB. NOS. 56198 - 56213

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|--------------|---------|--|-------------|-------------|-----------|----------------|------------|---------|----------|------------|-----|----------------|
| | | 1B1a | | | | | 3A1 | | | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | | |
| | | 2.1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 | |
| 0-6 | A1p | 0.1 | 0.1 | 0.4 | 0.4 | 1.1 | 66.1 | 31.5 | 34.1 | 33.3 | | |
| 6-9 | A12 | 0.1 | 0.3 | 0.3 | 0.4 | 0.9 | 63.9 | 34.1 | 31.8 | 33.2 | | |
| 9-12 | A12 | 0.1 | 0.3 | 0.3 | 0.4 | 1.0 | 63.3 | 34.6 | 32.6 | 31.9 | | |
| 12-15 | A12 | 0.1 | 0.3 | 0.3 | 0.4 | 0.9 | 63.0 | 35.0 | 31.5 | 32.6 | | |
| 15-18 | A3B1 | 0.2 | 0.3 | 0.3 | 0.3 | 0.9 | 62.6 | 35.4 | 31.1 | 32.6 | | |
| 18-21 | B21 | 0.1 | 0.3 | 0.2 | 0.3 | 1.1 | 61.8 | 36.2 | 31.1 | 32.0 | | |
| 21-24 | B22 | - | 0.3 | 0.2 | 0.2 | 1.2 | 60.5 | 37.6 | 30.0 | 31.8 | | |
| 24-28 | B22 | - | 0.1 | 0.1 | 0.2 | 1.3 | 60.5 | 37.8 | 30.1 | 31.8 | | |
| 28-33 | B3 | - | 0.2 | 0.2 | 0.3 | 1.4 | 61.7 | 36.2 | 31.6 | 31.7 | | |
| 33-38 | B3 | - | 0.1 | 0.2 | 0.3 | 1.5 | 64.1 | 33.8 | 32.5 | 33.3 | | |
| 38-43 | B3 | - | 0.1 | 0.2 | 0.3 | 1.4 | 66.6 | 31.4 | 35.6 | 32.6 | | |
| 43-49 | C1 | - | 0.1 | 0.2 | 0.4 | 1.5 | 66.0 | 31.8 | 34.5 | 33.2 | | |
| 49-55 | C1 | - | - | 0.1 | 0.4 | 2.0 | 67.2 | 30.3 | 37.7 | 31.7 | | |
| 55-61 | C1 | - | 0.1 | 0.1 | 0.4 | 1.9 | 66.6 | 30.9 | 38.1 | 30.7 | | |
| 61-66 | C1 | - | 0.1 | 0.2 | 0.5 | 1.4 | 67.4 | 30.4 | 34.4 | 34.7 | | |
| 66-72 | C1 | - | 0.1 | 0.2 | 0.3 | 1.7 | 69.5 | 28.2 | 38.0 | 33.4 | | |

| PH | | ORGANIC MATTER | | | EST% SALT (BUREAU CUP) | ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM @25°C. | CaCO ₃ equivalent | GYPSUM mg./100g SOIL | MOISTURE TENSIONS | | |
|------|-----|----------------|------------------|-----------------|------------------------|--|------------------------------|----------------------|-------------------|------------|-----------|
| 8C1a | | 6A1a | 6B1a | | | | | | 1/10 ATMOS. | 1/3 ATMOS. | 15 ATMOS. |
| | 1:5 | 1:10 | ORGANIC CARBON % | NITRO-GEN C/N % | | | | % | % | % | |
| 5.4 | | | 2.40 | .202 | 11.9 | | | | | | |
| 5.5 | | | 2.29 | .194 | 11.8 | | | | | | |
| 5.7 | | | 2.07 | .176 | 11.8 | | | | | | |
| 5.7 | | | 1.72 | .156 | 11.0 | | | | | | |
| 5.7 | | | 1.52 | .136 | 11.2 | | | | | | |
| 5.8 | | | 1.21 | .112 | 10.8 | | | | | | |
| 5.6 | | | 0.90 | .086 | 10.5 | | | | | | |
| 5.6 | | | 0.67 | .068 | 9.8 | | | | | | |
| 5.7 | | | 0.46 | .048 | 9.6 | | | | | | |
| 5.7 | | | 0.35 | .043 | 8.1 | | | | | | |
| 5.9 | | | 0.27 | .035 | 7.7 | | | | | | |
| 6.1 | | | 0.22 | .030 | | | | | | | |
| 6.3 | | | 0.16 | .027 | | | | | | | |
| 6.5 | | | 0.15 | .026 | | | | | | | |
| 6.6 | | | 0.14 | .026 | | | | | | | |
| 6.7 | | | 0.15 | .026 | | | | | | | |

| 5A3a | EXTRACTABLE CATIONS 5B1a | | | | | 5C3 | SATURATION EXTRACT SOLUBLE | | | | MOISTURE AT SATURATION % |
|------------------------------|-------------------------------------|------|------|------|------|--------------------------------|--------------------------------|---|--|--|--------------------------|
| CATION EXCHANGE CAPACITY Sum | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | Base Sat. % on Sum | No | K | | | |
| | Ca | Mg | H | Na | K | | ← milliequivalents per liter → | | | | |
| | ← milliequivalents per 100g. soil → | | | | | ← milliequivalents per liter → | | | | | |
| 27.8 | 12.9 | 3.1 | 11.0 | -0.1 | 0.8 | 60 | | | | | |
| 29.9 | 14.0 | 4.4 | 10.7 | 0.1 | 0.7 | 64 | | | | | |
| 30.1 | 13.5 | 5.7 | 10.2 | 0.1 | 0.6 | 66 | | | | | |
| 29.2 | 13.4 | 5.1 | 9.8 | 0.2 | 0.7 | 66 | | | | | |
| 31.9 | 16.0 | 5.8 | 9.3 | 0.1 | 0.7 | 70 | | | | | |
| 29.9 | 14.0 | 6.6 | 8.5 | 0.2 | 0.6 | 71 | | | | | |
| 31.2 | 15.4 | 7.4 | 7.5 | 0.2 | 0.7 | 75 | | | | | |
| 31.5 | 16.2 | 7.3 | 7.1 | 0.2 | 0.7 | 77 | | | | | |
| 32.7 | 17.1 | 8.3 | 6.4 | 0.2 | 0.7 | 80 | | | | | |
| 31.3 | 16.2 | 8.3 | 5.9 | 0.2 | 0.7 | 81 | | | | | |
| 28.5 | 15.5 | 7.8 | 5.2 | 0.3 | 0.7 | 85 | | | | | |
| 29.2 | 15.7 | 7.9 | 4.6 | 0.3 | 0.7 | 81 | | | | | |
| 28.6 | 15.5 | 7.8 | 4.3 | 0.3 | 0.7 | 84 | | | | | |
| 28.1 | 15.2 | 7.8 | 4.1 | 0.3 | 0.7 | 85 | | | | | |
| 27.1 | 15.3 | 8.2 | 2.6 | 0.3 | 0.7 | 90 | | | | | |
| 26.0 | 14.6 | 7.5 | 2.9 | 0.3 | 0.7 | 88 | | | | | |

Soil type: Macksburg silty clay loam

Soil No.: S55Iowa-1-1

Location: Greenfield Quadrangle; southeast quarter of northeast quarter of Sec. 13, T76N, R32W, Adair County, Iowa.

Slope: 0 percent.

Collected by and date: R. B. Daniels and F. J. Carlisle, November 3, 1955.

| Horizon and Beltsville Lab. Number | Sample Depth | |
|---|---|--|
| Alp 56198 | 0-6 | 0 to 6 inches. Black (10YR 2/1) friable, massive, light silty clay loam; abrupt to A12. |
| A12 56199 56200 56201 | 6-9 9-12 12-15 | 6 to 15 inches. Black (10YR 2/1.5) which crushes to very dark gray (10YR 3/1.5), weak to moderate granular, friable, light silty clay loam; gradual to A3B1. |
| A3B1 56202 | 15-18 | 15 to 18 inches. Mixed very dark gray brown (10YR 3.5/2) and black (10YR 2/1.5) weak to moderate subangular blocky, friable, silty clay loam; gradual to B21. |
| B21 56203 | 18-21 | 18 to 21 inches. Dark gray brown (10YR 4/2) with mixing of very dark gray (10YR 3/1.5), moderate fine subangular blocky, moderately friable, medium to heavy silty clay loam; thin continuous to nearly continuous clay skins; gradual to B22. |
| B22 56204 56205 | 21-24 24-28 | 21 to 28 inches. Dark gray brown (10YR 4/2), weak medium subangular blocky, moderately friable, heavy silty clay loam; continuous thin to moderate clay skins; gradual to B3. |
| B3 56206 56207 56208 | 28-33 33-38 38-43 | 28 to 43 inches. Dark gray brown (10YR 4/2.5) with few fine distinct mottles of grayish brown (2.5Y 5/2), weak medium blocky, moderately friable, silty clay loam; peds are arranged in weak to moderate, medium to coarse prisms which are coated with dark gray brown (2.5Y 4/2) extremely thin silt grains; thin discontinuous clay skins can be seen between silt grains; gradual to C1. |
| C1 56209 56210 56211 56212 56213 | 43-49 49-55 55-61 61-66 66-72 | 43 to 72 inches. Dark gray brown (10YR 4/2.5) with common distinct yellowish brown to strong brown and gray brown (2.5Y 5/2) mottles, moderate coarse prismatic, friable to moderately friable, light silty clay loam; thin discontinuous clay skins of dark gray brown (10YR 4/2) on vertical prism faces. |

SOIL SURVEY LABORATORY Beltsville, Md.

SOIL TYPE Mecksburg LOCATION Adair County, Iowa
 silty clay loam

SOIL NOS. S55Iowa-1-2 LAB. NOS. 56214 - 56231

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | | |
|--------------|---------|--|---------------------------------|-------------|----------------|----------------|------------|--------------------|----------------------------|------------|----------------|------------------------|------------|-----------|
| | | 1B1a | | | | | | | | | | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | > 2 | | | | | |
| | | 2:1 | 1:0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | | | |
| 0-7 | A1p | 0.2 | 0.4 | 0.3 | 0.4 | 0.9 | 65.2 | 32.6 | 34.3 | 32.0 | | | | |
| 7-10 | A12 | - | 0.2 | 0.2 | 0.4 | 1.2 | 62.5 | 35.5 | 32.7 | 31.2 | | | | |
| 10-13 | A12 | 0.1 | 0.3 | 0.2 | 0.4 | 1.0 | 61.9 | 36.1 | 30.7 | 32.4 | | | | |
| 13-16 | A12 | 0.3 | 0.3 | 0.2 | 0.4 | 0.7 | 62.1 | 36.0 | 30.8 | 32.3 | | | | |
| 16-19 | A3 | 0.1 | 0.4 | 0.2 | 0.4 | 0.9 | 61.7 | 36.3 | 31.0 | 31.8 | | | | |
| 19-22 | B21 | 0.1 | 0.2 | 0.2 | 0.3 | 0.9 | 61.1 | 37.2 | 29.9 | 32.2 | | | | |
| 22-25 | B21 | - | 0.1 | 0.2 | 0.3 | 1.0 | 60.1 | 38.3 | 29.3 | 32.0 | | | | |
| 25-29 | B22 | - | 0.1 | 0.1 | 0.3 | 1.1 | 60.6 | 37.8 | 30.6 | 31.3 | | | | |
| 29-33 | B22 | - | - | 0.1 | 0.2 | 0.9 | 62.5 | 36.3 | 30.1 | 33.4 | | | | |
| 33-36 | B3 | - | - | - | 0.1 | 1.3 | 63.6 | 35.0 | 33.9 | 31.1 | | | | |
| 36-39 | B3 | - | 0.1 | 0.1 | 0.3 | 1.0 | 64.6 | 33.9 | 34.6 | 31.2 | | | | |
| 39-42 | B3 | - | 0.1 | 0.2 | 0.4 | 1.2 | 65.5 | 32.6 | 34.1 | 32.8 | | | | |
| 42-46 | B3 | - | 0.1 | 0.1 | 0.4 | 1.1 | 66.5 | 31.8 | 34.0 | 33.9 | | | | |
| 46-50 | C1 | - | - | 0.1 | 0.3 | 1.0 | 67.1 | 31.5 | 34.1 | 34.2 | | | | |
| 50-54 | C1 | - | 0.1 | 0.1 | 0.3 | 1.5 | 66.0 | 32.0 | 35.0 | 32.7 | | | | |
| 54-60 | C1 | - | 0.1 | 0.2 | 0.4 | 1.1 | 66.1 | 32.1 | 34.3 | 33.1 | | | | |
| 60-66 | C1 | - | 0.1 | 0.2 | 0.4 | 1.0 | 67.8 | 30.5 | 36.8 | 32.2 | | | | |
| 66-72 | C1 | - | 0.1 | 0.2 | 0.5 | 1.2 | 67.4 | 30.6 | 35.4 | 33.5 | | | | |
| | | PH | | | | | | | | | | | | |
| | | ORGANIC MATTER | | | | | | | | | | | | |
| | | ESTIMATE | | | | | | | | | | | | |
| | | ELECTRICAL CONDUCTIVITY | | | | | | | | | | | | |
| | | MOISTURE TENSIONS | | | | | | | | | | | | |
| | | 1:1 | 1:5 | 1:10 | ORGANIC CARBON | NITROGEN | C/N | ESTIMATE | ELECTRICAL CONDUCTIVITY | CaCO3 | GYP SUM | 1/10 ATMOS. | 1/3 ATMOS. | 15 ATMOS. |
| | | | | | % | % | | (BUREAU CUP) | EC-109 | equiv-ment | me./100g. SOIL | % | % | % |
| | | | | | | | | | MILLIMHO PER CM AT 25°C. | | | | | |
| 5.5 | | | | | 0.32 | .040 | 8.0 | | | | | | | |
| 5.8 | | | | | 0.30 | .038 | 7.9 | | | | | | | |
| 6.0 | | | | | 0.27 | .038 | 7.1 | | | | | | | |
| 6.0 | | | | | 0.19 | .032 | | | | | | | | |
| 6.1 | | | | | 0.16 | .028 | | | | | | | | |
| 6.2 | | | | | 0.15 | .027 | | | | | | | | |
| 6.2 | | | | | 0.14 | .026 | | | | | | | | |
| 6.4 | | | | | 0.15 | .027 | | | | | | | | |
| 6.3 | | | | | 0.14 | .027 | | | | | | | | |
| 6.4 | | | | | 2.35 | .195 | 12.0 | | | | | | | |
| 5.6 | | | | | 2.04 | .172 | 11.9 | | | | | | | |
| 5.6 | | | | | 1.72 | .151 | 11.4 | | | | | | | |
| 5.6 | | | | | 1.65 | .148 | 11.1 | | | | | | | |
| 5.3 | | | | | 1.51 | .132 | 11.4 | | | | | | | |
| 5.5 | | | | | 1.03 | .095 | 10.8 | | | | | | | |
| 5.6 | | | | | 0.84 | .078 | 10.8 | | | | | | | |
| 5.6 | | | | | 0.56 | .060 | 9.3 | | | | | | | |
| 5.8 | | | | | 0.43 | .048 | 9.0 | | | | | | | |
| | | EXTRACTABLE CATIONS | | | | | | | | | | | | |
| | | SATURATION EXTRACT SOLUBLE | | | | | | | | | | | | |
| | | MOISTURE AT SATURATION | | | | | | | | | | | | |
| | | 5A3a | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | 503 | SATURATION EXTRACT SOLUBLE | | | MOISTURE AT SATURATION | | |
| | | CATION EXCHANGE CAPACITY | Co | Mg | H | Na | K | Base Sat. % on Sum | No | K | | | % | |
| | | Sum | milliequivalents per 100g. soil | | | | | Cations | milliequivalents per liter | | | % | | |
| 26.9 | | 15.4 | 4.6 | 6.1 | 0.2 | 0.6 | 77 | | | | | | | |
| 27.3 | | 15.2 | 5.4 | 5.9 | 0.2 | 0.6 | 78 | | | | | | | |
| 25.7 | | 14.9 | 4.2 | 5.9 | 0.2 | 0.6 | 77 | | | | | | | |
| 25.4 | | 15.0 | 4.0 | 5.6 | 0.2 | 0.6 | 78 | | | | | | | |
| 25.6 | | 15.1 | 4.5 | 5.1 | 0.3 | 0.6 | 80 | | | | | | | |
| 25.2 | | 15.3 | 4.3 | 4.6 | 0.3 | 0.7 | 82 | | | | | | | |
| 25.4 | | 15.8 | 4.3 | 4.4 | 0.3 | 0.6 | 83 | | | | | | | |
| 24.8 | | 15.3 | 4.3 | 4.3 | 0.3 | 0.6 | 83 | | | | | | | |
| 24.8 | | 15.0 | 4.4 | 4.6 | 0.2 | 0.6 | 81 | | | | | | | |
| 28.7 | | 17.2 | 3.4 | 7.4 | -0.1 | 0.7 | 74 | | | | | | | |
| 28.9 | | 14.0 | 4.7 | 9.5 | -0.1 | 0.7 | 67 | | | | | | | |
| 28.0 | | 13.3 | 5.0 | 9.0 | -0.1 | 0.7 | 68 | | | | | | | |
| 27.9 | | 13.2 | 5.4 | 8.7 | -0.1 | 0.6 | 69 | | | | | | | |
| 29.5 | | 13.6 | 6.6 | 8.5 | 0.1 | 0.7 | 71 | | | | | | | |
| 29.3 | | 14.0 | 7.1 | 7.5 | 0.1 | 0.6 | 74 | | | | | | | |
| 30.8 | | 14.9 | 8.0 | 7.1 | 0.1 | 0.7 | 77 | | | | | | | |
| 32.7 | | 15.2 | 8.3 | 8.4 | 0.1 | 0.7 | 74 | | | | | | | |
| 26.7 | | 15.4 | 4.4 | 6.2 | 0.1 | 0.6 | 77 | | | | | | | |

Soil type: Macksburg silty clay loam

Soil No.: S55Iowa-1-2

Location: Greenfield Quadrangle; southwest quarter of northwest quarter of southwest quarter of Sec. 17, T76N, R31W, Adair County, Iowa.

Slope: 0 percent.

Collected by and date: R. E. Daniels and F. J. Carlisle, November 5, 1955.

Horizon and

Beltsville
Lab. Number Sample
Depth

| | | |
|-------|-------|---|
| Alp | | 0 to 7 inches. Black (10YR 2/1) cloddy, which breaks to fine granular, friable, light silty clay loam; clear to A12. |
| 56214 | 0-7 | |
| A12 | | 7 to 16 inches. Black (10YR 2/1) weak fine and medium granular, friable, light silty clay loam; gradual to A3. |
| 56215 | 7-10 | |
| 56216 | 10-13 | |
| 56217 | 13-16 | |
| A3 | | 16 to 19 inches. Black (10YR 2/1.5) with a minor amount of very dark gray brown (10YR 3/2), weak to moderate fine subangular blocky, friable, light to medium silty clay loam; gradual to B21. |
| 56218 | 16-19 | |
| B21 | | 19 to 25 inches. Very dark gray brown (10YR 3/2) with some mixing of very dark gray (10YR 3/1), weak fine subangular blocky, friable, medium to heavy silty clay loam; continuous thin clay skins; gradual to B22. |
| 56219 | 19-22 | |
| 56220 | 22-25 | |
| B22 | | 25 to 33 inches. Dark gray brown (10YR 4/2.5) with a small amount of very dark brown (10YR 2/2), moderate fine subangular blocky, slightly firm, medium to heavy silty clay loam; thin continuous clay skins; few fine faint grayer and browner mottles in lower part of horizon; gradual to B3. |
| 56221 | 25-29 | |
| 56222 | 29-33 | |
| B3 | | 33 to 46 inches. Dark gray brown (10YR 4/2) with many distinct gray brown (2.5Y 5/2) and strong brown to brown mottles; weak to moderate, medium blocky, slightly firm, silty clay loam; thin continuous clay skins coating larger aggregates which are arranged weak medium to coarse prisms; gradual to C1. |
| 56223 | 33-36 | |
| 56224 | 36-39 | |
| 56225 | 39-42 | |
| 56226 | 42-46 | |
| C1 | | 46 to 72 inches. Mottled gray brown (2.5Y 5/2) and strong brown to dark brown in fine to medium pattern, massive, friable, light silty clay loam with thin to moderate clay skins on vertical faces of cleavage planes; common fine dark oxide accumulation. |
| 56227 | 46-50 | |
| 56228 | 50-54 | |
| 56229 | 54-60 | |
| 56230 | 60-66 | |
| 56231 | 66-72 | |

SOIL SURVEY LABORATORY Lincoln, Nebr. Sept., 1963

SOIL TYPE Macksburg LOCATION Madison County, Iowa
 silty clay loam

SOIL NOS. S61Iowa-61-1 LAB. NOS. 16343-16354

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | 2A2 > 2 | TEXTURAL CLASS |
|--|---|--|----------------------|-------------------------|----------------------------|-----------------------------|--|----------------------------|---|---------------------------|----------------------------------|------------------------------|----------------|
| | | 1B1b | | 3A1 | | | | | | | | | |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | | | |
| 0-6 | A1p | 0.2a | 0.4a | 0.4a | 0.5a | 0.9a | 65.0 | 32.6 | 29.6 | 36.5 | - | | |
| 6-12 | A12 | 0.2a | 0.4a | 0.4a | 0.5a | 0.7a | 61.8 | 36.0 | 27.3 | 35.4 | - | | |
| 12-18 | A3 | 0.2a | 0.6a | 0.4a | 0.5a | 0.7a | 60.3 | 37.3 | 26.3 | 35.0 | - | | |
| 18-24 | B1 | 0.4a | 0.6a | 0.4a | 0.4a | 0.6a | 58.8 | 38.8 | 24.6 | 35.0 | - | | |
| 24-30 | B21 | 0.3a | 0.4a | 0.3a | 0.5a | 0.6a | 58.1 | 39.8 | 25.4 | 34.6 | - | | |
| 30-36 | B22 | 0.1a | 0.3a | 0.2a | 0.6a | 0.6a | 59.4 | 38.8 | 25.8 | 34.6 | - | | |
| 36-42 | B23 | 0.1a | 0.5a | 0.3a | 0.7a | 0.7a | 62.5 | 35.2 | 27.6 | 36.1 | - | | |
| 42-52 | B31 | 0.1a | 0.3a | 0.2a | 0.5a | 0.9b | 64.3 | 33.7 | 29.2 | 36.3 | - | | |
| 52-62 | B32 | 0.1a | 0.1a | 0.1a | 0.3a | 0.9b | 64.7 | 33.8 | 32.5 | 33.3 | - | | |
| 62-73 | C1 | - | 0.1a | 0.1a | 0.3a | 0.9b | 67.9 | 30.8 | 34.8 | 34.1 | - | | |
| 73-83 | C2 | 0.1a | 0.2a | 0.2a | 0.5a | 1.0b | 69.3 | 28.7 | 35.4 | 35.2 | - | | |
| 83-90 | C3 | 0.1a | 0.1a | 0.2a | 0.5a | 1.2b | 69.4 | 28.5 | 35.2 | 35.7 | - | | |
| 8Cl a | | Organic Matter | | | | Bulk Density | | | | Moisture Retention | | | |
| | CaCO ₃ Equiv- alent 1:1 % | 6A1a O.C. % | 6B1a N % | C/N | Field Moist 4B4 % M. | | 30 Cm. 4A1a g/cc | | A.D. 4A1b g/cc | 4B1b 1/3-Bar Pieces | 4C1 15-to 1/3-Bar in/in | 4B2 15-Bar Sieved % | |
| 6.3 | | 3.03 | 0.247 | 12 | 27.4 | 1.38 | 29.2 | 1.37 | 1.55 | 27.3 | .16 | 15.3 | |
| 5.2 | | 2.80 | 0.217 | 13 | 28.5 | 1.28 | 32.3 | 1.24 | 1.40 | 27.8 | .15 | 16.0 | |
| 5.3 | | 2.03 | 0.171 | 12 | | | | | | | | 16.1 | |
| 5.1 | | 1.45 | 0.127 | 11 | 27.5 | 1.31 | 28.4 | 1.30 | 1.50 | 29.7 | .17 | 16.8 | |
| 5.1 | | 1.00 | 0.092 | 11 | 28.3 | 1.31 | 27.3 | 1.31 | 1.52 | 29.2 | .15 | 18.0 | |
| 5.2 | | 0.62 | | | | | | | | | | 18.0 | |
| 5.6 | | 0.37 | | | 29.1 | 1.34 | 30.2 | 1.31 | 1.53 | 29.7 | .17 | 16.9 | |
| 5.9 | | 0.25 | | | | | | | | | | 15.8 | |
| 6.1 | | 0.15 | | | 29.6 | 1.39 | 30.3 | 1.35 | 1.58 | 31.8 | .21 | 15.9 | |
| 6.6 | | 0.09 | | | | | | | | | | 14.8 | |
| 6.9 | - | 0.09 | | | | | | | | | | 14.6 | |
| 7.1 | - | 0.10 | | | | | | | | | | 14.9 | |
| 5A1a | | EXTRACTABLE CATIONS 5B1a | | | | | Base Sat. | | 8D1 | 8D3 | 6C1a | 6G1a | |
| CATION EXCHANGE CAPACITY NH ₄ OAc | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a No | 6Q2a K | 5A3a Sum | 5C1 on NH ₄ OAc > CEC % | 5C3 on Sum Cations % | Ratio to Clay NH ₄ OAc CEC | Ca/Mg | Ext. Iron as Fe % | Ext. KCl-Ext. me/100g | |
| 25.8 | 23.0 | 4.1 | 8.3 | Tr. | 0.4 | 35.8 | 106 | 77 | .79 | 5.6 | 1.1 | Tr. | |
| 26.8 | 17.1 | 4.6 | 12.6 | Tr. | 0.6 | 34.9 | 83 | 64 | .74 | 3.7 | 1.1 | - | |
| 26.4 | 15.8 | 5.6 | 11.9 | Tr. | 0.6 | 33.9 | 83 | 65 | .71 | 2.8 | 1.2 | Tr. | |
| 27.2 | 15.8 | 6.8 | 10.6 | 0.1 | 0.6 | 33.9 | 86 | 69 | .70 | 2.3 | 1.3 | 0.1 | |
| 28.7 | 17.1 | 7.8 | 9.3 | 0.1 | 0.7 | 35.0 | 90 | 73 | .72 | 2.2 | 1.2 | 0.2 | |
| 29.9 | 17.8 | 8.4 | 8.5 | 0.1 | 0.8 | 35.6 | 91 | 76 | .77 | 2.1 | 1.1 | 0.3 | |
| 28.5 | 17.5 | 8.4 | 7.1 | 0.1 | 0.7 | 33.8 | 94 | 79 | .81 | 2.1 | 1.3 | 0.1 | |
| 27.2 | 17.0 | 8.4 | 6.3 | 0.1 | 0.7 | 32.5 | 96 | 81 | .81 | 2.0 | 1.3 | 0.1 | |
| 26.4 | 16.9 | 8.5 | 5.1 | 0.1 | 0.7 | 31.3 | 99 | 84 | .78 | 2.0 | 1.3 | | |
| 24.9 | 16.1 | 8.5 | 3.8 | 0.1 | 0.6 | 29.1 | 102 | 87 | .81 | 1.9 | 1.4 | | |
| 24.4 | 15.9 | 8.4 | 3.2 | 0.1 | 0.6 | 28.2 | 102 | 89 | .85 | 1.9 | 1.6 | | |
| 23.6 | 15.9 | 8.5 | 2.6 | 0.1 | 0.6 | 27.7 | 106 | 91 | .83 | 1.9 | 1.8 | | |
| a. | Many Fe/Mn nodules | | | | | | | | | | | | |
| b. | Common Fe/Mn nodules | | | | | | | | | | | | |
| c. | 24 Kg/M ² to 60 inches | | | | | | | | | | | | |

Soil type: Macksburg silty clay loam

Soil No.: S61Iowa-61-1

Location: 783 feet west and 390 feet north of southeast corner of Sec. 31, T75N, R28W, Madison County, Iowa.

Vegetation: Flowed meadow field.

Parent material: Wisconsin loess.

Physiographic position: Upland ridge on top of an interfluvium with slope slightly convex toward the northwest.

Slope: About 1 percent.

Drainage: Imperfectly drained.

Permeability: Moderately slow.

Ground water: Water table at 48 inches.

Moisture: Very moist.

Described by: D. F. Slusher, October 9, 1961.

Horizon and

Lincoln Lab. No.

- Alp 0 to 6 inches. Black (10YR 2/1)¹ light silty clay loam, dark gray (10YR 4/1) when dry; weak fine and medium subangular blocky structure; firm²; a few worm casts; abrupt smooth boundary.
- 16343
- Al2 6 to 12 inches. Black (10YR 2/1) light silty clay loam, dark gray (10YR 4/1) when dry; weak fine subangular blocky breaking to moderate fine granular structure; friable; kneaded color the same; moist color value slightly lower and dry chroma slightly lower than the above horizon; few fine imbed tubular pores; few very dark gray (10YR 3/1) worm casts; gradual smooth boundary.
- 16344
- A3 12 to 18 inches. Black (10YR 2/1) and very dark brown (10YR 2/2) light silty clay loam, gray (10YR 5/1) when dry; moderate very fine subangular blocky and moderate fine granular structure; friable; ped exteriors are black (10YR 2/1); ped interiors are very dark brown (10YR 2/2), and kneaded color is the same; few fine and medium imbed tubular pores; few fine hard concretions of an oxide; few very dark grayish brown (10YR 3/2) worm casts; gradual smooth boundary.
- 16345
- B1 18 to 24 inches. Very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) medium silty clay loam; grayish brown (10YR 5/2) when dry; moderate very fine subangular blocky with some moderate fine granular structure; friable; ped exteriors are very dark gray (10YR 3/1) with few fine dark grayish brown (10YR 4/2) mottles; interiors are very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) with no mottles; kneaded color same as interior colors; common fine imbed tubular pores; few fine hard concretions of an oxide; few dark grayish brown (10YR 4/2) worm casts; gradual smooth boundary.
- 16346
- B21 24 to 30 inches. Dark grayish brown (10YR 4/2) and brown (10YR 5/3) medium to heavy silty clay loam; moderate fine subangular blocky structure; firm; ped exteriors are dark grayish brown (10YR 4/2) with few fine brown (10YR 5/3) mottles; few very dark gray (10YR 3/1) stains; ped interiors are brown (10YR 5/3) grading to a slightly yellowish hue than 10YR, and with common very dark gray (10YR 3/1) stains; common fine imbed tubular pores; no clay films noted; common fine hard concretions and few fine soft concretions of an oxide; common very dark gray color in root channels and wormholes; gradual smooth boundary.
- 16347
- B22 30 to 36 inches. Grayish brown (2.5Y 5/2) and grayish brown to light olive brown (2.5Y 5/3) heavy silty clay loam; weak medium prismatic breaking to moderate fine subangular blocky structure; firm; ped exteriors are grayish brown (2.5Y 5/2) with very few fine 7.5YR 3/2 mottles; ped interiors are grayish brown to light olive brown (2.5Y 5/3) with few to common fine yellowish brown (10YR 5/6) and few fine grayish brown (2.5Y 5/2) mottles; kneaded color the same as ped interiors; many fine imbed tubular pores; few thin discontinuous clay films on ped faces; common fine hard concretions of an oxide; gradual smooth boundary.
- 16348
- B23 36 to 42 inches. Grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) medium silty clay loam; weak medium prismatic breaking to moderate medium subangular blocky structure; firm; ped exteriors and prism faces are grayish brown (2.5Y 5/2) with common fine distinct dark brown to dark yellowish brown (10YR 3/4) mottles; ped interiors are light brownish gray (2.5Y 6/2) with common fine distinct yellowish brown (10YR 5/6) and common fine distinct brown to dark brown (10YR 4/3) mottles; many fine imbed tubular pores; common thin distinct continuous clay films on ped faces; common fine hard concretions of an oxide; gradual smooth boundary.
- 16349
- B31 42 to 52 inches. Grayish brown (2.5Y 5/2) light to medium silty clay loam; weak medium prismatic structure; firm; common fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles, and few fine distinct dark brown (7.5YR 3/2) and light olive gray (5Y 6/2) mottles; kneaded color is grayish brown to light olive brown (2.5Y 5/3); common fine imbed tubular pores; few thin discontinuous clay films on prism faces; common fine hard concretions of an oxide; gradual smooth boundary.
- 16350
- B32 52 to 62 inches. Gray (2.5Y 5/1) and grayish brown (2.5Y 5/2) light silty clay loam; weak medium prismatic structure; firm; grayish brown (2.5Y 5/2) peds with gray (2.5Y 5/1) prism faces; many to common fine prominent yellowish brown (10YR 5/6) mottles; few fine distinct segregations of strong brown (7.5YR 5/8); grayish brown to light olive brown (2.5Y 5/3) when kneaded; common fine imbed tubular pores; no clay flows in pores or channels and no clay films on prism faces; common fine soft and hard concretions of an oxide; gradual smooth boundary.
- 16351
- C1 62 to 73 inches. Gray (2.5Y 5/1) and olive gray (5Y 5/2) to light olive gray (5Y 6/2) silt loam; weak coarse prismatic structure; firm; ped exteriors are gray (2.5Y 5/1) with common fine distinct yellowish brown (10YR 5/6) mottles; ped interiors are olive gray (5Y 5/2) to light olive gray (5Y 6/2) with many fine segregations of strong brown (7.5YR 5/6); common fine imbed tubular pores; a few clay flows and black saucer-shaped clay accumulations (see notes); common soft and hard concretions of an oxide; gradual smooth boundary.
- 16352
- C2 73 to 83 inches. Olive gray (5Y 5/2) silt loam; massive with some vertical cleavage; firm; common fine distinct segregations of strong brown (7.5YR 5/6) and brown to dark brown (7.5YR 4/4); common fine imbed tubular pores; clay flows and accumulations extend from above horizon; common fine soft concretions of an oxide; gradual smooth boundary.
- 16353
- C3 83 to 90 inches. Light olive gray (5Y 6/2) silt loam; massive with some vertical cleavages; firm; common fine distinct segregations of strong brown (7.5YR 5/6) and yellowish red (5YR 4/8); common fine imbed tubular pores; few fine clay flows in fine pores; common fine tubular concretions of an oxide (1-2 inches long; 3-4 mm. wide).
- 16354

Notes: Roots common from 0 to 12 inches; few from 12 to 42 and nearly absent below 42 inches. Distinct clay flows and clay accumulations from 62 to 83 inches. The vertical clay flows are very dark gray (10YR 3/1), 2-3 mm. wide. These flows are connected to saucer-shaped clay accumulations (1/4 to 1/2 inch in diameter). Strong brown (7.5YR 5/6 to 5/8) which occurs as segregations, horizontal bands, and vertical streaks, is considered to be higher in iron oxide than the associated matrix. Oxides are spherical in shape, dark brown to black in color, and are considered to be composed predominantly of iron-manganese. Horizons Alp, B21, and B32 were sampled for the Bureau of Public Roads.

¹Munsell color for moist soil.

²Consistence at moist field conditions.

SOIL SURVEY LABORATORY Lincoln, Nebr. Sept., 1963

SOIL TYPE Mahaska LOCATION Keokuk County, Iowa
 silty clay loam

SOIL NOS. S61Iowa-54-1 LAB. NOS. 16273-16283

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | Textural Class |
|--|----------------------------------|--|-------------|-------------|-------------|----------------|------------------------|---------|----------|------------|--------------------|----------------|
| | | 1B1b | 3A1 | | | | | | | 2A2 | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | | > 2 |
| | | 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | |
| 0-7 | A1p | 0.2 | 0.5 | 0.6 | 0.6 | 0.7 | 67.5 | 29.9 | 27.8 | 40.7 | - | |
| 7-13 | A12 | 0.3 | 0.4 | 0.7 | 0.6 | 0.5 | 64.3 | 33.2 | 24.8 | 40.3 | - | |
| 13-18 | A3 | 0.9 | 0.9 | 0.5 | 0.5 | 0.5 | 60.5 | 36.2 | 23.4 | 37.8 | - | |
| 18-24 | B1 | 0.4 | 0.8 | 0.4 | 0.4 | 0.6 | 57.8 | 39.6 | 22.1 | 36.5 | - | |
| 24-30 | B21 | 0.1 | 0.2 | 0.3 | 0.4 | 0.8 | 56.3 | 41.9 | 22.7 | 34.6 | - | |
| 30-40 | B22 | 0.2 | 0.6 | 0.4 | 0.4 | 0.9 | 61.1 | 36.4 | 29.0 | 33.2 | - | |
| 40-51 | B31 | 0.1 | 0.2 | 0.2 | 0.2 | 0.6 | 65.2 | 33.5 | 31.8 | 34.1 | - | |
| 51-61 | B32 | 0.1 | Tr. | 0.1 | 0.2 | 0.7 | 67.4 | 31.5 | 33.3 | 34.9 | - | |
| 61-73 | C1 | Tr. | 0.2 | 0.2 | 0.4 | 0.7 | 68.5 | 30.0 | 36.8 | 32.6 | - | |
| 73-78 | C2 | 0.2 | 0.4 | 0.3 | 0.7 | 1.5 | 69.9 | 27.0 | 35.2 | 36.6 | - | |
| 78-90 | C3 | - | Tr. | 0.1 | 0.2 | 1.1 | 75.6 | 23.0 | 37.2 | 39.6 | - | |
| 8C1a | 6E1b | Organic Matter | | | | | Bulk Density | | | | Moisture Retention | |
| pH 1:1 | CaCO ₃ Equivalent % a | 6A1a | 6B1a | C/N | Field Moist | | 30 Cm. | | A.D. | 4B1b | 4C1 | 4B2 |
| | | O.C. | N | | 4B4 | 4A1a | 4B3 | 4A1c | 4A1b | Pieces | 15-to | 15-Bar |
| | | % b | % | | % M. | g/cc | % M. | g/cc | g/cc | % | in/in | % |
| 5.6 | | 2.66 | 0.208 | 13 | 24.8 | 1.44 | | | 1.56 | 25.5 | .17 | 13.5 |
| 5.0 | | 2.03 | 0.164 | 12 | 26.9 | 1.31 | 31.8 | 1.26 | 1.40 | 29.0 | .18 | 14.4 |
| 4.8 | | 1.30 | 0.124 | 10 | | | | | | | | 16.2 |
| 4.8 | | 0.96 | 0.106 | 9 | 25.6 | 1.36 | 28.0 | 1.32 | 1.58 | 29.8 | .16 | 17.3 |
| 4.8 | | 0.51 | 0.067 | 8 | | | | | | | | 19.3 |
| 5.2 | | 0.31 | | | 25.3 | 1.45 | 28.3 | 1.36 | 1.66 | 30.4 | .18 | 17.3 |
| 6.0 | | 0.14 | | | | | | | | | | 16.2 |
| 6.5 | - | 0.10 | | | | | | | | | | 15.1 |
| 7.1 | 2 | 0.09 | | | 28.2 | 1.45 | 32.4 | 1.37 | 1.56 | 32.2 | .27 | 12.6 |
| 7.2 | 3 | 0.08 | | | | | | | | | | 16.4 |
| 7.5 | 9 | 0.06 | | | 25.0 | 1.52 | 28.8 | 1.44 | 1.63 | 29.3 | .26 | 11.2 |
| 5A1a | EXTRACTABLE CATIONS 5B1a | | | | | Base Sat. | | | 8D1 | 8D3 | 6C1a | 6C1a |
| CATION EXCHANGE CAPACITY NH ₄ OAc | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | 5A3a | 5C1 | 5C3 | Ratio | | Ext. | Al |
| | Ca | Mg | H | No | K | Sum | on NH ₄ OAc | on Sum | to Clay | Ca/Mg | Iron as Fe | KCl-Ext. |
| | milliequivalents per 100g. soil | | | | | | CEC % | % | CEC | | % | mg/100g |
| 25.4 | 18.0 | 4.6 | 10.0 | Tr. | 0.4 | 33.0 | 90 | 70 | .85 | 3.9 | 0.9 | - |
| 25.3 | 13.7 | 4.9 | 13.8 | Tr. | 0.5 | 32.9 | 75 | 58 | .76 | 2.8 | 0.9 | 0.1 |
| 26.0 | 14.5 | 7.2 | 12.2 | 0.1 | 0.6 | 34.6 | 86 | 65 | .72 | 2.0 | 1.0 | 0.1 |
| 28.2 | 15.9 | 7.8 | 11.0 | 0.1 | 0.6 | 35.4 | 86 | 69 | .71 | 2.0 | 1.0 | 0.4 |
| 31.1 | 18.1 | 9.2 | 10.4 | 0.1 | 0.7 | 38.5 | 90 | 73 | .74 | 2.0 | 1.0 | 0.4 |
| 28.8 | 16.8 | 9.4 | 7.8 | 0.1 | 0.7 | 34.8 | 94 | 76 | .79 | 1.8 | 1.0 | 0.1 |
| 25.4 | 16.4 | 8.6 | 4.5 | 0.2 | 0.5 | 30.2 | 101 | 85 | .76 | 1.9 | 1.1 | 0.1 |
| 24.9 | 16.2 | 8.5 | 3.0 | 0.2 | 0.5 | 28.4 | 102 | 89 | .79 | 1.9 | 0.9 | |
| 20.8 | | | 1.9 | 0.2 | 0.5 | | | | .69 | | 0.8 | |
| 18.4 | | | 2.4 | 0.1 | 0.4 | | | | .68 | | 6.7 | |
| 18.1 | | | 1.6 | 0.1 | 0.4 | | | | .79 | | 0.6 | |

a. No carbonate clay.
 b. 18 Kg/M² to 60 inches.

Soil type: Mahaska silty clay loam

Soil No.: S61Iowa-54-1

Location: 965 feet south and 278 feet east of NW corner of NE1/4 Sec. 34, T77N, R10W, Keokuk County, Iowa.

Vegetation: Clover field.

Parent material: Wisconsin loess.

Physiographic position: Upland ridge on top of an interfluvium with slope slightly convex toward the southeast.

Slope: About 0.75 percent.

Drainage: Imperfectly drained.

Permeability: Moderately slow.

Ground water: Water table at 85 inches.

Moisture: Slightly moist.

Described by: D. F. Slusher, October 2, 1961.

Horizon and

Lincoln Lab. No.

- A_{1p} 0 to 7 inches. Black (10YR 2/1)¹ light silty clay loam, dark gray (10YR 4/1) when dry; moderate fine angular blocky and subangular blocky structure; friable to slightly firm²; kneaded color black (10YR 2/1) to very dark brown (10YR 2/2); a few worm casts; abrupt smooth boundary.
- A_{1s} 7 to 13 inches. Black (10YR 2/1) light silty clay loam, dark gray (10YR 4/1) when dry; moderate fine subangular blocky breaking to moderate fine granular structure; friable; a very few medium impeded tubular pores; clear smooth boundary.
- A₃ 13 to 18 inches. Very dark gray (10YR 3/1) to black (10YR 2/1) light silty clay loam, dark gray (10YR 4/1) when dry; moderate fine subangular blocky structure; friable; few fine hard concretions of an oxide; very few fine impeded tubular pores; gradual smooth boundary.
- B₁ 18 to 24 inches. Very dark gray (10YR 3/1) and dark grayish brown to olive brown (2.5Y 4/3) medium silty clay loam, gray (10YR 5/1) when dry; weak medium prismatic breaking to moderate fine subangular blocky and very fine subangular blocky structure; friable; ped exteriors are very dark gray (10YR 3/1) with common fine distinct grayish brown (10YR 5/2) mottles; ped interiors are dark grayish brown to olive brown (2.5Y 4/3); kneaded color very dark grayish brown (10YR 3/2); very few fine impeded tubular pores; many fine hard concretions of an oxide at 18 to 24 inches; gradual smooth boundary.
- B₂₁ 24 to 30 inches. Dark gray (10YR 4/1) and grayish brown to light olive brown (2.5Y 5/3) heavy silty clay loam; weak fine prismatic breaking to moderate fine subangular blocky structure; friable to firm; ped exteriors are dark gray (10YR 4/1) with common fine distinct grayish brown (2.5Y 5/2) mottles; ped interiors are grayish brown to light olive brown (2.5Y 5/3) with common fine distinct yellowish brown (10YR 5/8) mottles inside peds; some faint coatings of silt grains partially imbedded in peds; kneaded color dark grayish brown to olive brown (2.5Y 4/3); few fine impeded tubular pores; few thin discontinuous very dark gray (10YR 3/1) clay films on ped surfaces; few fine hard concretions of an oxide; gradual smooth boundary.
- B₂₂ 30 to 40 inches. Dark gray (10YR 4/1) and grayish brown (2.5Y 5/2) medium silty clay loam; moderate medium prismatic breaking to moderate medium subangular blocky structure; firm; prism faces have faint coatings of silt grains partially imbedded in peds--coatings more distinct than in B₂₁; few oxide stains on ped exteriors; few fine distinct yellowish brown (10YR 5/6) mottles; mottles more common in interior of peds and are few medium prominent brown to dark brown (7.5YR 4/4) in color; kneaded color grayish brown to light olive brown (2.5Y 5/3); common very fine impeded tubular pores; few thin dark gray (10YR 4/1) clay films on ped surfaces; common fine hard concretions of an oxide; gradual smooth boundary.
- B₃₁ 40 to 51 inches. Olive gray (5Y 5/2) and light olive gray (5Y 6/2) light to medium silty clay loam; weak medium prismatic structure; firm; ped exteriors are olive gray (5Y 5/2); ped interiors are light olive gray (5Y 6/2); common medium and fine prominent yellowish brown (10YR 5/6) mottles throughout peds but less contrast inside peds; few fine prominent segregations of strong brown (7.5YR 5/8) inside peds; few vertical clay flows about 2 to 3 mm. wide on prism faces that are black (10YR 2/1) in color; few prism faces are dark gray (10YR 4/1) and have more prominent thin clay flows; numerous very fine clay flows in very fine pores; gradual smooth boundary.
- B₃₂ 51 to 61 inches. Olive gray (5Y 5/2) light silty clay loam; weak coarse prismatic structure; firm; few to common fine distinct yellowish brown (10YR 5/6); few coarse segregations of strong brown (7.5YR 5/8); common to many very fine impeded tubular pores; thin common black (10YR 2/1) clay films on vertical ped surfaces and few clay flows in vertical pores; gradual smooth boundary.
- C₁ 61 to 73 inches. Gray to light gray (5Y 6/1) silt loam; massive with a few vertical cleavage faces; firm; common fine distinct yellowish brown (10YR 5/6) mottles which increase in abundance in some places; common very fine impeded tubular pores; a few medium black (10YR 2/1) clay accumulations in vertical pores; few fine soft concretions of an oxide; abrupt irregular boundary.
- C₂ 73 to 78 inches. Strong brown (7.5YR 5/8) silt loam; massive with a few vertical cleavage faces; firm; horizon appears to be a horizontal band of strong brown (7.5YR 5/8) with individual layers 1 to 3 inches wide stratified with light olive gray (5Y 6/2) color between bands; few fine impeded tubular pores; clear wavy boundary.
- C₃ 78 to 90 inches. Light olive gray (5Y 6/2) silt loam; massive with a few vertical cleavage faces; firm; vertical cleavage faces have exterior color of olive gray (5Y 5/2); common fine distinct segregations of strong brown (7.5YR 5/8) in some places and yellowish brown (10YR 5/6) mottles in other places; very few impeded tubular pores; some thin distinct very dark gray (10YR 3/1) clay in fine vertical streaks but some random orientation of clay in pores; diffuse smooth boundary.
- 90 to 126 inches. The cleavage faces present in above horizon are absent; otherwise, colors and texture same as above; abrupt smooth boundary.
- 126 inches. Farmdale paleosol.

Notes: Roots plentiful from 0 to 7 inches, common from 7 to 13, few from 13 to 30, and very few from 30 to 51 inches. Horizons from 51 inches to 126 inches have a very irregular pattern of strong brown segregations. Strong brown (7.5YR 5/6 to 5/8) color which occurs as segregations, horizontal bands, and vertical streaks, is considered to be higher in iron oxide than the associated matrix. Thick, prominent, black, vertical clay accumulations surrounding dark gray krotovines at 4 to 7 feet. These clay accumulations are dominantly 1/16- to 1/8-inch thick but are 1/4-inch thick in places. Oxides are spherical in shape, dark brown to black in color, and considered to be predominantly composed of iron-manganese. Horizons A_p, B₂₁, and B₃₂ were sampled for the Bureau of Public Roads.

¹/Munsell color for moist soil.

²/Consistence at moist field conditions.

SOIL SURVEY LABORATORY Lincoln, Nebr. Sept., 1963

SOIL TYPE Mahaska LOCATION Washington County, Iowa
silty clay loam

SOIL NOS. S61Iowa-92-2 LAB. NOS. 16318-16330

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--|-----------------------------------|--|----------------------|-------------------------|------------------------|-----------------------------|----------------------------------|--|--------------------|------------|-------------------|-----------------|---------------------|
| | | 1B1b | | | | | 3A1 | | | | | | 2A2 > 2 |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | | | |
| 0-8 | A1p | 0.2 | 0.4 | 0.4 | 0.4 | 0.5 | 67.3 | 30.8 | 28.6 | 39.4 | - | | |
| 8-13 | A12 | - | 0.4 | 0.3 | 0.4 | 0.5 | 63.6 | 34.8 | 25.3 | 39.0 | - | | |
| 13-17 | A3 | 0.5 | 0.3 | 0.2 | 0.2 | 0.5 | 61.7 | 36.6 | 25.2 | 37.1 | - | | |
| 17-23 | B1 | 0.4 | 0.5 | 0.3 | 0.7 | 0.3 | 59.8 | 38.0 | 25.6 | 35.0 | - | | |
| 23-30 | B21 | 0.2 | 0.3 | 0.2 | 0.9 | 0.3 | 59.2 | 38.9 | 27.1 | 33.1 | - | | |
| 30-35 | B22 | 0.3 | 0.6 | 0.4 | 0.9 | 0.5 | 60.9 | 36.4 | 28.1 | 33.9 | - | | |
| 35-42 | B31 | 0.2 | 0.4 | 0.2 | 0.7 | 0.5 | 64.3 | 33.7 | 31.5 | 33.8 | - | | |
| 42-51 | B32 | 0.1 | 0.4 | 0.2 | 0.7 | 0.4 | 65.6 | 32.6 | 31.4 | 35.1 | - | | |
| 51-55 | C1 | 0.3 | 0.3 | 0.2 | 0.7 | 0.5 | 65.3 | 32.7 | 30.8 | 35.5 | - | | |
| 55-62 | C2 | 0.1 | 0.1 | 0.1 | 0.7 | 0.6 | 70.5 | 27.9 | 35.1 | 36.5 | - | | |
| 62-67 | C3 | - | 0.2 | 0.2 | 0.6 | 0.7 | 72.1 | 26.2 | 36.6 | 36.6 | - | | |
| 67-75 | C4 | 0.1 | 0.1 | 0.1 | 0.7 | 0.4 | 73.5 | 25.1 | 36.9 | 37.6 | - | | |
| 75-82 | C5 | 0.1 | 0.1 | 0.1 | 0.7 | 0.3 | 73.5 | 25.2 | 36.0 | 38.4 | - | | |
| 8C1a | 6E1b | Organic Matter | | | | Bulk Density | | | Moisture Retention | | | 4B2 | |
| pH 1:1 | CaCO ₃ Equiv.alent % a | 6A1a O.C. | 6B1a N % | C/N | Field Moist. % M. | 30 Cm g/cc | A. D. | | | | 15-Bar Sieved % | | |
| 5.5 | | 2.89 | 0.235 | 12 | | | | | | | 13.6 | | |
| 4.9 | | 2.18 | 0.175 | 12 | | | | | | | 14.4 | | |
| 5.0 | | 1.47 | 0.136 | 11 | | | | | | | 15.6 | | |
| 5.0 | | 1.07 | 0.094 | 11 | | | | | | | 16.7 | | |
| 5.0 | | 0.58 | 0.064 | 9 | | | | | | | 17.7 | | |
| 5.2 | | 0.36 | | | | | | | | | 17.8 | | |
| 5.5 | | 0.21 | | | | | | | | | 15.5 | | |
| 6.0 | | 0.14 | | | | | | | | | 15.1 | | |
| 6.7 | - | 0.16 | | | | | | | | | 16.8 | | |
| 6.8 | - | 0.12 | | | | | | | | | 13.9 | | |
| 6.7 | - | 0.08 | | | | | | | | | 13.1 | | |
| 7.0 | - | 0.05 | | | | | | | | | 11.7 | | |
| 7.2 | 2 | 0.05 | | | | | | | | | 12.9 | | |
| 5A1a | EXTRACTABLE CATIONS | | | | | 5B1a | Base Sat. | | 8D1 | 8D3 | Ext. Iron as Fe % | 6C1a | |
| CATION EXCHANGE CAPACITY NH ₄ OAc | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a No | 6Q2a K | 5A3a Sum | 5C1 on NH ₄ OAc CEC % | 5C3 on Sum Cations NH ₄ OAc % | Ratio to Clay CEC | Ca/Mg | | Ext. KCl-Ext. % | Al KCl-Ext. me/100g |
| 23.9 | 13.3 | 4.4 | 14.9 | 0.1 | 0.5 | 33.2 | 76 | 55 | .78 | 3.0 | | Tr. | |
| 24.7 | 13.6 | 4.6 | 13.9 | 0.1 | 0.4 | 32.6 | 76 | 57 | .71 | 3.0 | | 0.1 | |
| 25.0 | 13.8 | 5.7 | 12.3 | 0.1 | 0.5 | 32.4 | 80 | 62 | .68 | 2.4 | | 0.2 | |
| 25.8 | 15.0 | 6.6 | 11.1 | 0.1 | 0.6 | 33.4 | 86 | 67 | .68 | 2.3 | | 0.3 | |
| 28.0 | 16.6 | 8.7 | 8.6 | 0.1 | 0.6 | 34.6 | 93 | 75 | .72 | 1.9 | | 0.3 | |
| 27.4 | 16.8 | 8.7 | 7.7 | 0.2 | 0.6 | 34.0 | 96 | 77 | .75 | 1.9 | | 0.1 | |
| 26.1 | 16.0 | 8.4 | 6.5 | 0.2 | 0.6 | 31.7 | 96 | 79 | .77 | 1.9 | | 0.1 | |
| 24.4 | 15.6 | 8.2 | 4.8 | 0.2 | 0.6 | 29.4 | 101 | 84 | .75 | 1.9 | | Tr. | |
| 24.0 | 15.4 | 8.2 | 5.0 | 0.2 | 0.5 | 29.3 | 101 | 83 | .73 | 1.9 | | | |
| 21.5 | 14.7 | 7.8 | 2.8 | 0.2 | 0.5 | 26.0 | 108 | 89 | .77 | 1.9 | | | |
| 20.5 | 14.1 | 7.6 | 2.6 | 0.2 | 0.5 | 25.0 | 109 | 90 | .78 | 1.8 | | | |
| 20.0 | 12.9 | 7.2 | 2.0 | 0.2 | 0.4 | 22.7 | 104 | 91 | .80 | 1.8 | | | |
| 18.6 | | | 1.4 | 0.1 | 0.4 | | | | .73 | | | | |

a. No carbonate clay.

Soil type: Mahaska silty clay loam

Soil No.: S61Iowa-92-2

Location: 445 feet north and 68 feet west of SE corner of SW1/4 SW1/4 Sec. 22, T76N, R6W, Washington County, Iowa.

Vegetation: Clover and timothy field.

Parent material: Wisconsin loess.

Physiographic position: Upland ridge on top of an interfluvium with slope slightly convex toward the northeast.

Slope: About 2 percent.

Drainage: Imperfectly drained.

Permeability: Moderately slow.

Ground water: Water table at 73 inches.

Moisture: Slightly moist.

Described by: D. F. Slusher, October 5, 1961.

Horizon and

Lincoln Lab. No.

- Alp 0 to 8 inches. Black (10YR 2/1)¹ light silty clay loam, dark gray (10YR 4/1) when dry; weak medium subangular blocky breaking to weak very fine granular structure; friable to firm²; kneaded color black (10YR 2/1) to very dark brown (10YR 2/2); a few worm casts; clear smooth boundary.
- Al2 8 to 13 inches. Black (10YR 2/1) light silty clay loam, dark gray (10YR 4/1) when dry; weak fine subangular blocky breaking to moderate fine, very fine granular structure; friable; kneaded color black (10YR 2/1); few fine impeded tubular pores; very few fine hard concretions of an oxide; few worm casts; gradual smooth boundary.
- A3 13 to 17 inches. Very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) light silty clay loam, gray (10YR 5/1) when dry; moderate very fine subangular blocky and moderate fine granular structure; friable; ped interiors 10YR 3/2; ped exteriors 10YR 3/1; kneaded color very dark grayish brown (10YR 3/2); very few fine impeded tubular pores; very few fine hard concretions of an oxide; gradual smooth boundary.
- B1 17 to 23 inches. Very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), and dark grayish brown (10YR 4/2) medium silty clay loam, grayish brown (10YR 5/2) when dry; moderate very fine subangular blocky breaking to moderate fine granular structure; majority ped exteriors very dark gray (10YR 3A) with some very dark grayish brown (10YR 3/2) in places; ped interiors dark grayish brown (10YR 4/2) to (2.5Y 4/2); kneaded color very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) with hue grading to 2.5Y; few fine impeded tubular pores; few fine hard concretions of an oxide; many worm casts, both lighter and darker than matrix colors; gradual smooth boundary.
- B21 23 to 30 inches. Dark grayish brown (2.5Y 4/2) and light olive brown to grayish brown (2.5Y 5/3) heavy silty clay loam; moderate fine subangular blocky breaking to moderate very fine subangular blocky structure; ped exteriors dark grayish brown (2.5Y 4/2); ped interiors light olive brown to grayish brown (2.5Y 5/3); few distinct very dark gray (10YR 3/1) stain streaks on ped exteriors; few fine faint light olive brown (2.5Y 5/6) mottles inside; kneaded color dark grayish brown (2.5Y 4/2); common fine impeded tubular pores; few distinct thin discontinuous clay films on peds; common fine hard concretions of an oxide; gradual smooth boundary.
- B22 30 to 35 inches. Olive gray (5Y 5/2), light olive gray (5Y 6/2) medium silty clay loam; weak fine prismatic breaking to moderate fine subangular blocky structure; firm; ped exteriors olive gray (5Y 5/2); interiors light olive gray (5Y 6/2); mottling variable in degree, consists mainly of common fine distinct strong brown (7.5YR 5/8) segregations, common fine distinct yellowish brown (10YR 5/6), and few fine distinct dark brown to brown (7.5YR 4/4) mottles; common very fine impeded tubular pores; few distinct thin discontinuous dark gray (10YR 4/1) clay films on peds; few fine hard concretions of an oxide; gradual smooth boundary.
- B31 35 to 42 inches. Olive gray (5Y 5/2) and light olive gray (5Y 6/2) medium silty clay loam; moderate medium prismatic breaking to moderate medium subangular blocky structure; firm; ped exteriors olive gray (5Y 5/2); interiors light olive gray (5Y 6/2); common fine faint light olive brown (2.5Y 5/4) mottles; few distinct segregations of strong brown (7.5YR 5/6); common very fine impeded tubular pores; few dark gray (10YR 4/1) clay flows in vertical pores or channels and few thin clay films on prism faces in places; common fine hard concretions of an oxide in association with strong brown colors; gradual smooth boundary.
- B32 42 to 51 inches. Gray (5Y 5/1) and light olive gray (5Y 6/2) light to medium silty clay loam; moderate coarse and medium prismatic structure; firm; ped exteriors gray (5Y 5/1); interiors light olive gray (5Y 6/2); common fine distinct yellowish brown (10YR 5/4) mottles; few distinct segregations of strong brown (7.5YR 5/6) and vertical streaks about 1-inch thick occurring in places; many very fine impeded tubular pores; few distinct thin very dark gray (10YR 3/1) clay films in vertical streaks, some clay flows in pores; frequent spherical clay accumulations; abrupt smooth spherical clay accumulations; abrupt smooth boundary.
- G1 51 to 55 inches. Strong brown (7.5YR 5/6) and gray (5Y 5/1) light silty clay loam; moderate coarse prismatic structure; firm; many very fine impeded tubular pores; common fine very dark gray (10YR 3/1) clay films as streaks in places and in some fine pores; few fine soft concretions of an oxide; strong brown (7.5YR 5/6) occurs as a prominent horizontal band; gradual wavy boundary.
- G2 55 to 62 inches. Gray (5Y 5/1) light silty clay loam; massive with vertical cleavage; firm; many fine prominent yellowish brown (10YR 5/4) mottles; distinct strong brown (7.5YR 5/6) occurring as vertical streaks from above horizon; many very fine impeded tubular pores; common fine thread-like very dark gray (10YR 3/1) clay accumulations in fine pores; few fine hard concretions of an oxide; gradual wavy boundary.
- G3 62 to 67 inches. Gray to light gray (5Y 6/1) silt loam; massive with vertical cleavage; firm; many fine prominent yellowish brown (10YR 5/4) mottles; many fine impeded tubular pores; many fine thread-like clay accumulations in fine pores; diffuse smooth boundary.
- G4 67 to 75 inches. Same as above.
- G5 75 to 82 inches. Strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) silt loam; massive; firm; common fine distinct gray to light gray (5Y 6/1) mottles; strong brown (7.5YR 5/6) occurs as horizontal band; many fine impeded tubular pores; few to common distinct fine clay accumulations in fine pores and vertical channels; clear wavy boundary.
- G6 82 to 86 inches. Gray to olive gray (5Y 6/1) silt loam with light olive brown (2.5Y 5/4) to yellowish brown (10YR 5/4) mottles.

Notes: Roots abundant from 0 to 8 inches, common from 8 to 13, few from 13 to 35, and very few below 35 inches. Clay spherical accumulations about 1/2 inch in diameter with saucer-shaped tops and spherical-shaped bottoms frequent from 42 to 55 inches; connected above and below to vertical streaks of black clay fills. Krotovinas coated with 1/4- to 1/16-inch thick clay films and 1-2 inches wide occur from 48 to 70 inches; interiors partly filled with material similar in color to B horizon. Oxides are spherical in shape, dark brown to black in color and predominantly composed of iron-manganese. Strong brown (7.5YR 5/6 to 5/8) which occurs as segregations, horizontal bands, and vertical streaks, is considered to be higher in iron oxide than the associated matrix.

¹ Munsell color for moist soil. ² Consistence at moist field conditions.

SOIL TYPE Marcus LOCATION Clay County, Iowa
silty clay loam

SOIL NOS. S59Iowa-21-3-(1-8) LAB. NOS. 11135-11142

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|---|---------------------------------|--|------------------|-------------|-----------|--|--------------------------|--------------------|-----------|---------------|----------|--------------------------------|--------------------------|
| | | 1B1a | 3A1 | | | | | 2A2 | | | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | | > 2 (19mm) | |
| | | 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | | |
| 0-7 | A1p | 0.1a | 0.4b | 0.4b | 0.8c | 1.1c | 56.6 | 40.6 | 30.0 | 28.2 | Tr. | sic | |
| 7-12 | A12 | <0.1 | 0.3b | 0.4b | 0.8c | 1.3c | 56.3 | 40.9 | 29.7 | 28.3 | Tr. | sic | |
| 12-17 | A3 | 0.1a | 0.3b | 0.4b | 0.7c | 1.4c | 55.8 | 41.3 | 28.4 | 29.2 | Tr. | sic | |
| 17-24 | B21 | 0.1a | 0.4b | 0.4b | 0.8c | 1.5c | 56.5 | 40.3 | 27.6 | 30.8 | Tr. | sic/sicl | |
| 24-30 | B22 | 0.2d | 0.6d | 0.5e | 1.0e | 1.8e | 59.0 | 36.9 | 29.5 | 31.8 | Tr. | sicl | |
| 30-35 | B31 | 0.2e | 0.4e | 0.4e | 0.9e | 3.1e | 65.2 | 29.8 | 36.5 | 32.3 | Tr. | sicl | |
| 35-41 | B32 | 1.0e | 1.6e | 1.9e | 3.8e | 5.8e | 56.9 | 29.0 | 36.7 | 28.0 | Tr. | sicl | |
| 41-55+ | IIC | 0.8e | 2.6e | 3.4e | 5.7e | 3.1e | 49.6 | 34.8 | 24.4 | 31.0 | Tr. | sicl | |
| pH | | ORGANIC MATTER | | | | 6C1a | Bulk Density | | | Water Content | | | |
| 8C1a | | 6A1a | 6B1a | | | Free Iron Fe ₂ O ₃ % | 4A1a | 4A1c | 4A1h | 4B4 | 4B3 | 4B2 | |
| 1:1 | 1:5 | 1:10 | ORGANIC CARBON % | NITRO-GEN % | C/N | | Field-Moist g/cc | 30-Cm. g/cc | O.D. g/cc | Field-Moist % | 30-Cm. % | 15-Bar % | |
| 7.2 | | | 4.23 | 0.321 | 13.2 | 0.6 | | | | | | 23.2 | |
| 7.0 | | | 2.56 | 0.234 | 10.9 | 0.6 | 1.29 | 1.27 | 1.50 | 27 | 30 | 22.1 | |
| 7.0 | | | 1.29 | 0.130 | 9.9 | 0.8 | | | | | | 17.3 | |
| 7.6 | | | 0.87 | 0.086 | 10 | 1.2 | 1.38 | 1.35 | 1.56 | 23 | 27 | 16.7 | |
| 7.8 | | | 0.61 | | | 1.0 | | | | | | 15.2 | |
| 8.0 | | | 0.42 | | | 0.6 | 1.44 | 1.42 | 1.55 | 20 | 23 | 11.7 | |
| 8.0 | | | 0.28 | | | 1.0 | | | | | | 12.2 | |
| 8.0 | | | 0.18 | | | 1.8 | 1.63 | 1.60 | 1.76 | 17 | 18 | 13.8 | |
| 5A1a | EXTRACTABLE CATIONS | | | | | 5B1a | BASE SAT. % | 5C3 | 5B1a | 5A3a | 6D3 | 6E1a | |
| CATION EXCHANGE CAPACITY NH ₄ Ac | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | | NH ₄ Ac EXCH. | Base Sat. % on Sum | Sum Ext. | Sum Ext. | Ca/Mg | CaCO ₃ equivalent % | MOISTURE AT SATURATION % |
| | Ca | Mg | H | No | K | | | | | | | | |
| | milliequivalents per 100g. soil | | | | | 5C1 | | Cations | Bases | Cations | | | |
| 35.9 | 37.8 | 10.8 | 3.8 | 0.1 | 0.6 | 137 | 93 | 49.3 | 53.1 | 3.5 | | | |
| 32.6 | 32.7 | 9.8 | 4.3 | 0.1 | 0.4 | 132 | 91 | 43.0 | 47.3 | 3.3 | | | |
| 31.5 | 28.9 | 9.3 | 3.8 | 0.1 | 0.4 | 123 | 91 | 38.7 | 42.5 | 3.1 | | | |
| 29.9 | 28.0 | 8.5 | 2.3 | 0.1 | 0.4 | 124 | 94 | 37.0 | 39.3 | 3.3 | | | |
| 23.5 | | | | 0.1 | 0.4 | | | | | | | | 3 |
| 19.0 | | | | 0.1 | 0.3 | | | | | | | | 14 |
| 17.5 | | | | 0.1 | 0.3 | | | | | | | | 15 |
| 17.0 | | | | 0.1 | 0.3 | | | | | | | | 17 |
| a. Many (Fe-Mn?) concr. b. Common (Fe-Mn?) concr. c. Few (Fe-Mn?) concr. d. Common (Fe-Mn?) concr. Few carbonate concr. (CaCO ₃ ?) e. Few (Fe-Mn?) concr. Few carbonate concr. (CaCO ₃ ?) | | | | | | | | | | | | | |

Soil type: Marcus silty clay loam
 Soil No.: S59Iowa-21-3-(1-8)
 Location: 260 feet north of the northwest corner of the SW1/4 of SW1/4 of Sec. 12, T95N, R38W, and 380 feet east of road center, Clay County, Iowa.
 Vegetation and use: Soybeans; cropland.
 Slope and land form: Broad level portion of loess-mantled Tazewell till plain. Slope gradient, less than 1 percent.
 Drainage: Poorly drained.
 Parent material: About 41 inches of very silty, nearly sand-free, material thought to be loess overlying light clay loam, pebbly Tazewell drift.
 Collected by: R. E. Jordan and R. L. Juve.
 Described by: F. J. Carlisle and R. I. Turner, June 9, 1959.

Horizon and

Lincoln

Lab. Number

| | |
|--------------|---|
| Alp 11135 | 0 to 7 inches. Black (10YR 2/0.5, 3/1 dry) medium to heavy silty clay loam; weak very fine subangular blocky and fine granular; friable under weak pressure, firm and plastic under strong pressure; indistinct boundary. |
| A12 11136 | 7 to 12 inches. Black (10YR 2/0.5, 3/1 dry) medium to heavy silty clay loam; moderate very fine subangular blocky; consistence as above; few to common fine tubular pores; few dark spherical oxide concretions about 2 mm. in diameter; gradual boundary. |
| A3 11137 | 12 to 17 inches. Black (10YR 2.5/1, 3.5/1 dry) medium to heavy silty clay loam; structure, consistence, and pore space as in horizon above; a few more dark spherical oxide concretions than above; peds have distinctly shiny surfaces; gradual boundary. |
| B21 11138 | 17 to 24 inches. Very dark gray (10YR 3/1, 4/1 dry) medium to heavy silty clay loam; moderate very fine subangular blocky; slightly firmer than horizon above but still quite friable under weak pressure and firm and plastic under strong pressure; oxide concretions and pore space as in horizon above; distinct shiny surfaces on peds; a few hard light gray irregularly shaped carbonate concretions about 1/2 by 1 cm. across are arranged in approximately vertical rows; the soil matrix is noncalcareous; clear wavy boundary. |
| B22 11139 | 24 to 30 inches. Very dark grayish brown (2.5Y 3/2) in upper part grading to dark grayish brown (2.5Y 4/2) in lower part, medium silty clay loam; moderate fine and very fine blocky; consistence as in horizon above; fine faint very dark gray and very fine browner mottles; crushed color is 2.5Y 4/2; distinct shiny faces on peds; matrix is predominantly noncalcareous; contains some soft and some firm carbonate segregations as above and some spots 3 to 4 inches in diameter with calcareous matrix; common fine tubular pores; distinct clay films line a few tubular pores 1 to 2 mm. in diameter; gradual boundary. |
| B31 11140 | 30 to 35 inches. Grayish brown (2.5Y 4.5/2) medium silty clay loam; moderate fine blocky arranged in weak prisms; slightly firm; contains some dark gray worm casts and a few fine faint 2.5Y 5/4 mottles; calcareous matrix; common carbonate and fine dark oxide concretions; gradual boundary. |
| B32 11141 | 35 to 41 inches. Grayish brown (2.5Y 4.5/2) light to medium silty clay loam; weak medium blocky arranged in moderate medium and coarse prisms; slightly firm; prism faces quite uniformly 2.5Y 4.5/2 and ped interiors distinctly and finely mottled with light olive brown to olive yellow; matrix calcareous; abundant light gray (white, dry) carbonate concretions 1 to 2 cm. across with hard centers; clear boundary. |
| IIC 11142 | 41 to 55 inches plus. Mottled olive gray (5Y 5.5/2) and dark yellowish brown (10YR 4/4-5/6) light to medium clay loam (approaching gritty silty clay loam); weak medium and coarse prismatic with nearly uniform olive gray prism faces and mottled prism interiors; firm; calcareous; carbonate concretions less abundant than in horizon above; contains some pebbles and coarse sand grains; tubular pores are somewhat larger and more abundant than in horizons B21 and B22. |

Notes: Colors are of fully moist soil unless indicated otherwise. Only a few roots in this profile. They diminish in numbers gradually from the surface to about 3 feet and are rare below 3 feet. Horizon B21 is probably the layer of maximum clay content but there was uncertainty as to which of the uppermost 4 horizons contains the most clay. Shiny ped faces described in the A3 and B horizons might be very thin patchy clay films but they could not be identified as such with any confidence. Boring showed gritty light silty clay loam from 60 to 90 inches. At 90 inches the material grades to loam high in fine sand with some gravel. At 95 inches firm pebbly light clay loam, thought to be till, was encountered. The material from 41 to 90 inches is thought to be local wash (or alluvium) deposited on the till.

SOIL TYPE Marcus LOCATION O'Brien County, Iowa
 silty clay loam

SOIL NOS. S59Iowa-71-1-(1-8) LAB. NOS. 11153-11160

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------|---------|--|----------------------|-------------------------|------------------------|-----------------------------|--------------------|-----------------|------|------|-----|----------------|----------------------|
| | | 1B1a | | | | | | | | | | | 2A2 > 2 (19mm) |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 3A1 | | 3A1 | | |
| 0-7 | A1p | <0.1 | 0.2a | 0.2a | 0.2b | 1.0b | 58.1 | 40.3 | 29.3 | 29.9 | - | sic/sic | |
| 7-14 | A12 | <0.1 | 0.1c | 0.2a | 0.2a | 1.0b | 58.7 | 39.8 | 29.1 | 30.7 | - | sic/sic | |
| 14-23 | A3 | 0.1c | 0.1c | 0.2a | 0.2a | 0.9b | 58.4 | 40.1 | 28.3 | 31.1 | Tr. | sic/sic | |
| 23-29 | B21 | <0.1 | 0.1c | 0.1a | 0.2a | 0.8b | 58.9 | 39.9 | 26.5 | 33.3 | - | sic/sic | |
| 29-37 | B22 | <0.1 | 0.2c | 0.1a | 0.2a | 1.4b | 64.2 | 33.9 | 33.6 | 32.1 | - | sic | |
| 37-43 | B31 | <0.1 | 0.1c | 0.1a | 0.4a | 1.8b | 67.5 | 30.1 | 39.3 | 30.3 | - | sic | |
| 43-53 | B32 | 0.1d | 0.2d | 0.2e | 0.6e | 3.0d | 68.5 | 27.4 | 43.5 | 28.4 | Tr. | sic/sil | |
| 53-62 | C1 | 1.7d | 3.3d | 4.0d | 6.3d | 4.1d | 57.9 | 22.7 | 41.5 | 23.5 | Tr. | sil | |

| 8C1a | pH | ORGANIC MATTER | | | 6C1a Free Iron Fe ₂ O ₃ % | Bulk Density | | | Water Content | | | |
|------|-----|---------------------|----------------|-------|--|---------------------|----------------|--------------|------------------|-------------|-------------|------|
| | | 6A1a | 6B1a | | | 4A1a | 4A1c | 4A1e | 4B1a | 4B1c | 4B1e | |
| | | ORGANIC CARBON % | NITRO-GEN % | C/N | | Field-Moist g/cc | 30-Cm. g/cc | O.D. g/cc | Field-Moist % | 30-Cm. % | 15-Bar % | |
| 1:1 | 1:5 | 1:10 | | | | | | | | | | |
| 6.4 | | | 4.57 | 0.370 | 12.4 | 0.6 | | | | | 20.8 | |
| 6.7 | | | 2.15 | 0.221 | 9.7 | 0.6 | 1.24 | 1.21 | 1.48 | 27 | 33 | 19.7 |
| 7.4 | | | 1.36 | 0.150 | 9.1 | 0.6 | | | | | | 19.2 |
| 7.6 | | | 0.77 | 0.083 | 9 | 0.8 | 1.37 | 1.34 | 1.53 | 22 | 26 | 18.4 |
| 7.7 | | | 0.37 | | | 0.8 | | | | | | 14.4 |
| 7.8 | | | 0.27 | | | 0.7 | 1.39 | 1.37 | 1.51 | 21 | 25 | 13.3 |
| 8.0 | | | 0.19 | | | 0.6 | | | | | | 12.1 |
| 8.0 | | | 0.14 | | | 1.1 | 1.53 | 1.51 | 1.59 | 17 | 23 | 10.1 |

| 5A1a CATION EXCHANGE CAPACITY NH ₄ Ac | EXTRACTABLE CATIONS | | | | | 5B1a BASE SAT. % NH ₄ Ac EXCH. | 5C3 Base Sat. % on Sum | 5B1a Sum Ext. | 5A3a Sum Ext. | 8D3 Ca/Mg | 6E1a CaCO ₃ equivalent % | MOISTURE AT SATURATION % |
|--|---------------------------------|------------|-----------|------------|-----------|---|------------------------------|------------------|------------------|--------------|--|--------------------------|
| | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | | | | | | | |
| | milliequivalents per 100g. soil | | | | | | | | | | | |
| 43.9 | 37.5 | 11.9 | 7.1 | 0.2 | 0.5 | 114 | 88 | 50.1 | 57.2 | 3.2 | | |
| 40.6 | 33.7 | 10.6 | 4.8 | 0.1 | 0.4 | 110 | 90 | 44.8 | 49.6 | 3.2 | Δ | |
| 38.7 | 31.9 | 10.7 | 2.8 | 0.1 | 0.4 | 111 | 94 | 43.1 | 45.9 | 3.0 | Δ | |
| 32.1 | 26.2 | 10.2 | 2.0 | 0.1 | 0.4 | 115 | 95 | 36.9 | 38.9 | 2.6 | Δ | |
| 26.8 | 22.5 | 8.7 | 2.5 | 0.1 | 0.3 | 118 | 93 | 31.6 | 34.1 | 2.6 | Δ | |
| 24.0 | 21.1 | 9.5 | 1.0 | 0.1 | 0.3 | 129 | 97 | 31.0 | 32.0 | 2.2 | Δ | |
| 21.4 | | | | 0.2 | 0.3 | | | | | | 7 | |
| 17.0 | | | | 0.2 | 0.3 | | | | | | 10 | |

a. Common (Fe-Mn?) concr.
 b. Few (Fe-Mn?) concr.
 c. Many (Fe-Mn?) concr.
 d. Few (Fe-Mn?) concr. Few carbonate concr. (CaCO₃?).
 e. Common (Fe-Mn?) concr. Few carbonate concr. (CaCO₃?).

Soil type: Marcus silty clay loam
 Soil No.: 859Iowa-71-1-(1-8)
 Location: 430 feet north of road center and 355 feet west of the southeast corner of the SW1/4 of Sec. 15, T96N, R39W, O'Brien County, Iowa.
 Vegetation and use: Corn; cropland.
 Slope and land form: Level portion of the loess-mantled Tazewell till plain. Slope gradient less than 1 percent.
 Drainage: Poorly drained.
 Parent material: About 5 feet of loess overlying Tazewell drift.
 Collected by: R. H. Jordan and R. L. Juve.
 Described by: F. J. Carlisle and R. I. Turner, June 10, 1959.

Horizon and
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- Alp
 11153 0 to 7 inches. Black (10YR 2/0.5) medium silty clay loam, estimated 33 percent clay; massive in place, crushing to weak fine granular; friable under weak pressure, slightly firm and plastic under strong pressure; crushed color 10YR 2/1; clear boundary.
- A12
 11154 7 to 14 inches. Color and texture as above; moderate fine granular; friable under weak pressure, firm and plastic under strong pressure; some fine hard dark spherical oxide concretions; gradual boundary.
- A3
 11155 14 to 23 inches. Black (10YR 2/1) medium silty clay loam, estimated 36 percent clay; moderate fine and very fine subangular blocky; friable under gentle pressure, firm and plastic under strong pressure; some fine hard dark spherical oxide concretions; some smooth shiny patches on ped faces; rubbed color 10YR 2.4/1; very few visible tubular pores; clear wavy boundary.
- B21
 11156 23 to 29 inches. Very dark grayish brown (2.5Y 3.4/2) with narrow vertical tongues of very dark gray (10YR 3/1) making up about one-half of the upper part and about one-fourth of the lower part of the horizon, medium silty clay loam, estimated 36 percent clay; moderate fine and very fine subangular blocky; consistence as above; many hard dark spherical oxide concretions; distinct shiny patches on ped faces; common fine and very fine tubular pores; gradual wavy boundary.
- B22
 11157 29 to 37 inches. Olive gray (5Y 5/2) medium silty clay loam, estimated 34 percent clay; weak fine subangular blocky; friable under gentle pressure, slightly firm and plastic under strong pressure; few fine distinct light olive brown (2.5Y 5/4) mottles and a few narrow vertical tongues of very dark gray that appear to be old worm or root holes; several krotovinas 3 by 3 inches and 4 by 10 inches in outline; a few medium and common fine tubular pores; many dark oxide concretions; gradual boundary.
- B31
 11158 37 to 43 inches. Olive gray (5Y 5/2) light silty clay loam, estimated 29 percent clay; weak fine subangular blocky; shows horizontal and vertical parting but not prismatic structure; friable; less distinctly mottled than horizon above; many dark oxide concretions; noncalcareous matrix but contains a few white carbonate concretions less than 1 cm. across in the lower part; common medium and fine tubular pores mostly vertical; gradual boundary.
- B32
 11159 43 to 53 inches. Olive gray (5Y 5/2) heavy silt loam, estimated 27 percent clay, with common conspicuous white carbonate concretions ranging up to 1-1/2 cm. across; massive breaking to medium subangular blocky fragments; friable; common light olive brown (2.5Y 5/4) mottles and many fine dark oxide concretions; calcareous matrix; few coarse and common medium and fine tubular pores, mostly vertical; gradual boundary.
- C1
 11160 53 to 66 inches (sampled 53 to 62 inches). Olive gray (5Y 5/1.5) with many coarse distinct yellowish brown (10YR 5/6) mottles and many hard carbonate concretions up to 2 cm. across, silt loam; massive friable; calcareous matrix; this horizon is very silty and appears to have been derived primarily from loess; it contains a number of pebbles and a few strong brown tongues of loam texture extend upward from sandy layer below.
- IIC2 66 to 84 inches. Light olive brown (2.5Y 5/4) in upper part grading to pale brown (10YR 6/3) below; calcareous medium and fine sand; slightly coherent; soft.
- IIC3 84 to 90 inches plus. Yellowish brown (10YR 5/4 to 5/6) slightly pebbly light to medium clay loam; fine faint mottles of grayer and browner colors; calcareous; presumed to be glacial till.

Notes: Colors are of fully moist soil unless indicated otherwise. Only a few roots in this profile; they diminish in numbers gradually with depth. Shiny ped faces in the A3 and B horizons might be very thin patchy clay films, but they could not be identified as such with any confidence. Material below about 64 inches was examined with a bucket auger but not sampled.

SOIL SURVEY LABORATORY Lincoln, Nebr. October 1959

SOIL TYPE Monona LOCATION Harrison County, Iowa
silt loam, acid variant

SOIL NOS. S58Iowa-43-1 LAB. NOS. 9566-9572

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | 2A2 > 2 | TEXTURAL CLASS |
|--------------|---------------------------------|--|-----------------------------|-------------------------|---|--|---|-------------------|---------------------|---------------|--------------------------|------------|----------------|
| | | 1B1a | | 3A1 | | | | | 3A2 | | | | |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | | | |
| 0-7 | A11 | 0.1 | 0.1 | <0.1 | 0.2a | 2.6a | 73.1 | 23.9 | 49.5 | 26.3 | - | sil | |
| 7-10 | A12 | <0.1 | <0.1 | <0.1 | <0.1 | 2.6a | 73.9 | 23.5 | 49.9 | 26.6 | - | sil | |
| 10-16 | B21 | <0.1 | <0.1 | <0.1 | <0.1 | 2.2a | 73.3 | 24.5 | 48.1 | 27.4 | - | sil | |
| 16-24 | B22 | <0.1 | <0.1 | <0.1 | <0.1 | 2.3a | 73.8 | 23.9 | 47.6 | 28.5 | - | sil | |
| 24-42 | B3 | <0.1 | <0.1 | <0.1 | <0.1 | 2.4a | 73.4 | 24.2 | 45.8 | 30.0 | - | sil | |
| 54-70 | C1 | <0.1 | <0.1 | <0.1 | 0.1a | 3.1a | 76.2 | 20.6 | 51.2 | 28.2 | - | sil | |
| 92-105 | C2 | <0.1 | <0.1 | <0.1 | 0.3b | 4.2b | 80.0 | 15.5 | 55.1 | 29.3 | - | sil | |
| pH | | ORGANIC MATTER | | | Free Iron Fe ₂ O ₃ | ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM @ 25°C | 6E1a CaCO ₃ equiv- alent | MOISTURE TENSIONS | | | 4B2 15 ATMOS. | | |
| 8C1a | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITRO-GEN % | C/N | 6C1a | | | 1/10 ATMOS. | 1/3 ATMOS. | | | |
| 6.0 | | | 2.55 | 0.211 | 12.1 | 1.4 | | | | | 11.5 | | |
| 6.1 | | | 1.62 | 0.144 | 11.2 | 1.4 | | | | | 10.5 | | |
| 6.2 | | | 0.90 | 0.096 | 9 | 1.5 | | | | | 10.5 | | |
| 5.1 | | | 0.69 | 0.074 | 9 | 1.6 | | | | | 9.8 | | |
| 5.3 | | | 0.42 | | | 1.8 | | | | | 10.4 | | |
| 6.2 | | | 0.19 | | | 1.8 | | | | | 9.8 | | |
| 8.0 | | | 0.12 | | | 1.4 | | 6 | | | 8.6 | | |
| 5A1a | EXTRACTABLE CATIONS | | | | | 5B1a | 5C3 Base Sat. % on Sum Cations | 5B1a Sum Bases | 5A3a Sum Cations | 8D3 Ca/Mg | MOISTURE AT SATURATION % | | |
| | 6M2b Ca | 6O2b Mg | 6H1a H | 6P2a No | 6Q2a K | 5C1 NH ₄ Ac EXCH. | | | | | | | |
| | milliequivalents per 100g. soil | | | | | | | | | | | | |
| 22.9 | 16.6 | 4.0 | 7.4 | <0.1 | 0.5 | 92 | 74 | 21.1 | 28.5 | 4.2 | | | |
| 19.1 | 12.8 | 3.9 | 6.6 | <0.1 | 0.4 | 90 | 72 | 17.1 | 23.7 | 3.3 | | | |
| 17.8 | 11.3 | 4.7 | 5.7 | <0.1 | 0.4 | 92 | 74 | 16.4 | 22.1 | 2.4 | | | |
| 17.1 | 8.4 | 4.3 | 9.0 | 0.1 | 0.3 | 77 | 59 | 13.1 | 22.1 | 2.0 | | | |
| 17.8 | 10.7 | 4.9 | 7.0 | 0.1 | 0.3 | 90 | 70 | 16.0 | 23.0 | 2.2 | | | |
| 17.3 | 11.8 | 5.0 | 4.1 | 0.2 | 0.4 | | 81 | 17.4 | 21.5 | 2.4 | | | |
| 15.4 | | 5.8 | <0.1 | 0.1 | 0.4 | | | | | | | | |

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

Soil type: Monona silt loam, acid variant

Soil No.: S58Iowa-43-1

Location: 370 feet north and 555 feet east of the south center of Sec. 18, T80N, R42W, Harrison County, Iowa.

Slope: 1 percent.

Vegetation: Oak, walnut, with understory of sparse grass, gooseberry bushes, weeds, and vines. Timber stand has sparse small openings with bluegrass vegetation.

Geomorphic surface: Hatcher.

Collected by and date: G. H. Simonsen and R. B. Daniels, July 28, 1958.

Horizon and
Lincoln

Lab. Number

- O2 1 to 0 inch. Very dark gray (10YR 3/1) and dark brown (7.5YR 3/2) decomposed and decomposing leaves and twigs; abrupt to the A1.
- A11 0 to 7 inches. Very dark gray to black (10YR 2.5/1) silt loam; dark gray (10YR 4/1) dry; weak to moderate fine granular; abundant roots; many bleached silt grains apparent when moderately moist to dry; friable; leached post-Farmdale loess; clear to the A12.
- A12 7 to 10 inches. Very dark brown to very dark grayish brown (10YR 2.5/2) silt loam; sparse mixing of very dark gray (10YR 3/1) and brown to dark brown (10YR 4/3); very dark grayish brown (10YR 3/2) crushed; grayish brown (10YR 5/2) dry; weak fine granular; friable; abundant roots; gradual to the B21.
- B21 10 to 16 inches. Dark brown (10YR 3/3) silt loam; brown (10YR 5/3) dry; sparse mixing of very dark grayish brown (10YR 3/2); very dark grayish brown to dark brown (10YR 3/2.5) crushed; abundant light gray (10YR 6/1) patches of bleached silt grains on peds apparent when dry; moderate fine to medium subangular blocky; sparse very dark gray (10YR 3/1) coatings on exteriors of peds; friable; gradual to the B22.
- B22 16 to 24 inches. Brown to dark brown (10YR 4/3) silt loam; dark brown (10YR 3/3) ped coatings; dark yellowish brown (10YR 3/4) crushed; bleached silt grains on peds less prominent than in B21; weak fine and medium subangular blocky; friable; gradual to the B3.
- B3 24 to 42 inches. Dark yellowish brown (10YR 3/4) silt loam; dark yellowish brown (10YR 3/4) crushed; sparse dark brown (10YR 3.5/3) coating on exteriors of prisms; weak medium and coarse prisms breaking to very weak medium blocky; friable; gradual to the C1.
- C1 42 to 90 inches. Brown (10YR 4/3 to 5/3) silt loam; sparse fine indistinct gray and browner mottles; massive; friable; abrupt to the C2. (Sampled 54 to 70 inches.)
- C2 92 to 105 inches. Brown (10YR 5/3) silt loam; sparse fine indistinct gray and browner mottles; sparse white carbonate concretions; friable; massive; calcareous post-Farmdale loess.

SOIL SURVEY LABORATORY Lincoln, Nebr. October 1959

SOIL TYPE Monona LOCATION Harrison County, Iowa
silt loam, shallow carbonate variant

SOIL NOS. S58Iowa-43-2 LAB. NOS. 9573-9577

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1 | | | | | | | | | | TEXTURAL CLASS | |
|--------------------------|---------------------------------|--|-------------|-------------|------------|--------------------------------|--|-------------------------------|-----------------------|-------------------|------------------------|----------------|-------------|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | | | > 2 (< 9mm) |
| 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | | | | |
| 0-5 | A11 | 0.1 | 0.1 | <0.1 | 0.2a | 3.4a | 73.1 | 23.1 | 52.0 | 24.6 | - | sil | |
| 5-10 | A12 | <0.1 | <0.1 | <0.1 | 0.2a | 3.3a | 72.2 | 24.3 | 52.1 | 23.5 | - | sil | |
| 10-16 | B2 | <0.1 | 0.1 | <0.1 | 0.1a | 3.3a | 71.7 | 24.8 | 50.6 | 24.5 | Tr. | sil | |
| 16-21 | B3 | <0.1 | 0.1 | <0.1 | 0.2a | 3.5a | 72.0 | 24.2 | 52.4 | 23.2 | - | sil | |
| 21-33 | C1 | <0.1 | 0.1b | 0.1b | 0.2b | 4.5b | 75.3 | 19.8 | 55.6 | 24.3 | Tr. | sil | |
| pH | | ORGANIC MATTER | | | | | Free Iron | ELECTRICAL CONDUCTIVITY | 6E1a | MOISTURE TENSIONS | | | |
| 8C1a | 1:5 | 6A1a | 6B1a | | | Fe ₂ O ₃ | EC · 10 ³ MILLIMHOS PER CM @ 25°C | CaCO ₃ equiv. cent | GYPSUM mg./100g. SOIL | 1/10 ATMOS. | 1/3 ATMOS. | 15 ATMOS. | |
| 1:1 | 1:10 | % | % | C/N | | 6C1a | | % | | % | % | % | |
| 7.3 | | 3.09 | 0.247 | 12.5 | | 0.8 | | Δ | | | | 13.3 | |
| 7.4 | | 1.30 | 0.112 | 11.6 | | 0.8 | | Δ | | | | 11.2 | |
| 7.4 | | 0.68 | 0.068 | 10 | | 0.8 | | Δ | | | | 11.3 | |
| 7.5 | | 0.43 | 0.049 | 9 | | 0.9 | | Δ | | | | 11.4 | |
| 7.9 | | 0.38 | 0.043 | 9 | | 0.6 | | 7 | | | | 8.8 | |
| 5A1a | EXTRACTABLE CATIONS | | | | | BASE SAT. % | 5C3 | 5B1a | 5A3a | 8D3 | MOISTURE AT SATURATION | | |
| CATION EXCHANGE CAPACITY | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | NH ₄ Ac EXCH. | Base Sat. % on Sum Bases | Sum | Sum | Ca/Mg | % | | |
| NH ₄ Ac | Ca | Mg | H | Na | K | | Cations | me/100g | Cations | | | | |
| | milliequivalents per 100g. soil | | | | | 5C1 | | | | | | | |
| 27.6 | 24.9 | 6.0 | 2.5 | <0.1 | 1.8 | 118 | 93 | 32.7 | 35.2 | 4.2 | | | |
| 22.0 | 17.4 | 5.6 | 2.0 | <0.1 | 1.5 | 111 | 92 | 24.5 | 26.5 | 3.1 | | | |
| 20.2 | 15.2 | 5.7 | 1.6 | <0.1 | 1.1 | 109 | 93 | 22.0 | 23.6 | 2.7 | | | |
| 20.2 | 16.3 | 6.3 | 1.6 | <0.1 | 0.8 | 116 | 94 | 23.4 | 25.0 | 2.6 | | | |
| 16.7 | | 5.5 | 0.4 | <0.1 | 0.5 | | | | | | | | |

a. Few smooth dark brown to black coner. (Fe-Mn?)
 b. Trace smooth dark brown to black coner. (Fe-Mn?); few CaCO₃ coner.

Soil type: Monona silt loam, shallow carbonate variant

Soil No.: S58Iowa-43-2

Location: 425 feet north of and 212 feet east of south center of Sec. 18, T80N, R42W, Harrison County, Iowa.

Slope: 15 percent convex, west exposure.

Vegetation: Mature oak, walnut, basswood, completely shaded with a good stand of young trees; ground cover mainly weeds.

Geomorphic surface: Recent.

Collected by and date: G. H. Simonson and R. E. Daniels, July 29, 1958.

Horizon and

Lincoln

Lab. Number

- O2 2 to 0 inch. Partially decomposed leaves and bark; abundant fibrous roots of ground cover; fine granular structure in lower part; clear to the A11.
- A11 9573 0 to 5 inches. Black to very dark grayish brown (10YR 2.5/1.5) silt loam; gray (10YR 5/1) dry; weak fine granular; abundant roots; friable; leached post-Farmdale loess; gradual to the A12.
- A12 9574 5 to 10 inches. Very dark gray (10YR 3/1) silt loam; gray to brownish gray (10YR 5/1.5) dry; sparse to common mixing of very dark grayish brown (10YR 3/2); weak medium subangular blocky breaking to fine granular; friable; common worm casts; clear to B2.
- B2 9575 10 to 16 inches. Brown to dark brown (10YR 4/3) silt loam; light brownish gray (2.5Y 6/2) dry; abundant very dark grayish brown (10YR 3/2) ped exteriors; weak fine to medium subangular blocky; friable; gradual to B3.
- B3 9576 16 to 21 inches. Brown to dark brown (10YR 4/3) silt loam; sparse very dark grayish brown to dark brown (10YR 3/2 and 10YR 3/3) coatings on ped exteriors; sparse gray brown mottles; weak medium subangular blocky grading toward massive; friable; abrupt to the C1.
- C1 9577 21 to 33 inches. Brown (10YR 4.5/3) silt loam; sparse gray and yellowish red (5YR 4/6) mottles; massive; friable; calcareous post-Farmdale loess; few to common tubular lime concretions less than 1 mm. in diameter and a few larger lime concretions.

Notes: The subsoil colors tend toward the 2.5Y hue; they would probably fit a 1Y hue best.

SOIL TYPE Monona LOCATION Harrison County, Iowa
silt loam

SOIL NOS. S58Iowa-43-3 LAB. NOS. 9578-9583

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------|---------|--|----------------------|-------------------------|------------------------|-----------------------------|--------------------|-----------------|------|------|---|----------------|------------|
| | | 1B1a | | | | | | | | | | | 2A2 > 2 |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 3A1 | | | | |
| 0-4 | A11 | <0.1 | 0.1 | 0.1a | 0.2a | 3.0a | 72.2 | 24.4 | 48.4 | 26.9 | - | s11 | |
| 4-10 | A12 | <0.1 | <0.1 | <0.1 | <0.1 | 2.6a | 71.7 | 25.7 | 47.8 | 26.5 | - | s11 | |
| 10-18 | B2 | <0.1 | <0.1 | <0.1 | 0.1 | 2.9a | 71.7 | 25.3 | 48.4 | 26.3 | - | s11 | |
| 18-35 | B3 | <0.1 | <0.1 | <0.1 | 0.1 | 3.3a | 73.8 | 22.8 | 51.2 | 26.0 | - | s11 | |
| 35-53 | C1 | 0.1 | 0.1 | 0.1a | 0.2a | 4.7a | 74.9 | 19.9 | 56.0 | 23.7 | - | s11 | |
| 53-63 | C2 | 0.1b | 0.2b | 0.2b | 0.5b | 4.8b | 77.1 | 17.1 | 57.1 | 25.1 | - | s11 | |

| 8C1a | pH | | ORGANIC MATTER | | | Free Iron Fe ₂ O ₃ % 6C1a | ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM @25°C. | 6E1a CaCO ₃ equiv- alent % | MOISTURE TENSIONS | | |
|------|-----|------|-----------------------------|------------------------|------|---|--|--|---------------------|------|--|
| | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITRO-GEN % | C/N | | | | 4B2 15 ATMOS. | | |
| | | | | | | | | | | | |
| 6.7 | | | 4.09 | 0.318 | 12.9 | 1.4 | < | | | 14.6 | |
| 6.7 | | | 1.25 | 0.117 | 10.7 | 1.7 | < | | | 11.2 | |
| 6.6 | | | 0.68 | 0.070 | 10 | 1.8 | < | | | 11.0 | |
| 6.2 | | | 0.31 | 0.038 | 8 | 1.8 | | | | 10.6 | |
| 6.4 | | | 0.25 | | | 1.6 | | | | 9.4 | |
| 7.9 | | | 0.16 | | | 1.2 | 7 | | | 8.5 | |

| 5A1a CATION EXCHANGE CAPACITY NH ₄ Ac | EXTRACTABLE CATIONS | | | | | 5B1a BASE SAT. % NH ₄ Ac EXCH. 5C1 | 5C3 Base Sat. % on Sum Cations | 5B1a Sum Bases <-me/100g-> | 5A3a Sum Cations /100g-> | 8D3 Ca/Mg | MOISTURE AT SATURATION % |
|--|---------------------------------|------------|-----------|------------|-----------|--|--------------------------------------|----------------------------------|--------------------------------|--------------|-----------------------------|
| | 6N2b Ca | 6O2b Mg | 6H1a N | 6P2a Na | 6Q2a K | | | | | | |
| | milliequivalents per 100g. soil | | | | | | | | | | |
| 28.9 | 24.0 | 5.2 | 4.9 | <0.1 | 1.2 | 105 | 86 | 30.4 | 35.3 | 4.6 | |
| 20.1 | 15.7 | 4.7 | 4.5 | <0.1 | 0.6 | 104 | 82 | 21.0 | 25.5 | 3.3 | |
| 19.6 | 13.0 | 6.0 | 4.1 | <0.1 | 0.5 | 99 | 83 | 19.5 | 23.6 | 2.2 | |
| 17.8 | 10.9 | 6.2 | 4.1 | <0.1 | 0.4 | 98 | 81 | 17.5 | 21.6 | 1.8 | |
| 17.5 | 10.8 | 6.6 | 3.7 | 0.1 | 0.4 | 102 | 83 | 17.9 | 21.6 | 1.6 | |
| 15.8 | | 6.1 | <0.1 | 0.1 | 0.4 | | | | | | |

a. Few smooth dark brown to black coner. (Fe-Mn?)
 b. Trace smooth dark brown to black coner. (Fe-Mn?); few CaCO₃ coner.

Soil type: Monona silt loam

Soil No.: S58Iowa-43-3

Location: 750 feet east and 310 feet north of south center of Sec. 18, T80N, R42W, Harrison County, Iowa.

Slope: 7 percent convex, southeast exposure.

Vegetation: Mixed oak-walnut timber and bluegrass occupying about equal amounts of the area. The profile site is in a 50-foot square grassy area.

Geomorphic surface: Recent.

Collected by: G. H. Simonson and R. B. Daniels.

Horizon and
Lincoln
Lab. Number

| | |
|-------------|---|
| O2 | 1 to 0 inch. Partially decayed leaves; very abundant fibrous grass roots; mixture of organic and mineral matter in lower part; abrupt to the A11. |
| A11 9578 | 0 to 4 inches. Very dark gray (10YR 3/1) silt loam; gray (10YR 5/1) dry; abundant roots; moderate fine granular; friable; leached post-Farmdale loess; clear to the A12. |
| A12 9579 | 4 to 10 inches. Very dark grayish brown (10YR 3/2) silt loam; gray (10YR 5/2) dry; dark grayish brown (10YR 4/2) crushed; moderate fine subangular blocky breaking to fine granular; friable; thin discontinuous coatings on peds; common concentrations of bleached silt grains on ped exteriors; clear to the B2. |
| B2 9580 | 10 to 18 inches. Dark yellowish brown (10YR 3/4) silt loam; yellowish brown (10YR 5/4) dry; brown to dark brown (10YR 4/3) crushed; weak fine and medium subangular blocky; friable; thin coatings in larger pores; few bleached silt grains on peds; gradual to the B3. |
| B3 9581 | 18 to 35 inches. Brown to dark brown (10YR 4/3) silt loam; brown to dark brown (10YR 4/3) crushed; very weak medium and coarse subangular blocky; friable; gradual to the C1. |
| C1 9582 | 35 to 53 inches. Brown (10YR 5/3) silt loam; brown (10YR 5/3) dry; sparse gray and browner mottles; massive; friable; abrupt to the C2. |
| C2 9583 | 53 to 63 inches. Brown (10YR 5/3) silt loam; sparse gray and browner mottles; massive; friable; calcareous post-Farmdale loess. |

SOIL SURVEY LABORATORY Lincoln, Nebr. October 1959

SOIL TYPE Monona LOCATION Harrison County, Iowa
silt loam

SOIL NOS. 858 Iowa-43-4 LAB. NOS. 9584-9589

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|---|---------------------------------|--|-------------|-------------|----------------------------------|---------------------------------------|-----------------------------------|----------------------------|-------------------|------------|---------------|--------------------------|
| | | 1B1a | | | | | 3A1 | | | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | | |
| 0-8 | A11 | <0.1 | 0.1 | <0.1 | 0.1a | 2.3a | 72.1 | 25.4 | 47.8 | 26.7 | - | sil |
| 8-12 | A12 | <0.1 | <0.1 | <0.1 | 0.1a | 2.5a | 71.8 | 25.6 | 47.4 | 27.0 | - | sil |
| 12-21 | B2 | <0.1 | <0.1 | <0.1 | 0.1b | 2.3b | 72.8 | 24.8 | 46.3 | 28.9 | - | sil |
| 21-32 | B3 | <0.1 | <0.1 | <0.1 | 0.1b | 2.7b | 73.4 | 23.8 | 46.0 | 30.2 | - | sil |
| 30-62 | C1 | <0.1 | <0.1 | <0.1 | 0.1b | 2.8b | 78.0 | 19.1 | 52.3 | 28.6 | - | sil |
| 62-80 | C2 | <0.1 | <0.1 | <0.1 | 0.3c | 4.0c | 78.5 | 17.2 | 60.4 | 22.3 | - | sil |
| pH | | ORGANIC MATTER | | | Free Iron | ELECTRICAL CONDUCTIVITY | 6E1a | | MOISTURE TENSIONS | | | |
| 8C1a | 1:5 | 1:10 | 6A1a | 6B1a | Fe ₂ O ₃ % | EC x 10 ³ MILLIMHOS PER CM | CaCO ₃ equiv- alent | GYP SUM mg./100g SOIL | 1/10 ATMOS. | 1/3 ATMOS. | 4B2 15 ATMOS. | |
| 1:1 | | | % | % | C/N | 6C1a | % | | % | % | % | |
| 5.8 | | | 2.10 | 0.204 | 10.3 | 1.6 | 0.8 | | | | | 11.6 |
| 6.0 | | | 1.71 | 0.179 | 9.6 | 1.6 | 0.4 | | | | | 11.4 |
| 6.0 | | | 1.06 | 0.106 | 10.0 | 1.7 | 0.3 | | | | | 10.9 |
| 6.2 | | | 0.63 | 0.070 | 9 | 1.7 | 0.3 | | | | | 10.6 |
| 6.7 | | | 0.23 | | | 1.7 | 0.3 | Δ | | | | 9.4 |
| 8.1 | | | 0.13 | | | 1.5 | 0.5 | 7 | | | | 9.1 |
| 5A1a | EXTRACTABLE CATIONS | | | | | 5B1a | 5D2 | SATURATION EXTRACT SOLUBLE | | | 8A1 | 8A |
| CATION EXCHANGE CAPACITY NH ₄ Ac | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | EXCH. No % | 6P1a | 6Q1a | | | | MOISTURE AT SATURATION % |
| | Ca | Mg | H | Na | K | | No | K | | | | |
| | milliequivalents per 100g. soil | | | | | | milliequivalents per liter | | | | | |
| 21.1 | 14.0 | 4.8 | 6.6 | <0.1 | 0.5 | Δ | 0.4 | 0.2 | | | | 65.6 |
| 20.4 | 13.2 | 4.9 | 6.6 | 0.1 | 0.3 | Δ | 0.3 | 0.1 | | | | 65.1 |
| 19.6 | 13.1 | 5.4 | 5.3 | 0.1 | 0.3 | Δ | 0.4 | 0.1 | | | | 59.8 |
| 19.4 | 12.9 | 5.6 | 4.1 | 0.1 | 0.4 | Δ | 0.4 | 0.1 | | | | 59.1 |
| 16.6 | 11.4 | 5.3 | 3.3 | 0.2 | 0.3 | 1 | 0.4 | 0.1 | | | | 56.9 |
| 16.1 | | 5.8 | <0.1 | 0.1 | 0.3 | 1 | 0.7 | 0.1 | | | | 56.2 |

a. Few smooth dark brown to black coner. (Fe-Mn?)
 b. Trace smooth dark brown to black coner. (Fe-Mn?)
 c. Trace smooth dark brown to black coner. (Fe-Mn?); few CaCO₃ coner.

Soil type: Monona silt loam

Soil No.: 858Iowa-43-4

Location: 475 feet south and 20 feet west of the northeast corner of the SW1/4 of the SW1/4 of Sec. 7, T8N, R42W, Harrison County, Iowa.

Slope: 2 percent gently convex.

Vegetation: The site is dominantly bluegrass sod but the area in general contains much buckbrush. A few young ash and mulberry trees are scattered within the area.

Geomorphic surface: Millenik.

Collected by and date: G. K. Simonson and R. B. Daniels, August 6, 1958.

Horizon and

Lincoln

Lab. Number

A11 0 to 8 inches. Very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; fine granular; friable; abundant fine grass roots; leached post-Farmdale loess; gradual to the A12.
9584

A12 8 to 12 inches. Very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; sparse mixing of dark brown (10YR 3/3); very dark brown to very dark grayish brown (10YR 2.5/2) crushed; moderate fine granular; friable; gradual to the B2.
9585

B2 12 to 21 inches. Brown to dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; sparse to common very dark grayish brown to dark brown (10YR 3/2 and 10YR 3/3) peds; brown to dark brown (10YR 4/3) crushed; weak fine and medium subangular blocky breaking to weak fine granular; friable; common worm casts; thin discontinuous coatings on peds; gradual to the B3.
9586

B3 21 to 32 inches. Brown to dark brown (10YR 4/3) silt loam; sparse dark brown (10YR 3/3) coatings on peds; weak fine to medium subangular blocky; friable; common worm casts; gradual to the C1.
9587

C1 30 to 62 inches. Brown to dark brown (10YR 4/3) to (10YR 5/3) silt loam; sparse gray and browner mottles; massive; friable; sparse worm casts; abrupt to the C2.
9588

C2 62 to 80 inches. Brown (10YR 5/3) silt loam; sparse fine grayish brown (2.5Y 5/2) and strong brown (7.5YR 5/6) mottles; massive; friable; calcareous loess.
9589

SOIL TYPE Monona LOCATION Harrison County, Iowa
silt loam

SOIL NOS. 858Iowa-43-7 LAB. NOS. 9600-9605

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|---|---------|--|----------------------|-----------------------------|------------------------|-----------------------------|---|---|--------------------------------------|--------------------------|--------------|--------------------------|------------|
| | | 1B1a | | | | | | | | | | | 2A2 > 2 |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 3A1 | | | | |
| 0-5 | A11 | <0.1 | <0.1 | <0.1 | 0.1a | 2.4a | 75.8 | 21.7 | 51.4 | 26.9 | - | sil | |
| 5-10 | A12 | <0.1 | <0.1 | <0.1 | 0.2a | 3.0a | 74.0 | 22.8 | 50.1 | 27.0 | - | sil | |
| 10-18 | B2 | <0.1 | <0.1 | <0.1 | 0.1a | 2.2a | 74.4 | 23.3 | 49.5 | 27.2 | - | sil | |
| 18-26 | B3 | <0.1 | <0.1 | <0.1 | <0.1 | 2.6a | 75.6 | 21.8 | 51.3 | 26.9 | - | sil | |
| 34-52 | C1 | <0.1 | <0.1 | <0.1 | 0.2a | 4.1a | 76.4 | 19.3 | 55.0 | 25.7 | - | sil | |
| 71-84 | C2 | <0.1 | 0.1b | 0.1b | 0.3c | 5.0c | 79.1 | 15.4 | 60.9 | 23.4 | - | sil | |
| 8C1a | | pH | | ORGANIC MATTER | | | Free Iron Fe ₂ O ₃ % | ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM | 6E1a CaCO ₃ equivalent | MOISTURE TENSIONS 4E2 | | | |
| 1:1 | | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITROGEN % | C/N | 6C1a | % | % | 1/10 ATMOS. | 1/3 ATMOS. | 15 ATMOS. | |
| 6.5 | | | | 3.43 | 0.284 | 12.1 | 1.4 | Δ | | | | 12.4 | |
| 6.5 | | | | 1.56 | 0.147 | 10.6 | 1.6 | Δ | | | | 10.4 | |
| 6.4 | | | | 0.66 | 0.075 | 9 | 1.7 | | | | | 9.9 | |
| 6.5 | | | | 0.52 | 0.061 | 8 | 1.8 | Δ | | | | 9.5 | |
| 6.2 | | | | 0.28 | | | 1.6 | | | | | 9.0 | |
| 8.0 | | | | 0.13 | | | 1.5 | 8 | | | | 8.0 | |
| 5A1a | | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. NH ₄ Ac EXCH. | 5C3 Base Sat. % on Sum Cations | 5B1a Sum Bases | 5A3a Sum Cations | 8D3 Ca/Mg | MOISTURE AT SATURATION % | |
| NF14 Ac | | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | 5C1 | <me/100 g-> | | | | | |
| 25.2 | | 21.6 | 4.5 | 4.9 | <0.1 | 0.9 | 107 | 85 | 27.0 | 31.9 | 4.8 | | |
| 20.6 | | 15.5 | 4.0 | 4.9 | <0.1 | 0.7 | 98 | 80 | 20.2 | 25.1 | 3.9 | | |
| 14.2 | | 12.1 | 6.8 | 4.1 | <0.1 | 0.4 | 136 | 82 | 19.3 | 23.4 | 1.8 | | |
| 10.4 | | | 5.4 | 4.1 | <0.1 | 0.3 | | | | | | | |
| 12.2 | | 11.4 | 5.4 | 3.7 | 0.1 | 0.3 | 141 | 82 | 17.2 | 20.9 | 2.1 | | |
| 11.6 | | | 5.9 | <0.1 | 0.1 | 0.3 | | | | | | | |
| <p>a. Trace smooth dark brown to black conr. b. Trace smooth dark brown to black coner.; common CaCO₃ coner. c. Trace smooth dark brown to black coner.; few CaCO₃ coner.</p> | | | | | | | | | | | | | |

Soil type: Monona silt loam

Soil No.: 898Iowa-43-7

Location: 475 feet south and 530 feet west of the northeast corner of the SE1/4 of the SW1/4 of Sec. 5, T79N, R43W, Harrison County, Iowa.

Slope: 7 percent convex, northeast exposure.

Vegetation: Oak, walnut, elm, cedar, understory of buckbrush, gooseberry, and sumac, few small openings of blue-grass sod; some grass is general throughout the area.

Geomorphic surface: Recent.

Collected by and date: G. H. Simonson and R. B. Daniels, August 7, 1958.

Horizon and

Lincoln

Lab. Number

| | |
|-------------|--|
| A11 9600 | 0 to 5 inches. Black to very dark gray (10YR 2.5/1) silt loam, gray (10YR 5/1) dry; moderate fine granular; friable; abundant tree and grass roots; leached post-Farmdale loess; clear to the A12. |
| A12 9601 | 5 to 10 inches. Very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; sparse mixing of very dark grayish brown (10YR 3/2); very dark brown (10YR 2/2) crushed; moderate fine subangular blocky breaking to fine granular; friable; common tree roots; bleached silt grain coatings on peds fairly prominent when dry; gradual to the B2. |
| B2 9602 | 10 to 18 inches. Dark brown (10YR 3.5/3) silt loam, brown to pale brown (10YR 5.5/3) dry; sparse mixing of very dark grayish brown (10YR 3/2); dark brown (10YR 3.5/3) crushed; moderate fine subangular blocky; friable; common tree roots; sparse worm casts; gradual to the B3. |
| B3 9603 | 18 to 26 inches. Brown to dark brown (10YR 4/3) silt loam; sparse mixing of dark brown to very dark grayish brown (10YR 3/3-3/2); weak medium to fine subangular blocky; friable; few tree roots; gradual to the C1. |
| C1 9604 | 26 to 71 inches (sampled 34 to 52 inches). Brown to dark brown (10YR 4/3) silt loam; sparse faint gray and brown mottles; massive; friable; abrupt to the C2. |
| C2 9605 | 71 to 84 inches. Brown (10YR 5/3) silt loam; sparse faint gray and brown mottles; massive; friable; calcareous post-Farmdale loess. |

SOIL TYPE Monona LOCATION Harrison County, Iowa
silt loam

SOIL NOS. 858Iowa-43-8 LAB. NOS. 9606-9610

| DEPTH INCHES | HORIZON | 1B1a PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1 | | | | | | | | | | TEXTURAL CLASS |
|---|---------|---|-----------------------|-----------------|-----------|----------------------------------|---|-------------------------------|----------------------|---------------|-------------------|-----------------|
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | 2A2 | |
| | | 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 | |
| 0-8 | A1 | <0.1 | <0.1 | <0.1 | 0.1a | 3.5a | 73.8 | 22.6 | 53.3 | 24.1 | - | s11 |
| 8-16 | B2 | <0.1 | <0.1 | <0.1 | 0.2a | 4.4a | 72.7 | 22.7 | 53.9 | 23.3 | - | s11 |
| 16-25 | B3 | <0.1 | 0.1b | 0.1b | 0.2a | 4.4a | 73.1 | 22.1 | 54.0 | 23.6 | - | s11 |
| 25-36 | C1 | 0.1b | 0.1b | 0.1b | 0.3a | 4.9a | 75.4 | 19.1 | 56.1 | 24.4 | - | s11 |
| 36-50 | C2 | <0.1 | 0.1c | 0.1c | 0.5d | 5.3d | 78.2 | 15.8 | 57.8 | 26.0 | - | s11 |
| pH | | ORGANIC MATTER | | | | | Free Iron | ELECTRICAL CONDUCTIVITY | 6E1a | | MOISTURE TENSIONS | |
| 8C1a | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITROGEN % | C/N | Fe ₂ O ₃ % | EC * 10 ³ MILLIMHOS PER CM @ 25°C. | CaCO ₃ equiv-ent % | GYPSUM mg./100g SOIL | 1/10 ATMOS. % | 1/3 ATMOS. % | 4B2 15 ATMOS. % |
| 1d | | | % | % | | 6C1a | | % | | % | % | % |
| 7.1 | | | 2.86 | 0.247 | 11.6 | 1.4 | | 4 | | | | 12.3 |
| 7.3 | | | 0.85 | 0.089 | 10 | 1.5 | | 4 | | | | 10.2 |
| 7.4 | | | 0.49 | 0.057 | 8 | 1.6 | | 4 | | | | 10.1 |
| 7.6 | | | 0.41 | | | 1.5 | | 4 | | | | 9.5 |
| 7.9 | | | 0.19 | | | 1.2 | | 6 | | | | 8.7 |
| 5A1a CATION EXCHANGE CAPACITY NH ₄ Ac | | EXTRACTABLE CATIONS 5B1a | | | | | | | | | | |
| | | 6C2b | 6D1a | 6E2a | 6G2a | | | | | | | |
| | | Ca | Mg | H | Na | K | | | | | | |
| | | milliequivalents per 100g. soil → | | | | | | | | | | |
| 16.9 | | 3.5 | 3.3 | <0.1 | 1.0 | | | | | | | |
| 13.0 | | 3.5 | 2.0 | <0.1 | 0.7 | | | | | | | |
| 11.2 | | 4.0 | 1.6 | <0.1 | 0.7 | | | | | | | |
| 14.1 | | 5.6 | 1.2 | <0.1 | 0.7 | | | | | | | |
| 14.1 | | 5.5 | <0.1 | <0.1 | 0.8 | | | | | | | |
| <p>a. Trace smooth dark brown to black concr. (Fe-Mn?)</p> <p>b. Common smooth dark brown to black concr. (Fe-Mn?)</p> <p>c. Trace smooth dark brown to black concr. (Fe-Mn?); common CaCO₃ concr.</p> <p>d. Trace smooth dark brown to black concr. (Fe-Mn?); few CaCO₃ concr.</p> | | | | | | | | | | | | |

Soil type: Monona silt loam

Soil No.: S58Iowa-43-8

Location: 370 feet east of the northwest corner of the NE1/4 of the SE1/4 of Sec. 8, T79N, R43W, Harrison County, Iowa.

Slope: 15 percent, flat transverse to slope, northeast exposure.

Vegetation: Partly timbered bluegrass pasture, about 25 percent stand of oak, walnut, elm, and ash. There are buckbrush, gooseberry bushes, and weeds scattered throughout the area.

Geomorphic surface: Recent.

Collected by and date: G. H. Simonson and R. B. Daniels, October 8, 1958.

Horizon and

Lincoln

Lab. Number

- A1
9606 0 to 8 inches. Black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; very dark gray (10YR 3/1) crushed; moderate fine to medium granular; friable; leached post-Farmdale loess; gradual to the B2.
- B2
9607 8 to 16 inches. Very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; abundant mixing of black (10YR 2/1) and dark brown (10YR 3/3); very dark grayish brown (10YR 3/2) crushed; weak fine subangular blocky; friable; abundant worm casts; gradual to the B3.
- B3
9608 16 to 25 inches. Dark brown (10YR 3/3) and brown to dark brown (10YR 4/3) silt loam; brown (10YR 5/3) to pale brown (10YR 6/3) dry; brown to dark brown (10YR 4/3) crushed; weak fine to medium subangular blocky; friable; abundant worm casts; gradual to the C1.
- C1
9609 25 to 36 inches. Brown to dark brown (10YR 4/3) silt loam; brown (10YR 5/3) crushed; massive to very weak medium subangular blocky; friable; common worm casts; leached; abrupt to the C2.
- C2
9610 36 to 50 inches. Brown (10YR 5/3) silt loam; sparse indistinct gray and brown mottles; friable; sparse to common worm casts; calcareous post-Farmdale loess.

SOIL TYPE Monona LOCATION Harrison County, Iowa
silt loam

SOIL NOS. 859Iowa-43-1 LAB. NOS. 12162-12166

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------|---------------------------------|--|-------------|--|-----------|----------------------------------|---|--------------------------------|-----------------------|------------------|------------|--------------------------|--|
| | | 1B1a | | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | 3A1 | | 2A2 | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | > 2 | | |
| | | 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | | |
| 0-5 | A1 | <0.1 | 0.1a | 0.1a | 0.3 | 3.7 | 72.7 | 23.1 | 56.4 | 20.2 | - | sil | |
| 5-9 | B2 | <0.1 | 0.1a | 0.1a | 0.2 | 3.2 | 71.5 | 24.9 | 53.0 | 21.8 | - | sil | |
| 9-14 | B3 | <0.1 | 0.1a | 0.1a | 0.3 | 3.0 | 71.9 | 24.6 | 52.4 | 22.7 | - | sil | |
| 14-24 | C1 | 0.2b | 0.2c | 0.2c | 0.4c | 3.3c | 75.1 | 20.6 | 55.3 | 23.3 | - | sil | |
| 38-44 | C2 | 0.1b | 0.1b | 0.2b | 0.4c | 3.5c | 79.3 | 16.4 | 58.7 | 24.3 | - | sil | |
| | pH | ORGANIC MATTER | | | | Free Iron | ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM | 6B1a | MOISTURE TENSIONS | | | | |
| 8C1a | 1.5 | 6A1a | 6B1a | | | Fe ₂ O ₃ % | | CaCO ₃ equivalent % | GYPSUM mg./100g. SOIL | 1/10 ATMOS. | 1/3 ATMOS. | 15 ATMOS. | |
| | 1:1 | ORGANIC CARBON % | NITROGEN % | C/N | 6C1a | | | | | % | % | % | |
| 7.3 | | 5.15 | 0.374 | 14 | 0.8 | | | < 1 | | | | 15.8 | |
| 6.6 | | 1.15 | 0.105 | 11 | 0.8 | | | < 1 | | | | 11.1 | |
| 7.0 | | 0.78 | 0.084 | 9 | 0.8 | | | < 1 | | | | 11.2 | |
| 7.8 | | 0.57 | 0.064 | 9 | 0.8 | | | 8 | | | | 9.7 | |
| 7.9 | | 0.16 | | | 0.7 | | | 10 | | | | 8.7 | |
| | 5A1a | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. NH ₄ OAc EXCH. | Base Sat. % on Sum Cations | Sum Ext. Bases | Sum Ext. Cations | Ca/Mg | MOISTURE AT SATURATION % | |
| | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | 5C1 | 5C3 | 5B1a | 5A3a | 8D3 | | | |
| | Ca | Mg | H | Na | K | | | | | | | | |
| | milliequivalents per 100g. soil | | | | | | | | | | | | |
| 30.9 | 30.2 | 5.0 | 3.2 | < 0.1 | 1.2 | 118 | 92 | 36.4 | 39.6 | 6.0 | | | |
| 21.2 | 15.8 | 4.9 | 3.9 | < 0.1 | 0.8 | 101 | 85 | 21.5 | 25.4 | 3.2 | | | |
| 20.3 | 15.8 | 5.8 | 2.6 | < 0.1 | 0.6 | 109 | 90 | 22.2 | 24.8 | 2.7 | | | |
| 16.7 | | 4.7 | < 0.1 | < 0.1 | 0.5 | | | | | | | | |
| 14.4 | | 4.2 | < 0.1 | 0.1 | 0.4 | | | | | | | | |

- a. Many Fe-Mn? concr.
- b. Many carbonate concr. CaCO₃?
- c. Few carbonate concr. CaCO₃?

Soil type: Monona silt loam

Soil No.: 859Iowa-43-1

Location: 1090 feet east and 360 feet north of the southwest corner of the SW1/4 of the SE1/4 of Sec. 18, T80N, R42W, Harrison County, Iowa.

Slope: 20 percent convex, east exposure, lower part of slope.

Vegetation: Mixed mature white oak, hackberry, and young elm with a thin undergrowth of brush.

Geomorphic surface: Late Wisconsin to Recent.

Collected by and date: G. H. Simonson, September 29, 1959.

Horizon and
Lincoln
Lab. Number

- O2 1 to 0 inch. Partially decayed leaves and twigs; abrupt lower boundary.
- A1 0 to 5 inches. Black to very dark gray (10YR 2.5/1) silt loam, dark gray (10YR 4/1) dry; abundant fibrous roots; moderate fine granular, appears to be primarily worm casts; friable; leached post-Farmdale loess; gradual lower boundary.
- B2 5 to 9 inches. Mixed very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) silt loam, dark gray (10YR 4/1) and dark grayish brown (10YR 4/2) dry; weak to moderate fine subangular blocky; friable; common worm casts; common gray silt grains on ped exteriors; matrix leached but sparse carbonate concretions are present; clear lower boundary.
- B3 9 to 14 inches. Dark grayish brown (10YR 4/2) silt loam; sparse mixing of very dark gray (10YR 3/1) as worm casts; weak medium subangular blocky; friable; common worm casts; sparse gray silt grains on ped exteriors; matrix leached but sparse carbonate concretions are present; abrupt wavy lower boundary.
- C1 14 to 24 inches. Brown (10YR 5/3) silt loam; sparse mixing of dark grayish brown (10YR 4/2) in worm casts; very weak medium subangular blocky; calcareous, with abundant carbonate concretions present; diffuse lower boundary.
- C2 24 to 44 inches (sampled 38 to 44 inches). Brown (10YR 5/3) silt loam; sparse yellowish brown (10YR 5/6) mottles; massive; friable; sparse worm casts; calcareous post-Farmdale loess.

SOIL TYPE Monona LOCATION Harrison County, Iowa
silt loam

SOIL NOS. S59Iowa-43-2 LAB. NOS. 12167-12171

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--|---------|--|------------------|-------------|------------|----------------------------------|---------------------------------------|-------------------------------------|-----------------------|-------------------|------------|------------------------|--|
| | | 1B1a | | 3A1 | | | | | | 2A2 | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | > 2 | | | | |
| 2.1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | | | | |
| 0-4 | A1 | <0.1 | 0.1 | 0.1 | 0.2 | 3.4 | 71.9 | 24.3 | 52.0 | 23.3 | - | s11 | |
| 4-10 | B2 | <0.1 | <0.1 | 0.1 | 0.2 | 3.6 | 71.6 | 24.5 | 51.4 | 23.9 | - | s11 | |
| 10-15 | B3 | 0.4a | 0.2a | 0.1a | 0.4b | 3.3b | 77.2 | 18.4 | 53.1 | 27.6 | - | s11 | |
| 18-28 | C1 | 0.2a | 0.1a | 0.1a | 0.3b | 4.0b | 77.5 | 17.8 | 55.7 | 26.0 | - | s11 | |
| 34-40 | C2 | 0.4a | 0.1a | 0.1a | 0.4b | 4.6b | 78.2 | 16.2 | 58.1 | 24.9 | - | s11 | |
| pH | | ORGANIC MATTER | | | | Free Iron | ELECTRICAL CONDUCTIVITY | 6B1a | | MOISTURE TENSIONS | | | |
| 8C1a | | 1:5 | 6A1a | 6B1a | C/N | Fe ₂ O ₃ % | EC x 10 ³ MILLIMHOS PER CM | CaCO ₃ equiv- alent % | GYPSUM me./100g. SOIL | 1/10 ATMOS. | 1/3 ATMOS. | 15 ATMOS. | |
| 1:1 | | 1:10 | ORGANIC CARBON % | NITRO-GEN % | | 6C1a | | | | | | 4B2 | |
| 7.5 | | | 3.20 | 0.261 | 12 | 1.2 | | < 1 | | | | 13.6 | |
| 7.6 | | | 1.11 | 0.109 | 10 | 1.4 | | < 1 | | | | 11.1 | |
| 7.9 | | | 0.61 | 0.064 | 10 | 1.3 | | 8 | | | | 9.8 | |
| 8.0 | | | 0.28 | 0.031 | 9 | 1.3 | | 9 | | | | 9.0 | |
| 8.0 | | | 0.19 | | | 1.3 | | 12 | | | | 8.7 | |
| 5A1a | | EXTRACTABLE CATIONS | | | | | BASE SAT. % | Base Sat. % | Sum Ext. Bases | Sum Ext. Cations | Ca/Mg | MOISTURE AT SATURATION | |
| CATION EXCHANGE CAPACITY NH ₄ OAc | | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | NH ₄ OAc EXCH. | on Sum Cations | Sum Ext. Cations | | | | |
| | | Co | Mg | H | No | K | | 5C1 | 5B1a | 5A3a | 8D3 | % | |
| | | milliequivalents per 100g. soil | | | | | | 5C3 | | | | | |
| 26.3 | 24.1 | 6.0 | 2.6 | < 0.1 | 1.6 | 120 | 92 | 31.7 | 34.3 | 4.0 | | | |
| 21.2 | 19.3 | 5.4 | 2.4 | < 0.1 | 1.1 | 122 | 91 | 25.8 | 28.2 | 3.6 | | | |
| 17.1 | | 4.4 | < 0.1 | < 0.1 | 0.6 | | | | | | | | |
| 15.7 | | 4.2 | < 0.1 | < 0.1 | 0.5 | | | | | | | | |
| 14.5 | | 4.8 | < 0.1 | < 0.1 | 0.5 | | | | | | | | |

a. Many carbonate concn. CaCO₃?
b. Few carbonate concn. CaCO₃?

Soil type: Monona silt loam

Soil No.: 859Iowa-43-2

Location: 948 feet east and 360 feet north of the southwest corner of the SW1/4 of the NE1/4 of Sec. 18, T80N, R42W, Harrison County, Iowa.

Slope: 25 percent convex, east exposure, upper part of slope.

Vegetation: Mature oak and young elm, mixed brush and bluegrass ground cover.

Geomorphic surface: Recent.

Collected by and date: G. H. Simonson, September 29, 1959.

Horizon and

Lincoln

Lab. Number

- O2 1 to 0 inch. Partially decayed leaves and twigs; abrupt lower boundary.
- A1 0 to 4 inches. Very dark brown (10YR 2/2) silt loam, dark gray (10YR 3.5/1) dry; sparse mixing of very dark grayish brown (10YR 3/2) evident when crushed; moderate fine granular; friable; structure appears to be predominantly casts of earthworms and other fauna; abundant fibrous roots; leached post-Farmdale loess; clear lower boundary.
12167
- B2 4 to 10 inches. Mixed very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) silt loam, dark grayish brown (10YR 4/2) and brown (10YR 5/2) dry; weak fine subangular blocky; friable; abundant worm casts; matrix is leached but carbonate concretions are common; clear wavy lower boundary.
12168
- B3 10 to 15 inches. Brown (10YR 4.5/3) silt loam; common dark grayish brown (10YR 3/2) worm casts; weak medium subangular blocky; friable; calcareous; clear lower boundary.
12169
- C1 15 to 28 inches (sampled 18 to 28 inches). Brown (10YR 5/3) silt loam; very weak subangular blocky-massive; friable; calcareous; common worm casts; diffuse lower boundary.
12170
- C2 28 to 40 inches (sampled 34 to 40 inches). Brown (10YR 5/3) silt loam; sparse fine yellowish brown (10YR 5/6) mottles; massive; friable; sparse worm casts; calcareous post-Farmdale loess.
12171

SOIL SURVEY LABORATORY Lincoln, Nebr. August 1961

SOIL TYPE Monona LOCATION Harrison County, Iowa
silt loam

SOIL NOS. 859Iowa-43-3 LAB. NOS. 12172-12178

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------|--------------------------------|--|-----------------------|-------------------------|------------------------|----------------------------------|---|-------------------------------------|------------------------|-------------------|------------|--------------------------|-----|
| | | 1B1a | | | | | | | | | | | 2A2 |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 | | |
| 0-4 | A11 | <0.1 | <0.1 | 0.1 | 0.2 | 2.2 | 74.2 | 23.3 | 48.6 | 27.8 | - | sil | |
| 4-8 | A12 | <0.1 | <0.1 | 0.1 | 0.2 | 2.2 | 74.8 | 22.7 | 49.6 | 27.5 | - | sil | |
| 8-14 | B1 | <0.1 | <0.1 | <0.1 | 0.3 | 2.3 | 74.6 | 22.8 | 46.9 | 30.2 | - | sil | |
| 14-22 | B2 | <0.1 | <0.1 | <0.1 | 0.1 | 2.1 | 72.9 | 24.9 | 45.9 | 29.1 | - | sil | |
| 24-34 | B3 | <0.1 | <0.1 | <0.1 | 0.2 | 2.0 | 74.3 | 23.5 | 46.5 | 29.9 | - | sil | |
| 40-50 | C1 | <0.1 | <0.1 | 0.1 | 0.3 | 2.5 | 73.6 | 23.5 | 44.3 | 32.0 | - | sil | |
| 64-74 | C2 | <0.1 | <0.1 | 0.1a | 0.3b | 2.6 | 77.2 | 19.8 | 52.1 | 27.9 | - | sil | |
| pH | | ORGANIC MATTER | | | | Free Iron | ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM | 6E1a | | MOISTURE TENSIONS | | | |
| 8C1a | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITROGEN % | C/N | Fe ₂ O ₃ % | | CaCO ₃ equiv- alent % | GYP SUM me./100g. SOIL | 1/10 ATMOS. | 1/3 ATMOS. | 4B2 15 ATMOS. % | |
| 1:1 | | | | | | 6C1a | | | | | | | |
| 6.9 | | | 4.88 | 0.386 | 13 | 1.2 | | < 1 | | | | 15.3 | |
| 5.7 | | | 2.04 | 0.177 | 12 | 1.4 | | | | | | 10.7 | |
| 5.4 | | | 1.32 | 0.124 | 11 | 1.5 | | | | | | 10.4 | |
| 5.7 | | | 0.73 | 0.080 | 9 | 1.6 | | | | | | 10.6 | |
| 5.8 | | | 0.46 | 0.052 | 9 | 1.8 | | | | | | 10.4 | |
| 6.1 | | | 0.28 | | | 1.6 | | | | | | 11.4 | |
| 6.4 | | | 0.24 | | | 1.8 | | | | | | 9.9 | |
| 5A1a | EXTRACTABLE CATIONS | | | | | 5B1a | BASE SAT. % | Base Sat. % | Sum Ext. Bases | Sum Ext. Cations | Ca/Mg | MOISTURE AT SATURATION % | |
| | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | | NH ₄ OAc EXCH. | on Sum Cations | | | | | |
| | Ca | Mg | H | Na | K | | 5C1 | 5C3 | 5B1a | 5A3a | 8D3 | | |
| | millequivalents per 100g. soil | | | | | | | | | | | | |
| 29.4 | 26.7 | 4.5 | 6.0 | < 0.1 | 0.6 | 108 | 84 | 31.8 | 37.8 | 5.9 | | | |
| 20.9 | 14.2 | 3.5 | 8.4 | < 0.1 | 0.5 | 87 | 68 | 18.2 | 26.6 | 4.0 | | | |
| 18.3 | 10.9 | 3.6 | 7.2 | < 0.1 | 0.4 | 81 | 67 | 14.9 | 22.1 | 3.0 | | | |
| 17.7 | 11.1 | 4.6 | 5.8 | 0.1 | 0.4 | 92 | 74 | 16.2 | 22.0 | 2.4 | | | |
| 17.6 | 11.2 | 5.4 | 5.8 | 0.1 | 0.4 | 97 | 75 | 17.1 | 22.9 | 2.1 | | | |
| 19.3 | 12.5 | 6.4 | 3.9 | 0.1 | 0.4 | 100 | 83 | 19.4 | 23.3 | 2.0 | | | |
| 17.3 | 11.0 | 5.6 | 3.4 | 0.2 | 0.4 | 99 | 83 | 17.2 | 20.6 | 2.0 | | | |

a. Many Fe-Mn? concr.
b. Few Fe-Mn? concr.

Soil type: Monona silt loam
 Soil No.: 859Iowa-43-3
 Location: 468 feet east and 425 feet north of the southwest corner of the SW1/4 of the SE1/4 of Sec. 18, T80N,
 R42W, Harrison County, Iowa.
 Slope: 3 to 4 percent convex.
 Vegetation: Mature and young elm, sparse brush ground cover.
 Geomorphic surface: Hatcher.
 Collected by and date: G. H. Simonson, September 30, 1959.

Horizon and
 Lincoln
 Lab. Number

- O2 1 to 0 inch. Partially decayed leaves and twigs.
- A11 0 to 4 inches. Black (10YR 2/1) silty loam, very dark gray (10YR 3.5/1) dry; weak very fine granular; very friable; appears to be mainly droppings of small fauna; abundant light gray silt grains apparent when dry; leached post-Farmdale loess; clear lower boundary.
 12172
- A12 4 to 8 inches. Very dark gray (10YR 3/1) silt loam, dark gray (10YR 4.5/1) dry; very dark grayish brown (10YR 3/2) crushed; weak fine subangular blocky with a definite tendency toward platiness in spots; friable; abundant droppings of small fauna including common worm casts; abundant light gray silt grains apparent when dry; clear lower boundary. (This horizon appears to have some characteristics of an incipient A2.)
 12173
- E1 8 to 14 inches. Mixed very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) silt loam, dark grayish brown (10YR 4/2) crushed; moderate fine subangular blocky; friable; light gray silt grains in patches prominent on ped surfaces when dry; common worm casts; gradual lower boundary.
 12174
- E2 14 to 22 inches. Dark brown (10YR 3/3) silt loam; dark brown (10YR 4/3) ped interiors; moderate fine subangular blocky; friable; sparse light gray silt grains on ped surfaces; sparse worm casts; gradual lower boundary.
 12175
- E3 22 to 36 inches (sampled 24 to 34 inches). Brown (10YR 4/4) silt loam; weak medium subangular blocky; friable; diffuse lower boundary.
 12176
- C1 36 to 60 inches (sampled 40 to 50 inches). Brown (10YR 4/3) silt loam; some patches of brown (10YR 5/3); weak medium subangular blocky to massive; friable; diffuse lower boundary.
 12177
- C2 60 to 86 inches (sampled 64 to 74 inches). Brown (10YR 5/3-5/4) silt loam; sparse gray mottles; massive; friable; clear wavy lower boundary.
 12178
- C3 86 inches plus. Brown (10YR 5/3) silt loam; sparse gray and yellowish brown mottles; massive; friable; calcareous post-Farmdale loess.

SOIL TYPE Monona LOCATION Harrison County, Iowa
silt loam, acid variant

SOIL NOS. 859Iowa-43-4 LAB. NOS. 12179-12185

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------------------|---------|--|----------------------|-------------------------|------------------------|-----------------------------|----------------------------------|---|-------------------------------|-----------------------|-------------------|----------------|------------------------|
| | | 1B1a VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | 2A2 > 2 | | |
| 0-3½ | A11 | <0.1 | 0.2a | 0.1a | 0.4 | 2.2 | 73.9 | 23.2 | 48.1 | 28.2 | - | sil | |
| 3½-6 | A12 | 0.1a | 0.1a | 0.1a | 0.2 | 2.5 | 73.7 | 23.3 | 48.9 | 27.4 | - | sil | |
| 6-12 | B21 | <0.1 | <0.1 | <0.1 | 0.2 | 2.6 | 71.8 | 25.4 | 47.0 | 27.5 | - | sil | |
| 12-22 | B22 | <0.1 | <0.1 | <0.1 | 0.2 | 2.6 | 71.9 | 25.3 | 46.1 | 28.5 | - | sil | |
| 25-35 | B3 | <0.1 | 0.1 | 0.1 | 0.2 | 2.6 | 74.3 | 22.7 | 50.8 | 26.2 | - | sil | |
| 40-50 | C1 | <0.1 | 0.1 | 0.2 | 0.3 | 3.7 | 72.8 | 22.9 | 48.8 | 27.8 | - | sil | |
| 60-70 | C2 | 0.1b | 0.1b | 0.1b | 0.4c | 2.6c | 80.7 | 16.0 | 50.8 | 32.7 | - | sil | |
| 8C1a | | pH | | ORGANIC MATTER | | | Free Iron | ELECTRICAL CONDUCTIVITY | 6E1a | | MOISTURE TENSIONS | | |
| 1:1 | | 1:5 | 1:10 | ORGANIC CARBON | NITROGEN | C/N | Fe ₂ O ₃ % | EC × 10 ³ MILLIMHOS PER CM @ 25°C. | CaCO ₃ equiv-alent | GYPSUM me./100g. SOIL | 1/10 ATMOS. | 1/3 ATMOS. | 15 ATMOS. |
| | | | | % | % | | 6C1a | | % | | % | % | % |
| 7.1 | | | | 4.63 | 0.387 | 12 | 1.3 | | < 1 | | | | 15.7 |
| 6.4 | | | | 1.81 | 0.164 | 11 | 1.3 | | | | | | 11.7 |
| 5.5 | | | | 0.70 | 0.068 | 10 | 1.6 | | | | | | 10.9 |
| 4.7 | | | | 0.48 | 0.050 | 10 | 1.8 | | | | | | 10.7 |
| 5.1 | | | | 0.36 | 0.040 | 9 | 1.7 | | | | | | 10.1 |
| 6.7 | | | | 0.24 | | | 1.6 | | < 1 | | | | 11.4 |
| 7.9 | | | | 0.19 | | | 1.2 | | 8 | | | | 9.8 |
| 5A1a | | EXTRACTABLE CATIONS | | | | | 5B1a | BASE SAT. % | Base Sat. % | Sum Ext. | Sum Ext. | Ca/Mg | MOISTURE AT SATURATION |
| CATION EXCHANGE CAPACITY | | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | NH ₄ OAc EXCH. | on Sum Cations | Sum Bases | Cations | | | |
| NH ₄ OAc | | Ca | Mg | H | No | K | | | | | | | |
| | | milliequivalents per 100g. soil | | | | | 5C1 | 5C3 | 5B1a | 5A3a | 8D3 | | |
| 32.9 | | 30.1 | 5.7 | 4.4 | <0.1 | 1.3 | 113 | 89 | 37.1 | 41.5 | 5.3 | | |
| 21.8 | | 16.2 | 4.8 | 6.2 | <0.1 | 0.9 | 100 | 78 | 21.9 | 28.1 | 3.4 | | |
| 18.3 | | 11.2 | 4.8 | 6.0 | <0.1 | 0.6 | 91 | 73 | 16.6 | 22.6 | 2.3 | | |
| 18.5 | | 7.5 | 4.6 | 10.3 | <0.1 | 0.5 | 68 | 55 | 12.6 | 22.9 | 1.6 | | |
| 17.8 | | 9.5 | 5.2 | 6.7 | 0.1 | 0.4 | 85 | 69 | 15.2 | 21.9 | 1.8 | | |
| 20.4 | | 13.4 | 7.9 | 3.1 | 0.2 | 0.4 | 107 | 88 | 21.9 | 25.0 | 1.7 | | |
| 16.3 | | | 6.6 | <0.1 | 0.1 | 0.4 | | | | | | | |

- a. Many organic matter residues.
- b. Many carbonate concn. CaCO₃?
- c. Few carbonate concn. CaCO₃?

Soil type: Monona silt loam, acid variant
 Soil No.: S59Iowa-43-4
 Location: 360 feet east and 425 feet north of the southwest corner of the SW¹/₄ of the SE¹/₄ of Sec. 18, T80N, R42W, Harrison County, Iowa.
 Slope: 11 percent convex, west exposure, upper part of slope.
 Vegetation: Large and small elm with some hackberry.
 Geomorphic surface: Late Wisconsin to Recent.
 Collected by and date: G. H. Simonson, September 30, 1959.

Horizon and
 Lincoln
 Lab. Number

| | |
|--------------|---|
| O2 | 1½ to 0 inches. Partially decayed leaves and twigs. |
| A11 12179 | 0 to 3½ inches. Very dark gray (10YR 3/1) silt loam; dark gray (10YR 4/1) dry; very fine weak granular; very friable; appears to be predominantly small fauna droppings other than earthworm casts; leached post-Farmdale loess; clear lower boundary. |
| A12 12180 | 3½ to 6 inches. Very dark grayish brown (10YR 3/2) silt loam; common mixing of very dark gray (10YR 3/1); dark grayish brown (10YR 4/2) dry; weak fine granular with slight tendency to platiness in spots; friable; sparse light gray silt grains apparent when dry; abundant small fauna droppings and common worm casts; clear lower boundary. |
| B21 12181 | 6 to 12 inches. Dark brown (10YR 3/3) silt loam; brown (10YR 3/4) ped interiors; moderate fine subangular blocky; friable; light gray silt grains in patches on peds prominent when dry; gradual lower boundary. |
| B22 12182 | 12 to 22 inches. Dark brown to brown (10YR 3/4) silt loam; brown (10YR 4/4) ped interiors; weak to moderate medium subangular blocky; friable; sparse worm casts; gradual lower boundary. |
| B3 12183 | 22 to 40 inches. Sampled 25 to 35 inches. Brown (10YR 3.5/4) silt loam; brown (10YR 4/4) crushed; very weak medium subangular blocky; friable; diffuse lower boundary. |
| C1 12184 | 40 to 52 inches. Brown (10YR 5/3) silt loam; sparse to common gray and yellow brown mottles; massive; friable; abrupt lower boundary. |
| C2 12185 | 52 to 70 inches. Sampled 60 to 70 inches. Brown (10YR 5/3) silt loam; common gray and yellow brown mottles; massive; friable; calcareous post-Farmdale loess. |

SOIL SURVEY LABORATORY Lincoln, Nebr. August 1961

SOIL TYPE Monona LOCATION Harrison County, Iowa
silt loam, acid variant

SOIL NOS. 859Iowa-43-5 LAB. NOS. 12186-12192

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|--------------|---------------------------------|--|-----------------------------|-----------------------|-------------------------|--|--|---|-------------------|---------------|--------------------------|---------------------|
| | | 3A1 | | | | | | | | | | |
| | | 1B1a | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | |
| 0-4 | A11 | <0.1 | 0.1a | 0.1a | 0.2 | 2.9 | 72.7 | 24.0 | 51.8 | 23.9 | - | sil |
| 4-8 | A12 | <0.1 | 0.1a | 0.1a | 0.3 | 3.7 | 71.0 | 24.8 | 51.9 | 23.0 | - | sil |
| 8-13 | B1 | <0.1 | 0.1a | 0.1a | 0.3 | 3.5 | 69.5 | 26.5 | 50.6 | 22.6 | - | sil/sicl |
| 13-21 | B2 | <0.1 | 0.1a | 0.1a | 0.4 | 3.5 | 69.5 | 26.4 | 49.6 | 23.6 | - | sil |
| 24-34 | B3 | 0.1a | 0.1a | 0.1a | 0.4 | 3.5 | 70.2 | 25.6 | 49.9 | 24.0 | - | sil |
| 34-48 | C1 | 0.1a | 0.1a | 0.2a | 0.5 | 3.0 | 72.6 | 23.5 | 51.1 | 24.8 | - | sil |
| 52-62 | C2 | 0.1b | 0.3b | 0.2b | 0.6c | 3.3c | 76.1 | 19.4 | 54.1 | 25.7 | - | sil |
| pH | | ORGANIC MATTER | | | | Free Iron | ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM @25°C. | 6E1a CaCO ₃ equiv- alent | MOISTURE TENSIONS | | | 4B2 15 ATMOS. |
| 8C1a | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITROGEN % | C/N | Fe ₂ O ₃ % 6C1a | | | 1/10 ATMOS. | 1/3 ATMOS. | | |
| 7.2 | | | 4.25 | 0.363 | 12 | 1.0 | | < 1 | | | 16.7 | |
| 6.2 | | | 1.51 | 0.135 | 11 | 1.2 | | | | | 11.0 | |
| 5.3 | | | 0.84 | 0.088 | 10 | 1.3 | | | | | 11.0 | |
| 5.8 | | | 0.50 | 0.053 | 9 | 1.4 | | | | | 10.8 | |
| 5.8 | | | 0.37 | 0.043 | 9 | 1.1 | | | | | 11.5 | |
| 6.4 | | | 0.32 | | | 1.0 | | | | | 11.3 | |
| 7.8 | | | 0.20 | | | 0.9 | | 10 | | | 10.3 | |
| 5A1a | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % NH ₄ OAc EXCH. | Base Sat. % on Sum Cations | Sum Ext. Bases | Sum Ext. Cations | Ca/Mg | MOISTURE AT SATURATION % | |
| | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | 5C1 | 5C3 | 5B1a | 5A3a | 8D3 | | |
| | milliequivalents per 100g. soil | | | | | | | | | | | |
| 30.7 | 29.3 | 3.5 | 3.4 | < 0.1 | 0.9 | 110 | 91 | 33.7 | 37.1 | 8.4 | | |
| 21.6 | 15.5 | 4.0 | 5.8 | < 0.1 | 0.7 | 94 | 78 | 20.2 | 26.0 | 3.9 | | |
| 18.9 | 12.2 | 3.8 | 6.5 | < 0.1 | 0.6 | 88 | 72 | 16.6 | 23.1 | 3.2 | | |
| 18.8 | 12.5 | 4.8 | 5.0 | < 0.1 | 0.6 | 95 | 78 | 17.9 | 22.9 | 2.6 | | |
| 19.6 | 12.6 | 5.6 | 4.3 | < 0.1 | 0.5 | 95 | 81 | 18.7 | 23.0 | 2.2 | | |
| 19.8 | 14.3 | 5.2 | 2.9 | 0.1 | 0.4 | 101 | 87 | 20.0 | 22.9 | 2.8 | | |
| 16.9 | | 4.5 | <0.1 | 0.1 | 0.4 | | | | | | | |

- a. Many Fe-Mn? concr.
- b. Many carbonate concr. CaCO₃?
- c. Few carbonate concr. CaCO₃?

Soil type: Monona silt loam, acid variant

Soil No.: S59Iowa-43-5

Location: 115 feet east and 430 feet north of the southwest corner of the SW¹/₄ of the SE¹/₄ of Sec. 18, T80N, R42W, Harrison County, Iowa.

Slope: 15 percent convex, west exposure, near base of slope.

Vegetation: Large elm and hackberry, no understory.

Geomorphic surface: Recent.

Collected by and date: G. H. Simonson, September 30, 1959.

Horizon and
Lincoln
Lab. Number

| | |
|--------------|---|
| O2 | 1½ to 0 inches. Partially decayed leaves and twigs. |
| A11 12186 | 0 to 4 inches. Black (10YR 2.5/1) silt loam; very dark gray (10YR 3.5/1) dry; fine granular; very friable; abundant worm casts and small fauna droppings; leached post-Farmdale loess; clear lower boundary. |
| A12 12187 | 4 to 8 inches. Very dark gray (10YR 3/1) silt loam; very dark grayish brown (10YR 3/2) crushed; dark gray (10YR 4.5/1) dry; moderate very fine subangular blocky breaking to fine granular; friable; common light gray silt particles apparent when dry; abundant worm and other small fauna casts; gradual lower boundary. |
| B1 12188 | 8 to 13 inches. Very dark grayish brown (10YR 3/2) silt loam; some mixing of very dark gray (10YR 3/1); moderate fine subangular blocky; friable; common patches of light gray silt grains prominent on ped surfaces when dry; abundant worm casts; gradual lower boundary. |
| B2 12189 | 13 to 22 inches. Brown (10YR 4/3) silt loam; brown (10YR 4/4) ped interiors; weak to moderate medium subangular blocky; friable; sparse light gray silt grains on peds; abundant worm casts; gradual lower boundary. (Sampled 13 to 21 inches.) |
| B3 12190 | 22 to 36 inches. Brown (10YR 4/4) silt loam; brown to yellowish brown (10YR 4.5/4) crushed; weak medium subangular blocky; friable; common worm casts; diffuse lower boundary. (Sampled 24 to 34 inches.) |
| C1 12191 | 36 to 48 inches. Brown to yellowish brown (10YR 5/3.5) silt loam; sparse to common yellowish brown and grayer mottles; massive; friable; sparse worm casts; abrupt lower boundary. (Sampled 38 to 48 inches.) |
| C2 12192 | 48 to 62 inches. Brown (10YR 5/3) silt loam; common yellow brown and grayer mottles; massive; friable; sparse worm casts; calcareous post-Farmdale loess. (Sampled 52 to 62 inches.) |

SOIL TYPE Monona LOCATION Harrison County, Iowa
silt loam

SOIL NOS. S59Iowa-43-6 LAB. NOS. 12382-12387

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------|---------|--|----------------------|-------------------------|------------------------|-----------------------------|--------------------|-----------------|----------|------------|-----|----------------|-----------------------------|
| | | 1B1a | | | | | | | | | | | 2A2 > 2 ($< 19\mu$) |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | 3A1 | | |
| 0-4 | A11 | <0.1 | <0.1 | 0.1 | 0.5 | 2.6 | 71.2 | 25.6 | 46.6 | 27.4 | - | s11 | |
| 4-8 | B1 | <0.1 | <0.1 | 0.1 | 0.3 | 2.6 | 71.5 | 25.5 | 45.2 | 29.1 | - | s11 | |
| 8-13 | B2 | <0.1 | <0.1 | 0.1 | 0.2 | 2.5 | 72.4 | 24.8 | 47.2 | 27.8 | - | s11 | |
| 13-19 | B3 | <0.1 | <0.1 | 0.1 | 0.2 | 2.4 | 74.4 | 22.9 | 47.2 | 29.7 | - | s11 | |
| 19-25 | C1 | <0.1 | <0.1 | 0.1 | 0.2 | 2.3 | 75.2 | 22.2 | 50.1 | 27.4 | - | s11 | |
| 36-48 | C2 | 0.3a | 0.2a | 0.1a | 0.4b | 2.7b | 76.8 | 19.5 | 51.0 | 28.7 | Tr. | s11 | |

| pH | ORGANIC MATTER | | | | Free Iron $Fe_2O_3\%$ | ELECTRICAL CONDUCTIVITY EC $\times 10^3$ MILLIMHOS PER CM 25°C. | 6E1a CaCO ₃ equiv- alent % | MOISTURE TENSIONS | | | | |
|-------------|------------------------|------|------------------|-------|--------------------------|--|--|-------------------|-----------------------------|----------------|---------------|--------------|
| | 6A1a ORGANIC CARBON | | 6B1a NITROGEN | | | | | 6C1a | GYPSUM me./100g. SOIL | 1/10 ATMOS. | 1/3 ATMOS. | 15 ATMOS. |
| | % | % | C/N | % | | | | | | | | |
| 8C1a 1:1 | 1.5 | 1:10 | | | | | | | | | | |
| 6.1 | | | 2.66 | 0.233 | 11 | 1.6 | | | | | | 13.4 |
| 6.1 | | | 1.88 | 0.169 | 11 | 1.6 | | | | | | 12.2 |
| 6.2 | | | 1.33 | 0.125 | 10 | 1.7 | | | | | | 11.3 |
| 6.4 | | | 0.96 | 0.096 | 10 | 1.7 | | | | | | 10.8 |
| 6.6 | | | 0.72 | 0.074 | 10 | 1.6 | < 1 | | | | | 10.4 |
| 7.9 | | | 0.23 | | | 1.5 | 12 | | | | | 10.3 |

| 5A1a CATION EXCHANGE CAPACITY NH ₄ OAc | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % NH ₄ OAc EXCH. | Base Sat. % on Sum Cations | Sum Ext. Bases | Sum Ext. Cations | Ca/Mg | MOISTURE AT SATURATION % |
|---|---------------------------------|------------|-----------|------------|-----------|--|-------------------------------|----------------|------------------|-------|--------------------------|
| | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a No | 6Q2a K | | | | | | |
| | milliequivalents per 100g. soil | | | | | | | | | | |
| 23.4 | 15.2 | 5.2 | 6.5 | <0.1 | 0.7 | 90 | 76 | 21.1 | 27.6 | 2.9 | |
| 22.8 | 14.1 | 5.2 | 6.7 | 0.1 | 0.4 | 87 | 75 | 19.8 | 26.5 | 2.7 | |
| 21.0 | 13.1 | 5.4 | 5.0 | 0.1 | 0.4 | 90 | 79 | 19.0 | 24.0 | 2.4 | |
| 19.4 | 12.8 | 5.4 | 4.1 | 0.1 | 0.4 | 96 | 82 | 18.7 | 22.8 | 2.4 | |
| 18.9 | 13.2 | 5.4 | 3.1 | 0.1 | 0.4 | 101 | 86 | 19.1 | 22.2 | 2.4 | |
| 16.9 | | 5.7 | <0.1 | 0.1 | 0.4 | | | | | | |

a. Many carbonate concn. CaCO₃?
b. Few carbonate concn. CaCO₃?

Soil type: Monona silt loam

Soil No.: S59Iowa-43-6

Location: 465 feet north and 320 feet west of the southeast corner of the SW¹/₄ of the SW¹/₄ of Sec. 7, T80N, R42W, Harrison County, Iowa.

Slope: 5 percent west-southwest exposure.

Site: The profile is in a virgin area on a moderately convex interfluvial summit near the break in gradient to a steep valley slope.

Vegetation: Bluegrass and buckbrush.

Geomorphic surface: Recent.

Collected by and date: G. H. Simonson and R. B. Daniels, October 19, 1959.

Horizon and

Lincoln

Lab. Number

- A11
12382 0 to 4 inches. Very dark brown (10YR 2.5/2) silt loam; very dark grayish brown (10YR 3/2) crushed; moderate fine granular; friable; abundant fine worm casts, mainly as individual pellets; abundant fine fibrous roots; noncalcareous post-Farmdale loess; gradual lower boundary.
- B1
12383 4 to 8 inches. Mixed very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) silt loam; dark brown (10YR 3/3) crushed; weak to moderate fine subangular blocky; friable; abundant worm casts, both in strings and individual pellets; abundant roots; gradual lower boundary.
- B2
12384 8 to 13 inches. Dark brown (10YR 3/3) silt loam; some mixing of very dark grayish brown (10YR 3/2); weak fine subangular blocky; friable; abundant distinct worm casts; common roots; gradual lower boundary.
- B3
12385 13 to 19 inches. Dark yellowish brown (10YR 3/4) silt loam; dark brown to brown (10YR 4/3) crushed; sparse mixing of very dark grayish brown and dark brown (10YR 3/2-3/3) worm casts; very weak medium subangular blocky breaking to very fine granular structure that appears to be mainly worm cast pellets; friable; abundant worm casts; common roots; clear lower boundary.
- C1
12386 19 to 25 inches. Dark brown to brown (10YR 4/3) silt loam; brown (10YR 4.5/3) crushed; massive but breaks to very fine individual worm cast pellets; very friable; abundant worm casts; abrupt lower boundary.
- C2
12387 25 to 48 inches (sampled 36 to 48 inches). Brown (10YR 4.5/3) silt loam; brown (10YR 5/3) crushed; massive; friable; common worm casts; sparse fine carbonate aggregates; calcareous post-Farmdale loess.

SOIL SURVEY LABORATORY Lincoln, Nebr. August 1961

SOIL TYPE Monona LOCATION Harrison County, Iowa
silt loam

SOIL NOS. 859Iowa-43-8 LAB. NOS. 12392-12396

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------------------|---------------------------------|--|------------------------|-------------------------|------------------------|----------------------------------|--|-----------------------------------|----------------------------|----------------|---------------------|-------------------------|-----|
| | | 1B1a | | | | | | | | | | | 2A2 |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 ($< 9\mu$) | | |
| 0-6 | A11 | <0.1 | <0.1 | 0.1 | 0.3 | 4.1 | 73.0 | 22.5 | 57.0 | 20.3 | - | s11 | |
| 6-11 | A12 | <0.1 | <0.1 | 0.1 | 0.3 | 3.8 | 74.1 | 21.7 | 54.6 | 23.5 | Tr. | s11 | |
| 11-19 | B1 | <0.1 | 0.1a | 0.1a | 0.6a | 3.7a | 75.2 | 20.3 | 54.3 | 24.9 | Tr. | s11 | |
| 19-29 | C1 | <0.1 | 0.1b | 0.2b | 0.6a | 3.5a | 76.6 | 19.0 | 55.4 | 25.0 | Tr. | s11 | |
| 29-40 | C2 | <0.1 | 0.1b | 0.1b | 0.5a | 3.3a | 79.5 | 16.5 | 56.3 | 26.7 | Tr. | s11 | |
| pH | | ORGANIC MATTER | | | | Free Iron | ELECTRI-CAL CONDUCTIVITY EC=10 ³ MILLIMHUS PER 2.5 CM | 6E1a | MOISTURE TENSIONS | | | | |
| 8C1a | 1:5 | 1:10 | 6A1a ORGANIC CARBON | 6E1a NITRO-GEN | C/N | Fe ₂ O ₃ % | | CaCO ₃ equiv- alent | GYPSUM mg./100g SOIL | 1/10 ATMOS. | 1/3 ATMOS. | 4B2 15 ATMOS. | |
| 1:1 | | | % | % | | 6C1a | | % | | % | % | % | |
| 7.4 | | | 2.14 | 0.192 | 11 | 1.3 | | < 1 | | | | 12.1 | |
| 7.7 | | | 1.75 | 0.161 | 11 | 1.3 | | < 1 | | | | 11.0 | |
| 7.9 | | | 1.33 | 0.129 | 10 | 1.2 | | 5 | | | | 10.9 | |
| 8.0 | | | 0.78 | 0.078 | 10 | 1.0 | | 11 | | | | 9.6 | |
| 8.0 | | | 0.33 | | | 0.7 | | 11 | | | | 8.5 | |
| 5A1a | EXTRACTABLE CATIONS | | | | | 5B1a | BASE SAT. % | Base Sat. % | Sum Ext. | Sum Ext. | Ca/Mg | MOISTURE AT SATU-RATION | |
| CATION EXCHANGE CAPACITY | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | | NEP.OAc EXCH. | on Sum Cations | Bases | Cat-ions | | % | |
| NEP.OAc | Ca | Mg | H | No | K | | | | | | | | |
| | milliequivalents per 100g. soil | | | | | 5C1 | 5C3 | 5B1a | 5A3a | 8D3 | | | |
| 22.4 | 18.0 | 6.2 | 1.7 | <0.1 | 0.6 | 111 | 94 | 24.8 | 26.5 | 2.9 | | | |
| 21.3 | 17.6 | 6.0 | 1.7 | <0.1 | 0.5 | 113 | 93 | 24.1 | 25.8 | 2.9 | | | |
| 17.9 | | 5.4 | <0.1 | <0.1 | 0.5 | | | | | | | | |
| 15.4 | | 5.3 | <0.1 | <0.1 | 0.4 | | | | | | | | |
| 14.2 | | 5.6 | <0.1 | 0.1 | 0.4 | | | | | | | | |

- a. Few carbonate concn. CaCO₃?
- b. Common carbonate concn. CaCO₃?

Soil type: Monona silt loam

Soil No.: 859Iowa-43-8

Location: 460 feet north and 632 feet west of the southeast corner of the SW1/4 of the SW1/4 of Sec. 7, T30N, R42W, Harrison County, Iowa.

Slope: 18 percent west exposure, slightly convex.

Site: Lower third of valley slope, just below the break in gradient to the "catstepped" steeper upper slope.

Vegetation: Tall native grasses, mainly big bluestem; profile site is on the boundary to an area of young timber just downslope.

Geomorphic surface: Recent.

Collected by and date: G. H. Simonson and R. B. Daniels, October 20, 1959.

Horizon and

Lincoln

Lab. Number

- A11 0 to 6 inches. Very dark grayish brown (10YR 3/2) silt loam, very dark grayish brown (10YR 3/2) crushed; weak fine subangular blocky breaking to moderate fine granular; friable; common worm casts; noncalcareous post-Farmdale loess; gradual lower boundary.
- 12392
- A12 6 to 11 inches. Very dark grayish brown (10YR 3/2) silt loam, very dark grayish brown (10YR 3.5/2) crushed; weak fine subangular blocky breaking to granular; friable; common worm casts; abrupt wavy boundary.
- 12393
- B1 11 to 19 inches. Very dark to dark grayish brown (10YR 3.5/2) silt loam; common very dark grayish brown (10YR 3/2) worm casts; weak medium subangular blocky; very friable; abundant worm casts; calcareous; gradual lower boundary.
- 12394
- C1 19 to 29 inches. Grayish brown to brown (10YR 5/2.5) silt loam; weak medium subangular blocky breaking to fine granular; very friable; abundant worm casts; calcareous; diffuse lower boundary.
- 12395
- C2 29 to 40 inches. Brown (10YR 5/3) silt loam; very weak medium subangular blocky grading to massive with depth; very friable; crumbles easily due to common worm cast pellets; calcareous post-Farmdale loess.
- 12396

SOIL TYPE Miscatline LOCATION Benton County, Iowa
silty clay loam

SOIL NOS. S60Iowa-6-1-(1-15) LAB. NOS. 14179-14193

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--|---------------------------------|--|-------------|-------------|-----------|----------------|----------------------------|--------------|---------------|---------------|---------------|----------------|------|
| | | 1A1a | | 3A1 | | | | | | 2A2 | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | > 2 (19mm) | | |
| | | 2.1 | 1.0-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.20-0.02 | 0.02-0.002 | | | |
| 0-7 | A1 | - | 0.4 | 0.3 | 0.4 | 1.2 | 67.6 | 30.1 | 32.8 | 36.2 | - | | |
| 7-11 | A12 | 0.1 | 0.3 | 0.3 | 0.4 | 1.1 | 63.1 | 34.7 | 30.2 | 34.2 | - | | |
| 11-18 | A3 | - | 0.3 | 0.3 | 0.4 | 1.1 | 62.7 | 35.2 | 30.6 | 33.4 | - | | |
| 18-22 | B1 | 0.1 | 0.5 | 0.3 | 0.4 | 1.1 | 62.8 | 34.8 | 30.8 | 33.3 | - | | |
| 22-29 | B21 | 0.1 | 0.5 | 0.2 | 0.4 | 1.4 | 61.9 | 35.5 | 32.5 | 31.0 | - | | |
| 29-35 | B22 | 0.2 | 0.6 | 0.3 | 0.4 | 1.9 | 63.1 | 33.5 | 35.9 | 29.3 | - | | |
| 35-41 | B23 | 0.1 | 0.3 | 0.2 | 0.4 | 2.8 | 64.2 | 32.0 | 39.8 | 27.4 | - | | |
| 41-46 | B3 | - | 0.1 | 0.2 | 0.4 | 2.5 | 66.9 | 29.9 | 40.1 | 29.5 | - | | |
| 46-52 | C1 | - | - | 0.1 | 0.2 | 2.5 | 70.9 | 26.3 | 45.5 | 28.0 | - | | |
| 52-58 | C2 | - | 0.1 | 0.1 | 0.2 | 3.7 | 70.3 | 25.3 | 46.8 | 27.5 | - | | |
| 58-66 | C3 | - | 0.1 | 0.2 | 0.5 | 4.0 | 70.4 | 24.8 | 46.1 | 28.6 | - | | |
| 66-72 | C4 | - | - | 0.1 | 0.4 | 3.3 | 71.6 | 24.6 | 44.7 | 30.4 | - | | |
| 72-78 | C5 | 0.3 | 1.0 | 1.3 | 2.4 | 3.7 | 69.5 | 21.8 | 48.6 | 25.7 | - | | |
| 78-84 | IID1 | 4.5 | 10.4 | 11.5 | 19.8 | 9.0 | 28.3 | 16.5 | 32.2 | 13.9 | 9 | | |
| 84-98 | IID2 | 2.2 | 6.2 | 8.5 | 29.8 | 17.2 | 23.8 | 12.3 | 47.2 | 10.2 | 2 | | |
| 8C1a | 6C1a | ORGANIC MATTER | | | | | | Bulk Density | | | Moist. Reten. | | |
| pH | Ext. Iron as Fe | 6A1a | | 6B1a | | Field Moist | | 30 Cm. | | O.D. | | 1/3 | |
| | | ORGANIC CARBON | NITRO-GEN | C/N | 4B4 | 4A1a | 4B3 | 4A1c | 4A1b | ATMOS. Pieces | 15 | | |
| | % | % | % | % | % | g/cc | % | g/cc | g/cc | % | ATMOS. Sieved | % | |
| 6.0 | 0.9 | 3.20 | 0.250 | 13 | 24.6 | 1.38 | 29.0 | 1.35 | 1.50 | | 14.4 | | |
| 5.4 | 0.8 | 3.13 | 0.240 | 13 | | | | | | | 16.0 | | |
| 5.4 | 0.9 | 2.44 | 0.201 | 12 | 31.8 | 1.25 | 34.2 | 1.24 | 1.36 | | 16.0 | | |
| 5.2 | 1.0 | 1.69 | 0.143 | 12 | 29.9 | 1.26 | 32.0 | 1.26 | 1.39 | | 15.6 | | |
| 5.3 | 1.0 | 1.16 | 0.107 | 11 | 28.0 | 1.31 | 29.4 | 1.31 | 1.46 | | 15.7 | | |
| 5.6 | 1.0 | 0.66 | | | 24.9 | 1.34 | 27.6 | 1.32 | 1.50 | | 15.2 | | |
| 6.5 | 1.0 | 0.41 | | | 22.8 | 1.38 | 26.8 | 1.36 | 1.53 | | 14.8 | | |
| 6.8 | 1.1 | 0.30 | | | 24.4 | 1.41 | 27.4 | 1.38 | 1.59 | | 14.4 | | |
| 7.1 | 1.0 | 0.20 | | | | | | | | | 12.5 | | |
| 7.3 | 1.1 | 0.14 | | | 29.1 | 1.42 | 29.1 | 1.42 | 1.58 | | 12.5 | | |
| 7.6 | 1.0 | 0.12 | | | | | | | | | 12.7 | | |
| 7.6 | 1.0 | 0.10 | | | 30.8 | 1.42 | 29.4 | 1.42 | 1.54 | 23.6 | 12.2 | | |
| 7.5 | 1.0 | 0.12 | | | | | | | | | 10.7 | | |
| 7.5 | 2.1 | 0.03 | | | | | | | | | 7.1 | | |
| 7.5 | 0.5 | 0.02 | | | | | | | | | 4.9 | | |
| 5A1a | EXTRACTABLE CATIONS | | | | | | Base Sat. | | 8B1 | 8D3 | Carbonate | | 8E1a |
| CATION EXCHANGE CAPACITY NH ₄ OAc | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | 5A3a Sum | 5C1 on NH ₄ OAc | 5C3 on Sum | Ratio to Clay | Ca/Mg | <2-mm. | Clay | |
| | Co | Mg | H | Na | K | | CBC % | % | CBC | | % | % | |
| | milliequivalents per 100g. soil | | | | | | | | | | | | |
| 26.5 | 20.8 | 4.4 | 10.7 | 0.1 | 0.3 | 36.3 | 97 | 70 | .88 | 4.7 | | | |
| 27.7 | 17.5 | 4.9 | 14.6 | 0.1 | 0.3 | 37.4 | 82 | 61 | .80 | 3.6 | | | |
| 27.2 | 16.0 | 5.5 | 14.1 | 0.1 | 0.4 | 36.1 | 81 | 61 | .77 | 2.9 | | | |
| 25.9 | 14.4 | 7.0 | 12.9 | 0.1 | 0.4 | 34.8 | 84 | 63 | .74 | 2.0 | | | |
| 25.3 | 14.8 | 7.4 | 10.6 | 0.1 | 0.4 | 33.3 | 90 | 68 | .71 | 2.0 | | | |
| 25.5 | 16.0 | 8.5 | 7.4 | 0.1 | 0.5 | 32.5 | 98 | 77 | .76 | 1.9 | | | |
| 24.2 | 16.0 | 8.7 | 4.6 | 0.1 | 0.4 | 29.8 | 104 | 84 | .76 | 1.8 | | | |
| 22.7 | 15.8 | 8.5 | 2.9 | 0.1 | 0.4 | 27.7 | 109 | 90 | .76 | 1.8 | | | |
| 20.1 | 14.4 | 8.0 | 2.1 | 0.1 | 0.4 | 25.0 | 114 | 92 | .76 | 1.8 | | | |
| 19.6 | | | | 0.1 | 0.4 | | | | .77 | | | | |
| 19.6 | | | | 0.1 | 0.4 | | | | .79 | | 2 | tr. | |
| 20.0 | | | | 0.1 | 0.4 | | | | .81 | | 5 | tr. | |
| 17.4 | | | | 0.1 | 0.4 | | | | .80 | | 7 | tr. | |
| 9.5 | | | | 0.1 | 0.2 | | | | .58 | | 2 | tr. | |
| 7.4 | | | | tr. | 0.2 | | | | .60 | | tr. | | |

a. 26 kg/M² to 60 inches

Soil type: Muscatine silty clay loam
 Soil No.: 860Iowa-6-1-(1-15)
 Location: 476 feet north and 90 feet east of SW corner of SE1/4 SW1/4 Sec. 7, T85N, R12W, Benton County, Iowa.
 Vegetation: Small grain stubble. Parent material: Wisconsin loess.
 Physiographic position: Upland on convex south-facing slope near the top of an east-west ridge.
 Slope: About 1-1/2 percent. Drainage: Imperfectly drained.
 Permeability: Moderate. Ground water: None within 98 inches.
 Moisture: Moist.
 Described by: R. I. Turner, October 13, 1960.

Horizon and
 Lincoln Lab. No.

- A1
 14179 0 to 7 inches. Black (N 2/ to 10YR 2/1)¹ light silty clay loam; cloddy, breaking to moderate fine granular structure; slightly firm; gradual boundary.
- A12
 14180 7 to 11 inches. Black (N 2/) light silty clay loam; weak fine subangular blocky structure breaking to moderate fine and very fine granules; friable; numerous earthworm casts; gradual boundary.
- A3
 14181 11 to 18 inches. Black (10YR 2/1) to very dark gray (10YR 3/1) light silty clay loam; moderate fine and very fine subangular blocky and moderate fine granular structure; slightly firm; gradual boundary.
- B1
 14182 18 to 22 inches. Very dark gray (10YR 3/1) medium silty clay loam; moderately fine and very fine subangular blocky structure; friable; few fine faint very dark grayish brown (10YR 3/2) mottles; common fine tubular inped pores; a few small dark oxide concretions; gradual boundary.
- B21
 14183 22 to 29 inches. Very dark gray (10YR 3/1) to dark gray (10YR 4/1) medium silty clay loam; moderate fine and very fine subangular blocky structure; slightly firm; common fine faint dark grayish brown (10YR 4/2) mottles; common fine tubular inped pores; a few thin discontinuous clay films on vertical ped surfaces; common small dark hard oxide concretions; gradual boundary.
- B22
 14184 29 to 35 inches. Dark grayish brown (2.5Y 4/2) medium silty clay loam; weak medium prismatic structure breaking to moderate fine subangular blocks; slightly firm; few fine faint dark gray (10YR 4/1), a few fine distinct yellowish brown (10YR 5/6), and common fine distinct olive brown (2.5Y 4/4) to light olive brown (2.5Y 5/4) mottles; common fine tubular inped pores; a few thin discontinuous clay films; common small dark hard oxide concretions; gradual boundary.
- B23
 14185 35 to 41 inches. Dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) to light olive brown (2.5Y 5/4) medium silty clay loam; weak medium prismatic structure breaking to weak medium subangular blocks; slightly firm; dark grayish brown (2.5Y 4/2) ped exteriors with a few fine distinct dark gray (10YR 4/1) mottles; grayish brown (2.5Y 5/2) to light olive brown (2.5Y 5/4) ped interiors with yellowish brown (10YR 5/6) mottles; common fine tubular inped pores; a few dark gray distinct clay films on peds and in root channels; common small dark hard oxide concretions; gradual boundary.
- B3
 14186 41 to 46 inches. Grayish brown (2.5Y 5/2), light brownish gray (2.5Y 6/2), and yellowish brown (10YR 5/6) light silty clay loam; weak medium prismatic structure breaking to very weak coarse subangular blocks; friable; grayish brown (2.5Y 5/2) ped exteriors; light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6) ped interiors; abundant fine tubular inped pores; some thin clay films on ped faces and in root channels; many medium dark soft oxide concretions; gradual boundary.
- C1
 14187 46 to 52 inches. Mixed light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6) heavy silt loam; massive with distinct vertical cleavage; friable; grayish brown (2.5Y 5/2) on cleavage surfaces; abundant fine tubular inped pores; a few root channels filled with dark gray clay flows; many medium dark soft oxide concretions; gradual boundary.
- C2
 14188 52 to 58 inches. Same as above.
- C3
 14189 58 to 66 inches. Mixed grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) heavy silt loam; massive with some vertical cleavage; friable; abundant fine tubular inped pores; a few root channels filled with dark gray clay flows; common medium dark soft oxide concretions; gradual boundary.
- C4
 14190 66 to 72 inches. Same as above.
- C5
 14191 72 to 78 inches. Mixed grayish brown (2.5Y 5/2) to light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/4) silt loam; massive; abundant fine tubular inped pores; a very few clay fills in root channels; common medium soft dark oxide concretions; abrupt boundary.
- IID1
 14192 78 to 84 inches. Strong brown (7.5YR 5/6) heavy sandy loam; massive; friable; few fine faint yellowish brown mottles; a concentration of stones in upper 2 inches of this horizon; clear boundary.
- IID2
 14193 84 to 98 inches. Brownish yellow (10YR 6/4) stratified sand and silt; massive; very friable; there are several 1/2-inch thick bands of sandy loam slightly cemented and strong brown in color within this layer.

Notes: Very dark gray (10YR 3/1) krotovinas about 3 inches in diameter from 52 to 58 inches. A few clear uncoated quartz grains are present on ped surfaces from 0 to 29 inches. Roots plentiful 0 to 11 inches, common from 11 to 22, few from 22 to 41, and nearly absent from 41 to 98 inches. The 7.5YR 5/6 sandy loam portion might qualify as a "Beta" horizon. This profile may be a little darker than modal in the B horizon. Horizons A1p, E21, and C1 were sampled for the Bureau of Public Roads.

^{1/} Munsell colors for moist soil.

SOIL TYPE Muscatine LOCATION Grundy County, Iowa
 silty clay loam

SOIL NOS. 860Iowa-38-1-(1-11) LAB. NOS. 14168-14178

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|-----------------------------------|---------------------------------|--|----------------------|-------------------------|------------------------|-----------------------------|----------------------------|--------------------|---------------------------|--------------------------------|--------------------|----------------|-----|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 (19mm) | | |
| 0-7 | A1p | 0.3 | 0.4 | 0.4 | 0.5 | 1.4 | 64.2 | 32.8 | 30.4 | 35.4 | - | | |
| 7-14 | A12 | 0.1 | 0.4 | 0.3 | 0.5 | 1.3 | 62.8 | 34.6 | 29.9 | 34.4 | - | | |
| 14-18 | A3 | 0.1 | 0.6 | 0.4 | 0.5 | 1.4 | 61.7 | 35.3 | 30.2 | 33.1 | - | | |
| 18-23 | B1 | 0.1 | 0.6 | 0.3 | 0.4 | 1.6 | 60.8 | 36.2 | 31.8 | 30.8 | - | | |
| 23-30 | B21 | 0.2 | 0.6 | 0.2 | 0.4 | 2.1 | 61.7 | 34.8 | 34.9 | 29.1 | - | | |
| 30-35 | B22 | - | 0.2 | 0.2 | 0.5 | 3.0 | 63.3 | 32.8 | 38.9 | 27.7 | - | | |
| 35-41 | B31 | - | - | 0.1 | 0.4 | 4.6 | 63.8 | 31.1 | 42.3 | 26.3 | - | | |
| 41-47 | B32 | - | - | 0.1 | 0.5 | 4.8 | 64.2 | 30.4 | 40.4 | 28.9 | - | | |
| 47-53 | B3C1 | - | - | 0.1 | 0.3 | 4.1 | 67.1 | 28.4 | 41.9 | 29.5 | tr. | | |
| 53-60 | C2 | - | 0.1 | 0.2 | 0.5 | 4.0 | 71.0 | 24.2 | 46.1 | 29.2 | tr. | | |
| 60-70 | C3 | - | 0.2 | 0.1 | 0.4 | 3.5 | 73.7 | 22.1 | 46.9 | 30.5 | tr. | | |
| 8C1a | 5C1a | ORGANIC MATTER | | | | | Bulk Density | | | | Moist. Reten. | | |
| pH | Ext. Iron as Fe % | 6A1a | 6B1a | C/N | Field Moist | | 30 Cn. | | O.D. | 1/3 | 4B2 | | |
| | | ORGANIC CARBON % | NITROGEN % | | 4B4 % M. | 4A1a g/cc | 4B3 % M. | 4A1c g/cc | 4A1b g/cc | ATMOS. Pieces | 15 ATMOS. Sieved % | | |
| 6.1 | 0.9 | 3.46 | 0.270 | 13 | 25.5 | 1.35 | 31.5 | 1.30 | 1.48 | 15.5 | | | |
| 5.7 | 0.9 | 2.44 | 0.196 | 12 | 29.6 | 1.28 | 30.8 | 1.28 | 1.41 | 15.0 | | | |
| 5.6 | 1.0 | 1.72 | 0.142 | 12 | 26.8 | 1.32 | 28.3 | 1.32 | 1.50 | 14.6 | | | |
| 5.6 | 1.0 | 1.04 | 0.100 | 10 | 25.2 | 1.33 | 28.0 | 1.31 | 1.50 | 15.6 | | | |
| 5.9 | 1.0 | 0.61 | 0.062 | 10 | 22.4 | 1.40 | 26.6 | 1.37 | 1.54 | 15.7 | | | |
| 6.4 | 1.0 | 0.44 | | | 26.9 | 1.45 | 27.1 | 1.45 | 1.64 | 15.1 | | | |
| 6.7 | 1.2 | 0.31 | | | | | | | | 14.4 | | | |
| 7.1 | 1.0 | 0.20 | | | | | | | | 14.4 | | | |
| 7.5 | 0.8 | 0.16 | | | | | | | | 13.8 | | | |
| 7.7 | 1.0 | 0.11 | | | | | | | | 11.8 | | | |
| 7.7 | 0.8 | 0.12 | | | 24.0 | 1.57 | 25.9 | 1.53 | 1.66 | 10.8 | | | |
| 5A1a | EXTRACTABLE CATIONS 5B1a | | | | | Base Sat. | | 8D1 | 8D3 | Carbonate as CaCO ₃ | | | |
| CATION EXCHANGE CAPACITY MEQ, OAc | 6N2b Co | 6O2b Mg | 6H1a H | 6P2a No | 6Q2a K | 5A3a Sum | 5C1 on NH ₄ OAc | 5C3 on Sum to Clay | Ratio NH ₄ OAc | Ca/Mg | 6E1c | | |
| | milliequivalents per 100g. soil | | | | | | CEC % | % | CEC | % | Clay % | | |
| 28.3 | 20.4 | 7.1 | 8.9 | 0.1 | 0.4 | 36.9 | 99 | 76 | .86 | 2.9 | | | |
| 24.8 | 17.6 | 5.7 | 10.0 | 0.1 | 0.4 | 33.8 | 96 | 70 | .72 | 3.1 | | | |
| 26.5 | 16.9 | 5.8 | 10.0 | 0.1 | 0.4 | 33.2 | 88 | 70 | .75 | 2.9 | | | |
| 26.2 | 18.1 | 6.9 | 8.6 | 0.1 | 0.4 | 34.1 | 97 | 75 | .72 | 2.6 | | | |
| 26.4 | 19.1 | 7.1 | 6.5 | 0.1 | 0.5 | 33.3 | 102 | 80 | .76 | 2.7 | | | |
| 25.6 | 18.9 | 7.4 | 4.3 | 0.1 | 0.5 | 31.2 | 105 | 86 | .78 | 2.6 | | | |
| 23.2 | 18.2 | 6.9 | 3.1 | 0.1 | 0.4 | 28.7 | 110 | 89 | .74 | 2.6 | | | |
| 23.1 | 18.4 | 7.4 | 1.9 | 0.1 | 0.4 | 28.2 | 114 | 93 | .76 | 2.5 | | | |
| 21.5 | | | | 0.1 | 0.4 | | | | .76 | | | | |
| 17.7 | | | | 0.1 | 0.4 | | | | .73 | | | | |
| 16.3 | | | | 0.1 | 0.4 | | | | .74 | | | | |

a. 21 kg/M² to 60 inches.

Soil type: Muscatine silty clay loam
 Soil No.: 860Iowa-38-1-(1-11)
 Location: 130 feet south and 126 feet west of NE corner of NW1/4 SW1/4 NE1/4 Sec. 20, T87N, R17W, Grundy Co., Iowa.
 Vegetation: Meadow. Parent material: Wisconsin loess.
 Physiographic position: Nearly level upland on a very slightly convex east-facing slope.
 Slope: About 1 percent. Drainage: Imperfectly drained.
 Permeability: Moderate. Ground water: None within 70 inches.
 Moisture: Moist.

Described by: D. F. Glusker and R. L. Buckner, October 13, 1960.

Horizon and
 Lincoln Lab. No.

- Alp
 14168 0 to 7 inches. Black (10YR 2/1)¹ light silty clay loam; cloddy, breaking to weak fine subangular blocky structure and then to weak fine granules; slightly firm; gradual boundary.
- A12
 14169 7 to 14 inches. Black (10YR 2/1) light silty clay loam; moderate fine granular structure; friable; gradual boundary.
- A3
 14170 14 to 18 inches. Black (10YR 2/1) light silty clay loam; moderate very fine and fine subangular blocky structure; friable; few fine distinct very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2 to 2.5Y 4/2) worm casts and mixings; kneaded color very dark gray (10YR 3/1); gradual boundary.
- B1
 14171 18 to 23 inches. Mixed very dark gray (10YR 3/1) and dark grayish brown (10YR 4/2 to 2.5Y 4/2) medium silty clay loam; moderate fine and very fine subangular blocky structure; friable; kneaded color very dark grayish brown (10YR 3/2); common fine tubular pores in peds; gradual boundary.
- B21
 14172 23 to 30 inches. Dark grayish brown (10YR 4/2 to 2.5Y 4/2) and olive brown (2.5Y 4/4) medium silty clay loam; moderate fine and very fine subangular blocky structure; friable; dark grayish brown (10YR 4/2 to 2.5Y 4/2) on ped surfaces, olive brown (2.5Y 4/4) inside peds; a few very dark gray (10YR 3/1) worm casts and mixings from rodents; kneaded color olive brown (2.5Y 4/4); common fine tubular pores in peds; a few fine iron-manganese concretions; a few distinct patchy clay films on vertical ped surfaces; gradual boundary.
- B22
 14173 30 to 35 inches. Dark grayish brown (10YR 4/2 to 2.5Y 4/2) and grayish brown (2.5Y 5/2) to light olive brown (2.5Y 5/4) light to medium silty clay loam; weak to moderate fine subangular blocky structure; friable; dark grayish brown (10YR 4/2 to 2.5Y 4/2) on ped surfaces; grayish brown (2.5Y 5/2) to light olive brown (2.5Y 5/4) with a very few fine faint yellowish brown (10YR 5/6) mottles inside peds; common fine tubular pores in peds; a few faint patchy clay films; gradual boundary.
- B31
 14174 35 to 41 inches. Grayish brown (2.5Y 5/2) and dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2) weak medium subangular blocky structure; friable; dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2) with common fine faint dark brown (10YR 4/3) and a few fine faint yellowish brown (10YR 5/6) mottles on ped faces; grayish brown (2.5Y 5/2) with common fine distinct yellowish brown (10YR 5/6) and a few fine distinct strong brown (7.5Y 5/6) mottles inside peds; common fine tubular pores in peds; a very few faint dark gray (10YR 4/1) clay accumulations as streaks on ped faces; common fine soft iron-manganese concretions; gradual boundary.
- B32
 14175 41 to 47 inches. Grayish brown (2.5Y 5/2) light silty clay loam; weak medium prismatic structure breaking to weak medium subangular blocks; friable; grayish brown (2.5Y 5/2) with common fine faint brown (10YR 5/3) mottles on ped surfaces; grayish brown (2.5Y 5/2) with common fine distinct yellowish brown (10YR 5/6) and a few fine distinct strong brown (7.5Y 5/6) mottles inside peds; common fine tubular pores in peds; a few fine soft iron-manganese concretions; gradual boundary.
- B3C1
 14176 47 to 53 inches. Grayish brown (2.5Y 5/2) silt loam; weak coarse prismatic structure; friable; grayish brown (2.5Y 5/2) with common fine distinct yellowish brown (10YR 5/6) and a very few fine and medium distinct strong brown (7.5Y 5/8) mottles inside prisms; grayish brown (2.5Y 5/2) on prism surfaces; common fine tubular pores in peds; a few fine distinct iron-manganese concretions; weakly calcareous; gradual boundary.
- C2
 14177 53 to 60 inches. Light brownish gray (2.5Y 6/2) silt loam; massive; friable; many fine to medium prominent yellowish brown (10YR 5/6) and a few fine distinct strong brown (7.5Y 5/8) mottles; common very fine pores; a few soft iron-manganese concretions; a few soft very pale brown (10YR 8/3) lime concretions; calcareous; gradual boundary.
- C3
 14178 60 to 70 inches. Light brownish gray (2.5Y 6/2) silt loam; massive; friable; many fine to medium prominent yellowish brown (10YR 5/6) and a few medium distinct yellowish red (5YR 4/8) mottles; common very fine tubular pores; a few fine soft iron-manganese concretions; a very few soft very pale brown (10YR 8/3) lime concretions in upper part; calcareous.

Notes: Roots are plentiful from 0 to 14 inches, common from 14 to 23, few from 23 to 41, and very few from 41 to 70 inches. A few clear uncoated quartz grains are on ped surfaces from 0 to 23 inches. The loess thickness is greater than 120 inches and depth to carbonates is 80 inches at a point about 100 feet southwest of sample site. Loess thickness at sample site is considered to be about the same. Horizons Alp, B21, and C2 were sampled for the Bureau of Public Roads.

¹/ Munsell colors for moist soil.

SOIL SURVEY LABORATORY Lincoln, Nebr. October 1959

SOIL TYPE Napier LOCATION Harrison County, Iowa
silt loam

SOIL NOS. 858Iowa-43-6 LAB. NOS. 9593-9599

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------|---------|--|----------------------|-------------------------|------------------------|-----------------------------|--------------------|-----------------|----------|------------|---|----------------|------------|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 > 2 |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | | | |
| 0-7 | A11 | <0.1 | <0.1 | <0.1 | <0.1 | 2.7a | 74.2 | 23.1 | 53.4 | 23.5 | - | sil | |
| 7-18 | A12 | <0.1 | 0.1b | <0.1 | 0.2a | 3.0a | 73.3 | 23.4 | 54.2 | 22.2 | - | sil | |
| 18-29 | B1 | <0.1 | <0.1 | <0.1 | 0.2a | 2.6a | 72.7 | 24.5 | 51.8 | 23.7 | - | sil | |
| 29-37 | B2 | <0.1 | <0.1 | <0.1 | <0.1 | 2.7a | 73.0 | 24.3 | 52.5 | 23.2 | - | sil | |
| 37-53 | B3 | 0.1b | <0.1 | <0.1 | 0.1a | 2.4a | 73.6 | 23.8 | 52.3 | 23.8 | - | sil | |
| 53-63 | C1 | 0.1b | <0.1 | <0.1 | <0.1 | 2.6a | 74.6 | 22.7 | 53.7 | 23.5 | - | sil | |
| 63-73 | C2 | 0.1b | 0.1b | <0.1 | 0.2a | 2.7a | 75.5 | 21.4 | 54.1 | 24.2 | - | sil | |

| 8C1a | pH | | ORGANIC MATTER | | | Free Iron Fe ₂ O ₃ % 6C1a | ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM | 6E1a CoCO ₃ equiv- alent | GYPSUM mg./100g. SOIL | MOISTURE TENSIONS | | |
|------|-----|------|------------------------|------------------|------|---|---|---|-----------------------------|-------------------|---------------|--------------|
| | 1:5 | 1:10 | 6A1a ORGANIC CARBON | 6B1a NITROGEN | C/N | | | | | 1/10 ATMOS. | 1/3 ATMOS. | 15 ATMOS. |
| | | | % | % | | | | | | % | % | % |
| 6.6 | | | 3.35 | 0.297 | 11.3 | 1.1 | Δ | | | | 14.1 | |
| 7.0 | | | 1.55 | 0.140 | 11.1 | 1.2 | Δ | | | | 10.9 | |
| 7.1 | | | 1.40 | 0.129 | 10.8 | 1.3 | Δ | | | | 11.1 | |
| 7.1 | | | 1.14 | | | 1.3 | Δ | | | | 11.3 | |
| 7.2 | | | 0.87 | | | 1.4 | Δ | | | | 11.1 | |
| 6.9 | | | 0.62 | | | 1.3 | Δ | | | | 10.5 | |
| 6.3 | | | 0.45 | | | 1.3 | | | | | 10.2 | |

| 5A1a CATION EXCHANGE CAPACITY NH ₄ Ac | EXTRACTABLE CATIONS | | | | | 5B1a BASE SAT. NH ₄ Ac EXCH. | 5C3 Base Sat. % on Sum Cations | 5B1a Sum Bases | 5A3a Sum Cations | 8D3 Ca/Mg | MOISTURE AT SATURATION % |
|--|---------------------------------|------------|-----------|------------|-----------|--|--------------------------------------|-------------------|---------------------|--------------|--------------------------|
| | 6N2b Ca | 6O2b Mg | 6F1a H | 6P2a No | 6Q2a K | | | | | | |
| | milliequivalents per 100g. soil | | | | | | | | | | |
| 27.6 | 24.8 | 3.4 | 5.0 | <0.1 | 0.6 | 104 | 85 | 28.8 | 33.8 | 7.3 | |
| 21.4 | 17.9 | 3.8 | 4.5 | <0.1 | 0.5 | 104 | 83 | 22.2 | 26.7 | 4.7 | |
| 20.8 | 15.6 | 5.2 | 4.5 | <0.1 | 0.5 | 102 | 82 | 21.3 | 25.8 | 3.0 | |
| 19.5 | 14.1 | 6.0 | 3.7 | 0.1 | 0.4 | 106 | 85 | 20.6 | 24.3 | 2.4 | |
| 19.1 | 13.5 | 5.7 | 3.7 | 0.1 | 0.4 | 103 | 84 | 19.7 | 23.4 | 2.4 | |
| 18.3 | 13.1 | 5.3 | 3.3 | 0.1 | 0.4 | 103 | 85 | 18.9 | 22.2 | 2.5 | |
| 17.9 | 12.5 | 4.4 | 3.3 | 0.1 | 0.4 | 97 | 84 | 17.4 | 20.7 | 2.8 | |

a. Trace smooth dark brown to black concr. (Fe-Mn?)
b. Many smooth dark brown to black concr. (Fe-Mn?)

Soil type: Napier silt loam

Soil No.: 858Iowa-43-6

Location: 425 feet east and 635 feet north of the southwest corner of the SW1/4 of the NW1/4 of Sec. 18, T80N, R42W, Harrison County, Iowa.

Slope: 7 percent concave upward.

Vegetation: Timbered bluegrass pasture with approximately 50 percent of area covered by oak, walnut, and elm; some buckbrush and gooseberry bushes.

Geomorphic surface: Recent.

Collected by and date: G. H. Simonson and R. B. Daniels, August 6, 1958.

Horizon and

Lincoln

Lab. Number

- A11 0 to 7 inches. Very dark gray to black (10YR 2.5/1) silt loam, dark gray (10YR 4/1) dry; moderate medium and fine granular; friable; abundant fine fibrous roots; leached Recent alluvium; gradual to the A12.
- 9593
- A12 7 to 18 inches. Very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; very dark gray (10YR 3/1) crushed; moderate fine and medium granular; friable; roots abundant to 12 or 13 inches, common below; common worm casts; diffuse to the B1.
- 9594
- B1 18 to 29 inches. Very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; very dark brown (10YR 2/2) crushed; moderate to weak medium subangular blocky breaking to medium granular; friable; thin continuous coatings on peds; common worm casts; gradual to the B2.
- 9595
- B2 29 to 37 inches. Very dark brown (10YR 2/2) silt loam; sparse very dark grayish brown (10YR 3/2) ped surfaces; very dark grayish brown (10YR 3/2) crushed; moderate to weak medium subangular blocky; friable; thin continuous coatings on peds; sparse worm casts; gradual to the B3.
- 9596
- B3 37 to 53 inches. Very dark grayish brown (10YR 3/2) silt loam, dark brown (10YR 3/3) crushed; weak medium subangular blocky; friable; indistinct coatings on ped surfaces; sparse worm casts; gradual to the C1.
- 9597
- C1 53 to 63 inches. Dark brown (10YR 3.5/3) silt loam, brown to dark brown (10YR 4/3) crushed; weak coarse prismatic to massive; friable; clear to the C2.
- 9598
- C2 63 to 73 inches. Dark yellowish brown to yellowish brown (10YR 4.5/4) silt loam; massive; friable; abrupt to the C3.
- 9599
- C3 73 inches plus. Yellowish brown (10YR 5/4) silt loam; abundant white CaCO₃ concretions; sparse browner mottles; friable; massive; calcareous alluvium.

SOIL TYPE Napier LOCATION Harrison County, Iowa
silt loam

SOIL NOS. S58Iowa-43-9 LAB. NOS. 9611-9617

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|---|---------|--|-------------|-------------|----------------------------------|----------------------|-----------------------------------|--------------------------|---------------|-------------|-----------|------------------------|
| | | 1B1a | | 3A1 | | | | | | 2A2 | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | > 2 | | | |
| 2.1 | 1.0-5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | | | |
| 0-7 | A11 | <0.1 | <0.1 | <0.1 | 0.2a | 2.6a | 73.7 | 23.5 | 51.0 | 25.4 | - | sil |
| 7-15 | A12 | <0.1 | <0.1 | <0.1 | 0.2a | 3.4a | 72.7 | 23.7 | 51.4 | 24.8 | - | sil |
| 15-23 | B21 | <0.1 | <0.1 | <0.1 | 0.2a | 3.2a | 71.4 | 25.2 | 50.2 | 24.5 | - | sil |
| 23-36 | B22 | <0.1 | <0.1 | <0.1 | 0.1a | 2.9a | 70.9 | 26.1 | 49.1 | 24.8 | - | sil |
| 36-50 | B3 | <0.1 | 0.1b | 0.1b | 0.2a | 3.9a | 70.4 | 25.3 | 51.3 | 23.1 | - | sil |
| 55-65 | C1 | 0.1b | 0.1b | 0.1b | 0.2a | 3.9a | 71.6 | 24.0 | 52.0 | 23.6 | - | sil |
| 77-89 | C2 | <0.1 | 0.1b | 0.1b | 0.2a | 4.3a | 71.2 | 24.1 | 51.8 | 23.8 | - | sil |
| pH | | ORGANIC MATTER | | | | Free Iron | ELECTRICAL CONDUCTIVITY | MOISTURE TENSIONS | | | | |
| 8C1a | | 6A1a | 6B1a | | Fe ₂ O ₃ % | EC x 10 ⁵ | CaCO ₃ equiv- alent | GYPSUM me./100g. SOIL | 1/10 ATMOS. | 1/3 ATMOS. | 15 ATMOS. | 4B2 |
| 1:1 | | % | % | C/N | 6C1a | | % | | % | % | % | |
| 6.2 | | | 4.41 | 0.376 | 11.7 | 1.0 | | | | | | 16.5 |
| 6.1 | | | 2.08 | 0.169 | 12.3 | 1.3 | | | | | | 12.1 |
| 6.2 | | | 1.09 | 0.100 | 10.9 | 1.3 | | | | | | 11.2 |
| 5.3 | | | 1.03 | 0.098 | 10.5 | 1.3 | | | | | | 11.6 |
| 5.8 | | | 0.86 | | | 1.2 | | | | | | 11.2 |
| 6.0 | | | 0.73 | | | 1.2 | | | | | | 10.9 |
| 5.8 | | | 0.60 | | | 1.5 | | | | | | 10.8 |
| 5A1a | | EXTRACTABLE CATIONS | | | | 5B1a | BASE SAT. % | 5C3 | 5B1a | 5A3a | 8D3 | MOISTURE AT SATURATION |
| CATION EXCHANGE CAPACITY NR ₁ Ac | | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | NR ₁ Ac EXCH. | Base Sat. % | Sum Bases | Sum Cations | Ca/Mg | % |
| | | Ca | Mg | N | Na | K | 5C1 | on Sum Cations | < me/100 g. > | | | |
| | | milliequivalents per 100g. soil | | | | | | | | | | |
| 24.5 | | 3.7 | 7.4 | <0.1 | 0.5 | | | | | | | |
| 15.3 | | 3.3 | 6.6 | <0.1 | 0.6 | | | | | | | |
| 17.6 | 14.3 | 4.3 | 5.7 | <0.1 | 0.7 | 110 | 77 | 19.3 | 25.0 | 3.3 | | |
| 20.6 | 11.3 | 4.7 | 8.6 | <0.1 | 0.7 | 81 | 66 | 16.7 | 25.3 | 2.4 | | |
| 19.2 | 12.2 | 5.1 | 6.1 | <0.1 | 0.6 | 93 | 74 | 17.9 | 24.0 | 2.4 | | |
| 19.0 | 12.4 | 4.6 | 5.3 | 0.1 | 0.4 | 92 | 77 | 17.5 | 22.8 | 2.7 | | |
| 18.3 | 12.5 | 4.7 | 4.9 | 0.1 | 0.4 | 97 | 78 | 17.7 | 22.6 | 2.6 | | |

a. Trace smooth dark brown to black concr. (Fe-Mn?)
b. Many smooth dark brown to black concr. (Fe-Mn?)

Soil type: Napier silt loam

Soil No.: S58Iowa-43-9

Location: 200 feet east and 475 feet south of the northwest corner of the SW1/4 of the SE1/4 of Sec. 18, T60N, R42W, Harrison County, Iowa.

Slope: 9 percent concave upward; western exposure.

Vegetation: Dominantly elm with a few walnut and basswood; understory of young trees; sparse weed and grass ground cover.

Geomorphic surface: Recent.

Collected by and date: G. H. Simonson and R. B. Daniels, August 8, 1958.

Horizon and

Lincoln

Lab. Number

- O2 1 to 0 inch. Decomposed and partially decomposed tree leaves and twigs; abundant fine fibrous roots; abrupt to the A11.
- A11 0 to 7 inches. Black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine granular; friable; abundant fine fibrous grass and tree roots; leached Recent alluvium; gradual to the A12.
9611
- A12 7 to 15 inches. Black (10YR 2/1) silt loam, gray (10YR 5/1) dry; weak fine subangular blocky breaking to fine granular; friable; abundant roots; gradual to the B21.
9612
- B21 15 to 23 inches. Black to very dark gray (10YR 2.5/1) silt loam, grayish brown (10YR 5/2) dry; very dark brown to very dark grayish brown (10YR 2.5/2) crushed; moderate fine subangular blocky; friable; thin continuous coatings on peds; abundant worm casts; abundant tree roots; gradual to the B22.
9613
- B22 23 to 36 inches. Very dark brown to very dark grayish brown (10YR 2.5/2) silt loam, very dark grayish brown (10YR 3/2) crushed; moderate medium subangular blocky; friable; thin continuous coatings on peds; sparse to common tree roots; gradual to the B3.
9614
- B3 36 to 50 inches. Very dark grayish brown (10YR 3/2) silt loam, dark brown (10YR 3/3) crushed; weak medium and coarse subangular blocky; friable; diffuse to the C1.
9615
- C1 50 to 70 inches (sampled 55 to 65 inches). Very dark grayish brown (10YR 3/2) silt loam; dark grayish brown to very dark grayish brown (10YR 3.5/2) crushed; massive; friable; leached; diffuse to the C2.
9616
- C2 70 to 89 inches (sampled 77 to 89 inches). Dark grayish brown (10YR 4/2) silt loam; massive; friable; leached alluvium.
9617

SOIL SURVEY LABORATORY Beltsville, Maryland

SOIL TYPE Olmitz LOCATION Adair County, Iowa
silty clay loam

SOIL NOS. S56Iowa-1-3 LAB. NOS. 5722-5731

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|-------------------------------------|---------|--|-----------------------|-----------------|------------|------------------------|--|----------------------------|-------------------|--------------|-------------|--------------------------|--|
| | | 3A1 | | | | | | | | | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | 2A2 | | | | |
| 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 (76mm) | | | | |
| 0-6 | A1p | 1.2 | 4.7 | 7.8 | 13.9 | 7.0 | 40.7 | 24.7 | 36.6 | 18.4 | <1 | 1 | |
| 6-14 | A12 | 1.1 | 4.4 | 6.5 | 11.9 | 6.8 | 41.6 | 27.7 | 35.6 | 19.3 | <1 | cl/1 | |
| 14-22 | A12 | 1.0 | 4.1 | 5.7 | 10.2 | 6.5 | 43.2 | 29.3 | 34.6 | 20.6 | <1 | cl | |
| 22-29 | AB | 0.9 | 3.6 | 5.5 | 10.6 | 6.8 | 43.7 | 28.9 | 35.0 | 21.3 | <1 | cl | |
| 29-36 | B21 | 1.1 | 3.4 | 4.9 | 9.8 | 5.7 | 46.1 | 29.0 | 35.3 | 21.9 | <1 | cl | |
| 36-46 | B22 | 1.1 | 3.1 | 4.5 | 9.6 | 6.6 | 45.2 | 29.9 | 35.2 | 21.9 | <1 | cl | |
| 46-51 | B23 | 1.6 | 2.9 | 4.5 | 9.9 | 7.0 | 43.0 | 31.1 | 33.9 | 21.7 | 15 | cl | |
| 51-62 | IR24 | 1.8 | 3.7 | 5.0 | 10.6 | 7.7 | 51.2 | 20.0 | 31.5 | 33.4 | 2 | sil | |
| 62-81 | IIc1 | 2.2 | 4.3 | 5.7 | 11.7 | 9.6 | 35.4 | 31.1 | 31.8 | 19.7 | 2 | cl | |
| 81-93 | IIc2 | 2.3 | 4.7 | 5.5 | 10.8 | 8.4 | 40.7 | 27.6 | 32.4 | 23.0 | 3 | cl/1 | |
| pH | | ORGANIC MATTER | | | | | ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM @25°C. | | MOISTURE TENSIONS | | | | |
| 8C1a | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITROGEN % | C/N | EST% SALT (BUREAU CUP) | CoCO ₃ equivalent % | GYP SUM mg./100g. SOIL | 1/10 ATMOS. % | 1/3 ATMOS. % | 15 ATMOS. % | | |
| 1:1 | | | | | | | | | | | | | |
| 5.4 | | | 2.33 | 0.217 | 10.7 | | | | | | | | |
| 5.4 | | | 2.00 | 0.180 | 11.1 | | | | | | | | |
| 5.5 | | | 1.67 | 0.150 | 11.1 | | | | | | | | |
| 5.5 | | | 1.27 | 0.120 | 10.6 | | | | | | | | |
| 5.8 | | | 0.94 | 0.097 | 9.7 | | | | | | | | |
| 6.2 | | | 0.74 | 0.084 | 8.8 | | | | | | | | |
| 6.5 | | | 0.36 | 0.072 | 5.0 | | | | | | | | |
| 6.6 | | | 0.43 | | | | | | | | | | |
| 6.8 | | | 0.25 | | | | | <1 | | | | | |
| 7.8 | | | 0.18 | | | | | 11.8 | | | | | |
| 5A3a CATION EXCHANGE CAPACITY Sum | | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % | SATURATION EXTRACT SOLUBLE | | | | MOISTURE AT SATURATION % | |
| 6N2d Co | | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | | No | K | | | | | |
| ← milliequivalents per 100g. soil → | | | | | | 503 | ← milliequivalents per liter → | | | | % | | |
| 22.7 | 9.6 | 2.9 | 9.1 | 0.1 | 1.0 | 60 | | | | | | | |
| 23.5 | 10.6 | 2.9 | 9.6 | <0.1 | 0.4 | 59 | | | | | | | |
| 24.3 | 11.3 | 3.6 | 9.1 | <0.1 | 0.3 | 63 | | | | | | | |
| 21.2 | 11.6 | 3.0 | 6.2 | 0.1 | 0.3 | 71 | | | | | | | |
| 23.8 | 12.2 | 3.1 | 8.0 | 0.1 | 0.3 | 66 | | | | | | | |
| 21.5 | 13.2 | 3.3 | 4.5 | 0.1 | 0.4 | 79 | | | | | | | |
| 22.0 | 14.0 | 3.5 | 4.0 | 0.1 | 0.4 | 82 | | | | | | | |
| 20.7 | 14.4 | 3.8 | 2.0 | 0.1 | 0.4 | 90 | | | | | | | |
| 18.0 | 13.2 | 3.3 | 1.1 | 0.1 | 0.3 | 94 | | | | | | | |
| calcareous | | | | | | | | | | | | | |

Soil type: Olmitz silty clay loam

Soil No.: 856Iowa-1-3

Location: Greenfield Quadrangle; 468 feet east of southwest corner of southwest quarter of northeast quarter of northwest quarter of Section 18, T76N, R31W, Adair County, Iowa.

Slope: 9 percent, concave.

Vegetation: Cultivated field.

Collected by and date: R. B. Daniels, F. J. Carlisle, and G. H. Simonson, July 25, 1956.

Horizon and
Beltsville
Lab. Number

- A1p 0 to 6 inches. Black (10YR 2/1) friable to very friable gritty light silty clay loam to heavy silt loam; weak medium granular structure; black to very dark gray (10YR 2.5/1) crushed and dark gray to dark gray brown dry; clear boundary to A12.
- A12 6 to 22 inches. Sampled 6 to 14 and 14 to 22 inches. Black (10YR 2/1) friable gritty light silty clay loam; weak to moderate fine subangular blocky structure; black to very dark gray changing to very dark gray (10YR 2.5/1 changing to 3/1) with depth; dark gray to dark gray brown (10YR 4/1.5) dry; gradual boundary to AB.
- AB 22 to 29 inches. Very dark brown (10YR 2/2) friable gritty light silty clay loam with more sand than A12; some mixing of black (10YR 2/1) by biological activity; weak fine subangular blocky structure with tendency for peds to be arranged in very weak fine and medium prisms; very dark gray brown (10YR 3/2) crushed and very dark gray brown to dark gray brown (10YR 3.5/2) dry; gradual boundary to B21.
- B21 29 to 36 inches. Very dark brown to very dark gray brown (10YR 2.5/2) friable gritty medium silty clay loam; occasional areas of black (10YR 2/1) along channels; weak fine subangular blocky structure with thin discontinuous clay skins; the peds have a tendency to be arranged in very weak medium prisms; very dark gray brown (10YR 3/2) crushed and dark gray brown (10YR 4/2) dry; gradual boundary to B22.
- B22 36 to 46 inches. Very dark gray brown (10YR 3/2) friable medium clay loam with an increase in coarse sand over the B21 and occasional gravel is present; weak fine subangular blocky structure with thin clay skins which may be continuous, but identification as such is doubtful; peds are arranged in weak medium prisms; very dark gray brown (10YR 3/2) crushed and dark gray brown (10YR 4/2) dry; clear boundary to B23.
- B23 46 to 51 inches. Very dark gray brown (10YR 3/2 to 3.5/2) firm medium clay loam; weak fine and medium subangular blocky structure with thin continuous clay skins; the depth to the upper boundary of the stone line ranges from 45 to 47 inches across the face of the cut; stones range in diameter from 2 mm. to 10 inches; clear boundary to IIB24.
- IIB24 51 to 62 inches. Dark yellowish brown (1Y 4/4) firm medium to heavy clay loam; the soil material requires more pressure to crush than horizon above; weak medium blocky structure with thin continuous clay skins on vertical surfaces and discontinuous on horizontal surfaces; clay skins are dark gray brown to dark brown (10YR 4/2.5); some mixing of very dark gray brown (10YR 3/2); gradual boundary to IIC1.
- IIC1 62 to 81 inches. Sampled 63 to 75 inches. Dark brown (1Y 4/3) massive firm medium clay loam with occasional gravel; common fine distinct gray (5Y 5/1) and few fine dark yellowish brown to dark brown mottles; thin discontinuous clay skins on vertical cleavage faces; clear boundary to IIC2.
- IIC2 81 to 93 inches. Gray brown (2.5Y 5/2) massive calcareous slightly firm light clay loam; common medium to coarse gray (5Y 5/1) and dark brown (7.5YR 4/4) mottles; common white carbonate concretions less than 1/4-inch in diameter; few fine dark oxide coatings.

Note: Roman II parent material is Kansan till; above is waterway sediment.

SOIL SURVEY LABORATORY Beltsville, Maryland

SOIL TYPE Omiltz LOCATION Adair County, Iowa
 silty clay loam

SOIL NOS. 856Iowa-1-4 LAB. NOS. 5732-5738

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|----------------------------------|---------------------------------|--|----------------------|-------------------------|------------------------|--|---|-----------------------------|---------------------|--------------------------|------------------------|----------------|
| | | 1B1b VERY COARSE SAND 2.1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | 2A2 > 2 < 7 (mm) | |
| 0-7 | A _{1p} | 0.9 | 2.4 | 3.7 | 6.2 | 3.9 | 53.9 | 29.0 | 36.1 | 24.9 | < 1 | sil |
| 7-17 | A ₁₂ | 0.9 | 2.2 | 3.2 | 5.4 | 4.1 | 54.0 | 30.2 | 34.5 | 26.5 | < 1 | sicl |
| 17-27 | AB | 1.0 | 3.0 | 4.3 | 7.3 | 4.6 | 50.2 | 29.6 | 36.0 | 22.8 | < 1 | sicl/cl |
| 27-43 | B ₂₁ | 2.8 | 3.6 | 5.0 | 9.5 | 6.3 | 43.9 | 28.9 | 35.3 | 20.1 | < 1 | cl |
| 43-54 | B ₂₂ | 3.4 | 5.0 | 6.3 | 11.9 | 7.8 | 38.0 | 27.6 | 34.6 | 17.8 | 3 | cl/l |
| 54-59 | B ₃ | 6.9 | 9.0 | 9.5 | 14.3 | 8.6 | 25.1 | 26.6 | 30.0 | 11.2 | 25 | scl |
| 59-78 | D ₁ | 1.6 | 5.1 | 7.0 | 13.9 | 12.7 | 35.1 | 24.6 | 40.2 | 15.8 | < 1 | l |
| pH | | ORGANIC MATTER | | | EST% SALT (BUREAU CUP) | ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM 25°C | MOISTURE TENSIONS | | | | | |
| 8C1a | | 6A1a ORGANIC CARBON % | 6B1a NITROGEN % | C/N | | | 6E1e CaCO ₃ equiv- alent % | GYPSUM mo./100g. SOIL | 1/10 ATMOS. % | 1/3 ATMOS. % | 15 ATMOS. % | |
| 1:1 | 1.5 | 1:10 | | | | | | | | | | |
| 6.2 | | | 2.47 | 0.222 | 11.1 | | | | | | | |
| 5.8 | | | 2.14 | 0.200 | 10.7 | | | | | | | |
| 6.0 | | | 1.60 | 0.152 | 10.5 | | | | | | | |
| 6.5 | | | 0.71 | 0.075 | 9.5 | | | | | | | |
| 6.6 | | | 0.37 | 0.047 | 7.9 | | | | | | | |
| 7.0 | | | 0.23 | | | | | | | | | |
| 7.2 | | | 0.12 | | | | | | | | | |
| 5A3a CATION EXCHANGE CAPACITY | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % | SATURATION EXTRACT SOLUBLE | | | MOISTURE AT SATURATION % | | |
| 6N2d Sum | 6O2b Ca | 6H1a Mg | 6P2a H | 6Q2a Na | 6R2a K | | Na | K | | | | |
| | milliequivalents per 100g. soil | | | | | 503 | milliequivalents per liter | | | | | |
| 29.5 | 17.5 | 3.2 | 8.3 | 0.1 | 0.4 | 72 | | | | | | |
| 27.6 | 15.4 | 3.2 | 8.5 | 0.1 | 0.4 | 69 | | | | | | |
| 25.4 | 15.9 | 2.9 | 6.1 | 0.1 | 0.4 | 76 | | | | | | |
| 22.4 | 15.8 | 3.0 | 3.2 | 0.1 | 0.3 | 86 | | | | | | |
| 22.4 | 15.2 | 3.2 | 3.6 | 0.1 | 0.3 | 84 | | | | | | |
| 21.5 | 14.7 | 2.8 | 3.6 | 0.1 | 0.3 | 83 | | | | | | |
| 17.2 | 12.8 | 2.6 | 1.5 | < 0.1 | 0.3 | 91 | | | | | | |

Soil type: Olmitz silty clay loam

Soil No.: S56Iowa-1-4

Location: Greenfield Quadrangle; 210 feet east and 400 feet south of the northwest corner of northwest quarter of northwest quarter of southeast quarter of Section 18, T6N, R31W, Adair County, Iowa.

Slope: 7 percent, flat to slightly concave.

Vegetation: Cultivated field.

Collected by and date: R. B. Daniels and G. H. Simonson, July 30, 1956.

Horizon and
Beltsville
Lab. Number

- A1p 0 to 7 inches. Black (10YR 2/1) friable heavy silt loam to light silty clay loam; cloddy structure which breaks to weak fine granular; black to very dark brown (10YR 2/1.3) crushed and dark gray (10YR 4/1) dry; clear boundary to A12.
- A12 7 to 17 inches. Black (10YR 2/1 to 2/1.5) friable light silty clay loam; moderate fine subangular blocky and very fine granular structure; black to very dark brown (10YR 2/1.5) crushed and dark gray (10YR 4/1) dry; gradual boundary to AB.
- AB 17 to 27 inches. Very dark brown (10YR 2/2) with some mixing of black and very dark gray brown (10YR 2/1 and 3/2) friable light to medium silty clay loam; weak fine subangular blocky structure with thin discontinuous coatings; identification of the coatings as clay skins is questionable; peds are arranged in weak medium prisms; very dark gray brown (10YR 3/2) crushed and dark gray to gray brown (10YR 4.5/1.5) dry; gradual boundary to B21.
- B21 27 to 43 inches. Sampled 30 to 40 inches. Very dark gray brown (10YR 3/2) friable medium clay loam with some mixing of very dark brown (10YR 2/2) due to biological activity; weak fine to medium subangular blocky structure with peds arranged in weak medium prisms; thin continuous clay skins on surface of prisms, but thin discontinuous clay skins on the subangular blocky peds in the interior of the prisms; very dark gray brown (10YR 3/2) crushed and dark gray brown (10YR 4/2) dry; gradual boundary to B22.
- B22 43 to 54 inches. Dark gray brown to dark brown (10YR 4/2) clay skins coating the surface and dark yellowish brown to yellowish brown (10YR 4.5/4) interiors with few fine faint gray mottles; slightly firm medium to heavy clay loam; weak fine to medium subangular blocky structure with peds arranged in weak medium prisms; thin continuous clay skins on surfaces of prisms; but thin discontinuous clay skins on the subangular blocky peds in the interior of the prisms; abrupt boundary to B3.
- B3 54 to 59 inches. Yellowish brown (10YR 5/4) with few faint gray brown mottles, firm gravelly medium clay loam; maximum diameter of gravel fragments is 1 inch; very weak medium blocky structure with thin discontinuous clay skins found largely on vertical surfaces; abrupt boundary to D1.
- D1 59 to 78 inches. Sampled 59 to 68 inches. Yellowish brown (10YR 5/6) massive, firm sandy clay loam with common medium gray brown (2.5Y 5/2) mottles; abrupt boundary to D2.
- D2 78 to 102 inches. Stratified clays, sandy clays, and sands; colors range from olive gray (5Y 5/2) with strong brown mottles to yellowish brown (10YR 5/6) mottles for the clays and sandy clays; the sands are mottled strong brown and gray brown (7.5YR 5/8 and 2.5Y 5/2); abrupt boundary to D3 (Kansan till).
- D3 102 plus inches. Brown (10YR 5/3) firm calcareous clay loam; a stone line separates the D2 layer from the underlying Kansan till.

Note: The horizons above the Kansan till are developed in waterway sediment.

SOIL SURVEY LABORATORY Lincoln, Nebr. Sept., 1963

SOIL TYPE Otley LOCATION Keokuk County, Iowa
silty clay loam

SOIL NOS. S61Iowa-54-2 LAB. NOS 16284-16295

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------|---|--|----------------------|-------------------------|----------------------------|-----------------------------|---------------------|---|----------------------------------|--|-------------------------|-------------------------------------|---------------------------------------|
| | | 1B1b VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 2A1 | | 2A2 > 2 | | |
| 0-7 | A1p | - | 0.2 | 0.2 | 0.2 | 0.7 | 68.9 | 29.8 | 32.6 | 37.1 | - | | |
| 7-12 | A12 | - | 0.1 | 0.1 | 0.2 | 0.4 | 65.9 | 33.3 | 30.9 | 35.5 | - | | |
| 12-17 | A3 | - | Tr. | 0.1 | 0.2 | 0.6 | 64.2 | 34.9 | 30.8 | 34.1 | - | | |
| 17-21 | B21 | - | 0.1 | 0.1 | 0.2 | 0.5 | 63.0 | 36.1 | 29.2 | 34.4 | - | | |
| 21-26 | B22 | - | 0.1 | 0.1 | 0.2 | 0.5 | 61.7 | 37.4 | 29.2 | 33.1 | - | | |
| 26-32 | B23 | 0.2 | 0.3 | 0.2 | 0.2 | 0.9 | 62.0 | 36.2 | 30.4 | 32.6 | - | | |
| 32-40 | B24 | - | 0.1 | 0.1 | 0.2 | 0.6 | 65.0 | 34.0 | 31.7 | 34.0 | - | | |
| 40-46 | B31 | 0.1 | 0.2 | 0.2 | 0.2 | 0.7 | 67.1 | 31.5 | 31.9 | 36.0 | - | | |
| 46-53 | B32 | - | - | Tr. | 0.1 | 0.5 | 69.9 | 29.5 | 34.7 | 35.8 | - | | |
| 53-61 | B33 | - | - | Tr. | Tr. | 0.7 | 69.7 | 29.6 | 34.7 | 35.7 | - | | |
| 61-73 | C1 | - | - | Tr. | Tr. | 0.8 | 71.1 | 28.1 | 35.8 | 36.1 | - | | |
| 73-89 | C2 | - | - | 0.1 | Tr. | 1.0 | 74.3 | 24.6 | 38.1 | 37.2 | - | | |
| 8C1a | | Organic Matter | | | | | Bulk Density | | | | Moisture Retention | | |
| | CaCO ₃ Equiv- 1:1 alent % | 6A1a O.C. % | 6B1a N % | C/N | Field Moist 4B4 % M. | 30 Cm. 4A1a g/cc | A.D. 4B3 % M. | 4A1c g/cc | 4A1b g/cc | 1/3 Bar Pieces | 15-to 3-Bar in/in | 4B2 4C1 15-Bar Sieved % | |
| 6.0 | | 2.44 | 0.207 | 12 | 23.0 | 1.53 | 28.2 | 1.46 | 1.64 | 25.7 | .18 | 13.0 | |
| 5.1 | | 2.08 | 0.195 | 11 | | | | | | | | 14.0 | |
| 5.1 | | 1.66 | 0.141 | 12 | 25.3 | 1.35 | 30.0 | 1.30 | 1.45 | 29.1 | .19 | 14.4 | |
| 5.0 | | 1.34 | 0.124 | 11 | | | | | | | | 15.1 | |
| 5.0 | | 1.02 | 0.094 | 11 | 25.1 | 1.35 | 28.7 | 1.31 | 1.52 | 28.8 | .18 | 14.7 | |
| 5.2 | | 0.56 | | | | | | | | | | 16.2 | |
| 5.2 | | 0.39 | | | | | | | | | | 15.8 | |
| 5.2 | | 0.22 | | | 21.6 | 1.43 | 29.0 | 1.34 | 1.55 | 28.7 | .19 | 14.8 | |
| 5.8 | | 0.16 | | | | | | | | | | 14.1 | |
| 6.3 | | 0.12 | | | 26.4 | 1.44 | 29.5 | 1.38 | 1.59 | 29.1 | .21 | 14.1 | |
| 6.8 | - | 0.11 | | | | | | | | | | 13.5 | |
| 7.2 | - | 0.06 | | | | | | | | | | 11.6 | |
| 5A1a | | EXTRACTABLE CATIONS | | | | | 5B1a | Base Sat. | | 8M | 8D3 | 6C1a Ext. Iron as Fe | 6G1a Al KCl- Ext. me/100g |
| | CATION EXCHANGE CAPACITY NH ₄ OAc | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | 5A3a Sum | 5C1 on NH ₄ OAc CEC % | 5C3 on Sum Cations % | Ratio to Clay NH ₄ OAc CEC | Ca/Mg | % | |
| | | milliequivalents per 100g. soil | | | | | | | | | | | |
| 22.0 | 15.9 | 4.6 | 8.2 | Tr. | 0.4 | 29.1 | 95 | 72 | .74 | 3.4 | 1.0 | Tr. | |
| 21.7 | 12.4 | 5.0 | 11.7 | Tr. | 0.4 | 29.5 | 82 | 60 | .65 | 2.5 | 0.9 | Tr. | |
| 22.6 | 12.1 | 5.6 | 11.5 | 0.1 | 0.5 | 29.8 | 81 | 61 | .65 | 2.2 | 1.0 | 0.1 | |
| 24.0 | 12.4 | 6.7 | 10.6 | 0.1 | 0.5 | 30.3 | 82 | 65 | .66 | 1.8 | 1.1 | 0.1 | |
| 25.1 | 13.2 | 7.7 | 10.1 | 0.1 | 0.5 | 31.6 | 86 | 68 | .67 | 1.7 | 1.1 | 0.3 | |
| 26.3 | 13.6 | 7.9 | 8.7 | 0.1 | 0.6 | 30.9 | 84 | 72 | .73 | 1.7 | 1.3 | 0.3 | |
| 24.3 | 13.7 | 8.2 | 7.8 | 0.1 | 0.5 | 30.3 | 92 | 74 | .71 | 1.7 | 1.3 | 0.1 | |
| 24.0 | 13.7 | 8.2 | 6.3 | 0.1 | 0.5 | 28.8 | 94 | 78 | .76 | 1.7 | 1.3 | Tr. | |
| 22.1 | 13.1 | 7.0 | 4.2 | 0.1 | 0.5 | 24.9 | 94 | 83 | .75 | 1.9 | 1.1 | Tr. | |
| 21.5 | 13.4 | 7.6 | 4.2 | 0.1 | 0.5 | 25.8 | 100 | 84 | .73 | 1.8 | 1.1 | | |
| 21.8 | 13.5 | 8.0 | 3.2 | 0.2 | 0.5 | 25.4 | 102 | 87 | .78 | 1.7 | 1.2 | | |
| 19.4 | 12.3 | 7.8 | 1.6 | 0.1 | 0.4 | 22.2 | 106 | 93 | .79 | 1.6 | 0.6 | | |

a. 20 Kg/M² to 60 inches.

Soil type: Otley silty clay loam

Soil No.: S61Iowa-54-2

Location: 154 feet east and 481 feet south of NW corner of SMI/4 NE1/4 Section 34, T77N, R10W, Keokuk County, Iowa.

Vegetation: Clover field.

Parent material: Wisconsin loess.

Physiographic position: Upland ridge on top of an interfluvium with slope nearly straight to slightly concave toward the south; near crest.

Slope: About 1.5 percent.

Drainage: Moderately well to well drained.

Permeability: Moderately slow.

Ground water: No water table at 121 inches.

Moisture: Slightly moist.

Described by: R. I. Dideriksen, A. R. Hidlebaugh, and R. C. Russell, October 2, 1961.

Horizon and

Lincoln Lab. No.

- A1p 0 to 7 inches. Black (10YR 2/1)¹ to very dark brown (10YR 2/2) light silty clay loam, 10YR 5/1 dry, 10YR 2/2 kneaded; medium subangular blocky breaking to weak fine granular structure; slightly firm²; abundant wormholes and casts; abrupt smooth boundary.
- A12 7 to 12 inches. Black (10YR 2/1) to very dark brown (10YR 2/2) light silty clay loam, 10YR 5/1 to 5/2 dry, 10YR 2/2 kneaded; weak fine subangular blocky breaking to moderate fine granular structure; friable; few pedes of very dark grayish brown (10YR 3/2) mixed in horizon; abundant wormholes and few casts; weak fine platy structure at 7 to 8 inches; gradual smooth boundary.
- A3 12 to 17 inches. Mixed very dark brown (10YR 2/2) and very dark grayish brown (10YR 3/2) silty clay loam, 10YR 5/2 and 5/1 dry, 10YR 3/2 kneaded; weak very fine subangular blocky breaking to moderate fine granular structure; friable; majority of pedes very dark brown (10YR 2/2); abundant fine and very fine impeded tubular pores; few very dark gray (10YR 3/1) worm casts; common wormholes; clear smooth boundary.
- B21 17 to 21 inches. Mixed dark brown to brown (10YR 4/3) and very dark grayish brown (10YR 3/2) silty clay loam, 10YR 6/2 and 6/3 dry, 10YR 4/3 kneaded; moderate very fine subangular blocky structure; friable to slightly firm; very few very fine faint dark grayish brown (2.5Y 4/2) mottles; majority of pedes 10YR 4/3; abundant fine and very fine impeded tubular pores; few fine soft oxide concretions; common wormholes and few very dark gray (10YR 3/1) casts; gradual smooth boundary.
- B22 21 to 26 inches. Same as above horizon.
- B23 26 to 32 inches. Dark brown (10YR 4/3) to yellowish brown (10YR 5/4) silty clay loam, 10YR 5/3 kneaded; moderate very fine and fine subangular blocky structure; slightly firm; pedes 10YR 4/3 exterior, 10YR 5/4, interior; few fine distinct dark reddish brown (5YR 3/3) and very few fine faint dark grayish brown (2.5Y 4/2) mottles; abundant very fine and fine impeded tubular pores; thin continuous clay films on all pedes; few fine soft oxide concretions; common wormholes, very few casts; gradual smooth boundary.
- B24 32 to 40 inches. Brown (10YR 5/3) to grayish brown (2.5Y 5/2) silty clay loam, 10YR 5/4 kneaded; weak medium prismatic breaking to moderate medium and fine subangular blocky structure; slightly firm to firm; pedes 10YR 5/3 exterior, 2.5Y 5/2 interior; some dark grayish brown (10YR 4/2) stains on pedes in places; few medium distinct dark brown (10YR 3/3) and few fine prominent dark reddish brown (5YR 3/3) mottles; abundant fine and very fine impeded tubular pores; few thin discontinuous clay films on pedes; few fine soft oxide concretions; very few wormholes; gradual smooth boundary.
- B31 40 to 46 inches. Dark grayish brown to grayish brown (2.5Y 4/2 to 5/2) light silty clay loam; weak medium prismatic breaking to strong medium angular blocky structure; slightly firm; few common 10YR 5/4 mottles; common distinct 7.5YR 5/6 segregations; abundant fine and very fine impeded tubular pores; common fine hard oxide concretions; horizon distinctly grayer than above; gradual smooth boundary.
- B32 46 to 53 inches. Grayish brown (2.5Y 5/2) light silty clay loam; weak coarse prismatic breaking to coarse and medium angular blocky structure; slightly firm; some faint coatings of silt grains on prism faces; common medium distinct yellowish brown (10YR 5/4) mottles; distinct (1 to 3 inches thick) horizontal band of strong brown (7.5YR 5/6) to 56 inches in places; abundant very fine and fine impeded tubular pores; common coarse oxide concretions; diffuse wavy boundary.
- B33 53 to 61 inches. Mixed (about 50 percent each) light olive gray (5Y 6/2) and brownish yellow (10YR 6/6) light silty clay loam; distinct vertical cleavage breaking to weak coarse angular blocky structure; firm; common medium distinct dark brown mottles; common fine and very fine impeded tubular pores; some pores or root channels filled with very dark gray (10YR 3/1) clay--thin prominent dark brown (10YR 3/3) clay films on vertical cleavage faces in places, decreasing in color, intensity, and thickness with depth; few fine hard oxide concretions; diffuse smooth boundary.
- C1 61 to 73 inches. Yellowish brown (10YR 5/4) to light olive brown (2.5Y 5/4) heavy silt loam; massive with vertical cleavage; firm; common medium distinct dark brown (10YR 3/3) mottles; distinct strong brown (7.5YR 5/6) in irregular horizontal bands 1 to 2 inches wide intermixed with light olive gray (5Y 6/2); abundant fine and very fine impeded tubular pores; thin clay films on cleavage faces extend from B33 to about 74 inches; some fine root holes or vertical pores filled with very dark gray (10YR 3/1) clay; few very fine hard oxide concretions; diffuse wavy boundary.
- C2 73 to 89 and 89 to 98 inches. Gray to light gray (5Y 6/1) heavy silt loam; massive with few cleavage faces; firm; common medium prominent dark brown (10YR 3/3) and abundant fine faint olive brown (2.5Y 4/4) mottles; distinct 2- to 4-inch thick wavy band of strong brown (7.5YR 5/6); common fine and medium impeded tubular pores; distinct krotovinas; diffuse wavy boundary.
- C3 98 to 121 inches. Mixed yellowish brown (10YR 5/4) to light olive brown (2.5Y 5/4) and gray (5Y 6/1) light silty clay loam; massive; firm; most pedes 10YR 5/4, some 5Y 6/1; common medium distinct dark brown (10YR 3/3) mottles; abundant very fine and few fine impeded tubular pores; abundant fine hard oxide concretions; clear smooth boundary.
- IIAb 121 to 130 inches. Mixed gray (5Y 5/1) and dark grayish brown (10YR 4/2) gritty heavy silty clay loam; massive; firm; paleosol derived from till sediment.

Remarks: Roots plentiful 0 to 17 inches, common 17 to 32, few 32 to 53, nearly absent below 53 inches and large gopher hole at 17 inches on one side; very few 1-inch krotovinas 73 to 144 inches, coated with very dark gray (10YR 3/1) clay films 1/16- to 1/8-inch thick; interiors mixed soil and organic matter. Farndale paleosol appears to be absent at this site. Oxides spherical in shape, dark brown to black, and most likely composed of iron-manganese. Strong brown (7.5YR 5/6-5/8) segregations, horizontal bands, and vertical streaks are likely higher in iron oxide than the matrix. The 0- to 12-, 17- to 32-, and 46- to 73-inch zones were sampled for the Bureau of Public Roads.

^{1/} Munsell color for moist soil. ^{2/} Consistence at moist field conditions.

SOIL SURVEY LABORATORY Lincoln, Nebr. Sept., 1963

SOIL TYPE Otley LOCATION Washington County, Iowa
silty clay loam

SOIL NOS. S61Iowa-92-1 LAB. NOS. 16296-16307

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | | | |
|---|---------------------------------|--|----------------------|-------------------------|-------------------------|-------------------------------|----------------------------------|-----------------|--------------------------|---|----------------------|----------------------------|------------------------------|-----|------|
| | | 1B1b | | | | | 3A1 | | | | | | 2A2 > 2 | | |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.075 | VERY FINE SAND 0.075-0.005 | SILT 0.05-0.002 | CLAY < 0.002 | 0.25-0.02 | 0.02-0.002 | | | | | |
| 0-6 | A1p | - | 0.1a | 0.3a | 0.2a | 0.5a | 68.4 | 30.5 | 29.8 | 39.2 | - | | | | |
| 6-11 | A12 | - | 0.1a | 0.2a | 0.2a | 0.4a | 63.2 | 35.9 | 26.9 | 36.9 | - | | | | |
| 11-15 | A3 | - | 0.1a | 0.1a | 0.2a | 0.4a | 61.1 | 38.1 | 25.1 | 36.5 | - | | | | |
| 15-20 | B1 | - | Tr.a | 0.1a | 0.2a | 0.5a | 59.2 | 40.0 | 23.4 | 36.4 | - | | | | |
| 20-26 | B21 | - | 0.2a | 0.2a | 0.2a | 0.6a | 61.2 | 37.6 | 26.0 | 35.9 | - | | | | |
| 26-32 | B22 | - | Tr.a | 0.1a | 0.2a | 0.7a | 62.4 | 36.6 | 26.1 | 37.1 | - | | | | |
| 32-38 | B23 | - | 0.1a | 0.1a | 0.2a | 0.7a | 64.1 | 34.8 | 31.5 | 33.4 | - | | | | |
| 38-46 | B31 | - | 0.2a | 0.2a | 0.2a | 0.6a | 67.2 | 31.6 | 33.1 | 34.8 | - | | | | |
| 46-56 | B32 | - | - | - | Tr.a | 0.6b | 70.8 | 28.6 | 34.7 | 36.7 | - | | | | |
| 56-67 | C1 | - | - | - | Tr.a | 0.9b | 72.7 | 26.4 | 36.3 | 37.3 | - | | | | |
| 67-79 | C2 | - | 0.1a | 0.1a | 0.1a | 0.8b | 77.2 | 21.7 | 37.6 | 40.5 | - | | | | |
| 79-88 | C3 | - | - | - | 0.1a | 0.8b | 77.7 | 21.4 | 37.9 | 40.7 | - | | | | |
| 8C1a | 6K1b | Organic Matter | | | | | Bulk Density | | | Moisture Retention | | | | | |
| | 6A1a | 6B1a | C/N | | Field Moist | | 30 Cm. | | A.D. | | 4B2 15-Bar Sieved | | | | |
| pH 1:1 | Equi- valent % | % | N | | % M. | g/cc | % M. | g/cc | g/cc | | | % | | | |
| 6.6 | | 1.98 | 0.178 | 11 | | | | | | | | 14.0 | | | |
| 5.3 | | 1.61 | 0.146 | 11 | | | | | | | | 14.6 | | | |
| 5.1 | | 1.16 | 0.107 | 11 | | | | | | | | 16.3 | | | |
| 5.1 | | 0.80 | 0.079 | 10 | | | | | | | | 16.9 | | | |
| 5.2 | | 0.54 | 0.067 | 8 | | | | | | | | 17.2 | | | |
| 5.3 | | 0.37 | | | | | | | | | | 16.8 | | | |
| 5.5 | | 0.26 | | | | | | | | | | 16.0 | | | |
| 5.7 | | 0.20 | | | | | | | | | | 15.4 | | | |
| 6.5 | - | 0.11 | | | | | | | | | | 13.4 | | | |
| 7.1 | - | 0.08 | | | | | | | | | | 12.4 | | | |
| 7.5 | 8 | 0.06 | | | | | | | | | | 10.5 | | | |
| 7.4 | 7 | 0.05 | | | | | | | | | | 9.9 | | | |
| 5A1a | EXTRACTABLE CATIONS | | | | | | | | | | 5B1a | Base Sat. | 8D1 | 8D3 | 6G1a |
| CATION EXCHANGE CAPACITY NH ₄ OAc | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | 5A3a | 5C1 on NH ₄ OAc | | 5C3 in Sum Cations | Ratio to Clay NH ₄ OAc | Ca/Mg | Ext. Iron as Fe % | Al KCl- Ext. %/100g | | |
| | Ca | Mg | H | Na | K | Sum | CEC % | % | CEC | | | | | | |
| | milliequivalents per 100g. soil | | | | | | | | | | | | | | |
| 22.6 | 17.1 | 4.4 | 6.2 | Tr. | 0.5 | 28.2 | 97 | 78 | .74 | 3.9 | | | | | |
| 23.7 | 13.7 | 5.8 | 10.5 | 0.1 | 0.5 | 30.6 | 85 | 66 | .66 | 2.4 | | | Tr. | | |
| 26.2 | 14.6 | 6.1 | 9.5 | 0.1 | 0.7 | 31.0 | 82 | 69 | .69 | 2.4 | | | 0.1 | | |
| 28.1 | 15.9 | 9.0 | 8.3 | 0.1 | 0.6 | 33.9 | 91 | 76 | .70 | 1.8 | | | 0.2 | | |
| 28.2 | 16.0 | 9.2 | 8.2 | 0.1 | 0.6 | 34.1 | 92 | 76 | .75 | 1.7 | | | 0.1 | | |
| 27.1 | 15.9 | 9.4 | 7.1 | 0.1 | 0.6 | 33.1 | 96 | 78 | .74 | 1.7 | | | Tr. | | |
| 25.8 | 15.5 | 9.0 | 6.5 | 0.1 | 0.6 | 31.7 | 98 | 79 | .74 | 1.7 | | | 0.1 | | |
| 25.5 | 15.1 | 9.1 | 5.9 | 0.1 | 0.6 | 30.8 | 98 | 81 | .81 | 1.6 | | | 0.1 | | |
| 21.5 | 13.5 | 8.3 | 3.4 | 0.1 | 0.5 | 25.8 | 104 | 87 | .75 | 1.6 | | | | | |
| 20.4 | 13.2 | 8.1 | 2.2 | 0.1 | 0.4 | 24.0 | 107 | 91 | .77 | 1.6 | | | | | |
| 17.3 | | | 1.4 | 0.1 | 0.4 | | | | .80 | | | | | | |
| 16.6 | | | 1.0 | 0.1 | 0.3 | | | | .78 | | | | | | |

- a. Many Fe/Mn nodules
- b. Few Fe/Mn nodules
- c. No carbonate clay

Soil type: Otley silty clay loam

Soil No.: S61Iowa-92-1

Location: 757 feet east and 226 feet south of NW corner of NW1/4 NW1/4 Section 27, T76N, R5W, Washington Co., Iowa.

Vegetation: Clover field.

Parent material: Wisconsin loess.

Physiographic position: Upland ridge on top of an interfluvium with slope slightly convex toward the southeast.

Slope: About 2 percent.

Drainage: Moderately well to well drained.

Permeability: Moderately slow.

Ground water: No water table at 124 inches.

Moisture: Slightly moist.

Described by: D. F. Slusher, October 3, 1961.

Horizon and
Lincoln Lab. No.

- A1p 0 to 6 inches. Black (10YR 2/1)¹ to very dark brown (10YR 2/2) light silty clay loam, 10YR 4/1 dry, 10YR 2/2 kneaded; moderate medium angular blocky structure; firm²; abrupt smooth boundary.
- 16296
- A12 6 to 11 inches. Very dark brown (10YR 2/2) to very dark grayish brown (10YR 3/2) light silty clay loam, 10YR 5/2 dry; moderate fine granular structure; friable; ped exteriors 10YR 2/2; ped interiors 10YR 3/2; some mixing of 10YR 2/1 peds from Ap; few 10YR 3/2 worm casts and wormholes; clear smooth boundary.
- 16297
- A3 11 to 15 inches. Very dark brown (10YR 2/2) to very dark grayish brown (10YR 3/2) light silty clay loam, 10YR 5/3 dry, 10YR 3/2 kneaded; moderate very fine subangular blocky and moderate fine granular structure; friable; ped exteriors 10YR 2/2; ped interiors 10YR 3/2; common 10YR 4/3 worm casts and a few 10YR 2/1 worm casts, common wormholes; clear smooth boundary.
- 16298
- B1 15 to 20 inches. Dark brown to brown (10YR 4/3) medium silty clay loam, 10YR 6/2 dry; moderate very fine subangular blocky and moderate fine granular structure; friable; half unit higher in value and chroma kneaded; few streaks of 10YR 2/2 stains on peds; few fine inped tubular pores; few fine hard oxide concretions; few fine 10YR 2/2 worm casts, few wormholes; gradual smooth boundary.
- 16299
- B21 20 to 26 inches. Dark brown to brown (10YR 4/3) and dark grayish brown (10YR 4/2) medium silty clay loam, 10YR 4/3 to 5/3 kneaded; moderate fine subangular blocky breaking to moderate very fine subangular blocky structure; firm; ped exteriors 10YR 4/2; ped interiors 10YR 4/3; few 10YR 3/2 stains on peds; few very fine faint 10YR 5/2 and very few fine distinct 10YR 5/6 mottles; common fine and very fine inped tubular pores; few distinct thin discontinuous clay films on ped faces; few fine soft oxide concretions; gradual smooth boundary.
- 16300
- B22 26 to 32 inches. Dark grayish brown (10YR 4/2) and brown (10YR 5/3) medium silty clay loam, 10YR 4/3 to 5/4 kneaded; weak fine prismatic breaking to moderate fine subangular blocky structure; firm; ped exteriors 10YR 4/2 with 10YR 5/2 prism faces; ped interiors 10YR 5/3; common fine faint 10YR 5/2, 10YR 5/4, and 10YR 4/3 mottles inside peds; common fine and very fine inped tubular pores; few distinct thin discontinuous clay films on ped faces; common fine hard oxide concretions and few oxide stains; gradual smooth boundary.
- 16301
- B23 32 to 38 inches. Grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) medium silty clay loam, 10YR 5/4 kneaded; moderate medium prismatic breaking to moderate fine subangular blocky structure; firm; ped exteriors 2.5Y 5/2; interiors 2.5Y 5/2 and 10YR 5/4; exteriors mottle-free but interiors have common fine distinct 10YR 4/3 mottles; common fine inped tubular pores; few fine soft oxide stains inside peds; gradual smooth boundary.
- 16302
- B31 38 to 46 inches. Grayish brown (2.5Y 5/2) light silty clay loam; moderate coarse prismatic breaking to weak medium subangular blocky structure; firm; prism faces have faint grainy coatings partially imbedded in peds, evident when dry and very faint when moist; many fine distinct 10YR 5/6 and 10YR 4/4 mottles; common fine inped tubular pores; common distinct thin clay films on prism and faces; common fine soft oxide concretions; clear smooth boundary.
- 16303
- B32 46 to 56 inches. Grayish brown (2.5Y 5/2) and gray to light gray (5Y 6/1) very light silty clay loam; moderate coarse prismatic structure; firm; ped exteriors 2.5Y 5/2; ped interiors are 5Y 6/1; common medium prominent 7.5YR 5/8 segregations inside prisms; common very fine inped tubular pores generally free of clay flows; few distinct thin 10YR 3/1 clay films on prism faces as vertical streaks, few clay flows in root channels or pores, and spherical clay accumulations (see Remarks); few fine soft oxide concretions; gradual smooth boundary.
- 16304
- C1 56 to 67 inches. Gray to light gray (5Y 6/1) silt loam; massive with some vertical cleavage; firm; common fine distinct 7.5YR 5/8 vertical streaks and segregations occur in places; common very fine inped tubular pores; few fine hard oxide concretions; diffuse smooth boundary.
- 16305
- C2 67 to 79 inches. Same as above except for 3 to 4 continuous 7.5YR 5/8 horizontal bands about 1 to 2 inches wide crossing face of pit at 45° angle; slight decrease in clay from above horizon; gradual smooth boundary.
- 16306
- C3 79 to 88 inches. Same as above.
- 16307
- C4 88 to 124 inches. Similar to above; paleosol at 124 inches.

Remarks: Roots common from 0 to 6 inches; few from 6 to 14, very few from 15 to 38, and nearly absent below 38 inches. A few krotovinas occur from about 54 inches to 85 inches. Krotovinas about 2 inches in diameter are coated with 1/4- to 1/16-inch thick very dark gray (10YR 3/1) clay films which are usually thicker on one side than the other; three krotovinas occur in pit that is 5 feet in diameter. The vertical cleavage faces from 56 to 88 inches are distinct and have very thin faint discontinuous dark yellowish brown (10YR 3/4) clay films in most places. Numerous (3 per 6-inch square) spherical clay accumulations from 42 to 52 inches; 1/4- to 1/2-inch in diameter with saucer-shaped tops and spherical-shaped bottoms; connected with 1/16-inch very dark gray (10YR 3/1) vertical clay flows in old channels or pores. Above the saucer-shaped accumulations a cavity or void occurs in places. Oxides are spherical in shape, dark brown to black in color, and are considered to be predominantly composed of iron-manganese. Strong brown (7.5YR 5/6 to 5/8) color which occurs as segregations, horizontal bands, and vertical streaks, is considered to be higher in iron oxide than the associated matrix.

¹/Munsell color for moist soil.

²/Consistence at moist field conditions.

SOIL TYPE *Pringhar LOCATION Clay County, Iowa
silty clay loam

SOIL NOS. S59Iowa-21-4-(1-10) LAB. NOS. 11143-11152

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1 | | | | | | | | | | 2A2 > 2 ($< 19\mu$) | TEXTURAL CLASS | | | | |
|---|-------------------------------------|--|------------------|-------------|-----------|----------------------------------|--------------------|-------------|-----------|----------------|------------------------------|-----------------------------|----------------|------|--|------|--|
| | | 1B1a | | COARSE SAND | | MEDIUM SAND | | FINE SAND | | VERY FINE SAND | | | | SILT | | CLAY | |
| | | 2.1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | | | | | | |
| 0-7 | Alp | 0.1a | 0.3b | 0.3c | 0.4c | 1.3c | 58.9 | 38.7 | 31.7 | 28.7 | - | sic1 | | | | | |
| 7-11 | A12 | 0.1a | 0.4b | 0.3c | 0.4c | 1.1c | 59.2 | 38.5 | 30.0 | 30.5 | Tr. | sic1 | | | | | |
| 11-16 | A3 | 0.2a | 0.4b | 0.2b | 0.4c | 1.3c | 58.9 | 38.6 | 29.0 | 31.4 | - | sic1 | | | | | |
| 16-21 | B21 | 0.8a | 0.5b | 0.2b | 0.2c | 1.1c | 61.2 | 36.0 | 32.2 | 30.2 | - | sic1 | | | | | |
| 21-30 | B22 | 0.1 | 0.2b | 0.1b | 0.2c | 2.1c | 65.4 | 32.0 | 37.8 | 29.8 | - | sic1 | | | | | |
| 30-35 | B3 | 0.1d | 0.2e | 0.3e | 0.7e | 3.5d | 69.4 | 25.8 | 43.2 | 30.1 | Tr. | sil | | | | | |
| 35-42 | C | 0.5d | 0.7e | 0.7e | 1.3e | 3.0d | 68.4 | 25.4 | 41.1 | 31.0 | Tr. | sil | | | | | |
| 42-47 | C2 | 1.2f | 2.1f | 2.3d | 4.1d | 3.9d | 60.9 | 25.5 | 38.7 | 28.2 | Tr. | sil | | | | | |
| 47-60 | IIC3 | 3.9f | 5.2f | 4.8f | 8.6f | 6.4f | 40.7 | 30.4 | 26.7 | 24.8 | 3 | cl | | | | | |
| 60-84+ | IIC4 | 2.6f | 4.2f | 4.1f | 8.1f | 7.4f | 42.1 | 31.5 | 28.1 | 25.8 | Tr. | cl | | | | | |
| pH | | ORGANIC MATTER | | | | | Bulk Density | | | Water Content | | | | | | | |
| 8C1a | | 6A1a | 6B1a | Free Iron | 4A1a | 4A1c | 4A1h | 4B4 | 4B3 | 4B2 | | | | | | | |
| 1:1 | 1:5 | 1:10 | ORGANIC CARBON % | NITROGEN % | C/N | Fe ₂ O ₃ % | Field-Moist g/cc | 30-Cm. g/cc | O.D. g/cc | Field-Moist % | 30-Cm. % | 15-Bar | | | | | |
| 5.6 | | | 3.87 | 0.313 | 12.4 | 1.0 | | | | | | 17.1 | | | | | |
| 5.7 | | | 3.80 | 0.312 | 12.2 | 1.1 | 1.18 | 1.15 | 1.36 | 27 | 33 | 17.2 | | | | | |
| 5.7 | | | 1.92 | 0.180 | 10.7 | 1.4 | | | | | | 16.7 | | | | | |
| 6.1 | | | 1.05 | 0.107 | 9.8 | 1.4 | 1.35 | 1.32 | 1.49 | 23 | 26 | 15.5 | | | | | |
| 7.1 | | | 0.48 | 0.055 | 9 | 1.2 | 1.39 | 1.36 | 1.50 | 19 | 25 | 13.6 | | | | | |
| 7.9 | | | 0.26 | | | 0.9 | 1.44 | 1.42 | 1.51 | 17 | 23 | 11.4 | | | | | |
| 8.0 | | | 0.18 | | | 0.9 | | | | | | 10.7 | | | | | |
| 8.0 | | | 0.14 | | | 1.1 | | | | | | 10.9 | | | | | |
| 8.1 | | | 0.10 | | | 1.9 | 1.80 | 1.68 | 1.81 | 10 | 18 | 11.0 | | | | | |
| 8.0 | | | 0.09 | | | 2.3 | | | | | | 10.4 | | | | | |
| 5A1a | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % | 5C3 | 5B1a | 5A3a | 8D3 | 6E1a | | | | | | |
| CATION EXCHANGE CAPACITY NH ₄ Ac | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | NH ₄ Ac EXCH. | Base Sat. % on Sum | Sum Ext. | Sum Ext. | Ca/Mg | CaCO ₃ equivalent | MOISTURE AT SATURATION % | | | | | |
| | Ca | Mg | H | Na | K | | | | | | | | | | | | |
| | ← milliequivalents per 100g. soil → | | | | | 5C1 | Cations | Bases | Cations | | | | | | | | |
| 31.4 | 23.6 | 9.2 | 12.1 | 0.1 | 0.4 | 106 | 73 | 33.3 | 45.4 | 2.6 | | | | | | | |
| 34.9 | 22.9 | 9.1 | 11.9 | 0.1 | 0.4 | 93 | 73 | 32.5 | 44.4 | 2.5 | | | | | | | |
| 33.0 | 21.7 | 10.2 | 10.3 | 0.1 | 0.4 | 98 | 76 | 32.4 | 42.7 | 2.1 | | | | | | | |
| 29.9 | 19.1 | 10.4 | 5.8 | 0.1 | 0.4 | 100 | 84 | 30.0 | 35.8 | 1.8 | | | | | | | |
| 26.1 | 18.1 | 10.0 | 2.8 | 0.2 | 0.4 | 110 | 91 | 28.7 | 31.5 | 1.8 | < 1 | | | | | | |
| 19.8 | | | | 0.2 | 0.3 | | | | | | 11 | | | | | | |
| 19.0 | | | | 0.2 | 0.3 | | | | | | 14 | | | | | | |
| 18.2 | | | | 0.2 | 0.3 | | | | | | 14 | | | | | | |
| 14.4 | | | | 0.3 | 0.3 | | | | | | 20 | | | | | | |
| 13.8 | | | | 0.2 | 0.3 | | | | | | 19 | | | | | | |

- a. Many (Fe-Mn?) concr.
- b. Common (Fe-Mn?) concr.
- c. Few (Fe-Mn?) concr.
- d. Few (Fe-Mn?) concr. Few carbonate concr. (CaCO₃?)
- e. Common (Fe-Mn?) concr. Few carbonate concr. (CaCO₃?)
- f. Few carbonate concr. (CaCO₃?)

Soil type: *Frimghar silty clay loam
 Soil No.: S59Iowa-21-4-(1-10)
 Location: 360 feet south of road center and 120 feet west of northwest corner of NE1/4 of NE1/4 of Sec. 14, T95N, R38W, Clay County, Iowa.
 Vegetation and use: Corn; cropland.
 Slope and land form: The site is on a broad very slightly convex rise in the loess-mantled Tazewell till plain. It is a few feet higher and southwest of the site of S59Iowa-21-3. Slope gradient is less than 1 percent.

Drainage: Imperfect.

Parent material: About 4 feet of loess overlying pebbly clay loam Tazewell till.

Collected by: R. H. Jordan and R. L. Juve.

Described by: F. J. Carlisle and R. I. Turner, June 9, 1959.

Horizon and
 Lincoln
 Lab. Number

- Alp
 11143 0 to 7 inches. Black (10YR 2/1, 3/1 dry) light silty clay loam, estimated 30 percent clay; moderate fine granular; friable; slightly browner color (about 2/1.2) when rubbed; numerous clear (uncoated) coarse silt and some fine sand grains; clear boundary.
- A12
 11144 7 to 11 inches. Black (10YR 2/1, 3/1 dry) medium silty clay loam, estimated 32 percent clay; weak to moderate fine granular; friable; slightly browner color when rubbed; numerous clear (uncoated) coarse silt and some fine sand grains; gradual boundary.
- A3
 11145 11 to 16 inches. Black (10YR 2/1.3) medium silty clay loam; mixed moderate fine granular and fine subangular blocky; friable; rubbed color is very dark brown (10YR 2/1.7); dry color is 10YR 3/1 with 2- to 3-mm. spots of yellowish brown; the horizon contains several nearly horizontal krotovinas about 1 inch in diameter filled with yellowish brown silty clay loam; common fine tubular pores; gradual boundary.
- B21
 11146 16 to 21 inches. Dark grayish brown (1Y 3.5/2) and very dark gray (10YR 3/1) in fine pattern and about equal proportions, medium silty clay loam; moderate fine and very fine subangular blocky; friable; few fine spherical dark oxide concretions; mottling appears due to physical mixing of materials for the most part but some peds have 3/1 surfaces over 3.5/2 interiors; patches of smooth shiny surfaces on peds and in common fine tubular pores; clear wavy boundary.
- B22
 11147 21 to 30 inches. Olive brown (1.5Y 4/3) medium silty clay loam; weak fine subangular blocky; friable; many fine tubular pores; patches of smooth shiny surfaces on most peds; common dark hard spherical oxide concretions; the horizon is noncalcareous but in the lower inch or two are a few white carbonate concretions less than 5 mm. across; fingers of dark gray (10YR 3.5/1) 2 to 4 mm. across extend into the upper part of this horizon from the horizon above (have the appearance of old root channels or worm burrows); clear boundary.
- B3
 11148 30 to 35 inches. Light olive brown (2.5Y 5/3) light silty clay loam; weak fine subangular blocky with some weak prisms evident; friable; calcareous matrix; some soft carbonate concretions, mostly less than 1 cm. across, and less abundant than below; a few fine faint light olive brown (2.5Y 5/4 to 5/6) mottles; a few thin vertical streaks of dark gray appear to be old root channels, wormholes, or cracks; many fine and very fine tubular pores; clear boundary.
- C1
 11149 35 to 42 inches. Mottled grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) in about equal proportions, heavy silt loam; grayish brown color is predominant on weak medium and coarse prism faces; prisms show distinct horizontal and vertical parting to form medium blocky fragments; friable; hard when dry; calcareous; white carbonate concretions 1/2 to 1-1/2 cm. in diameter are common; they are irregular in shape, soft in outer part and hard inside, are larger and more abundant than in horizon above; a few fine dark oxide concretions; many fine and very fine tubular pores; clear boundary.
- C2
 11150 42 to 47 inches. Very similar to horizon above but containing a number of pebbles 1/2 to 2 inches in diameter and enough sand to be noticeable; lower surface of the pebbles is coated with carbonate; many fine and very fine tubular pores. The pebbles occur mostly in the upper part of the horizon and probably represent a stone line, though not a distinct or continuous one. The matrix material has the "feel" and consistence of the loess in the overlying horizon; clear boundary.
- IIC3
 11151 47 to 60 inches. Yellowish brown (10YR 5/4) clay loam, estimated 32 percent clay; weak coarse prismatic with some grayish brown (10YR 5/2) surfaces of prisms and a few smooth shiny patches suggestive of clay films; firm; very hard when dry; calcareous with common white carbonate concretions; common fine tubular pores mostly lined with grayish brown or brown clay films; a few 1 to 3 mm.-diameter vertical tubular pores; prism faces extend across boundary between horizons C2 and IIC3.
- IIC4
 11152 60 to 84 inches plus. Sampled with bucket auger. Yellowish brown (10YR 5/5) clay loam, estimated 30 to 32 percent clay; common fine distinct strong brown and grayish brown mottles; some white carbonate concretions 1/2 to 1 cm. across, but there is a visible decrease in abundance of carbonate concretions at about 60 inches.

Notes: Colors are of fully moist soil unless indicated otherwise. The material from 47 to 84 inches is Tazewell till. Numbers of roots decrease gradually from the surface downward and some roots are present in horizon IIC3. Smooth shiny surfaces described in the B horizon might be very thin clay films but could not be identified as such with confidence.

SOIL TYPE *Pringhar LOCATION O'Brien County, Iowa
Silty clay loam

SOIL NOS. S59Iowa-71-2-(1-9) LAB. NOS. 11161-11169

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|---|-------------------------------------|--|----------------------|-------------------------|------------------------|--------------------------------------|--------------------|-----------------|----------|---------------|-------------------------------|------------------------|
| | | 1B1a 3A1 | | | | | | | | | | |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | 2A2 > 2 ($< 19\mu$) | |
| 0-6 | Alp | 0.2a | 0.2a | 0.3a | 0.6b | 1.4b | 60.3 | 37.0 | 33.7 | 28.3 | Tr. | sic1 |
| 6-11 | Al2 | <0.1 | 0.2c | 0.3a | 0.5a | 1.4a | 60.5 | 37.1 | 31.9 | 30.3 | - | sic1 |
| 11-17 | A3 | <0.1 | 0.2a | 0.2a | 0.5a | 1.2b | 62.1 | 35.8 | 31.9 | 31.7 | - | sic1 |
| 17-25 | B21 | 0.1a | 0.3a | 0.3a | 0.5a | 1.8b | 64.4 | 32.6 | 35.9 | 30.6 | - | sic1 |
| 25-35 | B22 | <0.1 | 0.1a | 0.1a | 0.4a | 2.7b | 67.6 | 29.1 | 42.1 | 28.5 | - | sic1 |
| 35-44 | B3 | 0.1d | 0.3d | 0.3d | 0.7d | 5.2d | 70.7 | 22.7 | 49.0 | 27.3 | - | sil |
| 44-49 | C1 | 1.7d | 2.9d | 3.3d | 4.8d | 5.2d | 60.3 | 21.8 | 43.4 | 24.3 | 5 | sil |
| 49-60+ | IIIC2 | 3.3d | 5.3d | 5.2d | 10.6d | 8.7d | 41.3 | 25.6 | 30.6 | 25.0 | 4 | 1 |
| 63-83 | IIIC3 | 3.2d | 5.1d | 4.8d | 10.6d | 9.1d | 41.4 | 25.8 | 31.1 | 25.2 | Tr. | 1 |
| pH | | ORGANIC MATTER | | | | 6C1a | Bulk Density | | | Water Content | | |
| 8C1a | | 6A1a | 6B1a | | | Free Iron | Field-Moist | 30-Cm. | O.D. | Field-Moist | 30-Cm. | 15-Bar |
| 1:1 | 1:5 | 1:10 | ORGANIC CARBON % | NITRO-GEN % | C/N | Fe ₂ O ₃ % | g/cc | g/cc | g/cc | % | % | % |
| 5.8 | | | 3.50 | 0.256 | 13.7 | 1.2 | | | | | | 15.6 |
| 5.8 | | | 2.20 | 0.196 | 11.2 | 1.3 | | | | | | 15.5 |
| 6.0 | | | 1.35 | 0.133 | 10.2 | 1.4 | | | | | | 15.3 |
| 6.4 | | | 0.68 | 0.074 | 9 | 1.3 | | | | | | 13.9 |
| 7.4 | | | 0.38 | | | 1.1 | | | | | | 13.0 |
| 8.0 | | | 0.16 | | | 0.9 | | | | | | 10.5 |
| 8.1 | | | 0.13 | | | 1.0 | | | | | | 9.4 |
| 8.0 | | | 0.07 | | | 1.3 | | | | | | 9.9 |
| 8.1 | | | 0.06 | | | 1.7 | | | | | | 11.0 |
| 5A1a | EXTRACTABLE CATIONS | | | | | 5B1a | 5C3 | 5B1a | 5A3a | 8D3 | 6E1a | MOISTURE AT SATURATION |
| CATION EXCHANGE CAPACITY NH ₄ Ac | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | BASE SAT. % NH ₄ Ac EXCH. | Base Sat. % on Sum | Sum Ext. | Sum Ext. | Ca/Mg | CoCO ₃ equiv-olent | % |
| | Ca | Mg | H | No | K | | | | | | | |
| | ← milliequivalents per 100g. soil → | | | | | 5C1 | Cations | Bases | Cations | | | |
| 32.7 | 22.4 | 7.4 | 10.6 | 0.1 | 0.5 | 93 | 74 | 30.4 | 41.0 | 3.0 | | |
| 30.4 | 20.6 | 8.1 | 9.1 | 0.1 | 0.4 | 96 | 76 | 29.2 | 38.3 | 2.5 | | |
| 28.4 | 19.0 | 8.0 | 7.6 | 0.1 | 0.4 | 97 | 78 | 27.5 | 35.1 | 2.4 | | |
| 25.8 | 17.9 | 7.9 | 5.3 | 0.1 | 0.4 | 102 | 83 | 26.3 | 31.6 | 2.3 | | |
| 24.3 | 18.8 | 7.7 | 2.8 | 0.1 | 0.3 | 111 | 90 | 26.9 | 29.7 | 2.4 | | |
| 19.0 | | | | 0.1 | 0.3 | | | | | | | 11 |
| 17.1 | | | | 0.2 | 0.3 | | | | | | | 12 |
| 12.0 | | | | 0.2 | 0.2 | | | | | | | 23 |
| 12.0 | | | | 0.2 | 0.3 | | | | | | | 23 |

a. Common (Fe-Mn?) concn.
 b. Few (Fe-Mn?) concn.
 c. Many (Fe-Mn?) concn.
 d. Few (Fe-Mn?) concn. Few carbonate concn. (CaCO₃?).

Soil type: *Pringhar silty clay loam
 Soil No.: S59Iowa-71-2-(1-9)
 Location: 160 yards north of road center and 290 yards east of the southwest corner of SE1/4 of Sec. 34, T97N, R40W, O'Brien County, Iowa.
 Vegetation and use: Corn; cropland.
 Slope and land form: Very gently convex slope of 1/2 to 1 percent gradient on broad gently undulating Tazewell till plain.
 Drainage: Imperfectly drained.
 Parent material: About 4 feet of loess overlying pebbly clay loam Tazewell till.
 Collected by: R. H. Jordan and R. L. Juve.
 Described by: F. J. Carlisle and R. I. Turner, June 11, 1959.

Horizon and
 Lincoln
 Lab. Number

A1p 0 to 6 inches. Black (10YR 2/1) light silty clay loam, estimated 30 percent clay; massive in place, crushing to weak fine granular and subangular blocky; friable; rubbed color about 10YR 2/1.2; clear boundary.
 11161

A12 6 to 11 inches. Black (10YR 2/1) light silty clay loam; moderate fine granular; friable; rubbed color about 10YR 2/1.4; gradual boundary.
 11162

A3 11 to 17 inches. Very dark brown (10YR 2/1.5) medium silty clay loam, estimated 33 percent clay; moderate fine subangular blocky and medium granular; friable; in the lower part of the horizon spots or mottles of very dark grayish brown (10YR to 2.5Y 3/2) make up about 20 percent of the material; few fine dark hard oxide concretions; rubbed color 10YR 2.8/2; gradual and slightly wavy boundary.
 11163

B21 17 to 25 inches. Dark grayish brown (1Y 3.5/2) medium silty clay loam, estimated 35 percent clay; moderate fine subangular blocky; friable; many narrow very dark gray tongues, apparently old worm or root holes; many fine hard dark oxide concretions; many fine and a few medium tubular pores; gradual boundary.
 11164

B22 25 to 35 inches. Olive brown (2.5Y 4/3) medium silty clay loam, estimated 33 percent clay; weak fine subangular blocky; friable; many soft dark oxide concretions less than 1 mm. and many very fine brown mottles; many fine and very fine tubular pores; shows irregular vertical parting to form roughly prismatic clods; gradual boundary.
 11165

B3 35 to 44 inches. Light olive brown (2.5Y 5/4) with common fine faint grayish brown and very fine browner mottles, heavy silt loam; weak coarse prisms composed of very weak subangular blocks; friable; prism faces are mottled but predominantly grayish brown; common firm carbonate concretions up to 1 cm. in diameter; calcareous matrix; oxide concretions as above; many fine and few medium tubular pores; wavy boundary.
 11166

C1 44 to 49 inches. A pebble band in loess-like material, probably a mixture of loess and till-derived materials. The matrix is similar to horizon above but contains somewhat more fine sand and about 20 percent of pebbles 3/4 to 3 inches in diameter. Most pebbles have white carbonate coating about 1-mm. thick on lower surface; thickness varies from about 2 to 5 inches.
 11167

IIC2 49 to 60 inches plus. Yellowish brown (10YR 5/4) clay loam; massive; firm; common fine faint grayish brown mottles are mostly associated with common very fine to medium tubular pores; calcareous; some carbonate concretions; glacial till.
 11168

IIC3 63 to 83 inches. Augered sample of the glacial till.
 11169

Notes: Colors are for fully moist soil unless indicated otherwise. A pocket about 1 foot in diameter of yellowish brown sand occurred at the top of the glacial till in part of the sampling pit.

SOIL SURVEY LABORATORY Lincoln, Nebr.

1/24/58

SOIL TYPE Protivin
loam

LOCATION Howard County, Iowa

SOIL NOS. S56Iowa-45-2-(1-9)

LAB. NOS. 4854-4862

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1 | | | | | | | | | | TEXTURAL CLASS | |
|--------------|---|--|----------------------|-------------------------|------------------------|--------------------------------------|--|-----------------------------------|-------------------|------------|-----------------------------|-----------------|-----|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 (19mm) | | |
| 0-7 | Alp | 0.9 | 5.4 | 5.2 | 6.4 | 2.6 | 48.9 | 30.6 | 24.8 | 29.2 | - | cl | |
| 7-10 | Al2 | 0.8 | 4.6 | 4.7 | 6.1 | 2.4 | 49.7 | 31.7 | 24.4 | 30.0 | - | sic1 | |
| 10-14 | A3 | 1.3 | 4.9 | 4.6 | 5.9 | 2.6 | 49.2 | 31.5 | 24.7 | 29.5 | - | sic1 | |
| 14-18 | E1 | 1.6 | 4.3 | 4.1 | 6.7 | 4.5 | 46.0 | 32.8 | 26.9 | 26.6 | Tr. | cl | |
| 18-22 | IIB21 | 3.1 | 5.7 | 5.8 | 11.2 | 8.3 | 34.3 | 31.6 | 28.8 | 19.2 | 3 | cl | |
| 22-28 | IIB22 | 1.8 | 6.3 | 6.9 | 12.3 | 9.5 | 30.7 | 32.5 | 30.4 | 16.8 | Tr. | cl | |
| 28-37 | IIB23 | 3.8 | 5.7 | 6.4 | 11.0 | 9.1 | 32.4 | 31.6 | 29.1 | 18.8 | Tr. | cl | |
| 37-46 | IIB3 | 2.8 | 5.8 | 6.8 | 12.0 | 9.6 | 31.6 | 31.4 | 30.4 | 17.8 | Tr. | cl | |
| 46-60 | IIC | 3.6 | 6.0 | 6.4 | 11.2 | 9.3 | 35.3 | 28.2 | 32.2 | 18.8 | 3 | cl | |
| | pH | 8C1a ORGANIC MATTER | | | | EST% SALT (BUREAU CUP) | ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM 5A1a | 6E1a CaCO ₃ equivalent | MOISTURE TENSIONS | | | 4B2 15 ATMOS. % | |
| | 1:1 | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITROGEN % | | | | C/N | | | | |
| | 5.2 | 5.5 | 5.7 | 4.80 | .398 | 12.1 | 0.3 | | | | 16.8 | | |
| | 5.4 | 5.6 | 5.7 | 2.71 | .235 | 11.5 | 0.4 | | | | 15.1 | | |
| | 5.7 | 6.2 | 6.2 | 1.46 | .142 | 10.3 | 0.4 | | | | 13.5 | | |
| | 6.2 | 6.6 | 6.6 | 0.73 | .078 | 9.4 | 0.4 | | | | 12.6 | | |
| | 6.5 | 6.8 | 6.9 | 0.38 | .038 | 10.0 | 0.3 | | | | 10.8 | | |
| | 6.9 | 7.2 | 7.3 | 0.30 | .023 | 13.0 | 0.3 | | | | 10.6 | | |
| | 7.2 | 7.6 | 7.6 | 0.21 | | | 0.3 | | | | 10.9 | | |
| | 7.8 | 8.2 | 8.5 | 0.21 | | | 0.5 | 2 | | | 11.3 | | |
| | 8.1 | 8.5 | 8.7 | 0.21 | | | 0.5 | 6 | | | 10.6 | | |
| | 5A1a | EXTRACTABLE CATIONS 5B1a | | | | BASE SAT. % NH ₄ Ac EXCH. | SATURATION EXTRACT SOLUBLE 8A1 | | | | 8A MOISTURE AT SATURATION % | | |
| | CATION EXCHANGE CAPACITY NH ₄ Ac | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a No | | 6Q2a K | 6P1a No | 6Q1a K | 6N1a Ca | | 6O1a Mg | |
| | | ← milliequivalents per 100g. soil → | | | | | 5C1 | ← milliequivalents per liter → | | | | | |
| | 31.2 | 17.6 | 3.5 | 19.0 | 0.1 | 0.3 | 69 | 0.3 | - | 1.6 | 0.9 | 62.5 | |
| | 26.7 | 15.9 | 3.3 | 16.1 | 0.1 | 0.2 | 73 | 0.5 | - | 2.0 | 0.6 | 63.1 | |
| | 24.1 | 16.6 | 4.0 | 9.4 | 0.1 | 0.2 | 87 | 0.4 | - | 1.8 | 0.6 | 57.5 | |
| | 22.9 | 17.6 | 4.2 | 5.8 | 0.1 | 0.3 | 97 | 0.4 | - | 1.7 | 0.6 | 54.5 | |
| | 18.8 | 15.2 | 3.4 | 4.5 | 0.1 | 0.2 | | 0.4 | - | 1.5 | 0.6 | 52.7 | |
| | 16.8 | 14.0 | 3.2 | 2.9 | 0.1 | 0.2 | | 0.4 | - | 1.6 | 0.6 | 52.8 | |
| | 15.5 | 13.0 | 3.2 | 2.4 | - | 0.2 | | 0.4 | - | 1.7 | 0.6 | 56.9 | |
| | 14.2 | | 2.1 | 0.4 | 0.1 | 0.2 | | 0.5 | - | 3.0 | 0.6 | 52.7 | |
| | 11.6 | | 2.6 | - | - | 0.2 | | 0.5 | 0.1 | 2.5 | - | 48.3 | |

Soil type: *Protivin loam
 Soil No.: 856Iowa-45-2-(1-9)
 Location: Approximately 660 feet east and 400 feet north of southwest corner of SE1/4 of Sec. 15, T99N, R13 W, Howard County, Iowa.

Vegetation or crop: Soybeans.

Parent material: Firm Iowan till with silty overburden.

Physiographic position: Concave portion of a side slope, as slope approaches waterway; upland.

Topography: Gently sloping or undulating.

Slope: 1 to 2 percent.

Drainage: Imperfect.

Ground water: None observed due to long period of dry weather.

Permeability: Very slow for the firm till and moderate for the overburden.

Moisture: Slightly moist.

Stoniness: Some pebbles occur through the firm till; a band of pebbles is concentrated just above the firm till; the silty material above this is usually pebble free.

Described by: L. E. Tyler, October 10, 1956.

Horizon and

Lincoln

Lab. Number

| | |
|---------------|---|
| A1p 4854 | 0 to 7 inches. Black (10YR 2/1 moist) gritty silt loam; friable; weak fine granular structure; boundary clear. |
| A12 4855 | 7 to 10 inches. Same as above horizon except boundary gradual. |
| A3 4856 | 10 to 14 inches. Mixed colors, approximately 60 percent black (10YR 2/1 moist) and 40 percent dark gray brown (2.5Y 4/2 moist); crushed color 10YR 2.5/1 moist; gritty silt loam; friable; weak fine granular structure; boundary gradual. |
| B1 4857 | 14 to 18 inches. Mixed colors, approximately 75 percent very dark gray (2.5Y 3/1 moist) and 25 percent dark gray brown (2.5Y 4/2 moist) with the latter color also being the crushed color; light clay loam; slightly firm; moderate fine granular; pebble band at approximately 18 inches; boundary gradual. |
| IIB21 4858 | 18 to 22 inches. Dark gray brown (2.5Y 4/2 moist) ped coatings with yellowish brown (10YR 5/6 moist) ped interiors; crushed color olive brown to light olive brown (2.5Y 4.5/3 moist); light clay loam; slightly firm; moderate very fine subangular blocky structure; boundary gradual. |
| IIB22 4859 | 22 to 28 inches. Gray (5Y 5/1 moist) ped coatings with few fine faint dark yellowish brown (10YR 4.5/4 moist) mottles and few discontinuous very dark gray (10YR 3/1 moist) deposits of illuviated clay; ped interiors are strong brown (7.5YR 5/6 moist) and dark yellowish brown (10YR 4/4 moist); crushed color olive brown to light olive brown (2.5Y 4.5/3 moist); light to medium clay loam; firm; weak coarse prismatic structure breaking to moderate fine and medium blocky; boundary gradual. |
| IIB23 4860 | 28 to 37 inches. Gray (5Y 5/1 moist) ped surfaces with many fine faint yellowish brown (10YR 5/4 moist) mottles and with very dark gray (10YR 3/1 moist) illuviated clay along old root channels; crushed color olive brown (2.5Y 4/3 moist); medium clay loam; firm; moderate medium blocky structure with some large vertical cleavage faces; boundary diffuse. |
| IIB3 4861 | 37 to 46 inches. Gray (5Y 5/1 moist) ped surfaces with many fine prominent yellowish brown (10YR 5/6 moist) mottles; there are a few discontinuous streaks of very dark gray (10YR 3/1 moist) illuviated clay along former root channels; crushed color dark yellowish brown to yellowish brown (10YR 4.5/4 moist); light to medium clay loam; firm; weak medium subangular blocky structure; some small soft iron concretions yellowish red (5YR 5/8 moist) in color; this horizon and all above it are leached; boundary clear. |
| IIC 4862 | 46 to 60 inches. Mixed colors, approximately 50 percent gray (5Y 5/1 moist) and 50 percent dark brown to brown (10YR 4/3 moist); some iron concretions yellowish red (5YR 4/6 moist) in color; crushed color olive brown (2.5Y 4/3 moist); light clay loam; firm; very weak medium subangular blocky to massive structure; unleached. |

Notes: Crevices filled with sand, ranging to sandy clay loam, were found in firm till beneath overburden and varied in width from 1-5 inches; sometimes widened into pockets. Although these were avoided on face described, at least 1 was present in area covered by each pit (2 by 5 feet). Prismatic structure described may not be evident under wet conditions; the soil was much dryer than normal due to long dry weather period. Textures are field estimates.

SOIL SURVEY LABORATORY Lincoln, Nebr. 1/24/58

SOIL TYPE *Protivin LOCATION Howard County, Iowa
loam

SOIL NOS. S56Iowa-45-3-(1-11) LAB. NOS. 4863-4873

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|--------------|-------------------------------------|--|-----------------------|-----------------|------------|------------------------|--|---------------------------------|-----------------------|------------|--------------------------|----------------|
| | | 1B1a | | 3A1 | | | | | 2A2 | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | 0.2-0.02 | 0.02-0.002 | > 2 (9mm) | |
| 2.1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | < 0.002 | | | |
| 0-6 | Alp | 0.8 | 5.2 | 6.3 | 6.8 | 2.6 | 49.9 | 28.4 | 26.7 | 29.0 | - | cl |
| 6-10 | Al2 | 0.8 | 4.7 | 6.1 | 6.6 | 2.6 | 50.6 | 28.6 | 26.4 | 30.0 | - | cl |
| 10-15 | A3 | 1.6 | 6.0 | 6.5 | 6.8 | 2.2 | 49.2 | 27.7 | 25.7 | 28.6 | - | cl |
| 15-19 | IIB11 | 3.0 | 10.0 | 12.8 | 13.8 | 3.4 | 34.0 | 23.0 | 24.4 | 18.7 | 6 | l |
| 19-23 | IIB12 | 3.5 | 17.0 | 22.5 | 27.5 | 4.1 | 10.8 | 14.6 | 19.2 | 4.8 | 3 | sl |
| 23-29 | IIB21 | 2.4 | 6.8 | 7.4 | 13.8 | 9.0 | 28.4 | 32.2 | 28.3 | 15.6 | Tr. | cl |
| 29-34 | IIB22 | 2.0 | 6.2 | 6.4 | 13.0 | 9.5 | 29.9 | 33.0 | 28.8 | 17.0 | 2 | cl |
| 34-40 | IIB23 | 2.6 | 6.0 | 6.6 | 11.5 | 9.1 | 31.3 | 32.9 | 28.4 | 18.5 | 3 | cl |
| 40-45 | IIB3 | 2.4 | 6.2 | 6.5 | 12.9 | 9.8 | 30.2 | 32.0 | 29.7 | 16.6 | Tr. | cl |
| 45-52 | IIC1 | 2.9 | 6.0 | 6.2 | 12.4 | 9.4 | 33.0 | 30.1 | 29.7 | 18.8 | Tr. | cl |
| 52-60 | IIC2 | 2.6 | 6.2 | 6.2 | 12.5 | 9.8 | 33.6 | 29.1 | 32.5 | 17.1 | Tr. | cl |
| | pH 8C1a | ORGANIC MATTER | | | | | ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM 8A1a | CO ₂ EQUIV. PER CENT | MOISTURE TENSIONS 4B2 | | | |
| | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITROGEN % | C/N | EST. SALT (BUREAU CUP) | | | 15 ATMOS. % | | | |
| 1.9 | 5.2 | 5.4 | 3.96 | .326 | 12.1 | | 0.4 | | 13.9 | | | |
| 5.0 | 5.3 | 5.4 | 2.43 | .214 | 11.4 | | 0.4 | | 13.0 | | | |
| 5.2 | 5.5 | 5.6 | 1.13 | .114 | 9.9 | | 0.3 | | 11.0 | | | |
| 5.5 | 5.9 | 6.0 | 0.45 | .050 | 9.0 | | 0.4 | | 9.1 | | | |
| 6.0 | 6.6 | 6.6 | 0.20 | .021 | 9.5 | | 0.4 | | 5.8 | | | |
| 6.5 | 7.1 | 7.2 | 0.26 | .021 | 12.4 | | 0.3 | | 11.4 | | | |
| 6.9 | 7.2 | 7.3 | 0.22 | | | | 0.3 | | 11.3 | | | |
| 7.3 | 7.6 | 7.7 | 0.19 | | | | 0.3 | | 11.9 | | | |
| 7.8 | 8.4 | 8.5 | 0.16 | | | | 0.5 | | 11.6 | | | |
| 8.1 | 8.6 | 8.7 | 0.15 | | | | 0.5 | 8 | 11.6 | | | |
| 8.1 | 8.6 | 8.8 | 0.14 | | | | 0.5 | 9 | 12.6 | | | |
| | 5A1a | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % NH ₄ AC EXCH. | SATURATION EXTRACT SOLUBLE 8A1 | | | | 8A |
| | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | | 6P1a | 6Q1a | 6N1a | 6O1a | MOISTURE AT SATURATION % | |
| | Ca | Mg | H | Na | K | | Na | K | Ca | Mg | | |
| | ← milliequivalents per 100g. soil → | | | | | 5C1 | ← milliequivalents per liter → | | | | | % |
| 25.9 | 12.8 | 2.9 | 18.9 | 0.1 | 0.2 | 62 | 0.4 | - | 2.1 | 0.9 | 58.1 | |
| 22.7 | 11.7 | 2.4 | 15.5 | 0.1 | 0.2 | 63 | 0.4 | - | 1.7 | 0.8 | 54.6 | |
| 19.2 | 11.3 | 2.8 | 10.9 | 0.1 | 0.2 | 75 | 0.5 | 0.1 | 1.2 | 0.8 | 49.8 | |
| 16.1 | 11.1 | 3.0 | 4.9 | 0.1 | 0.2 | 89 | 0.5 | 0.1 | 1.4 | 0.9 | 43.7 | |
| 9.4 | 7.1 | 2.0 | 2.4 | - | 0.1 | 98 | 0.5 | - | 1.5 | 1.2 | 31.7 | |
| 17.6 | 14.4 | 3.4 | 2.9 | 0.1 | 0.2 | | 0.4 | - | 1.5 | 0.8 | 54.6 | |
| 17.3 | 14.4 | 3.5 | 2.5 | 0.1 | 0.2 | | 0.4 | - | 1.4 | 0.9 | 54.8 | |
| 16.0 | 13.2 | 3.3 | 1.6 | 0.1 | 0.2 | | 0.4 | - | 1.3 | 0.8 | 57.4 | |
| 15.2 | 16.5 | 3.0 | 0.8 | 0.1 | 0.2 | | 0.6 | - | 2.8 | 1.2 | 56.8 | |
| 13.0 | | 3.0 | - | 0.1 | 0.2 | | 0.6 | 0.1 | 2.7 | 1.4 | 58.1 | |
| 12.4 | | 2.9 | - | 0.1 | 0.2 | | 0.6 | 0.1 | 2.2 | 1.6 | 52.9 | |

Soil type: *Protivin loam
 Soil No.: S56Loam-45-3-(1-11)
 Location: Approximately 380 feet west and 63 feet south of northeast corner of NW1/4 of NE1/4 of Sec. 9, T99N, R13W, Howard County, Iowa.
 Vegetation or crop: Soybeans.
 Parent material: Firm Iowan till with silty overburden.
 Physiographic position: Middle of very gentle upland side slope.
 Topography: Nearly level.
 Slope: 1 to 2 percent.
 Drainage: Imperfect.
 Ground water: None observed due to long period of dry weather.
 Permeability: Very slow for the firm till and moderate for the overburden.
 Moisture: Slightly moist.
 Stoniness: Some pebbles occur through the firm till; a band of pebbles is concentrated just above the firm till; the silty material above this is usually pebble free.
 Described by: L. E. Tyler, October 11, 1956.

Horizon and
 Lincoln
 Lab. Number

- Alp
4863 0 to 6 inches. Black (10YR 2/1 moist) gritty silt loam; friable; weak fine granular structure; boundary clear.
- Al2
4864 6 to 10 inches. Mixed colors, approximately 50 percent black (10YR 2/1 moist) and 50 percent very dark gray (10YR 3/1 moist) gritty silt loam; crushed color is 10YR 2.5/1 moist; friable; moderate fine granular structure; boundary gradual.
- A3
4865 10 to 15 inches. Mixed colors, approximately 50 percent very dark gray (10YR 3/1 moist) and 50 percent dark grayish brown (10YR 4/2 moist) gritty silt loam; friable; weak medium subangular blocky structure. Mixing appears to have been mostly mechanical (by worms). Boundary gradual.
- IIB11
4866 15 to 19 inches. Dark gray brown (2.5Y 4/2 moist) with common fine faint yellowish brown (10YR 5/4 moist) mottles and a few fine distinct very dark gray (10YR 3/1 moist) mottles; crushed color olive brown (2.5Y 4/3 moist); light clay loam; friable; weak fine to very fine subangular blocky structure; boundary clear.
- IIB12
4867 19 to 23 inches. Mixed colors, approximately 80 percent olive brown (2.5Y 4/3 moist) and 20 percent yellowish brown (10YR 5/6 moist) sandy clay loam; crushed color olive brown (2.5Y 4/3 moist); very friable; weak fine to medium prismatic structure; this sandy layer is discontinuous and contains pebbles up to 1-1/2 inches in diameter (pebble band); boundary clear.
- IIB21
4868 23 to 29 inches. Gray (5Y 5/1) ped coatings with discontinuous very dark gray (2.5Y 3/1 moist) illuviated clay along old root and worm channels; ped interiors are mixed gray (5Y 5/1 moist) and yellowish brown (10YR 5/6 moist); crushed color is olive brown to light olive brown (2.5Y 4.5/4 moist); clay loam; firm; weak medium prismatic structure breaking to strong medium to fine blocky; boundary diffuse.
- IIB22
4869 29 to 34 inches. Colors same as horizon above except strong brown (7.5YR 5/6 moist) replaces yellowish brown (10YR 5/6 moist) on ped interiors; clay loam; firm; weak medium prismatic structure breaking to moderate fine subangular blocky; boundary diffuse.
- IIB23
4870 34 to 40 inches. Colors same as horizon above except ped coats are not as continuous and more strong brown (7.5YR 5/6 moist) color is present; light clay loam; firm; weak medium subangular blocky structure; boundary diffuse.
- IIB3
4871 40 to 45 inches. Mixed colors, approximately 50 percent gray (5Y 5/1 moist), 25 percent yellowish brown (10YR 5/6 moist), and 25 percent strong brown (7.5YR 5/6 moist); very few peds; some, but very few, discontinuous streaks of very dark gray (2.5Y 3/1 moist) illuviated clay; light clay loam; firm; very weak medium subangular blocky structure; this horizon and all above it are leached; boundary clear.
- IIC1
4872 45 to 52 inches. Mixed colors, approximately 40 percent dark gray to gray (2.5Y 4.5/1), 30 percent yellowish brown (10YR 5/6 moist), and 30 percent strong brown (7.5YR 5/6 moist); very few prominent iron concretions reddish brown (5YR 4/4 moist) in color; crushed soil color olive brown (2.5Y 4/3 moist); light clay loam; firm; massive but having some vertical cleavage; unleached; boundary diffuse.
- IIC2
4873 52 to 60 inches. Mixed colors, approximately 70 percent yellowish brown (10YR 5/4 moist), 20 percent gray (2.5Y 4.5/1 moist), and 10 percent dark gray brown (2.5Y 4/2); crushed color olive brown (2.5Y 4/3 moist); iron concretions as in above horizon; light clay loam; firm; massive; unleached.

Notes: Pebble band contains pebbles varying in size from fine gravel to stones 3 or 4 inches in diameter. The pebbles are distributed vertically through a 4- to 6-inch layer and are so prevalent that one practically always strikes one or more with the auger when boring through the B12. Vertical cleavages are as much as 10 inches from top to bottom in B horizon. Crevices filled with sand, ranging to sandy clay loam, were found in firm till beneath overburden and varied in width from 1-5 inches; sometimes widened into pockets. Although these were avoided on face described, at least 1 was present in area covered by each pit (2 by 5 feet). Prismatic structure described may not be evident under wet conditions; soil much dryer than normal due to long dry weather period. Textures are field estimates.

SOIL TYPE *Readlyn Loam LOCATION Bremer County, Iowa

SOIL NOS. S60Iowa-9-2-(1-9) LAB. NOS. 14116-14124

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--|--------------------------|--|-------------|-------------|-----------|----------------|----------------------------------|----------------------------------|---------------------------------------|---------------|-------------------------------------|----------------|--|
| | | 3A1 | | | | | | | | | | | |
| | | 1B1a | 2A2 | | | | | 3A1 | | | 2A2 | TEXTURAL CLASS | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | 0.20-0.02 | 0.02-0.002 | 0.002-0.0002 | > 2 | |
| | | 2.1 | 1.0-5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.20-0.02 | 0.02-0.002 | 0.002-0.0002 | < 19mm | |
| 0-8 | Alp | 1.4a | 7.6a | 9.6 | 12.9 | 4.6 | 41.1 | 22.8 | 26.2 | 24.6 | tr. | | |
| 8-12 | A3 | 2.1a | 8.0 | 9.3 | 12.8 | 4.4 | 39.8 | 23.6 | 24.0 | 25.2 | tr. | | |
| 12-17 | B1 | 3.6a | 8.2 | 8.9 | 13.7 | 5.1 | 34.2 | 26.3 | 26.0 | 18.9 | 3 | | |
| 17-24 | IIB21 | 4.8 | 9.1 | 9.7 | 16.2 | 8.1 | 23.8 | 28.3 | 26.4 | 12.5 | 4 | | |
| 24-30 | IIB22 | 2.8 | 6.9 | 8.2 | 16.2 | 10.3 | 27.7 | 27.9 | 30.7 | 15.1 | 6 | | |
| 30-37 | IIB23 | 4.2 | 7.6 | 7.8 | 15.3 | 9.8 | 28.2 | 27.1 | 30.0 | 15.3 | 5 | | |
| 37-44 | IIB3 | 4.0 | 7.3 | 7.8 | 15.5 | 10.4 | 29.1 | 25.9 | 30.8 | 16.1 | 6 | | |
| 44-50 | IIC1 | 4.5b | 7.6b | 7.8b | 15.6b | 10.5b | 32.8 | 21.2 | 31.8 | 19.0 | 10 | | |
| 50-60 | IIC2 | 5.8b | 9.2b | 10.1b | 18.8b | 10.3b | 31.1 | 14.7 | 35.9 | 14.2 | 9 | | |
| 8C1a | 6C1a | ORGANIC MATTER | | | | Bulk Density | | | | Moist. Reten. | | | |
| pH | Ext. Iron as Fe | 6A1a | 6B1a | Field Moist | | 30 Cm. | | O.D. | 1/3 15 | | | | |
| | | ORGANIC CARBON | NITRO-GEN | C/N | 4B4 | 4A1a | 4B3 | 4A1c | 4A1h | ATMOS. Pieces | ATMOS. Sieved | | |
| 1:1 | % | % C | % | % | % M. | g/cc. | % M. | g/cc. | g/cc. | % | % | | |
| 5.5 | 0.8 | 2.51 | 0.228 | 11 | 18.4 | 1.46 | 23.9 | 1.42 | 1.53 | | 10.5 | | |
| 5.2 | 1.0 | 1.27 | 0.124 | 10 | | | | | | | 9.4 | | |
| 5.1 | 1.3 | 0.65 | 0.074 | 9 | 18.7 | 1.40 | 21.7 | 1.40 | 1.48 | | 10.3 | | |
| 5.3 | 1.6 | 0.35 | 0.040 | 9 | 17.6 | 1.48 | 19.3 | 1.48 | 1.58 | | 10.4 | | |
| 5.8 | 2.0 | 0.24 | | | 14.4 | 1.64 | 16.3 | 1.60 | 1.73 | | 10.4 | | |
| 6.7 | 1.7 | 0.13 | | | 12.7 | 1.71 | 14.9 | 1.67 | 1.78 | | 10.1 | | |
| 7.2 | 1.7 | 0.12 | | | | | | | | | 9.8 | | |
| 7.9 | 1.5 | 0.08 | | | 14.5 | 1.77 | 15.1 | 1.76 | 1.84 | | 8.8 | | |
| 8.0 | 0.8 | 0.05 | | | 12.2 | 1.90 | 12.8 | 1.83 | 1.94 | | 5.9 | | |
| 5A1a | EXTRACTABLE CATIONS 5B1a | | | | | Base Sat. | | | 8D1 | 8D3 | Carbonate as CaCO ₃ 6E1c | | |
| CATION EXCHANGE CAPACITY NH ₄ OAc | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | 5A3a Sum | 5C1 on NH ₄ OAc CEC % | 5C3 on Sum NH ₄ OAc % | Ratio to Clay NH ₄ OAc CEC | Ca/Mg | ← 2-mm % | Clay % | |
| | Ce | Mg | H | No | K | | | | | | | | |
| ← milliequivalents per 100g. soil | | | | | | | | | | | | | |
| 19.0 | 11.0 | 5.3 | 11.2 | 0.1 | 0.2 | 27.8 | 87 | 60 | .83 | 2.1 | | | |
| 15.8 | 8.9 | 2.5 | 10.0 | 0.1 | 0.2 | 21.7 | 74 | 54 | .67 | 3.6 | | | |
| 16.0 | 9.6 | 2.9 | 7.6 | 0.1 | 0.2 | 20.4 | 80 | 63 | .61 | 3.3 | | | |
| 16.1 | 11.5 | 3.5 | 5.2 | 0.1 | 0.2 | 20.5 | 95 | 75 | .57 | 3.3 | | | |
| 16.0 | 11.9 | 3.7 | 3.8 | 0.1 | 0.2 | 19.7 | 99 | 81 | .57 | 3.2 | | | |
| 14.2 | 11.4 | 3.5 | 3.3 | 0.1 | 0.2 | 18.5 | 107 | 82 | .52 | 3.2 | | | |
| 13.3 | 10.7 | 3.4 | 1.2 | 0.1 | 0.2 | 15.6 | 108 | 92 | .51 | 3.1 | | | |
| 9.9 | | | | 0.1 | 0.2 | | | | .47 | | 13 | 1 | |
| 8.5 | | | | tr. | 0.2 | | | | .58 | | 7 | tr. | |

a. Few Fe/Mn nodules.
 b. Few carbonate nodules.
 c. 13 kg/M² to 60 inches.

Soil type: *Readlyn loam
 Soil No.: S60Iowa-9-2-(1-9)
 Location: 878 feet north and 605 feet west from SE corner of Sec. 34, T91N, R11W, Bremer County, Iowa.
 Vegetation: Clover-timothy meadow. Parent material: Gritty overburden over Iowan till.
 Physiographic position: Upland till plain on a very slightly convex west-facing slope. Side slopes of 2-3 percent.
 Slope: 1 percent. Drainage: Imperfectly drained.
 Permeability: Moderate in gritty overburden; moderately slow in Iowan till.
 Ground water: None within 60 inches. Moisture: Slightly moist.
 Described by: D. F. Slusher and J. D. Highland, October 11, 1960.

Horizon and
 Lincoln Lab. No.

- Alp 0 to 8 inches. Black (10YR 2/1)¹ loam; cloddy, breaking to weak fine and very fine subangular blocky structure; slightly firm; numerous worm casts; a few clear uncoated quartz grains (fine-sand size) on ped surfaces; clear boundary.
 14116
- A3 8 to 12 inches. Very dark brown (10YR 2/2) to very dark grayish brown (10YR 3/2) heavy loam; weak fine subangular blocky structure with platy tendency breaking to moderate fine granules; friable; common fine faint black (10YR 2/1) and very dark grayish brown (10YR 3/2) mixing and worm casts and a few fine distinct dark grayish brown (10YR 4/2) worm casts; a few clear uncoated quartz grains (fine-sand size) on ped surfaces; gradual boundary.
 14117
- B1 12 to 17 inches. Mixed (in equal proportions) very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) heavy loam; weak fine subangular blocky and moderate fine granular structure; friable; a few fine distinct very dark brown (10YR 2/2) and yellowish brown (10YR 5/4) worm casts and mixings; kneaded color dark grayish brown (10YR 4/2 to 2.5Y 4/2); a few rounded stones of 1/2-inch to 3-inch diameter in lower part of horizon; gradual boundary.
 14118
- IIB21 17 to 24 inches. Grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) heavy loam; weak fine subangular blocky structure; friable; common fine faint strong brown (7.5YR 5/8) mottles; kneaded color is yellowish brown (10YR 5/6); common fine tubular pores in peds; a few 1/2-inch to 3-inch diameter rounded stones in upper part of horizon; gradual boundary.
 14119
- IIB22 24 to 30 inches. Grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) heavy loam; weak medium prismatic structure breaking to moderate fine subangular blocks; slightly firm; grayish brown (2.5Y 5/2) with common fine distinct dark yellowish brown (10YR 4/4) mottles on ped faces; grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) with a few fine distinct strong brown (7.5YR 5/8) mottles inside peds; kneaded color is yellowish brown (10YR 5/4); common fine tubular pores in peds; a few faint very dark gray patchy clay films on ped faces and as distinct streaks along channels; gradual boundary.
 14120
- IIB23 30 to 37 inches. Grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) heavy loam to light clay loam; moderate coarse prismatic structure breaking to moderate fine and medium subangular blocks; slightly firm; grayish brown (2.5Y 5/2) on vertical prism faces with no mottling; grayish brown (2.5Y 5/2) with common fine distinct yellowish brown mottles on surfaces of subangular blocky peds; grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) with a few fine distinct strong brown (7.5YR 5/8) mottles inside peds; common fine tubular pores in peds; a few distinct very dark gray vertical clay streaks on prism faces; gradual boundary.
 14121
- IIB3 37 to 44 inches. Grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/8) heavy loam; weak coarse prismatic structure breaking to weak medium subangular blocks; slightly firm; grayish brown (2.5Y 5/2) with common fine distinct yellowish brown (10YR 5/4) mottles on prism faces; grayish brown (2.5Y 5/2) to light olive brown (2.5Y 5/4) and yellowish brown (10YR 5/8) with many fine distinct strong brown (7.5YR 5/8) and grayish brown (2.5Y 5/2) mottles inside peds; common fine tubular pores in peds; a few faint patchy clay streaks on ped faces; clear boundary.
 14122
- IIC1 44 to 50 inches. Grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) loam; massive with some vertical cleavage; slightly firm; common distinct light gray (10YR 7/1) lime accumulations; calcareous; gradual boundary.
 14123
- IIC2 50 to 60 inches. Yellowish brown (10YR 5/6) and gray (10YR 5/1) heavy loam; massive; slightly firm; common fine distinct mottles of strong brown (7.5YR 5/8) and common fine distinct light gray (10YR 7/1) lime accumulations; calcareous.
 14124

Notes: A few clear uncoated quartz grains are on ped faces from 0 to 36 inches. Roots are plentiful from 0 to 8 inches, few from 8 to 30, and scarce from 30 to 60 inches. An oval sand pocket between the 30- and 50-inch depths crossed the pit diagonally but did not occur in face of pit where samples were collected. The A3 and B1 horizons seem to indicate slight forest influence. The Mollie epipedon is thinner than modal for the series. Horizons Alp, IIB22 and IIC1 were sampled for the Bureau of Public Roads.

¹/ Munsell colors for moist soil.

SOIL SURVEY LABORATORY

Lincoln, Nebr.

October 1963

SOIL TYPE *Readlyn
loam

LOCATION Bremer County, Iowa

SOIL NOS. S60Iowa-9-4-(1-11)

LAB. NOS 14138-14148

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|--|------------------------------------|--|----------------------|-------------------------|------------------------|-----------------------------|----------------------------------|----------------------|---------------------------------------|---------------|--------------------------------|----------------|
| | | 1B1a VERY COARSE SAND 2-1 | COARSE SAND 1.0-5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 3A1 | | 2A2 > 2 (19mm) | |
| 0-9 | Alp | 1.0 | 6.6 | 8.7 | 14.2 | 4.6 | 40.3 | 24.6 | 28.5 | 22.0 | tr. | |
| 9-14 | A3 | 1.2 | 5.5 | 7.1 | 11.8 | 4.4 | 41.5 | 28.5 | 26.2 | 24.5 | tr. | |
| 14-19 | IIB1 | 2.3 | 5.1 | 5.6 | 10.3 | 5.9 | 38.0 | 32.8 | 24.9 | 23.6 | 1 | |
| 19-23 | IIB21 | 4.2 | 6.6 | 6.6 | 12.1 | 8.5 | 29.3 | 32.7 | 26.4 | 17.4 | 2 | |
| 23-27 | IIB22 | 3.1 | 7.8 | 7.7 | 14.2 | 9.8 | 28.1 | 29.3 | 28.2 | 16.5 | 2 | |
| 27-32 | IIB23 | 3.9 | 7.1 | 7.5 | 13.7 | 9.3 | 29.7 | 28.8 | 27.9 | 17.8 | 2 | |
| 32-38 | IIB24 | 4.2 | 7.7 | 7.9 | 14.8 | 10.4 | 29.5 | 25.5 | 30.3 | 16.8 | 2 | |
| 38-43 | IIB3 | 3.7 | 7.5 | 7.6 | 14.8 | 10.9 | 29.5 | 26.0 | 31.4 | 16.4 | 1 | |
| 43-50 | IIC1 | 3.8 | 7.4 | 7.8 | 14.9 | 10.9 | 32.0 | 23.2 | 33.0 | 17.4 | 3 | |
| 50-58 | C2 | 3.7 | 7.3 | 7.4 | 13.7 | 10.5 | 33.5 | 23.9 | 32.1 | 18.9 | 4 | |
| 58-72 | C3 | 4.5 | 7.0 | 7.7 | 14.3 | 10.6 | 33.0 | 22.9 | 33.1 | 17.8 | 3 | |
| 8C1a | 6C1a | ORGANIC MATTER | | | | Bulk Density | | | | Moist. Reten. | | |
| pH | Ext. Iron as Fe % | 6A1a | 6B1a | C/N | Field Moist | | 30 Cm. | | O.D. | 1/3 | 15 | |
| | | ORGANIC CARBON % a | NITROGEN % | | 4B4 % M. | 4A1a g/cc | 4B3 % M. | 4A1c g/cc | 4A1h g/cc | ATMOS. Pieces | ATMOS. Sieved % | |
| 6.3 | 1.0 | 2.47 | 0.207 | 12 | 24.0 | 1.46 | 25.9 | 1.46 | 1.61 | 11.9 | | |
| 5.2 | 1.1 | 1.19 | 0.117 | 10 | | | | | | 12.1 | | |
| 5.2 | 1.5 | 0.67 | 0.072 | 9 | 24.3 | 1.40 | 23.9 | 1.42 | 1.52 | 13.2 | | |
| 5.3 | 2.2 | 0.39 | 0.040 | 10 | | | | | | 12.5 | | |
| 5.6 | 2.2 | 0.27 | 0.031 | 9 | 16.0 | 1.64 | 16.0 | 1.65 | 1.77 | 11.3 | | |
| 5.8 | 2.2 | 0.21 | | | | | | | | 11.1 | | |
| 6.4 | 1.9 | 0.14 | | | 13.1 | 1.76 | 15.7 | 1.70 | 1.86 | 10.2 | | |
| 7.5 | 1.9 | 0.12 | | | 15.2 | 1.66 | 16.6 | 1.66 | 1.78 | 10.6 | | |
| 7.8 | 1.7 | 0.08 | | | 14.2 | 1.82 | 14.7 | 1.81 | 1.92 | 9.4 | | |
| 7.8 | 1.6 | 0.08 | | | | | | | | 9.6 | | |
| 7.8 | 1.7 | 0.05 | | | 14.7 | 1.84 | 15.0 | 1.82 | 1.92 | 15.1 | 9.5 | |
| 5A1a | EXTRACTABLE CATIONS | | | | | 5B1a | Base Sat. | | 8M | 8D3 | Carbonate as CaCO ₃ | |
| CATION EXCHANGE CAPACITY NH ₄ OAc | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | 5A3a Sum | 5C1 on NH ₄ OAc CEC % | 5C3 on Sum Cations % | Ratio to Clay NH ₄ OAc CEC | Ca/Mg | 2-mm. | Clay |
| | Ca | Mg | H | No | K | | | | | | % | % |
| 19.5 | 15.0 | 5.2 | 7.4 | 0.1 | 0.2 | 27.9 | 105 | 73 | .79 | 2.9 | | |
| 17.7 | 11.3 | 3.0 | 10.0 | 0.1 | 0.3 | 24.7 | 83 | 60 | .62 | 3.8 | | |
| 18.2 | 12.8 | 3.7 | 7.9 | 0.1 | 0.3 | 24.8 | 93 | 68 | .55 | 3.4 | | |
| 16.5 | 12.5 | 3.5 | 5.7 | 0.1 | 0.3 | 22.1 | 99 | 74 | .50 | 3.6 | | |
| 14.7 | 11.7 | 3.3 | 4.3 | 0.1 | 0.2 | 19.6 | 104 | 78 | .50 | 3.5 | | |
| 14.6 | 12.0 | 3.0 | 3.8 | 0.1 | 0.2 | 19.1 | 105 | 80 | .51 | 4.0 | | |
| 12.7 | 10.4 | 2.9 | 2.6 | 0.1 | 0.2 | 16.2 | 107 | 84 | .50 | 3.6 | | |
| 12.4 | | | | 0.1 | 0.2 | | | | .48 | | tr. | tr. |
| 10.2 | | | | 0.1 | 0.2 | | | | .44 | | 12 | tr. |
| 9.9 | | | | 0.1 | 0.2 | | | | .41 | | 12 | tr. |
| 9.3 | | | | 0.1 | 0.2 | | | | .41 | | 11 | tr. |
| a. | 14 Kg/M ² to 60 inches. | | | | | | | | | | | |

Soil type: *Readlyn loam
 Soil No.: S60Iowa-9-4-(1-11)
 Location: 489 feet north and 72¹/₄ feet east of SW corner of NW1/4 SW1/4 of Sec. 2, T91N, R12W, Bremer County, Iowa.
 Vegetation: Corn. Parent material: Gritty overburden over Iowan till.
 Physiographic position: Upland level till plain on top of a slope slightly convex to the west by southwest; near crest.
 Slope: Less than 1 percent. Drainage: Imperfectly drained.
 Permeability: Moderate in gritty overburden; moderately slow in Iowan till.
 Ground water: None within 72 inches. Moisture: Slightly moist.
 Described by: R. I. Turner, October 11, 1960.

Horizon and
 Lincoln Lab. No.

- Alp 0 to 9 inches. Black (10YR 2/1)¹ heavy loam (approaching silt loam); slightly cloddy, breaking to weak fine subangular blocky structure and weak to moderate fine granules; slightly firm; clear boundary.
 14138
- A3 9 to 14 inches. Black (10YR 2/1) to very dark gray (10YR 3/1) heavy loam; weak fine subangular blocky structure breaking to moderate fine granules; friable; a few black (10YR 2/1) stains from above; kneaded color black (10YR 2/1) to very dark gray (10YR 3/1); common fine inped tubular pores; gradual boundary.
 14139
- IIB1 14 to 19 inches. Mixed (in about equal proportions) dark grayish brown (10YR 4/2) and very dark gray (10YR 3/1) loam; weak to moderate fine subangular blocky structure; friable; the very dark gray colors tend to be replaced with dark gray (10YR 4/1) colors with depth; a few fine faint yellowish brown (10YR 5/8) mottles; kneaded color very dark grayish brown (10YR 3/2); common fine inped tubular pores; a concentration of rounded stones up to 2-1/2 inches in diameter scattered throughout this horizon as a slight pebble band; gradual boundary.
 14140
- IIB21 19 to 23 inches. Dark grayish brown (10YR 4/2) and dark brown (10YR 4/3) heavy loam to light clay loam; weak to moderate fine and very fine subangular blocky structure; friable; ped interiors dark brown (10YR 4/3); ped exteriors dark grayish brown (10YR 4/3); ped interiors dark grayish brown (10YR 4/2) with common fine faint yellowish brown (10YR 5/8) mottles; kneaded color dark brown (10YR 4/3); common fine inped tubular pores; gradual boundary.
 14141
- IIB22 23 to 27 inches. Grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) heavy loam; moderate medium prismatic structure breaking to moderate fine subangular blocks; slightly firm; ped interiors yellowish brown (10YR 5/6); grayish brown (2.5Y 5/2) ped exteriors and prism faces; common fine distinct yellowish brown (10YR 5/6) mottles on ped exteriors; kneaded color yellowish brown (10YR 5/6); common fine inped tubular pores; a few thin discontinuous gray clay films on some concave ped surfaces and in root channels; gradual boundary.
 14142
- IIB23 27 to 32 inches. Same as above.
 14143
- IIB24 32 to 38 inches. Grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) heavy loam; moderate medium prismatic structure breaking to moderate fine subangular blocks; slightly firm to firm; ped interiors yellowish brown (10YR 5/6); grayish brown (2.5Y 5/2) ped exteriors and prism faces with common fine distinct yellowish brown (10YR 5/8) mottles; common fine inped tubular pores; a few fine discontinuous gray clay films on some concave ped surfaces and in root channels; gradual boundary.
 14144
- IIB3 38 to 43 inches. Grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) heavy loam; weak medium prismatic structure breaking to weak fine and medium subangular blocks; firm; ped interiors yellowish brown (10YR 5/6); grayish brown (2.5Y 5/2) ped exteriors and prism faces with common fine distinct yellowish brown mottles; common fine inped tubular pores; a very few discontinuous very indistinct gray clay films on ped surfaces and root channels; clear wavy boundary to carbonates.
 14145
- IIC1 43 to 50 inches. Mixed (in about equal proportions) grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) heavy loam; massive or weak coarse prismatic structure breaking to very weak coarse subangular blocks; slightly firm; few to common fine inped tubular pores; calcareous; common white lime filaments and a few hard white carbonate concretions up to 1/2 inch in diameter; gradual boundary.
 14146
- C2 50 to 58 inches. The hard white carbonate concretions as in above horizon seem to be absent; otherwise same as above.
 14147
- C3 58 to 72 inches. Mixed (in about equal proportions) gray (10YR 6/1) and yellowish brown (10YR 5/6) heavy loam; massive with distinct vertical cleavage to very weak coarse subangular blocky fragments; slightly firm; few to common fine inped tubular pores; calcareous; lime filaments appear less plentiful than in above C1 and C2 horizons.
 14148

Notes: A few clear uncoated quartz grains are on ped surfaces from 0 to 27 inches. Roots plentiful from 0 to 14 inches, common from 14 to 23, few from 23 to 38, and practically absent below 38 inches. A 1-inch thick vein of sandy loam material runs diagonally about half way across the face of pit from 38 to 57 inches in depth. Free water occurred at a depth of 72 inches at the time of sampling. Horizons Alp, IIB22, IIB23, IIC1, and IIC2 were sampled for the Bureau of Public Roads.

¹/ Munsell colors for moist soil.

SOIL TYPE *Riceville LOCATION Howard County, Iowa
loam

SOIL NOS. S56Iowa-45-6-(1-11) LAB. NOS. 4894-4904

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|--|---------------------------------|--|----------------------|--------------------------|------------------------|--|---------------------------------|--|----------------------------|-------------------|--------------------------------|----------------|
| | | 1B1a VERY COARSE SAND 2.1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 2A2 > 2 (19mm) | 3A1 0.2-0.02 | 0.02-0.002 | |
| 0-8 | Ap | 0.8 | 5.7 | 6.5 | 7.7 | 3.1 | 52.1 | 24.1 | 28.4 | 30.5 | - | sil |
| 8-12 | A21 | 1.4 | 6.4 | 6.9 | 9.5 | 4.4 | 49.6 | 21.8 | 30.2 | 28.7 | - | 1 |
| 12-16 | A22 | 2.1 | 6.6 | 7.7 | 11.6 | 6.2 | 43.7 | 22.1 | 31.2 | 24.9 | - | 1 |
| 16-20 | IIAB | 2.9 | 6.0 | 6.7 | 11.6 | 8.9 | 34.7 | 29.2 | 30.9 | 19.1 | 3 | cl |
| 20-24 | IIB21 | 2.1 | 5.4 | 6.3 | 11.4 | 9.2 | 31.0 | 34.6 | 29.5 | 17.3 | Tr. | cl |
| 24-29 | IIB22 | 1.7 | 5.0 | 5.5 | 11.5 | 9.5 | 30.7 | 36.1 | 29.5 | 16.6 | Tr. | cl |
| 29-34 | IIB23 | 2.5 | 5.3 | 5.5 | 11.7 | 9.4 | 30.8 | 34.8 | 29.3 | 16.9 | 3 | cl |
| 34-41 | IIB24 | 2.5 | 5.3 | 5.8 | 12.0 | 9.7 | 31.1 | 33.6 | 29.9 | 16.9 | 3 | cl |
| 41-49 | IIB31 | 2.2 | 5.3 | 5.8 | 12.0 | 9.4 | 32.3 | 33.0 | 29.9 | 17.8 | 2 | cl |
| 49-53 | IIB32 | 2.0 | 6.0 | 6.0 | 11.9 | 9.5 | 32.5 | 32.1 | 29.9 | 18.1 | 2 | cl |
| 53-63 | IIC | 2.5 | 5.1 | 5.4 | 11.8 | 9.8 | 34.8 | 30.6 | 31.7 | 19.0 | 2 | cl |
| pH | 1:1 | 1:5 | 1:10 | ORGANIC MATTER | | | EST% SALT (BUREAU CUP) | ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM 6A1a | CO ₂ equiv-alem | MOISTURE TENSIONS | | |
| | | | | 6A1a ORGANIC CARBON % | 6B1a NITRO-GEN % | C/N | | | | 15 ATMOS. | 4B2 | |
| 6.0 | 6.3 | 6.4 | 2.78 | .235 | 11.8 | | 0.5 | | | | 11.5 | |
| 5.2 | 5.3 | 5.4 | 0.51 | .065 | 7.8 | | 0.3 | | | | 8.1 | |
| 5.1 | 5.3 | 5.4 | 0.35 | .044 | 8.0 | | 0.3 | | | | 8.3 | |
| 4.7 | 5.2 | 5.3 | 0.32 | .039 | 8.2 | | 0.3 | | | | 10.0 | |
| 4.6 | 5.2 | 5.3 | 0.31 | .037 | 8.4 | | 0.2 | | | | 12.0 | |
| 4.6 | 5.2 | 5.3 | 0.24 | | | | 0.2 | | | | 13.2 | |
| 4.7 | 5.4 | 5.5 | 0.22 | | | | 0.2 | | | | 12.7 | |
| 5.2 | 5.8 | 5.8 | 0.19 | | | | 0.2 | | | | 12.5 | |
| 6.6 | 7.0 | 7.0 | 0.16 | | | | 0.3 | | | | 12.8 | |
| 7.6 | 7.2 | 8.1 | 0.12 | | | | 0.4 | | | | 13.2 | |
| 8.0 | 8.5 | 8.7 | 0.12 | | | | 0.4 | 5 | | | 12.2 | |
| 5A1a CATION EXCHANGE CAPACITY NH ₄ Ac | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % NH ₄ Ac EXCH. 5C1 | SATURATION EXTRACT SOLUBLES 6A1 | | | | 8A MOISTURE AT SATURATION % | |
| | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | | 6P1a Na | 6Q1a K | 6N1a Ca | 6O1a Mg | | |
| | milliequivalents per 100g. soil | | | | | | milliequivalents per liter | | | | | |
| 23.2 | 14.1 | 4.4 | 10.1 | - | 0.2 | 81 | 0.5 | 0.1 | 3.3 | 2.4 | 51.5 | |
| 13.2 | 6.2 | 1.8 | 9.2 | - | 0.1 | 61 | 0.5 | 0.1 | 1.3 | 0.6 | 37.0 | |
| 12.6 | 6.2 | 1.7 | 6.9 | - | 0.2 | 64 | 0.5 | 0.1 | 1.3 | 0.8 | 39.0 | |
| 15.1 | 8.1 | 2.2 | 8.2 | - | 0.2 | 70 | 0.5 | 0.1 | 1.3 | 0.6 | 46.4 | |
| 18.0 | 9.4 | 3.0 | 8.6 | 0.1 | 0.2 | 70 | 0.4 | 0.1 | 1.2 | 0.3 | 56.9 | |
| 19.0 | 10.3 | 3.6 | 8.6 | 0.1 | 0.3 | 75 | 0.4 | 0.1 | 0.8 | 0.8 | 59.4 | |
| 18.7 | 11.0 | 3.4 | 7.4 | 0.1 | 0.3 | 79 | 0.4 | 0.1 | 1.0 | 0.5 | 65.1 | |
| 18.2 | 11.8 | 3.8 | 5.7 | 0.1 | 0.3 | 88 | 0.5 | 0.1 | 0.8 | 0.5 | 66.1 | |
| 18.0 | 13.7 | 3.6 | 3.7 | 0.1 | 0.2 | 98 | 0.5 | - | 1.4 | 0.9 | 61.1 | |
| 16.2 | 14.3 | 3.5 | 1.6 | 0.1 | 0.3 | | 0.5 | - | 3.2 | 1.2 | 54.7 | |
| 13.9 | | 2.9 | 0.4 | 0.1 | 0.3 | | 0.5 | - | 2.7 | 0.9 | 51.6 | |

Soil type: *Riceville loam
 Soil No.: S56Iowa-45-6-(1-11)
 Location: Approximately 480 feet south and 205 feet east of west side of field gate which is approximately 975 feet west of northeast corner of NW1/4 of Sec. 33, T99N, R13W, Howard County, Iowa.
 Vegetation or crop: Red clover and timothy meadow.
 Parent material: Firm Iowan till with silty overburden.
 Physiographic position: Upland; concave portion of a side slope as slope approaches waterway; also slightly depressed in terms of a lateral traverse of the side slope.
 Topography: Gently undulating.
 Slope: 1 to 2 percent.
 Drainage: Imperfect.
 Ground water: None observed within 63 inches due to long period of dry weather.
 Permeability: Very slow for the firm till and moderate for the overburden.
 Moisture: Slightly moist.
 Stoniness: Some pebbles occur through the firm till, a band of pebbles is concentrated just above the firm till and the silty material above this is usually pebble free.
 Described by: L. E. Tyler, October 12, 1956.

Horizon and
 Lincoln
 Lab. Number

| | |
|----------------|---|
| Ap 4894 | 0 to 8 inches. Black (10YR 2/1 moist) gritty silt loam; friable; moderate very fine granular structure to cloddy; boundary abrupt. |
| A21 4895 | 8 to 12 inches. Dark gray brown (10YR 4/2 moist) with many fine distinct dark brown (10YR 3/3 to 4/3 moist) mottles; crushed color black (10YR 2/1 moist); dry color gray to light brownish gray (10YR 6/1 to 5/2 dry); gritty silt loam; friable; weak fine platy structure breaking to weak fine sub-angular blocky; worm casts present; boundary gradual. |
| A22 4896 | 12 to 16 inches. Dark gray brown (10YR 4/2 moist) with many fine distinct dark yellowish brown (10YR 4/4 moist) mottles, common fine distinct strong brown (7.5YR 5/8 moist) mottles, and few fine prominent very dark gray (N 3/0 moist) iron-manganese concretions; crushed color dark yellowish brown (10YR 4/4 moist) to olive brown (2.5Y 4/4 moist); heavy loam; slightly firm; mixed weak medium platy and weak fine subangular blocky structure; few pebbles at approximately 16-inch depth; boundary gradual. |
| IIAB 4897 | 16 to 20 inches. Gray (2.5Y 5/1 moist) ped surfaces with common fine prominent yellowish brown (10YR 5/6 to 5/8 moist) mottles; crushed color yellowish brown (10YR 5/6 moist); dry peds gray (10YR 6/1); light clay loam; slightly firm; weak medium subangular blocky structure; few thin discontinuous clay skins may be present; boundary gradual. |
| IIIB1 4898 | 20 to 24 inches. Gray to light gray (5Y 6/1 moist) ped surfaces with common medium distinct strong brown (7.5YR 5/6 moist) mottles and streaks of very dark gray (N 3/0 moist) transported clay; ped interiors are mixed gray (5Y 5/1 moist) and strong brown (7.5YR 5/8 moist); crushed color yellowish brown (10YR 5/6 moist); medium clay loam; moderate to strong medium prismatic structure breaking to moderate to strong medium blocky; firm; boundary gradual. Clay skins difficult to identify. |
| IIIB2 4899 | 24 to 29 inches. Both prism and block surfaces are gray (5Y 5/1 moist) with block faces having many medium distinct dark brown to brown (7.5YR 4/4 moist) mottles; interiors of peds are mixed gray (5Y 5/1 moist) and strong brown (7.5YR 4/6 moist); dry prism faces white (N 8/0 dry); light to medium clay loam; firm; moderate to strong coarse prismatic structure breaking to moderate medium blocky; clay skins difficult to find; boundary gradual. |
| IIIB3 4900 | 29 to 34 inches. Prism and block surfaces both gray (5Y 5/1 moist) with block surfaces having many medium distinct dark brown to brown (10YR 4/3 moist) mottles; ped interiors mixed dark brown to strong brown (7.5YR 4/4 to 4/6 moist) and gray (5Y 5/1); crushed color dark yellowish brown (10YR 4/4 moist); light to medium clay loam; firm; moderate coarse prismatic structure breaking to weak medium subangular blocky; few streaks of dark-colored transported clay present; boundary gradual. |
| IIIB4 4901 | 34 to 41 inches. Some large cleavage faces gray (5Y 5/1 moist) in color and some lesser-defined faces of same color but with many medium distinct dark brown to brown (10YR 4/3 moist) mottles; few iron-manganese soft concretions black (7.5YR 2/1 to 5YR 2/1 moist) in color; ped interiors are mixed approximately 80 percent dark yellowish brown (10YR 4/4 moist) and 20 percent gray (5Y 5/1 moist); crushed color dark yellowish brown (10YR 4/4 moist); medium clay loam; firm; weak coarse prismatic structure to massive; some black (N 2/0 moist) clay streaks on the few faces that exist; boundary gradual. |
| IIIB31 4902 | 41 to 49 inches. Mixed colors, approximately 85 percent dark brown to dark yellowish brown (10YR 4/3 to 4/4 moist) and 15 percent gray (5Y 5/1 moist); crushed color dark yellowish brown (10YR 4/4 moist); light to medium clay loam; firm; few vertical faces but mostly massive; few thin very dark gray (N 3/0 moist) streaks of transported clay on the few gray (5Y 5/1 moist) cleavage faces that exist; boundary gradual. |
| IIIB32 4903 | 49 to 53 inches. Dark yellowish brown (10YR 4/4 moist) with common medium distinct gray (5Y 5/1 moist) mottles; crushed color dark yellowish brown to olive brown (10YR 4/4 to 2.5Y 4/4 moist); light to medium clay loam; firm; mostly massive but has a few vertical faces; very dark gray (N 3/0 moist) streaks of transported clay on the cleavage faces that exist; this horizon and all above are leached; boundary gradual. |
| IIC 4904 | 53 to 63 inches. Colors and texture as above; firm; massive; unleached; contains small lime pebbles most of which appear to be primary carbonates; a few small roots have penetrated this horizon. |

Notes: Light gray vertical cleavage faces in upper part of firm till hold considerable sand; dark colors on faces occur below this horizon but not as continuous as in S56Iowa-45-5. Crevices filled with sand, ranging to sandy clay loam, found in firm till beneath overburden and varied in width from 1-5 inches; sometimes widened into pockets; although these were avoided on face described, at least 1 was present in area covered by each pit (2 by 5 feet). Prismatic structure described may not be evident under wet conditions; soil much dryer than normal due to long dry period.

SOIL SURVEY LABORATORY Lincoln, Nebr. 1/27/58

SOIL TYPE *Riceville loam LOCATION Howard County, Iowa

SOIL NOS. S56Iowa-45-8-(1-10) LAB. NOS. 4915-4924

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------------------|---------|--|------------------|-------------|----------------------|-------------------------|------------------------------|---------------------------|-----------|-------------------|------------------------|----------------|--------------|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | | | > 2 (9mm) |
| 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | | | | |
| 0-7 | Ap | 1.0 | 5.8 | 6.1 | 8.7 | 3.8 | 49.2 | 25.4 | 27.5 | 29.0 | - | 1 | |
| 7-11 1/2 | A21 | 1.3 | 5.8 | 6.0 | 9.1 | 4.4 | 48.2 | 25.2 | 27.4 | 29.0 | - | 1 | |
| 11 1/2-15 1/2 | A22 | 2.6 | 6.7 | 6.4 | 10.6 | 6.5 | 39.0 | 28.2 | 27.7 | 22.7 | 3 | cl | |
| 15 1/2-20 | T1B21 | 1.7 | 5.6 | 6.4 | 12.9 | 9.4 | 30.2 | 33.8 | 29.1 | 17.0 | - | cl | |
| 20-26 | T1B22 | 1.7 | 5.4 | 5.9 | 12.5 | 9.7 | 29.6 | 35.2 | 28.8 | 16.8 | - | cl | |
| 26-34 | T1B23 | 2.2 | 6.2 | 6.0 | 12.2 | 9.4 | 30.9 | 33.1 | 28.7 | 17.6 | - | cl | |
| 34-41 | T1B24 | 1.9 | 5.7 | 6.0 | 12.4 | 9.7 | 32.2 | 32.1 | 29.4 | 18.7 | Tr. | cl | |
| 41-48 | T1B3 | 2.7 | 5.6 | 5.9 | 12.1 | 9.8 | 33.4 | 30.5 | 30.4 | 18.9 | 4 | cl | |
| 48-56 | T1C1 | 2.2 | 5.7 | 6.5 | 11.4 | 9.4 | 35.2 | 29.6 | 31.9 | 19.3 | Tr. | cl | |
| 56-63 | T1C2 | 3.0 | 5.8 | 6.1 | 11.1 | 9.5 | 34.7 | 29.8 | 30.7 | 20.1 | 4 | cl | |
| pH 8C1a | | ORGANIC MATTER | | | | ELECTRICAL CONDUCTIVITY | | 6E1a | | MOISTURE TENSIONS | | | |
| 1:1 | | 6A1a | | 6B1a | EC x 10 ³ | | CaCO ₃ equivalent | | 15 ATMOS. | | | | |
| 1:5 | | 1:10 | ORGANIC CARBON % | NITROGEN % | C/N | 8A1a | | | | 4B2 | | | |
| 5.6 | 5.9 | 6.1 | 3.27 | .253 | 12.9 | 0.5 | | | | 12.8 | | | |
| 5.2 | 5.5 | 5.7 | 0.69 | .078 | 8.8 | 0.3 | | | | 9.9 | | | |
| 5.0 | 5.5 | 5.7 | 0.51 | .055 | 9.3 | 0.3 | | | | 10.1 | | | |
| 4.9 | 5.5 | 5.6 | 0.46 | .044 | 10.4 | 0.3 | | | | 11.8 | | | |
| 5.1 | 5.5 | 5.7 | 0.32 | .036 | 8.9 | 0.3 | | | | 12.8 | | | |
| 6.0 | 6.5 | 6.5 | 0.24 | | | 0.3 | | | | 12.3 | | | |
| 7.3 | 7.6 | 7.7 | 0.19 | | | 0.4 | | | | 12.3 | | | |
| 8.1 | 8.7 | 8.9 | 0.17 | | | 0.4 | | 6 | | 11.8 | | | |
| 8.1 | 8.7 | 8.8 | 0.16 | | | 0.5 | | 9 | | 11.8 | | | |
| 8.1 | 8.6 | 8.8 | 0.24 | | | 0.4 | | 7 | | 11.9 | | | |
| 5A1a | | EXTRACTABLE CATIONS | | | | 5B1a | SATURATION EXTRACT SOLUBLE | | | | 8A | | |
| CATION EXCHANGE CAPACITY | | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | 6P1a | 6Q1a | 6N1a | 6O1a | MOISTURE AT SATURATION | | |
| NH ₄ Ac | | Ca | Mg | H | Na | K | Na | K | Ca | Mg | % | | |
| | | millequivalents per 100g. soil | | | | | 5C1 | millequivalents per liter | | | | | |
| 25.5 | 15.2 | 3.3 | 12.1 | 0.1 | 0.2 | 74 | 0.5 | 0.1 | 3.4 | 1.3 | 57.3 | | |
| 17.4 | 9.1 | 2.2 | 7.9 | 0.1 | 0.2 | 67 | 0.5 | - | 1.4 | 0.5 | 43.6 | | |
| 16.9 | 9.0 | 2.0 | 7.5 | 0.1 | 0.2 | 67 | 0.5 | 0.1 | 1.4 | 0.6 | 43.2 | | |
| 19.8 | 10.8 | 2.9 | 8.0 | 0.1 | 0.2 | 71 | 0.5 | 0.1 | 1.2 | 0.7 | 55.4 | | |
| 19.2 | 11.5 | 3.0 | 8.0 | 0.1 | 0.2 | 77 | 0.9 | 0.2 | 1.2 | 0.4 | 56.0 | | |
| 18.5 | 13.6 | 3.6 | 3.3 | 0.1 | 0.2 | 94 | 0.6 | - | 1.4 | 1.2 | 57.1 | | |
| 17.5 | 14.0 | 3.5 | 2.1 | 0.1 | 0.2 | | 0.6 | - | 1.9 | 0.8 | 56.3 | | |
| 13.8 | | 3.1 | - | 0.1 | 0.2 | | 0.6 | - | 2.7 | 0.8 | 51.6 | | |
| 13.0 | | 3.0 | - | - | 0.2 | | 0.6 | 0.1 | 2.7 | 1.2 | 52.9 | | |
| 13.2 | | 2.8 | - | 0.1 | 0.2 | | 0.5 | 0.1 | 2.6 | 1.2 | 52.4 | | |

Soil type: *Riceville loam
 Soil No.: S56Iowa-45-8-(1-10)
 Location: Approximately 1035 feet north and 260 feet west of southeast corner of Sec. 33, T99N, R13W, Howard County, Iowa.

Vegetation or crop: Red clover and timothy seeding.

Parent material: Firm Iowan till with silty overburden.

Physiographic position: Upland; concave portion of a side slope as a slope approaches waterway.

Topography: Gently undulating.

Slope: 1 to 2 percent.

Drainage: Imperfect.

Ground water: None observed within 63 inches due to long period of dry weather.

Permeability: Very slow for the firm till and moderate for the overburden.

Moisture: Slightly moist.

Stoniness: Some pebbles occur through the firm till; a band of pebbles is concentrated just above the firm till and the silty material above this is usually pebble free; occasional boulders are found.

Described by: L. E. Tyler, October 15, 1956.

Horizon and

Lincoln

Lab. Number

- Ap
4915 0 to 7 inches. Black (10YR 2/1 moist) gritty silt loam; friable; moderate fine granular structure; boundary clear.
- A21
4916 7 to 11½ inches. Dark gray brown (10YR 4/2 moist) with some very dark gray (10YR 3/1 moist) and yellowish brown (10YR 5/4 moist) colors from mechanical mixing; crushed color dark gray brown (10YR 4/2 moist); gritty silt loam; friable; very weak, very fine platy and weak very fine subangular blocky structure; boundary gradual.
- A22
4917 11½ to 15½ inches. Ped surfaces dark gray brown (10YR 4/2 moist) with many fine distinct yellowish brown (10YR 5/6 moist) mottles; ped interiors mixed dark gray brown (10YR 4/2 moist) and strong brown (7.5YR 5/6 moist); crushed color yellowish brown to dark yellowish brown (10YR 4.5/4 moist); light clay loam; slightly firm; moderate to strong, fine to very fine subangular blocky structure; very little mixing as evidenced by worm casts; pebble band present; boundary gradual.
- IIB21
4918 15½ to 20 inches. Ped surfaces gray (2.5Y 5/1 moist) with common fine to medium distinct yellowish brown (10YR 5/6 moist) mottles; ped interiors are mixed gray (2.5Y 5/1 moist) and strong brown (7.5YR 5/7 moist); crushed color yellowish brown (10YR 5/6 moist); light to medium clay loam; slightly firm to firm; moderate to strong, fine to very fine subangular blocky structure; boundary gradual.
- IIB22
4919 20 to 26 inches. Prism surfaces gray (2.5Y 5/1 moist) with few medium distinct yellowish brown (10YR 5/6 moist) mottles; block surfaces same base color with common fine distinct dark brown to brown (7.5YR 4/4 moist) mottles; ped interiors are mixed gray (2.5Y 5/1 moist) and strong brown (7.5YR 5/6 moist); crushed color dark yellowish brown (10YR 4/6 moist); medium clay loam; firm to very firm; moderate medium prismatic structure breaking to strong to moderate medium subangular blocky; if any very dark gray (N3/0 moist) transported clay is smeared on ped surfaces, it is masked by gray sand coatings; boundary gradual.
- IIB23
4920 26 to 34 inches. Ped surfaces gray (2.5Y 5/1 moist) with common medium distinct yellowish brown (10YR 5/6 moist) mottles and with very dark gray (N3/0 moist) transported clay in small root channels and as streaks on ped surfaces; ped interiors mixed gray (2.5Y 5/1 moist) and yellowish brown (10YR 5/6 moist); crushed color dark yellowish brown to yellowish brown (10YR 4.5/4 moist); medium clay loam; very firm; moderate coarse prismatic structure breaking to moderate coarse angular blocky; the sand coating on prism faces in above horizon is absent in this horizon; boundary diffuse.
- IIB24
4921 34 to 41 inches. Ped faces gray (5Y 5/1 moist) with horizontal faces only having many medium distinct yellowish brown (10YR 5/4 to 5/6 moist) mottles; ped interiors are mixed, approximately 75 percent yellowish brown (10YR 5/4 to 5/6 moist) and 25 percent gray (5Y 5/1 moist); crushed color yellowish brown to dark yellowish brown (10YR 5/4 to 5/6 moist); medium clay loam; firm to very firm; weak coarse prismatic structure; transported clay as described above is present to a lesser extent; boundary gradual.
- IIB3
4922 41 to 48 inches. Mixed gray (5Y 5/1 moist) and yellowish brown to dark yellowish brown (10YR 4.5/4 moist); a few vertical faces present that are gray to light gray (5Y 6/1 moist); crushed color yellowish brown to dark yellowish brown (10YR 4.5/4 moist); medium clay loam; firm; principally massive but some large vertical faces present; this horizon is transitional to carbonates, the carbonate line being wavy. All horizons above are leached and all below are unleached; fewer small root channels but some larger ones filled with transported clay; boundary gradual.
- IIC1
4923 48 to 56 inches. Mixed, approximately 50 percent dark yellowish brown (10YR 4/4 moist) and 50 percent gray (5Y 5.5/1 moist); the few vertical faces present are gray (5Y 5.5/1 moist); crushed color yellowish brown (10YR 5/4 moist) to light olive brown (2.5Y 5/4 moist); texture, consistence, and structure as in above horizon; boundary diffuse.
- IIC2
4924 56 to 63 inches. Colors as in above horizon; light to medium clay loam; firm; massive.

Notes: Vertical (prism) faces in upper firm till are gray with sand grains. Crevices filled with sand, ranging to sandy clay loam, were found in firm till beneath overburden and varied in width from 1-5 inches; sometimes widened into pockets. Although these were avoided on face described, at least 1 was present in area covered by each pit (2 by 5 feet). Prismatic structure described may not be evident under wet conditions; soil much dryer than normal due to long dry weather period. Textures are field estimates.

SOIL TYPE ^{*Sac} silty clay loam LOCATION Clay County, Iowa

SOIL NOS. S59Iowa-21-5-(1-8) LAB. NOS. 11170-11177

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--|-------------------------------------|--|-------------|-------------|----------------------------------|--------------------------|--------------|------------|---------------|---------------|--------------------------------|--------------------------|---------------|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | | | > 2 (19mm) |
| 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | | | | |
| 0-7 | Alp | 0.2 | 0.7 | 0.8 | 1.1 | 1.6 | 58.1 | 37.5 | 33.5 | 26.7 | - | sic1 | |
| 7-11 | A3 | 0.2 | 0.6 | 0.7 | 0.9 | 1.6 | 57.6 | 38.4 | 33.3 | 26.3 | Tr. | sic1 | |
| 11-18 | B1 | 0.1 | 0.5 | 0.6 | 0.9 | 2.8 | 57.7 | 37.4 | 36.4 | 24.5 | - | sic1 | |
| 18-25 | B21 | 0.2 | 1.2 | 1.5 | 2.5 | 3.4 | 57.6 | 33.6 | 37.8 | 24.4 | - | sic1 | |
| 25-28 | B22 | 0.7 | 2.6 | 3.2 | 5.2 | 4.5 | 52.1 | 31.7 | 36.9 | 22.1 | Tr. | sic1 | |
| 28-33 | IIB23 | 1.6 | 5.7 | 7.6 | 11.9 | 5.4 | 35.8 | 32.0 | 27.7 | 19.2 | Tr. | cl | |
| 33-44 | IIB3 | 3.2a | 4.2a | 3.6a | 7.1a | 6.1a | 42.1 | 33.7 | 25.7 | 26.5 | 5 | cl | |
| 44-57+ | IIC | 3.0a | 4.1a | 3.3a | 7.1a | 6.1a | 42.0 | 34.4 | 25.7 | 26.5 | 7 | cl | |
| pH | | ORGANIC MATTER | | | | 6C1a | Bulk Density | | | Water Content | | | |
| 8C1a | | 6A1a | 6B1a | | Free Iron | 4A1a | 4A1c | 4A1h | 4B1a | 4B3 | 4B2 | | |
| 1:1 | 1.5 | ORGANIC CARBON | NITROGEN | C/N | Fe ₂ O ₃ % | Field-Moist g/cc | 30-Cm g/cc | O.D. g/cc | Field-Moist % | 30-Cm % | 15-Bar % | | |
| | | % | % | | | | | | | | | | |
| 5.7 | | 3.14 | 0.283 | 11.1 | 1.4 | | | | | | 14.7 | | |
| 5.6 | | 2.45 | 0.221 | 11.1 | 1.5 | 1.23 | 1.19 | 1.34 | 23 | 30 | 15.2 | | |
| 5.7 | | 1.57 | 0.138 | 11.4 | 1.5 | | | | | | 14.7 | | |
| 6.0 | | 0.77 | 0.079 | 10 | 1.5 | 1.46 | 1.43 | 1.54 | 19 | 24 | 13.1 | | |
| 6.3 | | 0.45 | | | 1.6 | | | | | | 12.2 | | |
| 6.7 | | 0.33 | | | 2.3 | 1.57 | 1.52 | 1.63 | 14 | 18 | 12.0 | | |
| 7.9 | | 0.16 | | | 2.3 | 1.69 | 1.63 | 1.73 | 15 | 19 | 13.8 | | |
| 8.0 | | 0.12 | | | 2.2 | | | | | | 14.2 | | |
| 5A1a | EXTRACTABLE CATIONS | | | | | 5B1a | 5C3 | 5B1a | 5A3a | 8D3 | 6E1a | MOISTURE AT SATURATION % | |
| CATION EXCHANGE CAPACITY | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | BASE SAT. % | Base Sat. % | Sum Ext. | Sum Ext. | Ca/Mg | CoCO ₃ equiv. alent | | |
| NH ₄ Ac | Ca | Mg | H | No | K | NH ₄ Ac EXCH. | on Sum | Ext. | Ext. | | % | | |
| | ← milliequivalents per 100g. soil → | | | | | 5C1 | Cations | Bases | Cations | | % | | |
| 30.3 | 20.0 | 5.1 | 12.9 | 0.2 | 0.8 | 86 | 67 | 26.1 | 39.0 | 3.9 | | | |
| 28.6 | 18.2 | 6.1 | 11.4 | 0.1 | 0.5 | 87 | 68 | 24.9 | 36.3 | 3.0 | | | |
| 26.3 | 17.3 | 6.6 | 9.6 | 0.1 | 0.4 | 93 | 72 | 24.4 | 34.0 | 2.6 | | | |
| 23.8 | 17.0 | 6.3 | 5.8 | 0.1 | 0.4 | 100 | 80 | 23.8 | 29.6 | 2.7 | | | |
| 21.6 | 15.9 | 5.8 | 4.3 | 0.1 | 0.4 | 103 | 84 | 22.2 | 26.5 | 2.7 | | | |
| 18.8 | 14.2 | 5.3 | 3.0 | 0.1 | 0.3 | 106 | 87 | 19.9 | 22.9 | 2.7 | | | |
| 15.9 | | | | 0.1 | 0.3 | | | | | | < 18 | | |
| 15.3 | | | | 0.2 | 0.3 | | | | | | 19 | | |
| a. Few carbonate concr. (CaCO ₃ ?). | | | | | | | | | | | | | |

Soil type: *S_{ac} silty clay loam
 Soil No.: S59Iowa-21-5-(1-8)
 Location: 305 feet west of road center and 135 yards north of northeast corner of the SE1/4 of SE1/4 of Sec. 16,
 T95N, R38W, Clay County, Iowa.
 Vegetation and use: Legume hay; cropland.
 Slope and land form: Loess-mantled Tazewell till plain; convex slope adjacent to drainage way to southeast; to the
 northwest the surface rises very slightly to nearly level Primghar soils. Slope to south is 2
 percent at site grading to 3 percent; slope to east is 1 percent at site grading to 2 percent.
 Drainage: Well drained.
 Parent material: About 28 inches of loess overlying clay loam glacial till.
 Collected by: R. H. Jordan and R. L. Juve.
 Described by: F. J. Carlisle and R. I. Turner, June 11, 1959.

Horizon and
 Lincoln
 Lab. Number

Alp 0 to 7 inches. Black (10YR 2/1, 3/2 dry) light silty clay loam, estimated 28 percent clay; massive
 11170 breaking to weak fine granular; friable; hard when dry; rubbed color 10YR 2/1; the few fine sand grains
 are mostly free of coatings; clear boundary.

A3 7 to 11 inches. Mixed black (10YR 2/1) and very dark grayish brown (10YR 3/2) light silty clay loam;
 11171 weak very fine subangular blocky; friable; rubbed color 10YR 2.5/2; gradual boundary.

B1 11 to 18 inches. Mixed colors apparently due to worm activity, predominantly very dark grayish brown
 11172 (10YR 3/2) with some dark brown (10YR 4/3) and black (10YR 2.5/1), medium silty clay loam, estimated
 33 percent clay; weak coarse prismatic breaking to weak very fine subangular blocky; friable; darker
 colors predominantly on ped surfaces; gradual boundary.

B21 18 to 25 inches. Dark brown (10YR 4/3) medium silty clay loam, estimated 31 percent clay; weak medium
 11173 to coarse prismatic breaking to weak medium to coarse subangular blocky; ped faces are slightly darker
 (about 3.5/2.5) than ped interiors; friable; common fine tubular pores; gradual boundary.

B22 25 to 28 inches. Dark brown (10YR 4/3) light silty clay loam; weak medium to coarse prismatic breaking
 11174 to weak medium subangular blocky; ped faces 10YR 4/2 with distinct smooth shiny patches; friable; common
 fine tubular pores; contains some pebbles and more fine sand than horizons above but is still loess-like;
 clear boundary.

IIB23 28 to 33 inches. Dark brown (10YR 4/3) medium clay loam; structure as above; slightly firm; common
 11175 very fine and few fine tubular pores; contains a few small carbonate concretions but the matrix is noncal-
 careous; few fine dark soft oxide concretions; few pebbles; clear boundary.

IIB3 33 to 44 inches. Dark yellowish brown (10YR 4/4) medium clay loam; weak medium to coarse prismatic break-
 11176 ing to very weak blocky; smooth shiny brown patchy films on prism faces and on some block faces; firm;
 common fine faint grayish brown (10YR 5/2) mottles and few dark oxide patches or dendrites; common soft
 and hard carbonate concretions 1 to 3 mm. in diameter; matrix calcareous; common fine tubular pores;
 gradual boundary.

IIC 44 to 57 inches plus. Yellowish brown (10YR 4.5/4) clay loam, estimated 32 percent clay; carbonate con-
 11177 cretions 1 to 3 mm. in diameter are common; matrix calcareous; pebbles 1/2 to 3 inches in diameter have
 carbonate coatings about 1-mm. thick on lower surfaces; few dark oxide patches or dendrites; common fine
 tubular pores; firm; glacial till.

Notes: Colors are for fully moist soil unless indicated otherwise. Roots decrease gradually in numbers with depth.
 They are abundant in the A horizon, common in the upper B horizon, and scarce in the C horizon. pH with chlorphenol
 red and bromthymol blue:

| | |
|-----------------|-----------------|
| 4 inches - 5.8 | 22 inches - 6.4 |
| 14 inches - 6.3 | 27 inches - 6.6 |
| 18 inches - 6.3 | 30 inches - 6.8 |

SOIL TYPE *Sac silt loam LOCATION Clay County, Iowa

SOIL NOS. S59Iowa-21-6-(1-8) LAB. NOS. 11178-11185

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--|-------------------------------------|--|----------------|-------------|-----------|--------------------------------|--------------------|-------------|-------------|---------------|------------------------------|------------------------|---------------|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | | | > 2 (19mm) |
| | | 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | < 19mm | | |
| 0-8 | Alp | 0.5 | 1.1 | 1.2 | 1.7 | 1.9 | 56.8 | 36.8 | 33.3 | 26.2 | Tr. | sicl | |
| 8-13 | A3 | 0.1 | 0.6 | 1.0 | 1.6 | 1.8 | 56.7 | 38.2 | 32.9 | 26.4 | Tr. | sicl | |
| 13-18 | B1 | 0.2 | 0.9 | 1.1 | 1.8 | 2.4 | 56.8 | 36.8 | 34.7 | 25.4 | Tr. | sicl | |
| 18-25 | B21 | 0.3 | 1.3 | 1.7 | 3.1 | 3.3 | 56.3 | 34.0 | 36.8 | 24.4 | Tr. | sicl | |
| 25-28 | IIB22 | 1.5 | 4.1 | 4.5 | 7.8 | 5.3 | 45.1 | 31.7 | 32.9 | 21.2 | Tr. | cl | |
| 28-33 | IIB23 | 1.6 | 3.8 | 4.5 | 8.8 | 7.0 | 38.8 | 35.5 | 28.0 | 22.3 | Tr. | cl | |
| 33-47 | IIB3 | 3.9 a | 4.0 a | 3.4 a | 7.2 a | 7.5 a | 45.8 | 28.2 | 28.6 | 28.7 | 5 | cl | |
| 47-60+ | IIC | 4.0 a | 4.8 a | 4.3 a | 8.8 a | 8.2 a | 44.3 | 25.6 | 29.5 | 27.9 | 7 | 1 | |
| pH | | ORGANIC MATTER | | | | 6C1a | Bulk Density | | | Water Content | | | |
| 8C1a | | 6A1a | 6B1a | | Free Iron | 4A1a | 4A1c | 4A1h | 4B1 | 4B3 | 4B2 | | |
| 1:1 | 1:5 | 1:10 | ORGANIC CARBON | NITRO-GEN | C/N | Fe ₂ O ₃ | Field-Moist | 30-Cm. O.D. | Field-Moist | 30-Cm. | 15-Bar | | |
| | | | % | % | | % | g/cc | g/cc | g/cc | % | % | | |
| 6.0 | | | 2.96 | 0.258 | 11.5 | 1.4 | | | | | 14.8 | | |
| 5.9 | | | 2.10 | 0.184 | 11.4 | 1.5 | 1.29 | 1.26 | 1.38 | 23 | 29 | 15.0 | |
| 6.0 | | | 1.49 | 0.138 | 10.8 | 1.6 | | | | | | 14.4 | |
| 6.1 | | | 0.79 | 0.078 | 10 | 1.6 | 1.43 | 1.42 | 1.52 | 18 | 23 | 13.3 | |
| 6.4 | | | 0.46 | | | 1.8 | | | | | | 11.9 | |
| 6.8 | | | 0.34 | | | 2.5 | 1.48 | 1.46 | 1.57 | 18 | 20 | 13.6 | |
| 8.0 | | | 0.12 | | | 2.2 | 1.74 | 1.67 | 1.75 | 11 | 17 | 12.3 | |
| 8.0 | | | 0.10 | | | 2.3 | | | | | | 11.7 | |
| 5A1a | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % | 5C3 | 5B1a | 5A3a | 8D3 | 6E1a | MOISTURE AT SATURATION | |
| CATION EXCHANGE CAPACITY NH ₄ Ac | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | NH ₄ Ac EXCH. | Base Sat. % on Sum | Sum Ext. | Sum Ext. | Ca/Mg | CaCO ₃ equivalent | | |
| | Ca | Mg | H | No | K | | | | | | % | % | |
| | ← milliequivalents per 100g. soil → | | | | | 5C1 | Cations | Bases | Cations | | | | |
| 29.8 | 20.6 | 5.5 | 10.8 | <0.1 | 0.6 | 90 | 71 | 26.7 | 37.5 | 3.7 | | | |
| 27.7 | 19.6 | 6.8 | 9.8 | 0.1 | 0.4 | 97 | 73 | 26.9 | 36.7 | 2.9 | | | |
| 27.1 | 18.7 | 6.7 | 7.8 | 0.1 | 0.4 | 96 | 77 | 25.9 | 33.7 | 2.8 | | | |
| 24.0 | 17.2 | 6.5 | 5.8 | 0.1 | 0.4 | 101 | 81 | 24.2 | 33.0 | 2.6 | | | |
| 20.3 | 15.0 | 5.6 | 4.0 | 0.1 | 0.3 | 103 | 84 | 21.0 | 25.0 | 2.7 | | | |
| 19.8 | 15.4 | 5.6 | 2.8 | 0.1 | 0.3 | 108 | 88 | 21.4 | 24.2 | 2.8 | | | |
| 13.9 | | | | 0.2 | 0.2 | | | | | | | | |
| 12.7 | | | | 0.2 | 0.2 | | | | | | | | |
| a. Few carbonate concr. (CaCO ₃ ?). | | | | | | | | | | | | | |

Soil type: *Sac silt loam
 Soil No.: S59Iowa-21-6-(1-8)
 Location: 350 yards south and 300 feet east of the northwest corner of SW1/4 of Sec. 28, T95N, R37W, Clay County, Iowa.
 Vegetation and use: Corn; cropland.
 Slope and land form: Loess-mantled Tazewell till plain. Gently convex ridge top with gradient about 1-1/2 percent at site and grading to 2 to 3 percent gradient to east, south, and west. To the northeast the ridge rises very slightly to nearly level Primghar soils.
 Drainage: Well drained.
 Parent material: About 28 inches of loess overlying clay loam glacial till.
 Collected by: R. H. Jordan and R. L. Juve.
 Described by: F. J. Carlisle and R. I. Turner, June 12, 1959.

Horizon and
 Lincoln
 Lab. Number

Alp 0 to 8 inches. Black (10YR 2/1 to 2.5/1, 3/2 dry) silt loam borderline to silty clay loam; massive in place breaking to weak fine granular and subangular blocky; friable; rubbed color 10YR 2/1.7; a few fine spots of 10YR 2/2; some fine sand grains are coated dark brown, others uncoated; clear boundary.
 11178

A3 8 to 13 inches. Very dark brown (10YR 2/2) with some mixing of very dark grayish brown and black (10YR 3/2 and 2/1, light silty clay loam, estimated 29 percent clay; moderate fine to medium granular and weak fine subangular blocky; friable; rubbed color about 10YR 2.4/2; gradual boundary.
 11179

B1 13 to 18 inches. Very dark brown (about 60 percent 10YR 2/2) and dark brown (about 40 percent 10YR 3/2.5) medium silty clay loam, estimated 33 percent clay; moderate fine subangular blocky; friable; gradual boundary.
 11180

B21 18 to 25 inches. Dark brown (10YR 3.5/3) medium silty clay loam, estimated 34 percent clay, with some very dark gray in 3 to 4 mm. thick tongues in the upper part, apparently due to worm activity; weak to moderate fine subangular blocky with faces shiny but not smooth; friable; common fine tubular pores; clear boundary.
 11181

IIB22 25 to 28 inches. Dark brown (10YR 4/3) gritty silty clay loam; weak medium prismatic breaking to weak fine subangular blocky; slightly firm; numerous small pebbles; many fine and few medium to coarse tubular pores; gradual boundary.
 11182

IIB23 28 to 33 inches. Dark brown (10YR 4/3) medium clay loam, estimated 32 percent clay; weak prismatic breaking to weak fine subangular blocky; slightly firm under weak pressure, firm under strong pressure; a few hard carbonate concretions in lower part but matrix is noncalcareous; smooth shiny dark brown patches on many ped faces and on some gravel fragments; a few fine faint gray and browner mottles and a few very fine dark oxide dendrites; many fine and few medium tubular pores; clear boundary.
 11183

IIB3 33 to 47 inches. Dark brown (10YR 4/3) clay loam, estimated 31 percent clay; weak to moderate medium prismatic breaking to weak medium subangular blocky; firm; matrix calcareous; common firm white carbonate concretions up to 1-1/2 cm. in diameter; thin carbonate coating on lower surface of pebbles; common fine faint gray and browner mottles; dark brown smooth shiny patches barely visible in cross section on ped faces look like clay films; few very fine dark oxide dendrites; common fine and few medium tubular pores; gradual boundary.
 11184

IIC 47 to 72 inches plus (sampled 47 to 60 inches). Dark brown (10YR 4/3) clay loam, estimated 30 percent clay; weak coarse prismatic; firm; calcareous matrix; carbonate concretions fewer than in horizon above; common fine faint gray and brown mottles; common soft and hard dark oxide concretions; fewer dark brown smooth shiny patches on prism faces than above; thin carbonate coating on lower surfaces of pebbles; common fine and few medium tubular pores.
 11185

Notes: Colors are for fully moist soil unless indicated otherwise. Roots decrease in numbers gradually with depth. They are common in the Alp, few in A3, and sparse below. In face of sampling pit an irregular seam of yellowish brown sand about three inches thick extends from 60 plus inches up to 36 inches. Another elliptical area of sand in horizon IIC has 8- by 16-inch dimension with long axis vertical. Oxide accumulations are predominantly in the form of firm to hard, spherical concretions in the Primghar (S59Iowa-21-4 and -71-2) and Marcus (S59Iowa-21-3 and -71-1) profiles. In the Sac (S59Iowa-21-5 and -6) profiles oxide accumulations are mainly as soft dendritic coatings.

SOIL SURVEY LABORATORY Beltsville, Md.

SOIL TYPE Sharpsburg LOCATION Adair County, Iowa
 silty clay loam

SOIL NOS. S55Iowa-1-3 LAB. NOS. 56232 - 56248

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|--------------|---------|--|----------------------|-------------------------|------------------------|-----------------------------|--------------------|-----------------|----------|------------|--|----------------|
| | | 1E1a | | 3A1 | | | | | | > 2 | | |
| | | VERY COARSE SAND 2.1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | | |
| 0-6 | A1p | 0.1 | 0.2 | 0.1 | 0.3 | 1.5 | 61.9 | 35.9 | 35.1 | 28.5 | | |
| 6-9 | A3B1 | - | 0.1 | 0.1 | 0.2 | 1.4 | 60.1 | 38.1 | 31.8 | 29.8 | | |
| 9-12 | B21 | - | 0.1 | 0.1 | 0.3 | 1.1 | 61.5 | 36.9 | 31.6 | 31.3 | | |
| 12-15 | B22 | - | 0.1 | 0.1 | 0.2 | 1.0 | 63.1 | 35.5 | 31.3 | 32.9 | | |
| 15-18 | B22 | - | - | - | - | 0.8 | 64.2 | 35.0 | 31.9 | 33.1 | | |
| 18-21 | B22 | - | - | - | 0.1 | 0.6 | 65.5 | 33.8 | 31.7 | 34.5 | | |
| 21-24 | B3 | - | - | - | 0.1 | 0.6 | 66.2 | 33.1 | 32.4 | 34.5 | | |
| 24-27 | B3 | - | - | - | 0.1 | 0.9 | 67.4 | 31.6 | 33.9 | 34.5 | | |
| 27-30 | B3 | - | - | - | 0.1 | 0.8 | 68.3 | 30.8 | 33.2 | 36.0 | | |
| 30-33 | B3 | - | - | - | 0.1 | 0.7 | 69.5 | 29.7 | 35.8 | 34.5 | | |
| 33-36 | B3 | - | - | - | 0.1 | 0.7 | 69.6 | 29.6 | 33.8 | 36.6 | | |
| 36-42 | C1 | - | - | - | 0.1 | 0.8 | 69.5 | 29.6 | 36.2 | 34.2 | | |
| 42-48 | C1 | - | - | 0.1 | 0.3 | 1.1 | 69.2 | 29.3 | 38.8 | 31.7 | | |
| 48-54 | C1 | - | - | 0.1 | 0.4 | 1.4 | 71.4 | 26.7 | 40.8 | 32.3 | | |
| 54-60 | C1 | - | 0.1 | 0.2 | 0.6 | 1.7 | 71.7 | 25.7 | 41.1 | 32.7 | | |
| 60-66 | C1 | - | 0.1 | 0.1 | 0.5 | 1.6 | 71.5 | 26.2 | 41.2 | 32.2 | | |
| 66-72 | D | - | 0.1 | 0.1 | 0.3 | 0.8 | 72.1 | 26.6 | 37.8 | 35.3 | | |

| pH | ORGANIC MATTER | | | | | ESTR. SALT (BUREAU CUP) | ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM @ 25°C. | MOISTURE TENSIONS | | | | |
|-----|----------------|------|------------------|-------------|------|-------------------------|---|-------------------------------|-----------------------|-------------|------------|-----------|
| | 6A1a | | 6B1a | | C/N | | | CaCO ₃ equiv. cent | GYPSUM mg./100g. SOIL | 1/10 ATMOS. | 1/3 ATMOS. | 15 ATMOS. |
| | 1:5 | 1:10 | ORGANIC CARBON % | NITRO-GEN % | | | | | | | | |
| 5.9 | | | 1.80 | .162 | 11.1 | | | | | | | |
| 5.7 | | | 1.40 | .124 | 11.3 | | | | | | | |
| 5.7 | | | 1.00 | .096 | 10.4 | | | | | | | |
| 5.8 | | | 0.78 | .077 | 10.1 | | | | | | | |
| 6.1 | | | 0.56 | .062 | 9.0 | | | | | | | |
| 5.9 | | | 0.47 | .053 | 8.9 | | | | | | | |
| 5.9 | | | 0.38 | .044 | 8.6 | | | | | | | |
| 5.9 | | | 0.32 | .041 | 7.8 | | | | | | | |
| 6.0 | | | 0.26 | .036 | 7.2 | | | | | | | |
| 6.1 | | | 0.27 | .034 | 7.9 | | | | | | | |
| 6.1 | | | 0.22 | .032 | | | | | | | | |
| 6.2 | | | 0.20 | .028 | | | | | | | | |
| 6.3 | | | 0.16 | .026 | | | | | | | | |
| 6.4 | | | 0.14 | .024 | | | | | | | | |
| 6.5 | | | 0.12 | .021 | | | | | | | | |
| 6.5 | | | 0.12 | .021 | | | | | | | | |
| 6.5 | | | 0.11 | .021 | | | | | | | | |

| CATION EXCHANGE CAPACITY Sum | EXTRACTABLE CATIONS 5B1a | | | | | 5C3 Base Sat. % on Sum | SATURATION EXTRACT SOLUBLE | | MOISTURE AT SATU. RATION % |
|------------------------------|---------------------------------|------|------|------|------|------------------------|----------------------------|---|----------------------------|
| | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | | Na | K | |
| | Ca | Mg | H | Na | K | | | | |
| | milliequivalents per 100g. soil | | | | | Cations | milliequivalents per liter | | |
| 27.7 | 15.4 | 3.0 | 8.5 | 0.2 | 0.7 | 69 | | | |
| 27.9 | 14.8 | 3.9 | 8.5 | 0.2 | 0.4 | 70 | | | |
| 32.4 | 15.8 | 8.1 | 7.7 | 0.2 | 0.6 | 76 | | | |
| 32.5 | 16.4 | 8.4 | 6.9 | 0.2 | 0.6 | 78 | | | |
| 31.8 | 16.4 | 8.4 | 6.1 | 0.3 | 0.6 | 80 | | | |
| 27.9 | 14.2 | 7.2 | 5.6 | 0.3 | 0.6 | 80 | | | |
| 28.1 | 13.8 | 7.7 | 5.6 | 0.4 | 0.6 | 80 | | | |
| 29.0 | 14.8 | 8.1 | 5.2 | 0.3 | 0.6 | 82 | | | |
| 29.1 | 15.3 | 8.1 | 4.8 | 0.3 | 0.6 | 83 | | | |
| 28.9 | 15.5 | 7.9 | 4.6 | 0.3 | 0.6 | 84 | | | |
| 29.0 | 15.5 | 7.9 | 4.6 | 0.4 | 0.6 | 84 | | | |
| 28.9 | 15.2 | 8.8 | 3.9 | 0.4 | 0.6 | 86 | | | |
| 27.9 | 15.2 | 7.8 | 3.9 | 0.4 | 0.6 | 86 | | | |
| 26.3 | 14.1 | 7.3 | 3.9 | 0.4 | 0.6 | 85 | | | |
| 23.4 | 13.0 | 7.0 | 2.5 | 0.4 | 0.5 | 89 | | | |
| 23.4 | 13.2 | 6.9 | 2.6 | 0.3 | 0.4 | 89 | | | |
| 26.0 | 13.7 | 7.5 | 3.9 | 0.4 | 0.5 | 85 | | | |

Soil type: Sharpsburg silty clay loam

Soil No.: S55Iowa-1-3

Location: Greenfield Quadrangle; southeast quarter of northeast quarter of Sec. 13, T76N, R32W, Adair County, Iowa.

Slope: 6 percent gently convex, also convex at right angles to slope direction.

Collected by and date: R. B. Daniels and F. J. Carlisle, November 4, 1955.

| Horizon and Beltsville Lab. Number | Sample Depth | |
|---|---|--|
| Alp 56232 | 0-6 | 0 to 6 inches. Very dark brown (10YR 2.5/2) cloddy, friable, silty clay loam; clear to A3B1. |
| A3B1 56233 | 6-9 | 6 to 9 inches. Very dark gray brown (10YR 3/2) and dark brown (10YR 3.5/3) weak fine subangular blocky, friable, silty clay loam; gradual to B21. |
| B21 56234 | 9-12 | 9 to 12 inches. Dark brown (10YR 3/3) with few very dark gray brown (10YR 3/2) weak to moderate fine subangular blocky, friable, silty clay loam; thin discontinuous clay skins; gradual to B22. |
| B22 56235 56236 56237 | 12-15 15-18 18-21 | 12 to 21 inches. Dark brown (10YR 3.5/3) in upper part grading to brown (10YR 4/2.5) in lower part, weak to moderate fine subangular blocky, friable, silty clay loam; few fine faint gray and brown mottles in lower 2 inches of horizon; thin discontinuous clay skins; gradual diffuse to B3. |
| B3 56238 56239 56240 56241 56242 | 21-24 24-27 27-30 30-33 33-36 | 21 to 36 inches. Dark gray brown (10YR 4/2) to (10YR 4/2.5), few fine gray brown (2.4Y 5/2) and strong brown mottles and few fine distinct soft dark oxide concretions, weak medium blocky, friable, silty clay loam; diffuse to C1. |
| C1 56243 56244 56245 56246 56247 | 36-42 42-48 48-54 54-60 60-66 | 36 to 66 inches. Mottled gray brown (2.5Y 5/2) and dark gray brown (10YR 4/2), massive, with tendency for very weak coarse prisms, friable, heavy silt loam to light silty clay loam; gradual to D. |
| D 56248 | 66-72 | 66 to 72 inches. Light brownish gray (2.5Y 6/2) with common fine and medium distinct strong brown grading to dark reddish brown mottles, massive, moderately friable, light silty clay loam; this horizon is deoxidized loess. |

SOIL SURVEY LABORATORY Beltsville, Md.

SOIL TYPE Sharpsburg **LOCATION** Adair County, Iowa
silty clay loam

SOIL NOS. S55Iowa-1-4 **LAB. NOS.** 56249 - 56265

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|------------------------------|---------|--|-------------|-------------|-----------------------|-----------------|---|----------------------------|--------------------------------|------------------------|---------------|--------------------------|-------------|
| | | 1R1a | | | | | 3A1 | | | | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | > 2 | | | | |
| 2.1 | 1.0-5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.20-0.02 | 0.02-0.002 | | | | | |
| 0-6 | A1p | 0.1 | 0.2 | 0.2 | 0.4 | 1.3 | 63.0 | 34.8 | 33.1 | 31.4 | | | |
| 6-9 | A3B1 | - | 0.2 | 0.2 | 0.4 | 1.2 | 61.8 | 36.2 | 31.2 | 32.0 | | | |
| 9-12 | B21 | - | 0.1 | 0.1 | 0.2 | 1.3 | 60.3 | 38.0 | 30.2 | 31.5 | | | |
| 12-15 | B21 | - | 0.2 | 0.1 | 0.2 | 1.4 | 60.2 | 37.9 | 30.5 | 31.2 | | | |
| 15-18 | B21 | - | 0.2 | 0.1 | 0.3 | 1.6 | 60.7 | 37.1 | 31.7 | 30.8 | | | |
| 18-21 | B22 | - | 0.1 | 0.1 | 0.3 | 1.4 | 61.9 | 36.2 | 31.3 | 32.2 | | | |
| 21-25 | B22 | - | 0.1 | 0.1 | 0.4 | 1.4 | 63.5 | 34.5 | 37.1 | 32.0 | | | |
| 25-28 | B31 | - | 0.1 | 0.1 | 0.3 | 1.3 | 65.3 | 32.9 | 34.4 | 32.4 | | | |
| 28-31 | B31 | - | 0.2 | 0.3 | 0.5 | 1.4 | 64.5 | 33.1 | 33.2 | 33.0 | | | |
| 31-35 | B31 | - | 0.1 | 0.2 | 0.3 | 1.5 | 65.2 | 32.7 | 33.4 | 33.5 | | | |
| 35-39 | B32 | - | 0.1 | 0.2 | 0.3 | 1.3 | 65.8 | 32.3 | 34.3 | 33.0 | | | |
| 39-43 | B32 | - | 0.1 | 0.2 | 0.3 | 1.4 | 65.3 | 32.7 | 34.4 | 32.5 | | | |
| 43-48 | C | - | - | 0.1 | 0.3 | 1.2 | 65.5 | 32.5 | 34.2 | 33.1 | | | |
| 48-54 | C | - | 0.1 | 0.2 | 0.4 | 1.3 | 67.7 | 30.3 | 37.6 | 31.6 | | | |
| 54-60 | C | - | 0.1 | 0.2 | 0.3 | 1.5 | 68.8 | 29.1 | 39.9 | 30.6 | | | |
| 60-66 | C | - | 0.1 | 0.2 | 0.4 | 1.1 | 69.3 | 28.9 | 36.0 | 34.6 | | | |
| 66-72 | C | - | 0.1 | 0.2 | 0.3 | 1.2 | 69.8 | 28.4 | 36.3 | 34.9 | | | |
| pH | | ORGANIC MATTER | | | | | ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM AT 25°C | | MOISTURE TENSIONS | | | | |
| 8C1a | | 1:1 | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITROGEN % | C/N | EST% SALT (BUREAU CUP) | CaCO ₃ equivalent % | GYP SUM me./100g. SOIL | 1/10 ATMOS. % | 1/3 ATMOS. % | 15 ATMOS. % |
| 5.7 | | | | | 1.82 | .163 | 11.2 | | | | | | |
| 5.7 | | | | | 1.75 | .151 | 11.6 | | | | | | |
| 5.8 | | | | | 1.04 | .095 | 10.9 | | | | | | |
| 5.8 | | | | | 0.82 | .078 | 10.5 | | | | | | |
| 5.9 | | | | | 0.65 | .065 | 10.0 | | | | | | |
| 5.8 | | | | | 0.52 | .054 | 9.6 | | | | | | |
| 5.6 | | | | | 0.41 | .047 | 8.7 | | | | | | |
| 5.6 | | | | | 0.34 | .042 | 8.1 | | | | | | |
| 5.7 | | | | | 0.30 | .039 | 7.7 | | | | | | |
| 5.8 | | | | | 0.24 | .033 | | | | | | | |
| 6.1 | | | | | 0.20 | .032 | | | | | | | |
| 6.1 | | | | | 0.18 | .030 | | | | | | | |
| 6.3 | | | | | 0.18 | .029 | | | | | | | |
| 6.3 | | | | | 0.15 | .026 | | | | | | | |
| 6.4 | | | | | 0.14 | .025 | | | | | | | |
| 6.4 | | | | | 0.14 | .025 | | | | | | | |
| 6.4 | | | | | 0.14 | .024 | | | | | | | |
| 5A3a | | EXTRACTABLE CATIONS 5B1a | | | | | 5C3 | | SATURATION EXTRACT SOLUBLE | | | MOISTURE AT SATURATION % | |
| CATION EXCHANGE CAPACITY Sum | | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | Base Sat. % on Sum | No | K | | | | |
| | | milliequivalents per 100g. soil | | | | | Cations | milliequivalents per liter | | | | | % |
| 29.5 | 13.0 | 6.0 | 9.8 | 0.2 | 0.5 | 67 | | | | | | | |
| 30.0 | 13.1 | 6.7 | 9.5 | 0.2 | 0.5 | 68 | | | | | | | |
| 31.5 | 14.3 | 8.0 | 8.5 | 0.2 | 0.5 | 73 | | | | | | | |
| 32.1 | 14.7 | 8.1 | 8.5 | 0.2 | 0.6 | 74 | | | | | | | |
| 30.9 | 14.4 | 8.2 | 7.5 | 0.2 | 0.5 | 76 | | | | | | | |
| 31.8 | 15.2 | 8.7 | 7.0 | 0.3 | 0.6 | 78 | | | | | | | |
| 31.0 | 15.2 | 8.3 | 6.7 | 0.3 | 0.5 | 78 | | | | | | | |
| 28.5 | 14.4 | 8.1 | 5.2 | 0.3 | 0.5 | 82 | | | | | | | |
| 30.5 | 15.4 | 8.9 | 5.4 | 0.2 | 0.6 | 82 | | | | | | | |
| 28.5 | 15.0 | 8.2 | 4.4 | 0.4 | 0.5 | 84 | | | | | | | |
| 29.3 | 15.2 | 8.4 | 4.8 | 0.4 | 0.5 | 84 | | | | | | | |
| 29.4 | 15.7 | 8.5 | 4.3 | 0.3 | 0.6 | 85 | | | | | | | |
| 29.7 | 15.5 | 8.6 | 4.6 | 0.4 | 0.6 | 84 | | | | | | | |
| 27.8 | 14.9 | 8.1 | 3.9 | 0.4 | 0.5 | 86 | | | | | | | |
| 26.6 | 14.5 | 8.0 | 3.3 | 0.3 | 0.5 | 88 | | | | | | | |
| 27.4 | 14.7 | 8.1 | 3.8 | 0.3 | 0.5 | 86 | | | | | | | |
| 26.4 | 14.3 | 7.9 | 3.4 | 0.3 | 0.5 | 87 | | | | | | | |

Soil type: Sharpsburg silty clay loam

Soil No.: 855Iowa-1-4

Location: Greenfield Quadrangle; southeast quarter of northeast quarter of Sec. 13, T76N, R32W, Adair County, Iowa.

Slope: 2 percent straight, slightly convex at right angles to slope direction.

Collected by and date: R. B. Daniels and F. J. Carlisle, November 4, 1955.

| Horizon and Beltsville Lab. Number | Sample Depth | |
|--|---|--|
| A1p 56249 | 0-6 | 0 to 6 inches. Very dark brown (10YR 2/2) cloddy, friable, light to medium silty clay loam; abrupt to A3B1. |
| A3B1 56250 | 6-9 | 6 to 9 inches. Very dark brown (10YR 2/2) with about one-third dark brown (10YR 3/3), weak fine and very fine subangular blocky, friable, silty clay loam; clear to E21. |
| E21 56251 56252 56253 | 9-12 12-15 15-18 | 9 to 18 inches. Dark brown (10YR 3/3) weak to moderate fine to very fine subangular blocky approaching granular, friable, silty clay loam, with considerable mixing of very dark gray brown (10YR 3/2) in upper four inches apparently iron earthworm activity; thin discontinuous clay skins; gradual to E22. |
| E22 56254 56255 | 18-21 21-25 | 18 to 25 inches. Brown (10YR 4/2.5) with few fine faint strong brown mottles, weak to moderate fine subangular blocky, moderately friable, silty clay loam; thin continuous clay skins; gradual to B31. |
| B31 56256 56257 56258 | 25-28 28-31 31-35 | 25 to 35 inches. Dark gray brown (10YR 4/2) with common fine faint gray brown (2.5Y 5/2) and few fine distinct strong brown and yellowish brown mottles, moderate medium blocky, moderately friable, light to medium silty clay loam, arranged in weak medium prisms; gradual to B32. |
| B32 56259 56260 | 35-39 39-43 | 35 to 43 inches. Mottled dark gray brown and gray brown (10YR 4/2 and 2.5Y 5/2) with common fine distinct strong brown mottles and few fine distinct dark oxides, weak medium coarse, blocky, friable, medium to light silty clay loam arranged in weak, medium prisms; gradual to C1. |
| C 56261 56262 56263 56264 56265 | 43-48 48-54 54-60 60-66 66-72 | 43 to 72 inches. Mottled gray brown and brown (2.5Y 5/2 and 7.5YR 4/4) and strong brown with few fine distinct dark oxides, massive, friable, light silty clay loam to heavy silt loam. |

SOIL SURVEY LABORATORY Baltaville, Mi.

SOIL TYPE Sharpsburg LOCATION Adair County, Iowa
silty clay loam

SOIL NOS. 855Iowa-1-5 LAB. NOS. 56266 56282

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|------------------------------|---------------------------------|--|-----------------------|-----------------|-----------|------------------------|---|---------------------------------|-----------------------|---------------|--------------------------|----------------|
| | | 1B1a | | | | | | | | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | > 2 | | | |
| | 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | | |
| 0-6 | A1p | 0.1 | 0.3 | 0.3 | 0.5 | 1.2 | 61.5 | 33.1 | 35.9 | 30.1 | | |
| 6-9 | A12 | - | 0.2 | 0.2 | 0.4 | 1.1 | 62.3 | 35.8 | 33.1 | 30.5 | | |
| 9-12 | A12 | - | 0.2 | 0.2 | 0.5 | 1.1 | 61.2 | 36.8 | 31.4 | 31.2 | | |
| 12-15 | A3B1 | 0.1 | 0.3 | 0.2 | 0.4 | 1.2 | 59.8 | 38.0 | 29.8 | 31.4 | | |
| 15-19 | B21 | - | 0.2 | 0.2 | 0.4 | 0.9 | 59.7 | 38.6 | 30.7 | 30.1 | | |
| 19-22 | B22 | - | 0.2 | 0.2 | 0.4 | 0.9 | 59.5 | 38.8 | 29.1 | 31.5 | | |
| 22-26 | B22 | - | 0.1 | 0.2 | 0.3 | 1.1 | 60.3 | 38.0 | 29.7 | 31.9 | | |
| 26-30 | B22 | - | 0.1 | 0.1 | 0.3 | 1.3 | 61.1 | 37.1 | 31.4 | 31.2 | | |
| 30-33 | B3 | - | 0.1 | 0.1 | 0.2 | 1.3 | 63.6 | 34.7 | 33.1 | 31.9 | | |
| 33-36 | B3 | - | 0.2 | 0.2 | 0.4 | 1.4 | 64.2 | 33.6 | 34.8 | 31.0 | | |
| 36-39 | B3 | - | 0.1 | 0.1 | 0.3 | 1.3 | 64.0 | 34.2 | 32.2 | 33.3 | | |
| 39-43 | B3 | - | 0.1 | 0.2 | 0.4 | 1.4 | 65.0 | 32.9 | 34.9 | 31.7 | | |
| 43-48 | C1 | - | 0.1 | 0.2 | 0.4 | 1.4 | 64.7 | 33.2 | 34.0 | 32.3 | | |
| 48-54 | C1 | - | 0.1 | 0.1 | 0.3 | 1.2 | 66.0 | 32.3 | 33.9 | 33.5 | | |
| 54-60 | C1 | - | 0.2 | 0.2 | 0.5 | 1.3 | 67.3 | 30.5 | 31.5 | 37.4 | | |
| 60-66 | C1 | - | 0.1 | 0.2 | 0.5 | 1.5 | 68.6 | 29.1 | 35.9 | 34.5 | | |
| 66-72 | C1 | - | 0.1 | 0.2 | 0.6 | 1.1 | 69.7 | 28.3 | 34.5 | 36.7 | | |
| pH | | ORGANIC MATTER | | | | | ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM @25°C | MOISTURE TENSIONS | | | | |
| 8C1a | 1:5 | 1:10 | 6A1a ORGANIC CARBON % | 6B1a NITROGEN % | C/N | EST% SALT (BUREAU CUP) | | CoCO ₂ equiv-alent % | GYPSUM mm./100g. SOIL | 1/10 ATMOS. % | 1/3 ATMOS. % | 15 ATMOS. % |
| 1:1 | | | | | | | | | | | | |
| 6.4 | | | 2.16 | .194 | 11.1 | | | | | | | |
| 5.2 | | | 1.99 | .180 | 11.0 | | | | | | | |
| 5.3 | | | 1.75 | .152 | 11.5 | | | | | | | |
| 5.4 | | | 1.44 | .125 | 11.5 | | | | | | | |
| 5.6 | | | 1.08 | .095 | 11.4 | | | | | | | |
| 5.8 | | | 0.80 | .073 | 11.0 | | | | | | | |
| 5.8 | | | 0.61 | .060 | 10.2 | | | | | | | |
| 5.8 | | | 0.44 | .048 | 9.2 | | | | | | | |
| 5.7 | | | 0.37 | .042 | 8.8 | | | | | | | |
| 5.7 | | | 0.31 | .040 | 7.8 | | | | | | | |
| 5.9 | | | 0.27 | .033 | 8.2 | | | | | | | |
| 5.9 | | | 0.23 | .034 | | | | | | | | |
| 5.8 | | | 0.21 | .030 | | | | | | | | |
| 6.2 | | | 0.16 | .027 | | | | | | | | |
| 6.0 | | | 0.15 | .025 | | | | | | | | |
| 6.3 | | | 0.14 | .024 | | | | | | | | |
| 6.2 | | | 0.16 | .024 | | | | | | | | |
| 5A3a | EXTRACTABLE CATIONS 5B1a | | | | | 5C3 | SATURATION EXTRACT SOLUBLE | | | | | |
| CATION EXCHANGE CAPACITY Sum | 6N2b Co | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | Base Sat. % on Sum | Na | K | | | MOISTURE AT SATURATION % | |
| | milliequivalents per 100g. soil | | | | | Cations | milliequivalents per liter | | | | | % |
| 30.1 | 16.7 | 4.7 | 7.9 | -0.1 | 0.8 | 73 | | | | | | |
| 29.5 | 12.2 | 5.1 | 11.6 | -0.1 | 0.6 | 61 | | | | | | |
| 29.4 | 12.2 | 5.8 | 10.8 | -0.1 | 0.6 | 63 | | | | | | |
| 30.0 | 12.9 | 6.6 | 9.8 | 0.1 | 0.6 | 67 | | | | | | |
| 31.3 | 13.8 | 7.7 | 2.2 | 0.1 | 0.5 | 71 | | | | | | |
| 32.0 | 14.8 | 8.6 | 7.7 | 0.3 | 0.6 | 76 | | | | | | |
| 31.9 | 15.2 | 8.8 | 7.2 | 0.2 | 0.5 | 77 | | | | | | |
| 31.6 | 15.5 | 9.1 | 6.2 | 0.2 | 0.6 | 80 | | | | | | |
| 30.8 | 15.2 | 8.8 | 6.1 | 0.2 | 0.5 | 80 | | | | | | |
| 30.1 | 14.9 | 8.6 | 5.9 | 0.2 | 0.5 | 80 | | | | | | |
| 30.4 | 15.2 | 8.8 | 5.7 | 0.2 | 0.5 | 81 | | | | | | |
| 31.0 | 15.9 | 8.8 | 5.4 | 0.3 | 0.6 | 82 | | | | | | |
| 30.7 | 15.9 | 8.8 | 5.1 | 0.4 | 0.5 | 83 | | | | | | |
| 30.2 | 15.9 | 8.8 | 4.3 | 0.6 | 0.6 | 86 | | | | | | |
| 29.9 | 15.4 | 8.4 | 4.3 | 1.3 | 0.5 | 86 | | | | | | |
| 28.4 | 15.0 | 8.4 | 3.9 | 0.6 | 0.5 | 86 | | | | | | |
| 26.6 | 14.2 | 8.0 | 3.4 | 0.4 | 0.6 | 87 | | | | | | |

Soil type: Sharpsburg silty clay loam

Soil No.: S55Iowa-1-5

Location: Greenfield Quadrangle; northeast corner of southeast quarter of northeast quarter of southeast quarter of Sec. 18, T76N, R31W, Adair County, Iowa.

Slope: 2 percent straight, slightly convex at right angles to slope direction.

Collected by and date: R. B. Daniels and F. J. Carlisle, November 5, 1955.

| Horizon and Beltsville Lab. Number | Sample Depth | |
|---|---|--|
| A1p 56266 | 0-6 | 0 to 6 inches. Very dark brown (10YR 2/1.5) cloddy, breaking to fine granular, friable, light silty clay loam; clear to A12. |
| A12 56267 56268 | 6-9 9-12 | 6 to 12 inches. Very dark gray to black (10Y 2.5/1) weak medium granular, friable, light to medium silty clay loam; gradual to A3R1. |
| A3R1 56269 | 12-15 | 12 to 15 inches. Very dark brown (10YR 2/2) with some mixing of dark brown (10YR 3.5/3), moderate fine subangular blocky, friable, medium silty clay loam; gradual to B21. |
| B21 56270 | 15-19 | 15 to 19 inches. Dark brown (10YR 3/3) with about 25 percent very dark gray brown and very dark gray (10YR 3/2 and 10YR 3/1), moderate fine subangular blocky, moderately friable, silty clay loam; thin continuous clay skins; gradual boundary to B22. |
| B22 56271 56272 56273 | 19-22 22-26 26-30 | 19 to 30 inches. Dark brown (10YR 3/3) moderate fine subangular blocky, moderately firm, silty clay loam; thin continuous clay skins; few fine faint mottles in lower three inches; gradual boundary to B3. |
| B3 56274 56275 56276 56277 | 30-33 33-36 36-39 39-43 | 30 to 43 inches. Dark brown (10YR 3/3) grading with depth to dark gray brown (10YR 4/2) with common fine gray brown (2.5Y 5/2) and strong brown mottles, moderate to strong (dry), medium blocky, moderately firm, light to medium silty clay loam; gradual diffuse to C1. |
| C1 56278 56279 56280 56281 56282 | 43-48 48-54 54-60 60-66 66-72 | 43 to 72 inches. Mottled yellowish brown and gray brown (10YR 5/4 and 2.5Y 5/2) with common very fine dark oxides, massive, friable, heavy silt loam to light silty clay loam; thin continuous clay skins on vertical cleavage faces to a depth of about 50 inches. |

Soil type: Sharpsburg silty clay loam, gray subsoil variant
 Soil No.: 855Iowa-1-6
 Location: Greenfield Quadrangle; southeast quarter of northeast quarter of Sec. 13, T76N, R32W, Adair County, Iowa.
 Slope: 6 percent straight, slightly convex at right angles.
 Collected by and date: R. B. Daniels and F. J. Carlisle, November 4, 1955.

| Horizon and Beltsville | Sample Lab. Number | Depth | |
|---------------------------|--|--|--|
| A1p | 56283 | 0-6 | 0 to 6 inches. Very dark brown (10YR 2/1.5) weak medium to fine blocky (fragmental), friable, silty clay loam; clear to A12. |
| A12 | 56284 56285 | 6-9 9-12 | 6 to 12 inches. Very dark brown (10YR 2/2), moderate fine subangular blocky and fine to very fine granular, friable, light to medium silty clay loam; gradual to A3E1. |
| A3E1 | 56286 | 12-15 | 12 to 15 inches. Mixed very dark brown and dark gray brown (10YR 2/2 and 10YR 4/2.5), moderate fine and very fine subangular blocky, friable, light to medium silty clay loam; gradual to E2. |
| E2 | 56287 56288 | 15-18 18-21 | 15 to 21 inches. Dark brown (10YR 3/3 to 10YR 3.5/3) with few fine faint gray brown and dark yellowish brown (10YR 5/2 and 10YR 4/4) mottles, moderate to weak fine subangular blocky, friable, medium to light silty clay loam; thin discontinuous clay skins; gradual boundary to B3. |
| B3 | 56289 56290 56291 56292 56293 | 21-24 24-27 27-30 30-34 34-38 | 21 to 38 inches. Dark gray brown (10YR 4/2.5) with common fine and medium gray brown (2.5Y 5/2) and strong brown grading to yellowish red and dark reddish brown mottles, weak to moderate fine and medium blocky, friable, medium to light silty clay loam; thin discontinuous clay skins; diffuse to C1. |
| C1 | 56294 56295 56296 56297 56298 56299 | 38-43 43-48 48-54 54-60 60-66 66-72 | 38 to 72 inches. Gray brown (2.5Y 5/2) with common prominent strong brown to yellowish red and dark reddish brown mottles, coarse prismatic, moderately friable, light silty clay loam with thin continuous clay skins on vertical prism faces; vertical faces extend to 6 feet and at this depth are very coarse. |

Notes: Colors of lower E2 and B3 horizons suggest profile may be less well-drained than 855Iowa-1-3, -4, and -5.

SOIL SURVEY LABORATORY Beltsville, Maryland

SOIL TYPE Sharpsburg silty clay LOCATION Adair County, Iowa
 Loam, 5-13% slopes

SOIL NOS. 856 Iowa-1-11

LAB. NOS. 5783-5787

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------|------------------|--|----------------------|-------------------------|------------------------|-----------------------------|--------------------|-----------------|----------|------------|-----|----------------|----------------------|
| | | 1B1b | | | | | | | | | | | 2A2 > 2 (75µm) |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | 3A1 | | |
| 0-5 | A ₁ D | 0.0 | 0.1 | 0.2 | 0.4 | 0.8 | 60.7 | 37.8 | 31.6 | 30.1 | △ | sicl | |
| 5-9 | AB | 0.0 | 0.0 | 0.1 | 0.3 | 0.6 | 61.4 | 37.6 | 30.5 | 31.6 | △ | sicl | |
| 9-22 | B ₂ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 67.3 | 32.7 | 32.4 | 34.9 | △ | sicl | |
| 22-37 | B ₃ | 0.0 | 0.0 | 0.1 | 0.2 | 0.6 | 68.6 | 30.5 | 30.9 | 38.4 | △ | sicl | |
| 37-51 | C | 0.0 | 0.0 | 0.1 | 0.3 | 0.6 | 71.2 | 27.8 | 37.8 | 34.2 | △ | sicl/sil | |

| 8C1a | pH | 6A1a ORGANIC MATTER | | | EST% SALT (BUREAU CUP) | ELECTRICAL CONDUCTIVITY EC × 10 ³ MILLIMHOS PER CM @ 25°C. | CoCO ₃ equiv- alent | GYPSUM me./100g SOIL | MOISTURE TENSIONS | | |
|------|-----|---------------------|------------------|-------------|------------------------|---|-----------------------------------|----------------------|-------------------|------------|-----------|
| 1:1 | 1:5 | 1:10 | ORGANIC CARBON % | NITRO-GEN % | C/N | | | | 1/10 ATMOS. | 1/3 ATMOS. | 15 ATMOS. |
| 6.1 | | | 1.59 | | | | | | | | |
| 5.8 | | | 0.98 | | | | | | | | |
| 6.0 | | | 0.44 | | | | | | | | |
| 6.2 | | | 0.23 | | | | | | | | |
| 6.2 | | | 0.14 | | | | | | | | |

| 5A3a CATION EXCHANGE CAPACITY | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % | SATURATION EXTRACT SOLUBLE | | MOISTURE AT SATURATION |
|-------------------------------------|--------------------------|------|------|------|-----|-------------|--------------------------------|---|------------------------|
| 6N2a | 6O2b | 6H1a | 6P2a | 6Q2a | | | Na | K | |
| Ca | Mg | H | Na | K | | | milliequivalents per liter | | % |
| ← milliequivalents per 100g. soil → | | | | | | 5C3 | ← milliequivalents per liter → | | |
| 33.9 | 17.7 | 7.3 | 8.3 | 0.1 | 0.5 | 75 | | | |
| 33.3 | 17.0 | 8.1 | 7.6 | 0.1 | 0.5 | 77 | | | |
| 30.8 | 16.1 | 8.2 | 5.8 | 0.1 | 0.6 | 81 | | | |
| 29.2 | 16.3 | 8.1 | 4.0 | 0.3 | 0.6 | 86 | | | |
| 27.2 | 14.7 | 8.1 | 3.4 | 0.4 | 0.6 | 88 | | | |

Soil type: Sharpsburg silty clay loam, 5 to 13 percent slopes
 Soil No.: 556Iowa-1-11
 Location: Greenfield Quadrangle; 429 feet north and 162 feet west of southwest corner of southwest quarter of southwest quarter of northwest quarter of Section 17, T76N, R31W, Adair County, Iowa.
 Slope: 9 percent, gently convex.
 Vegetation: Cultivated field.
 Collected by and date: R. B. Daniels, August 28, 1956.

Horizon and
 Beltsville
 Lab. Number

A1p
 5783 0 to 5 inches. Very dark brown (10YR 2/2 to 2.5/2) friable medium to heavy silty clay loam; cloddy which breaks to weak fine granular structure; very dark brown (10YR 2.5/2) crushed and dark gray brown (10YR 4/2) dry; clear boundary to AB.

AB
 5784 5 to 9 inches. Very dark gray brown (10YR 3/2) friable heavy silty clay loam with some mixing of very dark brown and dark brown (10YR 2/2 and 3/3); weak fine and very fine subangular blocky structure with thin continuous coatings, identification as clay skins doubtful; very dark gray brown (10YR 3/2) crushed and dark gray brown to gray brown (10YR 4.5/2) dry; clear boundary to B2.

B2
 5785 9 to 22 inches. Sampled 10 to 20 inches. Dark brown (10YR 3.5/3) friable heavy silty clay loam with some mixing of very dark gray brown (10YR 3/2) in upper part; weak fine subangular blocky structure with thin continuous clay skins; dark brown (10YR 4/3) crushed and brown to pale brown (10YR 5.5/3) dry; gradual boundary to B3.

B3
 5786 22 to 37 inches. Sampled 24 to 34 inches. Dark gray brown to dark brown (10YR 4/2.5) friable medium silty clay loam with few to common fine gray brown (2.5Y 5/2) and strong brown mottles; weak medium blocky structure with thin continuous clay skins in upper part becoming discontinuous on horizontal surfaces in lower part of the horizon; dark yellowish brown (10YR 4/4) crushed and pale brown (10YR 6/3) dry; gradual boundary to C.

C
 5787 37 to 51 inches. Sampled 41 to 51 inches. Brown (10YR 5/3) friable massive light silty clay loam with common fine and medium gray brown (2.5Y 5/2) and few to common fine dark brown and strong brown (7.5YR 4/4 and 5/6) mottles; thin continuous clay skins along cleavage planes; dark yellowish brown to yellowish brown (10YR 4.5/4) crushed; mottled pale brown to very pale brown (10YR 6.5/3), light brown gray (2.5Y 6/2) and reddish yellow (7.5YR 7/6) dry.

SOIL SURVEY LABORATORY
Beltsville, Maryland

LOCATION Polk County, Iowa

SOIL TYPE Sharpsburg silt loam

LAB NOS. 52239-52247

SURVEY NOS. S51Iowa-77-7-(1-9)

| LABORATORY NUMBER | DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) 3A1 | | | | | | | | | | | TEXTURAL CLASS | | |
|-------------------|--------------|---------|--|--------------------------|----------------------|---------------------|--------------------------|--|----------------------------|--------------|----------------|-----|---------------|----------------|-----|--|
| | | | 1B1b | VERY FINE SAND | | | | | SILT | | CLAY | | INTERNATIONAL | | 2A2 | |
| | | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | 0.05-0.002 | < 0.002 | II 0.2-0.02 | III 0.02-0.002 | > 2 | | | | |
| 52239 | 0-10 | Ap | 0.1 | 0.1 | 0.1 | 0.3 | 1.4 | 67.5 | 30.5 | 36.0 | 33.1 | 0 | | | | |
| 52240 | 10-13 | A3 | 0.0 | 0.1 | 0.1 | 0.2 | 1.0 | 65.8 | 32.8 | 33.3 | 33.7 | 0 | | | | |
| 52241 | 13-18 | El | 0.0 | 0.0 | 0.1 | 0.2 | 1.1 | 63.0 | 35.6 | 31.4 | 32.8 | 0 | | | | |
| 52242 | 18-22 | B21 | 0.0 | 0.0 | 0.1 | 0.2 | 0.9 | 62.9 | 35.9 | 30.0 | 33.9 | 0 | | | | |
| 52243 | 22-25 | B22 | 0.0 | 0.1 | 0.1 | 0.2 | 1.0 | 61.6 | 37.0 | 29.6 | 33.2 | 0 | | | | |
| 52244 | 25-29 | B23 | 0.0 | 0.0 | 0.1 | 0.2 | 0.8 | 62.4 | 36.5 | 28.7 | 34.6 | 0 | | | | |
| 52245 | 29-33 | B3 | 0.0 | 0.1 | 0.1 | 0.3 | 0.9 | 63.6 | 35.0 | 30.9 | 33.8 | 0 | | | | |
| 52246 | 33-48 | C1 | 0.0 | 0.0 | 0.1 | 0.2 | 1.5 | 64.2 | 34.0 | 34.1 | 31.7 | 0 | | | | |
| 52247 | 48-60 | C2 | 0.0 | 0.0 | 0.0 | 0.2 | 1.2 | 66.3 | 32.3 | 35.1 | 32.5 | 0 | | | | |
| | | | pH | | ORGANIC MATTER | | | FREE IRON OXIDE Fe ₂ O ₃ | MOISTURE RETAINED AT | | | | | | | |
| | | | 8C1a H ₂ O 1:1 | 6A1a ORGANIC CARBON % | NITROGEN % | C/N | | BULK DENSITY g/cc | 1/10 ATMOS. % | 1/3 ATMOS. % | 15 ATMOS. % | | | | | |
| 52239 | 6.4 | | | 2.44 | | | | | | | | | | | | |
| 52240 | 5.2 | | | 2.21 | | | | | | | | | | | | |
| 52241 | 5.6 | | | 1.74 | | | | | | | | | | | | |
| 52242 | 5.6 | | | 1.30 | | | | | | | | | | | | |
| 52243 | 5.6 | | | 1.08 | | | | | | | | | | | | |
| 52244 | 5.6 | | | 0.77 | | | | | | | | | | | | |
| 52245 | 5.7 | | | 0.60 | | | | | | | | | | | | |
| 52246 | 5.8 | | | 0.34 | | | | | | | | | | | | |
| 52247 | 5.9 | | | 0.32 | | | | | | | | | | | | |
| | | | 5A3a CATION EXCHANGE CAPACITY (SUM) | EXTRACTABLE CATIONS 5B1a | | | | | BASE SATURATION% 5C3 (SUM) | | | | | | | |
| | | | 6N2b Ca | 6O2b Mg | 6P2a Na | 6Q2a K | 6R1a H | | | | | | | | | |
| | | | milliequivalents per 100g soil | | | | | | | | | | | | | |
| 52239 | 27.3 | 16.6 | 3.2 | 0.1 | 0.8 | 6.6 | 76 | | | | | | | | | |
| 52240 | 27.2 | 13.3 | 3.6 | 0.1 | 0.6 | 9.6 | 65 | | | | | | | | | |
| 52241 | 28.4 | 13.7 | 4.9 | 0.1 | 0.6 | 9.1 | 68 | | | | | | | | | |
| 52242 | 29.4 | 14.0 | 5.7 | 0.1 | 0.6 | 9.0 | 69 | | | | | | | | | |
| 52243 | 29.8 | 14.6 | 6.7 | 0.1 | 0.5 | 7.9 | 73 | | | | | | | | | |
| 52244 | 29.7 | 14.9 | 7.2 | 0.1 | 0.5 | 7.0 | 76 | | | | | | | | | |
| 52245 | 29.9 | 14.9 | 7.4 | 0.1 | 0.5 | 7.0 | 76 | | | | | | | | | |
| 52246 | 28.7 | 15.0 | 7.4 | 0.1 | 0.5 | 5.7 | 80 | | | | | | | | | |
| 52247 | 27.9 | 15.2 | 7.2 | 0.2 | 0.5 | 4.8 | 83 | | | | | | | | | |

Soil type: Sharpsburg silt loam
 Soil No.: S51Iowa-77-7-(1-9)
 Location: NE1/4 SE1/4 SW1/4 of Sec. 26, T78N, R25W, Bloomfield Township, Polk County, Iowa, 75 feet from a point on north-south gravel road 1000 feet north of south section line.
 Position: Very gently sloping broad ridgetop, about 1000 feet wide, in dissected Peorian loess-mantled region, slightly more than 1 mile south of southwestern Des Moines city limits.
 Vegetation: Soybeans 1951, original vegetation prairie grasses.
 Collected by and date: Dean Einspahr and Ralph McCracken, December 6, 1951.

Horizon and
 Beltsville
 Lab. Number

| | |
|--------------|---|
| Ap 52239 | 0 to 10 inches. Very dark grayish brown (10YR 3/2) firm moderate medium granular heavy silt loam. |
| A3 52240 | 10 to 13 inches. Mottled very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) firm moderate medium granular heavy silt loam. |
| B1 52241 | 13 to 18 inches. Dark brown (10YR 4/3) firm moderate medium granular silty clay loam. |
| B21 52242 | 18 to 22 inches. Dark brown (10YR 4/3) firm moderate fine and medium subangular blocky silty clay loam. |
| B22 52243 | 22 to 25 inches. Dark brown (10YR 4/3) firm moderate medium subangular blocky silty clay loam. |
| B23 52244 | 25 to 29 inches. Dark brown (10YR 4/3) firm weak medium subangular blocky silty clay loam. |
| B3 52245 | 29 to 33 inches. Dark brown (10YR 4/3) with a few medium contrast fine mottles and spots of light yellowish brown (10YR 6/4), also a few iron stains; firm, weak subangular blocky light silty clay loam. |
| C1 52246 | 33 to 48 inches. Yellowish brown (10YR 5/4) fine and medium mottles of light yellowish brown (10YR 6/4) and iron stains; friable; massive, heavy silt loam. |
| C2 52247 | 48 to 60 inches. Yellowish brown (10YR 5/4) medium mottles and spots of light yellowish brown (2.5Y 6/4) and reddish yellow (7.5YR 6/6); firm; massive, heavy silt loam. |

SOIL SURVEY LABORATORY Beltsville, Maryland

SOIL TYPE Shelby clay loam, LOCATION Adair County, Iowa
deep t carbonates

SOIL NOS. 856Iowa-1-5 LAB. NOS. 5739-5747

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | | | | |
|-------------------------------------|-----------------|--|-------------|------------------|------------|------------------------|---|-----------------------------------|-----------------------|-------------------|-----|--------------------------|--------------------------------|--|--|--|
| | | 1B1b | | | | | | | | | | | | | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | 3A1 | | 2A2 | | | | | |
| 2-1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 | | | | | | | |
| | | | | | | | | | | | | < 75µm | | | | |
| 0-4 | A ₁₁ | 0.4 | 1.7 | 2.8 | 5.8 | 4.2 | 53.4 | 31.7 | 35.9 | 24.8 | <1 | sic1 | | | | |
| 4-9 | A ₁₂ | 0.4 | 1.7 | 2.6 | 5.0 | 3.9 | 52.2 | 34.2 | 33.1 | 25.8 | <1 | sic1 | | | | |
| 9-13 | AB | 0.2 | 1.6 | 2.6 | 5.2 | 4.4 | 51.4 | 34.6 | 32.6 | 26.0 | <1 | sic1 | | | | |
| 13-22 | B ₂₁ | 1.0 | 2.2 | 3.4 | 6.6 | 5.2 | 46.0 | 35.6 | 30.4 | 24.4 | <1 | sic1 | | | | |
| 22-30 | B ₂₂ | 1.7 | 3.6 | 5.4 | 10.9 | 8.1 | 33.2 | 37.1 | 27.7 | 19.5 | <1 | cl | | | | |
| 30-37 | B ₃₁ | 1.6 | 3.9 | 5.4 | 10.2 | 8.5 | 34.4 | 36.0 | 28.4 | 20.2 | 2 | cl | | | | |
| 37-43 | B ₃₂ | 1.5 | 4.0 | 5.6 | 10.3 | 8.7 | 34.8 | 35.1 | 29.2 | 20.0 | 2 | cl | | | | |
| 43-54 | B ₃₃ | 2.1 | 4.6 | 5.5 | 10.4 | 9.3 | 36.4 | 31.7 | 31.5 | 20.3 | 2 | cl | | | | |
| 54-72 | C | 2.0 | 4.2 | 5.4 | 10.0 | 8.5 | 39.2 | 30.7 | 32.2 | 21.1 | 2 | cl | | | | |
| pH | | ORGANIC MATTER | | | | EST% SALT (BUREAU CUP) | ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM @ 25°C. | 6E1e | | MOISTURE TENSIONS | | | | | | |
| 8G1a | | 6A1a | | 6B1a | | | | CaCO ₃ equiv- alent | GYPSUM mg./100g. SOIL | 1/10 | 1/3 | 15 | | | | |
| 1:1 | | 1:5 | 1:10 | ORGANIC CARBON % | NITROGEN % | C/N | % | | | % | % | % | % | | | |
| 5.5 | | | | 3.12 | 0.304 | 10.3 | | | | | | | | | | |
| 5.6 | | | | 2.06 | 0.206 | 10.0 | | | | | | | | | | |
| 5.6 | | | | 1.59 | 0.164 | 9.7 | | | | | | | | | | |
| 5.7 | | | | 0.52 | 0.065 | 8.0 | | | | | | | | | | |
| 5.9 | | | | 0.25 | 0.042 | 6.0 | | | | | | | | | | |
| 6.0 | | | | 0.16 | 0.032 | | | | | | | | | | | |
| 6.6 | | | | 0.16 | 0.031 | | | | | | | | | | | |
| 7.8 | | | | 0.10 | 0.024 | | | | | | | | | | | |
| 7.8 | | | | 0.08 | | | | 7 | | | | | | | | |
| | | | | | | | | 8 | | | | | | | | |
| 5A3a | | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % | SATURATION EXTRACT SOLUBLE | | | | MOISTURE AT SATURATION % | | | | |
| CATION EXCHANGE CAPACITY Sum | 6N2d | 6O2b | 6H1a | 6P2a | 6Q2a | Na | | K | | | | | | | | |
| | Ca | Mg | H | Na | K | | | | | | | | | | | |
| ← milliequivalents per 100g. soil → | | | | | | | | | | | | 503 | ← milliequivalents per liter → | | | |
| 30.8 | 14.9 | 5.0 | 10.5 | <0.1 | 0.4 | 66 | | | | | | | | | | |
| 29.6 | 15.1 | 4.6 | 9.5 | <0.1 | 0.4 | 68 | | | | | | | | | | |
| 28.7 | 15.4 | 4.6 | 8.3 | 0.1 | 0.3 | 71 | | | | | | | | | | |
| 26.3 | 14.7 | 5.4 | 5.9 | 0.1 | 0.4 | 78 | | | | | | | | | | |
| 21.9 | 13.1 | 4.4 | 4.0 | 0.1 | 0.3 | 82 | | | | | | | | | | |
| 21.1 | 13.2 | 4.1 | 3.4 | 0.1 | 0.3 | 84 | | | | | | | | | | |
| | 13.4 | 3.7 | 0.0 | 0.1 | 0.3 | 100+ | | | | | | | | | | |
| calcareous | | | | | | | | | | | | | | | | |
| calcareous | | | | | | | | | | | | | | | | |

Soil type: Shelby clay loam, deep to carbonates

Soil No.: 856Iowa-1-5

Location: Greenfield Quadrangle; 297 feet west and 190 feet south of southeast corner of southwest quarter of northeast quarter of southeast quarter of Section 18, T76N, R31W, Adair County, Iowa.

Slope: 12 percent, convex.

Vegetation: Bluegrass.

Collected by and date: R. B. Daniels, July 12, 1956.

Horizon and

Beltsville

Lab. Number

- A11
5739 0 to 4 inches. Very dark brown (10YR 2/2) friable medium silty clay loam to clay loam; moderate to strong very fine granular structure; clear boundary to A12.
- A12
5740 4 to 9 inches. Very dark brown (10YR 2/2) friable to firm medium silty clay loam to medium clay loam; moderate to strong fine granular structure; clear boundary to AB.
- AB
5741 9 to 13 inches. Very dark gray brown (10YR 3/2) friable to slightly firm medium clay loam to silty clay loam with some mixing of dark brown (10YR 3/3); moderate fine subangular blocky structure; gradual boundary to B21.
- B21
5742 13 to 22 inches. Dark brown (10YR 4/3) firm medium to heavy clay loam; moderate fine subangular blocky structure with thin continuous clay skins; gradual boundary to B22.
- B22
5743 22 to 30 inches. Dark brown to dark yellowish brown (10YR 4/3.5) firm heavy clay loam; weak to moderate fine and medium subangular blocky structure with medium continuous clay skins; few fine strong brown mottles; gradual boundary to B31.
- B31
5744 30 to 37 inches. Dark gray brown to dark brown (10YR 4/2.5) firm medium to heavy clay loam; interior of peds are gray brown, dark yellowish brown, and strong brown (2.5Y 5/2, 10YR 4/4, and 7.5YR 5/6); weak medium blocky structure with thin to medium continuous clay skins; gradual boundary to B32.
- B32
5745 37 to 43 inches. Dark gray brown to dark brown (10YR 4/2.5) firm medium clay loam with few fine to medium gray brown and strong brown mottles (2.5Y 5/2 and 7.5YR 5/6); weak medium to coarse blocky structure with thin discontinuous clay skins on horizontal surfaces; abrupt boundary to B33.
- B33
5746 43 to 54 inches. Dark gray brown (10YR 4/2) firm medium calcareous clay loam with common olive gray to gray (5Y 5/1.5) streaks which range up to 2 inches in length and 1/4-inch in width; common fine to medium strong brown (7.5YR 5/6) mottles; very weak medium and coarse blocky with thin continuous clay skins on vertical surfaces and thin discontinuous clay skins on horizontal surfaces; few white firm carbonate concretions less than 1/4-inch in diameter; diffuse boundary to C.
- C
5747 54 to 72 inches. Mottled dark gray brown to brown and gray brown (10YR 4/2.5 and 2.5Y 5/2) firm massive calcareous light clay loam with common fine and coarse strong brown (7.5YR 5/6), few to common fine and coarse yellowish red (5YR 4/6), and few fine olive brown (2.5Y 4/4) mottles; common carbonate concretions less than 1/4-inch in diameter; thin discontinuous clay skins on vertical cleavage planes.

SOIL SURVEY LABORATORY Beltsville, Maryland

SOIL TYPE Shelby clay loam, deep to carbonates LOCATION Adair County, Iowa

SOIL NOS. S56Iowa-1-6

LAB. NOS. 5748-5755

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|------------------------------|--------------------------|--|----------------------|-------------------------|------------------------|-------------------------------------|--------------------------------|--|-----------------------------------|-----------------------|--------------------------|----------------|
| | | 1B1b 3A1 2A2 | | | | | | | | | | |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | | | | |
| 0-7 | A _{1D} | 1.2 | 4.0 | 6.6 | 15.0 | 10.0 | 34.8 | 28.4 | 36.0 | 17.3 | 4 | cl |
| 7-11 | AB | 1.4 | 3.9 | 6.0 | 13.7 | 9.7 | 32.6 | 32.7 | 33.4 | 16.6 | 1 | cl |
| 11-17 | B ₂₁ | 1.5 | 4.6 | 6.0 | 12.0 | 8.0 | 32.7 | 35.2 | 30.1 | 17.4 | 1 | cl |
| 17-23 | B ₂₂ | 1.7 | 3.9 | 5.1 | 10.9 | 8.7 | 33.7 | 36.0 | 29.4 | 19.3 | 2 | cl |
| 23-34 | B ₃₁ | 1.2 | 4.2 | 5.7 | 11.9 | 9.2 | 33.9 | 33.9 | 31.0 | 18.9 | 2 | cl |
| 34-48 | B ₃₂ | 2.0 | 4.3 | 5.6 | 11.3 | 8.3 | 36.4 | 32.1 | 31.0 | 20.0 | 1 | cl |
| 48-60 | C ₂₁ | 2.2 | 4.3 | 5.6 | 13.0 | 11.0 | 36.5 | 27.4 | 34.6 | 20.8 | 2 | cl/l |
| 72-82 | C ₂₃ | 1.8 | 4.4 | 5.4 | 10.9 | 9.1 | 38.2 | 30.2 | 31.2 | 22.5 | 3 | cl |
| pH | | ORGANIC MATTER | | | | | EST% SALT (BUREAU CUP) | ELECTRICAL CONDUCTIVITY EC x 10 ³ MILLIMHOS PER CM @25°C. | MOISTURE TENSIONS | | | |
| 8C1a | | 6A1a | 6B1a | C/N | | 6E1e | | | CoCO ₃ equiv- alent | GYPSUM ma./100g. SOIL | 1/10 ATMOS. | 1/3 ATMOS. |
| | 1:5 | 1:10 | ORGANIC CARBON % | NITRO-GEN % | | | | | | | | |
| | 1:1 | | | | | | | | | | | |
| | | | 2.56 | 0.221 | 11.6 | | | | | | | |
| | | | 1.65 | 0.155 | 10.6 | | | | | | | |
| | | | 1.02 | 0.103 | 9.9 | | | | | | | |
| | | | 0.49 | 0.056 | 8.8 | | | | | | | |
| | | | 0.25 | 0.036 | 6.9 | | | | | | | |
| | | | 0.16 | 0.030 | | | | | | | | |
| | | | 0.09 | | | | | 6 | | | | |
| | | | 0.08 | | | | | 9 | | | | |
| 5A3a | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % | SATURATION EXTRACT SOLUBLE | | | | | |
| CATION EXCHANGE CAPACITY Sum | 6N2d | 6O2b | 6H1a | 6P2a | 6Q2a | | No | K | | | MOISTURE AT SATURATION % | |
| | Ca | Mg | H | Na | K | ← milliequivalents per 100g. soil → | | | | | | |
| | | | | | | 503 | ← milliequivalents per liter → | | | | | |
| 26.1 | 13.1 | 3.4 | 9.1 | 0.1 | 0.4 | 65 | | | | | | |
| 26.0 | 13.6 | 4.0 | 8.0 | 0.1 | 0.3 | 69 | | | | | | |
| 25.5 | 14.1 | 4.0 | 7.0 | 0.1 | 0.3 | 73 | | | | | | |
| 29.4 | 14.4 | 4.1 | 10.4 | 0.1 | 0.4 | 65 | | | | | | |
| 21.5 | 14.5 | 3.5 | 3.1 | 0.1 | 0.3 | 86 | | | | | | |
| 26.3 | 16.0 | 2.6 | 7.3 | 0.1 | 0.3 | 72 | | | | | | |
| calcareous | | | | | | | | | | | | |
| calcareous | | | | | | | | | | | | |

Soil type: Shelby clay loam, deep to carbonates
 Soil No.: S56Iowa-1-6
 Location: Greenfield Quadrangle; 297 feet east and 129 feet south of northwest corner of southwest quarter of southeast quarter of northwest quarter of Section 18, T6N, R31W, Adair County, Iowa.
 Slope: 15 percent, convex.
 Vegetation: Cultivated field.
 Collected by and date: R. B. Daniels and G. H. Simonson, July 31, 1956.

Horizon and
 Beltsville
 Lab. Number

A1p 0 to 7 inches. Very dark brown (10YR 2/2) friable light silty clay loam to light clay loam; weak fine granular structure; black to very dark brown (10YR 2/1.5) crushed and dark gray (10YR 4/1) dry; clear boundary to AB.
 5748

AB 7 to 11 inches. Very dark gray brown (10YR 3/2) slightly firm light to medium silty clay loam to clay loam with some mixing of very dark brown and dark brown (10YR 2/2 and 3/3); moderate fine subangular blocky structure; very dark gray brown (10YR 3/2) crushed and dark gray to dark gray brown (10YR 4/1 and 4/2) dry; clear boundary to B21.
 5749

B21 11 to 17 inches. Dark brown (10YR 3.5/3) firm medium clay loam with some mixing of very dark brown (10YR 2/2) along channels; moderate fine and very fine subangular blocky structure with thin continuous clay skins; clear boundary to B22.
 5750

B22 17 to 23 inches. Dark yellowish brown (10YR 4/4) firm medium to heavy clay loam with some mixing of very dark brown (10YR 2/2) along channels in the upper part; weak to moderate fine subangular blocky structure with medium continuous clay skins; clear boundary to B31.
 5751

B31 23 to 34 inches. Dark brown (10YR 4/3) very firm medium clay loam with few fine faint gray and few coarse strong brown and reddish yellow (7.5YR 5/6 and 6/8) mottles; weak fine and medium blocky structure with thin to medium continuous clay skins; gradual boundary to B32.
 5752

B32 34 to 48 inches. Sampled 36 to 46 inches. Dark brown (10YR 4/3) very firm medium clay loam with common medium gray brown (2.5Y 5/2) and few fine strong brown mottles; weak to very weak medium to coarse blocky structure with medium clay skins on vertical surfaces of weak medium prisms and thin continuous on the blocky pedis becoming discontinuous in the lower part; clay skins become thin but continuous in lower part of horizon on prisms; clear boundary to C21.
 5753

C21 48 to 60 inches. Sampled 48 to 58 inches. Mottled gray brown and dark yellowish brown (2.5Y 5/2 and 10YR 4/4) firm to very firm massive calcareous light clay loam; thin discontinuous clay skins on vertical surfaces; common white soft to very hard carbonate concretions less than 1/4-inch in diameter; gradual boundary to C22.
 5754

C22 60 to 72 inches. Mottled gray brown and yellowish brown (2.5Y 5/2 and 10YR 5/6) friable massive calcareous sandy loam; gradual boundary to C23.
 5755

C23 72 to 82 inches. Yellowish brown (10YR 5/4) firm massive calcareous light clay loam; common medium gray brown (2.5Y 5/2) and few fine strong brown mottles.
 5755

Soil type: Shelby clay loam, moderately shallow to carbonates
 Soil No.: 856Iowa-1-7
 Location: Greenfield Quadrangle; 165 feet west and 17 feet south of northeast corner of southwest quarter of north-east quarter of southeast quarter of Section 18, T76N, R31W, Adair County, Iowa.
 Slope: 4 percent along axis of interfluvium, but sharply convex transverse to the interfluvium axis.
 Vegetation: Bluegrass.
 Collected by and date: R. B. Daniels, July 27, 1956.

Horizon and
 Beltsville
 Lab. Number

| | |
|-------------|---|
| A1 5756 | 0 to 6 inches. Very dark brown (10YR 2/2) friable medium clay loam to medium silty clay loam; weak to moderate fine granular structure; clear boundary to AB. |
| AB 5757 | 6 to 10 inches. Very dark gray brown (10YR 3/2) friable medium clay loam to medium silty clay loam with some mixing of black and dark brown (10YR 2/1 and 3/3); moderate fine and very fine subangular blocky structure; clear boundary to B2. |
| B2 5758 | 10 to 19 inches. Dark brown (10YR 4/3) slightly firm medium clay loam with some mixing of very dark gray brown and very dark brown (10YR 3/2 and 2/2) along channels; moderate fine subangular blocky structure with thin to medium continuous clay skins; clear boundary to B31. |
| B31 5759 | 19 to 33 inches. Sampled 21 to 31 inches. Brown (10YR 4.5/3) firm medium clay loam; few to common fine and medium gray (5Y 5.5/1) and few fine strong brown mottles; weak medium blocky structure with thin continuous clay skins; abrupt boundary to B32. |
| B32 5760 | 33 to 48 inches. Sampled 35 to 45 inches. Dark yellowish brown (10YR 4/4) firm calcareous light to medium clay loam with common medium to coarse gray (5Y 5.5/1) mottles and streaks, and few fine strong brown mottles; weak medium to coarse blocky structure with thin continuous clay skins becoming discontinuous in the lower part of the horizon; common white soft to very hard carbonate concretions and limestone fragments less than 3/4-inch in diameter; gradual to diffuse boundary to C. |
| C 5761 | 48 to 60 inches. Sampled 50 to 60 inches. Brown (1Y 5/3) firm massive calcareous light to medium clay loam with common gray (5Y 5.5/1) streaks less than 1/4-inch wide and common fine to coarse strong brown (7.5YR 5/6) mottles; many white soft to very hard carbonate concretions and limestone fragments less than 1-inch in diameter; thin discontinuous clay skins on vertical cleavage planes. |

Soil type: Shelby clay loam, moderately shallow to carbonates
 Soil No.: 856Iowa-1-8
 Location: Greenfield Quadrangle; 412 feet east and 33 feet north of southwest corner of southwest quarter of southwest quarter of northeast quarter of Section 18, T76N, R31W, Adair County, Iowa.
 Slope: 12 percent, slightly convex.
 Vegetation: Bluegrass.
 Collected by and date: R. B. Daniels, August 1, 1956.

Horizon and
 Beltsville
 Lab. Number

A1
 5762 0 to 9 inches. Very dark brown (10YR 2/2) friable light to medium clay loam; moderate fine and very fine subangular blocky; very dark brown (10YR 2/2) crushed; clear boundary to AB.

AB
 5763 9 to 14 inches. Very dark gray brown (10YR 3/2) friable medium to heavy clay loam with mixing of very dark brown (10YR 2/2) along vertical channels and some mixing of dark brown (10YR 3/3); moderate fine and very fine subangular blocky structure with discontinuous coatings on ped surfaces, identification as clay skins doubtful; very dark gray brown to dark gray brown (10YR 3.5/2) crushed; clear boundary to B21.

B21
 5764 14 to 22 inches. Dark brown (10YR 4/3) slightly firm medium clay loam with some mixing of very dark gray brown (10YR 3/2) along vertical channels; moderate to strong fine subangular blocky structure with thin continuous clay skins; dark brown (10YR 4/3) crushed; clear boundary to B22.

B22
 5765 22 to 30 inches. Dark brown (10YR 4/3) slightly firm medium clay loam; weak to moderate fine subangular blocky structure with thin to medium continuous clay skins; yellowish brown (10YR 5/4) crushed; very few white carbonate concretions less than 1/4-inch in diameter in the lower part but the matrix is leached; abrupt boundary to B23.

B23
 5766 30 to 36 inches. Dark yellowish brown (10YR 4/4) slightly firm calcareous medium to heavy clay loam; common medium to coarse yellowish red (5YR 4/6) and common fine strong brown (7.5YR 5/6) and grayer mottles; weak fine and medium subangular blocky structure with thin continuous clay skins; common white firm to very firm carbonate concretions less than 1/4-inch in diameter; strong brown (7.5YR 5/8) crushed; clear boundary to B3.

B3
 5767 36 to 46 inches. Yellowish brown (10YR 5/6) firm calcareous medium clay loam; few medium and coarse gray (5Y 5.5/1) and few fine strong brown mottles; weak medium blocky structure with thin discontinuous clay skins on horizontal surfaces and thin continuous clay skins on vertical surfaces; few white firm to very firm carbonate concretions and limestone fragments less than 1/4-inch in diameter; abrupt boundary to C21.

C21
 5768 46 to 48 inches. Yellowish brown (10YR 5/4) very friable massive calcareous sandy loam; common fine to medium strong brown (7.5YR 5/6) mottles; few white firm to very firm carbonate concretions and limestone fragments less than 1/4-inch in diameter; abrupt boundary to C22.

C22
 5769 48 to 58 inches. Gray brown to brown (10YR 5/2.5) massive calcareous light clay loam; common medium and coarse strong brown (7.5YR 5/6), yellowish red (5YR 5/8), and common medium and fine gray (5Y 5.5/1) mottles; few to common dark oxide coatings; few white firm to very firm carbonate concretions less than 1/2-inch in diameter; thin discontinuous clay skins along vertical cleavage planes.

Soil type: Shelby clay loam, thin solum variant

Soil No.: 856Iowa-1-9

Location: Greenfield Quadrangle; 380 feet west and 363 feet south of northeast corner of the northeast quarter of northeast quarter of northwest quarter of Section 18, T76N, R31W, Adair County, Iowa.

Slope: 4 percent, flat along axis of interfluvium, but sharply convex at right angles to the axis of the interfluvium.

Vegetation: Bluegrass.

Collected by and date: R. B. Daniels, F. J. Carlisle and G. H. Simonson, July 24, 1956.

Horizon and

Beltsville

Lab. Number

- A1
5770 0 to 6 inches. Very dark brown (10YR 2/2) friable light clay loam; dark gray (10YR 4/1) when dry; weak to moderate fine granular structure; clear boundary to AB.
- AB
5771 6 to 10 inches. Very dark gray brown (10YR 3/2) friable medium clay loam with some mixing of dark brown (10YR 4/3); dark gray brown (10YR 4/2) when dry; moderate fine and very fine subangular blocky structure; clear boundary to B21.
- B21
5772 10 to 14 inches. Dark brown (10YR 3/3) friable medium clay loam with an appreciable mixing of very dark gray brown (10YR 3/2) and some dark brown (10YR 4/3); moderate fine subangular blocky structure with thin continuous clay skins; occasional white carbonate concretions less than 1/8-inch in diameter, but the matrix is leached; abrupt boundary to B22.
- B22
5773 14 to 19 inches. Dark brown (10YR 4/3) friable calcareous medium clay loam with some mixing of yellowish brown (10YR 5/4) and very few very dark brown (10YR 3/2) colors which appear to be worm channel fillings; few fine dark brown (7.5YR 4/4 to 4/6) mottles; weak to moderate fine subangular blocky structure with thin continuous clay skins; common white carbonate concretions with a maximum diameter of 1/2-inch and a range of consistence from soft to hard; gradual boundary to B31.
- B31
5774 19 to 28 inches. Dark brown and yellowish brown (10YR 4/3 and 5/4) in about equal proportions; friable calcareous light to medium clay loam; few fine gray brown and dark brown (2.5Y 5/2 and 7.5YR 4/4 and 4/6) mottles; many white carbonate concretions and limestone fragments ranging in diameter from less than 1/8-inch to 1 inch and consistence from loose to hard; weak medium to fine subangular blocky structure with thin continuous clay skins; gradual boundary to B32.
- B32
5775 28 to 34 inches. Brown (1Y 4/3 to 5/3) firm calcareous light clay loam; gray (5Y 5/1) streaks less than 1/4-inch wide and 2 to 4 inches long; arrangement is both horizontal and vertical; strong brown (7.5Y 5/8) streaks 1 to 2 inches wide with a vertical orientation; the strong brown streaks extend from the top of the B32 to the C horizon; few distinct dark oxides which coat the structural aggregate; weak medium to coarse blocky structure with patchy thin clay skins; common to many white carbonate concretions and limestone fragments ranging in diameter from less than 1/8- to 3/4-inch, and in consistence from soft to very hard; gradual boundary to C.
- C
5776 34 to 48 inches. Mottled brown to yellowish brown and gray (10YR 5/3 to 5/4 and 1Y 5/1) calcareous massive light clay loam; few medium to coarse strong brown to dark brown mottles; common white carbonate concretions and limestone fragments ranging in diameter from less than 1/8- to 1/2-inch and in consistence from soft to very hard; a smooth surface is plainly visible along vertical cleavage planes, but identification as clay skins is questionable.

Soil type: Shelby clay loam, thin solum variant

Soil No.: S56Iowa-1-10

Location: Greenfield Quadrangle; 180 feet west and 56 feet south of northeast corner of southwest quarter of north-east quarter of southeast quarter of Section 18, T76N, R31W, Adair County, Iowa.

Slope: 6 percent, convex.

Vegetation: Bluegrass.

Collected by and date: R. E. Daniels, July 17, 1956.

Horizon and

Beltsville

Lab. Number

- A1
5777 0 to 4 inches. Very dark brown (10YR 2/2 to 2.5/2) friable to slightly firm light to medium clay loam; weak to moderate fine and very fine granular structure; clear boundary to AB.
- AB
5778 4 to 9 inches. Very dark gray brown (10YR 3/2) friable to slightly firm medium clay loam with some mixing of very dark brown and dark brown (10YR 2/2 and 3/3); weak to moderate fine granular structure; clear boundary to B2.
- B2
5779 9 to 18 inches. Dark brown (10YR 4/3 to 4/3.5) friable to slightly firm calcareous medium clay loam; moderate to strong fine subangular blocky structure with medium continuous clay skins; few to common loose to extremely hard limestone fragments and carbonate concretions ranging in diameter from less than 1/8-inch to 3/4-inch; the larger fragments are loose; gradual boundary to B31.
- B31
5780 18 to 29 inches. Dark brown to dark yellowish brown (10YR 4/3.5) firm calcareous medium clay loam; common gray (5Y 5/1.5) streaks up to 3 and 4 inches in length and less than 1/4-inch wide; orientation of the streaks is both horizontal and vertical; the gray colors may cover an entire ped or form only a part of the ped, but with a sharp boundary between the gray and dark brown; weak medium blocky structure with thin continuous clay skins; common limestone fragments and carbonate concretions which range from loose to extremely hard and in diameter from less than 1/8-inch to 1-inch; gradual boundary to B32.
- B32
5781 29 to 43 inches. Dark brown to brown (10YR 4/3 to 5/3) firm calcareous medium clay loam; common gray (5Y 5/1.5) streaks with the same characteristics as in the B31; few to common loose to extremely hard limestone fragments and carbonate concretions ranging in diameter from less than 1/8- to 1-inch; weak medium blocky structure with thin continuous clay skins becoming discontinuous in the lower part; diffuse boundary to C.
- C
5782 43 to 60 inches. Brown (10YR 4/3) firm calcareous medium to light clay loam with common fine to coarse dark brown and strong brown (7.5YR 4/4 and 5/6) mottles and common gray (5Y 5/1.5) streaks; few to common loose to very hard limestone fragments and carbonate concretions ranging in diameter from less than 1/8-inch to 3/4-inch; massive, with thin discontinuous clay skins along vertical cleavage planes.

OIL TYPE Shelby LOCATION Shelby County, Iowa
loam

SOIL NOS. 855Iowa-83-3 LAB. NOS. 5370-5376

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|--------------|------------------|--|-------------|-------------|-----------|----------------|---------|----------|------------|-----------|-----|----------------|-----|
| | | 1B1a | | | | | | | | | | | 2A2 |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | | | > 2 | | |
| | 2.1 | 1.0-3 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | < 0.075mm | | | |
| 0-6 | A1p | 1.4 | 3.5 | 4.5 | 12.5 | 8.4 | 39.5 | 30.2 | 38.8 | 16.0 | 1 | cl | |
| 6-11 | A3 | 1.9 | 3.4 | 4.1 | 11.2 | 8.0 | 37.0 | 34.4 | 35.1 | 16.1 | 1 | cl | |
| 11-16 | B21 | 2.1 | 3.7 | 4.2 | 11.5 | 8.1 | 36.0 | 34.4 | 34.2 | 16.1 | 3 | cl | |
| 16-22 | B22 | 2.7 | 4.0 | 4.1 | 10.8 | 8.1 | 35.8 | 34.5 | 32.7 | 17.2 | 2 | cl | |
| 22-30 | B3 | 2.6 | 4.2 | 4.3 | 10.0 | 8.2 | 37.9 | 32.8 | 32.0 | 20.3 | 2 | cl | |
| 30-48 | C1 ^{a/} | 4.9 | 4.3 | 4.0 | 9.4 | 8.3 | 41.4 | 27.7 | 31.1 | 24.4 | 3 | cl | |
| 48-54 | C2 | 3.4 | 4.0 | 4.3 | 10.0 | 8.8 | 42.5 | 27.0 | 33.7 | 23.9 | 2 | cl | |

| pH | 8C1a | | | ORGANIC MATTER | | | ESTD SALT (BUREAU CUP) | ELECTRICAL CONDUCTIVITY EC-10 ³ MILLIMHOS PER CM @25°C | 6E1a CoCO ₃ equiv- alent | MOISTURE TENSIONS | | | |
|-----|------|-----|------|------------------------|-------------------|-----|------------------------|---|---|---------------------------------|-------------|------------|------------------|
| | 1:5 | | 1:10 | 6A1a ORGANIC CARBON | 6B1a NITRO-GEN | C/N | | | | CoCO ₃ me./100g SOIL | 1/10 ATMOS. | 1/3 ATMOS. | 4B2 15 ATMOS. |
| | % | % | % | % | % | % | | | | % | % | % | |
| 5.4 | 5.6 | 5.8 | 1.82 | .161 | 11.3 | | 0.5 | | | | 11.7 | | |
| 5.7 | 5.9 | 6.0 | 1.46 | .125 | 11.7 | | 0.5 | | | | 12.7 | | |
| 5.8 | 6.0 | 6.1 | 1.14 | .099 | 11.5 | | 0.4 | | | | 12.3 | | |
| 6.1 | 6.2 | 6.4 | 0.89 | .081 | 11.0 | | 0.4 | | | | 12.1 | | |
| 6.7 | 6.8 | 6.9 | 0.56 | .054 | 10.4 | | 0.5 | - | | | 11.9 | | |
| 8.0 | 8.5 | 8.6 | 0.24 | | | | 0.6 | 14 | | | 10.4 | | |
| 8.0 | 8.4 | 8.6 | 0.07 | | | | 0.7 | 11 | | | 11.2 | | |

| 5A1a CATION EXCHANGE CAPACITY NH ₄ Ac | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % NH ₄ Ac EXCH. | SATURATION EXTRACT SOLUBLE 8A1 | | | | 8A MOISTURE AT SATURATION % |
|---|-------------------------------------|-----|------|------|-----|--------------------------------------|--------------------------------|------|------|------|--------------------------------|
| | 6N2b | | 6H1a | 6P2a | | | 6P1a | 6Q1a | 6N1a | 6O1a | |
| | Ca | Mg | H | Na | K | | Na | K | Ca | Mg | |
| | ← milliequivalents per 100g. soil → | | | | | 5C1 | ← milliequivalents per liter → | | | | % |
| 22.0 | 14.3 | 3.3 | 8.7 | - | 0.4 | 82 | 0.5 | 0.2 | 3.3 | 1.3 | 45.1 |
| 22.8 | 16.0 | 3.4 | 6.7 | - | 0.4 | 87 | 0.4 | 0.2 | 3.2 | 1.2 | 46.8 |
| 22.2 | 15.7 | 3.0 | 5.8 | - | 0.4 | 86 | 0.4 | 0.2 | 3.1 | 1.0 | 47.3 |
| 21.0 | 15.8 | 2.6 | 5.0 | - | 0.4 | 90 | 0.4 | 0.1 | 2.7 | 0.8 | 50.4 |
| 19.4 | 16.6 | 2.2 | 2.9 | 0.1 | 0.4 | 99 | 0.5 | 0.1 | 3.6 | 0.6 | 54.8 |
| 14.6 | | 1.6 | 1.2 | 0.1 | 0.3 | | 0.5 | 0.1 | 4.6 | 0.8 | 48.3 |
| 13.4 | | 2.0 | 0.8 | 0.1 | 0.3 | | 0.7 | 0.1 | 4.7 | 1.2 | 48.5 |

a/ Some CaCO₃ present in sand fraction

Soil type: Shelby loam
 Soil No.: 855Iowa-83-3
 Location: 265 feet east and 125 feet north of southwest corner of NW1/4 of Sec. 25, T79N, R37W, Shelby County, Iowa.
 Site: Gently convex slope of 12 percent gradient; western exposure.
 Collected by and date: W. M. Jury, L. E. Tyler, and F. J. Carlisle, August 23, 1955.

Horizon and
 Lincoln
 Lab. Number

Alp 0 to 6 inches. Black to very dark gray (10YR 2.5/1) heavy loam; cloddy breaking to weak very fine crumb structure; friable when moist; noncalcareous; gradual boundary.
 5370

A3 6 to 11 inches. Very dark grayish brown (10YR 3/2) medium loam with mixture of slightly darker and slightly browner colors; friable when moist; moderate fine and very fine subangular blocky structure; boundary clear; noncalcareous. (If textural difference from Alp, probably depositional rather than genetic.)
 5371

B21 11 to 16 inches. Mixed very dark grayish brown (10YR 3/2) and dark brown to brown (10YR 4/3) gritty medium silty clay loam (probably the mixing is due to biological action); weak fine subangular blocky structure; slightly firm when moist; noncalcareous; gradual boundary.
 5372

B22 16 to 22 inches. Brown or dark brown (10YR 4/3) to dark yellowish brown (10YR 4/4) heavy silty clay loam; weak, medium and fine subangular blocky structure with thin discontinuous colloidal coatings on peds; firm when moist; noncalcareous; gradual boundary.
 5373

B3 22 to 30 inches. Dark brown to brown (10YR 4/3) medium silty clay loam with a few fine faint yellowish brown and strong brown mottles; weak medium subangular blocky structure; firm when moist; noncalcareous; clear boundary.
 5374

C1 30 to 48 inches. Dark yellowish brown (10YR 4/4) medium clay loam with finely disseminated, white carbonate concretions and common, fine, distinct, yellowish brown, strong brown and gray brown mottles; weak medium and coarse subangular blocky structure; firm when moist; diffuse boundary.
 5375

C2 48 to 54 inches. Yellowish brown mottled with strong brown and gray light to medium clay loam; massive or fragmental structure; firm when moist; calcareous.
 5376

Note: The 42- to 48 -inch layer has a few large white carbonate concretions 3 to 4 inches in diameter. Coarse sand and gravel content of profile increases with depth.

SOIL TYPE Shelby

LOCATION Shelby County, Iowa

silt loam

SOIL NOS. S53Iowa-83-3

LAB. NOS. 5377-5382

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|---|---------|--|----------------------|-------------------------|------------------------|-----------------------------|--------------------------------------|---|---|--------------------|--------------------------|----------------|---------------------|
| | | 1B1a | | | | | 3A1 | | | | | | 2A2 |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 (<19mm) | > 2 | | |
| 0-7 | A1 | 1.2 | 1.7 | 2.2 | 5.6 | 5.2 | 52.4 | 31.7 | 38.1 | 23.1 | Tr. | sic1 | |
| 7-12 | B1 | 2.9 | 2.7 | 2.7 | 6.6 | 6.3 | 39.5 | 39.3 | 30.2 | 19.9 | 1 | cl | |
| 12-22 | B2 | 1.4 | 2.7 | 3.2 | 7.7 | 7.0 | 38.6 | 39.4 | 29.6 | 20.8 | Tr. | cl | |
| 22-30 | B3 | 2.1 | 3.1 | 3.4 | 8.4 | 7.5 | 40.2 | 35.3 | 30.3 | 22.6 | Tr. | cl | |
| 30-42 | C1 | 2.8 | 2.8 | 3.3 | 8.1 | 7.6 | 41.7 | 33.7 | 31.5 | 23.0 | Tr. | cl | |
| 42-46 | C2 | 2.4 | 3.0 | 3.1 | 8.7 | 7.7 | 41.7 | 33.4 | 31.9 | 22.4 | Tr. | cl | |
| pH 5C1a | | ORGANIC MATTER | | | | | ESTD SALT (BUREAU CUP) | ELECTRICAL CONDUCTIVITY EC-103 MILLIMETERS PER CM | 6E1a CoCO ₂ equiv- alent | MOISTURE TENSIONS | | | 4B2 15 ATMOS. |
| 1:1 | | 6A1a ORGANIC CARBON | 6B1a NITRO-GEN | C/N | | 1/10 ATMOS. | | | | 1/3 ATMOS. | 4B2 15 ATMOS. | | |
| | 1:5 | 1:10 | % | % | | | % | % | % | % | % | % | |
| 5.9 | 6.2 | 6.3 | 2.91 | .236 | 12.3 | | | | | | | 15.1 | |
| 6.0 | 6.3 | 6.4 | 0.73 | .076 | 9.6 | | | | | | | 14.3 | |
| 5.8 | 6.1 | 6.3 | 0.37 | .034 | 10.9 | | | | | | | 13.2 | |
| 5.5 | 5.7 | 5.9 | 0.26 | .028 | 9.3 | | | | | | | 12.7 | |
| 5.4 | 5.7 | 5.8 | 0.22 | | | | | | | | | 12.7 | |
| 5.7 | 6.1 | 6.1 | 0.19 | | | | | | | | | 12.8 | |
| 5A1a | | EXTRACTABLE CATIONS 5B1a | | | | | BASE SAT. % NH ₄ Ac EXCH. | SATURATION EXTRACT SOLUBLE | | | MOISTURE AT SATURATION % | | |
| CATION EXCHANGE CAPACITY NH ₄ Ac | | 6N2b Ca | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | | No | K | | | | |
| | | ← milliequivalents per 100g. soil → | | | | | 5C1 | ← milliequivalents per liter → | | | | | |
| 27.0 | 19.4 | 4.4 | 7.9 | - | 0.7 | 91 | | | | | | | |
| 26.0 | 19.0 | 5.0 | 5.9 | 0.1 | 0.7 | 95 | | | | | | | |
| 25.2 | 18.5 | 4.8 | 6.7 | 0.1 | 0.6 | 95 | | | | | | | |
| 23.0 | 17.1 | 3.9 | 5.4 | 0.1 | 0.5 | 94 | | | | | | | |
| 21.7 | 16.7 | 3.3 | 5.1 | 0.1 | 0.5 | 95 | | | | | | | |
| 21.7 | 18.2 | 2.9 | 3.3 | 0.1 | 0.5 | | | | | | | | |

Soil type: Shelby silt loam

Soil No.: S53Iowa-83-3

Location: Northeast corner of NE1/4 of Sec. 11, T79N, R39W, Shelby County, Iowa.

Site: Gently convex north-facing slope of 15 percent gradient. Soil was sampled 42 feet downslope from the outcrop of the Late Sangamon paleosol B horizon. The ground surface at the sampling site was 5 feet lower in elevation than the top of the paleosol B upslope, which outcropped upslope.

Collected by and date: O. D. Friedrich, August, 1953.

Horizon and

Lincoln

Lab. Number

| | |
|------------|--|
| A1 5377 | 0 to 7 inches. Very dark gray (10YR 3/1) silt loam; granular; friable; some gray coatings on peds; clear boundary. |
| B1 5378 | 7 to 12 inches. Brown (10YR 4.5/3) clay loam, crushed color 4/2.5; very fine subangular blocky structure; firm; some streaks of very dark gray (10YR 3/1) material; clear boundary. |
| B2 5379 | 12 to 22 inches. Yellowish brown (10YR 5/5) clay loam with very fine subangular blocky structure; firm; gradual boundary. |
| B3 5380 | 22 to 30 inches. Olive brown to light olive brown (2.5Y 4.5/4) clay loam with fine subangular blocky structure; firm; some material included with dark yellowish brown color (10YR 4/4); gradual boundary. |
| C1 5381 | 30 to 42 inches. Light olive brown (2.5Y 5/3) clay loam; weak subangular blocky structure to massive with strong vertical cleavage; firm; some 10YR 4/4 mottling and some dark oxide concretions; slightly calcareous with some carbonate concretions; gradual boundary. |
| C2 5382 | 42 to 46 inches. Similar to horizon above but with numerous dark yellowish brown mottles; massive with strong vertical cleavage. |

SOIL SURVEY LABORATORY Lincoln, Nebr. Sept., 1963

SOIL TYPE Taintor LOCATION Keokuk County, Iowa
silty clay loam

SOIL NOS. S61Iowa-54-3 LAB. NOS. 16308-16317

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | | |
|--------------|---------------------------------|--|----------------|-------------|-----------|----------------|---------------------|-----------|---------------------|--------------------|------|----------------|-------------------------------|--------|
| | | 1B1b VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | | CLAY | | 3A1 | | | |
| 0-6 | A1p | 2.1 | 1.05 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | 2A2 | | | |
| 6-12 | A12 | - | 0.2a | 0.1a | 0.1a | 0.3a | 62.7 | 36.6 | 24.3 | 38.8 | > 2 | | | |
| 12-17 | A3 | 0.1a | 0.1a | 0.1a | 0.1a | 0.3a | 58.3 | 41.1 | 22.9 | 35.8 | - | | | |
| 17-22 | B1 | 0.2a | 0.3a | 0.2a | 0.2a | 0.4a | 56.5 | 42.8 | 21.6 | 35.3 | - | | | |
| 22-28 | B21 | 0.6a | 0.6a | 0.2a | 0.4a | 0.5a | 55.9 | 42.8 | 21.2 | 35.2 | - | | | |
| 28-34 | B22 | 0.2a | 0.2a | 0.1a | 0.2a | 0.8b | 56.6 | 41.1 | 23.8 | 33.5 | - | | | |
| 34-40 | B31 | 0.2a | 0.2a | 0.1a | 0.2a | 0.9b | 62.6 | 35.9 | 28.6 | 34.9 | - | | | |
| 40-50 | B32 | - | 0.1a | 0.2a | Tr.a | 0.6c | 63.7 | 34.7 | 29.6 | 35.1 | - | | | |
| 50-60 | B33 | - | 0.2a | 0.2a | 0.3a | 0.6c | 67.7 | 31.4 | 32.1 | 36.2 | - | | | |
| 60-70 | C1 | - | 0.2a | 0.2a | 0.2a | 0.6d | 70.8 | 27.9 | 32.9 | 38.6 | - | | | |
| | 8C1a | 6K1b | Organic Matter | | | | Bulk Density | | | Moisture Retention | | | | |
| | CaCO ₃ | 6A1a | 6B1a | C/N | | Field Moist | | 30 Cm. | | A.D. | 4B1b | 4C1 | 4B2 | |
| pH | Equivalent | O.C. | N | C/N | | 4B4 | | 4A1a | 4B3 | 4A1c | 4A1b | Pieces | 15-to | 15-Bar |
| 1:1 | alent | % | % | | | % M. | | g/cc | % M. | g/cc | g/cc | 1/3-Bar | 15-Bar | Sieved |
| | | | | | | % | | | | | | in/in | | % |
| 6.5 | | 3.57 | 0.269 | 13 | | 26.7 | | 1.36 | 31.9 | 1.30 | 1.65 | 29.5 | .15 | 18.0 |
| 5.6 | | 2.22 | 0.177 | 12 | | 26.1 | | 1.40 | 24.0 | 1.42 | 1.76 | 28.5 | .14 | 18.9 |
| 5.9 | | 1.14 | 0.094 | 12 | | 26.1 | | 1.40 | 24.0 | 1.42 | 1.76 | 28.5 | .14 | 18.9 |
| 6.1 | | 0.67 | 0.071 | 9 | | 27.1 | | 1.40 | 24.2 | 1.42 | 1.71 | 28.0 | .13 | 18.5 |
| 6.4 | | 0.46 | 0.046 | 10 | | 24.1 | | 1.49 | | | 1.76 | 26.4 | | 16.6 |
| 6.7 | - | 0.26 | | | | 24.8 | | 1.49 | 26.8 | 1.44 | 1.70 | 27.2 | .17 | 15.2 |
| 7.3 | - | 0.21 | | | | | | | | | | | | 14.0 |
| 7.5 | - | 0.12 | | | | | | | | | | | | 13.1 |
| 7.5 | 4 | 0.12 | | | | | | | | | | | | |
| 7.8 | 8 | 0.12 | | | | | | | | | | | | |
| | 5A1a | EXTRACTABLE CATIONS | | | | | 5B1a | Base Sat. | | 8D1 | 8D3 | 6C1a | A1 KCl- Ext. me/100g | |
| | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | 5A3a | 5C1 | 5C3 | Ratio | Ca/Mg | Ext. | | | |
| | Ca | Mg | H | Na | K | Sum | on | on | to Clay | as Fe | | | | |
| | milliequivalents per 100g. soil | | | | | | NH ₄ OAc | | NH ₄ OAc | | | | | |
| | | | | | | | CEC % | | CEC | | | | | |
| 32.7 | 29.3 | 6.4 | 6.1 | 0.1 | 0.5 | 42.4 | 111 | 86 | .89 | 4.6 | 0.5 | | | |
| 35.5 | 28.0 | 8.5 | 6.9 | 0.1 | 0.6 | 44.1 | 105 | 84 | .86 | 3.3 | 0.5 | | | |
| 33.6 | 26.1 | 9.3 | 4.7 | 0.1 | 0.6 | 40.8 | 107 | 88 | .78 | 2.8 | 0.7 | | | |
| 32.2 | 25.3 | 9.5 | 4.7 | 0.1 | 0.6 | 40.2 | 110 | 88 | .75 | 2.7 | 1.1 | | | |
| 33.1 | 23.7 | 9.1 | 4.5 | 0.1 | 0.6 | 38.0 | 101 | 88 | .80 | 2.6 | 1.8 | | | |
| 27.4 | 21.3 | 7.7 | 3.1 | 0.1 | 0.5 | 32.7 | 108 | 90 | .76 | 2.8 | 1.0 | | | |
| 28.4 | | | 2.6 | 0.1 | 0.5 | | | | .82 | | 0.8 | | | |
| 25.3 | | | 2.6 | 0.1 | 0.6 | | | | .80 | | 0.7 | | | |
| 22.6 | | | 1.4 | 0.1 | 0.6 | | | | .81 | | 0.8 | | | |
| 21.0 | | | 1.2 | 0.1 | 0.5 | | | | .80 | | 1.0 | | | |

- a. Many Fe/Mn nodules.
- b. Common Fe/Mn nodules.
- c. Few Fe/Mn nodules.
- d. Common Fe/Mn nodules. Trace carbonate nodules.
- e. No carbonate clay.
- f. 18 Kg/M² to 60 inches..

Soil type: Taintor silty clay loam

Soil No.: 85110wa-54-3

Location: 385 feet north and 51 feet east of SW corner of SE1/4 SW1/4 Sec. 27, T77N, R10W, Keokuk County, Iowa.

Vegetation: Clover field, recently plowed. Parent material: Wisconsin loess.

Physiographic position: Broad upland divide about 1/2-mile wide. Appears to be highest elevation within the watershed.

Slope: Less than 1 percent.

Drainage: Poorly drained.

Permeability: Slow to moderately slow.

Ground water: Water table at 40 inches.

Moisture: Very moist.

Described by: D. F. Slusher, October 4, 1961.

Horizon and

Lincoln Lab. No.

- Alp 0 to 6 inches. Black (N 2/)¹ medium silty clay loam, very dark gray (10YR 3/1) when dry; moderate fine and medium angular blocky structure; firm²; kneaded color remains the same; abrupt smooth boundary.
16308
- A12 6 to 12 inches. Black (N 2/) medium silty clay loam, very dark gray (N 3/0) when dry; moderate very fine sub-angular blocky and moderate fine granular structure; friable to firm; kneaded color about one unit higher in value and chroma; gradual smooth boundary.
16309
- A3 12 to 17 inches. Black (N 2/) heavy silty clay loam; very dark gray (10YR 3/1) when dry; moderate very fine subangular blocky with some moderate fine granular structure; friable to firm; ped exteriors are black (10YR 2/1); ped interiors are very dark gray (10YR 3/1); common fine very faint very dark grayish brown (2.5Y 3/2) mottles inside peds; kneaded color black (10YR 2/1) to very dark gray (10YR 3/1); few fine hard concretions of an oxide; gradual smooth boundary.
16310
- B1 17 to 22 inches. Very dark gray (10YR 3/1) and very dark grayish brown (2.5Y 3/2) heavy silty clay loam, dark gray (10YR 4/1) when dry; weak fine subangular blocky breaking to moderate very fine subangular blocky structure; friable to firm; ped exteriors are very dark gray (10YR 3/1); ped interiors are very dark grayish brown (2.5Y 3/2); common fine faint light olive brown (2.5Y 5/4) mottles; kneaded color very dark grayish brown (2.5Y 3/2); few very fine impeded tubular pores; few fine soft concretions of an oxide; gradual smooth boundary.
16311
- B21 22 to 28 inches. Dark gray (5Y 4/1), olive gray (5Y 5/2), and light olive brown (2.5Y 5/4) heavy silty clay loam; weak fine prismatic breaking to moderate fine and very fine subangular blocky structure; friable to firm; ped exterior colors are mixed with majority of peds dark gray (5Y 4/1) and few peds olive gray (5Y 5/2) in places; ped interiors are light olive brown (2.5Y 5/4); few very dark gray (N 3/0) stains orientated in vertical streaks; common fine distinct yellowish brown (10YR 5/6) mottles inside peds; kneaded color light olive brown (2.5Y 5/4); few fine and very fine impeded tubular pores; common faint thin discontinuous clay films on ped faces; common fine hard and few fine soft concretions of an oxide in the 26- to 28-inch layer; clear smooth boundary.
16312
- B22 28 to 34 inches. Olive gray (5Y 5/2) and dark gray (10YR 4/1) medium silty clay loam; moderate coarse prismatic breaking to moderate fine subangular blocky structure; firm; ped exteriors are olive gray (5Y 5/2) with stains of dark gray (5Y 4/1) in places; ped interiors are mixed (in about equal proportions) olive gray (5Y 5/2) and yellowish brown (10YR 5/6); yellowish brown (10YR 5/6) color appears as a mottle on ped exteriors; few fine impeded tubular pores; common distinct dark gray (5Y 4/1) clay films on ped and prism surfaces; many fine slightly hard and few medium soft concretions of an oxide; clear wavy boundary.
16313
- B31 34 to 40 inches. Olive gray (5Y 5/2) medium silty clay loam; moderate coarse prismatic breaking to moderate fine and medium subangular blocky structure; firm; common fine faint light olive brown (2.5Y 5/4) mottles inside peds; mottling pattern is irregular with common fine prominent yellowish brown (10YR 5/6) mottles in some places; faint wavy horizontal band of strong brown (7.5YR 5/8) at 30 to 40 inches; few fine impeded tubular pores; very few distinct thin patchy dark gray (5Y 4/1) clay films on prism faces; common fine hard concretions of an oxide; gradual smooth boundary.
16314
- B32 40 to 50 inches. Olive gray (5Y 5/2) and light olive gray (5Y 6/2) light silty clay loam; moderate coarse prismatic structure; firm; ped exteriors are olive gray (5Y 5/2); ped interiors are light olive gray (5Y 6/2) common fine distinct yellowish brown (10YR 5/6) mottles; common prominent segregations of strong brown (7.5YR 5/6) in places; common very fine impeded tubular pores; very few faint thin dark gray (5Y 4/1) films on prism faces which may be clay; diffuse wavy boundary.
16315
- B33 50 to 60 inches. Colors same as above horizon; silt loam; moderate coarse prismatic structure; firm; common very fine impeded tubular pores; gradual smooth boundary.
16316
- C1 60 to 70 inches. Light olive gray (5Y 6/2) silt loam; massive; firm; many fine prominent segregations of strong brown (7.5YR 5/8); few fine impeded tubular pores.
16317

Notes: Roots common from 0 to 6 inches, few from 6 to 34, nearly absent below 34 inches. Few very dark gray (N 3/) krotovinas which are 1 to 2 inches in diameter are present at 40 to 70 inches. Oxides are spherical in shape, dark brown to black in color, and are considered to be predominantly composed of iron-manganese. Strong brown (7.5YR 5/6 to 5/8) color which occurs as segregations, horizontal bands, and vertical streaks, is considered to be higher in iron oxide than the associated matrix. Horizons Alp, B21, and B32 were sampled for the Bureau of Public Roads.

^{1/2} Munsell color for moist soil.
^{2/2} Consistence at moist field conditions.

SOIL SURVEY LABORATORY Lincoln, Nebr. Sept., 1963

SOIL TYPE Taintor LOCATION Washington County, Iowa
silty clay loam

SOIL NOS. S61Iowa-92-3 LAB. NOS. 16331-16342

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS |
|--------------|-----------------------------------|--|-------------|-------------|-------------|----------------|------------------------|------------|-------------|--------------------|-----------------|----------------|
| | | 1B1b | | 3A1 | | | | | | 2A2 | | |
| | | VERY COARSE SAND | COARSE SAND | MEDIUM SAND | FINE SAND | VERY FINE SAND | SILT | CLAY | > 2 | > 2 | | |
| 2.1 | 1-0.5 | 0.5-0.25 | 0.25-0.10 | 0.10-0.05 | 0.05-0.002 | < 0.002 | 0.2-0.02 | 0.02-0.002 | | | | |
| 0-7 | A1p | 0.1 | 0.2 | 0.2 | 0.5 | 0.3 | 65.1 | 33.6 | 28.8 | 37.0 | - | |
| 7-13 | A12 | 0.2 | 0.2 | 0.1 | 0.3 | 0.5 | 59.6 | 39.1 | 25.3 | 35.0 | - | |
| 13-18 | A3 | 0.3 | 0.5 | 0.2 | 0.5 | 0.3 | 57.0 | 41.2 | 19.9 | 37.8 | - | |
| 18-23 | B21 | 0.6 | 0.5 | 0.3 | 0.5 | 0.4 | 56.5 | 41.2 | 23.9 | 33.3 | - | |
| 23-28 | B22 | 0.4 | 0.5 | 0.3 | 0.7 | 0.7 | 57.9 | 39.5 | 27.0 | 32.1 | - | |
| 28-34 | B23 | 0.3 | 0.5 | 0.3 | 0.7 | 0.6 | 60.5 | 37.1 | 28.0 | 33.6 | - | |
| 34-37 | B31 | 1.4 | 1.9 | 1.0 | 1.4 | 1.1 | 58.4 | 34.8 | 27.3 | 32.9 | - | |
| 37-46 | B32 | 0.3 | 0.2 | 0.1 | 0.2 | 0.4 | 67.3 | 31.5 | 32.7 | 35.1 | - | |
| 46-53 | C1 | 0.1 | 0.2 | 0.2 | 0.3 | 0.7 | 69.0 | 29.5 | 34.0 | 35.9 | - | |
| 53-64 | C2 | 0.1 | 0.2 | 0.2 | 0.4 | 0.7 | 70.6 | 27.8 | 34.5 | 37.0 | - | |
| 64-72 | C3 | 0.1 | 0.2 | 0.2 | 0.3 | 0.6 | 74.8 | 23.8 | 37.8 | 37.8 | - | |
| 72-82 | C4 | 0.2 | 0.2 | 0.2 | 0.4 | 0.7 | 75.2 | 23.1 | 36.3 | 39.8 | - | |
| 8C1a | 6E1b | Organic Matter | | | | Bulk Density | | | | Moisture Retention | | |
| | CaCO ₃ equiv- alent | 6A1a | 6B1a | | Field Moist | | 30 Cm. | | A.D. | | 4B2 | |
| pH | % a | O.C. | N | C/N | % M. | g/cc | % M. | g/cc | g/cc | | 15-Bar Sieved % | |
| 5.8 | | 3.48 | 0.271 | 13 | | | | | | | 17.0 | |
| 5.6 | | 2.10 | 0.162 | 13 | | | | | | | 17.7 | |
| 6.0 | | 1.21 | 0.101 | 12 | | | | | | | 18.4 | |
| 6.2 | | 0.76 | 0.064 | 12 | | | | | | | 18.2 | |
| 6.4 | | 0.47 | 0.044 | 11 | | | | | | | 17.9 | |
| 6.7 | - | 0.29 | | | | | | | | | 17.6 | |
| 7.0 | - | 0.25 | | | | | | | | | 18.1 | |
| 7.2 | - | 0.18 | | | | | | | | | 15.4 | |
| 6.9 | - | 0.10 | | | | | | | | | 14.8 | |
| 7.2 | 2 | 0.08 | | | | | | | | | 14.6 | |
| 7.4 | 9 | 0.08 | | | | | | | | | 11.7 | |
| 7.4 | 10 | 0.05 | | | | | | | | | 11.6 | |
| | 5A1a | EXTRACTABLE CATIONS 5B1a | | | | | Base Sat. | | 8D1 | 8D3 | Ext. | A1 |
| | 6N2b | 6O2b | 6R1a | 6P2a | 6Q2a | 5A3a | 5C1 | 5C3 | Ratio | Ca/Mg | Iron | KCl- Ext. |
| | Ca | Mg | H | Na | K | Sum | on NH ₄ OAc | n Cations | Sum to Clay | | as Fe | me/100g |
| | milliequivalents per 100g. soil | | | | | | | | | | | |
| 32.6 | 24.4 | 7.3 | 9.3 | Tr. | 0.5 | 41.5 | 99 | 78 | .97 | 3.3 | | |
| 31.6 | 25.3 | 9.0 | 7.5 | 0.1 | 0.6 | 42.5 | 111 | 82 | .81 | 2.8 | | |
| 33.0 | 24.6 | 9.6 | 5.9 | 0.1 | 0.6 | 40.8 | 106 | 86 | .80 | 2.6 | | |
| 31.6 | 23.0 | 10.0 | 5.3 | 0.1 | 0.6 | 39.0 | 107 | 86 | .77 | 2.3 | | |
| 31.2 | 21.6 | 10.1 | 4.3 | 0.1 | 0.5 | 36.6 | 104 | 88 | .79 | 2.1 | | |
| 30.5 | 20.8 | 10.0 | 3.7 | 0.1 | 0.5 | 35.1 | 103 | 89 | .82 | 2.1 | | |
| 28.0 | 19.9 | 8.7 | 4.3 | 0.1 | 0.5 | 33.5 | 104 | 87 | .80 | 2.3 | | |
| 26.4 | 17.9 | 8.8 | 2.4 | 0.1 | 0.5 | 29.7 | 103 | 92 | .84 | 2.0 | | |
| 24.8 | 16.9 | 8.6 | 2.2 | 0.1 | 0.6 | 28.4 | 106 | 92 | .84 | 2.0 | | |
| 22.2 | | | 1.6 | 0.1 | 0.6 | | | | .80 | | | |
| 18.6 | | | 0.8 | 0.1 | 0.5 | | | | .78 | | | |
| 18.0 | | | 1.0 | 0.1 | 0.5 | | | | .78 | | | |
| | a. No carbonate clay | | | | | | | | | | | |

Soil type: Taintor silty clay loam

Soil No.: 861 Iowa-92-3

Location: 511 feet north and 743 feet west of the SE corner of SW1/4 SW1/4 Section 22, T76N, R8W, Washington Co., Iowa.

Vegetation: Clover and timothy field.

Parent material: Wisconsin loess.

Physiographic position: Moderately broad upland divide about 1/4-mile wide; appears to be highest elevation within the watershed.

Slope: Less than 1 percent.

Drainage: Poorly drained.

Permeability: Slow to moderately slow.

Ground water: Water table at 53 inches.

Moisture: Very moist.

Described by: R. I. Møller and A. R. Hildebaugh

October 4, 1961.

Horizon and
Lincoln Lab. No.

- A1p 0 to 7 inches. Black (N 2/)¹ medium silty clay loam, 10YR 3/1 dry, 10YR 2/1 kneaded; moderate medium sub-angular blocky breaking to weak fine granular structure; friable to firm²; many wormholes, few worm casts; abrupt smooth boundary.
- A12 7 to 13 inches. Black (N 2/) medium silty clay loam, N 3/0 dry and kneaded; moderate fine subangular blocky structure; friable; common fine and very fine inped tubular pores; distinct moisture films on ped; very few fine 10YR 3/2 coatings in old root channels; many wormholes and few worm casts; gradual smooth boundary.
- A3 13 to 18 inches. Black (N 2/) medium silty clay loam, 10YR 3/1 dry, 10YR 2/1 kneaded; weak medium prismatic breaking to moderate fine subangular blocky structure; friable to firm; few fine and many very fine inped tubular pores; some mixing of very few 2.5Y 3/2 peds at 15 to 18 inches; common very fine soft concretions and few very fine hard oxide concretions; common wormholes and few 10YR 2/1 worm casts; clear smooth boundary.
- B21 18 to 23 inches. Very dark gray (5Y 3/1) and very dark grayish brown (2.5Y 3/2) heavy silty clay loam, 10YR 4/1 dry; moderate medium prismatic breaking to moderate to strong very fine subangular blocky structure; firm to friable; ped exteriors are 5Y 3/1, interiors 2.5Y 3/2; common distinct 10YR 2/1 stains in some places; common fine distinct 10YR 5/4 mottles; common fine distinct segregations of 7.5YR 5/6; many fine and very fine inped tubular pores; thin distinct continuous clay films on all peds; common medium soft concretions and few fine hard oxide concretions; common wormholes with few 10YR 2/1 worm casts; gradual smooth boundary.
- B22 23 to 28 inches. Very dark gray (5Y 3/1) mixed with 2.5Y 3/2 heavy silty clay loam; moderate medium prismatic breaking to strong fine and very fine subangular blocky structure; firm; majority of ped exteriors are 5Y 3/1 with some 2.5Y 3/2 in places; interiors are 2.5Y 3/2; few distinct 10YR 3/1 stains oriented on prism faces (less than in B21); common very fine distinct 10YR 5/4 mottles; very few distinct segregations of 7.5YR 5/6; common very fine and fine inped tubular pores; many moderately thick distinct clay films on all peds (maximum in this horizon); common very fine soft concretions and few very fine hard oxide concretions; few wormholes and very dark gray worm casts; clear wavy boundary.
- B23 28 to 34 inches. Olive gray (5Y 5/2) mixed with 2.5Y 4/3 medium silty clay loam; moderate medium prismatic breaking to moderate fine subangular blocky structure; firm; majority of ped exteriors are 5Y 5/2 with some 2.5Y 4/3 in places; ped interiors are 5Y 5/2; very few thin 10YR 2/1 stains on prism faces in some places; common fine distinct 10YR 5/4 mottles; common very fine and fine inped tubular pores; common thin clay films on many peds; few fine moderately hard oxide concretions; few very dark gray worm casts; clear wavy boundary.
- B31 34 to 37 inches. Strong brown (7.5YR 5/6) medium silty clay loam; weak medium prismatic breaking to weak medium subangular blocky structure; firm; some 5Y 5/2 in places; many fine and very fine inped tubular pores; few faint thin discontinuous clay films on prism faces; one prominent strong brown horizontal band from 2 to 4 inches thick; clear wavy boundary.
- B32 37 to 46 inches. Olive gray (5Y 5/2) light silty clay loam; weak coarse prismatic breaking to weak medium angular blocky structure; firm; some stains or very thin clay films on prism faces which are 5Y 4/1; few fine distinct 10YR 5/4 mottles; many fine and very fine inped tubular pores; dark gray clay fills in root channels or vertical pores but most pores are clean; many fine soft concretions concentrated in a 7.5YR 5/6 wavy horizontal band which extends from above horizon; clear wavy boundary.
- C1 46 to 53 inches. Light olive gray (5Y 6/2) light silty clay loam; massive with common distinct cleavage faces; firm; few fine 2.5Y 4/4 mottles; many fine and very fine inped tubular pores; 2.5Y 4/2 fills of silty material in some large root channels; nearly all pores free of clay; very few fine soft concretions of an oxide; clear wavy boundary.
- C2 53 to 64 inches. Strong brown (7.5YR 5/6) heavy silt loam; massive with few distinct cleavage faces; firm; some 5Y 6/2 in places; many fine and very fine inped tubular pores; channels and pores are clean and free of clay; many fine soft oxide concretions; strong brown color occurs as a distinct horizontal band 6 to 12 inches thick; clear wavy boundary.
- C3 64 to 72 inches. Light olive gray (5Y 6/2) silt loam; massive with few distinct cleavage faces; firm; common medium 7.5YR 5/6 and common fine 10YR 5/4 mottles; many fine and very fine inped tubular pores; channels and pores are clean and free of clay; few fine soft oxide concretions; diffuse smooth boundary.
- C4 72 to 82 inches. Light olive gray (5Y 6/2) mixed with 10YR 5/4 silt loam; massive with faint cleavage faces in places; firm; majority of peds 5Y 6/2 with some 10YR 5/4 in places; many fine and very fine inped tubular pores; pores free of clay; common medium soft and a few fine hard oxide concretions; tubular oxide concretions 2 to 3 mm. in diameter; horizon appears to be partly reoxidized or oxidized.

Remarks: Roots many from 0 to 7 inches, common from 7 to 28, few from 28 to 34, and nearly absent below 34 inches. Soil peds below water table (53 inches) have slightly moist interiors and majority of water movement appears to be at cleavage faces. Few krotovinas at 53 inches and below; no clay accumulation in krotovinas; few oxides in mixed soil material in krotovinas; krotovinas cannot be traced to present B horizon; oxides are spherical in shape, dark brown to black in color, and considered predominantly iron-manganese. Strong brown (7.5YR 5/6 to 5/8) color which occurs as segregations, horizontal bands and vertical streaks, is considered to be higher in iron oxide than the associated matrix.

¹/Munsell color for moist soil.

²/Consistence at moist field conditions.

SOIL SURVEY LABORATORY Lincoln, Nebr.

SOIL TYPE Tama LOCATION Tama County, Iowa
silty clay loam

SOIL NOS. S59Iowa-86-1 LAB. NOS. 11528-11537

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | TEXTURAL CLASS | |
|-------------------------------------|---------|--|----------------------|-------------------------|------------------------|-----------------------------|----------------------------|------------------------|-----------------------|-------------------|--------------------------|----------------|-----|
| | | 1B1a | | | | | | | | | | | 2A2 |
| | | VERY COARSE SAND 2.1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | > 2 (19mm) | | |
| 0-6 1/2 | Ap | 0.1a | 0.2a | 0.3a | 0.4b | 1.2b | 69.2 | 28.6 | 37.6 | 33.0 | - | sic1 | |
| 6 1/2-11 | A12 | <0.1 | 0.2a | 0.2a | 0.3a | 1.1b | 66.0 | 32.2 | 34.4 | 32.8 | - | sic1 | |
| 11-16 1/2 | A3 | <0.1 | 0.2a | 0.2a | 0.3a | 1.1b | 64.0 | 34.2 | 32.4 | 32.8 | - | sic1 | |
| 16 1/2-20 | B1 | <0.1 | 0.1a | 0.1a | 0.2a | 1.2b | 62.8 | 35.6 | 33.6 | 30.5 | - | sic1 | |
| 20-25 | B21 | <0.1 | 0.1a | 0.1a | 0.2a | 1.2b | 63.0 | 35.4 | 35.7 | 28.6 | - | sic1 | |
| 25-29 | B22 | <0.1 | <0.1 | <0.1 | 0.2a | 1.4b | 65.2 | 33.2 | 36.2 | 30.5 | - | sic1 | |
| 29-35 | B23 | <0.1 | <0.1 | <0.1 | 0.1a | 1.5c | 67.9 | 30.5 | 39.1 | 30.4 | - | sic1 | |
| 35-45 | B31 | <0.1 | <0.1 | <0.1 | 0.1b | 1.7c | 70.0 | 28.2 | 40.4 | 31.4 | - | sic1 | |
| 45-51 | B32 | <0.1 | <0.1 | <0.1 | 0.1d | 2.2d | 69.2 | 28.5 | 43.4 | 28.1 | - | sic1 | |
| 51-61 | C1 | 0.2d | 0.4d | 0.3d | 0.5d | 2.0d | 69.0 | 27.6 | 44.1 | 27.1 | - | sic1 | |
| pH | | ORGANIC MATTER | | | | Free Iron | ELECTRICAL CONDUCTIVITY | 6E1a | | MOISTURE TENSIONS | | | |
| 8C1a | | 6A1a | | 6B1a | C/N | Fe2O3% | 6C1a | CaCO3 equiv- valent | GYPSUM me./100g. SOIL | 15 | | | |
| 1:1 | | ORGANIC CARBON % | | NITRO-GEN % | | | | | | 4B2 | | | |
| 1:5 | | 1:10 | | | | | | | | Atmos. % | | | |
| 5.7 | | 2.35 | | 0.210 | 11.2 | 0.9 | 0.4 | | | 12.7 | | | |
| 5.8 | | 1.95 | | 0.174 | 11.2 | 1.5 | 0.4 | | | 13.6 | | | |
| 5.7 | | 1.42 | | 0.131 | 10.8 | 1.6 | 0.4 | | | 14.4 | | | |
| 5.8 | | 0.97 | | 0.095 | 10 | 1.6 | 0.3 | | | 15.0 | | | |
| 5.7 | | 0.68 | | 0.072 | 9 | 1.7 | 0.3 | | | 14.2 | | | |
| 5.7 | | 0.45 | | 0.054 | 8 | 1.7 | 0.3 | | | 13.8 | | | |
| 5.7 | | 0.34 | | 0.041 | 8 | 1.7 | 0.2 | | | 13.3 | | | |
| 5.8 | | 0.21 | | 0.032 | | 1.7 | 0.3 | | | 12.6 | | | |
| 6.1 | | 0.15 | | 0.026 | | 1.6 | 0.5 | | | 12.4 | | | |
| 6.5 | | 0.12 | | 0.025 | | 1.5 | 0.6 | | | 12.2 | | | |
| 5A1a | | EXTRACTABLE CATIONS | | | | 5B1a | 5C1 | 5C3 | 5B1a | 5A3a | 8D3 | 8A | |
| CATION EXCHANGE CAPACITY NH4 Ac | 6N2b | 6O2b | 6H1a | 6P2a | 6Q2a | Base Sat. % NH4 Ac Exch. | Base Sat. % on Sum Cations | Sum Bases me/100g. | Sum Cations me/100g. | Ca/Mg | MOISTURE AT SATURATION % | | |
| | Ca | Mg | H | Na | K | | | | | | | | |
| ← milliequivalents per 100g. soil → | | | | | | | | | | | | | |
| 20.6 | 13.9 | 3.4 | 9.3 | 0.1 | 0.5 | 87 | 66 | 17.9 | 27.2 | 4.1 | 50.9 | | |
| 21.4 | 13.8 | 4.2 | 11.4 | 0.1 | 0.4 | 86 | 62 | 18.5 | 29.9 | 3.3 | 57.1 | | |
| 23.8 | 14.3 | 5.8 | 9.6 | 0.1 | 0.4 | 86 | 68 | 20.6 | 30.2 | 2.5 | 60.9 | | |
| 24.0 | 14.6 | 6.4 | 8.5 | 0.1 | 0.4 | 90 | 72 | 21.5 | 30.0 | 2.3 | 60.5 | | |
| 23.6 | 15.0 | 6.8 | 8.1 | 0.1 | 0.4 | 94 | 73 | 22.3 | 30.4 | 2.2 | 61.0 | | |
| 22.8 | 14.7 | 6.6 | 7.6 | 0.1 | 0.3 | 95 | 74 | 21.7 | 29.3 | 2.2 | 59.3 | | |
| 21.7 | 14.3 | 6.6 | 6.8 | 0.1 | 0.3 | 98 | 76 | 21.3 | 28.1 | 2.2 | 59.7 | | |
| 20.9 | 14.4 | 5.8 | 6.1 | 0.1 | 0.3 | 98 | 77 | 20.6 | 26.7 | 2.5 | 60.0 | | |
| 20.3 | 15.2 | 5.7 | 5.1 | 0.1 | 0.3 | 105 | 81 | 21.3 | 26.4 | 2.7 | 55.9 | | |
| 20.1 | 16.1 | 5.6 | 4.1 | 0.2 | 0.4 | 111 | 84 | 22.3 | 26.4 | 2.9 | 56.5 | | |

- a. Many (Fe-Mn?) concr.
- b. Common (Fe-Mn?) concr.
- c. Few (Fe-Mn?) concr.
- d. Trace (Fe-Mn?) concr.

Soil type: Tama silty clay loam

Soil No.: 899Iowa-86-1

Location: 140 feet south of east-west fence and 43 feet west of north-south fence of the northeast corner of the S $\frac{1}{2}$ of NW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 14, T85N, R13W, Tama County, Iowa, on the R. L. and R. D. Wilson farm.

Vegetation: Cats, sown to alfalfa; very productive soil.

Slope: 2 to 3 percent gradient, slightly convex.

Parent material: Loess of Wisconsin age which overlies mainly Iowan and Kansan glacial till; at this profile site the loess was 61 inches thick and deposited on Iowan glacial till.

Drainage: Well drained.

Sampled by and date: F. F. Riecken, W. D. Shrader, R. I. Turner, and E. C. A. Ruge, July 23, 1959.

Horizon and
Lincoln

Lab. Number

- Ap
11528 0 to 6 $\frac{1}{2}$ inches. Black to very dark brown (10YR 2/1.5 moist), friable to slightly firm, light silty clay loam; crushed color very dark brown (10YR 2/2 moist); massive, breaking to weak fine to medium subangular blocky structure; abundant earthworms, earthworm holes, and roots; gradual boundary.
- A12
11529 6 $\frac{1}{2}$ to 11 inches. Black to very dark brown (10YR 2/1.5 moist), friable, heavy silt loam; crushed color very dark brown (10YR 2/2 moist); moderate, fine to medium granular structure; abundant earthworms, earthworm holes, and roots; gradual boundary.
- A3
11530 11 to 16 $\frac{1}{2}$ inches. Mixed black to very dark brown and very dark grayish brown (10YR 2/1.5 and 10YR 3/2 moist), darker color on peds, friable, light silty clay loam; moderate fine subangular blocky structure; abundant earthworms, earthworm holes, and roots; gradual boundary.
- B1
11531 16 $\frac{1}{2}$ to 20 inches. Mixed very dark grayish brown and brown to dark brown (10YR 3/2 and 4/3 moist), darker color on peds, friable, light silty clay loam; crushed color very dark brown to brown (10YR 4/3 moist); ped surfaces, when moderately dry, have very thin gray, grainy coats over much of surface; moderate fine subangular blocky structure; abundant roots and common earthworm holes; gradual boundary.
- B21
11532 20 to 25 inches. Mixed very dark grayish brown and dark grayish brown (10YR 3/2 and 4/2 moist), darker color on peds, slightly firm, light silty clay loam; crushed color brown to dark yellowish brown (10YR 4/3.5 moist); ped surfaces have very thin gray, grainy coats as in above horizon; moderate fine to medium subangular blocky structure; abundant roots and common earthworm holes and small pores; gradual boundary.
- B22
11533 25 to 29 inches. Brown to dark brown (10YR 4/3 moist) with some dark yellowish brown (10YR 3/4 moist) ped coats, friable to slightly firm, light silty clay loam; crushed color brown to dark brown (10YR 4/3.3 moist); very thin gray, grainy ped coats much more patchy than in above two horizons; moderate medium subangular blocky structure; abundant roots and common earthworm holes and small pores; gradual boundary.
- B23
11534 29 to 35 inches. Brown to dark brown (10YR 4/3.5 moist) with dark yellowish brown (10YR 4/4 moist) inside peds, friable to slightly firm, light silty clay loam; crushed color dark yellowish brown (10YR 4/4 moist); very thin gray grainy ped coats as in above horizon; weak fine prismatic breaking to moderate medium subangular blocky structure; abundant roots and common earthworm holes and pores; gradual boundary.
- B31
11535 35 to 45 inches. Dark yellowish brown to yellowish brown (10YR 4.5/4 moist), friable to slightly firm, light silty clay loam; few fine faint brown to yellowish brown (10YR 5/3 and 5/6 moist) mottles; very thin patchy gray, grainy ped coats as in above horizon; weak medium prismatic breaking to moderate to weak medium subangular blocky; abundant roots and pores and few to common earthworm holes; gradual boundary.
- B32
11536 45 to 51 inches. Yellowish brown (10YR 5/4 moist) with brown (10YR 5/3 moist) coatings on prism faces, friable silt loam; common fine distinct yellowish brown and light brownish gray (10YR 5/6 and 6/2 moist) mottles; definite gray to light gray (10YR 6/1 dry) grainy coats along prism faces; weak coarse prismatic structure; common roots and plentiful pores; few fine soft dark iron or manganese concretions; gradual boundary.
- C1
11537 51 to 61 inches. Yellowish brown (10YR 5/4 moist) with brown (10YR 5/3 moist) coatings on prism faces, friable silt loam; few fine faint yellowish brown and light brownish gray (10YR 5/6 and 6/2 moist) mottles; definite gray to light gray (10YR 6/1 dry) grainy coats along prism faces; weak coarse prismatic structure; common roots and plentiful pores; few fine soft dark iron or manganese concretions; a large, 3- to 4-inch, krotovina with abundant roots in horizon.

SOIL SURVEY LABORATORY Lincoln, Nebr. Sept., 1963

SOIL TYPE Winterset LOCATION Madison County, Iowa
silty clay loam

SOIL NOS. S61Iowa-61-2 LAB. NOS. 16355-16367

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | Textural Class |
|---|--------------------------------------|--|----------------------|-------------------------|------------------------|-----------------------------|----------------------------------|------------------|------------------------------------|------------------------|-------------------------|---------------------------------------|
| | | 1E1b VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 3A1 0.2-0.02 | 0.02-0.002 | 2A2 > 2 | |
| 0-7 | A1p | 0.1 | 0.2 | 0.2 | 0.4 | 0.7 | 70.0 | 28.4 | 31.1 | 39.8 | - | |
| 7-13 | A12 | 0.2 | 0.4 | 0.6 | 0.5 | 0.9 | 64.6 | 32.8 | 29.7 | 36.0 | - | |
| 13-18 | A3 | 0.2 | 0.4 | 0.4 | 0.6 | 0.9 | 60.6 | 36.9 | 28.2 | 33.6 | - | |
| 18-24 | B21 | 0.3 | 0.5 | 0.4 | 0.5 | 0.8 | 56.8 | 40.7 | 25.9 | 31.9 | - | |
| 24-28 | B22 | 0.6 | 0.7 | 0.4 | 0.6 | 0.8 | 55.0 | 41.9 | 24.4 | 31.7 | - | |
| 28-34 | B23 | 0.3 | 0.3 | 0.2 | 0.4 | 1.1 | 56.7 | 41.0 | 26.3 | 31.7 | - | |
| 34-40 | B31 | 0.5 | 0.6 | 0.3 | 0.5 | 1.0 | 58.9 | 38.2 | 28.0 | 32.2 | - | |
| 40-47 | B32 | 0.4 | 0.7 | 0.4 | 0.6 | 0.9 | 61.6 | 35.4 | 28.9 | 34.0 | - | |
| 47-56 | B3C1 | 0.2 | 0.4 | 0.3 | 0.6 | 1.0 | 63.7 | 33.8 | 30.6 | 34.5 | - | |
| 56-63 | C1 | 0.1 | 0.2 | 0.2 | 0.7 | 1.0 | 67.3 | 30.5 | 34.1 | 34.7 | - | |
| 63-71 | C2 | 0.1 | 0.3 | 0.3 | 0.6 | 1.0 | 68.3 | 29.4 | 34.3 | 35.4 | - | |
| 71-75 | C3 | 0.1 | 0.1 | 0.1 | 0.3 | 0.6 | 69.6 | 29.2 | 34.4 | 36.0 | - | |
| 75-81 | C4 | - | 0.1 | 0.1 | 0.1 | 0.7 | 70.0 | 29.0 | 36.0 | 34.8 | - | |
| 8C1a | 6E1b | Organic Matter | | | | Bulk Density | | | | Moisture Retention | | |
| pH 1:1 | CaCO ₃ Equivalent % | 6A1a O.C. | 6B1a N | C/N | Field Moist % M. | 30 Cm. 4B3 | A.D. 4A1c | 4A1b g/cc | 1/3-Bar Pieces | 4B1b 15-to in/in | 4C1 15-Bar Sieved | 4B2 15-Bar Sieved |
| | | % | % | | g/cc | % M. | g/cc | g/cc | % | % | % | % |
| 5.7 | | 2.44 | 0.186 | 13 | 21.1 | 1.52 | 26.0 | 1.45 | 1.61 | 24.8 | .17 | 13.2 |
| 5.5 | | 1.64 | 0.127 | 13 | 25.9 | 1.32 | 29.5 | 1.29 | 1.46 | 28.1 | .18 | 14.0 |
| 5.5 | | 1.31 | 0.100 | 13 | | | | | | | | 15.3 |
| 5.7 | | 1.07 | 0.083 | 13 | | | | | | | | 17.0 |
| 5.6 | | 0.83 | 0.069 | 12 | 29.2 | 1.37 | 24.5 | 1.41 | 1.73 | 30.0 | .16 | 18.6 |
| 5.9 | | 0.33 | | | | | | | | | | 18.1 |
| 6.0 | | 0.30 | | | | | | | | | | 17.8 |
| 6.2 | | 0.22 | | | | | | | | | | 17.4 |
| 6.5 | - | 0.14 | | | 28.0 | 1.45 | 31.2 | 1.37 | 1.64 | 30.7 | .19 | 16.9 |
| 7.0 | - | 0.12 | | | | | | | | | | 15.4 |
| 7.4 | - | 0.09 | | | | | | | | | | 15.3 |
| 7.7 | 3 | 0.09 | | | 27.6 | 1.48 | 30.2 | 1.38 | 1.61 | 34.6 | .27 | 14.7 |
| 7.7 | 5 | 0.09 | | | | | | | | | | 13.4 |
| 5A1a | EXTRACTABLE CATIONS | | | | | 5B1a | Base Sat. | | 6D1 | 6D3 | 6C1a | A1 Ext. KCl- Ext. me/100g |
| CATION EXCHANGE CAPACITY NH ₄ OAc | 5N2b Ca | 6O2b Mg | 6H1a H | 6P2a Na | 6Q2a K | 5A3a Sum | 5C1 on NH ₄ OAc | 5C3 on Sum | Ratio on NH ₄ OAc | Ca/Mg | Ext. Iron as Fe | |
| | milliequivalents per 100g. soil | | | | | | CEC % | % | CEC | % | % | |
| 24.0 | 17.6 | 4.0 | 9.0 | Tr. | 0.5 | 31.1 | 92 | 71 | .84 | 4.4 | 0.8 | |
| 24.5 | 15.8 | 5.0 | 9.5 | Tr. | 0.6 | 30.9 | 87 | 69 | .75 | 3.2 | 0.9 | |
| 26.6 | 16.5 | 6.4 | 8.3 | Tr. | 0.7 | 31.9 | 89 | 74 | .72 | 2.6 | 1.0 | |
| 29.3 | 17.8 | 7.7 | 7.3 | 0.1 | 0.8 | 33.7 | 90 | 78 | .72 | 2.3 | 1.2 | |
| 30.3 | 18.9 | 8.6 | 7.7 | 0.1 | 0.8 | 36.1 | 94 | 79 | .72 | 2.2 | 1.3 | |
| 31.3 | 18.9 | 9.0 | 5.9 | 0.1 | 0.8 | 34.7 | 92 | 83 | .76 | 2.1 | 1.0 | |
| 30.2 | 19.0 | 7.5 | 5.3 | 0.1 | 0.8 | 32.7 | 91 | 84 | .79 | 2.5 | 1.0 | |
| 28.7 | 18.4 | 7.4 | 5.7 | 0.1 | 0.7 | 32.3 | 93 | 82 | .81 | 2.5 | 1.7 | |
| 27.6 | 18.6 | 7.9 | 0.2 | 0.2 | 0.7 | 27.6 | 99 | 99 | .82 | 2.4 | 1.5 | |
| 25.2 | 17.3 | 8.8 | - | 0.2 | 0.6 | 26.9 | 107 | 100 | .83 | 2.0 | 1.0 | |
| 24.2 | 17.1 | 8.0 | - | 0.1 | 0.6 | 25.8 | 107 | 100 | .82 | 2.1 | 1.7 | |
| 23.0 | | | - | 0.1 | 0.6 | | | | .79 | | 1.2 | |
| 22.3 | | | 0.4 | 0.1 | 0.6 | | | | .77 | | 0.5 | |

a. No carbonate clay

Soil type: Minter set silty clay loam

Soil No.: S61Iowa-61-2

Location: 450 feet north of road center and 25 feet west of SE corner of SW1/4 NE1/4 Section 4, T75N, R28W, Madison County, Iowa. Parent material: Wisconsin loess.

Physiographic position: Broad upland divide; appears to be highest elevation within the watershed.

Vegetation: Clover field.

Drainage: Poorly drained. Moisture: Very moist.

Slope: Less than 1 percent.

Permeability: Slow to moderately slow.

Ground water: Water table at 40 inches.

Described by: R. I. Mideriksen and A. R. Hidlebaugh,

October 9, 1961.

Horizon and
Lincoln Lab. No.

- Alp 0 to 7 inches. Black (10YR 2/1)¹ light silty clay loam, 10YR 4/1 dry; moderate medium subangular blocky structure; firm²; common wormholes and casts; abundant fine root channels; abrupt smooth boundary.
- 16355
- A12 7 to 13 inches. Black (10YR 2/1) light silty clay loam, 10YR 4/1 dry; moderate fine granular and few peds with weak subangular blocky structure; friable; very faint grainy coatings noted when moist and distinct when dry; common fine and very fine inped tubular pores; common wormholes and casts; gradual smooth boundary.
- 16356
- A3 13 to 18 inches. Black (10YR 2/1) medium silty clay loam, 10YR 5/1 dry, 10YR 2/2 kneaded; weak very fine subangular blocky structure; friable to firm; very faint grainy coatings noted when moist and distinct when dry; many fine and very fine inped tubular pores; few very fine soft oxide concretions; common wormholes and casts; clear smooth boundary.
- 16357
- B21 18 to 24 inches. Very dark gray (10YR 3/1) mixed with 2.5Y 3/2 medium to heavy silty clay loam, 10YR 5/1 dry, 2.5Y 3/2 kneaded; moderate to strong very fine subangular blocky structure; friable to firm; very faint imbedded grainy coatings noted when moist, distinct when dry; majority of peds are 10YR 3/1 but a few are 2.5Y 3/2; many fine and very fine inped tubular pores; thin continuous clay films on all ped surfaces; few very fine soft concretions and few fine hard oxide concretions; few wormholes and casts; clear smooth boundary.
- 16358
- B22 24 to 28 inches. Dark gray (10YR 4/1) mixed with 2.5Y 3/2 heavy silty clay loam; weak medium prismatic breaking to strong fine and medium subangular blocky structure; firm; ped exteriors are 10YR 4/1, interiors 2.5Y 3/2, with common fine distinct 10YR 4/4 mottles; few fine inped tubular pores; distinct moderately thick continuous clay films on all peds; few very fine hard concretions and common very fine soft oxide concretions; clear wavy boundary.
- 16359
- B23 28 to 34 inches. Dark gray (5Y 4/1) and olive gray (5Y 5/2) medium silty clay loam; weak medium prismatic breaking to moderate medium subangular blocky structure; firm; ped exteriors are 5Y 4/1, interiors 5Y 5/2, with common fine distinct 2.5Y 4/4 and few fine distinct 10YR 5/4 mottles; common 10YR 3/1 stains on vertical cleavage faces; many fine and very fine inped tubular pores; thin discontinuous clay films on peds; few fine hard spherical and moderately hard tubular-shaped concretions and few fine soft oxide concretions; gradual smooth boundary.
- 16360
- B31 34 to 40 inches. Gray (5Y 5/1) and olive gray (5Y 5/2) medium silty clay loam, 5Y 5/3 kneaded; moderate medium prismatic breaking to moderate medium subangular blocky structure; firm; ped exterior colors mixed so majority of peds are 5Y 5/1 with some 5Y 4/1 in places; interiors 5Y 5/2 with common fine 2.5Y 4/4 and few fine distinct 10YR 4/4 mottles; few distinct 7.5YR 5/6 segregations; some 10YR 3/1 stains on prism faces; many fine and very fine inped tubular pores; thin discontinuous clay films on prism faces and some peds; common to many fine and medium soft oxide concretions; gradual wavy boundary.
- 16361
- B32 40 to 47 inches. Gray (5Y 5/1) and olive gray (5Y 5/2) light to medium silty clay loam; weak coarse prismatic breaking to weak medium to coarse angular blocky structure; firm; ped exteriors are 5Y 5/1, interiors are 5Y 5/2 with common to many fine distinct 10YR 5/4 mottles; common distinct 7.5YR 5/6 segregations; many very fine and fine inped tubular pores; few thin discontinuous clay films on prism faces; common 10YR 3/1 clay fills in fine pores; many fine soft oxide concretions; gradual smooth boundary.
- 16362
- B3Cl 47 to 56 inches. Olive gray (5Y 5/2) and gray (5Y 5/1) light silty clay loam; weak coarse prismatic breaking to weak coarse angular blocky structure; firm; peds predominantly 5Y 5/2 with few exteriors 5Y 5/1; many medium 2.5Y 4/4 mottles; common distinct 7.5YR 5/6 vertical streaks; many medium and fine inped tubular pores; common 10YR 3/1 clay fills in pores with very few thin discontinuous clay films on some prism faces; common coarse soft concretions and few fine hard oxide concretions; gradual smooth boundary.
- 16363
- G1 56 to 63 inches. Olive gray (5Y 5/2) light silty clay loam; massive with some vertical cleavage; firm; common medium 10YR 5/4 mottles; common prominent 7.5YR 5/6 vertical streaks; some vertical cleavage faces have gray (5Y 5/1) exteriors; common medium and fine inped tubular pores; few 10YR 3/1 clay fills in very fine and fine pores; many fine soft oxide concretions; clear wavy boundary.
- 16364
- G2 63 to 71 inches. Predominantly yellowish brown (10YR 5/6) mixed with 5Y 5/2 heavy silt loam; massive with some vertical cleavage; firm; prominent wavy 7.5YR 5/6 horizontal band and a few individual segregations; common medium and fine inped tubular pores; common 10YR 3/1 clay fills (more distinct than in horizons above or below) in very fine and fine pores; very few very fine soft oxide concretions; clear smooth boundary.
- 16365
- G3 71 to 75 inches. Light olive gray (5Y 6/2) silt loam; massive with some vertical cleavage; firm; common large prominent 7.5YR 5/6 and common fine distinct 10YR 5/6 mottles; many medium and fine inped tubular pores; few 10YR 3/1 clay fills in very fine pores but most pores free of clay or stains; common fine soft oxide concretions and smears; matrix not calcareous but a hard carbonate concretion present at 72 inches; diffuse smooth boundary.
- 16366
- G4 75 to 81 inches. Light olive gray (5Y 6/2) silt loam; massive with some vertical cleavage; firm; common fine faint 2.5Y 4/4 mottles; many medium and fine inped tubular pores; few 10YR 3/1 clay fills in very fine pores; common very fine soft oxide concretions and a few 5 to 10 mm. in diameter moderately hard tubular concretions; few hard carbonate concretions but matrix is not calcareous.
- 16367

Remarks: Roots plentiful from 0 to 18 inches, common from 18 to 28, few from 28 to 56, and nearly absent below 56 inches. Several krotovinas present below 62 inches; there is a black (N 2/0) clay coating in krotovina and interiors have some mixed olive gray and strong brown material. Oxides are spherical in shape, dark brown to black, and considered predominantly iron-manganese unless otherwise noted. Strong brown (7.5YR 5/6 to 5/8) segregations, horizontal bands, and vertical streaks are considered higher in iron oxide than the associated matrix. Horizons Alp, B22 and C3 were sampled for the Bureau of Public Roads.

¹/Munsell color for moist soil.

²/Consistence at moist field conditions.

SOIL SURVEY LABORATORY Lincoln, Nebr. Sept., 1963

SOIL TYPE Winterset LOCATION Madison County, Iowa
silty clay loam

SOIL NOS. S61Iowa-61-3 LAB. NOS. 16368-16378

| DEPTH INCHES | HORIZON | PARTICLE SIZE DISTRIBUTION (in mm.) (per cent) | | | | | | | | | | 2A2 > 2 | Textural Class |
|--------------------------|---------------------------------|--|----------------------|-------------------------|------------------------|-----------------------------|---------------------|-----------------|---------------------|--------------------|--------------|---------------|----------------|
| | | 3A1 | | | | | | | | | | | |
| | | VERY COARSE SAND 2-1 | COARSE SAND 1-0.5 | MEDIUM SAND 0.5-0.25 | FINE SAND 0.25-0.10 | VERY FINE SAND 0.10-0.05 | SILT 0.05-0.002 | CLAY < 0.002 | 0.2-0.02 | 0.02-0.002 | | | |
| 0-7 | A1p | 0.2 | 0.4 | 0.4 | 0.6 | 0.8 | 69.7 | 27.9 | 31.3 | 39.5 | - | | |
| 7-13 | A12 | 0.2 | 0.4 | 0.6 | 0.7 | 0.8 | 65.7 | 31.6 | 28.4 | 38.4 | - | | |
| 13-19 | A13 | 0.1 | 0.5 | 0.5 | 0.7 | 0.9 | 62.1 | 35.2 | 27.3 | 36.0 | - | | |
| 19-25 | A3 | 0.9 | 0.9 | 0.6 | 0.8 | 0.8 | 55.6 | 40.4 | 25.1 | 31.7 | - | | |
| 25-32 | B21 | 0.4 | 0.4 | 0.2 | 0.4 | 0.9 | 55.1 | 42.6 | 24.1 | 32.1 | - | | |
| 32-39 | B22 | 0.3 | 0.6 | 0.3 | 0.4 | 0.8 | 60.0 | 37.6 | 27.4 | 33.6 | - | | |
| 39-48 | B31 | 0.1 | 0.2 | 0.2 | 0.4 | 0.7 | 60.8 | 37.6 | 28.2 | 33.5 | - | | |
| 48-58 | B32 | 0.1 | 0.2 | 0.2 | 0.4 | 0.8 | 63.5 | 34.8 | 30.7 | 33.8 | - | | |
| 58-69 | C1 | - | 0.1 | 0.1 | 0.2 | 0.9 | 64.8 | 33.9 | 32.1 | 33.7 | - | | |
| 69-79 | C2 | 0.1 | 0.1 | Tr. | 0.1 | 0.8 | 67.3 | 31.6 | 32.3 | 35.9 | - | | |
| 79-89 | C3 | - | 0.1 | 0.1 | 0.1a | 0.8 | 68.8 | 30.1 | 33.9 | 55.8 | - | | |
| 8C1a | 6E1b | Organic Matter | | | | Bulk Density | | | | Moisture Retention | | | |
| | CaCO ₃ Equiv | 6A1a O.C. | 6B1a N | C/N | Field Moist | | 30 Cm. | | A.D. | 4B1b 1/3-Bar | 4C1 15-to | 4B2 15-Bar | |
| pH | alent | % | % | | 4B1 % M. | 4A1a g/cc | 4B3 % M. | 4A1c g/cc | 4A1b g/cc | Pieces | 1/3-Bar | Sieved | |
| 1:1 | | | | | | | | | | % | in/in | % | |
| 6.9 | | 2.78 | 0.138 | 15 | 26.2 | 1.44 | 29.4 | 1.40 | 1.56 | 27.8 | .21 | 12.9 | |
| 6.1 | | 1.38 | 0.132 | 14 | 27.8 | 1.28 | 30.0 | 1.26 | 1.40 | 29.8 | .20 | 14.2 | |
| 6.0 | | 1.32 | 0.107 | 12 | 29.0 | 1.28 | 26.2 | 1.31 | 1.50 | 28.1 | .16 | 15.6 | |
| 6.0 | | 0.92 | 0.078 | 12 | | | | | | | | 18.6 | |
| 6.2 | | 0.48 | | | | | | | | | | 19.9 | |
| 5.8 | | 0.25 | | | 28.8 | 1.43 | 28.3 | 1.38 | 1.66 | 31.1 | .18 | 18.3 | |
| 6.2 | | 0.18 | | | | | | | | | | 17.6 | |
| 6.3 | | 0.12 | | | | | | | | | | 16.9 | |
| 6.7 | | 0.12 | | | 30.2 | 1.42 | 32.5 | 1.33 | 1.61 | 32.4 | .21 | 16.5 | |
| 7.1 | | 0.08 | | | | | | | | | | 15.5 | |
| 7.3 | 1 | 0.09 | | | | | | | | | | 15.3 | |
| 5A1a | 6N2b | EXTRACTABLE CATIONS | | | | 5B1a | Base Sat. | | 8D1 | 8D3 | Ext. | A1 | |
| CATION EXCHANGE CAPACITY | Ca | Mg | H | Na | K | 5A3a Sum | 5C1 on | 5C3 on Sum | Ratio to Clay | Ca/Mg | Iron | KCl- Ext. | |
| NH ₄ OAc | milliequivalents per 100g. soil | | | | | | NH ₄ OAc | Cations | NH ₄ OAc | % | as Fe | %/100g | |
| 25.3 | 21.4 | 4.1 | 5.4 | Tr. | 0.4 | 31.3 | 102 | 83 | .91 | 5.2 | | | |
| 24.5 | 15.8 | 5.1 | 8.7 | 0.1 | 0.5 | 30.2 | 88 | 71 | .78 | 3.1 | | | |
| 25.3 | 15.8 | 6.3 | 8.1 | 0.1 | 0.6 | 30.9 | 90 | 74 | .72 | 2.5 | | | |
| 30.4 | 18.0 | 8.1 | 8.8 | 0.2 | 0.7 | 35.8 | 89 | 75 | .75 | 2.2 | | | |
| 33.4 | 19.5 | 8.5 | 7.8 | 0.3 | 0.8 | 36.9 | 87 | 79 | .78 | 2.3 | | | |
| 30.4 | 18.4 | 8.4 | 6.3 | 0.3 | 0.7 | 34.1 | 91 | 82 | .81 | 2.2 | | | |
| 29.8 | 18.2 | 8.8 | 5.3 | 0.3 | 0.7 | 33.3 | 94 | 84 | .79 | 2.1 | | | |
| 28.2 | 17.8 | 8.0 | 4.3 | 0.3 | 0.6 | 31.0 | 95 | 86 | .81 | 2.2 | | | |
| 27.2 | 17.6 | 7.1 | 3.0 | 0.3 | 0.6 | 28.6 | 94 | 90 | .80 | 2.5 | | | |
| 25.1 | 16.6 | 8.0 | 2.4 | 0.3 | 0.6 | 27.9 | 102 | 91 | .79 | 2.1 | | | |
| 24.0 | | | 1.4 | 0.2 | 0.6 | | | | .80 | | | | |

a. 18 Kg/M² to 60 inches.
b. No carbonate clay.

Soil type: Winterset silty clay loam
 Soil No.: 861Iowa-61-3
 Location: 483 feet west and 336 feet south of NE corner of Sec. 6, T75N, R28W, Madison County, Iowa.
 Vegetation: Glover field. Parent material: Wisconsin loess.
 Physiographic position: Broad upland divide. Appears to be the highest elevation within the watershed.
 Slope: Less than 1 percent. Drainage: Poorly drained.
 Permeability: Slow to moderately slow. Ground water: Water table at 30 inches.
 Moisture: Very moist. Described by: D. F. Slusher and A. R. Hildebaugh, Oct. 11, 1961.

Horizon and
 Lincoln Lab. No.

- A1p 0 to 7 inches. Black (10YR 2/1)¹ light silty clay loam, dark gray (10YR 4/1) when dry; weak medium subangular blocky structure; firm²; kneaded color remains the same; very few fine hard concretions of an oxide; clear smooth boundary.
- A12 7 to 13 inches. Black (10YR 2/1) light silty clay loam, dark gray (10YR 4/1) when dry; moderate fine granular structure; friable; very faint grainy coatings when moist, distinct when dry; moist chroma slightly less than 1; kneaded color black (10YR 2/1); very few fine hard concretions of an oxide; gradual smooth boundary.
- A13 13 to 19 inches. Black (10YR 2/1) medium silty clay loam, gray (10YR 5/1) when dry; moderate fine subangular blocky structure; friable; very faint grainy coatings when moist, distinct when dry; kneaded color black (10YR 2/1) to very dark gray (10YR 3/1); few fine hard concretions of an oxide--slightly more than in above horizon; gradual smooth boundary.
- A3 19 to 25 inches. Very dark gray (10YR 3/1) and black (10YR 2/1) medium silty clay loam; gray (10YR 5/1) when dry; moderate very fine subangular blocky structure; friable to firm; very faint imbedded grainy coatings when moist, distinct when dry; majority of peds very dark gray (10YR 3/1) with few black (10YR 2/1) peds in places; common fine faint dark grayish brown to olive brown (2.5Y 4/3) mottles; kneaded color very dark grayish brown (2.5Y 3/2); common very fine and fine imbed tubular pores; few to common fine hard concretions of an oxide; gradual smooth boundary.
- B21 25 to 32 inches. Very dark gray (10YR 3/1) and dark grayish brown (2.5Y 4/2) heavy silty clay loam; weak medium prismatic breaking to moderate very fine subangular blocky structure; firm; ped exteriors are very dark gray (10YR 3/1) with common fine distinct dark yellowish brown (10YR 4/4) and common fine faint olive brown (2.5Y 4/4) mottles; ped interiors are dark grayish brown (2.5Y 4/2) with common medium distinct yellowish brown (10YR 5/4) mottles; few black (10YR 2/1) stains on ped exteriors; kneaded color dark grayish-brown (2.5Y 4/2); very few very fine imbed tubular pores; common thin discontinuous clay films on prism and ped faces; many fine hard concretions of an oxide 27 inches and below; gradual smooth boundary.
- B22 32 to 39 inches. Dark gray (5Y 4/1) and mixed grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) heavy silty clay loam; moderate medium prismatic breaking to moderate fine subangular blocky structure; ped exteriors are dark gray (5Y 4/1) with common fine distinct dark yellowish brown (10YR 4/4) mottles; ped interiors grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) mixed in about equal proportions; common very dark gray (10YR 3/1) stains on prism faces; kneaded color grayish brown (2.5Y 5/2); few fine imbed tubular pores; common thin discontinuous clay films on prism and ped surfaces; many fine hard and a few soft concretions of an oxide to 36 inches; gradual smooth boundary.
- B31 39 to 48 inches. Mixed dark gray (5Y 4/1) with very dark gray (10YR 3/1) and olive gray (5Y 5/2) medium silty clay loam; moderate medium prismatic breaking to moderate medium subangular blocky structure; firm; majority ped exteriors dark gray (5Y 4/1) with about equal proportions very dark gray (10YR 3/1) in some places; ped interiors olive gray (5Y 5/2) with many fine prominent yellowish brown (10YR 5/6) mottles; few black (10YR 2/1) stains on prism faces; kneaded color grayish brown to light olive brown (2.5Y 5/3); common fine imbed tubular pores; common discontinuous clay films mainly on prism faces and few very dark gray (10YR 3/1) clay flows 2 to 3 mm. wide on prism faces; common fine hard and few fine soft concretions of an oxide; gradual wavy boundary.
- B32 48 to 58 inches. Mixed dark gray (5Y 5/1), olive gray (4Y 5/2), and very dark gray (10YR 3/1) medium silty clay loam; moderate coarse prismatic breaking to weak coarse subangular blocky structure; majority ped exteriors are dark gray (5Y 4/1) with common olive gray (5Y 5/2) and few very dark gray (10YR 3/1) and mottled with common fine distinct olive brown (2.5Y 4/4); ped interiors olive gray (5Y 5/2) with few fine faint olive brown mottles; few medium segregations prominent strong brown (7.5YR 5/6); common fine imbed tubular pores; common thin discontinuous clay films on very dark gray prism faces; a few very dark gray (10YR 3/1) clay flows 2 to 3 mm. wide in root channels, and a few saucer-shaped clay accumulations 5 to 10 mm. in diameter; few fine soft concretions of an oxide; gradual smooth boundary.
- C1 58 to 69 inches. Gray (5Y 5/1) and olive gray (5Y 5/2) light silty clay loam; massive with distinct vertical cleavage; firm; ped exteriors gray (5Y 5/1) with few to common fine distinct yellowish brown (10YR 5/4) mottles; ped interiors olive gray (5Y 5/2) with common fine distinct yellowish brown (10YR 5/6) mottles; few fine prominent vertical streaks of strong brown (7.5YR 5/6); common fine imbed tubular pores; few thin very dark gray (10YR 3/1) clay flows on prism faces; many fine thread-like clay fills in pores, and a few saucer-shaped clay accumulations 5 to 10 mm. in diameter; very few fine hard concretions of an oxide; diffuse smooth boundary.
- C2 69 to 79 inches. Same as above horizon but silt loam in texture.
- C3 79 to 89 inches. Mixed yellowish brown (10YR 5/6) and olive gray (5Y 5/2) silt loam; massive with weak vertical cleavage; firm; common medium prominent vertical streaks of strong brown (7.5YR 5/6); common fine imbed tubular pores; few very dark gray (10YR 3/1) clay flows in pores and a few saucer-shaped clay accumulations but less than in above horizon.

Notes: Roots plentiful from 0 to 7 inches, common from 7 to 13, few from 13 to 32, and nearly absent below 32 inches. Saucer-shaped clay accumulations from 48 to 89 inches. Oxides are spherical in shape, dark brown to black in color, and are considered to be predominantly composed of iron-manganese. Strong brown (7.5YR 5/6 to 5/8) which occurs as segregations, horizontal bands, and vertical streaks, is considered to be higher in iron than the associated matrix.

¹/ Munsell color for moist soil.
²/ Consistence at moist field conditions.