Soil Survey Investigations Report No. 36

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

••MICHIGAN

SOIL CONSERVATION SERVICE • U.S. DEPARTMENT OF AGRICULTURE
In cooperation with Michigan Agricultural Experiment Station

Soil survey investigations reports already published:

SSIR No.	1	Soil Survey Laboratory Methods and Procedures for Collecting Soil Samples
		Soil Survey Laboratory Data and Descriptions for Some Soils of:
SSIR No.	2	North Dakota
SSIR No.	3	Iowa
SSIR No.	4	Kansas
SSIR No.	5	Nebraska
SSIR No.	6	Arkansas, Louisiana, and Missouri
SSIR No.	7	Montana
SSIR No.	8	Wyoming
SSIR No.	9	Minnesota
SSIR No.	10	Colorado
SSIR No.	11	Oklahoma
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SSIR No.	13	Mississippi
SSIR No.	14	Kentucky
SSIR No.	15	Tennessee
SSIR No.	16	North Carolina, South Carolina, and Georgia
SSIR No.	17	Wisconsin
SSIR No.	18	Indiana
SSIR No.	19	Illinois
SSIR No.	20	New England States
SSIR No.	21	A Toposequence of Soils in Tonalite Grus in the Southern California Peninsular Range
		Soil Survey Laboratory Data and Descriptions for Some Soils of:
SSIR No.	22	Alabama and Florida
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SSIR No.	25	New York
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PREFACE

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

This report contains descriptions and data obtained in Michigan from 1966 to 1975. The laboratory analyses were conducted at the soil survey laboratories in Lincoln, Nebr., and Beltsville, Md.

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

Many pedons no longer represent the soil series with which they were originally identified.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

METHODS CODE SYMBOLS

1. SAMPLE COLLECTION AND PREPARATION
   - A. Field sampling
     - 1. Site selection
     - 2. Soil sampling
       - a. Stony soils
       - b. Marsh and swamp soils
   - B. Laboratory preparation
     - 1. Standard (airdry)
       - a. Square-hole 2-mm 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
     - - : analysis run but not detected
     - blank: analysis not run
     - nd: analysis not run
     - < : less than reported amount or none present
3. PARTICLE-SIZE ANALYSES
   - A. Particles < 2-mm (pipet method)
     - 1. Airdry samples
       - a. Carbonate and noncarbonate clay
       - b. Fine clay
       - c. Water-dispersible clay
   - B. Particles > 2-mm
     - 1. Weight estimates
       - a. By field and laboratory weights
       - b. From volume and weight estimates
     - 2. Volume estimates
4. FABRIC-RELATED ANALYSES
   - A. Bulk density
     - 1. Saran-coated clods
       - a. Field state
       - b. 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
     - 3. Cores
       - a. Field moist
   - B. Water retention
     - 1. Pressure-plate extraction (1/3 or 1/10 bar)
       - a. Sieved samples
       - b. Soil pieces
       - c. Natural clods
     - 2. Pressure-membrane extraction (15 bars)
       - a. Field-moist samples
     - 3. Sand-table absorption
     - 4. Field state
     - 5. Airdry
   - C. Water-retention difference
     - 1. 1/3 bar to 15 bars
     - 2. 1/10 bar to 15 bars
   - D. Linear extensibility
     - 1. Dry to moist
   - E. Micromorphology
     - 1. Thin sections
       - a. Preparation
       - b. Interpretation
       - c. Moved-clay percentage
   - F. Plasticity index
     - 1. Liquid limit
     - 2. Plastic limit
5. ION-EXCHANGE ANALYSES
   - A. Cation-exchange capacity
     - 1. NH_4OAc, pH 7.0
       - a. Direct distillation
     - 2. NaOAc, pH 8.2
       - a. Centrifuge method
     - 3. Sum of cations
       - a. Acidity by $BaCl_2$-TEA, pH 8.2; bases by NH_4OAc, pH 7.0
       - b. Sum of bases plus Al
     - 6. NH_4OAc, pH 7.0 leaching tube
       - a. Direct distillation
   - B. Extractable bases
     - 1. NH_4OAc extraction
       - a. Uncorrected
       - b. Corrected (exchangeable)
       - c. See 5B4
     - 2. KCl-TEA extraction, pH 8.2
     - 3. KCl-TEA, pH 8.2 (revised)
       - a. Uncorrected
       - b. Corrected (exchangeable)
     - 4. NH_4OAc, pH 7.0 (modified)
       - a. Uncorrected
       - b. Corrected (exchangeable)
   - 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
   - F. Calcium saturation
     - 1. NH_4OAc, pH 7.0
6. CHEMICAL ANALYSES
   - A. Organic carbon
     - 1. Acid-dichromate digestion
       - a. $FeSO_4$ titration
       - b. CO_2 evolution, gravimetric
     - 2. Dry combustion
       - a. CO_2 evolution I
       - b. CO_2 evolution II
   - B. Nitrogen
     - 1. Kjeldahl digestion
       - a. Ammonia distillation
   - C. Iron
     - 1. Dithionite extraction
       - a. Dichromate titration
       - b. EDTA titration
     - 2. Dithionite-citrate extraction
       - a. Orthophenanthroline colorimetry
       - b. Atomic absorption
     - 3. Dithionite-citrate-bicarbonate extraction
       - a. Potassium thiocyanate colorimetry
     - 4. Pyrophosphate-dithionite extraction
     - 5. Sodium-pyrophosphate extraction
       - a. Atomic absorption
     - 6. Ammonium oxalate extraction
       - a. Atomic absorption
   - E. Calcium carbonate
     - 1. HCl treatment
       - a. Gas volumetric
       - b. Manometric
       - c. Weight loss
       - d. Titrimetric
     - 2. Sensitive qualitative method
       - a. Visual, gas bubbles

G. Aluminum
  1. KCl extraction I, 30 min.
    a. Aluminon I
    b. Aluminon II
    c. Aluminon III
    d. Fluoride titration
    e. Atomic absorption
  2. KCl extraction II, overnight
    a. Aluminon I
  3. NH_4OAc extraction
    a. Aluminon III
  4. NaOAc extraction
    a. Aluminon III
  5. Sodium pyrophosphate extraction
    a. Atomic absorption
  6. Ammonium oxalate extraction
    a. Atomic absorption
  7. Dithionite-citrate extraction
    a. Atomic absorption
H. Extractable acidity
  1. $BaCl_2$-triethanolamine I
    a. Back-titration with HCl
  2. $BaCl_2$-triethanolamine II
    a. Back-titration with HCl
I. Carbonate
  1. Saturation extract
    a. Acid titration
J. Bicarbonate
  1. Saturation extract
    a. Acid titration
K. Chloride
  1. Saturation extract
    a. Mohr titration
    b. Potentiometric titration
L. Sulfate
  1. Saturation extract
    a. Gravimetric, $BaSO_4$
    b. EDTA titration
  2. NH_4OAc extraction
    a. Gravimetric, $BaSO_4$
M. Nitrate
  1. Saturation extract
    a. PDS acid colorimetry
    b. Diphenylamine
N. Calcium
  1. Saturation extract
    a. EDTA titration
    b. Atomic absorption
  2. NH_4OAc extraction
    a. EDTA-alcohol separation
    b. Oxalate-permanganate I
    c. Oxalate-permanganate II Fe, Al, and Mn removed
    d. Oxalate-cerate
    e. Atomic absorption
  3. NH_4Cl-EtOH extraction
    a. EDTA titration
  4. KCl-TEA extraction
    a. Oxalate-permanganate
    b. EDTA titration
    c. Atomic absorption
O. Magnesium
  1. Saturation extract
    a. EDTA titration
    b. Atomic absorption
  2. NH_4OAc extraction
    a. EDTA-alcohol separation
    b. Phosphate titration
    c. Atomic absorption
  3. NH_4Cl-EtOH extraction
    a. EDTA titration
  4. KCl-TEA extraction
    a. Phosphate titration
    b. EDTA titration
    c. Atomic absorption
P. Sodium
  1. Saturation extract
    a. Flame photometry
    b. Atomic absorption
  2. NH_4OAc extraction
    a. Flame photometry
    b. Atomic absorption
Q. Potassium
  1. Saturation extract
    a. Flame photometry
    b. Atomic absorption
  2. NH_4OAc extraction
    a. Flame photometry
    b. Atomic absorption
R. Sulfur
  1. $NaHCO_3$ extract, pH 8.5
    a. Methylene blue
  2. HCl release (sulfide)
    a. Iodine titration
S. Total phosphorus
  1. Perchloric acid digestion
    a. Molybdovanadophosphoric acid colorimetry
T. Available phosphorous

7. MINERALOGY
A. Instrumental analysis
  1. Preparation
    a. Carbonate removal
    b. Organic-matter removal
    c. Iron removal
    d. Particle-size fractionation
    e. PSDA pretreatment
  2. X-ray diffraction
    a. Thin film on glass, solution pretreatment
    b. Thin film on glass, resin pretreatment
    c. Thin film on glass, $NaPO_3$ pretreatment
    g. Powder mount, diffractometer recording
    h. Powder mount, camera recording
  3. Differential thermal analysis
B. Optical analysis
  1. Grain studies
  2. Electron microscopy
C. Total analysis
  1. Chemical
  2. X-ray emission spectrography
D. Surface area
  1. Gylcerol retention

8. MISCELLANEOUS
A. Saturated paste, mixed
  1. Saturation extract
    a. Conductivity
    b. Conductivity, quick test
  2. Bureau of Soils cup, resistance
B. Saturated paste, capillary rise
  1. Saturation extract
    a. Conductivity
C. pH
  1. Soil suspensions
    a. Water dilution
    b. Saturated paste
    c. KCl
    d. NaF
    e. $CaCl_2$
D. Ratios and estimates
  1. To total clay
  2. To noncarbonate clay
  3. Ca to Mg (extractable)
  4. Estimated clay percentage
  5. Estimated total salt
E. Soil resistivity
  1. Saturated paste

SOIL CLASSIFICATION-

SERIES - - - - - - -

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

SOIL NO- - - - - - - -   COUNTY - - -

GENERAL METHODS- - -   SAMPLE NOS.-

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

Depth (in.)	Horizon	Sand (2-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Fine clay <0.0002)	Very coarse (2-1)	Coarse 1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	(0.05-0.02)	Int. III (0.02-0.002)	(0.005-0.002)	Family texture sand (2-0.1	International II (0.2-0.02)	Ratio fine clay to clay	Non-carbonate clay pct	Ratio 15-bar to clay
		Size class and particle diameter (mm)				Sand					Silt							
		Pct of < 2mm																
COLUMN 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

```
DEPTH  (PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)(  BULK DENSITY  )(- - - -WATER  CONTENT- - - -) CARBONATE  (- -PH - -)
       VOL. (- - - - - - - WEIGHT - - - - - - - -) 4A1D  4A1H  4D1    4B1C  4B1C  4B2   4C1         6E1B  3A1A  8C1A  8C1E
       GT    GT    75-20 20-5  5-2   LT    20-2    1/3-  OVEN  COLE   1/10  1/3-  15-   WRD         LT    LT    1/1   1/2
       2     75                      .074  PCT     BAR   DRY          BAR   BAR   BAR   CM/         2     .002  H2O   CACL
 OM    PCT   PCT  (- - - PCT LT 75 - - - ) LT20    G/CC  G/CC         PCT   PCT   PCT   CM          PCT   PCT
```

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

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

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

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

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

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

COLUMN HEADINGS FOR COMPUTER PRINTED DATA SHEETS

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

COLUMN HEADINGS FOR COMPUTER PRINTED DATA SHEETS

Column	
57	Base saturation - sum of the extractable bases divided by the ammonium acetate cation exchange capacity - given as a percent
58	Saturated paste (soil plus water) resistivity given in ohm-cm
59	Saturated paste (soil plus water) pH
60	Saturated paste (soil plus water) water content given as a percent
61	Exchangeable sodium percentage
62	Sodium adsorption ratio
63	Total soluble salt given in parts per million
64	Gypsum given in percent
65	Electrical conductivity of the saturation extract given in mmhos per centimeter
66	Calcium content of the saturation extract given in milliequivalents per liter
67	Magnesium content of the saturation extract given in milliequivalents per liter
68	Sodium content of the saturation extract given in milliequivalents per liter
69	Potassium content of the saturation extract given in milliequivalents per liter
70	Carbonate (CO_3) content of the saturation extract given in milliequivalents per liter
71	Bicarbonate (HCO_3) content of the saturation extract given in milliequivalents per liter
72	Chloride content of the saturation extract given in milliequivalents per liter
73	Sulfate (SO_4) content of the saturation extract given in milliequivalents per liter
74	Nitrate (NO_3) content of the saturation extract given in milliequivalents per liter
75	Liquid limit given as percent water - percentage basis is soil material less than 0.4 millimeter
76	Plastic index

CLASSIFICATION INDEX

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AQUALF

OCHRAQUALF

Aeric Ochraqualf
Fine-loamy, mixed, mesic
Capac 3
Capac 5
Shebeon 7

Fine, illitic, mesic
Del Rey 9
Del Rey 11

EUTROBORALF

Typic Eutroboralf
Fine-loamy, mixed
Onaway taxadjunct 13
Onaway taxadjunct 15

Fine, illitic
Kent 17

Fine, mixed
Nester 19

Arenic Eutroboralf
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Emmet taxadjunct 21

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Sandy over loamy, mixed
Menominee taxadjunct 23

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Typic Fragiboralf
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UDALF

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Locke taxadjunct 35

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Teasdale taxadjunct 41

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Sandy, mixed, mesic
Thetford taxadjunct 55

Psammentic Hapludalf
Sandy, mixed, mesic
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Spinks 59
Spinks taxadjunct 61

ENTISOL

AQUENT

FLUVAQUENT

Aeric Fluvaquent
Fine, mixed, nonacid, frigid
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1/ County numbers (the number following "MI" in the Soil Survey No.) are as follows:

Projects Sampled Before 1974

2.	Alger	44.	Lapeer
7.	Baraga	45.	Leelanau
16.	Cheboygan	50.	Macomb
17.	Chippewa	52.	Marquette
18.	Clare	54.	Mecosta
19.	Clinton	58.	Monroe
21.	Delta	63.	Oakland
23.	Eaton	67.	Osceola
24.	Emmet	70.	Ottawa
26.	Gladwin	74.	St. Clair
29.	Gratiot	78.	Shiawassee
31.	Houghton	80.	Van Buren
33.	Ingham	81.	Washtenaw
43.	Lake	82.	Wayne

Projects Sampled During 1974 and 1975

21.	Berrien	57.	Gratiot
35.	Clare	63.	Huron
37.	Clinton	75.	Jackson
45.	Eaton	161.	Washtenaw

SCS-421

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Capac SOIL Nos. S71Mich-19-1 LOCATION Clinton County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 71B330 - 71B341

	Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1: Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (<0.002)	Sand: Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Silt: Coarse (.05-0.02)	Fine (0.02-0.002)	Clay: Coarse (0.002-0.0002)	3A1b Fine <0.0002	3A1a Carbonate <0.002	(0.2-0.02)	(2-0.1)	<0.074	Coarse fragments 75-20	20-5	5-2
			Pct. of <2mm																Pct. of <75mm		
30	0-23	Ap	53.1	36.4	10.5	1.8	4.0	11.1	22.8	13.4	16.6	19.8		3.7		43.1	39.7	54.4	-	2	2
31	23-31	B&A	39.4	33.8	26.8	1.8	3.3	7.3	16.0	10.9	13.1	20.7		12.5		33.5	28.5	66.8	-	3	1
32	31-51	B21t	44.6	30.4	25.0	1.8	3.7	8.2	18.3	12.7	12.7	17.7		11.3		36.7	31.9	62.4	5	2	2
33	51-79	B22t	46.1	30.2	23.7	1.8	3.4	7.8	18.8	14.2	15.2	15.0		7.1		41.3	31.9	61.8	3	2	2
34	79-109	C1	46.5	36.6	16.9	3.4	4.3	7.7	17.5	13.6	15.8	20.8		4.4		40.6	32.9	61.3	1	3	3
35	79-109	C1	43.5	36.6	19.9	2.0	3.2	7.2	17.5	13.7	15.7	20.9		6.3		40.6	29.8	64.3	-	4	2
36	79-109	C1		Not	Run														-	-	4
37	109-142	C2	46.4	36.6	17.0	3.8	4.3	7.9	17.3	13.0	15.4	21.2		4.1		39.2	33.4	60.9	-	5	3
38	109-142	C2	47.0	36.0	17.0	9.8	7.1	6.5	13.3	10.4	13.4	22.6		4.5		32.1	36.6	59.0	-	5	2
39	109-142	C2		Not	Run														-	1	1
40	142-165	C3	46.2	36.	7.1	3.1	4.1	7.6	17.6	13.7	14.3	22.4		4.8		39.0	32.5	61.7	-	3	3
41	165-180	C4	46.5	36.6	[illegible]	3.1	4.2	7.6	18.0	13.6	14.1	22.5		4.5		38.8	32.9	61.3	1	4	3

	Depth (cm)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.		6C1a Fe Pct.	6G7a Al Pct.			4F1 Liquid limit	4F Plasticity index	3B2 Cm	8E1 Resistivity ohms cm	Bulk density 4A1e 1/3 bar g/cc	4A1h oven dry g/cc	Linear extens. 4D1 LE (whole soil) Pct.	4D1 LE (<2mm) Pct.	Water content 4B1c 1/3 bar Pct.	4B2 15 bar Pct.	WRD 4C1 (whole soil) in/in	4C1 (<2mm) in/in
30	0-23	1.24									0.98		1.54	1.57	1		15.1	5.8	0.14	
31	23-31	0.39									0.97		1.66	1.76	2		17.2	10.8	0.10	
32	31-51	0.30							27	10	0.94		1.69	1.80	2		17.4	10.4	0.11	
33	51-79	0.21			0.4	0.1					0.95		1.71	1.79	1		16.0	8.5	0.12	
34	79-109	0.20			0.3	tr.			18	4	0.95		1.85	1.92	1		13.1	6.9	0.11	
35	79-109	0.20			0.4	0.1					0.96		1.73	1.82	2		15.9	8.3	0.13	
36	79-109	0.20			0.5	0.1														
37	109-142	0.20			0.3	0.1					0.94		1.94	1.99	1		12.2	7.0	0.10	
38	109-142	0.20			0.2	tr.					0.95		1.66	1.72	1		15.4	7.4	0.13	
39	109-142	0.20			0.4	0.1														
40	142-165	0.20			0.3	0.1					0.96		1.91	1.95	1		12.5	6.9	0.10	
41	165-180	0.22			[illegible]						0.94	4,000	1.89	1.93	1		13.0	6.9	0.11	

	Depth (cm)	Extractable bases 5B1a 6N2e Ca	6G2d Mg	6P2b Na	6Q2b K	8um	6H2a Ext. acidity	KCl ext. 6C1e Al	CEC 5A3a Sum cations	5A6 NH_4OAc	8um bases plus KCl Al	Base saturation 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.	6E1e Carbonate as $CaCO_3$ Pct.	pH 8C1e (1:1) KCl	8C1a (1:2) $CaCl_2$	8C1a (1:1) H_2O		Ratios to total clay CEC sum	Fine clay	15-bar water
		mmq/100 g																			
30	0-23	5.1	1.1	0.1	0.2	6.5	6.3		12.8	8.9		51	73		4.8	5.3	5.6		1.22	0.35	0.55
31	23-31	8.4	3.2	0.1	0.2	11.9	6.1		18.0	9.2		66	297		4.3	5.2	5.7		0.67	0.47	0.40
32	31-51	9.7	4.2	0.1	0.1	14.1	3.2		17.3	10.4		82	103		5.6	6.5	6.9			0.45	0.42
33	51-79	24.3	4.8	tr.	0.1	29.2				8.8				10	7.1	7.6	8.1			0.30	0.36
34	79-109	38.3	2.6	tr.	0.1	41.0				5.5				22	7.4	7.6	8.2			0.26	0.41
35	79-109	36.9	4.1	tr.	0.1	41.1				8.9				16	7.2	7.7	8.1			0.32	0.42
36	79-109	38.0	2.6	tr.	0.1	40.7				5.9				23							
37	109-142	36.8	2.5	tr.	0.1	39.4				5.3				22	7.4	7.7	8.2			0.24	0.41
38	109-142	38.0	3.7	tr.	0.1	41.8				8.2				27	7.2	7.8	8.2			0.26	0.44
39	109-142	38.2	2.7	0.1	0.1	41.1				5.7				23							
40	142-165	40.1	2.5	tr.	0.1	42.7				5.1				21	7.3	7.7	8.1			0.28	0.40
41	165-180	38.7	2.3	tr.	0.1	41.7				5.7				21	7.3	7.7	8.2			0.27	0.41

Depth (cm)	Clay fraction analysis 7A1b, d: <0.002 mm 7A2 X-ray a/3/	7A5 DTA Pct.	Sand and silt fraction analysis 7A1: 7B1 Petrographic Pct.	total weath.
330 0-23	VC5,VM3,KK3,MI2,QZ1			
332 31-51	MI4,VR4,MT3,VM2,VC2,KK2			
333 51-79	MI4,VR4,KK3,VM2,VC2			
334 79-109	MI5,VR3,KK3,VM2,CL2			

a/ Mineral code: VR= vermiculite, MI= mica, MT= montmorillonite, VM= vermiculite-mica, interstratified, KK= kaolinite, QZ= quartz, CL= chlorite, VC= vermiculite-chlorite, interstratified

Pedon classification: Aeric Ochraqualf; fine-loamy, mixed, mesic.
Series classification: (Same)
Soil: Capac
Soil Nos.: S71MI-19-1 (BSL Nos. 71B330-71B341)
Location: Clinton County, Michigan; NE 1/4, SW 1/4, SW 1/4, SE 1/4 of Sec. 5, T7N, R1W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 67° F. Frost-free season is 140-150 days.
Vegetation and land use: Field beans. Cropland.
Parent material: Loam glacial till.
Physiography: Ground moraine.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat poorly.
Ground water: More than 70 inches.
Erosion: Slight.
Permeability: Moderate and moderately slow.
Described by: H. R. Sinclair, Jr. and K. Pregitzer.

(Colors are for moist soil unless otherwise stated.)

Ap 330 0 to 23 cm (0 to 9 inches). Dark brown (10YR 3/3) fine sandy loam dark brown (10YR 3/3) rubbed; light brownish gray (10YR 6/2) dry; cloddy separating to moderate fine and medium granular structure; friable; common, very fine roots; 5 percent gravel (2 to 19 mm is 50 percent; 19 to 76 mm is 50 percent), less than 1 percent cobbles; medium acid; abrupt smooth boundary.

B&A 331 23 to 31 cm (9 to 12 inches). Yellowish brown (10YR 5/6) light clay loam (B part) and pale brown (10YR 6/3) loam (A part); white (10YR 8/2) dry coatings on surface of peds and along root and worm channels; common fine distinct reddish brown (5YR 4/3) and few fine distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate fine angular blocky; friable; common very fine roots; continuous and grayish brown (10YR 5/2) clay films; peds have pale brown material on vertical faces between abutting peds; matrix is 30 percent material 2 to 10 mm thick and 5 percent material 10 to 30 mm thick; vertical extension of the pale brown material is through the horizon; black (N 2/0) iron-manganese aggregations; 5 percent pebbles; medium acid; clear wavy boundary.

B21t 332 31 to 51 cm (12 to 20 inches) Strong brown (7.5YR 5/6) loam, brown (7.5YR 4/4) rubbed; common fine distinct greenish gray (5GY 6/1) and common fine faint brown (7.5YR 4/4) mottles; weak medium prismatic separating to moderate fine and medium angular blocky structure; friable; common very fine roots on surfaces of peds; many brown (7.5YR 4/2) clay films and many dark reddish brown (5YR 2/2) and dark brown (7.5YR 3/2) clay-organic films; black (N 2/0) iron-manganese aggregations; 5 percent gravel (2 to 19 mm is 50 percent, 19 to 76 mm is 50 percent), less than 1 percent cobble; neutral; clear wavy boundary. The horizon has 65 percent with chroma of 3 or more.

B22t 333 51 to 79 cm (20 to 31 inches). Strong brown (7.5YR 5/6) loam, dark yellowish brown (10YR 4/4); few fine prominent greenish gray (5GY 6/1) and common fine distinct gray (10YR 5/1) light gray (10YR 6/1), and brown (7.5YR 4/4 and 5/2) mottles; moderate fine to coarse subangular blocky structure; friable; few very fine roots; many dark grayish brown (10YR 4/2) and brown (7.5YR 4/2) clay films; black (N 2/0) iron-manganese aggregations; 5 percent gravel (2 to 19 mm is 50 percent and 19 to 76 mm is 50 percent), less than 1 percent cobbles; moderately alkaline; clear wavy boundary using effervescent soil material, clear irregular boundary using soil structure. The horizon has 65 percent with chroma of 3 or more.

C1 334-335-336 79 to 109 cm (31 to 43 inches) Yellowish brown (10YR 5/6) loam yellowish brown (10YR 5/4) crushed; common fine distinct grayish brown (10YR 5/2) and brown (10YR 4/3) mottles; massive parting to weak medium to very thick platy structure; friable; very few very fine roots in matrix, few very fine roots in gray tongues; 22 percent of horizon is gray tongues with red rim 0.5 to 1.0 cm thick; the diameter of the tongues including the red rim is 1.5, 2.0, 1.5, 2.0, 10.0, 14.0, 5.0, 2.5, and 6.0 cm, the red rims are strong brown (7.5YR 5/6), the gray tongues are gray (N 5/0), light gray (N 6/0 and N 7/0), white (N 8/0), and greenish gray (5GY 6/1), continuous dark grayish brown (10YR 4/2) clay films on vertical surfaces of tongues, 65 percent of the horizon has a chroma of 3 or more; black (N 2/0) iron-manganese aggregations; 5 percent coarse fragments; moderately alkaline; slight effervescence; sampling boundary. (334 is sample of horizon without tongues, 335 is sample of whole tongue, 336 is sample of strong brown rim.)

C2 337-338-339 109 to 142 cm (43 to 56 inches). Yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) crushed; few fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6 and 5/8) mottles; massive parting to weak medium platy structure; friable; very few very fine roots in matrix, few very fine roots in gray tongues; 33 percent of the horizon is gray tongues with red rim 0.5 to 1.0 cm thick, the diameter of the tongues including the red rim is 1.5, 2.0, 1.5, 2.0, 10.0, 14.0, 5.0, 2.5, and 6 cm, the red rims are strong brown (7.5YR 5/6), the gray tongues are gray (N 5/0), light gray (N 6/0 and N 7/0), white (N 8/0, and greenish gray (5GY 6/1); very few dark grayish brown (10YR 4/2) clay films on vertical surfaces of tongues; black (N 2/0) iron-manganese aggregations; 5 percent coarse fragments; moderately alkaline; slight effervescence; clear irregular boundary. (8 to 35 inches thick for the C1 and C2 horizons.) (337 is sample of horizon without tongues, 338 is sample of whole tongue, 339 is sample of strong brown rim.)

C3 340 142 to 165 cm (56 to 65 inches). Yellowish brown (10YR 5/4) loam; common fine prominent gray (N 5/0) and light gray (N 6/0) and common fine faint yellowish brown (10YR 5/6) mottles; massive parting to weak medium platy structure; friable; very few very fine roots; the red rims are strong brown (7.5YR 5/6), the gray tongues are gray (N 5/0), light gray (N 6/0 and N 7/0), white (N 8/0), and greenish gray (5GY 6/1); black (N 2/0) iron-manganese aggregations; 5 percent coarse fragments; moderately alkaline; slight effervescence; gradual wavy boundary.

C4 341 165 to 180 cm (65 to 71 inches). Yellowish brown (10YR 5/4) loam; common fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) motles; massive; friable; 5 percent coarse fragments; moderately alkaline; slight effervescence.

SCS-421

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Capac SOIL Nos. S71Mich-23-1 LOCATION Eaton County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 71B342 - 71B349

	Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1: Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (<0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: Coarse (.05-0.02)	Silt: Fine (0.02-0.002)	Clay: Coarse (0.002-0.0002)	Clay: 3A1b Fine <0.0002	Clay: 3A1a Carbonate <0.002	(0.2-0.02)	(2-0.1)	<0.074	Coarse fragments: 75-20	20-5	5-2
			Pct. of <2mm																Pct. of >2mm		
42	0-23	Ap	45.5	38.0	16.5	1.5	4.2	10.2	20.1	9.4	13.8	24.2		6.4		35.1	36.1	59.7	1	2	2
43	23-34	B21t	37.2	35.1	27.7	2.1	4.0	8.6	13.8	8.7	14.4	20.7		14.9		32.2	28.5	67.7	3	3	2
44	34-48	B22t	34.8	33.6	31.6	1.9	3.3	7.0	13.8	8.8	12.5	21.1		14.7		29.4	26.0	70.3	-	2	2
45	48-61	B23t	44.4	30.7	24.9	1.7	3.9	9.1	19.0	10.6	11.4	19.3		11.5		33.0	33.8	61.5	1	2	2
46	61-75	B3	46.9	31.0	22.1	1.9	4.2	9.6	19.9	11.4	12.0	19.0		9.3		34.8	35.5	59.4	tr.	1	1
47	75-105	C1	41.7	41.4	16.9	2.7	4.1	7.9	16.5	10.5	15.8	25.6		4.9		36.0	31.2	64.3	7	4	3
48	105-127	C2	42.6	41.8	15.6	3.3	4.6	8.2	16.2	10.4	16.4	25.4		4.0		36.4	32.2	63.4	1	4	3
49	127-165	C3	40.4	42.6	17.0	2.7	4.6	7.9	15.5	9.7	14.7	27.9		4.1		33.5	30.7	65.4	2	3	3

	Depth (cm)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.		Dit-cit ext. 6C2b Fe Pct.	Dit-cit ext. 6C7a Al Pct.				4F1 Liquid limit	4F Plasticity index	3B2 Cm	8E1 Resistivity ohms/cm	Bulk density 4A1a 1/3 bar g/cc	Bulk density 4A1b oven dry g/cc	Linear extens. 4D1 LE (whole soil) Pct.	Linear extens. 4D1 LE (<2mm) Pct.	Water content 4B1c 1/3 bar Pct.	Water content 4B2 15 bar Pct.	WRD 4C1 (whole soil) in/in	WRD 4C1 (<2mm) in/in
42	0-23	1.88										0.96		1.56	1.64	2		20.0	7.2	0.19	
43	23-34	0.49										0.94		1.61	1.77	3		18.7	10.3	0.13	
44	34-48	0.22										0.96		1.64	1.81	3		17.3	11.8	0.09	
45	48-61	0.34								26	11	0.96		1.72	1.83	2		15.0	9.4	0.09	
46	61-75	0.13										0.98		1.75	1.84	2		14.9	8.4	0.11	
47	75-105	0.14								20	6	0.89		1.86	1.91	2		12.9	7.0	0.10	
48	105-127	0.14										0.93		1.90	1.94	1		12.2	6.1	0.11	
49	127-165	0.13										0.93	4,000	1.89	1.93	1		12.4	7.0	0.09	

	Depth (cm)	Extractable bases 5B4a: 6H2e Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	KCl ext. 6G1e Al	CEC 5A3a Sum cations	5A6 NH_4OAc	Sum bases plus KCl Al	Base saturation 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.	6E1e Carbonate as $CaCO_3$ Pct.	pH 8C1c (1:1) KCl	8C1e (1:2) $CaCl_2$	8C1a (1:1) H_2O		Ratios to total clay: CEC sum	Fine clay	15-bar water
		meq/100 g																			
42	0-23	10.8	2.5	tr.	0.2	13.5	4.5		18.0	13.6		75	167		5.6	6.0	6.4		1.09	0.39	0.44
43	23-34	14.1	4.2	0.1	0.2	18.6	3.6		22.2	17.9		84	111		5.2	6.0	6.4		0.80	0.54	0.37
44	34-48	12.1	4.6	0.1	0.3	17.1	3.4		20.5	16.5		83	112		5.5	6.5	6.9		0.65	0.47	0.37
45	48-61	9.7	3.8	0.1	0.2	13.8	2.2		16.0	13.0		86	123	tr.	5.7	6.7	7.1		0.64	0.46	0.38
46	61-75	11.7	5.8	0.1	0.2	17.8	1.3		19.1	11.1		93	184	3	6.5	7.2	7.6		0.86	0.42	1.38
47	75-105	21.3	4.1	0.1	0.1	35.6				6.3				24	7.1	7.5	8.0			0.29	0.41
48	105-127	35.8	2.2	0.1	0.1	38.2				5.3				28	7.2	7.6	8.0			0.26	0.39
49	127-165	39.1	2.1	0.1	0.1	41.4				5.5				29	7.2	7.6	8.0			0.24	0.41

Depth (cm)	Clay fraction analysis 7A1b, d: <0.002 mm 7A2 X-ray a/b/	7A3 DTA Pct.	Sand and silt fraction analysis 7A1: 7B1 Petrographic Pct.	total weath.
0-23 - 34-48	VC5,MI3,MI2,KK2,VM2,QZ1 MT5,MI3,KK2			
- - 75-105	MI4,MT4,VR2,KK2			

b/ Mineral code: VR= vermiculite, MI= mica, MT= montmorillonite, VM= vermiculite-mica, interstratified, KK= kaolinite, QZ= quartz, VC= vermiculite-chlorite, interstratified

Pedon classification: Aeric Ochraqualfs; fine-loamy, mixed, mesic
Series classification: (Same)
Soil: Capac
Soil Nos.: 871MI-23-1 (BSL Nos. 71B342-71B349)
Location: Eaton County, MIchigan; 1030 ft. south and 1000 ft. east of NW corner of Sec. 20, T4N, R5W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 67° F. Frost-free season is 140-150 days.
Vegetation and land use: Wheat stubble. Cropland.
Parent material: Loam glacial till.
Physiography: Ground moraine.
Topography: Level. Gradient is 0 percent.
Drainage: Somewhat poorly.
Ground water: More than 70 inches.
Erosion: Slight.
Permeability: Moderately and moderately slow.
Described by: H. R. Sinclair, Jr., and G. R. Landtiser.

(Colors are for moist soil unless otherwise stated.)

Ap 342 0 to 23 cm (0 to 9 inches). Dark grayish brown (10YR 4/2) loam, gray (10YR 6/1) dry; cloddy to moderate fine and medium granular structure; friable; common fine roots; 6 percent pebbles and cobbles; slightly acid; abrupt smooth boundary.

B&A 343 23 to 34 cm (9 to 13 inches). Yellowish brown (10YR 5/4) light clay loam (B part); brown (10YR 5/3) fine sandy loam (A part), white (10YR 8/2) dry; coatings (A part) approximately 2 mm thick on vertical faces and surrounding some peds; few fine faint strong brown (7.5YR 5/6) and dark brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin dark brown (7.5YR 4/4) and dark grayish brown (10YR 4/2) clay films on faces of peds and in root channels; about 1 percent cobbles and 6 percent pebbles; slightly acid; clear wavy boundary.

B21t 344 34 to 48 cm (13 to 19 inches). Dark yellowish brown (10YR 4/4) clay loam; few fine faint brown (7.5YR 5/2, 5/4) and common medium distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure separating to moderate fine and medium angular blocky; firm; few fine roots; thin dark brown (7.5YR 4/2) and dark reddish gray (5YR 4/2) clay films on faces of peds; 1 percent cobbles and about 6 percent pebbles; slightly acid; clear wavy boundary.

B22t 345 48 to 61 cm (19 to 24 inches). Yellowish brown (10YR 5/8) heavy loam; common fine faint brown (7.5YR 5/4) and strong brown (7.5YR 5/8) mottles and common fine distinct light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure separating to strong fine and medium angular blocky; friable; common fine roots; thin dark brown (7.5YR 4/2) and greenish gray (5GY 5/1) clay films on faces of peds; 1 percent cobbles and 5 percent pebbles; slightly acid; gradual wavy boundary.

B3 346 61 to 75 cm (24 to 30 inches). Yellowish brown (10YR 5/6) heavy loam; few fine distinct dark brown (7.5YR 4/4) mottles and many medium distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure separating to moderate fine and medium angular blocky; friable; thin patchy dark brown (10YR 4/2) clay films on faces of peds; 1 percent cobbles and 5 percent pebbles; neutral; clear wavy boundary.

C1 347 75 to 105 cm (30 to 41 inches). Brown (7.5YR 5/4) loam; common fine distinct light gray (N 7/0) pinkish gray (7.5YR 6/2), reddish brown (5YR 4/4) and greenish gray (5GY 6/1) mottles; weak thick and very thick platy structure; firm in place, friable in hand; very few roots; 6 percent gravel, 1 percent cobbles and stones; moderately alkaline; strong effervescence; gradual smooth boundary.

C2 348 105 to 127 cm (41 to 50 inches). Brown (10YR 5/3) loam, yellowish brown (10YR 5/4) crushed; common fine faint brown (7.5YR 5/2) and yellowish brown (10YR 5/4 and 5/6) mottles; massive; firm in place, friable in hand; very few fine roots; 6 percent gravel, 1 percent cobbles and stones; moderately alkaline; strong effervescence; gradual smooth boundary.

C3 349 127 to 165 cm (50 to 65 inches) Brown (10YR 5/3) loam, yellowish brown (10YR 5/4) crushed, common fine distinct brown (7.5YR 5/2) yellowish brown (10YR 5/4 and 5/6) and greenish gray (5GY 6/1) mottles; massive; friable; very few fine roots; 6 percent gravel, 1 percent cobbles and stones; moderately alkaline; strong effervescence.

SOIL CLASSIFICATION-AERIC OCHRAQUALF
FINE-LOAMY, MIXED, MESIC
SERIES - - - - - - -SHEBZON

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

SOIL NO - - - - - - S74NI-63-2 COUNTY - - - HURON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 74B461-74B466

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM) SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	SAND VCOS 2-1	COAS 1-.5	MEDS .5-.25	FINES .25-.10	VFNS .10-.05	SILT COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	RATIO NON-CLAY PCT	8D1 15-BAR TO CLAY
0-28	AP	42.9	35.1	22.0	8.7	1.4	4.7	11.6	17.3	7.9	13.9	21.2		35.0	31.4	40		.45
28-43	B21T	38.4	33.1	28.5	12.2	1.0	4.4	9.7	15.4	7.9	11.5	21.6		30.5	28.3	43		.38
43-58	B22T	37.6	32.6	29.8	10.6	1.4	4.3	9.7	14.7	7.5	10.6	22.0		30.1	26.4	36		.38
58-85	C1	41.5	43.7	14.8	4.0	2.6	5.7	10.3	15.6	7.3	13.6	30.1		34.2	30.2	27		.41
85-125	C2	50.1	33.4	16.5		3.5	6.0	11.6	18.3	10.7	14.1	19.3		39.4	35.7			.39
125-178	C3	49.4	33.8	16.8		3.2	5.4	11.2	19.0	10.6	13.4	20.4		38.8	35.4			.36

DEPTH CM	(PARTICLE SIZE ANALYSIS, NM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20	20-5	5-2	LT .074	BULK DENSITY 20-2 PCT LT20	4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 NRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1B 1/2 CACL
0-28	1	0	0	1	1	64	2	1.67	1.77	.020		17.2	9.8	.12	1		6.8	6.7
28-43	2	0	0	2	2	66	4	1.74	1.91	.031		17.4	10.7	.11	1		7.0	6.7
43-58	3	0	0	3	2	68	5	1.72	1.85	.023		17.7	11.3	.11	2		7.5	7.1
58-85	6	0	0	5	4	62	9	1.87	1.90	.007		13.3	6.0	.13	28		8.0	7.0
85-125	9	0	2	4	4	55	8	2.07	2.11	.006		10.0	6.4	.07	29		7.9	7.5
125-178	8	0	1	4	4	56	8	2.13	2.16	.003		9.3	6.1	.06	26		8.0	7.5

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA	6O2B MG	6P2B NA	6Q2B K	SUM EXTB / 100	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(MEQ					G)								
0-28	.94			.8		14.0	3.2	TR	1.4	18.6	3.4		22.0	15.9	.72	4.8	88	84	117
28-43	.43			.8		10.9	3.4	.2	1.1	15.6	2.3		17.9	14.4	.51	3.2	71	87	108
43-58	.39			.8			6.0	.2	.6					13.9	.47				
58-85	.18			.5			2.4	.1	.3					4.6	.31				
85-125	.31			.5			2.4	.1	.4					4.2	.25				
125-178	.19			.5			2.6	TR	.4					4.0	.24				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 6A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
								(MEQ / LITER)											
0-28																			
28-43																			
43-58																		32	14
58-85																			
85-125	4600	7.9	26.3					.6										17	4
125-178	4400	7.8	24.9					.76											

DEPTH CM	(PYROPHOSPHATE,PH10) 6C5A EXT FE PCT	6G5A EXT AL PCT	6A1B EXT C PCT	(DITHIONITE-CITRATE) 6C2B EXT FE PCT	6G7A EXT AL PCT	6D1B EXT MN PCT	(PYROPHOSP) FE+AL TO CLAY	AL+C TO CLAY	PYRO FE+AL TO D - C FE+AL	CEC -1/2 CLAY X THIC	BASES SG1 PLUS KCL AL	PH 8C1C 1:1 KCL
0-28				.8	.1							
28-43				.8	.1							
43-58				.8	.1							
58-85				.5	TR							
85-125				.5	TR							
125-178				.5	TR							

Pedon classification: Aeric Ochraqualf; fine-loamy, mixed, mesic
Series classification: (Same)
Soil: Shebeon
Soil Nos.: S74MI-63-2 (BLS Nos. 74B461-74B466)
Location: Huron County, Michigan; 2160 feet south and 510 feet west of the northeast corner of Sec. 21, T17N, R10E.
Climate: Average annual precipitation is about 28 inches. Mean annual air temperature is about 47° F., and the mean summer air temperature is about 68° F. Frost-free season is 150-160 days.
Vegetation and land use: Sugar beets. Cropland.
Parent material: Loam till.
Physiography: Till plains.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat poorly drained.
Ground water: Greater than 70 inches.
Erosion: Slight.
Permeability: Moderate over very slow.
Described by: N. Stroesenreuther, L. Linsemier, S. Cowan, and W. Frederick.

(Colors are for moist soil unless otherwise stated.)

Ap 461 0 to 28 cm (0 to 11 inches). Dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; weak coarse granular structure; friable; few fine roots; about 1 percent by volume of pebbles and cobbles; neutral; abrupt smooth boundary.

B21t 462 28 to 43 cm (11 to 17 inches). Yellowish brown (10YR 5/4) clay loam; few fine prominent gray (10YR 5/1) and few fine prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; mildly alkaline; few fine roots; brown (10YR 4/3) clay films on faces of peds; about 3 percent by volume of pebbles and cobbles; mildly alkaline; gradual wavy boundary.

B22t 463 43 to 58 cm (17 to 23 inches). Grayish brown (10YR 5/2) clay loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; brown (10YR 4/3) clay films on faces of peds; about 3 percent by volume of pebbles and cobbles; mildly alkaline; abrupt wavy boundary.

C1 464 58 to 85 cm (23 to 33 inches). Grayish brown (10YR 5/2) loam; common medium prominent yellowish brown (10YR 5/6) and few fine distinct brown (7.5YR 5/4) mottles; weak medium platy structure; firm; 3 percent pebbles and 2 percent cobbles by volume; slight effervescence; moderately alkaline; gradual wavy boundary.

C2 465 85 to 125 cm (33 to 49 inches). Yellowish brown (10YR 5/4) loam; common fine distinct yellowish brown (10YR 5/6) mottles; surfaces of peds are gray (10YR 6/1); moderate coarse platy structure; very firm; 3 percent pebbles and 2 percent cobbles by volume; strong effervescence; moderately alkaline; gradual wavy boundary.

C3 466 125 to 178 cm (49 to 70 inches). Yellowish brown (10YR 5/4) loam; few fine prominent yellowish brown (10YR 5/8) mottles; horizontal and some vertical faces of peds are dark reddish brown (5YR 3/2); light brownish gray (10YR 6/2) coatings on other vertical and oblique faces of peds and fracture planes; strong coarse platy structure; very firm; 3 percent pebbles and 2 percent cobbles by volume; strong effervescence; moderately alkaline.

1241A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Del Rey SOIL Nos. S69Mich-58-4 LOCATION Monroe County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 69B570 - 69B577

Depth cm	Horizon	1B1b Total Sand (2–0.05)	Total Silt (0.05–0.002)	Total Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	<0.074	3B2 Cm	Coarse fragments 3B1: 2A2 ≥ 2 Pct	2–20	20–75
		Size class and particle diameter (mm) 3A1																
		Pct. of < 2 mm															Pct. of < 75 mm	
0-23	Ap	34.0	40.8	25.2	0.1	0.6	1.9	5.4	26.1	20.5	20.3	50.1	7.9	83.3	1.00	0	0	0
23-31	B21t	23.3	33.6	43.1	0.1	0.2	0.8	2.4	19.8	15.4	18.2	36.8	3.5	89.8	1.00	0	0	0
31-49	B22t	20.4	39.0	40.6	0.1	0.2	0.6	2.5	17.0	17.6	21.4	36.4	3.4	92.0	1.00	0	0	0
49-70	B23t	15.6	54.5	29.9	0.1	0.3	0.8	1.1	13.3	27.5	27.0	41.2	2.3	94.9	1.00	0	0	0
70-96	B3g	13.2	64.1	22.7	0.2	0.3	0.5	1.2	11.0	32.8	31.3	44.6	2.2	96.0	1.00	0	0	0
96-123	IIC1	15.4	66.4	18.2	0.2	0.4	0.6	1.6	12.7	34.8	31.6	48.5	2.7	95.7	1.00	tr.	tr.	tr.
123-157	IIC2	14.8	71.3	13.9	0.1	0.3	0.4	1.2	12.8	38.0	33.3	51.5	2.0	96.7	1.00	tr.	tr.	tr.
157-168	IIIC3	5.1	50.7	44.2	0.6	0.4	0.3	0.8	3.1	12.5	38.2	16.1	2.0	97.5	1.00	2	2	2

Depth cm	6A1a Organic carbon Pct.	Nitrogen Pct.	C/N		6E1d Carbonate as $CaCO_3$ Pct.	Ext. iron as Fe Pct.	Bulk density: g/cc	4A1d ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohms-cm 60°F	4C1 WRD in/in	pH: 8C1e (1:2) $CaCl_2$	8C1c (1:1) KCl	8C1a (1:1) H_2O
0-23	1.32							1.70	1.80	0.02		17.9	10.2		0.13	5.8	5.1	6.1
23-31	1.05							1.51	1.77	0.05		24.4	14.9		0.14	5.8	4.8	6.2
31-49	0.64							1.51	1.79	0.06		23.9	15.1		0.13	6.2	5.2	6.5
49-70	0.38							1.56	1.74	0.04		22.5	12.6	2400	0.15	7.3	6.3	7.5
70-96	0.53				17			1.59	1.68	0.02		21.1	10.2	2400	0.17	7.6	7.0	8.0
96-123	0.50				20			1.52	1.59	0.02		21.9	8.7		0.20	7.6	7.1	8.0
123-157	0.39				15			1.56	1.67	0.02		22.4	6.9		0.24	7.7	7.1	8.1
157-168	0.40				17			1.51	1.69	0.04		28.7	17.4		0.17	7.7	7.0	8.0

Depth cm	Extractable bases 5B4a: 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations	5A1a NH_4OAc	6G1d Ext. Al	3A1b Fine clay <0.0002 mm Pct.	Ratios to clay 8D1: Fine clay	CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-23	6.0	2.9	tr.	tr.	8.9	5.8	14.7	15.8		11.0	0.44	0.58		0.40			61	56
23-31	8.5	4.7	tr.	tr.	13.2	5.0	18.2	22.1		18.9	0.44	0.42		0.34			73	60
31-49	8.0	4.6	tr.	tr.	12.6	3.3	15.9	21.1		17.8	0.44	0.39		0.37			79	60
49-70	6.0	4.7	0.2	tr.	10.7	1.7	12.4	15.6		11.9	0.40	0.41		0.42			86	69
70-96			0.2	tr.				12.1		9.2	0.41			0.45				
96-123			0.2	tr.				10.0		7.8	0.43			0.48				
123-157			0.2	tr.				8.0		5.8	0.42			0.50				
157-168			tr.	tr.				14.2		12.3	0.28			0.39				

Depth cm	a/ Clay fraction mineralogy 7A1b, d — 7A2 X-ray: Total clay <0.002 mm b/	Fine clay <0.0002 mm b/
0-23	MI3,VR3,MT3,KK2,QZ1	VR4,MI4,MT2,KK1,VM1,VC1
23-31		
31-49		
49-70	MT4,VR3,MI3,KK2,VM2,VC2,QZ1	MT4,VR3,VI3,KK1,VM1,VC1
70-96		
96-123		
123-157		
157-168		

a/ Mineral code
VR = vermiculite
MI = mica
KK = kaolinite
QZ = quartz
VM = vermiculite/mica
VC = vermiculite/chlorite

b/ Approximate weight fractions (X-ray)
5 = more than half
4 = half to one-third
3 = one-third to one-fifth
2 = one-fifth to one-twentieth
1 = less than one-twentieth

Pedon classification: Aeric Ochraqualf; fine, illitic, mesic
Series classification: (Same)
Soil: Del Rey
Soil Nos.: S69MI-58-4 (BSL Nos. 69B570-69B577)
Location: Monroe County, Michigan; NE1/4, NW 1/4, SW 1/4, NE 1/4, Sec. 20, T8S, R8E.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 50° F., and the mean summer air temperature is about 69° F. Frost-free season is 160-170 days.
Vegetation and land use: Legume-grass hay. Cropland.
Parent material: Stratified lacustrine silty clay loam and silt loam.
Physiography: Lake plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat poorly drained.
Ground water: Below 60 inches.
Erosion: Slight.
Permeability: Slow.
Described by: R. Larson, G. Earle.

(Colors are for moist soil unless otherwise stated.)

Ap 570 0 to 23 cm (0 to 9 inches). Very dark grayish brown (10YR 3/2) loam; dark grayish brown (10YR 4/2) rubbed and smoothed; light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; friable; abundant fine and coarse roots; slightly acid; abrupt smooth boundary.

B21t 571 23 to 31 cm (9 to 12 inches). Brown (10YR 3/1) clay; common fine distinct yellowish brown (10YR 5/6) and few fine distinct light brownish gray (10YR 6/2) mottles; moderate medium angular blocky structure; very firm; common fine and coarse roots; slightly acid; clear wavy boundary.

B22t 572 31 to 49 cm (12 to 19 inches). Brown (10YR 5/3) clay; common fine and medium distinct yellowish brown (10YR 5/6) and few fine distinct gray (10YR 6/1) mottles; dark gray (10YR 4/1) coatings on ped faces; continuous thin clay coatings; abundant fine and coarse roots; slightly acid; clear wavy boundary.

B23t 573 49 to 70 cm (19 to 28 inches). Brown (10YR 5/3) silty clay loam; many medium distinct dark brown to brown (7.5YR 4/4) and common meduim distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic parting to medium angular blocky structure; very firm; grayish brown (10YR 5/2) coatings on ped faces; thin continuous clay films; common fine and coarse roots; mildly alkaline; clear irregular boundary.

B3g 574 70 to 96 cm (28 to 38 inches). Light brownish gray (10YR 6/2) silt loam; common medium distinct strong brown (7.5YR 5/8) and few medium fine light gray to gray (10YR 6/1) mottles; weak coarse prismatic parting to coarse subangular blocky structure; firm; grayish brown (2.5Y 5/2) coatings on ped faces; thin clay films on verticle faces only; few fine and coarse roots; slight effervescence; clear wavy boundary.

IIC1 575 96 to 123 cm (38 to 48 inches). Mottled light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) silt loam; weak thick platy structure; friable; light gray (10YR 7/1) $CaCO_3$ accumulations between strata; few coarse roots; clear irregular boundary.

IIC2 576 123 to 157 cm (48 to 62 inches). Mottled light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) silt loam; moderate thick platy structure; friable; few Mn concretions; strong effervescence; abrupt smooth boundary.

IIIC3 577 157 to 168 cm (62 to 66 inches). Brown (10YR 5/3) silty clay; common coarse distinct light gray to gray (10YR 6/1) and common medium distinct yellowish brown (10YR 5/6) mottles; moderate thick platy structure parting along clay strata; friable to firm; few Mn concretions; strong effervescence; moderately alkaline.

1559A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Del Rey SOIL Nos. 869Mich-58-6 LOCATION Monroe County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 69B585 - 69B591

Depth cm	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Size class and particle diameter (mm) 3A1 Sand: Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Silt (0.05-0.02)	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<0.074	3B2 Cm	Coarse fragments 3B1: 2A2 > 2 Pct.	2-20	20-75
		Pct. of < 2 mm														Pct.	Pct. of < 75 mm	
0-20	Ap	17.3	55.9	26.8	0.6	1.2	1.1	1.9	12.5	21.5	34.4	35.1	4.8	92.8	1.00	tr.	tr.	0
20-28	Ap2	16.7	55.5	27.8	0.5	1.2	1.0	1.7	12.4	20.3	35.2	33.7	4.3	93.2	1.00	tr.	tr.	0
28-48	B21t	4.5	50.3	45.2	0.1	0.2	0.4	0.7	3.1	12.8	37.5	16.3	1.4	98.0	1.00	tr.	tr.	0
48-69	B22t	2.6	56.8	40.6	0.0	0.2	0.3	0.7	1.5	13.0	43.8	14.9	1.1	98.6	1.00	1	1	0
69-94	C1	3.5	65.4	31.1	0.3	0.9	0.5	0.7	1.1	10.5	54.9	12.0	2.4	97.3	1.00	1	1	0
94-135	C2	10.2	64.0	25.8	0.4	0.4	0.5	1.0	7.9	29.4	34.6	37.9	2.3	96.6	1.00	tr.	tr.	0
135-154	C3	9.5	68.5	22.0	0.3	0.4	0.4	1.1	7.4	30.9	37.6	39.0	2.1	96.8	1.00	tr.	tr.	tr.

Depth cm	6A1a Organic carbon Pct.	Nitrogen Pct.			6E1d Carbonate as $CaCO_3$ Pct.	Liquid Limit Pct.	Plasticity Index Pct.	Bulk density 4A1d ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content 4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohms-cm 60°F	4C1 WRD in/in	pH 8C1c (1:2) $CaCl_2$	8C1c (1:1) KCl	8C1a (1:1) H_2O
0-20	1.36							1.43	1.52	0.02		19.1	10.8		0.12	4.8	4.1	5.1
20-28	1.29							1.54	1.65	0.02		20.7	11.0		0.15	4.6	3.9	5.2
28-48	0.60					46	21	1.48	1.80	0.07		25.8	16.4	2400	0.14	6.0	5.1	6.1
48-69	0.39				2			1.46	1.81	0.07		26.6	16.3	2000	0.15	7.3	6.5	7.5
69-94	0.39				24			1.54	1.72	0.04		24.3	12.8		0.18	7.7	6.9	8.1
94-135	0.25				18	29	10	1.55	1.62	0.02		22.6	11.4		0.17	7.7	7.0	8.1
135-154	0.25				20			1.52	1.62	0.02		23.7	10.2		0.20	7.7	6.9	7.9

Depth cm	Extractable bases 5B4a: 6N2e Ca	6Q2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations	5A1a NH_4OAc	6G1d Ext. Al	3A1b Fine clay <0.0002 mm Pct.	Ratios to clay: Fine clay	CEC Sum	Ext. iron	8D1 15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-20	8.3	2.7	tr.	tr.	11.0	10.2	21.2	16.2		12.0	0.45	0.79		0.40			52	68
20-28	8.8	2.6	tr.	tr.	11.4	9.5	20.9	16.4		11.9	0.43	0.75		0.40			55	70
28-48	16.0	7.5	tr.	tr.	23.5	5.6	29.1	24.1		21.5	0.48	0.64		0.36			81	98
48-69			tr.	tr.				21.1		16.9	0.42			0.40				
69-94			tr.	tr.				14.2		11.6	0.37			0.41				
94-135			tr.	tr.				12.7		9.7	0.38			0.44				
135-154			tr.	tr.				11.1		8.8	0.40			0.46				

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int.	Qtz.	Kl.	Gibbsite
	7A2 X-ray						7A3	

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

USDA-SCS-HYATTSVILLE, MD. 1966

Pedon classification: Aeric Ochraqualf; fine, illitic, mesic
Series classification: (Same)
Soil: Del Rey
Soil Nos.: S69MI-58-6 (BSL Nos. 69B585-69B591)
Location: Monroe County, Michigan; NE 1/4, NW 1/4, SW 1/4, Sec. 32, T8S, R8E.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 50° F., and the mean summer air temperature is about 70° F. Frost-free season is 160-170 days.
Vegetation and land use: Wheat stubble. Cropland.
Parent material: Stratified lacustrine clays and loams.
Physiography: Lake plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat poorly.
Ground water: Below 60 inches.
Erosion: Slight.
Permeability: Slow.
Described by: R. Larson, R. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap1 585 0 to 20 cm (0 to 8 inches). Dark grayish brown (10YR 4/2), light brownish gray (10YR 6/2), dry, dark grayish brown (10YR 5/2) crushed and smoothed silt loam; weak coarse subangular blocky parting to weak medium granular structure; friable; abundant roots; strongly acid; abrupt smooth boundary.

Ap2 586 20 to 28 cm (8 to 11 inches). Dark grayish brown (10YR 4/2), brown (10YR 4/3) crushed and smoothed silty clay loam; weak coarse subangular blocky structure; firm; strongly acid; abundant roots; clear wavy boundary.

B21t 587 28 to 48 cm (11 to 19 inches). Brown (10YR 5/3) light silty clay; many coarse distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic parting moderate medium angular blocky structure; very firm; grayish brown (10YR 5/2) continuous clay films on vertical ped faces and few patchy films on horizontal ped faces; abundant roots; slightly acid; gradual wavy boundary.

B22t 588 48 to 69 cm (19 to 27 inches). Brown (10YR 5/3) light silty clay; moderate medium distinct light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) and common medium faint yellowish brown (10YR 5/4) mottles; weak coarse angular blocky parting to weak fine angular blocky structure; firm; dark gray (10YR 4/1) clay films on vertical ped faces and few patchy films on horizontal ped faces; abundant roots, mildly alkaline; clear wavy boundary.

C1 589 69 to 94 cm (27 to 37 inches). Mottled yellowish brown (10YR 5/6-5/4) and grayish brown (2/5Y 5/2) silty clay loam; moderate medium platy structure; friable; few thin grayish brown (10YR 5/2) clay films along some vertical ped faces; light gray (10YR 7/1) $CaCO_3$ layers 3 mm thick 2 cm apart; few roots; slight effervescence; moderately alkaline; clear wavy boundary.

C2 590 94 to 135 cm (37 to 53 inches). Yellowish brown (10YR 5/4) silt loam; many medium distinct gray (10YR 6/1) and yellowish brown (10YR 5/6) and few coarse distinct light olive brown (2.5Y 5/4) mottles; moderate thick platy structure; friable; few thin seams of light gray (10YR 7/1) of $CaCO_3$; numerous FeMn concretions; slight effervescence; moderately alkaline; gradual wavy boundary.

C3 591 135 to 154 cm (53 to 61 inches). Yellowish brown (10YR 5/4) silt loam; many coarse distinct grayish brown (10YR 5/2) and gray (10YR 6/1) and many medium faint yellowish brown (10YR 5/6) mottles; weak thick platy structure; friable; slight effervescence; moderately alkaline.

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL: Onaway taxadjunct SOIL Nos. 866Mich-21-2 LOCATION: Delta County, Michigan

SOIL SURVEY LABORATORY: Beltsville, Maryland LAB. Nos. 66489 - 66496

Depth (in.)	Horizon	1B1b Total Sand (2–0.05)	Total Silt (0.05–0.002)	Total Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 > 2 < 76 Pct.	2 – 19 (Pct. of < 76mm)	19–76 (Pct. of < 76mm)
		Pct. of < 2 mm																
0-2	O2 or A1															tr.	tr.	0
2-6	A2	57.0	38.7	4.3	1.2	5.2	12.2	24.2	14.2	17.3	21.4	45.0	42.8			3	3	0
6-9	B211r	47.7	36.5	15.8	0.7	3.6	9.8	20.2	13.4	15.1	21.4	39.9	34.3		0.99	2	2	0
9-12	B221r	50.1	36.2	13.7	1.5	4.2	10.4	20.8	13.2	15.1	21.1	40.0	36.9			2	2	0
12-18	A'2x	47.8	41.9	10.3	1.0	4.0	9.6	19.8	13.4	19.2	22.7	43.4	34.4		0.99	1	1	0
18-24	B'21t	38.2	39.4	22.4	0.8	3.2	7.3	15.3	11.6	18.5	20.9	38.6	26.6		0.99	2	2	0
24-28	B'22t	45.1	30.0	24.9	1.4	4.0	9.2	18.9	11.6	13.8	16.2	35.7	33.5		0.98	3	3	0
28-42	C1	53.4	33.9	12.7	2.8	4.8	8.7	20.8	16.3	14.8	19.1	43.5	37.1		0.80	28	20	7

Depth (in.)	6A1a Organic carbon (Pct.)	6B2a Nitrogen (Pct.)	C/N		Carbonate as $CaCO_3$ (Pct.)	6C2a Ext. iron as Fe (Pct.)	Bulk density: (g/cc)	4A1e ⅓ bar (g/cc)	4A1h Oven dry (g/cc)	4D1 COLE	Water content: 4B1c 1/10 bar (Pct.)	4B1c ⅓ bar (Pct.)	4B2 15 bar (Pct.)		4C1 WRD (in/in)	pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-2	10.4	0.43	24			0.3							19.1			4.3	4.9
2-6	0.58	0.04	14			0.5							2.5			4.0	5.0
6-9	1.18	0.07	17			1.7		1.31	1.33	0.006	16.0	14.0	8.0		0.08	4.3	5.4
9-12	0.71	0.04	18			1.4							6.2			4.4	5.5
12-18	0.23				-	1.0		1.62	1.62	0.000	14.3	11.4	3.7		0.12	4.5	5.8
18-24	0.32				-	2.1		1.44	1.55	0.025	26.1	21.9	9.1		0.18	5.4	6.5
24-28	0.39	0.03	13		3	2.0		1.38	1.46	0.019	26.2	20.9	9.7		0.15	6.4	7.3
28-42	0.12				35	0.6		1.71	1.74	0.004	14.8	11.8	4.5		0.10	7.2	7.9

Depth (in.)	Extractable bases 5A1c: 6H2a Ca	6G2a Mg	6F2b Na	6G2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations		6B1d Ext. Al			Ratios to clay 8D1: DEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-2	14.3	2.4	0.1	0.5	17.3	20.5	37.8		0.2								46	
2-6	1.2	0.2	tr.	tr.	1.4	2.2	3.6		0.4			0.84	0.12	0.58			39	
6-9	3.5	0.6	tr.	0.1	4.2	12.3	16.5		1.4			1.04	0.11	0.51			25	
9-12	2.7	0.7	-	0.1	3.5	7.9	11.4		1.0			0.83	0.10	0.45			31	
12-18	2.2	0.6	tr.	0.1	2.9	2.8	5.7		0.2			0.55	0.10	0.36			51	
18-24	7.5	2.6	tr.	0.1	10.2	3.2	13.4		tr.			0.60	0.09	0.41			76	
24-28	12.1	3.6	tr.	0.2	15.9	1.2	17.1		tr.			0.69	0.08	0.39			93	
28-42	17.3	0.9	tr.	0.1	18.3	-	18.3		0.1			1.44	0.05	0.35			100	

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int. Vm.-Mi.	Qtz.	Kl.	Gibbsite	
	X-ray 7A2					7A2			
0-2									
2-6	xxx	tr.	-	tr.	-	x	x		
6-9	-	-	tr.	-	xx	x	x		
9-12									
12-18	-	-	xx	tr.	x	x	x		
18-24	-	-	xx	tr.	tr.	x	x		
24-28									
28-42	-	tr.	xx	x	-	x	x		

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, int. = interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant

USDA-SCS-BELTSVILLE, MD. 1966

Pedon classification: Typic Eutroboralf; fine-loamy, mixed
Series classification: Alfic Haplorthod; fine-loamy, mixed, frigid
Soil: Onaway, taxadjunct*
Soil Nos.: S66MI-21-2 (BSL Nos. 66489-66496)
Location: Delta County, Michigan; SW 1/4, SW 1/4, Sec. 33, T40N, R24W.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 42° F., and the mean summer air temperature is about 64° F. Frost-free season is 120-140 days.
Vegetation and land use: Red maple, white birch, balsam fir and aspen. Woodland.
Parent material: Sandy loam glacial till.
Physiography: Till plain.
Topography: Gently sloping. Gradient is 4 percent.
Drainage: Well drained.
Ground water: Below 60 inches.
Erosion: Slight.
Permeability: Moderate or moderately slow.
Described by: R. Johnson.

(Colors are for moist soil unless otherwise stated.)

O2 or A1 489 0 to 5 cm (0 to 2 inches). Black (N 2/0) fine sandy loam with high organic matter content; weak medium granular structure; very friable; many fibrous roots; very strongly acid; abrupt smooth boundary.

A2 490 5 to 15 cm (2 to 6 inches). Reddish brown (5YR 5/3 moist) and pinkish gray (5YR 7/2 dry) loam; weak thick platy structure; friable; few fibrous roots; very strongly acid; abrupt wavy boundary

B21ir 491 15 to 23 cm (6 to 9 inches). Dark reddish brown (5YR 3/4) loam; weak coarse granular structure; friable; many roots; strongly acid; clear wavy boundary.

B22ir 492 23 to 30 cm (9 to 12 inches). Yellowish red (5YR 5/6) loam; weak medium subangular blocky structure; friable; few roots; strongly acid; clear irregular boundary.

A'2x 493 30 to 45 cm (12 to 18 inches). Reddish brown (5YR 5/3 moist) and pinkish gray (7.5YR 7/2 dry) loam; reddish brown (5YR 4/4) on the interior of some peds; the lower part of the horizon tongues into the B'21t; weak coarse subangular blocky structure to massive; vesicular; very hard, brittle when dry; medium acid; clear irregular boundary.

B'21t 494 45 to 60 cm (18 to 24 inches). Yellowish red (5YR 5/6) on exterior of peds and reddish brown (5YR 4/4) on interior of peds, loam; many clay skins on ped faces and in root channels; weak medium to coarse subangular blocky structure; firm; few coarse roots; slightly acid; clear wavy boundary.

B'22t 495 60 to 70 cm (24 to 28 inches). Reddish brown (5YR 4/3) loam, with reddish brown (5YR 5/4) coatings on exterior of peds and heavy reddish brown (5YR 5/3) clay flows along root channels and on ped faces; moderate medium subangular blocky structure; firm; few coarse roots; neutral with some limy pebbles; clear smooth boundary.

C1 496 70 to 105 cm (28 to 42 inches). Light brown (7.5YR 6/4) to brown (7.5YR 5/4) sandy loam; weak medium subangular blocky structure; friable; calcareous.

* This soil was sampled as Onaway. It is a taxadjunct because it has a lower amount of extractable iron and aluminum than typical for the series.

1593A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Onaway taxadjunct SOIL Nos. S66Mich-21-3 LOCATION Delta County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 66497 - 66503

Depth (in.)	Horizon	1B1b Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Size class and particle diameter (mm) 3A1 — Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 ≥ 2 <76 Pct.	2 – 19	19 – 76
		Pct. of < 2 mm														Pct. of < 76mm		
1-0	O2															0	0	0
0-3½	A2	67.5	29.6	2.9	0.1	2.1	21.7	33.9	9.7	13.1	16.5	36.2	57.8			tr.	tr.	0
3½-6	B21ir	66.1	25.7	8.2	0.2	1.4	17.1	33.6	13.8	12.4	13.3	40.8	52.3			2	2	0
6-9	B22ir	61.3	31.0	7.7	0.3	1.7	13.1	29.1	17.1	14.2	16.8	45.8	44.2		1.00	0	tr.	0
9-13	A'2x[a]	38.0	44.2	17.8	0.5	2.1	6.1	15.5	13.8	15.1	29.1	38.3	24.2		1.00	0	1	0
13-21	B'22t	23.6	44.9	31.5	0.2	0.9	2.7	9.1	10.7	14.4	30.5	31.0	12.9		1.00	0	tr.	0
21-40	C1	22.3	54.0	23.7	0.1	0.9	2.5	8.5	10.3	15.6	38.4	31.5	12.0		1.00	0	tr.	0

Depth (in.)	6A1a Organic carbon	6B2a Nitrogen	C/N		Carbonate as $CaCO_3$	6C2a Ext. iron as Fe	Bulk density:	4A1e ⅓ bar	4A1h Oven dry	4D1 COLE	Water content: 4B1e 1/10 bar	4B1c ⅓ bar	4B2 15 bar		4C1 WRD	pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
	Pct.	Pct.			Pct.	Pct.	g/cc	g/cc	g/cc		Pct.	Pct.	Pct.		in/in		
1-0	10.0	0.57	18		2	0.3							23.5			6.5	6.8
0-3½	0.79	0.05	16		tr.	0.3							2.8			6.8	7.5
3½-6	0.80	0.05	16	a	-	0.7							4.4			6.3	6.9
6-9	0.81	0.05	16		-	0.7		1.36	1.37	.003	20.0	15.5	4.4		.15	6.3	7.1
9-13	0.39	0.03	13		tr.	1.0		1.79	1.83	.007	15.7	14.5	5.8		.16	6.1	7.0
13-21	0.39	0.04	10		2	1.5		1.41	1.54	.030	27.7	25.3	11.2		.20	6.7	7.3
21-40	0.17				27	0.6		1.62	1.67	.010	21.5	19.9	7.8		.20	7.1	7.7

Depth (in.)	Extractable bases 5B1c: 6H2a Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations		6G1d Ext. Al			Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations	5C1 NH_4OAc
	meq/100 g																Pct.	Pct.
1-0	43.9	2.6	tr.	0.4	46.9	7.1	54.0		tr.								87	
0-3½	5.4	0.3	tr.	0.1	5.8	0.3	6.1		tr.			2.10	0.10	0.97			95	
3½-6	8.5	0.4	tr.	0.1	9.0	3.1	12.1		0.1			1.48	0.09	0.54			74	
6-9	7.6	0.4	tr.	0.1	8.1	3.1	11.2		tr.			1.45	0.09	0.57			72	
9-13	5.9	0.9	tr.	0.3	7.1	2.1	9.2		tr.			0.52	0.06	0.33			77	
13-21	16.3	3.1	tr.	0.5	19.9	0.7	20.6		tr.			0.65	0.05	0.36			97	
21-40	21.0	1.6	tr.	0.1	22.7	-	22.7		tr.			0.96	0.03	0.33			100	

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int. Vm.-Kl.	Qtz.	Kl.	Gibbsite	
	X-ray 7A2						7A2		
1-0	xx	-	-	tr.	x	x	x		
0-3½									
3½-6									
6-9									
9-13									
13-21	tr.	x	xx	x	-	x	x		
21-40	tr.	tr.	x	x	tr.	x	x		

a Also includes horizon B21tr.

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

USDA-SCS-HYATTSVILLE, MD. 1966

Pedon classification: Typic Eutroboralf; fine-loamy, mixed
Series classification: Alfic Haplorthod; fine-loamy, mixed, frigid
Soil: Onaway, taxadjunct*
Soil Nos.: S66MI-21-3 (BSL Nos. 66497-66503)
Location: Delta County, Michigan; NW 1/4, SE 1/4, Sec. 7, T37N, R24W.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 42° F., and the mean summer air temperature is about 64° F. Frost-free season is 120-140 days.
Vegetation and land use: Hard maple, beech. Woodland.
Parent material: Loam glacial till.
Physiography: Drumlin.
Topography: Gently sloping. Gradient is 2 percent.
Drainage: Well drained.
Ground water: Below 60 inches.
Erosion: Slight.
Permeability: Moderate or moderately slow.
Described by: R. Johnson and L. Berndt.

(Colors are for moist soil unless otherwise stated.)

02 497 3 to 0 cm (1 to 0 inches). Black (10YR 2/1) well decomposed leaf litter; moderate medium granular structure; very friable; many fibrous roots; neutral; abrupt smooth boundary.

A2 498 0 to 9 cm (0 to 3 1/2 inches). Brown (7.5YR 5/2) and light gray to gray (5YR 6/1) dry, light fine sandy loam; weak medium granular structure; very friable; few fibrous roots; mildly alkaline abrupt wavy boundary.

B21ir 499 9 to 15 cm (3 1/2 to 6 inches). Dark reddish brown (5YR 3/4) fine sandy loam; weak coarse subangular blocky structure; friable; many fine roots; neutral; clear wavy boundary.

B22ir 500 15 to 23 cm (6 to 9 inches). Reddish brown (5YR 4/4) fine sandy loam; weak coarse granular structure; friable; many fine roots; neutral; abrupt wavy boundary.

A'2x and B'21tx 501 23 to 33 cm (9 to 13 inches). Light reddish brown (5YR 6/3) and pinkish gray (5YR 7/2) dry fine sandy loam, representing the A'2 portion and dark reddish brown (5YR 3/4) clay loam representing the B'21tx portion; the A'2x consists of heavy coating up to 1 inch thick around peds of finer textured material; massive breaking to weak coarse subangular blocky structure; vesicular; very hard, brittle when dry; no roots; neutral; clear irregular boundary.

B'22t 502 33 to 53 cm (13 to 21 inches). Dark reddish brown (5YR 3/4) to reddish brown (5YR 4/4) clay loam; heavy clay flows in root channels and on ped faces; moderate coarse prismatic breaking to weak medium subangular blocky structure; very firm; few coarse roots; neutral; clear smooth boundary.

C1 503 53 to 100 cm (21 to 40 inches). Light brown (7.5YR 6/4) to brown (7.5YR 5/4) silt loam; moderate thick platy structure breaking to weak fine subangular blocky structure; friable; few coarse roots; mildly alkaline.

* This soil was sampled as Onaway. It is a taxadjunct because it has a lower amount of extractable iron and aluminum than typical for the series.

1594A

SOIL CLASSIFICATION-TYPIC EUTROBORALF
FINE, ILLITIC
SERIES - - - - - - -KENT

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

SOIL NO - - - - - - S70MI-26-1 COUNTY - - - GLADWIN

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 708451-708458

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM) SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
0-17	AP	51.7	33.4	14.9	3.5	1.1	4.7	13.8	21.5	10.6	11.7	21.7		41.1		23	15	.37
17-23	A2	43.9	38.9	17.2		.8	4.0	11.8	18.3	9.0	12.4	26.5		34.9			17	.28
23-29	B&A	30.8	32.6	36.6	13.4	.4	2.6	8.2	13.0	6.6	8.5	24.1		24.2		37	37	.31
29-43	B21T	20.1	32.9	47.0	16.1	.4	1.6	5.1	8.3	4.7	7.9	25.0		15.4		34	45	.35
43-69	B22T	17.7	40.9	41.4	9.1	.7	1.5	4.2	6.9	4.4	8.3	32.6		13.3		22	34	.32
69-97	B3	13.9	40.9	45.2	9.3	.4	1.1	3.0	5.4	4.0	7.8	33.1		9.9		21	35	.30
97-118	C1	13.4	40.4	46.2	9.3	.7	1.4	2.8	4.9	3.7	7.4	33.0		9.7		20	33	.29
118-153	C2	12.7	40.9	46.4	9.9	.5	1.1	2.8	4.7	3.6	7.8	33.1		9.1		21		.31

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	GT 75 PCT	75-20	20-5	5-2	LT .074	20-2 PCT LT20	(BULK DENSITY) 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	(WATER CONTENT) 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	(PH) 8C1A 1/1 H2O	8C1E 1/2 CACL
0-17	2		0	2	1	55		1.72	1.75	.01		11.2	5.5	.10			5.6	5.4
17-23	1		0	1	1	62		1.84	1.89	.01		13.7	4.8	.16			5.4	5.0
23-29	2		0	3	1	73		1.6 A					11.3				5.4	5.0
29-43	1		0	TR	1	84		1.54	1.83	.06		23.1	16.5	.10	5	2	7.5	7.2
43-69	3		0	3	1	85		1.79	1.94	.03		16.8	13.4	.06	26	7	8.0	7.7
69-97	1		0	0	1	90		1.79	1.92	.02		16.5	13.6	.05	32	10	8.1	7.7
97-118	1		0	0	1	89		1.80	1.96	.03		17.1	13.5	.06	35	13	8.2	7.8
118-153	1		1	0	1	91		1.78	2.00	.04		17.8	14.6	.06	36		8.2	7.8

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB / 100	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(MEQ)					G								
0-17	1.16					5.9	1.5	TR	.1	7.5	4.6		12.1	7.4	.50	3.9	80	62	101
17-23	.59					4.0	1.1	TR	.1	5.2	4.2		9.4	6.2	.36	3.6	65	55	84
23-29	.53					7.4	2.9	.1	.3	10.7	6.2		16.9	12.8	.35	3.6	65	63	84
29-43	.50							.1	.4					17.2	.37				
43-69	.34							.1	.3					10.8	.26				
69-97	.35							.1	.2					10.8	.24				
97-118	.33							.1	.2					9.8	.21				
118-153	.32							.1	.2					9.6	.21				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
									(MEQ / LITER)										
0-17																			
17-23																			
23-29																			
29-43																		40	18
43-69																		33	14
69-97																			
97-118																			
118-153			3500																

CLAY MINERALOGY (7A2I, 7A3)

DEPTH-CM	X-RAY							DTA (AS PERCENT)
0-17	VR2	MI2	KK2	MT1	CL1	QZ1		KK10
29-43	VR2	MI2	KK2	MT1	CL1	QZ1	DL1	KK15
97-118	VR2	MI2	KK1	MT1	CL1	QZ1	DL1 CA1	KK5

RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MT = MONTMORILLONITE MI = MICA KK = KAOLINITE CL = CHLORITE VR = VERMICULITE CA = CALCITE
QZ = QUARTZ DL = DOLOMITE

(A) ESTIMATED.

Pedon classification: Typic Eutroboralf; fine, illitic
Series classification: (Same)
Soil: Kent
Soil Nos.: S70MI-26-1 (BSL Nos. 70B451-70B458)
Location: Gladwin County, Michigan; Sec. 32, T20N, R1W.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 43° F., and the mean summer air temperature is about 65° F. Frost-free season is 115-130 days.
Vegetation and land use: Bluegrass, bromegrass. Pastureland.
Parent material: Calcareous clay loam glacial till.
Physiography: Ground moraine.
Topography: Undulating. Gradient is 5 percent.
Drainage: Well drained.
Ground water: More than 60 inches.
Erosion: Slight.
Permeability: Slow.
Described by: H. R. Sinclair, Jr. and H. Webber.

(Colors are for moist soil unless otherwise stated.)

Ap 451 0 to 17 cm (0 to 7 inches). Dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; many roots; 2 percent gravel; medium acid; abrupt smooth boundaries.

A2 453 17 to 23 cm (7 to 9 inches). Light brownish gray (10YR 6/2) loam; weak thick platy separating to moderate fine and medium granular structure; friable; common roots; 2 percent gravel; strongly acid; abrupt broken boundary; this horizon contains remnants of brown (7.5YR 5/4) B material; the B material lacks clay films and consists of about 10 percent by volume of this horizon.

B&A 452 23 to 29 cm (9 to 11 inches). Brown (7.5YR 5/4) clay loam and light brownish gray (10YR 6/2) loam, white (10YR 8/2) dry interfingering, coatings on surfaces of peds and along worm and root channels; brown peds have light brownish gray material 2 to less than 10 mm thick on vertical faces between abutting peds (30 percent of matrix), horizontal spacing is 10 to 20 mm, vertical extension is through horizon, more than 90 percent of the peds covered with skeletons; very weak fine prismatic separating to moderate very fine and fine subangular blocky structure; friable; common roots; brown (7.5YR 5/3) clay films on surfaces of peds; 2 percent gravel; strongly acid; clear wavy boundary.

B21t 454 29 to 43 cm (11 to 17 inches). Brown (7.5YR 5/4) clay and pale brown (10YR 6/3) fine sandy loam, white (10YR 8/2) dry interfingering, coatings on surfaces of peds and along worm and root channels; brown peds have pale brown material less than 1 to 9 mm thick on vertical faces between abutting peds (20 percent of matrix), horizontal spacing is about 25 mm, vertical extension is 5 to 13 cm from the top of the horizon, many peds covered with skeletons; moderate coarse prismatic separating to moderate very fine and fine angular blocky structure; very firm; common roots; brown (7.5YR 4/2, 4/3 and 5/3) clay films on surfaces of peds; 2 percent gravel; mildly alkaline; gradual wavy boundary.

B22t 455 43 to 69 cm (17 to 27 inches). Brown (10YR 5/3) silty clay; moderate coarse prismatic separating to moderate very fine and fine angular blocky structure; very firm; common roots; brown (7.5YR 4/2 and 4/3) clay films on surfaces of some peds; very few thin skeletons on surfaces of some peds; 2 percent gravel; slight effervescence; mildly alkaline; gradual wavy boundary.

B3 456 69 to 97 cm (27 to 38 inches). Brown (10YR 5/3) silty clay; moderate coarse prismatic separating to moderate medium and coarse angular blocky structure; very firm; common roots; majority of the roots are on the surfaces of the prism faces; light brownish gray (2.5Y 6/2) lime accumulation covering 50 percent of surfaces of peds; 2 percent gravel; slight effervescence; moderately alkaline; gradual wavy boundary.

C1 457 97 to 118 cm (38 to 46 inches). Brown (10YR 5/3) silty clay; few fine distinct brownish yellow (10YR 6/6) mottles; weak coarse prismatic separating to weak thick and very thick platy separating to moderate fine to coarse angular blocky structure; very firm; few roots on surfaces of peds; light brownish gray (10YR 6/2) and light olive gray (5Y 6/2) lime accumulation covering 50 percent of surface of peds; 2 percent gravel; slight effervescence; moderately alkaline; sampling break.

C2 458 118 to 153 cm (46 to 60 inches). Brown (10YR 5/3) silty clay; few fine distinct brownish yellow (10YR 6/6) mottles; weak coarse prismatic separating to weak coarse angular blocky structure; very firm; few roots on surfaces of peds; light brownish gray (10YR 6/2) and light olive gray (5Y 6/2) lime accumulation covering 60 percent of surfaces of peds; 2 percent gravel; slight effervescence; moderately alkaline.

1346A

SOIL CLASSIFICATION-TYPIC EUTROBORALF
FINE, MIXED
SERIES - - - - - - - -NESTER

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

SOIL NO - - - - - - - S70MI-18-1 COUNTY - - - CLARE

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 708444-708450

DEPTH CM	HORIZON	SAND 2- .05	SILT .05- .002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2- 1	CORS 1- .5	MEDS .5- .25	FNES .25- .10	VFNS .10- .05	COSI .05 .02	FNSI .02 .002	VFSI .005- .002	SAND 2- .10	INTR II .2- .02	FINE CLAY TO CLAY PCT	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
		(- - PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - - PCT LT 2MM																
0-25	AP	47.4	32.0	20.6	6.3	1.4	5.3	13.6	19.7	7.4	8.5	23.5		40.0	26.0	31		.37
25-35	B&A	38.4	26.6	35.0	14.1	1.1	4.2	11.0	16.2	5.9	6.3	20.3		32.5	20.4	40		.32
35-58	B21T	37.4	26.5	35.6	14.1	1.2	3.8	10.8	15.7	5.9	6.4	20.1		32.8	20.7	40		.35
58-73	B22T	34.3	32.8	32.9	10.8	1.1	3.6	9.7	14.2	5.8	7.8	25.0		28.5	21.1	33		.36
73-97	B3	32.2	35.9	31.9	8.3	1.3	3.8	9.0	12.9	5.2	8.2	27.7		27.0	20.1	26		.33
97-112	C1	32.0	36.0	32.0	7.4	2.2	3.6	8.6	12.3	5.3	8.6	27.4		26.7	20.3	23	24	.33
112-153	C2	32.7	35.8	31.5	7.7	2.3	3.6	8.8	12.7	5.3	11.3	24.5		27.4	23.2	24		.34

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20 PCT LT 75	20-5	5-2	LT .074	20-2 PCT LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
0-25	3		0	4	1	60		1.61	1.66	.01		13.5	7.6	.10			6.0	5.8
25-35	3		3	4	1	66		1.66	1.79	.02		16.3	11.3	.08			6.8	6.8
35-58	TR		0	0	1	65		1.69	1.82	.02		15.5	12.4	.05	4		7.6	7.3
58-73	3		0	2	2	69		1.73	1.85	.02		15.7	11.8	.07	17		8.0	7.6
73-97	3		0	2	2	73		1.95	2.04	.02		12.3	10.6	.03	28		8.2	7.7
97-112	4		0	3	2	72		1.93	2.02	.02		13.4	10.5	.06	32	8	8.2	7.8
112-153	3		1	1	2	70		1.93	2.04	.02		12.7	10.6	.04	31		8.2	7.9

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	EXTRACTABLE BASES 5B4A 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						MEQ / 100 G													
0-25	1.43					6.9	2.2	TR	.2	9.3	5.6		14.9	9.4	.46	3.1	73	62	98
25-35	.52					9.0	4.0	TR	.2	13.2	3.6		16.8	14.8	.42	2.3	61	79	89
35-58	.46						9.2	TR	.2					13.1	.37				
58-73	.36						5.6	.1	.2					10.0	.30				
73-97	.25						3.4	.1	.1		.0			7.3	.23				
97-112	.17						3.4	.1	.1		.0			6.6	.21				
112-153	.20						4.4	TR	.1					6.7	.21				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	SATURATION EXTRACT 8A1 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
									MEQ / LITER										
0-25																			
25-35																			
35-58																		32	14
58-73																		30	13
73-97																			
97-112																			
112-153	4500																		

CLAY MINERALOGY (7A2I, 7A3)

DEPTH-CM	X-RAY					DTA (AS PERCENT)
0-25	MV2	MI2	KK2	CL1	QZ1	KK15
35-58	MV3	MI3	KK2	CL1	QZ1	KK10
97-112	MV2	MI3	KK2	QZ1		KK15

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

Pedon classification: Typic Eutroboralf; fine, mixed
Series classification: (Same)
Soil: Nester
Soil Nos.: 870MI-18-1 (BSL Nos. 70B444-70B450)
Location: Clare County, Michigan; Sec. 4, T17N, R3W.
Climate: Average annual precipitation is about 30 inches. Mean annual air temperature is about 44° F., and the mean summer air temperature is about 65° F. Frost-free season is 110-130 days.
Vegetation and land use: Bluegrass, goldenrod, Queen Anne's lace. Pastureland.
Parent material: Calcareous clay loam glacial till.
Physiography: Moraine.
Topography: Undulating. Gradient is 5 percent.
Drainage: Well drained.
Ground water: Greater than 60 inches.
Erosion: Slight.
Permeability: Moderately slow.
Described by: H. R. Sinclair, Jr. and H. Webber.

(Colors are for moist soil unless otherwise stated.)

Ap 444 0 to 25 cm (0 to 10 inches). Dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; cloddy separating to moderate fine and medium granular structure; friable; many roots; 3 percent coarse fragments; medium acid; abrupt wavy boundary.

B&A 445 25 to 35 cm (10 to 14 inches). Strong brown (7.5YR 5/8) clay loam and light brownish gray (10YR 6/2) loam, white (10YR 8/1) dry interfingering, coatings on surfaces of peds and along worm and root channels; strong brown peds typically have light brownish gray material 1 to 5 mm (rectangular shaped and semicircular shaped) thick on vertical faces between abutting peds (25 percent of matrix), horizontal spacing is 10 to 20 mm, vertical extension is through the horizon, more than 40 percent of peds covered with skeletons; moderate fine and medium subangular blocky structure; B is firm, A is friable; continuous brown (7.5YR 4/2) clay films; 3 percent coarse fragments; neutral; clear irregular boundary.

B21t 446 35 to 58 cm (14 to 23 inches). Strong brown (7.5YR 5/6) clay loam and pale brown (10YR 6/3) loam, white (10YR 8/1) dry interfingering, coatings on surfaces of peds and along worm and root channels; strong brown peds have pale brown material 5 to 9 mm thick on vertical faces between abutting peds (15 percent of matrix) with vertical extension 1 to 2 cm from top of horizon and less than 2 mm thick on vertical faces between abutting peds, vertical extension is through horizon; moderate coarse prismatic separating to moderate very fine and fine angular blocky structure; very firm; few roots on surfaces of peds; dark reddish brown (5YR 4/2) clay and black (5YR 2/1) clay-organic films on surfaces of peds; 3 percent gravel and cobbles; neutral; clear wavy boundary.

B22t 447 58 to 73 cm (23 to 29 inches). Yellowish brown (10YR 5/6) clay loam; moderate coarse prismatic separating to moderate fine angular blocky structure; very firm; few roots on surfaces of peds; dark grayish brown (10YR 4/2) clay films on surfaces of peds; 3 percent gravel and cobbles; white (10YR 8/1) lime accumulation covering 5 percent of surfaces of peds; slight effervescence; moderately alkaline; gradual wavy boundary.

B3 448 73 to 97 cm (29 to 38 inches). Yellowish brown (10YR 5/6) clay loam; moderate coarse prismatic separating to strong medium and coarse angular blocky structure; very firm; few roots on surfaces of peds; dark reddish gray (5YR 4/2) clay films on surfaces of peds; white (10YR 8/1) lime accumulation covering 20 percent of surfaces of peds; 3 percent gravel and cobbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C1 449 97 to 112 cm (38 to 44 inches). Pinkish gray (7.5YR 6/2) clay loam, brown (7.5YR 5/4) crushed; weak coarse prismatic separating to strong moderate and coarse angular blocky structure; very firm; very few roots on surface of peds; 3 percent gravel and cobbles; white (10YR 8/1) lime accumulation covering 45 percent of surfaces of peds; strongly effervescent; moderately alkaline; sampling break.

C2 450 112 to 153 cm (44 to 60 inches). Brown (7.5YR 5/4) clay loam, moderate coarse angular blocky structure; very firm; very few roots on surfaces of peds; white (10YR 8/1) lime accumulation covering 65 percent of surfaces of peds; 3 percent gravel and cobbles; strong effervescence; moderately alkaline.

1344A

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Emmet taxadjunct SOIL No. S70Mich-45-1 LOCATION Leelanau County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. No. 70B422 - 70B427

	Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1: Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (<0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: Coarse (.05-0.02)	Silt: Fine (0.02-0.002)	Silt: Coarse (0.002-0.002)	Clay: 3A1b Fine 0.0002	Clay: 3A1a Carbonate <0.002	(0.2-0.02)	(2-0.1)	<0.074	Coarse fragments: 75-20	20-5	5-2
			Pct. of <2mm																Pct. of <75mm		
422	0-21	Ap	83.1	12.7	4.2	2.0	14.8	32.4	27.4	6.5	5.5	7.2		1.3		24.1	76.6	20.1	-	4	2
423	21-33	B21hir	82.5	13.5	4.0	1.5	14.9	32.3	27.3	6.5	5.7	7.8	-	1.2		24.5	76.0	23.6	1	2	2
424	33-52	B22	84.5	11.7	3.8	2.0	15.3	33.1	27.7	6.4	4.7	7.0		0.8		23.1	78.1	18.7		5	3
425	52-72	B'2t	77.2	11.5	11.3	1.9	14.0	29.7	25.6	6.0	5.6	5.8		6.7		22.6	71.3	25.6	1	4	2
426	72-106	C1	81.8	12.9	5.3	2.6	14.4	30.7	25.7	7.5	6.4	6.5		2.2		26.1	74.3	22.2	9	9	5
427	106-153	C2	82.2	12.2	5.6	3.6	15.7	31.3	25.0	6.5	5.6	6.6		2.0		23.9	75.7	21.5	9	14	4

	Depth (cm)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.		Dit-cit ext. 6G2b Fe Pct.	Dit-cit ext. 6G7a Al Pct.	Na pyrophosphate ext. 6C5a Fe Pct.	Na pyrophosphate ext. 6G5a Al Pct.	Na pyrophosphate ext. 6C5 C Pct.	4F1 Liquid limit	4P Plasticity index	3B2 Ca	8E1 Resistivity Ohms cm	Bulk density 4A1e 1/3 bar g/cc	Bulk density 4A1h Oven dry g/cc	Linear extens. 4N1 LE (whole soil) Pct.	Linear extens. 4N1 LE (<2mm) Pct.	Water content 4B1c 1/3 bar Pct.	Water content 4B2 15 bar Pct.	WRD 4C1 (whole soil) in/in	WRD 4C1 (<2mm) in/in
422	0-21	0.93			0.1	tr.						0.92		1.64	1.65	-		6.2	2.6	0.06	
423	21-33	0.34			0.1	tr.	0.1	tr.				0.93		1.77	1.78	-		6.5	1.9	0.08	
424	33-52	0.14			0.1	tr.	tr.	tr.				0.91		1.68	1.69	-		5.2	1.5	0.05	
425	52-72	0.29			0.1	tr.	tr.	tr.				0.92		1.73	1.78	1		6.6	4.5	0.04	
426	72-106	0.07			0.1	tr.						0.79		1.97	2.00	-		5.5	2.1	0.07	
427	106-153	0.07			0.1	tr.						0.75	11000	2.00	2.03	-		5.7	2.3	0.07	

	Depth (cm)	Extractable bases 5B4a: 6H2a Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	KCl ext. 6G1e Al	CEC: 5A3a Sum cations	5A6 NH_4OAc	Sum bases plus KCl Al	Bases saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.	8E1e Carbonate as $CaCO_3$ Pct.	pH: 8C1c (1:1) KCl	8C1e (1:2) $CaCl_2$	8C1a (1:1) H_2O	CEC-1/2 clay x thickness	Ratios to total clay: 15-bar water	Na pyro. ext.	CEC SUM
		meq/100 g																			
422	0-21	4.4	0.6	-	0.2	5.2	3.3		8.5	7.8		61	67		5.0	5.2	5.3		0.62		2.02
423	21-33	2.6	0.4	-	0.1	3.1	2.1		5.2	3.5		60	88		5.7	5.9	6.6		0.48	<0.1	1.30
424	33-52	1.7	0.3	tr.	0.1	2.1	0.9		3.0	2.6		70	81	tr.	5.9	6.2	7.0		0.39		0.79
425	52-72	8.1	1.7	0.1	0.2	10.1	0.9		11.0	6.5		92		1	7.0	7.3	7.8		0.40		
426	72-106		1.1	0.1	0.1					2.3				10	7.7	7.7	8.4		0.40		
427	106-153		0.6	0.1	0.1					1.9		-		12	7.8	7.8	8.5		0.41		

Depth (cm)	Clay fraction analysis 7A1b, d: <0.002 mm 7A2 X-ray a/b/	7A3 DTA Pct.	Sand and silt fraction analysis 7A1: 7B1 Petrographic b/ Pct.	total weath.
0-21	MV3,MI2,CL2,QZ1,KK1	KK 5		
21-33	VR3,MI2,KK2,MT1,CL1,QZ1	KK15		
33-52	VR3,MI2,KK2,MT1,CL1,QZ1	KK10		
52-72	MV3,MI2,KK2,CL1,QZ1	KK10		
72-106	MV3,MI2,KK2,LC1,QZ1	KK10		
106-153	MV3,MI2,CL2,KK2,QZ1	KK10		

a/ Relative amounts (X-ray): 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.
b/ Mineral code: MV = montmorillonite-vermiculite, MI = mica, CL = chlorite, QZ = quartz, KK = kaolinite, VR = vermiculite, and MT = montmorillonite.

Pedon classification: Arenic Eutroboralf; coarse-loamy, mixed
Series classification: Alfic Haplorthod; coarse-loamy, mixed, frigid
Soil: Emmet taxadjunct*
Soil Nos.: S70MI-45-1 (BSL Nos. 70B422-70B427)
Location: Leelanau County, Michigan; Sec. 29, T29N, R11E.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 42° F., and the mean summer air temperature is about 64° F. Frost-free season is 140 d.
Vegetation and land use: Alfalfa stubble.
Parent material: Calcareous sandy loam glacial till.
Physiography: Moraine.
Topography: Gently sloping. Gradient is 2 percent.
Drainage: Well drained.
Ground water: Greater than 60 inches.
Erosion: Slight.
Permeability: Moderately rapid.
Described by: H. R. Sinclair, Jr. and R. Larson.

(Colors are for moist soil unless otherwise stated.)

Ap 422 0 to 21 cm (0 to 8 inches). Very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; very friable; many roots; 10 percent coarse fragments; strongly acid; abrupt smooth boundary.

Bhir 423 21 to 33 cm (8 to 13 inches). Dark yellowish brown (10YR 3/4) loamy sand; moderate fine and medium granular structure; very friable; many roots; 10 percent coarse fragments; slightly acid; clear wavy boundary.

A'2 424 33 to 52 cm (13 to 20 inches). Brown (7.5YR 5/4) loamy sand; weak medium and coarse granular structure; very friable; 10 percent coarse fragments; slightly acid; clear wavy boundary.

B't 425 52 to 72 cm (20 to 28 inches). Reddish brown (5YR 4/4) sandy loam; moderate fine and medium subangular blocky structure; friable; dark reddish brown (5YR 3/3 and 3/4) continuous clay films; 15 percent coarse fragments with less than 5 percent larger than 3 inches; neutral; clear irregular boundary.

C1 426 72 to 106 cm (28 to 42 inches). Brown (10YR 5/3) loamy sand, brown (7.5YR 4/2) coatings on peds; weak coarse subangular blocky structure; firm in pit, friable in hand; few roots; 15 percent coarse fragments with less than 5 percent larger than 3 inches; slight effervescence; moderately alkaline; gradual broken boundary.

C2 427 106 to 153 cm (42 to 60 inches). Brown (10YR 5/3) loamy sand, brown (7.5YR 5/4) coatings on peds; weak coarse subangular blocky structure; firm in pit, friable in hand; few roots; 15 percent coarse fragments with less than 5 percent larger than 3 inches; strong effervescence; moderately alkaline.

* This was sampled as Emmet. It is a taxadjunct because it has less clay in the upper 50 cm than is typical for the series.

1309A

SOIL CLASSIFICATION-GLOSSIC EUTROBORALF
SANDY OVER LOAMY, MIXED
SERIES - - - - - - - -MENOMINEE TAXADJUNCT

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

SOIL NO - - - - - - S74MI-35-3 COUNTY - - - CLARE

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 74B437-74B444

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM) SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .002-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
0-10	A1	82.8	9.9	7.3		1.7	10.7	29.8	34.3	6.3	5.2	4.7		76.5	29.0			1.2
10-28	A2	85.8	13.0	1.2		2.9	11.2	29.9	35.3	6.5	5.8	7.2		79.3	30.0			
28-36	B21IR	77.8	14.9	7.3		2.5	8.0	24.0	34.7	8.6	7.2	7.7		69.2	34.2			.75
36-47	B22IR	75.2	19.5	5.3		2.4	6.8	19.5	34.2	12.3	9.7	9.8		62.9	41.3			.98
47-59	B3	60.1	33.1	6.8		3.0	6.7	14.7	24.1	11.6	15.8	17.3		48.5	42.2			.56
59-77	A'2&2BT	61.5	24.5	14.0		7.1	8.7	14.5	22.2	9.0	9.2	15.3		52.5	31.4			.31
77-117	2BT	50.5	23.5	26.0	8.5	1.5	5.7	15.0	21.4	6.9	7.7	15.8		43.6	26.2	33		.41
117-163	2C	49.7	31.0	19.3	5.6	3.3	5.8	14.0	19.4	7.2	10.5	20.5		42.5	28.3	29		.41

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20	20-5	5-2	LT .074	20-2 PCT LT 75	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WED CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
0-10	TR	0	0	TR	1	21	1	1.07	1.15	.024	19.2		8.4	.12			4.5	4.1
10-28	1	0	0	2	1	17	3	1.1 A					1.8				4.6	4.2
28-36	2	0	1	4	2	24	6	1.14	1.19	.014	21.0		5.5	.18			5.1	4.9
36-47	4	0	1	4	4	29	8	1.29	1.33	.010	14.5		5.2	.12			5.4	5.2
47-59	6	0	0	6	4	46	10	1.59	1.60	.003	11.2		3.8	.12			5.7	5.3
59-77	6	0	1	4	4	43	8	1.85	1.89	.007	10.4		4.4	.11			6.0	5.6
77-117	5	0	2	2	4	52	6	1.63	1.76	.023	17.4		10.6	.11	TR		7.0	6.6
117-163	8	0	1	4	7	49	11	1.84	1.92	.013	13.6		8.0	.09	18		7.7	7.5

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(-EQ / 100 G)													
0-10	2.69			.2		4.6	.8		.6	6.0	8.8	.2	14.8	8.6		5.8	53	40	70
10-28	.09			.2		.8	.2		.1	1.1	1.2	.2	2.3	1.6	1.3	4.0	50	48	69
28-36	.94			.8		3.6	.4		.1	4.1	4.7	.2	8.8	7.1	.97	9.0	51	46	58
36-47	.71			.6		2.4	.3		.2	2.9	9.0	.2	11.9	5.3	1.0	8.0	45	24	55
47-59	.28			.5		2.1	.6		.1	2.8	4.0	.2	6.8	3.6	.53	3.5	58	41	78
59-77	.24			.5		3.5	1.3		.3	5.1	1.9	.1	7.0	5.3	.38	2.7	66	73	96
77-117	.18			.9			4.2	.2	.7		1.5			10.4	.40				
117-163	.18			.6			3.0	.2	.4					6.7	.35				

DEPTH CM	(PYROPHOSPHATE,PH10) 6C5A EXT FE PCT	6G5A EXT AL PCT	6A1B EXT C PCT	(DITHIONITE-CITRATE) 6C2B EXT FE PCT	6G7A EXT AL PCT	6D1B EXT MN PCT	(PYROPHOSP) FE+AL TO CLAY	AL+C TO CLAY	PYRO FE+AL TO D - C FE+AL	CEC -1/2 CLAY X THIC	BASES 5G1 PLUS KCL AL	PH 8C1C 1:1 KCL
0-10	.2	TR		.2	TR						6.2	4.0
10-28	TR	TR		.2	TR						1.3	3.9
28-36	.1	TR		.8	.3						4.3	4.7
36-47	.1	TR		.6	.4						3.1	4.9
47-59	.2	TR		.5	.2						3.0	5.0
59-77	.1	TR		.5	.1						5.2	4.9
77-117	.1	TR		.9	.1							6.1
117-163	TR	TR		.6	.1							7.1

CLAY MINERALOGY (7A2C).
0-10 MI2 QZ1 KK1
26-36 VR2 QZ1
RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MI = MICA KK = KAOLINITE VR = VERMICULITE QZ = QUARTZ.

SAND MINERALOGY (7B1). PLACEMENT: MIXED.
0-10 VFNS - TR74 QZ73 FD24 FE1 GN1 HN1 SP PO EP. FNES - TR81 QZ78 FD16 FE2 SP1 CL1 MS1 HN1.
28-36 VFNS - TR79 QZ76 FD18 FE1 SP1 HN1 TM ZR CL EN GN AU EP SO.
RELATIVE AMOUNTS: AS PERCENT.
MINERAL CODE: TR = TOTAL RESISTANT MINERALS GN = GARNET SO = STAUROLITE
CL = CHLORITE EP = EPIDOTE FD = FELDSPARS HN = HORNBLENDE MS = MUSCOVITE
PO = PLANT OPAL QZ = QUARTZ TM = TOURMALINE ZR = ZIRCON SP = SPHENE
EP = EPIDOTE FE = IRON OXIDES EN = ENSTATITE AU = AUGITE

(A) ESTIMATED.

Pedon classification: Glossic Eutroboralf; sandy over loamy, mixed
Series classification: Alfic Haplorthod; sandy over loamy, mixed, frigid
Soil: Menominee, taxadjunct*
Soil Nos.: S74MI-35-3 (BSL Nos. 74B437-74B444)
Location: Clare County, Michigan; 150 feet east and 2145 feet south of the northwest corner of Sec. 34, T19N, R3W.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 44° F., and the mean summer air temperature is about 64° F. Frost-free season is 120-130 days.
Vegetation and land use: Bracken ferns and various grasses. Idle land.
Parent material: Sand over clay loam.
Physiography: Moraine.
Topography: Nearly level. Gradient is 2 percent.
Drainage: Well drained.
Ground water: Greater than 64 inches.
Erosion: Slight.
Permeability: Rapid over moderately slow.
Described by: N. Stroesenreuther and P. Corder.

(Colors are for moist soil unless otherwise stated.)

A1 437 0 to 10 cm (0 to 4 inches). Very dark brown (10YR 2/2) loamy sand; moderate fine granular structure; very friable; abundant fine roots; 3 percent pebbles; very strongly acid; clear wavy boundary.

A2 438 10 to 28 cm (4 to 11 inches). Pinkish gray (7.5YR 7/2) loamy sand; weak medium granular structure; very friable; abundant fine roots; 3 percent pebbles; very strongly acid; clear wavy boundary.

B21ir 439 28 to 36 cm (11 to 14 inches). Reddish brown (5YR 4/4) loamy sand; very weak medium granular structure; friable; abundant fine roots; 3 percent pebbles; strongly acid; clear wavy boundary.

B22ir 440 36 to 47 cm (14 to 19 inches). Reddish brown (5YR 5/4) and yellowish brown (10YR 5/6) loamy sand; moderate fine subangular blocky structure; friable; common fine roots; 3 percent pebbles; strongly acid; clear wavy boundary.

B3 441 47 to 59 cm (19 to 23 inches). Strong brown (7.5YR 5/6) sandy loam; weak medium subangular blocky structure; friable; few fine roots; brown (10YR 5/3) ped coatings; 3 percent pebbles; medium acid; clear wavy boundary.

A'2&IIBt 442 59 to 77 cm (23 to 30 inches). Pale brown (10YR 6/3) sandy loam (A'2) as coatings on the faces of peds; brown (7.5YR 5/4) and reddish brown (5YR 5/4) sandy clay loam (Bt); common medium distinct brownish yellow (10YR 6/6) and common fine faint strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; firm; few fine roots; 5 percent pebbles; medium acid; clear wavy boundary.

IIBt 443 77 to 117 cm (30 to 46 inches). Dark brown to brown (7.5YR 4/4) sandy clay loam; few fine distinct yellowish brown (10YR 5/4) mottles; moderate coarse prismatic parting to moderate coarse angular blocky structure; firm; few fine roots; 5 percent pebbles, few cobbles; clay films on vertical faces; neutral; gradual wavy boundary.

IIC 444 117 to 163 cm (46 to 64 inches). Light brown (7.5YR 6/4) loam; common fine prominent light brownish gray (10YR 6/2) and few fine distinct strong brown (7.5YR 5/6) mottles; weak coarse prismatic parting to weak coarse angular blocky structure; firm; 5 percent pebbles, few cobbles; slight effervescence; mildly alkaline.

* This was sampled as Menominee. It is a taxadjunct because it lacks a spodic horizon.

1158A

SOIL CLASSIFICATION-MOLLIC EUTROBORALF
FINE, ILLITIC
SERIES - - - - - - -KENT TAXADJUNCT

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

SOIL NO - - - - - - S70MI-16-1 COUNTY - - - CHEBOYGAN

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 708428-708434

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM) SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	SAND VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	SILT COSI .05-.02	FNSI .02-.002	VFSI .002-.05	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	RATIO NON-CO3-CLAY PCT	8D1 15-BAR TO CLAY
0-21	AP	66.9	22.2	10.9	4.9	.3	2.1	5.6	31.3	27.6	12.1	10.1		39.3	61.4	45	11	.50
21-33	A2	52.0	30.2	17.8	7.9	.2	1.3	3.4	22.2	24.9	15.5	14.7		27.1	56.9	44	18	.38
33-51	2B21T	1.6	38.0	60.4	16.9	.0	.0	.1	.7	.8	2.6	35.4		.8	3.9	28	60	.33
51-66	2B22T	.5	48.5	51.0	14.7	.0	.0	.1	.3	.2	4.2	44.3		.3	4.6	29	51	.35
66-84	2B3	.3	56.1	43.6	13.1	.0	.0	.0	.2	.1	7.5	48.6		.2	7.8	30	44	.39
84-107	2C1	.3	56.9	42.8	10.0	.2	.0	.0	.0	.1	8.5	48.4		.2	8.6	23	43	.39
107-153	2C2	.6	58.0	41.4	8.9	.0	.0	.0	.0	.6	14.9	43.1			15.5	21	38	.40

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	GT 75 PCT	WEIGHT (PCT LT 75) 75-20	20-5	5-2	LT .074	20-2 LT20	(BULK DENSITY) 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	(WATER CONTENT) 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	(PH) 8C1A 1/1 H2O	8C1E 1/2 CACL
0-21	0		0	0	0	51		1.53	1.58	.01		11.4	5.4	.09	TR		7.1	6.7
21-33	0		0	0	0	64		1.67	1.73	.01		10.1	6.8	.06	1		7.4	6.8
33-51	0		0	0	0	99		1.45	1.76	.07		26.7	19.7	.10	5		7.6	7.3
51-66	0		0	0	0	100		1.47	1.77	.06		28.4	18.1	.15	23	0	7.9	7.5
66-84	0		0	0	0	100		1.54	1.83	.06		26.4	17.2	.14	32	0	8.0	7.6
84-107	0		0	0	0	100		1.60	1.80	.04		25.4	16.7	.14	33	0	8.0	7.7
107-153	0		0	0	0	100		1.67	1.83	.03		23.0	16.6	.11	34	3	8.0	7.8

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA	6Q2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(MEQ / 100 G)													
0-21	1.79					9.3	2.1	.1	.2	11.7	2.7		14.4	10.8	.99	4.3	86	81	108
21-33	.87					8.9	2.4	.1	.4	11.8	2.9		14.7	11.5	.65	3.7	77	80	103
33-51	.23						8.5	.3	1.1					23.2	.38				
51-66	.14						9.5	.2	.9					19.0	.37				
66-84	.06						5.0	.2	.8					14.7	.34				
84-107	.06						4.0	.2	.8					13.6	.32				
107-153	.07						4.0	.2	.8					13.0	.31				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
								(MEQ / LITER)											
0-21																			
21-33																			
33-51																		56	28
51-66																			
66-84																			
84-107																		42	20
107-153	3000																		

CLAY MINERALOGY (7A2I, 7A3)

DEPTH-CM	X-RAY							DTA (AS PERCENT)
0-21	MT3	MI2	KK2	CL2	QZ1			KK10
33-51	MV3	MI2	KK1	CL2	QZ1			KK8
51-66	MV3	MI2	KK1	CL2	QZ1			KK8
84-107	VR2	MI3	MT1	CL1	QZ1	DL1	KK1	KK5

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

Pedon classification: Mollic Eutroboralf; fine, illitic
Series classification: Typic Eutroboralf; fine, illitic
Soil: Kent taxadjunct*
Soil Nos.: S70MI-16-1 (BSL Nos. 70B428-70B434)
Location: Cheboygan County, Michigan; NE 1/4, SE 1/4, NW 1/4 of Sec. 8, T37N, R1W.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 42° F., and the mean summer air temperature is about 64° F. Frost-free season is 140 days.
Vegetation and land use: Alfalfa, timothy, brome grass. Cropland.
Parent material: Calcareous silty clay till.
Physiography: Till plain.
Topography: Gently sloping. Gradient is 3 percent.
Drainage: Moderately well to well drained.
Ground water: Greater than 60 inches.
Erosion: Slight.
Permeability: Slow.
Described by: H. R. Sinclair, Jr. and S. Holcomb.

(Colors are for moist soil unless otherwise stated.)

Ap 428 0 to 21 cm (0 to 8 inches). Very dark grayish brown (10YR 3/2) fine sandy loam, gray (10YR 5/1) dry; moderate medium granular structure; friable; many roots; neutral; abrupt smooth boundary.

A2 429 21 to 33 cm (8 to 13 inches). Light brownish gray (10YR 6/2) fine sandy loam; few fine distinct reddish yellow (7.5YR 6/6) mottles; moderate medium granular structure; friable; common roots; mildly alkaline; abrupt wavy boundary.

IIB21t 430 33 to 51 cm (13 to 20 inches). Reddish brown (5YR 4/4) clay; strong very fine angular blocky structure; firm; common roots; reddish brown (5YR 4/3) continuous clay films; mildly alkaline; clear smooth boundary.

IIB22t 431 51 to 66 cm (20 to 26 inches). Reddish brown (5YR 5/4) silty clay; few fine distinct light brownish gray (10YR 6/2) mottles; moderate fine angular blocky structure; firm; common roots; reddish brown (5YR 5/3) continuous clay films; slight effervescence; moderately alkaline; clear smooth boundary.

IIB3 432 66 to 84 cm (26 to 33 inches). Reddish brown (5YR 5/4) silty clay; few fine distinct light olive gray (5Y 6/2) mottles; moderate medium prismatic separating to strong fine and medium angular blocky structure; firm; common roots; few light brownish gray (2.5Y 6/2) coatings on surfaces of peds; slight effervescence; moderately alkaline; clear smooth boundary.

IIC1 433 84 to 107 cm (33 to 42 inches). Reddish brown (5YR 5/4) silty clay; few fine distinct light olive gray (5Y 6/2) mottles; strong coarse prismatic separating to strong coarse angular blocky structure; very firm; common roots are on faces of peds; many light brownish gray (2.5Y 6/2) coatings on surfaces of peds; few black (10YR 2/1) iron-manganese stains on surfaces of peds; strong effervescence; moderately alkaline; sampling break.

IIC2 434 107 to 153 cm (42 to 60 inches). Reddish brown (5YR 5/4) silty clay; few fine distinct light olive gray (5Y 6/2) mottles; strong coarse prismatic separating to strong coarse angular blocky structure; very firm; few roots are on faces of peds; many light brownish gray (2.5Y 6/2) coatings on surfaces of peds; strong effervescence; moderately alkaline.

* This was sampled as Kent. This is a taxadjunct because it has a darker surface than is typical for the series.

1305A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL McBride taxadjunct SOIL Nos. S66Mich-67-1 LOCATION Osceola County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 66577 - 66583

Depth (in.)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 > 2 <76 Pct.	2-19 (Pct. of < 76mm)	19-76 (Pct. of < 76mm)
		Size class and particle diameter (mm) 3A1 — Pct. of < 2 mm																
0-2	A1	72.6	20.7	6.7	0.9	8.2	28.3	31.0	4.2	7.8	12.9	21.3	66.4			2	1	1
2-8	A2	72.3	22.9	4.8	0.6	5.6	21.6	33.4	11.1	9.0	13.9	35.1	61.2		0.97	6	5	1
8-13	B211r	73.0	19.9	7.1	0.7	5.9	22.7	33.4	10.3	7.5	12.4	32.5	62.7		0.98	4	4	0
13-29	A'2x	81.2	14.1	4.7	0.6	8.2	28.9	36.1	7.4	4.4	9.7	26.1	73.8		0.99	1	1	0
29-43	A'2x & B'21t	69.6	11.8	18.6	0.4	6.6	24.1	31.9	6.6	3.6	8.2	23.3	63.0		0.99	2	1	1
43-73	B'22t	67.9	12.2	19.9	0.3	7.1	23.8	30.3	6.4	3.7	8.5	22.2	61.5		0.99	2	2	tr.
73-111	C1	64.4	18.5	17.1	0.3	6.0	21.5	29.4	7.2	6.1	12.4	25.5	57.2			6	6	0

Depth (in.)	6A1e Organic carbon Pct.	6B2a Nitrogen Pct.	C/N		Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density: g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: 4B1c 1/10 bar Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.		4C1 WRD in/in		pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-2	6.7	0.36	19		-	0.2							17.2				4.8	6.0
2-8	0.60	0.04	15			0.3		1.36	1.37	.002	12.3	11.3	2.8		0.11		4.0	5.5
8-13	0.81[a]	0.07	12			0.5		1.52	1.53	.003	13.0	9.0	3.7		0.08		4.2	5.6
13-29	0.09					0.2		2.16	2.16	.000	5.9	4.4	1.0		0.07		4.5	6.5
29-43	0.08				tr.	0.5		1.79	1.82	.006	11.1	9.0	5.5		0.06		4.1	5.6
43-73	0.06				tr.	0.5		1.72	1.78	.012	11.7	10.2	5.9		0.07		4.1	5.8
73-111	0.02				9	0.3							5.6				6.2	7.7

Depth (in.)	Extractable bases 5B1c: 6N2e Ca	6Q2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations		6G1d Ext. Al		Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water		8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-2	10.5	1.8	tr.	0.4	12.7	8.0	20.7		0.1		3.09	0.03	2.57				61	
2-8	1.0	0.2	tr.	tr.	1.2	4.8	6.0		1.0		1.25	0.06	0.58				20	
8-13	1.0	0.3	tr.	tr.	1.3	8.9	10.2		1.6		1.44	0.07	0.52				13	
13-29	0.2	tr.	tr.	tr.	0.2	1.4	1.6		0.3		0.34	0.04	0.21				12	
29-43	2.2	1.4	tr.	0.2	3.8	3.9	7.7		1.2		0.41	0.03	0.30				49	
43-73	3.0	2.3	tr.	0.2	5.5	3.3	8.8		0.5		0.44	0.03	0.30				62	
73-111	9.6	3.4	tr.	0.1	13.1	-	13.1		0.1		0.77	0.02	0.33				100	

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int. Vm. - Mi.	Qtz.	Kl.	Gibbsite	
	7A2 X-ray					7A2			
0-2									
2-8	xxx	-	-	-	tr.	x	x		
8-13	-	-	x	-	xx	x	x		
13-29	-	-	x	x	x	xx	x		
29-43									
43-73	xx	tr.	-	x	x	xx	x		
73-111	-	tr.	-	x	xx	xx	xx		

a Rerun

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

USDA-SCS-BEATTSVILLE MD. 1966

Pedon classification: Typic Fragiboralf; coarse-loamy, mixed
Series classification: Alfic Fragiorthod; coarse-loamy, mixed, frigid
Soil: McBride, taxadjunct*
Soil Nos.: S66MI-67-1 (BSL Nos. 66577-66583)
Location: Osceola County, Michigan.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 45° F., and the mean summer air temperature is about 64° F. Frost-free season is 100-120 days.
Vegetation and land use: Aspen, hard maple, cherry and ash.
Parent material: Sandy loam till.
Physiography: Moraine.
Topography: Gently sloping. Gradient is 3 percent.
Drainage: Moderately well drained.
Ground water: Below 73 inches.
Erosion: Slight.
Permeability: Moderately rapid above the fragipan and slow in the pan.
Described by: H. Weber and R. Johnson.

(Colors are for moist soil unless otherwise stated.)

A1 577 0 to 5 cm (0 to 2 inches). Very dark gray (10YR 3/1) sandy loam; weak medium granular structure; very friable; medium acid; abrupt smooth boundary.

A2 578 5 to 20 cm (2 to 8 inches). Reddish brown (5YR 5/3) light sandy loam; weak medium subangular blocky structure; very friable; strongly acid; clear wavy boundary.

B2ir 579 20 to 33 cm (8 to 13 inches). Dark reddish brown (5YR 3/2) sandy loam; weak medium subangular blocky structure; friable; medium acid; clear wavy boundary.

A'2x 580 33 to 73 cm (13 to 29 inches). Grayish brown (10YR 5/2) representing 70 percent of the color and dark yellowish brown (10YR 4/4) representing 30 percent of the color, loamy sand; massive, vesicular; very hard, brittle when dry; slightly acid; gradual irregular boundary.

A'2x and B'21t 581 73 to 108 cm (29 to 43 inches). Light reddish brown (5YR 6/3) loamy sand representing the A'2 portion and dark reddish brown (5YR 3/4) sandy loam representing the B't portion; heavy clay flows in root channels and in pores; weak coarse subangular blocky structure, vesicular; very firm, brittle; medium acid; gradual irregular boundary.

B22t 582 108 to 183 cm (43 to 73 inches). Reddish brown (5YR 4/3) sandy loam; heavy clay flows on ped faces and in root channels; weak coarse subangular blocky structure; firm; medium acid; clear wavy boundary (Sampled with spade to 60 inches - auger sample from 60 to 73 inches)

C1 583 183 to 278 cm (73 to 111 inches). Reddish brown (5YR 4/3) heavy sandy loam; massive; friable; mildly alkaline. (Sampled with auger)

* This soil was sampled as McBride. It is a taxadjunct because it lacks the extractable Fe and Al required for a spodic horizon.

1657A

SOIL CLASSIFICATION-TYPIC HAPLUDALF
LOAMY-SKELETAL, MIXED, MESIC
SERIES - - - - - - -LEONI

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

SOIL NO - - - - - - S75MI-75-3 COUNTY - - - JACKSON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 760413-760418 APRIL 1979

DEPTH	HORIZON	(- - - PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B			FINE	(- - SAND				)	(- -SILT	- -)					)RATIO
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	SAND	INTR	FINE	NON-	8D1
		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005-	2-	II	CLAY	CO3-	15-
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	.10	.2- .02	TO CLAY	CLAY	BAR TO
CM		(- - -							PCT LT 2MM						- - -)	PCT	PCT	CLAY
000-027	AP	69.5	23.5	7.0	3.4	7.5	19.8	21.8	15.9	4.5	8.4	15.1		65.0		49		.73
027-033	A2	62.0	26.3	11.7	5.8	7.2	18.3	17.6	13.3	5.6	9.5	16.8		56.4		50		.43
033-046	B21T	57.7	16.1	26.2	15.5	9.2	17.1	14.1	12.4	4.9	5.9	10.2		52.8		59		.42
046-074	B22T	70.2	11.9	17.9	11.2	9.4	25.2	20.4	11.5	3.7	5.2	6.7		66.5		63		.43
074-108	B3	77.1	9.4	13.5	8.7	10.9	37.1	20.0	6.7	2.4	4.4	5.0		74.7		64		.46
108-132	C	79.7	15.0	5.3	3.6	33.8	25.7	8.8	6.6	4.8	6.8	8.2		74.9		68	5	.59

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)							(BULK DENSITY		)	(- - -WATER CONTENT			- - -)	CARBONATE		(- -PH - -)	
	VOL.	(- - - WEIGHT					- - -)	4A1D	4A1H	4D1	4B1C	4B1C	4B2	4C1	6E1B	3A1A	8C1A	8C1E
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD	LT	LT	1/1	1/2
	2	75				.074	PCT	BAR	DRY		BAR	BAR	BAR	CM/	2	.002	H2O	CACL
CM	PCT	PCT	(- - - PCT LT 75			- - -)	LT20	G/CC	G/CC		PCT	PCT	PCT	CM	PCT	PCT		
000-027	11	0	9	8	3	20	11	1.48	1.61	.021		21.9	5.1	.19			6.0	5.4
027-033	27	0	20	16	7	24	23						5.0				6.6	5.8
033-046	45	6	33	22	11	15	33	1.65	1.74	.009		16.0	11.1	.04			6.5	6.1
046-074	37	13	22	22	10	10	32	1.43	1.60	.018		23.2	7.7	.11			6.7	6.5
074-108	37	3	34	21	8	9	29						6.2		TR		7.0	6.7
108-132	52	5	18	47	23	3	70						3.1		25	0	8.0	7.0

DEPTH	(ORGANIC MATTER	)		IRON	PHOS	(- -EXTRACTABLE BASES 5B4A- -)					ACTY	AL	(CAT EXCH)		RATIO	RATIO	CA	(BASE SAT)	
	6A1A	6B1A	C/N	6C2B		6N2E	6O2D	6P2B	6Q2B		6H1A	6G1E	5A3A	5A6A	8D1	8D3	5F1	5C3	5C1
	ORGN	NITG		EXT	TOTL	CA	MG	NA	K	SUM	BACL	KCL	EXTB	NHAC	NHAC	CA	SAT	EXTB	NHAC
	CARB			FE						EXTB	TEA	EXT	ACTY		TO	TO	NHAC	ACTY	
CM	PCT	PCT		PCT	PCT	(- - -			-MEQ	/ 100	G- - -			- - -)	CLAY	MG	PCT	PCT	PCT
000-027	1.62	.146	11			6.9	1.0	.0	.1	8.0	4.2		12.2	9.2	1.31	6.9	75	66	87
027-033	.31	.050	6			5.9	.6	TR	TR	6.5	2.8		9.3	7.2	.62	9.8	82	70	90
033-046	.41	.044	9			12.4	1.3	TR	.2	13.9	4.7		18.6	15.7	.60	9.5	79	75	89
046-074	.20	.026	8			8.0	1.3	.1	.1	9.5	3.6		13.1	10.8	.60	6.2	74	73	88
074-108	.26	.028	9				1.8	TR	.1					7.6	.56				
108-132	.13	.016	8				1.1	.0	.0					3.1	.58				

DEPTH	(SATURATED PASTE)			NA	NA	SALT	GYP	(- - - - SATURATION EXTRACT 8A1-									- - - -)	ATTERBERG	
	8E1	8C1B	8A	5D2	5E	8D5	6F1A	8A1A	6N1B	6O1B	6P1B	6Q1B	6I1A	6J1A	6K1A	6L1A	6M1A	4F1	4F2
	REST	PH	H2O	ESP	SAR	TOTL		EC	CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3	LQID	PLST
	OHM-					SOLU		MMHOS/										LMIT	INDX
CM	CM		PCT	PCT		PPM	PCT	CM	(- - -				MEQ / LITER				- - -)	PCT	
000-027																			
027-033																			
033-046																			
046-074																		35A	18A
074-108																			
108-132	14000	8.1	18.8			40		.30	2.3	.7	.2	TR	0	2.1	0	0		22A	3A

CLAY MINERALOGY (7A2C)
033-46 MT2 VR2 MI2 KK2.
046-74 MT2 VR2 MI1 KK1.
COMMENTS - POORLY ORDERED CLAYS. MIXED LAYER CLAY MINERALS LIKELY PRESENT.
RELATIVE AMOUNTS - (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE - MT = MONTMORILLONITE MI = MICA KK = KAOLINITE VR = VERMICULITE
SAND MINERALOGY (7B1) PLACEMENT:MIXED
033-046 FNES - RE79 QZ72 OP2 FE1 CD2 GN1 AR1 FK5 BT7 FP4 CL4 HN1 VFNS - RE65 QZ53 OP8 FE2 CD2 FK12 BT13 CL5 HN2 EP1 MS1.(FNES-GRAINS COUNTED-333 AND VFNS-317 GRAINS COUNTED)
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: RE = RESISTANT MINERALS AR = AGGREGATES BT = BIOTITE CL = CHLORITE EP = EPIDOTE HN = HORNBLENDE
MS = MUSCOVITE OP = OPAQUE QZ = QUARTZ FK = POTASSIUM FELDSPAR FP = PLAGIOCLASE FELDSPAR
CD = CHALCEDONY GN = GARNET.

(A) BY SOIL MECHANICS LABORATORY, USDA-SCS, LINCOLN, NE.

Pedon classification: Typic Hapludalf; loamy-skeletal, mixed, mesic
Series classification: (Same)
Soil: Leoni
Soil Nos.: S75MI-075-3 (NSSL Nos. 760413-760418)
Location: Jackson County, Michigan; 460 feet south and 2240 feet east of the northwest corner of Sec. 23, T2S, R1W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 68° F. Frost-free season is 145-155 days.
Vegetation and land use: Bromegrass. Idle land.
Parent material: Gravelly and cobbly outwash sands.
Physiography: Outwash plain.
Topography: Gently undulating. Gradient is 4 percent.
Drainage: Well drained.
Ground water: Below 52 inches.
Erosion: Slight.
Permeability: Moderate in the solum and rapid or very rapid in the IIC horizon.
Described by: N. Stroesenreuther and R. Engel.

(Colors are for moist soil unless otherwise stated.)

Ap 413 0 to 27 cm (0 to 11 inches). Very dark grayish brown (10YR 3/2) gravelly sandy loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; 20 percent pebbles; medium acid; abrupt smooth boundary.

A2 414 27 to 33 cm (11 to 13 inches). Dark brown to brown (7.5YR 4/4) gravelly sandy loam; moderate medium subangular blocky structure; friable; 25 percent pebbles; neutral; clear wavy boundary.

B21t 415 33 to 46 cm (13 to 18 inches). Dark brown to brown (7.5YR 4/4) gravelly sandy clay loam; moderate medium subangular blocky structure; firm; 35 percent pebbles, 3 percent cobblestones; slightly acid; gradual wavy boundary.

B22t 416 46 to 74 cm (18 to 29 inches). Dark brown to brown (7.5YR 4/4) gravelly sandy loam; moderate medium subangular blocky structure; firm; 30 percent pebbles, 10 percent cobblestones; neutral; clear wavy boundary.

B3 417 74 to 108 cm (29 to 42 inches). Dark brown to brown (7.5YR 4/4) gravelly sandy loam; weak medium subangular blocky structure; friable; 35 percent pebbles, 3 percent cobblestones; neutral; abrupt irregular boundary.

C 418 108 to 132 cm (42 to 52 inches). Dark yellowish brown (10YR 4/4) gravelly loamy sand; single grained; loose; 75 percent pebbles, 5 percent cobblestones; slight effervescence; moderately alkaline.

1249A

SOIL CLASSIFICATION-TYPIC HAPLUDALF
FINE, ILLITIC, MESIC
SERIES - - - - - - -KENT TAXADJUNCT

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

SOIL NO - - - - - - S70MI-54-1 COUNTY - - - MECOSTA

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 708435-708443

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B: SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR SILT .2-.02	FINE CLAY TO CLAY	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
		PCT LT 2MM																
0-5	A1	34.5	42.0	23.5	4.9	.3	3.3	11.2	14.8	4.9	12.0	30.0		29.6	24.0	21	24	.41
5-13	A2	33.4	41.8	24.8	5.5	.5	2.8	10.7	14.1	5.3	12.2	29.6		28.1	24.1	22	25	.36
13-26	B&A	20.5	38.0	41.5	15.1	.1	1.4	6.3	9.0	3.7	9.4	28.6		16.8	17.4	36	42	.31
26-39	B21T	7.2	29.8	63.0	28.6	.1	.5	2.3	3.1	1.3	4.4	25.4		5.9	7.2	45	63	.32
39-53	B22T	2.1	37.4	60.5	21.1		.1	.6	.8	.6	4.2	33.2		1.5	5.2	35	61	.27
53-66	B23T	.9	44.5	54.6	15.3		.1	.1	.3	.4	3.2	41.3		.5	3.8	28	46	.32
66-84	B3	.9	44.9	54.2	12.1	.1	.1	.1	.3	.3	3.1	41.8		.6	3.6	22	40	.30
84-119	C1	1.3	40.5	58.2	13.0	.3	.1	.3	.4	.2	2.2	38.3		1.1	2.6	22	40	.29
119-160	C2	.8	41.0	58.2	12.6	.2	.2	.1	.2	.1	1.4	39.6		.7	1.6	22	40	.30

DEPTH CM	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2: VOL. GT 2 PCT	GT 75 PCT	75-20	20-5	5-2	LT .074	20-2 PCT LT20	BULK DENSITY: 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	WATER CONTENT: 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE: 6E1B LT 2 PCT	3A1A LT .002 PCT	PH: 8C1A 1/1 H2O	8C1E 1/2 CACL
			PCT LT 75															
0-5	0	0	0	0	0	67		1.13	1.20	.02		14.6	9.6	.61			5.2	5.2
5-13	1	0	0	2	0	72		1.54	1.59	.01		18.9	9.0	.15			5.5	5.1
13-26	1	0	2	0	0	83		1.71	1.74	.01		16.6	12.9	.06			5.6	5.1
26-39	0	0	0	0	0	94		1.37	1.73	.08		30.2	19.9	.14			5.5	5.3
39-53	0	0	0	0	0	99		1.40	1.72	.07		28.6	16.4	.17	6		7.6	7.5
53-66	0	0	0	0	0	99		1.47	1.78	.07		26.8	17.6	.14	28	9	8.0	7.8
66-84	0	0	0	0	0	99		1.62	1.87	.05		21.8	16.2	.09	36	14	8.2	7.9
84-119	0	0	0	0	0	99		1.63	1.84	.04		21.8	16.7	.08	41	18	8.4	7.9
119-160	0	0	0	0	0	99		1.64	1.84	.04		22.2	17.6	.08	41	18	8.3	8.0

DEPTH CM	ORGANIC MATTER: 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	EXTRACTABLE BASES 5B4A: 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB / 100	ACTY 6H1A BACL TEA G	AL 6G1E KCL EXT	CAT EXCH: 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	BASE SAT: 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						MEQ													
0-5	3.99					10.3	2.3	TR	.2	12.8	13.0		25.8	17.2	.73	4.5	60	50	74
5-13	1.35					5.9	1.9	TR	.2	8.0	7.7		15.7	11.4	.46	3.1	52	51	70
13-26	.56					7.3	4.7	TR	.3	12.3	7.8		20.1	15.7	.38	1.6	46	61	78
26-39	.56					11.6	10.4	.1	.6	22.7	9.4		32.1	26.5	.42	1.1	44	71	86
39-53	.48							.1	.5		1.6			23.3	.39				
53-66	.33							.1	.4					12.0	.22				
66-84	.27							.1	.3					13.8	.25				
84-119	.27							.1	.3					12.0	.21				
119-160	.31							.1	.3					11.2	.19				

DEPTH CM	SATURATED PASTE: 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	SATURATION EXTRACT 8A1: 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG: 4F1 LQID LMIT PCT	4F2 PLST INDX
									MEQ / LITER										
0-5																			
5-13																			
13-26																			
26-39																			
39-53																			
53-66																			
66-84																		38	16
84-119																			
119-160	3500																		

CLAY MINERALOGY (7A2I, 7A3)

DEPTH-CM	X-RAY								DTA (AS PERCENT)
0-5	VR2	MI2	KK2	MT1	CL1	QZ1			KK15
26-39	MV3	MI2	KK2	CL1	QZ1				KK15
53-66	MV3	MI2	DL2	CL1	QZ1	KK1			KK8
84-119	MV2	MI2	DL1	CL1	QZ1	KK1	CA1		KK5

RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
QZ = QUARTZ MV = MONTMORILLONITE-VERMICULITE VR = VERMICULITE CA = CALCITE

Pedon classification: Typic Hapludalf; fine, illitic, mesic
Series classification: Typic Eutroboralf; fine, illitic
Soil: Kent taxadjunct*
Soil Nos.: S70MI-54-1 (BSL Nos. 70B435-70B443)
Location: Mecosta County, Michigan; 760 feet east and 2277 feet north of the SW corner of Sec. 28, T16N, R10W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 46° F., and the mean summer air temperature is about 67° F. Frost-free season is 130-140 days.
Vegetation and land use: Apple trees, bluegrass, thistles, Queen Anne's lace. Fruit production.
Parent material: Calcareous glacial clayey till.
Physiography: Till plain.
Topography: Gently sloping. Gradient is 4 percent.
Drainage: Well or moderately well drained.
Ground water: Greater than 60 inches.
Erosion: Slight.
Permeability: Slow.
Described by: H. R. Sinclair, Jr. and R. Larson.

(Colors are for moist soil unless otherwise stated.)

A1 435 0 to 5 cm (0 to 2 inches). Very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; moderate fine and medium granular structure; friable; many roots; 5 percent coarse fragments; strongly acid; clear smooth boundary.

A2 436 5 to 13 cm (2 to 5 inches). Dark grayish brown (10YR 4/2) loam; moderate fine subangular blocky structure; friable; many roots; dark gray (10YR 4/1) staining on surfaces of peds in upper part of this horizon; 5 percent coarse fragments; strongly acid; clear irregular boundary.

B&A 437 13 to 26 cm (5 to 10 inches). Yellowish red (5YR 4/8) clay (60 percent) and dark grayish brwon (10YR 4/2) and grayish brown (10YR 5/2) loam (40 percent), light gray (10YR 7/2), dry interfingering, coatings on surfaces of peds, and along worm and root channels; yellowish red peds have dark grayish brown and grayish brown materials more than 2 mm thick on vertical faces between abutting peds (more than 15 percent of matrix), vertical extension is through horizon, more than 60 percent of the peds covered with skeletons; moderate fine and medium subangular blocky structure; B is firm, A is friable; common roots; many reddish brown (5YR 5/4) clay films on surface of peds; 5 percent coarse fragments; medium acid; clear irregular boundary.

B21t 438 26 to 39 cm (10 to 15 inches). Reddish brown (5YR 4/4) clay and dark grayish brown (10YR 4/2) loam, light gray (10YR 7/2), dry interfingering, coatings on surfaces of peds and along worm and root channels, reddish brown peds have dark grayish brown material less than 1 to 10 mm thick on vertical faces between abutting peds, 5 to 10 mm thickness occupies 8 percent horizontal volume; weak coarse prismatic separating to moderate very fine angular blocky structure; firm; common roots; continuous reddish brown (5YR 4/3) clay films on surfaces of peds; 5 percent coarse fragments; strongly acid; clear wavy boundary.

B22t 439 39 to 53 cm (15 to 21 inches). Reddish brown (5YR 4/4) clay; strong coarse prismatic separating to moderate very fine angular blocky structure; firm; common roots; continuous reddish brwon (5YR 4/3) clay films; many slickensides, 60 degrees; 5 percent coarse fragments; mildly alkaline; clear wavy boundary.

B23t 440 53 to 66 cm (21 to 26 inches). Reddish brown (5YR 4/4) silty clay; strong coarse prismatic separating to moderate very fine angular blocky structure; firm; few roots; continuous reddish brown (5YR 5/3) clay films; many slickensides, 60 degrees; 5 percent coarse fragments; slight effervescence; moderately alkaline; clear wavy boundary.

B3 441 66 to 84 cm (26 to 33 inches). Brown (10YR 5/3) silty clay, few grayish brown (10YR 5/2) reduced color on surfaces of peds; few fine distinct yellowish brown (10YR 5/8) mottles; strong coarse prismatic separating to moderate very fine and fine angular blocky structure; firm; few roots; continuous reddish brwon (5YR 5/3) clay films; brown (7.5YR 7/2) secondary lime on surfaces of peds; 5 percent coarse fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

C1 442 84 to 119 cm (33 to 47 inches). Brown (7.5YR 5/2) silty clay; few olive gray (5Y 5/2) reduced color on surfaces of peds; strong coarse prismatic separating to moderate very fine to medium angular blocky structure; firm; few roots; pinkish gray (7.5YR 7/2) secondary lime on surfaces of peds; 5 percent coarse fragments; strong effervescence; moderately alkaline; sampling break.

C2 443 119 to 160 cm (47 to 64 inches). Brown (7.5YR 5/2) silty clay; common olive gray (5Y 5/2) reduced color on surfaces of peds; strong coarse prismatic separating to moderate very fine and medium angular blocky structure; firm; pinkish gray (7.5YR 7/2) secondary lime on surfaces of peds; 5 percent coarse fragments; strong effervescence; moderately alkaline.

* This was sampled as Kent. It is a taxadjunct because it has a warmer climate than typical for the series.

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Kibbie taxadjunct SOIL Nos. S69Mich-81-2 LOCATION Washtenaw County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 69B540 - 69B548

Depth cm	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand Very coarse (2-1)	Sand Coarse (1-0.5)	Sand Medium (0.5-0.25)	Sand Fine (0.25-0.1)	Sand Very fine (0.1-0.05)	Silt (0.05-0.02)	Silt Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<0.074	3B2 Cm	Coarse fragments 3B1 2A2 > 2 Pct.	2-20 (Pct. of < 75 mm)	20-75 (Pct. of < 75 mm)
		Pct. of < 2 mm																
0-25	Ap	54.0	34.7	11.3	2.5	8.5	16.9	19.2	6.9	9.4	25.3	24.9	47.1	49.7	0.98	2	2	0
25-36	B21t	37.6	43.6	18.8	2.4	6.2	10.6	13.1	5.3	11.5	32.1	22.9	32.3	65.3	0.98	4	4	0
36-53	B22t	20.1	51.1	28.8	1.2	3.9	5.6	6.2	3.2	11.3	39.8	17.2	16.9	81.8	0.97	4	4	0
53-82	B23t	4.6	63.6	31.8	0.6	0.8	1.1	1.2	0.9	6.9	56.7	8.4	3.7	96.0	0.99	1	1	0
82-99	IIB3	4.3	86.9	8.8	0.1	0.2	0.2	0.5	3.3	42.9	44.0	46.8	1.0	98.7	1.00	tr.	tr.	0
99-114	IIIC1	5.6	73.2	21.2	0.3	0.4	0.2	0.7	4.0	17.4	55.8	22.0	1.6	97.4	1.00	1	1	0
114-132	IVC2	66.4	32.0	1.6	0.0	0.1	0.1	14.6	51.6	27.7	4.3	93.3	14.8	64.7	1.00	0	0	0
132-147	VC3	6.6	86.0	7.4	0.2	0.4	0.5	1.2	4.3	33.0	53.0	38.1	2.3	96.9	1.00	1	1	0
147-153+	VIC4	4.0	84.1	11.9	0.1	0.2	0.3	0.9	2.5	26.1	58.0	29.1	1.5	98.0	1.00	0	0	0

Depth cm	6A1a Organic carbon Pct.	Nitrogen Pct.	C/N		6E1d Carbonate as $CaCO_3$ Pct.	Ext. iron as Fe Pct.	Bulk density g/cc	4A1d ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohms-cm 60°F	4C1 WRD in/in	pH 8C1e (1:2) $CaCl_2$	8C1c (1:1) KCl	8C1a (1:1) H_2O
0-25	1.16							1.73	1.77	0.01		14.5	5.0		0.16	6.5	6.0	6.9
25-36	0.51							1.69	1.80	0.02		15.9	7.4		0.14	5.9	5.2	6.4
36-53	0.52							1.59	1.81	0.04		19.9	10.9	4400	0.14	6.0	5.3	6.4
53-82	0.65							1.50	1.85	0.07		23.8	13.7		0.15	6.7	6.0	7.1
82-99	0.51				29			1.48	1.52	0.01		23.8	5.7	5200	0.26	7.6	7.0	8.1
99-114	0.39				9			1.52	1.59	0.02		22.5	11.4		0.17	7.6	7.1	7.8
114-132	0.26				31			1.52	1.51	0.00		8.0	1.8		0.09	7.6	7.5	8.3
132-147	0.38				30			1.62	1.67	0.01		21.4	5.1		0.26	7.5	7.4	8.2
147-153+	0.51				35			1.47	1.52	0.01		25.8	6.8		0.28	7.7	7.5	8.1

Depth cm	Extractable bases 5B4a 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC 5A3a Sum cations	5A1a NH_4OAc	6G1d Ext. Al	3A1b Fine clay <0.0002 mm Pct.	Ratios to clay Fine clay	CEC Sum	Ext. iron	8D1 15-bar water	8D3 Ca/Mg		Base saturation 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-25	6.8	2.0	tr.	tr.	8.8	3.3	12.1	9.4		4.2	0.37	1.07		0.44			73	94
25-36	7.6	1.8	tr.	tr.	9.4	4.9	14.3	10.6		8.8	0.47	0.76		0.39			66	89
36-53	11.7	2.6	tr.	tr.	14.3	6.4	20.7	15.8		14.9	0.52	0.72		0.38			69	91
53-82	14.2	3.2	tr.	tr.	17.4	8.3	25.7	17.2		16.1	0.51	0.81		0.43			68	-
82-99			tr.	tr.				5.7		4.7	0.53			0.65				
99-114			tr.	tr.				12.3		8.7	0.41			0.54				
114-132			tr.	tr.				1.8		1.6	1.00			1.12				
132-147			tr.	tr.				4.3		3.2	0.43			0.69				
147-153+			tr.	tr.				5.1		4.2	0.35			0.57				

Depth cm	a/ Clay fraction mineralogy 7A1b, d — 7A2 X-ray: Total clay b/	Fine clay b/
0-25 25-36 36-53	VR3,MI3,VM3,KK2,MT1,CL1,QZ1	VR3,MI3,MT3,KK2,MV2,VM2
53-82 82-99 99-114	MI4,VR3,MT3,KK2,VM2,VC2,QZ1	VR3,MI3,MT3,KK2,VM2
114-132 132-147 147-153+		

a/ Mineral code
- VR = vermiculite
- MI = mica
- MT = montmorillonite
- KK = kaolinite
- CL = chlorite
- QZ = quartz
- VM = vermiculite/mica
- MV = montmorillonite/vermiculite
- VC = vermiculite/chlorite

b/ Approximate weight fractions (X-ray)
- 5 = more than half
- 4 = half to one-third
- 3 = one-third to one-fifth
- 2 = one-fifth to one-twentieth
- 1 = less than one-twentieth

Pedon classification: Aquollic Hapludalf; fine-silty, mixed, mesic
Series classification: Aquollic Hapludalf; fine-loamy, mixed, mesic
Soil: Kibbie taxadjunct*
Soil Nos.: S69MI-81-2 (BSL Nos. 69B540-69B548)
Location: Washtenaw County, Michigan; SW 1/4, NW 1/4, SE 1/4 of Sec. 28, T2S, R5E.
Climate: Average annual precipitation is about 30 inches. Mean annual air temperature is about 49° F., and the mean summer air temperature is about 70° F. Frost-free season is 160-165 days.
Vegetation and land use: Red clover. Cropland.
Parent material: Stratified lacustrine very fine sands, silts and clays.
Physiography: Lake plain.
Topography: Nearly level. Gradient is 2 percent.
Drainage: Somewhat poorly drained.
Ground water: At 60 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: N. Stroesenreuther and R. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap 540 0 to 25 cm (0 to 10 inches). Very dark grayish brown (10YR 3/2) and grayish brown (10YR 5/2) dry fine sandy loam; moderate medium granular structure; friable; abundant roots; neutral; abrupt smooth boundary.

B21t 541 25 to 36 cm (10 to 14 inches). Yellowish brown (10YR 5/4) loam; moderate medium subangular blocky parting to fine subangular blocky structure; friable; few patchy brown (10YR 4/3) clay films on vertical ped faces; plentiful fine roots; slightly acid; gradual wavy boundary.

B22t 542 36 to 53 cm (14 to 21 inches). Yellowish brown (10YR 5/4) silty clay loam; few fine faint yellowish brown (10YR 5/6) and few fine faint grayish brown (10YR 6/2) mottles; moderate medium angular blocky structure; firm; thin brown (10YR 4/3) clay coatings on most vertical and horizontal ped faces; few fine roots; slightly acid; clear wavy boundary.

B23t 543 53 to 82 cm (21 to 32 inches). Yellowish brown (10YR 5/6) silty clay loam; many fine distinct light grayish brown (10YR 6/2) and common coarse faint yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; thick brown (10YR 4/3) clay films on vertical ped faces; few fine rots; neutral; abrupt irregular boundary.

IIB3 544 82 to 99 cm (32 to 39 inches). Yellowish brown (10YR 5/4) silt; common medium faint (10YR 5/6), few medium prominent light gray (5Y 6/1) and few medium distinct grayish brown (10YR 5/2) mottles; weak medium angular blocky structure; friable; slight effervescence; moderatly alkaline; abrupt wavy boundary.

IIIC1 545 99 to 114 cm (39 to 45 inches). Light grayish brown (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6-5/8) mottles and light gray (10YR 7/1) seams of secondary $CaCO_3$; weak medium platy structure; friable; few very thin lenses of very fine sand; strong effervescence; moderately alkaline; abrupt smooth boundary.

IVC2 546 114 to 132 cm (45 to 52 inches). Pale brown (10YR 6/3) very fine sandy loam; common medium distinct yellowish brown (10YR 5/6), grayish brown (10YR 5/2) and light gray (10YR 6/1) mottles; weak coarse subangular blocky structure; very friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

VC3 547 132 to 147 cm (52 to 58 inches). Light yellowish brown (10YR 6/4) and yellowish brown (10YR 5/6) silt; gray (5Y 6/1-5/1) coatings on horizontal faces; weak medium platy structure; few 1/8 inch diameter $CaCO_3$ concretions; strong effervescence; moderately alkaline; abrupt smooth boundary.

VIC4 548 147 to 153+ cm (58 to 60+ inches). Yellowish brown (10YR 5/4) silt; weak thin platy structure; friable; few Mn concretions around old root channels; few light gray (10YR 7/1) secondary $CaCO_3$ concretions; strong effervescence; moderately alkaline.

* This was sampled as Kibbie. It is a taxadjunct because it has less than 15 percent, by weight, particles that are fine sand or coarser.

1354A

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Locke taxadjunct SOIL Nos. S71Mich-50-1 LOCATION Macomb County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 71B383 - 71B389

	Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1																	
			Total			Sand					Silt			Clay					Coarse fragments		
			Sand (2-0.05)	Silt (0.05-0.002)	Clay <0.002	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Coarse (.05-0.02)	Fine (0.02-0.002)	Coarse (0.002-0.0002)	3A1b Fine <0.0002	3A1a Carbonate <0.002	(0.2-0.02)	(2-0.1)	<0.074	75-20	20-5	5-2
			Pct. of <2mm																Pct. of >75mm		
383	0-23	Ap	63.5	24.5	12.0	7.3	11.1	17.5	20.0	7.6	11.2	13.3		4.7		28.2	55.9	40.4	3	4	5
384	23-26	A&B	73.0	20.2	6.8	6.0	10.1	20.3	26.5	10.2	11.0	9.2		3.2		34.5	62.8	32.1	-	1	4
385	26-36	B&A	70.7	20.6	8.7	9.9	10.9	18.6	22.3	8.9	11.9	8.7		3.7		31.6	61.8	33.9	-	4	5
386	36-53	B21t	56.1	31.3	12.6	5.1	6.8	12.9	21.4	9.9	17.5	13.8		5.3		39.0	46.2	48.9	1	5	3
387	53-74	B22t	59.1	27.3	13.6	3.6	6.5	12.7	23.3	12.9	12.5	14.8		5.6		38.6	46.2	47.4	3	5	2
388	74-124	B3	54.3	34.1	11.6	5.1	7.5	10.8	21.1	9.9	17.6	16.5		3.9		39.7	44.4	49.7	6	4	3
389	124-155	C1	54.9	34.5	10.6	5.5	7.1	10.2	19.8	12.4	16.6	17.9		3.0		40.4	42.5	51.8	7	6	4

	Depth (cm)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.		Dit-cit ext. 6C2b Fe Pct.	6G7a Al Pct.			4F1 Liquid limit	4F Plasticity index	3H2 Cm	8E1 Resistivity Ohms/cm	Bulk density 4A1e 1/3 bar g/cc	4A1h oven dry g/cc	Linear extens. 4H1 LE (whole soil) Pct.	4H1 LE (<2mm) Pct.	Water content 4B1c 1/3 bar Pct.	4B2 15 bar Pct.	MRD 4C1 (whole soil) in/in	4C1 (<2mm) in/in
383	0-23	2.98									0.93		1.44	1.50	1		16.5	8.4	0.11	
384	23-26	0.40																3.5		
385	26-36	0.28								N.P.	0.94		1.66	1.73	1		9.8	4.3	0.09	
386	36-53	0.25									0.94		1.68	1.73	1		11.2	5.8	0.09	
387	53-74	0.34									0.94		1.57	1.61	1		13.3	6.3	0.10	
388	74-124	0.27									0.90		2.04	2.02	-		8.5	5.3	0.06	
389	124-155	0.20								N.P.	0.86	4,000	2.03	2.07	1		10.1	4.6	0.10	

	Depth (cm)	Extractable bases 5B4a 6H2e Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	KCl ext. 6G1e Al	CEC 5A3a Sum cations	5A6 NH_4OAc	Sum bases plus KCl Al	Base saturation 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.	8E1e Carbonate as $CaCO_3$ Pct.	pH 8C1c (1:1) KCl	8C1e (1:2) $CaCl_2$	8C1a (1:1) H_2O	Ratios to total clay	CEC sum	Fine clay	15-bar water
		meq/100 g																			
383	0-23	14.9	2.0	0.1	0.1	17.1	3.9		21.0	18.0		81	534	1	6.4	6.7	7.0				
384	23-26	5.3	0.9	tr	tr.	6.2	1.4		7.6	5.5		82	214	tr.	6.5	7.0	7.4				
385	26-36	6.6	1.4	tr.	tr.	8.0	1.0		9.0	5.3		89	170	2	7.1	7.5	7.7				
386	36-53	7.2	1.6	0.1	0.1	9.0	1.3		10.3	6.5		87	180	2	7.0	7.4	7.8				
387	53-74	7.6	1.9	tr.	0.1	9.6	2.8		12.4	6.3		77	188	2	7.0	7.5	7.8				
388	74-124	32.4	1.0	0.1	0.1	33.6				4.5				18	7.4	7.6	8.0				
389	124-155	32.0	1.3	tr.	0.1	33.4				3.2				22	7.5	7.6	8.2				

Depth (cm)	Clay fraction analysis 7A1b, d: <0.002 mm 7A2 X-ray a/b/	7A3 DTA Pct.	Sand and silt fraction analysis 7A1: 7B1 Petrographic b/ Pct.	total weath.
0-23	VR4,MI3,KK3,VM2,MT1,QZ1			
-				
-				
36-53	MI4,VR3,KK2,VM2,MT2,QZ1			
-				
-				
124-155	MI5,VR3,KK2,VM1,QZ1			

a/ Relative amounts (X-ray): 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.

b/ Mineral code: VR= vermiculite, MI= mica, MT= montmorillonite, VM= vermiculite-mica, interstratified, KK= kaolinite, QZ= quartz

Pedon classification: Glossaquic Hapludalf; coarse-loamy, mixed, mesic
Series classification: Aquollic Hapludalf; fine-loamy, mixed, mesic
Soil: Locke taxadjunct*
Soil Nos.: 871MI-50-1 (BLS Nos. 71B383-71B389)
Location: Macomb County, Michigan; SE 1/4 of Sec. 2, T4N, R13E.
Climate: Average annual precipitation is about 30 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 70° F. Frost-free season is 165 days.
Vegetation and land use: Alfalfa, red clover. Cropland.
Parent material: Sandy loam glacial till.
Physiography: Ground moraine.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat poorly.
Ground water: Greater than 60 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: H. R. Sinclair, Jr. and N. Stroesenreuther.

(Colors are for moist soil unless otherwise stated.)

Ap 383 0 to 23 cm (0 to 9 inches). Very dark gray (10YR 3/1) sandy loam, dark gray (10YR 4/1) dry; cloddy parting to moderate fine and medium granular structure; friable; many fine and common medium and coarse roots; 5 percent gravel; neutral; abrupt smooth boundary.

A&B 384 23 to 26 cm (9 to 10 inches). Yellowish brown (10YR 5/4) loamy sand, very pale brown (10YR 7/3) dry (A part) surrounding yellowish brown (10YR 5/4) fine sandy loam peds (B part, 20 percent by volume); moderate fine granular structure; friable; common fine to coarse roots; no clay films; Ap material mixed in this horizon by organisms; 5 percent gravel, less than 1 percent cobbles; mildly alkaline; clear broken boundary.

B&A 385 26 to 36 cm (10 to 14 inches). Dark yellowish brown (10YR 4/4) sandy loam (B part) and yellowish brown (10YR 5/4) sandy loam, very pale brown (10YR 7/3) dry (A part) coatings on surfaces of peds and along root and worm channels; dark yellowish brown peds have yellowish brown material typically 2 to 10 mm thick on vertical faces between abutting peds (20 percent by volume), vertical extension is through the horizon; moderate fine and medium subangular blocky structure; friable; common fine to coarse roots; common brown (10YR 4/3 and 5/3) clay films on vertical and horizontal surfaces of peds; 5 percent gravel, less than 1 percent cobbles; mildly alkaline; clear wavy boundary.

B21t 386 36 to 53 cm (14 to 21 inches). Dark yellowish brown (10YR 4/4) fine sandy loam, dark yellowish brown (10YR 4/4) crushed; common fine distinct grayish brown (10YR 5/2) yellowish brown (10YR 5/6 and 5/8), brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky parting to moderate fine subangular blocky structure; friable; common fine to coarse roots; many brown (10YR 4/3) clay films on vertical and horizontal surfaces of peds; black (N 2/0) iron-manganese aggregations; 5 percent gravel, less than 1 percent cobbles; mildly alkaline; gradual wavy boundary.

B22t 387 53 to 74 cm (21 to 27 inches). Dark yellowish brown (10YR 4/4) fine sandy loam, yellowish brown (10YR 5/4) crushed; many (50 percent) fine distinct grayish brown (10YR 5/2), yellowish brown (10YR 5/6 and 5/8), brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; few roots in interiors of peds and common roots on surfaces of peds; common grayish brown (10YR 5/2) clay films on vertical and horizontal surfaces of peds; black (N 2/0) iron-manganese aggregations; 5 percent gravel, less than 1 percent cobbles; mildly alkaline; clear wavy boundary.

B3 388 74 to 124 cm (27 to 49 inches). Mottled with 40 percent light gray (10YR 6/1 and N 6/0) and with 60 percent yellowish brown (10YR 5/4 and 5/6) and strong brown (7.5YR 5/6) sandy loam; massive (very weak very coarse prismatic structure) parting to weak fine and medium platy structure; friable; few roots in plates, few roots on surfaces of plates, common and many roots on surfaces of prism; black (N 2/0) iron-manganese aggregations; 15 percent pebbles, less than 1 percent cobbles; moderately alkaline; slight effervescence, gradual smooth boundary.

C1 389 124 to 155 cm (49 to 61 inches). Yellowish brown (10YR 5/4) sandy loam; massive parting to weak fine and medium platy structure; friable; few roots in peds, few roots on surfaces of plates, common and many roots on surfaces of prism; black (N 2/0) iron and manganese aggregations; 15 percent pebbles, less than 1 percent cobbles; moderately alkaline; slight effervescence.

* It is a taxadjunct because of the lower average clay percentage of the argillic horizon and the presence of interfingering.

1293A

SOIL CLASSIFICATION-GLOSSAQUIC HAPLUDALF
COARSE-LOAMY, SILICEOUS, MESIC
SERIES - - - - - - -TEASDALE,

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

SOIL NO - - - - - - S75MI-75-1 COUNTY - - - JACKSON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 760400-760405 APRIL 1979

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM) SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	FINE SAND VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	SILT FNSI .02-.002	VFSI .002-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
000-022	AP	58.5	31.9	9.6	3.1	3.2	6.9	15.0	23.0	10.4	10.3	21.6		48.1		32		.54
022-034	A2	57.6	31.9	10.5	3.7	3.3	7.1	14.8	22.4	10.0	9.1	22.8		47.6		35		.42
034-061	B&A	53.3	35.1	11.6	4.6	2.9	6.4	13.4	20.6	10.0	12.3	22.8		43.3		40		.39
061-109	B21T	67.3	16.8	15.9	8.1	4.0	7.6	14.7	26.2	14.8	7.4	9.4		52.5		51		.40
109-140	B22T	66.3	15.4	18.3	10.1	3.5	8.4	16.0	26.6	11.8	5.2	10.2		54.5		55		.43
140-165	C	71.4	17.9	10.7	4.8	7.6	11.1	16.2	25.9	10.6	6.3	11.6		60.8		45	11	.43

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	GT 75 PCT	WEIGHT 75-20 (PCT LT 75)	20-5	5-2	LT .074	20-2 PCT LT20	(BULK DENSITY) 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	(WATER CONTENT) 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	(CARBONATE) 6E1B LT 2 PCT	3A1A LT .002 PCT	(PH) 8C1A 1/1 H2O	8C1E 1/2 CACL
000-022	5	2	3	4	2	40	7	1.21	1.40	.047		32.4	5.2	.31			5.5	5.2
022-034	5	1	1	5	2	44	6						4.4				5.5	4.9
034-061	9	5	5	4	1	45	6	1.56	1.66	.017		17.1	4.5	.16			5.2	5.0
061-109	10	2	3	9	3	35	11	1.59	1.69	.017		16.5	6.4	.14			5.3	5.1
109-140	8	2	3	5	3	35	9	1.62	1.66	.007		14.1	7.9	.09			6.3	6.0
140-165	15	5	5	10	5	27	16						4.6		26	0	8.0	7.0

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA (MEQ)	6O2D MG	6P2B NA	6Q2B K	SUM EXTB / 100	ACTY 6H1A BACL TEA G-	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	PATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
000-022	1.29	.104	12			4.4	.6	.0	.1	5.1	6.1		11.2	8.6	.90	7.3	51	46	59
022-034	.26	.039	7			2.5	.3	.0	.0	2.8	4.2		7.0	5.2	.50	8.3	48	40	54
034-061	.19	.032	6			2.6	.4	.0	.0	3.0	4.5		7.5	5.6	.48	6.5	46	40	54
061-109	.20	.024	8			4.5	1.6	TR	TR	6.1	4.5		10.6	7.9	.50	2.8	57	58	77
109-140	.27	.027	10			6.9	2.3	TR	.1	9.3	3.0		12.3	11.6	.63	3.0	59	76	80
140-165	.20	.013	15				1.1	.0	.0					3.1	.29				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 8A1A EC MMHOS/CM	6N1B CA (MEQ / LITER)	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
000-022																			
022-034																			
034-061																			
061-109																		22A	5A
109-140	6400	6.6	32.0			40		.21	1.2	.5	.2	TR	0	4.4	0	.6			
140-165																		14A	1A

SAND MINERALOGY (7B1) PLACEMENT:SILICEOUS.
061-109 FNES - RE96 QZ92 FE2 AR2 FK4 BT VFNS - RE86 QZ81 FE2 AR2 GN1 FK11 BT2 CL1 MS.
109-140 FNES - RE94 QZ90 FE1 AR1 CD1 GN1 FK4 CL2 VFNS - RE77 QZ72 CD2 FE2 OP1 FK10 EP2 CL2 BT1.
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: RE = RESISTANT MINERALS AR = AGGREGATES BT = BIOTITE CL = CHLORITE EP = EPIDOTE MS = MUSCOVITE
OP = OPAQUE QZ = QUARTZ FK = POTASSIUM FELDSPAR CD = CHALCEDONY GN = GARNET.

(A) BY SOIL MECHANICS LABORATORY, USDA-SCS, LINCOLN, NE.

Pedon classification: Glossaquic Hapludalf; coarse-loamy, siliceous, mesic
Series classification: (Same)
Soil: Teasdale
Soil Nos.: S75MI-075-1 (BLS Nos. 760400-760405)
Location: Jackson County, Michigan; 1440 feet west and 600 feet south of the northeast corner of Sec. 3, T3S, R2W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 68° F. Frost-free season is 145-155 days.
Vegetation and land use: Pasture grasses. Cropland.
Parent material: Sandy loam till.
Physiography: Till plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat poorly drained.
Ground water At 65 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: N. Stroesenreuther and R. Engel.

(Colors are for moist soil unless otherwise stated.)

Ap 400 0 to 22 cm (0 to 9 inches). Dark brown (10YR 3/3) fine sandy loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; 5 percent cobblestones, 2 percent pebbles; medium acid; abrupt smooth boundary.

A2 401 22 to 34 cm (9 to 13 inches). Yellowish brown (10YR 5/4) fine sandy loam; few fine faint dark yellowish brown (10YR 4/4) and common medium faint brown (10YR 5/3) and pale brown (10YR 6/3) mottles; moderate thin platy parting to weak medium granular structure; friable; 2 percent cobblestones, 2 percent pebbles; strongly acid; gradual wavy boundary.

B&A 402 34 to 61 cm (13 to 24 inches). Brown (10YR 5/3) fine sandy loam (A2); weak medium granular; friable; interfingering into dark yellowish brown (10YR 4/4) fine sandy loam (B); common medium faint grayish brown (10YR 5/2) and common medium distinct strong brown (7.5YR 5/6, 5/8) mottles; moderate medium subangular blocky structure; friable; 10 percent cobblestones; 7 percent pebbles; strongly acid; clear wavy boundary.

B21t 403 61 to 109 cm (24 to 43 inches). Dark brown (7.5YR 4/4) fine sandy loam; many medium distinct strong brown (7.5YR 5/6, 5/8) and common medium distinct grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) mottles; moderate coarse subangular blocky structure; friable; thin brown (10YR 4/3) coatings on the faces of peds in the upper 25 cm of horizon; thin discontinuous dark grayish brown (10YR 4/2) clay films; 5 percent cobblestones, 5 percent pebbles; strongly acid; gradual wavy boundary.

B22t 404 109 to 140 cm (43 to 55 inches). Dark yellowish brown (10YR 4/4) fine sandy loam; common medium distinct yellowish brown (10YR 5/6) and few coarse prominent light brownish gray (10YR 6/2) mottles; moderate coarse subangular blocky structure; friable; thick continuous very dark grayish brown (10YR 3/2) clay films; 5 percent cobblestones, 5 percent pebbles; slightly acid; gradual wavy boundary.

C 405 140 to 165 cm (55 to 65 inches). Yellowish brown (10YR 5/4) fine sandy loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; 10 percent cobblestones, 5 percent pebbles; slight effervescence; moderately alkaline.

1245A

SOIL CLASSIFICATION-GLOSSAQUIC HAPLUDALF
FINE-LOAMY, MIXED, MESIC
SERIES - - - - - - - -GRINDSTONE

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

SOIL NO - - - - - - S74NI-63-3 COUNTY - - - HURON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 74B467-74B472

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B: SAND 2-.05 PCT	SILT .05-.002 PCT	CLAY LT .002 PCT	FINE CLAY LT .0002 PCT	VCOS 2-1 PCT	COBS 1-.5 PCT	MEDS .5-.25 PCT	FNES .25-.10 PCT	VFNS .10-.05 PCT	COSI .05-.02 PCT	FNSI .02-.002 PCT	VFSI .002-.05 PCT	SAND 2-.10 PCT	INTR II .2-.02 PCT	FINE CLAY TO CLAY PCT	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
0-24	AP	35.5	46.7	17.8	3.7	1.9	3.2	6.4	13.0	11.0	21.9	24.8		24.5	42.2	21		.44
24-29	B6A	34.8	41.6	23.6		1.2	2.9	6.4	12.9	11.4	17.2	24.4		23.4	37.0			.39
29-51	B2T	30.4	38.6	31.0	13.5	1.1	2.7	5.4	11.4	9.8	15.7	22.9		20.6	32.9	44		.38
51-68	B3	11.7	64.3	24.0		.4	1.0	2.0	4.5	3.8	20.6	43.7		7.9	27.3			.37
68-140	C1	30.1	46.3	23.6	5.2	1.9	4.3	6.8	10.7	6.4	12.3	34.0		23.7	25.1	22		.36
140-178	C2	28.6	44.8	26.6		1.8	3.2	5.8	10.6	7.2	14.2	30.6		21.4	27.8			.33

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20 PCT	20-5 PCT	5-2 PCT	LT .074 PCT	20-2 PCT LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1B OVEN DRY G/CC	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1B 1/2 CACL
0-24	3	0	1	2	2	72	4	1.60	1.64	.007		18.8	7.8	.17	1		7.0	6.8
24-29	2	0	0	1	2	70	3	1.62	1.71	.017		18.0	9.2	.14	1		7.4	6.9
29-51	2	0	0	1	3	77	4	1.48	1.68	.043		23.4	11.7	.17	1		7.4	6.9
51-68	1	0	0	1	1	90	2	1.68	1.77	.017		18.4	8.9	.16	40		8.0	7.6
68-140	6	0	2	3	3	70	6	1.94	1.99	.009		12.4	8.5	.07	37		8.0	7.6
140-178	5	0	1	2	3	74	5	2.02	2.05	.003		11.7	8.9	.05	42		7.9	7.6

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6E2E CA	6G2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA G	AL 6G1B KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
0-24	1.43			.8			3.9	.2	.7		3.9			12.5	.70				
24-29	.67			1.1			3.2	.1	.6		4.0			11.9	.50				
29-51	.45			1.0			4.4	.2	.8					16.4	.53				
51-68	.26			.5			3.2	.3	.5					6.6	.28				
68-140	.17			.4			2.4	.2	.4					5.8	.25				
140-178	.11			.3			3.0	TR	TR					5.7	.21				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP PCT	SATURATION EXTRACT 8A1 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
0-24																			
24-29																			
29-51																		33	15
51-68																			
68-140	3600		32.4					.63										22	7
140-178	3800		30.6					.56											

DEPTH CM	(PYROPHOSPHATE,PH10) 6C5A EXT FE PCT	6G5A EXT AL PCT	6A1B EXT C PCT	(DITHIONITE-CITRATE) 6C2B EXT FE PCT	6G7A EXT AL PCT	6D1B EXT MN PCT	(PYROPHOSP) FE+AL TO CLAY	AL+C TO CLAY	PYRO FE+AL TO D - C FE+AL	CEC -1/2 CLAY X THIC	BASES 5G1 PLUS KCL AL	PH 8C1C 1:1 KCL
0-24				.8	.1							
24-29				1.1	.1							
29-51				1.0	.1							
51-68				.5	.1							
68-140				.4	.1							
140-178				.3	TR							

Pedon classification: Glossaquic Hapludalf; fine-loamy, mixed, mesic
Series classification: (Same)
Soil: Grindstone
Soil Nos.: S74MI-63-3 (BLS Nos. 74B467-74B472)
Location: Huron County, Michigan; 1210 feet north and 1180 feet west of the center of Sec. 32, T19N, R13E.
Climate: Average annual precipitation is about 28 inches. Mean annual air temperature is about 47° F., and the mean summer air temperature is about 68° F. Frost-free season is 150-160 days.
Vegetation and land use: Legume hay. Cropland.
Parent material: Loam till.
Physiography: Till plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Moderately well drained.
Ground water: Greater than 70 inches.
Erosion: Slight.
Permeability: Moderate over very slow.
Described by: N. Stroesenreuther, L. Linsemier, S. Cowan, and W. Frederick.

(Colors are for moist soil unless otherwise stated.)

Ap 467 0 to 24 cm (0 to 9 inches). Dark grayish brown (10YR 4/2) loam; moderate fine granular structure; friable; common fine roots; about 2 percent by volume of pebbles and cobbles; neutral; abrupt smooth boundary.

B&A 468 24 to 29 cm (9 to 11 inches). Yellowish brown (10YR 5/4) clay loam (B2t); pale brown (10YR 6/3) sandy loam (A2) occurs as coatings on the faces of peds; common, fine prominent strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; friable; few fine roots; about 2 percent by volume of pebbles and cobbles; mildly alkaline; abrupt irregular boundary.

B2t 469 29 to 51 cm (11 to 20 inches). Brown (10YR 5/3) clay loam; few fine faint grayish brown (10YR 5/2) and common fine prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic parting to moderate medium angular blocky structure; firm; few fine roots; thin continuous dark brown (10YR 4/3) clay films on vertical faces of peds and thin patchy clay films on horizontal faces; about 2 percent by volume of pebbles and cobbles; mildly alkaline; clear wavy boundary.

B3 470 51 to 68 cm (20 to 27 inches). Light yellowish brown (10YR 6/4) silt loam; few fine distinct yellowish brown (10YR 5/6) and common medium prominent gray (10YR 6/1) mottles; weak fine subangular blocky structure; friable; few fine roots; about 3 percent by volume of pebbles and cobbles; strong effervescence; moderately alkaline; clear wavy boundary.

C1 471 68 to 140 cm (27 to 55 inches). Brown (10YR 5/3) loam; strong coarse platy structure; very firm; about 4 percent by volume of pebbles and cobbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C2 472 140 to 178 cm (55 to 70 inches). Brown (10YR 5/3) loam; few fine prominent yellowish brown (10YR 5/6) mottles; moderate coarse platy structure; very firm; about 4 percent by volume of pebbles and cobbles; strong effervescence; moderately alkaline.

1242A

SOIL CLASSIFICATION GLOSS AQUIC HAPLUDALF
FINE-LOAMY, SILICEOUS, MESIC
SERIES - - - - - - -TEASDALE, TAXADJUNCT*

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

SOIL NO - - - - - - S75MI-75-2 COUNTY - - - JACKSON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 760406-760412 APRIL 1979

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM) SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	SAND VCOS 2-1	SAND CORS 1-.5	SAND MEDS .5-.25	SAND FNES .25-.10	SAND VFNS .10-.05	SILT COSI .05-.02	SILT FNSI .02-.002	SILT VFSI .005-.002	INTR SAND 2-.10	INTR II .2-.02	RATIO FINE CLAY TO CLAY	RATIO NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
000-021	AP	55.3	36.5	8.2	3.0	2.9	7.7	14.0	21.1	9.6	12.6	23.9		45.7		37		.55
021-033	A2	61.9	27.6	10.5	3.5	4.9	8.0	14.9	23.4	10.7	11.0	16.6		51.2		33		.43
033-048	B&A	58.7	23.4	17.9	8.8	4.3	9.4	14.2	20.7	10.1	9.1	14.3		48.6		49		.42
048-075	B2T	59.1	17.5	23.4	14.6	4.1	8.5	15.4	22.1	9.0	7.4	10.1		50.1		62		.43
075-086	B3	70.7	17.0	12.3	6.5	4.9	10.3	18.3	26.3	10.9	8.0	9.0		59.8		53	12	.48
086-127	C1	72.6	18.4	9.0	4.2	6.8	10.9	17.9	26.9	10.1	8.6	9.8		62.5		47	9	.49
127-168	C2	74.4	17.8	7.8	3.7	6.6	11.2	18.0	27.6	11.0	8.3	9.5		63.4		47	8	.50

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20	20-5	5-2	LT .074 PCT LT 75	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	4B1C 1/10 BAR PCT	WATER CONTENT 4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
000-021	6	2		5	3	40	8 1.53	1.58	.009		20.8	4.5	.21			5.8	5.6
021-033	10	2		7	7	35	15 1.64	1.70	.010		15.4	4.5	.14			5.8	5.4
033-048	12	2	2	7	8	35	15 1.71	1.76	.008		15.7	7.6	.11			5.3	4.8
048-075	17	3	4	9	12	30	21 1.59	1.74	.023		18.7	10.0	.10			5.3	4.9
075-086	16	2	3	14	8	25	22 1.63	1.67	.006		11.9	5.9	.07	2	0	7.5	6.6
086-127	16	4	4	9	7	25	16 1.82	1.87	.007		10.8	4.4	.09	13	0	8.2	7.3
127-168	17	4	4	10	7	25	17					3.9		13	0	8.3	7.5

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB MEQ / 100 G	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
000-021	1.30	.099	13			4.0	1.1	.0	.1	5.2	3.8		9.0	7.1	.87	3.6	56	58	73
021-033	.32	.035	9			2.6	1.0	.0	.0	3.6	3.4		7.0	5.1	.49	2.6	51	51	71
033-048	.19	.026	7			4.0	1.7	.0	.1	5.8	5.7		11.5	8.7	.49	2.4	46	50	67
048-075	.21	.027	8			7.2	2.9	TR	.1	10.2	5.5		15.7	12.7	.54	2.5	57	65	80
075-086	.34	.019	18				2.8	.0	.0					6.7	.54				
086-127	.23	.018	13				1.2	.0	.0					3.1	.34				
127-168	.14	.011	13				1.2	.0	.0					2.7	.35				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
000-021																			
021-033																			
033-048																			
048-075																		34A	16A
075-086																			
086-127																			
127-168	12000	8.1	18.7			30		.27	1.9	.7	.2	TR	0	2.1	0	.1			NP

SAND MINERALOGY (7B1) PLACEMENT:BORDERLINE MIXED-SILICEOUS
048-075 FNES - RE91 QZ85 FE2 GN1 CD3 FK9 CL. VFNS - RE78 QZ72 FE3 CD2 OP1 FK18 BT2 CL1 EP1 CL1.
(FNES-353 GRAINS COUNTED,VFNS-393 GRAINS COUNTED)
COMMENTS: BORDERLINE MIXED-SILICEOUS. WEIGHTED AVERAGE RE 89.1 (FNES-353)
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: RE = RESISTANT MINERALS BT = BIOTITE CL = CHLORITE EP = EPIDOTE OP = OPAQUE QZ = QUARTZ
FK = POTASSIUM FELDSPAR CD = CHALCEDONY GN = GARNET.

(A) BY SOIL MECHANICS LABORATORY, USDA-SCS, LINCOLN, NE.
*TAXADJUNCT BECAUSE MINERALOGY IS SILICEOUS AND NOT MIXED.

Pedon classification: Glossaquic Hapludalf; fine-loamy, siliceous, mesic
Series classification: Glossaquic Hapludalf; coarse-loamy, siliceous, mesic
Soil: Teasdale, taxadjunct*
Soil Nos.: S75MI-075-2 (NSSL Nos. 760406-760412)
Location: Jackson County, Michigan; 2400 feet east and 150 feet south of the northwest corner of Sec. 9, T3S, R2W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 68° F. Frost-free season is 145-155 days.
Vegetation and land use: Grasses and weeds. Idle land.
Parent material: Sandy loam till.
Physiography: Till plain.
Topography: Nearly level. Gradient is 3 percent.
Drainage: Somewhat poorly drained.
Ground water: At 66 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: N. Stroesenreuther and R. Engel.

(Colors are for moist soil unless otherwise stated.)

Ap 406 0 to 21 cm (0 to 8 inches). Dark grayish brown (10YR 4/2) fine sandy loam; moderate medium granular structure; friable; 2 percent cobblestones, 10 percent pebbles; medium acid; abrupt smooth boundary.

A2 407 21 to 33 cm (8 to 13 inches). Light yellowish brown (10YR 6/4) fine sandy loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; 2 percent cobblestones, 7 percent pebbles; medium acid; clear wavy boundary.

B&A 408 33 to 48 cm (13 to 19 inches). Yellowish brown (10YR 5/4) fine sandy loam (A2) interfingering into strong brown (7.5YR 5/6) sandy clay loam (B); common medium light brownish gray (10YR 6/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium and coarse subangular blocky structure; friable; 4 percent cobblestones, 5 percent pebbles; strongly acid; clear wavy boundary.

B2t 409 48 to 75 cm (19 to 30 inches). Yellowish brown (7.5YR 5/6) sandy clay loam; few medium prominent light brownish gray (10YR 6/2) and few medium distinct yellowish brown (10YR 5/6, 5/8) mottles; moderate medium and coarse subangular blocky structure; firm; brown (10YR 4/3) clay films on faces of peds; 7 percent cobblestones, 7 percent pebbles; strongly acid; clear irregular boundary.

B3 410 75 to 86 cm (30 to 34 inches). Yellowish brown (10YR 5/4) fine sandy loam; few medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; 5 percent cobblestones, 7 percent pebbles; mildly alkaline; gradual wavy boundary.

C1 411 86 to 127 cm (34 to 50 inches). Yellowish brown (10YR 5/4) fine sandy loam; common medium faint yellowish brown (10YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; massive; friable; 8 percent cobblestones, 10 percent pebbles; slight effervescence; moderately alkaline; diffuse wavy boundary.

C2 412 127 to 168 cm (50 to 66 inches). Yellowish brown (10YR 5/4) fine sandy loam; common medium faint yellowish brown (10YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; massive; friable; 8 percent cobblestones, 10 percent pebbles; slight effervescence; moderately alkaline.

* This was sampled as Teasdale. It is a taxadjunct because the average clay content of the argillic is higher than allowed in the series.

1247A

SCS-421

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Hillsdale taxadjunct SOIL Nos. 871Mich-23-2 LOCATION Eaton County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 71B359 - 71B366

	Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1: Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (<0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: Coarse (.05-0.02)	Silt: Fine (0.02-0.002)	Clay: Coarse (0.002-0.0002)	Clay: 3A1b Fine <0.0002	3A1a Carbonate <0.002	(0.2-0.02)	(2-0.1)	<0.074	Coarse fragments: 75-20	20-5	5-2
			Pct. of <2mm																Pct. of <75mm		
59	0-25	Ap	63.0	30.4	6.6	1.8	5.0	13.5	28.7	14.1	15.1			1.8		46.0	48.9	44.2	-	2	2
60	25-34	A&B	63.6	25.9	10.5	2.8	5.1	13.2	28.3	14.1	13.0			3.8		43.7	49.5	43.4	1	2	2
61	34-57	B&A1	67.0	19.3	13.7	2.0	5.8	14.7	30.4	14.0	9.9			6.9		41.4	53.0	40.2	1	3	1
62	57-84	B&A2	71.3	18.0	10.7	2.6	6.3	16.3	31.5	14.7	9.4			4.7		41.9	56.6	35.9	4	2	2
63	84-127	B21t	61.3	21.2	17.5	1.9	4.5	12.8	28.1	13.9	9.8			8.4		40.4	47.4	45.7	tr.	3	1
64	127-191	B22t	56.1	26.2	17.7	0.9	4.1	11.0	25.5	13.8	12.1			7.6		41.3	42.3	51.3	1	1	1
65	191-232	B3	66.1	23.7	15.2	1.2	4.7	13.0	27.9	14.3	9.7			6.1		40.6	46.8	46.4	1	2	1
66	232-252	C	62.2	28.9	8.9	1.7	4.5	12.0	27.8	16.1	13.8			3.4		46.4	46.1	46.4	1	3	2

	Depth (cm)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.		Dit-cit ext. 6C9b Fe Pct.	Dit-cit ext. 6C7a Al Pct.			4F1 Liquid limit	4F Plasticity index	3B2 Cm	8E1 Resistivity ohms/cm	Bulk density 4A1c 1/3 bar g/cc	Bulk density 4A1h oven dry g/cc	Linear extens. 4D1 LE (whole soil) Pct.	Linear extens. 4D1 LE (<2mm) Pct.	Water content 4B1c 1/3 bar Pct.	Water content 4B2 15 bar Pct.	WRD 4C1 (whole soil) in/in	WRD 4C1 (<2mm) in/in
59	0-25	0.85									0.97		1.64	1.66	-		11.6	3.1	0.14	
60	25-34	0.20									0.97		1.72	1.73	-		12.3	4.3	0.13	
61	34-57	0.18									0.97		1.70	1.73	1		13.6	5.4	0.12	
62	57-84	0.07									0.95		1.69	1.72	1		11.7	4.1	0.12	
63	84-127	0.07									0.97		1.77	1.80	1		11.8	6.4	0.09	
64	127-191	0.07									0.98		1.74	1.79	1		13.3	7.4	0.10	
65	191-232	0.13									0.97		1.78	1.83	1		13.0	6.5	0.11	
66	232-252	0.13									0.96	8,000	1.82	1.84	-		10.5	4.4	0.11	

	Depth (cm)	Extractable bases 5B4a: 6H2e Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	KCl ext. 6G1e Al	CEC: 5A3a Sum cations	5A6 NH_4OAc	Sum bases plus KCl Al	Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.	6E1e Carbonate as $CaCO_3$ Pct.	pH: 8C1c (1:1) KCl	8C1e (1:2) $CaCl_2$	8C1a (1:1) H_2O	Ratios to total clay:	CEC sum	Fine clay	15-bar water
		meq/100 g																			
59	0-25	2.8	0.4	0.1	0.1	3.4	3.6		7.0	5.2		49	97		4.9	5.4	5.9				
60	25-34	3.1	0.5	tr.	0.1	3.7	3.3		7.0	5.3		53	77		4.5	5.4	5.7				
61	34-57	2.4	0.6	tr.	0.1	3.1	5.0		8.1	6.3		38	57		3.8	4.4	4.9				
62	57-84	1.4	0.5	0.1	0.1	2.1	3.7		5.8	4.0		36	54		3.8	4.4	4.9				
63	84-127	2.0	0.1	0.1	0.2	2.4	4.4		6.8	5.9		35	96		3.7	4.4	5.0				
64	127-191	3.4	2.1	tr.	0.1	5.6	3.2		8.8	7.4		64	200		4.1	5.0	5.6				
65	191-232	9.9	4.1	0.1	0.1	14.2	0.0		14.2	6.3		100	229	3	6.9	7.4	7.9				
66	232-252													11	7.3	7.6	8.1				

Depth (cm)	Clay fraction analysis 7A1b, d: <0.002 mm 7A2 X-ray a/b/	7A3 DTA Pct.	Sand and silt fraction analysis 7A1: 7B1 Petrographic Pct.	total weath.

Pedon classification: Glossoboric Hapludalf; coarse-loamy, mixed, mesic
Series classification: Typic Hapludalf; coarse-loamy, mixed, mesic
Soil: Hillsdale taxadjunct*
Soil Nos.: S71MI-23-2 (BLS Nos. 71B359-71B366)
Location: Eaton County, Michigan; 1220 feet north and 812 feet east of the SW corner of Sec. 34, T1N, R5W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 67° F. Frost-free season is 145 days.
Vegetation and land use: Alfalfa. Cropland.
Parent material: Sandy loam glacial till.
Physiography: Moraine.
Topography: Rolling. Gradient is 10 percent.
Drainage: Well drained.
Ground water: More than 99 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: H. R. Sinclair, Jr. and G. Landtiser.

(Colors are for moist soil unless otherwise stated.)

Ap 359 0 to 25 cm (0 to 10 inches). Dark grayish brown (10YR 4/2) fine sandy loam; cloddy separating to moderate medium and coarse granular structure; friable; many roots; 6 percent gravel; medium acid; abrupt smooth boundary.

A&B 360 25 to 34 cm (10 to 13 inches). Yellowish brown (10YR 5/4) loamy fine sand, white (10YR 8/2) dry (A part) surrounding yellowish brown (10YR 5/6) fine sandy loam (B part); white (dry) material surrounding the yellowish brown fine sandy loam is typically 2 to 15 mm thick between vertical faces of the fine sandy loam peds and some is 15 to 100 mm (less than 15 percent by volume), white (dry) material extends through the horizon; moderate fine and medium subangular blocky structure; very friable; common roots; very few clay films; 6 percent gravel; medium acid; clear wavy boundary.

B&A1 361 34 to 57 cm (13 to 22 inches). Strong brown (7.5YR 5/6) fine sandy loam (B part) and yellowish brown (10YR 5/4) loamy fine sand, white (10YR 8/2) dry (A part) coatings on surfaces of peds and along root and worm channels; strong brown peds have yellowish brown material typically 2 to 15 mm thick on vertical faces between abutting peds (more than 15 percent by volume) and some 15 to 100 mm (less than 15 percent by volume), vertical extension is through the horizon; moderate fine and medium angular and subangular blocky structure; friable; common roots; brown (10YR 4/3) clay films on surfaces of peds; 6 percent gravel; very strongly acid; clear broken boundary.

B&A2 362 57 to 84 cm (22 to 33 inches). Brown (7.5YR 5/4) fine sandy loam (B part) and brown (10YR 5/3) loamy fine sand, white (10YR 8/2) dry (A part) coatings on surfaces of peds and along worm and root channnels; brown peds have white (dry) material typically 2 to 15 mm thick on vertical faces between abutting peds (more than 15 percent by volume) but range thicker than 15 mm (less than 15 percent by volume), vertical extension is through the horizon; moderate fine and medium angular and subangular blocky structure; friable; common roots; many reddish brown (5YR 4/3) clay films on surfaces of peds; 6 percent gravel; very strongly acid; diffuse smooth boundary.

B21t 363 84 to 127 cm (33 to 50 inches). Brown (7.5YR 5/4) fine sandy loam; moderate fine to very coarse subangular blocky structure; friable; few roots in interiors of peds, common roots on surfaces of peds; many brown (7.5YR 4/4) clay films on surfaces of peds; white (10YR 8/2) dry skeletons, less than 2 mm thick; 6 percent gravel; very strongly acid; diffuse smooth boundary.

B22t 364 127 to 191 cm (50 to 75 inches). Brown (7.5YR 5/4) fine sandy loam; weak coarse or very coarse subangular blocky structure parting to weak fine and medium subangular blocky structure; few roots in interiors of peds, common roots on surfaces of peds; many brown (7.5YR 4/4) clay films on surfaces of peds; 6 percent gravel; medium acid; clear wavy boundary.

B3 365 191 to 232 cm (75 to 91 inches). Brown (7.5YR 5/4) fine sandy loam; weak fine to very coarse subangular blocky structure; friable; few roots in interior of peds, common roots on surfaces of peds; common brown (7.5YR 4/4) clay films on surfaces of peds; 6 percent gravel; slight effervescence; moderately alkaline; gradual smooth boundary.

C 366 232 to 252 cm (91 to 99 inches). Yellowish brown (10YR 5/6) fine sandy loam; massive; friable; few roots; 6 percent gravel; slight effervescence; moderately alkaline.

* The pedon is a taxadjunct because of the presence of interfingering.

1289A

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Lapeer texadjunct SOIL Nos. S71Mich-44-1 LOCATION Lapeer County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 71B375 - 71B382

	Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1: Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (<0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: Coarse (.05-0.02)	Silt: Fine (0.02-0.002)	Clay: Coarse (0.002-0.0002)	Clay: 3A1b Fine <0.0002	Clay: 3A1a Carbonate <0.002	(0.2-0.02)	(2-0.1)	<0.074	Coarse fragments: 75-20	20-5	5-2
			Pct. of <2mm																Pct. of <75mm		
375	0-23	Ap	66.3	26.0	7.7	3.8	7.5	16.7	27.0	11.3	13.9	12.1		2.5		39.6	55.0	39.8	2	3	2
376	23-30	A&B	62.0	30.4	7.6	2.9	6.4	14.5	25.7	12.5	13.9	16.5		1.8		40.5	49.5	44.6	1	6	3
377	30-41	B&A	62.5	27.9	9.6	4.6	7.3	14.5	24.9	11.3	11.7	16.2		3.2		36.7	51.2	43.3	2	3	3
378	41-56	B21t	60.6	27.7	11.7	5.0	7.3	14.1	24.0	10.2	11.1	16.6		4.3		34.4	50.4	44.8	2	3	3
379	56-76	B22t	58.4	24.1	17.5	4.2	6.8	13.3	24.3	9.8	10.6	13.5		8.6		33.3	48.6	46.6	2	5	3
380	76-112	B3	59.6	24.3	16.1	3.4	7.3	13.5	23.8	11.6	11.6	12.7		8.4		36.7	48.0	46.2	1	5	2
381	112-155	C1	61.1	30.8	8.1	7.3	8.7	12.4	21.6	11.0	14.4	16.4		2.9		37.8	50.1	44.7	7	9	4
382	155-183	IIC2	90.1	7.8	2.1	38.0	27.2	15.2	8.0	1.7	4.1	3.7		1.0		8.9	88.4	10.7	20	18	14

	Depth (cm)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.		Dit-cit ext. 6C2b Fe Pct.	Dit-cit ext. 6C7a Al Pct.				4F1 Liquid limit	4F Plasticity index	3B2 Ca	8E1 Resistivity ohms/cm	Bulk density 4A1a 1/3 bar g/cc	Bulk density 4A1h oven dry g/cc	Linear extens. 4D1 LE (whole soil) Pct.	Linear extens. 4D1 LE (<2mm) Pct.	Water content 4B1c 1/3 bar Pct.	Water content 4B2 15 bar Pct.	WRD 4C1 (whole soil) in/in	WRD 4C1 (<2mm) in/in
375	0-23	1.17										0.96		1.58	1.61	1		10.3	4.1	0.09	
376	23-30	0.21										0.93		1.72	1.73	-		9.8	2.8	0.11	
377	30-41	0.13										0.94		1.84	1.86	-		10.7	3.6	0.12	
378	41-56	0.14										0.94		1.78	1.82	1		11.8	4.4	0.12	
379	56-76	0.07										0.91		1.67	1.73	1		14.1	6.6	0.11	
380	76-112	0.14										0.92		1.52	1.58	1		13.5	6.4	0.10	
381	112-155	0.11										0.68		1.83	1.86			10.0	3.6	0.08	
382	155-183	0.07											12,000						1.7		

	Depth (cm)	Extractable bases 5B4a: 6H2a Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	KCl ext. 6G1e Al	CEC 5A3a Sum cations	5A6 NH_4OAc	Sum bases plus KCl Al	Base saturation 5G3 Sum cations Pct.	5C1 NH_4OAc Pct.	6E1e Carbonate as $CaCO_3$ Pct.	pH 8C1c (1:1) KCl	pH 8C1e (1:2) $CaCl_2$	pH 8C1a (1:1) H_2O	Ratios to total clay: CEC sum	Fine clay	15-bar water
		meq/100 g																			
375	0-23	5.2	1.2	tr.	0.1	6.5	0.6		7.1			92	232	3	6.5	6.9	7.3				
376	23-30	2.4	0.6	tr.	0.1	3.1	1.2		4.3	4.5		72	97	-	6.1	6.7	7.1				
377	30-41	2.9	0.6	tr.	0.1	3.6	1.6		5.2	5.9		69	95	tr.	5.9	6.7	7.1				
378	41-56	3.1	0.8	tr.	0.1	4.0	2.0		6.0	4.7		67	114	tr.	5.8	6.5	7.1				
379	56-76	4.9	1.3	0.1	0.2	6.5	2.5		9.0	6.9		72	295	1	5.8	6.6	7.1				
380	76-112	5.4	2.3	0.1	0.2	8.0	2.2		10.2	3.2		78	170	1	6.2	6.8	7.3				
381	112-155	24.6	2.1	tr.	tr.	26.7				3.6				18	7.4	7.7	8.1				
382	155-183	18.6	1.8	tr.	tr.	20.4				1.7				27	7.8	7.7	8.1				

Depth (cm)	Clay fraction analysis 7A1b, d: <0.002 mm 7A2 X-ray a/b/	7A3 DTA Pct.	Sand and silt fraction analysis 7A1: 7B1 Petrographic b/ Pct.	total weath.

Pedon classification: Glossoboric Hapludalf; coarse-loamy, mixed, mesic
Series classification: Typic Hapludalf; coarse-loamy, mixed, mesic
Soil: Lapeer taxadjunct*
Soil Nos.: S71MI-44-1 (BSL Nos. 71B375-71B382)
Location: Lapeer County, Michigan; SW 1/4, NW 1/4 of Sec. 28, T7N, R10E.
Climate: Average annual precipitation is about 30 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 70° F. Frost-free season is 150 days.
Vegetation and land use: Alfalfa. Cropland.
Parent material: Sandy loam glacial till.
Physiography: Moraine.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Well drained.
Ground water: More than 70 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: H. R. Sinclair, Jr.

(Colors are for moist soil unless otherwise stated.)

Ap 375 0 to 23 cm (0 to 9 inches). Dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; cloddy separating to moderate very fine and fine granular structure; very friable; many roots; 3 percent gravel; neutral; abrupt smooth boundary.

A&B 376 23 to 30 cm (9 to 12 inches). Brown (10YR 5/3) loamy fine sand, light gray (10YR 7/2) dry and brown (7.5YR 5/4) fine sandy loam; weak coarse platy separating to moderate fine angular blocky structure; very friable; brown (7.5YR 4/4) films on surfaces of peds; 3 percent gravel, less than 1 percent cobble; neutral; clear broken boundary.

B&A 377 30 to 41 cm (12 to 16 inches). Brown (7.5YR 5/4) fine sandy loam and brown (10YR 5/3) loamy fine sand, light gray (10YR 7/2) dry interfingering, coatings on surfaces of peds and along worm and root channels; brown peds have brown material 2 to 10 mm thick on vertical faces between abutting peds (25 percent of matrix), vertical extension is through horizon; moderate fine and medium subangular blocky structure; friable; common roots; many brown (7.5YR 4/4) clay films on surfaces of peds; 3 percent gravel, less than 1 percent cobble; neutral; clear wavy boundary.

B21t 378 41 to 56 cm (16 to 22 inches). Brown (7.5YR 5/4) fine sandy loam; moderate fine and medium subangular blocky structure; friable; common roots; many brown (7.5YR 4/4) clay films on surfaces of peds; brown (10YR 5/3) skeletons, light gray (10YR 7/2) dry; 3 percent gravel, less than 1 percent cobble; neutral; clear wavy boundary.

B22t 379 56 to 76 cm (22 to 30 inches). Brown (7.5YR 5/4) fine sandy loam; moderate fine to coarse subangular blocky structure; friable; common roots concentrated on surfaces of peds; many brown (7.5YR 4/4) clay films on surfaces of peds; black (N 2/0) soft material, less than 2 mm in diameter; 10 percent gravel, 3 percent cobbles; neutral; gradual wavy boundary.

B3 380 76 to 112 cm (30 to 44 inches). Brown (7.5YR 5/4) fine sandy loam; weak moderate and coarse subangular blocky structure; friable; few roots; common brown (7.5YR 4/4) clay films on surfaces of peds; black (N 2/0) soft material, less than 2 mm in diameter; 10 percent gravel, 3 percent cobbles; neutral; gradual wavy boundary.

C1 381 112 to 155 cm (44 to 61 inches). Yellowish brown (10YR 5/4) gravelly sandy loam; massive separating to weak medium platy structure; very friable; few roots; 25 percent cobbles; slight effervescence; moderately alkaline; clear smooth boundary.

IIC2 382 155 to 183 cm (61 to 72 inches). Yellowish brown (10YR 5/6) gravelly sand; massive; very friable; 65 percent gravel, less than 1 percent cobble; slight effervescence; moderately alkaline.

* The pedon is a taxadjunct because of the presence of interfingering of the A into the B horizon.

1290A

SCS-421

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Kidder taxadjunct SOIL Nos. S71Mich-63-1 LOCATION Oakland County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 71B367 - 71B374

	Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1: Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (<0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: Coarse (.05-0.02)	Silt: Fine (0.02-0.002)	Clay: Coarse (0.002-0.0002)	Clay: 3A1b Fine <0.0002	Clay: 3A1a Carbonate <0.002	(0.2-0.02)	(2-0.1)	<0.074	Coarse fragments: 75-20	20-5	5-2
			Pct. of <2mm																Pct. of <75mm		
67	0-22	Ap	65.3	27.1	7.6	5.5	8.6	15.8	24.1	11.3	13.2	13.9		2.3		37.0	54.0	40.8	2	3	3
68	22-31	B&A	57.2	30.9	11.9	2.7	6.4	12.9	23.5	11.6	13.0	17.9		4.8		37.4	45.6	48.7	1	4	2
69	31-53	B21t	47.3	30.4	22.3	3.8	5.2	8.8	18.2	11.3	11.5	18.9		9.2		33.3	36.0	59.0	-	3	2
70	53-76	B22t	48.2	27.8	24.0	5.0	5.7	8.8	17.4	11.3	12.8	15.0		11.8		34.4	36.9	57.9	3	3	3
71	76-89	B23t	52.7	21.8	25.5	3.6	6.6	10.8	22.5	11.2	10.2	11.6		13.3		33.2	41.5	52.9	1	3	3
72	89-99	B3	57.8	27.7	14.5	4.0	6.2	11.4	23.2	13.0	13.4	14.3		7.0		39.9	44.8	49.0	1	3	3
73	99-130	C1	64.6	27.5	7.9	7.3	8.8	13.2	23.1	12.2	12.6	14.9		3.0		38.0	52.4	41.9	10	9	5
74	130-157	C2	62.0	29.6	8.4	8.2	9.1	12.2	20.9	11.6	15.0	14.6		2.6		38.6	50.4	44.2	2	6	4

	Depth (cm)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.		Dit-cit ext.: 6C2b Fe Pct.	6C7a Al Pct.			4F1 Liquid limit	4F Plasticity index	3B2 Cm	8E1 Resistivity ohms/cm	Bulk density: 4A1e 1/3 bar g/cc	4A1h Oven dry g/cc	Linear extens.: 4D1 LE (whole soil) Pct.	4D1 LE (<2mm) Pct.	Water content: 4B1c 1/3 bar Pct.	4B2 15 bar Pct.	WRD: 4C1 (whole soil) in/in	4C1 (<2mm) in/in
67	0-22	1.08									0.95		1.59	1.56	-		7.2	4.1	0.05	
68	22-31	0.27									0.95		1.70	1.77	1		10.3	4.7	0.09	
69	31-53	0.23							23	7	0.97		1.65	1.76	2		14.1	8.0	0.10	
70	53-76	0.21									0.94		1.63	1.70	1		11.9	9.0	0.04	
71	76-89	0.22							27	11	0.96		1.58	1.66	2		15.4	9.4	0.09	
72	89-99	0.14									0.96		1.60	1.64	1		10.7	5.8	0.07	
73	99-130	0.13								N.P.	0.82		1.82	1.84	-		9.7	3.7	0.09	
74	130-157	0.14									0.91	8,000	1.85	1.88	-		10.8	3.6	0.12	

	Depth (cm)	Extractable bases 5B4a: 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	KCl ext.: 6G1e Al	CEC: 5A3a Sum cations	5A6 NH_4OAc	Sum bases plus KCl Al	Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.	6E1e Carbonate as $CaCO_3$ Pct.	pH: 8C1c (1:1) KCl	8C1a (1:2) $CaCl_2$	8C1a (1:1) H_2O		Ratios to total clay: CEC sum	Fine clay	15-bar water
		meq/100 g																			
67	0-22	5.4	1.0	tr.	0.2	6.6	1.9		8.5	6.4		78	114		6.0	6.4	6.8		1.12	0.30	0.54
68	22-31	4.1	0.9	tr.	0.1	5.1	1.4		6.5	4.9		78	104	-	5.8	6.5	7.0		0.55	0.40	0.39
69	31-53		3.7	0.1	0.1		1.4		13.6	9.8				2	6.5	7.1	7.5		0.61	0.41	0.36
70	53-76	6.9	2.8	0.1	0.2	10.0	2.3		12.3	10.1		81	99	tr.	5.8	6.6	7.0		0.51	0.49	0.38
71	76-89	7.9	3.6	0.1	0.2	11.8	0.8		12.6	10.4		94	113	tr.	6.4	7.0	7.4		0.49	0.52	0.37
72	89-99		4.3	0.1	0.1	16.3	0.6			6.1				5	7.0	7.4	7.8			0.48	0.40
73	99-130		1.2	0.1	0.1	31.8				3.2				20	7.4	7.6	8.1			0.38	0.47
74	130-157		1.0	0.2	0.1	37.5				2.6				20	7.5	7.6	8.1			0.31	0.43

Depth (cm)	Clay fraction analysis 7A1b, d: <0.002 mm 7A2 X-ray	7A3 DTA Pct.	Sand and silt fraction analysis 7A1: 7B1 Petrographic Pct.	total weath.
0-22 - 31-53	VR4,MI3,VM3,VC2,KK2,QZ1 / MI4,VR3,VM2,KK2,MI2			
53-76 - -	MI4,VR3,VM2,KK2,MI2			
99-130	MI5,VR3,VM2,KK2,MT1,CL1			

Mineral code: VR= vermiculite, MI= mica, MT= montmorillonite, VM= vermiculite-mica, interstratified, KK= kaolinite, QZ= quartz, CL= chlorite, VC= vermiculite-chlorite, interstratified

Pedon classification: Glossoboric Hapludalf; fine-loamy, mixed, mesic
Series classification: Typic Hapludalf; fine-loamy, mixed, mesic
Soil: Kidder taxadjunct*
Soil Nos.: S71MI-63-1 (BSL Nos. 71B367-71B374)
Location: Oakland County, Michigan; Sec. 14, T5N, R10E.
Climate: Average annual precipitation is about 30 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 70° F. Frost-free season is 155 days.
Vegetation and land use: Quackgrass, timothy, goldenrod. Idle cropland.
Parent material: Sandy loam glacial till.
Physiography: Ground moraine.
Topography: Gently sloping. Gradient is 3 percent.
Drainage: Well drained.
Ground water: Greater than 70 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: H. R. Sinclair, Jr. and N. Stroesenreuther.

(Colors are for moist soil unless otherwise stated.)

Ap 367 0 to 22 cm (0 to 9 inches). Dark yellowish brown (10YR 3/4) fine sandy loam, light brownish gray (10YR 6/2) dry; cloddy parting to moderate fine and medium granular structure; friable; medium few roots; 7 percent gravel and less than 1 percent cobble; neutral; abrupt smooth boundary.

B&A 368 22 to 31 cm (9 to 12 inches). Dark yellowish brown (10YR 4/4) fine sandy loam (B part) and pale brown (10YR 6/3) loamy fine sand, white (10YR 8/2) dry (A part) coatings on surfaces of peds and along root and worm channels; dark yellowish brown peds have pale brown material typically 2 to 10 mm thick on vertical faces between abutting peds (more than 15 percent by volume) and some 10 to 15 mm thick (less than 15 percent by volume), the 2 to 15 mm thick material is 30 percent by volume of the horizon, vertical extension is through the horizon; weak medium prismatic parting to moderate fine subangular blocky structure; friable; common fine roots; common brown (7.5YR 4/4) clay films on vertical and horizontal surfaces of peds; 7 percent gravel, less than 1 percent cobbles; netrual; clear wavy boundary.

B21t 369 31 to 53 cm (12 to 21 inches). Dark yellowish brown (10YR 4/4) loam, dark yellowish brown (10YR 4/4) crushed; moderate fine subangular blocky structure; friable; common fine roots; many brown (7.5YR 4/4) clay films on vertical and horizontal surfaces of peds; 7 percent gravel, less than 1 percent cobbles; mildly alkaline; clear wavy boundary.

B22t 370 53 to 76 cm (21 to 30 inches). Yellowish brown (10YR 5/4) sandy clay loam, brown (7.5YR 4/4) crushed; moderate fine and medium subangular and angular blocky structure; friable; common fine roots; many brown (7.5YR 4/3) clay films on vertical and horizontal surfaces of peds; 7 percent gravel, less than 1 percent cobbles; neutral; gradual wavy boundary.

B23t 371 76 to 89 cm (30 to 35 inches). Yellowish brown (10YR 5/4) sandy clay loam; moderate fine and medium subangular blocky structure; friable; few roots in interiors of peds, common roots on surface of peds and in tubular pores; many dark brown (7.5YR 3/3) and brown (7.5YR 4/3) clay films on vertical and horizontal surfaces of peds; 7 percent gravel, less than 1 percent cobbles; mildly alkaline; clear broken boundary.

B3 372 89 to 99 cm (35 to 39 inches). Yellowish brown (10YR 5/4) fine sandy loam, brown (7.5YR 4/4) crushed; weak medium and coarse subangular blocky structure; friable; common fine roots; many reddish brown (5YR 4/3) clay films on vertical and horizontal surfaces of peds; 7 percent gravel, less than 1 percent cobbles; mildly alkaline; slight effervescence; clear broken boundary.

C1 373 99 to 130 cm (39 to 51 inches). Yellowish brown (10YR 5/4) fine sandy loam; massive parting to weak coarse platy structure; friable; few fine roots; 10 percent gravel, less than 1 percent cobbles; moderately alkaline; slight effervescence; gradual wavy boundary.

C2 374 130 to 157 cm (51 to 62 inches). Yellowish brown (10YR 5/4) fine sandy loam; massive parting to weak coarse platy structure; friable; very few fine roots; 10 percent gravel, less than 1 percent cobbles; moderately alkaline; slight effervescence.

* This was sampled as Lapeer. It was correlated as Kidder. It is a taxadjunct because of the presence of interfingering of the A into the B horizon

1292A

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Marlette SOIL Nos. S70Mich-29-2 LOCATION Gratiot County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 70B466 - 70B472

	Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1: Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (<0.002)	Sand Very coarse (2-1)	Sand Coarse (1-0.5)	Sand Medium (0.5-0.25)	Sand Fine (0.25-0.1)	Sand Very fine (0.1-0.05)	Silt Coarse (.05-0.02)	Silt Fine (0.02-0.002)	Clay Coarse (0.002-0.0002)	Clay 3A1b Fine <0.0002	Clay 3A1a Carbonate <0.002	(0.2-0.02)	(2-0.1)	<0.074	Coarse fragments 75-20	20-5	5-2
			Pct. of <2mm																Pct. of <75		
466	0-28	Ap	64.1	26.8	9.1	1.2	4.8	14.6	31.4	12.1	10.8	16.0		2.1		40.8	52.0	45.7	1	2	1
467	28-36	A2	60.5	26.3	13.2	1.8	4.9	13.7	28.5	11.7	9.9	16.4		3.8		37.9	48.8	46.5	tr.	1	2
468	36-51	A&A	53.3	22.8	23.9	1.7	4.3	11.0	25.2	10.2	7.9	14.0		10.3		32.9	43.1	52.0	-	1	1
469	51-67	B21t	50.0	22.3	27.7	1.2	4.1	11.8	23.7	9.3	7.9	14.4		13.9		30.5	40.7	54.9	-	2	1
470	67-86	B22t	47.5	29.7	22.8	1.7	3.7	10.7	21.6	9.8	10.6	19.1		9.9		32.8	37.7	60.7	tr.	3	2
471	86-106	C1	45.8	34.9	19.3	2.0	4.6	10.2	19.7	9.3	19.1	15.8		6.5		39.7	36.5	59.4	tr.	4	3
472	106-153	C2	45.9	36.0	18.1	2.1	5.2	10.3	19.3	9.0	11.7	24.3		4.4		31.9	36.9	59.2	-	3	3

	Depth (cm)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.	Dit-cit ext. 6C1b Fe Pct.	Dit-cit ext. 6C7a Al Pct.	4F1 Liquid limit	4F Plasticity index	3B2 Cm	8K1 Resistivity ohms cm	Bulk density 4A1e 1/3 bar g/cc	Bulk density 4A1h oven dry g/cc	Linear extens. 4D1 LE (whole soil) Pct.	Linear extens. 4D1 LE (<2mm) Pct.	Water content 4B1c 1/3 bar Pct.	Water content 4B2 15 bar Pct.	VBD 4C1 (whole soil) in/in	VBD 4C1 (<2mm) in/in
466	0-28	1.56						0.98		1.54	1.57	1		9.0	4.0	0.08	
467	28-36	0.33						0.98		1.86	1.88	-		11.2	4.1	0.13	
468	36-51	0.21						0.99		1.66	1.74	2		16.3	7.9	0.14	
469	51-67	0.22						0.98		1.61	1.72	2		17.2	10.3	0.11	
470	67-86	0.14						0.97		1.64	1.75	2		18.4	9.2	0.15	
471	86-106	0.14						0.95		1.86	1.92	1		13.5	7.8	0.11	
472	106-153	0.07						0.96	6000	1.89	1.94	1		12.1	6.9	0.10	

	Depth (cm)	Extractable bases 5B4a: 6H2a Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6E2a Ext. acidity	KCl ext. 6G1e Al	CEC 5A3a Sum cations	5A6 NH_4OAc	Sum bases plus KCl Al	Base saturation 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.	6E1e Carbonate as $CaCO_3$ Pct.	pH 8C1c (1:1) KCl	pH 8C1e (1:2) $CaCl_2$	pH 8C1a (1:1) H_2O	Ratios to total clay:	CEC sum	Fine clay	15-bar water
		meq/100 g																			
466	0-28	6.3	1.2	tr	0.7	8.2	3.6		11.8	7.7		69	94		5.4	5.7	5.8		1.30	0.22	0.44
467	28-36	2.9	1.0	tr	0.4	4.3	2.0		6.3	4.8		68	111		5.3	5.9	6.2		0.48	0.29	0.31
468	36-51	3.9	2.2	tr	0.9	7.0	3.3		10.3	8.4		68			4.9	5.8	6.0		0.43	0.43	0.32
469	51-67	4.5	2.8	tr	1.1	8.4	3.4		11.8	9.8		71			5.0	5.9	6.2		0.42	0.50	0.37
470	67-86		7.5	tr	0.7					7.9				13	7.1	7.6	7.9			0.43	0.40
471	86-106		2.9	tr	0.4					6.2				24	7.0	7.7	8.0			0.34	0.40
472	106-153		1.9	tr	0.2					4.9				31	7.3	7.9	8.1			0.24	0.38

Depth (cm)	Clay fraction analysis 7A1b, d: <0.002 mm 7A8 X-ray a/b/	7A3 DTA Pct.	Sand and silt fraction analysis 7A1: 7B1 Petrographic b/ Pct.	total weath.
0-28	VR2,KK2,MI1,MT1,CL1,QZ1	KK15		
28-36				
36-51				
51-67	VR3,MI3,CL1,KK1,QZ1	KK 5		
67-86				
86-106	VR2,MI2,KK2,CL1,QZ1	KK10		
106-153				

a/ Relative amounts (X-ray): 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.

b/ Mineral code: VR = vermiculite, KK = kaolinite, MI = mica, MT = montmorillonite, CL = chlorite, and QZ = quartz.

Pedon classification: Glossoboric Hapludalf; fine-loamy, mixed, mesic
Series classification: (Same)
Soil: Marlette
Soil Nos.: S70MI-29-2 (BSL Nos. 70B466-70B472)
Location: Gratiot County, Michigan; 1030 feet east and 125 feet north of the SW corner of SE 1/4 of Sec. 12, T11N, R4W.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 46° F., and the mean summer air temperature is about 66° F. Frost-free season is 140-150 days.
Vegetation and land use: Wheat stubble. Cropland.
Parent material: Calcareous loam glacial till.
Physiography: Ground moraine.
Topography: Nearly level. Gradient is 2 percent.
Drainage: Moderately well and well drained.
Ground water At 63 inches.
Erosion: Slight.
Permeability: Moderate or moderately slow.
Described by: H. R. Sinclair, Jr. and K Pregitzer.

(Colors are for moist soil unless otherwise stated.)

Ap 466 0 to 28 cm (0 to 11 inches). Dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; cloddy separating to moderate fine granular structure; friable; many roots; 3 percent coarse fragments; medium acid; abrupt smooth boundary.

A2 467 28 to 36 cm (11 to 14 inches). Pale brown (10YR 6/3) fine sandy loam; weak thick platy separating to moderate fine angular blocky structure; friable; few roots; 3 percent coarse fragments; slightly acid; clear broken boundary; the A2 horizon contains a few remnants of yellowish brown (10YR 5/4) B material.

B&A 468 36 to 51 cm (14 to 20 inches). Yellowish brown (10YR 5/4) sandy clay loam and pale brown (10YR 6/3) fine sandy loam, white (10YR 8/2) dry interfingering, coatings on surfaces of peds and along worm and root channels; yellowish brown peds have pale brown material 4 to 9 mm (rectangular and semicircular shaped) thick on vertical faces between abutting peds (30 percent of matrix) horizontal spacing is less than 50 mm, vertical extension is through horizon, more than 50 percent of peds covered with skeletons; yellowish brown peds having pale brown material 10 to 14 mm thick on vertical faces between abutting peds is less than 2 percent of the volume of the matrix; weak coarse prismatic separating to moderate medium angular and subangular blocky structure; friable; few roots; continuous brown (7.5YR 4/4) clay films; 3 percent coarse fragments; medium acid; gradual irregular boundary.

B21t 469 51 to 67 cm (20 to 26 inches). Brown (7.5YR 5/4) clay loam and pale brown (10YR 6/3) sandy loam, white (10YR 8/1) dry interfingering, coatings on surfaces of peds and along worm and root channels; brown peds have pale brown material 5 to 10 mm (rectangular shaped) and 12 to 35 mm (semicircular shaped) thick on vertical faces between abutting peds (15 to 20 percent of matrix), horizontal spacing is 30 to 40 mm, vertical extension typically is about 90 mm with a few extending through horizon; more than 50 percent of peds covered with skeletons, brown peds having pale brown material 10 to 35 mm thick on vertical faces between abutting peds is less than 15 percent of the volume of the matrix; moderate medium and coarse prismatic separating to moderate medium and coarse angular and subangular blocky structure; friable; few roots; continuous reddish brown (10YR 4/3) clay films; few black (N 2/0) stains on surfaces of peds; 3 percent coarse fragments; slightly acid; clear irregular boundary.

B22t 470 67 to 86 cm (26 to 34 inches). Strong brown (7.5YR 5/6) loam and pale brown (10YR 6/3), white (10YR 8/2) dry interfingering and coatings on surfaces of peds; strong brown peds have pale brown material 5 to 6 mm (rectangular and semicircular shaped) thick on vertical faces between abutting peds (5 percent of matrix), horizontal spacing is about 60 mm, vertical extension is 50 to 100 mm, more than 20 percent of peds covered with skeletons; moderate, medium and coarse, prismatic separating to moderate medium and coarse angular and subangular blocky structure; friable; few roots; continuous brown (7.5YR 4/2 and 4/3) clay films; few black (N 2/0) stains on surfaces of peds; few iron-manganese concretions; 3 percent coarse fragments; moderately alkaline; clear wavy boundary.

C1 471 86 to 106 cm (34 to 42 inches). Brown (10YR 5/3) loam; few fine distinct light olive brown (2.5Y 5/6) mottles; weak very coarse prismatic separating to weak coarse subangular blocky structure; friable; few roots; few light brownish gray (10YR 6/2) reduced color on surfaces of peds; light gray (10YR 7/2) lime accumulation on surfaces of peds; 5 percent coarse fragments; slight effervescence; moderately alkaline; clear wavy boundary.

C2 472 106 to 153 cm (42 to 60 inches). Brown (10YR 5/3) loam; common fine distinct light olive brown (2.5Y 5/4) mottles; weak very coarse prismatic separating to weak coarse subangular blocky structure; friable; few roots; few light brownish gray (10YR 6/2) reduced color on surfaces of peds; light gray (10YR 7/2) lime accumulation on surfaces of peds; 5 percent coarse fragments; strong effervescence; moderately alkaline.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Marlette taxadjunct SOIL Nos. S70Mich-29-1 LOCATION Gratiot County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 70B459 - 70B465

	Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1: Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (<0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: Coarse (.05-0.02)	Silt: Fine (0.02-0.002)	Clay: Coarse (0.002-0.0002)	Clay: 3A1b Fine <0.0002	Clay: 3A1a Carbonate <0.002	(0.2-0.02)	(2-0.1)	<0.074	Coarse fragments 75-20	20-5	5-2
			Pct. of < 2 mm																Pct. of < 75		
459	0-18	Ap	72.2	21.6	6.2	1.5	6.2	19.9	33.8	10.9	9.8	11.8		1.4		38.3	61.3	34.1	tr.	4	1
460	18-26	A2	64.4	25.4	10.2	1.5	6.0	17.3	29.4	10.2	10.1	15.3		2.3		36.2	54.2	42.2	-	4	2
461	26-39	B&A	52.9	25.2	21.9	1.7	4.5	13.9	23.7	9.2	9.8	15.4		9.4		32.2	43.7	53.9		1	2
462	39-64	B21t	56.4	21.1	22.5	2.1	5.7	14.6	24.6	9.4	9.1	12.0		11.2		31.9	47.0	48.5	1	2	2
463	64-86	B22t	55.0	21.4	23.6	2.3	5.5	14.5	23.7	9.1	9.0	12.4		11.5		31.1	45.9	52.9	2	3	2
464	86-109	B3	63.4	20.0	16.6	2.4	6.8	16.2	27.3	10.8	8.4	11.6		8.1		34.1	52.6	42.6	1	5	2
465	109-153	C1	63.6	24.0	12.4	4.1	7.8	16.1	25.1	10.6	10.6	13.4		5.4		34.6	53.0	42.1	1	6	5

	Depth (cm)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.		Dit-bit ext. 6C7b Fe Pct.	Dit-bit ext. 6C7a Al Pct.			4F1 Liquid limit	4F Plasticity index	3B2 Cm	8E1 Resistivity ohms/cm	Bulk density 4A1c 1/3 bar g/cc	4A1b oven dry g/cc	Linear extens. 4B1 LE (whole soil) Pct.	4B1 LE (< 2mm) Pct.	Water content 4B1c 1/3 bar Pct.	4B2 15 bar Pct.	WRD 4C1 (whole soil) in/in	4C1 (< 2mm) in/in
459	0-18	0.63									0.97		1.74	1.75	-		7.1	2.4	0.08	
460	18-26	0.13									0.96		1.83	1.87	1		12.1	3.2	0.16	
461	26-39	0.07									0.99		1.77	1.83	1		15.0	7.7	0.13	
462	39-64	0.07									0.97		1.74	1.81	1		13.9	8.3	0.10	
463	64-86	0.13									0.95		1.66	1.73	1		13.7	8.7	0.08	
464	86-109	0.07									0.94		1.56	1.63	2		13.3	6.4	0.11	
465	109-153	0.13									0.91	7000	1.73	1.78	1		9.9	4.9	0.08	

	Depth (cm)	Extractable bases 5B4a: 6E2a Ca	6G2d Mg	6F2b Na	6G2b K	Sum	6E2a Ext. acidity	NCl ext. 6G1e Al	CEC 5A3a Sum cations	5A6 NH_4OAc	Sum bases plus KCl Al	Base saturation 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.	6E1e Carbonate as $CaCO_3$ Pct.	pH 8C1c (1:1) KCl	8C1e (1:2) $CaCl_2$	8C1a (1:1) H_2O	Ratios to total clay: CEC sum	Fine clay	15-bar water
		meq/100 g																		
459	0-18		0.3	-	0.1		-			3.2				tr.	7.2	7.4	7.6		0.22	0.39
460	18-26	3.4	0.2	tr.	0.1	3.7	1.0		4.7	3.2		79	116	tr.	6.2	7.0	7.3	0.46	0.22	0.31
461	26-39	4.9	1.2	tr.	0.1	6.2	3.3		9.3	7.0		67	88		5.4	6.0	6.5	0.42	0.43	0.35
462	39-64	4.2	1.9	tr.	0.2	6.3				7.3			86		4.0	5.0	5.2		0.50	0.37
463	64-86	5.5	3.0	tr.	0.2	8.7	3.7		12.4	8.4		70	104		5.4	6.1	6.1	0.52	0.49	0.37
464	86-109													3	6.6	7.0	7.2		0.49	0.38
465	109-153													13	7.2	7.7	8.0		0.44	0.40

Depth (cm)	Clay fraction analysis 7A1b, d: < 0.002 mm 7A2 X-ray a/b/	7A3 DTA Pct.	Sand and silt fraction analysis 7A1: 7M1 Petrographic b/ Pct.	total weath.
0-18	VR2,MI2,KK2,MT1,CL1,QZ1	KK10		
18-26				
26-39				
39-64	VR3,MI3,KK3,CL1,QZ1	KK10		
64-86				
86-109				
109-153	VR3,MI2,KK2,CL2,QZ1	KK10		

a/ Relative amounts (X-ray): 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.

b/ Mineral code: VR = vermiculite, MI = mica, KK = kaolinite, MT = montmorillonite, CL = chlorite, and QZ = quartz.

Pedon classification: Glossoboric Hapludalf; fine-loamy, mixed, mesic
Series classification: (Same)
Soil: Marlette taxadjunct*
Soil Nos.: S70MI-29-1 (BSL Nos. 70B459-70B465)
Location: Gratiot County, Michigan; 1072 feet north and 205 feet east of the SW corner of NW 1/4 of Sec. 23, T12N, R4W.
Climate: Average annual precipitation is about 30 inches. Mean annual air temperature is about 46° F., and the mean summer air temperature is about 66° F. Frost-free season is 140-150 days.
Vegetation and land use: Quackgrass, bromegrass, ragweed, wild lettuce. Idle cropland.
Parent material: Calcareous sandy loam glacial till.
Physiography: Ground moraine.
Topography: Nearly level. Gradient is 2 percent.
Drainage: Well drained.
Ground water: More than 60 inches.
Erosion: Slight.
Permeability: Moderate or moderately slow.
Described by: H. R. Sinclair, Jr. and K. Pregitzer.

(Colors are for moist soil unless otherwise stated.)

Ap 459 0 to 18 cm (0 to 7 inches). Dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry, cloddy separating to moderate very fine and fine granular structure; very friable; many roots; 5 percent coarse fragments; mildly alkaline; abrupt smooth boundary; this horizon contains 7 percent material from the subhorizons.

A2 460 18 to 26 cm (7 to 10 inches). Grayish brown (10YR 5/2, 40 percent) and pale brown (10YR 6/3, 60 percent) light fine sandy loam; weak fine and medium platy separating to moderate very fine and fine granular structure; very friable; few roots; 5 percent coarse fragments; neutral; clear broken boundary.

B&A 461 26 to 39 cm (10 to 15 inches). Brown (7.5YR 5/4) fine sandy loam and pale brown (10YR 6/3) loamy sand, white (10YR 8/1) dry interfingering, coatings on surfaces of peds and along worm and root channels; brown peds have pale brown material 2 to 10 mm (rectangular shaped) and 10 mm (semicircular shaped) thick on vertical faces between abutting peds (30 percent of matrix) but ranges to 27 mm (less than 15 percent of matrix); horizontal spacing is 45 to 110 mm, vertical extension is through horizon, more than 50 percent of the peds covered with skeletons; weak coarse angular blocky separating to moderate very fine angular blocky structure; friable; few roots; continuous brown (7.5YR 4/4) clay films on surfaces of peds; 5 percent coarse fragments; slightly acid; gradual irregular boundary.

B21t 462 39 to 64 cm (15 to 25 inches). Strong brown (7.5YR 5/6) sandy clay loam and pale brown (10YR 6/3) loamy sand, white (10YR 8/1) dry interfingering, coatings on surfaces of peds and along worm and root channels; strong brown peds have pale brown material 3 to 9 mm (rectangular shaped) thick on vertical faces between abutting peds (15 to 20 percent of matrix), horizontal spacing is 35 to 75 mm, vertical extension is through horizon, more than 50 percent of peds covered with skeletons, strong brown peds having pale brown material 12 mm thick on vertical faces between abutting peds is less than 15 percent of the volume of the matrix; weak coarse prismatic separating to moderate fine and medium angular and subangular blocky structure; friable; few roots; continuous reddish brown (5Y 4/4) clay films on surfaces of peds; few black (N 2/0) stains on surfaces of peds; 5 percent coarse fragments; strongly acid; gradual irregular boundary.

B22t 463 64 to 86 cm (25 to 34 inches). Yellowish brown sandy clay loam and pale brown (10YR 6/3) loamy sand, white (10YR 8/2) dry interfingering, coatings on surfaces of peds and along worm and root channels; yellowish brown peds have pale brown material 10 to 15 mm (rectangular shaped and semicircular shaped) thick on vertical faces between abutting peds (7 percent of matrix), horizontal spacing is 50 to 110 mm, vertical extension typically is 75 to 130 mm with a few extending through horizon; more than 50 percent of peds covered with skeletons, yellowish brown peds having pale brown material more than 10 mm thick on vertical faces between abutting peds is less than 15 percent of the volume of the matrix; moderate fine and medium angular blocky structure; friable; few roots; continuous reddish brown (5YR 4/4) clay films on surfaces of peds; 5 percent coarse fragments; slightly acid; clear irregular boundary.

B3 464 86 to 109 cm (34 to 43 inches). Yellowish brown fine sandy loam and pale brown (10YR 6/3) loamy sand, white (10YR 8/2) dry interfingering and coatings on surfaces of peds; yellowish brown peds have pale brown material 15 to 30 mm (rectangular shaped) and 10 to 30 mm (semicircular shaped) thick on vertical faces between abutting peds (9 percent of matrix), horizontal spacing is 100 to 150 mm, vertical extension is 6 to 26 mm, more than 10 percent of peds covered with skeletons, yellowish brown peds having pale brown material more than 15 mm thick on vertical faces between abutting peds is less than 15 percent of the volume of the matrix; moderate medium angular blocky structure; friable; few roots; continuous brown (7.5YR 4/4) clay films on surfaces of peds; 10 percent coarse fragments; neutral; clear wavy boundary.

C 465 109 to 153 cm (43 to 60 inches). Yellowish brown (10YR 5/4) fine sandy loam; massive separating to weak coarse subangular blocky structure; friable; few roots; 10 percent coarse fragments; slight effervescence; moderately alkaline.

* This was sampled as Marlette. It is a taxadjunct because it has less clay in the argillic horizon and IIC than is typical for the series.

SCS-421

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Riddles taxadjunct SOIL Nos. S71Mich-81-1 LOCATION Washtenaw County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos 71B350 - 71B358

	Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (<0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: Coarse (.05-0.02)	Silt: Fine (0.02-0.002)	Clay: Coarse (0.002-0.0002)	Clay: 3A1b Fine (<0.0002)	Clay: 3A1a Carbonate <0.002	(0.2-0.02)	(2-0.1)	<0.074	Coarse fragments: 75-20	20-5	5-2
			Pct. of 2mm																Pct. of <75mm		
50	0-15	Ap	61.1	29.6	9.3	1.9	5.0	12.4	28.0	13.9	11.2	18.4		2.0		41.5	47.2	46.2	2	5	2
51	15-20	A&B	53.1	32.3	14.6	2.7	5.7	11.2	22.0	11.5	11.3	21.0		4.0		35.5	41.6	53.1	1	3	3
52	20-31	B&A	49.3	28.1	22.6	3.2	6.0	9.8	20.0	10.3	11.0	17.1		8.6		32.7	39.0	56.3	1	4	3
53	31-56	b21t	52.8	24.1	23.1	3.1	5.8	12.0	21.6	10.1	10.0	14.1		11.0		31.9	42.7	52.7	2	1	2
54	56-81	B22t	59.3	22.2	18.5	3.1	6.4	13.5	24.8	11.5	10.7	11.5		10.0		35.9	47.8	46.7	1	2	2
55	81-112	B3	51.8	22.0	26.2	2.7	5.7	11.9	21.6	10.0	10.9	11.1		16.3		32.7	41.8	53.6	-	3	2
56	81-112	B3	59.4	24.9	15.7	2.8	6.1	13.4	25.0	12.1	12.9	12.0		8.8		38.9	47.3	47.0	2	2	2
57	112-150	C1	70.6	24.4	5.0	6.5	9.8	17.1	25.4	11.7	13.2	11.2		2.0		38.5	58.9	35.9	1	5	4
58	150-165	C2	69.1	25.0	5.9	4.0	8.1	14.7	28.1	14.1	12.9	12.1		1.9		42.9	55.0	38.3	tr.	6	4

	Depth (cm)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.		Dit-cit ext. 6C2b Fe Pct.	6G7a Al Pct.				4F1 Liquid limit	4F Plasticity index	3B2 Cm	8E1 Resistivity ohms/cm	Bulk density 4A1e 1/3 bar g/cc	4A1b oven dry g/cc	Linear extens. 4D1 LE (whole soil) Pct.	4D1 LE (<2mm) Pct.	Water content 4B1c 1/3 bar Pct.	4B2 15 bar Pct.	WRD 4C1 (whole soil) in/in	4C1 (<2mm) in/in
50	0-15	1.19										0.94		1.60	1.63	1		11.1	4.2	0.10	
51	15-20	0.28										0.95		1.76	1.78	-		12.3	5.0	0.12	
52	20-31	0.27								22	9	0.94		1.75	1.79	1		13.1	8.0	0.08	
53	31-56	0.21								25	11	0.97		1.65	1.74	2		16.5	8.6	0.12	
54	56-81	0.14										0.97		1.67	1.74	1		14.8	7.7	0.12	
55	81-112	0.12										0.97		1.65	1.72	1		17.4	10.5	0.11	
56	81-112	0.14								20	7	0.96		1.57	1.63	1		14.6	7.1	0.11	
57	112-150	0.13									N.P.	0.93		1.79	1.81	-		7.1	2.5	0.08	
58	150-165	0.12										0.93	8.000	1.82	1.82	-		7.9	2.8	0.09	

	Depth (cm)	Extractable bases 5B4a: 6N2e Ca	6Q2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	KCl ext. 6G1e Al	CEC: 5A3a Sum cations	5A6 NH_4OAc	Sum bases plus KCl Al	Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.	6E1e Carbonate as $CaCO_3$ Ppt.	pH: 8C1c (1:1) KCl	8C1e (1:2) $CaCl_2$	8C1e (1:1) H_2O	Ratios to total clay: CEC sum	Fine clay	15-bar water
		meq/100 g																			
50	0-15	5.1	1.2	tr.	0.1	6.4	2.8		9.2	7.1		70	136		5.5	5.9	6.2		0.99	0.22	0.45
51	15-20	4.0	1.1	0.1	0.1	5.3	3.9		9.2	5.9		58	132		5.3	6.1	6.5		0.63	0.27	0.34
52	20-31	5.7	1.3	0.1	0.1	7.2	3.1		10.3	8.6		70	99		5.0	5.9	6.3		0.46	0.38	0.35
53	31-56	5.1	1.1	0.1	0.2	6.5	4.4		10.9	9.3		60	224		4.2	5.0	5.4		0.47	0.48	0.37
54	56-81	4.8	1.3	0.1	0.2	6.4	3.9		10.3	8.4		62	123		4.1	5.0	5.4		0.56	0.54	0.42
55	81-112	7.4	1.9	0.1	0.2	9.6	4.7		14.3	11.8		67	457		4.2	5.2	5.6		0.55	0.62	0.40
56	81-112	6.4	2.2	0.1	0.1	8.8	0.9		9.7	8.6		91	196	tr.	6.1	6.7	7.1		0.62	0.57	0.45
57	112-150	32.4	0.9	0.1	0.4	33.8				2.1				22	7.5	7.6	8.1			0.40	0.50
58	150-165	32.4	1.0	0.1	0.4	33.9				2.9				22	7.6	7.6	8.2			0.32	0.47

Depth (cm)	Clay fraction analysis 7A1b, d: <0.002 mm 7A2 X-ray	7A3 DTA Pct.	Sand and silt fraction analysis 7A1: 7B1 Petrographic Pct.	total weath.
0-15	VR3,MI3,KK2,VC2,VM2,QZ1			
-				
-				
31-56	MI4,VR3,KK2,VM2,MT1			
-				
-				
81-112	MI4,VM3,VR2,KK2,MT1			
112-150	MI5,VR3,VM2,KK2			

Mineral code: VR= vermiculite, MI= mica, MT= montmorillonite, VM= vermiculite-mica, interstratified, KK= kaolinite, QZ= quartz, VC= vermiculite-chlorite, interstratified

Pedon classification: Glossoboric Hapludalf; fine-loamy, mixed, mesic
Series classification: Typic Hapludalf; fine-loamy, mixed, mesic
Soil: Riddles taxadjunct*
Soil Nos.: S71MI-81-1 (BSL Nos. 71B350-71B358)
Location: Washtenaw County, Michigan SE 1/4 of Sec. 29, T1S, R4E.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 67° F. Frost-free season is 160 days.
Vegetation and land use: Cropland.
Parent material: Sandy loam glacial till.
Physiography: Moraine.
Topography: Undulating. Gradient is 5 percent.
Drainage: Well drained.
Ground water: More than 70 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: H. R. Sinclair, Jr. and N. Stroesenreuther.

(Colors are for moist soil unless otherwise stated.)

Ap 350 0 to 15 cm (0 to 6 inches). Brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) crushed and pale brown (10YR 6/3) dry; coarse subangular blocky parting to moderate fine and medium granular structure; friable; many fine roots; 5 percent gravel, less than 1 percent cobbles; slightly acid; abrupt smooth boundary.

A&B 351 15 to 20 cm (6 to 8 inches). Yellowish brown (10YR 5/4) fine sandy loam, white (10YR 8/2) dry (A part, 85 percent by volume) surrounding yellowish brown (10YR 5/6) fine sandy loam (B part); moderate fine subangular blocky structure; friable; common fine roots; 5 percent gravel, less than 1 percent cobbles; slightly acid; clear wavy boundary.

B&A 352 20 to 31 cm (8 to 12 inches). Yellowish brown (10YR 5/6) sandy clay loam (B part) and yellowish brown (10YR 5/4) fine sandy loam, white (10YR 7/2) dry (A part) coatings on surface of peds and along root and worm channels; yellowish brown (10YR 5/6) peds have yellowish brown (10YR 5/4) material typically 2 to 10 mm thick on vertical faces between abutting peds (10 to 15 percent by volume), and some less than 2 mm thick, A material is 30 percent by volume of horizon, vertical extension is through the horizon; moderate fine subangular blocky structure; friable; few fine roots; many brown (7.5YR 4/4) clay films on vertical and horizontal surfaces of peds; 5 percent gravel, less than 1 percent coarse fragments; slightly acid; clear wavy boundary.

B21t 353 31 to 56 cm (12 to 22 inches). Yellowish brown (10YR 5/6) sandy clay loam, brown (7.5YR 4/4) crushed; moderate very coarse prismatic structure parting to moderate very fine and fine subangular blocky structure; few fine roots in interiors of peds, common fine roots on surfaces of peds; many strong brown (7.5YR 5/4) clay films on vertical and horizontal surfaces of peds; skeletons on surfaces of peds, less than 2 mm thick; many black (N 2/0) specks on surfaces of peds; 5 percent gravel, less than 1 percent cobbles; strongly acid; gradual wavy boundary.

B22t 354 56 to 81 cm (22 to 32 inches). Strong brown (7.5YR 5/6) fine sandy loam, brown (7.5YR 4/4) crushed; very weak very coarse prismatic structure parting to moderate fine to coarse subangular blocky structure; friable; few fine roots; many brown (7.5YR 4/4) clay films on vertical and horizontal surfaces of peds; many black (N 2/0) specks on surfaces of peds; 5 percent gravel, less than 1 percent cobbles; strongly acid; gradual wavy boundary.

B3 355-356 81 to 112 cm (32 to 44 inches). Yellowish brown (10YR 5/4) fine sandy loam, brown (7.5YR 4/4) crushed; moderate fine to very coarse subangular blocky structure; friable; few fine roots; many brown (7.5YR 4/3) clay films on vertical and horizontal surfaces of peds; many black (N 2/0) specks on surfaces of peds; 5 percent gravel, less than 1 percent cobbles; medium acid; clear wavy boundary (356); the horizon contains material that is beta material; the material is yellowish brown (10YR 5/4) clay loam; moderate fine to very coarse subangular blocky structure; friable; few fine roots; many brown (7.5YR 4/3) clay films on vertical and horizontal surfaces of peds; many black (10YR 2/1) specks on surfaces of peds; 5 percent gravel, less than 1 percent cobble; strongly acid (355).

C1 357 112 to 150 cm (44 to 59 inches). Yellowish brown (10YR 5/4) fine sandy loam; massive parting to weak medium or thick platy structure; friable; very few fine roots; 5 percent gravel, less than 1 percent cobbles; moderately alkaline; slight effervescence; gradual wavy boundary.

C2 358 150 to 165 cm (59 to 65 inches). Yellowish brown (10YR 5/4) fine sandy loam; massive parting to weak medium or thick platy structure; friable; very few fine roots; 7 percent gravel, less than 1 percent cobbles; moderately alkaline; slight effervescence.

* This was sampled as Hillsdale. It was correlated as Riddles. It is a taxadjunct because of the presence of interfingering of the A into the B horizon.

SOIL CLASSIFICATION—PSAMMAQUENTIC HAPLUDALF
SANDY, MIXED, MESIC
SERIES - - - - - - - -THETFORD, TAXADJUNCT*

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

SOIL NO - - - - - - - S75MI-21-9   COUNTY - - - BERRIEN

GENERAL METHODS- - -1A,1B1B,2A1,2B   SAMPLE NOS. 760424-760429   APRIL 1979

DEPTH CM	HORIZON	SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
		(- - - PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B																
		PCT LT 2MM																
000-025	AP	83.4	10.4	6.2		.7	3.9	18.4	50.8	9.6	4.1	6.3		73.8				.52
025-050	B1	91.3	4.7	4.0		.2	5.0	25.5	54.9	5.7	2.5	2.2		85.6				.38
050-079	A2	97.9	.8	1.3		.0	1.3	14.5	75.2	6.9	.6	.2		91.0				.62
079-083	BT	87.7	3.7	8.6		.1	1.2	9.1	64.6	12.7	3.3	.4		75.0				.50
087-098	A2	89.6	7.3	3.1		.1	2.9	13.1	52.3	21.2	5.2	2.1		68.4				.45
098+	B&A	96.4	2.1	1.5		.1	2.9	18.7	67.2	7.5	1.3	.8		88.9				.80

DEPTH CM	VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20	20-5	5-2	LT .074	20-2 PCT LT20	4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	FIELD STATE PCT	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	PH 8C1E 1/2 CACL
	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)		(- - - PCT LT 75 - - -)					(BULK DENSITY)			(- - - -WATER CONTENT- - - -)								
000-025	TR	0	0	TR	TR	20	TR	1.67	1.68	.002		13.8	3.2	.18				5.4	4.9
025-050	TR	0	0	0	TR	10	TR						1.5					5.7	4.6
050-079	0	0	0	0	0	3	0		1.49A				.8		11.8A			5.1	4.5
079-083	TR	0	0	TR	0	17	TR						4.3					5.0	4.3
087-098	0	0	0	0	0	19	0						1.4					5.0	4.3
098+	0	0	0	0	0	6	0	1.72	1.76	.008		14.1	1.2	.22				5.1	4.5

DEPTH CM	ORGANIC MATTER 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	CAT EXCH 5A3A EXTB ACTY	CAT EXCH 5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	BASE SAT 5C3 EXTB ACTY PCT	BASE SAT 5C1 NHAC PCT
						(- -EXTRACTABLE BASES 5B4A- -) MEQ / 100 G													
000-025	1.06	.083	13			1.2	.6	.0	TR	1.8	5.6		7.4	4.5	.73	2.0	27	24	40
025-050	.11	.013	8			.3	.2	.0	.0	.5	2.0		2.5	1.2	.30	1.5	25	20	42
050-079	.02	.002	10			.1	.2	.0	.0	.3	1.9		2.2	.6	.46	.5	17	14	50
079-083	.05	.008	6			1.2	.7	.0	.0	1.9	7.7		9.6	3.6	.42	1.7	33	20	53
087-098	.01	.004	3			.5	.2	.0	.0	.7	1.7		2.4	1.6	.52	2.5	31	29	44
098+	.01	.002	5			.4	.1	.0	.0	.5	1.6		2.1	1.0	.67	4.0	40	24	50

DEPTH CM	SATURATED PASTE 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
								(SATURATION EXTRACT 8A1)	(MEQ / LITER)										
000-025																			
025-050																			
050-079																			
079-083																			
087-098																			
098+	57000	5.4	23.0			10		.07	.3	.1	.1	.1	0	.3	0	.0			

SAND MINERALOGY (7B1)   PLACEMENT:MIXED.
079-083 FNES - RE82 QZ80 CD2 FK17 FP1 HN.(345 GRAINS COUNTED)
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: RE = RESISTANT MINERALS HN = HORNBLENDE QZ = QUARTZ FK = POTASSIUM FELDSPAR
FP = PLAGIOCLASE FELDSPAR CD = CHALCEDONY.

(A) CORE SAMPLE, METHOD 4A3A.
*TAXADJUNCT BECAUSE PEDON IS MORE ACID THAN TYPICAL FOR THE SERIES.

Pedon classification: Psammaquentic Hapludalf; sandy, mixed, mesic
Series classification: (Same)
Soil: Thetford taxadjunct*
Soil Nos.: S75MI-021-9 (NSSL Nos. 760424-760429)
Location: Berrien County, Michigan; 402 feet east and 1878 feet north of the southwest corner of Sec. 16, T3S, R17W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 50° F., and the mean summer air temperature is about 68° F. Frost-free season is 160-170 days.
Vegetation and land use: Grasses and weeds. Idle cropland.
Parent material: Sand.
Physiography: Outwash plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat poorly drained.
Ground water At 54 inches.
Erosion: Slight.
Permeability: Moderately rapid.
Described by: N. Stroesenreuther and J. Larson.

(Colors are for moist soil unless otherwise stated.)

Ap 424 0 to 25 cm (0 to 10 inches). Dark brown to brown (10YR 4/3) loamy fine sand; moderate fine granular structure; very friable; strongly acid; abrupt smooth boundary.

B1 425 25 to 50 cm (10 to 20 inches). Brownish yellow (10YR 6/6) fine sand; common medium faint yellowish brown (10YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; weak fine granular structure; very friable; medium acid; gradual wavy boundary.

A2 426 50 to 79 cm (20 to 31 inches). Very pale brown (10YR 7/3) fine sand; common medium distinct light brownish gray (10YR 6/2) and common medium prominent strong brown (7.5YR 5/8) mottles; single grain; loose; strongly acid; abrupt wavy boundary.

A&B 427-428-429 79 to 152 cm (31 to 60 inches). Pale brown (10YR 6/3) fine sand (A2)(428); common medium faint light gray (10YR 7/2) and common medium prominent yellowish red (5YR 5/6) mottles; single grained; loose; with lamellae and bands of yellowish brown (10YR 5/4) loamy fine sand (Bt)(427); few medium distinct light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure in thicker bands; friable; wavy and discontinuous 1 to 6 inch thick bands with a total accumulation of 18 inches; strongly acid; (429) a combination of B&A.

* This was sampled as Thetford. It is a taxadjunct because it is more acid than typical for the series.

1251A

SOIL CLASSIFICATION-PSAMMENTIC HAPLUDALF
SANDY, MIXED, MESIC
SERIES - - - - - - -SPINKS

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

SOIL NO - - - - - - S75MI-21-10 COUNTY - - - BERRIEN

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 760430-760436 APRIL 1979

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM) SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .002-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY	NON-CO3-CLAY	RATIO 8D1 15-BAR TO CLAY
000-025	AP	84.9	11.4	3.7		.3	1.8	10.5	57.0	15.3	6.1	5.3		69.6				.54
025-041	A2	86.5	10.6	2.9		.3	2.1	10.6	56.2	17.3	4.1	6.5		69.2				.41
041-081	A2	96.2	1.9	1.9		1.3	5.5	17.9	63.2	8.3	1.3	.6		87.9				.53
041-081	B21T	87.8	2.7	9.5		.4	3.7	16.1	58.7	8.9	1.4	1.3		78.9				.40
081-101	2B22T	90.1	2.9	7.0		12.4	26.9	27.5	20.8	2.5	1.3	1.6		87.6				.41
101-152	3A'2	97.5	1.1	1.4		.0	.2	5.7	85.7	5.9	.7	.4		91.6				.57
101-152	3B'2T	85.5	3.2	11.3		TR	.4	6.9	66.3	11.9	1.9	1.3		73.6				.34

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20	20-5	5-2	LT .074	20-2 PCT LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	4B1C 1/10 BAR PCT	WATER CONTENT 4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
000-025	TR	0	0	TR	TR	20	TR	1.72	1.73	.002		6.7	2.0	.08			6.6	6.0
025-041	TR	0	0	TR	TR	21	TR	1.62	1.62	.000		8.9	1.2	.13			6.6	6.0
041-081	2	0	0	2	1	6	3						1.0				5.1	4.5
041-081	TR	0	0	TR	TR	15	TR	1.61	1.66	.011		10.0	3.8	.10			5.4	4.6
081-101							20						2.9				5.0	4.3
101-152	TR	0	0	0	TR	4	TR						.8				5.1	4.6
101-152	TR	0	0	0	TR	19	TR	1.68	1.71	.006		8.8	3.8	.09			5.0	4.5

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) CA	MG	NA	K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(MEQ / 100 G)													
000-025	.45	.027	17			2.0	.9	.0	.3	3.2	2.2		5.4	3.1	.84	2.2	65	59	103
025-041	.07	.006	12			.6	.5	.0	TR	1.1	3.5		4.6	1.2	.41	1.2	50	24	92
041-081	.02	TR				.3	.2	.0	.0	.5	1.1		1.6	.9	.47	1.5	33	31	56
041-081	.07	.008	9			1.6	1.2	.0	.1	2.9	3.8		6.7	3.9	.41	1.3	41	43	74
081-101	.02	.008	3			1.4	.4	.0	TR	1.8	3.1		4.9	3.4	.49	3.5	41	37	53
101-152	.00	.002				.4	.1	.0	.0	.5	1.4		1.9	.8	.57	4.0	50	26	63
101-152	.04	.011	4			2.0	.7	.0	.1	2.8	2.8		5.6	3.9	.35	2.9	51	50	72

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
								(MEQ / LITER)											
000-025																			
025-041																			
041-081																			
041-081																			
081-101																			NP
101-152	33000	5.6	26.4			20		.14	.6	.3	.1	.1	0	.0	0	.0	.2		
101-152	16000	5.3	24.1			20		.16	.8	.3	.1	.1	0	.0	0	.2	.3		

SAND MINERALOGY (7B1) PLACEMENT:MIXED
041-081 FNES - RE88 QZ85 CD2 AR1 FK11 HN1 (318 GRAINS COUNTED)
RELATIVE AMOUNTS: AS PERCENT
MINERAL: RE = RESISTANT MINERALS AR = AGGREGATES HN = HORNBLEND QZ = QUARTZ FK = POTADTASSIUM FELDSPAR CD = CHALCEDONY

Pedon classification: Psammentic Hapludalf; sandy, mixed, mesic
Series classification: (Same)
Soil: Spinks
Soil Nos.: S75MI-021-10 (NSSL Nos.760430-760436)
Location: Berrien County, Michigan; 960 feet north and 520 feet east of the southwest corner of Sec. 17, T3S, R17W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 50° F., and the mean summer air temperature is about 68° F. Frost-free season is 160-170 days.
Vegetation and land use: Rhubarb. Cropland.
Parent material: Sand.
Physiography: Outwash plain.
Topography: Nearly level. Gradient is 2 percent.
Drainage: Well drained.
Ground water Below 60 inches.
Erosion: Slight.
Permeability: Moderately rapid or rapid.
Described by: N. Stroesenreuther and J. Larson.

(Colors are for moist soil unless otherwise stated.)

Ap 430 0 to 25 cm (0 to 10 inches). Dark brown to brown (10YR 4/3) loamy fine sand; moderate medium granular structure; very friable; neutral; abrupt smooth boundary.

A2 431 25 to 41 cm (10 to 16 inches). Light yellowish brown (10YR 6/4) fine sand; weak medium granular structure: very friable; neutral; abrupt wavy boundary.

A2&B21t 432-433 41 to 81 cm (16 to 32 inches). Brownish yellow (10YR 6/6) fine sand (A2)(432); single grain; loose; with lamellae and bands of dark brown to brown (7.5YR 4/4) loamy fine sand (B21t)(433); weak medium subangular blocky structure in thicker bands; very friable; wavy and discontinuous 1/4 to 1 inch thick bands with a total accumulation of 8 inches; strongly acid; abrupt wavy boundary.

IIB22t 434 81 to 101 cm (32 to 40 inches). Dark brown to brown (7.5YR 4/4) gravelly sand; weak medium subangular blocky structure; very friable; 20 percent pebbles; strongly acid; clear wavy boundary.

IIIA'2&B'2t 435-436 101 to 152 cm (40 to 60 inches). Light brown (10YR 6/4) fine sand (A'2)(435); single grain; loose; with lamellae and bands of dark brown to brown (7.5YR 4/4) loamy fine sand (B'2t)(436); few fine prominent dark reddish brown (5YR 3/2) iron-manganese concretions; weak fine granular structure; very friable; dark grayish brown (10YR 4/2) clay bridging between sand grains; strongly acid.

1252A

SOIL CLASSIFICATION-PSAMMENTIC HAPLUDALF
SANDY, MIXED, MESIC
SERIES - - - - - - -SPINKS

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

SOIL NO - - - - - - S75MI-75-4 COUNTY - - - JACKSON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 760419-760423 APRIL 1979

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B: SAND 2-.05 PCT	SILT .05-.002 PCT	CLAY LT .002 PCT	FINE CLAY LT .0002 PCT	SAND VCOS 2-1 PCT	SAND CORS 1-.5 PCT	SAND MEDS .5-.25 PCT	SAND FNES .25-.10 PCT	SAND VFNS .10-.05 PCT	SILT COSI .05-.02 PCT	SILT FNSI .02-.002 PCT	SILT VFSI .005-.002 PCT	SAND 2-.10 PCT	INTR II .2-.02 PCT	FINE CLAY TO CLAY PCT	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
000-015	AP	89.6	7.6	2.8	2.2	.4	4.1	27.0	51.6	6.5	2.3	5.3		83.1		79		.86
015-046	B1	90.9	7.2	1.9	1.6	.6	4.4	27.7	53.3	4.9	2.6	4.6		86.0		84		.68
046-073	A2	96.4	2.8	.8		.1	2.0	25.2	65.1	4.0	2.4	.4		92.4				1.00
073-172	A&B	98.1	1.3	.6		.1	3.2	30.1	60.2	4.5	.7	.6		93.6				1.33
073-172	B2T	91.3	2.2	6.5		.1	3.2	29.1	54.3	4.6		3.2		86.7				.49

DEPTH CM	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2: VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20 PCT LT 75	20-5 PCT LT 75	5-2 PCT LT 75	LT .074 PCT LT 75	20-2 PCT LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	FIELD STATE PCT	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
000-015	1	0	0	1	1	13	2		1.37A				2.4		9.3A			5.5	5.0
015-046	1	0		1	1	11	2		1.39A				1.3		6.5A			5.5	4.8
046-073	TR	0	0	TR	TR	5	TR		1.45A				.8		5.2A			5.6	4.8
073-172	TR	0	0	0	TR	3	TR		1.33A				.8		5.0A			5.7	5.0
073-172	TR	0	0	0	TR	10	TR	1.65	1.70	.010		9.0	3.2	.10				5.8	5.4

DEPTH CM	ORGANIC MATTER 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	EXTRACTABLE BASES 5B4A: 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB MEQ / 100 G	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
000-015	.70	.069	10			1.7	.3	.0	.1	2.1	4.5		6.6	3.5	1.25	5.7	49	32	60
015-046	.10	.016	6			.3	.1	.0	.1	.5	2.7		3.2	1.3	.68	3.0	23	16	38
046-073	.04	.010	4			.2	.1	.0	.1	.4	1.6		2.0	.8	1.00	2.0	25	20	50
073-172	.02	.005	4			.4	.1	.0	.0	.5	1.5		2.0	.6	1.00	4.0	67	25	83
073-172	.07	.009	8			2.1	.4	.0	.2	2.7	2.3		5.0	3.4	.53	5.3	62	54	79

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	SATURATION EXTRACT 8A1: 6A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
000-015																			
015-046																			
046-073																			
073-172	61000	6.4	23.7		1	10		.07	.2	TR	.2	.2	0	.0	0	.0			
073-172	19000	6.2	23.9			20		.15	.6	.1	.1	.3	0	.0	0	.2			

SAND MINERALOGY (7B1) PLACEMENT:MIXED
073-172 FNES - RE81 QZ78 CD1 OP1 GN1 FK13 FP3 HN2 BT1.(351 GRAINS COUNTED)
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: RE = RESISTANT MINERALS BT = BIOTITE HN = HORNBLENDE OP = OPAQUE QZ = QUARTZ
FK = POTASSIUM FELDSPAR FP = PLAGIOCLASE FELDSPAR CD = CHALCEDONY GN = GARNET.

(A) CORE SAMPLE, METHOD 4A3A.

Pedon classification: Psammentic Hapludalf; sandy, mixed, mesic
Series classification: (Same)
Soil: Spinks
Soil Nos.: 875MI-075-4 (NSSL Nos. 760419-760423)
Location: Jackson County, Michigan; 100 feet south and 910 feet east of the center of Sec. 36, T3S, R1W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 68° F. Frost-free season is 145-155 days.
Vegetation and land use: Corn. Cropland.
Parent material: Sand.
Physiography: Outwash plain.
Topography: Nearly level. Gradient is 2 percent.
Drainage: Well drained.
Ground water: Below 68 inches.
Erosion: Slight.
Permeability: Moderately rapid or rapid.
Described by: N. Stroesenreuther and R. Engel.

(Colors are for moist soil unless otherwise stated.)

Ap 419 0 to 15 cm (0 to 6 inches). Dark brown to brown (10YR 4/3) fine sand; moderate fine granular structure; very friable; strongly acid; abrupt smooth boundary.

B1 420 15 to 46 cm (6 to 18 inches). Brownish yellow (10YR 6/6) sand; single grain; loose; 1 percent pebbles; strongly acid; gradual wavy boundary.

A2 421 46 to 73 cm (18 to 29 inches). Light yellowish brown (10YR 6/4) fine sand; single grain; loose; medium acid; abrupt wavy boundary.

A&B 422-423 73 to 172 cm (29 to 68 inches). Light yellowish brown (10YR 6/4) fine sand (A2)(422); single grain; loose; with lamellae and bands of dark brown to brown (7.5YR 4/4) fine sand (B2t)(423); weak medium subangular blocky structure in thicker bands; friable; wavy and discontinuous 1 to 6 inch thick bands with a total accumulation of 25 inches; medium acid.

1250A

SOIL CLASSIFICATION: PSAMMENTIC HAPLUDALF
SANDY, MIXED, MESIC
SERIES - - - - - - - - SPINKS , TAXADJUNCT*

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

SOIL NO - - - - - - - S75MI-21-12 COUNTY - - - BERRIEN

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 760443-760450 APRIL 1979

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM) SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	SAND VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	SILT COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
000-020	AP	80.3	15.4	4.3	1.4	5.2	20.7	29.0	21.8	3.6	4.6	10.8		76.7		33		.77
020-036	B1	86.4	9.4	4.2	1.9	6.4	23.2	35.3	19.0	2.5	2.5	6.9		83.9		45		.57
036-053	B21T	84.1	11.1	4.8	2.2	6.2	22.8	32.6	19.7	2.8	3.1	8.0		81.3		46		.52
053-091	B22T	91.7	3.9	4.4	2.5	2.8	25.2	48.1	14.7	.9	1.4	2.5		90.8		57		.48
091-115	B23T	83.9	5.7	10.4	6.4	6.8	29.7	34.7	11.5	1.2	1.5	4.2		82.7		62		.44
115-135	B3	94.4	2.1	3.5	2.6	8.0	32.1	40.5	13.4	.4	.7	1.4		94.0		74		.54
135-168	2C	90.8	6.4	2.8	1.7	14.6	37.8	25.3	8.7	4.4	3.3	3.1		86.4		61		.64
161-168	2C	94.4	4.6	1.0	.2	18.5	48.1	23.2	3.3	1.3	1.9	2.7		93.1		20		1.20

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20 (PCT LT 75)	20-5	5-2	LT .074	20-2 PCT LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	4B1C 1/10 BAR PCT	WATER CONTENT 4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	(PH) 8C1A 1/1 H2O	8C1E 1/2 CACL
000-020	8	0	TR	9	5	15	14	1.60	1.63	.005		15.4	3.3	.16			5.7	5.3
020-036	15	0	TR	17	8	10	25	1.63	1.69	.010		12.1	2.4	.13			5.6	4.9
036-053	9	0	TR	9	5		14						2.5				5.7	4.9
053-091	10	0	TR	10	6	7	16	1.72	1.74	.003		8.4	2.1	.08			5.7	4.9
091-115	17	0	TR	20	9	12	30	1.64	1.66	.003		7.1	4.6	.03			5.5	5.0
115-135	9	0	TR	8	7	5	15						1.9				5.6	5.1
135-168	29	0	TR	35	14	6	49						1.8		12		8.1	7.6
161-168	22	0	TR	23	14	4	37						1.2		12		8.1	7.5

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA (MEQ)	6Q2D MG	6P2B NA	6Q2B K	SUM EXTB / 100	ACTY 6H1A BACL TEA G	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
000-020	.86	.063	14			2.4	1.0	TR	.2	3.6	4.1		7.7	5.1	1.19	2.4	47	47	71
020-036	.14	.014	10			1.2	.4	TR	.2	1.8	2.5		4.3	2.7	.64	3.0	44	42	67
036-053	.10	.013	8			1.4	.4	TR	.2	2.0	2.4		4.4	2.9	.60	3.5	48	45	69
053-091	.05	.004	13			1.4	.5	TR	.1	2.0	1.9		3.9	2.7	.61	2.8	52	51	74
091-115	.11	.031	4			3.0	.9	TR	.1	4.0	4.0		8.0	5.5	.53	3.3	55	50	73
115-135	.04	.006	7			1.3	.5	TR	.1	1.9	1.9		3.8	2.3	.66	2.6	57	50	83
135-168	.08	.007	11				1.6	TR	TR					1.9	.68				
161-168							.9	.0	.0					1.0	1.00				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT) 8A1A EC MMHOS/CM	6N1B CA (MEQ / LITER)	6D1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
000-020																			
020-036																			
036-053																			
053-091																			NP
091-115																			
115-135																			
135-168	12000	7.8	20.3			50		.37	2.6	1.0	.2	.1	0	1.8	0	.3	1.0		
161-168																			

SAND MINERALOGY (7B1) PLACEMENT: MIXED
091-115 FNES - RE86 QZ70 AR8 OP6 GN2 FK13 BT1 ZR (242 GRAINS COUNTED)
MED - RE92 QZ92 FK7 OP1 HN (319 GRAINS COUNTED).
RELATIVE AMOUNTS: AS PERCENT.
MINERAL CODE: RE = RESISTANT MINERALS AR = AGGREGATES BT = BIOTITE OP = OPAQUE QZ = QUARTZ ZR = ZIRCON
FK = POTASSIUM FELDSPAR GN = GARNET

*TAXADJUNCT BECAUSE PEDON HAS LESS CLAY IN THE SURFACE 50 CM AND ARGILLIC HORIZON THAN IS TYPICAL FOR THE SERIES.

Pedon classification: Psammentic Hapludalf; sandy, mixed, mesic
Series classification: (Same)
Soil: Spinks taxadjunct*
Soil Nos.: S75MI-021-12 (NSSL Nos. 760443-760450)
Location: Berrien County, Michigan; 2120 feet south and 820 feet east of the northwest corner of Sec. 22, T5S, R18W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 50° F., and the mean summer air temperature is about 68° F. Frost-free season is 160-170 days.
Vegetation and land use: Wheat. Cropland.
Parent material: Sand and gravelly sand.
Physiography: Outwash plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Well drained.
Ground water: Greater than 66 inches.
Erosion: Slight.
Permeability: Moderately rapid.
Described by: N. Stroesenreuther and J. Larson.

(Colors are for moist soil unless otherwise stated.)

Ap 443 0 to 20 cm (0 to 8 inches). Dark grayish brown (10YR 4/2) loamy sand; moderate medium granular structure; friable; 5 percent pebbles; many fine roots; medium acid; abrupt smooth boundary.

B1 444 20 to 36 cm (8 to 14 inches). Dark yellowish brown (10YR 4/4) loamy sand; moderate medium granular structure; very friable; 5 percent pebbles; many fine roots; medium acid; gradual wavy boundary.

B21t 445 36 to 53 cm (14 to 21 inches). Brown (7.5YR 5/4) gravelly loamy sand; moderate medium subangular blocky structure; friable; 17 percent pebbles; common fine roots; medium acid; gradual wavy boundary.

B22t 446 53 to 91 cm (21 to 36 inches). Dark brown to brown (7.5YR 4/4) gravelly loamy sand; moderate medium subangular blocky structure; friable; 17 percent pebbles; few fine roots; medium acid; clear wavy boundary.

B23t 447 91 to 115 cm (36 to 45 inches). Dark brown to brown (7.5YR 4/4) gravelly loamy sand; moderate medium subangular blocky structure; friable; thin discontinuous reddish brown clay films on the faces of peds; 20 percent pebbles; strongly acid; abrupt wavy boundary.

B3 448 115 to 135 cm (45 to 53 inches). Dark yellowish brown (10YR 4/4) gravelly sand; weak fine granular structure; very friable; 20 percent pebbles; medium acid; abrupt wavy boundary.

IIC 449-450 135 to 168 cm (53 to 66 inches). Yellowish brown (10YR 5/4) gravelly sand; single grained; loose; 20 percent pebbles; moderately alkaline. (450) at 161 cm for base saturation.

* This was sampled as Oshtemo. It is a taxadjunct to Spinks because it has more coarse fragments in the solum and IIC horizon.

1256A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Pickford taxadjunct SOIL Nos. S67Mich-17-1 LOCATION Chippewa County, Mich.

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 67B565 - 67B575

Depth (cm)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand (2-1) Very coarse	Sand (1-0.5) Coarse	Sand (0.5-0.25) Medium	Sand (0.25-0.1) Fine	Sand (0.1-0.05) Very fine	Silt (0.05-0.02)	Silt Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<.074 mm	3B2 Cm	Coarse fragments 3B1 2A2 ≥ 2 Pct.	2-19	19-76
		Pct. of < 2 mm															Pct. of < 76mm	
0-8	A11	a/															0	0
8-18	A12	3.5	39.9	56.6	0.0	0.2	0.2	0.7	2.4	5.4	34.5	8.3	1.1	98.4	1.00	0	0	0
18-23	B21g	5.7	41.5	52.8	0.0	0.2	0.1	0.5	4.9	7.5	34.0	12.8	0.8	98.4			0	0
23-36	B22	2.9	35.1	62.0	0.0	0.1	0.2	1.0	1.6	2.5	32.6	4.8	1.3	98.2	1.00	0	0	0
36-43	B23	2.6	37.2	60.2	0.0	0.1	0.3	1.2	1.0	2.0	35.2	3.9	1.6	98.1	1.00	0	0	0
43-61	B31	2.7	34.5	62.7	0.0	0.2	0.3	1.1	1.1	0.8	33.7	2.7	1.6	97.9	1.00	0	0	0
61-66	B32	1.5	50.5	48.0	0.0	0.1	0.1	0.6	0.7	0.4	50.1	1.6	0.8	99.0			0	0
66-81	C1	0.8	63.3	35.9	0.0	0.1	0.1	0.4	0.2	0.5	62.8	1.0	0.6	99.3	1.00	0	0	0
81-102	C2	2.2	39.2	58.6	0.0	0.5	0.7	0.7	0.3	0.6	38.6	1.3	1.9	98.0	1.00	0	0	0
102-137	C3	2.7	20.6	76.7	0.9	0.7	0.4	0.4	0.3	0.3	20.3	0.8	2.4	97.5	1.00	0	0	0
137-163	C4	0.9	18.7	80.4	0.0	0.1	0.1	0.1	0.6	1.1	17.6	1.8	0.3	99.6	1.00	0	0	0

Depth (cm)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N	Loss on ignition 400°C	6E1e Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohm-cm 60°F	4C1 WRD in/in	pH	8C1c (1:1) KCl	8C1a (1:1) H_2O
0-8	25.04	1.69	15	42.7		2.2							51.9				5.5	6.0
8-18	2.51	0.21	12			0.8		1.29	1.71	0.094		36.7	20.6		0.21		4.9	6.0
18-23	0.80	0.08	10			1.1							17.2				4.7	6.0
23-36	0.32					1.9		1.30	1.71	0.096		36.2	21.6		0.19		4.8	6.2
36-43	0.23					1.7		1.25	1.64	0.095		39.2	22.0		0.22		5.0	6.5
43-61	0.19					1.3		1.20	1.57	0.094		40.1	20.6		0.23		6.0	6.9
61-66	0.16				11	0.9							16.4				6.5	7.4
66-81	0.12				22	0.6		1.49	1.64	0.032		27.9	11.3		0.25		6.8	7.6
81-102	0.14				26	0.7		1.49	1.71	0.047		28.8	18.2		0.16		6.9	7.8
102-137	0.26				17	0.9		1.38	1.66	0.064		34.5	22.7		0.16		7.0	7.9
137-163	0.30				12	0.9		1.40	1.63	0.052		34.0	23.9	2600	0.14		6.9	8.0

Depth (cm)	Extractable bases 5B4a 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC 5A3a Sum cations	5A1a NH_4OAc	6G1e Ext. Al			Ratios to clay CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-8	58.9	14.9	0.2	0.6	74.6	33.6	108.2	83.8	0.1						4		69	89
8-18	19.3	7.3	0.1	0.4	27.1	14.1	41.2	29.9	0.0			0.73	0.01	0.36	3		66	91
18-23	15.6	6.6	0.1	0.4	22.7	7.7	30.4	24.8	0.1			0.58	0.02	0.32	2		75	92
23-36	19.6	9.3	0.2	0.5	29.6	6.6	36.2	31.6	0.0			0.58	0.03	0.35	2		82	94
36-43	20.0	9.9	0.2	0.5	30.6	5.4	36.0	31.2	0.1			0.60	0.03	0.36	2		85	98
43-61	20.0	10.8	0.3	0.4	31.5	3.6	35.1	28.7	0.1			0.56	0.02	0.33	2		90	110
61-66			0.2	0.3				20.9	0.0				0.02	0.34	4			
66-81			0.1	0.3				11.8	0.1				0.02	0.31	7			
81-102			0.2	0.4				16.5	0.1				0.01	0.31	7			
102-137			0.3	0.6				15.4	0.0				0.01	0.30	5			
137-163			0.3	0.7				16.0	0.0				0.01	0.30	5			

Depth (cm)	Clay fraction analysis 7A1: 0.002 mm 7A2 X-ray b/c/	7A3 DTA c/ Pct.	Sand fraction analysis 7A1: 0.05-0.10 mm 7B1 Petrographic c/ Pct.	TW
0-8				
8-18	VR2,CL1,MI1	KK10	QZ50,AR18,FM<1,TM<1,ZR<1,FD29,HN1,SP1,EN<1	38
18-23				
23-36	VR2,MI2,CL1	KK10	QZ60,ZR5,FM<1,TM<1,ZR<1,FD30,HN2,SP1,EN<1	33
36-43				
43-61				
61-66				
66-81	VR3,CL2,MI2,QZ2	KK10	QZ40,AR4,FM1,TM<1,ZR<1,FD14,HN29,DL11	51
81-102				
102-137				
137-163				

a/ Not determined because of high organic matter.

b/ Relative amounts (X-ray): 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.

c/ Mineral code: AR = aggregates, mostly siliceous materials, CL = chlorite, DL = dolomite, EN = enstatite, FD = feldspar, FM = ferromagnesian minerals, HN = hornblende, KK = kaolinite, MI = mica, QZ = quartz, SP = sphene, TM = tourmaline, TW = total weatherable minerals, VR = vermiculite, ZR = zircon.

Pedon classification: Aeric Fluvaquents; fine, mixed, non-acid, frigid
Series classification: Aeric Haplaquept; fine, illitic, non-acid, frigid
Soil: Pickford, taxadjunct*
Soil Nos.: S67MI-17-1 (67B565-67B575)
Location: Chippewa County, Michigan; NE 1/4, NE 1/4, NW 1/4, Sec. 33, T44N, R1W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 44° F., and the mean summer air temperature is about 62° F. Frost-free season is 140-150 days.
Vegetation and land use: Willow, aspen, and alder. Woodland.
Parent material: Lacustrine clays.
Physiography: Lake plain.
Topography: Nearly level. Gradient is less than 1 percent.
Drainage: Poorly drained.
Ground water: At 60 inches.
Erosion: Slight.
Permeability: Very slow.
Described by: S. Alfred and E. P. Whiteside.

(Colors are for moist soil unless otherwise stated.)

A11 565 0 to 8 cm (0 to 3 inches). Black (10YR 2/1) mucky clay loam; moderate medium granular structure; friable; many medium roots; medium acid; smooth boundary.

A12 566 8 to 18 cm (3 to 7 inches). Very dark gray (10YR 3/1) silty clay; moderate medium angular blocky structure; very firm; few fine roots; medium acid; abrupt wavy boundary

B21g 567 18 to 23 cm (7 to 9 inches). Dark gray (10YR 4/1) clay, with many medium prominent reddish brown (5YR 5/4) mottles; moderate medium angular blocky structure; very firm; few fine roots; slightly acid; abrupt smooth boundary.

B22 568 23 to 36 cm (9 to 14 inches). Reddish brown (5YR 5/3) clay, with few medium distinct yellowish red (5YR 4/6) mottles; weak medium angular blocky structure; firm; few fine roots; slightly acid; clear smooth boundary.

B23 569 31 to 43 cm (14 to 17 inches). Reddish brown (5YR 5/3) clay, with few medium faint reddish brown (5YR 5/4) mottles; weak medium angular blocky structure; firm; few fine roots; slightly acid; clear smooth boundary.

B31 570 43 to 61 cm (17 to 24 inches). Reddish brown (5YR 5/3) clay; weak coarse angular blocky structure; firm; few gleyed surfaces; 1/4 inch weak red (2.5YR 5/2) lense; few fine roots; neutral; abrupt smooth boundary.

B32 571 61 to 66 cm (24 to 26 inches). Reddish brown (5YR 5/3) comprising 70 percent of the matrix and reddish brown (5YR 5/4) comprising 30 percent, silty clay; weak coarse angular blocky structure; firm; gray (5Y 6/1) gleyed ped faces and some light gray (5Y 7/1) lime coatings; mildly alkaline; abrupt smooth boundary.

C1 572 66 to 81 cm (26 to 32 inches). Reddish brown (5YR 5/3) silty clay loam; massive to weak coarse platy structure; variable; firm; many thin light gray (5YR 7/1) silt lenses ($CaCO_3$); slight effervescence; mildly alkaline; abrupt smooth boundary.

C2 573 81 to 102 cm (32 to 40 inches). Reddish brown (5YR 5/3-4/3) clay; weak coarse platy structure; varied; very firm;; light gray (5YR 7/1) lime coatings and some gray (5Y 6/1) gleyed ped surfaces; one thin light brownish gray (10YR 6/2) medium sand lense at bottom of the horizon; slight effervescence; mildly alkaline; abrupt smooth boundary.

C3 574 102 to 137 cm (40 to 54 inches). Reddish brown (2.5YR 5/4) clay with common medium faint (5YR 5/3) mottles; weak coarse platy structure; varied; very firm; gray (5Y 5/1-6/1) gleyed surfaces surrounding few fine root channels; strong effervescence; moderately alkaline; abrupt smooth boundary.

C4 575 137 to 163 cm (54 to 64 inches). Reddish brown (2.5YR 5/4) clay, with few medium distinct grayish brown (2.5YR 5/2) mottles; weak coarse platy structure; very firm; gray (5Y 5/1) gleyed surfaces on some peds; strong effervescence; moderately alkaline.

* This soil was sampled as Pickford. It is a taxadjunct because it has an irregular decrease in organic carbon.

1726A

SCS-421
10-64 (Rev. 9-66)

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Lenawee taxadjunct SOIL Nos. 869Mich-58-3 LOCATION Monroe County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 69B564 - 69B569

Depth cm	Horizon	1B1b Total: Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Size class and particle diameter (mm) 3A1 Sand: Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Silt: 0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<0.074	3B2 Cm	Coarse fragments 3B1: 2A2 > 2 Pct.	2-20	20-75
		Pct. of < 2 mm															Pct. of < 75 mm	
0-25	Ap	10.7	53.9	35.4	0.1	0.2	0.4	1.1	8.9	24.1	29.8	33.7	1.8	96.6	1.00	0	0	0
25-38	B21g	11.5	50.5	38.0	0.2	0.5	0.5	1.0	9.3	23.8	26.7	33.7	2.2	96.1	1.00	0	0	0
38-56	B22g	12.9	50.5	36.6	0.1	0.5	0.5	1.2	10.7	23.3	27.2	34.7	2.2	95.6	1.00	0	0	0
56-84	B23g	15.0	41.1	43.9	0.0	0.2	0.5	1.1	13.2	16.9	24.2	30.8	1.8	95.4	1.00	0	0	0
84-127	IIC1g	5.1	70.6	24.3	0.1	0.1	0.3	0.6	4.1	29.4	41.2	33.9	1.0	98.3	1.00	0	0	0
127-156	IIIC2g	3.7	71.8	24.5	0.0	0.2	0.3	0.6	2.6	25.1	46.7	28.1	1.1	98.4	1.00	0	0	0

Depth cm	6A1e Organic carbon Pct	Nitrogen Pct	C/N		6E1d Carbonate as $CaCO_3$ Pct.	Ext. iron as Fe Pct.	Bulk density: g/cc	4A1d ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohms-cm 60°F	4C1 WRD in/in	pH: 8C1e (1:2) $CaCl_2$	8C1c (1:1) KCl	8C1a (1:1) H_2O
0-25	1.97							1.51	1.70	0.04		22.8	14.0		0.13	5.4	4.8	5.6
25-38	0.53							1.54	1.78	0.05		22.8	14.0	2800	0.14	6.4	5.7	6.8
38-56	0.66							1.55	1.80	0.05		22.8	14.3		0.13	6.8	6.3	7.1
56-84	0.66				4			1.60	1.81	0.04		22.4	16.0	2400	0.10	7.3	6.6	7.5
84-127	0.66				15			1.51	1.59	0.02		23.4	11.1		0.19	7.5	7.0	7.8
127-156	0.77				19			1.57	1.71	0.03		22.5	11.4		0.17	7.6	7.1	7.9

Depth cm	Extractable bases 5B4a: 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations	5A1a NH_4OAc	6G1d Ext. Al	3A1b Fine clay <0.0002 mm Pct.	Ratios to clay 8D1: Fine clay	CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	mea/100 g																	
0-25	8.1	3.9	tr.	tr.	12.0	6.2	18.2	22.7		14.1	0.40	0.51		0.40			66	53
25-38	7.9	4.2	tr.	tr.	12.1	2.7	14.8	19.6		17.1	0.45	0.39		0.37			82	62
38-56	7.0	3.9	tr.	tr.	10.9	2.1	13.0	17.5		16.3	0.45	0.36		0.39			84	62
56-84			tr.	tr.				16.7		19.3	0.44			0.36				
84-127			tr.	tr.				11.9		10.2	0.42			0.45				
127-156			tr.	tr.				10.0		9.2	0.38			0.46				

Depth cm	a/b/Clay fraction mineralogy 7A1b, d 7A2 X-ray: Total clay <0.002 mm c/	Fine clay <0.0002 mm c/
0-25	MT4,MI4,VR3,KK2,VM2,QZ1	
25-38		
38-56		
56-84	MI4,VR3,MT3,VM2,VC2,KK2,QZ1	
84-127		
127-156		

a/Mineral code
MT = montmorillonite
VR = vermiculite
MI = mica
KK = kaolinite
QZ = quartz
VM = vermiculite/mica
VC = vermiculite/chlorite

b/Family mineralogy is mixed.

c/Approximate weight fractions (X-ray)
5 = more than half
4 = half to one-third
3 = one-third to one-fifth
2 = one-fifth to one-twentieth
1 = less than one-twentieth

Pedon classification: Mollic Fluvaquent; fine, mixed, nonacid, mesic
Series classification: Mollic Haplaquept; fine,mixed, nonacid, mesic
Soil: Lenawee, taxadjunct*
Soil Nos.: 869MI-58-3 (BSL Nos. 69B564-69B569)
Location: Monroe County, Michigan; 815 feet south and 390 feet east of the NW corner of the SW 1/4, Sec. 29, T8S, R8E.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 50° F., and the mean summer air temperature is about 69° F. Frost-free season is 160-170 days.
Vegetation and land use: Wheat. Cropland.
Parent material: Stratified lacustine silty clay loam and clay loam.
Physiography: Lake plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Poorly drained.
Ground water: At 63 inches.
Erosion: Slight.
Permeability: Moderately slow.
Described by: R. Larson and R. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap 564 0 to 25 cm (0 to 10 inches). Very dark grayish brown (10YR 3/2) silty clay loam; very dark gray (10YR 3/1) crushed and smooth; weak coarse subangular blocky structure; firm; abundant roots; acid abrupt smooth boundary.

B21g 565 25 to 38 cm (10 to 15 inches). Grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and few fine distinct dark gray (10YR 4/1) mottles; weak medium angular blocky parting to fine angular blocky structure; firm; few coarse roots; neutral; clear wavy boundary.

B22g 566 38 to 56 cm (15 to 22 inches). Grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and common fine distinct gray (10YR 6/1) mottles; weak medium prismatic parting to medium angular blocky structure; very firm; grayish brown (10YR 5/2) coatings on verticle faces of prisms and dark gray (10YR 4/1) stains along root channels; few coarse roots; neutral; gradual wavy boundary.

B23g 567 56 to 84 cm (22 to 33 inches). Brown (7.5Y 5/2) silty clay; many medium distinct yellowish brown (10YR 5/6) and common fine prominent greenish gray (5GY 6/1) mottles; weak coarse prismatic parting to medium angular blocky structure; very firm; gray (5Y 6/1) coatings on verticle prism faces; few coarse roots; clear wavy boundary.

IIC1g 568 84 to 127 cm (33 to 50 inches). Mottled light gray to gray (5Y 6/1) and light olive brown (2.5Y 5/6) silt loam; common medium and coarse distinct yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; friable; gray (5Y 6/1) coatings on verticle faces; slight effervescence; moderately alkaline; abrupt wavy boundary.

IIIC2g 569 127 to 156 cm (50 to 61 inches). Mottled olive (5Y 5/4) and greenish gray (5GY 5/1) silt loam; many coarse distinct light olive brown (2.5Y 5/6) and gray (5Y 6/1) mottles; moderate thick platy parting to fine platy structure; friable; light gray (10YR 7/1) $CaCO_3$ concretions imbedded between strata; strong effervescence; moderately alkaline.

* This soil was sampled as Lenawee. It is a taxadjunct because it has an irregular decrease in organic carbon.

1554A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Lenawee taxadjunct SOIL Nos. S69Mich-58-5 LOCATION Monroe County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 69B578 - 69B584

Depth cm	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand Very coarse (2-1)	Sand Coarse (1-0.5)	Sand Medium (0.5-0.25)	Sand Fine (0.25-0.1)	Sand Very fine (0.1-0.05)	Silt 0.05-0.02	Silt Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<0.074	3B2 Cm	Coarse fragments 3B1 2A2 > 2 Pct.	2-20	20-75
		Size class and particle diameter (mm) 3A1 — Pct. of < 2 mm															Pct. of < 75 mm	
0-18	Ap	16.3	44.4	39.3	0.2	0.4	1.3	5.5	8.8	15.2	29.2	27.6	7.5	89.7	1.00	tr.	tr.	0
18-25	A12	16.8	43.6	39.6	0.2	0.5	1.5	5.9	8.7	14.7	28.9	27.3	8.1	89.1	1.00	1	1	0
25-42	B21g	18.6	42.7	38.7	0.1	0.5	1.7	7.0	9.3	13.9	28.8	27.8	9.3	87.5	1.00	tr.	tr.	0
42-66	B22g	24.1	40.9	35.0	0.1	0.4	2.0	9.8	11.8	14.5	26.8	32.9	12.3	83.5	1.00	tr.	tr.	0
66-92	B23g	20.5	44.3	35.2	0.1	0.3	1.4	7.2	11.5	16.1	28.2	32.5	9.0	87.4	1.00	tr.	tr.	0
92-122	B3g	9.6	47.4	43.8	0.2	0.3	0.8	3.3	5.0	12.1	35.3	19.2	4.6	93.8	1.00	tr.	tr.	0
122-153	Cg	8.6	44.5	46.9	0.6	1.0	1.0	2.6	3.4	8.6	35.9	13.6	5.2	93.7	1.00	1	1	0

Depth cm	6A1a Organic carbon Pct	Nitrogen Pct.			6E1d Carbonate as $CaCO_3$ Pct.	Liquid Limit Pct.	Plasticity Index Pct.	Bulk density 4A1d ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohms-cm 60°F	4C1 WRD in/in	pH 8C1e (1:2) $CaCl_2$	8C1c (1:1) KCl	8C1a (1:1) H_2O
0-18	2.25							1.50	1.71	0.04		21.4	15.4		0.09	6.2	5.6	6.2
18-25	2.01							1.53	1.75	0.05		22.1	15.3		0.10	6.3	5.6	6.4
25-42	0.80							1.52	1.78	0.05		23.4	14.5		0.14	6.5	5.8	6.6
42-66	0.38							1.61	1.80	0.04		21.1	13.5	2400	0.12	6.8	6.0	7.0
66-92	0.25					39	18	1.63	1.95	0.06		21.1	14.0		0.12	6.9	6.2	7.2
92-122	0.52							1.58	1.78	0.04		24.3	16.6		0.12	7.5	6.8	7.8
122-153	0.52				16	40	17	1.58	1.75	0.04		24.9	17.3	2400	0.12	7.7	6.9	8.1

Depth cm	Extractable bases 5B4a 6N2e Ca	6O2a Mg	6P2b Na	6Q2b K	1/ Sum	6H2a Ext. acidity	1/ CEC 5A3a Sum cations	5A1a NH_4OAc	6G1d Ext. Al	3A1b Fine clay <0.0002 mm Pct.	Ratios to clay 8D1 Fine clay	CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-18	18.3	8.5	tr.	tr.	26.8	5.9	32.7	21.0		16.2	0.41	0.83		0.39			82	-
18-25	16.4	6.2	tr.	tr.	22.6	5.9	28.5	28.9		16.3	0.41	0.72		0.39			79	78
25-42	13.1	4.9	tr.	tr.	18.0	4.0	22.0	19.7		17.9	0.46	0.57		0.37			82	91
42-66	13.1	5.3	tr.	tr.	18.4	2.1		17.6		16.7	0.48	0.59		0.38			1/	1/
66-92	13.0	4.9	tr.	tr.	17.9	2.1		16.8		16.1	0.46	0.57		0.40			1/	1/
92-122			tr.	tr.		0.8		17.7		15.7	0.36			0.38				
122-153			tr.	tr.				14.4		15.0	0.32			0.37				

Depth (in.)	Clay Fraction Analysis 7A1b-d Mt.	Chl.	Vm.	Mi.	Int.	Qtz.	Kl.	Gibbsite
	7A2 X-ray						7A3	

1/ Sum of bases larger than NH_4OAc CEC, indicates that some soluble carbonates influenced extractable base measurements. Base saturation and sum of cation CEC is, therefore, not calculated.

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

Pedon classification: Mollic Fluvaquent; fine; mixed, nonacid, mesic
Series classification: Mollic Haplaquept; fine, mixed, nonacid, mesic
Soil: Lenawee, taxadjunct*
Soil Nos.: S69MI-58-5 (BSL Nos. 69B578-69B584)
Location: Monroe County, Michigan; 600 feet east of I-75 and 500 feet south of Dunbar road in Government Claim 561, T7S., R9E.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 50° F., and the mean summer air temperature is about 69° F. Frost-free season is 160-170 days.
Vegetation and land use: Legume-grass hay. Cropland.
Parent material: Stratified lacustrine silty clay loam and silt loam.
Physiography: Lake plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Poorly drained.
Ground water: At 58 inches.
Erosion: Slight.
Permeability: Moderately slow.
Described by: R. Johnson and R. Larson.

(Colors are for moist soil unless otherwise stated.)

Ap 578 0 to 18 cm (0 to 7 inches). Very dark gray (10YR 3/1) silty clay loam; very dark grayish brown (10YR 3/2) crushed and smoothed; weak medium and coarse granular structure; firm; abundant roots; slightly acid; abrupt smooth boundary.

A12 579 18 to 25 cm (7 to 10 inches). Very dark gray (10YR 3/1) silty clay loam; very dark grayish brown (10YR 3/2) crushed and smoothed; weak coarse angular blocky parting to medium angular blocky structure; firm; common roots; slightly acid; abrupt wavy boundary.

B21g 580 25 to 42 cm (10 to 17 inches). Gray (10YR 5/1) heavy silty clay loam; many medium and coarse distinct yellowish brown (10YR 5/6) and coarse prominent light olive brown (2.5Y 5/4) mottles; coatings on vertical ped faces of dark greenish gray (5GY 4/1); weak medium prismatic parting to medium angular blocky structure; very firm; few roots; neutral; clear wavy boundary.

B22g 581 42 to 66 cm (17 to 22 inches). Gray (10YR 5/1) heavy clay loam; many medium and coarse distinct yellowish brown (10YR 5/6) mottles; coatings on vertical ped faces of dark greenish gray (5GY 5/1) and very dark gray (10YR 3/1) organic stains on some prism faces; weak medium prismatic parting to medium angular blocky structure; very firm; few roots; neutral; clear wavy boundary.

B23g 582 66 to 92 cm (26 to 36 inches). Light gray to gray (10YR 6/1) heavy clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; gray (10YR 5/1) coatings on vertical faces and dark gray (10YR 4/1) organic stains along root channels; weak medium prismatic parting to medium angular blocky structure; firm; few roots; neutral; clear wavy boundary.

B3g 583 92 to 122 cm (36 to 48 inches). Light gray to gray (5Y 6/1) light silty clay; many medium and coarse prominent brown (7.5YR 5/2) mottles; gray (10YR 5/1) coatings on vertical ped faces; weak coarse subangular blocky structure; firm; few roots; mildly alkaline; abrupt smooth boundary.

Cg 584 122 to 153 cm (48 to 60 inches). Light gray to gray (5Y 6/1) light silty clay; many medium prominent light olive brown (2.5YR 5/4) and brown (7.5YR 5/2) and many medium and coarse distinct strong brown (7.5YR 5/6) mottles; weak medium platy structure; firm; light gray (10YR 7/1) $CaCo_3$ accumulations; strong effervescence; moderately alkaline

* This soil was sampled as Lenawee. It is a taxadjunct because it has an irregular decrease in organic carbon.

1558A

SOIL CLASSIFICATION- TYPIC UDORTHENT
SANDY, MIXED, FRIGID
SERIES - - - - - - - -EMMET TAXADJUNCT

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

SOIL NO - - - - - - - S70M1-24-1 COUNTY - - - EMMET

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 70B414-70B421

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	SAND VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	SILT- COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY	NON-CO3-CLAY	RATIO 8D1 15-BAR TO CLAY
		PCT LT 2MM															PCT	
0-18	AP	76.6	16.5	6.9	2.5	1.4	15.4	31.4	23.0	5.4	7.5	9.0		71.2	21.8	36		.62
18-26	B21IR	71.1	22.7	6.2	2.0	1.7	14.2	28.6	20.6	6.0	11.0	11.7		65.1	24.9	32		.56
26-46	B22IR	78.7	15.9	5.4	1.7	1.4	15.9	32.7	23.2	5.6	7.8	8.1		73.1	22.3	32		.44
46-56	A'2	73.3	19.6	7.1	3.1	1.5	15.4	29.4	20.7	6.4	9.9	9.7		66.9	24.3	44		.39
56-74	B'2	81.4	10.4	8.2	3.8	2.1	18.2	34.2	22.4	4.6	5.5	4.9		76.8	18.5	46		.35
74-99	2C1	72.8	16.6	10.6	3.1	4.0	16.3	28.2	19.4	5.0	7.3	9.3		67.8	20.4	29	7	.33
99-125	2C2	74.9	15.7	9.4	3.0	6.2	16.4	28.1	19.5	4.7	6.0	9.7		70.2	18.6	32	5	.32
125-153	2C3	64.4	24.8	10.8	2.9	4.6	6.7	29.4	19.4	4.3	14.0	10.8		60.1	25.9	27	7	.28

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20	20-5	5-2	LT .074	20-2 PCT LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	WATER CONTENT- 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	(-PH-) 8C1A 1/1 H2O	8C1E 1/2 CACL
			PCT LT 75															
0-18	TR		1	2	1	26		1.61	1.63	.004		6.5	4.3	.04	TR		7.1	7.0
18-26	5		0	5	1	32		1.61	1.63	.004		9.3	3.5	.09	TR		7.3	7.0
26-46	TR		0	3	1	24		1.61	1.58	.000		6.7	2.4	.07	0		7.5	7.0
46-56	5		0	4	1	31		1.64	1.65	.004		5.7	2.8	.05	1		7.4	7.0
56-74	5		1	4	1	21		1.67	1.65	.000		6.1	2.9	.05	1		7.9	7.3
74-99	25		13	10	5	30		1.99	2.01	.002		5.5	3.5	.04	22	4	8.4	7.8
99-125	25		19	9	5	28		1.93	1.94	.001		5.3	3.0	.04	20	4	8.5	7.8
125-153	20		14	4	5	38		1.90	1.93	.002		5.0	3.0	.04	28	4	8.6	7.9

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(-EXTRACTABLE BASES 5B4A-) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						MEQ / 100 G-													
0-18	1.26			.2			.9	TR	.5		1.9			6.3	.91				
18-26	.89			.2			.5	TR	.4		2.0			5.3	.85				
26-46	.34			.1			.2	TR	.2		1.2			3.4	.63				
46-56	.26			.1			.4	TR	.2					4.2	.59				
56-74	.33			.1			.2	TR	.1					4.2	.51				
74-99	.17			.1			.6	TR	.1					2.4	.23				
99-125	.13			TR			.5	TR	.1					2.2	.23				
125-153	.07			TR			.6	TR	.1					2.1	.19				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(-SATURATION EXTRACT 8A1-) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
									MEQ / LITER										
0-18																			
18-26																			
26-46																			
46-56																			
56-74																			
74-99																			
99-125																			
125-153	13000																		

DEPTH CM	(PYROPHOSPHATE,PH10) 6C5A EXT FE PCT	6G5A EXT AL PCT	6A1B EXT C PCT	(DITHIONITE-CITRATE) 6C2B EXT FE PCT	6G7A EXT AL PCT	6D1B EXT MN PCT	(PYROPHOSP) FE+AL TO CLAY	AL+C TO CLAY	PYRO FE+AL TO D - C FE+AL	CEC -1/2 CLAY X THIC
0-18				.2	TR					
18-26	.1	.1		.2	TR		<.1			
26-46	.1	.1		.1	TR		<.1			
46-56	.1	.1		.1	TR		<.1			
56-74	TR	TR		.1	TR					
74-99				.1	TR					
99-125				TR	TR					
125-153				TR	TR					

CLAY MINERALOGY (7A2I, 7A3)

DEPTH-CM	X-RAY				
26-46	VR3	MI2	MT1	CL1	QZ1
74-99	MV2	MI3	CA2	CL2	QZ1

RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MT = MONTMORILLONITE MI = MICA CL = CHLORITE VR = VERMICULITE CA = CALCITE QZ = QUARTZ
MV = MONTMORILLONITE-VERMICULITE

Pedon classification: Typic Udorthent; sandy, mixed, frigid
Series classification: Alfic Haplorthod; coarse-loamy, mixed, frigid
Soil: Emmet taxadjunct*
Soil Nos.: S70MI-24-1 (BSL Nos. 70B414-70B421)
Location: Emmet County, Michigan; southeast 1/4, southeast 1/4, southwest 1/4 of Sec. 11, T34N, R6W.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 42° F., and the mean summer air temperature is about 64° F. Frost-free season is 140 days.
Vegetation and land use: Timothy. Cropland.
Parent material: Calcareous sandy loam glacial till.
Physiography: Ground moraine.
Topography: Gently sloping. Gradient is 3 percent.
Drainage: Well drained.
Ground water: Greater than 60 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: H. R. Sinclair, Jr. and R. Larson.

(Colors are for moist soil unless otherwise stated.)

Ap 414 0 to 18 cm (0 to 7 inches). Very dark grayish brown (10YR 3/2) sandy loam, grayish brwon (10YR 5/2) dry; moderate fine to coarse granular structure; very friable; many roots; 5 percent coarse fragments; neutral; abrupt smooth boundary.

B21ir 415 18 to 26 cm (7 to 10 inches). 50 percent dark yellowish brown and 50 percent yellowish brown (10YR 5/6) sandy loam; weak fine and medium granular structure; very friable; many roots; 5 percent coarse fragments; neutral; clear broken boundary.

B22ir 416 26 to 46 cm (10 to 18 inches). Strong brown (7.5YR 5/6) loamy sand; weak fine and medium granular structure; very friable; common roots; black (10YR 2/1) coatings on surfaces of worm holes and root channels; 5 percent coarse fragments; mildly alkaline; gradual wavy boundary.

A'2 417 46 to 56 cm (18 to 22 inches). Brown (7.5YR 5/4) sandy loam; weak fine and medium granular structure; very friable; common roots; black (10YR 2/1) coatings on surfaces of worm holes and root channels; 5 percent coarse fragments; mildly alkaline; gradual irregular boundary.

B'2 418 56 to 74 cm (22 to 29 inches). Brown (7.5YR 5/4) loamy sand; weak very coarse subangular blocky structure; very friable; common roots; reddish brown (5YR 4/3) clay bridging of sand grains; black (10YR 2/1) coatings on surfaces of worm holes and root channels; 5 percent coarse fragments; moderately alkaline; clear wavy boundary.

IIC1 419 74 to 99 cm (29 to 39 inches). Light brown (7.5YR 6/4) gravelly sandy loam; massive parting to weak medium platy structure; friable; few roots; 40 percent coarse fragments; strong effervescence; moderately alkaline; gradual wavy boundary; reddish brown (5YR 4/3) tongues of B'2 horizon spaced 2 to 8 inches apart.

IIC2 420 99 to 125 cm (39 to 49 inches). Pale brown (10YR 6/3) cobbly sandy loam; common fine distinct strong brown (7.5YR 5/6) mottles; massive; friable; few roots; pinkish gray (7.5YR 6/2) coatings of lime; 50 percent coarse fragments; strong effervescence; strongly alkaline; gradual wavy boundary; reddish brown (5YR 4/3) tongues of B't horizon spaced 6 to 12 inches apart.

IIC3 421 125 to 153 cm (49 to 60 inches). Light brown (7.5YR 6/4) stony sandy loam; common fine faint strong brown (7.5YR 5/6) mottles; massive; friable; few roots; light gray (10YR 6/1) coatings of lime; 70 percent coarse fragments; strong effervescence; strong alkaline.

* This was sampled as Emmet. It is a taxadjunct because it lacks a spodic horizon, has less clay in the 10 to 40 inch control section and has more coarse fragments than is typical for the series.

1307A

SCS-421
10-64 (Rev. 9-65)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Grayling SOIL Nos. 866Mich-16-1 LOCATION Cheboygan County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 66467 - 66474

Depth (in.)	Horizon	1B1b Total Sand (2–0.05)	Total Silt (0.05–0.002)	Total Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 > 2 <76 Pct.	2 – 19 (Pct. of < 76mm)	19 – 76 (Pct. of < 76mm)
		Pct. of < 2 mm																
0-1½	A1	92.2	5.7	2.1	0.6	25.0	48.4	17.0	1.2	2.3	3.4	7.8	91.0			0	0	0
1½-3	A3	93.3	5.0	1.7	1.0	26.5	48.2	16.7	0.9	1.6	3.4	6.5	92.4			0	0	0
3-7	B21	91.8	6.1	2.1	1.3	24.5	47.2	17.8	1.0	2.3	3.8	7.9	90.8			1	1	0
7-15	B22	95.1	3.4	1.5	2.0	29.7	48.6	14.2	0.6	1.2	2.2	4.6	94.5			3	3	tr.
15-22	B3	98.6	0.8	0.6	1.3	27.3	49.0	20.5	0.5	0.3	0.5	5.5	98.1			1	1	0
22-44	C1	98.8	0.8	0.4	0.8	18.4	52.4	26.5	0.7	0.5	0.3	7.6	98.1			1	1	0
44-66	C2	99.4	0.4	0.2	0.2	9.6	64.0	25.4	0.2	0.1	0.3	3.7	99.2			tr.	tr.	0
66-122	C3	92.3	7.2	0.5	0.7	17.4	50.4	23.5	0.3	7.0	0.2	12.4	92.0			1	1	0

Depth (in.)	6A1a Organic carbon (Pct.)	6B2a Nitrogen (Pct.)	C/N		Carbonate as $CaCO_3$ (Pct.)	6C2a Ext. iron as Fe (Pct.)	Bulk density: 4A3a Field Moist (g/cc)	4A1e ⅓ bar (g/cc)	4A1h Oven dry (g/cc)	4D1 COLE	Water content: 4B1c 0.05 bar (Pct.)	4B1c 1/10 bar (Pct.)	4B2 15 bar (Pct.)		4C1 WRD (in/in)	pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-1½	3.16	0.11	29		tr.	0.3							4.7			5.7	6.2
1½-3	0.43	0.02	22			0.2	1.37				8.9	7.0	2.3			5.1	6.2
3-7	0.31					0.4	1.30				7.8	5.7	1.8			4.7	5.6
7-15	0.12					0.4	1.39				6.0	4.5	1.3			4.8	5.5
15-22	0.06					0.1	1.46				4.0	2.5	0.7			4.8	5.2
22-44	0.04					0.1	1.54				3.6	2.1	0.4			4.9	5.3
44-66	-					0.1	1.55				3.1	1.9	0.3			4.9	5.3
66-122						tr.							0.3			4.9	5.5

Depth (in.)	Extractable bases 5B1c: 6H2e Ca (meq/100 g)	6G2d Mg	6P2b Na	6Q2b K	Sum	6N2a Ext. acidity	CEC: 5A3a Sum cations		6G1d Ext. Al		Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations (Pct.)	5C1 NH_4OAc (Pct.)
0-1½	8.4	0.8	tr.	0.1	9.3	3.7	13.0		tr.		6.19	0.14	2.24			72	
1½-3	2.4	0.3	0.1	tr.	2.8	2.9	5.7		tr.		3.35	0.12	1.35			49	
3-7	0.1	0.1	0.1	tr.	0.3	2.5	2.8		0.5		1.33	0.19	0.86			11	
7-15	-	tr.	tr.	tr.	tr.	1.7	1.7		0.3		1.13	0.27	0.87			tr.	
15-22	-	-	-	-	-	0.8	0.8		0.2		1.25	0.17	1.17			-	
22-44	-	-	tr.	tr.	tr.	0.4	0.4		0.1		1.00	0.25	1.00			tr.	
44-66	-	-	tr.	-	tr.	0.3	0.3		0.1		1.50	0.50	1.50			tr.	
66-122						0.3			0.1			tr.	0.60				

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int.	Qtz.	Kl.	Gibbsite
	7A2 X-ray						7A2	
0-1½								
1½-3	-	-	x	-	xx	x	x	
3-7								
7-15	-	-	-	-	xx	x	tr.	
15-22								
22-44	-	-	-	tr.	x	x	x	
44-66								
66-122								

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

Pedon classification: Typic Udipsamments; mixed, frigid
Series classification: (Same)
Soil: Grayling
Soil Nos.: S66MI-16-1 (BSL Nos. 66467-66474)
Location: Cheboygan County, Michigan; SW 1/4, SE 1/4, Sec. 27, T35N, R2W.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 44° F., and the mean summer air temperature is about 64° F. Frost-free season is 110-120 days.
Vegetation and land use: Jack pine, scub oak, and choke cherry. Woodland.
Parent material: Sand.
Physiography: Lake plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Excessively drained.
Ground water Below 122 inches
Erosion: Slight.
Permeability: Rapid.
Described by: S. Alfred, R. Johnson and N. Stroesenreuther

(Colors are for moist soil unless otherwise stated.)

A1 467 0 to 4 cm (0 to 1 1/2 inches). Black (10YR 2/1) sand; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

A3 468 4 to 8 cm (1 1/2 to 3 inches). Dark yellowish brown (10YR 3/4) and grayish brown (10YR 5/2 dry) to dark grayish brown (10YR 4/2 dry) sand; very weak coarse granular structure; very friable; slightly acid; clear wavy boundary.

B21 469 8 to 18 cm (3 to 7 inches). Brown to dark brown (7.5YR 5/4-4/4) to dark yellowish brown (10YR 4/4) and light yellowish brown (10YR 6/4 dry) sand; very weak coarse granular structure; very friable; medium acid; clear smooth boundary.

B22 470 18 to 38 cm (7 to 15 inches). Yellowish brown (10YR 5/6 moist) to dark yellowish brown (10YR 4/4) and brownish yellow (10YR 6/6 dry) sand; single grain; loose; strongly acid; gradual smooth boundary.

B3 471 38 to 55 cm (15 to 22 inches). Yellowish brown (10YR 5/4) and yellow (10YR 7/6 dry) sand; single grain; loose; strongly acid; clear smooth boundary.

C1 472 55 to 110 cm (22 to 44 inches). Light yellowish brown (10YR 6/4) to very pale brown (10YR 7/4) sand; single grain; loose; strongly acid; clear smooth boundary.

C2 473 110 to 165 cm (44 to 66 inches). Light yellowish brown (10YR 6/4) sand; with a few 1/16 to 1/8 inch brownish yellow (10YR 6/6) color bands; single grain; loose; strongly acid.

C3 165 to 305 cm (66 to 122 inches). Light yellowish brown (10YR 6/4) sand; single grain; loose; strongly acid. (Auger sample)

1589A

SCS-421
10-64 (Rev. 9-66)

SOIL CONSERVATION SERVICE

SOIL Grayling SOIL Nos. S66Mich-21-1 LOCATION Delta County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 66483 - 66488

Depth (in.)	Horizon	1B1b Total: Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Sand: Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	Silt: (0.05–0.02)	Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 > 2 < 76 Pct.	2 – 19	19 – 76
		Size class and particle diameter (mm) 3A1																
		Pct. of < 2 mm															Pct. of < 76mm	
0-1	A1	94.3	3.1	2.6	0.1	12.3	53.0	27.2	1.7	0.9	2.2	11.2	92.6			0	0	0
1-2½	A3	94.3	3.6	2.1	0.0	10.5	50.2	30.8	2.8	0.9	2.7	14.0	91.5			0	0	0
2½-7	B21	95.2	2.7	2.1	0.1	10.2	50.9	31.9	2.1	0.7	2.0	13.5	93.1			0	0	0
7-12	B22	97.4	1.2	1.4	0.1	14.6	52.4	28.4	1.9	0.1	1.1	11.4	95.5			0	0	0
12-22	B3	99.2	0.2	0.6	0.1	19.4	55.8	22.7	1.2	0.0	0.2	7.9	98.0			0	0	0
22-68	C1	91.2	8.3	0.5	0.1	16.9	45.0	26.9	2.3	8.2	0.1	19.8	88.9			0	0	0

Depth (in.)	6A1a Organic carbon	6B2a Nitrogen	C/N		Carbonate as $CaCO_3$	6C2a Ext. iron as Fe	Bulk density: 4A3a Field Moist	4A1e ⅓ bar	4A1h Oven dry	4D1 COLE	Water content: 4B1c 0.05 bar	4B1c 1/10 bar	4B2 15 bar		4C1 WRD	pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
	Pct.	Pct.			Pct.	Pct.	g/cc	g/cc	g/cc		Pct.	Pct.	Pct.		in/in		
0-1	2.79	0.10	28			0.2							5.6			3.9	4.7
1-2½	0.70	0.02	35			0.2							2.0			4.1	4.9
2½-7	0.29					0.4	1.46				7.6	5.6	1.8			4.5	5.4
7-12	0.12					0.2	1.46				5.7	3.6	1.0			4.6	5.4
12-22	0.02					0.2	1.60				3.5	1.9	0.4			4.6	5.2
22-68	-					0.1	1.60				3.2	1.6	0.3			4.7	5.3

Depth (in.)	Extractable bases 5B1c: 6N2e Ca	6Q2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A1a Sum cations		6G1d Ext. Al		Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct	5C1 NH_4OAc Pct.
	meq/100 g																
0-1	2.5	0.3	0.1	tr.	2.9	11.4	14.3		1.0		5.50	0.08	2.15			20	
1-2½	0.4	0.1	tr.	tr.	0.5	4.0	4.5		1.2		2.14	0.10	0.95			11	
2½-7	-	tr.	0.1	tr.	0.1	3.2	3.3		0.6		1.57	0.19	0.86			3	
7-12	-	-	tr.	-	tr.	1.6	1.6		0.4		1.14	0.14	0.71			tr.	
12-22	-	-	tr.	-	tr.	0.5	0.5		0.1		0.83	0.33	0.67			tr.	
22-68	-	tr.	tr.	-	tr.	0.2	0.2		0.1		0.40	0.20	0.60			tr.	

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int. Vm.-Mi.	Qtz.	Kl.	Gibbsite	
	7A2 X-ray					7A2			
0-1									
1-2½									
2½-7									
7-12	-	-	-	-	xx	x	tr.		
12-22									
22-68									

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

USDA-SCS-HYATTSVILLE MD 1966

Pedon classification: Typic Udipsamment; mixed, frigid
Series classification: (Same)
Soil: Grayling
Soil Nos.: S66MI-21-1 (BSL Nos. 66483-66488)
Location: Delta County, Michigan; SE 1/4, SW 1/4, Sec. 34, T41N, R21W.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 42° F., and the mean summer air temperature is about 64° F. Frost-free season is 120-140 days.
Vegetation and land use: Jack pine, reindeer moss, blueberries and sweet fern. Woodland.
Parent material: Sand.
Physiography: Lake plain.
Topography: Gently sloping. Gradient is 3 percent.
Drainage: Excessively drained.
Ground water Below 123 inches.
Erosion: Slight.
Permeability: Very rapid.
Described by: R. Johnson.

(Colors are for moist soil unless otherwise stated.)

A1 483 0 to 2 cm (0 to 1 inch). Black (N 2/0) sand; weak medium granular structure; very friable; very strongly acid; abrupt smooth boundary.

A3 484 2 to 6 cm (1 to 2 1/2 inches). Brown to dark brown (7.5YR 4/2) sand; weak medium granular structure; very friable; very strongly acid; abrupt smooth boundary.

B21 485 6 to 18 cm (2 1/2 to 7 inches). Brown to dark brown (7.4YR 4/4) sand; weak coarse granular structure; very friable; strongly acid; clear smooth boundary.

B22 486 18 to 30 cm (7 to 12 inches). Strong brown (7.5YR 5/6) sand; very weak coarse granular structure to single grain; very friable to loose; medium acid; clear irregular boundary.

B3 487 30 to 55 cm (12 to 22 inches). Light brown (7.5YR 6/4) sand with common, coarse, distinct strong brown (7.5YR 5/6) color stains in a blotchy pattern which is not due to impeded drainage; single grain; loose; medium acid; gradual smooth boundary.

C1 488 55 to 170 cm (22 to 68 inches). Light yellowish brown (10YR 6/4) to light brown (7.5YR 6/4) sand; single grain; loose; medium acid; abrupt smooth boundary.

C2 170 to 253 cm (68 to 101 inches). Light yellowish brown (10YR 6/4) sand with common coarse distinct yellowish brown (10YR 5/6) color stains in a blotchy pattern which do not appear to be due to impeded drainage; single grain; loose; strongly acid; abrupt smooth boundary. (Not sampled)

C3 253 to 278 cm (101 to 111 inches). Yellowish brown (10YR 5/6) sand; single grain; loose; strongly acid; abrupt smooth boundary. (Not sampled)

C4 278 to 308 cm (111 to 123 inches). Light yellowish brown (10YR 6/4) sand, with three, 4 inch yellowish brown (10YR 5/8 and 5/4) coarse sand bands; single grain; loose; strongly acid. (Not sampled)

1590A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL: Omega SOIL Nos.: S66Mich-7-3 LOCATION: Baraga County, Michigan

SOIL SURVEY LABORATORY: Beltsville, Maryland LAB. Nos.: 66445 - 66451

Depth (in.)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 ≥ 2 <76 Pct.	2 - 19	19 - 76
		Pct. of < 2 mm															Pct. of < 76mm	
3/4-0	O2															tr.	tr.	0
0-2	A2	90.7	6.7	2.6	2.8	20.2	36.9	27.2	3.6	2.3	4.4	15.3	87.1			2	2	0
2-8	B21	91.6	5.8	2.6	3.2	18.7	37.1	28.7	3.9	2.4	3.4	16.4	87.7			12	8	4
8-17	B22	94.3	4.0	1.7	3.1	18.0	40.4	29.5	3.3	2.3	1.7	15.6	91.0			9	8	1
17-25	B3	97.4	1.7	0.9	2.8	21.5	44.2	26.4	2.5	1.0	0.7	12.1	94.9			16	9	7
25-37	C1	98.9	0.7	0.4	1.4	16.2	44.6	34.8	1.9	0.5	0.2	13.1	97.0			2	1	1
37-93	C2	98.8	1.0	0.2	0.5	9.5	43.9	42.2	2.7	0.7	0.3	16.6	96.1			tr.	tr.	0

Depth (in.)	6A1a Organic carbon	6B2a Nitrogen	C/N		Carbonate as $CaCO_3$	6C2a Ext. iron as Fe	Bulk density: 4A3a Field Moist	4A1e ⅓ bar	4A1h Oven dry	4D1 COLE	Water content: 4B1c 0.05 bar (1/10)	4B1e bar	4B2 15 bar		4C1 WRD	pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
	Pct.	Pct.			Pct.	Pct.	g/cc	g/cc	g/cc		Pct.	Pct.	Pct.		in/in		
3/4-0	4.32	0.18	24			0.3							7.2			3.4	4.5
0-2	1.13	0.05	22			0.3							2.7			4.4	4.5
2-8	0.32					0.4	1.35				9.4	6.3	1.9			4.5	5.4
8-17	0.10					0.2	1.52				5.0	3.0	1.1			4.7	5.8
17-25	-					0.2	1.53				3.6	2.2	0.6			4.7	5.5
25-37	-					0.1	1.48				4.7	2.1	0.4			4.7	5.5
37-93	-					0.2	1.49				5.2	2.1	0.3			4.8	5.7

Depth (in.)	Extractable bases 5B1c: 6N2e Ca	6Q2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations		6G1d Ext. Al		Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water		8D3 Ca/Mg		Base saturation: 5C3 Sum cations	5C1 NH_4OAc
	meq/100 g																Pct.	Pct.
3/4-0	2.0	0.4	0.1	0.2	2.7	18.9	21.6		2.2								12	
0-2	0.2	0.1	tr.	tr.	0.3	5.4	5.7		2.1			2.19	0.12	1.04			5	
2-8	-	-	tr.	tr.	tr.	3.4	3.4		0.5			1.31	0.15	0.73			tr.	
8-17	-	tr.	tr.	tr.	tr.	1.8	1.8		0.4			1.06	0.12	0.65			tr.	
17-25	-	tr.	-	tr.	tr.	0.9	0.9		0.2			1.00	0.22	0.67			tr.	
25-37	-	tr.	tr.	tr.	tr.	0.5	0.5		0.1			1.25	0.25	1.00			tr.	
37-93	-	tr.	tr.	tr.	tr.	0.3	0.3		0.1			1.33	1.00	1.50			tr.	

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int. Vm. - Mi.	Qtz.	Kl.	Gibbsite	
	X-ray 7A2					7A2			
3/4-0									
0-2	xx	-	xx	-	tr.	x	x		
2-8									
8-17	-	-	-	-	xx	x	x		
17-25									
25-37	-	xx	-	tr.	-	x	x		
37-93									

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

USDA-SCS-HYATTSVILLE, MD 1966

Pedon classification: Typic Udipsamment; mixed, frigid
Series classification: (Same)
Soil: Omega
Soil Nos.: S66MI-7-3 (BSL Nos. 66445-66451)
Location: Baraga County, Michigan; SW 1/4, SW 1/4, Sec. 8, T49N, R34W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 44° F., and the mean summer air temperature is about 61° F. Frost-free season is 90-110 days.
Vegetation and land use: Jack pine, scrub oak, reindeer moss, blueberries, sweet fern and bracken fern.
Parent material: Sand.
Physiography: Outwash plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Excessively drained.
Ground water Below 93 inches.
Erosion: Slight.
Permeability: Very rapid.
Described by: R. Johnson and E. P. Whiteside.

(Colors are for moist soil unless otherwise stated.)

O2 445 2 to 0 cm (3/4 to 0 inches). Dark reddish brown (5YR 2/2) well decomposed leaf litter; weak fine granular structure; very friable; many fine fibrous roots; very strongly acid; abrupt smooth boundary.

A2 446 0 to 5 cm (0 to 2 inches). Very dark gray (5YR 3/1) to dark reddish brown (5YR 3/2 moist) and pinkish gray (5YR 6/2 dry) sand; very weak fine granular structure; very friable; extremely acid; abrupt smooth boundary.

B21 447 5 to 20 cm (2 to 8 inches). Reddish brown (5YR 4/4-4/3 moist) and reddish brown (5YR 5/4 dry) sand; very weak medium granular structure; very friable; strongly acid; clear smooth boundary.

B22 448 20 to 43 cm (8 to 17 inches). Reddish brown (5YR 5/4) sand; very weak medium granular structure; very friable; medium acid; clear wavy boundary.

B3 449 43 to 63 cm (17 to 25 inches). Strong brown (7.5YR 5/6) sand; few reddish brown (5YR 5/4) color bands; very weak medium granular structure; very friable; strongly acid; clear wavy boundary.

C1 450 63 to 93 cm (25 to 37 inches). Light brown (7.5YR 6/4) sand; single grain; loose; strongly acid; clear smooth boundary.

C2 451 93 to 233 cm (37 to 93 inches). Light reddish brown (5YR 6/3) sand; single grain; loose; medium acid; abrupt smooth boundary.

1581A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL: Omega SOIL Nos. S66Mich-52-1 LOCATION: Marquette County, Michigan

SOIL SURVEY LABORATORY: Beltsville, Maryland LAB. Nos. 66558 - 66565

Depth (in.)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand Very coarse (2-1)	Sand Coarse (1-0.5)	Sand Medium (0.5-0.25)	Sand Fine (0.25-0.1)	Sand Very fine (0.1-0.05)	Silt 0.05-0.02	Silt Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 ≥ 2 <76 Pct.	2-19 (Pct. of < 76mm)	19-76 (Pct. of < 76mm)
		Size class and particle diameter (mm) 3A1 — Pct. of < 2 mm																
0-3	A1 & A2	92.7	4.2	3.1	0.7	6.3	29.3	52.7	3.7	2.3	1.9	23.7	89.0			tr.	tr.	0
3-8	B21	90.3	5.9	3.8	0.9	6.0	26.7	52.4	4.3	3.1	2.8	25.6	86.0			1	1	0
8-12	B22	93.7	3.5	2.8	1.2	5.6	27.0	55.8	4.1	2.0	1.5	25.5	89.6			3	3	0
12-18	B3	97.0	1.4	1.6	1.6	6.3	34.9	51.4	2.8	1.4	0.0	21.8	94.2			3	3	0
18-28	C1	98.7	0.2	1.1	0.1	0.9	16.2	74.7	6.8	0.1	0.1	37.2	91.9			tr.	tr.	0
28-37	C2	99.5	0.0	0.5	0.8	11.7	51.1	33.7	1.7	0.0	0.5	10.5	97.8			3	3	0
37-43	C3	98.5	0.4	1.1	0.1	1.3	8.7	77.1	11.3	0.3	0.1	53.8	87.2			tr.	tr.	0
43-94	C4	99.4	0.2	0.4	2.9	25.8	44.3	24.9	1.5	0.2	0.0	9.6	97.9			4	3	1

Depth (in.)	6A1a Organic carbon (Pct.)	6B2a Nitrogen (Pct.)	C/N		Carbonate as $CaCO_3$ (Pct.)	6C2a Ext. iron as Fe (Pct.)	Bulk density: 4A1e ⅓ bar (g/cc)	4A1e (g/cc)	4A1h Oven dry (g/cc)	4D1 COLE	Water content: (Pct.)	4B1c ⅓ bar (Pct.)	4B2 15 bar (Pct.)		4C1 WRD in/in	pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-3	1.40	0.08	18			0.2							4.8			4.5	4.2
3-8	0.56	0.03	19			0.5							3.4			4.7	5.3
8-12	0.20					0.4							2.2			4.9	5.7
12-18	0.08					0.2							1.0			4.9	5.6
18-28	0.02					0.2							0.6			4.9	5.6
28-37	0.02					0.2							0.4			4.9	5.6
37-43	-					0.2							0.6			4.9	5.6
43-94	-					0.1							0.4			4.8	5.6

Depth (in.)	Extractable bases 5B1c: 6N2e Ca (meq/100 g)	6Q2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A1e Sum cations		6G1d Ext. Al			Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct	5C1 NH_4OAc Pct.
0-3						7.3			1.8				0.06	1.55				
3-8	0.3	0.3	-	-	0.6	5.9	6.5		0.9			1.71	0.13	0.89			9	
8-12	0.3	-	tr.	-	0.3	3.0	3.3		0.4			1.18	0.14	0.79			9	
12-18	-	-	-	-	-	1.4	1.4		0.2			0.88	0.12	0.62			-	
18-28	-	-	-	-	-	0.7	0.7		0.1			0.64	0.18	0.55			-	
28-37	-	-	-	-	-	0.5	0.5		tr.			1.00	0.40	0.80			-	
37-43	-	-	tr.	-	tr.	0.5	0.5		0.1			0.45	0.18	0.55			tr.	
43-94	-	tr.	tr.	tr.	tr.	0.4	0.4		0.1			1.00	0.25	1.00			tr.	

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int. Vm. - Mi.	Qtz.	Kl.	Gibbsite
	7A2 X-ray						7A2	
0-3								
3-8	-	-	-	-	xx	-	-	
8-12								
12-18								
18-28								
28-37								
37-43								
43-94								

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant

USDA-SCS-HYATTSVILLE, MD 1966

Pedon classification: Typic Udipsamments, mixed, frigid
Series classification: (Same)
Soil: Omega
Soil Nos.: S66MI-52-1 (BSL Nos. 66558-66565)
Location: Marquette County, Michigan; SW 1/4, SE 1/4, Sec. 27, T46N, R25W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 44° F., and the mean summer air temperature is about 62° F. Frost-free season is 110-130 days.
Vegetation and land use: Jack pine, sweet fern, reindeer moss, and blueberries. Woodland.
Parent material: Sand.
Physiography: Outwash plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat excessively drained.
Ground water: Below 94 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: R. Johnson, E. P. Whiteside

(Colors are for moist soil unless otherwise stated.)

A1 558 0 to 3 cm (0 to 1 inch). Black (5YR 2/1) fine sand; weak medium granular structure; very friable; extremely acid; abrupt smooth boundary.

A2 558 3 to 8 cm (1 to 3 inches). Brown (7.5YR 5/2) fine sand; weak fine granular structure; very friable; extremely acid; abrupt wavy boundary.

B21 559 8 to 20 cm (3 to 8 inches). Brown to dark brown (7.5YR 4/2-4/4 moist) and brown (7.5YR 5/4 dry) fine sand; weak medium granular structure; very friable; strongly acid; clear smooth boundary.

B22 560 20 to 30 cm (8 to 12 inches). Brown to dark brown (7.5YR 4/4 moist) and light brown (7.5YR 6/4 dry) to brown (7.5YR 5/4 dry) fine sand; weak medium granular structure; very friable; medium acid; clear smooth boundary.

B3 561 30 to 45 cm (12 to 18 inches). Brown to dark brown (7.5YR moist) and light brown (7.5YR 6/4 dry) fine sand; weak medium to coarse granular structure; very friable; medium acid; clear smooth boundary.

C1 562 45 to 70 cm (18 to 28 inches). Reddish brown (5YR 5/3 moist) and light brown (7.5YR 6/4 dry) fine sand; single grain; loose; medium acid; abrupt smooth boundary.

C2 563 70 to 93 cm (28 to 37 inches). Reddish brown (5YR 5/3 moist) and light brown (7.5YR 6/4 dry) sand; single grain; loose; medium acid; abrupt smooth boundary.

C3 564 93 to 108 cm (37 to 43 inches). Light reddish brown (5YR 6/3-6/4) fine sand with a 1/32 inch reddish brown (5YR 4/4) color band; weak thick platy structure to single grain; very friable to loose; medium acid; abrupt smooth boundary.

C4 565 108 to 235 cm (43 to 94 inches). Light reddish brown (5YR 6/3) sand; single grain; loose; medium acid. (Sampled with auger)

1650A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Rousseau taxadjunct SOIL Nos. S66Mich-7-4 LOCATION Baraga County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 66452 - 66459

Depth (in.)	Horizon	1B1b Total: Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Size class and particle diameter (mm) 3A1 Sand: Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Silt: 0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 > 2 <76 Pct.	2-19	19-76
		Pct. of < 2 mm														Pct.	Pct. of < 76mm	
1½-0	O2															0	0	0
0-4	A2	93.7	4.9	1.4	0.3	1.3	13.7	64.9	13.5	1.8	3.1	51.3	80.2			tr.	tr.	0
4-8	B21ir	95.2	2.7	2.1	0.0	1.9	14.7	65.6	13.0	1.6	1.1	50.6	82.2			0	0	0
8-14	B22ir	97.1	1.5	1.4	0.1	1.4	15.3	67.5	12.8	0.9	0.6	49.3	84.3			0	0	0
14-20	B3	98.3	1.1	0.6	0.0	0.5	10.0	72.3	15.5	0.6	0.5	55.6	82.8			0	0	0
20-27	C1	99.0	0.7	0.3	0.0	0.7	13.8	71.6	12.9	0.1	0.6	50.3	86.1			0	0	0
27-47	C2	98.7	0.9	0.4	0.0	1.4	19.9	65.9	11.5	0.8	0.1	43.3	87.2			0	0	0
47-73	IIC3	65.9	33.5	0.6	0.0	0.1	0.5	17.2	48.1	28.5	5.0	92.1	17.8			tr.	tr.	0

Depth (in.)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N		Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density 4A3a Field Moist g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content 4B1c 0.05 bar Pct.	4B1c 1/10 bar Pct.	4B2 15 bar Pct.		4C1 WRD in/in	pH 8C1c (1:1) KCl	8C1a (1:1) H_2O
1½-0	4.6	0.22	21		-	0.2							15.6			4.3	4.9
0-4	0.41	0.03	14			0.2	1.18				14.3	8.6	1.8			3.6	4.9
4-8	0.46	0.03	15			0.4	1.26				8.0	6.4	3.0			4.4	5.5
8-14	0.26					0.3	1.30				11.3	5.1	1.9			4.6	5.8
14-20	0.10					0.2							0.8			4.9	5.8
20-27	0.04					0.3	1.33				10.0	2.9	0.5			4.8	5.8
27-47	-					0.3	1.29				11.4	2.9	0.4			4.8	5.8
47-73	0.02					0.4	1.20				31.3	24.1	1.2			4.8	5.9

Depth (in.)	Extractable bases 5B1c: 6N2e Ca	6Q2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC 8A3a Sum cations		6G1d Ext. Al			Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation 5C3 Sum cations Pct	5C1 NH_4OAc Pct.
	meq/100 g																	
1½-0	11.1	1.3	tr.	0.5	12.9	14.7	27.6		0.2								47	
0-4	0.5	0.1	tr.	0.1	0.7	1.8	2.5		0.6			1.79	0.14	1.29			28	
4-8	0.5	0.1	tr.	0.1	0.7	5.8	6.5		0.6			3.10	0.19	1.43			11	
8-14	0.2	0.1	-	0.1	0.4	3.3	3.7		0.4			2.64	0.21	1.36			11	
14-20	0.1	tr.	-	tr.	0.1	1.5	1.6		0.1			2.67	0.33	1.33			6	
20-27	-	tr.	-	tr.	tr.	0.9	0.9		0.1			3.00	1.00	1.67			tr.	
27-47	-	tr.	tr.	tr.	tr.	0.6	0.6		0.2			1.50	0.75	1.00			tr.	
47-73	0.2	0.1	tr.	tr.	0.3	1.2	1.5		0.3			2.50	0.67	2.00			20	

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl	Vm.	Mi.	Int. Vm. - Mi.	Qtz.	Kl.	Gibbsite	
	7A2 X-ray						7A2		
1½-0									
0-4									
4-8									
8-14	-	-	-	-	xx	x	tr.		
14-20									
20-27	-	x	x	tr.	tr.	x	x		
27-47									
47-73									

Mt. = Montmorillonite, Chl = chlorite, Vm. = Vermiculite, m = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

USDA-SCS-HYATTSVILLE MD 1966

Pedon classification: Typic Udipsamment; mixed, frigid
Series classification: Entic Haplorthod; sandy, mixed, frigid
Soil: Rousseau, taxadjunct*
Soil Nos.: S66MI-7-4 (BSL Nos. 66452-66459)
Location: Baraga County, Michigan; SW 1/4, NW 1/4, Sec. 10, T50N, R34W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 42° F., and the mean summer air temperature is about 61° F. Frost-free season is 90-110 days.
Vegetation and land use: Aspen, white pine, red pine, red oak, jack pine, white birch and hard maple. Woodland.
Parent material: Sand.
Physiography: Old lake dune.
Topography: Moderately sloping. Gradient is 11 percent.
Drainage: Well drained.
Ground water: Below 73 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: E. P. Whiteside and R. Johnson.

(Colors are for moist soil unless otherwise stated.)

O2 452 3 to 0 cm (1 1/4 to 0 inches). Black (10YR 2/1) well decomposed leaf litter containing considerable amounts of fine sand; weak fine to medium granular structure; very friable; many fine roots; very strongly acid; abrupt smooth boundary.

A2 453 0 to 10 cm (0 to 4 inches). Brown (7.5YR 5/2 moist) and pinkish gray (7.5YR 7/2 dry) fine sand; weak medium to coarse granular structure; very friable to loose; few fine roots; very strongly acid; abrupt wavy boundary.

B21ir 454 10 to 20 cm (4 to 8 inches). Reddish brown (5YR 4/4) fine sand; weak medium to coarse subangular blocky to weak coarse granular structure; very friable; many fine roots, but less than in A1 horizon; strongly acid; clear wavy boundary.

B22ir 455 20 to 35 cm (8 to 14 inches). Yellowish red (5YR 4/6) fine sand; weak coarse granular to weak fine subangular blocky structure; very friable; few roots; medium acid; clear wavy boundary.

B3 456 35 to 50 cm (14 to 20 inches). Reddish brown (5YR 5/4) fine sand; single grain; loose; with few weakly cemented nodules 1/4 inches to 3/8 inches in diameter; medium acid; clear wavy boundary.

C1 457 50 to 68 cm (20 to 27 inches). Reddish brown (5YR 5/3) fine sand; single grain; loose; with weakly cemented lenses; medium acid; abrupt smooth boundary.

C2 458 68 to 118 cm (27 to 47 inches). Reddish brown (5YR 5/3) fine sand with reddish brown (5YR 4/4) color laminae; single grain with weak medium to thick platy laminae; loose to very friable; medium acid; abrupt smooth boundary.

IIC3 459 118 to 183 cm (47 to 73 inches). Reddish brown (5YR 5/3) very fine sand with 1 inch to 1/2 inch reddish brown (2.5YR 4/4) silt bands; weak thin to medium platy structure; very friable; medium acid; abrupt smooth boundary.

* This soil was sampled as Rousseau. It is a taxadjunct because it lacks the extractable Fe and Al required for a spodic horizon.

1585A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Oakville SOIL Nos. S66Mich-50-1 LOCATION Macomb County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 66549 - 66557

Depth (in.)	Horizon	1B1b Total Sand (2–0.05)	Total Silt (0.05–0.002)	Total Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)		3B2 Cm	Coarse fragments 2A2 > 2 < 76 Pct.	2 – 19	19 – 76
		Size class and particle diameter (mm) 3A1 — Pct. of < 2 mm														Pct.	Pct. of < 76mm	
1-0	O2															tr.	tr.	0
0-2	A2	85.8	10.0	4.2	1.2	4.7	14.9	54.2	10.8	3.2	6.8	41.8	75.0			2	2	0
2-6	B21	86.1	10.2	3.7	1.8	4.5	14.1	53.6	12.1	3.8	6.4	43.8	74.0			6	6	0
6-12	B22	87.1	9.5	3.4	1.2	4.9	14.7	54.0	12.3	4.1	5.4	44.9	74.8			6	6	tr.
12-20	B23	91.2	6.2	2.6	2.7	6.1	17.6	53.2	11.6	2.5	3.7	41.7	79.6			10	8	2
20-29	B3	95.1	3.1	1.8	3.5	10.2	32.4	42.9	6.1	1.6	1.5	25.5	89.0			10	10	tr.
29-47	IIC1	96.5	2.1	1.4	3.0	9.2	40.1	42.2	2.0	0.9	1.2	14.2	94.5			12	12	0
47-66	IIIC2	93.8	3.4	2.8	0.0	0.5	5.8	62.9	24.6	2.6	0.8	65.7	69.2			tr.	tr.	0
66-122	IIIC3	95.8	2.2	2.0	0.1	0.6	11.6	74.6	8.9	2.2	0.0	44.6	86.9			tr.	tr.	0

Depth (in.)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N		Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density 4A3a Field Moist g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content 4B1c 0.05 bar Pct.	4B1c 1/10 bar Pct.	4B2 15 bar Pct.		4C1 WRD in/in	pH 8C1c (1:1) KCl	8C1e (1:1) H_2O
1-0	10.7	0.54	20		-	0.4							26.6			5.4[a]	6.0[a]
0-2	2.16	0.14	15			0.4							7.2			4.3	5.3
2-6	0.47	0.05	9			0.5	1.27				20.8	10.9	3.3			4.2	5.3
6-12	0.30					0.4	1.44				17.7	8.9	2.8			4.4	5.2
12-20	0.18					0.4	1.37				15.3	7.4	2.0			4.4	5.2
20-29	0.08					0.3	1.50				6.5	4.1	1.4			4.7	5.3
29-47	0.08				-	0.3	1.45				5.9	4.1	1.2			4.8	5.7
47-66	0.07				tr.	0.4	1.48				21.1	8.4	1.5			5.0	6.0
66-122	0.06				9	0.2							0.8			6.2	7.0

Depth (in.)	Extractable bases 5B1c 6N2e Ca	6Q2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC 5A3a Sum cations		6G1d Ext. Al		Ratios to clay 5D1 CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	mea/100 g																
1-0	16.2	2.8	tr.	0.6	19.6	14.2	33.8		0.2							58	
0-2	2.1	0.5	tr.	0.1	2.7	7.6	10.3		0.6		2.45	0.10	1.71			26	
2-6	0.4	0.1	-	tr.	0.5	4.9	5.4		1.0		1.46	0.14	0.89			9	
6-12	0.3	tr.	-	tr.	0.3	3.8	4.1		1.0		1.21	0.12	0.82			7	
12-20	0.1	-	tr.	tr.	0.1	2.6	2.7		0.6		1.04	0.15	0.77			4	
20-29	0.2	tr.	-	-	0.2	1.6	1.8		0.3		1.00	0.17	0.78			11	
29-47	0.3	tr.	tr.	tr.	0.3	1.1	1.4		0.2		1.00	0.21	0.86			21	
47-66	1.5	0.4	tr.	tr.	1.9	0.8	2.7		tr.		0.96	0.14	0.54			70	
66-122	9.8	0.3	tr.	-	10.1	-	10.1		0.1		5.05	0.10	0.40			100	

Depth (in.)	Clay Fraction Analysis 7A1b-d Mt.	Chl.	Vm.	Mi.	Int	Qtz.	Kl.	Gibbsite	
	7A2 X-ray						7A2		
1-0									
0-2									
2-6									
6-12	-	-	-	-	xx	-	tr.		
12-20									
20-29									
29-47									
47-66	-	-	xxx	x	tr.	x	tr.		
66-122									

a 1:2 soil-water ratio.

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant

USDA-SCS-HYATTSVILLE MD 1966

Pedon classification: Typic Udipsamment; mixed, mesic
Series classification: (Same)
Soil: Oakville
Soil Nos.: S66MI-50-1 (BSL Nos. 66549-66557)
Location: Macomb County, Michigan; NE 1/4, SW 1/4, Sec. 9, T3N, R12E.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 50° F., and the mean summer air temperature is about 69° F. Frost-free season is 150-160 days.
Vegetation and land use: Black cherry, ash, maple, white and black oak, and tulip poplar. Woodland.
Parent material: Sand.
Physiography: Lake plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Well and moderately well drained.
Ground water: At 89 inches.
Erosion: Slight.
Permeability: Rapid or very rapid.
Described by: B. Watson.

(Colors are for moist soil unless otherwise stated.)

02 549 2 to 0 cm (1 to 0 inches). Black (10YR 2/1) well decomposed leaf litter; weak fine granular structure; very friable; many fibrous roots; medium acid; abrupt smooth boundary.

A2 550 0 to 5 cm (0 to 2 inches). Dark grayish brown (10YR 4/2) fine sand; weak coarse granular structure; very friable; many fibrous roots; strongly acid; abrupt wavy boundary.

B21 551 5 to 15 cm (2 to 6 inches). Brown to dark brown (7.5YR 4/4) to strong brown (7.5YR 5/6) fine sand; weak coarse granular structure; very friable; many roots; strongly acid; clear wavy boundary.

B22 552 15 to 30 cm (6 to 12 inches). Strong brown (7.5YR 5/6) fine sand; weak medium to coarse granular structure; very friable; few roots; strongly acid; clear wavy boundary.

B23 553 30 to 50 cm (12 to 20 inches). Yellowish brown (10YR 5/6) fine sand; weak medium granular structure; very friable; few roots; strongly acid; clear smooth boundary.

B3 554 50 to 73 cm (20 to 29 inches). Yellowish brown (10YR 5/4-5/6) sand; single grain; loose; very few roots; strongly acid; abrupt wavy boundary.

IIC1 555 73 to 118 cm (29 to 47 inches). Yellowish brown (10YR 5/4) sand; containing 5 to 10 percent fine gravel; single grain; loose; many coarse roots; medium acid; abrupt wavy boundary.

IIIC2 556 118 to 165 cm (47 to 66 inches). Light yellowish brown (10YR 6/4) fine sand with common fine distinct strong brown (7.5YR 5/6) mottles; single grain; loose when moist, non sticky when wet; medium acid.

IIIC3 557 165 to 305 cm (66 to 122 inches). Light yellowish brown (10YR 6/4) fine sand; single grain; loose when moist, non sticky when wet; neutral. (78 to 122 inch portion sampled with auger)

1667A

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Plainfield SOIL Nos. S73Mich-80-1(1-8) LOCATION Van Buren County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 73B421 - 73B422

Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1: Total Sand 2-0.05	Total Silt (0.05-0.002)	Total Clay (<0.002	Sand Very coarse (2-1)	Sand Coarse (1-0.5)	Sand Medium (0.5-0.25)	Sand Fine (0.25-0.1)	Sand Very fine (0.1-0.05)	Silt Coarse (.05-0.02)	Silt Fine (0.02-0.002)	Clay Coarse (0.002-0.0002)	Clay 3A1b Fine 0.0002	Clay 3A1a Carbonate <0.002	(0.2-0.02)	(2-0.1)	<0.074	Coarse fragments 75-20	20-5	5-2
		Pct. of <2mm																Pct. of <75mm		
41-76	B1hir	95.8	1.3	2.9																
76-120	B2hir	98.6	0.1	1.3																

Depth (cm)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.		Dit-cit ext. 6C2b Fe Pct.	6G7a Al Pct.	Na pyrophosphate ext. 6C5a Fe Pct.	6G5a Al Pct.	6A1b C Pct.	Pyro. Fe+Al / C.D. Fe+Al	4F Plasticity index	3H2 Cm		Bulk density 4A1e 1/3 bar g/cc	4A1h Oven dry g/cc	Linear extens. 4D1 LE (whole soil) Pct.	4D1 LE (<2mm) Pct.	Water content 4B1c 1/3 bar Pct.	4B2 15 bar Pct.	WRD 4C1 (whole soil) in/in	4C1 (<2mm) in/in
41-76	0.26			0.1	0.2	0.1	0.2		1.0											
76-120	0.38			tr.	0.1	tr.	0.1	0.3	1.0											

Depth (cm)	Extractable bases 5B4a: 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	KCl ext. 6G1e Al	CEC: 5A3a Sum cations	5A6 NH_4OAc	Sum bases plus KCl Al	Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.	6E1e Carbonate as $CaCO_3$ Pct.	pH: 8C1e (1:2) $CaCl_2$	8C1a (1:1) water	CEC-1/2 clay x thickness	Ratios to total clay: 15-bar water	Na pyro. ext. Fe+Al
	meq/100 g																	
41-76	1.7	0.1	-	0.1	1.9	8.2		10.1	3.5		19	54			5.7	303		0.1
76-120	1.1	0.1	-	tr.	1.2	4.1		5.3	2.3		23	52			5.9	214		0.1

Depth (cm)	Clay fraction analysis 7A1b, d: <0.002 mm 7A2 X-ray s/b/	7A3 DTA Pct.	Sand and silt fraction analysis 7A1: 7B1 Petrographic Pct.	total wgtd.

Pedon classification: Typic Udipsamment; mixed, mesic
Series classification: (Same)
Soil: Plainfield
Soil Nos.: S73MI-80-1 (BSL Nos. 73B421-73B422)
Location: Van Buren County, Michigan; 760 feet east and 105 feet north of the southwest corner of Sec. 4, T2S, R17W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 47° F., and the mean summer air temperature is about 67° F. Frost-free season is 160-170 days.
Vegetation and land use: Grass and weeds. Idle land.
Parent material: Sand.
Physiography: Lake plain.
Topography: Gently sloping. Gradient is 4 percent.
Drainage: Excessively drained.
Ground water: Greater than 60 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: F. Austin.

(Colors are for moist soil unless otherwise stated.)

Ap 0 to 25 cm (0 to 10 inches). Black (10YR 2/1) sand, gray (10YR 5/1) dry; weak fine granular structure; very friable; many roots; neutral; clear smooth boundary.

A2 25 to 41 cm (10 to 16 inches). Grayish brown (10YR 5/2) sand; single grain; loose; common roots; neutral; clear wavy boundary.

B1hir 421 41 to 76 cm (16 to 30 inches). Dark yellowish brown (10YR 3/4) sand; single grain; loose; few roots; medium acid; gradual wavy boundary.

B2ir 422 76 to 120 cm (30 to 47 inches). Dark brown (7.5YR 4/4) sand; single grain; loose; few roots; medium acid; gradual wavy boundary.

C 120 to 152 cm (47 to 60 inches). Pale brown (10YR 6/3) sand; single grain; loose; slightly acid.

1260A

SOIL CLASSIFICATION- ALFIC UDIPSAMMENT
MIXED, FRIGID
SERIES - - - - - - - -GRAYCALM .

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

SOIL NO - - - - - - S74NI-35-1 COUNTY - - - CLARE

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 74B425-74B431

DEPTH CM	HORIZON	SAND 2- .05	SILT .05- .002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2- 1	COBS 1- .5	MEDS .5- .25	FNES .25- .10	VFNS .10- .05	COSI .05 .02	FNSI .02 .002	VFSI .005- .002	SAND 2- .10	INTE II .2- .02	FINE CLAY TO CLAY PCT	NON- COB- CLAY PCT	RATIO 8D1 15- BAR TO CLAY
		PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM)																
0-7	A1	86.2	9.6	4.2		1.1	11.0	40.6	31.9	1.6	3.8	5.8		84.6	16.2			1.4
7-15	B21IR	87.7	8.3	4.0		.6	8.1	39.5	36.7	2.8	3.1	5.2		84.9	19.1			.65
15-34	B22IR	89.4	7.0	3.6		1.5	9.1	41.0	35.6	2.2	3.4	3.6		87.2	17.6			.61
34-56	B3	91.5	5.3	3.2		1.7	9.7	44.7	32.3	3.1	2.5	2.8		88.4	17.5			.44
56-88	A2	97.0	1.4	1.6		1.2	15.7	59.8	19.9	.4	1.0	.4		96.6	5.9			.50
88-152	A2&BT(A	96.7	1.3	2.0		1.6	16.9	54.7	22.4	1.1	.9	.4		95.6	8.0			.40
88-152	A2&BT(B	94.3	1.3	4.4		4.9	30.3	48.2	10.5	.4	.9	.4		93.9	3.9			.36

DEPTH CM	VOL. GT 2 PCT	VOL. GT 75 PCT	WEIGHT 75-20 PCT	WEIGHT 20-5 PCT	WEIGHT 5-2 PCT	WEIGHT LT .074 PCT LT 75	WEIGHT 20-2 PCT LT20	BULK DENSITY 4A1D 1/3- BAR G/CC	BULK DENSITY 4A1H OVEN DRY G/CC	BULK DENSITY 4D1 COLE	WATER CONTENT 4B1C 1/10 BAR PCT	WATER CONTENT 4B1C 1/3- BAR PCT	WATER CONTENT 4B2 15- BAR PCT	WATER CONTENT 4C1 WRD CM/ CM	CARBONATE 6E1B LT 2 PCT	CARBONATE 3A1A LT .002 PCT	PH 8C1A 1/1 H2O	PH 8C1E 1/2 CACL
0-7	1	0	0	1	1	14	2						5.8				4.1	4.0
7-15	2	0	1	1	1	13	2						2.6				4.3	4.1
15-34	3	0	1	3	2	11	5	1.52	1.55	.007	3.6		2.2	.02			4.7	4.6
34-56	3	0	0	2	2	10	4	1.56	1.59	.007	2.8		1.4	.02			4.6	4.5
56-88	3	0	1	2	1	3	3						.8				4.8	4.6
88-152	6	0	3	4	2	4	6						.8				5.1	4.7
88-152	7	0	3	4	4	6	8	1.68	1.74	.010	2.5		1.6	.02			7.3	7.2

DEPTH CM	ORGANIC MATTER 6A1A ORGN CARB PCT	ORGANIC MATTER 6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	EXTRACTABLE BASES 5B4A 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB / 100	ACTY 6H1A BACL TRA G-	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						NEQ													
0-7	2.09			.3		1.3	.3	TR	.4	2.0	7.8	1.0	9.8	8.3	2.0		16	20	24
7-15	.65			.3		.4	.1	.0	TR	.5	4.1	1.0	4.6	3.6	.90		11	11	14
15-34	.38			.3		.2	.1	.0	.1	.4	2.7	.5	3.1	2.4	.67		8	13	17
34-56	.24			.2		.1	TR	.0	TR	.1	2.0	.6	2.1	1.7	.53		6	5	6
56-88	.20			.1		.1	TR	.0	TR	.1	.8	.2	.9	.8	.50		13	11	12
88-152	.24			.2		.3	.1	.0	TR	.4	.8	.2	1.2	.9	.45		33	33	44
88-152	.25			.1															

DEPTH CM	PYROPHOSPHATE,PH10) 6C5A EXT FE PCT	PYROPHOSPHATE,PH10) 6G5A EXT AL PCT	DITHIONITE-CITRATE) 6A1B EXT C PCT	DITHIONITE-CITRATE) 6C2B EXT FE PCT	DITHIONITE-CITRATE) 6G7A EXT AL PCT	DITHIONITE-CITRATE) 6D1B EXT MN PCT	PYROPHOSP) FE+AL TO CLAY	PYROPHOSP) AL+C TO CLAY	PYRO FE+AL TO D - C FE+AL	CEC -1/2 CLAY X THIC	BASES 5G1 PLUS KCL AL	PH 8C1C 1:1 KCL
0-7	.1	TR		.3	.1						3.0	3.8
7-15	.1	TR		.3	.1						1.5	4.2
15-34	.1	TR		.3	.1						.9	4.3
34-56	.1	0		.2	TR						.7	4.2
56-88	TR	0		.1	TR						.3	4.4
88-152	TR	0		.2	TR						.6	4.5
88-152	TR	0		.1	TR							7.2

(A) A2 MATERIAL.
(B) BT MATERIAL.

Pedon classification: Alfic Udipsamment; mixed, frigid
Series classification: (Same)
Soil: Graycalm
Soil Nos.: S74MI-35-1 (BSL Nos. 74B425-74B431)
Location: Clare County, Michigan; 2310 feet west and 700 feet north of the southeast corner of Sec. 6, T20N, R4W.
Climate: Average annual precipitation is about 28 inches. Mean annual air temperature is about 44° F., and the mean summer air temperature is about 64° F. Frost-free season is 115-130 days.
Vegetation and land use: Red oak, aspen, and sweet fern. Woodland.
Parent material: Sand.
Physiography: Outwash plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat excessively drained.
Ground water: Greater than 60 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: N. Stroesenreuther and P. Corder.

(Colors are for moist soil unless otherwise stated.)

A1 425 0 to 7 cm (0 to 3 inches). Very dark grayish brown (10YR 3/2) sand; moderate medium granular structure; very friable; many fine roots; very strongly acid; clear wavy boundary.

B21ir 426 7 to 15 cm (3 to 6 inches). Dark brown (7.5YR 4/4) sand; weak fine granular structure; very friable; common fine roots; strongly acid; clear irregular boundary.

B22ir 427 15 to 34 cm (6 to 13 inches). Strong brown (7.5YR 5/6) sand; weak fine granular structure; very friable; few fine roots; medium acid; gradual wavy boundary.

B3 428 34 to 56 cm (13 to 22 inches). Yellowish brown (10YR 5/6) sand; single grained; loose; few fine roots; slightly acid; gradual wavy boundary.

A2 429 56 to 88 cm (22 to 35 inches). Light yellowish brown (10YR 6/4) sand; single grained; loose; very few fine roots; slightly acid; abrupt broken boundary.

A2&Bt 430-431 88 to 152 cm (35 to 60 inches). Light yellowish brown (10YR 6/4) sand (A2); single grained; loose; lamellae and bands of brown (7.5YR 5/4) and reddish brown (5YR 5/4) loamy sand (Bt); weak medium subangular blocky structure; friable; bands are 1/4 to 2 inches in thickness with a total accumulation of 5 inches; 5 percent by volume of pebbles; slightly acid.

1156A

SOIL CLASSIFICATION-ALFIC UDIPSAMMENT
MIXED FRIGID
SERIES - - - - - - - -GRAYCALM

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

SOIL NO - - - - - - S74MI-35-2 COUNTY - - - CLARE

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 74B432-74B436

DEPTH CM	HORIZON	SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	COES 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
		(- - PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - -) PCT LT 2MM																
0-6	A1&A2	89.4	7.7	2.9		.3	5.4	36.6	41.4	5.7	3.1	4.6		83.7	26.3			2.7
6-13	B21IR	91.0	6.6	2.4		.8	6.9	42.6	38.1	2.6	2.2	4.4		88.4	19.0			1.2
13-25	B22IR	91.6	6.0	2.4		.5	5.3	38.6	42.6	4.6	1.6	4.4		87.0	23.0			.92
25-49	B3	92.9	4.7	2.4		.9	4.5	40.5	42.6	4.4	1.9	2.8		88.5	23.2			.75
49-102	A'2	96.9	1.9	1.2		.5	6.9	45.3	41.5	2.7	1.5	0.4		94.2	19.0			.67

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20	20-5	5-2	LT .074	20-2 PCT LT20	(BULK DENSITY) 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	(WATER CONTENT) 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	(PH) 8C1A 1/1 H2O	8C1E 1/2 CACL
			(- - - PCT LT 75 - - -)															
0-6	1	0	0	1	1	12	2						7.8				4.1	3.5
6-13	3	0	0	3	1	9	4						2.8				4.3	4.2
13-25	2	0	0	2	1	10	3						2.2				4.3	4.3
25-49	1	0	0	1	1	9	2						1.8				4.8	4.5
49-102	1	TR	2	TR	TR	4	TR						.8				4.9	4.6

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(- - - MEQ / 100 G - - -)													
0-6	1.65			.4		.2	.2	.0	.1	.5	10.5	1.5	11.0	9.5	3.3		2	5	5
6-13	.21			.3		.1	TR	.0	.3	.4	5.0	1.1	5.4	3.6	1.5		3	7	11
13-25	.05			.3		.2	TR	.0	.1	.3	3.8	.8	4.1	2.1	.88		10	7	14
25-49	.04			.2		.2	.1	.0	.1	.4	3.1	.6	3.5	1.7	.71		12	11	23
49-102	.62			.2		.2	TR	.0	.1	.3	1.0	.3	1.3	.5	.42		40	23	60

DEPTH CM	(PYROPHOSPHATE, PH10) 6C5A EXT FE PCT	6G5A EXT AL PCT	6A1B EXT C PCT	(DITHIONITE-CITRATE) 6C2B EXT FE PCT	6G7A EXT AL PCT	6D1B EXT MN PCT	(PYROPHOSP) FE+AL TO CLAY	AL+C TO CLAY	PYRO FE+AL TO D - C FE+AL	CEC -1/2 CLAY X THIC	BASES 5G1 PLUS KCL AL	PH 8C1C 1:1 KCL
0-6	TR	TR		.4	TR						2.0	3.3
6-13	.1	TR		.3	.1						1.5	4.1
13-25	.1	TR		.3	.1						1.1	4.2
25-49	.1	TR		.2	.1						1.0	4.3
49-102	.1	TR		.2	TR						.6	4.6
102-152												

Pedon classification: Alfic Udipsamment; mixed, frigid
Series classification: (Same)
Soil: Graycalm
Soil Nos.: 74MI-35-2 (BSL Nos. 74B432-74B436)
Location: Clare County, Michigan; 858 feet east and 100 feet south of the northwest corner of Sec. 1, T20N, R3W.
Climate: Average annual precipitation is about 28 inches. Mean annual air temperature is about 44° F., and the mean summer air temperature is about 64° F. Frost-free season is 115-130 days.
Vegetation and land use: Scrub oak and aspen. Woodland.
Parent material: Sand.
Physiography: Moraine.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat excessively drained.
Ground water: Greater than 60 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: N. Stroesenreuther and P. Corder.

(Colors are for moist soil unless otherwise stated.)

A1&A2 432 0 to 6 cm (0 to 2 inches). Very dark brown (10YR 2/2)(A1) and light brownish gray (10YR 6/2)(A2) sand; moderate fine granular structure; very friable; abundant fine roots; 1 percent pebbles; extremely acid; clear wavy boundary.

B21ir 433 6 to 13 cm (2 to 5 inches). Brown (7.5YR 5/4) sand; weak medium granular structure; very friable; common fine roots; 1 percent pebbles; extremely acid; clear wavy boundary.

B22ir 434 13 to 25 cm (5 to 10 inches). Strong brown (7.5YR 5/6) sand; weak medium granular structure; very friable; common fine roots; 1 percent pebbles; extremely acid; gradual wavy boundary.

B3 435 25 to 49 cm (10 to 19 inches). Yellowish brown (10YR 5/6) sand; single grain; loose; few fine roots; 1 percent pebbles; strongly acid; gradual wavy boundary.

A'2 436 49 to 102 cm (19 to 40 inches). Light yellowish brown (10YR 6/4) sand; single grain; loose; 1 percent pebbles; strongly acid; abrupt broken boundary.

A'2&Bt 102 to 152 cm (40 to 60 inches). Light yellowish brown (10YR 6/4) sand (A2); single grain; loose; lamellae and bands of brown (7.5YR 5/4) loamy sand (Bt); weak medium subangular blocky structure; very friable; bands total 1 to 2 inches in thickness; strongly acid.

11[illegible]

SOIL CLASSIFICATION-ALFIC UDIPSAMMENT
MIXED FRIGID
SERIES - - - - - - - -GRAYCALM

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

SOIL NO - - - - - - - S74NI-35-4 COUNTY - - - CLARE

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 74B445-74B452

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM) SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	COBS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .002-.10	SAND 2-.02	INTR II .2-.02	FINE CLAY TO CLAY	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
0-5	A1	82.9	12.8	4.3		1.9	17.3	36.8	23.8	3.1	5.0	7.8		75.8	17.1			2.1
5-8	A2	88.3	10.5	1.2		1.7	16.0	38.2	27.8	4.6	4.5	6.0		83.7	20.2			1.8
8-14	B21IR	83.6	12.8	3.6		1.1	11.1	33.0	31.7	6.7	6.7	6.1		76.9	27.7			.78
14-23	B22IR	85.8	10.6	3.6		3.6	14.3	36.7	27.1	4.1	5.0	5.6		81.7	20.1			.83
23-45	B23	88.1	9.1	2.8		3.8	15.0	36.6	28.5	4.2	3.9	5.2		83.9	19.8			.82
45-81	B3	93.5	5.7	0.8		4.7	16.6	39.9	29.7	2.6	3.3	2.4		90.9	18.4			
81-163	A'2BT(A	97.6	2.4	TR		0.7	4.9	35.1	54.7	2.2	0.8	1.6		95.4	22.6			
81-163	A'2BT(B	77.8	10.5	11.7	4.4	2.7	10.3	30.0	29.8	5.0	6.1	4.4		72.8	24.0	38		

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	GT 75 PCT	75-20	20-5	5-2	LT .074	BULK DENSITY 4A1D PCT LT20	4A1H 1/3-BAR G/CC	OVEN DRY G/CC	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1B 1/2 CACL
0-5	1	0	0	0	1		1						9.1				3.8	3.8
5-8	1	0	0	1	1		2						2.2				4.0	3.8
8-14	2	0	0	3	1		4	1.53	1.55	.003	7.9		2.8	.08			4.1	3.9
14-23	2	0	0	2	2		4	1.51	1.53	.003	5.2		3.0	.03			4.3	4.0
23-45	3	0	0	3	3		6	1.47	1.51	.010	4.9		2.3	.04			4.3	4.0
45-81	3	0	0	3	3		6	1.66	1.68	.003	3.8		1.0	.05			4.3	4.1
81-163	2	0	0	2	1		3	1.67	1.73	.010	9.2		.6	.14			4.7	4.4
81-163	7	0	3	8	3		11	1.7 C									6.0	5.7

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(MEQ / 100 G)													
0-5	4.04					5.4	.9	TR	TR	6.3	11.7	.2	18.0	11.9	2.8	6.0	45	35	53
5-8	.48					.6	.2		.1	.9	2.7	.6	3.6	2.5	2.1		24	25	36
8-14	.51					.6	.1	.2	.2	1.1	6.1	1.4	7.2	4.0	1.1		15	15	28
14-23	.48					.4	.1		.3	.8	1.6	1.4	3.0	3.6	1.0		11	27	22
23-45	.29					.2	TR		.1	.3	4.4	1.1	5.5	2.7	1.0		7	5	11
45-81	.05					.2	TR	TR	.1	.3	1.8	.5	2.3	1.0	1.3		20	13	30
81-163	.06					.2	.1		TR	.3	1.0	.2	1.2	.7			29	25	43
81-163	.09					4.6	2.0	.1	.5	7.2	1.8	.1	9.0	5.0	.43	2.3	92	80	144

DEPTH CM	(PYROPHOSPHATE,PH10) 6C5A EXT FE PCT	6G5A EXT AL PCT	6A1B EXT C PCT	(DITHIONITE-CITRATE) 6C2B EXT FE PCT	6G7A EXT AL PCT	6D1B EXT MN PCT	(PYROPHOSP) FE+AL TO CLAY	AL+C TO CLAY	PYRO FE+AL TO D - C FE+AL	CEC -1/2 CLAY X THIC	BASES 5G1 PLUS KCL AL	PH 8C1C 1:1 KCL
0-5	TR	TR		.2	.1						6.5	3.8
5-8	TR	TR		.2	TR						1.5	3.5
8-14	.1	TR		.4	TR						2.5	3.8
14-23	.1	TR		.4	.1						2.2	4.0
23-45	.1	TR		.3	.1						1.4	4.0
45-81	.1	TR		.1	TR						.8	4.2
81-163	.1	TR		.1	TR						.5	4.3
81-163	.1	TR		.4	.1						7.3	5.2

(A) A'2 MATERIAL.
(B) BT MATERIAL.
(C) ESTIMATED.

Pedon classification: Alfic Udipsamment; mixed, frigid
Series classification: (Same)
Soil: Graycalm
Soil Nos.: S74MI-35-4 (BSL Nos. 74B445-74B452)
Location: Clare County, Michigan; 990 feet west and 990 feet south of the NE corner of Sec. 1, T17N, R6W.
Climate: Average annual precipitation is about 28 inches. Mean annual air temperature is about 44° F., and the mean summer air temperature is about 64° F. Frost-free season is 115-130 days.
Vegetation and land use: Red pine, white oak and red maple. Woodland.
Parent material: Sand.
Physiography: Outwash plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat excessively drained.
Ground water: Greater than 64 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: N. Stroesenreuther and P. Corder.

(Colors are for moist soil unless otherwise stated.)

A1 445 0 to 5 cm (0 to 2 inches). Black (10YR 2/1) sand; moderate fine granular structure; very friable; common fine roots; extremely acid; clear wavy boundary.

A2 446 5 to 8 cm (2 to 3 inches). Brown (7.5YR 5/2) sand; weak fine granular structure; very friable; common fine roots; extremely acid; clear wavy boundary.

B21ir 447 8 to 14 cm (3 to 5 inches). Reddish brown (5YR 4/4) sand; weak fine granular structure; very friable; common fine and few medium roots; extremely acid; clear wavy boundary.

B22ir 448 14 to 23 cm (5 to 9 inches). Strong brown (7.5YR 5/6) sand; weak fine granular structure; very friable; many fine roots; extremely acid; gradual wavy boundary.

B23 449 23 to 45 cm (9 to 18 inches). Yellowish brown (10YR 5/6) sand; very weak fine granular structure; very friable; many fine and few medium roots; extremely acid; gradual wavy boundary.

B3 450 45 to 81 cm (18 to 32 inches). Light yellowish brown (10YR 6/4) sand; weak medium subangular blocky parting to weak fine granular; common fine and few medium roots; extremely acid; gradual wavy boundary.

A'2&Bt 451-452 81 to 163 cm (32 to 64 inches). Pale brown (10YR 6/3) sand (A'2)(451); single grain; loose; brown (7.5YR 5/4) loamy sand (Bt) lamellae or bands; weak medium subangular blocky structure; friable; brown (7.5YR 4/4) sandy loam bodies (452) occupy less than 10 percent of the horizon. Total accumulations of bands is less than 6 inches; very strongly acid.

1220A

523-421
10-66 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL: Rubicon taxadjunct SOIL Nos. 86Mich-16-2 LOCATION: Cheboygan County, Michigan

SOIL SURVEY LABORATORY: Beltsville, Maryland LAB. Nos. 66475 - 66482

Depth (in.)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Silt: Int. II (0.2-0.02)	Silt: (2-0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 ≥ 2 <76 Pct.	2-19	19-76
		Size class and particle diameter (mm) 3A1 — Pct. of < 2 mm														Pct. of < 76mm		
0-1	A1 or O2	92.7	6.9	0.4	0.9	26.6	45.8	18.4	1.0	1.5	5.4	6.9	91.7			tr.	tr.	0
1-6	A2	94.3	4.6	1.1	0.8	22.0	47.5	22.2	1.8	1.4	3.2	8.9	92.5			1	1	0
6-10	B21ir	92.9	4.1	3.0	1.9	21.1	45.0	23.4	1.5	1.4	2.7	9.1	91.4			4	4	0
10-18	B22ir	96.7	1.8	1.5	1.7	22.0	48.5	23.3	1.2	0.5	1.3	7.9	95.5			4	4	0
18-36	B3	98.8	0.8	0.4	1.8	22.6	50.5	23.1	0.8	0.5	0.3	6.8	98.0			1	1	0
36-60	C1	99.1	0.3	0.6	0.4	16.2	49.9	31.7	0.9	0.0	0.3	8.5	98.2			tr.	tr.	0
60-120	C2	98.8	0.6	0.6	1.0	31.3	49.3	16.6	0.6	0.1	0.5	4.2	98.2			1	1	0
18-24	Ortstein	97.1	1.6	1.3	0.2	9.3	51.5	34.5	1.6	0.7	0.9	11.1	95.5			tr.	tr.	0

Depth (in.)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N		Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density: 4A3a Field Moist g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: 4B1c 1/10 bar Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.		4C1 WRD in/in		pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-1	2.17	0.08	27		tr.	0.1							7.6				5.1	5.6
1-6	0.28					tr.	1.36				7.5	5.7	1.7				4.2	4.9
6-10	0.17					0.3	1.30				9.0	6.9	2.3				4.6	5.5
10-18	0.16					0.2	1.31				6.5	5.1	1.2				4.9	5.6
18-36	0.06					0.1	1.49				3.3	2.1	0.6				5.1	5.8
36-60	0.02					0.1	1.50				3.8	2.5	0.4				4.9	5.8
60-120						0.1							0.4				6.0	6.3
18-24	0.12					0.2							1.2				5.2	6.3

Depth (in.)	Extractable bases 5B1c: 6H2a Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations		6G1d Ext. Al			Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g.																	
0-1	5.2	0.7	tr.	0.2	6.1	5.6	11.7		0.1			29.25	0.25	19.00			52	
1-6	-	tr.	0.1	tr.	0.1	1.2	1.3		0.5			1.18	tr.	1.55			8	
6-10	tr.	tr.	tr.	tr.	tr.	3.8	3.8		0.6			1.27	0.10	0.77			tr.	
10-18	-	tr.	-	tr.	tr.	2.0	2.0		0.2			1.33	0.13	0.80			tr.	
18-36	-	-	-	-	-	0.8	0.8		0.1			2.00	0.25	1.50			-	
36-60	-	-	-	-	-	0.5	0.5		0.1			0.83	0.17	0.67			-	
60-120						0.2			tr.				0.17	0.67				
18-24	tr.	tr.	tr.	tr.	tr.	2.6	2.6		0.1			2.00	0.15	0.92			tr.	

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int. Vm.-Mi.	Qtz.	Kl.	Gibbsite	
	X-ray 7A2						7A2		
0-1									
1-6	xxx	-	tr.	tr.	-	xx	x		
6-10									
10-18	-	-	-	-	xx	x	tr.		
18-36									
36-60	-	x	-	x	-				
60-120									
18-24									

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica.
Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected,
tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

USDA-SCS-BELTSVILLE MD. 1969

Pedon classification: Spodic Udipsamment; mixed, firgid
Series classification: Entic Haplorthod; sandy, mixed, frigid.
Soil: Rubicon, taxadjunct*
Soil Nos.: S66MI-16-2 (BSL Nos. 66475-66482)
Location: Cheboygan County, Michigan; SW 1/4, SE 1/4, Sec. 5, T35N, R1W.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 44° F., and the mean summer air temperature is about 64° F. Frost-free season is 110-120 days.
Vegetation and land use: Red oak, aspen, red maple, white pine, and red pine. Woodland.
Parent material: Sand.
Physiography: Lake plain.
Topography: Nearly level. Gradient is 2 percent.
Drainage: Excessively drained.
Ground water: Below 120 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: S. Alfred, E. Johnson and N. Stroesenreuther

(Colors are for moist soil unless otherwise stated.)

A1 or 02 475 0 to 3 cm (0 to 1 inch). Black (10YR 2/1) sand, flecked with light brownish gray (10YR 6/2); weak fine granular structure; very friable; medium acid; abrupt smooth boundary.

A2 476 3 to 15 cm (1 to 6 inches). Light brownish gray (10YR 6/2) sand; very weak medium to coarse granular structure; very friable; very strongly acid; clear smooth boundary.

B21ir 477 15 to 25 cm (6 to 10 inches). Reddish brown (5YR 4/4) to dark brown (7.5YDR 4/4) sand; weak medium to coarse granular structure; very friable; strongly acid; clear wavy boundary.

B22ir 478 25 to 45 cm (10 to 18 inches). Dark yellowish brown (10YR 4/4) sand; weak coarse granular structure; very friable; medium acid; clear irregular boundary.

B3 479 45 to 90 cm (18 to 36 inches). Light gray (10YR 7/2) and yellowish brown (10YR 5/6) in equal proportions with a honeycomb pattern, sand; very weak coarse subangular blocky structure to massive in spots; very friable to weakly cemented in chunks; medium acid; clear irregular boundary.

C1 480 90 to 150 cm (36 to 60 inches). Light yellowish brown (10YR 6/4) sand; single grain; loose; medium acid.

C2 481 150 to 300 cm (60 to 120 inches). Light yellowish brown (10YR 6/4) sand; single grain; loose; slightly acid. (Auger sample)

Ortstein 482 45 to 60 cm (18 to 24 inches). Yellowish brown (10YR 5/6) representing 60 percent of mass and dark reddish brown (5YR 3/4) and pale brown (10YR 6/3) representing the major remaining colors, sand; massive; weakly to strongly cemented chunks; chunks are longer than wide and range from 16 to 38 inches thick and 4 to 6 inches in diameter; medium acid. 18 to 24 inch ortstein portion representing about 15 percent of B22ir and B3 horizons and occurring at depths of 18 to 24 inches.

* This soil was sampled as Rubicon. It is a taxadjunct because it has a lower combined index of accumulation of amorphous material than typical for the series.

1587A

SCS-421
(10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL: Eastport taxadjunct SOIL Nos. 866Mich-74-1 LOCATION: St. Clair County, Michigan

SOIL SURVEY LABORATORY: Beltsville, Maryland LAB. Nos. 66584 - 66591

Depth (in.)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: (0.05-0.02)	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)		3B2 Cm	Coarse fragments 3E1: 2A2 >2 <76 Pct.	2-19	19-76
		Size class and particle diameter (mm) 3A1 — Pct. of < 2 mm														Pct.	Pct. of < 76mm	
0-7	Ap	96.3	2.3	1.4	0.0	6.5	49.3	39.5	0.9	0.0	2.4	7.3	95.4			0	0	0
7-10	A2	97.4	1.5	1.1	0.0	6.7	52.8	36.9	0.6	0.0	1.9	6.1	96.8			0	0	0
10-13	B1	97.2	1.2	1.6	0.0	6.3	51.6	38.7	0.5	0.0	1.3	6.9	96.7			0	0	0
13-19	B21	97.9	0.8	1.3	0.0	9.1	52.0	36.0	0.4	0.0	1.2	6.1	97.5			0	0	0
19-26	B22	98.5	0.3	1.2	0.1	11.2	54.2	32.4	0.2	0.0	0.7	5.0	98.3			0	0	0
26-34	B3	98.7	0.6	0.7	0.0	5.8	50.4	41.7	0.4	0.0	1.0	7.0	98.3			0	0	0
34-52	C1	98.7	0.4	0.9	0.2	3.7	50.3	44.0	0.5	0.4	0.0	7.1	98.2			tr.	tr.	0
52-58	C2	97.9	0.8	1.3	2.3	20.3	45.3	29.5	0.5	0.4	0.4	5.5	97.4			tr.	tr.	0

Depth (in.)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N		Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density: 4A3a Field Moist g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: 4B1c 0.05 bar Pct.	4B1c 1/10 bar Pct.	4B2 15 bar Pct.		4C1 WRD in/in	pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-7	1.08	0.05	22		-	0.2	1.38				9.1	6.2	4.2			4.9	5.8
7-10	0.20					0.2	1.36				5.7	3.6	1.6			4.8	5.3
10-13	0.16					0.3	1.46				5.2	3.3	1.2			4.8	5.5
13-19	0.20					0.3	1.48				4.5	2.8	1.2			5.2	5.8
19-26	0.21					0.2	1.45				3.5	1.9	1.0			5.2	6.0
26-34	0.18				-	0.2	1.47				3.4	1.3	0.7			5.3	5.7
34-52	-					0.1	1.45				3.1	1.2	0.5			5.3	6.0
52-58	0.04				-	0.1							0.8			5.3	6.0

Depth (in.)	Extractable bases 5B1c: 6H2e Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations		6G1d Ext. Al			Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-7	2.6	0.4	-	0.1	3.1	3.0	6.1		0.1			4.36	0.14	3.00			51	
7-10	0.8	0.1	tr.	tr.	0.9	1.0	1.9		0.1			1.73	0.18	1.45			47	
10-13	0.9	0.1	tr.	tr.	1.0	1.1	2.1		0.1			1.31	0.19	0.75			48	
13-19	1.0	0.1	tr.	tr.	1.1	1.4	2.5		0.1			1.92	0.23	0.92			44	
19-26	1.0	0.1	tr.	tr.	1.1	1.3	2.4		0.1			2.00	0.17	0.83			46	
26-34	0.9	tr.	tr.	tr.	0.9	0.7	1.6		tr.			2.29	0.29	1.00			56	
34-52	0.3	tr.	tr.	tr.	0.3	0.2	0.5		tr.			0.56	0.11	0.56			60	
52-58	0.4	tr.	tr.	-	0.4	0.2	0.6		tr.			0.46	0.08	0.62			67	

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int. Vm.-Mi.	Qtz.	Kl.	Gibbsite	
	X-ray 7A2						7A2		
0-7									
7-10									
10-13									
13-19	-	-	-	-	xx	tr.	x		
19-26									
26-34	-	x	x	x	tr.	xxx	x		
34-52									
52-58									

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = interstratified layer, Qtz = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

USDA SCS HYATTSVILLE MD. 1966

Pedon classification: Spodic Udipsamment; mixed, mesic
Series classification: Spodic Udipsamment; mixed, frigid
Soil: Eastport, taxadjunct*
Soil Nos.: S66MI-74-1 (BSL Nos. 66584-66591)
Location: St. Clair County, Michigan; SW 1/4, SW 1/4, SE 1/4, NE 1/4 Sec. 9, T7N, R17E.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 68° F. Frost-free season is 160-170 days.
Vegetation and land use: Aspen and chokecherry.
Parent material: Sand
Physiography: Beach ridge.
Topography: Gently rolling. Gradient is 5 percent.
Drainage: Well drained.
Ground water: Below 85 inches.
Erosion: Slight.
Permeability: Very rapid.
Described by: E. P. Whiteside

(Colors are for moist soil unless otherwise stated.)

Ap 584 0 to 18 cm (0 to 7 inches). Very dark gray (10YR 3/1) sand; weak fine granular structure; very friable; medium acid; abrupt smooth boundary.

A2 585 18 to 25 cm (7 to 10 inches). Brown (10YR 5/3) sand; very weak fine crumb structure to single grain; very friable to loose; strongly acid; abrupt wavy boundary.

B1 586 25 to 33 cm (10 to 13 inches). Light yellowish brown (10YR 6/4) to brown (7.5YR 5/4) sand; very weak coarse granular structure to single grain; very friable to loose; strongly acid; clear wavy boundary.

B21 587 33 to 48 cm (13 to 19 inches). Brown (7.5YR 5/4) to strong brown (7.5YR 5/6) sand; weak coarse granular to weak medium subangular blocky structure; very friable; with some weakly cemented chunks, 1/2 to 1 inch in diameter; medium acid; gradual wavy boundary.

B22 588 48 to 65 cm (19 to 26 inches). Brown (7.5YR 5/4) to strong brown (7.5YR 5/6) sand; weak coarse granular to weak medium subangular blocky structure; very friable with some weakly cemented chunks, 1/2 to 1 inch in diameter; medium acid; clear wavy boundary.

B3 589 65 to 85 cm (26 to 34 inches). Yellowish brown (10YR 5/4) sand; weak coarse granular structure to single grain; very friable to loose; medium acid; clear wavy boundary.

C1 590 85 to 130 cm (34 to 52 inches). Brown (10YR 5/3) sand; single grain; loose; medium acid; abrupt smooth boundary.

C2 591 130 to 213 cm (52 to 85 inches). Grayish brown (2.5Y 5/2-10YR 5/2) sand, with some darker colored coarse sand strata; single grain; loose; medium acid; abrupt smooth boundary. Sampled with spade to 66 inches. Auger sample 66 to 85 inches.

C3 592 213 to 254 cm (85 to 98 inches). Grayish brown (2.5Y 5/2) coarse sand and fine gravel; single grain; loose; calcareous; abrupt smooth boundary. Not sampled.

C4 593 254 to 298 cm (98 to 119 inches). Grayish brown (2.5Y 5/2) sand and fine gravel with dark brown (7.5YR 4/4) staining; single grain; loose; calcareous; abrupt smooth boundary. Not sampled.

C5 298 to 313 cm (119 to 125 inches). Gray (10YR 5/1) sand; single grain; non sticky when wet; calcareous. Not sampled.

* This soil was sampled as Eastport. It is a taxadjunct because it has a slightly warmer temperature than typical for the series.

1668A

SOIL CLASSIFICATION-TYPIC MEDISAPRIST
EUIC,MESIC
SERIES - - - - - - -HOUGHTON

SOIL NO - - - - - - - S74MI-37-1 COUNTY - - - CLINTON

GENERAL METHODS- - -1A,1B1B,2A1,2B (A) SAMPLE NOS. 74L396-74L404

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

AUGUST 1978

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B: SAND 2-.05 PCT	SILT .05-.002 PCT	CLAY LT .002 PCT	FINE CLAY LT .0002 PCT	SAND VCOS 2-1 PCT	SAND CORS 1-.5 PCT	SAND MEDS .5-.25 PCT	SAND FNES .25-.10 PCT	SAND VFNS .10-.05 PCT	SILT COSI .05-.02 PCT	SILT FNSI .02-.002 PCT	SILT VFSI .005-.002 PCT	SAND 2-.10 PCT	INTR II .2-.02 PCT	FINE CLAY TO CLAY PCT	RATIO NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY PCT
000-23	OAP																	
023-48	OA2																	
048-76	OA3																	
076-115	OA4																	
115-190	OA5																	
190-290	OA6																	
325-400	LCO																	
400-500	LCO																	
500-650	LCO																	

DEPTH CM	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2: VOL. WEIGHT GT 2 PCT	GT 75 PCT	75-20 PCT LT 75	20-5 PCT LT 75	5-2 PCT LT 75	LT .074	20-2 PCT LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2A 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
000-23	TR	0	0	0	TR		TR	.29	.73		301	267	103	.48			6.8	6.4
023-48	0	0	0	0	0		0	.15	.53		577	446	117	.49			6.4	5.9
048-76	TR	0	0	0	TR		TR	.15	.65		638	470	123	.52			6.2	5.7
076-115	TR	0	0	0	TR		TR	.20	1.07		577	416	123	.61			6.4	5.7
115-190	0	0	0	0	0		0	12	.51		865	592	116	.57			6.0	5.6
190-290													109				5.08	4.8
325-400													32.0		62		7.78	7.6
400-500													38.4		61		7.79	7.5
500-650													44.8		56		7.88	7.6

DEPTH CM	ORGANIC MATTER 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	EXTRACTABLE BASES 5B4A: 5N2E CA	6Q2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 5H1A BACL TEA	AL 6G1E KCL EXT	CAT EXCH 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5C1 SAT NHAC PCT	BASE SAT 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						NEQ / 100 G													
000-23	45.0	5.18	14			154	25.8	.6	2.0	182	48.8		231	176		6.0	88	79	104
023-48	43.8	2.37	19			155	28.4	.9	1.2	185	55.8		241	183		5.5	85	77	101
048-76	39.0	3.38	12			132	27.7	1.3	1.0	162	61.6		224	152		4.8	87	72	107
076-115	32.0	3.11	10			151	28.6	1.5	.9	182	76.2		258	175		5.3	86	70	104
115-190	49.5	3.20	15			140	5.5	1.8	.6	168	81.2		249	152		5.5	86	67	104
190-290	26.6					108	22.0	.3	.1	130				120		4.9	90		108
325-400	11.5						7.4	.0	TR					27.5					
400-500	10.1						7.8	.0	.0					30.3					
500-650	9.10						8.1	.0	TR					26.0					

DEPTH CM	SATURATED PASTE 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	SATURATION EXTRACT 8A1: 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
									NEQ / LITER										
000-23	2500	6.3	346			1200		.51	2.9	1.0	.5	1.0	0	1.5	.0	.3	2.0		
023-48	3200	6.3	720			1700		.31	2.0	.7	.5	.4	0	1.3	.5	.0	.3		
048-76	3100	6.2	1060			2700		.39	2.2	.9	.6	.3	0	1.3	.2	.6	.2		
076-115	2200	6.0	872		1	3500		.63	3.6	1.5	.8	.3	0	.4	.5	3.9	.0		
115-190	3500	6.0	985		1	2000		.31	1.8	.6	.7	.1	0	1.1	1.2	.1	.0		
190-290																			
325-400																			
400-500																			
500-650																			

DEPTH CM	HISTOSOL CHARACTERIZATION: STATE OF DECOMPOSITION 8F MINL CONT PCT	8G (FIBER UNRB PCT	VOL RUB PCT)	8H PYROPHOSPHT SOLUBILITY (MUNS	COLOR)	PH 8C1E .01M CACL	BULK DENS 4A3A FILD STAT G/CC	4A1I 1/3B REWT G/CC	COLE 4D1 RE-WET	SUBS RES-IDUE PCT	WATER CONTENT 4B4 FILD STAT PCT	4B1C 1/3B REWT PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	SHEAR STRENGTH KPA (PSF)
000-23	19		5	7.5YR	3/2	6.2	.30	.34	.29	90	255	208	97.0	.38	
023-48	14	24	3	7.5YR	3/2	6.2	.17	.25	.28	81	498	278	100	.45	
048-76	11	20	3	7.5YR	4/2	5.8	.12	.28	.23	59	699	241	103	.39	8.0(167)
076-115	16	38	2	7.5YR	4/2	5.7	.13	.42	.37	61	667	152	93.0	.25	
115-190	13	40	2	7.5YR	4/3	5.6	.12	.22	.32	58	705	306	110	.63	9.8(205)
190-290	14	44	4	7.5YR	5/4	5.4					688				4.8(101)
325-400	80	17	4	7.5YR	5/4	7.3	.30				290				7.6(158)
400-500	73	36	5	7.5YR	5/4	7.2	.26				356				
500-650	82	12	3	7.5YR	5/4	7.3	.39				240				

(A) ANALYSES DETERMINED ON FEILD MOIST SAMPLES UNLESS OTHERWISE INDICATED. CATION EXCHANGE CAPACITY, EXTRACTABLE BASES, CARBONATE CONTENT AND PH (H2O AND CACL2) DETERMINED ON AIRDRY SAMPLES FOR 74L401 THRU 74L404.
(B) 1/10 H2O AND 1/10 CACL2.

Pedon classification: Typic Medisaprist; euic, mesic
Series classification: (Same)
Soil: Houghton
Soil Nos.: S74MI-37-1 (LSL Nos. 74L396-74L404)
Location: Clinton County, Michigan; 150 feet south and 1,720 feet west of NE corner of Sec. 14, T5N, R1W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 68° F. Frost-free season is 140-150 days.
Vegetation and land use: Lettuce. Cropland.
Parent material: Herbaceous material.
Physiography: Till plain.
Topography: Level. Gradient less than 1 percent.
Drainage: Very poorly drained.
Ground water: At 21 inches.
Erosion: Slight.
Permeability: Moderately slow to moderately rapid.
Described by: N. Stroesenreuther, D. Mokma, and W. K. Mettert.

(Colors are for moist soil unless otherwise stated.)

Oap 396 0 to 23 cm (0 to 9 inches). Black (N 2/0), black (10YR 2/1) rubbed; about 5 percent fibers, 1 percent rubbed; weak fine granular structure; friable; few fine roots; estimated mineral content 20 percent; abrupt smooth boundary.

Oa2 397 23 to 48 cm (9 to 19 inches). Black (10YR 2/1), very dark brown (10YR 2/2) rubbed; about 20 percent fibers, 4 percent rubbed; weak coarse blocky structure; friable; few fine roots; estimated mineral content 25 percent; clear smooth boundary.

Oa3 398 48 to 76 cm (19 to 30 inches). Very dark brown (10YR 2/2) broken face and rubbed; about 40 percent fibers, 10 percent rubbed; weak thick platy structure; friable; very few fine roots; estimated mineral content 15 percent; clear smooth boundary.

Oa4 399 76 to 115 cm (30 to 46 inches). Very dark brown (10YR 2/2) broken face and rubbed; about 25 percent fibers, 4 percent rubbed; weak thick platy structure; friable; estimated mineral content 15 percent; clear smooth boundary.

Oa5 400 115 to 190 cm (46 to 76 inches). Dark brown (7.5YR 3/2), very dark brown (10YR 2/2) rubbed; about 35 percent fibers, 7 percent rubbed; weak thick platy structure; friable; estimated mineral content 12 percent; clear smooth boundary.

Oa6 401 190 to 290 cm (76 to 116 inches). Dark brown (7.5YR 3/2), black (10YR 2/1) rubbed; about 50 percent fibers, 10 percent rubbed; weak thick platy structure; friable; estimated mineral content 12 percent; clear smooth boundary.

Oa7 402 290 to 325 cm (116 to 130 inches). Dark brown (7.5YR 3/2), black (10YR 2/1) rubbed; about 50 percent fibers, 15 percent rubbed; massive; friable; estimated mineral content 12 percent; abrupt smooth boundary.

LCO 403-404 325 to 650 cm (130 to 260 inches). Gray (10YR 5/1) coprogenous earth; massive; friable. 325-500 cm (403). 500-650 cm (404).

SOIL CLASSIFICATION-TYPIC HEDISAPRIST
EUIC,MESIC
SERIES - - - - - - -HOUGHTON

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

SOIL NO - - - - - - S74MI-37-2 COUNTY - - - CLINTON

GENERAL METHODS- - -1A,1B1B,2A1,2B (A) SAMPLE NOS. 74L405-74L412 AUGUST 1978

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B: SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY	NON-CO3 CLAY PCT	RATIO 8D1 15-BAR TO CLAY
		(PCT LT 2MM)																
000-23	OA1																	
023-48	OA2																	
048-130	CA3																	
130-190	LC01																	
190-223	LC02																	
223-277	LC03																	
277-327	LC04																	
370-430	2CG	13.1	67.6	19.3		.1	.4	.3	1.9	10.4	21.5	46.1		2.7	33.3			.66

DEPTH CM	VOL. GT 2 PCT	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) WEIGHT GT 75 PCT	75-20	20-5	5-2	LT .074	20-2 PCT LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	4B1C 1/10 BAR PCT	WATER CONTENT 4B2A 1/3-BAR PCT	4B1C 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 9C1A 1/1 H2O	8C1E 1/2 CACL
000-23	TR	0	0	0	TR		TR	.29	.67		287	230	94.1	.39			6.2	5.8
023-48	TR	0	0	0	TR			.23	1.01		394	329	126	.46			6.0	5.7
048-130													111				5.48	5.2
130-190													24.8				5.6	5.5
190-223													64.7		3		6.88	6.6
223-277													34.4		49		7.89	7.6
277-327													14.1		31		7.5	7.4
370-430													12.8		42		7.7	7.6

DEPTH CM	ORGANIC MATTER 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	EXTRACTABLE BASES 5B4A (MEQ) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB / 100	ACTY 6H1A BACL TEA G	AL 6G1E KCL EXT	CAT EXCH 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	BASE SAT 5D3 EXTB ACTY PCT	5C1 NHAC PCT
000-23	49.3	3.20	15			148	25.7	.1	.3	174	54.8		229	179		5.8	83	76	97
023-48	47.7	3.28	15			153	30.0	.3	.3	184	67.4		251	187		5.1	82	73	98
048-130	33.2					144	28.2	.2	.1	173				169		5.1	85		102
130-190	7.16						11.0	.0	.1					35.0					
190-223	15.2						27.7	.1	.1					67.0					
223-277	9.68						8.7	.0	TR					25.9					
277-327	3.88						5.3	.0	TR					13.6					
370-430	2.14						4.7	.0	.1					6.1					

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	SATURATION EXTRACT 8A1 (MEQ/LITER) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
000-23	3200	6.5	298			880		.27	3.4	1.1	.1	TR	0	3.7	.0	.0	.5		
023-48	3300	6.2	521			1200		.24	2.6	.9	.1	TR	0	2.6	.2	.0	.0		
048-130																			
130-190																			
190-223																			
223-277																			
277-327																			
370-430																			

DEPTH CM	HISTOSOL CHARACTERIZATION: 8F MINL CONT PCT	8G (STATE OF DECOMPOSITION) (FIBER VOL) UNRB PCT	RUB PCT	8H PYROPHOSPHT SOLUBILITY (MUNS COLOR)		PH 8C1E .01M CACL	(BULK DEN) 4A3A FILD STAT G/CC	4A1I 1/3B REWT G/CC	COLE 4D1 RE-WET	SUBS RES-IDUE PCT	WATER CONTENT 4B4 FILD STAT PCT	4B1C 1/3B REWT PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	SHEAR STRENGTH KPA (PSF)
000-23	21		1	7.5YR	2/1	6.3	.31	.31	.29	91	252	198	92	.33	
023-48	15	16	2	7.5YR	3/1	6.1	.23	.41	.35	78	365	153	107	.19	
048-130	23	12	2	7.5YR	3/2	5.7	.17			73	564				10.7(223)
130-190	67	8	2	7.5YR	4/2	5.7	.34			62	275				4.0(84)
190-223	71	18	3	7.5YR	4/2	6.9	.36			58	260				
223-277	76		4	10 YR	6/3	7.3	.36				253				
277-327	93			10 YR	6/3	7.4	.76				104				
370-430	93			10 YR	7/2	7.3	1.03				68				

(A) ANALYSES DETERMINED ON FIELD MOIST SAMPLES UNLESS OTHERWISE INDICATED. CATION EXCHANGE CAPACITY, EXTRACTABLE BASES, CARBONATE CONTENT AND PH (H2O AND CACL2) DETERMINED ON AIRDRY SAMPLES FOR 74L407 THRU 74L4212.
(B) 1/10 H2O AND 1/10 CACL2.

Pedon classification: Typic Medisaprist; euic, mesic
Series classification: (Same)
Soil: Houghton
Soil Nos.: S74MI-37-2 (LSL Nos. 74L405-74L412)
Location: Clinton County, Michigan; 200 feet north and 800 feet east of the SE corner of Sec. 12, T5N, R1W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 68° F. Frost-free season is 140-150 days.
Vegetation and land use: Willows and bluegrass. Idle land.
Parent material: Herbaceous material.
Physiography: Depression in till plain.
Topography: Level or newly level. Gradient is 1 percent.
Drainage: Very poorly drained.
Ground water: At 5 inches.
Erosion: Slight.
Permeability: Moderately slow to moderately rapid.
Described by: R. Harner, N. Stroesenreuther, and W. Mettert.

(Colors are for moist soil unless otherwise stated.)

Oa1 405 0 to 23 cm (0 to 9 inches). Black (N 2/0) broken face and rubbed; about 5 percent fibers, 2 percent rubbed; weak medium granular structure; friable; few fine roots; estimated mineral content 20 percent; abrupt smooth boundary.

Oa2 406 23 to 48 cm (9 to 19 inches). Black (N 2/0), black (10YR 2/1) rubbed; about 5 percent fibers, 1 percent rubbed; moderate medium subangular blocky structure; friable; few fine roots; estimated mineral content 20 percent; clear smooth boundary.

Oa3 407 48 to 130 cm (19 to 51 inches). Black (10YR 2/1) broken face and rubbed; about 15 percent fibers, 3 percent rubbed; weak thick platy structure; friable; estimated mineral content 15 percent; gradual smooth boundary.

Lco1 408 130 to 190 cm (51 to 75 inches). Very dark gray (10YR 3/1) coprogenous earth; massive; slightly sticky; estimated mineral content 20 percent; abrupt smooth boundary.

Oa4 409 190 to 223 cm (75 to 89 inches). Black (10YR 2/1), very dark brown (10YR 2/2) rubbed; about 15 percent fibers, 3 percent rubbed; weak thick platy structure; friable; estimated mineral content 15 percent; abrupt smooth boundary.

Lco2 410 223 to 277 cm (89 to 111 inches). Dark gray (10YR 4/1) coprogenous earth; massive; slightly sticky; estimated mineral content 25 percent; few shell fragments; abrupt smooth boundary.

Lco3 411 277 to 370 (111 to 148 inches). Gray (10YR 5/1) coprogenous earth; massive; slightly sticky; estimated mineral content 25 percent; few shell fragments; gradual smooth boundary.

IICg 412 370 to 430 cm (148 to 172 inches). Gray (10YR 5/1) silty clay loam; massive; firm.

SOIL CLASSIFICATION-TYPIC MEDISAPRIST
EUIC,MESIC
SERIES - - - - - - -HOUGHTON

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SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SOIL NO - - - - - - S74MI-45-1 COUNTY - - - EATON

GENERAL METHODS- - -1A,1B1B,2A1,2B (A) SAMPLE NOS. 74L413-74L421 AUGUST 1978

DEPTH CM	HORIZON	SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	NON-CO3 CLAY PCT	RATIO 8D1 15-BAR TO CLAY
		(- - - PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - - -) PCT LT 2MM			FINE	(- - SAND - -)					(- -SILT- -)							
000-25	OAP																	
025-56	OA2																	
056-157	OA3																	
157-193	OA4																	
193-244	OA5																	
244-270	LCO1																	
270-285	LCOOA																	
325-375	LCOCA																	
430-475	LCOCA																	

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20 PCT LT 75	20-5	5-2	LT .074	20-2 PCT LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2A 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
000-25	TR	C	0	0	TR		TF	.38	.73		201	168	80.2	.33			6.0	5.7
025-56	TR	0	0	0	TR		TR	.15	.51		617	439	130	.50			5.9	5.6
056-157	0	0	0	0	0		0	.14	.53		708	470	99.0	.52			5.7	5.4
157-193													113				4.98	4.7
193-244													102				4.78	4.6
244-270													92.4				4.68	4.4
270-285													27.1		81		7.98	7.7
325-375													26.8		63		7.98	7.6
430-475													28.2		20		7.78	7.3

DEPTH CM	ORGANIC MATTER 6A1A ORGN CARB PCT	6B?A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	EXTRACTABLE BASES 5B4A 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	CAT EXCH 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	BASE SAT 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(- - - MEQ / 100 G- - -)													
000-25	45.7	2.50	18			156	18.8	.2	2.6	178	61.1		239	179		8.3	87	74	99
025-56	45.3	2.43	9			177	27.6	.4	2.2	207	65.2		272	193		6.4	92	76	107
056-157	40.3	3.03	13			134	22.2	.4	1.5	158	74.4		233	154		6.0	87	68	103
157-193	38.6						13.1	.1	.2					137					
193-244	38.9						13.9	.0	.1					132					
244-270	29.3						15.6	.1	.2					107					
270-285	6.87						5.3	TR	.0					11.5					
325-375	7.90						5.5	.0	TR					14.3					
430-475	3.92						10.3	.0	.1					10.5					

DEPTH CM	SATURATED PASTE 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	SATURATION EXTRACT 8A1 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
									(- - - MEQ / LITER - - -)										
000-25	1400	5.1	230			2300		1.60	11.0	3.1	.3	2.4	0	.9	5.6	11.1	2.8		
025-56	1400	6.0	762			4800		.8	6.3	2.2	.2	1.2	0	1.5	4.0	3.7	.6		
056-157	1900	5.8	858			4200		.74	4.9	1.8	.2	.7	0	.2	2.6	2.7	.4		
157-193																			
193-244																			
244-270																			
270-285																			
325-375																			
430-475																			

DEPTH CM	HISTOSOL CHARACTERIZATION (STATE OF DECOMPOSITION) 8F MINL CCNT PCT	8G (FIBER VOL) UNRB PCT	RUB PCT	8H PYROPHOSPHT SOLUBILITY (MUNS COLOR)		PH 8C1E .01M CACL	(BULK DEN) 4A3A FILD STAT G/CC	4A1I 1/3B REWT G/CC	COLE 4D1 RE-WET	SUBS RES-IDUE PCT	WATER CONTENT 4B4 FILD STAT PCT	4B1C 1/3B REWT PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	SHEAR STRENGTH KPA (PSF)
000-25	22		3	7.5YR	2/1	6.1	.39	.39	.24	100	186	171	78.2	.35	
025-56	13	44	8	7.5YR	3/2	5.8	.16	.22	.32	77	526	270	101	.37	
056-157	10	47	5	7.5YR	5/4	5.4	.14	.26	.27	70	648	265	99.1	.45	6.7(131), 4.2(88)
157-193	12	52	15	7.5YR	7/2	5.4	.13			64	804				
193-244	21	20	7	7.5YR	6/4	5.6	.13			57	793				
244-270	16	30	13	7.5YR	6/4	5.6	.08			38	1140				
270-285	78			10YR	8/2	7.3	.28				325				3.9(81)
325-375	81			10YR	7/2	7.2	.39				253				
430-475	96		2	10YR	6/3	7.3	.79				5				

(A) ANALYSES DETERMINED ON FEILD MOIST SAMPLES UNLESS OTHERWISE INDICATED. CATION EXCHANGE CAPACITY, EXTRACTABLE BASES, CARBONATE CONTENT AND PH (H2O AND CACL2) DETERMINED ON AIRDRY SAMPLES FOR 74L416 THRU 74L421.
(B) 1/10 H2O AND 1/10 CACL2.

Pedon classification: Typic Medisaprist, euic, mesic
Series classification: (Same)
Soil: Houghton
Soil Nos.: S74MI-45-1 (LSL Nos. 74L413-75L421)
Location: Eaton County, Michigan. 1,130 feet north and 125 feet west of the SE corner, Sec. 36, T4N, R4W.
Climate: Average annual precipitation is about 30 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 69° F. Frost-free season is 140-150 days.
Vegetation and land use: Radishes. Cropland.
Parent material: Herbaceous material.
Physiography: Depression in outwash plain.
Topography: Level. Gradient less than 1 percent.
Drainage: Very poorly drained.
Ground water: At 25 inches.
Erosion: Slight.
Permeability: Moderately slow to moderately rapid.
Described by: N. Stroesenreuther, E. Whiteside, and R. Engel.

(Colors are for moist soil unless otherwise stated.)

Oap 413 0 to 25 cm (0 to 10 inches). Black (N 2/0), black (10YR 2/1) rubbed; about 5 percent fibers, 2 percent rubbed; weak medium granular structure; friable; few fine roots; estimated mineral content 20 percent; neutral; abrupt smooth boundary.

Oa2 414 25 to 56 cm (10 to 22 inches). Black (10YR 2/1), very dark brown (10YR 2/2) rubbed; about 40 percent fibers, 7 percent rubbed; weak thick platy structure; friable; very few fine roots; estimated mineral content 30 percent; neutral; gradual smooth boundary.

Oa3 415 56 to 157 cm (22 to 63 inches). Dark brown (7.5YR 3/2), very dark brown (10YR 2/2) rubbed; about 50 percent fibers, 10 percent rubbed; weak thick platy structure; friable; very few fine roots; estimated mineral content 10 percent; few wood fragments; neutral; gradual smooth boundary.

Oa4 416 157 to 193 cm (63 to 77 inches). Dark brown (7.5YR 3/2), very dark brown (10YR 2/2) rubbed; about 60 percent fibers, 10 percent rubbed; weak thick platy structure; friable; very few fine roots; estimated mineral content 10 percent; neutral; clear smooth boundary.

Oa5 417 193 to 244 cm (77 to 98 inches). Very dark brown (10YR 3/2) broken face and rubbed; about 20 percent fibers, 5 percent rubbed; weak thick platy structure; friable; estimated mineral content 20 percent; mildly alkaline; clear smooth boundary.

Lco1 418 244 to 270 cm (98 to 108 inches). Dark grayish brown (10YR 4/2), very dark grayish brown (10YR 3/2) rubbed coprogenous earth; massive; friable; estimated mineral content 25 percent; mildly alkaline; abrupt smooth boundary.

Lca2 419-420 270 to 475 cm (108 to 190 inches). Gray (5Y 6/1) marl; many shells; massive; slightly smooth boundary. 270 to 375 (419). 375 to 475 (420).

IICg 421 475 to 500 cm (190 to 200 inches). Gray (5Y 5/1) silt loam; massive; slightly sticky; slight effervescence; moderately alkaline.

SOIL CLASSIFICATION-MEMIC MEDISAPRIST
EUIC, MESIC
SERIES - - - - - - -PINNEBOG

U. S. DEPARTMENT OF AGRICULTURE
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LINCOLN, NEBRASKA

SOIL NO - - - - - - S74MI-57-1 COUNTY - - - GRATIOT

GENERAL METHODS- - -1A,1B1B,2A1,2B (A) SAMPLE NOS. 74L427-74L437 AUGUST 1978

DEPTH CM	HORIZON	SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	NON-CO3 CLAY PCT	RATIO 8D1 15-BAR TO CLAY
		(- - - PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - - - PCT LT 2MM - - -)																
000-23	OAP																	
023-61	OA2																	
061-100	OA3																	
100-163	OE1																	
163-190	LCO1																	
190-223	LCO2																	
223-267	LCO3																	
267-300	2CG	10.4	60.6	29.0		.0	.4	1.2	3.7	5.1	17.7	42.9		5.3	25.0			.56
300-360	2CG	60.4	26.6	13.0		2.5	7.4	14.2	26.1	10.2	9.1	17.5		50.2	32.0			.35
130-160	OE1																	
100-130	OE1																	

DEPTH CM	VCL GT 2 PCT	GT 75 PCT	75-20	20-5	5-2	LT .074	20-2 PCT LT20	4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2A 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	PH 8C1E 1/2 CACL
	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)		(- - WEIGHT - - PCT LT 75 - -)					(BULK DENSITY)			(- - WATER CONTENT - -)							
000-23	TR	0	0	0	TR		TR	.30	.61		235	201	78.0	.37			5.8	5.4
023-61	TR	0	0	0	TR		TR	.14	.45		627	532	107	.60			5.6	5.1
061-100	TR	0	0	0	TR		TR	.12	.40		837	606	109	.60			5.6	5.0
100-163	0	0	0	0	0		0	.09	.27		1100	716	107	.55			5.5	5.2
163-190													186				5.38	5.1
190-223													310				4.83	4.6
223-267													66.2				4.88	4.6
267-300													16.2		30		7.6	7.5
300-360													4.6		29		8.2	7.8
130-160													111		0		4.98	4.5
100-130													124		0		5.78	5.5

DEPTH CM	6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	6C2B EXT FE PCT	PHOS TOTL PCT	6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	6H1A BACL TEA ACTY	6G1E AL KCL EXT	5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	5C3 EXTB ACTY PCT	5C1 NHAC PCT
	(ORGANIC MATTER)			IRON		(- - EXTRACTABLE BASES 5B4A - -)				(- - MEQ / 100 G - -)			(CAT EXCH)					(BASE SAT)	
000-23	42.4	1.89	22			126	6.8	.1	.6	144	2.8		216	155		7.5	81	66	93
023-61	40.6	2.63	15			165	3.7	.2	.3	189	88.0		277	193		7.0	85	69	98
061-100	35.6	3.05	12			77.1	15.0	.3	.3	92.7	83.0		176	113		5.1	68	53	82
100-163	54.9	3.03	18			58.9	10.9	.4	.0	70.2	88.4		159	85.0		5.4	69	44	83
163-190	25.4					49.9	13.9	.0	.1	63.9				57.0		3.6	88		112
190-223	18.0					37.7	8.2	TR	.2	46.1				53.0		4.6	71		87
223-267	12.9					25.4	5.5	.1	.2	31.2				39.1		4.6	65		80
267-300	.51						12.5	.0	.2					8.4	.29				
300-360	.15						6.3	.0	TR					2.9	.22				
130-160	31.8						9.4	.1	.0					119					
100-130	39.8						12.1	.1	.0					119					

DEPTH CM	8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5C2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	4F1 LQID LMIT PCT	4F2 PLST INDX
	(SATURATED PASTE)							(- - SATURATION EXTRAC. 8A1 - - MEQ / LITER - -)										(ATTERBERG)	
000-23	3500	5.8	228			660		.44	3.2	1.0	.1	.2	0	.9	.0	.0	2.5		
023-61	4200	5.8	617			1300		.22	2.4	.7	.1	TR	0	1.5	.0	.0	.6		
061-100	4800	5.6	1130			2100		.24	2.1	.7	.1	TR	0	1.5	.5	1.0	.4		
100-163	3900	5.6	1260			3200		.41	3.0	.9	.1	TR	0	1.1	.2	2.6	.0		
163-190																			
190-223																			
223-267																			
267-300																			
300-360																			
130-160																			
100-130																			

DEPTH CM	8F MINL CONT PCT	8G (FIBER VOL) UNRB PCT	8G RUB PCT	8H PYROPHOSPHT SOLUBILITY (MUNS COLOR)		PH 8C1E .01M CACL	4A3A FILD STAT G/CC	4A1I 1/3B REWT G/CC	COLE 4D1 RE-WET	SUBS RES-IDUE PCT	4B4 FILD STAT PCT	4B1C 1/3B REWT PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	SHEAR STRENGTH KPA (PSF)
	(- - HISTOSOL CHARACTERIZATION - -) (STATE OF DECOMPOSITION)						(BULK DEN)				(- - WATER CONTENT - -)				
000-23	27		2	7.5YR	2/2	5.4	.35	.35	.21	95	158	155	66.2	.31	
023-61	14	20	4	7.5YR	4/4	5.2	.16	.23	.25	76	523	258	91.0	.38	
061-100	9	48	9	10YR	7/4	5.1	.13	.22	.22	66	687	294	98.5	.43	6.0(126)
100-163	6	65	24	10YR	8/3	5.9	.11	.16	.19	57	840	398	87.5	.50	21.5(449)
163-190	15		2	10YR	8/3	6.3	.07				1470				
190-223	35		2	10YR	6/2	5.8	.11				927				4.7(99)
223-267	61			10YR	8/2	5.7	.16			34	624				
267-300	99			10YR	6/3	7.1	1.04			40	65				
300-360	99			10YR	7/3	7.3	1.76			35	18				
130-160	6	66	30	10YR	8/2	5.0									11.5(240)
100-130	11	72	35	10YR	8/3	4.6									15.8(330)

(A) ANALYSES DETERMINED ON FEILD MOIST SAMPLES UNLESS OTHERWISE INDICATED. CATION EXCHANGE CAPACITY, EXTRACTABLE BASES, CARBONATE CONTENT AND PH (H2O AND CACL2) DETERMINED ON AIRDRY SAMPLES FOR 74L431 THRU 74L437.

(B) 1/10 H2O AND 1/10 CACL2.

Pedon classification: Hemic Medisaprist; euic, mesic
Series classification: (Same)
Soil: Pinnebog
Soil Nos.: S74MI-57-1 (LSL Nos. 74L427-74L437)
Location: Gratiot County, Michigan; 72 feet south of road in NW 1/4, NE 1/4, Sec. 13, T11N, R4W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 67° F. Frost-free season is 130-140 days.
Vegetation and land use: Golden rod, thistles and quack grass. Idle cropland.
Parent material: Herbaceous material.
Physiography: Till plain.
Topography: Level. Gradient is less than 1 percent.
Drainage: Very poorly drained.
Ground water: At 12 inches.
Erosion: Slight.
Permeability: Moderately slow to moderately rapid.
Described by: N. Stroesenreuther, J. Feenstra, and T. Sanders.

(Colors are for moist soil unless otherwise stated.)

Oap 427 0 to 23 cm (0 to 9 inches). Black (N 2/0), black (10YR 2/1) rubbed; about 5 percent fibers, 2 percent rubbed; moderate medium granular structure; friable; common fine roots; estimated mineral content 20 percent; abrupt smooth boundary.

Oa2 428 23 to 61 cm (9 to 24 inches). Black (N 2/0), black (10YR 2/1) rubbed; about 10 percent fibers, 2 percent rubbed; weak thick platy structure; friable; few fine roots; estimated mineral content 15 percent; clear smooth boundary.

Oa3 429 61 to 100 cm (24 to 40 inches). Dark brown (7.5YR 3/2), very dark brown (10YR 2/2) rubbed; about 35 percent fibers, 10 percent rubbed; weak thick platy structure; friable; few fine roots; estimated mineral content 5 percent; clear smooth boundary.

Oe1 430 100 to 163 cm (40 to 65 inches). Dark yellowish brown (10YR 4/4), very dark grayish brown (10YR 3/2) rubbed; about 80 percent fibers, 40 percent rubbed; weak thick platy structure; non-sticky; no mineral content; gradual smooth boundary.

Lco1 431 163 to 190 cm (65 to 76 inches). Very dark grayish brown (10YR 3/2) coprogenous earth; about 5 percent fibers, 1 percent rubbed; weak thin platy structure; slightly sticky; estimated mineral content 15 percent; clear smooth boundary.

Lco2 432 190 to 223 cm (76 to 89 inches). Dark reddish brown (5YR 3/2) coprogenous earth; about 10 percent fibers, 2 percent rubbed; weak thin platy structure; slightly sticky; estimated mineral content 15 percent; clear smooth boundary.

Lco3 433 223 to 267 cm (89 to 107 inches). Dark grayish brown (2.5Y 4/2) coprogenous earth; about 5 percent fibers, 1 percent rubbed; weak thin platy structure; slightly sticky; estimated mineral content 15 percent; abrupt smooth boundary.

IICg 434-435 267 to 360 cm (107 to 144 inches). Gray (5Y 6/1) stratified silt loam, very fine sand, and silt; massive; very sticky.

IICg 436 130 to 160 cm (52 to 64 inches). Second vane.

IICg 437 100 to 130 cm (40 to 52 inches). Second vane.

SOIL CLASSIFICATION-LIMNIC MEDISAPRIST
MARLY,EUIC,MESIC
SERIES - - - - - - -EDWARDS

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

SOIL NO - - - - - - S74MI-161-2 COUNTY - - - WASHTENAW

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 74L444-74L447 AUGUST 1978

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM) FINE SAND 2-.05	SAND .05-.002	SILT .002-.0002	CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .002-.002	SILT SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	NON-COS. CLAY PCT	RATIO 8D1 15-BAR TO CLAY
000-25	OAP																	
025-28	2LCA1	9.7	80.4	9.9	7.5	.4	1.4	1.0	3.3	3.6	4.8	75.6		6.1	10.4	76		3.5
028-104	3OA2																	
104-203	4LCA2	48.0	48.6	3.4	1.4	.3	2.4	5.2	20.2	19.9	15.6	33.0		28.1	48.2	41		2.2

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20	20-5	5-2	LT .074 PCT (PCT LT 75)	20-2 LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2A 15 BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	6E1B LT .002 PCT	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
000-25	TR	0	0	0	TR		TR	.56	.71		122	113	53.8	.33	40		7.3	6.8
025-28	TR	0	0	TR	TR		TR	.23	1.04		361	331	34.6	.68	58		7.4	7.0
028-104	TR	0	0	0	TR		TR						111				7.2	7.0
104-203													7.5		93		7.7	7.6

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA (MEQ / 100 G)	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
000-25	22.5	1.13	14				5.2	.1	1.2					88.0					
025-28	13.5	1.08	13				3.2	.1	.2					21.2	2.1				
028-104	32.5	2.9	11			166	11.4	.2	.9	179	34.4		212	177		14.6	94	84	101
104-203	2.48						2.5	.0	.0					2.8	.84				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 8A1A EC MMHOS/CM	6N1B CA (MEQ / LITER)	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
000-25	1800	7.1	159			1100		1.11	8.4	.7	.1	1.4	0	2.4	1.6	3.0	3.2		
025-28	1800	7.3	160			1200		1.07	9.7	1.0	.1	.6	0	2.2	.5	6.2	1.6		
028-104	1500	7.1	570			4000		1.02	8.9	1.3	.2	.6	0	1.5	.5	7.0	1.0		
104-203																			

DEPTH CM	(HISTOSOL CHARACTERIZATION) 8F MINL CONT PCT	(STATE OF DECOMPOSITION) 8G (FIBER VOL) UNRB PCT	RUB PCT	8H PYROPHOSPHT SOLUBILITY (MUNS COLOR)	PH 8C1E CACL	(BULK DEN) 4A3A FILD STAT G/CC	4A1I 1/3B REWT G/CC	COLE 4D1 RE-WET	SUBS RES-IDUE PCT	(WATER CONTENT) 4B4 FILD STAT PCT	4B1C 1/3B REWT PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	SHEAR STRENGTH KPA (PSI)
000-25	59		2	7.5YR 3/2	7.1	.52	.57	.08	79	118	103	44.7	.33	
025-28	83		3	7.5YR 4/2	7.1	.54	.46	.31	80C	114	143	27.9	.53	
028-104	22		3	7.5YR 3/2	6.9	.23			100	337		89.2		3.4(176)
104-203	95			7.5YR 6/4	7.3					81				8.6(179)

(A) ANALYSES DETERMINED ON FEILD MOIST SAMPLES UNLESS OTHERWISE INDICATED. CATION EXCHANGE CAPACITY, EXTRACTABLE BASES, CARBONATE CONTENT AND PH (H2O AND CACL2) DETERMINED ON AIRDRY SAMPLES FOR 74L447.
(B) 1/10 H2O AND 1/10 CACL2.
(C) ESTIMATED.

Pedon classification: Limnic Medisaprist; marly, euic, mesic
Series classification: (Same)
Soil: Edwards
Soil Nos.: S74MI-161-2 (74L444-74L447)
Location: Washtenaw County, Michigan; 2,115 feet north and 600 feet east of the SW corner, Sec. 18, T3S, R4E.
Climate: Average annual precipitation is about 28 inches. Mean annual air temperature is about 49° F., and the mean summer air temperature is about 68° F. Frost-free season is 150-160 days.
Vegetation and land use: Potatoes. Cropland.
Parent material: Herbaceous material over marl.
Physiography: Outwash plain.
Topography: Level. Gradient is less than 1 percent.
Drainage: Very poorly drained.
Ground water: At 22 inches.
Erosion: Slight.
Permeability: Moderately slow to moderately rapid in the organic layers and variable in the marl.
Described by: N. Stroesenreuther, J. Barnes, and R. Engel.

(Colors are for moist soil unless otherwise stated.)

Oap 444 0 to 25 cm. Black (10YR 2/1), very dark brown (10YR 2/2) rubbed; about 5 percent fibers, 2 percent rubbed; weak medium granular structure; friable; few fine roots; estimated mineral content 35 percent; abrupt smooth boundary.

IILca 445 25 to 28 cm. Light brownish gray (10YR 6/2) silt loam; massive; friable; few fine roots; abrupt smooth boundary.

IIIOa2 446 28 to 104 cm. Black (10YR 2/1) broken face and rubbed; about 10 percent fibers, 2 percent rubbed; weak thick platy structure; friable; few fine roots; abrupt smooth boundary.

IVLca2 447 104 to 203 cm. Gray (5Y 6/1) marl; massive; friable.

SOIL CLASSIFICATION-TERRIC MEDISAPRIST
SANDY OR SANDY SKELETAL,MIXED,EUIC,MESIC
SERIES - - - - - - -ADRIAN

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

SOIL NO - - - - - - S74NI-57-2 COUNTY - - - GRATIOT

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 74L686-74L690 AUGUST 1978

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B: SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	RATIO NON-COB-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
		PCT LT 2MM																
C00-18	CA1																	
C18-36	CA2																	
C36-79	CA3																	
C79-97	CA4																	
C97-150	2CG	94.0	3.5	2.5		1.9	11.5	34.5	37.6	8.5	1.5	2.0		85.5	23.9			

DEPTH CM	PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2B: VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20	20-5	5-2	LT .074 PCT LT 75	4A1D BULK DENSITY 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	4B1C WATER CONTENT 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2A 15-BAR PCT	4C1 WRD CM/CM	6E1B CARBONATE LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
C00-18	TR	0	0	0	TR		TR					65.9				6.5	5.1
C18-36	1	0	0	0	5		5	.32	.93		240	220	73.5	.47		6.0	5.0
C36-79	1	0	0	TR	6		6	.30	.98		348	314	92.4	.66			
C79-97													62.8				
C97-150																	

DEPTH CM	ORGANIC MATTER 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	EXTRACTABLE BASES 5B4A: 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	CAT EXCH 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	BASE SAT 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						MEQ / 100 G-													
C00-18	29.8	2.28	13			87.3	11.5	.5	.3	99.6	69.5		169	123		7.6	71	59	81
C18-36	29.8	2.29	13			87.4	12.0	.5	.2	100	69.0		169	132		7.3	66	59	76
C36-79	30.8	2.38	13			93.4	12.9	.4	.3	107	80.1		127	124		7.2	75	57	86
C79-97																			
C97-150																			

DEPTH CM	SATURATED PASTE 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	SATURATION EXTRACT 6A1: 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
								MEQ / LITER											
C00-18	2400	5.8	267			1200		.63	4.8	1.4	.7	TR	0	.9	.0	4.8			
C18-36	2300	5.5	259			1100		.62	4.5	1.4	.5	TR	0	.0	.0	3.2	1.6		
C36-79	2400	5.6	432			1600		.57	4.2	1.3	.4	TR	0	.2	.0	4.4			
C79-97																			
C97-150	2300	7.0	22.7			420		2.40	23.5	4.4	.8	.1	0	1.5	.9	29.3			

DEPTH CM	HISTOSOL CHARACTERIZATION: 8F MINL CONT PCT	8G (STATE OF DECOMPOSITION) (FIBER VOL) HARB RUB PCT	8H PYROPHOSPHT SOLUBILITY (MUNS COLOR)	PH 8C1E .01M CACL	BULK DEN 4A3A FILD STAT 1/3B REWT G/CC	4A1I 1/3B REWT G/CC	COLE 4D1 RE-WET	SUBS RES-TDUE PCT	WATER CONTENT 4B4 FILD STAT PCT	4B1C 1/3B REWT PCT	4B2 15-BAR PCT	4C1 WRD CM/CM
C00-18	44	5	1	7.5YR 2/1	5.2				249		57	
C18-36	43	25	1	7.5YR 2/1	5.0	.44	.55	.19	93	198	90	55
C36-79	25	10	4	7.5YR 2/2	5.2	.24	.43	.27	100	376	121	65
C79-97	32	5	4	7.5YR 3/2	5.2	.22			83	420		
C97-150					7.0							

Pedon classification: Terric Medisaprists; sandy or sandy-skeletal, mixed, euic, mesic
Series classification: (Same)
Soil: Adrian
Soil Nos.: S74MI-57-2 (74L686-74L690)
Location: Gratiot County, Michigan; 100 feet east of Rawson road in NW 1/4, NW 1/4, SW 1/4, Sec. 16, T9N, R1W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 47° F., and the mean summer air temperature is about 67° F. Frost-free season is 130-140 days.
Vegetation and land use: Cattails. Idle land.
Parent material: Herbaceous material over sands.
Physiography: Till plain.
Topography: Level. Gradient is 1 percent.
Drainage: Very poorly drained.
Ground water: At 5 inches.
Erosion: Slight.
Permeability: Moderately slow to moderately rapid.
Described by: N. Stroesenreuther, J. Feenstra, D. Krause, and C. C. Wang.

(Colors are for moist soil unless otherwise stated.)

Oa1 686 0 to 18 cm (0 to 7 inches). Black (10YR 2/1) broken face and rubbed; about 5 percent fibers, 2 percent rubbed; weak medium granular structure; friable; many fine roots; estimated mineral content 15 percent; neutral; abrupt smooth boundary.

Oa2 687 18 to 38 cm (7 to 15 inches). Very dark brown (10YR 2/2), black (10YR 2/1) rubbed; about 25 percent fibers, 3 percent rubbed; weak thin platy structure; friable; few fine roots; estimated mineral content 15 percent; neutral; gradual smooth boundary.

Oa3 688 38 to 79 cm (15 to 32 inches). Black (10YR 2/1) broken face and rubbed; about 10 percent fibers, 3 percent rubbed; weak thick platy structure; friable; few fine roots; estimated mineral content 20 percent; neutral; gradual smooth boundary.

Oa4 689 79 to 97 cm (32 to 39 inches). Very dark grayish brown (10YR 3/2) broken face and rubbed; about 5 percent fibers, 2 percent rubbed; massive; friable; few fine roots; estimated mineral content 30 percent; neutral; abrupt smooth boundary.

IICg 690 97 to 150 cm (39 to 60 inches). Gray (5Y 5/1) sand; single grain; loose; neutral.

TERRIC MEDISAPRIST

SOIL CLASSIFICATION SANDY, MIXED, EUIC, MESIC

SERIES - - - - - - ADRIAN

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

SOIL NO - - - - - - S74MI-45-2 COUNTY - - - EATON

GENERAL METHODS- - -1A,1B1B,2A1,2B (A) SAMPLE NOS. 74L422-74L426 AUGUST 1978

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM) SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	FINE SAND VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	SILT COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	RATIO NOM-CO3-CLAY PCT	8D1 15-BAR TO CLAY
000-23	CAP																	
023-71	CA2																	
071-117	CA3																	
117-122	LCO																	
122-200	2CG	90.7	6.6	2.7		7.2	17.5	32.4	30.9	2.7	2.3	4.3		88.0	12.4			.70

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VCL. 2 PCT	GT 75 PCT	WEIGHT 75-20	20-5	5-2	LT .074 PCT LT 75	20-2 PCT LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2A 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	(-PH-) 8C1A 1/1 H2O	8C1E 1/2 CACL
000-23	TR	0	0	TR	TR		TR	.32	.84		247	213	78.0	.43			5.9	5.4
023-71	TR	0	0	0	TR		TR	.30	1.11		279	259	125	.38			5.9	5.5
071-117													103				5.58	5.2
117-122																		
122-200													1.9		11		7.4	7.2

DEPTH CM	(ORGANIC MATTER 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA C	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						MEQ / 100 G													
000-23	43.1	2.80	15			151	17.7	.1	1.0	170	72.3		242	181		8.5	83	70	4
023-71	36.8	2.67	14			160	19.0	.1	.3	179	65.0		244	183		8.4	87	73	98
071-117	34.3						18.7	.0	.1					132					
117-122																			
122-200	4.60						8.7	.0	.0					1.7					

DEPTH CM	(SATURATED PASTE) 8E1 REST CHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
									MEQ / LITER										
000-23	2100	5.8	236			1100		.73	5.1	1.4	.1	.6	0	.9	.0	.3	5.4		
023-71	2500	5.9	390			1300		.45	4.1	1.0	.1	.1	0	.9	.0	1.3	1.5		
071-117																			
117-122																			
122-200																			

DEPTH CM	(HISTOSOL CHARACTERIZATION) 8F MINL CONT PCT	(STATE OF DECOMPOSITION) 8G (FIBER VOL) UNRB PCT	RUB PCT	8H PYROPHOSPHT SOLUBILITY (MUNS	COLOR)	PH 8C1E .01M CACL	(BULK DEN) 4A3A FILD STAT G/CC	4A1I 1/3B REWT G/CC	COLE 4D1 RE-WET	SUBS RES-IDUE PCT	(WATER CONTENT) 4B4 FILD STAT PCT	4B1C 1/3B REWT PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	SHEAR STRENGTH KPA (PSF)
000-23	24		1	10YR	2/2	5.7	.32	.34	.35	90	178	187	76.5	.37	
023-71	18	23	2	7.5YR	3/2	5.8	.19	.45	.35	87	439	138	78.1	.27	
071-117	17	13	3	7.5YR	3/2	5.2	.21			97	505				12.9(270)
117-122	54						.29			74	324				
122-200				10YR	7/3	6.7									

(A) ANALYSES DETERMINED ON FIELD MOIST SAMPLES UNLESS OTHERWISE INDICATED. CATION EXCHANGE CAPACITY, EXTRACTABLE BASES, CARBONATE CONTENT AND PH (H2O AND CACL2) DETERMINED ON AIRDRY SAMPLES FOR 74L424 THRU 74L426.
(B) 1/10 H2O AND 1/10 CACL2.

Pedon classification: Terric Medisaprist; sandy, mixed, euic, mesic
Series classification: (Same)
Soil: Adrian
Soil Nos.: S74MI-45-2 (LSL Nos. 74L422-74L425)
Location: Eaton County, Michigan; 1,035 feet south and 150 feet west of the NE corner, Sec. 36, T4N, R4W.
Climate: Average annual precipitation is about 30 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 69° F. Frost-free season is 140-150 days.
Vegetation and land use: Radishes. Cropland.
Parent material: Herbaceous material over sands.
Physiography: Depression in outwash plain.
Topography: Level. Gradient is less than 1 percent.
Drainage: Very poorly drained.
Ground water: At 16 inches.
Erosion: Slight.
Permeability: Moderately slow to moderately rapid in the organic layers and moderate or moderately slow in the loamy material.
Described by: N. Stroesenreuther and R. Engel.

(Colors are for moist soil unless otherwise stated.)

Oap 422 0 to 23 cm (0 to 9 inches). Black (N 2/0) broken face and rubbed; about 5 percent fibers, 2 percent rubbed; strong fine granular structure; friable; many fine roots; estimated mineral content 20 percent; abrupt smooth boundary.

Oa2 423 23 to 71 cm (9 to 28 inches). Black (N 2/0), black (10YR 2/1) rubbed; about 5 percent fibers, 2 percent rubbed; moderate coarse subangular blocky structure; friable; few fine roots; estimated mineral content 15 percent; gradual smooth boundary.

Oa3 424 71 to 117 cm (28 to 47 inches). Black (N 2/0) broken face and rubbed; about 10 percent fibers, 5 percent rubbed; weak thick platy structure; friable; estimated mineral content 15 percent; abrupt smooth boundary.

Lco 425 117 to 122 cm (47 to 49 inches). Dark reddish brown (5YR 3/2), dark reddish brown (5YR 2/2) rubbed; 4 percent fibers, 1 percent rubbed; massive; friable; estimated mineral content 15 percent; abrupt smooth boundary.

IICg 426 122 to 200 cm (49 to 80 inches). Dark gray (5YR 4/1) sand, massive, friable; 15 percent pebbles.

1546A

SOIL CLASSIFICATION TERRIC MEDISAPRIST
SANDY, MIXED, EUIC, MESIC

SERIES - - - - - ADRIAN

SOIL NO - - - - - - - S74MI-161-1 COUNTY - - - WASHTENAW

GENERAL METHODS- - -1A,1B1B,2A1,2B (A) SAMPLE NOS. 74L438-74L443

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

AUGUST 1978

DEPTH CM	HORIZON	SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	NON-CO3 CLAY PCT	RATIO 8D1 15 BAR TO CLAY
		(- - PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - - PCT LT 2MM - -)																
C00-23	CAP																	
C23-43	CA2																	
C43-94	CA3																	
C94-112	CA4																	
112-152	2CG	79.4	13.9	6.7		7.1	18.9	21.0	25.3	7.1	5.8	8.1		72.3	23.9			.82
152-	3CG	86.5	10.1	3.4		9.2	28.7	26.8	18.9	2.9	2.7	7.4		83.6	11.3			.53

DEPTH CM	VCL. GT 2 PCT	WEIGHT GT 75 PCT	75-20 (PCT LT 75)	20-5 (PCT LT 75)	5-2 (PCT LT 75)	LT .074	20-2 PCT LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2A 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1E 1/2 CACL
C00-23	TR	0	0	TR	TR		TR	.36	.92		202	178	17.2	.33			5.9	5.6
C23-43	TR	0	0	0	TR		TR	.22	.90		331	331	122	.46			5.4	5.1
C43-94	TR	0	0	TR	TR		TR	.21	.94		438	371	114	.54			5.4	5.1
C94-112													36.8				4.98	4.7
112-152													5.5				5.58	5.3
152-													1.8		15		7.78	7.6

DEPTH CM	ORGANIC MATTER 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	EXTRACTABLE BASES 5B4A 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	CAT EXCH 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	BASE SAT 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(- - MEQ / 100 G - -)													
C00-23	44.3	2.68	17			165	12.6	.1	2.2	180	46.6		227	175		13.1	94	79	103
C23-43	35.5	2.90	12			135	15.8	.2	1.1	152	86.4		239	171		8.5	79	64	89
C43-94	36.7	2.97	2			133	16.1	.1	1.0	150	82.9		233	167		8.3	80	64	90
C94-112	23.6					81.7	11.3	.1	.7	93.8				119		7.2	69		79
112-152	.68						6.9	.0	.3					9.6					
152-	.37						1.7	.0	TR					1.2					

DEPTH CM	SATURATED PASTE 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	SATURATION EXTRACT 8A1 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
									(- - MEQ / LITER - -)										
C00-23	1800	6.0	204			1200		1.02	6.3	1.1	.1	1.7	0	1.8	2.8	.2	4.1		
C23-43	1700	5.3	583			3500		.92	6.7	1.8	.1	.7	0	1.8	1.2	1.4	4.1		
C43-94	1800	5.4	604			3200		.80	6.1	1.6	.1	.5	0	.9	.7	3.8	2.4		
C94-112																			
112-152																			
152-																			

DEPTH CM	HISTOSOL CHARACTERIZATION: STATE OF DECOMPOSITION 8F MINL CONT PCT	8G (FIBER VOL) UNRB PCT	8G RUB PCT	8H PYROPHOSPHT SOLUBILITY (MUNS COLOR)		PH 8C1E .01M CACL	BULK DEN 4A3A FILD STAT G/CC	4A1I 1/3B REWT G/CC	COLE 4D1 RE-WET	SUBS RES-IDUE PCT	WATER CONTENT 4B4 FILD STAT PCT	4B1C 1/3B REWT PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	SHEAR STRENGTH KPA (PSF)
C00-23	25		6	10YR	2/2	5.9	.36	.39	.33	100	146	166	81.0	.33	
C23-43	25		1	10YR	2/2	5.1	.27	.44	.26	94C	274	153	82.0	.31	
C43-94	30		1	10YR	4/2	5.3	.22	.39	.34	86	370	177	82.9	.37	8.6(179)
C94-112	67	36	4	7.5YR	4/2	5.0	.31			57	222				
112-152				7.5YR	2/2	5.7									
152-				10YR	5/2	7.1									

(A) ANALYSES DETERMINED ON FEILD MOIST SAMPLES UNLESS OTHERWISE INDICATED. CATION EXCHANGE CAPACITY, EXTRACTABLE BASES, CARBONATE CONTENT AND PH (H2O AND CACL2) DETERMINED ON AIRDRY SAMPLES FOR 74L441 THRU 74L443.

(B) 1/10 H2O AND 1/10 CACL2.

(C) COMPUTED AS HALF SURFACE AND HALF SUBSURFACE.

Pedon classification: Terric Medisaprist; sandy, mixed, euic, mesic
Series classification: (Same)
Soil: Adrian
Soil Nos.: S74MI-161-1 (LSL Nos. 74L438-74L443)
Location: Washtenaw County, Michigan; 2,550 feet east and 1,500 feet north of SW corner, Sec. 18, T3S, R4E.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 69° F. Frost-free season is 160-170 days.
Vegetation and land use: Potatoes. Cropland.
Parent material: Herbaceous material overlying sands.
Physiography: Outwash plain.
Topography: Level. Gradient is less than 1 percent.
Drainage: Very poorly drained.
Ground water: At 30 inches.
Erosion: Slight.
Permeability: Moderately slow to moderately rapid in the organic layers and moderate or moderately.
Described by: N. Stroesenreuther, R. Harner, and J. Barnes.

(Colors are for moist soil unless otherwise stated.)

Oap 438 0 to 23 cm (0 to 9 inches). Black (N 2/0), black (10YR 2/1) rubbed; about 5 percent fibers, 2 percent rubbed; moderate fine granular structure; friable; common fine roots; estimated mineral content 20 percent; abrupt smooth boundary.

Oa2 439 23 to 43 cm (9 to 17 inches). Black (10YR 2/1), very dark brown (10YR 2/2) rubbed; about 5 percent fibers, 2 percent rubbed; weak thick platy structure; firm; few fine roots; estimated mineral content 20 percent; clear smooth boundary.

Oa3 440 43 to 94 cm (17 to 38 inches). Very dark brown (10YR 2/2) broken face and rubbed; about 20 percent fibers, 5 percent rubbed; weak thick platy structure; firm; few fine roots; estimated mineral content 20 percent; clear smooth boundary.

Oa4 441 94 to 112 cm (38 to 45 inches). Black (10YR 2/1), very dark brown (10YR 2/2) rubbed; about 15 percent fibers, 5 percent rubbed; weak thick platy structure; firm; estimated mineral content 20 percent; abrupt smooth boundary.

IICg 442 112 to 152 cm (45 to 61 inches). Gray (5Y 6/1) loamy sand; massive; friable; slight effervescence; moderately alkaline; gradual smooth boundary.

IIICg 443 152 + cm (61 + inches). Light brownish gray (10YR 6/2) gravelly sand; massive; slight effervescence; moderately alkaline.

1549A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Ensley taxadjunct. SOIL Nos. S67Mich-21-2 LOCATION Delta County, Mich.

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 673558 - 67B564

Depth (cm)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand Very coarse (2-1)	Sand Coarse (1-0.5)	Sand Medium (0.5-0.25)	Sand Fine (0.25-0.1)	Sand Very fine (0.1-0.05)	Silt 0.05-0.02	Silt Int. III (0.02-0.002)	Silt Int. II (0.2-0.02)	Silt (2-0.1)	<.074 mm	3B2 Cm	Coarse fragments 3B1 2A2 > 2 Pct.	Coarse fragments 3B1 2-19 (Pct. of < 76mm)	Coarse fragments 3B1 19-76 (Pct. of < 76mm)
		Pct. of < 2 mm																
10-0	O2	54.1	28.3	17.6	4.5	10.0	15.1	17.2	7.3	10.3	18.0	26.6	46.5	49.6			3	0
0-8	A1	55.4	32.9	11.7	1.3	5.9	12.3	21.7	14.2	17.1	15.8	44.7	41.2	52.8			tr.	0
8-15	B1g	47.2	43.8	9.0	1.0	4.3	9.5	19.0	13.4	24.7	19.1	49.9	33.8	60.9	1.00	0	tr.	0
15-25	B2	52.9	38.4	8.7	1.3	4.4	10.9	21.8	14.5	21.3	17.1	49.2	38.4	55.6	1.00	0	tr.	0
25-46	B3	69.7	22.9	7.4	4.9	8.1	15.3	26.7	14.7	11.9	11.0	42.3	55.0	38.6	0.70	39	20	19
46-74	C1	67.2	25.2	7.6	4.9	8.9	15.2	24.9	13.3	11.7	13.5	39.1	53.9	40.3	0.77	29	15	14
74-94	C2	66.6	25.0	8.4	4.4	8.7	16.2	24.9	12.4	11.6	13.4	36.1	54.2	40.6		34	16	18

Depth (cm)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N	Loss on ignition 400°C	6E1e Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density g/cc	4A1a ⅓ bar g/cc	4A1b Oven dry g/cc	4D1 COLE	Water content Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohm-cm 60°F	4C1 WRD in/in	pH 8C1c (1:1) KC.	pH 8C1a (1:1) H_2O
10-0	12.37			21.0		0.4							18.2			4.6	5.3
0-8	1.51	0.10	15			0.6							6.7			4.9	5.8
8-15	0.21					0.6		1.84	1.88	0.007		12.9	4.0		0.16	5.5	6.5
15-25	0.11				1	0.8		1.81	1.83	0.004		12.5	4.0		0.16	6.1	7.4
25-46	0.06				12	0.5		1.80	1.83	0.003		10.3	3.5		0.08	7.0	7.7
46-74	0.06				16	0.5		1.92	1.94			9.7	3.7		0.09	7.4	8.0
74-94	0.06				17	0.4							3.6	7000		7.6	8.0

Depth (cm)	Extractable bases 5B4a 6N2e Ca	6O2a Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC 5A3a Sum cations	CEC 5A1a NH_4OAc	6G1e Ext. Al	Ratios to clay CEC/Sum	Ratios to clay Ext. iron	Ratios to clay 15-bar water	8D3 Ca/Mg	Base saturation 5F3 Sum cations Pct.	Base saturation 5E1 NH_4OAc Pct.
	meq/100 g														
10-0	18.4	5.0	0.1	0.2	23.7	32.3	56.0	43.2	0.3	3.16	0.02	1.03	4	42	55
0-8	6.9	2.1	tr.	0.1	9.1	8.4	17.5	11.0	0.0	1.50	0.05	0.57	3	52	83
8-15	4.4	1.8	tr.	0.1	6.3	1.6	7.9	6.2	0.0	0.88	0.06	0.44	2	80	102
15-25	4.6	2.6	tr.	0.1				4.9	0.0		0.09	0.46	2		
25-46			tr.	0.1				2.8	0.0		0.07	0.47	2		
46-74			tr.	0.1				2.5	0.0		0.07	0.49	8		
74-94			tr.	0.1				2.1	0.0		0.05	0.43	11		

Depth (cm)	Clay fraction analysis 7A1 <0.002 mm 7A2 X-ray a/b/	7A3 DTA b/ Pct.	Sand fraction analysis 7A1 0.05-0.10 mm 7B1 Petrographic b/ Pct.	TW
10-0				
0-8				
8-15				
15-25	VM3,VR2	KK10	QZ65,AR7,FM1,FD23,DL2,HN1,SP1	29
25-46				
46-74				
74-94				

a/ Relative amounts (X-ray): 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.

b/ Mineral code: AR = aggregates, mostly siliceous material, DL = dolomite, FD = feldspar, FM = ferromagnesian minerals, HN = hornblende, KK = kaolinite, QZ = quartz, SP = sphene, TW = total weatherable minerals, VM = vermiculite-mica, VR = vermiculite.

Pedon classification: Aeric Haplaquept; coarse-loamy, mixed, nonacid, frigid
Series classification: (Same)
Soil: Ensley, taxadjunct*
Soil Nos.: S67MI-21-2 (BSL Nos. 67B558-67B564)
Location: Delta County, Michigan; SE 1/4, SW 1/4, Sec. 9, T42N, R23W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 44° F., and the mean summer air temperature is about 62° F. Frost-free season is 120-130 days.
Vegetation and land use: Tag alder, balsam fir, aspen, black ash and black spruce. Woodland.
Parent material: Sandy loam till.
Physiography: Till plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Poorly drained.
Ground water: At 40 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: L. Berndt, D. Buchanan, R. Johnson.

(Colors are for moist soil unless otherwise stated.)

01 20 to 10 cm (8 to 4 inches). Dark reddish brown (5YR 2/2) live root mat within a matrix of partially decomposed leaf litter; 80 to 90 percent of live roots concentrated within this horizon; abrupt smooth boundary.

02 558 10 to 0 cm (4 to 0 inches). Black (5YR 2/1) well to moderately well decomposed litter which breaks down upon rubbing to about 90 percent; moderate medium crumb structure; friable; few fine roots; strongly acid; abrupt smooth boundary.

A1 559 0 to 7 cm (0 to 3 inches). Very dark gray (10YR 3/1) sandy loam with common medium distinct dark brown (7.5YR 4/2) and few medium distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; few fine roots; medium acid; abrupt wavy boundary.

B1g 560 7 to 15 cm (3 to 6 inches). Reddish gray (5YR 5/2) loam, with many medium distinct strong brown (7.5YR 5/6) mottles; massive; friable; few coarse roots; slightly acid; clear broken boundary.

B2 561 15 to 25 cm (6 to 10 inches). Reddish brown (2.5YR 4/4) sandy loam, with many medium distinct strong brown (7.5YR 5/6) mottles; massive breaking to weak medium platy structure; friable; few dark gray (5YR 4/1) coatings on cleavage faces; mildly alkaline; clear wavy boundary.

B3 562 25 to 46 cm (10 to 18 inches). Reddish brown (2.5YR 5/4) sandy loam, with common medium distinct strong brown (7.5YR 5/8) mottles; weak coarse platy breaking to medium subangular blocky structure; friable; few light reddish brown (5YR 6/3) coatings on cleavage faces; slight effervescence; mildly alkaline; clear wavy boundary.

C1 563 46 to 74 cm (18 to 29 inches). Reddish brown (5YR 5/3) sandy loam with few medium distinct light gray (5YR 7/1) and strong brown (7.5YR 5/6) mottles; weak medium platy structure; friable; strong effervescence; moderately alkaline; gradual wavy boundary.

C2 564 74 to 94 cm (29 to 37 inches). Reddish brown (5YR 5/3) gravelly sandy loam, with few fine distinct light gray (5YR 7/1) mottles; massive friable; 30 to 40 percent by volume; 3/4 to 3 inch limestone gravels; strong effervescence; moderately alkaline; gradual wavy boundary.

C3 94 to 102 cm (37 to 40 inches). Light reddish brown (5YR 6/3) sandy loam with many coarse prominent greenish gray (5BG 5/1) and many medium distinct yellowish red (5YR 5/6) mottles; massive; friable; 12 to 10 inch stones occupying approximately 40 percent by volume of the horizon; calcareous.

102 plus cm (40 plus inches). 80 to 90 percent by volume of limestone stones and cobbles with the possibility of bedrock within a few feet.

* This soil is a taxadjunct because the B horizon is too red and the pedon contains more coarse fragments than is typical for the series.

SOIL CLASSIFICATION-ARRIC HAPLAQUEPT
COARSE-LOAMY, MIXED (CALCAREOUS), MESIC
SERIES - - - - - - -AUBARQUE

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

SOIL NO - - - - - - S74NI-63-4 COUNTY - - - BURON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 74B473-74B479

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM) SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	SAND VCOS 2-1	SAND COBS 1-.5	SAND MEDS .5-.25	SAND FNES .25-.10	SAND VFNS .10-.05	SILT COSI .05-.02	SILT FNSI .02-.002	SILT VFSI .005-.002	INTR SAND 2-.10	INTR SILT .2-.02	FINE CLAY TO CLAY	NON-CO3-CLAY PCT	8D1 15-BAR TO CLAY
0-31	AP	39.0	43.5	17.5	6.1	1.7	4.0	9.2	15.2	8.9	18.6	24.9		30.1	36.5	35		.44
31-44	B2	40.8	42.4	16.8	5.2	3.9	5.0	8.3	14.2	9.4	16.8	25.6		31.4	34.9	31		.39
31-44	B2 (A)	22.4	65.2	12.4	4.4	1.7	2.1	3.5	7.0	8.1	34.9	30.3		14.3	47.4	35		.44
44-82	C1	40.6	43.5	15.9	3.6	4.6	5.0	8.4	13.7	8.9	19.2	24.3		31.7	36.3	23		.40
82-114	C2	40.5	44.4	15.1		3.7	4.8	8.4	14.3	9.3	19.3	25.1		31.2	37.3			.39
114-147	C3	38.2	43.1	18.7		3.4	5.1	8.6	12.6	8.5	18.4	24.7		29.7	34.3			.37
147-178	C4	29.4	43.6	27.0		3.3	2.7	4.9	12.1	6.4	13.8	29.8		23.0	27.8			.37

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20 PCT LT 75	20-5	5-2	LT .074	20-2 LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1B OVEN DRY G/CC	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 HRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1B 1/2 CACL
0-31	3	0	0	3	2	66	5	1.47	1.53	.014		18.0	7.7	.15	2		7.4	7.2
31-44	7	0	3	4	3	61	7	1.83	1.86	.006		12.7	6.5	.11	20		7.9	7.5
31-44	2	0	0	1	2	83	3						5.4		18		7.9	7.4
44-82	8	0	2	4	4	61	8	1.96	1.98	.003		11.5	6.3	.09	26		7.7	7.5
82-114	11	0	2	8	5	58	13	1.97	1.99	.002		11.6	5.9	.09	27		8.0	7.6
114-147	10	0	2	6	4	62	10	1.96	2.01	.006		12.9	7.0	.10	27		8.0	7.6
147-178	8	0	2	4	4	69	8	2.00	2.05	.003		12.3	9.9	.04	27		8.1	7.6

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA	6Q2D MG	6P2B NA	6Q2B K	SUM EXTB MEQ / 100 G	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
0-31	.99						5.4	.1	.6		3.1			10.8	.62				
31-44	.28						3.0	.1	.3					5.5	.33				
31-44	.32						2.4	.2	.5					6.5	.52				
44-82	.28						3.4	.2	.3					5.9	.37				
82-114	.26						2.4	.1	.3					5.0	.33				
114-147	.16						1.9	.1	.2					2.4	.13				
147-178	.22						2.0	.2	.4					5.0	.19				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
0-31																			
31-44																		20	5
31-44																			
44-82																			
82-114																			
114-147	3800		29.1					.72											
147-178	3100		34.5					.69											

DEPTH CM	(PYROPHOSPHATE,PH10) 6C5A EXT FE PCT	6G5A EXT AL PCT	6A1B EXT C PCT	(DITHIONITE-CITRATE) 6C2B EXT FE PCT	6G7A EXT AL PCT	6D1B EXT MN PCT	(PYROPHOSP) FE+AL TO CLAY	AL+C TO CLAY	PYRO FE+AL TO D - C FE+AL	CEC -1/2 CLAY X THIC	BASES 5G1 PLUS KCL AL	PH 8C1C 1:1 KCL
0-31				.8	.1							
31-44				.6	.1							
31-44				.6	.1							
44-82				.6	.1							
82-114				.6	.1							
114-147				.6	TR							
147-178				1.1	.1							

CLAY MINERALOGY (7A2C).

0-31	MI2	VR2	KK2	VM2 MT1
31-44	MI3	KK2	VR1	QZ1
31-44	MI2	KK2	VR1	
147-178	MI3	KK3	VR1	

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

SAND MINERALOGY (7B1). PLACEMENT: MIXED.

0-31	VFNS -	TR80	QZ76	FD17	FE2	TR1	SP1	HN1	CB1	ZR	EP	MS	GN.
31-44	VFNS -	TR63	QZ62	CB22	FD13	FE1	MS1	HN1	TM	ZR	SP	GN	CL.
31-44 (A)	VFNS -	TR66	QZ65	CB16	FD16	FE1	CL1	ZR	SP	EP	HN	MS	GN.
147-178	VFNS -	TR66	QZ64	CB17	FD15	FE1	HN1	TM	ZR	SP	GN	CL	MS.

RELATIVE AMOUNTS: AS PERCENT.
MINERAL CODE: TR = TOTAL RESISTANT MINERALS CB = CARBONATE AGGREGATES SP = SPHENE EP = EPIDOTE GN = GARNET
CL = CHLORITE FD = FELDSPARS HN = HORNBLENDE MS = MUSCOVITE QZ = QUARTZ TM = TOURMALINE
ZR = ZIRCON FE = IRON OXIDE.

(A) SILTY PORTION.

Pedon classification: Aeric Haplaquept; coarse-loamy, mixed (calcareous), mesic
Series classification: (Same)
Soil: Aubarque
Soil Nos.: S74MI-63-4 (BSL Nos. 74B473-74B479)
Location: Huron County, Michigan; 1540 feet south and 470 feet east of the center of Sec. 30, T16N, R16E.
Climate: Average annual precipitation is about 28 inches. Mean annual air temperature is about 47° F., and the mean summer air temperature is about 68° F. Frost-free season is 150-160 days.
Vegetation and land use: Winter wheat. Cropland.
Parent material: Loam till.
Physiography: Till plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat poorly drained.
Ground water: Greater than 70 inches.
Erosion: Slight.
Permeability: Moderate over very slow.
Described by: N. Stroesenreuther, L. Linsemier, S. Cowan, and W. Frederick.

(Colors are for moist soil unless otherwise stated.)

Ap 473 0 to 31 cm (0 to 12 inches). Dark grayish brown (10YR 4/2) loam; moderate fine granular structure; friable; common fine roots; about 3 percent by volume of pebbles and cobbles; slight effervescence; mildly alkaline; abrupt smooth boundary.

B2 474-475 31 to 44 cm (12 to 17 inches). Yellowish brown (10YR 5/4) silt loam (474); grayish brown (10YR 5/2) coatings on peds; common fine prominent yellowish brown (10YR 5/8) mottles; weak fine platy parting to weak fine angular blocky structure; friable; common fine roots; about 3 percent by volume of pebbles and cobbles; slight effervescence; mildly alkaline; clear wavy boundary; silt pocket (475).

C1 476 44 to 82 cm (17 to 32 inches). Brown (10YR 5/3) loam, pale brown (10YR 6/3)(70%) and grayish brown (10YR 5/2)(30%) coatings on peds; common fine prominent yellowish brown (10YR 5/6) mottles; strong medium platy structure; very firm; few fine roots; about 5 percent by volume of pebbles and cobbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C2 477 82 to 114 cm (32 to 45 inches). Pale brown (10YR 6/3) loam, gray (10YR 6/1) coatings on peds; few medium prominent yellowish brown (10YR 5/6) mottles; strong coarse platy structure; very firm; about 5 percent by volume of pebbles and cobbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C3 478 114 to 147 cm (45 to 58 inches). Brown (10YR 5/3) loam, dark reddish brown (5YR 2/2) coatings on peds; few fine prominent yellowish brown (10YR 5/6) mottles; moderate coarse platy structure; extremely firm; about 5 percent by volume of pebbles and cobbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C4 479 147 to 178 cm (58 to 70 inches). Reddish brown (2.5YR 4/4) loam, dark reddish brown (5YR 2/2) and dark gray (10YR 4/1) coatings on peds; weak coarse platy structure; extremely firm; about 5 percent by volume of pebbles and cobbles; strong effervescence; moderately alkaline.

1224A

SOIL CLASSIFICATION- ARIC HAPLAQUEPT
COARSE-LOAMY, MIXED(CALCAREOUS), MESIC

SERIES - - - - - - - SANILAC

SOIL NO. - - - - - - - S75MI-63-2 COUNTY - - - HURON

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

GENERAL REMARKS- - - 1B1B,2A1,2B SAMPLE NOS.- 75L1C6-75L110 AUGUST 1975

REVISED: MARCH 1976

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM) SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	COAS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	CCSI .05-.02	FNSI .02-.002	VFSI .002-.005	FAPL TEXT SAND 2-.1	INTR II .2-.02	FINE CLAY TO CLAY PCT	NON-CO3- CLAY PCT	RATIO 8D1 15-BAR TO CLAY
000-33	AP	39.4	47.4	13.2		2.4	6.1	7.6	9.2	14.1	22.8	24.6		25.3	41.8		13	.43
033-46	B21	17.4	68.4	14.2		1.2	1.6	1.2	2.0	11.4	30.6	37.8		6.0	43.3		14	.38
046-64	B22	18.3	67.1	14.6		.9	1.5	1.1	1.9	13.1	25.4	41.7		5.2	39.7		15	.36
064-81	C1	24.2	64.6	11.2		.2	.8	.9	2.4	19.9	31.8	32.8		4.3	53.5		11	.41
081-152	C2	42.6	48.8	8.6		.2	.3	.5	3.1	38.5	29.9	18.9		4.1	71.0		9	.40

DEPTH CM	0.1-0.074	0.074-0.05
000-33	4.8	9.3
033-46	3.0	8.4
046-64	3.7	9.4
064-81	6.0	13.8
081-152	13.6	24.8

DEPTH CM	(PARTICLE SIZE ANALYSIS, PP, 3B, 3B1, 3B2) VOL. GT 2 PCT	VOL. GT 75 PCT	WEIGHT 75-20 PCT LT 75	WEIGHT 20-5 PCT LT 75	WEIGHT 5-2 PCT LT 75	LT .074 PCT LT20	20-2 PCT LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4B1 COLE	4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	WATER CONTENT 4F2 15-BAR PCT	4C1 WRD CM/CM	6A1A ORGN CARB PCT	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	(PH) 8C1A 1/1 H2O	8C1E 1/2 CACL
000-33		C	C	2	2	67	4						5.7		1.08	3	0	7.7	7.5
033-46		C	0	1	1	89	2						5.4		.18	37	TR	8.0	7.7
046-64		C	0	TR	TR	91	TR						5.3			38	TR	8.1	7.7
064-81		C	0	TR	TR	89	TR						4.6			34	0	8.0	7.8
081-152		C	0	0	TR	82	TR						3.4			30	0	8.1	7.8

Pedon classification: Aeric Haplaquept; coarse-silty, mixed (calcareous), mesic
Series classification: (Same)
Soil: Sanilac
Soil Nos.: 875MI-063-2 (LSL Nos. 75L106-75L110)
Location: Huron County, Michigan; 660 feet west and 258 feet north of the SE corner of Sec. 23, T15N, R10E.
Climate: Average annual precipitation is about 28 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 66° F. Frost-free season is 150-160 days.
Vegetation and land use: Wheat. Cropland.
Parent material: Stratified very fine sandy loam and silt loam.
Physiography: Lake plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat poorly drained.
Ground water: At 48 inches.
Erosion: Slight.
Permeability: Moderately slow or moderate.
Described by: L. Linsemier, E. Cowan, W. Fredericks, and N. Stroesenreuther.

(Colors are for moist soil unless otherwise stated.)

Ap 106 0 to 33 cm (0 to 13 inches). Dark grayish brown (10YR 4/2) silt loam; pale brown (10YR 6/3) dry; weak fine subangular blocky structure; friable; common roots; moderately alkaline; calcareous; abrupt smooth boundary.

B21 107 33 to 45 cm (13 to 18 inches). Pale brown (10YR 6/3) very fine sandy loam, grayish brown (10YR 5/2) coatings on peds; common fine faint light brownish gray (10YR 6/2) mottles and common medium prominent yellowish brown (10YR 5/6) mottles; weak fine platy structure; friable; no roots; moderately alkaline, calcareous; abrupt wavy boundary.

B22 108 45 to 63 cm (18 to 25 inches). Brown (10YR 5/3) very fine sandy loam; common medium prominent yellowish brown (10YR 5/6) mottles and common medium faint light brownish gray (10YR 6/2) mottles; medium fine platy structure; friable; no roots; moderately alkaline; calcareous; abrupt wavy boundary.

C1 109 63 to 80 cm (25 to 32 inches). Pale brown (10YR 6/3) stratified very fine sandy loam and loamy very fine sand; few fine faint light brownish gray (10YR 6/2) mottles and few fine prominent yellowish brown (10YR 5/6) mottles; weak fine platy structure; friable; no roots; moderately alkaline; calcareous; abrupt wavy boundary.

1662A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Bergland SOIL Nos. S67Mich-17-2 LOCATION Chippewa County, Mich.

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 67B576 - 67B584

Depth (cm)	Horizon	1B1h Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<.074 mm	3B2 Cm	Coarse fragments 5B1: 2A2 ≥ 2 Pct.	2-19	19-76
		Size class and particle diameter (mm) 3A1															Pct. of < 76 mm	
0-4	A11	3.8	30.2	66.0	0.0	0.4	0.5	1.3	1.6	3.4	26.8	5.6	2.2	97.3			0	0
4-8	A12	0.9	17.8	81.3	0.0	0.1	0.1	0.3	0.4	1.2	16.6	1.8	0.5	99.4			0	0
8-18	B21g	4.9	50.4	44.7	0.0	0.2	0.6	1.7	2.4	10.4	40.0	13.9	2.5	97.0	1.00	0	0	0
18-30	B22	3.8	31.7	64.5	0.0	0.1	0.5	1.5	1.7	4.8	26.9	7.5	2.1	97.4	1.00	0	0	0
30-41	B23	2.3	32.2	65.5	0.0	0.2	0.4	0.9	0.8	2.4	29.8	3.7	1.5	98.2	1.00	0	tr.	0
41-53	B3	1.6	33.7	64.7	0.2	0.2	0.3	0.6	0.3	1.9	31.8	2.5	1.3	98.6	1.00	0	tr.	0
53-71	C1	1.6	31.5	66.9	0.1	0.4	0.3	0.5	0.3	1.1	30.4	1.7	1.2	98.6	1.00	0	0	0
71-97	C2	1.2	31.4	67.4	0.2	0.2	0.2	0.3	0.3	1.4	30.0	1.9	0.9	99.0	1.00	0	tr.	0
97-152	C3	0.6	33.0	66.4	0.0	0.0	0.1	0.3	0.2	1.5	31.5	1.9	0.4	99.5	1.00	0	tr.	0

Depth (cm)	6A1e Organic carbon Pct.	6B2a Nitrogen Pct.	C/N	Loss on ignition 400°C	6E1e Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density: g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohm-cm 60°F	4C1 WRD m/m	pH:	8C1c (1:1) KCl	8C1e (1:1) H_2O
0-4	13.74	0.87	16	25.5		0.5							36.8				4.7	5.5
4-8	6.34	0.34	19			0.6												5.2
8-18	1.46					0.4		1.56	1.78	0.045		24.1	14.0		0.16		4.6	6.0
18-30	0.36					1.5		1.35	1.72	0.084		32.9	19.6		0.18		5.2	6.8
30-41	0.21				8	1.2		1.32	1.66	0.079		33.6	20.7		0.17		6.5	7.6
41-53	0.12				20	0.8		1.42	1.69	0.060		28.8	19.6		0.13		6.9	7.9
53-71	0.13				22	0.8		1.44	1.69	0.055		28.8	19.5		0.13		7.1	8.1
71-97	0.16				22	0.8		1.46	1.71	0.054		29.1	20.5		0.12		7.1	8.1
97-152	0.22				22	0.8		1.42	1.67	0.056		31.6	21.3	2500	0.15		7.1	8.0

Depth (cm)	Extractable bases 5B1a: 6H2e Ca	6G2d Mg	6P2b Na	6Q2b K	Sum (meq/100 g)	6H2e Ext. acidity	CEC: 5A3a Sum cations	5A1a NH_4OAc	6G1e Ext. Al			Ratios to clay: CEC silt	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
0-4	27.1	9.2	0.1	1.3	37.7	34.1	71.8	58.0	0.2			1.09	0.01	0.56	3		52	65
4-8	21.8	9.2	0.1	1.0	32.1	30.3	62.4	45.3	0.5			0.77	0.01		2		51	71
8-18	11.6	4.9	0.1	0.4	17.0	8.3	25.3	18.9	0.2			0.56	0.01	0.31	2		67	90
18-30	18.7	8.8	0.2	0.6	28.3	5.1	33.4	28.2	0.0			0.52	0.02	0.30	2		85	100
30-41			0.2	0.5				24.8	0.0				0.01	0.30	4			
41-53			0.2	0.5				19.6	0.0				0.01	0.30	5			
53-71			0.2	0.5				17.4	0.0				0.01	0.29	6			
71-97			0.2	0.6				16.1	0.0				0.01	0.30	5			
97-152			0.2	0.6				14.4	0.0				0.01	0.32	5			

Depth (cm)	Clay fraction analysis 7A1: <0.002 mm 7A2 X-ray a/b/	7A3 DTA b/ Pct.	Sand fraction analysis 7A1: 0.05-0.10 mm 7E1 Petrographic b/ Pct.	
0-4				
4-8				
8-18				
18-30	VM3,VR2,MI2,QZ2	KK10	QZ45,AR3,FM<1,ZR<1,FD41,HN9,SP1	53
30-41				
41-53				
53-71				
71-97				
97-152				

a/ Relative amounts (X-ray): 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.

b/ Mineral code: AR = aggregates, mostly siliceous materials, FD = feldspar, FM = ferromagnesian minerals, HN = hornblende, KK = kaolinite, MI = mica, QZ = quartz, SP = sphene, TW = total weatherable minerals, VM = vermiculite-mica, VR = vermiculite, ZR = zircon.

Pedon classification: Aeric Haplaquept; very-fine, mixed, nonacid, frigid
Series classification: (Same)
Soil: Bergland
Soil Nos.: S67MI-17-2 (BSL Nos. 67B576-67B584)
Location: Chippewa County, Michigan; SW 1/4, SE 1/4, SW 1/4, Sec. 20, T44N, R1W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 44° F., and the mean summer air temperature is about 62° F. Frost-free season is 140-150 days.
Vegetation and land use: Black spruce, balsam fir, aspen, willow, northern wheat grass and various weeds. Woodland.
Parent material: Lacustrine clays.
Physiography: Lake plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Poorly drained.
Ground water: At 60 inches.
Erosion: Slight.
Permeability: Very slow.
Described by: L. Berndt, E. P. Whiteside, and S. Alfred.

(Colors are for moist soil unless otherwise stated.)

O2 5 to 0 cm (2 to 0 inches). Black (10YR 2/1) well decomposed organic matter; moderate medium crumb structure; friable; medium acid; abrupt smooth boundary.

A11 576 0 to 4 cm (0 to 1 1/2 inches). Black (10YR 2/1) clay; moderate medium angular blocky structure; firm; many fine roots; strongly acid; abrupt broken boundary.

A12 577 4 to 8 cm (1 1/2 to 3 inches). Very dark gray (10YR 3/1) clay; moderate medium angular blocky structure; firm; many fine roots; strongly acid; abrupt irregular boundary.

B21g 578 8 to 18 cm (3 to 7 inches). Dark gray (10YR 4/1) silty clay with common medium prominent yellowish red (5YR 5/4-5/6) mottles; moderate medium angular blocky structure; very firm; common medium roots; medium acid; abrupt irregular boundary.

B22 579 18 to 30 cm (7 to 12 inches). Reddish brown (5YR 5/3) clay, with many medium distinct yellowish red (5YR 4/6) and reddish yellow (5YR 6/6) mottles; moderate medium angular blocky structure; very firm; common medium roots; dark gray (5Y 4/2) coatings on some structure faces; neutral; clear wavy boundary.

B23 580 30 to 41 cm (12 to 16 inches). Reddish brown (5YR 5/3) clay; moderate medium angular blocky structure; firm; few medium roots; gray (5Y 6/1) coatings in root channels and cleavage plains; mildly alkaline; clear wavy boundary.

B3 581 41 to 54 cm (16 to 21 inches). Reddish brown (5YR 5/3) clay; weak coarse angular blocky structure; firm; greenish gray (5GY 6/1) coatings on horizontal cleavage faces; slight effervescence; moderately alkaline; clear smooth boundary.

C1 582 54 to 71 cm (21 to 28 inches). Reddish brown (5YR 5/3) clay; weak coarse platy structure; firm; gray (5Y 6/1) segregated lime coatings on vertical faces and in fine root channels; strong effervescence; moderately alkaline; gradual smooth boundary.

C2 583 71 to 97 cm (28 to 38 inches). Reddish brown (5YR 5/2) clay; weak coarse angular blocky structure; firm; gray (5Y 6/1) coating on vertical faces and in fine root channels; strong effervescence; moderately alkaline; clear wavy boundary.

C3 584 97 to 152 cm (38 to 60 inches). Reddish brown (5YR 5/3) clay; weak coarse angular blocky structure; firm; gray (5Y 6/1) coatings on vertical faces and in fine root channels; strong effervescence; moderately alkaline.

1710A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Sims SOIL Nos. 867Mich-18-2 LOCATION Clare County, Mich.

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 67B593 - 67B601

Depth (cm)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<.074 mm	3B2 Cm	Coarse fragments 3B1: 2A2 ≥ 2 Pct.	2-19	19-76
		Pct. of < 2 mm														Pct. of < 76mm		
0-10	A11	38.1	29.6	32.3	0.8	3.8	10.7	16.5	6.3	8.2	21.4	22.8	31.8	65.5	1.00	1	1	0
10-20	A12	35.2	29.3	35.5	0.6	3.3	9.8	15.5	6.0	7.6	21.7	21.5	29.2	68.2	0.99	1	1	0
20-43	B21g	41.6	26.8	31.6	0.6	3.9	11.4	18.5	7.2	8.2	18.6	24.8	34.4	62.4	0.95	7	6	1
43-74	B22g	35.2	26.9	37.9	0.8	3.4	9.6	15.5	5.9	6.3	20.6	20.1	29.3	68.0	0.98	3	3	0
74-89	C1	31.1	33.2	35.7	0.9	3.0	8.2	13.4	5.6	7.8	25.4	20.4	25.5	72.1	0.99	2	2	0
89-117	C2	29.4	35.7	34.9	0.6	3.5	7.8	12.3	5.2	8.1	27.6	19.6	24.2	73.6	0.97	5	4	1
117-137	C3	28.5	36.9	34.6	1.3	3.1	7.4	11.8	4.9	8.1	28.8	19.1	23.6	74.4	0.96	6	4	2
137-163	C4g	27.2	37.0	35.8	0.9	3.1	7.1	11.2	4.9	8.2	28.8	18.9	22.3	75.6			6	0
163-180	C5g	25.0	39.2	35.8	1.2	2.7	6.3	10.3	4.5	8.0	31.2	17.9	20.5	77.6			2	0

Depth (cm)	6A1a Organic carbon Pct.	Nitrogen Pct.	C/N		6E1e Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density: g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohm-cm 60°F	4C1 WRD in/in	pH:	8C1c (1:1) KCl	8C1a (1:1) H_2O
0-10	4.27	0.95	4		1	0.4		1.12	1.34	0.061		29.9	15.6		0.16		6.2	7.0
10-20	1.65	0.16	10		1	0.6		1.55	1.75	0.041		23.0	13.1		0.15		6.0	7.0
20-43	0.38				1	0.7		1.72	1.89	0.030		17.4	10.7		0.11		6.1	7.2
43-74	0.35				2	1.3		1.65	1.84	0.036		20.9	13.3		0.12		6.6	7.5
74-89	0.34				12	1.0		1.77	1.88	0.020		16.9	12.8		0.07		6.9	7.8
89-117	0.27				25	0.9		1.80	1.89	0.016		15.7	11.8		0.07		7.3	8.1
117-137	0.26				30	0.8		1.80	1.88	0.014		15.9	11.9		0.07		7.3	8.1
137-163	0.44				29	0.9							12.5				7.3	8.1
163-180	0.35				31	0.9							12.6	3500			7.3	8.1

Depth (cm)	Extractable bases 5B4a: 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations	5A1a NH_4OAc	6G1e Ext. Al			Ratios to clay: CEC sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-10	24.5	6.1	tr.	0.4	31.0			26.5				0.96	0.01	0.48	4			117
10-20	16.4	5.2	tr.	0.4	22.0			20.4				0.62	0.02	0.37	3			108
20-43	12.5	4.4	tr.	0.3	17.2			15.9				0.54	0.02	0.34	3			108
43-74			tr.	0.3				16.6					0.03	0.35	2			
74-89			0.1	0.3				13.9					0.03	0.36	4			
89-117			tr.	0.3				9.1					0.02	0.34	7			
117-137			0.1	0.2				7.6					0.02	0.34	8			
137-163			0.1	0.2				8.0					0.02	0.34	8			
163-180			0.1	0.2				7.7					0.02	0.35	8			

Depth (cm)	Clay fraction analysis 7A1: <0.002 mm 7A2 X-ray b/c/	7A3 DTA c/ Pct.	Sand fraction analysis 7A1: 0.05-0.10 mm 7B1 Petrographic c/ Pct.	TW
0-10				
10-20				
20-43				
43-74	VM3,VR2,QZ2	KK< 5	QZ75,AR1,FM<1,GN<1,FD18,HN ,DL4,SP<1	20
74-89				
89-117				
117-137				
137-163				
163-180				

a/ Sample calcareous, acidity not determined.
b/ Relative amounts (X-ray): 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.

c/ Mineral code: AR = aggregates, mostly siliceous materials, DL = dolomite, FD = feldspar, FM = ferromagnesian minerals, GN = garnet, HN = hornblende, KK = kaolinite, QZ = quartz, SP = sphene, TW = total weatherable minerals, VM = vermiculite-mica, VR = vermiculite.

Pedon classification: Mollic Haplaquept; fine, mixed, nonacid, frigid
Series classification: (Same)
Soil: Sims
Soil Nos.: S67MI-18-2 (67B593-67B601)
Location: Clare County, Michigan; SW 1/4, SW 1/4, Sec. 2, T17N, R3W.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 45° F., and the mean summer air temperature is about 65° F. Frost-free season is 120-130 days.
Vegetation and land use: Elm, aspen, white birch, balsam fir, soft maple. Woodland.
Parent material: Clay loam till.
Physiography: Till plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Poorly drained.
Ground water: At 48 inches.
Erosion: Slight.
Permeability: Slow.
Described by: N. Stroesenreuther, A. Hyde, and E. P. Whiteside.

(Colors are for moist soil unless otherwise stated.)

A11 593 0 to 10 cm (0 to 4 inches). Very dark gray (10YR 3/1) light clay loam; moderate fine subangular blocky structure; friable; many fine roots; neutral; abrupt smooth boundary.

A12 594 10 to 20 cm (4 to 8 inches). Very dark gray (10YR 3/1-4/1) clay loam, with few fine prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; neutral; clear wavy boundary.

B21g 595 20 to 43 cm (8 to 17 inches). Gray (5Y 5/1-6/1) clay loam, with few medium prominent strong brown (7.5YR 5/6) mottles; moderate medium angular blocky structure; firm; few very dark gray (10YR 3/1) coatings on some ped faces and crayfish channels; common medium roots; neutral; clear wavy boundary.

B22g 596 43 to 74 cm (17 to 29 inches). Gray (5Y 5/1-6/1) comprising 60 percent of the matrix and on the surfaces of most peds and strong brown (7.5YR 5/6) comprising 40 percent of the matrix, heavy clay loam; moderate medium angular blocky structure; firm; some very dark gray (10YR 3/1) coatings along crayfish channels; common medium roots; mildly alkaline; clear wavy boundary.

C1 597 74 to 89 cm (29 to 35 inches). Brown (7.5YR 5/4) comprising 70 percent of the matrix and gray (5Y 6/1) comprising 30 percent of the matrix and coatings on ped surfaces and along root channels, heavy clay loam; weak medium platy structure; firm; slight effervescence; mildly alkaline; wavy boundary.

C2 598 89 to 117 cm (35 to 46 inches). Strong brown (7.5YR 5/6) comprising 60 percent of the matrix and brown (7.5YR 5/2) and gray (5Y 6/1) comprising 40 percent of the matrix, clay loam; gray (5Y 6/1) and light gray (N 7/0) coatings on the surface of peds; weak coarse platy structure; firm; light gray (5Y 7/1) lime coatings on some peds; strong effervescence; moderate alkaline; gradual wavy boundary.

C3 599 117 to 137 cm (46 to 54 inches). Brown (7.5YR 5/4) comprising 45 percent, gray (5Y 6/1) comprising 30 percent and brown (7.5YR 5/2) comrising 25 percent of the matrix, clay loam; gray (5Y 6/1) and light gray (N 7/0) coatings on ped faces; weak coarse angular blocky structure; firm; light gray (5Y 7/1) lime coatings on some peds; vitreous to slaty carbon fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

C4g 600 137 to 163 cm (54 to 64 inches). Gray (N 6/0) comprising 60 percent of the matrix and yellowish brown (10YR 5/4-5/6) comprising 40 percent, clay loam; common medium distinct brown (7.5YR 5/2) mottles; weak coarse angular blocky structure; firm; some very dark gray (10YR 3/1) coatings along crayfish channels; light gray (5Y 7/1) lime coatings; numerous carbon fragments; strong effervescence; clear wavy boundary.

C5g 601 163 to 180 cm (64 to 71 inches). Grayish brown (10YR 5/2) clay loam with few medium faint brown (10YR 5/3) and few medium distinct yellowish brown (10YR 5/6) mottles; massive to weak coarse angular blocky structure; firm; greenish gray (5GY 6/1) coatings in root channels and on occasional ped surfaces; calcareous.

SOIL CLASSIFICATION- TYPIC ARGIAQUOLL
FINE-LOAMY, MIXED, MESIC
SERIES - - - - - - -BARRY TAXADJUNCT

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

SOIL NO - - - - - - S68NI-29-1 COUNTY - - - GRATIOT

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 68B368-68B374

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B: SAND 2-.05 PCT	SILT .05-.002 PCT	CLAY LT .002 PCT	FINE CLAY LT .0002 PCT	SAND VCOS 2-1 PCT	SAND CORS 1-.5 PCT	SAND MEDS .5-.25 PCT	SAND FNES .25-.10 PCT	SAND VFNS .10-.05 PCT	SILT COSI .05-.02 PCT	SILT FNSI .02-.002 PCT	SILT VFSI .005-.002 PCT	SAND 2-.10 PCT	INTR II .2-.02 PCT	FINE CLAY TO CLAY PCT	RATIO NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
0-9	AP	55.4	25.7	18.9	7.8	1.0	4.7	13.2	25.3	11.2	9.9	15.8		44.2	34.7	41		.48
9-13	B21GT	51.1	25.8	23.1	10.4	.8	4.4	12.6	23.0	10.3	9.2	16.6		40.8	31.6	45		.39
13-21	B22GT	53.6	25.5	20.9	9.7	.9	4.5	12.9	24.3	11.0	9.6	15.9		42.6	33.7	46		.38
21-31	B23GT	56.6	23.6	19.8	9.6	1.1	5.2	13.7	25.4	11.2	9.1	14.5		45.4	33.8	48		.40
31-39	B3G	59.2	24.1	16.7	7.9	1.4	5.0	13.3	27.0	12.5	9.5	14.6		46.7	36.9	47		.44
39-54	C1	53.0	29.3	17.7	7.1	1.7	5.1	12.7	23.4	10.1	11.0	18.3		42.9	33.3	40		.44
54-70	C2	42.8	37.4	19.8	5.0	2.5	5.0	9.1	17.4	8.8	12.6	24.8		34.0	31.0	25		.34

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20 PCT	20-5 PCT	5-2 PCT	LT .074 PCT	20-2 LT20 PCT	BULK DENSITY 1/3-BAR G/CC	OVEN DRY G/CC	COLE	WATER CONTENT 1/10 BAR PCT	1/3-BAR PCT	15-BAR PCT	WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1B 1/2 CACL
0-9			0			51	3	1.51	1.62	.023		19.3	9.0	.15			6.0	
9-13			0			55	3	1.63	1.77	.027		18.3	9.0	.15			6.6	
13-21			0			53	4	1.67	1.78	.021		16.0	8.0	.13			6.5	
21-31			2			50	6	1.66	1.79	.024		16.8	7.9	.14			6.7	
31-39			TR			48	3	1.69	1.78	.017		14.9	7.4	.12			7.0	
39-54			1			53	5	1.72	1.80	.015		16.0	7.7	.14			7.4	
54-70			1			62	10	1.89	1.96	.011		11.8	6.8	.09			7.8	

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2B CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA G	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
0-9	1.70	.18	9																
9-13	.51																		
13-21	.32																		
21-31	.25																		
31-39	.28																		
39-54	.23																		
54-70	.18																		

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM- CM	8C1B PH	8A H2O PCT	5D2 ESP PCT	5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX PCT
0-9																			
9-13																			
13-21																			
21-31																			
31-39																			
39-54																			
54-70	1750																		

DEPTH CM	(D - C) 6G7A EXT AL PCT
0-9	3.10
9-13	0.12
13-21	0.10
21-31	0.12
31-39	0.10
39-54	0.08
54-70	0.04

CLAY MINERALOGY (7A2I,7A3)

DEPTH-CM	X-RAY			DTA (AS PERCENT)
0-9	M12	MV3	QZ1	KK20
13-21	M13	MV3	QZ1	KK15
54-70	M13	MV3	QZ1	KK10

RELATIVE AMOUNTS: (X-RAY) 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MI = MICA KK = KAOLINITE QZ = QUARTZ MV = MONTMORILLONITE-VERMICULITE

Pedon classification: Typic Argiaquoll; fine-loamy, mixed, mesic
Series classification: (Same)
Soil: Barry, taxadjunct*
Soil Nos.: S68MI-29-1 (BSL Nos. 68B368-68B374)
Location: Gratiot County, Michigan; NW 1/4, NE 1/4, NE 1/4, Sec. 34, T12N, R2W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 47° F., and the mean summer air temperature is about 67° F. Frost-free season is 140-170 days.
Vegetation and land use: Corn. Cropland.
Parent material: Loam till.
Physiography: Till plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Poorly drained.
Ground water: Below 70 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: J. Feenstra, J. Long and R. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap 368 0 to 23 cm (0 to 9 inches). Very dark grayish brown (10YR 3/2) sandy loam; weak coarse subangular blocky breaking to weak fine subangular blocky structure; friable; many fine roots; medium acid; abrupt smooth boundary.

B21gt 369 23 to 33 cm (9 to 13 inches). Grayish brown (10YR 5/2) sandy clay loam with many coarse distinct yellowish brown (10YR 5/8) and few coarse distinct dark gray (10YR 4/1) mottles; weak coarse subangular blocky structure; firm; numerous grainy coatings on vertical faces; few thin patchy clay films; common roots; neutral; clear wavy boundary.

B22gt 370 33 to 54 cm (13 to 21 inches). Gray (10YR 5/1) sandy clay loam, with many coarse distinct yellowish brown (10YR 5/4) and many coarse faint gray (10YR 6/1) mottles; weak coarse subangular blocky breaking to weak fine subangular blocky structure; firm; few dark gray (10YR 4/1) clay fillings in some pores; common roots; neutral; clear wavy boundary.

B23gt 371 54 to 79 cm (21 to 31 inches). Gray (10YR 5/1) sandy loam, with common coarse distinct yellowish grown (10YR 5/6) and many medium faint gray (10YR 6/1); weak coarse angular blocky structure; very firm; thick dark greenish gray (5GY 4/1) clay coatings on some vertical faces and fillings in some pores; few fine roots; neutral; clear wavy boundary.

B3g 372 79 to 99 cm (31 to 39 inches). Gray (10YR 5/1) sandy loam, with few coarse distinct yellowish brown (10YR 5/8) and many coarse faint gray (10YR 6/1) mottles; weak coarse prismatic breaking to weak coarse subangular blocky structure; firm; thick greenish gray (5GY 4/1) clay coatings on vertical faces; some grainy coatings; few fine roots; neutral; gradual wavy boundary.

C1 373 99 to 137 cm (39 to 54 inches). Mottled gray (10YR 6/1) and yellowish brown (10YR 5/8) sandy loam; weak coarse prismatic breaking to weak coarse subangular blocky structure friable; thick greenish gray (5GY 5/1) clay coatings on vertical faces along cracks; grainy coatings on some ped faces; few fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

C2 374 137 to 178 cm (54 to 70 inches). Yellowish brown (10YR 5/4) loam, with few coarse faint yellowish brown (10YR 5/6) and few fine distinct gray (10YR 5/1) mottles; moderate thick platy breaking to medium platy structure; friable; few 2 to 5 mm concreations and flecks of Mn; strong effervescence; moderately alkaline.

* This soil was sampled as Parkhill. It is a taxadjunct because the surface layer is thinner than defined for the Barry series.

1561A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL BARRY SOIL Nos. S68Mich-33-1 LOCATION Ingham County, Mich.

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 68B354 - 68B360

Depth (cm)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand (Size class and particle diameter (mm) 3A1) Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Silt 0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<.074 mm	3B2 Cm	Coarse fragments 3B1 2A2 >2 Pct.	2-19	19-76
		Pct. of < 2 mm															Pct. of < 76mm	
0-28	Ap	50.6	33.1	16.3	1.2	4.1	11.9	22.4	11.0	13.4	19.7	36.2	39.6	56.0	0.99	2	2	0
28-38	B21gt	44.1	34.4	21.5	1.4	3.9	9.3	19.4	10.1	12.4	22.0	33.2	34.0	61.7	0.99	1	1	0
38-48	B22gt	40.7	33.4	25.9	0.9	3.4	8.5	17.9	10.0	11.6	21.8	31.6	30.7	65.1	0.96	7	4	3
48-64	B23gt	45.2	30.3	24.5	1.1	4.2	9.6	20.1	10.2	10.5	19.8	31.9	35.0	60.6	0.98	3	3	0
64-86	B3g	51.5	31.1	17.4	1.9	5.0	10.7	22.0	11.9	12.6	18.5	36.7	39.6	55.5	0.97	4	4	0
86-122	C1	50.5	34.8	14.7	2.4	5.4	10.2	21.0	11.5	13.2	21.6	36.6	39.0	56.2	0.96	6	6	0
122-160	C2	50.9	34.8	14.3	3.1	5.7	10.3	20.5	11.3	13.7	21.1	36.5	39.6	55.7	0.95	7	7	tr.

Depth (cm)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N	6G6a C-D Al	6E1e Carbonate as $CaCO_3$ Pct.	6C2b Ext. iron as Fe Pct.	Bulk density g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohm-cm 60°F	4C1 WRD cm/cm	pH	8C1c (1:1) KCl	8C1e (1:1) H_2O
0-28	1.87	0.16	12	0.10		0.22		1.61	1.70	0.018		18.0	7.8		0.16		5.5	5.7
28-38	0.60	0.16	10	0.08		0.25		1.68	1.81	0.025		16.7	8.6		0.14		5.9	6.3
38-48	0.26			0.17		1.31		1.64	1.84	0.037		18.4	10.5		0.12		6.2	6.6
48-64	0.28			0.17		1.43		1.74	1.87	0.024		16.3	9.9		0.11		6.2	6.7
64-86	0.22			0.12	11	1.29		1.74	1.81	0.013		12.8	7.6		0.09		7.2	7.3
86-122	0.23			0.08	28	0.82		1.87	1.92	0.008		12.1	6.3		0.10		7.6	7.7
122-160	0.22			0.04	27	0.58		1.91	1.94	0.005		11.5	5.9	6000	0.10		7.6	7.7

Depth (cm)	Extractable bases 5B4a 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC 5A3e Sum cations	5A1a NH_4OAc	6G1e Ext. Al	3A1b Fine clay <.0002	Ratio Fine clay / Total clay	Ratios to clay CEC sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-28	10.6	2.2	0.1	0.2	13.1	5.5	18.6	13.8		7.5	0.46	1.14		0.48	4.8		70	95
28-38	11.0	2.5	0.1	0.2	13.8	2.9	16.7	13.2		10.8	0.50	0.78		0.40	4.4		83	104
38-48	12.0	3.1	0.1	0.2	15.4	2.1	17.5	14.4		12.6	0.49	0.68	0.05	0.40	3.9		88	107
48-64	10.5	2.5	0.1	0.2	13.3	1.6	14.9	12.1		11.2	0.46		0.06	0.40	4.2			110
64-86		7.8	0.1	0.1		0.1		7.1		7.4	0.43		0.07	0.44				
86-122		3.3	0.1	0.1		-		3.2		4.3	0.29			0.43				
122-160		2.7	0.1	0.1		-		3.6		4.2	0.33			0.41				

Depth (cm)	Clay fraction analysis 7A1 <0.002 mm 7A2 X-ray a/b/	7A3 DTA b/ Pct.
0-28		
28-38		
38-48	MT3,VR2,MI2,KK2,QZ1	KK10
48-64		
64-86		
86-122		
122-160		

a/ X-ray notation: 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.
b/ Mineral code: KK = kaolinite, MI = mica, MT = montmorillonite, QZ = quartz, VR = vermiculite.

Pedon classification: Typic Argiaquoll; fine-loamy, mixed, mesic
Series classification: (Same)
Soil: Barry
Soil Nos.: S68MI-33-1 (BSL Nos. 68B354-68B360)
Location: Ingham County, Michigan; 600 feet west and 250 feet north of the center of Sec. 33, T3N, R2W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 49° F., and the mean summer air temperature is about 69° F. Frost-free season is 150-160 days.
Vegetation and land use: Corn. Cropland.
Parent material: Loam till.
Physiography: Till plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Very poorly drained.
Ground water: At 63 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: S. Holcomb, G. Threlkeld, and R. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap 354 0 to 28 cm (0 to 11 inches). Very dark brown (10YR 2/2) loam; weak medium subangular blocky structure; friable; many roots; medium acid; abrupt smooth boundary.

B21tg 355 28 to 38 cm (11 to 15 inches). Dark gray (10YR 4/1) loam with common medium distinct brownish yellow (10YR 6/6) mottles; weak medium subangular blocky structure; firm; some very dark grayish brown (10YR 3/2) crack fillings and coatings on some ped faces; thin dark gray (10YR 4/1) clay films on vertical ped faces; common fine roots; slightly acid; clear wavy boundary.

B22tg 356 38 to 48 cm (15 to 19 inches). Light brownish gray (2.5Y 6/2) loam with common medium distinct brownish yellow (10YR 6/6) and strong brown (7.5YR 5/6) mottles; weak coarse prismatic breaking to weak medium angular blocky structure; very firm; dark gray (10YR 4/1) coatings around krotovina; medium gray (10YR 5/1) clay films on vertical ped faces; few fine roots; neutral; clear wavy boundary.

B23tg 357 48 to 64 cm (19 to 25 inches). Grayish brown (2.5Y 5/2) loam with common medium distinct brownish yellow (10YR 6/6) and yellowish brown (10YR 5/6) mottles; weak coarse angular blocky structure; very firm; gray (10YR 5/1) continuous medium clay films on horizontal and vertical ped faces; few fine roots; neutral; clear wavy boundary.

B3 358 64 to 86 cm (25 to 34 inches). Light brownish gray (2.5Y 6/2) loam with common medium distinct yellowish brown (10YR 5/8) mottles; weak coarse angular blocky structure; firm; gray (10YR 5/1) thin patchy clay films on some ped faces; few calcareous pebbles; few fine roots; neutral; clear wavy boundary.

C1 359 86 to 122 cm (34 to 48 inches). Yellowish brown (10YR 5/6) loam with grayish brown (2.5Y 5/2) mottles; massive breaking to weak medium platy, then weak fine angular blocky structure; firm; grayish brown (2.5Y 5/2) on faces surrounding krotovina; many 2 to 5 mm pebbles; slight effervescence; mildly alkaline; clear wavy boundary.

C2 360 122 to 160 cm (48 to 63 inches). Yellowish brown (10YR 5/4) loam with few fine distinct brownish yellow (10YR 6/6) and few coarse distinct grayish brown (10YR 5/2) mottles; weak thick platy breaking to weak fine subangular blocky structure; firm; many 2 to 5 mm pebbles; slight effervescence; mildly alkaline.

Note: Many worn casts and krotovina up to 2 inches wide extending from below the Ap to a depth of 4 feet.

1521A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Parkhill taxadjunct SOIL Nos. S68Mich-29-2 LOCATION Gratiot County, Mich.

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 68B375 - 68B381

Depth (cm)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand Very coarse (2-1)	Sand Coarse (1-0.5)	Sand Medium (0.5-0.25)	Sand Fine (0.25-0.1)	Sand Very fine (0.1-0.05)	Silt 0.05-0.02	Silt Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<.074 mm	3B2 Cm	Coarse fragments 3B1 2A2 > 2 Pct.	2-19	19-76
		Pct. of < 2 mm															Pct. of < 76mm	
0-23	Ap	50.0	26.5	23.5	1.0	5.1	13.8	21.4	8.7	9.4	17.1	29.0	41.3	54.8	0.99	2	2	0
23-33	B21gt	38.9	28.8	32.3	0.9	3.5	8.9	16.9	8.5	9.1	19.7	27.1	30.2	66.1	0.99	2	2	0
33-46	B22gt	39.3	28.5	32.2	0.9	3.5	9.2	17.3	8.4	8.8	19.7	26.7	30.9	65.5	0.99	1	1	0
46-71	B23gt	41.7	31.3	27.0	0.7	4.0	9.4	18.1	9.5	10.9	20.4	30.3	32.2	63.8	0.95	7	4	3
71-91	B3g	34.0	35.7	30.3	1.8	3.4	7.0	13.9	7.9	10.7	25.0	26.3	26.1	70.8	0.97	5	4	1
71-91	a/B3g	37.2	31.0	31.8	0.8	3.2	8.3	16.4	8.5	5.9	25.1	23.8	28.7	67.8				
91-130	C1g	33.7	39.8	26.5	2.7	4.0	6.9	13.0	7.1	11.0	28.8	25.3	26.6	70.6	0.95	7	6	1
91-130	a/C1g	34.5	33.7	31.8	1.9	3.4	7.2	14.1	7.8	9.9	23.8	25.6	26.6	70.1				
130-152	IIC2	38.8	39.2	22.0	3.2	5.1	7.9	14.7	7.9	12.6	26.6	28.4	30.9	66.0	0.92	11	8	3
130-152	a/IIC2	40.0	34.6	25.4	2.0	4.7	8.5	16.2	8.7	11.5	23.1	29.2	31.4	65.2				

Depth (cm)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N	6G6a C-D A1	6E1e Carbonate as $CaCO_3$ Pct.	6C2b Ext. iron as Fe Pct.	Bulk density g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohm-cm 60°F	4C1 WRD in/in	8A1a Conductivity sat.ext. mmhos/cm	pH 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-23	2.43			0.09		0.39		1.59	1.73	0.028		20.3	10.4		0.16		6.4	6.6
23-33	0.42			0.10		0.86		1.62	1.82	0.039		19.8	10.6		0.15		6.5	6.8
33-46	0.34			0.10		0.99		1.62	1.87	0.049		19.2	11.9		0.12		6.6	6.7
46-71	0.23			0.12	8	1.31		1.66	1.85	0.035		18.7	10.7		0.13		7.0	7.4
71-91	0.25			0.12	14	1.36		1.67	1.87	0.037		19.1	12.0		0.12	0.5	7.1	7.1
91-130	0.32			0.08	30	0.99		1.87	1.97	0.017		14.2	10.4		0.07		7.4	7.4
130-152	0.26			0.06	31	0.70		1.95	2.04	0.014		12.5	8.2	6000	0.08		7.5	7.6

Depth (cm)	Extractable bases 5B4a 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC 5A3a Sum cations	CEC 5A1a NH_4OAc	6G1e Ext. Al	3A1b Fine clay < .0002	Ratio Fine clay / Total clay	Ratios to clay CEC sum	Ratios to clay Ext. iron	Ratios to clay 15-bar water	8D3 Ca/Mg		Base saturation 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-23	17.0	2.4	-	0.3	19.7	4.6		17.8		8.7	0.37			0.44	7.08			111
23-33	15.7	2.9	tr.	0.3	18.9	1.8	20.7	17.1		14.0	0.43			0.33	5.41			110
33-46	14.2	3.5	tr.	0.3	18.0	1.6		15.7		14.0	0.43			0.37	4.05			115
46-71		7.8	0.1	0.2		0.4		11.5		11.5	0.43		0.05	0.40				
71-91		6.5	0.1	0.2		-		11.3		11.6	0.38		0.04	0.40				
71-91										14.4	0.45		0.04	0.39				
91-130		4.0	0.1	0.2		-		8.3		8.3	0.31			0.37				
91-130										11.2	0.35							
130-152		3.3	0.1	0.2		-		5.4		6.1	0.28							
130-152										8.5	0.33							

Depth (cm)	Clay fraction analysis 7A1 <0.002 mm 7A2 X-ray b/c/	7A3 DTA c/ Pct.
0-23		
23-33		
33-46	MI4.MV3.KK2.QZ1	KK15
46-71		
71-91		
91-130		
130-152		

a/ Carbonates removed.
b/ X-ray notation: 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.
c/ Mineral code: KK = kaolinite, MI = mica, MV = montmorillonite-vermiculite, QZ = quartz.

Pedon classification: Typic Argiaquoll; fine-loamy, mixed, mesic
Series classification: Mollic Haplaquept; fine-loamy, mixed, mesic
Soil: Parkhill, taxadjunct*
Soil Nos.: S68MI-29-2 (BSL Nos. 68B375-68B381)
Location: Gratiot County, Michigan; NW 1/4, NE 1/4, NW 1/4, Sec. 16, T11N, R1W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 68° F. Frost-free season is 140-150 days.
Vegetation and land use: Field beans. Cropland.
Parent material: Loam till.
Physiography: Till plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Poorly drained.
Ground water: At 47 inches.
Erosion: Slight.
Permeability: Moderately slow.
Described by: J. Feenstra, J. Long, and R. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap 375 0 to 23 cm (0 to 9 inches). Very dark grayish brown (10YR 3/2) loam; massive breaking to weak coarse granular; friable; many fine roots; neutral; abrupt smooth boundary.

B21tg 376 23 to 33 cm (9 to 13 inches). Gray (10YR 6/1) clay loam, with many coarse distinct yellowish brown (10YR 5/6) and common coarse faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky breaking to weak fine subangular blocky structure; firm; few thin patchy grayish brown (10YR 5/2) clay films; some dark gray (10YR 4/1) fillings of worn casts; few fine roots; neutral; clear wavy boundary.

B22tg 377 33 to 46 cm (13 to 18 inches). Mottled gray (10YR 6/1) and light olive brown (2.5Y 5/6) clay loam; moderate medium subangular blocky breaking to fine subangular blocky structure; firm; a few patchy grayish brown (10YR 5/2) clay films; a few Mn concreation about 3 mm in diameter; many 1 to 10 mm diameter pebbles; neutral; gradual wavy boundary.

B23tg 378 46 to 71 cm (18 to 28 inches). Mottled gray (10YR 6/1) and yellowish brown (10YR 5/6) clay loam; weak coarse subangular blocky structure; firm; faces of peds are gray (10:YR 6/1); grainy coatings on some ped faces; patchy clay films in some root channels; many 1 to 10 mm diameter pebbles; mildly alkaline; gradual wavy boundary.

B3g 379 71 to 91 cm (28 to 36 inches). Mottled gray (10YR 6/1) and light olive brown (2.5Y 5/6) clay loam; weak coarse angular blocky to medium fine angular blocky structure; very firm; ped faces are gray (10YR 6/1); few light gray (10YR 7/1) secondary carbonate accumulations and fillings along root channels; neutral; gradual wavy boundary.

C1g 380 91 to 130 cm (36 to 51 inches). Greenish gray (5G 6/1) loam, with many coarse prominent light olive brown (2.5Y 5/6) mottles; weak coarse prismatic breaking to moderate coarse angular blocky structure; very firm; faces of peds greenish gray; slight effervescence; mildly alkaline; clear wavy boundary.

IIC2 381 130 to 152 cm (51 to 60 inches). Brown (10YR 5/3) loam; medium thick platy breaking to weak coarse angular blocky structure; very firm and compact; all horizontal ped faces are gray (10YR 6/1); slight effervescence; mildly alkaline.

* This soil was sampled as Parkhill. It is a taxadjunct because it has an argillic horizon.

1568A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Granby SOIL Nos. S68Mich-70-2 LOCATION Ottawa County, Mich.

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 68B331 – 68B337

Depth (cm)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: Int. III (0.05-0.02)	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<.074 mm	3B2 Cm	Coarse fragments 3B1: 2A2 ≥ 2 Pct.	2-19	19-76
		Size class and particle diameter (mm) 3A1															Pct. of < 76mm	
		Pct. of < 2 mm																
0-20	Ap	73.3	17.7	9.0	0.2	4.4	30.8	34.3	3.6	5.3	12.4	19.9	69.7	28.9			tr.	0
20-28	A12	69.1	20.0	10.9	0.1	3.0	26.8	35.1	4.1	6.8	13.2	21.7	65.0	33.4			1	0
28-38	B21	92.0	6.0	2.0	0.3	3.2	36.1	48.6	3.8	3.0	3.0	22.0	88.2	9.9			tr.	0
38-53	C1	98.1	1.2	0.7	0.1	5.5	52.0	38.9	1.6	0.5	0.7	12.4	96.5	2.5			tr.	0
53-76	C2	98.4	1.0	0.6	0.0	5.2	54.5	38.2	0.5	0.5	0.5	9.0	97.9	1.8			tr.	0
76-97	C3	98.8	0.9	0.3	0.0	2.7	54.9	40.9	0.3	0.5	0.4	8.3	98.5	1.3			0	0
97-127	C4	98.1	1.6	0.3	0.0	2.8	55.3	39.0	1.0	1.1	0.5	13.9	97.1	2.2			tr.	0

Depth (cm)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N	6G6a C-D A1	6E1e Carbonate as $CaCO_3$ Pct.	6C2b Ext. iron as Fe Pct.	Bulk density: 4A3a field g/cc	4A1a ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: 1/10 bar Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohm-cm 60°F	4C1 WRD in/in	pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-20	5.84	0.41	14	0.21		0.28	1.26				22.8	24.2	9.5		0.18	4.8	4.8
20-28	3.22	0.16	20	0.08		0.18							7.4			5.4	5.2
28-38	0.98			0.04		0.10	1.45				10.8	8.5	2.7		0.08	5.4	5.4
38-53	0.08			0.04		0.08	1.63				2.4	2.0	0.5		0.02	5.4	5.4
53-76	0.05			0.02	1	0.10	1.65				3.4	2.7	0.4		0.02	6.9	6.6
76-97	0.04			0.02	1	0.08	1.74				2.3	1.6	0.5		0.02	7.1	7.2
97-127	0.04			0.02	4	0.08							0.4	10000		8.2	7.8

Depth (cm)	Extractable bases 5B4a: 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations	5A1a NH_4OAc	6G1e Ext. Al			Ratios to clay: CEC sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-20	8.7	0.6	-	0.1	9.4	21.1	30.5	16.4	0.2			3.39		1.05			31	57
20-28	10.1	0.9	tr.	0.1	11.1	8.6	19.7	12.4	0.0			1.81		0.68			56	90
28-38	2.8	0.3	tr.	tr.	3.1	2.2	5.3	3.2				2.65		1.35			58	97
38-53	0.6	0.1	-	tr.	0.7	0.1		0.6										117
53-76		1.4	0.2	tr.		-		0.6										
76-97		1.5	tr.	-		-		0.4										
97-127		0.5	0.1	tr.		-		0.4										

Depth (cm)	Clay fraction analysis 7A1: <0.002 mm 7A2 X-ray a/b/	7A3 DTA b/ Pct.	Sand fraction analysis 7A1: 0.25-0.10 mm 7B1 Petrographic b/Pct.	TW
0-20	VR3,KK2,QZ1	KK15	QZ73,FE2,FD19,GN3,HN2,SP1	25
20-28				
28-38	CM3,CL2,MI2,QZ1	KK15	QZ77,FE1,TM<1,FD18,GN1,HN2,SP<1	21
38-53				
53-76				
76-97				
97-127				

a/X-ray notation: 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.
b/Mineral code: CL = chlorite, CM = chlorite-mica, FE = iron oxide minerals, FD = feldspar, GN = garnet, HN = hornblende, KK = kaolinite, MI = mica, QZ = quartz, SP = sphene, TM = tourmaline, TW = total weatherable minerals, VR = vermiculite.

Pedon classification: Typic Haplaquoll; sandy, mixed, mesic
Series classification: (Same)
Soil: Granby
Soil Nos.: S68MI-70-2 (BSL Nos. 68B331-68B337)
Location: Ottawa County, Michigan; SW 1/4, SW 1/4, NE 1/4, Sec. 29, T7N, R15W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 49° F., and the mean summer air temperature is about 68° F. Frost-free season is 150-160 days.
Vegetation and land use: Quackgrass and bluegrass. Idle cropland.
Parent material: Sand.
Physiography: Lake plain.
Topography: Level. Gradient is less than 1 percent.
Drainage: Very poorly drained.
Ground water: At 50 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: R. Johnson, K. Pregitzer.

(Colors are for moist soil unless otherwise stated.)

Ap 331 0 to 20 cm (0 to 8 inches). Black (N 2/0) fine sandy loam very high in organic matter; moderate medium granular structure; friable; many fine roots; very strongly acid; clear wavy boundary.

A12 332 20 to 28 cm (8 to 11 inches). Black (10YR 2/1) fine sandy loam with a few streaks of light brownish gray (10YR 6/2); weak coarse prismatic breaking to weak medium subangular blocky structure; friable; common fine roots; strongly acid; abrupt wavy boundary.

B2 333 28 to 38 cm (11 to 15 inches). Dark grayish brown (2.5Y 4/2) sand, with 20 percent of the horizon streaked with black (10YR 2/1) and many coarse distinct light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; very friable; few fine roots; strongly acid; abrupt wavy boundary.

C1 334 38 to 53 cm (15 to 21 inches). Light brownish gray (2.5Y 6/2) sand with few medium distinct yellowish brown (10YR 5/4) mottles and a few streaks of black (10YR 2/1); streaks are caused by dead roots; single grain; nonsticky; strongly acid; clear wavy boundary.

C2 335 53 to 76 cm (21 to 30 inches). Light brownish gray (2.5Y 6/2) sand, with common coarse distinct yellowish brown (10YR 5/4) and fine coarse faint grayish brown (2.5Y 5/2) mottles; few vertical black (10YR 2/1) streaks caused by dead roots; single grain; nonsticky; neutral; clear wavy boundary.

C3 336 76 to 97 cm (30 to 38 inches). Pale brown (10YR 6/3) sand with many coarse distinct light gray (10YR 7/2) and light olive brown (2.5Y 5/4) mottles; black (10YR 2/1) vertical streaks caused by dead roots; single grain; nonsticky; neutral; clear wavy boundary.

C4 339 97 to 127 cm (38 to 50 inches). Light brownish gray (10YR 6/2.5) sand; single grain; nonsticky; slight effervescence; mildly alkaline.

1570A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL: Granby SOIL Nos.: 71Mich-82-1 LOCATION: Wayne County, Mich.

SOIL SURVEY LABORATORY: Beltsville, Maryland LAB. Nos.: 72B87 - 72B90

Depth (cm)	Horizon	1B1b Total: Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Sand (Size class and particle diameter (mm) 3A1): Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Silt: 0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<.074	3B2 Cm	Coarse fragments 3B1: 2A2 > 2 Pct.	2-20 (Pct. of < 2 mm)	20-75 (Pct. of < 75 mm)
0-26	Ap	83.9	8.1	8.0	0.6	2.8	18.8	51.9	9.8	2.3	5.8	38.9	74.0	19.9			0	0
26-38	B2	89.7	5.6	4.8	0.3	3.7	19.2	54.3	11.9	2.2	3.4	42.3	77.5	15.5			tr.	0
38-127	C1	97.2	0.8	2.1	0.6	4.2	26.9	55.1	10.2	0.4	0.4	37.7	86.8	6.5			0	0
127-152	C2g	97.2	0.9	1.9	0.6	8.0	36.4	49.2	3.0	0.5	0.4	21.3	94.1	3.8			0	0

Depth (cm)	6A1a Organic carbon Pct.	Nitrogen Pct.	C/N	Coarse fragments 5-20 % of <75 mm	6E1e Carbonate as $CaCO_3$ Pct.	Ext. iron as Fe Pct.	Bulk density: g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	4C1 WRD In/In	pH: 8C1e (1:2) $CaCl_2$	8C1c (1:1) KCl	8C1a (1:1) H_2O
0-26	2.93			0	tr.								7.7		7.3	7.3	7.5
26-38	0.14			0	tr.								2.0		6.8	6.6	7.3
38-127	0.10			0	tr.								0.7		6.7	6.8	7.5
127-152	0.06			0	11								0.5		7.7	8.2	8.2

Depth (cm)	Extractable bases (meq/100 g): 6N2e Ca	6O2d Mg	6P2b Na	5B4a 6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3e Sum cations	5A6 NH_4OAc	6G1d Ext. Al	3A1b Fine clay <.0002 mm	Ratios to clay: Fine clay	CEC sum	Ext. iron	8D1 15-bar water	8D3 Ca/Mg	Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
0-26	a/17.9	b/1.8	tr.	0.6		1.6		12.6		4.0	0.50			0.96	10		
26-38	a/ 2.2	b/0.4	tr.	0.1		0.6		2.1		2.7	0.56			0.42			
38-127	a/ 1.0	b/0.2	tr.	tr.		-		0.9		1.2	0.57			0.33			
127-152	a/27.0	b/0.6	tr.	tr.		-		0.5		1.6	0.84			0.26			

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int.	Qtz.	Kl.	Gibbsite
	7A2 X-ray						7A3	

a/ Includes large Ca component from soluble $CaCO_3$.
b/ Values include some Mg from soluble carbonates, but much less than soluble Ca.

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

Pedon classification: Typic Haplaquoll; sandy, mixed, mesic
Series classification: (Same)
Soil: Granby
Soil Nos.: S71MI-82-1 (BSL Nos. 72B87-72B90)
Location: Wayne County, Michigan; SE 1/4, NW 1/4, SE 1/4, Sec. 31, T4S, R8E
Climate: Average annual precipitation is about 30 inches. Mean annual air temperature is about 49° F., and the mean summer air temperature is about 70° F. Frost-free season is 160-170 days.
Vegetation and land use: Corn. Cultivated crops.
Parent material: Sandy glaciofluvium
Physiography: Lake plain.
Topography: Level. Gradient is 0 percent.
Drainage: Poorly and very poorly drained.
Ground water: 36 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: J. Larson.

(Colors are for moist soil unless otherwise stated.)

Ap 87 0 to 26 cm (0 to 10 1/2 inches). Very dark brown (10YR 2/2) loamy fine sand, grayish brown (10YR 5/2) dry; moderate medium granular structure; very friable; very fine and fine many roots; mildly alkaline; abrupt smooth boundary.

B2 88 26 to 38 cm (10 1/2 to 15 inches). Yellowish brown (10YR 5/6) fine sand; common medium distinct grayish brown (10YR 5/2) and few fine distinct dark grayish brown (10YR 4/2) mottles; moderate medium granular structure; very friable; neutral; clear wavy boundary.

C1 89 38 to 127 cm (15 to 50 inches). Grayish brown (10YR 5/2) fine sand; single grain; loose; mildly alkaline; gradual wavy boundary.

C2g 90 127 to 152 cm (50 to 60 inches). Mottled grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) fine sand; single grain; loose; moderately alkaline; slight effervescence.

1274A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Granby taxadjunct SOIL Nos. S68Mich-70-1 LOCATION Ottawa County, Mich.

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 68B324 - 68B330

Depth (cm)	Horizon	1B1b Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Size class and particle diameter (mm) 3A1 — Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<.074 mm	3B2 Cm	Coarse fragments 3B1: 2A2 > 2 Pct.	2-19	19-76
		Pct. of < 2 mm															Pct. of < 76mm	
0-28	Ap	89.4	6.4	4.2	0.0	4.0	37.5	44.9	3.0	1.4	5.0	18.3	89.4	12.0			0	0
28-46	A12	94.2	3.2	2.6	0.0	3.3	38.7	49.4	2.8	0.2	3.0	18.9	91.4	7.0			0	0
46-66	A13	97.2	0.8	2.0	0.1	4.9	46.3	44.3	1.6	0.0	1.2	13.5	95.6	3.4			0	0
66-91	A2	97.5	0.7	1.8	0.1	5.4	44.7	44.1	3.2	0.0	1.0	16.8	94.3	3.9			tr.	0
91-99	B23h	97.2	0.0	2.8	0.2	8.2	50.4	36.1	2.3	0.0	0.5	13.1	94.9	3.7			tr.	0
99-112	B24h	96.9	0.9	2.2	1.5	6.5	35.1	49.7	4.1	0.0	1.4	23.3	92.8	4.5			tr.	0
112-155	IIC2	99.0		1.4	0.2	8.1	49.4	40.0	1.3	0.0	0.6	16.3	97.7	1.8			1	0

Depth (cm)	6A1e Organic carbon Pct.	6B2a Nitrogen Pct.	C/N	6G6a C-D Al	Carbonate as $CaCO_3$ Pct.	6C2b Ext. iron as Fe Pct.	Bulk density: 4A3a field g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: 4B1d 1/10 bar Pct.	4B1d ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohm-cm 60°F	4C1 WRD in/in	pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-28	3.59	0.16	22	0.13		0.15	1.36				16.4	12.5	5.4		0.10	5.8	5.6
28-46	1.97	0.04	49	0.07		0.05	1.55				7.8	5.6	1.7		0.06	5.3	5.3
46-66	0.90	0.04	22	0.04		0.05	1.45				5.2	3.5	0.8		0.04	5.1	5.1
66-91	0.37			0.04		0.05	1.58				2.6	1.8	0.8		0.02	5.0	5.1
91-99	0.36			0.05		0.05	1.69				5.2	3.8	0.9		0.05	5.0	5.1
99-112	0.29			0.04		0.05	1.68				7.7	4.6	0.8		0.06	5.0	5.1
112-155	0.19			0.02		0.05	1.72				5.0	2.6	0.4	25000	0.04	5.0	5.0

Depth (cm)	Extractable bases 5B4a: 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations	5A1a NH_4OAc	6G1e Ext. Al		Ratios to clay: CEC sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																
0-28	5.5	0.1	tr.	tr.	5.6	6.5	12.1	6.1	0.0		2.88		1.28			46	92
28-46	1.2	tr.	-	tr.	1.2	2.3	3.5	2.0	0.0		1.35		0.65			34	60
46-66	0.4	tr.	-	tr.	0.4	1.2	1.6	0.9	0.2		0.80					25	44
66-91	0.4	tr.	-	tr.	0.4	1.0	1.4	0.6	0.2		0.78					28	67
91-99	0.6	tr.	-	tr.	0.6	1.6	2.2	1.1	0.2		0.78					27	54
99-112	0.5	tr.	-	tr.	0.5	1.3	1.8	1.0	0.2		0.82					28	50
112-155	0.2	tr.	-	tr.	0.2	0.6	0.8	0.5	0.2		0.57					25	40

Depth (cm)	Clay fraction analysis 7A1: <0.002 mm 7A2 X-ray a/b/	7A3 DTA b/ Pct.	Sand fraction analysis 7A1: 0.25-0.10 mm 7B1 Petrographic b/ Pct.	TW
0-28	VR3,KK1,QZ1	KK5	QZ79,FE2,TM1,ZR1,FD13,HN2,SP1,GN1	17
28-46				
46-66	VR2,QZ2		QZ81,FE1,TM1,FD14,HN2,GN1	17
66-91				
91-99				
99-112				
112-155				

a/ X-ray notation: 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.

b/ Mineral code: FE = iron oxide minerals, FD = feldspar, GN = garnet, HN = hornblende, KK = kaolinite, QZ = quartz, SP = sphene, TM = tourmaline, TW = total weatherable minerals, VR = vermiculite, ZR = zircon.

Pedon classification: Typic Haplaquoll; sandy, mixed, mesic
Series classification: (Same)
Soil: Granby, taxadjunct*
Soil Nos.: S68MI-70-1 (BSL Nos. 68B324-68B330)
Location: Ottawa County, Michigan; SE 1/4, NE 1/4, Sec. 28, T7N, R15W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 49° F., and the mean summer air temperature is about 68° F. Frost-free season is 150-160 days.
Vegetation and land use: Quackgrass and junegrass sod. Idle land.
Parent material: Sand.
Physiography: Lake plain.
Topography: Level. Gradient is less than 1 percent.
Drainage: Poorly drained.
Ground water: At 53 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: R. Johnson and E. Pregitzer.

(Colors are for moist soil unless otherwise stated.)

Ap 324 0 to 28 cm (0 to 11 inches). Black (10YR 2/1) sand, dark gray (10YR 4/1) dry; weak coarse granular breaking to fine granular structure; very friable; many fine roots; medium acid; abrupt wavy boundary.

A12 325 28 to 46 cm (11 to 18 inches). Dark grayish brown (10YR 4/2), black (10YR 2/1) and light brownish gray (10YR 6/2); sand; weak coarse subangular blocky breaking to fine subangular blocky structure; very friable; many fine roots; strongly acid; clear wavy boundary.

A13 326 46 to 66 cm (18 to 26 inches). Grayish brown (10YR 5/2) sand; many medium faint dark gray (10YR 4/2), few fine faint light brownish gray (10YR 6/2) and few coarse distinct very dark grayish brown (10YR 3/2) mottles; weak coarse subangular blocky to massive structure; very friable; few fine roots; strongly acid; clear wavy boundary.

A2 327 66 to 91 cm (26 to 36 inches). Light grayish brown (10YR 6/2) sand, light gray (10YR 7/2) dry; massive when wet, single grain when dry; nonsticky; few fine roots; strongly acid; abrupt wavy boundary.

B21 328 91 to 99 cm (36 to 39 inches). Very dark grayish brown (10YR 3/2) sand; common coarse distinct pale brown (10YR 6/3) mottles; weak coarse subangular blocky to massive structure; nonsticky; very few roots; strongly acid; abrupt wavy boundary.

B22 329 99 to 112 cm (39 to 44 inches). Yellowish brown (10YR 5/4) sand; many medium distinct light brownish gray (10YR 6/2) and dark grayish brown (10YR 4/2) mottles; massive; slightly sticky; strongly acid; clear wavy boundary.

C2 330 112 to 155 cm (44 to 61 inches). Grayish brown (10YR 5/2) sand; single grain; loose; few dead roots; strongly acid.

* This soil was sampled as Granby. It is a taxadjunct because it is more acid than typical for the series.

1572A

SCS-421

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Barry taxadjunct SOIL Nos. S71Mich-44-2 LOCATION Lapeer County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos 71B313 - 71B319

	Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1: Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (<0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: Coarse (.05-0.02)	Silt: Fine (0.02-0.002)	Clay: Coarse (0.002-0.0002)	Clay: 3A1b Fine <0.0002	Clay: 3A1a Carbonate <0.002	(0.2-0.02)	(2-0.1)	<0.074	Coarse fragments: 75-20	20-5	5-2
			Pct. of <2mm																Pct. of <75mm		
13	0-29	Ap	41.6	40.2	18.2	0.8	5.7	3.2	18.7	13.1	14.6	25.6		5.5		40.0	28.5	68.3	-	0	1
14	29-41	B21g	42.1	39.6	18.3	1.8	3.7	7.0	16.0	13.7	18.1	21.5		7.8		41.3	28.4	66.0	-	1	1
15	41-57	B22g	42.2	39.2	18.6	1.6	3.6	6.8	16.3	14.0	18.0	21.2		8.7		41.8	28.2	66.1	-	1	1
16	57-92	B23g	40.4	41.8	17.8	1.3	3.3	6.4	15.5	13.9	17.8	24.0		8.3		41.1	26.5	67.9	1	2	1
17	57-92	B23g *	46.8	36.5	16.7	2.3	4.0	7.5	18.1	14.9	16.5	20.0		6.9		42.3	31.9	61.6	3	3	1
18	92-124	B3g	56.5	29.5	14.0	2.7	5.4	9.1	22.3	16.9	14.6	14.9		5.0		45.1	39.6	52.3	1	7	2
19	124-170	C	55.5	33.6	10.9	4.3	5.9	9.0	20.7	15.6	16.2	17.4		3.1		44.5	39.9	53.1	2	8	4

	Depth (cm)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.		Dit-cit ext. 6C3b Fe Pct.	Dit-cit ext. 6G7a Al Pct.			4F1 Liquid limit	4F Plasticity index	3B2 Ca	8E1 Resistivity ohms/cm	Bulk density 4A1e 1/3 bar g/cc	Bulk density 4A1h oven dry g/cc	Linear extens. 4D1 LE (whole soil) Pct.	Linear extens. 4D1 LE (<2mm) Pct.	Water content 4B1c 1/3 bar Pct.	Water content 4B2 15 bar Pct.	WRD 4C1 (whole soil) in/in	WRD 4C1 (<2mm) in/in
13	0-29	2.77									1.00		1.09	1.47	10		23.2	10.2	0.14	
14	29-41	0.65									0.99		1.60	1.67	2		17.0	7.8	0.10	
15	41-57	0.40									0.99		1.56	1.66	2		17.1	8.2	0.14	
16	57-92	0.34									0.97		1.69	1.77	2		16.4	8.7	0.13	
17	57-92	0.56																7.9		
18	92-124	0.25									0.93		1.70	1.75	1		15.0	7.4	0.12	
19	124-170	0.20									0.90	5,000	1.80	1.82	-		11.6	5.1	0.10	

	Depth (cm)	Extractable bases 5B4a: 6H2e Ca	6G2d Mg	6F2b Na	6G2b K	Sum	6H2a Ext. acidity	KCl ext. 6G1e Al	CEC: 5A3a Sum cations	5A6 NH_4OAc	Sum bases plus KCl Al	Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.	6E1e Carbonate as $CaCO_3$ Pct.	pH: 8C1c (1:1) KCl	8C1e (1:2) $CaCl_2$	8C1a (1:1) H_2O	Ratios to total clay: CEC sum	Fine clay	15-bar water
		meq/100 g																		
13	0-29	17.8	3.5	0.1	0.3	21.7	3.5		25.2	20.3		86	425	tr.	6.8	7.2	7.4			
14	29-41	10.0	2.8	0.1	0.1	13.0	2.2		15.2	12.8		86	200	tr.	6.2	6.9	7.3			
15	41-57	9.8	3.0	tr.	0.1	12.9	2.1		15.0	12.2		86	430	tr.	6.1	6.8	7.2			
16	57-92	8.4	2.6	tr.	0.1	11.1	2.0		13.1	10.6		85	150	1	6.2	6.9	7.3			
17	57-92	8.7	2.5	tr.	0.1	11.3	3.2		14.5	11.2		78	514	tr.	6.3	6.8	7.3			
18	92-124	8.6	3.0	tr.	0.1	11.7	1.1		12.8	5.4		91	433	3	7.0	7.4	7.9			
19	124-170	35.4	1.6	tr.	0.1	37.1	-			4.0				15	7.4	7.6	8.2			

Depth (cm)	Clay fraction analysis 7A1b, d: <0.002 mm 7A2 X-ray a/b/	7A3 DTA Pct.	Sand and silt fraction analysis 7A1: 7B1 Petrographic Pct.	total weath.

* Krotovina

Pedon classification: Typic Haplaquoll; coarse-loamy, mixed, mesic
Series classification: Typic Argiaquoll; fine-loamy, mixed, mesic
Soil: Barry taxadjunct*
Soil Nos.: S71MI-44-2 (BSL Nos. 71B313-71B319)
Location: Lapeer County, Michigan; southeast 1/4, northwest 1/4 of Sec. 16, T6N, R12W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 49° F., and the mean summer air temperature is about 70° F. Frost-free season is 150 days.
Vegetation and land use: Quackgrass and other weeds. Idle cropland.
Parent material: Sandy loam glacial till.
Physiography: Ground moraine.
Topography: Level area. Gradient is 0 percent.
Drainage: Poorly drained.
Ground water: 70 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: H. R. Sinclair, Jr.

(Colors are for moist soil unless otherwise stated.)

Ap 313 0 to 29 cm (0 to 11 inches). Very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; cloddy separating to moderate fine and medium granular structure; friable; many fine roots; 5 percent gravel, less than 1 percent cobble; mildly alkaline; abrupt smooth boundary.

B21g 314 29 to 41 cm (11 to 16 inches). Olive gray (5Y 5/2) loam; many (30 percent) fine prominent brown (7.5YR 4/4 and 5/4) and strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; friable; common fine roots; 5 percent gravel, less than 1 percent cobble; neutral; clear wavy boundary.

B22g 315 41 to 57 cm (16 to 22 inches). Olive gray (5Y 5/2) loam; many (35 percent) fine prominent brown (7.5YR 4/4 and 5/4) and strong brown (7.5YR 5/6) mottles; weak fine prismatic separating to moderate very fine and fine subangular blocky structure; friable; common fine roots; smooth surfaces on faces of peds resemble clay films, films cover less than 20 percent of surfaces; 5 percent gravel, less than 1 percent cobble; neutral; clear wavy boundary.

B23g 316-317 57 to 92 cm (22 to 36 inches). Mottled gray (N 5/0)(45 percent) and strong brown (7.5YR 5/6)(65 percent) loam, yellowish brown (10YR 5/6) rubbed; weak coarse prismatic separating to weak coarse subangular blocky structure; friable; few roots in interior of peds, common roots on surface of peds; black (10YR 2/1) krotovina; 5 percent gravel, less than 1 percent cobbles; neutral; gradual wavy boundary.

B3g 318 92 to 124 cm (36 to 49 inches). Mottled strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6)(65 percent), and gray (N 5/0)(35 percent), fine sandy loam; weak coarse subangular blocky structure; friable; few roots, 5 percent coarse fragments, less than 1 percent cobbles; moderately alkaline; gradual wavy boundary.

C 319 124 to 170 cm (49 to 67 inches). Yellowish brown (10YR 5/4) fine sandy loam; massive separating to weak thin platy structure; friable; very few roots; black (N 2/0) iron-manganese aggregations; 5 percent gravel, less than 1 percent cobbles; slight effervescence; moderately alkaline.

* This soil was sampled as Barry. It is a taxadjunct because it lacks an argillic horizon and is coarse-loamy.

1273A

SCS-421

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Gilford taxadjunct SOIL Nos. ST1Mich-44-4 LOCATION Lapeer County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 71B320 - 71B329

	Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1: Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (<0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: Coarse (.05-0.02)	Silt: Fine (0.02-0.002)	Clay: Coarse (0.002-0.0002)	Clay: 3A1b Fine <0.0002	Clay: 3A1a Carbonate <0.002	(0.2-0.02)	(2-0.1)	<0.074	Coarse fragments: 75-20	20-5	5-2
			Pct. of <2mm																Pct. of <75mm		
20	0-26	Ap	53.4	34.7	11.9	2.8	9.2	12.9	17.3	11.1	15.2	19.5		5.1		37.0	42.3	52.2	-	2	2
21	26-32	B21g	63.6	24.6	11.8	4.2	12.2	17.3	18.8	11.2	11.4	13.2		5.3		33.3	52.4	42.1	-	2	3
22	32-49	B22g	61.5	25.2	13.3	3.8	15.3	18.8	14.3	9.4	12.3	12.9		6.4		29.3	52.1	43.8	-	3	3
23	49-69	B23g	58.7	27.4	13.9	5.9	14.3	17.1	12.4	9.0	13.4	14.0		6.7		28.9	49.7	46.7	-	4	3
24	69-89	B24	64.3	23.0	12.7	8.2	16.2	19.3	12.5	8.2	10.9	12.1		5.8		25.7	56.1	40.1	7	9	4
25	89-91	B25t	47.3	36.4	16.3	4.6	8.2	11.6	11.9	10.9	13.1	23.3		5.4		29.9	36.4	59.2	-	2	4
26	91-109	IIC1	88.6	8.9	2.5	1.6	4.5	8.5	50.9	23.1	7.3	1.6		0.8		65.6	65.5	19.6	-	1	2
27	109-147	IIC2	90.6	7.9	1.5	1.1	2.9	4.8	55.9	25.9	7.7	0.2		0.3		80.1	64.7	19.1	-	1	1
28	109-147	IIC2	89.8	8.6	1.6	9.6	17.0	15.0	29.2	19.0	6.8	1.8		0.5		46.7	70.8	18.0	-	3	13
29	147-173	IIIC3	46.8	38.6	14.6	3.5	4.9	7.5	16.9	14.0	16.0	22.6		3.7		40.5	32.8	60.8	-	2	3

	Depth (cm)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.		Dit-cit ext. 6C2b Fe Pct.	Dit-cit ext. 6C7a Al Pct.			4F1 Liquid limit	4F Plasticity index	3B2 Cm	8K1 Resistivity ohms/cm	Bulk density 4A1e 1/3 bar g/cc	Bulk density 4A1h oven dry g/cc	Linear extens. 4D1 LE (whole soil) Pct.	Linear extens. 4D1 LE (<2mm) Pct.	Water content 4B1c 1/3 bar Pct.	Water content 4B2 15 bar Pct.	WRD 4C1 (whole soil) in/in	WRD 4C1 (<2mm) in/in
20	0-26	2.60									0.98		1.43	1.51	2		18.9	9.3	0.13	
21	26-32	0.74									0.97		1.64	1.69	1		13.1	6.1	0.11	
22	32-49	0.34									0.96		1.61	1.68	1		13.8	6.8	0.11	
23	49-69	0.32							23	6	0.96		1.61	1.68	1		13.9	6.8	0.11	
24	69-89	0.31									0.88		1.45	1.49	1		15.6	6.2	0.12	
25	89-91	0.28							23	5								9.2		
26	91-109	0.13									0.96		1.48	1.47	-		4.4	1.8	0.04	
27	109-147	0.13									0.99		1.66	1.66	-		6.5	0.9	0.09	
28	109-147	0.06																1.3		
29	147-173	0									0.96	11,000	1.90	1.94	1		12.7	6.3	0.12	

	Depth (cm)	Extractable bases 5B4a: 6H2e Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	KCl ext. 6G1e Al	CEC 5A3a Sum cations	CEC 5A6 NH_4OAc	8um bases plus KCl Al	Base saturation 5C3 Sum cations Pct.	Base saturation 5C1 NH_4OAc Pct.	6E1e Carbonate as $CaCO_3$ Pct.	pH 8C1c (1:1) KCl	pH 8C1e (1:2) $CaCl_2$	pH 8C1a (1:1) H_2O	Ratios to total clay:	CEC sum	Fine clay	15-bar water
		meq/100 g																			
20	0-26	13.0	2.0	tr.	0.1	15.1	6.0		21.1	18.0		72	117		5.5	6.0	6.2				
21	23-32	6.9	1.4	tr.	tr.	8.3	2.4		10.7	10.2		78	90		5.8	6.4	6.9				
22	32-49	9.1	2.1	tr.	0.1	11.3	1.8		13.1	10.4		86	109	tr.	6.0	6.7	7.2				
23	49-69	8.7	1.9	tr.	tr.	10.6	1.6		12.2	10.2		87	104	1	6.1	6.8	7.4				
24	69-89	7.6	1.9	tr.	tr.	2.5	1.6		11.1	9.4		86	101	tr.	6.3	6.9	7.4				
25	89-91	10.0	3.0	0.1	0.2	13.3	1.9		15.2	11.0		88	146	2	6.8	7.4	7.9				
26	91-109	3.9	2.3	tr.	0.1	6.3	0.7		7.0	1.9		90	332	3	7.1	7.2	7.7				
27	109-147	21.0	0.9	tr.	0.1	22.0				1.0				13	8.0	7.6	8.2				
28	109-147	18.9	0.9	0.1	0.1	20.0				1.2				17	7.9	7.6	8.2				
29	147-173	38.0	1.7	0.1	0.2	40.0				4.2				21	7.4	7.7	8.1				

Depth (cm)	Clay fraction analysis 7A1b, c: <0.002 mm 7A2 X-ray 5/2/	7A3 DTA Pct.	Sand and silt fraction analysis 7A1: 7B1 Petrographic Pct.	total weath.
0-29	VR4,MI4,MT3,VM3,KK3,QZ1			
49-69	MT5,MI4,VR2,VM2,KK2			
89-91	MI5,VM3,KK2			
91-109	MI5,VR3,KK3,VM2,CL1			

5/ Relative amounts (X-ray): 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.

2/ Mineral code: VR= vermiculite, MI= mica, MT= montmorillonite, VM= vermiculite-mica, interstratified, KK= kaolinite, QZ= quartz, CL= chlorite

Pedon classification: Typic Haplaquoll; coarse-loamy, mixed, mesic
Series classification: (Same)
Soil: Gilford, taxadjunct*
Soil Nos.: S71MI-44-4 (BSL Nos. 71B-320-71B329)
Location: Lapeer County, Michigan; Northeast 1/4, southwest 1/4 of Sec. 27, T6N, R12E.
Climate: Average annual precipitation is about 30 inches. Mean annual air temperature is about 49° F., and the mean summer air temperature is about 70° F. Frost-free season is 150 days.
Vegetation and land use: Alfalfa - brome. Cropland.
Parent material: Sandy loam glacial till.
Physiography: Ground moraine.
Topography: Nearly level. Gradient is 0 percent
Drainage: Poorly drained.
Ground water: 54 inches.
Erosion: Slight.
Permeability: Moderately rapid.
Described by: H. R. Sinclair, Jr.

(Colors are for moist soil unless otherwise stated.)

Ap 320 0 to 26 cm (0 to 10 inches). Very dark brown (10YR 2/2) fine sandy loam, grayish brown (10YR 5/2) dry; cloddy separating to moderate medium granular structure; friable; many fine to coarse roots; 5 percent gravel; slightly acid; abrupt smooth boundary.

B21g 321 26 to 32 cm (10 to 13 inches). Olive gray (5Y 5/2) sandy loam; many (25 percent) fine prominent yellowish brown (10YR 5/4 and 5/6) and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; common fine roots; smooth surfaces on faces of peds resemble clay films; 5 percent coarse fragments; neutral; clear broken boundary (85 percent of soil pit has a B21g horizon). Ap material mixed by worms in upper 2 inches of this horizon.

B22g 322 32 to 49 cm (13 to 19 inches). Mottled grayish brown (10YR 5/2) and olive gray (5Y 5/2), 40 percent, and yellowish brown (10YR 5/4 and 5/6) and strong brown (7.5YR 5/6), 60 percent, sandy loam, yellowish brown (10YR 5/6) rubbed; moderate fine and medium subangular blocky structure; friable; common fine to coarse roots; smooth surfaces on faces of peds resemble clay films; 5 percent gravel; neutral; gradual wavy boundary.

B23g 323 49 to 69 cm (19 to 27 inches). Mottled grayish brown (2.5Y 5/2), 55 percent, and yellowish brown (10YR 5/4 and 5/6) and strong brown (7.5YR 5/6), 45 percent, fine sandy loam, light olive brown (2.5Y 5/4) rubbed; moderate fine and medium subangular blocky structure; friable common fine to coarse roots; smooth surfaces on faces of peds resemble clay films; 5 percent gravel; mildly alkaline; gradual wavy boundary.

B24 324 69 to 89 cm (27 to 35 inches). Light olive brown (2.5Y 5/4) sandy loam; many (45 percent) fine distinct gray (10YR 5/1), grayish brown (10YR 5/2), yellowish brown (10YR 5/6 and 5/8), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) mottles; weak medium and coarse prismatic; common fine roots and few medium roots; 8 percent gravel; mildly alkaline; abrupt wavy boundary.

B25t 325 89 to 91 cm (35 to 36 inches). Mottled yellowish brown (10YR 5/6), light olive brown (2.5Y 5/6), and olive yellow (2.5Y 6/6), 70 percent, and grayish brown (10YR 5/2 and 2.5Y 5/2) and gray (10YR 5/1), 30 percent, fine sandy loam; weak medium and coarse subangular blocky structure; friable; common fine roots and few medium roots; few clay films; black (N 2/0) iron-manganese aggregations; 5 percent gravel; moderately alkaline; abrupt broken boundary (80 percent of soil pit has a B25t horizon.)

IIC1 326 91 to 109 cm (36 to 43 inches). Mottled yellowish brown (10YR 5/4, 50 percent) and light yellowish brown (10YR 6/4, 50 percent) fine sand; massive; very friable; few roots; black (N 2/0) iron-manganese aggregations; 3 percent gravel in part of the horizon and 10 percent gravel in remainder; mildly alkaline; clear broken boundary (60 percent of soil pit has a IIC horizon.)

IIC2 327 & 328 109 to 147 cm (43 to 58 inches). Stratified light olive brown (2.5Y 5/3) fine sand and mottled light olive brown (2.5Y 5/4 and 5/6) and light yellowish brown (2.5Y 6/4) sand; massive and single grain; very friable and loose; few roots; yellowish red (5YR 5/8) iron aggregations; 3 percent gravel in fine sand and 10 percent gravel in sand; slight effervescence; moderately alkaline; clear smooth boundary. (327 is fine sand) (328 is sand)

IIIC3 329 147 to 173 cm (58 to 68 inches). Light olive brown (2.5Y 5/4) loam; massive; friable; very few roots; 5 percent gravel; slight effervescence; moderately alkaline.

* This sand was sampled as Barry. It was correlated as Gilford. It is a taxadjunct because the IIC is fine sand and there is loam till at 58 inches.

SOIL CLASSIFICATION- Typic Haplaquoll
coarse-silty, mixed (calcareous), mesic
SERIES - - - - - - - Bach Taxadjunct

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

SOIL NO. - - - - - - S75NI-63-3 COUNTY - - - HURON

GENERAL REMARKS- - - 1B1B,2A1,2B SAMPLE NOS.- 75L111-75L115 AUGUST 1975

REVISED: MARCH 1976

DEPTH CM	HORIZON	SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2- 1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	CCSI .05-.02	FNSI .02-.002	VFSI .002-.005	FAPL TEXT SAND 2-.1	INTR II .2-.02	FINE CLAY TO CLAY	NON-CO3-CLAY PCT	RATIO BD1 15-BAR TO CLAY
		PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - PCT LT 2MM																
000-25	AP	31.0	51.9	17.1		.2	.4	.8	6.5	23.1	25.0	26.9		7.9	53.4			.46
025-46	B21G	26.0	60.4	13.6		TR	.2	.6	4.7	20.5	26.8	33.6		5.5	51.1			.37
046-76	B22G	30.2	59.2	10.6		.4	.1	.3	5.9	22.5	32.8	26.4		6.7	61.5			.37
076-109	C1	59.5	33.9	6.6		TR	.1	.5	14.8	44.1	23.8	10.1		15.4	61.7			.33
109-152	C2	9.1	55.9	35.0		1.0	.7	1.3	2.9	3.2	13.0	42.9		5.9	18.0		28	.34
109-152	DUPLICATE			34.0					0.10-0.074		0.074-0.05							
000-25									7.6		15.2							
025-46									5.6		14.8							
046-76									7.6		15.9							
076-109									18.6		25.6							

DEPTH CM	VCL. GT 2 PCT	GT 75 PCT	75-20	20-5	5-2	LT .074	20-2 PCT LT20	4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	6A1A ORGM CARB PCT	CARBONATE 6E1B LT 2 PCT	CARBONATE 6A1A LT .002 PCT	PH 8C1A 1/1 H2O	PH 8C1E 1/2 CACL
	PARTICLE SIZE ANALYSIS, PM, 3B, 3B1, 3B2 WEIGHT PCT LT 75							BULK DENSITY			WATER CONTENT								
000-25		0	0	0	TR	84	TR						7.9		2.03	15		7.8	7.6
025-46		0	0	0	TR	89	TR						5.0		.19	33		7.9	7.6
046-76		0	0	TR	TR	86	TR						3.9			38		7.9	7.7
076-109		0	0	TR	TR	86	TR						2.2			29		8.0	7.8
109-152		0	0	TR	TR	93	TR						11.9			30	7	7.9	7.7

Pedon classification: Typic Haplaquoll ; coarse-silty, mixed (calcareous), mesic
Series classification: Mollic Haplaquept; coarse-silty, mixed (calcareous), mesic
Soil: Bach, taxadjunct*
Soil Nos.: S75MI-063-3 (LSL Nos. 75L111-75L115)
Location: Huron County, Michigan; 350 feet north and 45 feet east of the SW corner of Sec. 20, T15N, R10E.
Climate: Average annual precipitation is about 28 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 66° F. Frost-free season is 150-160 days.
Vegetation and land use: Navy beans. Cropland.
Parent material: Stratified loamy very fine sand and silt loam.
Physiography: Lake plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Poorly drained.
Ground water: At 32 inches.
Erosion: Slight.
Permeability: Moderately slow or moderate.
Described by: L. Linsemier, E. Cowan, W. Fredericks and N. Stroesenreuther

(Colors are for moist soil unless otherwise stated.)

Ap 111 0 to 25 cm (1 to 10 inches). Very dark grayish brown (10YR 3/2) silt loam; grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; few fine roots; slight effervescence; moderately alkaline; abrupt smooth boundary.

B21g 112 25 to 45 cm (10 to 18 inches). Light brownish gray (10YR 6/2) very fine sandy loam; common medium prominent yellowish brown (10YR 5/6) and few fine faint gray (10YR 6/1) mottles; weak fine platy structure; friable; slight effervescence; moderately alkaline; gradual wavy boundary.

B22g 113 45 to 75 cm (10 to 30 inches). Light brownish gray (10YR 6/2) very fine sandy loam; common medium faint pale brown (10YR 6/3) and common medium prominent yellowish brown (10YR 5/6) mottles; weak fine platy structure; friable; slight effervescence; moderately alkaline; abrupt wavy boundary.

C1 114 75 to 108 cm (30 to 43 inches). Pale brown (10YR 6/3) stratified loamy very fine sand and silt loam; common medium distinct gray (10YR 6/1) and common medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; slight effervescence; moderately alkaline; abrupt wavy boundary.

1663A

* This pedon has a thicker layer of dark mineral material at the surface than is commonly present in this series.

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL: Brookston taxadjunct SOIL Nos.: S68Mich-23-1 LOCATION: Eaton County, Mich.

SOIL SURVEY LABORATORY: Beltsville, Maryland LAB. Nos.: 68B346 - 68B353

Depth (cm)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<.074 mm	3B2 Cm	Coarse fragments 3B1: 2A2 ≥ 2 Pct.	2-19 (Pct. of < 76mm)	19-76 (Pct. of < 76mm)
		Pct. of < 2 mm																
0-25	Ap	39.6	39.1	21.3	1.8	4.8	8.6	15.1	9.3	15.3	23.8	33.0	30.3	66.2	0.99	2	2	0
25-43	B21gt	40.0	38.8	21.2	0.9	4.2	9.1	15.8	10.0	15.4	23.4	34.0	30.0	66.4	0.99	2	2	0
43-56	B22gt	37.0	40.5	22.5	0.9	3.5	7.7	14.5	10.4	16.8	23.7	35.3	26.6	69.8	0.99	2	2	0
56-73	B23gt	41.8	37.1	21.1	1.3	3.8	9.0	17.1	10.6	15.2	21.9	35.2	31.2	64.9	0.99	2	2	0
73-81	IIC1	86.9	9.9	3.2	6.4	22.5	25.6	24.1	8.3	5.1	4.8	25.3	78.6	17.5			18	18
81-112	IIIC2g	45.4	38.9	15.7	2.8	4.8	8.5	18.5	10.8	15.0	23.9	36.3	34.6	61.2	0.94	8	6	2
112-140	IIIC3	44.2	39.6	16.2	3.0	4.4	7.8	18.1	10.9	15.4	24.2	36.9	33.3	62.4	0.92	11	9	2
140-160	IIIC4	44.3	39.6	16.1	2.6	4.5	8.2	18.1	10.9	15.7	23.9	37.1	33.4		0.93	10	10	tr.

Depth (cm)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N	6G6a C-D Al	6E1e Carbonate as $CaCO_3$ Pct.	6C2b Ext. iron as Fe Pct.	Bulk density: g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohm-cm 60°F	4C1 WRD cm/cm	pH:	8C1c (1:1) KCl	8C1a (1:1) H_2O
0-25	3.64	0.34	11	0.13		0.22		1.32	1.50	0.043		28.9	12.8		0.21		6.3	6.5
25-43	0.75	0.09	8	0.11		0.35		1.59	1.71	0.024		18.0	9.4		0.14		6.3	6.8
43-56	0.46			0.13		0.79		1.61	1.73	0.024		16.9	9.7		0.11		6.5	7.0
56-73	0.46			0.12		0.71		1.49	1.65	0.034		22.4	8.8		0.20		6.7	7.0
73-81	-			0.04	19	0.28											7.8	7.6
81-112	0.18			0.07	28	0.65		1.87	1.93	0.010		12.0	6.8		0.09		7.8	7.7
112-140	0.19			0.06	30	0.48		1.82	1.87	0.008		12.8	6.7		0.10		7.7	7.8
140-160	0.24			0.06	30	0.48		1.76	1.82	0.010		13.2	6.6	6000	0.11		7.4	7.5

Depth (cm)	Extractable bases 5B4a: 6N2e Ca	6O2d Mg	6P2b Na	6P2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations	5A1a NH_4OAc	6G1e Ext. Al	3A1b Fine clay <.0002	Ratio: Fine clay / Total clay	Ratios to clay: CEC sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-25	21.6	5.0	tr.	0.2	26.8	5.2	32.0	24.3		9.8	0.46			0.60	4.3			110
25-43	13.6	4.0	tr.	0.2	17.8	2.1	19.9	16.2		10.0	0.47			0.44	3.4			110
43-56	13.2	4.1	tr.	0.2	17.5	1.4		15.2		10.0	0.44			0.43	3.2			115
56-73	13.4	5.0	0.1	0.2	18.7	1.2		13.8		10.3	0.49			0.42	2.7			136
73-81		1.8	tr.	tr.		-		1.8		1.5	0.47							
81-112		2.6	tr.	0.1		-		4.0		4.7	0.30			0.43				
112-140		3.0	tr.	0.1		-		4.0						0.41				
140-160		2.8	tr.	0.1		-		3.8						0.41				

Depth (cm)	Clay fraction analysis 7A1: <0.002 mm 7A2 X-ray a/b/	7A3 DTA b/ Pct.
0-25	MT4,MI2,KK1,VR1,QZ1	KK5
25-43		
43-56	MT4,KK2,MI1,VR1,QZ1	KK10
56-74		
74-81		
81-112		
112-140	MI4,VR3,MV2,KK1	KK5
140-160		

a/ X-ray notation: 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.

b/ Mineral code: KK = kaolinite, MI = mica, MT = montmorillonite, MV = montmorillonite-vermiculite, QZ = quartz, VR = vermiculite.

Pedon classification: Typic Haplaquoll; fine-loamy, mixed, mesic
Series classification: Typic Argiaquoll; fine-loamy, mixed, mesic
Soil: Brookston, taxadjunct*
Soil Nos.: 568MI-23-1 (BSL Nos. 68B346-68B353)
Location: Eaton County, Michigan; 350 feet south, 850 feet east of NW corner of Sec. 17, T4N, R4W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 50° F., and the mean summer air temperature is about 69° F. Frost-free season is 150-160 days.
Vegetation and land use: Navy beans. Cropland.
Parent material: Loam till.
Physiography: Till plain.
Topography: Level. Gradient is .5 percent.
Drainage: Very poorly drained.
Ground water: At 63 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: S. Holcomb, R. Hicks, R. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap 346 0 to 26 cm (0 to 10 inches). Very dark gray (10YR 3/1), gray (10YR 5/1) dry, loam; weak medium subangular blocky structure; friable; abrupt smooth boundary.

B21g 347 26 to 43 cm (10 to 17 inches). Greenish gray (5GY 5/1) loam with few coarse distinct grayish brown (10YR 5/2 mottles; moderate medium subangular blocky structure; firm; neutral; clear smooth boundary.

B22g 348 43 to 56 cm (17 to 22 inches). Gray (10YR 5/4) loam with common medium faint grayish brown (10YR 5/2) and few coarse distinct yellowish brown (10YR 5/4 mottles; moderate medium angular blocky structure; firm; clear smooth boundary.

B23g 349 56 to 73 cm (22 to 29 inches). Greenish gray (5GY 5/1) loam with many coarse distinct dark gray (10YR 4/1), grayish brown (10YR 5/2)and yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; firm; neutral; abrupt wavy boundary.

IIC1 350 73 to 81 cm (29 to 32 inches). Grayish brown (10YR 5/2) loamy sand, single grain; loose; many 1 to 2 inch diameter pebbles; few Mn concreation 2 to 5 mm in diameter; a 1 to 3 inch tongue extends into the C3 horizon; slight effervescence; mildly alkaline; gradual smooth boundary.

IIIC2g 351 81 to 112 cm (32 to 44 inches). Grayish brown (10Yr 5/2) loam, with many fine distinct yellowish brown (10YR 5/4) and (10YR 5/6 mottles; weak medium subangular blocky structure; friable; exterior of peds are gray (10YR 5/1) few Mn concreations 2 to 5 mm in diameter; slight effervescence; mildly alkaline; gradual smooth boundary..

IVC3 352 112 to 140 cm (44 to 55 inches). Mottled gray (10YR 6/1) and yellowish brown (10YR 5/6) loam; weak coarse platy breaking to weak meduium subangular blocky structure; friable; few flecks and 2 to 5 mm Mn concreation; slight effervescence; mildly alkaline; gradual smooth boundary.

VC4 353 140 to 160 cm (55 to 63 inches). Dark yellowish brown (10YR 4/4) loam with common coarse faint yellowish brown (10YR 5/4) and few coarse distinct grayish brown (10YR 5/2) mottles; moderate coarse platy structure; friable; flecks of Mn throughout horizon; slight effervescence; mildly alkaline.

Note: Krotovina extends from the base of the Ap to a depth of 36 inches with an average diameter of 3 inches. Color is very dark gray (10YR 3/1).

* This was sampled as Brookston. It is a taxadjunct because it lacks an argillic horizon.

1536A

SOIL CLASSIFICATION-TYPIC HAPLAQUOLL
FINE-LOAMY, MIXED (CALCAREOUS), MESIC
SERIES - - - - - - -TAPPAN

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

SOIL NO - - - - - - - S74NI-63-1 COUNTY - - - HURON

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 74B453-74B460

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM) SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	COARSE SAND 1-.5	MEDS .5-.25	FINES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR SAND .2-.02	FINE CLAY TO CLAY	NON-CO3- CLAY PCT	RATIO 8D1 15-BAR TO CLAY
0-28	AP	45.8	33.2	21.0		3.1	6.2	10.7	18.3	7.5	12.6	20.6		38.3	29.2			.43
28-32	A12	46.5	33.8	19.7		2.4	5.8	10.8	19.4	8.1				38.4	51.6			.51
32-37	B11G	51.9	32.7	15.4		2.5	7.0	10.6	22.1	9.7	16.5	16.2		42.2	37.2			.33
37-54	B12G	33.5	42.3	24.2		2.0	3.8	7.5	13.1	7.1	14.4	27.9		26.4	29.1			.38
54-78	B2G	37.3	40.1	22.6	6.9	2.6	4.5	8.6	13.9	7.7	14.6	25.5		29.6	30.5	31		.39
78-123	C1	40.9	37.0	22.1	8.0	3.8	5.4	9.8	14.7	7.2	12.1	24.9		33.7	27.9	36		.38
123-170	C2	40.1	38.2	21.7		3.2	5.3	9.5	14.8	7.3	14.8	23.4		32.8	30.8			.38
170-192	C3	37.7	39.8	22.5		2.8	4.9	9.2	13.7	7.1	12.5	27.3		30.6	27.8			.36

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	GT 75 PCT	WEIGHT 75-20 (PCT LT 75)	20-5	5-2	LT .074	20-2 PCT LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1E OVEN DRY G/CC	4D1 COLE	4B1C 1/10 BAR PCT	WATER CONTENT 4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 HRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	(-PH-) 8C1A 1/1 H2O	8C1E 1/2 CACL
0-28	2	0	0	3	2	56	5	1.58	1.67	.017		18.8	9.0	.15	7		7.6	7.3
28-32	3	0	1	1	4	55	5	1.58	1.68	.019		19.5	10.1	.14	8		7.6	7.2
32-37	14	0	6	8	6	43	15	1.74	1.82	.012		15.6	5.1	.16	12		7.7	7.3
37-54	3	0	1	3	2	66	5	1.72	1.78	.010		17.7	9.2	.14	27		7.9	7.5
54-78	18	0	1	16	6	52	22	1.88	1.96	.011		18.3	8.8	.15	28		7.9	7.5
78-123	9	0	2	7	5	54	12	1.9 A	1.98	.013		13.9	8.5	.09	30		7.8	7.5
123-170	8	0	2	4	4	60	8	1.91	1.96	.009		13.6	8.2	.09	30		7.8	7.5
170-192	11	0	6	4	4	60	9	1.94	1.97	.006		12.6	8.1	.08	31		7.7	7.5

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB (MEQ / 100 G)	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
0-28	1.60			.4			1.9	.2	.9		1.9			13.3	.63				
28-32	2.60			.3			2.2	.1	.6		2.4			17.6	.89				
32-37	.46			.3			1.9	.1	.3		.9			7.9	.51				
37-54	.40			1.3			2.5	.2	.4					8.2	.34				
54-78	.45			.6			2.2	.2	.4					6.7	.30				
78-123	.41			.7			2.5	TR	.5					5.4	.24				
123-170	.40			.4			2.6	.1	.4					4.9	.23				
170-192	.35			.4			2.9	.1	.6					4.8	.21				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLS PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA (MEQ / LITER)	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
0-28																			
28-32																			
32-37																			
37-54																			
54-78																		22	7
78-123																			
123-170	3300	7.9	33.2					.71										20	7
170-192	1400	7.6	32.4					2.44											

DEPTH CM	(PYROPHOSPHATE,PH10) 6C5A EXT FE PCT	6G5A EXT AL PCT	6A1B EXT C PCT	(DITHIONITE-CITRATE) 6C2B EXT FE PCT	6G7A EXT AL PCT	6D1B EXT MN PCT	(PYROPHOSP) FE+AL TO CLAY	AL+C TO CLAY	PYRO FE+AL TO D - C FE+AL	CEC -1/2 CLAY X THIC	BASES 5G1 PLUS KCL AL	PH 8C1C 1:1 KCL
0-28				.4	.1							
28-32				.3	.1							
32-37				.3	TR							
37-54				1.3	.1							
54-78				.6	TR							
78-123				.7	TR							
123-170				.4	TR							
170-192				.4	TR							

(A) ESTIMATE.

Pedon classification: Typic Haplaquoll; fine-loamy, mixed (calcareous), mesic
Series classification: (Same)
Soil: Tappan
Soil Nos.: S74MI-63-1 (BLS Nos. 74B453-74B460)
Location: Huron County, Michigan; 152 feet south and 2340 feet west of the northeast corner of Sec. 19, T15N, R10E.
Climate: Average annual precipitation is about 28 inches. Mean annual air temperature is about 47° F., and the mean summer air temperature is about 68° F. Frost-free season is 150-160 days.
Vegetation and land use: Navy beans. Cropland.
Parent material: Loam till.
Physiography: Till plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Poorly drained.
Ground water: At 48 inches.
Erosion: Slight.
Permeability: Moderate or moderately slow.
Described by: N. Strossenreuther, L. Linsemier, S. Cowan, and W. Frederick.

(Colors are for moist soil unless otherwise stated.)

Ap 453 0 to 28 cm (0 to 11 inches). Very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak coarse granular structure; friable; few fine roots; 1 percent by volume of pebbles; slight effervescence; moderately alkaline; abrupt smooth boundary.

A12 454 28 to 32 cm (11 to 13 inches). Very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; friable; few fine roots; about 2 percent by volume of pebbles; slight effervescence; moderately alkaline; abrupt wavy boundary.

B11g 455 32 to 37 cm (13 to 15 inches). Light brownish gray (10YR 6/2)(50%) and gray (10YR 5/1)(50%) loam; few fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; about 5 percent by volume of pebbles and cobbles; slight effervescence; moderately alkaline; clear wavy boundary.

B12g 456 37 to 54 cm (15 to 21 inches). Grayish brown (10YR 5/2)(60%) and dark yellowish brown (10YR 4/4)(40%) loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine angular blocky structure; 6 percent by volume of pebbles and cobbles; strong effervescence; moderately alkaline; clear wavy boundary.

B2g 457 54 to 78 cm (21 to 31 inches). Gray (10YR 5/1) loam; common medium prominent yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 5/6) mottles; moderate coarse platy parting to moderate medium angular blocky structure; firm; 4 percent by volume of pebbles and cobbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C1 458 78 to 123 cm (31 to 48 inches). Yellowish brown (10YR 5/4) loam; common medium prominent gray (10YR 5/1) and common fine distinct yellowish brown (10YR 5/6) mottles; weak coarse angular blocky structure; firm; 4 percent by volume of pebbles and cobbles; strong effervescence; moderately alkaline; gradual smooth boundary.

C2 459 123 to 170 cm (48 to 67 inches). Yellowish brown (10YR 5/4) loam; few fine distinct yellowish brown (10YR 5/6) and few medium prominent light gray (10YR 6/1) mottles; weak coarse platy structure; firm; 4 percent by volume of pebbles and cobbles; strong effervescence; moderately alkaline; gradual smooth boundary.

C3 460 170 to 192 cm (67 to 76 inches). Dark brown to brown (7.5YR 4/4) loam, grayish brown (10YR 5/2) on faces of peds; strong coarse platy structure; firm; 4 percent by volume of pebbles and cobbles; strong effervescence; moderately alkaline.

1237A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL: Pella SOIL Nos. S69Mich-58-1 LOCATION: Monroe County, Michigan

SOIL SURVEY LABORATORY: Beltsville, Maryland LAB. Nos. 69B549 - 69B556

Depth cm	Horizon	1B1b Total Sand (2–0.05)	Total Silt (0.05–0.002)	Total Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	<0.074	3B2 Cm	Coarse fragments 3B1: 2A2 > 2 Pct.	2–20 (Pct. of < 75 mm)	20–75 (Pct. of < 75 mm)
		Pct. of < 2 mm																
0–29	Ap	38.9	42.2	18.9	0.2	0.3	0.5	11.3	26.6	25.0	17.2	62.4	12.3	84.3	1.00	0	0	0
29–34	A12	26.4	53.3	20.3	0.2	0.3	0.4	1.1	24.4	36.1	17.2	61.2	2.0	95.4	0.99	1	1	0
34–47	B21g	27.5	49.9	22.6	0.3	0.5	0.5	1.4	24.8	33.6	16.3	59.3	2.7	94.5	1.00	0	0	0
47–64	B22g	30.6	45.9	23.5	0.5	0.9	0.7	1.9	26.6	30.1	15.8	57.9	4.0	92.3	1.00	0	0	0
64–90	B23g	28.1	48.2	23.7	0.6	0.8	0.6	1.4	24.7	31.3	16.9	56.9	3.4	93.3	1.00	tr.	tr.	0
90–120	B3g	18.6	62.5	18.9	0.2	0.4	0.4	0.9	16.8	42.5	20.0	59.9	1.8	96.5	1.00	0	0	0
120–145	IIC1	11.5	71.8	16.7	0.0	0.2	0.2	0.5	10.6	42.0	29.8	52.9	0.9	98.1	1.00	0	0	0
145–165	IIC2	16.5	54.2	29.3	0.1	0.3	0.5	1.1	14.5	27.2	27.0	42.4	2.0	96.3	1.00	0	0	0

Depth cm	6A1a Organic carbon Pct.	Nitrogen Pct.			6E1d Carbonate as $CaCO_3$ Pct.	Liquid Limit Pct.	Plasticity Index Pct.	Bulk density 4A1d ⅓ bar g/cc	Bulk density 4A1h Oven dry g/cc	4D1 COLE	Water content Pct.	Water content 4B1c ⅓ bar Pct.	Water content 4B2 15 bar Pct.		4C1 WRD in/in	pH 8C1e (1:2) $CaCl_2$	pH 8C1c (1:1) KCl	pH 8C1a (1:1) H_2O
0–29	1.96					30	5	1.51	1.60	0.02		20.6	10.0		0.16	5.8	5.5	6.3
29–34	0.51							1.52	1.65	0.03		20.2	8.6		0.18	6.1	5.4	6.5
34–47	0.38							1.54	1.68	0.03		19.5	9.0		0.16	6.2	5.6	6.4
47–64	0.25					28	8	a/1.65	1.76	a/0.02		18.1	9.6		0.14	6.8	6.1	6.9
64–90	0.25							1.60	1.71	0.02		19.3	10.1		0.15	7.0	6.4	7.3
90–120	0.26				3			1.48	1.55	0.02		19.4	9.0		0.15	7.3	6.8	7.5
120–145	0.26				2		NP	1.46	1.52	0.01		21.4	8.6		0.19	7.2	6.8	7.8
145–165	0.25				8			1.54	1.65	0.02		24.2	12.9		0.17	7.2	6.7	7.6

Depth cm	Extractable bases 5B4a: 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations	CEC: 5A1a NH_4OAc	6G1d Ext. Al	3A1b Fine clay <0.0002 mm Pct.	Ratios to clay 8D1: Fine clay	CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0–29	7.1	2.9	tr.	tr.	10.0	6.0	16.0	19.2		6.0	0.32	0.85		0.53			63	52
29–34	6.0	1.3	tr.	tr.	7.3	2.9	10.2	15.1		8.4	0.41	0.50		0.42			72	48
34–47	5.9	2.6	tr.	tr.	8.5	2.9	11.4	14.9		8.7	0.39	0.50		0.40			75	57
47–64	6.0	1.4	tr.	tr.	7.4	2.3	9.7	13.7		9.7	0.41	0.41		0.41			76	54
64–90	6.2	2.8	tr.	tr.	9.0	2.9	11.9	16.3		9.1	0.38	0.50		0.43			76	55
90–120			tr.	tr.				10.0		7.9	0.42			0.47				
120–145			tr.	tr.				8.6		6.9	0.41			0.51				
145–165			tr.	tr.				11.0		9.8	0.33			0.44				

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int.	Qtz.	Kl.	Gibbsite
	7A2 X-ray						7A3	

a/ Value based on single determination.

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

USDA-SCS-HYATTSVILLE, MD. 1969

Pedon classification: Typic Haplaquoll; fine-silty, mixed, mesic
Series classification: (Same)
Soil: Pella*
Soil Nos.: S69MI-58-1 (BSL Nos. 69B549-69B556)
Location: Monroe County, Michigan; NW 1/4, NW 1/4, SE 1/4, Sec. 3, T8S, R8E.
Climate: Average annual precipitation is about 30 inches. Mean annual air temperature is about 49° F., and the mean summer air temperature is about 70° F. Frost-free season is 160-165 days.
Vegetation and land use: Sweet corn. Truck gardening.
Parent material: Stratified lacustrine loams.
Physiography: Lake plain.
Topography: Gradient is less than 1 percent.
Drainage: Poorly drained.
Ground water: At 48 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: R. Larson, G. Earle, and R. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap 549 0 to 29 cm (0 to 11 1/2 inches). Very dark gray (10YR 3/1) loam; weak medium subangular blocky structure; friable; abundant fine roots; slightly acid; abrupt smooth boundary.

A12 550 29 to 34 cm (11 1/2 to 13 1/2 inches). Mottled gray (5Y 5/1) and dark gray (5Y 4/1) silt loam; common medium prominent yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; abundant fine roots; slightly acid; clear wavy boundary.

B21g 551 34 to 47 cm (13 1/2 to 18 1/2 inches). Light olive gray (10YR 6/2) loam; many medium distinct yellowish brown (10YR 5/4-5/8) mottles; moderate coarse subangular blocky structure; friable; few fine roots; slightly acid; clear irregular boundary.

B22g 552 47 to 64 cm (18 1/2 to 25 inches). Mottled light brownish gray (10YR 6/2) and (10YR 5/6) loam; moderate medium angular blocky parting to moderate fine angular blocky structure; firm; few patchy grayish brown (10YR 5/2) clay films on vertical faces; few fine roots; neutral; gradual wavy boundary.

B23g 553 64 to 90 cm (25 to 35 1/2 inches). Light brownish gray (10YR 6/2) loam; moderate medium distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; firm; thin grayish brown (10YR 5/2) silt coatings along vertical faces; few Fe-Mn concretions; few fine roots; neutral; gradual wavy boundary.

B3g 554 90 to 120 cm (35 1/2 to 47 inches). Light brownish gray (10YR 6/2) silt loam; many coarse distinct (10YR 5/6) mottles; weak coarse subangular blocky parting to weak fine subangular blocky structure; friable; grayish brown (10YR 5/2) coatings on 30 percent of vertical faces; few fine roots; slight effervescence; mildly alkaline; clear smooth boundary.

IIC1 555 120 to 145 cm (47 to 57 inches). Mottled light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) silt loam with thin seams of very fine sand and silt; weak thin clayey structure; friable; few fine roots; slight effervescence; mildly alkaline; abrupt smooth boundary.

IIC2 556 145 to 165 cm (57 to 65 inches). Brown (7.5YR 5/4) silty clay loam with thin seams of silt and very fine sand; many medium and coarse distinct light gray (10YR 6/1) mottles; weak thick platy structure; friable; few Fe-Mn concretions; strong effervescence; mildly alkaline.

* This was sampled as Colwood. It was correlated as Pella because less than 15 percent, by weight, of the particles were fine sand or coarser.

1511A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Pewamo taxadjunct SOIL Nos. S68Mich-78-1 LOCATION Shiawassee County, Mich.

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 68B361 - 68B367

Depth (cm)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand Very coarse (2-1)	Sand Coarse (1-0.5)	Sand Medium (0.5-0.25)	Sand Fine (0.25-0.1)	Sand Very fine (0.1-0.05)	Silt (0.05-0.02)	Silt Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<.074 mm	3B2 Cm	Coarse fragments 3B1 2A2 > 2 Pct.	2-19	19-76
		Pct. of < 2 mm															Pct. of < 76mm	
0-28	Ap	27.2	39.0	33.8	0.6	2.1	5.0	11.9	7.6	10.6	28.4	25.1	19.6	77.3	0.99	1	1	0
28-38	B21gt	24.3	39.9	35.8	0.7	1.9	4.4	10.2	7.1	10.8	29.1	23.9	17.2	79.9	0.99	1	1	0
38-58	B22gt	22.4	40.2	37.4	0.5	1.9	4.0	9.4	6.7	11.0	29.2	23.3	15.8	81.6	0.99	1	1	0
58-79	B23gt	23.6	40.1	36.3	0.6	1.9	4.1	9.9	7.1	10.7	29.4	23.7	16.5	80.6	0.99	1	1	0
79-112	B24t	21.9	41.6	36.5	0.4	2.0	4.0	9.2	6.3	10.4	31.2	22.1	15.6	81.9	0.99	1	1	0
112-137	B3	27.2	42.7	30.1	1.4	2.9	4.7	10.8	7.6	11.7	31.0	25.5	19.8	77.4	0.99	2	2	tr.
112-137	a/B3	27.5	41.6	30.9	1.1	2.7	4.8	11.2	7.7	11.3	30.3	25.5	19.8	77.1				
137-152	C	24.7	40.0	35.3	0.8	2.2	4.4	10.3	7.0	10.2	29.8	23.3	17.7	79.5			2	0
137-152	a/C	25.6	36.8	37.6	0.9	2.0	4.8	10.8	7.2	9.4	27.4	23.0	18.5	78.7				

Depth (cm)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N	6G6a C-D A1	6E1e Carbonate as $CaCO_3$ Pct.	6C2b Ext. iron as Fe Pct.	Bulk density g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohm-cm 60°F	4C1 WRD in/in		pH 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-28	2.48	0.24	10	0.10		0.69		1.33	1.53	0.048		27.0	14.0		0.17		5.8	5.9
28-38	0.68	0.10	7	0.09		1.13		1.52	1.77	0.052		24.3	14.2		0.15		6.3	6.5
38-58	0.52			0.12		1.52		1.55	1.79	0.049		23.7	15.1		0.13		6.2	6.5
58-79	0.37			0.13		1.74		1.65	1.85	0.039		21.2	14.5		0.11		6.3	6.7
79-112	0.28			0.15		2.04		1.64	1.82	0.035		21.9	14.8		0.12		6.5	6.9
112-137	0.32			0.12	17	1.46		1.68	1.79	0.021		20.1	12.3		0.13		7.5	7.6
137-152	0.45			0.12	7	1.61							14.9	4000			7.2	7.4

Depth (cm)	Extractable bases 6N2e Ca	6O2d Mg	6P2b Na	5B4a 6Q2b K	Sum	6H2a Ext. acidity	CEC 5A3a Sum cations	5A1a NH_4OAc	6G1e Ext. Al	3A1b Fine clay <.0002	Ratio Fine clay / Total clay	Ratios to clay CEC sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-28	17.7	3.7	0.1	0.4	21.9	6.7	28.6	20.7		9.9	0.29	0.85		0.41	4.8		76	106
28-38	13.5	3.9	0.1	0.3	17.8	2.9	20.7	16.4		15.2	0.42	0.58	0.03	0.40	3.5		86	108
38-58	13.0	4.2	0.1	0.4	17.7	2.5	20.2	16.2		16.2	0.43	0.54	0.04	0.40	3.1		88	109
58-79	12.0	4.2	0.1	0.3	16.6	2.1	18.7	15.3		14.6	0.40	0.52	0.05	0.40	2.8		89	108
79-112	11.0	4.2	0.1	0.3	15.6	1.7	17.3	13.6		13.6	0.37		0.05	0.40	2.6			115
112-137		6.3	0.1	0.2		-		8.0		8.2	0.66		0.05	0.41				
112-137										9.4	0.30		0.04	0.42				
137-152		8.8	0.1	0.2		0.3		10.8		11.8	0.50							
137-152										13.0	0.35							

Depth (cm)	Clay fraction analysis 7A1 <0.002 mm 7A2 X-ray b/c/	7A3 DTA c/ Pct.
0-28	MI3,VR2,KK2,MV2,QZ1	KK15
28-38		
38-58		
58-79	KK3,MI3,MV3,VR2,QZ1	KK25
79-112		
112-137		
137-152	MI3,KK2,VR2,MI1,QZ1	KK20

a/ Carbonates removed.
b/ X-ray notation: 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.
c/ Mineral code: KK = kaolinite, MI = mica, MV = montmorillonite-vermiculite, QZ = quartz, VR = vermiculite.

Pedon classification: Typic Haplaquoll; fine, mixed, mesic
Series classification: Typic Argiaquoll; fine, mixed, mesic
Soil: Pewamo, taxadjunct*
Soil Nos.: S68MI-78-1 (BSL Nos. 68B361-68B367)
Location: Shiawassee County, Michigan; SE 1/4, SE 1/4, SE 1/4, Sec. 9, T7N, R4E.
Climate: Average annual precipitation is about 30 inches. Mean annual air temperature is about 50° F., and the mean summer air temperature is about 69° F. Frost-free season is 150-160 days.
Vegetation and land use: Wheat stubble. Cropland.
Parent material: Clay loam glacial till.
Physiography: Till plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Poorly and very poorly drained.
Ground water: At 53 inches.
Erosion: Slight.
Permeability: Moderately slow.
Described by: R. Johnson, G. Threlkeld, and A. Irvine.

(Colors are for moist soil unless otherwise stated.)

Ap 361 0 to 28 cm (1 to 11 inches). Very dark gray (10YR 3/1) clay loam; moderate medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

B21tg 362 28 to 38 cm (11 to 15 inches). Black (N 2/0) heavy clay loam with common medium distinct olive yellow (2.5Y 6/8) mottles; weak medium angular blocky breaking to fine angular blocky structure; very firm; thin patchy gray (10YR 5/1) clay films on ped faces and in root channels; fine roots are common; slightly acid; clear wavy boundary.

B22tg 363 38 to 59 cm (15 to 23 inches). Gray (N6/0) clay loam, with common coarse prominent light olive brown (2.5Y 5/6) mottles; weak medium prismatic breaking to moderate medium angular blocky structure; very firm; thick gray (10YR 6/1) clay flows in root channels and pores; few fine roots; slightly acid; clear wavy boundary.

B23tg 364 59 to 79 cm (23 to 31 inches). Gray (N 6/0) clay loam, with many coarse prominent yellowish brown (10YR 5/8) mottles; weak medium prismatic breaking to weak medium angular blocky structure; very firm; thick gray (10YR 6/1) clay flows on ped faces and in root channels; few fine roots; neutral; gradual wavy boundary.

B24t 365 79 to 112 cm (31 to 44 inches). Light olive brown (2.5Y 5/6) clay loam with many coarse distinct light gray (N 7/0) and gray (10YR 6/1) mottles; moderate coarse prismatic breaking to medium angular blocky structure; very firm; thick light gray (N 7/0) clay coatings on most ped faces and in root channels; few fine roots; neutral; gradual wavy boundary.

B3 366 112 to 137 cm (44 to 54 inches). Light olive brown (2.5Y 5/6) representing about 60 percent of the matrix and gray (10YR 6/1) representing 40 percent, clay loam; weak coarse angular blocky structure; firm; thin gray (10YR 6/1) clay coatings on vertical ped faces; few fine roots; mildly alkaline; gradual wavy boundary.

C 367 137 to 152 cm (54 to 60 inches). Mottled olive brown (2.5Y 4/4) and gray (N 6/0) clay loam; massive breaking to weak medium angular blocky structure firm; few fine roots; strong effervescence; moderately alkaline.

* This soil was sampled as Pewamo. It is a taxadjunct because it lacks an argillic horizon.

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Granby taxadjunct SOIL Nos. 71Mich-81-2 LOCATION Washtenaw County, Mich.

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 72B81 - 72B86

Depth (cm)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	< .074	3B2 Cm	Coarse fragments 3B1: 2A2 > 2 Pct.	2-20	20-75
		Size class and particle diameter (mm) 3A1															Pct. of < 75 mm	
		Pct. of < 2 mm																
0-28	Ap	87.7	9.3	3.0	0.1	1.9	18.5	61.2	6.0	5.2	4.1	30.4	84.7	13.3			tr.	0
28-43	B21	94.8	3.3	1.9	0.1	2.1	22.3	65.5	4.6	1.0	2.2	29.7	90.0	6.7			tr.	0
43-64	B22g	93.0	4.3	2.6	0.1	1.7	19.4	65.6	6.1	1.6	2.8	34.1	86.9	9.0			tr.	0
64-97	B3g	97.0	1.3	1.7	0.1	3.4	32.8	59.9	0.8	0.4	0.9	13.4	96.1	3.4			0	0
97-109	C1g	96.3	0.3	3.5	0.0	0.7	16.6	76.5	2.4	0.1	0.2	27.8	93.9	4.4			0	0
109-152	C2g	98.0	0.2	1.8	0.0	0.9	19.1	77.3	1.1	0.1	0.1	26.8	97.2	2.0			tr.	0

Depth (cm)	6A1a Organic carbon Pct.	Nitrogen Pct	C/N	Coarse fragments 5-20 % of <75 mm	Carbonate as $CaCO_3$ Pct.	Ext. iron as Fe Pct.	Bulk density: g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.		4C1 WRD in/in	pH: 8C1e (1:2) $CaCl_2$	8C1c (1:1) KCl	8C1a (1:1) H_2O
0-28	1.53			tr.									3.5			5.5	5.4	6.0
28-43	0.12			0									1.0			5.2	5.0	6.1
43-64	0.24			tr.									1.2			5.3	5.0	6.1
64-97	0.03			0									0.7			5.4	5.0	6.2
97-109	0.11			0									1.4			5.6	5.3	6.2
109-152	0.07			0									0.6			5.4	5.3	6.2

Depth (cm)	Extractable bases 5B4a: 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations	5A6 NH_4OAc	6G1d Ext. Al	3A1b Fine clay < .0002 mm	Ratios to clay 8D1: Fine clay	CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-28	4.1	0.7	tr.	0.1	4.9	3.5	8.4	5.1		2.3	0.77	2.80		1.17			58	96
28-43	0.6	0.1	tr.	tr.	0.7	0.9	1.6	0.8		1.6	0.84	0.84		0.53			44	88
43-64	0.8	0.2	tr.	0.1	1.1	1.4	2.5	1.5		1.4	0.54	0.96		0.46			44	73
64-97	0.4	0.1	tr.	tr.	0.5	0.4	0.9	0.6		1.2	0.71	0.53		0.41			56	83
97-109	1.6	0.3	tr.	tr.	1.9	0.9	2.8	1.9		2.2	0.63	0.80		0.40			68	100
109-152	0.7	0.1	tr.	-	0.8	0.4	1.2	0.7		1.2	0.67	0.67		0.33			67	

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int.	Qtz.	Kl.	Gibbsite
	7A2 X-ray						7A3	

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, int. = interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

USDA-SCS-HYATTSVILLE, MD. 1966

Pedon classification: Fluvaquentic Haplaquoll; sandy, mixed, mesic
Series classification: Typic Haplaquoll; sandy, mixed, mesic
Soil: Granby taxadjunct*
Soil Nos.: S71MI-81-2 (BSL Nos. 72B81-72B86)
Location: Washtenaw County, Michigan; 1995 feet west and 635 feet south of the northeast corner of Sec. 36, T4S, R7E.
Climate: Average annual precipitation is about 30 inches. Mean annual air temperature is about 49° F., and the mean summer air temperature is about 70° F. Frost-free season is 160-165 days.
Vegetation and land use: Vegetables. Vegetable production.
Parent material: Sandy glaciofluvium.
Physiography: Lake plain.
Topography: Level. Gradient is 0 percent.
Drainage: Poorly and very poorly drained.
Ground water: 36 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: N. Stroesenreuther.

(Colors are for moist soil unless otherwise stated.)

Ap 81 0 to 28 cm (0 to 11 inches). Very dark gray (10YR 3/1) fine sand, gray (10YR 5/1); moderate medium granular structure; very friable; fine common roots; medium acid; abrupt smooth boundary.

B21 82 28 to 43 cm (11 to 17 inches). Grayish brown (10YR 5/2) fine sand; single grain; loose; fine few roots; slightly acid; gradual wavy boundary.

B22g 83 43 to 64 cm (17 to 25 inches). Grayish brown (10YR 5/2) fine sand; single grain; loose; fine few roots; slightly acid; gradual wavy boundary.

B3g 84 64 to 97 cm (25 to 38 inches). Light gray (10YR 7/2) fine sand; single grain; loose; fine very few roots; slightly acid, clear wavy boundary.

C1g 85 97 to 109 cm (38 to 43 inches). Dark grayish brown (10YR 4/2) fine sand; common medium distinct light brownish gray (10YR 6/2) mottles; single grain; loose, slightly acid, clear wavy boundary.

C2g 86 109 to 152 cm (43 to 60 inches). Light brownish gray (10YR 6/2) fine sand; few fine distinct gray (10YR 5/1) mottles; single grain; loose; slightly acid.

* This was sampled as Granby. It is a taxadjunct because it has an irregular decrease in organic carbon.

1271A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Pella taxadjunct SOIL Nos. S69Mich-81-1 LOCATION Washtenaw County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 69B533 - 69B539, 69B849

Depth cm	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand Very coarse (2-1)	Sand Coarse (1-0.5)	Sand Medium (0.5-0.25)	Sand Fine (0.25-0.1)	Sand Very fine (0.1-0.05)	Silt 0.05-0.02	Silt Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<0.074	3B2 Cm	Coarse fragments 3B1 2A2 > 2 Pct.	2-20	20-75
		Pct. of < 2 mm															Pct. of < 75 mm	
0-30	Ap	35.0	45.9	19.1	0.0	0.2	0.7	12.8	21.3	20.4	25.5	52.2	13.7	77.5	1.00	0	0	0
30-51	B21g	30.4	48.8	20.8	0.0	0.2	0.6	10.0	19.6	20.9	27.9	48.7	10.8	81.3	1.00	0	0	0
51-64	B22g	21.9	56.1	22.0	0.1	0.2	0.8	7.7	13.2	22.6	33.5	41.3	8.7	86.8	1.00	0	0	0
64-89	IIC1g	33.6	56.6	9.8	0.0	0.2	0.4	8.6	24.5	28.8	27.8	60.9	9.1	81.8	1.00	0	0	0
89-114	IIIC2g	8.0	59.0	33.0	0.1	0.1	0.2	2.2	5.5	11.6	47.4	19.0	2.5	95.7	1.00	0	0	0
114-127	IVC3g	21.0	64.7	14.3	0.1	0.3	0.6	5.4	14.6	26.7	38.0	45.4	6.4	88.7	1.00	0	0	0
127-152	VC4g	16.7	64.5	18.8	0.1	0.1	0.3	3.5	12.8	23.5	41.0	39.3	3.9	91.9	1.00	0	0	0
51-63	Krotovina	24.7	54.4	20.9	0.0	0.1	0.4	7.6	16.6	24.0	30.4	46.8	8.1	85.4		0	0	0

Depth cm	6A1a Organic carbon Pct	Nitrogen Pct.	C/N		6E1d Carbonate as $CaCO_3$ Pct.	Ext. iron as Fe Pct.	Bulk density g/cc	4A1d ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohms-cm 60°F	4C1 WRD in/in	pH 8C1e (1:2) $CaCl_2$	8C1c (1:1) KCl	8C1a (1:1) H_2O
0-30	3.55							1.40	1.52	0.03		22.7	12.3		0.15	6.8	6.4	7.2
30-51	1.18							1.46	1.62	0.04		22.0	10.9		0.16	6.9	6.5	7.5
51-64	0.64				4			1.55	1.69	0.03		20.8	10.7	3600	0.16	7.3	6.7	7.6
64-89	0.51				24			1.59	1.66	0.01		17.7	4.9		0.20	7.5	7.2	8.1
89-114	0.78				21			1.66	1.83	0.03		21.6	14.6	2800	0.12	7.5	7.1	7.9
114-127	0.64				28			1.69	1.73	0.01		18.1	6.9		0.19	7.6	7.3	8.0
127-152	0.78				10			1.62	1.74	0.02		22.6	8.4		0.23	7.5	7.3	8.0
51-63	0.89															7.4	6.9	7.6

Depth cm	Extractable bases 5B4a 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC 5A3a Sum cations	5A1a NH_4OAc	6G1d Ext. Al	3A1b Fine clay <0.0002 mm	Ratios to clay 8D1 Fine clay	CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation 5C3 Sum cations	5C1 NH_4OAc
	meq/100 g									Pct.							Pct.	Pct.
0-30	19.0	4.6	tr.	tr.	23.6	3.3	26.9	24.6		9.1	0.48	1.41		0.64			88	96
30-51	15.4	3.2	tr.	tr.	18.6	2.5	21.1	18.5		10.3	0.50	1.01		0.52			88	100
51-64			tr.	tr.				14.1		10.9	0.50			0.49				
64-89			tr.	tr.				5.9		5.0	0.51			0.50				
89-114			tr.	tr.				11.8		12.1	0.37			0.44				
114-127			tr.	tr.				6.1		6.2	0.43			0.48				
127-152			tr.	tr.				5.3		7.5	0.40			0.45				
51-63	15.9	5.6	tr.	tr.	21.5	2.9	24.4	14.3										

Depth cm	a/Clay fraction mineralogy 7A1b, d 7A2 X-ray: Total clay <0.002 mm b/	Fine clay <0.0002 mm b/
0-30	VR4,MI3,VM3,MT2,KK2	MT4,MV2,VM2,MI1,KK1
30-51	VR4,MT4,MI2,VM2,KK1,CL1	MT4,MV2,VM2,MI1,KK1
51-64		
64-89		
89-114		
114-127		
127-152		
51-63		

a/Mineral code
- VR = vermiculite
- MI = mica
- MT = montmorillonite
- KK = kaolinite
- CL = chlorite
- VM = interstratified vermiculite/mica
- MV = interstratified montmorillonite/vermiculite

b/Approximate weight fractions (X-ray)
- 5 = more than half
- 4 = half to one-third
- 3 = one-third to one-fifth
- 2 = one-fifth to one-twentieth
- 1 = less than one-twentieth

Pedon classification: Fluvaquentic Haplaquoll; fine-silty, mixed, mesic
Series classification: Typic Haplaquoll; fine-silty, mixed, mesic
Soil: Pella taxadjunct*
Soil Nos.: 869MI-81-1 (BBL Nos. 69B533-69B539)
Location: Washtenaw County, Michigan; 298 feet west of ditch and 475 feet south of Textile Road in NE 1/4, NE 1/4, NW 1/4 of Sec. 29, T35N, R6E.
Climate: Average annual precipitation is about 30 inches. Mean annual air temperature is about 49° F., and the mean summer air temperature is about 70° F. Frost-free season is 160-165 days.
Vegetation and land use: Soybeans. Cropland.
Parent material: Stratified lacustrine loam.
Physiography: Lake plain.
Topography: Level. Gradient is .5 percent.
Drainage: Poorly drained.
Ground water: Greater than 60 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: N. Stroesenreuther and R. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap 533 0 to 30 cm (0 to 12 inches). Very dark brown (10YR 2/2) loam; moderate medium and fine granular structure; friable; common roots; neutral; abrupt smooth boundary.

B21g 534 30 to 51 cm (12 to 20 inches). Very dark gray (10YR 3/1) and dark grayish brown (10YR 4/2) crushed loam; many fine prominent light reddish brown (5YR 6/4) and common medium prominent gray (5Y 6/1) and common fine distinct yellowish brown (10YR 5/4) mottles; moderate coarse subangular blocky parting to fine angular blocky structure; friable; few roots; mildly alkaline; clear irregular boundary.

B22g 535 51 to 64 cm (20 to 25 inches). Gray (5Y 5/1) silt loam; common medium prominent strong brown (7.5YR 5/6) and few fine prominent yellowish red (5YR 4/6) mottles; moderate medium angular blocky structure; firm; few roots; gray (5YR 6/1) silt coatings on vertical ped faces; mildly alkaline; abrupt smooth boundary.

IIC1g 536 64 to 89 cm (25 to 35 inches). Gray (5Y 6/1) silt loam; few medium prominent strong brown (7.5YR 5/6), brownish yellow (10YR 6/6) and few fine distinct dark gray (5Y 4/1) mottles; medium and fine platy parting to fine subangular blocky structure; friable; very thin (2 to 4 mm) horizontal strata of very fine sand to silt; few roots; slight effervescence; moderately alkaline; abrupt smooth boundary.

IIIC2g 537 89 to 114 cm (35 to 45 inches). Gray (5Y 5/1) silty clay loam; common medium prominent yellowish brown (10YR 5/4), few fine prominent strong brown (7.5YR 5/6) and few fine faint gray (5Y 6/1) mottles; weak coarse prismatic parting to weak coarse subangular blocky structure; very firm; few roots; strong effervescence; moderately alkaline; abrupt smooth boundary.

IVC3g 538 114 to 127 cm (45 to 50 inches). Mottled gray (5Y 5/1) and yellowish brown (10YR 5/4) silt loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak medium platy structure; firm; few thin gray (5Y 5/1) clay films on some vertical ped faces; few dark gray (10YR 4/1) krotovinas; strong effervescence; moderately alkaline; abrupt smooth boundary.

VC4g 539 127 to 152 cm (50 to 60 inches). Gray (5Y 5/1) silt loam with thin (1/16 to 2 inches) thick strata of very fine sand, fine sand and silty clay loam; common medium prominent yellowish brown (10YR 5/4) mottles; massive; friable; strong effervescence; moderately alkaline.

* This was sampled as Colwood. It was correlated as Pella. It is a taxadjunct because of the irregular decrease in organic carbon.

1352A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Pewamo taxadjunct SOIL Nos. S68Mich-19-1 LOCATION Clinton County, Mich.

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 68B338 - 68B345

Depth (cm)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Size class and particle diameter (mm) 3A1 Sand: Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Silt: 0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<.074 mm	3B2 Cm	Coarse fragments 3B1: 2A2 > 2 Pct.	2-19	19-76
		Pct. of < 2 mm															Pct. of < 76mm	
0-18	Ap	12.7	46.5	40.8	0.4	1.1	2.5	5.5	3.2	8.6	37.9	14.9	9.5	89.3	1.00	0	tr.	0
18-33	A12	17.9	39.3	42.8	0.5	1.6	3.7	7.6	4.5	10.2	29.1	18.9	13.4	84.9	0.99	1	1	0
33-53	A3g	17.1	37.6	45.3	0.4	1.6	3.5	7.2	4.4	11.0	26.6	19.3	12.7	85.7	0.99	1	1	0
53-69	B21gt	17.3	39.0	43.7	0.4	1.4	3.5	7.4	4.6	11.5	27.5	20.1	12.7	85.6	1.00	0	tr.	0
69-99	B22gt	19.6	39.6	40.8	0.9	1.7	3.8	8.5	4.7	10.2	29.4	19.6	14.9	83.3	0.98	3	1	2
99-114	B3	18.0	44.4	37.6	1.2	2.0	3.2	7.4	4.2	10.5	33.9	18.9	13.8	84.6	0.99	2	2	0
114-152	C1	16.6	47.9	35.5	1.0	1.8	3.1	6.7	4.0	11.0	36.9	18.9	12.6	85.9	0.97	5	4	1
152-183	C2	14.7	50.5	34.8	0.7	1.6	2.8	6.1	3.5	10.3	40.2	17.3	11.2	87.5			2	0

Depth (cm)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N	6G6a C-D A1	6E1e Carbonate as $CaCO_3$ Pct.	6C2b Ext. iron as Fe Pct.	Bulk density: g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohm-cm 60°F	4C1 WRD cm/cm	pH:	8C1c (1:1) KCl	8C1a (1:1) H_2O
0-18	4.30	0.40	11	0.16		0.84		1.20	1.49	0.075		34.3	18.8		0.19		6.0	6.0
18-33	2.52	0.26	10	0.15		0.56		1.38	1.78	0.088		28.8	16.8		0.17		6.1	6.2
33-53	1.14	0.17	7	0.14		0.43		1.43	1.80	0.079		28.1	17.2		0.15		6.3	6.5
53-69	0.54			0.14		0.97		1.50	1.82	0.067		26.0	19.9		0.14		6.3	6.6
69-99	0.38			0.21		2.03		1.55	1.78	0.046		25.1	17.2		0.12		6.7	6.9
99-114	0.37			0.14	16	1.29		1.77	1.93	0.029		19.0	15.2		0.07		7.1	7.2
114-152	0.40			0.14	23	1.31		1.75	1.91	0.029		19.5	14.5		0.09		7.4	7.4
152-183				0.13	24	1.26							13.5	2000			7.5	7.4

Depth (cm)	Extractable bases 5B4a: 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations	5A1a NH_4OAc	6G1e Ext. Al	3A1b Fine clay <.0002	Ratio: Fine clay / Total clay	Ratios to clay: CEC sum	Ext iron	15-bar water	8D3 Ca/Mg	Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g.																
0-18	24.4	6.2	0.1	0.7	31.4	7.3	38.7	29.9		14.9	0.37	0.95		0.46	3.9	81	105
18-33	24.2	7.4	0.2	0.4	32.2	5.1	37.3	31.2		18.0	0.42	0.87		0.39	3.3	86	103
33-53	22.4	7.9	0.2	0.4	30.9	4.1	35.0	28.7		18.6	0.41	0.77		0.39	2.8	88	108
53-69	19.8	7.7	0.2	0.3	28.0	2.7	30.7	26.2		19.0	0.43	0.70		0.45	2.6	91	107
69-99		10.1	0.2	0.2		1.8		20.7		15.6	0.38	0.80	0.05	0.42	2.0		
99-114		6.4	0.1	0.2		-		14.8		12.2	0.32		0.03	0.40			
114-152		4.5	0.1	0.2		-		10.1		10.0	0.28		0.04	0.41			
152-183		4.9	0.2	0.2		-		8.5					0.04	0.39			

Depth (cm)	Clay fraction analysis 7A1: <0.002 mm 7A2 X-ray a/b	7A3 DTA b/ Pct.
0-18	MI3,MV3,KK3,QZ1	KK20
18-33		
33-53	MI3,MV3,KK3,QZ1	KK25
53-69		
69-99	MI3,MV3,KK3,CL1,QZ1	KK20
99-114		
114-152	MI3,VR3,KK3,MT1,QZ1	KK20
152-183		

a/ X-ray notation: 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.

b/ Mineral code: CL = chlorite, KK = kaolinite, MI = mica, MT = montmorillonite, MV = montmorillonite-vermiculite, QZ = quartz, VR = vermiculite.

Pedon classification: Fluvaquentic Haplaquoll; fine, mixed, mesic
Series classification: Typic Argiaquoll; fine, mixed, mesic
Soil: Pewamo taxadjunct*
Soil Nos.: S68MI-19-1 (BSL Nos. 68B338-68345)
Location: Clinton County, Michigan; NE 1/4, SW 1/4, SE 1/4, Sec. 10, T7N, R4W.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 68° F. Frost-free season is 140-150 days.
Vegetation and land use: Blue grass, timothy. Idle cropland.
Parent material: Clay loam glacial till.
Physiography: Till plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Poorly and very poorly drained.
Ground water: Greater than 72 inches.
Erosion: Slight.
Permeability: Moderately slow.
Described by: R. Johnson and K. Pregitzer.

(Colors are for moist soil unless otherwise stated.)

Ap 338 0 to 18 cm (0 to 7 inches). Very dark gray (10YR 3/1) silty clay; moderate medium granular structure; friable; many fine roots; medium acid; clear smooth boundary.

A12 339 18 to 33 cm (7 to 13 inches). Very dark gray (10YR 3/1) clay; moderate fine angular blocky structure; firm; many fine roots; slightly acid; clear smooth boundary.

A3 340 33 to 53 cm (13 to 21 inches). Very dark gray (N 3/0) clay with few coarse distinct olive brown (2.5Y 4/4) mottles; some peds are dark gray (N 4/0); moderate medium angular blocky breaking to fine angular blocky structure; very firm; few fine roots; slightly acid; clear wavy boundary.

B21tg 341 53 to 69 cm (21 to 27 inches). Dark gray (10YR 4/1) clay with common coarse distinct brown (10YR 5/3) and yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; very firm; gray (10YR 5/1) thick clay films in root channels and on most ped faces; few fine roots; neutral; gradual wavy boundary.

B22tg 342 69 to 99 cm (27 to 39 inches). Gray (10YR 5/1) silty clay with many coarse prominent olive brown (2.5Y 4/4) mottles; moderate coarse angular blocky breaking to medium subangular blocky structure; very firm; thick gray (10YR 5/1) clay films on all ped faces; few fine roots; neutral; gradual wavy boundary.

B3 343 99 to 114 cm (39 to 45 inches). Olive brown (2.5Y 4/4) silty clay loam with many coarse prominent gray (N 5/0) mottles; weak coarse prismatic breaking to weak coarse subangular blocky structure; very firm; thick gray (N 5/0) clay films on vertical and some horizontal ped faces; a few thin accumulations of light gray (N 7/0) secondary carbonates; few fine roots; neutral; interior of peds are weakly calcareous; gradual wavy boundary.

C1 344 114 to 152 cm (45 to 60 inches). Dark grayish brown (2.5Y 4/2) silty clay loam with common coarse distinct gray (N 5/0) mottles; weak coarse prismatic structure; very firm; thick gray (N 6/0) clay films on vertical faces; few thin light gray (N 7/0) secondary carbonate layers; slight effervescence; mildly alkaline; gradual wavy boundary.

C2 345 152 to 183 cm (60 to 72 inches). Grayish brown (10YR 5/2) silty clay loam, with common medium distinct gray (10YR 6/1) and few coarse prominent light olive brown (2.5Y 5/6) mottles; massive; very firm; slight effervescence; mildly alkaline.

* This soil was sampled as Pewamo. It is a taxadjunct because it lacks an argillic horizon and has an irregular decrease in organic carbon.

1515A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Sims Taxadjunct SOIL Nos. S67Mich-18-1 LOCATION Clare County, Mich.

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 67B585 - 67B592

Depth (cm)	Horizon	1B1b Total: Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Sand: Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Silt: 0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<.074 mm	3B2 Cm	Coarse fragments 3B1: 2A2 > 2 Pct.	2-19	19-76
		Size class and particle diameter (mm) 3A1															Pct. of < 76mm	
		Pct. of < 2 mm																
0-15	A11	20.0	34.4	45.6	0.8	2.2	5.3	8.0	3.7	8.3	26.1	16.2	16.3	82.1	1.00	0	tr.	0
15-28	A12	26.6	37.8	35.6	0.6	2.2	5.8	11.5	6.5	9.2	28.6	22.1	20.1	77.1			0	0
28-46	B21g	23.2	38.2	38.6	0.7	2.6	5.7	9.6	4.6	8.2	30.0	17.9	18.6	79.4	0.98	2	2	tr.
46-58	B22g	21.5	38.0	40.5	0.6	2.4	5.3	8.9	4.3	7.6	30.4	16.7	17.2	81.0	0.99	2	2	tr.
58-81	B23g	21.4	38.1	40.5	0.8	2.6	5.2	8.8	4.0	7.3	30.8	16.0	17.4	81.0	0.99	2	2	tr.
81-99	C1g	20.9	38.9	40.2	1.1	2.1	4.9	8.7	4.1	7.8	31.1	16.6	16.8	81.5	0.98	3	2	1
99-119	C2g	20.7	38.9	40.4	1.2	2.3	5.1	8.2	3.9	7.8	31.1	16.1	16.8	81.6	0.99	2	2	tr.
119-152	C3g	21.2	39.1	39.7	0.8	2.4	5.2	8.7	4.1	7.8	31.3	16.6	17.1	81.2	0.98	3	3	0

Depth (cm)	6A1a Organic carbon Pct	6B2a Nitrogen Pct	C/N	Loss on ignition 400°C	6E1e Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density: g/cc	4A1a ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct	8E1 Resistivity ohm-cm 60°F	4C1 WRD in/in	pH:	8C1c (1:1) KCl	8C1a (1:2) H_2O
0-15	11.72	0.52	23	21.8		0.6		0.66	1.07	0.175		64.8	32.2		0.22		6.3	6.5
15-28	6.19	0.30	21		2	0.4							22.7				7.0	7.4
28-46	0.48				24	0.5		2.09	2.49	0.059		18.1	13.0		0.10		7.0	7.9
46-58	0.46				32	0.6		1.78	1.94	0.029		17.8	13.0		0.08		7.2	8.2
58-81	0.37				33	0.7		1.77	1.91	0.025		17.6	13.3		0.08		7.2	8.1
81-99	0.37				33	0.7		1.76	1.89	0.024		17.0	12.9		0.07		7.4	8.1
99-119	0.36				33	0.6		1.74	1.85	0.020		16.9	12.8		0.07		7.3	8.0
119-152	0.39				33	0.6		1.73	1.85	0.022		17.4	12.3	2500	0.09		7.3	8.1

Depth (cm)	Extractable bases 5B4a: 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6N2a Ext. acidity	CEC: 5A3a Sum cations	5A1a NH_4OAc	6G1e Ext. Al		Ratios to clay: CEC sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g.																
0-15	45.9	11.1	0.1	0.4	57.5	22.2	79.7	56.1			1.75	0.01	0.71	4		72	102
15-28	40.8	9.9	0.2	0.2	51.1			42.7				0.01	0.64	4			
28-46			0.1	0.2				13.4				0.01	0.34	5			
46-58			0.1	0.2				9.4				0.02	0.32	8			
58-81			0.1	0.2				8.2				0.02	0.33	9			
81-99			0.1	0.2				7.5				0.02	0.32	8			
99-119			0.1	0.3				6.8				0.02	0.32	9			
119-152			0.1	0.2				6.4				0.02	0.31	8			

Depth (cm)	Clay fraction analysis 7A1: <0.002 mm 7A2 X-ray a/b/	7A3 DTA b/ Pct.	Sand fraction analysis 7A1: 0.05-0.10 mm 7B1 Petrographic b/ Pct.	TW
0-15				
15-28	VM3,CL1,VR2,MI2,QZ1	KK10	QZ66,AR20,FM1,GN 1,FD7,HN4,DL1	15
28-46				
46-58	MI3,CL2,VR2,QZ2	KK5	QZ65,AR11,FD9,HN1,DL14	13
58-81				
81-99	MI3,CL2,VR2,QZ1	KK< 5	QZ61,AR8,FD17,DL14	22
99-119				
119-152				

a/ Relative amounts (X-ray): 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.

b/ Mineral code: AR = aggregates, mostly siliceous materials, CL = chlorite, DL = dolomite, FD = feldspar, FM = ferromagnesian minerals, GN = garnet, HN = hornblende, KK = kaolinite, MI = mica, QZ = quartz, TW = total weatherable minerals, VM = vermiculite-mica, VR = vermiculite.

Pedon classification: Fluvaquentic Haplaquoll; fine, mixed (calcareous), frigid
Series classification: Mollic Haplaquept; fine, mixed, nonacid, frigid
Soil: Sims, taxadjunct*
Soil Nos.: S67MI-18-1 (67B585-67B592)
Location: Clare County, Michigan; NW 1/4, NE 1/4, SE 1/4, Sec. 21, T17N, R4W.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 45° F., and the mean summer air temperature is about 65° F. Frost-free season is 120-130 days.
Vegetation and land use: Elm, ash, soft maple. Woodland.
Parent material: Clay loam glacial till.
Physiography: Till plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Poorly drained.
Ground water: Greater than 60 inches.
Erosion: Slight.
Permeability: Slow.
Described by: N. Stroesenreuther, A. Hyde, E. P. Whiteside.

(Colors are for moist soil unless otherwise stated.)

A11 585 0 to 15 cm (0 to 6 inches). Black (10YR 2/1) clay; weak medium granular structure; friable; slightly acid; abrupt smooth boundary.

A12 586 15 to 28 cm (6 to 11 inches). Very dark gray (10YR 3/1) clay loam; moderate medium subangular blocky structure; friable; mildly alkaline; abrupt wavy boundary. (The lower boundary has an average depth of 9 inches)

B21g 587 28 to 46 cm (11 to 18 inches). Gray (10YR 5/1) representing about 70 percent of the matrix and grayish brown (10YR 5/2) representing 30 percent clay loam; few medium distinct yellowish brown (10YR 5/4) mottles; moderate medium platy structure; very firm; gray (10YR 5/1) on ped faces and in root channels; some very dark gray (10YR 3/1) infiltration on some vertical faces; moderately alkaline with few calcareous pebbles; clear irregular boundary.

B22g 588 46 to 59 cm (18 to 23 inches). Grayish brown (10YR 5/2) representing 60 percent of the matrix and brown (10YR 5/3) representing 40 percent, clay; weak medium platy structure; very firm; gray (10YR 5/1) occurring on ped faces and in root channels; few very dark gray (10YR 3/1) coatings in some root channels; strong effervescence; moderately alkaline; clear wavy boundary.

B23g 589 59 to 81 cm (23 to 32 inches). Grayish brown (10YR 5/2) clay, with many medium distinct yellowish brown (10YR 5/4) mottles; weak coarse platy structure; very firm; gray (10YR 5/1) occurring on ped faces and root channels; strong effervescence; moderately alkaline; clear wavy boundary.

C1g 598 81 to 99 cm (32 to 39 inches). Grayish brown (2.5YR 5/2) clay, with common medium distinct yellowish brown (10YR 5/4) mottles; weak coarse angular blocky structure; firm; gray (10YR 5/1) occurring along root channels and few ped faces; strong effervescence; moderately alkaline; gradual wavy boundary.

C2g 591 99 to 120 cm (39 to 47 inches). Grayish brown (2.5Y 5/2) clay with some yellowish brown (10YR 5/4-5/6) occurring along root channels; massive to weak coarse angular blocky structure; firm; strong effervescence; moderately alkaline; gradual wavy boundary.

C3g 592 120 to 152 cm (47 to 60 inches). Grayish brown (2.5Y 5/2) clay loam with some yellowish brown (10YR 5/4-5/6) occurring along root channels; massive to weak coarse angular blocky structure; firm; strong effervescence; moderately alkaline.

* This soil was sampled as Sims. It is a taxadjunct because it has a mollic epipedon and an irregular decrease in organic carbon.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Locke taxadjunct SOIL No. 871Mich-44-3 LOCATION Lapeer County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. No. 712390 - 712397

	Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1: Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (<0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: Coarse (.05-0.02)	Silt: Fine (0.02-0.002)	Clay: Coarse (0.002-0.0002)	Clay: 3A1h Fine <0.0002	Clay: 3A1a Carbonate <0.002	(0.2-0.02)	(2-0.1)	<0.074	Coarse fragments: 75-20	20-5	5-2
			Pct. of <2mm																Pct. of <75mm		
390	0-23	Ap	45.8	42.6	11.6	2.0	4.7	8.2	17.7	13.2	22.8	19.8		3.2		46.3	32.6	60.9	1	1	1
391	23-33	A&B	42.0	46.3	11.7	2.4	4.0	6.9	15.0	13.7	21.2	25.1		2.7		44.0	28.3	66.0	-	1	1
392	33-41	B&A	34.1	48.3	17.6	2.3	3.6	6.4	14.6	7.1	27.8	20.5		6.9		43.8	27.0	67.2	tr.	2	1
393	41-58	B2t	45.6	32.5	21.9	2.7	4.6	7.7	17.0	13.7	16.2	16.3		9.6		40.3	31.9	61.5	2	3	2
394	58-79	B3	47.1	38.5	14.4	3.0	5.2	7.3	16.2	15.4	17.9	20.6		4.5		43.4	31.7	61.5	-	3	3
395	79-100	C1	46.3	43.0	10.7	5.3	4.9	7.5	17.1	11.5	23.6	19.4		2.6		45.8	34.8	58.8	3	3	3
396	100-142	C2	52.6	36.5	10.9	4.2	6.0	9.4	19.6	13.4	20.5	16.0		4.5		46.0	39.2	53.5	1	7	3
397	142-173	C3	47.5	41.5	10.8	5.0	5.8	9.0	19.0	8.7	24.6	17.1		2.5		45.0	38.8	54.4	2	5	3

	Depth (cm)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.	Dit-cit ext. 6C2b Fe Pct.	Dit-cit ext. 6C7a Al Pct.	4F1 Liquid limit	4F Plasticity index	8H2 Ca	8E1 Resistivity ohms/cm	Bulk density 4A1e 1/3 bar g/cc	Bulk density 4A1h oven dry g/cc	Linear extens. 4D1 LE (whole soil) Pct.	Linear extens. 4D1 LE (<2mm) Pct.	Water content 4B1e 1/3 bar Pct.	Water content 4B2 15 bar Pct.	WRD 4C1 (whole soil) in/in	WRD 4C1 (<2mm) in/in
390	0-23	2.12						0.98		1.52	1.58	1		14.6	6.0	0.13	
391	23-33	0.55						0.99		1.66	1.70	1		14.7	5.0	0.16	
392	33-41	0.42						0.98		1.72	1.76	1		13.5	7.2	0.11	
393	41-58	0.38						0.96		1.64	1.71	1		14.2	9.0	0.08	
394	58-79	0.19						0.96		1.80	1.84	1		12.0	5.9	0.10	
395	79-100	0.31						0.92		1.88	1.92	1		11.6	4.9	0.12	
396	100-142	0.07						0.92		1.84	1.87	-		12.0	4.9	0.12	
397	142-173	0.13						0.93	6,000	1.85	1.90	1		12.5	4.8	0.13	

	Depth (cm)	Extractable bases 5B4a: 6H2e Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	KCl ext. 6G1e Al	CEC 5A3a Sum cations	CEC 5A6 NH_4OAc	Sum bases plus KCl Al	Base saturation 5C3 Sum cations Pct.	Base saturation 5C1 NH_4OAc Pct.	6E1e Carbonate as $CaCO_3$ Pct.	pH 8C1c (1:1) KCl	pH 8C1e (1:2) $CaCl_2$	pH 8C1a (1:1) H_2O	Ratios to total clay:	CEC sum	Fine clay	15-bar water
		meq/100 g										Pct.		Pct.							
390	0-23	9.9	1.8	tr.	0.2	11.9	4.1		16.0	12.6		74	140		5.9	6.3	6.7				
391	23-33	5.8	1.1	tr.	0.1	7.0	2.8		9.8	6.3		71	111	tr.	6.2	6.8	7.2				
392	33-41	8.5	2.2	0.1	0.1	10.9	2.7		13.6	9.3		80	117	1	6.4	7.0	7.4				
393	41-58	11.6	2.7	0.1	0.1	14.5	2.1		16.6	11.5				1	6.7	7.3	7.6				
394	58-79	31.4	1.8	0.1	0.1	33.4				5.7				15	7.3	7.6	8.0				
395	79-100	30.2	1.8	tr.	tr.	32.0				4.0				20	7.4	7.7	8.2				
396	100-142	29.9	-	tr.	tr.	29.9				4.1				20	7.3	7.6	8.2				
397	142-173	31.6	-	tr.	0.1	31.7				3.2				17	7.3	7.6	8.1				

Depth (cm)	Clay fraction analysis 7A1b, d: <0.002 mm 7A2 X-ray a/b/	7A3 DTA Pct.	Sand and silt fraction analysis 7A1: 7A1 Petrographic b/ Pct.	total weath.

a/ Relative amounts (X-ray): 5 = dominant, 4 = abundant, 3 = moderate, 2 = small, 1 = trace.
b/ Mineral code:

Pedon classification: Aquic Argiudoll; fine-loamy, mixed, mesic
Series classification: Aquollic Hapludalf; fine-loamy, mixed, mesic
Soil: Locke taxadjunct*
Soil Nos.: S71MI-44-3 (BSL Nos. 71B390-71B397)
Location: Lapeer County, Michigan; SE 1/4, SW 1/4 of Sec. 27, T6N, R12E.
Climate: Average annual precipitation is about 30 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 70° F. Frost-free season is 150 days.
Vegetation and land use: Alfalfa. Cropland.
Parent material: Sandy loam glacial till.
Physiography: Ground moraine.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat poorly.
Ground water: Greater than 60 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: H. R. Sinclair, Jr.

(Colors are for moist soil unless otherwise stated.)

Ap 390 0 to 23 cm (0 to 9 inches). Very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; cloddy parting to moderate fine and medium granular structure; friable; many fine to coarse roots; 5 percent gravel; neutral; abrupt smooth boundary.

A&B 391 23 to 33 cm (9 to 13 inches). Pale brown (10YR 6/3) loam, white (10YR 8/2) dry (A part) surrounding brown (10YR 4/3) loam peds (B part, 5 percent by volume); moderate thin platy structure; friable; common fine coarse roots; 5 percent gravel, less than 1 percent cobbles; neutral; clear wavy boundary.

B&A 392 33 to 41 cm (13 to 16 inches). Yellowish brown (10YR 5/4) loam (B part) and pale brown (10YR 6/3) loam, white (10YR 8/2) dry (A part) coatings on the surfaces of peds and along root and worm channels; yellowish brown peds have pale brown material typically 2 to 10 mm thick on vertical faces between abutting peds (10 percent by volume), vertical extension is through the horizon; moderate fine and medium subangular blocky structure; friable; common fine to coarse roots; common dark yellowish brown (10YR 4/4) clay films on vertical and horizontal surfaces of peds; black (N 2/0) iron-manganese aggregations; 5 percent gravel, less than 1 percent cobbles; mildly alkaline; clear wavy boundary.

B2t 393 41 to 58 cm (16 to 23 inches). Yellowish brown (10YR 5/4) loam; common medium distinct gray (N 5/0, N 6/0), pinkish gray (10YR 6/2) and few fine faint yellowish brown (10YR 5/6) mottles; weak medium prismatic breaking to moderate fine and medium angular blocky structure; friable; few roots in interiors of peds and common roots on surfaces of peds; common dark brown (7.5YR 4/2) and dark reddish brown (5YR 3/2) clay films on vertical and horizontal surfaces of peds; black (N 2/0) iron-manganese aggregations; 5 percent gravel, less than 1 percent cobbles; mildly alkaline; clear irregular boundary.

B3 394 58 to 79 cm (23 to 31 inches). Yellowish brown (10YR 5/4) loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate to weak thin platy structure; friable; few roots in plates, common roots on surfaces of plates; white (N 8/0) lime coatings on surfaces of peds; black (N 2/0) iron-manganese aggregations; 5 percent gravel, less than 1 percent cobbles; moderately alkaline; slight effervescence; gradual wavy boundary.

C1 395 79 to 100 cm (31 to 39 inches). Yellowish brown (10YR 5/4) loam; few fine distinct strong brown (7.5YR 5/6, 5/8) and yellowish brown (10YR 5/6) mottles; massive parting to weak medium platy structure; friable; very few roots in peds, few roots on surfaces of plates; white (N 8/0) lime coatings on surfaces of peds; 5 percent gravel, 1 percent cobbles; moderately alkaline; strong effervescence; gradual wavy boundary.

C2 396 100 to 142 cm (39 to 56 inches). Brown (10YR 5/3) fine sandy loam; few fine faint yellowish brown (10YR 5/4, 5/6) mottles; massive; friable; very few roots; white (N 8/0) lime coatings; 5 percent gravel; moderately alkaline; strong effervescence; gradual smooth boundary.

C3 397 142 to 173 cm (56 to 68 inches). Brown (10YR 5/3) loam; common fine distinct light brownish gray (10YR 6/2), yellowish brown (10YR 5/8) and strong brown (7.5YR 5/8) mottles; massive; friable; very few roots; 5 percent coarse fragments; moderately alkaline; strong effervescence.

* This is a taxadjunct because of the presence of interfingering and the presence of a mollic epipedon.

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL: Kibbie taxadjunct SOIL Nos. 869Mich-58-2 LOCATION: Monroe County, Michigan

SOIL SURVEY LABORATORY: Beltsville, Maryland LAB. Nos. 69B557 - 69B563

Depth cm	Horizon	1B1b Total: Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Sand: Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Silt: 0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<0.074	3B2 Cm	Coarse fragments 3B1: 2A2 ≥ 2 Pct.	2-20	20-75
		Pct. of < 2 mm														Pct. of < 75 mm		
0-23	Ap	48.6	32.2	19.2	0.2	0.8	2.5	8.2	36.9	18.2	14.0	60.4	11.7	76.5	1.00	0	0	0
23-36	B21t	39.3	27.8	32.9	0.2	0.6	1.5	5.4	31.6	14.1	13.7	49.3	7.7	82.7	1.00	0	0	0
36-54	B22t	42.0	33.9	24.1	0.1	0.3	0.3	1.1	40.2	23.1	10.8	64.1	1.8	95.1	1.00	0	0	0
54-69	IIC1	48.6	38.7	12.7	0.3	0.4	0.7	2.6	44.6	25.9	12.8	72.3	4.0	88.2	1.00	0	0	0
69-94	IIIC2	11.5	71.5	17.0	0.5	0.9	0.6	0.9	8.7	30.1	41.4	39.3	2.8	96.3	1.00	1	1	0
94-132	IIIC3	18.0	61.1	20.9	0.2	0.2	0.4	1.1	16.1	32.5	28.6	49.3	1.9	96.1	1.00	tr.	tr.	0
132-159	IIIC4	17.1	65.5	17.4	0.1	0.3	0.4	1.3	15.0	35.8	29.7	51.6	2.1	96.6	1.00	tr.	tr.	0

Depth cm	6A1a Organic carbon Pct.	Nitrogen Pct.			6E1d Carbonate as $CaCO_3$ Pct.	Liquid Limit Pct.	Plasticity Index Pct.	Bulk density: 4A1d ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: Pct	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	8E1 Resistivity ohms-cm 60°F	4C1 WRD in/in	pH: 8C1e (1:2) $CaCl_2$	8C1c (1:1) KCl	8C1a (1:1) H_2O
0-23	1.16							1.56	1.65	0.02		15.5	8.1		0.12	6.4	5.8	6.7
23-36	0.48							1.60	1.77	0.03		20.3	11.9	2400	0.13	6.1	5.2	6.4
36-54	0.38					26	4	1.54	1.67	0.03		18.0	10.0		0.12	6.4	5.6	6.8
54-69	0.25				10			1.60	1.64	0.01		12.3	6.5	3600	0.09	7.5	7.2	7.9
69-94	0.62				26	22	2	1.53	1.57	0.01		23.3	8.5		0.23	7.7	7.3	8.0
94-132	0.51				19			1.49	1.56	0.02		22.5	9.3		0.20	7.7	7.2	8.0
132-159	0.52				21			1.52	1.48	0.01		22.2	8.3		0.21	7.7	7.2	7.9

Depth cm	Extractable bases 5B4a: 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations	5A1a NH_4OAc	6G1d Ext. Al	3A1b Fine clay <0.0002 mm Pct.	Ratios to clay: Fine clay	CEC Sum	Ext. iron	8D1 15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-23	5.6	2.4	tr.	tr.	8.0	3.3	11.3	13.9		8.0	0.42	0.59		0.42			71	58
23-36	7.4	1.6	tr.	tr.	9.0	2.5	11.5	17.6		15.1	0.46	0.35		0.36			78	51
36-54	5.6	3.1	tr.	tr.	8.7	1.6	10.3	13.9		12.1	0.50	0.43		0.41			84	63
54-69			tr.	tr.				7.3		5.7	0.45			0.51				
69-94			tr.	tr.				8.4		5.5	0.32			0.50				
94-132			tr.	tr.				9.8		6.8	0.33			0.44				
132-159			tr.	tr.				8.6		6.5	0.37			0.48				

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int.	Qtz.	Kl.	Gibbsite
	7A2 X-ray						7A3	

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

USDA-SCS-HYATTSVILLE, MD. 1969

Pedon classification: Aquic Argiudoll; fine-silty, mixed, mesic
Series classification: Aquollic Hapludalf; fine-loamy, mixed, mesic
Soil: Kibbie, taxadjunct*
Soil Nos.: S69MI-58-2 (BSL Nos. 69B557-69B563)
Location: Monroe County, Michigan; NW 1/4, NW 1/4, SE 1/4, Sec. 3, T8S, R8E.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 50° F., and the mean summer air temperature is about 70° F. Frost-free season is 160-170 days.
Vegetation and land use: Sweet corn. Cropland.
Parent material: Lacustrine stratified silts and clays.
Physiography: Lake plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Poorly drained.
Ground water: At 90 inches.
Erosion: Slight.
Permeability: Moderate.
Described by: R. Larson, G. Earle, R. Johnson.

(Colors are for moist soil unless otherwise stated.)

Ap 557 0 to 23 cm (0 to 9 inches). Very dark grayish brown (10YR 3/2), grayish brown (10YR 5/2) dry, loam; weak coarse subangular blocky parting to weak medium granular structure; friable; abundant roots; abrupt smooth boundary.

B21t 558 23 to 36 cm (9 to 14 inches). Brown (10YR 5/3) clay loam; many medium faint yellowish brown (10YR 5/4) and few fine distinct grayish brown (10YR 5/2) mottles; moderate medium angular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) clay films on vertical faces and discontinuous on horizontal faces; abundant roots; clear wavy boundary.

B22t 559 36 to 54 cm (14 to 21 inches). Yellowish brown (10YR 5/4) loam; few fine distinct light brownish gray (10YR 6/2) and many coarse faint brown (10YR 5/3) mottles; moderate medium angular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) clay films on vertical faces and discontinuous on horizontal faces and in root channels; few coarse roots; neutral; clear smooth boundary.

IIC1 560 54 to 69 cm (21 to 27 inches). Light olive brown (2.5Y 5/6) very fine sand 2 to 3 cm thick and grayish brown (10YR 5/2) clay 1/2 to 1 cm thick; common medium distinct light gray (10YR 7/2) and light yellowish brown (10YR 6/4) mottles; weak coarse platy structure; friable; few coarse roots; slight effervescence; moderately alkaline; abrupt smooth boundary.

IIIC2 561 69 to 94 cm (27 to 37 inches). Gray to light gray (10YR 6/1) silt loam with thin 1/4 to 2 cm thick strata of clay and very fine sand; many coarse distinct yellowish brown (10YR 5/6) and common medium prominent olive yellow (2.5Y 6/6) mottles; moderate thick platy structure; friable; few Fe-Mn concretions; strong effervescence; moderately alkaline; abrupt smooth boundary.

IIIC3 562 94 to 132 cm (37 to 52 inches). Light brownish gray (10YR 6/2) silt loam; many medium distinct yellowish brown (10YR 5/4) and (10YR 5/6) and common medium prominent olive yellow (2.5Y 6/6) mottles; weak medium platy structure; friable; few Fe-Mn concretions; strong effervescence; moderately alkaline; abrupt smooth boundary.

IIIC4 563 132 to 159 cm (52 to 62 inches). Yellowish brown (10YR 5/4) silt loam; many medium distinct light brownish gray (10YR 6/2) and light olive brown (2.5Y 5/6) and many medium faint yellowish brown (10YR 5/6) mottles; moderate medium platy structure; friable; few Fe-Mn concretions; strong effervescence; moderately alkaline.

* This was sampled for Kibbie. It is a taxadjunct because less than 15 percent of particles are fine sand or coarser.

1553A

SOIL CLASSIFICATICN- TYPIC HAPLUDOLL
COARSE-SILTY, MIXED, MESIC

SERIES - - - - - - - GAGETOWN

SOIL NC. - - - - - - S75MI-63-1 COUNTY - - - HURON

GENFRAL METHODS- - - 1B1B,2A1,2B

SAMPLE NOS.- 75L103-75L105 AUGUST 1975

REVISED: MARCH 1976

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

DEPTH	HORIZON	(- - - PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - - -																)RATIO
					FINE	(- - - - -	- SAND -	- - - -	- - -	)(- - -	-SILT-	- - -)	FAML	INTR	FINE	NON-	8D1
		SAND	SILT	CLAY	CLAY	VCOS	CORS	MEDS	FNES	VFNS	COSI	FNSI	VFSI	TEXT	II	CLAY	CO3-	15-
		2-	.05-	LT	LT	2-	1-	.5-	.25-	.10-	.05	.02	.005-	SAND	.2-	TO	CLAY	BAR
		.05	.002	.002	.0002	1	.5	.25	.10	.05	.02	.002	.002	2-.1	.02	CLAY		TO
CM		(- - -	- - -	- - -	- - -	- - -	- - -	- PCT	LT 2MM	- - -	- - -	- - -	- - -	- - -	- -)	PCT	PCT	CLAY
000-23	AP	23.2	65.6	11.2		.3	.7	.7	2.0	19.5	40.1	25.5		3.7	61.1		11	.77
023-30	B2	20.7	71.3	8.0		.2	.6	.4	1.9	17.6	48.6	22.7		3.1	67.6		8	.45
030-152	C	16.0	78.1	5.9		.3	.2	.2	1.4	13.5	52.1	26.0		2.1	67.1		6	.47

	0.1-0.074	0.074-0.05
000-23	4.1	15.4
023-30	3.4	14.2
030-152	2.3	11.6

DEPTH	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)(						BULK DENSITY		)(- - - -WATER	CONTENT)				CARBONATE		(- -PH - -)	
	VOL.	(- - - - - - -	WEIGHT - - -	- - -	- - - -)		4A1C	4A1H	4D1	4B1C	4B1C	4B2	4C1	6A1A	6E1B	3A1A	8C1A	8C1E
	GT	GT	75-20	20-5	5-2	LT	20-2	1/3-	OVEN	COLE	1/10	1/3-	15-	WRD	ORGN	LT	LT	1/1	1/2
	2	75				.074	PCT	BAR	DRY		BAR	BAR	BAR	CM/	CARB	2	.002	H2O	CACL
	PCT	PCT	(- - - | PCT LT 75 | - - -)		LT20	G/CC	G/CC		PCT	PCT	PCT	CM	PCT.	PCT	PCT		
000-23		0	0	0	TR	92	TR						8.6		1.20		0	7.3	6.9
023-30		0	0	TR	TR	53	TR						3.6		.27	33	0	8.1	7.6
030-152		0	0	0	TR	96	TR						2.8			42	0	8.1	7.7

Pedon classification: Typic Hapludoll; coarse-silty, mixed, mesic
Series classification: (Same)
Soil: Gagetown
Soil Nos.: S75MI-063-1 (LSL Nos. 75L103-75L105)
Location: Huron County, Michigan; 980 feet north and 210 feet east of the SW corner of Sec. 5, T18N, R13E.
Climate: Average annual precipitation is about 28 inches. Mean annual air temperature is about 48° F., and the mean summer air temperature is about 68° F. Frost-free season is 150-160 days.
Vegetation and land use: Sugar beets. Cropland.
Parent material: Stratified very fine sandy loam and silt loam.
Physiography: Lake plain.
Topography: Nearly level. Gradient is 2 percent.
Drainage: Moderately well drained.
Ground water: Below 60 inches.
Erosion: Slight.
Permeability: Moderate or moderately slow.
Described by: L. Linsemier, E. Cowan, W. Federick, and N. Stroesenreuther.

(Colors are for moist soil unless otherwise stated.)

Ap 103 0 to 23 cm (0 to 9 inches). Very dark grayish brown (10YR 3/2) silt loam; grayish brown (10YR 5/2) dry; weak very thick platy structure separating to weak medium granular structure; friable; many roots; mildly alkaline; clear wavy boundary.

B2 104 23 to 30 cm (9 to 12 inches). Dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure separating to weak very fine subangular blocky structure; friable; common roots; discontinuous, thin, dark brown (10YR 4/3) coatings on faces of some peds; some mixing of Ap material into upper 1 to 2 inches by earthworms; mildly alkaline; clear broken boundary.

C 105 30 to 150 cm (12 to 60 inches). Yellowish brown (10YR 5/4) stratified fine; sand, very fine sand and silt loam; common medium faint pale brown (10YR 6/3) mottles and common medium distinct brownish yellow (10YR 6/6) mottles; weak thin platy structure; very friable; few roots; moderately alkaline; calcareous.

1661A

SOIL CLASSIFICATION-ENTIC HAPLAQUOD
SANDY, SILICEOUS, MESIC
SERIES - - - - - - -PIPESTONE, TAXADJUNCT*

SOIL NO - - - - - - S75MI-21-11 COUNTY - - - BERRIEN

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 760437-760442

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

APRIL 1979

DEPTH CM	HORIZON	SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	COFS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY	NON-CO3-CLAY	RATIO 8D1 15-BAR TO CLAY
		(- - - - - - - - - - - - - - - - PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - - - - - - - - - -																
						(- - - - - SAND - - - - - -)(- - -SILT- - - -)												
		(- PCT LT 2MM -)																
000-018	AP	89.6	7.5	2.9		.5	8.5	42.4	36.3	1.9	2.3	5.2		87.7				
018-031	A2	92.9	6.1	1.0		.4	7.3	41.6	42.0	1.6	1.0	5.1		91.3				
031-045	B21HIR	94.5	4.6	.9		.9	11.3	43.3	36.9	2.1	2.1	2.5		92.4				
045-068	B22IR	97.3	2.2	.5		.6	13.8	56.2	25.5	1.2	.7	1.5		96.1				
068-080	B3	96.9	2.7	.4		.5	10.6	58.4	25.4	2.0	.9	1.8		94.9				
080-110	C	95.5	3.9	.6		.9	8.8	55.0	27.5	3.3	1.2	2.7		92.2				

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)(VOL. GT 2 PCT	GT 75 PCT	(- - - - - - WEIGHT - - - - - - -) 75-20	20-5	5-2	LT .074	20-2 PCT	4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	(BULK DENSITY)(- - - -WATER CONTENT- - - -) 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	(- -PH - -) 8C1A 1/1 H2O	8C1E 1/2 CACL
			(- - - PCT LT 75 - - -)				LT20											
000-018	TR	0	0	0	TR	11	TR	1.36	1.39	.008		21.6	2.9	.26			5.4	4.3
018-031	0	0	0	0	0	8	0						1.0				5.1	4.4
031-045	25	32	0	0	TR	7	TR	1.80	1.83	.006		11.2	2.8	.15			5.1	4.4
045-068	TR	0	0	0	TR	3	TR	1.74	1.79	.010		10.8	1.2	.17			5.1	4.6
068-080	TR	0	0	TR	TR	4	TR	1.63	1.75	.025		8.1	1.0	.12			5.1	4.7
080-110		0	0	TR	1	6	1						.6				5.4	4.7

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(- -EXTRACTABLE BASES 5B4A- -) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(- - - - - - - - - - - -MEQ / 100					G- - - - - - - - - -)								
000-018	1.13	.072	16			1.1	.1	.0	.0	1.2	7.3		8.5	4.9	1.69	11.0	22	14	24
018-031	.15	.011	14			.2	.0	.0	.0	.2	2.4		2.6	1.0	1.00		20	8	20
031-045	.71	.030	24			.2	.0	.0	.0	.2	10.9		11.1	4.7	5.22		4	2	4
045-068	.31	.012	26			TR	.0	.0	.0		4.7		4.7	1.9	3.80				
068-080	.15	.007	21			.1	.0	.0	.0	.1	2.9		3.0	1.3	3.25		8	3	8
080-110	.08	.006	13			TR	.0	.0	.0		2.5		2.5	1.2	2.00				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(- - - - - - - - - SATURATION EXTRACT 8A1- - - - - - - - -) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
								(- - - - - - - - - - MEQ / LITER - - - - - - - - - - -)											
000-018																			
018-031																			
031-045																			
045-068																			
068-080																			
080-110	99000	5.3	22.2			10		.05	.3	.1	.1	TR	0	.0	0	.0			

SPODIC HORIZON IDENTIFICATION BY LABORATORY CRITERIA.

DEPTH	HORIZON	(PYROPHOSPHATE,PH10) 6C5A EXT FE PCT	6G5A EXT AL PCT	6A1B EXT C PCT	(CIT - DIT) 6C2A EXT FE PCT	6G7A EXT AL PCT	(PYROPHOSP) FE+AL / CLAY	AL+C / CLAY	PYRO FE+AL / C - D FE+AL	CEC -1/2 CLAY X THIC
031-45	B21IR	.0	.3		.1	.4	.3		.6	59
045-68	B22IR	.0	.2		.1	.2	.4		.7	37
068-80	B3	.0	.1		.1	.1	.3		.5	13

SAND MINERALOGY (7B1) PLACEMENT:SILICEOUS.
031-045 FNES - RE88 QZ82 CO3 AR2 GN1 FK12 HN.(320 GRAINS COUNTED)
MED - RE93 QZ91 FK8 OP1 HN EP GN (315 GRAINS COUNTED).
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: RE = RESISTANT MINERALS AR = AGGREGATES HN = HORNBLENDE QZ = QUARTZ FK = POTASSIUM FELDSPAR
CD = CHALCEDONY GN = GARNET.

* TAXADJUNCT BECAUSE MINERALOGY IS SILICEOUS AND NOT MIXED.

Pedon classification: Entic Haplaquod; sandy, siliceous, mesic
Series classification: Entic Haplaquod; sandy, mixed, mesic
Soil: Pipestone, taxadjunct*
Soil Nos.: 875MI-021-11 (NSSL Nos. 760437-760442)
Location: Berrien County, Michigan; 1172 feet south and 99 feet west of the northeast corner of Sec. 28, T3S, R18W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 50° F., and the mean summer air temperature is about 68° F. Frost-free season is 160-170 days.
Vegetation and land use: Grass and weeds. Idle cropland.
Parent material: Sand.
Physiography: Outwash plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat poorly drained.
Ground water: At 42 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: N. Stroesenreuther and J. Larson.

(Colors are for moist soil unless otherwise stated.)

Ap 437 0 to 18 cm (0 to 7 inches). Very dark brown (10YR 2/2) sand; moderate medium granular structure; very friable; strongly acid; abrupt smooth boundary.

A2 438 18 to 31 cm (7 to 12 inches). Light brownish gray (10YR 6/2) sand; few fine faint grayish brown (10YR 5/2) mottles; weak medium granular structure; very friable; strongly acid; abrupt irregular boundary.

B21hir 439 31 to 45 cm (12 to 18 inches). Dark reddish brown (5YR 3/3) sand; common medium prominent strong brown (7.5YR 5/6) and dark brown (7.5YR 4/4) mottles; moderate coarse subangular blocky structure; friable; 25 percent ortstein; strongly acid; gradual wavy boundary.

B22ir 440 45 to 68 cm (18 to 27 inches). Yellowish brown (10YR 5/6) sand; common medium prominent dark brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure parting to weak fine granular; very friable; strongly acid; gradual wavy boundary.

B3 441 68 to 80 cm (27 to 32 inches). Yellowish brown (10YR 5/4) sand; common medium prominent yellowish red (5YR 5/6) mottles; single grain; loose; strongly acid; gradual wavy boundary.

C 442 80 to 150 cm (32 to 60 inches). Light brownish gray (10YR 6/2) sand; single grain; loose; strongly acid.

* This was sampled as Pipestone. It is a taxadjunct because the mineralogy class is siliceous.

1253A

(Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Yalmer SOIL No. 866Mich-31-2 LOCATION Houghton County, Michigan

SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 66531 - 66540

Depth (in.)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 ≥ 2 <10 inch. Pct.	2-19	19-76
		Pct. of < 2 mm														Pct. of < 76mm		
1-0	O2															5	5	0
0-5	A2	76.7	20.0	3.3	2.9	9.2	15.8	31.0	17.8	9.3	10.7	45.1	58.9		0.95	10	10	0
5-9	B21hir	74.2	18.6	7.2	2.8	8.2	14.0	30.0	19.2	8.7	9.9	45.9	55.0			7	7	0
9-17	B221r	81.3	14.7	4.0	2.7	8.6	15.2	33.8	21.0	7.9	6.8	49.3	60.3			10	4	6
17-22	B3	84.9	11.8	3.3	2.7	10.2	17.4	34.9	19.7	7.4	4.4	46.4	65.2			10	7	3
22-27	A'21	88.2	9.2	2.6	3.7	11.6	20.2	35.0	17.7	6.0	3.2	42.5	70.5		0.85	21	13	9
27-40	A'22x	83.5	12.6	3.9	2.2	9.6	19.9	34.5	17.3	7.5	5.1	43.8	66.2		0.89	17	8	8
40-48	A'23[a]	78.9	16.2	4.9	2.0	8.2	17.2	32.6	18.9	9.1	7.1	46.9	60.0		0.94	9	6	3
48-66	B'22t[b]	79.5	14.5	6.0	2.1	10.1	18.9	31.7	16.7	7.8	6.7	41.8	62.8		0.96	5	5	1
66-79	B'23t	75.4	13.6	11.0	2.0	9.2	17.8	30.1	16.3	8.6	5.0	41.5	59.1		0.95	8	6	2
79-95	IIC1	85.8	8.8	5.4	1.4	12.3	28.9	34.0	9.2	4.5	4.3	28.1	76.6			6	6	0
95-115	IIIC2	58.4	26.5	15.1	1.6	7.6	14.7	21.4	13.1	11.3	15.2	35.9	45.3			2	2	0
115-122	IVC3	68.9	22.1	9.0	2.8	12.2	19.8	22.8	11.3	10.3	11.8	32.9	57.6			6	6	0

Depth (in.)	6A1a Organic carbon	6B2a Nitrogen	C/N		Carbonate as $CaCO_3$	6C2a Ext. iron as Fe	Bulk density: 4A1e ⅓ bar	4A1h Oven dry	4D1 COLE	Water content: 4B1c 1/10 bar	4B1e ⅓ bar	4B2 15 bar		4C1 WRD		pH: 8C1c (1:1) KCl	8C1e (1:1) H_2O
	Pct.	Pct.			Pct.	Pct.	g/cc	g/cc	g/cc		Pct.	Pct.	Pct.	in/in			
1-0	6.1	0.32	19			0.7						14.1				3.7	4.7
0-5	0.59	0.06	10			0.4		1.33	1.35	0.005	18.1	17.1	2.2	0.19		3.6	4.5
5-9	2.99	0.16	19			2.1							7.9			3.8	5.0
9-17	1.42	0.06	24			0.7							4.6			4.4	5.3
17-22	0.56	0.02	28			0.4							2.1			4.4	5.4
22-27	0.17					0.2		1.76	1.76	0.000	5.4	3.8	1.1	0.04		4.6	5.4
27-40	0.10					0.2		1.64	1.64	0.001	7.3	5.8	1.3	0.07		4.4	5.4
40-48	0.05					0.3		1.78	1.78	0.000	6.8	5.2	1.3	0.06		4.4	5.0
48-66	0.04					0.4		1.84	1.86	0.003	9.7	7.7	1.7	0.10		3.8	5.1
66-79	-					0.5		1.70	1.73	0.005	14.4	11.9	2.9	0.15		4.0	5.0
79-95	0.03					0.3							1.6			3.9	5.3
95-115	0.03					0.7							4.8			4.1	5.5
115-122	0.02					0.5							2.8			4.4	5.7

Depth (in.)	Extractable bases 5B1c: 6H2e Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations		6G1d Ext. Al			Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations	8C1 NH_4OAc
	meq/100 g																Pct.	Pct.
1-0	5.6	1.0	tr.	0.3	6.9	16.3	23.2		0.3								30	
0-5	0.7	0.2	-	tr.	0.9	2.4	3.3		0.5			1.00	0.12	0.67			27	
5-9	1.0	0.4	0.1	0.1	1.6	22.9	24.5		4.2			3.40	0.29	1.10			7	
9-17	0.1	tr.	0.1	-	0.2	13.3	13.5		2.4			3.38	0.18	1.15			1	
17-22	0.2	tr.	tr.	-	0.2	6.7	6.9		1.4			2.09	0.12	0.64			3	
22-27	-	-	tr.	tr.	tr.	2.8	2.8		0.7			1.08	0.08	0.42			tr.	
27-40	-	tr.	tr.	tr.	tr.	2.4	2.4		0.8			0.62	0.05	0.33			tr.	
40-48	tr.	tr.	0.1	tr.	0.1	1.8	1.9		1.2			0.39	0.06	0.27			5	
48-66	0.3	0.1	tr.	tr.	0.4	2.1	2.5		1.2			0.42	0.07	0.28			16	
66-79	1.1	0.4	tr.	tr.	1.5	2.4	3.9		1.2			0.35	0.05	0.26			38	
79-95	0.9	0.3	tr.	tr.	1.2	0.9	2.1		0.4			0.39	0.06	0.30			57	
95-115						1.3			0.3									
115-122						0.7			0.1									

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi	Int.	Qtz.	Kl.	Gibbsite
	7A2 X-ray					7A2		
1-0								
0-5								
5-9								
9-17								
17-22	xxx	x	-	-	-	xx	xx	
22-27								
27-40								
40-48	-	xx	-	tr.	tr.	x	x	
48-66								
66-79	x	xxx	-	x	-	xx	xx	
79-95								
95-115	tr.	xx	-	x	-	x	xx	
115-122	tr.	xx	-	x	-	x	xx	

a Also contains B21t horizon.
b Also contains A'24 horizon.

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

Pedon classification: Alfic Fragiorthod; sandy, mixed, frigid
Series classification: (Same)
Soil: Yalmer
Soil Nos.: S66MI-31-2 (BSL Nos. 66531-66540)
Location: Houghton County, Michigan; SW 1/4, SW 1/4, Sec. 25, T54N, R34W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 42° F., and the mean summer air temperature is about 62° F. Frost-free season is 110-130 days.
Vegetation and land use: Hard maple. Woodland.
Parent material: Sandy loam glacial till.
Physiography: Moraine.
Topography: Gently sloping. Gradient is 3 percent.
Drainage: Moderately well drained.
Ground water: Below 60 inches.
Erosion: Slight.
Permeability: Rapid in the sandy material, slow in the pan and moderate below the pan.
Described by: R. Johnson and E. P. Whiteside.

(Colors are for moist soil unless otherwise stated.)

O2 531 3 to 0 cm (1 to 0 inches). Black (5YR 2/1) well decomposed leaf litter, weak fine granular structure; friable; very strongly acid; abrupt smooth boundary.

A2 532 0 to 13 cm (0 to 5 inches). Gray (5YR 5/1) to dark gray (5YR 4/10) loamy sand; weak medium subangular blocky structure; friable; very strongly acid; abrupt wavy boundary.

B21hir 533 13 to 23 cm (5 to 9 inches). Very dusky red (2.5YR 2/2) representing the primary color and dark reddish brown (5YR 3/3) fine sandy loam; weak coarse granular to weak medium subangular blocky structure; friable with a few weakly cemented chunks; very strongly acid; clear wavy boundary.

B22ir 534 23 to 43 cm (9 to 17 inches). Dark reddish brown (5YR 3/4) to reddish brown (5YR 4/4) loamy sand; weak coarse subangular blocky, breaking to weak coarse granular structure; friable; strongly acid; clear wavy boundary.

B3 535 43 to 55 cm (17 to 22 inches). Reddish brown (5YR 4/3) loamy sand; weak coarse subangular blocky structure, breaking to weak medium granular structure; friable; strongly acid; clear smooth boundary.

A'21 536 55 to 68 cm (22 to 27 inches). Reddish brown (5YR 5/4) loamy sand; weak thick platy to weak fine subangular blocky structure; slightly hard when dry; strongly acid; clear smooth boundary.

A'22x 537 68 to 100 cm (27 to 40 inches). Reddish brown (5YR 5/3) loamy sand; reddish brown (2.5YR 4/4) remnants of Bt horizon with thin clay flows in root channels and in pores; weak thick platy breaking to weak medium platy structure; vesicular; hard and brittle when dry; strongly acid; gradual wavy boundary.

A'23 and B'21t 538 100 to 120 cm (40 to 48 inches). Reddish brown (5YR 5/3) representing A'23 and reddish brown (2.5YR 4/4) representing B'21t portion, loamy sand; weak thick platy structure; friable when moist and slightly brittle when dry; very strongly acid; gradual wavy boundary.

B'22t and A'24 539 120 to 165 cm (48 to 66 inches). Reddish brown (2.5YR 4/4) sandy loam, with heavy coatings of light reddish brown (5YR 6/3) and reddish gray (5YR 5/2) loamy sand; few thin clay flows in pores and vesicular where present; weak thick platy structure; friable; strongly acid; gradual wavy boundary.

B'23t 540 165 to 198 cm (66 to 79 inches). Reddish brown (2.5YR 4/4) fine sandy loam, with clay flows along root channels, in pores, and on ped faces; weak coarse subangular blocky structure; friable; very strongly acid; abrupt smooth boundary.

IIC1 541 198 to 238 cm (79 to 95 inches). Reddish brown (2.5YR 4/4) sandy loam, with a few reddish brown (5YR 5/3) sand lenses; massive in the matrix with single grain lenses; friable matrix with loose lenses; medium acid; abrupt smooth boundary. (Sampled with auger)

IIIC2 542 238 to 288 cm (95 to 115 inches). Reddish brown (2.5YR 4/4) sandy loam, with dark reddish brown (2.5YR 3/4) silty clay loam lenses; massive; friable to firm; medium acid; abrupt smooth boundary. (Sampled with auger)

IVC3 543 288 to 305 cm (115 to 122 inches). Reddish brown (2.5YR 4/4) sandy loam; massive; friable; slightly acid. (Sampled with auger)

1602A

SCS-421
10-64 (Rev. 9-68)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Yalmer SOIL Nos. S66Mich-43-1 LOCATION Lake County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 66544 - 66548

Depth (in.)	Horizon	1B1b Total: Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Sand: Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Silt: 0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 ≥ 2 <76 Pct.	2-19	19-76
		Pct. of < 2 mm														Pct. of < 76mm		
0-4	A1	80.2	14.4	5.4	0.4	7.6	27.7	37.2	7.3	5.9	8.5	29.1	72.9			1	1	0
4-6	A2	81.5	12.9	5.6	0.5	5.6	25.7	41.0	8.7	4.9	8.0	32.6	72.8			1	1	0
6-14	B21r	79.3	14.1	6.6	0.4	7.0	26.5	37.5	7.9	5.4	8.7	29.8	71.4			1	1	0
14-20	A'21	82.0	14.6	3.4	0.5	8.1	28.5	37.8	7.1	5.0	9.6	28.0	74.9			1	1	0
20-34	A'22x	85.1	10.5	4.4	0.5	8.4	29.5	39.8	6.9	4.0	6.5	27.6	78.2			1	1	0

Depth (in.)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N		Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density: g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.		4C1 WRD in/in	pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-4	2.87	0.18	16			0.3							7.8			3.9	4.3
4-6	0.79	0.05	16			0.3							3.2			3.9	4.4
6-14	0.59	0.06	10			0.4							2.9			4.1	5.0
14-20	0.29					0.2							1.6			4.4	5.1
20-34	0.12					0.2							1.2			4.6	5.5

Depth (in.)	Extractable bases 5B1c: 6N2a Ca	6Q2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A3a Sum cations	6G1d Ext. Al			Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water	8U3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																
0-4	3.6	0.6	tr.	0.1	4.3	9.5	13.8	0.6			2.56	0.06	1.44			31	
4-6	1.1	0.2	tr.	tr.	1.3	5.2	6.5	0.9			1.16	0.05	0.57			20	
6-14	0.9	tr.	tr.	tr.	0.9	6.0	6.9	1.3			1.05	0.06	0.44			13	
14-20	0.6	0.1	tr.	tr.	0.7	3.0	3.7	0.7			1.09	0.06	0.47			19	
20-34	0.5	0.1	tr.	tr.	0.6	1.8	2.4	0.5			0.55	0.05	0.27			25	

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int.	Qtz.	Kl.	Gibbsite
	7A2 X-ray						7A2	
0-4								
4-6								
6-14								
14-20								
20-34								

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

Pedon classification: Alfic Fragiorthod; sandy, mixed, frigid
Series classification: (Same)
Soil: Yalmer
Soil Nos.: S66MI-43-1 (BSL Nos. 66544-66548)
Location: Lake County, Michigan; NW 1/4, SE 1/4, Sec. 23, R11W, T20N.
Climate: Average annual precipitation is about 31 inches. Mean annual air temperature is about 46° F., and the mean summer air temperature is about 66° F. Frost-free season is 100-110 days.
Vegetation and land use: Hard maple. Woodland
Parent material: Sandy loam till.
Physiography: Moraine.
Topography: Gently sloping. Gradient is 5 percent.
Drainage: Moderately well.
Ground water: Below 78 inches.
Erosion: Slight.
Permeability: Rapid in the upper sandy layers, slow in the fragipan and moderate below.
Described by: R. Johnson.

(Colors are for moist soil unless otherwise stated.)

A1 544 0 to 10 cm (0 to 4 inches). Very dark gray (10YR 3/1) loamy sand; moderate medium granular structure; friable; very strongly acid; abrupt smooth boundary.

A2 545 10 to 15 cm (4 to 6 inches). Dark gray (10YR 4/1) to dark grayish brown (10YR 4/2) loamy sand; weak medium subangular blocky structure; very friable; traces of A2 horizon; are discernable, however most is mixed possible by earthworm or windthrow; very strongly acid; clear wavy boundary.

B2ir 546 15 to 35 cm (6 to 14 inches). Dark reddish brown (5YR 3/4) loamy sand; weak medium subangular blocky structure; very friable; very strongly acid; clear wavy boundary.

A'21 547 35 to 50 cm (14 to 20 inches). Brown (7.5YR 5/2) loamy sand; weak medium subangular blocky structure; very friable; strongly acid; clear smooth boundary.

A'22x 548 50 to 85 cm (20 to 34 inches). Reddish gray (5YR 5/2) and pinkish gray (5YR 7/2) loamy sand; massive; vesicular; very hard when dry, brittle; very strongly acid; gradual irregular boundary.

B'21t and A'23x 85 to 108 cm (34 to 43 inches). Reddish brown (5YR 4/3) sandy loam, with heavy reddish gray (5YR 5/2) coating around peds and as tongues; thin clay flows in some ped faces and in pores; weak thick platy structure; vesicular; very hard and brittle when dry; very strongly acid; gradual wavy boundary. (Not sampled)

B'22t 108 to 125 cm (43 to 50 inches). Dark reddish brown (5YR 3/4) to reddish brown (5YR 4/4) sandy loam; many thin clay coatings on ped faces and root channels; weak medium subangular blocky structure; firm; medium acid; clear wavy boundary. (Not sampled)

C 125 to 195 cm (50 to 78 inches). Brown (10YR 5/3) to yellowish brown (10YR 5/4) sandy loam; massive; friable; calcareous. (Not sampled)

1665A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL: Munising SOIL Nos. 8662Mich-7-1 LOCATION: Baraga County, Michigan

SOIL SURVEY LABORATORY: Beltsville, Maryland LAB. Nos. 66435 - 66444

Depth (in.)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 ≥ 2 <76 Pct.	2-19 (Pct. of < 76mm)	19-76 (Pct. of < 76mm)
		Pct. of < 2 mm																
0-1	A1	71.6	22.6	5.8	1.7	7.9	23.8	27.6	10.6	9.1	13.5	32.4	61.0			4	3	1
1-9	A2	74.5	21.7	3.8	1.6	7.7	25.0	28.8	11.4	9.9	11.8	34.5	63.1		0.93	12	3	9
9-13	B21hir	66.4	23.0	10.6	0.9	5.6	19.5	26.5	13.9	10.4	12.6	37.7	52.5			8	1	4
13-21	B22ir	69.7	22.5	7.8	1.6	6.2	21.7	27.0	13.2	9.8	12.7	36.2	56.5		0.97	8	4	2
21-29	B3x	84.3	11.3	4.4	2.7	10.3	29.5	31.5	10.3	6.0	5.3	30.5	74.0		0.90	16	9	6
29-40	A'2x	78.1	17.2	4.7	2.4	8.8	26.7	29.6	10.6	7.7	9.5	32.3	67.5		0.94	8	7	1
40-48	B'2x	72.2	15.4	12.4	1.9	7.9	24.8	27.9	9.7	6.6	8.8	29.1	62.5		0.90	14	6	8
48-62	B'22t	71.4	15.5	13.1	2.0	7.8	24.4	27.5	9.7	6.5	9.0	28.7	61.7		0.92	12	4	8
62-82	C1	73.4	16.5	10.1	2.3	8.0	24.8	28.1	10.2	7.4	9.1	30.8	63.2			12	6	6
82-100	C2	74.5	16.9	8.6	3.6	8.4	24.3	27.6	10.6	7.5	9.4	31.2	63.9			13	8	5

Depth (in.)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N		Carbonate as $CaCO_3$ Pct.	6C2a Ext. Iron as Fe Pct.	Bulk density:	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: 4B1c 1/10 bar Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.		4C1 WRD in/in	pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-1	6.6	0.43	15			0.4							16.0			3.7	4.8
1-9	1.21	0.08	15			0.4		1.45	1.45	0.001	13.0	10.2	3.7		0.09	3.4	4.5
9-13	2.55	0.12	21			1.0							8.6			3.9	4.7
13-21	1.74	0.08	22			0.6		1.26	1.26	0.000	20.2	17.9	5.3		0.15	3.9	4.8
21-29	0.23					0.4		1.69	1.69	0.000	7.8	6.0	1.8		0.06	4.1	5.0
29-40	0.18					0.5		1.88	1.88	0.000	8.8	7.0	1.4		0.10	4.0	5.2
40-48	0.03					0.7		1.78	1.82	0.007	12.0	10.9	4.3		0.10	3.4	5.0
48-62	0.03					0.7		1.73	1.76	0.006	12.0	10.7	4.8		0.09	3.6	4.9
62-82	0.02					0.7							3.7			4.0	5.7
82-100						0.6							3.2			3.2	4.1

Depth (in.)	Extractable bases 5B1c: 6H2e Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A8a Sum cations		6G1d Ext. Al			Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water	8G3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-1	6.7	1.3	tr.	0.5	8.5	18.0	26.5		0.3			4.57	0.07	2.76			32	
1-9	1.3	0.3	tr.	0.1	1.7	5.8	7.5		0.9			1.97	0.11	0.97			23	
9-13	1.1	0.3	tr.	0.1	1.5	24.4	25.9		6.1			2.44	0.09	0.81			6	
13-21	0.5	0.2	tr.	tr.	0.7	14.1	14.8		4.0			1.90	0.08	0.68			5	
21-29	0.2	0.2	tr.	tr.	0.4	3.1	3.5		1.2			0.80	0.09	0.41			11	
29-40	0.4	0.3	tr.	tr.	0.7	1.4	2.1		0.7			0.45	0.11	0.30			33	
40-48	1.8	1.1	0.1	0.1	3.1	2.1	5.2		0.8			0.42	0.06	0.35			60	
48-62	2.2	1.2	0.1	0.1	3.6	2.2	5.8		0.8			0.44	0.05	0.37			62	
62-82	2.3	1.1	0.1	0.1	3.6	0.8	4.4		0.2			0.44	0.07	0.37			82	
82-100						0.4			0.1				0.07	0.37				

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt	Chl.	Vm.	Mi.	Int. Vm.-Mi.	Qtz.	Kl.	Gibbsite	
			7A2 X-ray				7A2		
0-1	xxx	x	-	-	-	xx	xx		
1-9									
9-13									
13-21	-	xx	-	tr.	tr.	x	x		
21-29									
29-40	x	xxx	-	x	-	xx	xx		
40-48									
48-62	tr.	xx	-	x	-	x	xx		
62-82	tr.	xx	-	x	-	x	xx		
82-100									

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

USDA SCS-HYATTSVILLE, MD 1966

Pedon classification: Alfic Fragiorthod; coarse-loamy, mixed, frigid
Series classification: (Same)
Soil: Munising
Soil Nos.: S66MI-7-1 (BSL Nos. 66435-66444)
Location: Baraga County, Michigan; SW 1/4, NE 1/4, Sec. 4, T51N, R31W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 42° F., and the mean summer air temperature is about 61° F. Frost-free season is 90-110 days.
Vegetation and land use: Hard maple and yellow birch. Woodland.
Parent material: Sandy loam glacial till.
Physiography: Moraine.
Topography: Gently sloping. Gradient is 5 percent.
Drainage: Moderately well drained.
Ground water: Below 60 inches.
Erosion: Slight.
Permeability: Slow through the pan and moderate through the rest of the pedon.
Described by: R. Johnson and W. P. Whiteside.

(Colors are for moist soil unless otherwise stated.)

A1 435 0 to 2.5 cm (0 to 1 inch). Black (5YR 2/1) fine sandy loam; weak fine granular structure; friable; very strongly acid; abrupt smooth boundary.

A2 436 2.5 to 23 cm (1 to 9 inches). Pinkish gray (5YR 6/2 moist) and light gray to gray (5YR 6/1 dry) loamy sand; massive slightly hard when dry; very strongly acid; abrupt wavy boundary. (Few tongues extend into B21hir.)

B21hir 437 23 to 33 cm (9 to 13 inches). Dark reddish brown (5YR 3/3-3/2 moist) and dark reddish brown (5YR 3/3 dry) fine sandy loam; weak very coarse granular to weak medium subangular blocky structure; friable with strongly cemented tongues; very strongly acid; clear wavy boundary.

B22ir 438 33 to 53 cm (13 to 21 inches). Reddish brown (5YR 4/3 moist) and reddish brown (5YR 4/4 dry) fine sandy loam; weak coarse subangular blocky structure; slightly hard when dry and friable when moist; very strongly acid; clear wavy boundary.

B3x 439 53 to 73 cm (21 to 29 inches). Reddish brown (2.5YR 4/4 moist) and reddish brown (2.5YR 5/4 dry) loamy sand; weak thick platy structure to massive; slightly hard and brittle when dry; very strongly acid; clear wavy boundary.

A2x 440 73 to 100 cm (29 to 40 inches). Pinkish gray (5YR 6/2) loamy sand with reddish brown (2.5YR 4/4) chunks which appear to be remnants of B; massive; vesicular, very hard and compacted when dry; brittle; strongly acid; abrupt irregular boundary.

B21x 441 100 to 120 cm (40 to 48 inches). Reddish brown (2.5YR 4/4) fine sandy loam, with pinkish gray (5YR 6/2) tongues up to 2 inches thick extending down from A'2x; thin clay flows in root channels; massive; vesicular; very hard and brittle when dry; very compacted; very strongly; acid; clear wavy boundary.

B22t 442 120 to 155 cm (48 to 62 inches). Reddish brown (2.5YR 4/4) fine sandy loam with clay flows along verticle ped faces, in root channels and in pores; massive; friable; very strongly acid; gradual wavy boundary.

C1 443 155 to 205 cm (62 to 82 inches). Reddish brown (2.5 YR 4/4) to weak red (2.5YR 4/2) fine sandy loam; massive; friable; medium acid; gradual wavy boundary. (Auger sample)

C2 444 205 to 250 cm (82 to 100 inches). Reddish brown (2.5YR 4/4) to dusky red (10R 3/4) fine sandy loam; massive; friable; very strongaly acid. (Auger sample)

1579A

SCS-42)
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL: Kalkaska SOIL Nos.: S66Mich-7-2 LOCATION: Baraga County, Michigan

SOIL SURVEY LABORATORY: Beltsville, Maryland LAB. Nos.: 66460 - 66466

Depth (in.)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 ≥ 2 <76 Pct.	2-19	19-76
		Size class and particle diameter (mm) 3A1 — Pct. of < 2 mm														Pct. of < 76mm		
0-1	O2 or A1	90.5	7.0	2.5	1.6	16.1	40.3	30.7	1.8	1.9	5.1	12.8	88.7			0	0	0
1-5	A2	93.5	5.5	1.0	0.8	12.7	38.2	38.0	3.8	1.7	3.8	19.8	89.7			tr.	tr.	0
5-10	B211r	93.4	4.6	2.0	1.3	10.4	34.6	42.2	4.9	2.0	2.6	23.2	88.5			tr.	tr.	0
10-18	B221r	97.0	1.4	1.6	0.8	8.9	37.6	45.9	3.8	0.5	0.9	21.6	93.2			tr.	tr.	0
18-31	B3	98.6	0.9	0.5	0.8	9.6	39.4	45.4	3.4	0.5	0.4	20.5	95.2			tr.	tr.	0
31-72	C1	99.0	0.6	0.4	0.4	10.0	48.0	39.2	1.4	0.5	0.1	11.8	97.6			tr.	tr.	0
72-120	11C2	20.5	76.2	1.3	0.1	0.4	1.0	1.8	17.2	54.5	23.7	72.8	3.3			0	0	0

Depth (in.)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N		Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density: 4A3a Field Moist g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: 4B1c 0.05 bar Pct.	4B1c 1/10 bar Pct.	4B2 15 bar Pct.		4C1 WRD in/in	pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-1	6.0	0.26	23			0.2							14.9			3.0	4.2
1-5	0.16	0.01	16			0.2	1.41				10.0	6.5	1.4			3.7	4.4
5-10	0.43	0.02	22			0.5	1.29				9.5	5.9	3.2			4.6	5.3
10-18	0.24					0.4	1.39				7.4	3.4	1.7			4.8	5.5
18-31	0.04					0.2	1.44				4.8	2.3	0.5			5.0	5.6
31-72	-					0.2	1.47				3.2	1.7	0.3			4.7	5.5
72-120						0.6							1.8			4.6	5.6

Depth (in.)	Extractable bases 5B1c: 6H2a Ca	6G2a Mg	6F2b Na	6G2b K	Sum	6H2b Ext. acidity	CEC: 8A3a Sum cations		8Q1d Ext. Al			Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-1	1.1	1.2	tr.	0.4	2.7	22.7	25.4		1.4			10.16	0.08	5.96			11	
1-5	-	0.1	tr.	tr.	0.1	1.4	1.5		0.7			1.50	0.20	1.40			7	
5-10	-	tr.	tr.	0.1	0.1	6.6	6.7		1.0			3.35	0.25	1.60			2	
10-18	-	tr.	tr.	0.1	0.1	3.2	3.3		0.3			2.06	0.25	1.06			3	
18-31	-	tr.	tr.	tr.	tr.	0.8	0.8		0.1			1.60	0.40	1.00			tr.	
31-72	-	tr.	tr.	tr.	tr.	0.4	0.4		0.1			1.00	0.50	0.75			tr.	
72-120						2.1			0.4				0.46	1.38			tr.	

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int.	Qtz.	Kl.	Gibbsite
	7A2 X-ray					7A2		
0-1								
1-5	xx	-	x	tr.	-	xx	x	
5-10								
10-18	-	-	-	-	x	x	-	
18-31								
31-72	-	-	-	-	xx	xx	x	
72-120								

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

USDA-SCS-BEATTSVILLE, MD. 1966

Pedon classification: Typic Haplorthods; sandy, mixed, frigid
Series classification: (Same)
Soil: Kalkaska
Soil Nos.: S66MI-7-2 (BSL Nos. 66460-66466)
Location: Baraga County, Michigan; SW 1/4, NW 1/4, Sec. 8, T49N, R34W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 42° F., and the mean summer air temperature is about 61° F. Frost-free season is 90-110 days.
Vegetation and land use: Oak, large tooth aspen, white birch, red maple, and jack pines. Woodland.
Parent material: Sand.
Physiography: Outwash.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat excessively.
Ground water: Below 120 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: E. P. Whiteside.

(Colors are for moist soil unless otherwise stated.)

O2 or A1 460 0 to 3 cm (0 to 1 inch). Black (10YR 2/1) organic and sand grains; weak medium granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

A2 461 3 to 13 cm (1 to 5 inches). Brown (7.5YR 5/2 moist) and pinkish gray (7.5YR 6/2 dry) sand; weak fine crumb structure; very friable to loose; many fine roots; very strongly acid; abrupt wavy boundary.

B21hir 462 13 to 25 cm (5 to 10 inches). Reddish brown to dark reddish brown (5YR 3/4-4/4) sand; weak medium granular structure; very friable; many fine roots; the upper 1 inch is transitional between A2 and B21ir; neutral; clear wavy boundary.

B22ir 463 25 to 46 cm (10 to 18 inches). Reddish brown (5YR 4/4) sand; weak medium to coarse granular structure; very friable; with occasional cemented nodules; many fine roots; slightly acid; clear wavy boundary.

B3 464 46 to 79 cm (18 to 31 inches). Reddish brown (5YR 4/4-5/4) sand; weak thick platy to weak medium subangular blocky structure; very friable; slightly coherent and brittle; slightly acid, abrupt smooth boundary.

C1 465 79 to 183 cm (31 to 72 inches). Reddish brown (5YR 5/3-5/4) sand; single grain; loose; slightly acid; abrupt smooth boundary.

IIC2 466 183 to 300 cm (72 to 120 inches). Reddish gray (5YR 5/2) and reddish brown (5YR 4/3) stratified very fine sand and silt; massive; laminated; very friable; medium acid. (Auger sample)

1586A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Kalkaska SOIL Nos. S66Mich-24-1 LOCATION Emmet County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 66504 - 66513

Depth (in.)	Horizon	1B1b Total: Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Size class and particle diameter (mm) 3A1 Sand: Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	Silt: 0.05–0.02	Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)		9B2 Cm	Coarse fragments 3B1: 2A2 ≥ 2 <76 Pct.	2 – 19	19 – 76
		Pct. of < 2 mm														Pct. of < 76mm		
2-0	O2															0	0	0
0-9	A2	95.8	3.2	1.0	2.8	33.5	45.2	13.5	0.8	0.6	2.6	4.3	95.0			tr.	tr.	0
9-11	B21h	93.6	3.3	3.1	1.9	25.5	47.5	17.6	1.1	0.7	2.6	6.1	92.5			1	1	0
11-15	B221r	96.1	2.1	1.8	2.2	32.0	46.6	14.5	0.8	0.6	1.5	4.6	95.3			1	1	0
15-23	B231r[a]																	
23-38	B3	98.4	0.7	0.9	0.7	17.9	56.5	22.5	0.8	0.4	0.3	5.5	97.6			tr.	tr.	0
38-75	IIC1	97.7	2.1	0.2	0.2	4.3	24.0	66.7	2.5	1.0	1.1	25.5	95.2			tr.	tr.	0
75-90	IIIC2	78.9	17.2	3.9	0.4	8.5	23.0	27.3	19.7	10.9	6.3	43.7	59.2		1.00	tr.	tr.	0
90-128	IVC3	98.9	0.9	0.2	0.6	22.5	45.6	28.2	2.0	0.3	0.6	10.4	96.9			tr.	tr.	0
9-23	Ortstein	98.6	0.9	0.5	0.6	15.7	63.4	18.5	0.4	0.0	0.9	3.1	98.2		1.00	tr.	tr.	0

Depth (in.)	6A1a Organic carbon	6B2a Nitrogen	C/N		Carbonate as $CaCO_3$	6C2a Ext. iron as Fe	Bulk density: 4A3a Field moist	4A1e ⅓ bar	4A1h Oven dry	4D1 COLE	Water content: 4B1c 1/10 bar	4B1c ⅓ bar	4B2 15 bar	4B1c 0.05 bar	4C1 WRD		pH: 8C1c (1:1)	8C1a (1:1)
	Pct.	Pct.			Pct.	Pct.	g/cc	g/cc	g/cc		Pct.	Pct.	Pct.		in/in		KCl	H_2O
2-0	5.8	0.30	19			0.1							13.87				3.9	4.8
0-9	0.08	0.01	8			0.1	1.44				4.5		1.2	5.4			3.9	4.7
9-11	0.90	0.05	18			0.3	1.36				8.3		2.5	9.5			3.7	4.3
11-15	0.73	0.03	24			0.2							2.6				4.1	4.8
15-23	0.28					0.1	1.31				4.4		1.1	6.2			4.4	5.0
23-38	0.18					0.1							0.5				4.4	5.0
38-75	0.06					0.1	1.36				3.0		0.2	7.0			4.3	5.3
75-90						0.2		1.73	1.73	.000	10.6	7.3	2.3		0.09		4.6	5.5
90-128						0.1							2.1				4.7	5.3
9-23	0.61	0.02	30			0.3		1.66	1.67	.000	7.0	5.3	1.8		0.06		4.5	4.8

Depth (in.)	Extractable bases 5B1c: 6N2e Ca	6O2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 5A8a Sum cations		6G1d Ext. Al			Ratios to clay: CEC Sum	Ext. iron	8D1 15-bar water	8G3 Ca/Mg		Base saturation: 8C3 Sum cations	8C1 NH_4OAc
	mm/100 g.																Pct.	Pct.
2-0	3.4	0.8	tr.	0.3	4.5	14.4	18.9		0.3								24	
0-9	-	tr.	-	-	tr.	0.7	0.7		0.2			0.70	0.10	1.2			tr.	
9-11	0.2	tr.	tr.	-	0.2	10.1	10.3		3.0			3.3	0.10	0.81			2	
11-15	0.1	tr.	tr.	-	0.1	9.1	9.2		2.2			5.1	0.11	1.4			1	
15-23	-	-	tr.	-	tr.	4.0	4.0		0.9								tr.	
23-38	-	tr.	tr.	-	tr.	1.9	1.9		0.5			2.1	0.11	0.56			tr.	
38-75	-	-	tr.	-	tr.	1.0	1.0		0.3			5.0	0.10	1.0			tr.	
75-90						3.3			0.8				0.05	0.59				
90-128						0.4			0.2				0.50	10				
9-23	0.1	tr.	tr.	tr.	0.1	8.3	8.4		1.5			17	0.60	3.6			1	

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm. (7A2)	Mi.	Int. Vm.-mi.	Qtz.	Kl.	Gibbsite	
	X-ray						7A2		
2-0									
0-9	xxx	-	-	tr.	-	tr.	x		
9-11									
11-15									
15-23									
23-38	-	-	-	-	xx	tr.	tr.		
38-75	-	-	-	x	x	x	x		
75-90									
90-128									
9-23									

a Sample not run.

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts. blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

Pedon classification: Typic Haplorthod; sandy, mixed, frigid
Series classification: (Same)
Soil: Kalkaska
Soil Nos.: 866MI-24-1 (BSL Nos. 66504-66513)
Location: Emmet County, Michigan; 1720 feet north and 200 feet west of SE corner of Sec 36, T35N, R4W.
Climate: Average annual precipitation is about 28 inches. Mean annual air temperature is about 44° F., and the mean summer air temperature is about 64° F. Frost-free season is 120-140 days.
Vegetation and land use: Hard maple, black cherry. Woodland.
Parent material: Sand.
Physiography: High lake plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat excessively drained.
Ground water: Below 128 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: S. Alfred and R. Johnson.

(Colors are for moist soil unless otherwise stated.)

O2 504 5 to 0 cm (2 to 0 inches). Black (10YR 2/1) well decomposed leaf litter with a high proportion of mineral soil; weak medium granular structure; very friable; many fine roots; very strongly acid; abrupt smooth boundary.

A2 505 0 to 23 cm (0 to 9 inches). Light brownish gray (10YR 6/2) sand; single grain; loose; few fine roots; very strongly acid; abrupt irregular boundary.

B21h 506 23 to 28 cm (9 to 13 inches). Dark reddish brown (5YR 2/2) sand; weak medium granular structure; massive in chunks; very friable with some strongly cemented chunks of ortstein occurring in the lower part of this horizon and the B22ir, B23ir, and upper B3 horizon; many fine roots occurring in friable portion of the horizon only a few roots penetrate the ortstein chunks; very strongly acid; abrupt irregular boundary.

B22hir 507 28 to 38 cm (13 to 17 inches). Dark brown (7.5YR 3/2) sand; very weak coarse granular to medium subangular blocky structure; massive in chunks; very friable with strongly cemented chunks of ortstein; very strongly acid; clear irregular boundary.

B23ir 508 38 to 58 cm (17 to 23 inches). Brown to dark brown (7.5YR 4/4) sand; very weak coarse to medium granular structure; very friable with a few weakly cemented chunks of ortstein; very strongly acid; clear irregular boundary.

B3 509 58 to 95 (23 to 38 inches). Yellowish brown (10YR 5/4) sand; very weak coarse granular structure; very friable; very strongly acid; gradual wavy boundary.

C1 510 95 to 188 cm (38 to 75 inches). Light yellowish brown (10YR 6/4) sand; single grain; loose; slightly compacted just above IIC2; abrupt smooth boundary.

C2 511 188 to 225 cm (75 to 90 inches). Light yellowish brown (10YR 6/4) sand with dark brown (10YR 4/3) to dark yellowish brown (10YR 4/4) loamy sand bands; single grain matrix with massive vesicular bands; loose with slightly hard and slightly brittle bands; strongly acid; abrupt smooth boundary.

C3 512 225 to 320 cm (90 to 128 inches). Light yellowish brown (10YR 6/4) sand; with a few dark yellowish brown (10YR 4/4) color bands in the upper 10 inches of the horizon; single grain; loose; strongly acid. (Auger sample)

Ortstein 513. The ortstein occurs in columnar chunks extending from the lower part of the B21h horizon into the upper part of the B3 horizon. Approximately 30 percent of the surface area of the pit occupied by the B21h, B22ir, B23ir and B3 consists of ortstein material. Colors are predominantly dark reddish brown (5YR 2/2) and dark brown (7.5YR 3/2) with some brown (7.5YR 5/4) and dark yellowish brown (10YR 4/4) sand; massive; strongly cemented; roots extend 60 inches deep in tongues of B; very strongly acid; abrupt irregular boundary.

1664A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL: Kalkaska SOIL Nos. S66Mich-31-1 LOCATION: Houghton County, Michigan

SOIL SURVEY LABORATORY: Beltsville, Maryland LAB. Nos. 66514 - 66522

Depth (in.)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)		3B2 Cm	2A2 > 2 <76 Pct.	Coarse fragments 3B1: 2 - 19	19 - 76
		Pct. of < 2 mm														Pct. of < 76mm		
0-2	A1	81.8	14.1	4.1	2.0	15.7	30.3	29.0	4.8	4.6	9.5	20.9	77.0				tr.	0
2-8	A2	85.0	12.8	2.2	2.1	16.0	31.9	29.8	5.2	4.9	7.9	21.8	79.8		0.93	12	11	1
8-11	B21hir	81.0	12.2	6.8	2.5	12.8	28.7	31.2	5.8	5.4	6.8	23.8	75.2		0.97	6	6	0
11-17	B22ir	85.1	12.6	2.3	1.6	13.3	30.3	33.0	6.9	6.9	5.7	27.0	78.2			8	8	tr.
17-25	B31	95.9	3.3	0.8	4.3	16.6	32.6	37.0	5.4	1.6	1.7	22.6	90.5			11	9	2
25-33	B32	98.4	1.3	0.3	6.0	26.2	44.8	19.8	1.6	0.7	0.6	8.1	96.8			27	23	4
33-60	C1	99.1	0.7	0.2	2.1	12.8	47.9	34.2	2.1	0.0	0.7	11.3	97.0			9	8	1
60-90	C2	98.6	1.2	0.2	4.4	23.1	39.9	27.6	3.6	0.6	0.6	14.2	95.0			9	8	1
90-110	C3	98.1	1.7	0.2	2.7	15.2	35.9	36.7	7.6	1.1	0.6	25.5	90.5			7	7	0

Depth (in.)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N		Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density: 4A3a Field Moist g/cc	4A1e ⅓ bar g/cc	4A1b Oven dry g/cc	4D1 COLE	Water content: 4B1c 1/10 bar Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	4B1c 0.05 bar	4C1 WRD in/in		pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-2	4.9	0.31	16		-	0.4							15.5				4.8	5.2
2-8	0.57	0.05	11			0.4		1.50	1.50	0.000	7.2	6.8	3.0		0.05		4.1	4.8
8-11	1.56	0.11	14			1.1		1.35	1.36	0.003	7.6	6.9	6.0		0.01		4.1	4.8
11-17	1.25	0.08	16			0.6	1.28				7.5		4.2	9.5			4.5	5.1
17-25	0.36	0.02	18			0.3	1.38				6.2		1.3	9.1			4.7	5.3
25-33	0.18					0.3	1.42				3.0		0.9	5.2			4.7	5.2
33-60	0.13					0.2							0.6				4.4	5.4
60-90						0.2							0.5				4.3	5.2
90-110						0.3							0.5				4.3	5.4

Depth (in.)	Extractable bases 5B1c: 6H2a Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6N2a Ext. acidity	CEC: 5A3a Sum cations		6Q1d Ext. Al			Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water	8D3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g.																	
0-2	7.2	1.3	tr.	0.4	8.9	8.8	17.7		0.1			4.32	0.10	3.78			50	
2-8	1.2	0.2	tr.	0.1	1.5	2.7	4.2		0.3			1.91	0.18	1.36			36	
8-11	1.6	0.3	tr.	0.1	2.0	14.2	16.2		2.4			2.38	0.16	0.88			12	
11-17	0.3	tr.	tr.	tr.	0.3	12.2	12.5		1.9			5.43	0.26	1.83			2	
17-25	0.1	tr.	tr.	-	0.1	4.5	4.6		0.7			5.75	0.38	1.62			2	
25-33	-	-	tr.	tr.	tr.	2.6	2.6		0.5			8.67	1.00	3.00			tr.	
33-60	0.1	-	-	-	0.1	1.8	1.9		0.4			9.50	1.00	3.00			5	
60-90						1.4			0.3				1.00	2.50				
90-110						0.9			0.2				1.50	2.50				

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int.	Qtz.	Kl.	Gibbsite	
	7A2 X-ray						7A2		
0-2									
2-8	xxx	-	-	-	-	x	x		
8-11									
11-17	-	-	-	-	xx	tr.	tr.		
17-25									
25-33									
33-60	-	-	-	-	x	x	tr.		
60-90									
90-110									

Mt. = Montmorillonite, Chl = chlorite, Vm. = Vermiculite, Mi = mica, Int. = interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

Pedon classification: Typic Haplorthod; sandy, mixed, frigid.
Series classification: (Same)
Soil: Kalkaska
Soil Nos.: S66MI-31-1 (BSL Nos. 66514-66522)
Location: Houghton County, Michigan; NW 1/4, SE 1/4, Sec. 7, T53N, R35W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 42° F., and the mean summer air temperature is about 62° F. Frost-free season is 110-130 days.
Vegetation and land use: Cut over hard maple. Woodland.
Parent material: Sand.
Physiography: Outwash plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Somewhat excessively.
Ground water: Below 110 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: R. Johnson, E. P. Whiteside.

(Colors are for moist soil unless otherwise stated.)

A1 514 0 to 5 cm (0 to 2 inches). Black (5YR 2/1) loamy sand; weak fine granular structure; very friable; strongly acid; abrupt smooth boundary.

A2 515 5 to 20 cm (2 to 8 inches). Gray (5YR 5/1) to dark gray (5YR 4/1) moist and light gray (5YR 6/1) dry, loamy sand; weak medium to coarse granular structure; very friable; occasional tongues of A2 extending into Bhir; very strongly acid; abrupt wavy boundary.

B21hir 516 20 to 28 cm (8 to 11 inches). Dark reddish brown (5YR 2/2) loamy sand; weak medium to coarse granular to weak fine subangular blocky structure; very friable; very strongly acid; abrupt wavy boundary.

B22ir 517 28 to 43 cm (11 to 17 inches). Dark reddish brown (5YR 2/2) loamy sand; weak medium to coarse granular to weak fine subangular blocky structure; very friable; very strongly acid; abrupt wavy boundary.

B31 519 43 to 63 cm (17 to 25 inches). Reddish brown (5YR 4/4) to yellowish red (5YR 4/6) sand; weak medium to coarse granular structure; very friable; strongly acid; clear wavy boundary.

B32 519 63 to 83 cm (25 to 33 inches). Reddish brown (5YR 5/4) sand; weak medium to coarse granular structure; very friable; strongly acid; clear smooth boundary.

C1 520 83 to 150 cm (33 to 60 inches). Brown (7.5YR 5/4) sand; weak fine subangular blocky structure to single grain; very friable to loose; strongly acid; abrupt smooth boundary.

C2 521 150 to 225 cm (60 to 90 inches). Brown (7.5YR 5/4) sand with a few thin reddish brown (5YR 5/3) fine sand lenses; single grain; loose; strongly acid; abrupt smooth boundary.

C3 522 225 to 275 cm (90 to 110 inches). Brown (7.5YR 5/4) sand; single grain; loose; strongly acid. (Sampled with auger)

1597A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Kalkaska SOIL Nos. 66Mich-31-3 LOCATION Houghton County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 66523 - 66530

Depth (in.)	Horizon	18Ib Total Sand (2–0.05)	Total Silt (0.05–0.002)	Total Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 > 2 <76 Pct.	2 – 19	19 – 76
		Pct. of < 2 mm														Pct. of < 76mm		
0-1½	A1	86.4	10.1	3.5	2.1	16.6	39.3	25.8	2.6	2.1	8.0	12.6	83.8			tr.	tr.	0
1½-7	A2	91.8	6.1	2.1	0.6	12.1	36.5	38.4	4.2	1.3	4.8	20.2	87.6			1	1	0
7-11	B21h	92.3	4.1	3.6	1.2	10.5	36.3	40.8	3.5	0.9	3.2	20.2	88.8			2	2	0
11-23	B22hir	96.0	2.5	1.5	1.3	9.5	34.3	45.8	5.1	1.1	1.4	24.2	90.9			1	1	0
23-34	B3	96.8	1.7	1.5	0.9	6.5	29.2	55.1	5.1	0.6	1.1	29.4	91.7			1	1	0
34-66	C1	99.4	0.0	0.9	1.3	13.8	43.0	38.7	2.2	0.0	0.0	14.2	97.2			tr.	tr.	0
66-123	C2	99.4	0.0	0.8	2.0	19.7	43.2	32.3	2.0	0.0	0.0	12.2	97.4			1	1	0
7-11	Ortstein	96.6	1.6	1.8	1.2	9.0	32.4	49.1	4.9	0.7	0.9	27.4	91.7		0.99	1	1	0

Depth (in.)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N		Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density 4A3a Field Moist g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content 4B1c 1/10 bar Pct.	4B1c ⅓ bar Pct.	4B2 15 bar Pct.	4B1c 0.05 bar Pct.	4C1 WRD in/in	pH 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-1½	7.0	0.25	28			0.4							19.6			2.9	4.4
1½-7	0.43	0.03	14			0.4	1.40				6.5		2.0	9.9		3.5	4.5
7-11	1.10	0.06	18			0.8	1.24				5.0		3.0			3.8	5.0
11-23	0.74	0.04	18			0.5	1.28				4.8		2.4	8.5		4.1	5.6
23-34	0.43	0.02	22			0.3	1.42				4.3		1.4	7.2		4.2	5.4
34-66	0.11					0.2	1.50				2.1		0.4	3.4		4.1	5.2
66-123						0.2							0.3			4.7	5.4
7-11	0.64	0.03	21			0.5		1.62	1.63	0.001	5.6	4.3	2.8		0.02	4.3	5.2

Depth (in.)	Extractable bases 5B1c: 6H2e Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC 5A8a Sum cations		6G1d Ext. Al			Ratios to clay 6D1: CEC Sum	Ext. iron	15-bar water	8G3 Ca/Mg		Base saturation 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
0-1½	3.0	0.9	0.1	0.3	4.3	19.4	23.7		0.9			6.77	0.11	5.60			18	
1½-7	0.1	tr.	tr.	tr.	0.1	2.4	2.5		0.7			1.19	0.19	0.95			4	
7-11	3.5	0.3	tr.	0.1	3.9	12.1	16.0		3.2			4.44	0.22	0.83			24	
11-23	tr.	tr.	tr.	tr.	tr.	9.2	9.2		1.8			6.13	0.33	1.60			tr.	
23-34						4.6			0.9				0.20	0.93				
34-66	tr.	-	-	tr.	tr.	1.1	1.1		0.3			1.22	0.22	0.44			tr.	
66-123						0.9			0.2				0.25	0.38				
7-11	0.2	tr.	tr.	-	0.2	10.7	10.9		1.4			6.06	0.28	1.56			2	

Depth (in.)	Clay Fraction Analysis 7A1b-j: Mt.	Chl.	Vm.	Mi.	Int. Vm. - Mi.	Qtz.	Kl.	Gibbsite	
	X-ray 7A2					7A2			
0-1½									
1½-7									
7-11									
11-23	-	-	-	-	x	-	-		
23-34									
34-66									
66-123									
7-11									

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

Pedon classification: Typic Haplorthod; sandy, mixed, frigid
Series classification: (Same)
Soil: Kalkaska
Soil Nos.: S66MI-31-3 (BSL Nos. 66523-66530)
Location: Houghton County, Michigan; NW 1/4, NW 1/4, Sec. 2, T54N, R34W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 42° F., and the mean summer air temperature is about 62° F. Frost-free season is 110-130 days.
Vegetation and land use: Red oak, hard maple, ironwood. Woodland.
Parent material: Sand.
Physiography: Moraine.
Topography: Rolling. Gradient is 12 percent.
Drainage: Somewhat excessively.
Ground water: Below 123 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: R. Johnson.

(Colors are for moist soil unless otherwise stated.)

A1 523 0 to 4 cm (0 to 1 1/2 inches). Black (5YR 2/1) loamy sand; weak fine granular structure; very friable; many fine fibrous roots; extremely acid; abrupt smooth boundary.

A2 524 4 to 18 cm (1 1/2 to 7 inches). Gray (5YR 5/1 moist) and light gray to gray (5YR 6/1 dry) sand; weak coarse granular to weak fine subangular blocky structure; very friable; few fine roots; very strongly acid; abrupt irregular boundary.

B21h 525 18 to 28 cm (7 to 11 inches). Dark reddish brown (5YR 2/2) representing 90 percent of the horizon and dark reddish brown (5YR 3/3) representing the other 10 percent, loamy sand; weak coarse subangular blocky structure to massive; very friable with strongly cemented chunks which represent approximately 20 percent of the surface area of the pit sampled and occurring in the lower B21h and B22hir horizons; many fine roots in friable portion; very strongly acid; abrupt irregular boundary.

B22hir 526 28 to 58 cm (11 to 23 inches). Dark reddish brown (5YR 3/4) sand; weak coarse granular to weak fine subangular blocky structure; very friable with some strongly cemented chunks; many fine roots; medium acid; clear irregular boundary.

B3 527 58 to 85 cm (23 to 34 inches). Reddish brown (5YR 5/4 to 2.5YR 5/4) sand; single grain; loose with massive brittle chunks; strongly acid; clear wavy boundary.

C1 528 85 to 165 cm (34 to 66 inches). Reddish brown (5YR 5/4) to brown (7.5YR 5/4) sand with a few 1/8 to 1/4 inch dark reddish brown (5YR 3/4) color bands at 60 to 66 inches; single grain; loose; strongly acid; clear smooth boundary.

C2 529 165 to 308 cm (66 to 123 inches). Brown (7.5YR 5/4) to light brown (7.5YR 6/4) sand; single grain; loose; strongly acid. (Sampled with auger)

Ortstein 530. Ortstein represents approximately 20 percent of the surface area of pit in an area occurring in the lower part of the B21h and B22hir horizons. Colors of the ortstein are the same as those present in the B21h and B22hir horizons in about equal proportions. The chunks are strongly cemented; no roots penetrate the ortstein; reaction is very strongly acid. (Sampled separately)

1600A

CS-421
0-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL: Kalkaska SOIL Nos. S66Mich-67-2 LOCATION: Osceola County, Michigan

SOIL SURVEY LABORATORY: Beltsville, Maryland LAB. Nos. 66566 - 66576

Depth (in.)	Horizon	1B1b Total: Sand (2-0.05)	Silt (0.05-0.002)	Clay (< 0.002)	Sand: Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Silt: 0.05-0.02	Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 > 2 <76 Pct.	2 - 19	19 - 76
		Size class and particle diameter (mm) 3A1 — Pct. of < 2 mm															Pct. of < 76mm	
3-0	A+ & O2															3	3	0
0-4	A21	93.4	5.7	0.9	0.2	9.3	40.5	41.7	1.7	1.9	3.8	14.5	91.7			tr.	tr.	0
4-13	A22	95.7	3.7	0.6	0.2	10.0	44.6	39.8	1.1	1.4	2.3	12.0	94.6			tr.	tr.	0
13-15	B21h	93.5	2.6	3.9	0.2	6.1	37.5	48.6	1.1	0.7	1.9	15.3	92.4			tr.	tr.	0
15-19	B221r	97.5	1.2	1.3	0.6	5.0	36.0	54.8	1.1	0.8	0.4	16.3	96.4			tr.	tr.	0
19-27	B231r	98.6	0.4	1.0	0.3	5.2	35.8	55.0	1.5	0.0	1.2	17.2	97.1			1	1	0
27-37	B3	99.0	0.5	0.5	0.2	6.9	33.9	56.6	1.2	0.0	0.7	17.7	97.8			1	1	0
37-63	C1	99.2	0.2	0.6	0.2	2.7	34.5	60.4	1.4	0.2	0.0	18.8	97.8			tr.	tr.	0
63-86	C2	98.6	0.9	0.5	0.2	4.6	27.4	63.3	3.0	0.0	1.0	26.4	95.6			2	1	1
86-119	C3	99.1	0.7	0.2	0.8	8.6	43.8	44.2	1.3	0.0	1.1	13.7	97.8			2	2	0
	Ortstein	98.2	0.9	0.9	0.5	3.5	34.3	58.4	1.1	0.0	1.3	16.0	97.1			1	1	0

Depth (in.)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N		Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density: 4A3a Field Moist g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: 4B1c 0.05 bar Pct.	4B1c 1/10 bar Pct.	4B2 15 bar Pct.		4C1 WRD in/in	pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
3-0	3.20	0.18	18			0.1							9.5			3.9	4.8
0-4	0.28					0.1	1.35				8.9	6.0	2.2			3.8	4.3
4-13	0.04					0.1	1.41				5.8	3.7	1.3			3.8	4.3
13-15	0.77	0.04	19			0.3	1.27				9.0	6.7	2.6			3.6	4.5
15-19	0.72	0.03	24			0.3	1.10				6.4	6.0	2.4			3.6	4.7
19-27	0.47	0.02	24			0.2	1.27				6.2	3.8	1.7			4.0	5.0
27-37	0.16					0.1	1.34				4.2	2.5	0.6			4.1	5.1
37-63	0.08					0.1	1.46				4.2	1.9	0.4			4.1	5.4
63-86						0.1							0.4			4.2	5.5
86-119						0.1							0.3			4.2	5.5
	0.69	0.02	34			0.2							2.4			4.0	5.5

Depth (in.)	Extractable bases 5B1c: 6H2a Ca	6G2d Mg	6F2b Na	6G2b K	Sum	6H2a Ext. acidity	CEC: 5A8a Sum cations		6G1d Ext. Al			Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water	8G3 Ca/Mg		Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																	
3-0	1.6	0.4	tr.	0.2	2.2	9.3	11.5		0.6								19	
0-4	0.1	tr.	-	tr.	0.1	1.7	1.8		0.4			2.00	0.11	2.44			6	
4-13	-	tr.	0.1	tr.	0.1	0.6	0.7		0.3			1.17	0.17	2.17			14	
13-15	0.2	tr.	tr.	tr.	0.2	10.6	10.8		4.0			2.77	0.08	0.67			2	
15-19	-	tr.	tr.	tr.	tr.	10.2	10.2		2.3			7.85	0.23	0.18			tr.	
19-27	-	-	tr.	tr.	tr.	7.2	7.2		1.3			7.20	0.20	0.17			tr.	
27-37	-	-	-	-	-	2.4	2.4		0.5			4.80	0.20	1.20			-	
37-63	-	-	-	-	-	1.3	1.3		0.2			2.17	0.17	0.67			-	
63-86						1.4			0.3				0.20	0.80				
86-119						0.7			0.1				0.50	1.50				
	0.1	tr.	-	-	0.1	12.8	12.9		2.1			14.33	0.22	2.67			1	

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int. Vm. - Mi.	Qtz.	Kl.	Gibbsite	
	7A2 X-ray						7A2		
3-0									
0-4									
4-13									
13-15	-	-	-	-	xx	-	tr.		
15-19									
19-27									
27-37									
37-63									
63-86									
86-119									

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected.
tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

USDA-SCS-BEALTSVILLE, MD. 1966

Pedon classification: Typic Haplorthod; sandy, mixed, frigid
Series classification: (Same)
Soil: Kalkaska
Soil Nos.: S66MI-67-2 (BSL Nos. 66566-66576)
Location: Osceola County, Michigan; SE 1/4, SE 1/4, NE 1/4, Sec. 10, R10W, T20N.
Climate: Average annual precipitation is about 29 inches. Mean annual air temperature is about 45° F., and the mean summer air temperature is about 64° F. Frost-free season is 100-120 days.
Vegetation and land use: Red maple, aspen and bracken fern. Woodland.
Parent material: Sand.
Physiography: Moraine.
Topography: Gently sloping. Gradient is 3 percent.
Drainage: Well drained.
Ground water: Below 119 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: H. Weber and R. Johnson.

(Colors are for moist soil unless otherwise stated.)

A plus 566 8 to 3 cm (3 to 1 inches). Very dark gray (10YR 3/1) when crushed, sand; appears as a mixture of black (N 2/0) and light gray (10YR 6/1) imparting a salt and pepper effect; single grain; loose; very strongly acid; abrupt smooth boundary.

O2 566 3 to 0 cm (1 to 0 inches). Black (N 2/0) well decomposed leaf litter; moderate medium granular structure; very friable; many fibrous roots; extremely acid; clear smooth boundary.

A21 567 0 to 10 cm (0 to 4 inches). Grayish brown (10YR 5/2) sand; very weak medium granular structure; very friable; few fibrous roots; extremely acid; abrupt irregular boundary.

A22 568 10 to 33 cm (4 to 13 inches). Light gray to gray (10YR 6/1) when moist, and light gray (10YR 7/1) when dry, sand; very weak coarse to medium granular structure; very friable; extremely acid; abrupt irregular boundary.

B21h 569 33 to 38 cm (13 to 15 inches). Dark reddish brown (5YR 2/2-3/2) fine sand; weak coarse to medium subangular blocky structure to massive in spots; very friable; weakly cemented in spots; many fibrous roots; no roots in cemented chunks; very strongly acid; abrupt irregular boundary.

B22hir 570 38 to 48 cm (15 to 19 inches). Dark reddish brown (5YR 3/3-3/4) fine sand with patches of reddish brown (5YR 4/4) weak coarse subangular blocky structure to massive in spots; very friable to strongly cemented in spots; few roots; very strongly acid; clear irregular boundary.

B23ir 571 48 to 68 cm (19 to 27 inches). Dark yellowish brown (10YR 4/4) to brown or dark brown (7.5YR 4/4) representing 90 percent of the color, dark brown (10YR 3/3) representing the other 10 percent, fine sand; weak coarse subangular blocky structure to massive in spots; very friable to strongly cemented chunks; very strongly acid; clear irregular boundary.

B3 572 68 to 93 cm (27 to 37 inches). Yellowish brown (10YR 5/4) fine sand with few dark yellowish brown (10YR 4/4) concretions; weak coarse granular structure; very friable; strongly acid; clear wavy boundary.

C1 573 93 to 158 cm (37 to 63 inches). Light yellowish brown (10YR 6/4) to very pale brown (10YR 7/4) fine sand; single grain; loose; strongly acid; gradual wavy boundary.

C2 574 158 to 215 cm (63 to 86 inches). Light yellowish brown (10YR 6/4) fine sand with a few 1/4 inch yellowish brown (10YR 5/6) color bands of light loamy sand in the lower 10 inches of the horizon; single grain; loose; bands are coherent and very friable; strongly acid; gradual wavy boundary.

C3 575 215 to 298 cm (86 to 119 inches). Light yellowish brown (10YR 6/4) fine sand; single grain; loose; strongly acid.

Ortstein 576. Occurs in lower part of B21h and in the B22ir horizons in the form of chunks. The ortstein represents approximately 10 percent of the surface area of the pit occupied by these horizons. The color of the cemented chunks includes those of the B21h, B22ir, and B23ir horizons in about equal proportions. The chunks are strongly cemented.

1660A

SCS-421
10-64 (Rev. 9-66)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Rubicon SOIL Nos. 866Mich-2-1 LOCATION Alger County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 66425 - 66434

Depth (in.)	Horizon	1B1b Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: (0.05-0.02)	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)		3B2 Cm	Coarse fragments 3B1: 2A2 ≥ 2 <76 Pct.	2-19 (Pct. of < 76mm)	19-76 (Pct. of < 76mm)
		Pct. of < 2 mm																
0-1½	A1	90.3	4.8	4.9	1.1	23.9	36.5	25.7	3.1	2.6	2.2	14.9	87.2			tr.	tr.	0
1½-4	A2	92.7	5.1	2.2	1.5	22.5	36.9	28.4	3.4	2.0	3.1	15.8	89.3			tr.	tr.	0
4-9	B21ir	90.5	5.8	3.7	2.2	19.4	34.1	31.1	3.7	2.6	3.2	17.4	86.8			4	4	0
9-14	B221r	95.8	2.1	2.1	1.9	20.9	38.0	32.0	3.0	1.2	0.9	15.7	92.8			7	6	1
14-21	B31	98.3	0.6	1.1	4.3	24.6	40.1	26.3	3.0	0.5	0.1	13.0	95.3			7	7	tr.
21-27	B32	98.0	1.1	0.9	2.6	15.9	39.3	34.1	6.1	1.1	0.0	19.5	91.9			3	3	0
27-40	C1	99.1	0.3	0.6	2.5	23.8	41.8	29.1	1.9	0.3	0.0	11.6	97.2			6	6	0
40-65	C2	99.1	0.3	0.6	4.1	29.2	41.7	22.1	2.0	0.3	0.0	9.2	97.1			15	15	5
65-102	C3	99.1	0.3	0.6	0.9	13.6	42.9	38.1	3.6	0.3	0.0	16.9	95.5			3	2	1
9-27	Ortstein	97.8	1.3	0.9	3.6	24.6	39.8	25.5	4.3	1.0	0.3	15.3	93.5		0.98	4	4	0

Depth (in.)	6A1a Organic carbon Pct.	6B2a Nitrogen Pct.	C/N		Carbonate as $CaCO_3$ Pct.	6C2a Ext. iron as Fe Pct.	Bulk density: g/cc	4A1e ⅓ bar g/cc	4A1h Oven dry g/cc	4D1 COLE	Water content: 4B1c 1/10 bar Pct.	4B1e ⅓ bar Pct.	4B2 15 bar Pct.		4C1 WRD in/in	pH: 8C1c (1:1) KCl	8C1a (1:1) H_2O
0-1½	2.88	0.09	32			0.2							5.8			3.6	4.9
1½-4	0.47	0.02	24			0.1							2.3			3.5	4.6
4-9	0.88	0.04	22			0.5							4.1			4.3	5.4
9-14	0.22					0.2							1.9			4.7	5.7
14-21	0.08					0.1							0.8			4.9	5.8
21-27	0.06					0.2							0.6			4.6	5.6
27-40	0.04					0.1							0.4			4.8	5.4
40-65	0.04					0.1							0.2			4.7	5.5
65-102						0.1							0.3			4.7	5.5
9-27	0.19					0.2		1.62	1.62	0.000	5.2	4.6	1.0		0.06	4.3	5.4

Depth (in.)	Extractable bases 5B1c: 6H2a Ca	6G2d Mg	6P2b Na	6Q2b K	Sum	6H2a Ext. acidity	CEC: 6A1e Sum cations		6G1d Ext. Al			Ratios to clay 8D1: CEC Sum	Ext. iron	15-bar water	8G3 Ca/Mg		Base saturation: 5C3 Sum cations Pct	5C1 NH_4OAc Pct.
	meq/100 g																	
0-1½	1.9	0.3	tr.	0.1	2.3	9.1	11.4		0.6			2.33	0.04	1.18			20	
1½-4	0.4	0.1	tr.	tr.	0.5	2.7	3.2		0.7			1.45	0.05	1.05			16	
4-9	0.2	0.1	-	tr.	0.3	9.7	10.0		1.4			2.70	0.14	1.11			3	
9-14	-	tr.	tr.	tr.	tr.	3.2	3.2		0.4			1.52	0.10	0.90			tr.	
14-21	-	tr.	tr.	tr.	tr.	1.3	1.3		0.2			1.18	0.09	0.73			tr.	
21-27	-	tr.	tr.	tr.	tr.	1.0	1.0		0.2			1.11	0.22	0.67			tr.	
27-40	-	tr.	tr.	tr.	tr.	0.7	0.7		0.2			1.17	0.17	0.67			tr.	
40-65	-	-	tr.	tr.	tr.	0.4	0.4		0.1			0.67	0.17	0.33			tr.	
65-102						0.4	0.4		0.1			0.67	0.17	0.50				
9-27	-	-	tr.	tr.	tr.	3.9	3.9		0.5			4.33	0.22	1.11			tr.	

Depth (in.)	Clay Fraction Analysis 7A1b-d: Mt.	Chl.	Vm.	Mi.	Int.	Qtz.	Kl.	Gibbsite
	7A2 X-ray						7A2	
0-1½								
1½-4								
4-9								
9-14								
14-21								
21-27								
27-40								
40-65								
65-102								
9-27								

Mt. = Montmorillonite, Chl. = chlorite, Vm. = Vermiculite, mi = mica, Int. = Interstratified layer, Qtz. = quartz, Kl. = Kaolinite

Relative amounts: blank = not determined, dash = not detected, tr. = trace, x = small, xx = moderate, xxx = abundant, xxxx = dominant.

Pedon classification: Entic Haplorthod; sandy, mixed, firgid
Series classification: (Same)
Soil: Rubicon
Soil Nos.: S66MI-2-1 (BSL Nos. 66425-66434)
Location: Alger County, Michigan; NE 1/4, NE 1/4, Sec. 1, T45N, R19W.
Climate: Average annual precipitation is about 33 inches. Mean annual air temperature is about 43° F., and the mean summer air temperature is about 63° F. Frost-free season is 120-130 days.
Vegetation and land use: Redpine, aspen, bracken fern. Woodland.
Parent material: Sand.
Physiography: Outwash plain.
Topography: Nearly level. Gradient is 1 percent.
Drainage: Excessively drained.
Ground water: Below 102 inches.
Erosion: Slight.
Permeability: Very Rapid.
Described by: E. P. Whiteside and R. Johnson.

(Colors are for moist soil unless otherwise stated.)

AL 425 0 to 4 cm (0 to 1 1/2 inches). Dark gray (10YR 4/1 dry) and black (10YR 2/1 moist) sand; weak fine granular structure; very friable; very strongly acid; abrupt smooth boundary.

A2 426 4 to 10 cm (1 1/2 to 4 inches). Light brownish gray (10YR 6/2 dry) and brown to dark brown (7.5YR 5/2-4/2) moist sand; weak coarse granular to weak medium subangular blocky structure; very friable; very strongly acid; abrupt wavy boundary.

B21ir 427 10 to 23 cm (4 to 9 inches). Brown (7.5YR 5/4 dry) and reddish brown to dark reddish brown (5YR 4/4-3/4 moist) sand; weak coarse subangular blocky structure; very friable; strongly acid; gradual smooth boundary.

B22ir 428 23 to 35 cm (9 to 14 inches). Brown to strong brown (7.5YR 5/4-5/6 dry) and brown to dark brown (7.5YR 4/5 moist) sand; weak coarse granular to weak medium subangular blocky structure; very friable; few chunks of weak to strongly cemented ortstein; medium acid; gradual smooth boundary.

B31 429 35 to 53 cm (14 to 21 inches). Strong brown to reddish yellow (7.5YR 5/6-6/6 dry) and brown (7.5YR 5/4 moist) sand; single grain; loose; few massive chunks of weakly to strongly cemented ortstien; medium acid; abrupt smooth boundary.

B32 430 53 to 69 cm (21 to 27 inches). Brown (7.5YR 5/4) sand; single grain; loose; few massive chunks of weakly to strongly cemented ortstien; strongly acid; abrupt smooth boundary.

C1 431 69 to 101 cm (27 to 40 inches). Light brown (7.5YR 6/4) sand; single grain; loose; strongly acid; abrupt smooth boundary.

C2 432 101 to 165 cm (40 to 65 inches). Light brown (7.5YR 6/4) sand with small proportion of coarse sand and fine gravel; single grain; loose; strongly acid; abrupt smooth boundary.

C3 433 165 to 255 cm (65 to 102 inches). Light brown (7.5YR 6/4) to light yellowish brown (10YR 6/4) sand; single grain; loose; strongly acid. (Auger sample)

Ortstein* 434 23 to 68 cm (9 to 27 inches). Brown to dark brown (7.5YR 4/4) and dark reddish brown (5YR 3/2) in approximately equal proportions, sand; massive; weakly to strongly cemented; chunks or tongues are 1 1/2 to 3 inches wide and 10 to 19 inches thick; roots follow outside of ortstein tongues; however only few penetrate the mass; strongly acid.

* Occurs in lower part of B22ir, B31 and upper part of B32 horizons. Represents approximately 10 percent of surface area sampled.

1577A

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Covert SOIL Nos. S73Mich-80-2(1-2) LOCATION Van Buren County, Michigan

SOIL SURVEY LABORATORY Beltsville, Maryland LAB. Nos. 73B419 - 73B420

Depth (cm)	Horizon	Size class and particle diameter (mm) 3A1: Total Sand 2-0.05	Total Silt (0.05-0.002)	Total Clay (<0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: Coarse (.05-0.02)	Silt: Fine (0.02-0.002)	Clay: Coarse (0.002-0.0002)	Clay: 3A1b Fine 0.0002	Clay: 3A1c Carbonate <0.002	(0.2-0.02)	(2-0.1)	<0.074	Coarse fragments 75-20	20-5	5-2
		Pct. of <2mm																Pct. of <75mm		
30-56	B1hir	95.2	2.1	2.7																
56-69	B2hir	94.4	2.8	2.8																

Depth (cm)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.		Dit-cit ext. 6C2b Fe Pct.	6G7a Al Pct.	Na pyrophosphate ext. 6C5a Fe Pct.	6G5a Al Pct.	6C5 C Pct.	Pyro. Fe+Al / C.D. Fe+Al	4F Plasticity index	3B2 Cm		Bulk density 4A1e 1/3 bar g/cc	4A1h Oven dry g/cc	Linear extens. 4D1 LE (whole soil) Pct.	4D1 LE (<2mm) Pct.	Water content 4B1c 1/3 bar Pct.	4B2 15 bar Pct.	WRD 4C1 (whole soil) in/in	4C1 (<2mm) in/in
30-56	1.08			0.3	0.3	0.2	0.3		0.8											
56-69	1.61			0.5	0.6	0.3	0.5		0.7											

Depth (cm)	Extractable bases 5B4a: 6H2e Ca	6G2d Mg	6F2b Na	6Q2b K	Sum	6H2a Ext. acidity	KCl ext. 6G1e Al	CEC: 5A3a Sum cations	5A6 NH_4OAc	Sum bases plus KCl Al	Base saturation: 5C3 Sum cations Pct.	5C1 NH_4OAc Pct.	6E1e Carbonate as $CaCO_3$ Pct.	pH	8C1e (1:2) $CaCl_2$	8C1a (1:1) water	CEC-1/2 clay x thickness	Ratios to total clay: 15-bar water	Na pyro. ext. Fe+Al	
	meq/100 g																			
30-56	0.4	0.1	-	tr.	0.5	12.6		13.1	5.2		4	10				5.0	306		0.2	
56-69	0.7	0.1	-	0.1	0.9	22.8		23.7	8.0		4	11				4.8	290		0.3	

Depth (cm)	Clay fraction analysis 7A1b, d: <0.002 mm 7A2 X-ray a/b/	7A3 DTA Pct.	Sand and silt fraction analysis 7A1: 7B1 Petrographic b/ Pct.	total wash.

Pedon classification: Entic Haplorthod; sandy, mixed, mesic
Series classification: Same
Soil: Covert
Soil Nos.: S73MI-80-2 (BSL Nos. 73B419-73B420)
Location: Van Buren County, Michigan; 1040 feet south and 30 feet east of the northeast corner of Sec. 4, T2S, R17W.
Climate: Average annual precipitation is about 32 inches. Mean annual air temperature is about 47° F., and the mean summer air temperature is about 67° F. Frost-free season is 160-170 days.
Vegetation and land use: Bluegrass, quackgrass and weeds. Idle land.
Parent material: Sand.
Physiography: Lake plain.
Topography: Nearly level. Gradient is 2 percent.
Drainage: Moderately well.
Ground water: At 54 inches.
Erosion: Slight.
Permeability: Rapid.
Described by: F. Austin.

(Colors are for moist soil unless otherwise stated.)

Ap 0 to 20 cm (0 to 8 inches). Very dark grayish brown (10YR 3/2) loamy sand, gray (10YR 5/1) dry; weak fine granular structure; very friable; many roots; medium acid; abrupt smooth boundary.

A2 20 to 30 cm (8 to 12 inches). Light brownish gray (10YR 6/2) sand; few fine distinct strong brown (7.5YR 5/8) mottles; single grain; loose; common roots; medium acid; clear wavy boundary.

B1hir 419 30 to 56 cm (12 to 22 inches). Dark reddish brown (5YR 3/4) sand; single grain; loose; few roots; very strongly acid; gradual wavy boundary.

B2hir 420 56 to 69 cm (22 to 27 inches). Dark reddish brown (5YR 3/3) sand; single grain; loose; some cemented chunks; very strongly acid; gradual wavy boundary.

B2ir 69 to 94 cm (27 to 37 inches). Brown (7.5YR 4/4) sand; single grain; loose; medium acid; gradual wavy boundary.

C 94 to 152 cm (37 to 60 inches). Pale brown (10YR 6/3) sand; few fine faint yellowish brown (10YR 5/8) mottles; single grain; loose; medium acid.

1270A

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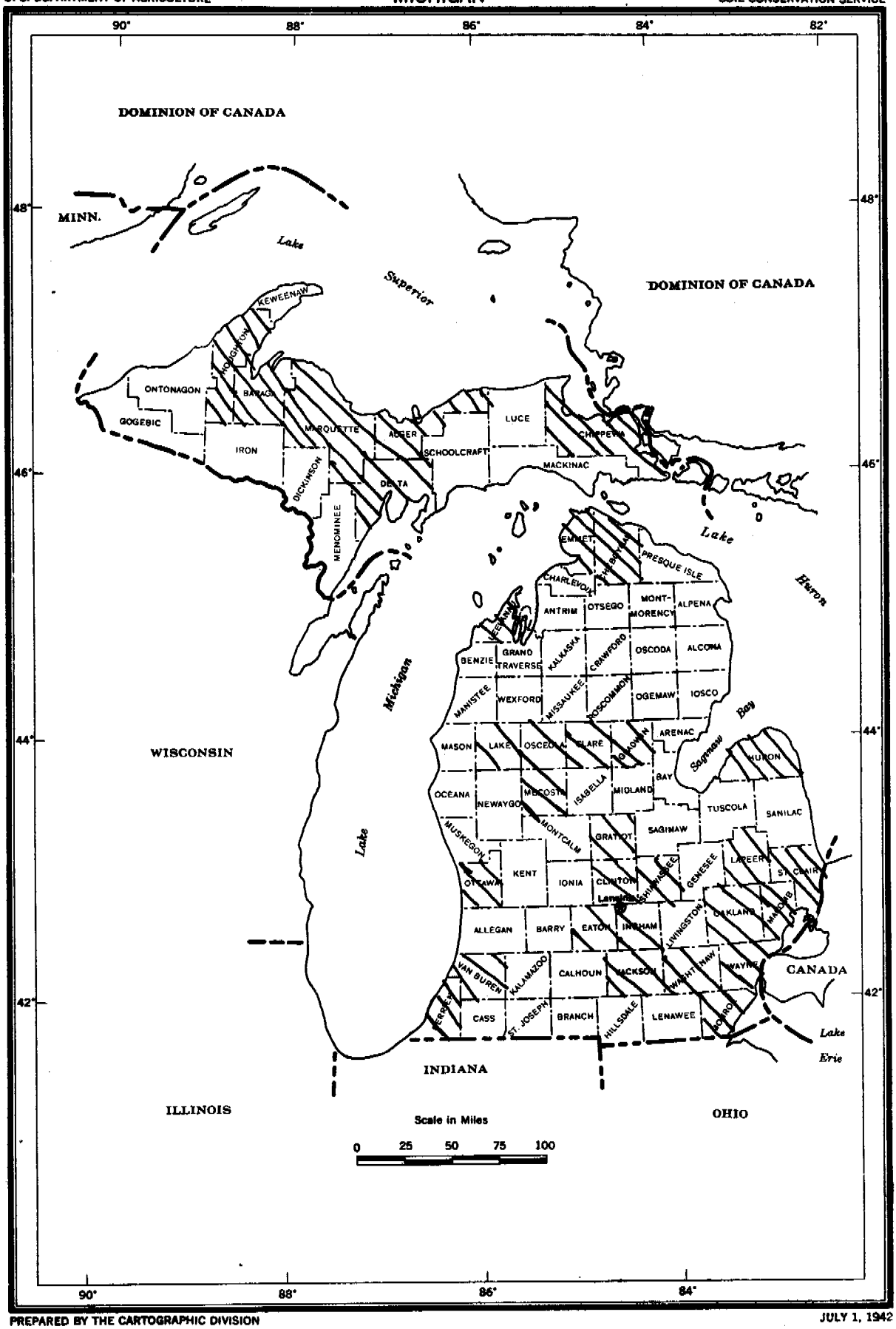
U. S. DEPARTMENT OF AGRICULTURE

MICHIGAN

SOIL CONSERVATION SERVICE



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