Atlas of Soil Reflectance Properties

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Department of Agronomy
and
Laboratory for Applications of Remote Sensing
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Soil Color in Perspective

In delineating differences between soils and in describing the characteristics of a soil profile, color is one of the most obvious and useful attributes for documenting these differences. For more than 50 years soil scientists have worked to refine and make more quantitative the descriptions of soil color.

In the 1920's a national committee on soil color standards was estabished and assigned the task of developing a standardized procedure for determining soil color. The work of this committee resulted in the adoption of the Munsell color notation along with color descriptions to document the color characteristics of specific soils and the different horizons within any soil profile (Pendleton and Nickerson, 1951).

Today the common method for determining this important soil property is for the human observer of soils to make a visual comparison between a given soil sample and the various color chips in an array of artificially produced Munsell colors, arranged according to hue, value and chroma. Once the observer has matched the color of the soil sample with that of the appropriate color chip, the soil is then assigned an alphanumeric Munsell color notation and a word description of the soil color. Often soil color will be determined by this method for soil samples in both air dry and moist conditions. In general, increasing moisture content will lower the numerical designation for value, i.e., reduce reflectance.

Since soil color is related to numerous other soil properties, it is important that soil color descriptions be as precise as possible. Recent developments in field and laboratory instrumentation now make it possible to reduce much of the subjectivity involved in the determination of soil color. New instrumentation also provides the opportunity to obtain precise quantitative reflectance measurements not only in the visible portion (color) of the electromagnetic spectrum but also in the near and middle infrared regions (Figure 1). This capability adds a new dimension to the possible use of soil spectral measurements to explain other soil characteristics and to predict soil response to different treatments, management, and variations in climate.

Reflectance measurements in the near and middle infrared often reveal textural, structural, mineralogical and/or other significant differences which may not be detectable by standard color observations (Figure 2). In this example, soils from three very different climatic regimes (Oklahoma, USA; Badajoz, Spain; Paraná, Brazil) were described by soil scientists as dark red and given the same Munsell color designation (2.5YR 3/6). The visible portion of the reflectance curves reveal similar spectral characteristics. However, in the near and middle infrared there are great differences in both the shapes of the curves and the intensity of reflectance.
Figure 1. Electromagnetic spectrum.
Figure 2. Reflectance curve for three dark red surface soils having moist Munsell color notations 2.5 YR 3/6. (Stoner, 1979).

Key to Soils Data

<table>
<thead>
<tr>
<th>Soil</th>
<th>Curve</th>
<th>% Organic Matter</th>
<th>% Fe$_2$O$_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dill (Oklahoma, USA)</td>
<td>---</td>
<td>0.6</td>
<td>0.87</td>
</tr>
<tr>
<td>Arroyo (Spain)</td>
<td>.....</td>
<td>1.28</td>
<td>2.00</td>
</tr>
<tr>
<td>Londrina (Brazil)</td>
<td>---</td>
<td>2.28</td>
<td>25.6</td>
</tr>
</tbody>
</table>
Purpose

The purpose of this atlas is to present for the first time a compendium of laboratory-measured soil parameters and soil site characteristics together with reflectance measurements of soils. Only those soil parameters and site characteristics known to influence soil reflectance properties are included, with the recognition that even more detailed soil mineralogical and organic constituent investigations are needed to understand soil reflectance differences.

The 251 soils shown here represent a wide range of soil forming factors characteristic of soils in the continental United States and Brazil. Selection of 247 of these soils based on stratification of the continental United States by soil temperature regime and climatic moisture zone provides a statistical sampling of soils in proportion to the geographic extent of each climatic region (Figure 3). Information about the soils in this atlas can be extended to many of those soils closely related in classification and geography.

This atlas is intended to promote an appreciation of the diversity of soil reflectance properties as those soils might be viewed by remote sensing devices. The well-ordered physical and chemical relationships that impart diverse spectral character to soils become apparent here. The need for a quantitative, reliable laboratory procedure for measuring soil spectral properties should also become evident.

Collection of Soil Samples

The Soil Survey Investigations Division of the Soil Conservation Service (USDA) cooperated with the Laboratory for Applications of Remote Sensing/Purdue University by taking responsibility for field collection of almost 6,411 individual soil samples from 190 counties within 39 states. Two separate soil samples were collected for each soil series, one at a site near the type location for the current official series, and another at a site from one to twenty miles distant from the first site in a different mapping delineation of the same series. Samples were forwarded to Purdue University complete with additional site information regarding exact sampling location, physiographic position, slope, drainage, vegetation, and parent material. Brazilian soils were sampled in connection with a soil survey of Paraná State, Brazil (Fasolo, 1978).

Measurement of Soil Reflectance Properties

The sieved soil fraction less than 2 mm diameter was used for reflectance measurements in an attempt to standardize this procedure in line with the use of this same size fraction for most laboratory determinations of soil properties. All measurements were made on uniformly-moist soils which were equilibrated for 24 hours at a one-tenth bar moisture tension on asbestos tension tables. Specially constructed 10 cm diameter by 2 cm rings with 60 mesh wire bottoms held the soil in place through the stages of saturation, equilibration, and spectral reading (Figure 4).
Figure 3. Climatic zones in the continental United States as identified by soil temperature regime (Soil Survey Staff, 1975; FAO-UNESCO, 1975) and the Thornthwaite (1948) moisture index.
a. Soil sample and 10 cm diameter sample holder.

b. Saturated sample being placed on asbestos tension table.

Figure 4. Setup for laboratory spectral measurements of soils.
c. Fifty-six soil samples ready for spectral measurement after 24 hours equilibration at 100 cm H₂O tension.

d. BRF reflectometer positioned for soil sample detection by the Exotech 20C spectro-radiometer.

Figure 4. (Cont.)
Soil reflectance was measured using an Exotech Model 20C spectro-radiometer adapted for indoor use with a reflectometer equipped with an artificial illumination source, transfer optics, and sample stage. Spectral readings were taken in 0.01 μm increments over the 0.52-2.32 μm wavelength range. A 1000 watt tungsten iodine coiled filament lamp provided incident irradiation similar to that of solar illumination. Pressed barium sulfate was used as a calibration standard, with measurements being taken after every fifth soil sample to account for possible changes in the intensity of the illumination source. A more detailed explanation of the instrumentation is found in Silva, et al. (1971), Leamer, et al. (1973) and DeWitt and Robinson (1976), while the sample preparation procedure is described by Stoner (1979).

The repeatable quantitative nature of reflectance measurements made using this procedure is evident from spectral curves of check samples measured on each of the ten days needed to run over 500 individual soil samples (Figure 5). Random soil reflectance readings of twenty separately prepared Fincastle silt loam soil samples (a fine-silty mixed mesic Aeric Ochraqualf) gave very similar results.

Soil Reflectance Properties Data Base

An identification record containing 100 items of information including complete soil taxonomic classification along with site characteristics and laboratory analyses is available in computer tape format for all of the soils in this atlas. This information together with digitized soil reflectance data is accessible for editing and rapid retrieval of all soils information by means of the LARSPEC software package (Simmons, et al., 1975). Graphical display of soil reflectance curves as shown in this atlas is accomplished by one of the LARSPEC processors while another processor permits selection of specific soil analyses, site characteristics, and taxonomic data in the abbreviated format used here.

Organization of Soil Atlas

Soils are arranged in this atlas by alphabetical order of the 39 states in which they were sampled. Four soils from Paraná State, Brazil follow at the end. Four soils are displayed on each page, while information specific to one of two field samples is given in separate columns under each soil series name. A few soils are represented by only one field sample. Two indices are included, arranged by state and by soil series name. A narrative key follows, with each numbered item of soil information identified in Figure 6 described in detail as it appears in the atlas.
Figure 5. Soil reflectance curves and moisture percentages by weight (W%) for 20 check samples of Fincaile sil, a fine-silty mesic Aeric Ochraqualf, from ten different setups of the tension table apparatus.
1. **ONTONAGON (MI)**

2) Glossic Eutroboralf
3) very fine, mixed
4) humid zone
5) glacial lake plain sediments
6) Ontonagon Co.

<table>
<thead>
<tr>
<th></th>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>7)</td>
<td>B slope</td>
<td>B slope</td>
</tr>
<tr>
<td>8)</td>
<td>mod. well drained</td>
<td>mod. well drained</td>
</tr>
<tr>
<td>9)</td>
<td>clay</td>
<td>clay</td>
</tr>
<tr>
<td>10)</td>
<td>7%S 22%S 70%C</td>
<td>6%S 29%S 66%C</td>
</tr>
<tr>
<td>11)</td>
<td>2.5YR 3/6 (moist)</td>
<td>2.5YR 4/4 (moist)</td>
</tr>
<tr>
<td>12)</td>
<td>5YR 6/4 (dry)</td>
<td>5YR 6/4 (dry)</td>
</tr>
<tr>
<td>13)</td>
<td>4.88% O.M.</td>
<td>3.95% O.M.</td>
</tr>
<tr>
<td>14)</td>
<td>38.0 meq/100g CEC</td>
<td>31.6 meq/100g CEC</td>
</tr>
<tr>
<td>15)</td>
<td>1.73% Fe₂O₃</td>
<td>2.76% Fe₂O₃</td>
</tr>
<tr>
<td>16</td>
<td>47.5 MW%</td>
<td>43.2 MW%</td>
</tr>
</tbody>
</table>

17) Figure 6. Numbered guide corresponding to narrative key to soil information.
Narrative Key to Soil Information

1) soil series name with two-letter state abbreviation

The series is the lowest category in the soil taxonomic system. Names of series as a rule are abstract place names with no connotation regarding soil diagnostic properties. This atlas contains soil information for 247 of the more than 10,000 soil series recognized in the United States. These 247 soil series were selected from a list of over 1,300 benchmark soils whose large geographic extent renders them an important part of a state or resource area. Soil samples were taken from sites within states having the responsibility for maintaining the standard series description for that soil series. Data from these soils are widely applicable to soils occurring in the continental United States.

2) soil subgroup name

Subgroup names consist of the name of a great group modified by one or more adjectives. About 970 subgroups are currently recognized in the United States. The name of a great group consists of the name of a suborder and a prefix that consists of one or two formative elements suggesting something of the diagnostic properties. There are about 225 great groups in the U.S. soil taxonomy (Soil Survey Staff, 1975). Names of suborders have exactly two syllables. The first syllable connotes some information about the diagnostic properties of the soils while the second is the formative element from the name of the order. Forty-seven suborders are recognized, while there are only ten soil orders.

It has been observed that high organic content surface soils of the Mollisol and Histosol soil order frequently have a concave-shaped reflectance curve in the 0.5 to 1.3 µm wavelength region. Lower organic content surface soils of the Alfisol soil order frequently have convex-shaped reflectance curves in the same wavelength region. Reflectance curves for surface soils of the Ultisol soil order often resemble those for Alfisols except for the presence of slight dips in the curve at 0.7 and 0.9 µm caused by iron absorption. It should be understood that these generalizations about soil reflectance of certain soil orders are only an aid to facilitate the appreciation of differences in spectral properties among surface soils. Soil orders distinguished primarily by subsoil horizon properties cannot always be expected to show characteristic reflectance in the surface horizon.

3) soil family modifiers

Names of soil families are polynomial, consisting of the name of a subgroup and adjectives. These adjectives describe the particle-size class (11 classes plus others if strongly contrasting), the mineralogy (20 classes and a few subclasses), the temperature regime (3 classes), and, in some families, depth of soil (3 classes), consistence (2 classes), moisture equivalent (2 classes) and other properties. Names of most families have three adjectives modifying the subgroup name but some have only one or two and others have four or more. Soil properties are used in this category without regard to their significance as marks of processes or lack of them. About 4,300 families are presently recognized in the United States.
Redundancy is avoided in naming families, thus, for example, the modifier frigid is left out of families in which the formative element bor in the suborder name indicates soils having a frigid temperature regime. Particle-size distribution and mineralogy are specified for only those horizons of major biologic activity below plow depth.

Soils have been observed to increase in reflectance with increasing soil temperature. This is most likely explained by decreased organic matter contents in warmer regions. Lower organic content soils reflect more than those with elevated levels of organic matter.

Soil mineralogy appears to influence soil reflectance in various manners. While soils with gypsic mineralogy reflect highly because of the inherent reflectance properties of gypsum, montmorillonitic soils, often associated with higher organic matter levels, show low reflectance attributable to this high organic matter content.

4) moisture zone

Although the soil moisture regime is an important property of a soil, the moisture regimes defined in the U.S. soil taxonomy are not always included in the taxonomic name, and are defined not necessarily by climatic moisture zone, but rather in terms of the ground-water level and the presence or absence of water held at a tension less than 15 bars throughout the year. Moisture zones in this atlas are defined in terms of climatic moisture zones as described by the Thornthwaite (1948) moisture index. Five main moisture zones are defined on this basis in the continental United States.

Soils from wetter climates generally reflect less than those from dry climates because of organic matter accumulation under higher rainfall conditions. Exceptions to this rule occur when soils are formed under prairie grass vegetation in drier climates.

5) parent material

Parent material, as the initial geologic material from which soils are formed, can be expected to demonstrate an eventual influence on soil reflectance. Certain soils referred to as lithochromic are even known to owe their spectral colors to inheritance from the parent material rather than from soil-forming processes. Parent material types listed in this atlas were obtained from the established series profile descriptions for each soil.

6) county

The county within the state where soils were collected is listed in order to specify the sampling location for each of two sets of samples whose analyses follow.
7) horizon designation

All soil samples represented only the surface soil, containing material from 0 to 15 cm (0 to 6 inches) if depth to a B horizon permitted. Those surface soils under cultivation or which still show the marks of cultivation are designated by the symbol "p" following the capital letter symbol for the horizon. Undisturbed soils are represented by horizon designations such as A1, A11, A1-A2, A1-A21 and A11-A12.

8) slope class

Relief, as expressed by slope class grouping, is an important soil-forming factor that is characteristic of each site in the soil landscape. Slope classes in this atlas follow the convention of capital letter symbols designating slope percentages as follows: A, 0-2%; B, 2-6%; C, 6-12%; D, 12-18%; E, 18-25%; F, 25-35%; G, greater than 35%.

9) internal drainage

All soil series have a specific internal drainage which is indicative of the local landscape position and broader climatic conditions under which they formed. Drainage classes used in this atlas are as follows: v. (very) poorly drained, poorly drained, s. (somewhat) poorly drained, mod. (moderately) well drained, well drained, s. excess. (somewhat excessively) drained, and excess. (excessively) drained.

Soils have been seen to show overall decreased reflectance with increasingly poorer drainage. Very poorly drained soils reflect considerably less than any of the other drainage classes at all wavelengths. As a site characteristic integrating the effects of climate, local relief, and accumulated organic matter, soil drainage characteristics are closely associated with reflectance properties of surface soils.

10) textural class name

Twenty-one textural class names have been defined in terms of size distribution of five sand size fractions plus silt and clay as determined by mechanical analysis in the laboratory (Soil Survey Staff, 1975). Organic soils are identified by using the term muck in place of the textural class name.

Because textural class names are defined wholly in terms of size distribution, the actual consistence or structure of the crushed, sieved soil samples may not necessarily be conveyed by this name. Highly aggregated clays may in some cases present surface structures similar to that of coarse sands. Use of the textural class name, however, is still the best available convention for expressing the size relationships among soil separates.
11) percent sand, silt, and clay

Particle size analysis was performed on organic matter-free soil portions (SCS-USDA, 1972). Clay and silt contents were determined by sedimentation-pipetting while five sand size fractions (here summed to give one sand amount) were separated by passing through a nest of sieves.

Decreasing particle size has been seen to increase soil reflectance among sand textured soils, possibly by forming a smoother surface with fewer voids to trap incoming light. The inverse appears to be true with medium to fine textured soils, however, possibly because increased moisture content and organic matter content associated with higher clay contents lead to lower reflectance.

12) Munsell color designations

Color standard comparisons were obtained at two soil moisture levels: air dry and field capacity. Moist soil colors were obtained by moistening samples and reading the color at a point in which visible moisture films were not present. Dry soil colors were obtained on the air dry sieved samples. All soil colors were determined by comparison to standard color chips of the Munsell Soil Color Charts.

Munsell designations for color consist of separate notations for hue, value, and chroma, which are combined in that order to form the color designation. The symbol for hue is the letter abbreviation of the color of the rainbow preceded by numbers from zero to ten. The notation for value, or relative lightness of color ranges from zero, for absolute black to ten, for absolute white. Chroma, or saturation, is the relative purity or strength of the spectral color and increases in number with decreasing grayness.

It is important to remember in comparisons between soil reflectance data and soil colors that the wavelength region of human physiological perception of visible reflectance extends only from about 0.4 to 0.7 μm, while reflectance data presented here extend from about 0.5 to 2.3 μm. While the color imparted to a soil may be due to specific absorptions in the visible region, it may also be caused by intense absorptions outside the visible wavelengths in either the ultraviolet or near infrared, the influence of which may extend into the visible. This points out the importance of having a full range of reflectance data from the visible to the middle infrared for thorough characterization of soil spectral properties.

13) organic matter content

Organic matter contents were determined by the modified Walkley-Black procedure of acid dichromate digestion with ferrous ammonium sulfate titration (Franzmeier, et al., 1977). Organic matter appears to be one of the dominant soil parameters responsible for imparting spectral properties to soils. Increased organic matter contents as a rule lead to decreased reflectance throughout the reflective spectrum. Many cases can be seen in this atlas where duplicate soil samples with otherwise similar properties exhibit
different reflectance curves because of slight differences in organic matter content.

Although increased organic matter content has been seen to decrease soil reflectance in mineral soils, the form or decomposition stage of organic material is more important in understanding reflectance properties of organic soils. Less decomposed organic materials have higher reflectance in the near infrared region because of enhanced reflectance attributable to remnant cell structure of well preserved fibers. In contrast, very highly decomposed organic materials show very low reflectance throughout the 0.5 to 2.3 μm range.

14) cation exchange capacity (CEC)

Cation exchange capacity (CEC) was measured for each soil sample as the sum of extractable cations of Ca, Mg, K, Na, plus extractable acidity, all expressed in terms of milliequivalents per 100 g of soil (SCS-USDA, 1972).

Cation exchange capacity is frequently seen to have a high negative correlation with reflectance, especially in the 2.08-2.32 μm middle infrared region. Although there is no direct physical basis for this relationship, it seems that cation exchange capacity is acting as a natural integrating factor for clay type and content as well as organic matter content, soil parameters which exhibit inherent spectral behavior.

15) iron oxide content

Free iron was measured by the so-called CBD procedure (Franzmeier, et al., 1977). Ferric iron absorption bands can be seen in certain soil reflectance curves in the 0.7 and 0.9 μm wavelength regions. Broad bands at these wavelengths frequently occur in high iron content soils; while a sharp, narrow absorption band at 0.9 μm is evident in many soils of relatively low or even negligible iron content.

Different forms of iron oxides are known to impart red and yellow colors to soils. Reflectance data in this atlas indicate that near infrared absorption may be partly responsible for coloring in high iron content soils.

16) moisture percentage by weight (MW%)

Soil moisture content by weight was determined gravimetrically on the soil samples used to obtain reflectance measurements. All soil samples were equilibrated at a one-tenth bar moisture tension, so resulting moisture differences are closely related to clay type, soil texture, and organic matter content. All other properties being equal, an increase in soil moisture content decreases soil reflectance at all wavelengths.

Strong water absorption bands at 1.45 and 1.95 μm are present in all of the spectral curves of these uniformly-moist soils. Weak water absorption bands at 1.2 and 1.77 μm are seen in some low organic content fine
sandy soils. Actual soil moisture content has been seen to be most highly correlated with soil reflectance in the 2.08-2.32 μm region.

17) plot of bidirectional reflectance factor (BRF%) versus wavelength (μm)

A convenient standard measure of reflectance that closely simulates the directional characteristics of illumination and viewing in an airborne remote sensor is the bidirectional reflectance factor. Bidirectional reflectance factor can be described as the ratio of the flux reflected by an object under specified conditions of negligibly small solid angles of irradiation and viewing to that reflected by the ideal, completely reflecting, perfectly diffusing surface, identically irradiated and viewed (Nicodemus, et al., 1977).

Wavelength, expressed in micrometer (μm) units, denotes the portion of the electromagnetic spectrum under consideration. Wavelength regions frequently referred to are the visible (0.38-0.72 μm), near infrared (0.72-1.3 μm), and middle infrared (1.3-3.0 μm).
**RED BAY (AL)**

Rhodic Paleudult  
fine-loamy, siliceous, thermic  
humid zone  
marine sediments  
Houston Co.

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Slope</th>
<th>Well Drained</th>
<th>Type</th>
<th>Color</th>
<th>Texture</th>
<th>OM</th>
<th>CEC</th>
<th>Fe$_2$O$_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap</td>
<td>B</td>
<td>loamy sand</td>
<td>70/5</td>
<td>7YR 3/4</td>
<td>(moist)</td>
<td>275</td>
<td>3.82</td>
<td>1.37 Fe$_2$O$_3$</td>
</tr>
<tr>
<td>B</td>
<td>B</td>
<td>sandy loam</td>
<td>70/5</td>
<td>7YR 3/4</td>
<td>(moist)</td>
<td>275</td>
<td>3.82</td>
<td>1.37 Fe$_2$O$_3$</td>
</tr>
</tbody>
</table>

**CONTINENTAL (AZ)**

Typic Haplargid  
fine, mixed, thermic  
arid zone  
acid rock alluvium  
Santa Cruz Co.

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Slope</th>
<th>Well Drained</th>
<th>Type</th>
<th>Color</th>
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<th>OM</th>
<th>CEC</th>
<th>Fe$_2$O$_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>A</td>
<td>coarse sandy loam</td>
<td>70/5</td>
<td>7YR 3/4</td>
<td>(moist)</td>
<td>275</td>
<td>3.82</td>
<td>1.37 Fe$_2$O$_3$</td>
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<tr>
<td>All</td>
<td>A</td>
<td>fine sandy loam</td>
<td>70/5</td>
<td>7YR 3/4</td>
<td>(moist)</td>
<td>275</td>
<td>3.82</td>
<td>1.37 Fe$_2$O$_3$</td>
</tr>
</tbody>
</table>

**PIMA (AZ)**

Cumulic Haplustoll  
fine-silty, mixed, thermic  
arid zone  
mixed alluvium  
Santa Cruz Co.

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Slope</th>
<th>Well Drained</th>
<th>Type</th>
<th>Color</th>
<th>Texture</th>
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<th>Fe$_2$O$_3$</th>
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<tbody>
<tr>
<td>Ap</td>
<td>A</td>
<td>silty clay</td>
<td>70/5</td>
<td>7YR 3/2</td>
<td>(moist)</td>
<td>275</td>
<td>3.82</td>
<td>1.37 Fe$_2$O$_3$</td>
</tr>
<tr>
<td>A</td>
<td>A</td>
<td>silty clay loam</td>
<td>70/5</td>
<td>7YR 3/2</td>
<td>(moist)</td>
<td>275</td>
<td>3.82</td>
<td>1.37 Fe$_2$O$_3$</td>
</tr>
</tbody>
</table>

**WHITE HOUSE (AZ)**

Ustolic Haplargid  
fine, mixed, thermic  
arid zone  
mixed alluvium  
Santa Cruz Co.

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Slope</th>
<th>Well Drained</th>
<th>Type</th>
<th>Color</th>
<th>Texture</th>
<th>OM</th>
<th>CEC</th>
<th>Fe$_2$O$_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>B</td>
<td>sandy loam</td>
<td>70/5</td>
<td>7YR 3/4</td>
<td>(moist)</td>
<td>275</td>
<td>3.82</td>
<td>1.37 Fe$_2$O$_3$</td>
</tr>
<tr>
<td>All</td>
<td>B</td>
<td>sand loam</td>
<td>70/5</td>
<td>7YR 3/4</td>
<td>(moist)</td>
<td>275</td>
<td>3.82</td>
<td>1.37 Fe$_2$O$_3$</td>
</tr>
</tbody>
</table>

**ORIGINAL PAGE IS OF POOR QUALITY**
**GILA (AZ)**

Typic Torrifluvent
coarse-loamy, mixed (calcareous), thermic

- **Arid zone**
  - mixed alluvium
  - Graham Co.

- **Ap horizon**
  - well drained
  - silty loam
  - 7.5YR 3/4 (moist)
  - 1.36% O.M.
  - 29.6 meq/100g CEC
  - 1.1% \( \text{Fe}_2\text{O}_3 \)
  - 37.2% \( \text{Mg}^+ \)

**SUPERSTITION (AZ)**

Typic Calciothid
sandy, mixed, hyperthermic

- **Arid zone**
  - mixed alluvium
  - Yuma Co.

- **All horizon**
  - well drained
  - sand
  - 75% 125-500 µm
  - 7.5YR 3/4 (moist)
  - 0.09% O.M.
  - 0.07 meq/100g CEC
  - 1.5% \( \text{Fe}_2\text{O}_3 \)

**GLENDALE (AZ)**

Typic Torrifluvent
fine-silty, mixed (calcareous), thermic

- **Arid zone**
  - mixed alluvium
  - Graham Co.

- **Al horizon**
  - well drained
  - silty clay loam
  - 10YR 5/3 (moist)
  - 0.64% O.M.
  - 17.0 meq/100g CEC
  - 0.39% \( \text{Fe}_2\text{O}_3 \)

**ENDERS (AR)**

Typic Mapludult
clayey, mixed, thermic

- **Humid zone**
  - residuum from shale and limestone
  - Franklin Co.

- **All-All horizon**
  - well drained
  - loam
  - 75% 125-500 µm
  - 7.5YR 4/6 (moist)
  - 10YR 6/6 (dry)
  - 4.2% O.M.
  - 18.0 meq/100g CEC
  - 3.2% \( \text{Fe}_2\text{O}_3 \)
SAFFELL (AR)

Typic Hapludult
loam-skeletal, siliceous, thermic
humid zone
marine sediments
Ouachita Co.

---

Ap horizon
A slope
well drained
well drained
fine sandy loam
fine sandy loam
665S 39251 35C
545S 10251 35C
7.5YR 4/4 (moist) 10YR 8/3 (moist)
10YR 8/3 (dry)
0.58% 0.1-H.
4.1 meq/100g CEC
0.4% Fe2O3
0.91% Fe2O3

18.0 MIR: 26.6 MIR:

GLENBERG (CO)

Psic Torrifficent
coarse-loamy, mixed (calcareous), mistic
semiarid zone
mixed alluvium
Crowley Co.

---

Ap horizon
A slope
well drained
well drained
coarse sandy loam
fine sandy loam
715S 14251 35C
645S 25351 15C
10YR 4/3 (moist) 10YR 3/2 (moist)
10YR 3/3 (dry)
1.12% 0.1-H.
19.8 meq/100g CEC
0.66% Fe2O3
0.922 Fe2O3

13.7 MIR: 27.1 MIR:

LINKER (AR)

Typic Hapludult
fine-loamy, siliceous, thermic
humid zone
residuum from sandstone
Pope Co.

---

Ap horizon
A slope
well drained
well drained
fine sandy loam
sandy loam
665S 39251 35C
605S 33251 75C
10YR 4/3 (moist) 10YR 4/3 (moist)
10YR 3/3 (dry)
1.58% 0.1-H.
5.3 meq/100g CEC
0.32% Fe2O3
0.96% Fe2O3

21.9 MIR: 23.9 MIR:

KUTCH (CO)

Torrific Argiustoll
fine, montmorillnnitic, mistic
semiarid zone
clayey sedimentary residuum
Elbert Co.

---

Al horizon
B slope
well drained
well drained
sandy clay loam
clay loam
535S 25351 25C
315S 41251 55C
10YR 4/2 (moist) 10YR 4/2 (moist)
10YR 3/3 (dry)
1.79% 0.1-H.
22.9 meq/100g CEC
0.63% Fe2O3
1.47% Fe2O3

33.2 MIR: 33.8 MIR:
**APISHAPA (CO)**

Vertic Fluvent
fine, montmorillonitic (calcareous),
semiarid zone
mixed alluvium
Crowley Co.

Ap horizon
A slope
s. poorly drained
s. poorly drained
clay loam
clay loam
20SZ 49P5 32EC 295 36NS 34EC
10YR 3/3 (moist) 10YR 4/2 (moist)
10YR 5/3 (dry) 10YR 5/3 (dry)
2.5% O.M.
2.5% O.M.
32.6 meq/100g CEC 52.7 meq/100g CEC
1.24% Fe$_2$O$_3$ 1.13% Fe$_2$O$_3$
34.4 MAZ  35.9 MAZ

**HAVERSON (CO)**

Vertic Torrufluent
fine-loamy, mixed (calcareous),
semiarid zone
mixed alluvium
Provers Co.

Ap horizon
A slope
s. well drained
s. well drained
clay loam
clay loam
115S 73PS 164C 195S 66PS 104C
10YR 4/2 (moist) 10YR 4/2 (moist)
10YR 6/3 (dry) 10YR 6/3 (dry)
2.5% O.M.
3.26% O.M.
32.6 meq/100g CEC 27.3 meq/100g CEC
1.14% Fe$_2$O$_3$ 1.09% Fe$_2$O$_3$
40.9 MAZ  40.6 MAZ

**KORNMAN (CO)**

Vertic Torrufluent
coarse-loamy, mixed (calcareous),
semiarid zone
mixed alluvium
Provers Co.

Ap horizon
B slope
w. well drained
w. well drained
clay loam
clay loam
324S 305S 36EC 205S 47251 33EC
10YR 3/3 (moist) 10YR 4/2 (moist)
10YR 5/3 (dry) 10YR 5/3 (dry)
1.64% O.M.
3.25% O.M.
33.4 meq/100g CEC 36.2 meq/100g CEC
1.17% Fe$_2$O$_3$ 1.31% Fe$_2$O$_3$
29.5 MAZ  35.5 MAZ

**MINNEQUA (CO)**

Vertic Torrufluent
fine-silty, mixed (calcareous),
semiarid zone
soft rock residuum
Provers Co.

Ap horizon
B slope
w. well drained
w. well drained
loam
silt loam
362S 495S 135C 2725 365S 155C
10YR 4/2 (moist) 10YR 4/2 (moist)
10YR 6/3 (dry) 10YR 6/3 (dry)
1.90% O.M.
1.90% O.M.
28.5 meq/100g CEC 29.2 meq/100g CEC
0.73% Fe$_2$O$_3$ 0.78% Fe$_2$O$_3$
28.9 MAZ  32.7 MAZ

**Graphs:**

- **APISHAPA (CO):** Wavelength vs. reflectance for different soil horizons.
- **HAVERSON (CO):** Wavelength vs. reflectance for different soil horizons.
- **KORNMAN (CO):** Wavelength vs. reflectance for different soil horizons.
- **MINNEQUA (CO):** Wavelength vs. reflectance for different soil horizons.

Each graph shows the reflectance (BF/FL) at various wavelengths (µm) for different soil horizons and slopes, indicating soil characteristics and moisture conditions.
Typic Haplaquoll
coarse-loamy, mixed (calcareous),
frigid
arid zone
alluvium from basalt
Conejos Co.
---
Al horizon
A slope
poorly drained
sandy loam
5YR 5/5 10PC
4/2 5YR 3/4 (wet)
7.3% O.M.
44.9 meq/100g CEC
2.6% Fe₂O₃
54.3 mg/kg  36.6 mg/kg

Typic Haplargid
fine-silty, mixed, mesic
semiarid zone
alluvium from basalt
Provo Co.
---
Ap horizon
A slope
well drained
silty clay
4% 20/25 46EC
24/2 39/25 37RC
10YR 4/2 (wet)
10YR 5/3 (wet)
3.7% O.M.
47.3 meq/100g CEC
1.3% Fe₂O₃
27.8 mg/kg

Wapiti Co.
---
Ap horizon
B slope
well drained
silt loam
2MS 57/25 20RC
29/2 61/25 10LC
10YR 6/3 (wet)
10YR 5/3 (wet)
1.30% O.M.
32.3 meq/100g CEC
0.83% Fe₂O₃
37.8 mg/kg

Typic Natrargid
coarse-loamy, mixed, frigid
arid zone
alluvium from basalt
Alamosa Co.
---
Al horizon
A slope
well drained
coarse sand
8/8 5YR 6/2
7.5YR 4/2 (wet)
7.5% O.M.
0.11% O.M.
0.54% Fe₂O₃
17.8 mg/kg

Typic Natrargid
coarse-loamy, mixed, frigid
arid zone
alluvium from basalt
Alamosa Co.
---
Al horizon
A slope
well drained
coarse sand
8/8 5YR 6/2
7.5YR 4/2 (wet)
7.5% O.M.
0.11% O.M.
0.36% Fe₂O₃
10.9 mg/kg

Typic Haplaquoll
coarse-loamy, mixed (calcareous),
frigid
arid zone
alluvium from basalt
Conejos Co.
---
Al horizon
A slope
poorly drained
sandy loam
5YR 5/5 10PC
4/2 5YR 3/4 (wet)
7.3% O.M.
44.9 meq/100g CEC
2.6% Fe₂O₃
54.3 mg/kg  36.6 mg/kg

Typic Haplargid
fine-silty, mixed, mesic
semiarid zone
alluvium from basalt
Provo Co.
---
Ap horizon
A slope
well drained
silty clay
4% 20/25 46EC
24/2 39/25 37RC
10YR 4/2 (wet)
10YR 5/3 (wet)
3.7% O.M.
47.3 meq/100g CEC
1.3% Fe₂O₃
27.8 mg/kg

Wapiti Co.
---
Ap horizon
B slope
well drained
silt loam
2MS 57/25 20RC
29/2 61/25 10LC
10YR 6/3 (wet)
10YR 5/3 (wet)
1.30% O.M.
32.3 meq/100g CEC
0.83% Fe₂O₃
37.8 mg/kg

Typic Natrargid
coarse-loamy, mixed, frigid
arid zone
alluvium from basalt
Alamosa Co.
---
Al horizon
A slope
well drained
coarse sand
8/8 5YR 6/2
7.5YR 4/2 (wet)
7.5% O.M.
0.11% O.M.
0.54% Fe₂O₃
17.8 mg/kg

Typic Natrargid
coarse-loamy, mixed, frigid
arid zone
alluvium from basalt
Alamosa Co.
---
Al horizon
A slope
well drained
coarse sand
8/8 5YR 6/2
7.5YR 4/2 (wet)
7.5% O.M.
0.11% O.M.
0.36% Fe₂O₃
10.9 mg/kg
**Bresser (CO)**

Aridic Argiustoll
fine-loamy, mixed, mesic
semiarid zone
coarse textured alluvial materials
Arapahoe Co.

- Al horizon
- C slope
- well drained
- coarse sandy loam

<table>
<thead>
<tr>
<th>Year</th>
<th>Moisture</th>
</tr>
</thead>
<tbody>
<tr>
<td>10YR 3/2</td>
<td>Overdried</td>
</tr>
<tr>
<td>10YR 5/2</td>
<td>Overdried</td>
</tr>
</tbody>
</table>

**Fondis (CO)**

Aridic Paleustoll
fine, montmorillonitic, mesic
semiarid zone
loess over coarse textured outwash
Arapahoe Co.

- Al horizon
- A slope
- well drained
- silt loam

<table>
<thead>
<tr>
<th>Year</th>
<th>Moisture</th>
</tr>
</thead>
<tbody>
<tr>
<td>10YR 3/2</td>
<td>Moist</td>
</tr>
<tr>
<td>10YR 5/2</td>
<td>Moist</td>
</tr>
</tbody>
</table>

**Vona (CO)**

Siltic Haplargid
coarse-loamy, mixed, mesic
semiarid zone
eolian materials
Morgan Co.

- Al horizon
- C slope
- well drained
- sandy loam

<table>
<thead>
<tr>
<th>Year</th>
<th>Moisture</th>
</tr>
</thead>
<tbody>
<tr>
<td>10YR 4/2</td>
<td>Moist</td>
</tr>
<tr>
<td>10YR 6/2</td>
<td>Moist</td>
</tr>
</tbody>
</table>

**BlakeLand (CO) & Vasquez (CO)**

Torricic Haplustoll
sandy, mixed, mesic
semiarid zone
eolian sediments
Douglas Co.

- Al horizon
- A slope
- well drained
- sandy loam

<table>
<thead>
<tr>
<th>Year</th>
<th>Moisture</th>
</tr>
</thead>
<tbody>
<tr>
<td>10YR 4/2</td>
<td>Moist</td>
</tr>
<tr>
<td>10YR 6/2</td>
<td>Moist</td>
</tr>
</tbody>
</table>

**Hudgel (CO)**

Humic Fergelic
Cryepts
coarse-loamy, mixed, acid
semiarid zone
local acid alluvium
Sloven Co.

- Al horizon
- A slope
- poorly drained
- loamy coarse sand

<table>
<thead>
<tr>
<th>Year</th>
<th>Moisture</th>
</tr>
</thead>
<tbody>
<tr>
<td>10YR 3/2</td>
<td>Moist</td>
</tr>
<tr>
<td>10YR 6/2</td>
<td>Moist</td>
</tr>
</tbody>
</table>

**Bresser (CO)**

**Fondis (CO)**

**Vona (CO)**

**BlakeLand (CO) & Vasquez (CO)**

**Hudgel (CO)**
SANGERIFL

Spodic Pampaquent
siliceous, hyperthermic
humid zone
Pasco Co.

- A horizon
  - A slope
  - poorly drained
  - fine sand
  - 98ES 2551 00C
  - 7.5YR 3/2 (moist)
  - 10TR 6/1 (dry)
  - 1.39% O.M.
  - 4.6 meq/100g CEC
  - trace Fe₂O₃
  - 24.5 Mce–

PUMPAHOFL

Typic Pampaquent
siliceous, hyperthermic
humid zone
Lee Co.

- A horizon
  - A slope
  - poorly drained
  - fine sand
  - 98ES 2551 00C
  - 7.5YR 3/2 (moist)
  - 10TR 6/1 (dry)
  - 1.71% O.M.
  - 4.4 meq/100g CEC
  - trace Fe₂O₃
  - 26.0 Mce–

WABASSOFIL

Alfic Haplaquult
sand, siliceous, hyperthermic
humid zone
marine sands over loess materials
Hernando Co.

- A horizon
  - A slope
  - poorly drained
  - fine sand
  - 94ES 5551 15C
  - 7.5YR 3/0 (moist)
  - 10TR 6/1 (dry)
  - 1.49% O.M.
  - 9.3 meq/100g CEC
  - trace Fe₂O₃
  - 10.5 Mce–

TERRA CEPAH

Typic Medisaprurt
sand, hyperthermic
humid zone
hydrophytic plant remains
Palm Beach Co.

- Oep horizon
  - A slope
  - w. poorly drained
  - muck
  - 98ES 6151 17C
  - 7.5YR 2/0 (moist)
  - 10TR 7/1 (dry)
  - 8.54% O.M.
  - 152.8 meq/100g CEC
  - 0.00% Fe₂O₃
  - 137. Mce–

- Oep horizon
  - A slope
  - mck
  - 98ES 6151 17C
  - 7.5YR 2/0 (moist)
  - 10TR 7/1 (dry)
  - 8.54% O.M.
  - 152.8 meq/100g CEC
  - 0.00% Fe₂O₃
  - 113. Mce–
FLANAGAN (IL)

Aquic Argidoll
fine, montmorillonitic, mesic
humid zone
thick loess over calcareous till
Champaign Co.

Ap horizon
A slope
s. poorly drained
silt loam
84S 66551 264C
10TYR 2/1 (moist)
10TYR 6/2 (dry)
3.72% O.M.
25.7 meq/100g CEC
1.17% Fe₂O₃
35.8 Mhos

RIDGEVILLE (IL)

Aquic Argidoll
coarse-loamy, mixed, mesic
humid zone
stratified glacial alluvium
Iroquois Co.

Ap horizon
A slope
s. poorly drained
fine sandy loam
66SS 23251 112C
10TYR 6/2 (moist)
10TYR 6/2 (dry)
1.94% O.M.
15.2 meq/100g CEC
0.57% Fe₂O₃
23.0 Mhos

HAYMOND (IN)

Typic Udifluvent
coarse-silty, mixed, nonacid. mesic
humid zone
silty alluvium
Clark Co.

Ap horizon
A slope
well drained
silt loam
102S 742151 162C
10TYR 4/4 (moist)
10TYR 6/4 (dry)
3.08% O.M.
15.0 meq/100g CEC
1.25% Fe₂O₃
35.3 Mhos

RUSSELL (IN)

Typic Hapudalf
fine-silty, mixed, mesic
humid zone
mod. thick loess and calcareous loam till
Decatur Co.

Ap horizon
B slope
well drained
silt loam
112S 10251 191C
10TYR 4/2 (moist)
10TYR 4/4 (dry)
2.18% O.M.
15.8 meq/100g CEC
1.2% Fe₂O₃
32.7 Mhos
### GENESEE (IN)

*(Typic Udifluent)*

- **humid zone:** alluvium
- **Locality:** Fayette Co.
- **Ap horizon**
  - A slope
  - well drained
  - fine-silty, mixed, mesic
  - silt loam
  - 20% 60% 20%
  - 2% 5% 1% 1%
  - 10TR 3/3 (moist) 10TR 3/3 (dry)
  - 1.54% Fe$_2$O$_3$
  - CEC 1.36

### ALFORD (IN)

*(Typic Hapludalf)*

- **humid zone:** loess
- **Locality:** Knox Co.
- **Ap horizon**
  - B slope
  - well drained
  - fine-silty, mixed, mesic
  - silt loam
  - 20% 60% 20%
  - 2% 5% 1% 1%
  - 10TR 4/4 (moist) 10TR 4/4 (dry)
  - 1.96% Fe$_2$O$_3$
  - CEC 1.35

### DOOR (IN)

*(Ultic Hapludalf)*

- **Locality:** Porter Co.
- **Ap horizon**
  - A slope
  - well drained
  - fine-silty, mixed, mesic
  - silt loam
  - 50% 25% 25%
  - 4% 5% 1% 1%
  - 10TR 2/1 (moist) 10TR 2/1 (dry)
  - 1.55% Fe$_2$O$_3$
  - CEC 1.32

### IVA (IN)

*(Aeric Ochraquifs)*

- **Locality:** Vigo Co.
- **Ap horizon**
  - A slope
  - poorly drained
  - fine-silty, mixed, mesic
  - loamy outwash
  - 30% 45% 25%
  - 1% 2% 1% 1%
  - 11TR 7/2 17/2 17/2
  - 1.2% Fe$_2$O$_3$
  - CEC 1.04

---

**Graphs:**

- **Wavelength (um):**
- **BTF (um):**

- **Genesee:**
  - A horizon:
  - B horizon:

- **Alford:**
  - A horizon:
  - B horizon:

- **Door:**
  - A horizon:
  - B horizon:

- **Iva:**
  - A horizon:
  - B horizon:
**SAC(1A)**

Typic Hapludoll
fine-silty, mixed, mesic
subhumid zone
loess and glacial till
Clay Co.

Ap horizon
A slope
well drained
silty clay loam
5S 585S 34EXC
10T 4/4 (moist)
10T 4/2 (dry)
5.37% O.M.
37.0 meq/100g CEC
1.43% Fe₂O₃

40.8% OC... 42.2% OC...

**IDA(1A)**

Typic Udorthent
fine-silty, mixed, calcareous, mesic
subhumid zone
loess
Crawford Co.

Ap horizon
B slope
well drained
silt loam
3S 745S 232C
10T 3/3 (moist)
10T 3/4 (dry)
1.18% O.M.
26.7 meq/100g CEC
1.33% Fe₂O₃

37.5% OC... 40.9% OC...

**MONONA(1A)**

Typic Hapludoll
fine-silty, mixed, mesic
subhumid zone
loess
Harrison Co.

Ap horizon
B slope
well drained
silt loam
3S 745S 2312C
10T 3/2 (moist)
10T 3/2 (dry)
3.58% O.M.
25.1 meq/100g CEC
1.46% Fe₂O₃

37.3% OC... 38.5% OC...

**HAYNIE(1A)**

Holistic Udifluvent
course-silty, mixed, calcareous, mesic
subhumid zone
recent alluvium
Honone Co.

Ap horizon
A slope
well drained
silt loam
9S 715S 242C
10T 3/4 (moist)
10T 3/4 (dry)
2.36% O.M.
20.2 meq/100g CEC
1.02% Fe₂O₃

36.0% OC... 36.8% OC...
DOWNSI (IA)

Mollis Hapludoll
fine-silty, mixed, mesic
humid zone
Clayton Co.

Ap horizon
B slope
well drained
silt loam
35% 76%Si 21%Clc
10%R 3/2 (silt)
10%R 5/3 (dry)
2.841 O.M.
21.1 meq/100g CEC
1.15% Fe₂O₃
33.0% MW

DUBUQUE (IA)

Typic Hapludoll
fine-silty, mixed, mesic
humid zone
Dubuque Co.

Ap horizon
C slope
well drained
silt loam
35% 76%Si 21%Clc
10%R 3/2 (silt)
10%R 6/4 (dry)
2.841 O.M.
37.3 meq/100g CEC
0.19% Fe₂O₃
32.9% MW

WAUKEE (IA)

Typic Hapludoll
fine-loamy over sandy or sandy-skeletal, mixed mesic
stratified loamy alluvium over sand
Howard Co.

Ap horizon
A slope
well drained
well drained
silt loam
47% 49%Si 21%Clc
10%R 2/1 (silt)
10%R 4/3 (dry)
4.9% O.M.
25.1 meq/100g CEC
1.11% Fe₂O₃
32.4% MW

HEDVILLE (KS)

Lithic Hapludoll
loamy, mixed, mesic
mollisol zone
sandstone residuum
Cloud Co.

All horizon
C slope
a. excess, drained
silt loam
49% 39%Si 12%Clc
7.5%R 3/2 (silt)
10%R 6/4 (dry)
3.6% O.M.
16.0 meq/100g CEC
1.67% Fe₂O₃
23.7% MW

Ap horizon
B slope
well drained
well drained
silt loam
35% 76%Si 21%Clc
7.5%R 3/2 (silt)
10%R 5/3 (dry)
3.82% O.M.
25.1 meq/100g CEC
1.11% Fe₂O₃
35.0% MW
### IRWIN (KS)

**Pachic Argiustoll**

Fine, mixed, mesic

Subhumid zone

Pediments from clay shales

GEDARY Co.

<table>
<thead>
<tr>
<th>Soil Horizon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap horizon</td>
<td>Well drained m.</td>
</tr>
<tr>
<td>B slope</td>
<td>Well drained</td>
</tr>
<tr>
<td>pH (7.5)</td>
<td>7.0 (7)</td>
</tr>
<tr>
<td>EC (10)</td>
<td>10.0 (2)</td>
</tr>
<tr>
<td>Moist</td>
<td>29.1 meq/100g CEC</td>
</tr>
<tr>
<td>Dry</td>
<td>32.6 meq/100g CEC</td>
</tr>
<tr>
<td>CEC</td>
<td>0.59 (3)</td>
</tr>
<tr>
<td>Fe_2O_3</td>
<td>0.29 (3)</td>
</tr>
</tbody>
</table>

7.5YR 312 (moist)

36.5 mg/m^2 37.0 mg/m^2

### GOESSEL (KS)

**Udic Pellustert**

Fine, montmorillonitic, mesic

Subhumid zone

Clayey alluvium

McPherson Co.

<table>
<thead>
<tr>
<th>Soil Horizon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap horizon</td>
<td>Well drained m.</td>
</tr>
<tr>
<td>B slope</td>
<td>Well drained</td>
</tr>
<tr>
<td>pH (7.5)</td>
<td>7.0 (7)</td>
</tr>
<tr>
<td>EC (10)</td>
<td>10.0 (2)</td>
</tr>
<tr>
<td>Moist</td>
<td>29.1 meq/100g CEC</td>
</tr>
<tr>
<td>Dry</td>
<td>32.6 meq/100g CEC</td>
</tr>
<tr>
<td>CEC</td>
<td>0.59 (3)</td>
</tr>
<tr>
<td>Fe_2O_3</td>
<td>0.29 (3)</td>
</tr>
</tbody>
</table>

7.5YR 312 (moist)

35.5 mg/m^2 37.3 mg/m^2

### LANCASTER (KS)

**Udic Argiustoll**

Fine-loamy mixed, mesic

Subhumid zone

Sandstone and sandy shale residuum

Saline Co.

<table>
<thead>
<tr>
<th>Soil Horizon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap horizon</td>
<td>Well drained m.</td>
</tr>
<tr>
<td>B slope</td>
<td>Well drained</td>
</tr>
<tr>
<td>pH (7.5)</td>
<td>7.0 (7)</td>
</tr>
<tr>
<td>EC (10)</td>
<td>10.0 (2)</td>
</tr>
<tr>
<td>Moist</td>
<td>29.1 meq/100g CEC</td>
</tr>
<tr>
<td>Dry</td>
<td>32.6 meq/100g CEC</td>
</tr>
<tr>
<td>CEC</td>
<td>0.59 (3)</td>
</tr>
<tr>
<td>Fe_2O_3</td>
<td>0.29 (3)</td>
</tr>
</tbody>
</table>

7.5YR 312 (moist)

31.2 mg/m^2 29.4 mg/m^2

### VERDIGRIS (KS)

**Udic Argiustoll**

Fine-loamy mixed, mesic

Subhumid zone

Sandstone and sandy shale residuum

Saline Co.

<table>
<thead>
<tr>
<th>Soil Horizon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap horizon</td>
<td>Well drained m.</td>
</tr>
<tr>
<td>B slope</td>
<td>Well drained</td>
</tr>
<tr>
<td>pH (7.5)</td>
<td>7.0 (7)</td>
</tr>
<tr>
<td>EC (10)</td>
<td>10.0 (2)</td>
</tr>
<tr>
<td>Moist</td>
<td>29.1 meq/100g CEC</td>
</tr>
<tr>
<td>Dry</td>
<td>32.6 meq/100g CEC</td>
</tr>
<tr>
<td>CEC</td>
<td>0.59 (3)</td>
</tr>
<tr>
<td>Fe_2O_3</td>
<td>0.29 (3)</td>
</tr>
</tbody>
</table>

7.5YR 312 (moist)

31.2 mg/m^2 29.4 mg/m^2

### Udic Argiustoll

Fine-loamy mixed, mesic

Subhumid zone

Sandstone and sandy shale residuum

Saline Co.
WHITLEY(KY)

Typic Hapludult
fine-silty, mixed, mesic
humid zone
part alluvium, part acid residuum
Laurel Co.

Ap horizon
A slope
well drained
silt loam
15% 715Zi 14SC
10% 7/3 (moist)
10% 6/4 (dry)
1.74% O.M.
7.1 meq/100g CEC
0.60% Fe₂O₃
34.6 mg/kg

MIDLAND(LA)

Typic Ochraqualf
fine, montmorillonitic, thermic
humid zone
clayey residuum
Acadia Parish

Ap horizon
A slope
poorly drained
silty clay loam
5% 715Zi 30SC
10% 7/3 (moist)
10% 6/3 (dry)
2.42% O.M.
25.11 meq/100g CEC
0.88% Fe₂O₃
37.7 mg/kg

CALHOUN(LA)

Typic Glossaqualf
fine-silty, mixed, thermic
humid zone
Loess
East Baton Rouge Parish

Al horizon
A slope
poorly drained
silt loam
15% 715Zi 14SC
10% 7/3 (moist)
10% 6/4 (dry)
1.74% O.M.
7.1 meq/100g CEC
0.60% Fe₂O₃
34.6 mg/kg

KENNER(LA)

Fluvaquent Medicaprast
eutric, thermic
humid zone
herbaceous plant remains with clayey alluvium
Jefferson Parish

Oel horizon
A slope
poorly drained
muck
4% 405Zi 55SC
7.5% 7/3 (moist)
10% 2/1 (dry)
53.14% O.M.
73.6 meq/100g CEC
0.00% Fe₂O₃
77.2 mg/kg
Typic Hapludalf
fine-silty, mixed, thermic humid
zone
mixed silty alluvium
Ouachita Parish

Ap horizon
A slope
well drained
silt loam
2015 70ES1 10EC
10YR 5/4 (moist) 10YR 1/4 (dry)
1.46% O.M. 0.85% O.M.
3.5 Fe₂O₃ 0.50 Fe₂O₃
33.5 mg/kg 31.2 mg/kg

Typic Paleudult
fine-loamy, siliceous, thermic humid
zone
loamy marine deposits
Union Parish

Ap horizon
B slope
well drained
loamy fine sand
76ES 21S51 10EC
10YR 5/3 (moist) 10YR 4/4 (moist)
1.10% O.M. 0.62% O.M.
0.6 meq/100g CEC 2.5 meq/100g CEC
21.5 mg/kg 22.7 mg/kg

Typic Fluvent
fine-silty, mixed, nonacid, thermic humid
zone
loamy alluvium
Tensas Parish

Ap horizon
A slope
well drained
silt loam
14ES 685S1 10EC
10YR 6/4 (moist) 10YR 6/4 (dry)
1.60% O.M. 3.28% O.M.
25.4 meq/100g CEC 0.65 Fe₂O₃
33.4 mg/kg 34.1 mg/kg

Typic Haplorthod
sandy-skeletal, mixed, frigid humid
zone
calcareous loam till
Aroostook Co.

Ap horizon
C slope
well drained
silt loam
29ES 59S51 30EC
7.9% 5/4 (moist) 10YR 6/4 (moist)
3.82% 0.58% Fe₂O₃
25.5 meq/100g CEC 7.31 Fe₂O₃
33.4 mg/kg 31.1 mg/kg

Typic Paleudult
fine-silty, mixed, thermic humid
zone
mixed silty alluvium
Onchita Parish

Ap horizon
A slope
well drained
silt loam
2015 70ES1 10EC
10YR 5/4 (moist) 10YR 5/4 (moist)
1.46% O.M. 0.85% O.M.
3.5 Fe₂O₃ 0.50 Fe₂O₃
33.5 mg/kg 31.2 mg/kg

Typic Paleudult
fine-loamy, siliceous, thermic humid
zone
loamy marine deposits
Union Parish

Ap horizon
B slope
well drained
loamy fine sand
76ES 21S51 10EC
10YR 5/3 (moist) 10YR 4/4 (moist)
1.10% O.M. 0.62% O.M.
0.6 meq/100g CEC 2.5 meq/100g CEC
21.5 mg/kg 22.7 mg/kg

Typic Haplorthod
sandy-skeletal, mixed, frigid humid
zone
calcareous loam till
Aroostook Co.
**PLAISTED (ME)**

Typic Fragiaorthod  
coarse-loamy, mixed, frigid  
humid zone  
glacial till  
Aroostook Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>C slope</th>
<th>well drained</th>
<th>Glacial Till</th>
<th>Typic Fragiaorthod</th>
</tr>
</thead>
<tbody>
<tr>
<td>65%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**SUDBURY (MA)**

Aquic Dysaurochrept  
sandy, mixed, humid  
humid zone  
mixed alluvium  
Essex Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>C slope</th>
<th>well drained</th>
<th>Mixed Alluvium</th>
<th>Aquic Dysaurochrept</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
</tbody>
</table>

---

**WINOOSKI (MA)**

Aquic Udifluvent  
coarse-silty, mixed, non-acid, mesic  
humid zone  
Fine sand and silt alluvium  
Franklin Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>A slope</th>
<th>mod. well drained</th>
<th>Typic Udifluvent</th>
</tr>
</thead>
<tbody>
<tr>
<td>65%</td>
<td>100%</td>
<td>0%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**BERKSHIRE (MA)**

Typic Haplorthod  
coarse-loamy, mixed, frigid  
humid zone  
glacial till  
Franklin Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>A slope</th>
<th>mod. well drained</th>
<th>Typic Haplorthod</th>
</tr>
</thead>
<tbody>
<tr>
<td>65%</td>
<td>100%</td>
<td>0%</td>
<td>100%</td>
</tr>
</tbody>
</table>
**AGAWAM (MA)**

Typic Dystrochrept
coarse-loamy over sandy or sandy-skeletal, mixed, mesic
humid zone
sandy alluvium
Hampden Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
<tr>
<td>fine sandy loam</td>
<td>fine sandy loam</td>
</tr>
<tr>
<td>73R 2/1/2 12C</td>
<td>73R 2/1/2 12C</td>
</tr>
<tr>
<td>10YR 3/3 (moist)</td>
<td>10YR 3/3 (moist)</td>
</tr>
<tr>
<td>10YR 5/4 (dry)</td>
<td>10YR 5/4 (dry)</td>
</tr>
<tr>
<td>1.46% G.N.</td>
<td>1.26% G.N.</td>
</tr>
<tr>
<td>9.7 meg/100g CEC</td>
<td>5.2 meg/100g CEC</td>
</tr>
<tr>
<td>0.9% Fe_2O_3</td>
<td>2.11% Fe_2O_3</td>
</tr>
<tr>
<td>17.8 mg/100g</td>
<td>15.2 mg/100g</td>
</tr>
</tbody>
</table>

**HADLEY (MA)**

Typic Udifluvent
coarse-silty, mixed, nonacid, mesic
humid zone
fine sand and silt alluvium
Hampshire Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
<tr>
<td>silt loam</td>
<td>silt loam</td>
</tr>
<tr>
<td>24R 3/1/2 12C</td>
<td>24R 3/1/2 12C</td>
</tr>
<tr>
<td>10YR 3/2 (moist)</td>
<td>10YR 3/2 (moist)</td>
</tr>
<tr>
<td>2.5Y 3/2 (dry)</td>
<td>2.5Y 3/2 (dry)</td>
</tr>
<tr>
<td>1.16% G.N.</td>
<td>1.16% G.N.</td>
</tr>
<tr>
<td>12.8 meg/100g CEC</td>
<td>13.1 meg/100g CEC</td>
</tr>
<tr>
<td>1.1% Fe_2O_3</td>
<td>1.1% Fe_2O_3</td>
</tr>
<tr>
<td>35.0 mg/100g</td>
<td>35.2 mg/100g</td>
</tr>
</tbody>
</table>

**HINCKLEY (MA)**

Typic Udeorthent
sandy-skeletal, mixed, mesic
humid zone
sandy alluvium
Worcester Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
<tr>
<td>s. excess. drained</td>
<td>s. excess. drained</td>
</tr>
<tr>
<td>loamy coarse sand</td>
<td>loamy coarse sand</td>
</tr>
<tr>
<td>75R 1/1/2 12C</td>
<td>75R 1/1/2 12C</td>
</tr>
<tr>
<td>10YR 3/2 (moist)</td>
<td>10YR 3/2 (moist)</td>
</tr>
<tr>
<td>10YR 4/3 (dry)</td>
<td>10YR 4/3 (dry)</td>
</tr>
<tr>
<td>6.20% O.M.</td>
<td>6.20% O.M.</td>
</tr>
<tr>
<td>17.5 meg/100g CEC</td>
<td>26.1 meg/100g CEC</td>
</tr>
<tr>
<td>0.95% Fe_2O_3</td>
<td>1.09% Fe_2O_3</td>
</tr>
<tr>
<td>30.2 mg/100g</td>
<td>22.4 mg/100g</td>
</tr>
</tbody>
</table>
IRON RIVER (MI)
Alfic Fragiorthod
coarse-loamy, mixed, frigid
humid zone
glacial till
Baraga Co.

Alf-a2 horizon
B slope
mod. well drained
silt loam
14% 7% 9% CEC
7.5YR 3/2 (moist) 7.5YR 3/2 (moist)
10YR 5/2 (dry) 10YR 5/2 (dry)
6.3% O.N. 10.7% O.N.
20.4 meq/100g CEC 26.3 meq/100g CEC
1.06% Fe₂O₃ 1.73% Fe₂O₃
52.2 Mä% 48.5 Mä%  

ONTONAGON (MI)
Glossic Eutroboralf
very fine, mixed
humid zone
glacial lake plain sediments
Ontonagon Co.

Ap horizon
B slope
mod. well drained
clay
ton 22% 70% CEC
2.5YR 3/6 (moist) 2.5YR 4/4 (moist)
5YR 6/4 (dry) 5YR 6/4 (dry)
38.0% O.N. 3.9% O.N.
31.6 meq/100g CEC 31.6 meq/100g CEC
1.73% Fe₂O₃ 2.76% Fe₂O₃
47.5 Mä% 45.2 Mä%  

Aeric Haplaquept
fine, mixed, nonacid, frigid
humid zone
clayey glacial till or
lacustrine material
Chippewa Co.

All-A2 horizon
A slope
poorly drained
silty clay
5% 8% 3% CEC
5YR 3/2 (moist) 10YR 3/2 (moist)
10YR 4/2 (dry) 10YR 4/2 (dry)
14.5% O.N. 15.16% O.N.
50.8 meq/100g CEC 50.8 meq/100g CEC
3.71% Fe₂O₃ 0.64% Fe₂O₃
60.8 Mä%  62.3 Mä%  

MUNISING (MI)
Alfic Fragiorthod
coarse-loamy, mixed, frigid
humid zone
glacial till
Baraga Co.

Alf-a2 horizon
B slope
mod. well drained
silt loam
14% 5% 3% CEC
7.5YR 3/2 (moist) 7.5YR 3/2 (moist)
10YR 5/2 (dry) 10YR 5/2 (dry)
6.3% O.N. 10.7% O.N.
20.4 meq/100g CEC 26.3 meq/100g CEC
1.06% Fe₂O₃ 1.73% Fe₂O₃
17.5 Mä% 24.5 Mä%  

PICKFORD (MI)
Aeric Haplaquept
fine, mixed, nonacid, frigid
humid zone
clayey glacial till or
lacustrine material
Chippewa Co.

All-A2 horizon
A slope
poorly drained
silty clay
5% 8% 3% CEC
5YR 3/2 (moist) 10YR 3/2 (moist)
10YR 4/2 (dry) 10YR 4/2 (dry)
14.5% O.N. 15.16% O.N.
50.8 meq/100g CEC 50.8 meq/100g CEC
3.71% Fe₂O₃ 0.64% Fe₂O₃
60.8 Mä%  62.3 Mä%  

The diagrams show the reflectance spectra of the soils at different wavelengths.
<table>
<thead>
<tr>
<th>AERIC Hapludalf</th>
<th>TYPIC ULMISEROSOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine-loamy, mixed, frigid</td>
<td>Fine-loamy, mixed, frigid</td>
</tr>
<tr>
<td>Humid zone</td>
<td>Humid zone</td>
</tr>
<tr>
<td>Delta Co.</td>
<td>Delta Co.</td>
</tr>
</tbody>
</table>

**Alf horizon**
- Well drained
- Fine sandy loam

**A slope**
- Well drained
- Fine sandy loam

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>4.7</td>
</tr>
<tr>
<td>EC</td>
<td>1.5</td>
</tr>
<tr>
<td>ECE</td>
<td>0.25</td>
</tr>
</tbody>
</table>

**ONAWAY (MI)**

**Ap horizon**
- Well drained
- Fine sandy loam

**B horizon**
- Well drained
- Fine sandy loam

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>4.7</td>
</tr>
<tr>
<td>EC</td>
<td>1.5</td>
</tr>
<tr>
<td>ECE</td>
<td>0.25</td>
</tr>
</tbody>
</table>

**RIFLE (MI)**

**Oil horizon**
- V. poorly drained
- Muck

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>4.7</td>
</tr>
<tr>
<td>EC</td>
<td>1.5</td>
</tr>
<tr>
<td>ECE</td>
<td>0.25</td>
</tr>
</tbody>
</table>

---

**GRAYLING (MI)**

**A1 horizon**
- Poorly drained
- Fine loamy

**A slope**
- Poorly drained
- Fine loamy

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>4.7</td>
</tr>
<tr>
<td>EC</td>
<td>1.5</td>
</tr>
<tr>
<td>ECE</td>
<td>0.25</td>
</tr>
</tbody>
</table>

**Al-2 horizon**
- Excessively drained
- Fine loamy

**A slope**
- Excessively drained
- Fine loamy

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>4.7</td>
</tr>
<tr>
<td>EC</td>
<td>1.5</td>
</tr>
<tr>
<td>ECE</td>
<td>0.25</td>
</tr>
</tbody>
</table>

---

**ANGELICA (MI)**

**A1 horizon**
- Silt loam

**A slope**
- Silt loam

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>4.7</td>
</tr>
<tr>
<td>EC</td>
<td>1.5</td>
</tr>
<tr>
<td>ECE</td>
<td>0.25</td>
</tr>
</tbody>
</table>

**Al-2 horizon**
- Silt loam

**A slope**
- Silt loam

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>4.7</td>
</tr>
<tr>
<td>EC</td>
<td>1.5</td>
</tr>
<tr>
<td>ECE</td>
<td>0.25</td>
</tr>
</tbody>
</table>
**EMMET (MI)**

Alfic Haplargid

coarse-loamy, mixed, frigid
humid zone

Glacial till

Dulce Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>B slope</td>
<td>B slope</td>
</tr>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
<tr>
<td>loamy sand</td>
<td>loamy sand</td>
</tr>
<tr>
<td>79% 19% 2%</td>
<td>78% 18% 2%</td>
</tr>
<tr>
<td>10% 3% (moist)</td>
<td>10% 3% (moist)</td>
</tr>
<tr>
<td>10% 1% (dry)</td>
<td>10% 1% (dry)</td>
</tr>
<tr>
<td>2.4% O.H.</td>
<td>2.3% O.H.</td>
</tr>
<tr>
<td>7.7 meq/100g CEC</td>
<td>10.2 meq/100g CEC</td>
</tr>
<tr>
<td>0.42% Fe₂O₃</td>
<td>0.54% Fe₂O₃</td>
</tr>
<tr>
<td>12.7 pHr.</td>
<td>12.2 pHr.</td>
</tr>
</tbody>
</table>

**HILLSDALE (MI)**

Typic Hapludalf

coarse-loamy, mixed, mottled
humid zone

Glacial till and drift

Jackson Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>B slope</td>
<td>B slope</td>
</tr>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
<tr>
<td>fine sandy loam</td>
<td>fine sandy loam</td>
</tr>
<tr>
<td>78% 18% 2%</td>
<td>78% 18% 2%</td>
</tr>
<tr>
<td>10% 3% (moist)</td>
<td>7.5% 5% (moist)</td>
</tr>
<tr>
<td>10% 1% (dry)</td>
<td>10% 1% (dry)</td>
</tr>
<tr>
<td>1.6% O.H.</td>
<td>2.0% O.H.</td>
</tr>
<tr>
<td>9.7 meq/100g CEC</td>
<td>9.6 meq/100g CEC</td>
</tr>
<tr>
<td>0.41% Fe₂O₃</td>
<td>0.99% Fe₂O₃</td>
</tr>
<tr>
<td>20.0 pHr.</td>
<td>19.7 pHr.</td>
</tr>
</tbody>
</table>

**TAYLOR (MN)**

Typic Eutroboralf

fine, mixed
subhumid zone

Silty clay loam till and lacustrine silt

Lake-of-the-Wood Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>B slope</td>
<td>B slope</td>
</tr>
<tr>
<td>mod. well drained</td>
<td>mod. well drained</td>
</tr>
<tr>
<td>loamy sand</td>
<td>fine sandy loam</td>
</tr>
<tr>
<td>78% 18% 2%</td>
<td>78% 18% 2%</td>
</tr>
<tr>
<td>5% 2% 1% (moist)</td>
<td>10% 3% (moist)</td>
</tr>
<tr>
<td>10% 1% (dry)</td>
<td>10% 1% (dry)</td>
</tr>
<tr>
<td>3.2% O.H.</td>
<td>2.1% O.H.</td>
</tr>
<tr>
<td>13.6 meq/100g CEC</td>
<td>9.2 meq/100g CEC</td>
</tr>
<tr>
<td>0.31% Fe₂O₃</td>
<td>0.23% Fe₂O₃</td>
</tr>
<tr>
<td>20.0 pHr.</td>
<td>23.9 pHr.</td>
</tr>
</tbody>
</table>

**WARBA (MN)**

Typic Eutroboralf

fine, mixed
subhumid zone

Calcereous clay loam materials

Cass Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>B slope</td>
<td>B slope</td>
</tr>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
<tr>
<td>silt loam</td>
<td>silt loam</td>
</tr>
<tr>
<td>78% 18% 2%</td>
<td>78% 18% 2%</td>
</tr>
<tr>
<td>10% 4% 1% (moist)</td>
<td>10% 3% (moist)</td>
</tr>
<tr>
<td>10% 1% (dry)</td>
<td>10% 1% (dry)</td>
</tr>
<tr>
<td>1.7% O.H.</td>
<td>1.6% O.H.</td>
</tr>
<tr>
<td>9.6 meq/100g CEC</td>
<td>9.2 meq/100g CEC</td>
</tr>
<tr>
<td>0.41% Fe₂O₃</td>
<td>0.4% Fe₂O₃</td>
</tr>
<tr>
<td>32.7 pHr.</td>
<td>29.3 pHr.</td>
</tr>
</tbody>
</table>
**ROLISS (MN)**

Typic Hapludoll
fine-loamy, mixed, calcareous, frigid
subhumid zone
calcereous glacial till
Grant Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>poorly drained</td>
<td>poorly drained</td>
</tr>
<tr>
<td>clay loam</td>
<td>clay loam</td>
</tr>
<tr>
<td>7TH 4.5/0 (moist)</td>
<td>7TH 4/0 (moist)</td>
</tr>
<tr>
<td>10YR 3/1 (dry)</td>
<td>10YR 3/1 (dry)</td>
</tr>
<tr>
<td>6.0% C.O.M.</td>
<td>4.7% C.O.M.</td>
</tr>
<tr>
<td>14.7 meq/100g CEC</td>
<td>37.6 meq/100g CEC</td>
</tr>
<tr>
<td>0.21% Fe$_2$O$_3$</td>
<td>0.32% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>28.0 pH (w)</td>
<td>30.3 pH (w)</td>
</tr>
</tbody>
</table>

**GRYGLAI (MN)**

Mollic Hapludoll
sands over loamy, mixed, nonacid, frigid
subhumid zone
lacustrine sediments over till
Kittson Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>poorly drained</td>
<td>poorly drained</td>
</tr>
<tr>
<td>fine sand</td>
<td>fine sand</td>
</tr>
<tr>
<td>9TH 7.5/1 (moist)</td>
<td>9TH 7/1 (moist)</td>
</tr>
<tr>
<td>10YR 7/1 (dry)</td>
<td>10YR 7/1 (dry)</td>
</tr>
<tr>
<td>2.09% C.O.M.</td>
<td>2.63% C.O.M.</td>
</tr>
<tr>
<td>9.4 meq/100g CEC</td>
<td>9.4 meq/100g CEC</td>
</tr>
<tr>
<td>0.11% Fe$_2$O$_3$</td>
<td>0.09% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>17.5 pH (w)</td>
<td>27.8 pH (w)</td>
</tr>
</tbody>
</table>

**ANOKA (MN)**

Eutric Gleyedalf
coarse-loamy, mixed
subhumid zone
sandy outwash
Isanti Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
<tr>
<td>loamy fine sand</td>
<td>silt</td>
</tr>
<tr>
<td>8TH 7.5/1 (moist)</td>
<td>12TH 7/1 (moist)</td>
</tr>
<tr>
<td>10YR 3/1 (dry)</td>
<td>10YR 3/1 (moist)</td>
</tr>
<tr>
<td>0.74% C.O.M.</td>
<td>0.74% C.O.M.</td>
</tr>
<tr>
<td>5.2 meq/100g CEC</td>
<td>3.0 meq/100g CEC</td>
</tr>
<tr>
<td>0.42% Fe$_2$O$_3$</td>
<td>0.21% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>22.3 pH (w)</td>
<td>16.8 pH (w)</td>
</tr>
</tbody>
</table>

**REDBY (MN)**

Aquic Udipsamment
mixed, frigid
subhumid zone
sands of glacial origin
Kittson Co.

<table>
<thead>
<tr>
<th>Al horizon</th>
<th>Al horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>s. poorly drained</td>
<td>s. poorly drained</td>
</tr>
<tr>
<td>fine sand</td>
<td>fine sand</td>
</tr>
<tr>
<td>9TH 7.5/1 (moist)</td>
<td>9TH 7/1 (moist)</td>
</tr>
<tr>
<td>10YR 7/1 (dry)</td>
<td>10YR 7/1 (dry)</td>
</tr>
<tr>
<td>0.96% C.O.M.</td>
<td>1.37% C.O.M.</td>
</tr>
<tr>
<td>5.4 meq/100g CEC</td>
<td>11.1 meq/100g CEC</td>
</tr>
<tr>
<td>0.14% Fe$_2$O$_3$</td>
<td>0.10% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>10.0 pH (w)</td>
<td>19.3 pH (w)</td>
</tr>
</tbody>
</table>

---

**Diagram:**
- Wavelength vs BRF
- Spectral reflectance curves for different soil horizons.
CORMANT (MN)

Hodolic Psamments
mixed, frigid
sub humid zone
sandy sediments
Lake-of-the-Woods Co.

Ap horizon
A slope
poorly drained
loamy fine sand
82.5% 1121 71C
10% 4/2 (moist)
10% 4/2 (dry)
4.5% O.M.

32.2 meq/100g CEC
0.37% FeO3

26.7 %

38.5 %

BUSE (MN)

Udorthentic Mapelboroll
fine-loamy, mixed
sub humid zone
glacial till
Ottertail Co.

Ap horizon
C slope
well drained
loam
42% 4425 241C
10% 3/2 (moist)
10% 3/2 (dry)
1.5% O.M.

29.3 meq/100g CEC
0.91% FeO3

30.0 %

33.9 %

LANGHEI (MN)

Typic Udorthent
fine-loamy, mixed, calcareous, frigid
sub humid zone
glacial till
Pope Co.

Ap horizon
D slope
s. excess. drained
silty clay loam
29% 4121 111C
10% 3/2 (moist)
10% 3/2 (dry)
3.0% O.M.

25.3 meq/100g CEC
0.71% FeO3

35.0 %

29.7 %

FLOM (MN)

Typic Maphiloll
fine-loamy, mixed, frigid
sub humid zone
glacial till
Stevens Co.

Ap horizon
A slope
s. poorly drained
silty clay loam
18% 4725 351C
7.5% 3/0 (moist)
10% 3/1 (dry)
6.0% O.M.

53.6 meq/100g CEC
0.30% FeO3

47.4 %

50.7 %
NICOLLET (MN)
Aquic Hapludoll
fine-loamy, mixed, mesic
subhumid zone
calcareous loam till
Martin Co.

Ap horizon
B slope
mod. well drained
loam
46IS 29K5 25EC
7.5YR 2/1 (moist)
7.5YR 3/1 (dry)
6.42% O.M.
30.2 meq/100g CEC
0.49% FeO
31.7 %Fe 2O3
29.8 %Fe 2O3

GLENCOE (MN)
Cumulic Hapludoll
fine-loamy, mixed, mesic
subhumid zone
loamy sediments and till
Steele Co.

Ap horizon
A slope
v. poorly drained
clay loam
35IS 35IS 35EC
7.5YR 3/1 (moist)
10YR 3/1 (dry)
8.4% O.M.
9.9% CEC
50.7 meq/100g CEC
0.54% FeO
41.0 %Fe 2O3
43.7 %Fe 2O3

CANISTEO (MN)
Typic Hapludoll
fine-loamy, mixed, calcareous, mesic
subhumid zone
glacial till
Steele Co.

Ap horizon
A slope
poorly drained
loam
39IS 39IS 39EC
7.5YR 2/0 (moist)
10YR 3/1 (dry)
4.98% O.M.
33.7 meq/100g CEC
0.38% FeO
36.3 %Fe 2O3
40.0 %Fe 2O3

HAYDEN (MN)
Typic Hapludalf
fine-loamy, mixed, mesic
subhumid zone
calcareous loam till
Rice Co.

Ap horizon
C slope
well drained
loam
40IS 40IS 40EC
10YR 3/2 (moist)
10YR 3/2 (dry)
2.16% O.M.
2.09% CEC
20.0 meq/100g CEC
0.06% FeO
28.0 %Fe 2O3
27.1 %Fe 2O3
CORDOVA (MN)

Typic Argiaquoll
fine-loamy, mixed, mesic
subhumid zone
calcareous loamy till
Waseca Co.

Ap horizon
A slope
poorly drained
clay loam
26/25 34251 312C
107R 2/1 (moist)
107R 2/2 (dry)
4.37% O.H.
35.8 meq/100g CEC
0.49% Fe₂O₃
39.3 PAZ= 37.1 PAZ=

SUSQUEHANNA (MS)

Vertic Paleudalf
fine, montmorillonitic, thermic
humid zone
coastal plain clays
George Co.

Al horizon
C slope
s. poorly drained
fine sandy loam
51/25 34251 312C
107R 4/2 (moist)
107R 7/2 (dry)
1.96% O.H.
8.5 meq/100g CEC
0.72% Fe₂O₃
29.8 PAZ= 33.9 PAZ=

GRENADA (MS)

Classic Fragudalf
fine-silty, sm-, d, thermic
humid zone
loess
Grenada Co.

Ap horizon
A slope
mod. well drained
silt loam
26/25 34251 412C
107R 5/6 (moist)
107R 6/6 (dry)
0.60% O.H.
11.3 meq/100g CEC
1.26% Fe₂O₃
33.0 PAZ= 34.6 PAZ=

UNION (MO)

Typic Hapludalf
very-fine, mixed, mesic
humid zone
limestone and shale residuum
Moniteau Co.

Ap horizon
C slope
well drained
silt loam
15/25 34251 412C
107R 4/4 (moist)
107R 6/6 (dry)
1.45% O.H.
12.0 meq/100g CEC
0.80% Fe₂O₃
33.4 PAZ= 33.4 PAZ=

---

---
**KILWINNING (MO)**

Vertic Ochraqualf  
Fine, montmorillonitic, mesic  
Humid zone  
Thick loams over till  
Scotland Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>A2 horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>B slope</td>
<td>B slope</td>
</tr>
<tr>
<td>a. poorly drained</td>
<td>a. poorly drained</td>
</tr>
<tr>
<td>silt loam</td>
<td>silt loam</td>
</tr>
<tr>
<td>5% 70/55 25C</td>
<td>12% 70/55 25C</td>
</tr>
<tr>
<td>10YR 3/2 (moist)</td>
<td>10YR 3/1 (moist)</td>
</tr>
<tr>
<td>10YR 7/2 (dry)</td>
<td>10YR 7/2 (dry)</td>
</tr>
<tr>
<td>2.34% O.M.</td>
<td>3.57% O.M.</td>
</tr>
<tr>
<td>25.8 meq/100g CEC</td>
<td>31.3 meq/100g CEC</td>
</tr>
<tr>
<td>1.62% Fe$_2$O$_3$</td>
<td>1.17% Fe$_2$O$_3$</td>
</tr>
</tbody>
</table>

39.5 m$\mu$2  42.4 m$\mu$2

**CHINOOK (MT)**

Aridic Haplorthol  
Coarse-loamy, mixed  
Semiarid zone  
Fine sandy loam alluvium  
Hill Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>A slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>B slope</td>
<td>A slope</td>
</tr>
<tr>
<td>v. fine sandy loam</td>
<td>well drained</td>
</tr>
<tr>
<td>clay loam</td>
<td>well drained</td>
</tr>
<tr>
<td>52% 45/54 25C</td>
<td>67% 35/65 35C</td>
</tr>
<tr>
<td>10YR 4/2 (moist)</td>
<td>10YR 3/2 (moist)</td>
</tr>
<tr>
<td>10YR 6/2 (dry)</td>
<td>10YR 6/3 (dry)</td>
</tr>
<tr>
<td>1.52 O.M.</td>
<td>2.67 O.M.</td>
</tr>
<tr>
<td>14.4 meq/100g CEC</td>
<td>10.3 meq/100g CEC</td>
</tr>
<tr>
<td>0.50% Fe$_2$O$_3$</td>
<td>0.67% Fe$_2$O$_3$</td>
</tr>
</tbody>
</table>

26.6 m$\mu$2  25.1 m$\mu$2

**ELLOAM (MT)**

Borollc Natrargid  
Fine, montmorillonitic  
Semiarid zone  
Calcareous loam alluvium  
Hill Co.

<table>
<thead>
<tr>
<th>A2 horizon</th>
<th>A2 horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>B slope</td>
<td>B slope</td>
</tr>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
<tr>
<td>silt loam</td>
<td>silt loam</td>
</tr>
<tr>
<td>25% 45/55 25C</td>
<td>30% 55/55 35C</td>
</tr>
<tr>
<td>10YR 4/2 (moist)</td>
<td>10YR 4/2 (moist)</td>
</tr>
<tr>
<td>10YR 6/2 (dry)</td>
<td>10YR 6/3 (dry)</td>
</tr>
<tr>
<td>3.82% O.M.</td>
<td>3.36% O.M.</td>
</tr>
<tr>
<td>22.4 meq/100g CEC</td>
<td>18.4 meq/100g CEC</td>
</tr>
<tr>
<td>0.72% Fe$_2$O$_3$</td>
<td>0.61% Fe$_2$O$_3$</td>
</tr>
</tbody>
</table>

42.2 m$\mu$2  37.0 m$\mu$2

**ETHRIDGE (MT)**

Aridic Argiboroll  
Fine, montmorillonitic  
Semiarid zone  
Lacustrine sediments  
Liberty Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>A slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
<tr>
<td>clay loam</td>
<td>clay loam</td>
</tr>
<tr>
<td>25% 45/55 25C</td>
<td>25% 55/55 35C</td>
</tr>
<tr>
<td>10YR 4/2 (moist)</td>
<td>10YR 4/2 (moist)</td>
</tr>
<tr>
<td>10YR 6/2 (dry)</td>
<td>10YR 6/3 (dry)</td>
</tr>
<tr>
<td>1.72 O.M.</td>
<td>2.68 O.M.</td>
</tr>
<tr>
<td>23.3 meq/100g CEC</td>
<td>28.0 meq/100g CEC</td>
</tr>
<tr>
<td>0.46% Fe$_2$O$_3$</td>
<td>0.98% Fe$_2$O$_3$</td>
</tr>
</tbody>
</table>

36.0 m$\mu$2  30.0 m$\mu$2

---

**BRF (R)**

30  20  10  0  
WAVELNGTH (\mu M)

---

**BRF (R)**

30  20  10  0  
WAVELNGTH (\mu M)
KEISER (MT)

Ustolic Haplargid
fine-silty, mixed, mesic
moderately well drained
calcimorphic silt loam material
Yellowstone Co.

Ap horizon
A slope
well drained
loam
3RS 372S 252C
10YR 4/3 (moist) 10YR 4/2 (dry)
1.14% O.M.
26.0 mg/100g CEC
0.81E Fe$_2$O$_3$

26.0 29.6

TARKIO (MT)

Typic Eutrudealf
very-fine, mixed
subhumid zone
glacial lake terrace deposits
Missouri Co.

A2 horizon
A slope
well drained
silty clay loam
342S 332S 33XC
5YR 4/2 (moist) 7.5YR 6/2 (dry)
3.00% O.M.
20.7 mg/100g CEC
0.862 Fe$_2$O$_3$

36.6 47.7

GREENOUGH (MT)

Typic Eutrudealf
fine-silty, mixed
subhumid zone
thin glacial till over bedrock
Missouri Co.

A2 horizon
B slope
well drained
loamy sand
1B2S 952S 72C
10YR 5/4 (moist) 10YR 5/6 (dry)
1.13% O.M.
10.1 mg/100g CEC
1.21E Fe$_2$O$_3$

25.3 42.8

HORD (NE)

Pachic HaplustOLL
fine-silty, mixed, mesic
subhumid zone
calcimorphic silt loam
Buffalo Co.

Ap horizon
A slope
well drained
silt loam
212S 592S 22GC
10YR 3/1 (moist) 10YR 4/2 (dry)
2.37% O.M.
23.8 mg/100g CEC
0.49% Fe$_2$O$_3$

36.2 37.9

WAVELENGHT (μm)
### Hastings (NE)

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Udic Argiustoll</td>
<td>fine, montmorillonitic, mixed subhumid zone loess Clay Co.</td>
</tr>
</tbody>
</table>

#### Ap horizon
- A slope
- Well drained
- Silt loam
- 52.5% 74% 22% 2C
- 7YR 3/2 (moist) 10YR 4/2 (dry)
- 3.05% silt 2.58% silt
- 0.67% Fe₂O₃

#### Alluvial horizon
- A slope
- Well drained
- Silt loam
- 38% 3% 65% 22% 2C
- 7YR 3/2 (moist) 10YR 4/2 (dry)
- 1.94% silt 1.85% silt
- 0.35% Fe₂O₃

### Alliance (NE)

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ardic Argiustoll</td>
<td>fine-silty, mixed, mixed subarid zone loess and calcareous residuum Daves Co.</td>
</tr>
</tbody>
</table>

#### Ap horizon
- A slope
- Well drained
- Silt loam
- 52.5% 74% 22% 2C
- 7YR 3/2 (moist) 10YR 4/2 (dry)
- 3.05% silt 2.58% silt
- 0.67% Fe₂O₃

#### Alluvial horizon
- A slope
- Well drained
- Silt loam
- 38.5% 45% 22% 2C
- 7YR 3/2 (moist) 10YR 4/2 (dry)
- 1.94% silt 1.85% silt
- 0.35% Fe₂O₃

### Jansen (NE)

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typic Argiustoll</td>
<td>fine-loamy over sandy or sandy-skeletal, mixed, mixed subhumid zone loamy alluvium or loess over sand Holt Co.</td>
</tr>
</tbody>
</table>

#### Ap horizon
- A slope
- Well drained
- Silt loam
- 52.5% 3% 65% 22% 2C
- 7YR 3/2 (moist) 10YR 4/2 (dry)
- 3.05% silt 2.58% silt
- 0.67% Fe₂O₃

#### Alluvial horizon
- A slope
- Poorly drained
- Sandy loam
- 30% 45% 22% 2C
- 7YR 3/2 (moist) 10YR 4/2 (dry)
- 0.07% Fe₂O₃

### Loup (NE)

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typic Haplusterell</td>
<td>sandy, mixed, mixed subhumid zone sandy alluvium Thomas Co.</td>
</tr>
</tbody>
</table>

#### Alluvial horizon
- A slope
- Poorly drained
- Fine sandy loam
- 72% 10% 20% 2C
- 7YR 3/2 (moist) 10YR 4/2 (dry)
- 5.51% silt 9.31% silt
- 0.07% Fe₂O₃

#### Alluvial horizon
- A slope
- Poorly drained
- Fine sandy loam
- 72% 10% 20% 2C
- 7YR 3/2 (moist) 10YR 4/2 (dry)
- 5.51% silt 9.31% silt
- 0.07% Fe₂O₃

### Hastings (NE)

- Udic Argiustoll
  - fine, montmorillonitic, mixed subhumid zone loess Clay Co.

### Alliance (NE)

- Ardic Argiustoll
  - fine-silty, mixed, mixed subarid zone loess and calcareous residuum Daves Co.

### Jansen (NE)

- Typic Argiustoll
  - fine-loamy over sandy or sandy-skeletal, mixed, mixed subhumid zone loamy alluvium or loess over sand Holt Co.

### Loup (NE)

- Typic Haplusterell
  - sandy, mixed, mixed subhumid zone sandy alluvium Thomas Co.
CROFTON (NE)

Typic Ustortht
fine-silty, mixed, calcareous, mesic
subhumid zone
silty loess
Thurston Co.

Ap horizon
D slope
well drained
silt loam
25% 70ES 25EC
10YR 4/3 (moist) 7.5YR 6/3 (moist)
10YR 5/4 (dry) 10YR 5/3 (dry)
1.92% O.M. 2.75% O.M.
39.2 meq/100g CEC 46.6 meq/100g CEC

1.172 FeO2  1.012 Fe2O3

30.7 mg/C 36.8 mg/C

GIBBON (NE)

Fluvaquentic Haplaquoll
fine-silty, mixed, calcareous, mesic
subhumid zone
calcareous alluvium
Webster Co.

Ap horizon
A slope
s. poorly drained
s. poorly drained
silty clay loam
silty clay loam
25% 55ES 35RC
7.5YR 65ES 28RC
10YR 5/2 (moist) 10YR 3/2 (moist)
10YR 6/2 (dry) 10YR 4/2 (dry)
2.75% O.M. 3.00% O.M.
42.2 meq/100g CEC 32.5 meq/100g CEC
0.412 FeO2  0.542 Fe2O3

48.4 mg/C  43.2 mg/C

APPIAN (NV)

Typic Haplargid
fine-loamy over sandy or sandy-skeletal, mixed, mesic
arid zone
loamy alluvium over lacustrine sands
Churchill Co.

All-Al2 horizon
A slope
well drained
sandy loam
25% 18ES 75EC
35% 95ES 55EC
10YR 5/2 (moist) 10YR 6/2 (moist)
10YR 6/3 (dry) 10YR 6/3 (dry)
0.132 O.M. 0.02 O.M.
8.5 meq/100g CEC 10.5 meq/100g CEC
0.342 FeO2  0.262 Fe2O3

16.1 mg/C  9.3 mg/C

CARSON (NV)

Vertic Haplaquoll
very-fine, montmorillonitic, mesic
arid zone
clayey mixed alluvium
Churchill Co.

Ap horizon
A slope
s. poorly drained
clay
25% 24ES 65EC
155E 27ES 55RC
10YR 4/1 (moist) 10YR 4/1 (moist)
10YR 5/1 (dry) 10YR 4/1 (dry)
1.93% O.M. 1.88% O.M.
54.4 meq/100g CEC 52.1 meq/100g CEC
0.482 FeO2  0.432 Fe2O3

56.7 mg/C  51.6 mg/C

WAVELENGTH (µM)

WAVELENGTH (µM)
**DIA(NV)**

Fluvaquentic Haploxeroll
fine-loamy over sandy-skeletal, mixed, mesic
arid zone
loamy over sandy alluvium
Churchill Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>n. poorly drained</td>
<td>n. poorly drained</td>
</tr>
<tr>
<td>fine sandy loam</td>
<td>fine sandy loam</td>
</tr>
<tr>
<td>5025 32251 18XC</td>
<td>5925 2451 18XC</td>
</tr>
<tr>
<td>10YR 4/2 (moist)</td>
<td>10YR 3/2 (moist)</td>
</tr>
<tr>
<td>10YR 5/2 (dry)</td>
<td>10YR 5/3 (dry)</td>
</tr>
<tr>
<td>2.162 O.M.</td>
<td>1.182 O.M.</td>
</tr>
<tr>
<td>23.1 meq/100g CEC</td>
<td>26.7 meq/100g CEC</td>
</tr>
<tr>
<td>0.62% Fe$_2$O$_3$</td>
<td>0.51% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>30.9 pH (<em>L</em>)</td>
<td>29.2 pH (<em>L</em>)</td>
</tr>
</tbody>
</table>

**PIQUETE(NV)**

Typic Haploxeroll
loamy-skeletal, mixed, mesic
arid zone
residuum from tuffs and basalts
Churchill Co.

<table>
<thead>
<tr>
<th>Al horizon</th>
<th>Al horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>B slope</td>
<td>B slope</td>
</tr>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
<tr>
<td>fine sandy loam</td>
<td>fine sandy loam</td>
</tr>
<tr>
<td>4925 35251 15XC</td>
<td>6525 26151 92C</td>
</tr>
<tr>
<td>10YR 4/2 (moist)</td>
<td>10YR 5/3 (moist)</td>
</tr>
<tr>
<td>10YR 5/2 (dry)</td>
<td>10YR 5/3 (dry)</td>
</tr>
<tr>
<td>0.90% O.M.</td>
<td>0.64% O.M.</td>
</tr>
<tr>
<td>32.4 meq/100g CEC</td>
<td>30.4 meq/100g CEC</td>
</tr>
<tr>
<td>0.42% Fe$_2$O$_3$</td>
<td>0.42% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>21.2 pH (<em>L</em>)</td>
<td>3.1 pH (<em>L</em>)</td>
</tr>
</tbody>
</table>

**BLACKHAWK(NV)**

Entic Durorthid
loamy, mixed, mesic, shallow
arid zone
loess over mixed alluvium
Pershing Co.

<table>
<thead>
<tr>
<th>Al horizon</th>
<th>Al horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
<tr>
<td>silt loam</td>
<td>silt loam</td>
</tr>
<tr>
<td>3325 58551 95C</td>
<td>1125 59251 102C</td>
</tr>
<tr>
<td>10YR 5/4 (moist)</td>
<td>10YR 4/2 (moist)</td>
</tr>
<tr>
<td>10YR 6/3 (dry)</td>
<td>10YR 6/3 (dry)</td>
</tr>
<tr>
<td>0.74% O.M.</td>
<td>0.40% O.M.</td>
</tr>
<tr>
<td>17.3 meq/100g CEC</td>
<td>20.0 meq/100g CEC</td>
</tr>
<tr>
<td>0.64% Fe$_2$O$_3$</td>
<td>0.51% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>26.8 pH (<em>L</em>)</td>
<td>26.2 pH (<em>L</em>)</td>
</tr>
</tbody>
</table>

**HUMBOLDT(NV)**

Fluvaquentic Haploxeroll
fine, montmorillonitic, calcareous, mesic
arid zone
silty mixed alluvium with volcanic ash
Pershing Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>poorly drained</td>
<td>poorly drained</td>
</tr>
<tr>
<td>silty clay</td>
<td>clay</td>
</tr>
<tr>
<td>325 47551 50XC</td>
<td>625 38551 56C</td>
</tr>
<tr>
<td>10YR 3/1 (moist)</td>
<td>10YR 3/1 (moist)</td>
</tr>
<tr>
<td>10YR 5/1 (dry)</td>
<td>10YR 4/1 (dry)</td>
</tr>
<tr>
<td>4.48% O.M.</td>
<td>4.83% O.M.</td>
</tr>
<tr>
<td>47.8 meq/100g CEC</td>
<td>72.4 meq/100g CEC</td>
</tr>
<tr>
<td>0.25% Fe$_2$O$_3$</td>
<td>0.26% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>56.0 pH (<em>L</em>)</td>
<td>66.0 pH (<em>L</em>)</td>
</tr>
</tbody>
</table>
LOVELOCK (NV)

Aquic Hapludol
fine, montmorillonitic, calcareous, mesic
arid zone
calcareous loamy alluvium
Pershing Co.

Ap horizon
A slope
poorly drained
silt loam
295S 76S 14EC
10YR 4/1 (moist)
10YR 6/1 (dry)
1.36% O.H.
34.9 meq/100g CEC
0.22% \( \text{Fe}_2\text{O}_3 \)

86.6 Ma% ~ 71.1 Ma% ~

PLACERITOS (NV)

Aquic Xerofluvent
fine-silty, mixed, calcareous, mesic
arid zone
mixed alluvium
Pershing Co.

Ap horizon
A slope
poorly drained
sandy clay loam
295S 76S 14EC
10YR 4/1 (moist)
10YR 6/1 (dry)
1.36% O.H.
28.9 meq/100g CEC
0.19% \( \text{Fe}_2\text{O}_3 \)

37.6 Ma% ~ 32.4 Ma% ~

RYEPATCH (NV)

Vertic Hapludoll
very-fine, montmorillonitic, calcareous, mesic
arid zone
calcareous mixed alluvium
Pershing Co.

Ap horizon
A slope
poorly drained
silt loam
285S 76S 14EC
10YR 3/1 (moist)
10YR 5/1 (dry)
2.80% O.H.
66.2 meq/100g CEC
0.23% \( \text{Fe}_2\text{O}_3 \)

59.9 Ma% ~ 58.6 Ma% ~

SONOMA (NV)

Aeric Fluvent
fine-silty, mixed, calcareous
arid zone
calcareous mixed alluvium
Pershing Co.

Ap horizon
A slope
poorly drained
silty clay
265S 43S 16EC
10YR 4/1 (moist)
10YR 6/1 (dry)
2.90% O.H.
53.9 meq/100g CEC
0.26% \( \text{Fe}_2\text{O}_3 \)

42.0 Ma% ~ 52.8 Ma% ~
INDIAN CREEK (NV)

Xerollic Durargid
clayey, montmorillonitic, mesic, shallow
semiarid zone
mixed alluvium
Douglass Co.

All horizon
Alp-A12 horizon
B slope
B slope
well drained
well drained
loam
sandy loam
2715 46Z51 262C
5S5 3R5S 72C
7.5YR 3/2 (moist)
5YR 3/2 (moist)
10YR 5/2 (dry)
10YR 5/2 (dry)
2.4% O.M.
0.87% O.M.
20.3 meq/100g CEC
8.9 meq/100g CEC
1.37% Fe$_2$O$_3$
1.0% Fe$_2$O$_3$
33.6 pH
10.8 pH

Ophir (NV)

Typic Haplaquoll
sandy, mixed, mesic
semiarid zone
mixed alluvium
Douglass Co.

Ap horizon
All horizon
A slope
A slope
poorly drained
poorly drained
sandy loam
loamy coarse sand
8925 82Z51 262C
3R5S 54ZS 62C
7.5YR 2.5/2 (moist)
10YR 3/3 (moist)
10YR 5/2 (dry)
10YR 5/2 (dry)
2.25% O.M.
0.65% O.M.
11.6 meq/100g CEC
7.7 meq/100g CEC
0.7% Fe$_2$O$_3$
0.67% Fe$_2$O$_3$
20.4 pH
9.5 pH

ORMSBY (NV)

Aqua Purgaorthid Xeropsamnit
mixed, mesic
semiarid zone
mixed sandy alluvium
Douglass Co.

Ap horizon
All horizon
A slope
A slope
poorly drained
poorly drained
sandy loam
loamy coarse sand
4625 825S 542C
3R5 2.5/2 (moist)
7.5YR 4/3 (moist)
10YR 4/3 (moist)
10YR 5/3 (dry)
10YR 5/3 (dry)
1.59% O.M.
2.87% O.M.
6.6 meq/100g CEC
6.5 meq/100g CEC
0.37% Fe$_2$O$_3$
0.32% Fe$_2$O$_3$
12.1 pH
10.0 pH

MOTTSVILLE (NV)

Terripalustic Haploxeroll
sandy, mixed, mesic
semiarid zone
mixed sandy alluvium from granitic sources
Douglass Co.

All horizon
All horizon
C slope
C slope
excessively drained
excessively drained
coarse sand
coarse sand
9025 82Z51 262C
82Z5 10YR 3/2
10YR 4/3 (moist)
10YR 4/3 (moist)
10YR 5/3 (dry)
10YR 5/3 (dry)
1.59% O.M.
2.87% O.M.
6.6 meq/100g CEC
6.5 meq/100g CEC
0.37% Fe$_2$O$_3$
0.32% Fe$_2$O$_3$
12.1 pH
10.0 pH

Xeropsamnit
mixed, mesic
semiarid zone
mixed sandy alluvium
Douglass Co.
RENO (NV)

Apturitic Basaltic Upland
Fine, montmorillonitic, semi-arid
mixed pediments and
fluvial sediments

Al-A2 horizon
B horizon
well drained
sandy loam
755S 1935 7EC
7.5YR 4/2 (moist)
10YR 1/3 (dry)
0.54% O.H.
9.1 meq/100g CEC
1.08% Fe2O3
15.9 Brix

TOIYABE (NV)

Typic Xeropach"omat
Mixed, frigid, shallow
subhumid zone
residual from granite and granodiorite

Al horizon
E horizon
excessively drained
loamy sand
755S 1935 7EC
10YR 3/2 (moist)
10YR 1/2 (dry)
1.5% O.H.
10.7 meq/100g CEC
0.26% Fe2O3
13.4 Brix

TURRIA (NV)

Kraslice Upland
Fine-loamy, mixed, semi-arid
semi-arid zone
mixed alluvium

Al horizon
A slope
well drained
fine sandy loam
575S 2635 5EC
10YR 5/3 (moist)
10YR 2/2 (dry)
0.52% O.H.
13.7 meq/100g CEC
0.72% Fe2O3
25.7 Brix

BITTER SPRING (NV)

Typic Xeropach"omat
Loamy-skeletal, mixed, thermic
arid zone
mixed alluvium

Al horizon
A slope
well drained
fine sandy loam
575S 2635 5EC
10YR 5/3 (moist)
10YR 2/2 (dry)
0.44% O.H.
13.9 meq/100g CEC
0.72% Fe2O3
17.4 Brix

---
### CALICO (NV)

Aquic Xerofertile  
coarse-loamy over clayey, mixed, calcareous, thermal  
ard zone  
aluvium  
Clark Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>s. poorly drained</td>
<td>s. poorly drained</td>
</tr>
<tr>
<td>v. fine sandy loam</td>
<td>v. fine sandy loam</td>
</tr>
<tr>
<td>5425 4/2 (moist)</td>
<td>5425 4/2 (moist)</td>
</tr>
<tr>
<td>7.5YR 5/3 (moist)</td>
<td>7.5YR 5/3 (moist)</td>
</tr>
<tr>
<td>1.10F O.M.</td>
<td>1.25F O.M.</td>
</tr>
<tr>
<td>25.0 meq/100g CEC</td>
<td>25.0 meq/100g CEC</td>
</tr>
<tr>
<td>0.55% Fe$<em>{2}$O$</em>{3}$</td>
<td>0.39% Fe$<em>{2}$O$</em>{3}$</td>
</tr>
<tr>
<td>31.9 pH</td>
<td>31.8 pH</td>
</tr>
</tbody>
</table>

### LAND (NV)

Typic Xerorthid  
fine-loamy, gypsic, thermal  
ard zone  
aluvium  
Clark Co.

<table>
<thead>
<tr>
<th>Al horizon</th>
<th>Al horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>mod. well drained</td>
<td>mod. well drained</td>
</tr>
<tr>
<td>fine loam</td>
<td>fine loam</td>
</tr>
<tr>
<td>4255 4/2 (moist)</td>
<td>4255 4/2 (moist)</td>
</tr>
<tr>
<td>7.5YR 5/3 (moist)</td>
<td>7.5YR 5/3 (moist)</td>
</tr>
<tr>
<td>1.25F O.M.</td>
<td>0.40F O.M.</td>
</tr>
<tr>
<td>99.2 meq/100g CEC</td>
<td>55.8 meq/100g CEC</td>
</tr>
<tr>
<td>0.46% Fe$<em>{2}$O$</em>{3}$</td>
<td>0.56% Fe$<em>{2}$O$</em>{3}$</td>
</tr>
<tr>
<td>27.4 pH</td>
<td>29.3 pH</td>
</tr>
</tbody>
</table>

### MC LEHRAN (NV)

Typic Xerorthid  
coarse-loamy, gypsic, thermal  
ard zone  
gyspilic, calcareous valley fill  
Clark Co.

<table>
<thead>
<tr>
<th>Al horizon</th>
<th>Al horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>mod. well drained</td>
<td>mod. well drained</td>
</tr>
<tr>
<td>fine sand</td>
<td>fine sand</td>
</tr>
<tr>
<td>5425 4/2 (moist)</td>
<td>5425 4/2 (moist)</td>
</tr>
<tr>
<td>7.5YR 5/4 (dry)</td>
<td>7.5YR 5/4 (dry)</td>
</tr>
<tr>
<td>1.10F O.M.</td>
<td>0.30F O.M.</td>
</tr>
<tr>
<td>12.9 meq/100g CEC</td>
<td>30.1 meq/100g CEC</td>
</tr>
<tr>
<td>0.10% Fe$<em>{2}$O$</em>{3}$</td>
<td>0.09% Fe$<em>{2}$O$</em>{3}$</td>
</tr>
<tr>
<td>14.4 pH</td>
<td>17.8 pH</td>
</tr>
</tbody>
</table>

### MORMAN MESA (NV)

Typic Xerorthid  
loamy, carbonatic, thermal, shallow  
ard zone  
limestone valley fill  
Clark Co.

<table>
<thead>
<tr>
<th>Al horizon</th>
<th>Al horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
<tr>
<td>loam</td>
<td>loam</td>
</tr>
<tr>
<td>4255 4/2 (moist)</td>
<td>4255 4/2 (moist)</td>
</tr>
<tr>
<td>7.5YR 5/3 (moist)</td>
<td>7.5YR 5/3 (moist)</td>
</tr>
<tr>
<td>7.5YR 7/4 (dry)</td>
<td>7.5YR 7/4 (dry)</td>
</tr>
<tr>
<td>0.25F O.M.</td>
<td>0.25F O.M.</td>
</tr>
<tr>
<td>18.2 meq/100g CEC</td>
<td>15.0 meq/100g CEC</td>
</tr>
<tr>
<td>0.32% Fe$<em>{2}$O$</em>{3}$</td>
<td>0.32% Fe$<em>{2}$O$</em>{3}$</td>
</tr>
<tr>
<td>12.4 pH</td>
<td>17.4 pH</td>
</tr>
</tbody>
</table>
OVERTON (NV)

Aeric Haplaquert
fine, montmorillonitic, calcareous, mesic

arid zone
clayey alluvium
Clark Co.

Ap horizon
A slope
v. poorly drained
silt clay
10YS 4/2 28EC
10YR 4/2 (moist)
10YR 6/3 (dry)
2.12% O.M.
31.1 meg/100g CEC
1.19% Fe$_2$O$_3$
10.8 PH

TOQUOPI (NV)

Typic Torripsamment
mixture, thermic

arid zone
deep sandy alluvium
Clark Co.

Ap horizon
A slope
v. poorly drained
silt clay
10YS 4/2 28EC
10YR 4/2 (moist)
10YR 6/3 (dry)
2.12% O.M.
31.1 meg/100g CEC
1.19% Fe$_2$O$_3$
10.8 PH

VIRGIN RIVER (NV)

Aquic Vertorexent
fine, mixed, calcareous, thermic

arid zone
clayey alluvium
Clark Co.

Ap horizon
A slope
v. poorly drained
silt clay
10YS 4/2 28EC
10YR 4/2 (moist)
10YR 6/3 (dry)
2.12% O.M.
31.1 meg/100g CEC
1.19% Fe$_2$O$_3$
10.8 PH

CORTEZ (NV)

Erocollic Modurargid
fine, montmorillonitic, mesic

arid zone
thin loess high in volcanic ash over alluvium
Eureka Co.

All-All horizon
A slope
well drained
silt loam
10YR 6/3 (dry)
10YR 6/3 (dry)
1.2% O.M.
5.6 meg/100g CEC
0.74% Fe$_2$O$_3$
3.2 PH

Elko Co.

All-All horizon
A slope
well drained
silt loam
10YR 6/3 (dry)
10YR 6/3 (dry)
1.2% O.M.
5.6 meg/100g CEC
0.74% Fe$_2$O$_3$
3.2 PH
### Bloor (NV)

**Typic Hatrarg**
- fine-loamy, micaceous, martic
- arid zone

**Lacustrine sediments**
- Humboldt Co.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
<th>Color Code</th>
<th>Texture</th>
<th>OM (%)</th>
<th>CEC (meq/100g CEC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2 horizon</td>
<td>A slope</td>
<td>10YR 5/3 (moist)</td>
<td>18.8</td>
<td>18.8</td>
<td>1.052 Fe_2O_3</td>
</tr>
<tr>
<td></td>
<td>well drained</td>
<td>10YR 5/2 (dry)</td>
<td>1.052 O.N.</td>
<td>0.952 Fe_2O_3</td>
<td></td>
</tr>
<tr>
<td>Silt loam</td>
<td>30.5 meq/100g CEC</td>
<td>10YR 6/3 (moist)</td>
<td>0.33% Fe_3O_4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Ninch (NV)

**Mertic Torrifluvent**
- sandy, mixed, martic
- arid zone

**Sandy solon materials**
- Humboldt Co.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
<th>Color Code</th>
<th>Texture</th>
<th>OM (%)</th>
<th>CEC (meq/100g CEC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al horizon</td>
<td>A slope</td>
<td>10YR 6/3 (dry)</td>
<td>0.87%</td>
<td>0.87%</td>
<td>0.21% Fe_2O_3</td>
</tr>
<tr>
<td></td>
<td>well drained</td>
<td>10YR 5/2 (dry)</td>
<td>0.53% O.N.</td>
<td>0.34% Fe_2O_3</td>
<td></td>
</tr>
<tr>
<td>Fine sand</td>
<td>90% 5% 5% 40% 40% 10% 10% 10%</td>
<td>10YR 5/1 (moist)</td>
<td>14.3</td>
<td>14.3</td>
<td>1.02% Fe_2O_3</td>
</tr>
</tbody>
</table>

### Rio King (NV)

**Entic Haplustoll**
- coarse-loamy, micaceous, martic
- semiarid zone

**Alluvium from granite, rhyolite, basalt**
- Humboldt Co.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
<th>Color Code</th>
<th>Texture</th>
<th>OM (%)</th>
<th>CEC (meq/100g CEC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap horizon</td>
<td>A slope</td>
<td>10YR 3/3 (moist)</td>
<td>16.2</td>
<td>16.2</td>
<td>0.952 Fe_2O_3</td>
</tr>
<tr>
<td></td>
<td>well drained</td>
<td>10YR 3/2 (dry)</td>
<td>1.052 O.N.</td>
<td>0.952 Fe_2O_3</td>
<td></td>
</tr>
<tr>
<td>Sandy loam</td>
<td>75% 25% 10% 10% 10% 10% 10%</td>
<td>10YR 2/3 (moist)</td>
<td>0.90%</td>
<td>0.90%</td>
<td>0.30% Fe_2O_3</td>
</tr>
</tbody>
</table>

### Valmy (NV)

**Durochidic Torrifluvent**
- coarse-loamy, mixed, calcareous, martic
- arid zone

**Thin loess over loamy alluvium**
- Humboldt Co.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
<th>Color Code</th>
<th>Texture</th>
<th>OM (%)</th>
<th>CEC (meq/100g CEC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al horizon</td>
<td>A slope</td>
<td>10YR 3/3 (moist)</td>
<td>20.2</td>
<td>20.2</td>
<td>0.952 Fe_2O_3</td>
</tr>
<tr>
<td></td>
<td>well drained</td>
<td>10YR 3/2 (dry)</td>
<td>0.952 O.N.</td>
<td>0.34% Fe_2O_3</td>
<td></td>
</tr>
<tr>
<td>Fine sand</td>
<td>90% 5% 5% 40% 40% 10% 10% 10%</td>
<td>10YR 2/3 (moist)</td>
<td>14.3</td>
<td>14.3</td>
<td>0.952 Fe_2O_3</td>
</tr>
</tbody>
</table>
**ACTON (NH)**

Entic Haploehod  
coarse-loamy, sand, mesic  
humid zone  
sandy granite till  
Billsboro Co.

<table>
<thead>
<tr>
<th></th>
<th>Ap horizon</th>
<th></th>
<th>B slope</th>
<th>mod. well drained</th>
<th>sandy loam</th>
<th></th>
<th>7ORR 2/2 (moist)</th>
<th>10YR 2/2 (moist)</th>
<th>10YR 2/3 (dry)</th>
<th>10YR 2/3 (dry)</th>
<th>10YR 2/3 (dry)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ap horizon</td>
<td></td>
<td>B slope</td>
<td>mod. well drained</td>
<td>fine sandy loam</td>
<td></td>
<td>70% 1/2 %</td>
<td>30% 1/2 %</td>
<td>20% 1/2 %</td>
<td>10% 1/2 %</td>
<td>5% 1/2 %</td>
</tr>
<tr>
<td></td>
<td>1.0% 1/2 %</td>
<td>0.5% 1/2 %</td>
<td>0.5% 1/2 %</td>
<td>1.5% 1/2 %</td>
<td>2.0% 1/2 %</td>
<td>2.5% 1/2 %</td>
<td>3.0% 1/2 %</td>
<td>3.5% 1/2 %</td>
<td>4.0% 1/2 %</td>
<td>4.5% 1/2 %</td>
<td>5.0% 1/2 %</td>
</tr>
<tr>
<td></td>
<td>0.97% Fe₂O₃</td>
<td>1.00% Fe₂O₃</td>
<td>0.97% Fe₂O₃</td>
<td>1.00% Fe₂O₃</td>
<td>0.97% Fe₂O₃</td>
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<td>0.97% Fe₂O₃</td>
<td>1.00% Fe₂O₃</td>
<td>0.97% Fe₂O₃</td>
</tr>
<tr>
<td></td>
<td>26% MGO</td>
<td>17% MGO</td>
<td>26% MGO</td>
<td>17% MGO</td>
<td>26% MGO</td>
<td>17% MGO</td>
<td>26% MGO</td>
<td>17% MGO</td>
<td>26% MGO</td>
<td>17% MGO</td>
<td>26% MGO</td>
</tr>
</tbody>
</table>

**FORTWINGATE (NM)**

Typic Eutroboralf  
fine, montmorillonitic, frigid  
seaward zone  
residual from sandstone  
McKinley Co.

<table>
<thead>
<tr>
<th></th>
<th>Al horizon</th>
<th></th>
<th>A slope</th>
<th>well drained</th>
<th>well drained</th>
<th>loamy fine sand</th>
<th>10YR 2/2 (moist)</th>
<th>10YR 2/2 (moist)</th>
<th>10YR 2/3 (dry)</th>
<th>10YR 2/3 (dry)</th>
<th>10YR 2/3 (dry)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Al horizon</td>
<td></td>
<td>A slope</td>
<td>well drained</td>
<td>fine sandy loam</td>
<td>70% 1/2 %</td>
<td>30% 1/2 %</td>
<td>20% 1/2 %</td>
<td>10% 1/2 %</td>
<td>5% 1/2 %</td>
<td>2.5% 1/2 %</td>
</tr>
<tr>
<td></td>
<td>1.0% 1/2 %</td>
<td>0.5% 1/2 %</td>
<td>0.5% 1/2 %</td>
<td>1.5% 1/2 %</td>
<td>2.0% 1/2 %</td>
<td>2.5% 1/2 %</td>
<td>3.0% 1/2 %</td>
<td>3.5% 1/2 %</td>
<td>4.0% 1/2 %</td>
<td>4.5% 1/2 %</td>
<td>5.0% 1/2 %</td>
</tr>
<tr>
<td></td>
<td>0.97% Fe₂O₃</td>
<td>1.00% Fe₂O₃</td>
<td>0.97% Fe₂O₃</td>
<td>1.00% Fe₂O₃</td>
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<td>1.00% Fe₂O₃</td>
<td>0.97% Fe₂O₃</td>
</tr>
<tr>
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<td>35% MGO</td>
<td>33% MGO</td>
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<td>35% MGO</td>
<td>33% MGO</td>
<td>35% MGO</td>
<td>33% MGO</td>
<td>35% MGO</td>
<td>33% MGO</td>
</tr>
</tbody>
</table>

**JAL (NM)**

Typic Calcic Haploehod  
fine-loamy, calcareous, thermic  
seaward zone  
alluvial or lacustrine fine  
textured material  
Lee Co.

<table>
<thead>
<tr>
<th></th>
<th>All horizon</th>
<th></th>
<th>A slope</th>
<th>well drained</th>
<th>well drained</th>
<th>loamy fine sand</th>
<th>10YR 2/2 (moist)</th>
<th>10YR 2/2 (moist)</th>
<th>10YR 2/3 (dry)</th>
<th>10YR 2/3 (dry)</th>
<th>10YR 2/3 (dry)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All horizon</td>
<td></td>
<td>A slope</td>
<td>well drained</td>
<td>fine sandy loam</td>
<td>70% 1/2 %</td>
<td>30% 1/2 %</td>
<td>20% 1/2 %</td>
<td>10% 1/2 %</td>
<td>5% 1/2 %</td>
<td>2.5% 1/2 %</td>
</tr>
<tr>
<td></td>
<td>1.0% 1/2 %</td>
<td>0.5% 1/2 %</td>
<td>0.5% 1/2 %</td>
<td>1.5% 1/2 %</td>
<td>2.0% 1/2 %</td>
<td>2.5% 1/2 %</td>
<td>3.0% 1/2 %</td>
<td>3.5% 1/2 %</td>
<td>4.0% 1/2 %</td>
<td>4.5% 1/2 %</td>
<td>5.0% 1/2 %</td>
</tr>
<tr>
<td></td>
<td>0.97% Fe₂O₃</td>
<td>1.00% Fe₂O₃</td>
<td>0.97% Fe₂O₃</td>
<td>1.00% Fe₂O₃</td>
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<td>1.00% Fe₂O₃</td>
<td>0.97% Fe₂O₃</td>
</tr>
<tr>
<td></td>
<td>26% MGO</td>
<td>17% MGO</td>
<td>26% MGO</td>
<td>17% MGO</td>
<td>26% MGO</td>
<td>17% MGO</td>
<td>26% MGO</td>
<td>17% MGO</td>
<td>26% MGO</td>
<td>17% MGO</td>
<td>26% MGO</td>
</tr>
</tbody>
</table>

**KIMBROUGH (NM)**

Petrocalcic Calciustoll  
fine, calcareous, thermic, shallow  
seaward zone  
coarse textured material over an  
indurated layer  
Lee Co.

<table>
<thead>
<tr>
<th></th>
<th>Al horizon</th>
<th></th>
<th>A slope</th>
<th>well drained</th>
<th>well drained</th>
<th>fine sandy loam</th>
<th>10YR 2/2 (moist)</th>
<th>10YR 2/2 (moist)</th>
<th>10YR 2/3 (dry)</th>
<th>10YR 2/3 (dry)</th>
<th>10YR 2/3 (dry)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Al horizon</td>
<td></td>
<td>A slope</td>
<td>well drained</td>
<td>fine sandy loam</td>
<td>70% 1/2 %</td>
<td>30% 1/2 %</td>
<td>20% 1/2 %</td>
<td>10% 1/2 %</td>
<td>5% 1/2 %</td>
<td>2.5% 1/2 %</td>
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<tr>
<td></td>
<td>1.0% 1/2 %</td>
<td>0.5% 1/2 %</td>
<td>0.5% 1/2 %</td>
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<td>3.0% 1/2 %</td>
<td>3.5% 1/2 %</td>
<td>4.0% 1/2 %</td>
<td>4.5% 1/2 %</td>
<td>5.0% 1/2 %</td>
</tr>
<tr>
<td></td>
<td>0.97% Fe₂O₃</td>
<td>1.00% Fe₂O₃</td>
<td>0.97% Fe₂O₃</td>
<td>1.00% Fe₂O₃</td>
<td>0.97% Fe₂O₃</td>
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<td>32% MGO</td>
<td>34% MGO</td>
<td>32% MGO</td>
</tr>
</tbody>
</table>
### MECKLENBURG (NC)

Udic Haplustalf
fine, mixed, thermic
humid zone
moderately firm basic rock residuum
Cabarrus Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>B slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
<tr>
<td>clay loam</td>
<td>fine sandy loam</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2YR 3/4 (moist)</th>
<th>7.5YR 6/1 (dry)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.75% O.H.</td>
<td>1.11% O.H.</td>
</tr>
<tr>
<td>14.3 meq/100g CEC</td>
<td>13.4 meq/100g CEC</td>
</tr>
<tr>
<td>3.92% Fe$_2$O$_3$</td>
<td>5.27% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>20.2 MAD</td>
<td>19.9 MAD</td>
</tr>
</tbody>
</table>

### CECIL (NC)

Udic Haplustalf
clayey, kaolinitic, thermic
humid zone
acid igneous and metamorphic rocks
Catawba Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
<tr>
<td>sandy loam</td>
<td>loam</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2YR 3/4 (moist)</th>
<th>10YR 6/6 (dry)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.12% O.H.</td>
<td>2.24% O.H.</td>
</tr>
<tr>
<td>6.8 meq/100g CEC</td>
<td>10.0 meq/100g CEC</td>
</tr>
<tr>
<td>0.64% Fe$_2$O$_3$</td>
<td>2.64% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>15.9 MAD</td>
<td>11.2 MAD</td>
</tr>
</tbody>
</table>

### CRAVEN (NC)

Aeric Haplustalf
clayey, mixed, thermic
humid zone
clayey coastal plain sediments
Craven Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>A slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>mod. well drained</td>
<td>A slope</td>
</tr>
<tr>
<td>silt loam</td>
<td>silt loam</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2YR 3/1 6/2</th>
<th>10YR 4/2 (moist)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.8 meq/100g CEC</td>
<td>8.6 meq/100g CEC</td>
</tr>
<tr>
<td>0.56% Fe$_2$O$_3$</td>
<td>0.35% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>29.5 MAD</td>
<td>33.6 MAD</td>
</tr>
</tbody>
</table>

### WAGRAM (NC)

Aeric Palustalf
loamy, siliceous, thermic
humid zone
loamy coastal plain sediments
Scotland Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>A slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>well drained</td>
<td>A slope</td>
</tr>
<tr>
<td>loamy sand</td>
<td>loamy sand</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2YR 3/1 6/2</th>
<th>10YR 4/2 (moist)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.87% O.H.</td>
<td>0.95% O.H.</td>
</tr>
<tr>
<td>1.4 meq/100g CEC</td>
<td>4.4 meq/100g CEC</td>
</tr>
<tr>
<td>0.20% Fe$_2$O$_3$</td>
<td>0.18% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>8.2 MAD</td>
<td>5.6 MAD</td>
</tr>
</tbody>
</table>
**PONZER (NC)**

Terric Haplustoll
loamy, mixed, dystric, thermic
humid zone

loamy mineral material
Washington Co. Hyde Co.

Ap horizon
A slope
v. poorly drained

silt loam

7.5YR 2.0 (moist) 7.5YR 2.0 (moist)
10YR 3/1 (dry) 10YR 3/1 (dry)
10.3% O.M. 30.5% O.M.
49.0 meq/100g CEC 61.8 meq/100g CEC
0.82% Fe₂O₃ 0.75% Fe₂O₃

76.4 MCA — 95.3 MCA —

**EKALAKA-DESART (ND)**

Typic Hapraqual Pelludolt
coarse-loamy, mixed
stratified alkaline alluvium or soft sandstone
Bowman Co.

Ap horizon
A slope
well drained
silt loam

30° 56'51" WEC 70° 20'25" 113°
10YR 4/1 (moist) 10YR 3/3 (moist)
10YR 5/1 (dry) 10YR 5/3 (dry)
3.42% O.M. 0.64% O.M.
9.9 meq/100g CEC 10.3 meq/100g CEC
0.92% Fe₂O₃ 1.05% Fe₂O₃

27.6 MCA — 15.3 MCA —

**SVEA (ND)**

Pachic Udic Haploboroll
fine-loamy, mixed
subhumid zone
calcereous glacial till
LaMoure Co.

Ap horizon
A slope
mod. well drained

clay loam

25° 55'54" 276° 55'54" 256°
7.5YR 2.0 (moist) 7.5YR 2.0 (moist)
10YR 3/1 (dry) 10YR 3/1 (dry)
5.20% O.M. 5.20% O.M.
32.0 meq/100g CEC 32.0 meq/100g CEC
0.63% Fe₂O₃ 0.70% Fe₂O₃

36.2 MCA — 37.5 MCA —

**TONKA (ND)**

Argiaque Argiaquoll
fine, montmorillonitic, frigid
subhumid zone
local alluvium over glacial till
Ransom Co.

Ap horizon
A slope
poorly drained

silt loam

31° 50'55" 31° 50'55" 31°
7.5YR 2.0 (moist) 2.5 YR 7/0 (moist)
10YR 4/1 (dry) 10YR 4/1 (dry)
6.11% O.M. 6.11% O.M.
34.9 meq/100g CEC 44.8 meq/100g CEC
0.32% Fe₂O₃ 0.60% Fe₂O₃

51.8 MCA — 42.8 MCA —
DIVIDE (ND)

Aeric Calciaqualf
fine-loamy over sandy or sandy-skeletal, frigid
subhumid zone
Loamy sediment over sand and gravel
Wells Co.

Ap horizon
A slope
a. poorly drained
coarse sandy loam
64ES 22521 14EC
10YR 2/2 (moist)
10YR 4/5 (dry)
2.31% O.H.
26.4 meq/100g CEC
0.14% Fe$_2$O$_3$
23.4 MBD

CINCINNATI (OH)

Typic Fragiudalf
fine-silty, mixed, mesic
humid zone
loamy over till
Highland Co.

Ap horizon
B slope
well drained
silt loam
63ES 73251 17EC
10YR 4/4 (moist)
10YR 6/4 (dry)
2.32% O.H.
12.8 meq/100g CEC
1.48% Fe$_2$O$_3$
37.6 MBD

HOLLY (OH)

Typic Fluventeualf
fine-silty, mixed, montic, mesic
humid zone
alluvium from glacial drift, sandstone and shale
Summit Co.

Ap horizon
A slope
poorly drained
silty clay loam
40ES 22521 22EC
9YR 6/1 (moist)
10YR 3/3 (dry)
7.56% O.H.
29.9 meq/100g CEC
2.27% Fe$_2$O$_3$
40.3 MBD

KEENE (OH)

Aquic Hapludalf
fine-silty, mixed, mesic
humid zone
silty residuum from sedimentary rock
Tuscarawas Co.

Ap horizon
B slope
mod. well drained
silt loam
63ES 73251 10EC
10YR 5/4 (moist)
10YR 6/4 (dry)
1.69% O.H.
15.9 meq/100g CEC
2.19% Fe$_2$O$_3$
34.8 MBD
**CANFIELD (OH)**

Aquic Fragiudalf
fine-loamy, mixed, mesic, humid zone
Glacial till with thin loam cap
Wayne Co.

Ap horizon  
B horizon  
mod. well drained  
mod. well drained  
silt loam  
silt loam  
10YR 4/3 (moist)  
10YR 4/3 (dry)  
10YR 6/4 (moist)  
10YR 6/4 (dry)  
2.98% O.M.  
2.56% O.M.  
11.5 meq/100g CEC  
10.5 meq/100g CEC  
2.3% Fe$_2$O$_3$  
1.56% Fe$_2$O$_3$

34.8 MAM  
30.4 MAM

**FOARD (OK)**

Typic Natrustoll
fine, montmorillonitic, thermic  
subhumid zone  
Old alluvium or red bed material
Cotton Co.

Ap horizon  
B horizon  
mod. well drained  
mod. well drained  
silt loam  
silt loam  
125S 61/25 17/2  
215S 61/25 20/2  
7.5YR 3/2 (moist)  
7.5YR 3/2 (dry)  
7.5YR 5/6 (moist)  
7.5YR 5/6 (dry)  
0.98% O.M.  
1.02% O.M.  
14.6 meq/100g CEC  
10.5 meq/100g CEC  
0.69% Fe$_2$O$_3$  
0.75% Fe$_2$O$_3$

27.6 MAM  
30.4 MAM

**PORT (OK)**

Cumulic Haplustoll
fine-silty, mixed, thermic  
subhumid zone  
Loamy alluvial sediments  
Grady Co.

Ap horizon  
A horizon  
well drained  
well drained  
silt loam  
silt loam  
7.5YR 4/3 (moist)  
7.5YR 4/3 (dry)  
7.5YR 3/2 (moist)  
7.5YR 3/2 (dry)  
0.77% O.M.  
2.13% O.M.  
11.5 meq/100g CEC  
8.3 meq/100g CEC  
0.80% Fe$_2$O$_3$  
0.75% Fe$_2$O$_3$

30.4 MAM  
29.3 MAM

**DARNELL (OK)**

Udic Ustochrept
loamy, siliceous, thermic, shallow  
subhumid zone  
Sandstone residuum  
Lincoln Co.

A horizon  
B horizon  
well drained  
well drained  
sand  
sand  
7.5YR 3/2 (moist)  
7.5YR 3/2 (dry)  
7.5YR 5/4 (moist)  
7.5YR 5/4 (dry)  
2.3% O.M.  
1.8% O.M.  
7.7 meq/100g CEC  
5.4 meq/100g CEC  
0.34% Fe$_2$O$_3$  
0.51% Fe$_2$O$_3$

28.2 MAM  
18.2 MAM
**RENFROW (OK)**

Udic Paleustoll
fine, mixed, thermic
subhumid zone
clay and shale residuum
Walmart Co.

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Al</td>
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</tr>
<tr>
<td>horizon</td>
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<tr>
<td>B</td>
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<tr>
<td>slope</td>
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<td>well</td>
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<td>drained</td>
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<tr>
<td>silt</td>
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<tr>
<td>loam</td>
<td>loam</td>
</tr>
<tr>
<td>65%</td>
<td>23%</td>
</tr>
<tr>
<td>312</td>
<td>7.5YR</td>
</tr>
<tr>
<td>(dry)</td>
<td>(moist)</td>
</tr>
<tr>
<td>4.0% O.M.</td>
<td>3.22% O.M.</td>
</tr>
<tr>
<td>5.9 mg/100g CEC</td>
<td>17.4 mg/100g CEC</td>
</tr>
<tr>
<td>0.36% Fe₂O₃</td>
<td>0.23% Fe₂O₃</td>
</tr>
<tr>
<td>36.5 mgO</td>
<td>29.8 mgO</td>
</tr>
</tbody>
</table>

**BETHANY (OK)**

Pachic Paleustoll
fine, mixed, thermic
subhumid zone
loams, alluvium, and red bed residuum
Oklahoma Co.

<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td>Ap</td>
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<tr>
<td>horizon</td>
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<td>slope</td>
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<td>drained</td>
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<td>silt</td>
<td>silt</td>
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<tr>
<td>loam</td>
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<tr>
<td>65%</td>
<td>23%</td>
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<tr>
<td>312</td>
<td>7.5YR</td>
</tr>
<tr>
<td>(dry)</td>
<td>(moist)</td>
</tr>
<tr>
<td>4.0% O.M.</td>
<td>3.22% O.M.</td>
</tr>
<tr>
<td>5.9 mg/100g CEC</td>
<td>17.4 mg/100g CEC</td>
</tr>
<tr>
<td>0.36% Fe₂O₃</td>
<td>0.23% Fe₂O₃</td>
</tr>
<tr>
<td>33.3 mgO</td>
<td>32.4 mgO</td>
</tr>
</tbody>
</table>

**CANADIAN (OK)**

Udic Haplustoll
coarse-loamy, mixed, thermic
subhumid zone
loamy sediments
Oklahoma Co.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Ap</td>
<td>Ap</td>
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<tr>
<td>horizon</td>
<td>horizon</td>
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<tr>
<td>A</td>
<td>A</td>
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<tr>
<td>slope</td>
<td>slope</td>
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<tr>
<td>well</td>
<td>well</td>
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<tr>
<td>drained</td>
<td>drained</td>
</tr>
<tr>
<td>v. fine sandy loam</td>
<td>v. fine sandy loam</td>
</tr>
<tr>
<td>65%</td>
<td>23%</td>
</tr>
<tr>
<td>312</td>
<td>7.5YR</td>
</tr>
<tr>
<td>(dry)</td>
<td>(moist)</td>
</tr>
<tr>
<td>4.0% O.M.</td>
<td>3.22% O.M.</td>
</tr>
<tr>
<td>5.9 mg/100g CEC</td>
<td>17.4 mg/100g CEC</td>
</tr>
<tr>
<td>0.36% Fe₂O₃</td>
<td>0.23% Fe₂O₃</td>
</tr>
<tr>
<td>30.1 mgO</td>
<td>27.0 mgO</td>
</tr>
</tbody>
</table>

**ZANEISI (OK)**

Udic Argiustoll
fine-loamy, mixed, thermic
subhumid zone
residuum from sandstone and shale
Oklahoma Co.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Ap</td>
<td>Ap</td>
</tr>
<tr>
<td>horizon</td>
<td>horizon</td>
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<tr>
<td>A</td>
<td>A</td>
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<tr>
<td>slope</td>
<td>slope</td>
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<tr>
<td>well</td>
<td>well</td>
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<tr>
<td>drained</td>
<td>drained</td>
</tr>
<tr>
<td>fine sandy loam</td>
<td>loam</td>
</tr>
<tr>
<td>65%</td>
<td>23%</td>
</tr>
<tr>
<td>312</td>
<td>7.5YR</td>
</tr>
<tr>
<td>(dry)</td>
<td>(moist)</td>
</tr>
<tr>
<td>4.0% O.M.</td>
<td>3.22% O.M.</td>
</tr>
<tr>
<td>5.9 mg/100g CEC</td>
<td>17.4 mg/100g CEC</td>
</tr>
<tr>
<td>0.36% Fe₂O₃</td>
<td>0.23% Fe₂O₃</td>
</tr>
<tr>
<td>30.4 mgO</td>
<td>30.3 mgO</td>
</tr>
</tbody>
</table>
DOUGHERTY (OK)

Arenic haplustalf
loamy, mixed, thermic
subhumid zone
sandy or loamy sediments
Payne Co.

Ap horizon
C slope
well drained
loamy fine sand
85% 12/22 15C
10YR 3/4 (moist)
7.5YR 6/6 (dry)
0.5% O.M.
3.0 meq/100g CEC
0.17% Fe₂O₃
15.9 mg/Kg 19.0 mg/Kg

ST. PAUL (OK)

Pachic Argiustoll
dark-silty, mixed, thermic
subhumid zone
sandy or loamy sediments
Roger Mills Co.

Ap horizon
C slope
well drained
fine sand
95% 12/22 15C
10YR 3/4 (moist)
7.5YR 6/6 (dry)
0.6% O.M.
3.2 meq/100g CEC
0.21% Fe₂O₃
13.3 mg/Kg 14.5 mg/Kg

DILL (OK)

Typic Paleudoll
dark-silty, mixed, thermic
subhumid zone
Washita Co.

Ap horizon
B slope
well drained
silt loam
12% 15/21 15C
10YR 3/3 (moist)
10YR 3/6 (dry)
0.8% O.M.
3.3 meq/100g CEC
0.1% Fe₂O₃
30.8 mg/Kg 26.8 mg/Kg

DILL (OK)

Typic Paleudoll
dark-silty, mixed, thermic
subhumid zone
Tulsa Co.

Ap horizon
B slope
well drained
silt loam
15% 15/21 15C
10YR 3/3 (moist)
10YR 4/3 (dry)
1.0% O.M.
3.6 meq/100g CEC
0.2% Fe₂O₃
30.8 mg/Kg 26.8 mg/Kg

NFWTONIA (OK)

Udic Ustochrept
course-loamy, mixed, thermic
subhumid zone
Washita Co.

Ap horizon
A slope
well drained
v. fine sandy loam
9% 25/21 15C
10YR 3/6 (moist)
2.5YR 3/6 (dry)
0.0% O.M.
6.5 meq/100g CEC
1.08% Fe₂O₃
26.0 mg/Kg 11.9 mg/Kg

Washita Co.

Ap horizon
A slope
well drained
loamy fine sand
7% 25/21 15C
10YR 3/6 (moist)
2.5YR 3/6 (dry)
1.6% O.M.
6.5 meq/100g CEC
0.8% Fe₂O₃
26.0 mg/Kg 11.9 mg/Kg

### ASTORIA (OR)

**Andic Haplumbrept**
- *modal, mixed*
- *perhumid zone*
- residuum from fine-grained sediments

Tillamook Co.

<table>
<thead>
<tr>
<th>All horizon</th>
<th>All horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>D slope</td>
<td>D slope</td>
</tr>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
</tbody>
</table>

- *clay*
- *silty clay*
- *silty clay*
- *silty clay*

<table>
<thead>
<tr>
<th>20XS 5Y 1/2 412C</th>
<th>21XS 592S 155C</th>
</tr>
</thead>
<tbody>
<tr>
<td>10YR 2/2 (moist)</td>
<td>10YR 2/2 (moist)</td>
</tr>
<tr>
<td>10YR 3/3 (dry)</td>
<td>10YR 3/3 (dry)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>26.47% O.M.</th>
<th>21.82% O.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>46.7 meq/100g CEC</td>
<td>57.4 meq/100g CEC</td>
</tr>
<tr>
<td>5.35% Fe₂O₃</td>
<td>2.04% Fe₂O₃</td>
</tr>
</tbody>
</table>

71.4 *P家乡* 67.4 *P家乡*

### BRENNER (OR)

**Fluvasequent Humaquept**
- *fine, mixed, acidic, mixed*
- *perhumid zone*
- *fine mixed alluvium*

Tillamook Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>poorly drained</td>
<td>poorly drained</td>
</tr>
</tbody>
</table>

- *silt loam*
- *silt loam*
- *silt loam*
- *silt loam*

<table>
<thead>
<tr>
<th>27XS 592S 152C</th>
<th>27XS 592S 152C</th>
</tr>
</thead>
<tbody>
<tr>
<td>10YR 3/4 (moist)</td>
<td>10YR 3/4 (moist)</td>
</tr>
<tr>
<td>10YR 5/4 (dry)</td>
<td>10YR 5/4 (dry)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10.62% O.M.</th>
<th>11.15% O.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>53.1 meq/100g CEC</td>
<td>58.3 meq/100g CEC</td>
</tr>
<tr>
<td>3.66% Fe₂O₃</td>
<td>2.82% Fe₂O₃</td>
</tr>
</tbody>
</table>

77.1 *P家乡* 73.4 *P家乡*

### HEBO (OR)

**Typic Humaquept**
- *very-fine, mixed, mixed*
- *perhumid zone*
- *silty and clayey alluvium*

Tillamook Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>poorly drained</td>
<td>poorly drained</td>
</tr>
</tbody>
</table>

- *silt loam*
- *silt loam*
- *silt loam*
- *silt loam*

<table>
<thead>
<tr>
<th>62XS 592S 152C</th>
<th>62XS 592S 152C</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5Y 2/2 (moist)</td>
<td>10YR 2/2 (moist)</td>
</tr>
<tr>
<td>10YR 3/2 (dry)</td>
<td>10YR 3/2 (dry)</td>
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</table>

<table>
<thead>
<tr>
<th>11.40% O.M.</th>
<th>12.28% O.M.</th>
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<tbody>
<tr>
<td>47.1 meq/100g CEC</td>
<td>43.9 meq/100g CEC</td>
</tr>
<tr>
<td>2.46% Fe₂O₃</td>
<td>2.84% Fe₂O₃</td>
</tr>
</tbody>
</table>

56.4 *P家乡* 60.4 *P家乡*

### NEHALEM (OR)

**Fluvistic Haplumbrept**
- *fine-silty, mixed, mixed*
- *perhumid zone*
- *medium textured recent alluvium*

Tillamook Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
</tbody>
</table>

- *silt loam*
- *silt loam*
- *silt loam*
- *silt loam*

<table>
<thead>
<tr>
<th>18XS 602S 222C</th>
<th>18XS 602S 222C</th>
</tr>
</thead>
<tbody>
<tr>
<td>5YR 3/3 (moist)</td>
<td>5YR 4/4 (moist)</td>
</tr>
<tr>
<td>10YR 4/4 (dry)</td>
<td>10YR 4/4 (dry)</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>10.66% O.M.</th>
<th>6.41% O.M.</th>
</tr>
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<tbody>
<tr>
<td>60.0 meq/100g CEC</td>
<td>58.3 meq/100g CEC</td>
</tr>
<tr>
<td>4.03% Fe₂O₃</td>
<td>3.38% Fe₂O₃</td>
</tr>
</tbody>
</table>

58.3 *P家乡* 46.9 *P家乡*
BLACKLOCK (OR)

Typic Sideraquod
sandy, mixed, mesic, orthic
perhumid zone
sandy marine terrace
Curry Co.

---

Ap horizon
A slope
poorly drained
fine sandy-loam
sandstone
45G 305346 38C
2.5YR 2.5/ (moist) 7.5YR 2/ (moist)
10YR 4/1 (dry) 10YR 3/1 (dry)
13.3% O.H. 18.0% O.M.
24.3 meq/100g CEC 42.2 meq/100g CEC
trace Fe₂O₃

35.6 %R indicates 47.7 %R.

---

OFORD (OR)

Typic Haplorthid
clayey, mixed, mesic
perhumid zone
residue from arkose sandstones and
siltstones
Curry Co.

---

Ap horizon
A slope
poorly drained
fine sandy-loam
sandstone
45G 305346 38C
2.5YR 2.5/ (moist) 7.5YR 2/ (moist)
10YR 4/1 (dry) 10YR 3/1 (dry)
13.3% O.H. 18.0% O.M.
24.3 meq/100g CEC 42.2 meq/100g CEC
trace Fe₂O₃

35.6 %R indicates 47.7 %R.

---

DUFFIELD (PA)

Ultic Hapludalf
fine-loamy, mixed, mesic
humid zone
residue from impure limestone
Lancaster Co.

---

Ap horizon
A slope
well drained
silt loam
sandstone
13G 305346 38C
7.5YR 3/1 (moist) 10YR 4/1 (dry)
10YR 5/4 (dry) 10YR 4/3 (dry)
18.0% O.H. 13.8% O.M.
13.5 meq/100g CEC 24.4 meq/100g CEC
0.22% Fe₂O₃

37.2 %R indicates 30.0 %R.

---

EDGEMONT (PA)

Typic Hapludalf
fine-loamy, mixed, mesic
humid zone
quartzite, quartz schist conglomerate
Lancaster Co.

---

Ap horizon
A slope
well drained
fine sandy-loam
sandstone
13G 305346 38C
7.5YR 3/1 (moist) 10YR 4/1 (dry)
10YR 5/3 (dry) 10YR 4/2 (dry)
18.0% O.H. 13.8% O.M.
13.5 meq/100g CEC 24.4 meq/100g CEC
0.22% Fe₂O₃

37.2 %R indicates 30.0 %R.
### ELLIBER (PA)

Typic Hapludult  
loamy-skeletal, mixed, mesic  
humid zone

- Ap horizon  
  well drained  
  sandy loam  
  
  10YR 6/3 (dry)  
  pH 6.9  
  9.9 meq/100g CEC  
  0.77% Fe$_2$O$_3$  
  20.1 MAF\%  

### RAIS (SC)

Typic Paleaquult  
fine-loamy, siliocon, thermic  
humid zone

- Al horizon  
  well drained  
  sandy loam  
  
  10YR 5/1 (dry)  
  pH 5.6  
  16.0 meq/100g CEC  
  0.00% Fe$_2$O$_3$  
  19.5 MAF\%  

### PACOLET (SC)

Typic Hapludult  
clayey, kaolinitic, thermic  
humid zone

- Al-A2 horizon  
  D slope  
  well drained  
  sandy loam  
  
  7.5YR 5/1 (dry)  
  pH 5.6  
  13.5 meq/100g CEC  
  0.77% Fe$_2$O$_3$  
  27.0 MAF\%  

### BEOTIA (SD)

Pachic Udic Hapludoll  
shelly, mixed  
humid zone

- Ap horizon  
  well drained  
  silty clay loam  
  
  10YR 5/1 (dry)  
  pH 5.6  
  20.8 meq/100g CEC  
  0.00% Fe$_2$O$_3$  
  44.5 MAF\%
EXLINE (SD)

Leptic Haploboroll
fine, montmorillonitic
subsoil zone
calcareous lacustrine deposits
Brown Co.

A1-A2 horizon
A slope
a. poorly drained
silty clay loam
72S 6BS5 15EC
7.50% 2/1 (soil)
10TR 4/1 (dry)
7.50% O.M.
30.7 meq/100g CEC
0.37% Fe2O3
57.7 pH

A2 horizon
A slope
a. poorly drained
silty clay loam
72S 6BS5 15EC
7.50% 2/1 (soil)
10TR 4/1 (dry)
7.50% O.M.
30.7 meq/100g CEC
0.43% Fe2O3
64.4 pH

FORDVILLE (SD)

Pedic Haploboroll
fine-loamy over sandy or sandy-skeletal, mixed
subsoil zone
loamy alluvium over stratified sand and gravel
Gooding Co.

Ap horizon
A slope
well drained
clay loam
32ES 50E51 20EC
7.50% 2/1 (soil)
10TR 3/2 (dry)
5.10% O.M.
37.1 meq/100g CEC
0.72% Fe2O3
38.5 pH

Ap horizon
A slope
well drained
clay loam
44ES 37E51 13EC
7.50% 2/1 (soil)
10TR 3/2 (dry)
4.54% O.M.
23.8 meq/100g CEC
0.72% Fe2O3
37.6 pH

RENSHAW (SD)

Udic Haploboroll
fine-loamy over sandy or sandy-skeletal, mixed
subsoil zone
loamy alluvium over thick sand and gravel
Gooding Co.

Ap horizon
A slope
a. excess. drained
sandy loam
40DS 6BS5 14EC
42S5 37S51 21EC
10TR 2/1 (soil)
10TR 2/1 (soil)
5.30% O.M.
28.4 meq/100g CEC
0.81% Fe2O3
40.3 pH

Ap horizon
A slope
a. excess. drained
sandy loam
40DS 6BS5 14EC
42S5 37S51 21EC
10TR 2/1 (soil)
10TR 2/1 (soil)
5.30% O.M.
28.4 meq/100g CEC
0.81% Fe2O3
39.8 pH

PEEVER (SD)

Udic Argiboroll
fine, montmorillonitic
subsoil zone
clay loam glacial till
Roberts Co.

Ap horizon
A slope
well drained
clay loam
22ES 30S51 40EC
7.50% 2/1 (soil)
10TR 3/2 (soil)
7.31% O.M.
38.7 meq/100g CEC
1.27% Fe2O3
45.4 pH

Ap horizon
A slope
well drained
clay loam
22ES 30S51 40EC
7.50% 2/1 (soil)
10TR 3/2 (soil)
7.31% O.M.
38.7 meq/100g CEC
1.27% Fe2O3
36.3 pH
**BETTS (SD)**

Typic Ustorthent
Fine-loamy, udic, calcareous, mesic
Subhumid zone
Glacial till
Davidson Co.

<table>
<thead>
<tr>
<th>Al horizon</th>
<th>Al horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>E slope</td>
<td>E slope</td>
</tr>
<tr>
<td>excess. drained</td>
<td>excess. drained</td>
</tr>
<tr>
<td>loam</td>
<td>loam</td>
</tr>
<tr>
<td>4R7 347 22RC</td>
<td>4R7 347 22RC</td>
</tr>
<tr>
<td>10YR 3/1 (moist)</td>
<td>10YR 4/2 (moist)</td>
</tr>
<tr>
<td>10YR 4/2 (dry)</td>
<td>10YR 4/2 (dry)</td>
</tr>
<tr>
<td>4.5% O.M.</td>
<td>3.7% O.M.</td>
</tr>
<tr>
<td>25.2 meq/100g CEC</td>
<td>26.8 meq/100g CEC</td>
</tr>
<tr>
<td>0.88% Fe$_2$O$_3$</td>
<td>1.01% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>30.7 MHz</td>
<td>32.7 MHz</td>
</tr>
</tbody>
</table>

**STICKNEY (SD)**

Classic Nitrolar
Fine, montmorillonitic, mesic
Subhumid zone
Calcareous clay loam/glacial till
Davidson Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>mod. well drained</td>
<td>mod. well drained</td>
</tr>
<tr>
<td>loam</td>
<td>loam</td>
</tr>
<tr>
<td>4R7 347 22RC</td>
<td>4R7 347 22RC</td>
</tr>
<tr>
<td>10YR 3/1 (moist)</td>
<td>10YR 4/2 (moist)</td>
</tr>
<tr>
<td>10YR 4/2 (dry)</td>
<td>10YR 4/2 (dry)</td>
</tr>
<tr>
<td>2.85% O.M.</td>
<td>2.70% O.M.</td>
</tr>
<tr>
<td>22.6 meq/100g CEC</td>
<td>25.7 meq/100g CEC</td>
</tr>
<tr>
<td>0.72% Fe$_2$O$_3$</td>
<td>0.66% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>32.3 MHz</td>
<td>34.4 MHz</td>
</tr>
</tbody>
</table>

**TETONKA (SD)**

Argiaquic Argiudoll
Fine, montmorillonitic, mesic
Subhumid zone
Local alluvial deposits over glacial till
Davidson Co.

<table>
<thead>
<tr>
<th>Al horizon</th>
<th>Al horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>poorly drained</td>
<td>poorly drained</td>
</tr>
<tr>
<td>silty loam</td>
<td>silty clay loam</td>
</tr>
<tr>
<td>4R7 347 22RC</td>
<td>4R7 347 22RC</td>
</tr>
<tr>
<td>10YR 3/1 (moist)</td>
<td>10YR 3/1 (moist)</td>
</tr>
<tr>
<td>10YR 4/2 (dry)</td>
<td>10YR 4/2 (dry)</td>
</tr>
<tr>
<td>3.1% O.M.</td>
<td>4.7% O.M.</td>
</tr>
<tr>
<td>30.8 meq/100g CEC</td>
<td>38.8 meq/100g CEC</td>
</tr>
<tr>
<td>0.62% Fe$_2$O$_3$</td>
<td>0.42% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>47.4 MHz</td>
<td>52.5 MHz</td>
</tr>
</tbody>
</table>

**BOYD (SD)**

Vertic Haplustoll
Fine, montmorillonitic, mesic
Subhumid zone
Residue from clay shales
Gregory Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>C slope</td>
<td>C slope</td>
</tr>
<tr>
<td>well drained</td>
<td>well drained</td>
</tr>
<tr>
<td>clay</td>
<td>clay</td>
</tr>
<tr>
<td>4R7 347 22RC</td>
<td>4R7 347 22RC</td>
</tr>
<tr>
<td>10YR 3/1 (moist)</td>
<td>10YR 3/1 (moist)</td>
</tr>
<tr>
<td>10YR 4/2 (dry)</td>
<td>10YR 4/2 (dry)</td>
</tr>
<tr>
<td>3.1% O.M.</td>
<td>2.9% O.M.</td>
</tr>
<tr>
<td>63.8 meq/100g CEC</td>
<td>68.8 meq/100g CEC</td>
</tr>
<tr>
<td>1.66% Fe$_2$O$_3$</td>
<td>1.83% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>49.6 MHz</td>
<td>41.6 MHz</td>
</tr>
</tbody>
</table>
TUTHILL (SD)

Aridic Argidoll
fine-loamy over sandy or sandy-skeletal, mixed, mollic semiarid zone
mixed sandy and loamy materials

Co.

Ap horizon
B horizon
C horizon

well-drained fine sandy loam
mod. well-drained fine sandy loam

1.15E 13/14B 14C
10.7/1 (wet) 10YR 6/1 (wet)
1.15E 0.6H 1.15E 0.6H
11.5 meg/100g CEC 10.5 meg/100g CEC
0.25% Fe₂O₃ 0.33% Fe₂O₃

28.6% MDC 39.3% MDC

DICKSON (IN)

Gleissic Fragudoil
fine-silty, silicocous, thermic

Ap horizon
C horizon

well-drained fine sandy loam
mod. well-drained silt loam

10YR 6/1 (dry) 10YR 6/2 (dry)
1.15E 0.6H 1.15E 0.6H
11.3 meg/100g CEC 10.5 meg/100g CEC
0.25% Fe₂O₃ 0.33% Fe₂O₃

27.3% MDC 33.9% MDC

MOUNT VIEW (TN)

Typic Paleudoll
fine-silty, silicocous, thermic

Ap horizon
C horizon

well-drained silt loam
mod. well-drained silt loam

2.25' 13/14B 13/14B
10YR 6/1 (wet) 10YR 6/3 (wet)
2.25E 0.6H 2.25E 0.6H
9.2 meg/100g CEC 13.5 meg/100g CEC
1.45% Fe₂O₃ 1.51% Fe₂O₃

33.9% MDC 35.0% MDC

BODINE (IN)

Typic Paleudoll
loess-skeletal, silicocous, thermic

Ap horizon
E horizon

well-drained silt loam
mod. well-drained silt loam

65S 73/1 13C 65S 73/1 13C
10YR 6/3 (wet) 10YR 6/3 (wet)
4.69E 0.6H 4.69E 0.6H
17.1 meg/100g CEC 10.0 meg/100g CEC
0.99% Fe₂O₃ 0.97% Fe₂O₃

30.3% MDC 34.8% MDC
### CUMBERLAND (TN)

**Rhodic Paleudalf**  
Fine, mixed, thermic  
Humid zone  
Old alluvium over limestone residuum  
Rutherford Co.

<table>
<thead>
<tr>
<th>Horizon</th>
<th>C horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap</td>
<td>Ap</td>
</tr>
<tr>
<td>C slope</td>
<td>C slope</td>
</tr>
<tr>
<td>Well drained</td>
<td>Well drained</td>
</tr>
<tr>
<td>Silty clay loam</td>
<td>Silt loam</td>
</tr>
<tr>
<td>75S 65/51 20EC</td>
<td>35S 77/51 20EC</td>
</tr>
<tr>
<td>7.5YR 5/6 (dry)</td>
<td>7.5YR 5/6 (moist)</td>
</tr>
<tr>
<td>7.5YR 5/6 (dry)</td>
<td>7.5YR 5/6 (moist)</td>
</tr>
<tr>
<td>7.5YR 5/6 (dry)</td>
<td>7.5YR 5/6 (moist)</td>
</tr>
<tr>
<td>7.5YR 5/6 (dry)</td>
<td>7.5YR 5/6 (moist)</td>
</tr>
<tr>
<td>7.5YR 5/6 (dry)</td>
<td>7.5YR 5/6 (moist)</td>
</tr>
<tr>
<td>3.25% Fe₂O₃</td>
<td>2.37% Fe₂O₃</td>
</tr>
<tr>
<td>29.6 mg%</td>
<td>31.9 mg%</td>
</tr>
</tbody>
</table>

### TALBOT (TN)

**Typic Hapludalf**  
Fine, mixed, thermic  
Humid zone  
Clayey limestone residuum  
Rutherford Co.

<table>
<thead>
<tr>
<th>Horizon</th>
<th>C horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap</td>
<td>Ap</td>
</tr>
<tr>
<td>B slope</td>
<td>B slope</td>
</tr>
<tr>
<td>Well drained</td>
<td>Well drained</td>
</tr>
<tr>
<td>Silty clay loam</td>
<td>Silt loam</td>
</tr>
<tr>
<td>145S 56/51 25EC</td>
<td>115S 67/51 25EC</td>
</tr>
<tr>
<td>7.5YR 4/6 (moist)</td>
<td>7.5YR 4/6 (moist)</td>
</tr>
<tr>
<td>10YR 6/6 (dry)</td>
<td>10YR 6/6 (dry)</td>
</tr>
<tr>
<td>1.84% O.M.</td>
<td>2.50% O.M.</td>
</tr>
<tr>
<td>13.6 meq/100g CEC</td>
<td>13.8 meq/100g CEC</td>
</tr>
<tr>
<td>3.66% Fe₂O₃</td>
<td>3.34% Fe₂O₃</td>
</tr>
<tr>
<td>28.2 mg%</td>
<td>30.2 mg%</td>
</tr>
</tbody>
</table>

### BRACKETT (TX)

**Typic Haplustalf**  
Loamy, carbonatic, thermic, shallow  
Subhumid zone  
Interbedded soft limestones and marly earth  
Bell Co.

<table>
<thead>
<tr>
<th>Horizon</th>
<th>C horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap</td>
<td>A horizon</td>
</tr>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>Well drained</td>
<td>Well drained</td>
</tr>
<tr>
<td>Fine sandy loam</td>
<td>Fine sandy loam</td>
</tr>
<tr>
<td>40% S 95/51 212EC</td>
<td>62% S 32/51 61C</td>
</tr>
<tr>
<td>10YR 5/2 (moist)</td>
<td>6YR 1/2 (moist)</td>
</tr>
<tr>
<td>10YR 4/2 (dry)</td>
<td>10YR 4/2 (dry)</td>
</tr>
<tr>
<td>3.20% O.M.</td>
<td>6.61% O.M.</td>
</tr>
<tr>
<td>23.7 meq/100g CEC</td>
<td>26.7 meq/100g CEC</td>
</tr>
<tr>
<td>1.82% Fe₂O₃</td>
<td>0.46% Fe₂O₃</td>
</tr>
<tr>
<td>27.6 mg%</td>
<td>32.0 mg%</td>
</tr>
</tbody>
</table>

### ELROSE (TX)

**Typic Haplustalf**  
Fine-loamy, silty-cos, thermic  
Subhumid zone  
Stratified marine sediments  
Anderson Co.

<table>
<thead>
<tr>
<th>Horizon</th>
<th>C horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap</td>
<td>A horizon</td>
</tr>
<tr>
<td>A slope</td>
<td>A slope</td>
</tr>
<tr>
<td>Well drained</td>
<td>Well drained</td>
</tr>
<tr>
<td>Fine sandy loam</td>
<td>Fine sandy loam</td>
</tr>
<tr>
<td>62% S 32/51 61C</td>
<td>67% S 28/51 51C</td>
</tr>
<tr>
<td>7.5YR 4/6 (moist)</td>
<td>7.5YR 3/4 (moist)</td>
</tr>
<tr>
<td>7.5YR 6/6 (dry)</td>
<td>7.5YR 6/6 (dry)</td>
</tr>
<tr>
<td>0.91% O.M.</td>
<td>2.57% O.M.</td>
</tr>
<tr>
<td>4.8 meq/100g CEC</td>
<td>6.6 meq/100g CEC</td>
</tr>
<tr>
<td>0.65% Fe₂O₃</td>
<td>2.58% Fe₂O₃</td>
</tr>
<tr>
<td>20.2 mg%</td>
<td>25.3 mg%</td>
</tr>
</tbody>
</table>
**Denton (TX)**

Vertic Calcisol
tight, montmorillonitic, thermic
subhumid zone
clayey materials over limestone and
ersilts
Coryell Co.

<table>
<thead>
<tr>
<th></th>
<th>Ap horizon</th>
<th></th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>well drained</td>
<td>A slope</td>
<td>well drained</td>
</tr>
<tr>
<td></td>
<td>silty clay</td>
<td></td>
<td>clay</td>
</tr>
<tr>
<td>42%</td>
<td>42%</td>
<td>38%</td>
<td>38%</td>
</tr>
<tr>
<td>7.5YR 3/2 (moist)</td>
<td>7.5YR 3/2 (moist)</td>
<td>7.5YR 3/2 (moist)</td>
<td>7.5YR 3/2 (moist)</td>
</tr>
<tr>
<td>1.28% O.M.</td>
<td>1.28% O.M.</td>
<td>1.28% O.M.</td>
<td>1.28% O.M.</td>
</tr>
<tr>
<td>10.9 meq/100g CEC</td>
<td>10.9 meq/100g CEC</td>
<td>10.9 meq/100g CEC</td>
<td>10.9 meq/100g CEC</td>
</tr>
<tr>
<td>1.6% Fe$_2$O$_3$</td>
<td>1.6% Fe$_2$O$_3$</td>
<td>1.6% Fe$_2$O$_3$</td>
<td>1.6% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>49.0 MCE</td>
<td>45.7 MCE</td>
<td>49.0 MCE</td>
<td>45.7 MCE</td>
</tr>
</tbody>
</table>

**Friol (TX)**

Osmotic Haplustoll
tight, mixed, thermic
subhumid zone
calcareous silty clay loam alluvium
Coryell Co.

<table>
<thead>
<tr>
<th></th>
<th>Ap horizon</th>
<th></th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>well drained</td>
<td>A slope</td>
<td>well drained</td>
</tr>
<tr>
<td></td>
<td>clay loam</td>
<td></td>
<td>clay loam</td>
</tr>
<tr>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>7.5YR 3/2 (moist)</td>
<td>7.5YR 3/2 (moist)</td>
<td>7.5YR 3/2 (moist)</td>
<td>7.5YR 3/2 (moist)</td>
</tr>
<tr>
<td>2.16% O.M.</td>
<td>2.16% O.M.</td>
<td>2.16% O.M.</td>
<td>2.16% O.M.</td>
</tr>
<tr>
<td>12.7 meq/100g CEC</td>
<td>12.7 meq/100g CEC</td>
<td>12.7 meq/100g CEC</td>
<td>12.7 meq/100g CEC</td>
</tr>
<tr>
<td>0.66% Fe$_2$O$_3$</td>
<td>0.66% Fe$_2$O$_3$</td>
<td>0.66% Fe$_2$O$_3$</td>
<td>0.66% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>36.1 MCE</td>
<td>41.9 MCE</td>
<td>36.1 MCE</td>
<td>41.9 MCE</td>
</tr>
</tbody>
</table>

**Trinity (TX)**

Typic Pelludert
tight, montmorillonitic, thermic
subhumid zone
calcareous clayey alluvium
Kaufman Co.

<table>
<thead>
<tr>
<th></th>
<th>Ap horizon</th>
<th></th>
<th>Ap horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A slope</td>
<td>well drained</td>
<td>A slope</td>
<td>well drained</td>
</tr>
<tr>
<td></td>
<td>silty clay loam</td>
<td></td>
<td>clay</td>
</tr>
<tr>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>7.5YR 3/2 (moist)</td>
<td>7.5YR 3/2 (moist)</td>
<td>7.5YR 3/2 (moist)</td>
<td>7.5YR 3/2 (moist)</td>
</tr>
<tr>
<td>3.17% O.M.</td>
<td>3.17% O.M.</td>
<td>3.17% O.M.</td>
<td>3.17% O.M.</td>
</tr>
<tr>
<td>10.9 meq/100g CEC</td>
<td>10.9 meq/100g CEC</td>
<td>10.9 meq/100g CEC</td>
<td>10.9 meq/100g CEC</td>
</tr>
<tr>
<td>0.77% Fe$_2$O$_3$</td>
<td>0.77% Fe$_2$O$_3$</td>
<td>0.77% Fe$_2$O$_3$</td>
<td>0.77% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>43.1 MCE</td>
<td>62.9 MCE</td>
<td>43.1 MCE</td>
<td>62.9 MCE</td>
</tr>
</tbody>
</table>

**Windthorst (TX)**

Ufic Paleustoll
tight, mixed, thermic
subhumid zone
stratified clay and loamy materials
Parker Co.

<table>
<thead>
<tr>
<th></th>
<th>Al horizon</th>
<th></th>
<th>Al horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>B slope</td>
<td>mod. well drained</td>
<td>B slope</td>
<td>mod. well drained</td>
</tr>
<tr>
<td></td>
<td>v. fine sandy loam</td>
<td></td>
<td>v. fine sandy loam</td>
</tr>
<tr>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>7.5YR 3/2 (moist)</td>
<td>7.5YR 3/2 (moist)</td>
<td>7.5YR 3/2 (moist)</td>
<td>7.5YR 3/2 (moist)</td>
</tr>
<tr>
<td>1.09% O.M.</td>
<td>1.09% O.M.</td>
<td>1.09% O.M.</td>
<td>1.09% O.M.</td>
</tr>
<tr>
<td>12.2 meq/100g CEC</td>
<td>12.2 meq/100g CEC</td>
<td>12.2 meq/100g CEC</td>
<td>12.2 meq/100g CEC</td>
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<tr>
<td>0.45% Fe$_2$O$_3$</td>
<td>0.45% Fe$_2$O$_3$</td>
<td>0.45% Fe$_2$O$_3$</td>
<td>0.45% Fe$_2$O$_3$</td>
</tr>
<tr>
<td>29.2 MCE</td>
<td>29.2 MCE</td>
<td>29.2 MCE</td>
<td>29.2 MCE</td>
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</table>
KIRVIN (TX)

Typic Hapludalf
clayey, mixed, thermic
brow zone
acid sandstone and loamy and
clayey alluvium
Smith Co.

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<thead>
<tr>
<th>All horizon</th>
<th>Ap horizon</th>
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<tbody>
<tr>
<td>B slope</td>
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<tr>
<td>well drained</td>
<td>well drained</td>
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<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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<tr>
<td>( \text{pH} )</td>
<td>6.3 (moist)</td>
</tr>
<tr>
<td>( \text{pH} )</td>
<td>6.2 (dry)</td>
</tr>
<tr>
<td>Organic C</td>
<td>0.12%</td>
</tr>
<tr>
<td>Calcium</td>
<td>0.53%</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.62%</td>
</tr>
<tr>
<td>Fe₂O₃</td>
<td>0.18%</td>
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</table>

26.8 mg/kg  28.8 mg/kg

TRIOMAS (TX)

Ustalfic Hapludalf
fine-loamy, mixed, thermic
brow zone
sandy alluvium materials
Andrews Co.

<table>
<thead>
<tr>
<th>All horizon</th>
<th>A slope</th>
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<tbody>
<tr>
<td>well drained</td>
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<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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<tr>
<td>( \text{pH} )</td>
<td>6.4 (moist)</td>
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<tr>
<td>( \text{pH} )</td>
<td>6.2 (dry)</td>
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<tr>
<td>Organic C</td>
<td>0.12%</td>
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<tr>
<td>Calcium</td>
<td>0.53%</td>
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<tr>
<td>Magnesium</td>
<td>0.62%</td>
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<tr>
<td>Fe₂O₃</td>
<td>0.18%</td>
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</table>

21.2 mg/kg  17.7 mg/kg

MONTELL (TX)

Eutric Pellustalf
fine, montmorillonitic, hyperthermic
brow zone
calcareous, clayey alluvium
Kinney Co.

<table>
<thead>
<tr>
<th>All horizon</th>
<th>A slope</th>
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<tbody>
<tr>
<td>well drained</td>
<td>well drained</td>
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<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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<tr>
<td>( \text{pH} )</td>
<td>6.4 (moist)</td>
</tr>
<tr>
<td>( \text{pH} )</td>
<td>6.2 (dry)</td>
</tr>
<tr>
<td>Organic C</td>
<td>0.12%</td>
</tr>
<tr>
<td>Calcium</td>
<td>0.53%</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.62%</td>
</tr>
<tr>
<td>Fe₂O₃</td>
<td>0.18%</td>
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</table>

26.7 mg/kg  26.9 mg/kg

AMARILLO (TX)

Aridic Paleustalf
fine-loamy, mixed, thermic
brow zone
old alluvium deposits or alluvium
Lamb Co.

<table>
<thead>
<tr>
<th>Ap horizon</th>
<th>A slope</th>
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</thead>
<tbody>
<tr>
<td>well drained</td>
<td>well drained</td>
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<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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<tbody>
<tr>
<td>( \text{pH} )</td>
<td>6.4 (moist)</td>
</tr>
<tr>
<td>( \text{pH} )</td>
<td>6.2 (dry)</td>
</tr>
<tr>
<td>Organic C</td>
<td>0.12%</td>
</tr>
<tr>
<td>Calcium</td>
<td>0.53%</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.62%</td>
</tr>
<tr>
<td>Fe₂O₃</td>
<td>0.18%</td>
</tr>
</tbody>
</table>

26.3 mg/kg  20.3 mg/kg

---

All horizon (A slope, well drained)
40.9 mg/kg  42.7 mg/kg

---


dotted line: 40.9 mg/kg  solid line: 42.7 mg/kg
ACUFF (TX)

Aridic Paleustoll
fine-loamy, mixed, thermic
sandy outwash or old alluvium
Lubbock Co.

Ap horizon
A slope
well drained
fine sandy loam
61% 22% 16% 15EC
7.5YR 3/2 (moist) 7.5YR 3/2 (moist)
7.5YR 4/4 (dry) 7.5YR 4/4 (dry)
1.15% 0.5% 0.75% 0.5%
18.2 meq/100g CEC 12.0 meq/100g CEC
0.58% Fe₂O₃ 0.59% Fe₂O₃
26.4 MB% 27.4 MB%

PATRICIA (TX)

Aridic Paleustoll
fine-loamy, mixed, thermic
sandy soils, sediments
Lynn Co.

Ap horizon
B slope
well drained
loamy fine sand
80% 15% 2EC
7.5YR 5/6 (dry) 7.5YR 5/6 (dry)
0.56% 0.5% 0.11% 0.1%
6.4 meq/100g CEC 6.3 meq/100g CEC
0.40% Fe₂O₃ 0.33% Fe₂O₃
24.5 MB% 20.4 MB%

TARRANT (TX)

Lithic Calciustoll
clayey-skeletal, montmorillonitic, thermic
subhumid zone
residuum from limestone
Nenard Co.

All horizon
A slope
well drained
silty clay
72% 41% 15% 2EC
7.5YR 4/4 (moist) 7.5YR 4/4 (moist)
10YR 3/2 (dry) 10YR 3/2 (dry)
4.61% 5.62% 0.75% 0.5%
59.0 meq/100g CEC 59.0 meq/100g CEC
0.94% Fe₂O₃ 0.87% Fe₂O₃
51.8 MB% 50.1 MB%

REAGAN (TX)

Ustolic Calciorthid
fine-silty, mixed, thermic
semiarid zone
silt loam material
Upton Co.

All horizon
A slope
well drained
loam
36% 66% 15% 2EC
64% 41% 15% 2EC
7.5YR 5/6 (moist) 7.5YR 5/6 (moist)
10YR 3/3 (moist) 10YR 3/3 (moist)
7.5YR 6/4 (dry) 7.5YR 6/4 (dry)
0.62% 0.62% 0.90% 0.5%
31.8 meq/100g CEC 29.3 meq/100g CEC
0.69% Fe₂O₃ 0.58% Fe₂O₃
28.9 MB% 26.2 MB%
### VICTORIA (TX)

**Udic Pellustert**  
Fine, montmorillonitic, hyperthermic  
Subhumid zone  
Calcareous clayey marine sediments  
Nuece Co.

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Slope Type</th>
<th>Drained Condition</th>
<th>Texture</th>
<th>Clay Percentage</th>
<th>CEC (meq/100g)</th>
<th>Fe₂O₃ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap</td>
<td>A</td>
<td>Poorly drained</td>
<td>Clay</td>
<td>45.4</td>
<td>47.3</td>
<td></td>
</tr>
</tbody>
</table>

### UVALDE (TX)

**Aridic Calcustert**  
Fine-silty, mixed, hyperthermic  
Semi-arid zone  
Calcareous clayey marine sediment  
Zavala Co.

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Slope Type</th>
<th>Drained Condition</th>
<th>Texture</th>
<th>Clay Percentage</th>
<th>CEC (meq/100g)</th>
<th>Fe₂O₃ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap</td>
<td>A</td>
<td>Well drained</td>
<td>Loam</td>
<td>57.2</td>
<td>39.1</td>
<td></td>
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</table>

### SHERM (TX)

**Torreric Paleustert**  
Fine, mixed, mesic  
Semi-arid zone  
Colluvial sediments  
Sherman Co.

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Slope Type</th>
<th>Drained Condition</th>
<th>Texture</th>
<th>Clay Percentage</th>
<th>CEC (meq/100g)</th>
<th>Fe₂O₃ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap</td>
<td>A</td>
<td>Well drained</td>
<td>Loam</td>
<td>36.6</td>
<td>39.0</td>
<td></td>
</tr>
</tbody>
</table>

### HODGINS (TX)

**Utelic Camborthid**  
Fine-silty, mixed, arid  
Semi-arid zone  
Calcareous loamy alluvium  
Pecos Co.

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Slope Type</th>
<th>Drained Condition</th>
<th>Texture</th>
<th>Clay Percentage</th>
<th>CEC (meq/100g)</th>
<th>Fe₂O₃ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-A12</td>
<td>A</td>
<td>Well drained</td>
<td>Silty clay</td>
<td>44.8</td>
<td>41.7</td>
<td></td>
</tr>
</tbody>
</table>
**ANTIGO (WI)**

Typic Glossoboralf
fine-silty over sandy or sandy-skeletal, mixed
humid zone
silty sediments over glacial sand
Langlade Co.

- **Ap horizon**
  - A slope
  - well drained
  - silt loam
  - 18.5 K 7.5/3 (dry)
  - 10YR 6/3 (dry)
  - 3.50% O.H.
  - 12.0 meq/100g CEC
  - 1.24% Fe₂O₃

\[
\text{Tone: } 59.1 \text{ mAU} \quad \text{10.0 mAU} \quad \text{39.1 mAU} \quad \text{31.2 mAU} \quad \text{28.7 mAU} \quad \text{26.1 mAU}
\]

**FENWOOD (WI)**

Typic Glossoboralf
fine-loamy, mixed
humid zone
silty sediments and residuum from granitic rocks
Marathon Co.

- **Ap horizon**
  - A slope
  - well drained
  - silt loam
  - 18.5 K 7.5/3 (dry)
  - 10YR 6/3 (dry)
  - 2.50% O.H.
  - 12.0 meq/100g CEC
  - 1.35% Fe₂O₃

\[
\text{Tone: } 36.2 \text{ mAU} \quad \text{37.2 mAU}
\]

**CAMPIA (WI)**

Typic Glossoboralf
fine-silty, mixed
humid zone
silty eolian or lacustrine deposits
Polk Co.

- **Ap horizon**
  - A slope
  - well drained
  - silt loam
  - 18.5 K 7.5/3 (dry)
  - 10YR 6/3 (dry)
  - 3.00% O.H.
  - 15.0 meq/100g CEC
  - 0.85% Fe₂O₃

\[
\text{Tone: } 52.0 \text{ mAU} \quad \text{39.9 mAU}
\]

**CUSHING (WI)**

Glossic Eutroboralf
fine-loamy, mixed
humid zone
loam till with a silty mantle
Polk Co.

- **Ap horizon**
  - B slope
  - well drained
  - fine sandy loam
  - 18.5 K 7.5/3 (dry)
  - 10YR 6/3 (dry)
  - 3.50% O.H.
  - 12.0 meq/100g CEC
  - 0.55% Fe₂O₃

\[
\text{Tone: } 28.7 \text{ mAU} \quad \text{29.1 mAU}
\]
GOODMAN (WI)

Alfic haplochre
coarse-silty, mixed, frigid
humid zone
silty sediments over acid till
Price Co.

Ap horizon
A slope
mod. well drained
silt loam
625.0 % 12
e 12EC
7.5YR 3/2 (moist)
10YR 6/3 (dry)
7.44\% O.M.
30.0 meq/100g CEC
1.04\% Fe_2O_3

41.5 MAF

FOX (WI)

Typic Hapludalf
fine-loamy over sandy or sandy-
skeletal, mixed, umicky
humid zone
loamy outwash over calcareous sand
Osage Co.

Ap horizon
A slope
well drained
silt loam
20\% 51251 12EC
10YR 3/3 (moist)
10YR 3/3 (dry)
2.78\% O.M.
17.0 meq/100g CEC
1.05\% Fe_2O_3

32.0 MAF

28.4 MAF
CASCALVE (PR., BRASIL)

Maple Acrothum
very-fine, oxic, thermic
humid zone
basalt
Municipio of Cascavel

A1 horizon
B slope
excess. drained
clay
1.25 mm 60% 60
2.5 mm 3/4 (moist)
2.5 mm 3/4 (dry)
5.5% O.M.
19.5 meq/100g CEC
23.9% Fe₂O₃

PATO BRANCO (PR., BRASIL)

Maple Acrothum
very-fine, kaolinitic, thermic
humid zone
basalt
Municipio of Pato Branco

Ap horizon
B slope
excess. drained
clay
9.05 2.5 mm 60%
2.5 mm 3/2 (moist)
2.5 mm 4/6 (dry)
3.0% O.M.
20.2 meq/100g CEC
11.7% Fe₂O₃

GUARAPUAVA (PR., BRASIL)

Typic Hapludoll
very-fine, oxic, thermic
humid zone
andesite
Municipio of Guarapuava

A1 horizon
B slope
excess. drained
clay
625 445 10 400
7.5 mm 3/2 (moist)
7.5 mm 4/6
9.2% O.M.
41.6 meq/100g CEC
14.0% Fe₂O₃

LONDrina (PR., BRASIL)

Typic Hapludoll
very-fine, kaolinitic, hyperthermic
humid zone
basalt
Municipio of Londrina

A1 horizon
C slope
excess. drained
clay
9.05 1425 1 777
2.5 mm 3/6 (moist)
2.5 mm 4/6 (dry)
2.2% O.M.
22.1 meq/100g CEC
25.6% Fe₂O₃

MUFUCA
References


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