# MLRA Region 10:
# Guideline for Completing and Updating Official Soil Series Descriptions

## 7/9/07

These guidelines are an addition to the guidelines in Part 614.06 in the National Soil Survey Handbook (NSSH) (http://soils.usda.gov/technical/handbook/contents/part614.html#06). These guidelines do not replace the guidelines in the NSSH. These guidelines are intended only for Official Series Descriptions (OSDs) that are the responsibility of MO10. The guidelines for Official Series Descriptions are as follows:

1. All initial and update soil surveys should use the OSD as the Taxonomic Unit Description when possible. Most Taxonomic Unit Descriptions (TUDs) are written in semitabular format. These guidelines for writing OSDs are in both narrative format and semitabular format.

2. All revisions to existing OSDs and all new OSDs submitted to MO10 should use these guidelines. These guidelines are posted on the MO10 website (http://www.mo10.nrcs.usda.gov/references/).

3. All edits/revisions should be made using the MS-Word/Tools "Track Changes." Record/Keep all changes marked on documents.

4. When you submit the OSDs to MO10, attach the OSDs as files and not in the body of the e-mail. If you send the file with a .txt extension, the file will be in the body of the message and a paragraph mark will occur at the end of each line.

5. If the series description is for a proposed new series or if the revision significantly changes the concept of the existing series, the Soil Survey Project leader should submit documentation to the SDQS for the series file. This documentation should include:
    - All of the completed pedon descriptions to determine the range of characteristics. The standard is generally 10 pedon descriptions.
    - Transects
    - Laboratory data that are completed in the soil survey office, a university laboratory, or the Soil Survey Laboratory in Lincoln.

**The guidelines for keying soil series descriptions are as follows:**

- Left margin is in column 1. Right margin is in column 66.
- Tabs, hyphens, automatic centering, bold fonts, and underlines should not be used. The space bar should be used instead of tabs.
- Everything is left justified except the horizon designations, which are indented at least 1 space using the space bar.
- Section headings are in capital letters.
- Depths and other property data should be expressed in the metric system. Conversion tables and systems can be found at http://www.mo10.nrcs.usda.gov/references/guides.
  *Note:* Precipitation is stated in millimeters. Depth to saturation and elevation is stated in meters.
- Legal descriptions and locations are in English units of measure.
- Special symbols, subscripts, and superscripts must be expressed as words. (For example: $43^{o}$ should be expressed as 43 degrees, and 10% should be expressed as 10 percent)

The first eight lines and the last line of the soil series description must be standardized in order for the OSD computer program to work.

Line 1-LOCATION ANTIGO WI
This line is entered in capital letters (upper case). The first letter of the state where the soil series is located must be in column 33. When additional states are using the series, the first state should be in column 33 followed by a "+" then the abbreviation for the next state, then if needed by a space and the abbreviation for the next state, and so on.
Example: IA+MO NE WI

Line 2--Blank

Line 3--Tentative series or Established series. All series are "Tentative" until the final correlation document is signed, at which time the series will be changed by the SDQS to "Established." The status in the Soil Classification (SC) file will also be changed.

Line 4--KHJ-RBD-TDT A maximum of three sets of initials should be on the OSD. The first set of initials should be those of the original author and should never change. The other initials should be those of the two people who most recently edited the series. The person submitting the revision needs to take responsibility for the action. The initials indicate who will answer future questions or comments.

Line 5--2/02 This should be the month and year that the soil series draft or revision was sent to the SDQS for review. This date is automatically changed when posted to the data base.

Line 6--Blank Line

Line 7--ANTIGO SERIES (All letters are upper case.)

Line 8 is followed by the introductory paragraph and the rest of the soil series description.

Next to last line--National Cooperative Soil Survey

Last line--U.S.A. (All letters are upper case and do not have spaces in between.) Delete any extra paragraph returns after this line.

**Introductory Paragraph**: This is a summary of data found in the body of the OSD. The information here should match nearly word-for-word with the information in the body of the OSD. The following format for the introductory paragraph should be used:

The Alpha series consists of ? (depth), ? drained soils that formed in ? (parent material--modifier, kind, and origin). These soils are on ? (landform(s). Slope ranges from ? to ? percent. Mean annual precipitation is about ? millimeters. Mean annual air temperature is about ? degrees C.
(Note: Depth classes are defined in Table 3-5 of the Soil Survey Manual [SSM]. Mean annual air temperature is usually about 1 degree C less than mean annual soil temperature. Also, the values here for MAP and MAAT are usually arithmetic means, averages of the ranges established in the Geographic Setting section of the OSD.)

Examples:
The Kevilar series consists of very deep, moderately well drained soils that formed in 50 to 100 centimeters of loamy alluvium over sandy alluvium underlain by stratified loamy and sandy alluvium at a depth of 100 to 150 centimeters. These soils are on valley trains. Slope ranges from 0 to 12 percent. Mean annual precipitation is about 760 millimeters. Mean annual air temperature is about 9 degrees C.

The Cublake series consists of very deep, moderately well drained soils that formed in deep sandy outwash underlain by stratified silty, loamy, and sandy glaciofluvial deposits. These soils are on outwash terraces, outwash plains, and glacial lake plains. Slope ranges from 0 to 15 percent. Mean annual precipitation is about 760 millimeters. Mean annual air temperature is about 5 degrees C.

The Norden series consists of well drained soils that are moderately deep to sandstone. These upland soils formed in loamy residuum from glauconitic sandstone. Slope ranges from 2 to 65 percent. Mean annual precipitation is about 725 millimeters. Mean annual air temperature is about 8 degrees C.

**NOTE -- ONLY USE ACCEPTED TERMS RECOGNIZED IN PART 629 OF THE NSSH, GLOSSARY OF LANDFORM AND GEOLOGIC TERMS (http://soils.usda.gov/technical/handbook/contents/part629.html#00).**

**If you wish to identify the geologic age of the parent material, do so in the Geographic setting paragraph.**

**TAXONOMIC CLASS:** This statement gives the family classification.

**TYPICAL PEDON: the following format for the typical pedon should be used:**

Alpha ? (surface texture), on a ? (aspect),? (slope shape) slope of ? percent, in ? (land type), at an elevation of about ? meters. (Colors are for moist soil unless otherwise stated.)
Example:
**TYPICAL PEDON:** Kevilar sandy loam, on a southwest-facing, convex slope of 4 percent, in an area of cropland, at an elevation of about 248 meters. (Colors are for moist soil unless otherwise stated.)

**TYPICAL PEDON:** Cublake loamy sand, on a linear slope of 1 percent, in a wooded area, at an elevation of about 393 meters. (Colors are for moist soil unless otherwise stated.)
(Note that no aspect is needed for slopes of 0 to 2 percent.)

**Pedon Description:** Refer to Part 614 of the NSSH for more detailed guidance on the content of pedon descriptions. Below are a few additional guidelines.
Surface fragments (rock or pararock) and surface litter are described just above the first horizon.

For example:
About 15 percent of the surface is covered by channers, 30 percent by cobbles, 5 percent by stones, and 3 percent by boulders. The fragments are sandstone.

The soil surface is the top of the mineral surface layer, or for soils with an O horizon, the surface is the top of the part of the O horizon that is at least partially decomposed, which excludes live and fresh moss, leaves, and twigs. The top of any surface horizon identified as an O horizon, whether Oi, Oe, or Oa, is considered the soil surface. The proper way to record the thickness of an O horizon is as follows:

Example:
Oi--0 to 5 centimeters; slightly decomposed plant material.

Below is the sequence of features described for a horizon as outlined in Part 614 of the NSSH. All terms are consistent with “Field Book for Describing and Sampling Soils.”

- Color (moist is the most common condition in MO10)
- Texture
- Color (dry color is usually given for the upper horizons to indicate whether there is an ochric epipedon, mollic epipedon, or albic horizon and also on A and E, E/B, B/E, AB, BA, EB, BE, E and Bt, and Bt and E horizons)
- Mottles (dry or moist, not related to wetness)
- Structure (note that commas are not used to separate terms in the phrase that describes structure. Also, the word "structure" is used only once in describing compound structure, for example, "weak coarse prismatic structure parting to moderate medium subangular blocky")
- Consistence (dry, moist, stickiness, plasticity)

- Roots
- Pores
- Additional features as follows:
    - Slickensides
    - Durinodes
    - Plinthite
    - Clay films
    - Sand or silt skeletans
    - Concretions
    - Carbonates
    - Salts
    - Sodium
    - Smeariness
    - Redoximorphic features
    - Pebbles, stones, and other rock fragments
    - Brittleness
- Reaction
- Lower boundary
- Range in thickness

If such features are not mentioned in the description of a horizon, they are assumed to be absent. (See Exhibit 614-1 of the NSSH for further information.)

**TYPE LOCATION**: The following format should be used:

Major Land Resource Area (MLRA) ?-Name of this really neat MLRA; ? County, ? (state), subset; about ? of ? (general location); located about ? feet ?(north or south) and ? feet (east or west) of the ? (northeast, southeast, southwest or northwest) corner of section ?, T. ?.N., R. ? W or E. (Public Land Survey location); USGS ? topographic quadrangle *(7.5-minute series)*; lat. ? degrees ? minutes ? seconds N. and long. ? degrees ? minutes ? seconds W., NAD ?. (North American Datum and year)

Note: Use Topozone to locate and to find quadrangle name, latitude, and longitude. NAD 83 is preferred. (http://www.topozone.com/)

Example:

> Major Land Resource Area (MLRA) 3000-Really Neat Glacial Drift; Any County, Any State, subset; about 10 miles southwest of Any Place; located about 1,000 feet south and 300 feet east of the northwest corner of section 6, T. 5 N., R. 8 W.; USGS Someplacespecial topographic quadrangle; lat. 35 degrees 40 minutes 20 seconds N. and long. 108 degrees 30 minutes 20 seconds W., NAD 83.

**Note: Give as complete and comprehensive a location as possible. Double check to make sure your locations agree with each other.**

**RANGE IN CHARACTERISTICS:** Refer to Part 614.06 of the NSSH for detailed guidelines on this section. All properties used to differentiate this series from other series

in the Competing Series section must be listed in this section. Range in characteristics must be consistent with the classification of the series. Established ranges cannot "cross-over" to other taxonomic subgroups or family classification. It is imperative that only representative pedon descriptions be used to develop the range in characteristics. The use of unusual or questionable descriptions when the range in characteristics is developed magnifies the problems involved with competing soil series. In addition, ranges should be limited to those ranges that are supported by lab data. For example, **the observed range of the percent clay in the particle-size control section for a pedon is 35 to 45 percent. This range, 35 to 45 percent clay, should be listed in the range in characteristics and not the default range of 35 to 60 percent clay for the fine particle-size class.**

In the OSD template, the statement "Depths are measured from the top of the mineral soil surface" is listed after the Range in Characteristics heading. This statement applies to soils that have "O" horizons. This statement should be deleted for soils that do not have "O" horizons.

The Range in Characteristics section is divided into two parts. The first part addresses the **whole soil,** and the second part addresses the **individual horizons**. Quantitative limits are given for the ranges in properties. The ranges specified must fall within the ranges of the family in which the soil series is classified. The recorded ranges are more limited than those that have been observed in the field or determined in the laboratory. This section of the soil series description, like others, is not meant to cover minor components of other series in the map unit. A standard arrangement of information in this section makes comparisons among soil series easier. Both tabular and narrative formats are acceptable.

**List only the observed ranges, not "default" ranges**. For example, if a soil has a fine-loamy particle-size class, do not automatically default to 18 to 35 percent clay when the observed range is only 18 to 25 percent clay.

It is important that the particle-size control section be clearly defined. As a minimum, the clay content must be listed. For some soils the sand content and size fraction are important. For other soils the amount, lithology, and size of rock fragments are listed.

Note: The following examples for the range in characteristics section are not totally inclusive or applicable to every pedon. Some items can be added or deleted as needed and justified.

**Whole Soil:**

- Mantle kind and thickness
- Depth to (lithic or paralithic contact) bedrock
- Depth to a fragipan
- Depth to a densic contact
- Depth to a lithologic discontinuity or contrasting particle-size
- Depth to carbonates
- Depth to argillic horizon
- Thickness of the argillic horizon
- Content of organic matter in the surface layer

- Range in content of rock fragments (volume of gravel, cobbles, stones, boulders, channers, flags, etc.)
- Reaction
- Base saturation
- Soil temperature
- Particle-size control section (weighted average)
    1. Percent clay content
    2. Percent (may use very fine, fine, medium, coarse, or very coarse) sand content
- Depth to redoximorphic features

*Example*

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RANGE IN CHARACTERISTICS:
Thickness of mollic epipedon--18 to 49 centimeters
Depth to lithic contact--100 to 150 centimeters
Depth to carbonates--150 to more than 200 centimeters
Clay content of the particle-size control section (weighted average)--
-10 to 16 percent
Sand content of the particle-size control section (weighted average)--
-60 to 80 percent
Rock fragment content--0 to 15 percent, mixed lithology
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**Individual Horizons:**

The horizons are the major ones described and are of consequence for the definition of the soil series. All horizons described in the Typical Pedon should have a range in characteristics defined in this section. The properties in the format below are not totally inclusive or applicable to all pedons. Properties may be added or deleted as needed and justified.

? horizon:
Hue: ?
Value: ?
Chroma: ?
Texture: ?
Clay content: ? to ? percent
Sand content: ? to ? percent
Rock fragment content: ? percent
Pararock fragment content: ? percent
Acid oxalate extractable Al + 1/2 Fe: ? to ? percent
Base saturation: ? percent
Calcium carbonate equivalent:
EC (mmhos/cm): ? to ?
Gypsum: ? to ? percent
Reaction:
Moist bulk density: ? g/cc to ? g/cc

**Tabular example**:

Bt horizon:
Hue--7.5YR or 10YR
Value--2 or 3 moist, 3 or 4 dry
Chroma--1 or 2 moist or dry
Texture--loam or clay loam
Clay content--22 to 33 percent
Sand content--40 to 60 percent, fine sand and coarser
Rock fragment content--2 to 10 percent gravel, 0 to 5 percent cobbles, mixed lithology
Reaction--very strongly acid to moderately acid

**Narrative example:**
The Bt horizon has hue of 7.5YR or 10YR, value of 2 or 3 moist or 3 or 4 dry, and chroma of 1 or 2 moist or dry. It is loam or clay loam. It averages 22 to 33 percent clay and 40 to 60 percent fine sand or coarser. The content of rock fragments ranges from 2 to 10 percent gravel, 0 to 5 percent cobbles, of mixed lithology. Reaction ranges from very strongly acid to moderately acid.

In cases where some pedons have horizons not in the typical pedon description, either define a set of properties as other horizons, adding (if present) behind the horizon designation, or add a statement like the following between the appropriate horizons:

Some pedons have an AB horizon

**Hue/Value/Chroma:** The range for hues should read red to yellow and not yellow to red. For example, the range for hue should read "5YR or 7.5YR", not "7.5YR or 5YR." Use the term "or" when listing a range of two and the term "to" when listing a range of three or more hues, values, or chromas. The term "to" is understood to include the end value. If the range is the same for both dry and moist colors (value and chroma), then this should be stated by adding the phrase "dry or moist."

Example:
Hue: 7.5YR to 2.5Y
Value: 3 to 5 dry, 3 or 4 moist
Chroma: 2 or 3 dry or moist

Textures: Textures should be written out and not abbreviated. For surface horizons, it is suggested that only the surface textures used in approved map units be listed even though other surface textures may have been observed in the field.

**Competing Series: Competing series are those with the identical taxonomic classification.** Competitors are listed alphabetically. State abbreviations are not needed. Competing statements are written individually in the order of listing, except for those soils with the same competing characteristics, which can be grouped together.

The most efficient means of determining the competing series is to go to the OSD web site and click on View OSDs by Query (with FTP option) (http://ortho.ftw.nrcs.usda.gov/cgi-

bin/osd/osdquery.cgi). This takes you to the OSD query facility. In the second paragraph you have the option to automatically populate the classification fields. Select "Click here to activate this process." Enter the soil series name of the OSD you are editing in the box provided. After entering the soil series name, click "Process." Go to the bottom of the OSD Query facility page and click "Process" again. Click on "View the selected OSDs" to view the competing series.

If competing series do not exist, you may select a closely similar soil from the same geographic area to compete against. Following is an example of such a statement:

> There are no competing series. A closely similar series is the Alpha series. Alpha soils have a mollic epipedon more than 50 centimeters thick.

Before competing statements are written, it is critical that the soil series being described has a complete and concise range in characteristics and other properties identified. Poorly written OSDs make it much more difficult to differentiate series. The competing statement should only identify the "major" difference in **soil properties**. Differences in every property need not be described. When writing competing statements, address only those properties that are distinctly different between the competitors. Properties that overlap cannot be used to differentiate series. Only properties in the series control section can be used to separate series.

Differentiating series by parent materials should be defined in soil properties, such as clay content, sand content, rock fragment content, or other property.

Series cannot be differentiated by landform and landscape position in this section.

Do not use different horizonation symbols as a reason to compete series. However, the pedogenic process represented by the symbol may be used if it is diagnostic. Following are some examples:

"Alpha soils have a BA horizon" should not be used because the BA horizon is not diagnostic.

"Alpha soils have a Bt horizon" is not correct. "Alpha soils have an argillic horizon" or "Alpha soils have accumulations of illuviated clay" is correct.

"Alpha soils have a Bk horizon" is not correct. "Alpha soils have accumulations of carbonates within a depth of 150 centimeters" is correct.

"Alpha soils have a Bg horizon" is not correct. "Alpha soils have a gleyed horizon" is correct.

**The particular property or feature that is used as the basis for competing must be clearly described in the series being described and in the descriptions of competitors. The same (but opposite) statement appears in the competing OSD. Competing OSDs are modified at the same time.**

The following is a list of features used to differentiate soils. It is suggested that this list be used as a key for writing competing statements. For example, if item 1 (soil depth) cannot be used as a property to compete, then go to item 2 (presence or absence of a diagnostic horizon or feature) and so on until a property is found that can be used as a basis for competing. This list is not totally inclusive for all pedons but will work for most soils.

1. soil depth (depth to lithic contact, paralithic contact, densic contact, or fragipan)
   *Example:*
   *Alpha--have a lithic contact within a depth of 100 centimeters*

2. Presence or absence of a diagnostic horizon or feature.
   *Example:*
   *Alpha--have a sand content of more than 70 percent in the lower third of the series control section*
   *Alpha soils have a clay content of less than 25 percent in the upper third of the series control section.*

3. Particle-size (may or may not be related to soil texture)
   *Example:*
   *Alpha--have a fine sand content of more than 50 percent in the series control section*
   *Alpha--have a sand content that averages more than 90 percent in the particle-size control section*
   *Alpha soils have a clay content that averages more than 27 percent in the particle-size control section.*

4. Soil chemistry (base saturation, pH)
   *Example:*
   *Alpha--have carbonates within a depth of 85 centimeters*
   *Alpha--have base saturation of more than 60 percent in the upper part of the argillic horizon*
   *Alpha soils are neutral or moderately alkaline throughout the series control section.*

5. content and/or type of rock or pararock fragments
   *Example:*
   *Alpha--have a rock fragment content of less than 15 percent in the series control section*
   *Alpha soils do not have rock fragments in the series control section.*

6. Thickness of the epipedon
   *Example:*
   *Alpha--have a mollic epipedon that is 30 to 46 centimeters thick.*

7. Thickness of a diagnostic horizon
   *Example:*
   *Alpha--have a spodic horizon 40 to 64 centimeters thick*
   *Alpha soils have paralithic materials that are 8 to 20 centimeters thick.*

8. Soil temperature and soil moisture

*Example:*
*Alpha--are in areas that have a mean annual air temperature ranging from 11 to 14 degrees C*
*Alpha soils are dry in all parts of the moisture control section for 60 consecutive days from July 15 to October 15.*

**GEOGRAPHIC SETTING:** The following semitabular format should be used. Other items can be added as needed to help describe the setting:

Parent material: ?
Landform: ?
Geologic formation-optional
Slope: ? percent
Elevation: ? to ? meters above sea level
Mean annual air temperature: ? to ? degrees C
Mean annual precipitation: ? to ? millimeters
Frost-free period: ? to ? days

**Parent material**: Describe the modifier, kind, and origin of the parent material. Use only terms recognized in Part 629, Glossary of Landforms and Geologic Terms, in the NSSH (http://soils.usda.gov/technical/handbook/contents/part629.html#00). The name of the geologic formation can also be identified. Naming the geologic formation does not necessarily limit the use of the series to that particular formation.

**Landform:** List the landform(s) and positions(s) on the landform(s) (if significant). Use only terms recognized in Part 629, Glossary of Landforms and Geologic Terms, in the NSSH (http://soils.usda.gov/technical/handbook/contents/part629.html#00). If the soil only occurs on the toeslopes of hills, then identifying the toeslope position is significant. If a soil occurs throughout a flood plain or on dunes, identifying a position is not significant.

**GEOGRAPHICALLY ASSOCIATED SOILS:** A narrative or semitabular format may be used. As a general guideline, list one soil that occurs in a lower landscape position on the landform, one that occurs in the same landscape position, and one that occurs in a higher landscape position on the landform. Do not list more than four associated soils. Identify the landform position and how the soils differ from the named series. Do not list all the differences. List only the most obvious differences. Do not repeat the difference for a soil that has been listed in the competing series section. **This section applies only to those soils associated at the original type location or soil survey area**. This section should only be updated when the type location has been moved to an area with different associated soils or the names of the associated soils have changed.

Example:
GEOGRAPHICALLY ASSOCIATED SOILS: These are the Alpha, Beta, and Delta soils. The Alpha soils are in the slightly higher landscape positions on the summits of ridges and have sandstone bedrock within a depth of 50 centimeters.. The Beta soils are in landscape positions similar to those of the ? soils and do not have calcic

horizons. The Delta soils are in the lower landscape positions on the toeslopes of hills and have a mollic epipedon.

**DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY:** List drainage class, list upper depth (i.e. most restrictive) to frequent saturation and months in normal years, saturated hydraulic conductivity range, and a flooding (or ponding) statement if flooded (or ponded).

Example 1 (from Cumulic Endoaquolls):
DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY:
Drainage class--poorly drained--these soils are frequently saturated at the soil surface during the wettest periods of normal years, and this saturation is considered apparent
Saturated hydraulic conductivity--1.00 to 10.00 micrometers per second
Flooding--rarely flooded to frequently flooded for very brief to long periods during the months of February to November from precipitation events and snowmelt

Example 2 (from Lithic Hapludalfs):
DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY:
Drainage class--well drained--frequent saturation does not occur within a depth of 1.8 meters during the wettest periods of normal years
Saturated hydraulic conductivity--1.00 to 10.00 micrometers per second in the loamy or silty materials, 0.10 to 1.00 micrometers per second in the paleosol, and 0.01 to 10.00 micrometers per second in the limestone bedrock, depending on the amount of weathered rock

Example 3 (from Mollic Oxyaquic Hapludalfs):
DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY:
Drainage class--moderately well drained--a frequently saturated zone occurs at a depth of 0.75 meter during April to June in normal years, and both perched and apparent saturation can occur in these soils based on the season and intensity of rainfall during a given period of time
Saturated hydraulic conductivity--1.00 to 10.00 micrometers per second in the silty or loamy sediments and 0.01 to 1.00 micrometers per second in the till

**USE AND VEGETATION:** List the major use or uses. If soils are used for crops, pasture, or forest or for urban or other uses, the uses are indicated along with the general extent of each, if known. List the key species of the native plant community or of the present community if the native community is not known.

**DISTRIBUTION AND EXTENT:** Refer to the Geomorphic Description System in section 3 of the "Field Book for Describing and Sampling Soils." List the physiographic location, geographic distribution, and extent by referencing the states and location. Give the Land Resource Region (LRR) and the MLRA(s) that the series occurs in. Give the extent of the series using the following guidelines:

1. Small extent or not extensive--less than 10,000 acres correlated
2. Moderate extent or moderately extensive--10,000 to 100,000 acres correlated

3. Large extent or extensive--more than 100,000 acres correlated

(Do not include acreage figures)

The Region 10 NASIS report "CORR-MO10 Series Extent (permanent dataset)(all ss status')" is helpful in determining the locations and acres in which the series occurs.

*Example:*

DISTRIBUTION AND EXTENT:
Physiographic Division--Interior Plains
Physiographic Province--Central Lowland
Physiographic sections--Western lake section, Wisconsin driftless section, Till plains, and Dissected till plains
MLRAs--Wisconsin and Minnesota Sandy Outwash (91),
Rolling Till Prairie (102A),
Central Iowa and Minnesota Till Prairies (103),
Eastern Iowa and Minnesota Till Prairies (104),
Northern Mississippi Valley Loess Hills (105),
Iowa and Missouri Deep Loess Hills (107),
Illinois and Iowa Deep Loess and Drift (108),
Iowa and Missouri Heavy Till Plain (109),
Northern Illinois and Indiana Heavy Till Plain (110),
Central Claypan Areas (113),
Southern Illinois and Indiana Thin Loess and Till Plain (114), and
Central Mississippi Valley Wooded Slopes (115)
LRR K and LRR M; Iowa, southern Minnesota, Nebraska, Missouri, Kansas, and Illinois
Extent--large

**MLRA OFFICE RESPONSIBLE:** List the MLRA office that is responsible for the series. The format of the entry is city, state.
*Example:* MLRA OFFICE RESPONSIBLE: St. Paul, Minnesota

**SERIES PROPOSED OR ESTABLISHED:** One of these headings is used, depending on the current status of the series. This must match the heading in line 3 and the status in the SC file. List the year, county, and state where the series was first proposed or established. The name of the soil survey area is given if it includes more than one county or parts of a county. List the source of the name for the series. If the name is coined, state so. The format that should be used is:

? county, ? state, ? year. The name ?.

**REMARKS:** There are three parts to this section. The first part defines the particle-size control section and the series control section of the typical pedon as per *Soil Taxonomy*. The second part identifies the diagnostic horizons and features in the typical pedon. The third part is for listing pertinent remarks about the series.

**Defining the particle-size control section and the series control section**

Examples:
(from Typic Endoaquolls)
Particle-size control section--the zone from a depth of 25 to 100 centimeters (A1, A2, and BA horizons);
series control section--the zone from the surface of the soil to a depth of 150 centimeters (Ap, A1, A2, A3, BA, Bg, BCg, and Cg horizons).

(from Typic Argialbolls)
Particle-size control section--the zone from a depth of 43 to 93 centimeters (Btg1, Btg2, and Btg3 horizons);
series control section--the zone from the surface of the soil to a depth of 203 centimeters (A, E, Btg1, Btg2, Btg3, Btg4, and Btg5 horizons).

(from Lithic Hapludalfs)
Particle-size control section--the zone from a depth of 18 to 41 centimeters (Bt1 and 2Bt2 horizons);
series control section--the zone from the surface of the soil to a depth of 41 centimeters (A, BE, Bt1, and 2Bt2 horizons).

**Diagnostic horizons and features in this pedon include:**
The purpose of this section is to list the diagnostic horizons and features that define the series. The zones and horizons representing the diagnostic horizons and features in the typical pedon are identified. It is not necessary to repeat criteria from *Soil Taxonomy*. For example, do not repeat the requirements for a mollic epipedon for a soil that has a mollic epipedon that occurs from the surface of the soil to a depth of 40 centimeters and includes the Bt1 horizon. All that is needed is to identify the zone and horizons that are included in the mollic epipedon. The following format should be used. This format is not inclusive for all pedons and can be modified as needed and justified:

? epipedon--the zone from the surface of the soil to a depth of ? centimeters;
albic--the zone from a depth of ? to ? centimeters;
argillic--the zone from a depth of ? to ? centimeters;
calcic--the zone from a depth of ? to ? centimeters;
cambic--the zone from a depth of ? to ? centimeters;
duripan--the zone from a depth of ? to ? centimeters;
fragipan--the zone from a depth of ? to ? centimeters;
glossic--the zone from a depth of ? to ? centimeters;
ortstein--the zone from a depth of ? to ? centimeters;
spodic--the zone from a depth of ? to ? centimeters;
lithic contact--the contact with ? at a depth of ? centimeters;
paralithic contact--the contact with ? at a depth of ? centimeters;
aquic conditions:

- Saturation: ? to ? centimeters
  - Endosaturation: ? to ? centimeters
  - Episaturation: ? to ? centimeters
- Redoximorphic features:
    - Redoximorphic concentrations: ? to ? centimeters;

    - Nodules and concretions: ? to ? centimeters
    - Masses: ? to ? centimeters
    - Pore linings: ? to ? centimeters
  - Redoximorphic depletions: ? to ? centimeters;
    - Iron: ? to ? centimeters
    - Clay: ? to ? centimeters
  - Reduced matrix: ? to ? centimeters

abrupt textural change--at the upper boundary of the ? horizon;
lithologic discontinuity--at the upper boundary of the ? horizon;
soil moisture control section--the zone from a depth of ? to ? centimeters;
udic (or ustic or aquic) moisture regime;
soil temperature control section--the zone from a depth of ? to ? centimeters;
? soil temperature regime;
Other features:

Any remarks that would help to better define the series or address unresolved problems are recorded here. For example, a proposal of a new soil series for soils originally from an already established series can be included in the "Remarks" section of the description of the new series. Any unresolved problem with defining the soil series or with differentiating it from others is listed.

Examples:
Cation-exchange activity class is supported by lab data from National Soil Survey Laboratory, Lincoln, Nebraska.

Cation-exchange activity class is inferred from lab data from similar soils in the surrounding area.

Oxyaquic subgroup based on a zone of saturation within a depth of 100 centimeters for 20 or more consecutive days or 30 or more cumulative days in normal years.

Some pedons have vertical seams or wedges of sand or loamy sand about 5 to 15 centimeters wide and about 0.9 to 1.2 meters deep extending downward from the stone line into the till.

The type location was moved within the same map unit because the original site has been disturbed.

Taxonomy version--Keys to Soil Taxonomy, 10th edition, 2006.

The change to bulk density of 1.75 to 1.90 g/cc and low to moderately low saturated hydraulic conductivity was based on field and lab data and supported by the MLRA 104 steering committee.

**ADDITIONAL DATA:** List any supporting laboratory data or other data collected for this pedon. Give the name of the lab and the soil survey sample number. If lab tests, such as particle-size analysis, calcium carbonate equivalent, and salinity, were done at the

project office, this needs to be stated. List those properties necessary to support the series classification.

Example:
ADDITIONAL DATA:
Refer to Minnesota Agricultural Experiment Station Central File Code No. 1276 for results of some analyses of a representative pedon.
Laboratory data--National Soil Survey Laboratory, Lincoln, Nebraska, user pedon ID 70MN039002 (http://ssldata.sc.egov.usda.gov/).

All OSDs end with the following. The last paragraph break in the document should appear after the period at the end of U.S.A.
**National Cooperative Soil Survey**
**U.S.A.**