# SSURGO Data Packaging and Use

## November 2007

United States Department of Agriculture
Natural Resources Conservation Service

# Table of Contents

# Introduction

Soil survey data can be downloaded from the Soil Data Mart:

http://soildatamart.nrcs.usda.gov

Data for a soil survey area includes a tabular component and a spatial component. The tabular component is typically imported into a database for querying, reporting and analysis. The spatial component is typically viewed and analyzed using a Geographic Information System (GIS).

Although a finished soil survey area always includes both components, a survey area's tabular component may be available in the Soil Data Mart long before the corresponding spatial component. A soil survey area's tabular component can be downloaded independent of its corresponding spatial component, and vice versa. A survey area cannot be posted to the Soil Data Mart until its tabular component is available. Therefore there will never be a soil survey area in the Soil Data Mart for which only the spatial component is available.

Data from the Soil Data Mart is distributed in what is referred to as "SSURGO" format. For the tabular component, this format dictates which soil attributes are included, how those attributes are defined, how those attributes are grouped and how those groups are related. For the spatial component, this format dictates which spatial layers are defined, which spatial layers are mandatory and the standards to which that spatial data conforms.

The SSURGO format has evolved over time. There have been two major versions and four minor versions. The major differences between these versions are summarized below.

| SSURGO Version | Date | Description |
|---|---|---|
| 1.0 | circa 1990? | The format of the tabular component is based on the State Soil Survey database (SSSD), the precursor to NASIS (National Soil Information System). |
| 2.0 | January 2001 | The format of the tabular component is based on the NASIS database. |
| 2.1 | December 2003 | The format of the tabular and spatial component is modified in order to support more explicit versioning of soil survey data. This format became available with the advent of the Soil Data Mart. |
| 2.2 | October 2005 | The format of the tabular component is modified to include the data necessary to drive the Soil Data Viewer application. |

# SSURGO Export Packaging

When soil data is exported from the Soil Data Mart, the end result is always a single zip file, regardless of what export options were selected.  The format of an export file name is: soil_*ssasymbol*.zip, where *ssasymbol* is the symbol of the corresponding soil survey area.  A soil survey area symbol uniquely identifies a soil survey area.  An export from the Soil Data Mart always contains data for one and only one soil survey area.

A survey area symbol is a five character string where the first two characters are a U.S. state or territory postal code, and the last three characters are digits that represent the soil survey area within the corresponding state or territory.

A SSURGO export file can be unzipped using WinZip or an equivalent application.  When an export file is unzipped, the following directory hierarchy is produced in the directory to which the export file was unzipped:

soil_*ssasymbol*
   tabular
   spatial

where *ssasymbol* is the symbol of the corresponding soil survey area.


## *Contents of Directory "soil_ssasymbol"*

In addition to subdirectories "tabular" and "spatial", this directory contains either three or four files:

1. soil_metadata_*ssasymbol*.txt

2. soil_metadata_*ssasymbol*.xml

3. readme.txt

4. *something*.zip (optional)

The first two files contain the FGDC metadata for the corresponding survey area, in plain ASCII and XML format, respectively.  FGDC is the acronym for Federal Geographic Data Committee.  The FGDC metadata primarily pertains to spatial soil data.  A smaller portion of the FGDC metadata pertains to the tabular soil data.

File "readme.txt" contains a lot of the same information that is presented in this document.  The top of this file documents the versions of the data included in the export, as well as any options that were specified if spatial data was included in the export.

---

File "*something*.zip", if it exists, is a zipped Microsoft Access database, into which the tabular soil data can be imported.  This file will only exist if the person who generated this export requested its inclusion.  The embedded Microsoft Access database is referred to as a "SSURGO template database".  There is more than one SSURGO template database, so the root portion of the file name can vary.  SSURGO template databases are discussed in the section titled "Using Soil Tabular Data".

If a SSURGO template database was not included in the export, one can always be downloaded from the following Soil Data Mart web page:

http://soildatamart.nrcs.usda.gov/Templates.aspx

# Contents of Directory "tabular"

Directory "tabular" contains a set of ASCII field and text delimited files.  Fields are delimited by the pipe or vertical bar character.  Text fields are double quote delimited because such a field can contain embedded field delimiters and/or line ends.  Within a text field, any embedded double quotes are doubled.

With the exception of "version.txt", each of these files corresponds to a table in a SSURGO template database.  Which ASCII delimited file ("Import/Export File Name") corresponds to which database table ("Table Physical Name") is documented in the "SSURGO Metadata – Tables" report.  This report is available at http://soildatamart.nrcs.usda.gov/ssurgometadata.aspx.

File "version.txt" records the SSURGO version of the corresponding tabular data.  The content of this file is checked when tabular data is imported into a SSURGO template database.

# Contents of Directory "spatial"

The exact content of directory "spatial" depends on the spatial format option that was selected when the export was generated.  Spatial data can be exported in any of the following formats:

1. ESRI Shape File

2. ArcInfo Coverage

3. ArcInfo Interchange

In addition to specifying a spatial format, a user exporting soil spatial data from the Soil Data Mart can specify a coordinate system and projection.  When spatial data is included in an export, the corresponding spatial format and coordinate system are documented in the "readme.txt" file, located in the root directory that was created by unzipping the export file.  The export spatial

format and coordinate system are also documented in the FGDC metadata, also located in the root directory that was created by unzipping the export file.

In discussing the spatial data, it helps to separate the logical from the physical. The possible logical spatial entities are:

1. Soil Survey Area Boundary Polygon(s) (Required)

2. Map Unit Boundary Polygons (Required)

3. Line Map Units (Optional)

4. Point Map Units (Optional)

5. Line Spot Features (Optional)

6. Point Spot Features (Optional)

7. Spot Feature Descriptions (Required if Line Spot Features or Point Spot Features are included)

Each of the first six spatial entities represent what is referred to as a "feature class". The last entity, Spot Feature Descriptions, is an ASCII field and text delimited file that contains narrative descriptions of any corresponding line or point spot features. In effect, this is "tabular data" that is considered to be part of the spatial data.

"Required" means that, if spatial data for the corresponding survey area exists, this data must be included. In other words, if spatial data exists, at a minimum, a soil survey area boundary polygon feature class and a map unit boundary polygon feature class will exist.

A single logical spatial entity is delivered as multiple files, sometimes with one or more subdirectories, depending on the spatial format that was selected when the export was generated. Some, but not necessarily all, of the files corresponding to a particular logical spatial entity have a name whose prefix denotes the corresponding spatial entity.

For spatial data in ESRI Shape File format, the following file name prefixes are used:

| File Name Prefix | Spatial Entity |
| --- | --- |
| soilsa_a | soil survey area boundary polygon(s) |
| soilmu_a | map unit boundary polygons |
| soilmu_l | line map units |
| soilmu_p | point map units |
| soilsf_l | line spot features |
| soilsf_p | point spot features |
| soilsf_t | spot feature descriptions |

For spatial data in ArcInfo Coverage or ArcInfo Interchange format, the following file name prefixes are used:

| File Name Prefix | Spatial Entity |
|---|---|
| ssa_a | soil survey area boundary polygon(s) |
| smu_a | map unit boundary polygons |
| smu_l | line map units |
| smu_p | point map units |
| ssf_l | line spot features |
| ssf_p | point spot features |
| ssf_t | spot feature descriptions |

# Non-Spatial Attributes Embedded in the Spatial Data

A handful of non-spatial (non-geometry) attributes are embedded into the various spatial feature classes. These attributes either: (1) logically identify a corresponding tabular entity, (2) serve as the physical link to the corresponding tabular entity, or (3) identify the corresponding spatial data version. See the section titled "Data Versioning" for more information about data versioning.

| Attribute | Present in the Following Spatial Feature Classes or Files | Purpose |
|---|---|---|
| Survey Area Symbol (column name is always "areasymbol") | All | Logically identifies the corresponding survey area. |
| Spatial Data Version (column name is either "spatialversion" or "spatialver" – for some spatial formats, column names are limited to no more than ten characters) | All | Logically identifies the corresponding spatial data version. |
| Legend Key (column name is always "lkey") | Survey Area Boundary Polygon(s) | Links survey area boundary spatial record to the corresponding legend table record. |
| Map Unit Symbol (column name is always "musym") | Map Unit Boundary Polygons, Line Map Units, Point Map Units | Logically identifies the corresponding map unit. |
| Map Unit Key (column name is always "mukey") | Map Unit Boundary Polygons, Line Map Units, Point Map Units | Links map unit boundary spatial record to the corresponding mapunit table record. |
| Spot Feature Symbol | Line Spot Features, Point | Logically identifies the |

---

| (column name is always "featsym") | Spot Features, Spot Feature Descriptions File | corresponding spot feature. |
|---|---|---|
| Spot Feature Key (column name is always "featkey") | Line Spot Features, Point Spot Features, Spot Feature Descriptions File | Links spot feature spatial record to corresponding feature description record. |

# Data Versioning

With the advent of the Soil Data Mart, data for a soil survey area is now explicitly versioned. There are three different versions:

1. Survey Area Version

2. Tabular Data Version

3. Spatial Data Version

Since tabular soil data for a survey area can be updated without updating the corresponding spatial soil data, and vice versa, tabular data and spatial data are versioned independently of one another. For a survey area, any new Tabular Data Version or Spatial Data Version results in a new Survey Area Version.

For any version, there are two version attributes:

1. Version Number (usually referred to as "version")

2. Version Established Date and Time

Version numbers are serially incremented integer values, starting at one.

## *Locating Version Information*

Survey area version information can be found in the following locations:

1. In the readme.txt file, located in the root directory that was created by unzipping the export file.

2. If tabular data is included in the export, in the sacatalog table record for the corresponding survey area (file sacatlog.txt or table sacatalog when that tabular data has been imported into a SSURGO template database).

3.  In the page footer of soil reports in the MS Access SSURGO template database, when tabular data is included in the export and that tabular data has been imported into a SSURGO template database.

4.  In soil report "Survey Area Data Summary" in the MS Access SSURGO template database, when tabular data is included in the export and that tabular data has been imported into a SSURGO template database.

Tabular data version information can be found in the following locations:

1.  In the readme.txt file, located in the root directory that was created by unzipping the export file, when tabular data is included in the export.

2.  If tabular data is included in the export, in the sacatalog table record for the corresponding survey area (file sacatlog.txt or table sacatalog when that tabular data has been imported into a SSURGO template database).

3.  In the body of soil report "Survey Area Data Summary" in the MS Access SSURGO template database, when tabular data is included in the export and that tabular data has been imported into a SSURGO template database.

Spatial data version information can be found in the following locations:

1.  In the readme.txt file, located in the root directory that was created by unzipping the export file, when spatial data is included in the export.

2.  Embedded in spatial data for any spatial feature class, when spatial data is included in the export.

## *Making Sure the Tabular Data Version is compatible with the Spatial Data Version*

Soil tabular and spatial data are compatible when:

1.  For every survey area polygon feature, there is a corresponding legend table record. All survey area features with the same area symbol share the same legend table record.

2.  For every map unit polygon, line or point feature, there is a corresponding mapunit table record.  All map unit features with the same map unit symbol share the same mapunit table record.

Every mapunit table record IS NOT required to have a corresponding map unit feature.  While this is rare, it is permitted.  The case for which this exception is permitted is for a survey area in the process of being mapped, where the spatial data is not yet complete.

If the export file includes both tabular and spatial data, that tabular data is compatible with that spatial data.  Where things can get out of sync is when tabular data is obtained independently of its corresponding spatial data, or vice versa.

On your PC there is no easy way to verify if a set of tabular and spatial data are compatible.  The most reliable way to verify compatibility is to visit the Soil Data Mart, access the Download page for the survey area in question, and look at the tabular and spatial version numbers displayed on the Download page.  If your version numbers don't match the version numbers displayed on the Download page, you should request a new export that includes both tabular and spatial data.

# Using Soil Tabular Data

The tabular data as delivered in a SSURGO export file isn't very usable as is.  The tabular data is distributed between approximately sixty ASCII delimited files.  In order to effectively use this data, it needs to be imported into a database.  Even after loading data into a database, you still need to understand what the tables and attributes represent, how tables are related and what data constraints are in place.  This type of information is available on the following web page:

http://soildatamart.nrcs.usda.gov/ssurgometadata.aspx

The above URL is also the location of this document.

At the current time we provide a Microsoft Access database into which soil tabular data can be imported.  We refer to this database as a "SSURGO template database".  In order to use this database, you have to have Microsoft Access installed on your PC.

In a SSURGO template database, the SSURGO database structure has already been created.  Tabular soil data can be imported by running a macro that resides in the database.  Once data has been imported, a variety of reports can be generated.  If you are willing to learn a little bit about Microsoft Access, you can create your own queries against the data you have imported.

If a SSURGO template database was included with the exported data, it will be the only zipped file in the root directory that was created by unzipping the export.  If a SSURGO template database was not included with the exported data, one can be downloaded from the following location:

http://soildatamart.nrcs.usda.gov/templates.aspx

A number of different SSURGO template databases are typically available.  A national SSURGO template database serves as the default.  For a national SSURGO template database, the corresponding "state code" in the template database web page data grid is "US".

Some states have created a customized SSURGO template database for their state.  If a customized SSURGO template database is available for the state in whose data you are interested, you should use that state's customized SSURGO template database in lieu of the national SSURGO template database.

When selecting a SSURGO template database, if possible, select one whose MS Access version is the same as the version of MS Access that you have installed on your PC.  At the current time, national SSURGO template databases are available for Access 97, Access 2000 and Access 2002/2003.  What MS Access versions are supported for a state customized SSURGO template database varies from state to state.  While you can convert a SSURGO template database from one version of MS Access to another, this conversion is not always successful.

At the current time, we do not support the use of any database other than MS Access.  If you are interested in loading soil tabular data into a database other than MS Access, and have questions, please contact the NASIS Hotline.  See the section titled "Contacting Support" for the details.

## *Using a SSURGO Template Database*

For information about importing tabular data into a template database, or information about the capabilities of the SSURGO template database in general, do the following:

1.  Open the MS Access SSURGO template database in the appropriate version of MS Access.

2.  Click the Reports tab of the Database Window.  The Database Window may be behind a form titled "SSURGO Import" or "Soil Reports".

3.  Either double-click the report titled "How to Understand and Use this Database", or select this report and then click "Preview".

4.  After the Report Viewer window is displayed, either click the printer icon or select "Print" from the File menu.  You can also browse this report using the Preview window.

# Using Soil Spatial Data

The spatial data can't be used until it has been imported into a GIS.  In order to import soil spatial data into a GIS, the GIS must be able to import one of the following spatial formats:

1.  ESRI Shape File

2.  ArcInfo Coverage

3.  ArcInfo Interchange

Obviously the spatial data isn't of much use unless the corresponding tabular data is also available.  Once you have successfully imported the soil tabular data into a database, and have also successfully imported soil spatial data into a GIS, it's pretty much uphill from there.  See the subsection titled "The Challenge of Using Soil Data in a GIS" for more details.


## *Personal Geodatabase*


If spatial data is available for the survey in which you are interested, and if you have access to ArcGIS, a personal geodatabase can be created.  To do this, import the tabular data into a SSURGO template database in the usual way, and then use ArcCatalog to import each of the spatial data feature classes into that same SSURGO template database.  The spatial data to be imported must be in either Shape File or Coverage format.  The resulting personal geodatabase can be used with ArcGIS or ArcView 8 or later.

The personal geodatabase doesn't know what tables are related unless you explicitly create relationship classes to indicate how two tables are related.  If you want to establish relationship classes to any of the tabular data tables, you must register ("register to the personal geodatabase") each of the tabular tables of concern.  The relationships between all SSURGO tables are documented in the SSURGO data model diagrams, which can be found at:

http://soildatamart.nrcs.usda.gov/ssurgometadata.aspx

If you create a personal geodatabase and want to be able to link to spot feature descriptions, the spot feature descriptions must be explicitly imported into the SSURGO template database, but keep in mind that a survey area may or may not include spot features.  Spot feature descriptions, when they exist, are bundled and versioned with the spatial data, but the spot feature *descriptions* are not a feature class.  To import spot feature descriptions into a SSURGO template database, run the macro titled "Import Feature Descriptions".  This macro will import spot feature descriptions into the table named "featdesc".  The macro displays a dialog box that prompts for the fully qualified path of the file containing the spot feature descriptions.  This file, if it exists, resides in the subdirectory named "spatial", and the name of the file containing the spot feature descriptions starts with "soilsf_t" or "ssf_t" for Shape File format or Coverage format, respectively.  This file has a ".txt" extension.

One last thing to keep in mind is the size limit of an MS Access database, which is 1 gigabyte for Access 97, and 2 gigabytes for Access 2000 and later versions.  The amount of space required for a given survey area's tabular and spatial data varies widely.  You may or may not be able to create a personal geodatabase that includes data for more than one survey area, depending on the size of the survey areas involved.  For a single very large survey area, you may be able to create a personal geodatabase, but performance may be degraded.

## *The Challenge of Using Soil Data in a GIS*

For compatible tabular and spatial data, the relationship between the tabular and spatial data has already been established before that data was ever exported from the Soil Data Mart. You are not responsible for establishing this relationship. (For information about tabular and spatial data compatibility, see the section titled "Making Sure the Tabular Data Version is compatible with the Spatial Data Version". For information about how the tabular and spatial data are linked, see the section titled "Non-Spatial Attributes Embedded in the Spatial Data".)

The challenge of using soil data in a GIS is due to the following:

1. Thematic maps must be based on map units.

2. The vast majority of attributes used to create a thematic map are not attributes of a map unit but attributes of an entity that repeats for its corresponding map unit.

## Thematic Map Generation

Thematic maps are a representation of reality and can only display a small part of that reality in a single map. Information on the map is typically for a single theme.

Polygons in the digital map data are map unit delineations. Therefore, themes for thematic maps are based on map units. Many map polygons can be labeled the same, but all point to the same record in the map unit table.

Map units are typically made up of one or more named soils. Other miscellaneous land types or areas of water may be included. These entities and their percent compositions make up the map unit components and define the map unit composition. Soil components are typically composed of multiple horizons (layers). Component attributes must be aggregated to a map unit level for map visualization. Horizon attributes must be aggregated to the component level, before components are aggregated to the map unit level. Horizon attributes may be aggregated for the entire soil profile or for a specific depth range. One may only be interested in the value of a horizon attribute for the surface layer.

## Methods of Aggregation

There are a number of options for aggregating data to the map unit level. The various options will be illustrated using selected columns from the "component" and "chorizon" tables. These tables and columns are described in reports "SSURGO Metadata - Tables" and "SSURGO Metadata - Table Column Descriptions". These reports are available at http://soildatamart.nrcs.usda.gov/ssurgometadata.aspx.

In SSURGO data, the field "mukey" uniquely identifies a map unit, and the field "cokey" uniquely identifies a map unit component.

Table: component

| mukey (Map Unit Key) | cokey (Component Key) | comppct_r (Representative Percent Composition) | corcon (Corrosion Concrete) | hydricrating (Hydric Rating) |
|---|---|---|---|---|
| 100017 | 100017:149541 | 60 | low | yes |
| 100017 | 100017:149542 | 40 | high | yes |
| | | | | |
| 100049 | 100049:149613 | 50 | low | yes |
| 100049 | 100049:149614 | 50 | moderate | no |
| | | | | |
| 147626 | 147626:215195 | 35 | moderate | no |
| 147626 | 147626:215196 | 25 | low | no |
| 147626 | 147626:215197 | 20 | low | no |

Table: chorizon

| cokey (Component Key) | hzdept_r (Representative Horizon Depth to Top) | hzdepb_r (Representative Horizon Depth to Bottom) | claytotal_r (Representative Clay Total Separate) |
|---|---|---|---|
| 100017:149541 | 0 | 20 | 9.5 |
| 100017:149541 | 20 | 76 | 12.5 |
| 100017:149541 | 76 | 152 | 1.5 |
| | | | |
| 100017:149542 | 0 | 20 | 9.5 |
| 100017:149542 | 20 | 30 | 11.5 |
| 100017:149542 | 30 | 152 | 3.5 |
| | | | |
| 100049:149613 | 0 | 76 | 6.0 |
| 100049:149613 | 76 | 152 | 6.0 |
| | | | |
| 100049:149614 | 0 | 36 | 6.5 |
| 100049:149614 | 36 | 152 | 4.5 |
| | | | |
| 147626:215195 | 0 | 10 | 12.0 |
| 147626:215195 | 10 | 41 | 7.0 |
| 147626:215195 | 41 | 51 | |
| | | | |
| 147626:215196 | 0 | 3 | 33.5 |
| 147626:215196 | 3 | 13 | 36.0 |
| 147626:215196 | 13 | 41 | 42.5 |
| 147626:215196 | 41 | 152 | |
| | | | |
| 147626:215197 | 0 | 8 | 22.5 |
| 147626:215197 | 8 | 41 | 22.5 |
| 147626:215197 | 41 | 46 | 26.5 |
| 147626:215197 | 46 | 152 | |

## *Dominant Component*

The interpretation rating class or soil property value of the component with the largest percent composition is used to class the map unit.  If there is more than one component that shares the highest percent composition, a "tie-break rule" indicates which value should be selected.

For this example, in the case of a tie on percent composition, we'll choose the more restrictive value.  The results for Dominant Component for Corrosion Concrete are shown below.

| mukey | comppct_r | corcon |
|-------|-----------|--------|
| 100017 | 60 | low |
| | | |
| 100049 | 50 | moderate<br>(more restrictive value was<br>returned for the tie) |
| | | |
| 147626 | 35 | moderate |

## *Dominant Condition*

For the components in each map unit, like interpretation rating classes or soil property values are grouped, and their corresponding percent compositions are summed.  The interpretation rating class or soil property value for the group with the largest percent composition is used to class the map unit.  If there is more than one group that shares the highest percent composition, a "tie-break rule" indicates which value should be selected.

For this example, in the case of a tie on percent composition, we'll choose the more restrictive value.  The results for Dominant Condition for Corrosion Concrete are shown below.

| mukey | comppct_r | corcon |
|-------|-----------|--------|
| 100017 | 60 | low |
| | | |
| 100049 | 50 | moderate<br>(more restrictive value was<br>returned for the tie) |
| | | |
| 147626 | 45 (25/low + 20/low) | low |

## *Most Limiting*

The most limiting interpretation rating class for all of the components in a map unit is used to class the map unit.  This aggregation method is limited to interpretive type attributes where which end of the spectrum is considered most limiting is already established.

The results for Most Limiting for Corrosion Concrete are shown below.

| mukey | corcon |
|---|---|
| 100017 | high |
| | |
| 100049 | moderate |
| | |
| 147626 | moderate |

## *Least Limiting*

The least limiting interpretation rating class for all of the components in a map unit is used to class the map unit. This aggregation method is limited to interpretive type attributes where which end of the spectrum is considered least limiting is already established.

The results for Least Limiting for Corrosion Concrete are shown below.

| mukey | corcon |
|---|---|
| 100017 | low |
| | |
| 100049 | low |
| | |
| 147626 | low |

## *Weighted Average*

A weighted average of the soil property value for all components in the map unit is used to class the map unit. Percent composition is used as the weighting factor. Obviously this aggregation method is only suitable for numeric attributes.

If the soil property being aggregated is an attribute of a soil horizon, for each component, a single value for all included horizons must be determined before computing a weighted average for all components. In this case, the single component value is also computed as a weighted average, where the weighting factor for each horizon is its percent of the depth range in question.

For this example, let's derive a weighted average value for total clay in the upper 50 centimeters of the soil.

Step 1 – For each component, compute a weighted average value for total clay in the upper 50 centimeters of the soil. Where soil depth is less than 50 cm, use whatever lowest depth is available.

Total Clay in the Upper 50 cm (or less) = $\sum$ (horizon thickness/total thickness*total clay) for all included soil horizons

---

| cokey | comppct_r | Total Clay in the Upper 50 cm (or less) |
|---|---|---|
| 100017:149541 | 60 | 20/50*9.5 + 30/50*12.5 = 11.3 |
| 100017:149542 | 40 | 20/50*9.5 + 10/50*11.5 + 20/50*3.5 = 7.5 |
| | | |
| 100049:149613 | 50 | 50/50*6.0 = 6.0 |
| 100049:149614 | 50 | 36/50*6.5 + 14/50*4.5 = 5.94 |
| | | |
| 147626:215195 | 35 | 10/41*12.0 + 31/41*7.0 = 8.22 (no clay data was available below 41 cm) |
| 147626:215196 | 25 | 3/41*33.5 + 10/41*36.0 + 28/41*42.5 = 40.26 (no clay data was available below 41 cm) |
| 147626:215197 | 20 | 8/46*22.5 + 33/46*22.5 + 5/46*26.5 = 22.93 (no clay data was available below 46 cm) |

Step 2 – For each map unit, compute a weighted average value for total clay in the upper 50 centimeters (or less) of the soil.

Total Clay in the Upper 50 cm (or less) = ∑ (percent composition* Total Clay in the Upper 50 cm (or less)) for all components in the map unit

| mukey | Total Clay in the Upper 50 cm (or less) |
|---|---|
| 100017 | .60*11.3 + .40*7.5 = 9.78 |
| | |
| 100049 | .50*6.0 + .50*5.94 = 5.97 |
| | |
| 147626 | .35*8.22 + .25*40.26 + .20*22.93 = 21.91 |

## *All Components*

The highest or lowest soil property value for all of the components in a map unit is used to class the map unit.

The results for All Components for Highest Total Clay in the Surface Layer are shown below.

| mukey | claytotal_r |
|---|---|
| 100017 | 9.5 |
| | |
| 100049 | 12.0 |
| | |
| 147626 | 33.5 |

*Presence/Absence*

All of the components in a map unit are evaluated as to whether a certain condition is present or absent, and the map unit is then assigned one of the following four classes:

1. Presence or absence of condition is always known, and condition is present for all components.

2. Presence or absence of condition is always known, and condition is never present for any component.

3. Presence or absence of condition is not always known, but condition is present for some components.

4. Presence or absence of condition is not always known, but condition was not present for any component for which the condition was known.

The result classes may be assigned names more specific to the condition in question.

The results for Presence/Absence of Hydric Components are shown below.

| mukey | Hydric Components |
|-------|-------------------|
| 100017 | All Hydric |
| | |
| 100049 | Partially Hydric |
| | |
| 147626 | All Not Hydric |

# Soil Data Viewer Application

The examples above represent relatively simple cases. Dealing with missing data or missing percent composition hasn't been addressed. None of the examples deal with attributes that don't have a one to one relationship with either a component or soil horizon. To be able to dynamically perform aggregation for large volumes of data, for a variety of attributes, in anything resembling real time, requires considerable programming. The functionality provided by commercial applications like Microsoft Access or ESRI's GIS products don't help much when it comes to aggregation.

The NRCS solution to this problem was to create an application that does the most commonly needed aggregations on demand. This application is known as "Soil Data Viewer".

Here is the description of the Soil Data Viewer application from the Soil Data Viewer User Guide:

*Soil Data Viewer is a tool built as an extension to ArcMap that allows a user to create soil-based thematic maps. The application can also be run independent of ArcMap, but output is then limited to a tabular report.*

*The soil survey attribute database associated with the spatial soil map is a complicated database with more than 50 tables. Soil Data Viewer provides users access to soil interpretations and soil properties while shielding them from the complexity of the soil database. Each soil map unit, typically a set of polygons, may contain multiple soil components that have different use and management. Soil Data Viewer makes it easy to compute a single value for a map unit and display results, relieving the user from the burden of querying the database, processing the data and linking to the spatial map.*

*Soil Data Viewer contains processing rules to enforce appropriate use of the data. This provides the user with a tool for quick geospatial analysis of soil data for use in resource assessment and management.*

To see which version of Soil Data Viewer is compatible with which version of ArcGIS (ArcMap is a component of ArcGIS), please visit:

http://soildataviewer.nrcs.usda.gov/download.aspx

Additional software requirements are listed on the download page that corresponds to a particular version of Soil Data Viewer.

For additional information about the capabilities of a particular version of Soil Data Viewer, please visit:

http://soildataviewer.nrcs.usda.gov/userguide.aspx

# Contacting Support

Questions should be directed to the National Soil Information System (NASIS) Hotline. The NASIS Hotline, which resides at the USDA NRCS National Soil Survey Center in Lincoln Nebraska, is staffed from 8:00 AM to 4:30 PM Central Time.

(402) 437-5378 – Steve Speidel
(402) 437-5379 – Tammy Cheever

e-mail:  hotline@lin.usda.gov