

Downloading SSURGO Soil Data from Internet

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Purpose

The purpose of this exercise to demonstrate the steps involved in downloading SSURGO soil data from the internet, and organizing the data in a geodatabase for future use in hydrologic modeling.

Downloading SSURGO data

To download SSURGO soil data, **go to soil data mart** website at the following link:
<http://soildatamart.nrcs.usda.gov/>

The screenshot shows the Soil Data Mart website in a Mozilla Firefox browser. The page title is "Soil Data Mart - Home". The address bar shows the URL "http://soildatamart.nrcs.usda.gov/". The page content includes the NRCS logo, navigation links, and a "Select State" button. The main content area contains a welcome message and a list of features:

- Determine where soil tabular and spatial data is available.
- Download data for one soil survey area at a time. (Download requests for more than one survey area at a time can be submitted through the [Geospatial Data Gateway](#). Going through the Geospatial Data Gateway also provides the option to obtain data on CD or DVD.)
- Download a template Microsoft Access® database for working with downloaded data.
- Generate a variety of reports for one soil survey area at a time.
- Find out who to contact for information about soil data for a particular state.
- "Subscribe" or "unsubscribe" to a soil survey area. A person who is subscribed will automatically be notified whenever data for that soil survey area is updated. You must register and login before doing this.

An alternative presentation of the soil survey area data contained in the Soil Data Mart, including on screen or printed soil maps and survey area manuscripts, when they exist for the corresponding survey area, is available through [Web Soil Survey](#).

Please either select from the list of options across the top of the page, or to request a download or generate reports, begin by selecting a state or territory.

The Soil Data Mart may be unavailable on Tuesdays and Thursdays from 6:30 to 8:30 p.m. Mountain time due to maintenance activities.

The Soil Data Mart has been tested under Mozilla Firefox® 1.0 and later, Microsoft Internet Explorer® 5.0 and later, and Netscape Navigator® 4.7 and later for Microsoft Windows®. There are differences in site navigation and mechanics under different versions of these browsers. Some differences are more significant than others. There are some major differences under Netscape Navigator® 4.7 and 4.8. For details on site navigation and mechanics under different versions of these browsers, please see [Navigating and Using the Soil Data Mart on the Soil Data Mart Help page](#).

The Soil Data Mart provides an entry point to allow its pages to be integrated easily into other web sites. [get detailed information](#).

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Click on *Select State*. In the next window, you will see a table with state abbreviations, names and number of survey areas. At least for the case of Indiana (I have not checked for other states), survey areas are basically counties. So there are 92 survey areas/counties in Indiana. Next **click** on *Select Survey Area* button:

Please select a soil survey area:

| Survey Area Symbol | Survey Area Name | Available Data |
|--------------------|-----------------------------|---------------------|
| IN001 | Adams County, Indiana | Tabular and Spatial |
| IN003 | Allen County, Indiana | Tabular and Spatial |
| IN005 | Bartholomew County, Indiana | Tabular and Spatial |
| IN007 | Benton County, Indiana | Tabular and Spatial |
| IN009 | Blackford County, Indiana | Tabular and Spatial |
| IN011 | Boone County, Indiana | Tabular and Spatial |
| IN013 | Brown County, Indiana | Tabular and Spatial |
| IN015 | Carroll County, Indiana | Tabular and Spatial |
| IN017 | Cass County, Indiana | Tabular and Spatial |
| IN019 | Clark County, Indiana | Tabular and Spatial |
| IN021 | Clay County, Indiana | Tabular and Spatial |
| IN023 | Clinton County, Indiana | Tabular and Spatial |
| IN025 | Crawford County, Indiana | Tabular and Spatial |
| IN027 | Davess County, Indiana | Tabular and Spatial |
| IN029 | Dearborn County, Indiana | Tabular and Spatial |
| IN031 | Decatur County, Indiana | Tabular and Spatial |
| IN033 | DeKalb County, Indiana | Tabular and Spatial |
| IN035 | Delaware County, Indiana | Tabular and Spatial |
| IN037 | Dubois County, Indiana | Tabular and Spatial |
| IN039 | Elkhart County, Indiana | Tabular and Spatial |
| IN041 | Fayette County, Indiana | Tabular and Spatial |

In the next window, check the following download options

1. *Tabular and Spatial Data* option is selected
2. Spatial Format is *ArcView Shapefile* (you can choose other format if you wish)
3. Appropriate coordinate system is selected (leave the default *UTM zone 16 (NAD 83)* for these data)

Please select the class of data you wish to download: (Survey Area Version 6 , Tabular Version 6 , Spatial Version 1)

Tabular Data Only
 Tabular and Spatial Data
 Spatial Data Only
 Template Database Only

Please select a spatial format:

Please select a coordinate system:

Please select a template database (optional):

| GA | Access 2002 | 31 | soildb_GA_2002 | 1.5M |
|----|-------------|------|----------------|------|
| GA | Access 97 | 31 | soildb_GA_97 | 1.3M |
| ID | Access 2002 | 32.9 | soildb_ID_2002 | 2.0M |
| ID | Access 2000 | 32.9 | soildb_ID_2000 | 2.0M |
| ID | Access 97 | 32.9 | soildb_ID_97 | 1.7M |
| IN | Access 2002 | 32 | soildb_IN_2002 | 1.7M |

Description:

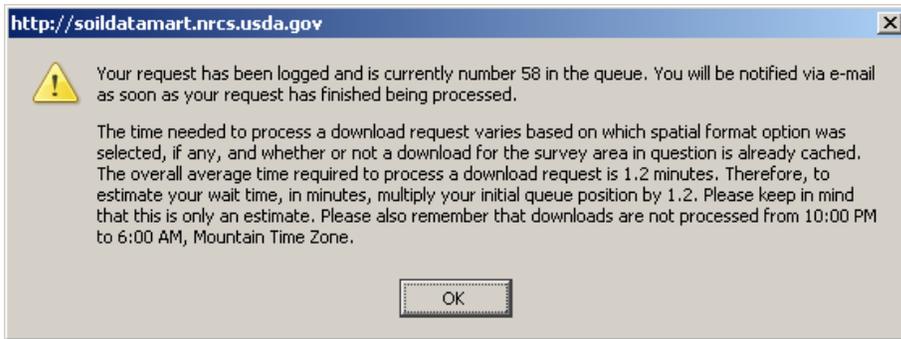
- Several reports not applicable to Indiana have been disabled in the template report list.
- This template contains a customized sand and gravel source interpretation for use in Indiana (Sand and Gravel Source report - Indiana).

Please enter your e-mail address:

If the e-mail account entered above is protected by spam blocking software, you will need to authorize e-mail from SoilDataMart@nrcc.usda.gov in order to receive e-mail notification once your request has been processed.

Also make sure the template database is selected (MS Access 2002, *soildb_IN_2002* - default option for Indiana). Enter you email address in the appropriate box, and **press** the *Submit Request* button.

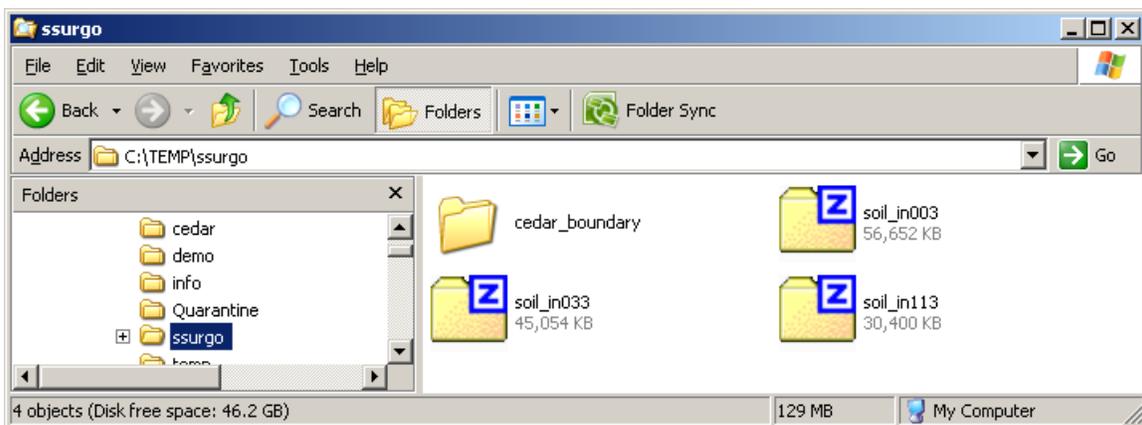
You will get a message similar to the one below saying you will be notified when the data is ready for download. **Press OK** on the message box.



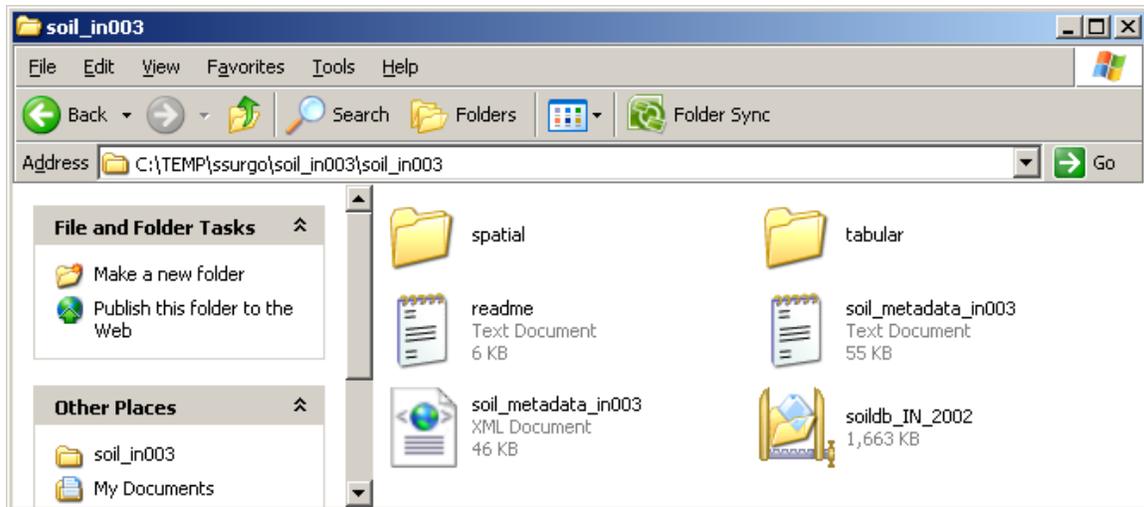
Next **press** the *Select Survey Area* button on the same window (bottom left corner). You will go back to the table with Survey Area Symbol, Survey Area Name and Available Data. **Select** the next survey area/county (De Kalb), **press** the *Download Data* button, and follow the same instructions as above to get the download message box. Similarly **download** data for *Noble County*.

Now you will wait until you get a message from NRCS saying the data are ready for download! Since you sent three requests, you will get three email notifications, one for each request. You will be sent a link to a zip file with the following name “soil_SSxxx.zip”, where SSxxx is the survey area symbol (SS = state abbreviation and xxx = FIPS county code).

Instead of waiting on NRCS, let us continue this tutorial with the data already downloaded for this exercise. They are stored at <ftp://ftp.ecn.purdue.edu/vmerwade/download/data/ssurgo.zip> (130 MB file), which contains three zip files that were downloaded from soil data mart, and a folder named Cedar_outline (containing a shapefile for the Cedar creek boundary) as shown below:



Unzip all these files. This will create three new folders inside the ssurgo folder (one for each dataset). Each folder will contain the following six items:

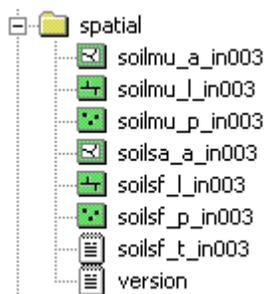


- Spatial folder: this contains spatial data (shapefiles)
- Tabular folder: this contains soil tables/properties associated with the spatial data (bunch of delimited text files)
- Readme file: instructions
- Soil_metadata_SSxxx.txt: text file with metadata
- Soild_metadata_SSxxx.xml: xml file with metadata
- Soildb_IN_2002.mdb: empty MS access template database that can be used to import data from the set of text files in tabular folder into an organized database.

Now that we have the spatial and temporal data, lets organize both by exporting these into a geodatabase.

Organizing Spatial Data

Open ArcCatalog, and **browse** to one of the spatial folder from SSURGO. You should see the following view:



Each spatial folder has six shapefiles:

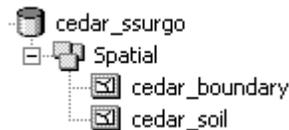
1. soilmu_a_ssxxx: map unit boundary polygons
2. soilsa_a_ssxxx: soil survey area boundary polygons
3. soilmu_l_ssxxx: line map units

4. soilmu_p_ssxxx: point map units
5. soilsf_l_ssxxx: line spot features
6. soilsf_p_ssxxx: point spot features
7. soilsf_t_ssxxx: spot feature descriptions

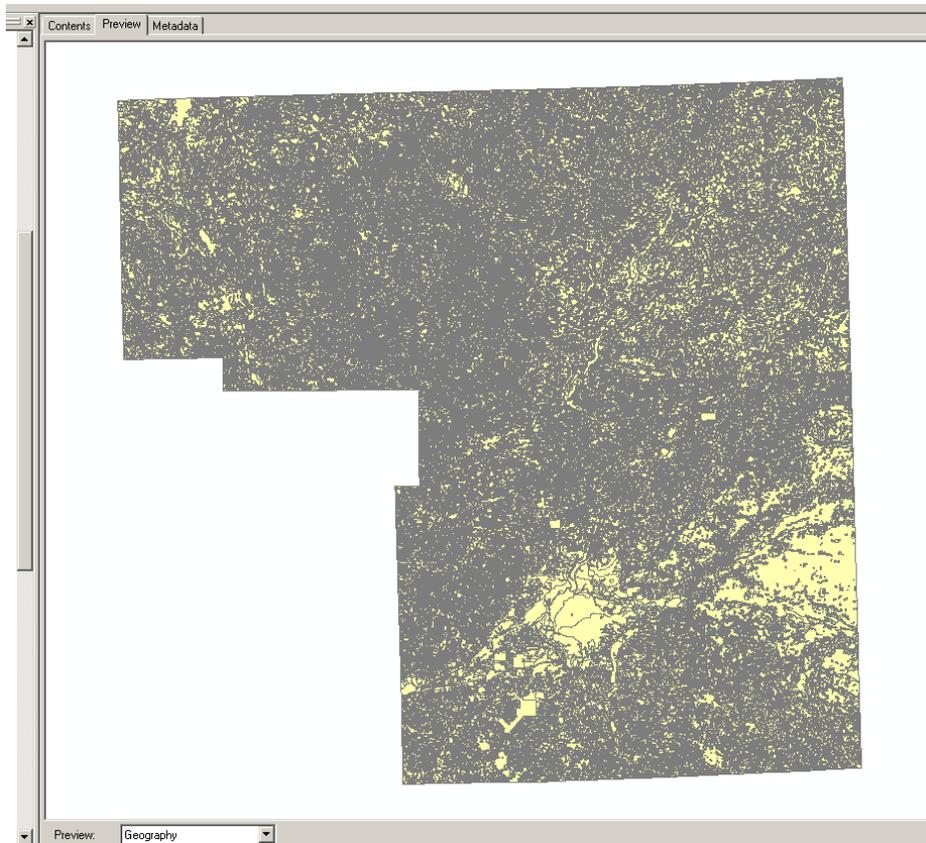
Spatial data always includes survey area and map unit boundary polygons, but all other feature classes are optional. Since each soil survey area is a county, *soilsa_a_ssxxx.shp* contains the boundary of the corresponding county. In hydrology we are mostly interested in map unit boundary polygons. So we will create a geodatabase feature class named *cedar_soil* by following the below sequence (it is assumed that you are familiar with ArcGIS to follow these steps on your own):

- 1) **Create** a geodatabase inside the ssurgo folder named *cedar_ssurgo.mdb*
- 2) **Create** a feature dataset (name *Spatial*) inside *cedar_ssurgo* and **assign** the same coordinate system that is assigned to the soil spatial data (UTM zone 16 NAD 83 in this case). You can use the **import** spatial reference from one of the spatial folder shapefiles to the feature dataset.
- 3) In the Spatial feature dataset, **import** *soilmu_a_in003.shp* as *cedar_soil* feature class
- 4) **Import** *soilmu_a_in033.shp* into *cedar_soil* feature class (use the load data option this will append the new data to existing features). Since both files have same fields, accept all the default setting while loading the data.
- 5) Similarly **import** *soildmu_a_in113.shp* into *cedar_soil* feature class.
- 6) Finally, import the *cedar_boundary* shapefile from *cedar boundary* folder as *cedar_boundary* feature class inside spatial feature dataset

The ArcCatalog view of the cedar_ssurgo geodatabase should look like the following figure:



The geography preview of the cedar_soil feature class should look like the following figure:



Now we have the soil spatial data organized into one feature class. The next step is to organize the tabular data.

Organizing Tabular Data

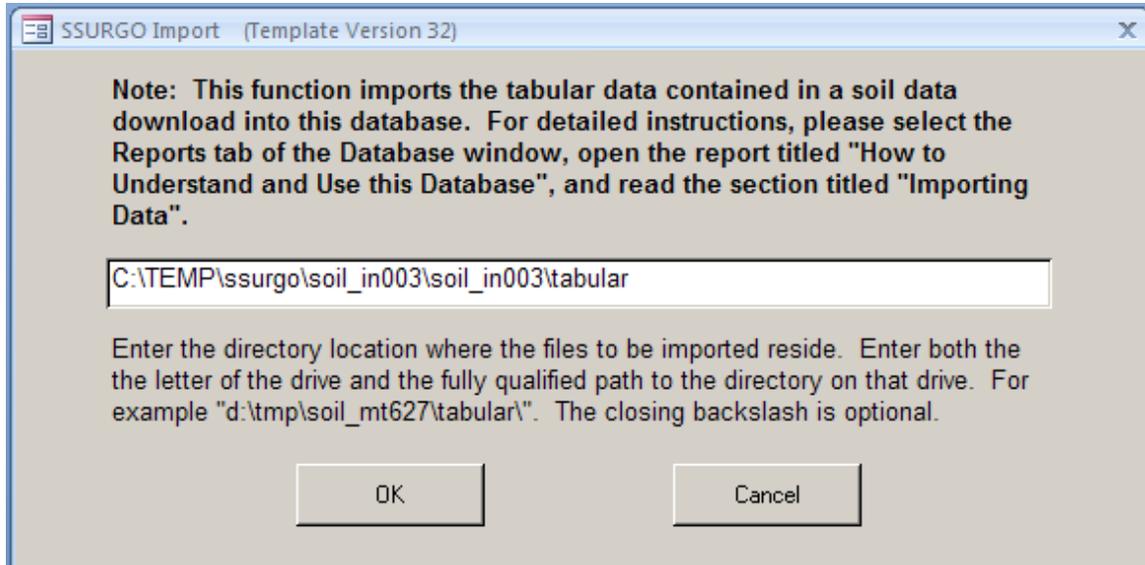
Tabular data is provided as a set of ASCII delimited files. Each file corresponds to table in the SSURGO 2.2 data model. To use the tabular data in GIS, it needs to be in a format that GIS can read. Also, these text files are not reader friendly (try opening one!). So the first step is to get these tables in a readable form by importing them in an MS Access SSURGO template database. **Unzip** *soildb_IN_2002* in *soil_in003* folder to get the MS access database template. Copy *soildb_IN_2002* outside the *soil_in003* folder and rename it as *tabular.mdb*.

(Note: Each download from SSURGO soil data mart comes with the MS Access template. If a template database was not included in the export file, you can download one from the following URL:

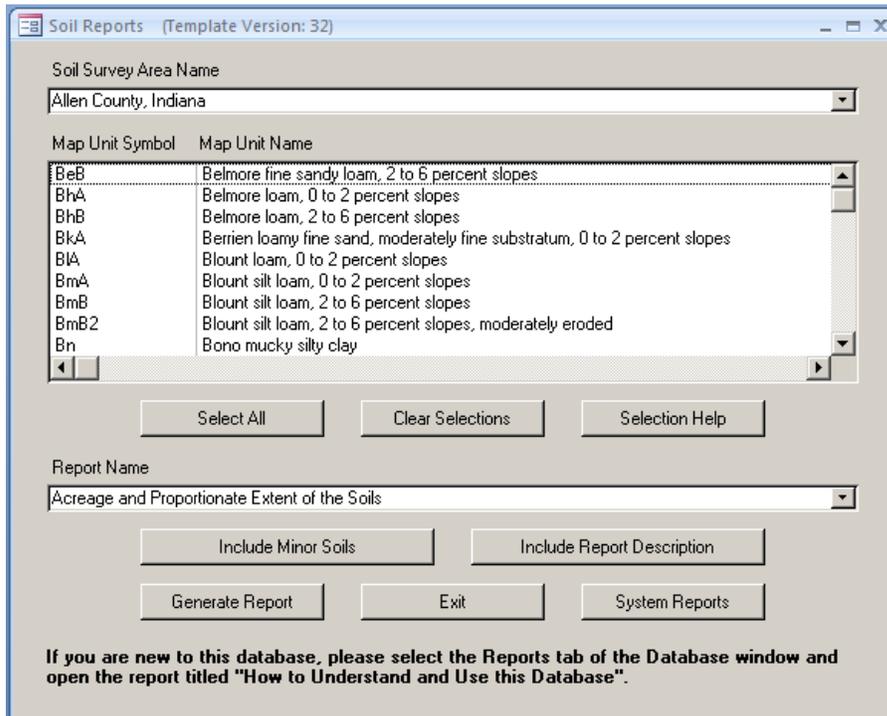
<http://soildatamart.nrcs.usda.gov/templates.aspx>)

Open *tabular.mdb* database in appropriate version of MS Access (or simply **double click** on *tabular.mdb* in windows explorer). If you get a *security warning*, just **ignore** it and **press** the *open* button. Depending on the version of MS Access you may get different

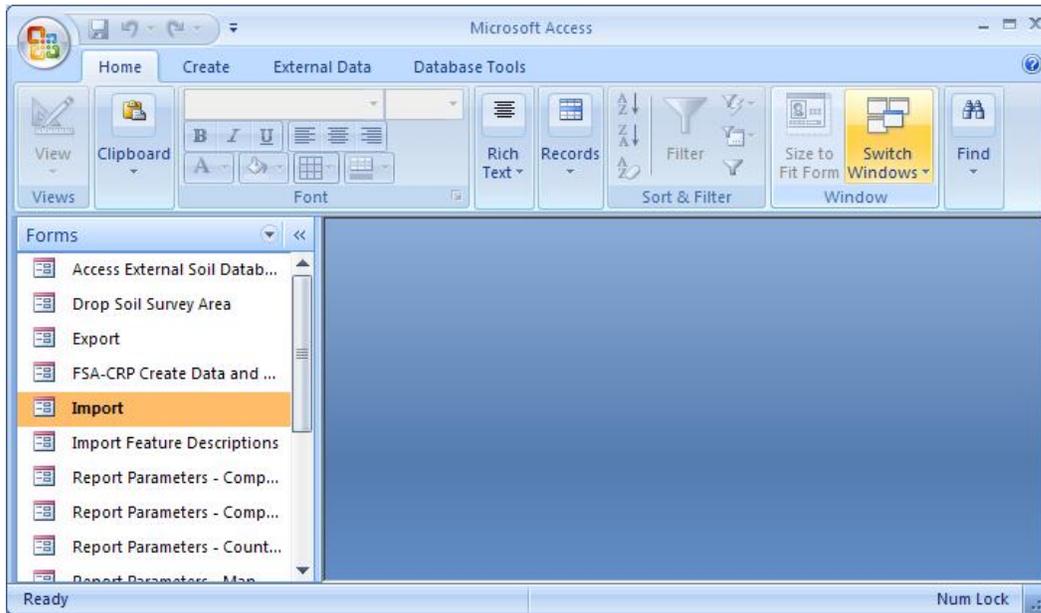
warning messages, so make sure that you enable the macros. If you do it right, you should get a *SSURGO Import form* asking for the path to the tabular SSURGO tabular folder as shown below (Note: if you do not get the import form, **click** the *Forms* tab in the database window and **double click** on a form named “Import”):



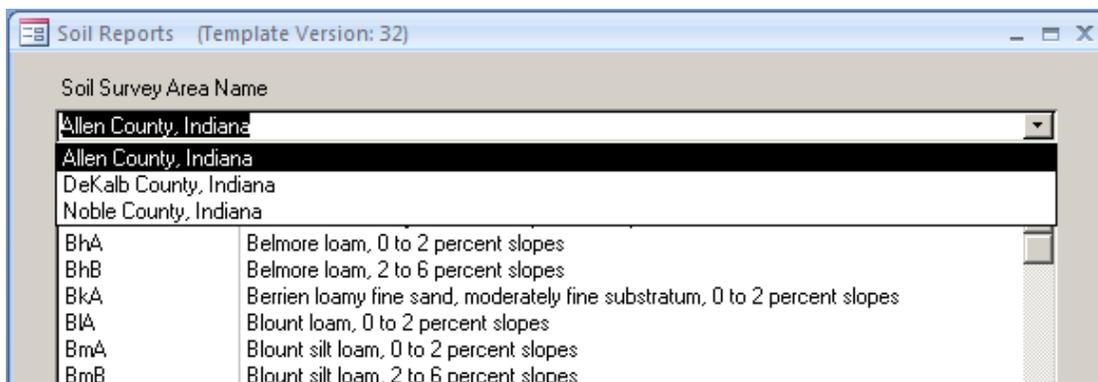
Enter the *path* for the tabular folder inside soil_in_003 (Allen County), and **click** *OK*. MS Access will then take all the text files from the tabular folder and populate the corresponding empty tables in the database. After the import is complete, the template will create a soil report for the soil survey area (Allen County, Indiana).



If you **click** on the *drop-down menu* for soil survey area name, you will see that we have report only for Allen County, Indiana since we have imported data only from soil_in003. To import tabular data from other survey areas, **click** *Exit* on the soil report, and **go to** *Forms tab*, and **double click** on *Import* form as shown below:



This will invoke the same SSURGO import form as before (when you first opened the MS access database). Now **provide** the *path* for tabular folder in soil_in033 to import tabular data from De Kalb County. Follow the same procedure to import the tabular data from soil_in113 (Noble county). When you get the final soil report, you will see that now you have data for all three counties in the access database as shown below.

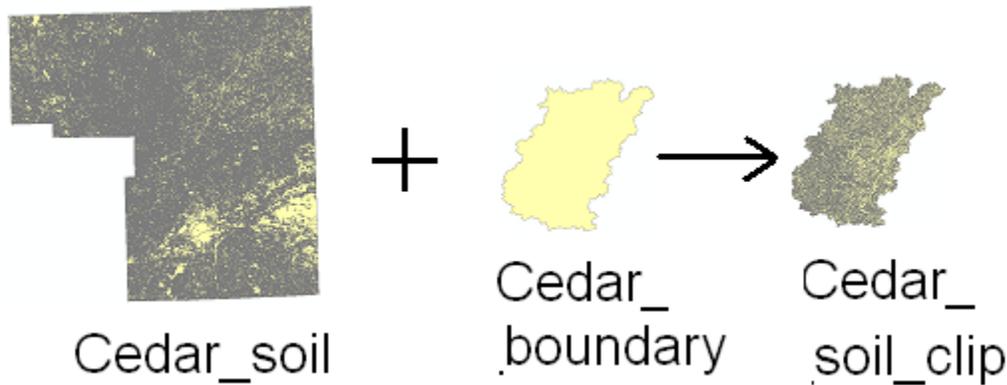


If you are an expert in MS Access database, you can browse different tabs, study the structure of the database, and see how the tabular data are stored.

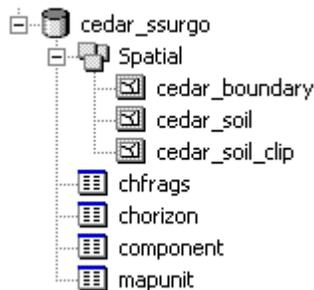
Now that we have the tabular data in an access database, we can export these tables into geodatabase.

Open *Arc Catalog* (if you closed it after organizing spatial data), and **import** the tables into *cedar_ssurgo* geodatabase by using the import table (single or multiple) option. In hydrology, the commonly used tables are mapunit, component, chorizon and chfrags.

The final step (which is optional) is to clip the *cedar_soil* polygons to the *cedar_boundary*. Use *ArcToolbox* to accomplish the clipping task. Use the *Clip* tool in the *Analysis Tools* toolbox with *cedar_soil* as *input features*, *cedar_boundary* as *clip features*, and name the output as *cedar_soil_clip*.



The *ArcCatalog* view of the *cedar_ssurgo* geodatabase with the spatial data and four tables (*chfrags*, *chorizon*, *component* and *mapunit*) is shown below:



The spatial (*cedar_soil* or *cedar_soil_clip*) and tabular data can be joined/related by using common fields. For example, *cedar_soil* and *component* can be linked by using *mukey* field. To understand the relationships you can refer to SSURGO data model diagram available the following link:

<http://soildatamart.nrcs.usda.gov/SSURGOMetadata.aspx>

We will explore these relationships and look at how to use the SSURGO data in another tutorial titled using SSURGO data.

OK, you are done for now!!