

GIS analysis of soils data to aid tax assessment of agricultural land

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Soils data (SSURGO) is readily available and interpretive maps are generated easily using the USDA-NRCS tool called the Soil Data Viewer. This extension operates with ESRI's ArcMap and links the soils map units to the soils database and makes creating a wide variety of soil maps very simple.

For assessment of agricultural land productivity, we recommend using the **Non-Irrigated Capability Class** interpretive soil map. The USDA states that, "land capability classification shows, in a general way, the suitability of soils for most kinds of field crops." Eight capability classes rank soils for their cultivation, grazing, forested potential. Each larger class number ***indicates progressively greater limitations*** and narrower choices for practical cultivation. Class 1 soils have few limitations that restrict their use while class 8 soils have serious limitations that preclude commercial plant production. Full class descriptions are provided at the end.

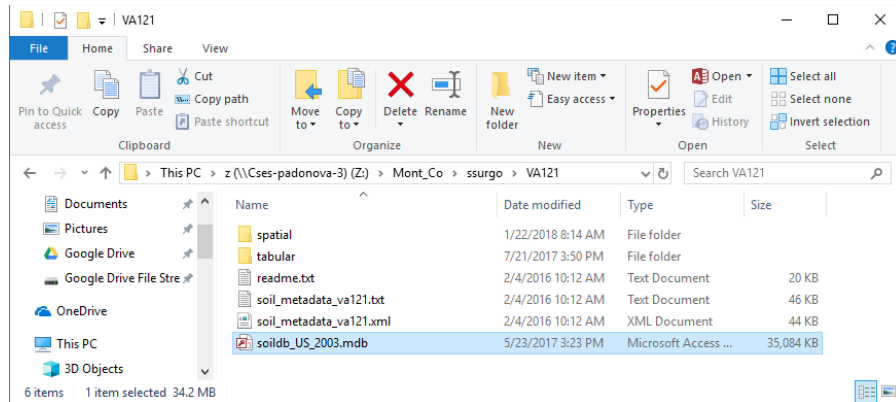
Currently, there are **two GIS formats of Virginia soils data available**- vector data, which uses Soil Data Viewer extension and raster data called gSSURGO which uses Soil Data Management Toolbox. For an individual county, we recommend using the (vector) SSURGO data and the USDA's Soil Data Viewer extension for ArcMap.

SSURGO and Soil Data Viewer extension:

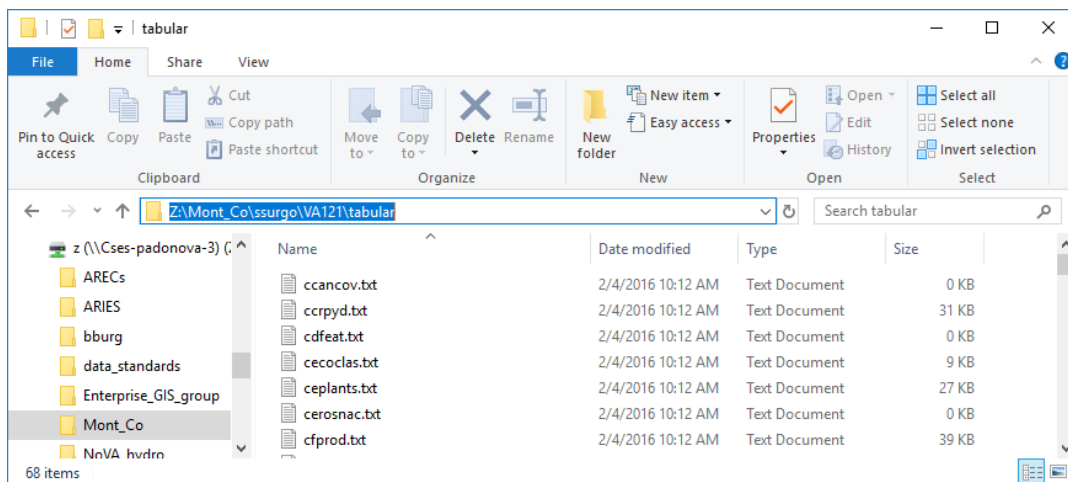
Download county-wide SSURGO soils maps using the USDA-NRCS Geospatial Data Gateway: <https://datagateway.nrcs.usda.gov/> Simple to follow, instructions provided.

Extract data from zip download into an appropriate file location. Next, you will need to ***link the soils tables in Microsoft Access***. This necessary process is simple but can take a couple minutes depending on your computer speed- it only needs to be done once.

In File Explorer, ***double-click the soildb_US_2003.mdb*** file that should reside in a folder with the following folder structure-



Microsoft Access will open and ask for the **folder/pathname of the tabular soils data**- you will copy and paste the folder location into the dialog box:



Access runs, linking soil data tables. Once completed, the Reports dialog opens, you are done with the necessary steps. Close Access.

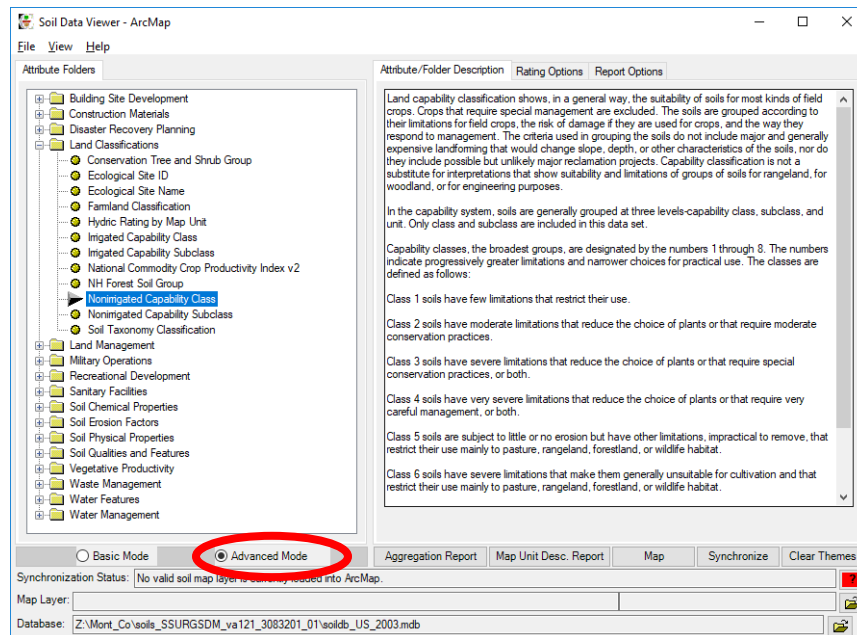
Soil Data Viewer extension for ArcMap:

The USDA-NRCS created the Soil Data Viewer extension for ArcMap, although the application will run independent of ArcMap, the output is tabular only. To create soil maps which can be overlaid and analyzed with parcels or other data, ArcMap is required. Download the USDA-NRCS Soil Data Viewer extension (SDV). Extract and install. In ArcMap, it is a simple process outlined here:

<https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/geo/?cid=nrcseprd337066>

It is because soils are complicated that makes this tool so helpful. Soils change across the landscape and with depth and each soil map unit commonly contains 2 or 3 very different soil series. The Soil Data Viewer does the complicated calculations (a lot of weighted averaging) for you when you specify a few soil parameters. These options may have an effect on outcome.

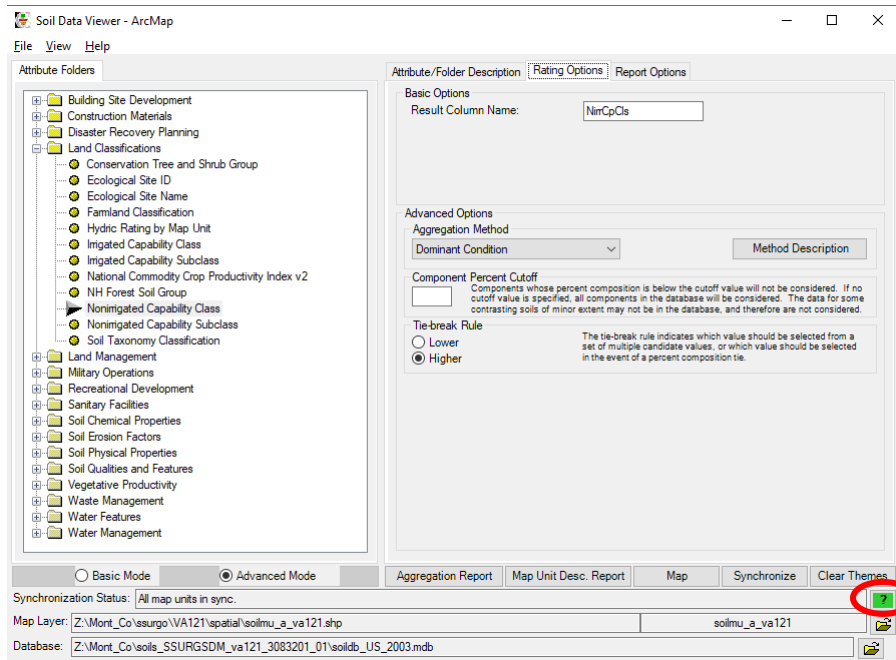
You will want to read the information about the soil interpretations to make sure you understand the output map; there is a full description on the **Attribute/Folder Description** tab and links to documentation for the soils data, see image below.



ArcGIS instructions (v10.6) SSURGO2 vector GIS data and Soil Data Viewer (USDA) installed:

In ArcMap, load your county polygon soil map units- specifically, load **soilmu_a_va<countycode>.shp** (polygon shpfile) from the \VA<co_code>\spatial\ folder. Click on the Soil Data Viewer icon (you may need to add the toolbar in **Customize-Toolbars-Soil Data Viewer Toolbar**).

In the lower section of the dialog, make sure you are working in the **Advanced Mode**, not Basic (in image above, circled in red). Check that the Synchronization Status is synced and the question mark to the right is bright green (circled in image below). IF it is red (see image above), your soil polygon layer and the soils database are not set to the same county. This is common when using the tool repeatedly for various counties. You will get an error message if you have not linked the soils database in Access- see steps above.



You can find the ***Non-irrigated Capability Class*** under ***Land Classifications*** category in the left side of the tool. On the Ratings tab, you can choose the aggregation method- Dominant Condition is the default and generally a good choice. You can read about the various methods in the Method Description button to the right. Once the aggregation method is selected, click on the Map button in the lower portion of the dialog; the NirCpCls field is added and the map is displayed. This layer is temporary and will be deleted unless you right-click on the soil map in the table of contents and go to Data-Export Data. Name and place your non-irrigated capability class soil map.

Next, you may want to add the capability classification to your parcels. One simple way to do this is ArcToolbox- go to ***Analysis Tools- Statistics-Tabulate Intersection***, set the parcels as the feature zone (parcel ID as field), SSURGO nirrcapcls as feature, units in square meters. Output table lists parcel ID, area w/in each capability class and the Percentage of each class in the parcel. These methods and the SDV should be no problem for your county's GIS people.

Non-Irrigated Capability Class

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.