United States Department of Agriculture

Soil Survey Geographic database (SSURGO)

Soil Data Access

National Crop Commodity Index (NCCPI)

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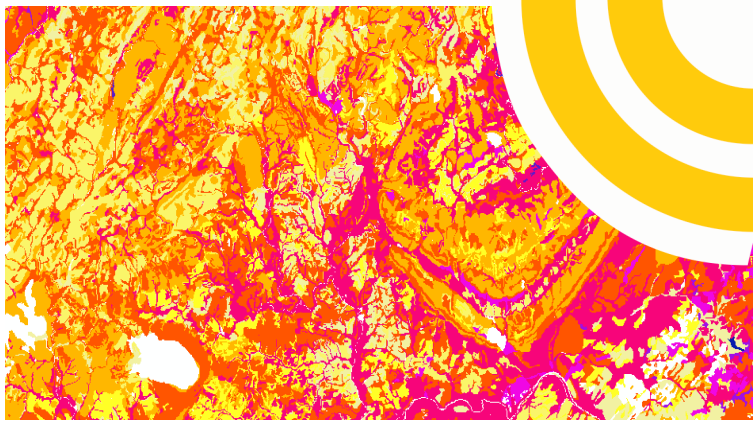
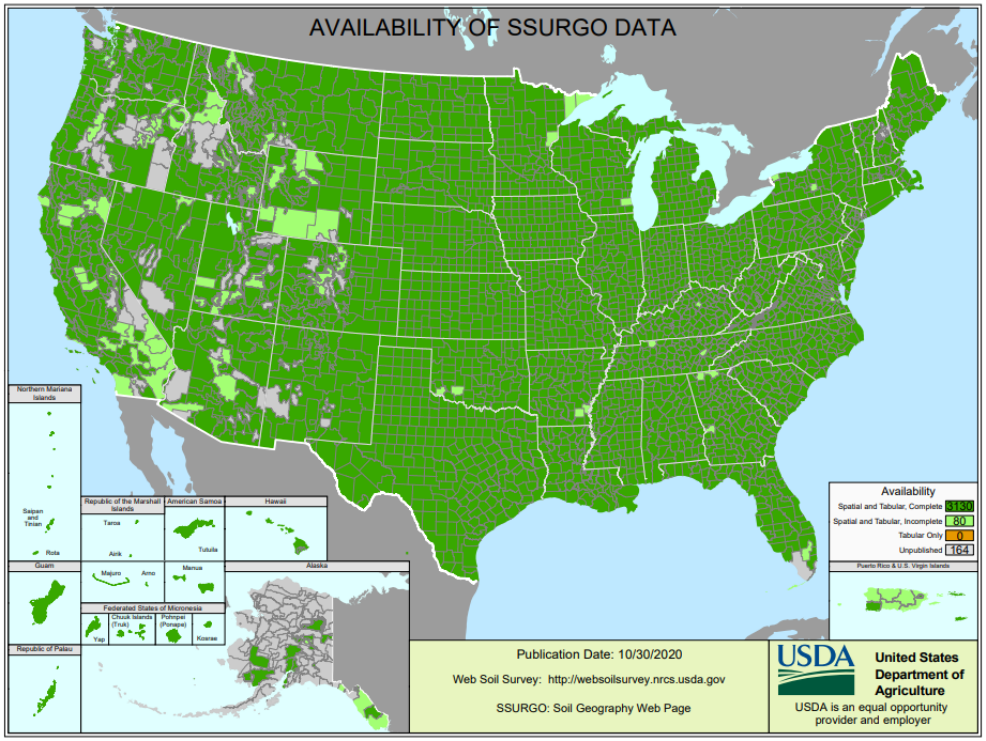


Natural Resources Conservation Service

nrcs.usda.gov/

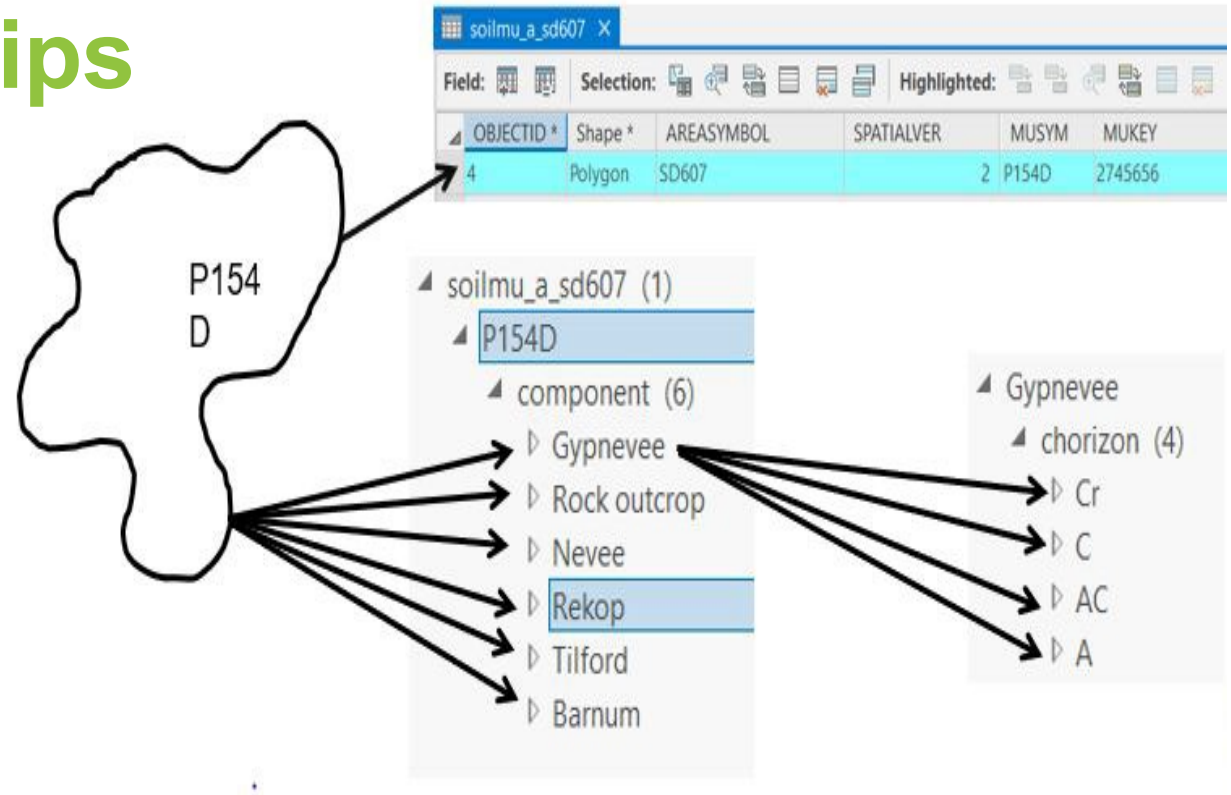
SSURGO

- SSURGO – Soil Survey Geographic Database
- The SSURGO database contains information about soil as collected by the National Cooperative Soil Survey.
- The maps are linked in the database to information about the component soils and their properties for each map unit.
- SSURGO datasets consist of map data, tabular data, and information about how the maps and tables were created.



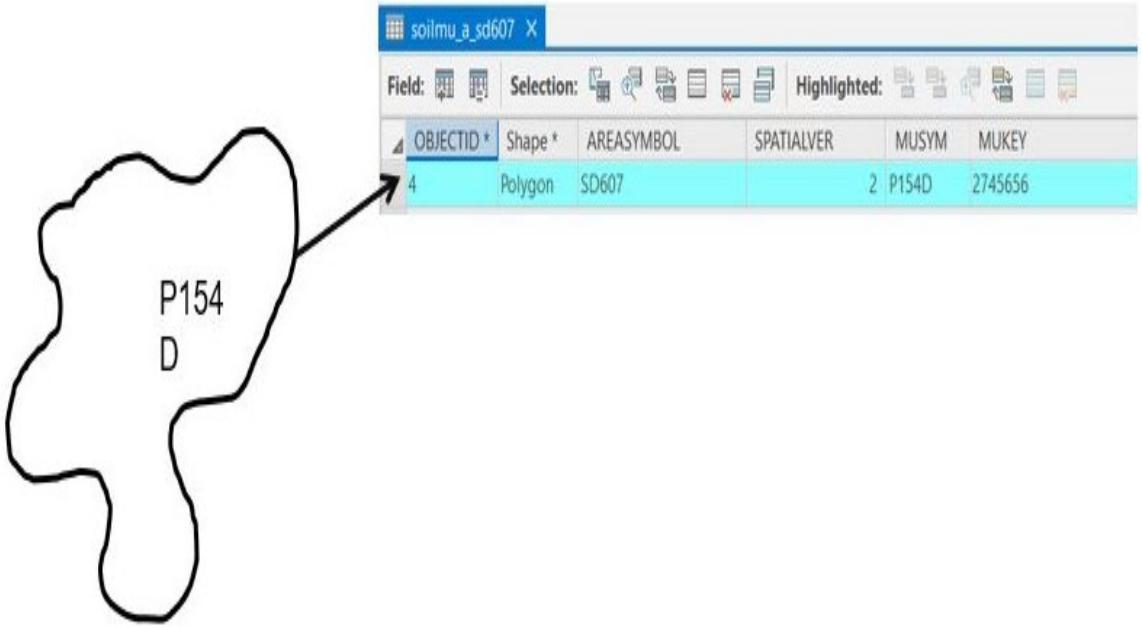
Three Types of Relationships

- One to one
- One to many
- Many to many



One to One

- One row in a table is linked to a row in another table
  - Specifically, a row in Table A can have no more than one matching row in Table B, and vice versa.
- For example:
  - A mapunit can only have one mapunit name, one mapunit symbol, and one farm class.
- There is one row of data in the mapunit table that corresponds to mapunit P154D



OBJECTID *	Shape *	AREASYMBOL	SPATIALVER	MUSYM	MUKEY
4	Polygon	SD607	2	P154D	2745656

One to One

CAUTION

Joining tables is only appropriate when there is a one-to-one relationship between the two.

- In this example, the Query Results table had each MUSYM listed only once
- Each map unit has a single InterpValue assigned values of interest in each table

	A	B
1	MUSYM	InterpValue
2	2Bu	4
3	2CeA	4
4	2Hb	1
5	AED	3
6	BdC	2
7	BdC2	1
8	BRD	2
9	BRD2	5
10	Bu	3
11	By	2
12	Fm	4
13	GeB2	3

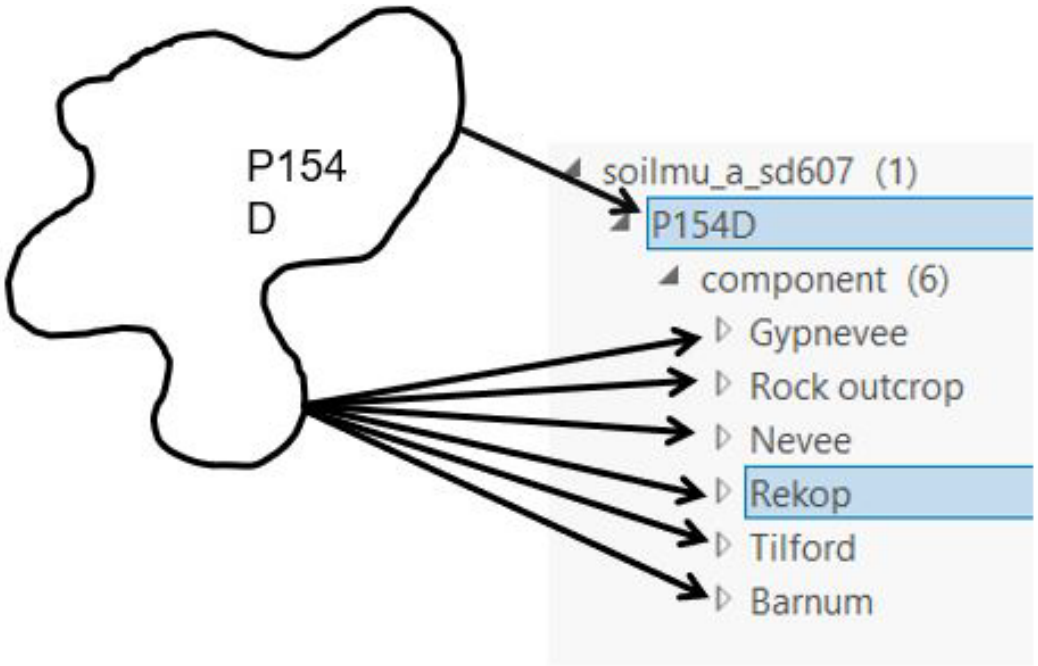
In the polygon attribute table, there are many polygons of each map unit symbol

- Each polygon is joined by a Mapunit symbol to the Excel table, and each polygon receives the same InterpValue

ne159_a.MUSYM	QueryResults$.MUSYM	QueryResults$.InterpValue
Sy	Sy	1
Sy	Sy	1
Sy	Sy	1
Sy	Sy	1
Sy	Sy	1
PwB2	PwB2	2
PwB2	PwB2	2
StE	StE	3
HbB	HbB	4
HbB	HbB	4

One to Many

- Most common type of relationship in NASIS
- A row in one table can have many matching rows in another table
- Specifically, a row in table A can have many matching rows in table B, but table B cannot have many matching rows in table A.
- For example:
  - A mapunit contains many components



One to Many

- **If the join data contains more than one data value for the same MUSYM (join field), the software will join on the first matching record!**
- This table has multiple values for the MUSYM '2Bu'
- When joined with the spatial data, each polygon with MUSYM = '2Bu' will receive an InterpValue of 4!
- The software can't determine which polygons should receive a value of 6 instead of the value of 4
- This is a **one-to-many relationship**:
- ***One*** MUSYM is matched with ***Many*** InterpValues
- In these cases, you should use a **RELATE** rather than a **Join**

CAUTION

	A	B
1	MUSYM	InterpValue
2	2Bu	4
3	2Bu	4
4	2Bu	6
5	2Bu	4
6	2CeA	4
7	2Hb	1
8	AED	3

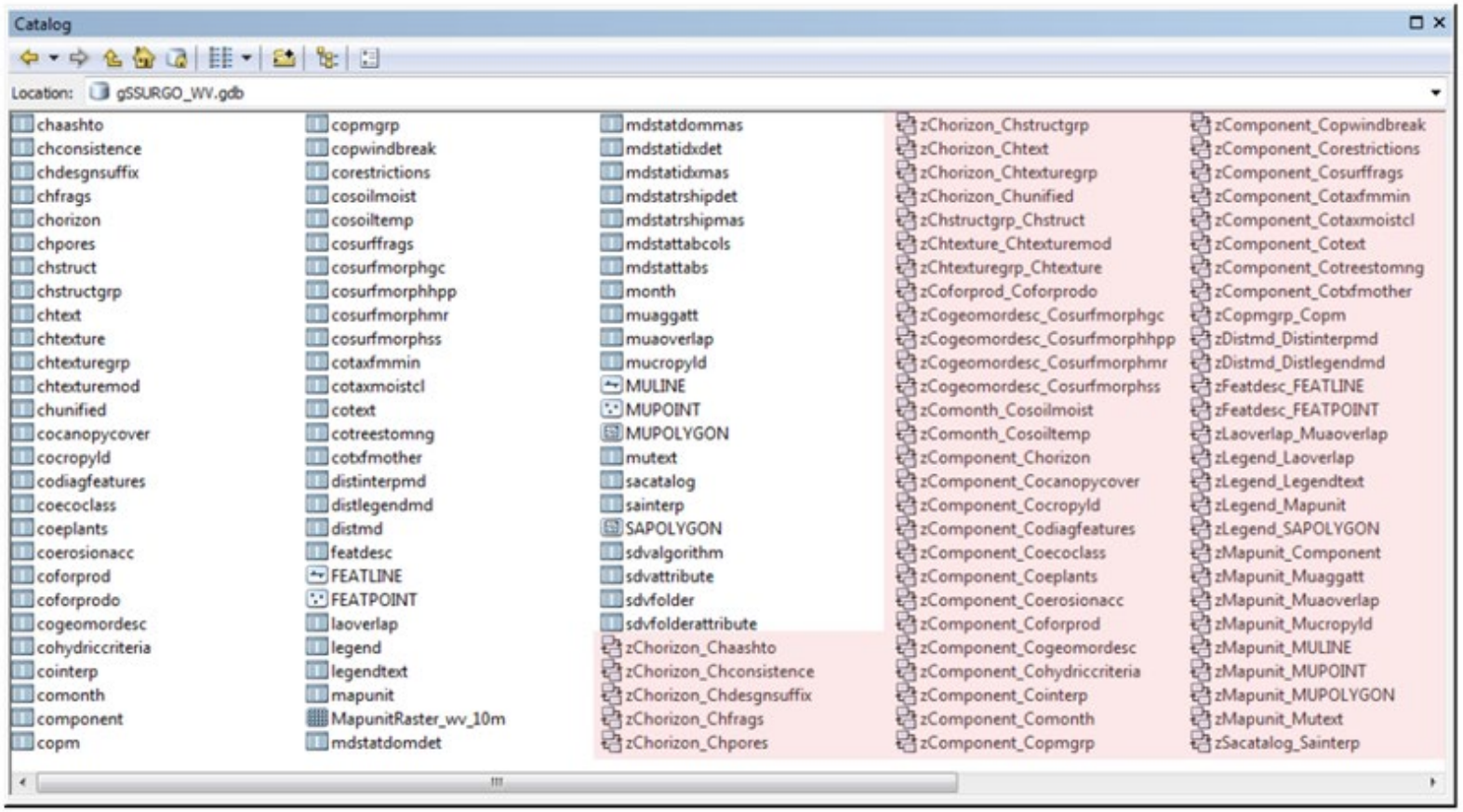
*** ArcGIS Pro Help has excellent information on the Joins and Relates**

Rules - Relates

- General procedure – perform any table joins first and then complete any relates on tables
  - When data is joined into a table, any previous relates are removed
  - If there is a relate on a joined table, the relate will be removed when the join is removed.
- Can create multiple relates as needed
- To view related tables within ArcGIS, tables must be loaded into the GDB or in the csv or xlsx or dbf format.

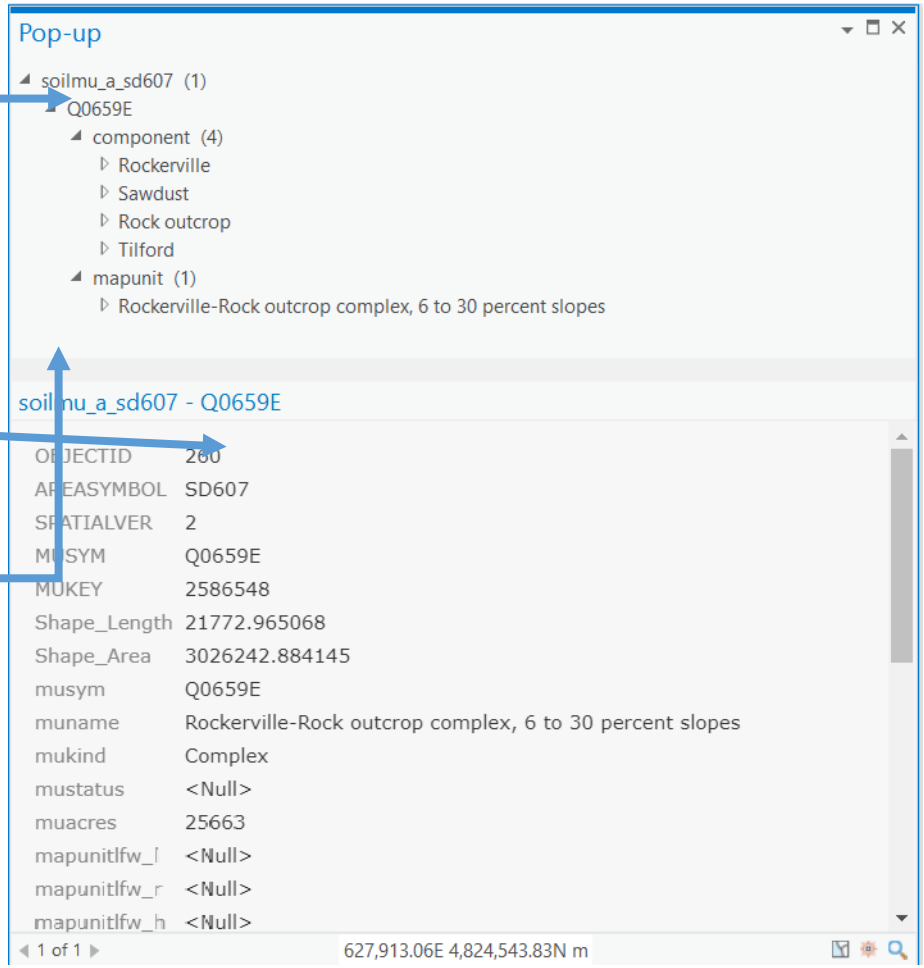
Using Relationship Classes in a Geodatabase

A relationship class stores information about table relates in a geodatabase. These classes are similar to relationships in a Microsoft® Access® database but are more limited in functionality. The relationships are prebuilt and are tables within the geodatabase. The relationships are shown in ArcCatalog as tables having the z prefix..



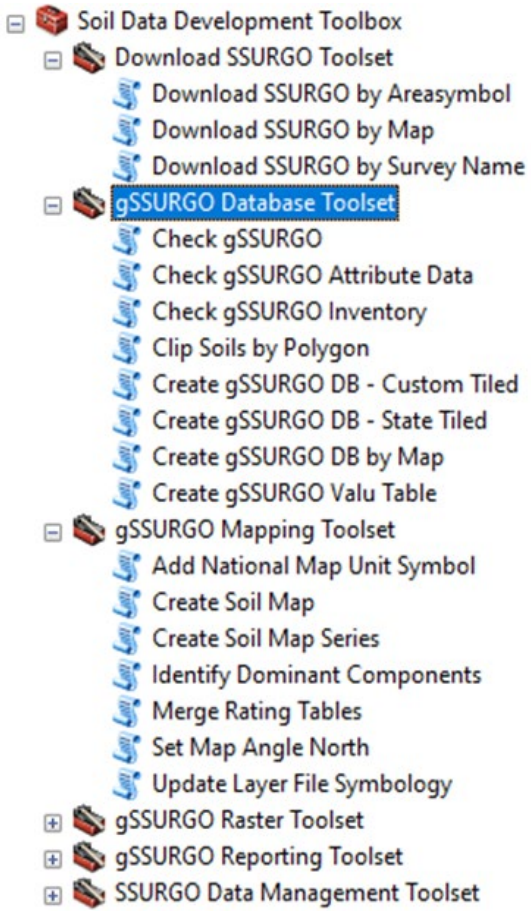
Identify - Relates

- Related tables (soilmu_a and component on mukey)
- Open Identify dialog select a soil polygon
  - Has the info for the soil mapunit
  - All component table info available based on that selected musym
- Can have more than one relate available and will list each relate



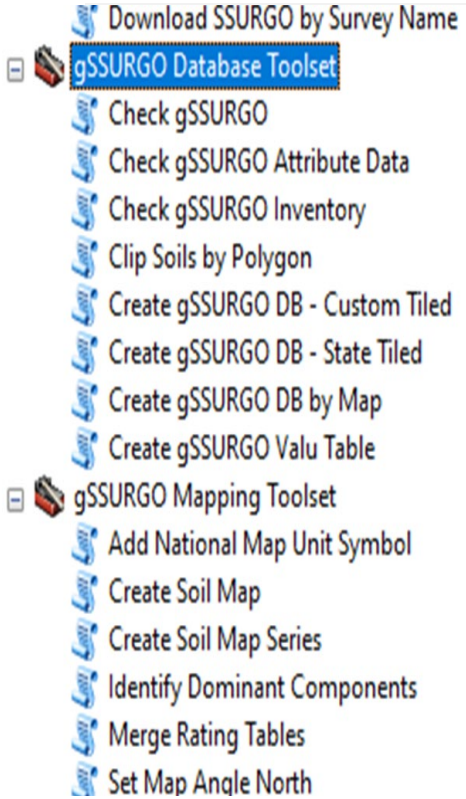
gSSURGO Tools for ArcGIS

- The Soil Data Development Tools for ArcGIS™ includes the same toolset used by USDA-NRCS to create and publish the gSSURGO databases each year.
- Other tools for creating soil maps and reports are also included. See the Development User Guide and the gSSURGO Mapping Toolset documents for more information.
- Download Toolbox
- Download User guide



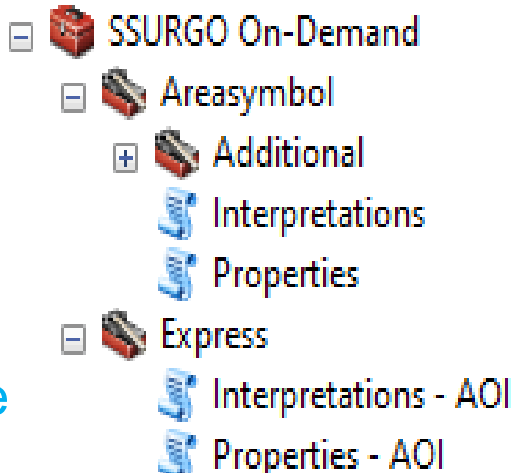
Value Added Lookup Table

- Included with the gSSURGO database, but not a part of the standard SSURGO dataset is a table called Valu1.
  - Soil organic carbon
  - Available water storage
  - National Commodity Crop Productivity Index (NCCPI) Version 3 - (Dobos, Sinclair, and Robotham, 2012)
  - Root-zone depth of commodity crops - (Dobos et al., 2012)
  - Available water storage within the root-zone depth
  - Drought-vulnerable soil landscapes
  - Potential wetland soil landscapes (PWSL Version 1)
- Valu1 link



SSURGO On-Demand

- SOD
  - SOD tools do not require users to have the data found in a traditional SSURGO download from the Web Soil Survey.
  - They are very similar to the United States Department of Agriculture - Natural Resource Conservation Service's distributed Soil Data Viewer (SDV), although there are distinct differences.
  - The most important difference is the data collected with the SSURGO On-Demand (SOD) tools are collected in real-time via web requests to Soil Data Access
  - Download Toolbox



Soil Data Access

Soil Data Access is the name of a suite of web services and applications whose purpose is to meet requirements for requesting and delivering soil survey spatial and tabular data that are not met by the Web Soil Survey and Geospatial Data Gateway websites.

Link to Soil Data Access

Examples SQL Soil Data Access

New Jersey Disposal Field example

```
SELECT l.areasymbol AS Area_symbol, m.musym AS Map_unit_symbol, m.mukey AS
MUKEY, c.compname AS Component_name, c.comppct_r AS Component_percent,
ci.mrulename AS Rule_name, interplr AS Rating, interplrc AS Rating_class

FROM legend AS l

INNER JOIN mapunit AS m ON l.lkey = m.lkey AND l.areasymbol LIKE 'NJ%'

INNER JOIN component AS c ON m.mukey = c.mukey AND c.majcompflag='yes' AND
c.cokey = (SELECT TOP 1 c2.cokey FROM component AS c2 WHERE
c2.mukey=m.mukey

ORDER BY c2.comppct_r DESC )

INNER JOIN cointerp AS ci ON c.cokey = ci.cokey AND ci.ruledepth=0 AND mrulename
= 'ENG - Disposal Field (NJ)'

ORDER BY musym
```

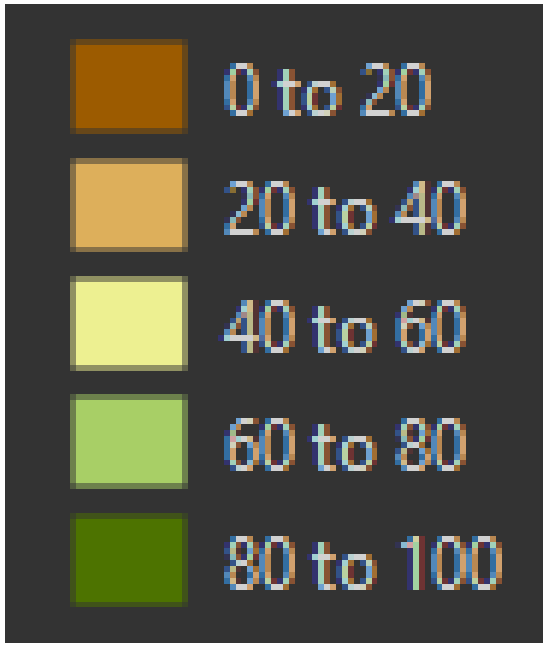
Soil Data Access

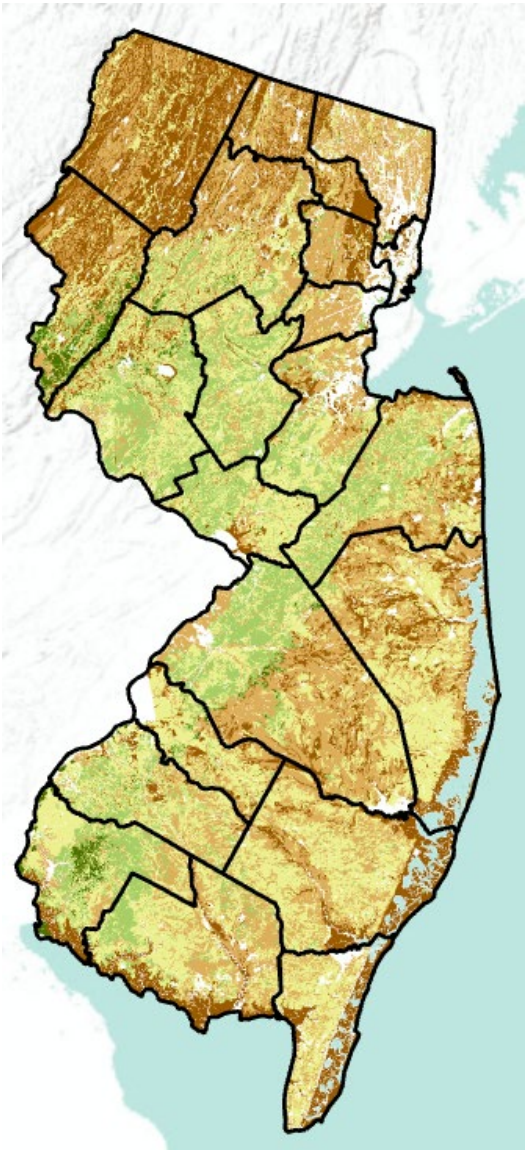
Demo

National Commodity Crop Productivity Index (NCCPI)

- The National Commodity Crop Productivity Index is an interpretation in the National Soil Information System (NASIS).
- The interpretation uses natural relationships of soil, landscape, and climate factors to model the response of commodity crops.
- It is applicable to both heavily populated and sparsely populated areas.
- Ratings are based on properties and qualities to the depth normally observed during soil mapping (approximately 6 feet).

NJ-NCCPI Overall Rating





NCCPI potential applications in GIS analysis

- Farmland assessment
- Land evaluation
  - Farmland preservation
  - Soil productivity
  - Development planning tool
  - Zoning policies
  - Land conversion
  - Guide the appropriate use of state, local, or Federal funds
  - Prepare environmental impact statements as they relate to agricultural land
  - Plan water and natural resource projects
  - Plan sewage, water, and transportation systems

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