

United States Department of Agriculture

Gridded Soil Survey Geographic (gSSURGO) Database

User Guide

Version 1.1 April 2014 National Soil Survey Center National Geospatial Center of Excellence

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Introduction

<u>Gridded SSURGO (gSSURGO)</u> is similar to the standard product from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) <u>Soil Survey Geographic (SSURGO)</u> <u>Database</u>, but is in the Environmental Systems Research Institute, Inc. (ESRI®) file geodatabase format. A file geodatabase has the capacity to store significantly more data and thus greater spatial extents than the traditional SSURGO product. This allows for statewide or even Conterminous United States (CONUS) tiling of data. gSSURGO contains all of the original soil attribute tables in SSURGO. All spatial data are stored within the geodatabase instead of externally as separate shape files. Both SSURGO and gSSURGO are considered products of the <u>National Cooperative Soil Survey (NCSS)</u>.

An important addition to the new format is a 10-meter raster (MapunitRaster_10m) of the map unit soil polygons feature class, which provides statewide coverage in a single layer. This new addition provides greater performance and important analysis capabilities to users of soils data. Statewide tiles consist of soil survey areas needed to provide full coverage for a given State. In order to create a true statewide soils layer, some clipping of excess soil survey area gSSURGO data may be required. The new format also includes a national Value Added Look Up (valu) Table database that has several new "ready to map" attributes.

Along with these important advantages, the gSSURGO format has a few disadvantages:

- File geodatabases such as gSSURGO are NOT compatible with the NRCS Soil Data Viewer application.
- The file geodatabase format supports a limited subset of the standard query language (SQL) that the Microsoft[®] Access[®] database format or Microsoft[®] SQL Server[®] uses.
- Unlike vector layers, the geodatabase is unable to store permanent table relates for raster layers.

Official Release of SSURGO/gSSURGO Data and Update Exceptions

The SSURGO data, available to the public on either the <u>USDA-NRCS Geospatial Data Gateway</u> (GDG) or <u>USDA-NRCS Web Soil Survey</u> (WSS), are updated or refreshed annually. The annual refresh normally occurs around October 1, which is the start of the Federal Government's fiscal year.

There can be exceptions to this once-a-year update when:

- A significant error is found in the data, or
- New data becomes available for an area that has not had coverage in the past.

The corrected or new data will be incorporated into the vector SSURGO data available from the Geospatial Data Gateway or Web Soil Survey. However, the gSSURGO data will NOT be updated. gSSURGO, available from the GDG, is created just once each fiscal year based on the October refresh.

How to Verify SSURGO and gSSURGO Data Creation Dates

There are several ways to compare the date of the soils data in gSSURGO with the date of the SSURGO vector data:

1. View the Web Soil Survey Download Soils Data page.

List all the data for a State.

- Natural Resource	ent of Agriculture es Conservation	71 ' al ' ol ' Service				Web Soil Survey	(chai)
ontact Us Subse	ribe 🔝 Arc	hived Soil Surve	ys Soil Survey Status Gl	lossary Preferences	Link Logout H	lelp A	AA
Area of Interest (AOI)	soil Map	Soil Data Explorer	Download Soils Data Cart (
							2
Download Soils I	Data for						0
Your AOI (SSURG	0)						
Soil Survey Area	(SSURGO)						
							?
General Informati	on						
Link D	escription of s	Soil Survey Geog	raphic (SSURGO) Database				
Download T Contents	abular data, spa	tial data (if availab	le), template database (if selecte	d), and FGDC metadata			
Spatial Data E Format	SRI Shapefile, G	eographic WGS84					
Options							
State	West Virginia	•					
County (optional)	•						
Only show Soil Survey Areas updated since			odate Clear				
Sort by	Area Symbol	•					
Include Template Database	7						
Soil Survey Area (SSURGO) Down	load Links					
Name	Area Symbo	l Data Availability	Version	Template Database	Download Size	Download Link	
Barbour County, West Virginia	WV001	Tabular and Spatial, complete	Survey Area: Version 6, Dec 26, 2013 Tabular: Version 6, Dec 26, 2013 Spatial: Version 3,	soildb_WV_2003 Access 2003 Version 36	15.2 MB	wss_SSA_WV001_soildb_WV_20 [2013-12-26].zip	03_ *

The individual survey dates from Web Soil Survey can be compared with the gSSURGO metadata. See following example.

Contents Preview Description
A Print D Edit D Validate Export D Import
Map Unit Raster 10m - West Virginia
File Geodatabase Raster Dataset
Tags
soils, United States of America, raster, West Virginia, Geospatial Data Gateway, WV604 (2013-12-31), WV051 (2013-12-20), WV103 (2013- 12-26), WV617 (2013-12-26), WV077 (2013-12-26), WV062 (2013-12-26), WV602 (2013-12-26), WV6003 (2013-12-26), WV0017 (2013-12-26), WV610 (2013-12-26), WV0017 (2013-12-26), WV021 (2013-12-26), WV0017 (2013-12-26), WV021 (2013-12-26), WV021 (2013-12-26), WV097 (2013-12-26), WV0001 (2013-12-26), WV021 (2013-12-26), WV021 (2013-12-26), WV097 (2013-12-26), WV000 (2013-12-30), WV624 (2013-12-31), WV603 (2013-12-26), WV007 (2013-12-26), WV071 (2013-12-26), WV015 (2013-12-26), WV015 (2013-12-26), WV015 (2013-12-19), WV011 (2013-12-26), WV015 (2013-12-26), WV015 (2013-12-19), WV011 (2013-12-26), WV075 (2013-12-26), WV039 (2013-12-19), WV621 (2013-12-26), WV099 (2013-12-26), WV033 (2013-12-19), WV621 (2013-12-26), WV039 (2013-12-26), WV025 (2013-12-19), WV705 (2013-12-26), WV033 (2013-12-19), WV705 (2013-12-26), WV033 (2013-12-19), WV705 (2013-12-26), WV033 (2013-12-26), WV035 (2013-12-26),
WV620 (2013-12-26), WV109 (2013-12-26), WV713 (2013-12-26), WV623 (2014-01-02), WV063 (2013-12-26), WV047 (2013-12-20),
gridded, Soil Survey, GDG, USA, gSSURGO, SSURGO
and

For this comparison, the date of the WV001 SSURGO data is "Dec 26, 2013" and the date of the WV001 gSSURGO data is "2013-12-26." The same data exists in both SSURGO and gSSURGO.

2. Query the Soil Data Access service at http://sdmdataaccess.nrcs.usda.gov/.



Select the option "Submit a custom request for soil tabular data."

Input the following query and select "Submit Query":

SELECT AREASYMBOL, AREANAME, CONVERT(varchar(10), [SAVEREST], 126) AS SAVEREST FROM SASTATUSMAP WHERE AREASYMBOL LIKE 'WV%' ORDER BY AREASYMBOL

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Submit your own SQL or SQL Data Shaping query of the query immediately or, for larger volumes of background. Information about the queries that m <u>Help</u> page.	data, you can choose to subm	it the query to be q	ueued and run in	
If you choose to view the results immediately, the results, popup blocking must be disabled. The SDN this is a good place to test any queries that you w <u>Web Service Help</u> page.	TabularService.RunQuery we	eb method is used t	o run the query, the	refore
If you choose to submit the query to be queued ar per text file if the Text option was selected or into a WinZip® archive (see the Downloads section of notified via e-mail when the results are ready to b you requested.	a single XML file if the XML o the <u>Help</u> page if you need mor	ption was selected e information abou	with all files then pl t archives). You will	laced in be
For immediate queries, the timeout is 30 seconds requests that can complete within 30 seconds but For queued queries, the timeout is 10 minutes and	return more than 10,000 red	ords must be subm	itted as a queued re	equest.
Please enter your SQL query: SELECT AREASYMBOL, AREANAME, CONVERT SASTATUSMAP WHERE AREASYMBOL LIKE 'W			T FROM	*
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SELECT AREASYMBOL, AREANAME, CONVER SASTATUSMAP WHERE AREASYMBOL LIKE 'W	v%' ORDER BY AREASYMBO	ts:		*
SELECT AREASYMBOL, AREANAME, CONVERT SASTATUSMAP WHERE AREASYMBOL LIKE 'W Please select the time frame and format in which y	v%' ORDER BY AREASYMBO rou would like to see the resu sDMTabularService.RunQue	ts:		*
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Result:

AREASYMBOL	AREANAME	SAVEREST
WV001	Barbour County, West Virginia	2013-12-26
w v 003	Berkeley County, West Virginia	2013-12-26
WV005	Boone County, West Virginia	2013-12-26
WV007	Braxton County, West Virginia	2013-12-26
WV011	Cabell County, West Virginia	2013-12-26

3. Open the SACATALOG table in the gSSURGO database and sort on the SAVEREST (Survey Area Version Established) column in descending order to find the newest data.

The SACATALOG table in the gSSURGO database:

Area Symbol *	Area Name	Survey Area Version	Survey Area Version Established	1	Tabular Version
WV604	Brooke, Hancock, and Ohio Counties, West Virginia	Survey Area Version	12/31/2013 3:20:54 PM	1	Sort Ascending
WV051	Marshall County, West Virginia		12/20/2013 6:57:53 PM	=	
WV103	Wetzel County, West Virginia		12/26/2013 4:19:50 PM	Ŧ	Sort Descending
WV611	Marion and Monongalia Counties. West Virginia	7	12/26/2013 4:23:20 PM	-	Advanced Sorting
WV077	Preston County, West Virginia	7	12/26/2013 4:07:49 PM		Summarize
WV065	Morgan County, West Virginia	10			
WV612	Pleasants and Tyler Counties, West Virginia	7	12/26/2013 4:23:20 PM	Σ	Statistics
WV608	Hampshire and Mineral Counties, West Virginia	7	12/26/2013 4:23:20 PM		Field Calculator
WV003	Berkeley County, West Virginia	7	12/26/2013 4:01:03 PM	333	NEWSON THE READER AND
WV017	Doddridge County, West Virginia	9	12/19/2013 9:59:40 PM		Calculate Geometry
WV610	Harrison and Taylor Counties, West Virginia	7	12/26/2013 4:23:20 PM		Turn Field Off
WV037	Jefferson County, West Virginia	8	12/19/2013 10:23:58 PM		5 555 72 97 15
WV601	Wood and Wirt Counties, West Virginia	8	12/31/2013 2:42:22 PM		Freeze/Unfreeze Colum
WV085	Ritchie County, West Virginia	8	12/26/2013 4:09:50 PM	×	Delete Field
WV001	Barbour County, West Virginia	6	12/26/2013 3:53:02 PM	-	
WV602	Tucker County and Northern Randolph County, West Virginia	6	12/26/2013 4:21:35 PM	r -	Properties
WV628	Grant and Hardy Counties, West Virginia	8	12/26/2013 4:30:50 PM		6 12
WV021	Gilmer County, West Virginia	6	12/19/2013 10:18:43 PM		5 12
WV041	Lewis County, West Virginia	5	12/19/2013 10:26:30 PM		5 12
WV097	Upshur County, West Virginia	6	12/26/2013 4:10:35 PM		6 12
WV600	Jackson and Mason Counties, West Virginia	8	12/30/2013 4:33:07 PM		5 12
WV624	Calhoun and Roane Counties, West Virginia	7	12/31/2013 2:44:08 PM		5 12
WV603	Randolph County Area, Main Part, West Virginia	8	12/26/2013 4:21:35 PM		5 12
		10	1	1	•

The Survey Area Version dates listed on the Web Soil Survey Download Soils Data page come from the SACATALOG\SAVEREST column.

The SACATALOG\SAVEREST result:

Table

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Area Symbol *	Area Name	Survey Area Version	Survey Area Version Established
WV001	Barbour County, West Virginia		12/26/2013 3:53:02 PM
	Berkeley County, West Virginia		10/00/0010 1 01 00 011
WV005	Boone County, West Virginia	5	12/26/2013 4:02:04 PM
WV007	Braxton County, West Virginia	8	12/26/2013 4:02:34 PM
WV011	Cabell County, West Virginia	9	12/26/2013 4:03:19 PM
WV015	Clay County, West Virginia	11	12/19/2013 9:43:53 PM
WV017	Doddridge County, West Virginia	9	12/19/2013 9:59:40 PM
WV021	Gilmer County, West Virginia	6	12/19/2013 10:18:43 PM
WV025	Greenbrier County, West Virginia	8	12/19/2013 10:22:43 PM
WV037	Jefferson County, West Virginia	8	12/19/2013 10:23:58 PM
WV039	Kanawha County, West Virginia	7	12/19/2013 10:25:14 PM
WV041	Lewis County, West Virginia	5	12/19/2013 10:26:30 PM
WV043	Lincoln County, West Virginia	7	12/19/2013 10:27:30 PM
WV047	McDowell County, West Virginia	6	12/20/2013 5:45:15 PM
WV051	Marshall County, West Virginia	7	12/20/2013 6:57:53 PM
WV063	Monroe County, West Virginia	7	12/26/2013 4:04:04 PM
WV065	Morgan County, West Virginia	10	12/26/2013 4:05:04 PM
WV071	Pendleton County, West Virginia	9	12/26/2013 4:05:49 PM
WV075	Pocahontas County, West Virginia	6	12/26/2013 4:07:04 PM
WV077	Preston County, West Virginia	7	12/26/2013 4:07:49 PM
WV079	Putnam County, West Virginia	6	12/26/2013 4:09:04 PM
	Ritchie County, West Virginia	8	12/26/2013 4:09:50 PM
WV085		6	12/26/2013 4:10:35 PM

The Web Soil Survey result:

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Soil Survey Are								
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	ESRI Shapefile, C	Geographic WGS84						
options State	West Virginia	•	1					
County (optional)	-							
Only show Soil Survey Areas updated since			date Clear					
Sort by	Area Symbol	+						
Include Template Database	<u>v</u>			saveres	t date			
Soil Survey Area	a publication in the second of the	a contrata c		7				
Name	Area Symbo	Availability	Version	Te	mplate Databas	e Download Size	Download Link	
Barbour County, West Virginia	WV001	Tabular and Spatial, complete	Survey Area: Versior Dec 26, 2013 Tabular: Version 6, Dec 26, 2013 Spatial: Version 3, Dec 26, 2013	Ad	oildb_WV_2003 access 2003 accion 36	15.2 MB	wss_SSA_WV001 [2013-12-26].zip	_soildb_WV_2003_

 $\square \times$

Example of Verifying Dates of SSURGO and gSSURGO Data

The Washington gSSURGO data were downloaded from the Geospatial Data Gateway. The data were created from the January 15, 2014 refresh of the SSURGO data. Has any of the individual Washington SSURGO data been updated since January 15?

The Web Soil Survey Download Soils Data page was queried to only show "Soil Survey Areas updated since..."

		.nrcs. u. ♀ ♂ ×	🙆 Web Soil Survey - Home	🙆 Web Soil Survey	×		6 2
Download So	ils Data for						
Your AOI (SSU	JRGO)						
Soil Survey A	rea (SSURGO)					
General Inform	nation						
Link	Description o	of Soil Survey Ge	eographic (SSURGO) Databas	e			
Download Contents	Tabular data, s	spatial data (if avai	ilable), template database (if sele	cted), and FGDC metadata			
Spatial Data Format	ESRI Shapefile	e, Geographic WGS	84				
ptions	-						
State	Washington		· •				
County (optional)		•					
Only show Soi Survey Areas updated since	Jan 16, 2014		Update Clear				
Sort by	Area Symbol	•					
Include Template Database	ম						
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oil Survey Are			dated since Jan 16, 2014.				
ioil Survey Are 1 Soil Survey Ar	reas for Washing	gton have been upo Data	dated since Jan 16, 2014. Version	Template Database	Download S	ize Download Link	
Soil Survey Are	reas for Washing	gton have been upo	()	Template Database soildb_WA_2003 Access 2003 Version 36	Download S 10.4 MB	ize Download Link wss_SSA_WA661_soild 3_[2014-03-25].zip	b_WA_2
t Soil Survey Are L Soil Survey Ar Name Snohomish County Area, Washington	reas for Washing Area Symbol	ton have been up Data Availability Tabular and Spatial, complete	Version Survey Area: Version 10, Mar 25, 2014 Tabular: Version 7, Dec 10, 2013 Spatial: Version 6,	soildb_WA_2003 Access 2003		wss_SSA_WA661_soild	lb_WA_2
Soil Survey Are L Soil Survey Are Name Snohomish County Area, Washington	reas for Washing Area Symbol WA661 WA661	ton have been up Data Availability Tabular and Spatial, complete	Version Survey Area: Version 10, Mar 25, 2014 Tabular: Version 7, Dec 10, 2013 Spatial: Version 6,	soildb_WA_2003 Access 2003		wss_SSA_WA661_soild	b_WA_2
oil Survey Are L Soil Survey Are Name Snohomish County Area, Washington J.S. General S Download SS	Area Symbol WA661 Goil Map (STAT	Data Availability Tabular and Spatial, complete TSGO2) ate Databases	Version Survey Area: Version 10, Mar 25, 2014 Tabular: Version 7, Dec 10, 2013 Spatial: Version 6,	soildb_WA_2003 Access 2003 Version 36	10.4 MB	wss_SSA_WA661_soild 3_[2014-03-25].zip	

The Snohomish County Area, Washington (WA661) survey has been updated from the January 15, 2014 refresh. The survey area version date of March 25, 2014 can be compared to the Washington gSSURGO metadata.

The gSSURGO metadata uses the survey area symbol ("WA661") and contains the date "2013-12-10."



Query the Soil Data Access service at http://sdmdataaccess.nrcs.usda.gov/.

USDA United States Depa	tment of Agriculture rcess Conservation Service Query Services for Cus	Access stom Access to Soil Data
	Home At	oout Soils Help Contact Us
Search Enter Keywords Go All NRCS Sites	Welcome to Soil Data Access	I Want To • Submit a custom request for soil tabular data
Browse by Subject ▶ Soils Home	whose purpose is to meet requirements for requesting and delivering soil survey spatial and tabular data, that are not being met by the current Soil Data Mart and Geospatial Data Gateway websites. These requirements include:	 <u>Subscribe to Soil Data</u> <u>Access News.</u> <u>Unsubscribe from Soil</u> <u>Data Access News.</u>
Web Soil Survey National Cooperative Viscos	Provide a way to request data for an ad hoc area of interest of any size. Provide a way to obtain data in real-time.	-Wap

Select "Submit a custom request for soil tabular data."

Input the following query and select "Submit Query":

SELECT AREASYMBOL, AREANAME, CONVERT(varchar(10), [SAVEREST], 126) AS SAVEREST FROM SASTATUSMAP WHERE SAVEREST > '20140116' AND SAPUBSTATUSCODE = 2 ORDER BY SAVEREST DESC, AREASYMBOL

USDA United States Department of Agriculture Natural Resources Conservation Service	
Home Query	Query Help Web Service Help Help
	ve data from the Soil Data Mart. You can choose to view the results of the query immediately or, uery to be queued and run in background. Information about the queries that may be run, <u>uery Help</u> page.
	displayed in a separate browser window. In order to view the results, popup blocking must be s used to run the query, therefore this is a good place to test any queries that you would like to on the <u>Web Service Help</u> page.
option was selected or into a single XML file if the XML opt	background, the results will be packaged either one query result set per text file if the Text ion was selected, with all files then placed in a WinZip⊗ archive (see the Downloads section of). You will be notified via e-mail when the results are ready to be downloaded, and that e-mail ed.
	more than 10,000 records can be returned to a browser. Immediate requests that can complete ust be submitted as a queued request. For queued queries, the timeout is 10 minutes and there sturned.
Please enter your SQL query:	
SELECT AREASYMBOL, AREANAME, CONVERT(varchar > '20140116' AND SAPUBSTATUSCODE = 2 ORDER BY	r(10), [SAVEREST], 126) AS SAVEREST FROM SASTATUSMAP WHERE SAVEREST A V SAVEREST DESC, AREASYMBOL
Please select the time frame and format in which you would	d like to see the results:
Immediate / XML (same format returned in the SDMTa	bularService.RunQuery web method response)
Immediate / HTML (results displayed in tables for easi	ier viewing)
Oueued / XML	Press and
O Queued / Text	
First row contains column names	Field Delimiter: Vertical Bar
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Please enter your e-mail address:	
Please confirm your e-mail address:	
If the e-mail account entered above is protected by spam order to receive e-mail notification once your query has be	blocking software, γου will need to authorize e-mail from SoilDataAccess@nrcs.usda.gov in
	Submit Query

AREASYMBOL	AREANAME	SAVEREST
AREASIMBOL		
WA661	Snohomish County Area, Washington	2014-03-25

The SSURGO data have been updated. The gSSURGO data still contain the previous, or older, data. The gSSURGO product, available from the NRCS Geospatial Data Gateway will be updated during the annual refresh. A consumer of the SSURGO data can update their copy at any time with a new download.

Obtaining gSSURGO Data

gSSURGO can be obtained as one or more statewide tiles via free download from the USDA-NRCS Geospatial Data Gateway (GDG) website located at http://datagateway.nrcs.usda.gov/. Depending on file size, the data may also be available on CD-ROM or DVD. The cost for a single CD-ROM is \$50; the cost for a single DVD is \$100.

The conterminous U.S. and/or national collection of gSSURGO data can be obtained by contacting the USDA-NRCS National Geospatial Center of Excellence (NGCE) representative Rosemary Rivera (<u>rosemary.rivera@ftw.usda.gov</u>) or by phoning (817) 509-3371. The cost for this service is \$250. The customer provides the external storage device and also pays shipping costs.

NOTE: All gSSURGO User Guide example processes shown in figures and screenshots were prepared using ESRI[®] ArcGIS[™] 10.1 software in a Microsoft[®] Windows[®] 7 operating system.

Raster Data Defined

Unlike feature layers which are made up of points, lines, or polygons, raster data is a cell-based matrix organized into rows and columns. Raster data typically possess a uniform cell size along the X and Y axes. Each cell represents a specific value (Figure 1). In the gSSURGO raster, cell values are represented by integer values, which in turn relate to the MUKEY (map unit key) for a soil map unit. Along with the original cell value, the attribute table also contains a MUKEY column.



Figure 1.—(a) An example of the traditional vector-based SSURGO map unit polygon format at 1:6,000 map scale; (b) the corresponding new raster-based Gridded SSURGO (gSSURGO) 10-meter map unit format.

Raster Format Advantages

The raster format offers significant advantages over the traditional polygon format when creating maps or performing analyses on a national, statewide, watershed, or regional basis. Map display time and geoprocessing overlay operations are enhanced 15 or 20 times. In addition, many other physical layers used in conjunction with soils data by modelers are commonly in raster format. Examples include land cover, land use, elevation, slope, and climate. Traditionally, raster was not the preferred format due to greater storage requirements. The availability of increased hard drive capacity has minimized this issue.

Raster Specifications

MapunitRaster_10m is the name of the standard file geodatabase raster contained within gSSURGO. It was created by converting the MUPOLYGON feature class to raster format using an Albers Equal Area projection. In order to facilitate analysis based upon areal calculations, a similar Albers Equal Area Conic coordinate system (meters) was selected for each geodatabase. Puerto Rico, the U.S. Virgin Islands, and the lower 48 States share in common the USA Contiguous Albers Equal Area Conic USGS version coordinate system with a horizontal datum of NAD 1983. Alaska, Hawaii, American Samoa, and the Pacific Islands Area each use a different variation of Albers Equal Area Conic coordinate system and a horizontal datum of WGS 1984.

During the conversion process, the output raster cell size is set to 10 meters and snapped to the United States Geological Survey (USGS) National Land Cover Database (NLCD 2006) 30-meter raster. This resolution was chosen to maintain the shape and extent of the original polygons without sacrificing display performance.

This resolution also enhances alignment to other raster layers, including the National Land Cover Database (NLCD) and the USDA National Agricultural Statistical Service (NASS) Cropland Data Layer (CDL). The example in Figure 1(b) exhibits moderate pixilation when compared to the vector in Figure 1(a) because it is being displayed at three times the original digitizing map scale (for illustrative purposes).

Associated Tables in the gSSURGO Database

A complete description of the tables and their relationships is included on the <u>SSURGO webpage</u>. Some of the commonly used tables are described below. Specific information is located in the SSURGO Tables and Columns Report document found on the <u>SSURGO Structural Metadata and Documentation webpage</u>.

- <u>Mapunit</u> Includes soil map unit name and prime farmland designation. Uses MUKEY as the join field with spatial data.
- <u>Muaggatt</u> Includes common soil interpretations for map units. Uses MUKEY as the join field with spatial data.
- <u>Component</u> Includes interpretations and properties for components of map units. Use of this table requires a relate since there are several records in this table for each single MUKEY in the raster data.
- <u>Chorizon</u> Includes data by horizon for components. Use of this table requires a relate since there are several records in this table for each single MUKEY in the raster data.

National Value Added Look Up (valu) Table Database

The National Value Added Look Up (valu) Table database is designed to facilitate thematic mapping for several important soil properties and interpretations. The valu1 table within this database is a compilation of 57 pre-summarized or "ready to map" attributes derived from the soil survey geographic database, including:

- Soil organic carbon
- Available water storage
- Crop productivity indices
- Crop root zone depths
- Available water storage within crop root zone depths
- Drought-vulnerable soil landscapes
- Potential wetland soil landscapes

Because this table is national in extent, it can be used in conjunction with any gSSURGO product of the same vintage. Related metadata values for themes are included (Figure 2). Table level metadata for specific column definitions are available in the Appendix.



Figure 2.—Screenshot of valu table database metadata shown in ArcCatalog™.

These attribute data are pre-summarized to the map unit level using best practice generalization methods intended to meet the needs of most users. The generalization methods include map unit component weighted averages and percent of the map unit meeting a given criteria. These themes were prepared to better meet the mapping needs of users of soil survey information and can be used with both SSURGO and gSSURGO datasets. The valu1 table contains data for all areas where SSURGO coverage exists.

Please note that some available water storage values in the valu1 table differ from similar calculations viewed in Web Soil Survey. These differences are due to the choice of method used to summarize horizon and component level data. Columns in the valu1 table for available water storage and soil organic carbon were created using strict rules for excluding map unit or component records with missing horizon information or with logical inconsistencies in component percent or horizon depth. Please review the valu table database metadata for greater detail about the valu table summary methods.

Soil Organic Carbon (SOC)

The map unit average soil organic carbon values are given in units of grams carbon per square meter for 11 standard layer or zone depths. Table column names begin with "soc." The average thickness of soil map unit component horizons used in these layer/zone calculations is also included. The standard layers include the following depth ranges:

- 0-5cm
- 5-20cm
- 20-50cm
- 50-100cm
- 100-150cm
- 150-150+cm (maximum reported soil depth)

The standard zones include:

- 0-5cm (also a standard layer)
- 0-20cm
- 0-30cm
- 0-100cm
- 0-150cm
- 0-150+cm (full reported soil depth)

Available Water Storage (AWS)

The map unit average available water storage values are given in units of millimeters for 11 standard layer or zone depths. Table column names begin with "aws." The average thickness of soil map unit component horizons used in these layer/zone calculations is also included. See the information above on soil organic carbon for a list of standard layers and zones.

National Commodity Crop Productivity Index (NCCPI)

The map unit average National Commodity Crop Productivity Index values are provided for major earthy components. (Low index values indicate low productivity, and high index values indicate high productivity.) Table column names begin with "nccpi." NCCPI values are included for corn/soybeans, small grains, and cotton crops. Of these crops, the highest overall NCCPI value is also identified. Earthy components are those soil series or higher level taxa components that can support crop growth. Major components are those soil components for which the MAJCOMPFLAG is "Yes" in the SSURGO component table. A map unit percent composition for earthy major components is provided (Dobos, Sinclair, Jr., and Robotham, 2012).

Crop Root Zone Depths

The map unit average root zone depth values for commodity crops are given in centimeters for major earthy components. Criteria for root-limiting soil depth include the presence of:

- Hard bedrock
- Soft bedrock
- A fragipan
- A duripan
- Sulfuric material
- A dense layer
- A layer having a pH less than 3.5
- A layer having an electrical conductivity greater than 12 decisiemens (dS) per meter within the component soil profile

If no root-restricting zone is identified, a depth of 150 centimeters is used to approximate the root zone depth (Dobos, Sinclair, Jr., and Robotham, 2012).

Available Water Storage within Crop Root Zone Depths

The value for map unit average available water storage within the root zone depth for major earthy components is given in millimeters. Table column is named "rootznaws."

Drought-Vulnerable Soil Landscapes

In the Drought-vulnerable soil landscapes column, map units are identified as either drought vulnerable (1) or not drought vulnerable (0). Drought-vulnerable soil landscape map units have 152 millimeters (6 inches) or less root zone available water storage for major components. Table column is named "droughty."

Potential Wetland Soil Landscapes

The potential wetland soil landscapes (PWSL version 1) information is given as the percentage of the map unit (all components) that meet the criteria for a potential wetland soil landscape. Table column is named "pwsl1pomu." Where water was determined to account for 80 percent or more of a map unit, a value of 999 was used to indicate a water body. This identifies a general water body class for mapping.

The map unit sum of the component percentage representative values is also provided as metadata.

For all columns in the valu1 table, "NULL" is used where data are incomplete or not available.

The valu1 table can be used to map 57 attributes. See examples in the following sections.

Working with the Raster Soils Layer (MapunitRaster_10m) in ArcMap™

Joining gSSURGO Data with the Muaggatt Table Using the MUKEY Field

The following example shows how to join the gSSURGO spatial data to the map unit aggregated attribute (muaggatt) table using the MUKEY field.

Start **ArcMap** with a new blank map.

Select **Add Data...** from the drop-down menu.

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Table Of Contents	Add Basemap	
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Lay		

Choose the appropriate file geodatabase (e.g., **gSSURGO_WV.gdb**), select the raster feature class (e.g., **MapunitRaster_WV_10m**), and click on the **Add** button.

Add Data				×
Look in:		gSSURGO_WV.gdb	- € 🏠 🐻 +	🖴 🖆 🗊 🚳
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Figure 3.— By default, the raster is symbolized on the Value field using a black to white color ramp.

NOTE: In Figure 3, it may appear that several areas in the south-central part are missing or contain "No Data." This, however, is not the case. Survey areas occasionally appear blank because the stretched renderer displays these areas as white. This is due to the new MUKEY values that have a much lower range than the rest.

Right-click on the raster feature class (e.g., MapunitRaster-WV_10m) and select **Open Attribute Table**.



Q Untitled - ArcMap - ArcInfo File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help 🗋 🚰 🔚 🖨 | % 👔 🛍 🗙 | 🔊 🍽 🚸 🛛 [1:2,853,766 - 🔜 🖳 🗔 🗔 🖓 🚬 🖓 .€. €. 🖑 🥝 | ;;; ;;; | (= ⇒ | |% - 🖾 | 📐 1 💷 | 🔛 🕅 📸 🐥 | 🗔 | 👰 🖕 : 🛞 🖕 📰 Identify Ψ× ٠ 3 Catalog Table Identify from: <Top-most layer> -MuRaster_WV Of Contents 2512856 Search **\$**1 1,309,081.427 1,802,604.913 M Location: Field Value Stretched value 255 Pixel value 2512856 OBJECTID 2820 MUKEY 2512856 mukey is populated Click here Identified 1 feature 🛛 🖻 😔 H 🛛 🔾 1401198.815 1630451.107 Meters

A quick way to check for missing data is to click in the white area with the **Identify** button.

If the MUKEY field contains data, the display renders white. Where the field contains "No Data," spatial data probably does not exist.

The raster attribute table contains three default fields: OBJECTID, Value, and Count.

- **OBJECTID** uniquely identifies each row in the table.
- **Value** uniquely lists each cell value contained in the raster.
- **Count** lists the number of cells that contain the cell value.

The MUKEY field (a new addition) will be used to join with other soil attribute tables containing the MUKEY column.

Tab	le					1
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M	Raster WV					>
	OBJECTID *	Value	Count	MUKEY		
F	+	512826	8572	512826		
	2	512827	35755	512827		
	3	512828	284570	512828		
	4	512829	977449	512829		
	5	512830	877836	512830		
	6	512831	23546	512831		
	7	512832	17986	512832		
	8	512833	37135	512833		
	٥	517834	10620	512834		"
	4 4	1))		(0 out of	f 2954 Selected)	
	uRaster_WV					

Select the Table Options drop-down arrow and click on Select All.

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Find & Replace	
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Switch Selection	
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Add Field	
Turn All Fields On	
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Arrange Tables	
Restore Default Column Widths	
Restore Default Field Order	
Joins and Relates	
Related Tables	
Create Graph	
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28 512853 156968 512853	-
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MuRaster_WV	

A warning may pop up indicating that the table may contain a large number of records and that the select operation may take significant time.



ArcMap	X
4	This table (potentially) contains a large number of records and the Select All operation could take a long period of time. Do you want to continue?
	Yes No

Both the ArcMap display and attribute table windows now show all records selected.



A join is typically established using the **Add Join** tool. This will temporarily append the fields of one table to another with a common attribute, e.g., MUKEY. In ArcGIS[™] 10.0, however, temporary joins do not allow symbolization of the data using a classified renderer. It is best to use the **Join Field** tool to permanently add the fields to the table for symbolization purposes. The fields can be dropped later, if necessary. In ArcGIS[™] 10.1, the longer column names are truncated using a temporary join.



Click on the red toolbox icon to open **ArcToolbox**.

Expand Data Management Tools, expand the Joins tools, and double-click on the Join Field tool to open a dialog box.



Complete the **Join Field** dialog box:

- For the Input Table, select MapunitRaster_WV_10m.
- For the Input Join Field, select **MUKEY.**
- For the Join Table, browse to muaggatt.
- For the Output Join Field, select mukey.
- For the Join Fields (optional), check musym, muname, aws0150wta, and hydgrpdcd.
- Click OK.

🔨 Join Field	
✓ Join Field Input Table MepunitRaster_WV_10m Input Join Field MUKEY Join Table C:\gSSURGO14\user_guide\West-Virginia\gSSURGO_WV.gdb\muaggatt Output Join Field mukey Join Field mukey Join Field (optiona) ✓ musym ✓ muname mustatus Sopegradvta brockdepmin wtdepannmin flodfreqdcd ✓	Join Fields (optional) The fields from the join table to be included in the join.
OK Cancel Environments << Hide Help	Tool Help

The attribute table will now contain the additional fields: Mapunit Symbol (musym), Mapunit Name (muname), Available Water Storage 0-150 cm – Weighted Average (aws0150wta), and Hydrologic Group – Dominant Conditions (hydgrpdcd).

Table						
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MuRaster_WV						
Г	Mapunit Symbol	Mapunit Name	Available Water Storage 0-150 cm - Weighted Average	Hydrologic Group - Dominant Conditions	-	
F	AgB	Allegheny loam, shale substratum, 3 to 8 percent slopes	22.05	В		
	AgC	Allegheny loam, shale substratum, 8 to 15 percent slopes	22.05	В		
	CDD	Clymer-Dekalb complex, moderately steep	10.34	В	_	
Г	CDE	Clymer-Dekalb complex, steep	10.19	В	_	
Г	CDF	Clymer-Dekalb complex, very steep	9.8	В	_	
	CaC	Clymer loam, 10 to 20 percent slopes	12.54	В	_	
Г	CoB	Coolville silt loam, 3 to 10 percent slopes	21.73	C	_	
Г	CoC	Coolville silt loam, 10 to 20 percent slopes	21.73	С	_	
Г	CrC3	Coolville silty clay loam, 10 to 20 percent slopes, severely eroded	21.73	C	-	
•					Þ.	
I						
N	1uRaster_WV					

TIP: If the attribute table does not display the additional columns after processing is complete, exit and restart ArcMap[™]. Add the raster and open the attribute table. The additional columns will appear.

Symbolize the data based on the entries for Hydrologic Group – Dominant Conditions.

Right-click on the raster layer and select **Properties...**



Page | 23

Select the **Symbology** tab in the **Layer Properties** dialog box.

In the Show group, select **Unique Values**.

From the Value Field drop-down menu, select **hydgrpdcd**.

Choose a color palette from the **Color Scheme**.

Click OK.

ayer Properties				? <mark>×</mark>
General Source Extent	Display Symbology Fields J	Joins & Relates		
Show: Unique Values	Draw raster assigning a colo	r to each value	Import.	
Stretched	Value Field	Color Scheme		-
Discrete Color	hydgrpdcd		-	
	Symbol <value></value>	Label	Count	
	<pre><all other="" values=""> </all></pre> <heading></heading>	<all other="" values=""> hydgrpdcd</all>		
	A	A	19721420	
	B	В	14484803	=
	B/D	B/D	9398700	
	c	С	37456708	
	C/D	C/D	10886327	
	P	D	50860551	
	Add All Values	Add Values	Remove	
	Default Colors			
	Colormap -	Display No	Data as	-
		ОК	Cancel	Apply

The dominant condition for the map unit is rendered for Hydrologic Group.



Available water storage is best symbolized using the classified renderer.

Right-click on the raster layer and select **Properties...**



Select the **Symbology** tab in the **Layer Properties** dialog box.

In the Show group select **Classified**.

From the **Fields** drop-down menu, select **aws0150wta**.

Choose a color palette from the **Color Ramp**.

Click OK.

	Display Symbology Fields	Joins & Relates	
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	7.789999962 - 11.619		
	11.61999989 - 16.049		
	16.04999924 - 22.559		
10.1	22.55999947 - 42.229	999954 22.55999948 - 42.	22999954
	Show class breaks using cell v	alues Di	splay NoData as
		Z: 1	
1	Use hillshade effect		





Clicking on the Symbol, Range, or Label column heading in the Layer Properties dialog box allows the user to alter settings, such as the number of decimal places. Changing these settings will also change the layer's legend in the Table of Contents and make it easier to read.

General Source Extent	Display Symbology Fields Joins & Relates	
how: Unique Values Classified Stretched Discrete Color	Draw raster grouping values into classes Fields Value aws0150wta Classification Natural Breaks (Jenks) Color Ramp	Classify
	11.84000015 - 16.12000084 11.8400001	54 - 11.84000015 16 - 16.12000084 35 - 22.559999947
About symbology	Show class breaks using cell values	Display NoData as

Other Classification Methods

The previous screenshot used the ArcGIS[®] default Natural Breaks (Jenks) classification method. Other classification options can be applied. It is important to consult a subject matter expert to ensure that appropriate and meaningful breaks are applied to the data.

Removing Join Columns from the Attribute Table

As mentioned earlier in this section, using **Add Join** in ArcGIS[™] 10.0 does not allow symbolization of the data using the classified methods. It is best to use the **Join Field** tool to permanently add the fields to the table for symbolization purposes. The following example demonstrates how to drop columns in the attribute table.

Choose the ArcToolbox tool Delete Field to delete multiple fields quickly.

Click on the red toolbox icon to open **ArcToolbox**.

Expand Data Management Tools, expand Fields, and double-click on the Delete Field tool to open a dialog box.



Complete the **Delete Field** dialog box:

- For the Input Table, select MapunitRaster_WV_10m.
- Place a check in the box beside the name of the field(s) that you want to delete.
- Click OK.

Notes Field	in the second		
Delete Field Input Table MapunitRaster_WV_10m Drop Field Value Count MUKEY Image: Image with the state of the sta	Add	The field exis	Put Table A table containing the ds to be deleted. The sting input table will be dified.
	OK Cancel Environments	< Hide Help	Tool Help

WARNING: Do NOT try to delete the Value, Count, or MUKEY columns. The Value and Count columns are managed by the geodatabase and cannot be deleted or calculated. See the section "Restoring MUKEY Values in Raster Layers" in the event that the MUKEY column or data is lost.

TIP: If, after processing is complete, the attribute table does not display with the additional fields removed, exit and restart ArcMap[™]. Add the raster and open the attribute table. The additional columns should be gone.

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.

Relationship classes can be used to:

- Navigate through related tables using the Identify button
- Select related records in related tables

In the following example, the relationship is traced between the Mapunit Polygon attribute table and the Component Geomorphic Description (cogeomordesc) Table. This is a "top down" approach. It can be useful to "drill down" through the component and horizon tables to investigate differences in interpretation values between adjacent surveys.

The selection sequence is: MUPOLYGON feature class, mapunit, component, cogeomordesc.

There must be relationship classes in the geodatabase for this to succeed.

Start **ArcMap** with a new blank map.

Select Add Data... from the drop-down menu.



Choose the appropriate file geodatabase (e.g., **MapunitRaster_WV_10m**), select the vector feature class (e.g., **MUPOLYGON**), and click on the **Add** button.


Use the **Identify** button to click on a single polygon.



The Identify results window can be docked in the ArcMap window.



Click on the **plus sign (+)** under the Mapunit Polygon and beside the area symbol (e.g., WV611) in the Identify results window.



The Mapunit Table is shown.

Click on the **plus sign (+)** beside the Mapunit Table in the Identify results window to expand.



The result displays the map unit for the selected polygon "Culleoka-Westmoreland silt loams, 15 to 25 percent slopes."

Select the **plus sign (+)** beside the map unit name in the Identify results window to expand the selected map unit.



The display shows the relationship classes created from the Mapunit Table and its child tables.

If the table does not contain records, there will not be a corresponding plus sign beside the table.

Select the **plus sign (+)** beside the Component Table in the Identify results window to expand.

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- Mapunit Polygon	CwE GuF GuF
B-WV611	CWE DaD
🖮 < Mapunit Table	CWE CWD DgD
🖻 Culleoka-Westmoreland silt loams, 15 to 25 percent slopes	
Mapunit Text Table	
Mapunit Crop Yield Table	GUE A
E > Component Table	
Other soils	CKC W
De Culleoka	
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	GUF GUE
	DgD (AgC)
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Location: 1,342,851.681 1,952,249.631 Meters	11112 bod
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Shape Polygon	
Managemetel	

The map unit components—Other soils, Culleoka, and Westmoreland—are displayed.





The display shows the relationship classes for the child tables of the Culleoka component.

Expand the **plus sign (+)** beside the Component Geomorphic Description Table in the Identify results window.



The landform and landscape positions of the Culleoka component are displayed.

Expand the **plus sign (+)** beside each Landform and Landscape choice in the Identify results window.





In order for the values to make sense, click on the individual numeric values to decode.

The table aliases are displayed in the Identify results tree. A table alias is one of the properties that was set when the relationship classes were created.

The Landform record can also be expanded to display information contained in four child tables of the Component Geomorphic Description Table. In this example, no related information exists in the Component Microrelief Surface Morphometry Table.

Using Relationship Classes to Find Related Records in Related Tables

In the following example, the relationship is traced between the Component Geomorphic Description (cogeomordesc) Table and the Map Unit Polygon attribute table. This is the "bottom up" approach.

The selection sequence is: cogeomordesc, component, mapunit, MUPOLYGON feature class.

Begin with the cogeomordesc table and find map units containing "flood plains."

Select Add Data...from the drop-down menu.

Choose the appropriate file geodatabase (e.g., **gSSURGO_WV.gdb**), select the table (e.g., **cogeomordesc**), and click on the **Add** button.



Right-click on the table name and choose **Open**.

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Narrow the number of records to work with.

Click on the **Select by Attributes** button in the Table dialog box.

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Т	OBJECTID *	Feature Type	Feature Name	Feature Modifier	Feature ID	Exists On Feature ID	RV?	Component Key *	
•	1	Landform	stream terraces	<null></null>	<null></null>	<null></null>	Yes	1155533:815557	
Ī	2	Landscape	river valleys	<null></null>	<null></null>	<null></null>	Yes	1155533:815557	_
	3	Landform	hillslopes	<null></null>	2	1	Yes	1155534:754716	-
٦	4	Landscape	hills	<null></null>	1	<null></null>	Yes	1155534:754716	-
1	5	Landscape	hills	<null></null>	<null></null>	<null></null>	Yes	1155534:779356	-
٦	6	Landform	ridges	<null></null>	<null></null>	<null></null>	Yes	1155534:779356	-
Т	7	Landscape	hills	<null></null>	<null></null>	<null></null>	Yes	1155535:1461012	-
1	8	Landform	ridges	<null></null>	<null></null>	<null></null>	Yes	1155535:1461012	-
1	9	Landform	mountain slopes	<null></null>	<null></null>	<null></null>	Yes	1155535:815559	-
	10	Landscape	mountains	<null></null>	<null></null>	<null></null>	Yes	1155535:815559	-
	11	Landform	flood plains	<nulls< td=""><td><nulls< td=""><td><nulls< td=""><td>Ves</td><td>1155538-1472319</td><td></td></nulls<></td></nulls<></td></nulls<>	<nulls< td=""><td><nulls< td=""><td>Ves</td><td>1155538-1472319</td><td></td></nulls<></td></nulls<>	<nulls< td=""><td>Ves</td><td>1155538-1472319</td><td></td></nulls<>	Ves	1155538-1472319	
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Complete the Select by Attributes dialog box:

- Double-click on **geomfname** (Feature Name).
- Single-click on equals sign (=).
- Click on the **Get Unique Values** button for a list of values for the feature name field.
- Double-click on **flood plains** to complete the selection.
- Select Apply.

Select by Attributes						
Enter a WHERE clause to select records in the table window.						
"OBJECTID"						
"geomfname" "geomfname" "geomfmod"						
"geomfeatid"						
= step 2 ; Tans'						
> >= And fills' flats'						
<pre></pre>						
Tree faces'						
_ % () Not gravel pits'						
Is step 3 Get Unique Values Go To:						
SELECT * FROM cogeomordesc WHERE:						
"geomftname" = 'flood plains'						
Clear Verify Help Load Save						
step 5 Apply Close						

eomordesc								
OBJECTID *	Feature Type	Feature Name	Feature Modifier	Feature ID	Exists On Feature ID	RV?	Component Key *	Т
933	Landscape	hills	<null></null>	1	<null></null>	Yes	9845509	٦
934	Landscape	hills	<null></null>	2	<null></null>	Yes	9845510	П
935	Landform	flood plains	<null></null>	1	2	Yes	9845510	П
936	Landscape	hills	<null></null>	1	<null></null>	Yes	9845511	
937	Landform	terraces	high	2	1	Yes	9845511	٦
938	Anthropogenic Feature	fills	<null></null>	<null></null>	<null></null>	Yes	9845513	٦
939	Anthropogenic Feature	cuts (road, railroad, etc.)	<null></null>	<null></null>	<null></null>	No	9845513	
940	Landform	flood plains	<null></null>	2	1	Yes	9845514	
941	Landscape	alluvial plains	<null></null>	1	<null></null>	Yes	9845514	
942	Landscape	alluvial plains	<null></null>	1	<null></null>	Yes	9845515	
943	Landform	flood plains	<null></null>	2	1	Yes	9845515	
944	Landform	flood plains	<null></null>	<null></null>	<null></null>	Yes	9845516	
945	Landscape	alluvial plains	<null></null>	1	<null></null>	Yes	9845516	
946	Anthropogenic Feature	quarries	<null></null>	<null></null>	1	Yes	9845517	
947	Landscape	mountains	<null></null>	1	<null></null>	Yes	9845517	
948	Landform	drainageways	<null></null>	2	1	Yes	9845518	
949	Landscape	mountain systems	<null></null>	1	<null></null>	Yes	9845518	
950	Landscape	mountains	<null></null>	1	<null></null>	Yes	9845519	
951	Landform	mountain slopes	<null></null>	2	1	Yes	9845519	
952	Landscape	hills	<null></null>	1	<null></null>	Yes	9845520	
953	Landform	streams	heads of	3	1	Yes	9845520	1
954	Landform	hillslopes	bases of	2	1	Yes	9845520	1
055	Landform	hillelonee	hasas of	2	1	Vae	08/6521	_

In this example, the query selected 722 records from the 9077 contained in the table.

Add the Component Table to the Table of Contents:

Click the down arrow next to **Table Options** in the cogeomordesc table dialog box.

Click on the arrow next to **Related Tables**.

Select Component Table.

	Find and Replace Select By Attributes		Feature Name	Feature Modifier	Feature ID	Exists On Feature ID	RV?	Component Key *
		hills		<null></null>	1	<null></null>	Yes	9845509
A	Clear Selection	hills		<null></null>	2		Yes	9845510
1	Switch Selection	floo	d plains	<null></null>	1		Yes	9845510
	Select All	hills	and the second sec	<null></null>	1	Contract Con	Yes	9845511
П	Select All	ter	aces	high	2	1	Yes	9845511
	Add Field	fills		<null></null>	<null></null>	<null></null>	Yes	9845513
	Turn All Fields On	cut	s (road, railroad, etc.)	<null></null>	<null></null>	<null></null>	No	9845513
-		floo	od plains	<null></null>	2	1	Yes	9845514
1	Show Field Aliases	allu	vial plains	<null></null>	1	<null></null>	Yes	9845514
	Arrange Tables	allu	vial plains	<null></null>	1	<null></null>	Yes	9845515
		floo	od plains	<null></null>	2	1	Yes	9845515
	Restore Default Column Widths	floo	od plains	<null></null>	<null></null>	<null></null>	Yes	9845516
	Restore Default Field Order	allu	vial plains	<null></null>	1	<null></null>	Yes	9845516
		qua	irries	<null></null>	<null></null>	1	Yes	9845517
_	Joins and Relates	mo	untains	<null></null>	1	<null></null>	Yes	9845517
	Related Tables	•	zCogeomordesc_Cosurfm	orphgc : > Component Three	Dimensional Sur	face Morphometry Table	(es	9845518
lb.	C C			orphhpp : > Component Two	Dimensional Com	fa an Manahamata, Tabla	res	9845518
llo	Create Graph						'es	9845519
	Add Table to Layout		zCogeomordesc_Cosurfm	orphmr : > Component Micro	orelief Surface Mo	orphometry Table	'es	9845519
~	Reload Cache		zCogeomordesc Cosurfm	orphss : > Component Slope	Shape Surface Mo	orphometry Table	res	9845520
2	Reload Cache						es	9845520
8	Print		zComponent_Cogeomord	esc : < Component Table			es	9845520
	Reports	hills	lopes	bases of	2	1	Yes	9845521
		stre	eams	heads of	3	1	Yes	9845521
	Export	hills		<null></null>	1	<null></null>	Yes	9845521
	Appearance	hills		<null></null>	1	<null></null>	Yes	9845522
-	, ppearance in	ridg	jes	broad	4	1	Yes	9845522
	960 Landform	ber	iches	<null></null>	2	1	Yes	9845522
	961 Landform	hills	lopes	gentle	3	1	Yes	9845522
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OBJECTID *	Comp % - Low Value	Comp % - Representative Value	Comp % - High Value	Component Name	Component Kind	Major Co
11		100	<null></null>	Atkins	Series	Yes
13		95	<null></null>	Chagrin	Series	Yes
14		5	<null></null>	Dunning	Series Series	No No
17		5	<null></null>	Dunning Dunning	Series	No
22		100	<null></null>	Dunning	Series	Yes
27		95	<null></null>	Huntington	Series	Yes
28	B <null></null>	5	<null></null>	Melvin	Series	No
29		5	<null></null>	Dunning	Series	No
30		95	<null></null>	Lindside	Series	Yes
32		5	<nul></nul>	Atkins	Series	No
		95	<null></null>	Philo Sensabaugh	Series Series	Yes Yes
33	0 zMulls			-		
79			<nulls< td=""><td>Sensahaunh</td><td>Series</td><td>Ves</td></nulls<>	Sensahaunh	Series	Ves
	0 <null></null>	65	<null></null>	Sensabaugh Sensabaugh	Series Series	Yes
79	0 <null> 5 <null></null></null>	65		Sensabaugh Sensabaugh Sensabaugh		
79 80 85	0 <null> 5 <null> 6 <null></null></null></null>	65 70	<null></null>	Sensabaugh	Series	Yes
79 80 85 86 87 90	0 <null> 5 <null> 6 <null> 7 <null> 0 <null> 0 <null></null></null></null></null></null></null>	65 70 75 3 3	<null> <null> <null> <null></null></null></null></null>	Sensabaugh Sensabaugh Melvin Melvin	Series Series Series Series	Yes Yes No No
79 80 89 80 80 80 81 90 91 97	0 <nuli> 5 <nuli> 6 <nuli> 7 <nuli> 0 <nuli> 0 <nuli> 7 <nuli> 7 <nuli> 10 <nuli> 10</nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli>	65 70 75 3 3 3 3	<null> <null <nul<="" <null="" td=""><td>Sensabaugh Sensabaugh Melvin Melvin Melvin</td><td>Series Series Series Series Series</td><td>Yes Yes No No No</td></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null>	Sensabaugh Sensabaugh Melvin Melvin Melvin	Series Series Series Series Series	Yes Yes No No No
79 80 85 86 87 90 90 97 91 91	0 <null> 5 <null> 6 <null> 7 <null> 0 <null> 7 <null> 8 <null></null></null></null></null></null></null></null>	65 70 75 3 3 3 3 3 3 3	<null> <null <null="" <null<="" td=""><td>Sensabaugh Sensabaugh Melvin Melvin Melvin Melvin</td><td>Series Series Series Series Series Series</td><td>Yes Yes No No No No</td></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null>	Sensabaugh Sensabaugh Melvin Melvin Melvin Melvin	Series Series Series Series Series Series	Yes Yes No No No No
79 80 85 86 87 90 97 96 96 99	0 <null> 5 <null> 6 <null> 0 <null> 1 <null> 0 <null> 0 <null> 0 <null> 0 <null> 0 <null></null></null></null></null></null></null></null></null></null></null>	65 70 3 3 3 3 3 3 3 3 3 3 3 3	<nul> <nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul>	Sensabaugh Sensabaugh Melvin Melvin Melvin Melvin Melvin	Series Series Series Series Series Series Series	Yes Yes No No No No No
79 80 88 80 90 90 97 90 90 90 90 90 90 90 90 90 90 90 90 90	0 <nuii> 5 <nuii> 5 <nuii> 6 <nuii> 7 <nuii> 7 <nuii> 8 <nuii> 8 <nuii> 9 </nuii> 9 10</nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii></nuii>	65 70 75 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	<nul> <nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul>	Sensabaugh Sensabaugh Melvin Melvin Melvin Melvin Melvin Melvin	Series Series Series Series Series Series Series Series Series	Yes Yes No No No No No No
79 80 85 86 87 90 97 97 98 99 99	0 <nuli> 5 <nuli> 6 <nuli> 7 <nuli> 8 <nuli> 7 <nuli> 8 <nuli> 9 <nuli> 0 <nuli> 3 <nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli></nuli>	65 70 3 3 3 3 3 3 3 3 3 3 3 3	<nul> <nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul>	Sensabaugh Sensabaugh Melvin Melvin Melvin Melvin Melvin	Series Series Series Series Series Series Series	Yes Yes No No No No No
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75 88 88 90 91 91 92 92 92 100 100 100 100 100 110 111	0 <nuli> 5 <nuli> 6 <nuli> 7 <nuli> 8 <nuli> 9 <nuli> 10 <nuli> 11 12 13 10 10 10 11 12 13 14 15 <</nuli></nuli></nuli></nuli></nuli></nuli></nuli>	65 70 75 3 3 3 3 3 3 3 3 3 3 5 5 5 5 5 5 5 80 80 80	<nul> <nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul>	Sensabaugh Sensabaugh Metvin Metvin Metvin Metvin Metvin Metvin Metvin Lobdell Lündside Chagrin	Series	Yes Yes No No No No No No No Yes Yes Yes
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75 88 88 90 91 91 92 92 92 100 100 100 100 100 110 114	0 <null> 5 <null> 6 <null> 7 <null> 7 <null> 8 <null> 9 <null> 0 <null> 10 <null> 11 12 <null> 13 <null> 14 14 15 <<null></null></null></null></null></null></null></null></null></null></null></null></null>	65 70 75 3 3 3 3 3 3 3 3 3 3 5 5 5 5 5 5 5 80 80 80	<nul> <nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul></nul>	Sensabaugh Sensabaugh Metvin Metvin Metvin Metvin Metvin Metvin Metvin Lobdell Lündside Chagrin	Series	Yes Yes No No No No No No No Yes Yes Yes

The component table is added to the Table of Contents and will open with all related records selected. In this example, 717 records out of 4424 were selected.

Add the Mapunit Table to the Table of Contents:

Click the down arrow next to **Table Options** in the component table dialog box.

Click on the arrow next to **Related Tables**.

Select Mapunit Table.

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5 C	g (Chagrin fine sandy loam	Consociation
7 CI	kB (Clarksburg silt loam, 3 to 8 percent slopes	Consociation
8 CI	kC (Clarksburg silt loam, 8 to 15 percent slopes	Consociation
11 Di		Dunning silt loam	Consociation
14 Hi		Huntington silt loam	Consociation
15 Lo		Lindside siit loam	Consociation
19 Pł		Philo silt loam	Consociation
68 Lr		Lindside silt loam, 0 to 3 percent slopes, occasionally flooded	Consociation
69 H		Huntington silt loam, 0 to 3 percent slopes, occasionally flooded	Consociation
70 Lo		Lobdell silt loam, 0 to 3 percent slopes, occasionally flooded	Consociation
79 SI 83 CI		Skidmore gravelly loam, 0 to 3 percent slopes, occasionally flooded	Consociation
83 CI 85 Ci		Cotaco silt loam, 0 to 3 percent slopes, rarely flooded Chagrin-Melvin complex, 0 to 3 percent slopes, frequently flooded	Consociation
		Huntington-Urban land complex, 0 to 3 percent slopes, requently nooded	Complex Complex
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		Urban land-Chagrin complex, 0 to 3 percent slopes	Complex
114 St		Sensabaugh-Urban land complex, 0 to 3 percent slopes, occasionally flooded	Complex
115 SI	-	Sensabaugh-Urban land complex, 3 to 8 percent slopes, rarely flooded	Complex
116 Se	eA S	Sensabaugh silt loam, 0 to 3 percent slopes, occasionally flooded	Consociation
117 St	fB :	Sensabaugh silt loam, 3 to 8 percent slopes, rarely flooded	Consociation
118 C	cA (Chagrin silt loam, 0 to 3 percent slopes, protected	Consociation
119 Ca	aA	Chagrin silt loam, 0 to 3 percent slopes, occasionally flooded	Consociation
		Udorthents, earthen dam	Consociation
127 UI		Elk silt loam, 3 to 8 percent slopes	Consociation
129 Ek	0	Huntington silt loam	Consociation
129 Ek 135 Hr			Complex
129 Ek 135 Hr 136 Hr	u I	Huntington-Urban land complex	
129 Ek 135 Hr 136 Hr 137 No	u	Nolin loam	Consociation
129 Ek 135 Hr 136 Hr 137 No 139 Si	u o k		
129 Ek 135 Hr 136 Hr 137 No	u	Nolin loam	Consociation

The Mapunit Table is added to the Table of Contents and will open with all related records selected. In this example, 467 of 2983 records were selected.

View the selected flood-plain feature in the map unit polygon layer:

Click the down arrow next to the **Table Options** button in the Mapunit Table dialog box.

Click on the arrow next to **Related Tables**.

Select MapUnit Polygon Layer.

This may take some time to process, depending on how many records are selected.

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_			grin fine sandy loam		Consociation	
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M	Select All	- 1	sburg silt loam, 8 to 15 percent slopes		Consociation	
			ning silt loam		Consociation	
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33		WV604	4	CkC	1602549	1161.024437	56349.323638	
44		WV604	4	Ни	1602567	1580.060571	70314.185366	
85		WV604	4	CkC	1602549	1039.730637	32525.441841	
86		WV604	4	CkC	1602549	856.707043	31572.597714	
111		WV604	4	CkC	1602549	1218.251909	77647.253274	
125		WV604		CkB	1602548	564.684375	20258.980694	
140		WV604	4	Ld	1602570	1289.803887	29891.708369	
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274		WV604	4	Hu	1602567	1184.867172	39110.925514	
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293		WV604	4	Hu	1602567	3443.940949	90887.311425	
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	Polygon	WV604		CkC	1602549	1476.786901	41026.58961	
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In this example, 38413 map unit polygons have a component with the landform "flood plain."

The Map Unit Polygons feature class is already in the Table of Contents.

Check the box next to the MapUnit Polygons feature class in the Table of Contents to display the data.



At the end of this "bottom up" approach to relationship classes is a display of flood-plain map units.

NOTE: In this example, the percentages of the components were not taken into consideration, only the presence or absence of flood plains.

Performance Tips

Displaying Layers in the ArcMap[™] Table of Contents

Making Newly Added Layers Visible by Default

Normally ArcMap[™] automatically begins to display a map layer as soon as the user adds it to the Table of Contents. When working with very large feature classes that have thousands, if not millions, of records, turning off the default draw can greatly speed up the process. This gives the user an opportunity to first modify the layer symbology or to zoom to a new location. This default setting can easily be changed by the user and need only be changed once.

Select Customize, then ArcMap Options...

Q Untitled - ArcMap - ArcInfo	
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Table Of Contents ₽ × Image: Second secon	Add-In Manager Customize Mode Style Manager
	ArcMap Options

Select the **General** tab from the ArcMap Options dialog box.

In the General section, uncheck the box next to Make newly added layers visible by default.

Select OK.

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The West Virginia file geodatabase has been added. There are more than 400,000 records in the geodatabase. The layer did not automatically draw after adding to the Table of Contents. Selecting a smaller area of interest before proceeding will help speed up the process.



Selecting an Area of Interest to Reduce the Number of Records

If a specific area is needed, a selection to reduce the number of records to draw in the display area is useful.

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		Selection options.	1

Complete the **Select by Attributes** dialog box:

- Select Map Unit Polygons for Layer.
- Double-click on "AREASYMBOL".
- Single-click on Like.
- Click on the **Get Unique Values** button.
- Double-click on **'WV604'**.
- Click OK.

Select By Attributes	x
Layer: Map Unit Polygons - WV	J
Method: Create a new selection	-
"OBJECTID" "AREASYMBOL" "SPATIALVER" "MUSYM" "MUKEY"	
= <> Like WV602' >> > And WV603' <	•
"AREASYMBOL" LIKE 'WV6041	+
Clear Verify Help Load Save OK Apply Close	

Creating a layer file to be used over and over again for analysis will eliminate the need to create a selected set each time specific data are needed.

Creating a Layer File from Selected Features

Right-click on the feature class (e.g., MapUnit Polygons-WV), click on arrow next to Selection, and select Create Layer From Selected Features.

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	Selection Edit Features Edit Features Convert Labels to Annotation Convert Features to Graphics Convert Symbology to Representation Data Save As Layer File Create Layer Package Properties		 Pan To Selected Features Clear Selected Features Switch Selection Select All Make This The Only Selectable Layer Copy Records For Selected Features Annotate Selected Features Create Layer From Selected Features 	E	



The new layer is automatically added to the Table of Contents. Adjust the symbology, if desired.

Using a Layer Definition Query to Reduce the Number of Selected Records

A definition query can be used to reduce the number of records before displaying in ArcMap[™].

Right-click on the feature class (e.g., Map Unit Polygons - WV) and select Properties...

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Select the **Definition Query** tab in the Layer Properties dialog box.

Select Query Builder...

Layer Properties	? ×
General Source Selection Display Symbology Fields Definition Query Labels Joins & Relates Time	HTML Popup
Definition Query:	
Query Builder	
OK Cancel	Apply

Complete the Query Builder dialog box:

- Double-click on "AREASYMBOL".
- Single-click on Like.
- Click on the **Get Unique Values** button.
- Double-click on **'WV604'**.

"OBJECTID" "AREASYMBOL" "SPATIALVER"		* E
"MUSYM" "MUKEY"		
= <> Like	'WV602' 'WV603'	•
> >= And	'WV604'	
< <= Or	'WV608' 'WV610'	
_% () Not	'WV611'	-
ls	Get Unique Values Go T	o:
SELECT * FROM MUPOL		12
"AREASYMBOL" LIKE "	VV604	1
		-
Clear Verify	Help Load.	Save
		Cancel

Click OK.

Check the box next to the feature class in the Table of Contents to display the selected records.

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Bookmarks

A bookmark can be created to reduce the time it takes to navigate to an area of interest.

_ O <mark>_ X</mark> Q WV_test - ArcMap Geoprocessing Customize Windows Help File Edit View Bookmarks Insert Selection 🗋 🚰 🖶 🖨 🗆 Create Bookmark... 41,561 - 🛃 🖽 🇊 🗟 🖾 加 🦕 🗨 🔍 🖑 🥥 🕌 🚮 Manage Bookmarks... 0) 🥖 💷 | 🔛 👖 👫 🖉 | 🗔 | 🗨 🖕 WV604 Table Of Contents Ψ× ^ 词 🐮 🔋 🗇 🐥 🔯 🏠 🗉 Catalog 🖃 🥩 Layers C:\gSSURGO14\user_guide\West-Virginia\gSSURGO_WV.gdb 🗉 🗹 Map Unit Polyg Ξ 🗄 🔲 MapunitRaster_WV_10m cogeomordesc component 💷 mapunit 🖾 🖻 😂 H 🕢 1261801.212 2067962.464 Meters

Select Bookmarks, then Create Bookmark...

Enter a bookmark name that can be used to navigate to a particular area, (e.g., **WV604**).

Click OK.

Create Bookmark	×
Bookmark Name: WV604	OK Cancel

Click on **Bookmarks** and the bookmark name.



ArcMap[™] will go directly to the area of interest.

The **Manage Bookmarks...** option in the **Bookmarks** menu can be used to delete bookmarks that are no longer needed. It can also be used to arrange the order of the bookmarks that appear in the drop-down box.

Turning Off Field Aliases in Attribute Tables

A geodatabase can store aliases for column or field names. This makes it easier to view a table. The longer names, however, can result in a very wide table. The field aliases can easily be turned off using the **Options** button at the bottom.

The field aliases are "off".

Table			
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hzdept_l	hzdept_r	hzdept_h	hzdepb_l
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102	127	208	127
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5	8	23	10
10	15	24	15
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Click on the down arrow next to the **Table Options** button in the dialog box and select **Show Field Aliases**.

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Find and Replace			
Select By Attributes	hzdept_r	hzdept_h	hzdepb_l
Clear Selection	112	170	102
	127	208	127
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Turn All Fields On	81	91	81
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Show Field Aliases	81	91	81
Arrange Tables	97	122	100
	112	170	102
Restore Default Column Widths	127	4 208	127



The field aliases are "on".

Displaying Very Large Rasters

There are settings or options in ArcMap[™] that can affect the way raster layers are displayed. In this example, the raster layer (October 2012 CONUS gSSURGO geodatabase) contains 290,786 unique MUKEY values.



ArcMap[™] normally defaults to the "stretched value" renderer for raster layers.

Attempting to alter symbology for an existing raster layer may not be possible for the **Unique Values** option.

Layer Properties		? ×
General Source Extent Display Symbology Fields Joins & Relates		
Show: Unique Values Classified Discrete Color Stretched Discrete Color	Import	
Too many unique values Image: Constraint of the second	×	
ОК	Cancel Ap;	ylq

If not possible, a warning message is displayed.

Open the attribute table for the offending raster.

Т	OBJECTID *	Value	Count	MapUnit Key	
	1	1	641485	523045	1-
ſ	2	2	151950	523046	
	3	3	189526	523047	
	4	4	2027428	523048	
	5	5	308991	523049	
	6	6	267676	523050	
	7	7	34879	523051	
	8	8	473239	523052	
	9	9	766077	523053	
	10	10	25025	523054	
	11	11	409946	523055	
	12	12	1895560	523056	
	13	13	423489	523057	
	14	14	273796	523058	
	15	15	59993	523059	
14	▲	ж н			1.0

The number of unique values is listed at the bottom left corner.

To alter the values to display a large raster, from the ArcMap[™] menu:

Select Customize.

Select ArcMap Options...



Select the **Raster** tab.

Change the maximum number of unique values to render to a number greater than would normally be in the data.

Select OK.

General	Data View	Layout View	Metadata	Tables	1	
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☑ Promp ☑ Create	t for subdataset se e Tiled <u>T</u> IFF	he coordinates of the r	raster		ArcMap Out of mem	

WARNING: Setting this value too high, especially on a Windows XP computer, can cause ArcMap[™] to use up all of the available RAM and crash the application.

Computers running Windows[®] 7 with 8 gigabytes or more of RAM may allow this value to be set to 300,000 or greater.

Restoring MUKEY Values in Raster Layers

Depending upon the version of ArcGIS being used, some geoprocessing procedures can cause the MUKEY column to be lost from the attribute table of output raster layers. The MUKEY column can be manually added to the raster.

Open the attribute table of the raster (e.g., MapunitRaster_WV_10m) to add the field and calculate the value.

Right-click on the raster feature class (e.g., MapunitRaster_WV_10m) and select Open Attribute Table.



Click on the down arrow next to the Table Options button in the dialog box and select Add Field...

able					
-	🗄 - 🔓 🌄 🛛 🕮 🗙				
1	Find and Replace				
	Select By Attributes	Y	Mapunit Symbol	Mapunit Name	
7	Clear Selection		AgB	Allegheny loam, shale substratum, 3 to 8 percent slopes	-
	lear Selection		AgC	Allegheny loam, shale substratum, 8 to 15 percent slopes	
	Switch Selection	5	CDD	Clymer-Dekalb complex, moderately steep	
2	Select All		CDE	Clymer-Dekalb complex, steep	
T	Select All	-	CDF	Clymer-Dekalb complex, very steep	
	Add Field		CaC	Clymer loam, 10 to 15 percent slopes	
	Turn All Fields On	-	CoB	Coolville silt loam, 3 to 10 percent slopes	
			CoC	Coolville silt loam, 10 to 20 percent slopes	
~	Show Field Aliases		CrC3	Coolville sitty clay loam, 10 to 20 percent slopes	

Use the following parameters to complete the **Add Field** dialog box:

- Name: MUKEY
- Type: Text
- Length: 30

Click OK.

/pe:	Text		
Field Propert	ties		
Alias			
Allow NUL	and the set of the set of the	Yes	
Default Va	due		
Length		30	
The column will not have data. Add the MUKEY values by calculating the Value field to **MUKEY** with the **Field Calculator**.

Right-click on the MUKEY column header and select Field Calculator...

Table							□ ×
:∃ • l뭠 •	- L	<u>م</u> الآ و	a x				
MapunitRaste	er_WV_10	0m					×
OBJECT	D* \	/alue	Count	MUKE	2		*
	1 5	12826	8572	<nul></nul>		Sort Ascending	
	2 5	12827	35754	<null></null>	₹.	Sort Descending	
	3 5	12828	284573	<null></null>		Advanced Sorting	
	4 5	12829	977427	<null></null>		Advanced sorting	
		12830	877840	<null></null>		Summarize	
	6 5	12831	23546	<null></null>	7	Statistics	
	7 5	12832	17985	<null></null>	44		
		12833	37134	<null></null>	靈	Field Calculator	
		12834	10629	<null></null>	-	Calculate Geometry	
		12835	43575	<null></null>			
		12836	54165	<null></null>		Turn Field Off	
Ц		12837	16818	<null></null>		Freeze/Unfreeze Column	
<u> </u>	-	12838	799633	<null></null>			
<u> </u>		12839	264260	<null></null>	×	Delete Field	
<u> </u>		12840	84330	<null></null>	-	Properties	
<u> </u>		12841	656494	<null></null>		riopentes	
<u> </u>		12842	773838	<null></null>			
<u> </u>		12843	92602	<null></null>	_		
H		12844	636455	<null></null>	_		
μ		12845	148236	<null></null>	-		
μ	-	12846	145677	<null></null>	_		
μ		12847	131887	<null></null>	-		
H		12848	29905	<null></null>	_		
┣━┩─────	24 5	12849	14597	<null></null>	-		*
I4 ◀ MapunitRast	0 er_WV_1			(0 ou	it of 2	981 Selected)	

A message will pop up warning that a calculation will be performed outside an edit session.

Click Yes.

eld Calculator			23
You are about to do a calculate outside session, but there is no way to undo yo			
🔲 Don't warn me again			
	Yes	No	

Complete the Field Calculator dialog box.

In the Field Calculator dialog box, double-click on Value to complete the statement.
Click OK.

Parser VB Script © Python		_
OBJECTID Value Count MUKEY	Type: Number String Date	Functions: Abs () Atn () Cos () Exp () Fix () Int () Log () Sin () Sqr () Tan ()
Show Codeblock 1UKEY = [Value]		• / & + - =

The MUKEY column is populated.

nitRaster_WV	_10m				
OBJECTID *	Value	Coun	MUKEY		
1	512826	857	512826		
2	512827	3575	512827		
3	512828	28457	512828		
4	512829	97742	512829		
5	512830	87784	512830		
6	512831	2354	512831		
7	512832	1798	512832		
8	512833	3713	512833		
9	512834	1062	512834		
10	512835	4357	512835		
11	512836	5416	512836		
12	512837	1681	512837		
13	512838	79963	512838		
14	512839	26426	512839		
15	512840	8433	512840		
16	512841	65649	512841		
17	512842	77383	512842		
18	512843	9260	512843		
19	512844	63645	512844		
20	512845	14823	512845		
21	512846	14567	512846		
22	512847	13188	512847		
23	512848	2990	512848		
24	512849	1459	512849		

Citing gSSURGO Data

It is a good scientific practice to cite all the data sources and methods used to conduct the assessment or research study. A section on methods and materials commonly cites other literature sources, which are listed in a reference section.

These gSSURGO and National Value Added Look Up (valu) Table data are anticipated to be released on an annual basis using a Soil Data Mart database snapshot source taken in October (the start of the Federal fiscal year). The metadata (Description tab in ArcCatalog[®]) provides information about the source date for the gSSURGO product.

The USDA Natural Resources Conservation Service recommends the following citations be used in internal and published documents that describe assessments and studies which used the Gridded SSURGO (gSSURGO) data product and the National Value Added Look Up (valu) Table Database.

The Citation for gSSURGO

State Tile

Soil Survey Staff. Gridded Soil Survey Geographic (gSSURGO) Database for *State name*. United States Department of Agriculture, Natural Resources Conservation Service. Available online at http://datagateway.nrcs.usda.gov/. month, day, year (FYyear official release).

Conterminous US Tile

Soil Survey Staff. Gridded Soil Survey Geographic (gSSURGO) Database for the Conterminous United States. United States Department of Agriculture, Natural Resources Conservation Service. Available online at <u>http://datagateway.nrcs.usda.gov/</u>. *month, day, year* (FY*year* official release).

National Collection of Tiles

Soil Survey Staff. Gridded Soil Survey Geographic (gSSURGO) Database for the United States of America and the Territories, Commonwealths, and Island Nations served by the USDA-NRCS. United States Department of Agriculture, Natural Resources Conservation Service. Available online at http://datagateway.nrcs.usda.gov/. *Month, day, year* (FYyear official release).

The Citation for the National Value Added Look Up (valu) Table Database

Soil Survey Staff. National Value Added Look Up (valu) Table Databasefor the Gridded Soil Survey Geographic (gSSURGO) Database for the United States of America and the Territories, Commonwealths, and Island Nations served by the USDA-NRCS. United States Department of Agriculture, Natural Resources Conservation Service. Available online at <u>http://datagateway.nrcs.usda.gov/</u>. *month, day, year* (FY*year* official release).

Citation Examples

The following examples are for the FY2014 gSSURGO dataset for the State of West Virginia. Such citations should appear in the reference section of your document.

State Tile

Soil Survey Staff. The Gridded Soil Survey Geographic (SSURGO) Database for West Virginia. United States Department of Agriculture, Natural Resources Conservation Service. Available online at http://datagateway.nrcs.usda.gov/. January 15, 2014 (FY2014 official release).

Conterminous US Tile

Soil Survey Staff. Gridded Soil Survey Geographic (gSSURGO) Database for the Conterminous United States. United States Department of Agriculture, Natural Resources Conservation Service. Available online at <u>http://datagateway.nrcs.usda.gov/</u>. January 15, 2014 (FY2014 official release).

National Collection of Tiles

Soil Survey Staff. Gridded Soil Survey Geographic (gSSURGO) Database for the United States of America and the Territories, Commonwealths, and Island Nations served by the USDA-NRCS. United States Department of Agriculture, Natural Resources Conservation Service. Available online at <u>http://datagateway.nrcs.usda.gov/</u>. January 15, 2014 (FY2014 official release).

The following example is for the National Value Added Look Up (valu) Table Database. Such citations should appear in the reference section of your document.

National Value Added Look Up (valu) Table Database

Soil Survey Staff. National Value Added Look Up (valu) Table Database for the Gridded Soil Survey Geographic (gSSURGO) Database for the United States of America and the Territories, Commonwealths, and Island Nations served by the USDA-NRCS. United States Department of Agriculture, Natural Resources Conservation Service. Available online at <u>http://datagateway.nrcs.usda.gov/</u>. January 15, 2014 (FY2014 official release).

See <u>http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/geo/?cid=nrcs142p2_053368</u> for recommended citations for other data provided by the USDA Natural Resources Conservation Service and the National Cooperative Soil Survey.

Acronyms

AWS	Available Water Storage
aws0150wta	Available Water Storage 0 to 150cm - Weighted Average
CDL	Cropland Data Layer
cm	centimeter
cogeomordesc	Component Geomorphic Description Table
CONUS	Conterminous United States
dS	decisiemens
ESRI®	Environmental Systems Research Institute, Inc.
FY	Fiscal Year (Federal fiscal year begins October 1 of each year)
GDG	Geospatial Data Gateway
gSSURGO	Gridded Soil Survey Geographic Database
hydgrpdcd	Hydrologic Group - Dominant Conditions
m	meter
MAJCOMPFLAG	Major Component Flag
muaggatt	Map Unit Aggregate Attribute Table
MUKEY	Map Unit Key
muname	Map Unit Name
MUPOLYGON	Map Unit Polygon
musym	Map Unit Symbol
NAD	North American Datum
NASS	National Agricultural Statistical Service
NCCPI	National Commodity Crop Productivity Index
NCSS	National Cooperative Soil Survey
NGCE	National Geospatial Center of Excellence
NLCD	National Land Cover Database
NRCS	Natural Resources Conservation Service
PWSL	Potential Wetland Soil Landscapes
RAM	Random Access Memory
SACATALOG	Survey Area Catalog
SAVEREST	Survey Area Version Established
SOC	Soil Organic Carbon
SQL	Standard Query Language
SSURGO	Soil Survey Geographic Database
US	United States
USDA	United States Department of Agriculture
USGS	United States Geological Survey
Valu	Value Added Look Up Table
WGS	World Geodetic System
WSS	Web Soil Survey

References

Note: Data were created using ArcGIS[®] software by Esri. ArcGIS[®] and ArcMap[™] are the intellectual property of Esri and are used herein under license. Copyright © Esri. All rights reserved. For more information about Esri[®] software, please visit <u>http://www.esri.com/</u>.

Dobos, Robert R., H. Raymond Sinclair, Jr., and Michael P. Robotham. 2012. National commodity crop productivity index (NCCPI) user guide, Version 2. United States Department of Agriculture, Natural Resources Conservation Service, Lincoln, Nebraska.

Homer, C., and others. 2007. Completion of the 2001 National Land Cover Database for the Conterminous United States. Photographic Engineering and Remote Sensing 73:337–341. Data are available online at http://www.mrlc.gov/nlcd2001.php.

United States Department of Agriculture, National Agricultural Statistics Service. 2012. News release: NASS releases new geospatial data in CropScape (Crop Data Layer [CDL]). Available online at http://www.nass.usda.gov/Newsroom/2012/02_03_2012.asp.

United States Department of Agriculture, Natural Resources Conservation Service. 2013a. Description of Gridded Soil Survey Geographic (gSSURGO) Database. Available online at http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/geo/?cid=nrcs142p2_053627.

United States Department of Agriculture, Natural Resources Conservation Service. 2013b. General Manual Title 430, Part 402—Soil Survey, Subpart A. Available online at <u>NRCS eDirectives - Subpart A - Introduction</u>.

Appendix: National Value Added Look Up (valu) Table Database

	А	В	С	D
1	VALU Table Theme	VALU Table Column Name _ short	VALU Table Column Name _ long	VALU Table Column Name Short Description
	Map unit identifier	mukey	mukey	Map unit key is the unique identifier of a record in the Mapunit table. Use this column to join
2				the Component table to the Mapunit table.
	Available Water Storage (mm)	aws0_5	aws_0_5	Available water storage estimate (AWS) in standard layer 1 or standard zone 1 (0-5 cm
		-		depth), expressed in mm. The volume of plant available water that the soil can store in this
				layer based on all map unit components (weighted average). NULL values are presented
3				where data are incomplete or not available.
_	Available Water Storage (mm)	aws5_20	aws_5_20	Available water storage estimate (AWS) in standard layer 2 (5-20 cm depth), expressed in
				mm. The volume of plant available water that the soil can store in this layer based on all map
				unit components (weighted average). NULL values are presented where data are incomplete
4				or not available.
	Available Water Storage (mm)	aws20 50	aws_20_50	Available water storage estimate (AWS) in standard layer 3 (20-50 cm depth), expressed in
	inter storage (min)	dw320_30	4445_20_50	mm. The volume of plant available water that the soil can store in this layer based on all map
				unit components (weighted average). NULL values are presented where data are incomplete
5				or not available.
5	Available Water Storage (mm)	aws50 100	aura EQ 100	Available water storage estimate (AWS) in standard layer 4 (50-100 cm depth), expressed in
i i	Available water Storage (mm)	aws50_100	aws_50_100	
				mm. The volume of plant available water that the soil can store in this layer based on all map
~				unit components (weighted average). NULL values are presented where data are incomplete
6				or not available.
	Available Water Storage (mm)	aws100_150	aws_100_150	Available water storage estimate (AWS) in standard layer 5 (100-150 cm depth), expressed in
				mm. The volume of plant available water that the soil can store in this layer based on all map
				unit components (weighted average). NULL values are presented where data are incomplete
7				or not available.
	Available Water Storage (mm)	aws150_999	aws_150_999	Available water storage estimate (AWS) in standard layer 6 (150 cm to the reported depth of
				the soil profile), expressed in mm. The volume of plant available water that the soil can store
				in this layer based on all map unit components (weighted average). NULL values are
8				presented where data are incomplete or not available.
	Available Water Storage (mm)	aws0_20	aws_0_20	Available water storage estimate (AWS) in standard zone 2 (0-20 cm depth), expressed in
				mm. The volume of plant available water that the soil can store in this zone based on all map
				unit components (weighted average). NULL values are presented where data are incomplete
9				or not available.
	Available Water Storage (mm)	aws0_30	aws_0_30	Available water storage estimate (AWS) in standard zone 3 (0-30 cm depth), expressed in
				mm. The volume of plant available water that the soil can store in this zone based on all map
				unit components (weighted average). NULL values are presented where data are incomplete
10				or not available.
	Available Water Storage (mm)	aws0 100	aws_0_100	Available water storage estimate (AWS) in standard zone 4 (0-100 cm depth), expressed in
		-		mm. The volume of plant available water that the soil can store in this zone based on all map
				unit components (weighted average). NULL values are presented where data are incomplete
11				or not available.
	Available Water Storage (mm)	aws0_150	aws_0_150	Available water storage estimate (AWS) in standard zone 5 (0-150 cm depth), expressed in
		4.000_100	4	mm. The volume of plant available water that the soil can store in this zone based on all map
				unit components (weighted average). NULL values are presented where data are incomplete
12				or not available.
12	Available Water Storage (mm)	aws0 999	aws 0 999	Available water storage estimate (AWS) in total soil profile (0 cm to the reported depth of the
	Available water Storage (IIIII)	aws0_999	aws_0_999	soil profile), expressed in mm. The volume of plant available water that the soil can store in
				this layer based on all map unit components (weighted average). NULL values are presented
13				where data are incomplete or not available.
	Thickness (cm) used in the Available Water Storage	tk0_5a	thick_0_5_aws	Thickness of soil components used in standard layer 1 or standard zone 1 (0-5 cm) expressed
	calculation			in cm (weighted average) for the available water storage calculation. NULL values are
14				presented where data are incomplete or not available.
	Thickness (cm) used in the Available Water Storage	tk5_20a	thick_5_20_aws	Thickness of soil components used in standard layer 2 (5-20 cm) expressed in cm (weighted
	calculation			average) for the available water storage calculation. NULL values are presented where data
15				are incomplete or not available.

	A	В	C	D
	Thickness (cm) used in the Available Water Storage	tk20_50a	thick_20_50_aws	Thickness of soil components used in standard layer 3 (20-50 cm) expressed in cm (weighted
	calculation	_		average) for the available water storage calculation. NULL values are presented where data
16				are incomplete or not available.
	Thickness (cm) used in the Available Water Storage	tk50_100a	thick_50_100_aws	Thickness of soil components used in standard layer 4 (50-100 cm) expressed in cm (weighted
	calculation	_		average) for the available water storage calculation. NULL values are presented where data
17				are incomplete or not available.
	Thickness (cm) used in the Available Water Storage	tk100_150a	thick_100_150_aws	Thickness of soil components used in standard layer 5 (100-150 cm) expressed in cm
	calculation	_		(weighted average) for the available water storage calculation. NULL values are presented
18				where data are incomplete or not available.
	Thickness (cm) used in the Available Water Storage	tk150_999a	thick_150_999_aws	Thickness of soil components used in standard layer 6 (150 cm to the reported depth of the
	calculation	_		soil profile) expressed in cm (weighted average) for the available water storage calculation.
19				NULL values are presented where data are incomplete or not available.
	Thickness (cm) used in the Available Water Storage	tk0_20a	thick_0_20_aws	Thickness of soil components used in standard zone 2 (0-20 cm) expressed in cm (weighted
	calculation			average) for the available water storage calculation. NULL values are presented where data
20				are incomplete or not available.
	Thickness (cm) used in the Available Water Storage	tk0_30a	thick_0_30_aws	Thickness of soil components used in standard zone 3 (0-30 cm) expressed in cm (weighted
	calculation			average) for the available water storage calculation. NULL values are presented where data
21				are incomplete or not available.
	Thickness (cm) used in the Available Water Storage	tk0_100a	thick_0_100_aws	Thickness of soil components used in standard zone 4 (0-100 cm) expressed in cm (weighted
	calculation			average) for the available water storage calculation. NULL values are presented where data
22				are incomplete or not available.
	Thickness (cm) used in the Available Water Storage	tk0_150a	thick_0_150_aws	Thickness of soil components used in standard zone 5 (0-150 cm) expressed in cm (weighted
	calculation			average) for the available water storage calculation. NULL values are presented where data
23				are incomplete or not available.
	Thickness (cm) used in the Available Water Storage	tk0_999a	thick_0_999_aws	Thickness of soil components used in total soil profile (0 cm to the reported depth of the soil
	calculation			profile) expressed in cm (weighted average) for the available water storage calculation. NULL
24				values are presented where data are incomplete or not available.
	Map Unit summed component percentage (representative	musumcpcta	mu_sum_comppct_r_aws	The sum of the comppct_r (SSURGO component table) values used in the available water
	value) for Available Water Storage calculations (metadata)			storage calculation for the map unit. Useful metadata information. NULL values are
25				presented where data are incomplete or not available.
25	Soil Organic Carbon (g C per square meter)	soc0_5	soc_0_5	Soil organic carbon stock estimate (SOC) in standard layer 1 or standard zone 1 (0-5 cm
	son organic carbon (5 c per square meter)	3000_3	300_0_5	depth). The concentration of organic carbon present in the soil expressed in grams C per
				square meter to a depth of 5 cm. NULL values are presented where data are incomplete or
26				not available.
	Soil Organic Carbon (g C per square meter)	soc5 20	soc_5_20	Soil organic carbon stock estimate (SOC) in standard layer 2 (5-20 cm depth). The
	son organic carbon (5 c per square meter)	5005_20	300_3_20	concentration of organic carbon present in the soil expressed in grams C per square meter for
1				the 5-20 cm layer. NULL values are presented where data are incomplete or not available.
27				
	Soil Organic Carbon (g C per square meter)	soc20 50	soc 20 50	Soil organic carbon stock estimate (SOC) in standard layer 3 (20-50 cm depth). The
		=		concentration of organic carbon present in the soil expressed in grams C per square meter for
1				the 20-50 cm layer. NULL values are presented where data are incomplete or not available.
28				. , , , , , , , , , , , , , , , , , , ,
	Soil Organic Carbon (g C per square meter)	soc50_100	soc_50_100	Soil organic carbon stock estimate (SOC) in standard layer 4 (50-100 cm depth). The
1		_		concentration of organic carbon present in the soil expressed in grams C per square meter for
1				the 50-100 cm layer. NULL values are presented where data are incomplete or not available.
29				,, ,, , , ,, , , , , , ,
	Soil Organic Carbon (g C per square meter)	soc100_150	soc_100_150	Soil organic carbon stock estimate (SOC) in standard layer 5 (100-150 cm depth). The
1		_		concentration of organic carbon present in the soil expressed in grams C per square meter for
				the 100-150 cm layer. NULL values are presented where data are incomplete or not
30				available.
<u> </u>		1		

	А	В	С	D
	Soil Organic Carbon (g C per square meter)	soc150_999	soc_150_999	Soil organic carbon stock estimate (SOC) in standard layer 6 (150 cm to the reported depth of
		_		the soil profile). The concentration of organic carbon present in the soil expressed in grams C
				per square meter for the 150 cm and greater depth layer. NULL values are presented where
31				data are incomplete or not available.
-	Soil Organic Carbon (g C per square meter)	soc0 20	soc 0 20	Soil organic carbon stock estimate (SOC) in standard zone 2 (0-20 cm depth). The
	son organic carbon (g e per square meter)	3000_20	300_0_20	concentration of organic carbon present in the soil expressed in grams C per square meter to
				a depth of 20 cm. NULL values are presented where data are incomplete or not available.
32				
52	Soil Organic Carbon (g C per square meter)	soc0 30	soc 0 30	Soil organic carbon stock estimate (SOC) in standard zone 3 (0-30 cm depth). The
		_		concentration of organic carbon present in the soil expressed in grams C per square meter to
				a depth of 30 cm. NULL values are presented where data are incomplete or not available.
33				· · · · · · · · · · · · · · · · · · ·
	Soil Organic Carbon (g C per square meter)	soc0_100	soc_0_100	Soil organic carbon stock estimate (SOC) in standard zone 4 (0-100 cm depth). The
		-		concentration of organic carbon present in the soil expressed in grams C per square meter to
				a depth of 100 cm. NULL values are presented where data are incomplete or not available.
34				· · · · · · · · · · · · · · · · · · ·
	Soil Organic Carbon (g C per square meter)	soc0_150	soc_0_150	Soil organic carbon stock estimate (SOC) in standard zone 5 (0-150 cm depth). The
		_		concentration of organic carbon present in the soil expressed in grams C per square meter to
				a depth of 150 cm. NULL values are presented where data are incomplete or not available.
35				
	Soil Organic Carbon (g C per square meter)	soc0 999	soc 0 999	Soil organic carbon stock estimate (SOC) in total soil profile (0 cm to the reported depth of
		_		the soil profile). The concentration of organic carbon present in the soil expressed in grams C
				per square meter for the total reported soil profile depth. NULL values are presented where
36				data are incomplete or not available.
	Thickness (cm) used in the Soil Organic Carbon calculation	tk0_5s	thick 0 5 soc	Thickness of soil components used in standard layer 1 or standard zone 1 (0-5 cm) expressed
				in cm (weighted average) for the Soil Organic Carbon calculation. NULL values are presented
37				where data are incomplete or not available.
	Thickness (cm) used in the Soil Organic Carbon calculation	tk5 20s	thick_5_20_soc	Thickness of soil components used in standard layer 2 (5-20 cm) expressed in cm (weighted
		-		average) for the Soil Organic Carbon calculation. NULL values are presented where data are
38				incomplete or not available.
	Thickness (cm) used in the Soil Organic Carbon calculation	tk20 50s	thick_20_50_soc	Thickness of soil components used in standard layer 3 (20-50 cm) expressed in cm (weighted
		_		average) for the Soil Organic Carbon calculation. NULL values are presented where data are
39				incomplete or not available.
	Thickness (cm) used in the Soil Organic Carbon calculation	tk50 100s	thick 50 100 soc	Thickness of soil components used in standard layer 4 (50-100 cm) expressed in cm (weighted
		_		average) for the Soil Organic Carbon calculation. NULL values are presented where data are
40				incomplete or not available.
	Thickness (cm) used in the Soil Organic Carbon calculation	tk100 150s	thick 100 150 soc	Thickness of soil components used in standard layer 5 (100-150 cm) expressed in cm
		-		(weighted average) for the Soil Organic Carbon calculation. NULL values are presented where
41				data are incomplete or not available.
	Thickness (cm) used in the Soil Organic Carbon calculation	tk150_999s	thick_150_999_soc	Thickness of soil components used in standard layer 6 (150 cm to the reported depth of the
	· · · · ·	_		soil profile) expressed in cm (weighted average) for the Soil Organic Carbon calculation. NULL
42				values are presented where data are incomplete or not available.
	Thickness (cm) used in the Soil Organic Carbon calculation	tk0_20s	thick_0_20_soc	Thickness of soil components used in standard zone 2 (0-20 cm) expressed in cm (weighted
	· · · · · · · · · · · · · · · · · · ·	_		average) for the Soil Organic Carbon calculation. NULL values are presented where data are
43				incomplete or not available.
	Thickness (cm) used in the Soil Organic Carbon calculation	tk0_30s	thick_0_30_soc	Thickness of soil components used in standard zone 3 (0-30 cm) expressed in cm (weighted
	· · · · ·	_		average) for the Soil Organic Carbon calculation. NULL values are presented where data are
44				incomplete or not available.
	Thickness (cm) used in the Soil Organic Carbon calculation	tk0_100s	thick_0_100_soc	Thickness of soil components used in standard zone 4 (0-100 cm) expressed in cm (weighted
		-		average) for the Soil Organic Carbon calculation. NULL values are presented where data are
1				incomplete or not available.

	А	В	С	D
	Thickness (cm) used in the Soil Organic Carbon calculation	tk0_150s	thick_0_150_soc	Thickness of soil components used in standard zone 5 (0-150 cm) expressed in cm (weighted
				average) for the Soil Organic Carbon calculation. NULL values are presented where data are
46				incomplete or not available.
	Thickness (cm) used in the Soil Organic Carbon calculation	tk0_999s	thick_0_999_soc	Thickness of soil components used in total soil profile (0 cm to the reported depth of the soil
				profile) expressed in cm (weighted average) for the Soil Organic Carbon calculation. NULL
47				values are presented where data are incomplete or not available.
	Map Unit summed component percentage (representative	musumcpcts	mu_sum_comppct_r_soc	The sum of the comppct_r (SSURGO component table) values used in the soil organic carbon
	value) for Soil Organic Carbon calculations (metadata)			calculation for the map unit. Useful metadata information. NULL values are presented where
48				data are incomplete or not available.
	National Commodity Crop Productivity Index - CORN and	nccpi2cs	nccpi2_corn_soybeans	National Commodity Crop Productivity Index for Corn and Soybeans (weighted average) for
	SOYBEANS			major earthy components. Values range from .01 (low productivity) to .99 (high productivity).
				Earthy components are those soil series or higher level taxa components that can support
				crop growth (Dobos et al., 2012). Major components are those soil components where the
				majorcompflag = 'Yes' (SSURGO component table). NULL values are presented where data
49				are incomplete or not available.
	National Commodity Crop Productivity Index - SMALL	nccpi2sg	nccpi2_small_grains	National Commodity Crop Productivity Index for Small Grains (weighted average) for major
	GRAINS			earthy components. Values range from .01 (low productivity) to .99 (high productivity).
				Earthy components are those soil series or higher level taxa components that can support
				crop growth (Dobos et al., 2012). Major components are those soil components where the
				majorcompflag = 'Yes' (SSURGO component table). NULL values are presented where data
50				are incomplete or not available.
	National Commodity Crop Productivity Index - COTTON	nccpi2co	nccpi2 cotton	National Commodity Crop Productivity Index for Cotton (weighted average) for major earthy
	National commonly crop rioductivity mack - corron	ncepizeo		components. Values range from .01 (low productivity) to .99 (high productivity). Earthy
				components are those soil series or higher level taxa components that can support crop
				growth (Dobos et al., 2012). Major components are those soil components where the
				majorcompflag = 'Yes' (SSURGO component table). NULL values are presented where data are
51				incomplete or not available.
51	National Commodity Crop Productivity Index - OVERALL	nccpi2all	nccpi2 overall	National Commodity Crop Productivity Index that has the highest value among Corn and
		ncepizan		Soybeans, Small Grains, or Cotton (weighted average) for major earthy components. Values
				range from .01 (low productivity) to .99 (high productivity). Earthy components are those
				soil series or higher level taxa components that can support crop growth (Dobos et al., 2012).
				Major components are those soil components where the majorcompflag = 'Yes' (SSURGO
				component table). NULL values are presented where data are incomplete or not available.
52				component table). Note values are presented where data are incomplete of not available.
52	National Commodity Crop Productivity Index - map unit	pctearthmc	mapunit_percent_earthy_mc	The National Commodity Crop Productivity Index map unit percent earthy is the map unit
	percent earthy major components (metadata)	peteartime	mapdint_percent_eartiy_inc	summed comppct r for major earthy components. Earthy components are those soil series
	percent earing major components (metadata)			
				or higher level taxa components that can support crop growth (Dobos et al., 2012). Major
				components are those soil components where the majorcompflag = 'Yes' (SSURGO
53				component table). Useful metadata information. NULL values are presented where data are
23	Root Zone Depth (cm) - earthy major components	rootznemc	root zone co donth porthy ma	incomplete or not available. Root zone depth is the depth within the soil profile that commodity crop (cc) roots can
			root_zone_cc_depth_earthy_mc	effectively extract water and nutrients for growth. Root zone depth influences soil
				, , , , , , , , , , , , , , , , , , , ,
				productivity significantly. Soil component horizon criteria for root-limiting depth include:
				presence of hard bedrock, soft bedrock, a fragipan, a duripan, sulfuric material, a dense layer,
				a layer having a pH of less than 3.5, or a layer having an electrical conductivity of more than
				12 within the component soil profile. If no root-restricting zone is identified, a depth of 150
				cm is used to approximate the root zone depth (Dobos et al., 2012). Root zone depth is
				computed for all map unit major earthy components (weighted average). Earthy components
				are those soil series or higher level taxa components that can support crop growth (Dobos et
				al., 2012). Major components are those soil components where the majorcompflag = 'Yes'
				(SSURGO component table). NULL values are presented where data are incomplete or not
54				available.

	Α	В	С	D
55	Root Zone Available Water Storage (mm) - earthy major components	rootznaws	root_zone_cc_aws_earthy_mc	Root zone (commodity crop) available water storage estimate (RZAWS), expressed in mm, is the volume of plant available water that the soil can store within the root zone based on all map unit earthy major components (weighted average). Earthy components are those soil series or higher level taxa components that can support crop growth (Dobos et al., 2012). Major components are those soil components where the majorcompflag = 'Yes' (SSURGO component table). NULL values are presented where data are incomplete or not available.
56		droughty	drought_vulnerable_soil_landscapes	Drought vulnerable soil landscapes comprise those map units that have available water storage within the root zone for commodity crops that is less than or equal to 6 inches (152 mm) expressed as "1" for a drought vulnerable soil landscape map unit or "0" for a non- droughty soil landscape map unit or NULL for miscellaneous areas (includes water bodies). It is computed as a weighted average for major earthy components. Earthy components are those soil series or higher level taxa components that can support crop growth (Dobos et al., 2012). Major components are those soil components where the majorcompflag = 'Yes' (SSURGO component table). NULL values are presented where data are incomplete or not available.
57	Potential Wetland Soil Landscapes	pwsl1pomu	pwsl1_percent_of_mapunit	"Potential Wetland Soil Landscapes" (PWSL) is expressed as the percentage of the map unit that meets the PWSL criteria. The hydric rating (soil component variable "hydricrating") is an indicator of wet soils. For version 1 (pwsl1), those soil components that meet the following criteria are tagged as PWSL and their comppct_r values are summed for each map unit. Soil components with hydricrating = 'YES' are considered PWSL. Soil components with hydricrating = "NO" are not PWSL. Soil components with hydricrating = 'NO" are not PWSL. Soil components with hydricrating = "NO" are not PWSL. Soil components with hydricrating = 'Poorly drained' or 'Very poorly drained' or the localphase or the otherph data fields contain any of the phrases "drained" or "undrained" or "channeled" or "protected" or "ponded" or "flooded". If these criteria do not determine the PWSL if the map unit name contains any of the phrases "drained" or "undrained" or "channeled" or "protected" or "ponded" or "flooded". For version 1 (pwsl1), waterbodies are identified as "999" when map unit names match a list of terms that identify water or intermittent water or map units have a sum of the comppet_r for "Water" that is 80% or greater. NULL values are presented where data are incomplete or not available.
57	Map Unit summed component percentage (representative value) (metadata)	musumcpct	mu_sum_comppct_r	The sum of the comppct_r (SSURGO component table) values for all listed components in the map unit. Useful metadata information. NULL values are presented where data are
58				incomplete or not available.
59	¹ Dobos, R. R., H. R. Sinclair, Jr, and M. P. Robotham. 2012. National Commodity Crop Productivity Index (NCCPI) User Guide, Version 2. USDA-NRCS. Available at: ftp://ftp- fc.sc.egov.usda.gov/NSSC/NCCPI/NCCPI_user_guide.pdf.			