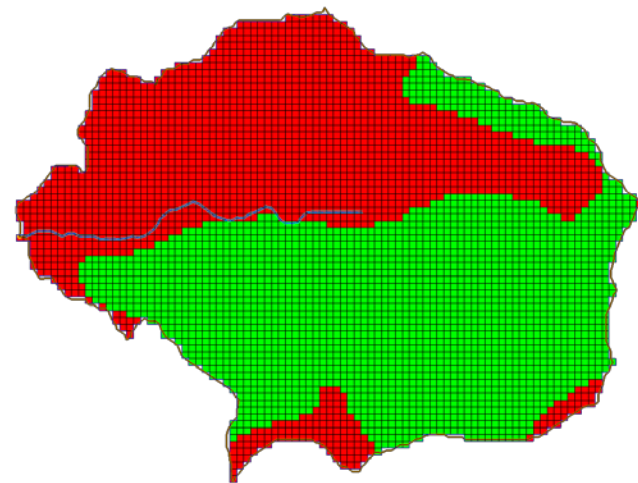




Watershed and Groundwater  
Modeling Solutions

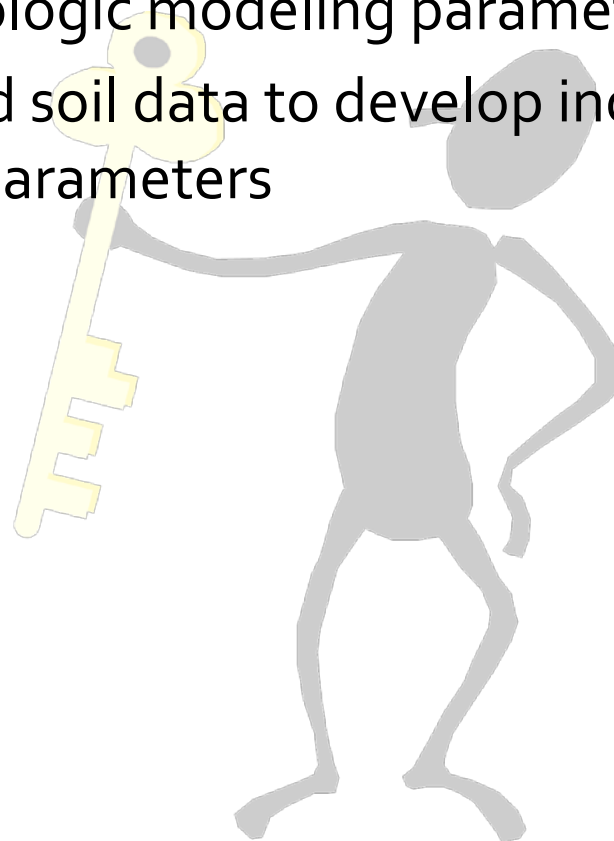
# Developing Index Maps with Spatial Data

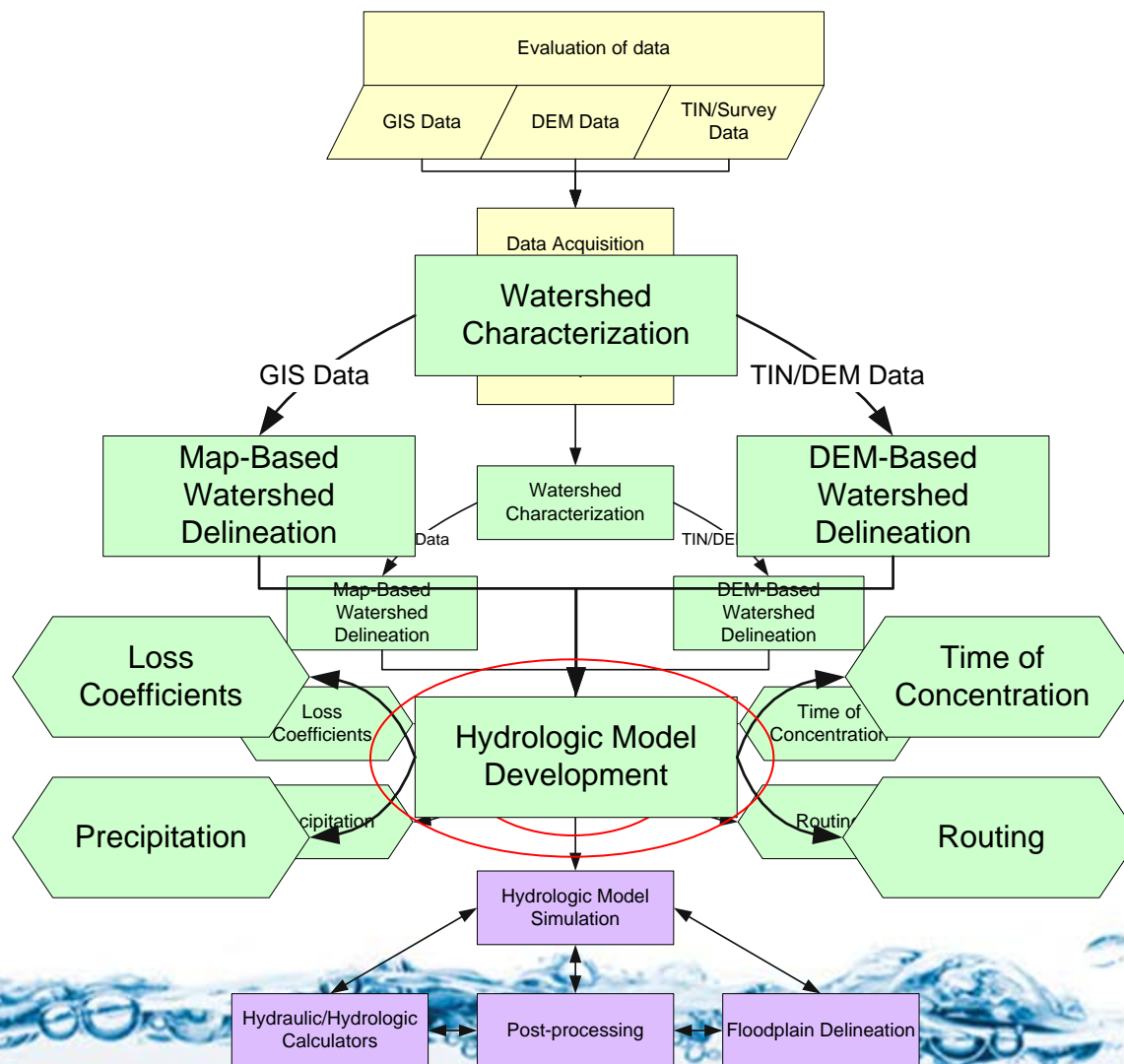




# Objectives

- Use the 2D grid as a basis for overlaying coverages to compute important hydrologic modeling parameters
- Use land use and soil data to develop index maps and initial mapping table parameters



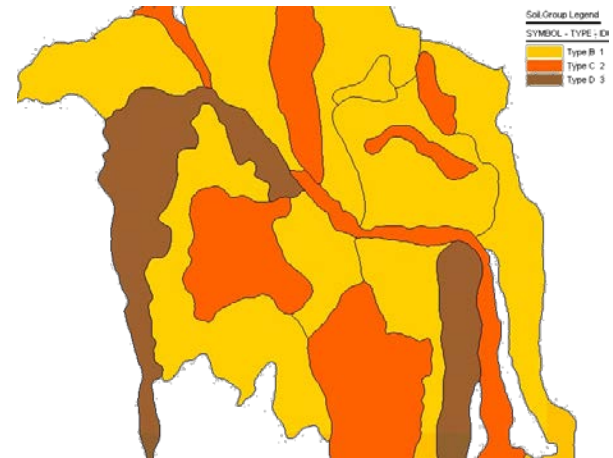
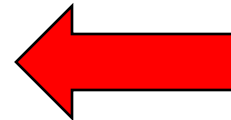
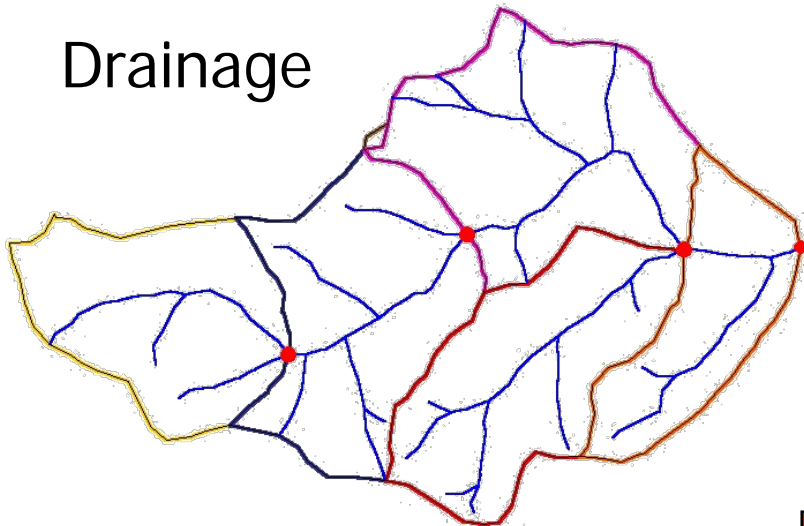




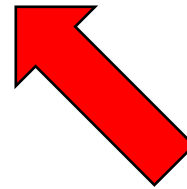
Watershed and Groundwater  
Modeling Solutions

# Mapping GIS

Drainage



Soils

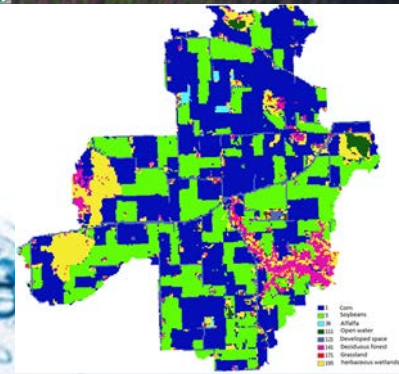
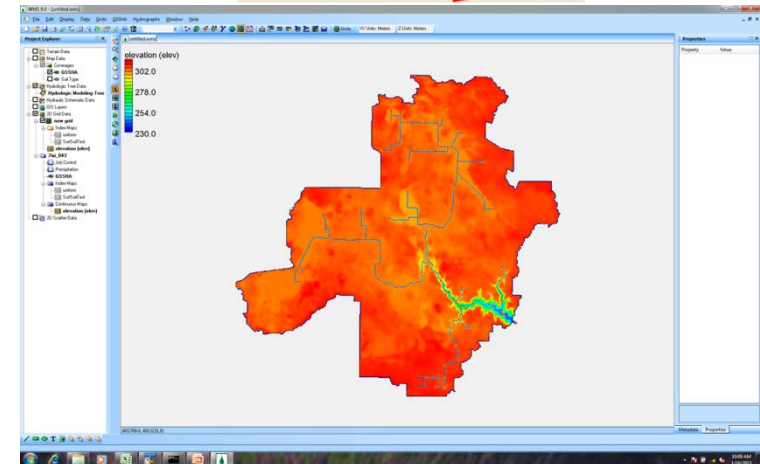


Land Use



# 2D Parameters in GSSHA

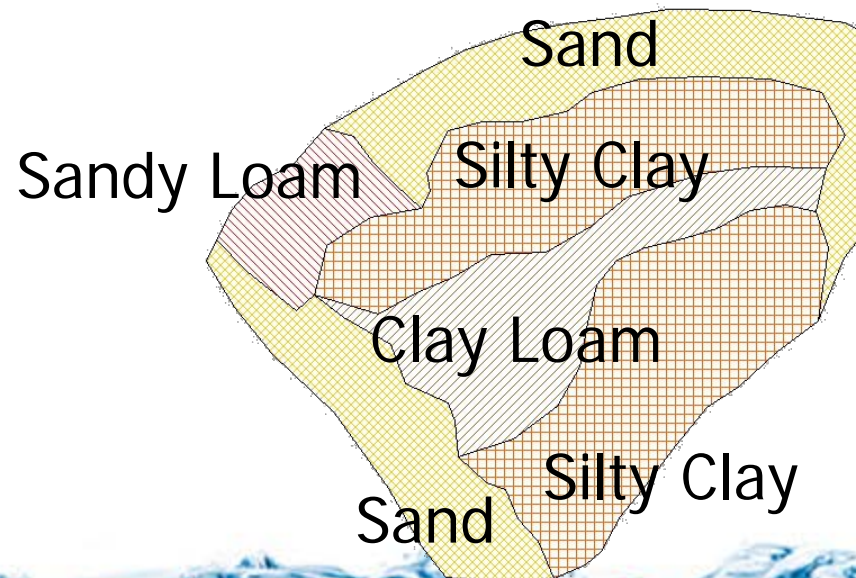
- Uniform
  - Preliminary models
- A unique value for every grid cell
  - Elevations
- Index map
  - Integer value
  - Derived from some physical property
    - Soils
    - Land use
    - Disturbance
  - Parameter values for each process specified with table of values linked to the index map
  - Used for most processes





# Soil Classifications

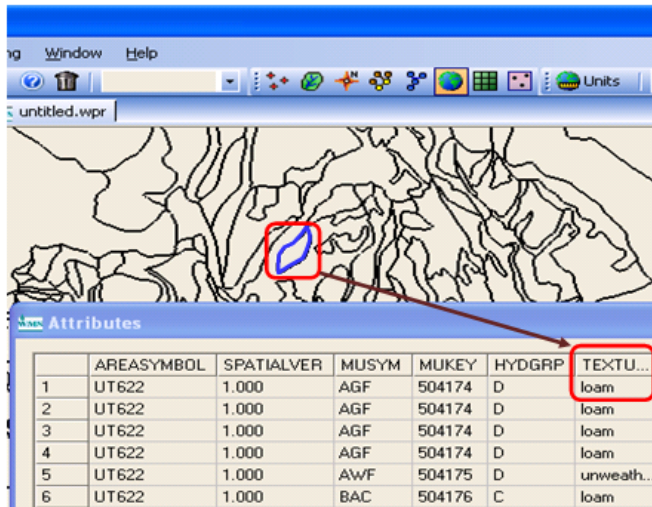
- Soil classifications are saved in the database of a shapefile for most soil surveys
- Soil Index map is created to use the soil information
- You can tie each soil classification to initial Green-Ampt infiltration values using the table in Rawls et al (1983)



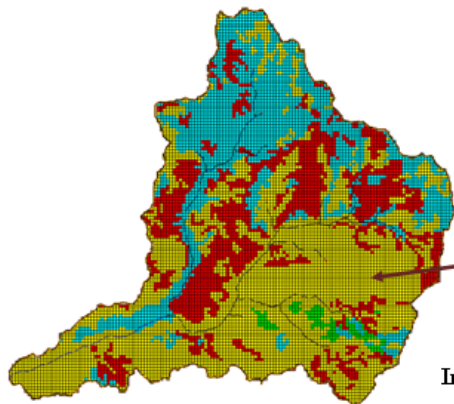


# Soil data and Infiltration Parameters

Watershed and Groundwater  
Modeling Solutions



SSURGO soil attributes



Index Map

Rawls and Brakensiek Table

USDA Textural Classification	$\theta_s$	$\theta_e$	$\theta_i$	$\theta_{wp}$	$\theta_r$	$\psi_b$ (cm)	$\lambda$	$K_s$ (cm/h)	$\psi_f$ (cm)
Sand	0.437	0.417		0.033	0.02	7.26	0.694	23.56	4.95
Loamy sand	0.437	0.401		0.055	0.035	8.69	0.553	5.98	6.13
Sandy loam	0.453	0.412		0.095	0.041	14.66	0.378	2.18	11.01
Loam	0.463	0.434		0.117	0.027	11.15	0.252	1.32	8.89
Silt loam	0.501	0.486		0.133	0.015	20.79	0.234	0.68	16.68

GSSHA Map Table Editor

Soil Erosion | Contaminants | Nutrients | Continuous Maps | Groundwater  
Roughness | Interception | Retention | Evapotranspiration | Infiltration | Initial Moisture

Using index map: SoilMap

Generate IDs | Add ID | Delete ID

Infiltration	15	17	19	25
ID	15	17	19	25
Description1	Clay loam	Loam	Silty clay	Sandy clay loam
Description2				
Hydraulic conductivity (cm/hr)	0.000000	0.000000	0.000000	0.000000
Capillary head (cm)	0.000000	0.000000	0.000000	0.000000
Porosity (m <sup>3</sup> /m <sup>3</sup> )	0.000000	0.000000	0.000000	0.000000
Pore distribution index (cm/cm)	0.000000	0.000000	0.000000	0.000000
Residual saturation (m <sup>3</sup> /m <sup>3</sup> )	0.000000	0.000000	0.000000	0.000000
Field capacity (m <sup>3</sup> /m <sup>3</sup> )	0.000000	0.000000	0.000000	0.000000

Help | Import Table... | Export Table... | Job Control | Done

Mapping Table



# Soils Data from the Internet

Watershed and Groundwater  
Modeling Solutions

GSDA: Soil Type - XMSwiki.com - Mozilla Firefox

United States Department of Agriculture  
**NRCS** Natural Resources Conservation Service

DC001 - District of Columbia  
District of Columbia County  
District of Columbia

Home Select State State Contacts Template Databases SSURGO Metadata Status Map US General Soil Map

Please select the class of data you wish to download: ( Survey Area Version 5 , Tabular Version 5 , Spatial Version 5 )

☐ Tabular Data Only ☒ Tabular and Spatial Data ☐ Spatial Data Only ☐ Template Database Only

Please select a spatial format:  
ArcView Shapefile

Please select a coordinate system:  
UTM Zone 18, Northern Hemisphere (NAD 83)

Reset Default

Please select a template database (optional):

<input type="checkbox"/>	AK	Access 2002	32.15	soildb_AK_2002	2.5M
<input type="checkbox"/>	CA	Access 2002	33.2	soildb_CA_2003	1.8M
<input type="checkbox"/>	CA	Access 2000	33.2	soildb_CA_2000	1.8M
<input type="checkbox"/>	CA	Access 2002	32.1	soildb_CA_2002	1.8M
<input type="checkbox"/>	CT	Access 2002	32.1	soildb_CT_2002	1.8M
<input checked="" type="checkbox"/>	DC	Access 2002	31	soildb_DC_2002	1.7M

Clear Selection

Description:  
Template customized for DC.

Please enter your e-mail address:

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

Submit Request  
View Metadata

Select Survey Area

▲ Back to Top

FOIA | Information Quality | Accessibility Statement  
White House | USA.gov | USDA | NRCS |

Special pages  
Printable version  
Permanent link

**NRCS** Natural Resources Conservation Service Obtain STATSGO soil type data

The United States Department of Agriculture (USDA) supports the Natural Resources Conservation Service (NRCS). A website they have developed is the National Cartography and Geospatial Center (NCGC). Supplied on this website are numerous links and descriptions of geospatial datasets. Through these links it is possible to acquire soil type data maps from the two main soils databases; STATSGO, and SSURGO.

Done

You will receive an  
email with a link to  
download the data

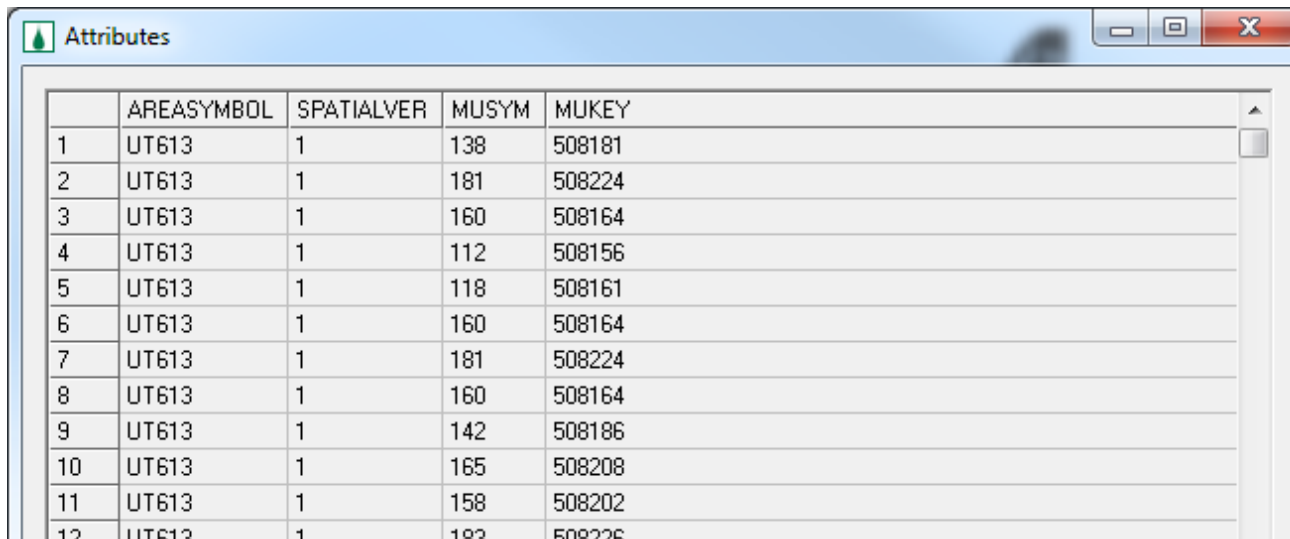




# Geospatial data processing

Watershed and Groundwater  
Modeling Solutions

- The SSURGO data you download does not have attributes such as soil texture joined to the shape file.



	AREASYMBOL	SPATIALVER	MUSYM	MUKEY
1	UT613	1	138	508181
2	UT613	1	181	508224
3	UT613	1	160	508164
4	UT613	1	112	508156
5	UT613	1	118	508161
6	UT613	1	160	508164
7	UT613	1	181	508224
8	UT613	1	160	508164
9	UT613	1	142	508186
10	UT613	1	165	508208
11	UT613	1	158	508202
12	UT613	1	183	508226

In SSURGO data, the attributes are stored as separate tables and they need to be linked with the shapefile before you can use them.





# Geospatial data processing

- WMS has a utility to join SSURGO tabular data to the shapefile

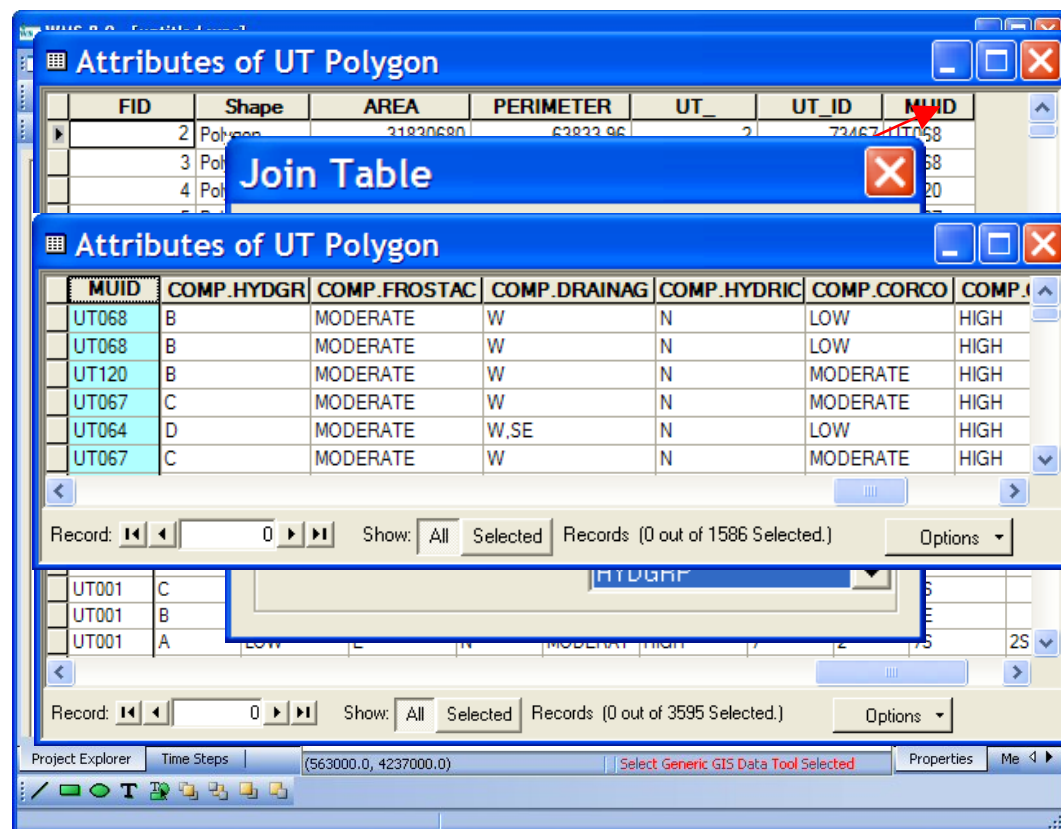
The screenshot shows the WMS software interface. The 'Project Explorer' on the left lists various data layers, including 'Terrain Data', 'DEM', 'Map Data', 'Coverages', 'GSSHA', 'Hydrologic Tree Data', 'Hydrologic Modeling Tree', 'Hydraulic Schematic Data', 'GIS Layers', '2D Grid Data', 'new grid', 'default', 'Index Map', 'GSSHAMod', 'Job Contr', 'Precipitati', 'GSSHA', 'Index Map', 'Continuou', and '2D Scatter Data'. The 'Join SSURGO Data' dialog box is open, showing 'Soil Group' as 'B' and 'Soil Texture' as 'Silty clay loam'. The 'Attributes' table is displayed, showing a list of attributes for 13 rows of data. The table is highlighted with a red border.

	AREASYMBOL	SPATIALVER	MUSYM	MUKEY	TEXTURE	KSAT	MOISTURE	FIELD CAP	WILTINGPT	HYDGP
1	UT613	1	138	508181	Clay loam	2.171893	0.160000	28.800000	14.800000	B
2	UT613	1	181	508224	Clay loam	1.077243	0.100000	15.900000	9.100000	C
3	UT613	1	160	508164	Loam	5.636535	0.100000	14.000000	9.900000	B
4	UT613	1	112	508156	Loam	3.611269	0.130000	12.300000	8.300000	B
5	UT613	1	118	508161	Sandy clay loam	6.193469	0.100000	14.000000	9.900000	B
6	UT613	1	160	508164	Loam	5.636535	0.100000	14.000000	9.900000	B
7	UT613	1	181	508224	Clay loam	1.077243	0.100000	15.900000	9.100000	C
8	UT613	1	160	508164	Loam	5.636535	0.100000	14.000000	9.900000	B
9	UT613	1	142	508186	Clay loam	1.039157	0.130000	15.900000	12.400000	C
10	UT613	1	165	508208	Loam	0.010498	0.070000	0.000000	0.000000	D
11	UT613	1	158	508202	Clay loam	0.059855	0.150000	23.100000	13.700000	C
12	UT613	1	183	508226	Clay loam	0.000000	0.000000	0.000000	0.000000	B
13	UT613	1	160	508164	Loam	5.636535	0.100000	14.000000	9.900000	B



# Joining STATSGO Tables

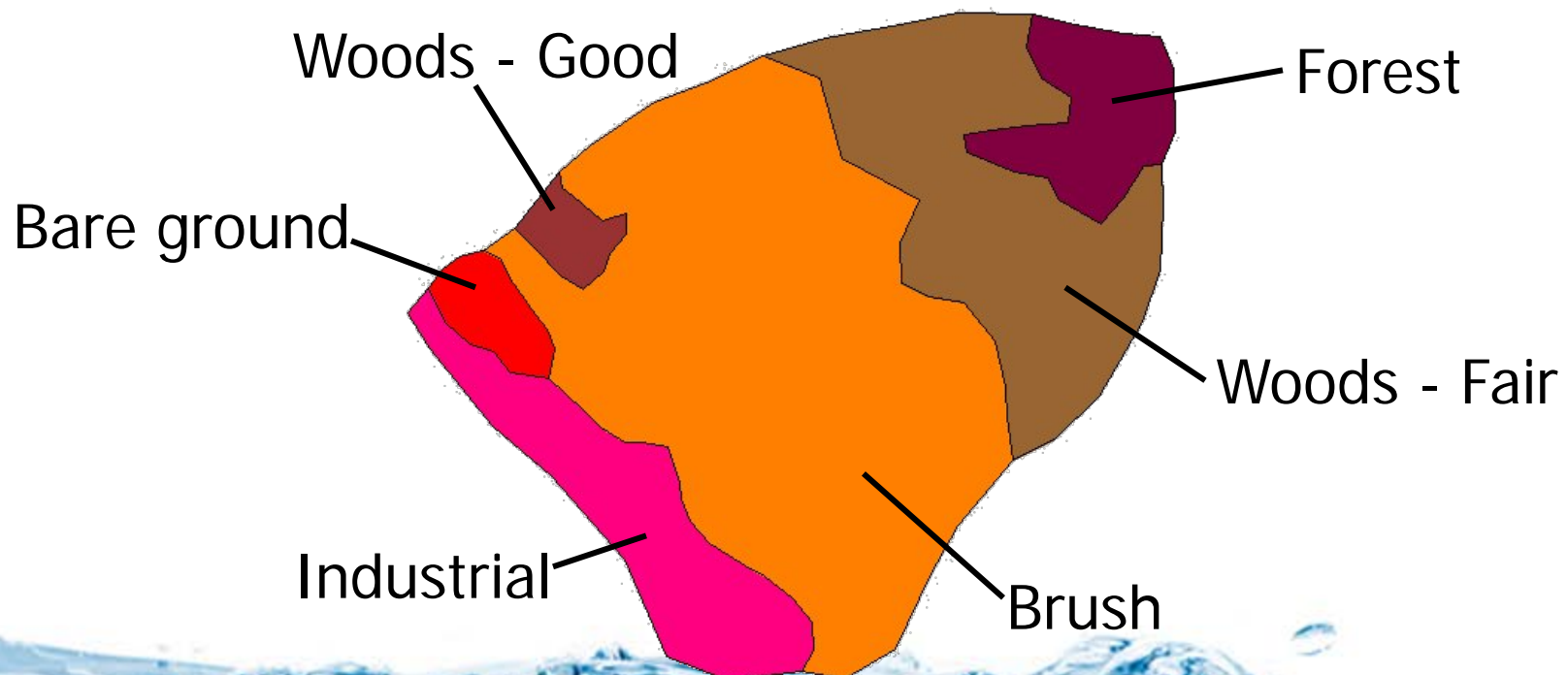
- Joining the HYDGRP attribute
  - Open soils file as a GIS layer
  - Join to COMP.DBF based on MUID





# Land Use

- How well water is retained on the land surface until it can transpire, evaporate, or infiltrate







# Use of Land use data

Standard Text book values for  
roughness based on land cover

GSSHA .cmt file relating LU Code and  
Manning's n

GSSHA mapping table relating .cmt file  
to the index map

ROUGH  
0.011000  
0.012000  
0.013000

Grass:	14	Transportation
	15	Industrial and
	16	Mixed Urban or
	17	Other Urban or
Range (n	21	Cropland and E
	22	Orchards, Grov
Woods	23	Confined Feedi
	24	Other Agricult
	31	Herbaceous Ran

GSSHA Map Table Editor

Contaminants	Nutrients	Continuous Maps	Groundwater
Roughness	Interception	Retention	Evapotranspiration
	Infiltration	Initial Moisture	Soil Erosion

Using index map:

Index map type:

Roughness						
ID	11	12	14	16	21	41
Description1	Untitled land...	Untitled land...	Untitled land...	Untitled land...	Untitled land...	Untitled land...
Description2	...	...	...	...	...	...
Surface roughness	0.011000	0.012000	0.011000	0.011000	0.035000	0.100000





# Land Use Data from the Internet

Watershed and Groundwater  
Modeling Solutions

WebGIS - Free LULC Data, USA, Utah - SEVIER - GIS - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.webgis.com/terr\_pages/UT/lulcgeo/sevier.html

Most Visited Customize Links Free Hotmail Windows Marketplace Windows

**WebGIS**

ISC=AERMOD View 3D Automatic Contouring DEMs Graphical Input

Your #1 Geographic Information Systems Resource

Home

- WebLakes.com
- WebMET

Terrain Data

- US
  - 7.5-min DEM
  - 1-deg DEM
  - SRTM1
- Global
  - SRTM3
  - SRTM30
  - GTOPO30

LULC Data

- US
  - Shapefile (Lat/Long)
  - Shapefile (UTM)
  - Standard (UTM)
- Global
  - GLCC

DLG Data

- US
  - Shapefile (Lat/Long)
  - Shapefile (UTM)
  - Standard (UTM)

Contact

About

**File Download**

Some files can harm your computer. If the file information below looks suspicious, or you do not fully trust the source, do not open or save this file.

File name: richfield.zip  
File type: WinZip File  
From: www.webgis.com

Would you like to open the file or save it to your computer?

☒ Always ask before opening this type of file

Additional LULC (UTM)

NAME
<a href="#">DELTA</a>
<a href="#">RICHFIELD</a>
<a href="#">SALINA</a>

Additional LULC (Standard)

NAME
<a href="#">DELTA</a>
<a href="#">RICHFIELD</a>
<a href="#">SALINA</a>

Additional 1 deg DEM maps are available for this county:

NAME	HALF	MIN LONG	MAX LONG	MIN LAT	MAX LAT
<a href="#">DELTA</a>	E	-113°00'00"	-112°00'00"	39°00'00"	40°00'00"
<a href="#">PRICE</a>	W	-112°00'00"	-111°00'00"	39°00'00"	40°00'00"
<a href="#">RICHFIELD</a>	E	-113°00'00"	-112°00'00"	38°00'00"	39°00'00"
<a href="#">SALINA</a>	W	-112°00'00"	-111°00'00"	38°00'00"	39°00'00"

Back to Top

Done



# Land Use Classification

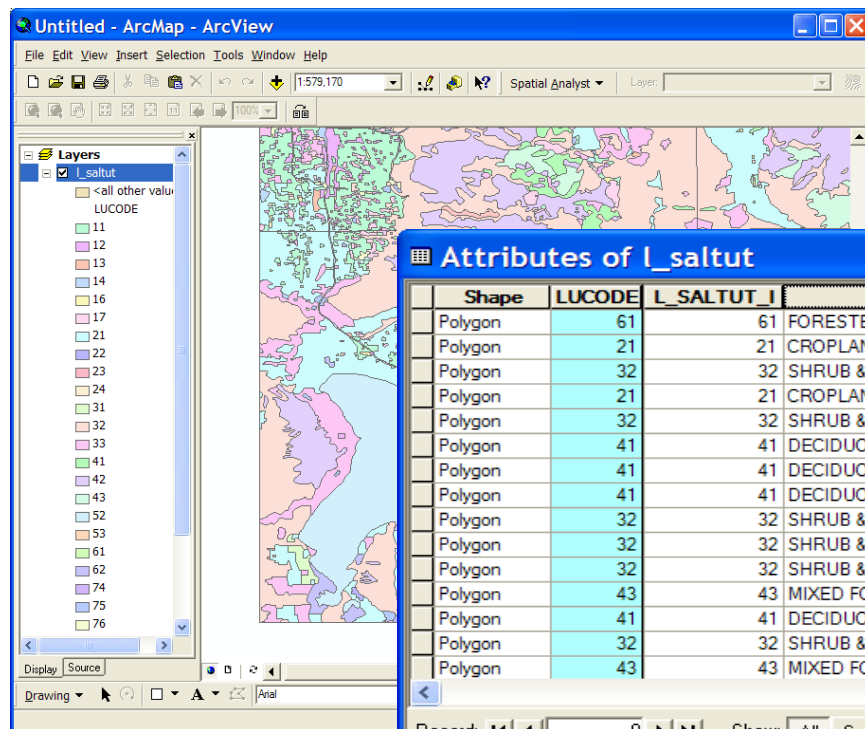


Table 1. Anderson Land Use Classification Codes

Classification Code	Land Use Description
11	Residential
12	Commercial Services
13	Industrial
14	Transportation, Communications
15	Industrial and Commercial
16	Mixed Urban or Built-Up Land
17	Other Urban or Built-Up Land
21	Cropland and Pasture
22	Orchards, Groves, Vineyards, Nurseries
23	Confined Feeding Operations
24	Other Agricultural Land
31	Herbaceous Rangeland
32	Shrub and Brush Rangeland
33	Mixed Rangeland
41	Deciduous Forest Land
42	Evergreen Forest Land
43	Mixed Forest Land
51	Streams and Canals
52	Lakes
53	Reservoirs
54	Bays and Estuaries
61	Forested Wetlands
62	Nonforested Wetlands
71	Dry Salt Flats
72	Beaches
73	Sandy Areas Other than Beaches
74	Bare Exposed Rock
75	Strip Mines, Quarries, and Gravel Pits
76	Transitional Areas
77	Mixed Barren Land
81	Shrub and Brush Tundra
82	Herbaceous Tundra
83	Bare Ground
84	Wet Tundra
85	Mixed Tundra
91	Perennial Snowfields
92	Glaciers



# Creating and Using Index Maps in GSSHA

Watershed and Groundwater  
Modeling Solutions

1. Read your land use and/or soil shapefiles
2. Join tables to values in other tables if necessary
3. Convert land use/soil shapefiles to map module polygons
4. Create index maps from land use/soil shapefiles
5. Define GSSHA mapping table properties and initial conditions

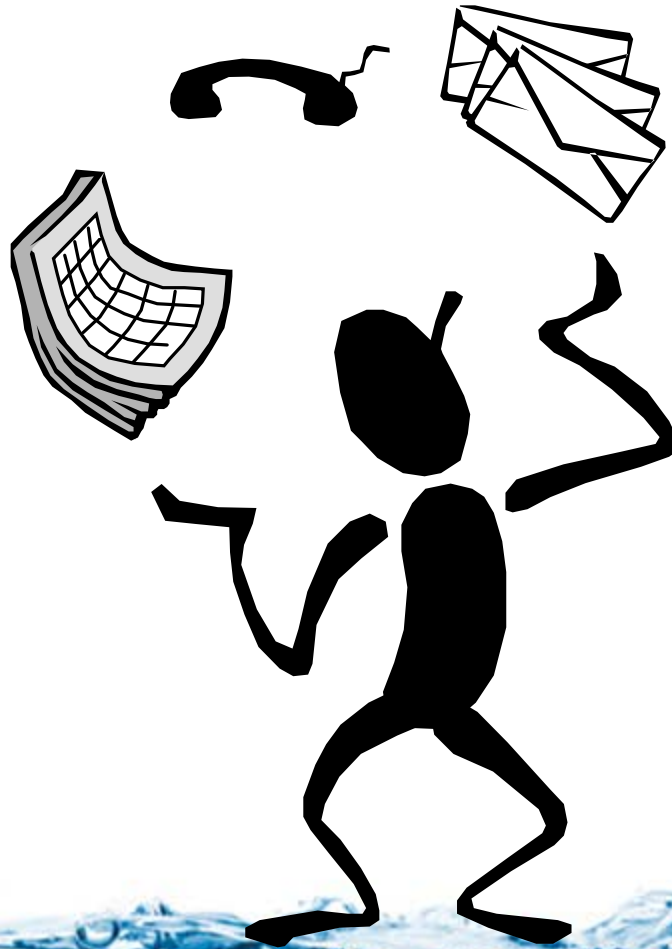






Watershed and Groundwater  
Modeling Solutions

# Demonstration





# Review & Discuss

- Objectives
  - Use the 2D grid as a basis for overlaying coverages to compute important hydrologic modeling parameters
  - Use land use and soil data to develop index maps and initial mapping table parameters
- Applications

