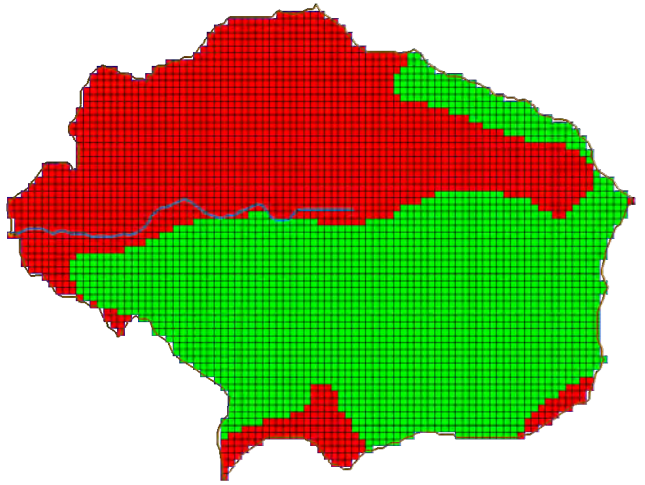
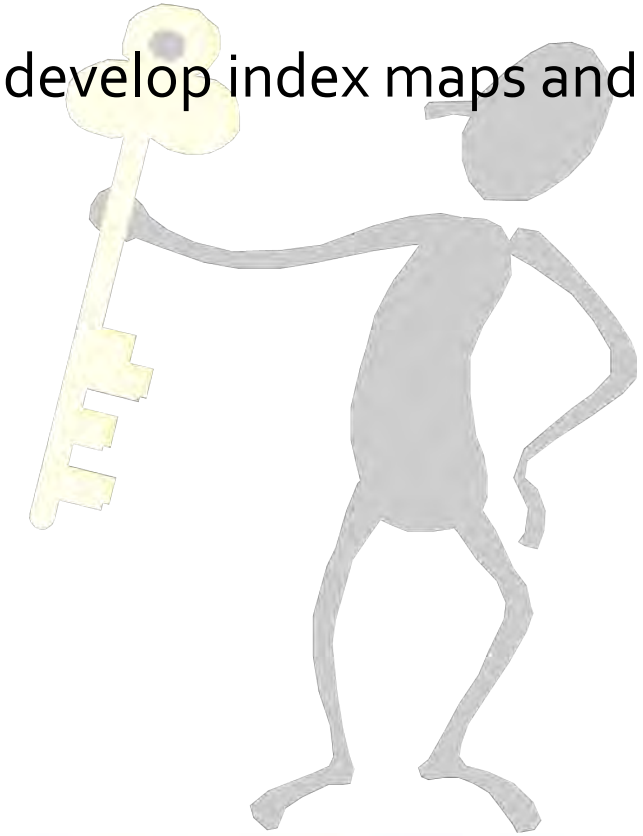
Developing Index Maps with Spatial Data



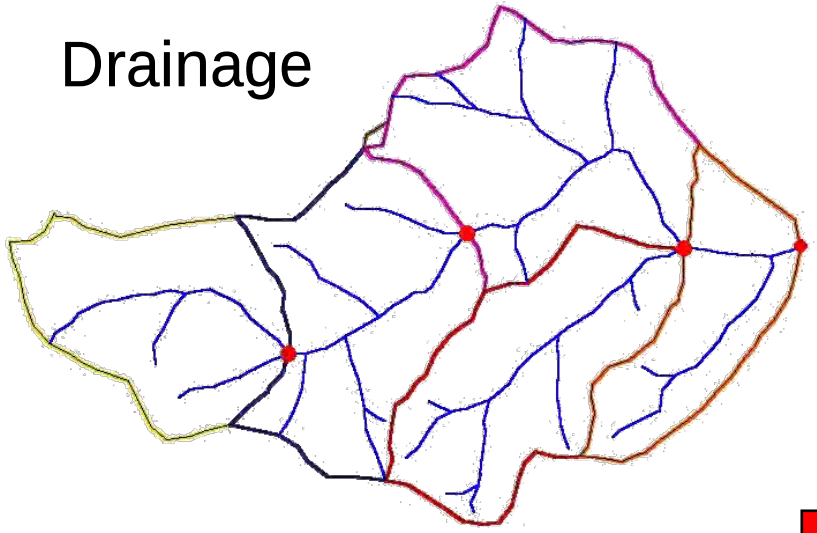
Objectives

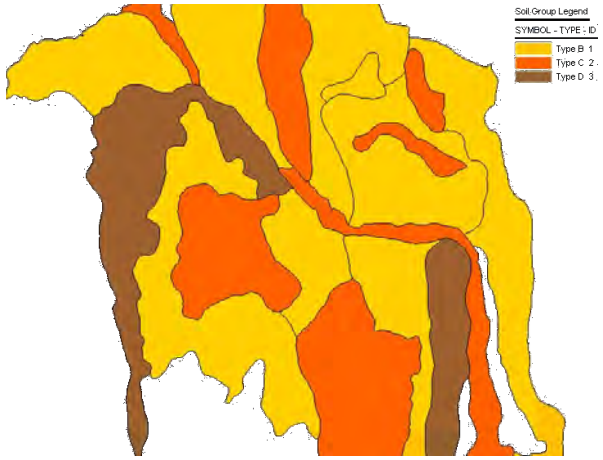
- Use the 2D grid as a basis for overlaying coverages to compute important hydrologic modeling parameters
- Use land use and soil data to develop index maps and initial mapping table parameters



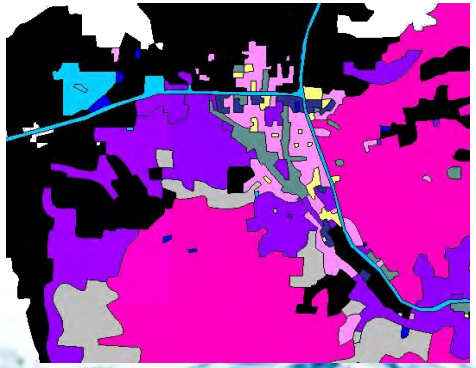
Mapping GIS Layers

Drainage





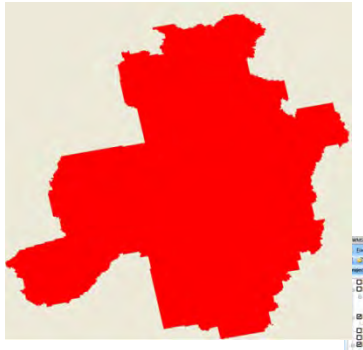
Soils

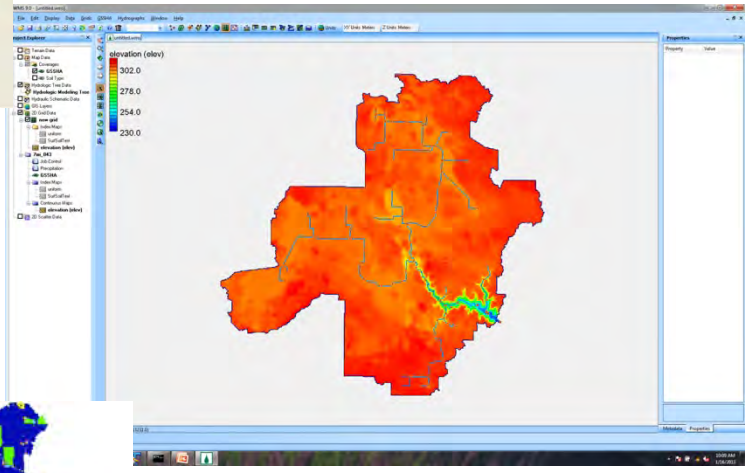


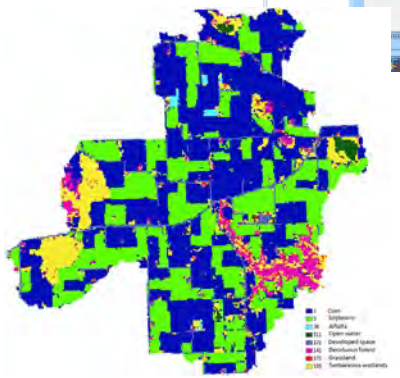
Land Use

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

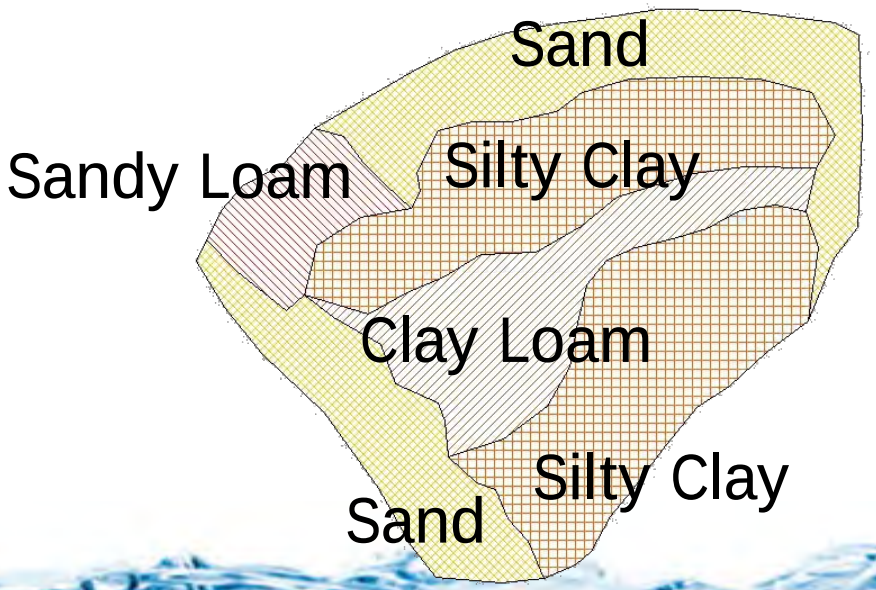




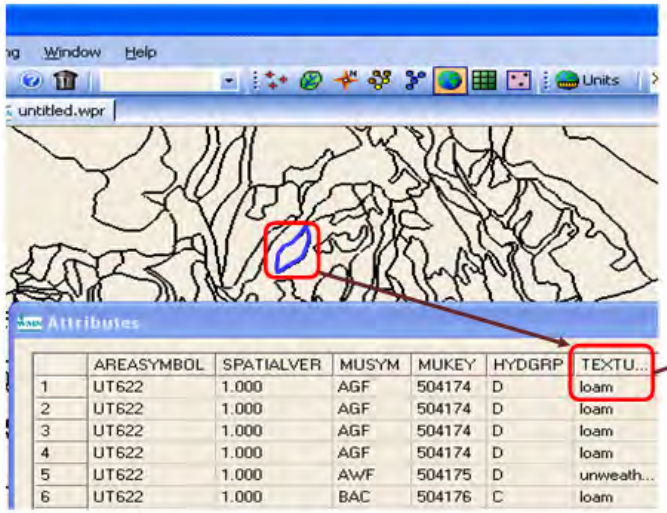


Soil Classifications

- 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

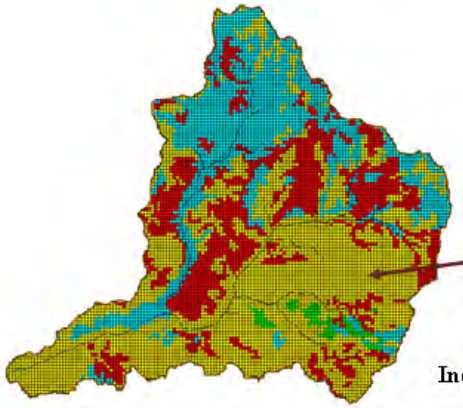


	AREASYMBOL	SPATIALVER	MUSYM	MUKEY	HYDGRP	TEXTU...
1	UT622	1.000	AGF	504174	D	loam
2	UT622	1.000	AGF	504174	D	loam
3	UT622	1.000	AGF	504174	D	loam
4	UT622	1.000	AGF	504174	D	loam
5	UT622	1.000	AWF	504175	D	unweath...
6	UT622	1.000	BAC	504176	C	loam

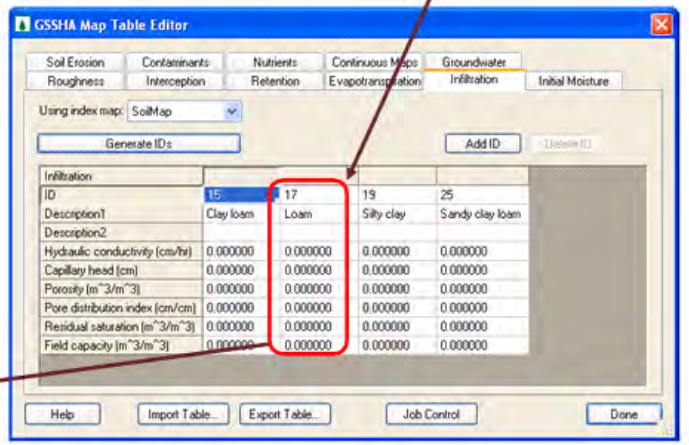
SSURGO soil attributes

Rawls and Brakensiek Table

USDA Textural Classification	θ_s	θ_e	θ_f	θ_{wp}	θ_r	Ψ_b (cm)	λ	K_s (cm/h)	Ψ_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



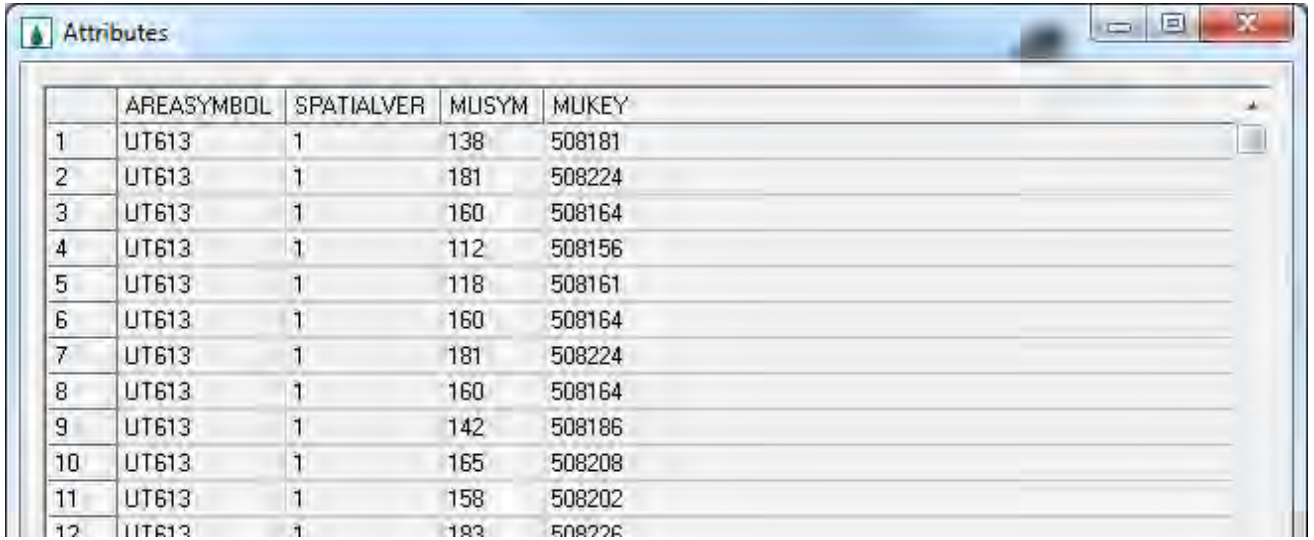
Index Map



Mapping Table

Geospatial data processing

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

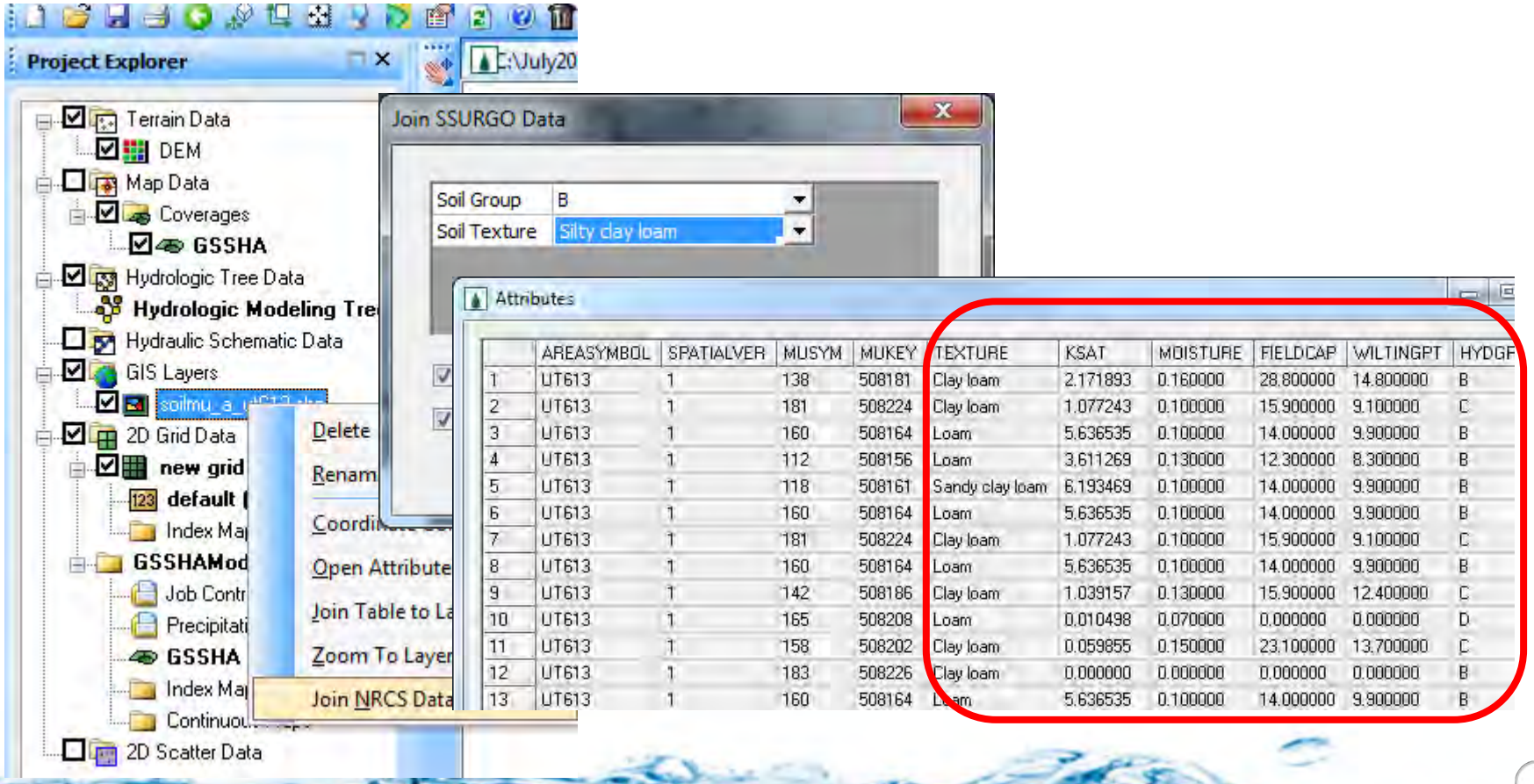


	AREASYMBOL	SPATIALVER	MUSYM	MUKEY
1	UT613	1	138	508181
2	UT613	1	181	508224
3	UT613	1	160	508164
4	UT613	1	112	508156
5	UT613	1	118	508161
6	UT613	1	160	508164
7	UT613	1	181	508224
8	UT613	1	160	508164
9	UT613	1	142	508186
10	UT613	1	165	508208
11	UT613	1	158	508202
12	UT613	1	183	508226

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

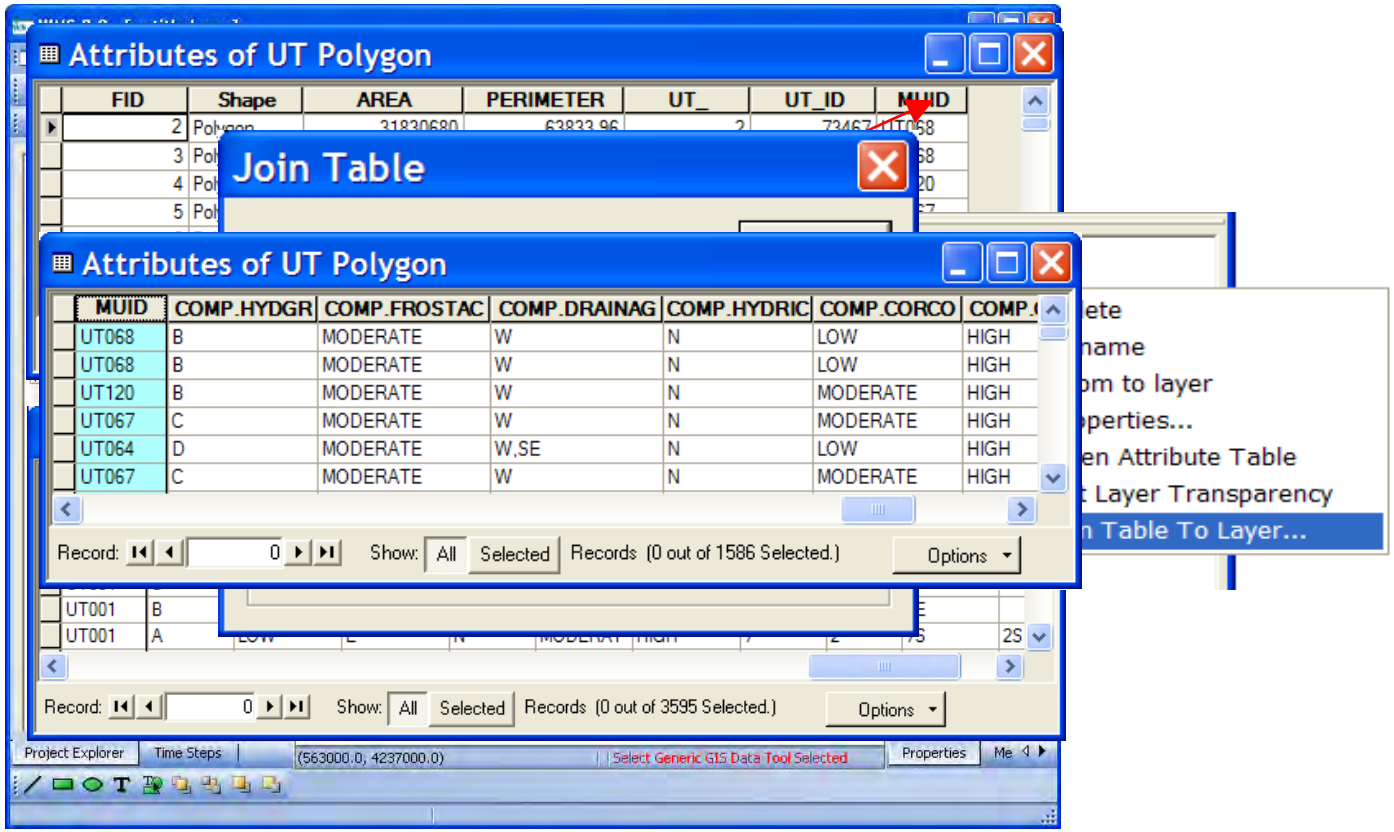
- WMS has a utility to join SSURGO tabular data to the shapefile



	AREASYMBOL	SPATIALVER	MUSYM	MUKEY	TEXTURE	KSAT	MOISTURE	FIELDCAP	WILTINGPT	HYDGF
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

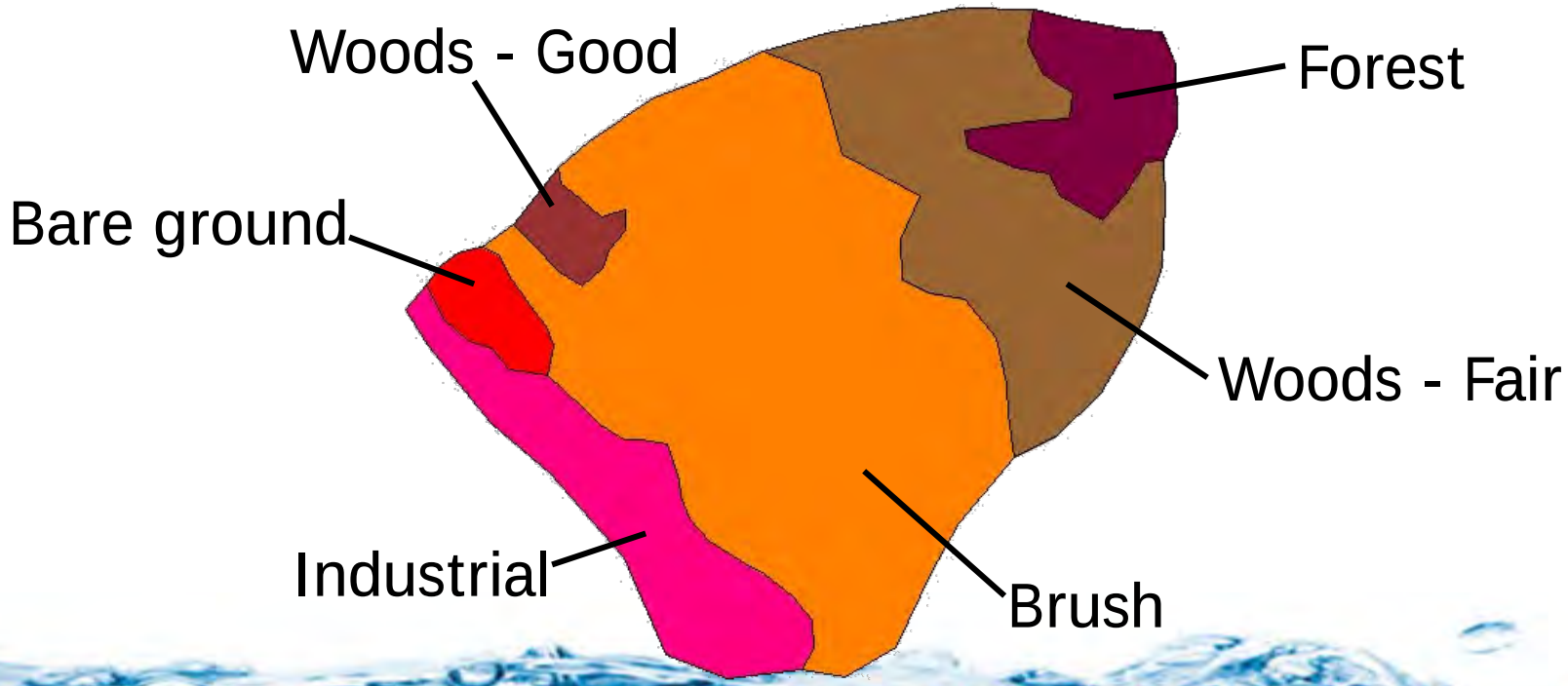
Joining STATSGO Tables

- 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

Classification Code	
11	
12	
13	
14	
15	Indu
16	Mixe
17	Othe
21	Crop
22	Orch
23	Cont
24	Othe
31	Herb
32	Shru
33	Mixe
41	Deci
42	Ever
43	Mixe
51	Streams and Canals
52	Lakes
53	Reservoirs
54	Bays and Estuaries
61	Forested Wetlands
62	Nonforested Wetlands
71	Dry Salt Flats

```
Grass:

Range (n

Woods
```

```
14  Transportation
15  Industrial and
16  Mixed Urban or
17  Other Urban or
21  Cropland and P
22  Orchards, Grov
23  Confined Feedi
24  Other Agricult
31  Herbaceous Ran
```

```
ROUGH
0.011000
0.012000
```

GSSHA Map Table Editor

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

Using index map: Land use
Index map type: Grid
Generate IDs | Add ID | Delete ID

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 Classification

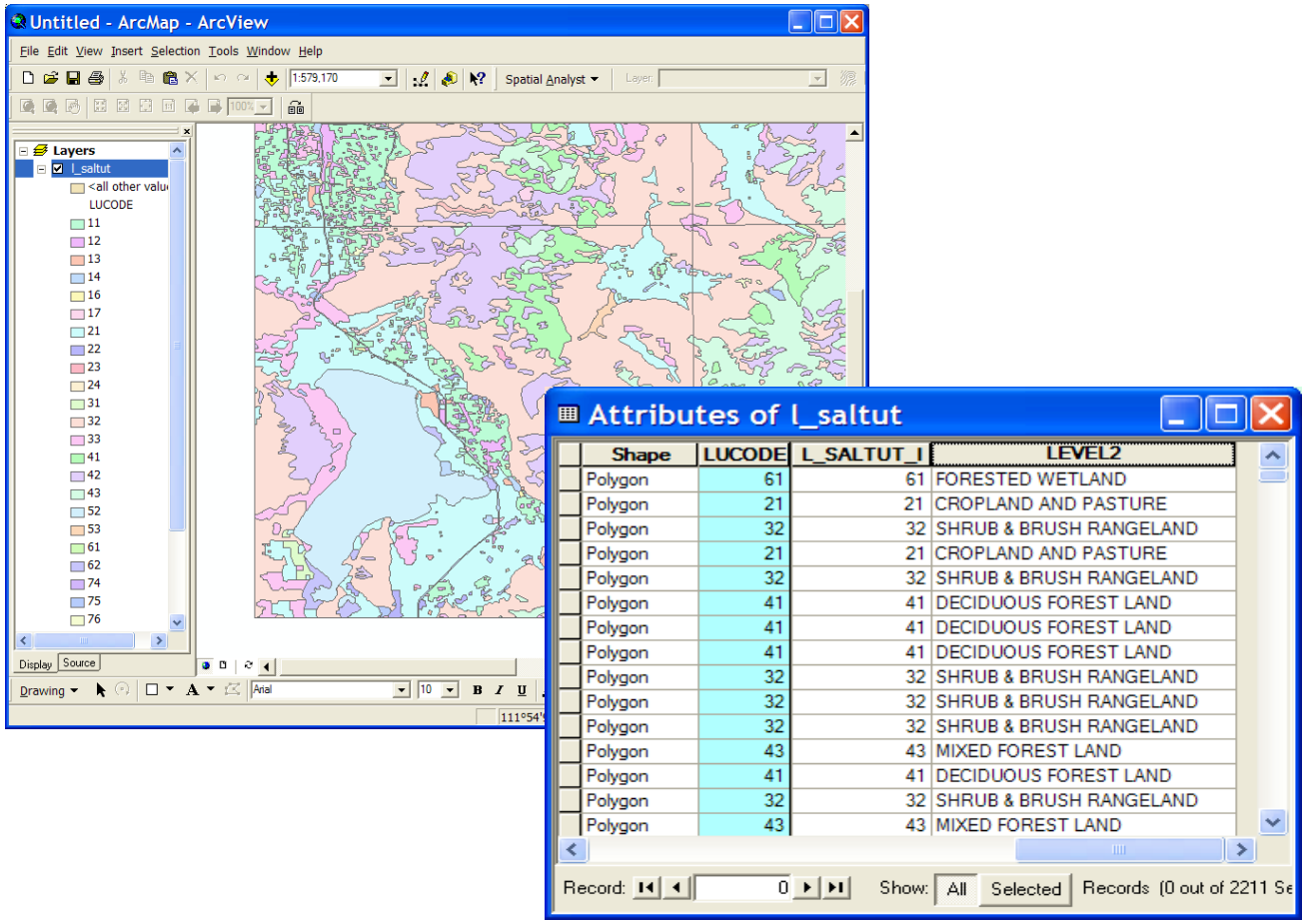


Table 1. Anderson Land Use Classification Codes

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

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

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