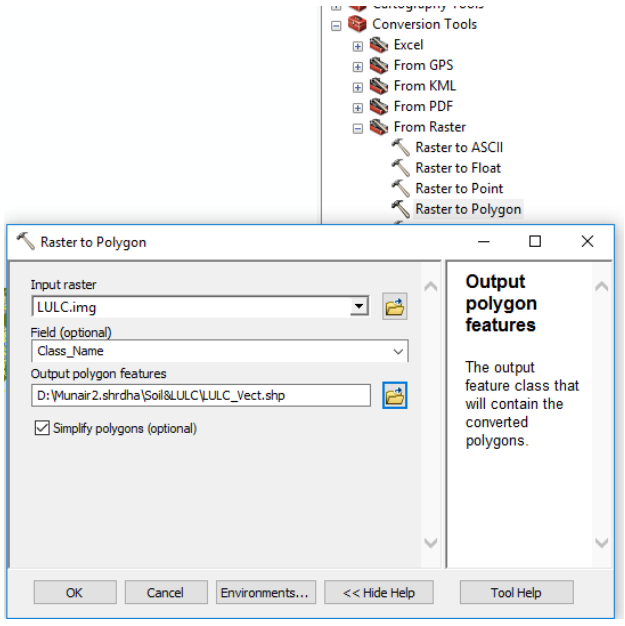
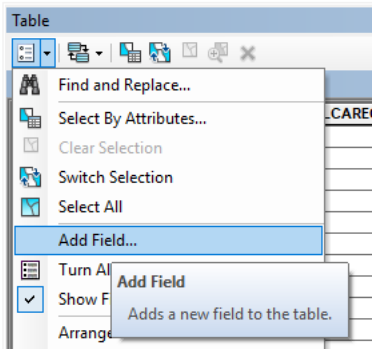
Creating SCS Curve Number Grid using HEC-GeoHMS

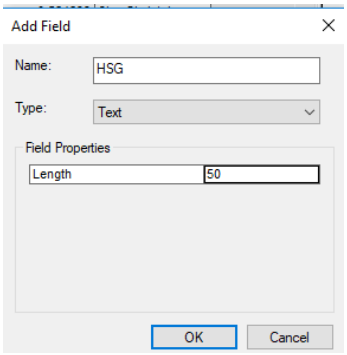
1. The objective of this tutorial is to use soil and land use data to create a curve number grid using HEC-GeoHMS
2. Data Requirements:
   (1) DEM for the study area
   (2) Soil data
   (3) Land cover grid
3. Create a new .mxd map document and save it.
4. We are going to use these land use classes and soil group type, in conjunction with SCS curve numbers, to create the curve number grid. The SCS CN table gives CN for different combinations of land use and soil group.
5. The first step in processing land use data is converting the land use grid into a polygon feature class which will be merged with soil data later. In Arc Toolbox, Click on Conversion Tools> From Raster > Raster to Polygon. Confirm the Input raster is lulc, the Field is Class Name, output geometry type is Polygon, and save the Output features as landuse_poly.shp in your working directory (this output is saved only as a shape file without any other options). Click OK.



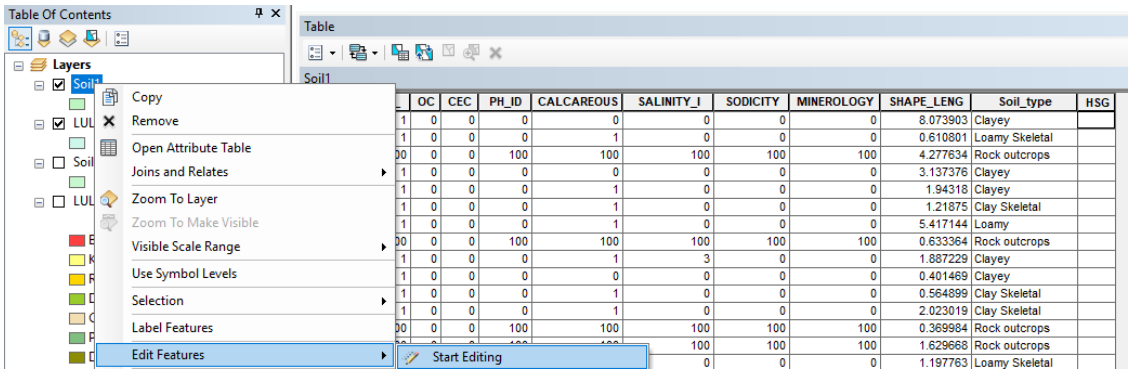
6. Add soil feature class from dataset. For extracting CN numbers, we need soil group for each polygon in soil feature class. If you open the attribute table for soil, you will notice that there is

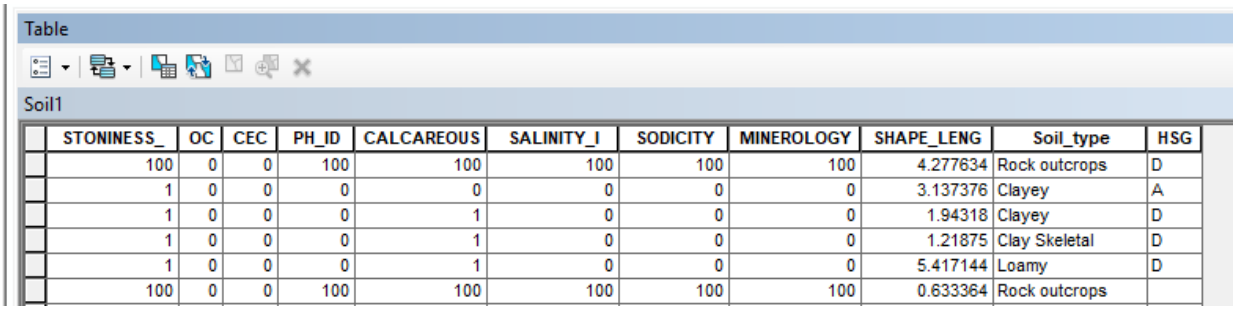
no field for storing soil group. So the first step is creating an empty field for storing soil group data. Create a field named “HSG” (type: Text) in soil.



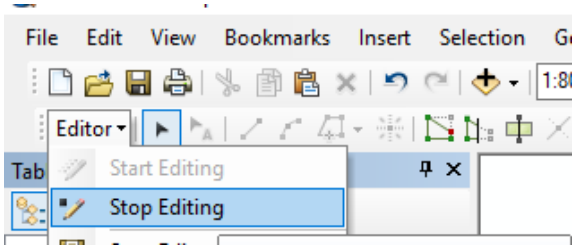


7. Divide the Soil type in four hydrological soil groups. Edit the column HSG with letters A/B/C/D.





STONINESS_	OC	CEC	PH_ID	CALCAREOUS	SALINITY_I	SODICITY	MINEROLOGY	SHAPE_LENG	Soil_type	HSG
100	0	0	100	100	100	100	100	4.277634	Rock outcrops	D
1	0	0	0	0	0	0	0	3.137376	Clayey	A
1	0	0	0	1	0	0	0	1.94318	Clayey	D
1	0	0	0	1	0	0	0	1.21875	Clay Skeletal	D
1	0	0	0	1	0	0	0	5.417144	Loamy	D
100	0	0	100	100	100	100	100	0.633364	Rock outcrops	



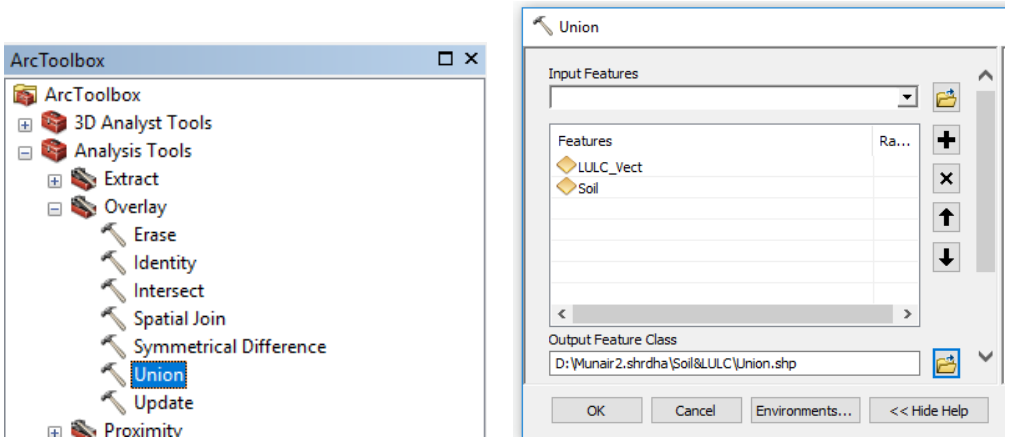
8. Next create four more fields named PctA, PctB, PctC, and PctD all of type short integer in soil feature class. For each feature (polygon) in soil PctA will define what percentage of area within the polygon has soil group A, PctB will define what percentage of area within the polygon will have soil group B and so on. For our study area we have one soil group assigned to each polygon so a polygon with soil group "A" will have PctA = 100, PctB = 0, PctC = 0, and PctD = 0. Similarly for a polygon with soil group D, only PctD = 100, and other three Pcts are 0. Now populate PctA, PctB, PctC and PctD based on SoilCode for each polygon. You can select features based on HSG and then use field calculator to assign numbers to polygons. The resulting attribute table should look like below

Table

Soil

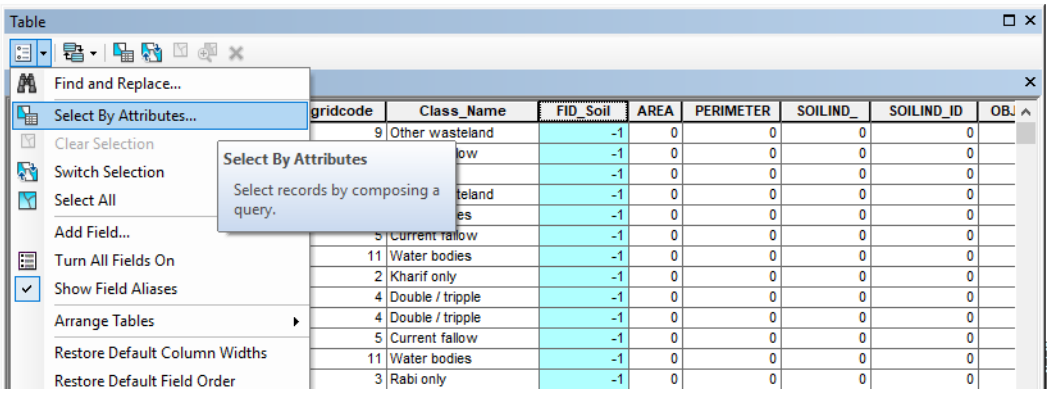
PH_ID	CALCAREOUS	SALINITY_I	SODICITY	MINEROLOGY	SHAPE_LENG	Soil_type	HSG	PctA	PctB	PctC	PctD
0	0	0	0	0	8.073903	Clayey	D	0	0	0	100
0	1	0	0	0	0.610801	Loamy Skeletal	A	100	0	0	0
100	100	100	100	100	4.277634	Rock outcrops	D	0	0	0	100
0	0	0	0	0	3.137376	Clayey	D	0	0	0	100
0	1	0	0	0	1.94318	Clayey	D	0	0	0	100
0	1	0	0	0	1.21875	Clay Skeletal	C	0	0	100	0
0	1	0	0	0	5.417144	Loamy	B	0	100	0	0
100	100	100	100	100	0.633364	Rock outcrops	D	0	0	0	100
0	1	3	0	0	1.887229	Clayey	D	0	0	0	100
0	0	0	0	0	0.401469	Clayey	D	0	0	0	100

9. To merge/union soil and landuse data, use the Union tool in ArcToolbox available under Analysis Tools Overlay. Browse/drag soil and landuse_poly as input features, name the output feature class as "Union" leave the default options, and click OK.

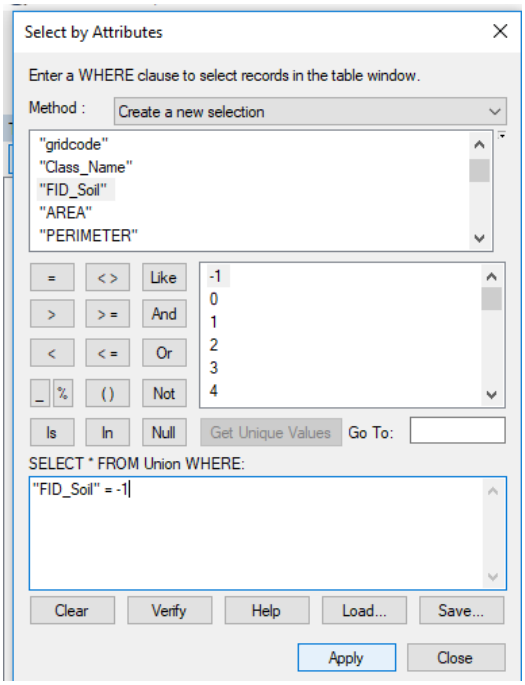


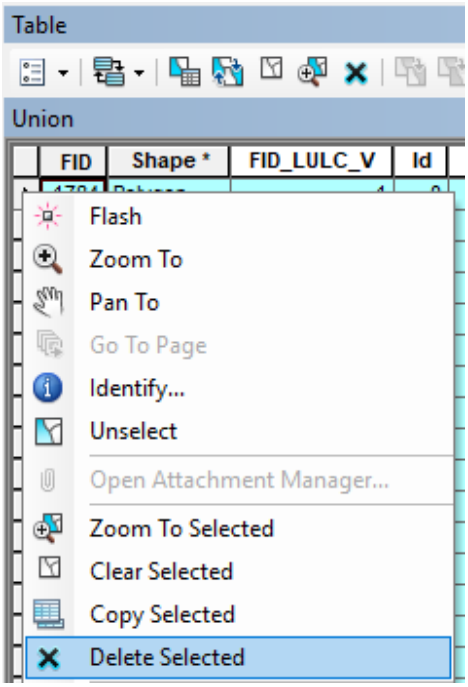
10. The result of union/merge features inherit attributes from both feature classes that are used as input. However, if the outer boundaries of input feature classes do not match exactly, the resulting merged feature class (Union in this case) usually will have features that will have attributes from only one feature class because the other feature do not exist in this area. These features are usually referred to as "slivers". If you open the attribute table for Union, you will find that there

are several sliver polygons in this feature class that have attributes only from landuse_poly and the soil attributes are empty, and vice versa as shown below:



In the above table the columns that start with FID_.... give the object ids of features from landuse_poly and soil. A value of -1 for FID_... means one of the feature classes do have features in that area to union with features from other feature classes. Basically a value of -1 for FID_... means that feature is a sliver polygon. Select all the features that have "FID_..." = -1 and delete them. Save your edits, stop the Editor, and save the map document.

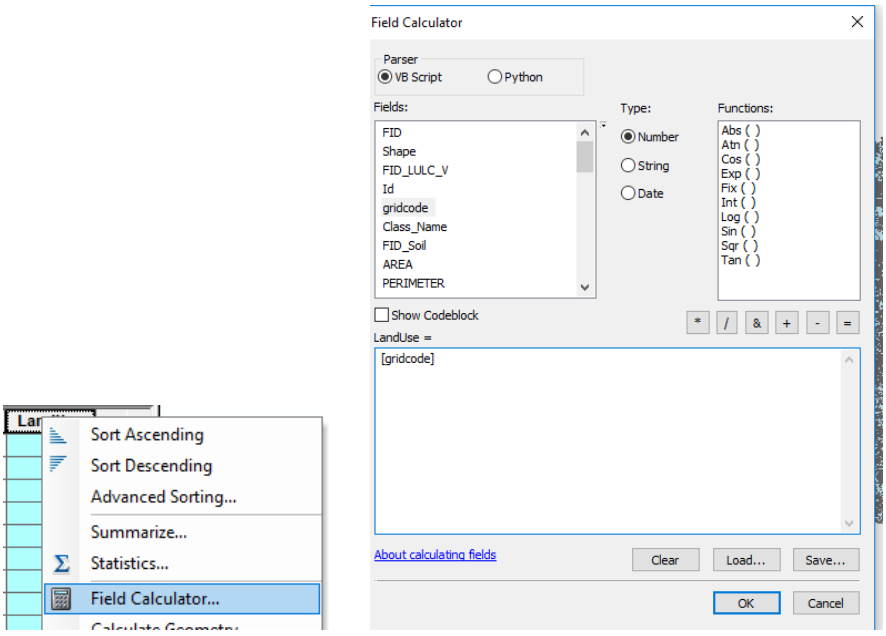




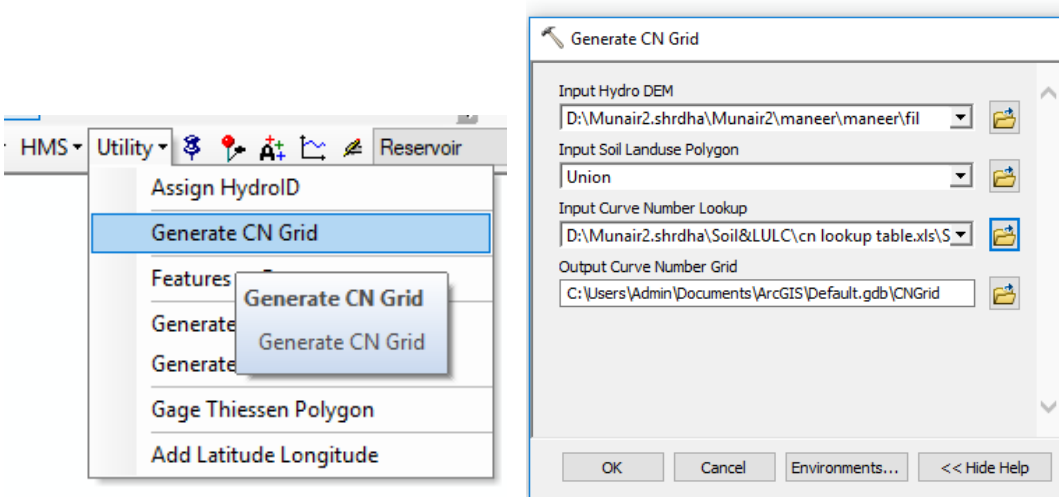
11. HEC-GeoHMS uses the merged feature class and the lookup table (CNLookUp) to create the curve number grid. Columns A/B/C/D store curve numbers for corresponding soil groups for each land use category (LUValue). These numbers are obtained from SCS

OBJECTID	LUVALUE	DESCRIPTION	A	B	C	D
1	1	Build up	61	75	83	87
2	2	Kharif only	72	81	88	91
3	3	Rabi only	74	83	88	90
4	4	Zaid only	74	83	88	90
5	5	Double / tripple	72	81	88	91
6	6	Current fallow	77	86	91	94
7	7	Plantation/orchard	57	73	82	86
8	8	Evergreen forest	30	55	70	77
9	9	Deciduous forest	36	60	73	79
10	10	Scrub/Deg. forest	45	66	77	83
11	11	Littoral Swamp	48	67	77	83
12	12	Grassland	49	69	79	84
13	13	Other wasteland	68	79	86	89
14	14	Gullied	74	83	88	90
15	15	Scrubland	48	67	77	83
16	16	Water Bodies	90	90	90	90
17	17	Snow Covered	95	95	95	95
18	18	Shifting Cultivation	74	83	88	90

12. Next step is to create a field in the Union feature class named “LandUse” that will have land use category information to link it to CNLookUp table. We already have this information stored in GRIDCODE field, but HEC-GeoHMS looks for this information in LandUse field. So **create** a field named LandUse (type: short integer), and **populate** it by equating it to GRIDCODE.



13. On the HEC-GeoHMS Project View toolbar, **click** on *Utility >Create Parameter Grids>* **Choose** the lookup parameter as Curve Number (which is default) in the next window, **Click** *OK*, and then select the inputs for the next window as shown below:



This process takes a while and CNGrid will be added to your map document.