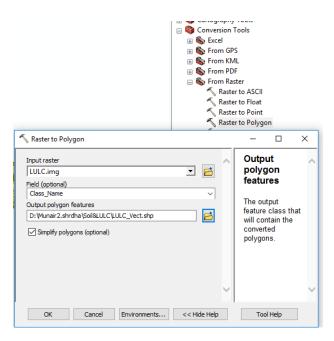
Creating SCS Curve Number Grid using HEC-GeoHMS

- 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.

able	
	🗄 + 🖫 🐼 🛛 🚳 🗙
AA.	Find and Replace
-	Select By Attributes
M	Clear Selection -
5	Switch Selection
	Select All
	Add Field
::::	Turn Al Add Field
~	Show F Adds a new field to the table.
	Arrange

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

able Of C			ά×	Table												
8 🔋 😓	> 🗧]	a	- 1	L	5	17 <i>d</i> 10	~							
🗉 🍠 Lay		_		Soil1		-			~							
= 🗹	Soil	Ð	Сору	2011			OC	CEC	PH_ID	CALCAREOUS	SALINITY_I	SODICITY	MINEROLOGY	SHAPE_LENG	Soil_type	няс
	LUL	×	Remove			1	0	0	0	0	0	0	0	8.073903	Clayey	
			Open Attribute Table		_	1	0	0	0	1	0	0	0		Loamy Skeletal	
	Soil					00	0	0	100	100	100	100	100		Rock outcrops	
			Joins and Relates		•	1	0	0	0	0	0	0	0	3.137376		
			Zoom To Layer			1	0	0	0	1	0	0	0	1.94318		_
	LUL	~				1	0	0	0	1	0	0	0		Clay Skeletal	
		Q?	Zoom To Make Visible			1	0	0	0	1	0	0	0	5.417144		
	• ••		Visible Scale Range		•	00	0	0	100	100	100	100	100		Rock outcrops	
	<u> </u>					1	0	0	0	1	3	0	0	1.887229		
	🔲 F		Use Symbol Levels			1	0	0	0	0	0	0	0	0.401469		
			Selection			1	0	0	0	1	0	0	0		Clay Skeletal	
						1	0	0	0	1	0	0	0	2.023019	Clay Skeletal	
			Label Features			00	0	0	100	100	100	100	100	0.369984	Rock outcrops	
			Edit Features						400	***	100	100	100	1.629668	Rock outcrops	
	- 4		Luit reatures			1	St	art Edi	ting		0	0	0	1.197763	Loamy Skeletal	

ble											
🗐 - I 🖶 - I 🖫 🚮 🖾 🐗 🗙											
oil1											
STONINESS_	0 C	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		
	bil1 STONINESS_ 100 1 1 1 1 1 1	▼ 號 ▼ 號 № STONINESS_ OC 100 0 100 1 0 1 1 0 1 0 1 0 1 0 1 0	▼ 號 ™ ™ ™ ∞ stoniness_ OC CEC 100 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0	▼ 畳 ▼ ™ ™ ™ ™ stoniness_ OC CEC PH_ID 100 0 0 100 100 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0	▼ Image: Stress of the	▼ ₽ ▼ ₽ ▼ ₩ № @ ∞ STONINESS_ OC CEC PH_ID CALCAREOUS SALINITY_I 100 0 0 100 100 100 100 0 0 0 0 00 1 0 0 0 1 0 1 0 0 0 1 0 1 0 0 0 1 0 1 0 0 0 1 0	▼ ₽ ▼ ₽ ▼ ₩ № ∞ ∞ ∞ stoniness_ OC CEC PH_ID CALCAREOUS SALINITY_I SODICITY 100 0 0 100 100 100 100 100 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 1 0 0 0 1 0 0 0 0 1 0 0 0 1 0 0 0 0 1 0 0 0 1 0 0 0 0	Image: Storight of the storigh	Image: Storight and S	Image: Storing State Storing Storing State Storing Storing State Storing State	

Fil	e E	dit	View	Bookma	rks I	nsert	Sele	ction	G
÷	D 🖸	<u>s</u> 6	a	% 🖻 🕻	ł ×	5	C <	→ - [1:8
1	Edito	or •	► ►	120	1/2-1 -			:: 📫	×
Tab	1	Sta	rt Editin	g		L	φ×		
8	1	Sto	p Editin	g					
	-	-		(

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

_													
Tal	Table												
🗄 - I 🖶 - I 🖫 🌄 🖾 🚚 🗙													
Soi	i												
	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	А	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	С	0	0	100	0	
	0	1	0	0	0	5.417144	Loamy	В	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.

		🔨 Union		
ArcToolbox	□ ×	Input Features		,
🚳 ArcToolbox			2	ľ
🕀 🚳 3D Analyst Tools				
🖃 🚳 Analysis Tools		Features Ra	+	
🕀 🍆 Extract		LULC_Vect Soil	×	
🖃 🇞 Overlay			1	
🔨 Erase				
🔨 Identity			Ŧ	
🔨 Intersect				
🔨 Spatial Join		< >		
🔨 Symmetrical Difference		Output Feature Class		
🔨 Union		D: \Munair2.shrdha \Soil&LULC \Union.shp	E	1
🔨 Update		OK Cancel Environments << Hide	e Help	
🖽 🛸 Proximitv				

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:

Table												×
-	🖥 - 🏪 🌄 🛛 🍕	×										
<i>P</i> A	Find and Replace											×
	Select By Attributes		gridcode	Clas	s_Name	FID_Soil	AREA	PERIMETER	SOILIND_	SOILIND_ID	OBJ	^
R	Clear Selection		9	Other was	steland	-1	0	0	0	0		
		Select By At	Select By Attributes ow Select records by composing a query. es		ow	-1	0	0	0	0		
N	Switch Selection					-1	0	0	0	0		
	Select All				teland	-1	0	0	0	0		
		query.			es	-1	0	0	0	0		
	Add Field	-	5 Current ta		low	-1	0	0	0	0		
	Turn All Fields On		11	Water boo	lies	-1	0	0	0	0		
	Show Field Aliases			Kharif on	Kharif only		0	0	0	0		
Ľ	Show Field Allases		4	Double / tr	ipple	-1 0	0	0	0			
	Arrange Tables	+	4	Double / tr	ipple	-1	0	0	0	0		
			5 Current f		llow	-1	0	0	0	0		
	Restore Default Column	Widths	11	Water boo	lies	-1	0	0	0	0		
	Restore Default Field Or	der	3	Rabi only		-1	0	0	0	0		

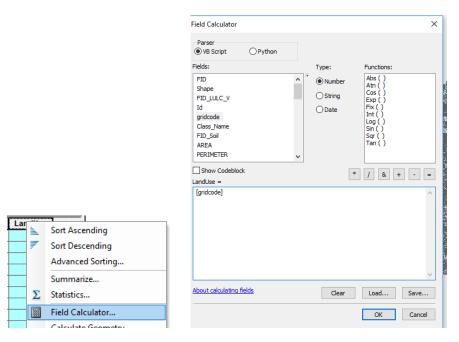
In the above table the columns that start with FID_.... give the object ids of features from landuse_poly and soil. A value of -1 for FID_... means one of the feature classes do have features in that area to union with features from other feature classes. Basically a value of -1 for FID_... means that 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.

Select by Attributes X	Table
Enter a WHERE clause to select records in the table window.	🗄 - 🖶 - 🖫 🚱 🛛 🚜 🗙 🗞 🦷
Method : Create a new selection	Union
"gridcode" ∧ [™] "Class_Name" "FID Soil"	FID Shape* FID_LULC_V Id
"AREA"	「 🔆 Flash 👘 👘
"PERIMETER" ✓ = <> Like -1 ^	🔍 Zoom To
= <> Like -1 ^	- 🖑 Pan To -
< <= Or 2	🛛 🕼 🛛 Go To Page
% () Not 4	- 🕕 Identify
Is In Null Get Unique Values Go To:	- 🗹 Unselect
SELECT * FROM Union WHERE: "FID_Soil" = -1	Open Attachment Manager
	- 🛃 Zoom To Selected
~	Clear Selected
Clear Verify Help Load Save	- 🛄 Copy Selected -
Apply Close	X Delete Selected

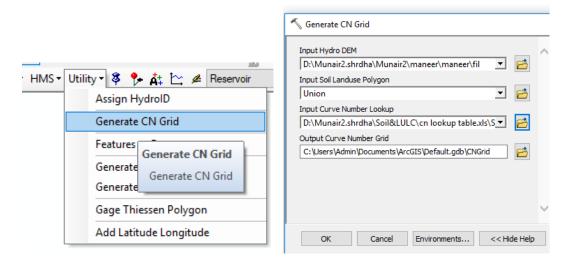
11. HEC-GeoHMS uses the merged feature class and the lookup table (CNLookUp) to create the curve number grid. Columns A/B/C/D store curve numbers for corresponding soil groups for each land use category (LUValue). These numbers are obtained from SCS

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

