

Land Cover Layer and Manning's n Values

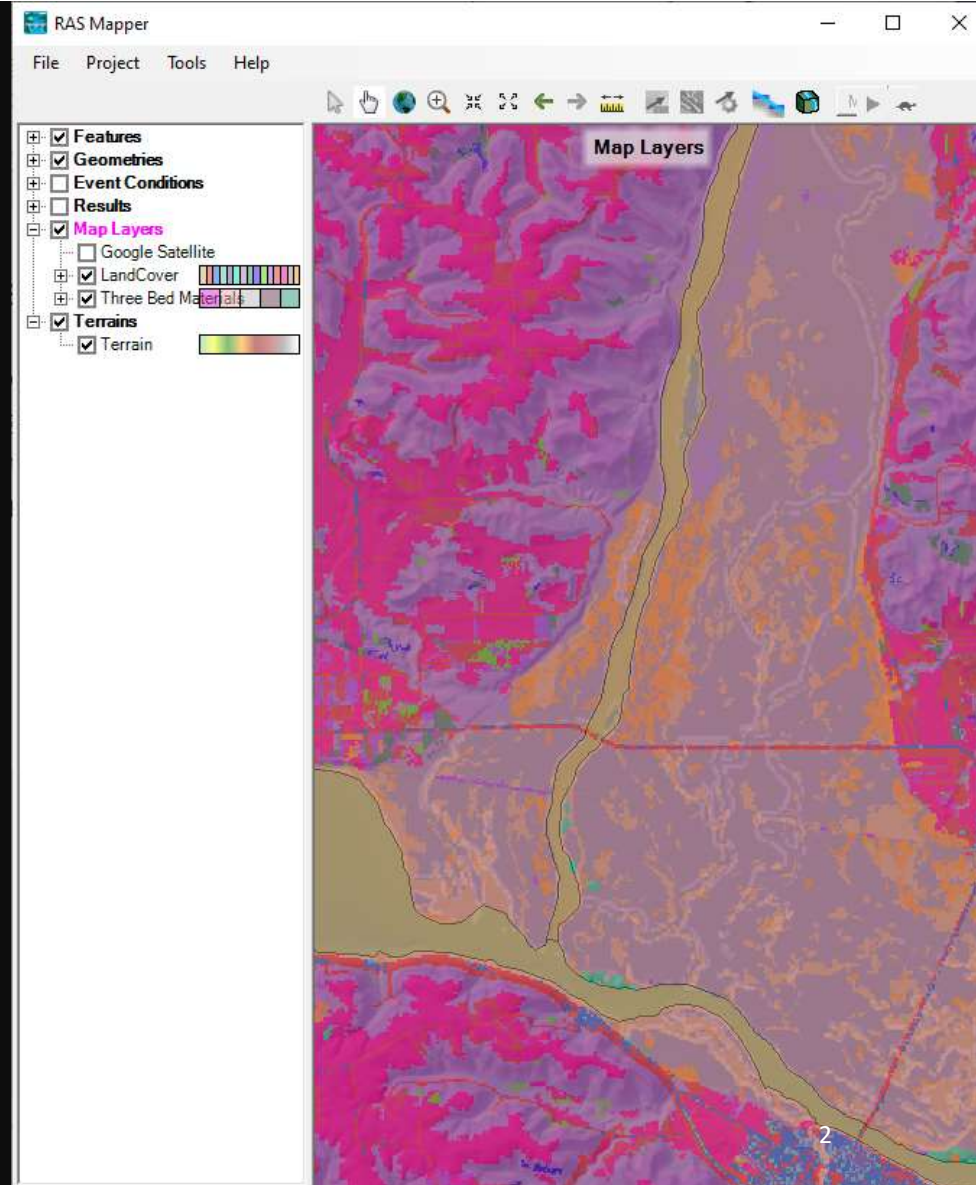
Stanford Gibson, Ph.D
Cameron Ackerman, P.E., D.WRE

USACE, Institute for Water Resources, Hydrologic Engineering Center



Overview

1. Land Cover Data Sources
 2. Importing Land Cover Data
 3. Associating Manning's n Values
 4. Modifying Land Cover Data
-





Land Cover Data Sources

- Support use of Land Cover data for estimating Manning's n values
 - Raster and Shapefile polygon datasets
- NLCD 2019
 - <http://www.mrlc.gov>
(30-m raster)
- USGS LULC
 - <http://water.usgs.gov/GIS/dsdl/ds240/index.html>
(vector or raster)

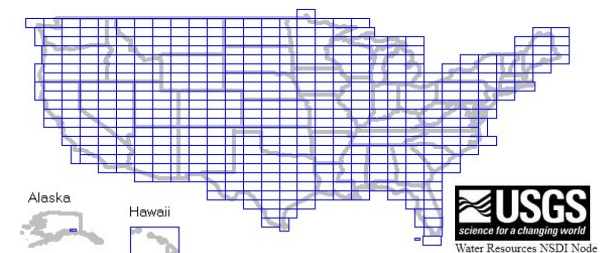
MRLC Celebrating 20+ years of Partnership
Multi-Resolution Land Characteristics
Consortium



Multi-Resolution Land Characteristics (MRLC)
Consortium

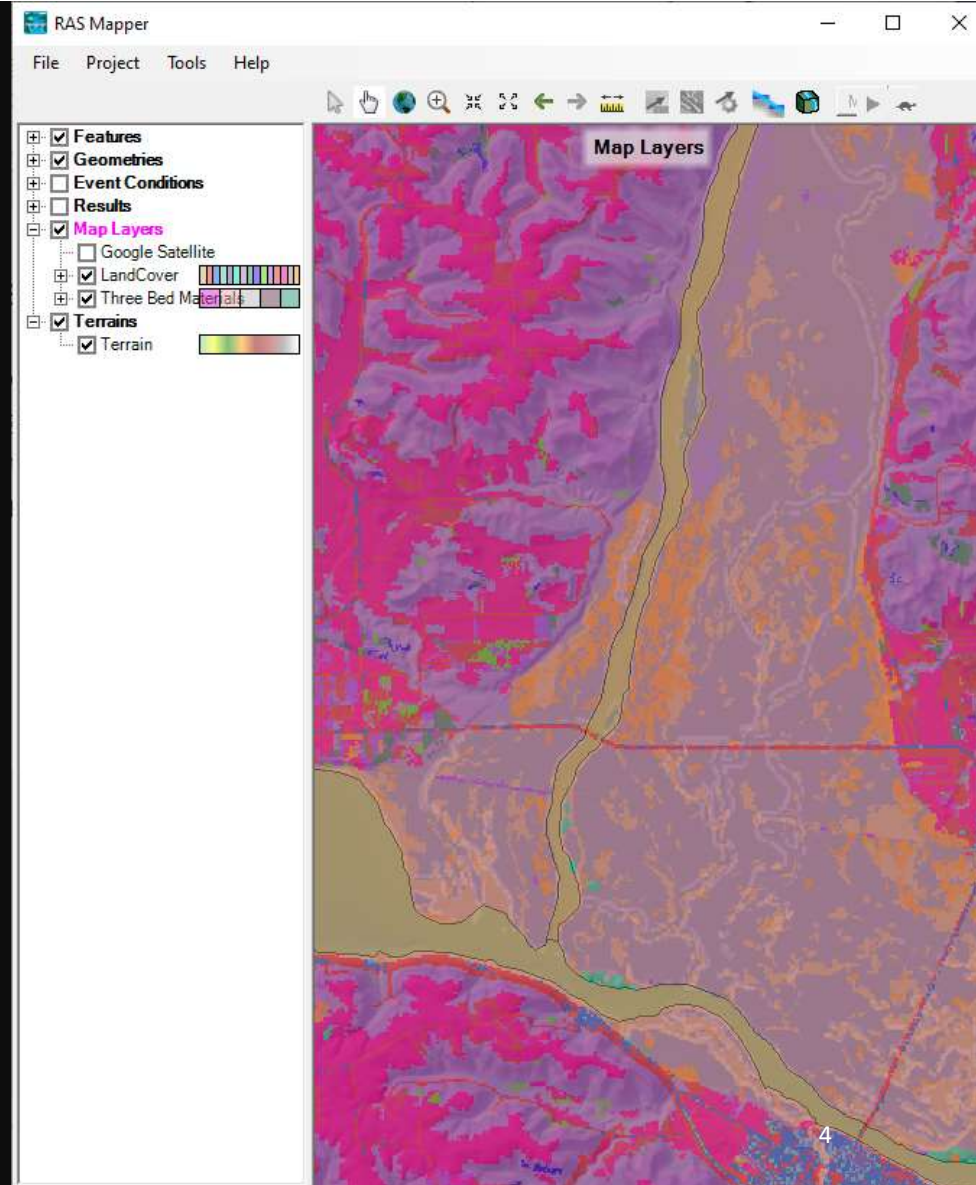
Download land use and land cover data sets using clickable image map

Click on the blue polygons on the image to download data sets.



Overview

1. Land Cover Data Sources
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 4. Modifying Land Cover Data
-



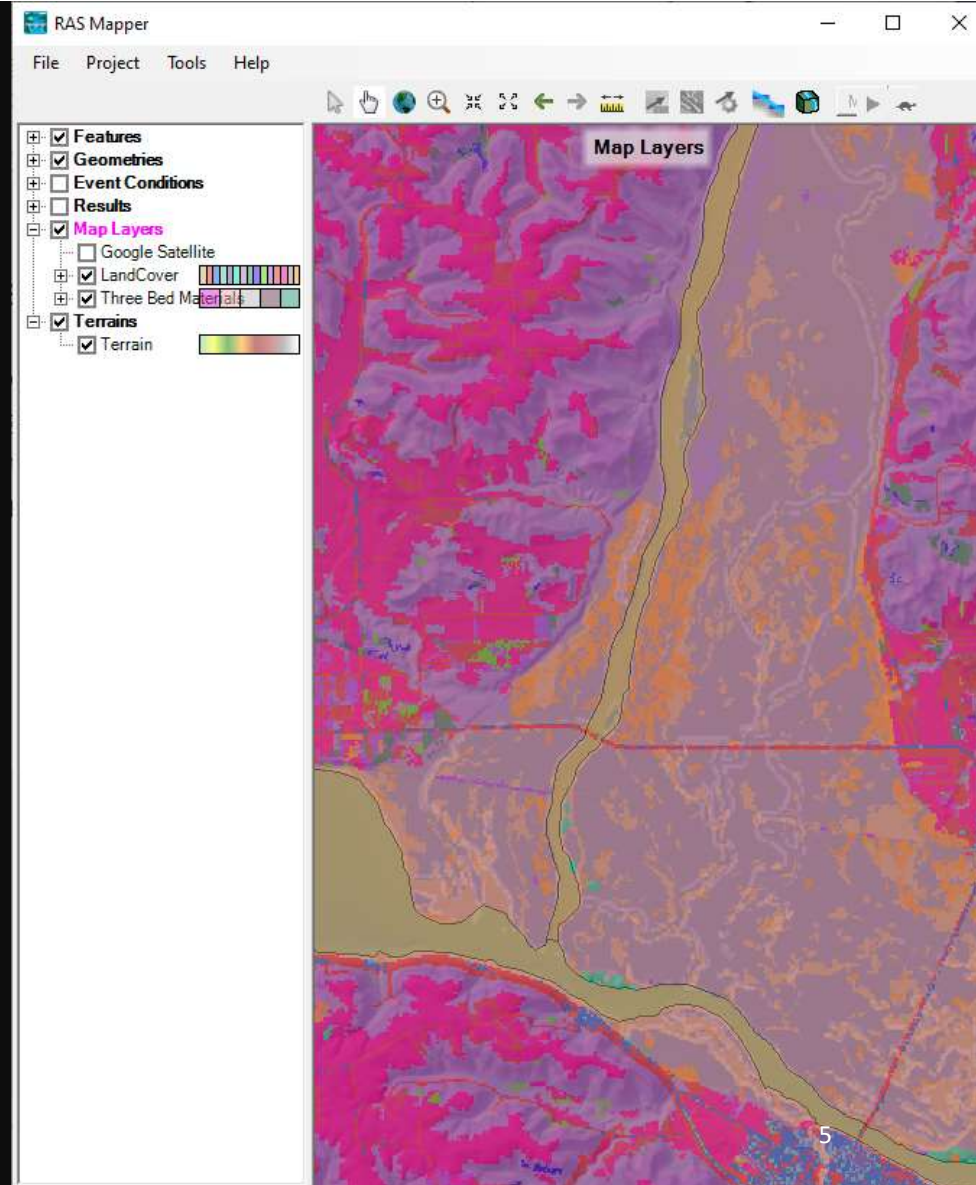
Overview

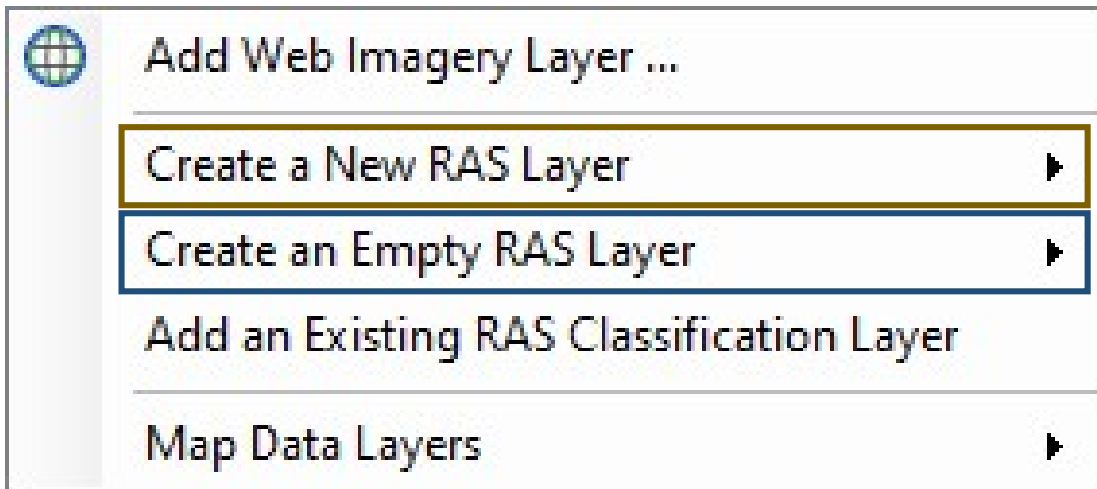
1. Land Cover Data Sources

2. *Creating*
~~Importing~~ Land Cover Data

3. Associating Manning's n Values

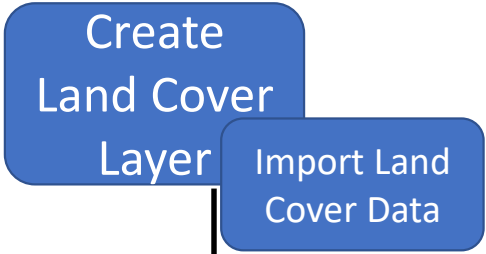
4. Modifying Land Cover Data



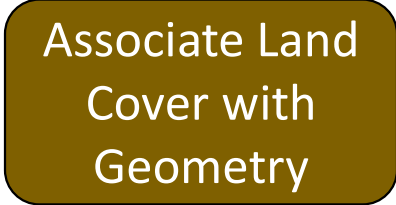


→ Create = Import
(from GIS file)

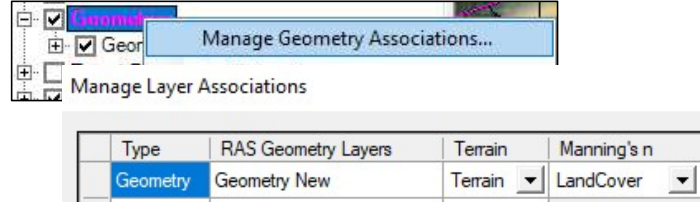
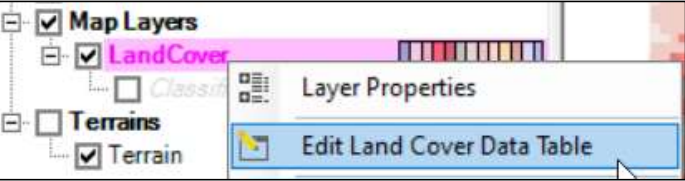
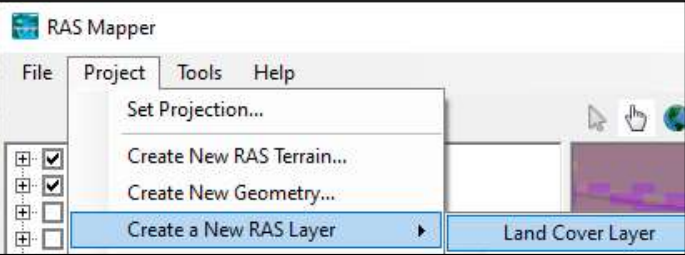
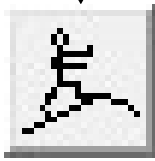
→ Create Empty =
Draw It

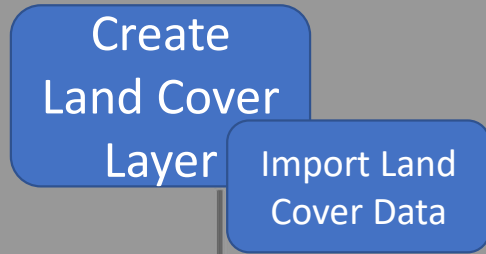
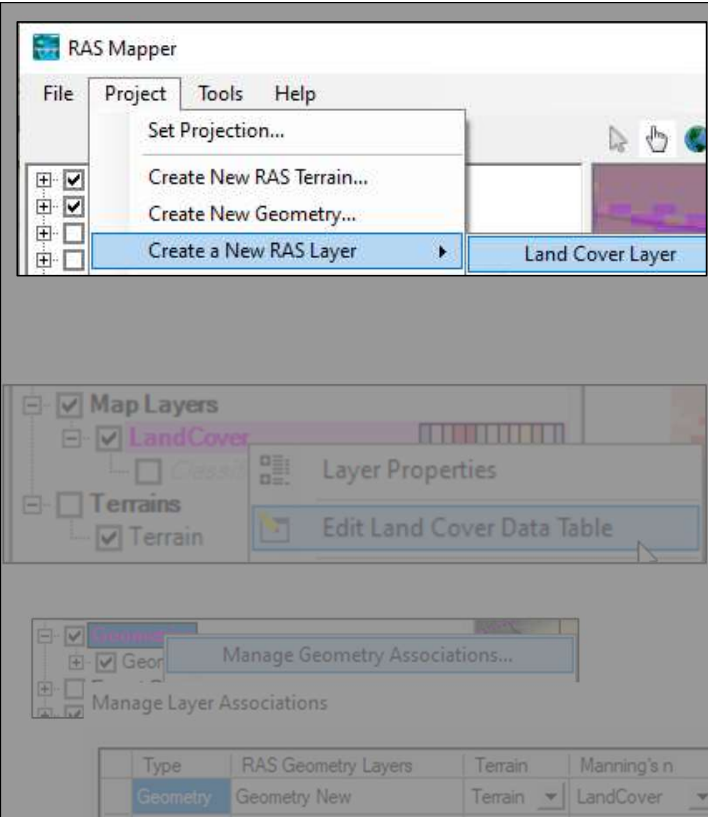


Optional

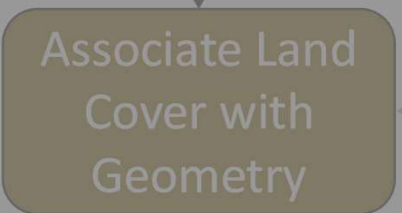


Optional

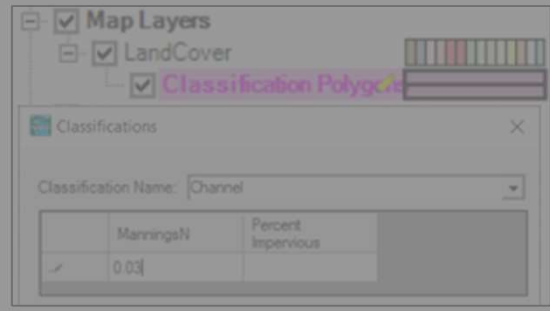
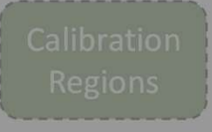




Optional



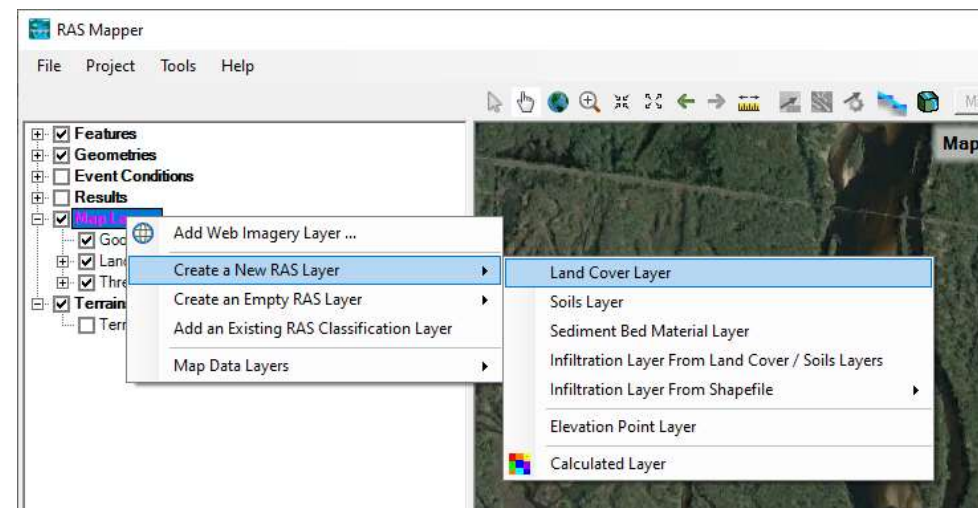
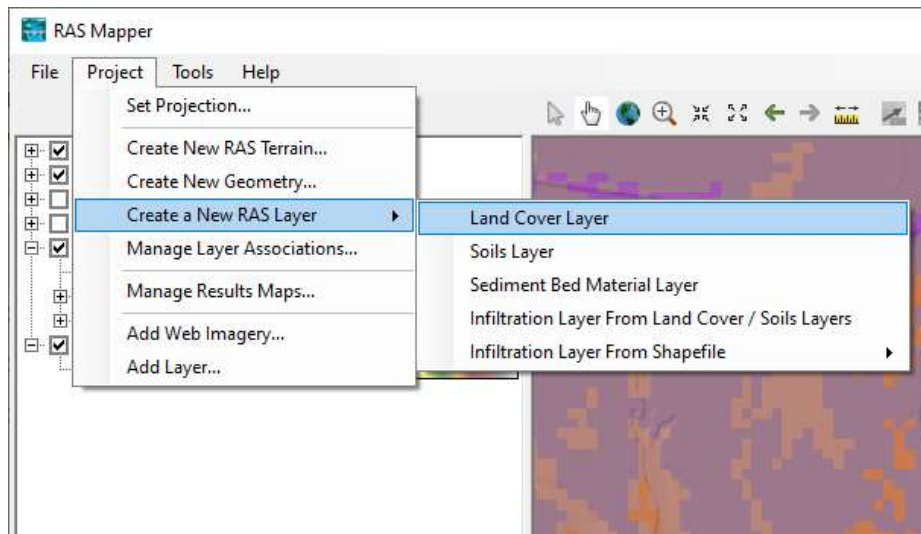
Optional





Importing Land Cover Data

- Define the project domain
 - Terrain model
 - River model construct
- Create a New Land Cover Layer



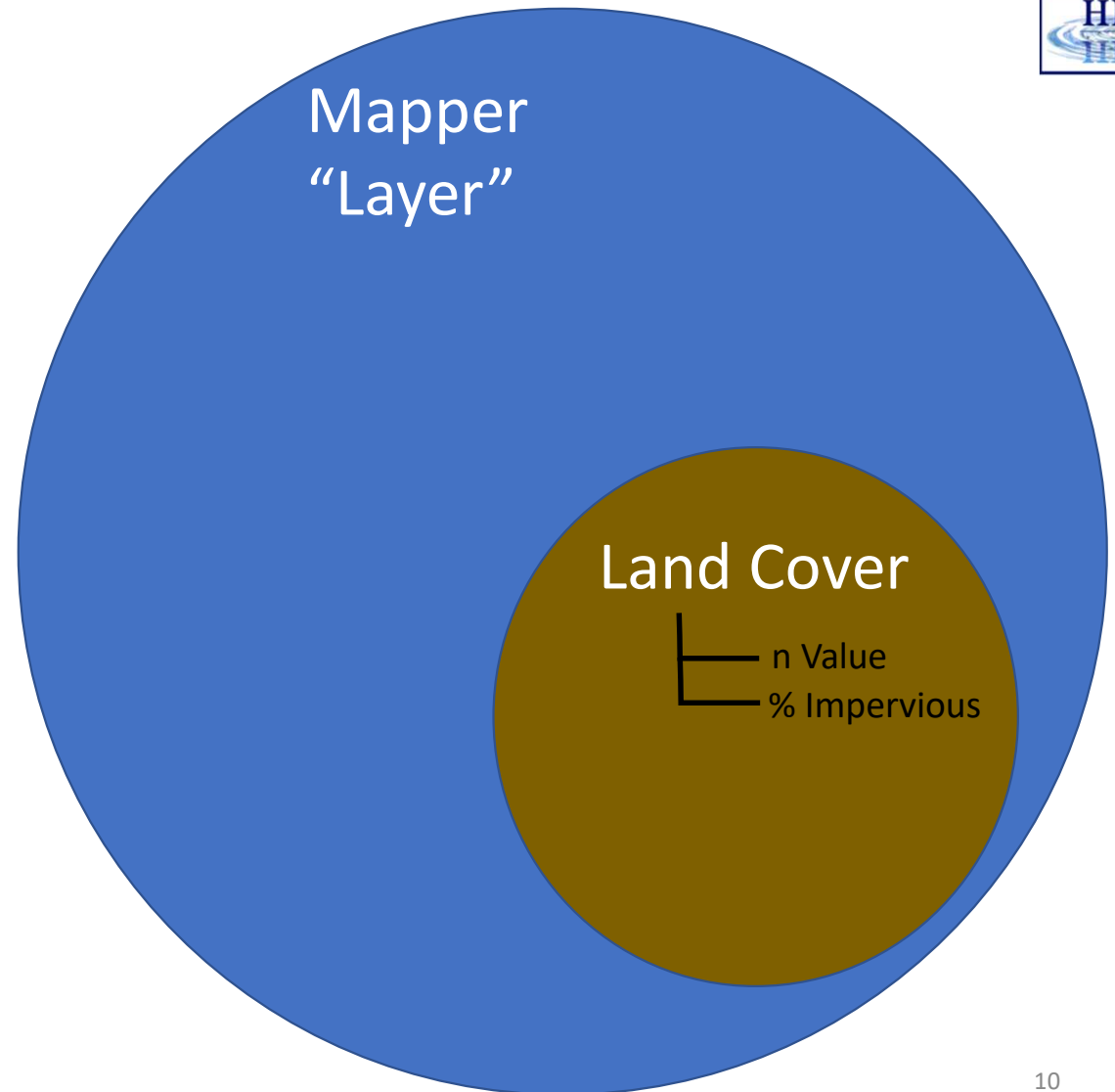


A Venn Diagram of Important Terms

Note: None of these terms is “n-Value”

Types of Mapper Layers

Land Cover Layer
Soils Layer
Sediment Bed Material Layer
Infiltration Layer From Land Cover / Soils Layers
Infiltration Layer From Shapefile ▶
Elevation Point Layer
Calculated Layer





New Land Cover Layer

- Set Extents
- Add Files
- Reclassify
- Set Cell Size
- Provide Filename
- Create

Create a New Land Cover Layer

Input Files: Geometries Terrains Geometries and Terrains Current View Entire Input File(s) NLCD 2016 Add Field...

Filename	Projection	Info	Naming Std.	Name Field
NLCD_2016_Land_Co...	PROJCS["Albers_...	Cell Size: 30 meters	NLCD 2016	N/A

Unique Classification Names for Selected File

Name Field	Classification
0	NoData
11	Open Water
21	Developed, Open Space
22	Developed, Low Intensity
23	Developed, Medium Intens...
24	Developed, High Intensity
41	Deciduous Forest
43	Mixed Forest
52	Shrub/Scrub
71	Grassland/Herbaceous
81	Pasture/Hay

Output File

RAS Classification	ID
NoData	0
Developed, Low Intensity	22
Developed, Medium Intensity	23
Developed, High Intensity	24
Developed, Open Space	21
Cultivated Crops	82
Pasture/Hay	81
Deciduous Forest	41
Shrub/Scrub	52
Grassland/Herbaceous	71
Open Water	11

Output ID Standards: NLCD 2016

Cell Size: feet Expected Output Size: <1 MB

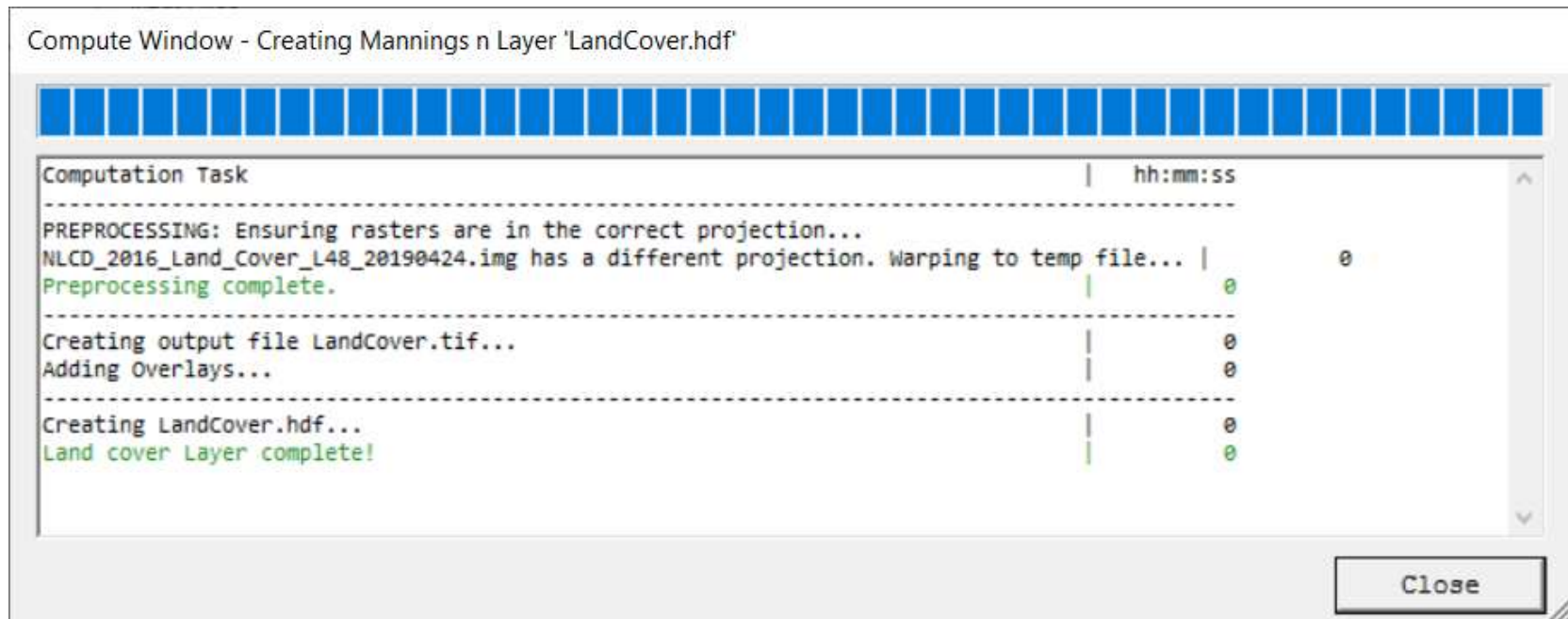
Filename:

Create Cancel



Land Cover Import

- New Raster is created (LandCover.tif and LandCover.hdf)
- Reprojected into coordinate system





Land Cover Layer



RAS Mapper

File Project Tools Help

Selected Layer: LandCover

- Features
- Geometries
 - Initial Mesh
- Event Conditions
- Results
- Map Layers
 - LandCover** (Color bar)
 - Classification Polygons
- Terrains
 - Terrain

Messages Views Profile Lines Active Featu

(414891.38, 1798945.86 1 pixel = 22.63 ft)

Select Surface Fill

Surface Symbol Settings

Available Color Ramps: RAS Defaults User Defined

Color Ramp: LCD

Surface Symbol

Classification	Color	Red (0-255)	Green (0-255)	Blue (0-255)	Alpha (0-255)
Open Water	Blue	84	117	168	255
Developed, Ope...	Light Red	232	209	209	255
Developed, Low ...	Red	226	158	140	255
Developed, Medi...	Dark Red	255	0	0	255
Developed, High ...	Dark Red	181	0	0	255
Deciduous Forest	Green	133	199	126	255
Mixed Forest	Light Green	212	231	176	255
Shrub/Scrub	Yellow-Green	220	202	143	255
Grassland/Herba...	Yellow	253	233	170	255
Pasture/Hay	Light Yellow	251	246	93	255
Cultivated Crops	Orange	202	145	70	255
Woody Wetlands	Light Blue	200	230	248	255

Reverse Colors Save Color Ramp

OK Cancel

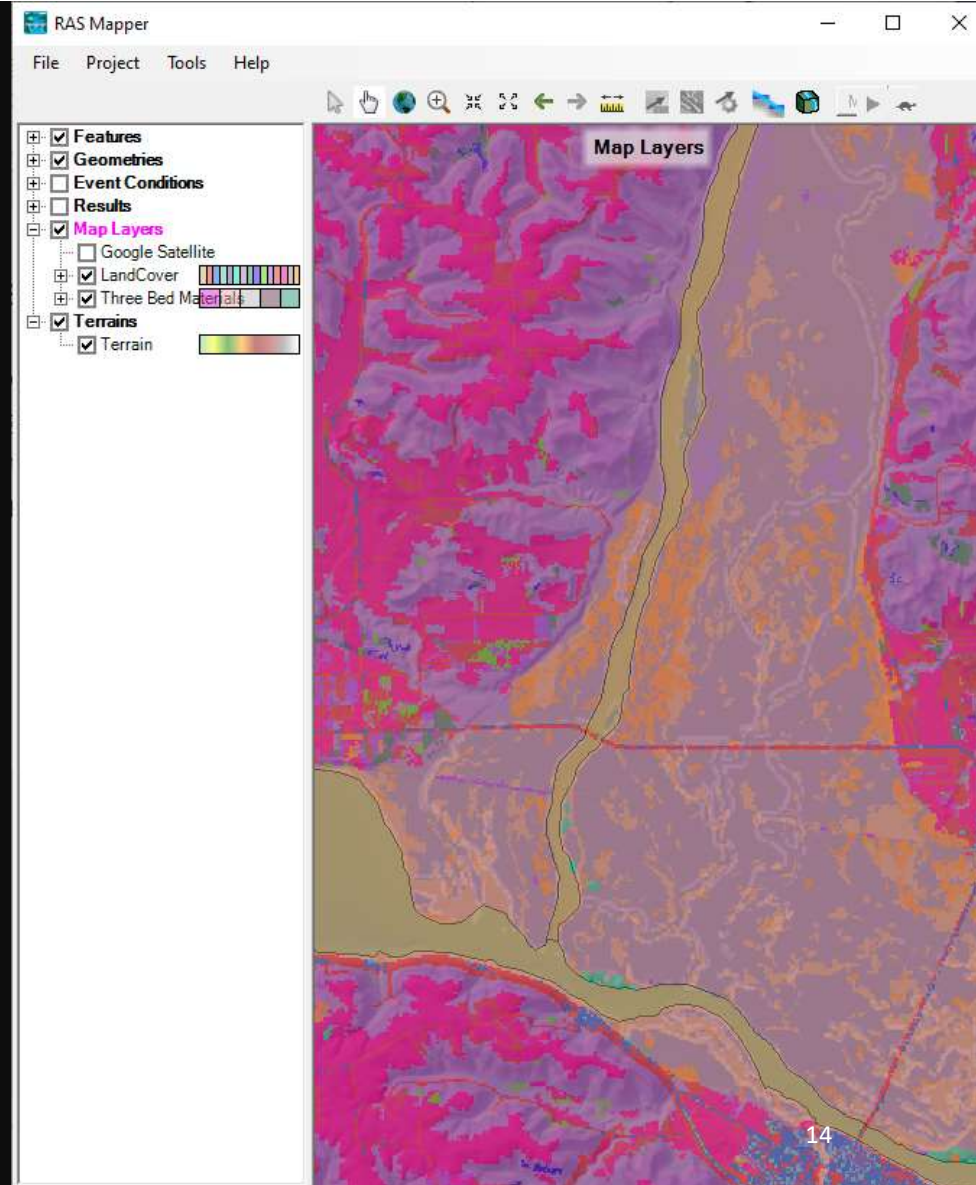
ID

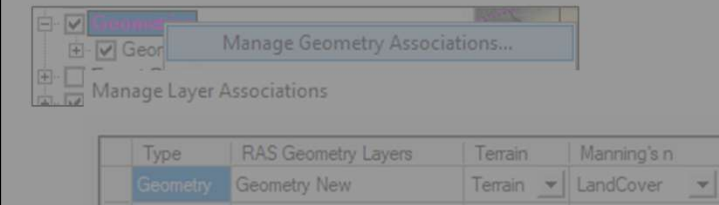
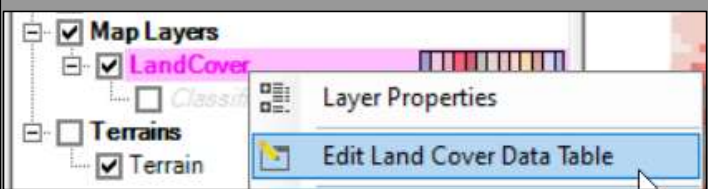
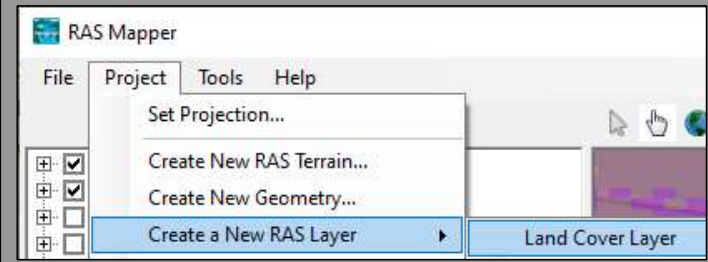
- 11
- 21
- 22
- 23
- 24
- 41
- 43
- 52
- 71
- 81
- 82
- 90
- 95

2000 ft

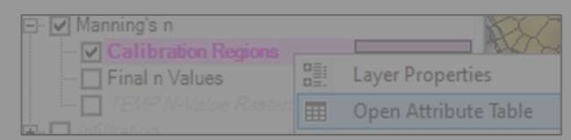
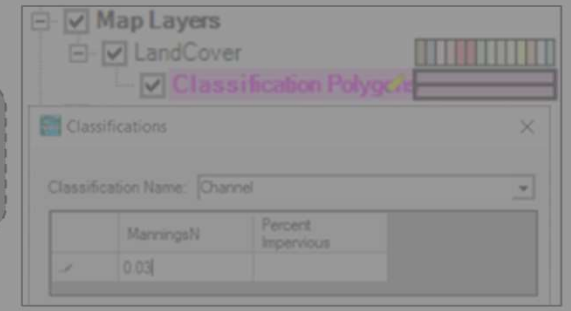
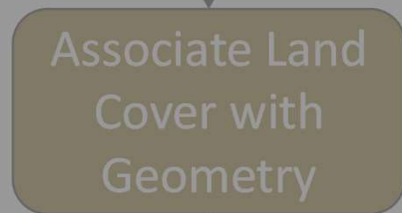
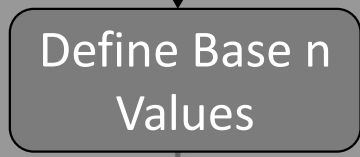
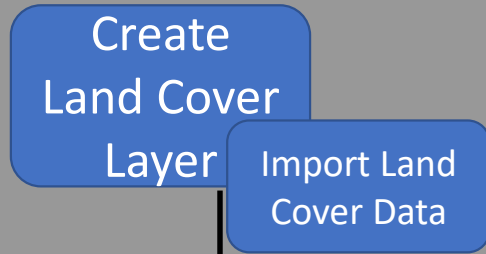
Overview

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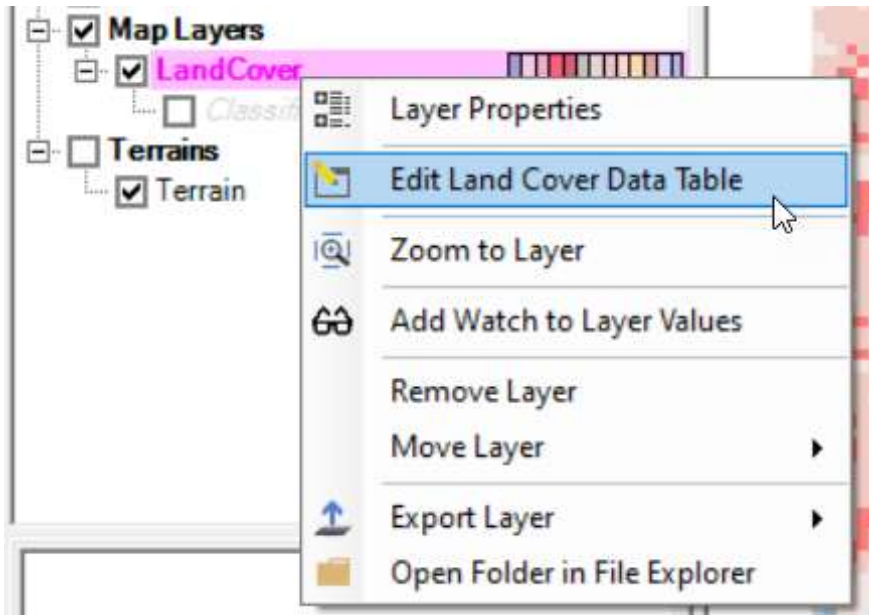
Type	RAS Geometry Layers	Terrain	Manning's n
Geometry	Geometry New	Terrain	LandCover





Manning's n Values

- Provide base Manning's n values

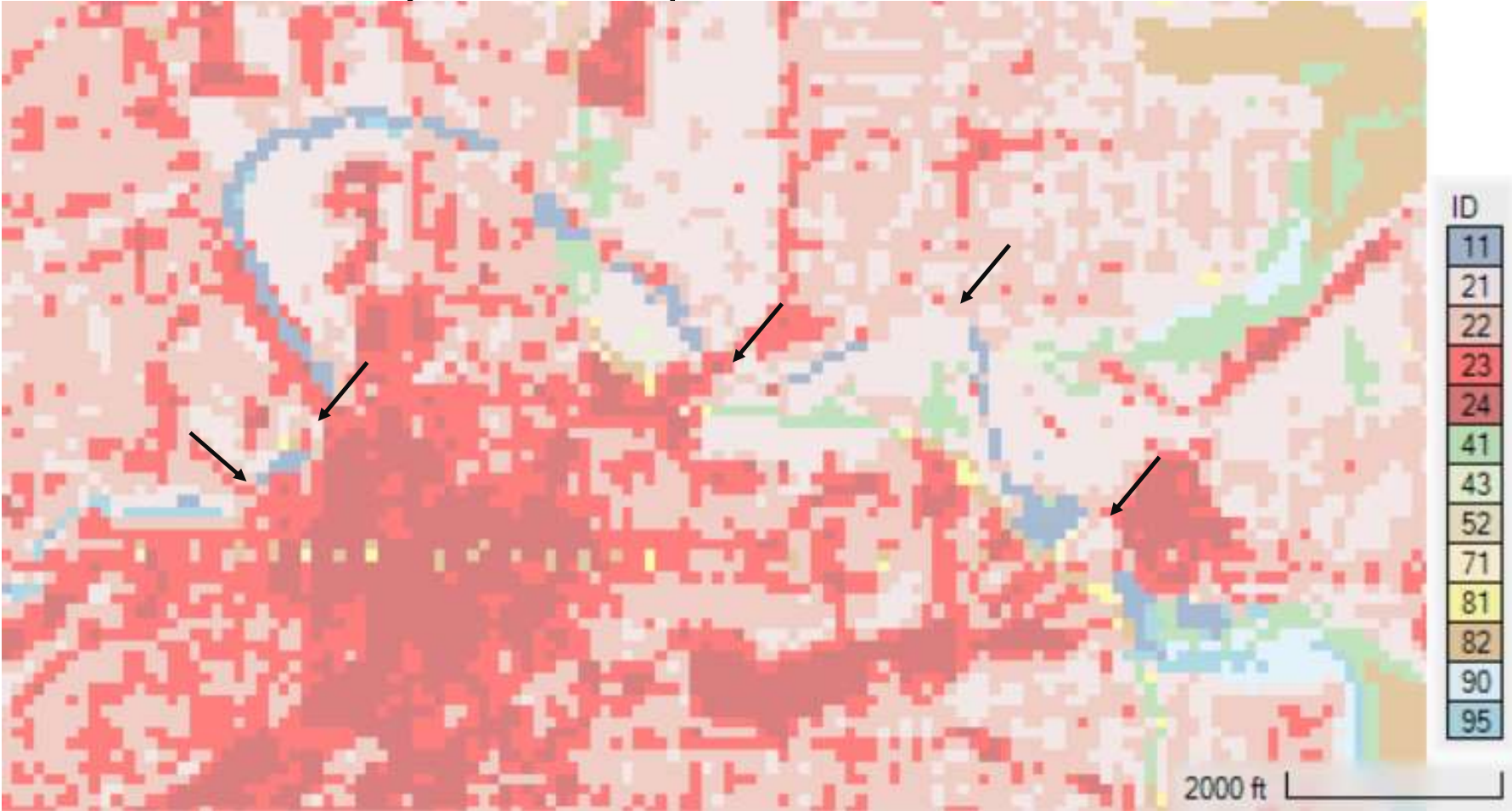


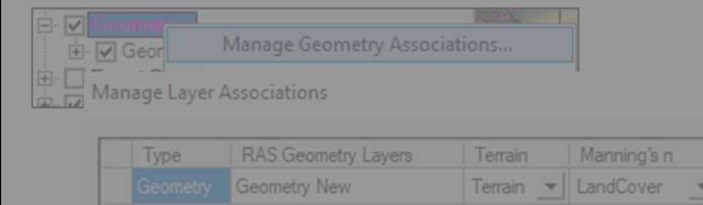
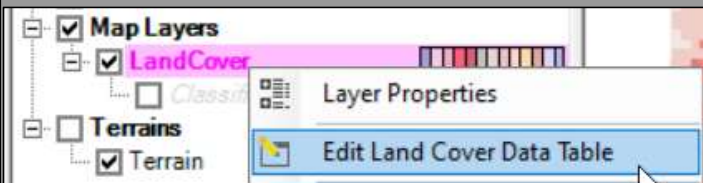
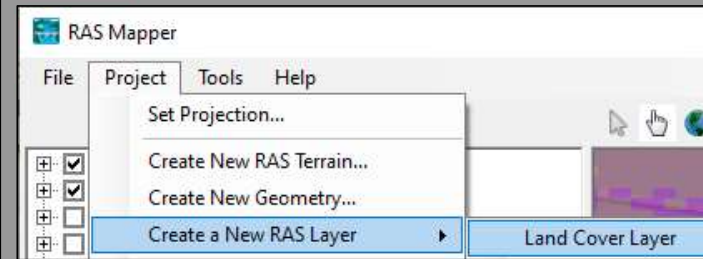
This is the first time you will actually see “Manning n”

ID	Name	ManningsN
0	NoData	0.066
11	Open Water	0.035
21	Developed, Open Space	0.04
22	Developed, Low Intensity	0.06
23	Developed, Medium Intensity	0.08
24	Developed, High Intensity	0.1
41	Deciduous Forest	0.16
43	Mixed Forest	0.14
52	Shrub/Scrub	0.04
71	Grassland/Herbaceous	0.055
81	Pasture/Hay	0.04
82	Cultivated Crops	0.05
90	Woody Wetlands	0.09
95	Emergent Herbaceous Wetlan...	0.65

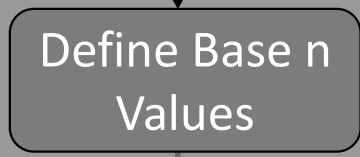
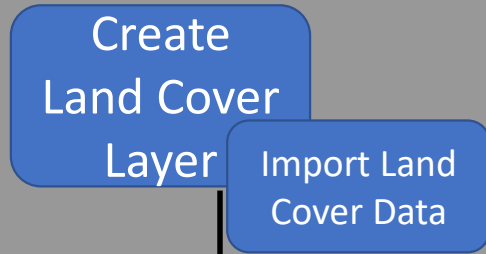


Land Cover Layer – Imperfect Data

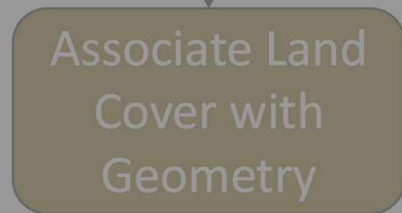




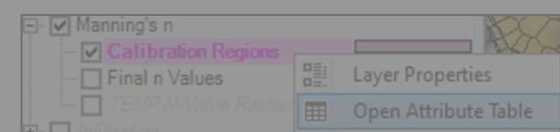
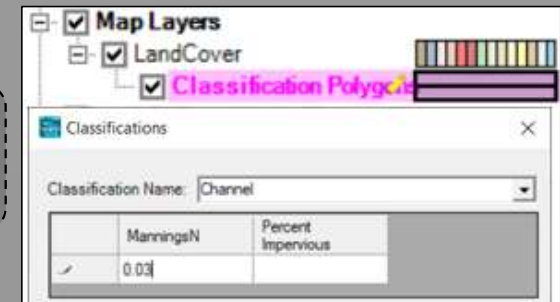
Type	RAS Geometry Layers	Terrain	Manning's n
Geometry	Geometry New	Terrain	LandCover



Optional



Optional





Land Cover Classification

The screenshot displays the RAS Mapper interface. The main window shows a map with a red and white pixelated background, overlaid with a brown channel line. A 'Classifications' dialog box is open in the foreground, showing a table with columns for 'ManningsN' and 'Percent Impervious'. The 'Classification Name' is set to 'Channel' and the 'ManningsN' value is 0.03. The dialog box has 'OK' and 'Cancel' buttons.

Selected Layer: Classification Polygons

Editing: 'Clas'

	ManningsN	Percent Impervious
	0.03	

Messages Views Profile Lines Active Featu

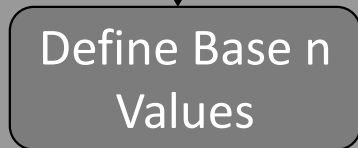
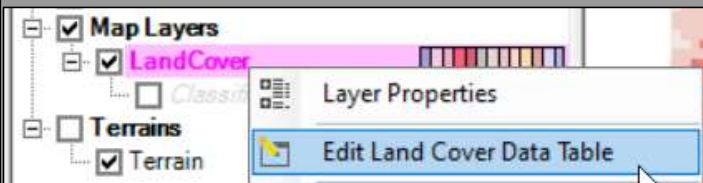
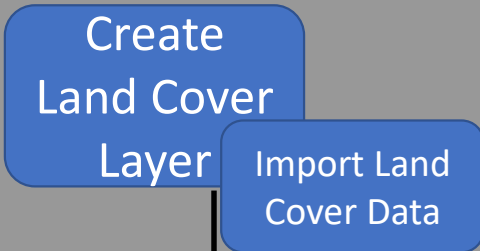
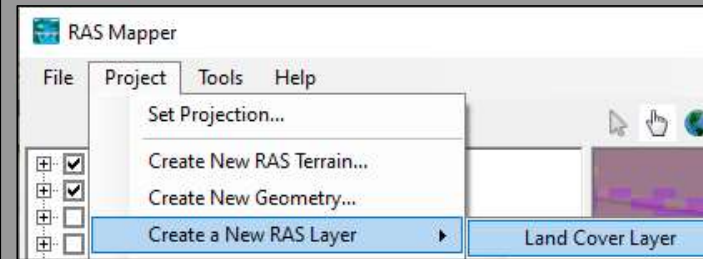
(408171.38, 1798855.36 1 pixel = 22.63 ft)

2000 ft

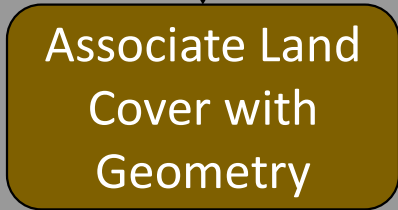
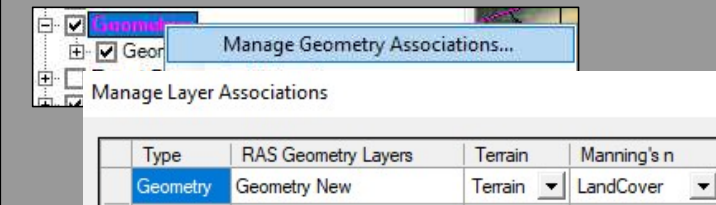


Land Cover Layer with Vector Polygons

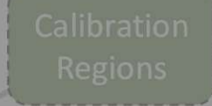
The screenshot displays the RAS Mapper interface. The title bar reads "RAS Mapper" and the menu bar includes "File", "Project", "Tools", and "Help". The status bar at the top indicates "Selected Layer: Classification Polygons". The main map area shows a pixelated land cover map with a blue vector polygon overlaid. A legend on the left side of the interface is expanded to show the "Classification Polygons" layer, which is highlighted in pink. The legend also shows other layers: "Features", "Geometries", "Event Conditions", "Results", "Map Layers", "LandCover", "Terrains", and "Terrain". The map area has a status bar at the bottom that reads "Selected: 'Classification Polygons'" and a scale bar indicating "2000 ft". The coordinates "(404053.40, 1807656.97 1 pixel = 22.63 ft)" are displayed at the bottom left of the map area.



Optional

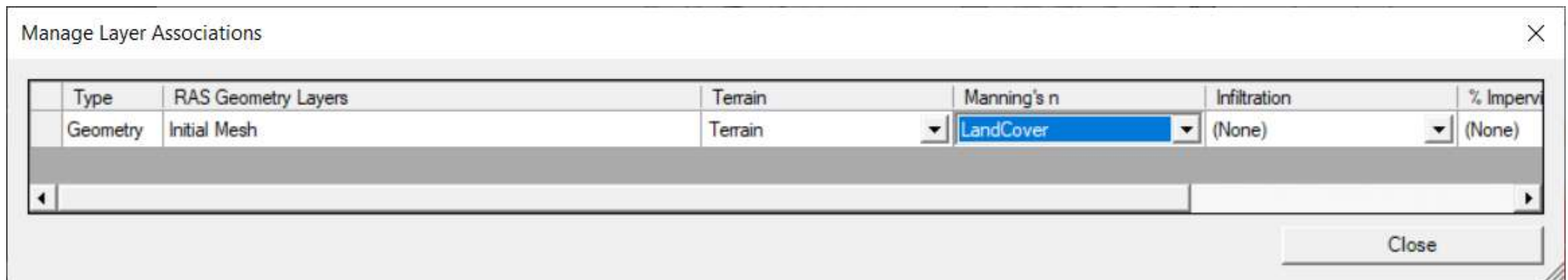
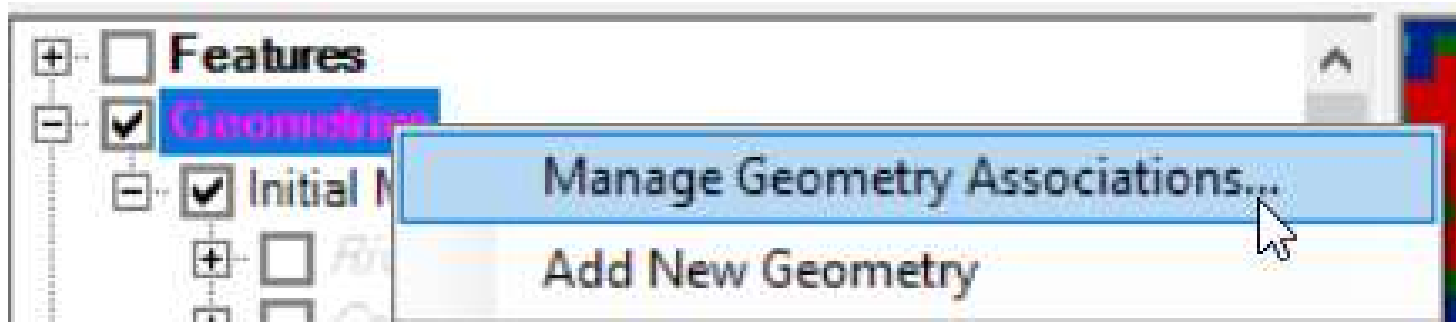


Optional





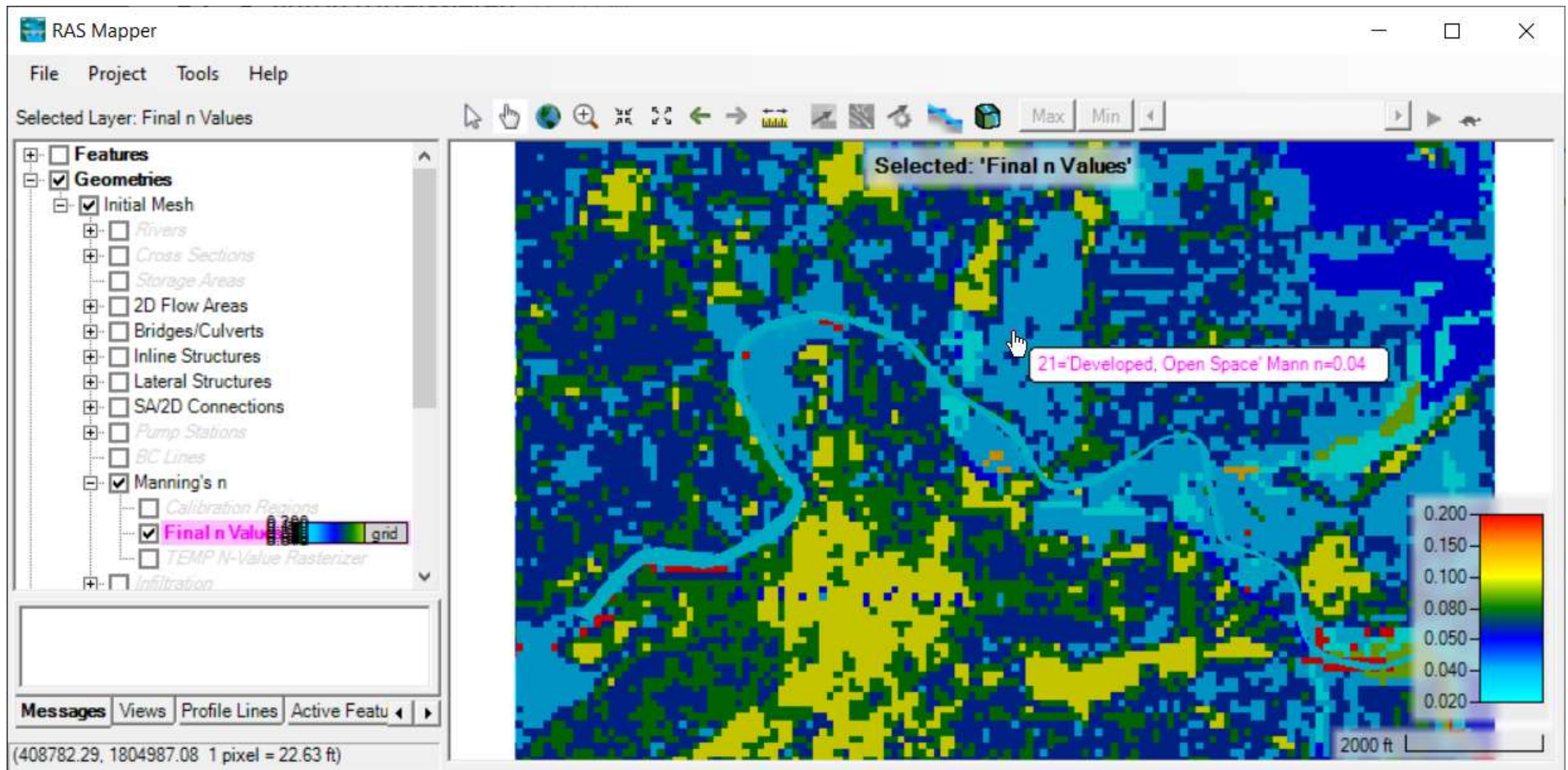
Associate Land Cover with Geometry



This is a commonly overlooked step for new users.



Final Manning's n Values





Inspection of Hydraulic Properties

The screenshot displays the RAS Mapper interface. The main window shows a 2D flow area mesh with a color-coded hydraulic property distribution. A red arrow points from a specific cell in the mesh to the '2D Flow Area Property Tables - Initial Mesh' window. This window has a 'Table' tab selected, showing a list of 'Face Index' values from 187 to 206. The value 195 is highlighted in blue. A second red arrow points from this highlighted value to a 'Manning's n' plot. The plot shows 'Elevation (ft)' on the y-axis (ranging from 933.4 to 933.6) and 'Manning's n [N/A]' on the x-axis (ranging from 0.05 to 0.1). A vertical green line at approximately 0.075 on the x-axis is labeled '195'.

Processing 2D Face Tables (3/4)
Processing 2D Cells (4/4)
2D Flow Area '2DArea' tables complete 0.74 se

Messages Views Profile Lines Active Featu

(408299.96, 1803476.37 1 pixel = 8.77 ft)



Base Overrides

- Global replacement of values from the Land Cover Layer

Layer Parameter Values

Selected Area Edits

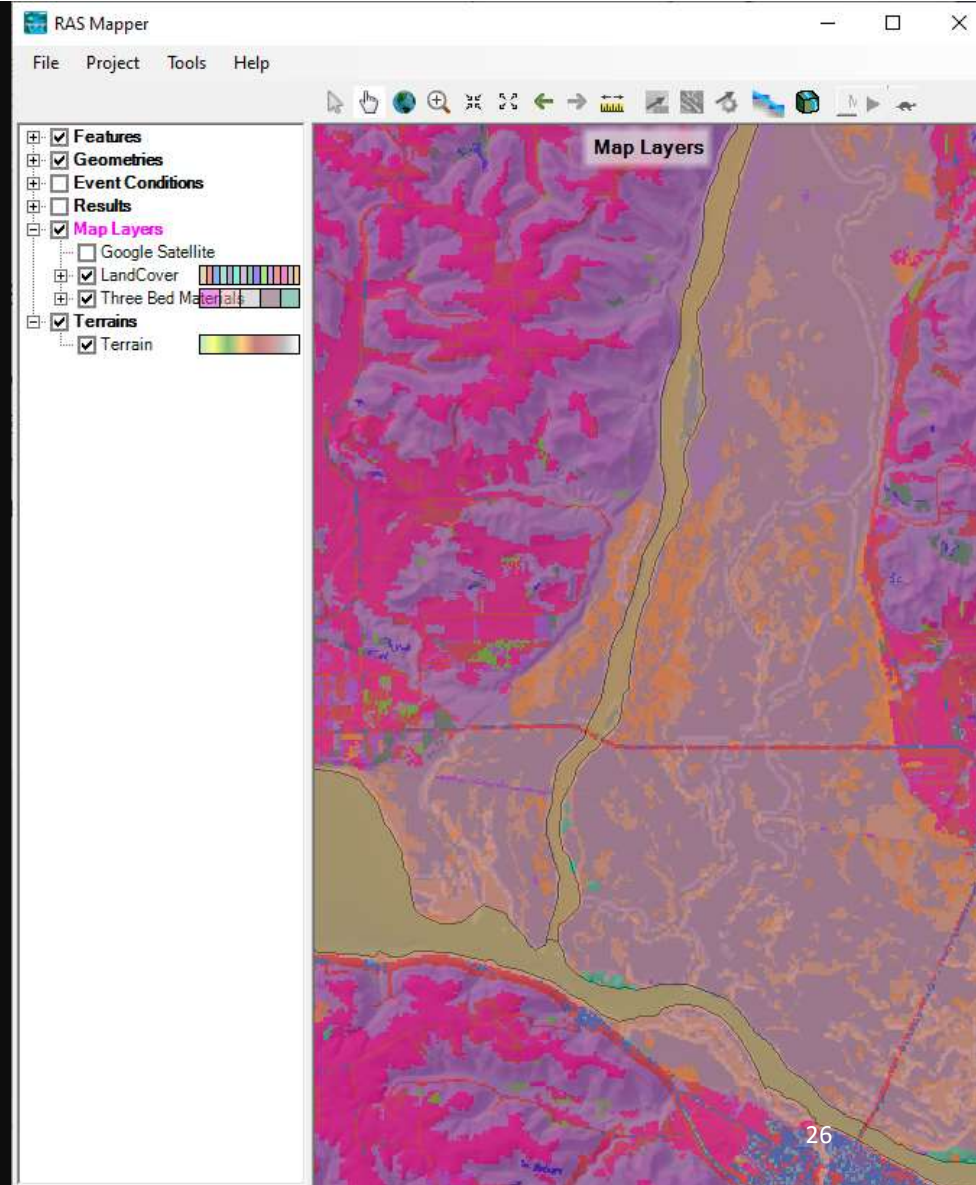
Show Base Overrides

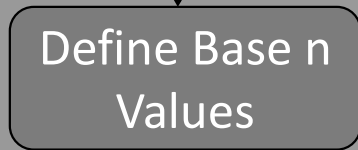
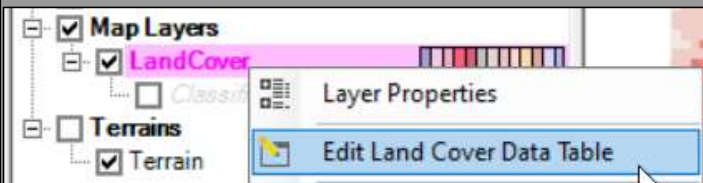
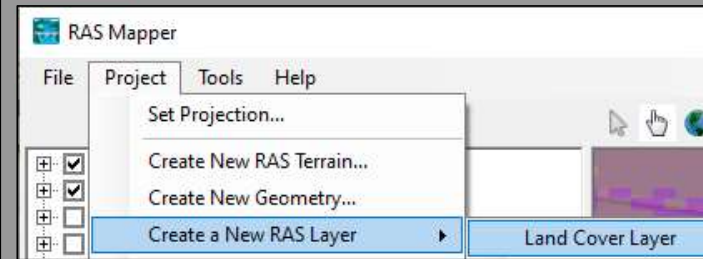
ID	Name	ManningsN	Base Override - ManningsN
0	NoData	0.066	
1	Channel	0.03	
11	Open Water	0.035	
21	Developed, Open Space	0.04	
22	Developed, Low Intensity	0.06	
23	Developed, Medium Intensity	0.08	
24	Developed, High Intensity	0.1	0.2
41	Deciduous Forest	0.16	
43	Mixed Forest	0.14	
52	Shrub/Scrub	0.04	
71	Grassland/Herbaceous	0.055	
81	Pasture/Hay	0.04	
82	Cultivated Crops	0.05	
90	Woody Wetlands	0.09	
95	Emergent Herbaceous Wetlan...	0.65	

OK Cancel

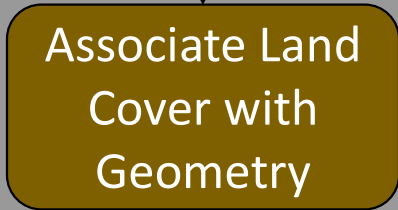
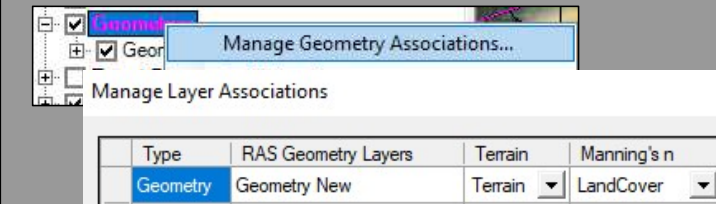
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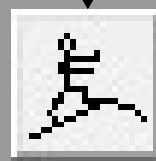




Optional



Optional





Calibration Regions

The screenshot shows the RAS Mapper interface. The main map displays a river channel with several calibration regions marked by black dots. A dialog box titled "Region Name" is open, prompting the user to provide a unique name for the region. The text "Steeper" is entered in the input field. The background map shows a color-coded terrain with a river channel. The left sidebar shows the layer tree with "Calibration Regions" selected. The bottom status bar shows coordinates and a scale of 1 pixel = 16.49 ft.

Layer Parameter Values

Selected Area Edits

Show Base Overrides

ID	Name	ManningsN	Base Override - ManningsN	Steeper - ManningsN
0	NoData	0.066		
22	Developed, Low Intensity	0.06		0.075
23	Developed, Medium Intensity	0.08		0.1
24	Developed, High Intensity	0.1	0.2	0.125
21	Developed, Open Space	0.04		0.05
82	Cultivated Crops	0.05		0.0625
81	Pasture/Hay	0.04		0.05
41	Deciduous Forest	0.16		0.2
52	Shrub/Scrub	0.04		0.05
71	Grassland/Herbaceous	0.055		0.06875
11	Open Water	0.035		0.04375
95	Emergent Herbaceous Wetlan...	0.65		0.8125
90	Woody Wetlands	0.09		0.1125
43	Mixed Forest	0.14		0.175
1	Channel	0.03		0.0375

OK Cancel

Land Cover Data – I Don't Have Any!

- If you don't have land cover data, you can create an Empty land cover dataset.
- Create Classification Polygons for each area using the RAS Mapper Editing Tools and Web Imagery

