

Land Cover Layer and Manning's n Values

Stanford Gibson, Ph.D

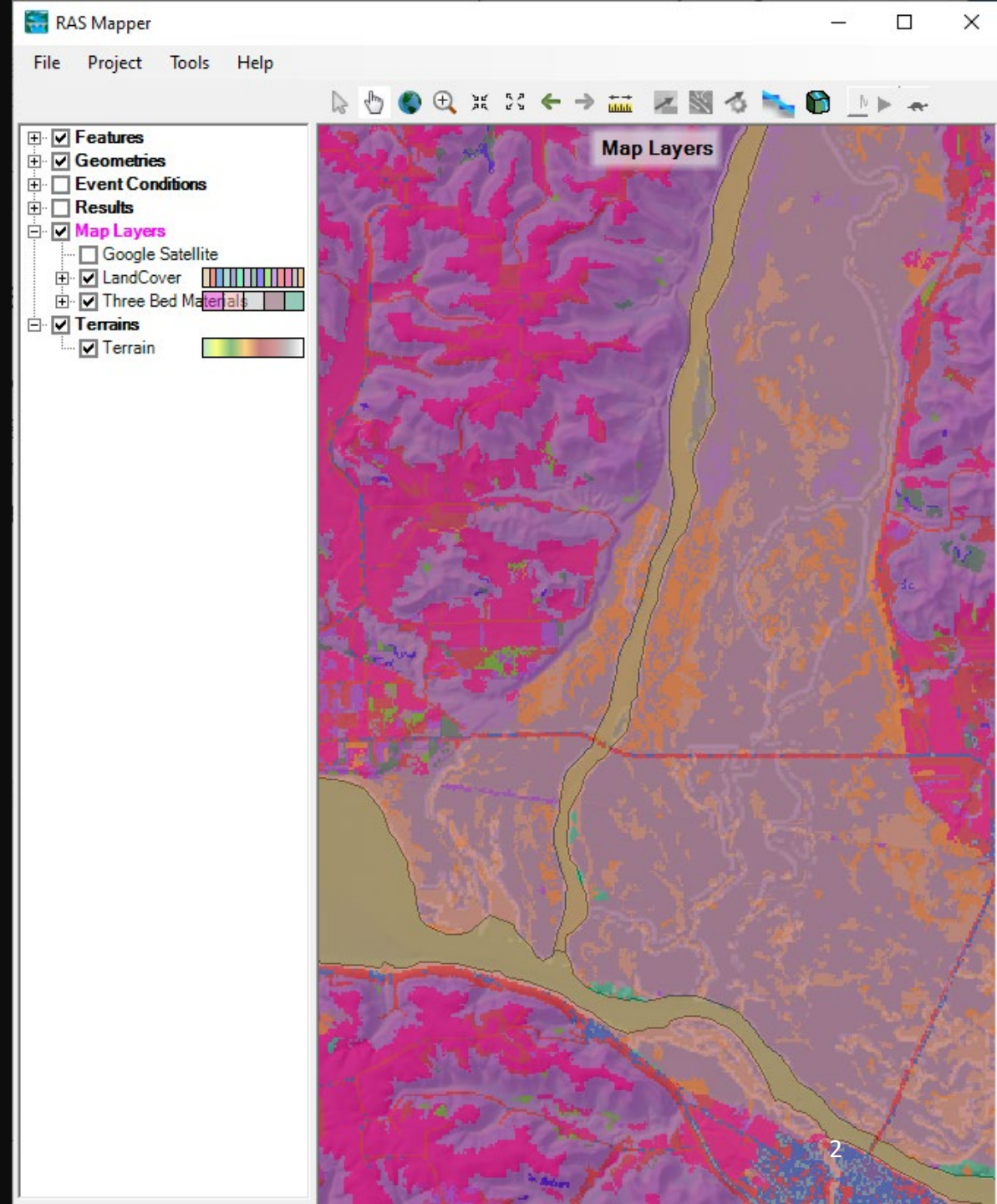
Cameron Ackerman, P.E., D.WRE

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 2016
 - <http://www.mrlc.gov>
(30-m raster)
- USGS LULC
 - <http://water.usgs.gov/GIS/dsdl/ds240/index.html>
(vector or raster)

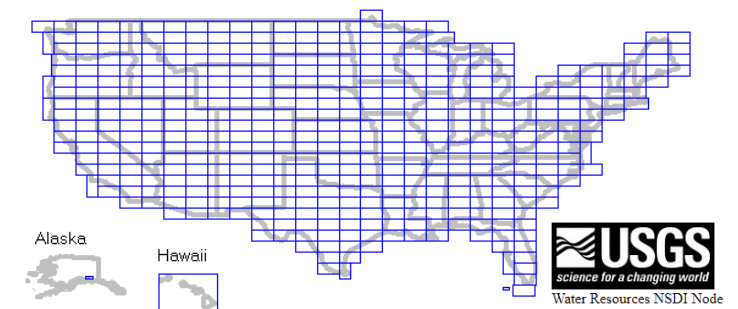
MRLC Celebrating 20+ years of Partnership
Multi-Resolution Land Characteristics
Consortium



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.



USGS
science for a changing world
Water Resources NSDI Node

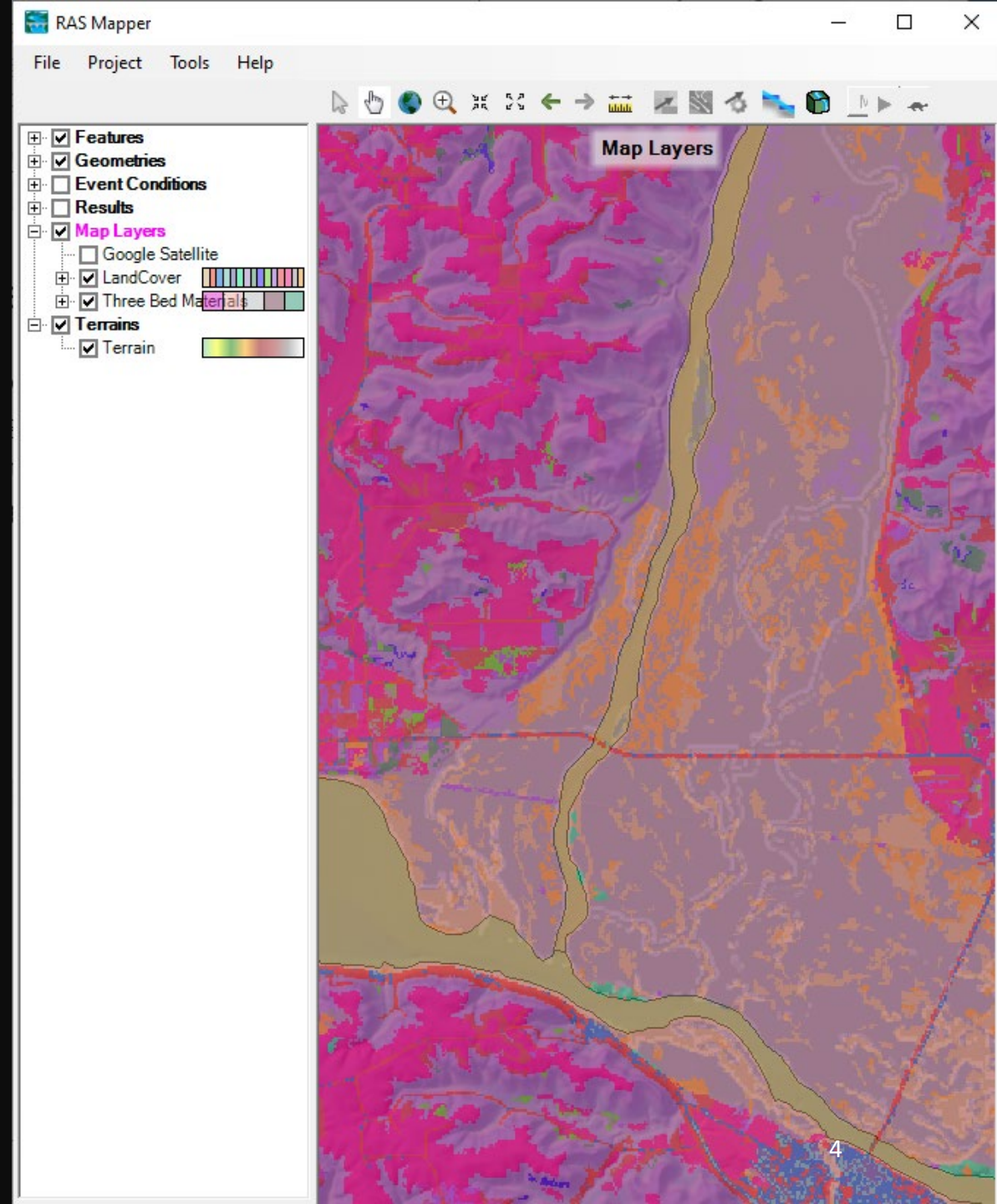
Overview

1. Land Cover Data Sources

2. Importing Land Cover Data

3. Associating Manning's n Values

4. Modifying Land Cover Data



Overview

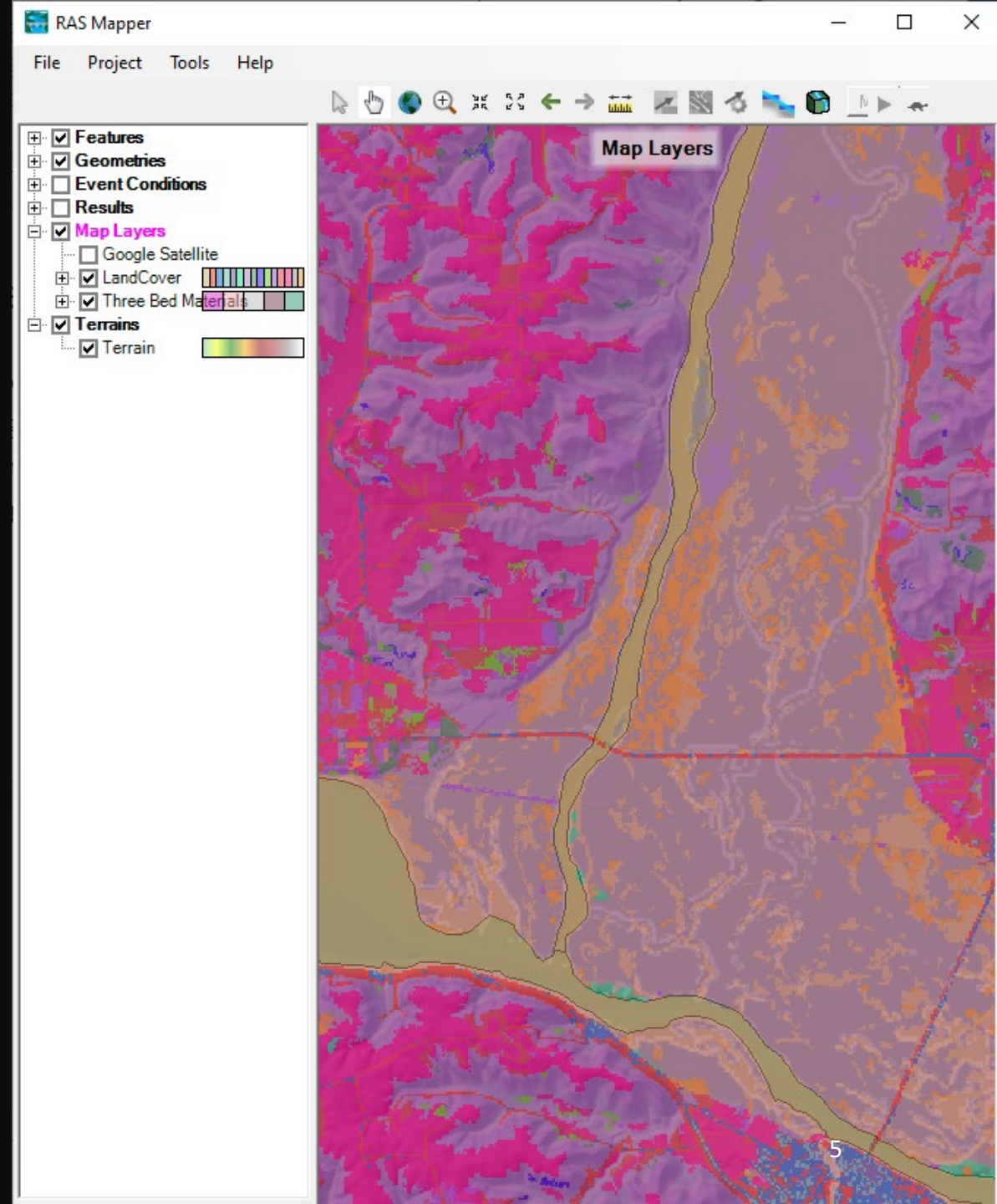
1. Land Cover Data Sources

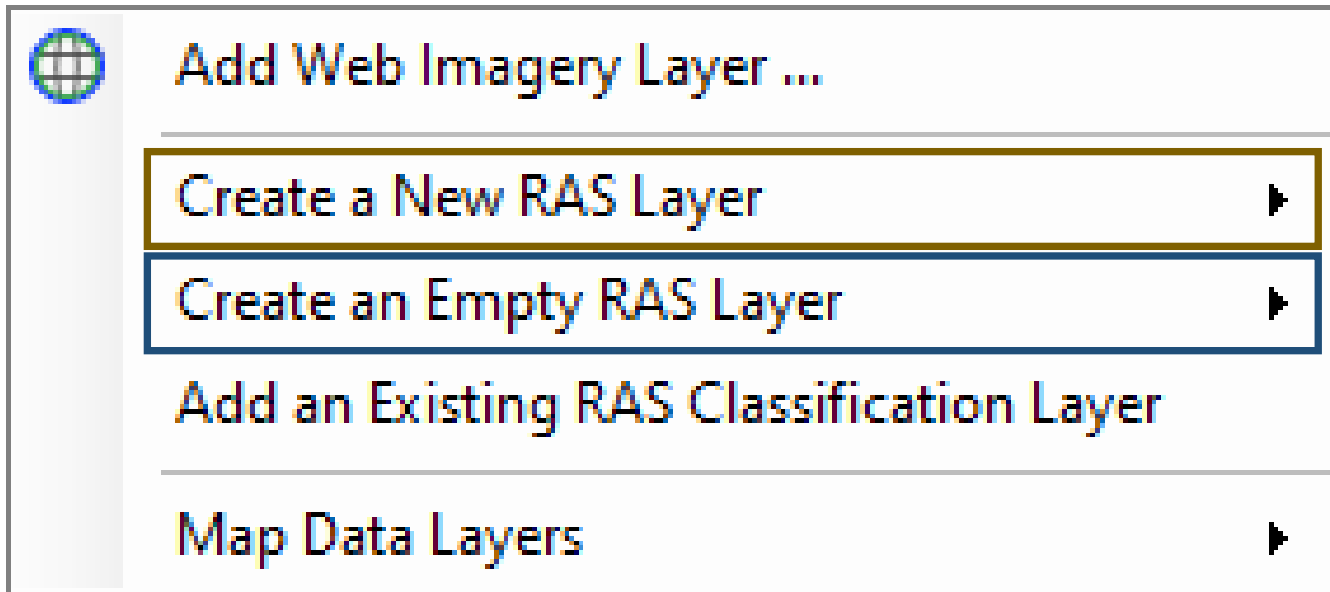
creating

2. Importing Land Cover Data

3. Associating Manning's n Values

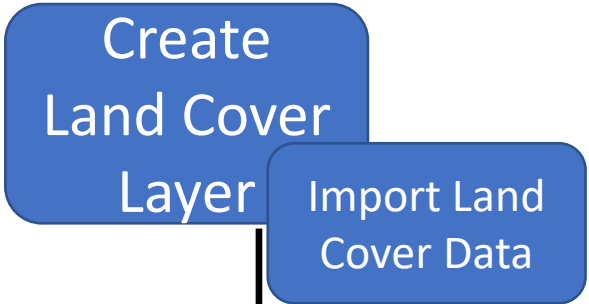
4. Modifying Land Cover Data



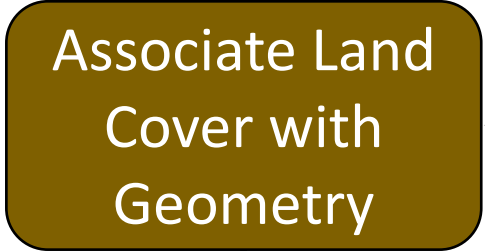


→ Create = Import
(from GIS file)

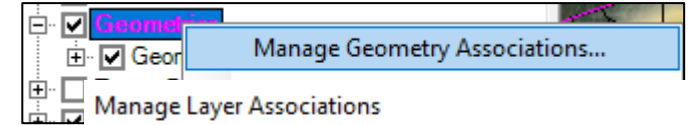
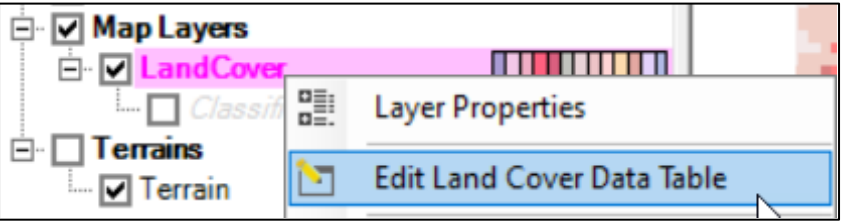
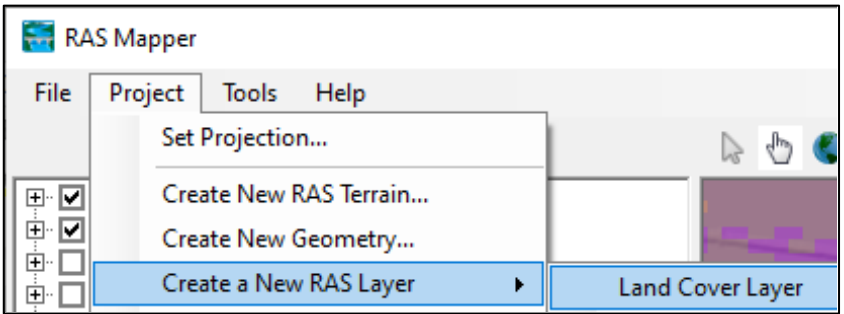
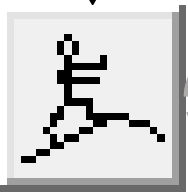
→ Create Empty =
Draw It



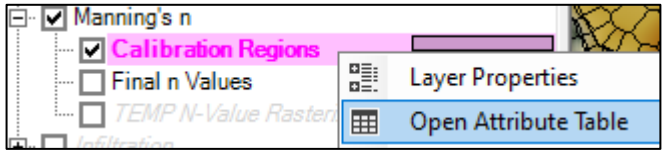
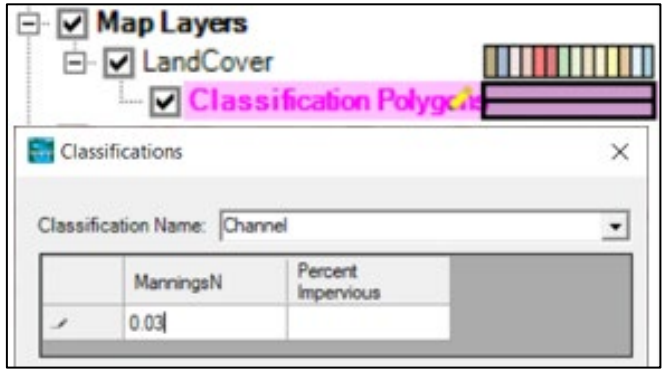
Optional

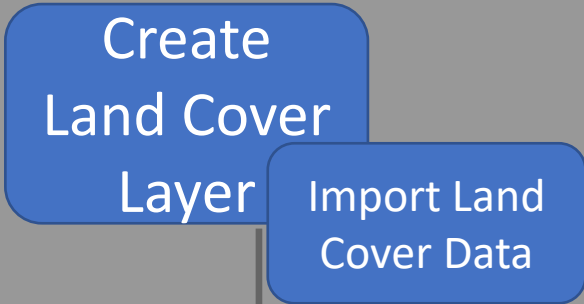


Optional

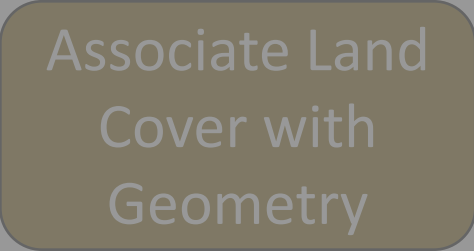


Type	RAS Geometry Layers	Terrain	Manning's n
Geometry	Geometry New	Terrain	LandCover

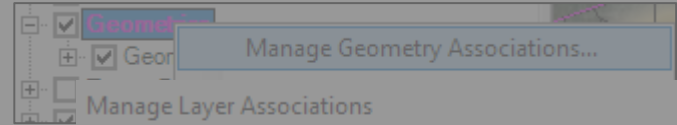
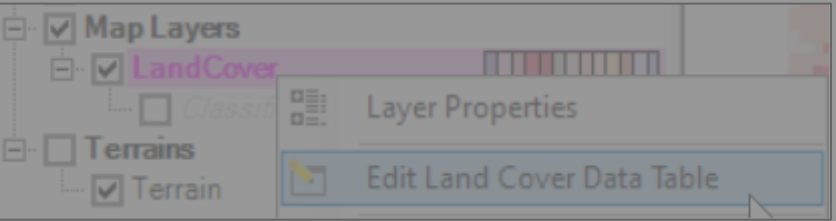
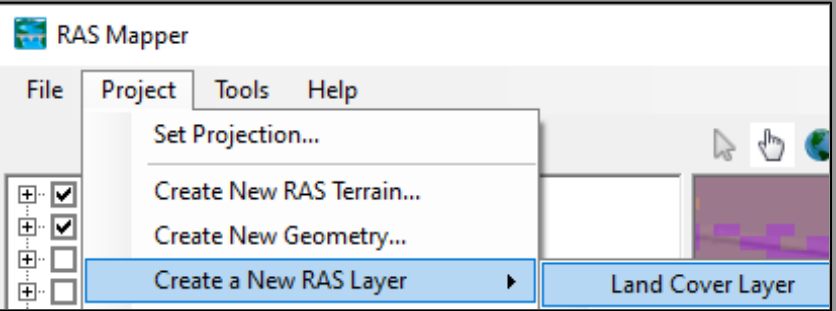
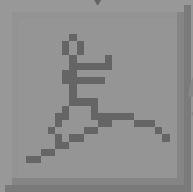




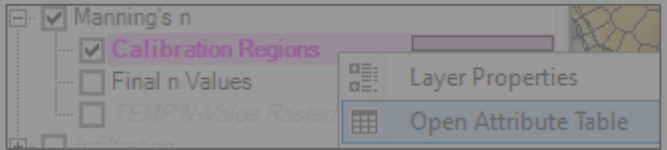
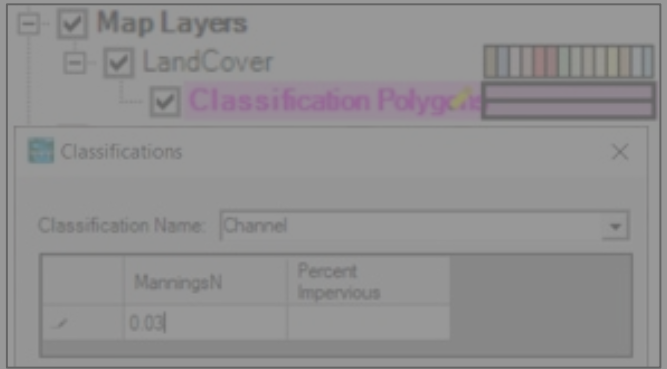
Optional



Optional

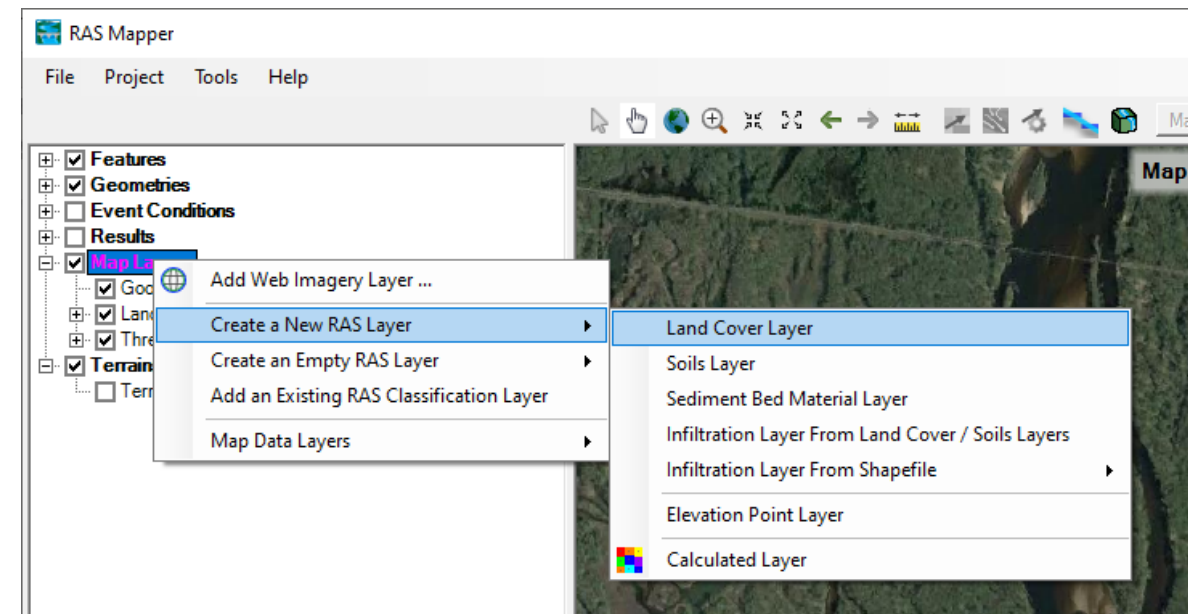
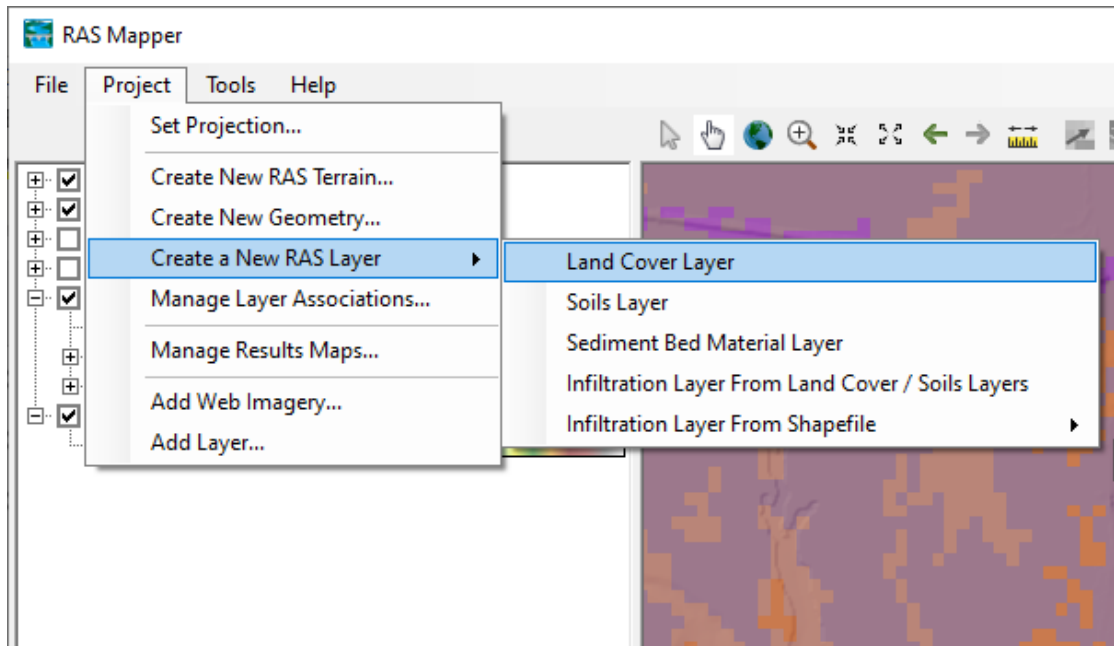


Type	RAS Geometry Layers	Terrain	Manning's n
Geometry	Geometry New	Terrain	LandCover



Importing Land Cover Data

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




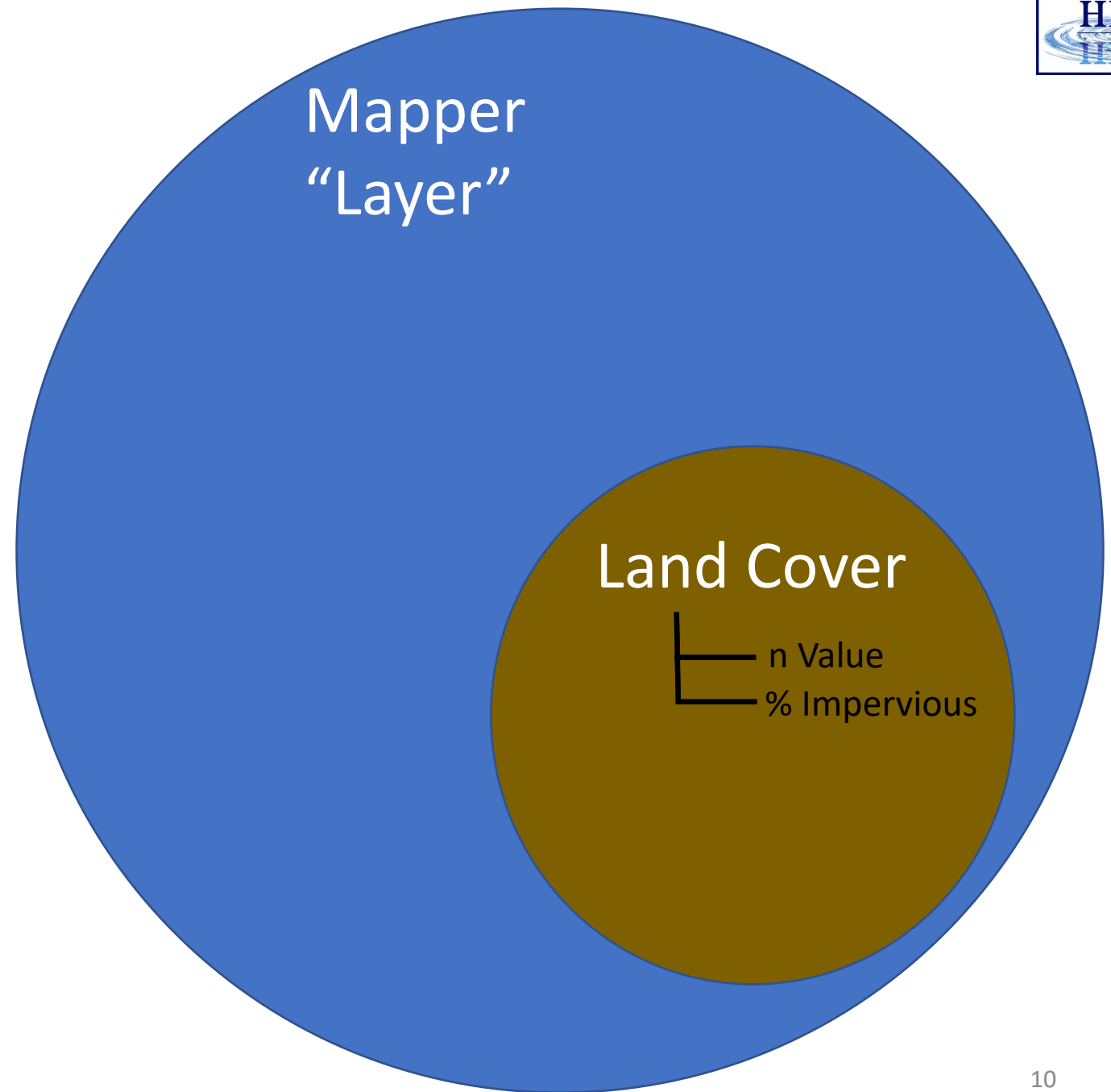


A Ven Diagram of Important Terms

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** (selected), Terrains, Geometries and Terrains, Current View, Entire Input File(s)

Import Ext: NLCD 2016 Add Field... X

+	Filename	Projection	Info	Naming Std.	Name Field
X	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: 10 feet Expected Output Size: <1 MB

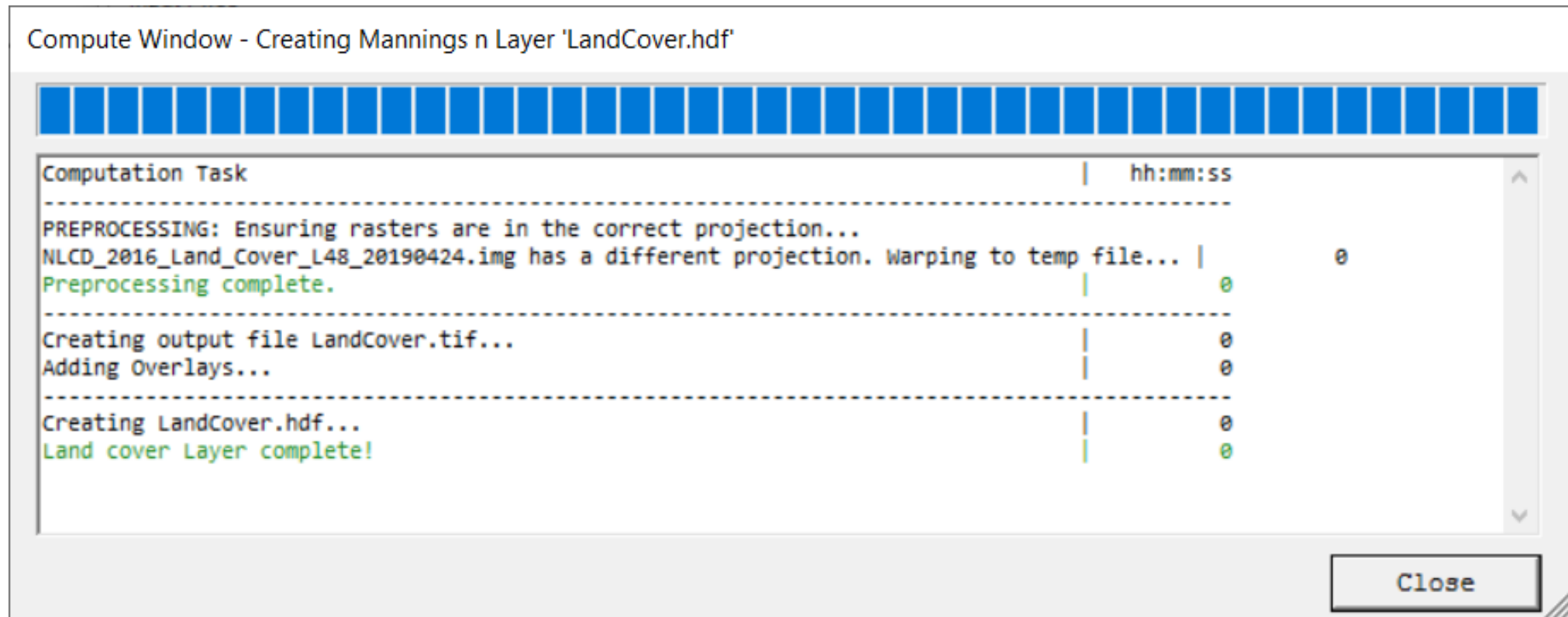
Filename: C:\... \Land Classification \LandCover.hdf

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
 - [x] Geometries
 - [-] Initial Mesh
 - [-] Event Conditions
 - [-] Results
 - [x] Map Layers
 - [x] LandCover
 - [-] Classification Polygons
 - [-] Terrains
 - [x] Terrain

Messages Views Profile Lines Active Featu

(414891.38, 1798945.86 1 pixel = 22.63 ft)

2000 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		84	117	168	255
Developed, Ope...		232	209	209	255
Developed, Low ...		226	158	140	255
Developed, Medi...		255	0	0	255
Developed, High ...		181	0	0	255
Deciduous Forest		133	199	126	255
Mixed Forest		212	231	176	255
Shrub/Scrub		220	202	143	255
Grassland/Herba...		253	233	170	255
Pasture/Hay		251	246	93	255
Cultivated Crops		202	145	70	255
Woody Wetlands		200	230	248	255

Reverse Colors Save Color Ramp

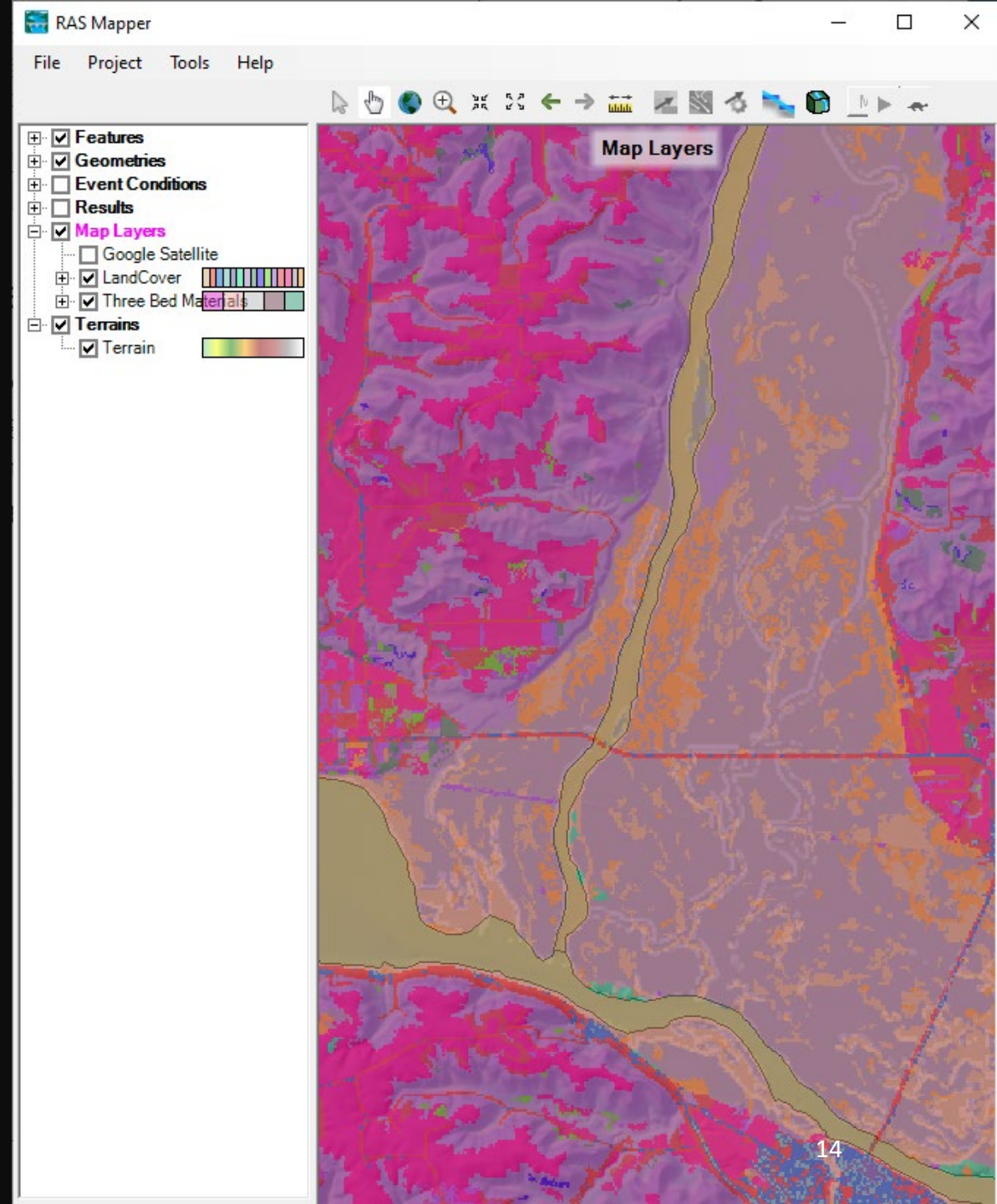
OK Cancel

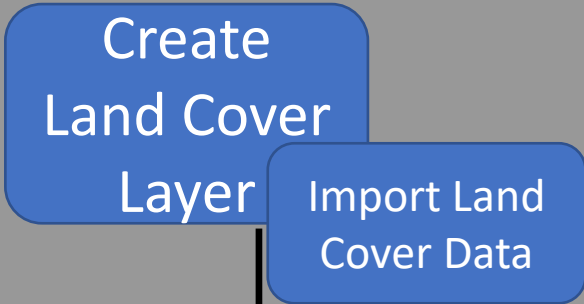
ID

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

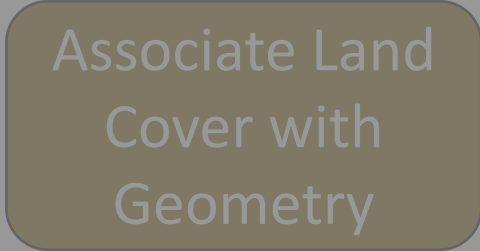
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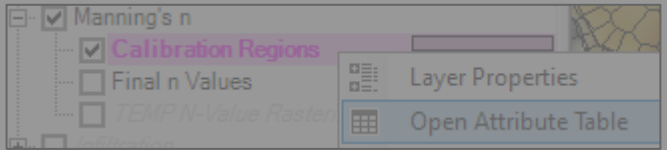
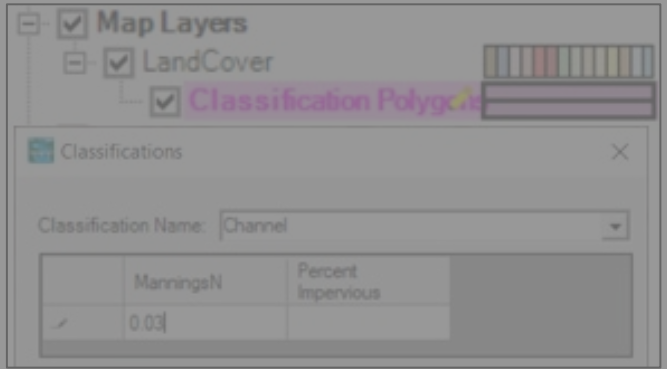
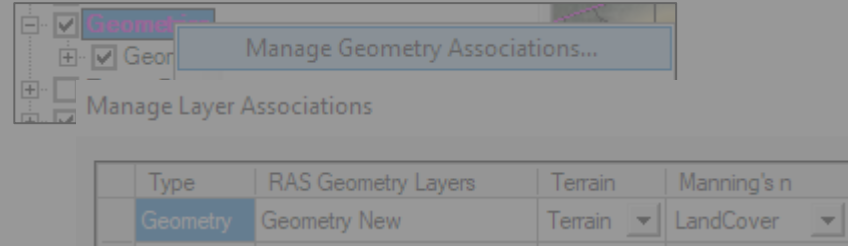
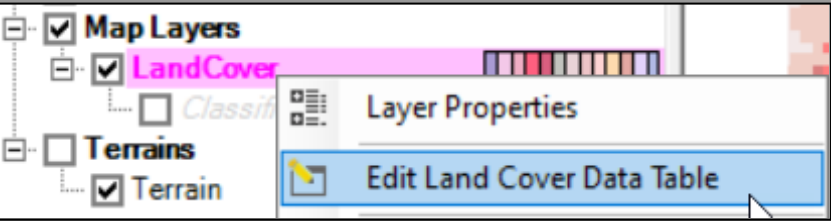
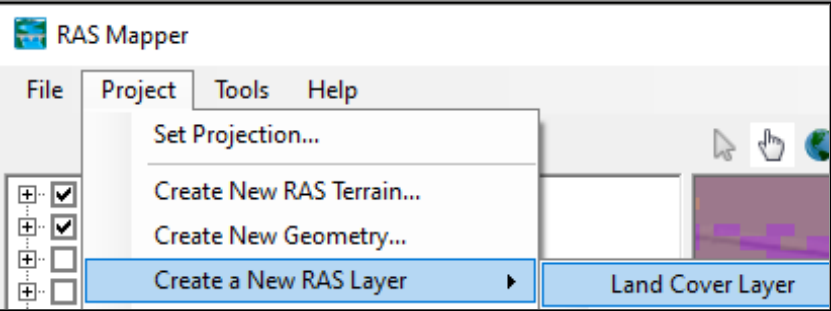
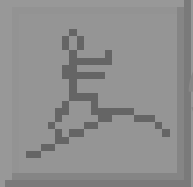




Optional



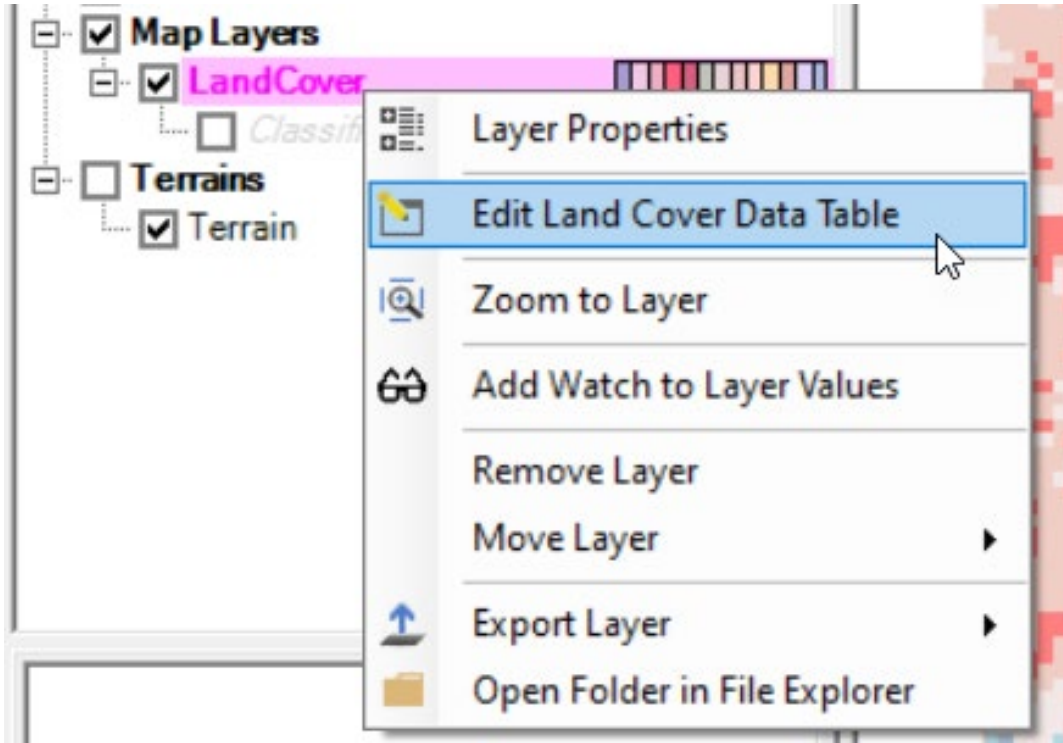
Optional





Manning's n Values

- Provide base Manning's n values



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

Classification Parameters

Selected Area Edits: [Icons for file operations]

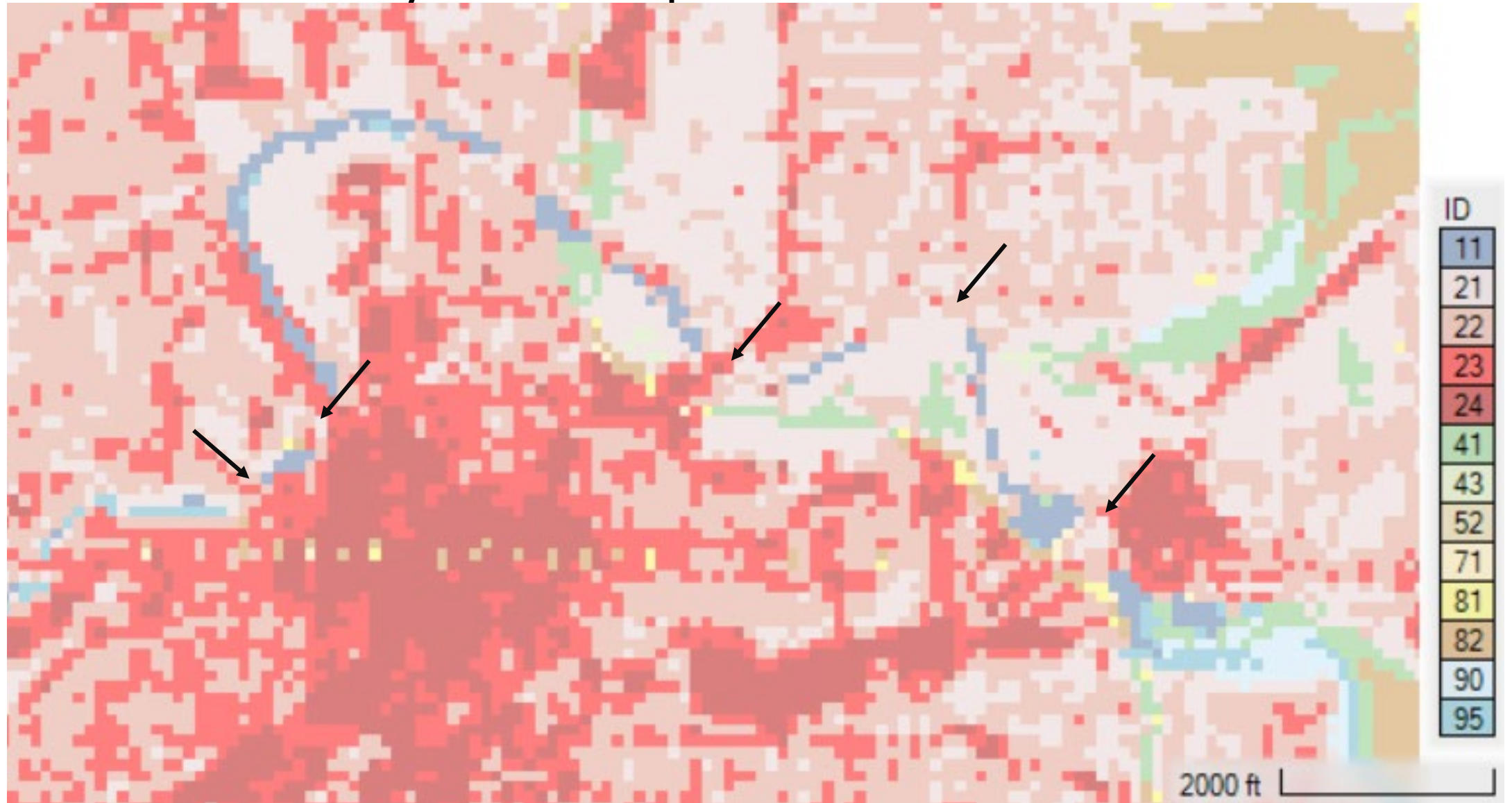
Parameter: **ManningsN**

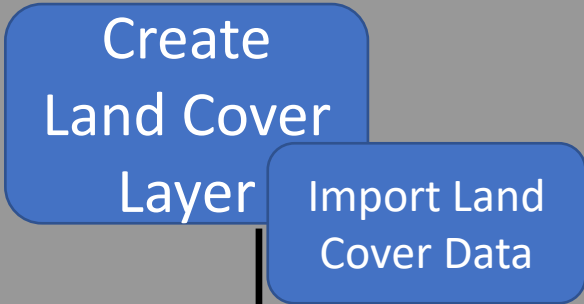
ID	Name	ManningsN
0	NoData	0.066
11	Open Water	0.035
21	Developed, Open Space	0.04
22	Developed, Low Intensity	0.06
23	Developed, Medium Intensity	0.08
24	Developed, High Intensity	0.1
41	Deciduous Forest	0.16
43	Mixed Forest	0.14
52	Shrub/Scrub	0.04
71	Grassland/Herbaceous	0.055
81	Pasture/Hay	0.04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

OK Cancel

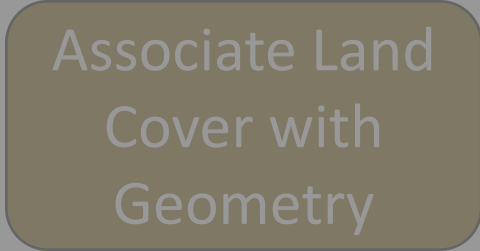


Land Cover Layer – Imperfect Data

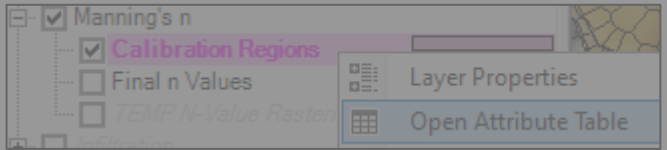
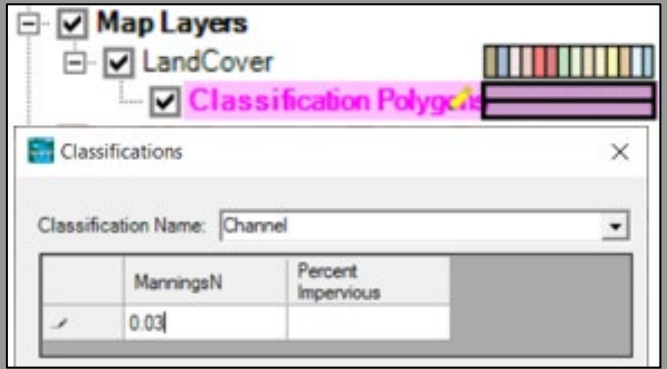
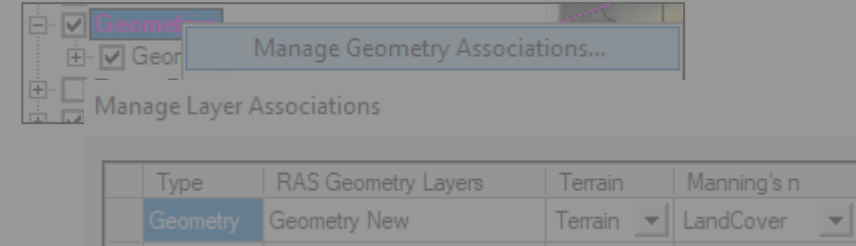
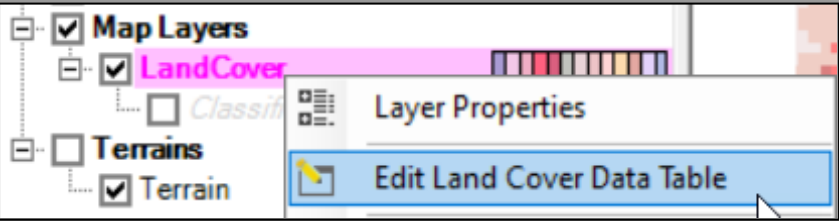
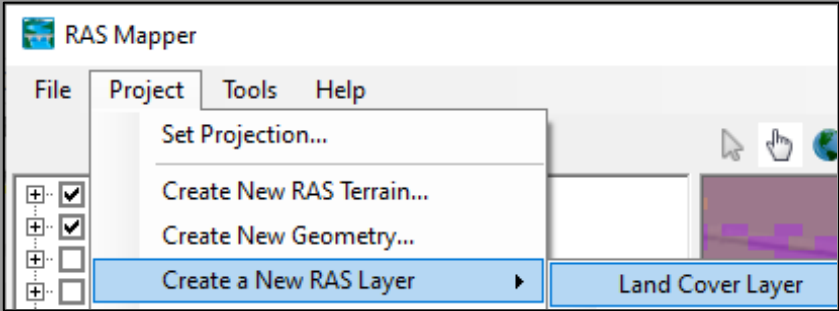
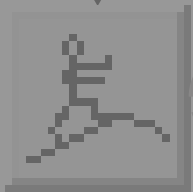
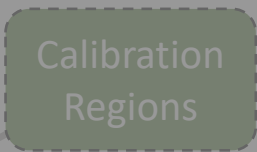




Optional



Optional





Land Cover Classification

The screenshot shows the RAS Mapper interface. The main window displays a land cover map with a channel highlighted in green. A dialog box titled 'Classifications' is open, showing the 'Channel' classification with a Manning's N value of 0.03. The 'Percent Impervious' field is empty. The 'Classifications' dialog box contains the following table:

	ManningsN	Percent Impervious
/	0.03	

The RAS Mapper interface includes a menu bar (File, Project, Tools, Help), a toolbar, and a left-hand panel with the following layers:

- Features
 - Geometries
 - Initial Mesh
 - Event Conditions
 - Results
 - Map Layers
 - LandCover
 - Classification Polygons
 - Terrains
 - Terrain

The status bar at the bottom left shows coordinates (408171.38, 1798855.36) and a scale of 1 pixel = 22.63 ft. A scale bar at the bottom right indicates 2000 ft.



Land Cover Layer with Vector Polygons

RAS Mapper

File Project Tools Help

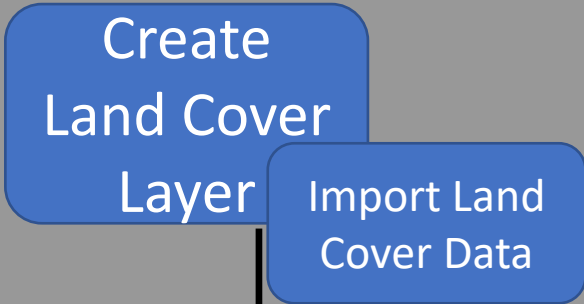
Selected Layer: Classification Polygons

- Features
- Geometries
 - Initial Mesh
- Event Conditions
- Results
- Map Layers
 - LandCover
 - Classification Polygons
- Terrains
 - Terrain

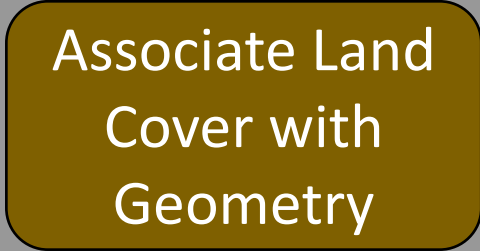
Messages Views Profile Lines Active Featu

(404053.40, 1807656.97 1 pixel = 22.63 ft)

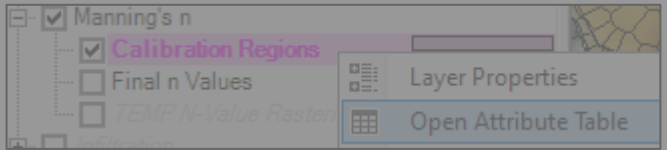
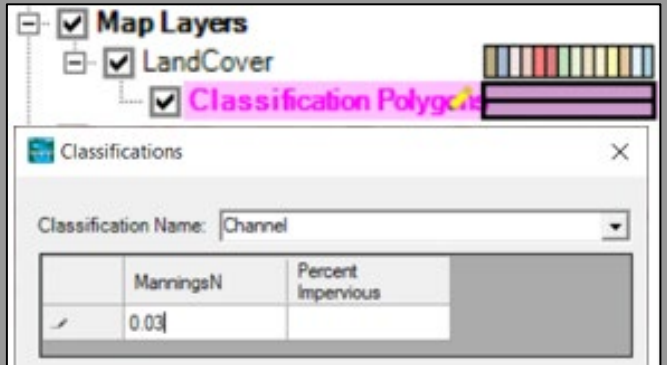
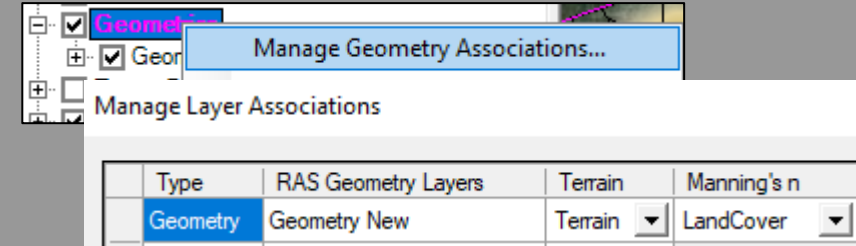
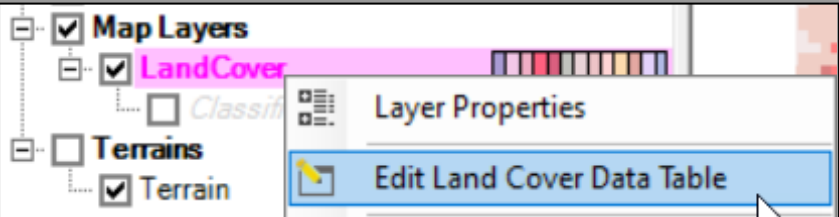
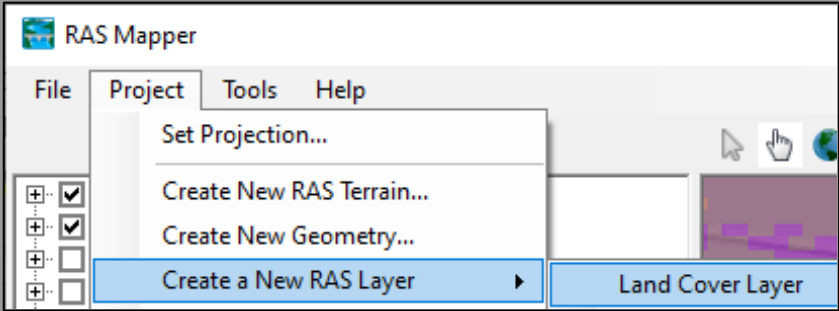
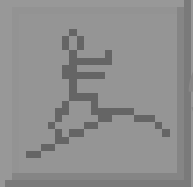
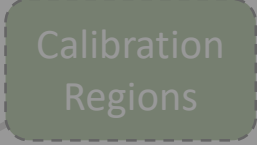
2000 ft



Optional

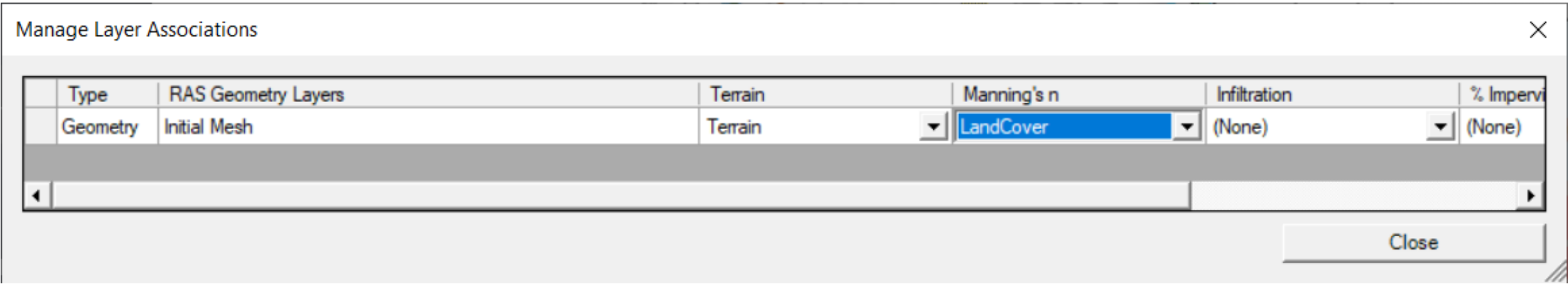
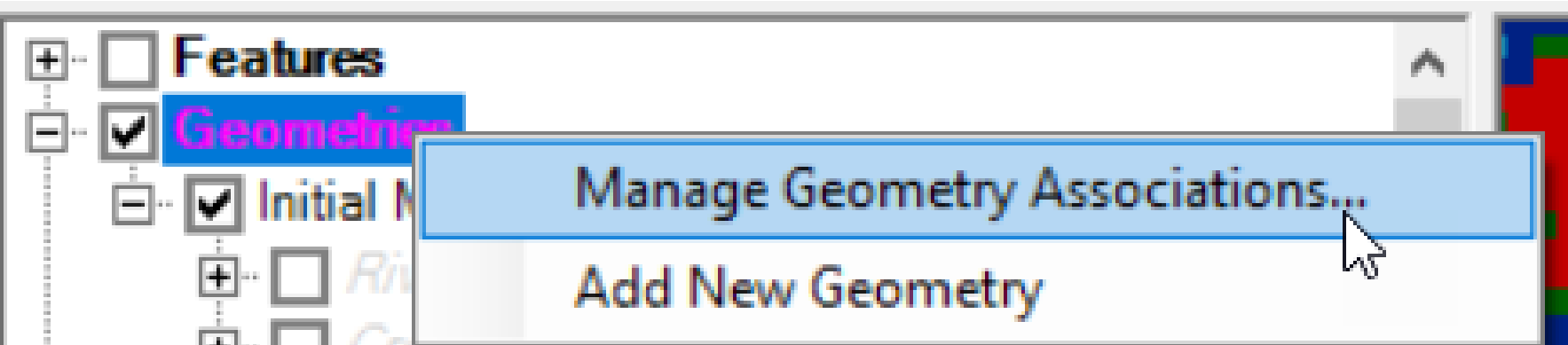


Optional





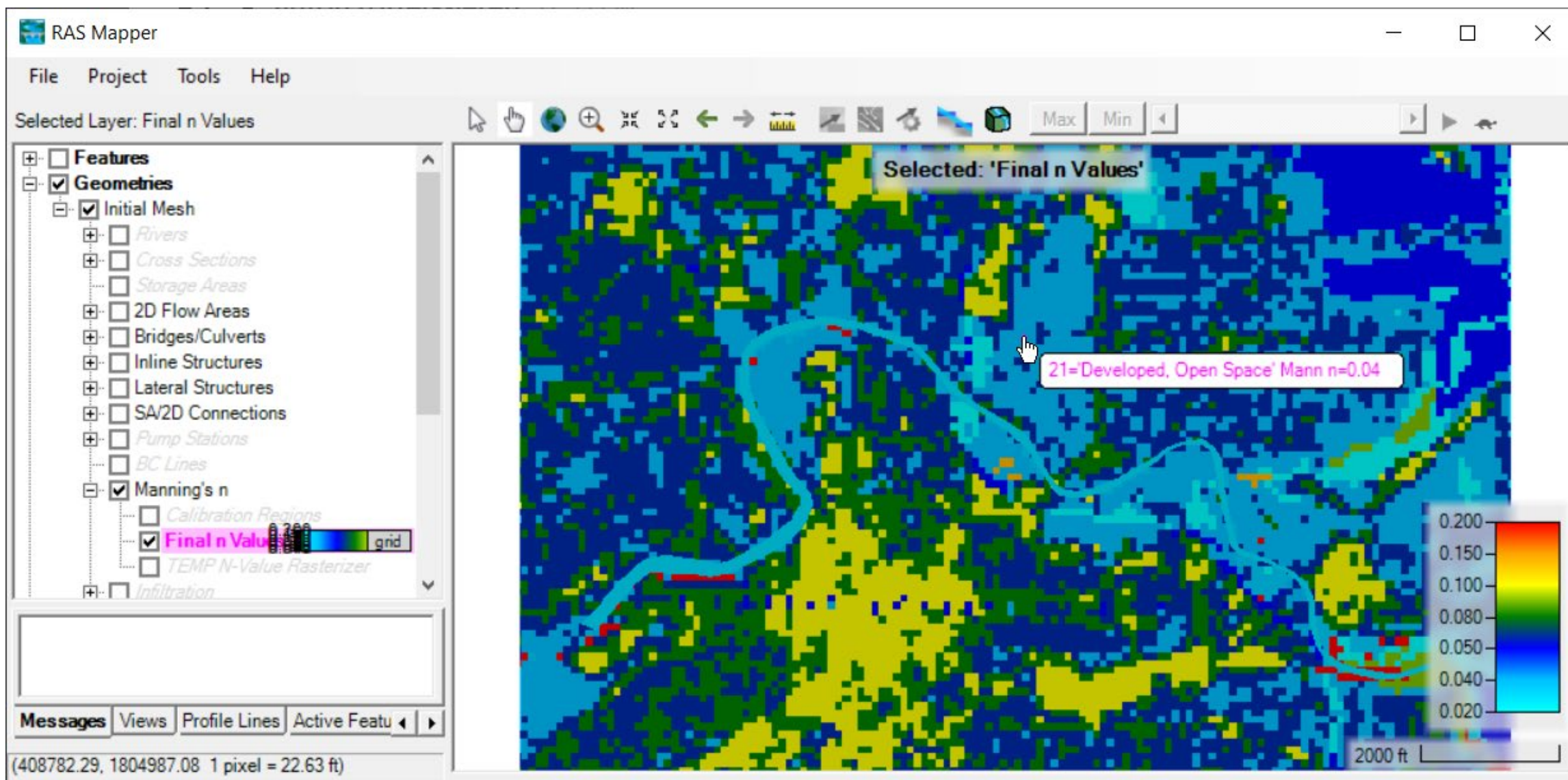
Associate Land Cover with Geometry



This is a commonly overlooked step for new users.



Final Manning's n Values





Inspection of Hydraulic Properties

RAS Mapper

File Project Tools Help

Selected Layer: 2D Flow Areas

- Features
 - Geometries
 - Initial Mesh
 - Rivers
 - Cross Sections
 - Storage Areas
 - 2D Flow Areas**
 - Bridges/Culverts
 - Inline Structures
 - Lateral Structures
 - SA/2D Connections
 - Pump Stations
 - BC Lines
 - Manning's n
 - Calibration Region
 - Final n Value
 - TEMP N-Value Rasterizer
 - Infiltration

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)

2D Flow Area Property Tables - Initial Mesh

2DArea

Face Manning's n vs Elevation

Face Index
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206

Plot Table

Manning's n

Elevation [ft]

Manning's n [N/A]

195



Base Overrides

- Global replacement of values from the Land Cover Layer

Layer Parameter Values

Selected Area Edits

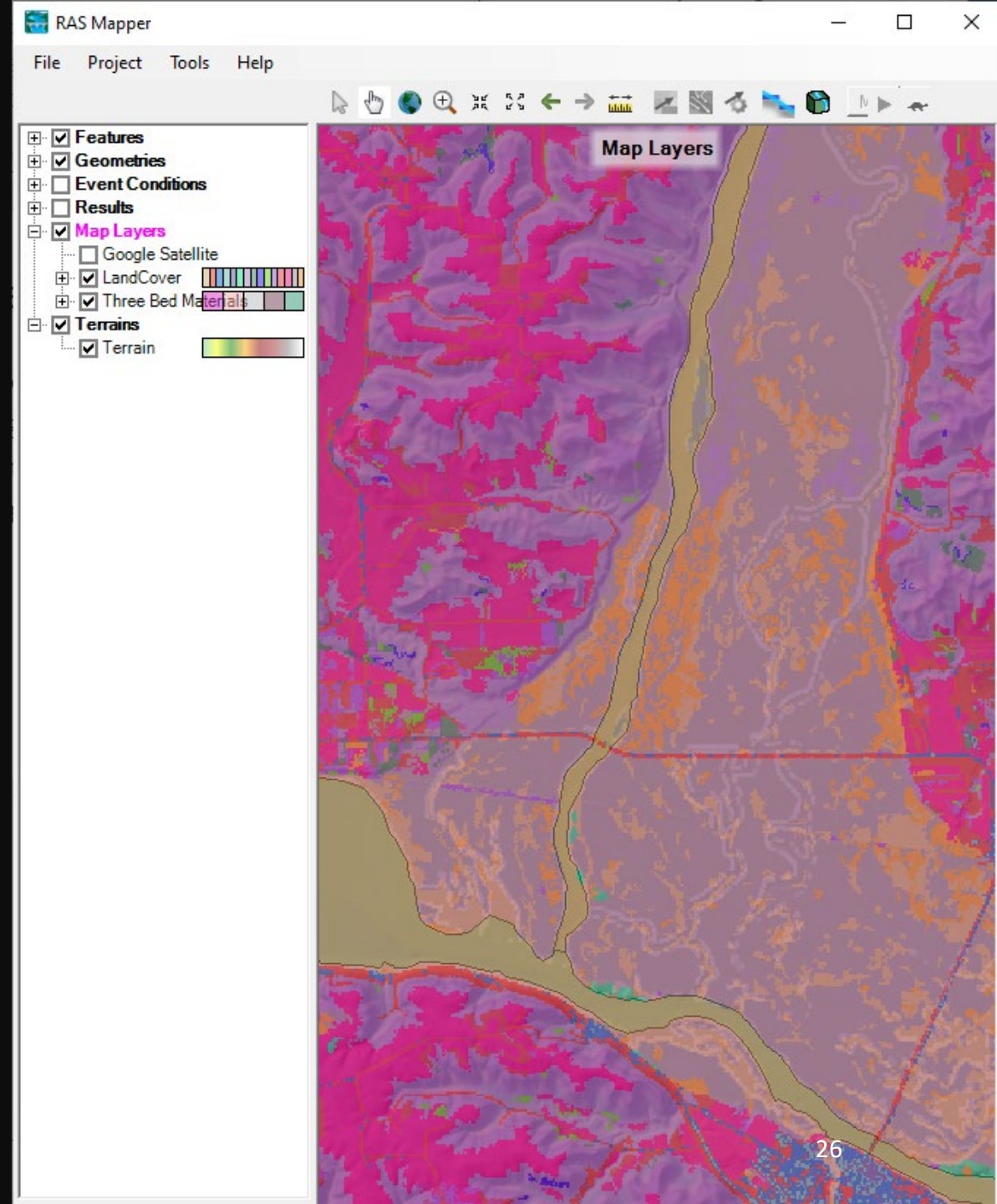
Show Base Overrides

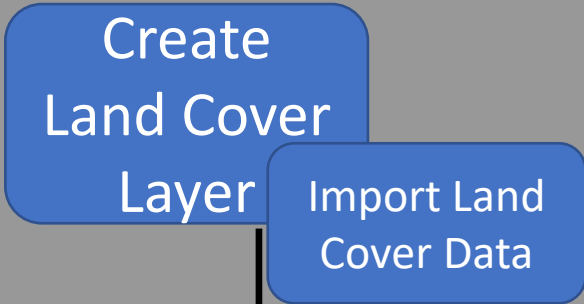
ID	Name	ManningsN	Base Override - ManningsN
0	NoData	0.066	
1	Channel	0.03	
11	Open Water	0.035	
21	Developed, Open Space	0.04	
22	Developed, Low Intensity	0.06	
23	Developed, Medium Intensity	0.08	
24	Developed, High Intensity	0.1	0.2
41	Deciduous Forest	0.16	
43	Mixed Forest	0.14	
52	Shrub/Scrub	0.04	
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

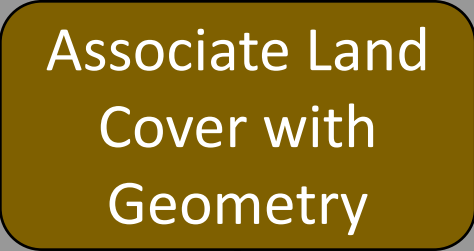
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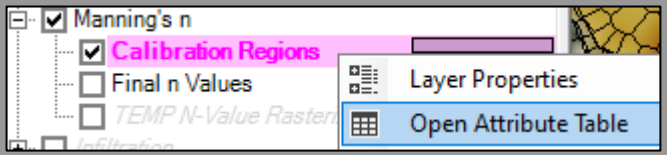
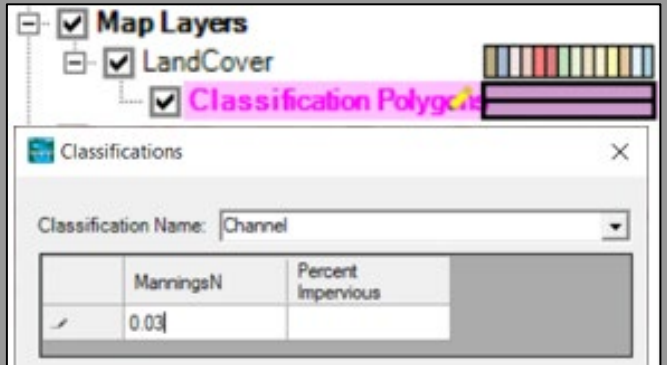
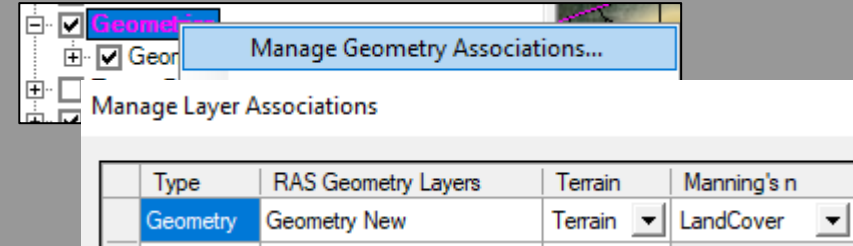
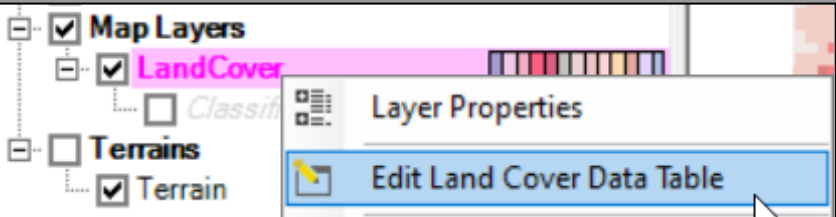
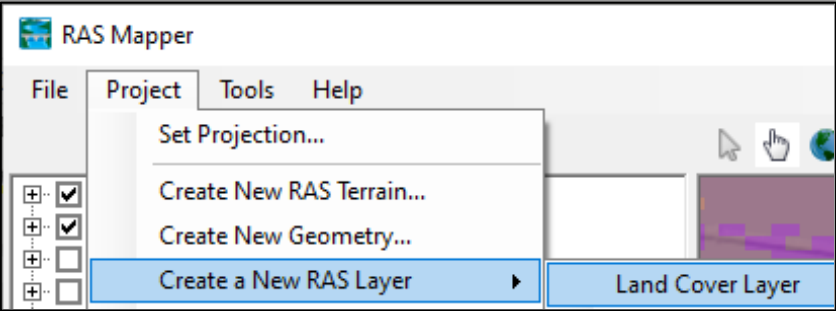
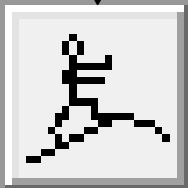
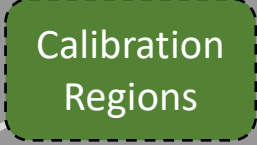




Optional



Optional





Calibration Regions

RAS Mapper

File Project Tools Help

Selected Layer: Calibration Regions

SA/2D Connections
Pump Stations
BC Lines
Manning's n
 Calibration Regions
 Final n Value grid
 TEMP N-Value Rasterizer
Infiltration
Percent Impervious
Reference Points
Errors
Event Conditions
Results
Map Layers
 LandCover
 Classification Pol
Terrains
 Terrain

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

(407300.95, 1804918.07 1 pixel = 16.49 ft)

Editing: 'Calibration'

Region Name
Provide a UNIQUE name for the region:
Steeper

OK Cancel

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

2000 ft



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

