

# Land Cover Layer and Manning's n Values

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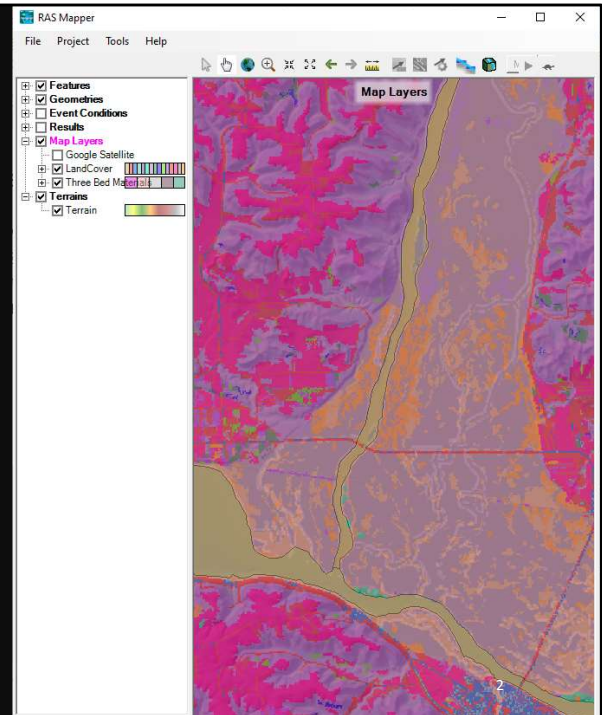
US Army Corps  
of Engineers®



# Overview

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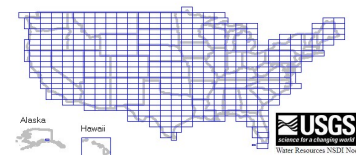
## Land Cover Data Sources

- 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)



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.



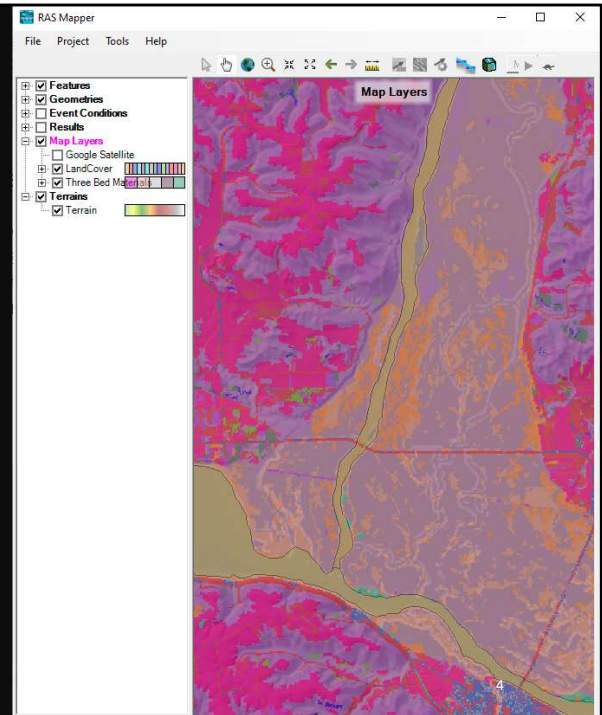
RAS Mapper supports the use of land cover data to assist in estimating Mannings n values. Currently, Raster formats (many) and vector data (in Shapefile polygon format) are supported.

The most current and complete (and appears to be best resolution) data for the USA is the National Land Cover Database data for 2016. It can be obtained as an Erdas Imagine grid file (.img extension) for the conterminous US. It is a big file > 16GB (1GB .zip download), but HEC-RAS will extract just the portion covered by your study area. This data follows a certain classification number scheme – RAS Mapper calls this NLCD2016. The data can be downloaded here:  
<http://www.mrlc.gov>.

# Overview

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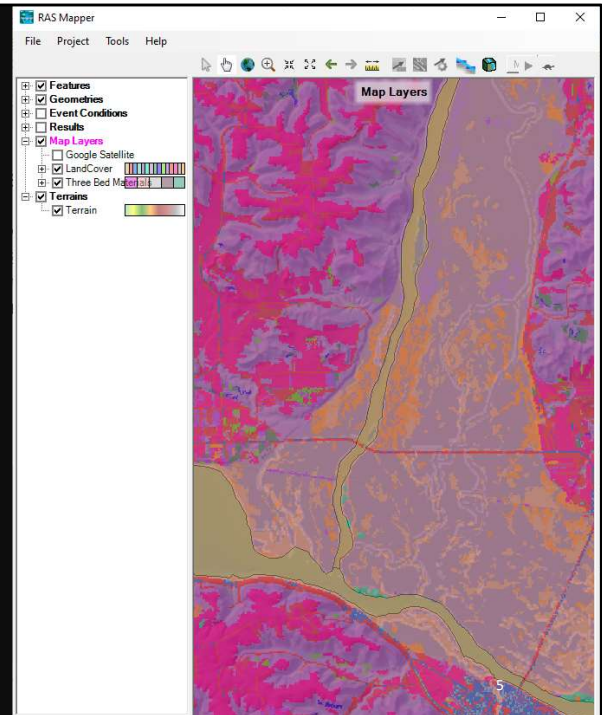
1. Land Cover Data Sources
  2. Importing Land Cover Data
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  4. Modifying Land Cover Data
- 



# Overview

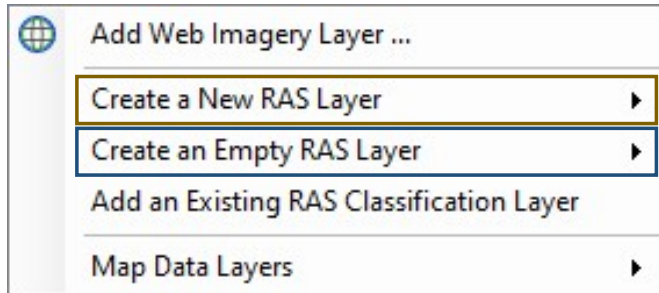
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1. Land Cover Data Sources
  2. *Creating* Importing Land Cover Data
  3. Associating Manning's n Values
  4. Modifying Land Cover Data
- 





## Legacy Approach

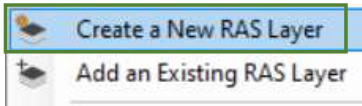


→ Create = Import  
(from GIS file)

→ Create Empty =  
Draw It



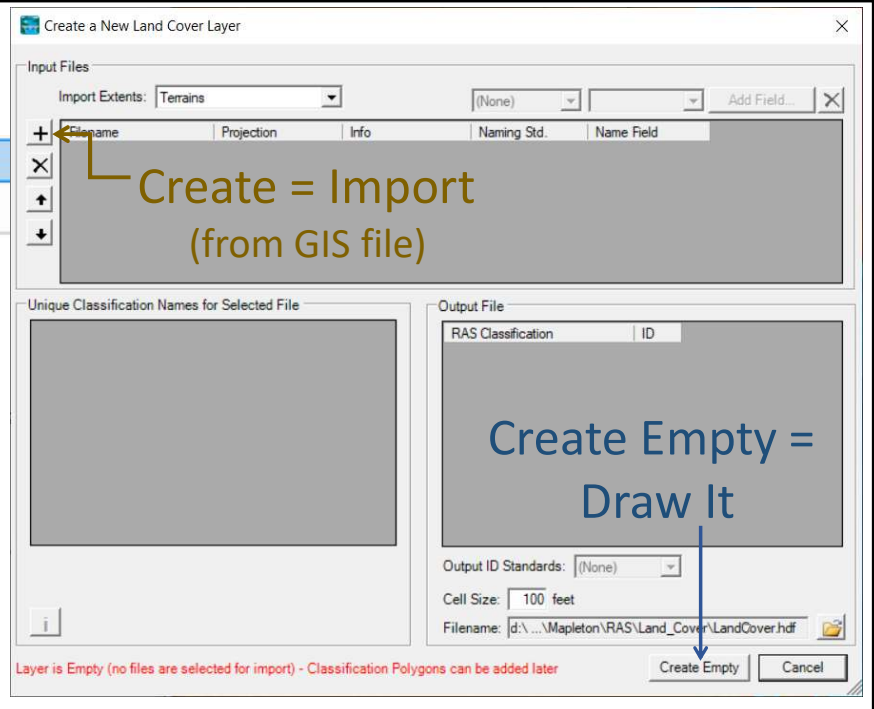
## Current Approach

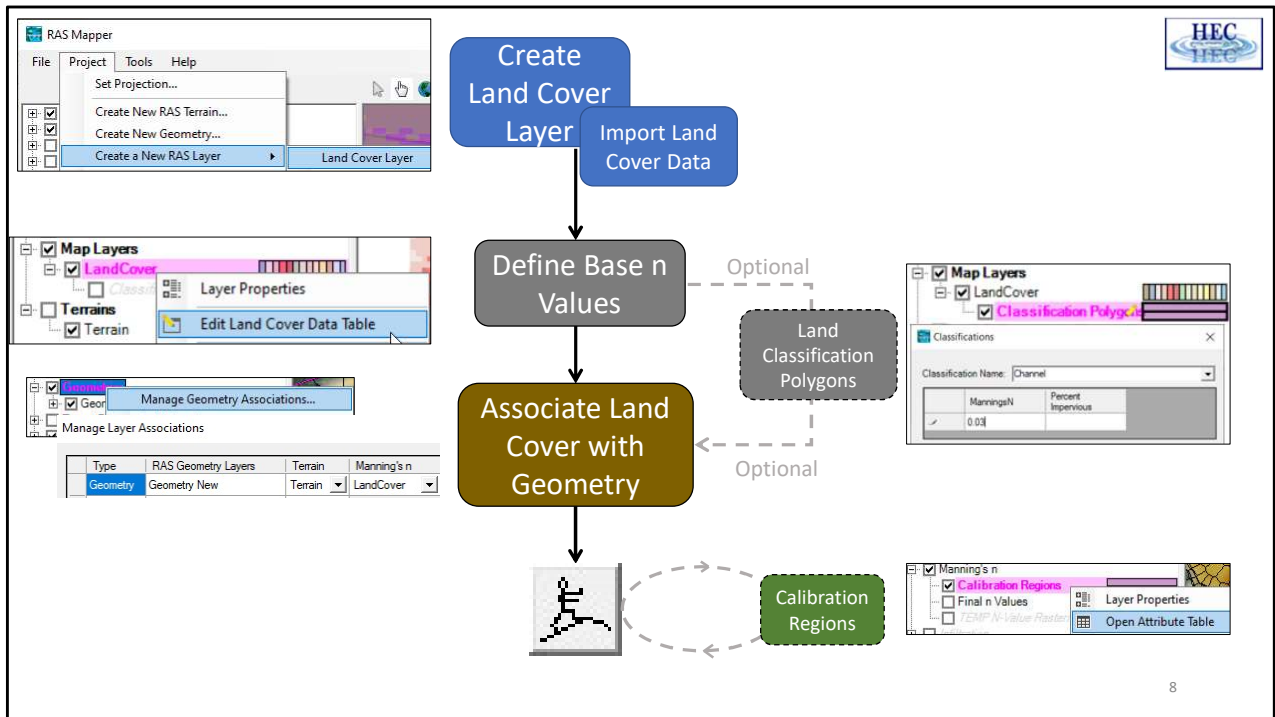


Just Create:

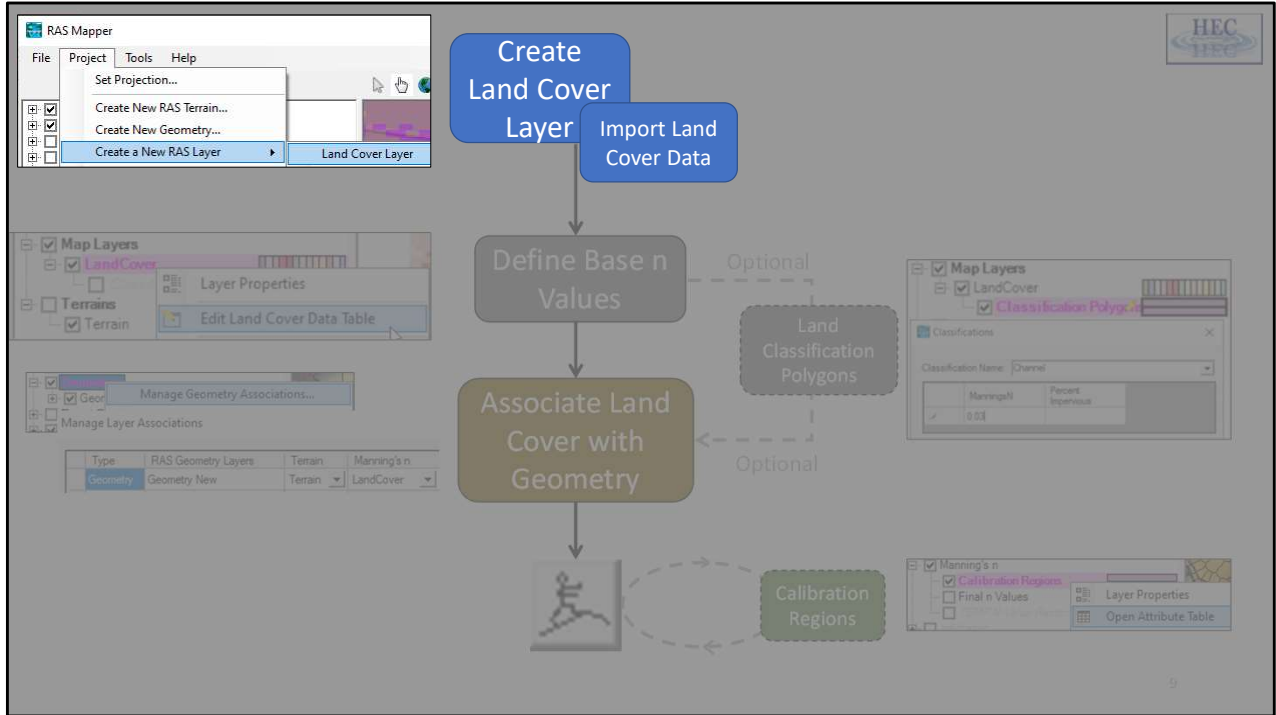
Then “+” if you  
have data

Press “Create  
Empty” button  
if you want to  
draw







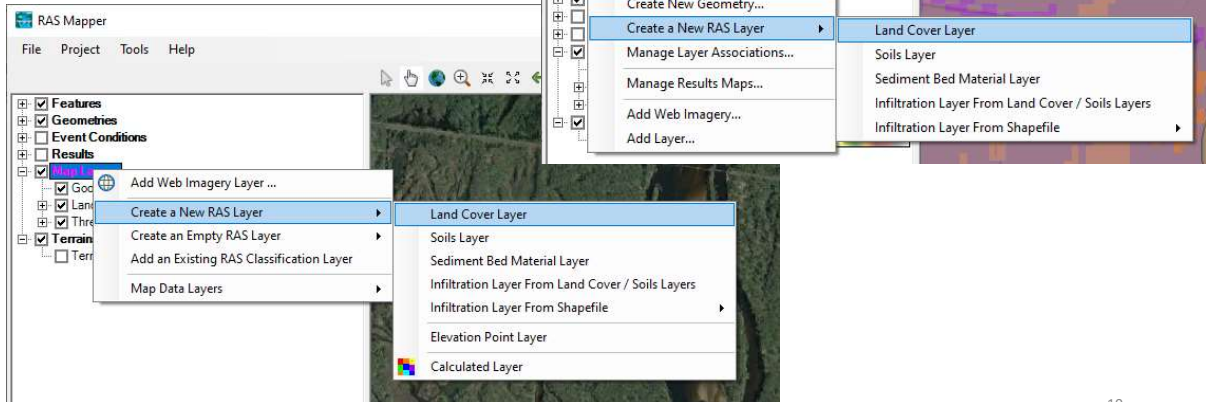




# Importing Land Cover Data



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



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Before we can assign Manning's n value data to our project, we need to create a Land Cover Layer.

Importing Land Cover Layer data is available from the Project menu in RAS Mapper.

Project | Create a New RAS Layer | Land Cover Layer

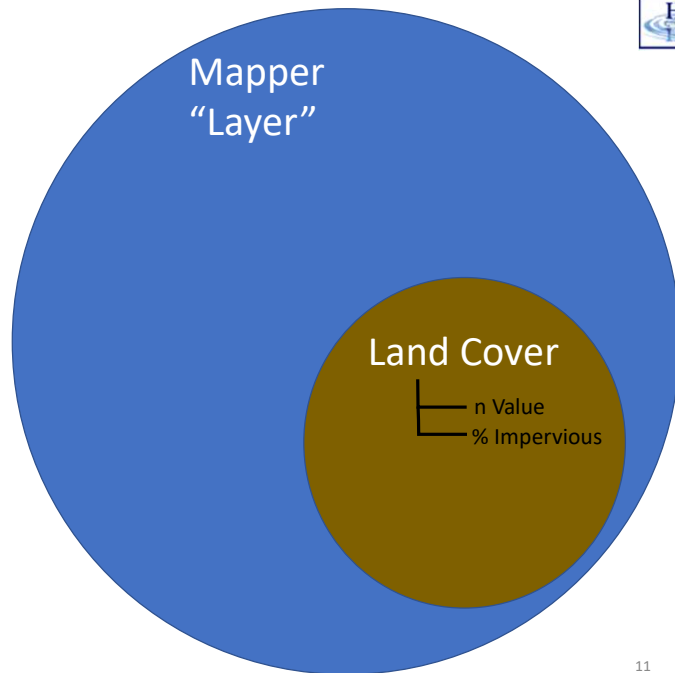


## A Venn Diagram of Important Terms

Note: None of these terms is "n-Value"

### Types of Mapper Layers

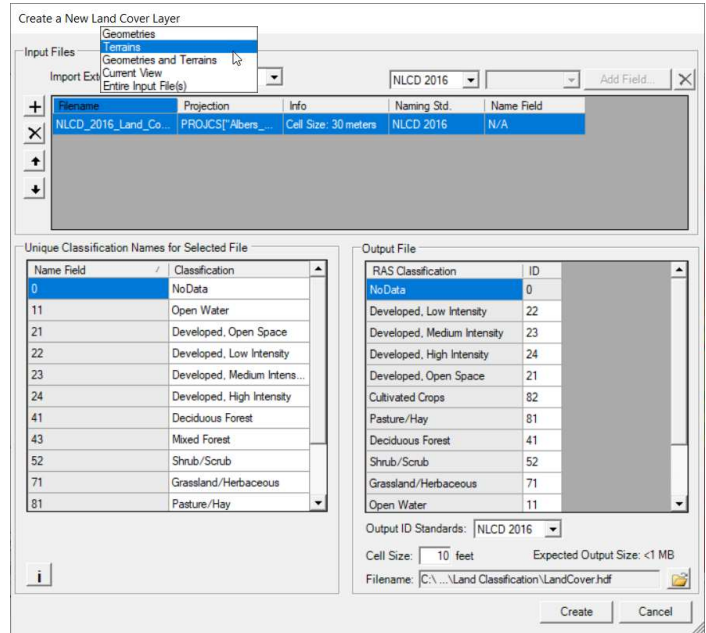
- Land Cover Layer
- Soils Layer
- Sediment Bed Material Layer
- Infiltration Layer From Land Cover / Soils Layers
- Infiltration Layer From Shapefile
- Elevation Point Layer
- Calculated Layer





## New Land Cover Layer

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



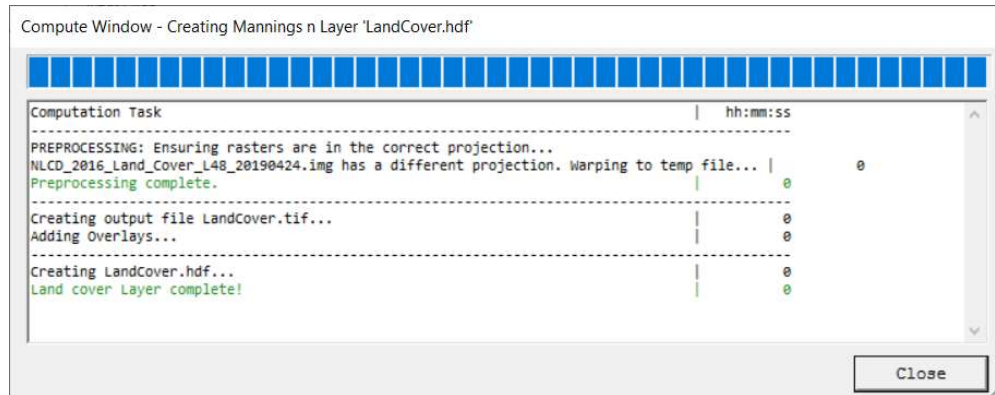
Importing land cover data is relatively straight forward.  
Grab a file and press the Create button.

The importer allows for flexibility in what data is imported and how.  
You can choose the extents for the data, reclassify the incoming data and provide a grid cell size.  
Because the data are stored as an integer grid, it is fairly efficient, so the cell size can be “relatively” small compared with the input data.



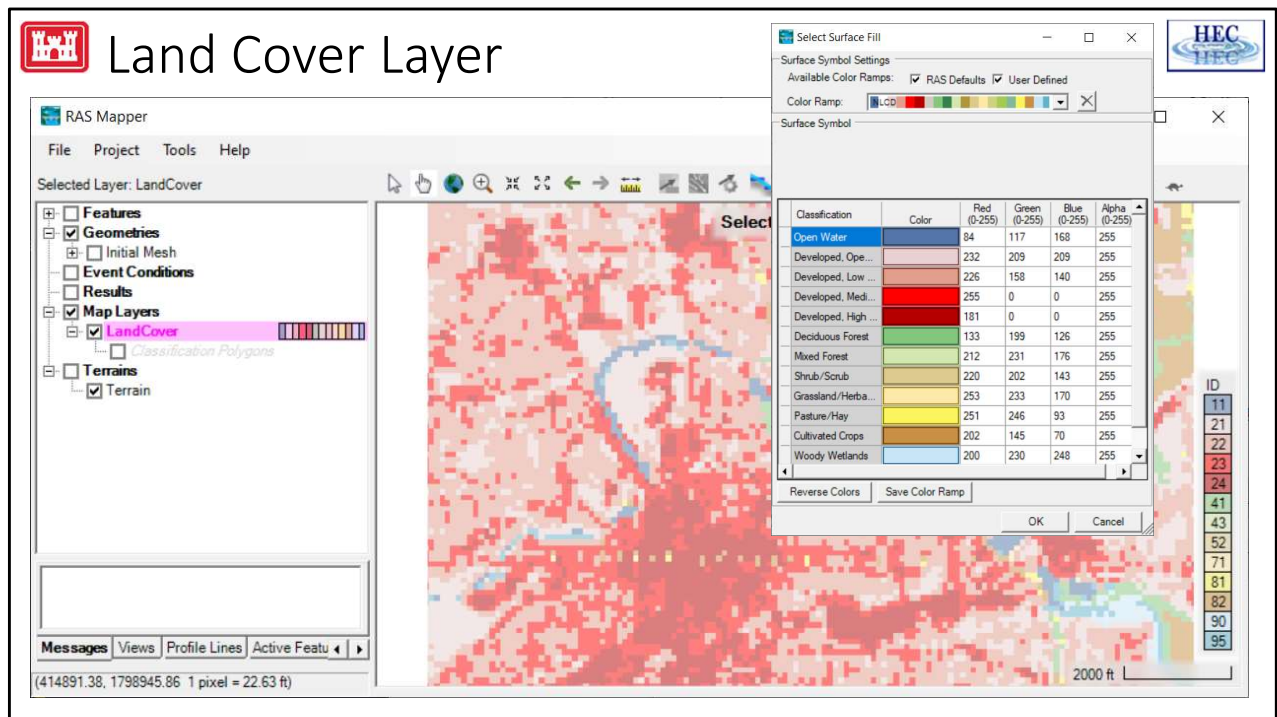
## Land Cover Import

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



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As the data is imported, the data will be reprojected to the study coordinate system. (So make sure you have a Coordinate System defined!)



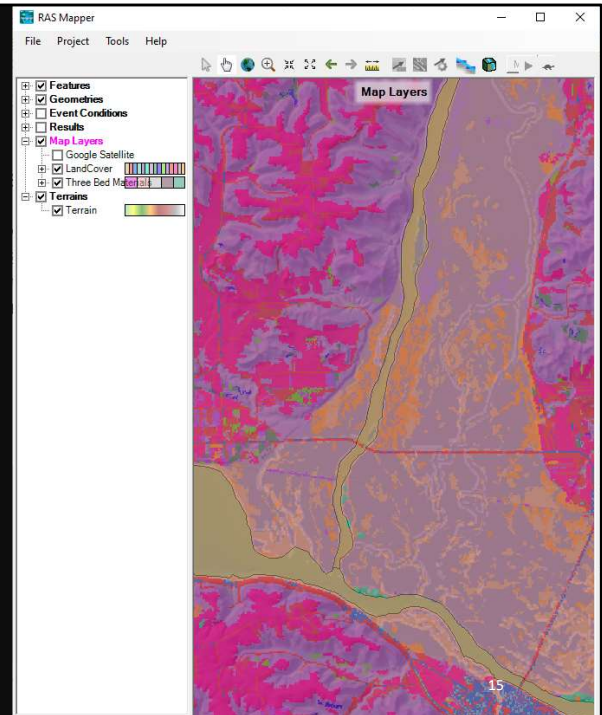
Here is an example of a land cover dataset that has been imported (US National Land Use Land Cover, NLCD2016).

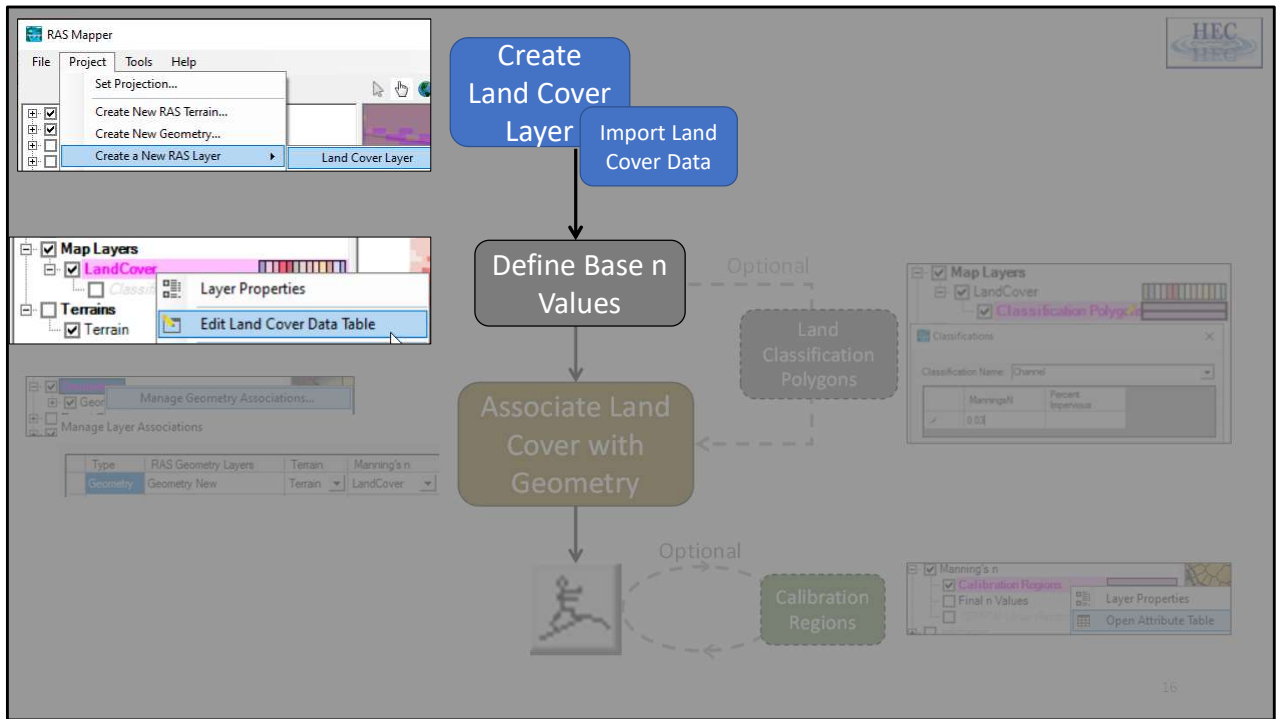
Once it has been imported, you can specify the color ramp (there is an NLCD ramp available).

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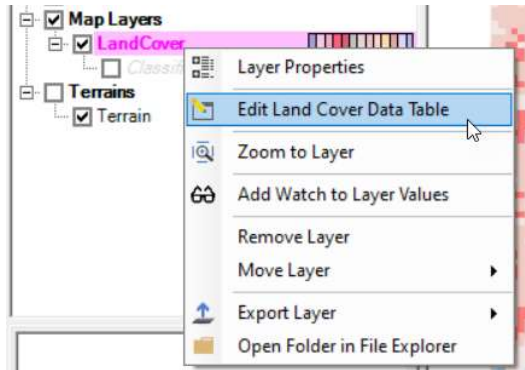




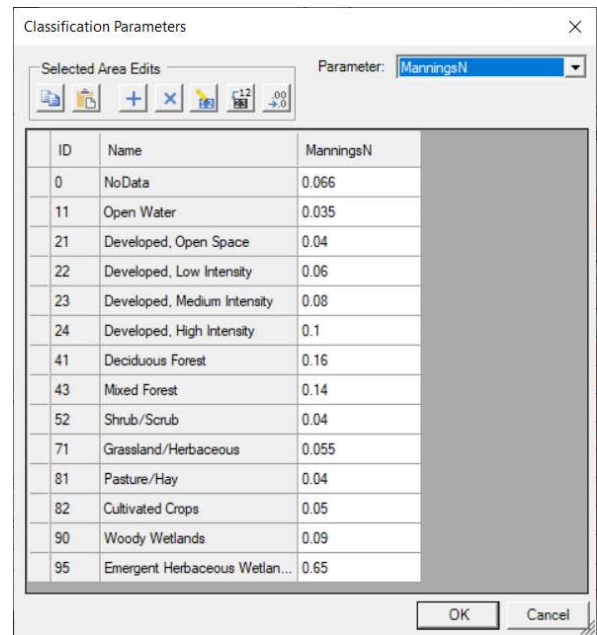


# Manning's n Values

- Provide base Manning's n values



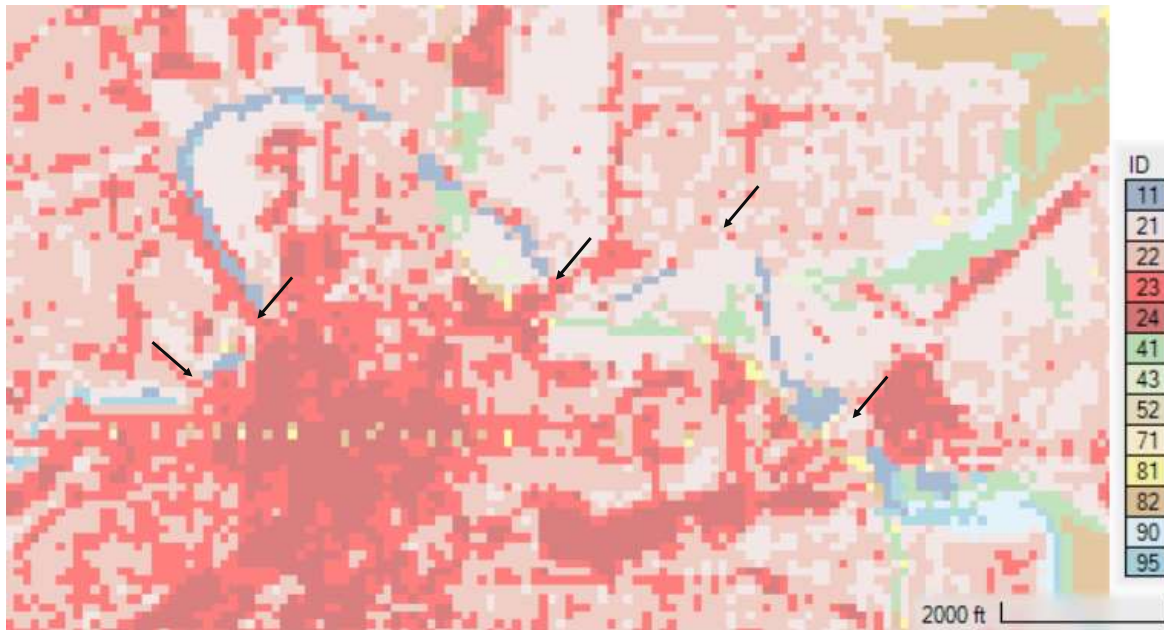
This is the first time you will actually see "Manning n"



You can then provide an Manning's n value for each land cover type in a provided table.

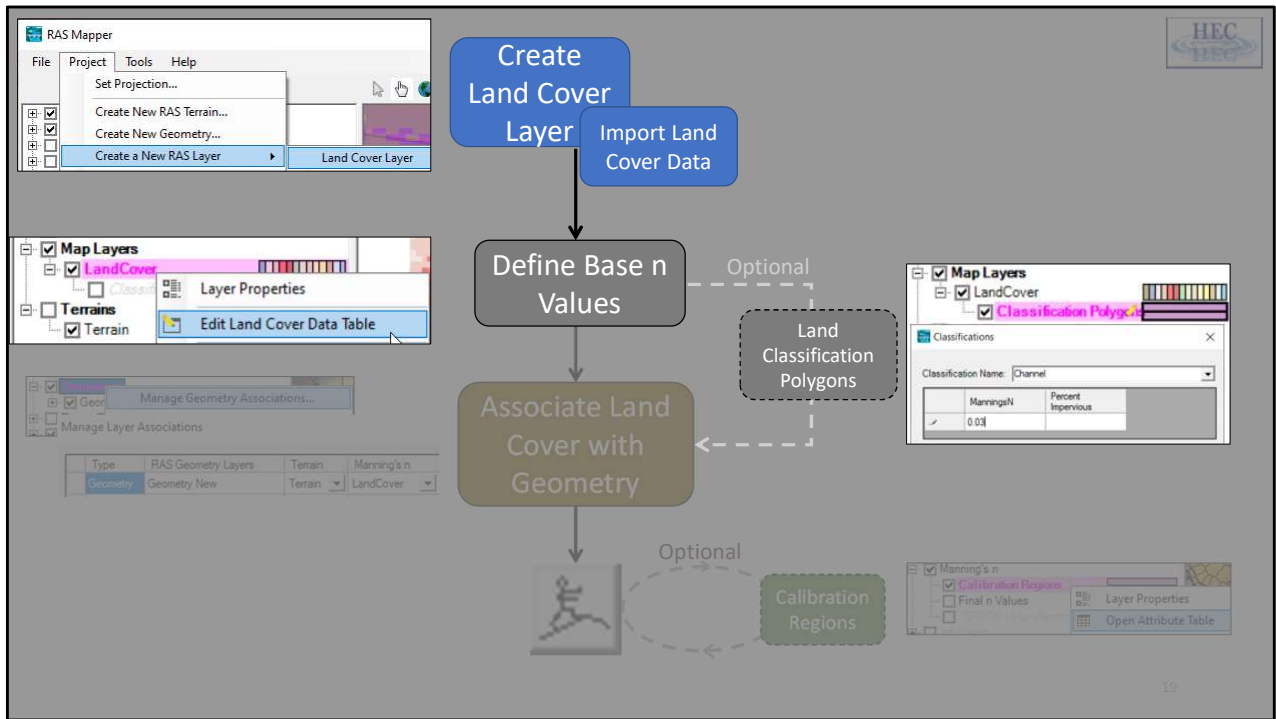


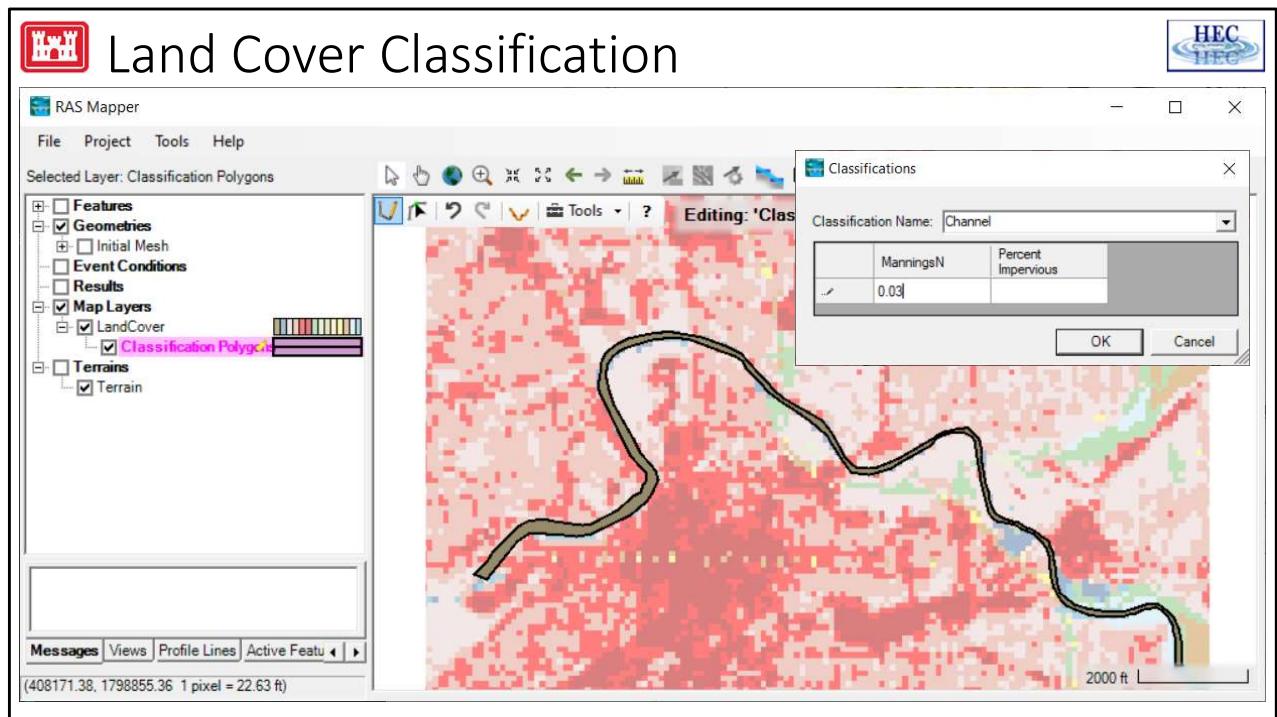
## Land Cover Layer –Data Issues



The land cover data for the US is at a poor resolution and can be relatively poor for hydraulic modeling. As you can see in the image above, the channel (water) land cover is missing from a lot of the area.

Therefore, we have provided a “Classification Polygon” (vector) tool to create your own land cover data.





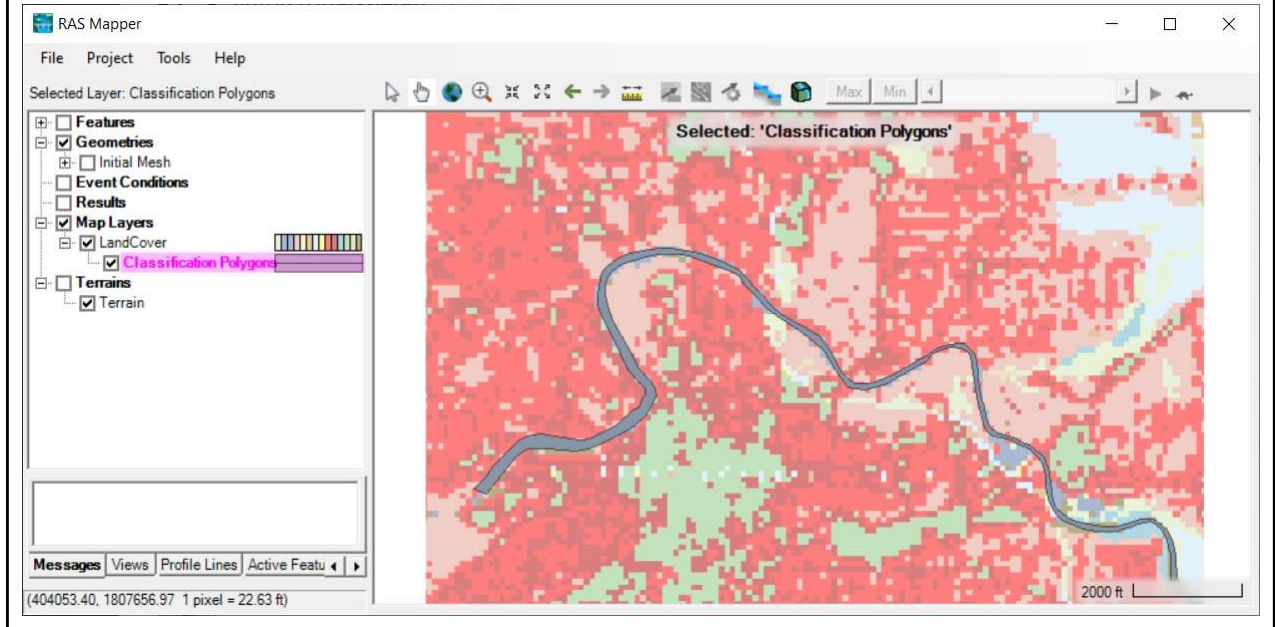
Using the Classification Polygons, then you can create a polygon and provide a name for that Classification.

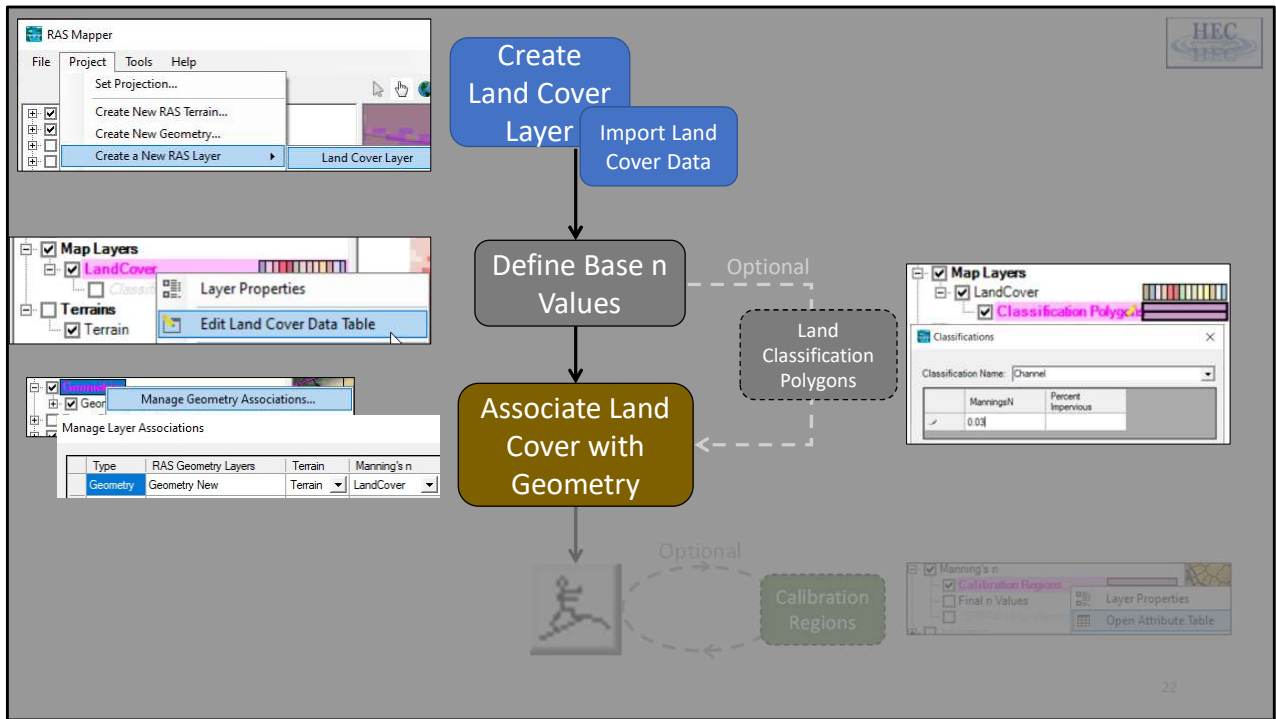
In general, you might want to use the same classifications as the base data. Or you might want to create your own.

For instance, you may want to use the class “water” for the main river or you might want to use the class “channel”. Depend on how you plan to use it for Manning’s n, later on.



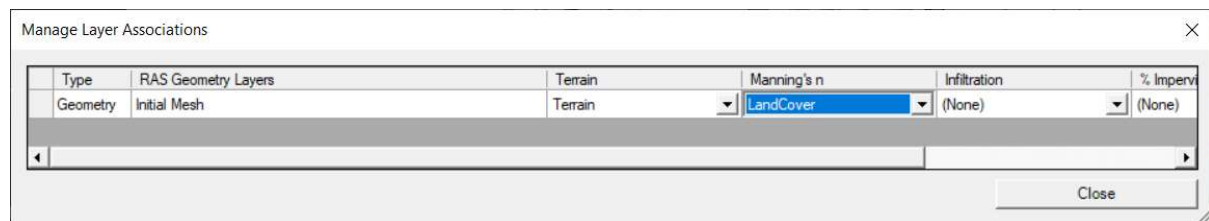
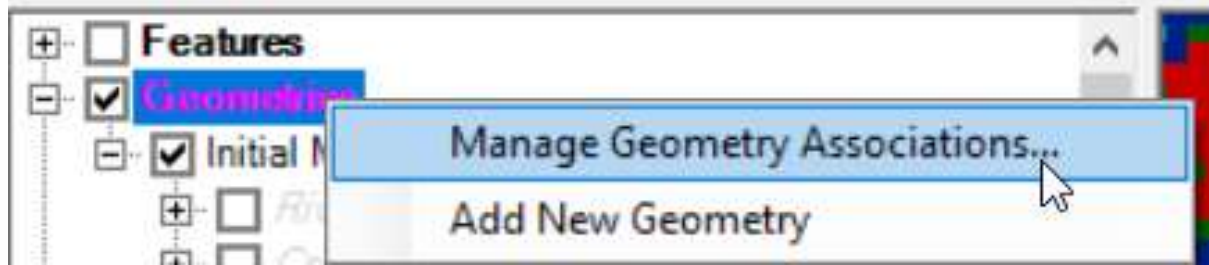
# Land Cover Layer with Vector Polygons







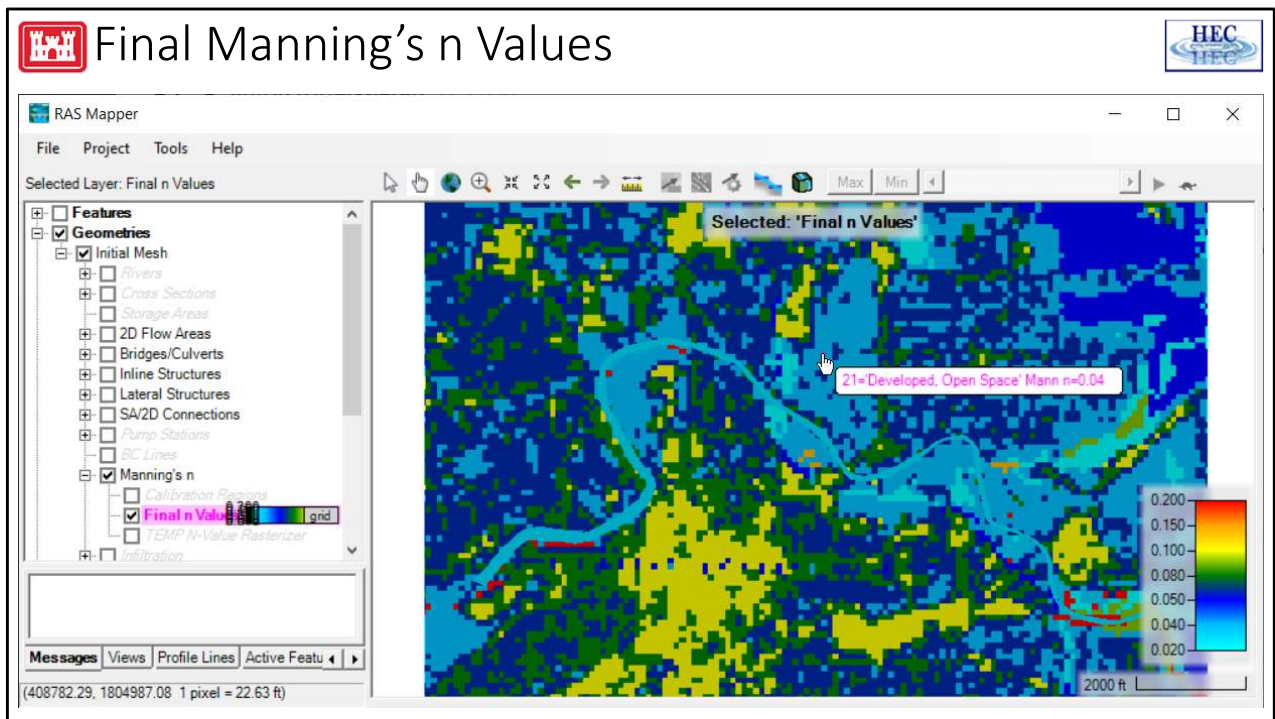
## Associate Land Cover with Geometry



This is a commonly overlooked step for new users.

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Once you have created your land cover dataset, you have to make sure to associate it with your geometry. In general, RAS Mapper does this for you automatically. But you should verify.

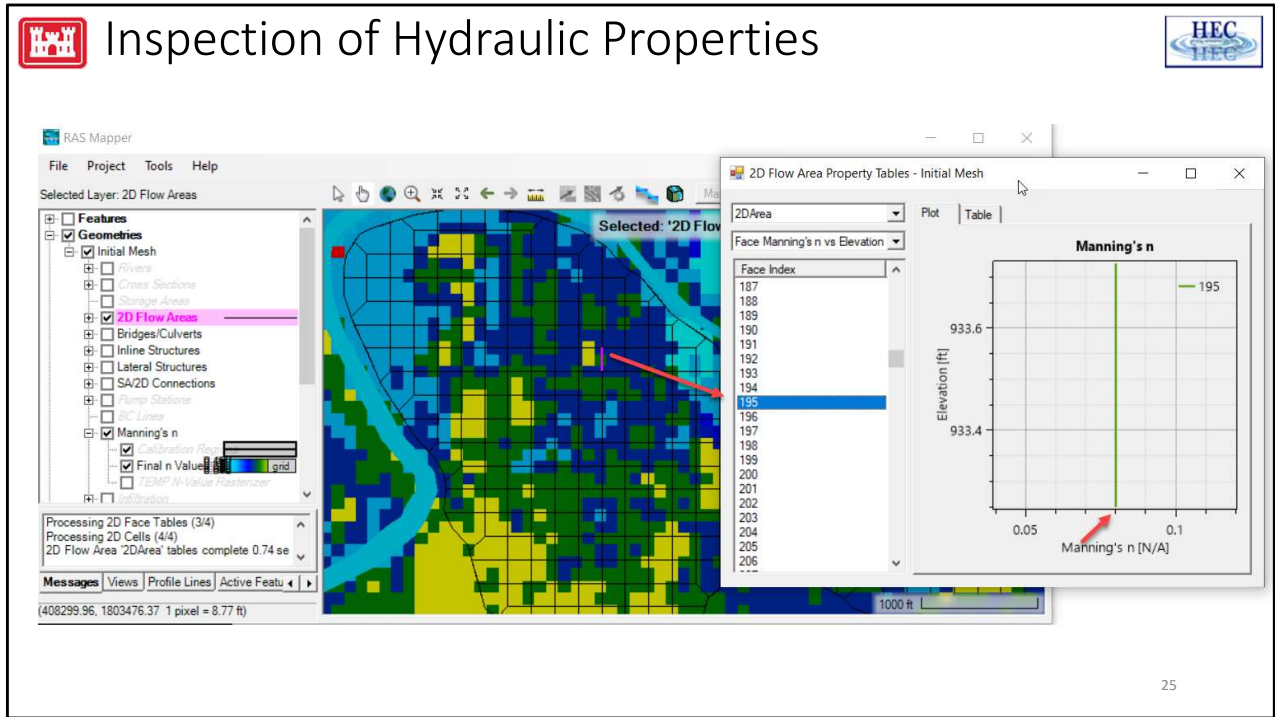


From the Geometry group, you can verify what the Final n values used in the model will be. Select the layer and hover over the cells to see the Land Cover classification and associated n value.





# Inspection of Hydraulic Properties



After processing the Hydraulic Property tables, verify the n values are as you expect for each cell face.



## 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

Now, if you don't like some the values, you can go back to the original land cover dataset and change the values.

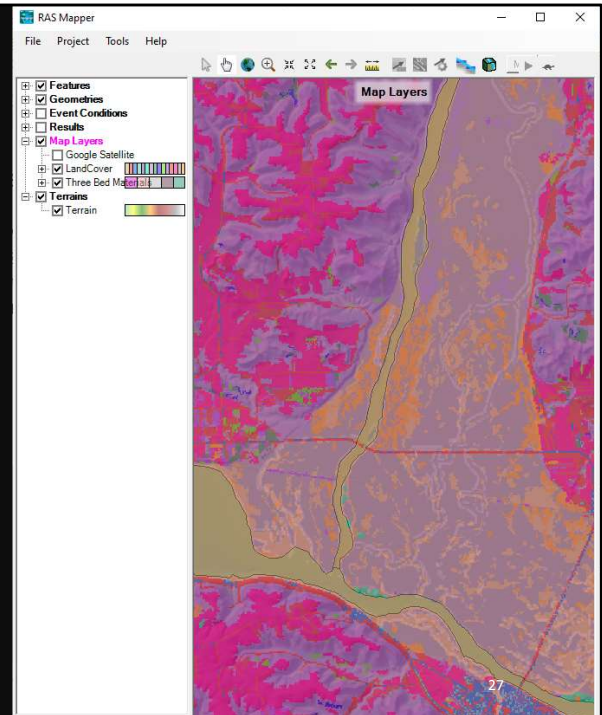
OR – if you are using the dataset for multiple geometries – you can use a base override. The base override REPLACES the original value.

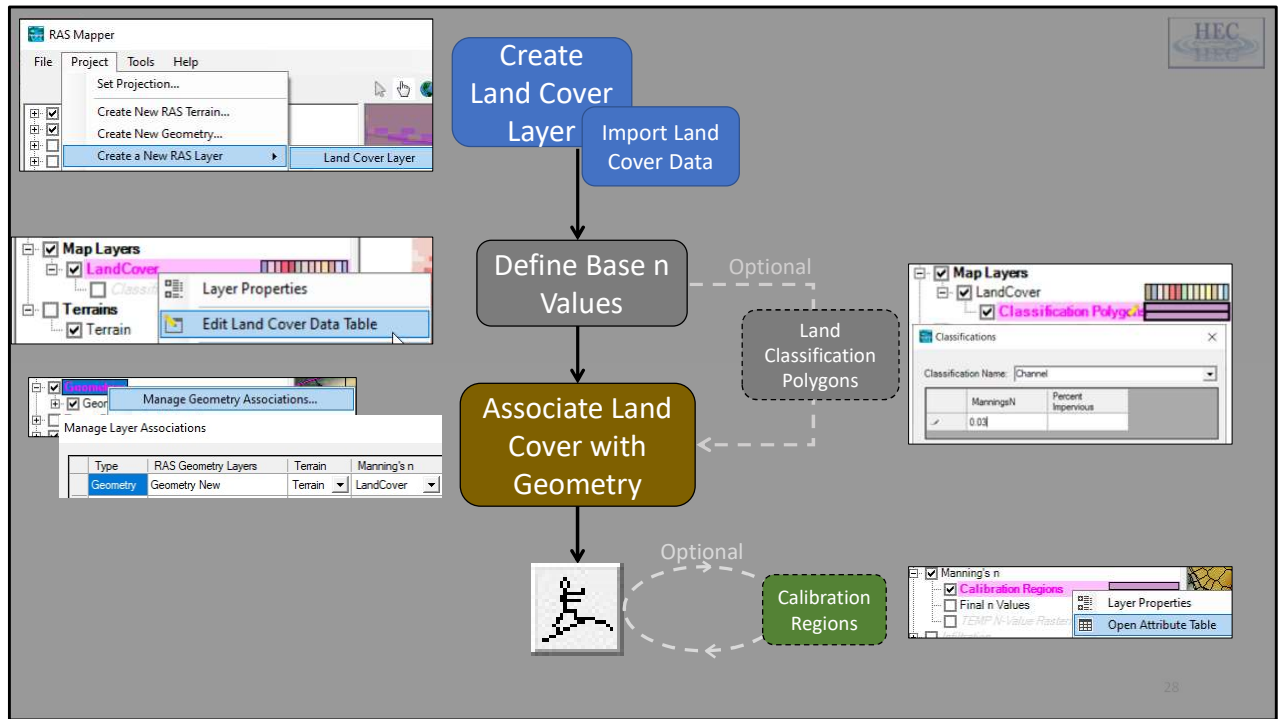
In the example above, High Intensity development is replaced with 0.2 (from 0.1)

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# Calibration Regions

Region Name  
Provide a UNIQUE name for the region:

Steeper

ID	Name	Manning'sN	Base Override - Manning'sN	Steeper - Manning'sN
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

Once you start running the model, you can use “Calibration Regions” to adjust the Manning’s n value.

In the example above, the “steeper” portion of the river reach needed increased n values, so those values were increased by 25% over that of the original n values.



## 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

