Lecture given at the

WCS Workshop on Land Change Modeling for REDD

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Bronx, New York, USA

Hosted by

Clark Labs and the Wildlife Conservation Society

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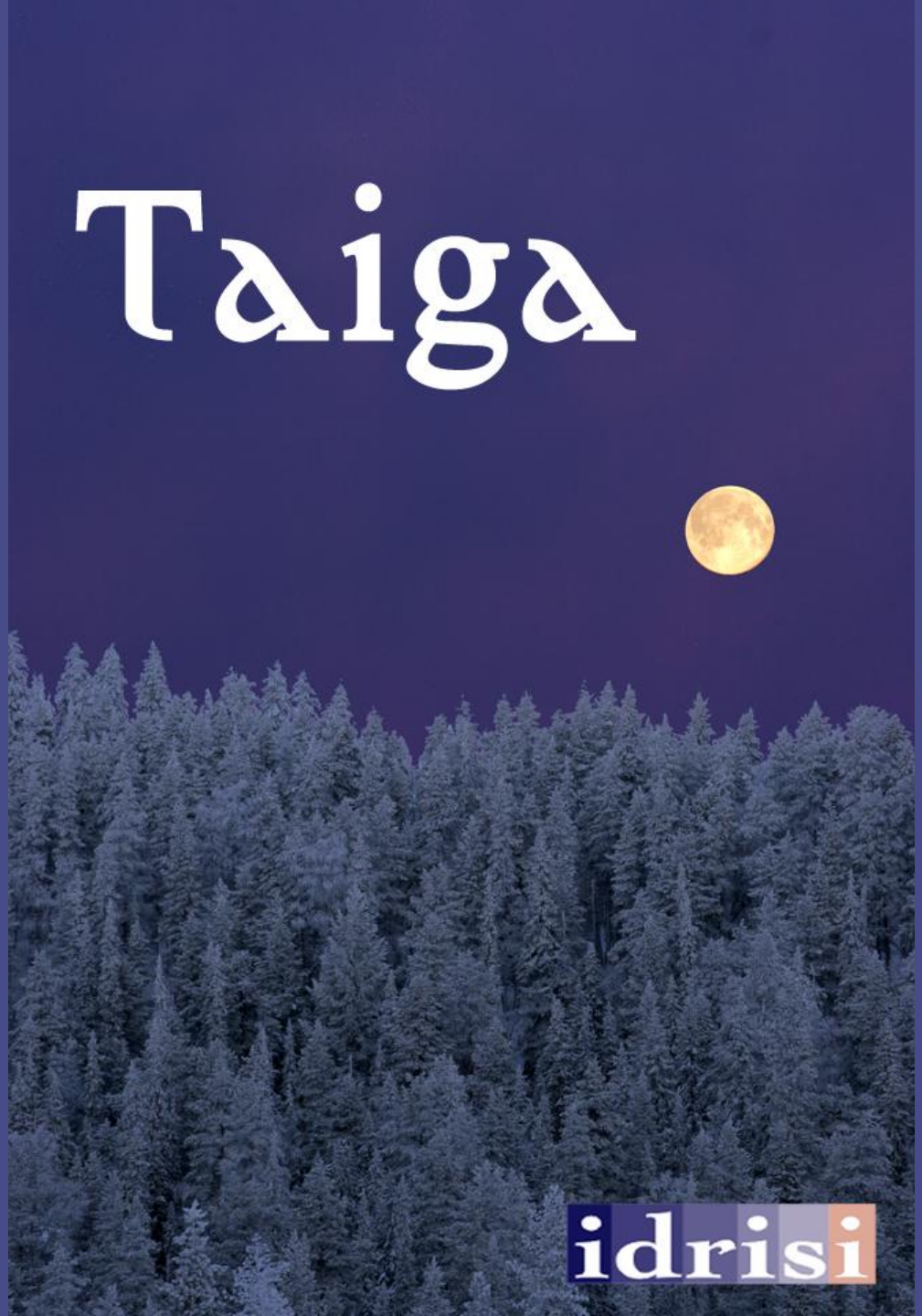
Taiga

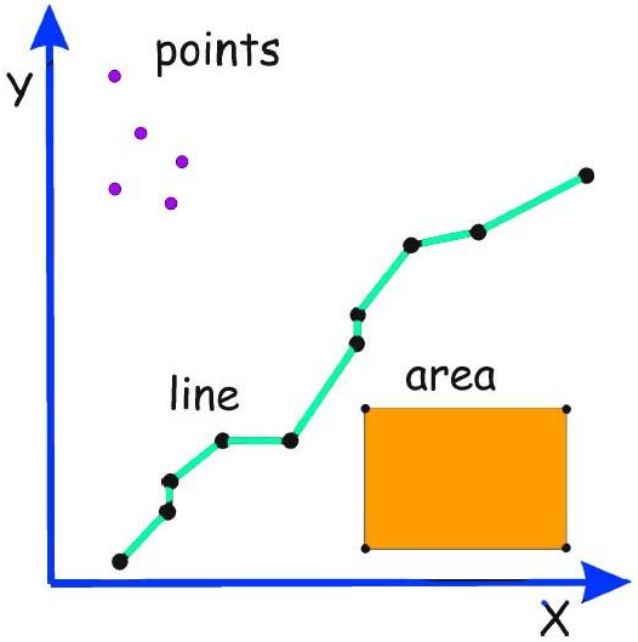


Introduction to Geographic Information Systems (GIS)

In this section you will learn:

- **Vector and Raster GIS Background**
- **Vector GIS in Idrisi Taiga**
  - How to import from an ArcGIS shapefile
  - How to make a raster file from a vector file
- **Raster GIS in Idrisi Taiga**
  - Basic raster tools: Overlay, Reclass and Histogram
  - How to import a raster
  - Projecting a raster image
  - Resampling a raster image

Vector and Raster GIS Background



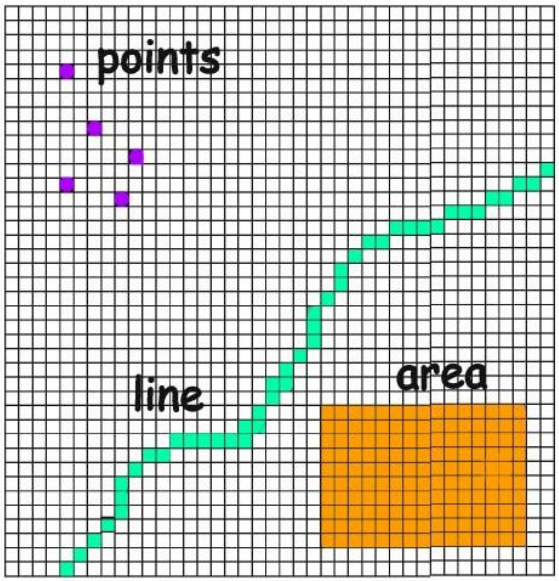


Figure 2-8: Vector and raster data models.

Modified from Bolstad

Vector and Raster GIS Background

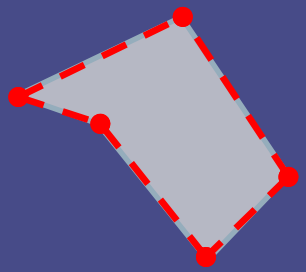
- **Point** is a 0 dimensional object (only a location in space)

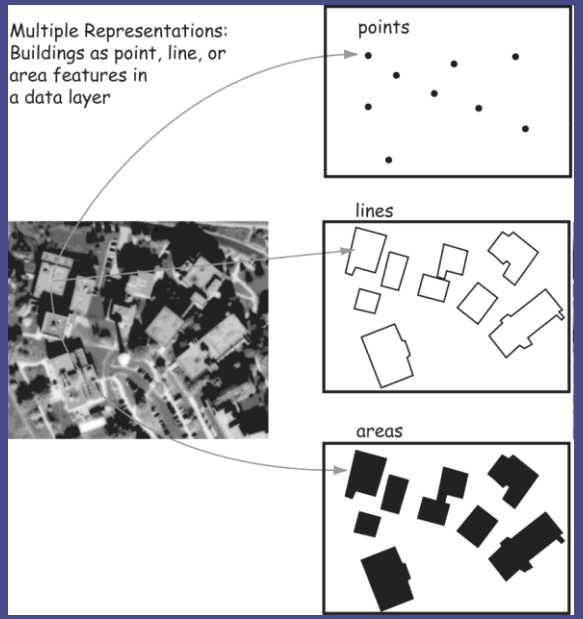
- Two points in a space can form a line.

A line is a 1 dimensional object since it has a length.

- A combination of lines form a polygon.

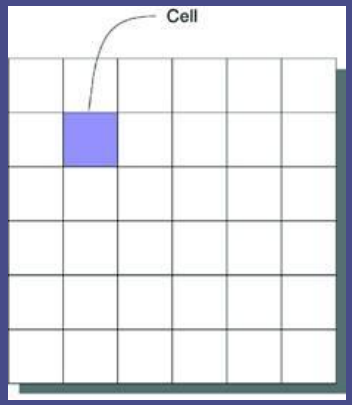
A **polygon** is a 2 dimensional object since it has a length and width.



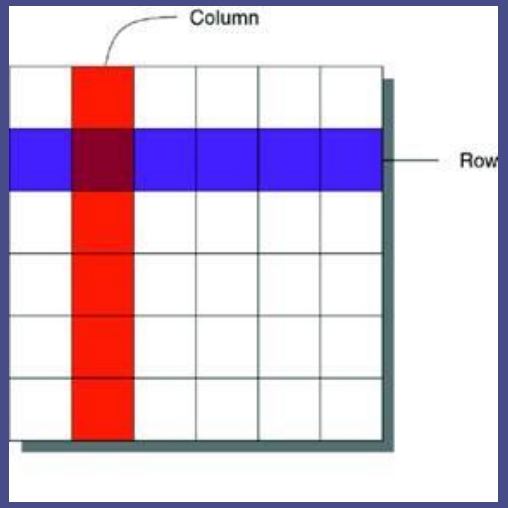


Vector and Raster GIS Background

- Raster Grids are composed of cells (or pixels)
  - Cells usually squared
  - Cells equally spaced
  - All cells have equal size

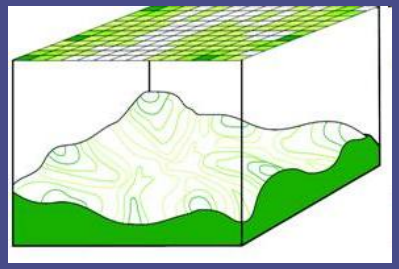


- Cells in a Grid are arranged in rows and columns, where rows represent the x-axis of a Cartesian plane and the columns the y-axis

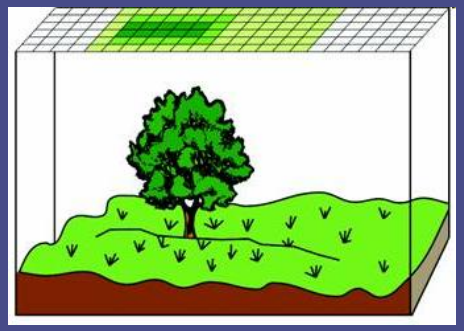


- Each cell has a unique row and column address

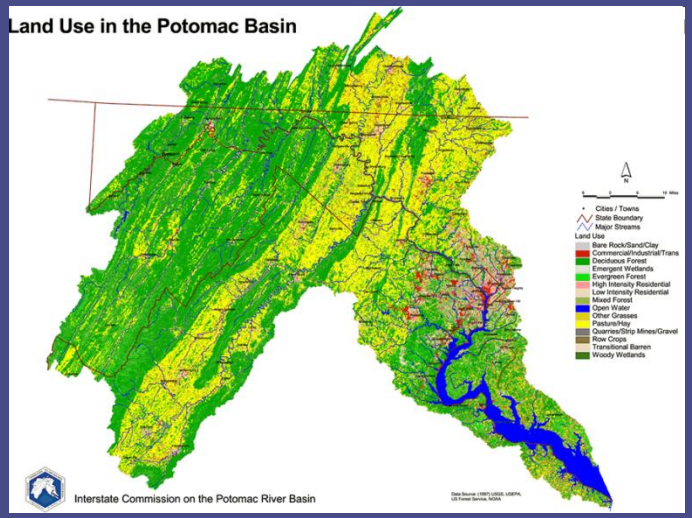
Vector and Raster GIS Background



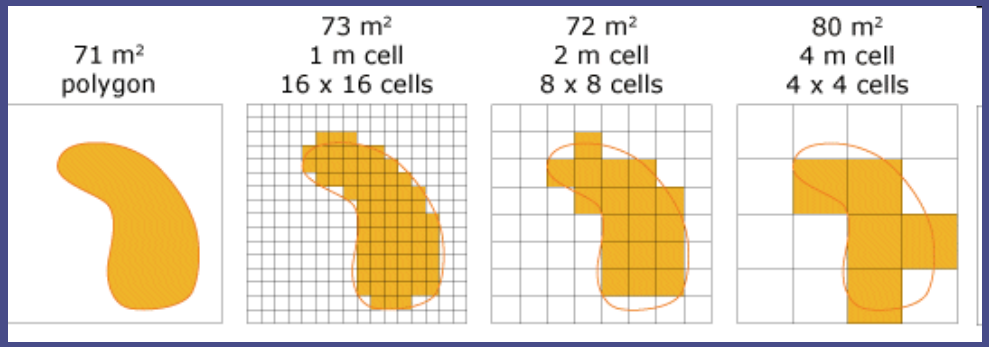
Elevation



Land Use/Land Cover



Vector and Raster GIS Background

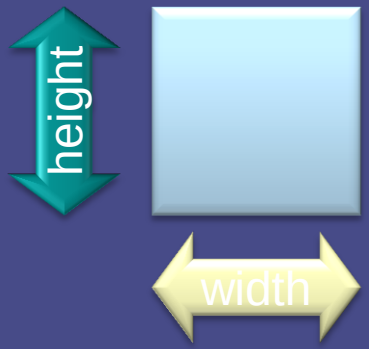


- Defines the resolution of the map:

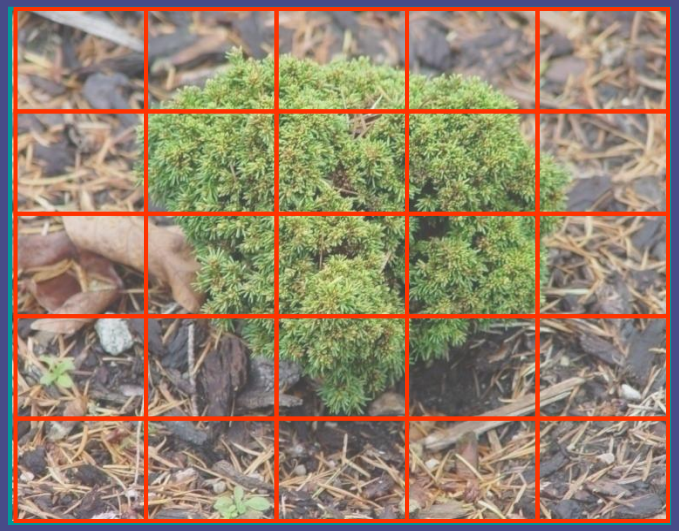
  Too coarse (large) cell size may distort the shape of objects

  Too fine (small) cell size may occupy too much HD space

- For smaller the cell sizes, we need more rows and columns to represent the same area, increasing the size of the file

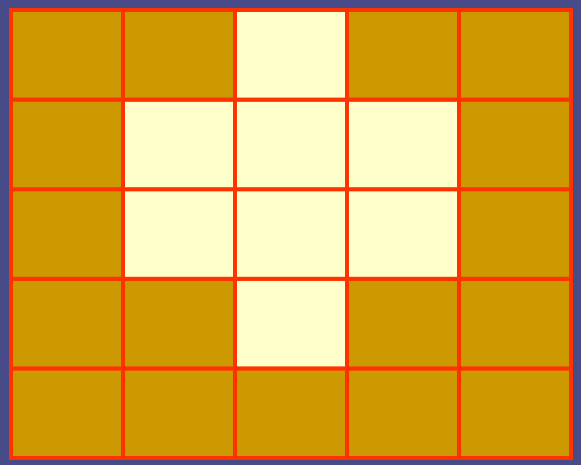


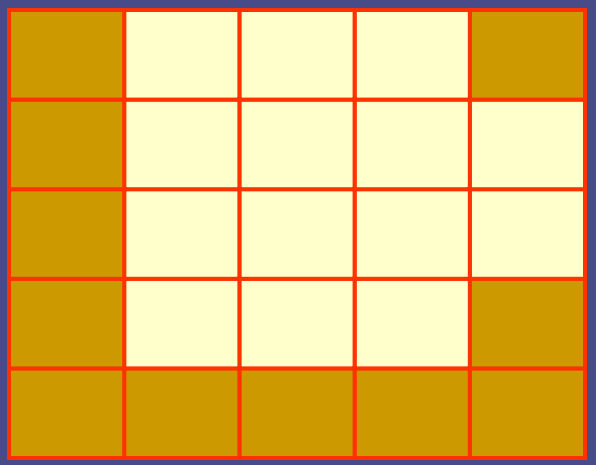
Vector and Raster GIS Background



One object displayed

two ways: which is correct?



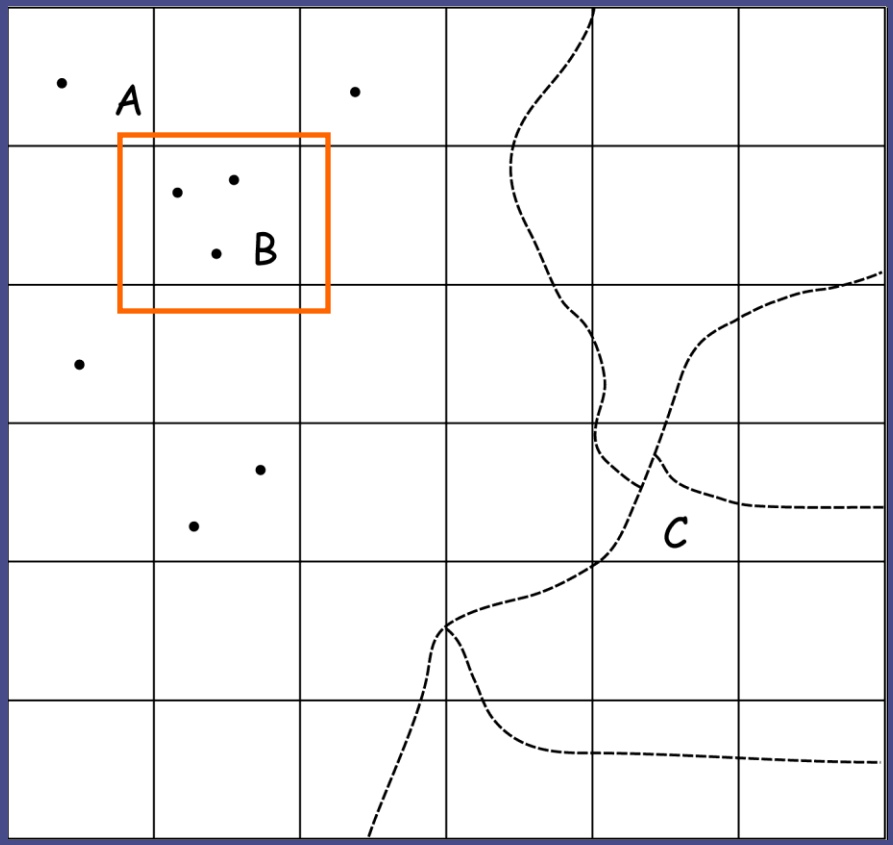


Vector and Raster GIS Background

Many Vector features inside one raster cell:

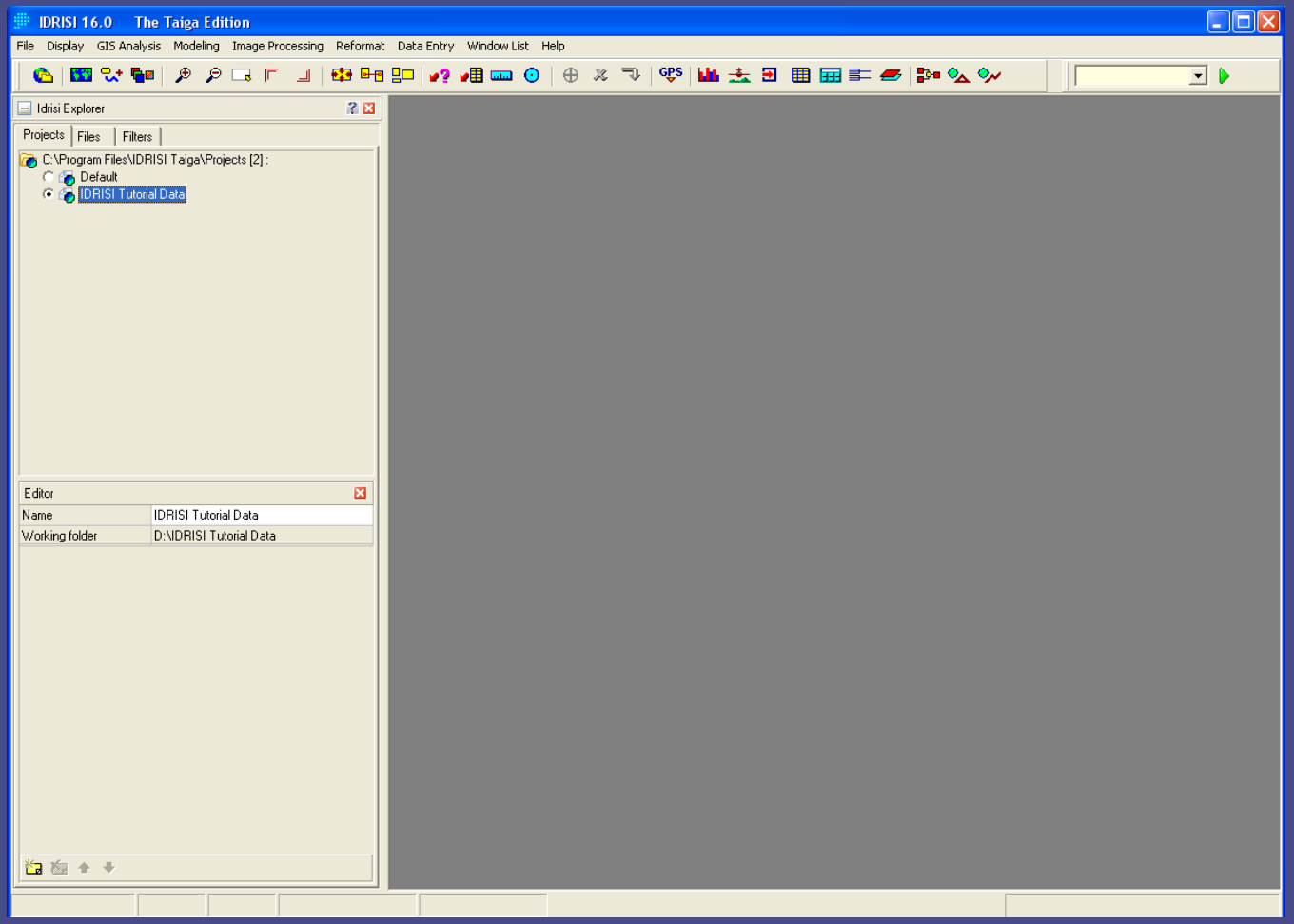
- can maintain cell size, but this means data loss

- can decrease cell size, but this increases the size of the dataset



Importing Shapefiles from ArcGIS

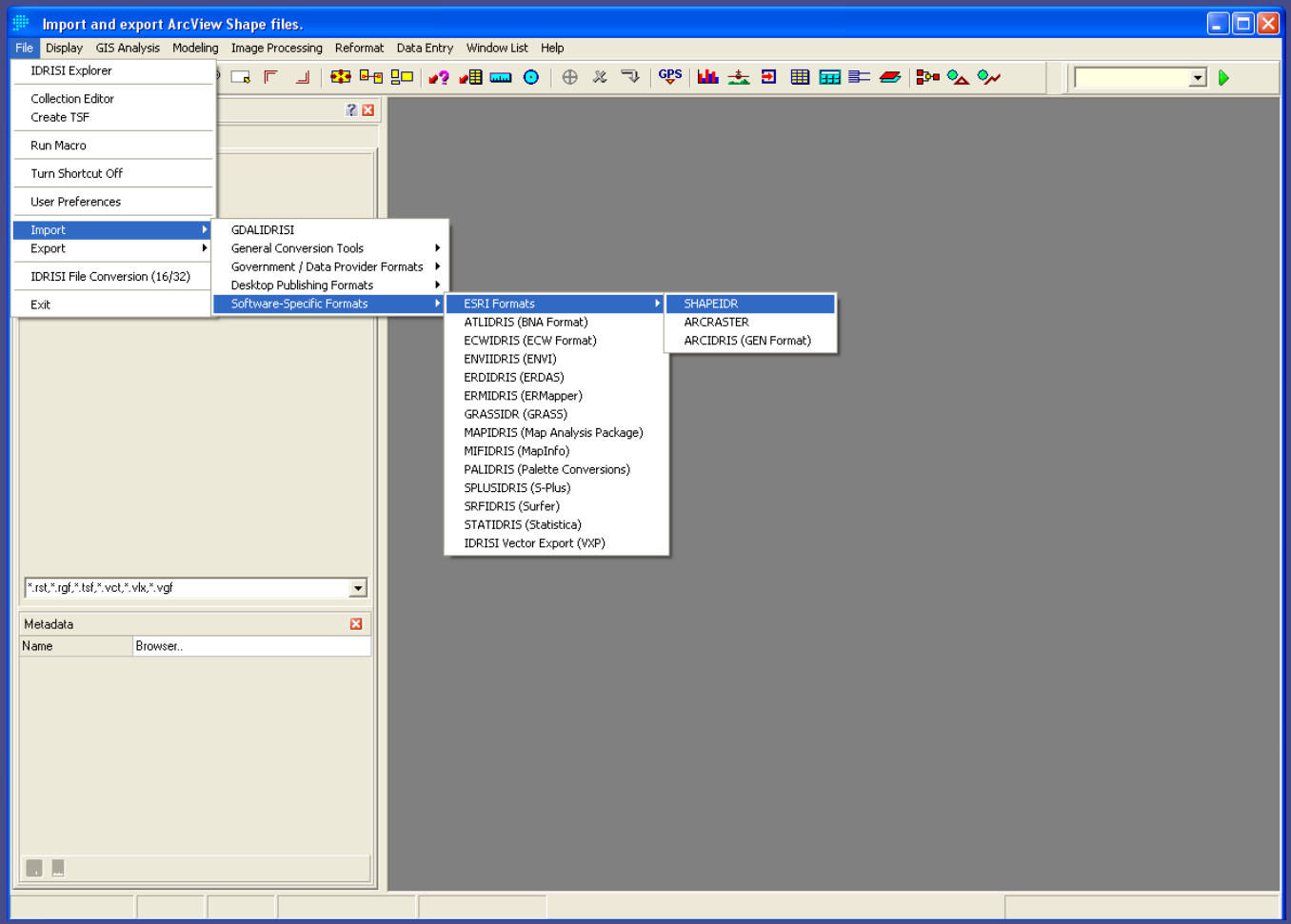
1. Click on the File Menu



Importing Shapefiles from ArcGIS

2. Navigate to:

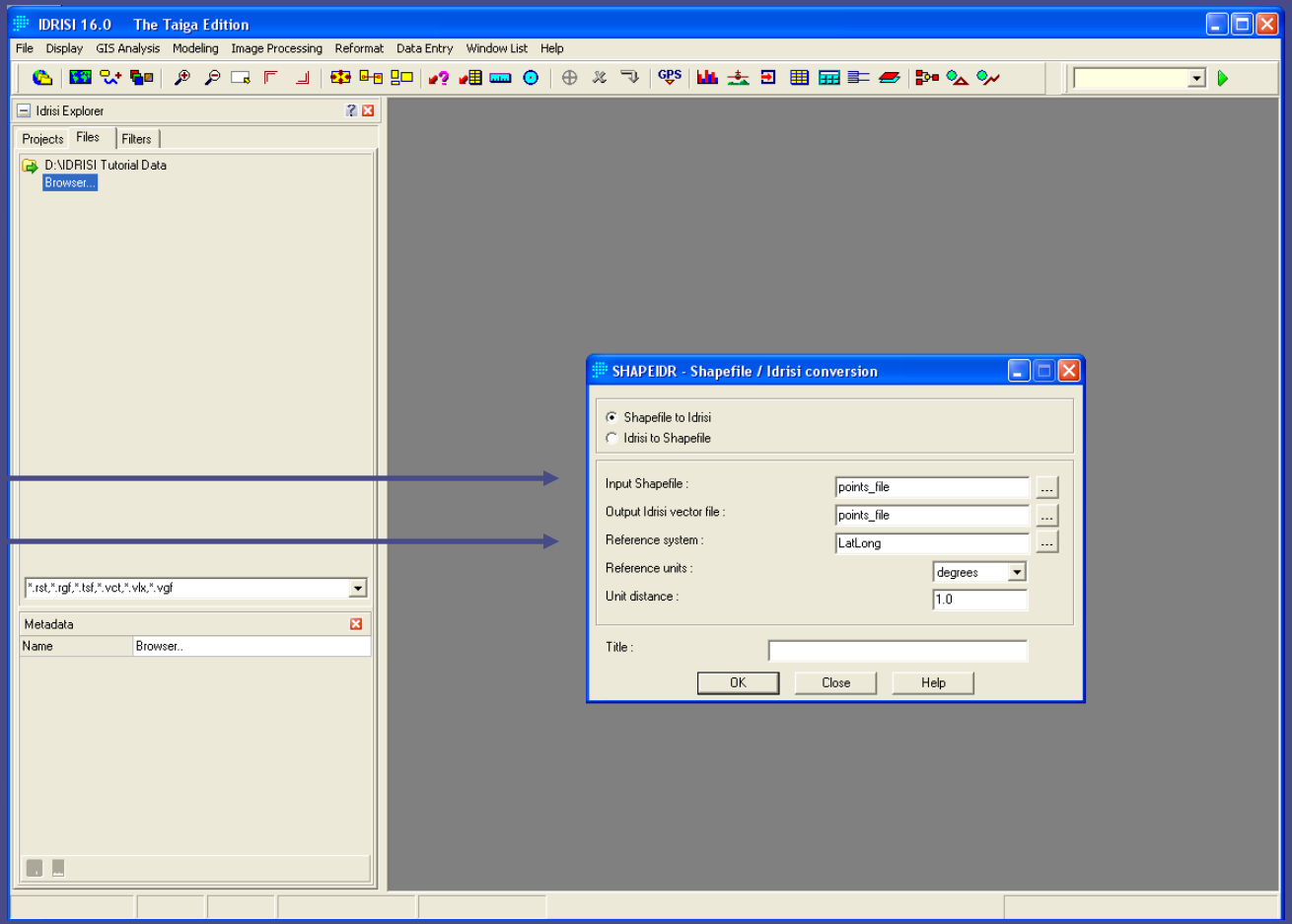
Import > Software Specific Formats > ESRI Formats > SHAPEIDR



Importing Shapefiles from ArcGIS

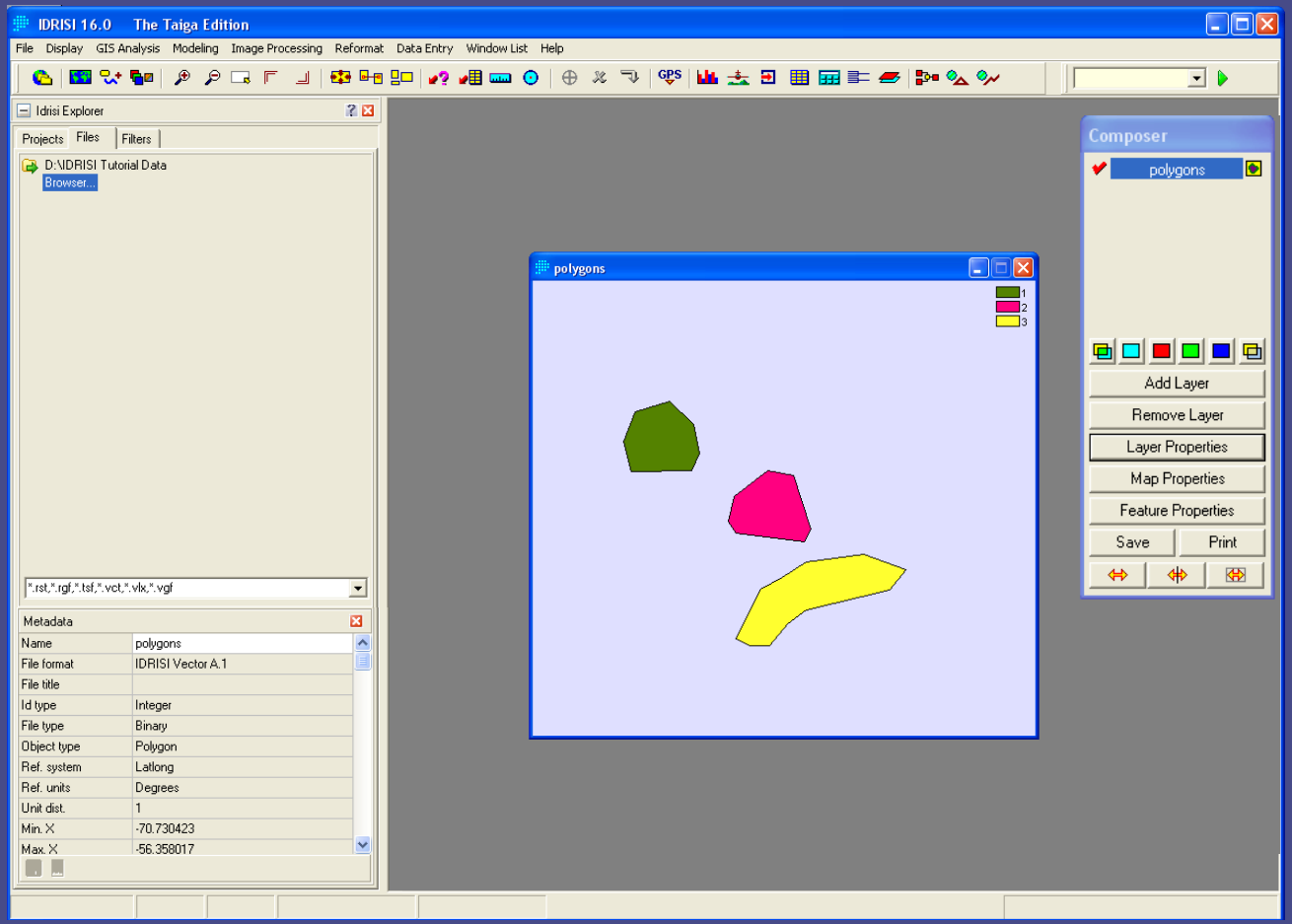
3. Click on the button next to the Input Shapefile text box to add your .shp file

4. Name your output file and choose your reference system



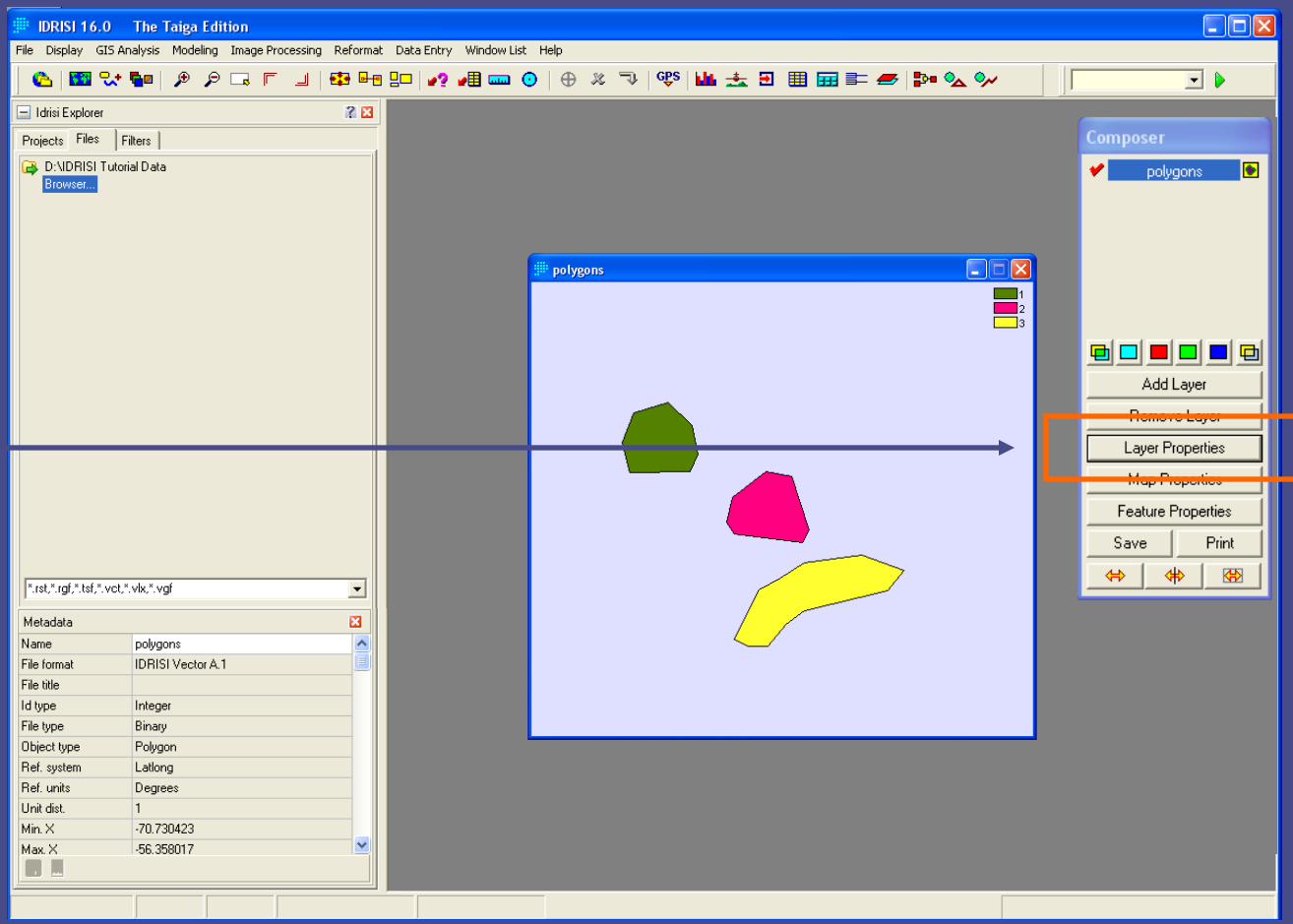
Importing Shapefiles from ArcGIS

5. The converted shapefile is automatically displayed in the data display area



Importing Shapefiles from ArcGIS

6. The symbolic display of data can be changed by clicking on Layer Properties



Importing Shapefiles from ArcGIS

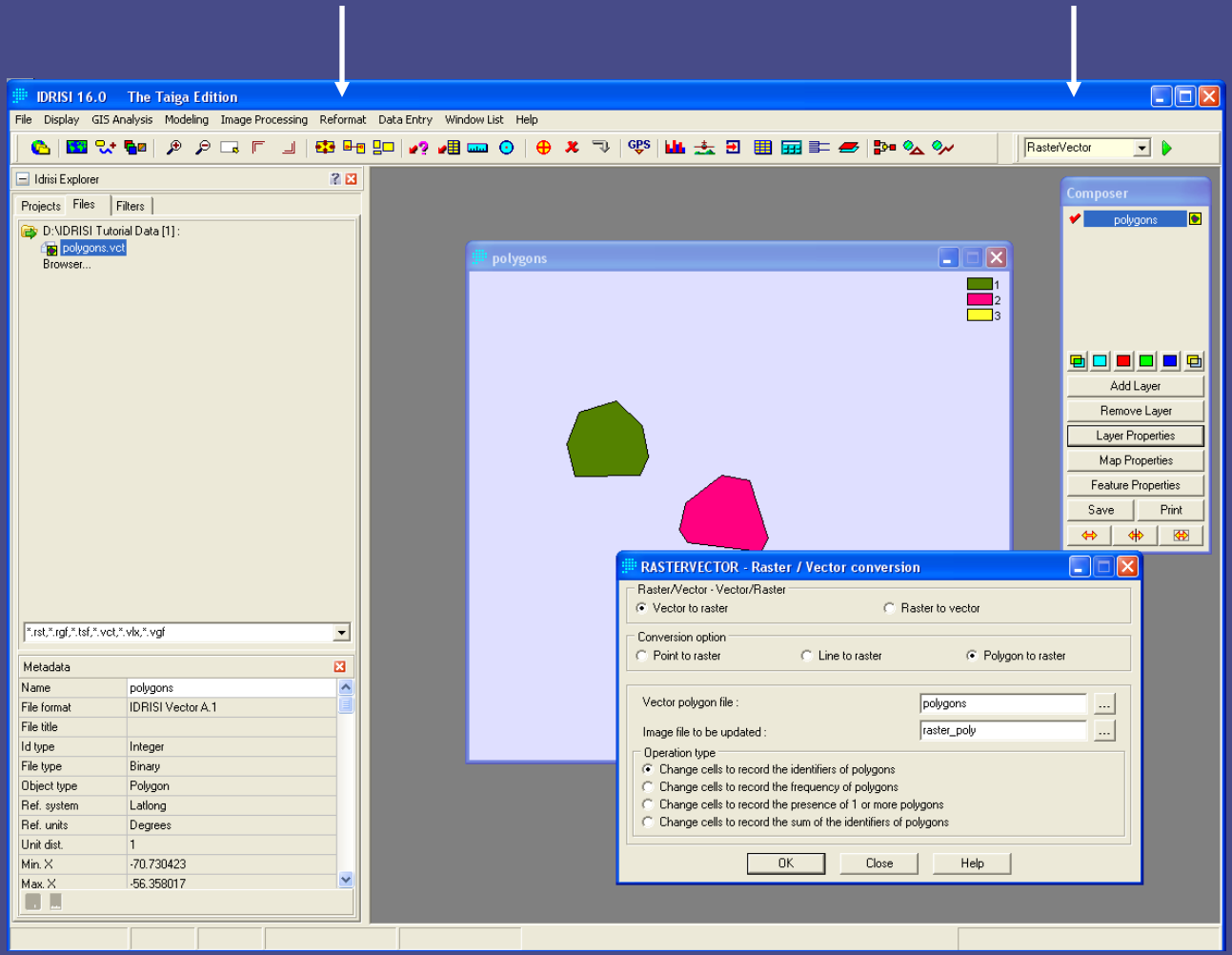
- Task: Using the **SHAPEIDR** tool, select Shapefile to Idrisi, and the input shapefile as Rroads1998.shp in the Shp resource folder. Name the output Roads_1998. Give the reference system as Utm-48N and click ok.

- Task: Investigate and change the **Layer Properties** of the file in the **Composer** window.

- Task: Close the file and open the 60m_landcover_1998_rc raster file, then add the new Roads_1998 Vector file to the 60m_landcover_1998_rc file using **Composer** and **Add Layer**. Click on vector files, browse to the Roads_1998 file and display with the symbol file Outline White. Click ok.

Converting Vector Files to Raster Files

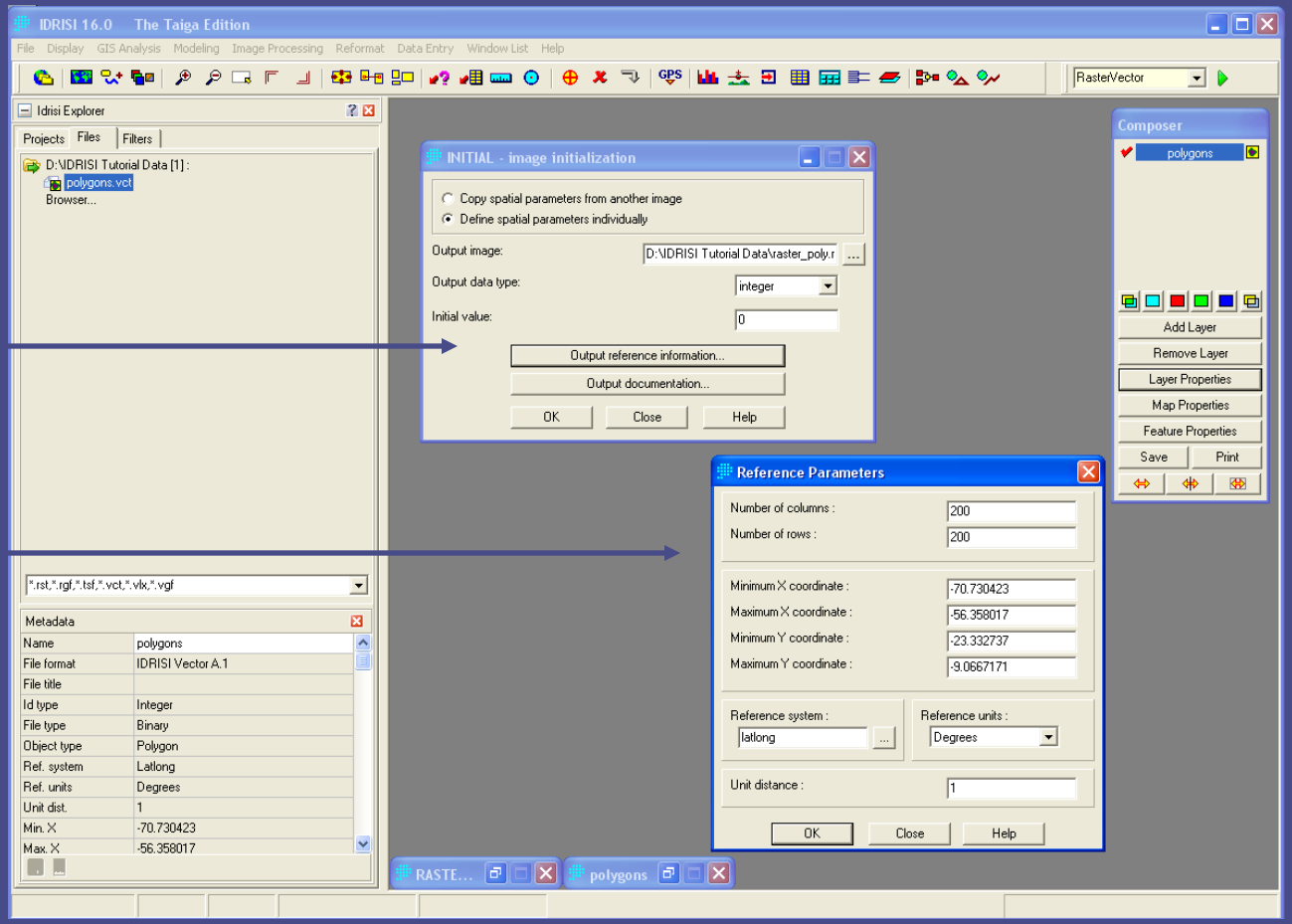
1. Open the RasterVector tool using the search, or find it in the Reformat menu



Converting Vector Files to Raster Files

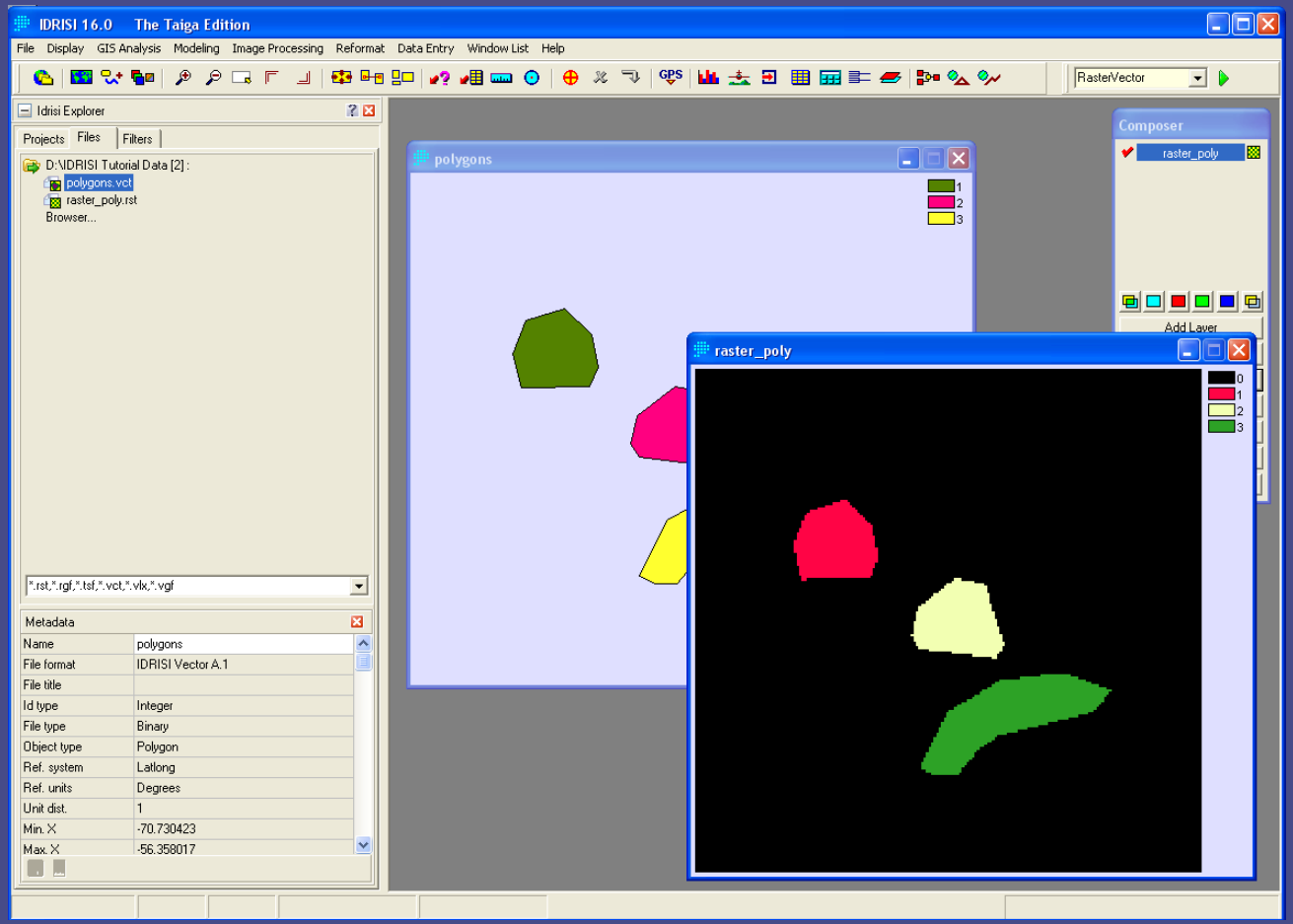
2. Running the tool will open the Initial tool, which creates the raster file

3. The extent can be chosen from another image, or set individually



Converting Vector Files to Raster Files

4. The new raster file is displayed in the display area



Converting Vector Files to Raster Files

- Task: Open the RasterVector tool from the Reformat menu or by using the tool search. Select vector to raster, then line to raster and browse to the Roads_1998 file in your Results folder. Enter Roads_1998_rc as the image file to be updated.

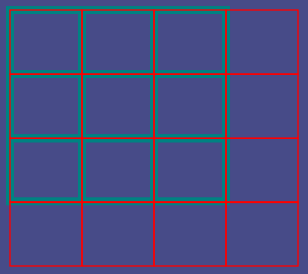
- Task: When the tool asks to open the Initial tool, click yes. In the Initial tool, choose to copy parameters from another image, and use the 60m_landcover_1998_rc image. The output data type should be byte. Click ok.

- Task: Assuming that all of the highways in this file are the same class, how would we convert the highways pixels to have the same value of 1?

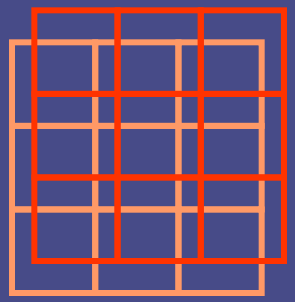
Basic Raster Tools

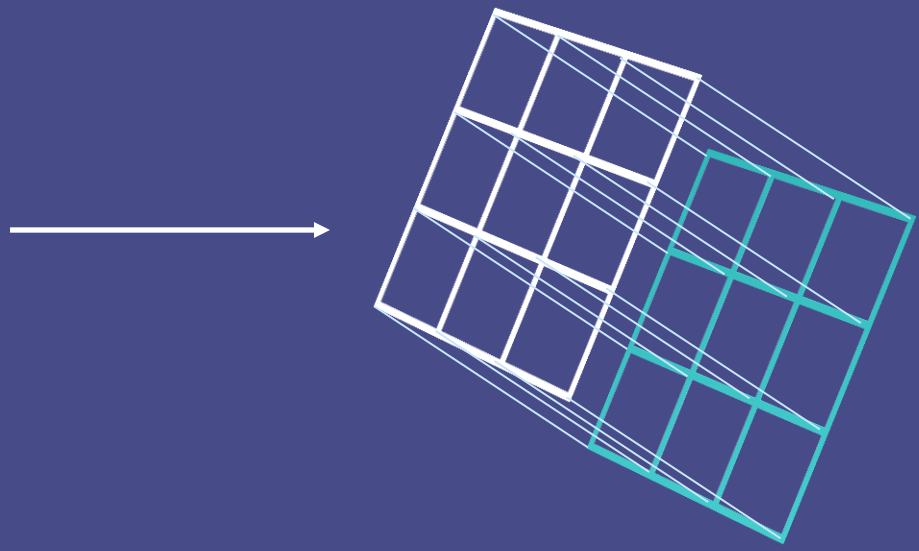
***Always use the same extent and resolution within one project:**

≠ Rows and columns

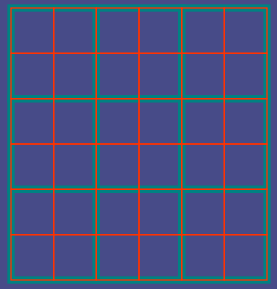


≠ Projection or offset



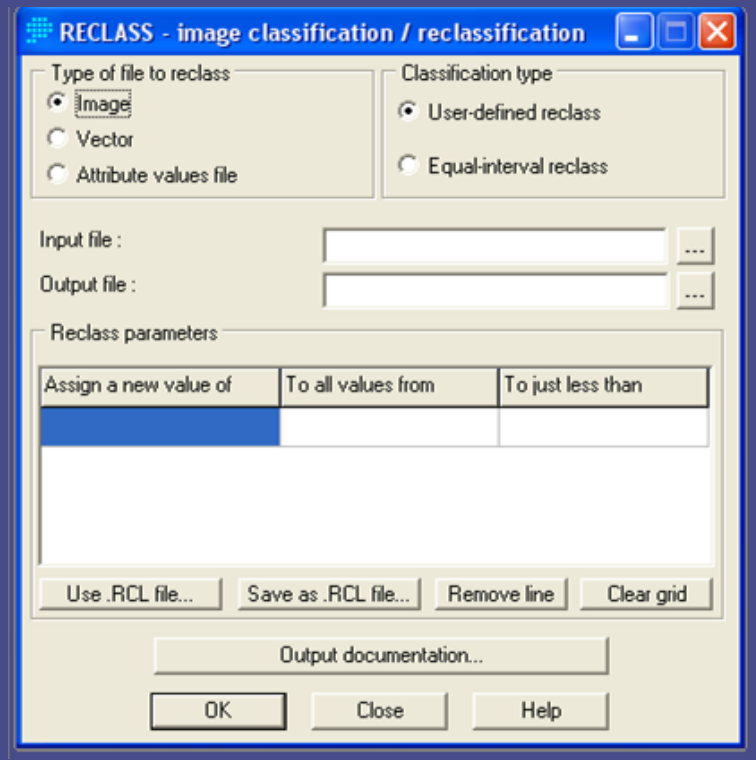


≠ Cell size

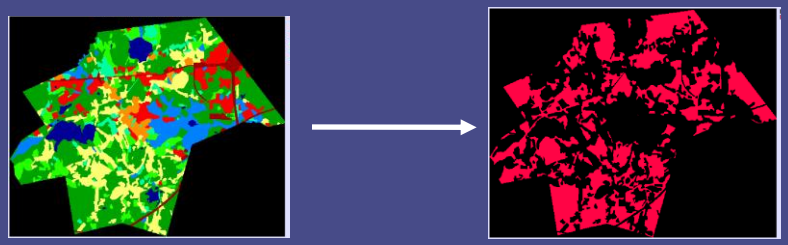


We need congruent (grids) across data layers in order to be able to do raster analysis

Basic Raster Tools



Reclass: classifies or reclassifies the pixel values stored in images



Basic Raster Tools

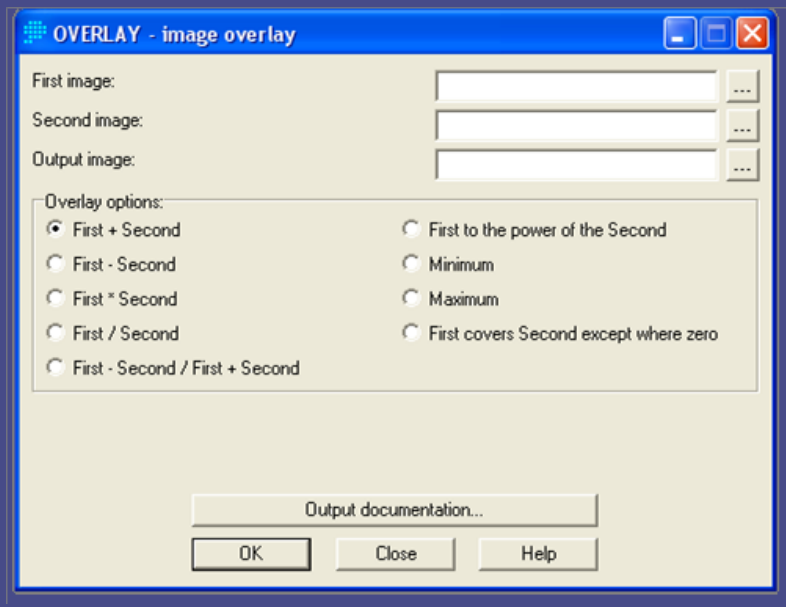
- Task: Open the **Reclass** tool and input your Roads_1998_rc raster image. Name the output file Roads_1998. Figure out how to convert the highways from many pixel numbers to the number 1 to create a Boolean image. Then close the Reclass tool.

- Task: Open the 60m_landcover_1998_rc file and add the Roads_1998 file. Click the transparent Button to show one raster over the other.

- Task: **Reclass** can also be used for other categorical maps or to create a mask. Open the Reclass tool and choose 60m_landcover_1998_rc as the input image. Name the output image 60m_landcover_mask. Figure out how to convert the land cover map from many pixel numbers to the number 1 to create a Boolean image.

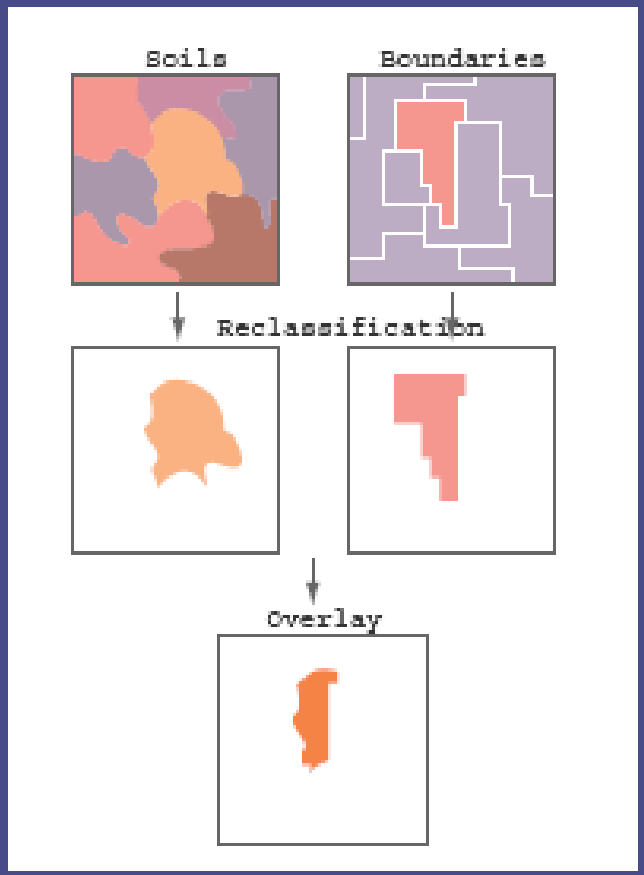
- Question: How would we mask out highways that fall outside of the study area?

Basic Raster Tools



Overlay: produces a new image from the data of two input images

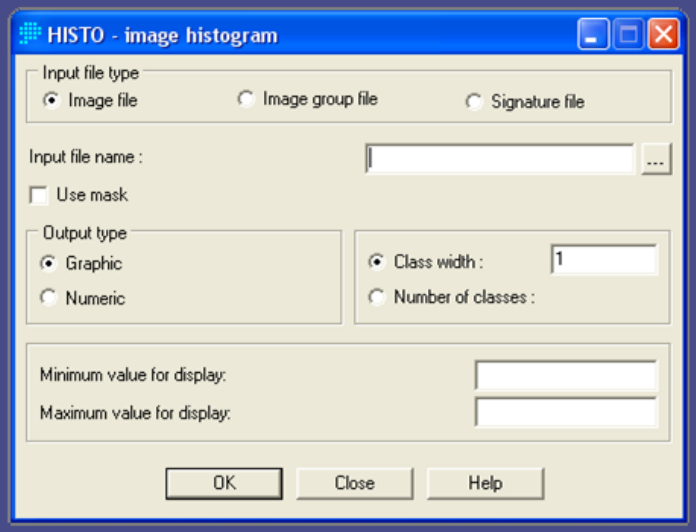
Map Algebra

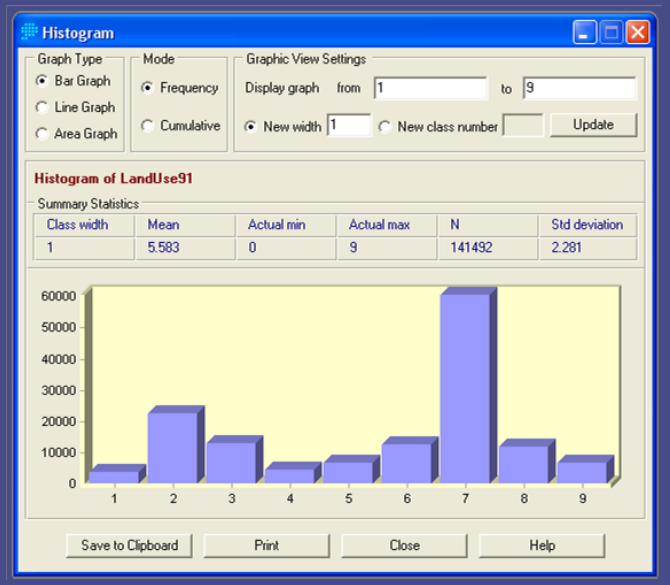


Basic Raster Tools

- Task: Open the **Overlay** tool and input the 60m_landcover_mask and Roads_1998 files. Select First * Second. Name the output image Roads_1998_studyarea. Open the 60m_landcover_mask file and add the Roads_1998_studyarea layer, and click the transparent layer button.

Basic Raster Tools





Histo: produces a frequency histogram of cell values in an IDRISI image or a signature file

Basic Raster Tools

- Task: Open the **Histo** tool and input the 60m_landcover_1998_rc categorical image. Accept all defaults and click ok. What can the resulting graph tell us about the amounts of each value in this image?

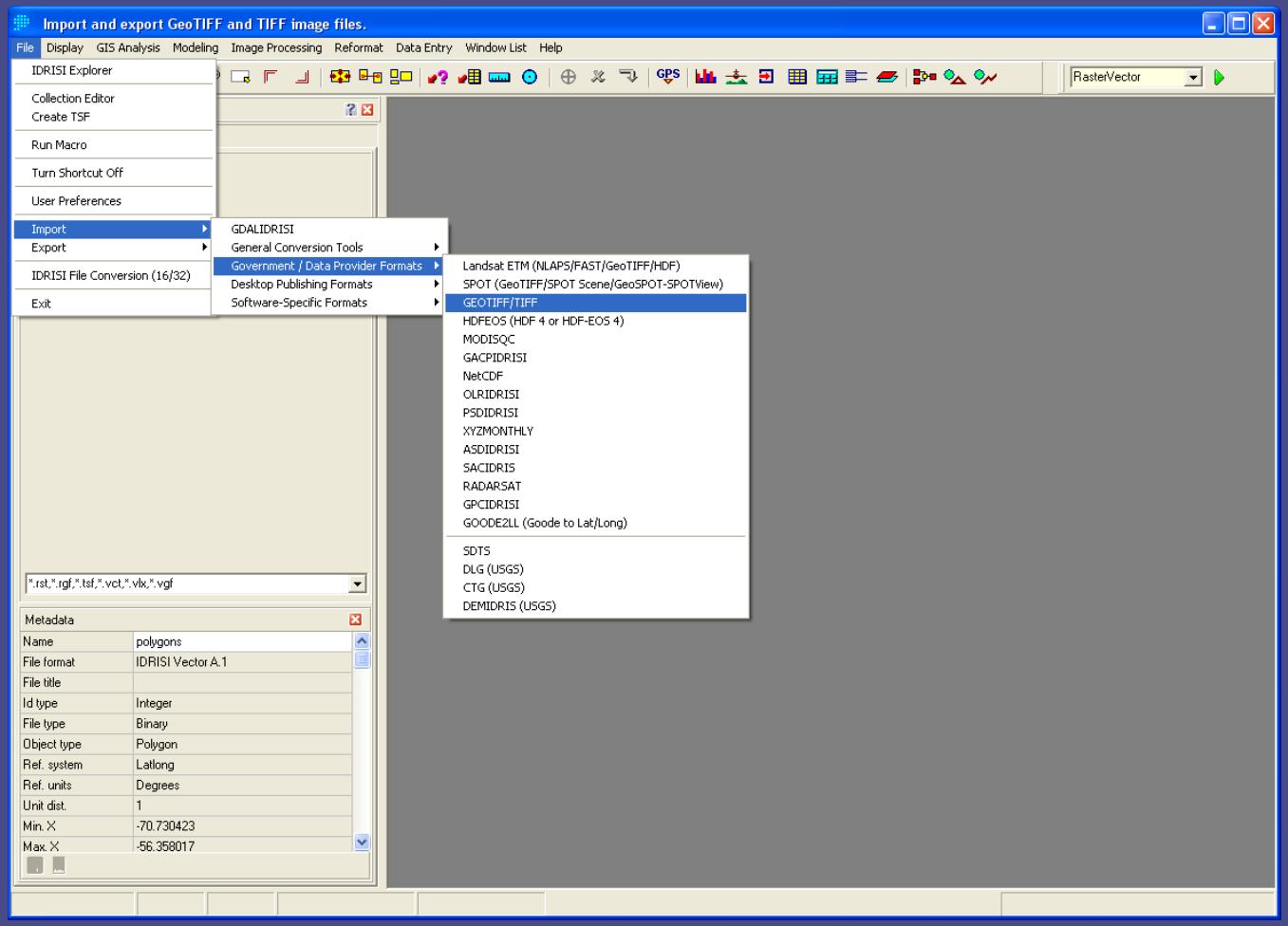
- Task: Change the display graph parameters from 0 – 20 to 10 – 20 and click on Update.

- Task: Open the 60m_landcover_1998_rc file and right click on the legend and click on Area and cells. Alternately, open the **Area** tool and input 60m_landcover_1998_rc and have the output be tabular, and select cells. Look at the resulting tables.

- Task: Run **Histo** again but with a numeric output and compare to the **Area** tabular output.

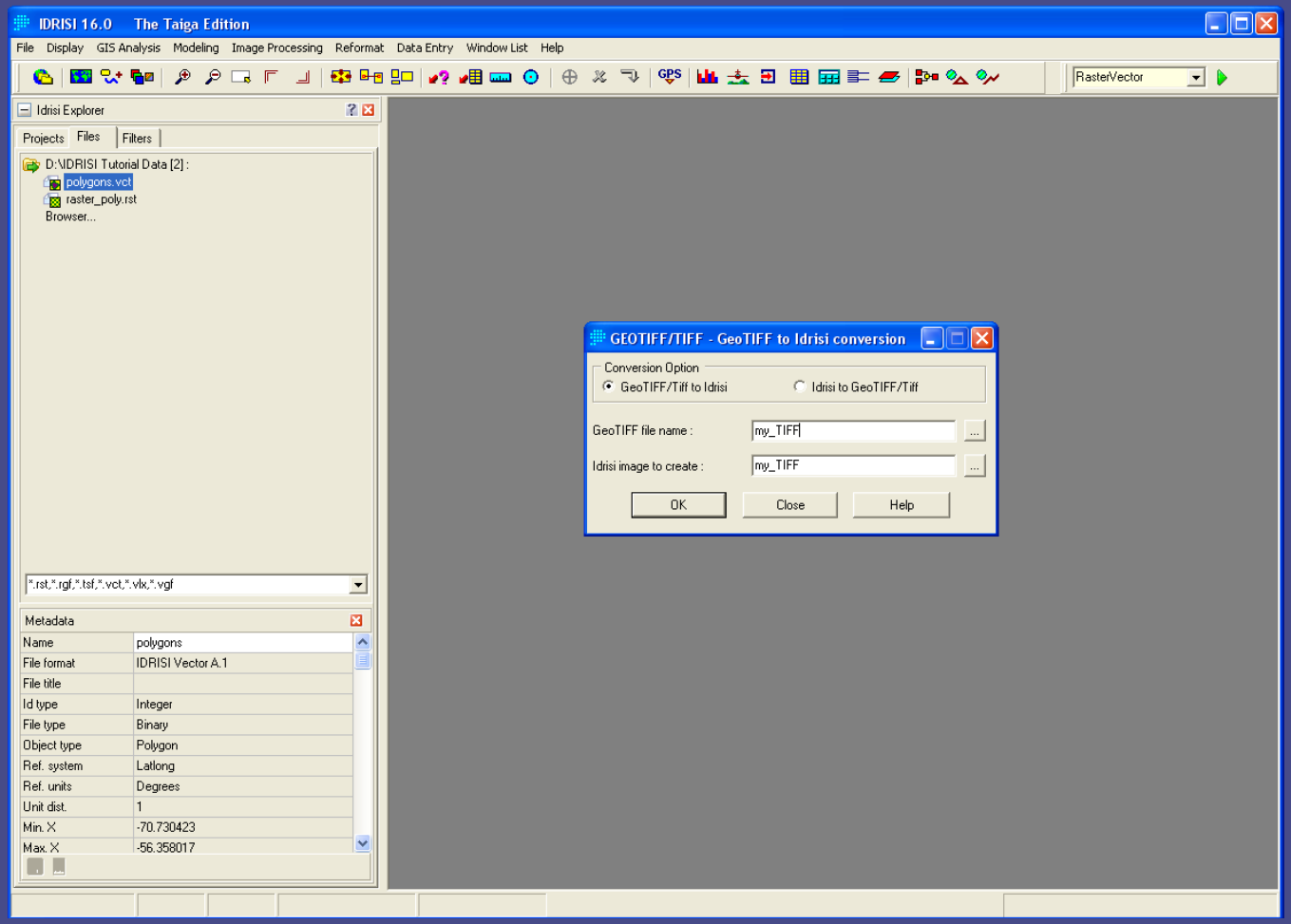
Importing a GeoTIFF Raster File

1. Navigate to the GEOTIFF/TIFF tool



Importing a GeoTIFF Raster File

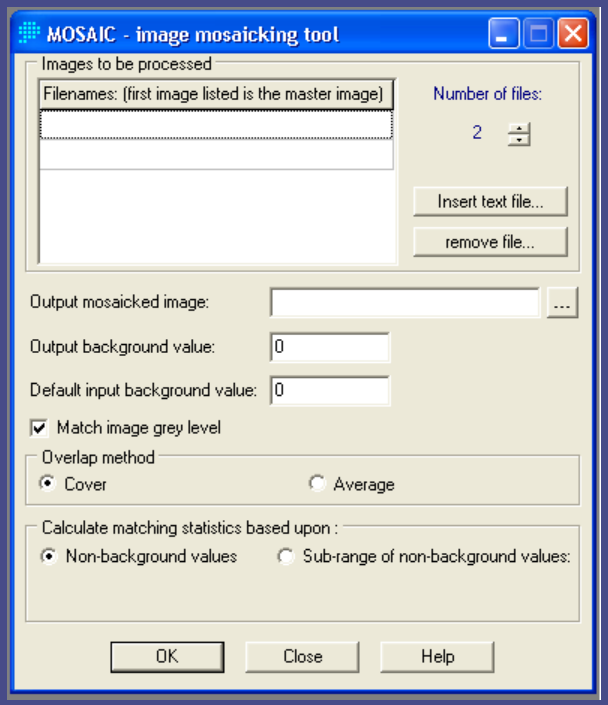
2. Browse to the GeoTIFF file and name the file you want to create



Importing a GeoTIFF Raster File

- Task: Open the **GeoTIFF** tool by navigating to the File > Import menu or using the tool search.
- Task: Browse to the Tiff folder and select the SRTM_58_10 file as the GeoTIFF file name, and keep the default output file name.
- Task: Double click on the file to open, then click on symmetrical stretch in the Composer window to see the image more clearly.
- Task: Look in the Metadata window to see that the ref. system is LatLong. The rest of the data is in Utm-48N. This data will have to be projected to match the study area data.

Mosaicing a Raster Image

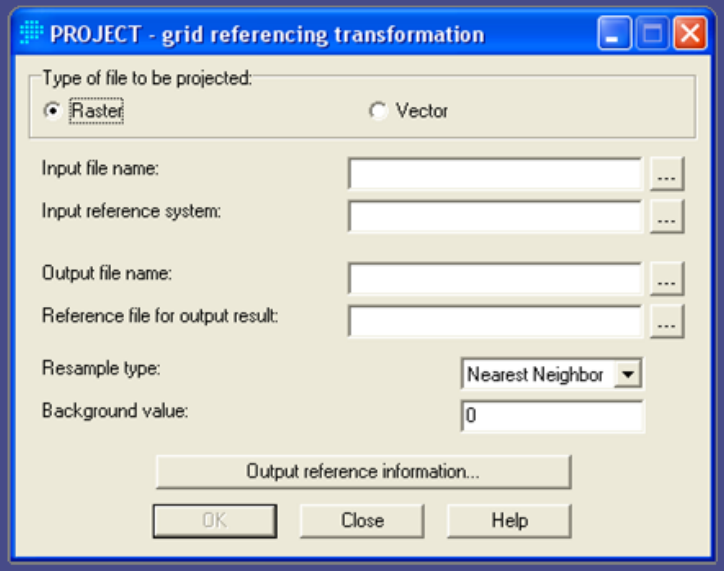


MOSAIC creates a new image by spatially orienting overlapping images and optionally balancing the numeric characteristics of the image set based on the overlapping areas.

Projecting a Raster Image

- Task: Open the **Mosaic** tool and input geo_srtm_57_10, geo_srtm_57_11, geo_srtm_58_09, geo_srtm_58_10, and geo_srtm_58_11images as the images to be processed. Name the output geo_srtm_mosaic. Enter 0 as the output background value and -32768 as the Default input background value. Accept all other default parameters.

Projecting a Raster Image



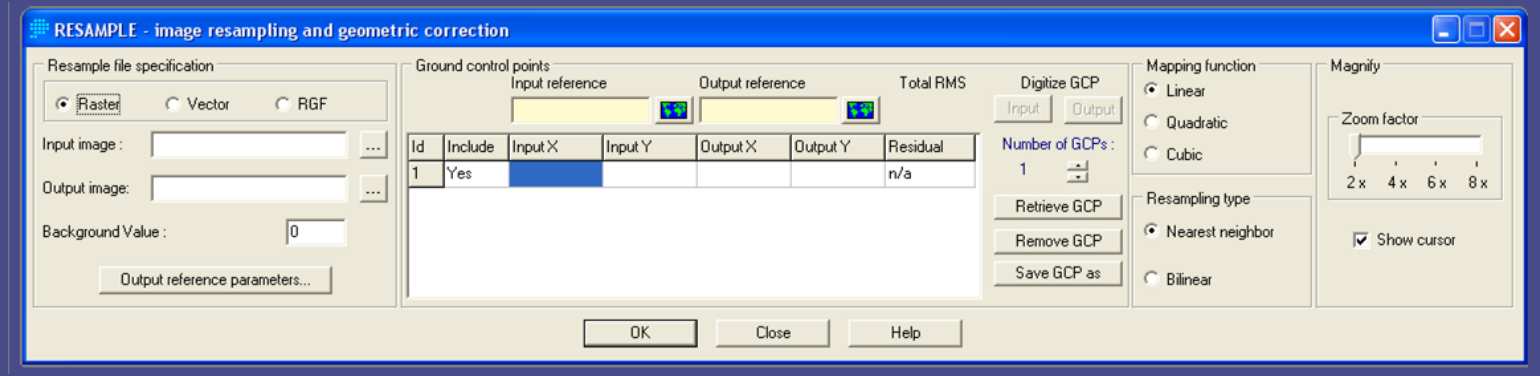
Project: transforms raster images and vector files from one grid referencing system to another.

Projecting a Raster Image

- Task: Open the **Project** tool and input the geo_srtm_mosaic image. Name the output 60m_elevation. The reference file for the output is UTM-48N. Click on the output reference information and copy the reference parameters from 60m_landcover_1998_rc. Note that this task may take some time.

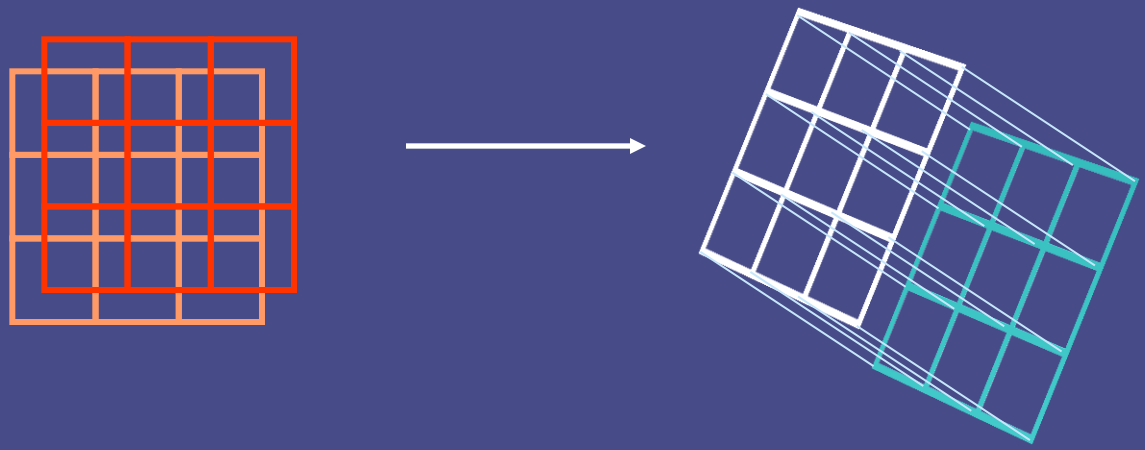
- Task: Look at the metadata for this file to see if the reference is now LatLong.

Resampling a Raster Image



Resample: registers the data in one grid system to a different grid system covering the same area.

≠ Projection
or offset



Resampling a Raster Image

- Task: Open the **Resample** tool and input 60m_soils_latlong as the input image. Name the output image 60m_soils_resampled. Set the output reference parameters as the same as 60m_landcover_1998_rc.

- Task: Set the input reference image as 60m_soils_latlong , and the output reference image as 60m_soils.

- Task: Digitize three Ground Control Points (GCPs) using the input and output buttons. Add a fourth GCP and see how it is placed automatically.

Introduction to Geographic Information Systems (GIS)

You have learned:

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- **Vector GIS in Idrisi Taiga**
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  - How to make a raster file from a vector file
- **Raster GIS in Idrisi Taiga**
  - Basic raster tools: Overlay, Reclass and Histogram
  - How to import a raster
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  - Resampling a raster image