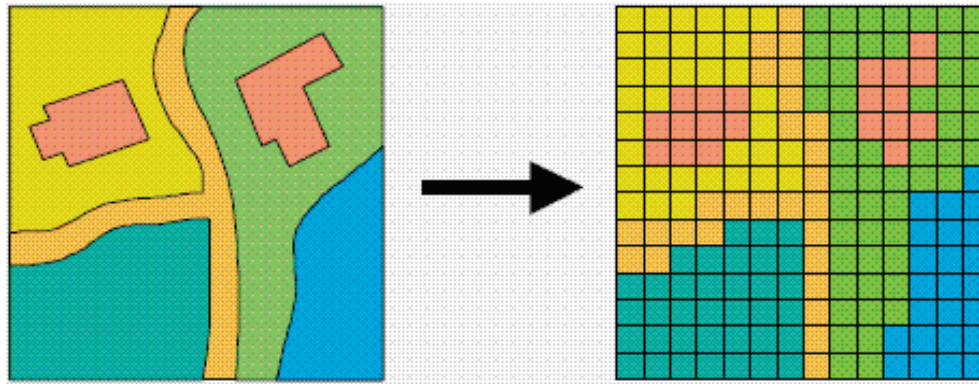


Raster is faster but vector is corrector

The old GIS adage “raster is faster but vector is corrector” comes from the two different fundamental GIS models: vector and raster. Each of these models has its own advantages and disadvantages. The vector model uses points and line segments to identify locations on the earth while the raster model uses a series of cells to represent locations on the earth. The figure represents vector (*left*) versus raster (*right*) data.



One of the most common types of raster data is land cover derived from satellite imagery. Land-cover data is produced by assigning each pixel in a Landsat thematic mapper image to one of 16 land-cover classes using a procedure known as *unsupervised classification*.

Build skills in these areas:

- ▶ Identifying vector and raster models
- ▶ Understanding the process of creating land cover from satellite imagery
- ▶ Calculating quantitative differences between the two models

What you need:

- ▶ No account needed
- ▶ Estimated time: **under 30 minutes**

Scenario

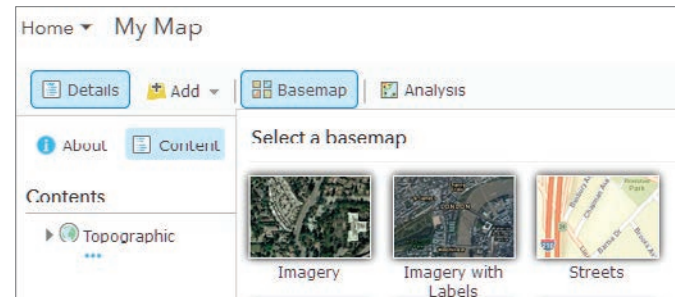
You have been asked to prepare a lesson that explains to beginning GIS users the difference between vector and raster data. Also to be included in the lesson is a basic explanation of a land-cover dataset that has been derived from satellite imagery. You have chosen the Great Salt Lake in Utah to be your study area.

Build the map

1. Click [ArcGIS.com](https://www.arcgis.com).
2. Sign into your organizational account.
3. Click Map on the upper ribbon.
4. In the Bookmarks search box in the upper-right corner, search for **Utah Lake, Utah, United States**



5. On the upper ribbon, change the basemap to Imagery.



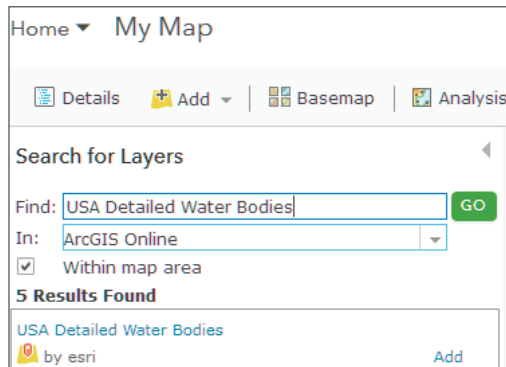
Zooming in and panning familiarizes you with the area, identifying different types of land cover and landscapes.

Add vectors

In this section, you are going to add and examine several vector layers to start the investigation. You will add both polygon and line vectors.

1. On the top ribbon, go to Add and search for USA Detailed Water Bodies. Use the following parameters:

- Find: **USA Detailed Water Bodies**
- In: ArcGIS Online



2. Click Add and then the back arrow to go back to the Contents Pane.



3. Expand the legend for USA Detailed Water Bodies.

Q1 What types of water are represented in the view?

Q2 Describe the border of the polygon.

Q3 Zoom into one of the sections of the polygon and describe the level of detail.

4. Following the same procedure as in steps 1 and 2, search for and add **USA Urban Areas**. Remove the 1:1.5m and the 1:500k-1.5m.
5. Click the three dots for both layers and set the visible range to be visible at all scales.



Once again, zoom in and examine the urban areas.

Q4 What urban areas are represented?

Q5 Describe the edge of the polygons.

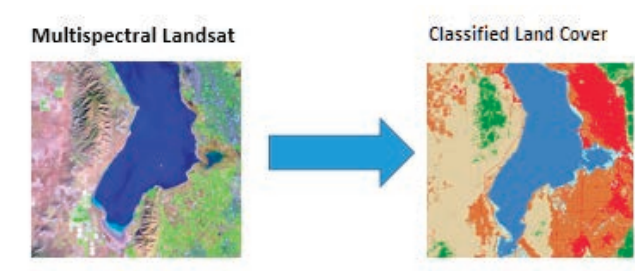
6. Following the same procedure as in steps 1 and 2, search for and add **Utah Major Roads Centerlines**.

Q6 What type of vector files are the roads?

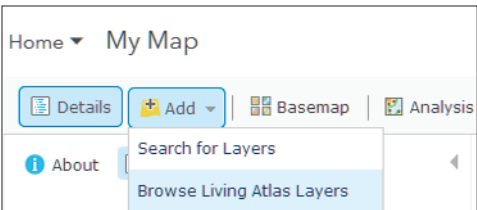
Q7 How well do they follow the imagery?

Add rasters

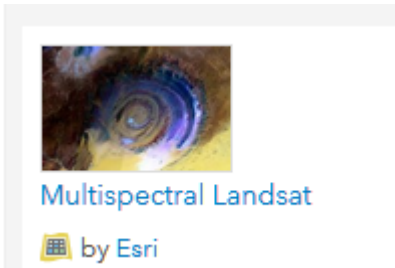
Now that you have added and examined some vector files, you will add two raster files. The first raster is land cover, which has been derived from satellite imagery. Starting with a Landsat satellite scene, an image is classified into one of the 16 defined classes of land. The procedure is represented in the figure.



- 1. On the top ribbon, go to Add>>Browse Living Atlas. The Living Atlas includes beautiful and authoritative maps on many topics. It combines reference and thematic maps relating to people, Earth, and life.



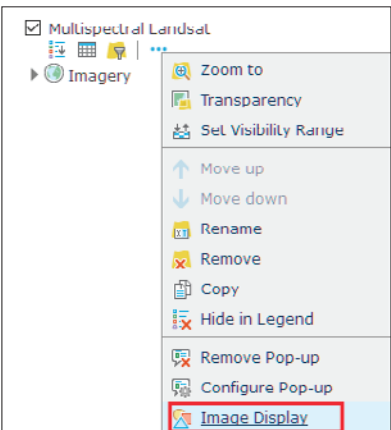
- 2. Search for Multispectral Landsat.



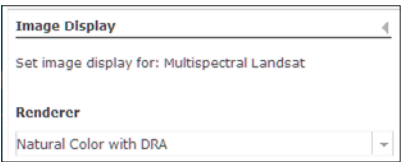
- 3. Click Add layer to map.

This multispectral Landsat image has a series of spectral bands that can be displayed in various combinations. For this exercise, you want to look at the image in natural color.

- 4. Right-click Multispectral Landsat and click Image Display.



- 5. Select Natural Color with DRA.



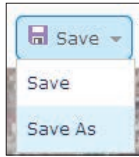
- 6. Click APPLY and click CLOSE.

Turn the Multispectral Landsat on and off and look at the basemap imagery below.

Q8 Which one is clearest?

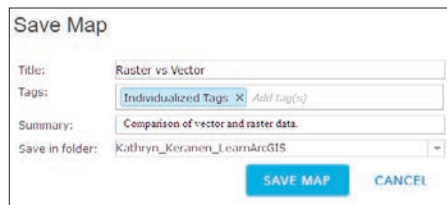
Q9 What does this say about the resolution of the two images?

7. Now is a good time to save your map. Go to the top ribbon and click Save As.



8. Use the following parameters to save your map:

- Title: **Raster vs Vector**
- Tags: individual tags
- Summary: **Comparison of vector and raster data**



9. Click SAVE MAP.

10. Go back to Add>>Browse Living Atlas Layers and search for USA NLCD Land Cover 2011.



11. Click Add layer to map.

12. Click CLOSE.

The Multispectral Landsat image was a raster. The USA NLCD Landscape is another example of raster characteristics.

13. Zoom in close to any part of the Utah Lake.

Q10 Describe the appearance of the image. How is it different from the previous vector files?

14. Expand the legend of USA NLCD Land Cover. h
These land-cover types are standards set by the US Geological Survey.

- ☒ USA NLCD Land Cover 2011
 - Open Water
 - Perennial Snow/Ice
 - Developed Open Space
 - Developed Low Intensity
 - Developed Medium Intensity
 - Developed High Intensity
 - Barren Land
 - Deciduous Forest
 - Evergreen Forest
 - Mixed Forest
 - Dwarf Scrub
 - Shrub/Scrub
 - Grassland/Herbaceous
 - Sedge/Herbaceous
 - Lichens
 - Moss
 - Pasture/Hay
 - Cultivated Crops
 - Woody Wetlands
 - Emergent Herbaceous Wetlands

Differences between raster and vector

You now have three vector and two raster images displayed on your map.

Q11 *Write a comparison between the two feature types. Following are some focus questions for your analysis.*

- Describe the difference between the two.
- Which is gridded?
- Which is the most appealing when you zoom in?
- Which is the most accurate compared with the basemap imagery?
- How are roads portrayed in vector and raster?
- Which feature type do you think is the most time consuming to produce?
- Which type shows the most detail?
- Give two examples when it would be best to use vector data.
- Give two examples when it would be best to use raster data.