Section : . Raster

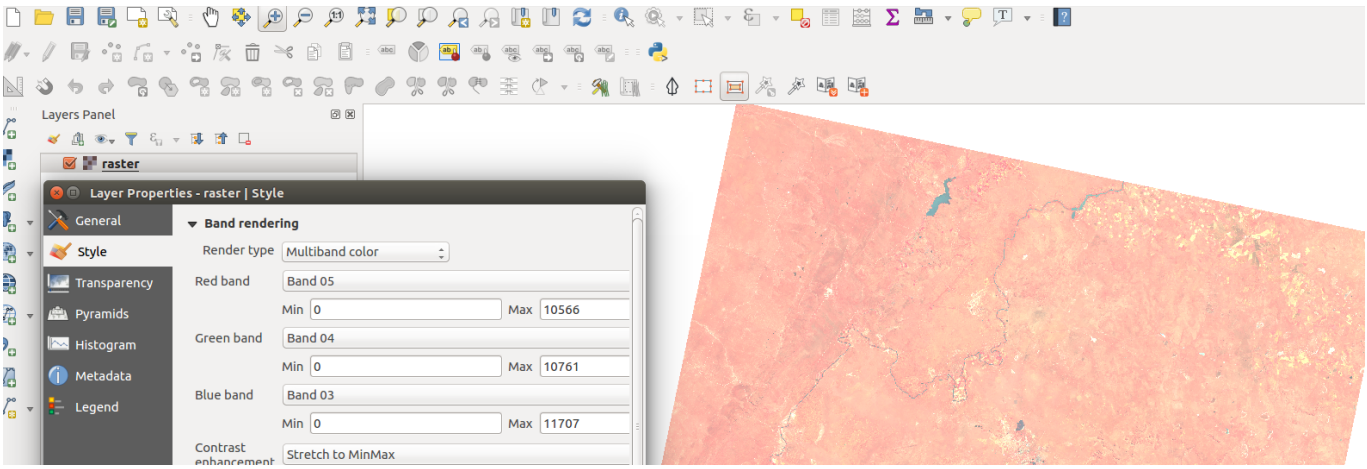
Module : . Multi band Satellite Imagery

Multi Spectral Images in Context

"Multi spectral images consist of several bands of data. Each band can be viewed as a single gray band or can be visualised as a combination of different bands."

The interpretation of the colour composites for the images can be analysed by understanding the spectral reflectance of the surface that was captured by the image.

In this module we look at ways in which we can visualise a multi band images and look at by products we can derive from the satellite image and interpret it based on the spectral signature of the image.



You try:

Goal: To learn how to load multi band raster and visualise the raster based on spectral bands.

Check your results:
Data: Download Landsat 8 USSG or using docker

- Download Landsat 8 data using the links provided above or any other public sites.
- Create a *Virtual raster* using all bands in the data.
  NB: Check the option to separate the bands in the virtual raster dialogue
- Symbolize the virtual raster using the spectral bands.
- Use the following band combinations to visualize the rasters. **Colour Infrared** using band combination 5,4,3 and **Natural Color** using band combination 4,3,2 or **False Color** using band combinations 6,5,4 or 7,6,4 or 7,5,3
- For each color combination interpret the results.
- Which band combinations clearly shows water bodies?
- Use the raster calculator to calculate the NDVI (Normalised difference vegetation index)
- Symbolise the NDVI result image.
- From the NDVI identify areas where healthy vegetation is growing.
- What other remote sensing indices can you derive from the data?
- Can you use these raster layers in land-use change detection?

Name	Expectation
Data	Landsat data
ndvi	(Band 5-Band 4)/(Band5 +Band 4)
Layer source	Virtual raster
RGB	4,3,2 Bands

More about

Satellite imagery provide accurate and large area coverage of the world. Satellites are equipped with sensors which capture useful information about a particular aspect of the earth surface.

The satellite imagery can be high resolution (features are clearly visible) and low course (features cannot be clearly visible). Hyper-spectral scanners have very high spectral resolution because of their narrow bandwidths.

When a satellite imagery consists of multiple spectral bands these can be combined to have a visual appearance that emphasises features on the surfaces. Adding and subtracting these bands also results in the creation of indices which can be used to monitor activity on the earth surface. Example of common indices are the NDVI and VI.

After loading the spectral bands in QGIS a user can combine the bands in various combinations to achieve natural colour or false colour composites which highlight particular features.

Check your knowledge:

1. What is a satellite image:
   a. *A layer that has been downloaded from the internet*
   b. *A raster layer that has pixel values which represent natural phenomenon*
   c. *A type of GIS dataset that consist of polygon,lines and point features*
2. What statement best describes the spatial resolution of a satellite image:
   a. *When a user is able to take accurate measurement from the satellite*
   b. *The amount of detail that is visible on a satellite image. It can be coarse of fine*
   c. *When the satellite contains more than 1 spectral band*
3. Can satellite imagery be used to monitor plant growth with consideration that plants grow rapidly:
   a. *True*
   b. *False*

Further reading:

- landsat.usgs.gov: https://landsat.usgs.gov/how-do-landsat-8-band-combinations-differ-landsat-7-or-landsat-5-satellite-data
- crisp.nus.edu.sg: http://www.crisp.nus.edu.sg/~research/tutorial/opt_int.htm
- landsatfact.com: http://www.landsatfact.com/about/project_methods