

GEO-A-CC-5-12-TH – Remote Sensing, GIS and GNSS

TOPIC- Preparation of False Colour Composites from Landsat TM / OLI data

MANAS PAUL
ASSISTANT PROFESSOR
RAMMOHAN COLLEGE, KOLKATA

Preparation of a False-Colour Satellite Image in QGIS

False-colour satellite images can be very useful to visually analyse different landscape characteristics. They also look really cool and are used to make very artistic maps and displays.

False-colour satellite images are created by displaying different band combinations with different colours. For example, a colour near-infrared image is created by displaying data from the near-infrared sensor as red, data from the red sensor as green, and data from the green sensor as blue.

Colour near-infrared is commonly used to show areas that are vegetated and areas that are covered by water (see image below). Vegetation reflects near-infrared (NIR) light and water absorbs both NIR and red light. This band and colour combination results in healthy green vegetation appearing bright red in the image water-covered areas appearing nearly black.

In QGIS false-colour composite images are created from satellite imagery by changing which image band is displayed by red, green, and blue light. These changes are made by setting the layer's symbology to multiband colour and changing the default band display settings.

Create a Multiband Raster Layer

If your imagery is already in a multiband format you can move on to the next section. Otherwise, follow these steps.

Determine the Number of Bands in a Raster Layer

To check the number of bands in your image, add it to QGIS and go to the layer properties. Select the Information tab on the left. This tab will probably contain statistics for each band. Scroll down until you see the Dimensions information. You will see the number of rows, columns, and bands in the raster layer.

Add Landsat Bands to QGIS

For this tutorial, I'll be using Landsat 8 Analysis Ready Data. The video below demonstrates how you can obtain these data free of charge.

Each Landsat band will be represented by a single raster file (.tif). Bands 1-7 (really 2-7) are what we are most interested in. The description of the bands is listed below. More information about Landsat 8 instrumentation can be obtained from the [USGS](https://www.usgs.gov/land-resources/earth-observation-data/landsat-8).

- Band 1 Coastal Aerosol (0.43 – 0.45 μm) 30 m
- Band 2 Blue (0.450 – 0.51 μm) 30 m
- Band 3 Green (0.53 – 0.59 μm) 30 m
- Band 4 Red (0.64 – 0.67 μm) 30 m
- Band 5 Near-Infrared (0.85 – 0.88 μm) 30 m
- Band 6 Short-Wave Infrared (SWIR) 1 (1.57 – 1.65 μm) 30 m
- Band 7 SWIR 2 (2.11 – 2.29 μm) 30 m

Add the Landsat 8 bands 1-7 to QGIS. Make sure the bands appear in numerical order in the table of contents. This is important to ensure each band corresponds to the correct layer of the multiband raster. Once added your table of contents should look similar to the image below.

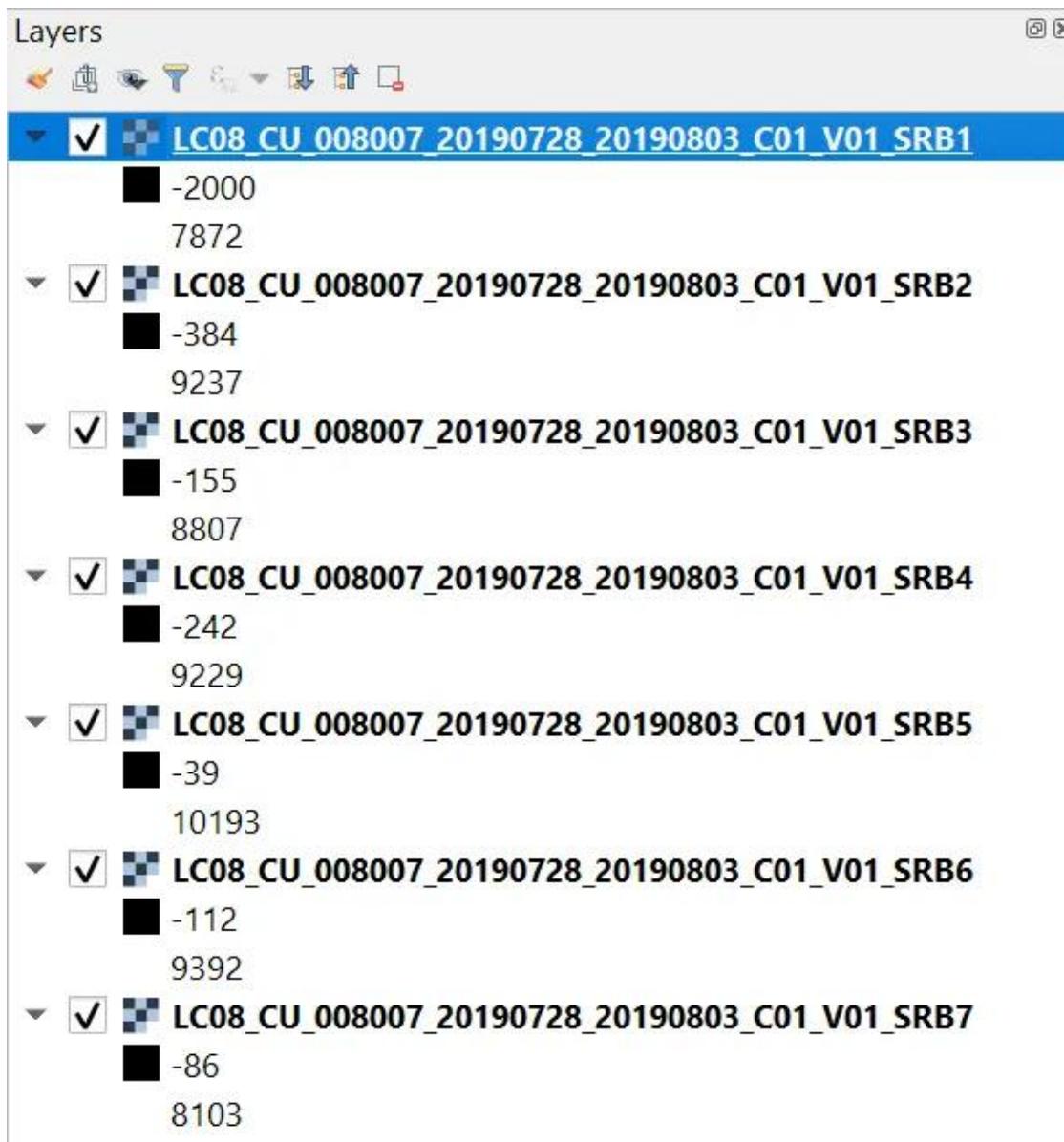


Table of contents with 7 Landsat 8 bands added.

Create a True Colour Satellite Image

After your multiband raster is created and added to the QGIS interface you will notice that it is probably displayed with some strange colours. Let's start by creating a true colour image to learn the basics of displaying and symbolizing multi-band imagery.

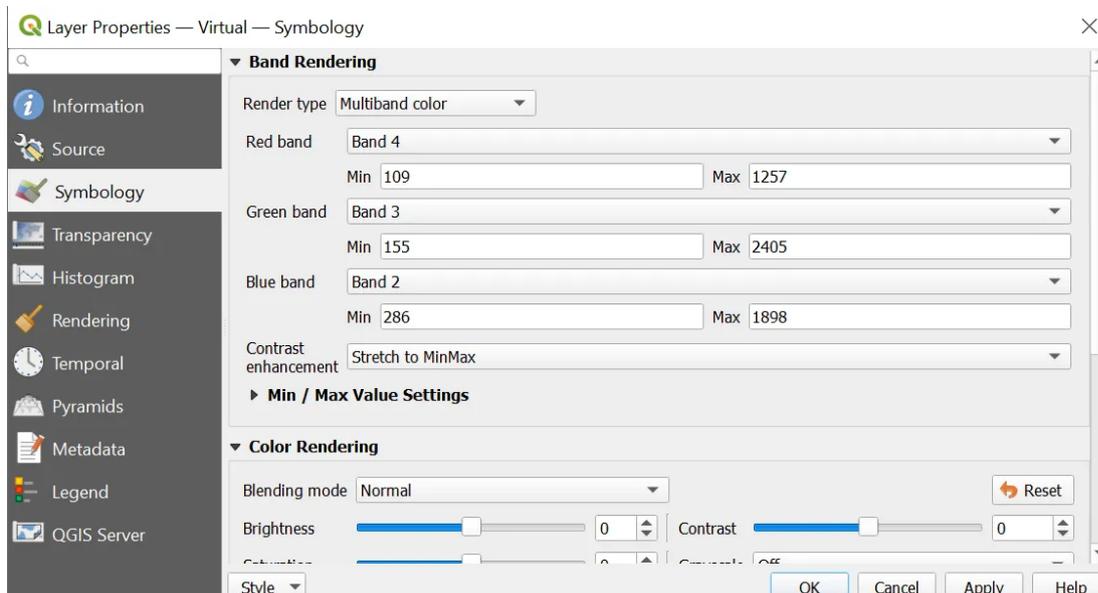
Open the properties for your multiband raster and go to the symbology tab. The 'Render type' should be 'Multiband colour'. If it is not change it to 'Multiband colour' from the 'Render type' drop-down menu.

The multiband colour renderer displays options for adjusting the red, green, and blue bands. By default red, green, and blue bands will probably be set to bands 1, 2, and 3, respectively. However, the Landsat bands that correspond to red, green, and blue are band 5, band 4, and band 3. Use the drop-down menu to assign the proper bands to the proper colours.

Display the Landsat 8 image in true colour with these band assignments:

- Red band: Landsat 8 band 4
- Green band: Landsat 8 band 3
- Blue band: Landsat 8 band 2

Your symbology window should look like the image below. Once it does click okay and the multiband image will be displayed in true colour.



True colour band combination for Landsat 8 in QGIS.

False-Colour Satellite Image with QGIS

Colour Near-Infrared

As mentioned earlier in this article, a colour near-infrared image displays green, healthy vegetation in red. This image is easy to create with the Landsat data we are using. We simply need to reassign which bands are shown in red, green, and blue. In the QGIS symbology tab change the band assignments to the following to create the colour near-infrared image.

Colour near-infrared false-colour band combinations

- Red band: Landsat 8 band 5
- Green band: Landsat 8 band 4
- Blue band: Landsat 8 band 3

You'll get an image with similar coloration to the one below. You can see that vegetation in the mountains and agricultural fields is bright red and the lake is almost black.



Colour near-infrared false-colour composite from Landsat 8.

Conclusion

Understanding the characteristics of how visible light represents different land surfaces is fundamental to remote sensing. Working with multiband imagery and generating false-colour composite images can help you understand the interaction between an image's different bands. Having the skill to make these images will also improve your data visualization and help you effectively display pertinent information.

Source: QGIS User Guide Release 3.4, 2020

MANAS PAUL
Assistant Professor
Rammohan College, Kolkata