Section 2: Using Band Combinations and Indices

Section Objective

Familiarize students with the advantages of using different band combinations. Additionally students will look at some basic methods of Raster Algebra using a near infra-red band.

Tools Used

Indices Tool	Pre-made indices which can be used with specific sensors
NDVI	Normalized Difference Vegetation Index – A band ratio used to highlight vegetation

Class Notes

Using Band Combinations and Indices

Objective: To understand the advantages of displaying multiple bands.

Task 1: Defining band combination display

We will now open a multispectral dataset and access the results of different band combinations.

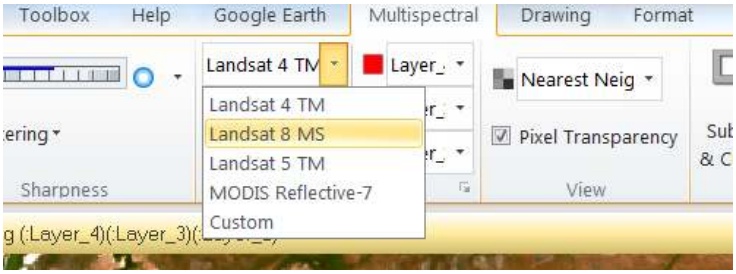
1. Go to File > Open > Raster Layer > Navigate to the exercise folder and open ***L8Carpentaria-msi.img***

L8carpentaria-msi.img – Multispectral dataset

L8carpentaria-pan.img – Panchromatic dataset

Whilst IMAGINE can automatically determine this is a Landsat data set we need to manually select which Landsat satellite this data was derived from.

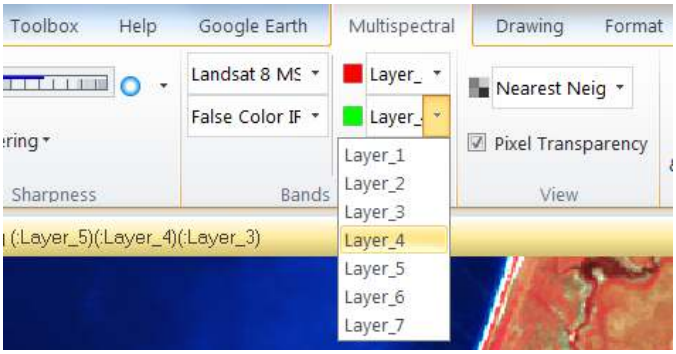
2. Go to the Multispectral Tab. From the Bands group click the Sensor drop-down list and select **Landsat 8 MS**



3. Now select **False Color IR** from the second drop-down list

Assess several other preset combinations.

You can also manually select different bands for each channel using the individual drop down lists.



4. Using the table below, manually input some of the different Landsat 8 band combinations listed in the table below.

		Landsat 7 Landsat 5	Landsat 8
	Color Infrared:	4, 3, 2	5,4,3
	Natural Color:	3, 2, 1	4,3,2
	False Color:	5,4,3	6,5,4
	False Color:	7,5,3	7,6,4
	False Color:	7,4,2	7,5,3

5. From the Home tab, Information Group. Select **Inquire**

6. Select Lat/Lon from the coordinate type drop-down list.
7. Input the following coordinates.

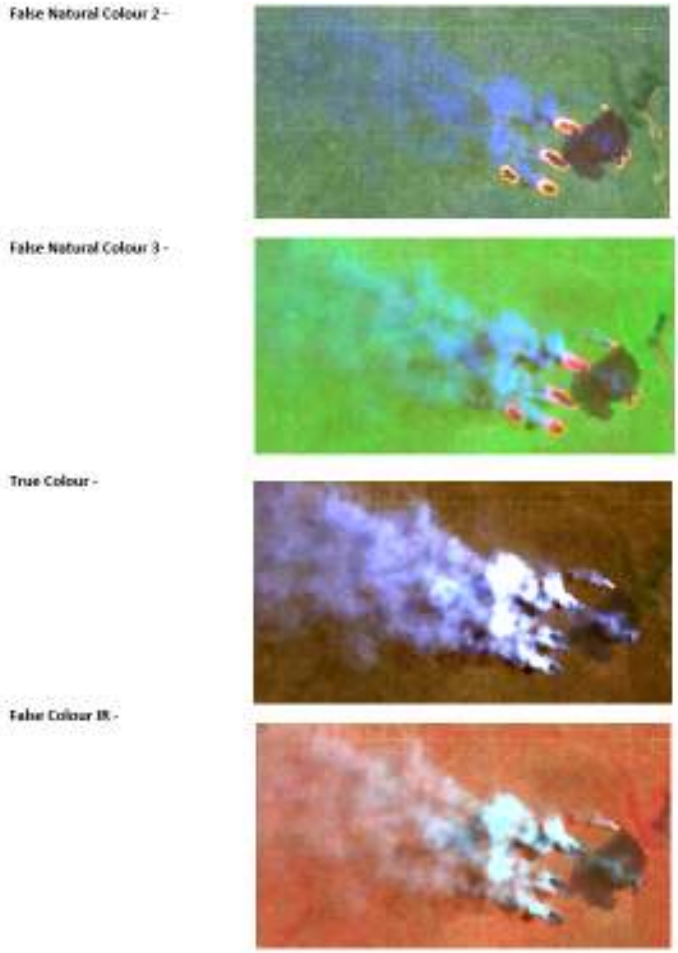
   Lat: 13 05 03 S **Lon: 141 44 01 E**

8. Click **Apply**.
9. Zoom to the location of the crosshair.

   Note you may need to zoom out to see the location of the crosshair.

   The feature at this location is a bush-fire which was burning at the time of capture.

10. From the preset band combination list choose the following combinations and assess the visual differences of the bushfire.



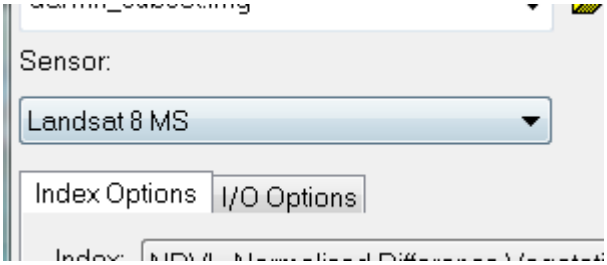
Task 2: Indices

This exercise will demonstrate a range of indices which can be used to identify certain features.

1. Open ***darwin_subset.img***
2. From the Multispectral tab, Bands group select **Landsat 8** as the sensor type and **False Color IR** as the band combination.

   This combination places the near infrared band in the red band, so features such as healthy vegetation are displayed as bright red. We can tell by looking at this image that there is plenty of healthy vegetation around the water areas.
3. From the Raster tab, Classification group select Unsupervised | **Indices**

   The indices dialog box provides a range of pre-made indices which can be matched to certain sensors such as Landsat 8.
4. From the Sensor drop-down list select **Landsat 8 MS**



   You may have noticed the information in the Band Selection Dialog box has been updated to match the sensor model of Landsat 8.
5. The NDVI formula of a Landsat 8 imagine is

   NDVI = (band 5 – band 4) / (band 5 + band 4)

   Band 5 = NIR portion of the electromagnetic spectrum

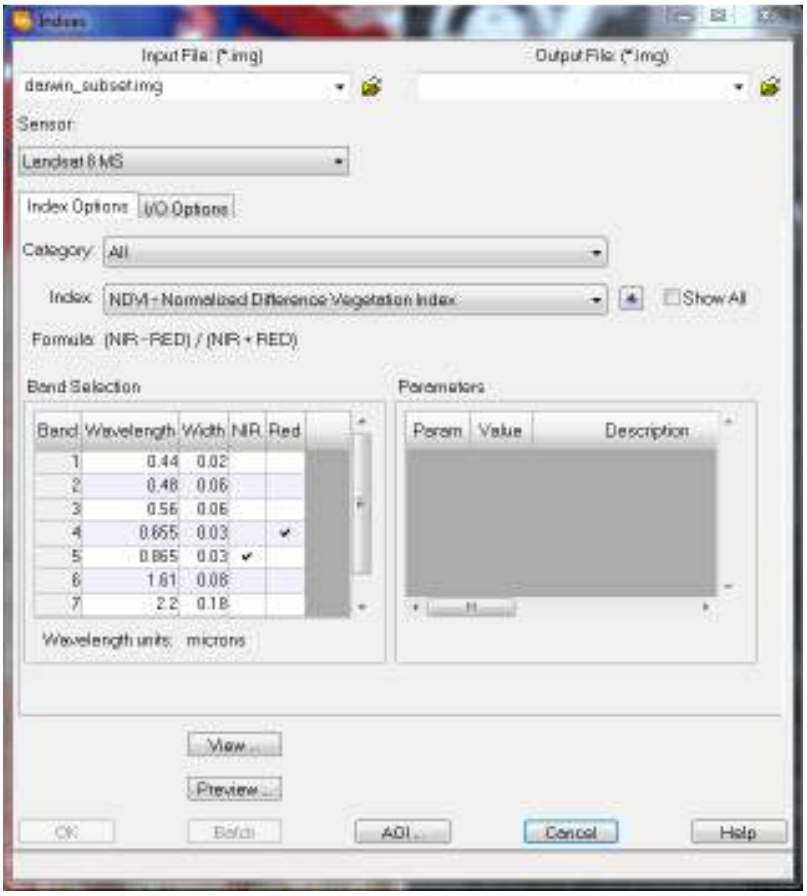
   Band 4 = Red portion of the electromagnetic spectrum

   Usually the formula is written as: **NDVI = NIR – R / NIR + R**

The following table explains some of the expected returns from IR and Visible bands

Feature	IR Value	Visible Value	Resulting NDVI Value
Vegetation	High	Low	High
Clouds/Water/Snow	Low	High	Negative
Rock/ Bare Soil	High	High	Near Zero

6. Ensure the NIR band is selected as band 5 and the Red band is selected as band 4



7. Click the **Preview** button to preview your result.
8. In the Output File dialog box, name the image ***Darwin_NDVI.img***
9. Click **OK** to run the process.
10. Open the resulting NDVI image in a 2D.

    The NDVI image is Float data type, the values can range from -1 to 1. Brighter values in an NDVI image usually represent healthy vegetation whereas darker value can represent the opposite.

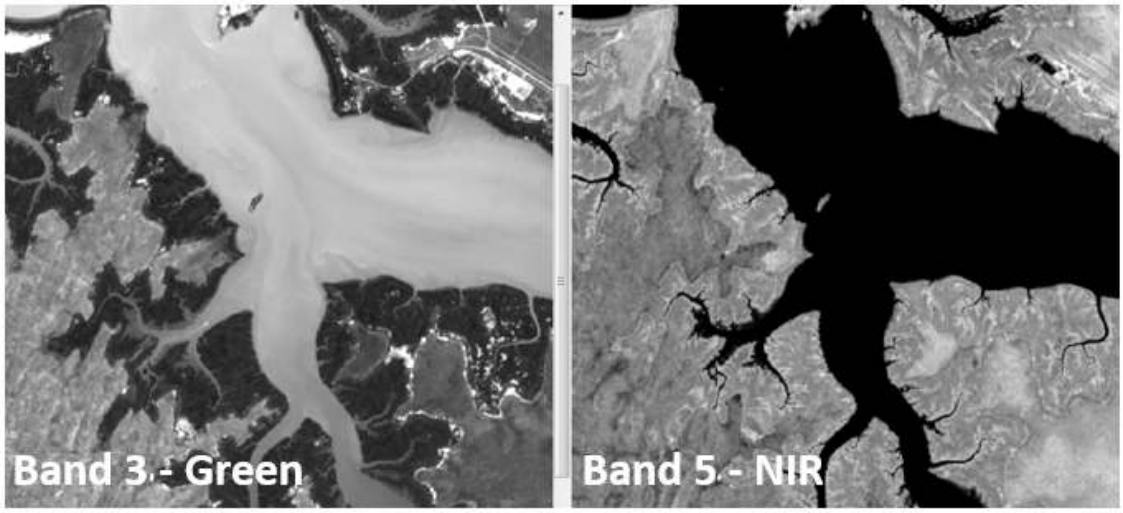
11. **Close** the **2D view** containing the NDVI dataset.

Task 3: Using an Index to Identify Water

Indices are useful as we can further utilize the spectral resolution of many datasets. We will now focus on creating an index to identify water.

1. Open the ***darwin_subset.img*** dataset again.
2. Go to **Raster** tab, **Classification** group > **Unsupervise**d > **Indices**

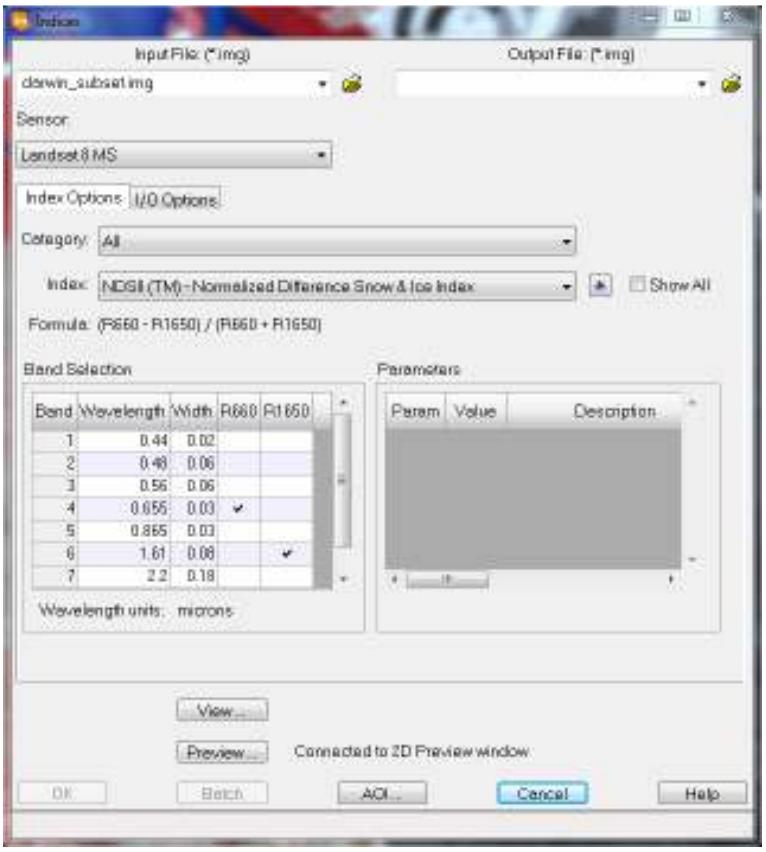
   Below is a comparison between band 3 and band 5. The water area appears very dark on band 5 (NIR) and very bright on band 3 (Green). As we have a distinct difference between these bands we can use them to create an index which identifies water.



3. In the Indices Dialog box select **Landsat 8 MS** from the Sensor dropdown list.
4. From the Index dropdown select **NDSII-2 Normalized Difference Snow/Ice Index 2**

   The NDSII-2 index is usually used for identifying snow or ice however it uses Band 3 and Band 5 which we previously identified as suitable for identifying water.

5. Ensure Band 3 is ticked as Green and Band 5 is ticked as NIR.



6. To Preview the dataset in a 2D View click the **Preview** button.
7. Enter the name ***darwin_NDWI.img*** in the Output File dialog box.
8. Click **OK** to create the dataset.

   You may want to experiment with an additional combination by making Band 7 the NIR band.

9. Clear all Views.

Class Notes