How to search for Landsat data on EarthExplorer

- Open a web browser and go to earthexplorer.usgs.gov.
- Zoom into your area of interest on the map and put a point or draw a box over the area where you would like to obtain imagery.
- Enter a date range.
- Click on the Data Sets tab and expand the Landsat Archive section. Then expand Collection 1 Level-1 and select the satellite mission you are interested.
    - Note: Your date range that was entered on the Search Criteria tab must match the date range for the particular Landsat mission you are searching. If you are interested in the older Landsat data (Landsat 1-3) you will need to use the Pre-collection Level-1 options.
- If you want to limit your search results to exclude cloudy images, you will need to click on the Additional Criteria tab. Scroll to Cloud Cover and select the amount that you prefer.
- Once all your fields are set, click on Results.
- Once you find images that fit your needs, click the icon with the green arrow to download the scene. You will need to have registered and created an account to download the image.
- The file comes as a .tar.gz, which means you will have to extract the file twice. One free option if you don't already have software is 7-zip: sourceforge.net/projects/sevenzip/.

How to view Landsat data in a GIS

Depending on the Landsat mission, the data package will have multiple bands for the individual scene. Here I will use Landsat 8 as the example, but you can search for band designations for older Landsat missions. Remember that band designations are not the same from one mission to the next, ex. Landsat 7 bands are different than Landsat 8 bands. Below is a table depicting the band designations for Landsat 8.

Landsat 8	Bands	Wavelength (micrometers)	Resolution (meters)
Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS)	Band 1 - Ultra Blue (coastal/aerosol)	0.43 - 0.45	30
	Band 2 - Blue	0.45 - 0.51	30
	Band 3 - Green	0.53 - 0.59	30
	Band 4 - Red	0.64 - 0.67	30
	Band 5 - Near Infrared (NIR)	0.85 - 0.88	30
	Band 6 - Shortwave Infrared (SWIR) 1	1.57 - 1.65	30
	Band 7 - Shortwave Infrared (SWIR) 2	2.11 - 2.29	30
	Band 8 - Panchromatic	0.50 - 0.68	15
	Band 9 - Cirrus	1.36 - 1.38	30
	Band 10 - Thermal Infrared (TIRS) 1	10.60 - 11.19	100 * (30)
	Band 11 - Thermal Infrared (TIRS) 2	11.50 - 12.51	100 * (30)

Combining bands to create a new image

- Open the Composite Bands tool in ArcGIS using either ArcToolbox or your Search Window.
- Select the bands you want to combine and place them in the Input Rasters field. Remember the order that you select matters.
- In the Output Raster field, navigate to where you want the new .tif file saved and give it a name.
- Click OK. After processing you will have a new .tif file for your use.

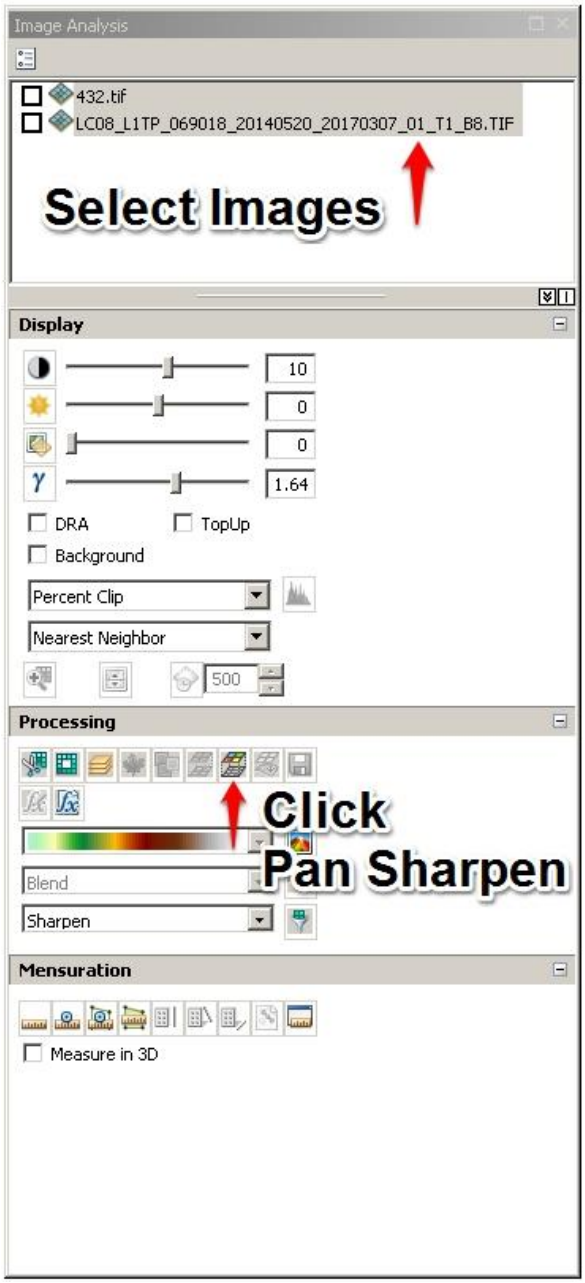
Below is a table of some of the most common used band combinations for Landsat 8.

Natural Color	4 3 2
False Color (urban)	7 6 4
Color Infrared (vegetation)	5 4 3
Agriculture	6 5 2
Atmospheric Penetration	7 6 5
Healthy Vegetation	5 6 2
Land/Water	5 6 4
Natural With Atmospheric Removal	7 5 3
Shortwave Infrared	7 5 4
Vegetation Analysis	6 5 4

How to Pan Sharpen an image using ArcGIS

Band 8 for Landsat 7 and Landsat 8 is the Panchromatic band (15m), which has a higher spatial resolution than the other multispectral bands (30m). The thermal bands have different spatial resolutions. You can use band 8 to sharpen images with band combinations.

- Click on the Windows tab at the top of your ArcMap screen and then click on Image Analysis.
- Select the image you created by combining bands and select band 8 in the top window of the Image Analysis screen.
- You will then click on the Pan Sharpening icon.



- Once finished it will add it to your ArcMap document.