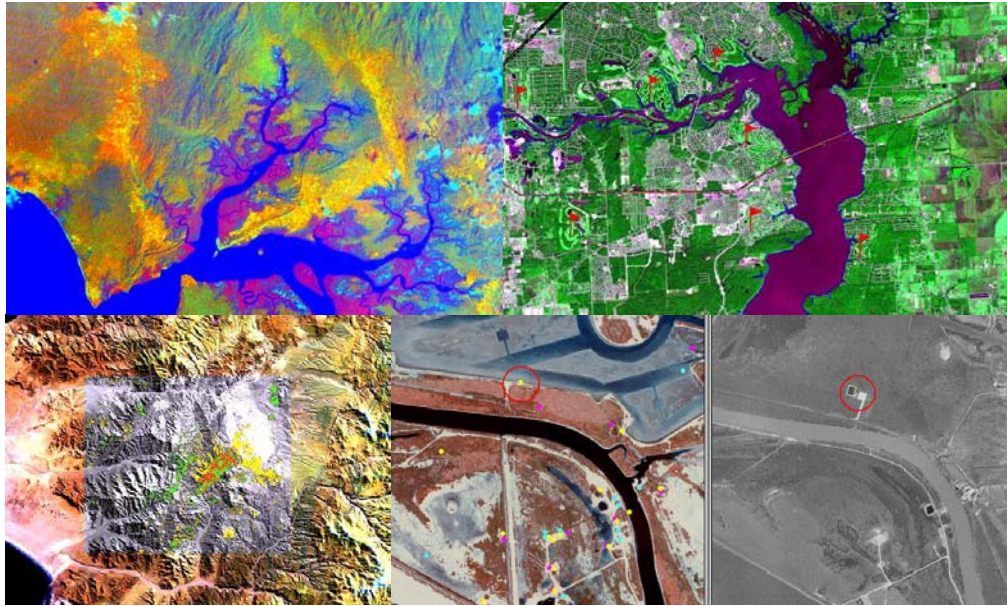


GEOB 373: Image Acquisition and Download Tutorial



Prepared for Geob 373 by BK March 8, 2018.

Image Analysis with ArcGIS 10 Image Acquisition and Download Tutorial

Introduction

This “Image Acquisition and Download Tutorial” has been prepared so that you can learn how to search for, order and download Landsat imagery. You will be required to download the imagery for your final projects, so it is important that you become familiar with the process.

Procedure

File management is crucial for a successful project! Before you start compiling your data, ensure you have become familiar with the file structure and the data used in a project. Create folders on the drive you are allowed to save data on (e.g., temporarily, during the download process, you can use C:\temp\download, but remember you will have to transfer the files to your USB drive).

Accessing Landsat Imagery using the USGS Global Visualization Viewer (GloVis)

In this tutorial you will be shown how to acquire an image using GloVis. After accessing the image through GloVis, you should confirm that the downloaded files are the correct ones by viewing them using ArcMap.

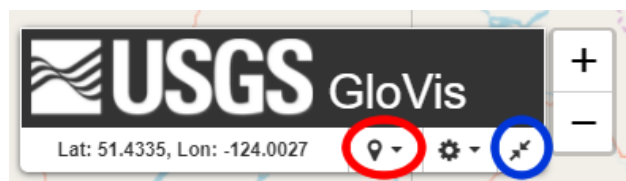
The following instructions will guide you through the necessary steps for accessing imagery from USGS’s GloVis website. For the purposes of the tutorial I will guide you through the acquisition of an image for Vancouver.

Step 1: Open GloVis (<http://glovis.usgs.gov>) in a web browser. Launch GloVis, but do not select the ‘full screen’ option as that will hide the login button.

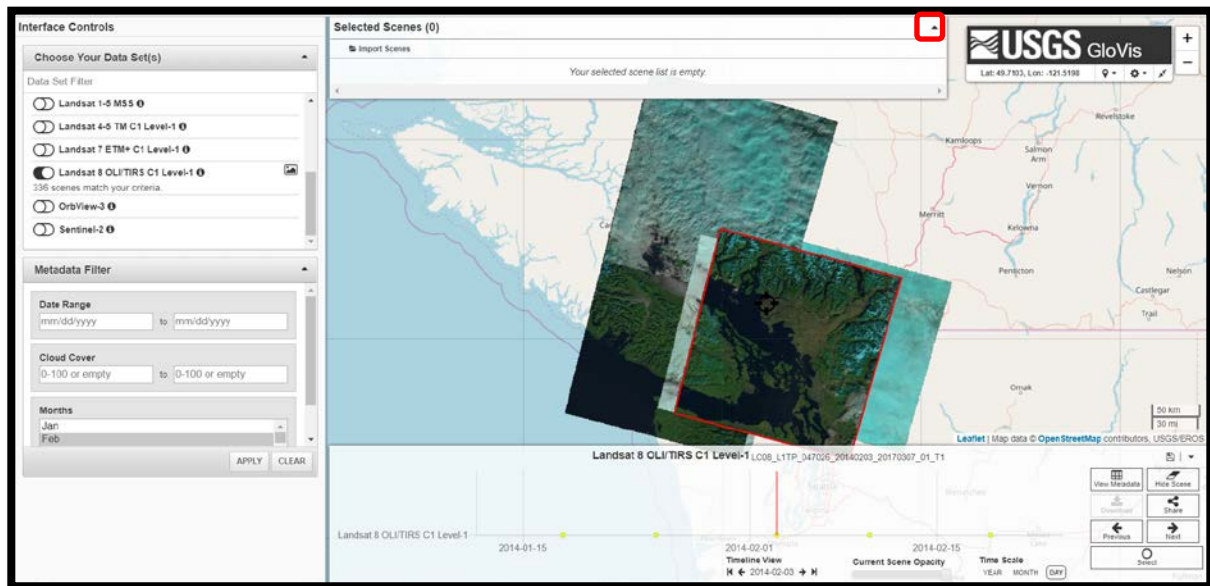
Step 2: Log into GloVis (or, if this is your first time entering the system, create an account). If you don’t see the login link, click on the **Toggle Full Screen mode button** (highlighted in blue in the figure below).

Step 3: Choose your data set—for the projects you will be using **Landsat 8 OLI imagery**.

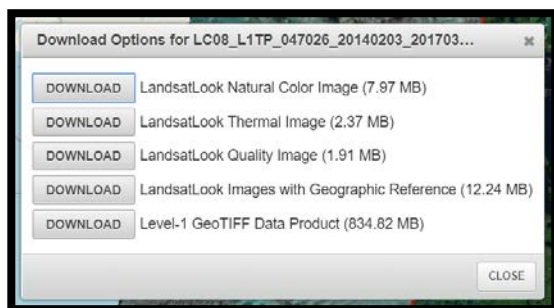
Step 4: Locate Vancouver, BC by clicking on the light bulb icon (highlighted in red the figure below)—the **Jump To...** link—and selecting **lat/Ing**. Vancouver’s latitude / longitude is 49.25 / -123.12. Enter the numbers and click on **Jump to location**.



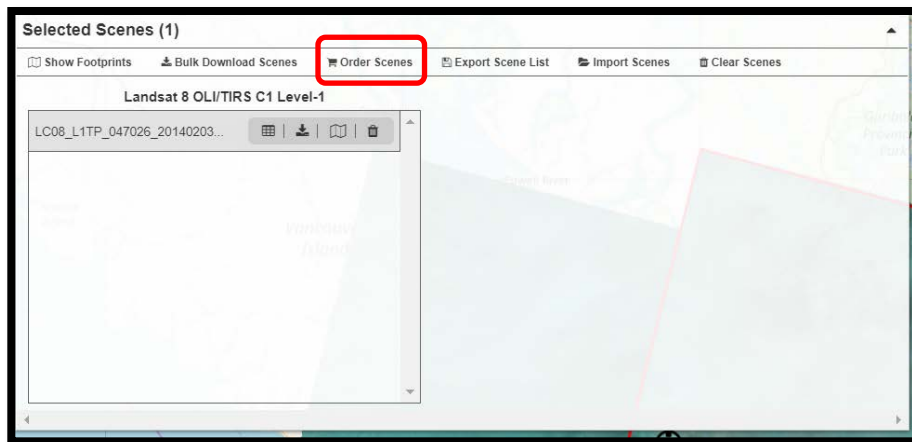
Step 4: You generally should select a (relatively) cloud-free image. I found the image acquired on 2014-02-01 to be a suitable image. You can use the time slider on the bottom of the image window to select the date (or use the Metadata filter to select the date; here you can also explicitly specify how much cloud you are willing to accept in an image).



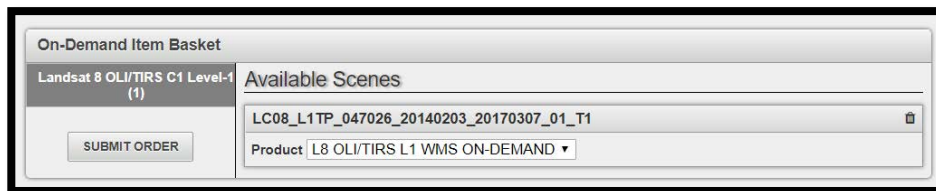
Step 5: With the cloud-free scene of Vancouver selected (highlighted in red above), right-mouse click and select **Download Scene**. The following window should pop-up. You should select the last Download option—the **Level-1 GeoTIFF data product**. Click on the close button once the processing message disappears. **I have discovered that on some browsers the data is downloaded immediately after this step. If so, congratulations, you have completed the downloading component of this tutorial!** No need to go through steps 6 through 9; you can skip directly to step 10.



Step 6: Click on the down arrow in the Selected Scenes (1) window (highlighted in red in the GloVis window above) and you should see the following (below). Click on **Order Scenes** and **Yes** to be redirected to the **Checkout screen**.



Step 7: If everything works correctly, you should be forwarded to the order confirmation screen (below). Ensure that the correct product has been selected (the Landsat Level-1 product) and click on **Submit Order**. You will need to wait for the order to be processed (the first email simply indicates that your order has been received), which will take some time (you should receive a second email once your order has been processed).

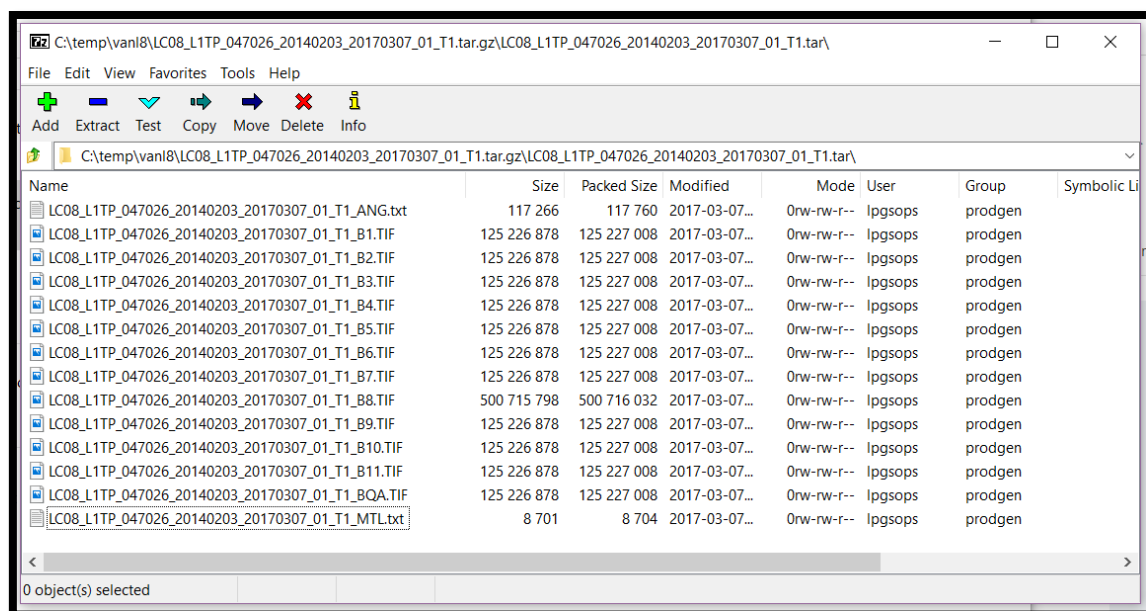


Step 8: Once the **second** email arrives ('order has been processed') **go back to the first email and click on the order tracking link**. In the new window that appears, **click on the link that appears under Entity ID (not on the WMS ON_DEMAND link)**. Scroll down to the bottom of the window that opens and click on **Download**.

Step 9: Once again, click on the **Download** button beside **Level-1 GeoTIFF**. This time the file should start to download to your computer. This will take some time as the file is very large--it may take up to an hour, depending on your Internet connection (best to download at UBC where the connection speeds are much higher). The files will be compressed and will need to be uncompressed – **Twice!!**

Step 10: Using Windows Explorer, go to your **Downloads** folder where the data was saved and decompress your GeoTIFF file by **righting click** on "LC08_L1TP_047026_20140203_20170307_01_T1.tar.gz" and in **7-Zip** click on **Extract files...** Click **OK**.

If you do not have 7-Zip it is available for download at: <http://www.7-zip.org/> and is a free utility for creating ZIP compressed archives.



Step 11: Repeat the same steps again on to decompress “LC08_L1TP_047026_20140203_20170307_01_T1.tar” and save in your **Downloads** folder.

You can look at these unzipped datasets in ArcCatalog – **note the last 2 digits identify the Band or Channel of the data (B1, B2, etc.).** You should “clean up” your folders by moving these files (copy/paste) into new sub-folders, renaming the files, and deleting unneeded folders created in the unzipping process. Below is a false-colour composite I created from the downloaded files.



A ReadMe.txt file is included with the download that can be viewed by double-clicking on it. This will give you more information about the data and especially which dataset represents which band. The information in the file varies with sensor and source. Details for the Landsat 5 & 7 images are presented below, details for the Landsat 8 OLI imagery are presented after.

Specifications

Spatial Resolution			Spectral Resolution	
Band	TM	ETM+	TM	ETM+
1 (Blue)	30 m	30 m	0.45-0.52 μm	0.45-0.52 μm
2 (Green)	30 m	30 m	0.52-0.60 μm	0.53-0.61 μm
3 (Red)	30 m	30 m	0.63-0.69 μm	0.63-0.69 μm
4 (Near IR)	30 m	30 m	0.76-0.90 μm	0.78-0.90 μm
5 (Middle IR)	30 m	30 m	1.55-1.75 μm	1.55-1.75 μm
6 (Thermal IR)*	120 m	60 m	10.4-12.5 μm	10.4-12.5 μm
7 (Middle IR)	30 m	30 m	2.08-2.35 μm	2.09-2.35 μm
8 (Panchromatic)**		15 m		0.52-0.90 μm

* - ETM+ Band 6 (Thermal IR) includes both high and low gain settings.

** - ETM+ Band 8 (Panchromatic) - most visible & near-IR data in single band.

Note: You normally work with six “channels” or “bands” of Landsat 5 or 7 spectral data (1, 2, 3, 4, 5, and 7), each of which has a spatial resolution of 30 meters. The spatial resolution of Band 6, and the characteristics of the data (i.e., thermal IR), are such that it is typically not used in classification exercises. Similarly, when working with Landsat 8 data, bands 1-7 would be used.





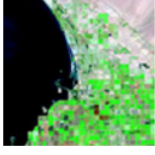
Some notes on Landsat 8 (vs Landsat 5 or 7) imagery are presented below.

Landsat 8 Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS) images consist of nine spectral bands with a spatial resolution of 30 meters for Bands 1 to 7 and 9. The ultra blue Band 1 is useful for coastal and aerosol studies. Band 9 is useful for cirrus cloud detection. The resolution for Band 8 (panchromatic) is 15 meters. Thermal bands 10 and 11 are useful in providing more accurate surface temperatures and are collected at 100 meters. The approximate scene size is 170 km north-south by 183 km east-west (106 mi by 114 mi).

Landsat 8 Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS)	Bands	Wavelength (micrometers)	Resolution (meters)
	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)

* TIRS bands are acquired at 100 meter resolution, but are resampled to 30 meter in delivered data product.

Displayed below are some common band combinations in RGB comparisons for Landsat 7 or Landsat 5, and Landsat 8.

		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