

Remote sensing, Fall 2023: project – download image data

The project goal could be to classify or threshold a selected area, generate clean and meaningful polygon vectors for selected features, and present these with the satellite image, and/or DEM layers. These might expand upon lab examples, using threshold values from ratios, indices, transforms or supervised / unsupervised classifications to enhance and extract features such as vegetated or urban classes, fires or glaciers. Using 2 or more images to show change can be appealing, not a requirement.

Week 1 (Nov 15); data search and download. Clip ...

Week 2 (Nov 22): channel creation / classification, analysis

Week 3 (Nov 29): vectors/analysis/write-up

Week 4 (Dec 5): 4-5 minute demonstration

Week one: Dataset extraction

Datasets can be created, from Landsat TM (1984-2011), OLI (2013-2023) or Sentinel MSI (2015-23) Plan for a subset - approximately filling a screen but not too much more. e.g. ~1800 x 1200 pixels, unless required for your goals. You could also select ASTER data (2000-07) and SPOT (2005-2010)

It is essential to select an area and possible application before you download any image data.

The process for data search is the same as for Lab 6 (Environmental Change), except for downloading and extracting the full scene product, which will range from 400mb to 1 Gb in size, compared to the images used in Lab 6 (~10mb). L8/9 image datafiles are bigger than L5 – more bands and 16-bit data.

1. Image search and selection

Earth Explorer: <http://earthexplorer.usgs.gov>

Zoom to your chosen area, and use 'Map' or 'circle' option to select your area

Change max cloud cover to 5% (or even 0%)

Collection: e.g. Landsat Collection 2 - Level 1 → Landsat 4-5 TM or Landsat 8 / 9 OLI

Remember in Canada to search for summer months only and pick your dates e.g. July 1-Sept 15

Identify your area with the 'use map' option

Search and preview the **browse image** to be sure it's good – e.g. view for clouds

Once you have found your image, Unlike the environmental change exercise, you will want the **Landsat Collection 2 Level-1 Product Bundle** .. the first option listed

..... Instead of the second option (GeoTIFF) you selected in Lab 6 – though you could download this first to further check the image quality.

You can expand the bundle to see the list of files you would download

Download only when you are confident this is the image you want – it takes some minutes to download

2. Scene download

Select the optimal scene(s) from Landsat archive or another

This brings up a new window asking for a user name and password

The class group username is: **geog357**

The password is: **unbc4thenorth**

Before you download, do these two things:

- a. Create a subfolder in your geog357 folder for your project
- b. Check your browser settings so the option is ticked for 'always ask where to place downloads'

If this is really the scene you want, then continue as below be sure to check for cloud cover

Select 'download' button for 'Level 1 bundle' (the first listed option)

This downloads a tar.gz file ('tape archive'), select your folder and save ... it may take 5-10 minutes

The downloaded file will be zipped as .tar or .tar.gz

From the windows start button, find and open the 7-Zip (file manager)

click on the downloaded filename and select 'extract', then follow the options to download all files

This will produce several .tif files – one for each band (7 for Landsat 5) or (12 for Landsat 8) .. bands 1-11, including 2 TIRS, 1 PAN and also BQA (quality assessment) plus 2 text files.

3. Creating a multi-channel .pix file – in Catalyst

Start Catalyst

All you need do is drag the metadata text file in the image folder into the TOC, and select the MS option, or file->open the metadata file (ends in mtl.txt) - all the TIFs are present, and rasters listed.

- If you get an error pop-up, see section 5 below.

It selects only layers with the same pixel resolution - 6 for TM and 8 for OLI. (No thermal/PAN).

This is not yet permanent, only onscreen so we then need to create the PIX file:

File-> Utility-> Import to PCIDSK

Name it suitably in destination file and navigate to suitable folder

Take the other parameter defaults and IMPORT .. this takes a few minutes

When done, open your new pix file and remove the previous mtl from the maps display

The file layers are nicely identified by their EM spectrum location.

You can also load the PAN file if there is one ... layer-> add -> grayscale and pick band 8 TIF

Similarly for the thermal band(s).

BUT it seems they have NOT formatted all image scenes in this way, with the metadata file, especially Landsat 9. If not, see instructions below

Make sure you have retained or recorded your **image date(s)**

I've repeated clipping/subset instructions below, though you already did this in Lab 6.

4. Subset/clip your area of interest - don't try to capture too large an area

Set up your screen display to cover the area you want – a 'landscape' rectangle is usually best to optimise the use of the screen; square or portrait shaped areas are less preferable, but may be needed to match your AOI.

Subset your area of interest:

Tools-> subsetting / clipping

Choose a new file name that will describe your selected area

Tick the bands you need (likely all) – though not the BQA and perhaps Cirrus band

Select **use current view** as option under Define Clip Region / Definition method dropdown

Note: if you are working with more than one image scene, you would do steps 1-3 independently for each scene, and when it comes to step 4, subset one first and then clip the rest to match the first - use 'select a file definition method' option if it's possible the current view has changed (use the first clip to define subsequent clips).
But why am I repeating this – you already did this in Lab 6 ..

5. Here is the other way to turn multiple band TIF files into a single .pix file you might have to use this if the .mtl text file is absent or does not link properly; this seems to be the case for Landsat 9 images

Open the first .tif (band 1) in Focus and convert this to a .pix file by:

a. File-> Utility → choose **translate**

The source file is your .tif, the destination file is a new .pix file (you pick the name)

Click on: Select all - . add transfer -> close

You now have a .pix file that the other bands can be transferred into:

*Now select File -> utility and choose **transfer***

For **source** file, pick the next band .tif file (Band 2)

For **destination**, pick the .pix file created in the previous step

select the new band, add and transfer

Repeat this process for the other .tif files - it will add them all into the SAME pix file

When done, view/enhance your favourite band combination as RGB composite e.g. SWIR-NIR-Red

You are now ready to view your scene and clip/subset as required

GEOG357 Project outline 2023 (here for reference)

1. Project design

- a. Geographic area ? (province / country / region ?
- b. Application area e.g. forestry, habitat (landcover), glaciers, urban development
- c. Image requirements – expected years, could include change but not required
- d. Anticipated processing e.g. classification, ratios, transforms, indices
- e. Expected outcomes e.g. extracted features or classes

2. Steps

Week 1: Preview and Download imagery, convert to pix file and clip to fit – I recommend a screen size study area to avoid excessive pan and zoom e.g. max. 1800 x1200 pixels (approx.)

Week 2: Image processing: classification, ratios/indices, transform etc., (change detection) feature extraction, vector creation etc..

Week 3: Final images and results – e.g. vectors overlain on optimal image, calculation and presentation of results; possible 3D images using DEM; possible inclusion of Google maps/earth image for context/reference. Write up text.

Project Output Summary

Introduction: A brief summary of your project – goals, area and result

Study Area and Data Source

- Study area description
- The data you need for the project (including image dates)
- Comments on image quality (clouds, time of year etc.)

Data methods and analysis

- brief description of methods (could use point form)
- the primary resulting channels from analysis e.g. ratio or classification

Results

- Discussion of results
- Final image display e.g. vectors on image
- Final conclusions of successes or limitation

Images do not need to be super high res. 150 dpi is suggested as enough (.jpg)
You can provide zoom in images if it helps to show detail

submit project as word doc (or libre) and pdf in case of minor edits, pdf for final presentation