

(‘Lab 9’) Environmental Change assignment (10%)

Due for: Monday 17 November

Submit on Moodle under ‘Lab 9’ or **Email** to RW as .ppt or .pdf by Nov 16, 6pm

Pick your area from personal knowledge/interests / google maps, earth time lapse etc..

Quick notes on Landsat vs Sentinel

Landsat: longer history (1984->); search pattern is better documented

Sentinel: higher resolution (10m), clip onscreen so no need for Catalyst, slicker !

1. General notes:

These conditions below apply equally to Landsat and Sentinel

Picking the two before/after scenes will likely take the longest time in the assignment

Cloud cover: The two images should ideally be cloud-free; these are easier to find in drier locations. I suggest 0-5% (max) - remote cloudy places e.g. Iceland, Greenland, and equatorial regions have fewer options

Years: you are looking for change – could be short or long-term, but it doesn’t have to cover the entire 1984-2025 period; it’s better to have a good contrast than a long period.

Dates: The ideal is the same general time of year. A smaller year span but with closer date / season is likely to show better. Images should usually be free of seasonal snow.

In Canada, a date range might be June 1-September 30 (July 15-Sept 15 in mountains); adjust for different areas – winter images in Canada and most places are not very useful. Landsat 7 ETM+ images after May 2003 are striped / of little use (1999-2002 are OK)

Area relative to scene edges: Some areas will be nicely placed in the middle of an image, while others may be on the edge, and not fit your screen as well. Technically if it’s in Canada, there is 50% side scene overlap, so it could be on the edge of one scene, and the middle of another, in an E-W direction. Scenes are ‘cut’ along a N-S swath, so some places may be tough to get images simply because they are always near a ‘join’ or scene top/bottom edge. In such a case, you might prefer to pick another area ...

Size of area change: a screen covers ~1800 x 1200 pixels. Your feature change should cover a good piece of this. If it’s too small, we won’t see much change.

You might review the Sentinel option first as it seems slicker

Copernicus browser: <https://browser.dataspace.copernicus.eu>

If unsuccessful, switch to the Landsat option below; so far most prefer Sentinel

2. Sentinel-2 data

Go to the Copernicus browser: <https://browser.dataspace.copernicus.eu>

login / account is not required for this exercise, but you could create one for the project otherwise check on 'Anonymously' box

zoom/pan to your area of interest, or enter a feature name in the box (then zoom in)
Either modify your window shape/size to fit your area, or draw a box/rectangle around (using the polygon symbol to the right – 2nd one down, below the 'i')

The left panel contains two tabs: Visualise and Search

Visualise: Pick display options (SWIR for us!)

Search: Find suitable scenes

Left panel: at top, switch to 'search' tab

Tick Sentinel-2 (MSI)

Slide cloud cover to 0 or close to 0

Tick L1C – there are fewer L2A scenes in Canada (A= 'atmospherically corrected')

Change from and until dates to match your needs and season dates:

e.g. 1 July / and year, Until 30 September / and year for summer images

Tick filter by months (to avoid winter scenes) and tick only July-September (for Canada)

Ok to leave blank for the tropics and areas that don't get snow / seasons

This next section could be a minor reason to stick with Landsat

Display may take longer than Landsat on EarthExplorer, and it may find 2 versions of the same scene, 4 if near UTM zone boundaries;

Click on the small 'visualize' text label under a selected scene or use the Visualise Tab
select layers colour option SWIR

Download (6th icon down on the right side)

**** Do not select the download option in the search Tab scene list – this is for projects**

Repeat for the second image – don't move your display !

3. Adding to powerpoint: Sentinel or Landsat

Open a new presentation with 2-4 blank slides

Insert (picture) each colour image into a blank slide; insert only, don't move them around or adjust, or you'll never get them to realign ...

Note: it usually fills the slide; but if they are either too big or small, then do this:

- right-click on an image -> size and position option to modify size - use EXACTLY the same parameters for each of the two slides.

Note: it is critical to insert the images first. If you add a title or text first, it will reduce the space available for images

Add feature location / date / year on each slide (insert-text box): for Sentinel, a scale bar is automatically added in the bottom left corner; for Landsat in power point, just use a straight line and add suitable distance by text

Create an extra introductory slide to explain what we are seeing in the change. This might also benefit from a location map e.g. from Google maps and/or ground photo.

You do NOT need one slide that only gives your name and course...

Submit as .ppt or .pdf – email to RW or post to Moodle under lab 9

4. EARTHEXPLORER: Landsat image view/download

<https://earthexplorer.usgs.gov/>

Note: Firefox may block pop-up windows which are essential here, so use **Chrome**

- Also check 'settings' to ensure it always asks you where to **save downloads**

You need to login to download once you pick your area / scenes, but not to browse

So far, most have used Sentinel, but for images pre-2016, you might need Landsat

Location

You will need to fill in location, search criteria, Data sets and additional criteria as below:

Either just pan/zoom to your area, or Enter feature placename (after picking US or World), click on the feature if it is major enough to show - then 'show' .. it should zoom to the location if it's major

click on 'use map' = map area will turn red (it will search for anywhere covered by this)

- Or you can draw a polygon around the area you want, click, click and end with double-click to close the polygon; there's also a circle option.

Date range to summer months as needed (except for tropical areas).

Change the months from 'All' to better suit your area e.g. July August September

Search from: insert your start date (day/month/year) and end date.

You could leave them if you plan to search the entire range e.g. Landsat 8/9 2013-25, though you are likely to be more selective.

Cloud cover: Move slider from 100% to 0 or max 5% (depending on the area)

Datasets: Landsat -> Landsat Collection 2 level 1

It appears you can pick all L8/9, L7 and L5 but you should only pick one for each search, as it will only search for the first one checked

Click **results** – brings up the search results – click on scene image thumbnails for zoom view .. and again on the new enlarged image

If you have a huge number of scenes e.g. >100, maybe you forgot to limit cloud cover?

If you have too few, maybe you need to allow for more cloud, e.g. Prince Rupert, Iceland ?

Check for the path and row for your images, and click on the first icon (show footprint)

It is usually ideal to pick two images from the same path/row

You will need to do all this twice for your 'before' and 'after' images

when you have the best choices (see below) - You will need to login to download

You may want to change your browser options/preferences if it goes straight to the 'downloads' folder. Settings -> downloads. Scroll down to Downloads and check the button for 'Always asks you where to save files'.

Scene download

After selecting the scene download option: (you must be logged in for this)

... you could also login when you first start the webpage

The class group username is: **geog357**

The password is: **unbc4thenorth**

Select the download icon and then in the pop-up window the first listed download option

Full Resolution Browse (Reflective Color) GeoTIFF



This is after the level 1 product bundle data at the top which is ~ 100 times bigger in size. **do NOT download the Product bundle** dataset (although you will choose this option for your project). The JPEG options are inadequate as they are not georeferenced. Save the download to your folder.

Viewing/subsetting in Catalyst

Start Catalyst and open the two TIF files: one for before and one after

The two should perfectly align – if they are from different paths, your geographic area will align, but the scenes will be offset.

Depending on your area of interest, you can change your display area to be ~ 3 x 2 ratio 'landscape' image ... zoom as needed, but not so much that you can see individual pixels. Zoom/pan to an area of interest that should fit on a screen without having to pan; as a rule the dimensions could be 1200-1600 ... enhance as needed, and so the two images match. Note that the TIF image is already stretched and compressed to an 8-bit format with SWIR-NIR-Red bands in RGB, so they may not enhance as previous lab examples. Include a 'marker feature' if there is one e.g. lake, river, town - when satisfied, Choose: **Tools-> Clipping/subsetting** .. tick the rasters box in the new window, and enter a new name for the clip .. it should be .pix format

On the right panel, change definition method dropdown to **Use Current View**

The red inset frame should now show your chosen area, and click on Clip to make it so

Repeat for the second image, ensure it's for the same area / current view - don't move around but you can also be sure to match the clip by choosing 'select a file' for definition method and browse to select your first clip as the file.

New project – using only your clipped images

Start a new project again, and load **ONLY** your two clipped images enhance as needed so they match as closely as possible (except for the changed areas !)

file-> export map to save each image as JPG (change 'save as type' dropdown)

Select JPG format, and display resolution to 150dpi

For each one, make sure you have the file you intend to be exported. To be sure, turn the other off and highlight the intended file when you export.

Double-check your two exported jpg files are what you intended – open in a graphics viewer by double-clicking on their icons in windows file manager.