

Lab 5: Environmental Change assignment (10%)
Due: Wednesday 2 November

But first, the Pansharpening we missed in last week's lab:

Combine the multispectral information with the higher panchromatic spatial resolution

Start Catalyst and in the Focus Window:

Open the McBride MS (2014) and then the Pan file from last week (your copies) ...

They should line up perfectly ... you can't see the higher res. at full view, so zoom in on an area of interest e.g. the town of McBride or avalanche slopes or glaciers. Click the top (PAN) layer on / off to see the higher resolution. You can also compare with Band 8 in the MS file – it loses its higher resolution in this file to match the MS pixel size (30m)

Tools-> algorithm librarian and find PANSHARP

Input: Multispectral Image channels, and tick 4,3,2 (Red, Green, Blue)

Input Ref: reference image channels: tick 4,3,2 again

Input Pan: panchromatic image channel – tick the Pan channel

Params tab: accept all default values

Output: viewer RGB .. we could also choose to save the new 'pseudo-bands' in the Pan image (15m pixels), not the MS image which only has 30m resolution.

Now you can zoom in on sections of the pansharpened image and compare with the original MS image for the higher resolution – 4 times as many pixels. This higher res. image should be used for interpretation more than analysis, as the results are 'synthetic'.

And back now to Lab 5

Procedure

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

1. General notes:

Picking the two image 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 sunnier (arid) locations. I suggest 0-5% (max)- remote cloudy places e.g. Iceland, Greenland have fewer options than places to the south.

Years: you are looking for change – could be long-term, but it doesn't have to cover the entire 1984-2022 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 30-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 be better to pick another area

2. EARTHEXPLORER: 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 ask you where to save downloads

Location

You need to fill in location, search criteria, Data sets and additional criteria as below:
Enter feature placename (after picking US/World), click on feature if it shows up - then 'show' .. it should show up with location if its major; zoom in as much as possible to your area as needed

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

- Or draw a polygon around the area you want, click, click and end with double-click to close the polygon

Change date range to summer months as needed (except for tropical areas)

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

Data sets: Landsat -> Collection level 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

Change the months from 'All' to better suite your area –

You can do it all with Landsat 5 if 1984-2011 or Landsat 8/9 2013-22 cover your change

Additional criteria: cloud cover : Less than 5% Be sure to check cloud cover

Click results – brings up the search results – click on scene image thumbnails for zoom view .. and again on the new enlarged image (we've found this does not always work with recent images)

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

It is 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

3. Scene download

After selecting the scene download option:

This brings up a new window asking for a user name and password, if you didn't login.

The class group username is: **geog357**

The password is: **unbc4thenorth**

Select the download icon and then the GeoTIFF (Natural Color) the second listed. NOT the level 1 image data at the top which is ~ 100 times bigger in size. I repeat **do NOT download the Product bundle** dataset (although you will choose this option for your project in later labs). The JPEG is inadequate as it is not georeferenced.

Save the download to your folder.

You may get some nasty security messages – note the account is linked to my email, not yours so I'm like Dumbledore with a protective blanket.

You may need 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'.

4. Viewing/subsetting in Catalyst

Start a new project in Focus and open the two TIF files: one for before and one after

The two should perfectly align

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 1000-1500 x 700-1000 – assuming a 'landscape' format which will best fit the final powerpoint frame; don't zoom in so much you can see the pixels ... enhance as needed, and so the two images match. Include a 'marker feature' if there is one e.g. lake, river, town and when satisfied, Choose:

Tools-> Clipping/subsetting .. check the rasters box in the new window, and enter a new name for the clip .. it can be .pix format

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

The red inset below 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 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 from AI)
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.

5. Adding to powerpoint

Open a new presentation with 2 blank slides

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

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

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

Add feature location / date / year on each slide (insert-text box), and a rough scale bar on the after image – in power point, just use a straight line and add suitable distance by text

Create an extra introductory slide to describe what we are seeing in the change – see Sunny's demo example

The goal at the end of the lab is to have your pair of images 'ready to go' in the ppt file.
You can add the text and explanation for class presentation later.