GEOG357: Remote Sensing

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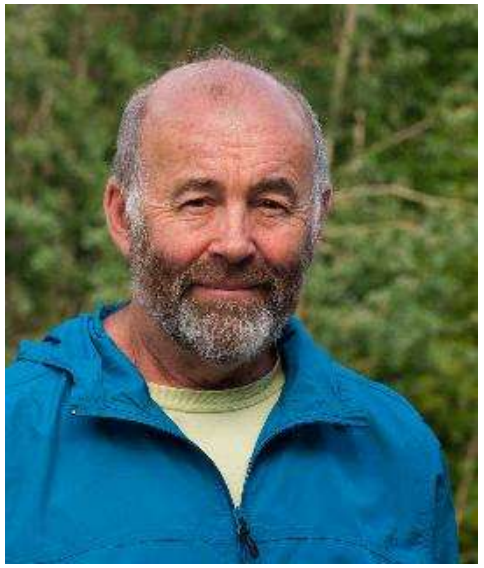


Lectures: Tues/Thurs 12.30-13.20

Labs: 8-125: Monday 11.30 – 14.20

Outline and notes: http://gis.unbc.ca

... the acquisition and analysis of aerial and satellite images

There are thousands of satellites in space, many of them for Earth Observation (EO)

e.g. As of ~2018: Satellite launches 8650, still in space 4700, operational 1700

https://earthobservatory.nasa.gov/

Iceland eruption: August 2022

Early aerial photography (since 1860):

Balloons, US Civil war

World War 1:

Pigeon with german camera; balloons and planes

Why did 'RS' appear in 1960s ?

Advent of :

a. Satellites (Space Race)

b. Use of non-visible energy
e.g. infra-red, RADAR

- extended beyond aerial photography

attributed to Evelyn Pruit, technician

Early to mid- 20th century RS milestones

~ 1840: Invention of camera / photography

1910s First use of aerial photography from planes
(World War I: photo interpretation)

1920s Development of photogrammetry for mapping

1940 Military use of RADAR (World War II)

1945-> Main aerial photo programs in Canada

1950s Use of colour photography and infra-red

1960 First reconnaissance satellites: Corona

1960s First weather satellites: Tiros (1960); Nimbus (1964)
(and first digital data transmission from space)

1970-present RS milestones

1970s: Landsat 1-3 (NASA) – first EO satellite

1980s: Landsat 4-5 – the 'next generation' imagery
First commercial software

1986: SPOT 1 (France)

1990s: more satellites from various countries / ESA

2000s: corporate high resolution (<1metre) satellites
2008: Landsat data freely downloadable (others follow)

2010s: LiDAR and UAVs

2020s: Online data processing 'in the cloud' e.g Google Earth Engine

Why is Remote sensing (maybe) more 'important' than GIS, especially in Canada ?

- Size and remoteness of Canada – cannot be mapped easily
- vector data is often quickly outdated e.g. forest cover;
  …. while images can be current or more recent
- Images cross administrative boundaries (vector data may stop)
- Images are not generalised (apart from scale)- shows it like it is
- Most GIS spatial data were created from remote sensing

Worldview3 2014
Rainbow Range
Chilcotin, BC 31cm

High resolution satellite imagery (Maxar), 15-30cm
Feb 28, 2022
Russian tanks

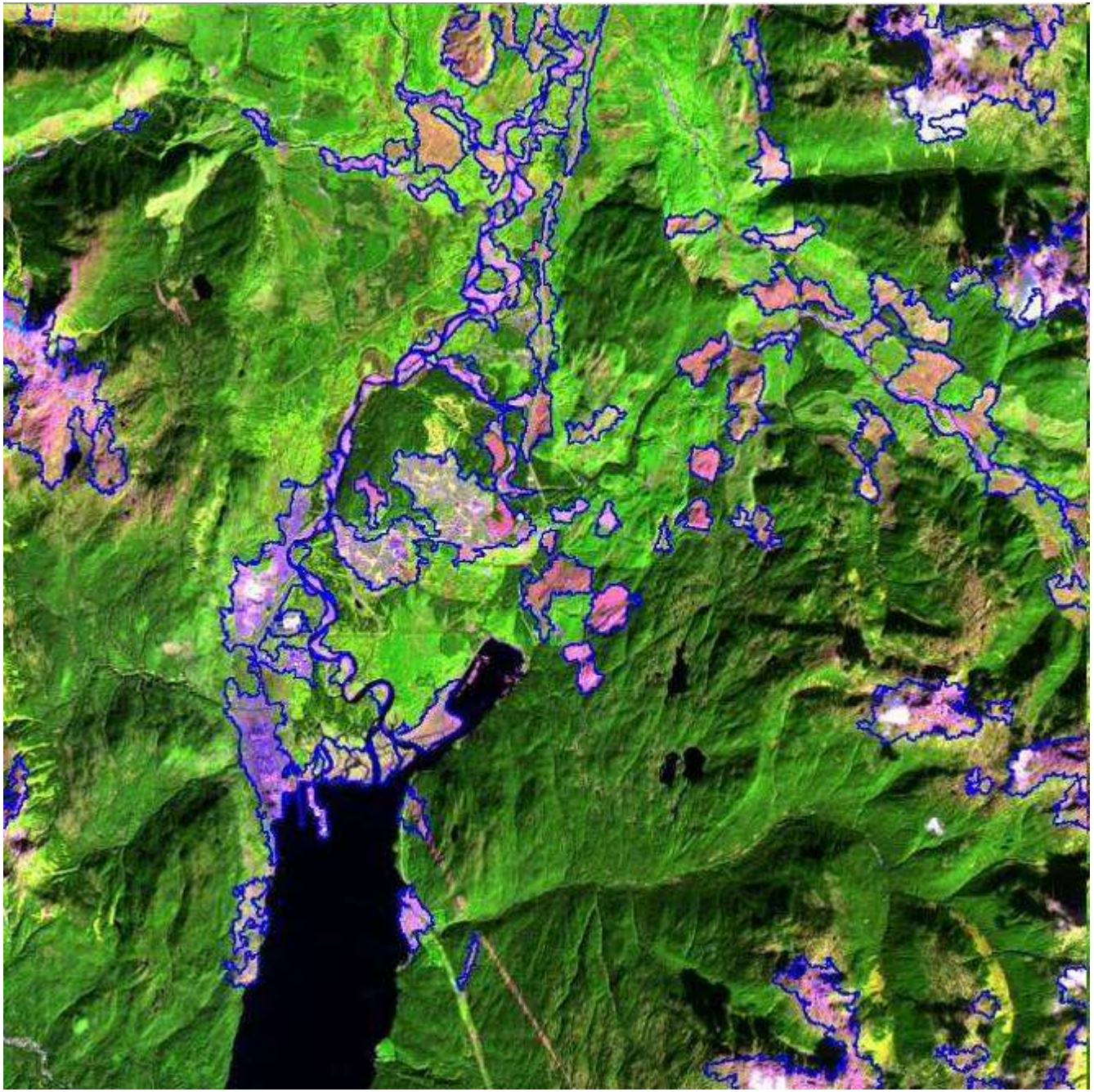
“it’s so big, you can see it from space” ☺

Traditional mapping from aerial photography and GIS layer creation – manual digitising

All Canada was mapped this way 1945-1995 = > 13,000 map sheets at 1:50,000 scale including many thematic layers e.g. forestry, geology

Digital remote sensing imagery – auto-generation of GIS layers - polygon data

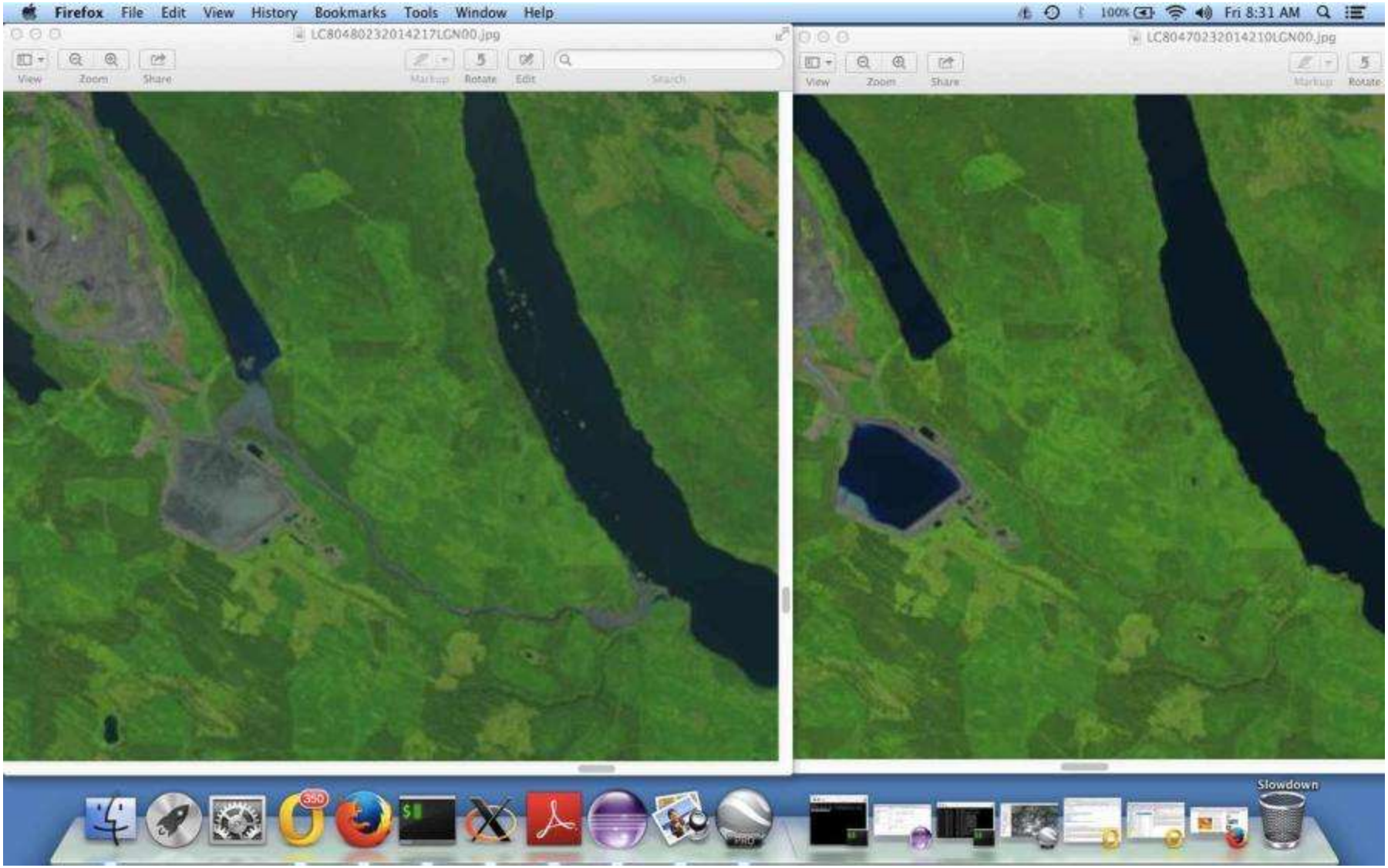
Sample from GEOG357 project: non-forested layer



Local environmental change example from satellite imagery

http://earthobservatory.nasa.gov/IOTD/view.php?id=84202

Mount Polley Dam Breach, central BC, August 2014

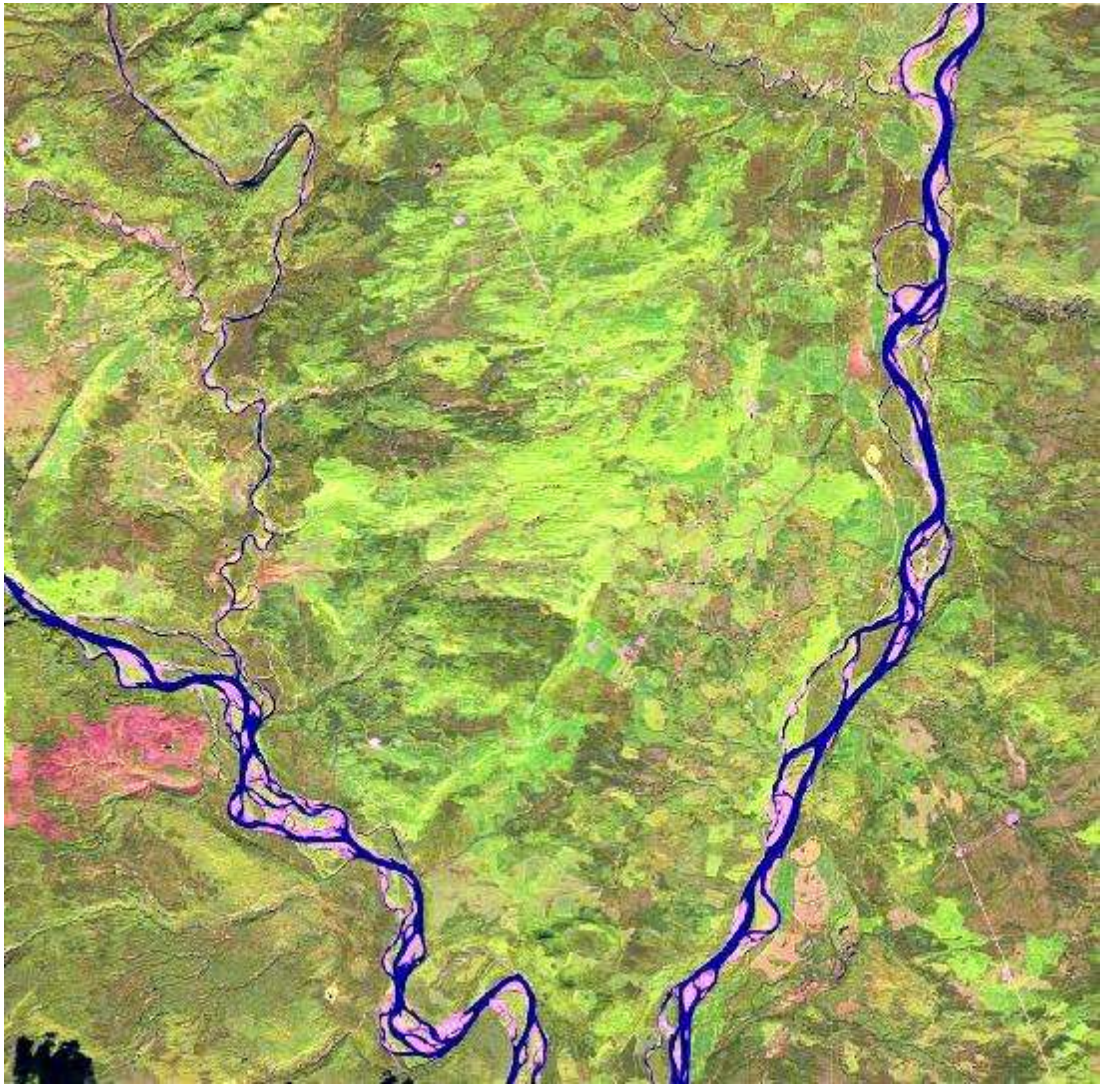


Here's another example showing glacier change 1986-2019

https://earthobservatory.nasa.gov/images/147171/inlets-iceberg-maker-is-nearly-gone?src=eoa-iotd

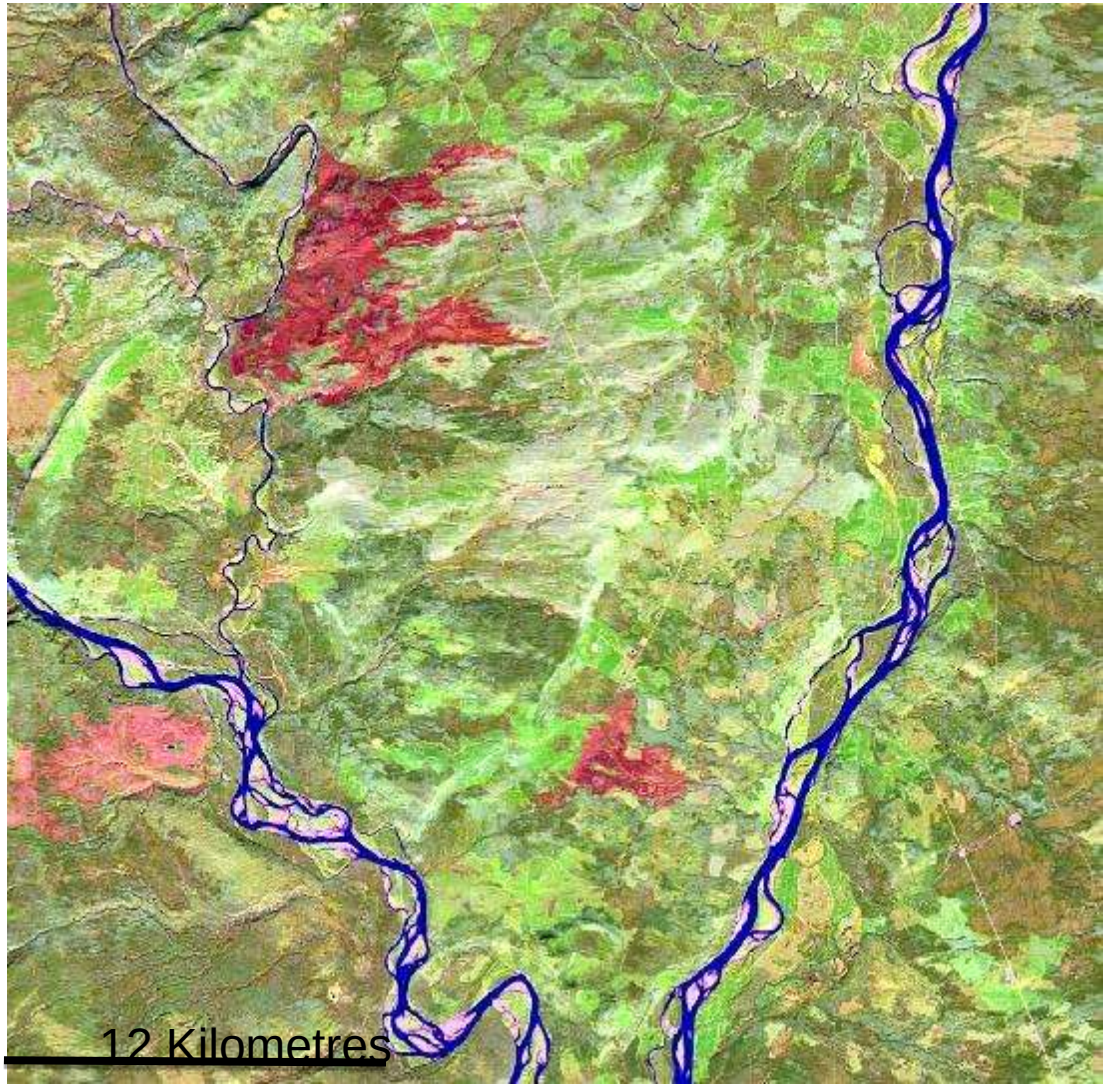
GEOG357 assignment example- before / after

Nelson
Forks
September
3rd 2017



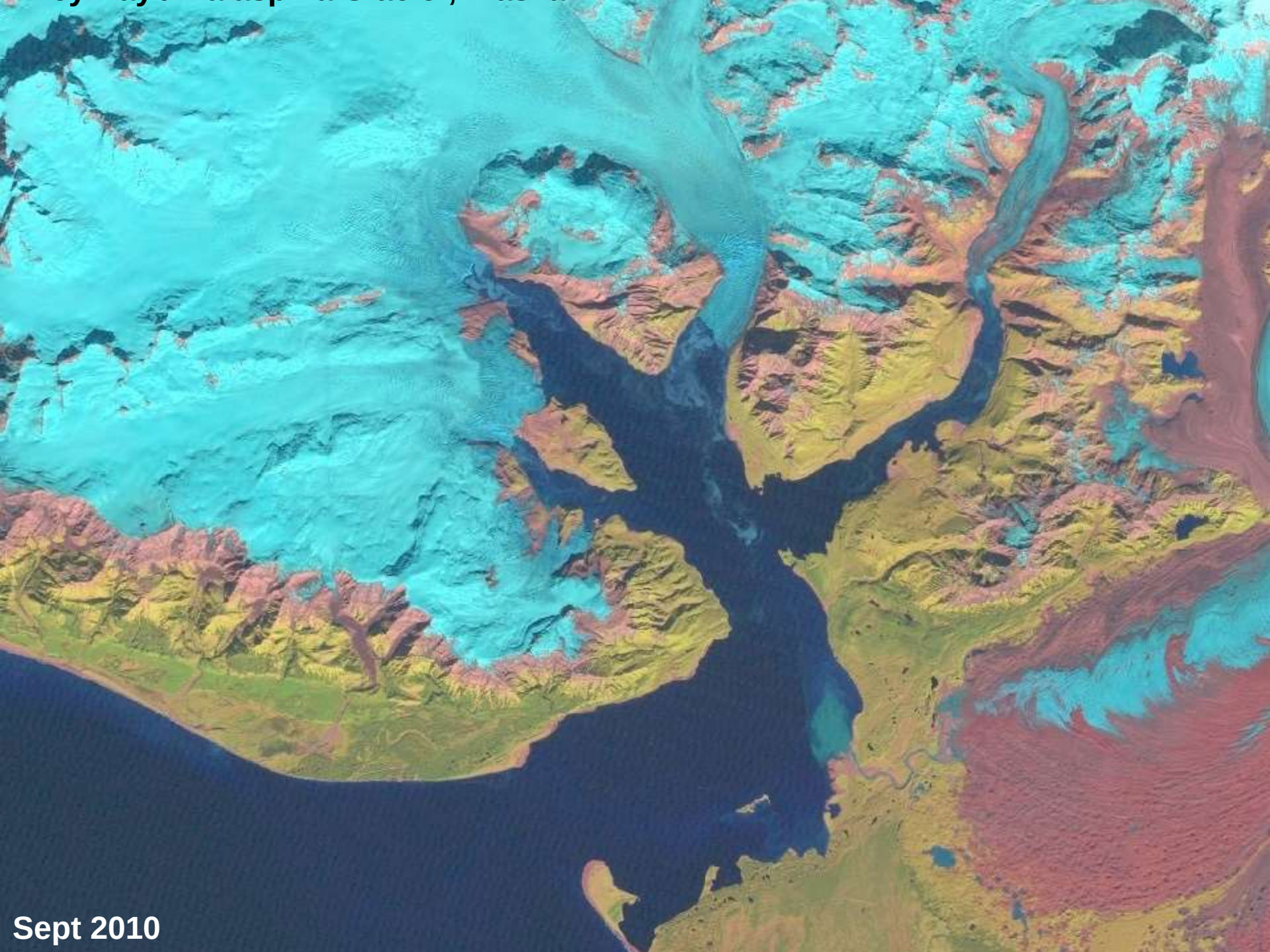
This is the first graded assignment – you select/download two images showing change

Nelson Forks September 9th, 2019



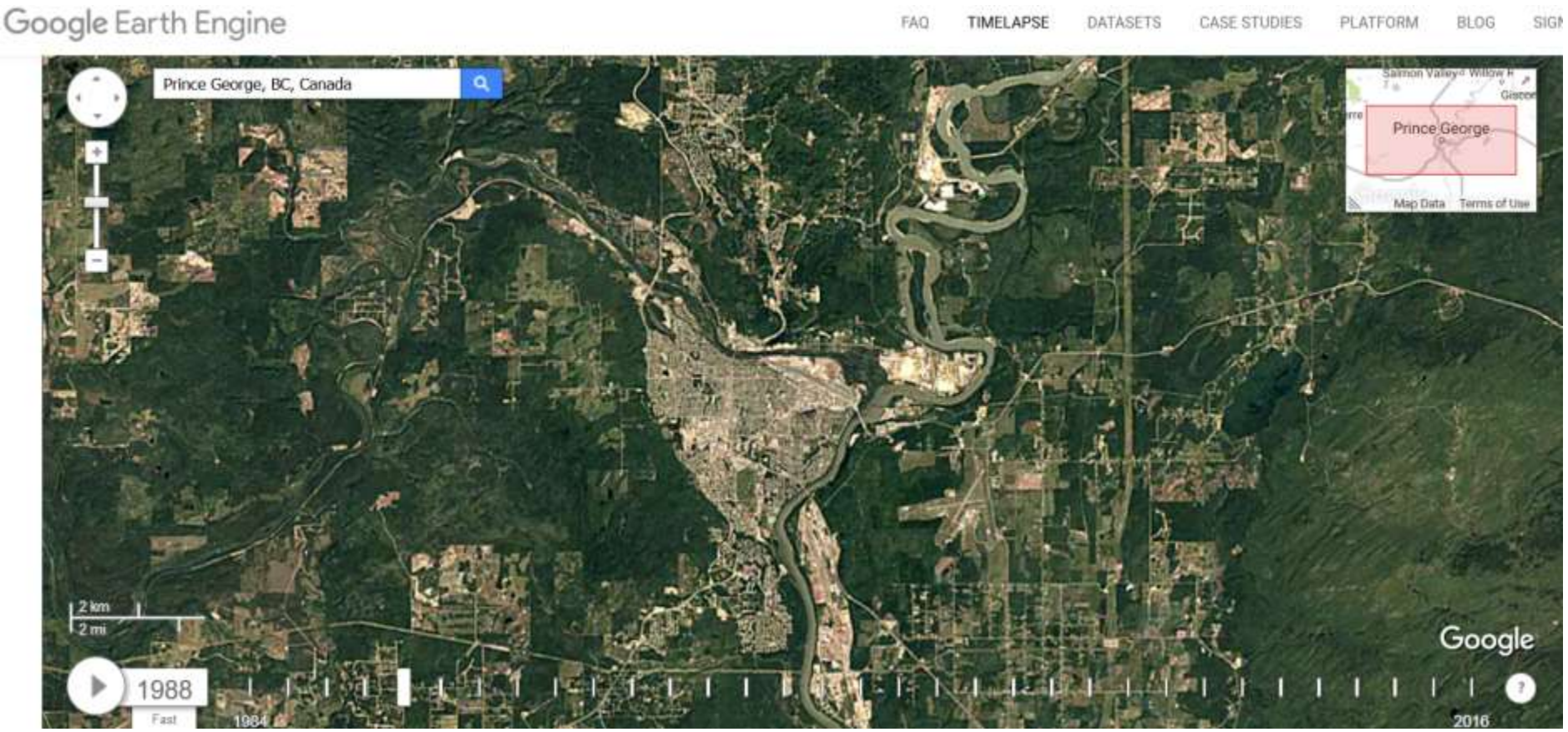
This was one of the student's last year, showing an area close to his home
Your project too should cover an area and topic of interest to you and your studies


Sept 1984


Sept 2010

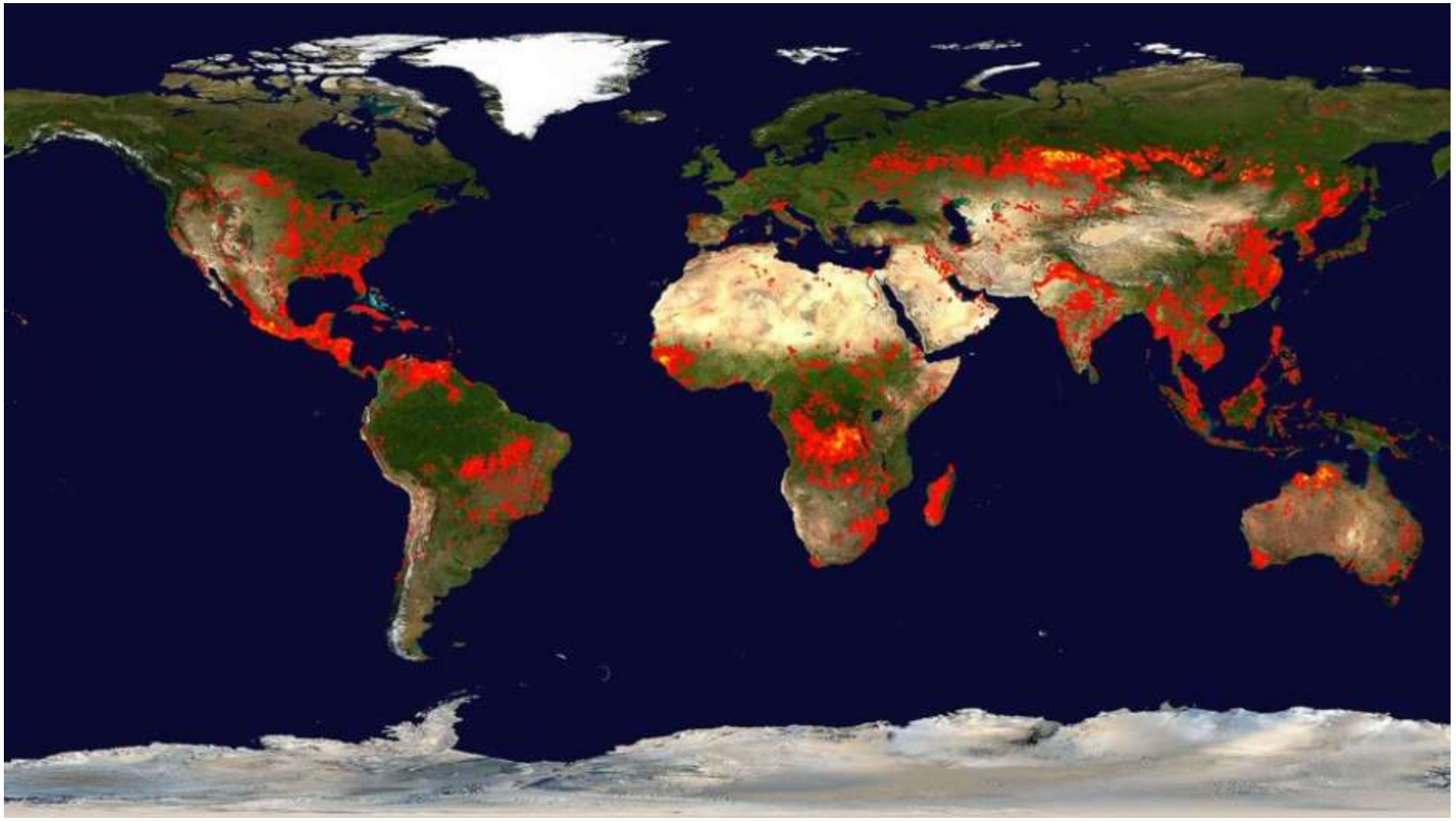
Mapping and showing change
Landsat images 1984 - 2021 (30m res.)

https://earthengine.google.com/timelapse/



The google earth engine now shows 35 years of change around the world, though the images chosen are not always the best – they will be in your work !.. You can use the link above to review where they might be interesting changes (quite subtle in Prince George)

Fires around the world, May 2019



Example of Global Remote Sensing from free satellite imagery

Course goals, you should develop / gain:

- Understanding of imagery and wavelengths
- Digital imagery to extract/map selected features
- Role of remote sensing in Geomatics / GIS
- Public education and media e.g. Google Earth
- Data availability for a range of applications
- Ongoing developments in current technology
- The power of multispectral remote sensing

GEOG357 Syllabus Fall 2022

Instructor: Roger Wheate, 8-307, 960-5865; wheate@unbc.ca

Lectures: Tuesday/Thursday 12.30-13.20, 5-171

Labs: Mondays 11.30-14.20

Evaluation 100%

- Exams: Oct 12, Dec 1 — 30%
- Environmental Change exercise, Nov 8 — 10%
- Article review Nov 16 — 10%
- Lab exercises 5 x 5% — 25%
- Final project, Dec 7 — 25%

Date	***Lecture Topics***	***Lab***
Sept 2022		
8	Introduction	
12-16	Electro-Magnetic Spectrum / Image data-display	*Lab 0: software / accounts*
19-23	Sensors/platforms Band ratios	*Lab 1: Image display and DNs*
26-29	Unsupervised / Supervised Classification	*Lab 2: Unsupervised Classification*
October		
3-7	Indices / Transforms	*Lab 3: Supervised Classification*
11-14	***MidTerm Exam*** / Thermal RS	No lab – Thanksgiving
17-21	Env.Change / Change detection	*Lab 4: Ratios and indices*
24-28	Image interpretation / Feature extraction	*Lab 5: Environmental Change*
November		
(Oct)31-4	Glaciers / DEMs	*Lab 6: Feature extraction*
7-10	Env.Change demos ; project options	*Lab 7: Glaciers / change*
14-18	Microwave / RADAR; LiDAR	*Labs 8-10: Project time*
21-25	New millenium sensors / Planetary RS	
28-Dec 2	RS Software - Course review / ***Second exam***	
Dec 5-6	Project demos	

Labs: we use PCI 'Catalyst' software
Monday's lab will be short – login / open review software and sample imagery