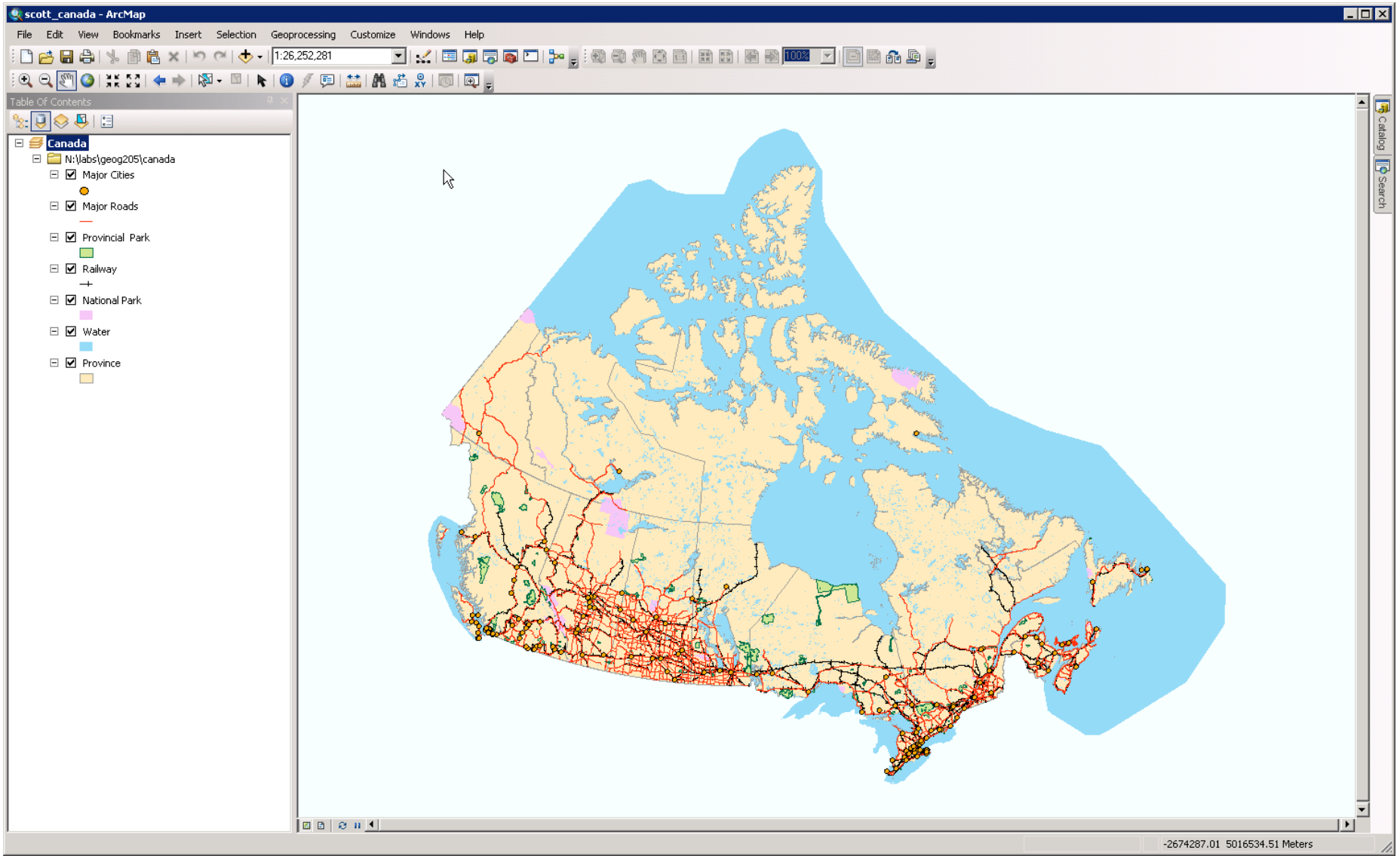
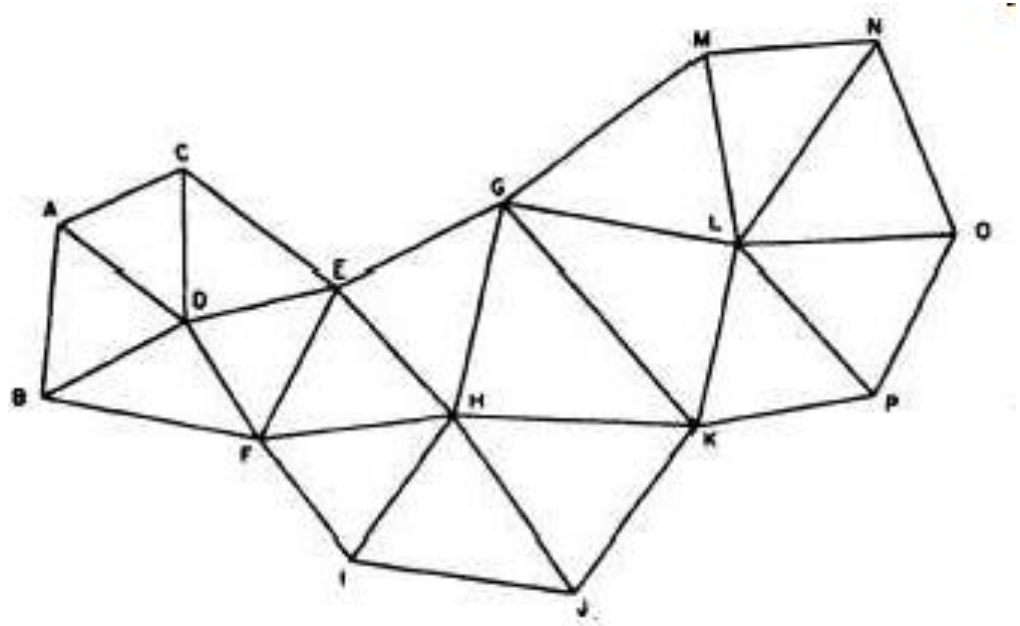
Digital (base) map data

Where do (base) map data and layers come from ?

Mostly from aerial photography and surveying … before 2000



Traditional surveying: triangulation



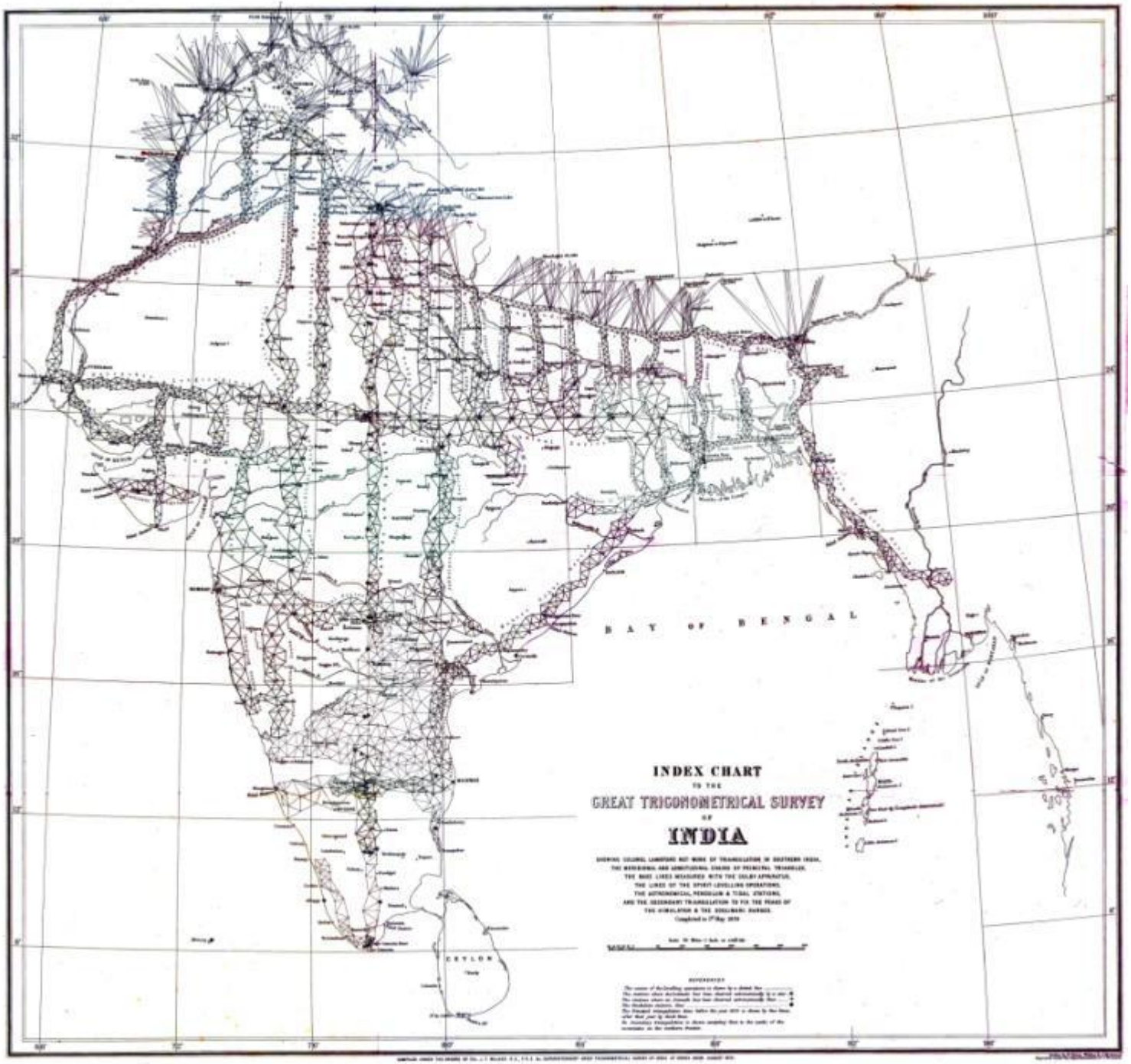
Theodolite

Or by Chain and compass

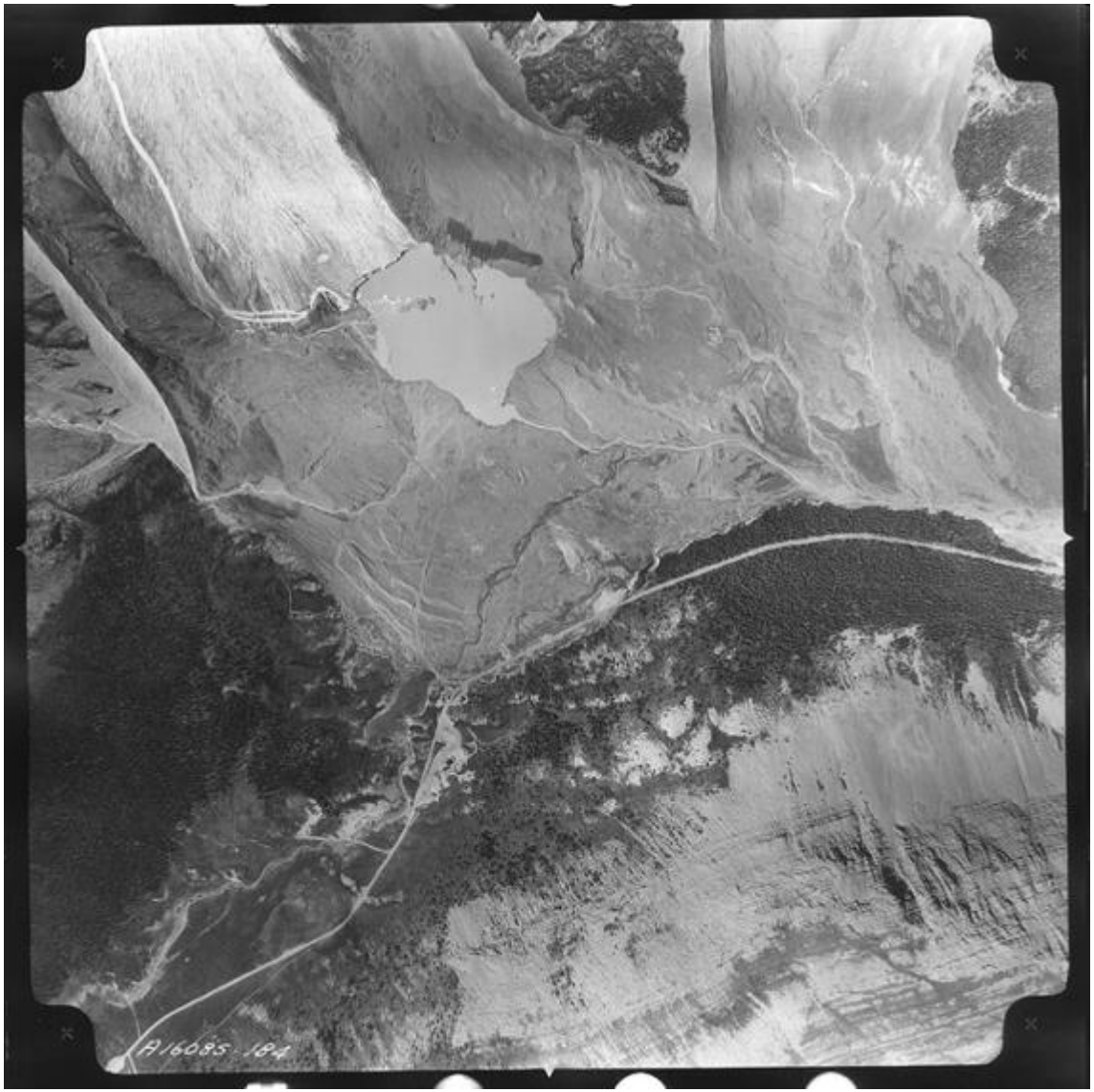
Triangulation station

Geodetic station

The Great trigonometrical survey of India, 1802 - 1870



Since ~1945, our topographic mapping has used aerial photography:
Air photos enabled a huge reduction in natural resources fieldwork costs, and increase how quickly and accurately large areas could be mapped

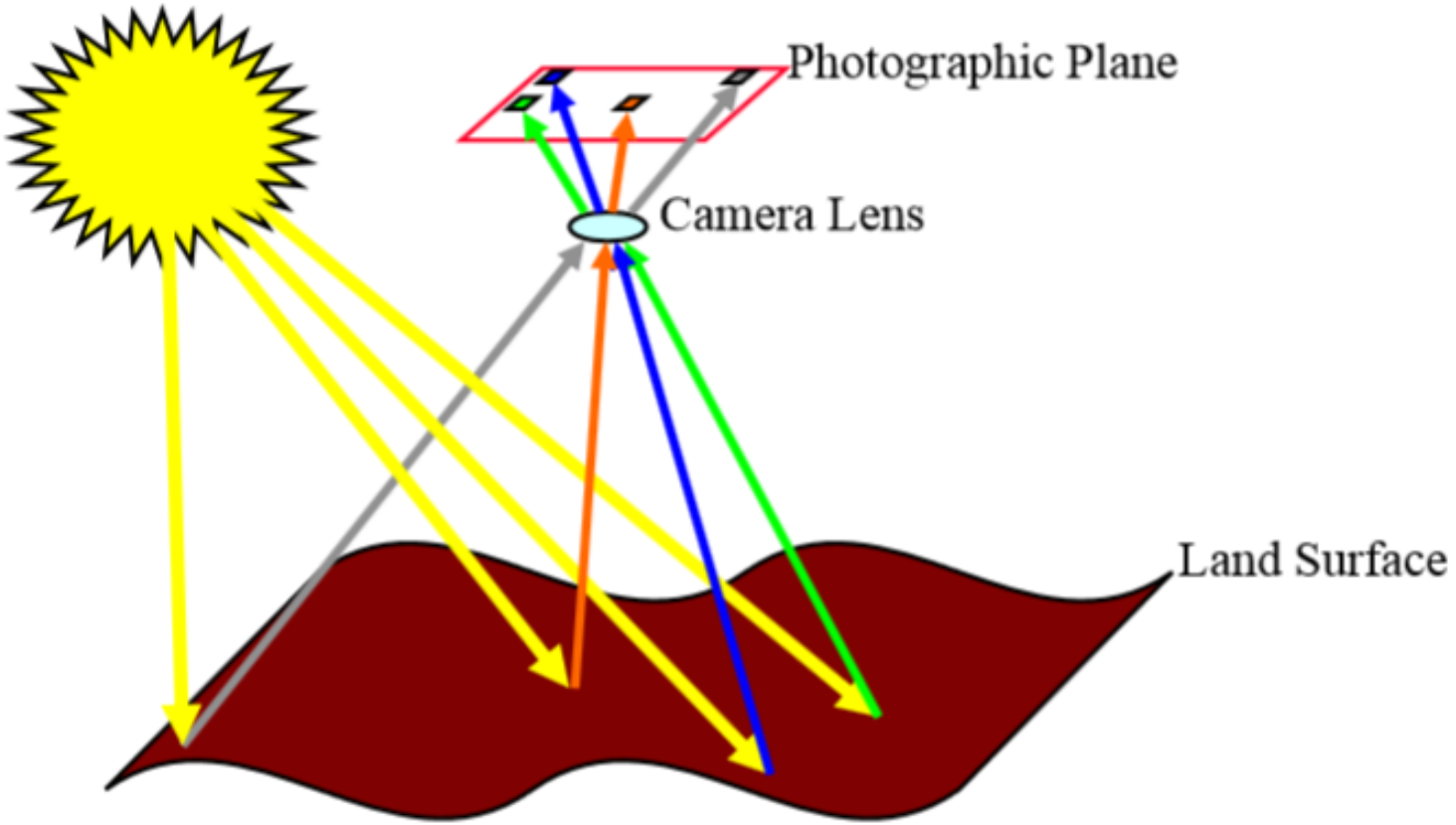


Athabasca Glacier, 1958

Ground points still surveyed by field crews

Photogrammetry: *"the science of obtaining reliable measurements from photos"*

Correction of distortions due to: airplane tip, tilt and swing, radial and relief distortion



Corrected automatically with modern digital photography

Aerial Photos -> ORTHOPHOTOS

Once corrected, and **georeferenced,** photos can be used for topographic mapping and also as a visual layer, with map data overlain on top.

e.g. google maps, pgmap or BC- imap

BC provincial photography was redone every ~10-30 years
City photography : ~3 years (2020 most recently)

UNBC 2003

2006

2010

https://pgmap.princegeorge.ca/Html5Viewer/index.html?viewer=PGMap

Digital (base) map data

1975-85 ~None available (world coastlines etc..)

1985-95 Data generated but not yet available

1995-2005 Data there, but not always affordable

2005 -> Online map viewers e.g. Google Earth

2015 -> More data freely downloadable

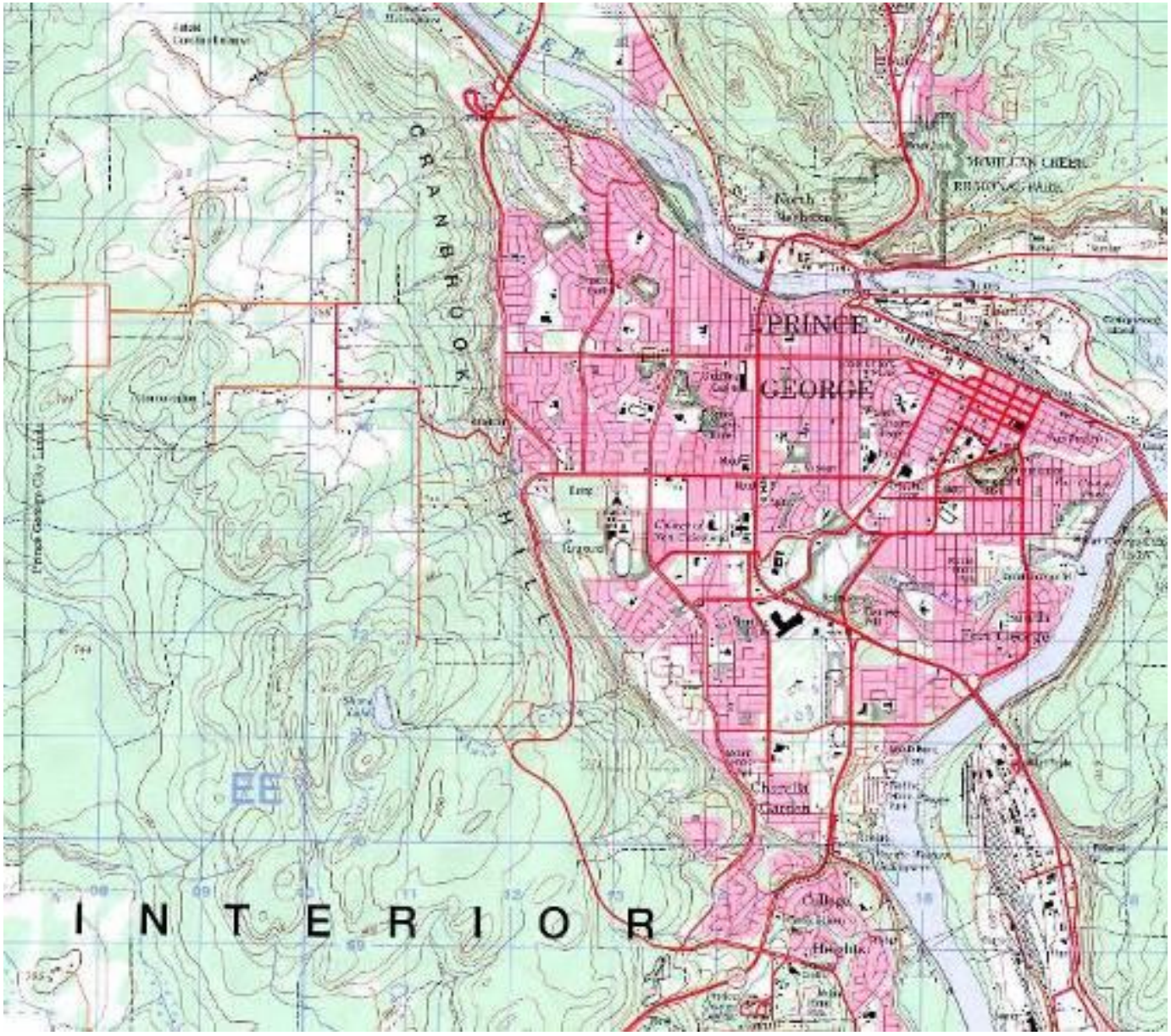
2020 -> Online ’in the cloud’ data links

How has it all been assembled … ?

1. Scanning old maps -> .jpg or .pdf; not editable layers

Georeferenced
(with coordinates)
e.g. geotiff

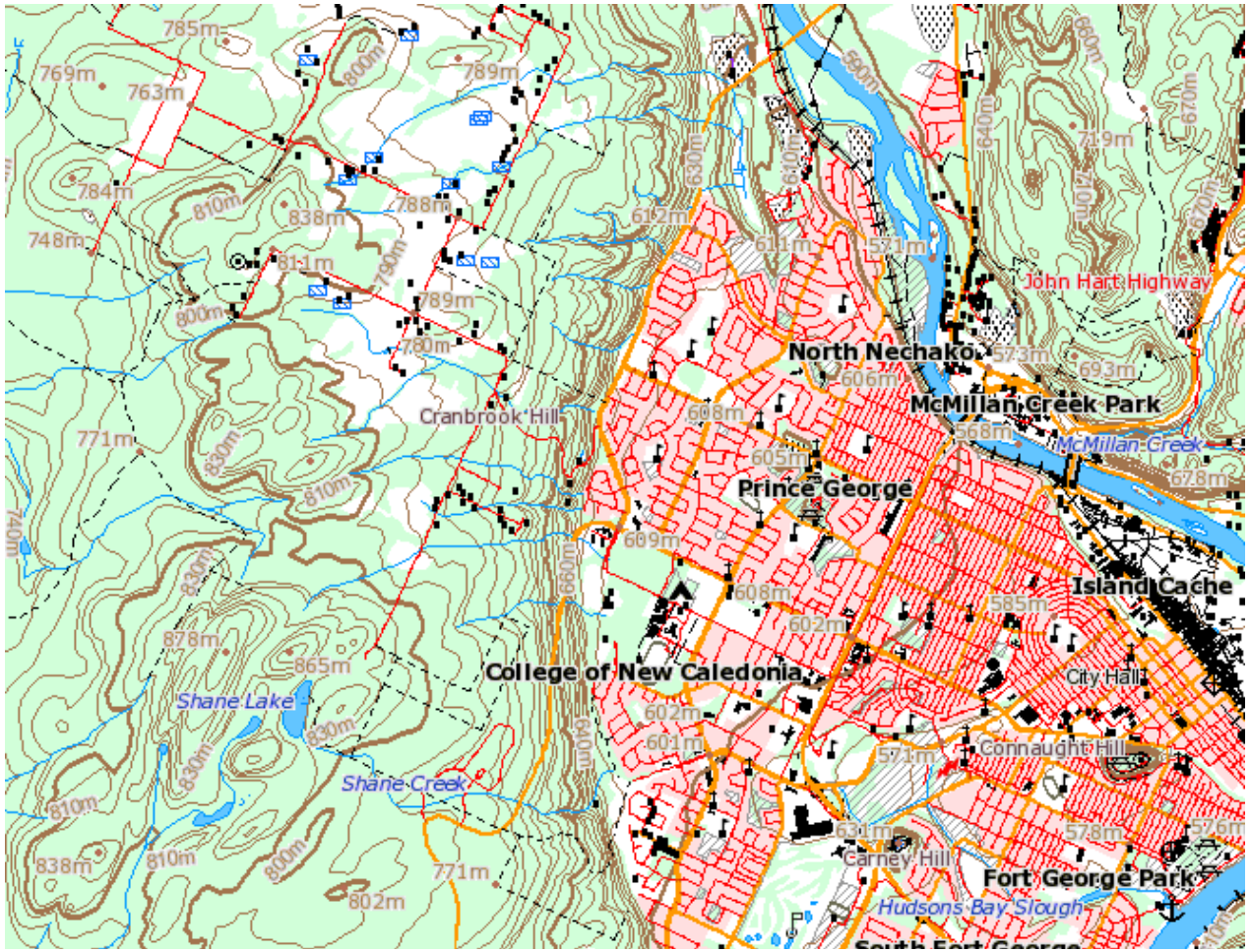
or ‘print ready’
e.g. pdf

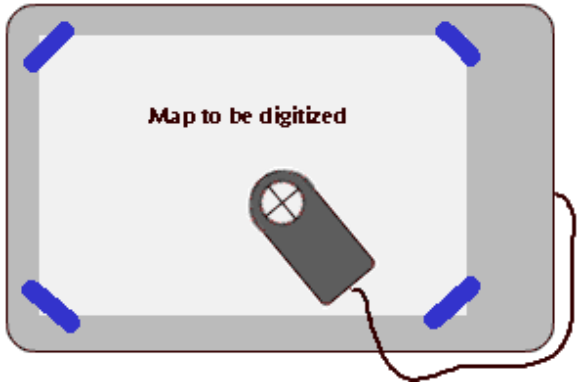


https://open.canada.ca/data/en/dataset/d248b5be-5887-4cfb-942f-d425d82e6ea9

2. Digitizing

Tracing lines on maps using a tablet with map taped down (pre 1995),
… or onscreen 'heads-up'– > 1995





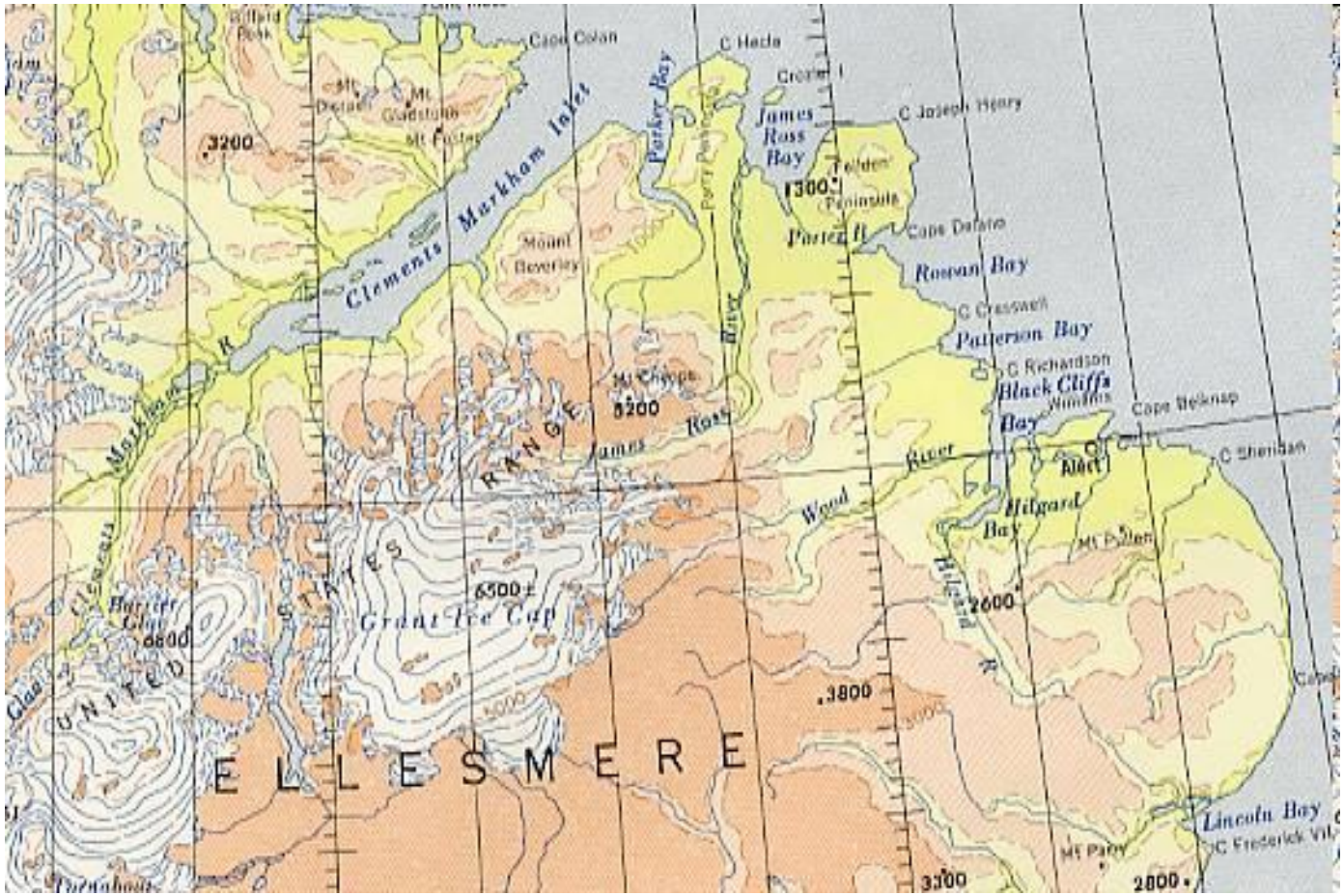
GIS technician jobs 1980s / 90s

Digitizing from printed maps

Purchase cost $500 per map sheet - free after 2007

3. Datasets
a. Global data (small scale)

- The largest scale for the whole world covered is 1:1,000,000.
- The Digital Chart of the World (DCW) was completed in 1993.
- Digitised from the printed International Map of the World (IMW) maps
- It is not suitable for mapping at larger scales.

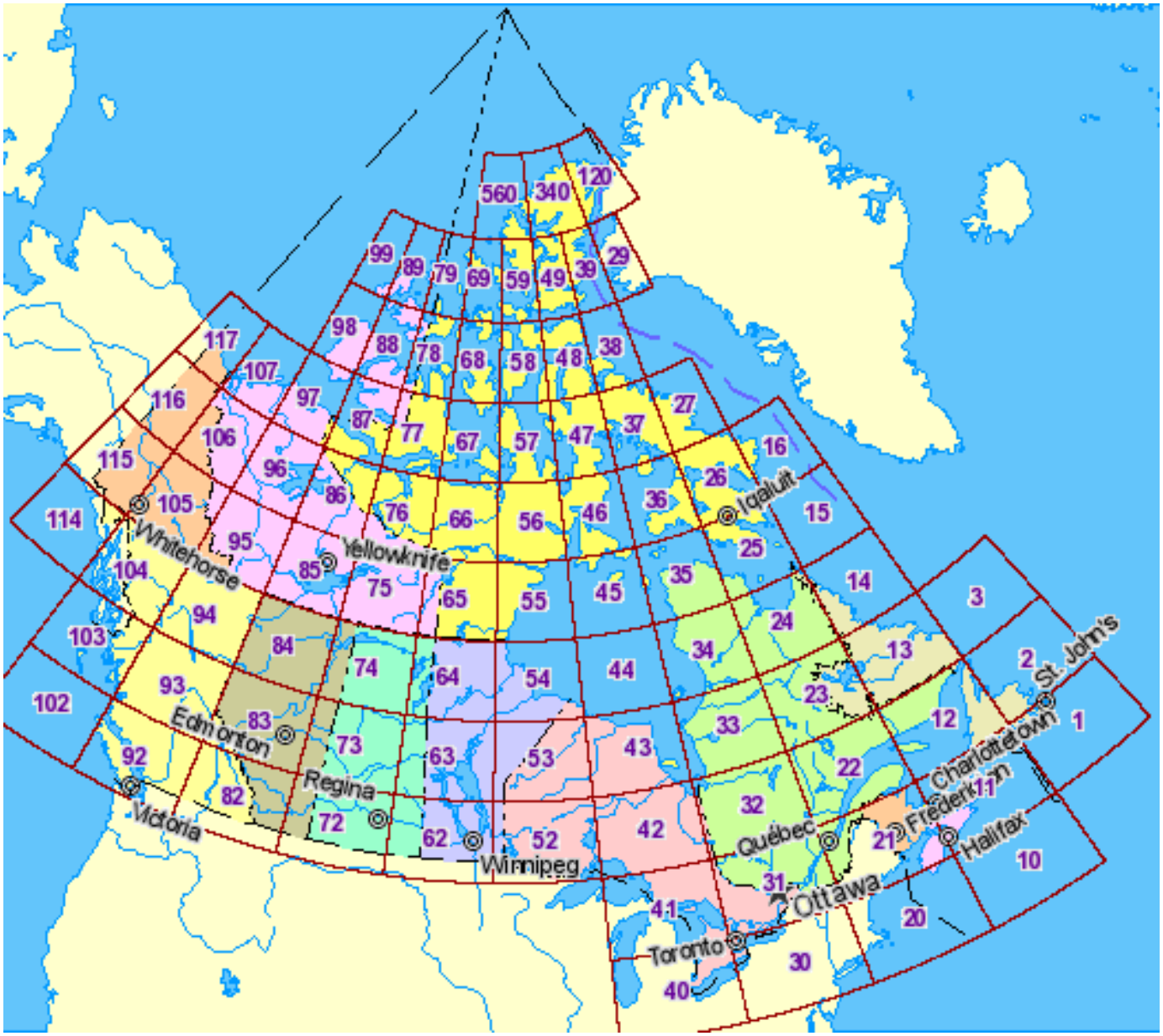


b. **Canada** is divided into 1:1,000,000 sheets, numbered 1-117, 8 ° longitude x 4 ° latitude **1960**

National Topographic Series (NTS)

Digital: National Topographic DataBase (NTDB)

Small-scale

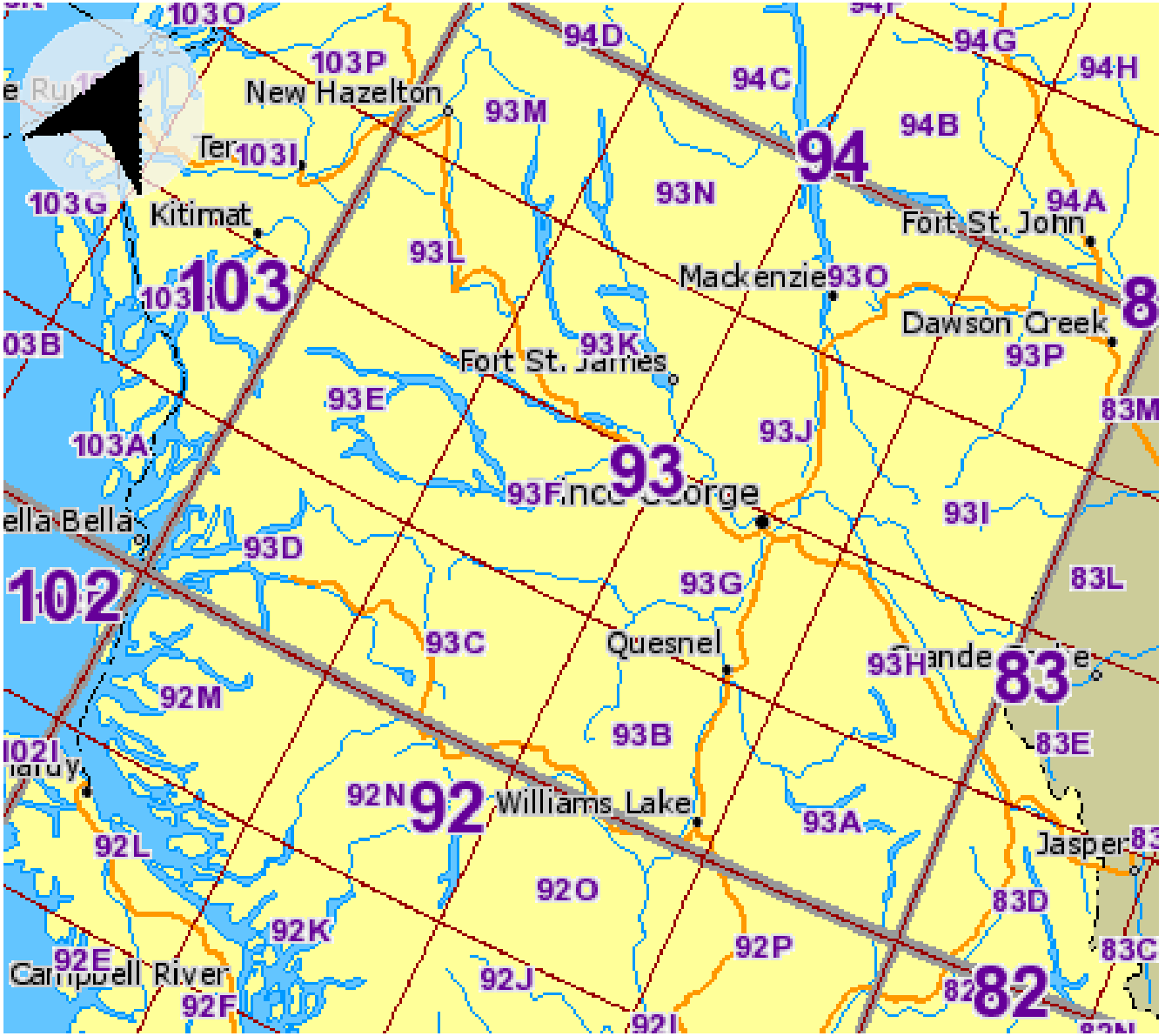


1:1,000,000 maps are divided into (16) 1:250,000 sheets, completed **1970**

c. 1:250,000

Medium-scale

Digital: 1990



1:250,000 corresponds to 1 cm = 2.5 km

then into 16 x 1:50,000 (A-P), completed for provinces ~**1994**

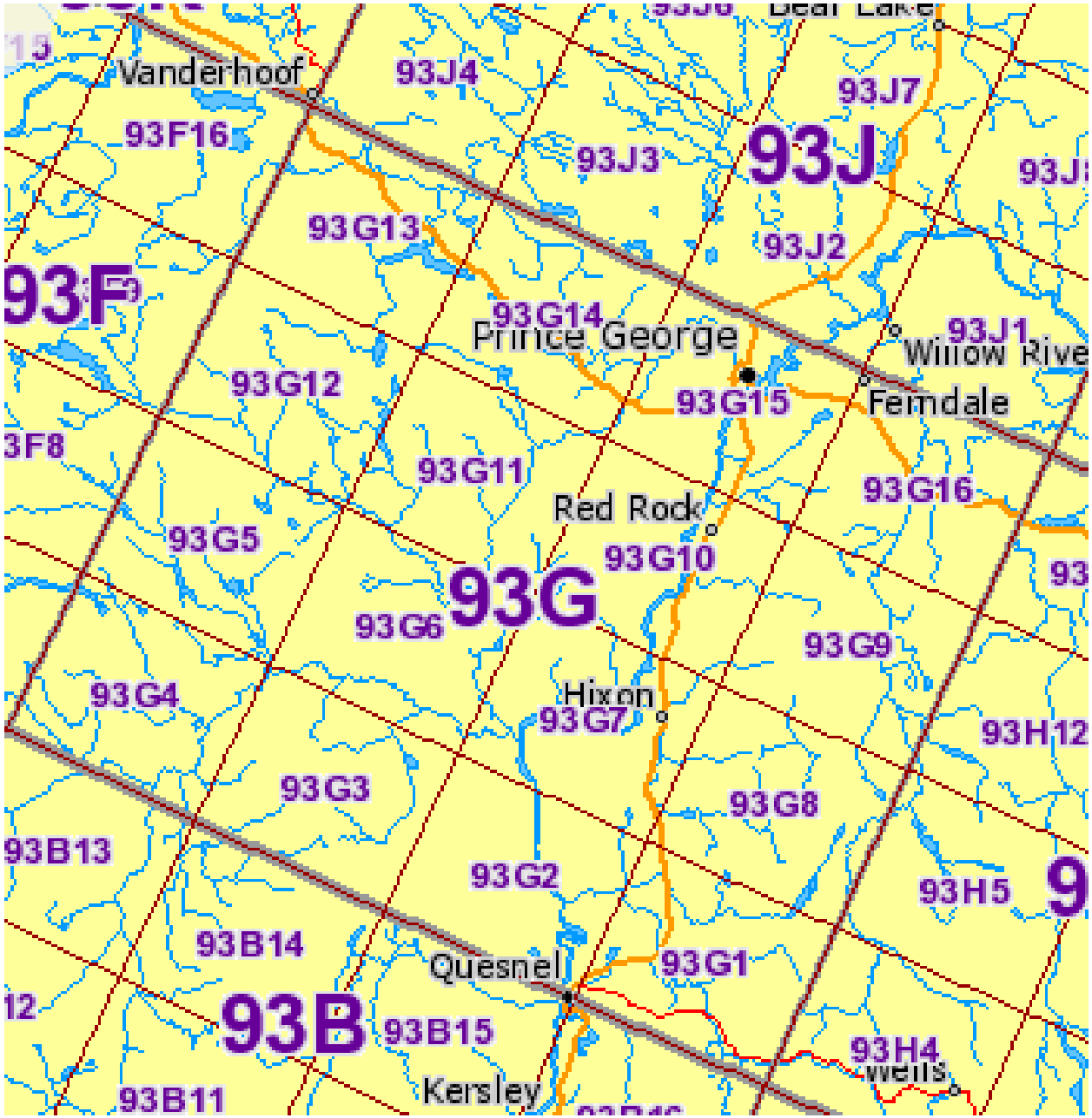
d. 1:50,000 large-scale

BC: 1168 maps

Canada: 13,377

Digital 2005

Canada Completed 2012



1:50,000 corresponds to 1cm = 0.5 km

NTS (National Topographic System) -> National Topographic Database (NTDB)

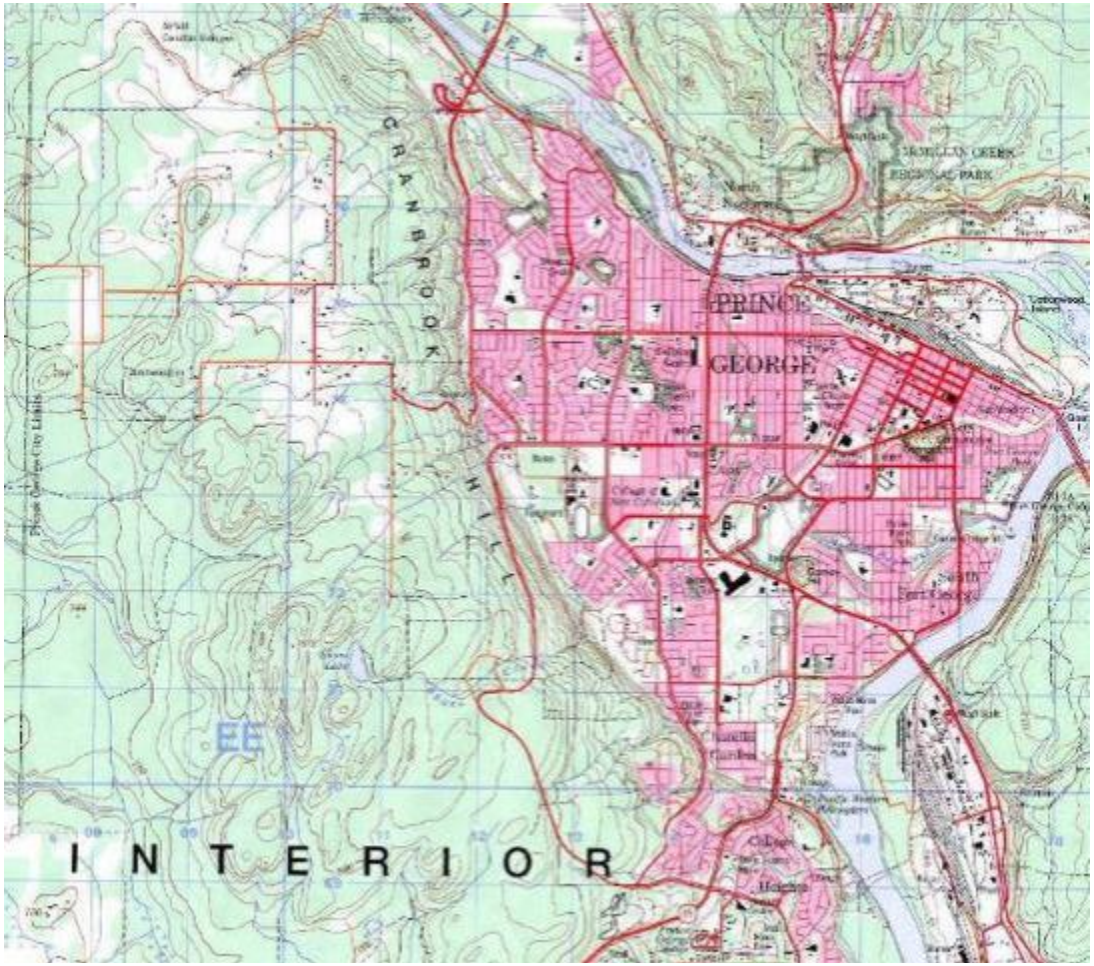
All Canada 13,377 maps : 1:50,000 Prince George: sheet 93G15

a. Printed NTS maps
(Weller Library)

a. Scanned map (pdf) - Raster image - 'print-ready' or georeferenced e.g. for GPS / background

a. **Digital vector layers for mapping – every point, line, feature manually digitised (but not all current)**
…. e.g. only roads are updated

PG: most data from 1982

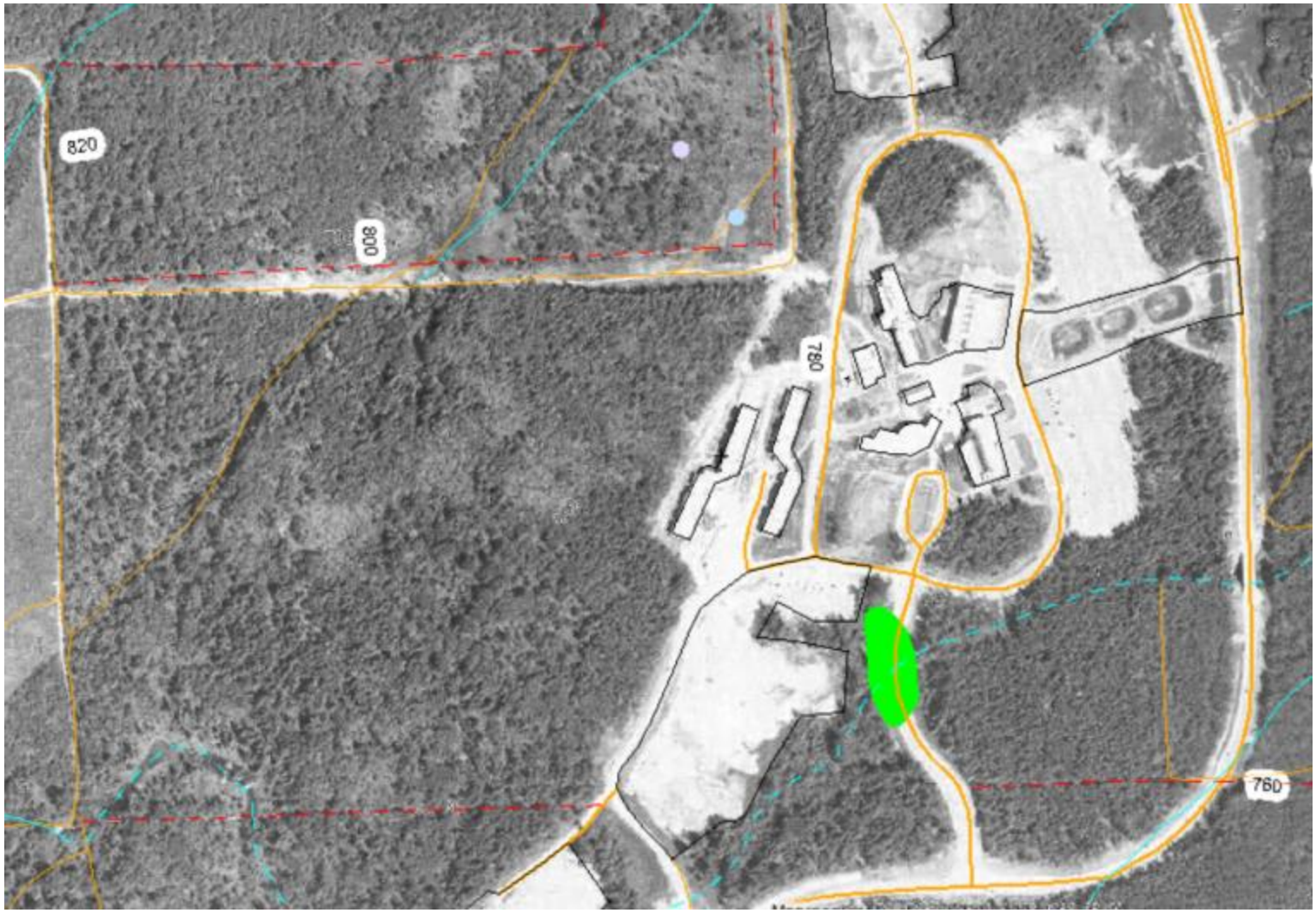


The promise of digital mapping (since 1975)

- **Data for everyone …… much are free since ~2010**
- **Seamless database …. after 2015 -map sheet or Area of Interest (AOI)**
- **Frequent updating …. municipal, not provincial / federal**
- **Errors of interpretation and change … always with us**

Errors are possible before or after digital eras

- Features are misinterpreted (e.g. UNBC Agora, and false trails)
- Changes will make features out of date e.g. NSC, T+L building



Spatial digital data: location and attributes

Map layers encode two different types of information:

a. Spatial location (where is it ?)

b. Attributes (what is it ?)

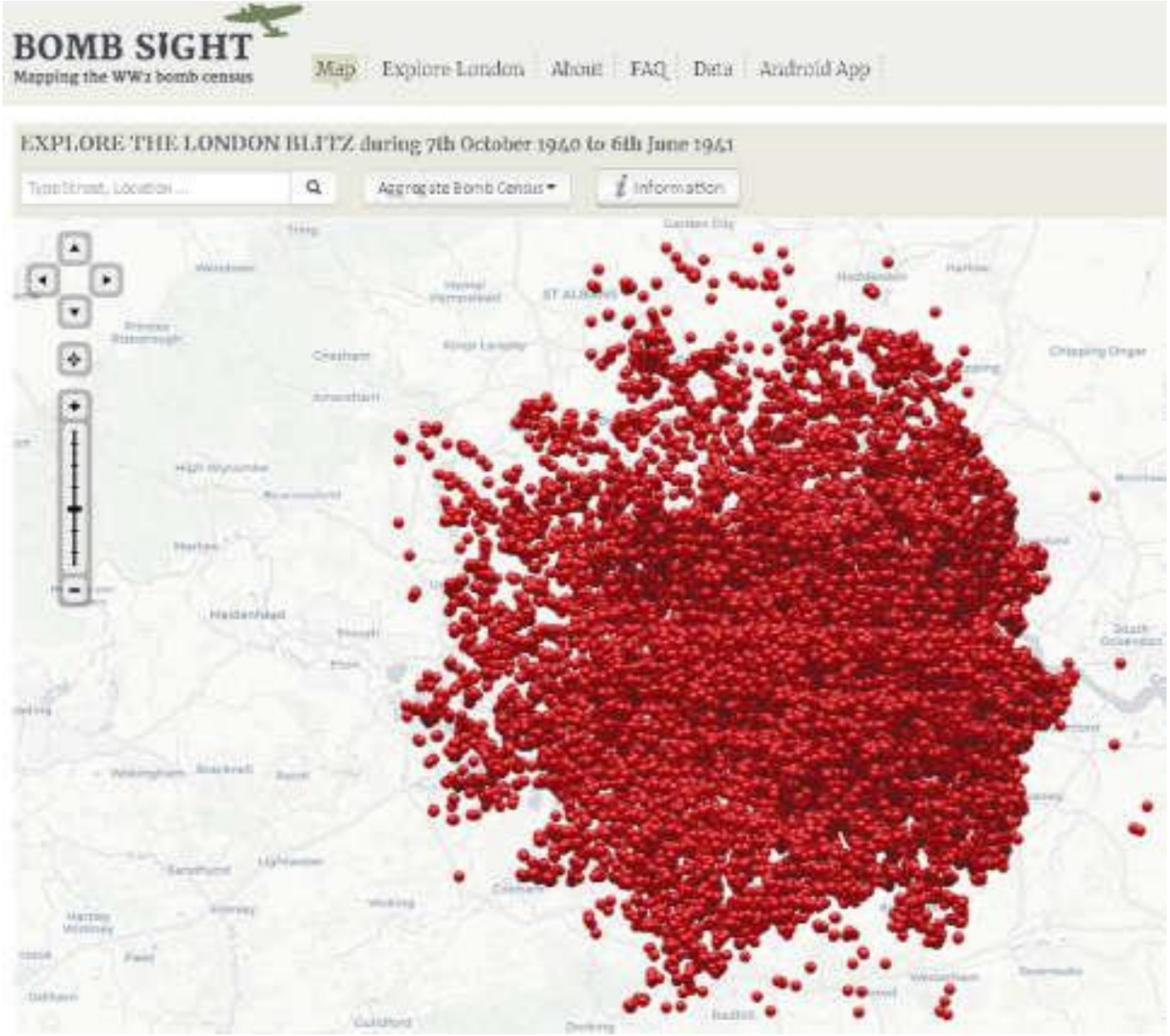
.....

In GIS software, these data are stored in a single 'layer'
but through multiple files - *This differs from non-GIS software*

e.g. Roads as a 'shapefile' (since ~1992)

roads.shp *roads.dbf* *roads.shx* *roads.prj*

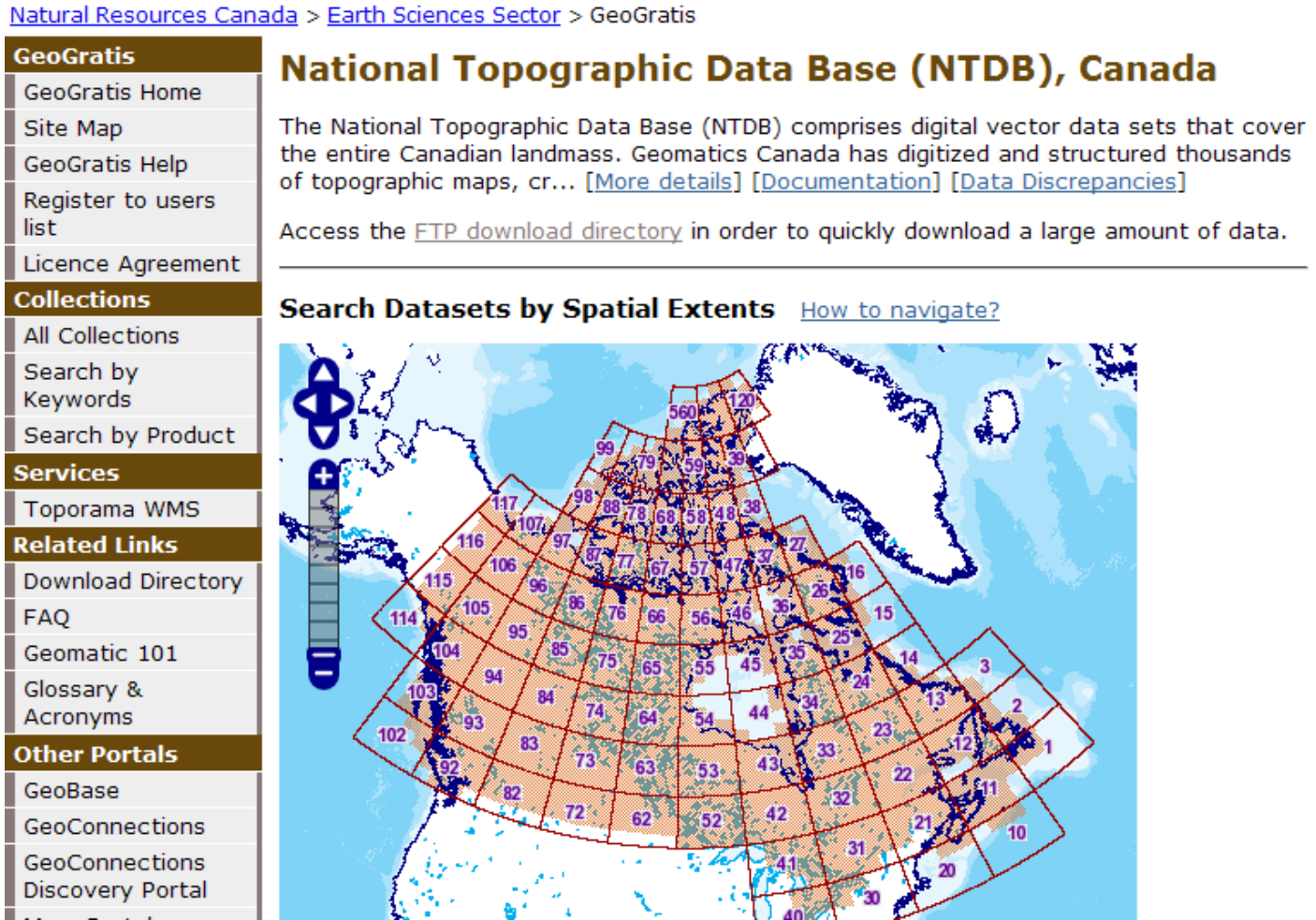
http://bombsight.org



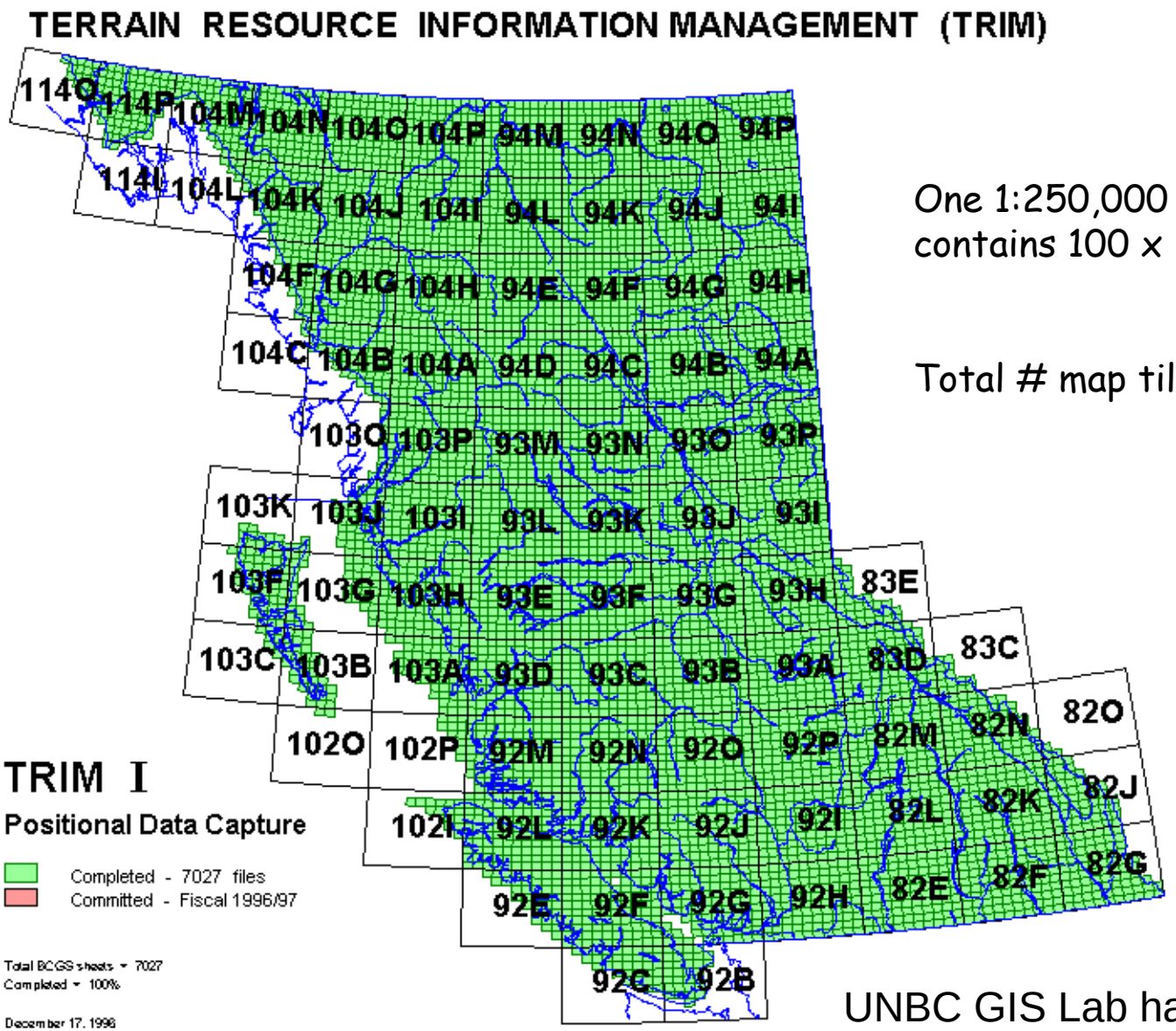
Federal: NTS (analogue maps) -> NTDB (digital) - medium to large scale

1:50,000 and 1:250,000

Since spring 2007 freely downloadable from geogratis.cgdi.gc.ca
August 2017: https://maps.canada.ca/czs/index-en.html
by map sheet or Area of Interest (AOI)



BC has its own provincial data at 1:20,000 and is 'more recent' 1980s, 90s

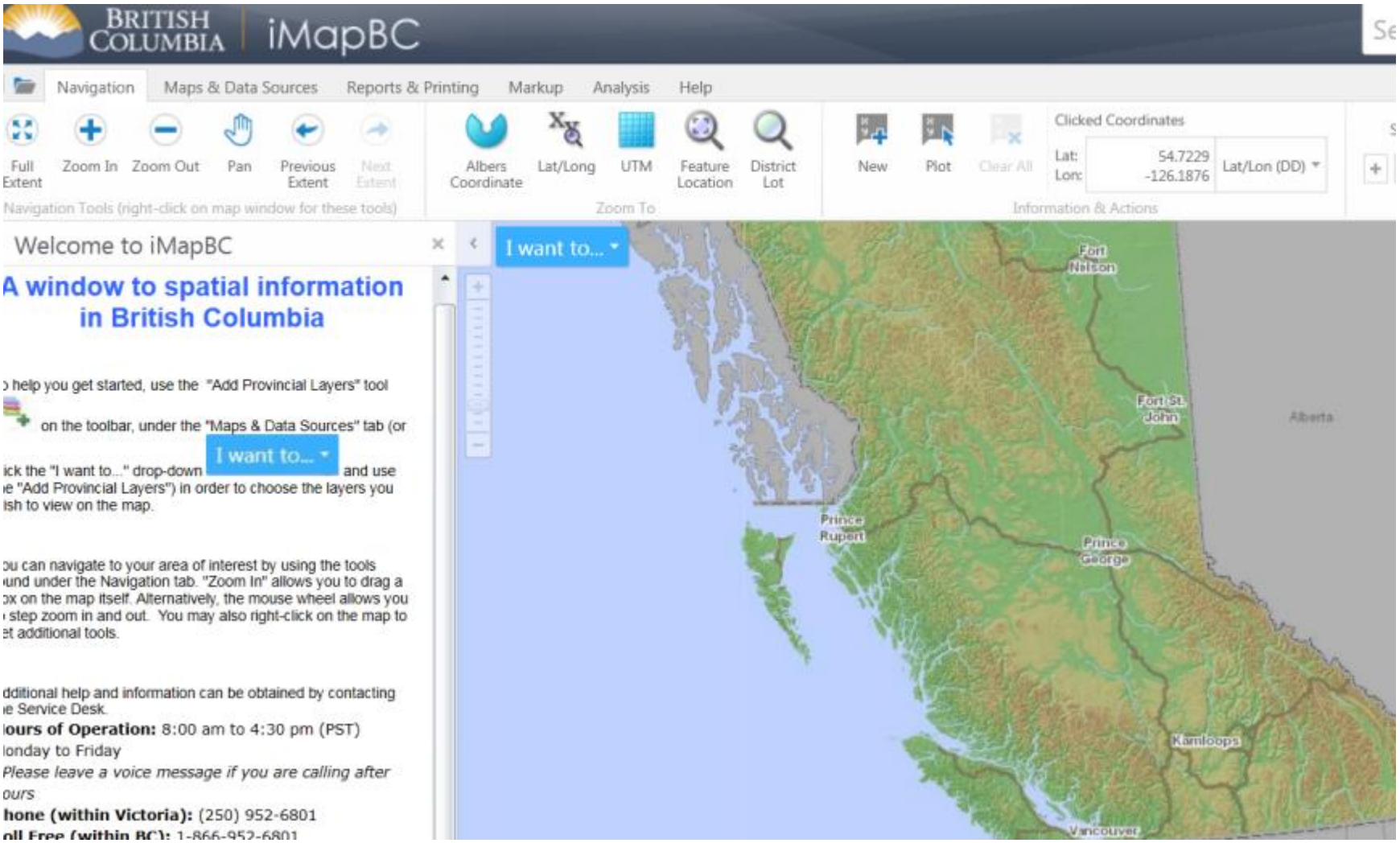


One 1:250,000 map sheet contains 100 x 1:20,000

Total # map tiles = 7027

UNBC GIS Lab has all these

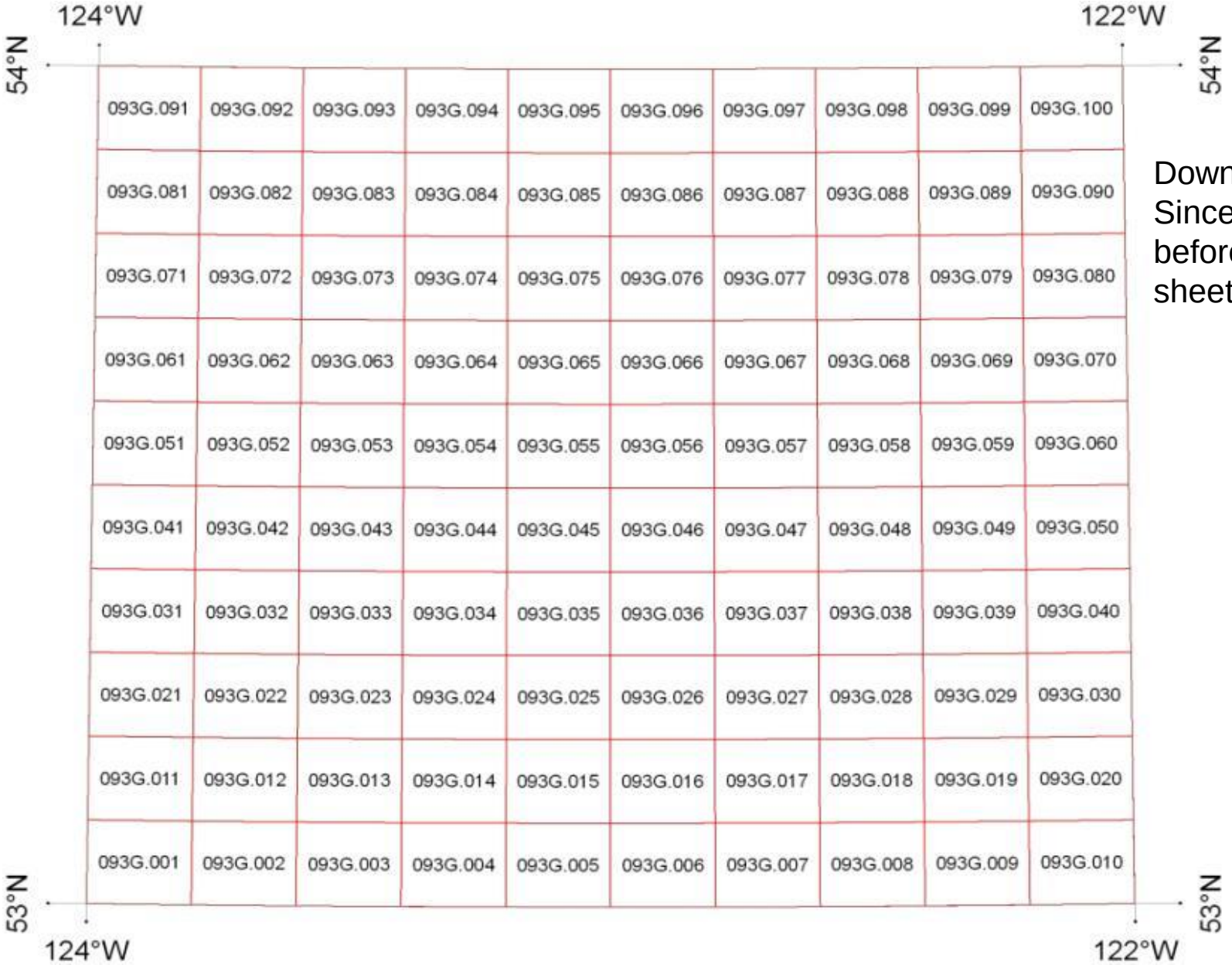
BC geographic data viewer ‘imapBC’



https://maps.gov.bc.ca/ess/hm/imap4m/

https://www2.gov.bc.ca/gov/content/industry/mineral-exploration-mining/british-columbia-geological-survey/mapplace

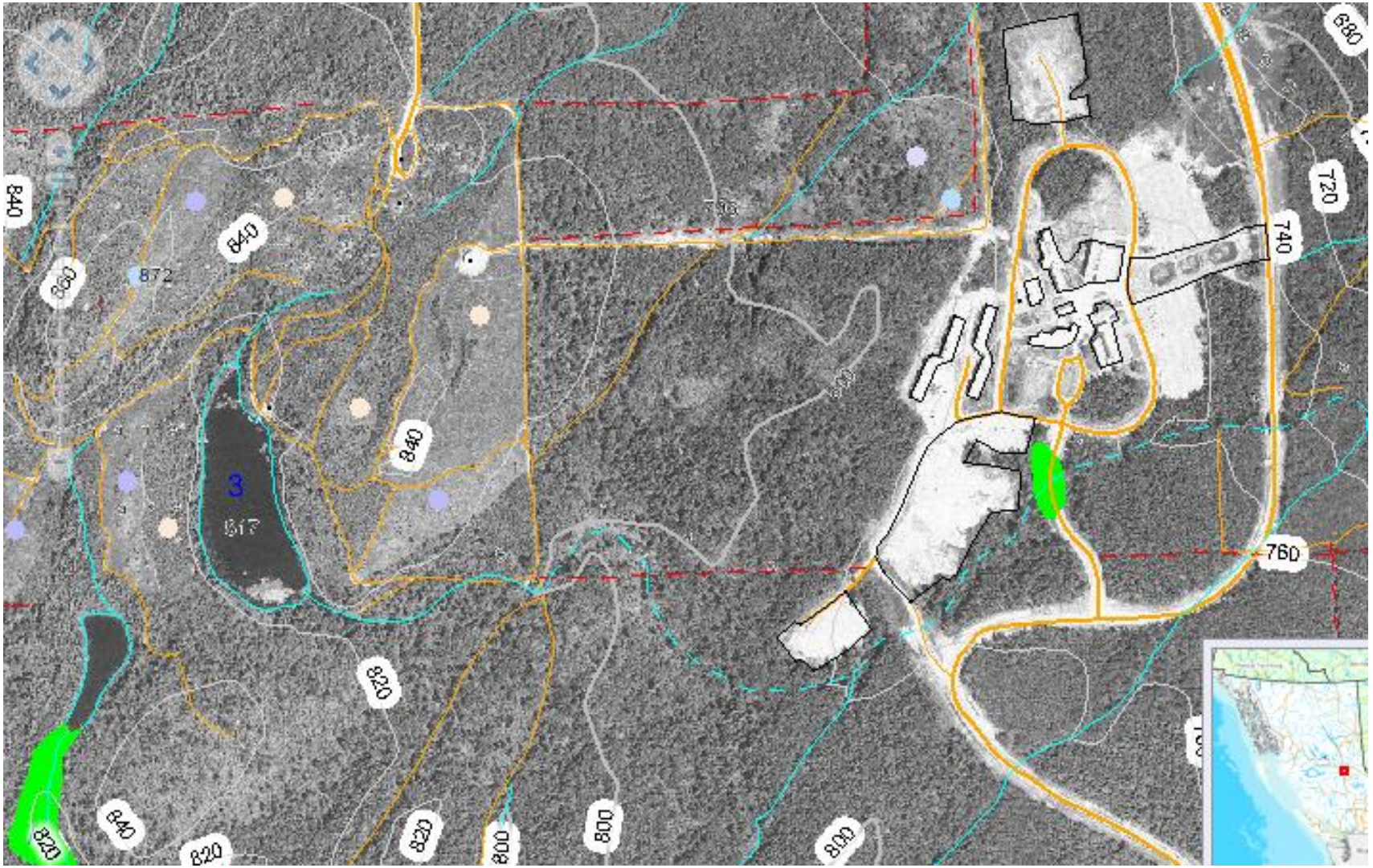
Each 1:20 000 TRIM sheet (13 x 11km) or 6′ latitude by 12′ longitude.



Download by AOI
Since ~2015,
before by map
sheet

BC digital data – Terrain Resource Information Management (TRIM)

Onscreen from digital (stereo) photogrammetry (not digitized from maps)
More 'current' and more detailed : 1:20,000 (from 1980s and 1990s)



TRIM BC 1:20,000 maps no **longer** available as printed maps

But you can pay $38 for a T-shirt …..

http://blog.oplopanax.ca/2013/06/bc-trim-maps-are-just-pdf/

Municipal data – not always accessible (1:5,000)

PG data - since 2011: https://data-cityofpg.opendata.arcgis.com/

From digital aerial photography – downloadable from PG city site or UNBC GIS Lab

Canada summary

Municipal data: sometimes available **(check around)**

Provincial 1:20,000 mapping (Bold = free download)

BC, AB, **MB**, ON (south = 50°N), QC (south), **NS**, NB, PEI

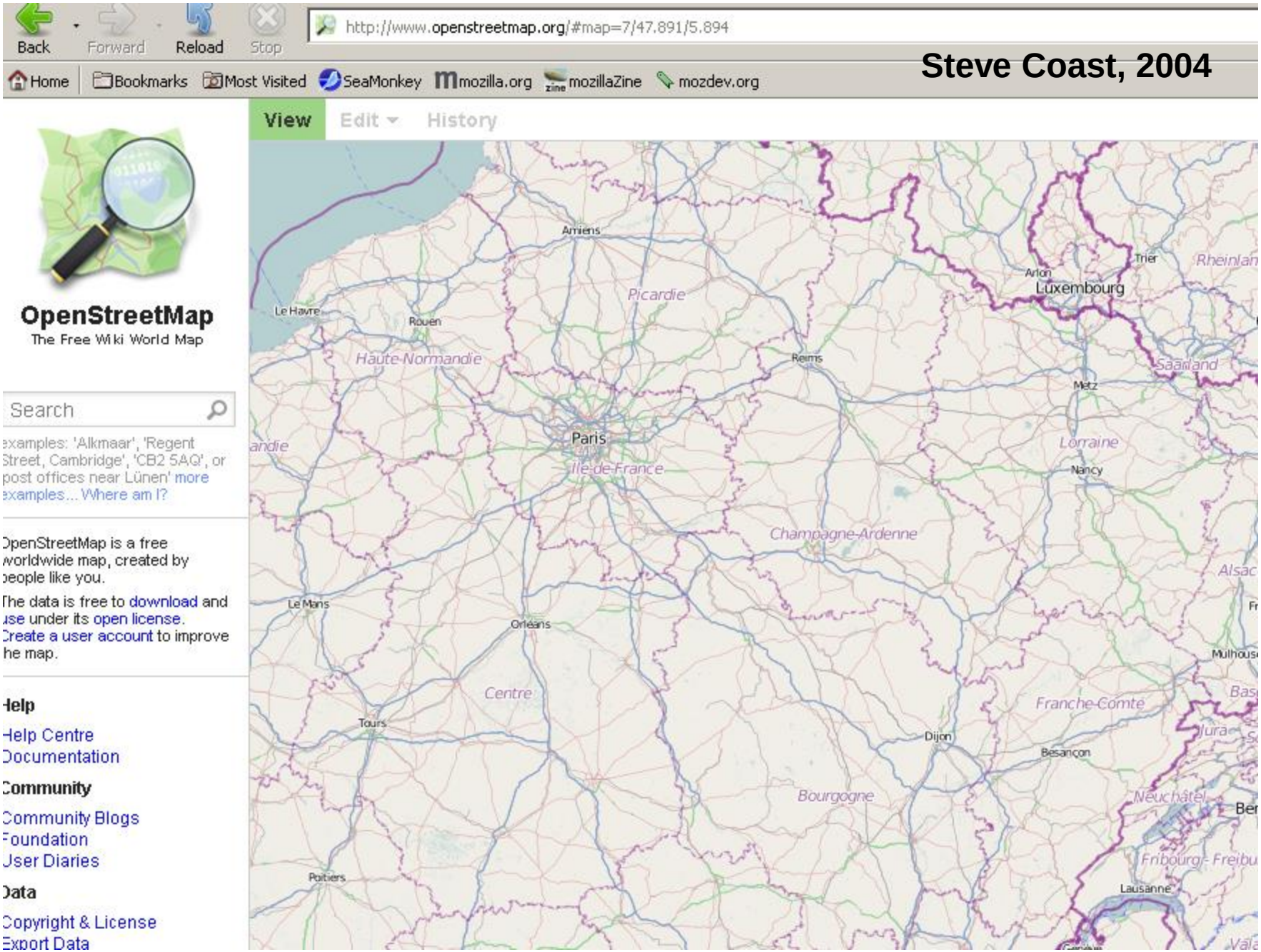
NTDB mapping only (1:50,000)

SK, NL, ON (north), QC (north) NT, NU, YT *

- Yukon Geomatics: http://www.geomaticsyukon.ca/
- Canada: http://canadiangis.com/data.php

Other countries: highly variable – free download, high cost, military only

User generated data (by digitizing, GPS etc..): http://www.openstreetmap.org



New millennium map data creation:

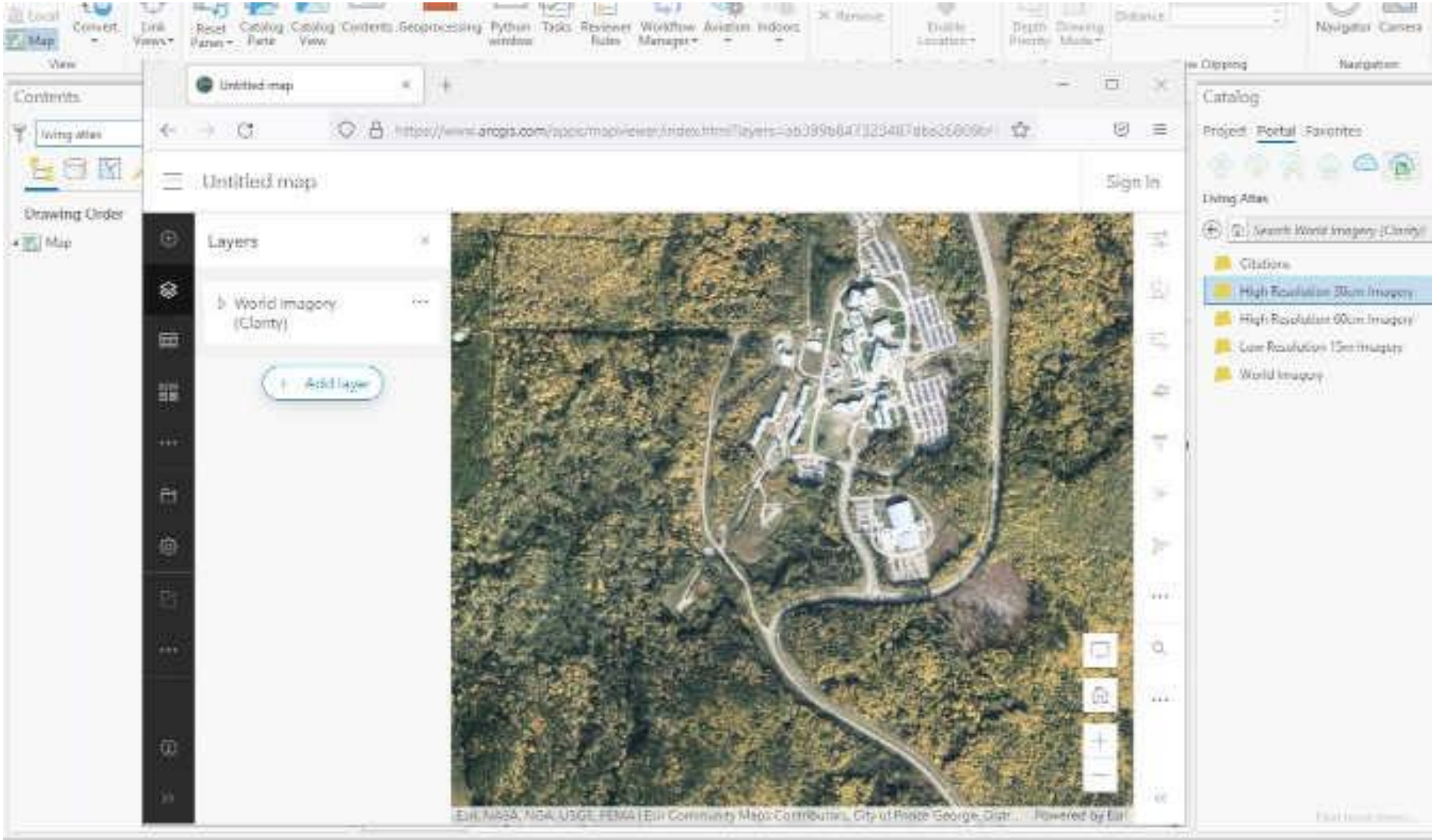
- Digital aerial photography
- Satellite imagery (remote sensing)
- Global Positioning Systems (GPS)
- UAVs (drones)
- LiDAR
- Online sources e.g. from GIS analysis

Data layers from ArcGIS online

e.g. living atlas of the world

Via the Portal

https://livingatlas.arcgis.com



Many thematic layers – see thematic lectures