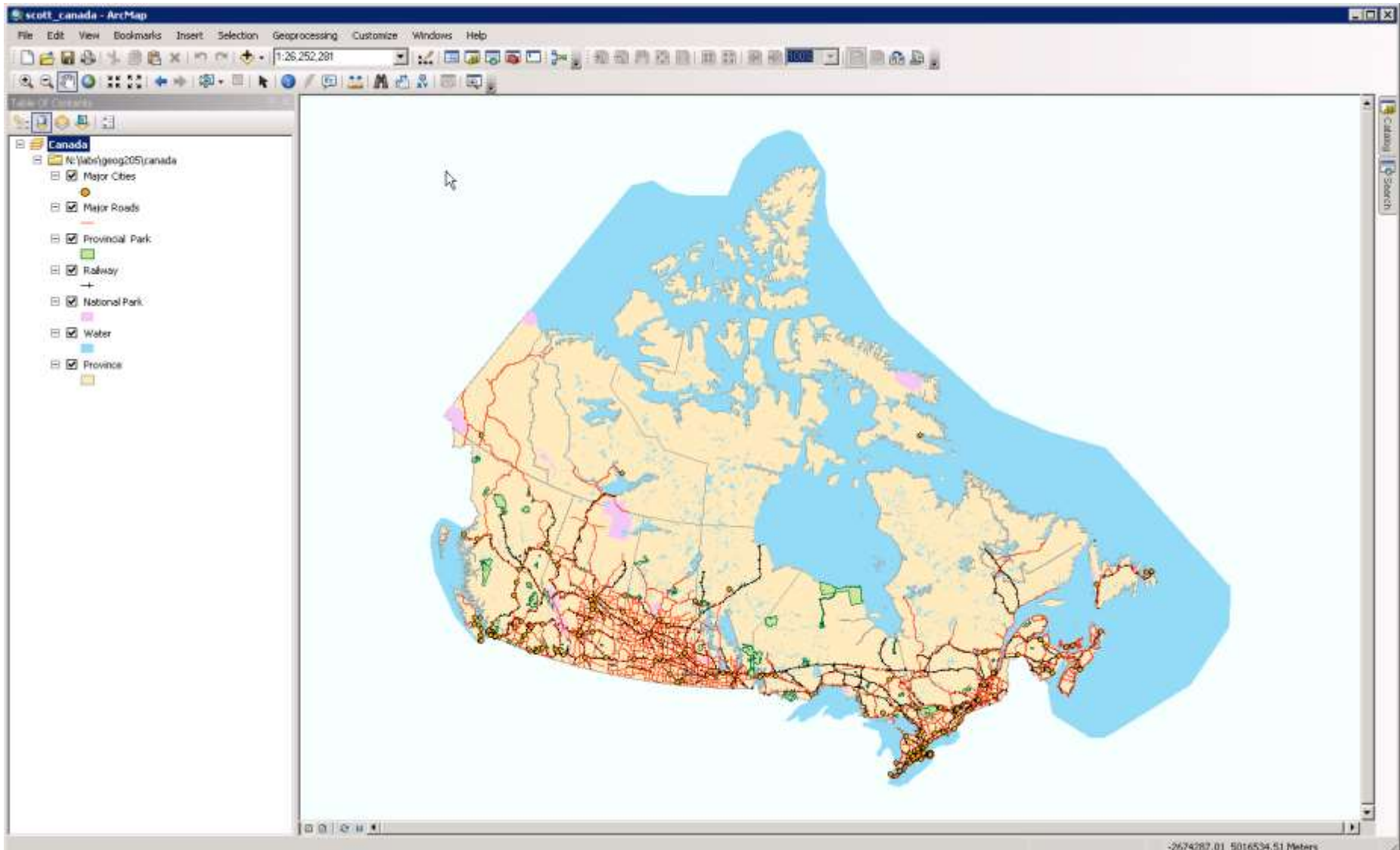


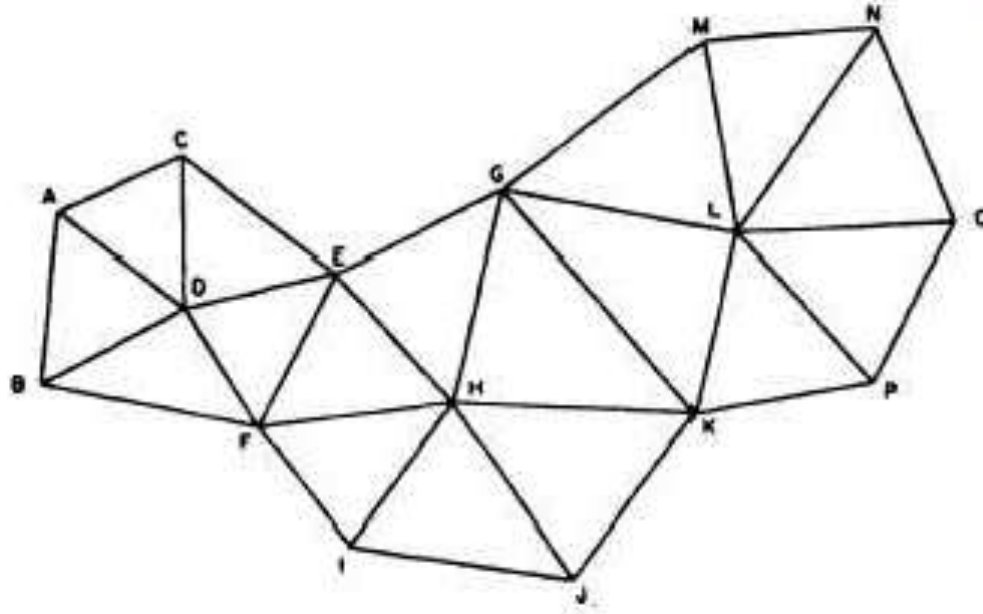
# Digital (base) map data

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

Mostly from aerial photography and surveying ... before 2000



# Traditional surveying: triangulation



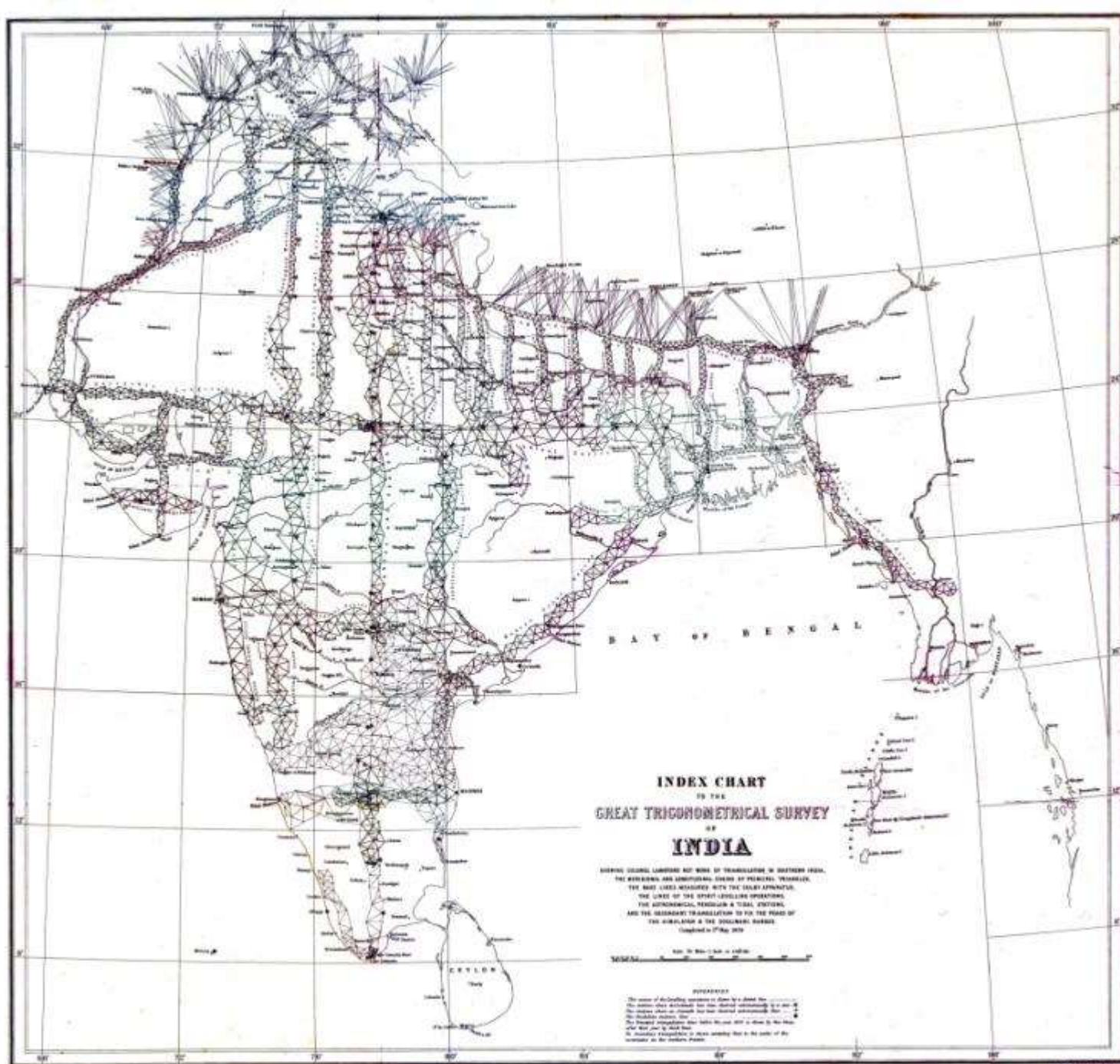
Or by Chain and compass

Theodolite



Triangulation station  
Geodetic station







Since ~1945, all 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

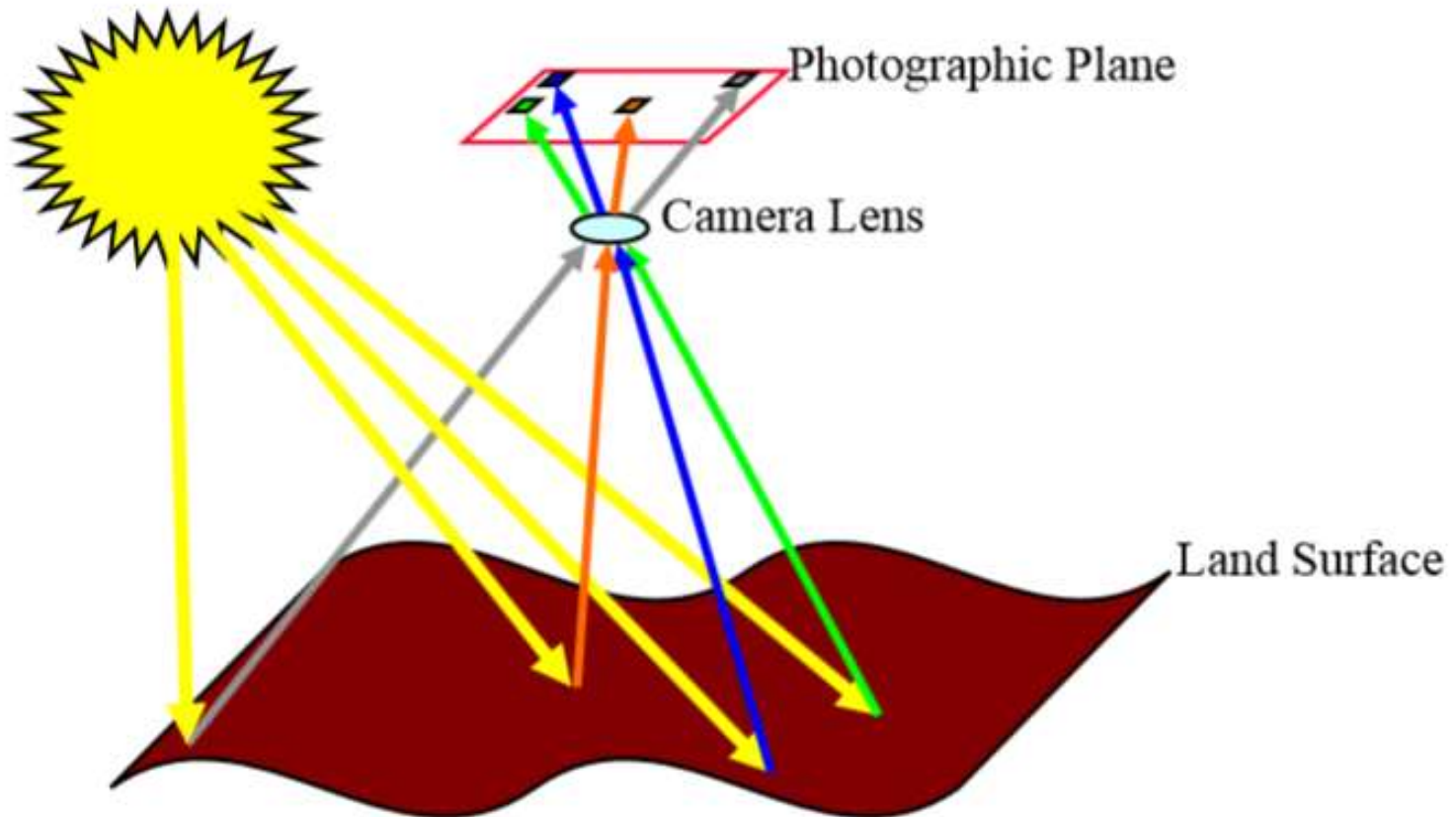


Athabasca Glacier, 1958

***The two branches of aerial photography are photogrammetry and Air photo interpretation***

***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

# 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](#) ).





Photo interpretation - identifying point, line and area features, and changes enabled from sequence of photos:  
BC provincial photography is generally redone every 10+ years  
City photography more frequently: ~3 years

PG 2003



2006



2010

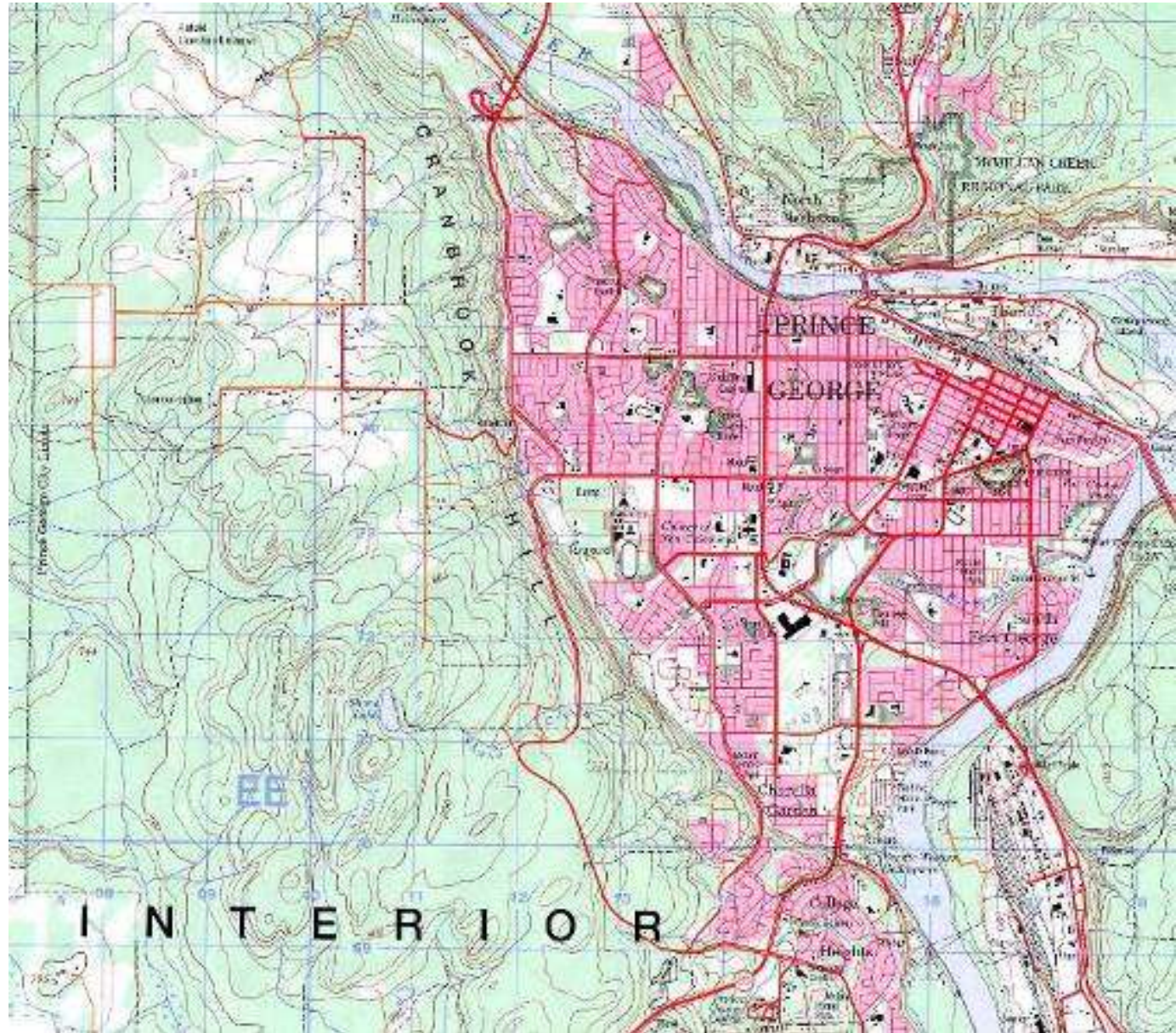


<https://pgmappub.princegeorge.ca/Html5Viewer/?viewer=PGMapMobile>



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

georeferenced  
or 'print ready'

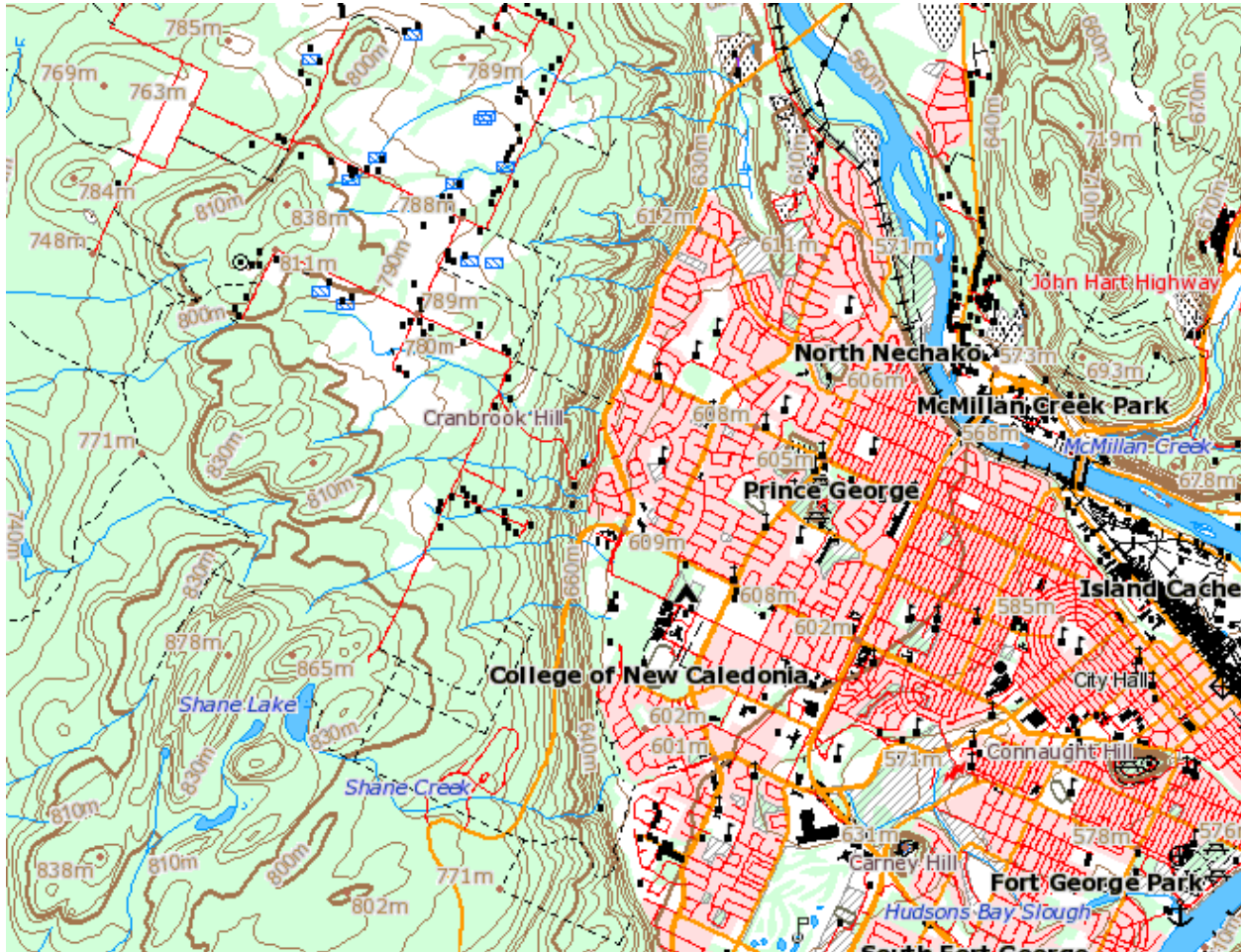


[ftp://ftp.geogratis.gc.ca/pub/nrcan\\_rncan/raster/toporama/](ftp://ftp.geogratis.gc.ca/pub/nrcan_rncan/raster/toporama/)



## 2. Digitizing

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



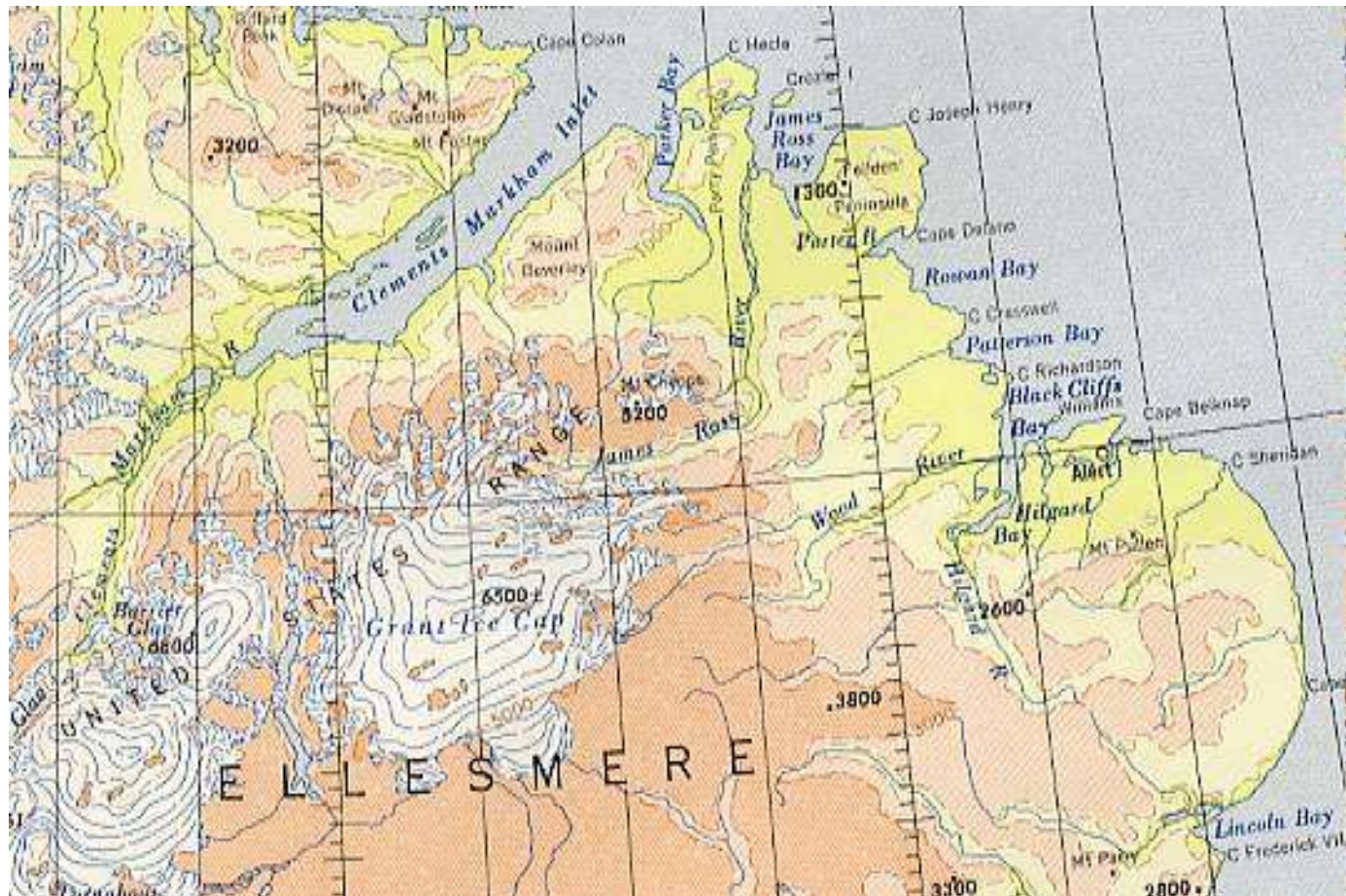
GIS technician  
jobs 1980s / 90s

Digitizing from  
printed maps

Purchase cost  
\$500 per map  
sheet - free  
after 2007

## Digitising 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.



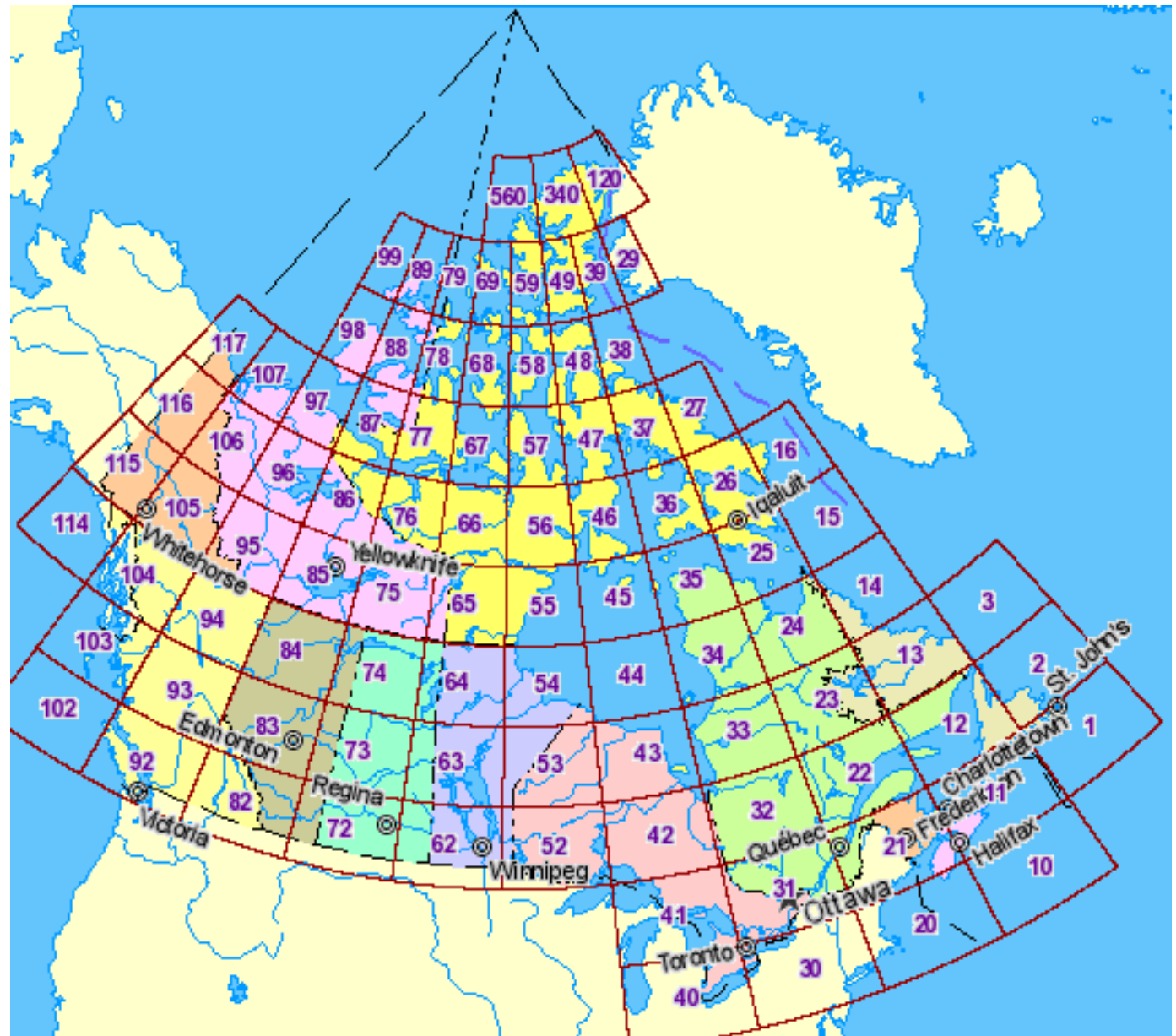


Canada is divided into 1:1,000,000 sheets, numbered 1-117,  
8 ° longitude x 4 ° latitude **1960**

## National Topographic Series (NTS)

Small-scale

Digital: National  
Topographic  
DataBase (NTDB)

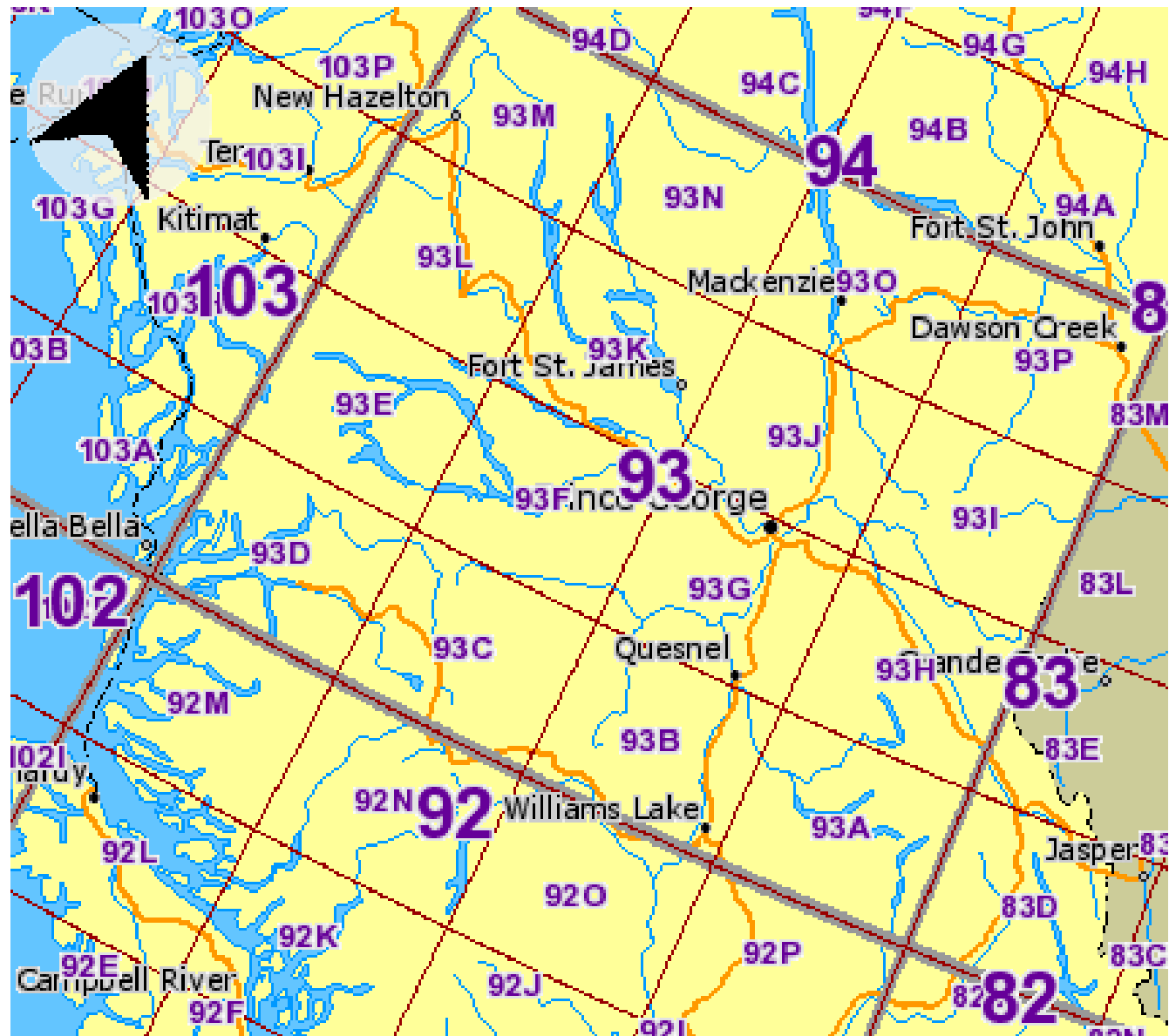


1:1,000,000 maps are divided into (16) 1:250,000 sheets, completed **1970**

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

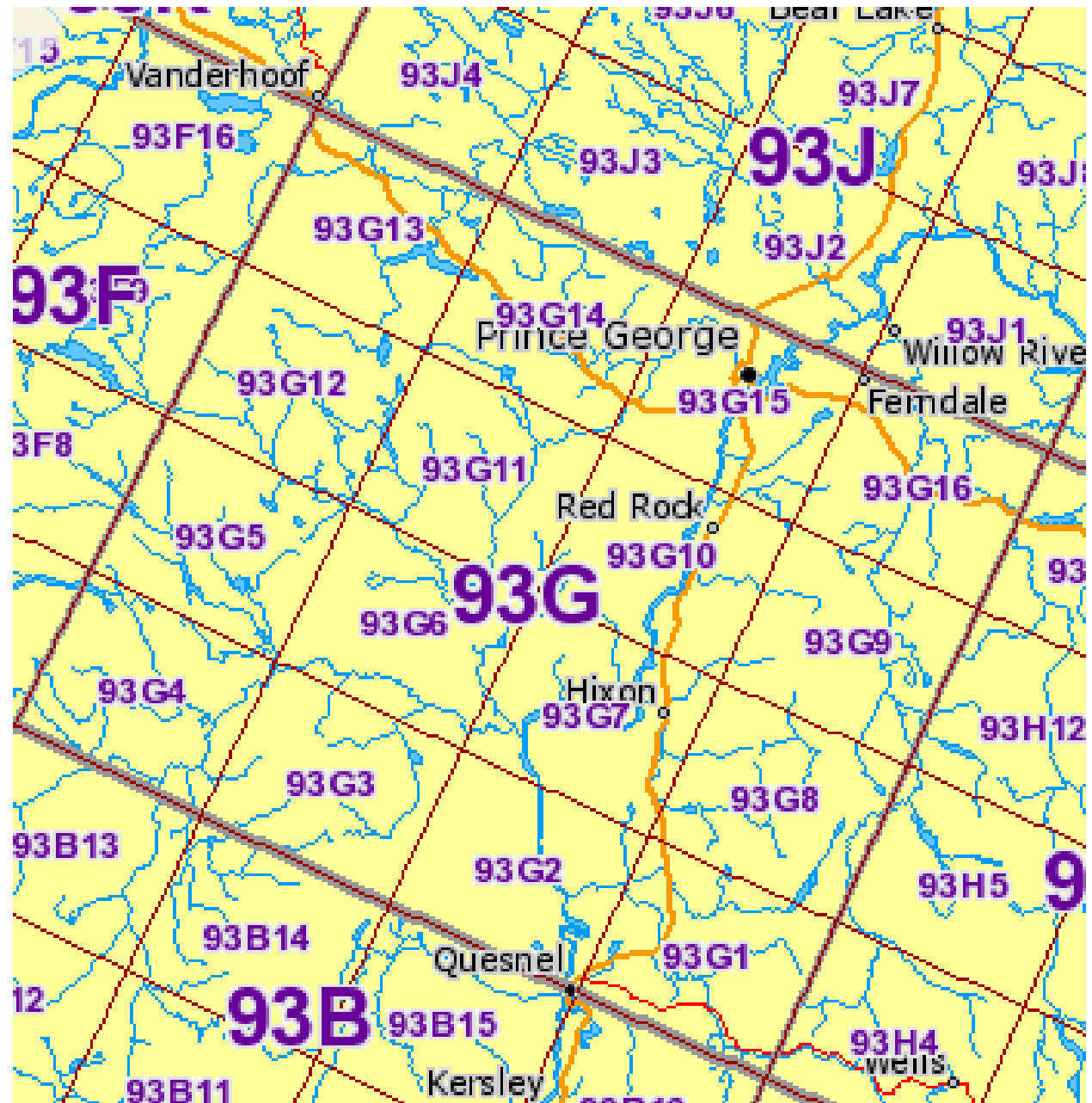
large-scale  
1:50,000

BC: 1168 maps

Canada: 13,377

Digital 2005

Canada Completed  
2012

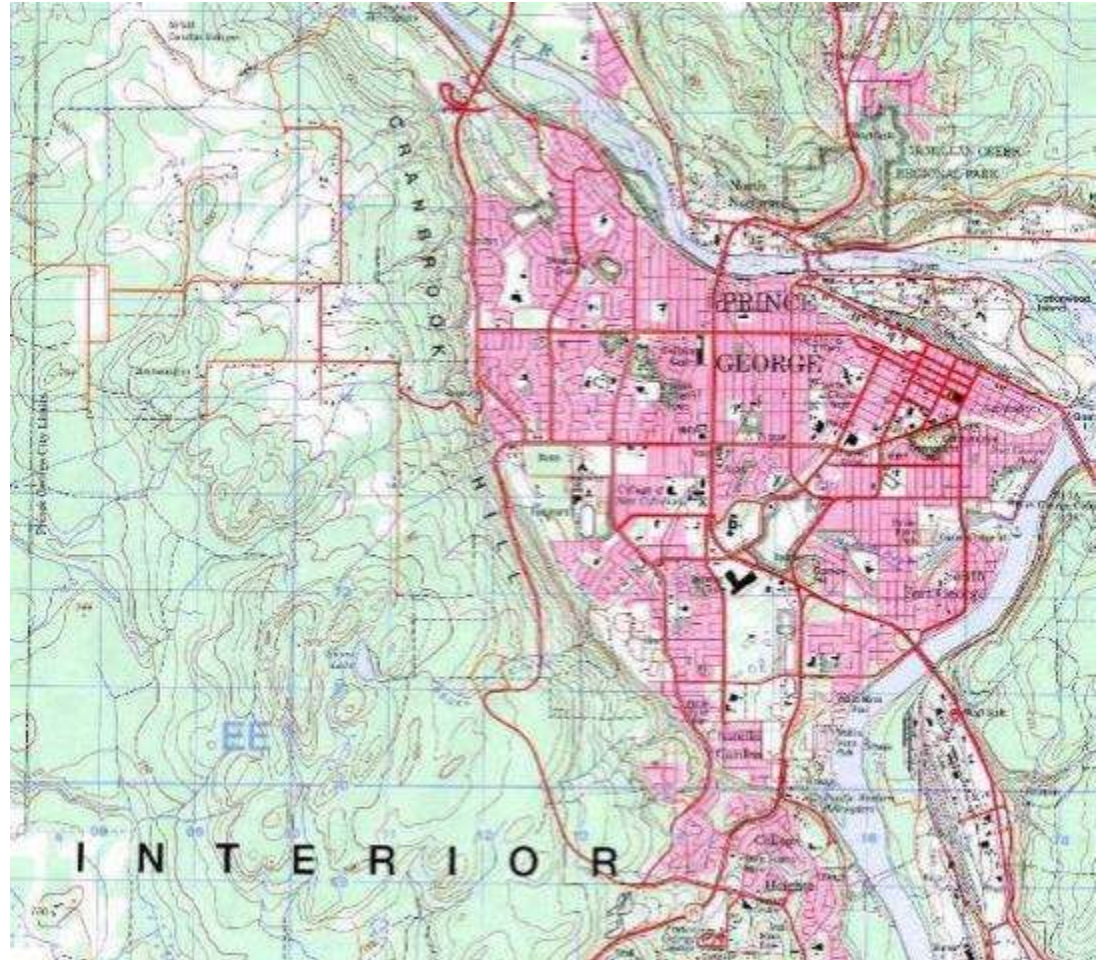


1:50,000 corresponds to 1cm = 0.5 km

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

All 13,377 maps available:

- a. Printed NTS maps  
(Weller Library)
- b. Scanned map (pdf) -  
Raster image - 'print-  
ready' or georeferenced  
e.g. for GPS / background
- c. Digital vector layers for  
mapping - every point,  
line, feature manually  
digitised (but not all current)





# **The promise of digital mapping (since 1975)**

- **Data for everyone ..... much free since ~2010**
- **Seamless database .... since 2015 (by map sheet before)**
- **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.prj*

*roads.shx*

- The Data Frame (display) takes on the coordinate system of the first layer loaded

Multiple different coordinate systems can be displayed together (since ~2000) =  
'on the fly' .. if they are properly 'defined'  
e.g. geographic, UTM, Albers

Defining or labelling creates a file named .prj  
(e.g. roads.prj)



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](http://geogratis.cgdi.gc.ca)

August 2017: <https://maps.canada.ca/czs/index-en.html>

by map sheet or Area of Interest (AOI)

[Natural Resources Canada](#) > [Earth Sciences Sector](#) > GeoGratis

#### GeoGratis

- GeoGratis Home
- Site Map
- GeoGratis Help
- Register to users list
- Licence Agreement

#### Collections

- All Collections
- Search by Keywords
- Search by Product

#### Services

- Toporama WMS

#### Related Links

- Download Directory
- FAQ
- Geomatic 101
- Glossary & Acronyms

#### Other Portals

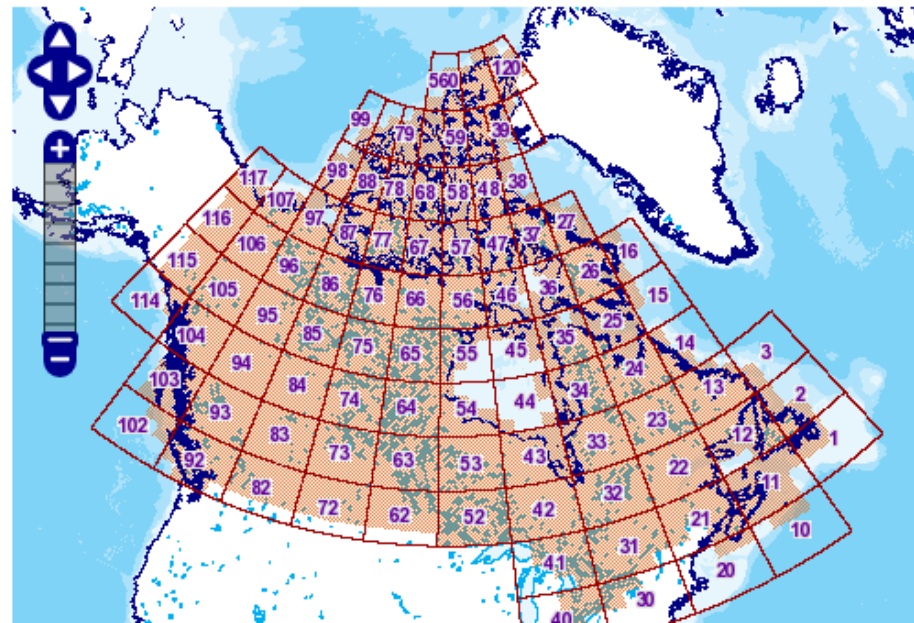
- GeoBase
- GeoConnections
- GeoConnections Discovery Portal
- Map Tools

## National Topographic Data Base (NTDB), Canada

The National Topographic Data Base (NTDB) comprises digital vector data sets that cover the entire Canadian landmass. Geomatics Canada has digitized and structured thousands of topographic maps, cr... [\[More details\]](#) [\[Documentation\]](#) [\[Data Discrepancies\]](#)

Access the [FTP download directory](#) in order to quickly download a large amount of data.

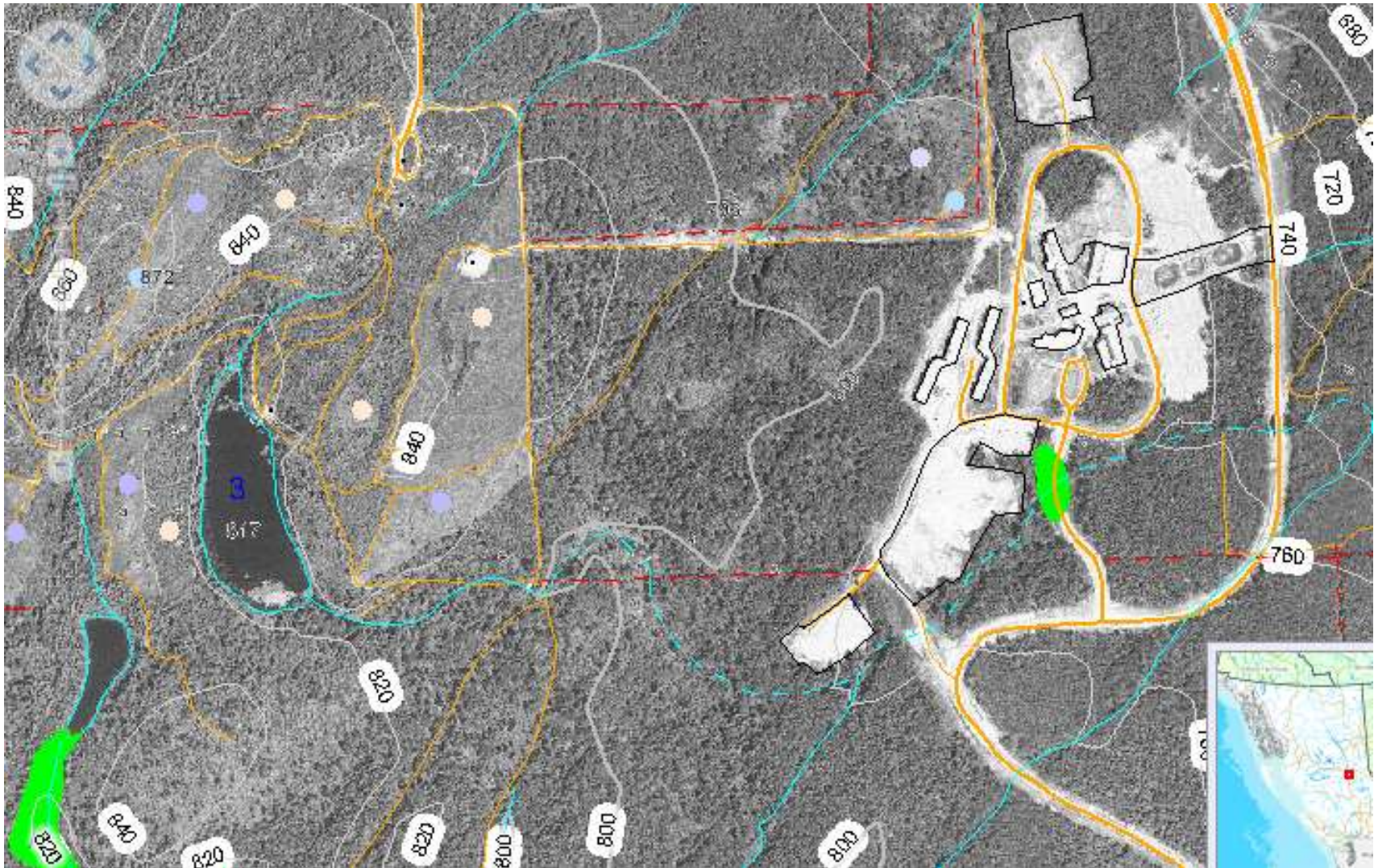
### Search Datasets by Spatial Extents [How to navigate?](#)





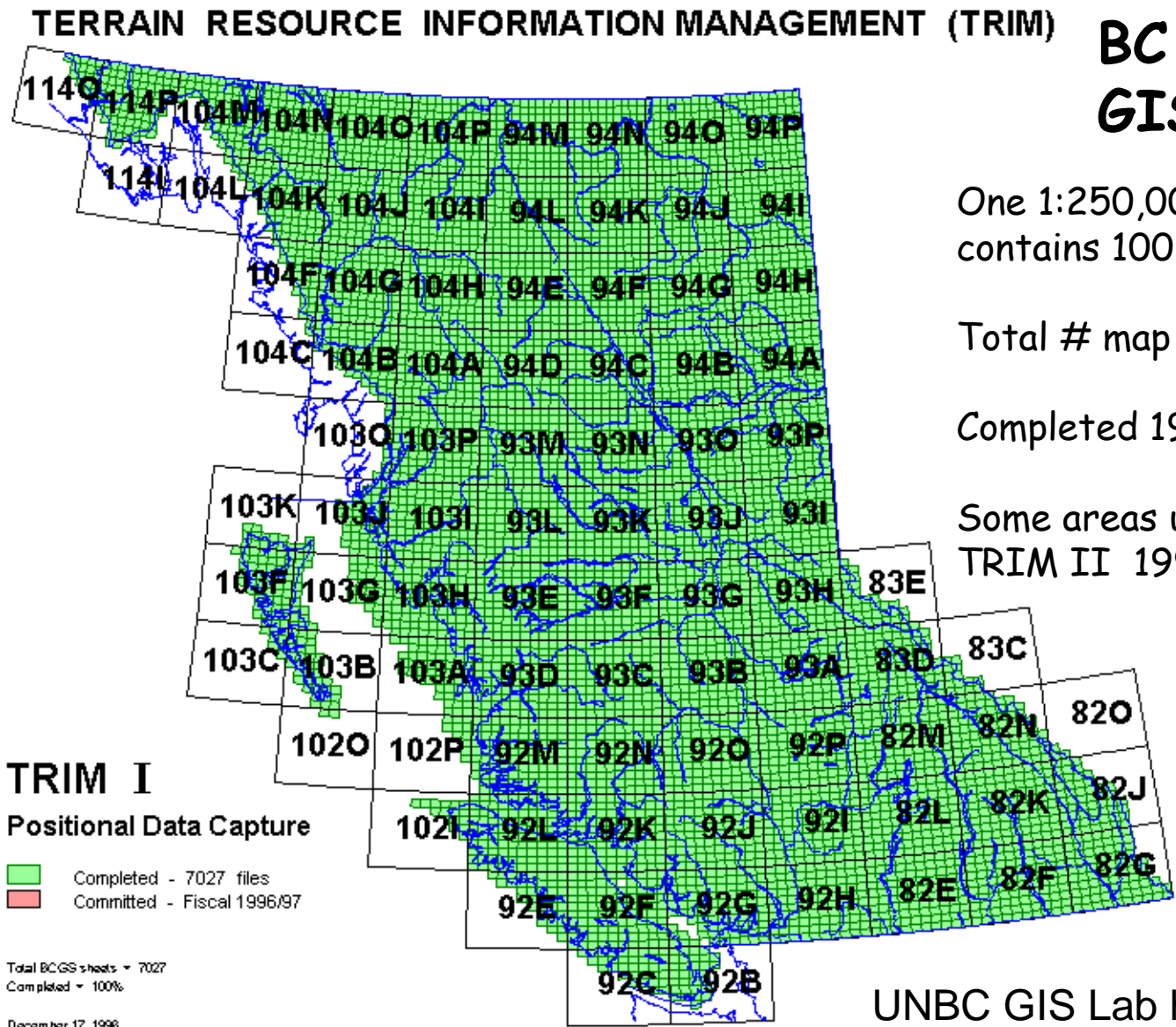
# Digital data - Terrain Resource Information Management (BC)

Onscreen from digital (stereo) photogrammetry (not digitized from maps)





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



TERRAIN RESOURCE INFORMATION MANAGEMENT (TRIM)

BC Provincial GIS data

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

Total # map tiles = 7027

Completed 1995

Some areas updated with TRIM II 1996->

TRIM I

Positional Data Capture

- Completed - 7027 files
- Committed - Fiscal 1996/97

Total BCGS sheets = 7027  
Completed = 100%  
December 17, 1996

UNBC GIS Lab has all these

Each 1:20 000 TRIM sheet is 6' latitude by 12' longitude.

Latitude	124°W	123°W	122°W
54°N	093G.091	093G.092	093G.093
53°N	093G.081	093G.082	093G.083
53°N	093G.071	093G.072	093G.073
53°N	093G.061	093G.062	093G.063
53°N	093G.051	093G.052	093G.053
53°N	093G.041	093G.042	093G.043
53°N	093G.031	093G.032	093G.033
53°N	093G.021	093G.022	093G.023
53°N	093G.011	093G.012	093G.013
53°N	093G.001	093G.002	093G.003



# BC geographic data viewer 'imapBC'

The screenshot displays the iMapBC web application interface. At the top, the header includes the "BRITISH COLUMBIA" logo and the "iMapBC" title. Below the header is a navigation bar with tabs: "Navigation", "Maps & Data Sources", "Reports & Printing", "Markup", "Analysis", and "Help".

The main toolbar contains several icons for navigation and data manipulation. The "Navigation" section includes "Full Extent", "Zoom In", "Zoom Out", "Pan", "Previous Extent", and "Next Extent". The "Maps & Data Sources" section includes "Albers Coordinate", "Lat/Long", "UTM", "Feature Location", and "District Lot". The "Reports & Printing" section includes "New", "Plot", and "Clear All".

On the right side, there is a "Clicked Coordinates" section with input fields for "Lat:" (54.7229) and "Lon:" (-126.1876), and a dropdown menu for "Lat/Lon (DD)".

The main map area shows a topographic map of British Columbia. A blue box with the text "I want to..." is overlaid on the map. The map includes labels for various locations: "Fort Nelson", "Fort St. John", "Prince Rupert", "Prince George", "Kamloops", and "Vancouver".

On the left side, there is a "Welcome to iMapBC" message. It states: "A window to spatial information in British Columbia". It provides instructions on how to use the "Add Provincial Layers" tool and the "I want to..." drop-down menu. It also provides contact information for the Service Desk, including hours of operation (8:00 am to 4:30 pm PST, Monday to Friday) and phone numbers (250) 952-6801 (within Victoria) and 1-866-952-6801 (toll free within BC).

<http://maps.gov.bc.ca/ess/hm/imap4m/>

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

**TRIM BC 1:20,000 maps** not  
available as printed maps  
(anymore)



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: <http://princegeorge.ca/cityservices/online/odc/Pages/default.aspx>



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

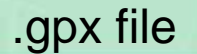
# Digital (base) map data

1975-85	None available (a wee bit from CIA)
1985-95	Data generated but not available
1995-2005	Data there, but not always affordable
2005 ->	Online map viewers e.g. Google Earth
2010->	More data freely downloadable (ongoing)
2020 ->	Too soon to tell ...




# New millennium map data creation:

- Digital aerial photography
- Satellite imagery
- Global Positioning Systems (GPS)
- UAVs (drones)
- LiDAR






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



**OpenStreetMap**  
The Free Wiki World Map

Search 

examples: 'Alkmaar', 'Regent Street, Cambridge', 'CB2 5AQ', or post offices near Lünen' more examples... Where am I?

OpenStreetMap is a free worldwide map, created by people like you.

The data is free to download and use under its [open license](#).  
[Create a user account](#) to improve the map.

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http://www.openstreetmap.org/#map=7/47.891/5.894


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