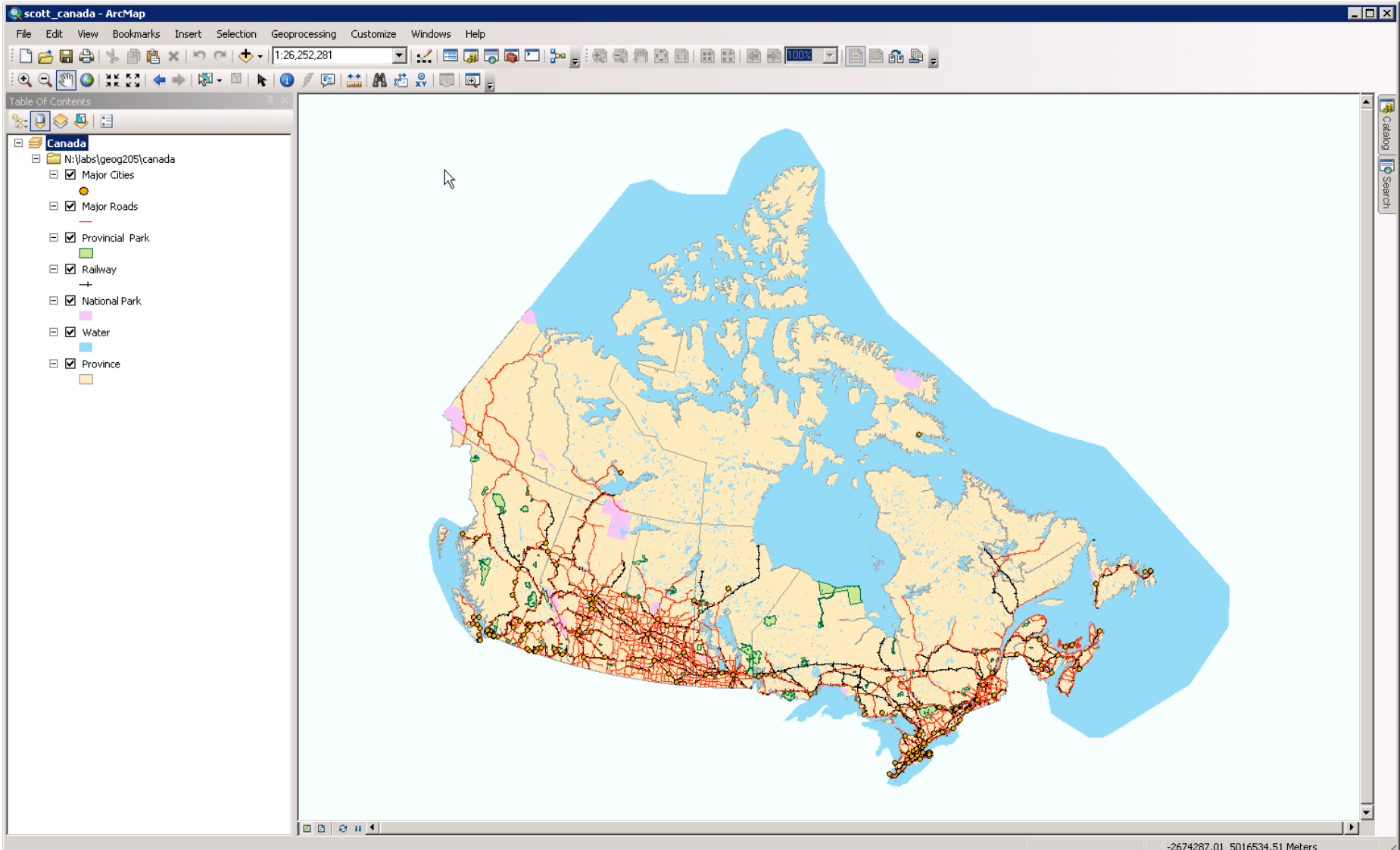


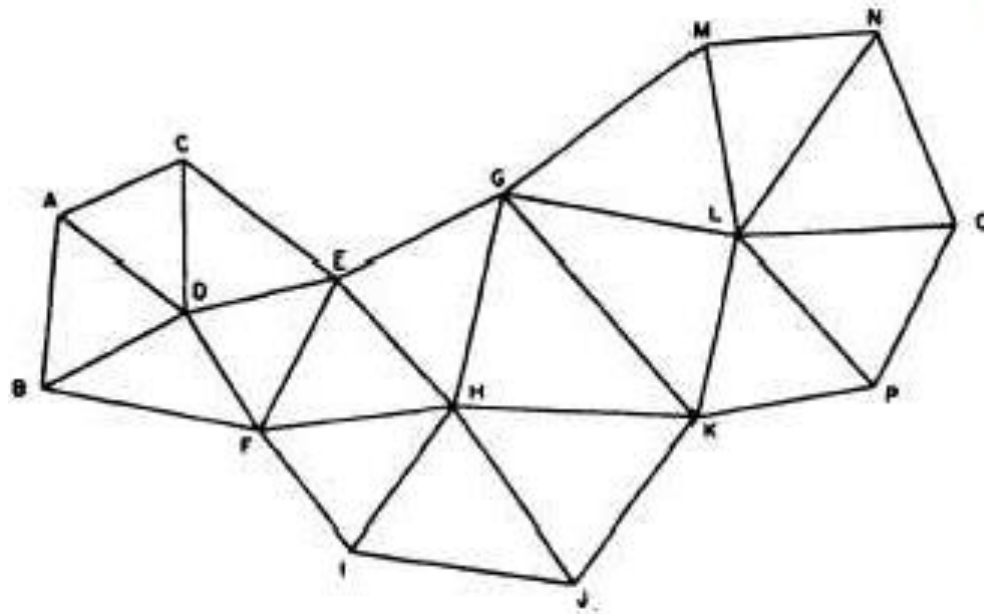
Digital (base) map data

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



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

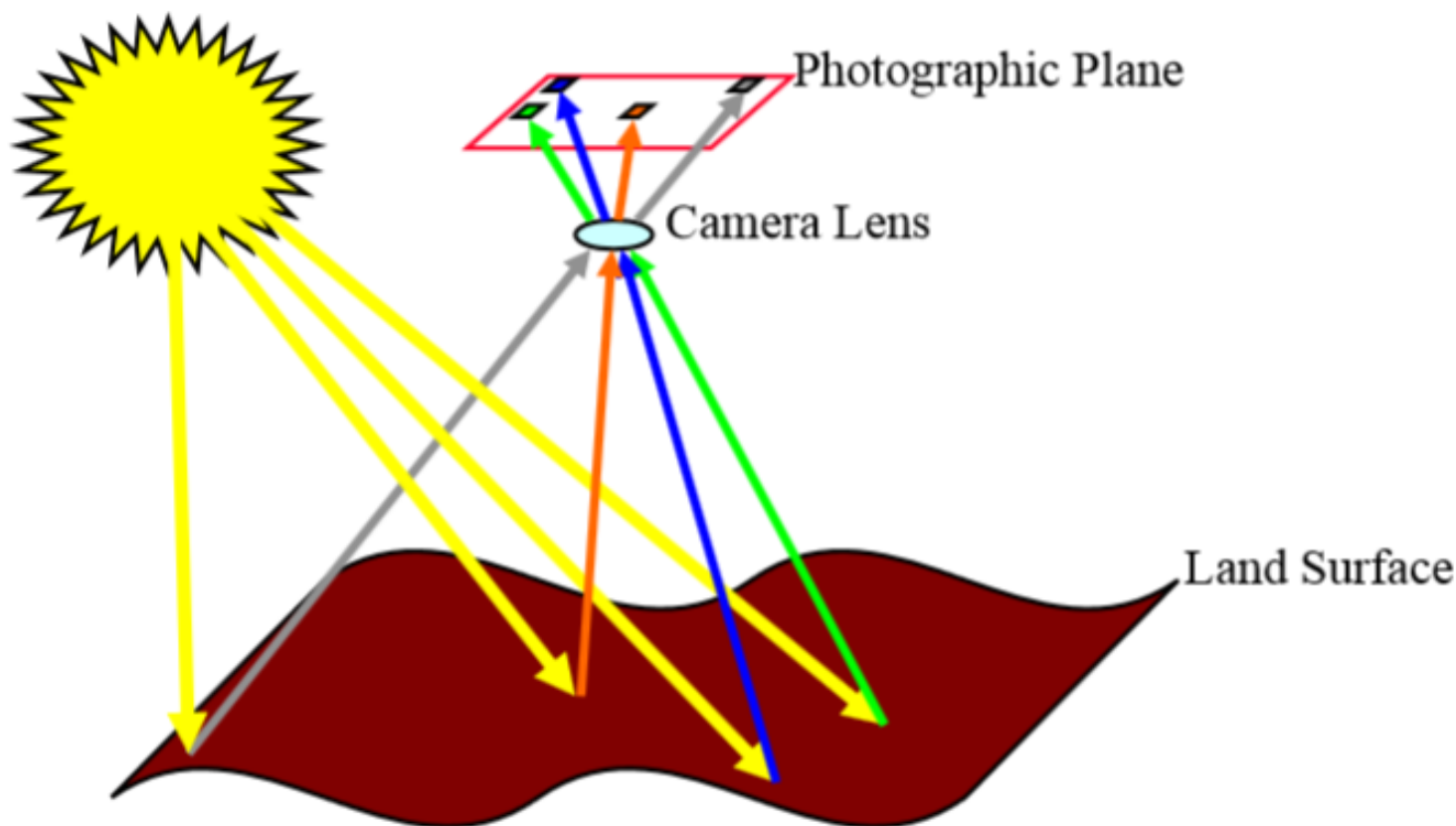


Ground points still
surveyed by field
crews

Athabasca Glacier, 1958

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

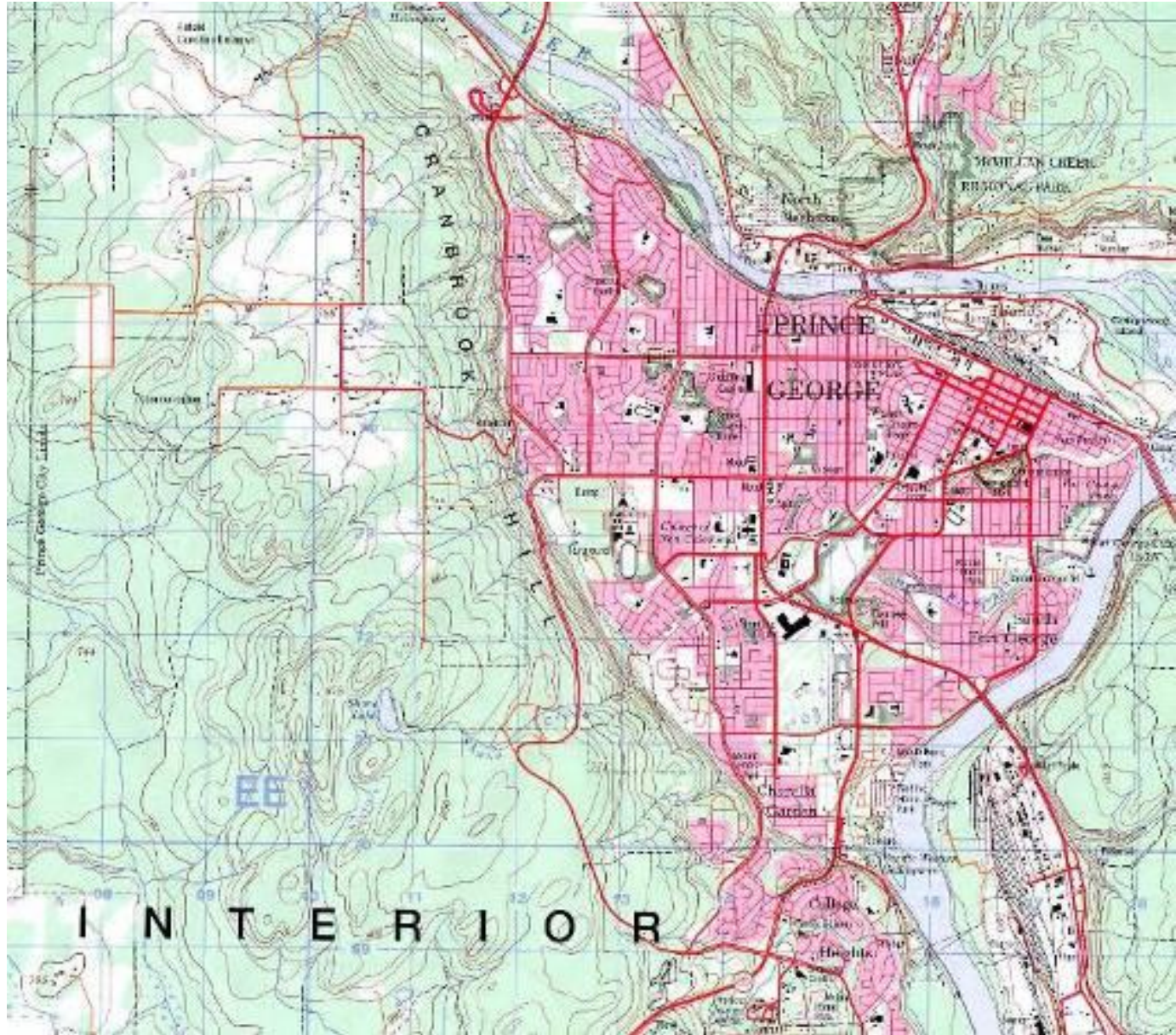
1975-85	~None available (world coastlines etc..)
1985-95	Data generated but not yet available
1995-2005	Data there, but not always affordable
2005 ->	Online map viewers e.g. Google Earth
2015 ->	More data freely downloadable
2020 ->	Online 'in the cloud' data links

How has it all been assembled ... ?

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

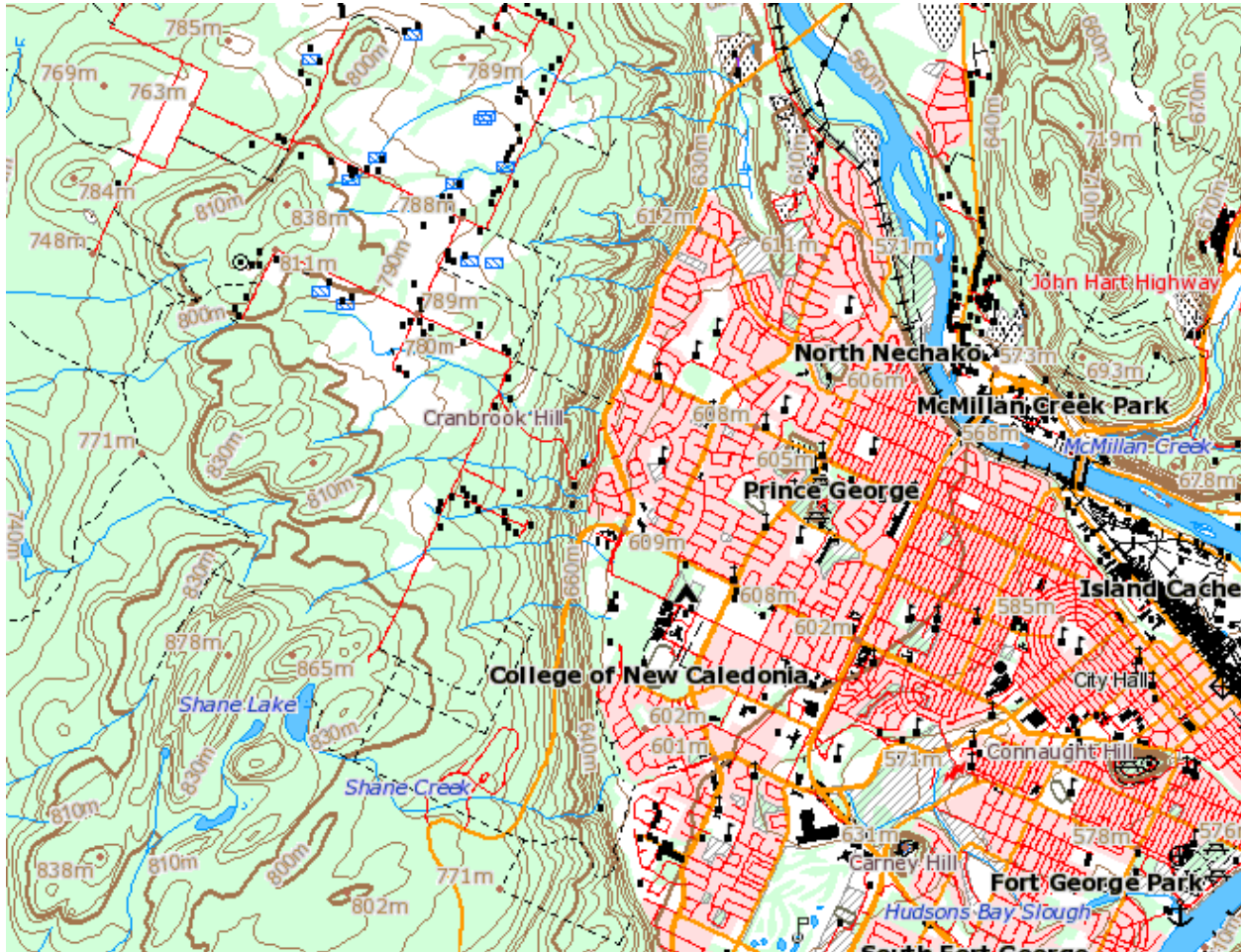
Georeferenced
(with coordinates)
e.g. geotiff

or 'print ready'
e.g. pdf



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

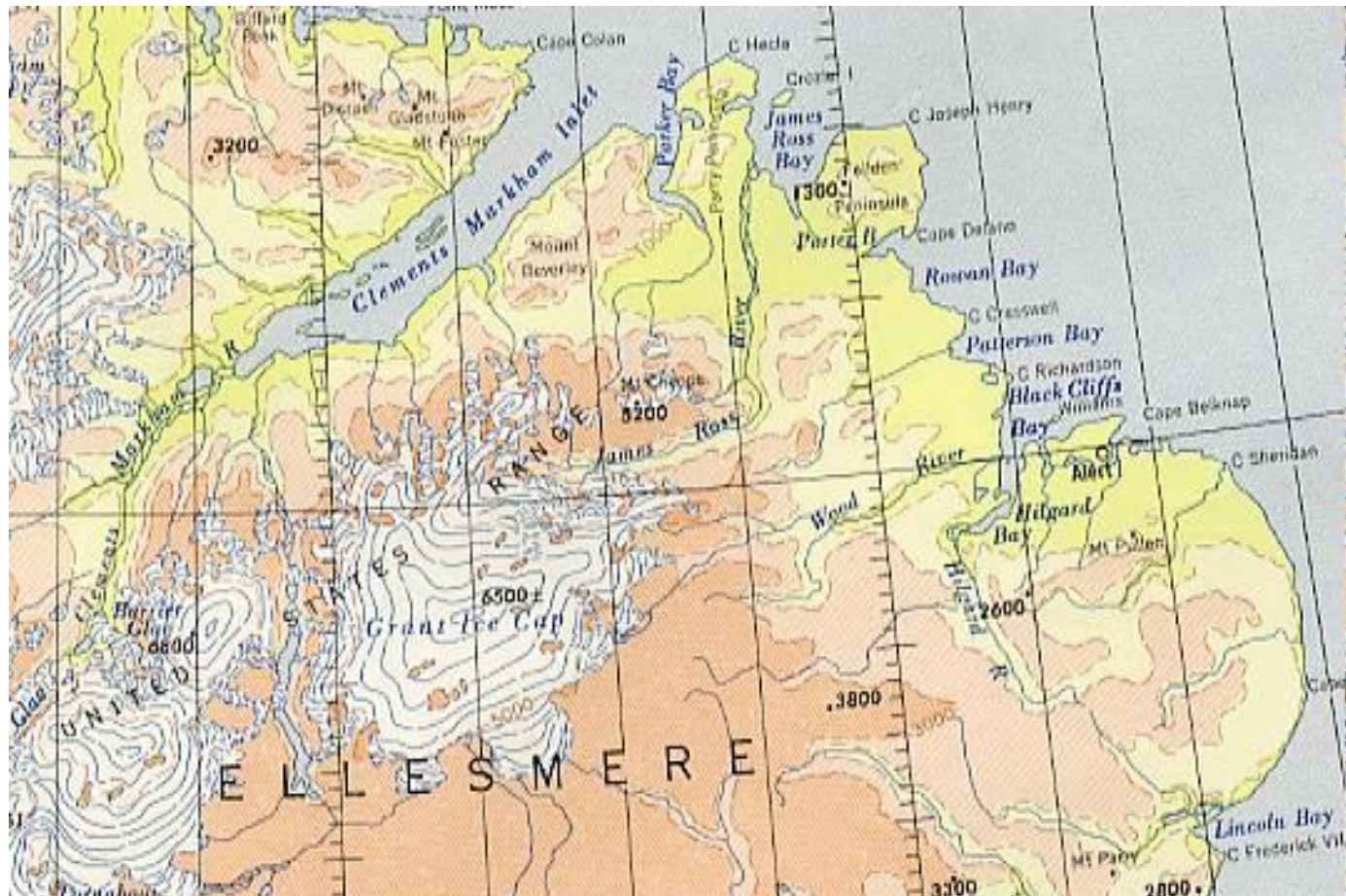
Digitizing from
printed maps

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.

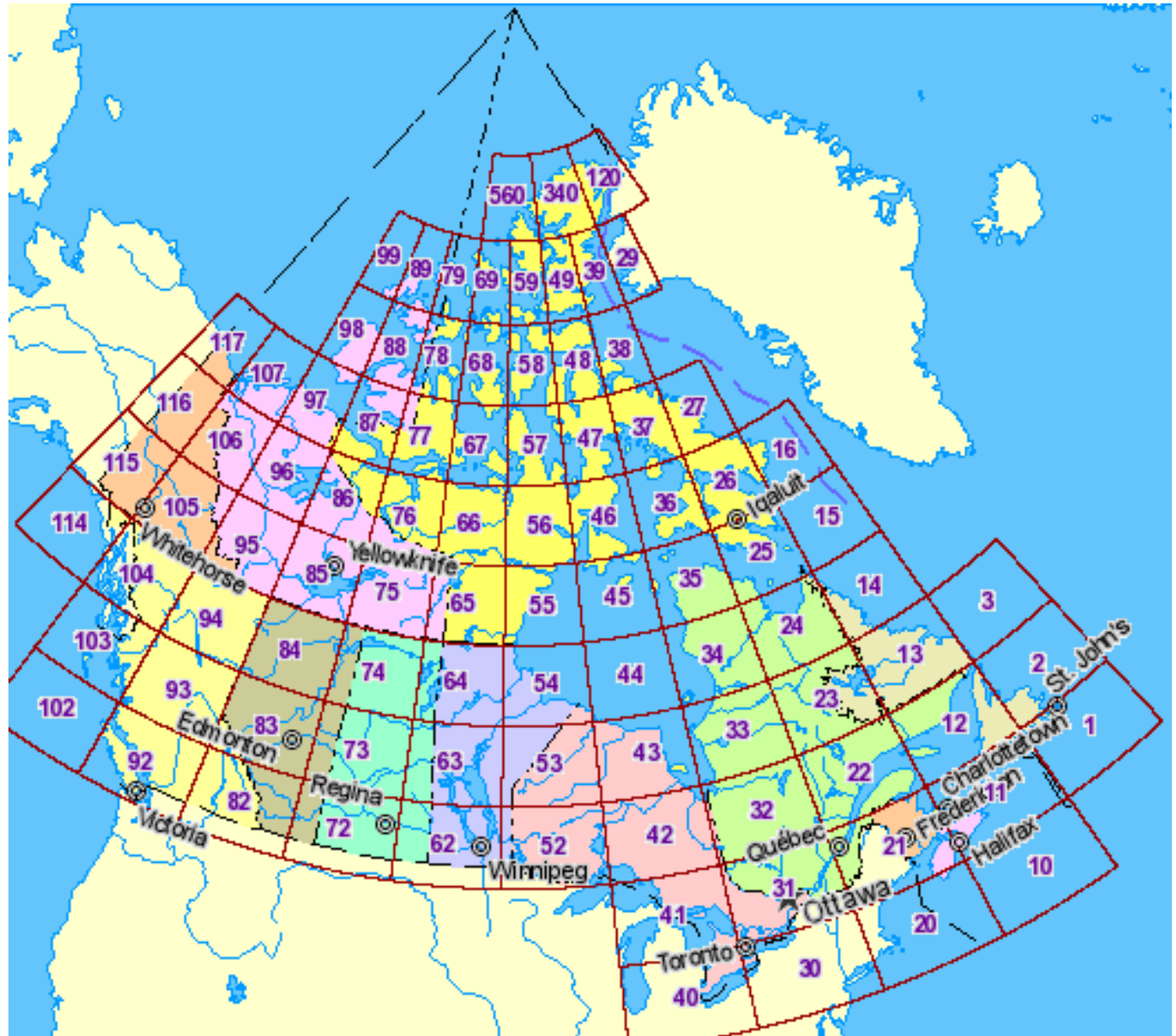


b. Canada is divided into 1:1,000,000 sheets, numbered 1-117,
8 ° longitude x 4 ° latitude 1960

National Topographic Series (NTS)

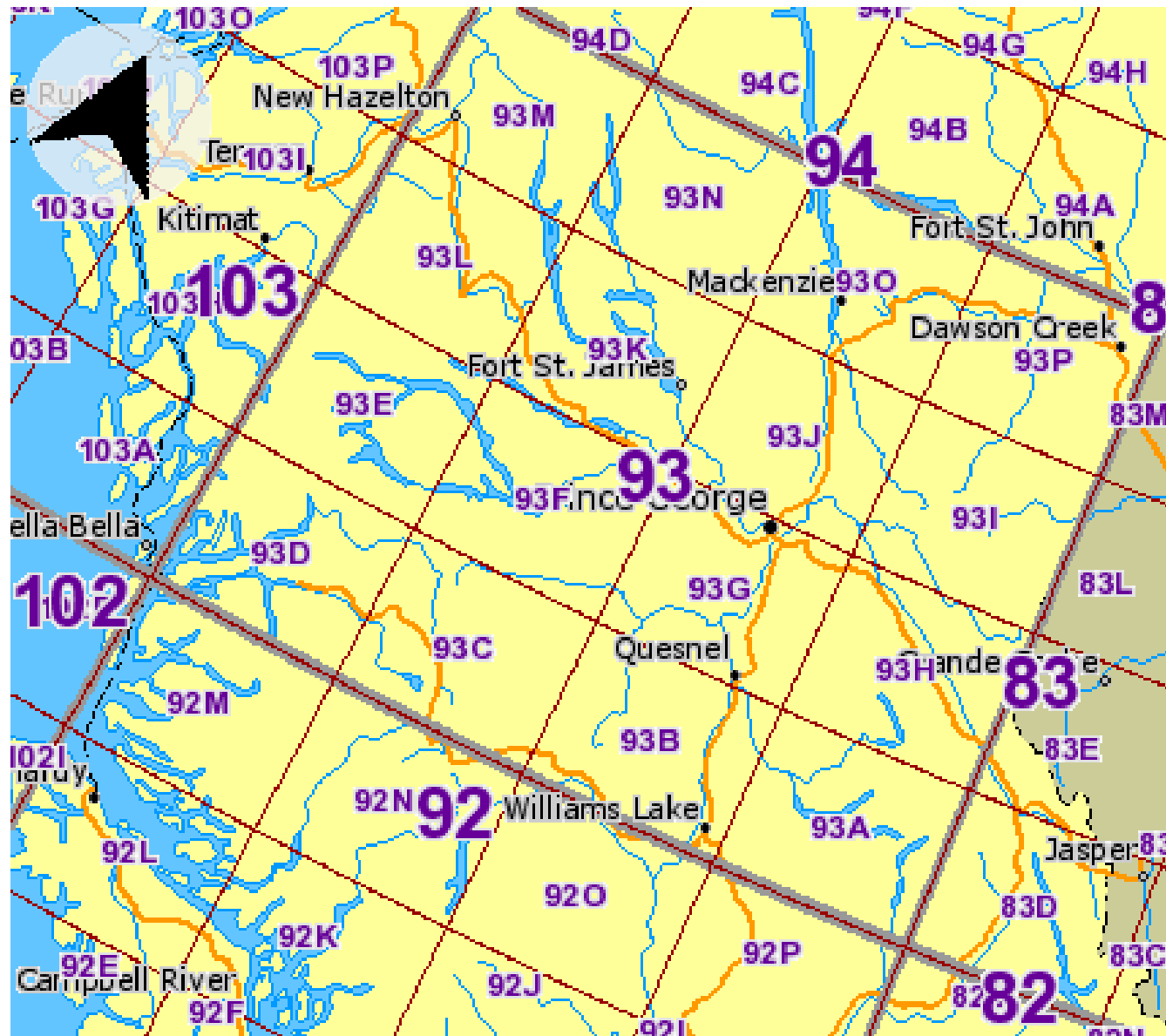
Digital: National
Topographic
DataBase (NTDB)

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

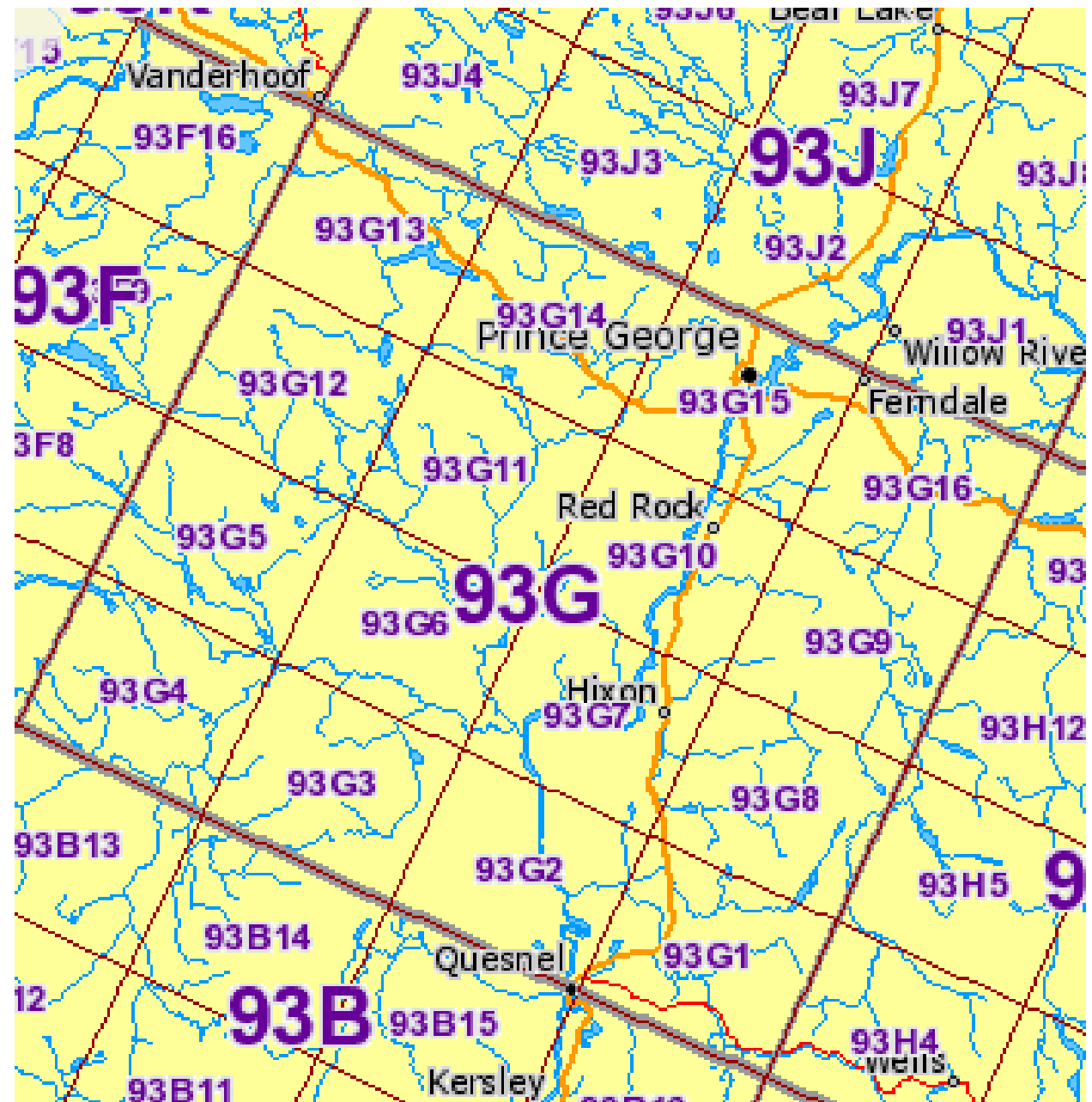
d. 1:50,000
large-scale

BC: 1168 maps

Canada: 13,377

Digital 2005

Canada Completed
2012



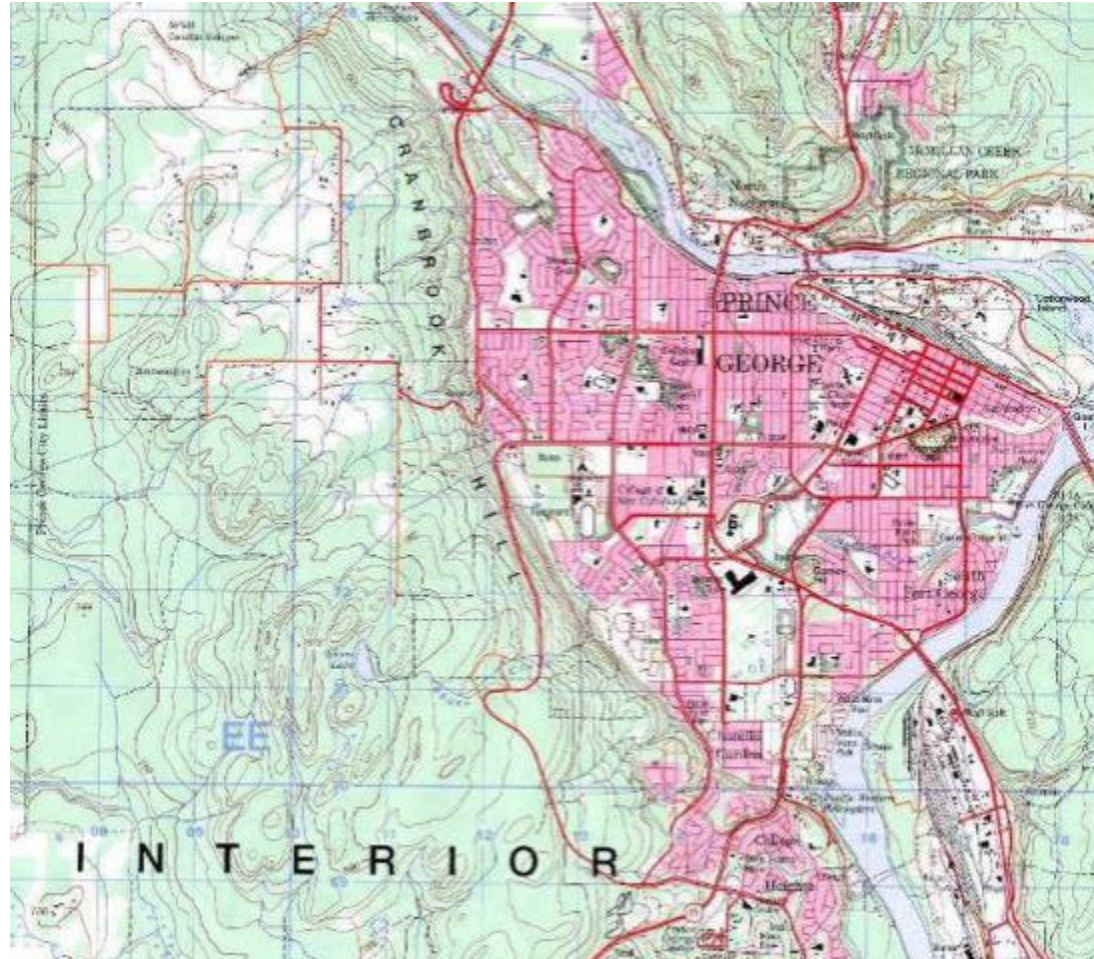
1:50,000 corresponds to 1cm = 0.5 km

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*

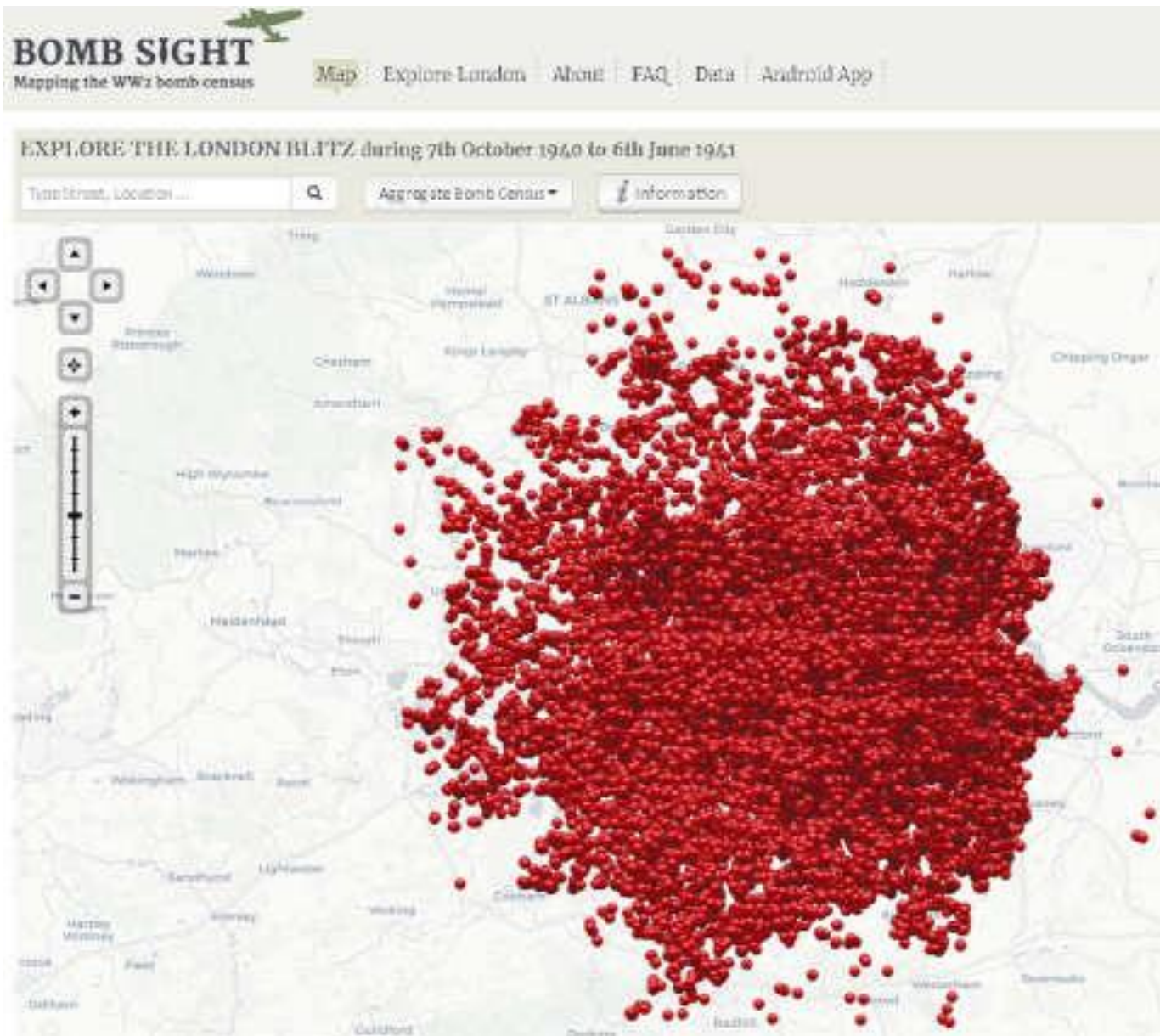
e.g. Roads as a 'shapefile' (since ~1992)

roads.shp

roads.dbf

roads.shx

roads.prj



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)

[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

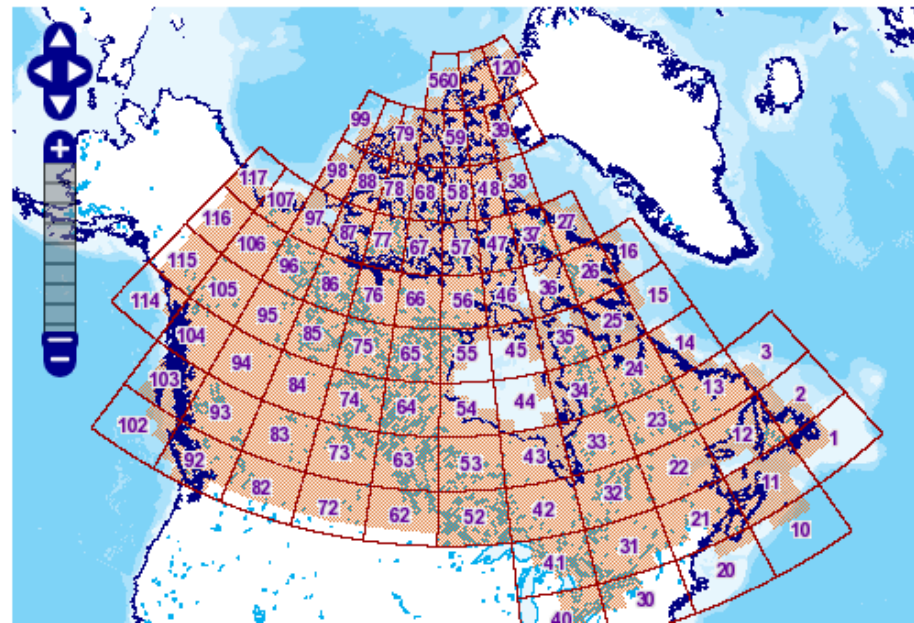
- GeoBase
- GeoConnections
- GeoConnections Discovery Portal
- Map Tools

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... [\[More details\]](#) [\[Documentation\]](#) [\[Data Discrepancies\]](#)

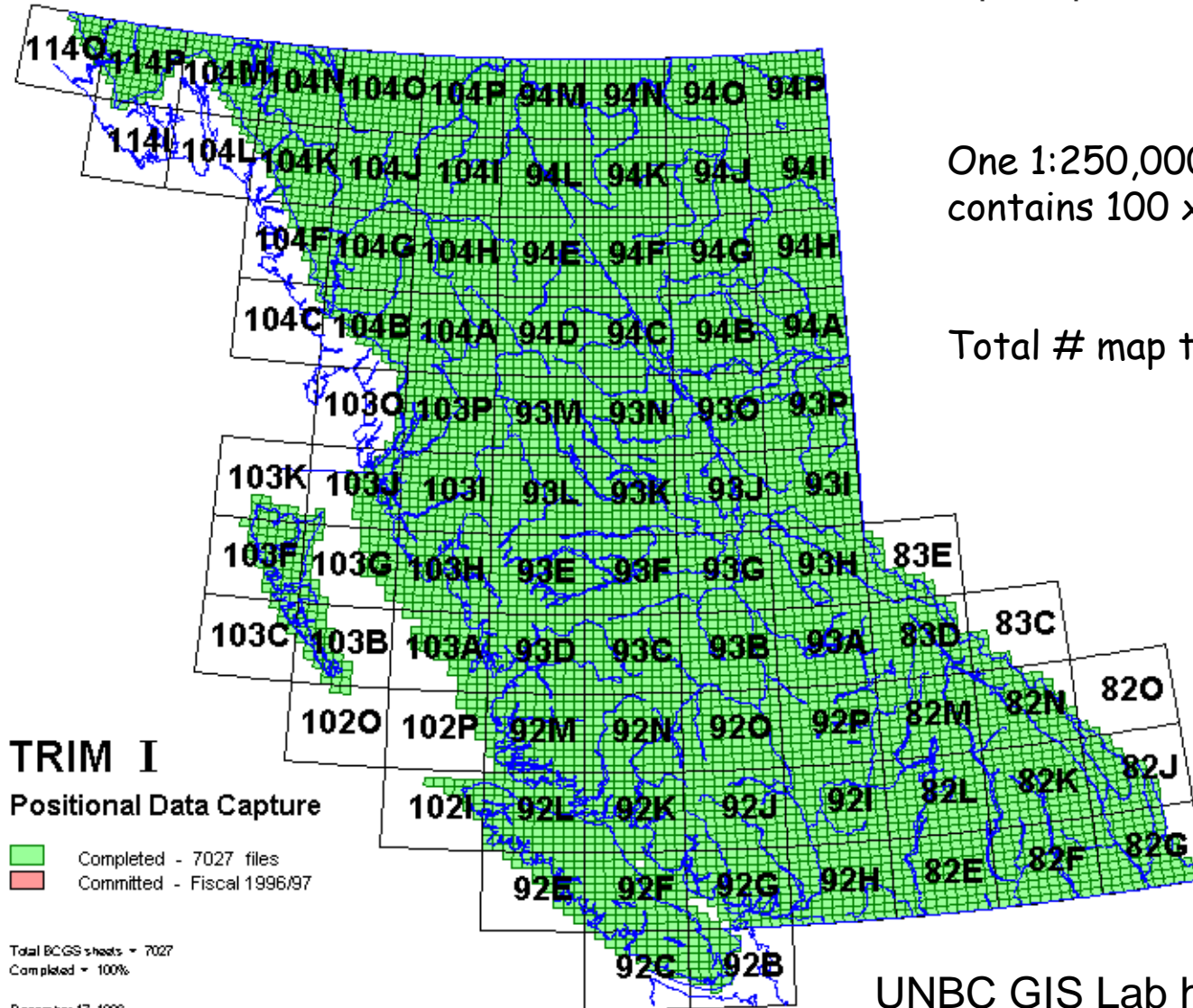
Access the [FTP download directory](#) in order to quickly download a large amount of data.

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



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

TERRAIN RESOURCE INFORMATION MANAGEMENT (TRIM)



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'

The screenshot displays the iMapBC web application interface. At the top, the header includes the British Columbia logo and the text "iMapBC". Below the header is a navigation bar with tabs: "Navigation", "Maps & Data Sources", "Reports & Printing", "Markup", "Analysis", and "Help". Under the "Navigation" tab, there are icons for "Full Extent", "Zoom In", "Zoom Out", "Pan", "Previous Extent", and "Next Extent". To the right of these icons are buttons for "Albers Coordinate", "Lat/Long", "UTM", "Feature Location", and "District Lot". Further right are buttons for "New", "Plot", and "Clear All". On the far right, there is a section for "Clicked Coordinates" with input fields for "Lat:" (54.7229) and "Lon:" (-126.1876), and a dropdown for "Lat/Lon (DD)".

Below the navigation bar, there is a "Welcome to iMapBC" message. It states: "A window to spatial information in British Columbia". It then provides instructions: "To help you get started, use the 'Add Provincial Layers' tool on the toolbar, under the 'Maps & Data Sources' tab (or click the 'I want to...' drop-down and use 'Add Provincial Layers') in order to choose the layers you wish to view on the map." It also mentions: "You can navigate to your area of interest by using the tools found under the Navigation tab. 'Zoom In' allows you to drag a box on the map itself. Alternatively, the mouse wheel allows you to step zoom in and out. You may also right-click on the map to get additional tools." Finally, it provides contact information: "Additional help and information can be obtained by contacting the Service Desk. Hours of Operation: 8:00 am to 4:30 pm (PST) Monday to Friday. Please leave a voice message if you are calling after hours. Phone (within Victoria): (250) 952-6801. Toll Free (within BC): 1-866-952-6801."

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 shows major cities like Prince Rupert, Prince George, Kamloops, and Vancouver, as well as Fort Nelson and Fort St. John. The map is bordered by Alberta to the east.

<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 × 11km) or 6' latitude by 12' longitude.

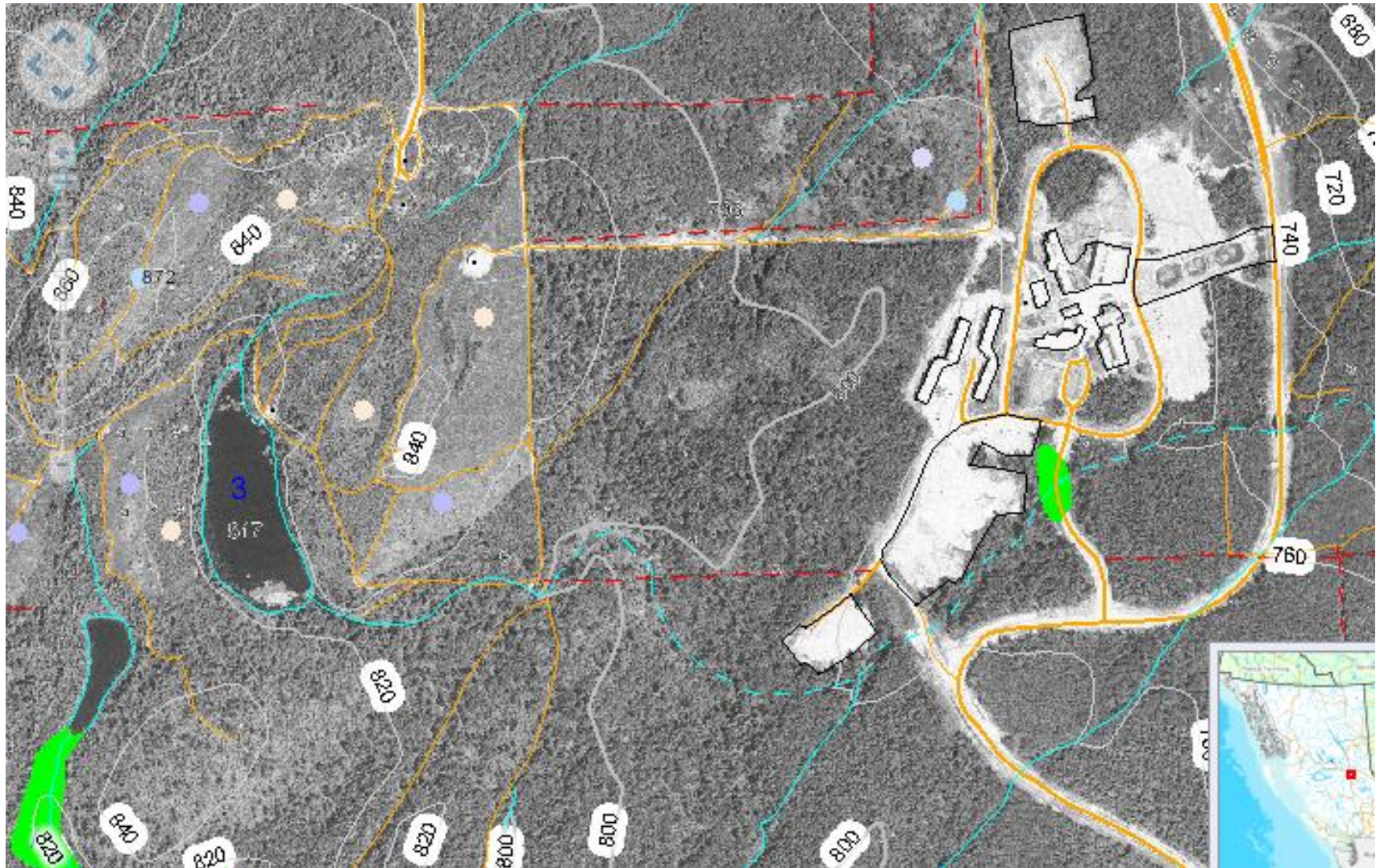
124°W											122°W
54°N	093G.091	093G.092	093G.093	093G.094	093G.095	093G.096	093G.097	093G.098	093G.099	093G.100	54°N
	093G.081	093G.082	093G.083	093G.084	093G.085	093G.086	093G.087	093G.088	093G.089	093G.090	
	093G.071	093G.072	093G.073	093G.074	093G.075	093G.076	093G.077	093G.078	093G.079	093G.080	
	093G.061	093G.062	093G.063	093G.064	093G.065	093G.066	093G.067	093G.068	093G.069	093G.070	
	093G.051	093G.052	093G.053	093G.054	093G.055	093G.056	093G.057	093G.058	093G.059	093G.060	
	093G.041	093G.042	093G.043	093G.044	093G.045	093G.046	093G.047	093G.048	093G.049	093G.050	
	093G.031	093G.032	093G.033	093G.034	093G.035	093G.036	093G.037	093G.038	093G.039	093G.040	
	093G.021	093G.022	093G.023	093G.024	093G.025	093G.026	093G.027	093G.028	093G.029	093G.030	
	093G.011	093G.012	093G.013	093G.014	093G.015	093G.016	093G.017	093G.018	093G.019	093G.020	
53°N	093G.001	093G.002	093G.003	093G.004	093G.005	093G.006	093G.007	093G.008	093G.009	093G.010	53°N
124°W											122°W

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>



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.

Help
[Help Centre](#)
[Documentation](#)

Community
[Community Blogs](#)
[Foundation](#)
[User Diaries](#)


Data
[Copyright & License](#)
[Export Data](#)

Back Forward Reload Stop

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

Home Bookmarks Most Visited SeaMonkey mozilla.org mozillaZine mozdev.org

View Edit History



Steve Coast, 2004

New millennium map data creation:

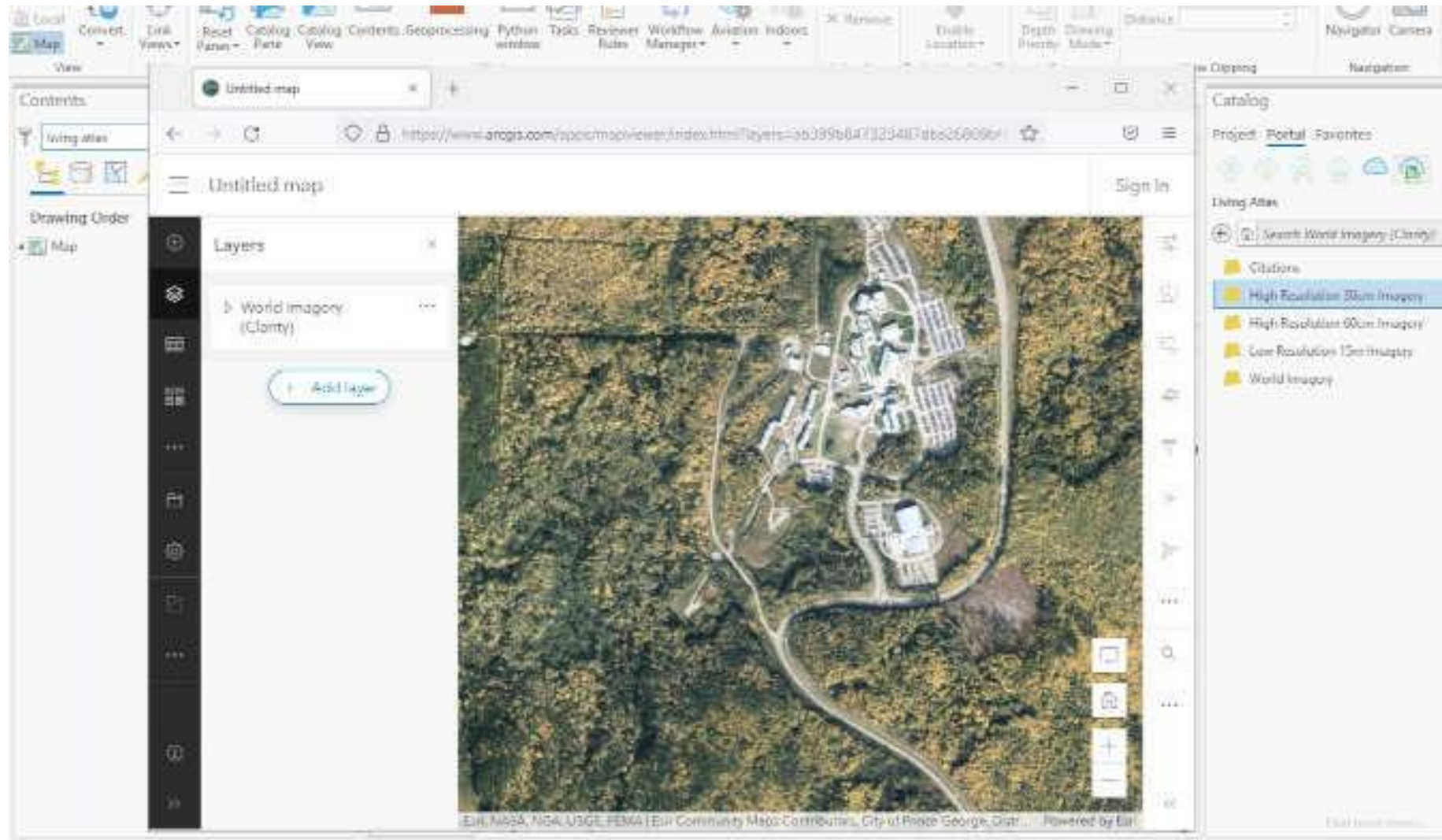
- Digital aerial photography
- Satellite imagery (remote sensing)
- Global Positioning Systems (GPS)
- UAVs (drones)
- LiDAR
- Online sources e.g. from GIS analysis

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