Introduction to GIS

Overview

- Intro to GIS
  - What is it?
  - Data types
  - Coordinate systems
- Spatial data sources
  - McMaster University Library
  - Scholars GeoPortal
  - Open data
- Intro to QGIS
  - QGIS
  - Tutorials and resources
- Exercise
  - John Snow’s 1854 map

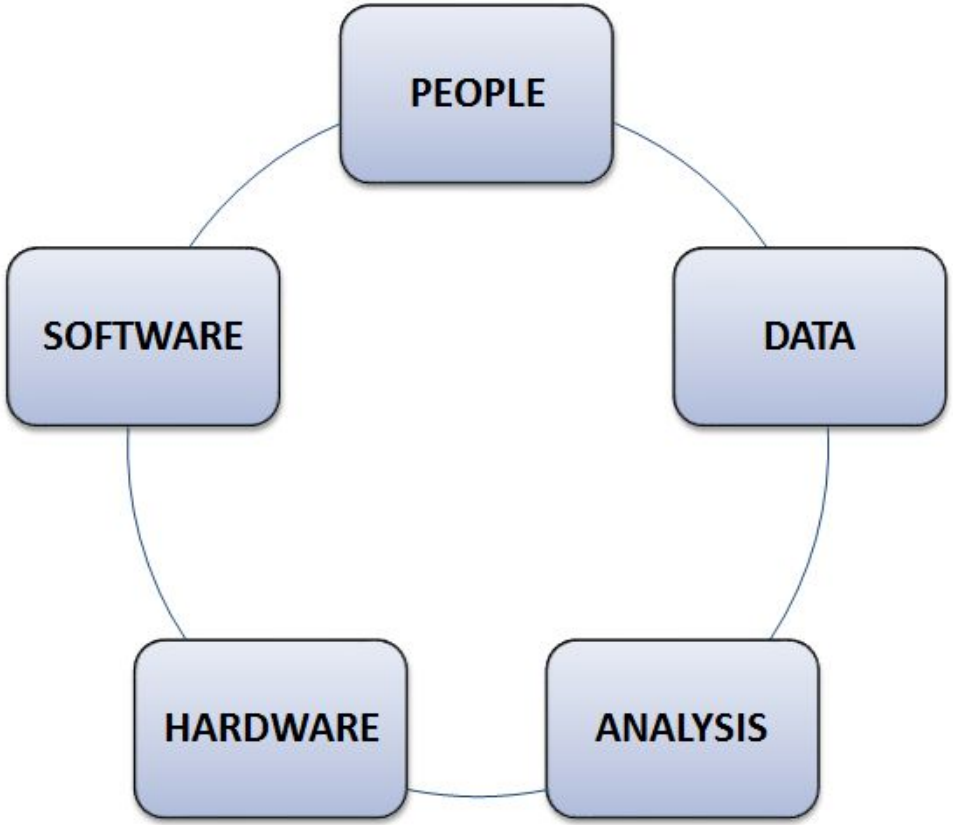
Learning Objectives

- Have a better understanding of what GIS is and how it can be used
- Become familiar with common sources of geospatial data
- Learn the QGIS interface and be able to create a simple map
- Know where you can get additional help and resources

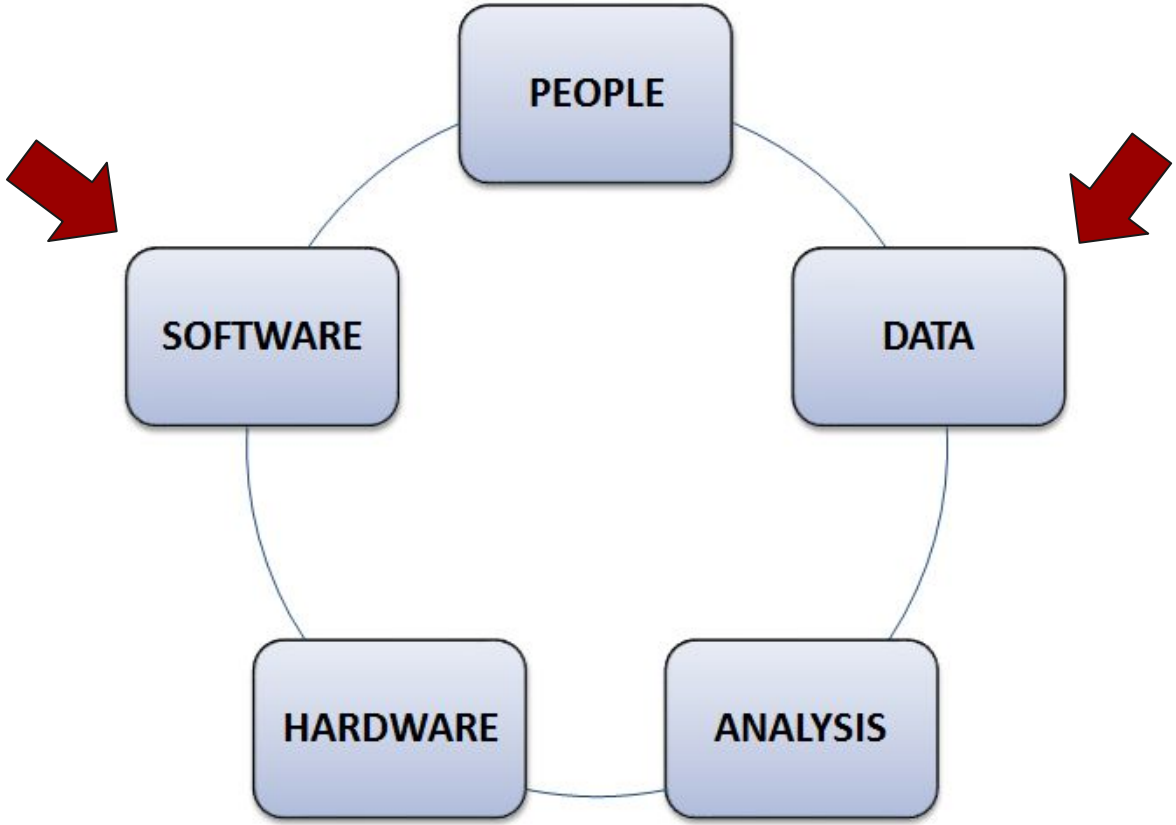
What is GIS?

- **G**eographic **I**nformation **S**ystems
- Digital or computer-based mapping
- A system to assemble, store, manipulate, analyze, and present ***geographically referenced data***
  - Data associated with, or identified by, their location
- A digital representation of real-world geographic attributes:
  - Location
  - Attributes
  - Spatial relationships
- Allows us to view, understand, question, interpret, and visualize data in many ways that reveal relationships, patterns, and trends

Components

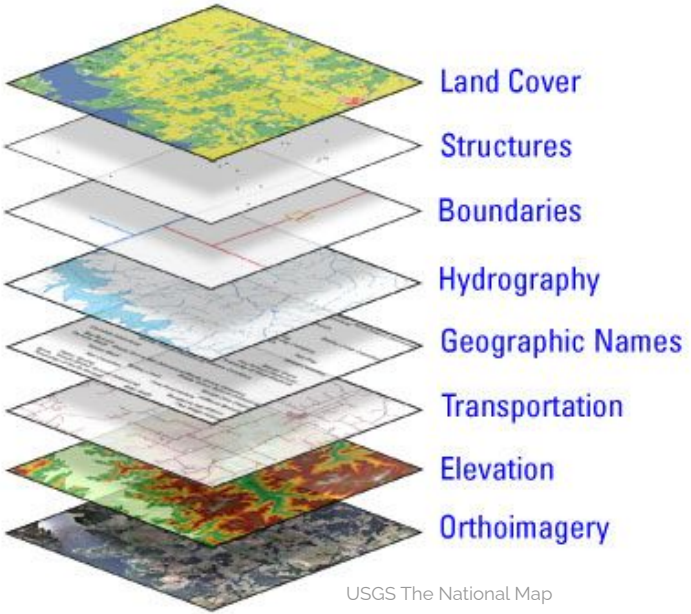


Components



Spatial data

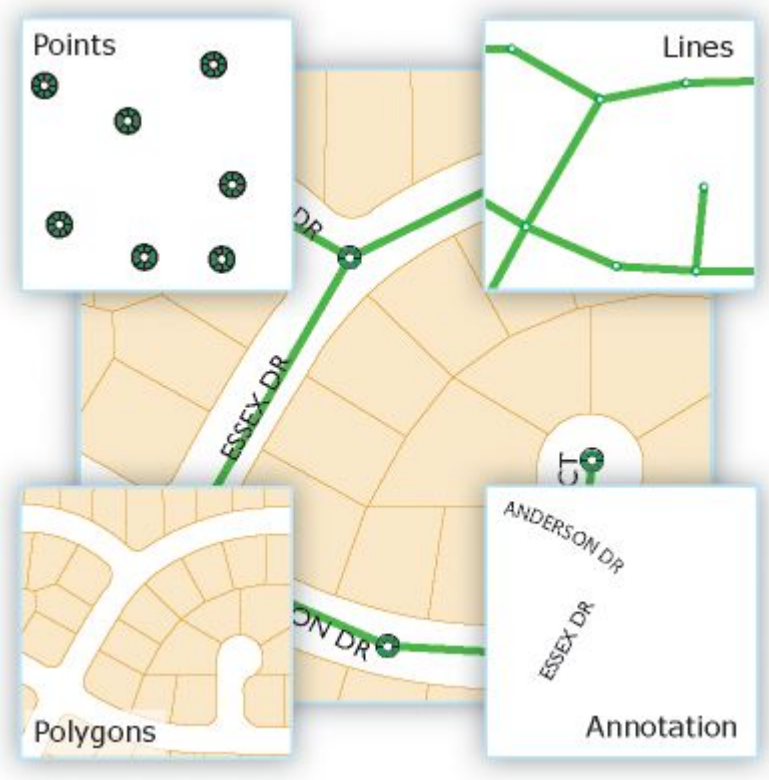
- Vector and raster data models used to represent the real world



USGS The National Map

Vector data

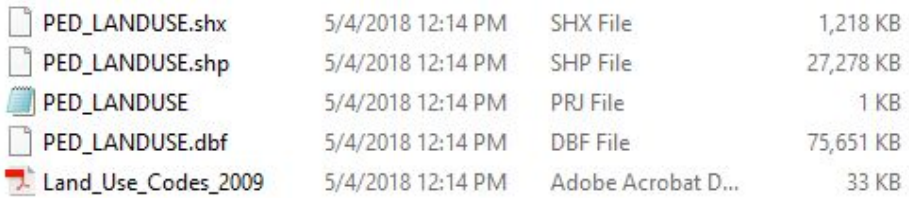
- **Points**
  - X / Y locations
- **Line**
  - Connected X / Y locations
- **Polygon** (area)
  - Connected X / Y locations forming a close figure
- Good for representing clearly defined objects



Esri

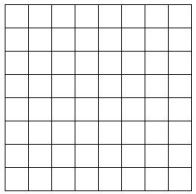
Vector data

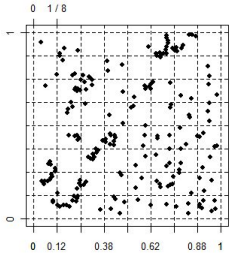
- **Format** - shapefile (.shp)



PED_LANDUSE.shx	5/4/2018 12:14 PM	SHX File	1,218 KB
PED_LANDUSE.shp	5/4/2018 12:14 PM	SHP File	27,278 KB
PED_LANDUSE	5/4/2018 12:14 PM	PRJ File	1 KB
PED_LANDUSE.dbf	5/4/2018 12:14 PM	DBF File	75,651 KB
Land_Use_Codes_2009	5/4/2018 12:14 PM	Adobe Acrobat D...	33 KB

Raster data





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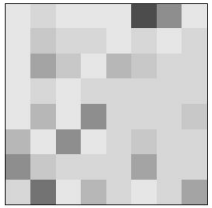
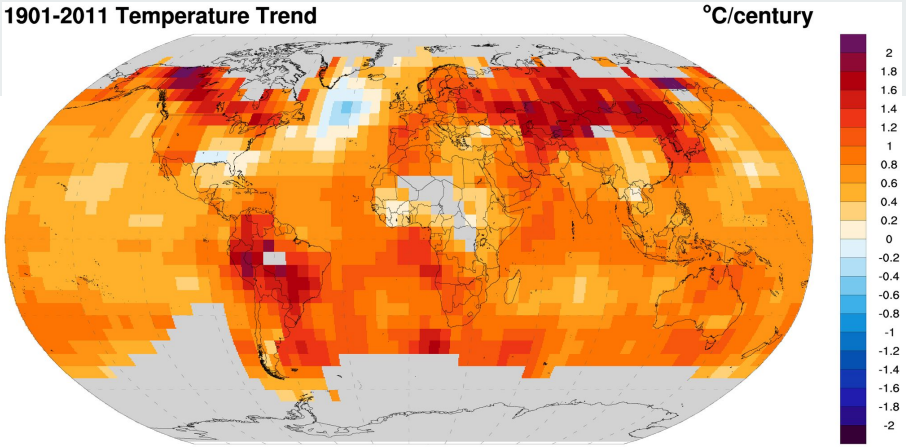
1	7	4	1	5	4	2	2
0	3	1	2	2	2	2	3
0	5	1	9	3	3	3	4
5	0	8	0	2	4	3	2
8	4	3	2	2	7	2	3
2	10	1	5	2	1	3	7



Wikimedia

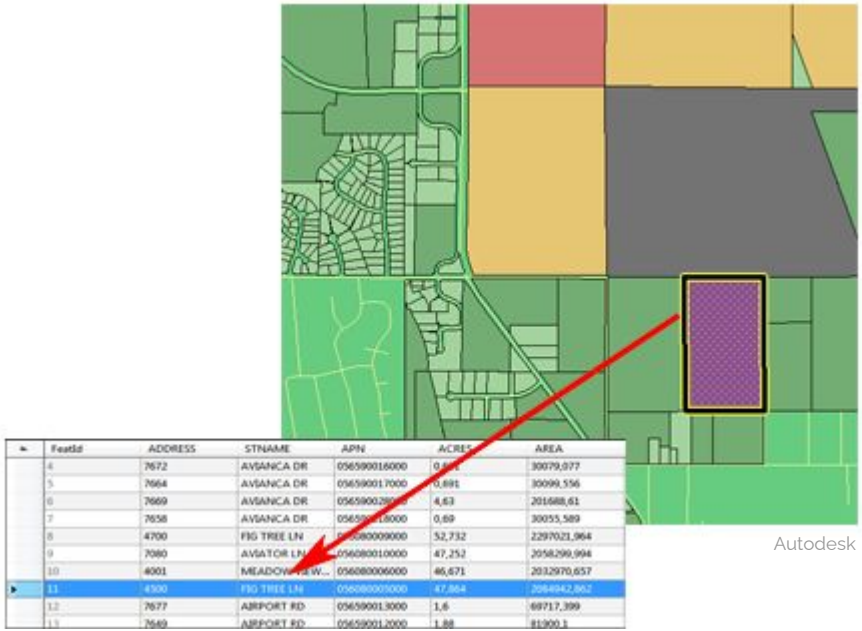
- Grid of cells
- Numbers assigned to each cell representing data
  - Categorical - Land use, e.g.
  - Continuous - Temperature, elevation, e.g.
- Good for representing continuously changing attributes



Wikimedia

Attribute data

- Tabular data appended to spatial data providing contextual information
- The spatial data is the where, and the attribute data is the *what*, *where*, and *why* (GIS Lounge)

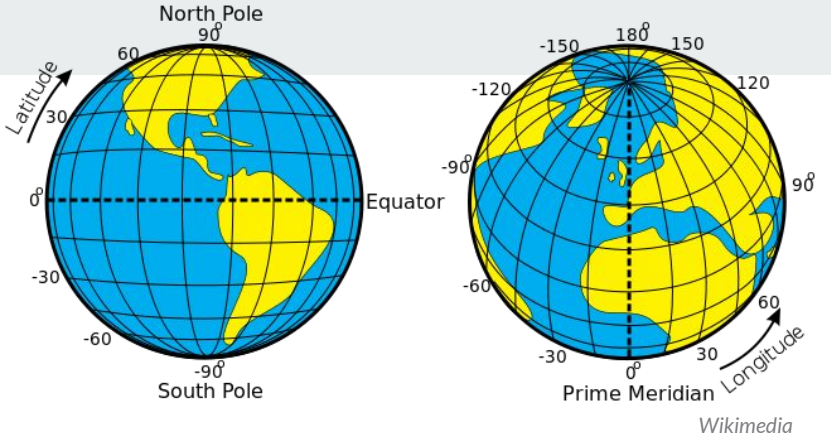


Autodesk

Coordinate Reference Systems (CRS)

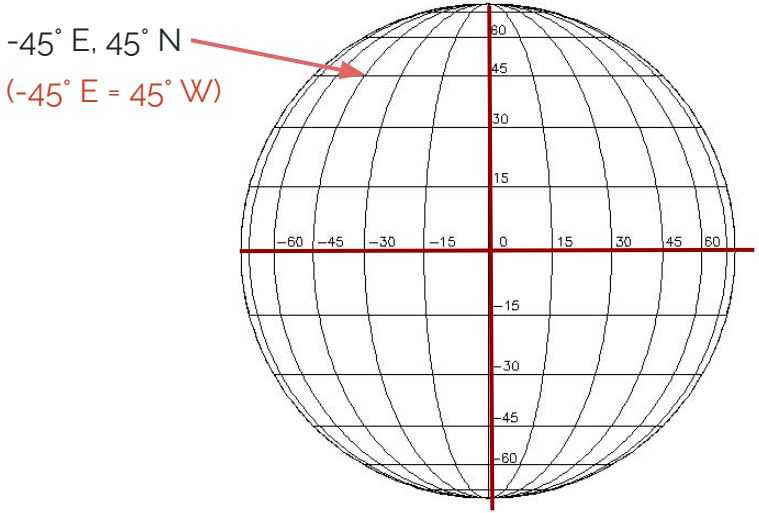
- Referencing the location of features on the earth's surface
- Two methods - **Geographic** Coordinate Systems or **Projected** Coordinate Systems

Geographic Coordinate Systems

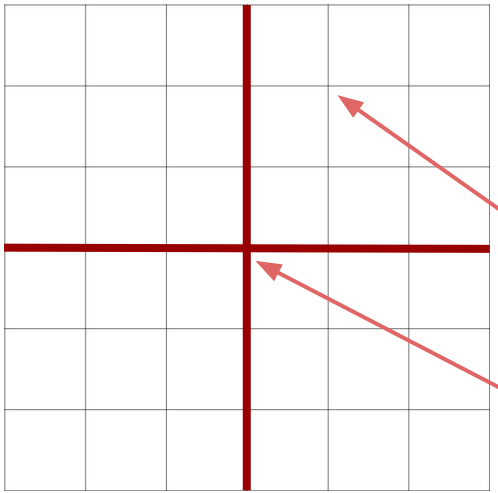


Wikimedia

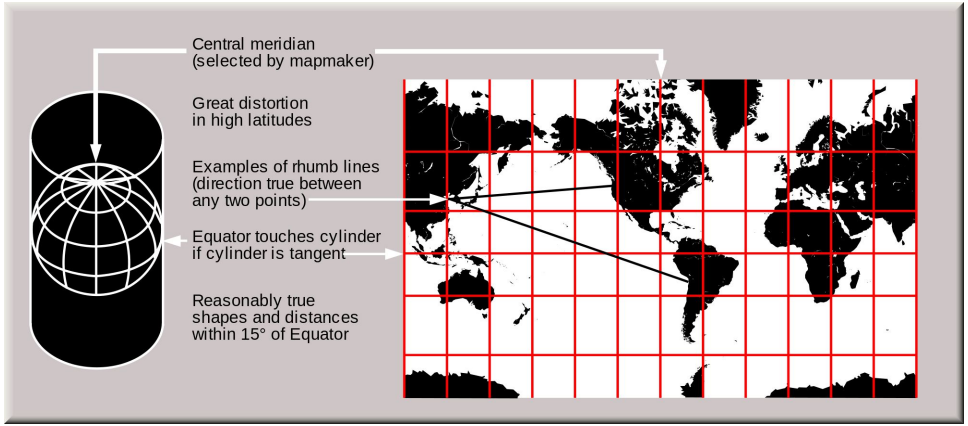
- Locations expressed as angles from a point
- Network or intersecting lines - meridians (longitude), parallels (latitude)
- Reference system for a curved earth based on a geodetic datum
- Many datums exist - World Geodetic System (WGS) 84, North American Datum (NAD) 83



Projected Coordinate Systems

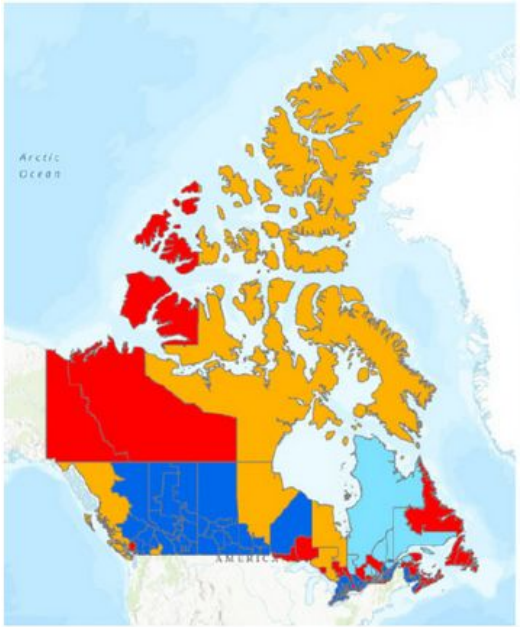


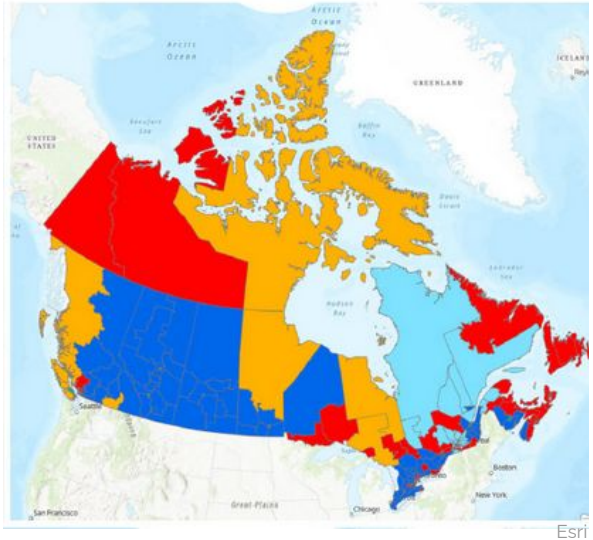
- Projecting the round earth onto a flat surface
- Representing the earth in two dimensions causes distortion
- Different projections preserve shape (*conformal*), area (*equal area*), distance (*equidistant*), **OR** direction (*true direction*)
- Locations are referenced as distance from reference point



Wikimedia

Why is this important?





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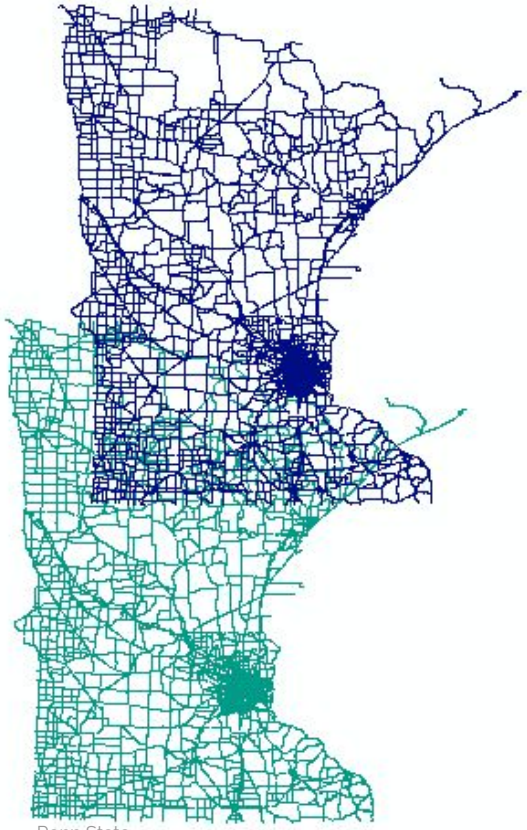


Penn State

Spatial data sources

Where can I get data?

- McMaster University Library
  - https://library.mcmaster.ca/collections/geospatial-data
- Scholars GeoPortal
  - http://geo.scholarsportal.info/
- City of Hamilton
  - http://open.hamilton.ca/
- Ontario GeoHub
  - https://geohub.lio.gov.on.ca/
- Canada's Open Government Portal
  - https://open.canada.ca/en/open-data

Quantum GIS (QGIS)

GIS Software

- Many, MANY types of software
- Different tools for different purposes
    - Full-featured vs. specialized
    - Open-source vs. Closed-source
    - User-friendly vs. technical

QGIS

- Free and open-source GIS software
- Fully-functional; relatively lightweight
- Product of the Open Source Geospatial Foundation (OSGeo)
- Written in C++ (allows python plugins)
- Version 1.0 released in 2009; Currently 3.x
- Rapidly gaining in popularity
- QGIS downloads, user guide, and training manual
    - https://qgis.org/en/site/

Questions about GIS and Geospatial Data?

EMAIL US →

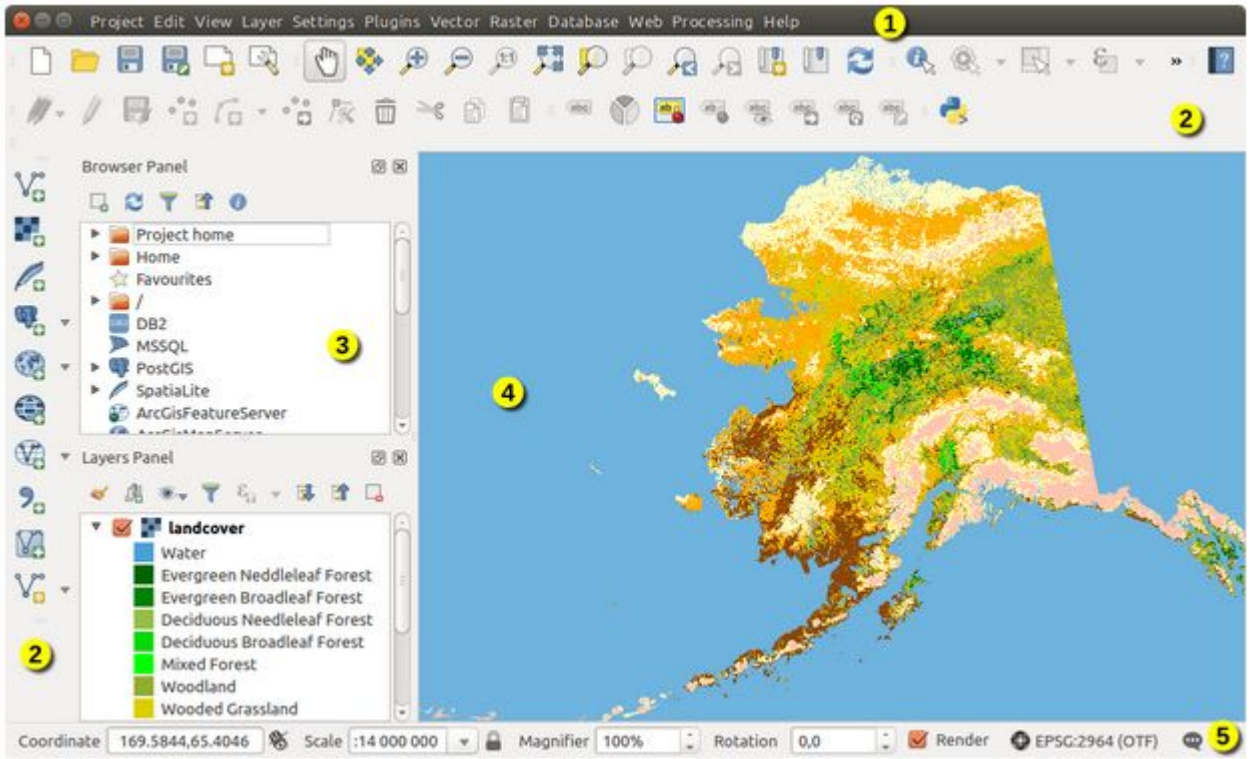
libgis@mcmaster.ca

QGIS Tutorials and Resources

- QGIS Tutorials
  http://www.qgistutorials.com
- QGIS video tutorials with Klas Karlsson
  - https://www.youtube.com/channel/UCxs7cfMwzgGZhtUuwhny4-Q
- QGIS Documentation
  - https://qgis.org/en/docs/index.html
  - User guide and training manual
- McMaster University Library - Maps, Data, GIS
  Mills Memorial Library, L102
  libgis@mcmaster.ca

QGIS

1. Menu bar
2. Toolbars
3. Panels
4. Map view
5. Status bar



Exercise

Re-creating John Snow's 1854 map of the cholera outbreak in London

Questions?

Thanks!

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