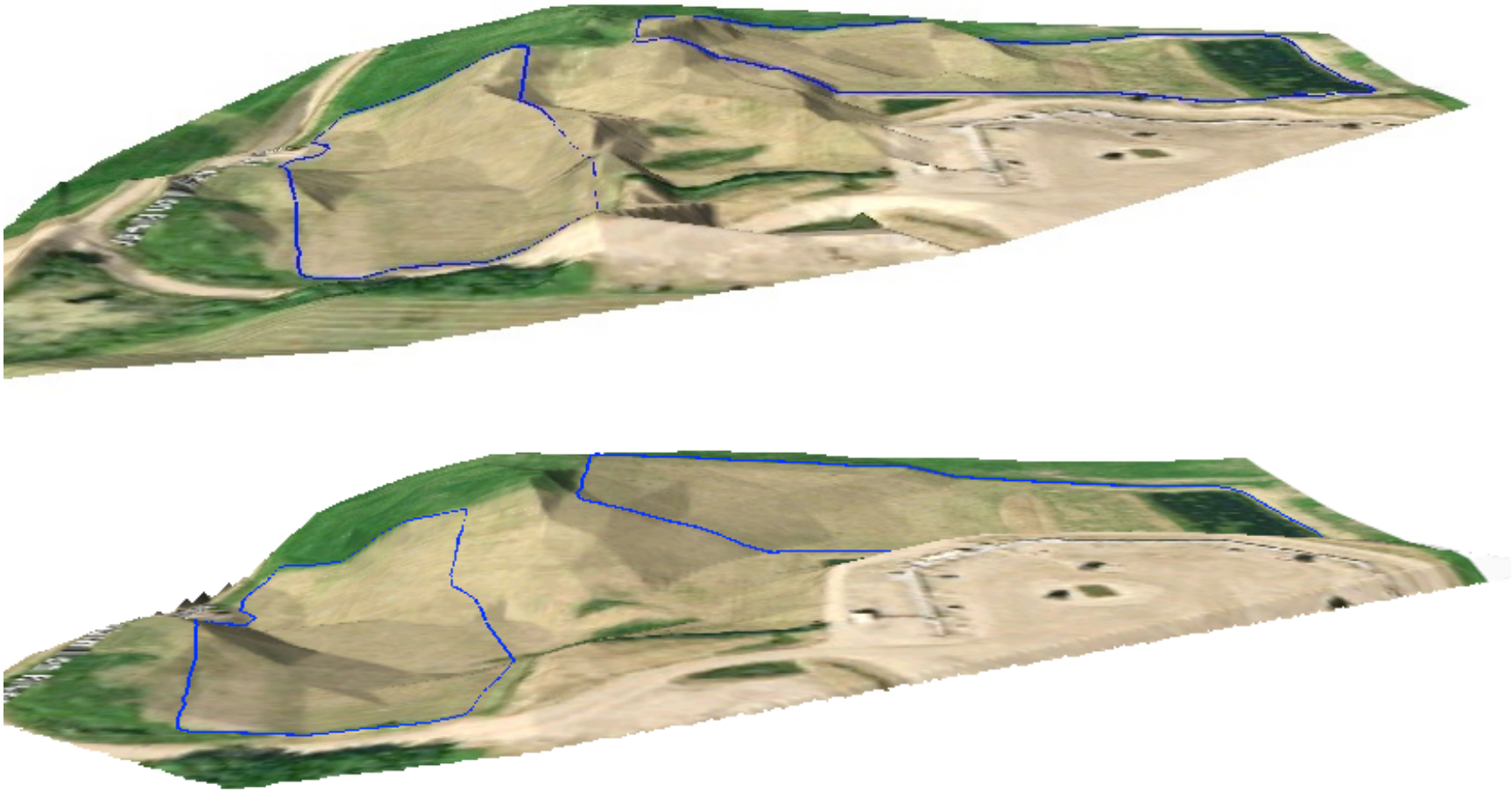
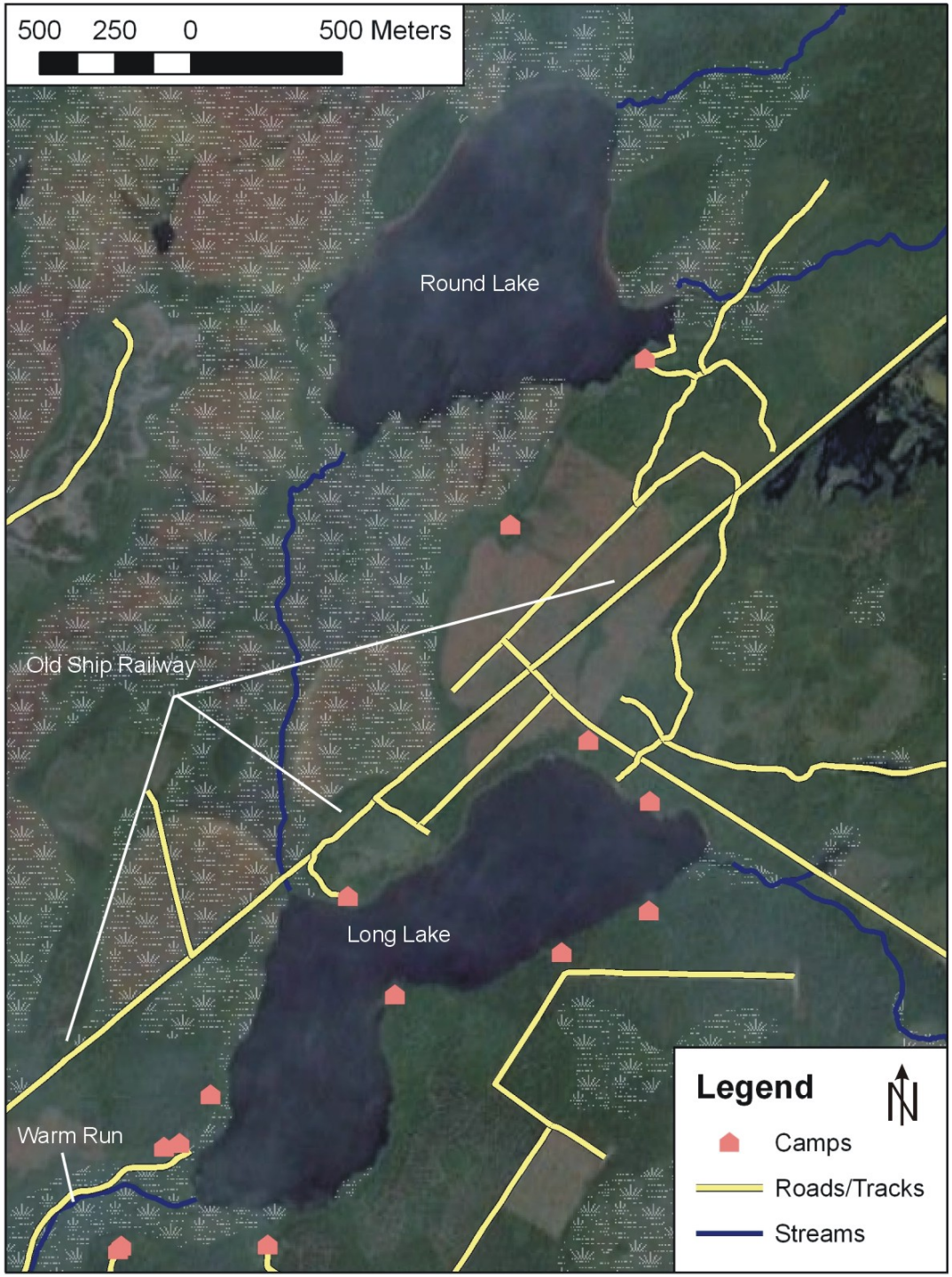


Introduction to GIS Short Course

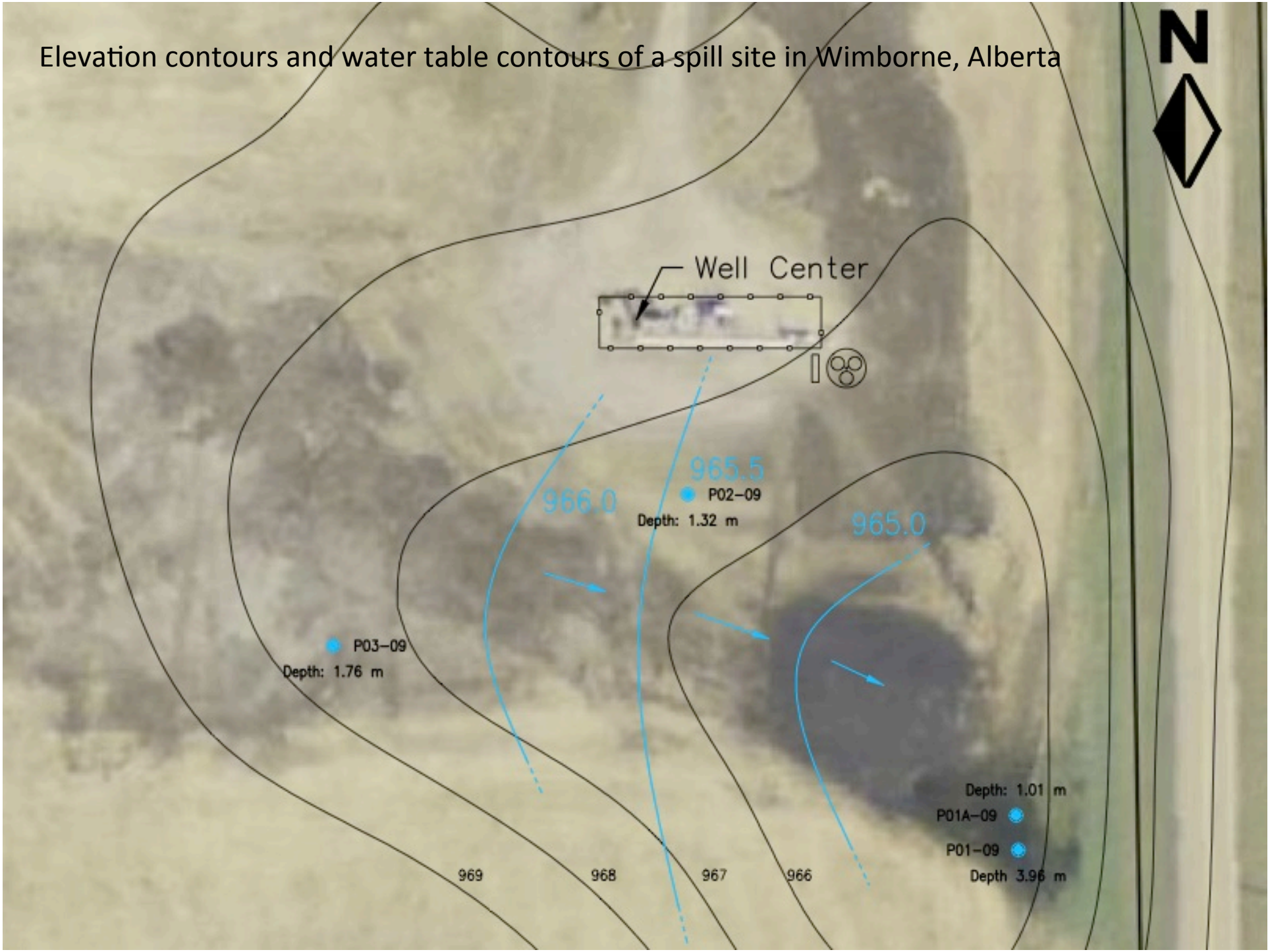
January 4th & 5th, 2015

My Background

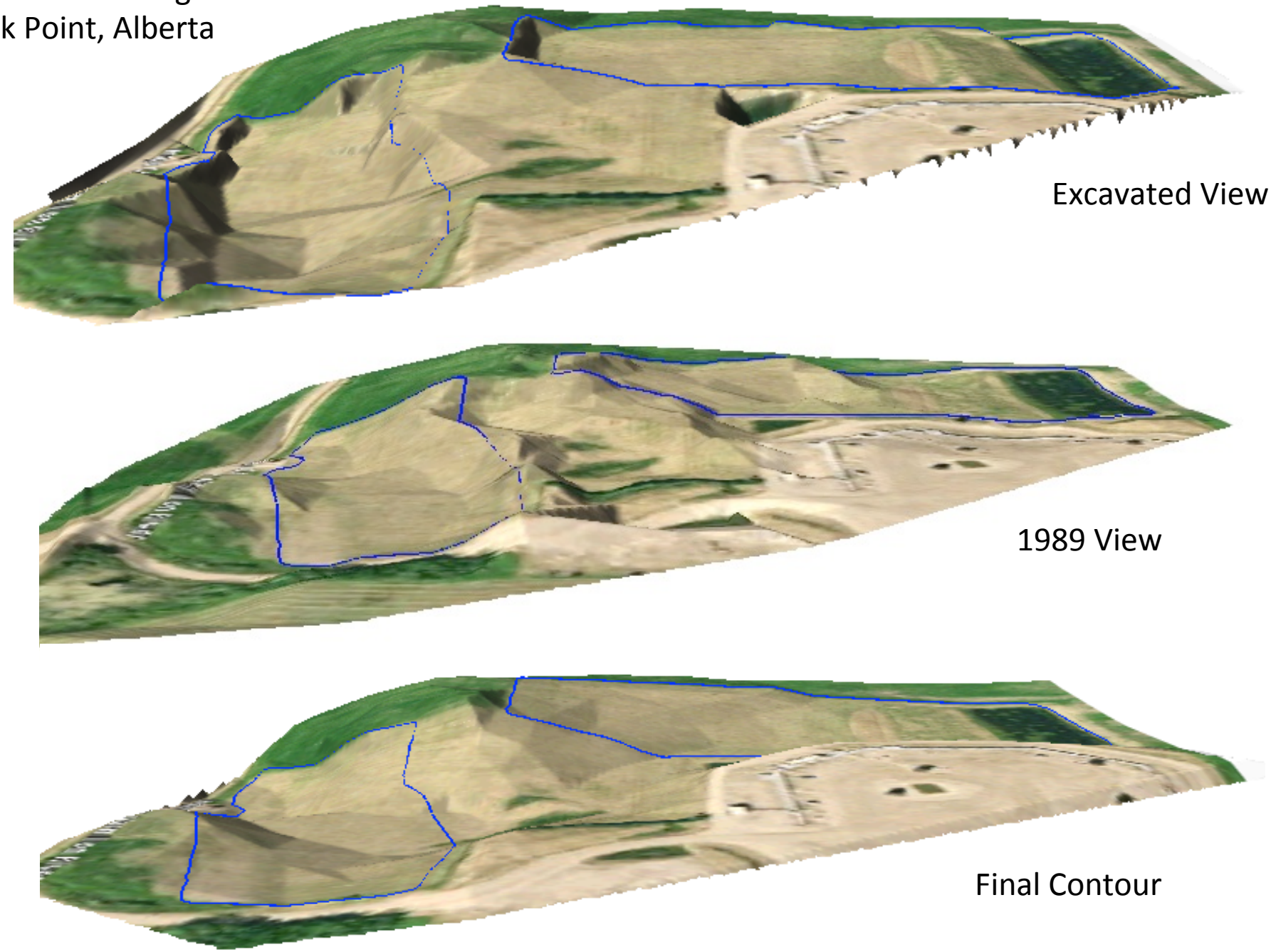
- Not in GIS!
- Environmental Science at Acadia
- Environmental Scientist/Project Coordinator at GeoGrid Environmental
- M.Sc. Geology at Acadia
- Use Geographic Information Systems in all 3
- Applied, Pragmatic approach to GIS


500 250 0 500 Meters
Round Lake
Old Ship Railway
Long Lake
Warm Run
Legend
N
Camps
Roads/Tracks
Streams

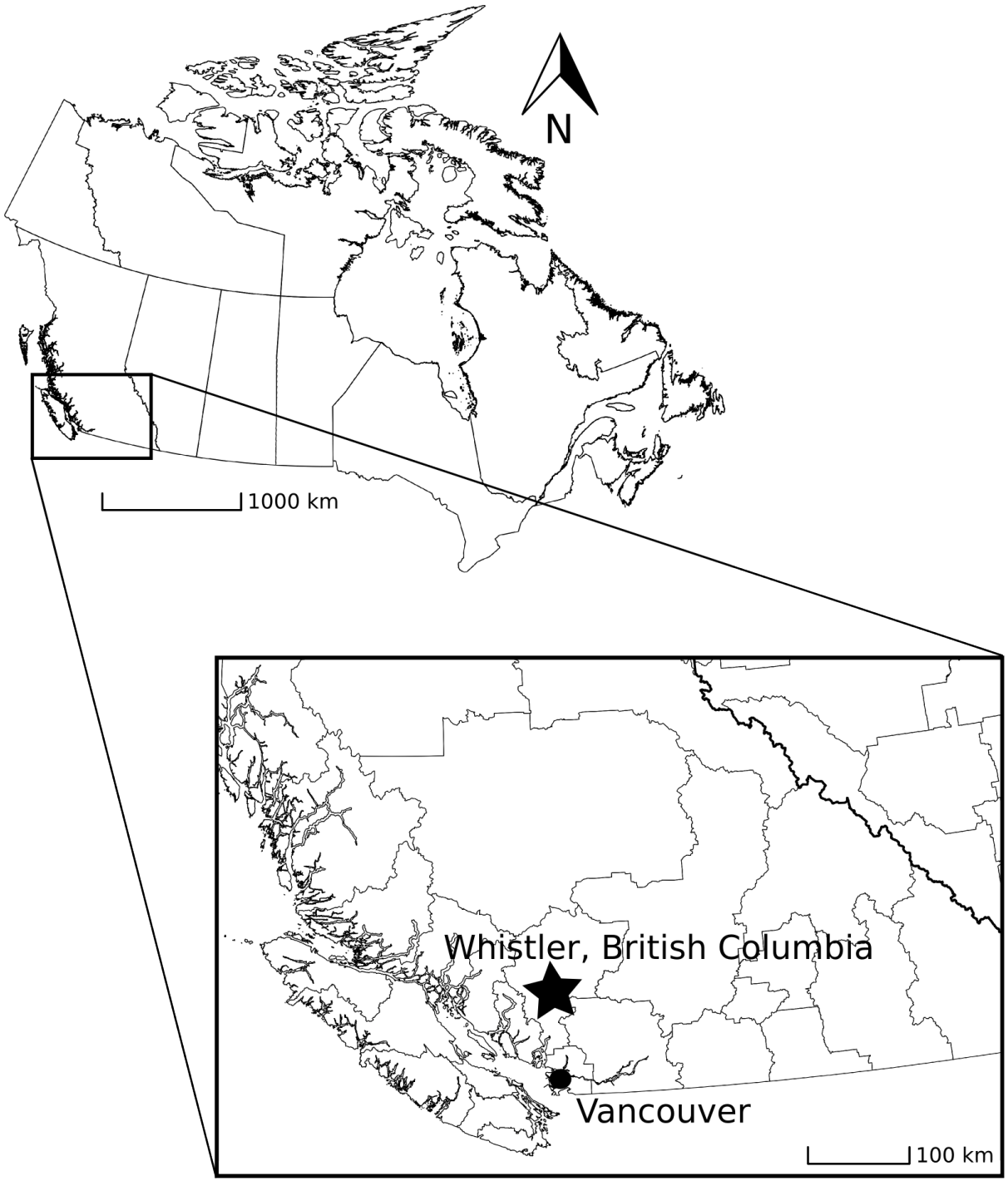
Elevation contours and water table contours of a spill site in Wimborne, Alberta

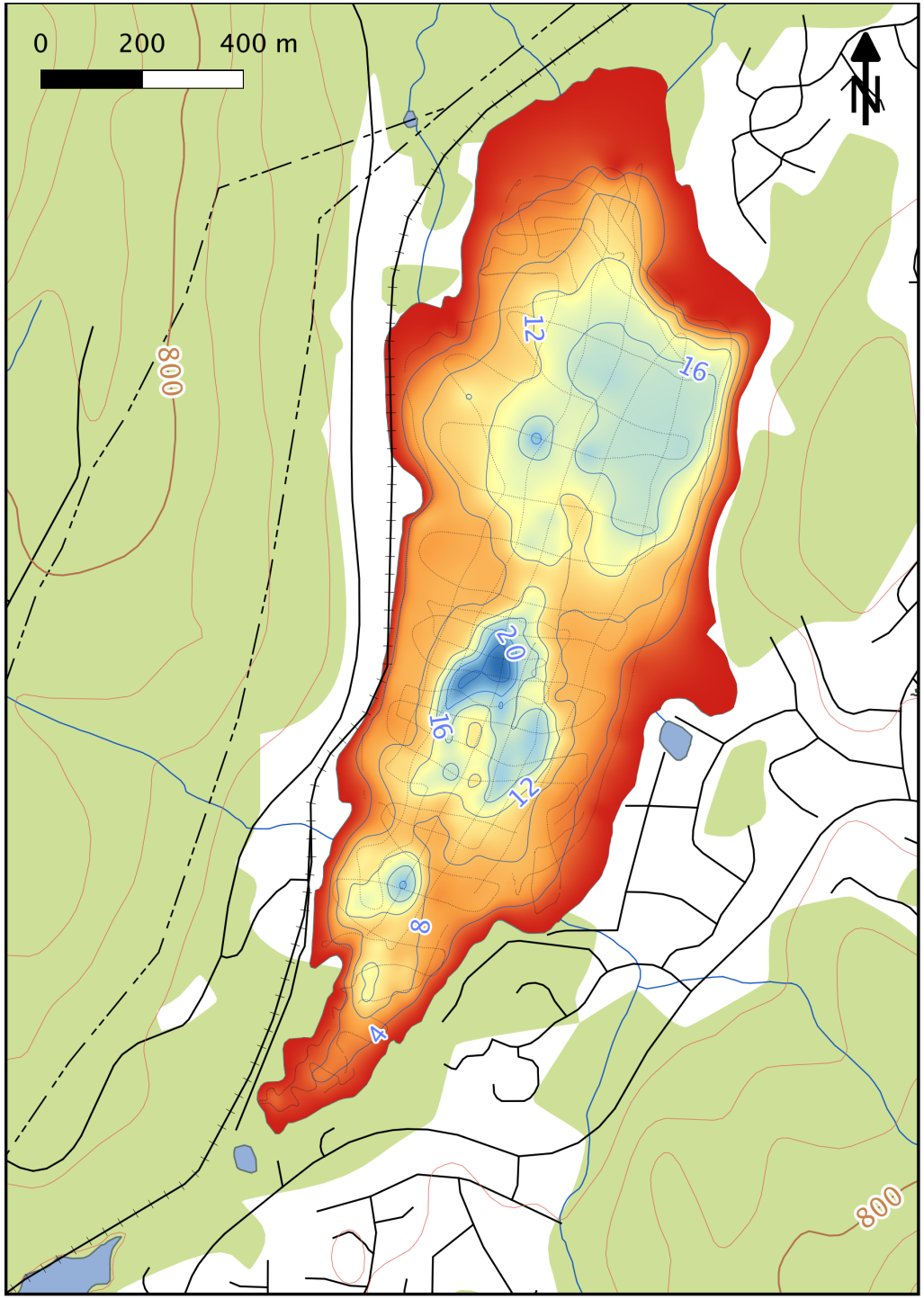


Cut and fill diagram of a site in Elk Point, Alberta



Cut and fill diagram of a site in Elk Point, Alberta

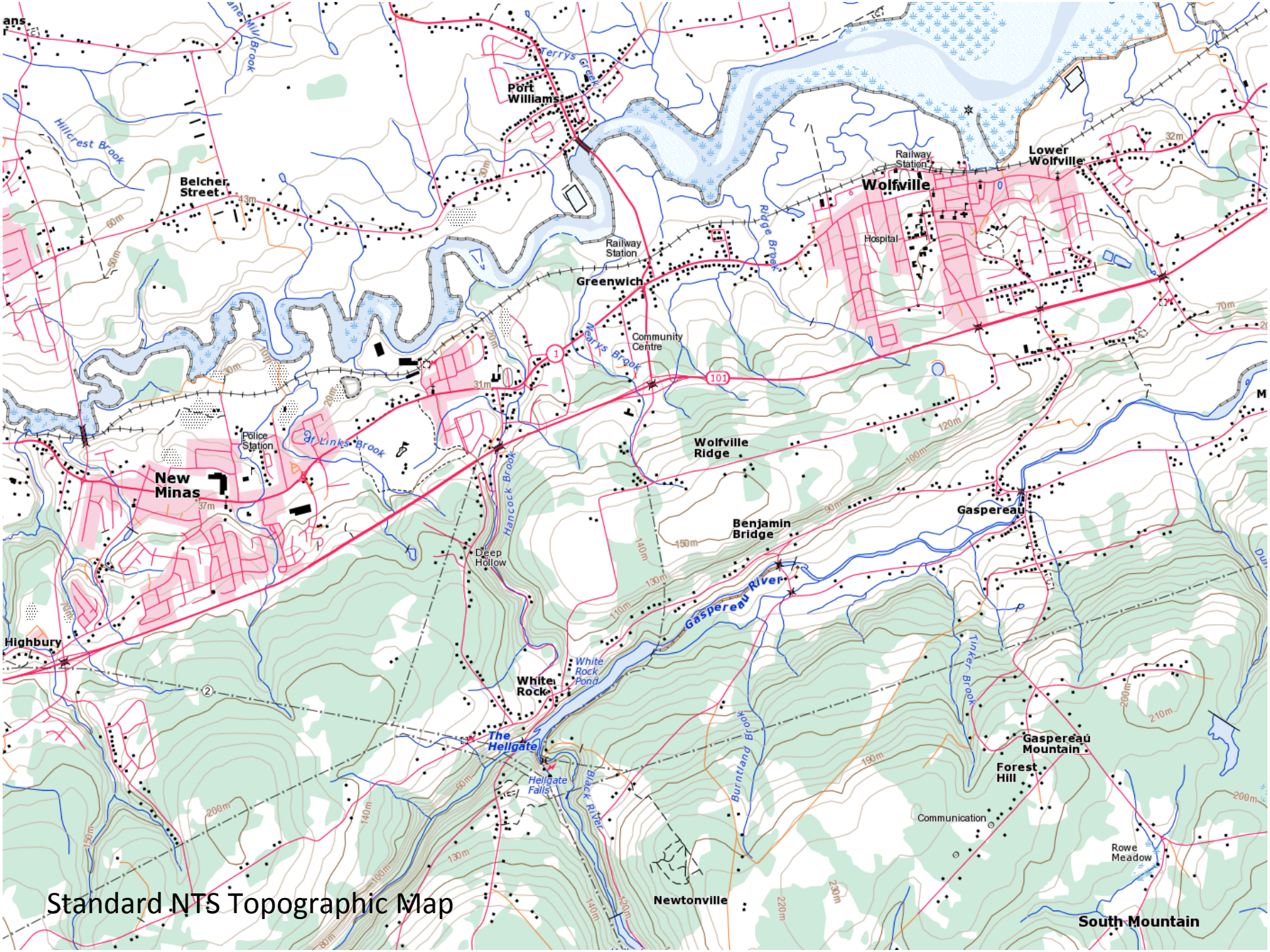

N
1000 km
Whistler, British Columbia
Vancouver
100 km


0
200
400 m
N
800
12
16
20
16
12
8
4
800

What is Geographic Information?

- GIS = Geographic Information System(s)
- Geographic Information is any information with a location associated with it (so, everything)

- Any information you want to put on a map.



Standard NTS Topographic Map

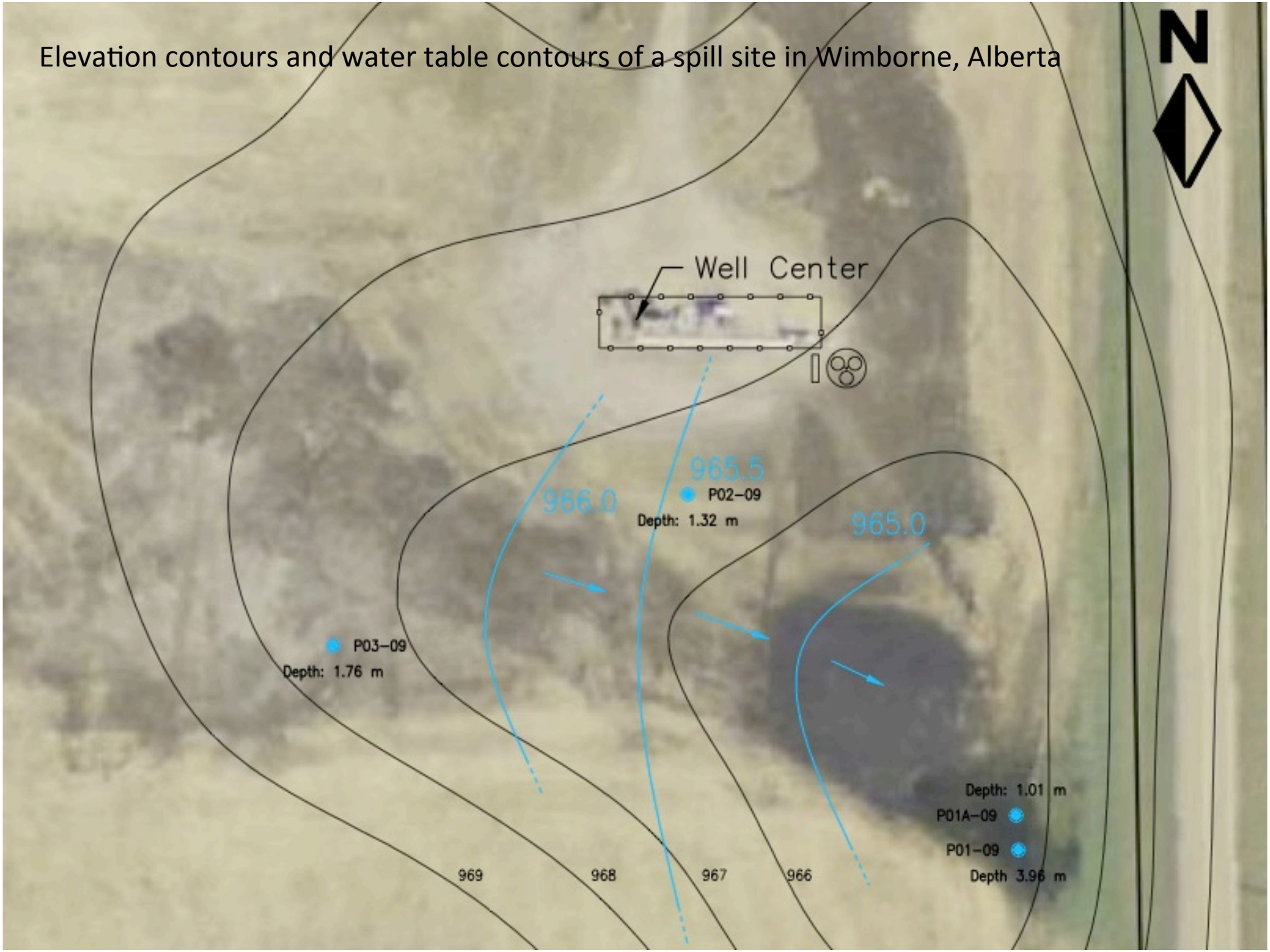
Why do we bother?

- Often a map is the best way to present and analyze information with a geographic component.
- Maps allow us to view multiple types of information together ("layers") to make connections.

Introduction to GIS Short Course

- Day 1: How do you make a map in QGIS?
  - Add data to the map
  - Format the data to look pretty
  - Export/Print the map
- Day 2: Creating, importing, and manipulating GIS Data
  - Add data from a GPS, from Google Earth, or from a spreadsheet.
  - Make a map of your study site
  - Contour point data

Elevation contours and water table contours of a spill site in Wimborne, Alberta



GIS Applications

- GIS = Programs that work with geographic data
- Google Earth (free to $400/year)
- ESRI ArcGIS ($1500 base license, $4000 per extension; free basic versions available)
- GRASS, QGIS (free or by donation)
- MapInfo ($1995)

esri

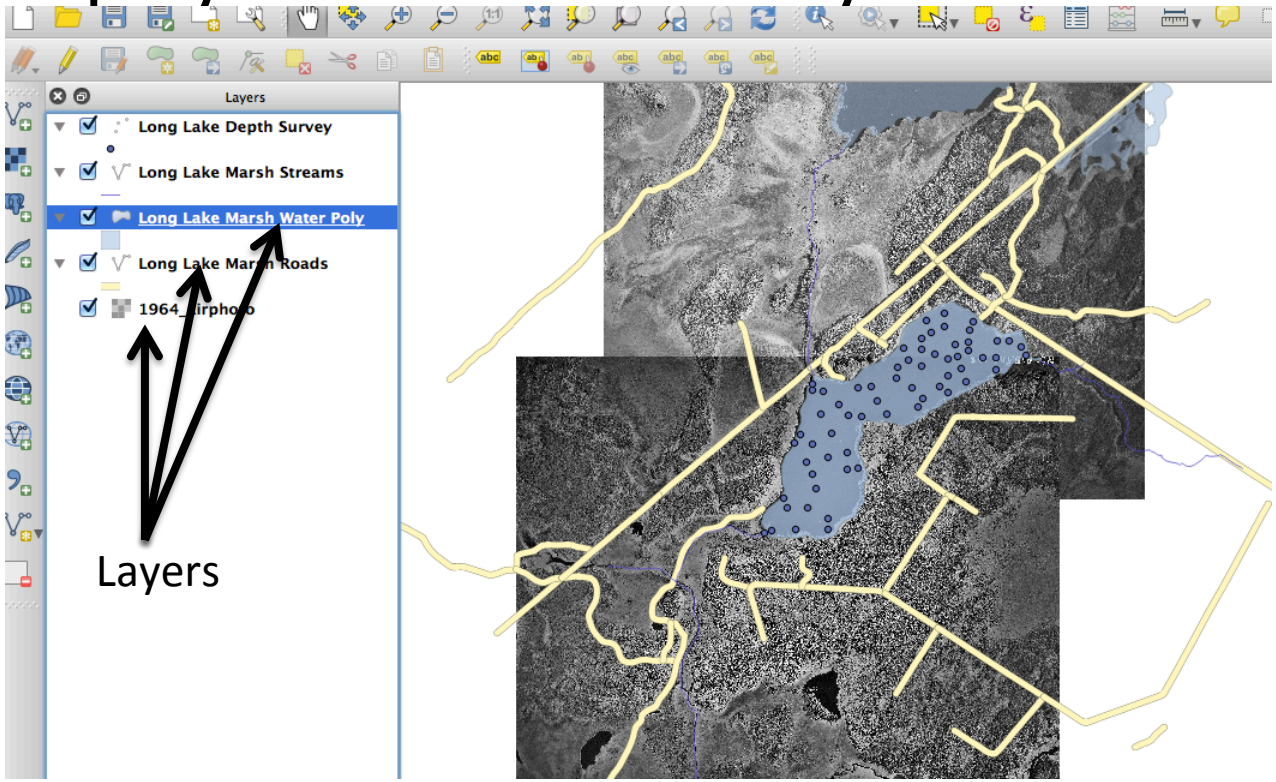
MapInfo.

GIS Applications

- All have same set of features:
  - Basemaps
  - Ability to add/edit/view geographic data (some free versions don't allow editing)
  - Analysis Tools
- We will be using QGIS because:
  - It doesn't cost money to install
  - It works (and works well) on multiple platforms
  - There is no license restriction (you can use it forever)

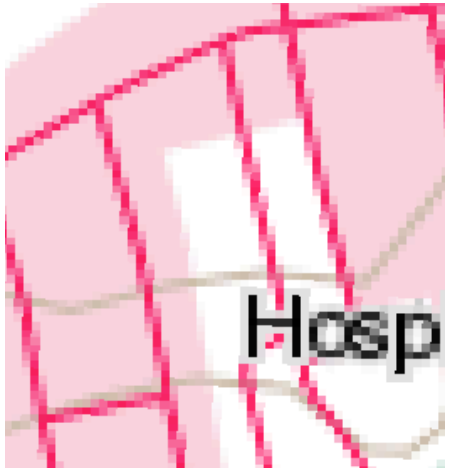
How is GIS Data Organized?

- GIS Data is organized in layers
- Each layer contains similar data that is usually displayed in a similar way.



Types of Layers

- Raster Layers
  - Contain a grid of data with a data value in each square
  - Can be color data (like a picture)
  - Can be other data (like elevation, concentration)
- Vector Layers
  - Contain a collection of points OR lines OR polygons (“features”)
  - Also contain data about these features (Sample number, elevation, depth, strike, dip; known as “attributes”).
- The power of GIS if often in comparing layers with each other and examining relationships.

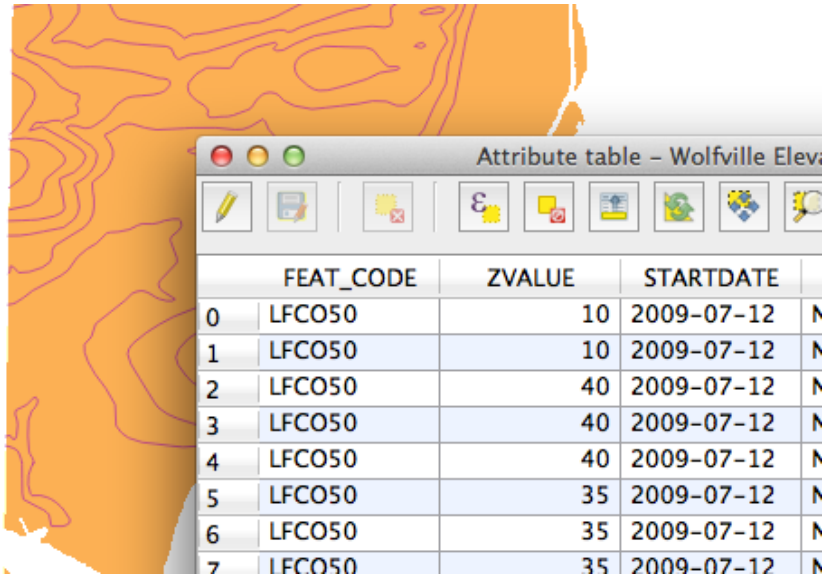


Raster Layers

- Can be displayed in a variety of ways – “color ramp” (shown below), grayscale, several discrete colors.
- For any point on the map, you can obtain a value from a raster.
- Also called a “surface”

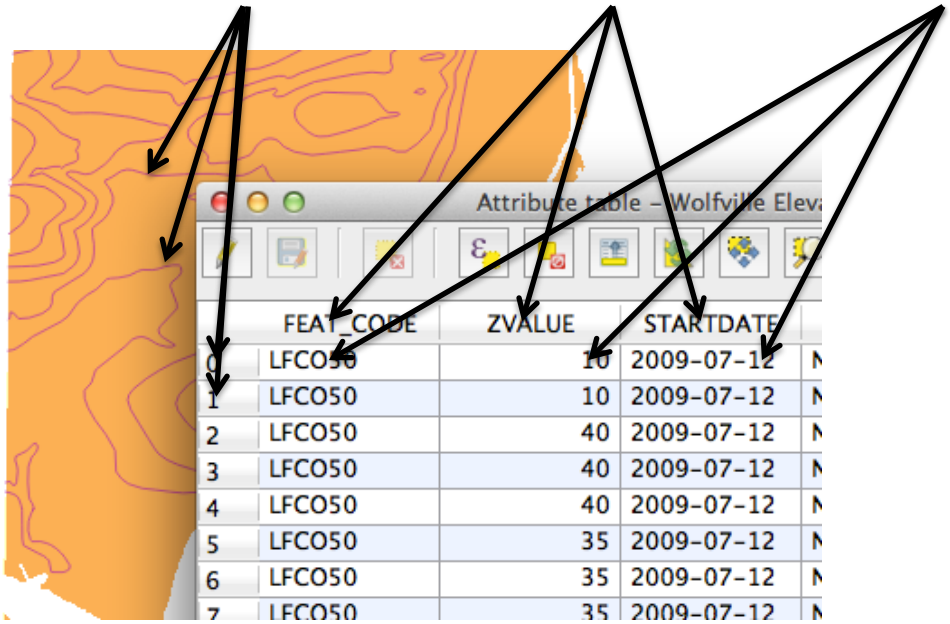
Vector Layers

- Made up of one or more “features” that have “attributes”
- Point OR line OR polygon features in a single layer



Vector Data

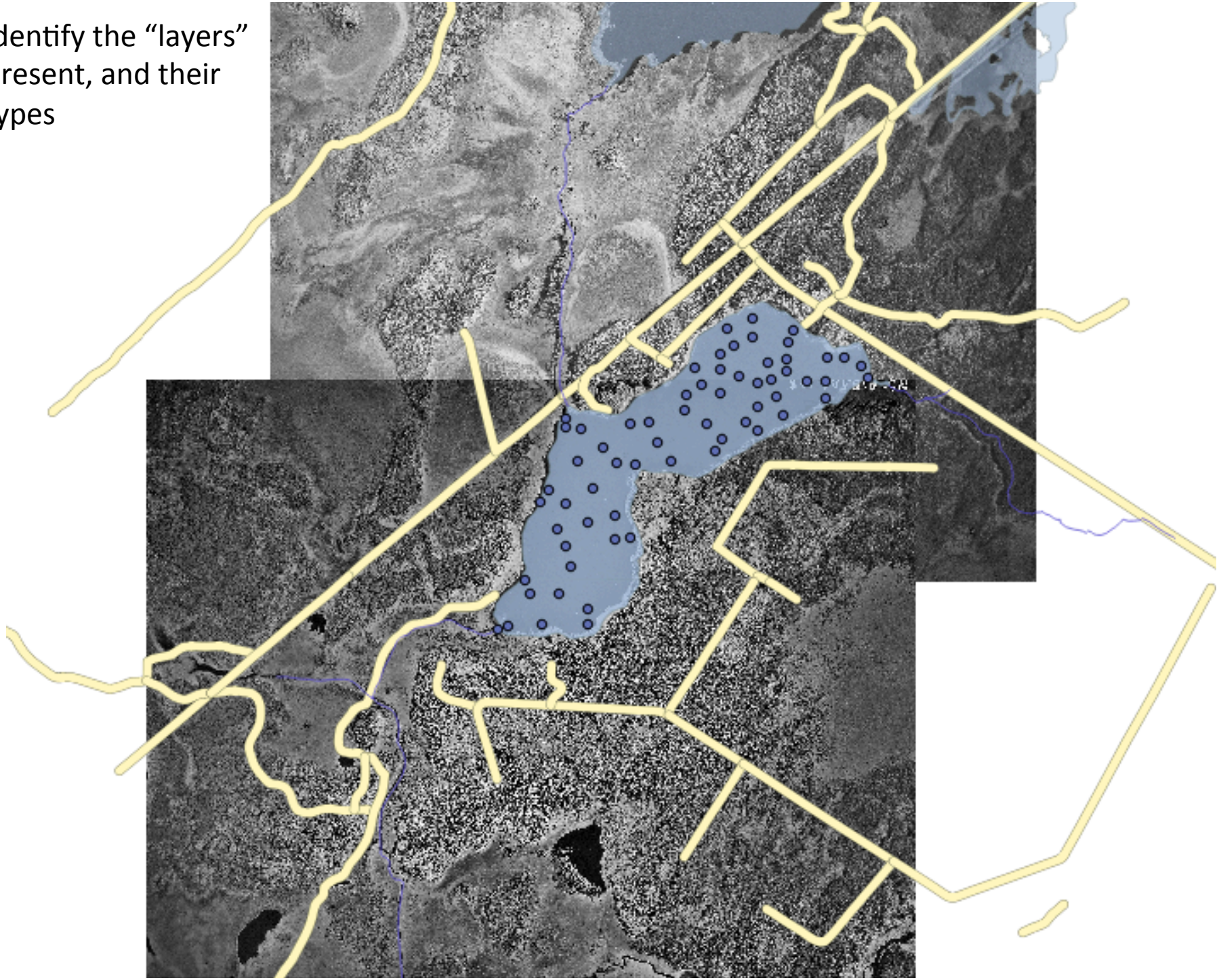
- Points
- Lines
- Polygons
- Features, Fields, Attributes

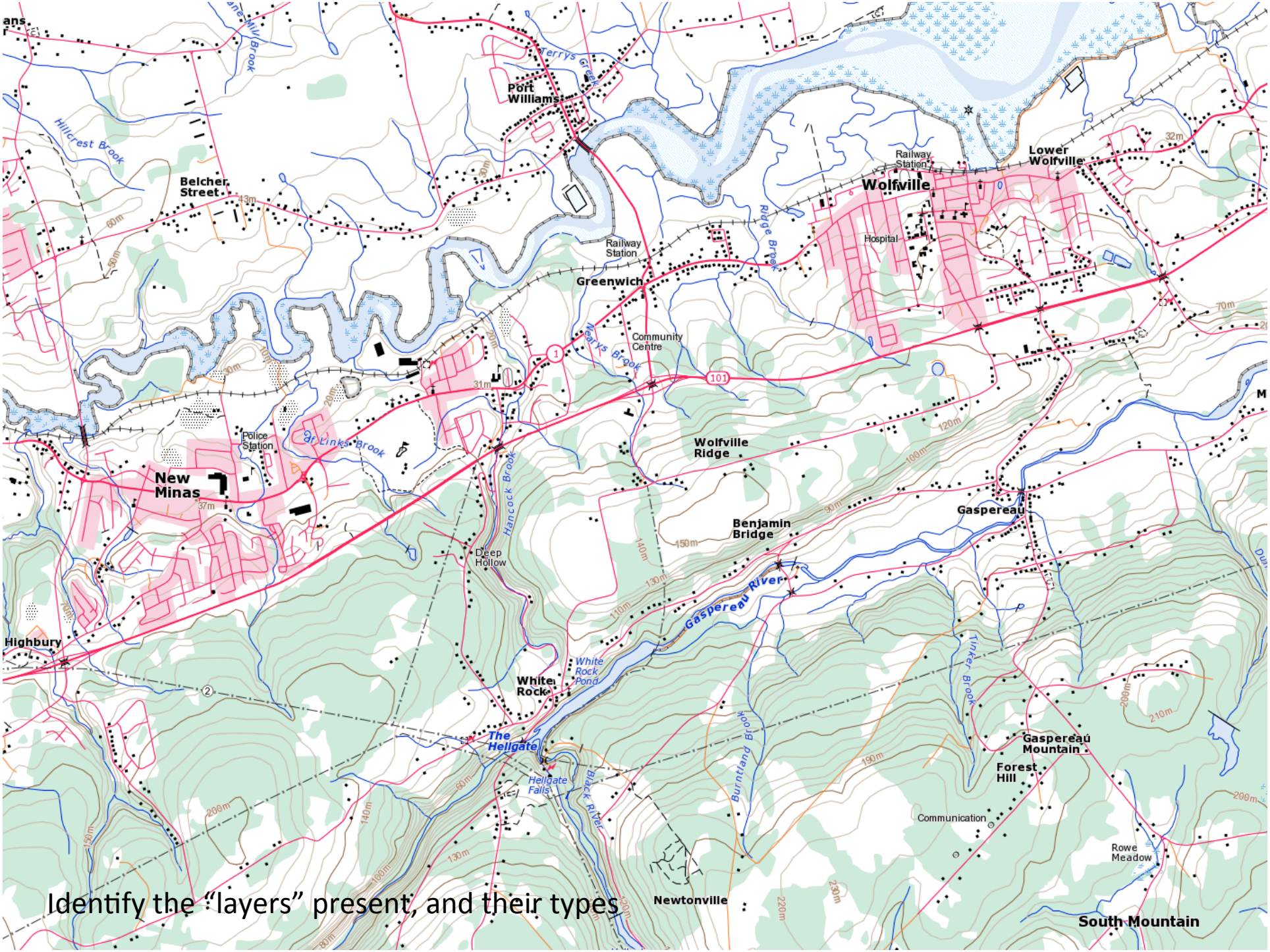


How could the following data be represented?

- Soil conductivity (Points, Contours, Raster)
- Water table depth (Points, Contours, Raster)
- Sample locations (Points, Raster)
- Strike & dip (Points, Contours, Raster)
- Slope steepness & direction of slope (Points, Contours, Raster)
- Roads (Lines, Polygons, Raster)
- Habitat suitability (Polygons, Raster)
- Bedrock type (Polygons, Raster)

Identify the “layers” present, and their types





Identify the "layers" present, and their types

Exercise!

Coordinate Reference Systems

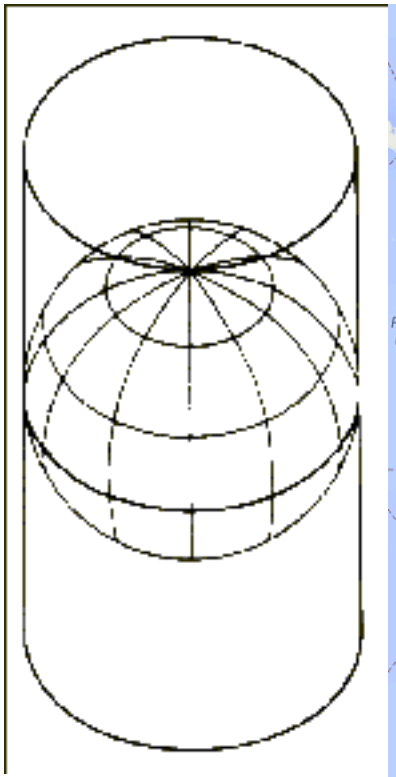
Coordinate Reference Systems (CRS)

- GIS Data (raster and vector) is represented by coordinates (X and Y).
- These X and Y coordinates can mean any number of things!
  - Latitude, Longitude, UTM Easting, UTM Northing, Arbitrary XY data from a defined grid
- Every GIS data file has a CRS, because X and Y coordinates must be represented somehow.

Projections

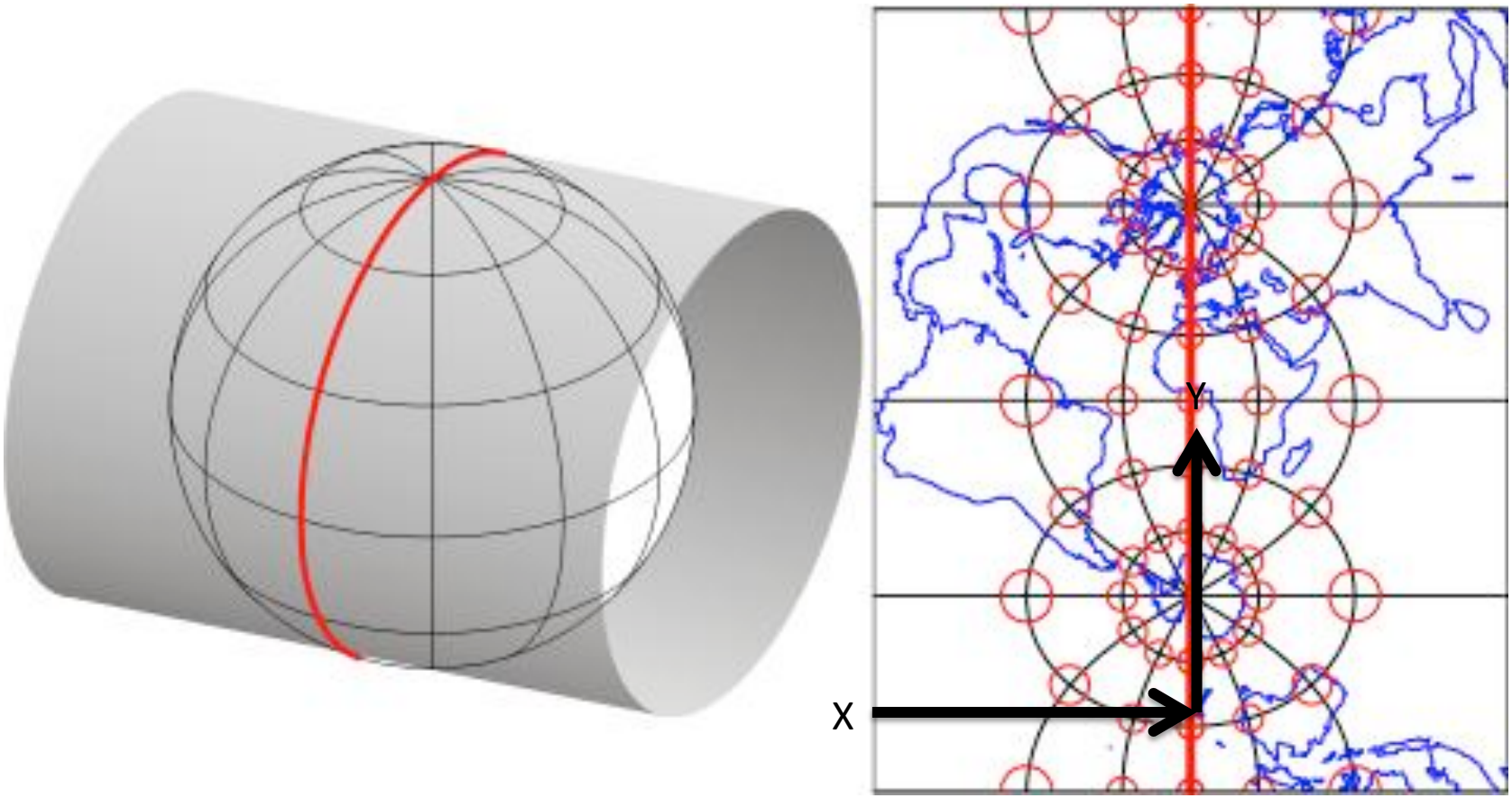
- Earth is a sphere (actually, an ellipsoid), so to represent it on something flat (your screen, a piece of paper) we need a projection.
- Projections are never perfect, always distort some combination of shape (angles), scale (distance), and area.
- Mathematically, projections convert Latitude/Longitude values (angles) to X/Y values (distances).

Mercator Projection

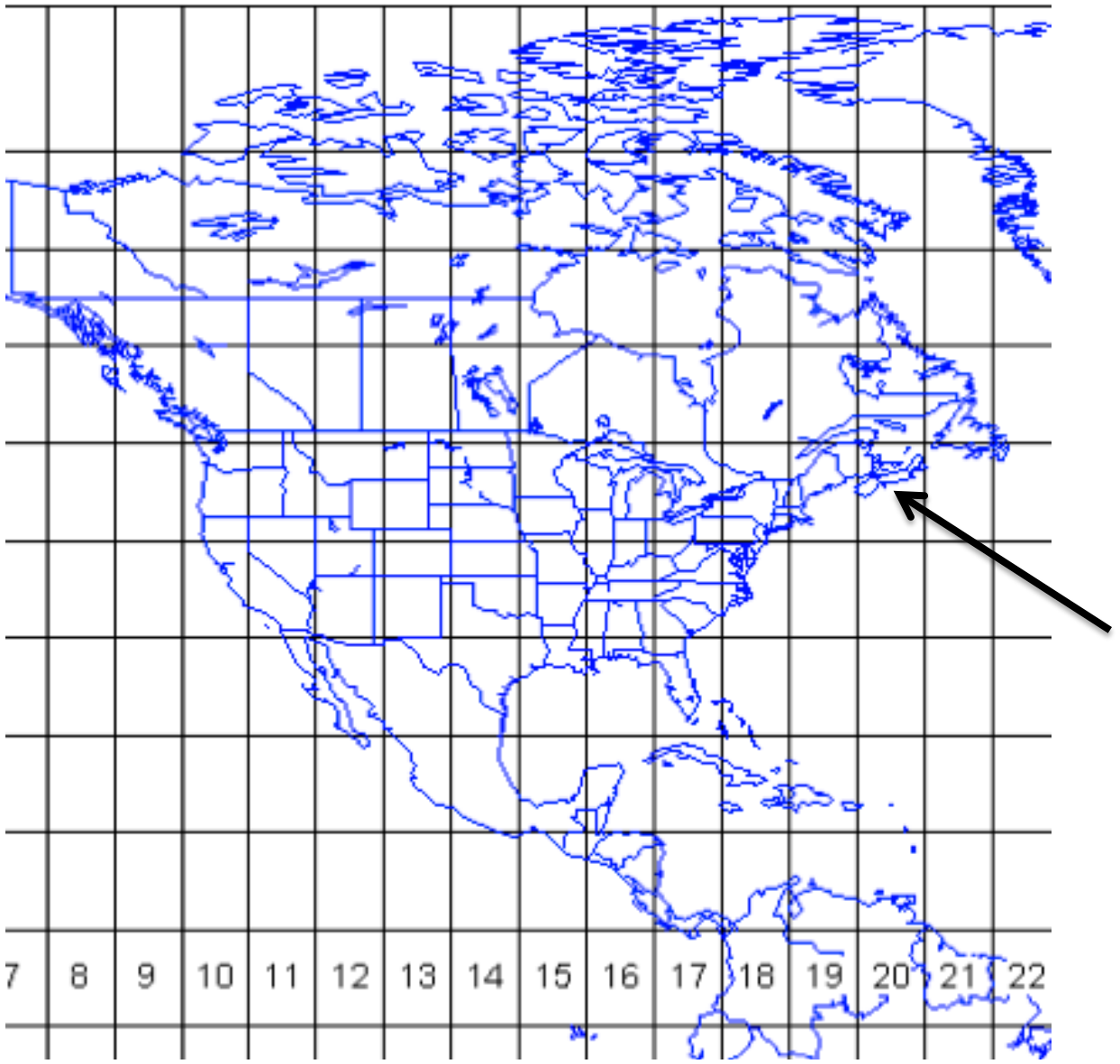


Transverse Mercator Projection

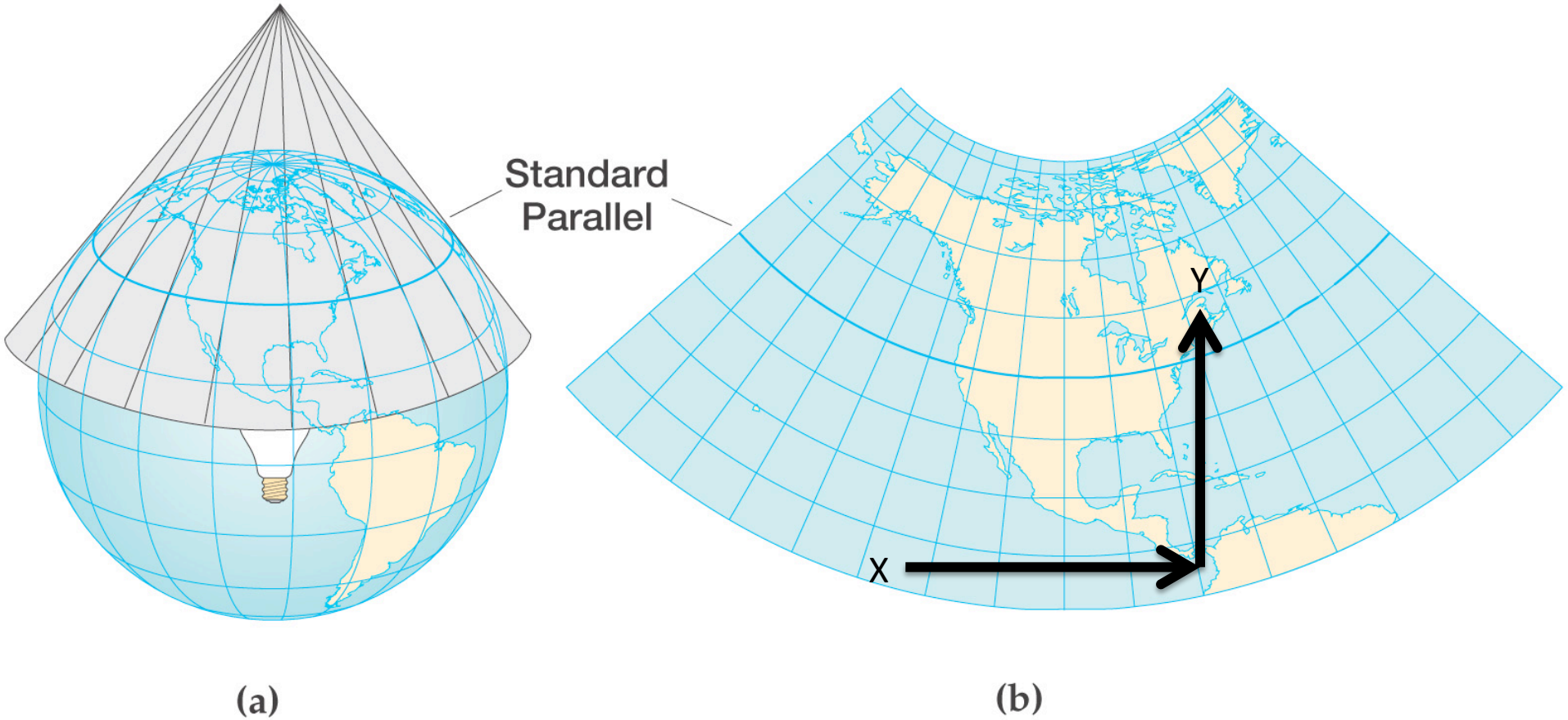
- Low distortion for a very specific strip of the world



Universal Transverse Mercator Zones



Conic Projection



Projections and CRSs

- The CRS for a dataset can be projected (XY values in distance units) or geographic (latitude/longitude)
- The projection in which you view geographic data can be different than the CRS of the dataset ("on-the-fly projection")

What You Need To Know

- WGS84 = Latitude/Longitude
- NAD83 = Latitude/Longitude fixed for North American Plate
- Nova Scotia is UTM Zone 20N
- For small areas (less than 50-100 km across) use UTM!
- For large areas (between UTM zones) use World Mercator or Albers Equal Area Conic
- For the arctic, you may need to use other projections

Exercise!