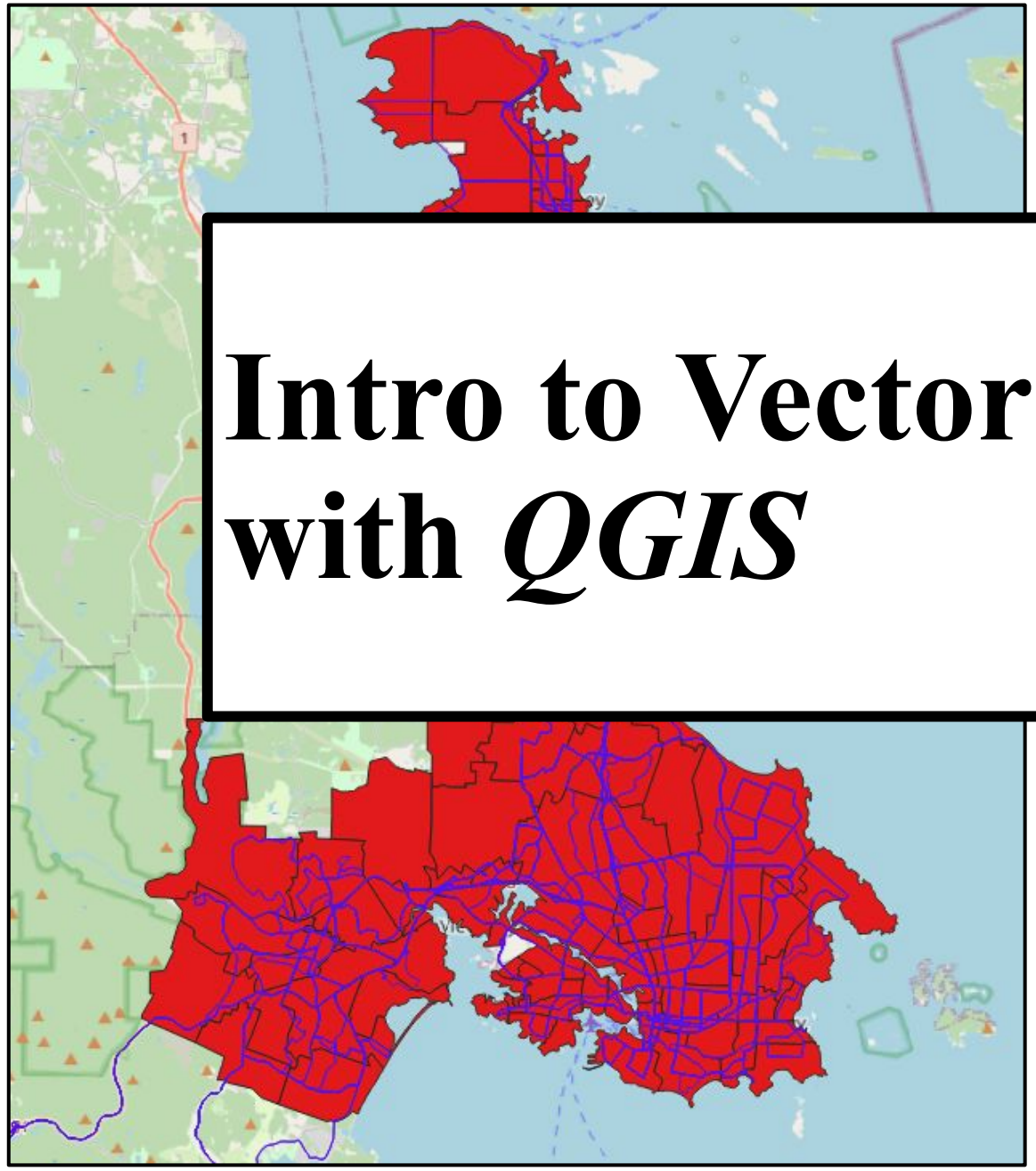
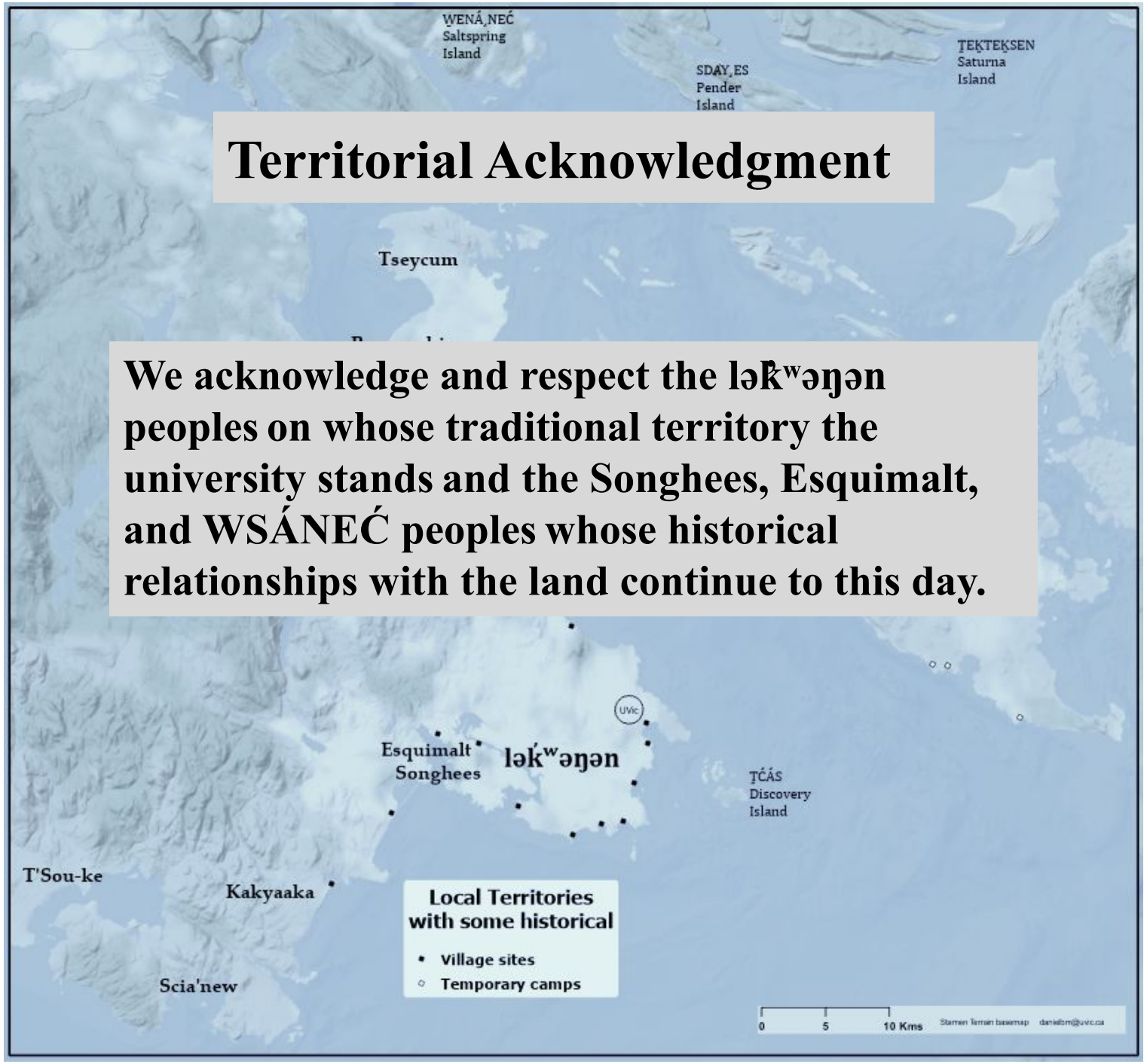


Intro to Vector Data with *QGIS*

2026

University of Victoria Libraries



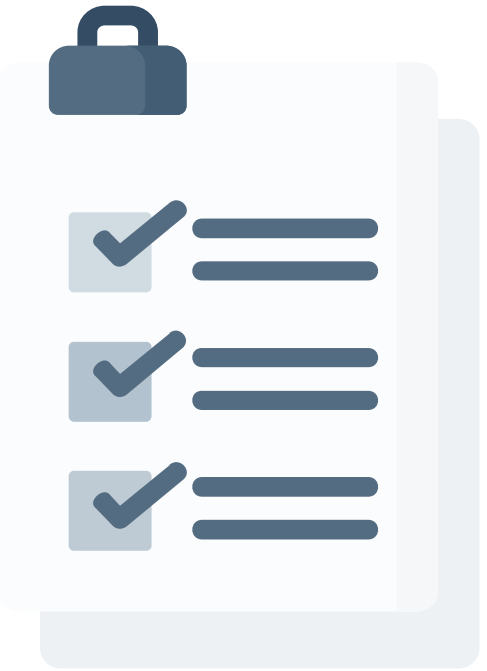
Territorial Acknowledgment

We acknowledge and respect the lək̓ʷəŋən peoples on whose traditional territory the university stands and the Songhees, Esquimalt, and WSÁNEĆ peoples whose historical relationships with the land continue to this day.

Learning Objectives

- **Distinguish** between GIS and other web map interfaces
- **Identify and navigate** key *QGIS* interface elements

  (Layers panel, Menu bar, Map view)
- **Define** the basics of **vector data**
- **Explore data layers** using tools such as identify feature



Outcomes

Using *QGIS*, participants will:

- **Load and display** vector data from the Capital Regional District
    - CRD neighbourhoods (polygon)
    - bus routes (lines)
    - location coordinate (points)
- **Import locations.csv data** and add to it
- **Style** above
- **Export map**

What is a Geospatial Tool?

Software/hardware typically designed for specific tasks or functions such as mapping

Web-based mapping tools, very limited spatial analysis.

What is a GIS?

A comprehensive system which encompasses a range of geospatial tools for spatial modelling and analysis

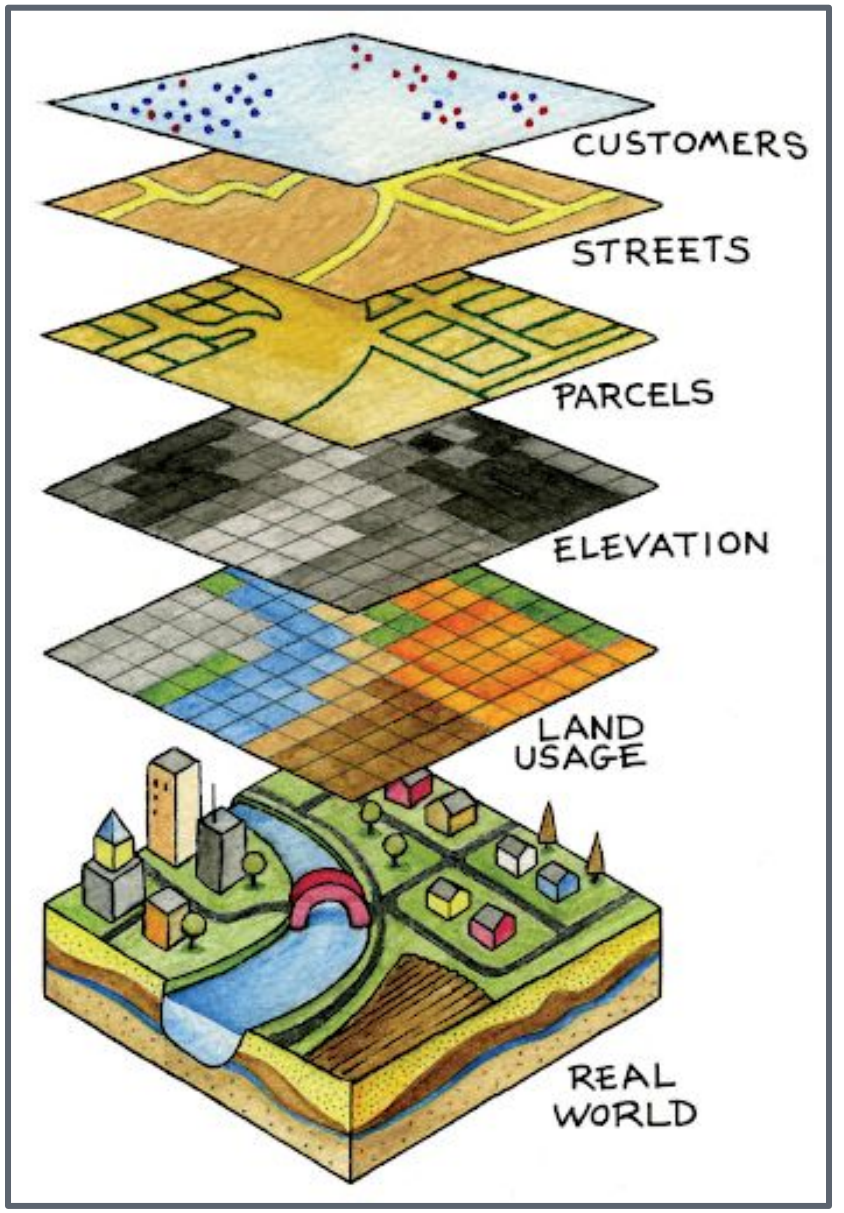
Not all geospatial tools are a GIS!

What is GIS?

GIS can:

- Create
- Edit (manipulate, sub-set, etc.)
- Query
- Manage
- Analyse
- Store

data



GIS and Mapping - Wyoming County, PA, USA

Maguire, D.J. (1991). An overview and definition of GIS. *Geographical information systems: Principles and applications.*

Chrisman, N.R. (1999). What does 'GIS' mean? *Transactions in GIS* 3(2)

Desktop GIS: *Proprietary*

Desktop GIS: *FOSS*
(Free and Open-Source Software)

GRASS GIS

OSGeo

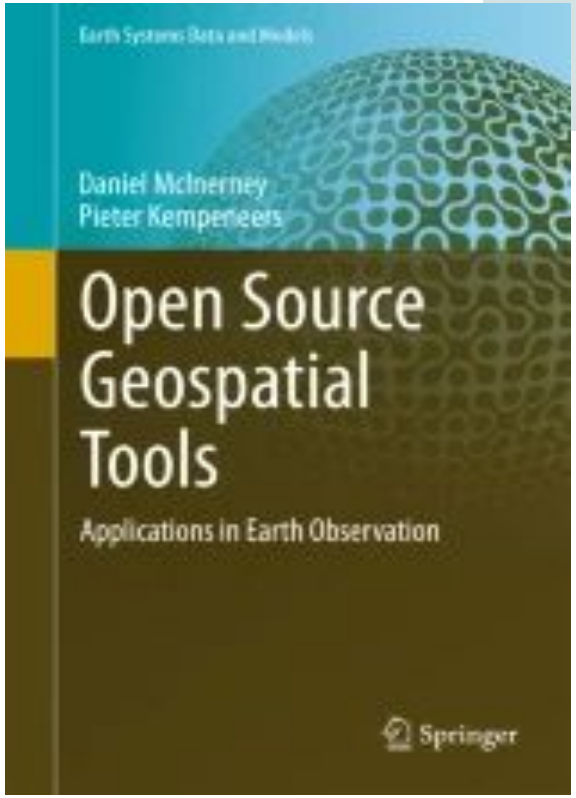
gvSIG

QGIS

QGIS

R

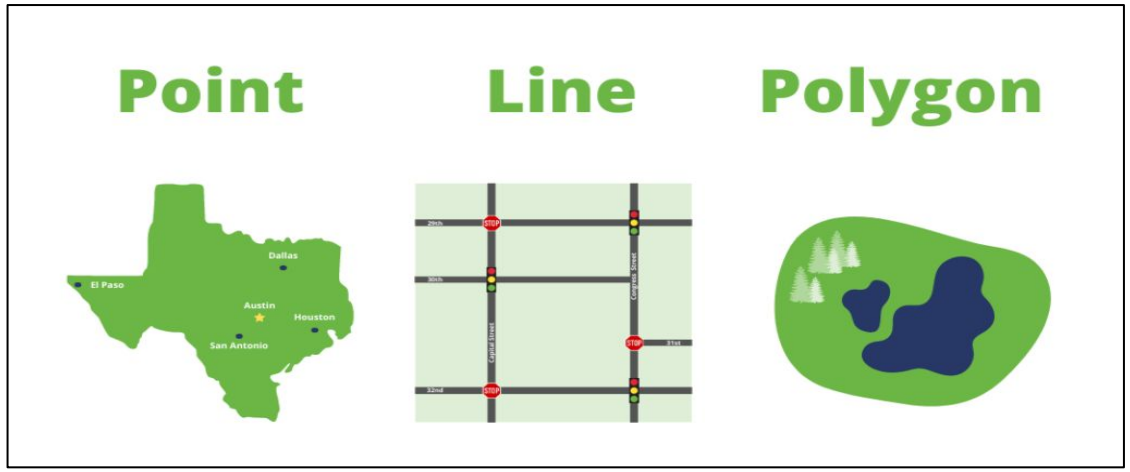
SAGA
System for Automated Geoscientific Analyses



Geospatial Data: Two Types

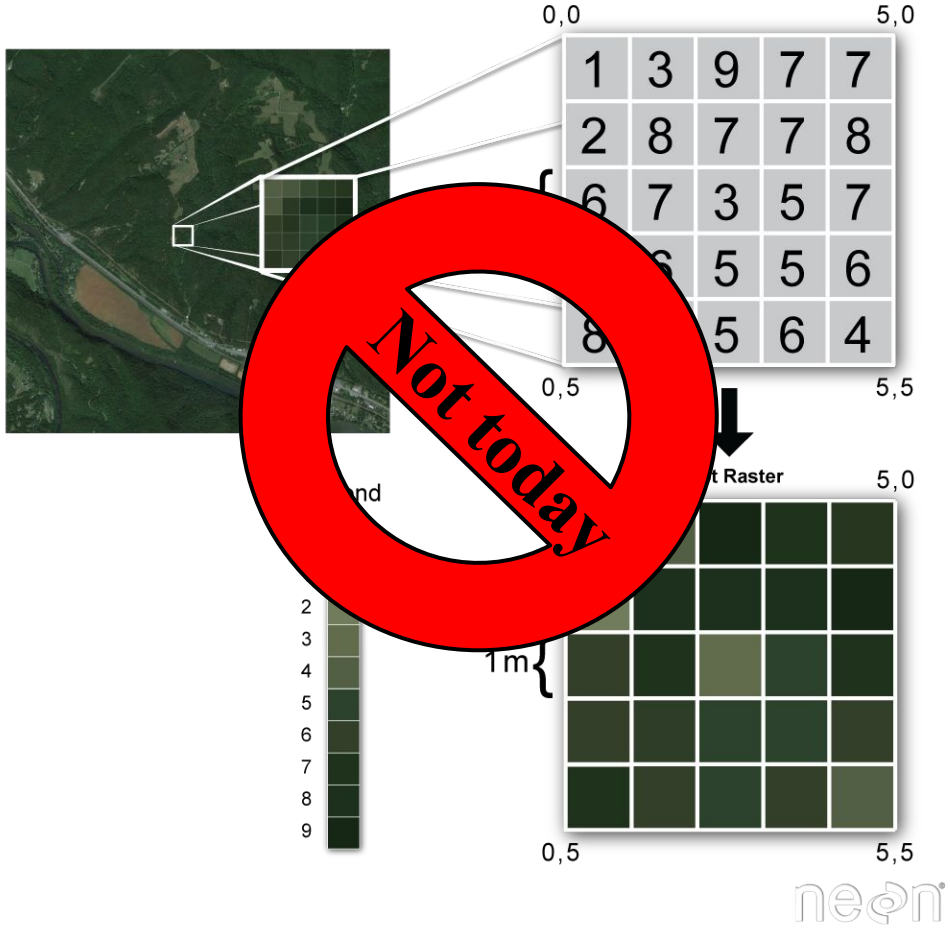
Vector

- sometimes no accompanying data values



Raster

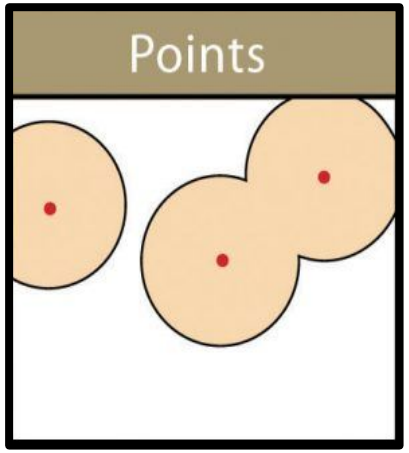
- grid consisting of data



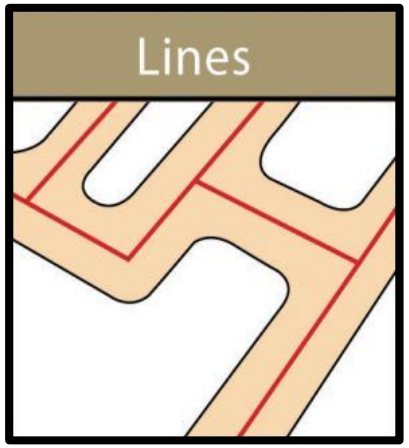
Visualizing Terrain in ArcGIS Pro

https://www.neonscience.org/resources/learning-hub/tutorials/dc-raster-data-r

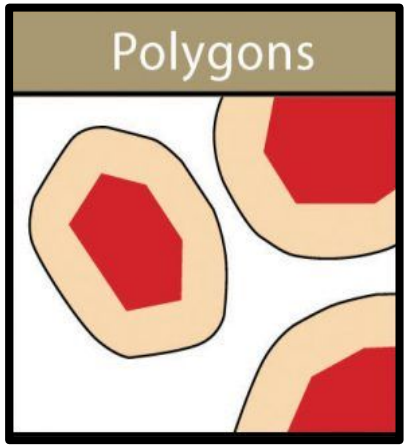
Vector Types



Points: Zero dimensions
individual geographic locations
defined by a single pair of coordinates.



Lines: One dimension (length)
connected set of points
linear features (roads, rivers, utility lines, etc.)



Polygons: Two dimensions (length and width)
area and perimeter
(census boundaries, neighbourhoods, buildings, etc.)

Vector Types

Polygons 

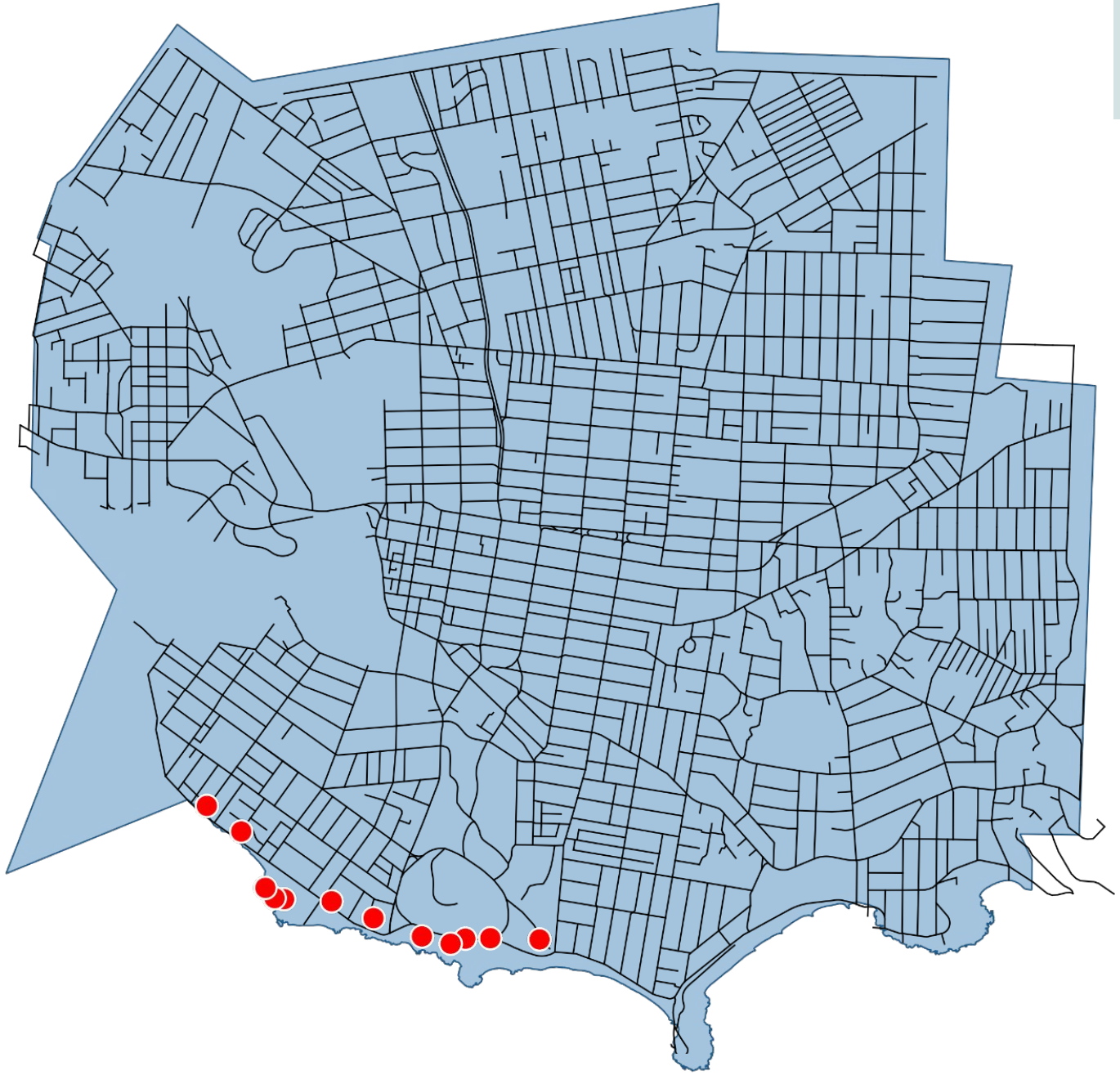
- Area, perimeter

Lines 

- Length, sometimes width

Points 

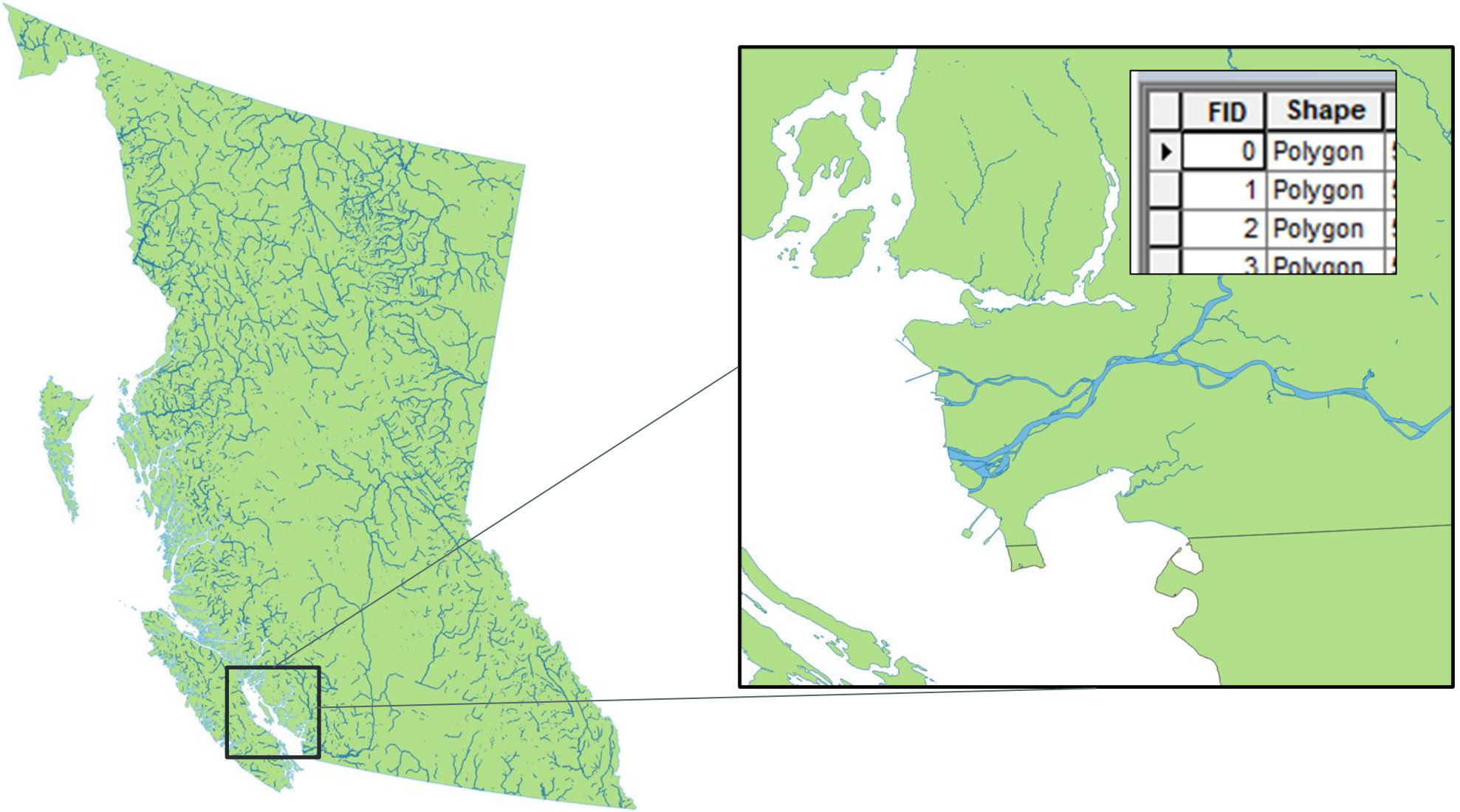
- No dimensions



Vector Data

Looks can be deceiving…

Rivers (or even roads) can be polygons



Vector Data

Looks can be deceiving…

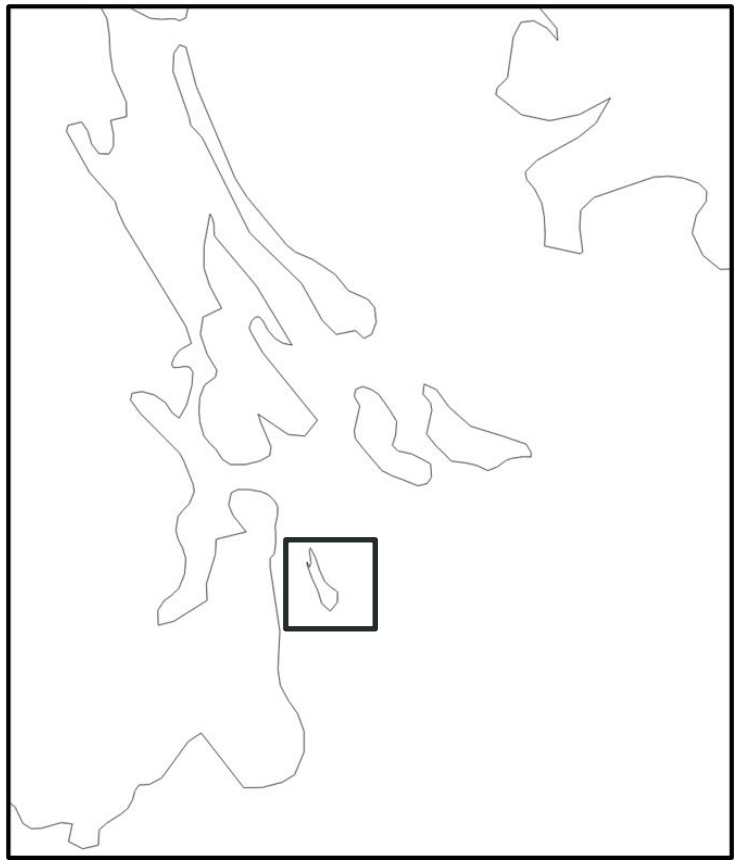
Lines can look like polygons
but can be a line outline
not a polygon, no area

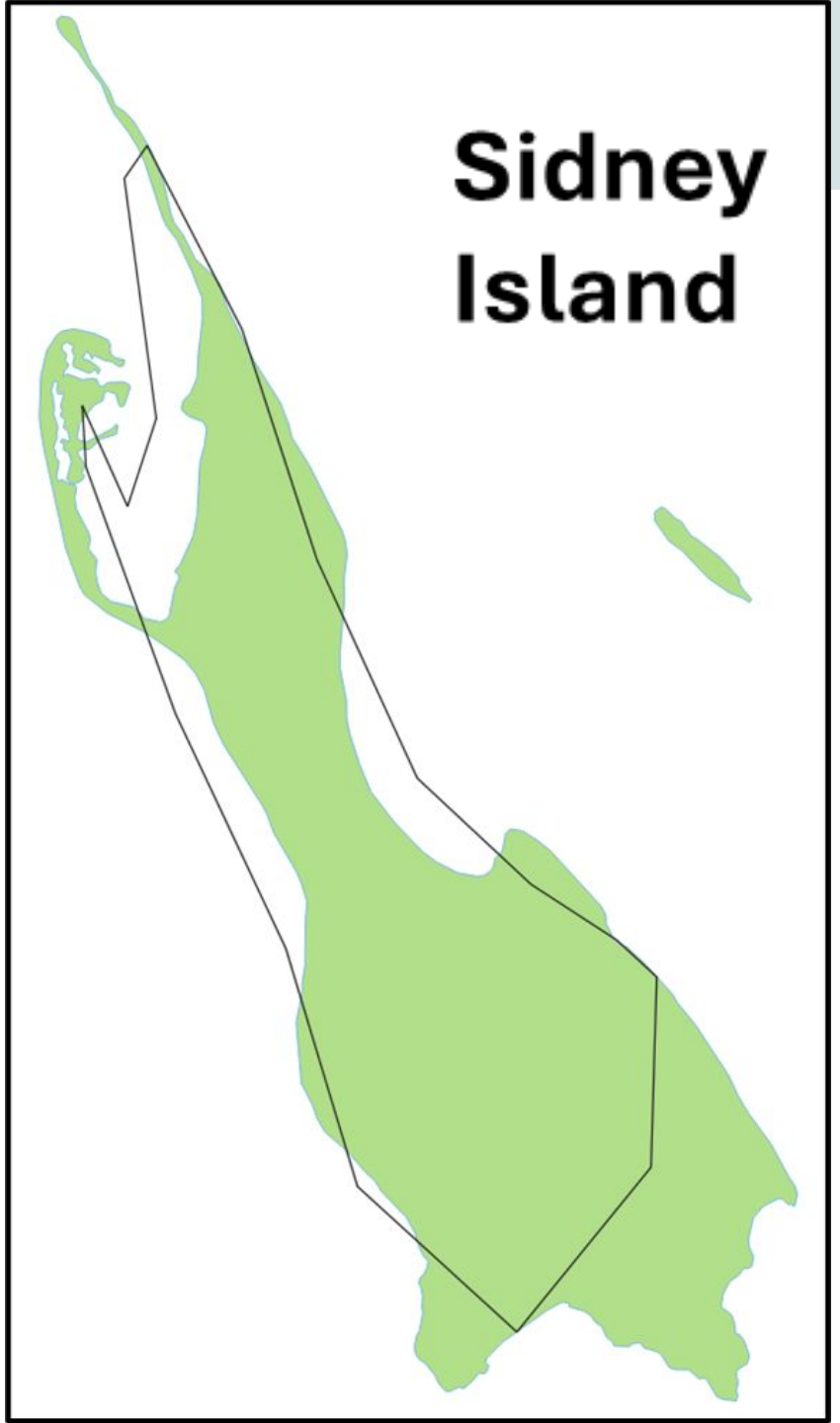
	FID	Shape
	0	Polyline
	1	Polyline
	2	Polyline
	3	Polyline

Vector Data

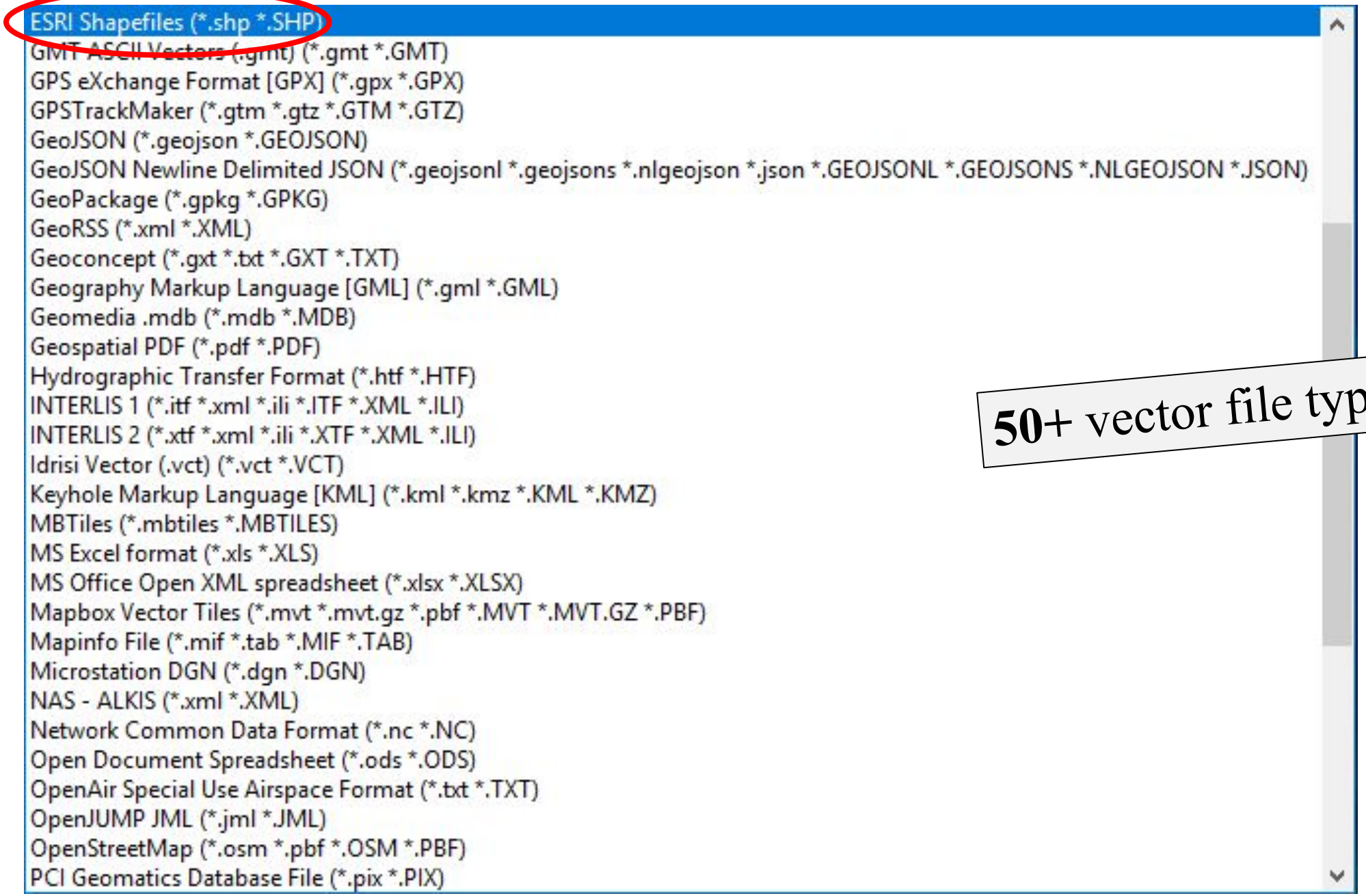
Looks can be deceiving…

Detail varies between datasets at different scales





Vector files:

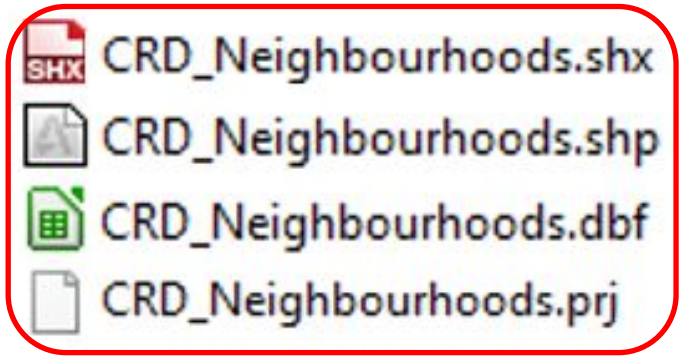


50+ vector file types!

Vector files:

ESRI shapefiles must have:

.shx shape index position, used for searching
.shp gives features their geometry
.dbf database file storing attribute data and object IDs
.prj for coordinate and projection system



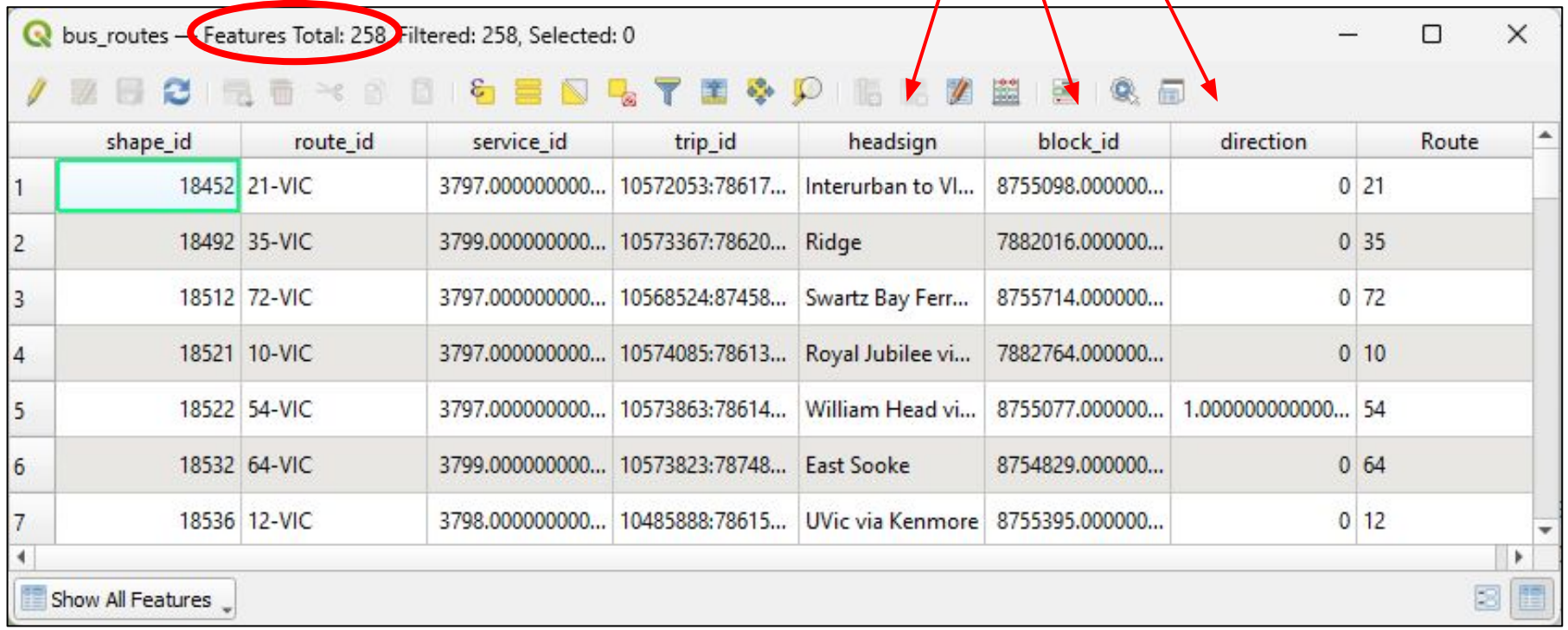
Sometimes additional files (but not necessary)

.cpg encoding applied to create the shapefile
.sbn optimizes spatial queries
.sbx speeds up loading times
.xml metadata associated with the shapefile

Database Files (.dbf)

- Vector features can have **attribute information**
- This attribute information is contained in the .dbf
- Information is organized into tables

Fields: Each column is called a *field*
each field describes a different attribute



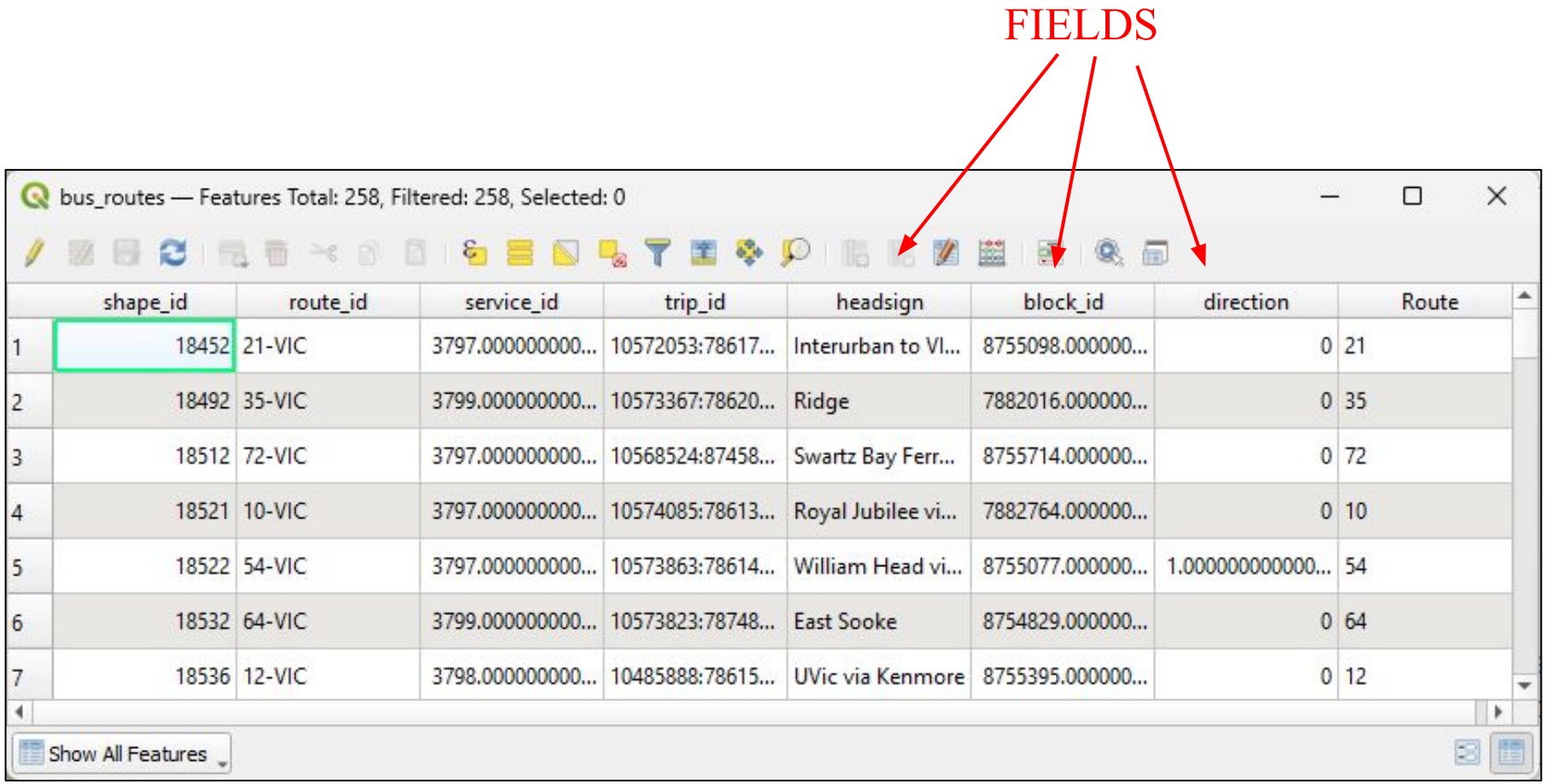
	shape_id	route_id	service_id	trip_id	headsign	block_id	direction	Route
1	18452	21-VIC	3797.000000000...	10572053:78617...	Interurban to VI...	8755098.000000...	0	21
2	18492	35-VIC	3799.000000000...	10573367:78620...	Ridge	7882016.000000...	0	35
3	18512	72-VIC	3797.000000000...	10568524:87458...	Swartz Bay Ferr...	8755714.000000...	0	72
4	18521	10-VIC	3797.000000000...	10574085:78613...	Royal Jubilee vi...	7882764.000000...	0	10
5	18522	54-VIC	3797.000000000...	10573863:78614...	William Head vi...	8755077.000000...	1.000000000000...	54
6	18532	64-VIC	3799.000000000...	10573823:78748...	East Sooke	8754829.000000...	0	64
7	18536	12-VIC	3798.000000000...	10485888:78615...	UVic via Kenmore	8755395.000000...	0	12

Features: Each row refers to a different feature on screen

Database Files (.dbf)

Column/Field names must follow these standards

- Maximum 10 characters
- Begin with a letter
- No dashes - or slashes /
- Underscores _ ok



	shape_id	route_id	service_id	trip_id	headsign	block_id	direction	Route
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4	18521	10-VIC	3797.000000000...	10574085:78613...	Royal Jubilee vi...	7882764.000000...	0	10
5	18522	54-VIC	3797.000000000...	10573863:78614...	William Head vi...	8755077.000000...	1.000000000000...	54
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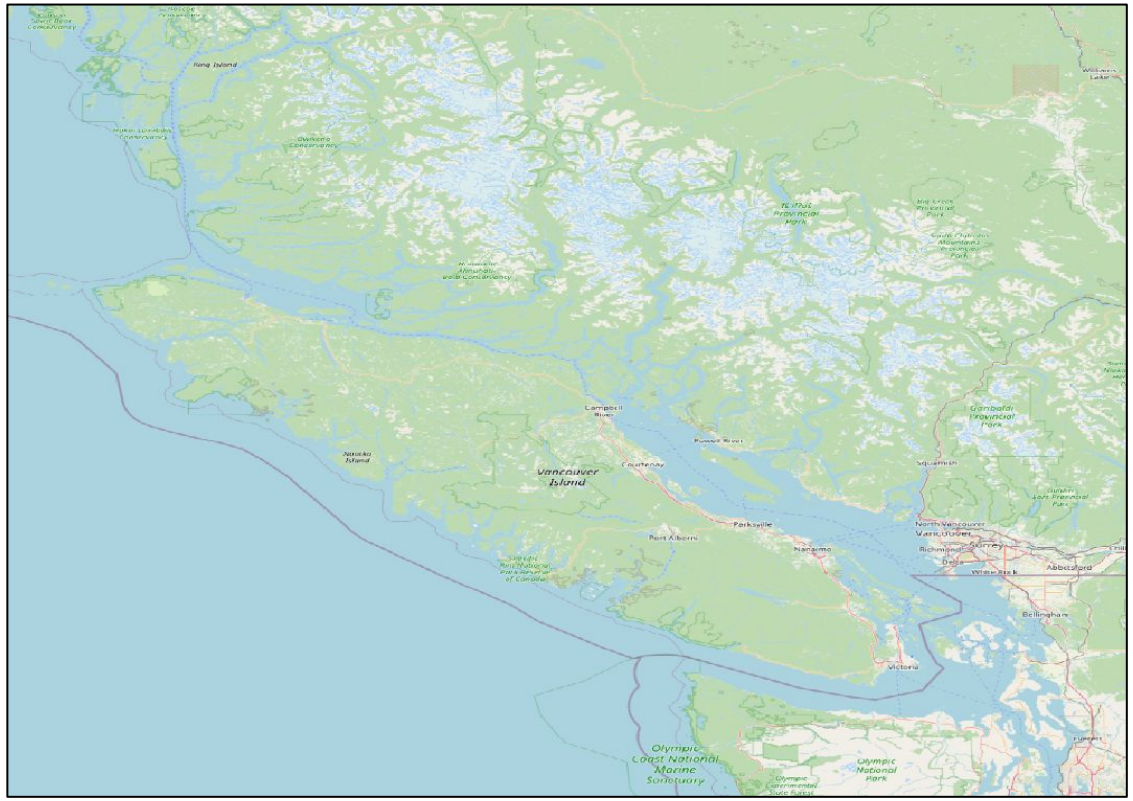
7	18536	12-VIC	3798.000000000...	10485888:78615...	UVic via Kenmore	8755395.000000...	0	12

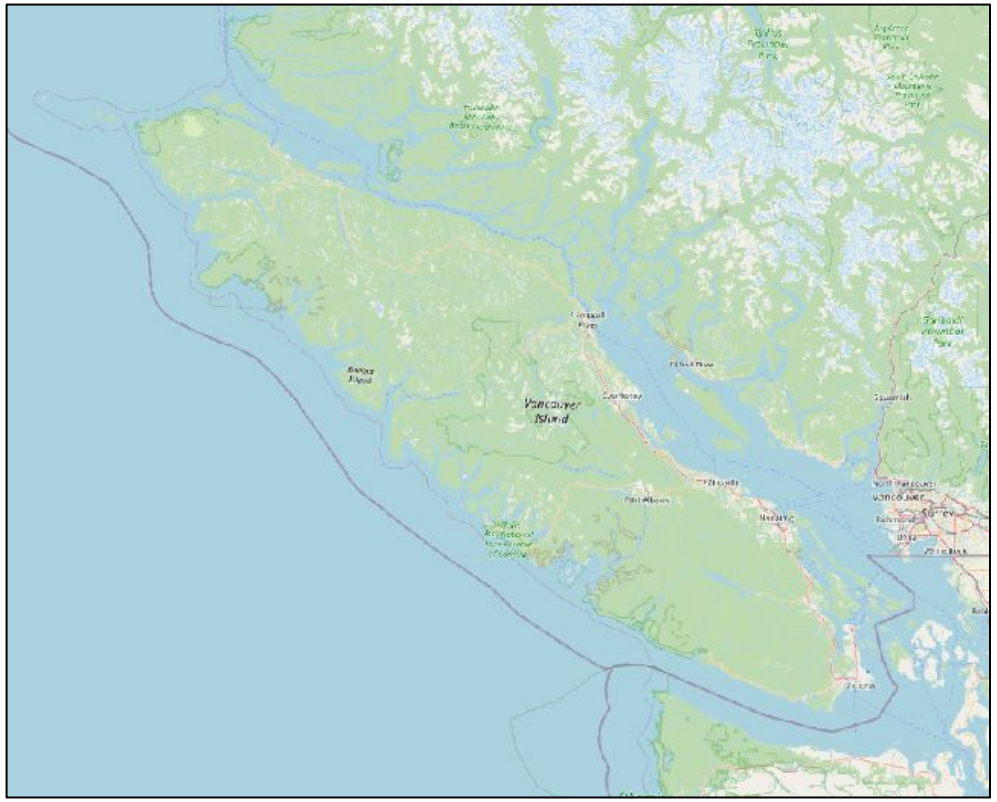
.dbf can exist without geometric data (**.shp**) but are difficult to interpret without visual representation

Geographic Coordinate Systems

- default GCS for *QGIS* is **EPSG 4326**
- data changed to **EPSG 3157** for our study area (Victoria, BC)



Vancouver Island in **EPSG 4326**



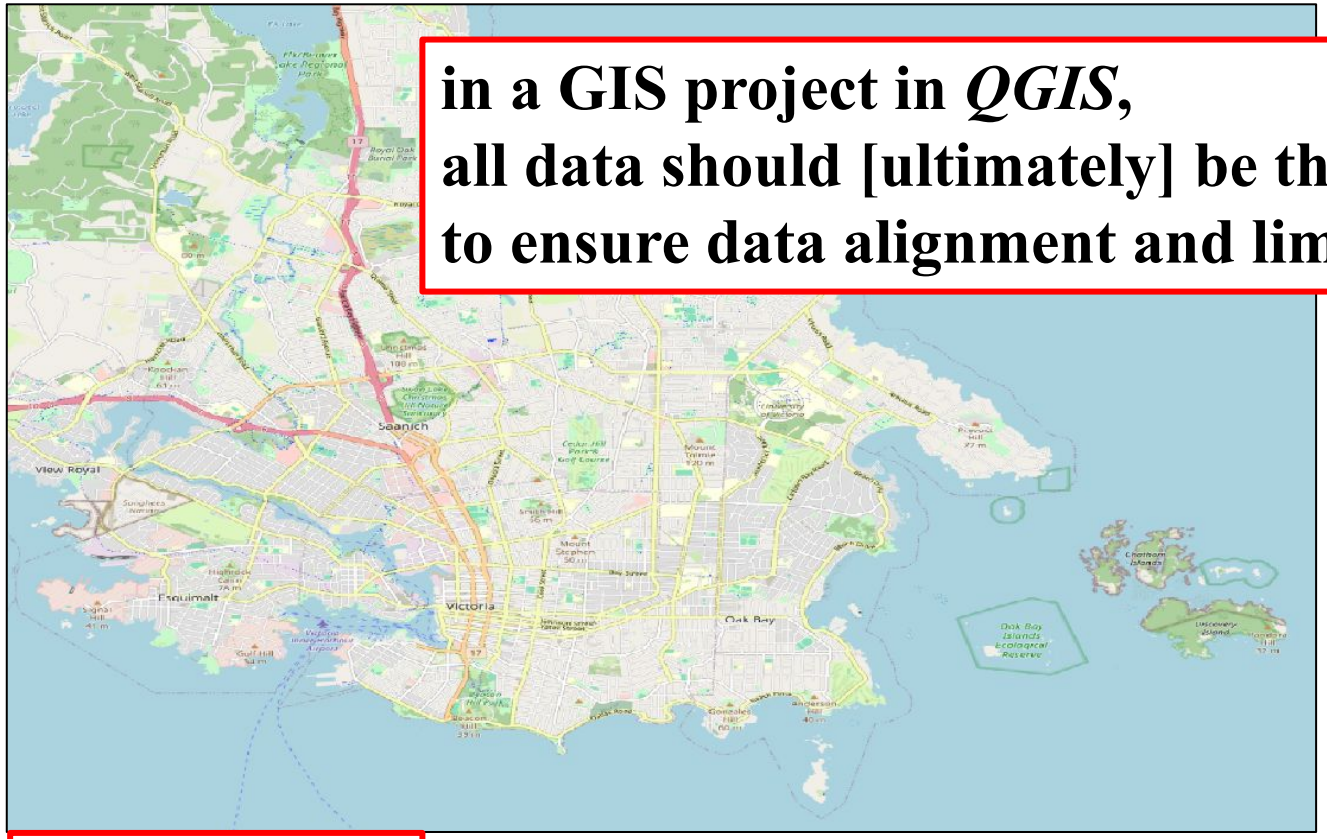
Vancouver Island in **EPSG 3157**

Which looks "better"?

Geographic Coordinate Systems

- default GCS for *QGIS* is **EPSG 4326**
- data changed to **EPSG 3157** for our study area (Victoria, BC)

in a GIS project in *QGIS*,
all data should [ultimately] be the same GCS/PCS
to ensure data alignment and limited distortions



Victoria in **EPSG 4326**

Victoria in **EPSG 3157**

The GCS/PCS depends on the project…
location, purpose, scale, accuracy needs, etc

Comma separated value (.csv) vector data

- (later) we will add **.csv** with Lat/Long to a map as (vector) points

	A	B	C
1	**Name**	**Latitude**	**Longitude**
2	YYJ	48.65255013	-123.4297931
3	Swartz Bay	48.68812438	-123.4146051
4	PKOLS	48.49348443	-123.3422378
5	Royal BC Museum	48.42113463	-123.3673963

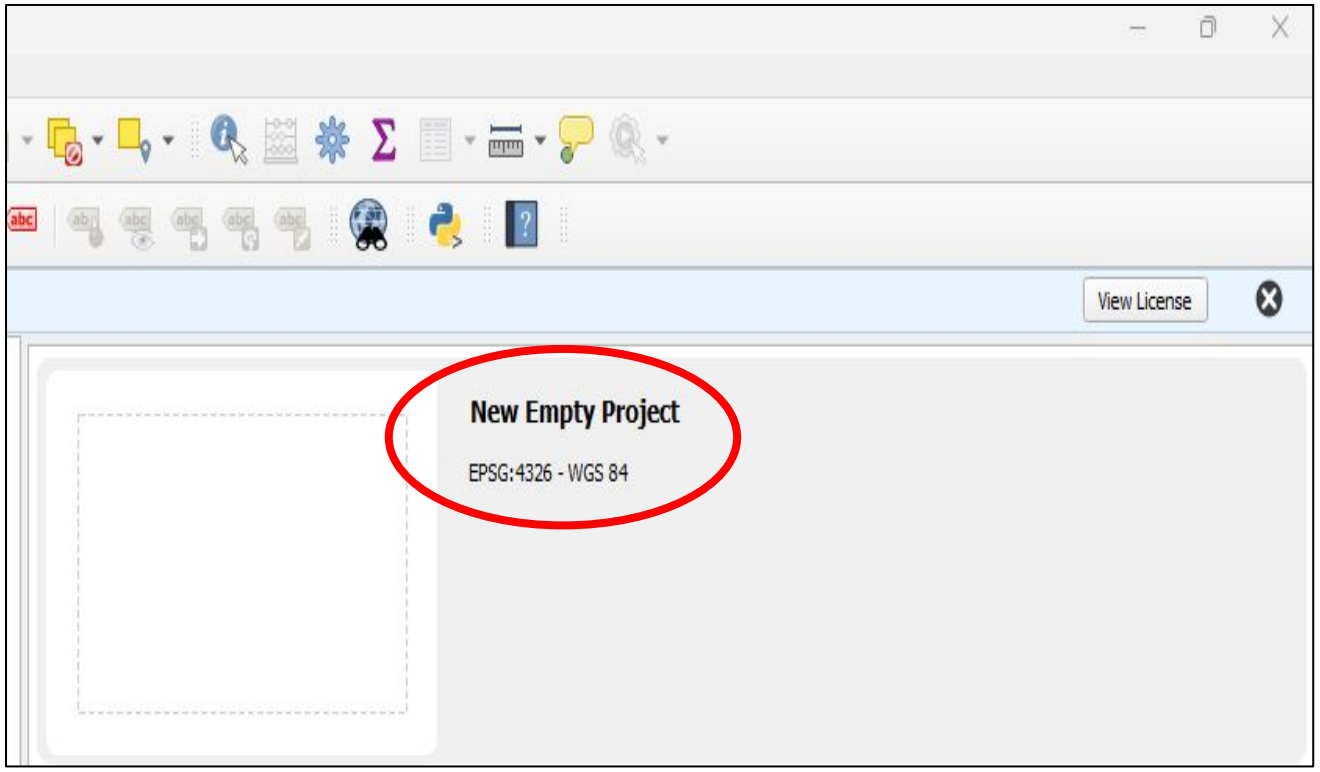
Start *QGIS*

Download workshop data

- Extract /unzip the .zip file
  - https://maps.library.uvic.ca/IntroVectorDataQGIS.zip
- Save it where you can find it…

Open QGIS (your version may be different)

- Double click on *New Empty Project*



Note: New *QGIS* projects open with Geographic Coordinate System (GCS) **EPSG:4326**

Understand *QGIS* interface

*your interface may look different

Menu Bar

Toolbar

Layers Panel

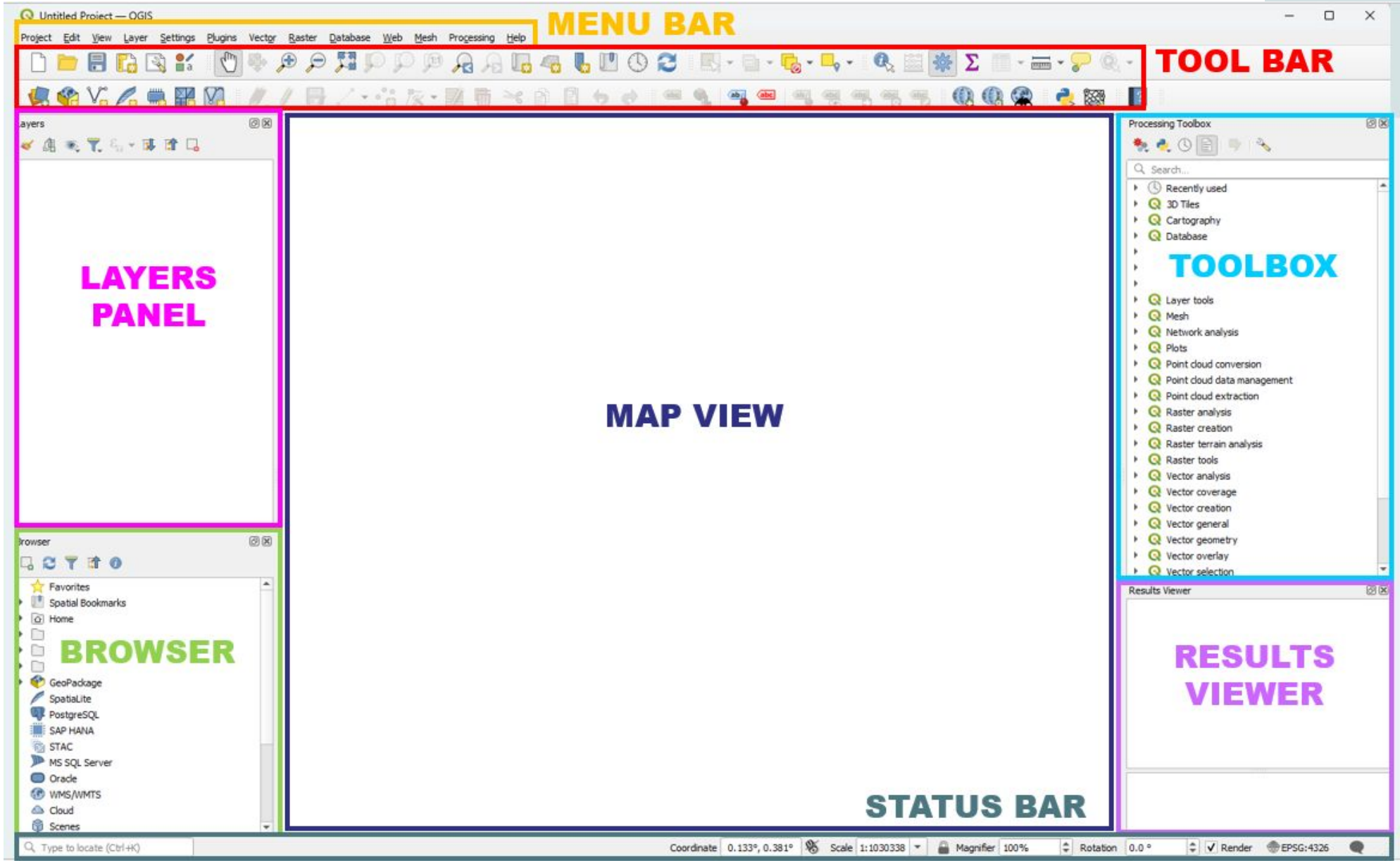
Map view

Browser

Toolbox

Status Bar

Results Viewer



Understand *QGIS* interface

Menu Bar:

Horizontal bar at the top providing access to various functions and tools

(Project management, Edit, Plugins, Vector & Raster tools, etc.)

Toolbar:

Contains icons for frequently used tools, such as Add Data, Pan, Zoom, Identify, etc.

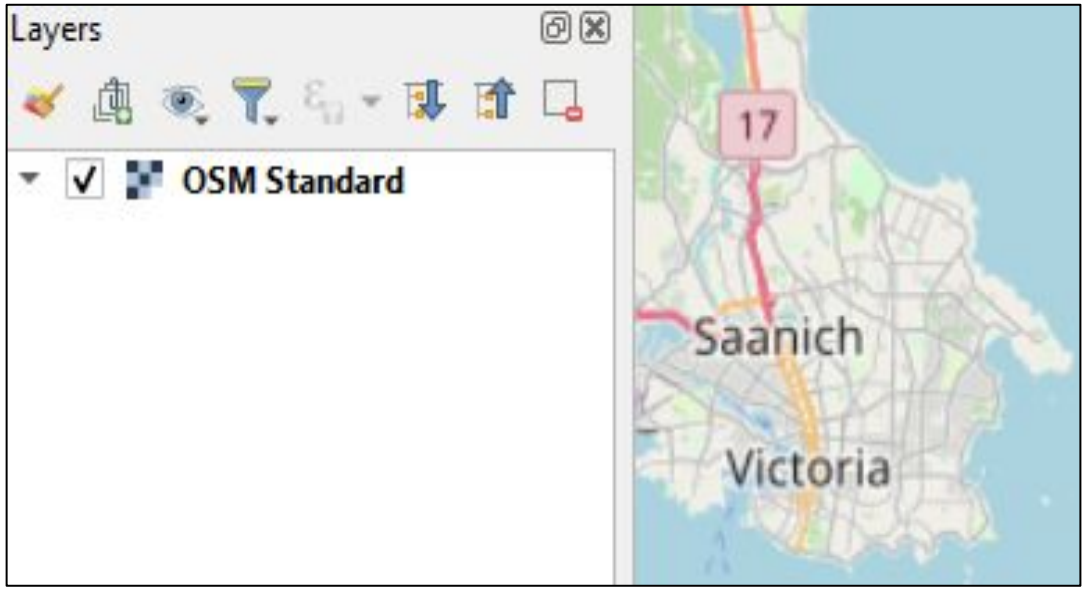
Quick access to essential operations.

Layers Panel:

Displays all active **Layers** in the project.

Allows users to organize, manage visibility

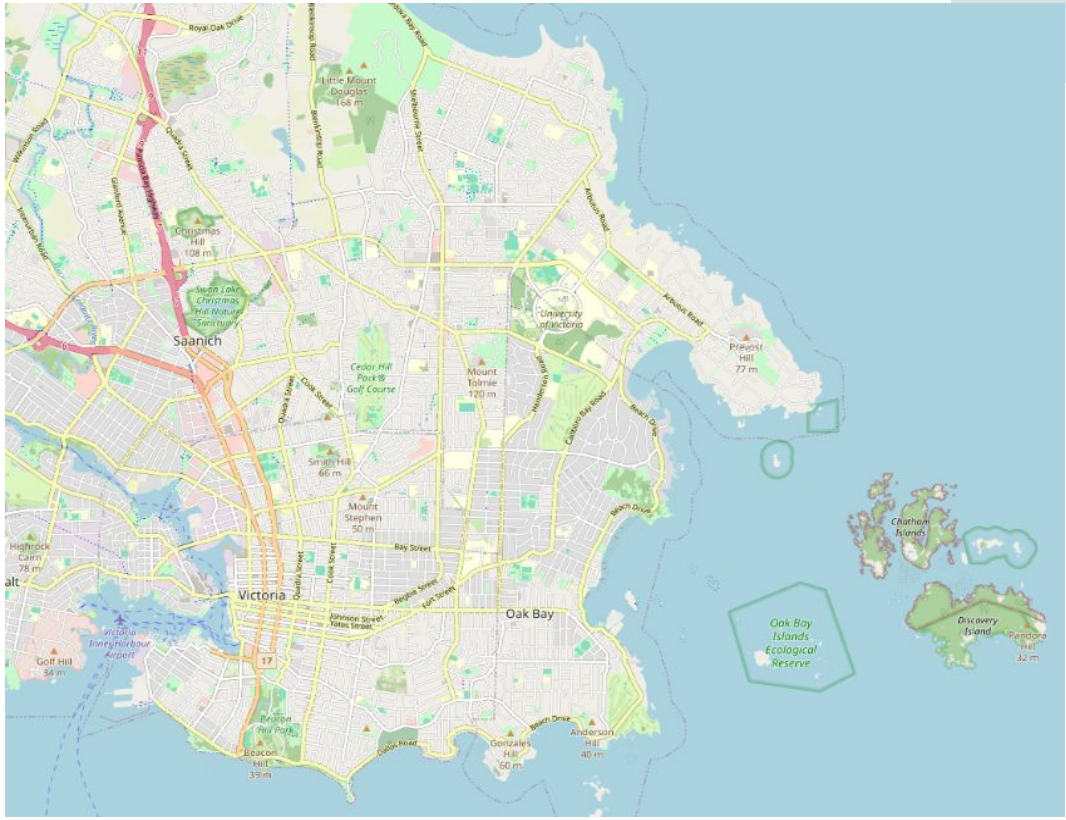
and access properties of layers



Understand *QGIS* interface

Map View:

The central area where spatial data is displayed. Interact with the map, visualize layers and analyze spatial relationships.



Status Bar:

Located at the bottom, it provides information about current project: coordinate display, scale and CRS settings.

Toolbar essentials

New project, open, and save

Pan

zoom

“**zoom full**”

Add data

https://maps.library.uvic.ca/IntroVectorDataQGIS.zip

(.zip file includes data for workshop and PDF of exercise instructions)

Proceed to **Workshop Exercise**

There are **Check-In** slides to **ask** for help
(or **ask** sooner!)