סדנת QGIS

יצירת מפות

I- Georeferencing

אוניברסיטת תל-אביב
הספרייה המרכזית ע"ש סוראסקי

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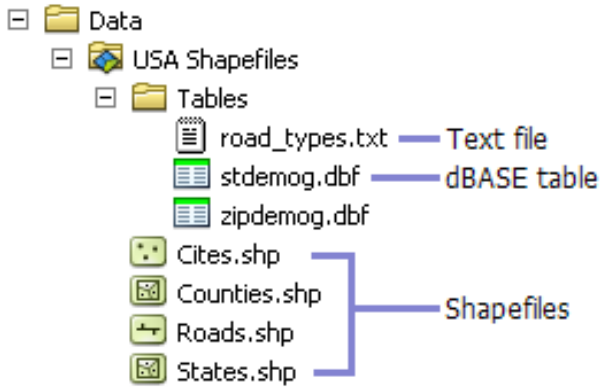
מטרות:

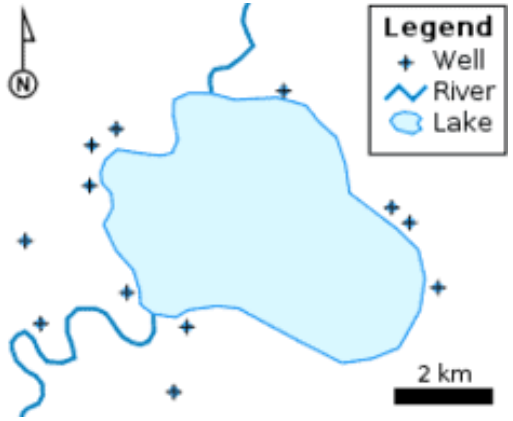
1. ביאור מושגי יסוד בגאוגרפיה וב-GIS
2. הכרות ראשונית עם תוכנת QGIS
3. יצירת מפת בסיס משכבות וקטוריות
4. העשרת מפת הבסיס במידע נוסף
5. התאמת מפות היסטוריות לזיהוי גאוגרפי מדויק (Georeferencing)

מהי תוכנת QGIS?

- מערכת מידע גאוגרפי בקוד פתוח (GNU) המאפשרת ניהול, עריכה ותצוגה של מידע בזיקה מרחבית, כולל יצירת מפות ופרסומן ברשת האינטרנט.
- ספריית תוספים (Plugins) עשירה להרחבת פונקציונליות.
- התחלת פיתוח: 2002.
- מערכות הפעלה נתמכות: Windows, MacOS, Linux, Unix.
- גרסה יציבה אחרונה: 3.16.14.
- אתר רשמי: https://qgis.org/.
- חלופה בתשלום: Esri ArcGIS (https://www.esri.com/).

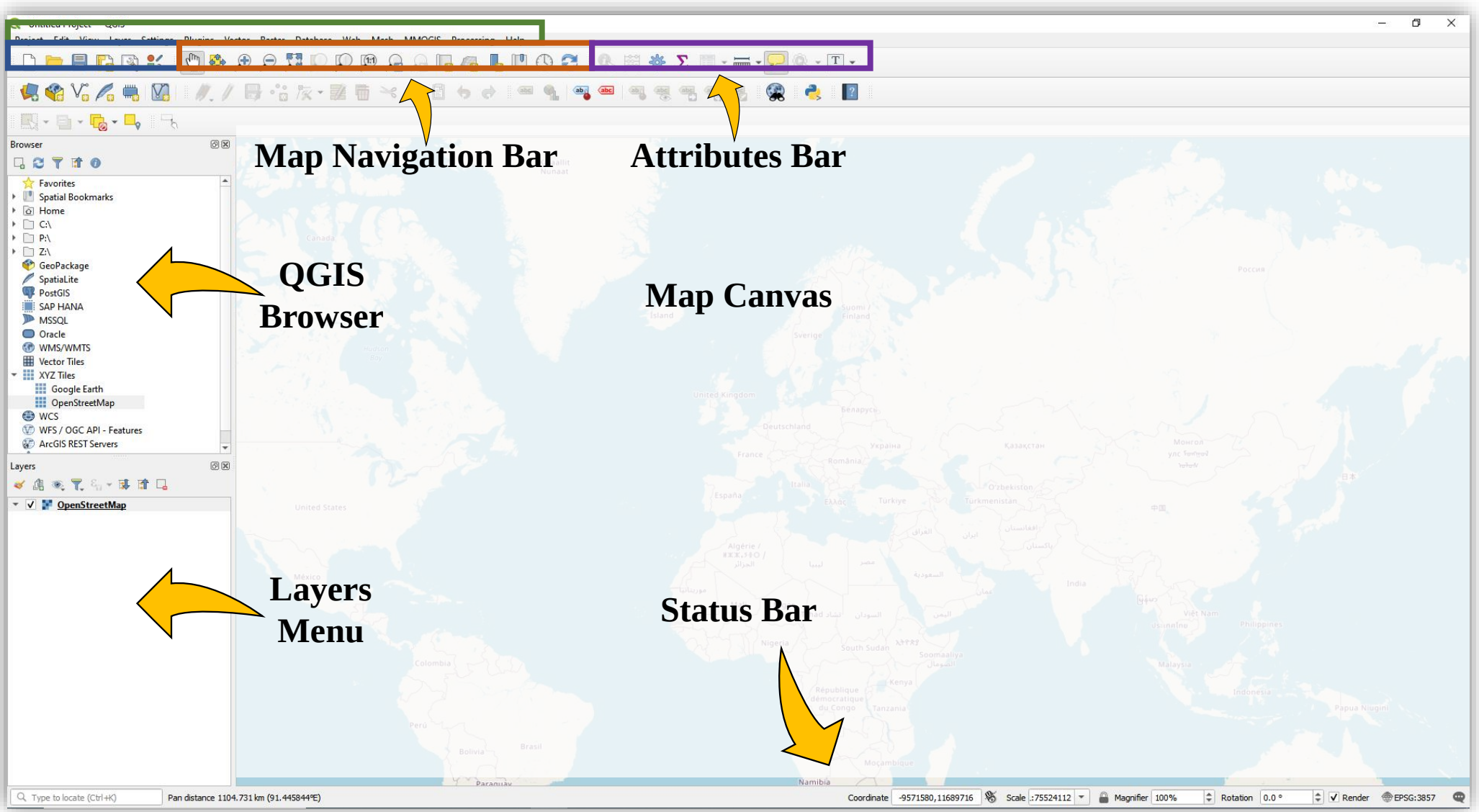
תצורת מידע וקטורי (Shapefiles)





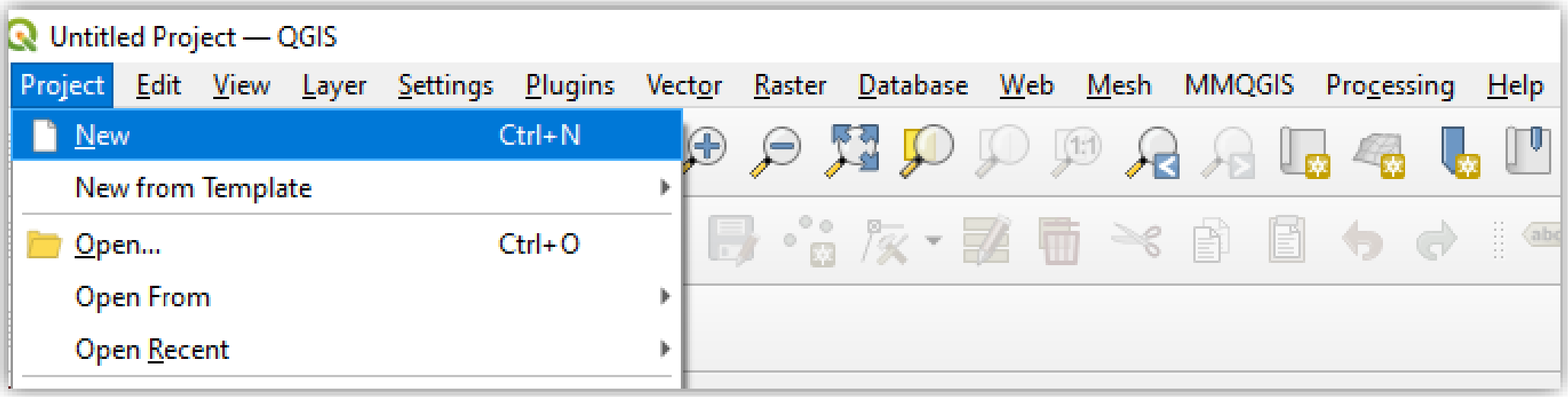
- פורמט וקטורי דיגיטלי לאחסון נתונים גאוגרפים
- המידע שמור בתצורה של צורות גיאומטריות פשוטות כגון קווים, נקודות ופוליגונים
- מידע וקטורי בתצורת Shapefile מכיל מספר קבצים:
  - .shp – נתונים גיאומטריים
  - .dbf – טבלת מאפיינים
  - .shx - אינדקס

QGIS Screen Layout



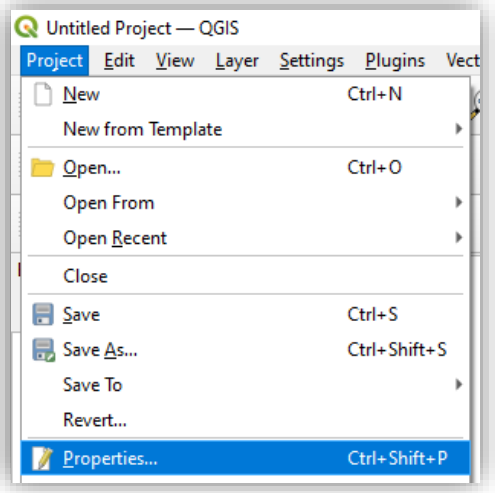
יצירת פרויקט חדש

Upper Toolbar: Project > New

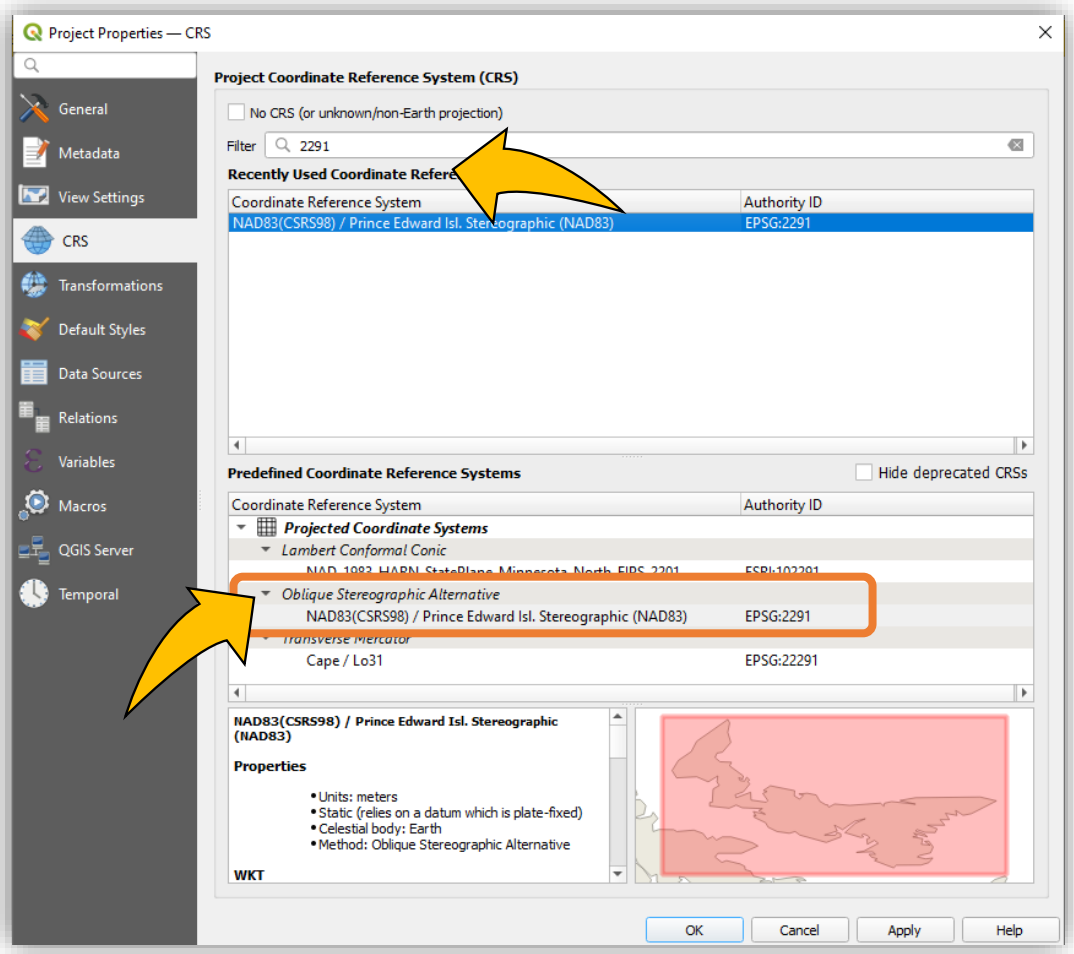


בחירת מערכת קואורדינטות

- Upper Toolbar: Project > Properties > CRS.

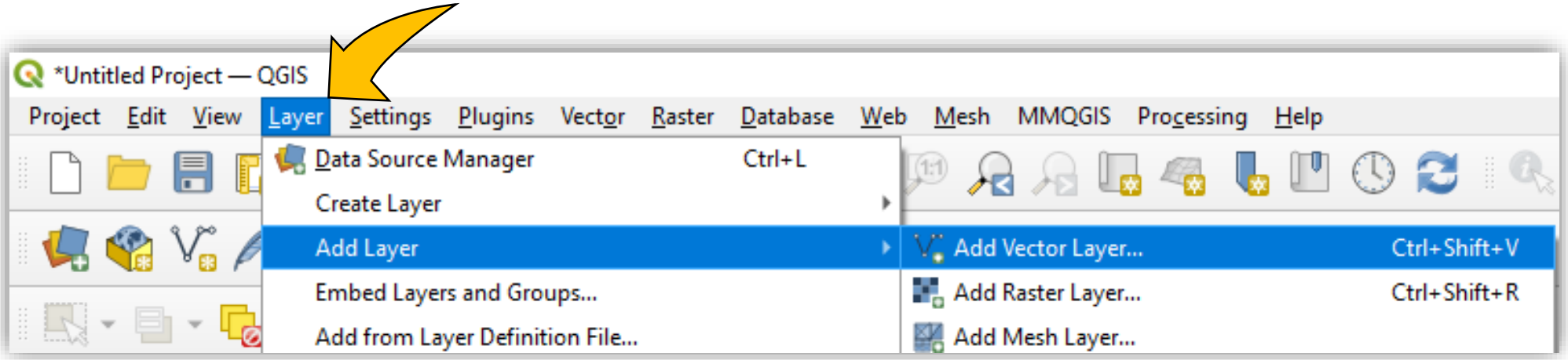


- Filter 2291 > select 'NAD83 (CSRS98)' and hit 'OK'.



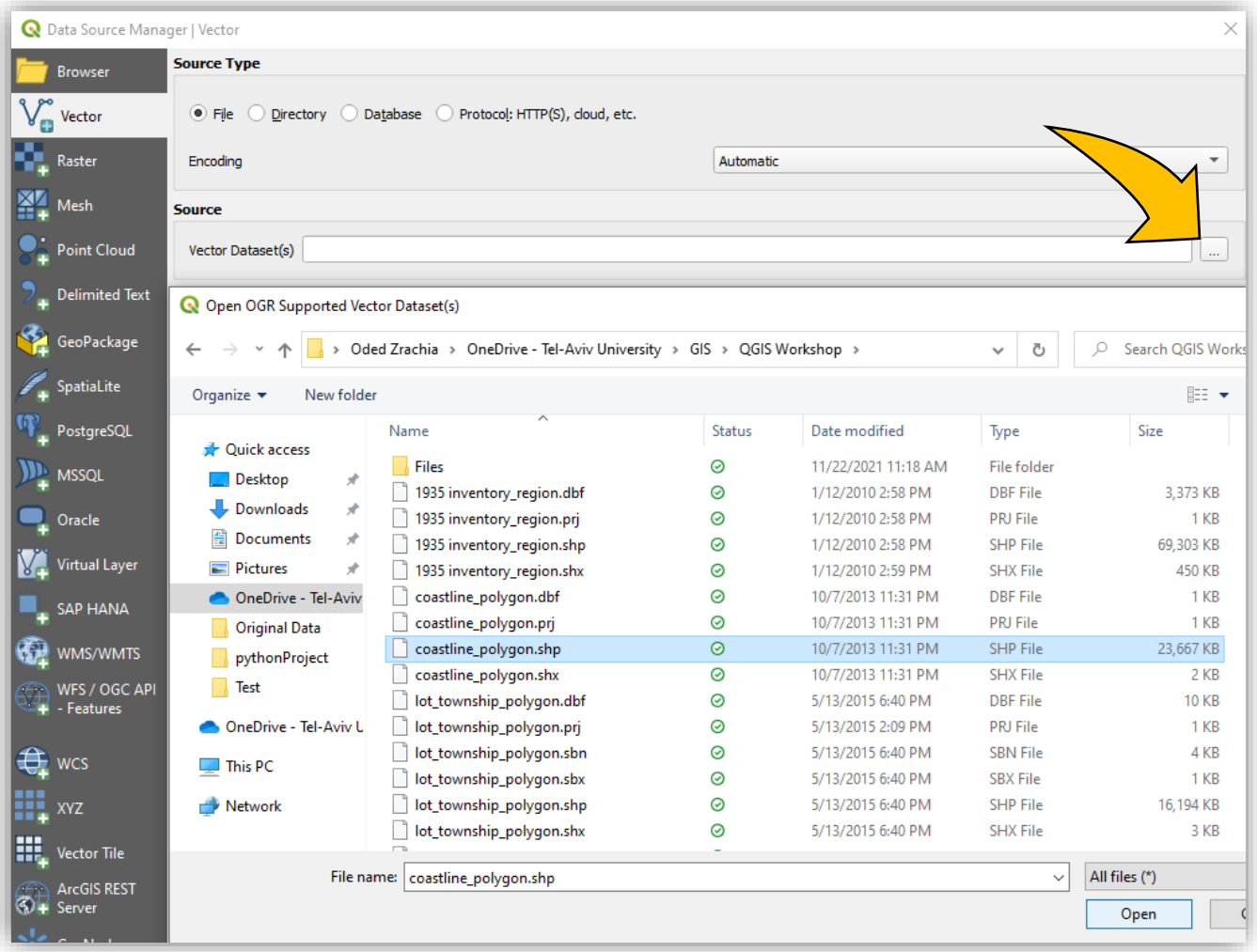
יצירת מפת בסיס

Upper Toolbar: Layer > Add Layer > Add Vector Layer



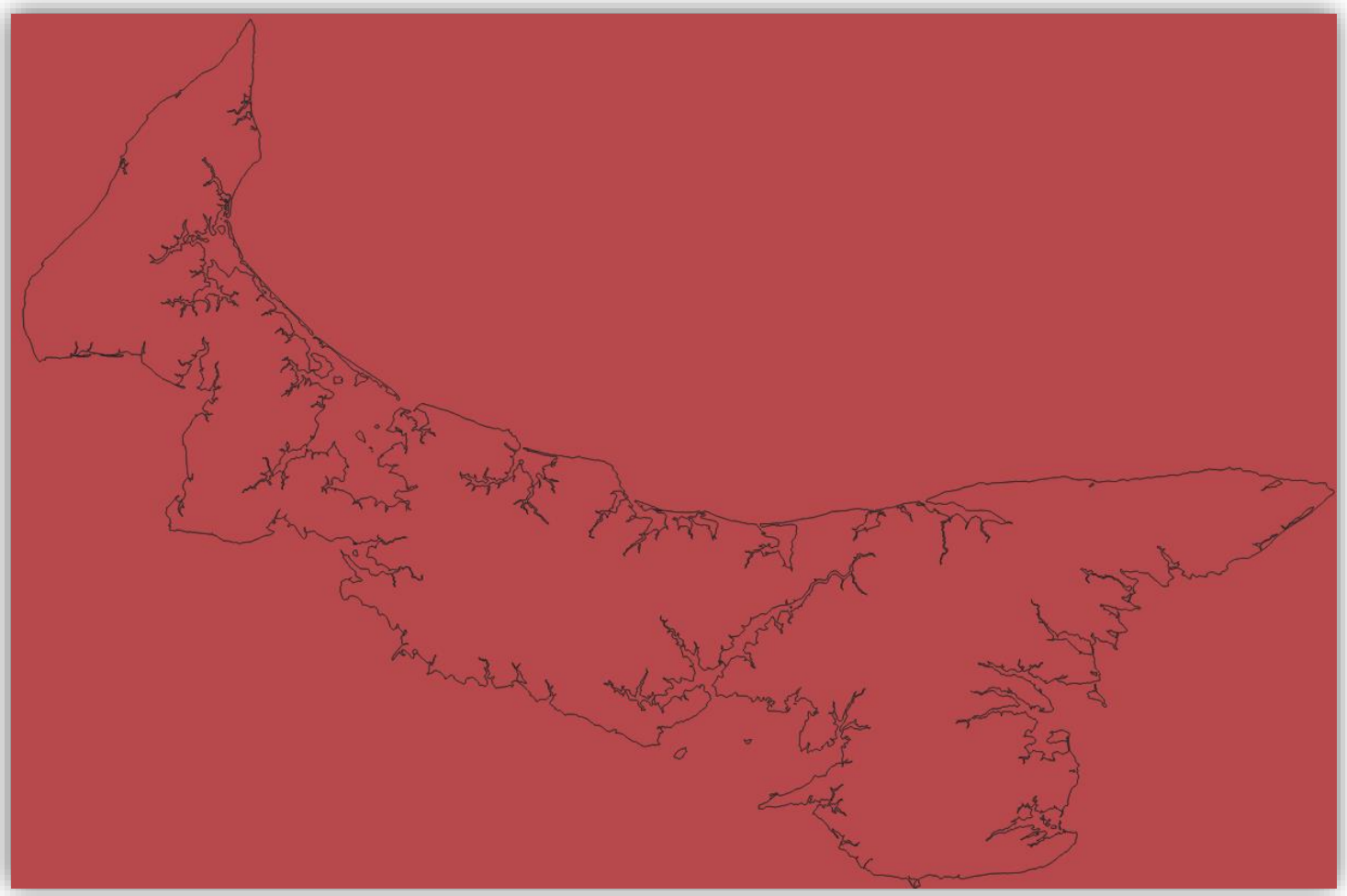
יצירת מפת בסיס

- Under Source > Vector Dataset(s) hit the ellipsis [...].
- Browse to the folder with the Prince Edward Island shapefiles.
- Select 'coastline polygon.shp' and hit 'Open' then 'Add'.



יצירת מפת בסיס

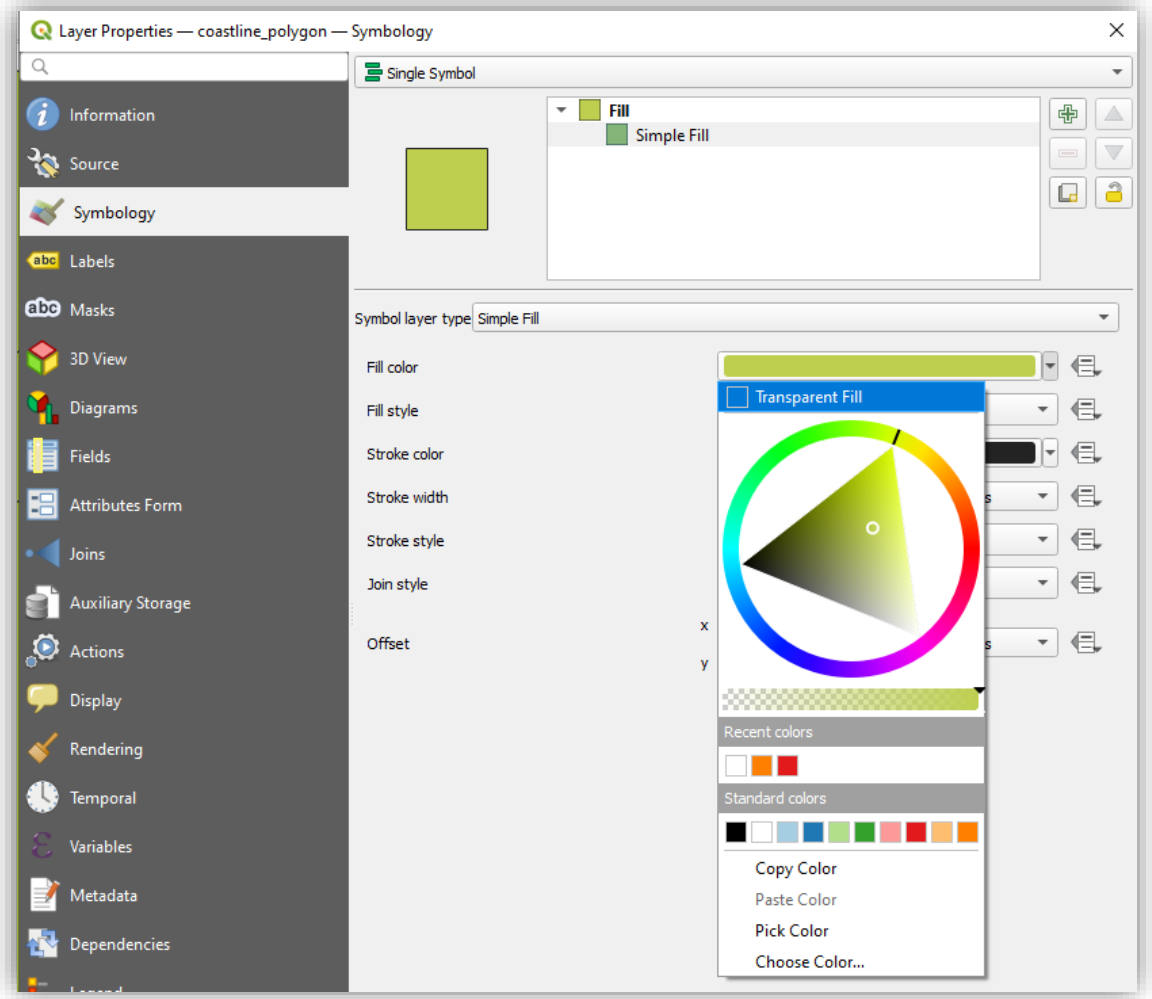
- QGIS should now display the island's coastline.
- A colored background is usually added by default.
- Follow next steps for some basic design options.



עיצוב מפת בסיס

- In the Layers menu (bottom left) double click on the layer (‘coastline_polygon’).

- Go to Symbology > Simple Fill > Fill Color.
- Pick ‘Transparent Fill’ then hit OK.

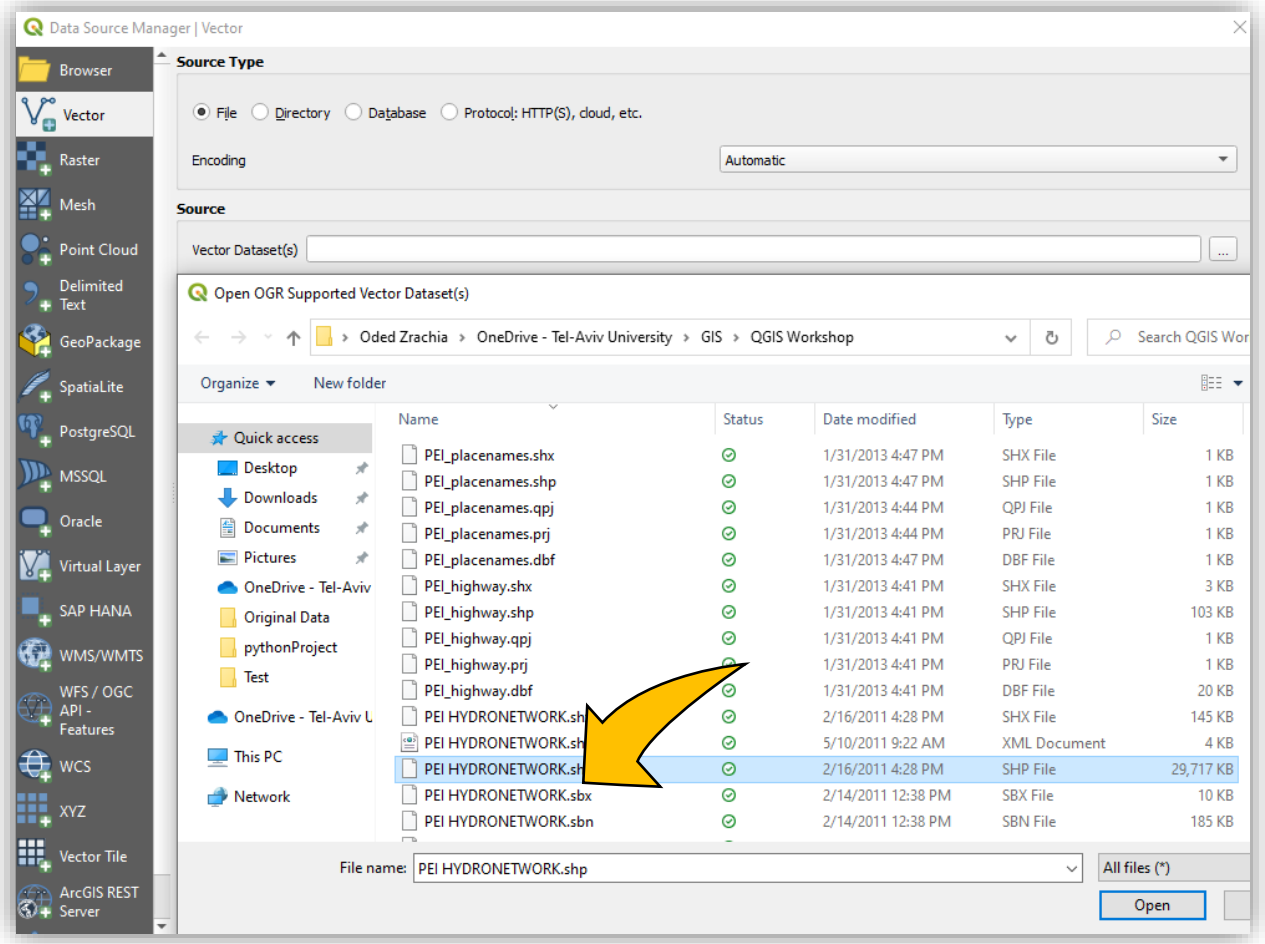


עיצוב מפת בסיס

QGIS should now display the island's coastline without background color.

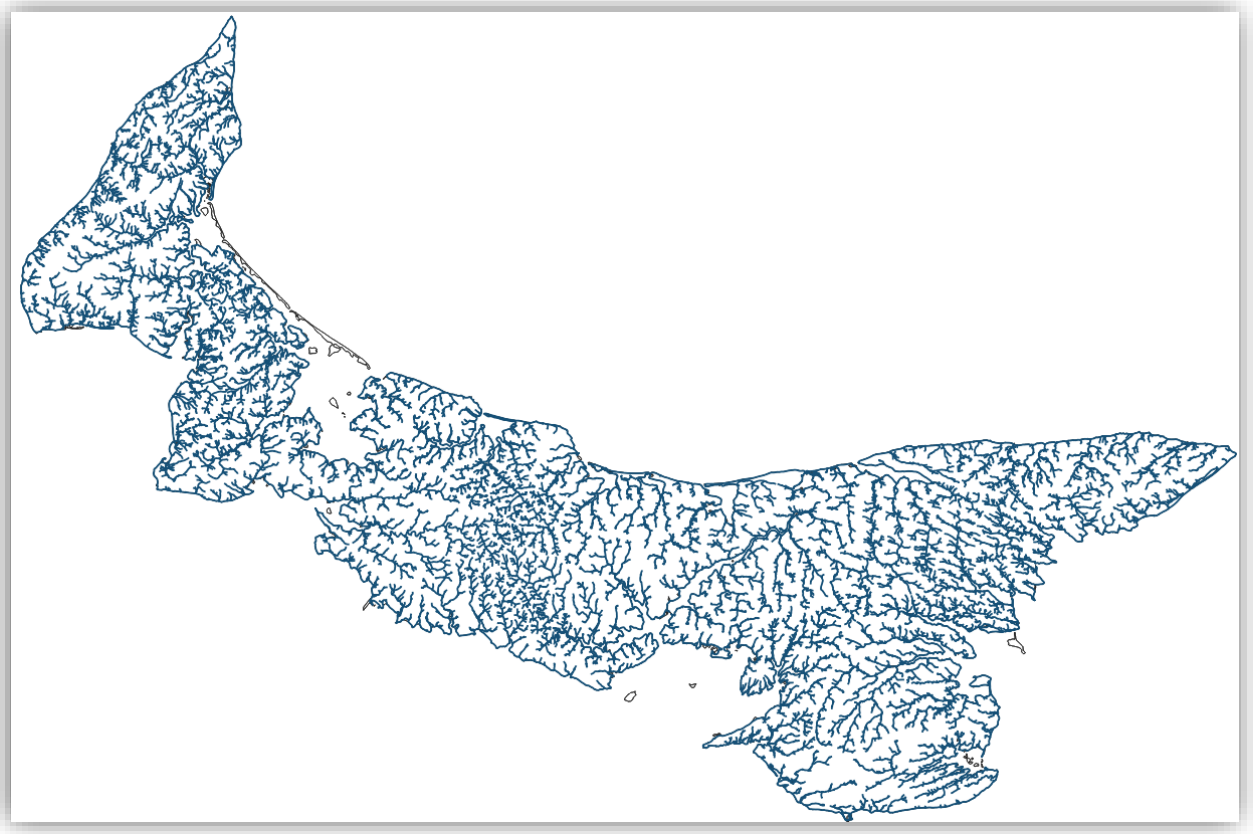
העשרת מפת הבסיס בנתונים וקטורים (מים)

- Choose Add Vector Layer again from the upper toolbar and hit the ellipsis in Vector Dataset(s).
- Browse to the folder with the Prince Edward Island shapefiles.
- Click on 'PEI_HYDRONETWORK.shp' and hit 'Open' then 'Add'.



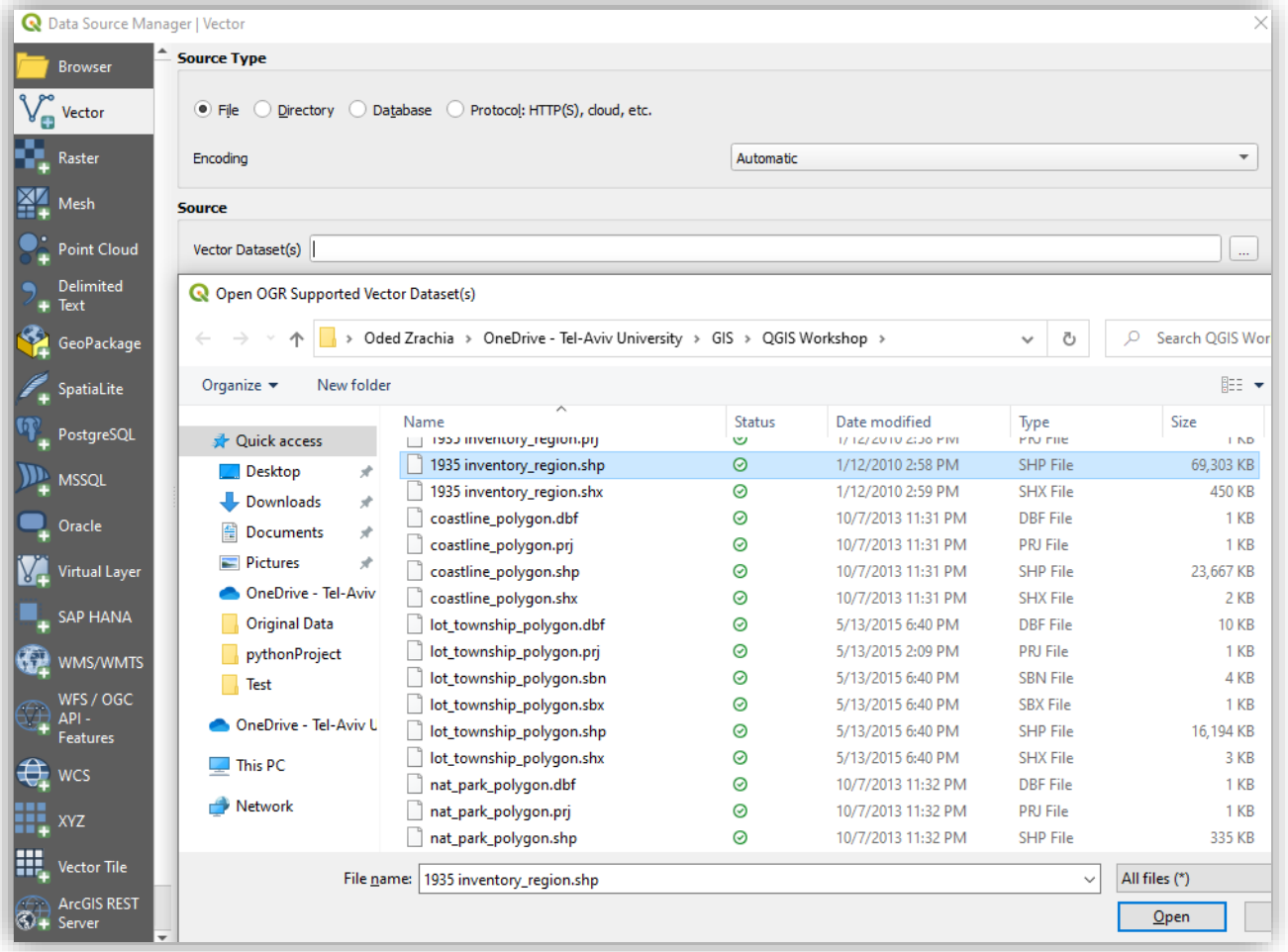
העשרת מפת הבסיס בנתונים וקטורים (מים)

- QGIS should now display the hydrological data of Prince Edward Island.
- If the default color is not to your liking, double click on the layer and go to Symbology.
- Choose an appropriate color (preferably blue).



העשרת מפת הבסיס בנתונים וקטורים (קרקע)

- Choose Add Vector Layer again from the upper toolbar and hit the ellipsis in Vector Dataset(s).
- Browse to the folder with the Prince Edward Island shapefiles.
- Click on - '1935 inventory_region.shp' and hit 'Open' then 'Add'.

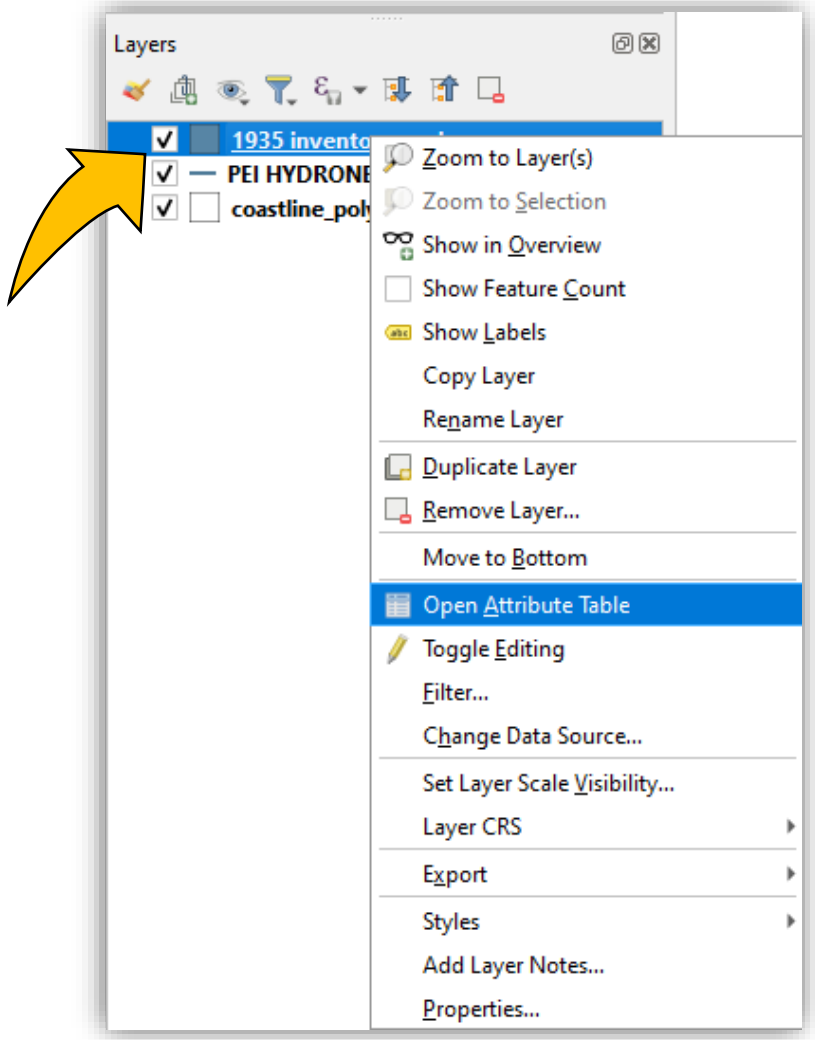


העשרת מפת הבסיס בנתונים וקטורים (קרקע)

- QGIS should now display a dense map showing the land use of Prince Edward Island in 1935.
- Follow next steps to represent different categories of land use on your map.

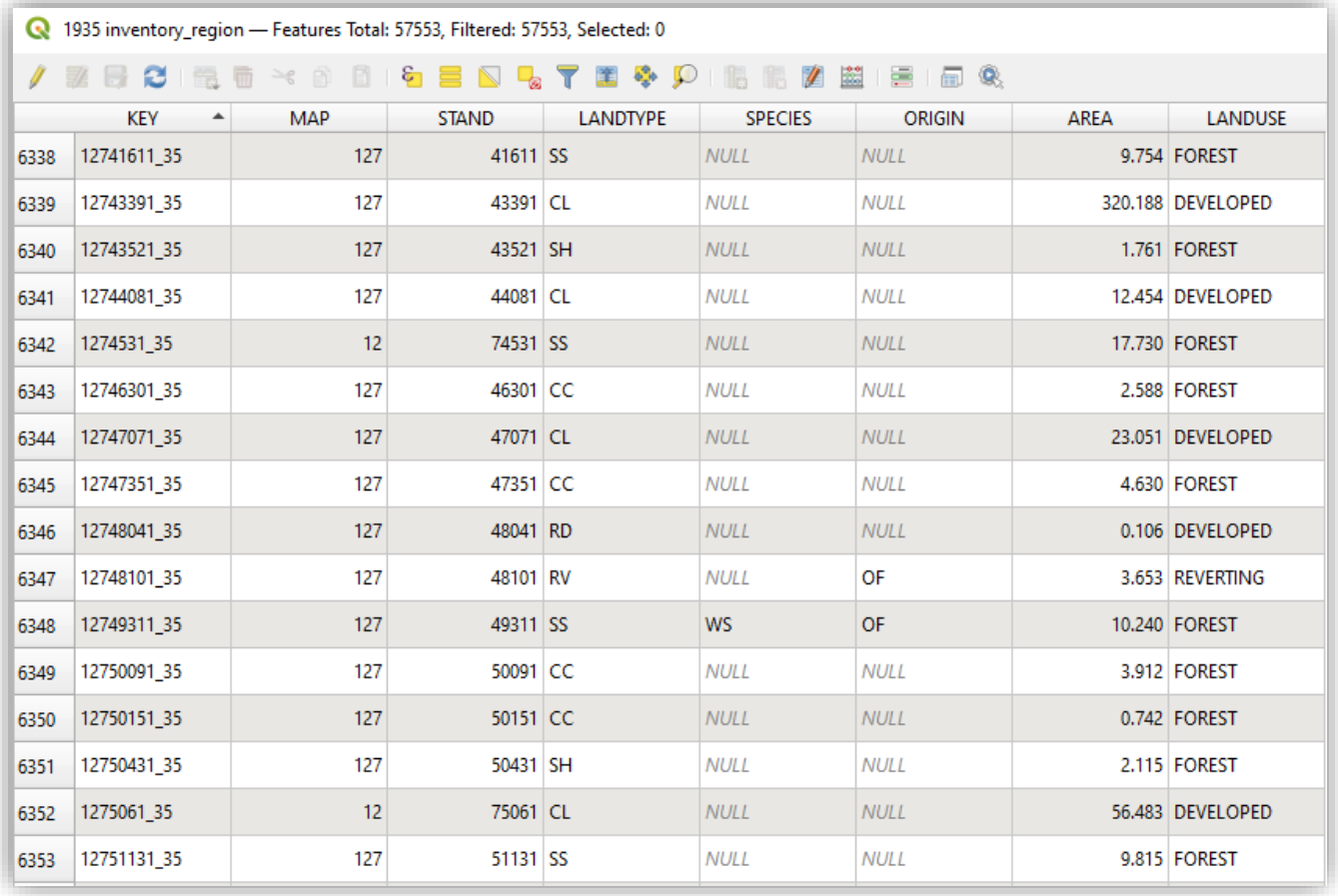
טבלת מאפיינים (קרקע)

- Let's look at the data contained within the '1935_inventory_region' shp file by loading its attributes.
- To do so, right click on the layer in the Layers menu and hit 'Open Attribute Table'.



טבלת מאפיינים (קרקע)

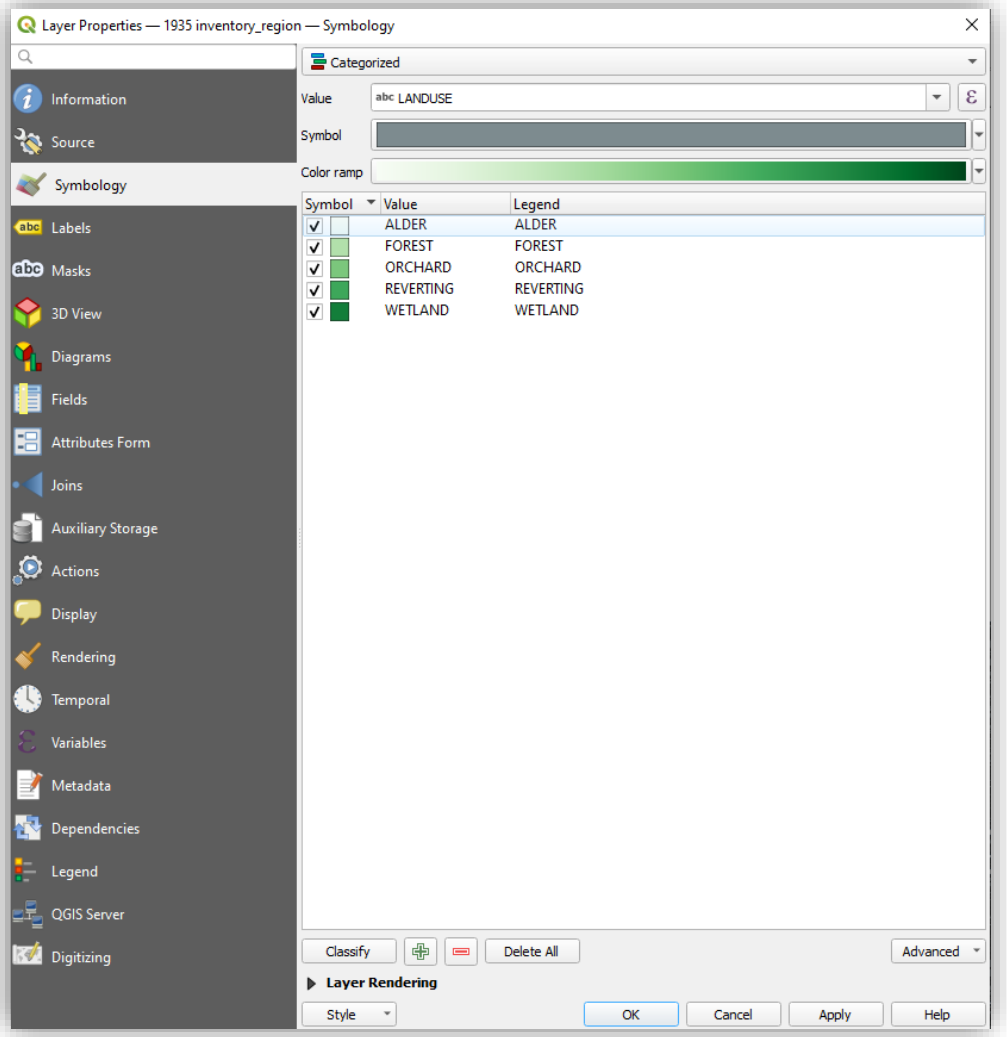
- Looking at our attribute table, the last column contains different categories of land use as recorded in 1935: forest, developed, wetland, etc.
- We shall focus on forest cover. Close the attribute table and double click on the layer ('1935_inventory_region') then go to Symbology.



	KEY	MAP	STAND	LANDTYPE	SPECIES	ORIGIN	AREA	LANDUSE
6338	12741611_35	127	41611	SS	NULL	NULL	9.754	FOREST
6339	12743391_35	127	43391	CL	NULL	NULL	320.188	DEVELOPED
6340	12743521_35	127	43521	SH	NULL	NULL	1.761	FOREST
6341	12744081_35	127	44081	CL	NULL	NULL	12.454	DEVELOPED
6342	1274531_35	12	74531	SS	NULL	NULL	17.730	FOREST
6343	12746301_35	127	46301	CC	NULL	NULL	2.588	FOREST
6344	12747071_35	127	47071	CL	NULL	NULL	23.051	DEVELOPED
6345	12747351_35	127	47351	CC	NULL	NULL	4.630	FOREST
6346	12748041_35	127	48041	RD	NULL	NULL	0.106	DEVELOPED
6347	12748101_35	127	48101	RV	NULL	OF	3.653	REVERTING
6348	12749311_35	127	49311	SS	WS	OF	10.240	FOREST
6349	12750091_35	127	50091	CC	NULL	NULL	3.912	FOREST
6350	12750151_35	127	50151	CC	NULL	NULL	0.742	FOREST
6351	12750431_35	127	50431	SH	NULL	NULL	2.115	FOREST
6352	1275061_35	12	75061	CL	NULL	NULL	56.483	DEVELOPED
6353	12751131_35	127	51131	SS	NULL	NULL	9.815	FOREST

תצוגה לפי קטגוריות (קרקע)

- In the Symbology menu bar that reads 'Single Symbol' select 'Categorized'.
- Set Value field to 'LANDUSE' and Color Ramp to 'Greens'.
- Hit 'Classify' (bottom left).
- As we want to highlight forested areas, select symbols for Developed land and fields with no value and hit the red minus sign (delete). Click 'OK'.

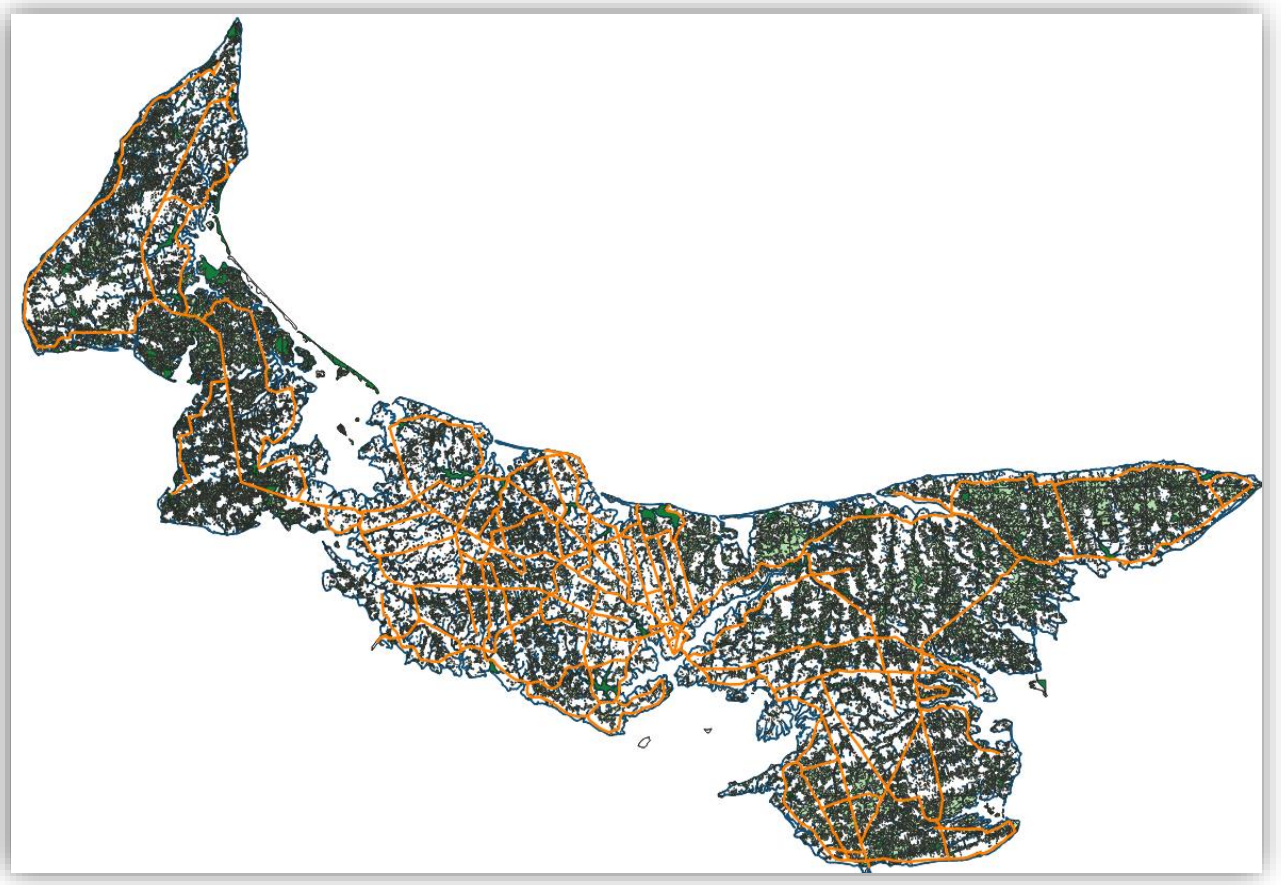


תצוגה לפי קטגוריות (קרקע)

- QGIS should now display the extent of the forests in Prince Edward Island in 1935.
- Try zooming in with the magnifying tool and explore the different land uses.
- Return to full view of the island by right clicking on any of the layers then 'Zoom to Layer(s)'.

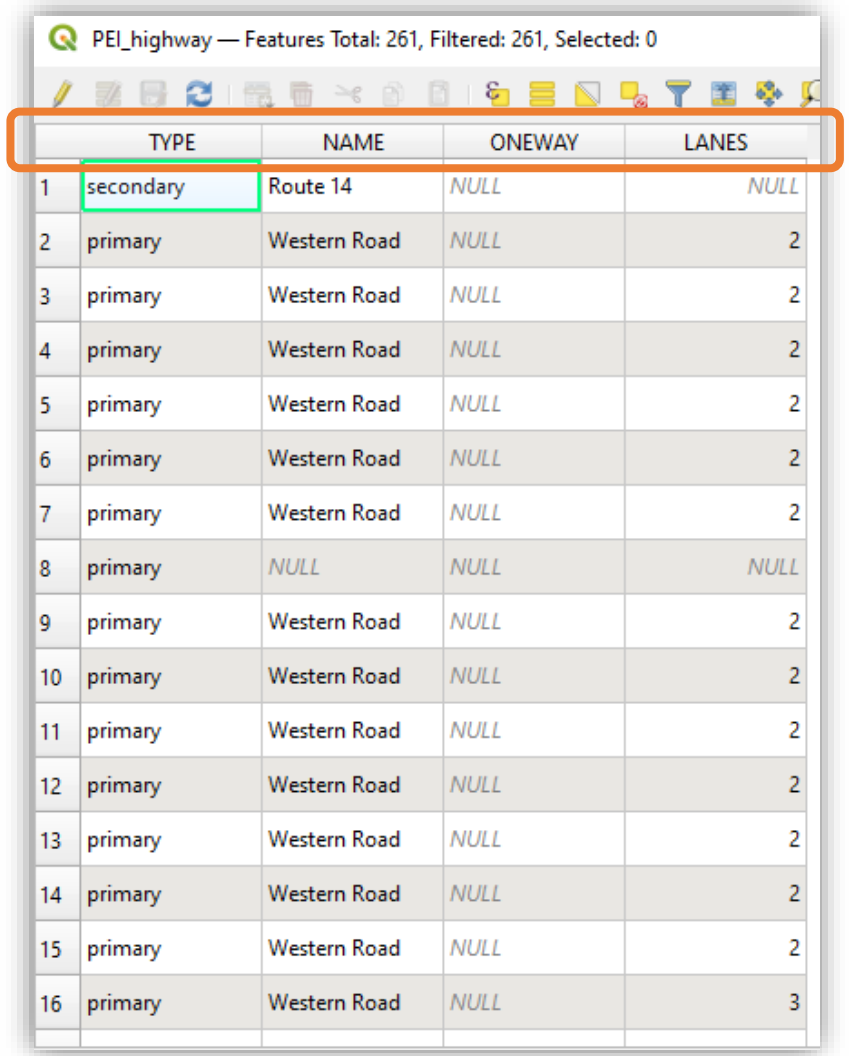
העשרת מפת הבסיס בנתונים וקטורים (דרכים)

- Add another vector layer from the upper toolbar. This time, select the file 'PEI_highway.shp'.
- QGIS should now display the roads of Prince Edward Island.
- As in previous layers, double click on the layer and go to Symbology if wish to change the color or design.



טבלת מאפיינים (דרכים)

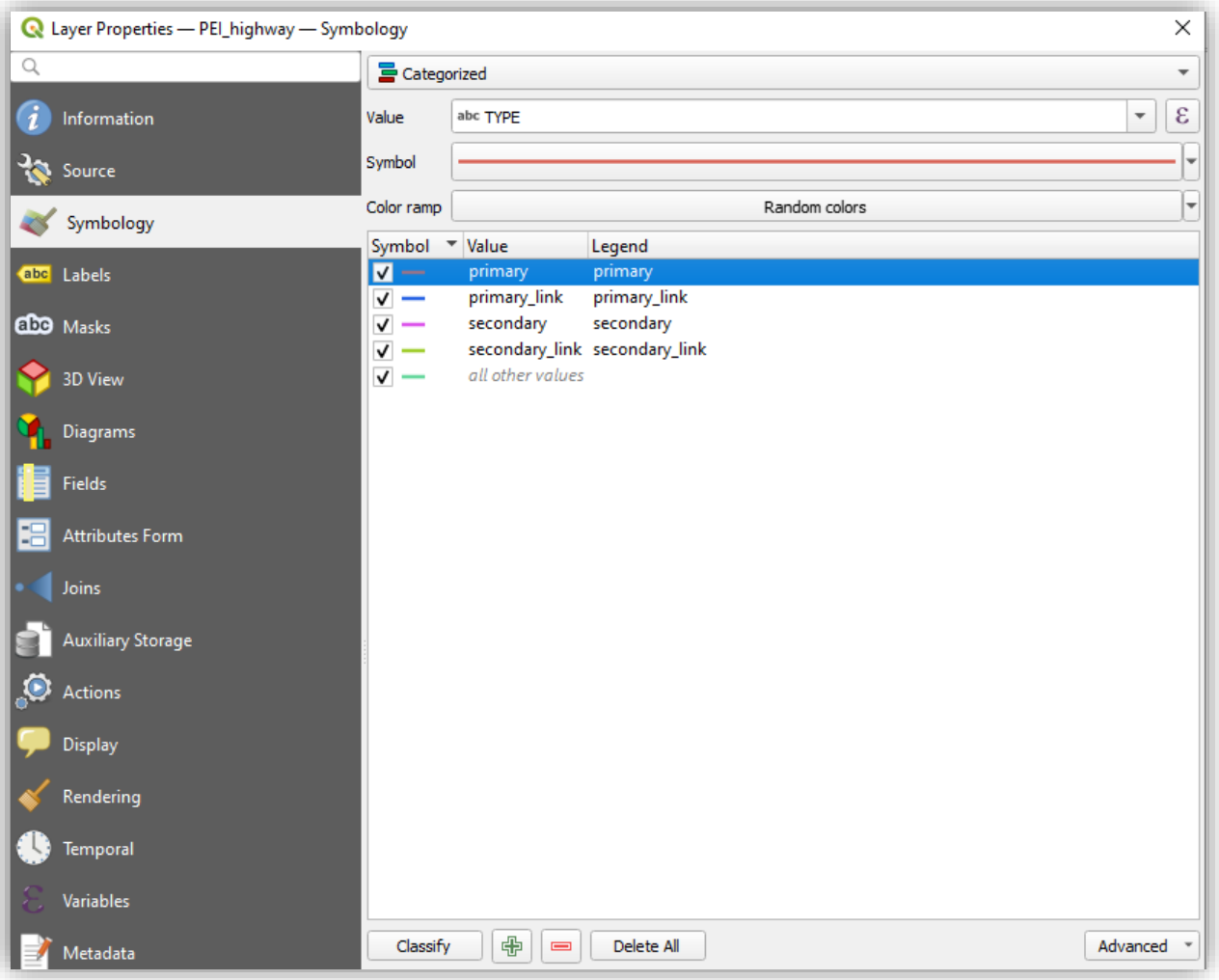
- Let's look at the type of roads included in our data by inspecting its attribute table.
- Looking at the first column ('TYPE'), we can see that our data includes both primary and secondary roads.
- Our data also includes the name of the roads ('NAME') and the number of lanes in each road ('LANES').


PEI_highway — Features Total: 261, Filtered: 261, Selected: 0

	TYPE	NAME	ONEWAY	LANES
1	secondary	Route 14	NULL	NULL
2	primary	Western Road	NULL	2
3	primary	Western Road	NULL	2
4	primary	Western Road	NULL	2
5	primary	Western Road	NULL	2
6	primary	Western Road	NULL	2
7	primary	Western Road	NULL	2
8	primary	NULL	NULL	NULL
9	primary	Western Road	NULL	2
10	primary	Western Road	NULL	2
11	primary	Western Road	NULL	2
12	primary	Western Road	NULL	2
13	primary	Western Road	NULL	2
14	primary	Western Road	NULL	2
15	primary	Western Road	NULL	2
16	primary	Western Road	NULL	3

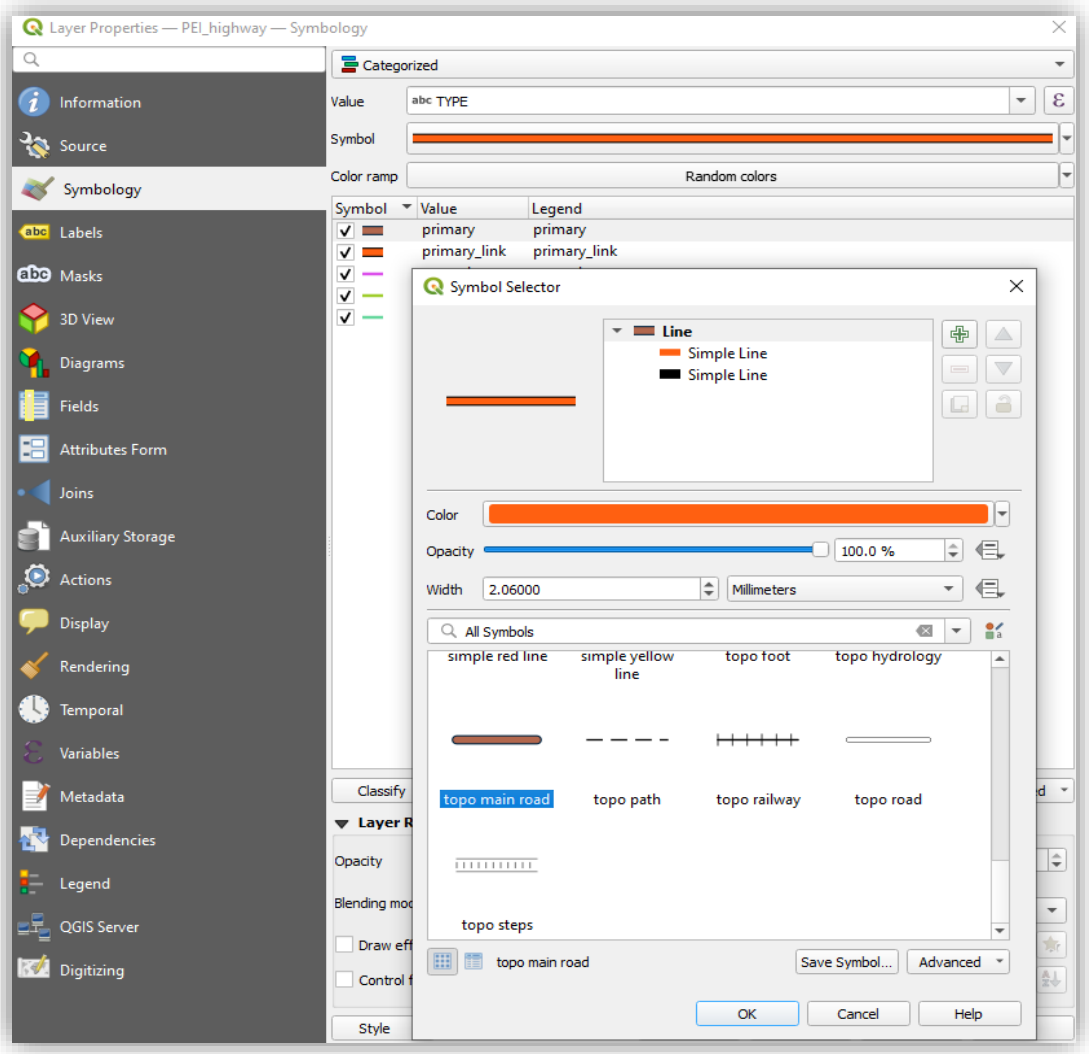
תצוגה לפי קטגוריות (דרכים)

- Let's reflect the distinction between 'primary' and 'secondary' roads on our map by opening the layer's Symbology.
- Change Symbology from 'Single Symbol' to 'Categorized'.
- Set Value to 'TYPE' and hit 'Classify'.



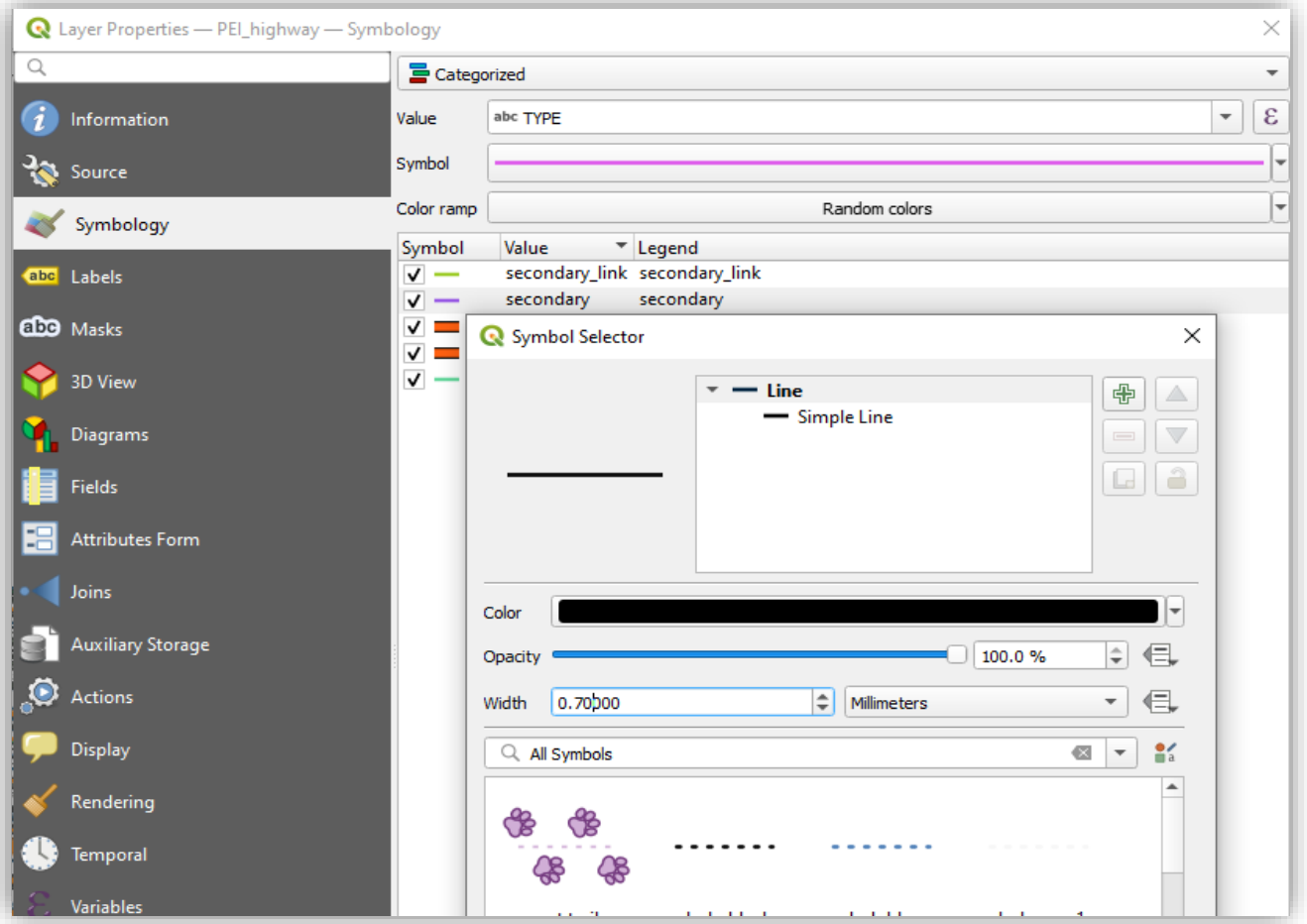
תצוגה לפי קטגוריות (דרכים)

- Double click on the symbol of the 'primary' road in the 'Symbol' column.
- In the ensuing window ('Symbol Selector') go to the symbols box and choose 'topo main road'. Hit OK.
- Repeat the action for the 'primary_link' symbol.



תצוגה לפי קטגוריות (דרכים)

- Double click on the symbol of the 'secondary' road in the 'Symbol' column.
- Change color to black and width to 0.7 mm. Hit OK.
- Repeat the action for the 'seconadry_link' symbol.

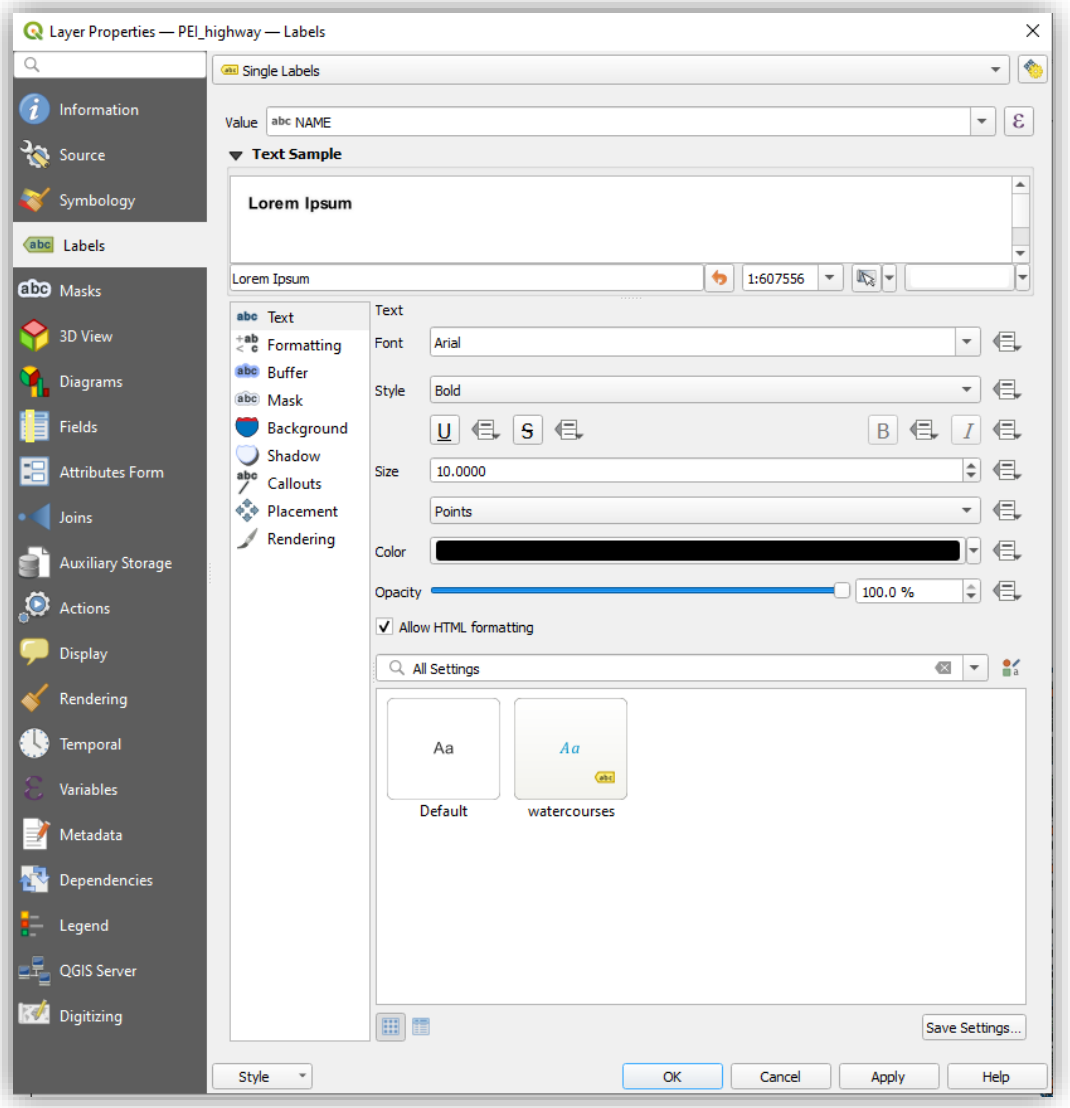


תצוגה לפי קטגוריות (דרכים)

- QGIS should display primary and secondary roads on your map of Prince Edward Island.
- Zoom in to view interchanges between primary and secondary roads.
- Check and uncheck the different categories in the Layers menu.

תוויות (דרכים)

- Included in the layer's attribute table are the names of each road.
- To display them on your map, double click on the layer ('PEI_highway) and go to 'Labels'.
- Change 'No Labels' to 'Single Labels' and set the Value to 'NAME'.
- Set 'Style' to 'Bold' and color to black.
  Hit OK.

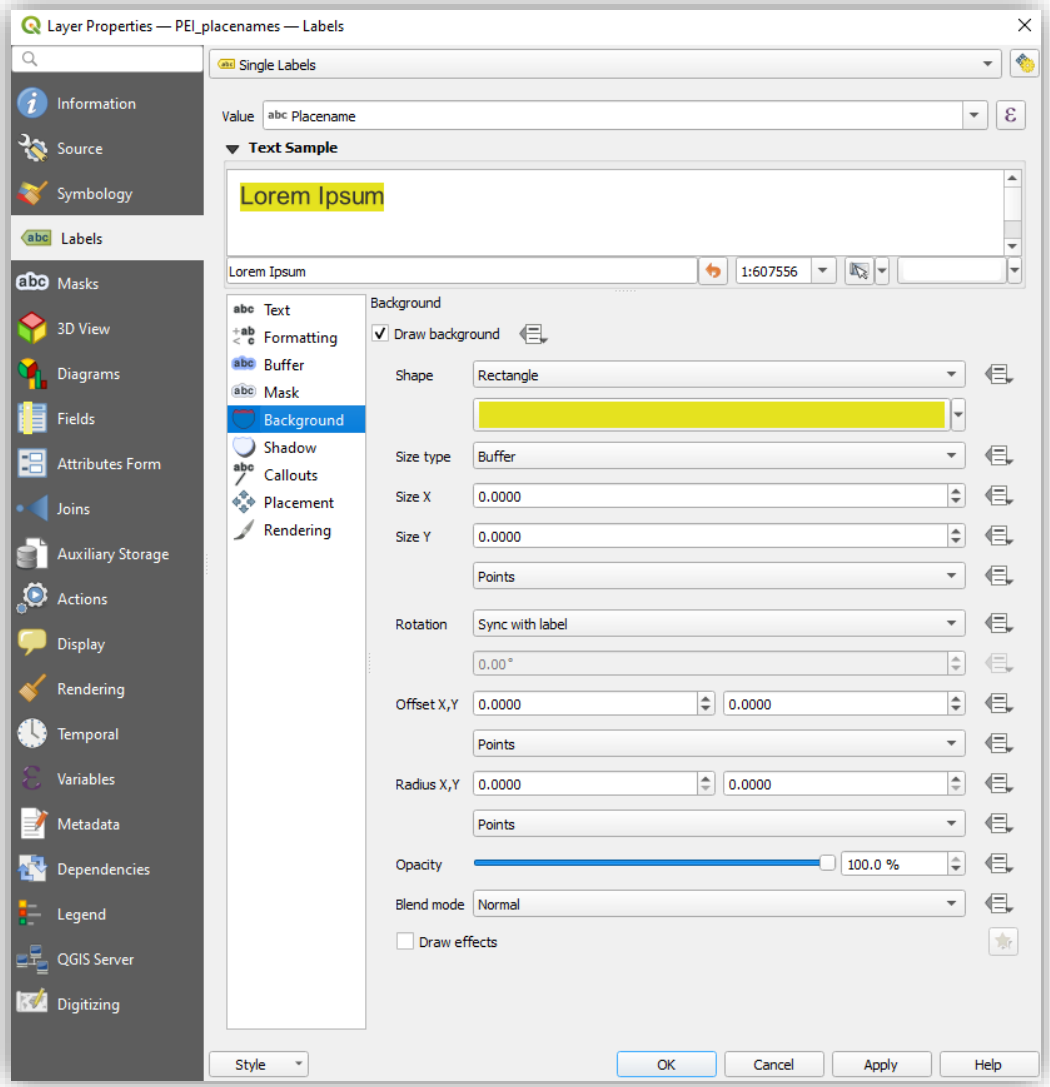


תוויות (דרכים)

- QGIS should now display road labels.
- Zoom in to view the position of labels along roads (parallel).
- Explore different styles or colors for your labels in the ‘Labels’ menu.

העשרת מפת הבסיס בנתונים וקטורים (ערים)

- Add another vector layer from the upper toolbar. This time, select the file 'PEI_placenames.shp'.
- Double click on the layer and go to 'Labels'. Change to 'Single Labels' and set 'Value' to 'Placename'.
- Set font size to 15. Go to 'Background' and check 'Draw background', then pick a suitable color. Hit OK.

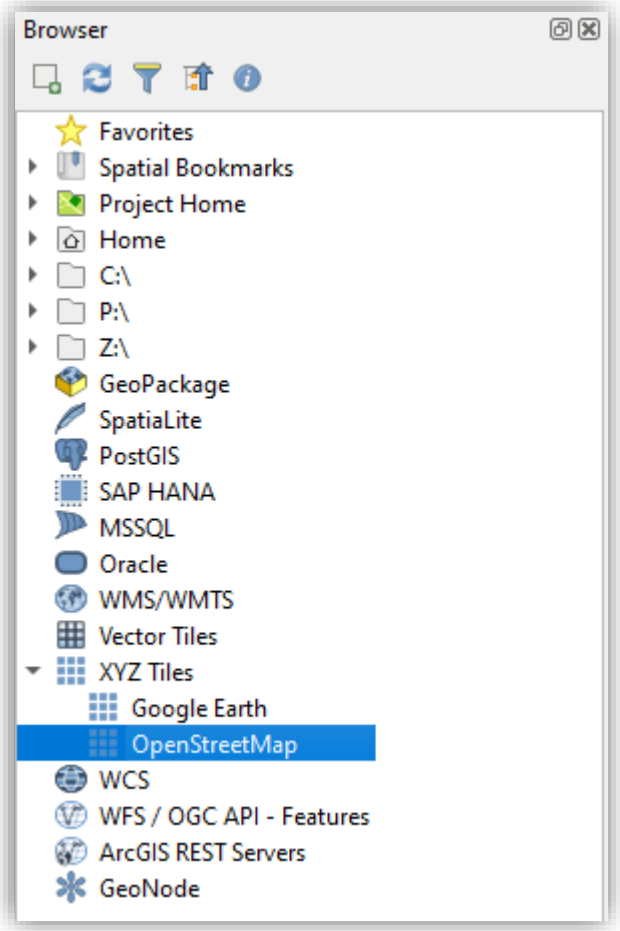


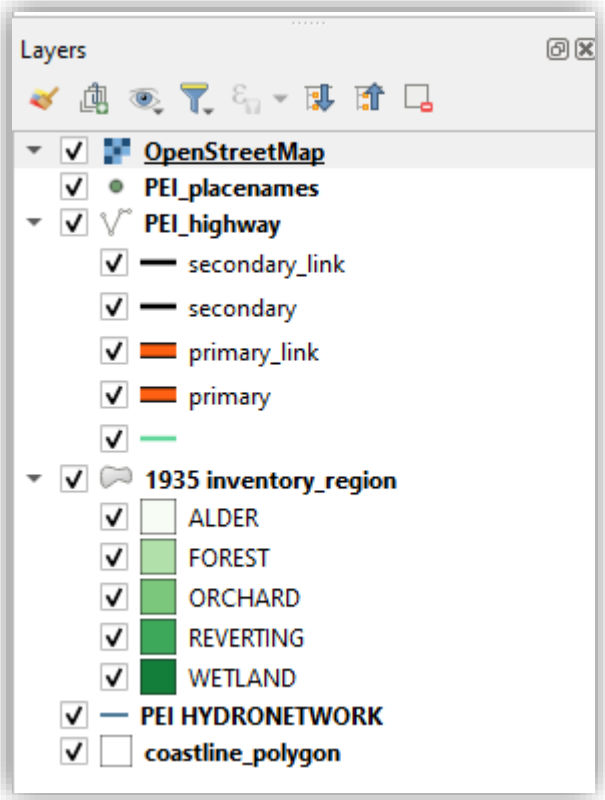
העשרת מפת הבסיס בנתונים וקטורים (ערים)

- QGIS should now display the four major cities of Prince Edward island.
- Zoom in to view location in relation to roads, water, and land use.
- You can remove or add the different layers in the Layers menu.

השוואה לנתוני OSM

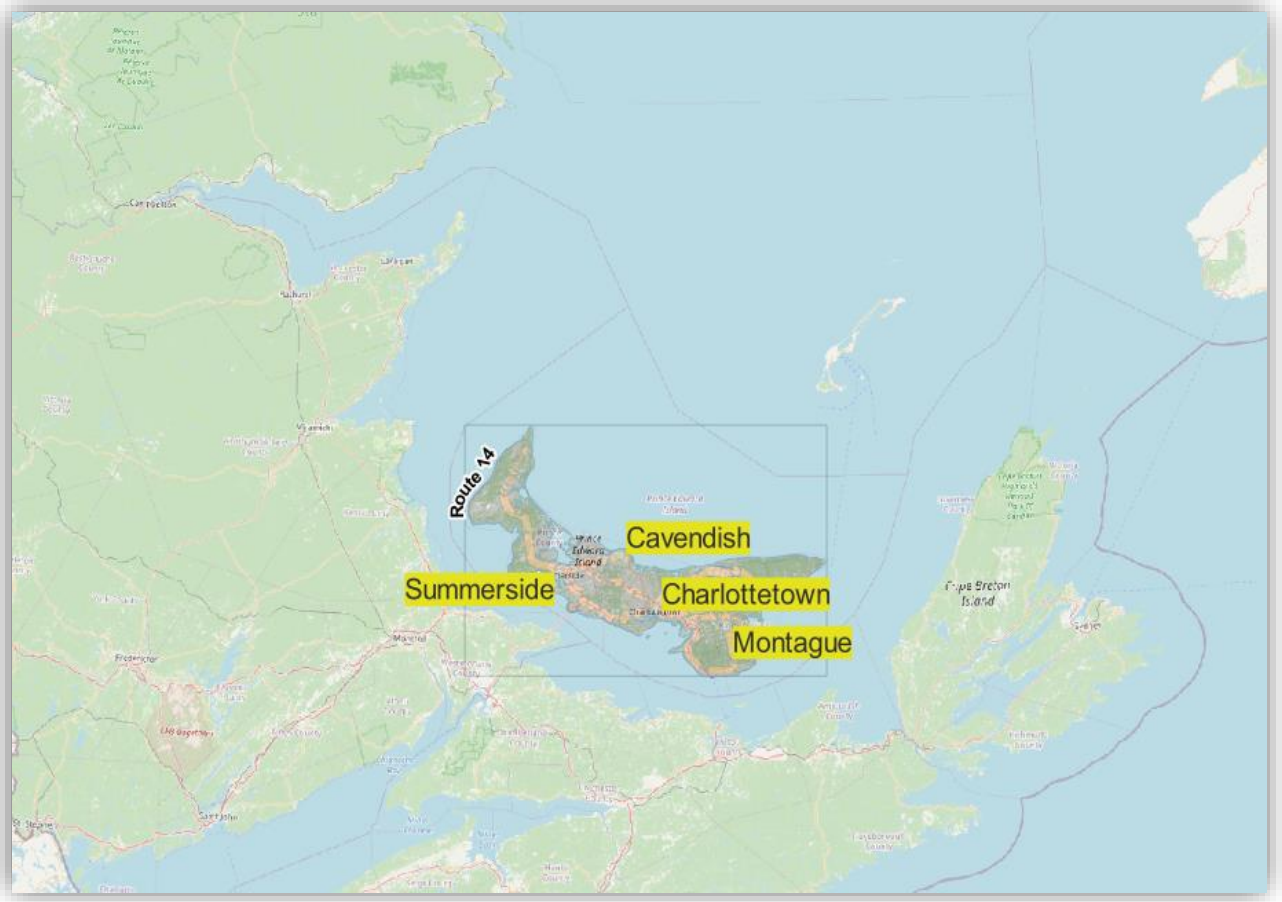
- To compare your representation of Prince Edward Island to real world data go to the Browser box and double click on 'OpenStreetMap'.
- This will add a layer containing a world map derived directly from OSM.





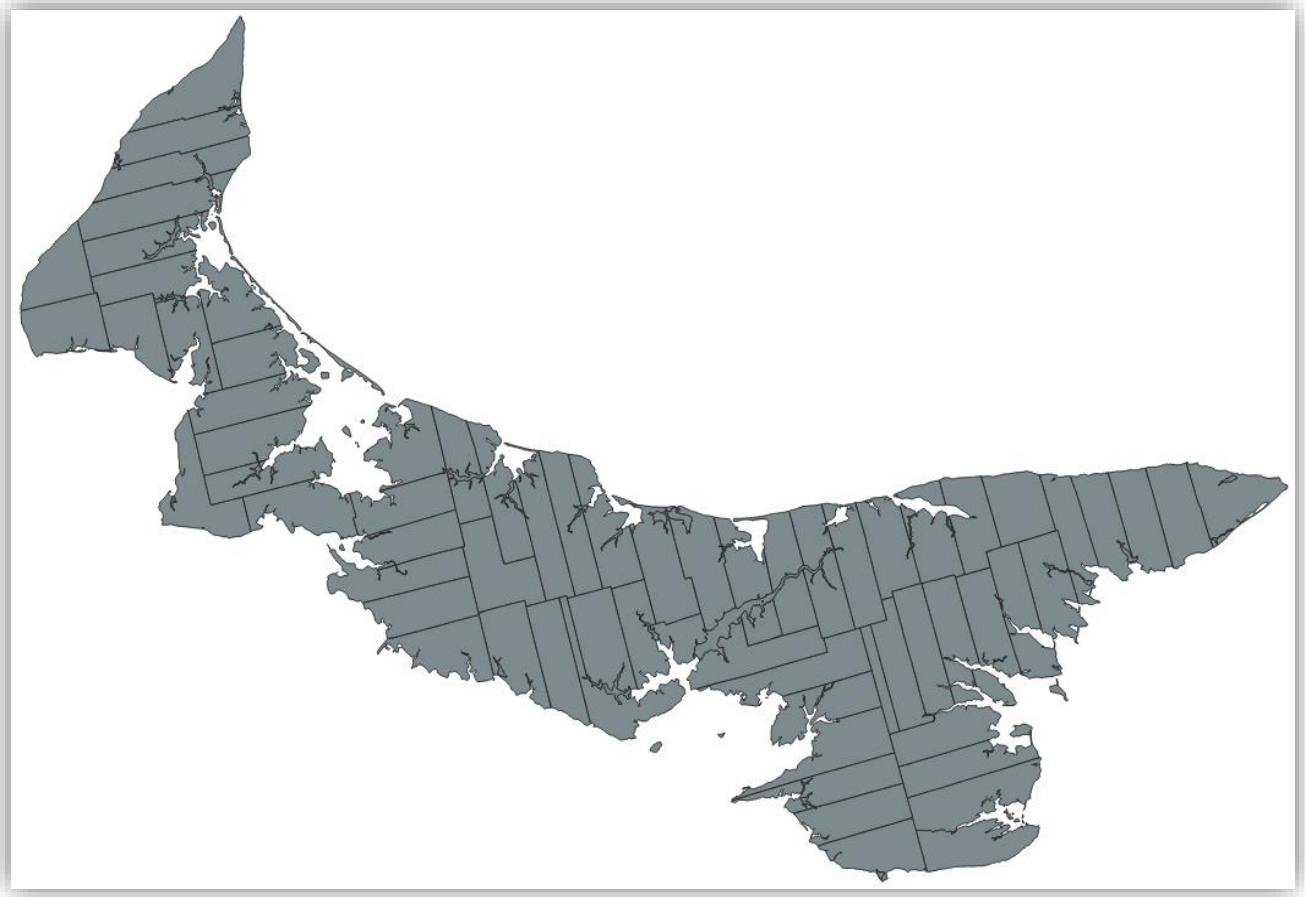
השוואה לנתוני OSM

- Double click on the layer ('OpenStreetMap') and go to 'Transparency'.
- Set 'Global Opacity' to 80% and hit OK.
- Zoom out to see your map in relation to real world data.



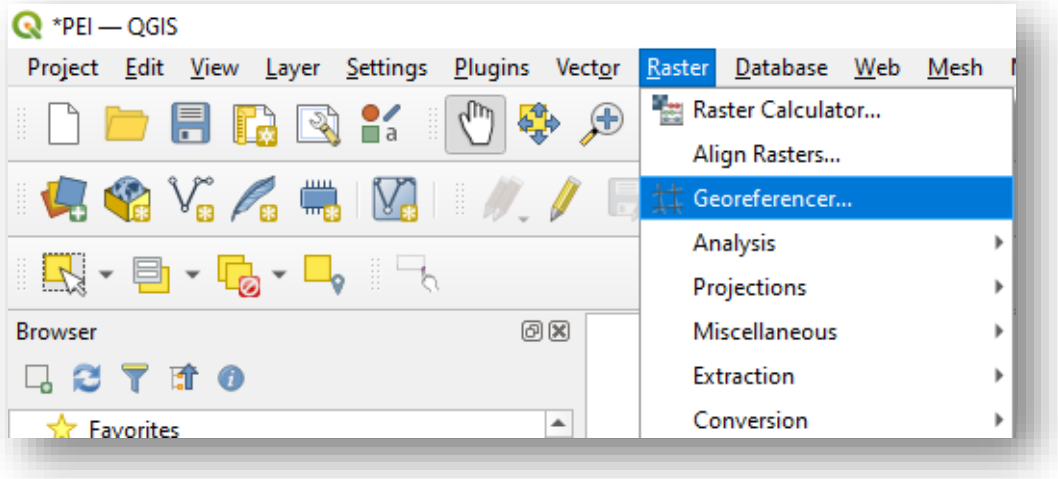
Georeferencing

- Uncheck all layers in your project. Make sure your display is blank.
- Add another vector layer from the upper toolbar. This time, select the file 'lot_township_polygon.shp'.
- QGIS should now display the township boundaries of Prince Edward Island (est. 1764).

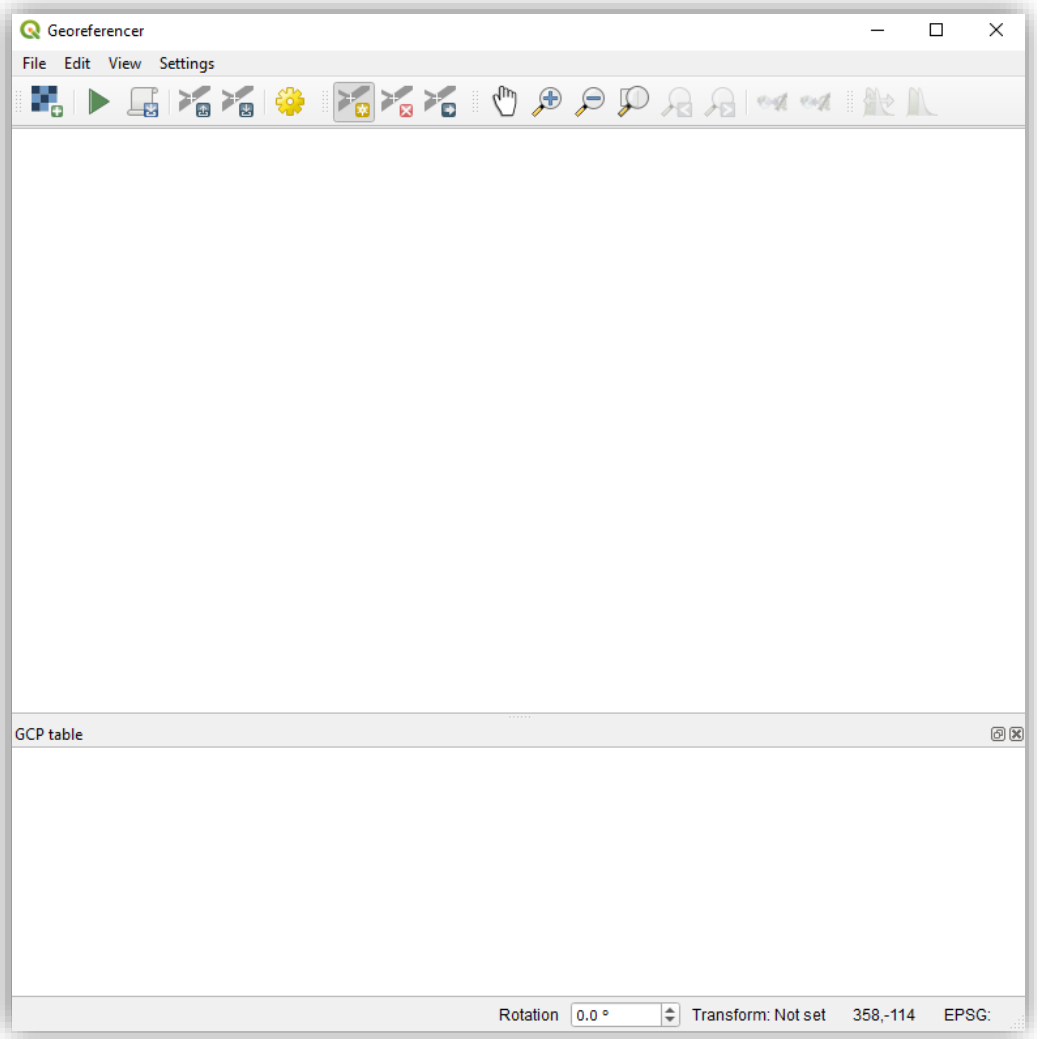


Georeferencing

- In the upper toolbar click Raster > Georeferencer.

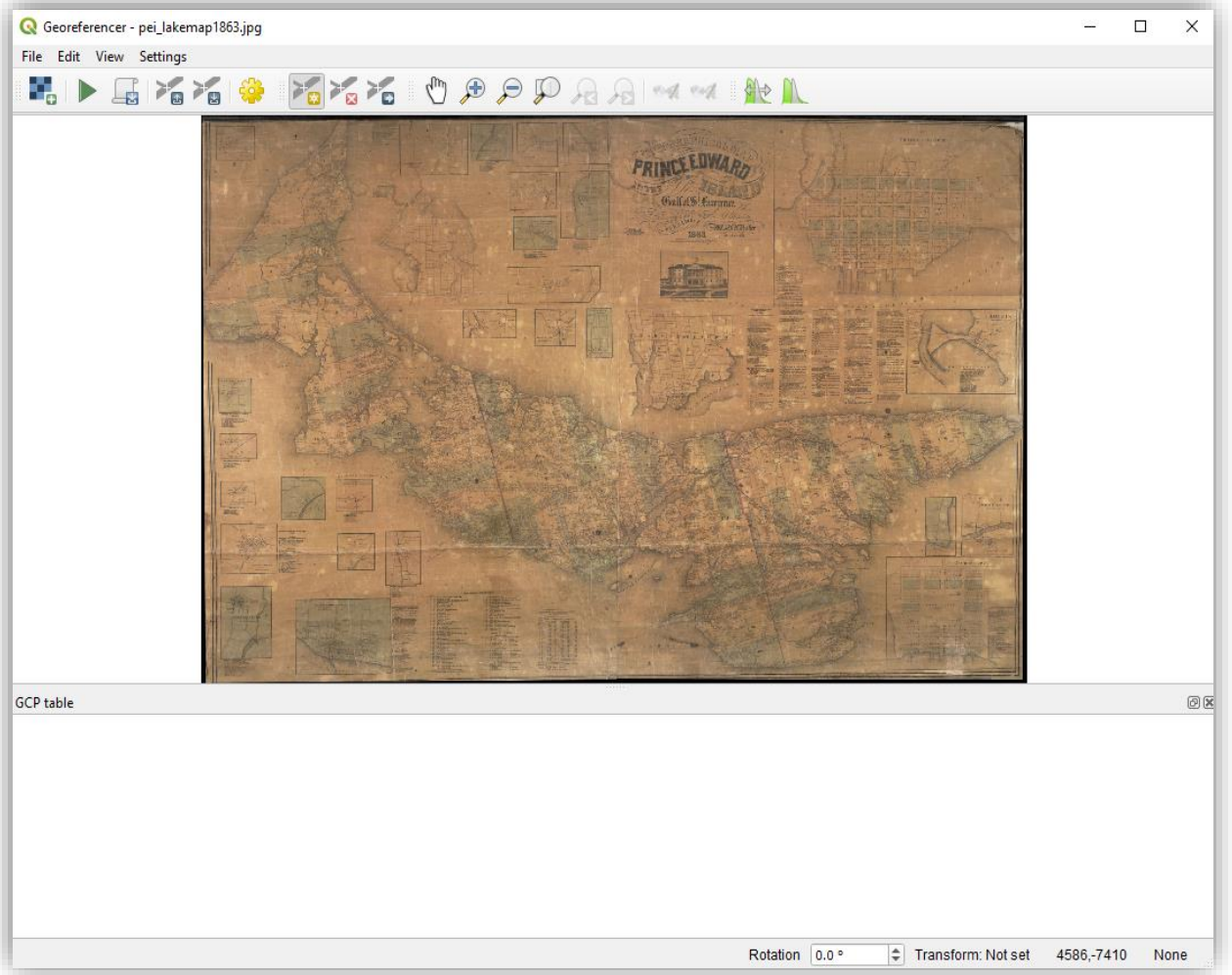


- This will open a blank Georeferencer tool on top of your project.



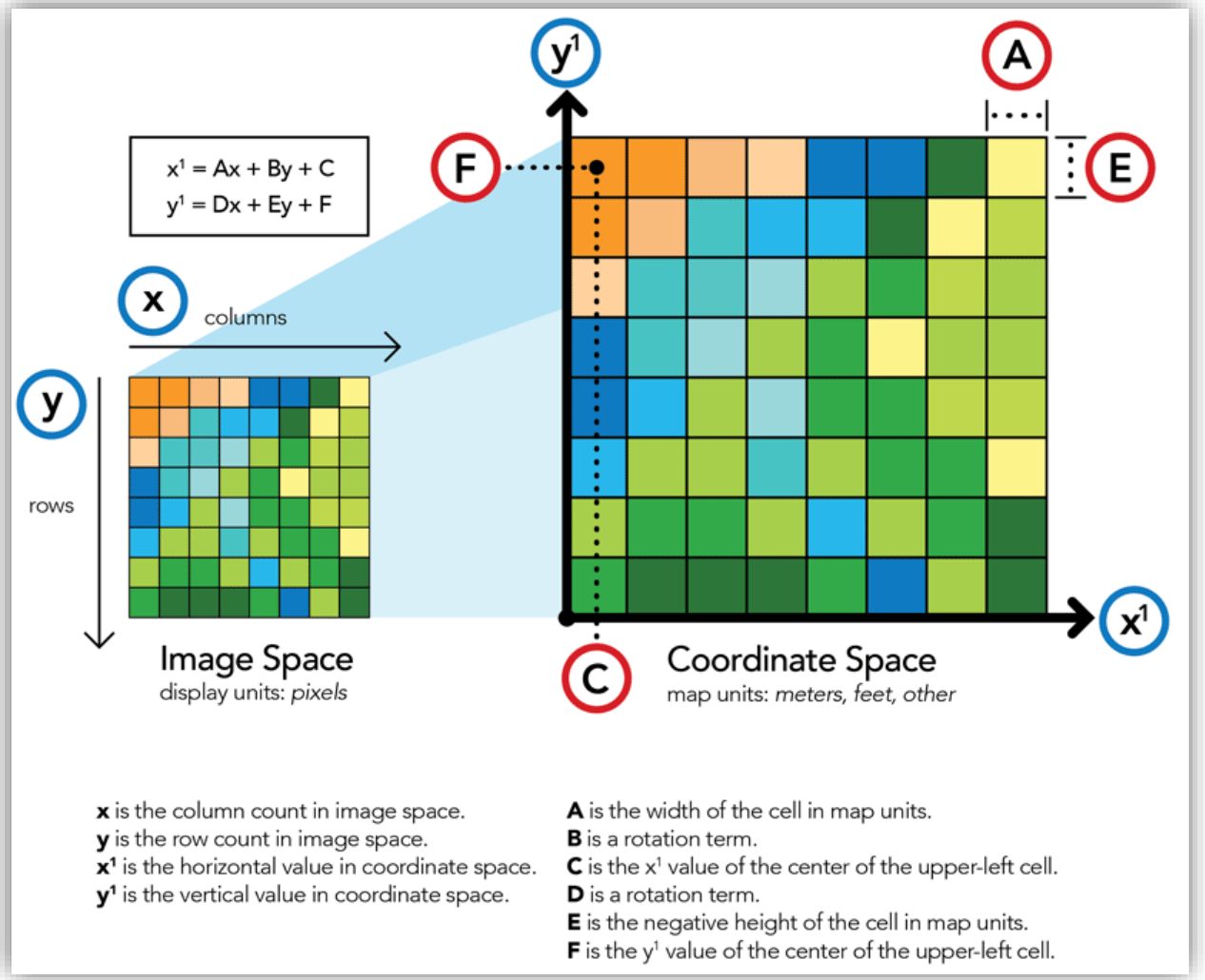
Georeferencing: Open Raster

- In the Georeferencer click on File > Open Raster.
- Browse to the file 'PEI_LakeMap1863.jpg' and click Open.
- The Georeferencer should now display a scanned map from 1863 of Prince Edward Island with township boundaries.



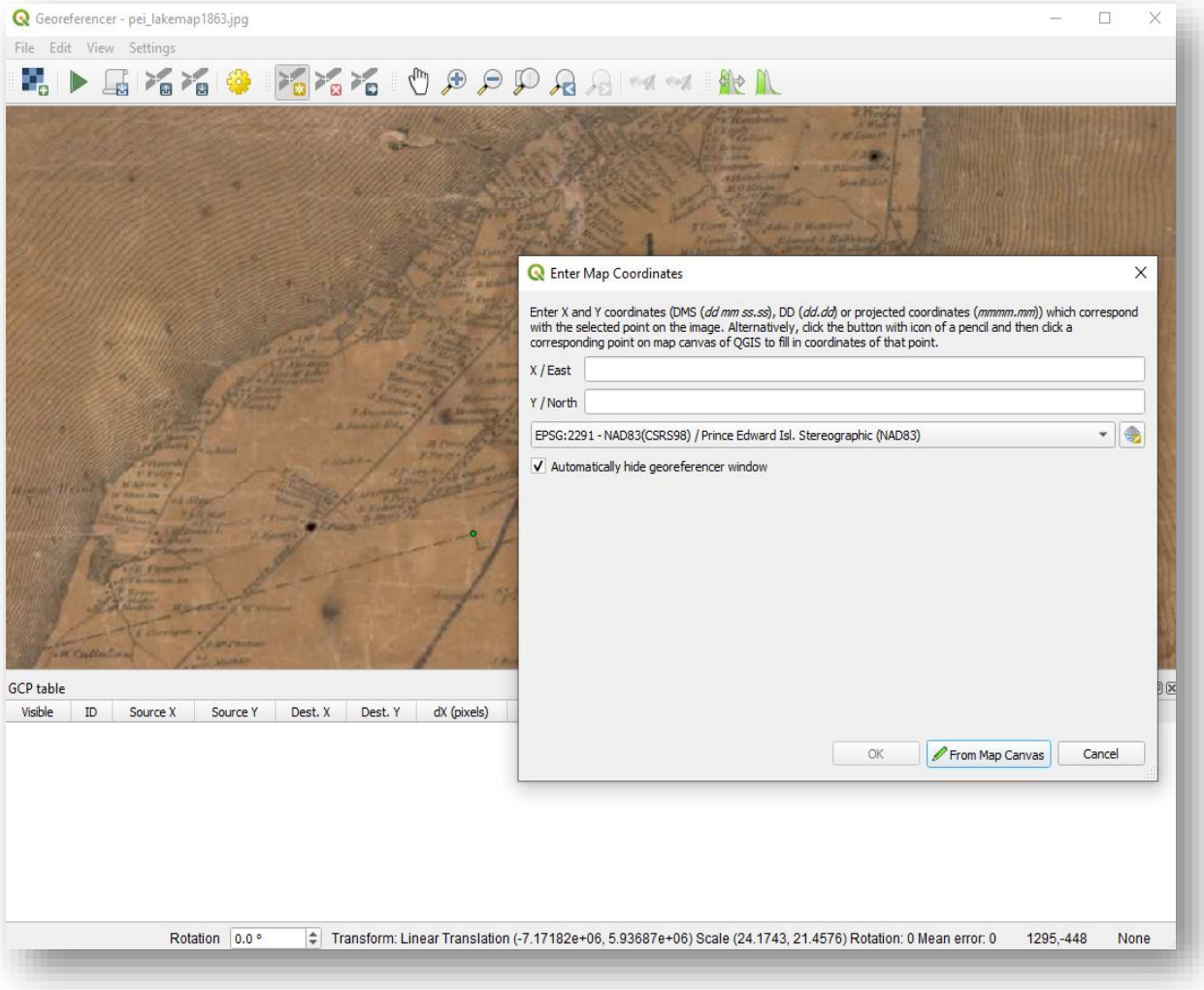
Georeferencing: Control Points

- A control point is one of various identifiable locations on a paper or digital map.
- It is used to link locations on the raster dataset with real-world coordinates.
- General guidelines: more points = more accurate; four corners; middle of intersections and roads.



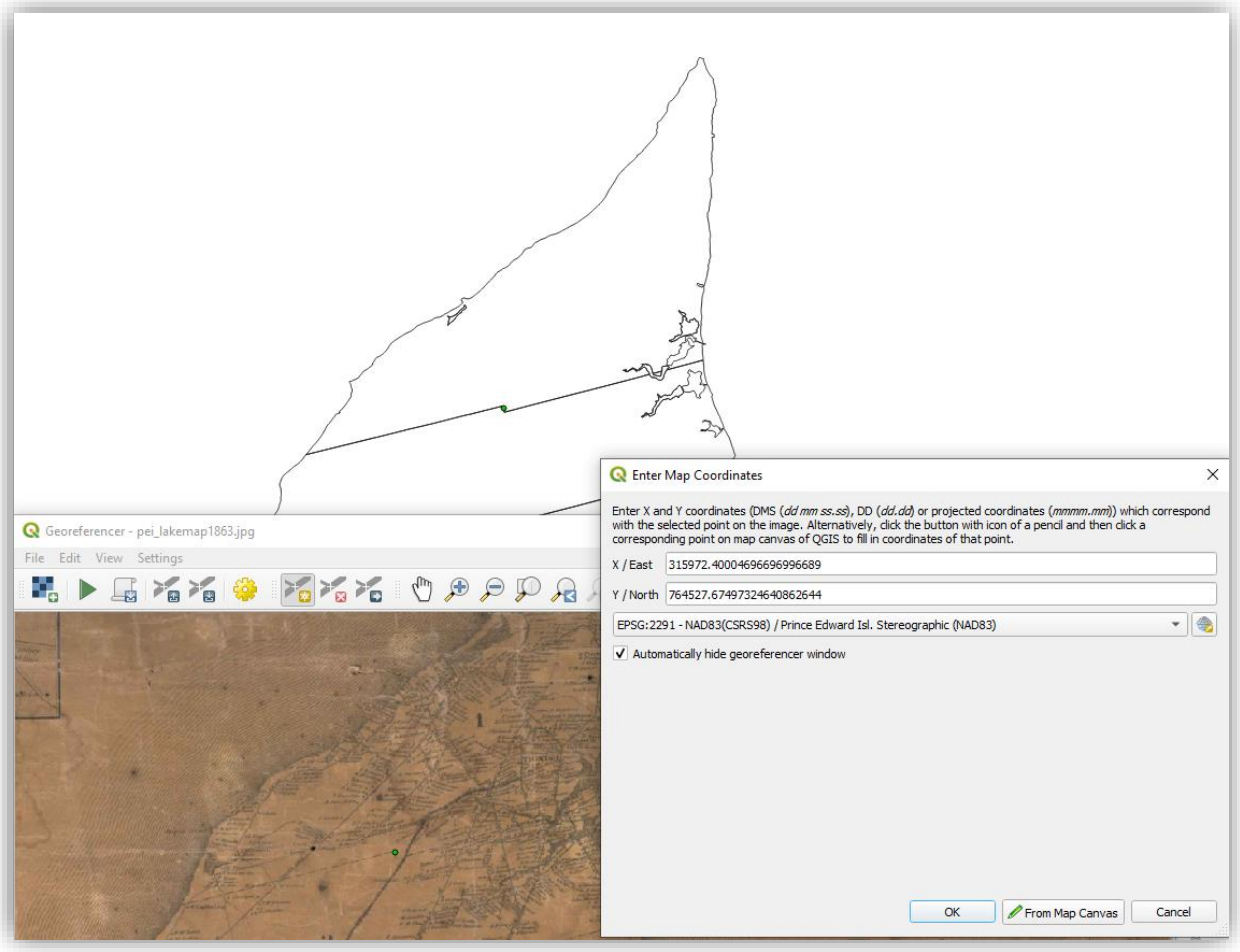
Georeferencing: Adding Control Points

- In the Georeferencer, zoom in to a point which you can identify on both your printed map and your GIS map.
- Click on Edit > Add Point.
- Click on the place in the printed map that you can locate in your GIS map, then select 'From Map Canvas'.



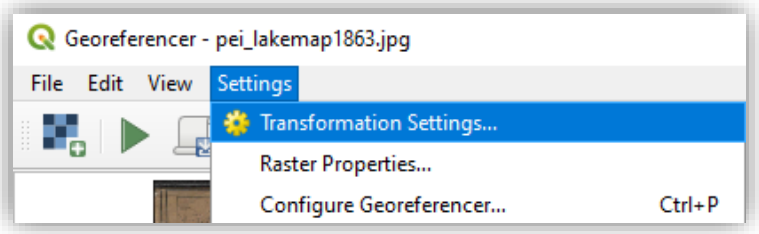
Georeferencing: Adding Control Points

- Click on the place in the GIS map which matches the control point.
- Notice how QGIS populates the coordinates fields.
- Hit OK. Your first control point should now appear in the GCP table at the bottom of the Georeferncer.

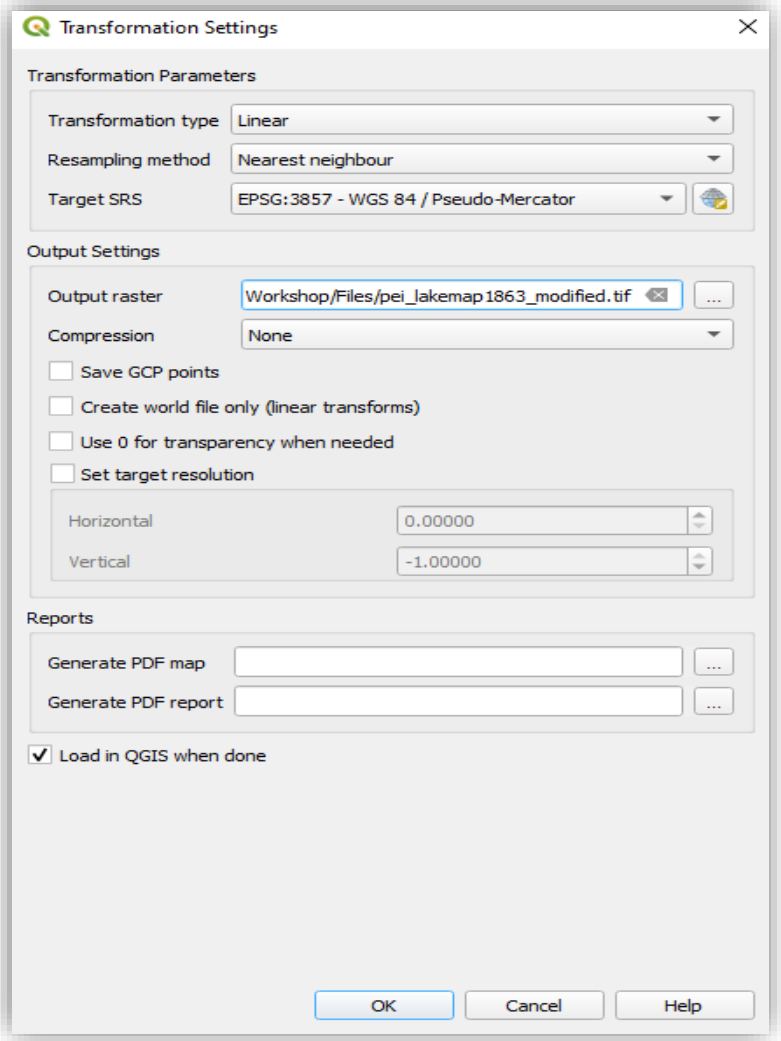


Georeferencing: Transformation Settings

- Before running the automated georeferencing process, go to Settings > Transformation settings.

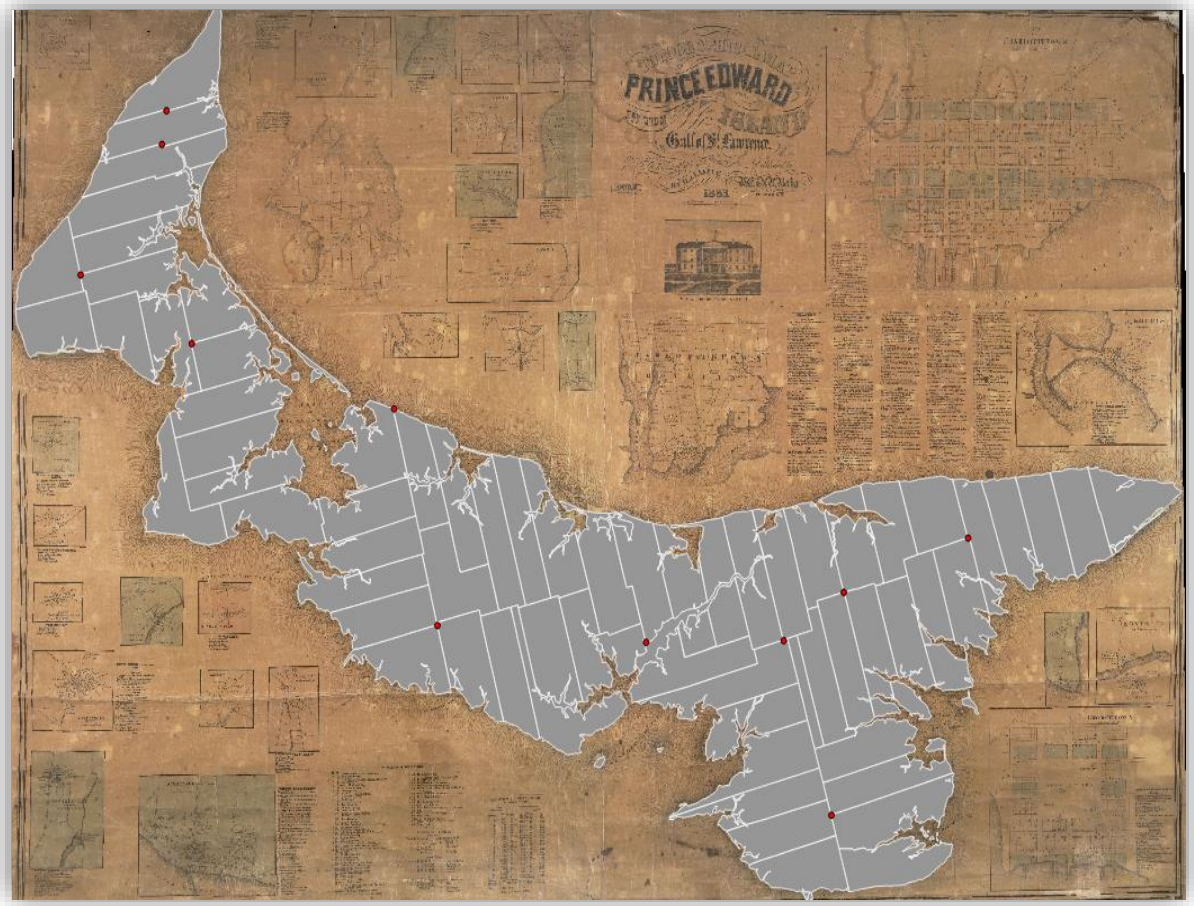


- Leave all settings as default.
- Make sure to check 'Load in QGIS When done'. Hit OK, then click on the green 'Play' button.



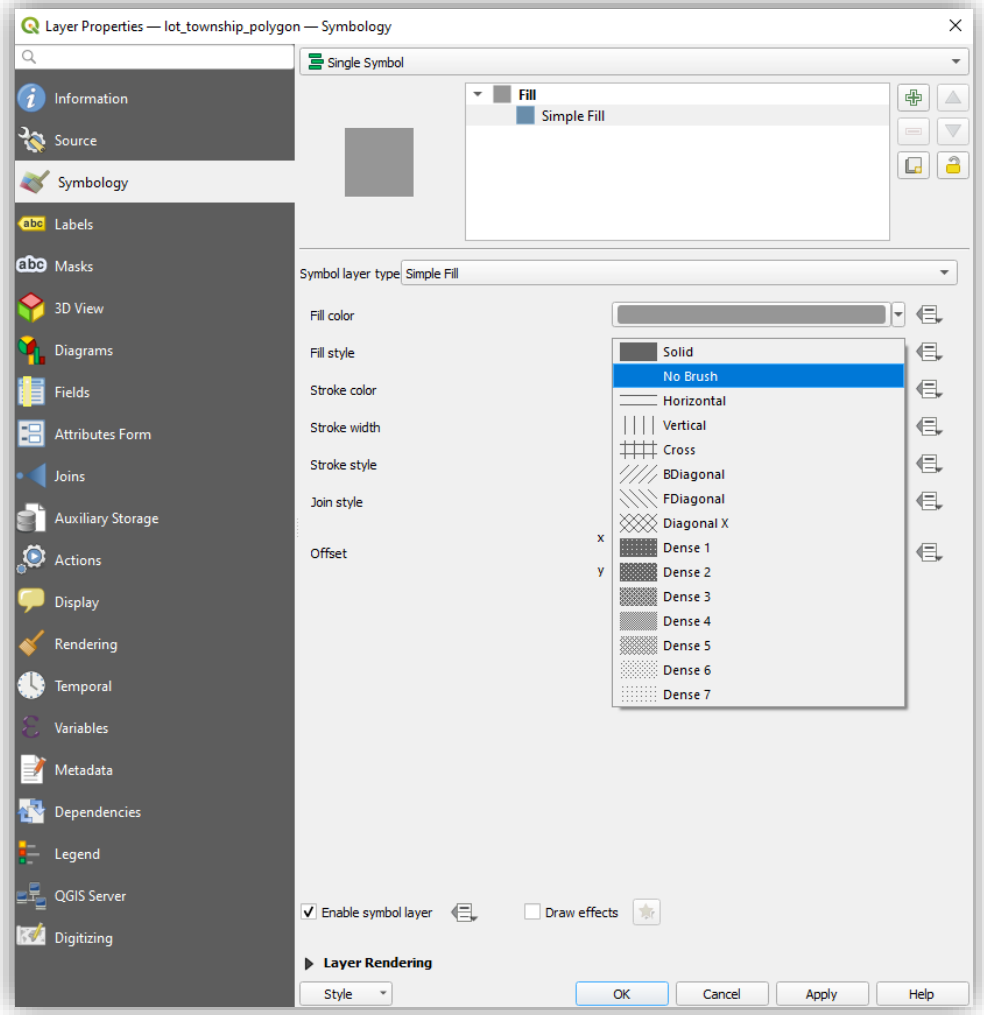
Georeferencing: Play

- Check the Layers menu for your modified map ('PEI_LakeMap1863_modified').
- Place the new layer below your previous layer ('lot_township_polygon').
- QGIS should now display your vector layer on top of your historical map.



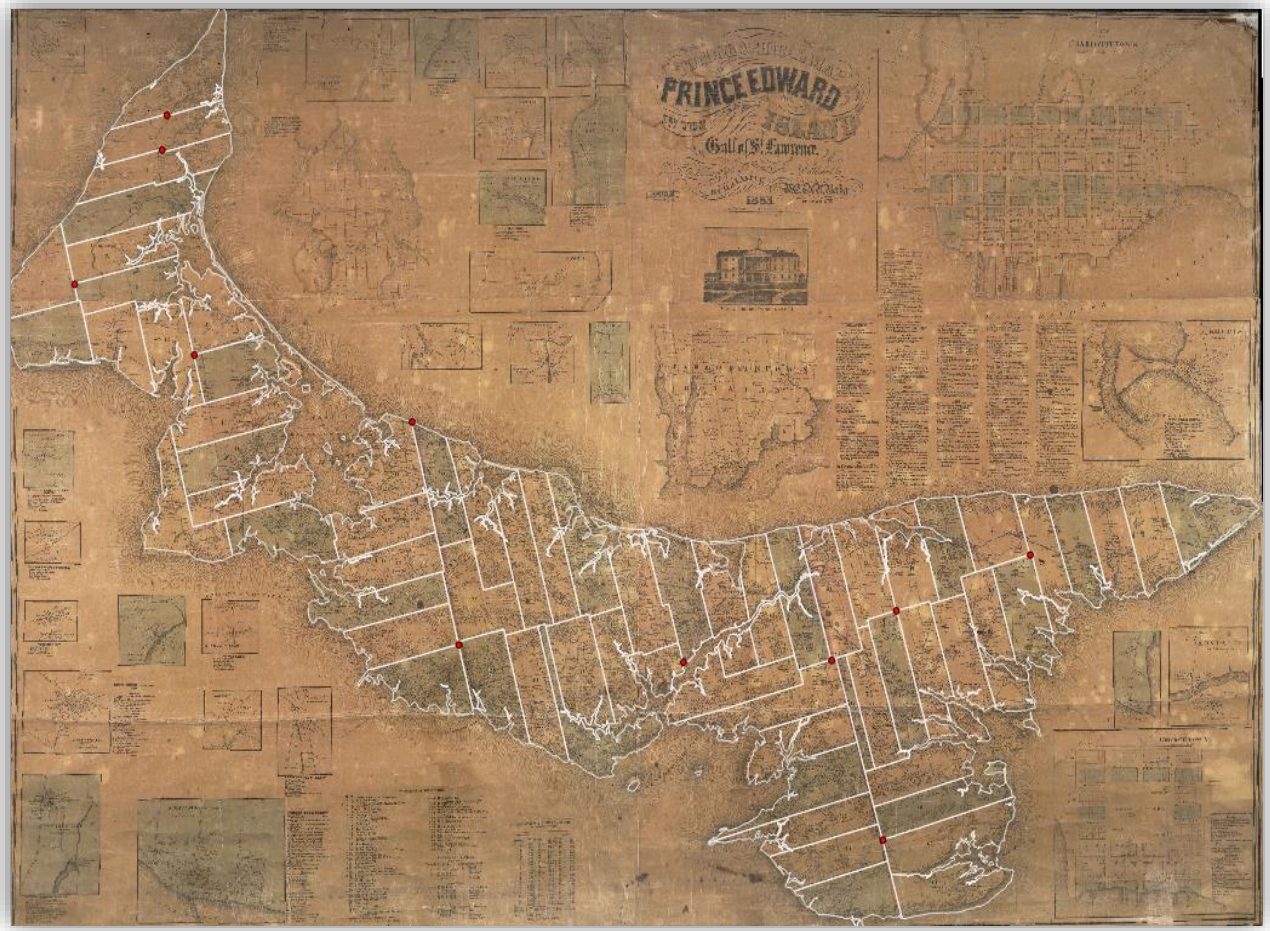
Georeferencing: Symbology

- To check the correlation of township boundaries between the two maps, double click on your vector layer and go to Symbology.
- Set 'Fill Style' to 'No Brush' and hit OK.



Georeferencing: Symbology

- QGIS should now display your modern GIS layer with the historical map behind.
- Zoom in to verify correlation between township boundaries.
- If the representation of boundaries is not accurate, go back to the georeferencer and edit your control points.



תודה!

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