1. Open QGIS and explore the interface
   1. Save QGIS Project and explain how Network Folder structure works.
2. Download Tiger Line file from Census.gov
   1. Open a web browser and head to [www.census.gov/geo/maps-data/](http://www.census.gov/geo/maps-data/)
      1. Click on TIGER Products, on the next page select ‘Cartographic Boundary Shapefiles’
      2. In the State Based Files section, Select ‘Census Tract’
      3. Click on the tab labeled ‘2014’ since our data is from 2014 and we want the geographies to match (I can make it 2015 if you want, but the Vacancy Index shapefile is 2014 Tracts)
      4. Select Michigan from the drop-down and click ‘Go’. A download should begin.
      5. Unzip the file and save to network drive folder
3. Discuss Data Sources: Vendors, Government, etc. while Tiger File extracts from website.
4. Add shapefile to QGIS Project via the Vector Button
   1. Have students explore the Pan, Zoom, Selection, and other navigation buttons
5. Clip
   1. Add Detroit\_Boundary Shapefile, Zoom to Layer
      1. Open Properties, Style
         1. Double-click Simple Fill and choose transparent Fill
         2. Change Border width to 1.25
   2. Click Vector 🡪 Geoprocessing Tools 🡪 Clip
      1. Input Vector Layer: tl\_2014\_26\_tract
      2. Clip Layer: Detroit Boundary
      3. Browse to Network Folder, Name file: Detroit\_Tracts
         1. Click Save.
      4. Click OK to run, then click Close
         1. The new shapefile should appear
   3. Remove Boundary Shapefile
   4. Remove Michigan Tracts file
6. Census Data Table (Per Capita household income) -
   1. Open table, discuss source (Simply Map vs. Fact Finder) and per capita income.
   2. Join table to Shapefile
      1. Open properties of shapefile, click join, click ‘+’ symbol
      2. Join Layer=HouseholdPCI\_2014; Join Field=Tract\_fips; Target field=TractCE
      3. Choose ‘Household\_PCI’ as fields to join
      4. Check Box for “Custom field name prefix’ and delete the text in the box
      5. Click OK and then click OK again to close the shapefile properties.
7. Save As… to make the join permanent
   1. Name File: Detroit\_PCI
8. Remove Detroit\_Tracts file
9. Change Style
   1. Right-click and open the properties of Detroit\_PCI shapefile
   2. Select ‘Style’ and from the drop-down menu at the top, select ‘graduated’
      1. Column = Household PCI
      2. Make sure method = color
      3. Mode = Natural Breaks (Jenks) and 4 classes, click ‘Classify’
      4. Click ‘apply’ and OK to close the window and view the range of incomes across the city.
10. Transform ‘Vacancy\_Index\_November\_2014\_Aggregated’ File to match other shapefiles
    * 1. Add ‘Vacancy\_Index\_November\_2014\_Aggregated’ file
         1. Note the difference in Shapefiles, same info but this has water removed
      2. Right-Click on shapefile, select Save As….
      3. Browse to Network Folder and name file, Detroit\_Vacancy\_NAD83
      4. On CRS line, click the orb symbol
         1. Type ‘4269’ in the filter bar and select the result in the window below
            1. Click OK to close the window
      5. Click ‘OK’ and once finished, the new shapefile will load.
      6. Remove the original Vacancy\_Index\_November\_2014’ file
11. Change Style of ‘Vacancy\_Index\_NAD83’
    1. Explain that Rule-based in like Definition Query in Arc, used to limit display of items but not to actually alter the original file.
    2. Open properties 🡪 Style 🡪 Select “rule based” from the drop down menu at top
    3. In the new window, click the [. . . ] button in the Filter row to enter your equation
       1. Select Fields and Values from middle window
          1. Dbl Click on “Pct\_VeryLi”
       2. Click Operators in middle window
          1. Dbl click on >=
       3. Enter 25 in left window to finish equation
          1. Finished query should be: “Pct\_VeryLi” >= 25
12. Selection to isolate neighborhoods by 2 criteria
    1. Open attribute table for Detroit\_PCI🡪 Select by Expression (top of window (ε))
       1. Select Fields and Values from the middle window
          1. Dbl click on Household, you will see it appear in the left window
       2. Select Operators in the middle window
          1. Double click on <=
       3. Enter 24000 in the Left window to finish the expression and Click the Select Button
       4. Close attribute table
    2. Do the same operation on the Vacancy\_Index\_NAD83 file so that the equation reads as follows:
       1. “Pct\_VeryLi” >= 25
       2. BUT and you MUST DO THIS!!!!! Click the drop down arrow NEXT to the Select button and click “Add to Selection”. Clicking the select button will remove selection from the previous shapefile
    3. Click Vector🡪Geoprocessing Tools🡪Intersect
       1. Input Vector Layer = Detroit\_Vacancy\_NAD83
       2. Intersect Layer = Detroit\_PCI
       3. Browse to Network Folder and Save as… Vacancy\_Income
       4. Click ‘OK’
13. Grocery Store Geocode
    1. Open CSV with Excel, discuss address format and parse address (maybe?), ways of geocoding
    2. Got to Plugins 🡪 Manage and Install Plugins 🡪 Search for and install “MMQGIS”
       1. Close plugins window
    3. Move back to QGIS, Click ‘MMQGIS’ and select Geocode
       1. then select Geocode CSV with Google Maps/Open Street Map
       2. Browse to the location of the Grocery Store.csv
       3. Verify that correct address attributes are selected in the drop downs
       4. Set paths to save the shapefile and ‘Not found’ CSV to the network folder.
    4. Click ‘OK’ to run, see the output.
14. Grocery Heat Map
    1. Go to Raster 🡪HeatMap 🡪HeatMap
       1. Input point layer = Grocery\_StoreList
       2. Output Raster = Click ‘Browse’ and save file to network folder
          1. Name file: Grocery\_Heatmap
       3. Leave other settings at Default (Radius should be 1000/ roughly .5 miles)
       4. Click ‘OK’ to run the tool and the Heat map should load
       5. Open Properties 🡪 Render Type (Singleband Pseudocolor) 🡪 Select YeloRD 🡪 Hit Classify button and click OK
15. Transform Heatmap to Vector
    1. Raster 🡪 Conversion 🡪 Polygonize
       1. Name new Vector file ‘Grocery\_Buffer and save to Network folder
       2. Click OK to run.
       3. View Vector output, discuss similarity to Buffers
16. Select by location to find Final Tracts
    1. Vector 🡪Select by Location
       1. Select Features in : Vacancy\_Income
       2. That Intersect Features in: Grocery\_Buffer
    2. Inverse Selection
       1. Open attribute table for Vacancy\_Income
       2. Hit ‘Invert Selection’ at the top
       3. Close attribute table
       4. Save As…
          1. Save Only Selected Features!
          2. Browse to Network Folder and save
             1. Name File: Detroit\_POI
       5. Open Properties, Click Style
          1. Change Fill to Transparent, thicken border width (1 or higher)
       6. Web 🡪 OpenLayersPlugin 🡪 Google Maps 🡪 Google Sattelite
          1. Have students observe spaces chosen for our Community Garden