QGIS Analysis: Comparing street tree locations and car collisions

I. Upload Census Tracts, ensure consistent CRS of NY 2263 throughout by reprojecting where necessary ("reproject layer")
   A. Source Link: https://data.cityofnewyork.us/City-Government/2020-Census-Blocks-Tabular/wmsu-5muw
      1. "Geo_export_507a85b3-308e-47f8-a4cf-8a02234b2bf3.shp"
   B. "Reproject layer" to NY2263
      1. Save temporary "preprojected" file as "BK_CensusTracts.shp"
         a) Filter "boroname" for "Brooklyn", save changes
      2. Open field calculator>create new field named "Area_acre", decimal
         a) "Shape_area" / 43560 (converts square feet to acres)
      3. Use the "basic statistics for fields" tool for "Area_acre" column, note total area of Brooklyn is 44,401.713 acres

II. Upload Brooklyn crash data .csv file from R analysis using latitude and longitude values
   A. Data Source Manager>Delimited Text>Point Coordinates
   B. File name: BK_crash_data_2015.csv
   C. "Reproject layer" to NY2263
      1. Save temporary "preprojected" file as "BK_crash_loc.shp"
      2. Edit Symbology to "Point Cluster" to show number of crashes at each unique location
   D. Create a copy of BK_crash_loc.shp, save as "BK_crash_loc_heat.shp"
      1. Edit Symbology to "Heatmap" set automatic maximum as dark blue, minimum as transparent

III. Upload Brooklyn tree data .csv file from R analysis using latitude and longitude values
   A. Data Source Manager>Delimited Text>Point Coordinates
   B. File name: BK_tree_data_2015.csv
   C. "Reproject layer" to NY2263
      1. Save temporary "preprojected" file as "BK_tree_loc.shp"
      2. Edit Symbology to "green dot", size 2.0 mm
      3. Use the "basic statistics for fields" tool for "tree_id" column, note total count for Brooklyn is 177,293 trees; matches # of objects in R data frame
         a) Total tree density for Brooklyn is calculated as ~3.99 trees/acre

IV. Create a temporary buffer layer extending 20 feet out from BK_CensusTracts.shp
   A. Vector>Geoprocessing Tools>Buffer
      1. "BK_CensusTracts_.shp", 20 feet, round
      2. This captures crashes/trees just on the other side of a census tract boundary along a street. This may double count some trees and crashes, but I am working with the assumption that these crashes occurred in both census tracts, as conditions within both tracts contributed to the crash. Likewise with trees, trees across the street from the border should be included in the adjacent tract as they are within the same streetscape.

V. Create a temporary Count layer, counting the number of crashes in each census tract
   A. Vector>Analysis Tools>Count points in polygon
      1. Polygon: “Buffered”; Points: “BK_crash_loc.shp”
      2. Save count field name as “num_crash”

VI. Create a temporary Count layer, counting the number of crashes in each census tract
   A. Vector>Analysis Tools>Count points in polygon
      1. Polygon: “Count”; Points: “BK_tree_loc.shp”
      2. Save count field name as “num_tree”
      3. Save buffered, twice counted layer as “buff_tracts_count_dens.shp”

VII. Within “buff_tracts_count_dens.shp” attribute table, calculate new fields
   A. Open field calculator>create new field named “area_acre”, decimal
      1. “Shape_area” / 43560 (converts square feet to acres)
   B. Open field calculator>create new field named “crash_dens”, decimal
      1. “Num_crash” / “area_acre”
   C. Open field calculator>create new field named “tree_dens”, decimal
      1. “Num_tree” / “area_acre”

VIII. Within “buff_tracts_count_dens.shp” attribute table, sort by highest “tree_dens”
   A. Identify the top two census tracts
   B. Select census tracts one at a time, Edit>copy features; Edit>paste features as> new vector layer
      1. Save layers as “High_tree_dens1.shp” and “High_tree_dens2.shp”
      2. Edit symbology, transparent fill, yellow outline for both tract layers

IX. Repeat the following steps for both high tree density census tracts: select crashes within each census tract and save to a new layer
   A. Select by location> select features from: “BK_crash_loc.shp”; by comparing to the features from: ““High_tree_dens1.shp” or “High_tree_dens2.shp”
   B. One at a time, Edit>copy features; Edit>paste features as> new vector layer
      1. Save layers as “high_tree_dens1_crash_loc.shp” and “High_tree_dens2_crash_loc.shp”
      2. Edit symbology, heatmap; dark red as maximum, transparent as minimum

X. Within the “BK_tree_loc.shp” layer, use the “select by polygon” to draw a selection area around the high tree density census tracts (one at a time), extending out by half a block in four directions. This is inexact, and for visualization purposes.
   A. One at a time, Edit>copy features; Edit>paste features as> new vector layer
      1. Save layers as “high_tree_dens1_tree_loc.shp” and “High_tree_dens2_tree_loc.shp”
      2. Edit symbology, “green dot”, size 2 mm

XI. Export the “buff_tracts_count_dens” layer as a .csv file to other folder to process in R

XII. Use the “basic statistics for fields” tool for the “crash_dens” column in the “buff_tracts_count_dens” layer
   A. Note the mean value is ~2.82 crashes/acre in a [buffered] census tract

XIII. Visually analyze the “BK_crash_loc_heat.shp” to identify outlier intersections with particularly high crash rates
    A. Identify and select these four intersections in “BK_crash_loc.shp” with “select feature(s)” tool.
    B. With four selected,Edit>copy features; Edit>paste features as> new vector layer
        1. Save layer as “high_crash_interx.shp”
        2. Edit symbology to simple gray dot, to be edited in other software

XIV. Create a temporary buffer layer extending 500 feet out from intersections
    A. Vector>Geoprocessing Tools>Buffer
        1. “high_crash_interx.shp”, 500 feet, round

XV. Remove the duplicate crash sites, as each crash is counted individually, even with identical longitude and latitude
    A. “Delete duplicates by attribute” tool
        1. Input layer: “Buffered”; field to match duplicates by: “latitude”

XVI. Count the number of trees within this buffer radius
    A. Vector>Analysis Tools>Count points in polygon
        1. Polygon: “Filtered (no duplicates)”; Points: “BK_tree_loc.shp”
        2. Save count field name as “trees_near_interx”
    B. Open field calculator>create new field named “tree_dens_intx”, decimal
        1. “trees_near_interx” / 18.030261 (convert 500 ft radius circle to acres)
            a) Returns a trees/acre density value within buffer of intersection
    C. Open field calculator>create new field named “avg_td”, decimal
        1. 177,293/44,401.713
            a) Returns the average tree/acre density across Brooklyn (3.99)

XVII. Export the “high_crash_interx_stat” layer as a .csv file for external visualization tool

XVIII. Upload Positron [no labels] (retina) basemap for simple, clean basemap.
    A. Upload Esri Light Gray for visual reference to street names, not to be used in visuals.