Predicting Future Victims of GTA Urban Sprawl

A Study of Which Urban Centers in Ontario Make the Best Candidates for Rapid Urban Growth, to Accommodate for Increased Centralization Around the Greater Toronto Area

Background

Many people are interested in predicting the expansion of the GTA, not necessarily as an administrative zone, but as a design and cultural style. Realtors, investors, companies and individuals seek to know how land value will change with demand, how zoning and municipal bylaw will protect from or encourage this expansion, and how they can make the most money from it all. Conservationists worry about potential ecological disaster from suburban extension. City planners begin work on how to manage an influx of new residents and by extension transportation needs, but intercity but also intracity.

Data and Study Area

The data used for this study are as follows:

- GTFS Data from:
    - Barrie
    - Brampton
    - Burlington
    - Kingston
    - Windsor
    - Cornwall
    - Durham Region
    - Grand River
    - Greater Sudbury
    - Guelph
    - Hamilton
    - Milton
    - Mississauga
    - Oakville
    - Ottawa
    - Thunder Bay
    - Toronto
    - York Region
    - Niagara Region
    - GO Transit
- Census Tract Boundaries
- Census Population Data
- GTA Administrative Boundary
- Union Station Point

- Ontario Road Network (ORN)

The Study Area was theoretically all of Ontario, however data was clipped to within 500km of Union Station, and erased from the Administrative Boundary of the GTA.

Analysis Procedures

The analysis was divided into 3 Major Steps. The first was to use GTFS data and the ORN to determine existing accessibility to Union Station via Public Transit. The Second was to create a Raster of Population Density across the Study Area. The final part was to do a simple Multicriteria Analysis using accessibility and population density in order to determine suitability.

After gathering all the GTFS Data, I then combined them all to form a Public Transit Model. The generated Stops were then bound to the ORN as Streets. Then using Schedule data, determine Service Areas according to the time required to get to Union Station.

The most obvious flaw in the analysis here was the fact that Public Transit is not a suitable method to access Union Station for nearly anyone, even residents of Toronto, so the Service Areas required incredibly large time intervals. But these should be adequately representative of the commuter base, who will likely be driving cars into Toronto, and while the ratio of travel time between Transit and Driving may not be 1:1 it should be proportional.

As such, I created three Service Areas, representing three levels of accessibility to the Toronto core. The first is almost entirely covered by existing GTA administration, with the second and third then being the main class dividers of accessibility-based prediction for GTA expansion.

Anything beyond the threshold of the third area is simply not in consideration (yet) for this expansion.

I had assumed that getting a shapefile of population density of Ontario Census Tracts would be as simple as a Google search but after multiple hours of searching, I decided to reverse engineer a visualization I saw that had several of its sources listed.

I joined Census Tracts to a CSV Population Table and spent some time exploring the data using various Symbology options. I then had to calculate Density using Population and Area, in order to properly account for non-standard Census Tract sizes. Because

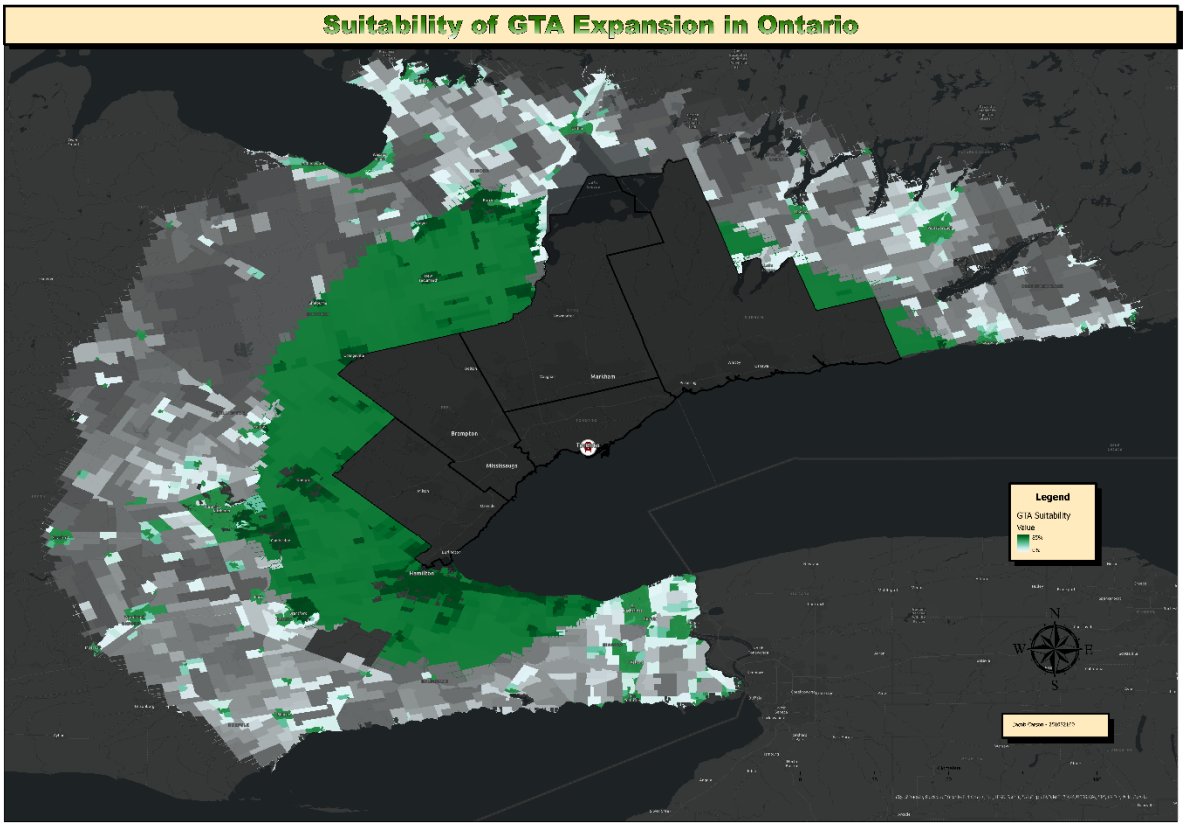
Ontario is generally very sparsely populated, it took a lot of effort to really accent the denser populated areas among the mass of uninhabited area.

The final step was to combine the two rasters, making some form of suitability measure that could be used to evaluate existing urban centers by both general proximity as well as existing population density.

There are a few way in which expansion happens, one of which being that you find the next closest empty area and build on it, or you find the next biggest city and build from it, hoping that the road and transit infrastructure is adequate for transporting from major urban node to the destination.

By valuing population at 70% of the criteria and proximity area as the remaining 30% I was able to create a visualization that combines the 2 concepts effectively.

Results



From these results we get some expected results and some that surprised me a little, perhaps due to my lack of geographic investment into Ontario urban centers. The main targets appear to be Hamilton, Barrie, and Kitchener-Waterloo-Cambridge as we have already begun to see those expansions already.

The second tier of targets then following as Niagara, Woodstock, Stratford, Orillia, and Peterborough, along with the rural expanses between those centers. I imagine if expansion goes to the first targets over the next decade or so, the second targets could be over the next few decades.

More and more of the population is gravitating towards urban areas, so it makes sense that the largest concentrations of population in Canada continue to grow.

Implications

What this study does is gives us an idea of what areas will require better access to the Toronto core, using multiple transit modes. As distance increases and car traffic demand will be continually increased, there will simply be no choice but to explore other transit options such as expanding the rail service and long trip bussing.

If these expansion regions do not learn from the mistakes of the existing GTA, and its housing, transportation, and cost of living crises, the effectiveness of Toronto as a center of business and residence will continue to be diminished.

If Ontario continues to centralize as it has, zoning density and public transit must be a focus, as the single family home, car-driven, mobility focused approach continues to show its flaws in every facet of our living experience.