

Planning the Greenville Transit System Bus Routes Based on Population Demographics

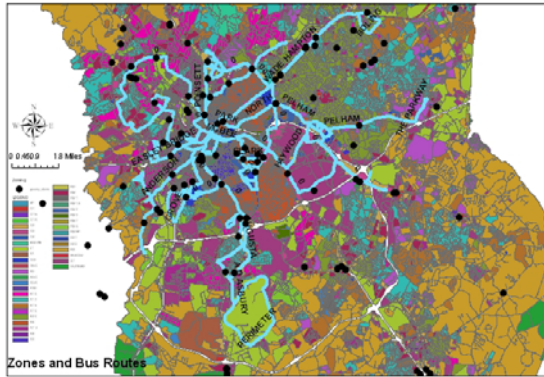


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ABSTRACT

There are many reasons why I chose this project, the main being my interest in the concept of sustainable development. Sustainable development practices are increasingly necessary as our civilization is on an unsustainable path that is causing a shortage of natural resources. Sustainable development is very important in cities such as Greenville which is one of the fastest developing in the US. Smart choices must be made to ensure that Greenville is a city that is safe and can house and cater to the needs of a growing population. Recently, Greenville has come under surveillance by the EPA for having poor air quality. Though Greenville has been given time to address this issue, if the air quality isn't improved, Greenville will lose business investments and its economic growth could slow. The majority of the pollution comes from cars, most of them having single occupancy, that crowd the city streets as people try to get to work or run errands. Perhaps less people would drive their cars if they were given reliable public transportation.

The purpose of this project was to understand what is currently plaguing the Greenville Transit System. What are the factors influencing bus ridership currently and based on census data and where the routes are currently placed, how can we increase ridership and thus reduce car traffic? My plan was to create a basic understanding by helping people visualize what is occurring in the field and what characteristics are affecting our current transit system. In a sense, this is a socio-economic study that has great implications for the environmental quality and future development of the city.



METHODS

- Data Collected (Shape files):

 - Current Bus Routes from GTA
 - Greenville County data including parcel, zoning, buildings and parking lots from Richard Hanning, Greenville county GIS manager and Grocery Stores and Airport from USC
 - Census Data (for each tract) from US Census Bureau website.

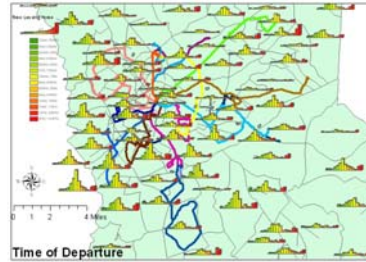
Data on annual house income, mode of transportation used, duration of commute to work, time leaving for work, and people per carpool was downloaded from the site. Microsoft Excel was used to compile various data for each tract and then saved into one database file. This database file was joined with the attribute table of the Greenville County tracts shape file. Several different maps were created based on the various data in the new Greenville County shape file.

Analysis

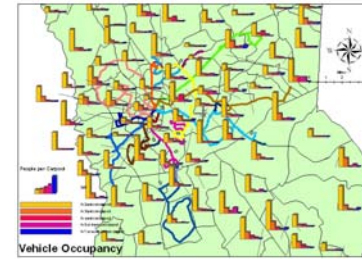
These demographics were chosen because they are typically used or can be used to help shape a city's mass transit system as noted by planners/developers of public transit systems from Asheville, NC and Charleston, SC. Bar graphs were made to show the difference in carpool vehicle occupancy, duration of commute, time leaving for work, and comparison of carpooling and driving alone for the population within each tract. The layer of current bus routes was added to this to compare the demographics with bus accessibility. A map was made with graduated colors to distinguish the different zones within the county. To determine the connectivity of the zones, the bus routes layer was added on top. Similarly, a stacked bar graph was made of average annual household incomes within each tract and the bus routes layer was added to reveal any connections between bus use and income level.

Personal Interviews & Research

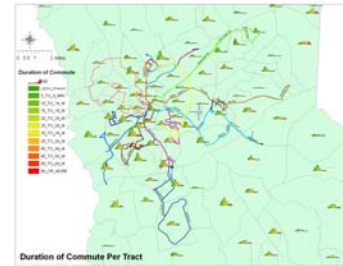
I interviewed the mass transit planners of Asheville, NC, Charleston, SC, and Greenville, SC. I was also able to interview a student in a sociology class at Furman who has to ride the Greenville Buses for a sociology project. This was to get an idea of what the bus system is like and the type of people that use the buses. Finally, I was able to use a recently published article about the Greenville Transit Authority in the Greenville Journal to better understand the complexity of the issues surrounding my project.



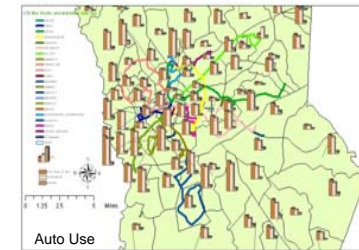
The map above depicts at what time people are leaving for work in every tract. This information can be used to predict what operating times would be best to increase ridership for buses. The map on the left shows the bus routes layer and its connectivity to different zones. This can be used to plan bus routes ensuring that they connect the highest possible residential areas with business and commercial areas.



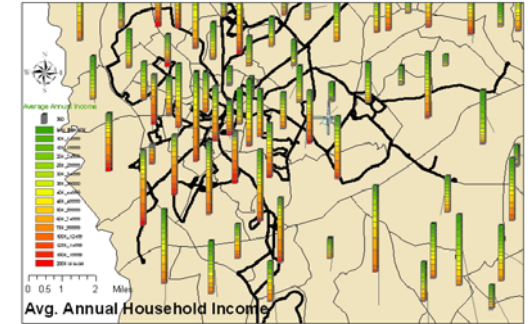
The map above depicts how many individuals per carpool in every tract. This information could be useful in determining which areas could benefit from bus routes. The map to the right displays the income levels of people for every tract along with the bus routes layer. This can be used to compare which areas could use the bus routes more as lower income people are the ones who generally use the bus system and or may be influenced not to drive cars if they cannot afford the fuel for their cars.



This map displays the duration of commute for people in every tract. This information could be useful in planning bus routes based on where people are less willing to drive their cars because of the duration of commute which results in higher fuel costs and stress for them.



The map above displays how many people are driving cars, trucks and vans, and how many of them are driving alone or carpooling in each tract. The bus routes layer is also projected on the map for comparison.



Results and Discussion

To understand the dynamics of a well utilized bus system I used various sources to get information. After speaking with the planners from Asheville Transit Authority and the Charleston Transit Authority I was able to confirm my methodology for planning bus routes. Both the planners mentioned the importance of socio-economic data in helping determine who needs to get a ride and to where.

Jeff Burns of the Asheville Transit Authority mentioned that in a traditional traffic model there are two things that affect movement: "generators," such as single family homes making on average 10 trips a day, and "attractors" such as malls, grocery stores and entertainment. This is how they modeled their system in Asheville. Peter Tecklenburg cautioned that a high population density didn't always correlate with increased ridership. The useful factors they mentioned that I analyzed were household incomes, connectivity of zones, and time of commute for workers. The basic policy Mr. Burns said was to "create a density that needs transit."

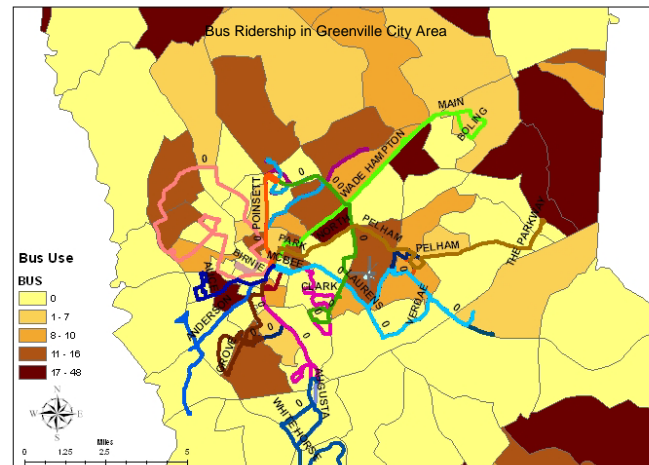
For a city the size of Greenville, we cannot yet say there is that level density thanks to the sprawl. From interviewing the sociology students riding the Greenville buses I learned that it was mainly African American working class people riding the buses on their way to work at fast food restaurants or hotels. Also, the main complaints were of the reliability of the buses. Peoples' faith in the bus system as been shaken since its shut down not too long ago, as mentioned in a recent article in the Greenville Journal about the Greenville Transit Authority. The main problem for the GTA is stability of funding according to Judy Dudley, GTA general manager. Without the proper funds, the system cannot expand or add more vehicles to their fleet. The maps I created are useful in displaying the changes in demographics within each tract that the bus routes transverse. All maps created have a projection of D_North_American_1983.

FUTURE STUDIES

This project was designed to provide a basis for further in depth research in how to construct a reliable and well utilized bus route for the Greenville city area. I would add a layer of traffic count data if it can ever be compiled, to assess which roads are the most utilized. This way buses could go on roads where traffic is heavy and hopefully help reduce traffic congestion. This project may also be used by city planners and developers to help them predict where public transportation is available or could be expanded to when considering development projects.

ACKNOWLEDGEMENTS

- Dr. Suresh Muthukrishnan, EES Department
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- Mr. Jeff Burns, Asheville Transit Authority Planner
- Mr. Peter Tecklenburg, Charleston Transit Authority Planner
- Mr. Richard Hanning, Greenville County GIS Manager
- Heather Stewart & Nalisha Henry, Cultural Sociology Students 05'



This map shows the current bus routes and the approximate bus use in each tract that the bus traverses. This is very useful information for creating an efficient bus system. Planners could use this map to determine which bus routes can be cut based on lack of ridership. Then the buses could go into areas that are already being utilized and help increase the reliability and efficiency in those areas.