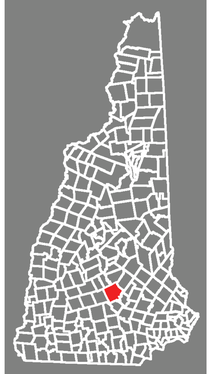
Making the Connection

Using Density, Demographic and Network Analyses to Map a Bus Route

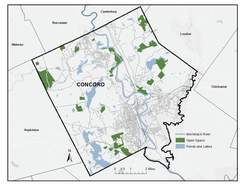


CASE STUDY:

CONCORD, NEW HAMPSHIRE

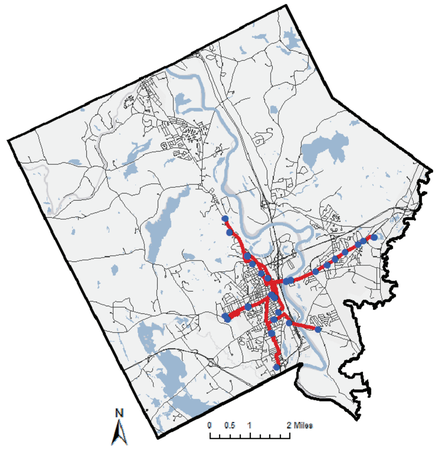
BACKGROUND

Concord is the capital of New Hampshire and is home to an approximate 43,000 residents. The city maintains a unique and concentrated downtown, with development growing outward from the city's central core. The sprawled growth has resulted in a city that relies on vehicular transportation to navigate from one location to another. Walkability is low, and the Merrimack River divides Concord into two distinct halves. Despite the clear necessity for a strong public transportation system to reduce dependency on cars, Concord lacks a strong, reliable bus



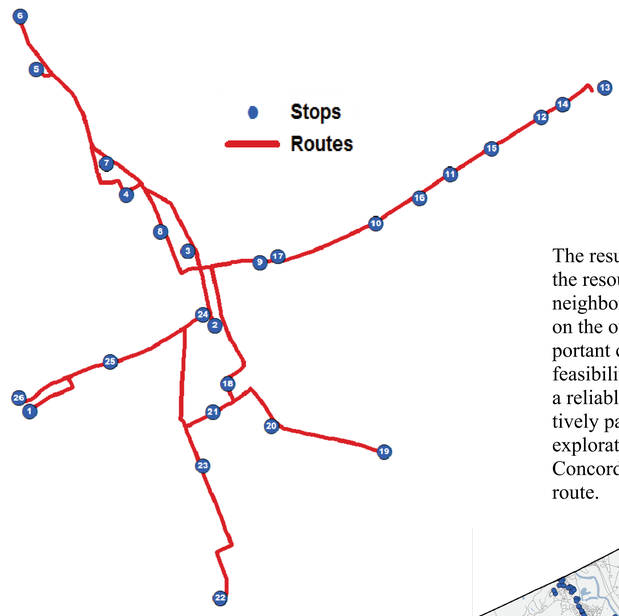
system to serve its citizens. Concord Area Transit provides a bus system Monday through Friday from 9am until 5pm. Saturday service is only available from November until January, a strategy meant to help increase shopping for the holiday season.

My analysis revolves around the idea that by providing a more consistent bus service to Concord residents, it will be used more often and by a larger and more diverse group of people. I used GIS to analyze the neighborhoods in most need of public transportation, and how to connect those people to the densest resource locations in Concord.



1. Pleasant View Retirement Community
2. Hills & Main
3. Merrimack County Courthouse
4. Concord Boys & Girls Club
5. NH State Prison
6. N. State & Palm
7. N. State & Foster
8. N. State & Pearl
9. Everett Arena
10. Loudon & Blodgett
11. Loudon & Canterbury @ Jiffy Lube
12. Loudon & Alton Woods
13. Regal Cinemas on Loudon
14. Shaw's Supermarkets on Loudon
15. Loudon & Allard
16. Heights Playground on Loudon
17. Everett Arena
18. S. State & Downing
19. Manchester & Crestwood
20. Hesser College on Hall
21. West & Spruce
22. End of Donovan
23. Broadway & Carter
24. Pleasant & N. State
25. Concord High School
26. Concord Hospital

PROPOSED WEEKEND BUS ROUTE

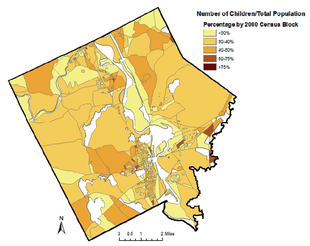


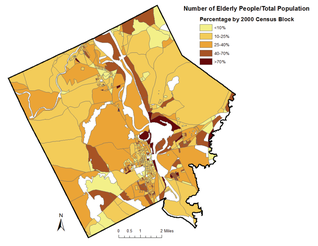
CHALLENGES

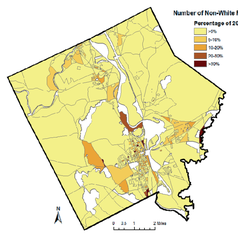
One of the main and most frustrating facets of my analysis that I encountered was the data available. Considering the relatively small population of Concord (approximately 43,000), census tracts and census block groups were not small enough to provide the detailed level of information necessary for my project. I had to rely on the 2000 census block data in order to compile my maps because the 2010 data was not yet available. Originally, I had wanted to target minority populations, homes with an income of less than $30,000 and households with limited vehicle access. With the limited data available at the 2000 block level, I changed my strategy to looking at specific age and ethnic demographics. I believe that if done in the future, the analysis should include a larger and more comprehensive analysis of populations with the highest need for public transportation.

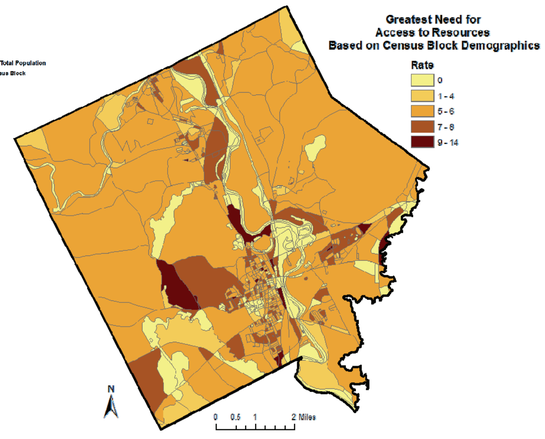
RESULTS

The results highlight the disconnect between certain populations and the resources of Concord. The map showing the total rating of neighborhoods clearly shows how underserved populations reside on the outskirts of the city, making it more difficult to reach important city services. Additionally, the final bus route map shows the feasibility of establishing a weekend bus route in Concord. Through a reliable weekend bus, people can connect with their city and actively participate in the reduction of vehicular emissions. For future exploration, neighborhoods located even further from the center of Concord could be connected to resources by a new or extended bus route.









METHODOLOGY

1. Choosing Demographics and City Resources

I decided to connect the elderly, children and minority populations to dense resource areas via public transportation. These populations in Concord have the least accessibility to vehicular travel. Additionally, the resources I chose to map as destinations for bus riders are as follows: park entrances, clothing stores, grocery stores, restaurants, historical locations, government facilities, community centers, recreational centers, places of worship, hospitals, schools and colleges.

2. Census Mapping and Rating

For each demographic, I mapped the population percentage for each census block. These maps allowed me to then create a rating system. Each demographic map divided into five percentage ranges. The lowest percentage range received a 1rating and the highest percentage range received a 5 rating. Each demographic received its own rating scale. Finally, I created a total rating that applied to all census blocks and all demographics. By adding the three rating systems (elderly rated, children rated, minority rated), a total rating number was given to each census block. Blocks with a higher number rating have a higher number of the targeted populations. These blocks are thus the neighborhoods with the highest need for public transportation. I then used the feature to point tool to create a point layer representing these neighborhoods.

3. Mapping City Resources

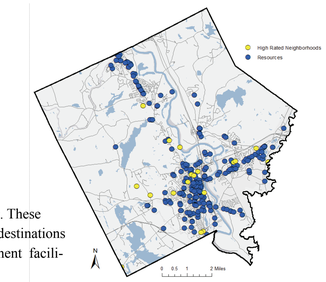
After having identified what city resources were the priority for potential bus riders, I geocoded the information from American FactFinder in addition to extracting it from GRANIT data layers. I then merged the two attribute tables in order to form one point layer. Having all of the key destinations together allowed me to complete a Kernel Density Analysis. The density analysis was completed with ½ mile radius (walking distance to a destination).

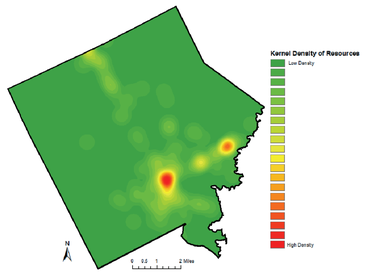
4. Overlaying Points of High Rated Neighborhoods and Resource Points

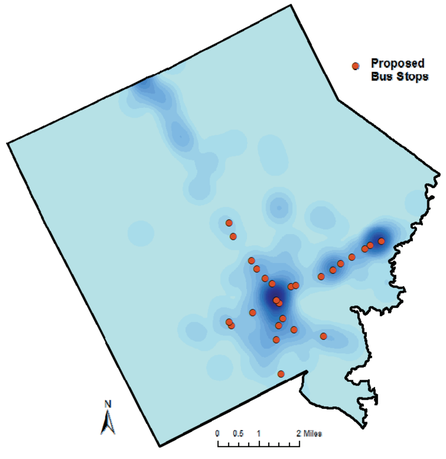
I chose to look at a map with point data of both resources in Concord and neighborhoods with the highest need for public transportation. I chose points from each neighborhood to connect to certain points within the densest resource areas in the city. These points represent the proposed bus stops for the weekend route.

5. Network Analysis

The final step of creating a potential bus route was accomplished with a Network Analysis. I used Network Analysis to find a route where the points would be visited in a specific sequence. I listed the points in a logical order, and the route analysis found the most efficient travel path between all of the points.







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Cartographer: Rebekah Stiles

Projected Coordinate System: NAD_1983_StatePlane_New_Hampshrie_FIPS_2800_Feet

Sources: 2000 Census (American FactFinder), GRANIT, Reference USA, TIGER

December 2011