EnviroAtlas

www.epa.gov

Proximity to Parks in the Durham, NC EnviroAtlas Community Area

Alexandra Sears[1], Laura Jackson[2]

[1]Student Services Contractor, US EPA/ORD, Research Triangle Park, NC, USA; [2]US EPA/ORD, Research Triangle Park, NC, USA

Abstract

This poster shows the proximity of any location to the nearest park entrance within greater Durham, NC, an EnviroAtlas pilot community. Park entrances were derived based on available federal, state, county, and local data, as well as aerial photography. The distance to each park entrance was then calculated along walkable roads for up to 5 kilometers. Using the distance calculation, proximity zones were interpolated across the study area. From these distance zones, the estimated residential population within easy walking distance (500 meters) of a park entrance was calculated for each Census block group. The purpose of this layer is to identify areas that could benefit from additional park access. These data can be assessed with other socio-economic factors to refine areas of need. The study area examined in this analysis (Figure 1) is defined as the EnviroAtlas Study Area for Durham, NC. The Area was derived using 2010 Census Urban Area Boundaries and 2010 Census Block Groups.

Figure 1. Study Area

Methods – Data and Pre-Processing

Data Sources:

- 2010 TIGERLINE Streets for Durham, Orange, Chatham, Wake Counties, NC
- 2010 US Census Bureau Block Groups and Block Group-Level Population Data
- 2010 EnviroAtlas Dasymetric Population Map
- Esri Business Analyst Parks Layer
- NAVTEQ Parks Layer
- Park Data Layers and Information from the Parks and Recreation Departments of City of Durham; Towns of Chapel Hill, Carrboro, and Hillsborough; Durham, Orange, Chatham, and Wake Counties, NC; Duke University; and State of North Carolina.

Pre-Processing:

1. Create a walkable roads layer from the TIGERLINE Streets layers for the four counties listed above. Walkable roads are defined as roads with 2 or fewer entrance/exit ramps and generally roads with a speed limit less than 55 mph. Roads are included/excluded at the discretion of the analyst (Figure 2).
2. Create a parks polygon layer using the sources listed above. This includes hand digitizing of parks listed on Parks and Recreation websites without GIS layers.
3. Hand-digitize park entrances. Entrances are placed along the walkable roads using aerial photography and park maps (where available). If a park is open to the street, like a park comprised of a city block, entrances are placed approximately at all road intersections bordering the park and never more than 1000m apart (Figure 3).

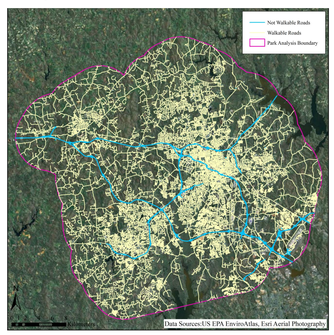

Figure 2. Walkable Roads

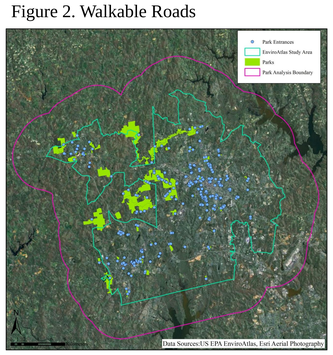

Figure 3: Park Entrances

Methods – Pre-Processing (continued)

4. Convert the walkable roads into a 10m raster.
5. Use the Cost Distance tool to calculate the distance along each rasterized, walkable road to the nearest park entrance. (Figure 4)
6. Reclassify into 9 distance breaks (listed in Figure 4 legend).

❖ Note, the highest distance break, over 5000m, is considered an area of insufficient data in the final maps because only parks within 5000m of the Durham, NC EnviroAtlas Study Area were analyzed.

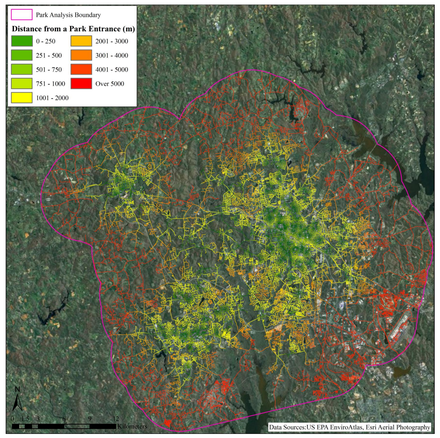

Figure 4. Cost Distance to Park Entrances

Methods and Results – Block Group Summaries

Objective:

The objective of this analysis is to summarize residential proximity to park by block group.

Processing:

1. Convert the reclassified distance raster into polygons and intersect the polygons with the original walkable roads.
2. Select the road sections that are within 500m of a park entrance and buffer by 60m.
3. Extract the pixels within the 60m buffer from the EnviroAtlas Dasymetric Layer (Figure 5).
4. Calculate the sum of the extracted dasymetric pixels in each census block group using zonal statistics.
5. Calculate the population and percent of the block group population within and beyond walking distance of a park entrance. These layers are all available in EnviroAtlas (Figure 6).

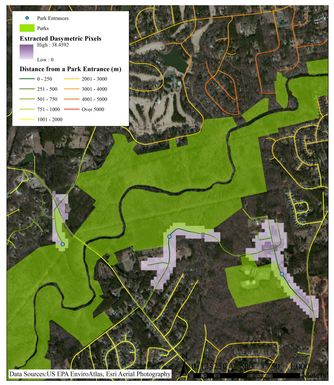

Figure 5. Extracted Dasymetric Pixels: Focused on Northeast Durham, this image includes Valley Springs Park and a portion of the Eno River State Park.

Parks Proximity Block Group Summaries

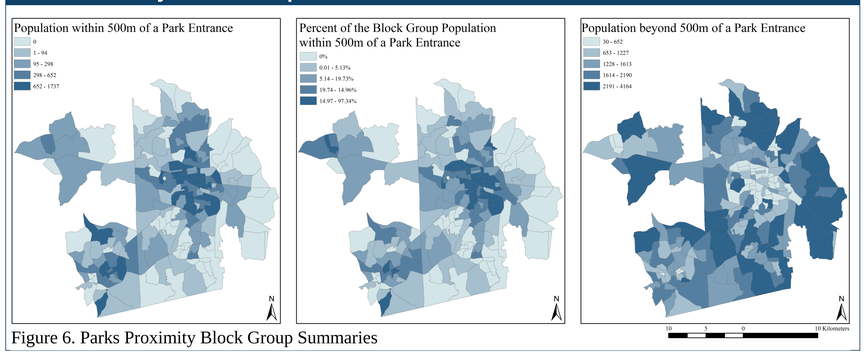

Figure 6. Parks Proximity Block Group Summaries

Methods and Results – Foundational Layer

Objective:

The objective of this analysis is to develop a spatially explicit layer describing proximity to parks for easy interpretation at street-level.

Processing:

1. Convert the raw cost distance raster into points.
2. Use Inverse Distance Weighted interpolation to create an estimated distance surface (Figure 7).
3. Reclassify the surface into distance breaks and convert to polygons (Figure 8).

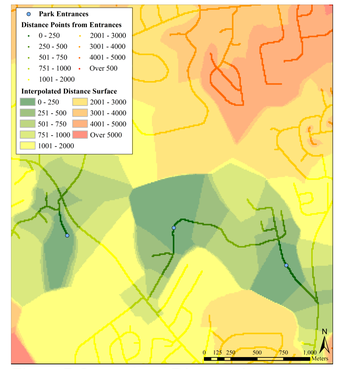

Figure 7. Interpolated Distance Areas

Proximity to Parks

Distance Range (m)	Percent of Study Area
0 - 250	3.71
251 - 500	4.61
501 - 750	4.80
751 - 1000	5.09
1001 - 2000	19.76
2001 - 3000	17.87
3001 - 4000	15.63
4001 - 5000	12.88
Over 5000	15.65

Table 1. Percent of the EnviroAtlas Durham Study Area in each Distance Range. The first two categories represent the areas within easy walking distance (0 – 500m) from a park entrance and comprise 8.32% of the Study Area.

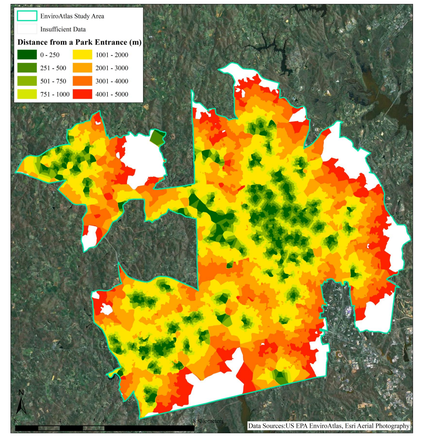

Figure 8. Proximity to Parks

Conclusions

Conclusions:

These layers illustrate the population relative to park entrances. These layers can be used to identify neighborhoods that have ready access to parks and those that are underserved and may benefit from additional parks or new park entrances to increase access. The summaries by census block group can be used to evaluate park access per capita. When overlaid with these maps, socio-economic layers within EnviroAtlas can highlight park proximity for specific age groups or other demographic groups for whom access could be especially beneficial.

Limitations:

These data are estimates and are inherently imperfect. The locations of these parks were estimated using available data and some parks may inadvertently have been overlooked. Walking distances were calculated using a national road dataset and do not typically account for walking along greenways or other trails throughout a city, unless those trails were included in the road dataset. There may be a shorter route to a park if such trails are available.

U.S. Environmental Protection Agency
Office of Research and Development

EPA