

# Using Data Analysis and Modeling to Build a Smart Neighborhood

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## Introduction

Q: What is a Smart Neighborhood?

A: A smart neighborhood is a cluster of houses that uses advanced technology and sensors to monitor its power consumption

Q: What is this project's purpose?

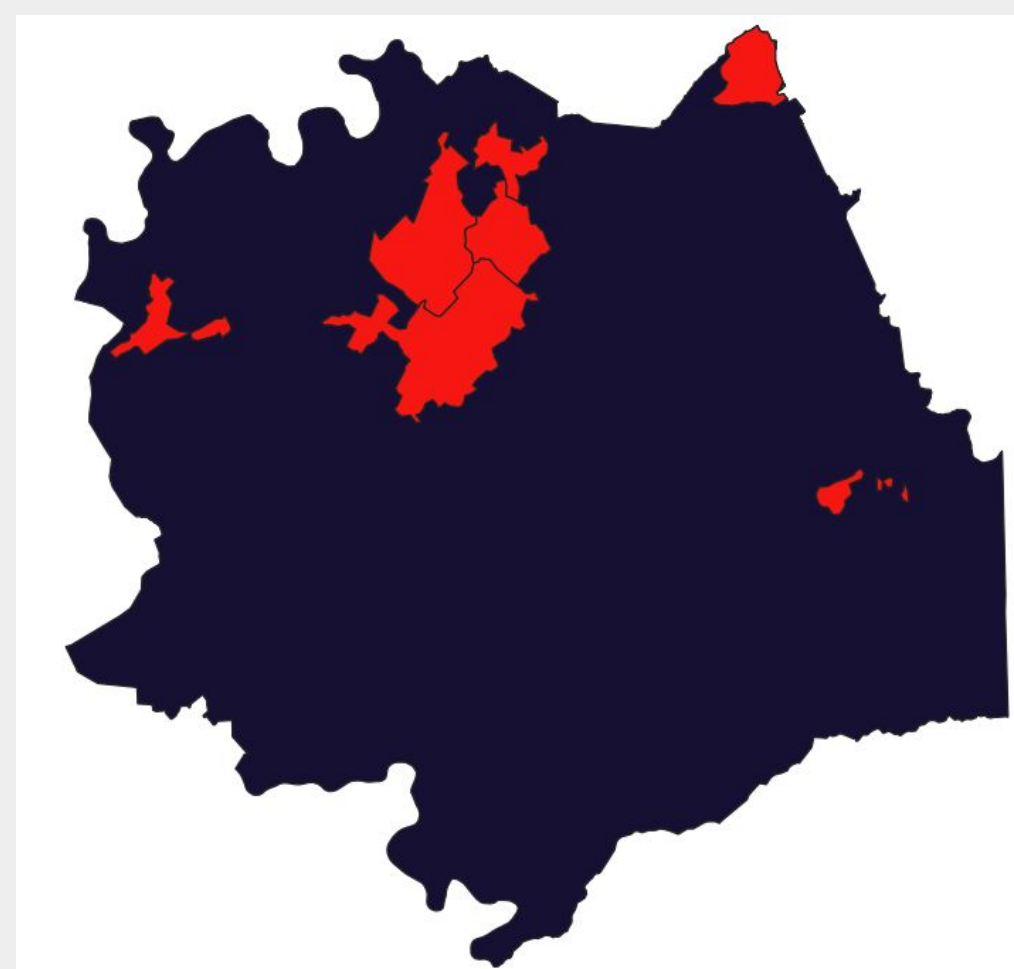
A: This project's purpose is to identify the best location for a new smart neighborhood within Blount County, Tennessee based on our criteria.

## Background

- QGIS functions as geographic information system (GIS) software, allowing users to analyze and edit spatial information, in addition to composing and exporting graphical maps.
- Vectors are used to describe a direction and magnitude of spatial data.
- Rasters are used to create a set of rows and columns to describe a certain type of data.
- Aggregation is the grouping of multiple objects with similar characteristics into a single object.

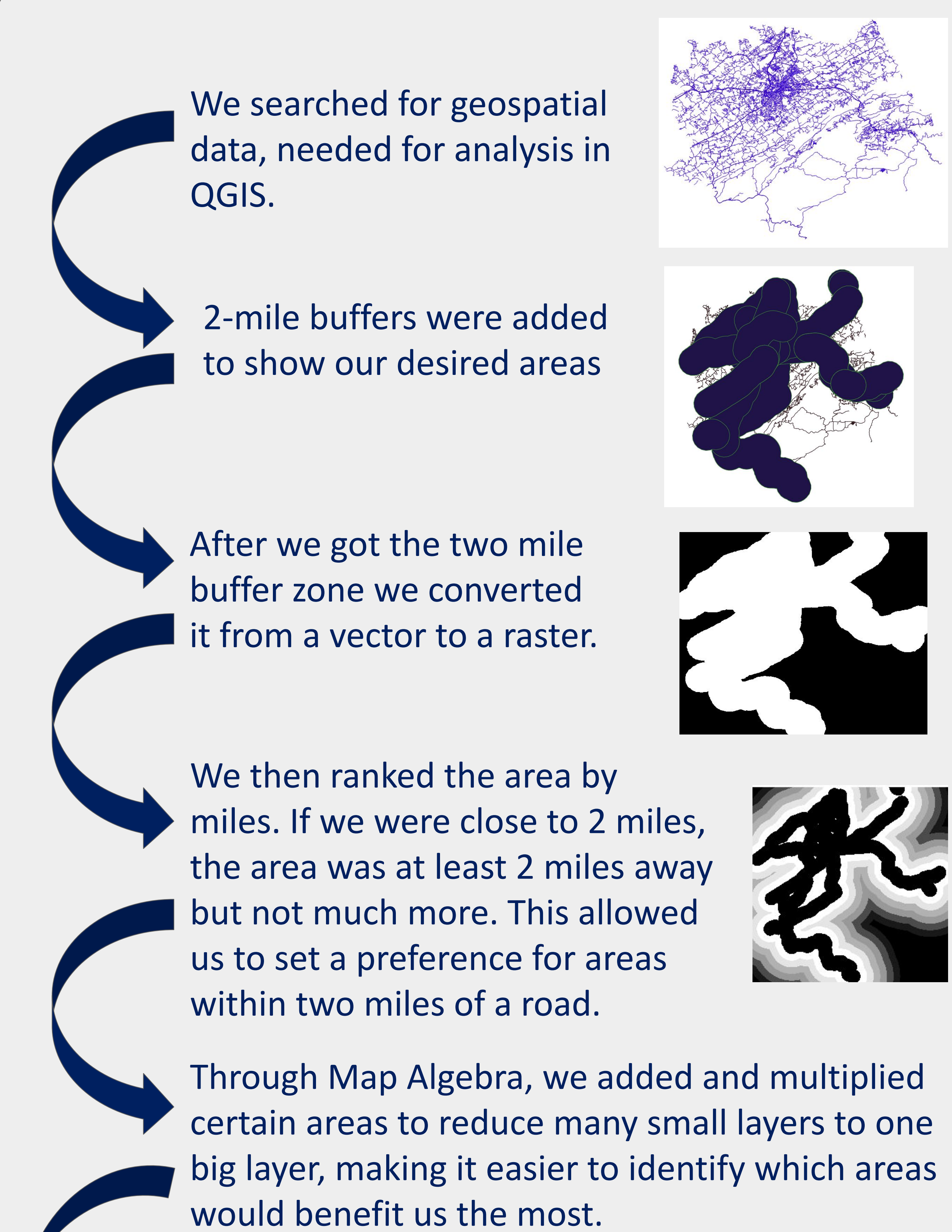
## Materials

- QGIS
- Geospatial Data:
  - Water Bodies
  - Roads
  - Railroads
  - Land Use
  - Terrain
  - City Limits



Layers of vector data that display the city limits of Blount County

## Methods



We searched for geospatial data, needed for analysis in QGIS.

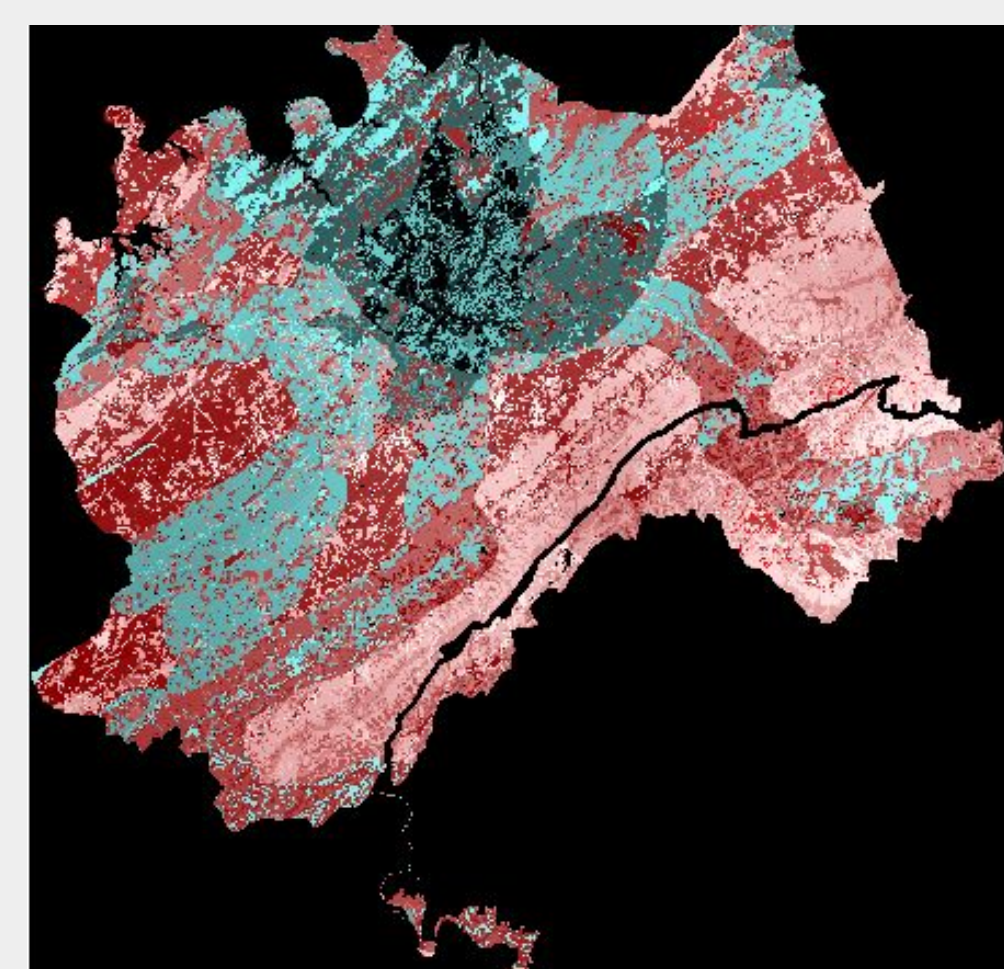
2-mile buffers were added to show our desired areas

After we got the two mile buffer zone we converted it from a vector to a raster.

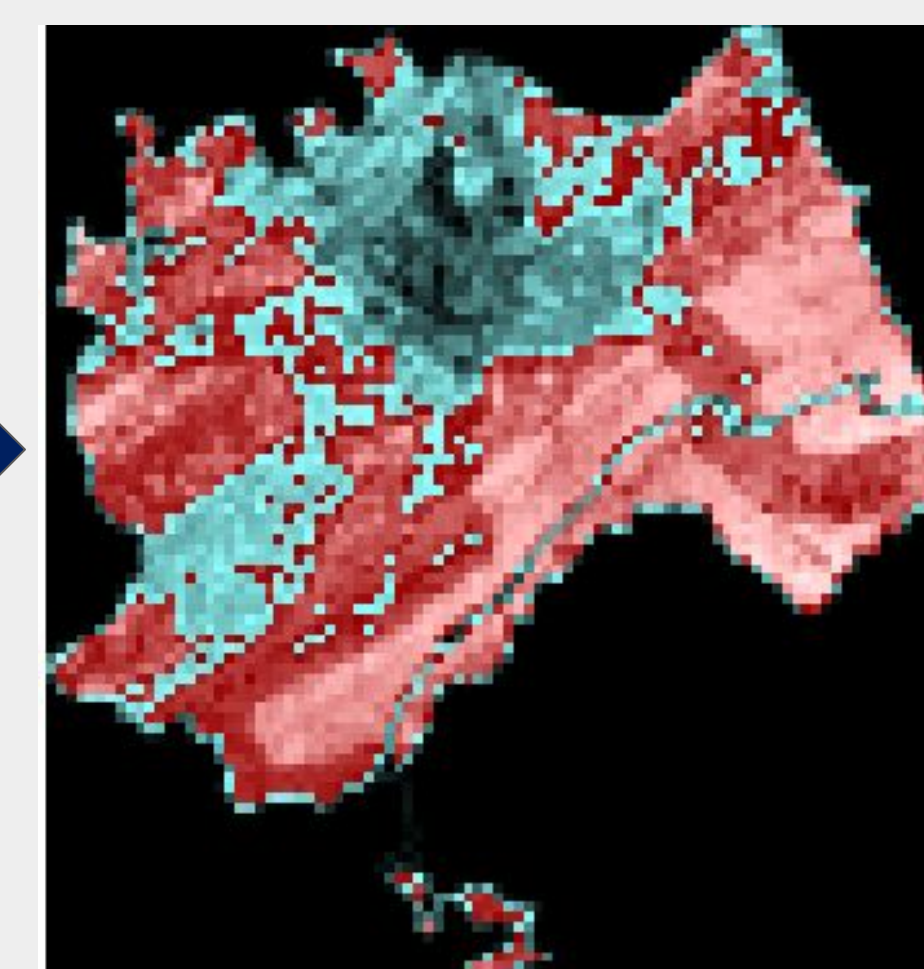
We then ranked the area by miles. If we were close to 2 miles, the area was at least 2 miles away but not much more. This allowed us to set a preference for areas within two miles of a road.

Through Map Algebra, we added and multiplied certain areas to reduce many small layers to one big layer, making it easier to identify which areas would benefit us the most.

### Model Output



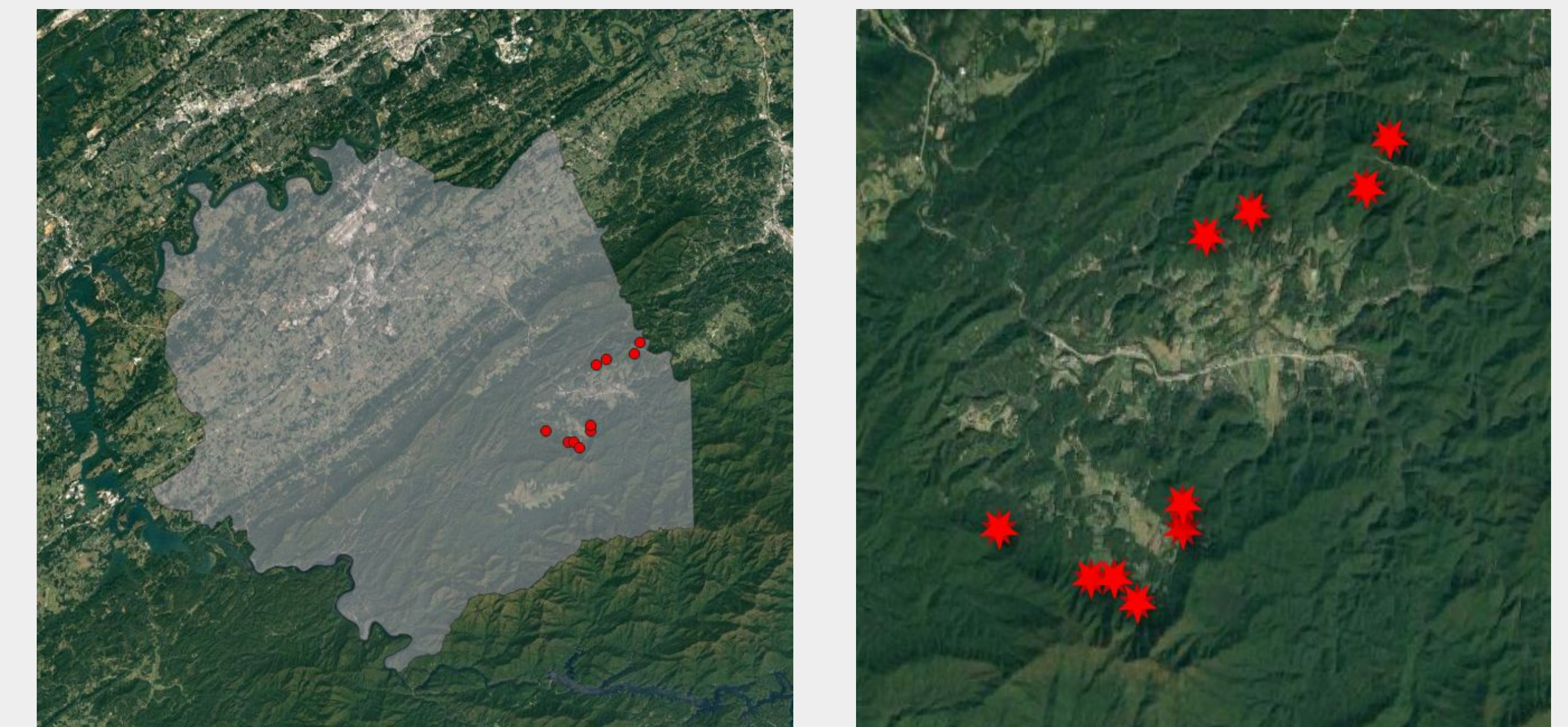
### Aggregated to 55 acres



55 acres was sufficient for 50-60 homes and a communal area in Blount County.

## Results

We calculated the top ten locations for where we can best place our smart neighborhood. We obtained these results by layering all of our data layers and aggregating them to find a cluster of points for our smart community.



## Conclusion

Based on our criteria; water, roads, railroads, mountains, land use, city limits, and through our data processing in QGIS, we were able to pinpoint the ideal locations in Blount County for a smart neighborhood, as indicated above.

## Acknowledgements

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- Researchers Jessica Moehl and Jake McKee
- Facilitator Loftin Gerberding
- Oak Ridge National Lab, Oak Ridge Associated Universities, and the Appalachian Regional Commission

## Citations

[Geospatial at the Bureau of Transportation Statistics : National Highway Planning Network : National Highway Planning Network \(arcgis.com\)](https://www.bts.gov/national-highway-planning-network-national-highway-planning-network-arcgis-com)  
[Data | Multi-Resolution Land Characteristics \(MRLC\) Consortium GIS Data \(tn.gov\)](https://www.mrlc.gov/data/multi-resolution-land-characteristics-mrlc-consortium-gis-data-tn-gov)  
<http://www.tngis.org/land-useland-cover.htm>  
[https://hifid-geoplatform.opendata.arcgis.com/datasets/87376bdb0cb3490cbda39935626f6604\\_0\\_/explore?location=35.909805%2C-84.269222%2C11.65](https://hifid-geoplatform.opendata.arcgis.com/datasets/87376bdb0cb3490cbda39935626f6604_0_/explore?location=35.909805%2C-84.269222%2C11.65)  
<https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.html>