

## Overview

The **Fresh Produce Program (FPP)** is run by **Root Causes**, a Duke-affiliated student group that aims to help improve community health by addressing food insecurity and improving local food systems through innovation, partnership development, and research. Every week, FPP collects locally sourced foods and delivers them to beneficiaries.

*Objective:* To help FPP in furthering its goal of creating a more equitable, sustainable, and integrated local food system through the help of data analysis and tool development to provide insights and improve the program's value and reach.

## Problem Exploration

Based on our project objective, understanding of FPP's organizational structure and goals, meetings with community partners, data availability, and feasibility of the possible project ideas, we decided on the following problem statement:

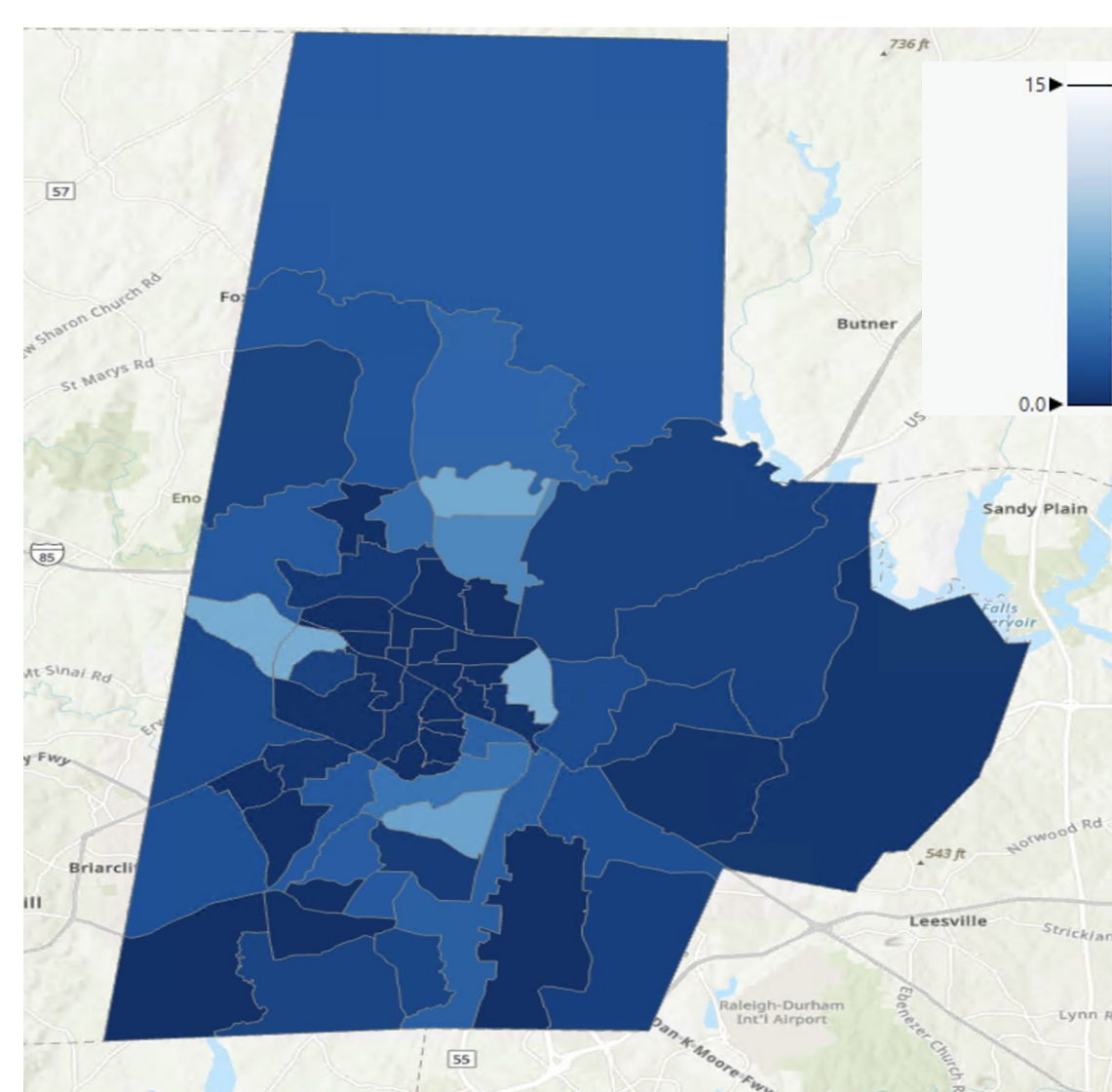
*Identifying & analyzing potential food-distribution hubs for Root Causes*

Our aim is to increase FPP's reach, support better utilization of the resources available, and also help other organizations address the near-universal problem of reaching underserved populations through the consideration of a hub-based model.

## Data Analysis

We compiled geo-identified data and explored it through ArcGIS in order to identify areas of high need using available variables:

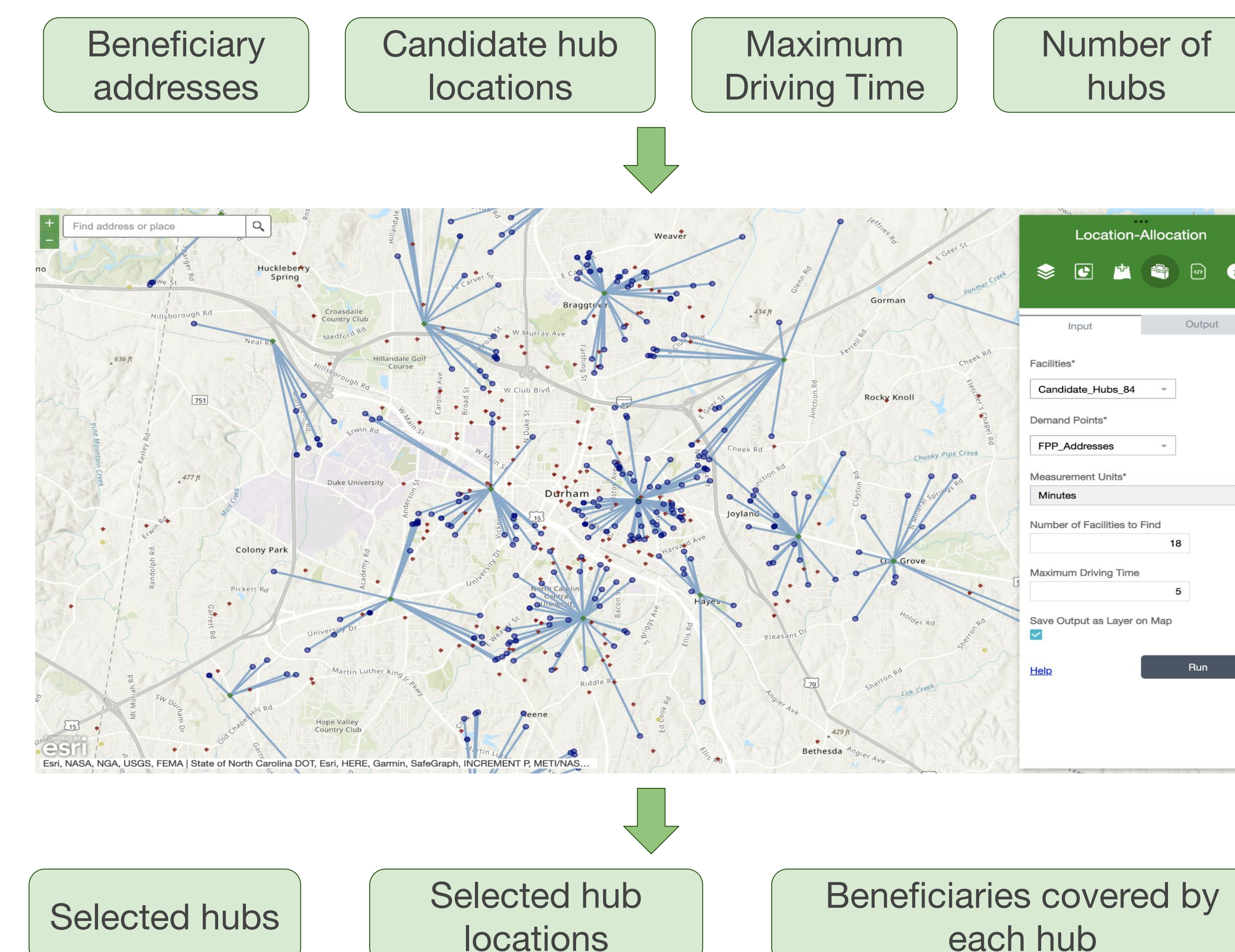
- Poverty rate
- % Population with low access
- % Population that are children & seniors in low access areas
- % Households receiving SNAP benefits
- % Households without vehicle access in low access areas



**Figure 1:** Map of Durham County, displaying the share of households in low access areas without vehicle access. The darker blue indicates a larger share of households *with* vehicle access.

## Identifying Optimal Food-Distribution Hubs

- Identified the hubs that would maximize coverage of beneficiaries using the Location-Allocation geoprocessing tool from ArcGIS Pro
- Found out the minimum number of hubs required to reach the present beneficiaries



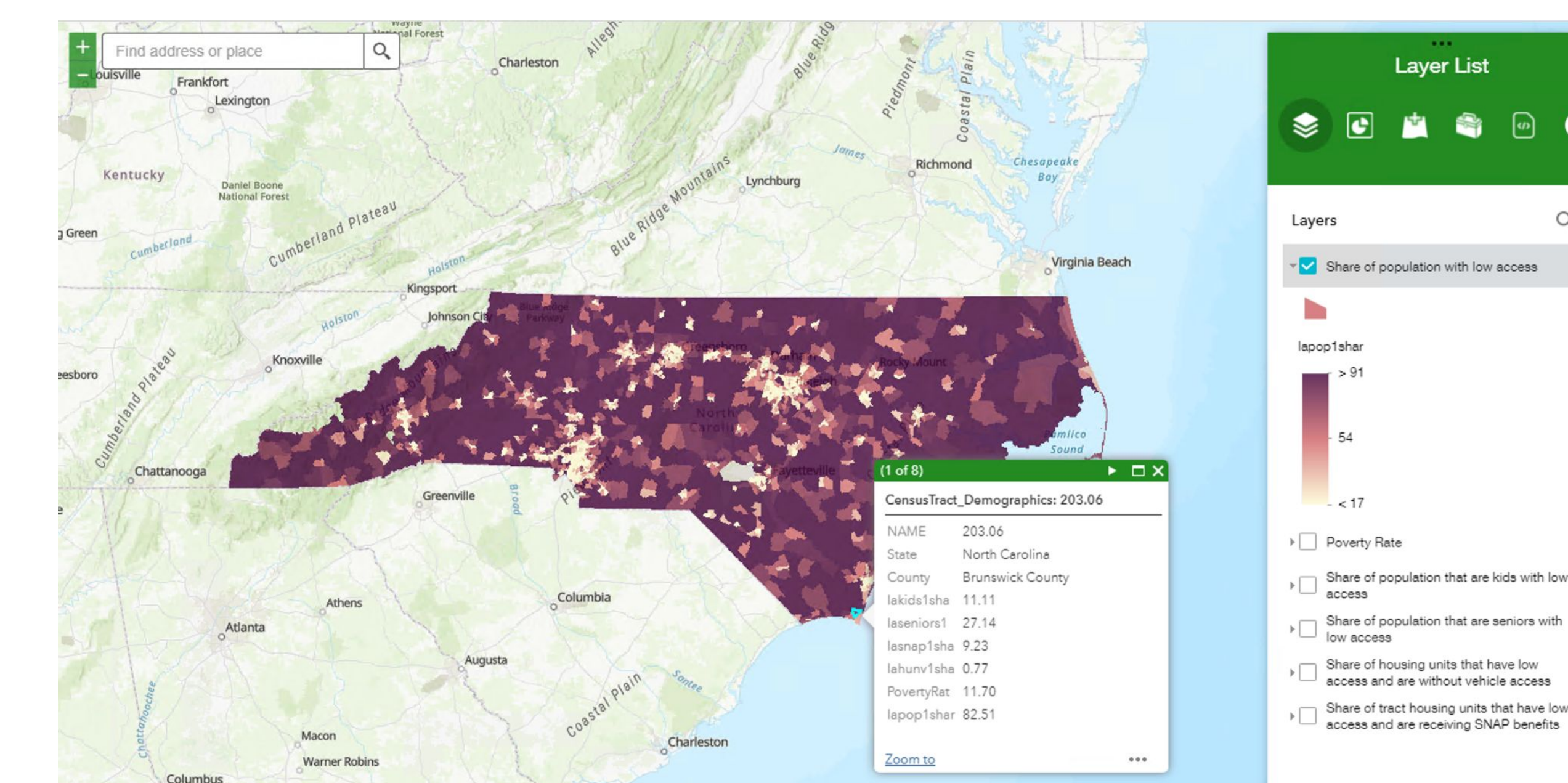
**Figure 2:** Flowchart of the Location-Allocation tool, and the output displayed as a layer on the web application (zoomed in on Durham county). The blue dots represent beneficiaries, connected to their closest hubs by the blue lines.

## Findings from the Durham Case Study

- The census tracts in central Durham show higher poverty rates and are more likely to be food insecure.
- The proportion of kids and seniors in low access areas is higher along the boundary of Durham, suggesting those areas might require different types of assistance.
- A large number of beneficiaries are in locations where people tend to have vehicle access. Thus, there may be a possibility of a useful hub-based delivery model here.
- For the given population and candidate hubs, a minimum of 18 hubs is required in order to have distribution locations within a 5 minute drive from most beneficiaries.

## ArcGIS Web App

- Allows the user to find optimal distribution hubs for their specific beneficiaries and partner (potential hub) locations
- Provides insights into important metrics related to food insecurity so as to help users understand distribution requirements and improve reach



**Figure 3:** Screenshot of the web app, displaying the share of the population with low access for each census tract in North Carolina.

## Applications & Next Steps

### Applications

- Makes food distribution easier for FPP by decreasing the number of volunteers needed to reach the beneficiaries
- Helps identify potential community partners and integrate the network by increasing their involvement
- Can be used by related organizations in other areas in NC

### Next Steps

- Customize tool to take into account more factors like walking time, neighborhood walkability, and beneficiaries who are unable to travel to a hub

## Data Sources & Acknowledgements

USDA Food Access Research Atlas: <https://www.ers.usda.gov/data-products/food-access-research-atlas/>  
 Durham Neighborhood Compass: <https://compass.durhamnc.gov/en>  
 American Community Survey: <https://www.census.gov/programs-surveys/acs>

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