Freddo Verde
Sane opportunità di verde e di acqua piovana per l'area di Birmingham, Alabama Area

A story map by the University of Alabama at Birmingham - Lister Hill Center for Health Policy, Cawaco RC&D Council, and the Nature Conservancy Alabama Chapter.

https://arcg.is/04GXer

Ariann Nassel

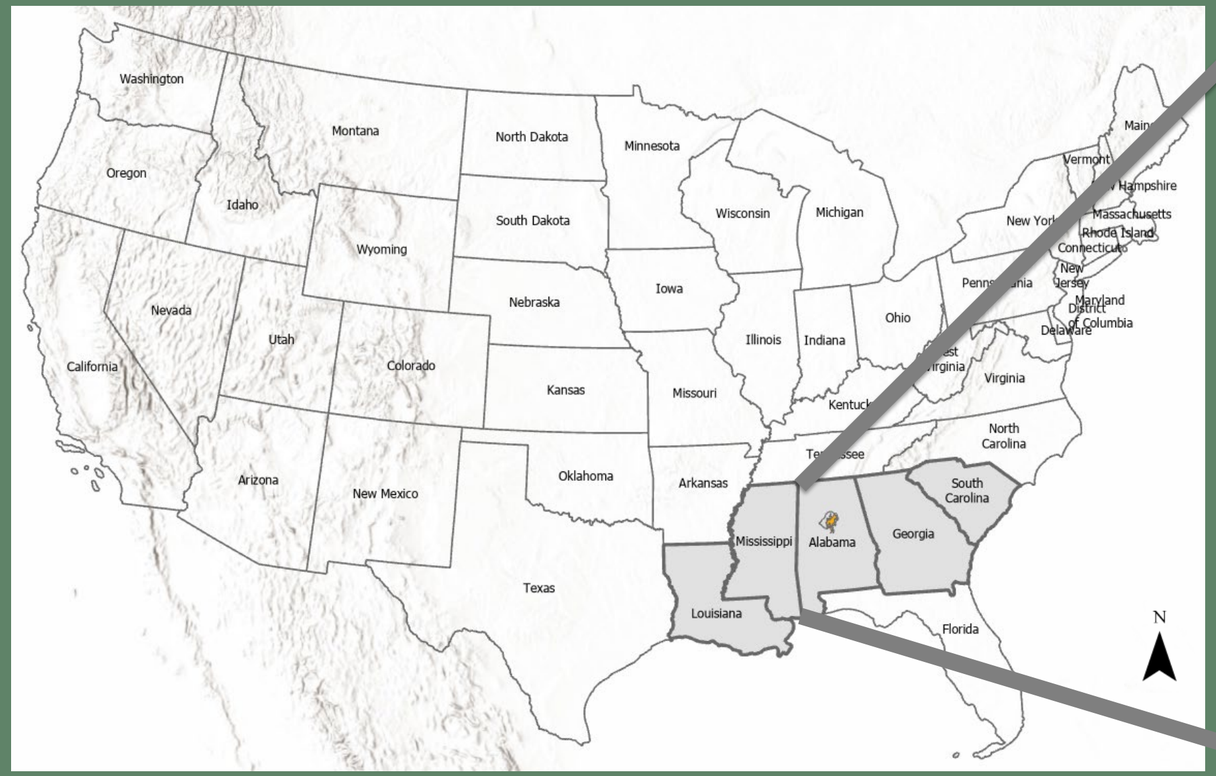
Technical Overview

- Birmingham, Alabama Study Area
- Data sources
  - EnviroAtlas
  - i-Tree
  - FEMA
- Geographic Information System (GIS)
  - Methods
- Story Map Platform
  - Digital storytelling
  - Interactive communication format

Alabama?


Washington
Oregon
California
Nevada
Idaho
Montana
Wyoming
Utah
Arizona
Colorado
New Mexico
North Dakota
South Dakota
Nebraska
Kansas
Oklahoma
Texas
Minnesota
Iowa
Missouri
Arkansas
Louisiana
Wisconsin
Illinois
Michigan
Indiana
Ohio
Kentucky
Tennessee
Mississippi
Alabama
Georgia
Florida
South Carolina
North Carolina
Virginia
West Virginia
Pennsylvania
New York
Maryland
District of Columbia
Delaware
New Jersey
Connecticut
Rhode Island
Massachusetts
Vermont
New Hampshire
Maine
Birmingham Study Area
Deep South States
N

Here we are.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Vermont
New Hampshire
Massachusetts
Rhode Island
Connecticut
New Jersey
Delaware
Maryland
District of Columbia
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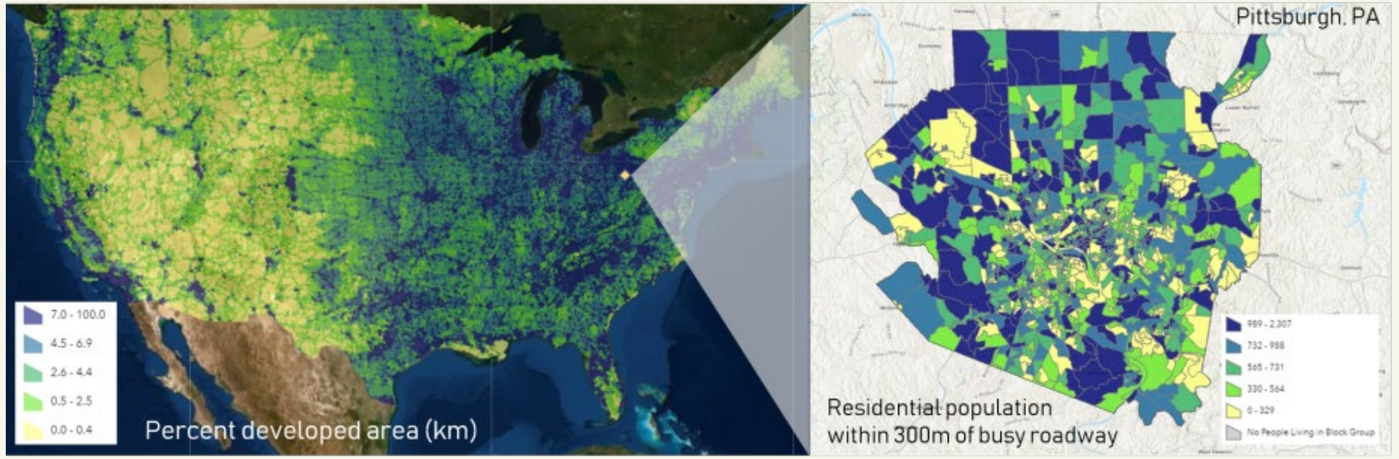
Jefferson County
Birmingham
ALABAMA
Montgomery
Study Area

Data

EnviroAtlas

National Coverage



- National extent has wall -to-wall data coverage
- 300+ data layers
- data layers summarized by hydrologic unit codes (12-digit HUCs)
- roughly 90,000 similarly sized spatial units.
- derived from data with a 30mresolution

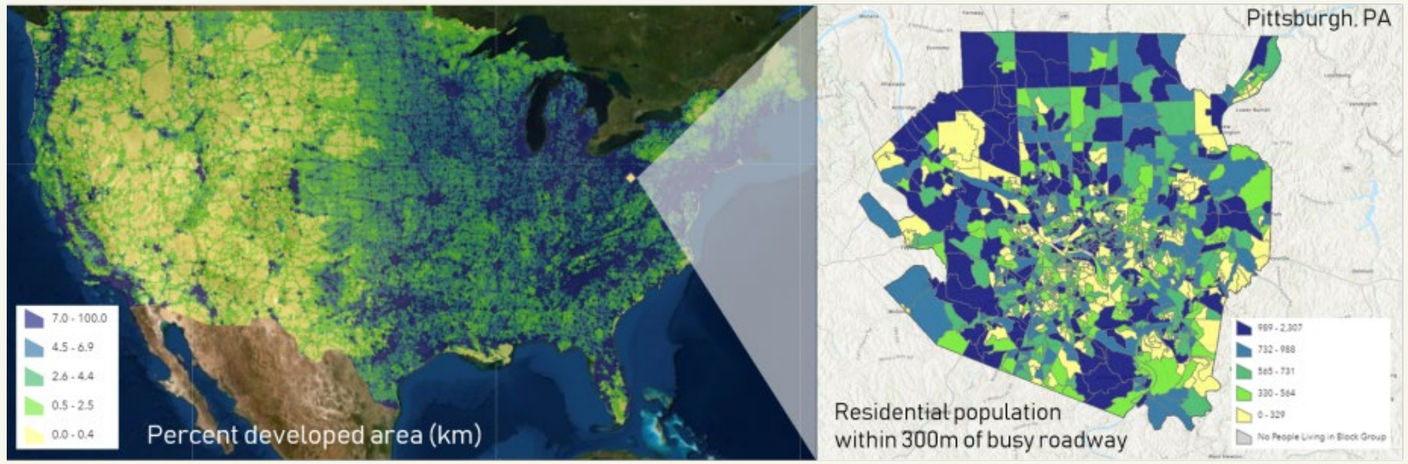
https://www.epa.gov/enviroatlas

Data

EnviroAtlas

National Coverage

Selected Urban Areas



- Higher resolution data inEnviroAtlasdraws from meter scale urban land cover data, census data, and models.
- 100+ data layers per area
- fine-scale data for more than 1400 cities and towns centered on 30 U.S. urbanized community areas
- high-resolution data is aggregated to census block groups.

https://www.epa.gov/enviroatlas

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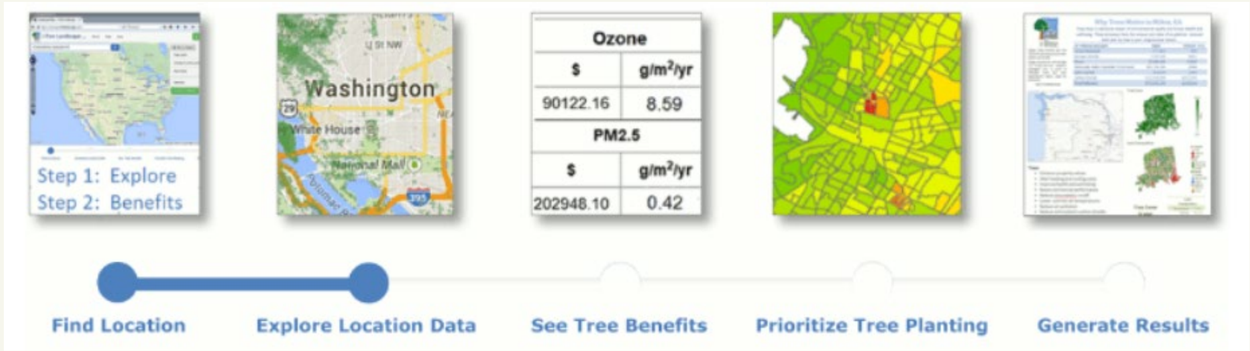
Data
i-Tree

Tree canopy data were calculated using **i-Tree landscape**

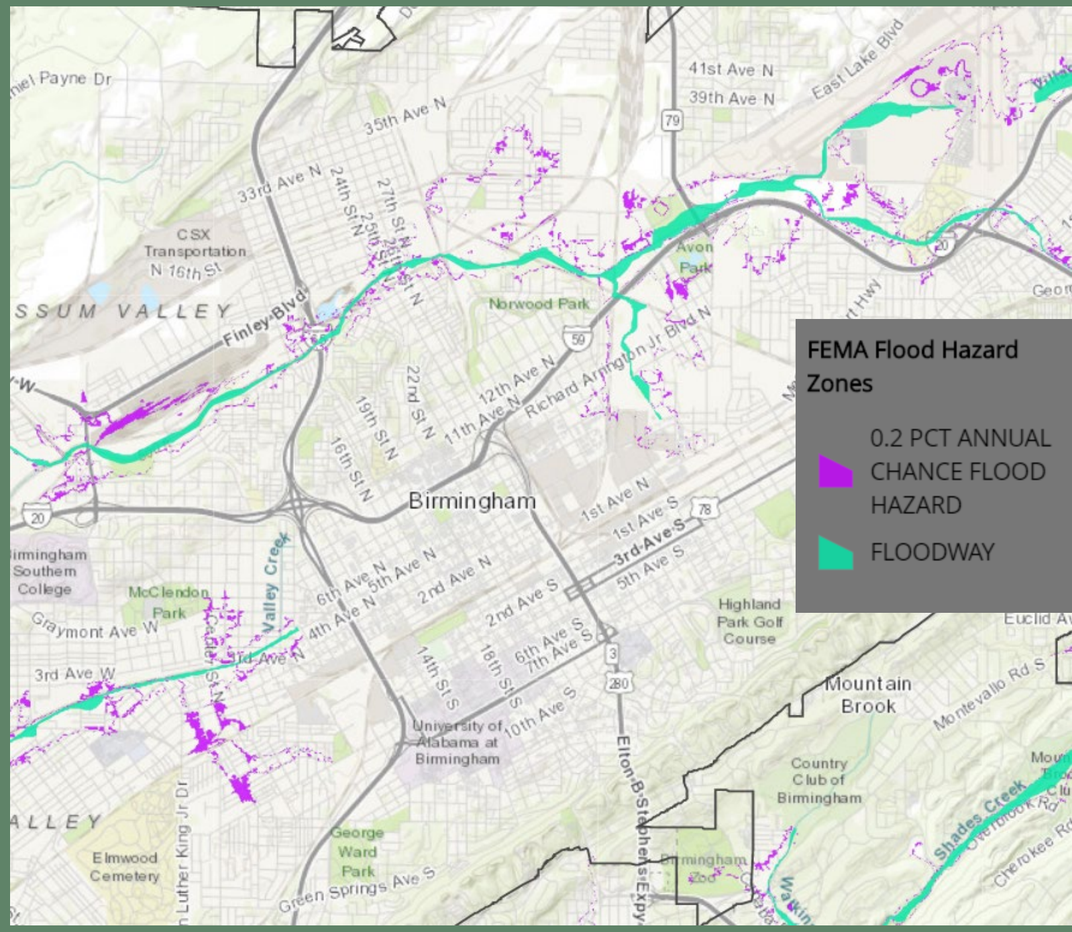


https://www.itreetools.org/

Data

Federal Emergency Management Agency (FEMA)

- FEMA publishes maps of the relative risk of flooding in urban communities across the United States.
- The FEMA Flood Map Service Center (MSC)
  - the official public source for flood hazard information
- access a range of flood hazard products tools



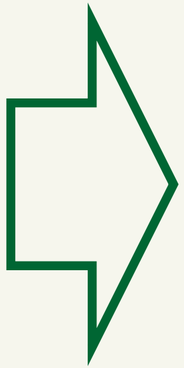
https://www.fema.gov/flood-maps

Geographic Information Systems (GIS)

Goal : Develop a lay persons guide to understanding the benefit of planting more trees in the Birmingham, Alabama area using publicly accessible data, spatial analysis, and digital storytelling.

Explain/ Illustrate

1) Reduce Summer Urban Heat Island effects
2) Reduce Local flooding
3) Improve air quality



Key Metrics/Domains
1. Urban Heat Island
2. Air Quality:
3. Flooding

Conceptual Development

- Identification of target audience
- Defining key takeaways

Data Acquisition/ management

- Content inventory
- Identify Key Metrics

Spatial Analysis

- Develop web maps
- Perform spatial analysis
- Integrate into StoryMap platform

StoryMap Design/Development

Rollout

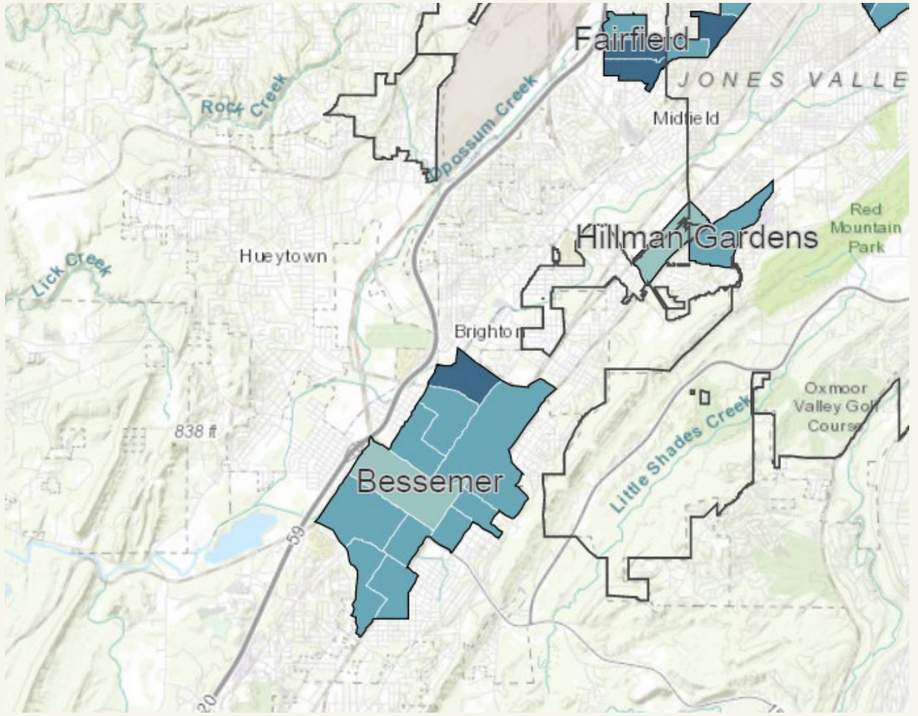
GIS and Spatial Analysis

Key Metric data variables:

1. Urban Heat Island
    1. Urban tree canopy *(percent tree coverage layer)*
    2. Night time cooling (*average reduction in nighttime temperature layer*)
    3. Percent Impervious Surfaces (*map of impervious surface data in study area)*

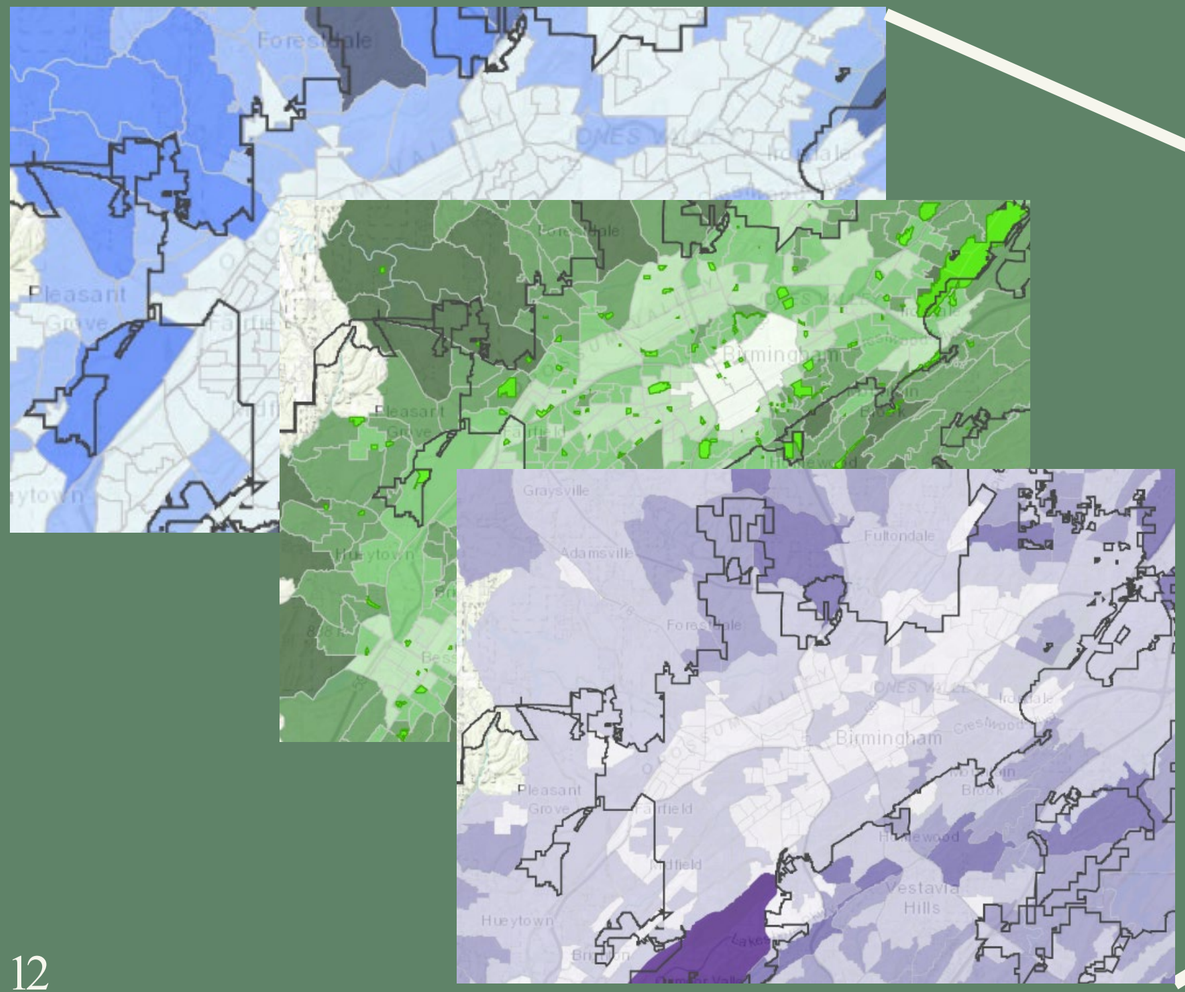
2. Air Quality:
    1. Improved health outcomes (*acute respiratory symptoms avoided due to Ozone From Trees)*
    2. Improved health outcomes (*acute respiratory symptoms avoided due to Reduction in PM2.5 From Trees)*

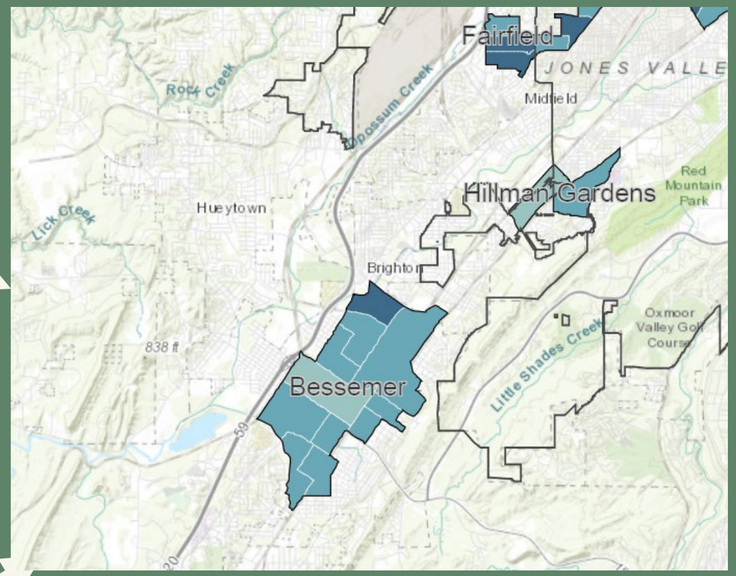
3. Flooding
    1. Proportions of tree canopy relative to impervious surfaces (*reduction in annual runoff (m3/yr)*
    2. Percent Parks and Open Space (*percent green spaces by Block Group)*
    3. FEMA Flood Zones



Spatial Analysis

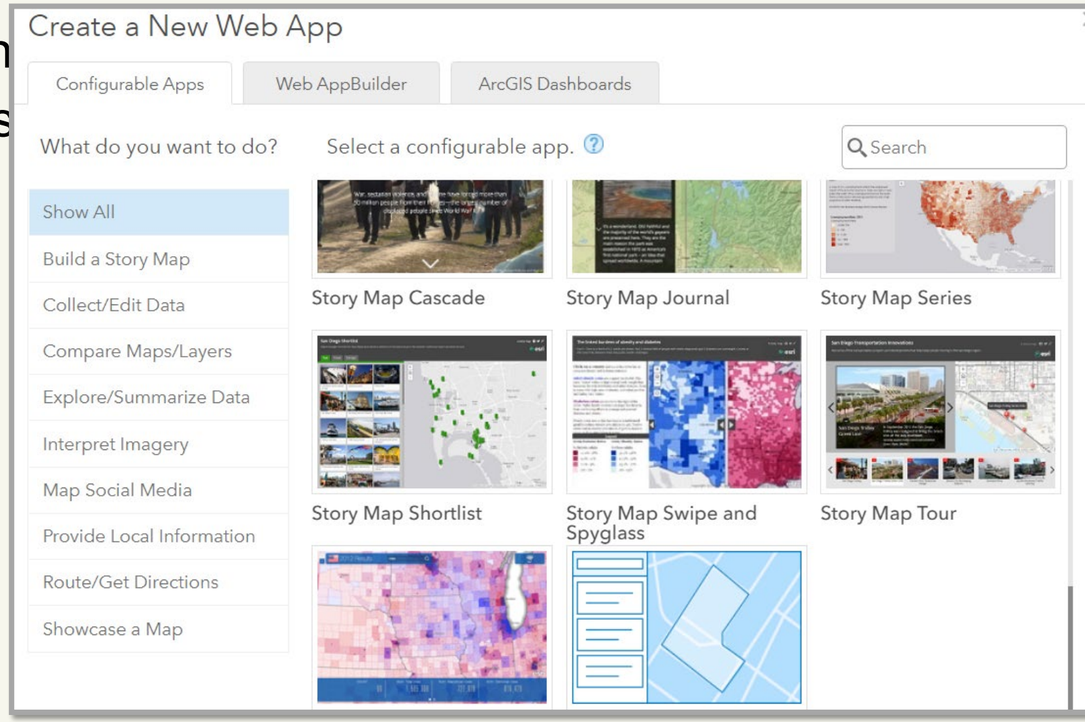
Overlay and Identify overlapping areas that meet specific criteria





ArcGIS StoryMaps

- StoryMapsis a platform for the development of multimedia storytelling presentations.
- Each StoryMap template is a web based application that enables engaging, and intuitive customized communication for lay users as well as lay audiences.
- We used multiple templates that we customized to help create an interactive narrative composed of custom web maps, text, photos and videos.
- relatively easy to implement
- Available with any Esri ArcGIS account



https://storymaps.arcgis.com/stories

A StoryMap within a StoryMap

SpyGlass StoryMap embedded in StoryMap series

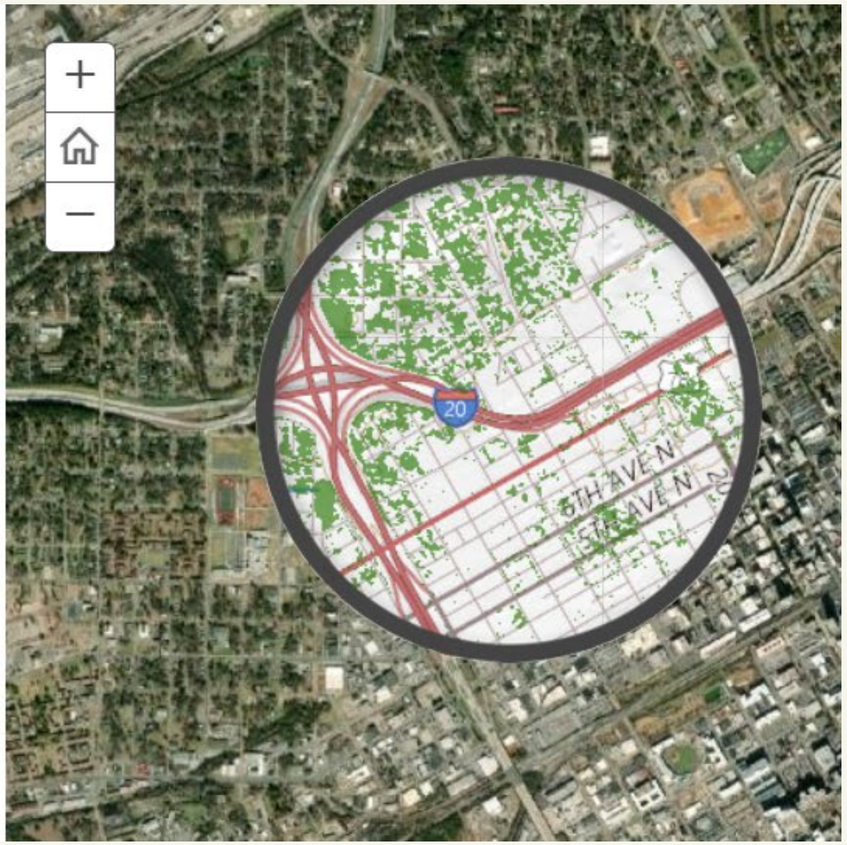
The Data-Driven Case for More Trees

The benefit of planting more trees is three-fold:

- Reduce summer urban heat island effects
- Reduce local flooding
- Improve air quality

The following series of maps demonstrate the positive impact of trees (shade trees cooling summer temperatures, roots absorbing stormwater, and tree leaves attracting particulate pollution).

The layers of branches and leaves that shade the ground is called a "canopy." Or more simply, shade! Trees can reduce noise, buffer pedestrians from traffic, and cool summer temperatures, making urban spaces more livable. **The map to the right shows the tree canopy in Birmingham - drag the "spyglass" around to see tree canopy under the aerial map.**



Green Natural Solutions

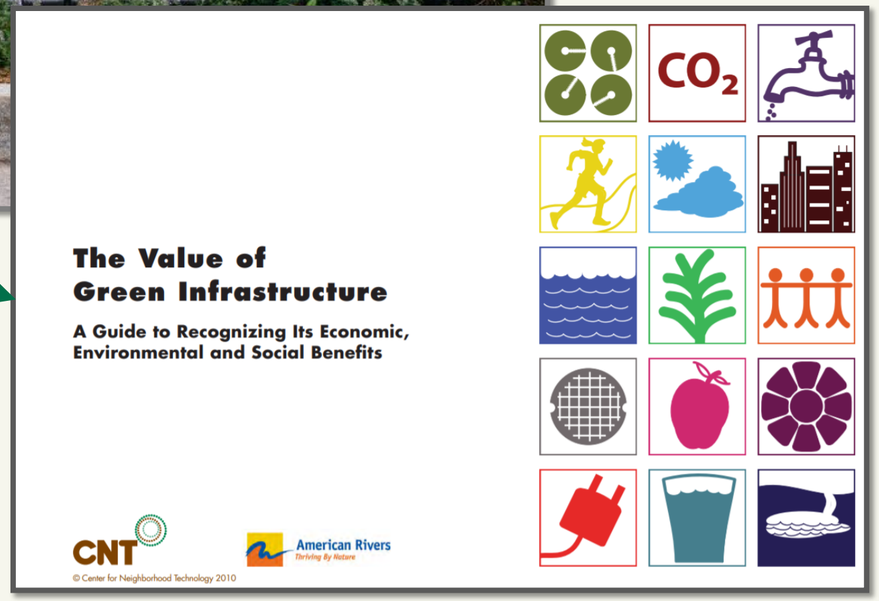
Our study set out to prioritize places that need cooler temperatures in the summer, less stormwater flooding, and better air quality. We wanted to find opportunities for *green infrastructure (GI)* - nature's Cool Green solution.

> *Green Infrastructure (GI) is a network of stormwater management practices, such as green roofs, trees, rain gardens, and permeable pavement, that can capture and infiltrate rain where it falls, to reduce stormwater runoff and improve the health of urban streams.*

> *GI practices can also positively impact energy consumption, air quality, carbon reduction and sequestration, property prices, recreation and other elements of community health and vitality.*

Learn more about Green Infrastructure here **The Value of Green Infrastructure: A Guide to Recognizing Its Economic, Environmental and Social Benefits** (Center for Neighborhood Technology and American Rivers).

(Photo on right: Street side tree well with bioswale and flowers.)



The addition of ancillary information for those interested in diving deeper enhances the StoryMap while maintaining lay audience messaging.

Story Map Design

Key Metrics Urban Heat Island Effects

1. Map Layer

Urban tree canopy *(percent tree coverage layer)*

- Consider why you would park your car under a tree in a parking lot in the summer. **a neighborhood without enough shade is like that hot car sitting in the open sun.** More trees provide shade and make your neighborhood cooler, improving quality of life.

2. Map Layer

Night time cooling (*average reduction in nighttime temperature layer*)

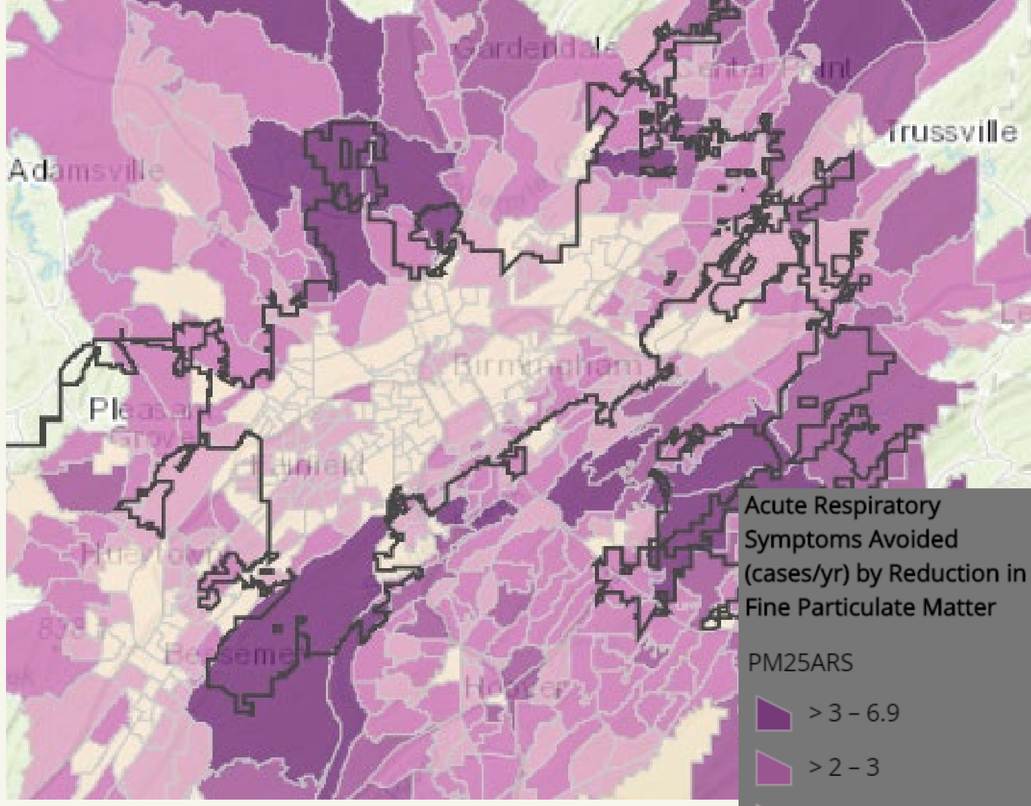
- Cooler nighttime temperatures are essential for healthy recovery time. Compare the tree canopy patterns in Birmingham with how much cooler different parts of town get over night. areas with higher shade canopy values have greater nighttime cooling, and thus are better for human health.

3. Map Layer

Percent Impervious Surfaces *(map of impervious surface data in study area*

- An impervious surface is a hard surface area that does not allow water to enter the soil below. In other words, concrete and asphalt, rooftops, paved roads, sidewalks, and parking lots. Instead, water continues running over those hard surfaces, washing pollutants into stormwater drains, and creating flooding when it has nowhere else to go. These impervious surfaces also absorb the sun's energy and contribute to summer urban heat islands.

Story Map Design
Key Metrics Air Quality



Acute respiratory symptoms include upper respiratory symptoms such as nasal congestion, wet cough, and eye irritation, as well as lower respiratory symptoms such as cough, chest pain, phlegm, and wheezing.

Types of pollution trees can reduce in our study area are based on health outcomes associated with **Amounts of Acute Respiratory Symptoms Avoided.**

1. Map Layer

Improved health outcomes *(acute respiratory symptoms avoided due to Ozone From Trees)*

- When inhaled, ground-level ozone can induce upper and lower acute respiratory symptoms, reduce lung function, and cause airway inflammation.

2. Map Layer

Improved health outcomes *(acute respiratory symptoms avoided due to Reduction in PM2.5 From Trees)*

- Solid particles of mixed composition with a maximum diameter of 2.5 micrometers (called PM2.5) can get into the air from a variety of sources such as fires, construction sites, power plants, industries, and automobiles.

Story Map Design
Key Metrics

1. Map Layer

Percent Reduction in Annual Runoff Due to Tree Cover *(reduction in annual runoff (m3/yr)*

- The proportion of tree canopy relative to hard surfaces in a neighborhood influence the amount and speed of *runoff* entering urban streams and floodways. Trees planted along roadways, in parking lots, retention basins, and on the sides of streams can benefit communities by slowing and reducing fast runoff and the influx of pollutants. Trees act as straws, absorbing stormwater along river banks and in city streets. Explore the difference in stormwater runoff in neighborhoods with dense, healthy tree canopy versus those without.

2. Map Layer

Percent Parks and Open Space *(percent green spaces by Block Group)*

- Green shady areas provide cool air that helps stabilize changes in climate. Green spaces also act as sponges that absorb and slowly release water, helping to mitigate natural hazards such as floods from rainstorms

3. Map Layer

FEMA Flood Zones

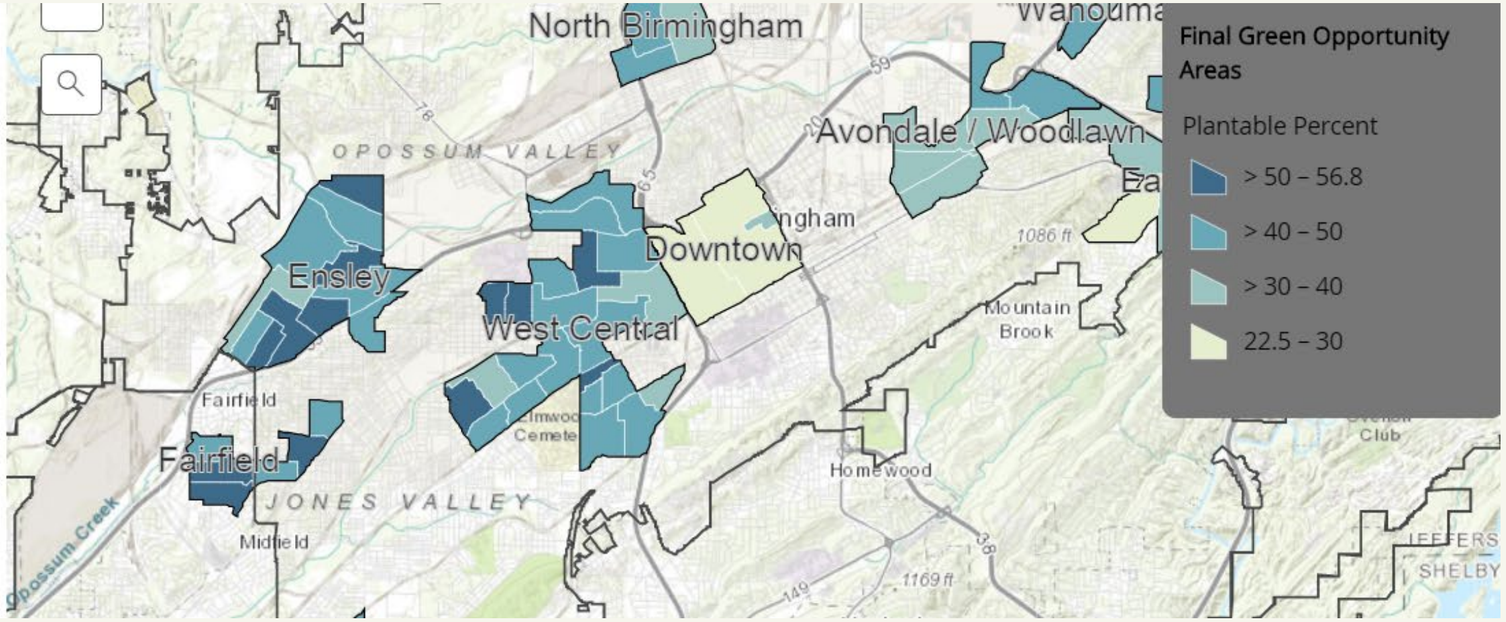
- The Federal Emergency Management Agency (FEMA) publishes maps of the relative risk of flooding in urban communities across the United States. In the Birmingham study area, floodways (rivers and streams) are shown as teal green and 500-year flood zones are shown in purple.

Story Ending = Results

Results: Focus on Green Opportunity

Our team looked closely in the study area for places that could benefit from Green Opportunity like spaces for new young forest and new natural 'sponges' to hold stormwater.

High Risk areas were based on elements from the **EnviroAtlas** Birmingham Community Study Area - percent green space, percent impervious, percent of summer night cooling reduction, annual runoff, and acute respiratory symptoms. Tree canopy data were calculated using **i-Tree landscape**. The map on the right shows 'plantable space' within the high risk areas (*click* on the blue color block for details). The dark blue areas have the most potential - areas worth exploring for Cool Green solutions.



Interactive links toEnviroAtlasand the i-Tree database encourage continued exploration and reiterate that the StoryMap conclusions are based on data driven methodology.

Fine

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