Community-focused
air monitoring collaborations between **multiple stakeholders**.

Calvin A. Cupini
Calvin@cleanaircarolina.org
ASIC Plenary Panel
Thursday September 13, 2018

Clean Air Carolina
Your advocates for healthy air

The Cloud and the Crowd

- Clean Air Carolina's **history and initiatives**
- **AirKeepers** and the Citizen Science program
- Clean Air Carolina's **statewide partners and scope**
- **Success stories** through Citizen Science

Our Mission

TO ENSURE
CLEANER AIR QUALITY
FOR **ALL**
NORTH CAROLINIANS
THROUGH **EDUCATION**
AND **ADVOCACY**
AND BY WORKING WITH OUR PARTNERS
TO REDUCE SOURCES OF
POLLUTION

Clean Air
Carolina
Your advocates for healthy air

Our Programs

Medical Advocates for Healthy Air

Clear the Air for the Kids!

Clean Construction

AirKeepers

The **Message**

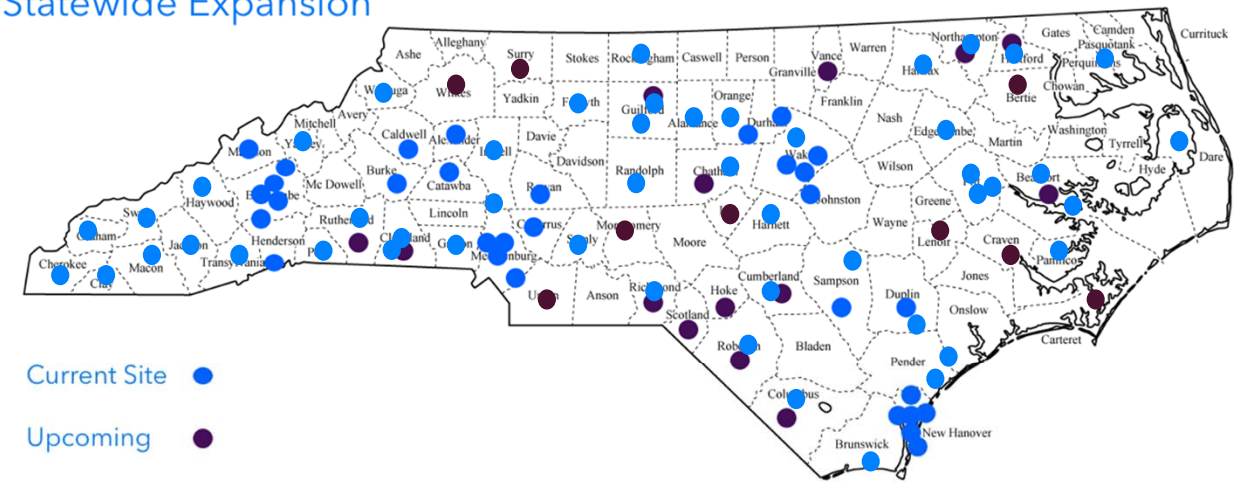
The most important part

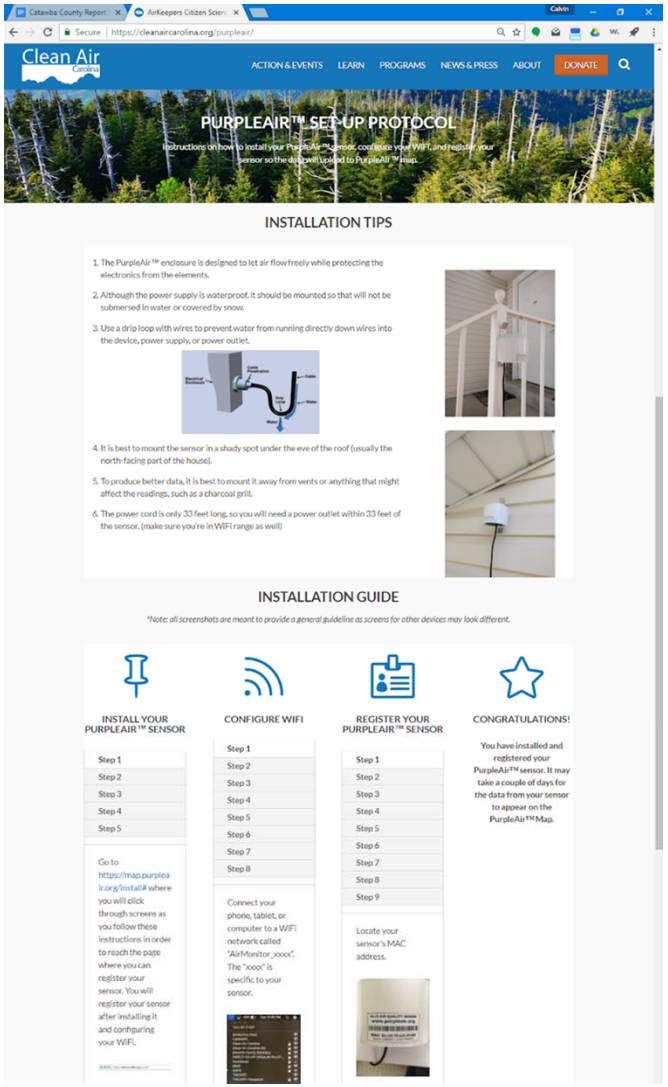
of Crowdsourcing

is the Crowd

Statewide **Platform**

Statewide Expansion





Air Quality Health Report
Richmond County
House Districts 48, 66 and Senate District 25

This report provides an overview of air quality issues in Richmond County, North Carolina. The report identifies vulnerable populations, examines the impact of air pollution on public health, and proposes possible solutions to achieve cleaner air.

- **23 toxic air emissions permits, including three Title V permits**
- **Traffic proximity higher than 67% of North Carolina counties**
- **50% of Richmond County residents are economically disadvantaged**
- **High rates of respiratory-related illness and death**

Air Quality Report

Due to the lack of air monitors in Richmond County, air pollution levels are currently unknown. However, large quantities of air pollution are emitted from industrial facilities and high-traffic roads, particularly in Rockingham and Hamlet.

Pollution sources

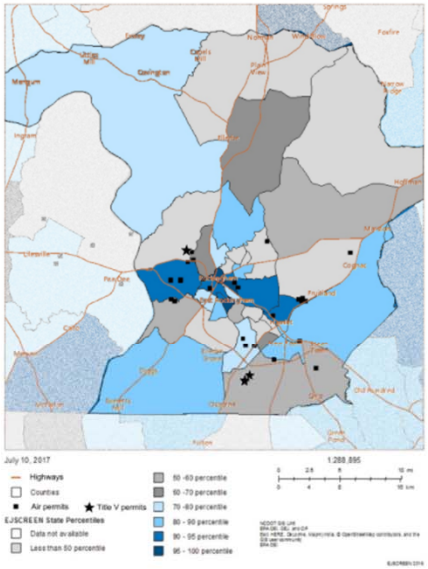
A. Industrial facilities

- Proximity to facilities using extremely hazardous substances for residents of Richmond County ranks higher than 80% of NC counties.
- 23 facilities have toxic air emissions permits (black squares in Figure 1) — 115% the state average.
- Three facilities have Title V permits, meaning they emit more than 100 tons of air pollutants annually (black stars in Figure 1). In 2017, a biomass company called Enviva acquired a Title V permit to build a large wood pellet production facility in Hamlet. This will push Richmond County past the state average for Title V permits.

B. Traffic emissions

- Traffic proximity is higher than 67% of North Carolina counties. In Rockingham, individuals are exposed to traffic-related air pollution levels higher than 80-90% of North Carolinians.
- Traffic-related air pollutants include diesel particles, NOx, and ozone.

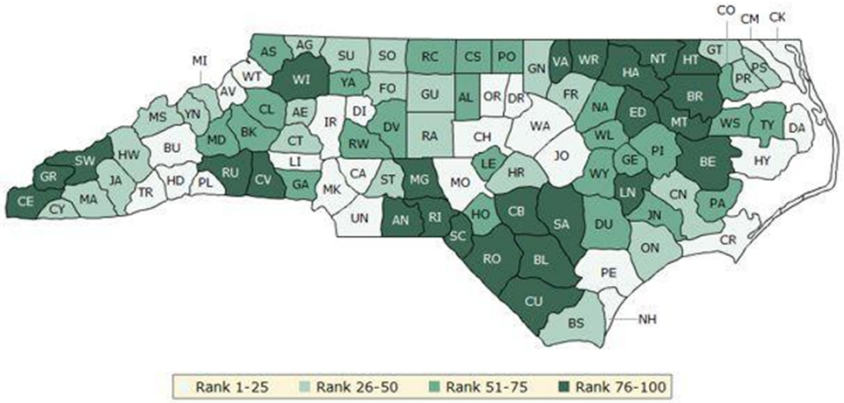
Fig.1 Distribution of Low Income Population (State Percentile)

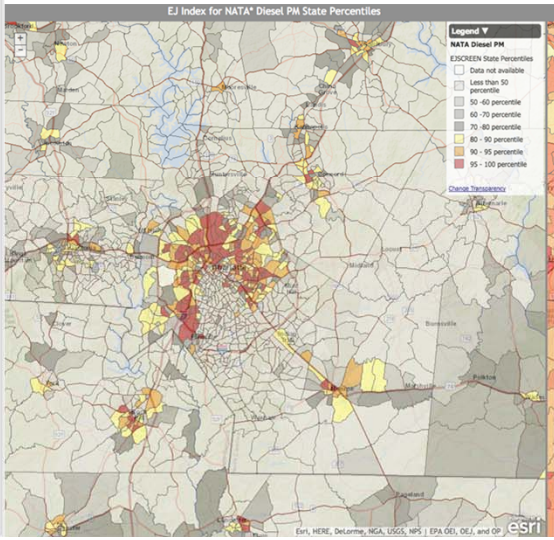


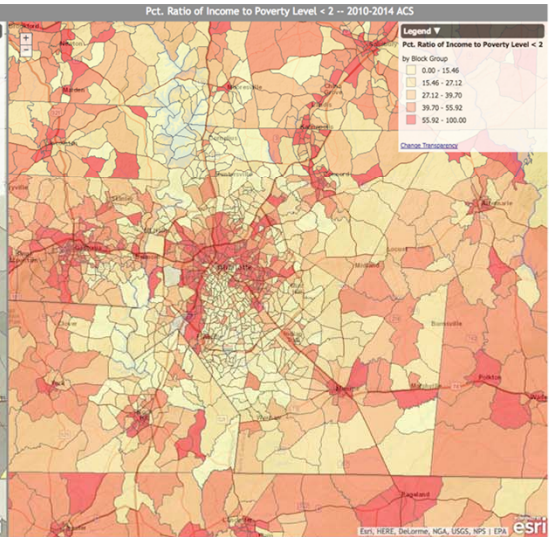
Demographics

- Low-income communities, children, the elderly, and individuals with respiratory illness are more susceptible to the negative health effects of air pollution.
- 50% of Richmond County is economically disadvantaged, and 20% of the population is elderly.
- Particularly in Hamlet and Rockingham, children living or going to school near industrial facilities and busy traffic routes are more likely to be exposed to unhealthy levels of air pollution.

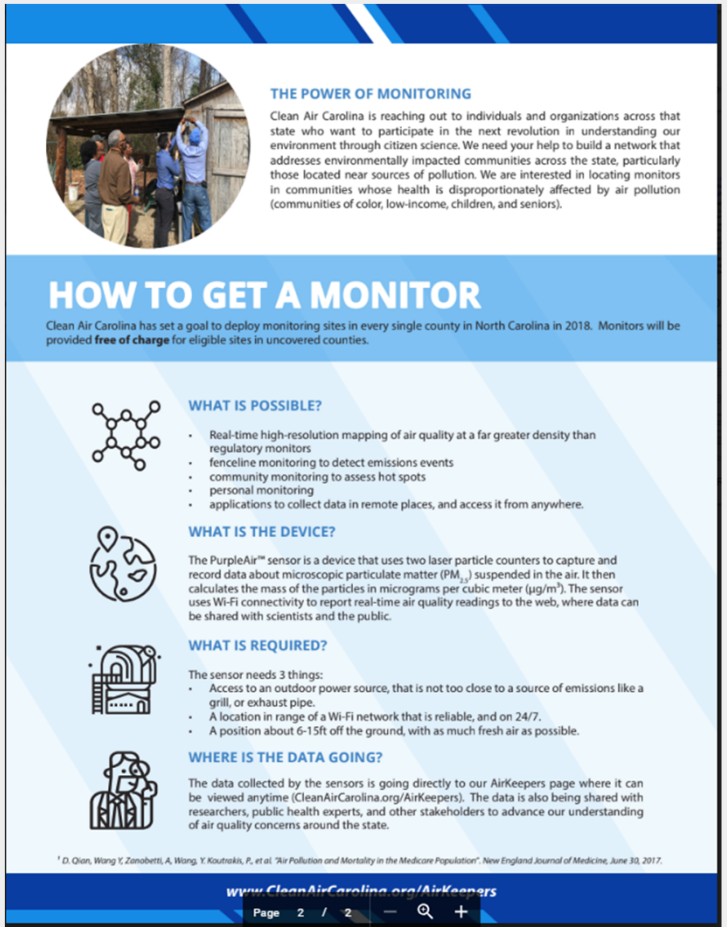
County Level Reports







Modular Protocols



THE POWER OF MONITORING

Clean Air Carolina is reaching out to individuals and organizations across that state who want to participate in the next revolution in understanding our environment through citizen science. We need your help to build a network that addresses environmentally impacted communities across the state, particularly those located near sources of pollution. We are interested in locating monitors in communities whose health is disproportionately affected by air pollution (communities of color, low-income, children, and seniors).

HOW TO GET A MONITOR

Clean Air Carolina has set a goal to deploy monitoring sites in every single county in North Carolina in 2018. Monitors will be provided **free of charge** for eligible sites in uncovered counties.

WHAT IS POSSIBLE?

- Real-time high-resolution mapping of air quality at a far greater density than regulatory monitors
- fenceline monitoring to detect emissions events
- community monitoring to assess hot spots
- personal monitoring
- applications to collect data in remote places, and access it from anywhere.

WHAT IS THE DEVICE?

The PurpleAir™ sensor is a device that uses two laser particle counters to capture and record data about microscopic particulate matter ($PM_{2.5}$) suspended in the air. It then calculates the mass of the particles in micrograms per cubic meter ($\mu g/m^3$). The sensor uses Wi-Fi connectivity to report real-time air quality readings to the web, where data can be shared with scientists and the public.

WHAT IS REQUIRED?

The sensor needs 3 things:

- Access to an outdoor power source, that is not too close to a source of emissions like a grill, or exhaust pipe.
- A location in range of a Wi-Fi network that is reliable, and on 24/7.
- A position about 6-15ft off the ground, with as much fresh air as possible.

WHERE IS THE DATA GOING?

The data collected by the sensors is going directly to our AirKeepers page where it can be viewed anytime (CleanAirCarolina.org/AirKeepers). The data is also being shared with researchers, public health experts, and other stakeholders to advance our understanding of air quality concerns around the state.

[1] D. Qian, Wang Y, Zanobetti, A, Wang, Y. Koutrakis, P., et al. "Air Pollution and Mortality in the Medicare Population". New England Journal of Medicine, June 30, 2017.

www.CleanAirCarolina.org/AirKeepers

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Clean Air Carolina

Your advocates for healthy air

Citizen Science Worksheet

1. List your Group Members:

   _____

   _____

2. Create a Session Name:

School	Team Name	Date	Session Title
Example: NWSA	*Eagles*	*9/8/16*	*NWSA Eagles 9/8/16*

3. Collect Environmental Conditions (Wait and complete this outside to observe conditions.)

   Using the data below, complete the following chart to get your AirCasting "Session Notes"

   Landscape:

   - "U" Dense urban areas surrounded by taller buildings, with roughly 1,000 people or more per square mile.
   - "S" Sparse suburban city areas, surrounding a city. Primarily houses and mixed use.
   - "R" Areas of mostly natural surroundings, including forests, farmland, and large undeveloped area.

   Cloud Cover:

   - "100%" If no sky is visible through clouds. Completely overcast.
   - "75%" If there is less blue sky visible than clouds. Mostly Cloudy.
   - "50%" If there is equal amounts of cloud and sky. Lightly Cloudy.
   - "25%" If only few clouds are visible, or most clouds are very small.
   - "0%" If the sky is clear.

   Wind:

   - "H" Heavy gusts of wind.
   - "M" Moderate levels of wind.
   - "L" Light wind, steady breeze.
   - "C" Calm conditions. Little to no noticeable wind.

   Most Recent Rain:

   - Count the number of days since rainfall at the testing location. "1" if rain fell the previous day, "2" if two days ago, "3" if three days ago, "3+" if longer than three days since last rainfall. *Do not record during the rain.*

Landscape	Cloud Cover	Wind	Most Recent Rain	Session Notes
Example: U	*75%*	*L*	*2*	*U75%L2*

4. Preliminary questions before AirCasting. Discuss as a group and answer.

   1) What is the air like where you live and go to school?

      _____

   a. Can you see air pollution, like exhaust, smog, or smoke?

      _____

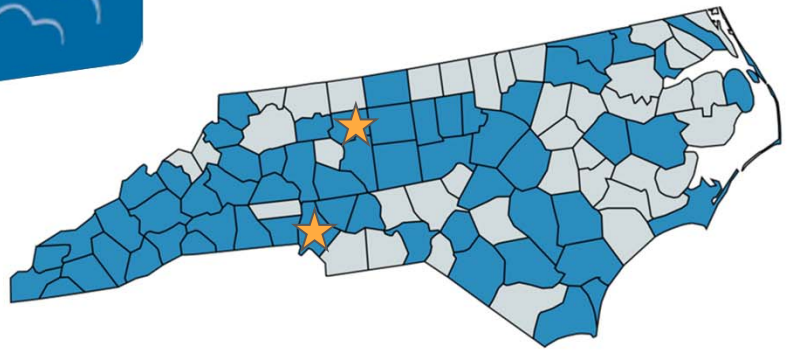
   b. Are there busy roads, trains, or airports nearby?

      _____

Collocation

Air Sensor

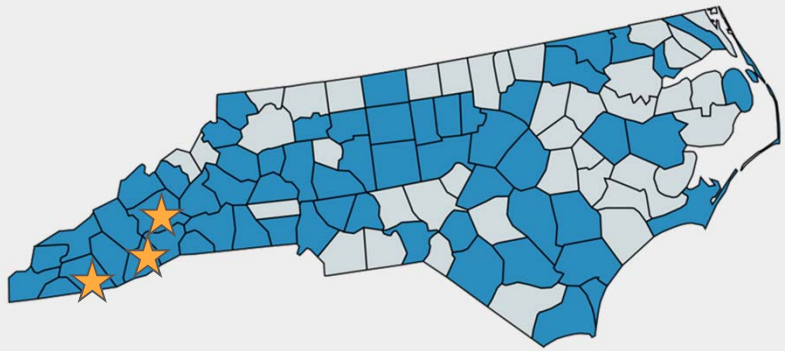
Measure · Learn · Share



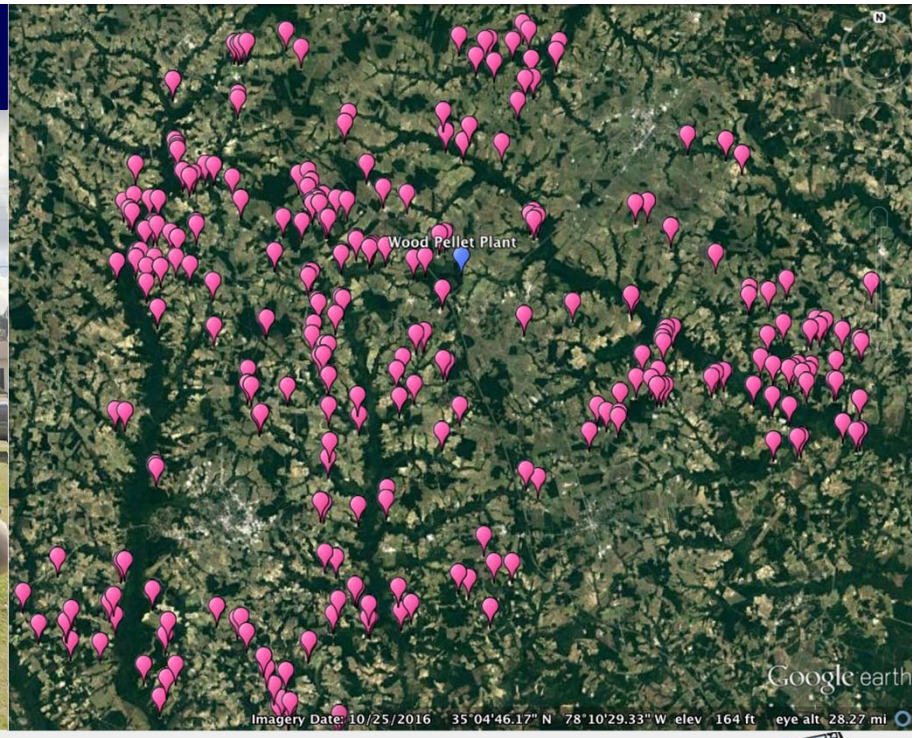
The **Message**

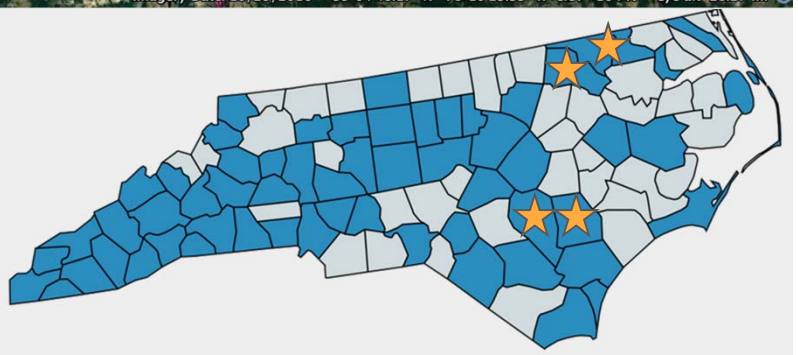
No one cares
how much you know
until they know
How much you care

STEM Outreach in the West

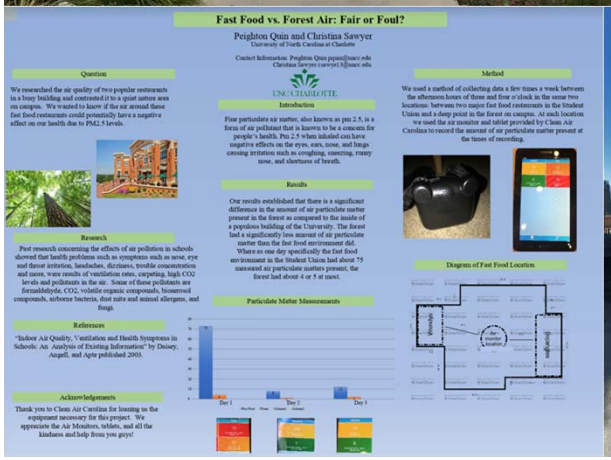


EJ issues in the east





Monitoring on Campus



UNCW University of North Carolina Pembroke

UNC Charlotte

East Carolina University

ECSU Elizabeth City State University Founded 1891

NCCentral University

The University of North Carolina at Chapel Hill

Duke University

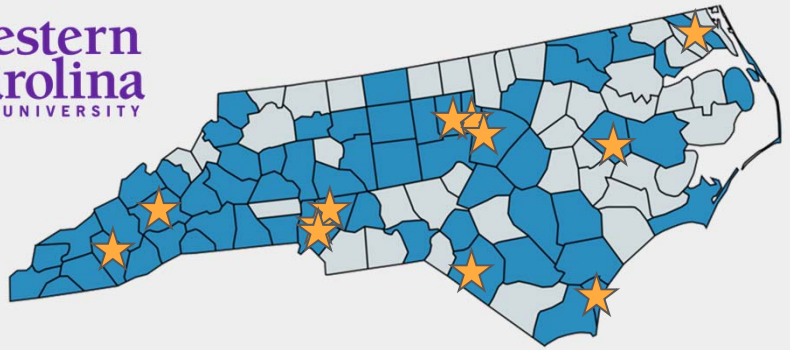
Johnson C. Smith University
Become yourself. Change our world.

Rowan-Cabarrus Community College

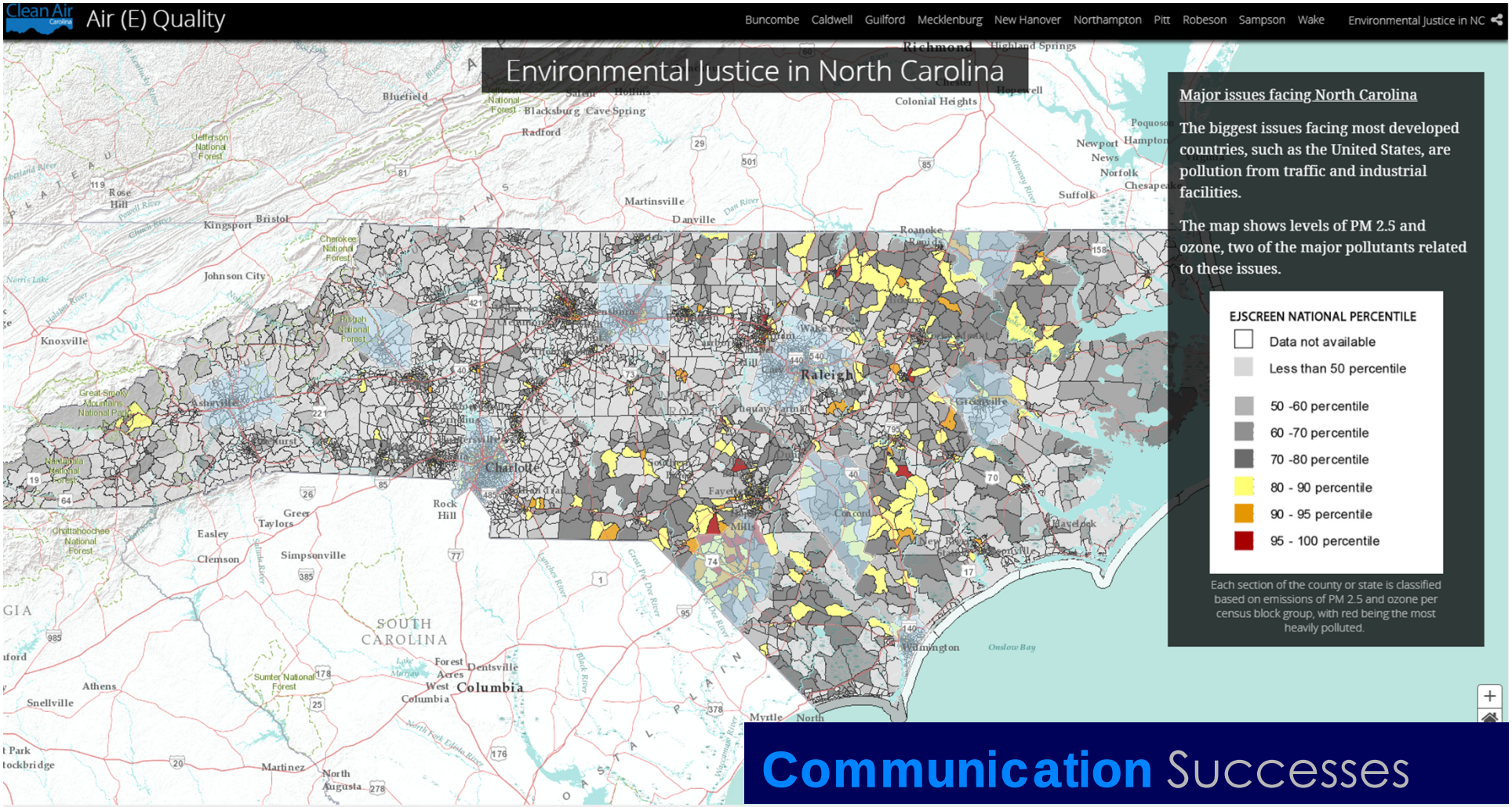
CPCC Central Piedmont Community College

Lenoir-Rhyne University

Western Carolina University

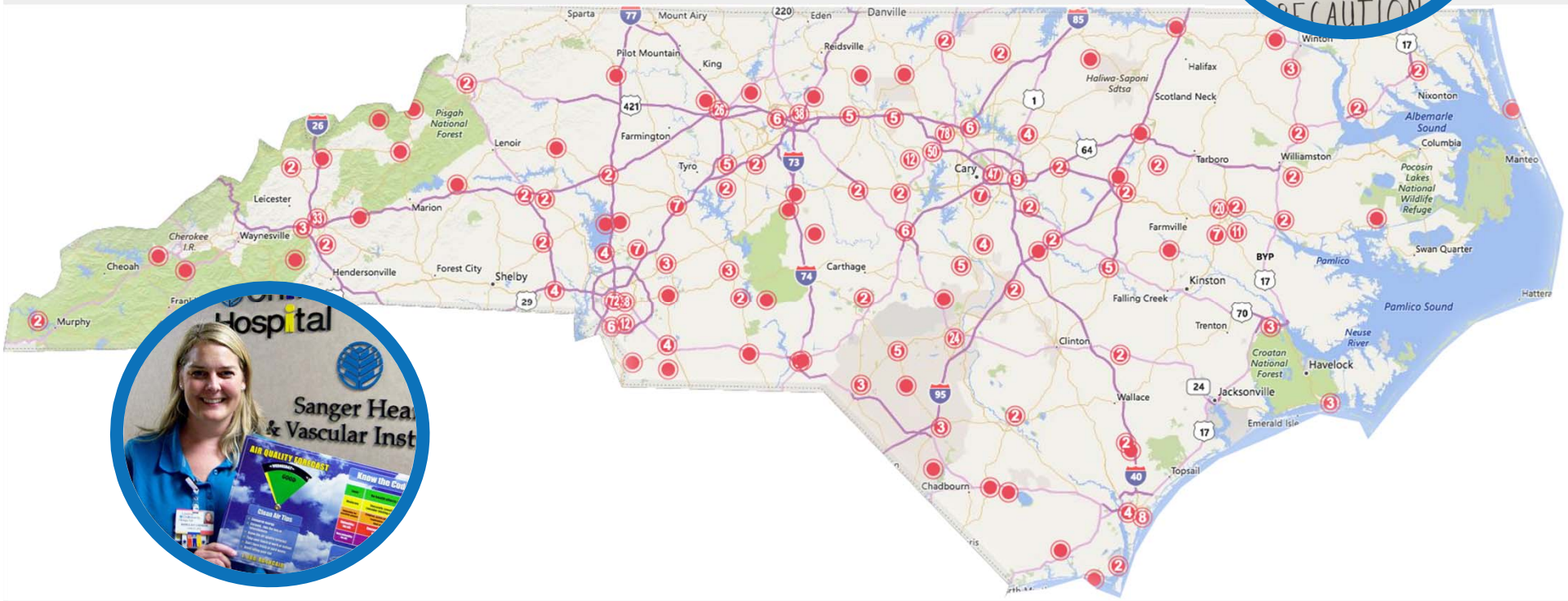



DON'T IDLE!
Particle Falls
Communication Successes

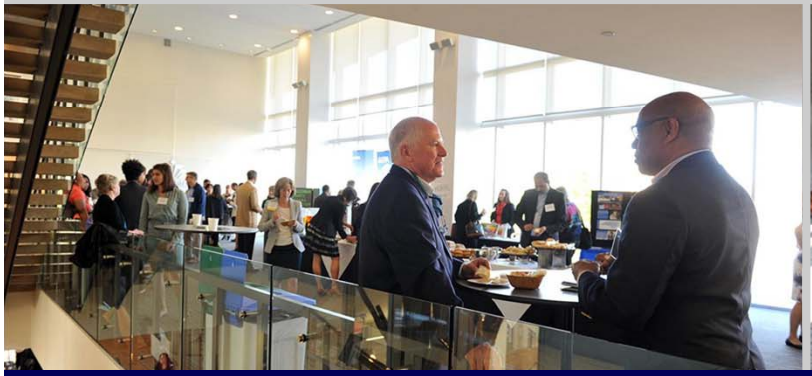

Clean Air Carolina
Air (E) Quality
Buncombe
Caldwell
Guilford
Mecklenburg
New Hanover
Northampton
Pitt
Robeson
Sampson
Wake
Environmental Justice in NC
Environmental Justice in North Carolina
Major issues facing North Carolina
The biggest issues facing most developed countries, such as the United States, are pollution from traffic and industrial facilities.
The map shows levels of PM 2.5 and ozone, two of the major pollutants related to these issues.
EJSCREEN NATIONAL PERCENTILE
Data not available
Less than 50 percentile
50 -60 percentile
60 -70 percentile
70 -80 percentile
80 - 90 percentile
90 - 95 percentile
95 - 100 percentile
Each section of the county or state is classified based on emissions of PM 2.5 and ozone per census block group, with red being the most heavily polluted.
Raleigh
Charlotte
Greensboro
Fayetteville
Wilmington
Durham
Asheville
Concord
Rock Hill
Columbia
SOUTH CAROLINA
Communication Successes

Action Network

More than 900 members across NC



NC BREATHE Conference



Late March 2019

Thank You

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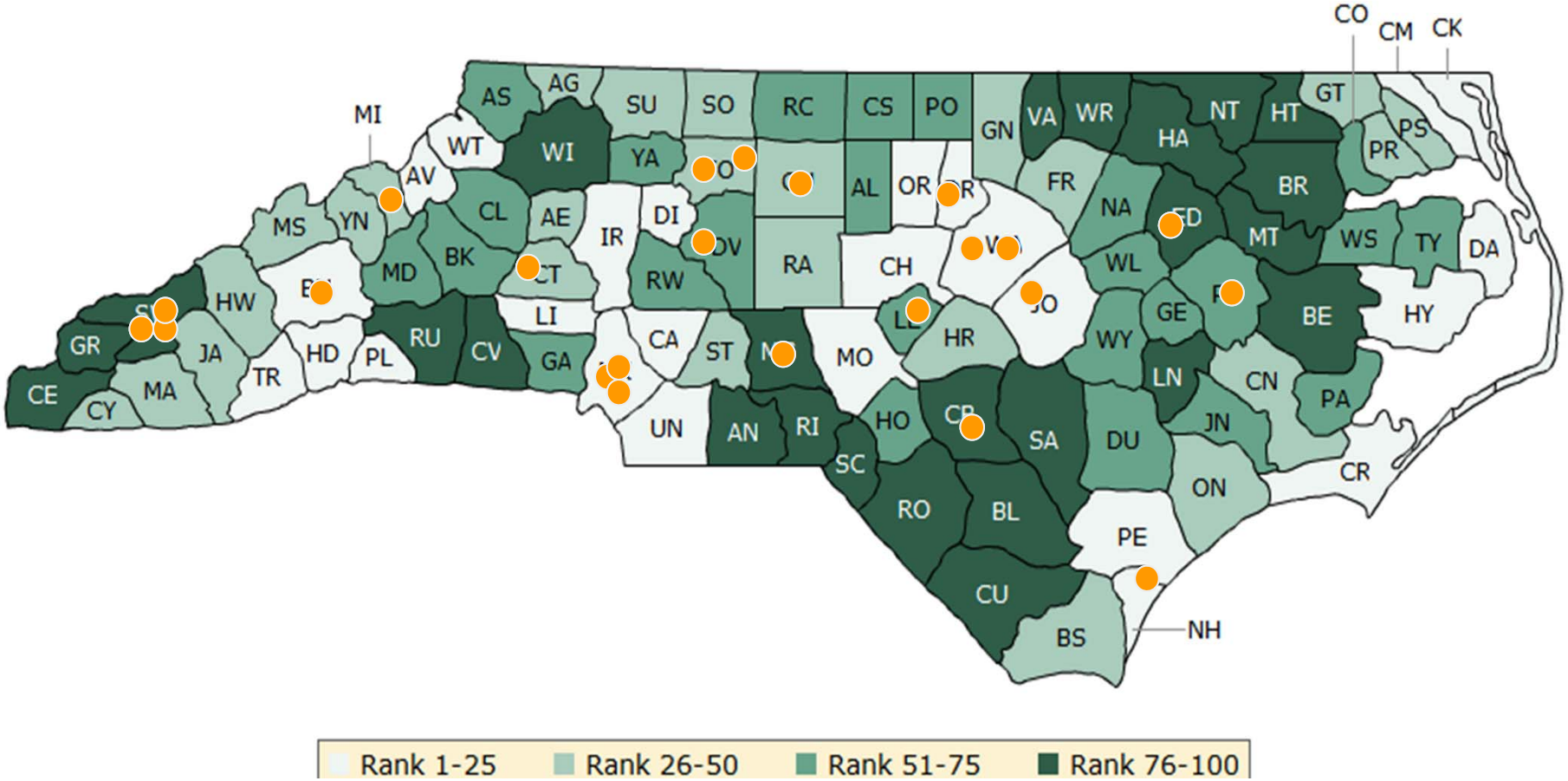
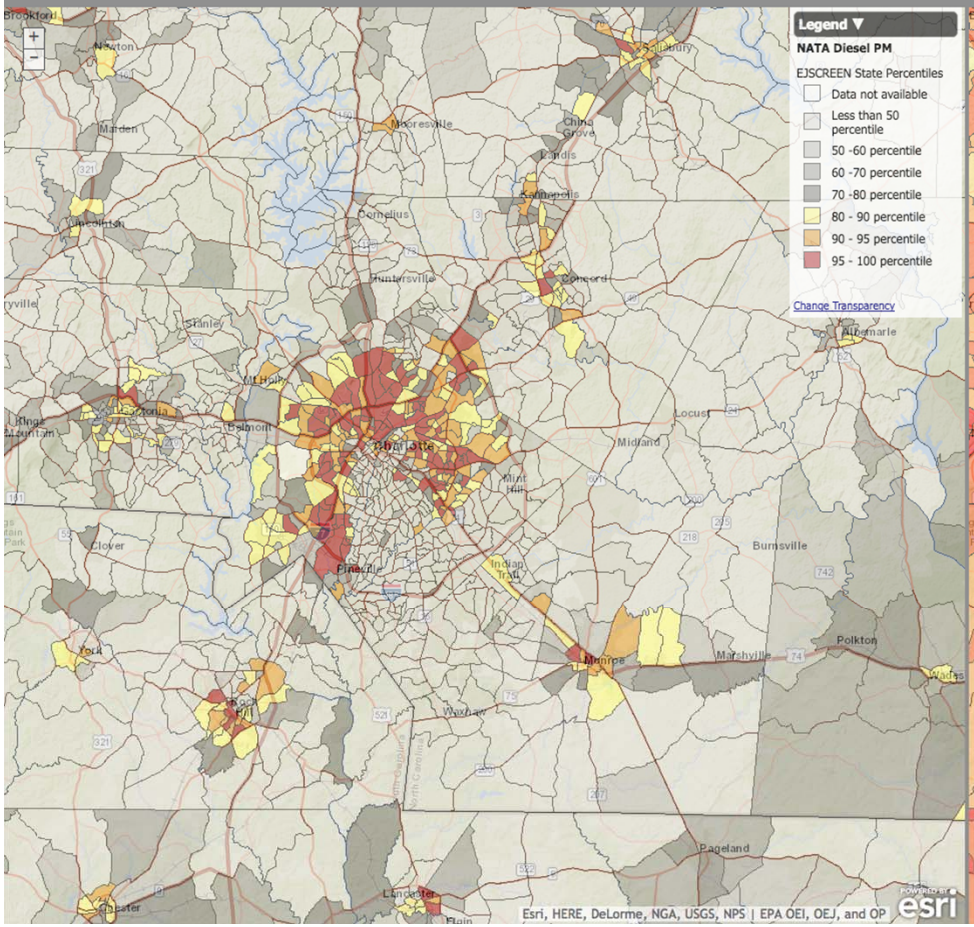
Philosophy

Our Challenge

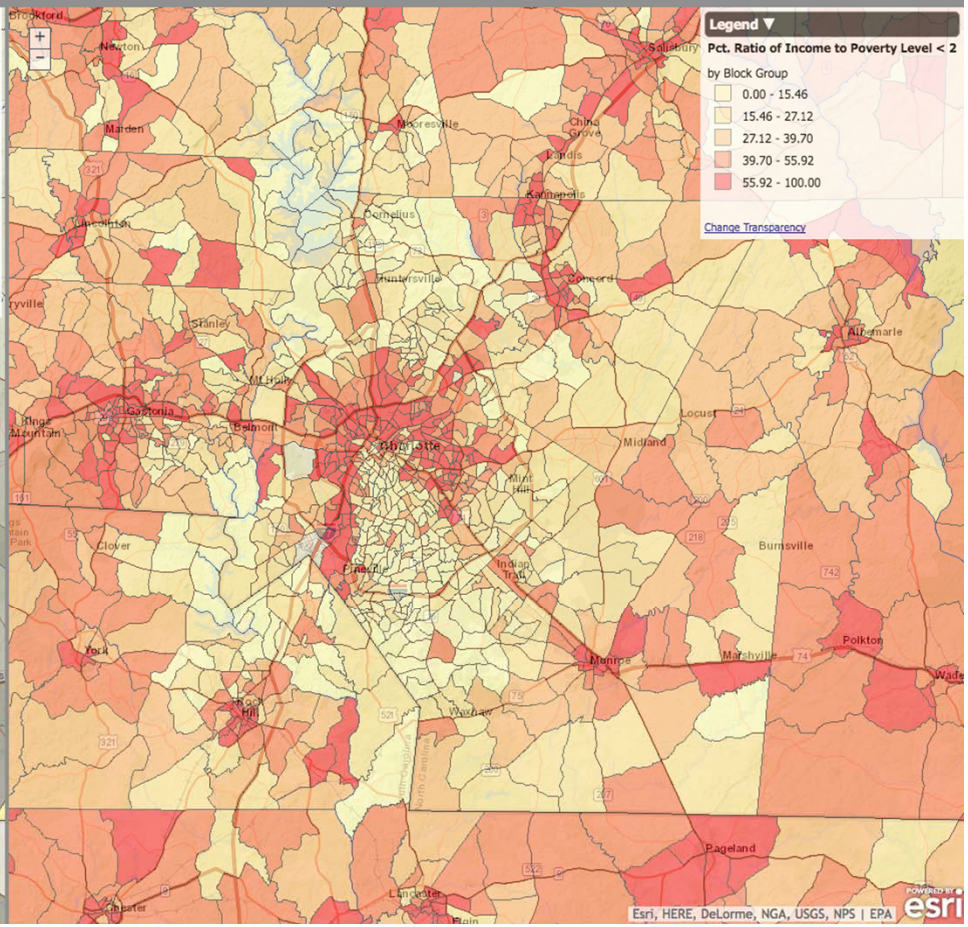


Environmental Disparities

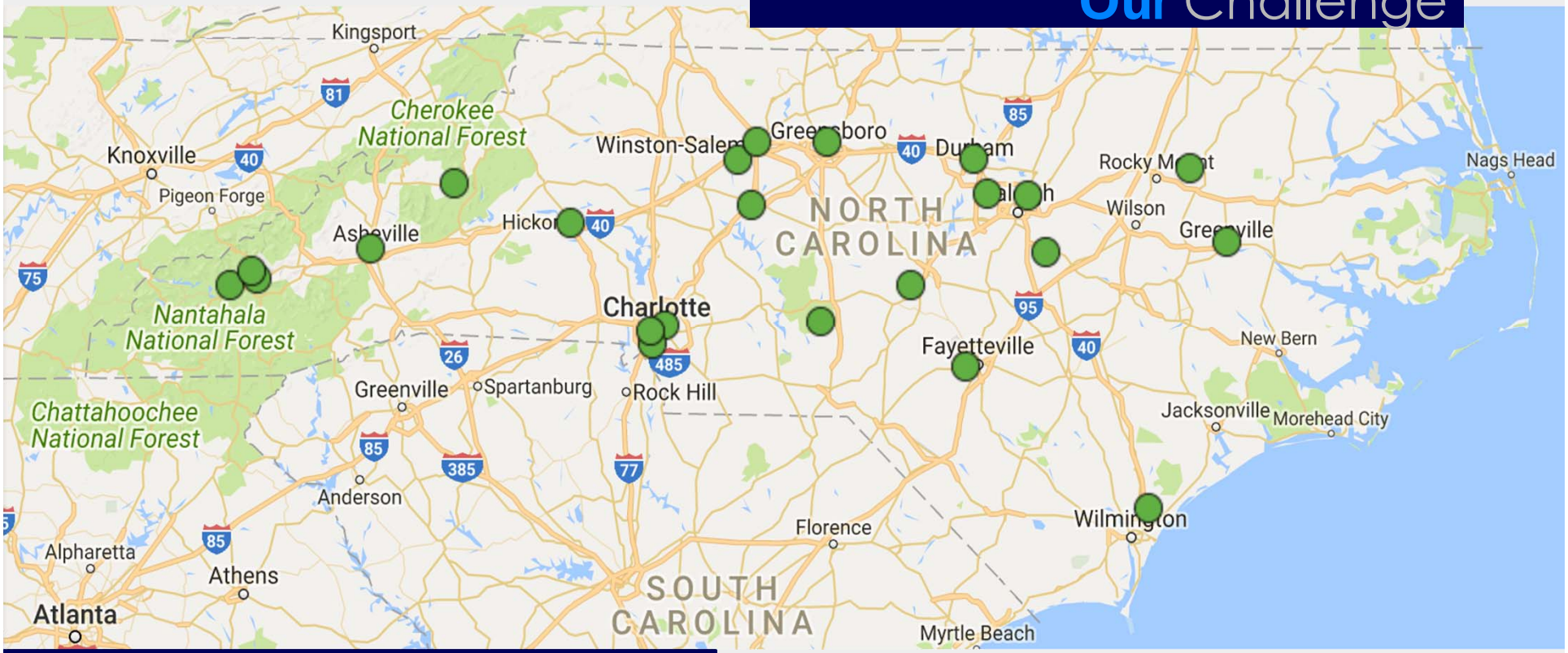
EJ Index for NATA* Diesel PM State Percentiles



Pct. Ratio of Income to Poverty Level < 2 -- 2010-2014 ACS



Our Challenge

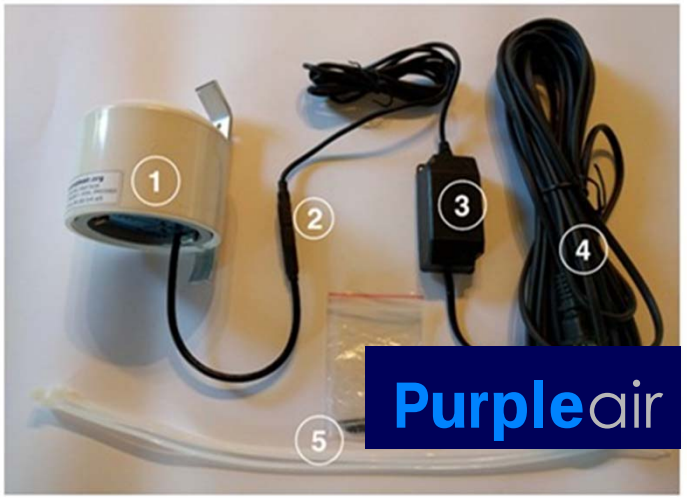


PM Reference Monitors


Particle Falls Charlotte
Particle Falls Raleigh

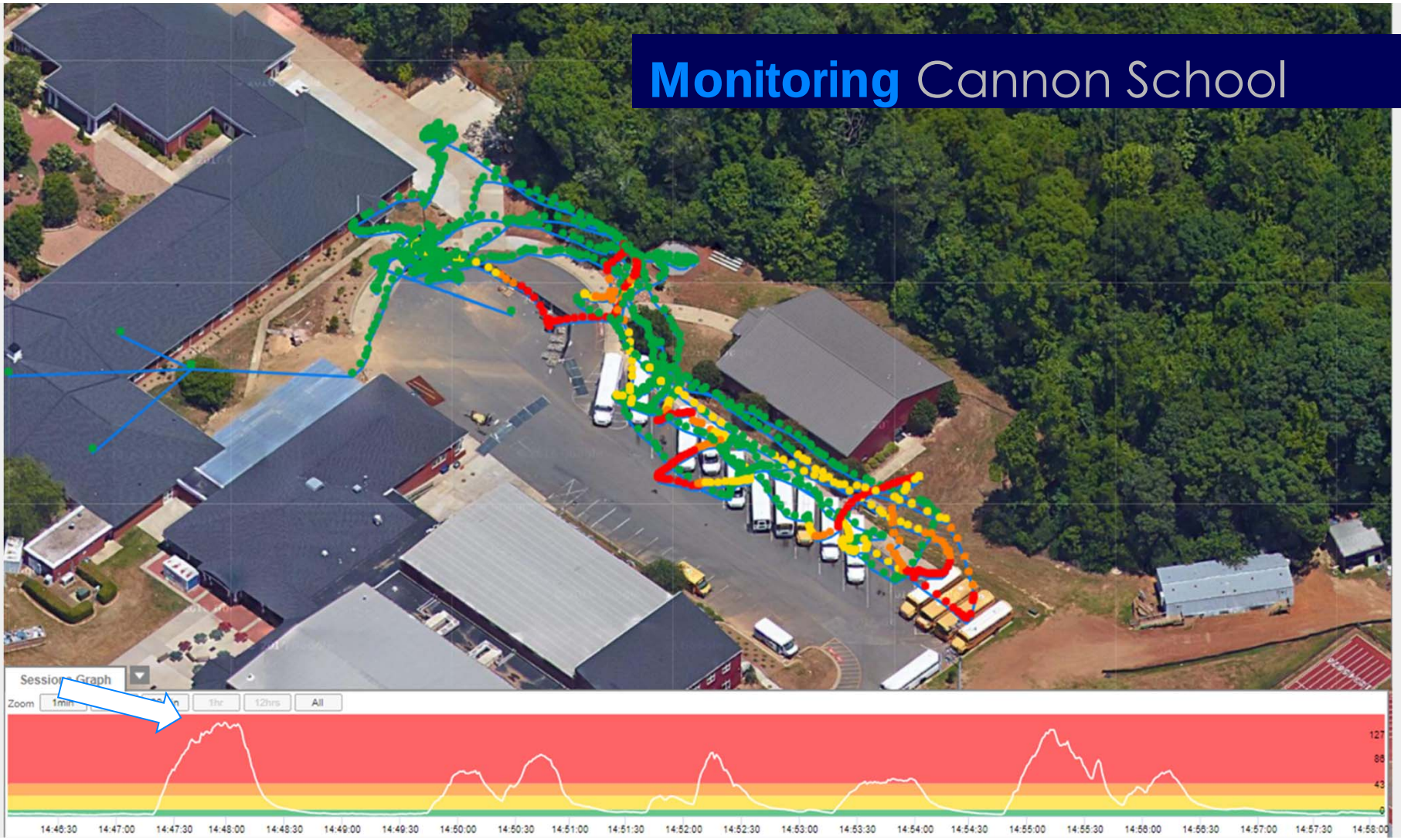
PM 2.5 Monitors

- Fraction of the **Cost**
- **Compact** size
- **Relative Humidity**, and **Temperature**
- **Geotagged** data-points
- Web-based **mapping**



NOT a replacement of professional tools

Monitoring Cannon School

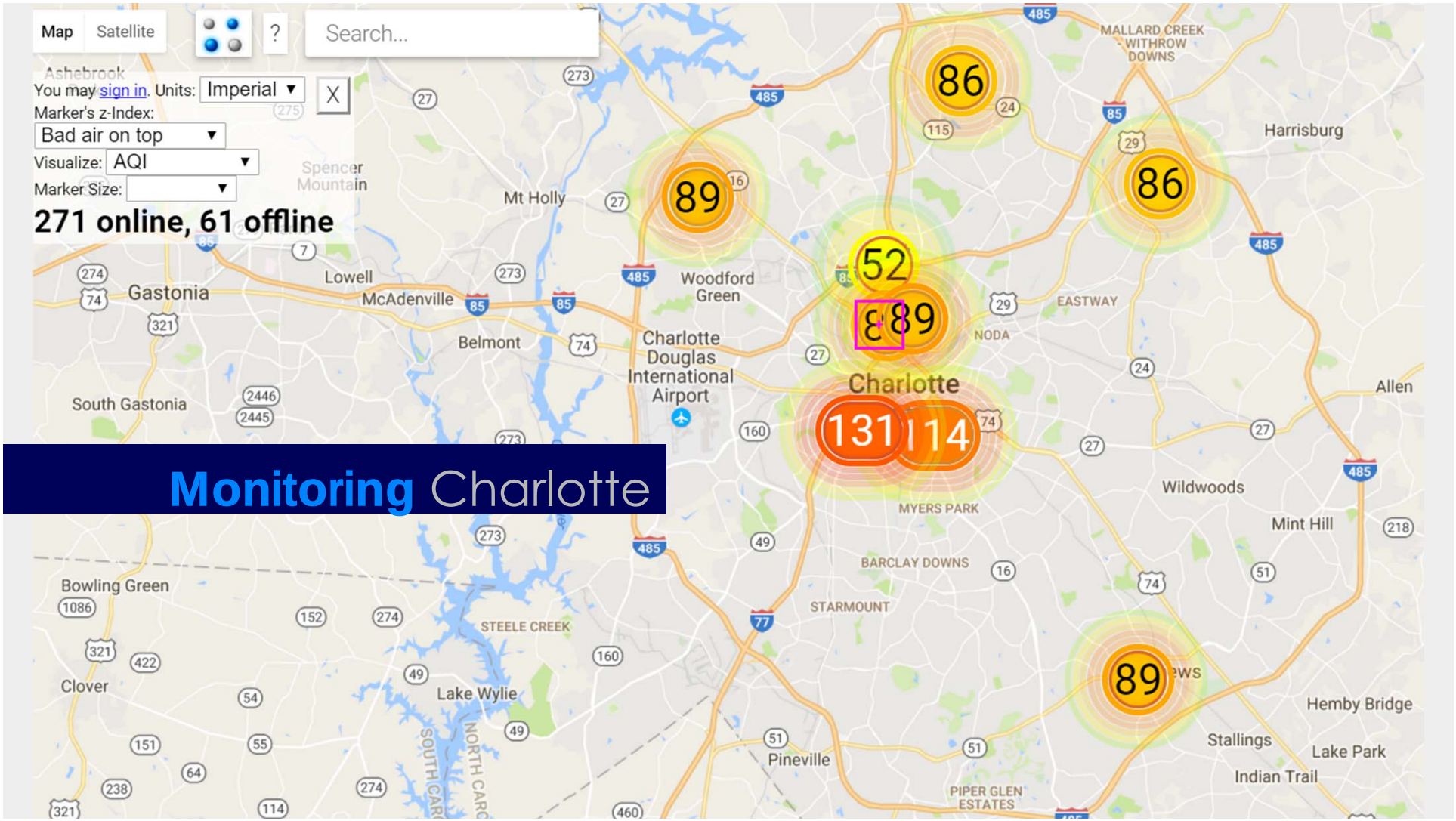


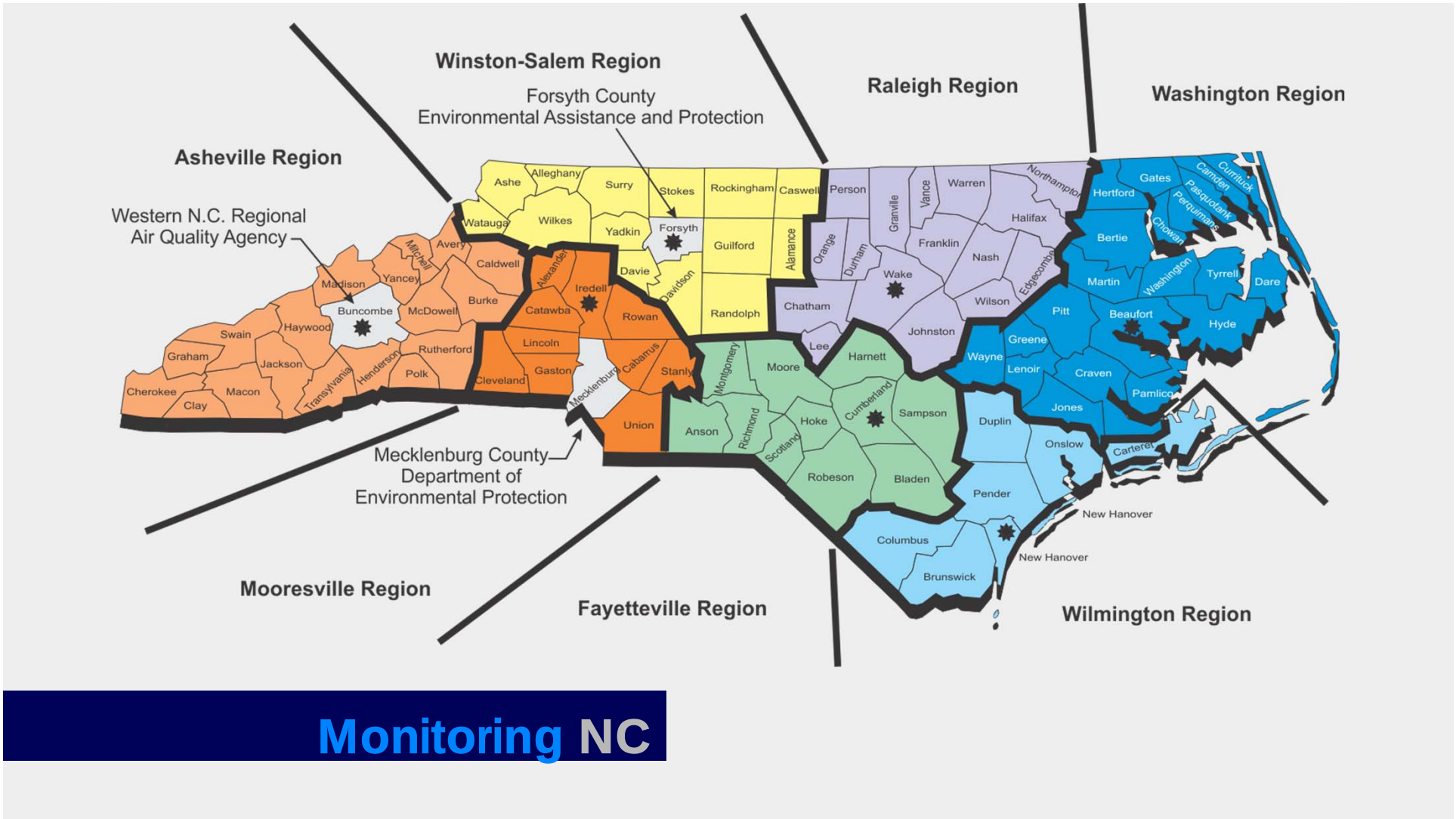
Citizen Science

- Interested members of the general public **contributing** to the collection or analysis of data
- Participating **actively or passively.**
- Citizen Science can provide **expanded capacity and scope** to projects with limited resources.
- The projects offer **STEM learning** opportunities
- **Direct public outreach** through hands on learning, and communication

Carolinas HealthCare System

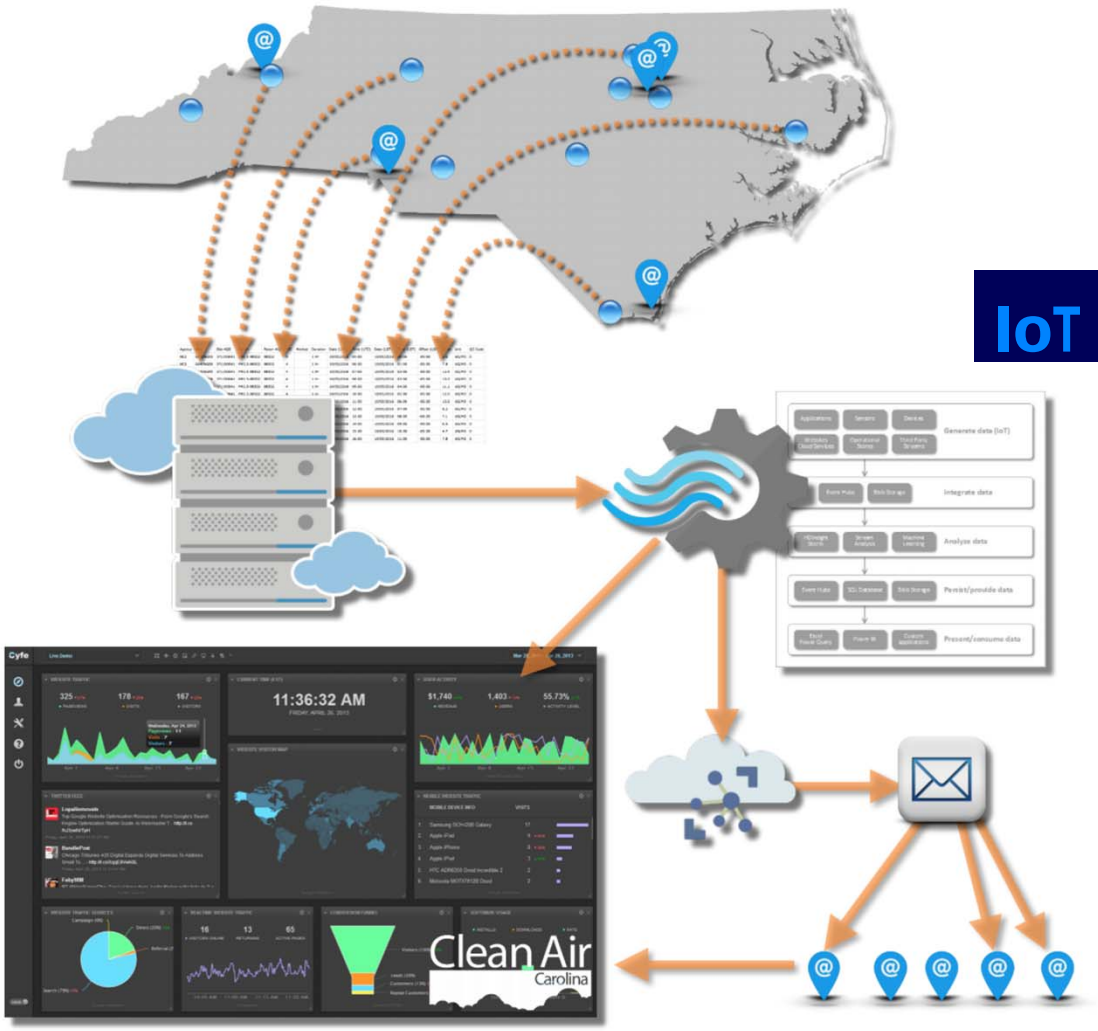
Cannon School


Map
Satellite
?
Search...
You may sign in. Units: Imperial
X
Marker's z-Index:
Bad air on top
Visualize: AQI
Marker Size:
271 online, 61 offline
Monitoring Charlotte
86
89
86
52
89
131
114
89
Charlotte
Charlotte Douglas International Airport
Woodford Green
Mt Holly
Gastonia
Lowell
McAdenville
Belmont
South Gastonia
Spencer Mountain
Harrisburg
MALLARD CREEK - WITHROW DOWNS
EASTWAY
NODA
Allen
Wildwoods
MYERS PARK
Mint Hill
BARCLAY DOWNS
STARMOUNT
STEELE CREEK
Lake Wylie
Clover
Bowling Green
Pineville
Stallings
Hemby Bridge
Lake Park
Indian Trail
PIPER GLEN ESTATES



Monitoring NC

IoT Platform



Low Cost Sensor **Validation**

Collocation

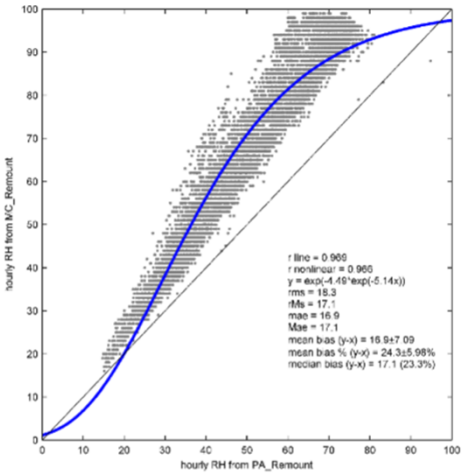
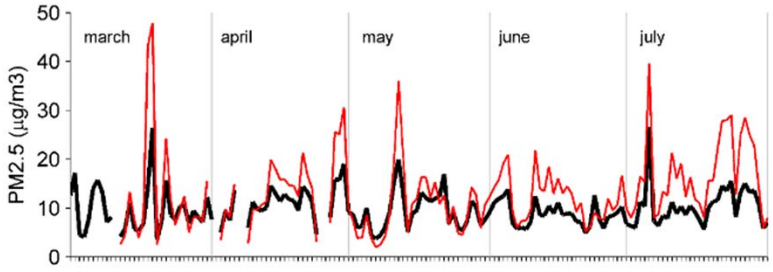


Figure 3: Daily comparison of PA-II with BAM



MAHA Initiative Clean Construction Partnership

Atrium Health

NOVANT HEALTH

Citizen Science **Presentations**

Our Mission

What factors predict success?

Clean Air Carolina

Your advocates for healthy air

Our Mission

Success Stories of communication?

Clean Air Carolina

Your advocates for healthy air

Our Mission

How can they be sustained after money is spent?

Clean Air Carolina

Your advocates for healthy air

Our Mission

How can the diverse partners work together to meet community needs? (MeBr)

Clean Air Carolina

Your advocates for healthy air

2019 Strategy