Earth Science Division | Applied Sciences Program | Capacity Building Program

19 September 2018

CBP Program & Portfolio & Overview

Applied Sciences

- **Partnering** with public and private organizations
- **Discovering** innovative NASA Earth science applications
- **Supporting** environmental decision-making activities
- **Demonstrating** practical benefits of NASA Earth science
- **Helping** improve the quality of life and strengthen the economy

Lines of Business

Innovative & Practical Applications

Capacity Building

Mission Planning

Capacity Building

- Engages current and future decision makers
- Improves skills and capabilities to access and apply NASA Earth science
- Three lines of business: trainings, product co-development, and relationship brokering
- Works through both program and element activities
- Identifies partnership opportunities to reach new end users
- Participates in both domestic and international capacity building groups, such as GEO and CEOS
- Supports three Elements (ARSET, DEVELOP, and SERVIR) and initiatives focused on indigenous peoples in North America and an interactive mapper

2017 Achievements

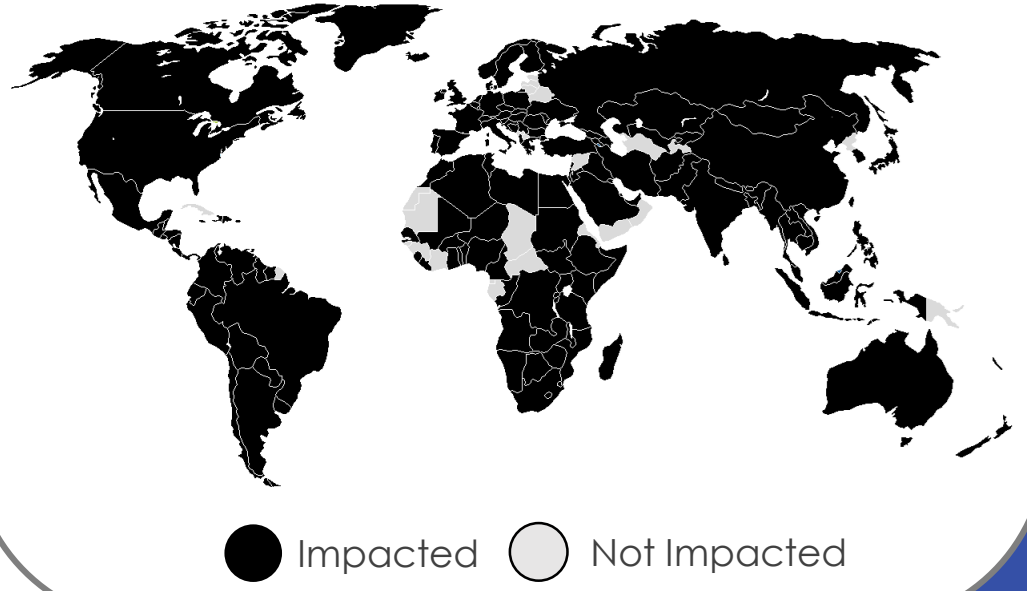
Programmatic Engagement:

6,622 Individuals

2,369 Institutions

104 Trainings

142 Countries



ARSET

https://arset.gsfc.nasa.gov

- Applied Remote Sensing Training Program
- Provides online and in-person trainings for:
  - Policy Makers
  - Regulatory Agencies
  - Applied Environmental Professionals
- Increases the use of NASA Earth Science models and data for environmental applications
- Thematic areas addressed:

Disasters

Health & Air Quality

Ecological Forecasting

Water Resources

DEVELOP

https://develop.larc.nasa.gov

- Bridges the gap between NASA Earth Science and society
- Addresses environmental and public policy issues around the globe
- Conducts 10-week long interdisciplinary feasibility studies (3 terms per year)
- Builds capacity to use Earth observations in both participants (students, recent grads & transitioning career professionals) and partner organizations
- Works within all 8 thematic areas

Disasters

Health & Air Quality

Energy

Agriculture & Food Security

Ecological Forecasting

Urban Development

Water Resources

Transportation & Infrastructure

SERVIR

https://www.servirglobal.net/

- Joint development initiative of NASA & USAID
- Works in partnership with leading regional organizations world-wide
- Helps developing countries use information provided by Earth observing satellites and geospatial technologies for managing climate risks and land use
- Empowers decision-makers with tools, products, and services to act locally on climate-sensitive issues
- Works within thematic topics such as:

Disasters

Agriculture & Food Security

Ecological Forecasting

Water Resources

CBP Health & Air Quality FY18 Portfolio Overview

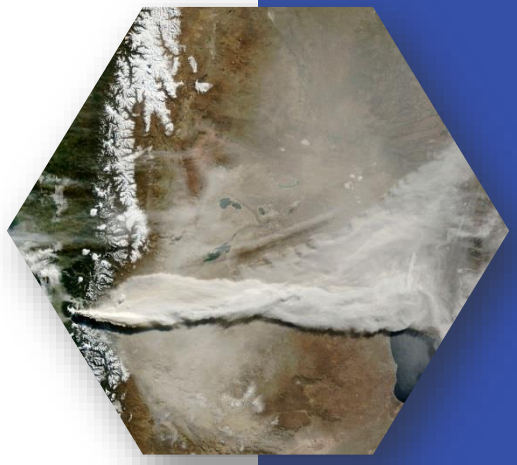
CBP FY18 Health & AQ Portfolio

ARSET – 4 Trainings

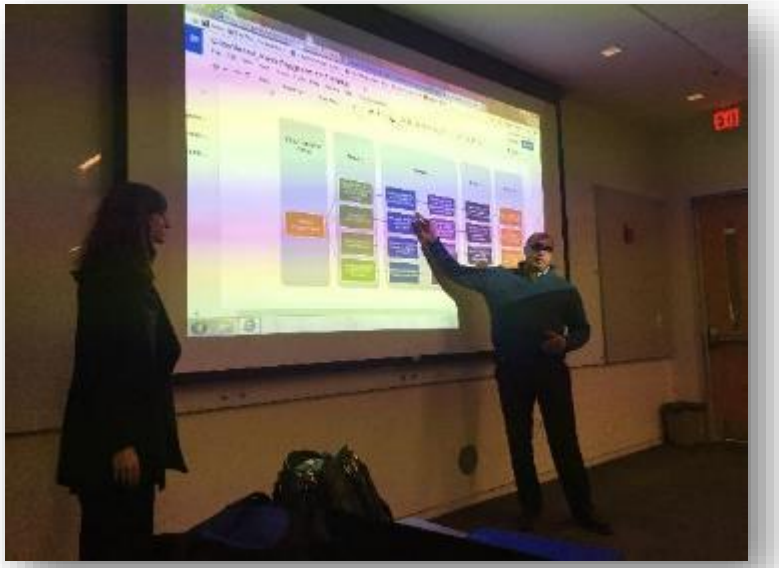
- *Advanced Webinar: Tools for High Resolution Datasets*
- *Air Quality Applications for Southeast Asia*
- *Air Quality Applications for the Northwest United States*
- *Air Quality Measurements for Geostationary Platforms*

DEVELOP – 6 Projects

- *Fall 2017: 1) Phoenix, AZ, 2) Western Europe I*
- *Spring 2018: 1) California, 2) Western Europe II*
- *Summer 2018: 1) Intermountain West, 2) Richmond, CA*



DEVELOP FY18 Overview & FY19 Plans

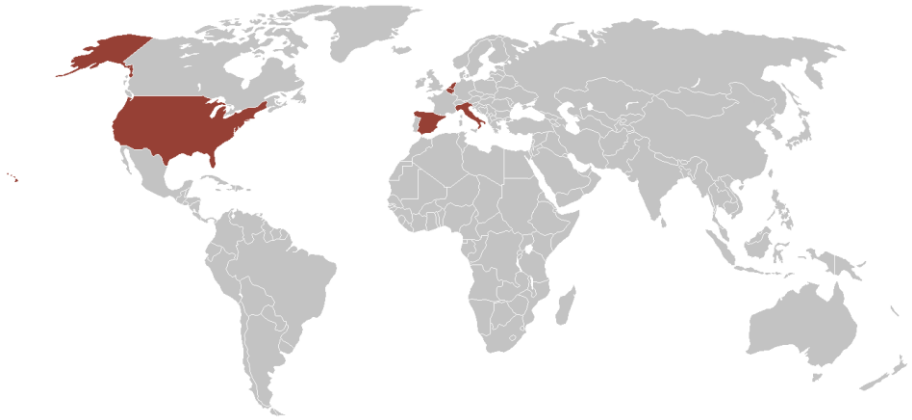


FY18 Health & Air Quality Portfolio

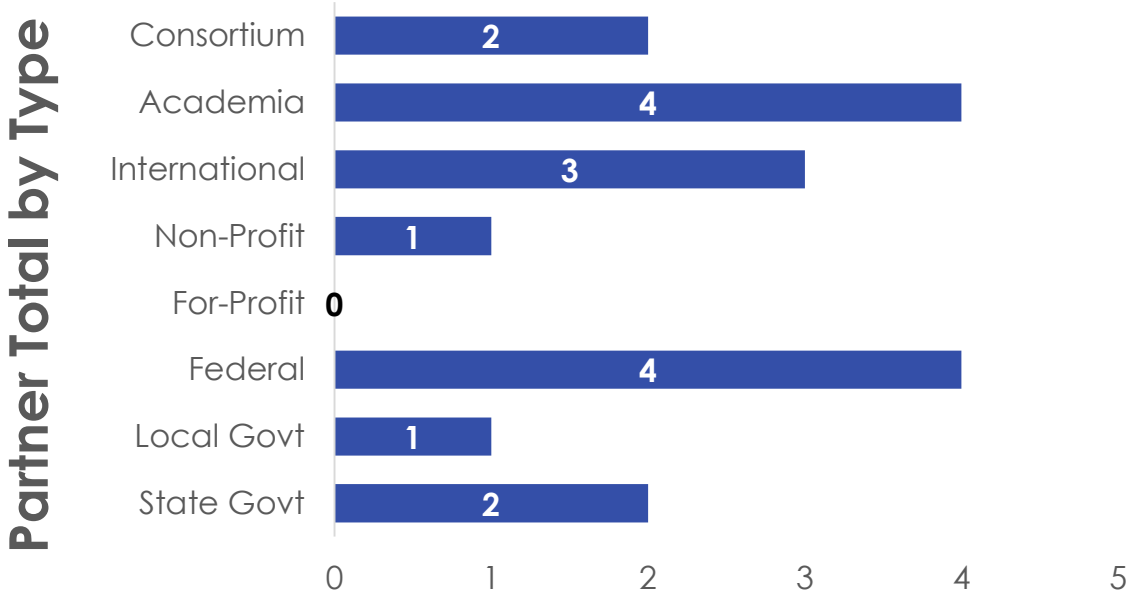
6 Projects

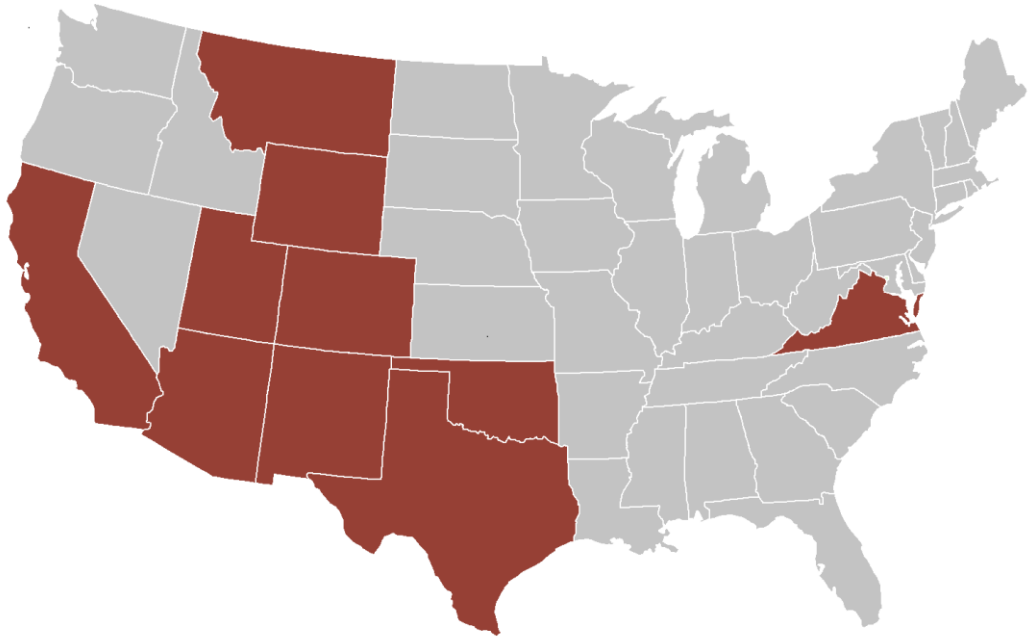
75% Domestic
25% International

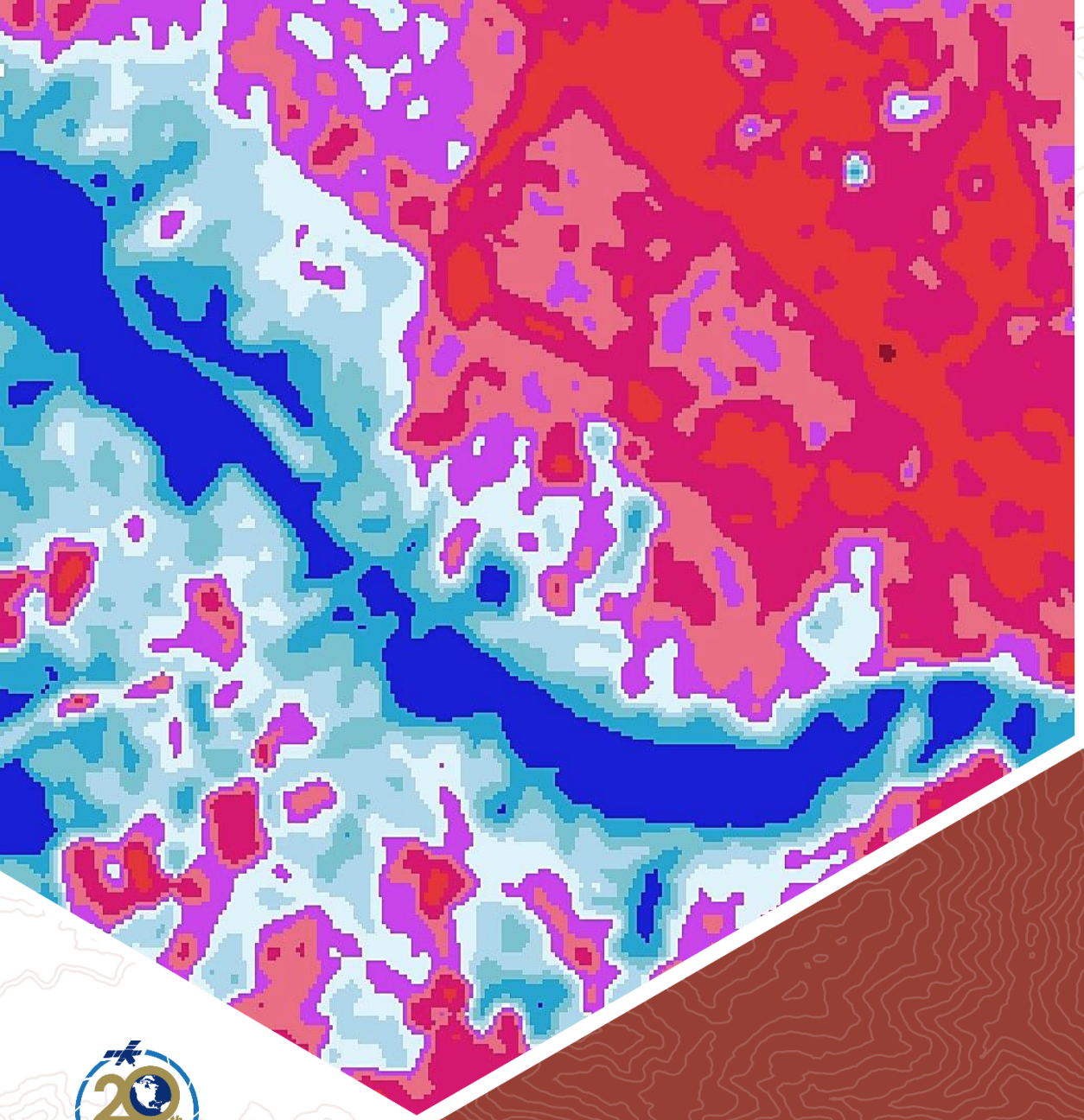
10 States & 5 Countries Impacted



17 Partners







2018 Summer | Virginia - Langley

Richmond Health & Air Quality

Synthesizing Temperature, Reflectance, and Socioeconomic Data to Provide Spatial and Temporal Temperature Analyses in Richmond, Virginia

Meg Fredericks (Project Lead)

Simeon Brown

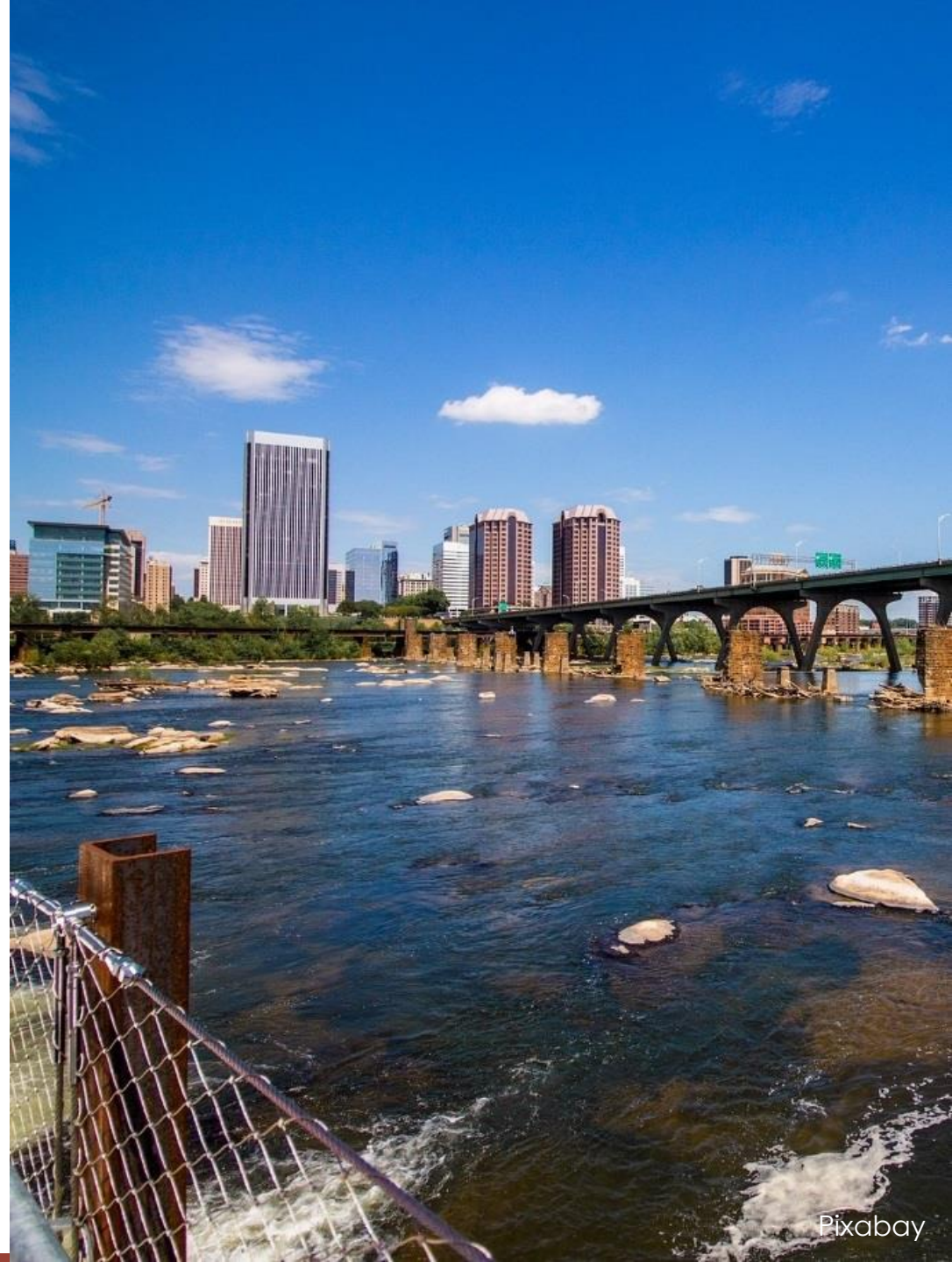
Patricia Abduragimova

Josh Turner

Project Context

- The **urban heat island effect** in Richmond, Virginia
  - Hottest areas of the city & populations most impacted by extreme heat

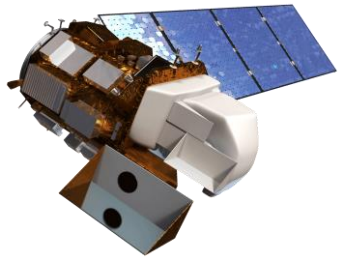
- Project Partner: **Groundwork RVA**
  - Prioritization of **green infrastructure** projects in the city by location
  - Inform **policy and decision-making** within Richmond's Planning and Development Office



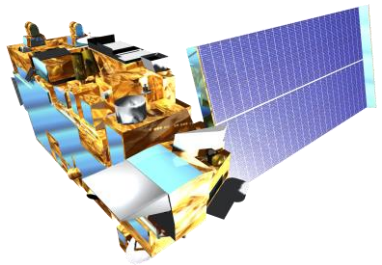
Methodology and Data Processing

Landsat 5 TM

Landsat 8 OLI/TIRS



Terra ASTER



NAIP Imagery (2016) → False Color Composite → Land Cover

Landsat Imagery (1994 – 2017) → Brightness Temperature → NDVI Calculation → Land Surface Temperature

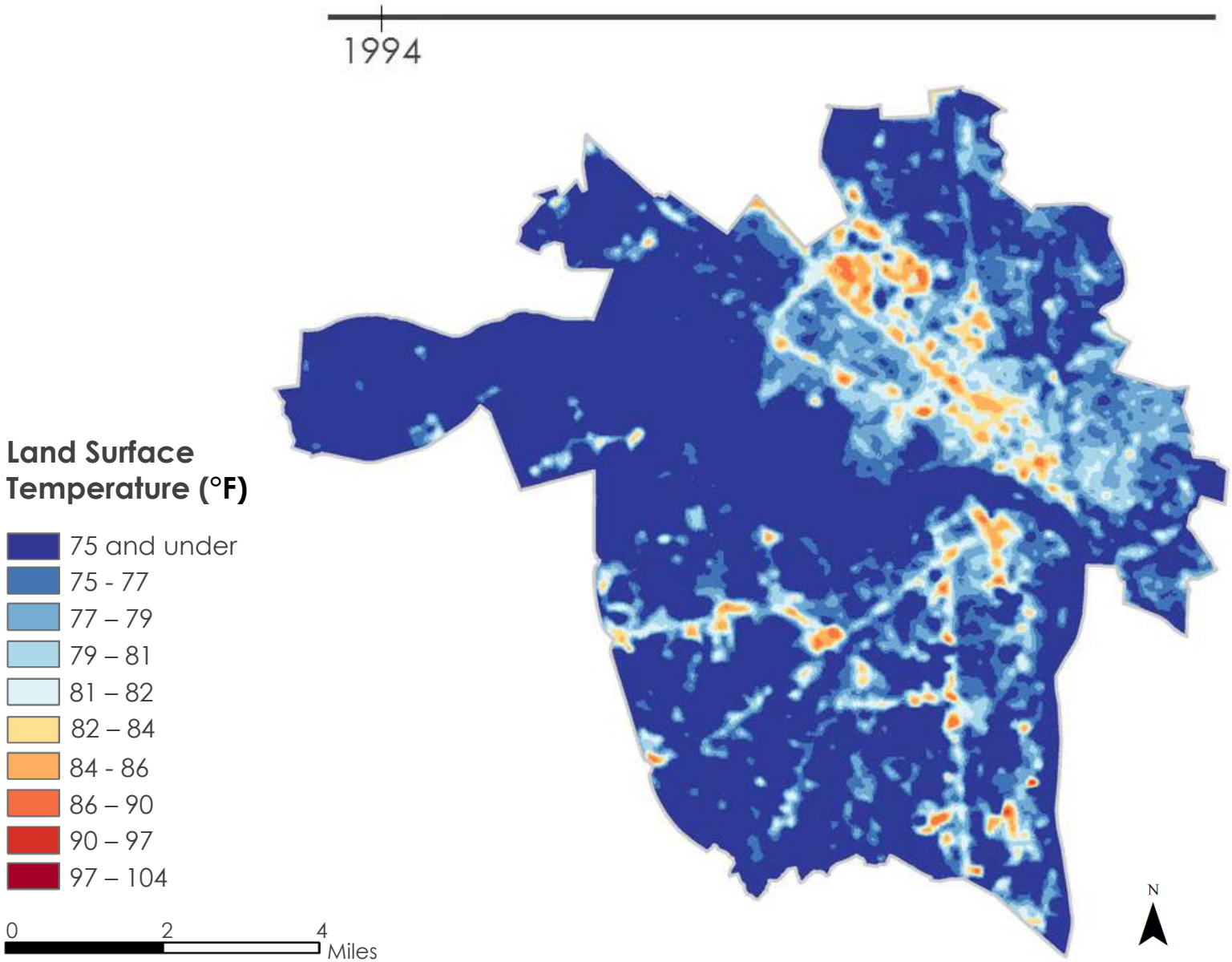
Identify Social Variables → Data from CDC and US Census Bureau (2016) → Percentile Rank Data to Create Index

Land Cover, Land Surface Temperature, and Percentile Rank Data to Create Index → Aggregate & Join to Census Tracts

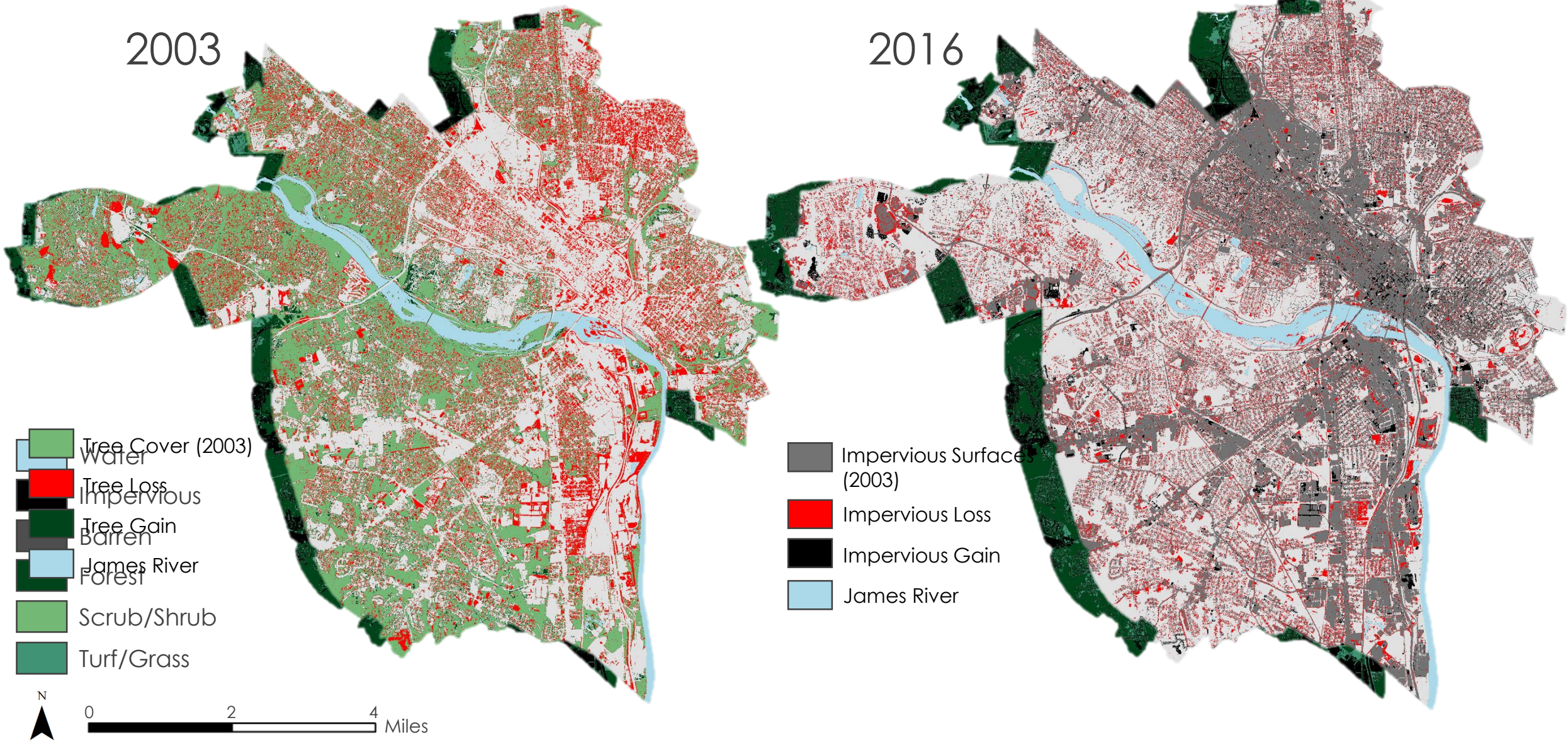
Aggregate & Join to Census Tracts → LST Time Series

Aggregate & Join to Census Tracts → Areas of Heat & Social Vulnerability

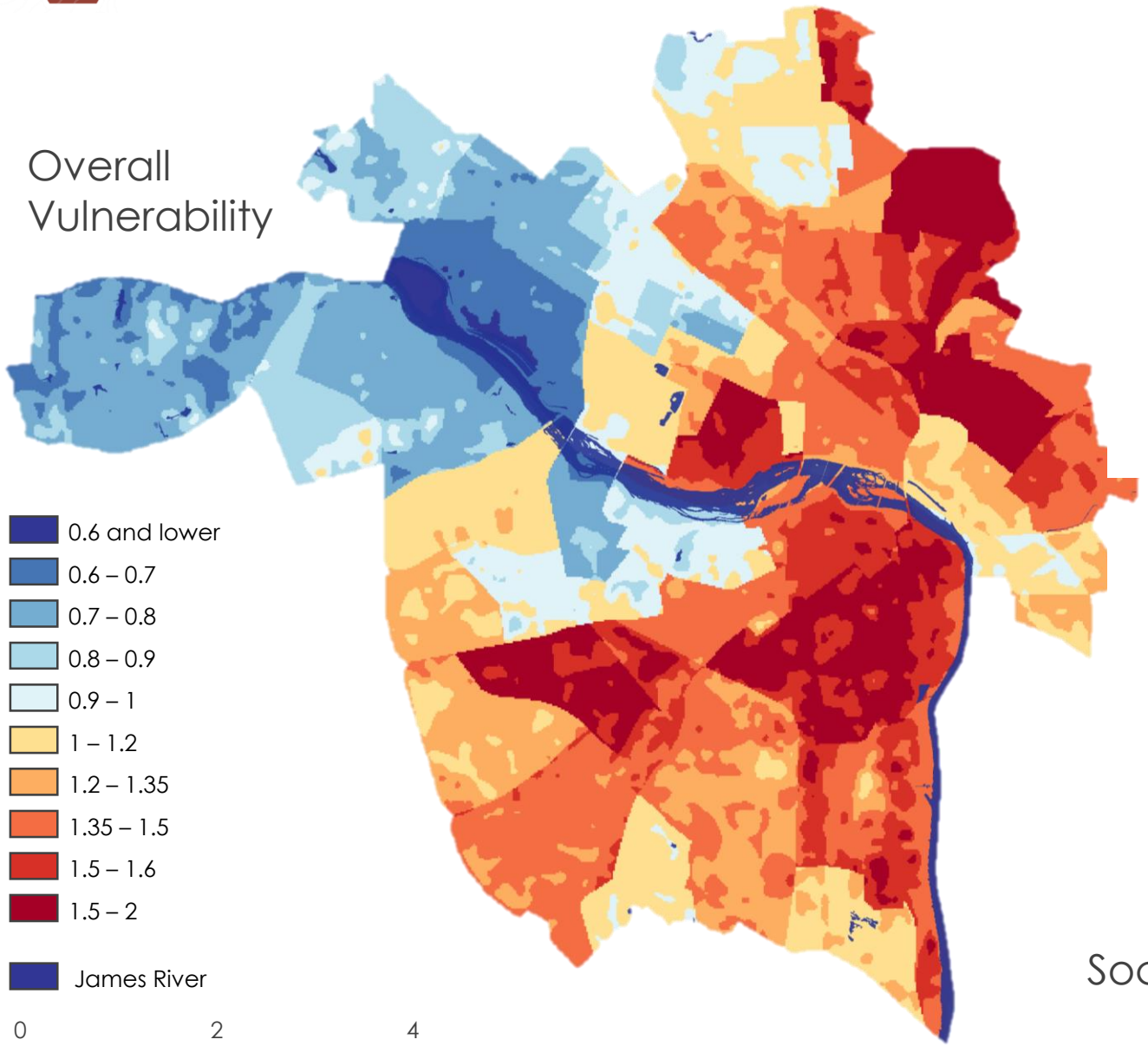
Results: Land Surface Temperature

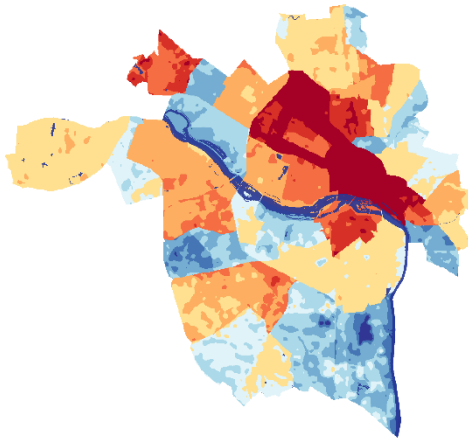


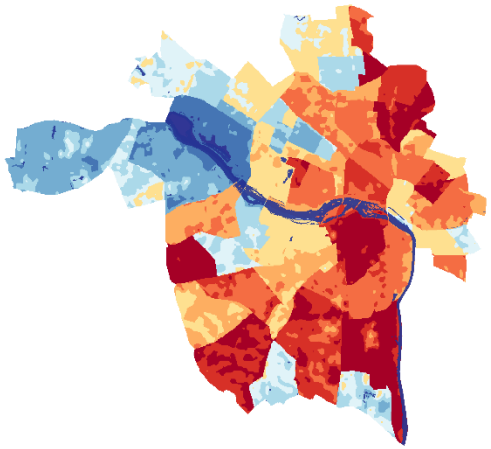
Results: Land Cover Overlay

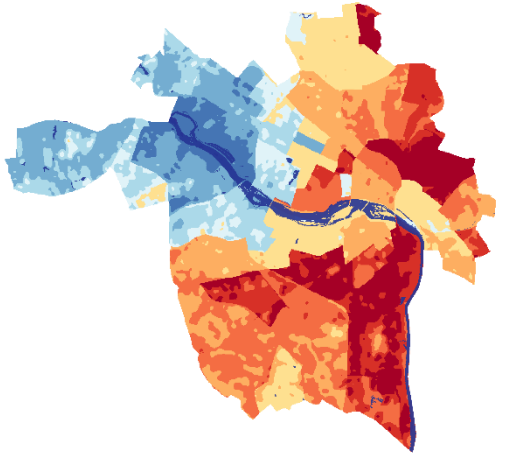


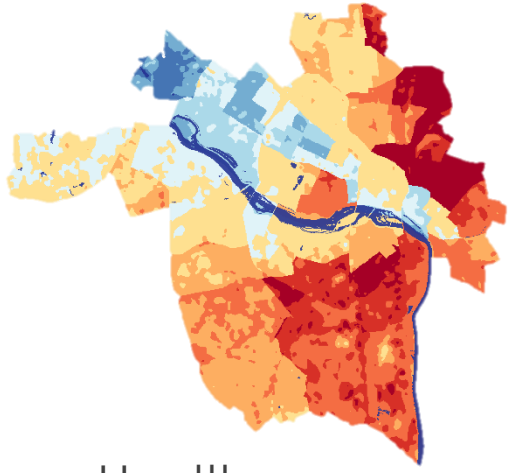
Results: Heat Vulnerability Assessment




Age


Minority Status


Socioeconomic Status


Health

0 2 4 Miles

Acknowledgements

Giles Harnsberger, Executive Director – Groundwork RVA

Jeremy S. Hoffman, Ph.D., Climate & Earth Science Specialist – Science Museum of Virginia

Kenton Ross, Ph.D., Lead Science Advisor – NASA DEVELOP, LaRC

Jonathan O'Brien, Center Lead – NASA DEVELOP, LaRC

Washoe County Urban Development Team – Summer 2018 DEVELOP, AZ

Team Members

Meg Fredericks
Project Lead

Simeon Brown

Patricia Abduragimova

Josh Turner

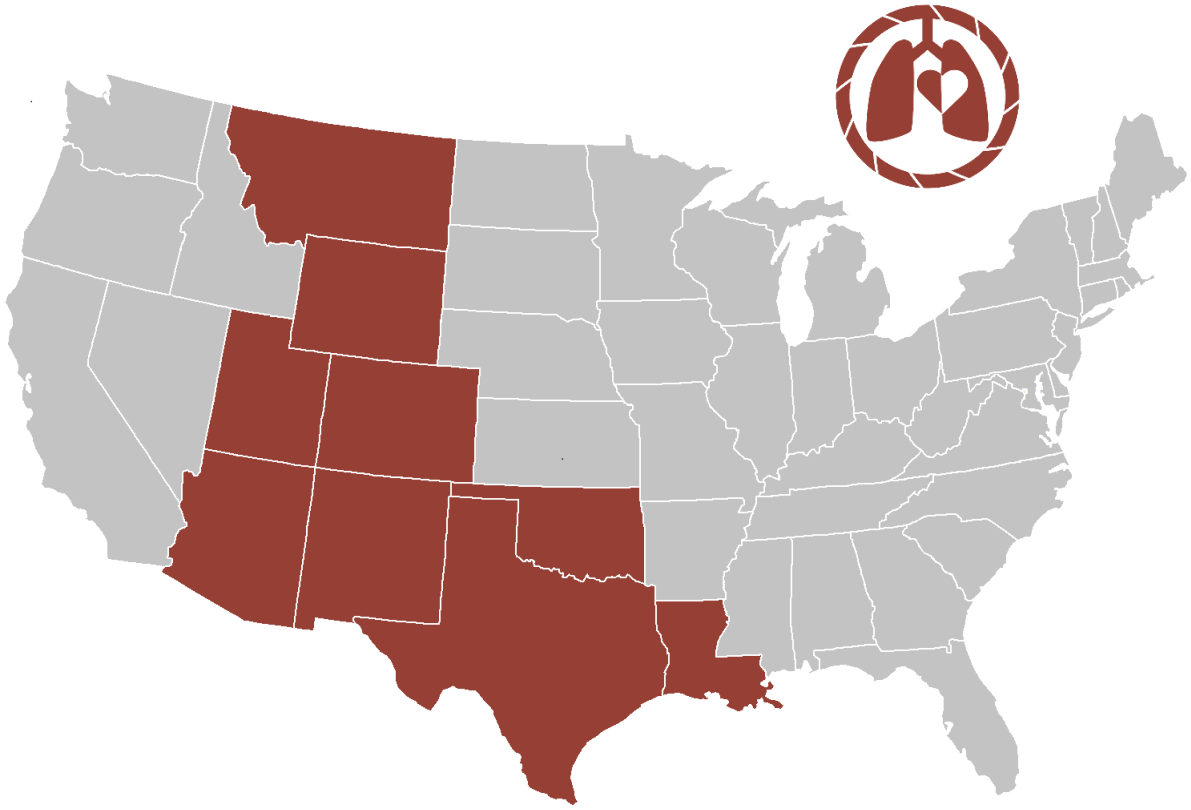
This material is based upon work supported by NASA through contract NNL16AA05C and cooperative agreement NNX14AB60A. Any mention of a commercial product, service, or activity in this material does not constitute NASA endorsement. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Aeronautics and Space Administration and partner organizations.

Fall 2018 Health & Air Quality Projects

2 Projects

1. **New Orleans Health & Air Quality:** *Monitoring the Urban Heat Island Effect on the Health of Residents of the New Orleans, Louisiana Metropolitan Area with Landsat, Sentinel, and MODIS Land Surface Temperature Products*

2. **Intermountain West Health & Air Quality II:** *Utilizing NASA Earth Observations to Help the National Park Service Monitor and Address Visibility in Intermountain Region National Parks*



Project Partners

Louisiana Public Health Institute
National Park Service, Intermountain Region

9 States Impacted

AZ, CO, LA, MT, NM, OK, TX, UT, WY

New Orleans Health & Air Quality

Alabama – Mobile

Community Concern: The Urban Heat Island (UHI) effect can directly impact the health of urban residents. New Orleans' paved surfaces, dark roofs, and grey infrastructures contribute to increases in temperature throughout the city. This phenomenon can increase the rate of hospitalization, stroke, respiratory difficulties, tiredness, fainting, and the risk of mortality.

Partners:

- Louisiana Public Health Institute

Earth Observations:

- Landsat 8 OLI/TIIRS
- Landsat 5 TM
- Sentinel-2 MSI
- Sentinel-3 SLSTR
- Terra MODIS

Impact & Benefit: The project aims to contribute to the LPHI's current clinic monitoring system by recognizing and monitoring severe urban heat levels in New Orleans, LA, and identifying the relationship between New Orleans' urban heat island, the city's land cover characteristics, and health-outcome disparities.

Image Credit: Pixabay

Intermountain West Health & Air Quality II

Virginia – Langley

Community Concern: Clean air supports natural resources including soils, water, vegetation, and visibility. Over the past 30 years, 90% of park visitors surveyed say that scenic views are extremely important to their visit. Park units have inadequate ground monitoring stations for to use for decision making related to air quality.

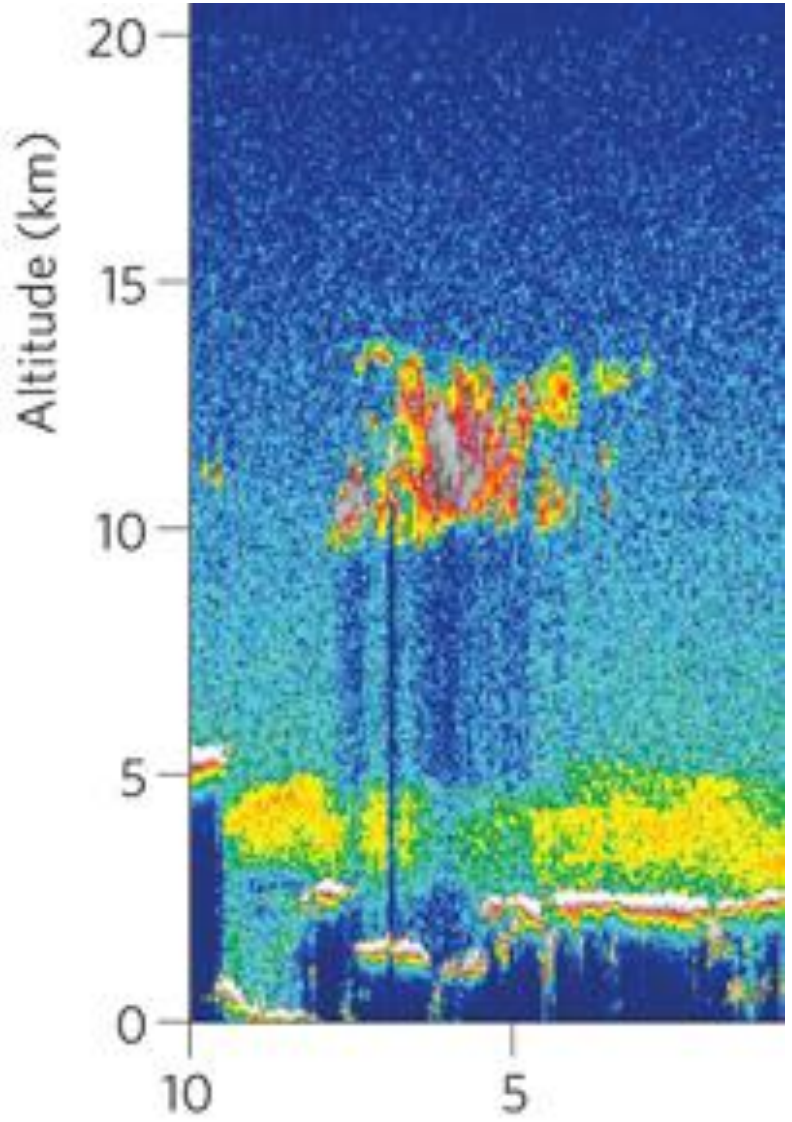
Partners:

- National Park Service, Intermountain Region

Earth Observations:

- Aqua & Terra MODIS
- Suomi NPP VIIRS
- Aura OMI
- Sentinel-5P Tropomi
- CALIPSO CALIOP

Impact & Benefit: This project will build upon previous work measuring pollutant trends and concentrations in the Intermountain Region by providing a vertical profile and measuring aerosol optical depth. This information could identify pollutant sources, allowing the NPS to better prioritize mitigation strategies.



ARSET FY19 Plans

Satellite Remote Sensing of Air Quality

Description: In-person training held as a pre-conference event for the ISPRS Technical Commission V Symposium on "Education & Outreach - Geospatial technology – Pixel to People." This training will fill some of the gaps in skills required to access, analyze and interpret satellite data sets for various air quality applications including, dust and smoke monitoring, urban pollution monitoring, and long term trend analysis.

Motivation: continue ongoing relationship with ISRO, high demand for flood-related training in India

Target Audience: Air quality professionals and decision makers from local, state, and federal agencies, NGOs, and the private sector.

Earth Observations

- Aura
- CALIPSO
- Suomi-NPP (VIIRS)
- Terra/Aqua (MODIS)

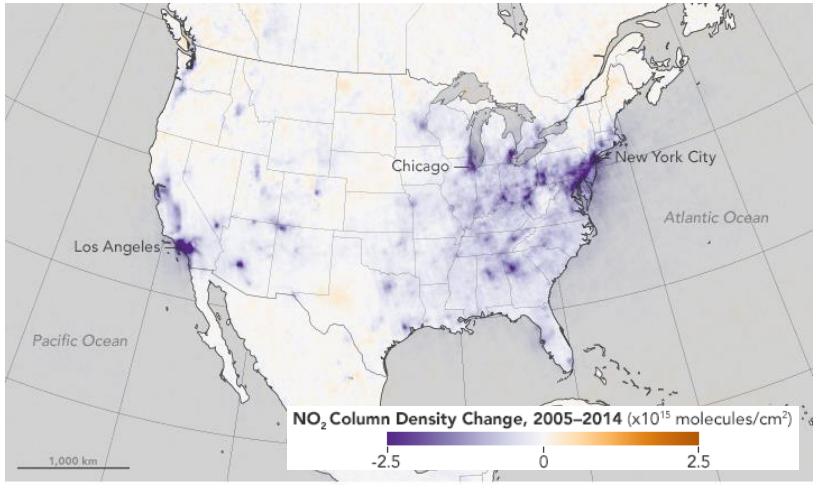
Training Level: ○ Fundamental ○ Introductory ● Advanced

NO_2 and SO_2 Data

Description: Introductory, online series. This webinar series will provide an overview of NO_2 and SO_2 data products from OMI and TROPOMI, present data access and tools to analyze the data products, and discuss how to appropriately use these observations to evaluate model simulations

Motivation: One of our most frequent questions during both webinars and in-person trainings is how to appropriately compare model and satellite observations

Target Audience: End-users who are familiar with satellite observation capabilities and have used online image archives or analysis tools at basic to intermediate levels for air quality applications.



Earth Observations:

- OMI
- TROPOMI (ESA)

Training Level: ○ Fundamental ● Introductory ○ Advanced

Air Quality Monitoring in the Southeast U.S. Using Low Earth Orbiting and Geostationary Satellite Data

Description: Advanced, in-person training. The workshop will detail the application of NASA and ESA's resources to decision-making activities as they relate to air quality monitoring, forecasting, smoke, fire and $PM_{2.5}$ monitoring, image interpretation, and data access for inclusion in modeling efforts.

Motivation: This is a potential region to explore a domestic, in-person training opportunity, possibly by collaborating with HAQAST PIs and end-users in the region.

Target Audience: National and state air quality agencies in the Southeast U.S.

Earth Observations:

- GOES-R
- OMI
- Suomi-NPP (VIIRS)
- Terra/Aqua (MODIS)

Training Level: ○ Fundamental ○ Introductory ● Advanced

Engage with CBP

ARSET

- *Sign up for a training*

DEVELOP

- *Propose a project idea to DEVELOP National Program Office*
- *Volunteer as a Science Advisor on a project*

SERVIR

- *SERVIR Applied Sciences Team solicitation (10/25)*
- *Coordinate projects in SERVIR regions with Science Coordination Office*

National Aeronautics and
Space Administration

THANK YOU