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Integrating Earth Observations and Socioeconomic Data to Identify Vulnerable Populations and Support Environmental Justice Initiatives

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ABSTRACT

Part of NASA's Earth Applied Sciences, DEVELOP is a dual capacity building program that introduces communities to applications of NASA Earth observation data to help inform environmental decision making. These projects are conducted by small teams of students, recent graduates, and early and transitioning career professionals and are tailored specifically to end-user decision making processes. Since 2018, a collaboration between NASA DEVELOP, Groundwork USA and its network of trusts, the AGU Thriving Earth Exchange, and local communities such as the City of Cambridge and the City of San Diego, has culminated in a campaign of 14 projects focused on assessing vulnerability to environmental threats such as extreme heat and flooding. These projects have explored the integration of satellite data and socioeconomic data to discern populations at risk of being negatively impacted and align with Groundwork's Climate Safe Neighborhoods Initiative that explores the relationship between historical race-based housing segregation and current and predicted impacts of climate change. This presentation will introduce an overview of the DEVELOP projects using Earth observations to support vulnerabilities assessments and community resilience, the collaboration with Groundwork USA, and future plans for environmental justice efforts at NASA.

ABOUT NASA EARTH SCIENCE & DEVELOP

Earth Science Division
Conducts and sponsors research to answer fundamental science questions about the environmental changes challenging Earth and delivers sound science to

Applied Sciences
Works to discover innovative and practical applications of NASA Earth Science. Partners with public and private organizations to support environmental decision making.

Capacity Building
Oversees programs supporting the training and implementation of NASA Earth Science applications with end users and the broader public across the United States and the globe.

DEVELOP
Collaborates with decision makers to conduct feasibility studies applying NASA Earth observations to address environmental issues while supporting capacity building efforts in both individuals and institutions

ENVIRONMENTAL JUSTICE & EARTH OBSERVATIONS

The NASA Earth Science Division defines environmental justice as, "The just treatment and meaningful involvement of all people – regardless of race, color, national origin, income, or ability – with respect to development, implementation, and evaluation of programs, practices, and activities that affect human health and the environment."

Environmental changes and hazards across the globe have highlighted a trend of marginalized, minoritized, indigenous and low-income communities are experiencing, and are projected to experience, significant negative impacts and disproportionate burden from climate change and extreme weather events. These injustices are often shaped by their regional political, environmental and social settings. NASA Earth observations are poised to identify and address environmental challenges that disproportionally impact these communities. Earth observations can help us identify areas that are at a particular risk for environmental injustice and can be used as a tool for policymakers to ensure everyone is able to adapt and mitigate to environmental changes across the globe.

DEVELOP'S ENVIRONMENTAL JUSTICE PROJECTS

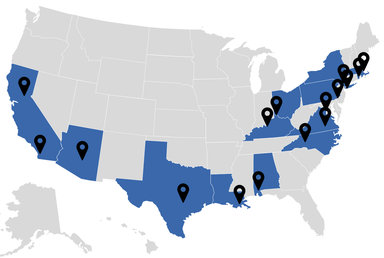
Sample Project Partners Engaged

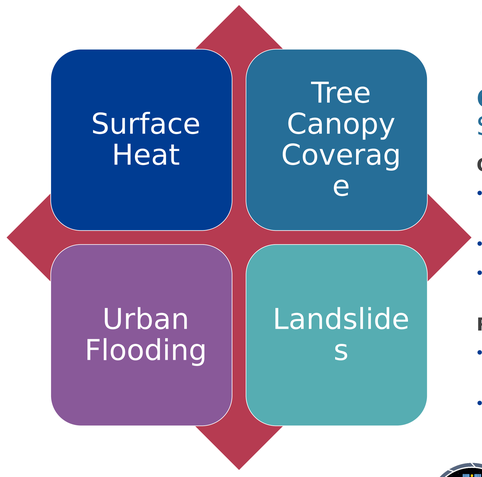
- Groundwork USA
- AGU Thriving Earth Exchange
- City of Austin, Office of Sustainability
- Philadelphia Department of Public Health
- City of New York, Mayor's Office of Resiliency
- Louisiana Public Health Institute
- Charles River Watershed Association

Austin Health & Air Quality
New Orleans Health & Air Quality
Philadelphia Health & Air Quality
Richmond Health & Air Quality

Asheville Urban Development
Cambridge Urban Development
Cincinnati & Covington Urban Development I & II
Fairfax Urban Development
Louisville Urban Development
Mobile Urban Development
New Orleans Urban Development
New York City Urban Development
Providence & Elizabeth Urban Development
Richmond Urban Development
Sacramento Urban Development
San Diego Urban Development
Yonkers Urban Development I & II

Charles River Water Resources





HIGHLIGHT PROJECTS

YONKERS, NY: Leveraging NASA Earth Observations to Support Modeling Urban Cooling Interventions and Urban Heat in Yonkers, New York

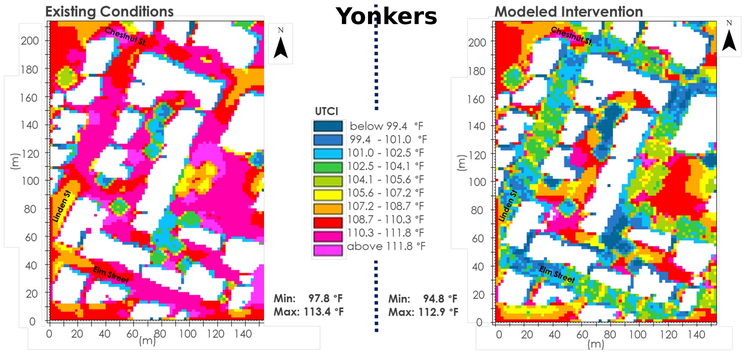
Objectives:

- Map & Conduct Heat Vulnerability Analysis based on social and environmental variables from the New York State Department of Health
- Model outdoor thermal comfort in high heat-vulnerability sites with increased tree canopy using ENVI-Met
- Produce heat literacy graphics and a StoryMap to help residents understand urban heat impacts

Results and Conclusions:

- Sociodemographics and physical properties are closely tied to heat risk and social vulnerability in Yonkers
- Increasing tree canopy along streets is a practical and cost-effective cooling strategy

Thermal Comfort: Old 7th Ward, Yonkers



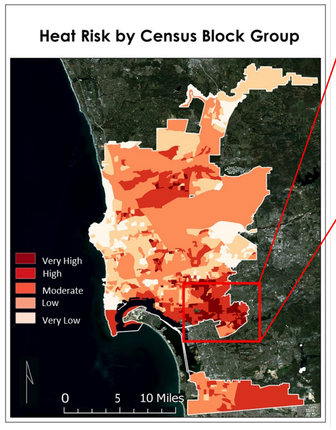
SAN DIEGO, CA: Utilizing NASA Earth Observations to Identify Drivers of Extreme Urban Heat and Generate a High-Resolution Vulnerability Index for Urban Planning and Climate Resiliency in San Diego, California

Objectives:

- Provide thematic maps showing median day and night land surface temperature
- Provide modeled output to show existing landscape cooling capacity and implications of increased tree canopy in targeted areas
- Establish a heat vulnerability index using social and health indicators from the U.S. Census and CDC

Results and Conclusions:

- Areas with the highest vulnerability were found near Skyline-Paradise, Encanto, and University Area neighborhoods
- These areas were identified to be highly vulnerable due to existing health conditions and high percentage of poverty
- Modeled cooling intervention output showed considerable overlap between areas of high heat risk and low heat mitigation/greenspace



Encanto, Skyline-Paradise Hills, Southeastern San Diego

CINCINNATI, OH & COVINGTON, KY: Assessing Flooding and Landslide Susceptibility Along the Ohio-Kentucky Border

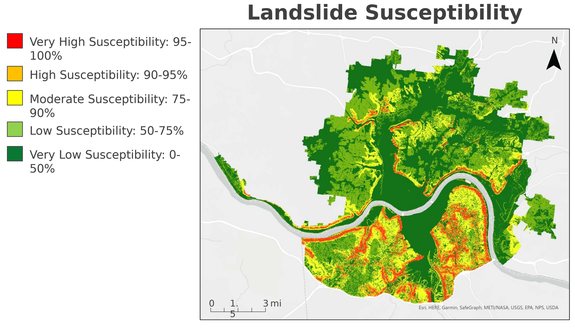
Objectives:

- Map stormwater runoff, runoff retention, and potential damage cost
- Map landslide susceptibility and exposure
- Create a standard operating procedure for future analysis

Results and Conclusions:

- High urbanized land cover types retained less than 10% of rainfall while forested areas retained 90%
- Many intersections between vulnerable populations and landslide susceptibility in neighborhoods such as North and South Fairmount

Landslide Susceptibility



NASA DEVELOP Program

For more information, visit:

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