

Leveraging data, partnerships, and policy to unlock the multiple benefits of tree canopy

Speakers: Derek Ouyang, Maya Briones, Erica Spotswood

Moderators: Belen Seara, Susan Wright

June 24, 2021

Stanford
Future Bay Initiative



SFEI
SAN FRANCISCO ESTUARY INSTITUTE





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WELCOME

Your name, organization, favorite tree



Please comment in the chat



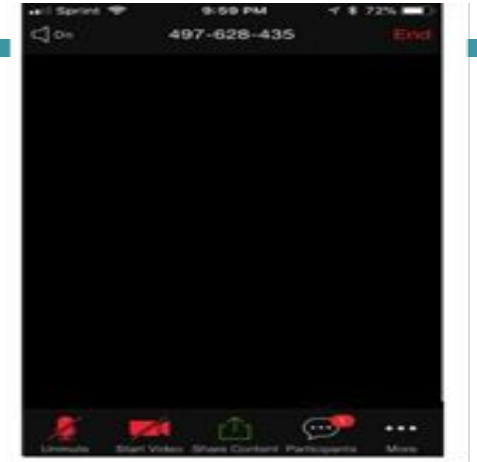
MEETING LOGISTICS

- **Everyone's microphones are muted**, but we encourage you to keep your video on.
- **Please use the chat function to ask questions or make comments during presentation.** Select “Chat” at the bottom of your Zoom window to type a message.
 - During Q/A use Raise Hand button
 - For phone only use *6 to unmute and Thumbs Up to raise hand

If you are having technical difficulties, please email Rosa, rtorpis@smcgov.org or send her a private message in the chat.



Zoom Housekeeping



To Mute or Unmute



End

Extreme Heat Task Force

Identifying gaps and working towards inclusive solutions to extreme heat

- Collaboration: Office of Sustainability & SMC Health
- Government, Academic Institutions, & Community Leaders
- Workplan on hiatus during pandemic--ready to resume development

Interest in joining: email bseara@smcgov.org ;
swright@smcgov.org

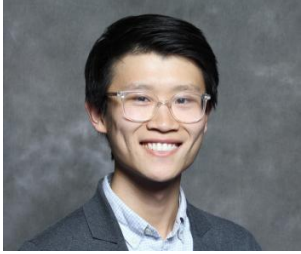


Issues raised by community leaders / EHTF members

- Heat thresholds are inadequate
- Insulation in existing housing stock is insufficient
- Residents lacked AC, air filters, insulating shades
- Lower-resourced neighborhoods have low tree canopy = higher heat
- Need for uniform heat safety message



SPEAKERS



Derek Ouyang graduated from Stanford University in 2013 with dual Bachelor's in Civil and Environmental Engineering and Architectural Design, and in 2015 with a Master's in Structural Engineering and Geomechanics. He has been featured as an up-and-coming designer in the LA Times, in Home Energy magazine's "30 under 30", at TEDxStanford, and at Stanford+Connects NY and Seattle. He is Co-Founder of City Systems and a Lecturer in Stanford's Future Bay Initiative (bay.stanford.edu).



Maya Briones is Community Forestry Manager of Canopy, a non-profit that aims to grow the tree canopy in Midpeninsula communities. Maya coordinates tree planting and stewardship programs in East Palo Alto, Belle Haven and North Fair Oaks. Prior to Canopy, Maya researched the efficacy of the County of San Mateo's Tree Replacement Program as a Planning Intern. She has also co-authored published research the accessibility and quality of urban green spaces in San Jose and the nexus between this and neighborhood disorder.



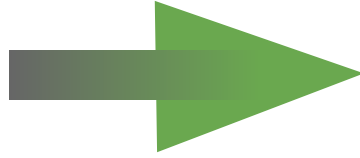
Erica Spotswood is Lead Scientist for the Urban Nature Lab at the San Francisco Estuary Institute. She uses data-driven approaches to quantify the benefits of nature for biodiversity and human well-being, and brings science into design and planning for nature in cities. Her work provides guidance for how to support biodiversity and human well-being, and brings science into design and planning for nature in cities better places for nature and for people.

Outline

- The ecological impacts associated with low tree canopy
- Moving towards a multi-benefit view of tree planting
- New evidence of health impacts through novel data analysis
- Tools and techniques on the ground in East Palo Alto
- Discussion: Our shared opportunities to further reduce inequities



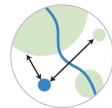
Nature for biodiversity and health in cities



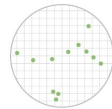
Ecology in cities



Patch Size



Connections



Matrix Quality



Habitat Diversity



Native Plants



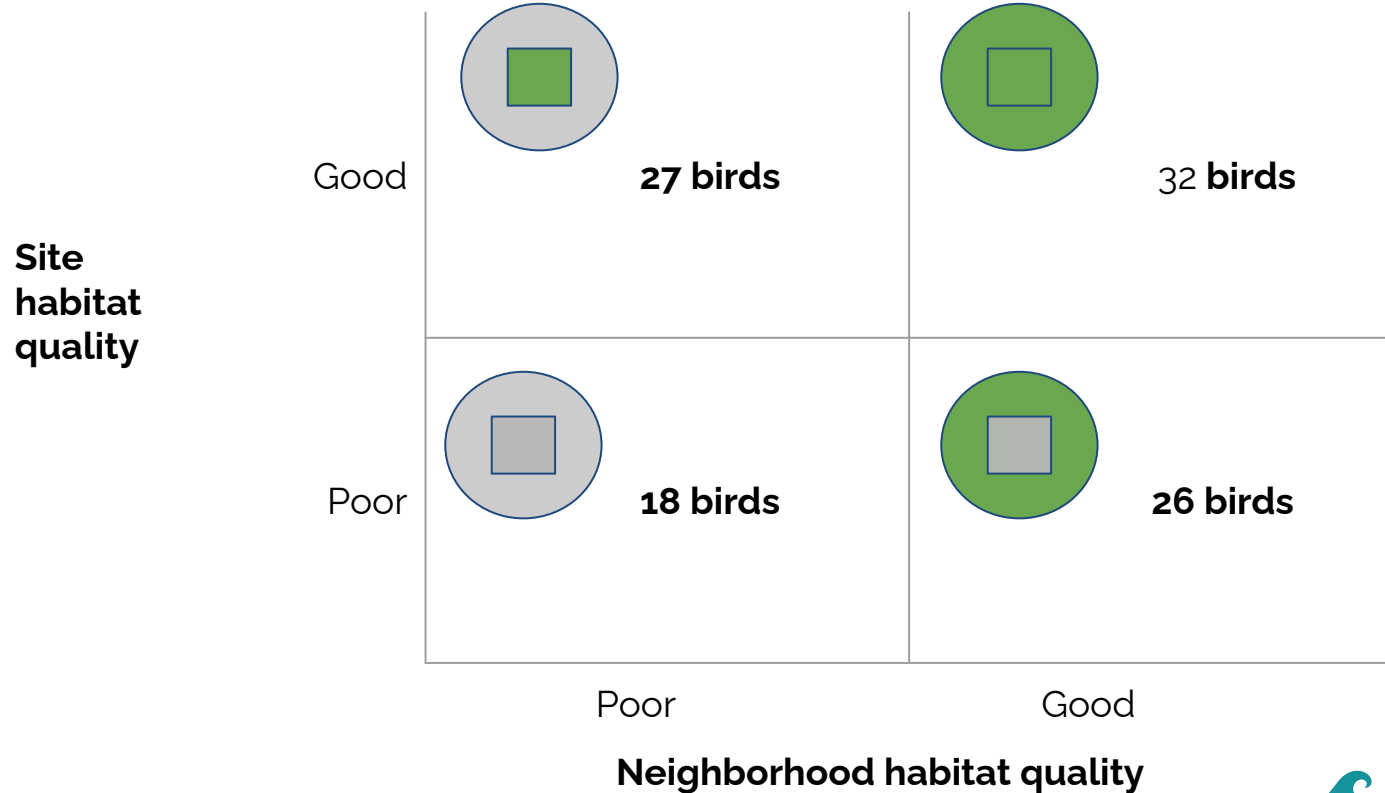
Special Resources



Management

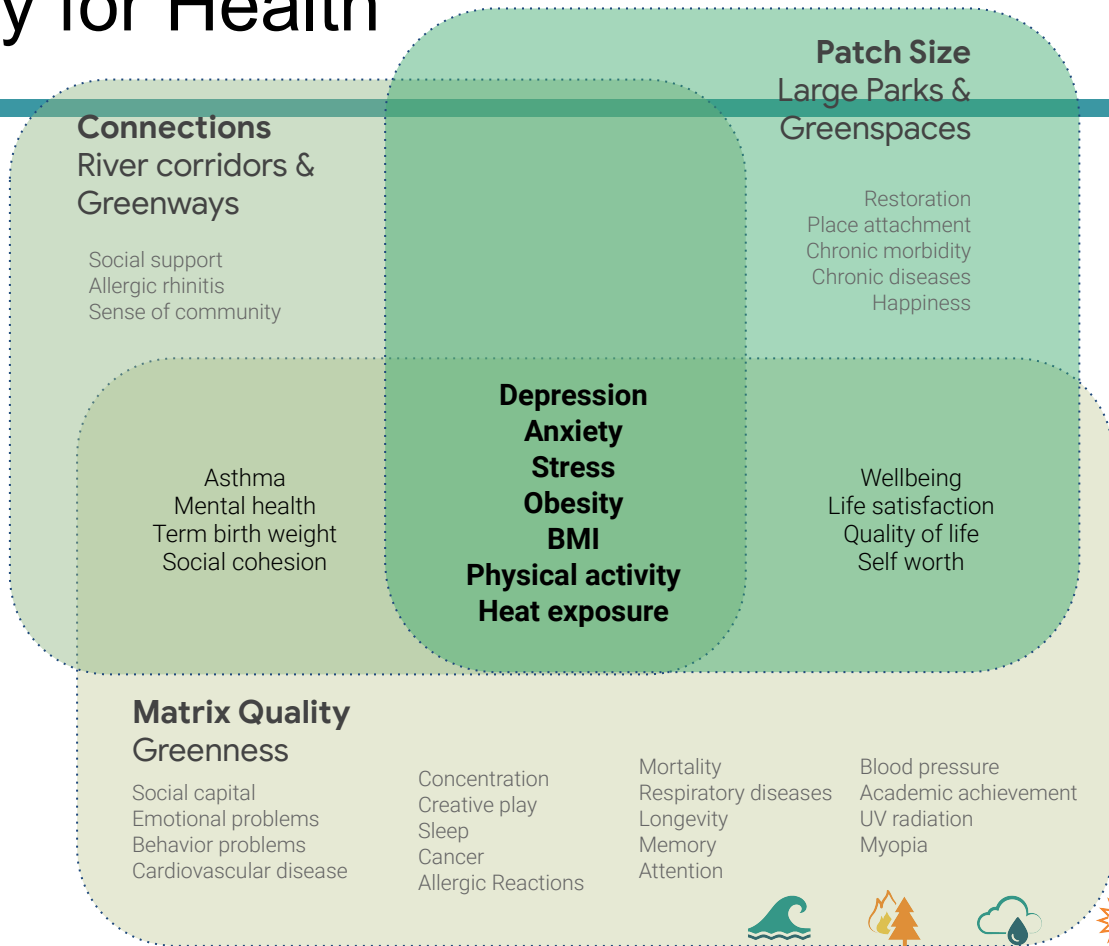


Both site and neighborhood actions matter



Ecology for Health

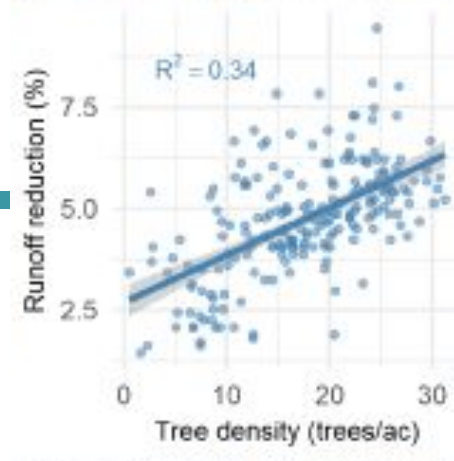
259 Scientific journal articles



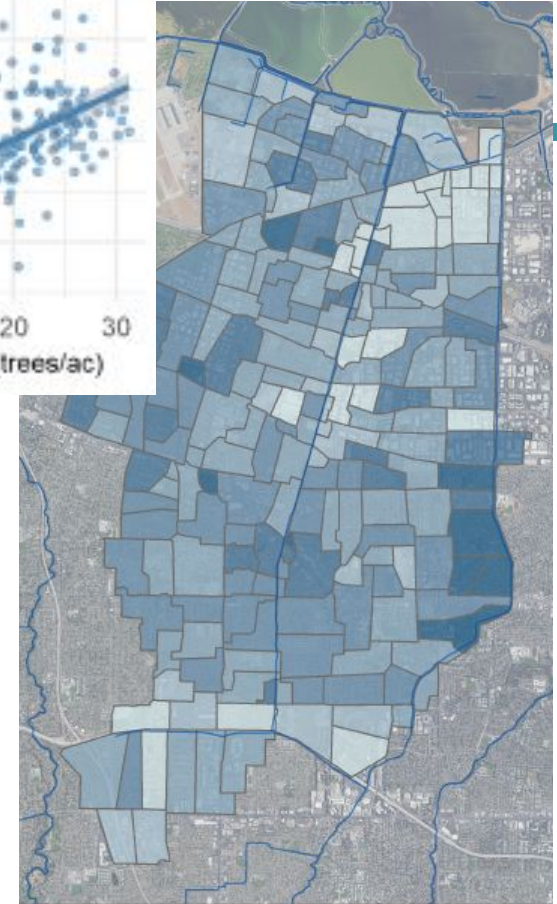
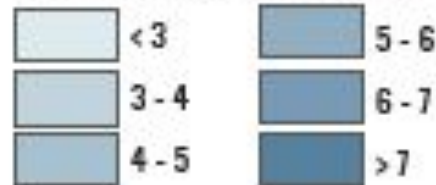
Robert Wood Johnson Foundation
Google
City of East Palo Alto
Acterra
Canopy

Trees & Stormwater

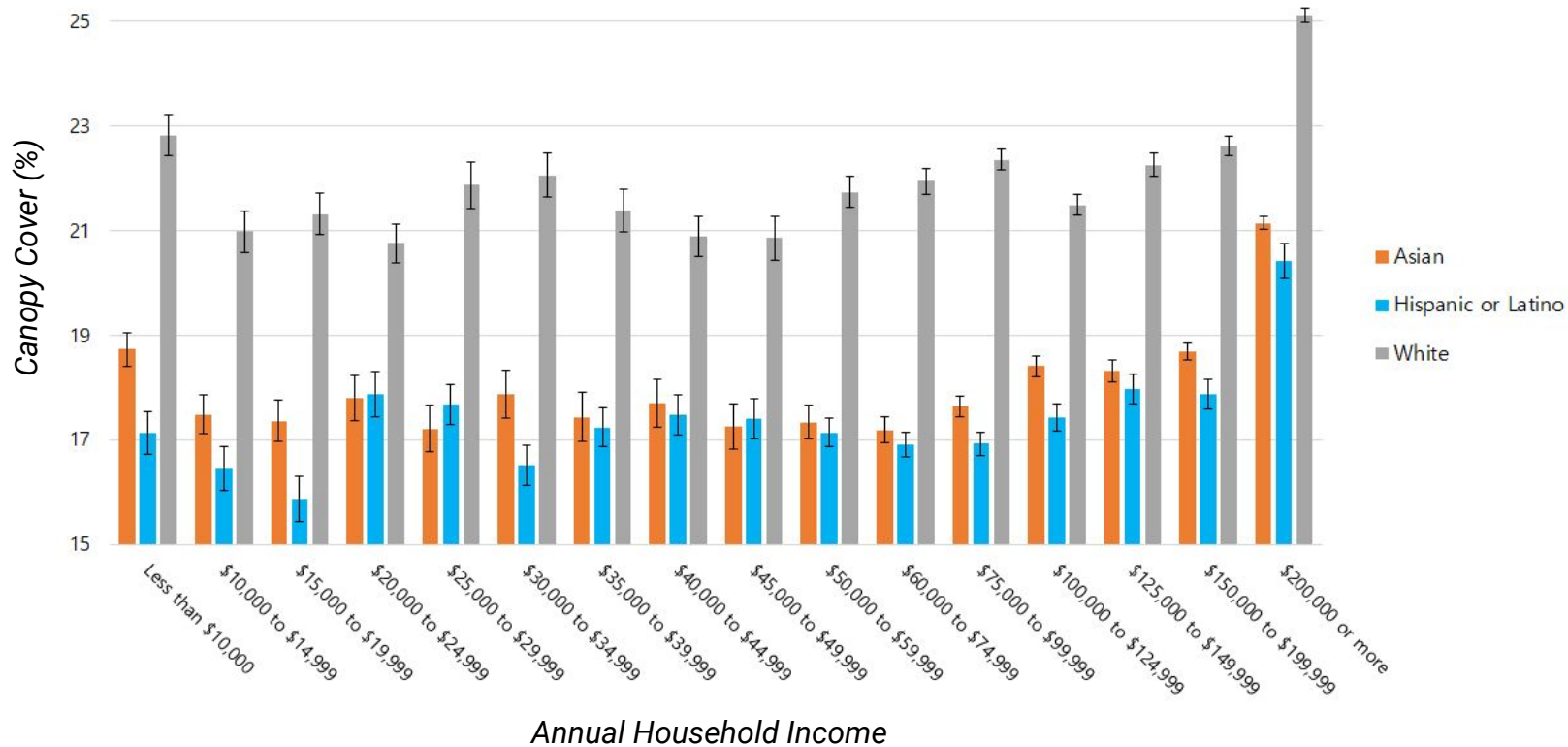
- Tree planting can reduce runoff by 20-30%, BUT
- Impervious removal is biggest driver
- Evergreen trees better than deciduous
- Existing trees already reducing runoff (3-7%)



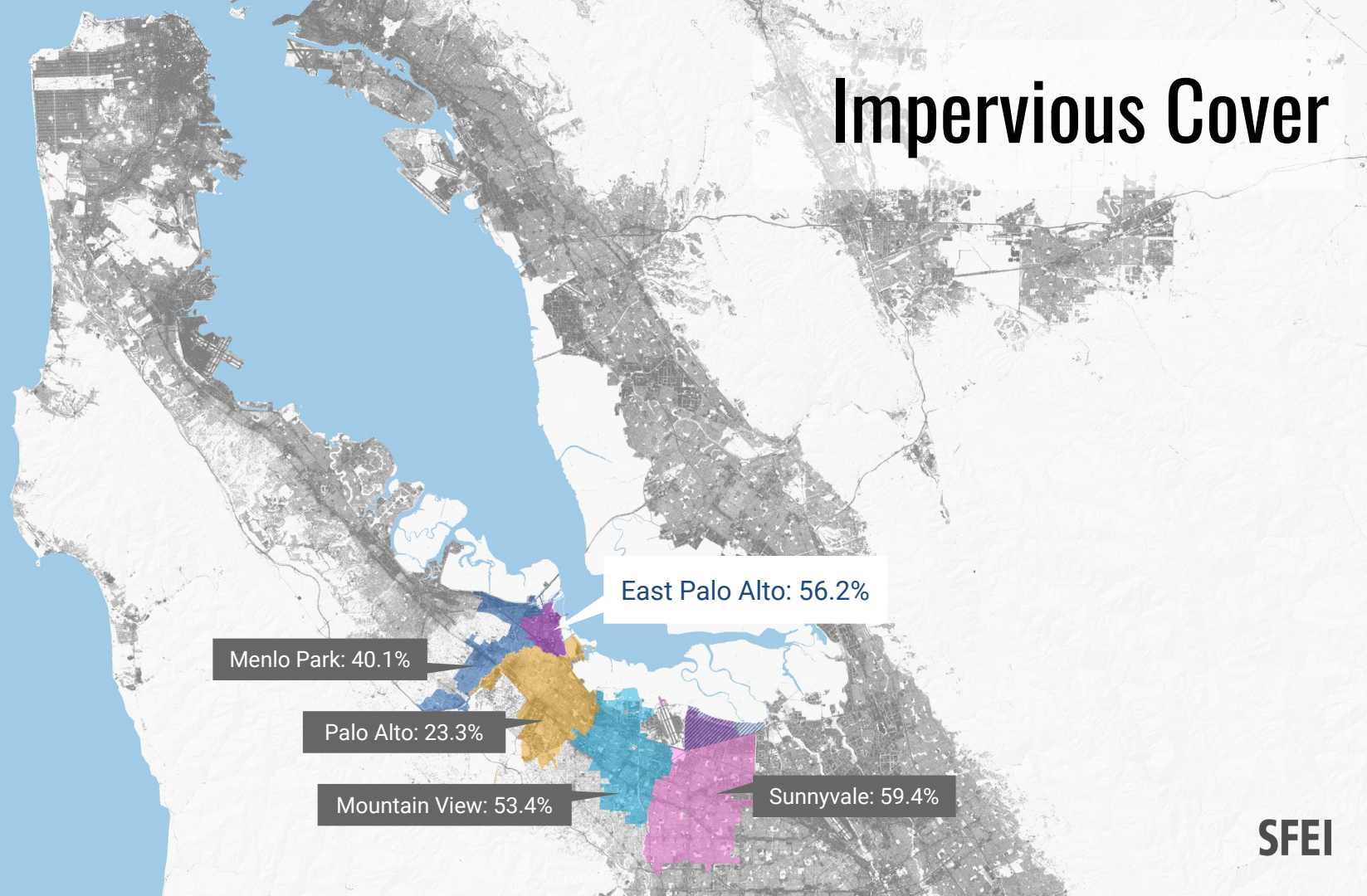
Runoff Reduction (% of Total Precipitation)



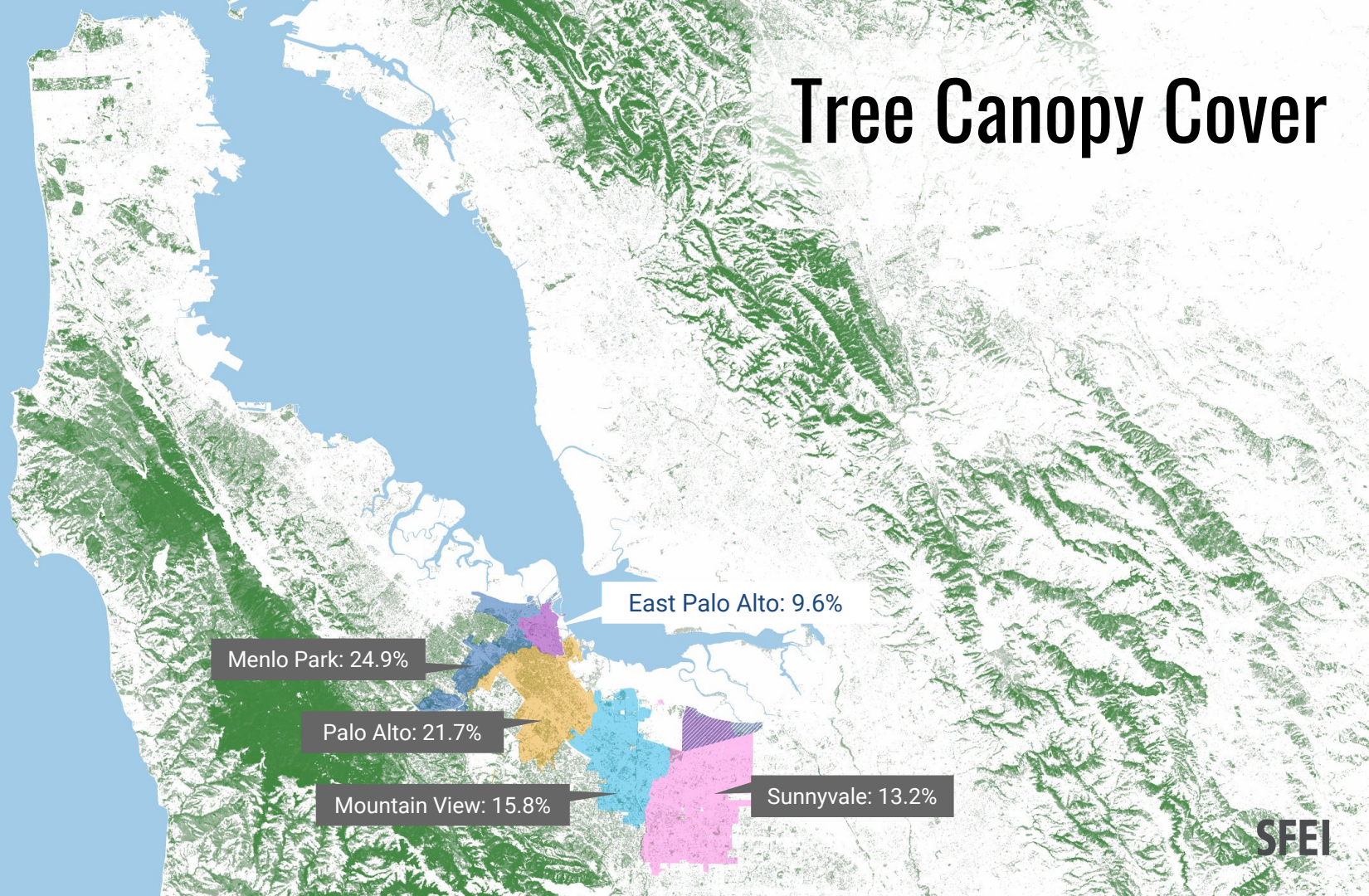
Disparity in tree canopy



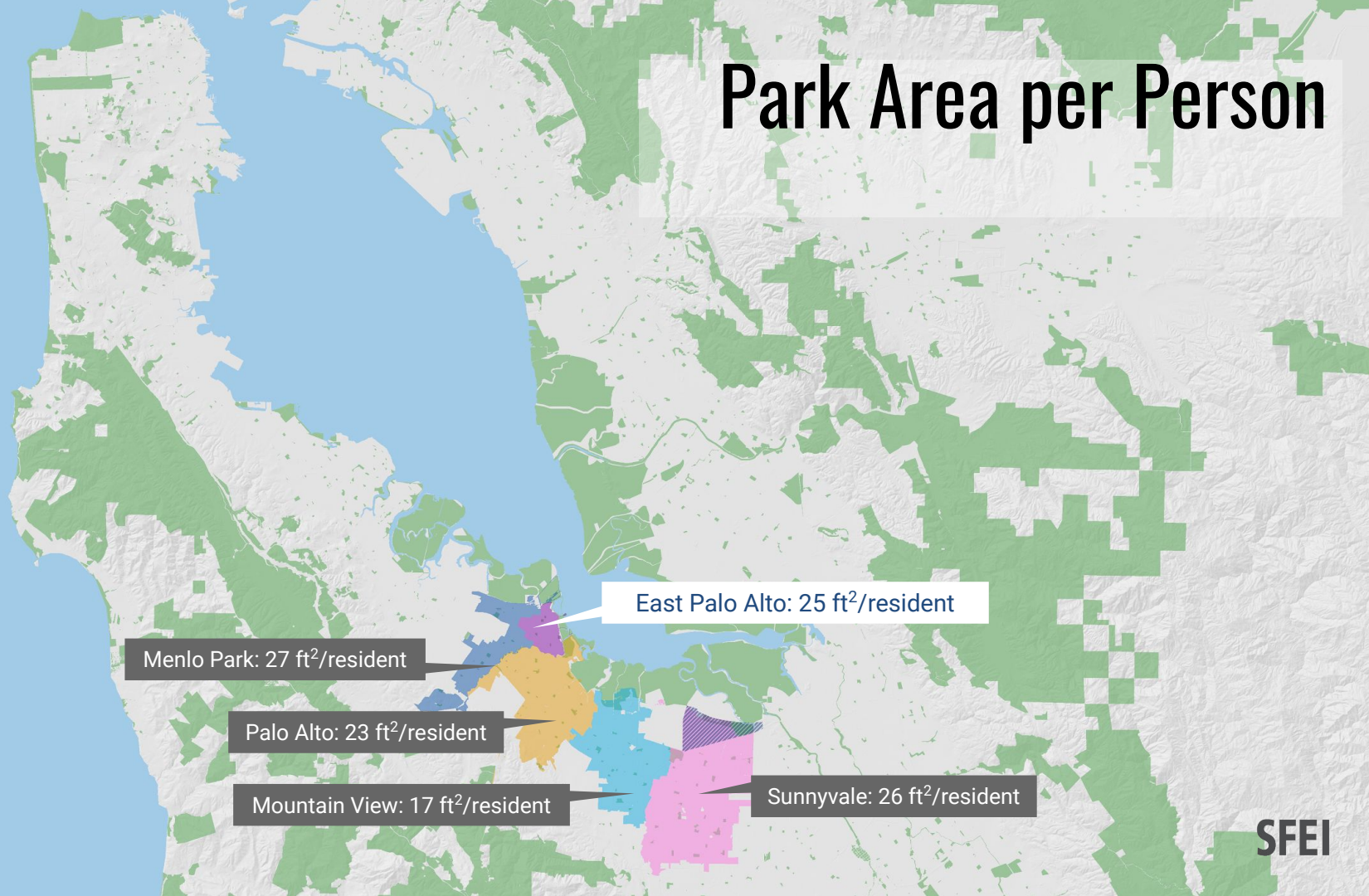
Impervious Cover



Tree Canopy Cover



Park Area per Person



Menlo Park: 27 ft²/resident

Palo Alto: 23 ft²/resident

Mountain View: 17 ft²/resident

East Palo Alto: 25 ft²/resident

Sunnyvale: 26 ft²/resident

- Tie to biodiversity & health science
- Quantify current tree cover
- Estimate benefits of trees
- Gather community input
- Identify community goals for trees

Next 4 slides (Maya + Derek) to be replaced by Erica's intro

Derek will prepare a more focused set of slides on the Stanford health data analysis and opportunity for academic-public partnerships with local counties



Lack of Trees: The Health Consequences



Higher health care costs



Increase in deaths due to air pollution



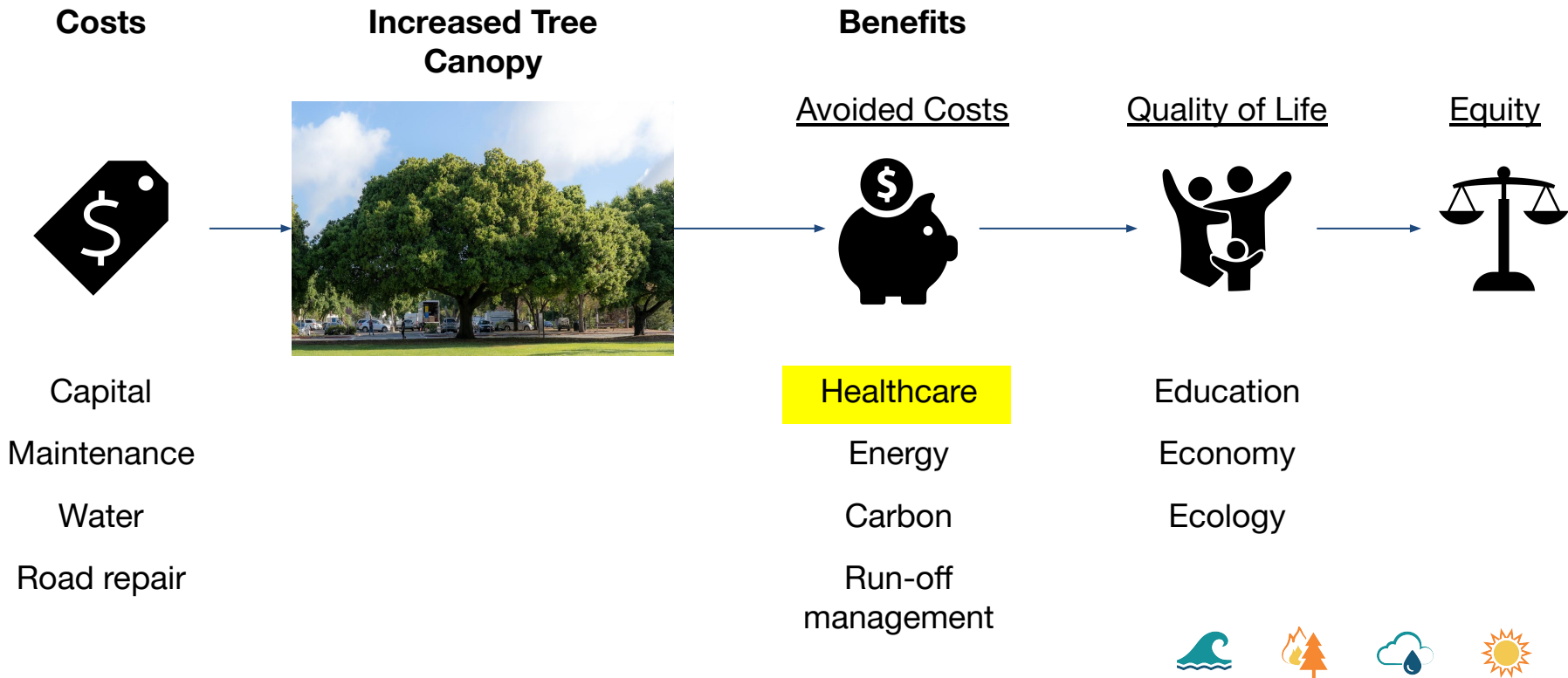
Deteriorating mental health



Decrease in outdoor activity



Towards a multi-benefit framework



Can we measure the impact of heat on health?

News // Weather

Scorching heat wave to push Bay Area temps above 110 in some spots

San Francisco Chronicle e-edition

NEWS

Bay Area's brutal heat wave might be the new normal thanks to climate change

 **Peter Fimrite**
Aug. 18, 2020 | Updated: Aug. 18, 2020 1:05 p.m.

Research | [Open Access](#) | Published: 24 January 2012

Emergency department visits, ambulance calls, and mortality associated with an exceptional heat wave in Sydney, Australia, 2011: a time-series analysis

[Andrea Schaffer](#) , [David Muscatello](#), [Richard Broome](#), [Stephen Corbett](#) & [Wayne Smith](#)

Environmental Health 11, Article number: 3 (2012) | [Cite this article](#)

7970 Accesses | 75 Citations | 46 Altmetric | [Metrics](#)



KQED Inform. Inspire. Involve.

Epidemiology of Hospitalizations and Deaths from Heat Illness in Soldiers

ROBERT CARTER III¹, SAMUEL N. CHEUVRONT¹, JEFFREY O. WILLIAMS², MARGARET A. KOLKA¹, LOU A. STEPHENSON¹, MICHAEL N. SAWKA¹, and PAUL J. AMOROSO¹

¹United States Army Research Institute of Environmental Medicine, Natick, MA; and ²Social Sectors Development Strategies, Inc., Natick, MA

[Coronavirus](#) [Climate](#) [Earthquakes](#) [Deep Look Videos](#)

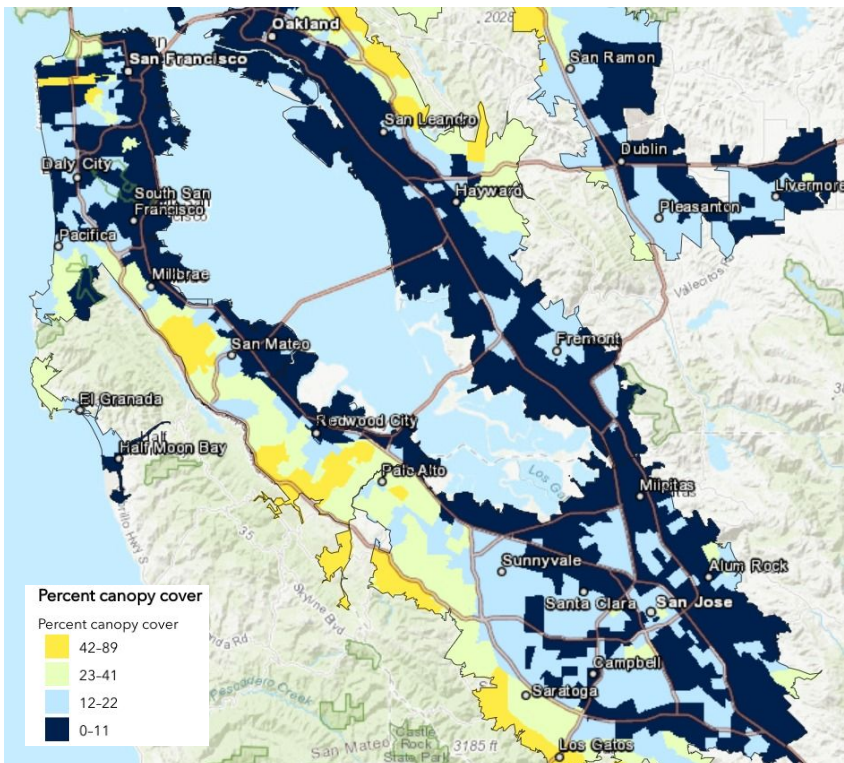
CLIMATE

Extreme Heat Killed 14 People in the Bay Area Last Year. 11 Takeaways From Our Investigation

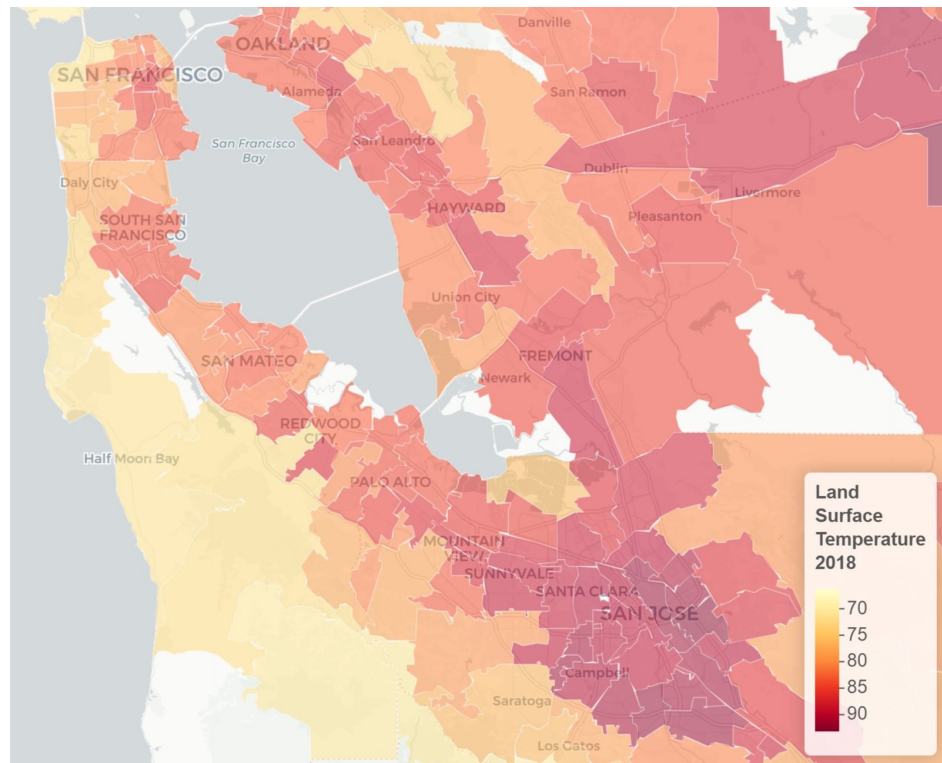
By Molly Peterson  Oct 17, 2018 [Save Article](#)



Low canopy coverage and high impervious surface correlated with high urban heat island



[Urban Tree Canopy in California, US Forest Services](#)

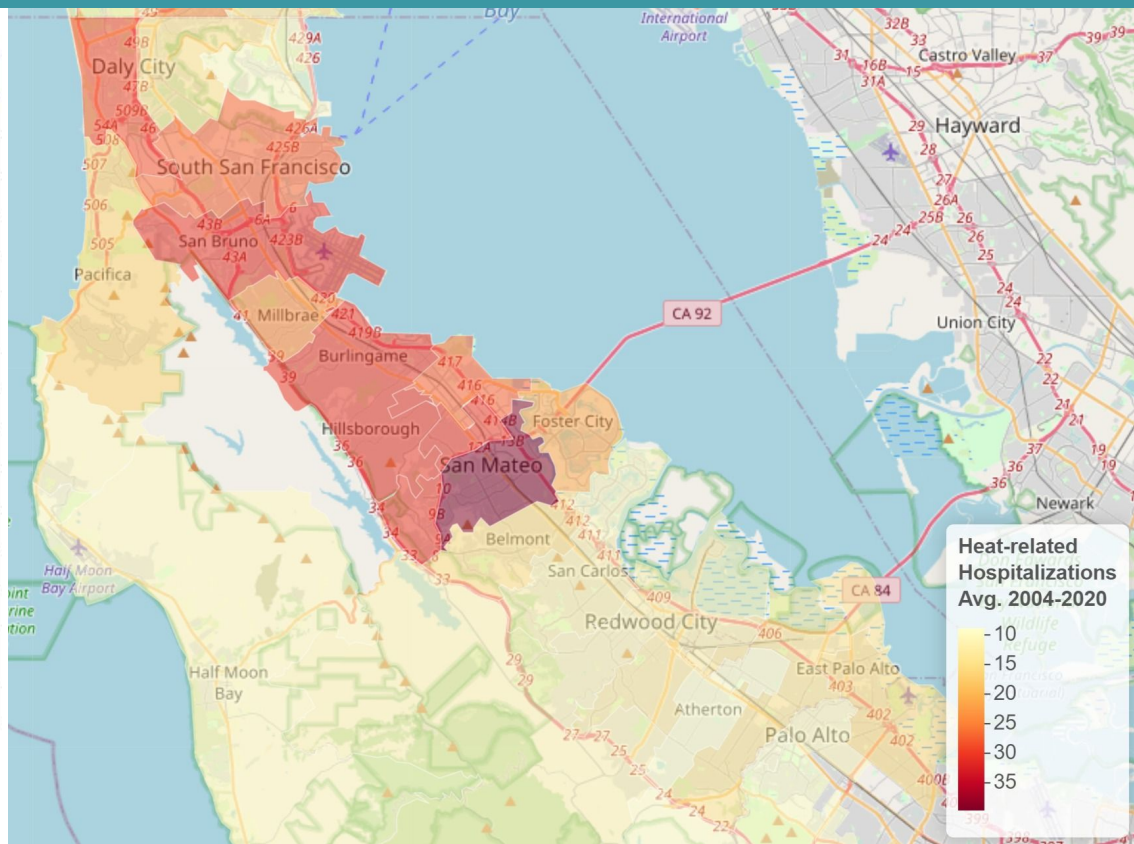


Google Earth Engine



Stanford analysis of healthcare data, member enrollment & medical diagnosis

ICD-10 Code	Diagnosis
T67 (category)	Effects of heat and light
T67.0	Heat stroke and sunstroke
T67.1	Heat syncope
T67.2	Heat cramps
T67.3	Heat exhaustion, anhydrotic
T67.4	Heat exhaustion due to salt depletion
T67.5	Heat exhaustion, unspecified
T67.5	Heat fatigue, transient
T67.7	Heat edema
T67.8	Other specified heat effects
T67.9	Unspecified effects of heat and light
E87.0	Hypersmolality
E87.1	Hyposmolality
T73.2	Exhaustion due to exposure
T73.3	Exhaustion due to excessive exertion



SMC hospital data would refine our understanding of the health impacts of heat + canopy

Data inputs

Heat data



Google Earth Engine

Canopy data



USDA FOREST SERVICE

Population data



AMERICAN
COMMUNITY
SURVEY
U.S. CENSUS BUREAU

Hospital data



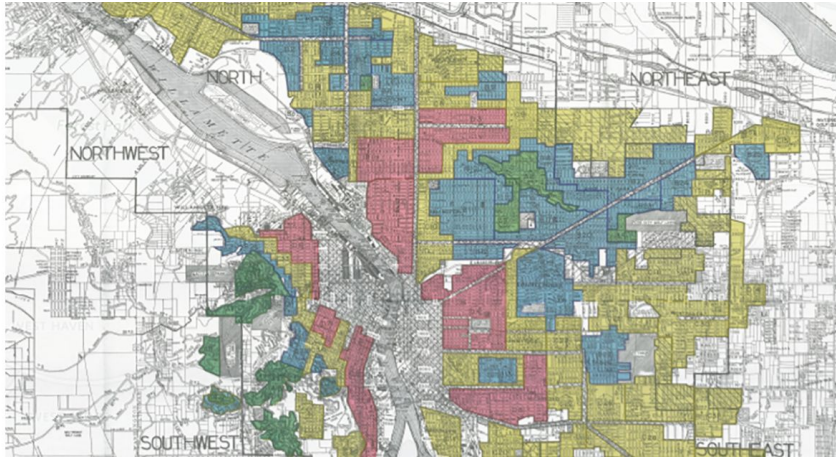
Statistical modeling

X increased tree canopy → Y decreased hospitalizations

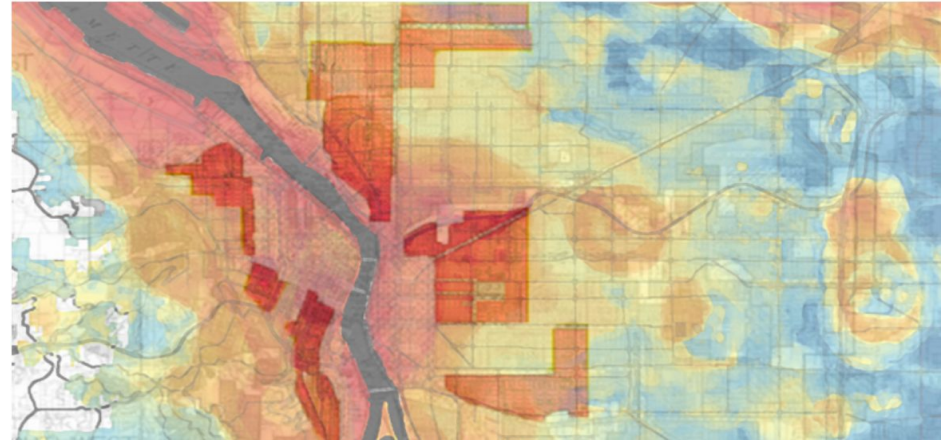


Past policies created lasting inequities

Redlined Portland Oregon



Heat Islands in Portland



Can today's policies do the reverse?



Case Study: Canopy in East Palo Alto

- Incorporated in 1983
- Canopy cover ranges from 2-13%
- Small government with limited resources
 - No parks department
 - No city arborist

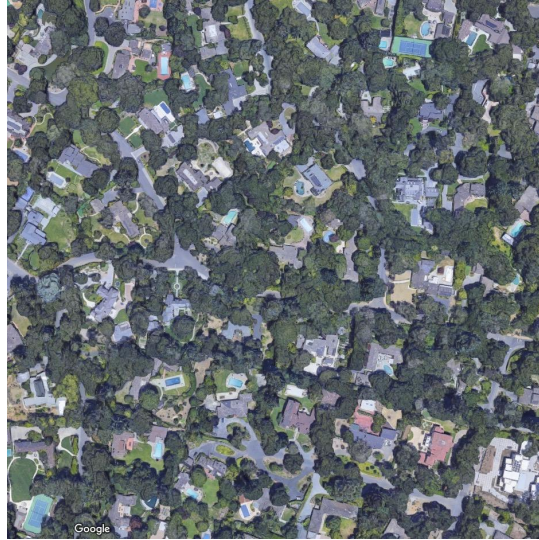
Canopy started planting trees in East Palo Alto in 2006.



The Green Gap



Palo Alto



Menlo Park



East Palo Alto

Blockbusting & Redlining



Redlining is shown by the division of East Palo Alto and Palo Alto with the free way dividing both.



First few plantings



- West bayshore/101 soundwall
- Schools
- Wangari Maathai Grove



Model - Planting, Education, Advocacy

- Free consultation with a tree specialist who will
 - Recommend an appropriate species
 - Check utilities
 - Purchase and plant the tree
- Free tree + planting
- 3 years of free tree care
- K-12 and Adult Education classes
- Tree care trainings/workshops
- Working with government officials

Canopy planted trees: 3074





Stanford Future Bay Initiative

The screenshot displays the 'Tree Plotter Inventory' application interface. It features a map of a residential area with several colored markers (green, yellow, red) indicating tree locations. An 'ADVANCED FILTER' dialog box is open, allowing users to filter the data. The filter settings are as follows:

- Tree Filter:** Alerts = (Red - Immediate Action or Yellow - Watch This Tree) and Program = (Branching Out: Trees for East Palo Alto)
- Alerts:** Alerts (with a close button 'X').
 - Toggle All
 - Red - Immediate Action
 - Yellow - Watch This Tree
 - Null Options:** Not
- Program:** Program (with a close button 'X').
 - Toggle All
 - Branching Out: Belle Haven
 - Branching Out: North Fair Oaks
 - Branching Out: Trees for East Palo Alto

Buttons for 'APPLY', 'CLEAR ALL FILTERS', 'Global Filter Settings', 'SAVE VIEW FILTER', 'CLEAR TREE FILTERS', and 'TREE MAP FILTER' are visible. The app header includes 'WELCOME', 'HUB', and 'DATA' options.



Prioritizing Tree Planting with a Parcel-level Analysis

Adjusted to show overall score based on current weighting

MapLayer:

Overall Score

Assessment of East Palo Alto parcels for tree planting for a score from 0 to 1. Higher score indicates an area with higher need of trees (more foot traffic, fewer trees, higher temperatures, etc.)

See more detailed documentation [here](#).

Adjust the weight of the sliders below to view overall score. Note: slider weights should total to 1.

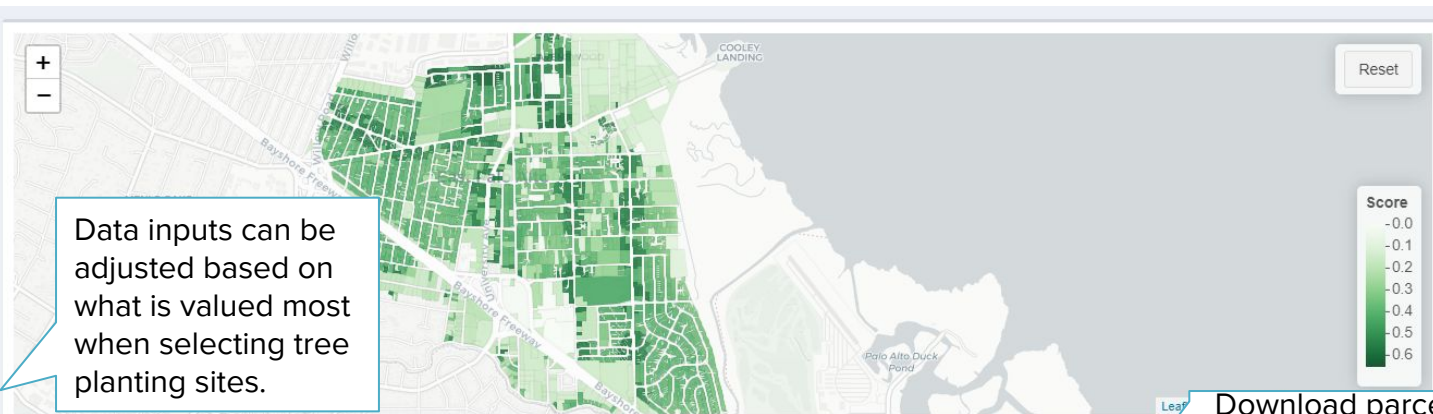
Pedestrian Traffic Pre-COVID



Thermal Data



Thermal with buffer



Data inputs can be adjusted based on what is valued most when selecting tree planting sites.







Download parcel-level data

Show 10 entries

Excel CSV PDF Column visibility

APN	Address	Score	Ped. Traffic Pre-COVID	Raw Thermal	Raw NDVI	Plantable Area	DAC & Low Income	Low Income	Near Bus Stop	Property Type	Exemption Code
AI	AI	AI	AI	AI	AI	All	AI	AI	AI	AI	All
055422060	1020 OBRIEN DR	0.1592	298.4	95.4	0.0279	1978.8	Yes	Yes	No	AI	38
055422070	950 OBRIEN DR	0.1593	298.4	94.6	0.0186	3140.4	Yes	Yes	No	AI	38

Types of Data

Type of data	What we measured	Source
 Parcel type	Parcel type (e.g., single family, commercial, school)	San Mateo County Assessor data
 Proximity to disadvantaged community	Parcels within ½ mile of a disadvantaged community, on census tract level	California Air Resources Board
 Pedestrian traffic	Estimated foot traffic on the sidewalk in front of each parcel	Safegraph
 Average surface temperature	Average surface temperature of each parcel (at 30m resolution) and for each parcel with a 1/16 mile buffer to mimic “how hot is it if I go for a walk?”	Aug 2020 NASA satellite image
 “Greenness” index	“How green is this parcel” using the Normalized Difference Vegetation Index (NDVI) and for each parcel with a 1/16 mile buffer to mimic taking a walk	2017 San Mateo County drone scan
 Potential front yard plantable area	Estimated front yard potential plantable area using building footprint data, location of sidewalks, and 10-foot circle that Canopy requires to plant a tree	San Mateo County Assessor data



A Call for Partnership



There are so many barriers to planting trees

- Existing infrastructure does not allow for trees including utility lines above and below ground
- Limited plantable area do to concrete and polluted soils
- Lack of funding to support urban forestry
- Outreach efforts are complicated and take a long time
- Resident push back is always a factor. There's often a distrust between residents and local governments, especially in historically redlined communities
- Sometimes plantable area is mostly on private property. How do we convince residents that trees are important?

How do we work together to solve this?



Discussion

- What are additional barriers you are facing in your jurisdiction?
- How has your jurisdiction been able to address those barriers?
- What else can be done? What resources, skills, collaborations are needed?



Closing Thoughts

- There is less disagreement on the value of trees than we might expect; it's really practical barriers and inertia that get in the way!
- Cross-jurisdictional working group to address barriers?





**CLIMATE
READY**
SAN MATEO COUNTY

Thank you!

Interested in joining the Extreme Heat Task Force ?

Belen Seara: bseara@smcgov.org

Susan Wright: swright@smcgov.org



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SUSTAINABILITY
COUNTY OF SAN MATEO



**SAN MATEO
COUNTY HEALTH**
All together better.

