



Heat in Cities: What It Means for Human Health

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& School of Geographical Sciences and Urban Planning**

DCDC/WET Education Workshop | Tempe | July 2015

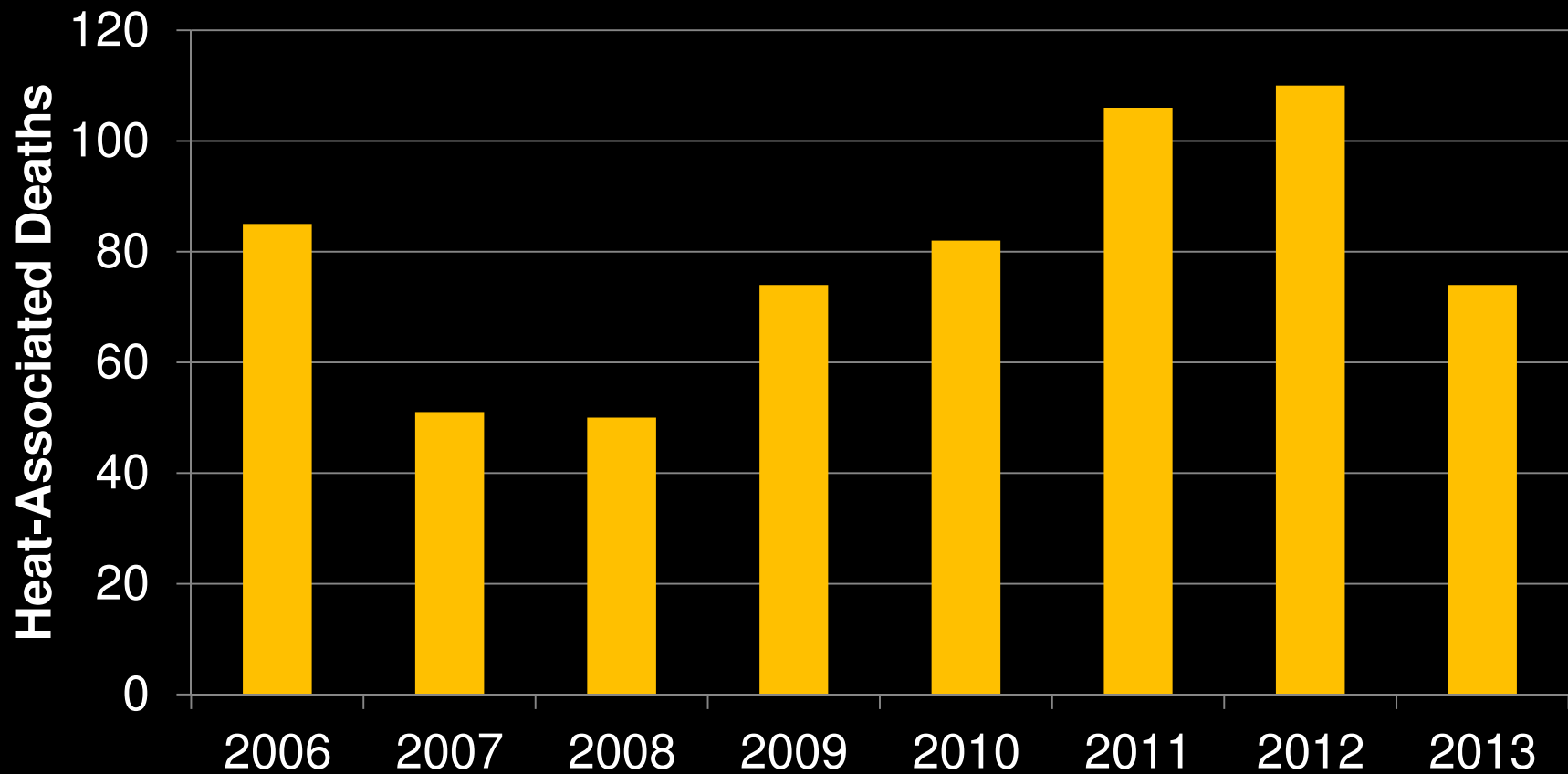


Heat

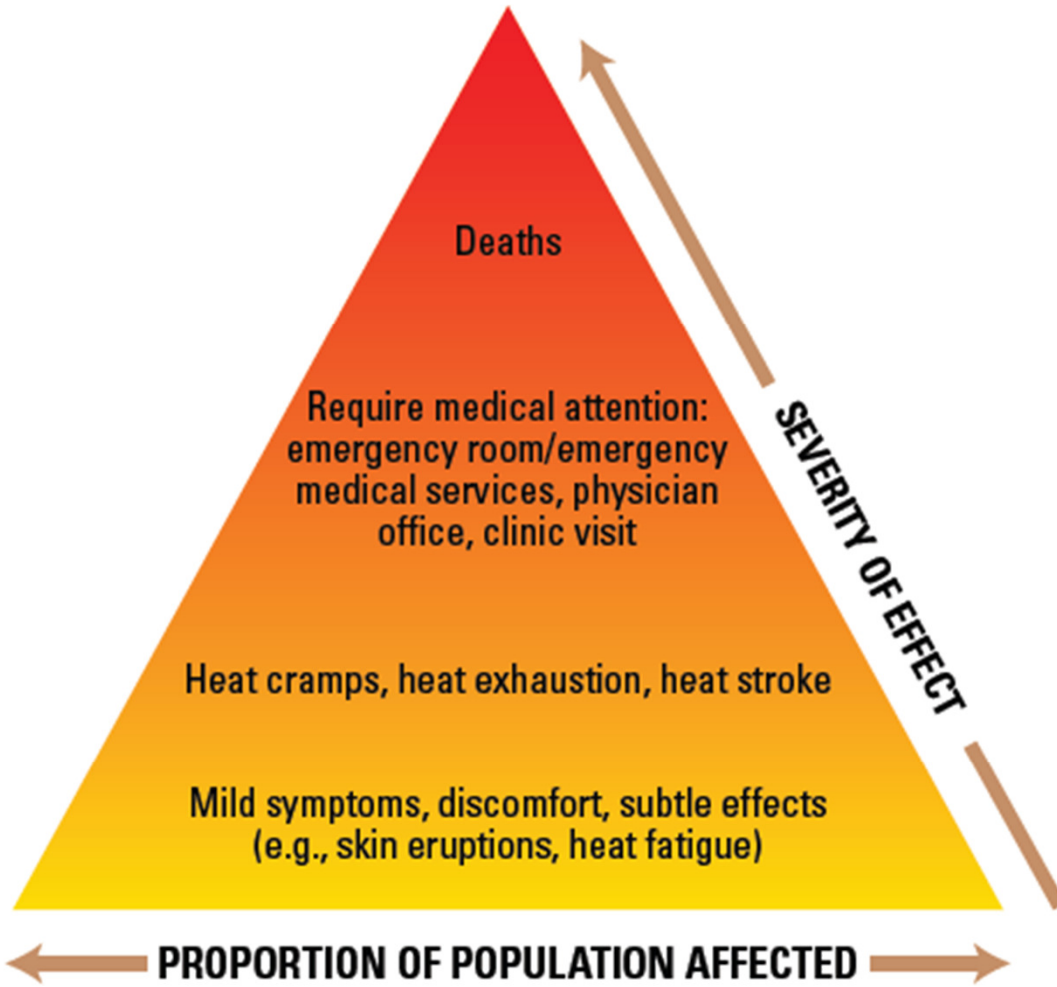
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Extreme Weather?

Heat-health impacts in Maricopa County



EXTREME HEAT EVENTS CAUSE A RANGE OF HEALTH PROBLEMS



Extreme heat events cause health problems and can make other health problems worse. Mild effects are more common, but in extreme cases, people can die.⁷

**Maricopa County
2008–2011**

153
deaths

1,336
hospitalizations

5,247
ED visits

Heat & Water?

Phoenix mayor calls for donations of bottled water

Associated Press

Wed May 29, 2013 3:44 PM

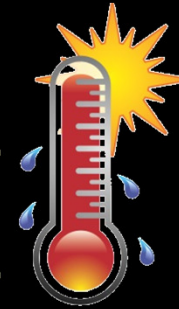
Phoenix Mayor Greg Stanton is calling on employers and individuals to donate bottled water to be given away to the homeless and others in need during the hot summer.

Stanton is renewing a so-called “call for water” that **resulted in the city collecting and distributing more than 210,000 bottles of water last year.**

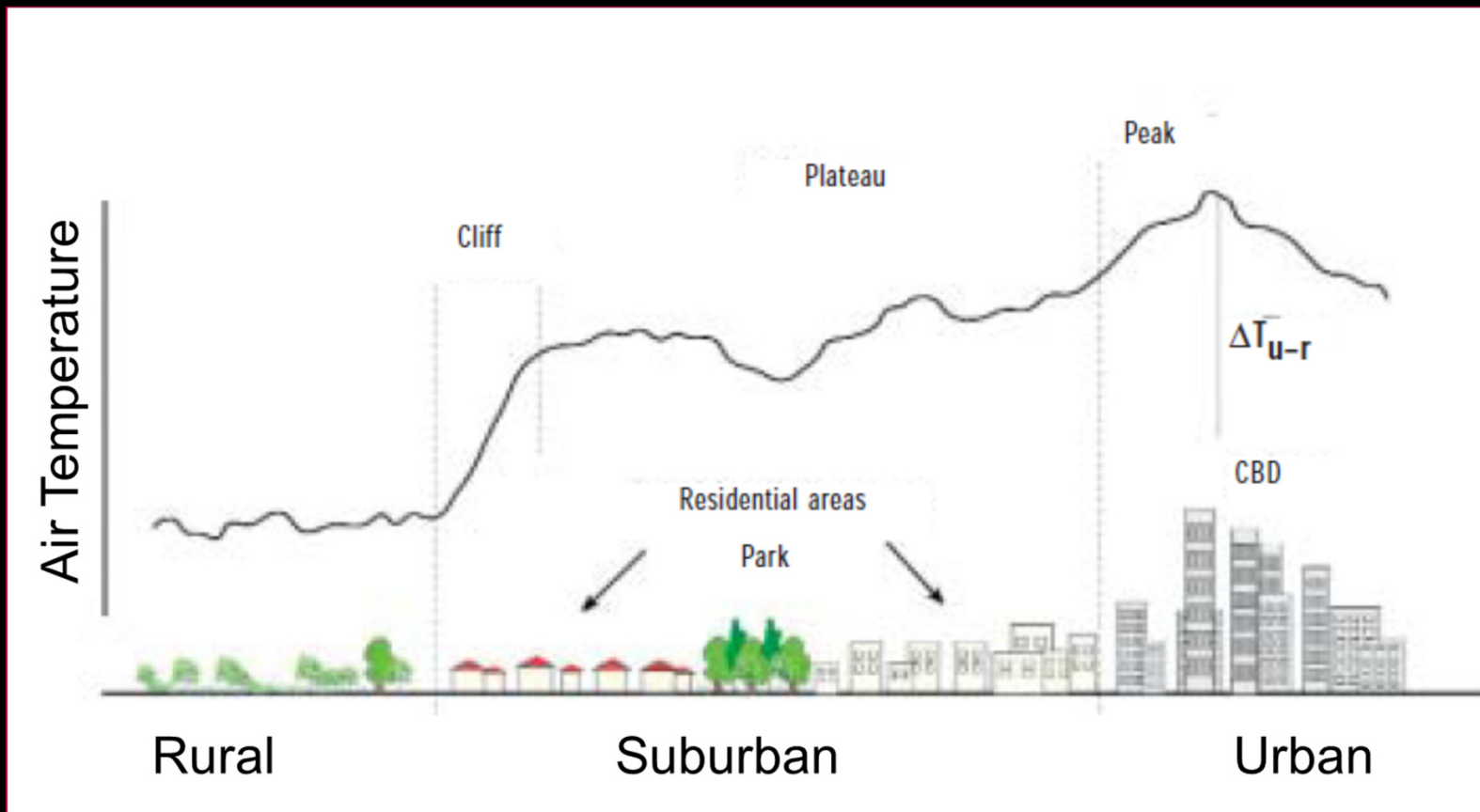
According to Stanton’s office, the donated water goes to the homeless, individuals with disabilities, homebound seniors and young people and families.



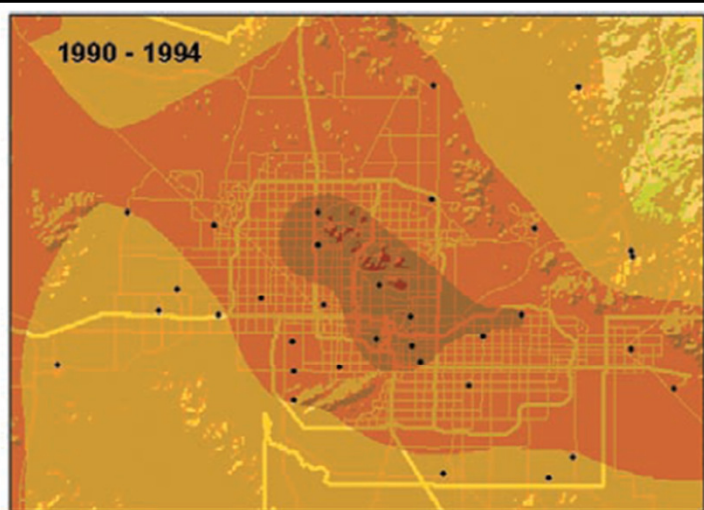
Heat in cities



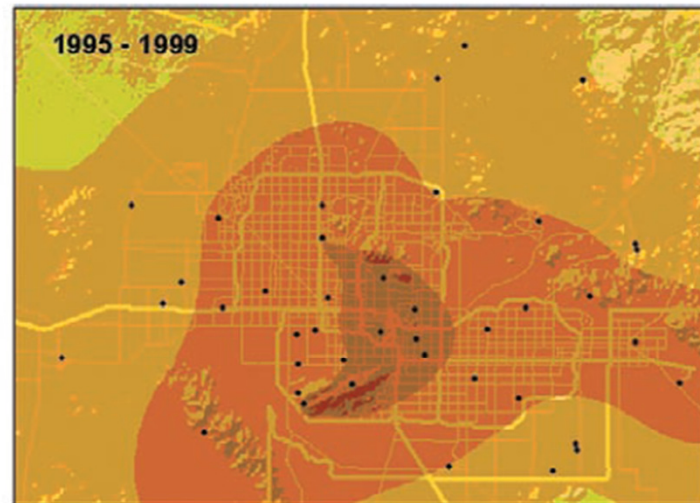
Heat in cities



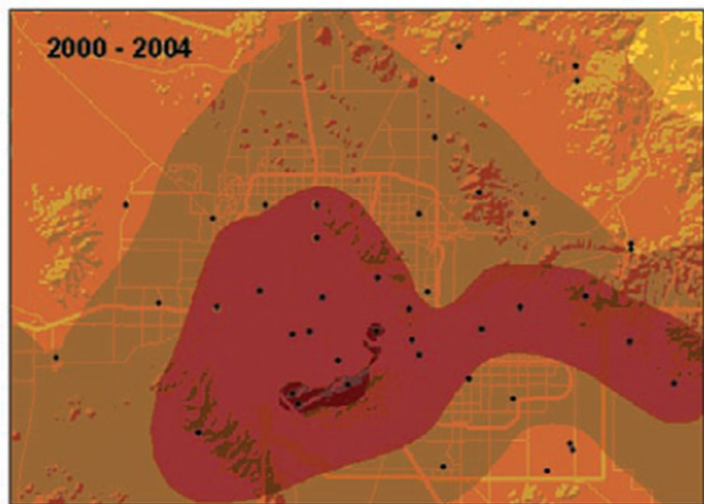
Phoenix's UHI



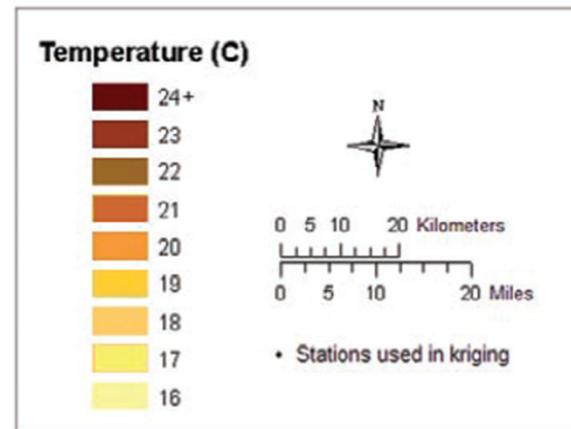
a)



b)



c)



Research Areas

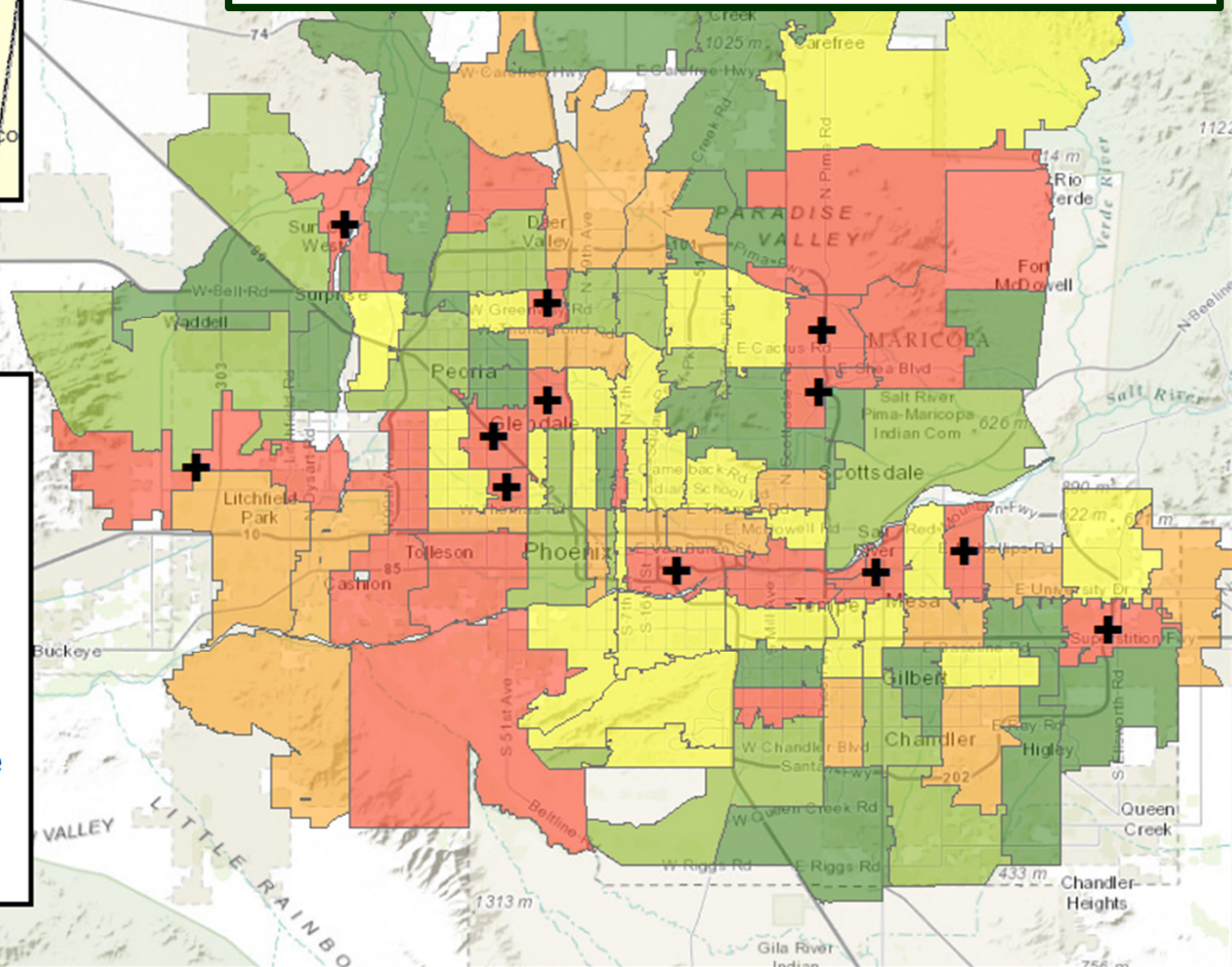
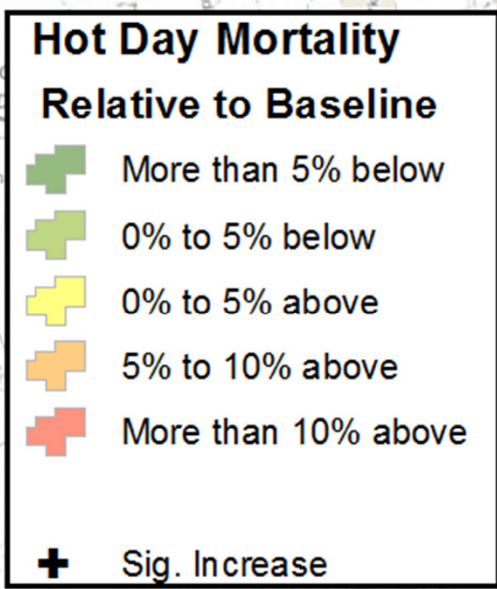
- Spatial Analysis of Heat Impacts
- Individual Heat Exposure
- Urban Climate Modeling

(d) Phoenix

Average summer max. temp: 39.9°C

Threshold temperature (T*): 42.5°C

Average RR when T* exceeded: +3.7%



(d) Phoenix



(+) Medium-intensity development

$p < 0.01$, Adj. $R^2 = 0.167$

(+) PC1: Low education, high poverty, high public assistance, high nonwhite

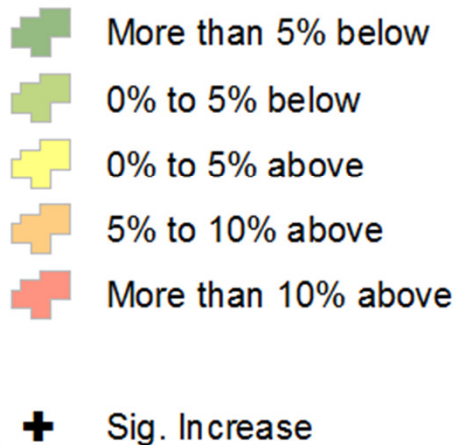
(+) PC2: High living alone, medium-intensity development

(-) PC4: High home values, high income, forest land cover

$p < 0.01$, Adj. $R^2 = 0.219$

Hot Day Mortality

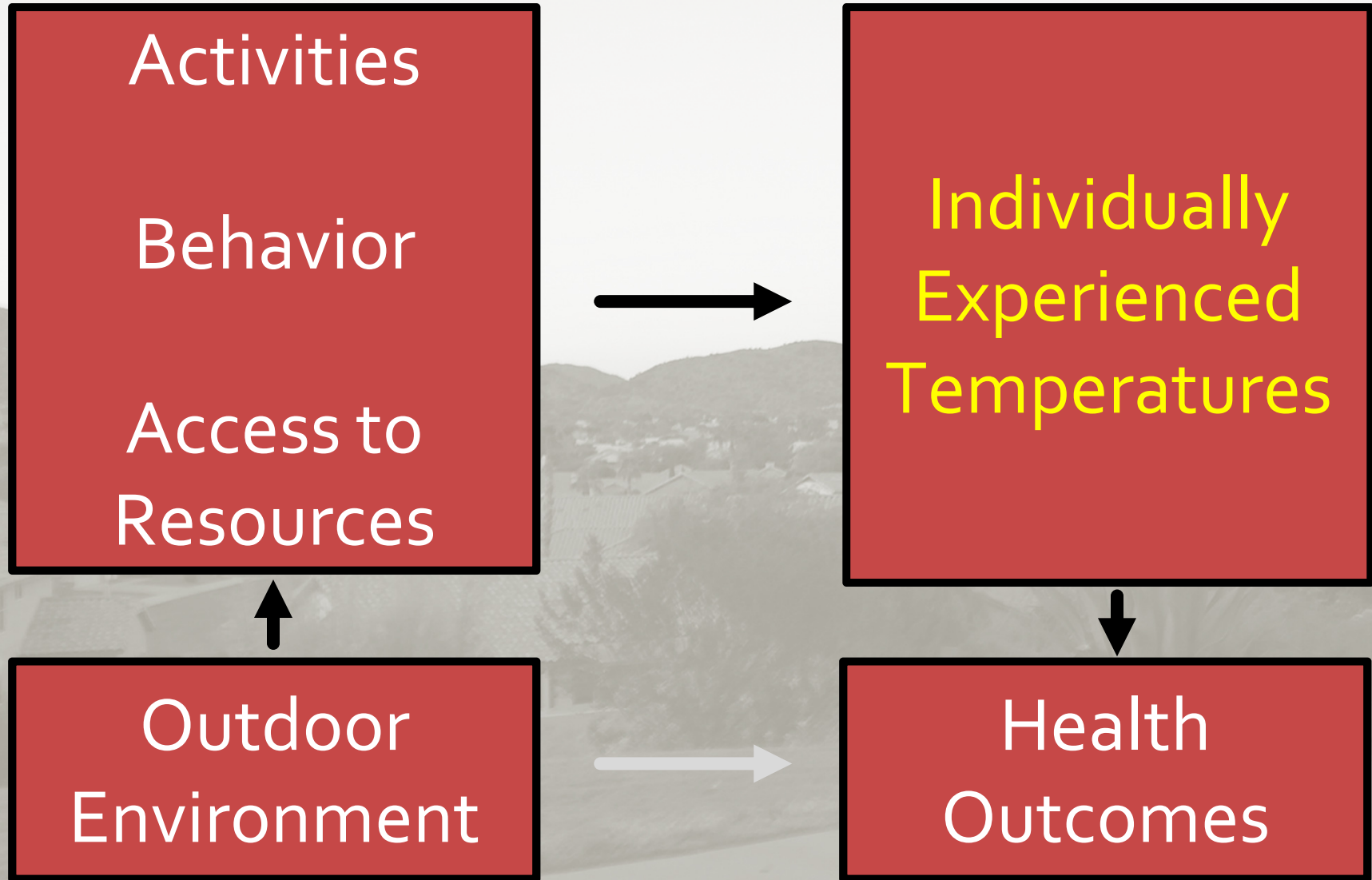
Relative to Baseline



Research Areas

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(Re)Defining Heat Exposure





**What are your
IETs today?**

Individually Experienced Temperatures (IETs)



Measuring IETs in Phoenix



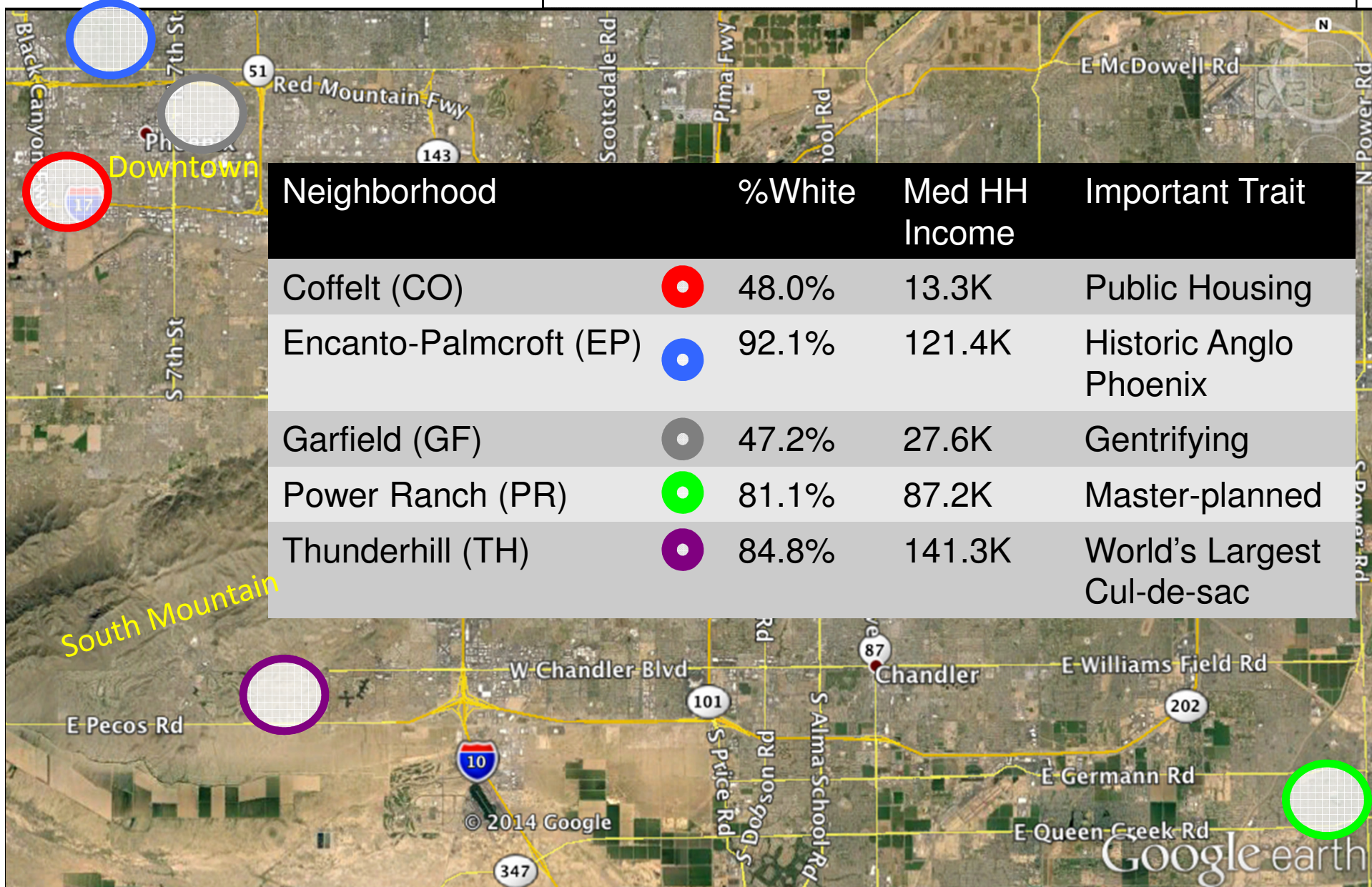
Central Arizona-Phoenix
Long-Term Ecological Research
CAP LTER

5 neighborhoods
8 undergrad researchers
100+ iButtons
80 participants
~20 iButtons in homes
~15 iButtons in trees
September 13-20, 2014

daily surveys
exit interviews
temperature sketch maps
demographic surveys
ethnographic field observations
activity logs

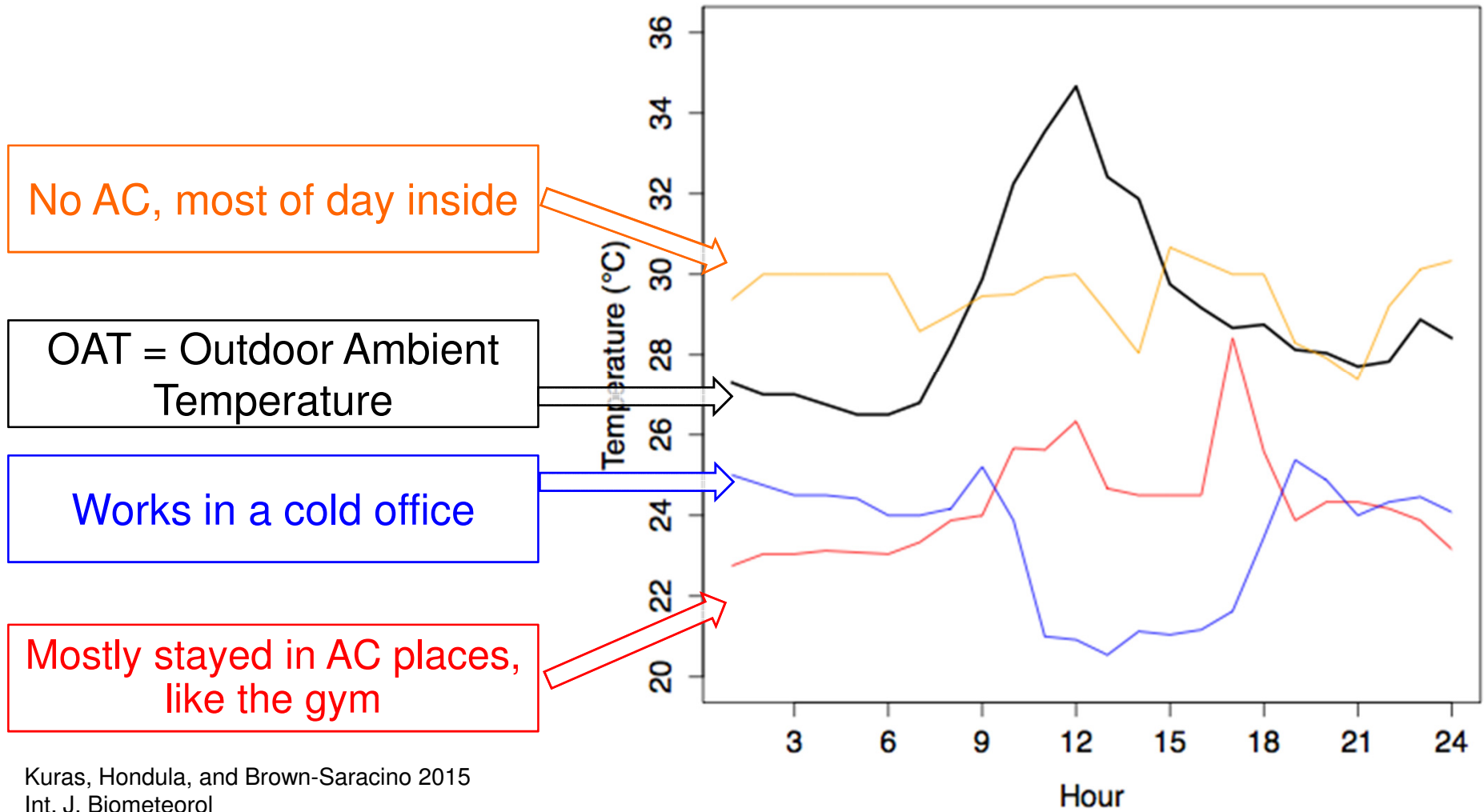


The Phoenix Neighborhoods

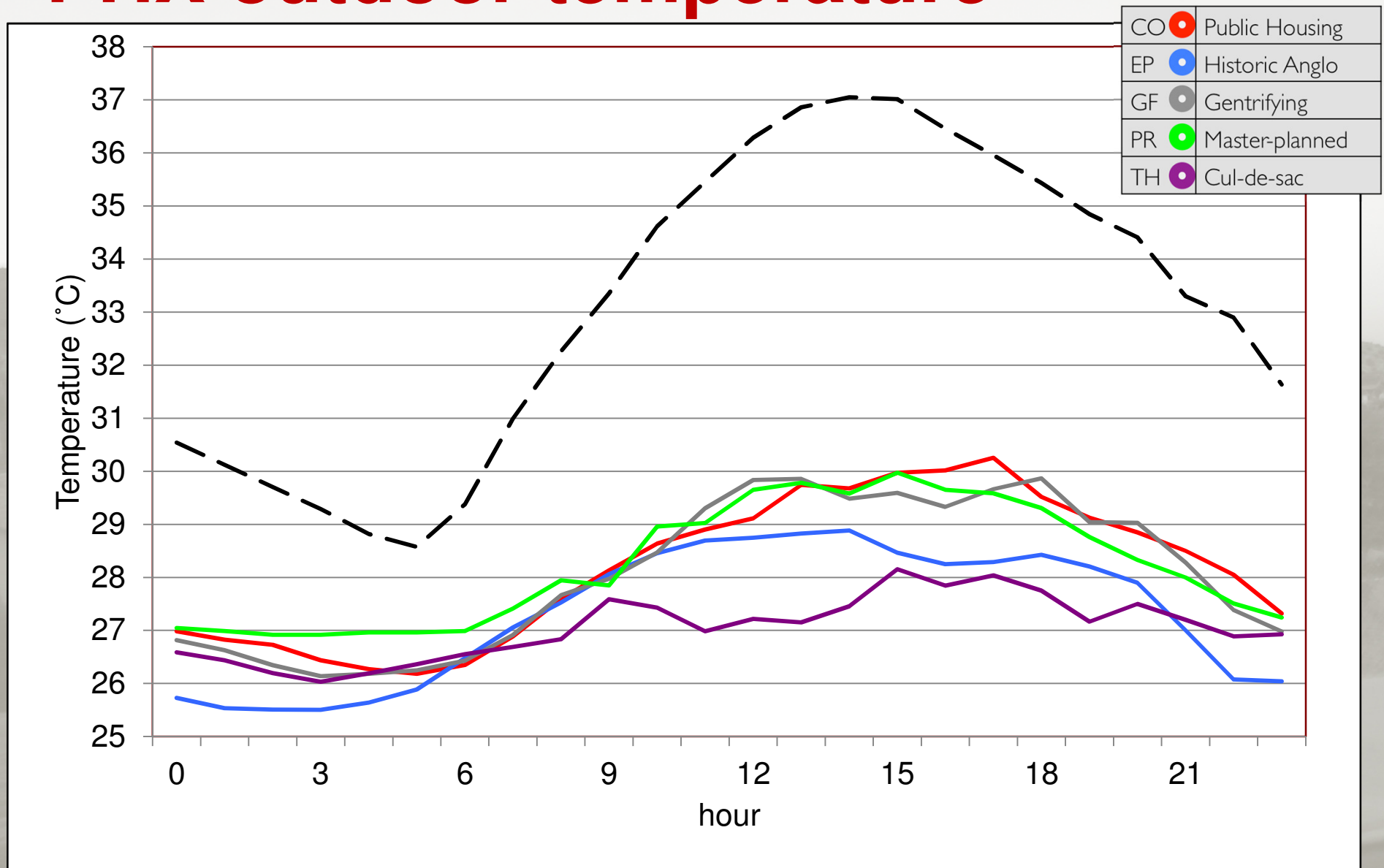


Sample of IET data (Boston)

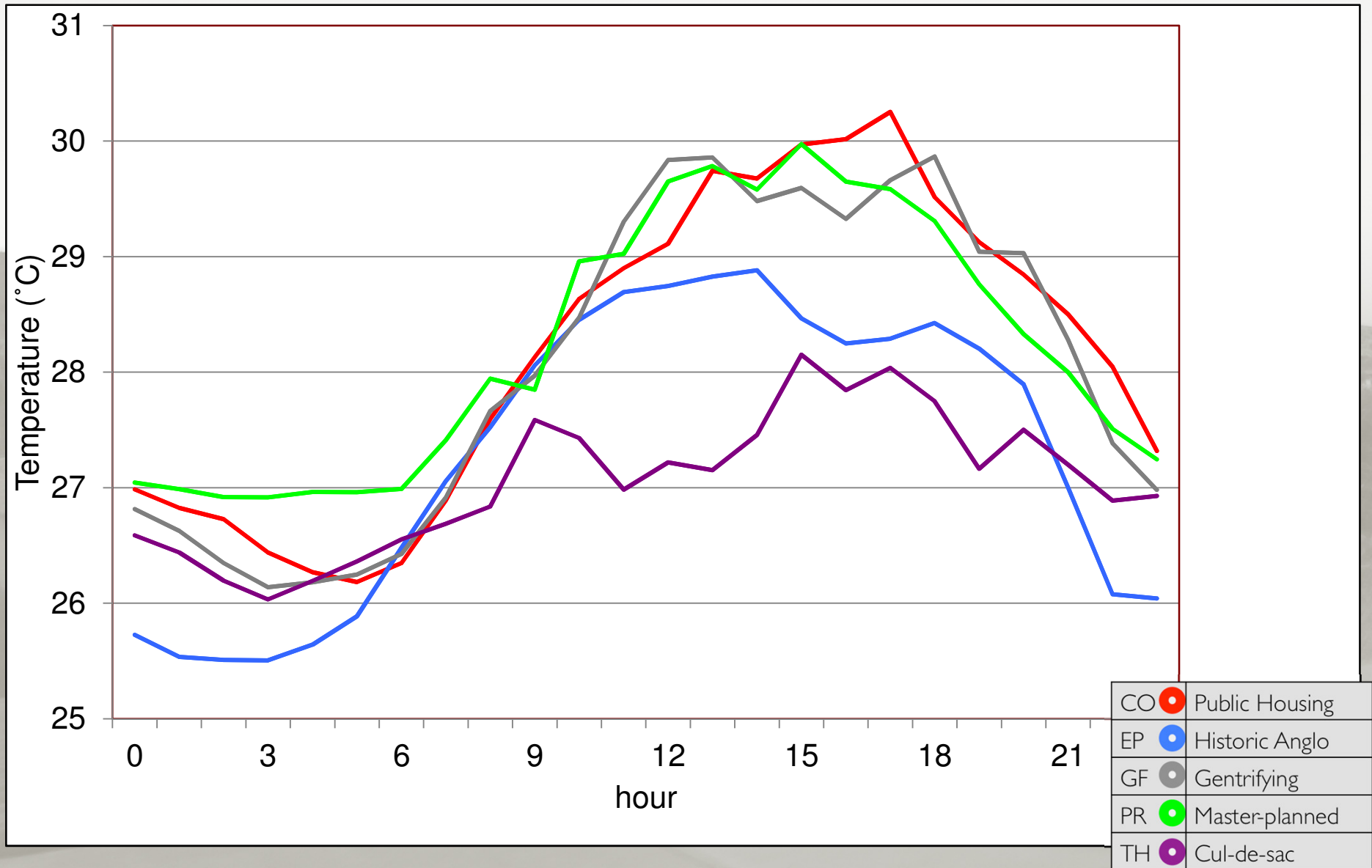
Thursday, July 18, 2013



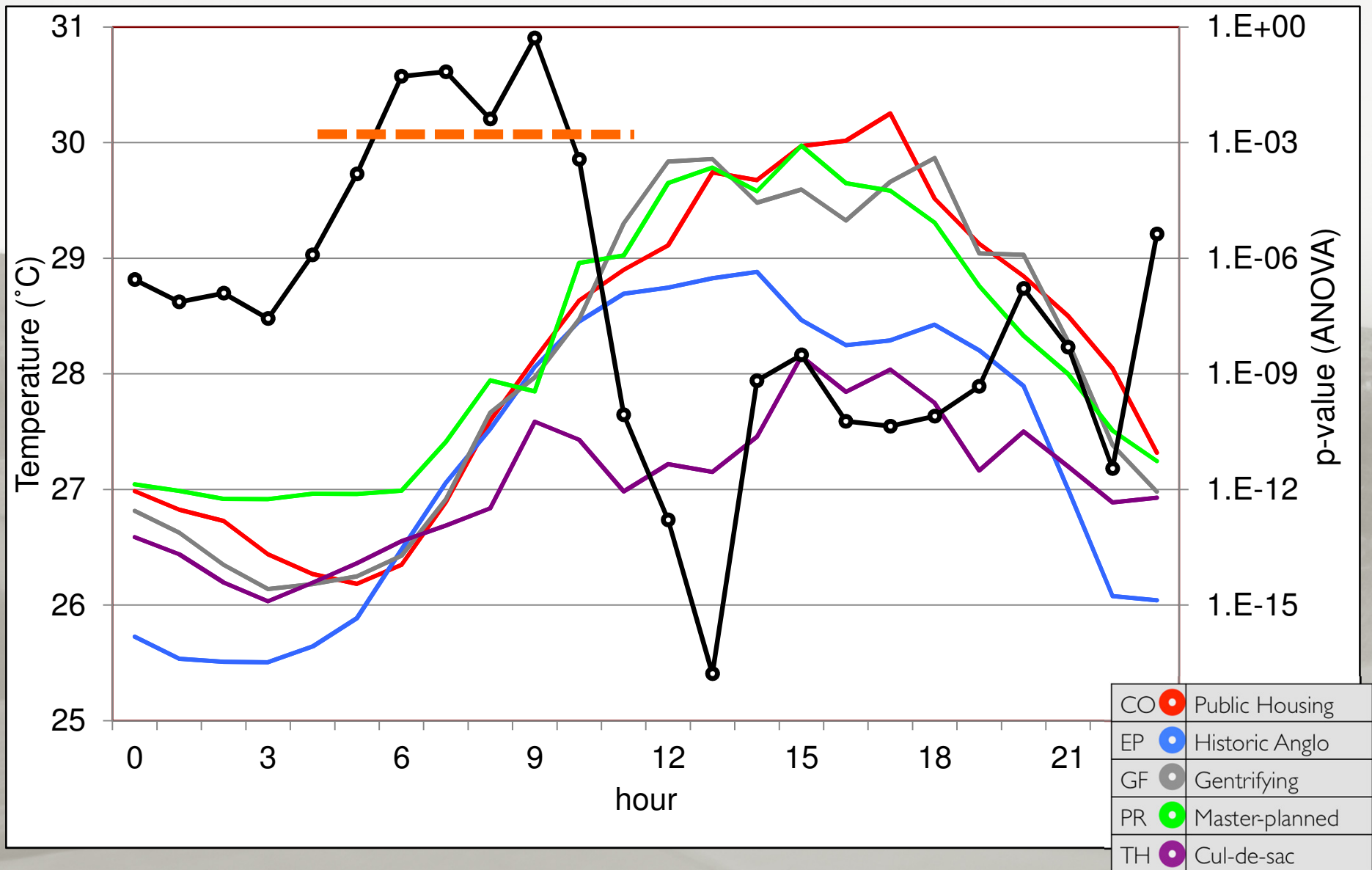
Neighborhood IETs vs. PHX outdoor temperature



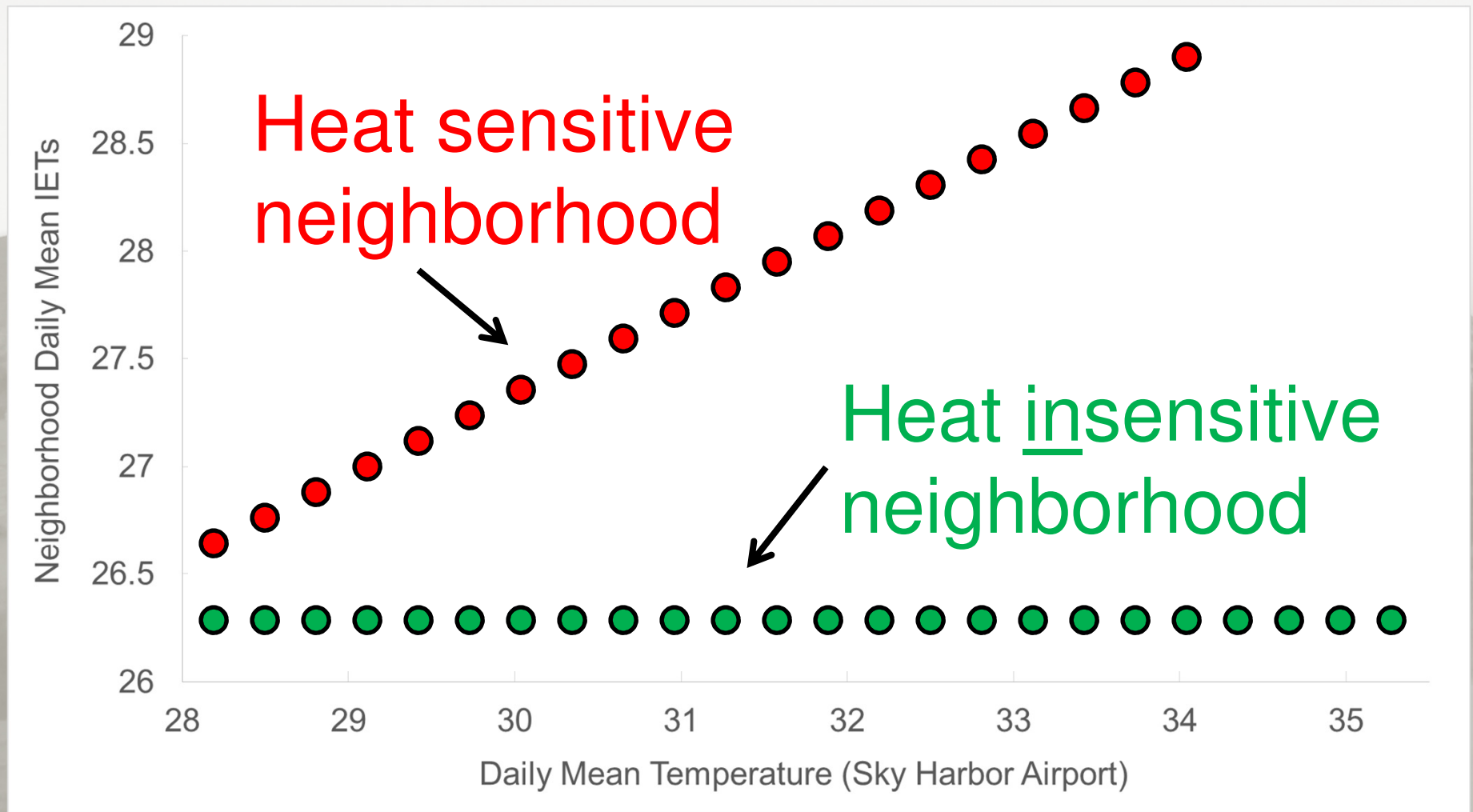
Comparing neighborhood IETs



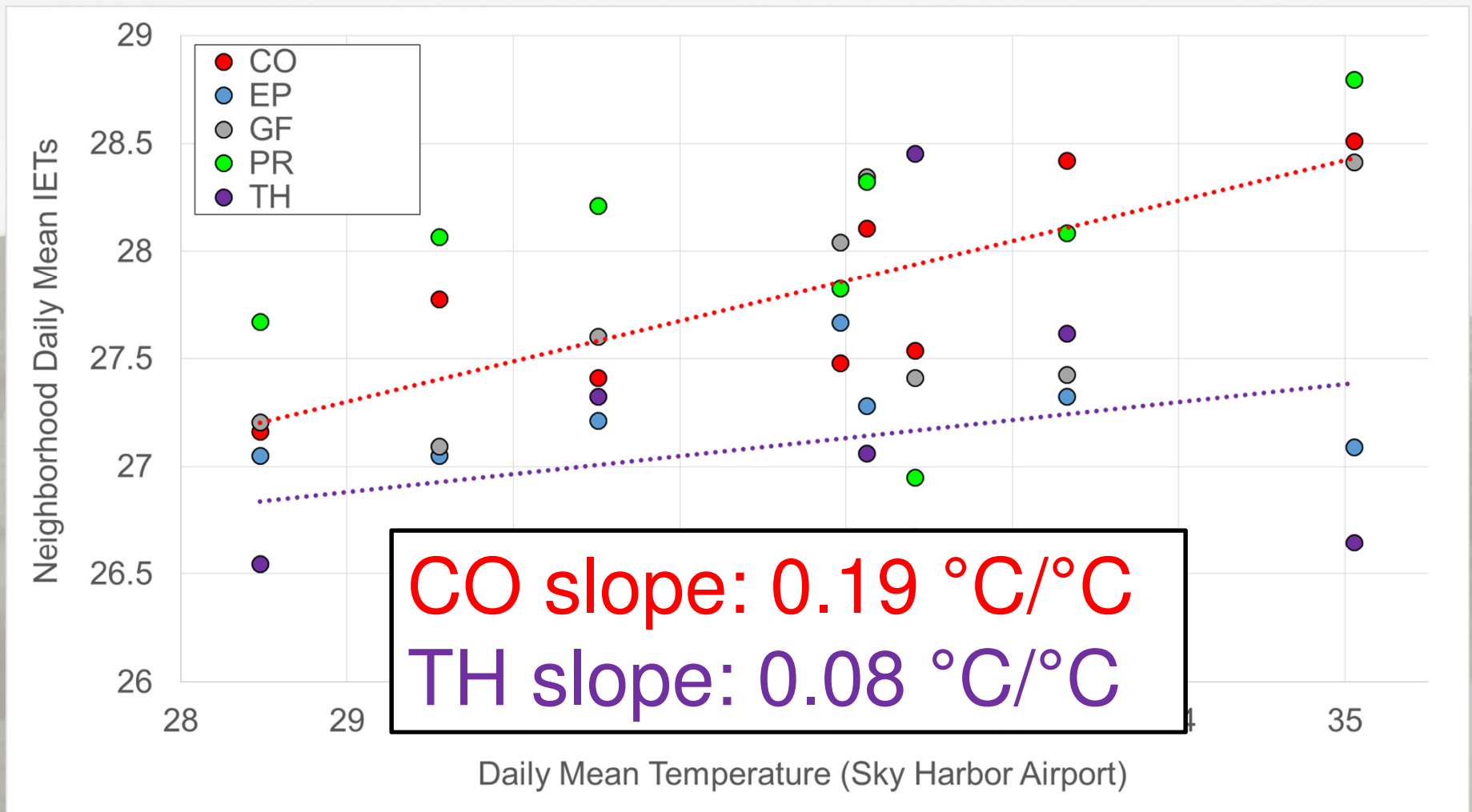
Comparing neighborhood IETs



Neighborhood Heat Sensitivity



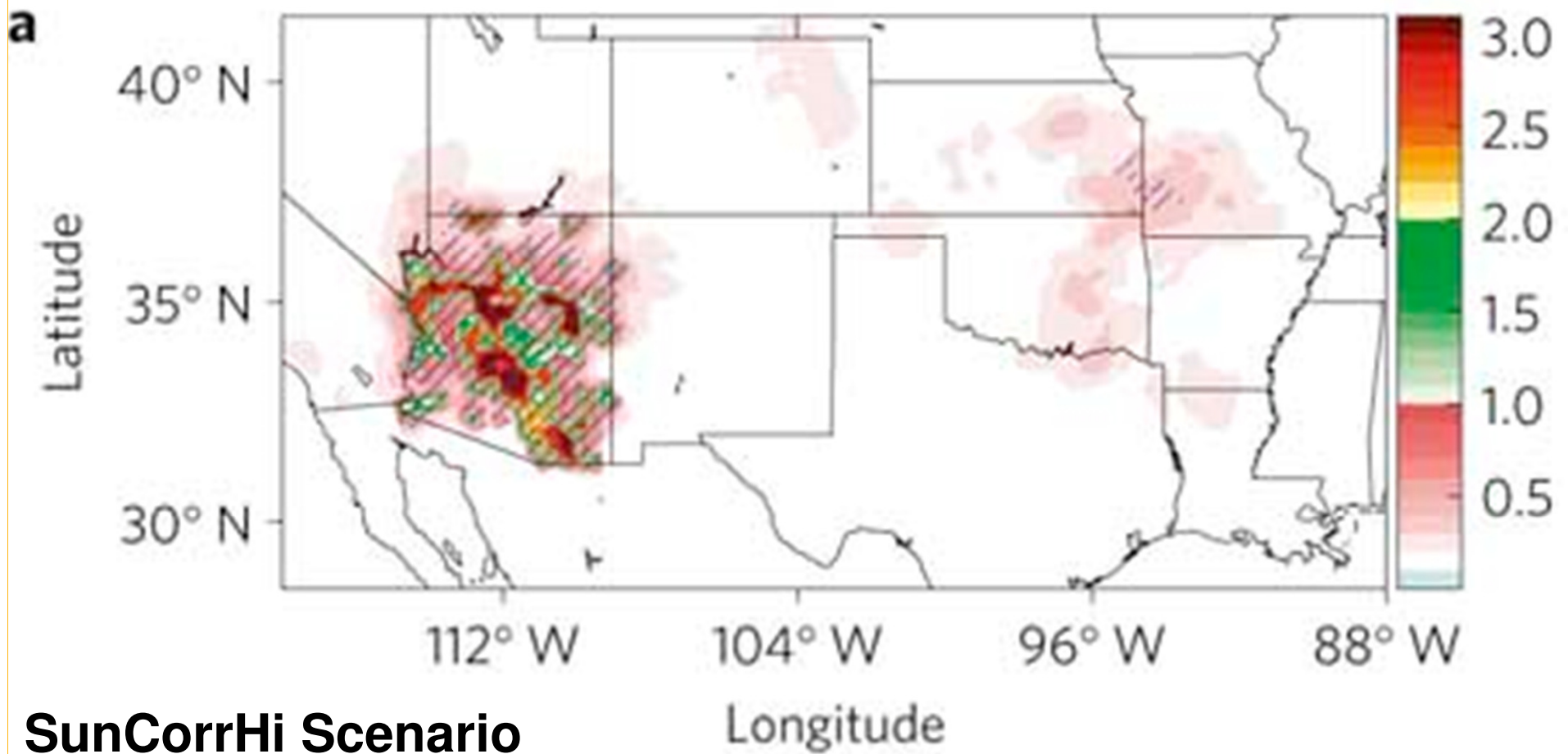
Neighborhood Heat Sensitivity



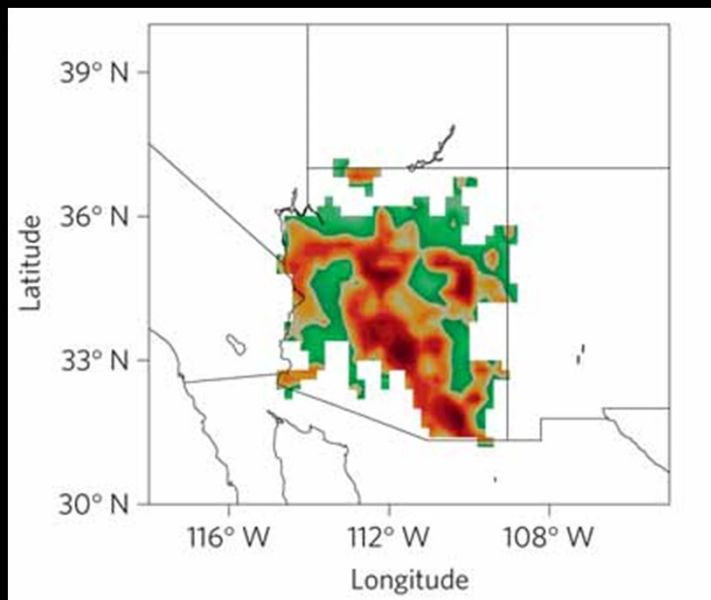
Research Areas

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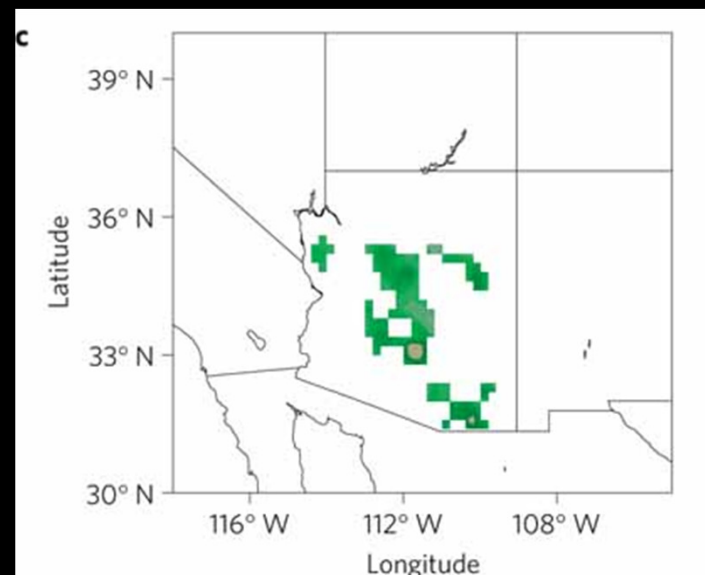
Urbanization: A key climate forcing



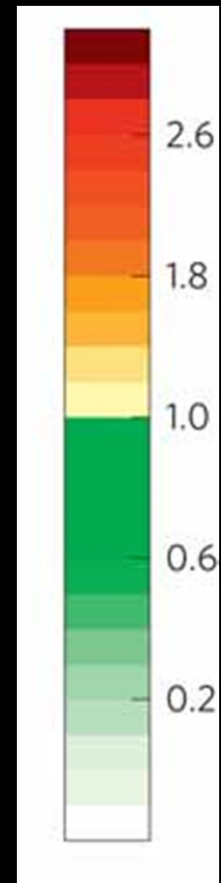
Urbanization: A key climate forcing



**SunCorrHi vs. B1
2040-2060**



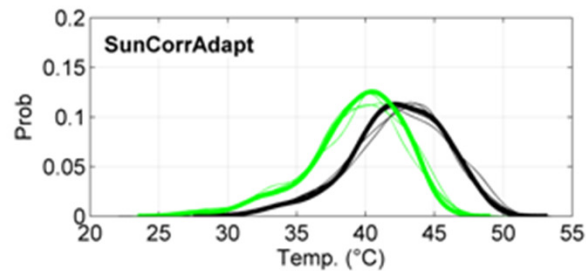
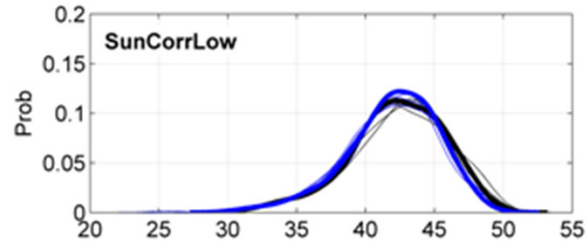
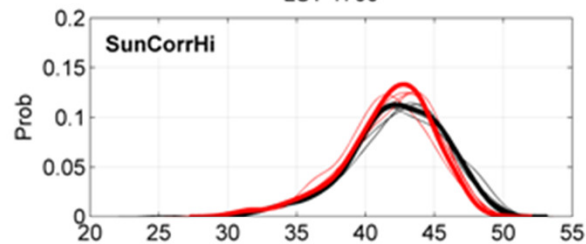
**SunCorrLow vs. A2
2040-2060**



Urbanization Effects on Temperature

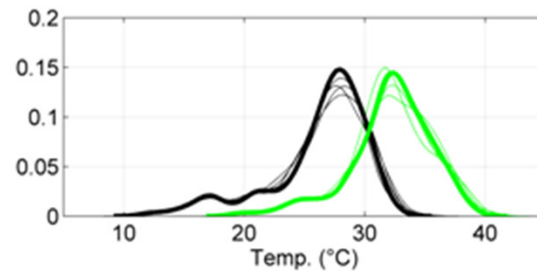
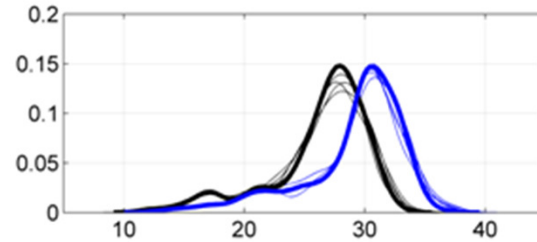
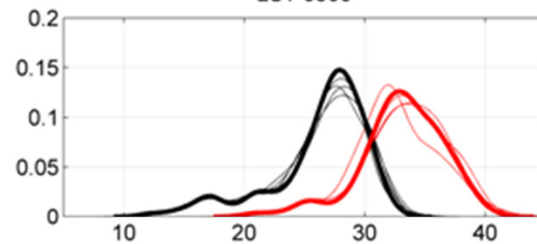
“Max”

LST 1700



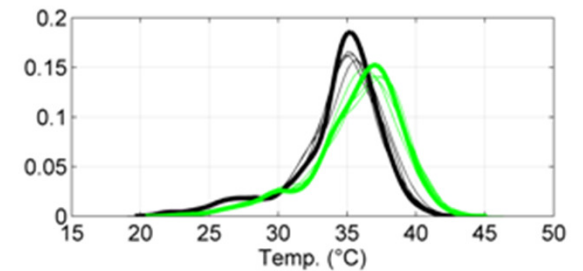
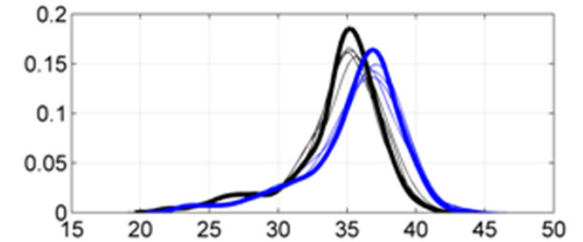
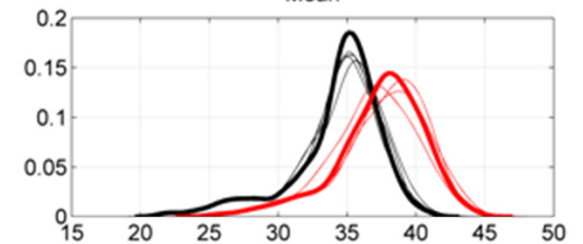
“Min”

LST 0500

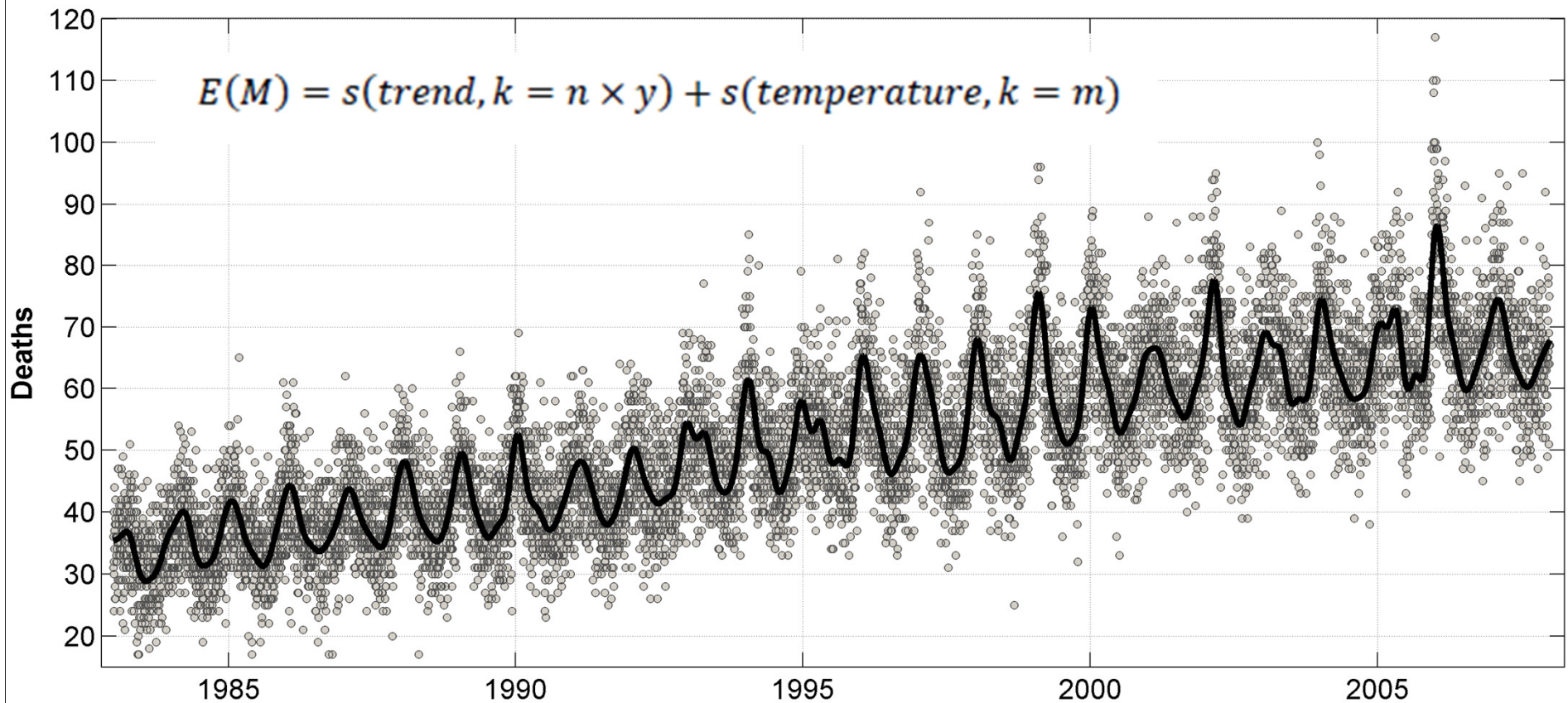


“Mean”

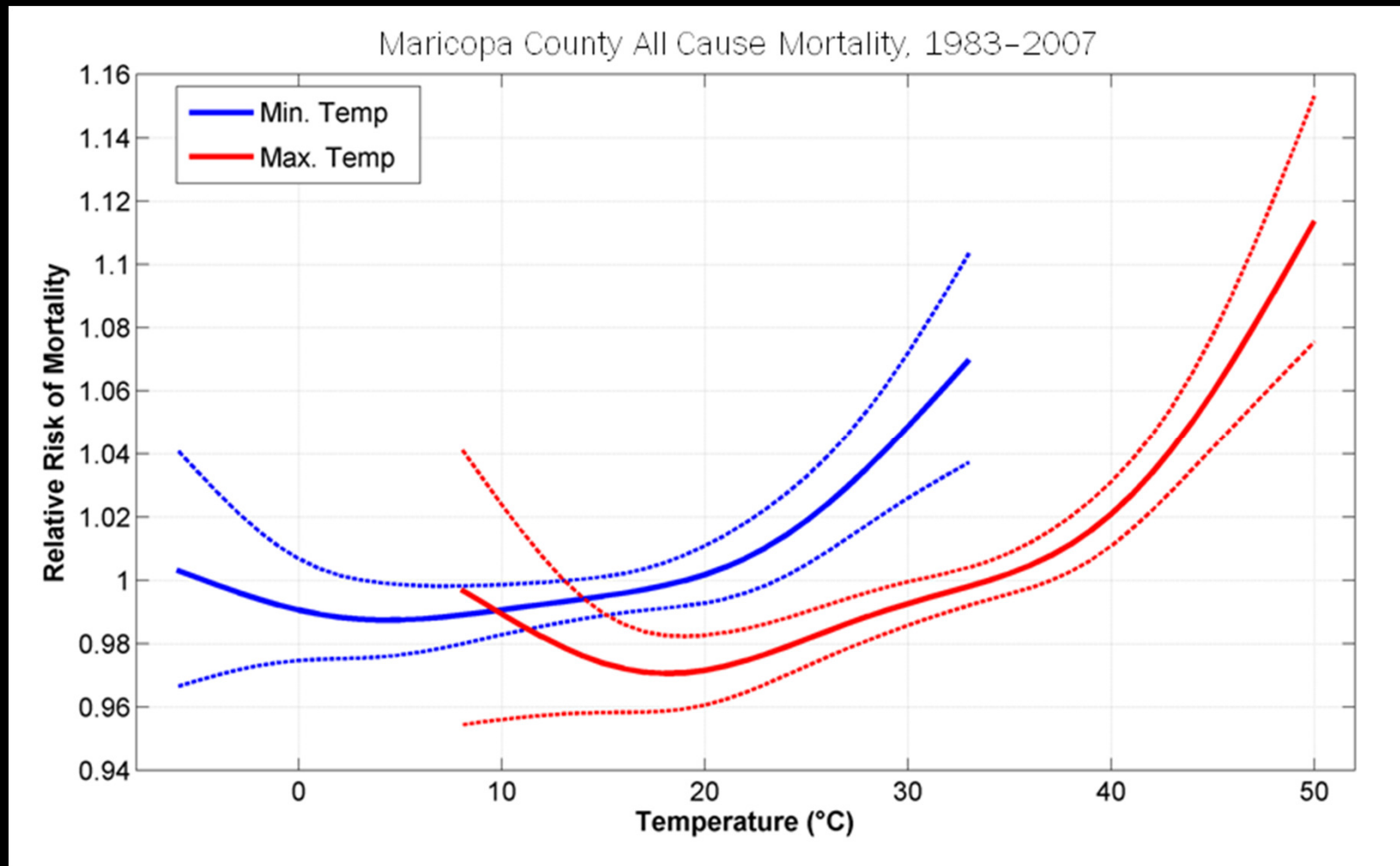
Mean



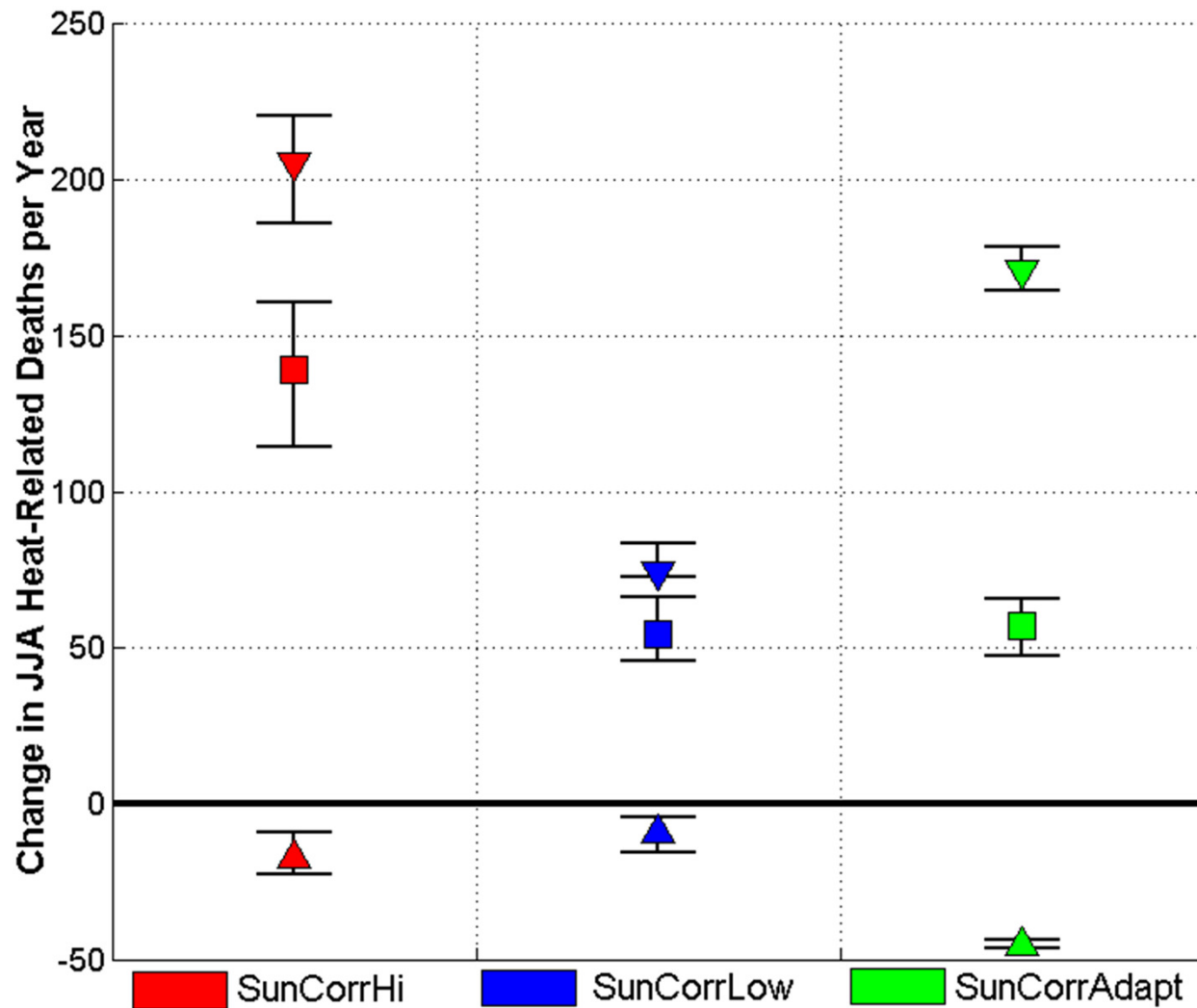
Temperature-Mortality Model



Temperature-Mortality Model



Projections of urbanization-induced heat-related mortality for greater Phoenix



△ Max
□ Mean
▽ Min

Hondula et al. 2014

Research Areas

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**What are the
solutions?**

Urban Greening



City of Phoenix
Tree and Shade
Master Plan

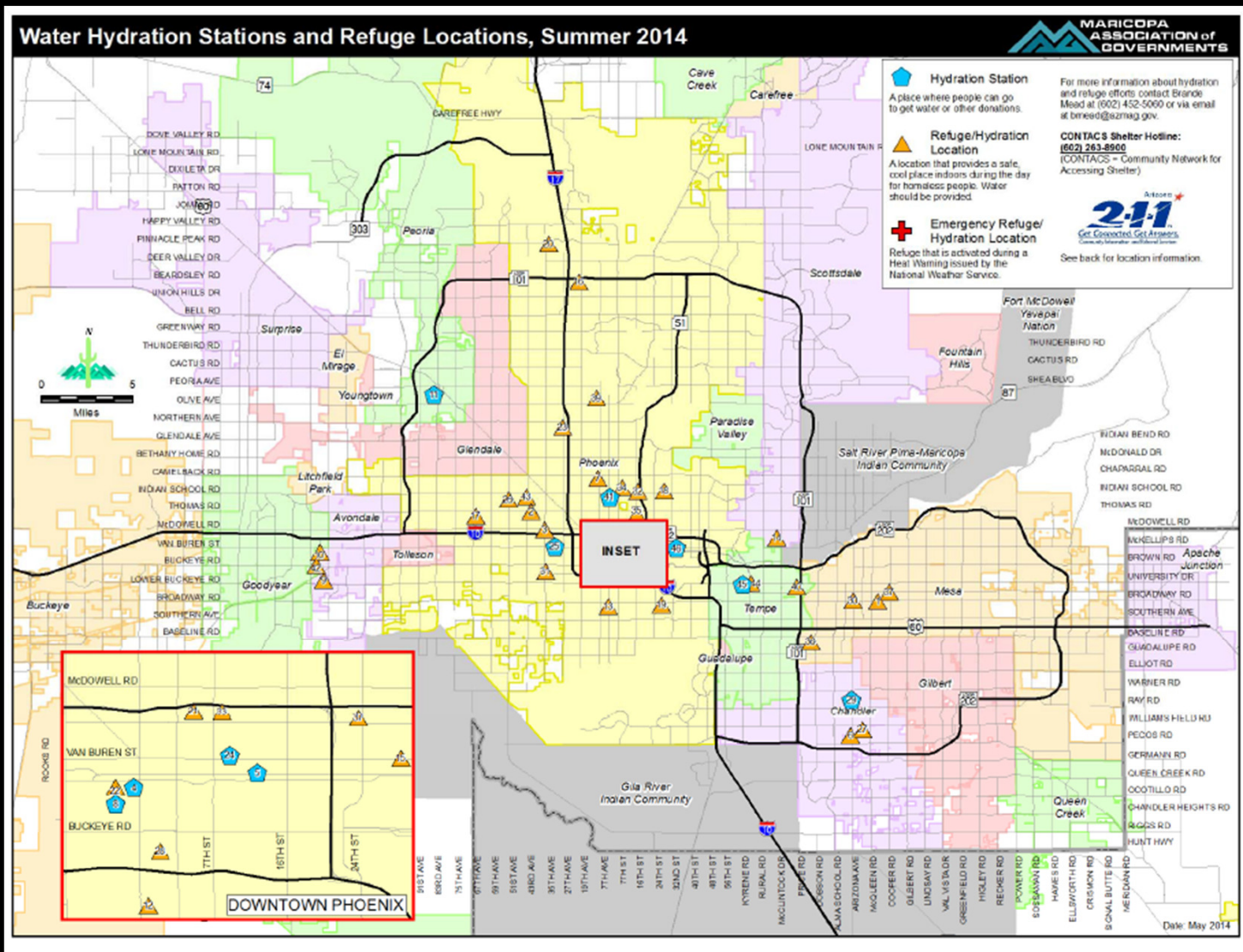


"An investment strategy for creating a healthier, more livable and prosperous Phoenix"

Phoenix Heat Relief Network



City of Phoenix



Heat Warnings



NATIONAL WEATHER SERVICE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HAZARDOUS WEATHER CONDITIONS

Excessive Heat Watch in effect from July 23, 10:00 AM MST until July 24, 08:00 PM MST

Current Conditions

[En Español](#)

[Share](#) | [Twitter](#) | [Facebook](#) | [Email](#)



Mostly Cloudy

100°F
38°C

Humidity 17%
Wind Speed VRBL 3 MPH
Barometer 29.94 in (1011.6 mb)
Dewpoint 47°F (8°C)
Visibility 10.00 mi
Heat Index 96°F (36°C)

Last Update on 22 Jul 10:51 am MST

Current conditions at

**Phoenix, Phoenix Sky Harbor
International Airport (KPHX)**

Lat: 33.427799°N Lon: 112.003465°W Elev: 1115ft.

[More Local Wx](#) | [3 Day History](#) | [Mobile Weather](#)

Phoenix AZ

7 Day Forecast

For More Weather Information:

[Phoenix, AZ Local Forecast Office](#)

THIS
AFTERNOON



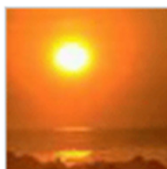
Partly
Sunny
High: 109 °F

TONIGHT



Partly
Cloudy
Low: 87 °F

WEDNESDAY



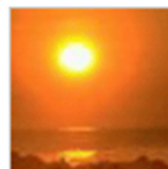
Hot
High: 112 °F

WEDNESDAY
NIGHT



Partly
Cloudy
Low: 89 °F

THURSDAY



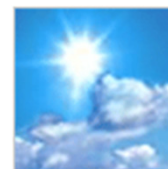
Hot
High: 112 °F

THURSDAY
NIGHT



Partly
Cloudy
Low: 88 °F

FRIDAY



Mostly
Sunny
High: 109 °F

FRIDAY
NIGHT



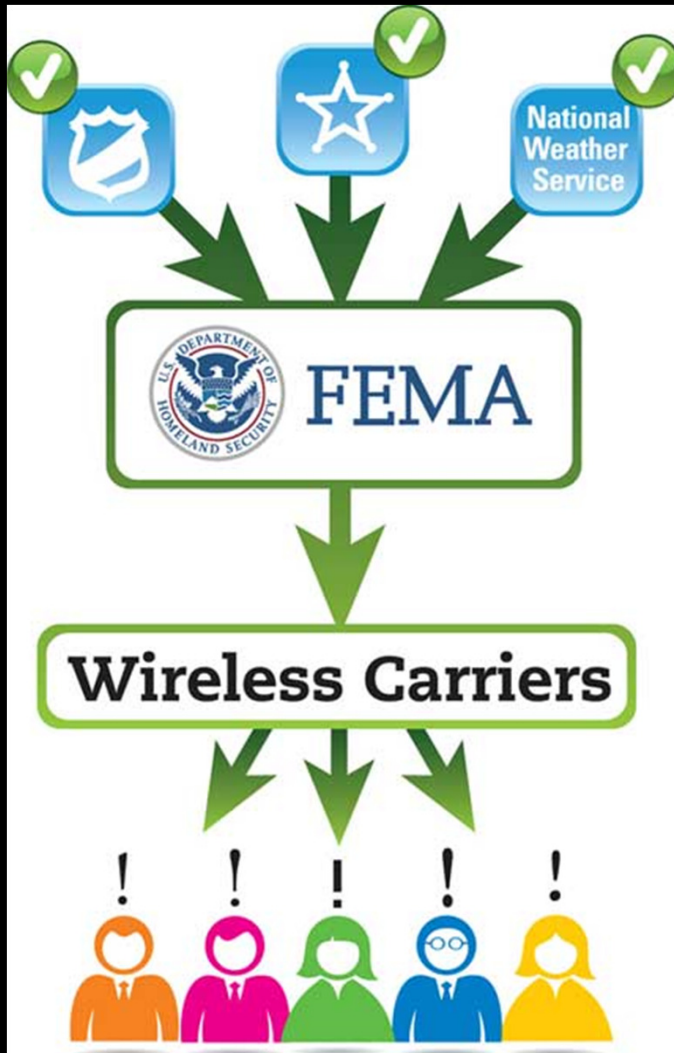
Partly
Cloudy
Low: 86 °F

SATURDAY



Slight Chc
Thunderstorms
High: 106 °F

Wireless Emergency Alerts

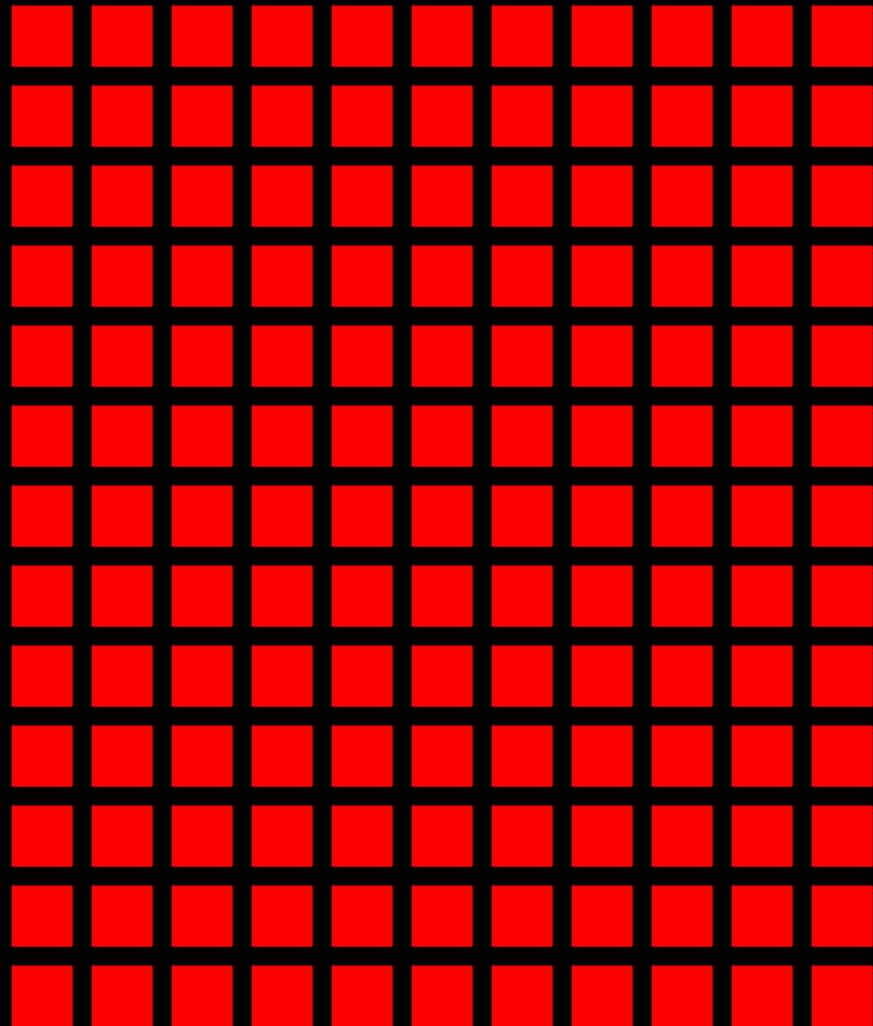
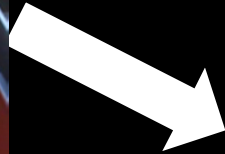


AT&T LTE



5:04

Friday, June 28

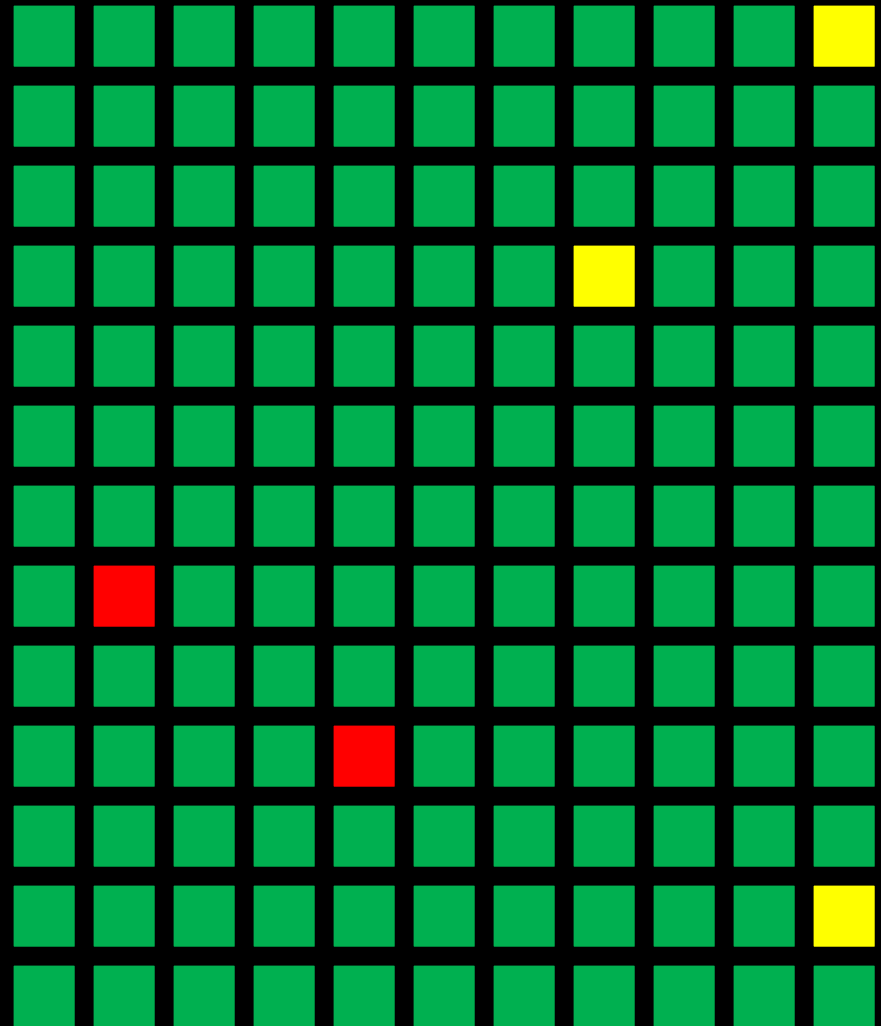
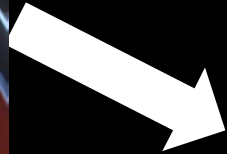


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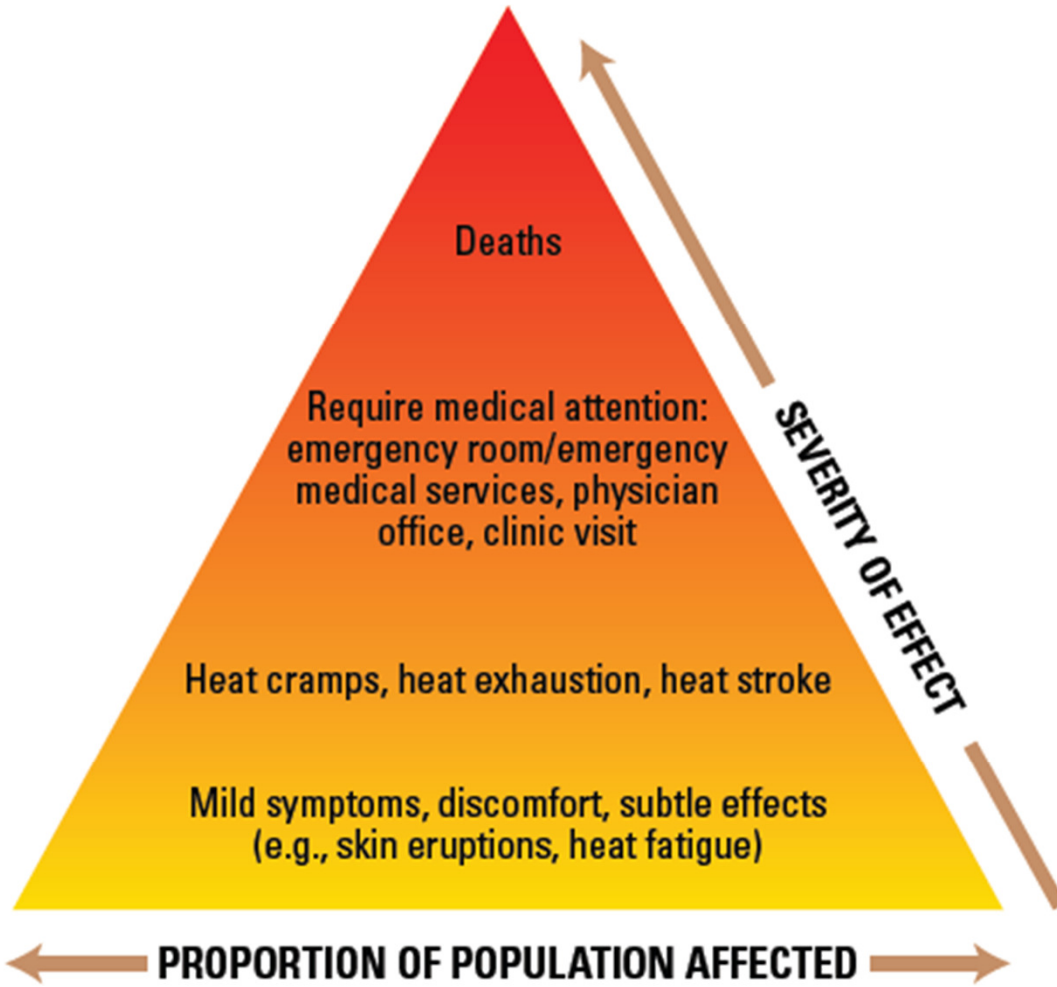


5:04

Friday, June 28



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