

Heat Waves, Heat Islands & Global Warming, Oh My: LA's One Hot City

Steve LaDochy, Hengchun Ye and Pedro Ramirez

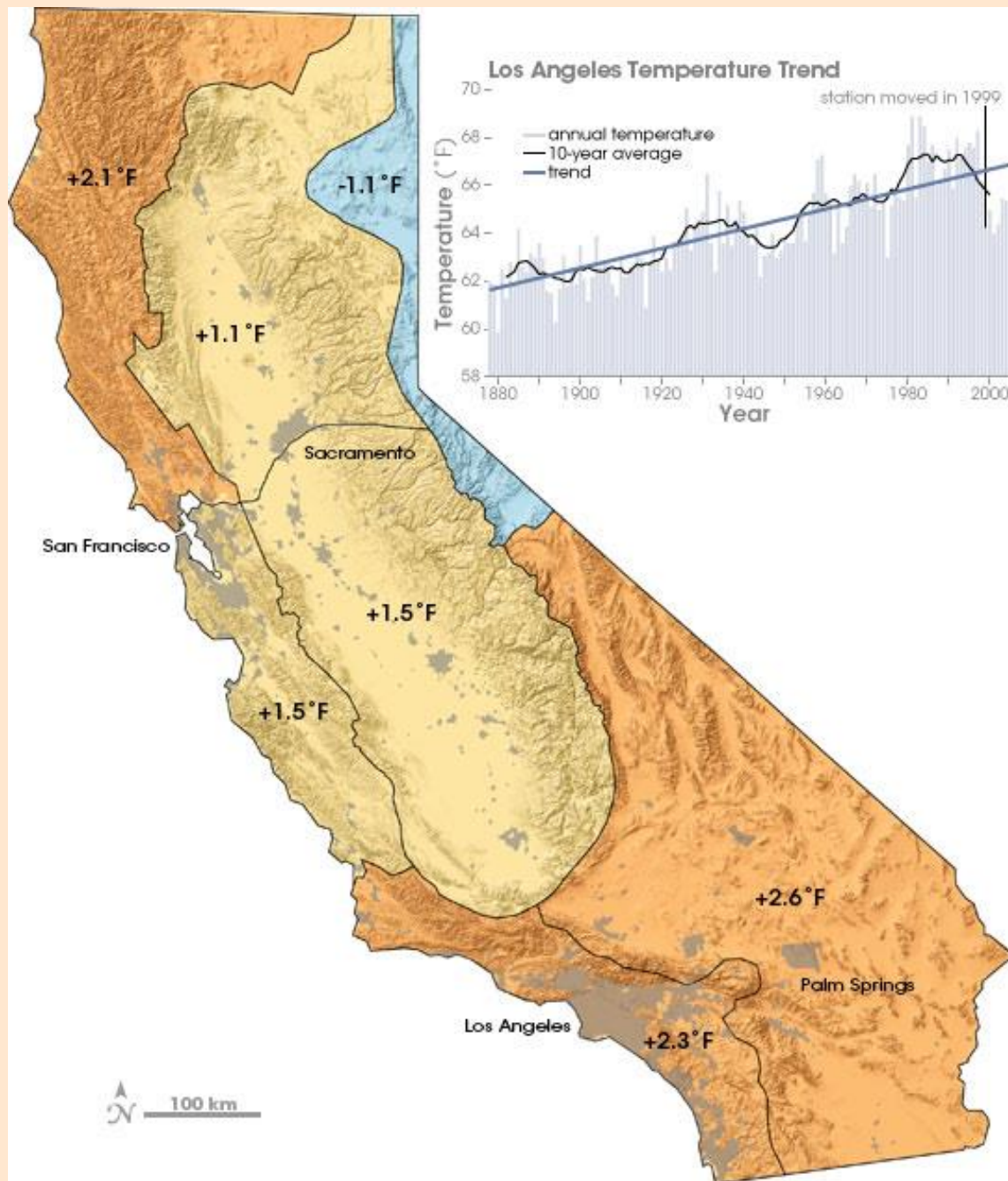
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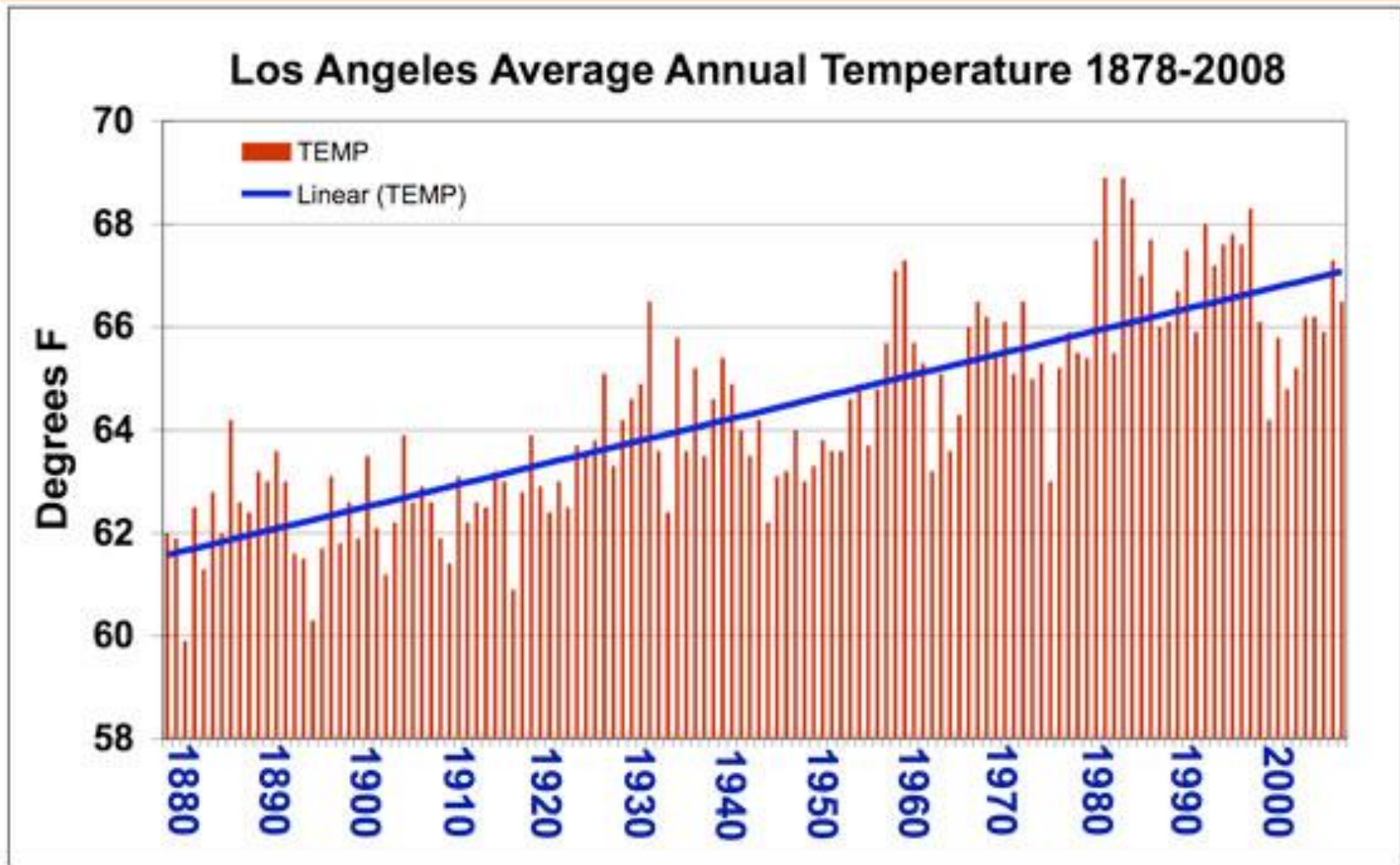
8th Annual NOAA-CREST Symposium: Climate and Extreme Weather Impacts on Urban Coastal, June 5-6, 2013, NYC, NY



California temperatures have risen about 2oF from 1950-2000, while urban areas have heated up much faster.

LaDochy, S., R. Medina, W. Patzert (2007)

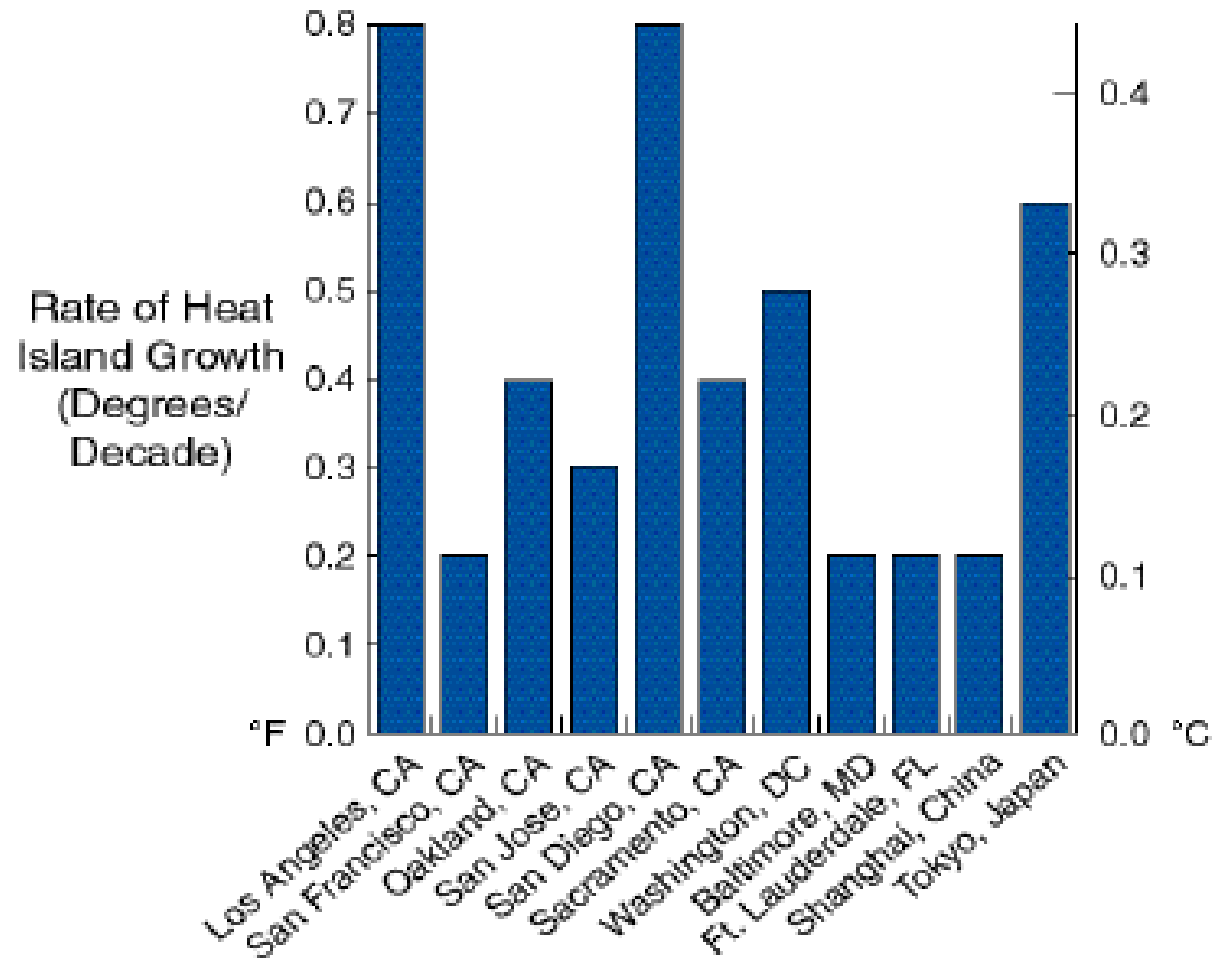
Urban Heat Island Grows as Cities Grow

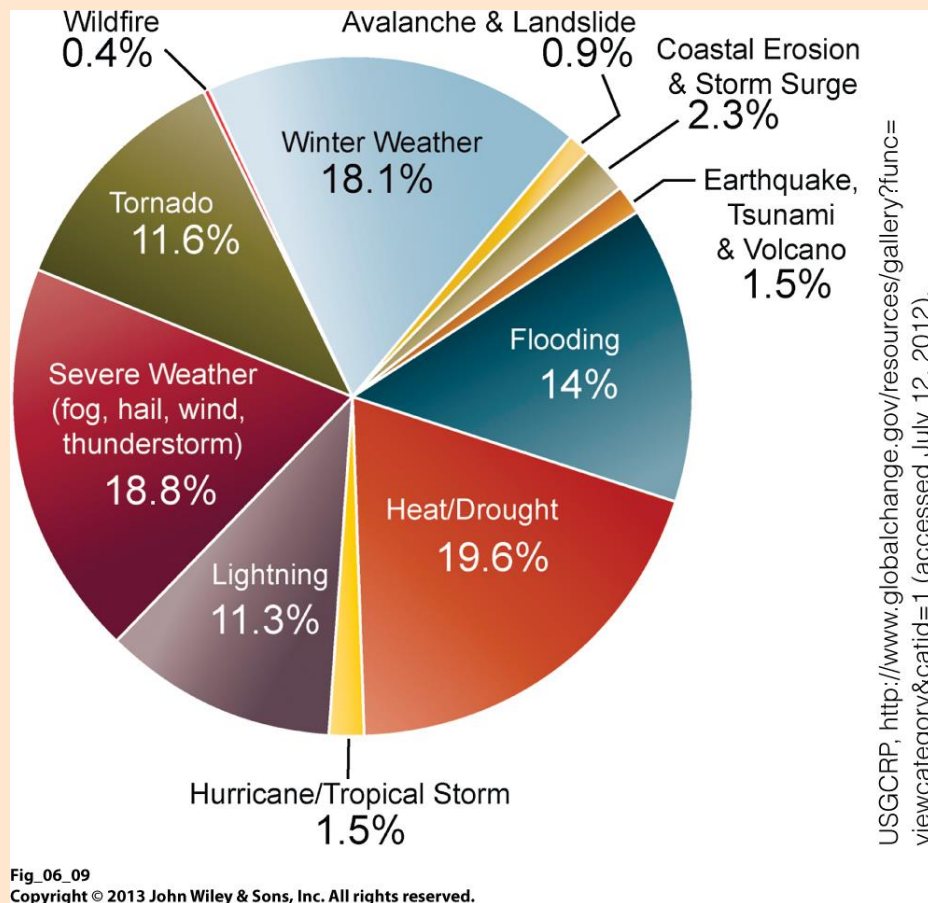


Source: Patzert et al (2007)

<http://ams.confex.com/ams/87ANNUAL/16Applied/papers/index.cgi?username=119064&password=355783>

Figure 1. Increasing urban temperature trends over the last 3–8 decades in selected cities



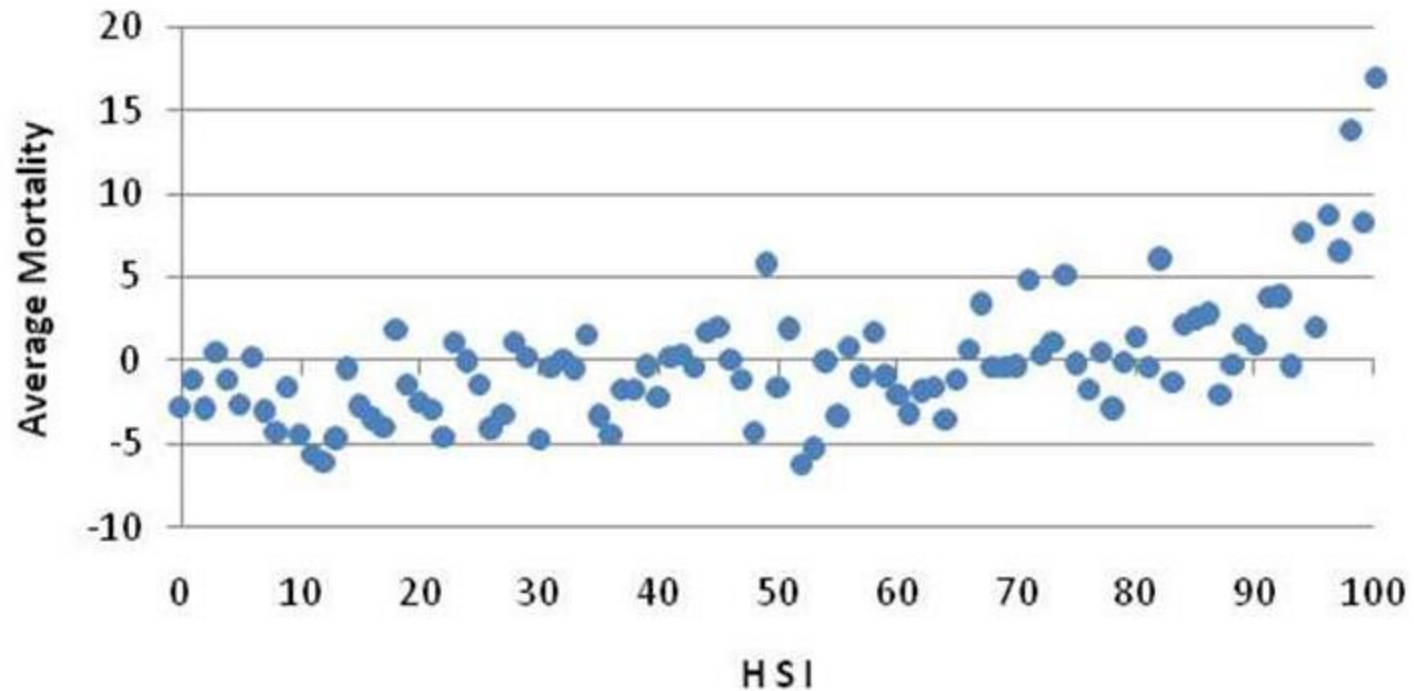


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HEAT KILLS

- Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat.
- In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the disastrous heat wave of 1980, more than 1,250 people died.

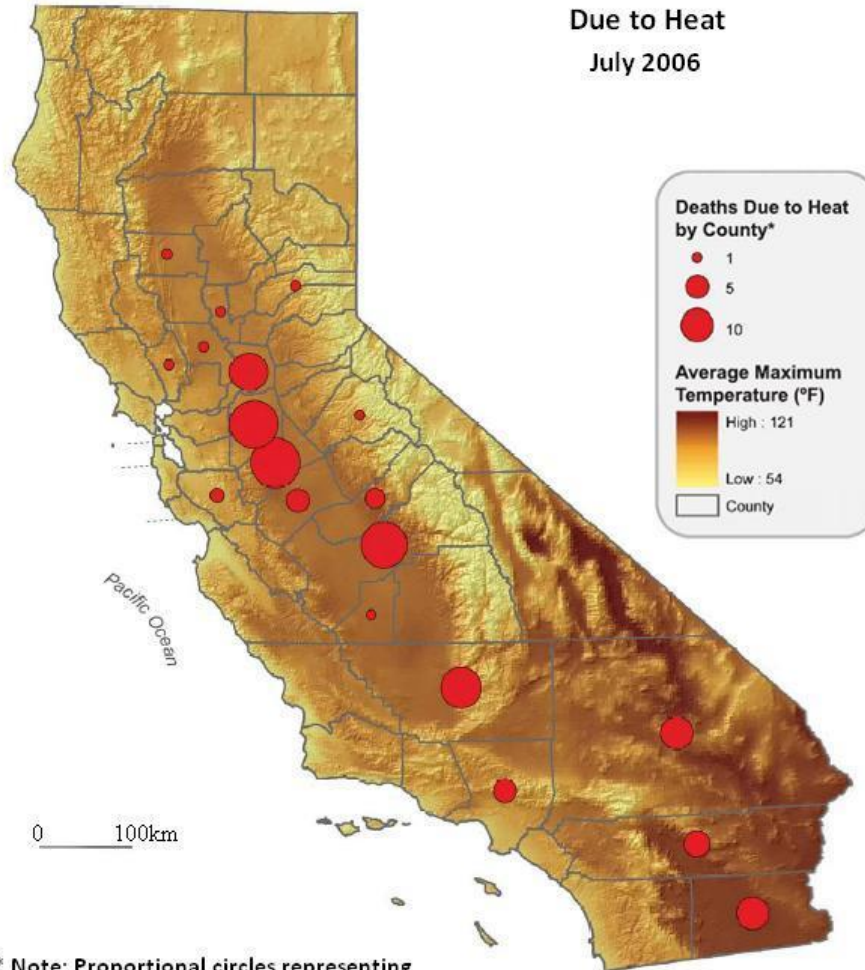
HSI and Mortality in Los Angeles



Death Rates rise quickly as Heat stress index (heat & air pollution) exceeds 90.

<http://climateresolve.org/pdf/heatandhealth.pdf>

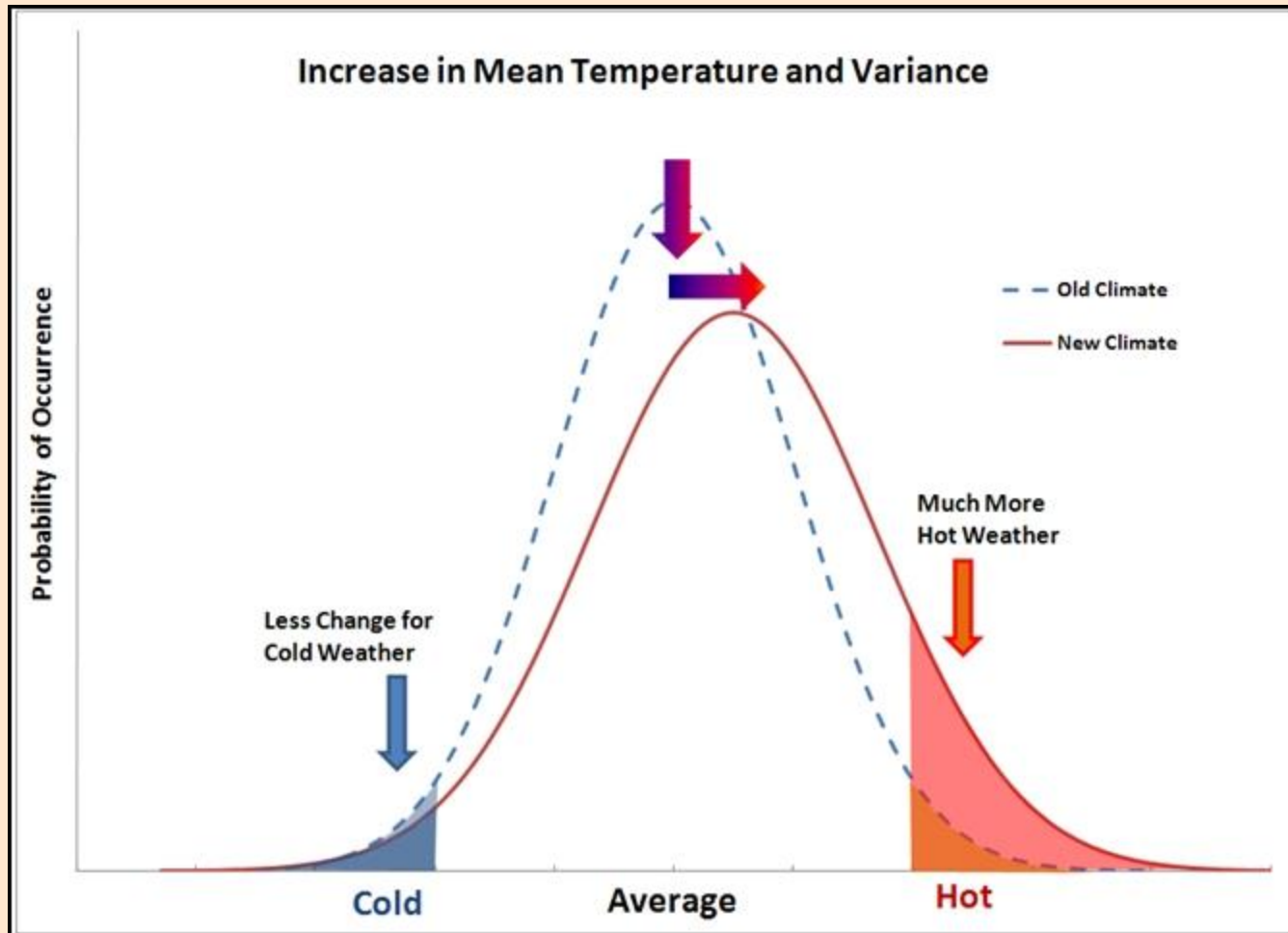
Geographic Distribution of Deaths Due to Heat July 2006



* Note: Proportional circles representing the number of deaths per county have been placed at the counties' geographic centers.

Source: California Department of Public Health

Climate Change Public Health Impacts Assessment and Response Collaborative



As mean temperatures rise, the number of extreme heat days grows.

Heat Waves in Southern California: Are They Becoming More Frequent and Longer Lasting?

Arbi Tamrazian, UC Berkeley , Steve LaDochy,
California State University, Los Angeles,
Josh Willis and William C. Patzert, JPL

<http://www.csus.edu/apcg/v70-ladochy.pdf>



Pierce College

DWP



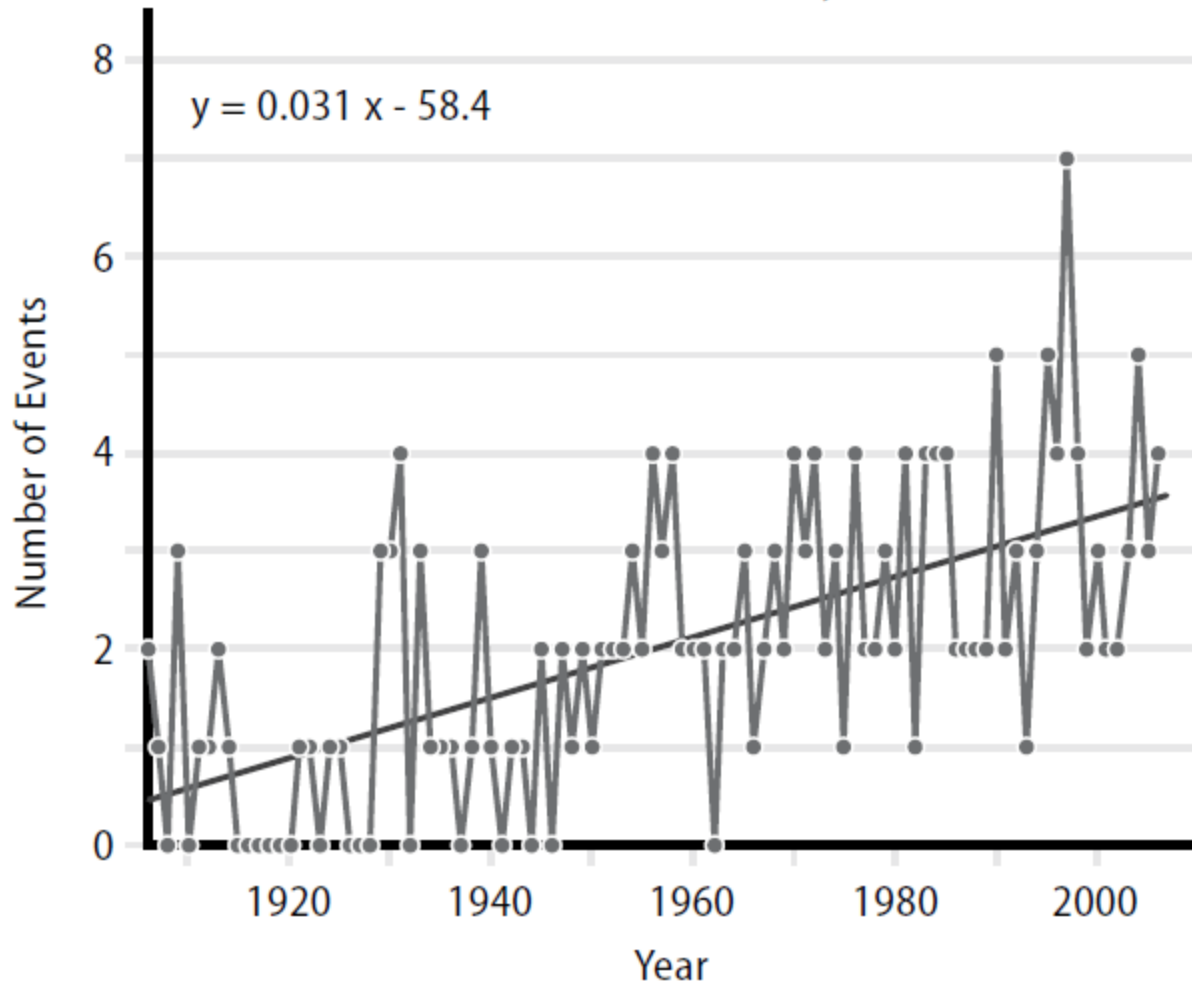
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Image NASA
Image © 2008 DigitalGlobe

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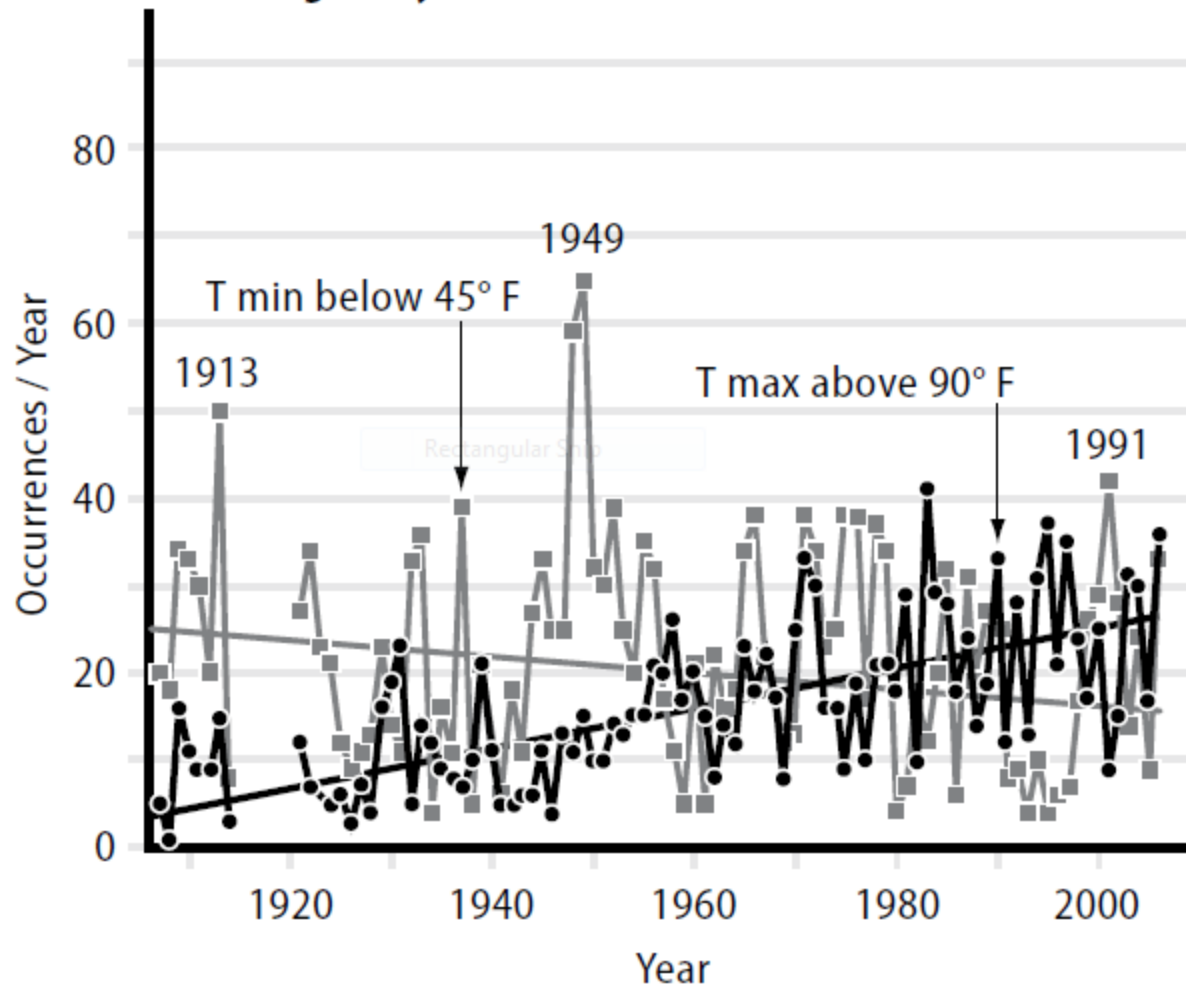
Number of Heat Waves

Three or More Consecutive Days Above 90° F



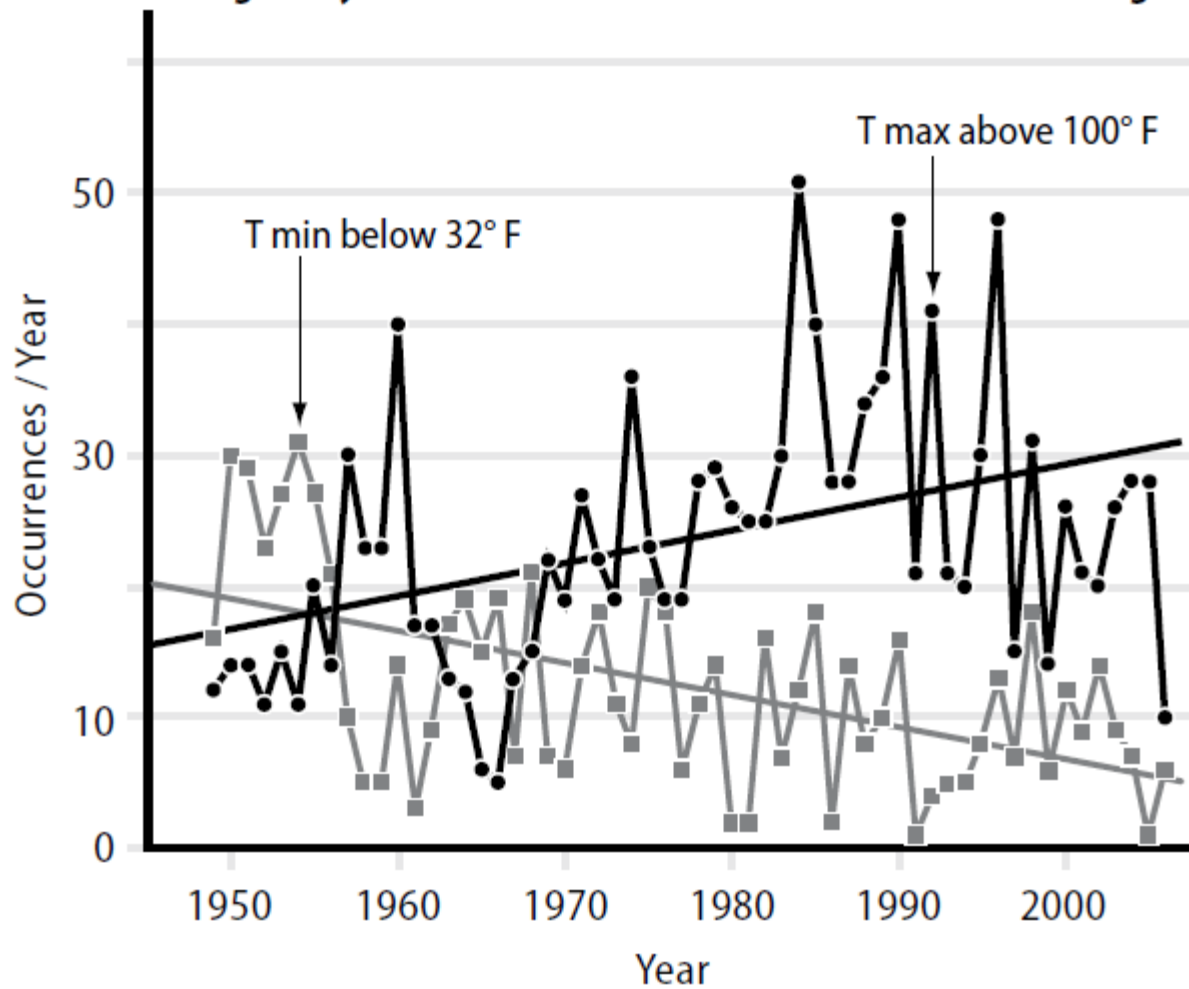
Number of Heat and Cold Days

Single Days Above 90° F and Below 45° F at DWP

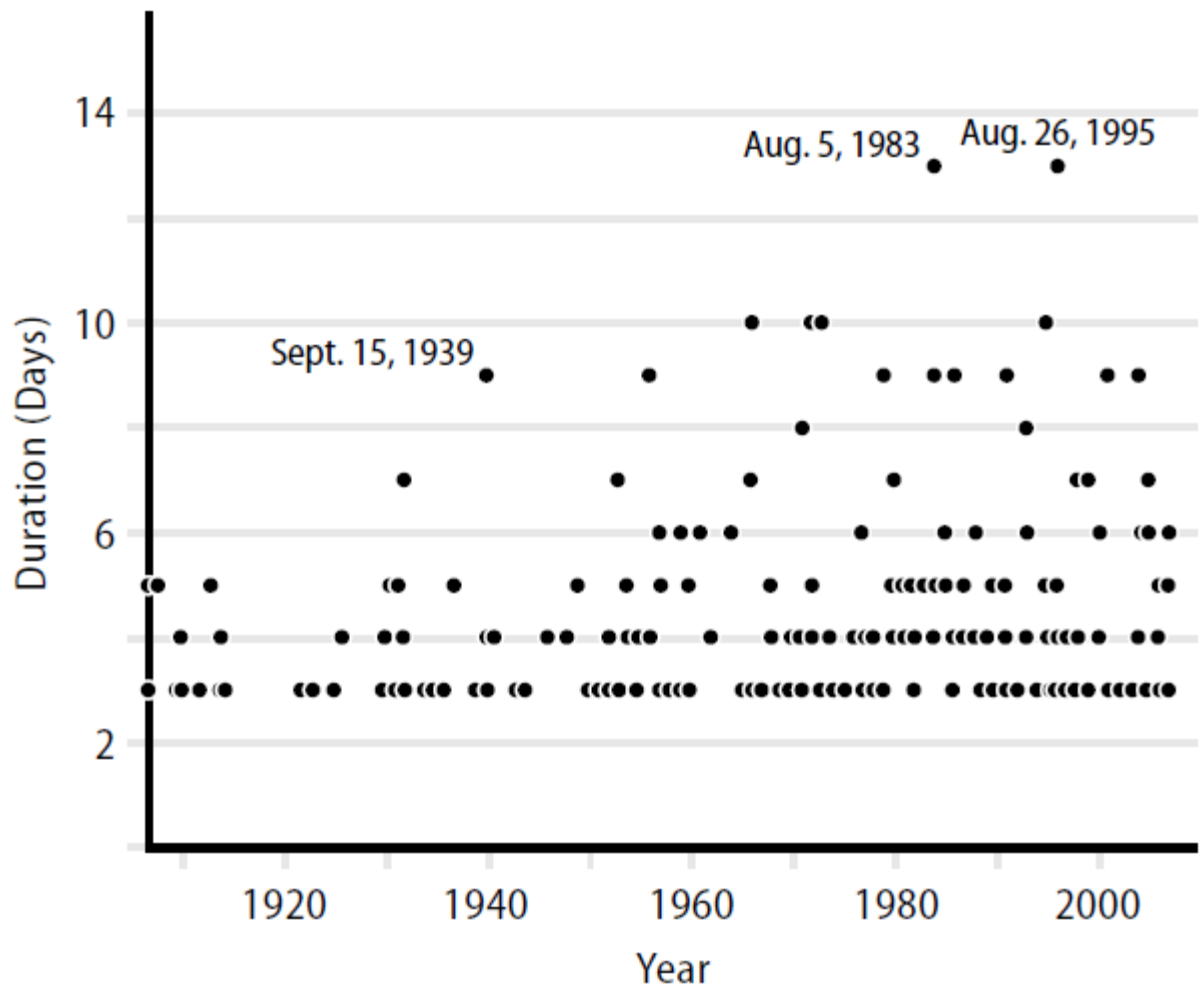


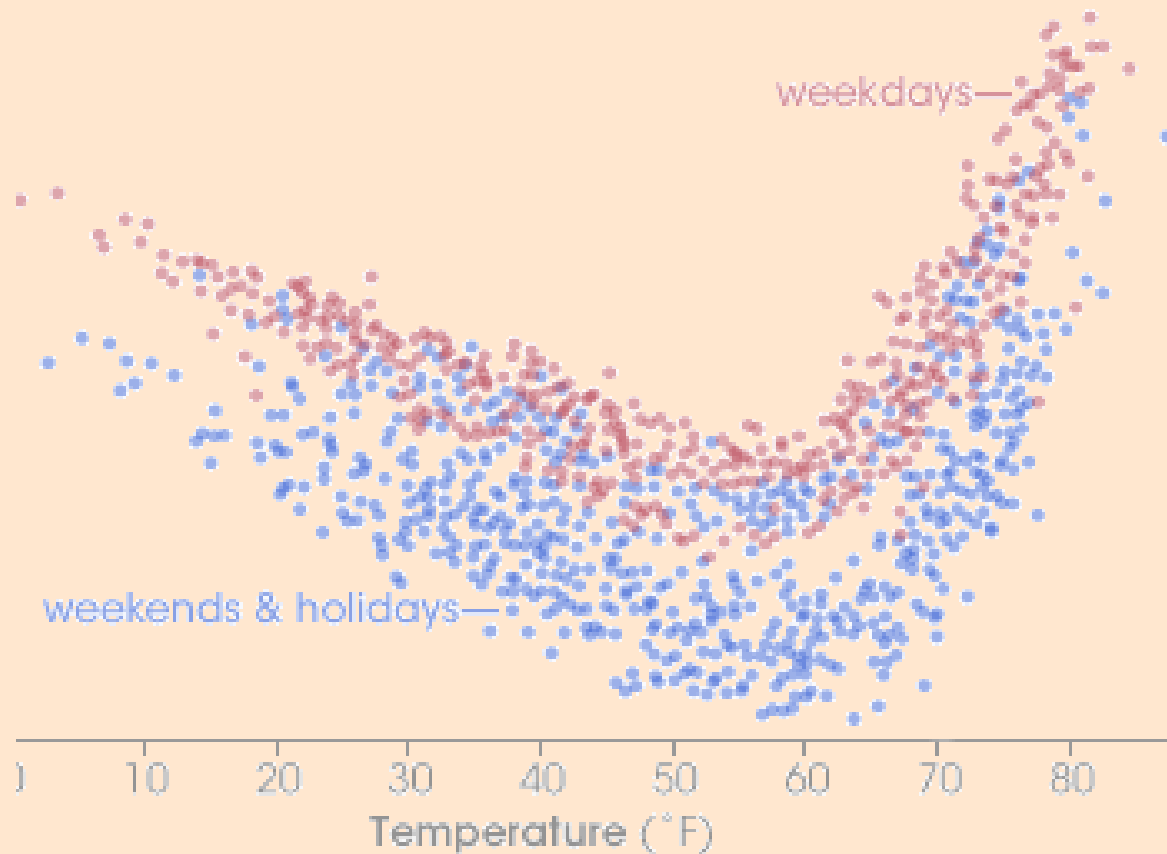
Number of Heat and Cold Days

Single Days Above 100° F and Below 45° F at Pierce College



Heat Wave Duration at DWP





New York City Energy Consumption rises with temperatures.

“Right now, we average about **14 days each summer above 90 degrees** [in New York]. In a couple decades, we could be experiencing 30 days or more” .

“So we have two forces—**urban heat islands and global warming**—that are reinforcing each other and are going to create hot, hot conditions for more than half the world’s population,” Gaffin explains. “How do we make cities more habitable in the future?”

<http://iopscience.iop.org/1748-9326/7/1/014029/>

I'm not paying my carbon tax unless this suburb gets cooler.



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W. H. H. H.

Adaptation, Mitigation



LINKING URBAN HEAT ISLANDS TO CLIMATE ADAPTATION PLANNING



EPA Urban Heat Island Webinar
Brendan Reed, Environmental Resource Mgr.



Mitigation: Trees and vegetation

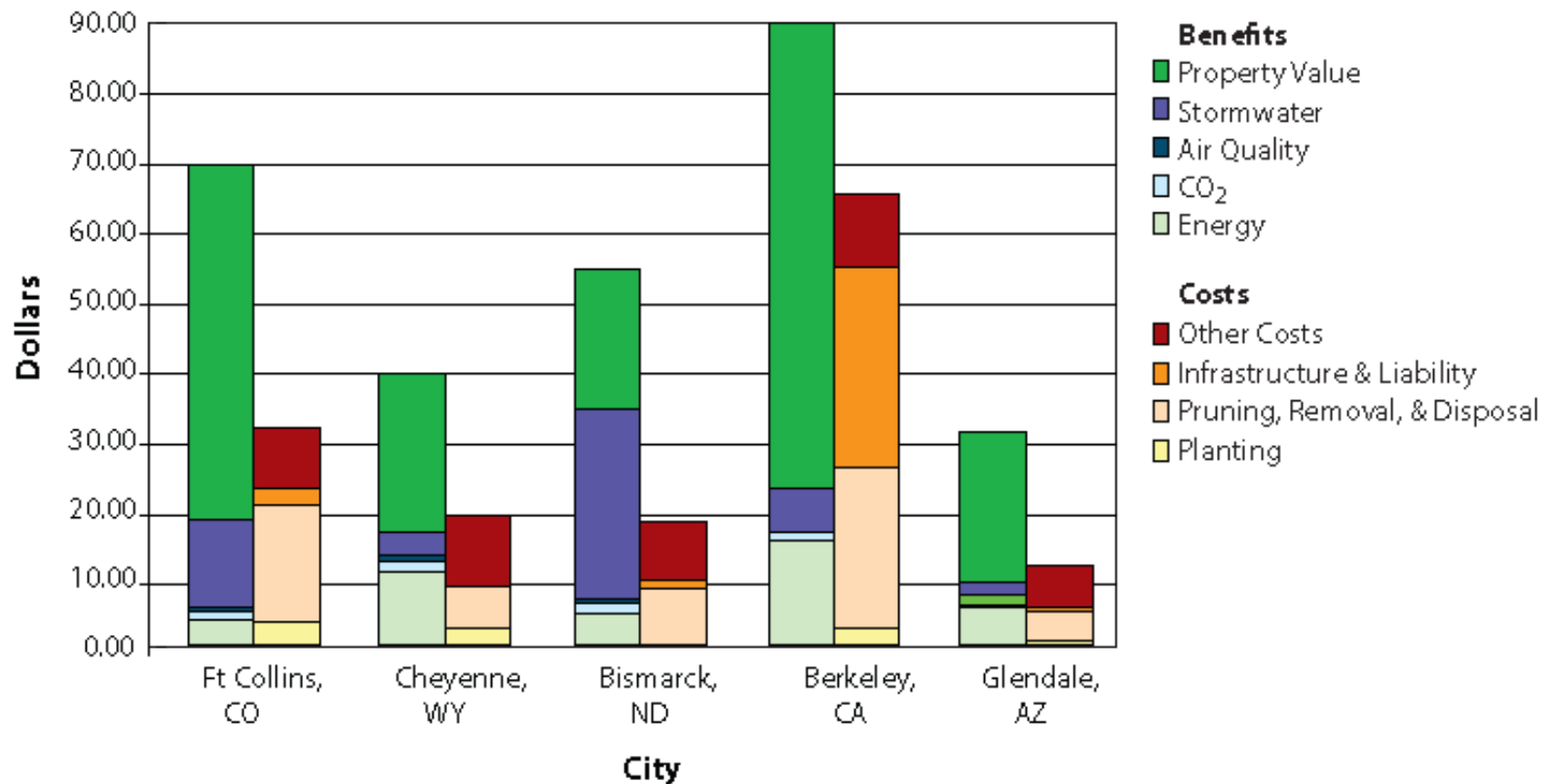
Figure 5: Tree Placement to Maximize Energy Savings



Picking the right trees and putting them in the right location will maximize their ability to shade buildings and block winds throughout the year.

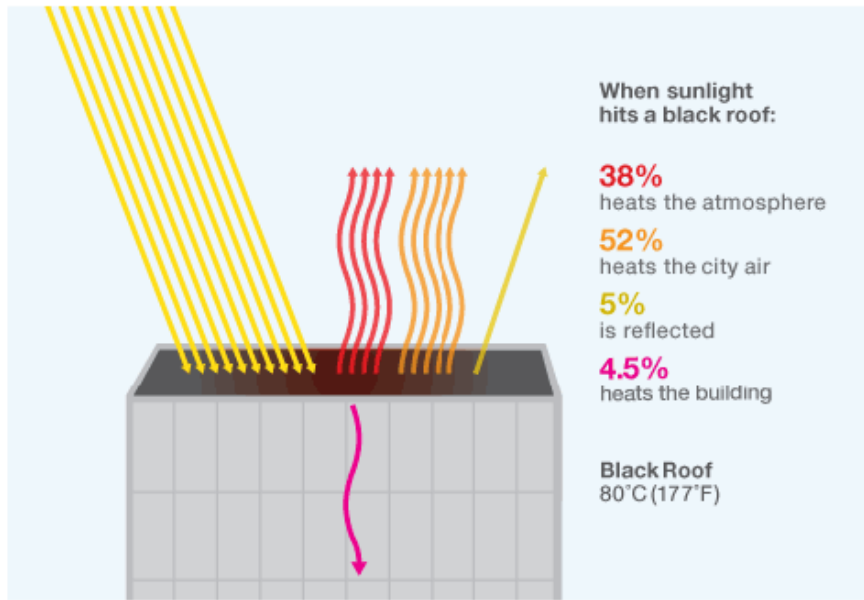
Cost-benefit of planting trees

Figure 9: Total Annual Benefits versus Costs (Per Tree)

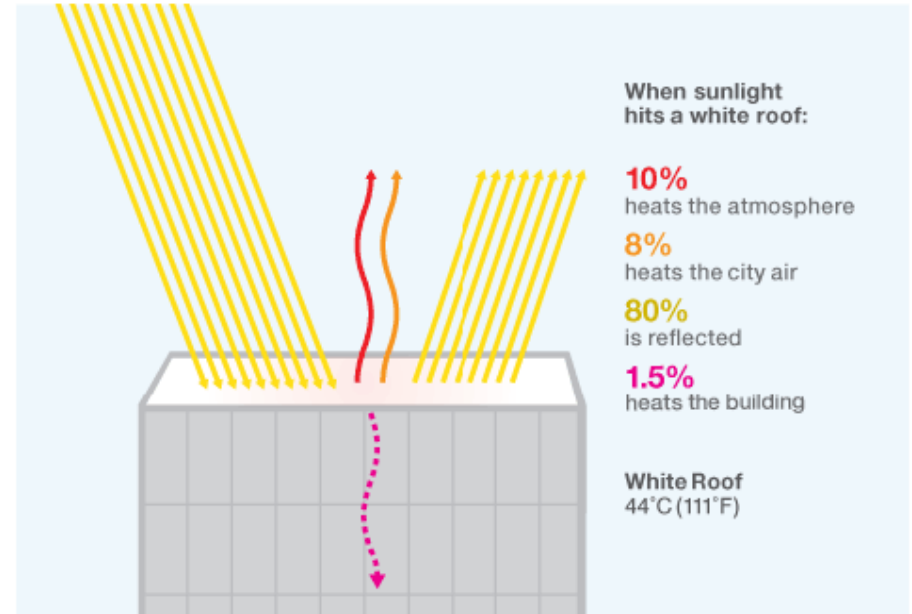


Net benefits were positive for all five cities, ranging from \$21 per tree in Cheyenne to \$38 per tree in Ft. Collins. Blue and green categories indicate benefits; red, orange, and yellow indicate costs.

▶ VIEW IT WITH A COOL ROOF

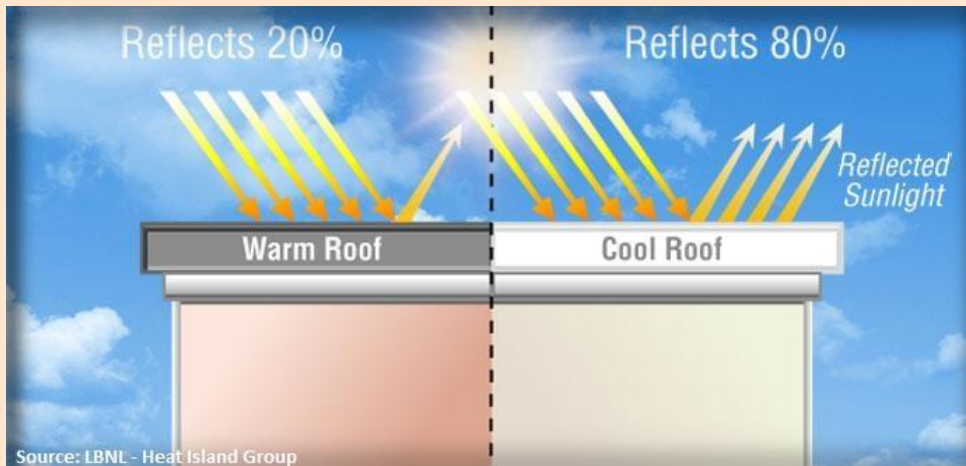


◀ VIEW IT WITHOUT A COOL ROOF



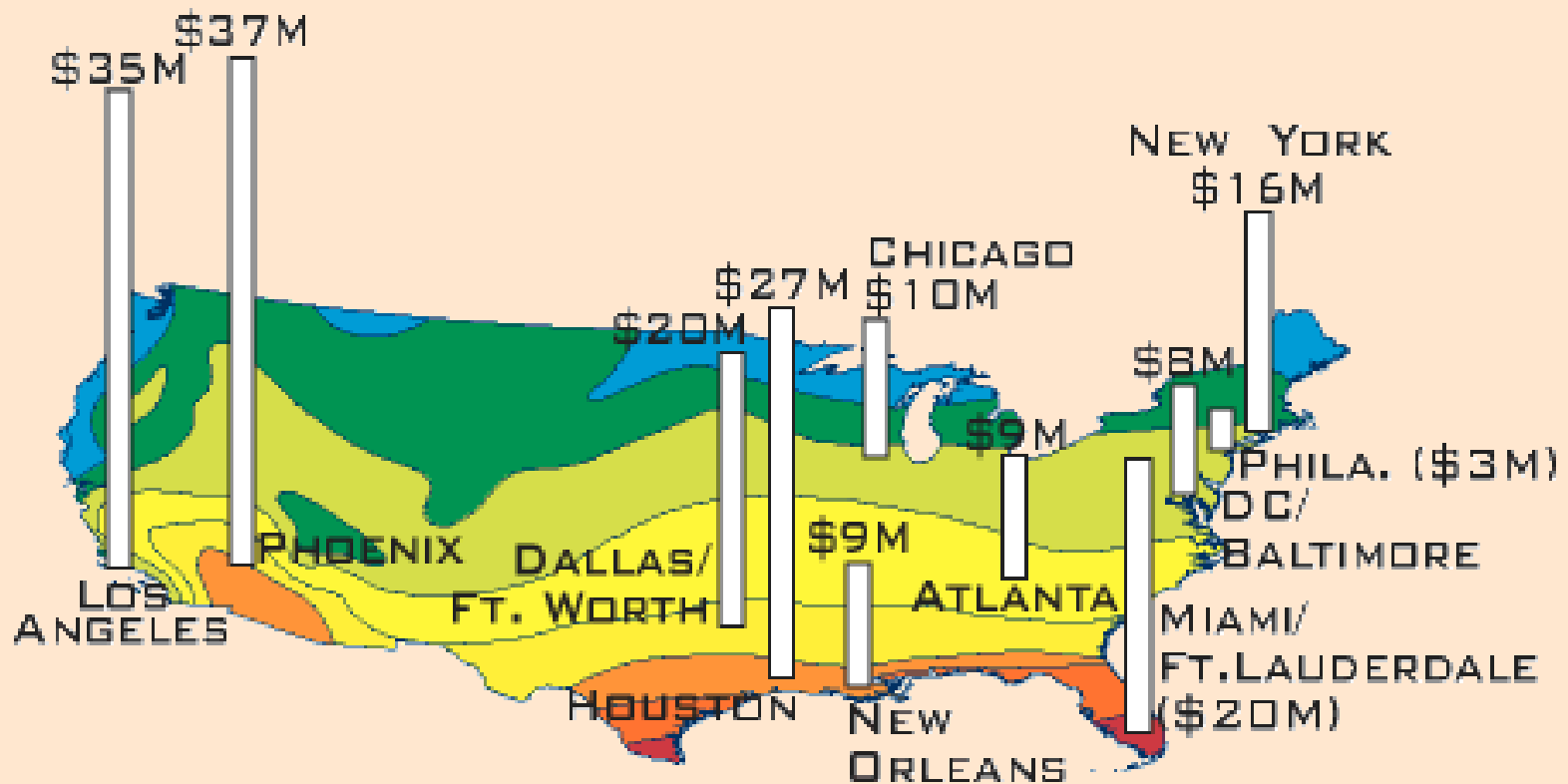
White roofs reflect sunlight, keeping our buildings and cities cooler. For example, a white roof in temperate or tropical regions absorbs about 70% less sunlight than an ordinary roof. White roofs cool the human environment as well as the atmosphere, and reduce our need for air conditioning.

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Source: EPA

COOL ROOFS



*Potential net energy savings from changing roof reflectivity. Savings are measured in dollars. Note that the **net** savings are the savings of cooling energy use less the penalties of heating energy use.*

Mitigation: Green Roofs

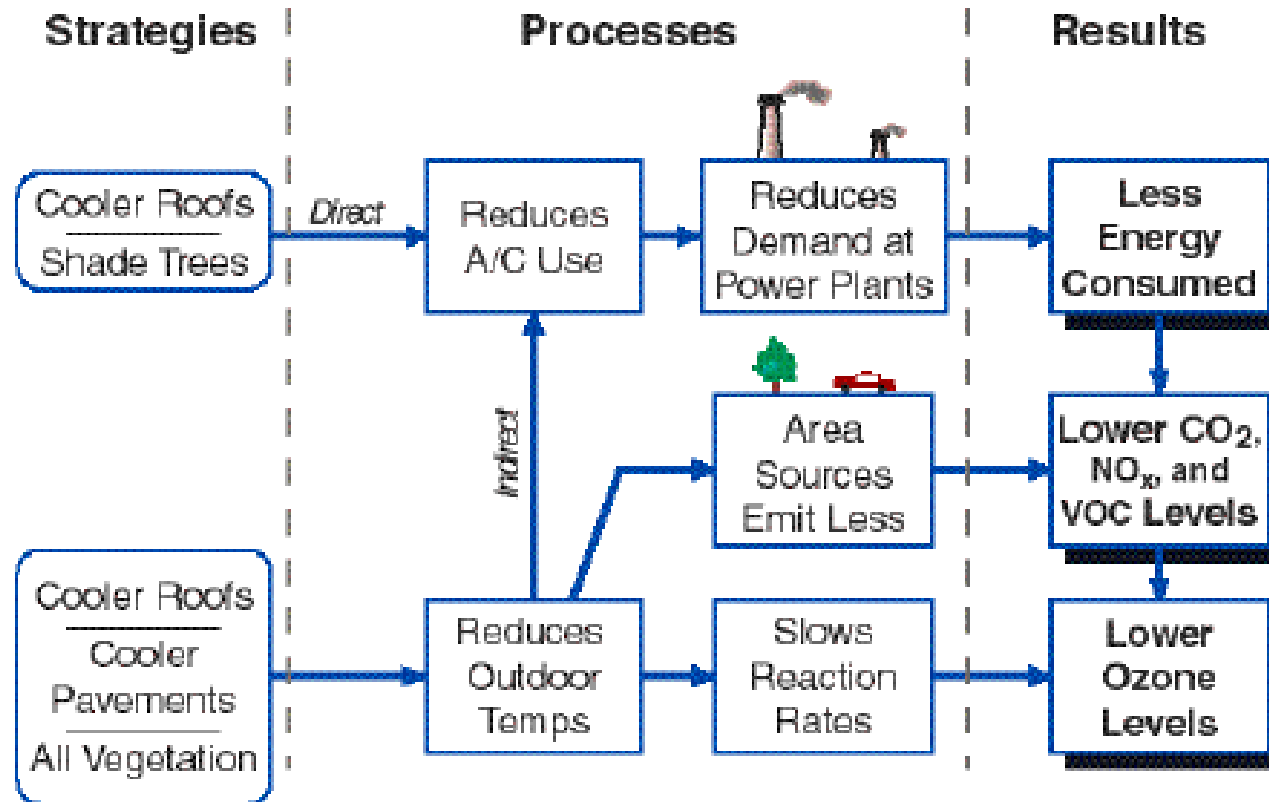
Figure 4: Temperature Differences between a Green and Conventional Roof



On a typical day, the Chicago City Hall green roof measures almost 80°F (40°C) cooler than the neighboring conventional roof.

<http://www.epa.gov/heatisland/resources/pdf/CoolRoofsCompendium.pdf>

Figure 2: Methodology for energy and air-quality





Questions?



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