



Green is the New Black: Managing Rising Heat Trends in Dallas

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anomaly



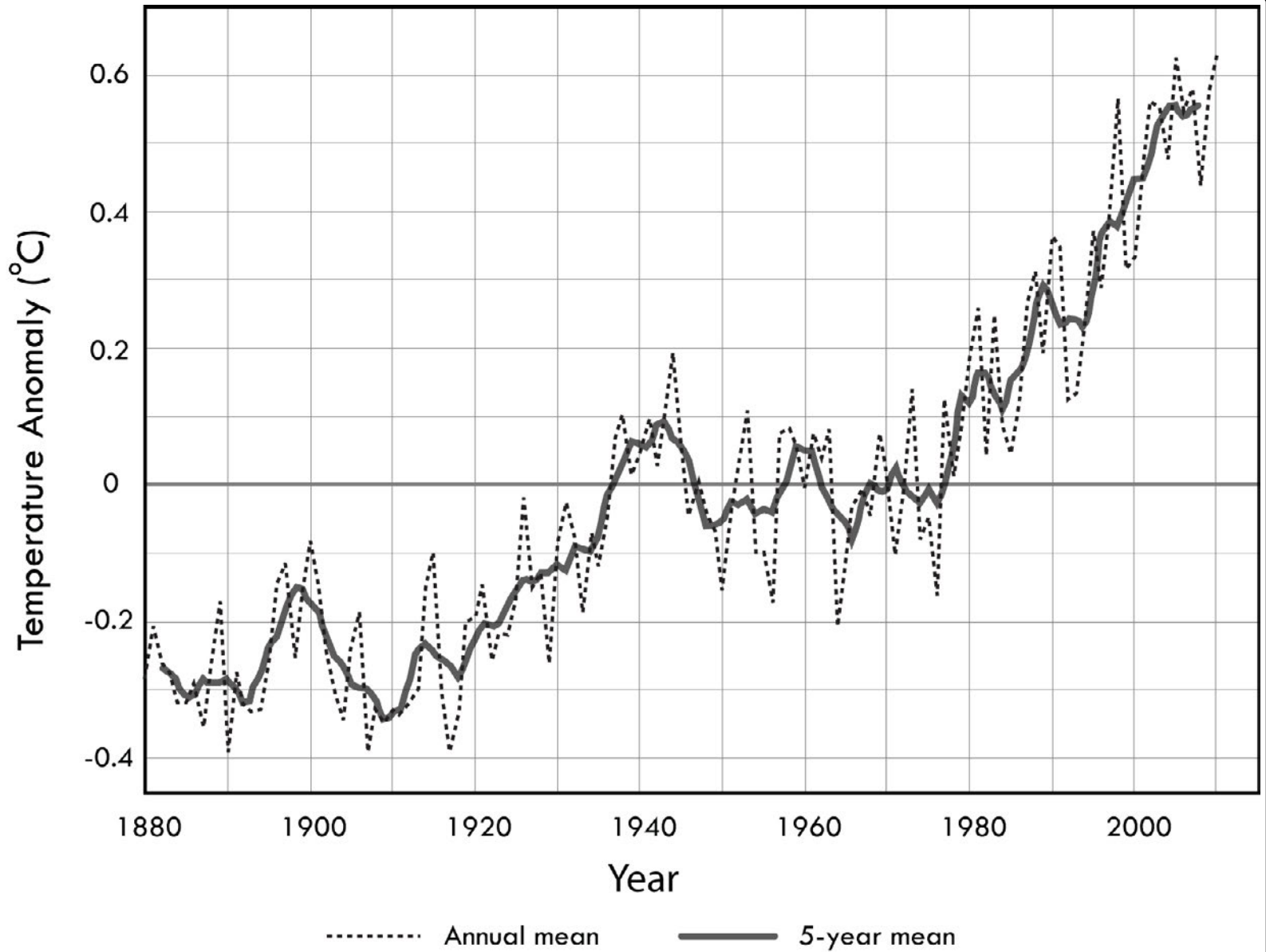
risk



response



Global temperature anomaly



Drivers of the urban heat island

1. Loss of natural vegetation



2. Replacement of vegetation with impervious materials



3. Waste heat from vehicles, industry, building air conditioning



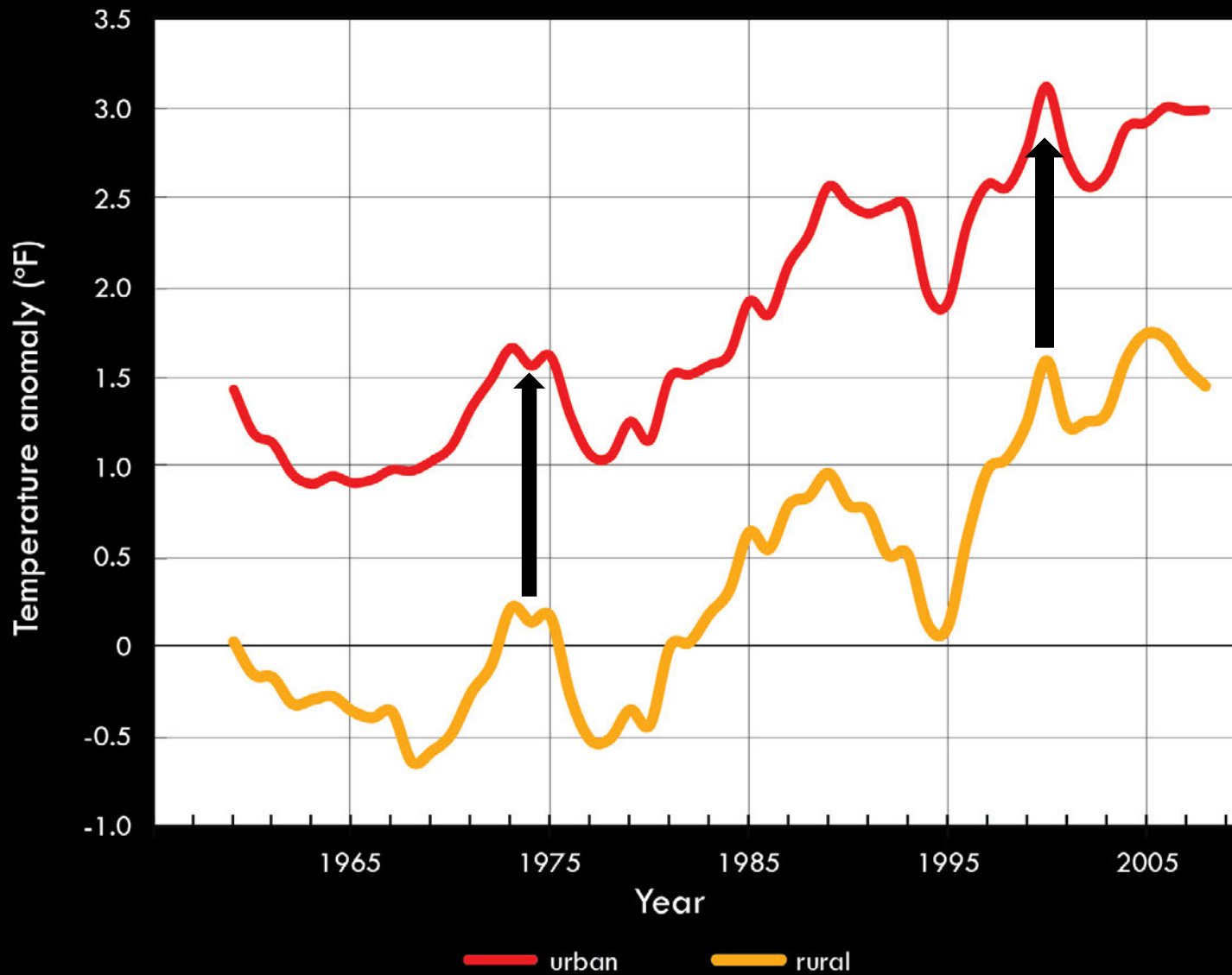
4. Trapping of heat by building "canyons"



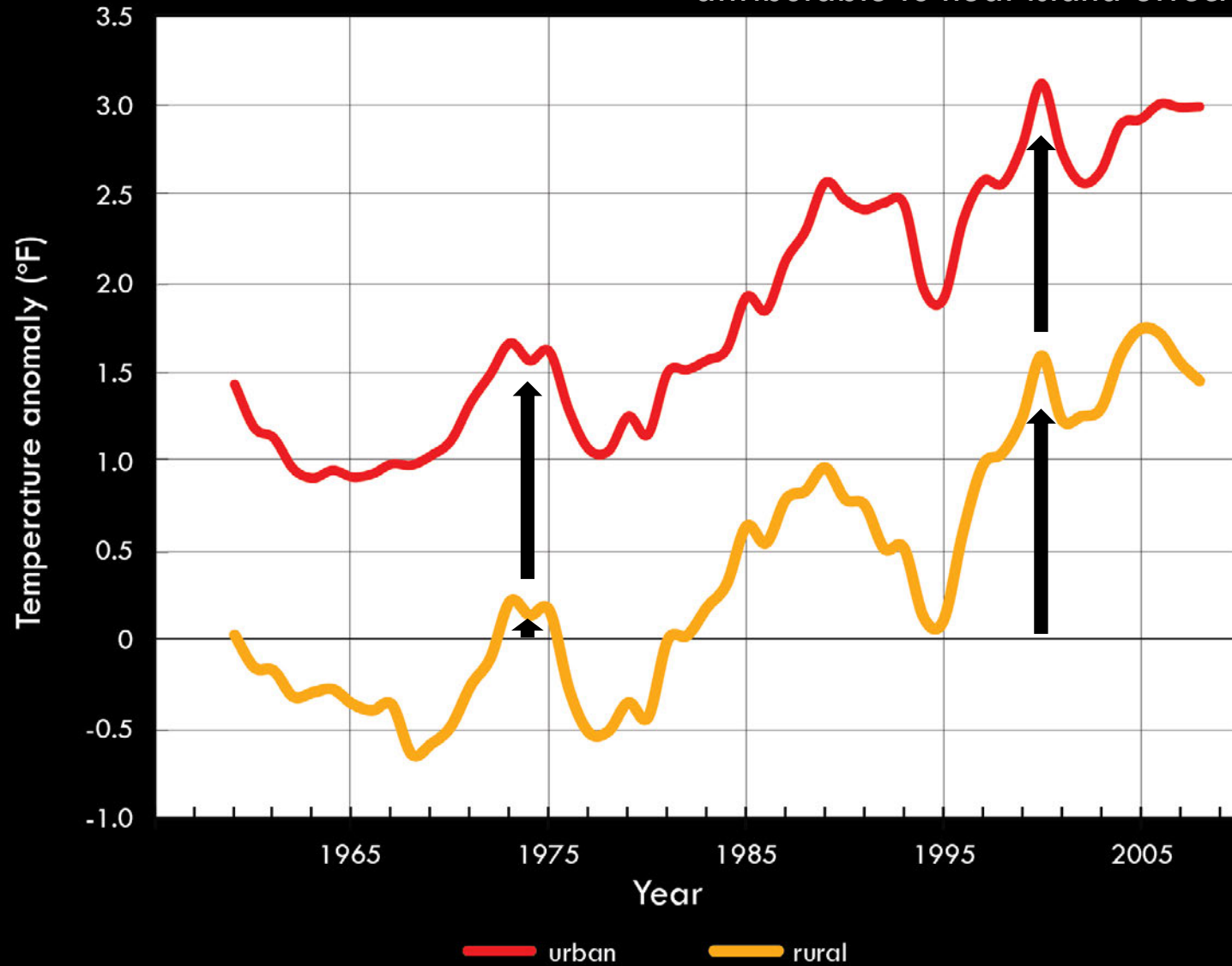
rural areas have warmed by about 1.5 °F over 50 years



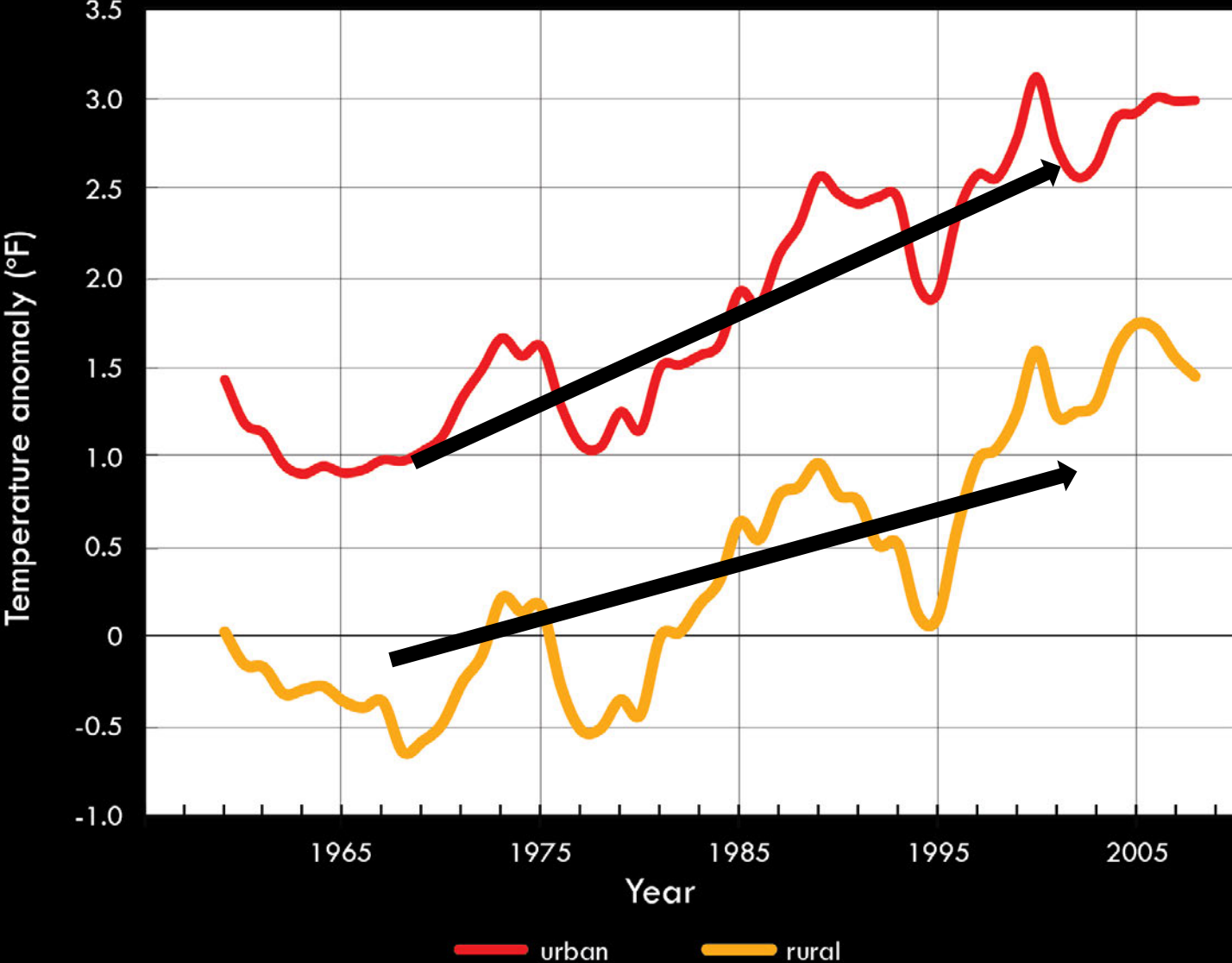
urban areas are about 1.5 °F warmer than rural areas

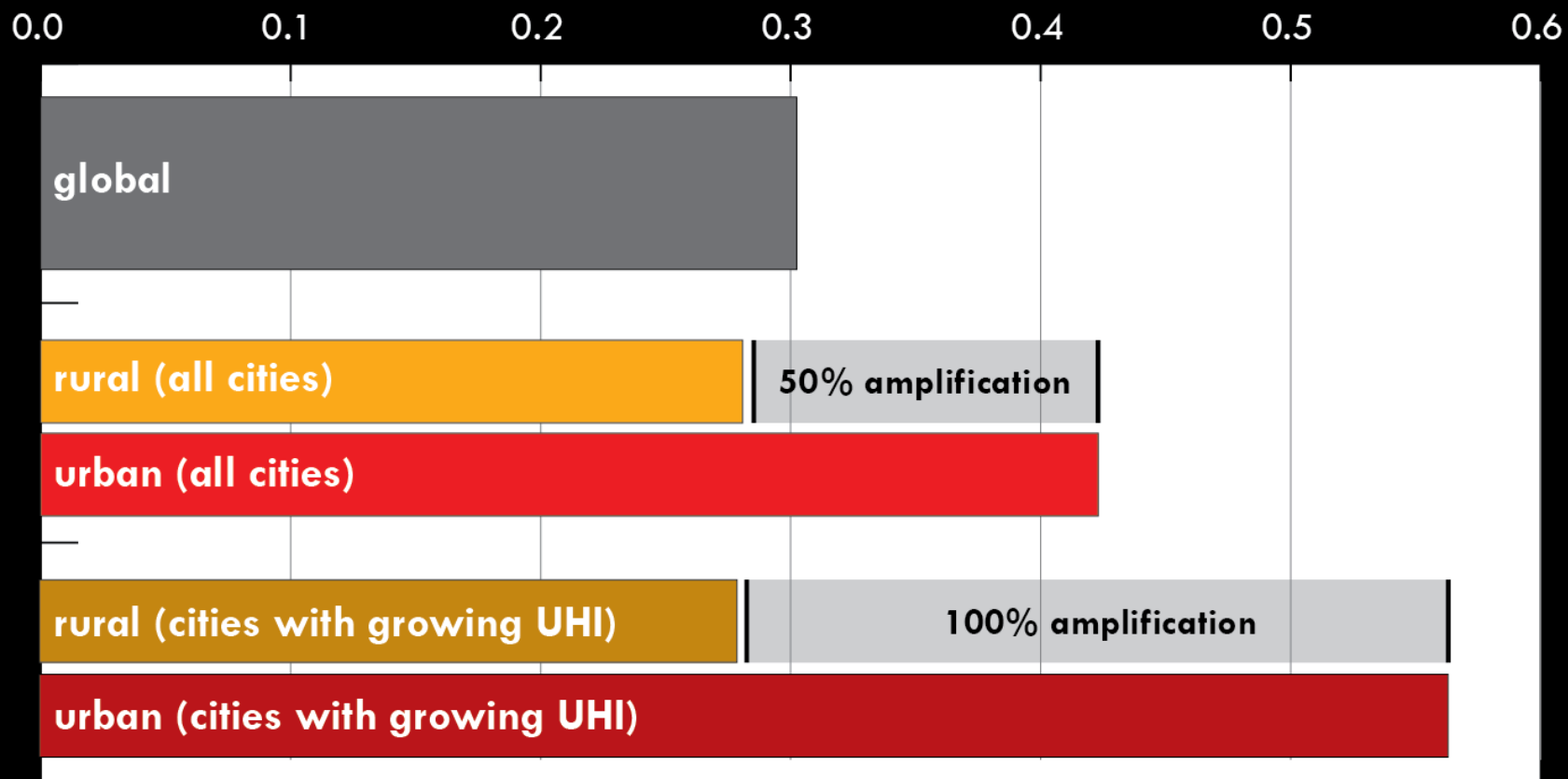


most of the temperature anomaly in cities is attributable to heat island effect



urban areas are warming more rapidly
over time than rural areas

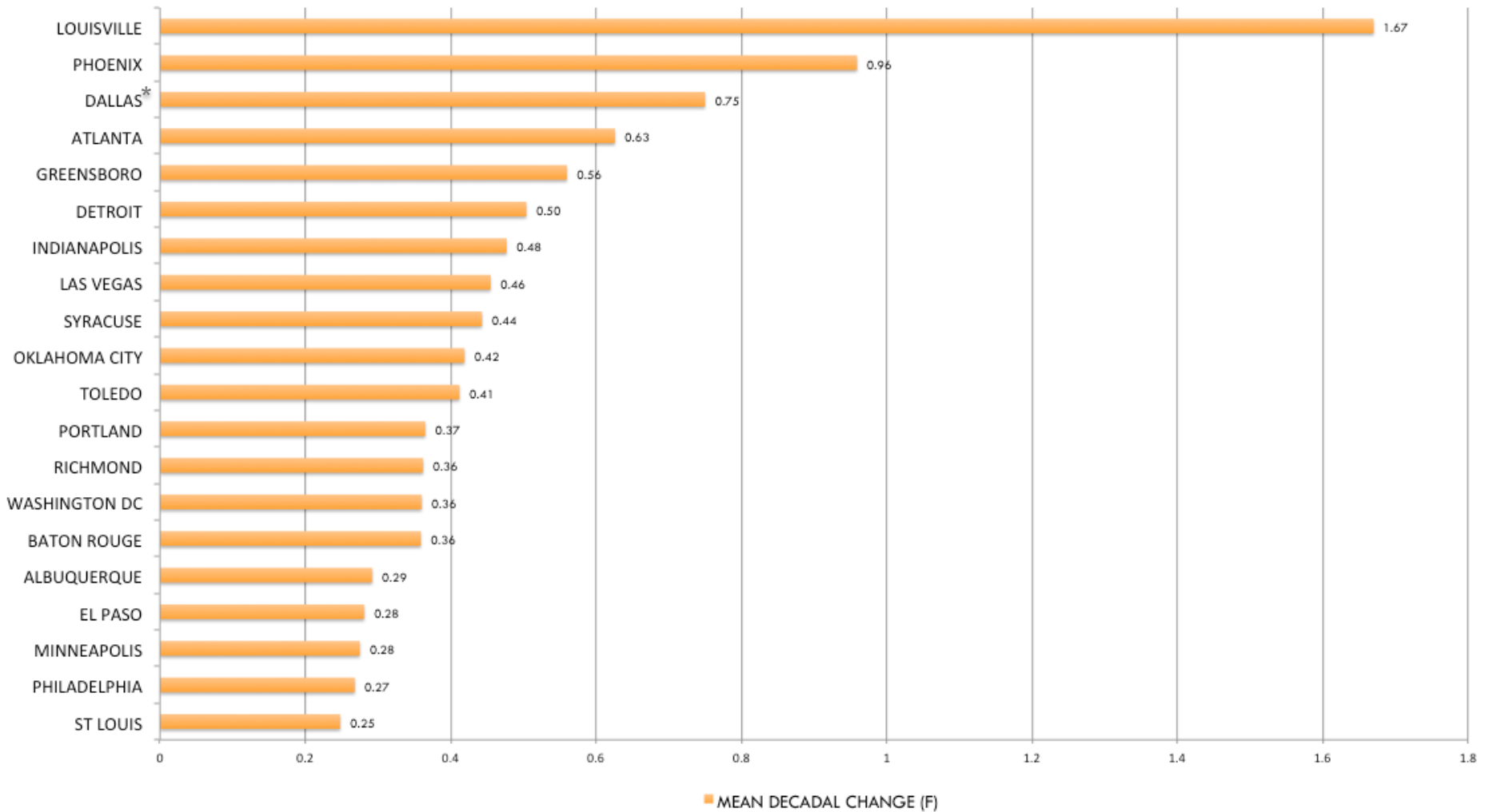




global vs. urban rates of warming (°F/decade): 1961-2010

Urban warming rankings

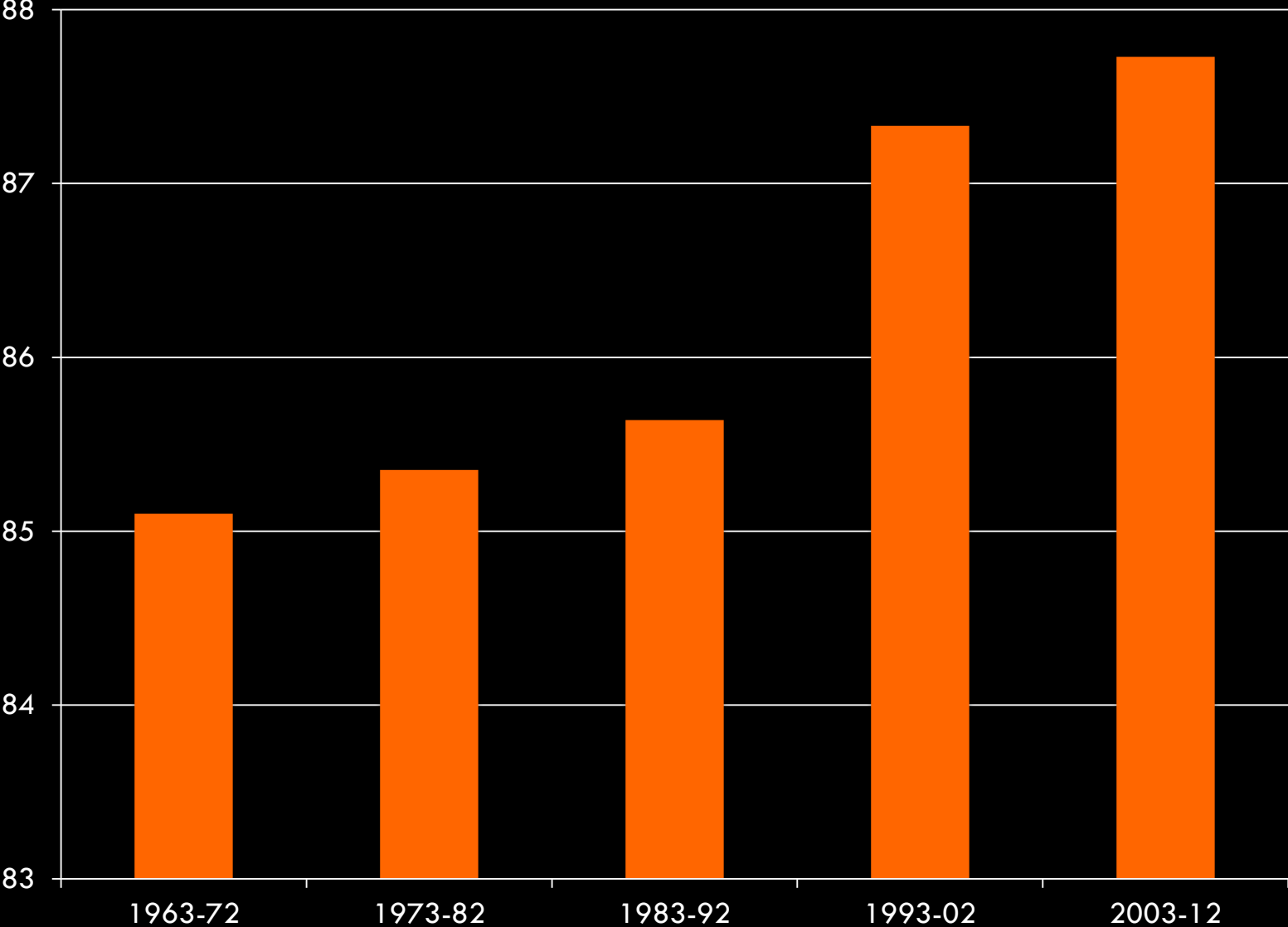
TOP 20 MOST RAPIDLY GROWING URBAN HEAT ISLANDS IN UNITED STATES: 1961 - 2010



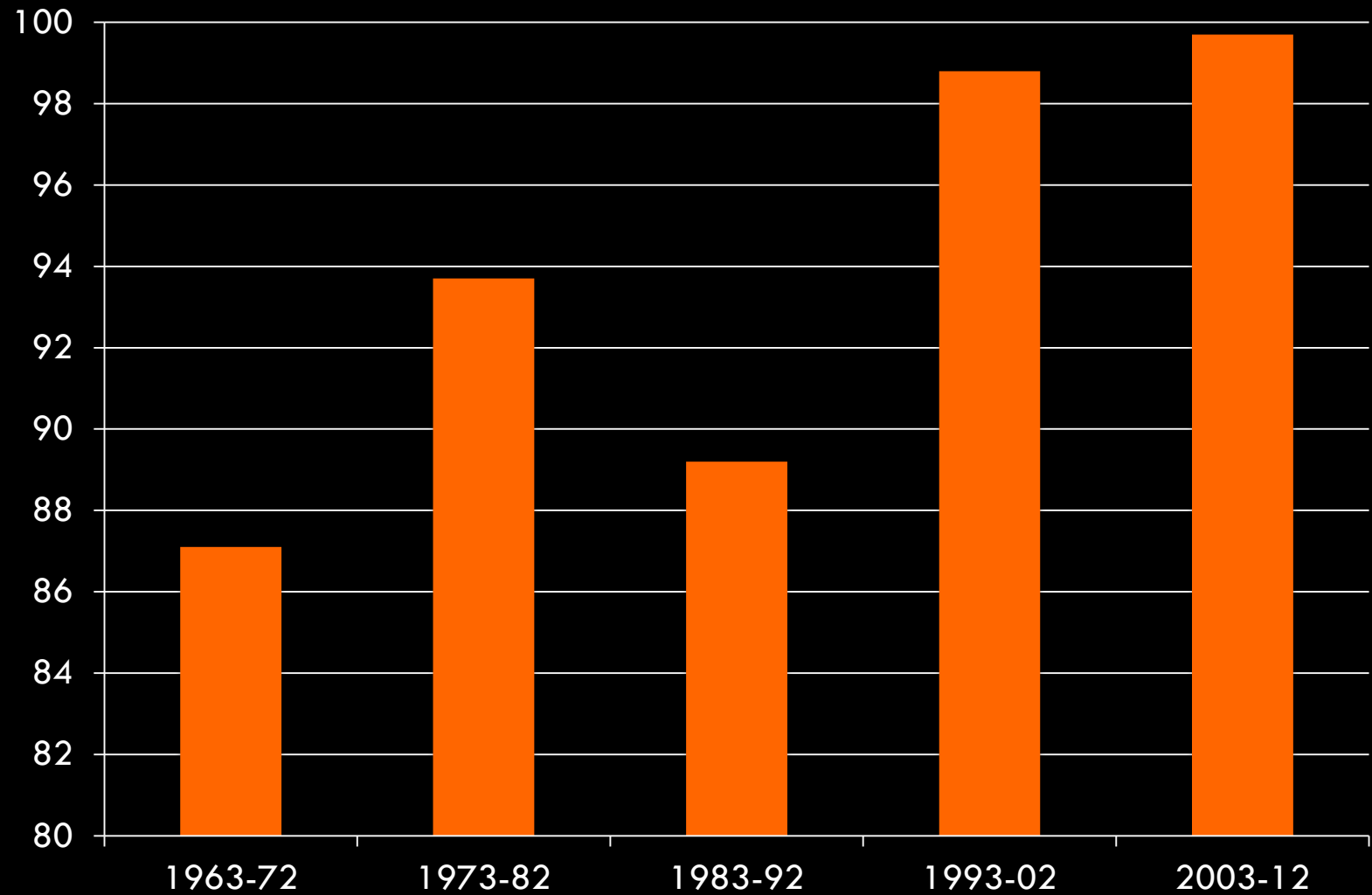
SOURCE: URBAN CLIMATE LAB, GEORGIA INSTITUTE OF TECHNOLOGY

warming in excess of rural trend (°F/decade)

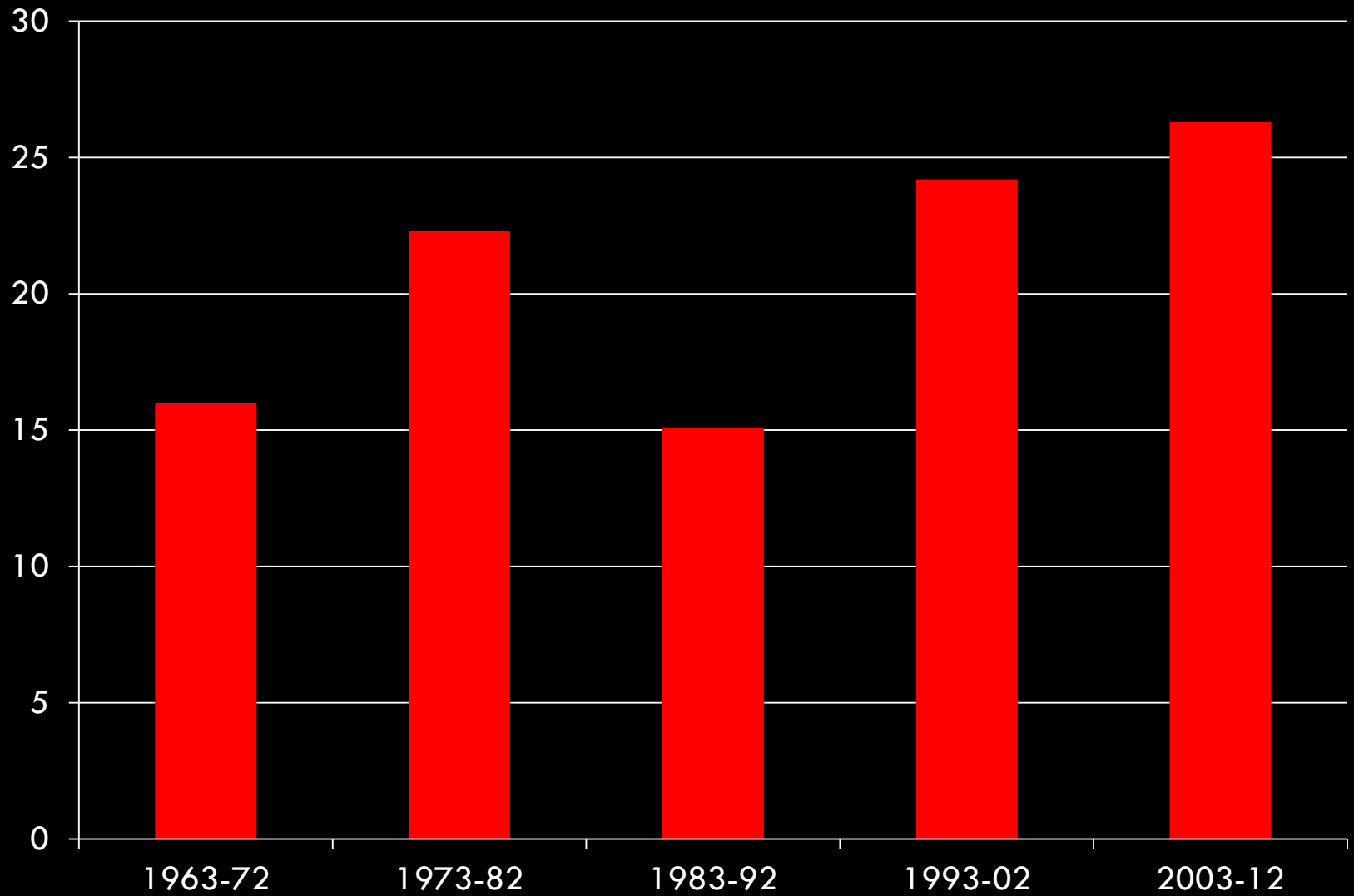
August average low temperature by decade



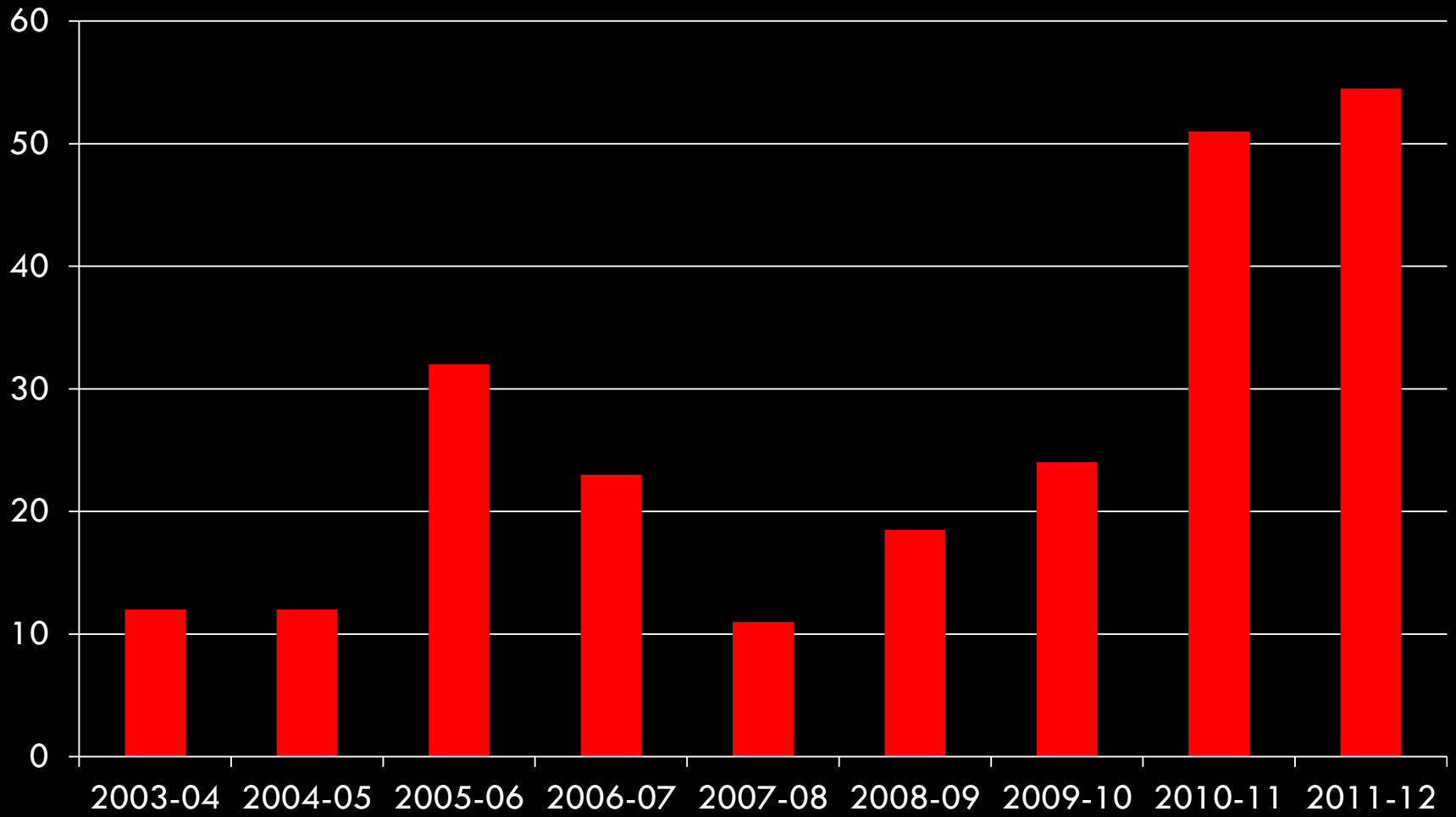
Average number of days with high temp > 90°F



Average number of days with high temp $> 100^{\circ}\text{F}$



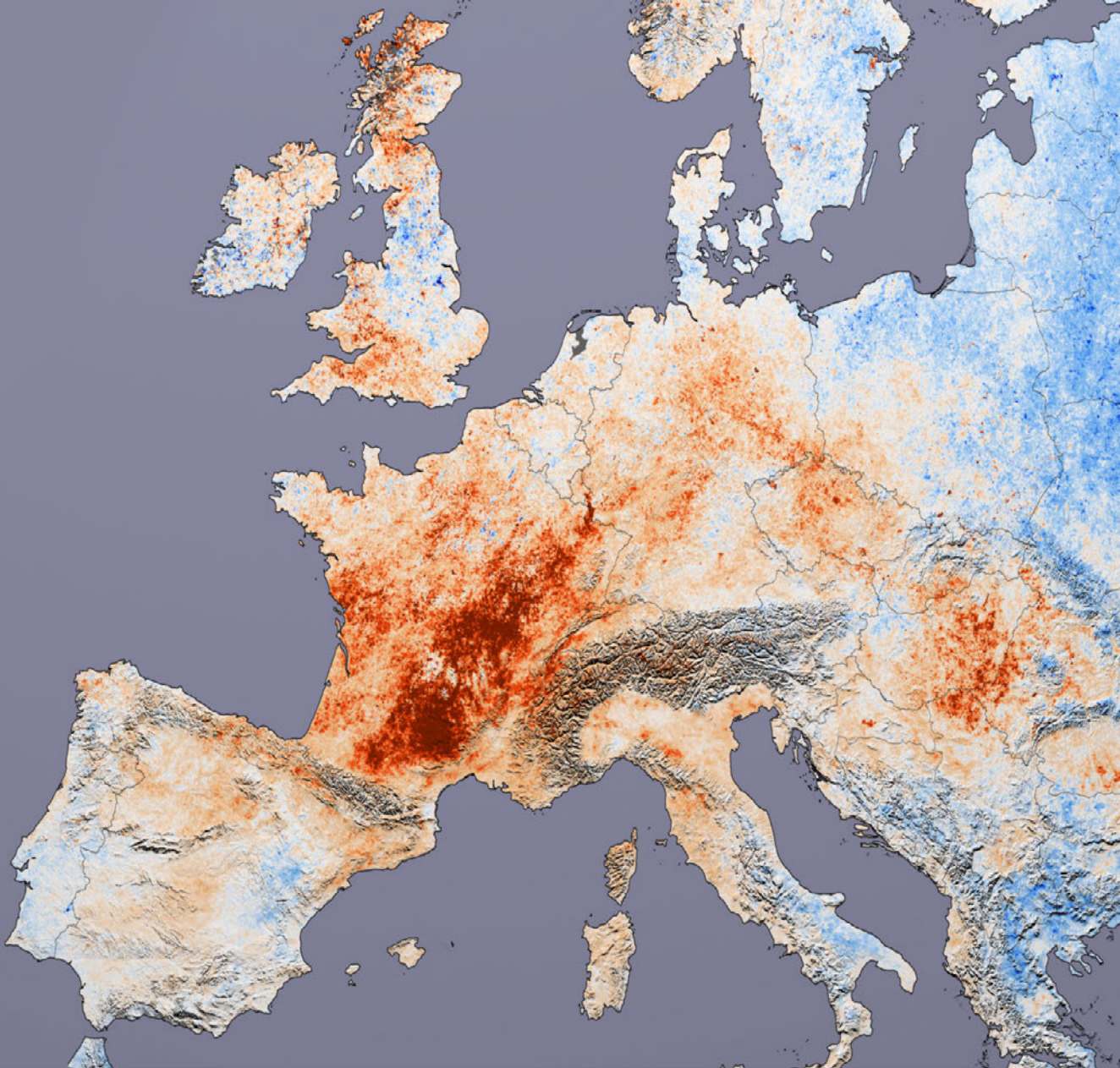
Two-year average number of days with high temp > 100°F



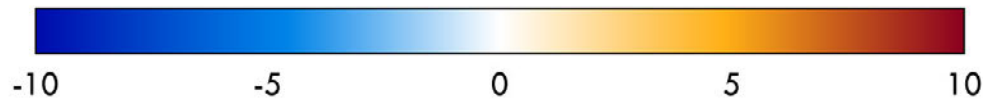
risk

exposure to danger, harm, or loss

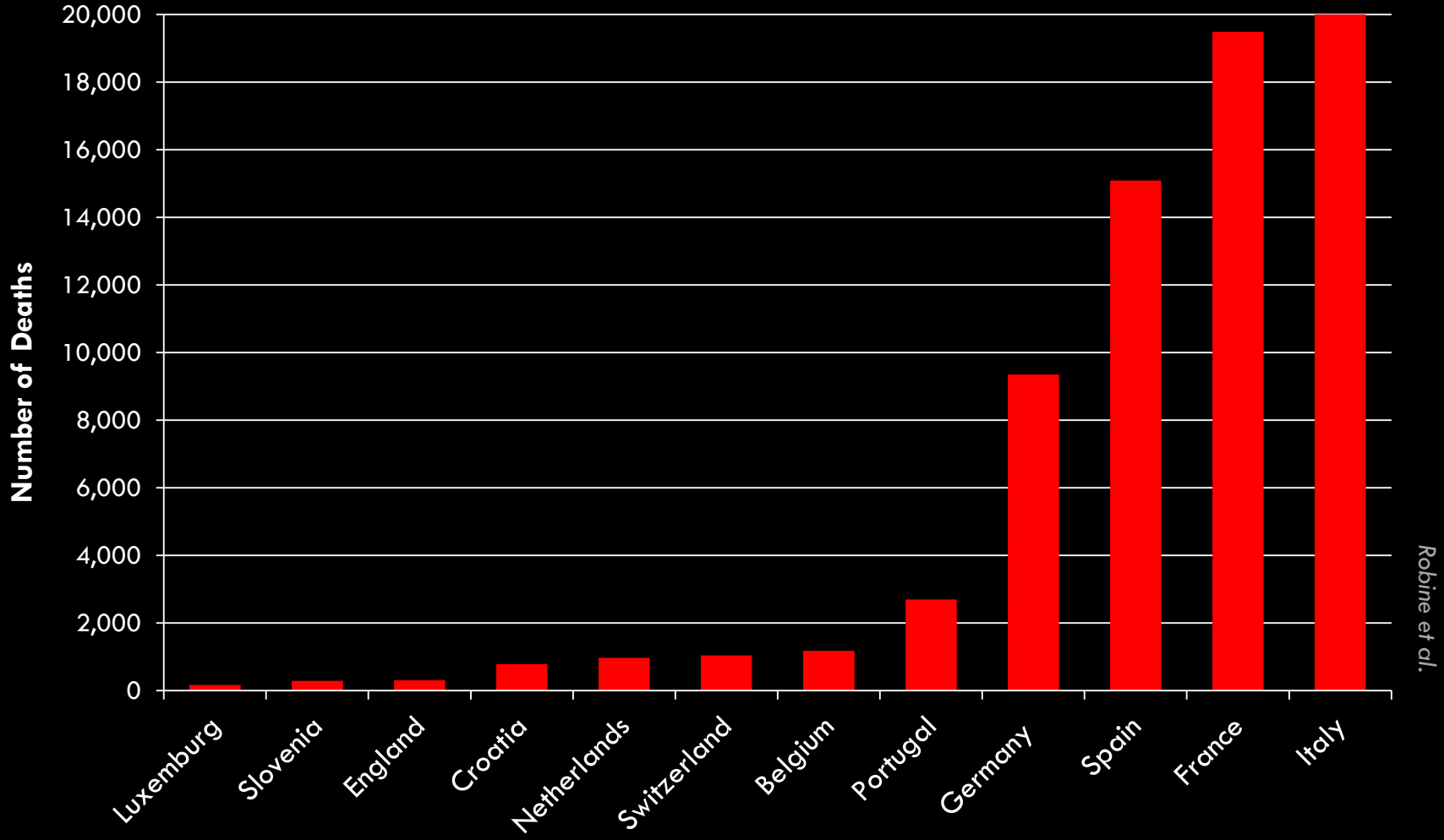
European heat wave of 2003



Temperature anomaly (°C)

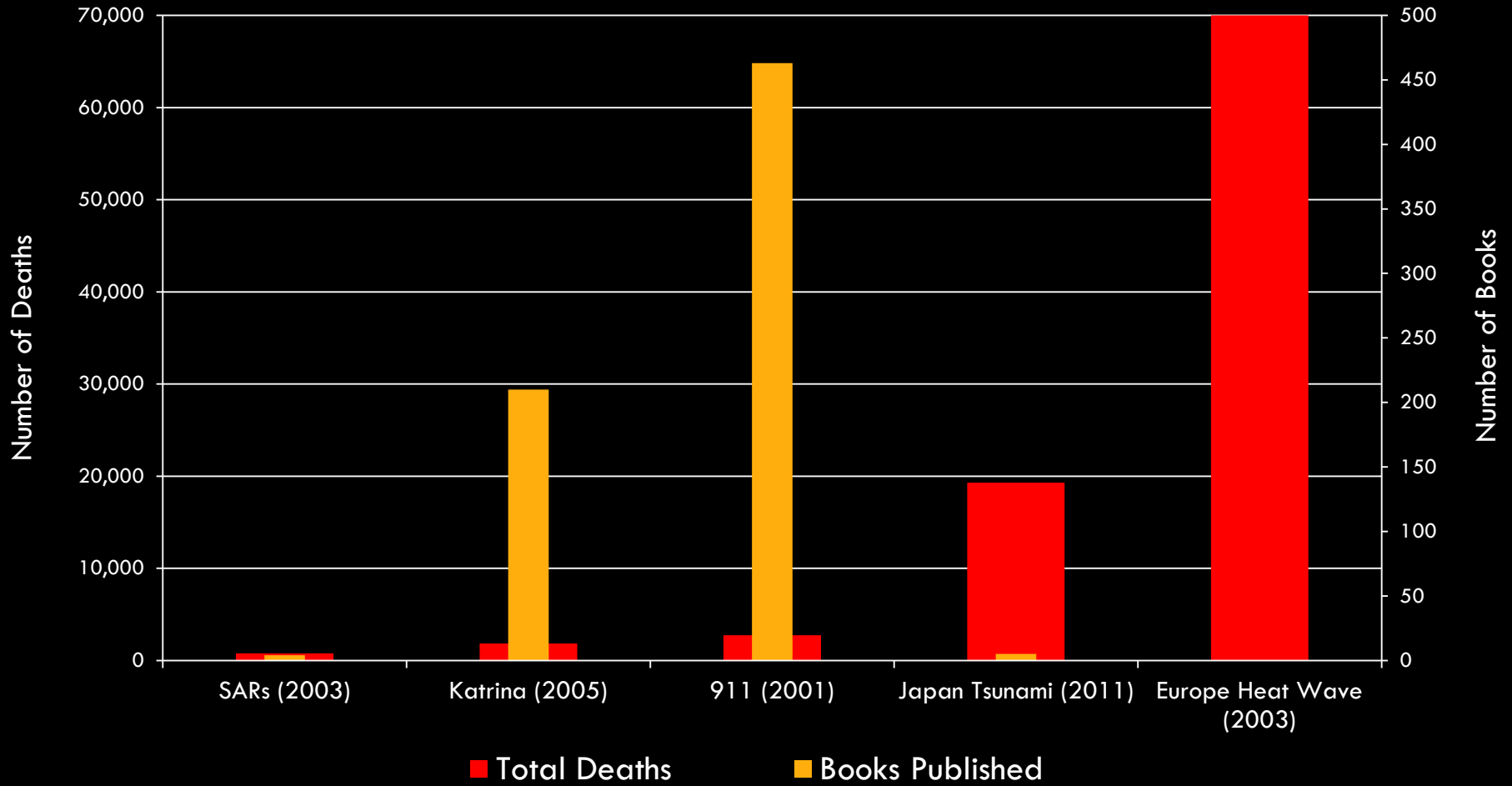


Heat-related deaths: June through September 2003

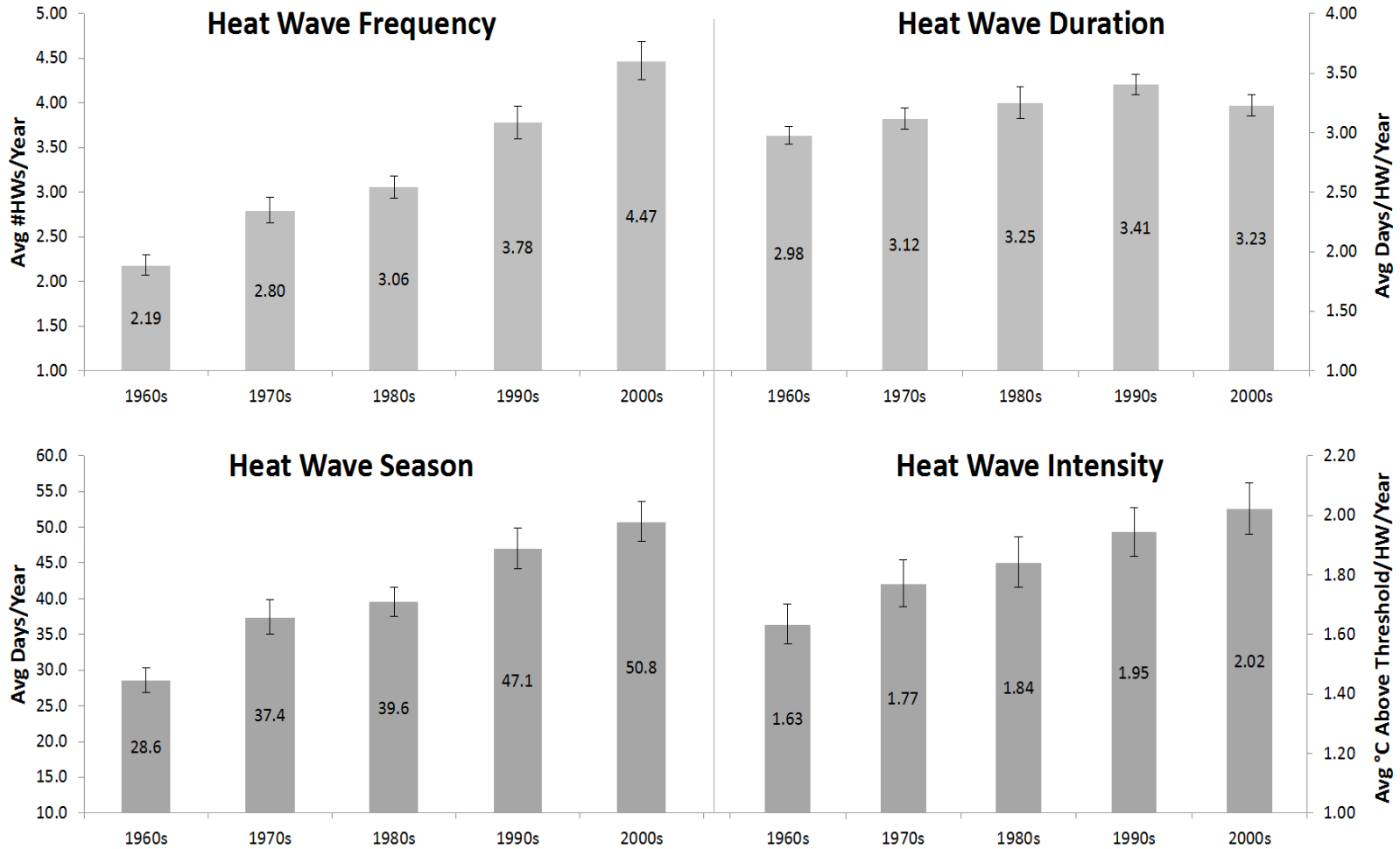


Robine et al.

Underestimating extreme heat: the books-to-bodies ratio



heat waves in US cities are hotter, longer,
more frequent, and earlier in the year

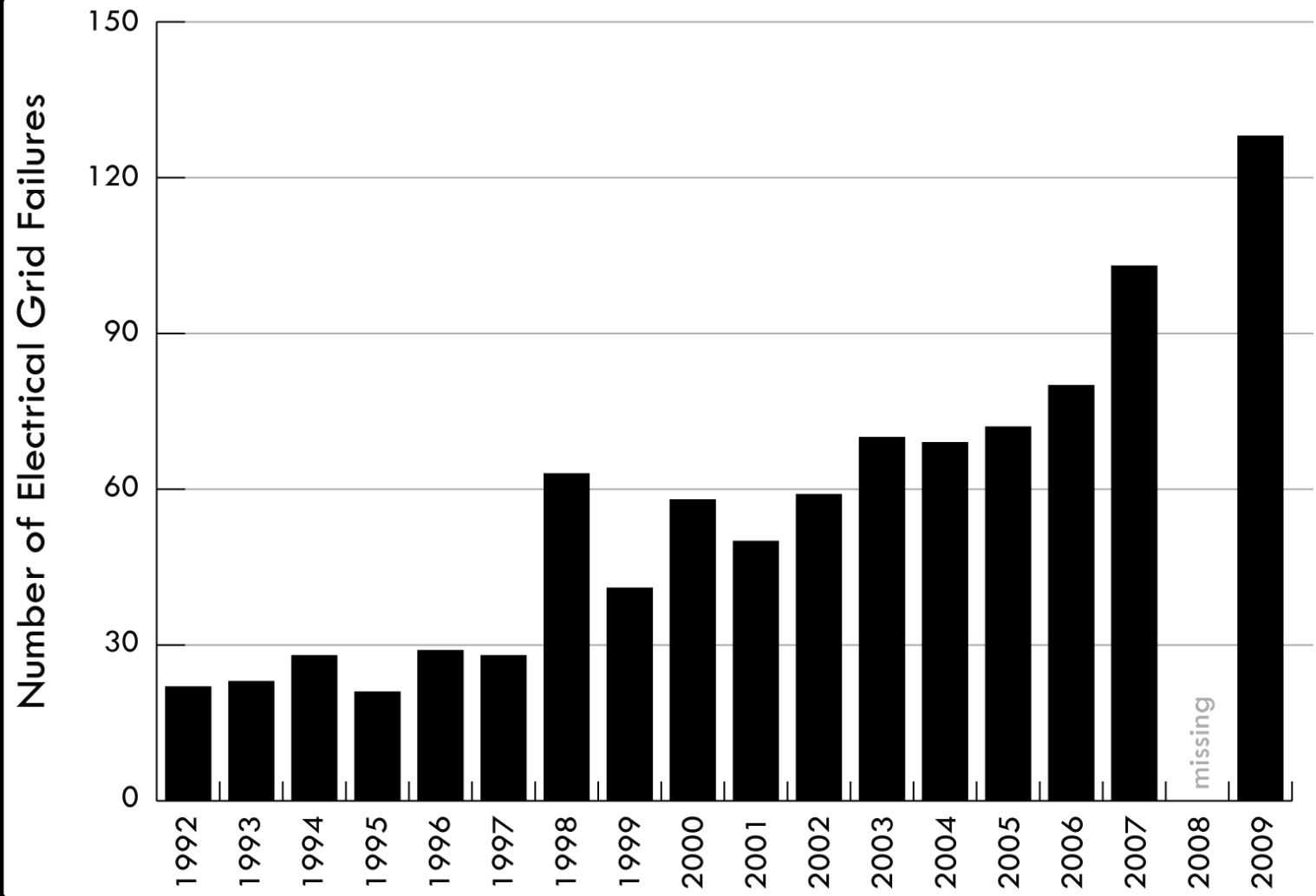


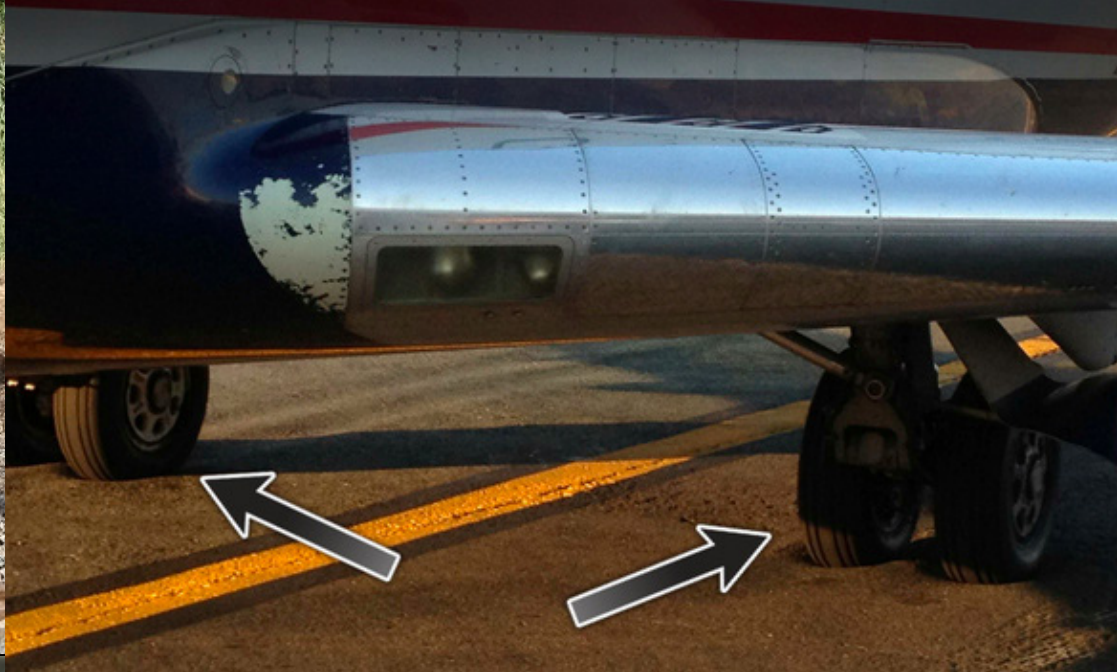
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ISAT GeoStar 45
23:15 EST 14 Aug. 2003



Trends in electrical system failures





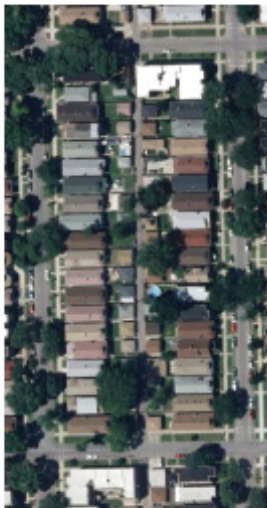
response

a behavior that results from an external
stimulus

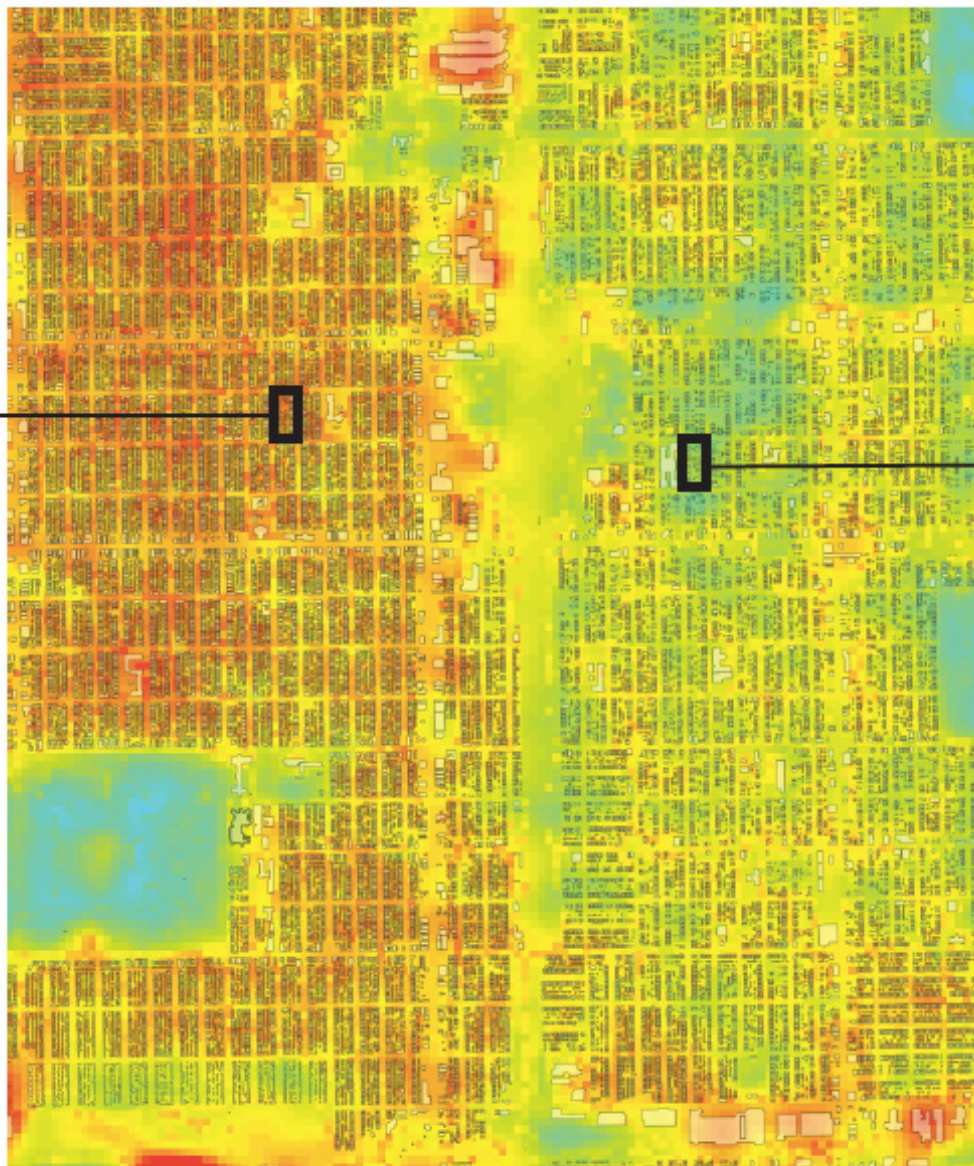


71 buildings
(39 houses)

36.4%
(footprint/block)

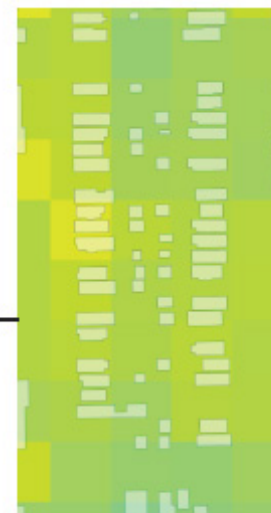


hot neighborhood



difference between the blocks in average LST

7.1 °C
(12.7 °F)



57 buildings
(35 houses)

22.0%
(footprint/block)

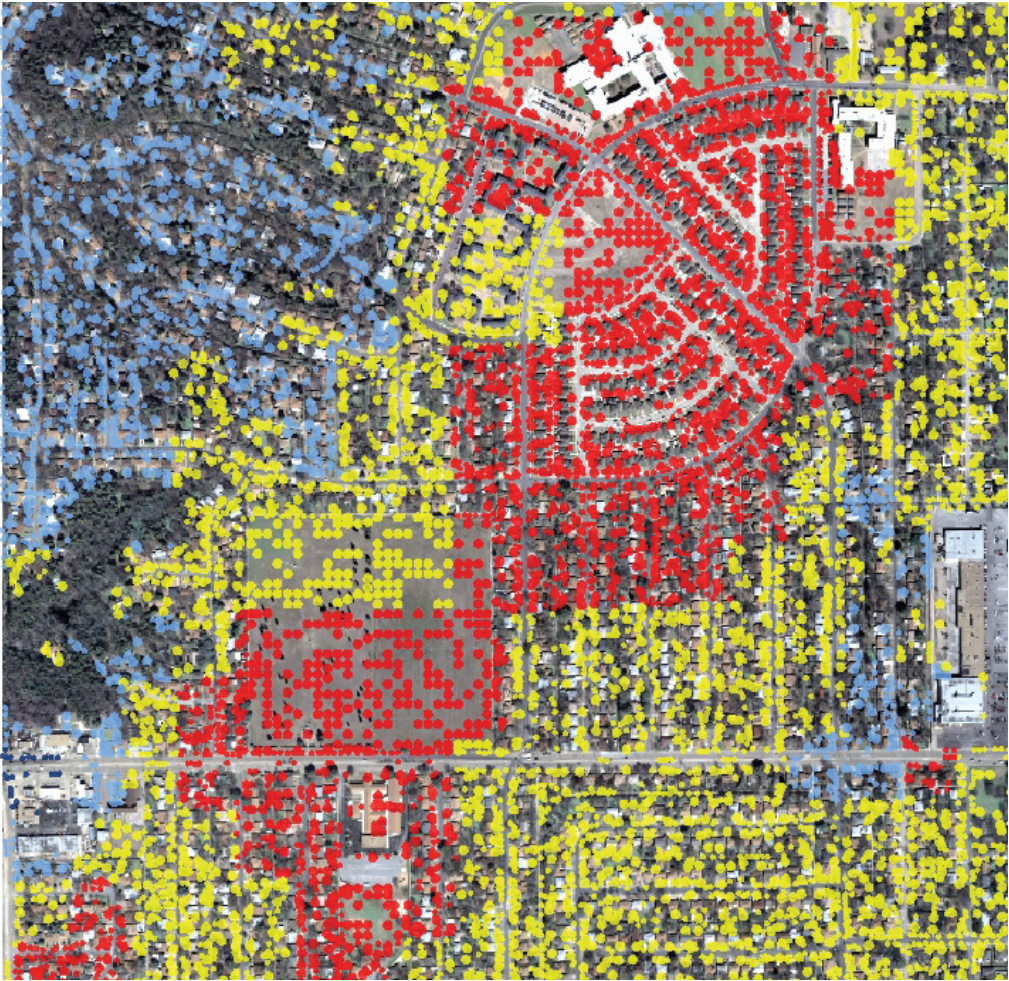


cool neighborhood

Recommendation 1: Conduct an urban tree canopy assessment



Dallas Roadmap to Tree Planting and Planning



*Tree Planting Locations
Color Coded by
Temperature Range*

*US Forest Service recommends
An Average Tree Canopy
cover of 40%*

Temperature Ranges (Degree F)

0-110	121-130	141 + N/A
111-120	131-140	



Recommendation 2: Strengthen regional policies to protect and expand greenspace



Reducing Dallas's Urban Heat Islands

TREES AND THE DALLAS URBAN HEAT ISLAND

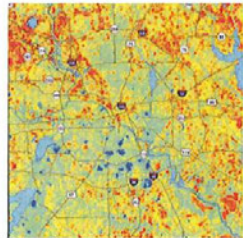
DALLAS SUSTAINABLE SKYLINES INITIATIVE: DALLAS URBAN HEAT ISLAND STUDY



forwardDallas! Vision cooler and greener



Mature Trees



Dallas surface temperatures 2006

EXECUTIVE SUMMARY

Trees help cool the city and, in many parts of Dallas, they are the defining feature. Dallas citizens and leaders are well aware that trees provide important benefits to the city and are a valued asset.¹³ For example, *forwardDallas!*, the City's comprehensive plan adopted in 2006, includes trees as a singular feature throughout. In some ways, however, unless trees are threatened, they can be taken for granted.

We know from research that trees add value to property; that human health responds positively to trees and greenspace; that people prefer shopping areas with good landscapes and vegetation; and that trees are an important part of the Dallas quality of life.¹⁴ We also know that areas without trees can be substantially hotter.

This report identifies the role that trees play in cooling the city; it quantifies the benefits; and it sets forth actions to reduce the urban heat island effect through expansion and protection of the Dallas urban tree canopy.

Dallas has a vibrant tree canopy over much of the city, but there are many areas that can be targeted for improvement. Like most growing cities, the Dallas tree canopy is continually challenged by new development and redevelopment. In addition, older and unhealthy trees are lost over time and not fully replaced.

To keep Dallas cooler while capturing the benefits of urban tree cover, the following conditions are needed:

- Identifying new planting areas
- Targeting of area hot spots
- Protecting the existing canopy.
- Adequately replacing trees lost as the city continues to grow

COSTS AND BENEFITS

The net benefit of trees has been found to outweigh the cost by as much as three to one. The net annual benefits of street trees have been estimated to range from \$30 to \$90 per tree.¹⁵ The initial cost of planting new trees can be substantial, ranging from \$200 to \$400 per tree (Table 8). Cities also incur costs such as pruning, removal/disposal, litter management, liability, administration and inspection.

Planting costs for tree programs are often shared among property owners, neighborhoods, businesses, and other governmental bodies. The Dallas reforestation fund, the MOWmentum program, and the emerging Adopt-A-Median program are examples.

Economic benefits of the Dallas urban tree canopy are substantial. Studies of other cities suggest the benefits amount to several hundred million dollars annually.¹⁶ This includes benefits such as energy savings, carbon storage, air quality improvements, human health, quality of life, and stormwater management. Loss of trees in the city also means loss of these benefits, making maintenance and reforestation essential.

Dallas residents say what they want to change most in the city is its appearance — they want it to look beautiful, with trees and pedestrian-friendly neighborhoods.

forwardDallas! Neighborhood Elements, 2006, p. II-7-1.

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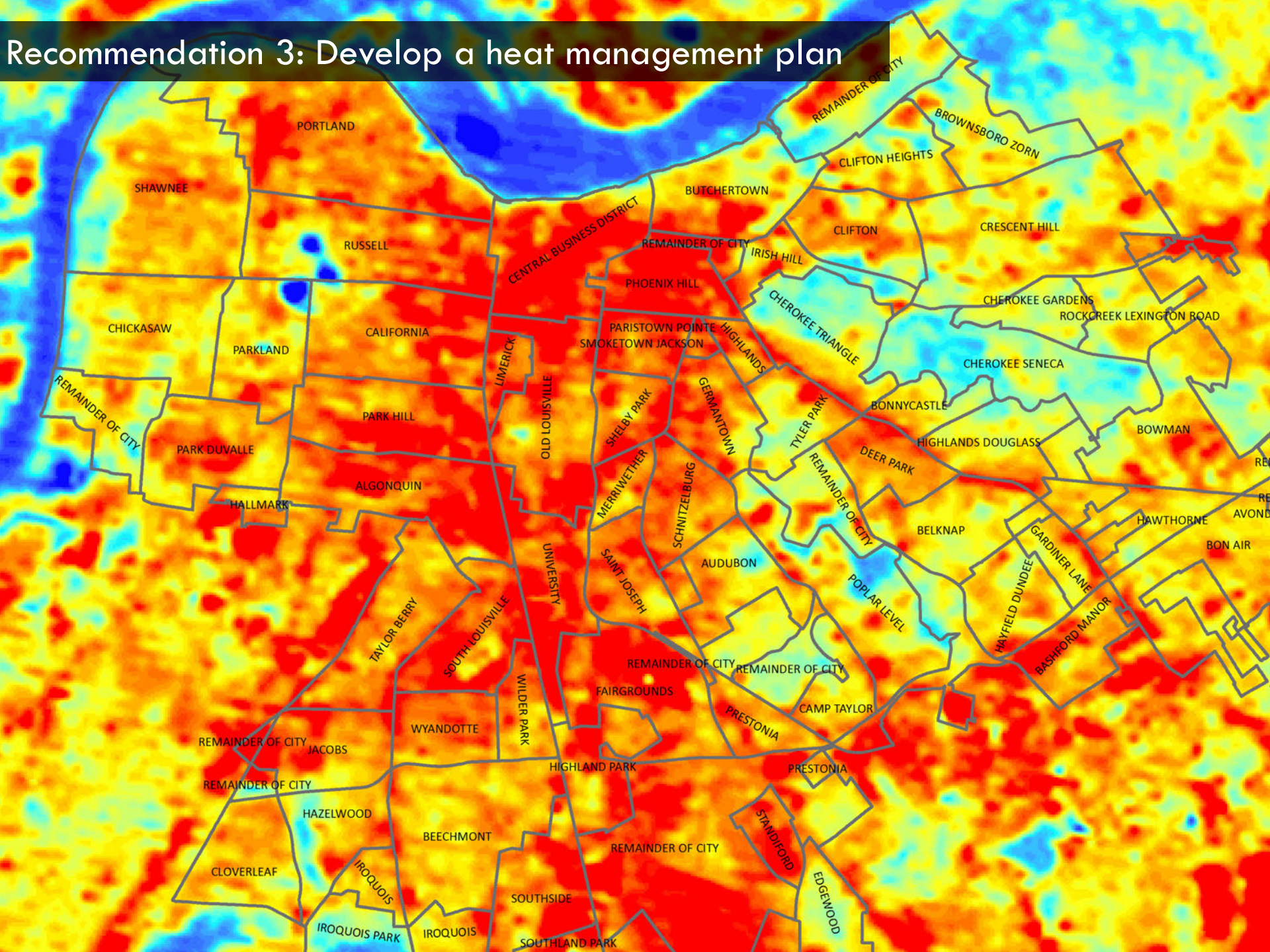
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Courtesy the Houston Advance Research Center (HARC) Dallas Urban Heat Island Report prepared for the EPA

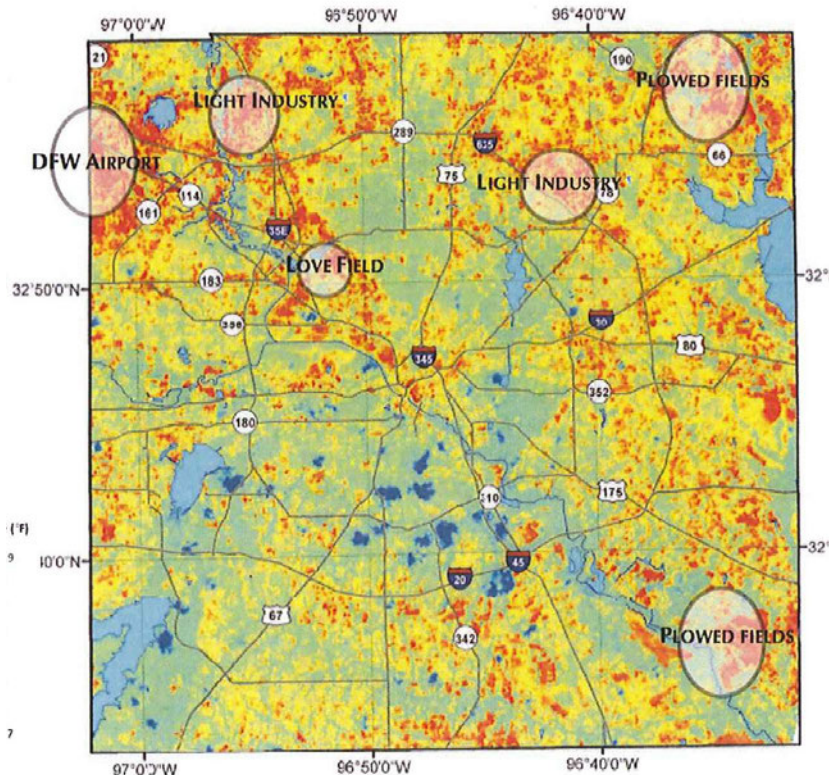


Recommendation 3: Develop a heat management plan

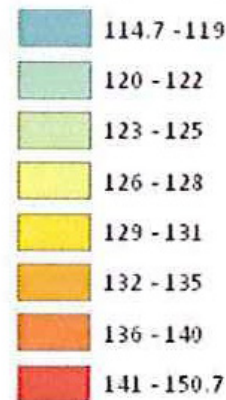


Dallas Sustainable Skyline Initiative

- Dallas was the first pilot project for EPA's Sustainable Skyline Initiative
- Urban Heat Island and Storm Water Mitigation



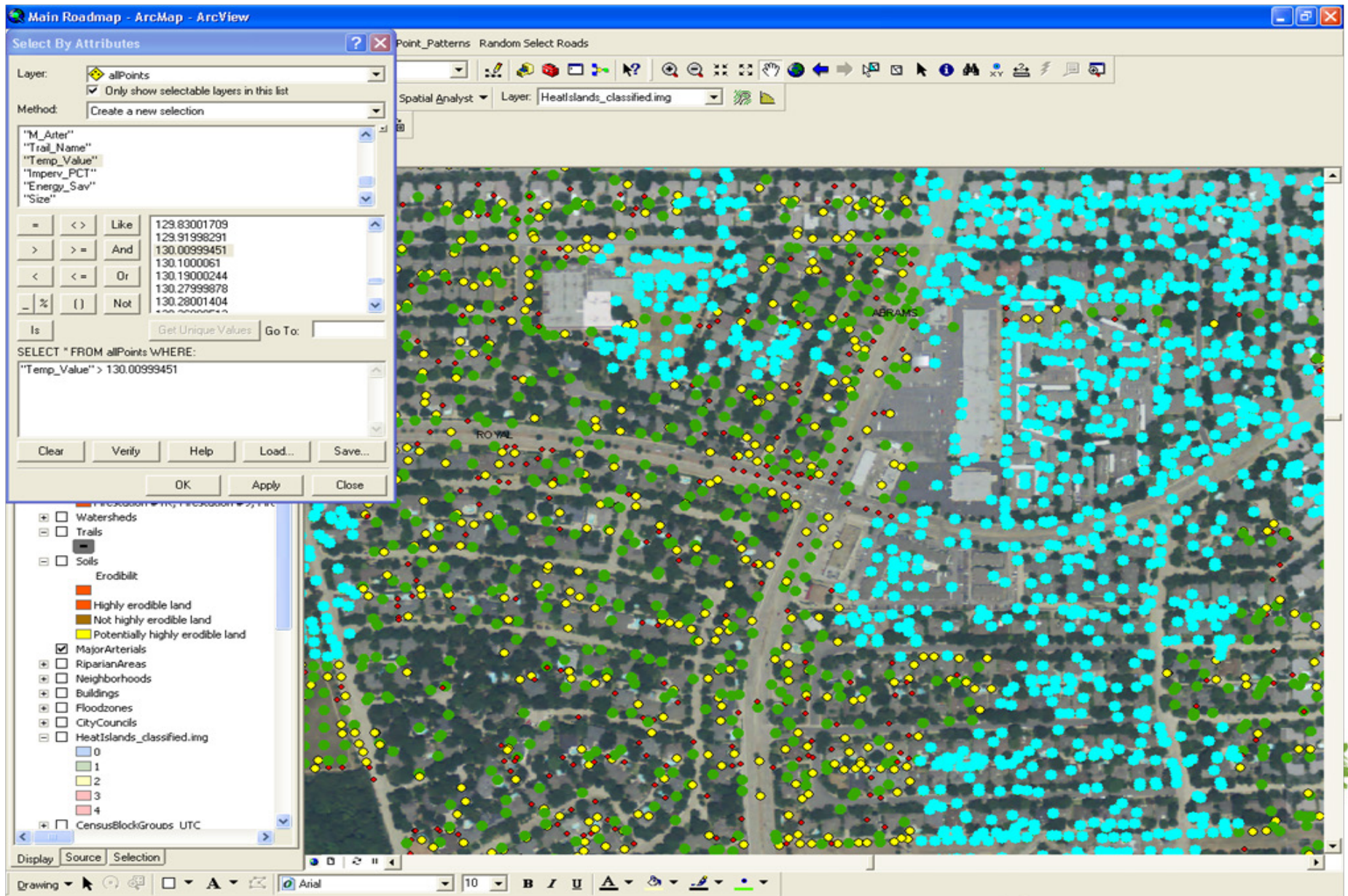
Surface Temperature (°F)



Courtesy the Houston Advance Research Center (HARC) Dallas Urban Heat Island Report prepared for the EPA



Planting locations in areas hotter than 130 degrees F



The Texas Trees Foundation: *Creating Healthy Communities through Education, Tree Planting, and Outreach.*

Since 1983 planted over 407,000 trees!



Planted trees in over 64 communities across North Texas!



Average over 4,000 volunteers a year!



Tree Strategies for Heat Island Reduction

“The net cooling effect of a young, healthy tree is equivalent to ten room-size air conditioners operating 20 hours a day.” —U.S. Department of Agriculture

- Tree Preservation
- Low Impact Development Techniques
- Examine Current City Codes and Ordinances
- Examine GIS Data for parking lots, sidewalks, and streets
- Plant Trees For Energy Efficiency
- Plant SMART, Plant Strategically!



“Trees properly placed around buildings can reduce air conditioning needs by 30 percent and can save 20-50 percent in energy used for heating.” – US Forest Service



Trees Create Livable Communities = \$\$



=



If only 50% of all available planting spaces reached 40 years of age, they would provide \$102,000,000 in annual benefits!



The true meaning of life is to
plant a tree, under whose shade
you do not expect to
sit. ~Nelson Henderson



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