

## WHEN HEAT THREATENS SOCIETY

by Sharon Harlan for *The Arizona Republic*  
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**N**ow that triple-digit temperatures have returned to the Valley, it is time to consider once again how to avoid health problems that can occur because of prolonged exposure to extreme heat.

Heat kills thousands of people around the world every summer. Most of the afflicted have at least one of the following characteristics: elderly, very young, urban residents, poor, socially isolated, disabled, ill or unprotected from the weather.

Many may not realize, however, that these deaths represent only a fraction of heat's toll on human comfort, health and general well-being.

Globally, extreme heat sickens multitudes of people through the spread of infectious diseases, causes diarrhea outbreaks through contaminated water supplies and increases hunger through its impact on livelihoods in developing nations.

Summer heat exhaustion, heatstroke and aggravated chronic illnesses are evident in cities with all types of climates in developed nations.

In desert cities such as Phoenix, people are exposed to average daily maximum temperatures of 105 degrees for several

months a year, while heat waves routinely push the thermometer well over 110 degrees.

A 2006 survey of more than 800 Phoenix-area households conducted by scientists from ASU's Central Arizona-Phoenix Long-Term Ecological Research project revealed that individuals in one of every four households had suffered from "symptoms related to heat or high temperatures such as leg cramps, dry mouth, dizziness, fatigue, fainting, rapid heart beat or hallucinations."

A few years ago, our interdisciplinary research team began a series of studies to determine which types of neighborhoods in the Phoenix region are most vulnerable to extreme heat.

Assessing vulnerability meant assessing both the risk of exposure to such a hazard as well as the natural, social and material resources residents possess to cope with threats presented by the hazard.

## WHAT DID OUR STUDIES REVEAL?

First, some yards are much warmer than others, experiencing as much as a 14-degree difference (ranging from 104 degrees to 118 degrees) during the late afternoon of a four-day heat wave in July 2003.

The warmer neighborhoods cool more slowly at night and heat more quickly in the morning.

We calculated that the "danger threshold" for human thermal comfort is exceeded for only 4 percent of total summer hours in the coolest neighborhoods, while the threshold for the warmest neighborhoods is exceeded for 20 percent of the entire summer.

Second, vegetation drives temperature in yards and neighborhoods. Location, elevation and open spaces are contributing factors, but the amount of actively synthesizing vegetation explains almost all variation in microclimates.

The coolest neighborhoods either have lawns and shade trees or contain large areas of natural desert. Xeriscaped residential neighborhoods with small lots in urban-fringe housing developments are warmer.

Warmest of all are urban neighborhoods with large amounts of pavement and little residential landscaping.

Third, the warmest and least-vegetated urban neighborhoods are populated by low-income residents who are much less likely to have central air-conditioning, swimming pools, reflective roofs, and strong social networks to protect them from the outdoor elements.

In other words, residents with the highest level of outdoor exposure do not have financial and other means to cool off.

Our surveys also found that these residents are less likely to leave the Valley in the summer and more likely to have jobs where they work outdoors.

For the most part, a warm and dry climate has been an asset for our region but, in the throes of an expanding urban heat island and projected global warming in the Southwest, we need to ask ourselves whether extreme summer heat threatens our sustainability.

Although we are taking some steps to protect the most exposed populations, such as homeless people, we also need to focus on reducing temperatures and providing public resources to the warmest residential neighborhoods.

Let us not forget that a society is only as sustainable as its most vulnerable members.

***Sharon L. Harlan is an associate professor at ASU's School of Human Evolution and Social Change and an affiliated faculty member with ASU's School of Sustainability. Send comments to sustainability@asu.edu.***