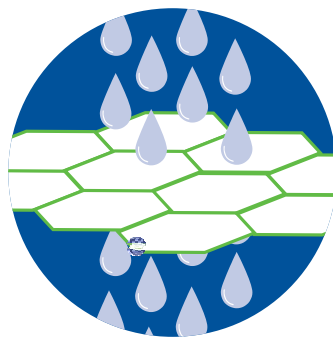


# EVERYONE talks about the weather. Maybe YOU can do something about it.

- Hot roofs in Houston can be 160° F. or hotter, heating the surrounding air as well as the building's interior.
- Long hot spells threaten the health of those living in homes with dark roofs and inadequate cooling.
- Hot pavement can reach more than 160° F, cooking surface contaminants in stormwater runoff.
- Hot streets and unshaded parking lots help create urban heat islands.
- Hot air cooks the atmosphere and produces ozone, a big problem for Houston.
- Cars parked on hot parking lots emit polluting fumes from their gas tanks.
- Homes and offices are hot so we use more air conditioning.
- Rains can't soak into impervious pavement, so they wash over the hot surface and dump hot contaminated water into streams.
- Retail and office centers can be much hotter than the countryside, helping to create more ozone.

**Cool Houston!** has innovative, cost-effective sustainable strategies to improve air and water quality, reduce flooding, and reduce energy costs for air conditioning.

## Three Simple Ways to create a **Cool Houston!**



1. Pave with light colored or porous materials.



2. Install reflective roofing.



3. Plant and protect urban shade trees.

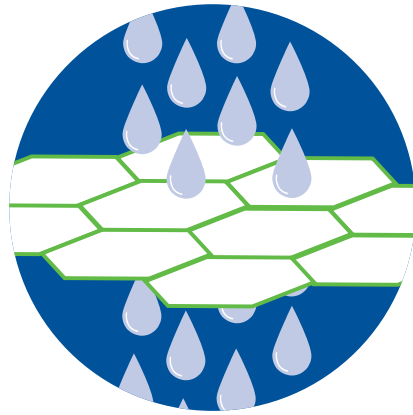
# LIGHTEN UP, COOL DOWN

Any child can tell you that it's too hot to walk barefooted on a parking lot in the summer. But in the shade or by the swimming pool, being barefoot is one of life's simple pleasures. Today, that simple childhood lesson is being reinforced and studied using high-tech imagery and sophisticated computer modeling.

Our cities are 6 to 10° F. hotter than the surrounding countryside. Heat absorbing structures have replaced trees and prairies, absorbing the sun's radiation and creating **Urban Heat Islands**. This added heat accelerates ozone formation, increases the demand for air conditioning (indirectly creating more emissions from power plants), creates more demand for water use and heats up surface pollutants which are carried into our bayous and streams in stormwater runoff.

The good news is that through use of some simple strategies, urban heat can be significantly reduced at costs that make sense. **Cool Houston's** strategies can help make the region's built environment more closely resemble the natural environment in terms of heat physics and the hydrologic cycle. In practical terms, use of cool roofs and cool paving coupled with more trees will make our area healthier and a better place to live and work.

How can we do that?  
It's as simple  
as 1...2...3...



- cools our air and reduces water runoff temperatures
- reduces heated pollutants in runoff
- reduces evaporating gasoline fumes from parked cars and trucks
- porous paving reduces stormwater runoff and the size of retention basins
- porous paving reduces watering requirements

*Reliant Stadium in Houston has 300,000 square feet of new porous paving that provides a cool and green space for tailgate parties.*

# 1 Pave with light colored or porous materials.

Large expanses of surface paving, like parking lots, are a major contributor to urban heat islands. A dark surface on parking lots can reach 160° F. or hotter. Rainfall on this surface is heated before it flows into waterways where it harms temperature-sensitive species and carries heated pollutants into our streams. Parked cars on hot pavement emit gasoline fumes contributing to air pollution. Light-colored pavements offer a cooler alternative, reducing surface heat and lowering the temperature of stormwater runoff.

Light-colored *porous paving* offers a good solution for low traffic areas such as parking lots and light duty roads. The open cell structure improves filtration and increases the surface area to trap pollutants. This porous structure allows cooler temperatures from below to cool the pavement. The material's ability to retain storm water means less land set aside for retention basins and improved irrigation for surrounding landscaping.



# 2 Install reflective roofing.

- lowers exterior and interior temperatures
- reduces energy costs for air conditioning
- reduces electric power generation and associated emissions

*In The Woodlands, more than 3 million square feet of reflective roofing have been installed in commercial buildings to save energy for building owners and tenants.*

Flat, dark-colored roofs like those on many retail centers, apartments, warehouses and offices can exceed 160° F. in the summer, enough to affect the temperature of whole neighborhoods. Greater use of more reflective roofing with high *albedo* (a measure of the reflectivity of solar radiation) helps cool urban air temperatures.

"Hot spots" can be seen clearly in Houston on infrared and thermal satellite images. Computer analysis by Lawrence Berkeley National Laboratory has shown for Los Angeles that if 15 percent of these hot spots adopted strategies such as high albedo roofing, more reflective paving and added shade trees, the temperature could be reduced by 6° F., reducing ozone by 12 percent.

While actual energy savings depend on many variables, the use of high-albedo roofing with appropriate insulation can result in a savings of as much as 50 percent in cooling costs and a reduction in a peak cooling demand of 10 to 15 percent.



# 3 Plant and protect urban shade trees.

- cools the air through evapotranspiration
- reduces air conditioning requirements
- filters harmful particulate matter
- controls erosion
- reduces storm-water runoff and flooding

From 1972 to 1999, the Houston region lost approximately 400 square miles of tree canopy or 25 acres per day (according to research by American Forests and the Houston Green Coalition using NASA satellite data). As a result, Houston's urban heat islands have grown larger and hotter. Lawrence Berkeley National Laboratory's studies show that for each 1° F. rise in summer temperature, the risk of ozone formation increases by 3 percent or more.

Trees and other plants cool air temperature through a process called *evapotranspiration*. They provide additional value to the region by slowing the movement of storm water, lowering total runoff volume, reducing flooding and controlling erosion. Shade from trees provides Houston area residents with \$26 million annually in energy savings, at the same time increasing property values and the quality of life in the region.

*With evapotranspiration, plants cool themselves by releasing moisture from the leaf surface.*

## Join the Cool Houston! Team

**Cool Houston!** offers many exciting opportunities and challenges:

- Adding 5 to 10 million new trees through the leadership of organizations and individuals in the Houston region.
- Gradually replacing older heat absorbing surfaces with economical cool roofing and cool paving technologies.
- Demonstrating the effectiveness and economy of heat island strategies.
- Achieving significant ozone and other air quality benefits that are lasting and continue to add benefits far into the future.
- Achieving the added benefits of improved streams, bayous and quality of life through heat island strategies.

## Cool Houston Strategies

Using these three simple measures greatly increases the effectiveness of heat island management, allowing our built environment to more closely resemble the natural environment. These measures are the beginning of **Cool Houston Strategies** that will improve air and water quality, reduce storm-water runoff and incorporate cost-effective and innovative approaches to pollution prevention.

- They are effective.
- They do not require behavioral changes.
- They can be implemented in new development and incorporated into normal maintenance and replacement cycles.
- They reduce energy costs and can pay for themselves.
- They improve the region's quality of life.

**Cool Houston!** is a program being coordinated by HARC as part of its role in sustainable development. Contact us or check our web site, <http://www.harc.edu/coolhouston>, for information on making your community a cool place.

## Important Houston Milestones

2004	Mid-Course Assessment of Texas Air Quality Plan
2004	Super Bowl XXXVIII
2005	Begin Work on New Air Quality Standards
2007	Achievement of Current Ozone Standard
2012	Olympics Games in Houston
2036	Houston Bicentennial Celebration

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**Cool Houston!**  
offers 3 simple strategies  
that cool our region,  
improve air quality,  
enhance streams and bayous,  
reduce flooding and  
lower energy costs.

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