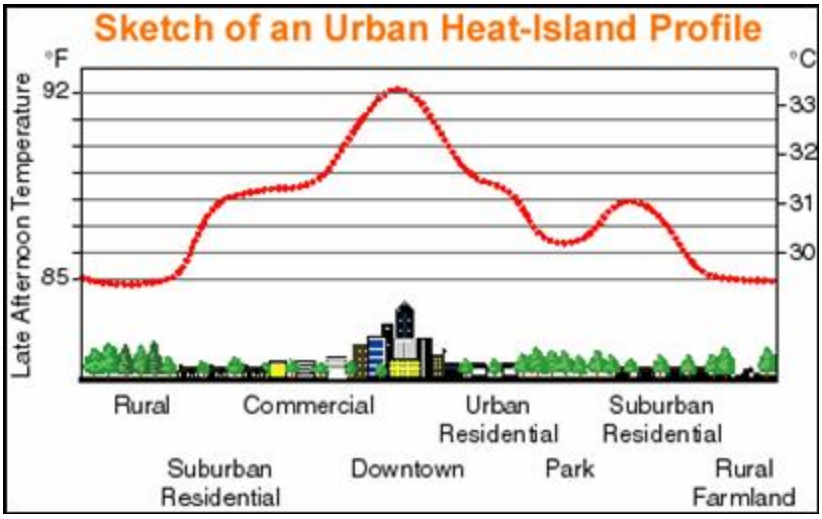
Cool Communities

Rapid growth in many areas of the Southeast is causing growing pains for the infrastructure. Air quality suffers, with many counties fast approaching or already in a non-attainment status. Increased impervious surface cover causes serious stormwater management problems with increased polluted runoff into our streams and waterways. It is not uncommon for developers to face stringent restrictions or even moratoriums in some areas as the infrastructure is stretched to the limits of its capacity by the increased growth. Forested and highly vegetative land cover is being replaced with built structures, roads, subdivisions, shopping malls, office parks and all the supporting infrastructure needed to support urban sprawl. These man-made surfaces, particularly large horizontal expanses of dark surfaces like commercial roofs and pavements, absorb the sun's rays, causing both surface temperature and overall ambient air temperature in urban areas to rise, creating heat islands. Often urban temperatures are as much as 10 degrees F higher than outlying areas with significant tree canopy and less developed space.



Urban heat islands have several adverse effects on communities. Increased pollutants in the air from cars and other sources coupled with the increased heat, create smog and ground level ozone – harmful to the environment and our health. As the summer heat increases, so does energy use for air conditioning at home, work and in our cars. This causes increased power plant emissions, not to mention higher energy bills. Heated run-off from impervious surfaces carries pollutants into our streams and tributaries, degrading water quality and affecting heat-sensitive species. In addition, rapid runoff from roadways, parking lots, and buildings can cause erosion and flooding while carrying increased sediment loads to streams.

Innovative studies in Atlanta and Houston are documenting the relationship between excess urban heat and air pollution. This effort to incorporate land cover into an air pollution control strategy has important implications for the green industry. Scientists from several different disciplines are testing strategies that would incorporate more tree canopy and a reduction of dark impervious surfaces that absorb solar radiation and store excess heat. If the air quality models are validated, state environmental officials could use tree plantings and forested areas as part of an approved air pollution control strategy.

The fundamental and over-arching objective of a design strategy based on Cool Communities principals is to construct the built environment in such a way as to mimic the natural environment in terms of heat

physics and the hydrologic cycle. In practical terms this means protecting and planting trees and reducing “heat sinks” by using lighter colored roofing and paving. “Green roofs” can also be part of a Cool Communities design strategy. Changing the land cover in a large urban area is an ambitious task that will take time, but is both good environmental policy and good for business. Green industry support for this program is essential.

Cool Communities is a non-profit program that has been advocating these sustainable design concepts since 1994. The independently funded program is a descendent of a pilot program initiated in 1992 and originally funded by the U.S. Department of Energy and U.S. Environmental Protection Agency. Since 1997, NASA’s Global Hydrology and Climate Center in Huntsville, Alabama, has participated as the research component for the program. NASA has provided valuable infrared satellite imagery and data though its heat island studies which focus on the impact of land-use change on urban temperature and air quality. The program also applies the research products of the Urban Heat Island Research project of Lawrence Berkeley National Laboratories and the Heat Island Reduction Initiative project of the U.S. Environmental Protection Agency. This diverse group of government, private industry, non-profit, and community leaders serves as a resource to develop stronger business and community based coalitions to implement Cool Communities concepts.

Call to Action on Air Quality

As cities across the Southeast are faced with non-attainment of EPA’s air quality standards, control strategies have focused on reducing emissions- mainly nitrogen oxides (NOx) and volatile organic compounds (VOCs). It is evident, however, that even with stringent emissions controls, we need to do more. Because NOx and VOCs react with heat and sunlight to form ground level ozone (O3), the newest approach in air quality is to reduce excess urban heat. NASA, in partnership with Georgia Environmental Protection Division, Georgia Regional Transportation Authority, Atlanta Regional Commissions and Cool Communities, is currently investigating ways of incorporating heat island mitigation strategies into a new air quality model – one that combines emission control with land cover thermal characteristics. A similar study funded by U.S. EPA and using the research of Lawrence Berkeley National Laboratories is underway in the Houston, TX, area.

Results from computer modeling by researchers at the Lawrence Berkeley National Laboratory indicate that each 1 oF rise in temperature over 70 oF increases the potential for ozone formation by approximately 3% (USDOE, 1996). In fact, it now seems likely that excess urban heat may be responsible for up to 30% of our ground level ozone. Research shows that use of lighter heat-reflective materials for roofing and paving along with careful planting of trees could lower the average summer afternoon temperature in some cities by as much as 5 degrees F, cutting the need for air conditioning by 18 percent and even reducing air pollution. For a city the size of Los Angeles, a reduction in urban temperatures of approximately 3 oF is estimated to produce air quality benefits roughly equivalent to replacing a city’s entire fleet of gas-powered cars with electric vehicles.

NASA's Project ATLANTA has generated the most remarkable mapping of the Atlanta region imaginable. A recently granted extension of that project will produce even more data. A new satellite, QuickBird II will use some of the most sophisticated photographic and infrared equipment to produce detailed maps. Computer enhanced, high-resolution imagery will produce very precise details that can differentiate land cover and produce a distinct heat signature for every structure in the built environment. In the near future, planners and policy makers may be able to meet air pollution goals by increasing the tree canopy and albedo (reflectivity) of certain large developments of regional impact. Reducing the amount of impervious land cover through the use of innovative design strategies like Green Roof technology and porous paving will help developments to more nearly resemble natural land cover

Low Tech Solution

Urban shade trees have been called the "low tech" solution to energy conservation. Because leaves intercept and store water, trees help to slow the movement of stormwater, lower total runoff volume, and reduce flooding. Tree roots hold soil in place so it cannot easily be washed away by wind or water, preventing the transport of sediment and chemicals into streams. Trees and other vegetation cool ambient air temperature through evapo-transpiration. A single properly watered tree can "evapo-transpirate" 40 gallons of water in a day, offsetting the heat equivalent to that produced by one hundred 100-watt lamps burning eight hours per day. By providing cooling shade, strategically placed trees around buildings and parking lots can reduce energy costs for cooling and mitigate the impact of heat absorbing parking lots, not to mention the aesthetic benefits provided to the urban streets. "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 leaves and roots act as natural filters of air and water (rain and ground), removing particulate matter and pollutants. Leaves filter the air we breathe by removing dust and other particulates. In the process of photosynthesis, leaves absorb carbon dioxide in addition to other air pollutants such as ozone, carbon monoxide, and sulfur dioxide, and give off oxygen.

Cool Communities and the Green Industry

Cool Communities' strategies of cool roofing, cool paving, and urban shade trees work together as a sustainable design "system," thus greatly increasing their effectiveness. While each of these measures presents separate challenges, tree canopy has the broadest implications. It is arguably the easiest to understand and is the most action-oriented. These measures offer a cost-effective and innovative approach to pollution prevention, providing tremendous benefit for minimal cost. This approach is non-regulatory; does not require behavior modification, can be implemented for new development or as part of a normal maintenance cycle. In addition it is energy efficient and helps to create a more pleasant urban environment.

Understanding and support from the green industry is essential to make Cool Communities successful. The leadership of the Southern Nursery Association has enthusiastically endorsed this program and expects to help develop some marketing and public awareness activities to promote Cool Communities. This program is a rare opportunity to support a sensible, effective environmental policy and a good business strategy for our industry. Our industry and our support for Cool Communities is part of the solution.

For more information about Cool Communities and ongoing research, visit their web site at www.coolcommunities.org