

## **Local Grassroots Group Gets Involved in National Research.**

Abstract : How do three grassroots organizations process and disseminate Urban Heat Island research and field data to the public for use in urban planning, forestry stewardship and community building.

Narrative:

Over the past several years, much attention has been focused on the Urban Heat Island phenomenon occurring in cities across the nation. Professionals, research scientists and public interest groups from a broad spectrum of disciplines have been studying Urban Heat Island impacts, contributing factors and mitigation strategies. Urban Heat Islands are the result of a multitude of factors present in all cityscapes - dark impervious surfaces at ground level and on rooftops, a minimum amount of trees and vegetation, high CO<sub>2</sub>, SO<sub>x</sub> and NO<sub>x</sub> emissions from cars, trucks and industry, and, in some cases, from topographical features or weather patterns. The effects of all these factors manifest themselves in ground level ozone, poor air quality, health problems and increased energy costs for all citizens

In 1997, the US Environmental Protection Agency's "Cool Communities" program began a research project known as the "Heat Island Reduction Initiative," partnering with non-profit urban forestry organizations in three cities. This project is a collaborative effort among US EPA, US Department of Energy, NASA's Global Hydrology and Climate Center, Lawrence Berkeley National Laboratory and a host of local partners. The overall goal was to analyze how urban heat islands contribute to rising temperatures, increased energy consumption and air quality degradation.

The grassroots tree groups participating are: Baton Rouge Green, Baton Rouge, Louisiana; Sacramento Tree Foundation, Sacramento, California; and TreeUtah, Salt Lake City, Utah. For each city, NASA scientists flew a Lear jet over a pre-determined land mass and took thermal "snap-shots" of the surfaces below. As part of the overall goal of analyzing heat islands, particular goals in each city were to 1) determine what types of surfaces contribute to the source of urban heat islands, 2) create baseline numbers for future growth and urban development, 3) obtain conclusive evidence of where vegetation is located and, perhaps most importantly for the non profits, 4) create visual maps that speak a thousand words.

Although each community organization was equally funded by a NASA grant and charged with the responsibility to disseminate this scientific information to the general public and officials, each one took a different path in accomplishing this

task, based on their partners, local community support, organizational structure and in-house resources. What follows are brief summaries of how each non-profit organization traveled its own path, the partnerships formed and the kinds of projects, policies and educational programs implemented since this began.

#### Salt Lake City, Utah

TreeUtah and the State Office of Energy Services “Cool Communities” program worked jointly on a number of different agenda items and individual projects. TreeUtah's objective was to get as many different groups involved, according to their level of interest, time and resources. TreeUtah worked with traditional government agency partners such as the Division of Air Quality and Salt Lake City Corporation, but we also partnered with the University of Utah’s Geography & Remote Sensing Departments, the Energy & Geoscience Institute, EnvisionUtah, and the Utah Board of Education. In the private sector, the project had interest and help from executives in the roofing and cement industries. We also worked with graduate students who used this opportunity to complete their thesis.

On the programming and implementation side, TreeUtah organized and coordinated temperature samplings of various surfaces in sun and shade within the flight line parameters during the time period that thermal data was being collected via remote sensing. The collectors of this data represented individual cities and municipalities located within the flight lines and were trained by the Chairman of the University of Utah’s Remote Sensing Department, NASA scientists, TreeUtah staff and the Cool Communities Coordinator. Our goal was not only to ground truth the thermal data that was being collected from the Lear jet in the sky, but to also build a foundation of interested public employees who could then help implement programs and influence public officials in future development and community planning.

With hundreds of data points, we discovered a number of interesting findings and were able to scientifically confirm our belief that Salt Lake had an urban heat island problem. One surprising outcome that we did not anticipate was that Utah's natural landscape of rock and bare soils registered as 'hot spots' in the study. Another interesting conclusion was that a shaded, dark, asphalt surface is cooler than a white, concrete surface in the sun. Based on this finding, TreeUtah advocates that tree canopy and shading strategies are a more cost-effective mitigation tool than light-colored concrete in certain situations.

As part of TreeUtah's education mission, we teach the "Kool Kids" program to engage young people in developing community design solutions that will keep Salt Lake cool. The program provides teachers with a collection of hands-on lesson plans for students at the elementary through high school level. A “Kool Box” filled with interactive activities and research-oriented lesson plans helps students

measure surface temperatures with a heat spy, build houses with different colored roofs, design landscape plans, or plant energy conserving landscaping and trees around their school.

The Energy & Geoscience Institute researchers provided us with thermal maps of every city council district in Salt Lake City. In 1999, as a way to bring together all the work that was being done in Salt Lake Valley neighborhoods, a statewide conference was organized to bring together experts and participants from a variety of professional and academic disciplines.

Community projects continue to attract investment based on the NASA research. This fall, an innovative design project funded by the State Energy Office and Key Bank Foundation will break ground. TreeUtah and ArtSpace, a non-profit organization dedicated to affordable housing and urban revitalization, are installing landscaping and design solutions that will cool the grounds, consume less energy and water, and use native plant materials. Given limited space for tree planting and the high cost of concrete, we are building a trellis along the parking lot's western exposure as a way to shade the asphalt and cars. By partnering with an arts organization, we can leverage our investment and support a local artist in the creation of a trellis with a sculptural element that complements the existing architectural details of the building. Additional landscaping includes a variety of trees around the building and a water wise demonstration garden using native shrubs and a drip irrigation system.

### *Baton Rouge, Louisiana*

The Baton Rouge urban forest is a major social, environmental, and economic factor in our community representing one of the most important natural resource components of the city's infrastructure.

Baton Rouge, Louisiana was one of three cities that participated in the Urban Heat Island Pilot Project (UHIPP), a joint project between the Global Hydrology and Climate Center (GHCC) in Huntsville, Alabama, working with the U.S. Environmental Protection Agency and several local governments. Working with the U.S. Environmental Protection Agency and several local governments. A false-color thermal image was produced of the Greater Baton Rouge Area on May 19, 1998 using a single thermal channel on the Airborne Terrestrial and Land Acquisition Sensor (ATLAS) aboard NASA's Lear 23 jet flying 2 km above the city. The image clearly showed the differences in temperatures between natural and manmade surfaces of the city.

Baton Rouge Green, a nonprofit organization dedicated to planting and conserving the urban forest, developed an educational outreach program, based upon the

UHIPP false-color infrared imagery, to educate local high school students on the complex relationships of trees, vegetation, roofing materials and paving surfaces that ultimately contribute to the urban heat island effect. The Baton Rouge Green Urban Forest Ecosystem Analysis Program was designed to teach our local educators and students about the latest developments in Geographic Information System (GIS) technology in order to explain the urban heat island effect in a format that can be taught in the classroom by using CITYgreen software developed by American Forest. Using aerial photography of a school campus, students are taught to use GIS technology to analyze the ecological and economic value of the trees located on the school site. Teachers and students conduct experiments and collect data, which reveal complex relationships between the urban forest, vegetation and man made elements of the physical environment. The short-term goal of the program is that it brings modern technology into the classroom and explains the value of environmental science to the students through specific classroom activities. The long-term goal is to instill greater community understanding of the crucial role the urban forest plays in the health, well being, and quality of life for us all.

#### Sacramento, California

The Sacramento Tree Foundation undertook a leadership role to organize the Sacramento Cool Community Program. Our approach focused on creating a local steering committee made up of targeted stakeholders: US EPA Region IX, USDA Western Center for Urban Forest Research and Education, California Air Resources Board, California Energy Commission, California Department of Health Services, City and County of Sacramento, Sacramento Municipal Utility District, Sacramento Metropolitan Air Quality Management District, Sacramento Area Council of Governments, Clean Air Partnership, California Cement Promotion Council and the Northern California Asphalt Producer. Two private roofing companies also signed on to the steering committee's Memorandum of Agreement between the US Environmental Protection Agency and the local cool community group.

The Steering Committee adopted the following mission statement and goals, and hired a part-time coordinator. Their mission is to improve the liveability of the greater Sacramento area by increasing shade trees and reflective surfaces that save energy, reduce greenhouse gas emissions, urban ozone, exposure to ultraviolet radiation and storm water runoff. The goals focused on services to low income neighborhoods, building broad community support for cool community measures, involving young people and developing demonstration projects. The Committee prepared and adopted a strategic two-year plan of work, which called for three working committees: trees and vegetation, roofing and pavement, and outreach and education.

With a steering committee of government and industry experts, access to researchers, prominence as the capital of California, and location in the heart of California's vast, hot central valley, the Sacramento Tree Foundation had put in place a team ready to work with our federal partners to address our urban heat island problems.

Our program has received a good amount of publicity from television reports to newspaper articles with headlines that read, "Changes in urban landscape can cut smog." We were featured speakers at many service organizations and government workshops. The Urban Land Institute hosted a special urban heat island presentation for their membership.

Our utility steering committee member offered the first financial incentive for the installation of cool roofs. Today, the Tree Foundation has a \$ 2 million cool roof incentive program with the California Energy Commission. Special presentations before the City and County Planning Commissions educated plan checkers and architects on the value of light roof surfaces.

Our Forest Service research steering committee member led a city parking lot analysis and major revisions to the existing shade tree parking lot ordinance in the areas of space criteria, tree species and most importantly, enforcement. The cement industry representative worked with local parks and recreation agencies to pour Northern California's first pervious surface parking lot.

Our cool community program also heightened the awareness and participation in our ten plus year partnership with the Sacramento Utility District that has provided 100,000 homeowners and renters over 300,000 energy saving shade trees.

#### Summary:

Grassroots tree organizations already know that trees planted in cities and towns help alleviate some of the symptoms associated with urban heat islands. Since our role in the community is to inform, educate and engage, it is a natural fit for community groups like TreeUtah, Sacramento Tree Foundation and Baton Rouge Green to partner with national agencies like EPA and NASA on research initiatives such as this. Non-profit leaders have found the Urban Heat Island Initiative to be a productive and equitable partnership. Researchers offer the technical and scientific expertise and authority that can help build a compelling and rational case for greater public investment in 'cool solutions' like trees. Local community organizations provide a life for the project after the research is complete, bridging the gap between theory and practice. In Salt Lake City, Baton Rouge and Sacramento, community non-profits are pushing for policy change, raising money from the private sector, educating the public, informing the media

and building a foundation of public support for sensible design and building practices. These three organizations helped initiate dialogue in diverse sectors of the local community so that citizens will remain engaged, make informed choices and gain knowledge about the urban heat island and its solutions.