Maximizing Benefits of Trees in Hot Climates

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Everyone appreciates cool shade on a hot day. But in urban settings in the arid west, trees provide benefits beyond the shade they cast. Researchers at the Center for Urban Forest Research in Davis, CA, have been working since 1992 to quantify the benefits that trees provide. However, with water supplies dwindling as population grows, arborists must help educate the general public on how to maximize these benefits while conserving resources.

Trees provide a multitude of benefits. During hot months, the obvious benefit is savings on air conditioning, usually powered by electricity. ***Saving money on power bills*** will be the most apparent advantage that can be "sold" to residential and commercial clients, as well as to municipalities that are implementing tree care budgets.

There are other less obvious yet quantifiable benefits. ***Mature trees increase property values.*** Not only do they increase "curb appeal," research shows that residential properties with trees fetch a higher selling price than those without. The HomeGain.com 2012 National Home Improvement Survey stated that landscape improvements provide a whopping 215 percent return on investment when selling a home.

BENEFITS BEYOND AESTHETICS

Through photosynthesis, trees use carbon dioxide and produce oxygen. Climate change has increased concern for reducing carbon "footprints." ***Trees absorb carbon and sequester it in their the leaves, branches, trunks and roots*** while alive. This storage continues with wood in service as buildings and furniture. Trees also facilitate the storage of carbon in soils by fueling the growth of mycorrhizae on their roots.

The shade that trees provide in hot climates go beyond aesthetics and can be quantified. All photos courtesy: Helen M. Stone

Air quality is improved by the trees that are planted and properly maintained. Trees absorb pollutants such as ozone and "grab" drifting smoke, dust and other particulate matter.

Finally, ***trees intercept storm water and turn it into a resource*** instead of a liability. Storm water may contain a cocktail of pollutants such as gasoline, pesticides and fertilizer nutrients that end up in oceans, rivers and wetlands. Trees divert torrential rains with their leaves and their roots absorb water, holding the soil and slowing erosion.

RUNNING THE NUMBERS

Tree benefits are often calculated using "Leaf Surface Area" (LSA). The greater the LSA, the greater the benefits. What this amounts to is the bigger the tree, the bigger the benefits. Along the same lines, the longer the tree grows and thrives, the bigger the payback.

While calculating LSA can be a complex procedure, there are many resources available to determine a tree's value. For example, the National Tree Benefit Calculator allows a user to input a zip code, then a tree's species and size to calculate an overall benefit in dollars, as well as storm water retention, increase in property value, energy savings, air quality benefits and atmospheric carbon capture, all monetized. Using the calculator, a five-inch diameter yellow palo verde tree in the Las Vegas area provides $44 in benefits a year. The benefit more than doubles to $103 if the tree grows to 10 inches in diameter.

LOCATION, LOCATION, LOCATION

Maximizing these benefits requires proper tree selection, placement, planting and maintenance. Sources for species selection include the Cooperative Extension, numerous books available from any major bookseller and even the local water authority.

To reap the greatest energy savings in hot climates, trees should be planted on the east and west sides of a building, to provide shade to the west or southwest exterior windows. Trees should be planted so the mature canopy edge is as close to the building as possible to maximize summer cooling, although access and fire safety must be considered. Deciduous trees allow the sun to provide winter heating, thus reducing winter fuel use and cost.

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For optimal carbon capture, ***grouping plants with similar needs*** will make irrigation and other maintenance procedures more efficient, which will reduce carbon inputs. Woody plants such as trees and shrubs sequester more carbon than grasses and other herbaceous plants.

Trees in mulched areas are better carbon collectors than trees in turfgrass. While fast-growing trees sequester more carbon early in their lives, they usually have a shorter lifespan than slow-growing trees, so *plant a diversity of species* for the best long-tem results.

For optimum cooling, trees should be planted so that the mature canopy is as close to the building as possible.

For improving air quality, ***trees planted near streets and parking lots collect dust and other particulate matter***. Not only do they intercept and remove pollutants, their mitigating qualities also reduce gases and hydrocarbons emitted by parked cars as the engines cool down.

SIZE MATTERS

Although large trees provide more cooling than small ones, be sure the tree has room to grow. A massive oak in a four-by-four foot cutout in a parking lot will only struggle and succumb, while an acacia can adapt to the small space and provide cooling for years. Parking lots can be designed so that trees have adequate soil volume to establish a large, healthy root system.

Minimize pruning by adopting structural pruning practices that build a strong tree architecture. Avoid thinning trees, as this reduces their effectiveness as cooling and shading features in the landscape. ***Prune in the dormant season*** when leave area reduction is less important to energy saving requirements of the warmer months.

WATER ISSUES

When storm water interception is a concern, look for trees that have big, rough leaves or dense thick canopies such as conifers. Conifers are also a good choice when choosing "air cleaners" because they provide shade and foliage all year. Trees with long leaf stems such as maple or ash and rough or fuzzy leaves (i.e. sycamore and oak) are especially efficient at scrubbing air pollutants.

Water is a major issue in arid climates, and ***the benefits that trees provide must offset the water they need to thrive***. Choosing desert species such as mesquite, acacia and palo verde is recommended, as well as low-water-use species from Mediterranean climates with little summer rainfall.

According to the Arizona Municipal Water Authority (AMWA), ***a mature desert tree will use 4,000 gallons of water a year.*** Obviously, trees use more water in summer than winter, so irrigation systems must be designed to accommodate mature trees at peak usage. However, proper scheduling is crucial. Schedules must be adjusted so that irrigation is decreased (or even eliminated), during rainy winter months. Mulch also conserves soil moisture.

A wise native plant restoration specialist once said that ***people don't live in deserts — they live in oases***. Trees provide incomparable benefits to the health and well being of desert dwellers, but proper selection, design, planting and maintenance are critical to make the advantages outweigh the inputs they require.

Further Reading/Links:

Tree Benefit Calculator
http://www.treebenefits.com/calculator/index.cfm

Desert Southwest Community Tree Guide
http://www.fs.fed.us/psw/programs/cufr/products/cufr542_72dpiDsrtSWCommTreeGd04.pdf

Potential of Tree Shade for Reducing Residential Energy Use in California
http://joa.isa-arbor.com/request.asp?JournalID=1&ArticleID=2704&Type=2

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