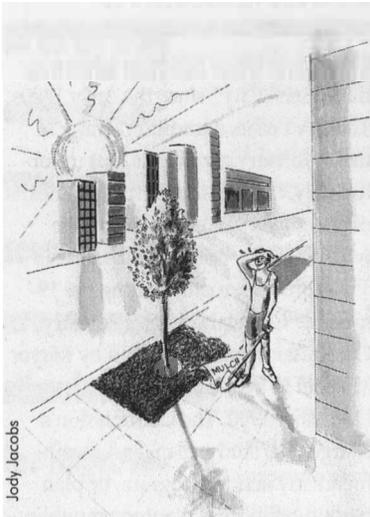


PLANTING THE URBAN DESERT

◆◆◆ Without a green canopy, our cities take on the same properties as a parched, sandy desert. By PHILLIP RODBELL, GREG MCPHERSON, and JIM GEIGER ◆◆◆



In the heat of an August afternoon, take a walk down the streets of your urban “desert”—heat waves dance off the hoods of cars, blinding sun rays reflect off store-front windows, and asphalt surfaces soften, their pungent odor permeating the air. In past issues of *URBAN FORESTS* magazine, we have reviewed the urban heat-island effect

(see Vol.10, No.1, “A Change of Seasons,” and Vol. 10, No.5, “Banking on Shade”). In this issue we focus on a related phenomenon: the urban desert.

New research shows that without the oasis effect of trees and green-spaces, urban areas grow hotter and dryer. As cities spread into surrounding forests and agricultural lands, expanding the amount of paved surfaces, urban temperatures rise, the air becomes dryer, and demand for water by plants and people escalates. A vicious ecological cycle is put into motion, much like desertification.

In Phoenix, Arizona, for example, the construction of a regional shopping center resulted in a 30 percent increase in pan evaporation rates. (A one percent rise boosts outdoor water demand by a corresponding one percent) In other words, the less vegetation there is in our urban areas, the hotter and dryer they become.

We impact our environment

through land development, and our environment, in turn, impacts upon us. Researchers have documented the warming of our communities and its affect on energy consumption—most major cities are almost 5°F warmer than they were in the early 1900s. Hashem Akbari of the Lawrence Berkeley Laboratory (LBL) estimates that “about 5 to 10 percent of the current urban electric demand is spent to cool buildings just to compensate for the heat-island effect.” Akbari estimates that Los Angeles spends roughly \$150,000 each hour, and Washington, DC, close to \$40,000 per hour (\$50 million annually) during peak times to compensate for those few degrees. Nationally, the hourly cost may be as high as \$1 million. But little has been said about the heat-island effect’s accompanying dryness.

Trees planted to reduce energy consumption around homes indirectly reduce water consumption on a massive scale. According to Tucson (Arizona) Electric Power, approximately 0.6 gallons of water are consumed in its cooling towers for each kilowatt-hour (kwh) of electricity produced. One drought-tolerant tree planted in the proper location to cool a home during the hottest part of the day will save up to 300 kWh per year in Tucson. This is equivalent to 180 gallons of water—almost one-fifth of the 1,000 gallons required annually to irrigate a drought-tolerant tree.

The dryness of heat islands can be aggravated by weather. Communities in California, experiencing the most severe drought in the state’s history,

are facing a dilemma. More than 10 million trees are estimated to have died due to the drought, and city trees are suffering the added indignities of drought-induced diseases and insect infestations. In an effort to reduce water consumption, many community leaders have decided to restrict tree planting.

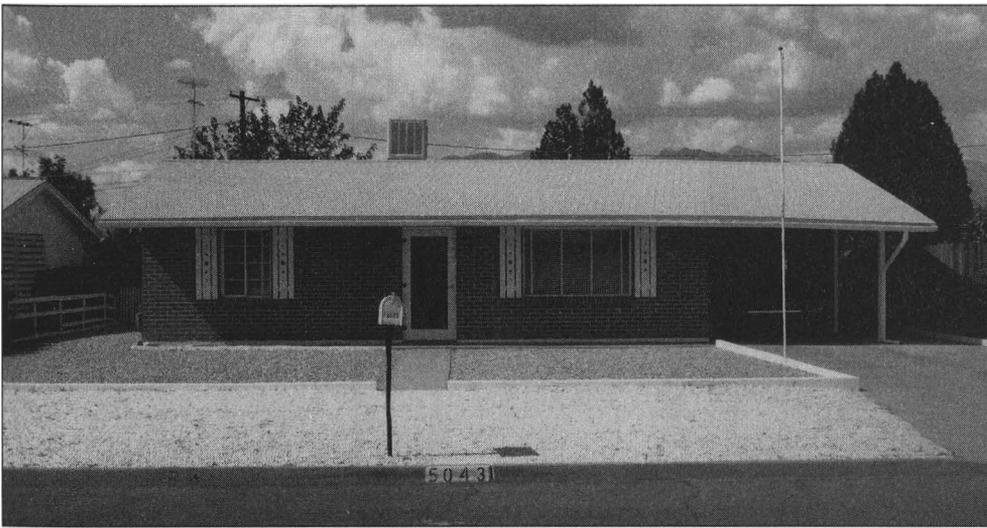
The California Department of Forestry and Fire Protection (CDF) was shocked by this decision. After all, only four percent of California’s municipal water is consumed by landscape plants, and more than 90 percent of that figure is used for lawn irrigation.

It is ironic that local water districts are opposed to planting new trees during a drought when trees are the only community resource that give more than they take. Without a green canopy, residents increase their demand for water. Lacking the cool shade from community trees, evapotranspiration rates spiral, as does the demand for energy to air-condition buildings and the water consumed in cooling towers to meet those demands.

The amount of water needed for trees is insignificant compared to other domestic water demands. The average daily consumption of water in the home is nearly 100 gallons per person. A newly planted tree requires only 10 to 15 gallons of water per week—the equivalent of two to three toilet flushes.

In a letter to the mayors, California State Forester Harold Walt stated that “during the 1970s’ energy crises, we didn’t stop driving our cars or heating our houses; we built more fuel-efficient cars and turned down the heat.” Backed by the Governor and the head of the state drought task force, Walt went on to say that a drought is not the time to stop planting trees, but a time to begin planting drought-tolerant species, and to conserve water to irri-

Phillip Rodbell is *URBAN FORESTS*’ science editor and AFA’s urban forester, Greg McPherson is Associate Professor of Landscape Architecture at University of Arizona, and Jim Geiger is California’s urban forest coordinator.



Chris Mooney

The popularity of xeriscapes such as this one is increasing in the Southwest. Are property owners really saving money without trees?

gate new and existing trees.

A study of Tucson bus stops led to some interesting new findings on the economic and health values of urban trees. Using a computer simulation to compare the cost-effectiveness of shade provided by metal shelters versus the natural shade and cooling effect of trees at more than 60 bus stops, the University of Arizona's Dr. Greg McPherson reported in a recent *International Society of Arboriculture (ISA) Journal* that costs for tree planting and tree maintenance over a 40-year period were less than half the cost of shelters. More importantly, shade at bus stops can "enhance the thermal comfort of waiting riders and encourage new passengers, thereby reducing air pollution and traffic congestion." (This study led to an "adopt a bus stop" program, which involved the city's transit officials, Trees for Tucson/Global ReLeaf, local businesses, and neighborhood groups in planting trees at bus stops.)

An earlier study of Tucson, where water is very scarce, found that for every dollar spent to maintain trees, \$2.62 worth of benefits were returned from air-conditioning energy savings, dust reduction, and the slowing of stormwater runoff. In a city where "xeriscapes" (landscapes of rocks and astroturf) have been replacing mesiscapes (landscapes of lush vegetation), this was welcome news.

Data derived from computer simulations suggest that xeriscapes are uneconomical when compared to xeriscapes (landscapes adapted to

low-moisture environments). While xeriscaped homes consumed slightly more water than xeriscaped homes, dwellings with drought-tolerant vegetation consumed nearly 30 percent less energy for a combined annual energy and water savings of \$121. Mesiscaped homes, with water-demanding trees and lawns, consumed over twice the water of xeriscaped homes, increasing water and energy costs by \$112. Therefore, it is not only where you plant but what you plant that is important.

Established trees need an average of 1,000 gallons of water a year—the amount an average person uses in only 10 days. However, sick trees are costly to treat. Drought-stressed trees are more susceptible to disease and pests. The cost of treatment or removal can run as high as \$1,000—much higher than the cost of water needed to maintain their health. In fact, TreePeople, a Los Angeles-based group, suggests that if you need to cut water use in your garden, stop watering your lawn—a newly planted lawn takes only two months to reestablish, whereas an adult tree takes 15 to 30 years to replace.

Calculations by Karina Garbesi at LBL suggest that the city of Los Angeles, by doubling the acreage covered by drought-tolerant trees and shrubs, and reducing lawn area from 13 percent to 5 percent city-wide, would reduce its outdoor water use by 30 percent. As you can see from this data, it is possible to increase tree cover and conserve

water at the same time.

Establishing trees in the urban desert, where temperatures are extreme and the soils are as dense as cinder blocks, requires an investment of time and resources. It is important to plant drought-tolerant trees and care for them properly to keep costs low while keeping benefits high.

Even drought-tolerant trees require watering until their roots are fully established. Water your new tree once or twice a week during dry periods, applying the water slowly enough to allow it time to seep into the soil rather than run off. Also, a two- to four-inch layer of mulch will reduce water demands by 75 percent.

An established tree can be watered

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**TREES PLANTED
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MINI-GLOSSARY

- ◆ **Desertification:** A process by which land becomes increasing unproductive and barren.
- ◆ **Evapotranspiration rate:** The rate at which plants lose water through a combination of evaporation of surface moisture and transpiration (sweat) through the stomatal openings.
- ◆ **Mesiscap:** Traditional turf-dominated, high water use landscape.
- ◆ **Pan evaporation rate:** The rate of water loss from a standard-sized (class A) pan. This rate provides an index of the air's drying potential.
- ◆ **Urban heat island:** Refers to a hotspot on the landscape created by the difference between urban temperatures and rural temperatures.
- ◆ **Xeriscap:** A water-efficient landscape design characterized by low water use plants and reduced or shaded lawn areas.
- ◆ **Zeroscap:** Landscape devoid of vegetation. Usually composed of crushed rock.

heavily once a month to avoid water stress. Never use sprinklers—water only where it is needed. While sprinklers waste water, drip-irrigation systems will increase efficiency and save significant amounts of water. And remember: Sandy soils require more frequent watering than clay soils, but clay soils take three to four times as much water as sandy soil (clay soils hold moisture longer and require less frequent watering).

In areas of severe water shortage, residents are beginning to harvest rainwater from their roofs and collect household “gray water” for watering gardens and trees. Gray water includes shower water, dishwasher water, and water from your washing machine. If you do use gray water, only use biodegradable soaps—avoid detergents with “whiteners and brighteners.” Also, don’t use gray water continually or as a sole source of irrigation water, but use it every second or third irrigation.

Americans living in the urban desert can learn from their desert cousins. The people of Africa bordering the Sahara Desert have long battled the encroaching sands. While many residents venture south to avoid the dry season, others stay in their villages and carefully tend newly planted trees—living fences that will slow or halt the expanding desert.

The dryer it gets, the greater our commitment should be to a healthier and greener community. UF

◆ *This feature is sponsored by the USDA Forest Service.*

CONFERENCE SPECIAL

L.A. DREAMIN’!

If sun, surf,

and stars appeal to your family, bring them along with you to next

November’s Urban Forest Conference.

By **DEBORAH BOERNER-EIN**

Los Angeles, site of the American Forestry Association’s (AFA) Fifth National Urban Forest Conference, might not immediately strike you as a top family vacation spot. But the smog and congestion for which the area is infamous fail to smother the enthusiasm of residents and tourists for all there is to see and do in the L.A. area. So if you are planning to attend the conference in November,

you might consider booking a companion flight. If you don’t want to leave your family for another business trip, the information below might help convince your spouse or the family to accompany you. You might even be tempted to extend your stay, joining

some of the extracurricular activities before or after the conference.

The hot, dry Santa Ana winds blow over Los Angeles from August through November, bringing the city

Deborah Boerner-Ein is a freelance writer and forestry consultant living in Pleasantville, New Jersey.

its warmest, clearest days. If you live in a colder climate, the weather should be reason enough to head west. Spending a few hours or a whole day at one of Los Angeles’ numerous beaches will be a nice reminder of summer.

Given such a wonderful weather forecast, municipal parks and forests also should top your list of sightseeing targets. The metropolitan area is dotted with parks, including one of the nation’s largest municipal parks. Within 4,063-acre Griffith Park are the Griffith Observatory and Planetarium, the Los Angeles Zoo, an equestrian center, and the Gene Autry Western Heritage Museum.

Directly across from the Olive Street entrance to the conference center is Pershing Square Park—a wonderful opportunity to show your family and friends part of Los Angeles’ urban forest. You should note that the park camouflages an underground parking garage. A daytime walking tour of the immediate downtown area will reveal an urban forest of rooftop gardens, parks atop parking decks, pocket parks, and numerous street trees.

Los Angeles also has several National Forests and Parks in its backyard. The Santa Monica National Recreation Area, the Angeles National Forest, and the San Bernardino National Forest are all within an hour’s drive of downtown Los Angeles, yet they offer a striking contrast to the city environment.

While you’re attending seminars,

If you live in a colder climate, the weather should be reason enough to head west.