

## Climate-Ready Trees for Southern California Inland Empire Communities – A 20-Year Evaluation

Urban forests provide many societal and ecological benefits to cities and their inhabitants such as carbon storage, reduced heat islands and energy use, improved air quality and human health, and water quality protection. Although there are an estimated 9.1 million street trees in California (about one for every four residents) street tree density has declined by 30% since 1988 because cities added more streets than trees. Los Angeles lost 667 acres of tree canopy each year from 2005 to 2009. Sadly, California cities have the lowest tree canopy per capita (108 yd<sup>2</sup> per capita) in the U.S.

Although street tree species composition is diverse at the state level, overreliance on certain species and genera at the city level poses a threat of catastrophic loss from pests, drought, storms and other stressors. The health and longevity of urban forests in California cities are at risk. Abiotic disorders such as drought, heat stress due to climate change, and root damage resulting from soil compaction can lead to stressed trees predisposed to disease and insect damage. The increased use of saline recycled water adversely impacts the health of sensitive trees. There is an increased probability of extreme weather events that could increase the number of tree failures as well. The tolerance of urban trees to these stressors varies considerably among species and the perpetuation of our urban forests depends on their resilience to climate induced stress.

The goal of this study is to evaluate the survival and growth of seldom used but promising trees in the Southern California Inland Empire. Trees have been selected for testing because of their apparent resilience to stressors such as heat, drought, high winds, salinity and pests. Also, they are attractive, require minimum maintenance and will pose little hazard to people or infrastructure. Long-term field testing (20 years) at a University of California Experiment Station plot in Riverside, and in 4 parks in the Los Angeles area will allow for direct comparisons of growth and longevity under a range of site conditions. Results will help urban foresters, landscape architects, planners and local tree planters select trees for planting that can improve the stability and long term success of future urban forests.

Twelve types of trees have been selected for testing, with 144 trees planted. Four individuals of each type (48 trees), were planted in the UC Experiment Station reference plot, where trees have similar soil, irrigation, and maintenance. Two individuals of each type were planted in each of 4 parks, where their performance will be observed under a variety of growing conditions. (Please see the attached map for site locations). Each tree will be measured and photographed annually for the first five years, and biannually thereafter. Soil samples have been collected and analyzed from each park and the reference plots. A web site for the project contains regular updates on tree growth and performance. By shifting the palette of planted trees to those proven to perform best when exposed to climate stressors, this study is helping create urban forests that are more resilient. Healthier and more extensive urban forests will benefit our children and our children's children. For more information visit:

<http://climatereadytrees.ucdavis.edu/>

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G. McPherson

Park tree plantings are conducted with staff from the Los Angeles Beautification Team, City Plants, Los Angeles Recreation and Parks Department and local volunteers.



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### **Mulga** (*Acacia aneura*)

Mulga is native to arid Western Australia and tolerates hot and dry conditions. It can grow in sandy, loam, or clay soil types. This versatile and hardy tree produces ascending thornless branches and grows 15 to 20 feet in height. The leaves are evergreen and the tree has yellow, showy flowers in the spring.



### **Netleaf Hackberry** (*Celtis reticulata*)

The netleaf hackberry is native to riparian areas in the Southwest. A deciduous tree, it reaches heights of 25 to 35 feet with a spreading or weeping canopy. The ovate leaves are medium green and turn yellow in the fall. The flowers mature into red drupes that attract birds. The netleaf hackberry is drought tolerant and able to thrive in a variety of soil types.



### **Desert Willow** (*Chilopsis linearis* 'Bubba')

The desert willow is native to California and the Southwest. It is a small flowering desert tree that can reach a height of 15 feet. The cultivar Bubba is upright in form and has profuse, long-lasting blooms. Leaves are linear blue green and turn golden in the fall. The showy flowers are pink and white. The desert willow is very drought and heat tolerant.



### **Ghost Gum** (*Corymbia papuana*)

The ghost gum is native to Australia and is a smaller eucalyptus, reaching 66 feet. The trunk is smooth and snow white. It has gray green evergreen leaves that are tinged purple by frost. White flowers bloom in the summer. It tolerates drought but can be used in well-irrigated landscapes.



### **Rosewood** (*Dalbergia sissoo*)

The Rosewood is native to Northern India and has evergreen foliage that can be damaged by frost, but tends to recover quickly in the spring. It reaches heights of 30 to 50 feet with a 40 foot canopy spread. Rosewood tolerates periods of drought and can grow in sandy, clay, and loam soil types. Its roots host nitrogen-fixing bacteria. The flowers are inconspicuous.



### **Palo Blanco** (*Mariosousa willardiana*)

Native to Sonora Mexico, Palo Blanco thrives in full sun and tolerates great heat. It prefers good drainage and can tolerate thin rocky soil. This tree has a weeping branching habit and grows 10 to 20 feet high, spreading 5 to 10 feet. Palo Blanco is a moderate grower that has thornless branches, peeling silvery white bark, and creamy white flower catkins that are present in spring.



### **Tecate Cypress (*Hesperocyparis forbesii*)**

Native to the coastal mountains of Southern California the tecate cypress is a fast growing, low branching evergreen tree that grows 10 to 25 feet tall and 20 feet wide. Growth rate slows after it reaches 15 feet. The bark of this tree is cherry red when young and dark brown when older.



### **Desert Museum Palo Verde (*Parkinsonia* x 'Desert Museum')**

Desert museum palo verde is a three way cross between *Parkinsonia microphylla*, *P. florida*, and *P. aculeate*. This tree is thornless, fast-growing to about 30 feet high and wide, and upright. Plant in full sun and well-drained soil, it will produce masses of yellow flowers from March through May. Saplings can be frost sensitive.



### **Red Push Pistache (*Pistacia* 'Red Push')**

The 'Red Push' is a hybrid between *P. atlantica* and *P. integerrima*. This long-lived deciduous tree has a moderate growth rate, and will reach 25 to 40 feet tall and develop a broad spreading form, 20 to 40 feet wide. The pinnately compound leaves first emerge with a red tint, mature to a medium green color, and then provide another color display in the fall. 'Red Push' is cold and drought tolerant, requires full sun, and can adapt to a variety of soils.



### **Maverick Mesquite (*Prosopis glandulosa* 'Maverick')**

Maverick is an upright-growing, thornless cultivar of the honey mesquite tree, which is native to the southwestern United States. This deciduous tree can quickly reach a height of 30 feet tall and 30 to 35 feet wide. The tree is cold hardy, drought tolerant, and adaptable to a range of soil types. The smooth gray bark provides contrast to the bright green foliage.



### **Escarpment Live Oak (*Quercus fusiformis*)**

The escarpment live oak is native to west Texas, is cold hardy, drought tolerant, and requires full sun. Typically evergreen, it can be deciduous in colder climates. This live oak is a slow grower that can reach 50 feet in height and width. The escarpment live oak can tolerate a wide range of soils but prefers good drainage.



### **Island Oak (*Quercus tomentella*)**

The island oak is native to five of the California Channel Islands and Guadalupe Island off of Baja California. It is evergreen and fast growing to a height of 20 to 50 feet and width of 25 to 40 feet, growth rate can be up to 24 inches per season. This oak refers deep, moist soils but can tolerate a wide range of soil conditions and soil types including clay, loam, and sand. This tree is considered drought tolerant and cold hardy.



