

Climate-Ready Trees for Northern California 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 yd² 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 Northern California. 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 Davis, and in 4 parks in the Sacramento 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/>

This study is possible because of support provided by a host of partners including:



Community members planting Climate-Ready Trees at Fisherman's Lake Park in Sacramento California.

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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 variety of soil types.



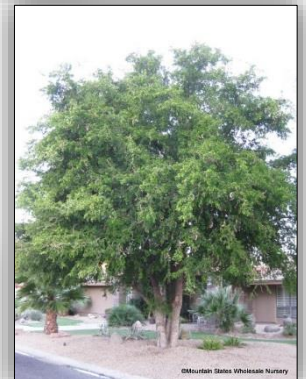
Desert Willow (*Chilopsis linearis* 'Bubba')

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.



Texas Ebony (*Ebenopsis ebano*)

The Texas Ebony is native to Texas and Northern Mexico, where it is evergreen. It tolerates modest frost but goes deciduous. The tree can reach a height of 30 feet, but is slow growing. Once established, it is very drought tolerant. It has a distinctive branching pattern, thorns, and fragrant yellow flowers that mature into large woody pods.



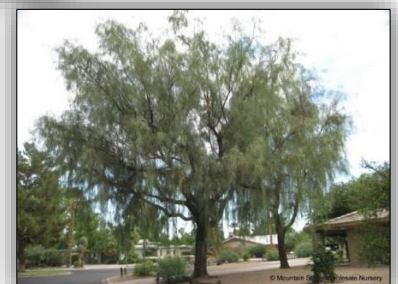
Ghost Gum (*Corymbia papuana*)

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.



Shoestring Acacia (*Acacia stenophylla*)

This evergreen thornless acacia from Australia grows rapidly into an arresting specimen. The canopy is open with weeping, linear leaves. Shoestring acacia reaches a height of 20 to 30 feet. Fragrant and showy yellow flowers grow in clusters from fall to spring. The tree is drought tolerant and prefers well-drained soil. May require staking initially and sometimes sprouts from roots.



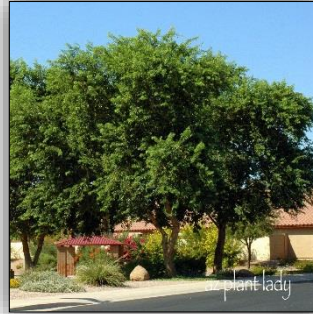
White Shield Osage Orange (*Maclura pomifera* 'White Shield')

Osage orange is native to the western Great Plains. It grows quickly to a height of 30 to 50 feet. The deciduous foliage is glossy green. The White Shield cultivar is thornless and fruitless.



Rosewood (*Dalbergia sissoo*)

The Rosewood is native to Northern India and its evergreen foliage can be damaged by frost. The tree recovers quickly in the spring. It reaches a height 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



Canby's Oak (*Quercus canbyi*)

The Canby oak is native to northern Mexico and Texas. It grows rapidly with an upright habit to reach 30 to 50 feet. The thick leathery leaves are semi-evergreen and resemble red oak. Acorns are small and narrow. This deep rooted oak is heat tolerant.



Thornless Honey Mesquite (*Prosopis glandulosa* x Maverick)

The Honey Mesquite is native to the southwestern United States. Maverick is an upright-growing, thornless cultivar of the Honey Mesquite tree. It can quickly reach a height of 30 feet. The tree is cold hardy, drought tolerant and adaptable to a range of soil types.



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

The Desert Museum is Palo Verde hybrid that exhibit qualities of the Blue Palo Verde, Foothills Verde, and Mexican Palo Verde. The tree has a strong upright branching structure and rapid growth. This hybrid is thornless and has little litter.

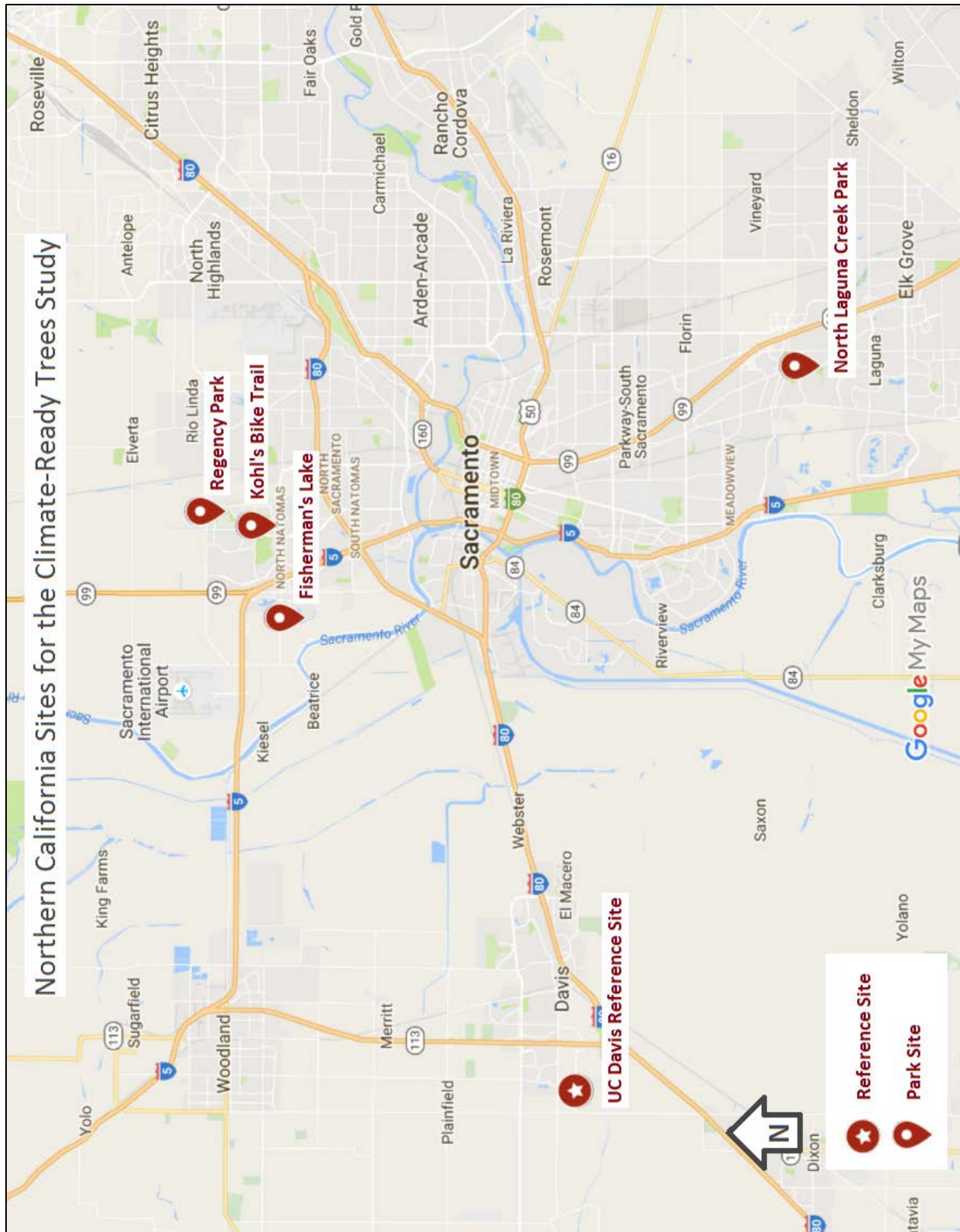


Emerald Sunshine Elm (*Ulmus propinqua*)

The Emerald Sunshine Elm is a deciduous tree that reaches 35 feet in height with a 25 foot spread. It has a vase shaped growth habit. Emerald Sunshine is tolerant of hot and windy conditions.



Northern California Sites for the Climate-Ready Trees Study



Reference Site


Park Site




Google My Maps