



# The State of California’s Street Trees

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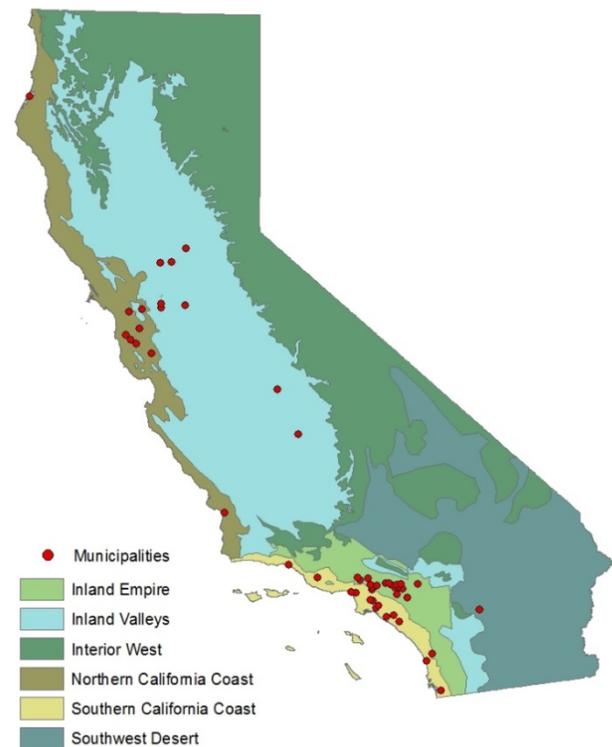
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California’s street trees comprise 10–20% of the total urban forest and provide crucial benefits in some of the toughest locations for human health and tree growth. This study analyzed data from 49 municipal inventories in six climate zones to summarize current structure, function and value of street trees across the state. It provides information for management and a baseline for future comparisons as the state renews its investment in urban forestry through projects that reduce atmospheric carbon dioxide, save energy, conserve water and promote environmental equity.

## Study highlights:

- 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, as cities added more streets than trees.
- Street tree species composition is diverse at the state level but overreliance on certain species and genera at the individual city level pose a threat of catastrophic loss from pests, drought, storms and other stressors.
- The total annual benefits provided by street trees are \$1 billion. With a replacement value of \$2.49 billion, street trees are a vital part of the state’s infrastructure and should be maintained as such.

California Municipal Inventories



**Figure 1. Locations of climate zones and cities with street tree inventories used in this study.**



### Structure

The number of street trees in California has increased from an estimated 5.9 million reported in 1988 to 9.1 million in 2014. Although the street tree population has increased in absolute numbers, it has failed to keep up with expanding cities and human population growth. The per capita number of trees has not changed, hovering at 0.26 trees/capita since 1988. Tree density has declined from the 105.5 trees per mile in 1988 to 75.0 trees per mile. These results suggest that relatively few removed trees are being replaced and new plantings are not keeping pace with growing municipal road networks.

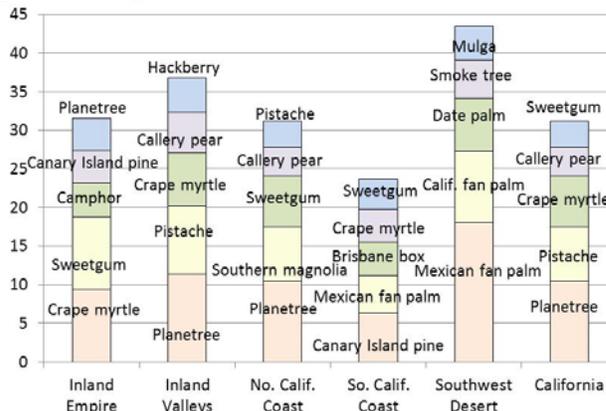
**Table 1. Numbers of street trees, vacant sites, tree density and trees per capita in each climate zone and statewide.**

Zone	Total Street Trees	Vacant Sites	Density (trees/mi.)	Trees/capita
IE	1,671,362	2,651,488	81.7	0.29
IV	2,042,700	4,895,861	62.2	0.28
NC	1,994,793	2,618,074	91.3	0.30
SC	2,763,290	4,334,530	82.2	0.21
SW	631,146	1,569,132	60.6	0.50
IW	26,516	502,568	10.6	0.13
<b>Total</b>	<b>9,129,806</b>	<b>16,042,568</b>	<b>75.0</b>	<b>0.26</b>

Note: IE=Inland Empire; IV = Inland Valleys; NC = Northern California Coast; SC = Southern California Coast; SW = Southwest Desert; IW = Interior West.

Adequate species diversity protects tree canopy by limiting the damage from threats such as pests, pathogens, drought, or storms. A commonly accepted diversity index for cities is for no single species to account for more than 10% of the population, no genus more than 20% and no family more than 30%. At the state scale, one species, London planetree (*Platanus acerifolia*), did account for more than 10% of all trees (10.5%), but no genus accounted for more than 20% of the population. However, evidence from the individual city level suggests the need

for diversification. For example, the 10% species target was exceeded in 36 of the municipal inventories. At the city scale, *Eucalyptus*, *Lagerstroemia* (crape myrtle), *Quercus* (oak), *Pistacia* (pistache), *Pinus* (pine) and *Washingtonia* (fan palm) exceeded the 20% genera target.



**Figure 2. Percentage of all trees in each climate zone and statewide that are represented by the top five species.**

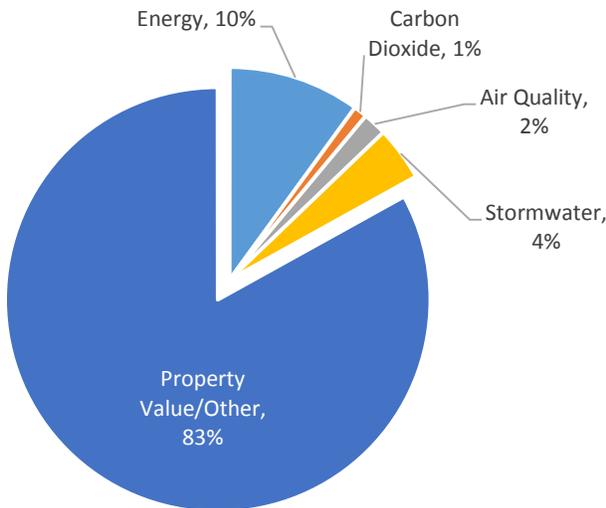
The age structure of street trees is another component that provides insight into the health and longevity of the urban forest. Statewide, the age structure is relatively youthful, but there are cities dominated by mature and senescent trees. These cities risk catastrophic loss of canopy if these highly vulnerable, older trees are afflicted by pests, pathogens, drought, and storms.

### Function and Value

Street trees provide critical ecosystem services by lowering energy use, storing carbon, inducing air pollutant uptake, intercepting rainfall and increasing property values, among other benefits. California's 9.1 million street trees save 684 GWH of electricity annually, equivalent to the amount required to air condition 530,000 California households each year. In addition, 7.78 million metric tonnes of CO<sub>2</sub> emissions are stored in the state's street trees. They remove and avoid 567,748 tonnes of CO<sub>2</sub> emissions annually, equivalent to removing 120,000 cars from the road. Street trees intercept the equivalent to the

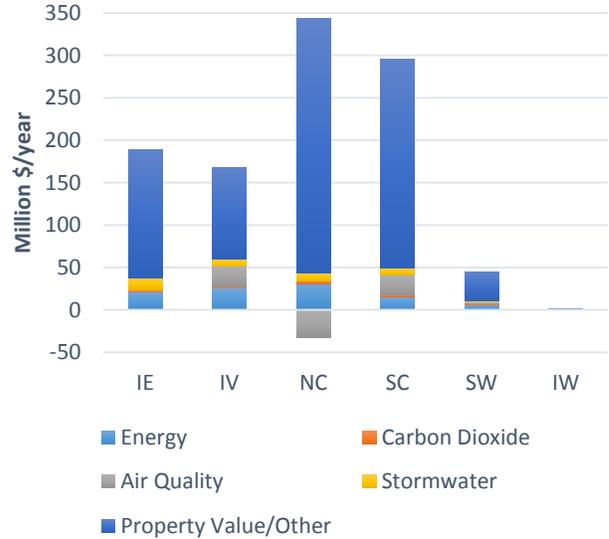
average amount of potable water consumed by 52,400 California households each year (6.92 billion gallons of rainfall annually). The average annual air pollutant uptake by California’s street trees is 0.64 lb.

When these ecosystem services are monetized their annual value is \$1 billion. Given the average annual costs associated with planting and maintaining trees (\$19/tree) and their benefits (\$110.63/tree), the return on investment is \$5.82 in benefits for every \$1 spent. The replacement value for all street trees is \$2.49 billion. This amount is the asset value of the state’s street trees when considered as a capital investment similar to other infrastructure such as roads and water systems.



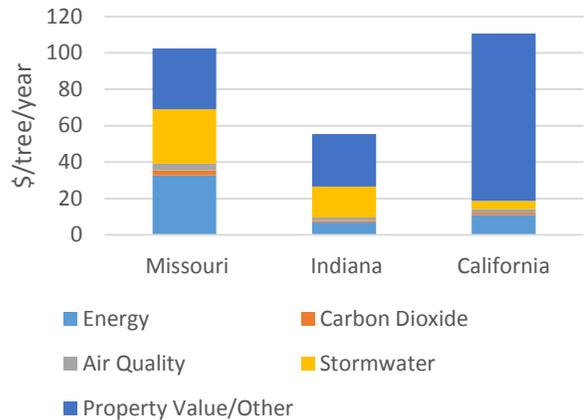
**Figure 3. Distribution of \$1 billion in annual benefits from California’s street trees.**

The value of California’s street tree services were compared with results for Missouri and Indiana. The annual value in California averages \$110.63 per tree, about twice the \$55.52 reported for Indiana, but similar to the value reported for street trees in Missouri (\$102.48).



**Figure 4. Value of annual benefits by climate zone (in million \$).** Note: IE=Inland Empire; IV = Inland Valleys; NC = Northern California Coast; SC = Southern California Coast; SW = Southwest Desert; IW = Interior West.

The effect of street trees on property values is the single largest benefit in California, averaging \$91.89 per tree. This value is greater than in Missouri (\$53.44) and Indiana (\$28.88) and reflects higher median home sales prices in California.



**Figure 5. Annual monetary value (\$US) per tree of services from street tree populations (Davey Resource Group 2010, Treiman et al. 2011).**

## Management

Increasing species and age diversity, as well as street tree abundance will help promote more stable street tree populations and healthier cities for people. The insights from this study are summarized in the following management considerations:

- Approximately 16 million vacant street tree sites remain in California and should be filled. As cities and their human populations grow, so should the street tree populations to support human and environmental health.
- There is need for increased species diversity in many cities. In particular, a new palette of climate-ready trees should be evaluated and utilized. Such trees are tolerant to drought, pests, storms, salinity and other stressors likely to prevail in the future. Planting of overly abundant and highly vulnerable species such as London planetree, sweetgum, Chinese pistache, and Callery pear should be restricted.
- A youthful street tree population needs pruning for structure and form to prevent defects that might occur later as the trees mature.



**Figure 6. Number of filled and vacant street tree sites by climate zone.**

California's street trees are working hard, providing \$29.17 in annual benefit per capita and \$110.63 per tree. By conserving its veteran trees, preserving the health of the maturing tree population and making wise planting choices,

California's municipal forests will provide benefits for generations to come.



**Figure 7. Planting tree species that are not overly abundant or vulnerable to drought, pests and other stressors will help perpetuate healthy and stable street tree populations.**

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