

Urban Street Trees

22 Benefits

Specific Applications



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Summer, 2006

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U.S Forest Service facts and figures and new traffic safety studies detail many urban street tree benefits. Once seen as highly problematic for many reasons, street trees are proving to be a great value to people living, working, shopping, sharing, walking and motoring in and through urban places.

For a planting cost of \$250-600 (includes first 3 years of maintenance) a single street tree returns over \$90,000 of direct benefits (not including aesthetic, social and natural) in the lifetime of the tree. Street trees (generally planted from 4 feet to 8 feet from curbs) provide many benefits to those streets they occupy. These trees provide so many benefits that they should always be considered as an urban area default street making feature.

With new attentions being paid to global warming causes and impacts more is becoming known about negative environmental impacts of treeless urban streets. We are well on the way to recognizing the need for urban street trees to be preferred urban design, rather than luxury items tolerated by traffic engineering and budget conscious city administrators.

The many identified problems of street trees are overcome with care by designers. Generally street trees are placed each 15-30 feet. These trees are carefully positioned to allow adequate sight triangles at intersections and driveways, to not block street luminaries, not impact utility lines above or below ground. Street trees of various varieties are used in all climates, including high altitude, semi-arid and even arid urban places.



The science of street tree placement and maintenance is well known and observed in a growing number of communities (i.e. Chicago, Illinois; Sacramento, Davis, California; Eugene, Oregon; Seattle, Redmond, Olympia and Issaquah, Washington; Charlotte, N.C.; Keene, New Hampshire and Cambridge, Mass). Although care and maintenance of trees in urban places is a costly task, the value in returned benefits is so great that a sustainable community cannot be imagined without these important green features.

Properly placed and spaced urban street trees provide these benefits:

Increased motorized traffic and pedestrian safety (contrary to engineering myths). See below article for details on mode safety enhancements. See especially the compilation of safety benefits detailed in, *Safe Streets, Livable Streets*, by Eric Dumbaugh *Journal of the American Planning Association*, Vol. 71, No. 3, Summer 2005. One such indication of increased safety with urban street trees is quoted from this document:

“...Indeed, there is a growing body of evidence suggesting that the inclusion of trees and other streetscape features in the roadside environment may actually reduce crashes and injuries on urban roadways. Naderi (2003) examined the safety impacts of aesthetic streetscape enhancements placed along the roadside and medians of five arterial roadways in downtown Toronto. Using a quasi-experimental design, the author found that the inclusion of features such as trees and concrete planters along the roadside resulted in statistically significant reductions in the number of mid-block crashes along all five roadways, with the number of crashes decreasing from between 5 and 20% as a result of the streetscape improvements. While the cause for these reductions is not clear, the author suggests that the presence of a well defined roadside edge may be leading drivers to exercise greater caution.”



Trees

I think that I shall never see
A poem lovely as a tree.
A tree whose hungry mouth is prest
Against the sweet earth's flowing breast;
A tree that looks at God all day,
And lifts her leafy arms to pray;
A tree that may in summer wear
A nest of robins in her hair;
Upon whose bosom snow has lain;
Who intimately lives with rain.
Poems are made by fools like me,
But only God can make a tree.

**...Joyce Kilmer (1913)
American poet,
killed during WWI at the age of 31**



22 Benefits Detailed:

1. **Reduced and more appropriate urban traffic speeds.** Urban street trees create vertical walls framing streets, providing a defined edge, helping motorists guide their movement and assess their speed (leading to overall speed reductions). Street safety comparisons show reductions of run-off-the-road crashes and overall crash severity when street tree sections are compared with equivalent treeless streets. (Texas A and M conducted simulation research which found people slow down while driving through a treed scape. These observations are also seen in the real world when following motorists along first a treed portion of a street, and then a non treed portion (see page 13). Speed differentials of 3 mph to 15 mph are noted.
2. **Create safer walking environments,** by forming and framing visual walls and providing distinct edges to sidewalks so that motorists better distinguish between their environment and one shared with people. If a motorist were to significantly err in their urban driving task, street trees help deflect or fully stop the motorist from taking a human life.
3. **Trees call for placemaking planting strips and medians,** which further separate motorists from one another, pedestrians, buildings and other urban fabric. This green area adds significantly to aesthetics and placemaking. Urban area medians with trees are safer than those without trees (R. Ewing, Caltrans Study, circa 2003). Medians reduce crashes by 50% or more.



4. **Increased security.** Trees create more pleasant walking environments, bringing about increased walking, talking, pride, care of place, association and therefore actual ownership and surveillance of homes, blocks, neighborhoods plazas, businesses and other civic spaces.

5. **Improved business.** Businesses on treescaped streets show 12% higher income streams, which is often the essential competitive edge needed for main street store success, versus competition from plaza discount store prices.

6. **Less drainage infrastructure.** Trees absorb the first 30% of most precipitation through their leaf system, allowing evaporation back into the atmosphere. This moisture never hits the ground. Another percentage (up to 30%) of precipitation is absorbed back into the ground and taken in and held onto by the root structure, then absorbed and then transpired back to the air. Some of this water also naturally percolates into the ground water and aquifer. Storm water runoff and flooding potential to urban properties is therefore reduced.

7. **Rain, sun, heat and skin protection.** For light or moderate rains, pedestrians find less need for rain protection. In cities with good tree coverage there is less need for chemical sun blocking agents. Temperature differentials of 5-15 degrees are felt when walking under tree canopied streets.



8. **Reduced harm from tailpipe emissions.** Automobile and truck exhaust is a major public health concern and contains significant pollutants, including carbon monoxide (CO), volatile organic compounds (VOC), nitrogen oxides (NOx), and particulate matter (PM). Tailpipe emissions are adding to asthma, ozone and other health impacts. Impacts are reduced significantly from proximity to trees.
9. **Gas transformation efficiency.** Trees in street proximity absorb 9 times more pollutants than more distant trees, converting harmful gasses back into oxygen and other useful and natural gasses.
10. **Lower urban air temperatures.** Asphalt and concrete streets and parking lots are known to increase urban temperatures 3-7 degrees. These temperature increases significantly impact energy costs to homeowners and consumers. A properly shaded neighborhood, mostly from urban street trees, can reduce energy bills for a household from 15-35%.
11. **Lower Ozone.** Increases in urban street temperatures that hover directly above asphalt where tailpipe emissions occur dramatically increase creation of harmful ozone and other gasses into more noxious substances impacting health of people, animals and surrounding agricultural lands.



12. **Convert streets, parking and walls into more aesthetically pleasing environments.** There are few streetmaking elements that do as much to soften wide, grey visual wastelands created by wide streets, parking lots and massive, but sometimes necessary blank walls than trees.

13. **Soften and screen necessary street features** such as utility poles, light poles and other needed street furniture. Trees are highly effective at screening those other vertical features to roadways that are needed for many safety and functional reasons.

14. **Reduced blood pressure, improved overall emotional and psychological health.** People are impacted by ugly or attractive environments where they spend time. Kathlene Wolf, Social Science Ph.D. University of Washington gave a presentation that said “the risk of treed streets was questionable compared to other types of accidents along with the increased benefit of trees on human behavior, health, pavement longevity, etc.” She noted that trees have a calming and healing effect on ADHD adults and teens.

15. **Time in travel perception.** Other research and observations confirm that motorists perceive the time it takes to get through treed versus non-treed environments has a significant differential. A treeless environment trip is perceived to be longer than one that is treed (Walter Kulash, P.E.; speech circa 1994, Glattig Jackson).



16. **Reduced road rage.**

Although this may at first seem a stretch, there is strong, compelling research that motorist road rage is less in green urban versus stark suburban areas. Trees and aesthetics, which are known to reduce blood pressure, may handle some of this calming effect.

17. **Improved operations**

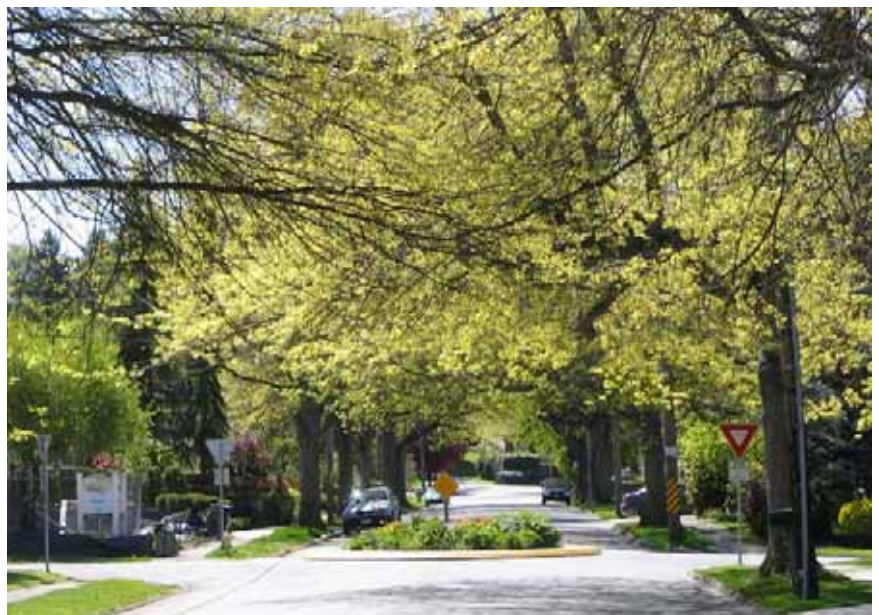
potential. When properly positioned and maintained, the backdrop of street trees allow those features that should be dominant to be better seen, such as vital traffic regulatory signs. The absence of a well developed Greenscape allows the sickly grey mass of strip to dominate the visual world. At the same time, poorly placed signs, signals, or poorly maintained trees reduces this positive gain, and thus proper placement and maintenance must be rigidly adhered to.

18. **Added value to adjacent homes, businesses and tax base.**

Realtor based estimates of street tree versus non street tree comparable streets relate a \$15-25,000 increase in home or business value. This often adds to the base tax base and operations budgets of a city allowing for added street maintenance. Future economic analysis may determine that this is a break-even for city maintenance budgets.



19. **Provides a lawn for a splash and spray zone, storage of snow, driveway elevation transition and more.** Tree lawns are an essential part of the operational side of a street.
20. **Filtering and screening agent.** Softens and screens utility poles, light poles, on-street and off-street parking and other features creating visual pollution to the street.
21. **Longer pavement life.** Studies conducted in a variety of California environments show that the shade of urban street trees can add from 40-60% more life to costly asphalt. This factor is based on reduced daily heating and cooling (expansion/contraction) of asphalt. As peak oil pricing increases roadway overlays, this will become a significant cost reduction to maintaining a more affordable roadway system.
22. **Connection to nature and the human senses.** Urban street trees provide a canopy, root structure and setting for important insect and bacterial life below the surface; at grade for pets and romantic people to pause for what pets and romantic people pause for; they act as essential lofty environments for song birds, seeds, nuts, squirrels and other urban life. Indeed, street trees so well establish natural and comfortable urban life it is unlikely we will ever see any advertisement for any marketed urban product, including cars, to be featured without street trees making the ultimate dominant, bold visual statement about place.





Trees provide enclosure

West Hartford's Farmington Avenue tree canopy forms an attractive wall of green. This sense of enclosure creates an important quality allowing pedestrians to feel fully separated from the movement of more than 25,000 vehicles in the adjacent street.





Trees provide shelter

It rained all day. When author Dan Burden spent mid morning to mid-afternoon on West Hartford's Farmington Avenue he did not get wet. The canopy cover kept sidewalks dry, despite a steady light all-day rain. Trees have the ability to capture significant rainfall then transpire it back into the atmosphere before reaching the ground. Meanwhile water runs down branches and trunk to allow deep root penetration.



Tree and Lamp Placement

Well placed trees allow even and attractive lamp placement. It is important that lamps provide proper levels of lumination to create welcoming and comfortable walking environments.

Generally lamps are placed mid-way between trees, allowing for some variation between other essential furniture such as seating and fire hydrants.



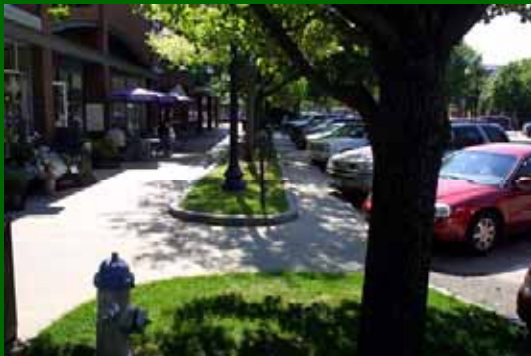


Traffic Calming results from correct tree placement

The top two images are both collector category streets (Avenues). Historic tree plantings reduce speeds, provide greater green cover, and allow homes to face streets, thus rewarding walking activity. More recent street making maximizes asphalt, increases the tendency to speed and highly discourages developers from orienting homes toward the street. Walking becomes a lonely and sometimes scary activity. The bottom two images each have the same curb to curb dimensions. Trees placed at the street and on street parking bring speeds down 7-8 mph.

Trees Screen Parking

Effective tree placement softens harshening effects of on-street parking. A combination of tree planting tools, from curb extensions, block entry tree clusters, mid-block tree clusters at curb extensions and tree wells are common tools for screening and greening parking areas.





Alley versus driveway loaded blocks

There is a distinct visual advantage in using alley loaded properties. Driveways break up the natural rhythm and opportunity of attractively and evenly spaced street trees. Driveways also eliminate the possibility of using a longer tree planter strip. Long and narrow strips are sometimes essential to getting in quality growth trees in a minimum right-of-way.



Maximize Green

Plan good caliper trees (3" or wider) on all streets to soften buildings and street impacts. Use wide or long tree wells and all of the technical knowledge for setting and maintaining successful urban trees. Utilities are placed in locations minimizing impact on green cover.

Urban street trees are generally placed each 15-20 feet. Dense placement is highly desired.



Tree Wells



Tree Wells

In tight urban spaces there may be insufficient space in sidewalks to place trees. In these settings placement of tree wells roughly every 40-60 feet allows two or three parking spaces. Often not a single parking space is lost. Tree wells can be added to both parallel and angled parking. Depending on the amount of parking needed, desired visual pattern, and tree density wells are placed every other car, third car and sometimes every fourth car. Wells must be deep enough to prevent backing into trees.

Tree Wells



Tree Wells and curb extensions

One of the greatest benefits to the use of tree wells is the added screening of parked cars. Properly used tree wells establish a compelling line of green, hiding much of the excess asphalt needed for parking. Tree wells are often accented with colorful ground cover. The term tree well is used independently of curb extension. Curb extensions add to the use of tree wells, but are much larger, and often include sitting areas or corner placement.





Kathlene Wolf, Social Science Ph.D. University of Washington gave a presentation that said that the risk of treed streets was questionable compared to other types of accidents along with the increased benefit of trees on human behavior, health, pavement longevity, etc. She noted that trees have a calming and healing effect on ADHD adults and teens. And I added that through my review of literature, ADHD males 16 to 22 years of age had an incident of serious accident that was 5 times what a control population of 16 to 22 male drivers would experience