



# Urban Forest Research

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Center for Urban Forest Research • Pacific Southwest Research Station • USDA Forest Service

## Will there be space for trees in our future?

Communities are projected to face imposing challenges during the next 30 years. In many metro regions, population will continue to grow, placing unprecedented demands on infrastructure and the environment. To best accommodate new growth and conserve natural resources, planners are advocating higher-density infill and transit-oriented development. The demand for multi-family housing will exceed demand for traditional single-family homes. Houses and lot sizes will continue to shrink. As the pressure for smart growth builds, what will happen to our trees? Will there be space for trees and parks in our future? What would our quality of life be without enough trees?



### Will trees be more than pretty ornaments?

Research during the past 20 years has shown that city trees are far more than decorative. Trees offer solutions to some of the most pressing economic, social, and environmental issues our communities face. Creating sustainable landscapes reduces fire danger, water use, and stormwater runoff; improves air quality; recycles green waste; conserves energy; increases property values; enhances business; strengthens sense of community; creates jobs; and reconnects residents with their local environment. However, actualizing the potential of urban forestry to improve quality of life as our communities grow will

require more than pretty pictures of tree-lined streets. Will sufficient space for trees be designed and planned for in the future?

### Begin by design

This space, called *Greenspace*—planting areas along streets and in medians, vest-pocket parks, and community gardens—must be designed as connected, multi-functional systems and engineered into a city's infrastructure. Nationwide, integrating green and gray infrastructure can save billions of dollars each year, make communities more attractive, and enhance quality of life for generations to come.

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However, to save money in the long-term, cities will have to spend money. More funds will be needed to protect critical habitats, create multi-functional parks, restore disturbed urban ecosystems, make more space for large trees along streets, build green parking lots, and better manage existing trees.

### The green strategy questions

Before spending money on these green strategies, each developer, planner, and local elected official will ask questions about functionality and long-term cost-effectiveness: How much more will the green strategy cost versus the way I do it now? What benefits will accrue? How will it perform over time? What are the hidden costs?

### Do we have the answers?

We have most of the answers. So why haven't we seen more adoption and implementation of the strategies? Part of the answer lies with us and not with the developers, planners, and local elected officials. We have not fully persuaded these partners that green solutions are in their best interest. They probably know the benefits trees provide and the value they have to communities, but pursuing greenspace boils down to dollars and cents. It has to work for the people who make the decisions.



**Urban Forest Research** is a publication of the Center for Urban Forest Research, Pacific Southwest Research Station, USDA Forest Service. For more information, contact the Center at the Department of Environmental Horticulture, University of California, 1 Shields Ave, Suite 1103, Davis, CA 95616-8587. (530) 752-7636

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*Trees offer solutions to some of the most pressing economic, social, and environmental issues our communities face.*

### Speaking the right language

Several new tools have recently been created at our Center that not only demonstrate the value of trees in a community, but also add value to the service delivered by developers, planners, and consultants. This unique combination of value to both the customer and service provider offers a new incentive to incorporate sufficient space for trees in future projects.

- **Valuing environmental services of city parks**

We are developing a numerical model that calculates the amount and value of stormwater-runoff reduction in parks. This is part of a 3-year research project led by the Trust for Public Land called *What is a Park System Worth?* A suite of seven models will allow park managers to calculate the value of services delivered to residents and taxpayers by an outstanding park system.

- **2004 Olympic Torch Relay tree planting study**

On March 25 the Olympic torch will begin a 3-month odyssey, traveling 50,000 miles through all five continents before returning to Athens for commencement of the summer games. This will involve quite a number of support vehicles and international air travel. In cooperation with the Athens Environmental Foundation and the International Society of Arboriculture, our Center is

calculating the number of trees needed to offset emissions associated with transport of the Olympic torch. Based on our results, countries will pledge to plant and maintain hundreds of thousands of trees around the world.

- **Tree growth animation**

Our Center received \$25,000 from the Slosson Fund to develop a web-based application that helps users visualize in 5 seconds what takes 50 years to occur. This 3-dimensional animation is based on measured street-tree dimensions for several common species and realistically depicts changes in tree size and habit for 50 years after planting. Vertical bars dynamically reflect the value of annual benefits and management costs. The final product will be posted on our website this summer at: <http://cuf.r.ucdavis.edu>.

- **STRATUM**

This computer program is a street-tree assessment tool that uses tree inventory data to quantify the dollar value of annual benefits from five sources: energy conservation, air quality improvement, CO<sub>2</sub> reduction, stormwater control, and property value increase. Through cooperative research and development agreements, STRATUM is being applied in the development of North Vancouver's and UC Davis's urban forestry plans. STRATUM is one of three programs that the

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Forest Service is integrating into a software suite for national release in 2005.

- **ecoSmart design software**

This web-based program being developed by our Center helps users evaluate trade-offs between different landscape practices on residential parcels. This interactive program will allow the user to re-configure landscapes and instantly see their impact on landscape water use and stormwater runoff (WaterWise), energy use for heating and cooling (EnergyWise), and fire safety (FireWise). The FireWise model, developed in cooperation with the National Institute of Standards and Technology and Earthview Computing, will be accessible via our website this spring.

### A final thought

As communities grow and become more densely populated, persuading planners, developers, and elected officials that the benefits of integrating trees into the gray infrastructure outweigh their costs is critical to the future health and well-being of city dwellers. Their quality of life depends on trees. We feel fortunate to be conducting science that is fueling the development of more sustainable cities in the future.

—Greg McPherson



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## Future research needs

Developing sustainable cities will continue to depend on our ability to convincingly demonstrate the value of quality trees and urban forests to civic leaders. Over the last several decades we have come a long way in uncovering the real value of urban trees. The “convincingly” part, however, is still in question. Look around and you will see examples of new development that is not sustainable.

As dollars become tighter and tighter it will become even more difficult to sell the value of trees using today’s information. Research must continue to investigate the true value of trees just to keep pace with skeptics. Investing in this discovery will pay for itself many times over. Gray or green, sizzling or shady, the choice remains.

Where will that information come from? Research is developing exciting new data and technologies that make the urban forest come alive—give it value and standing in the eyes of decision-makers. But this effort is a fraction of what needs to be done. There are a host of benefits that remain unexplored (e.g., reduced UV exposure and skin cancer), benefits that need to be translated into economic terms (e.g., reduced stress and

anxiety), and benefits that need more testing (e.g., how property value benefits change geographically). New methods of integrating trees into the gray infrastructure need to be engineered and tested in the field (e.g., structural soils for stormwater treatment).

Research in urban and community forestry can help improve the future quality of life in our communities, but the needs are great and the resources few. One solution is a national research initiative in urban and community forestry that focuses on the benefits of trees. The goal: to get you the facts you need to convince skeptics that urban and community forestry solutions can save money and improve quality of life. Such an initiative will accelerate the development of

- new knowledge about benefits of trees
- new methods of integrating trees into gray infrastructure
- new techniques for preserving and maintaining healthy trees
- new technologies for quantifying tree value
- new tools for communicating tree benefits

Let’s make the investment now. We can’t afford to wait.

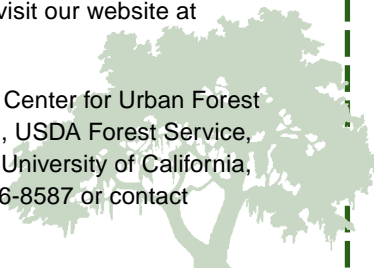


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Send comments or suggestions to Jim Geiger, Center for Urban Forest Research, Pacific Southwest Research Station, USDA Forest Service, c/o Department of Environmental Horticulture, University of California, 1 Shields Avenue, Suite 1103, Davis, CA 95616-8587 or contact [jgeiger@fs.fed.us](mailto:jgeiger@fs.fed.us).



# San Francisco trees poised to provide big benefits

## New urban forest analysis available

San Francisco's investment in street trees is about to pay off. Our study (December 2003) found that the city's population of approximately 100,000 street trees is now large enough to begin providing bigger benefits, despite the fact that nearly another 100,000 empty sites still exist. The report suggests that because more than 65% of the street trees are young and in good health, they are in a position to provide increased quality-of-life benefits as they mature and get larger.

The decision that the city and the local nonprofit, Friends of the Urban Forest, made more than two decades ago to begin planting trees on a regular basis is starting to pay huge dividends. By aggressively filling the 100,000 empty sites throughout the city, benefits to the residents of San Francisco will more than double in the next 25 years as the city's urban forest matures and fills in.

## The value of the urban forest

The city's street tree population contributes over \$7.5 million in benefits annually. The biggest benefit is property value enhancement, but the trees also make significant contributions to stormwater control, air quality improvement, and energy conservation.

In actuality, however, the real value of the benefits these trees provide is quite higher. If we were able to obtain values for improvements in community well-being such as stress reduction, a decreased need for medication, lower levels of domestic violence, and increases in business revenue, the actual figure would be considerably higher, probably 50% higher, approaching \$12 to \$13 million dollars per year. This is significant, but research has not found a

## What did we find in San Francisco's urban forest?

- There are approximately 100,000 street trees
- Annual benefits total \$7.5 million

way of attaching a value to these benefits...yet. However, we are working on it.

## The condition of the urban forest

Our report also provides some specifics on tree condition and infrastructure conflicts, pointing out that 60% of the trees are in good or fair condition, with less than 10% in poor or dying condition. Only 15% of the trees are causing some sidewalk heave, and fewer than 10% are obstructing signage or growing into overhead wires.

One surprising finding is the disparity between neighborhoods. Tree benefits vary widely from neighborhood to neighborhood, mainly because some neighborhoods have fewer, younger trees of smaller stature than other neighborhoods. This just points out the need to fill each vacant site with an appropriate tree, improve the health of all trees, and maximize the ability of each tree to provide benefits through proper pruning and maintenance.

Since the majority of street trees are owned and maintained by property owners and residents, the city will continue to cooperate with the Friends of the Urban Forest to plant trees throughout the city. The city will improve how trees are selected, relying more on well-adapted, long-lived trees to maximize future benefits, as well as emphasizing improving young-tree care to reduce future maintenance costs.

## San Francisco's future

The city plans to selectively remove and replace trees that are dying, especially in areas of the city where older trees predominate. Some next steps will be to target a few species that are really causing problems, look at pruning cycles, and set some maintenance priorities that will produce the biggest payback in terms of tree health, safety, and benefits.

Mohammed Nuru, Deputy Director of Operations, SF Dept. of Public Works, said "we have looked forward to this report for some time. Before this report we only knew how to manage trees. Now we have the information that will help us manage tree benefits. And that can only result in a better quality of life for city residents. We can now show the significant contribution trees make in controlling stormwater runoff and reducing pollution of our Bay. We can also demonstrate the benefits of cleaner air in San Francisco."

## Beyond beauty

Our report shows that San Francisco street trees are quite valuable, worth the city's investment of time and resources, and are a necessary part of the city's infrastructure. The December 2003 report demonstrates that trees are vital to community health and well-being and that they have a positive impact on business and a city's tax base.

Not that many years ago city trees were only valued for their beauty. People didn't think beyond beautiful park trees or wonderful fall color. Now science can show that trees are much more than just beauty: trees improve the quality of life in cities.

See the full report at: [http://cufr.ucdavis.edu/products/cufr427\\_SF%20STA%20Final.pdf](http://cufr.ucdavis.edu/products/cufr427_SF%20STA%20Final.pdf). 