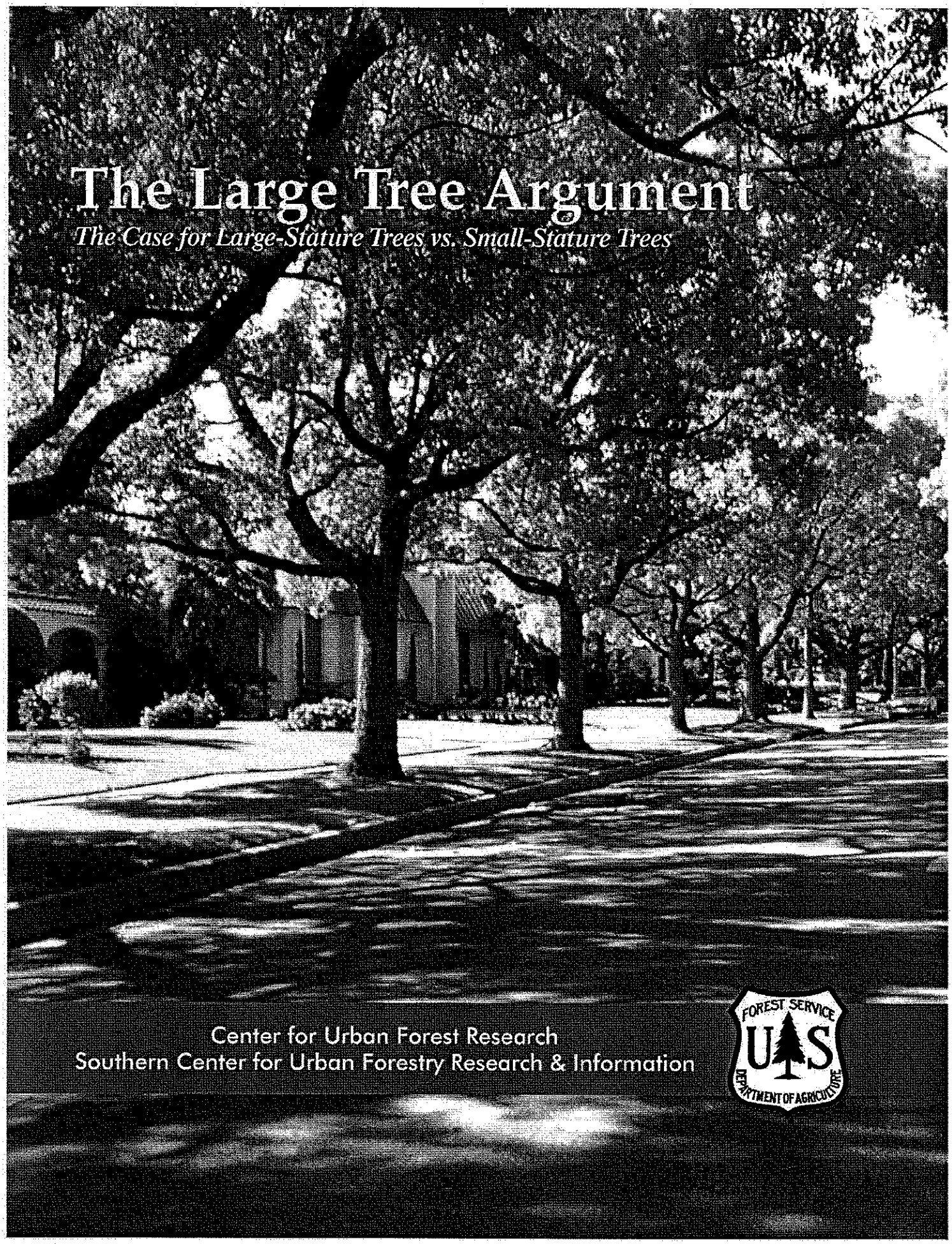
# The Large Tree Argument

*The Case for Large-Stature Trees vs. Small-Stature Trees*

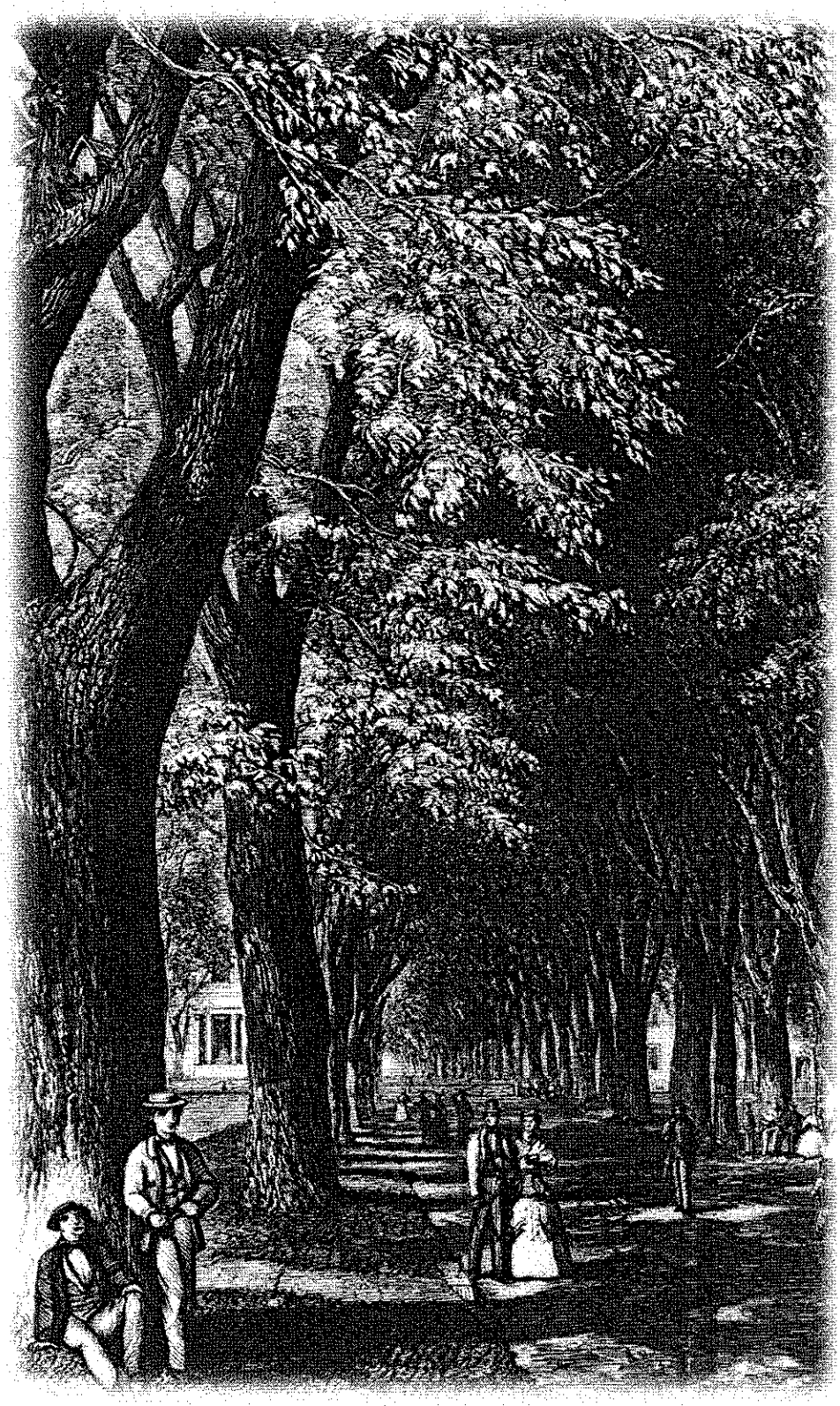


Center for Urban Forest Research
Southern Center for Urban Forestry Research & Information

# Why did we like elm trees so much?

Large stately elm trees once graced many communities throughout the US. But now they are gone. Why were entire communities so disappointed when they lost their elm trees to Dutch elm disease several decades ago?

People had a sense that these large trees were important to them, their family, and their community. And this was long before we quantified the benefits of trees. Now we have scientific evidence for what these people knew decades ago.



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## Large trees pay us back

We now know that, dollar for dollar, large-stature trees (see sidebar definition p.6) deliver big savings and other benefits we can't ignore. Small-stature trees like crape myrtle deliver far fewer benefits. In fact, research at The Center for Urban Forest Research shows that their benefits are up to eight times less.

Compared to a small-stature tree, a strategically located large-stature tree has a bigger impact on conserving energy, mitigating an urban heat island, and cooling a parking lot. They do more to reduce stormwater run off; extend the life of streets; improve local air, soil and water quality; reduce atmospheric carbon dioxide; provide wildlife habitat; increase property values; enhance the attractiveness of a community; and promote human health and well being. And when we use large-stature trees, the bottom-line benefits are multiplied. When it comes to trees, size really does matter.

## Don't forget the established "Old Guard"

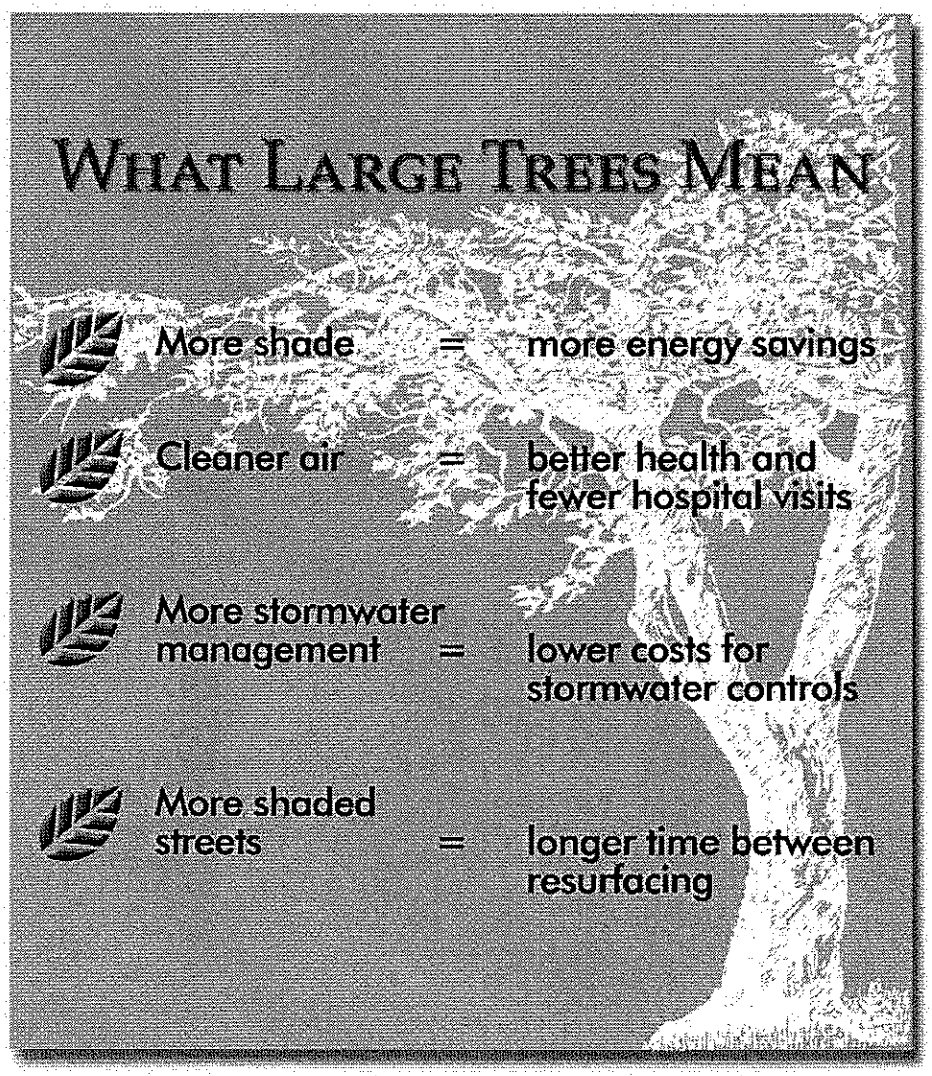
We can't forget the already-established trees. These older trees provide immediate benefits. The investment that community leaders made 30, 40, 50 years ago is producing dividends today. Dr. McPherson, Director of the Center for Urban Forest Research, points out that "since up-front costs to establish these large-stature trees have already been made, keeping these trees healthy and functional is one of the best investments communities can make."

## What do you lose if you don't plant large trees?

Municipal tree programs are dependent on tax-payer supported funding. Therefore, communities must ask themselves, are large-statured trees worth the price to plant and care for? Our research has shown that benefits of large-statured trees far outweigh the costs of caring for them, sometimes as much as eight to one. The big question communities need to ask is: can we afford not to invest in our trees? Are we willing to forego all of these benefits? Or, would we rather make a commitment to provide the best possible care and management of our tree resource and sustain these benefits for future generations.

## Costs vs benefits

In most areas of the country, communities can care for their largest trees for as little as $13 per year, per tree. And, each tree returns an average of $65 in energy savings, cleaner air, better managed stormwater, extended life of streets, and higher property values. Even at maturity, small-stature trees do not come close to providing the same magnitude of benefits.



## A hypothetical example

A few years ago, the community of Greentree was faced with a budget crisis and decided to save money by downsizing its community forest—planting a majority of small-stature trees like crape myrtle in favor of large-stature trees like ash and even replacing large trees with smaller ones (see below). It made choice X. Unfortunately, this is not an uncommon story in communities today. But the real question is, what did they give up in return, and was downsizing a wise choice?

**Table 1: Large trees vs small trees**

The city of Greentree chose planting scenario X. By year 20 it was already a $60,000 annual mistake (see discussion above).

| | | CHOICE X | | CHOICE Y | |
|---|---|---|---|---|---|
| | Avg. Ann. Benefit<br>Avg. Ann. Cost | # Trees | Total Benefit<br>Total Cost | # Trees | Total Benefit<br>Total Cost |
| Large Trees | $65.18<br>$13.72 | 259 | $16,882.00<br>$3,553.00 | 1,693 | $110,350.00<br>$23,228.00 |
| Medium Trees | $36.04<br>$6.87 | 753 | $27,138.00<br>$5,173.00 | 753 | $27,138.00<br>$5,173.00 |
| Small Trees | $17.96<br>$6.23 | 1,693 | $30,406.00<br>$10,547.00 | 259 | $4,652.00<br>$1,614.00 |
| Total Trees | | 2,705 | | 2,705 | |
| Total Benefits | | | $74,426.00 | | $142,140.00 |
| Total Costs | | | $19,273 | | $30,015.00 |
| Annual Net Value to Community | | | $55,153.00 | | $112,125.00 |

Note: Each "tree" represents 259 trees planted.

In this case, the city decided that planting 1693 small-stature trees and only 259 large-stature trees would be a good budget-cutting strategy. Over the short term this may save the city a little money. But over the long term they will have decidedly fewer benefits and a decreased quality of life. City elected officials failed to consider what the city would be giving up over the life of those trees.

Will people want to live, work, recreate, do business, and shop in this community? And will the new trees provide all of the benefits that the residents seek—energy conservation, clean air, clean water, attractive surroundings, and enhanced real estate values. The answer is a resounding NO! The growth of these trees was modeled by The Center for Urban Forest Research over 40 years. By year 20, the decision-makers had already made nearly a $60,000 dollar annual mistake.

Choice Y is clearly the way to go to maximize their return on budget dollars. The model shows that once the trees are mature the community will receive an annual return on investment of nearly $60,000 over choice X. Plus, the community will look quite different in the future and be a healthier and safer place to live.

## Is it possible to recreate the past ?

We may never have the arching canopies we once had with the stately elms of a few decades ago. But, we can still achieve large, extensive and functional canopies and reap all the benefits. It will take planting large-stature trees in as many appropriate places as possible while creating the best possible site that maximizes space and allows for adequate exchange of gases and water. And yes, it is possible!

## Editors Note

*We recognize that on some restricted sites small-stature trees may be the best choice. However, let's not succumb to the limited space argument so easily. We need to continue to fight for more space for trees in every new project and every retrofit. The bigger the tree, the bigger the benefits and, ultimately, the better our quality of life.*

### The Future Without Large Trees

Cities that are using small-stature trees to reduce costs may achieve some short-term savings, but over the long term, they have destined themselves to a future with fewer and fewer benefits as large-statured trees are replaced with smaller ones.

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# What are trees worth?

The value of tree benefits varies widely, but can be as much as $80 to $120 per tree per year for a large tree. Small trees that never get very large, like the crape myrtle, provide not much more than $15 in benefits on average. In some cases they are a net loss to communities after the costs are subtracted. The Center for Urban Forest Research has studied large, medium, and small trees in a number of locations throughout the West and found that, on average, mature large trees deliver an annual net benefit two to six times greater than mature small trees:

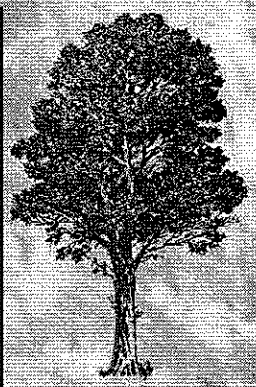
**Mature tree size**
The approximate tree size 40 years after planting.

**Relative Size at Maturity:**

**Small-stature**
Less than 25 feet tall and wide with trunk diameters less than 20 inches.

**Medium-stature**
25 - 40 feet tall and wide with trunk diameters 20 - 30 inches.

**Large-stature**
Greater than 40 feet tall and wide with trunk diameters commonly over 30 inches.



## Large Tree

- Total benefits/year = $55
- Total costs/year = $18
- Net benefits/year = $37
- Life expectancy = 120 years
- Lifetime benefits = $6,600
- Lifetime costs = $2,160
- Value to community = $4,440

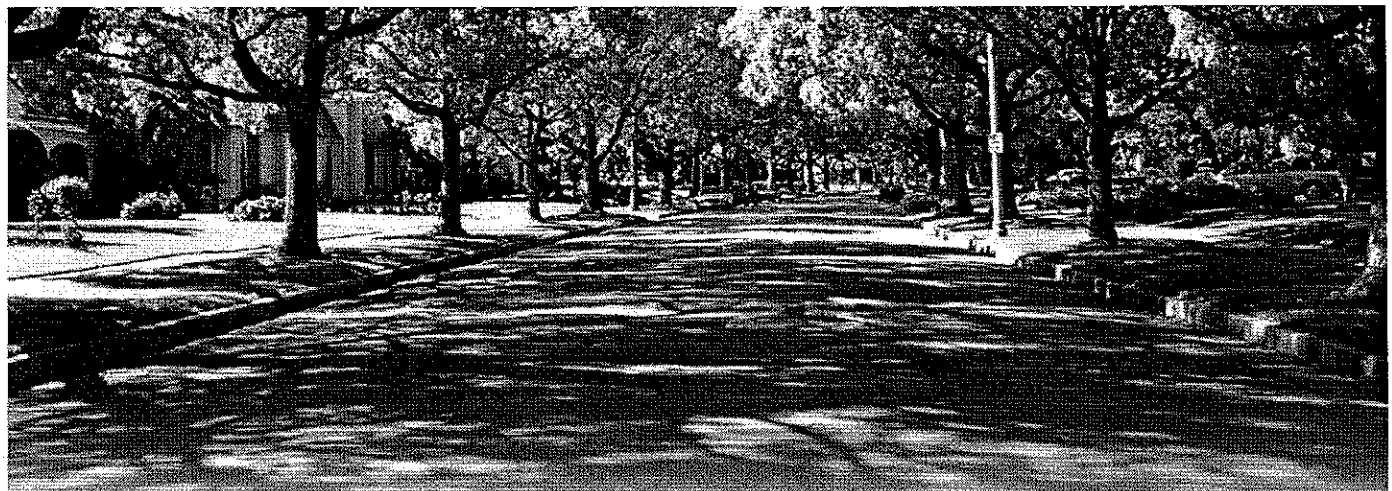
## Medium Tree

- Total benefits/year = $33
- Total costs/year = $17
- Net benefits/year = $16
- Life expectancy = 60 years
- Lifetime benefits = $1,980
- Lifetime costs = $1,020
- Value to community = $960

## Small Tree

- Total benefits/year = $23
- Total costs/year = $14
- Net benefits/year = $9
- Life expectancy = 30 years
- Lifetime benefits = $690
- Lifetime costs = $420
- Value to community = $270

*—hypothetical case using data for trees at year 30, projected to life expectancy from McPherson, E.G., et. al. 2003. Northern mountain and prairie community tree guide: benefits, costs and strategic planting. Center for Urban Forest Research, Pacific Southwest Research Station, USDA Forest Service. 92p.*



# Fact Sheet: Making the Case for Large Trees

## Large-stature trees need to be "marketed" as maximizing urban benefits:

- Cooling the air
- Shading paved surfaces
- Improving air and water quality
- Preventing water runoff and soil erosion
- And enhancing residential and commercial value

Even with these well-documented benefits, the challenges for increasing the number of large trees are consistently related to construction and preservation issues, space and persuading the community. Increasing the number of larger trees requires a combination of strategies that address these obstacles.

## Construction and preservation obstacles

Consider both the preservation and planting of large trees in planning and design. Preserving large trees during construction:

- Start early in the process.

  Designate which trees need to be preserved. Larger more mature trees (that are in good condition) provide more value and benefits than smaller ornamental trees.

- Advise construction management of project schedules related to season-specific activities such as root pruning, fertilization, and insect control.

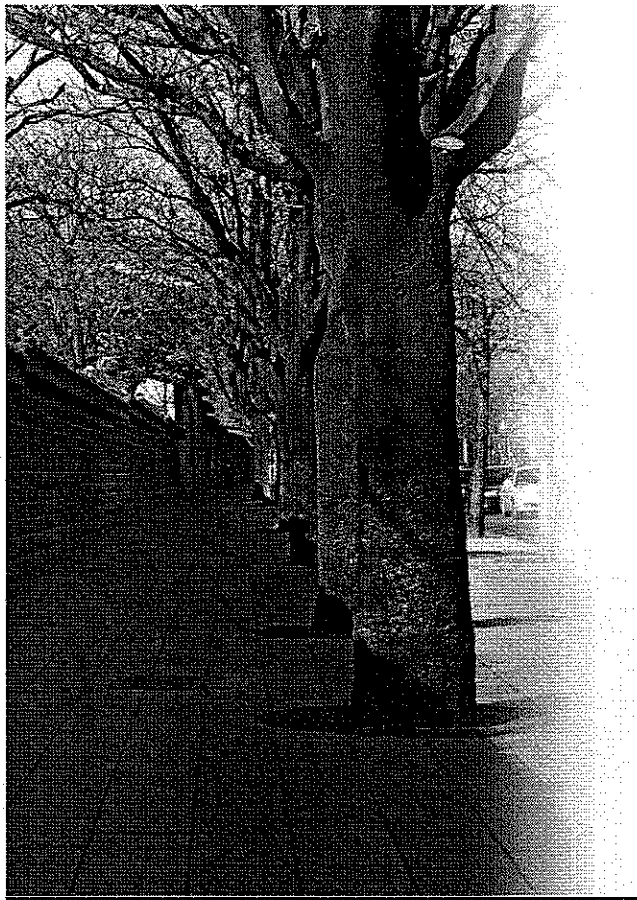
- Educate construction crews and the community about their role in preserving trees:
  - Soil compaction
  - Trunk and branch damage
  - Over or under watering
  - Chemical spills

- Pay careful attention to accidental damage, utility activities, or onsite crews that may impact the root system or soil composition.

- Accommodate utility lines near the critical root zone (CRZ), especially for larger trees by:
  - Tunneling under the tree root mat to install utility lines. This does little damage compared to trenching through the roots.
  - Use a pneumatic excavating tool for excavation work that must happen inside the CRZ. This tool can remove soil around tree roots without harming them.

- At the end of construction, plan for additional care as part of a recovery phase including watering, insect and disease control, and pruning.

*- adapted from work by Charlotte King, President, Snowden & King Marketing Communications*



## Finding space

Accommodating larger trees is an ongoing challenge that is complicated by the competing needs for utility lines and impervious surfaces. Here are a few suggestions to address the issue of space during the planning and design phase:

- Recommend planting large-stature trees as part of transportation corridors whenever possible.
- Tree roots generally stay in the upper 18 inches of soil; therefore, ensure that pipes such as gas, electric, communication and water are installed deeper and use the space above for trees.
- A new publication, "Reducing Infrastructure Damage by Tree Roots: a Compendium of Strategies," clearly outlines ways to install large trees in limited space so they coexist in harmony with hardscape. It is available through the Western Chapter ISA at http://www.wcisa.net.

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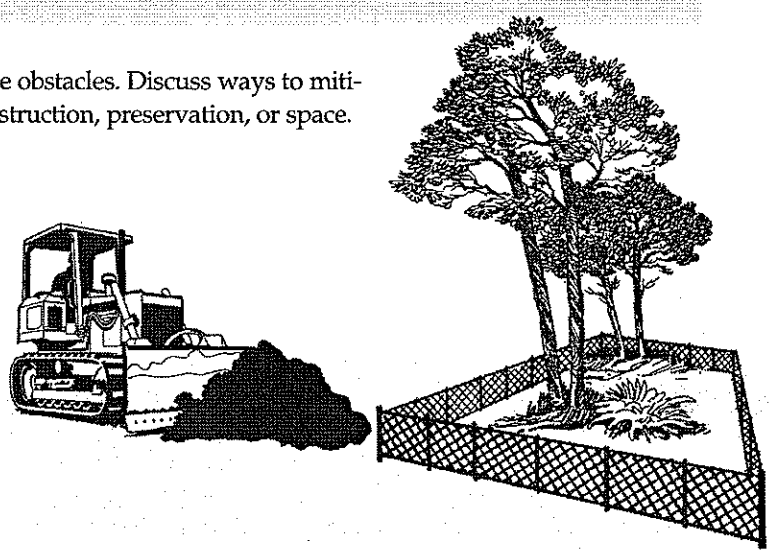
# Persuading the Community

You are the tree expert, and the public is looking to you for guidance and best practices that they can rely on for critical decisions related to budgeting, construction, esthetics, and long-term environmental impact. You also have an opportunity to talk with them about selection, preservation, and critical maintenance of trees, and persuade them that the benefits of larger trees far outweigh the costs:

1. Explain the benefits of the larger trees and point out the obstacles. Discuss ways to mitigate these obstacles as described above in terms of construction, preservation, or space.

2. Play an active role in the construction process to limit the damage done to trees, and identify post-construction tree care. Make sure the community understands the ongoing tree care requirements.

3. Increase your "marketing expertise" in leveraging the value of community partners, media recognition, or historic preservation status. A little recognition combined with community education can make a big difference in changing the commitment to including larger trees in community projects.