

Realizing The Benefits of our Urban Trees



Rick W. Harper

Ext. Assist. Professor – Urban & Community Forestry

rharper@eco.umass.edu



Benefits of a Healthy Urban Forest

- Air quality improvement
- Water quality improvement
- Cooler air temperature
- Greenhouse gas reduction
- Building energy conservation
- Noise reduction
- Wildlife habitat
- Social / physiological benefits
- Human health
- Aesthetics





Trees and Energy Conservation

- **Shade from two large trees on the west and one on the east side of a house can save up to 30% of a typical residence's annual air conditioning costs.**

Simpson & McPherson. 1996. Potential of tree shade for reducing residential energy use in California. *Journal of Arboriculture* 22(1): 10-18.

- **Trees properly placed around buildings as windbreaks can save up to 25% on winter heating costs.**

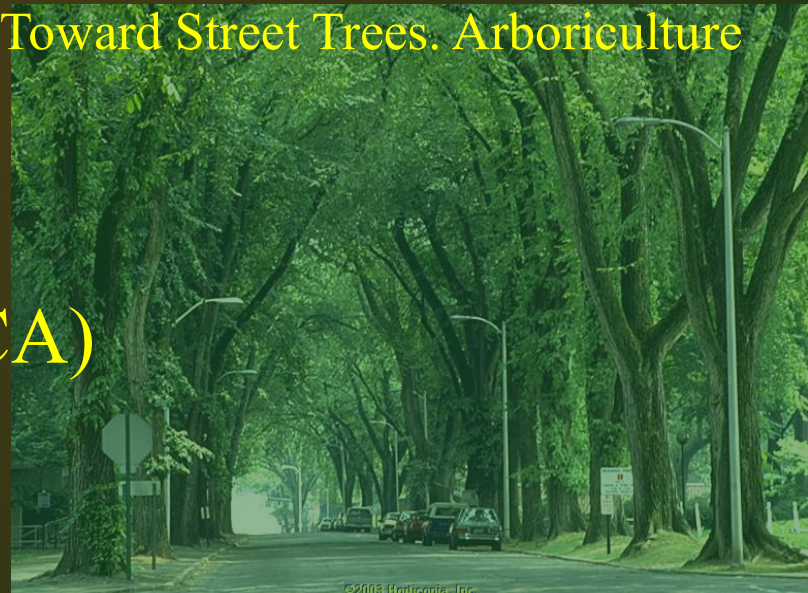
Heisler, G.M. 1986. Energy Savings With Trees. *Journal of Arboriculture* 12: 113-125.

Aesthetic Perspectives

- “Pleasing to the eye” and “Enhance the look of garden & home” were top responses of community members in international survey.

Schroeder et al. 2006. Residents' Attitude Toward Street Trees. *Arboriculture & Urban Forestry* 32(5): 236-246.

- National Arbor Day (US/CA)
- National Tree Week (UK)



Quantifying Environmental Benefits

- Regional market prices – elec/gas (ConEd, Peoples Nat. Gas, Boston Elect.)
- Carbon trading credits – CO₂ (\$15/ton)
- Cost of controlling air pollutants (Wang and Santini)
- Retention/detention costs - stormwater runoff (\$0.04 gal) – based on Washington pricing
- Average resale price - residential property increase (median sales price = \$291,000)





United States
Department of
Agriculture

Forest Service

Pacific Southwest
Research Station

General Technical
Report

PSW-GTR-202
August 2007



Northeast Community Tree Guide

Benefits, Costs, and Strategic Planting

*E. Gregory McPherson, James R. Simpson, Paula J. Peper,
Shelley L. Gardner, Kelsaine E. Vargas, and Qingfu Xiao*





I-Tree Tools

News

Resources

Support



Landscape

(web app)

Regional analyses of tree benefits in minutes for cities, counties, and more.

Design

(web app)

Parcel level analysis for current and future tree benefits.



Eco

(desktop app)

Our flagship i-Tree tool. Structure, Environmental Effects, & Value.

Hvdro



What is i-Tree?

- **Quantify structure, risk & environmental services of trees**
- **Advocacy and management tools for community trees**
- **Built upon peer-reviewed USFS science**
- **Free and easy to use**

i-Tree is a state-of-the-art, peer-reviewed software suite from the USDA Forest Service that provides urban and rural forestry analysis and benefits assessment tools. The i-Tree Tools help communities of all sizes to strengthen their forest management and advocacy efforts by quantifying the structure of trees and forests, and the environmental services that trees provide.

Since the initial release of the i-Tree Tools in August 2006, thousands of communities, non-profit organizations, consultants, volunteers and students have used i-Tree to report on individual trees, parcels, neighborhoods, cities and entire regions. i-Tree users can link forest



i-Tree Hydro workshop at WEFTEC2016 - Sept2016
[Learn more about the workshop in New Orleans >>](#)

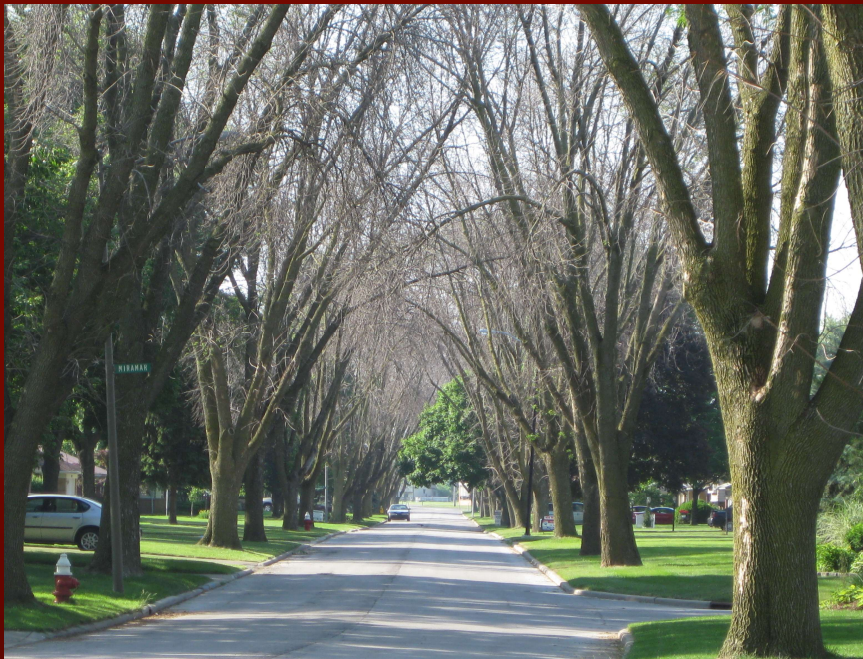
California's urban trees offer \$1 billion in benefits
[UPI article by Brook Hays >>](#)

MPs demand action on pollution mitigation
[A HorticultureWeek article by Gavin McEwan >>](#)

National Forest Service Turns Focus to Urban Settings, Like Pittsburgh
[WESA Radio Lab and article >>](#)

Economic Benefits of Trees

- Contribution to residential property values, 1-10%
- Increased time/\$ spent shopping



Annual Aesthetic Benefits

20-yr old residential yard tree

	Small	Medium	Large
Aesthetics	\$7.05	\$29.84	\$58.46

Energy Conservation in the Northeast

- Zelkova, 20 years (38-ft tall), West side of Residence
- Save up to 25% of annual AC costs (\$22/yr)
- Save 2% of winter heating costs (\$35)
- \$57/yr Total Savings



CO₂ Reduction

- Zelkova, 20 years
- Sequestered = 75 lb
- Avoided = 645 lb
- Release: Tree care = 4 lb
- Release: Decomp. = 16 lb
- Total Net = 700 lb
- Total Value = \$5.25



Annual Air Quality Improvement

20-yr old residential yard tree

	Small	Medium	Large
Ozone, NO₂, SO₂, PM₁₀, VOCs, Avoided and net	\$4.17 0.8 lbs	\$8.29 1.6 lbs	\$15.51 3.3 lbs

Reducing Stormwater Runoff

'Bradford' Pear (*Pyrus calleryana*)

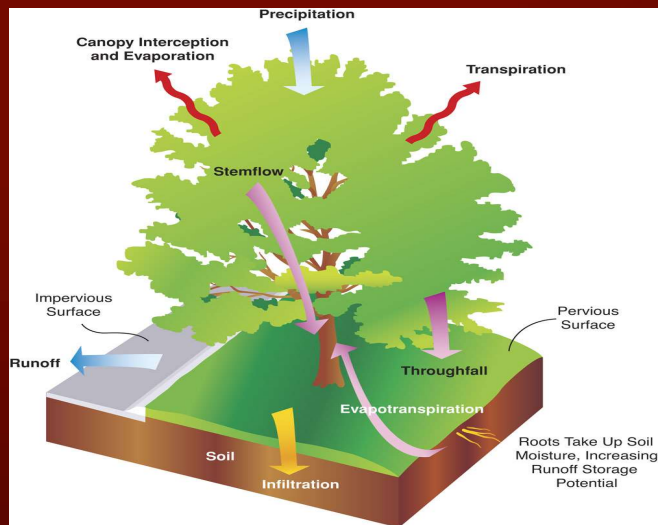
- 9 years old
- 9 inch dbh
- 28 ft. tall
- 19 ft. spread
- Leaf Count (N= 88,908)
- Retainment capacity = 56 gal
- 500 trees = 28,000 gal.



Reducing Stormwater Runoff

Zelkova (*Zelkova serrata*)

- 20 years
- Intercepted = 1,624 gal
- Value = \$13





In Summary...

- 100 trees remove 28 tons of CO₂ per year
- 100 trees remove 344 lbs of pollutants per year, including:
 - 54 lbs of ozone
 - 55 lbs of particulates
- 190,000 gal rainwater per year

100 Large Public Trees in the Northeast Over 40 Years...

Benefits = \$584,560

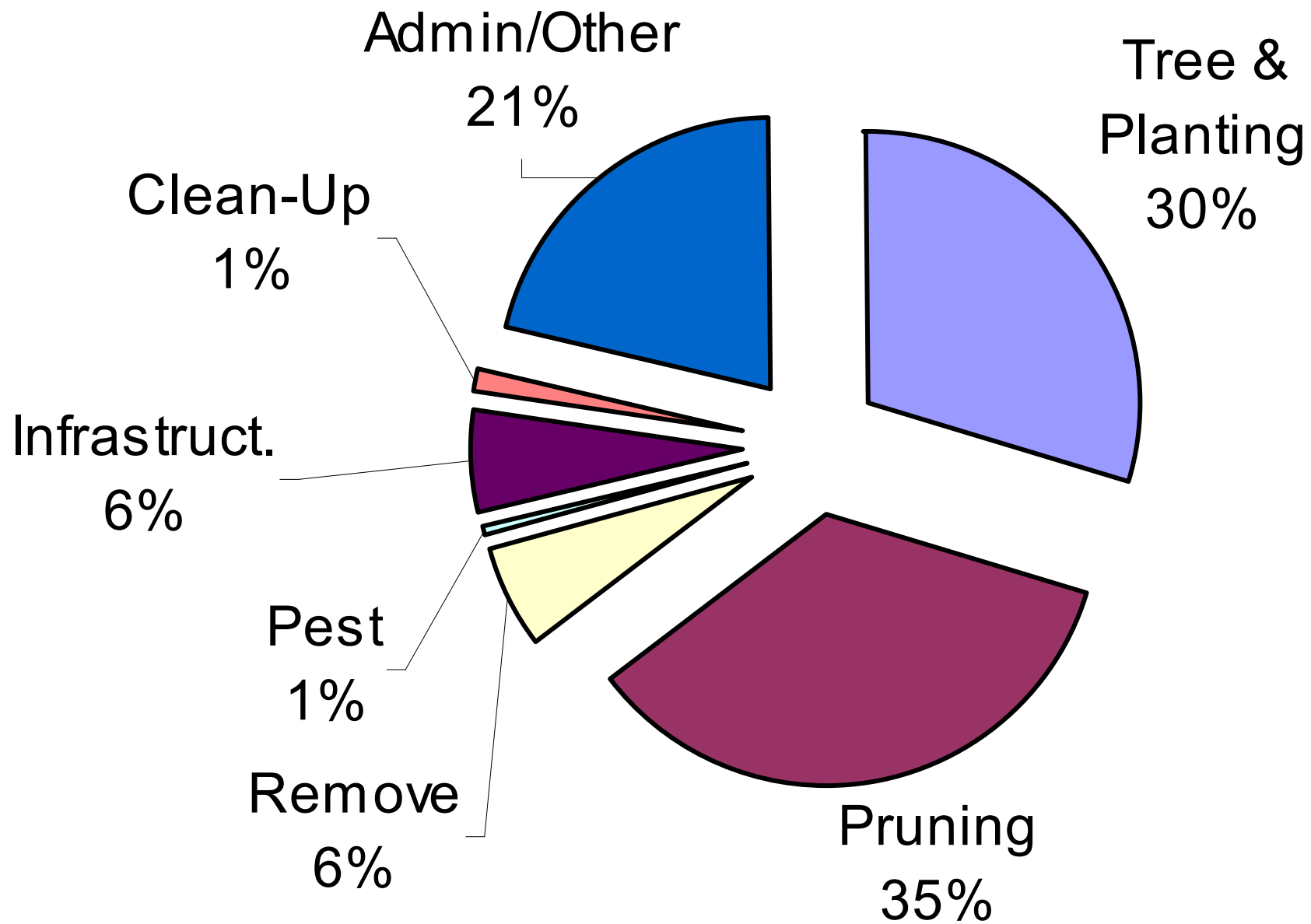
Energy Conservation
Air Quality Improvement
Runoff Reduction
Real Estate Value
Litter

Costs = \$134,280

Planting – Pruning
Removal/Disposal
Irrigation
Sidewalk Repair
Legal – Admin

Pay Off: \$450,280

\$4.35 returned for every \$1 spent



Average Annual Street Tree Costs = \$34/tree

Growth and Survival of Newly Established Urban Trees

- Street Trees Planted 1995-2003 in northern Philadelphia featured an overall survival 8-10 yr after planting to be 57%
- Avg. “Urban Core” Street Tree Lifespan less than 10 years (Moll 1989); 19-28 years (Roman 2014)



Maintenance Measures

Wrong Plant, Wrong Place



White Pine
(*Pinus strobus*)

Proper Plant Selection



White Fir
(*Abies concolor*)



Western Redcedar
(*Thuja plicata*)



Proper Installation

D. Lefcourt

**Over 90% of Trees Planted
Feature Excessive Soil on Roots**



D. Lefcourt

Granville Ave., Worcester, MA (Before)



Ken Law USDA-APHIS

Granville Ave., Worcester, MA (After)



Ken Law USDA-APHIS

Granville Ave., Worcester, MA (5-Yrs Later)



Mollie Freilicher, MA DCR

Stay in Touch by:



‘Liking’ www.facebook.com/uftoday

Signing Up



www.masstreewardens.org



Mollie.Freilicher@state.ma.us