

The Phoenix Tree and Shade Master Plan

A Program for the Sustainable Management
of the Urban Forest Resource

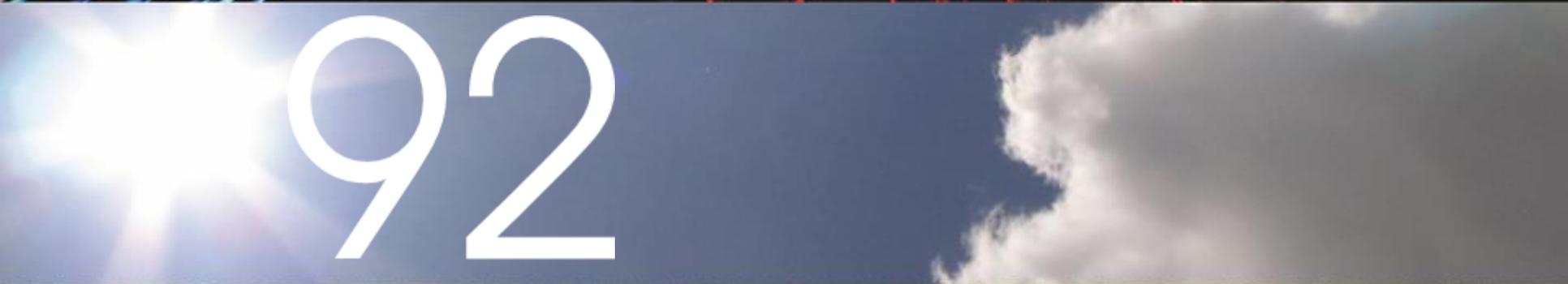




519



1.5



92



1









Benefits of Trees: Solution Multipliers

A low risk, high-yield investment for the community

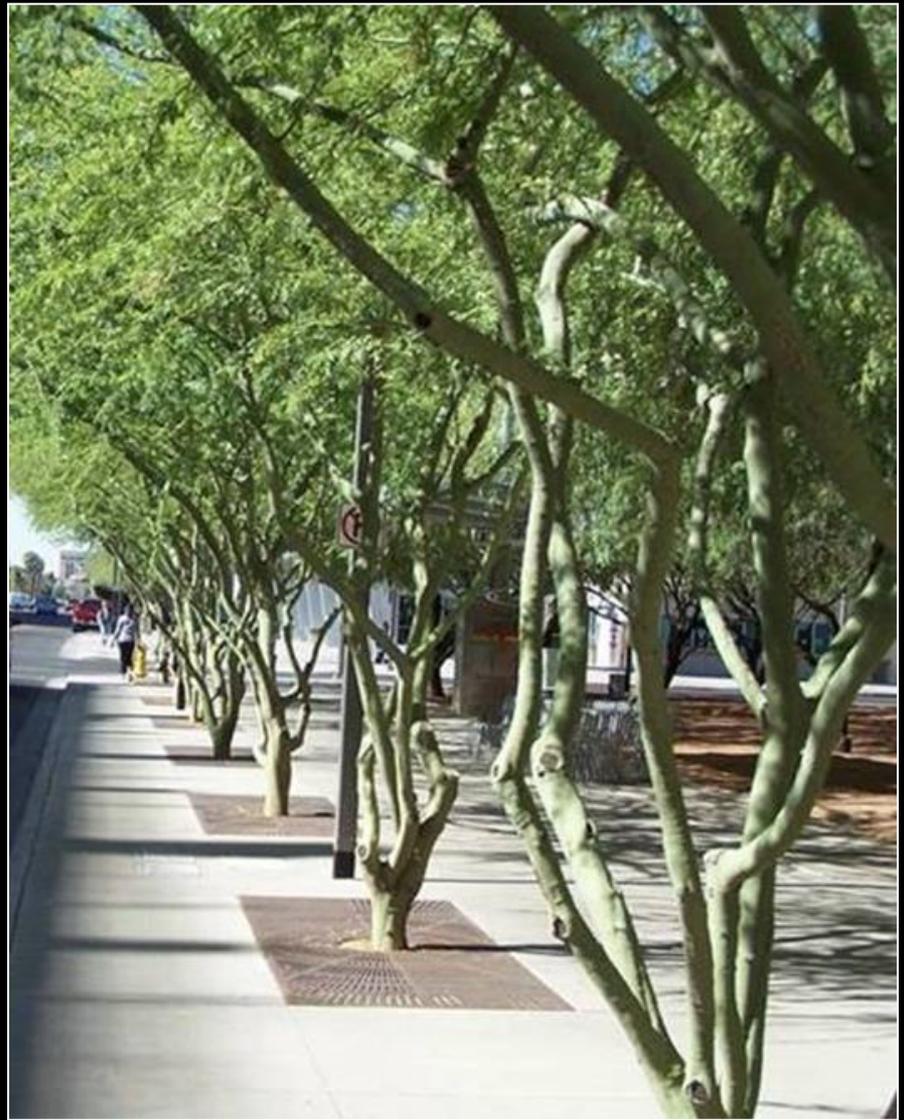
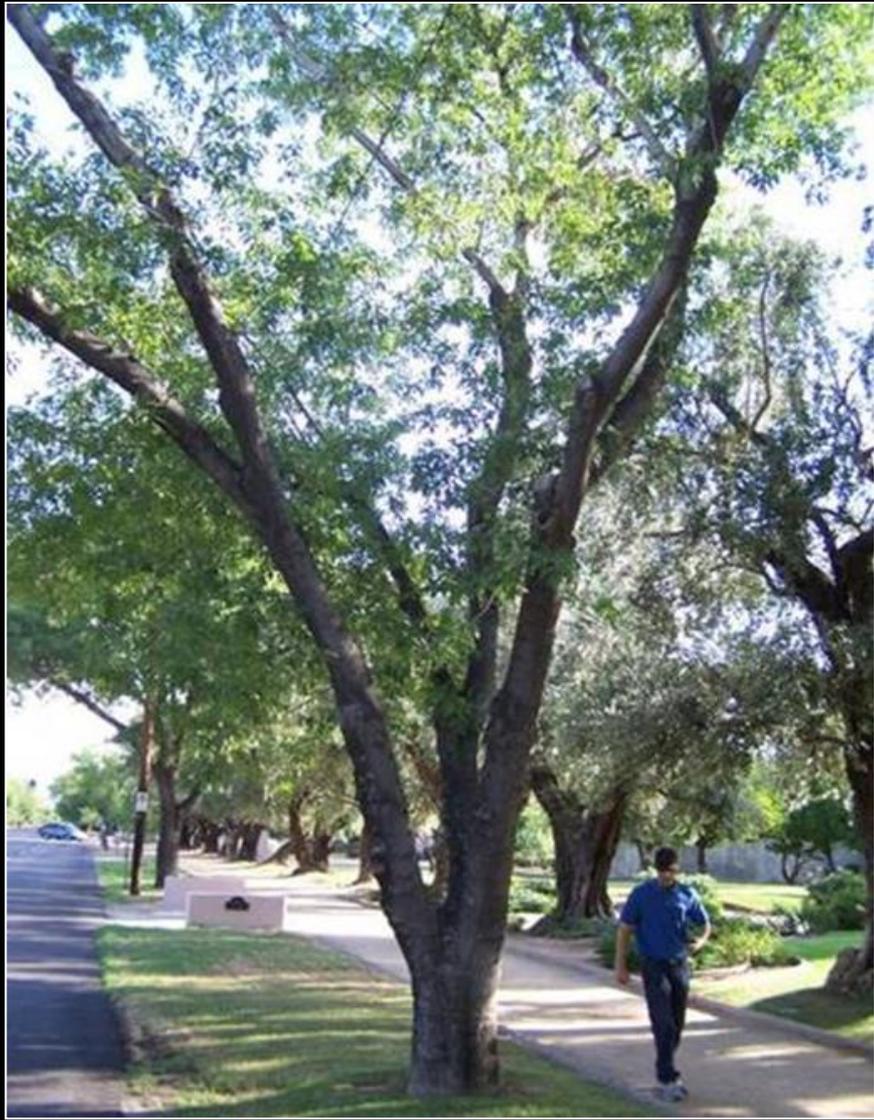
- Air quality, carbon sequestration
- Water quality, storm runoff
- Energy costs
- Property values
- Business
- Community safety and livability

Average ROI of \$2.23 in the Phoenix area



Engineered Shade

- Useful in redevelopment projects
- Potential for solar power integration
- Utilize non-heat loading materials
- Utilize recycled components



National Tree Benefit Calculator

Beta

Overall Benefits

Stormwater

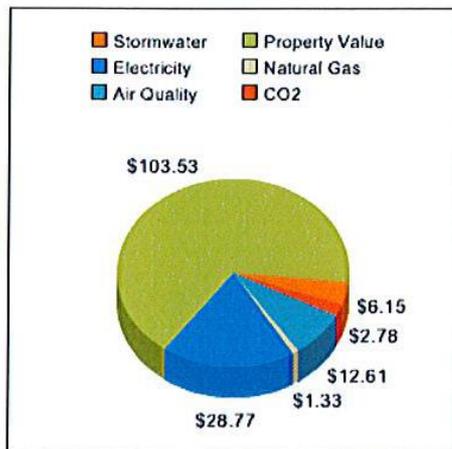
Property Value

Energy

Air Quality

CO2

About the model



Breakdown of your tree's benefits
Click on one of the tabs above for more detail

This 14 inch Blue paloverde provides overall benefits of: **\$155** every year.

While some functional benefits of trees are well documented, others are difficult to quantify (e.g., human social and communal health). Trees' specific geography, climate, and interactions with humans and infrastructure is highly variable and makes precise calculations that much more difficult. Given these complexities, the results presented here should be considered initial approximations—a general accounting of the benefits produced by urban street-side plantings.

Benefits of trees do not account for the costs associated with trees' long-term care and maintenance.

If this tree is cared for and grows to 19 inches, it will provide **\$217** in annual benefits.



Blue paloverde
Parkinsonia florida



The National Tree Benefit Calculator was conceived and developed by [Casey Trees](#) and [Davey Tree Expert Co.](#)



www.treebenefits.com/calculator/

Benefit-Cost Analysis

Murphy Bridle Trail - North Central

Total Annual Benefits, Net Benefits, and Costs for Public Trees

4/7/2009

Benefits	Total (\$) Standard Error	\$/tree Standard Error	\$/capita Standard Error
Energy	3,171 (N/A)	13.79 (N/A)	0.00 (N/A)
CO2	360 (N/A)	1.57 (N/A)	0.00 (N/A)
Air Quality	1,182 (N/A)	5.14 (N/A)	0.00 (N/A)
Stormwater	587 (N/A)	2.55 (N/A)	0.00 (N/A)
Aesthetic/Other	11,616 (N/A)	50.50 (N/A)	0.01 (N/A)
Total Benefits	16,916 (±0)	73.55 (±0)	0.01 (±0)
Costs			
Planting	1,000	4.35	0.00
Contract Pruning	5,000	21.74	0.00
Pest Management	0	0.00	0.00
Irrigation	3,500	15.22	0.00
Removal	500	2.17	0.00
Administration	0	0.00	0.00
Inspection/Servic	500	2.17	0.00
Infrastructure	0	0.00	0.00
Litter Clean-up	1,500	6.52	0.00
Liability/Claims	0	0.00	0.00
Other Costs	0	0.00	0.00
Total Costs	12,000	52.17	0.01
Net Benefits	4,916 (±0)	21.37 (±0)	0.00 (±0)
Benefit-cost ratio	1.41 (±0)		

Urban Forest Management Plan

- Formulates, establishes guidelines and documents the strategies and procedures for managing the trees within a jurisdictional area.
- Defines goals and objectives
- Identifies stakeholders
- Many parts/component

Urban Forest Management Plan

Includes the following:

- Planting plan
- Preservation plan
- Maintenance plan
- Removal and replacement plan
- Risk management plan
- Operations plan
- Storm response/emergency plan
- PR/education plan

Tree Resource Inventory

Data

Management Tool

Maintenance Tool

Research Tool

Tree Resource Inventory

- A record of the location, characteristics and assessment of individual trees over a well defined area.
- Most modern inventories use GPS/GIS technology.
- Are dependent on budgets.
- The depth of information collected:
 - Species
 - Diameter
 - Condition
 - Maintenance
 - Notes

Sustainability and Diversity

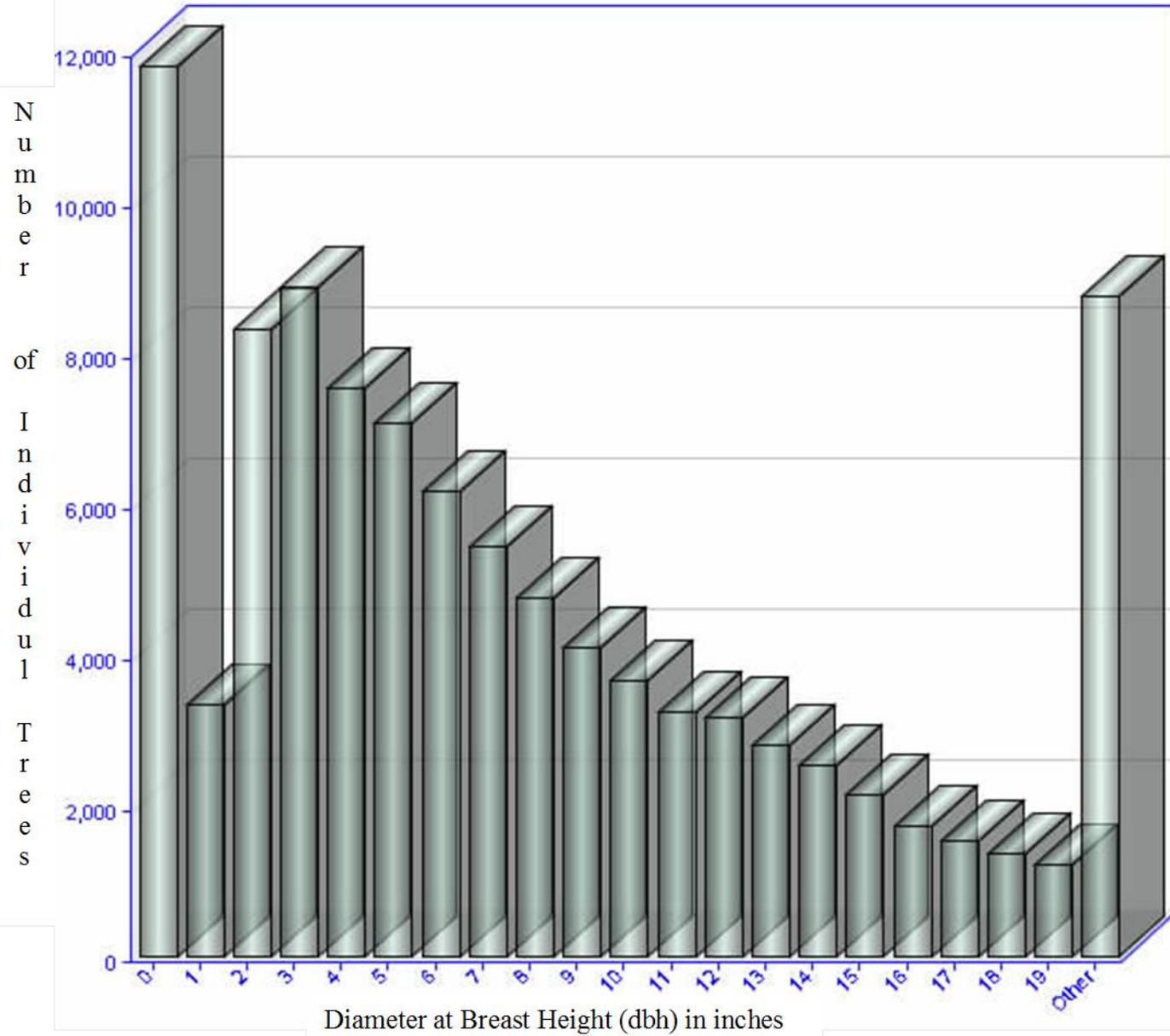
- Sustainability is the ability to maintain ecological, social and economic benefits over time.
- Urban Forest sustainability requires diversity of tree species as well as diversity of maturity.

Right Tree, Right Place

Age and size

30% Family, 20% Genus, 10 Species

Age Distribution of City of Phoenix Maintained Trees (105,000)



City of Phoenix Tree Inventory

Top Ten Species in City of Phoenix (104,860)

Vacant space	11.5%
<i>Prosopis velutina</i> Mesquite	8.8%
<i>Parkinsonia florida</i> Blue Palo verde	6.8%
<i>Pinus halepensis</i> Aleppo pine	5.8%
<i>Parkinsonia praecox</i> Palo brea	5.3%
<i>Ulmus parvifolia</i> Evergreen elm	4.3%
<i>Dalbergia sissoo</i> Indian rosewood	4.1%
<i>Washingtonia filifera</i> California fan palm	3.8%
<i>Acacia stenophylla</i> Shoestring acacia	3.1%
<i>Washingtonia robust</i> Mexican fan palm	3.1%
<i>Fraxinus velutina</i> Arizona ash	3.0%

City of Phoenix Tree Inventory

Top Ten Species in medians and street frontages (13,285)

Vacant space	23.4%
<i>Parkinsonia florida</i> Blue Palo verde	10.6%
<i>Prosopis velutina</i> Mesquite	5.1%
<i>Acacia stenophylla</i> Shoestring acacia	5.1%
<i>Dalbergia sissoo</i> Indian rosewood	5.0%
<i>Acacia aneura</i> Mulga	4.3%
<i>Parkinsonia praecox</i> Palo brea	4.2%
<i>Washingtonia robusta</i> Mexican fan palm	3.7%
<i>Carnegiea gigantea</i> Saguaro	3.6%
<i>Washingtonia filifera</i> California fan palm	3.8%
<i>Olneya tesota</i> Desert ironwood	3.5%

Valuation examples

Encanto Park:

- 1760 trees and palms
- Appraised replacement value @ \$6.1 M
- Annual benefit value @ \$75.7 K

Trees in street landscape and parks:

- 71,750 trees
- \$9.4 M annual benefit to the community.

Encanto Park Tree Resource Structure

Population Composition

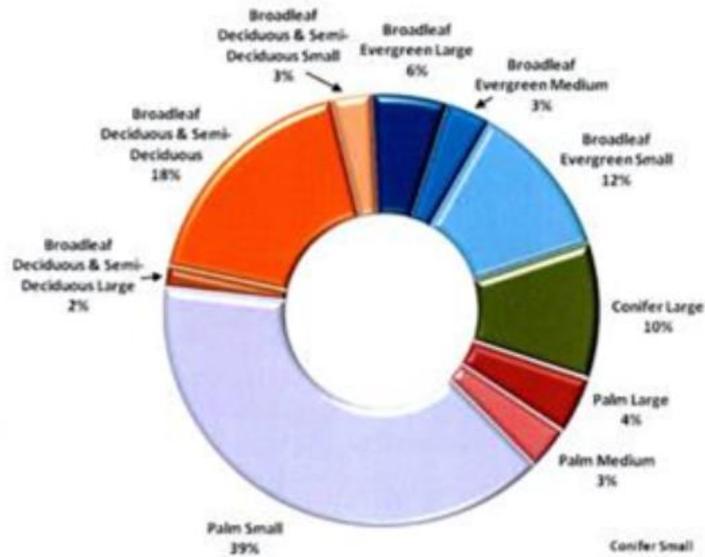
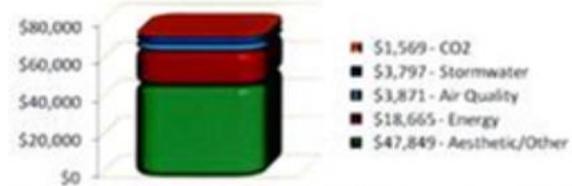


Figure 1. Composition of Tree Type at Encanto Park

Canopy Size

The quantifiable benefits produced by trees are primarily related to the amount and distribution of leaf surface area. As a tree canopy increases, so do many of the benefits associated with that tree. For this reason, i-Tree considers mature canopy size when determining species size composition. As an example, a Mexican fan palm (*Washingtonia robusta*), which is a rather substantial tree, is considered by i-Tree to be a small palm, based on the canopy area of a mature palm.

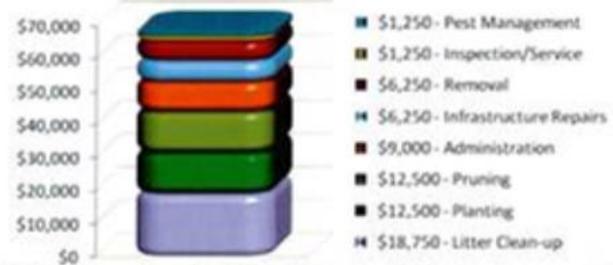
Figure 13. Benefit versus Investment Ratio for Encanto Park Trees



Total Annual Benefits from Encanto Park's Tree Resource: \$75,751

Average Annual Per Tree Benefits: \$43.04

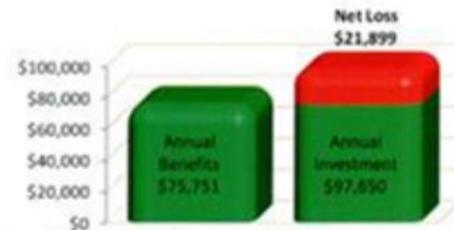
Annual Value of Benefits Per Capita: \$0.05



Total Annual Investment to Maintain Encanto Park's Tree Resource: \$97,650

Average Annual Per Tree Investment: \$55.48

Annual Investment Per Capita: \$0.06



Annual Net Loss of Encanto Park's Tree Resource: \$21,899



Funding Sources

Phoenix Parks and Preserve Initiative Program (PPPI)

- Renewed in 2008 for 30 years by 83% of voters.
- One cent of sales tax for every \$10 of purchases.
- 60 % to improvements, renovation and land acquisition.
- 40 % to acquisition and development of preserves.
- “Pay as you go program”.

Impact fees

- Four fee areas currently.
- Mostly for trails in preserves.

Memorial Tree Program

- Citizen donation
- New and replacement trees.



Ordinance Review

Departments involved:

- Neighborhood Services, Street Transportation, Parks and Recreation, Public Works, Planning, Zoning and Historic Preservation

- 23-32 Encroachment of trees, shrubs or bushes prohibited
- 27-13 Unobstructed passage in streets and alleys
- 31-10 Removal of debris, rubbish, weeds, overgrown or dead vegetation and other unhealthy or unsafe conditions on streets, alleys and sidewalks.
- 31-13 Obstructing visibility at intersections
- 39-7 Exterior premises and vacant land
- 34 Trees and vegetation

Celebrating Earth Day
at Encanto Park



Partnerships

Arizona Community Tree Council

Arizona Public Service

Arizona Landscape Contractors Association

Arizona State Urban and Community Forestry Program

ASU/GIOS Sustainable Cities Network

Audubon Society

Hands-On Greater Phoenix

International Society of Arboriculture Western Chapter

Neighborhood Associations

Phoenix Clean and Beautiful

Salt River Project

US Forest Service, Urban and Community Forestry Program

Valley Forward

Valley Permaculture Alliance

Watershed Management Group

And numerous private companies



Integrating Public Art

Trees and People



Sustainability Partners





Detail: Removals By Species



Cave Creek

- Acacia species (*Acacia* spp.)
- Acacia, Shoestring (*Acacia stenophylla*)
- Acacia, Willow (*Acacia salicina*)
- Desert Fern/Feather Bush (*Lysiloma watsonii*)
- Elm, Chinese (*Ulmus parvifolia*)
- Eucalyptus species (*Eucalyptus* spp.)
- Mesquite (*Prosopis glandulosa*)
- Palo Verde, Mexican (*Parinsonia aculeata*)
- Palo Verde, Sonoran (*Cercidium praecox*)
- Pine, Aleppo (*Pinus halepensis*)
- Pine, Mondale (*Pinus elliottii*)
- Palm, Mexican Fan (*Washingtonia robusta*)
- ∩ Overhead Lines



0.3 0 0.3 0.6 Miles

Establishing a Relationship

- Challenges
- Memorandum of Understanding (MOU) in March 2008.
- Removal, installation and maintenance in city ROW.
- Outlined roles and responsibilities of each party.
- Acceptable species palette.







SPEED
LIMIT
45





my phoenix my park



Citizen Forester Program



- <http://www.phoenix.gov/FORESTRY>

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