An aerial photograph of a city, likely Phoenix, Arizona, with a hazy sky and mountains in the background. The city's urban landscape, including buildings and roads, is visible through the semi-transparent text.

# Southwestern Regional i-Tree Eco Study: Air Quality and Beyond or **Project Desert Canopy — Growing a Healthier Community**

Richard Adkins, City of Phoenix

Alix Rogstad, Urban and Community Forestry, AZ State Forestry



# Project Partners

- USDA Forest Service, State and Private Forestry (funder)
- New Mexico State Forestry
- Arizona State Forestry
- Texas A&M Forest Service
- City of Phoenix
- City of El Paso
- City of Las Cruces
- City of Albuquerque
- Davey Resource Group





# i-Tree Eco Analysis

- Developed by USFS, Davey Tree Expert Company, and State University of New York (SUNY)

## USES:

- Field measurement data.
- Local hourly air pollution and meteorological data.

## TO:

- Help quantify urban forest structure, environmental effects, and value.

## FOR:

- Making resource management decisions.
- Development of policies.
- Support planting and maintenance of appropriate tree species.



# Trees and Air Quality

- Trees remove air pollution by interception of Particulate Matter on plant surfaces and absorption of gaseous pollutants through the leaves.
- Most benefit occurs in rural areas, but greatest health impacts/values are in urban areas.
- Trees remove substantial amounts of pollutants and can produce health benefits across the nation.

Nowak et al., 2014



# Project Goals

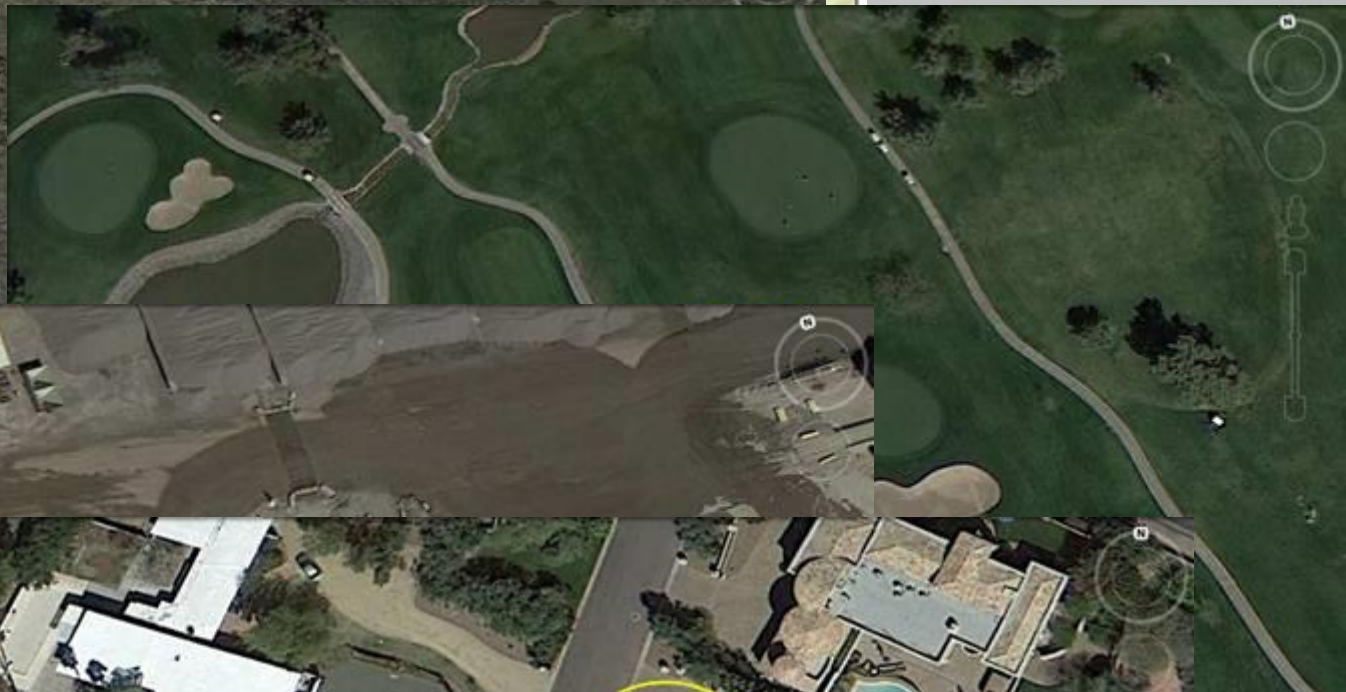
- Produce community forest assessments in four targeted municipalities.
- Create tools, outreach materials and partnership forums to increase awareness.
- Develop goals and strategies for air quality mitigation.



# Project Area





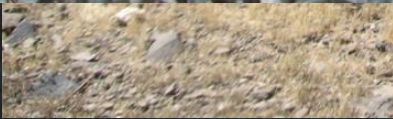


Google earth  
eye alt 1715 ft

Imagery Date: 3/13/2013 33°30'26.34" N 111°58'36.05" W elev 1306 ft eye alt 1023 ft



# Data Collection



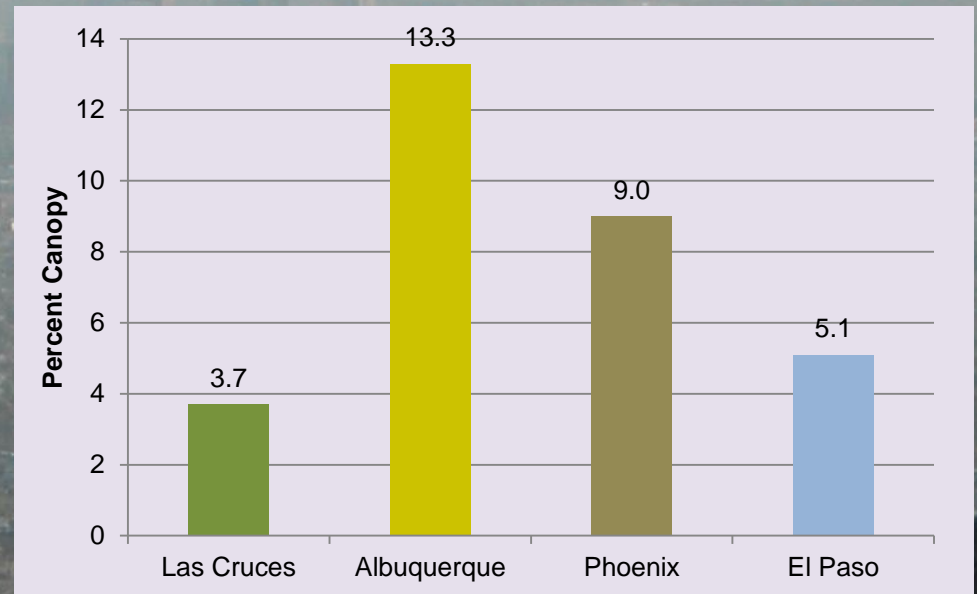
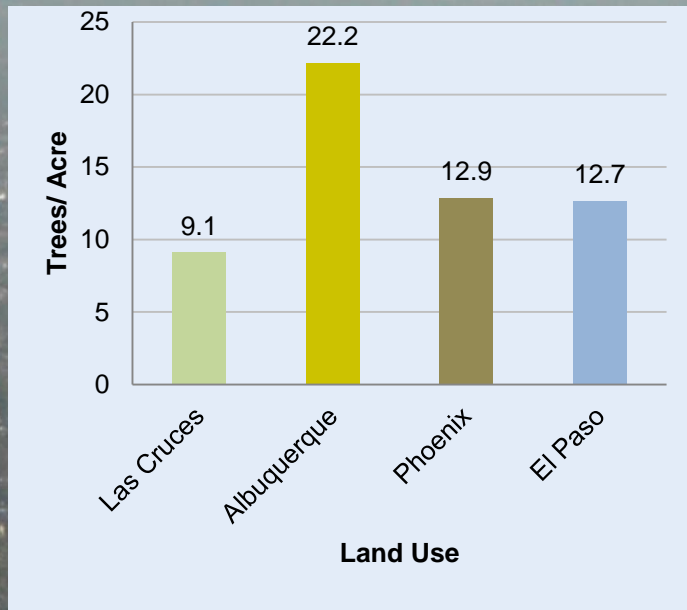


# Project Summary

Key Findings	Phoenix, AZ	El Paso, TX	Las Cruces, NM	Albuquerque, NM
Number of Trees (est.)	3,166,000	1,281,000	257,000	1,504,000
Number species samples	60	50	36	76
Land Area	519 sq. mi. 332,160 acres	256 sq. mi. 163,840 acres	76 sq. mi. 48,640 acres	181 sq. mi. 115,840 acres
Project Area	384.5 sq. mi. 246.064 acres	158.2 sq. mi. 101.238 acres	44.0 sq. mi. 28.171 acres	132.2 sq. mi. 84,626 acres
Tree Cover	9.0% - 12.9 trees/acre	5.1% - 12.7 trees/acre	3.7% - 9.1 trees/acre	13.3% - 22.2 trees/acre
Most Common Species	Velvet mesquite 8.3% California palm 7.5% Sweet acacia 6.7%	Italian cypress 25.8% Afghan pine 10.8% Mexican fan palm 7.3%	Desert willow 18.0% Italian cypress 15.8% Afghan pine 11.8%	Siberian elm 24.6% Desert olive 5.6% Desert willow 5.3%
Percentage of trees less than 6" DBH	44.8	53.4	64.3	59.9
Pollution Removal	1770 tons/year (\$5.67 million/year)	318 tons/year (\$247 thousand/year)	92 tons/year (\$235 thousand/year)	366 tons/year (\$1.1 million/year)
Carbon Sequestration	35,400 tons/year (\$2.52 million/year)	7,430 tons/year (\$529 thousand/year)	1,580 tons/year (\$112 thousand/year)	9,710 tons/year (\$692 thousand/year)
Carbon Storage	305,000 tons (\$21.7 Million)	92,800 tons (\$6.61 million)	17,800 tons (\$1.26 million)	226,000 tons (\$16.1 million)
Avoided Carbon Emissions	\$2.96 million/year	\$384 thousand/year	\$75 thousand/year	\$448 thousand/year
Oxygen Production	89,200 tons/year	14,100 tons/year	3,290 tons/year	21,300 tons/year
Building Energy Savings	\$22.9 million/year	\$2.7 million/year	\$563 thousand/year	\$3.31 million/year
Avoided Stormwater Runoff	91,700,000 cu ft \$6.11 million/year	32,867,000 cu ft (\$2.19 million/year)	898,000 cu ft (\$59.8 thousand/year)	51,386,000 cu ft (3.42 million/year)
Replacement Values	\$3.82 billion (\$1,207/tree)	\$1.02 billion (\$796/tree)	\$205 million (\$798/tree)	\$1.93 billion (\$1,283/tree)



# Sample Analysis: with similar tree density why is the canopy cover higher in Phoenix than El Paso?

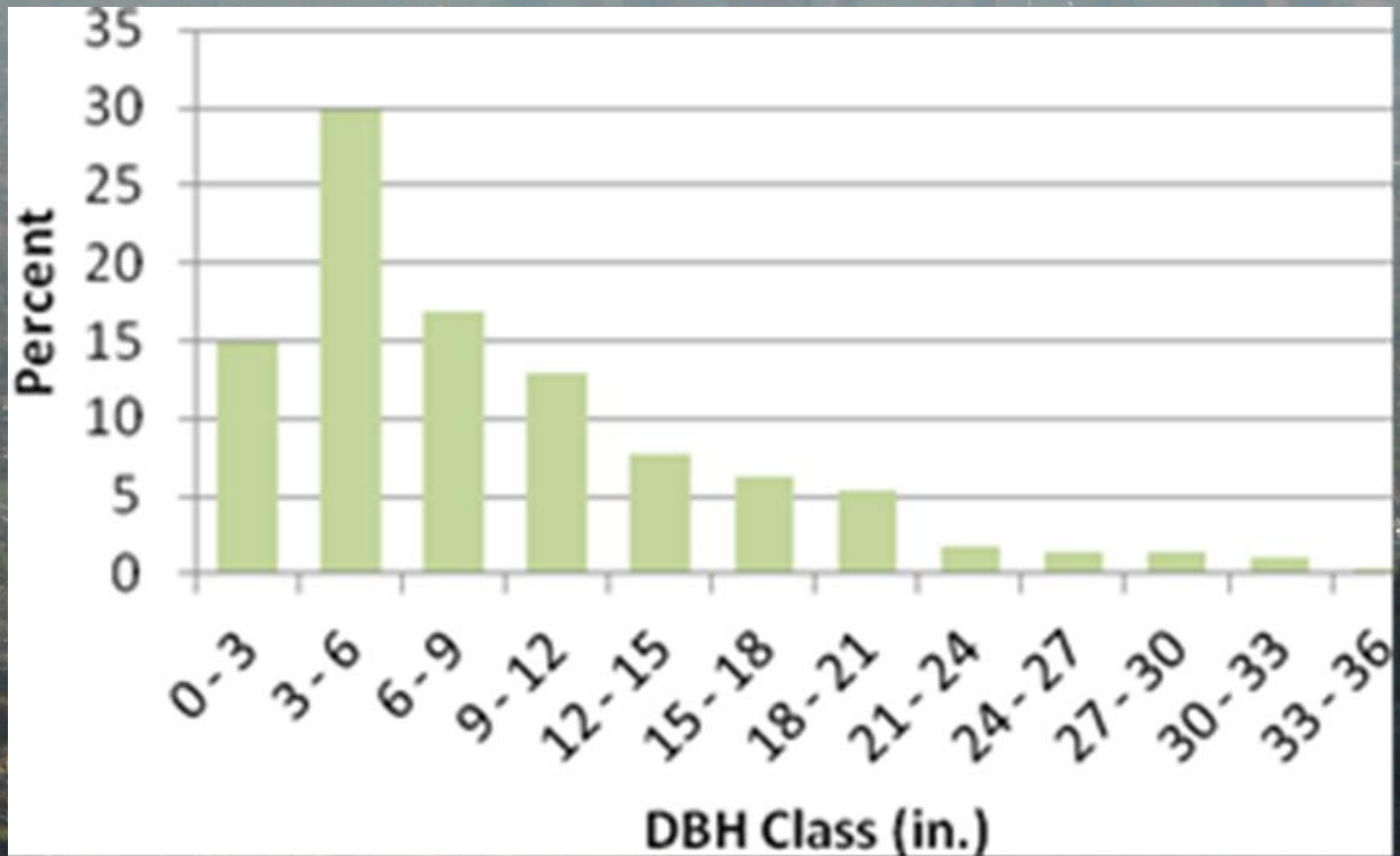


Species	Percent Population	Percent Leaf Area
Velvet mesquite	8.25	8.70
California palm	7.52	5.56
Sweet acacia	6.69	5.41

Species	Percent Population	Percent Leaf Area
El Paso		
Afghan pine	10.8	18.1
Italian cypress	25.8	2.6
White mulberry	5.9	19.7



# Relative Age Distribution in Phoenix





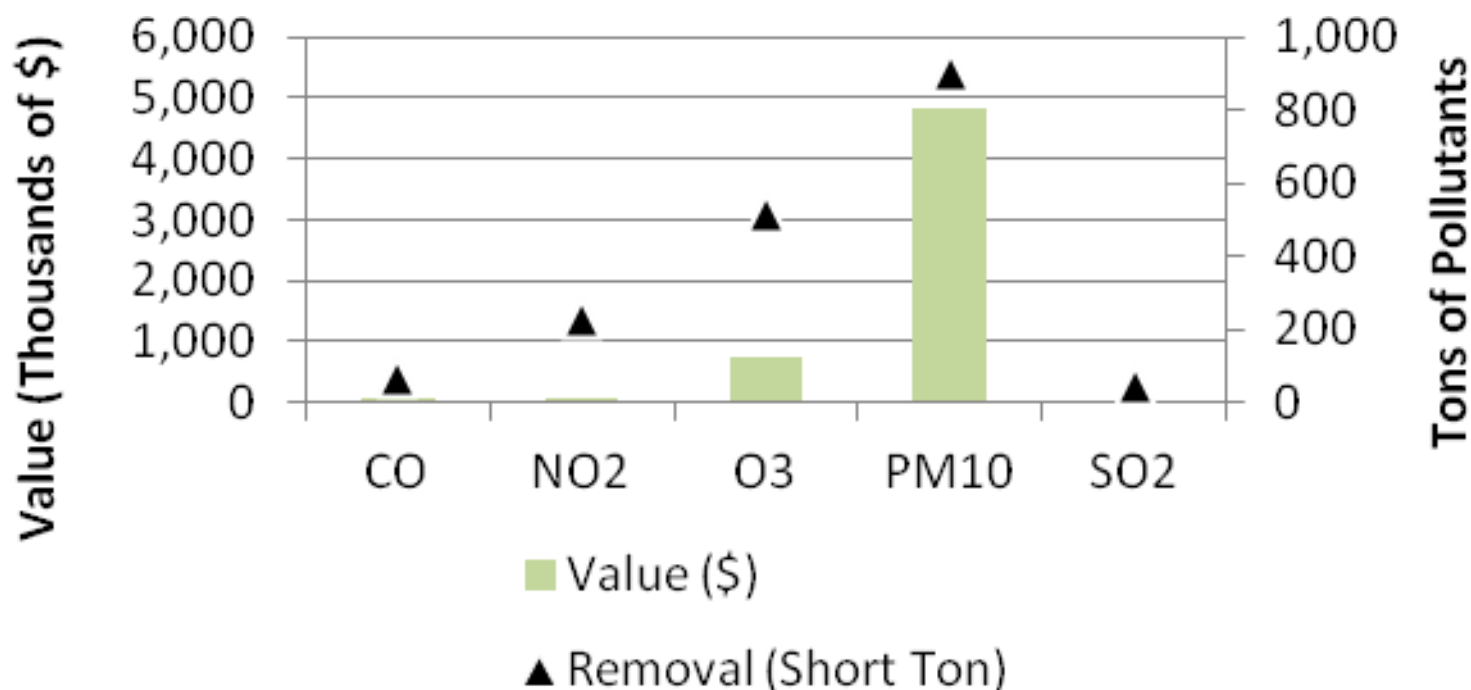
# Health Values

## Environmental Benefits Mapping and Analysis Program (BenMAP)

- Estimates the health impact and economic benefits for changes in air quality.
- Ozone, SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>2.5</sub> and PM<sub>10</sub>



# Annual Pollution Removal and Value for Phoenix





# Management Strategies to Improve Air Quality

Strategy	Result
Increase the number of healthy trees	Increase pollution removal
Sustain existing tree cover	Maintain pollution removal levels
Maximize use of low VOC-emitting trees	Reduces ozone and carbon monoxide formation
Sustain large, healthy trees	Large trees have greatest per-tree effects
Use long-lived trees	Reduce long-term pollutant emissions from planting and removal
Use low maintenance trees	Reduce pollutants emissions from maintenance activities
Reduce fossil fuel use in maintaining vegetation	Reduce pollutant emissions
Plant trees in energy conserving locations	Reduce pollutant emissions from power plants
Plant trees to shade parked cars	Reduce vehicular VOC emissions
Supply ample water to vegetation	Enhance pollution removal and temperature reduction
Plant trees in polluted or heavily populated areas	Maximizes tree air quality benefits
Avoid pollutant-sensitive species	Improve tree health
Utilize evergreen trees for particulate matter	Year-round removal of particles



For more data and information  
related to this project:

[www.desertcanopy.org](http://www.desertcanopy.org)

