

Breaking the Cycle of Low Urban Tree Diversity in Florida

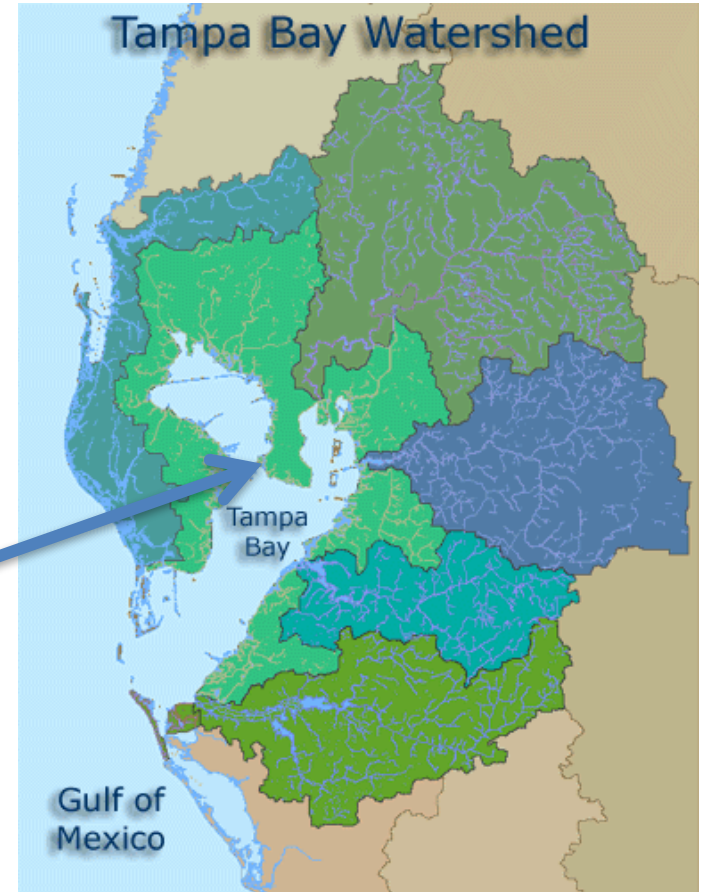
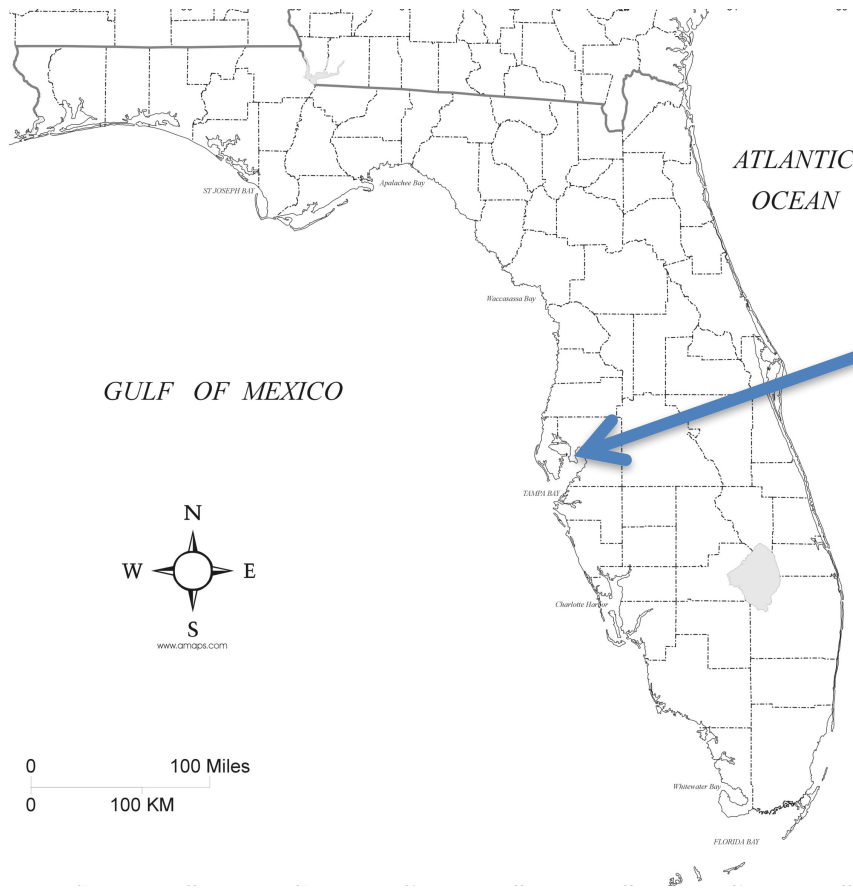
URBAN FOREST DIVERSITY
WORKING GROUP

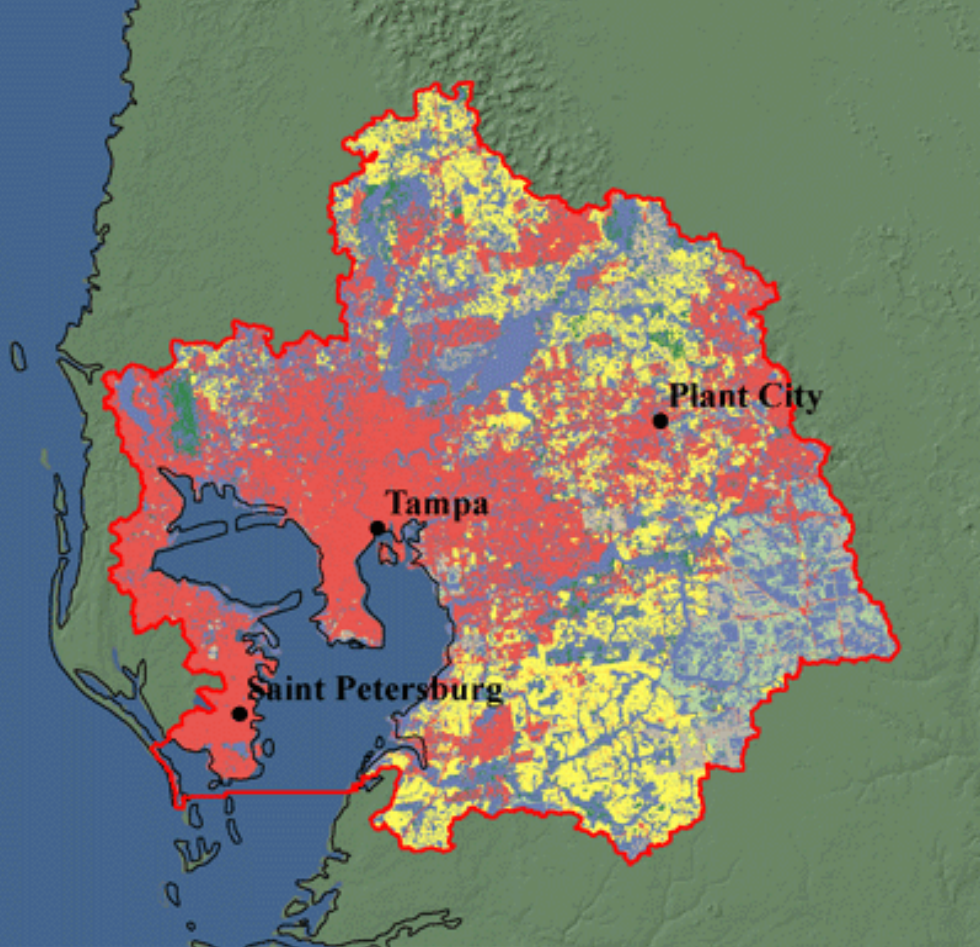


Rob Northrop
Andrew Koeser, PhD.

UF | **IFAS Extension**
UNIVERSITY of FLORIDA

Florida, U.S.A.





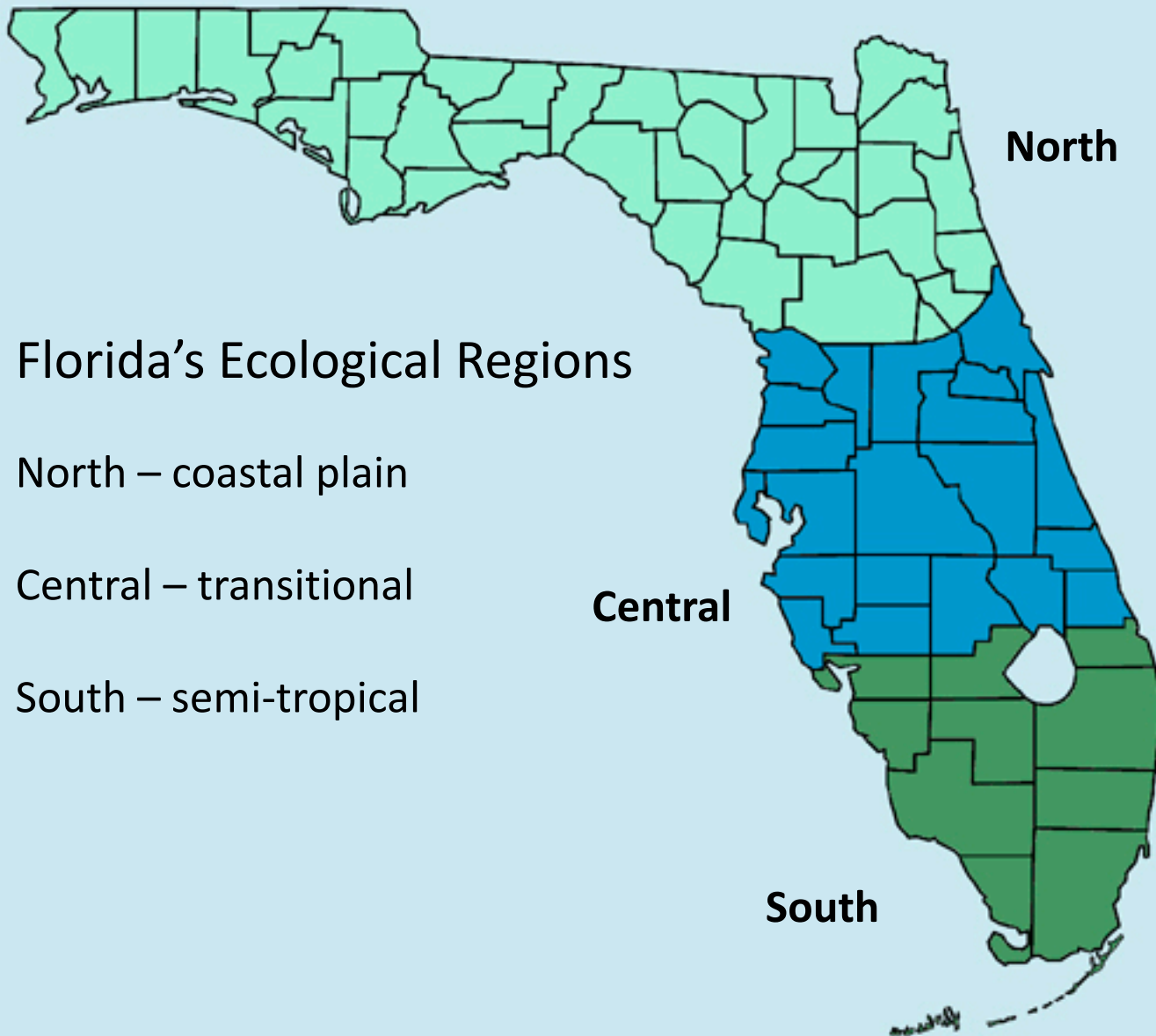
Population =
6,474,000

**Tampa Bay Watershed
2001 Land Cover Characteristics**

Water:	42.0%
Urban:	30.5%
Cropland/Pasture:	15.9%
Forest:	3.8%
Grassland:	3.8%
Shrubland:	2.3%
Barren:	1.6%

**Elevation Derivatives for
National Applications
Watershed Footprints**







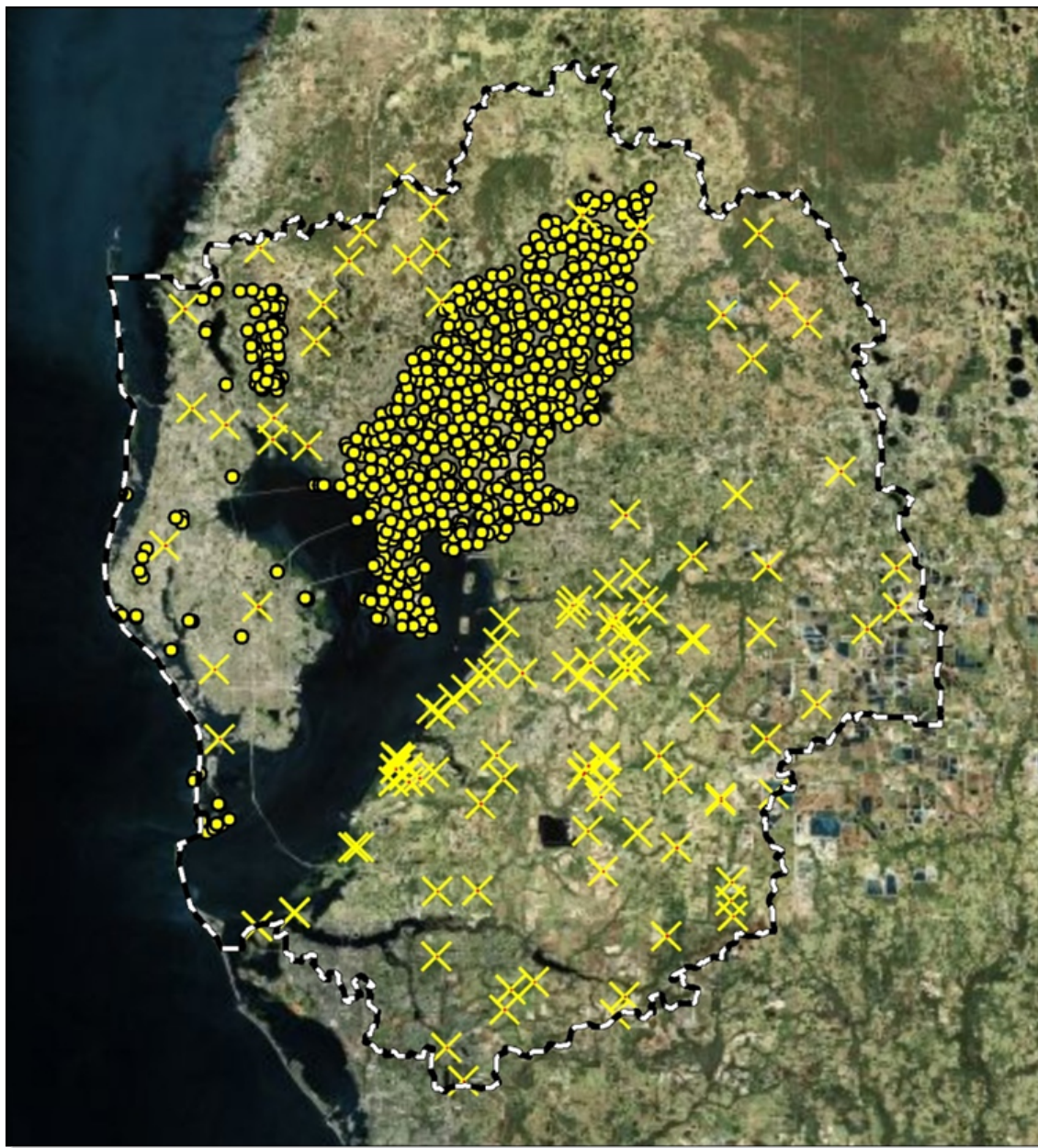




Tampa Bay Watershed

FOREST WORKING GROUP organized 2006





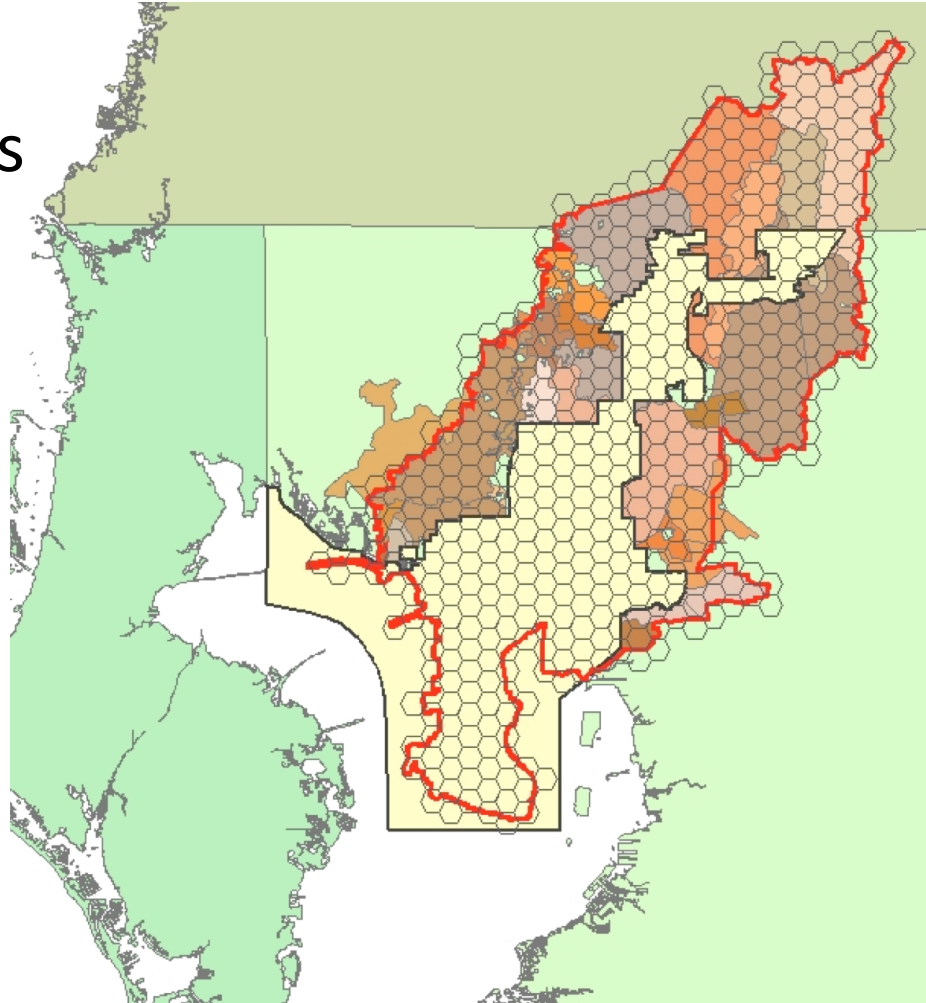
500 permanent plots

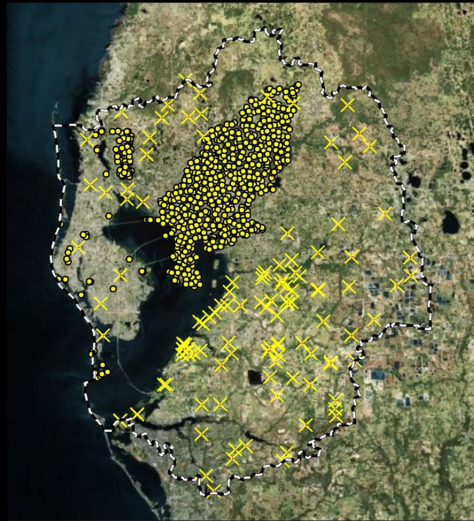


Tampa Bay
Watershed
FOREST WORKING GROUP

City of Tampa - Urban Plot allocation

200 permanent plots
measured every 5 years





Urban Forest Planning Improving Efficiency and Effectiveness of Management



Nature

People

Economy

Leadership



City of
Tampa
Florida

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Tree Diversity

Criteria and Key Objectives

Criteria	Key Objective
Species suitability for Tampa's climate zones	Establish a tree population suitable for Tampa's urban environment and adapted to the regional environment.
Tree species diversity	Establish a diverse tree population citywide.
Diameter distribution of trees in the city	Provide for uneven aged diameter distribution citywide.
Tree species longevity	Establish long-lived tree population that maximizes benefits vs costs.



A 2014 Urban & Community Forestry Census of Tree Activities



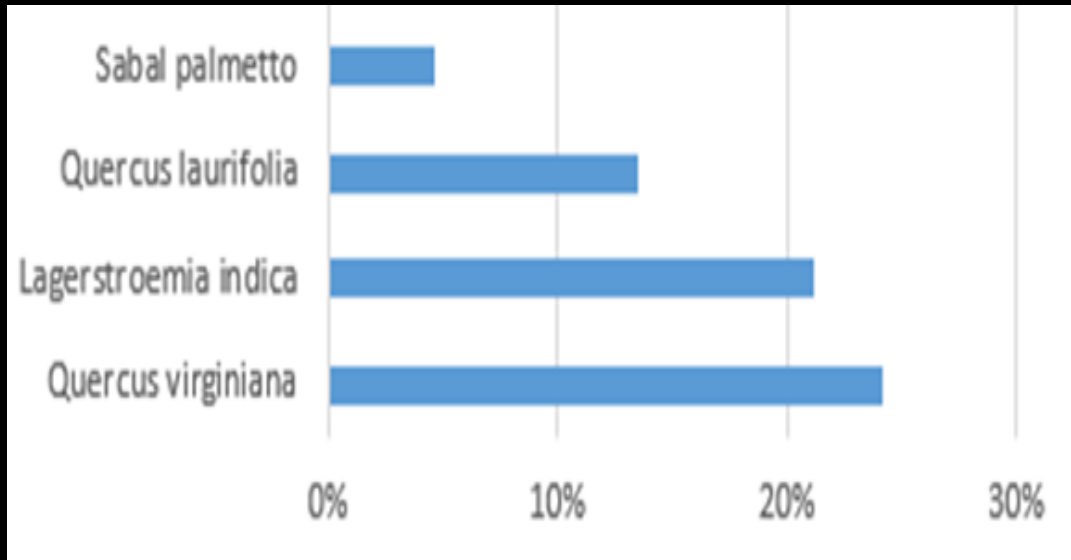
So how does the US Urban Forest stack up to these guidelines?

Insights from the 2014 Urban & Community Forestry Census...

24. If known, list the 6 most commonly occurring street tree species, their number and percentage of the total street trees?

Street Trees Species	Number	Percent

Top 90% (22 Species) North and Central Florida N = 6 Cities



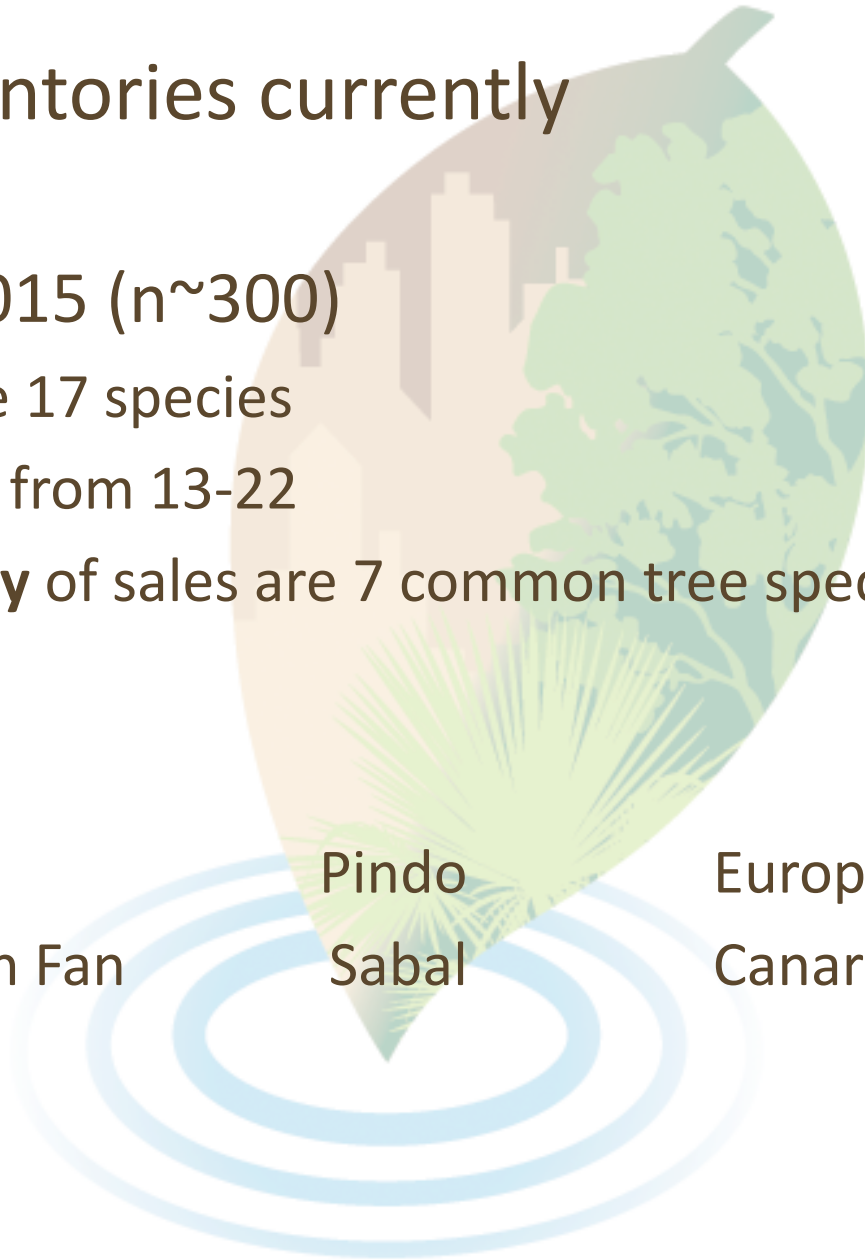
Nursery inventories currently

— Survey 2015 (n~300)

- Average 17 species
- Ranged from 13-22
- **Majority** of sales are 7 common tree species

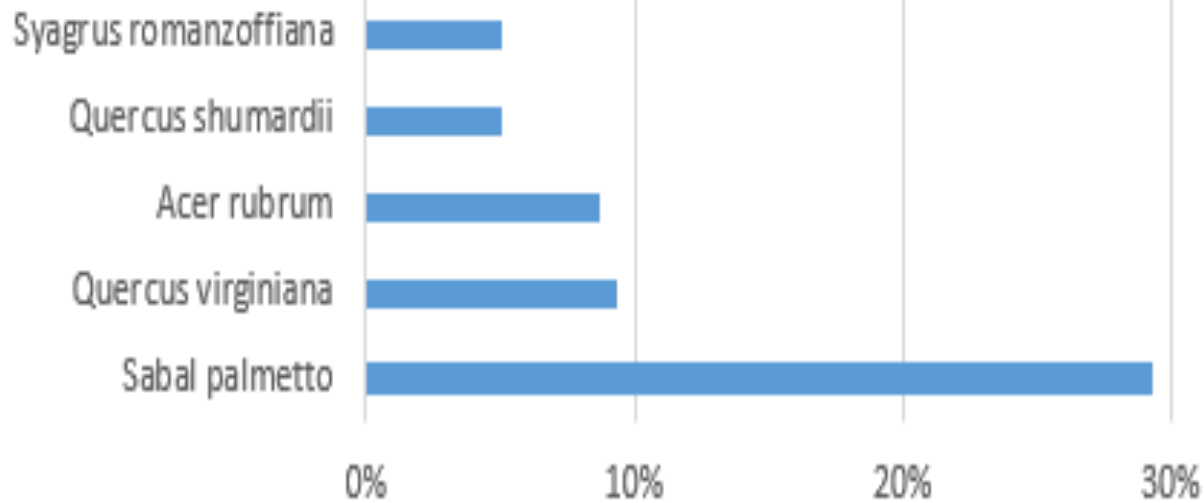
— Palms

- Queen
- Mexican Fan
- Pindo
- Sabal
- European fan
- Canary Island



Top 90% (24 species) South Florida

N = 3 Cities



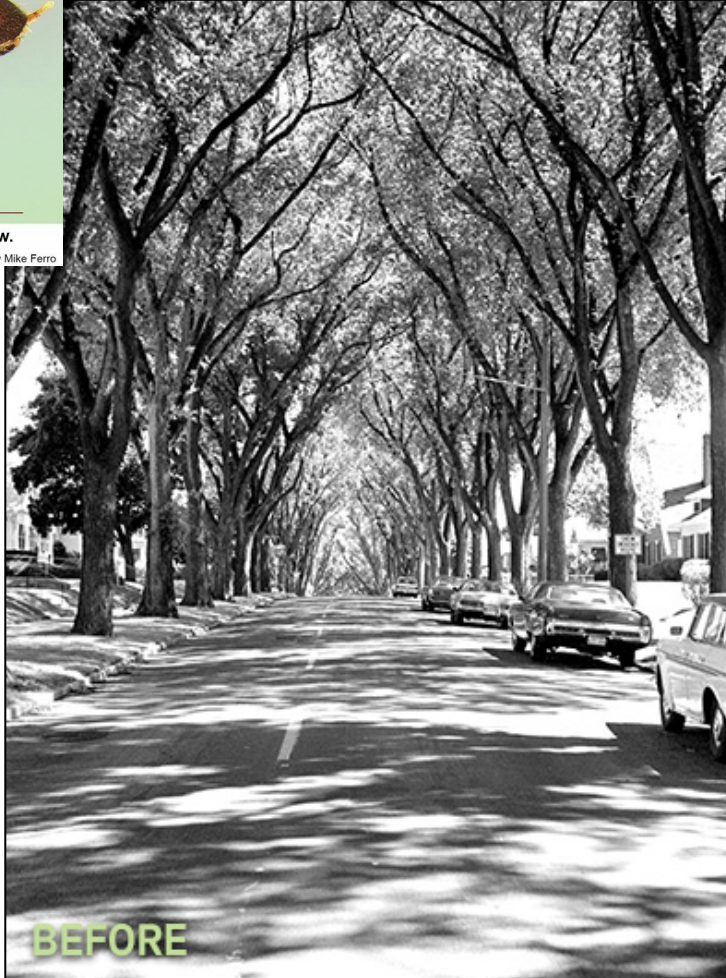
What are the consequences of this
localized lack of diversity?

Dutch Elm Disease 1928-Present



The smaller European elm bark beetle side view.

Photo by Mike Ferro

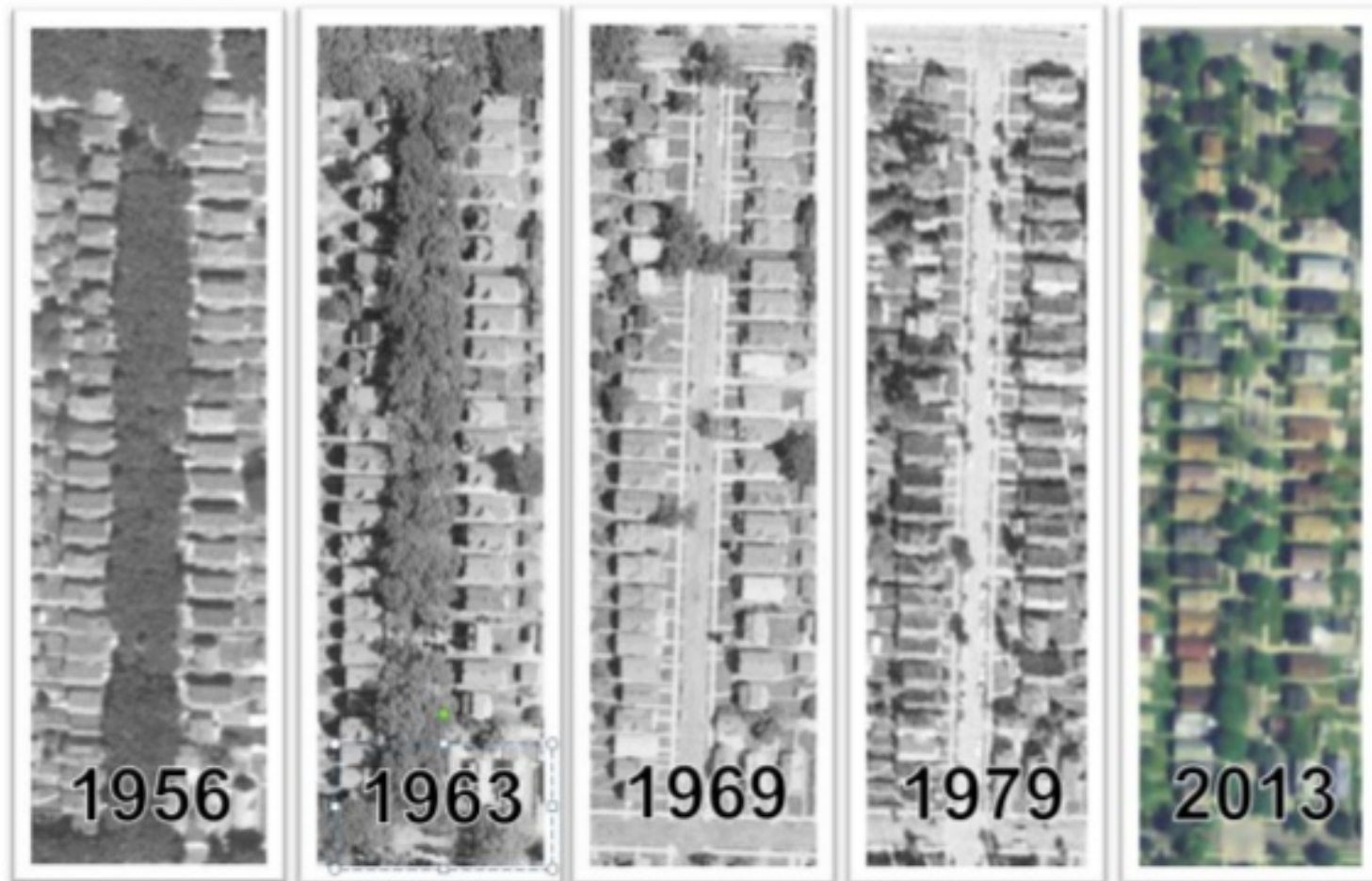


BEFORE



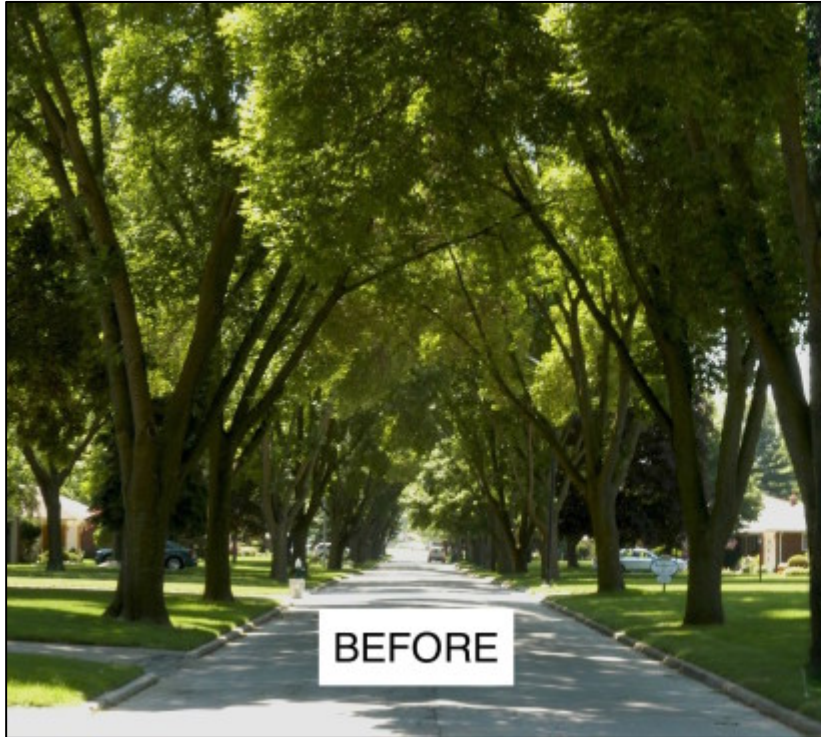
AFTER

Historical Canopy Cover Estimation



North 16th Street between West Keefe Avenue & West Concordia Avenue

Emerald Ash Borer 1990s-Present



The Relationship Between Trees and Human Health

Evidence from the Spread of the Emerald Ash Borer

Geoffrey H. Donovan, PhD, David T. Butry, PhD, Yvonne L. Michael, ScD,
Jeffrey P. Prestemon, PhD, Andrew M. Liebhold, PhD,
Demetrios Gatzolis, PhD, Megan Y. Mao

Background: Several recent studies have identified a relationship between the natural environment and improved health outcomes. However, for practical reasons, most have been observational, cross-sectional studies.

Purpose: A natural experiment, which provides stronger evidence of causality, was used to test whether a major change to the natural environment—the loss of 100 million trees to the emerald ash borer, an invasive forest pest—has influenced mortality related to cardiovascular and lower-respiratory diseases.

Methods: Two fixed-effects regression models were used to estimate the relationship between emerald ash borer presence and county-level mortality from 1990 to 2007 in 15 U.S. states, while controlling for a wide range of demographic covariates. Data were collected from 1990 to 2007, and the analyses were conducted in 2011 and 2012.

Results: There was an increase in mortality related to cardiovascular and lower-respiratory-tract illness in counties infested with the emerald ash borer. The magnitude of this effect was greater as infestation progressed and in counties with above-average median household income. Across the 15 states in the study area, the borer was associated with an additional 6113 deaths related to illness of the lower respiratory system, and 15,080 cardiovascular-related deaths.

Conclusions: Results suggest that loss of trees to the emerald ash borer increased mortality related to cardiovascular and lower-respiratory-tract illness. This finding adds to the growing evidence that the natural environment provides major public health benefits.

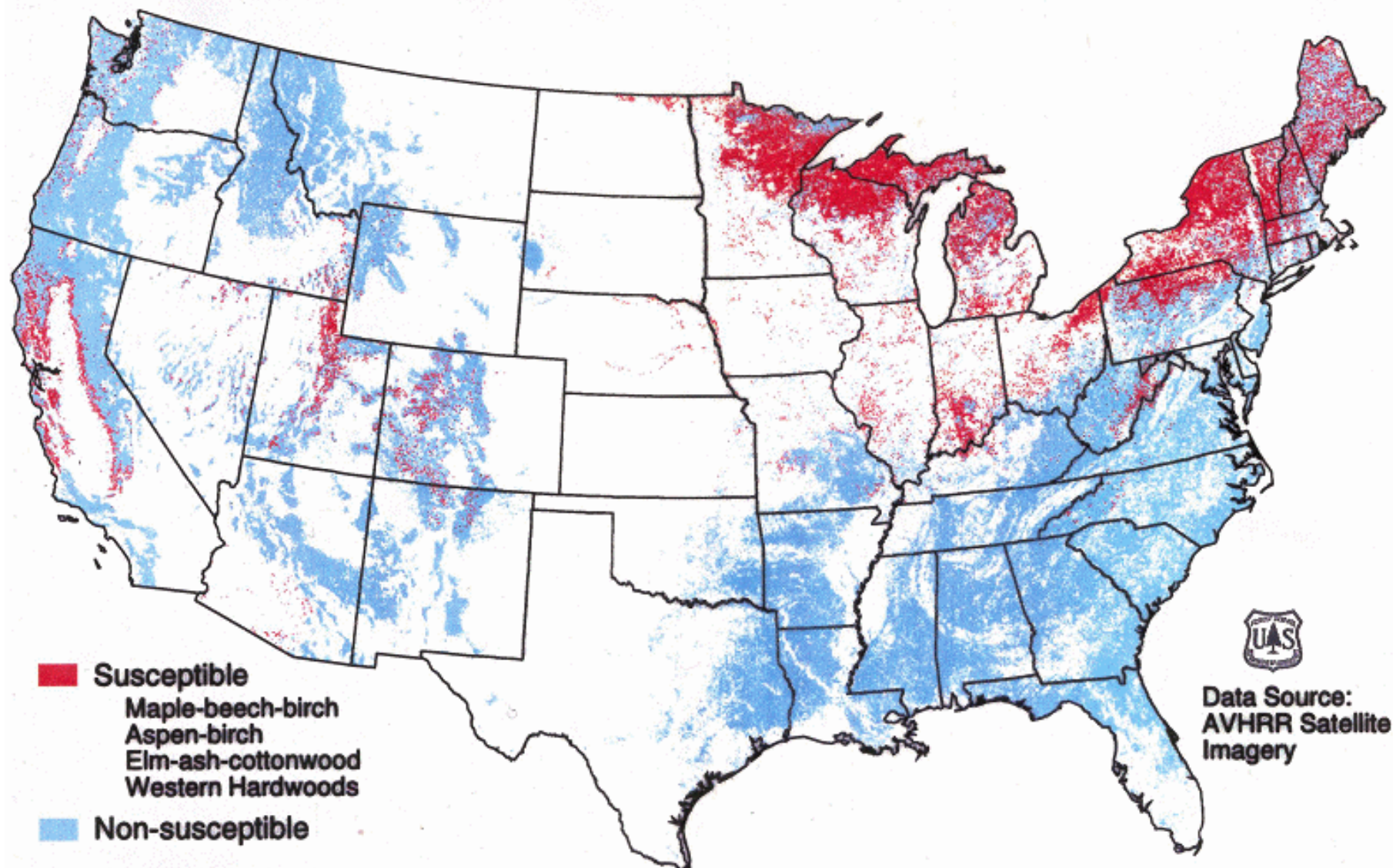
(Am J Prev Med 2013;44(2):139–145) Published by Elsevier Inc. on behalf of American Journal of Preventive Medicine



Asian Longhorn Beetle 1996-Present



Forest Types Potentially at Risk to Asian Long-horned Beetle *



* This does not include the risk to countless hardwood trees planted in cities and suburban areas across the country.

Texas Phoenix Palm Decline 2006-Present



Oak wilt ?????-?????

Oak Wilt: A Potential Future Threat to Oaks in Florida¹

Kelly Peacock and Jason Smith²

Overview:

Oak decline and mortality in Florida has been the subject of much debate and concern in recent years. Due to the ubiquitous nature of oak species in urban and rural landscapes, their high values as landscape trees, and their perceived long life spans, sick oak trees raise concern. One common killer of oak trees in other areas of the United States is oak wilt. This disease is sometimes suspected as the

and defensive structures called tyloses within its water-conducting cells in an attempt to inhibit the spread of the fungus; however, to fungal matter, but sapwood (Beckman). The interruption of causes the leaves to symptoms give the

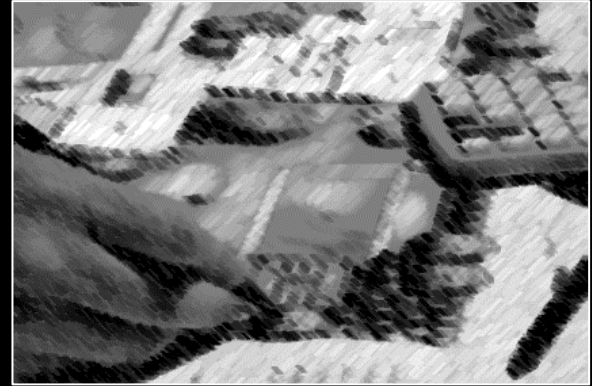


Why does Florida rely so heavily on so few species?

Players in Urban Tree Diversity



Growers



Landscape Architects/Designers



Planners and Developers



Arborists/Urban Foresters

Traits that Make Trees Ideal for Nursery Production/Sale

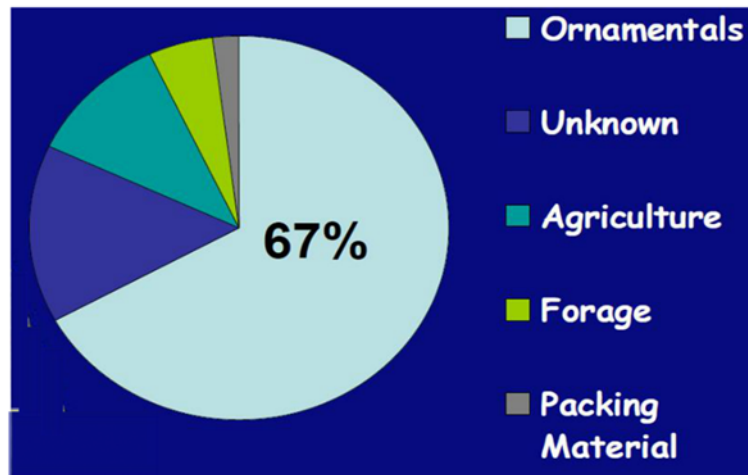
Production:

- Grows quickly
- Produces abundant seed
- Has no special germination requirements
- Has few pests or diseases

Key Traits of
Invasive Species
(if non-native)



Origin of FLEPPC Invasive Plants



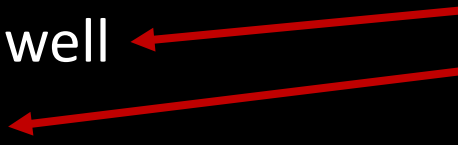
Traits that Make Trees Ideal for Nursery Production/Sale



Sale:

- Has a history of selling well
- Has a current demand
- Fill a niche not currently addressed
- Transplants and performs well in urban environments

Creates an overuse
feedback loop



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Arborists/Urban Foresters



Journal of Arboriculture, November 1975

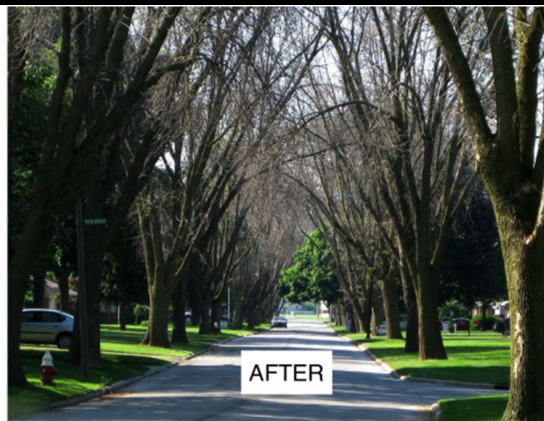
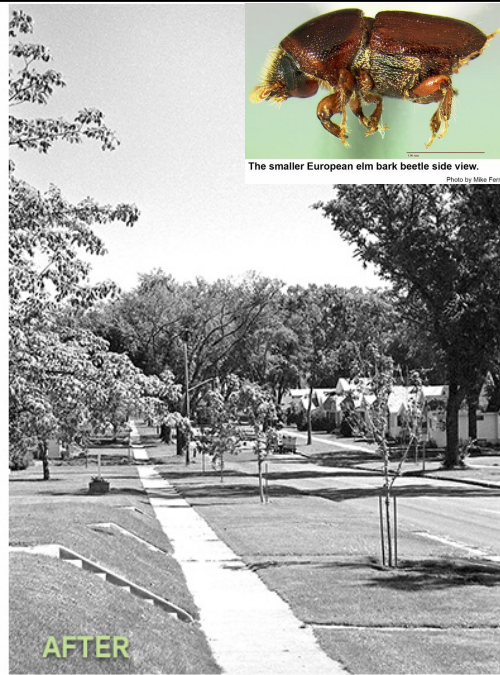
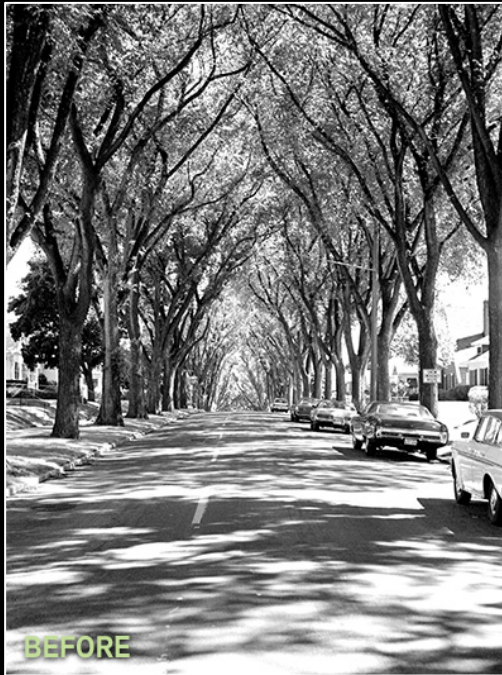
ORDINANCE CONTROL OF STREET TREES

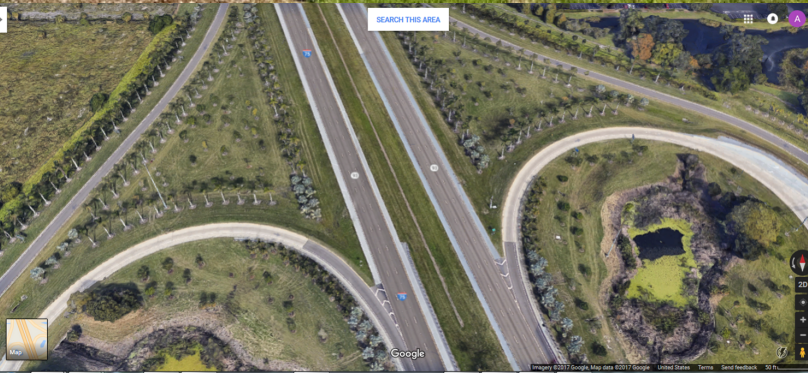
by Philip A. Barker

Monotypic Planting Recommended

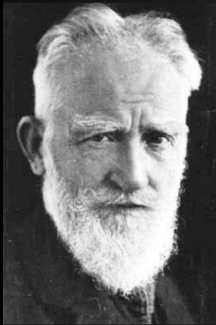
The number of kinds of trees that might be specified for planting along any street could vary, of course, even with the population density system. Frequently one hears admonitions against the so-called monotypic planting along streets. But for practicality of tree maintenance and for greatest avenue attractiveness, there is ample evidence to justify the planting of a single kind or alternate kinds of trees along a street. Furthermore, the beauty of a street canopied with single kind of tree is unsurpassed.

History Shows...neither Practical nor Beautiful





**If history repeats itself,
and the unexpected
always happens, how
incapable must Man be of
learning from experience.**

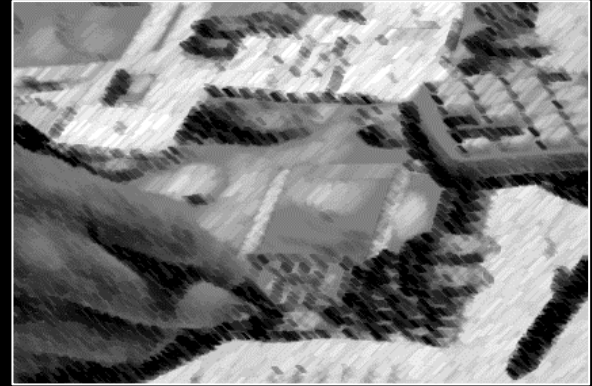


George Bernard Shaw
Irish Playwright

Players in Urban Tree Diversity



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Planners and Developers



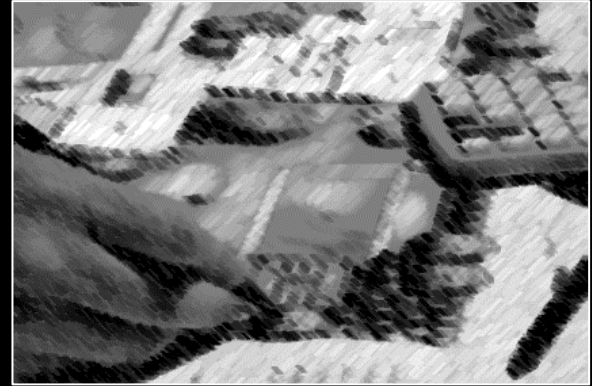
Arborists/Urban Foresters



Players in Urban Tree Diversity



Growers



Landscape Architects/Designers



Planners and Developers



Arborists/Urban Foresters

Just when **trees** become large enough to start **paying back** their economic and environmental costs...

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Seven Oaks neighborhood in Pasco to cut down 2,000 oaks



Breaking the Cycle – The Urban Forest Diversity Working Group and its Initiatives



Tampa Bay Watershed

FOREST WORKING GROUP

URBAN FOREST DIVERSITY
WORKING GROUP - 2014

Project description: Urban tree diversity

Intended Outcomes:

1. **Public policy** and strategic decision-making instrument
2. Formal assessment of implications for the maintenance of ecosystem services and benefits - **Monitoring**
3. Ongoing cooperation between growers and municipal, county and state governments – **Adaptive Management**



Working Group Approach is simple –
answer 3 questions for:
People, Institutions (business) & Science

1. What have we got?

2. What do we want?

3. How do we get what we want?

Three Key Initiatives



- Underutilized Species Planting Trials
- Development of Diversity Performance Criteria
- Baseline Assessment of Florida Urban Forest Management Efforts.

Underutilized Species Planting Trials

- Central FL Urban Forest Diversity Working Group
- Pinellas Co., Hillsborough Co., Lakeland, Orlando
- “Difficult” and “ideal” land use types

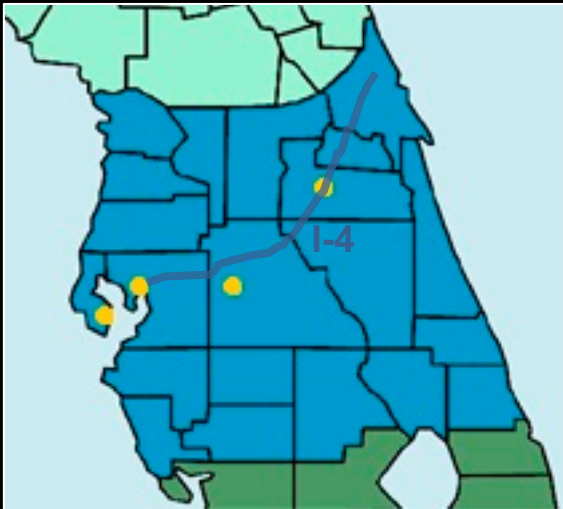


Photo from
AARoads



Photo from City of Winter Park

Underutilized Species Planting Trials



Map About Version 2.0 City of Tampa Tree Matrix Contact

City of Tampa Tree Matrix

In 2013, the City of Tampa approved an Urban Forest Management Plan as the strategic plan for the management of Tampa's Urban Forest (Tampa City Council Resolution No. 2013-921; visit TampaGov.net for more information). The Tampa Tree Matrix was developed as part of the plan to provide a list of tree species that are suitable to grow within the City of Tampa, based overall on climatic conditions. Each column in the Matrix represent characteristics that can be used to determine tree species suitability based on horticultural preferences and characteristics of the specific planting site. A PDF version of the Tree Matrix can also be obtained at the TampaGov.net website. *This matrix is a work in progress.*

Hint: Click a column header to sort. Click Show/Hide columns to change the display.

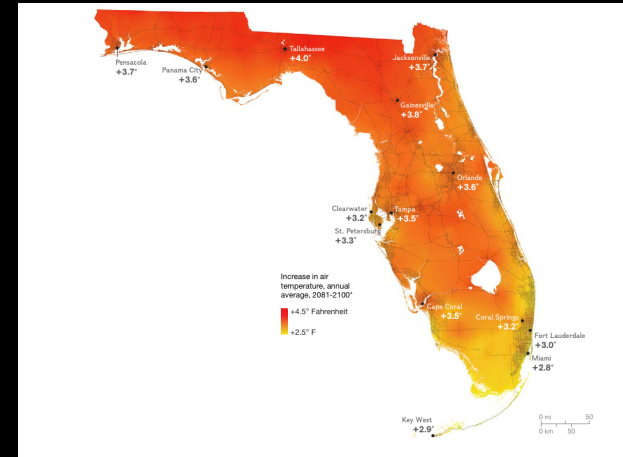
Show / hide columns Copy Print Save

Search all fields:

Show 10 trees

Scientific Name	Common Name	Florida Native	Mature Spread	Mature Height	Growth Rate	Drought Tolerance	Wind Resistance	Soil Area (w/3ft depth)
Acacia farnesiana	Sweet Acacia	Yes	15 to 25 feet	15 to 25 feet	fast		N/A	10' x 10'
Acer rubrum	Red Maple	Yes	25 to 35 feet	60 to 75 feet	fast	MEDIUM	MEDIUM LOW	30' x 30'
Acer saccharum subsp. floridanum	Florida Sugar Maple	Yes	25 to 40 feet	50 to 60 feet	moderate		YES	30' x 30'
Acoelorrhaphe wrightii	Paurotis Palm	Yes	12 feet	30 feet	moderate	HIGH	N/A	
Aesculus pavia	Red Buckeye	Yes	15 to 25 feet	15 to 20 feet	moderate		N/A	10' x 10'
Avicennia germinans	Black Mangrove	Yes					N/A	
Bismarkia nobilis	Bismarkia	No						
Butia capitata	Pindo Palm	No	10 to 15 feet	15 to 25 feet	slow	HIGH		
Callistemon citrinus	Lemon Bottlebrush	No	10 feet	25 feet	moderate	MEDIUM		
Callistemon rigidus	Upright Bottlebrush	No						

Showing 1 to 10 of 106 tree species



4" - 5" - 6" CATHEDRAL LIVE OAKS

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18,304 trees, 146 empty planting sites

Export Search Results

+ Add a Tree

Details

Eco Benefits

- Total annual benefits \$1,976,673 saved
- Energy conserved 1,269,574 kwh/year saved \$426,180
- Stormwater filtered 105,448,695 gal/year saved \$1,054,486

Underutilized Species Planting Trials

- ◇ Experimental Design (n = 200)
 - ◇ Four locations
 - ◇ 2 land use types
 - ◇ 5 species
 - ◇ 5 replicates



Photo by Ed Gilman



Photo by Ed Gilman

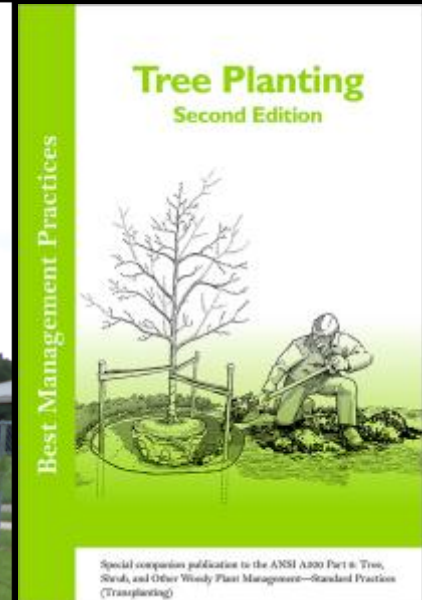


Photo by Ed Gilman



Photo from City of Lakewood

Underutilized Species Planting Trials

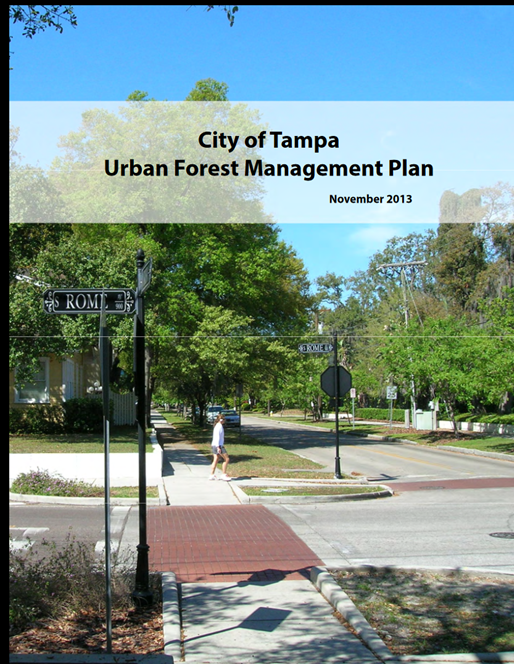


Underutilized Species Planting Trials

- ◆ Data Collection – Time of planting, **1 yr, 2 yr**
- ◆ RUSI methods
- ◆ Response variables
 - ◆ Survival: alive vs. standing dead or removed
 - ◆ Growth: caliper, height, twig elongation
 - ◆ Vitality: chlorophyll fluorescence, crown health (crown vitality, opacity...)
- ◆ Predictor variables
 - ◆ Site information: soil pH, compaction, moisture, nutrients, etc.



Diversity Performance Criteria Development



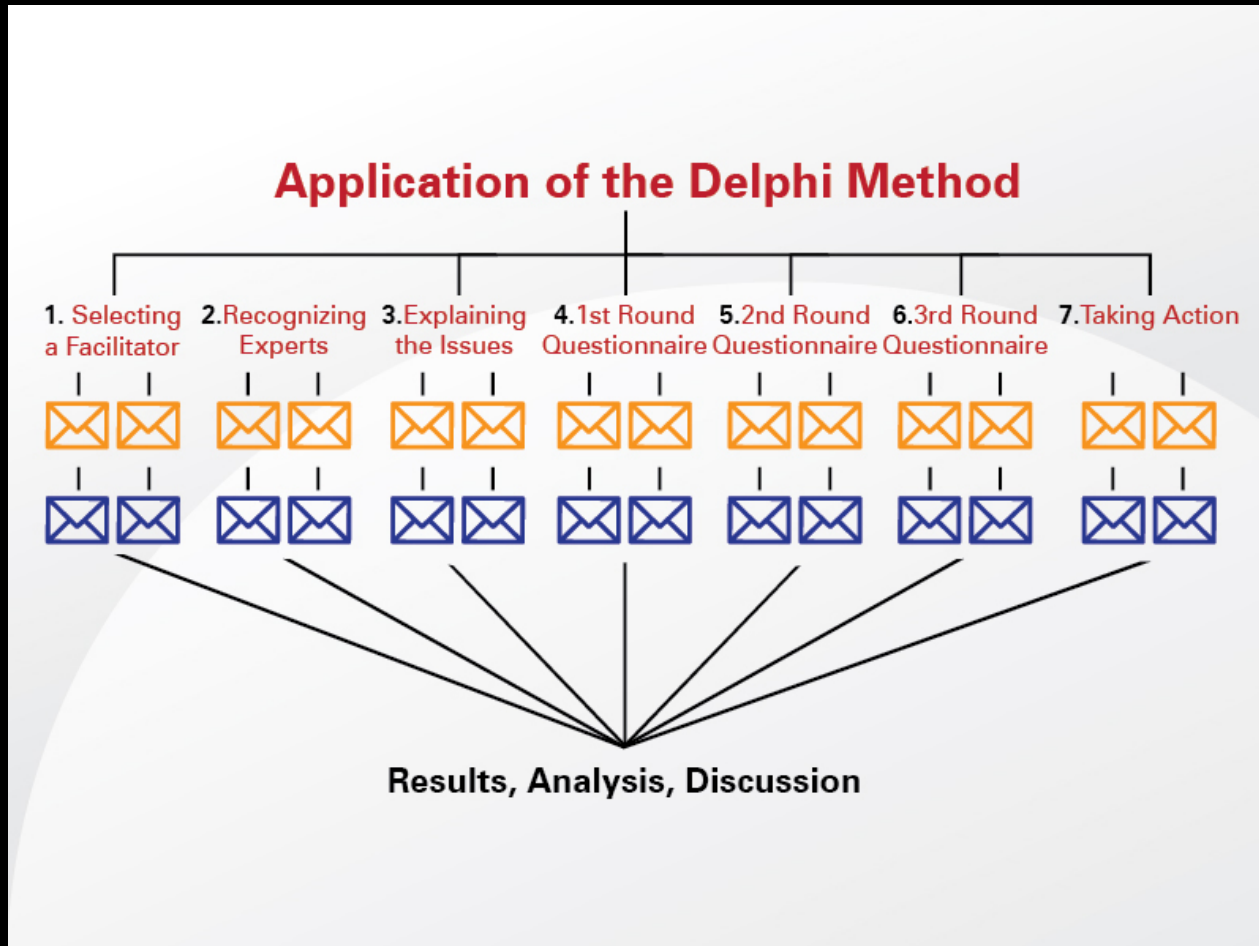
Tampa's 20-Year Framework for Urban Forest Management

Criteria	Vegetation Resource - Performance Indicators				Key Objective
	Low	Moderate	Good	Optimal	
Species suitability for Tampa's climate zones	Less than 50% of trees are of species considered suitable for Tampa.	50%-75% of trees are of species considered suitable for Tampa.	More than 75% of trees are of species considered suitable for Tampa.	At least 90% of the trees are of species suitable for Tampa.	Establish a tree population suitable for Tampa's urban environment and adapted to the regional environment.
Canopy cover relative to goals by municipal planning district	The existing canopy cover equals 0%-25% of the goal.	The existing canopy cover equals 25%-50% of the goal.	The existing canopy cover equals 50%-75% of the goal.	The existing canopy cover equals 75%-100% of the goal.	Relative canopy cover to goal for each municipal planning district category.
Tree species diversity	Fewer than five species dominate the entire tree population citywide.	No species represents more than 20% of the entire tree population citywide.	No species represents more than 15% of the entire tree population citywide.	No species represent more than 1% of the entire tree population citywide.	Establish a diverse tree population citywide.
Diameter (DBH) distribution of trees in the city	Any relative DBH (RDBH) class (0%-25% RDBH, 26%-50% RDBH, etc.) represents more than 75% of the tree population.	Any RDBH class represents between 50% and 75% of the tree population.	No RDBH class represents more than 50% of the tree population.	25% of the tree population is in each of four RDBH classes.	Provide for uneven aged distribution citywide.
Tree health condition by municipal planning district.	Less than 80% of trees rated as excellent health condition.	31-40% of trees rated as excellent health condition.	61-80% of trees rated as excellent health condition.	Greater than 80% of trees rated as excellent health condition in all municipal planning districts.	Healthy trees live longer, produce greater no. of benefits and reduce costs associated with maintenance.
Wind resistance of trees citywide	Majority of trees are rated in lowest category of wind resistance.	Majority of trees are rated in middle and high categories of wind resistance.	Majority of trees are rated in high category of wind resistance.	Greater than 80% of trees are rated in highest category of wind resistance.	Reduce disruption of social and economic services, reduce cost of damage and protect private property and human well being.
Tree species longevity	Less than 25% of trees are of species considered long-lived for Tampa.	25% to 49% of trees are of species considered long-lived for Tampa.	50%-75% of trees are of species considered long-lived for Tampa.	More than 75% of trees are of species considered long-lived for Tampa.	Establish a long-lived tree population that maximizes benefits vs. costs.
Condition assessment of the public trees (trees managed intensively)	No tree maintenance or condition assessment. Request a reactive system. The condition of the urban forest is unknown.	Sample based inventory indicating tree condition and condition level is in place.	Complete tree inventory that includes detailed tree condition ratings.	Complete tree inventory that includes detailed tree condition ratings.	Detailed understanding of the condition of all publicly owned trees.
Current State - Summary	1	3	1	1	

18

Criteria	Vegetation Resource - Performance Indicators				Key Objective
	Low	Moderate	Good	Optimal	
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Diversity Performance Criteria Development



Diversity Performance Criteria Development

Recognizing the Experts

- Nursery Growers
- Developers and HOAs
- Landscape Designers/Landscape Architects
- Landscapers and Arborists
- Utility/Transportation Managers
- City/County Tree Managers
- Tree Stewardship Groups
- State and Federal Government Agencies
- University Subject Matter Experts.

Diversity Performance Criteria Development

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Baseline Diversity Survey

Tampa's 20-Year Framework for Urban Forest Management

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Canopy cover relative to goal by municipal planning district	The existing canopy cover equals 25%-25% of the goal.	The existing canopy cover equals 25%-50% of the goal.	The existing canopy cover equals 50%-75% of the goal.	The existing canopy cover equals 75%-100% of the goal.	Relative canopy cover to goal for each municipal planning district category.
Tree species diversity	Fewer than five species dominates the entire tree population citywide.	No species represents more than 20% of the entire tree population citywide.	No species represents more than 15% of the entire tree population citywide.	No species represents more than 10% of the entire tree population citywide.	Establish a diverse tree population citywide.
Diameter (DBH) distribution of trees in the city	Any relative DBH (RDBH) class (20%-25% RDBH, 26%-30% RDBH, etc.) represents more than 75% of the tree population.	Any RDBH class represents between 50% and 75% of the tree population.	No RDBH class represents more than 50% of the tree population.	25% of the tree population is in each of four RDBH classes.	Provide for uneven aged distribution citywide.
Tree health condition by municipal planning district	Less than 50% of trees rated as excellent health condition.	51 - 60% of trees rated as excellent health condition.	61 - 80% of trees rated as excellent health condition.	Greater than 80% of trees rated as excellent health condition in all municipal planning districts.	Healthy trees live longer, produce greater no. of tree offsprings and reduce costs associated with maintenance.
Wind resistance of tree species citywide	Majority of trees are rated in lowest category of wind resistance.	Majority of trees are rated in medium and high categories of wind resistance.	Majority of trees are rated in high category of wind resistance.	Greater than 80% of trees are rated in highest category of wind resistance.	Reduce disruption of social and economic services; reduce cost of damage and protect private property and human well being.
Tree species longevity	Less than 25% of trees are of species considered long-lived for Tampa.	25% to 40% of trees are of species considered long-lived for Tampa.	40%-75% of trees are of species considered long-lived for Tampa.	More than 75% of trees are of species considered long-lived for Tampa.	Establish a long-lived tree population that maximizes benefits to costs.
Condition assessment of the publicly managed trees (trees managed intensively)	No tree maintenance or condition assessment, the quest based on reactive system. The condition of the urban forest is unknown.	Sample based inventory indicating tree condition and condition level is in place.	Complete tree inventory that includes detailed tree condition rating.	Complete tree inventory that includes detailed tree condition rating.	Detailed understanding of the condition of all publicly-owned trees.
Current State-Summary	1	3	1	1	

18





08/19/2014