

City of Pensacola Urban Tree Canopy Phase I Analysis Trends and Potential

Lucas N Furman
Data Modeling/ Visuals
GIS Technician WQLM

Jimmie Jarratt/ ISA Arborist
Water Quality & Land Management
(WQLM)
Escambia County

Brent Wipf
Study Design
Program Manager WQLM



Scope of Work

The County shall provide Environmental Support Services relating to an assessment of the Urban Forest within the jurisdictional boundary of Pensacola. Services will be provided in two phases.

Phase I :

- Data collection will characterize current baseline of tree canopy. The top-down study will use a statistical approach to characterize tree canopy coverage, past trends, available planting space, land use, watersheds and other considerations as determined with guidance from the City of Pensacola's Environmental Advisory Board

Phase II:

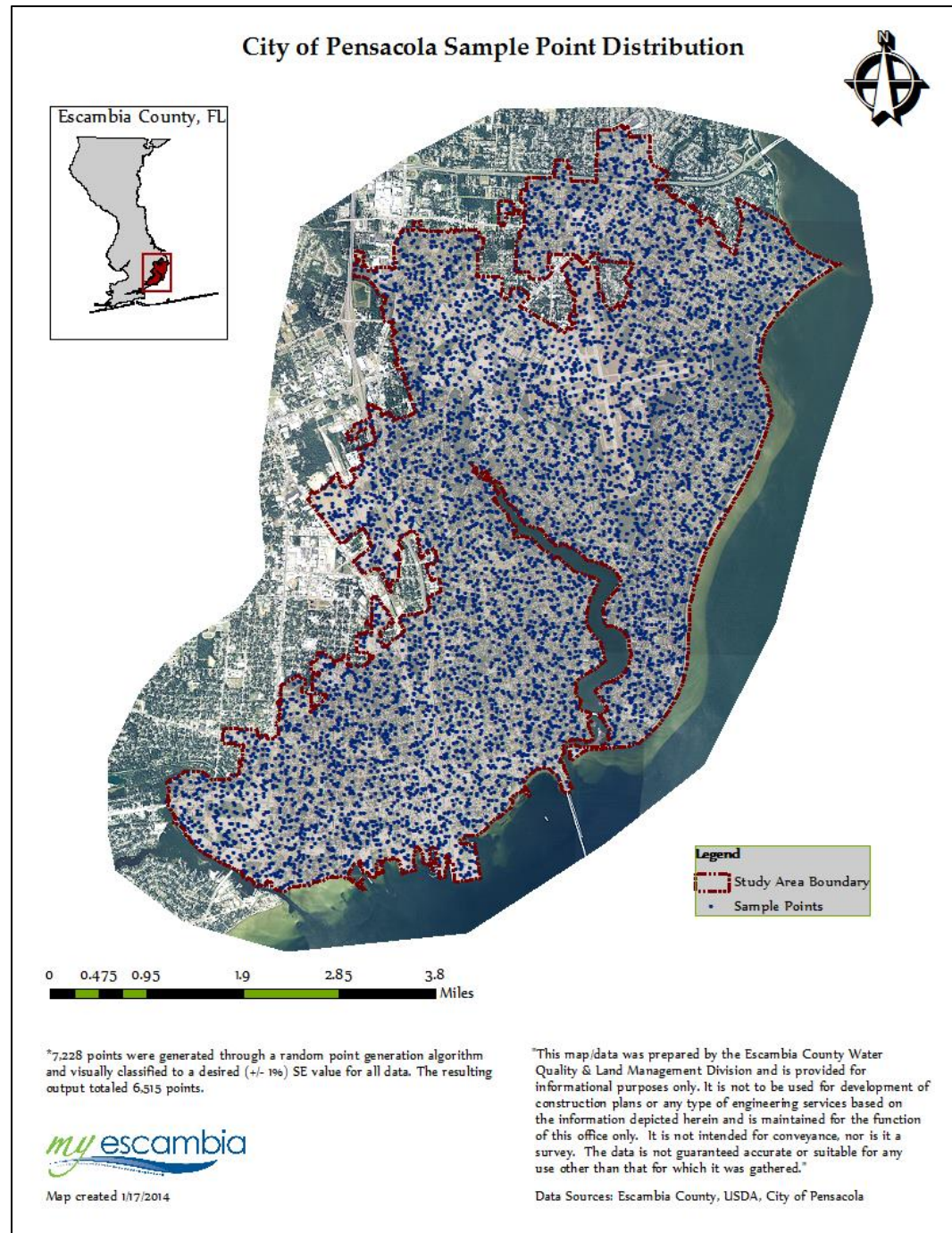
- Based on enhancement objectives determined in Phase I, site-specific recommendations will be provided, including identification of optimal planting areas, recommendation of species and confirmation of planting specifications. A final report will be submitted to the City Council.

Phase I (Turned into 2 separate analysis)

To answer questions on the baseline, trends and available planting space analysis was divided to be divided into two phases with two methods and two sources for data collection

Phase 1A: Trend Modeling

- Methodology based on U.S. Forest Service I-Tree software suite
- Utilized random sampling regime
 - Collected data spanning 19 years (1994, 2000, 2003, 2004, 2007, 2010, 2013)
- Sampled 6,515 data points for each year
 - Visually classified (45,605 total points)
- Achieved accuracy of +/-1% with 90% CI
- Post processed data utilizing kriging interpolation function
 - Filled data voids
 - Generated smooth raster for canopy modeling



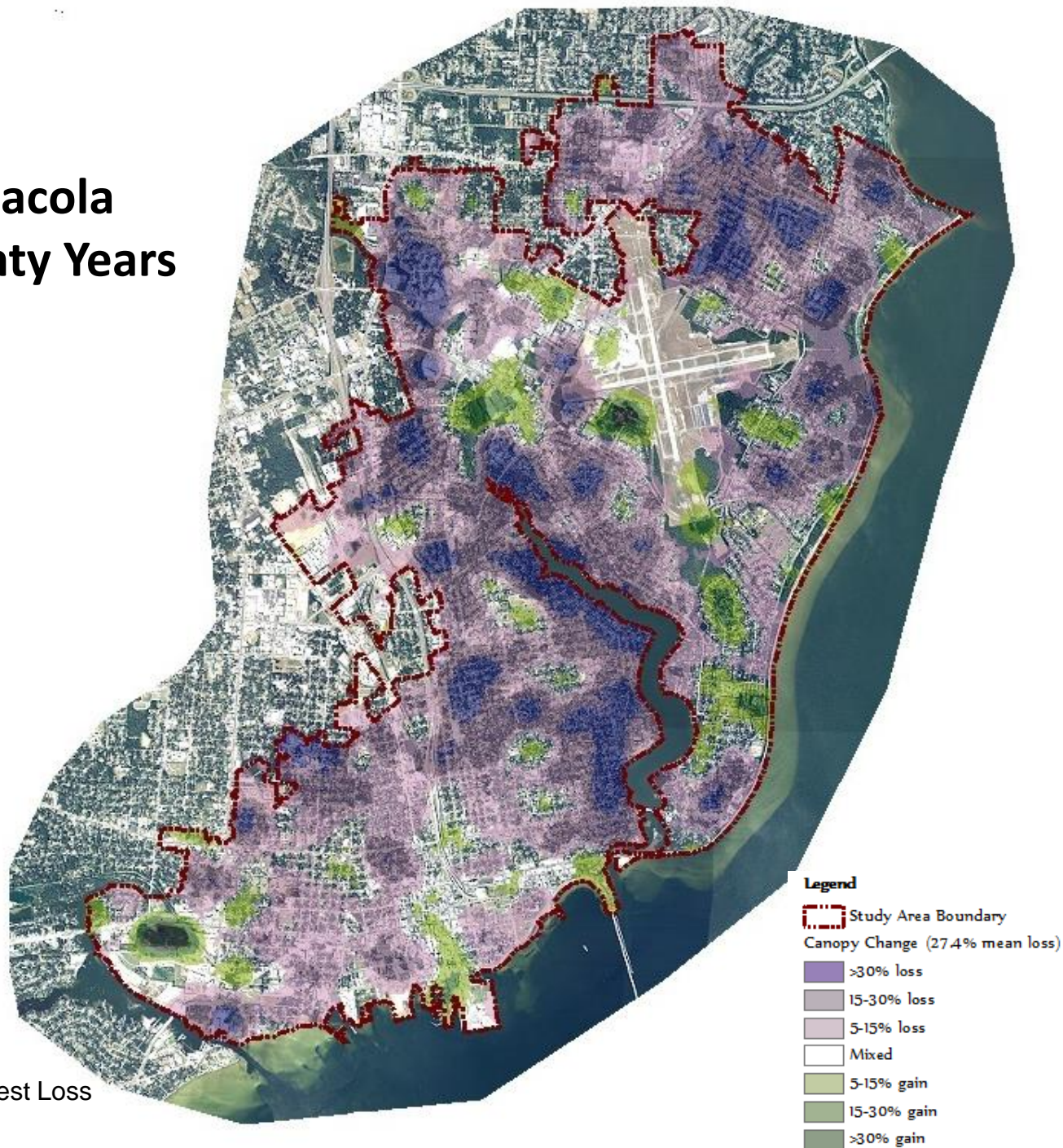
Questions to Answer

- What was the City of Pensacola's tree canopy before Erin (1995)
- How much canopy was lost after major events
- Where were the losses & have they recovered
- Where has greatest recovery happened since Ivan and why
- What is the tree capacity in the city's watersheds
- How is coverage distributed over our riparian areas
- How are trees distributed along population corridors

City of Pensacola Changes over Twenty Years

27% Decrease
Urban Tree Canopy

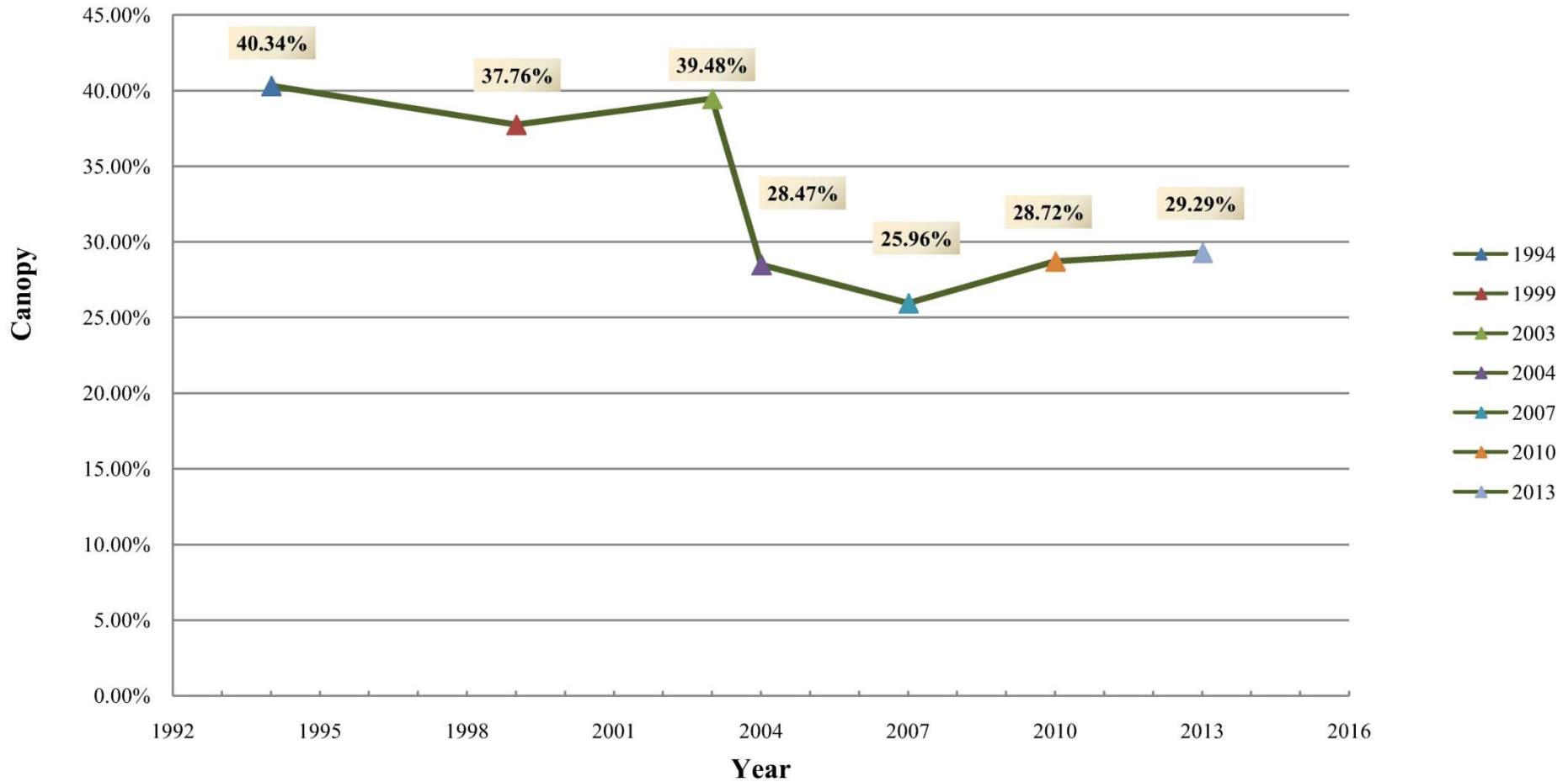
- Canopy 1994 at 40.37 %
- Canopy 2013 at 29.29%



*Dark Purple representing areas of highest Loss

Canopy Coverage 1994-2013

City of Pensacola



Major Hurricanes which have made landfall at or near Pensacola in the last 20 years include:

Erin (1995), Opal (1995), Georges (1998),
Ivan (2004), and Dennis (2005).

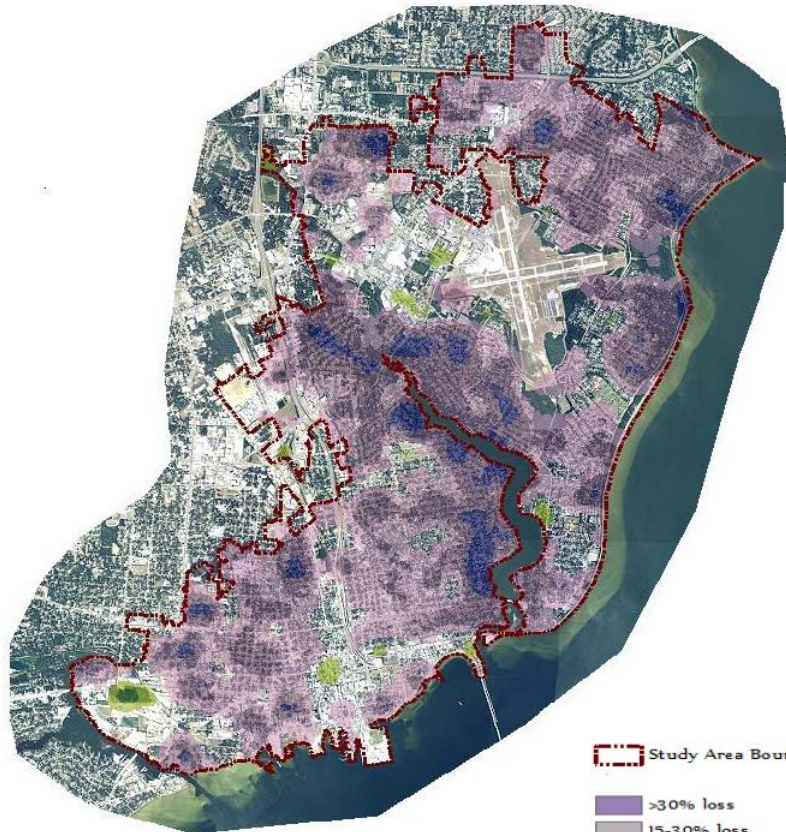
Highest Loss 2003 to 2007

33% City Wide Canopy Loss

Urban Tree Canopy Change
2003 to 2004
Pre- Ivan to Post Ivan

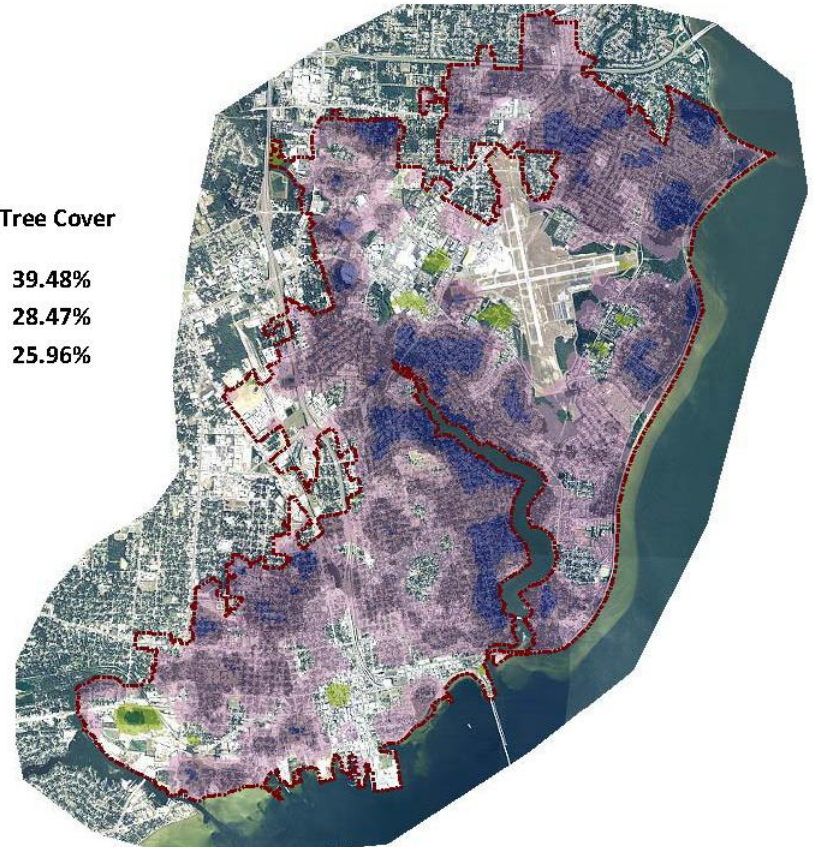
Dark Purple Represents Highest Loss


Urban Tree Canopy Change
2003 to 2007
Pre- Ivan to Post Dennis










Percentage Tree Cover

- 2003 39.48%
- 2004 28.47%
- 2007 25.96%



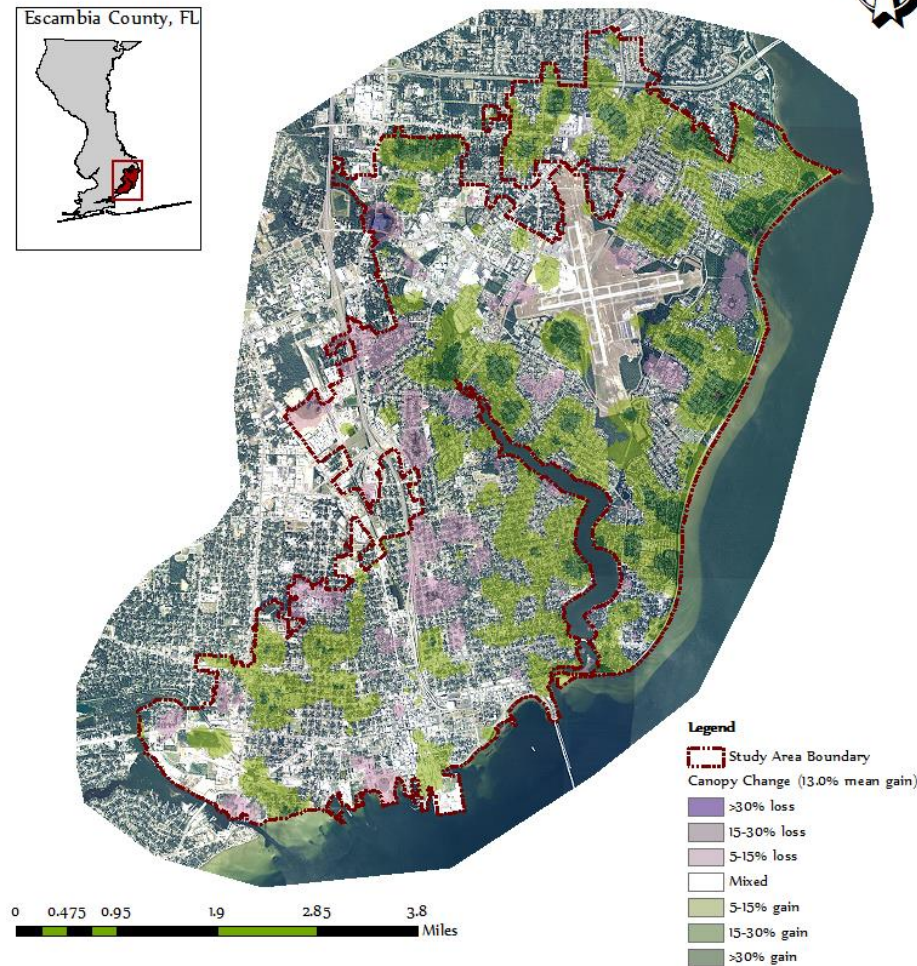
 Study Area Boundary

 >30% loss
 15-30% loss
 5-15% loss
 Mixed
 5-15% gain
 15-30% gain
 >30% gain

*Data Source: Escambia County, DOT, USDA, City of Pensacola

*Canopy Change map generated through a kriging interpolation function of 6,515 sample points visually classified with aerial orthophotos taken in 11/03, 12/04 & 04/07

City of Pensacola Canopy Change (2007 - 2013)




13% Urban Canopy Increase 2007 to 2013


Natural Regeneration or Planting Program?

- Dark green represent areas of greatest increase
- Purple areas represent areas of loss.


2013 Canopy Coverage Divided by Location

Legend


 Study Area Boundary

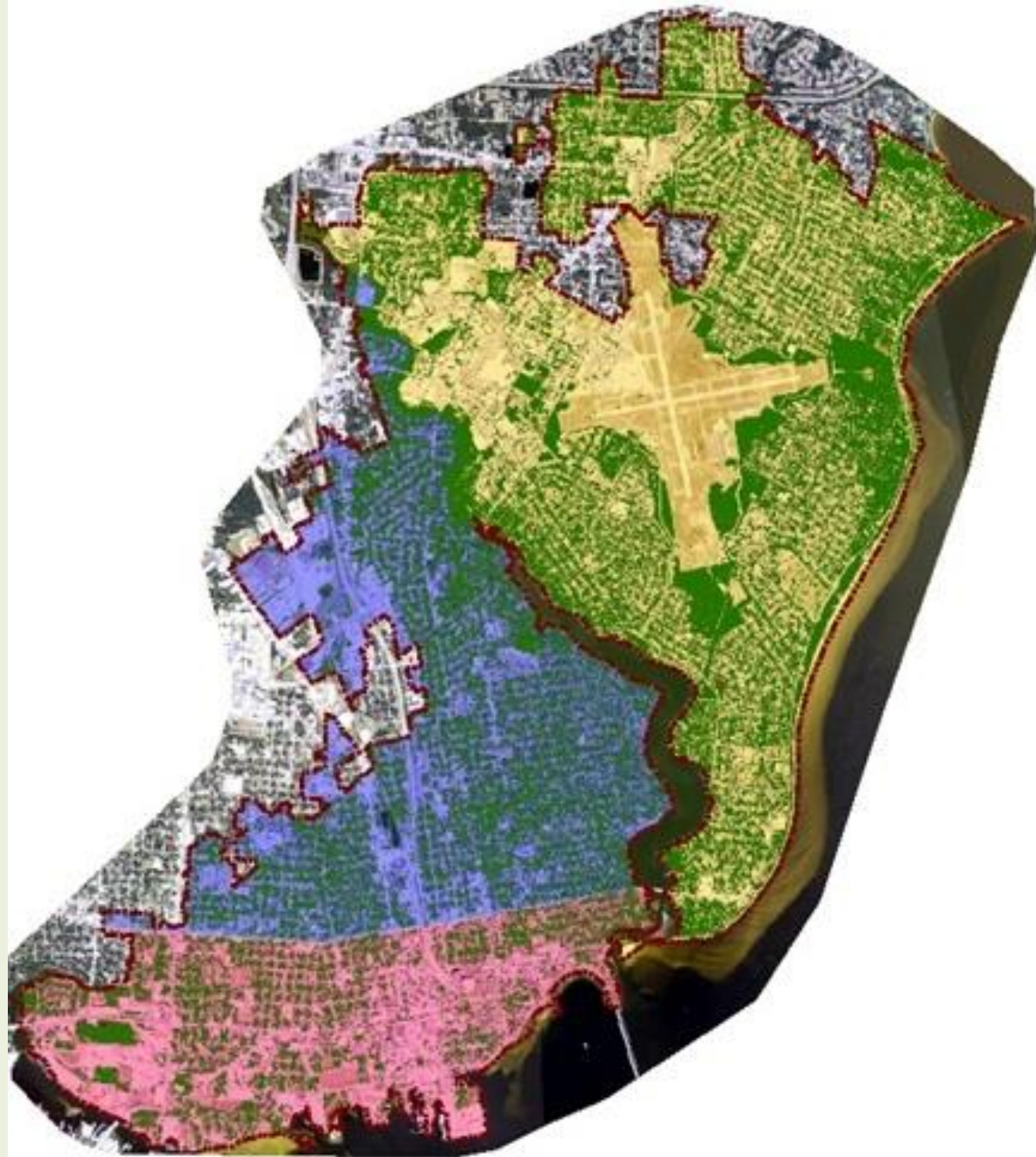
 Canopy

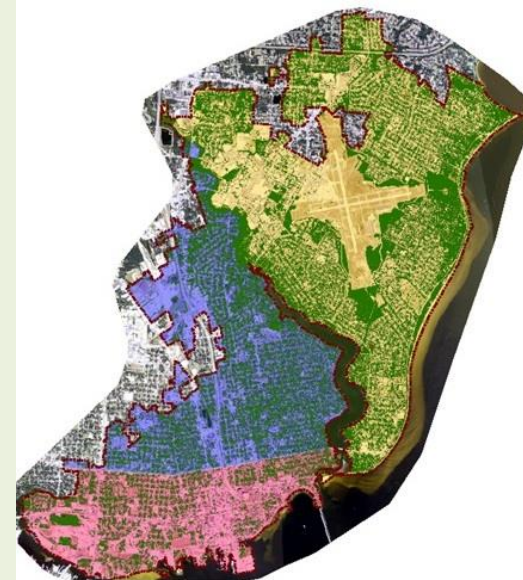
Canopy Cover by Location

 North (38.76%)

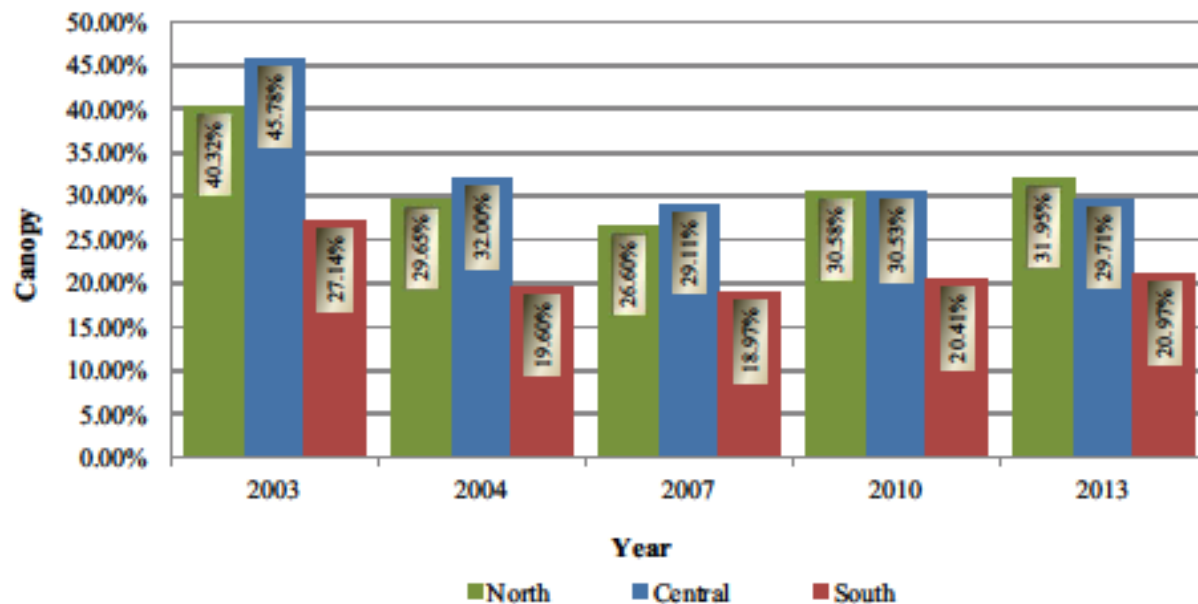
 Central (37.86%)

 South (24.80%)





Canopy Coverage 2003-2013
City of Pensacola NCS Delineations



Boundaries for Location


South - Downtown to Cervantes


Central- Cervantes to Texar/Carpenters Creek

North of Texar/Carpenters Creek


Watersheds


Legend


 Study Area Boundary


 Canopy

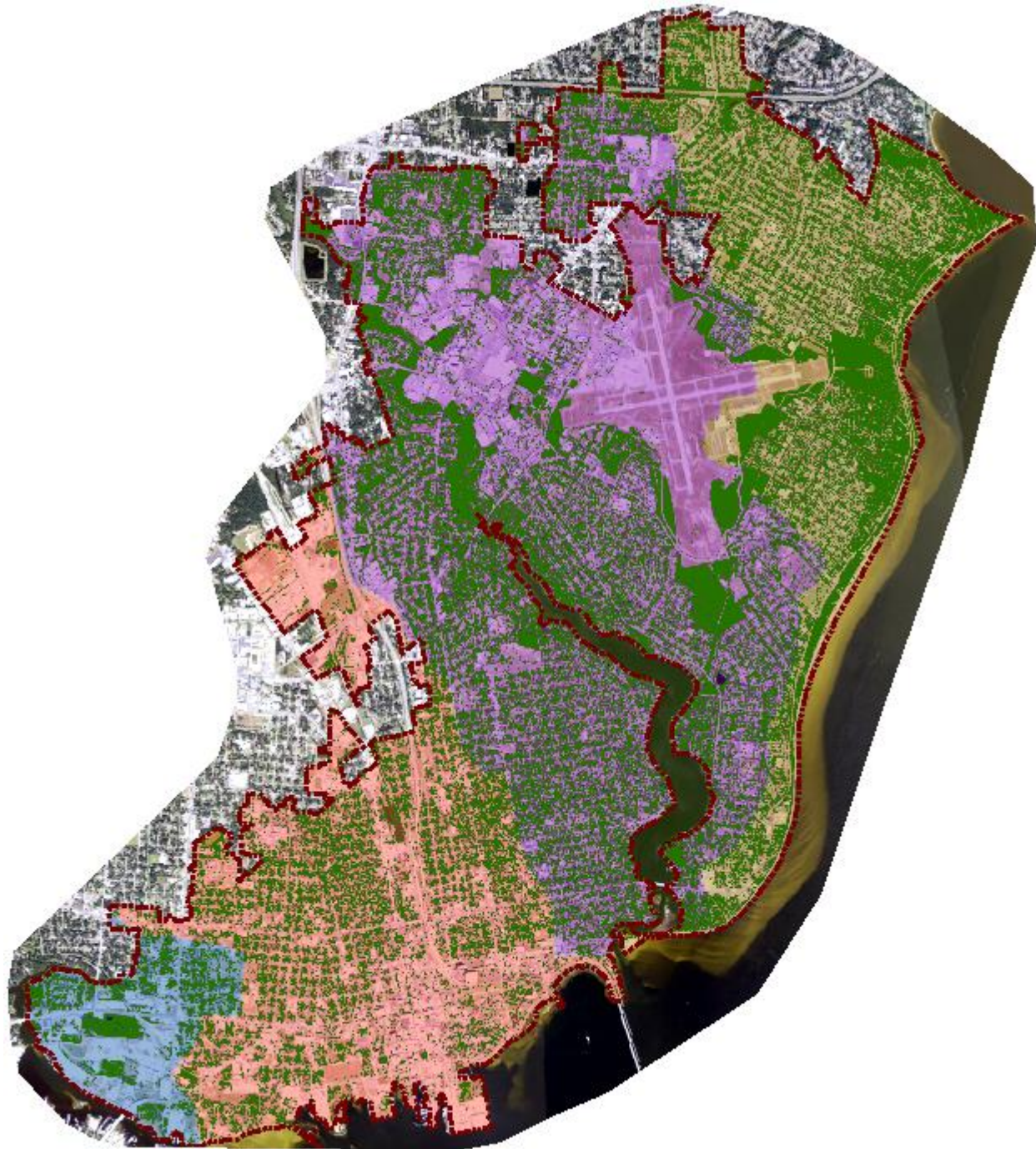
Canopy Cover by Watershed

 Chico Bayou (27.35%)

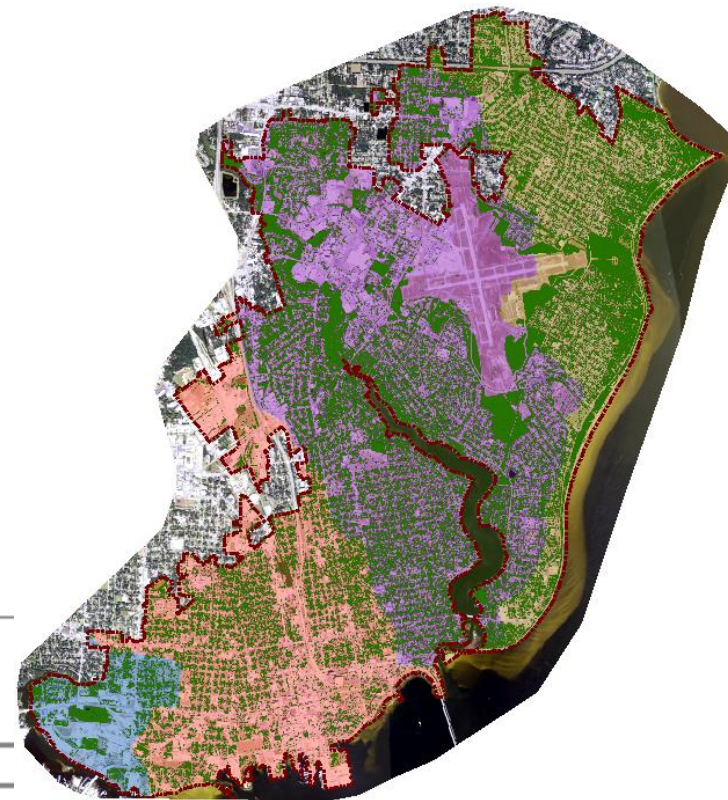
 Downtown (25.80%)

 Pensacola Bay (45.25%)

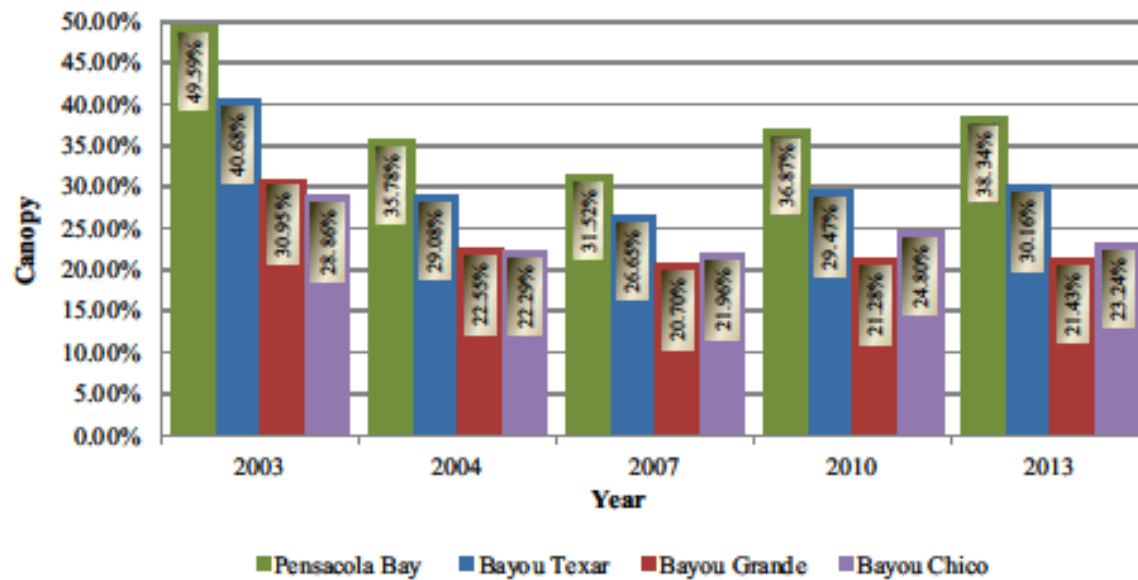
 Texar Bayou (38.18%)



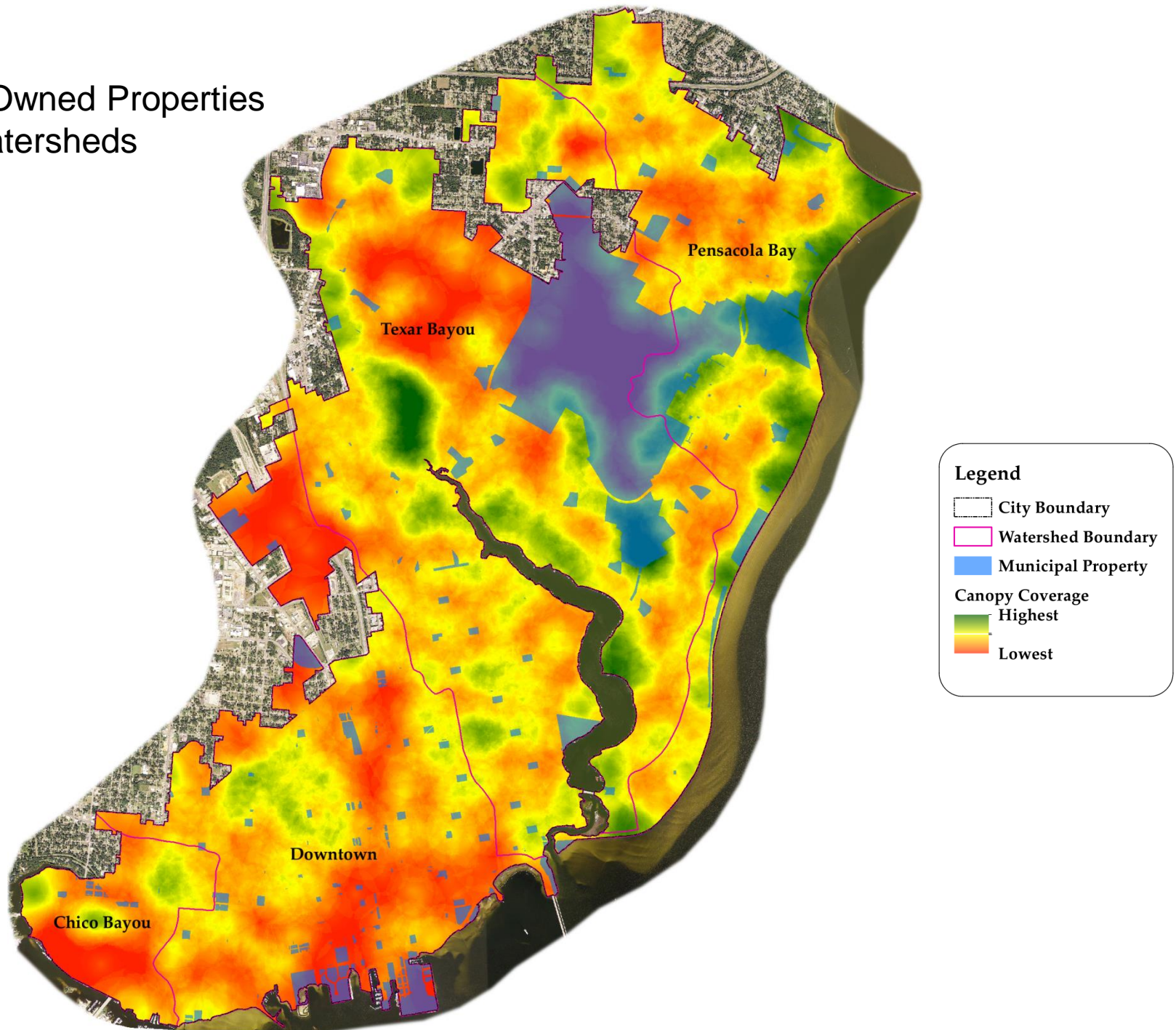
Watersheds



Canopy Coverage 2003-2013
City of Pensacola WBIDs



City Owned Properties in Watersheds



Questions to Answer

Phase 1.B

- Who owns the majority of the City's Trees? (Public vs Private)
- What is tree coverage capacity of public lands
- What public lands offer the best opportunity for immediate investment. (shade, water quality, aesthetics and sustainability)
- What can the canopy look like in 10 years without additional inputs
- Do those align with areas that would benefit the most from more canopy coverage
- Can the City recover to a pre-Erin canopy
- What is the potential canopy increase in watersheds
- How are trees distributed along population corridors
- Potential canopy in gateway corridors



**Find Potential Planting Areas
& Potential For Increase**



Phase 1B: Advanced Cover Modeling (Identifying “Plantable Space”)

- **Utilizes remote sensing (Supervised Classification) techniques** to extract actual canopy cover metrics
 - Methodology based upon ESRI & general remote sensing guidelines
- **Acquired & processed 4-band color infrared orthoimagery**
 - Applied 2-step image classification regime
 - **Phase 1B canopy metrics aligned with Phase-1A baseline!**
- **Created a land cover model** classifying (Canopy, Impervious areas and “Open Space”)
 - ***Aquired/edited^ and generated new**** layers defining “Un-plantable” space
 - Canopy*
 - Recreation Fields*
 - Stormwater/retention ponds & banks^
 - Stream areas* (listed in USGS database)
 - Other surface water^
 - Roads^
 - Buildings^
 - Other pavement^
 - Airport runway area*
 - 50ft railroad buffers*
 - ***Open Space (i.e. “Plantable Space”)*** determined by omitting all un-plantable areas

Phase 1B: Advanced Cover Modeling (Continued)

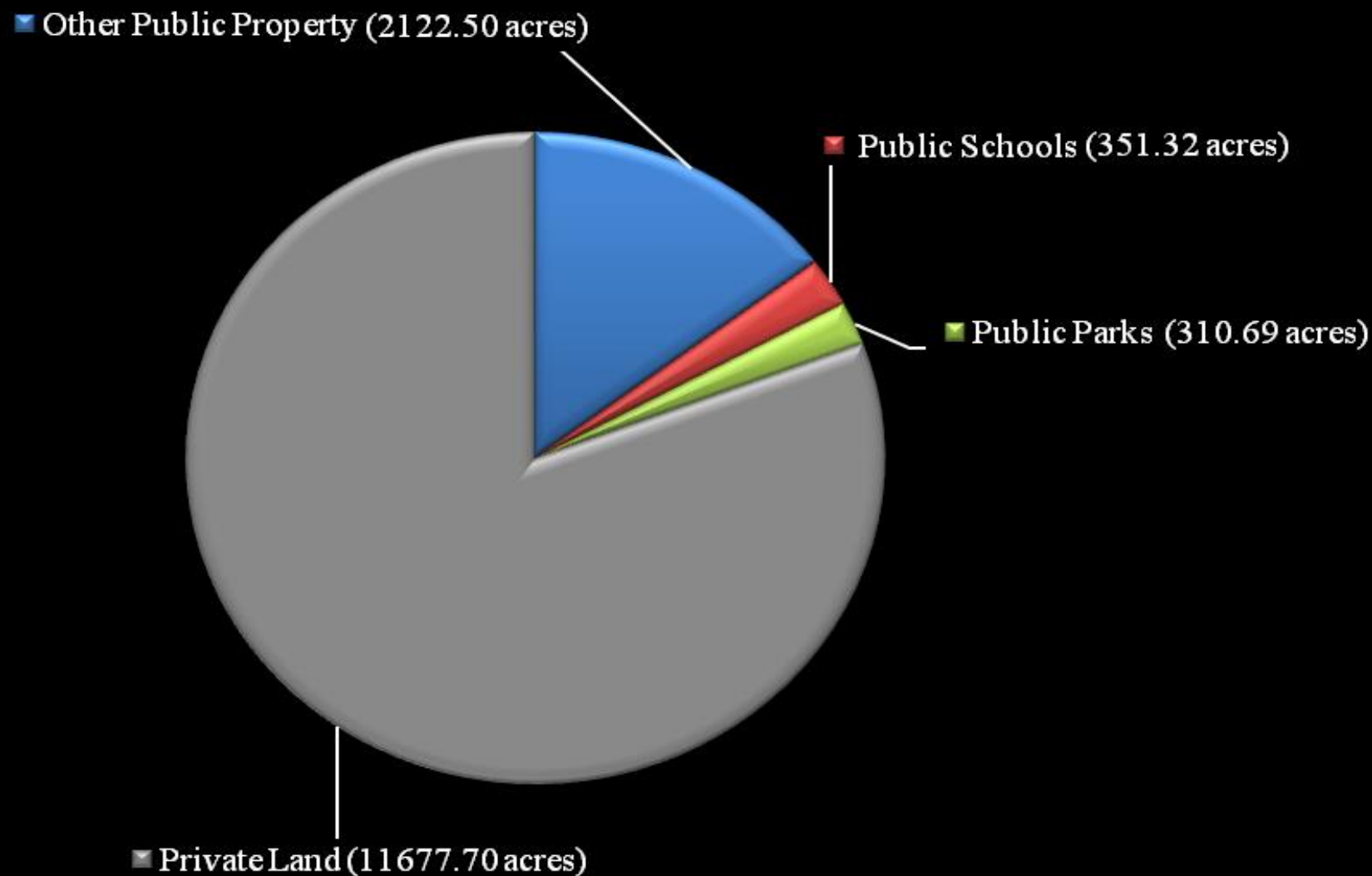
Identifying “Plantable Space”

- **Land cover model intersected with areas of interest to determine available planting space and land cover characteristics**
 - *Aquired/edited*^ and *generated new** layers defining areas of interest
 - Watersheds
 - Riparian buffers^ (50, 100 & 200 ft.)
 - Right of Ways*
 - Municipal, Gateway & State/Federal
 - Ownership/Land Use data by Parcel^
 - Residential, Commercial, Industrial, Institutional, Government & Other **Dept. of Revenue (DOR)** Use Codes
 - Municipal Property
 - Other Government (non-municipal) property
 - City Parks
 - Private Land

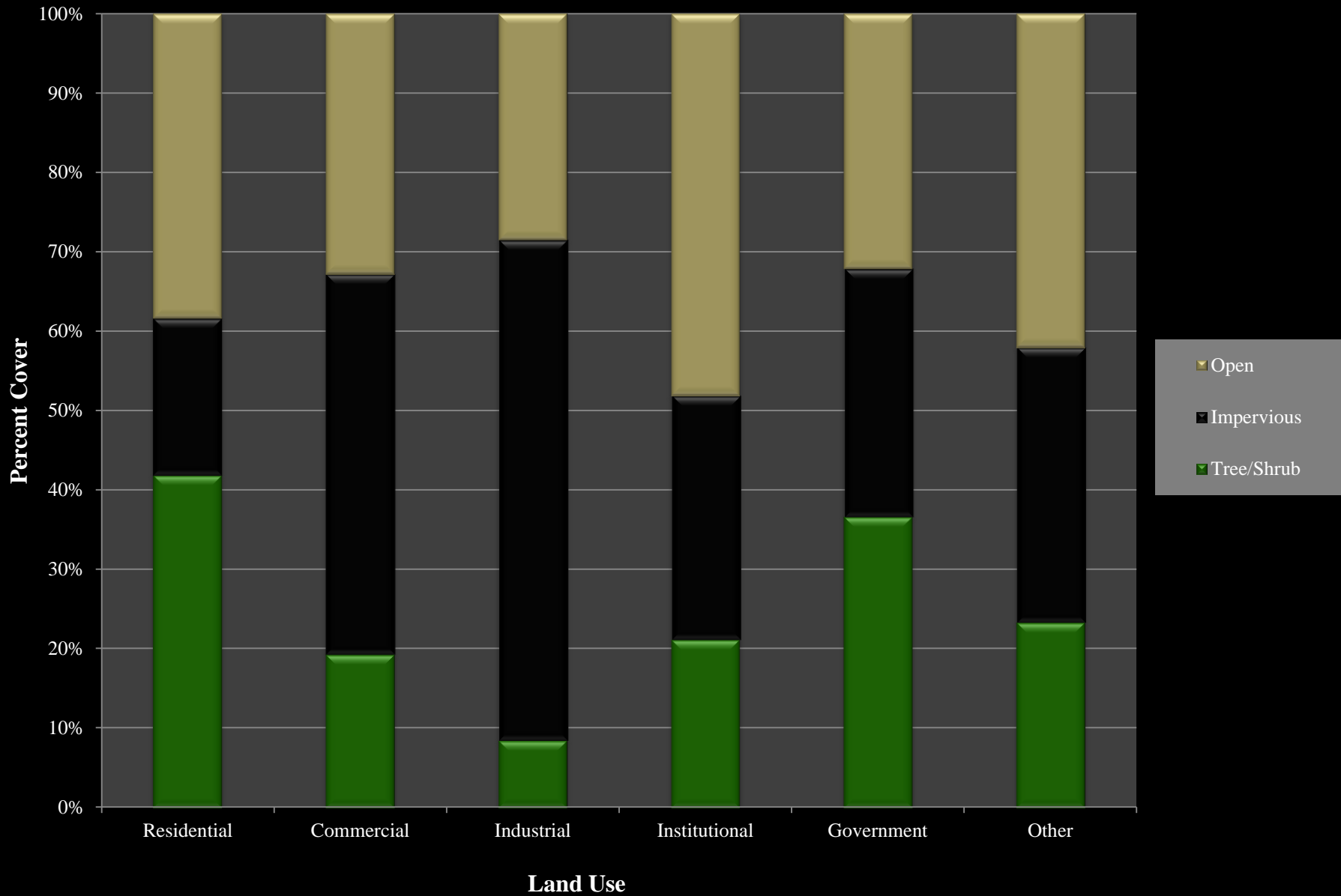
Terminology

- **Urban Tree Canopy:** layer of leaves branches and stems of trees that cover the ground when viewed from above.
- **Potential Planting Areas:** Open Space Measurement contains a minimum of 100 square feet of contiguous space for possible tree planting. non-water, non-road, non-building, non-ball field, non-canopy area.
- **Preferable Planting Space:** Areas with optimum soil volume for tree long term viability. Site characteristics taken into account including; over and in ground utility lines, sidewalks, site distance for vehicles, use of area.....
- **Starting Point** for municipality to set measureable & obtainable goals for management of urban forest resources.

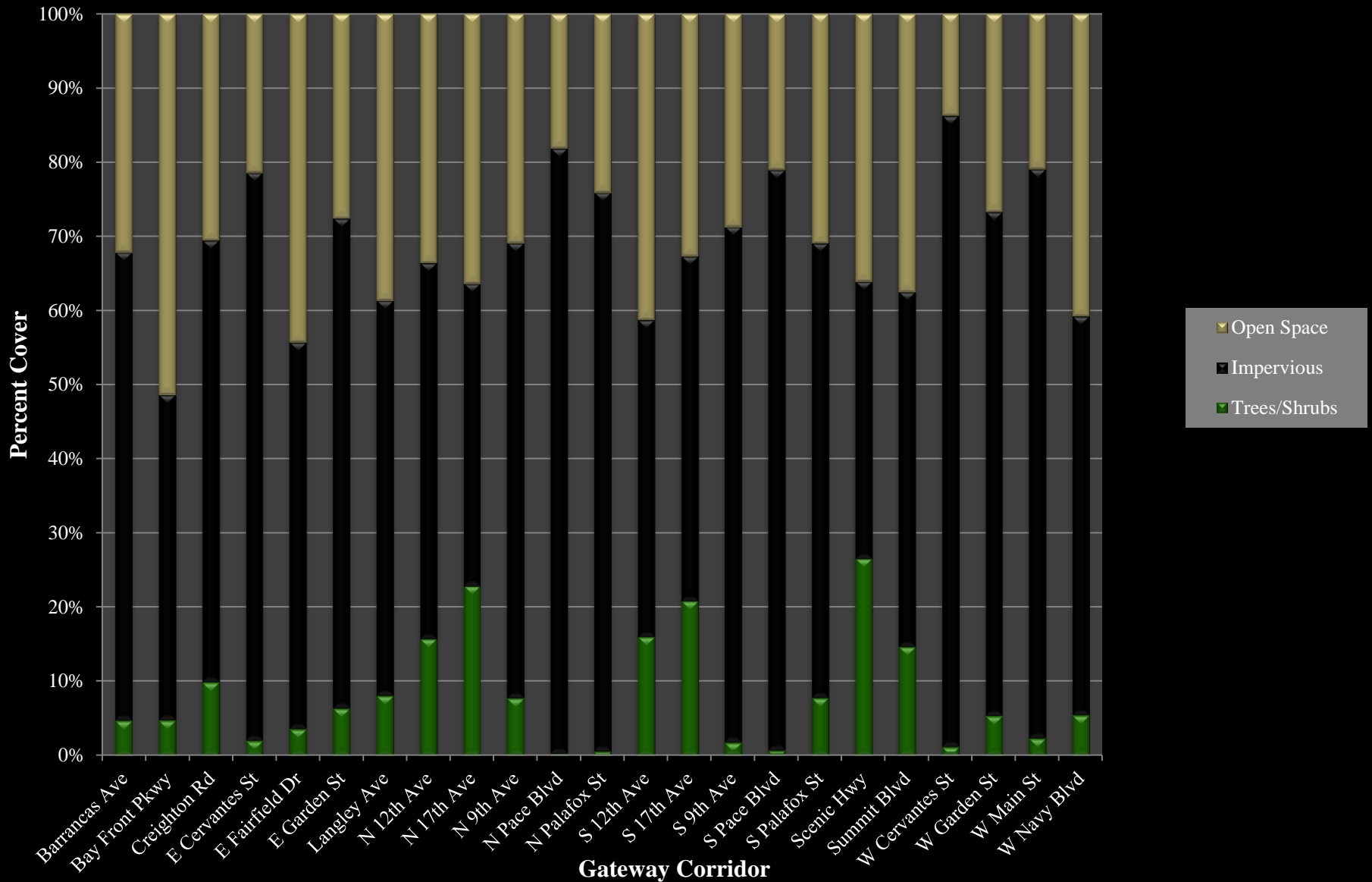
Public V.S. Private Land Area



Land Cover by DOR Classification



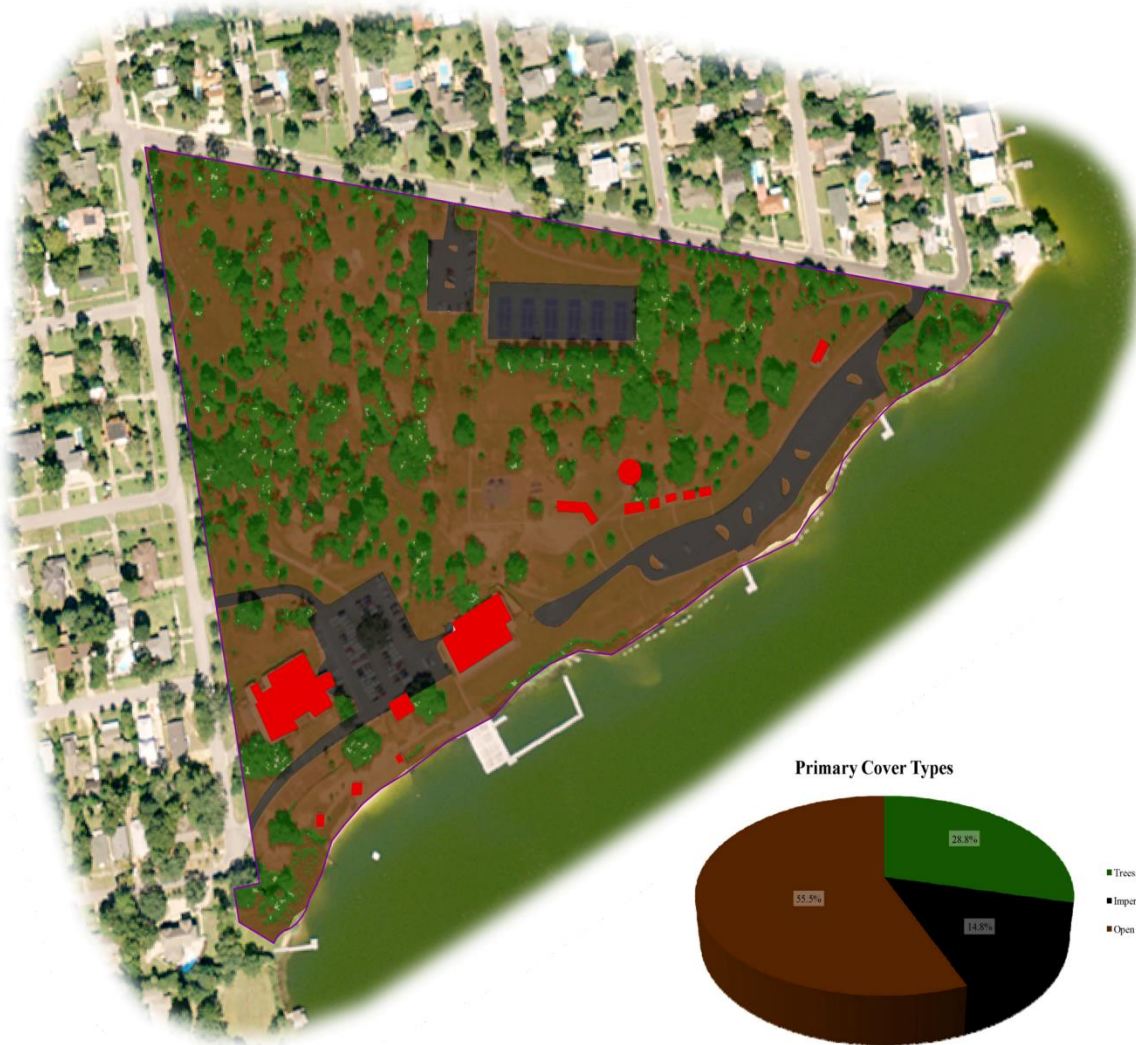
Land Cover by Gateway Corridor



Pensacola, FL Boundary



2013 Urban Cover Map Bayview Park

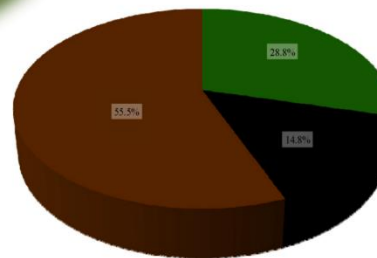


*Tree/Shrub cover was determined by performing a supervised image classification on USDA NAIP (1M/4-Band) aerial orthophotos acquired in October 2013. Additional land cover information was generated through a combination of editing existing datasets and the creation of new data.

Legend

- Park Boundary
- Buildings
- Pavement
- Open Space
- Trees/Shrubs

Primary Cover Types



- Trees/Shrubs
- Impervious
- Open Space



Data Sources:
Escambia County, City of Pensacola, U.S. Dept. of Agriculture

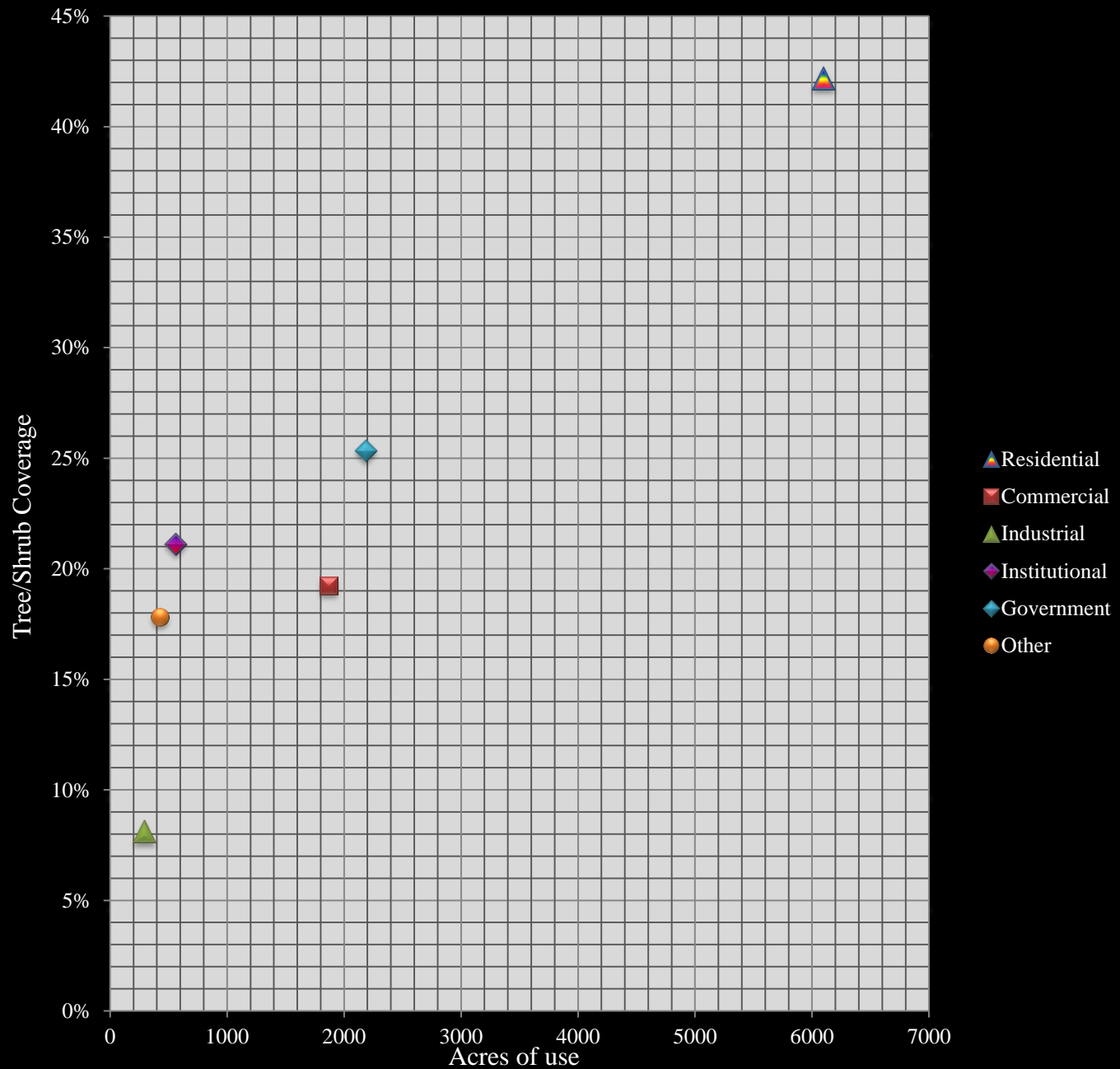
0 0.025 0.05 0.1 0.15 0.2 Miles
1 inch = 110 feet

"This map/data was prepared by the Escambia County Water Quality & Land Management Division and is provided for informational purposes only. It is not to be used for development of construction plans or any type of engineering services based on the information depicted herein and is maintained for the function of this office only. It is not intended for conveyance, nor is it a survey. The data is not guaranteed accurate or suitable for any use other than that for which it was gathered."

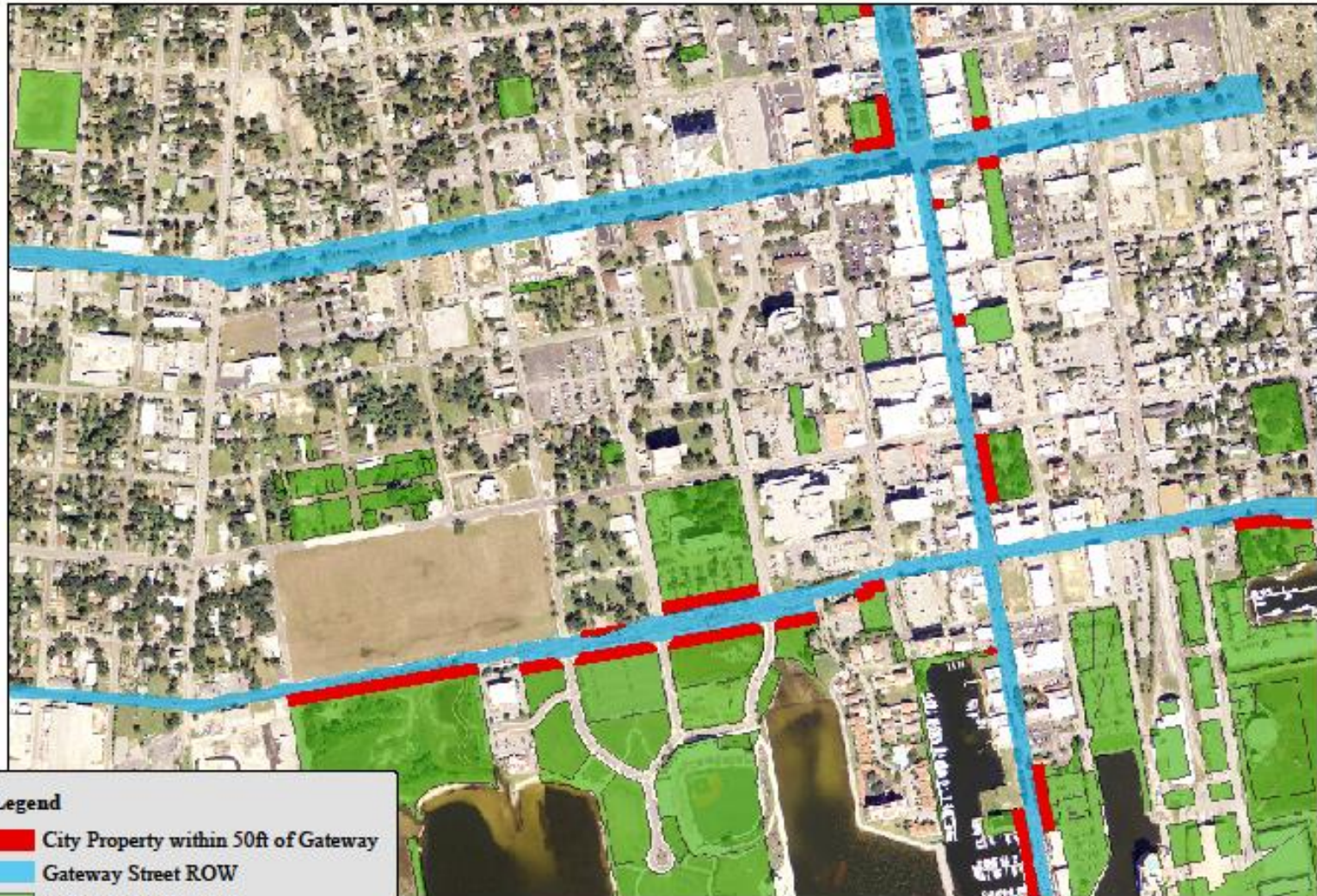
May 2014

Map Author: Lucas Fortman, Escambia County Water Quality & Land Management Division




Vegetation Assessment by DOR Classification



Potential Planting Areas in Gateway Right-of-Way (ROW) City of Pensacola



Legend

-  City Property within 50ft of Gateway
-  Gateway Street ROW
-  City Owned Property

0 0.05 0.1 0.2 0.3 0.4 Miles



Data Sources: Escambia County, City of Pensacola, U.S. Dept. of Agriculture

"This map/data was prepared by the Escambia County Water Quality & Land Management Division and is provided for informational purposes only. It is not to be used for development of construction plans or any type of engineering services based on the information depicted herein and is maintained for the function of this office only. It is not intended for conveyance, nor is it a survey. The data is not guaranteed accurate or suitable for any use other than that for which it was gathered."

Urban Tree Canopy

American Forest Recommendation

- 40% Overall
- 50% Suburban Residential
- 25% Urban Residential
- 15% Central Business
Districts

City of Pensacola 2013

- 29.2% Overall
- 42.2% Residential
- 18.6% Residential Downtown
- 18.6% Downtown Business

Urban Tree Canopy Increase

Can the City increase overall UTC by Planting on City Property?

- City Open Space currently 419 acres
- City overall tree canopy is 26.6%
- Increasing coverage to 40% on City Property within 20 years would require planting 5,376 trees (Forest Service to Confirm numbers)
- Answer is No, not with current conditions
- Is canopy increase the ultimate goal?

Phase II --Based on Enhancement Objectives

Ground truth targeted planting sites

Provide site specific recommendations including:

- Species selection
- Plant size
- Plant size
-
- Planting detail
- Maintenance recommendations
 - based on location, size and species.

Trees also have Costs

- ▶ **Costs = Out of pocket costs + Environmental**
 - Planting, maintenance, infrastructure damage, watering, salary, tree debris & litter



Minimize costs!



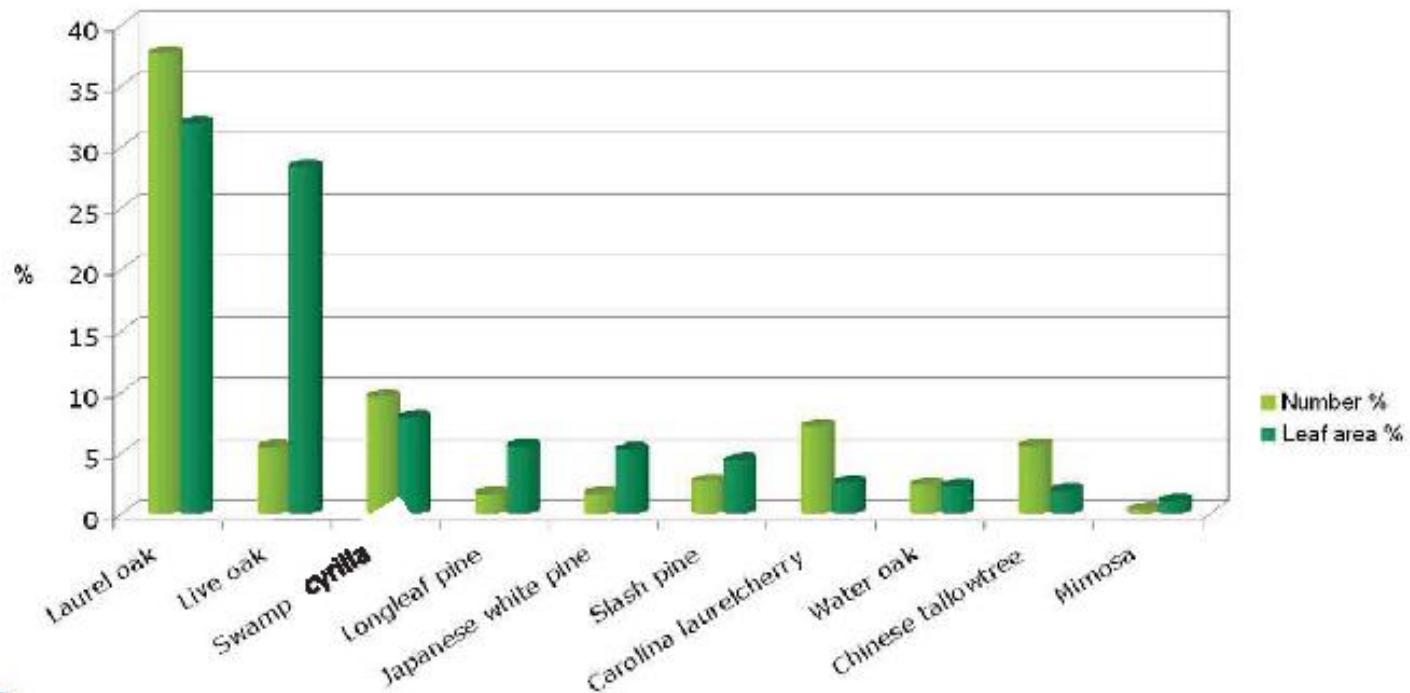
- Other Cost Reductions
 - Pruning with “loppers” to lift canopies over the street before they are a problem
 - Remove or cut back on tree grates
 - Prune new trees for structural improvement
 - Start Planting at site with over-mature trees

Minimize Cost

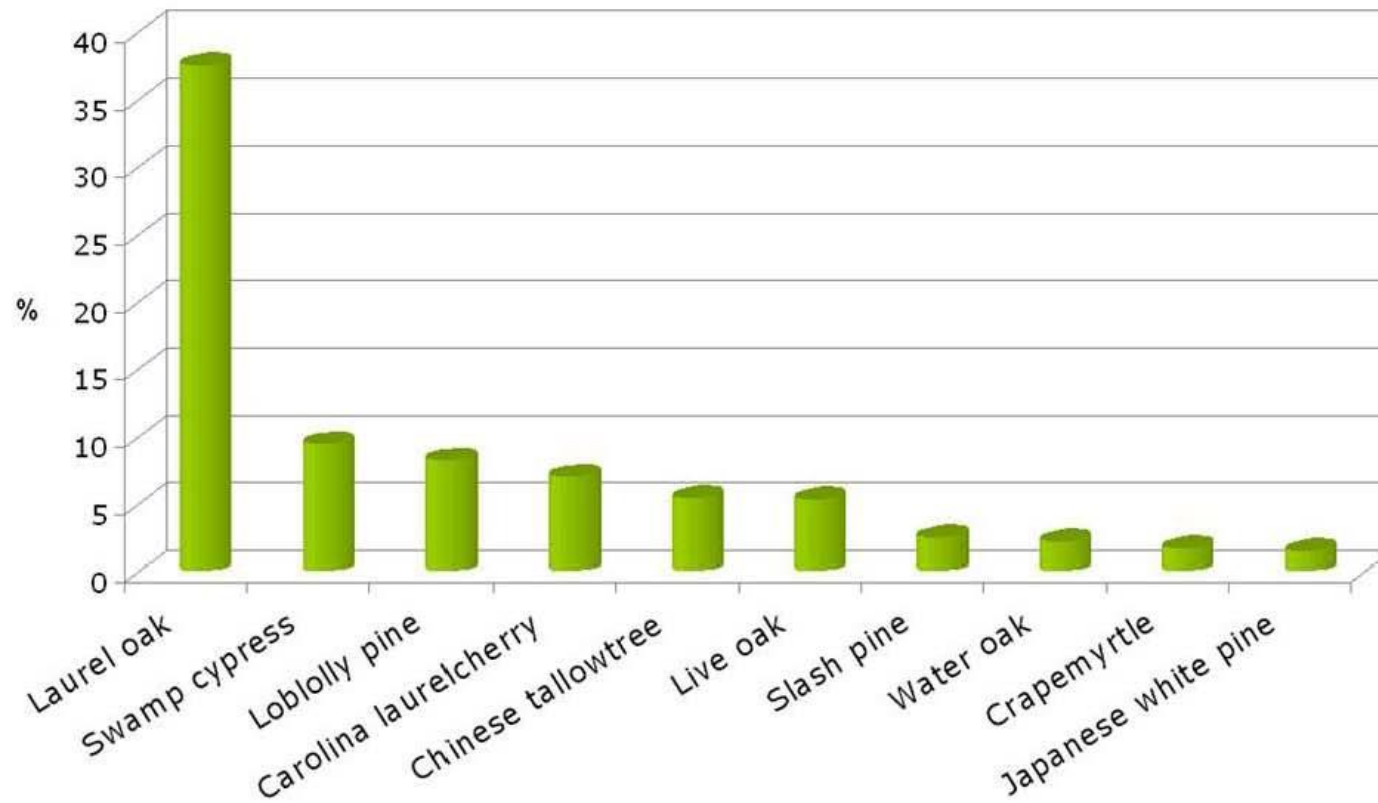
- Structural Pruning Rotation for Mature & Young Trees
- Determine Criteria for Removing High Risk or Hazard Trees
- Plant Right Tree Right Place
- Adequate planting space
- Protect Structural Root Plate

Larger Tree provide more Environmental benefits.

% of total trees and total leaf area for top 10 trees in Pensacola



Top 10 trees out of an estimated 721 thousand trees in Pensacola



Questions ?

