

Urban Forest Canopy Change and Mitigation



Rob Northrop

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Ethics, Conservation, Science

The Partnership

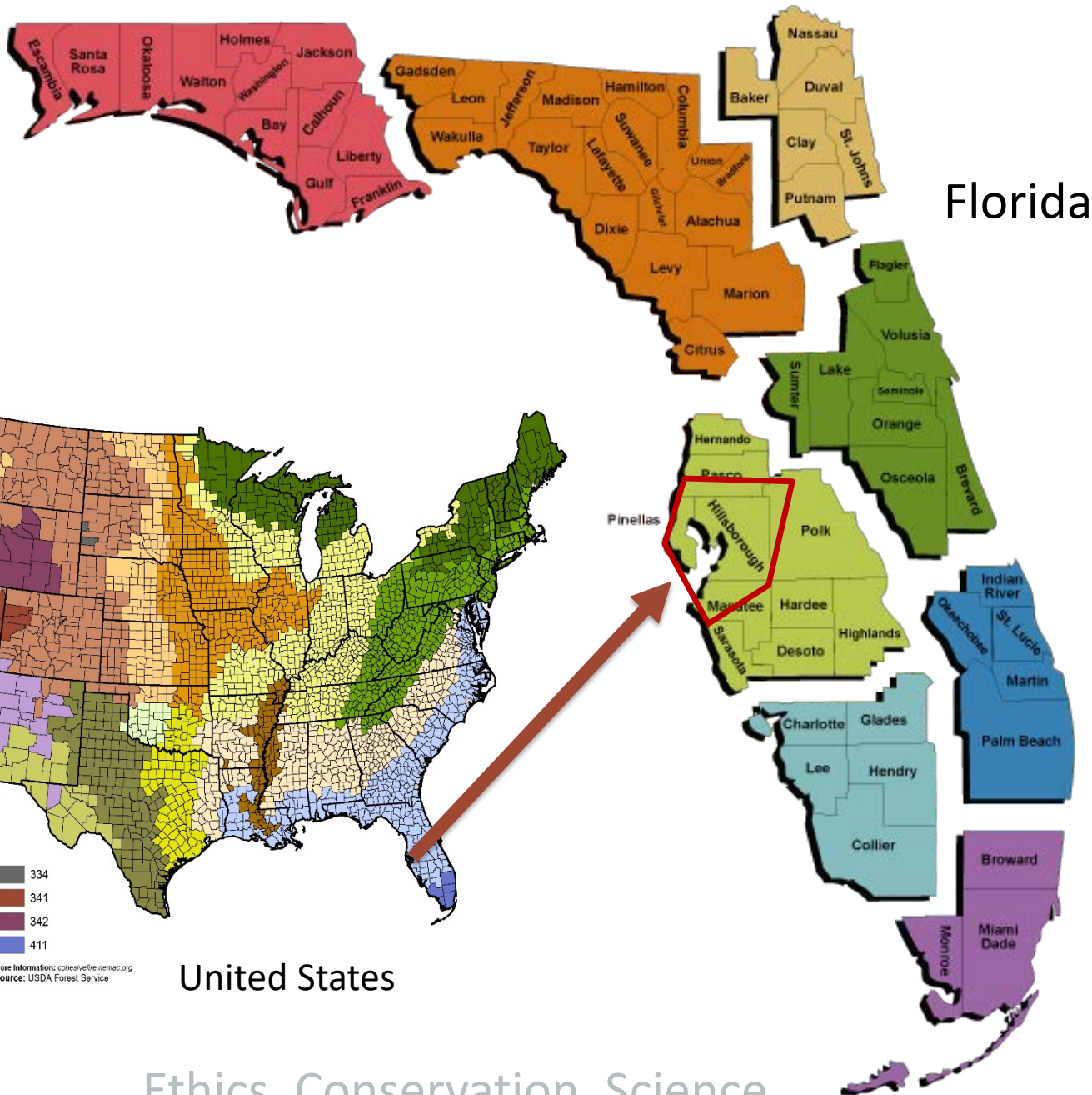
- ▶ City of Tampa
 - ▶ Kathy Beck
- ▶ University of South Florida
 - ▶ Shawn Landry
- ▶ University of Florida
 - ▶ Michael Andreu
 - ▶ Andrew Koeser
 - ▶ Rob Northrop
- ▶ Numerous residents

Inventory and Analysis

Years – 2006, 2011 and 2016 2021



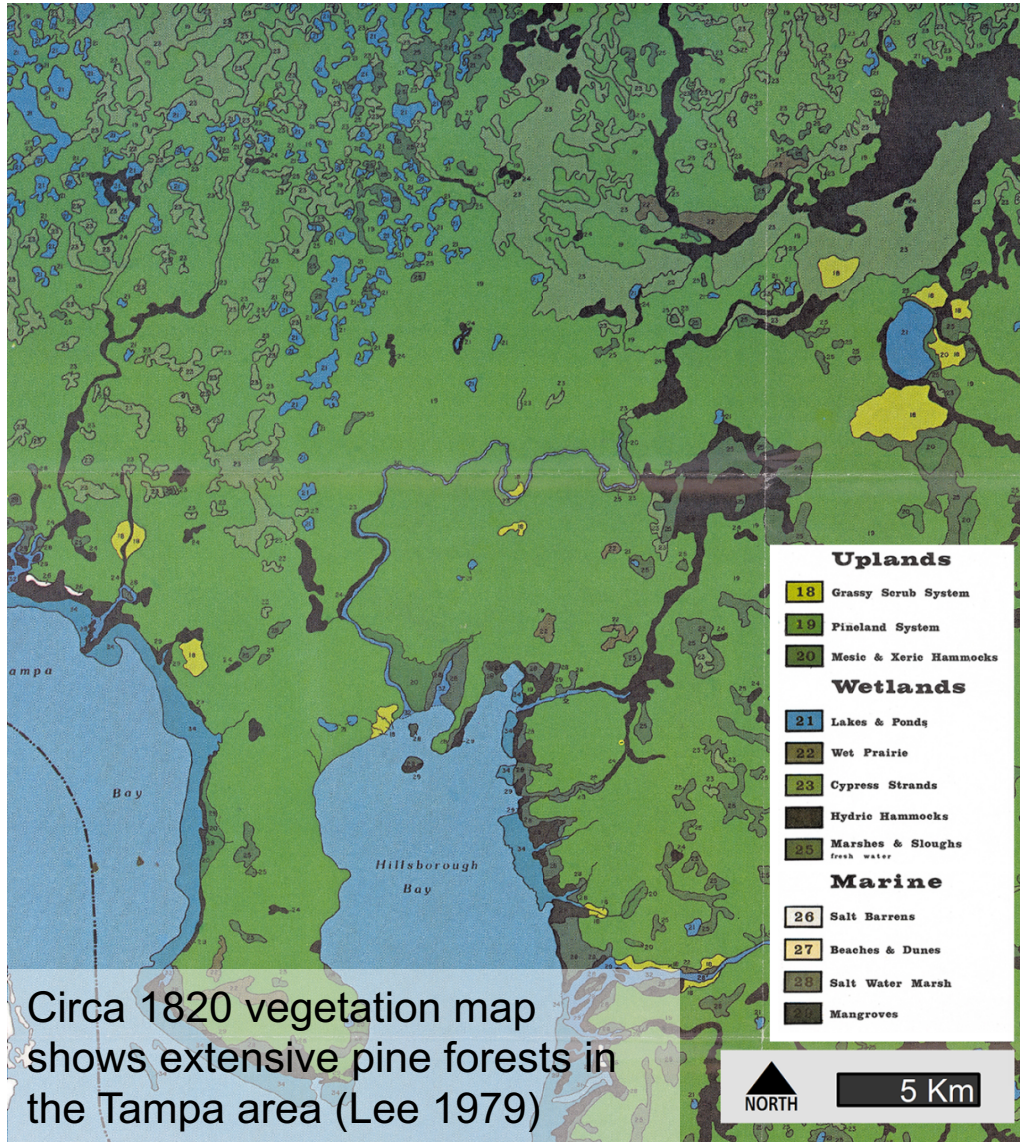
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Florida

United States

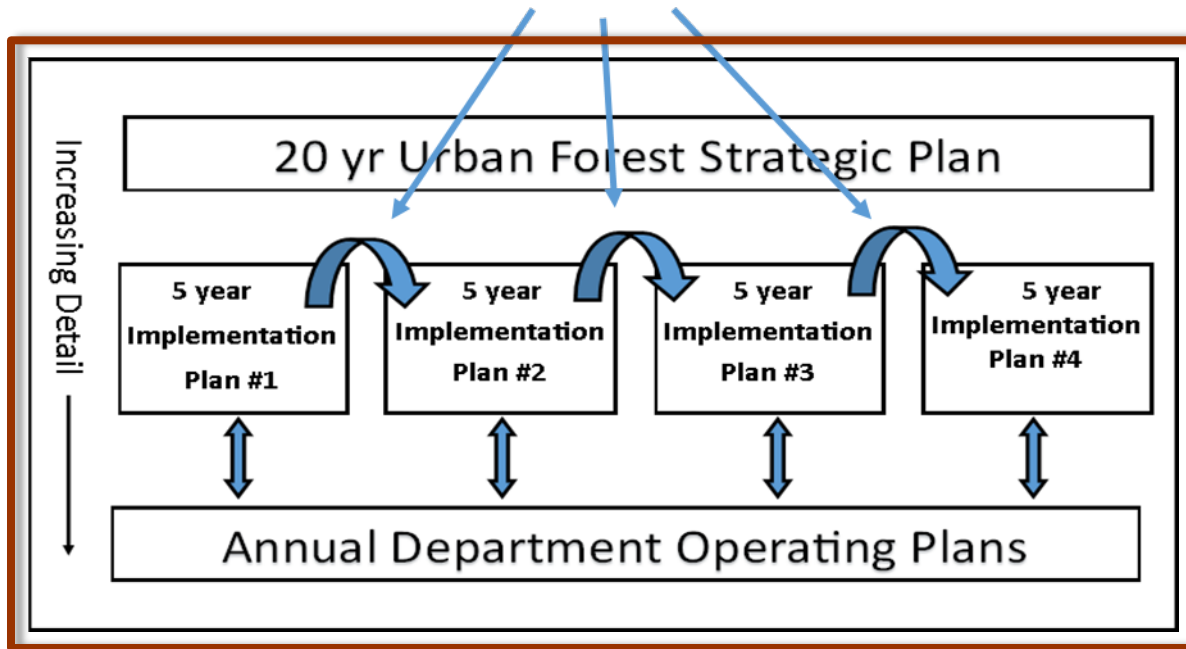
Background: A cultivated urban forest



Urban Forest Management Plan - 2011

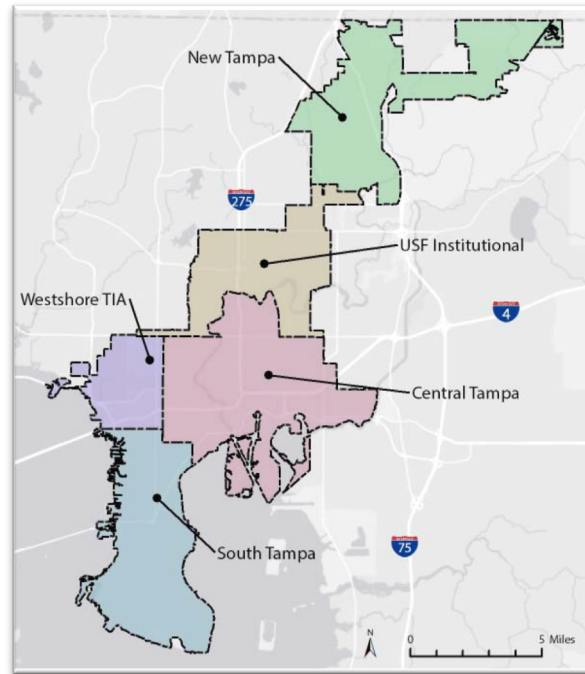
Adaptive Management

Urban Forest Inventory and Analysis (monitoring)



Essential element: Urban Forest Canopy

Key Objective: No Net Loss by Planning District ~ 5 year



Essential Element	Vegetation Resource – Performance Indicators				Key Objective
	Low	Moderate	Good	Optimal	
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. The goal is defined as no net loss in a Planning District.

Tree Canopy Mapping: Object-based Image Analysis

92% confidence interval

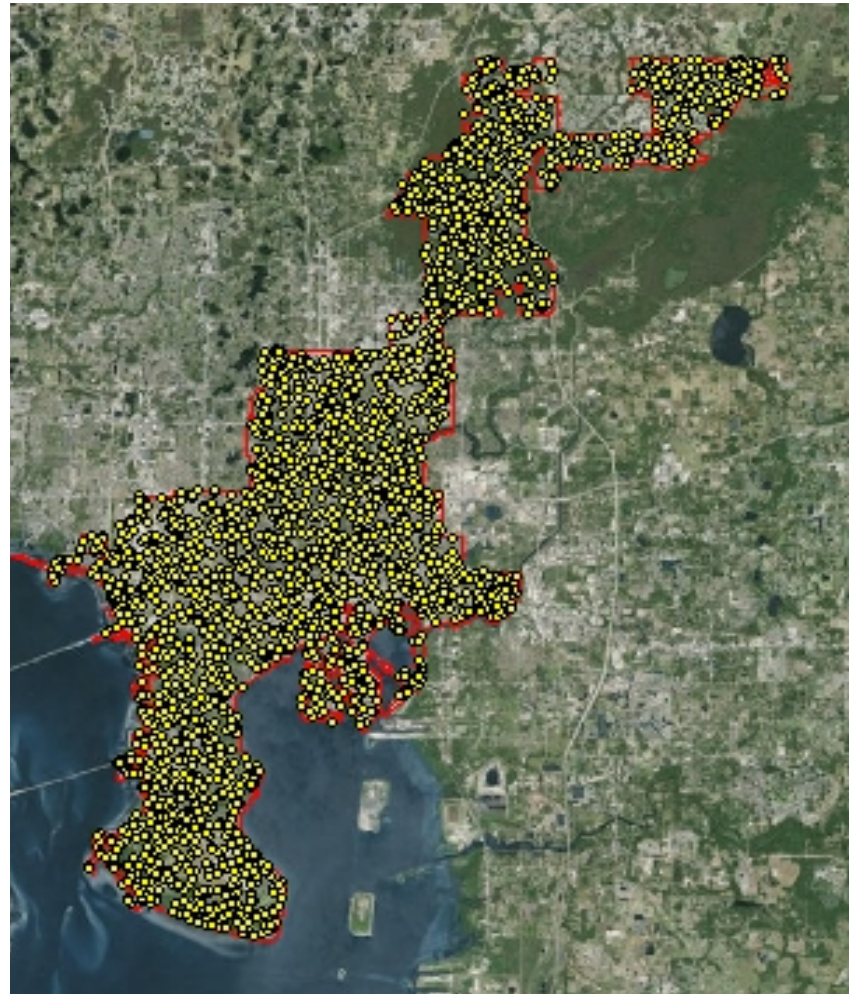
Distribution



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Tree Canopy Change: Dot-based Method

95% accuracy for City-wide canopy

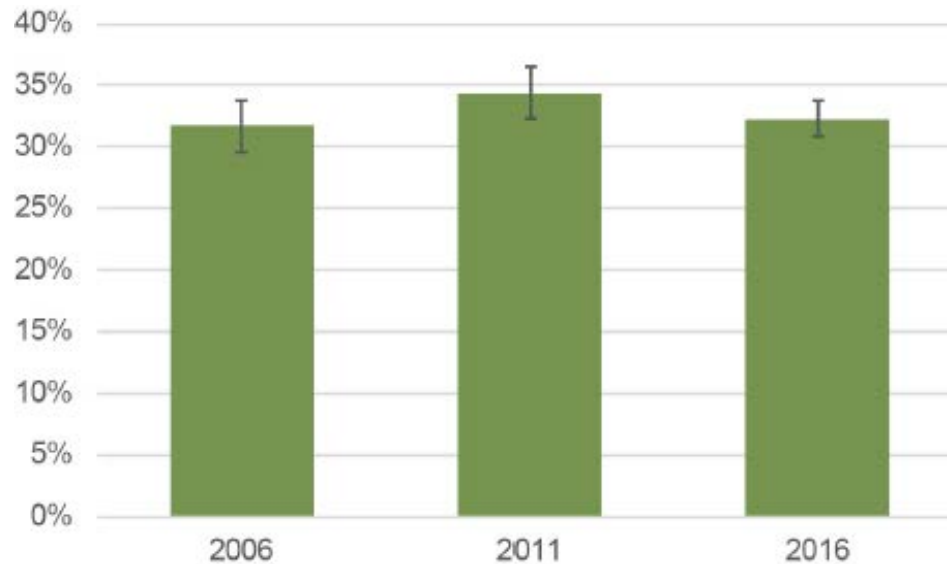


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Consistency in Monitoring

Citywide Tree Cover 2006-2016

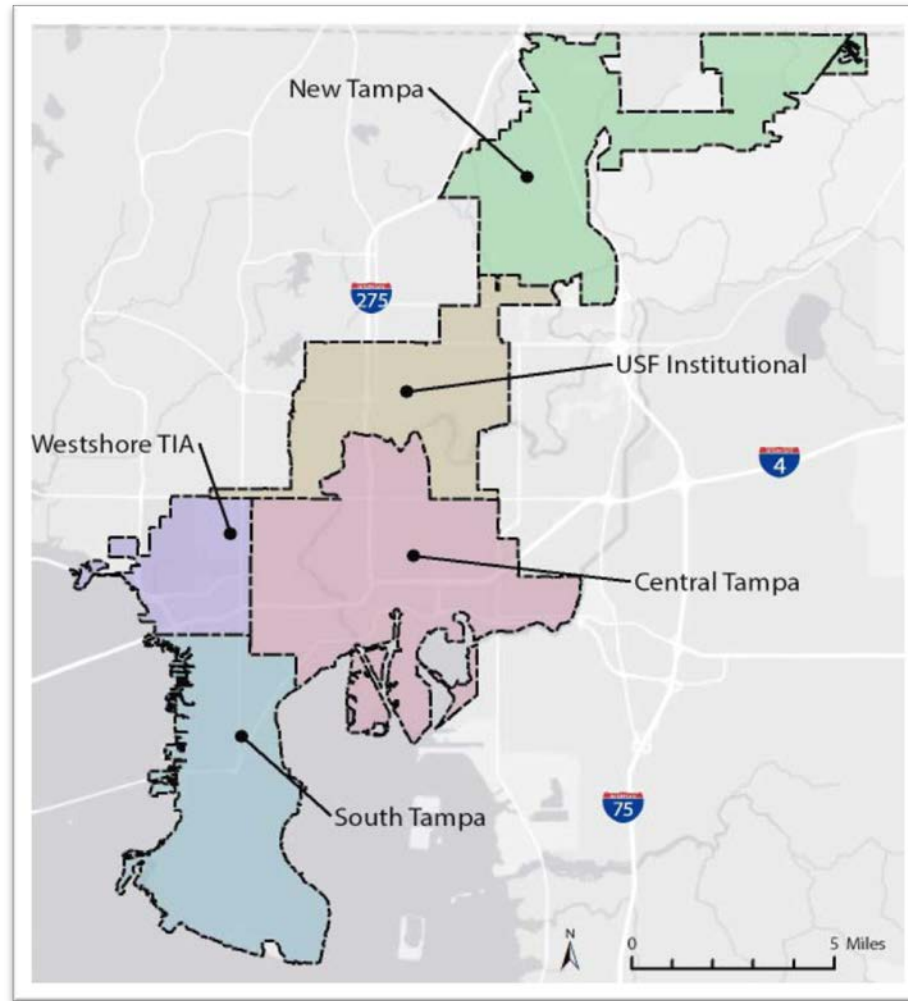


Year	Tree Canopy	95% Confidence Interval
2006	31.7%	CI = 29.6 - 33.8 %
2011	34.4%	CI = 32.2 - 36.5 %
2016	32.3%	CI = 30.9 - 33.7 %

4,199 dots Citywide to achieve 95% confidence interval

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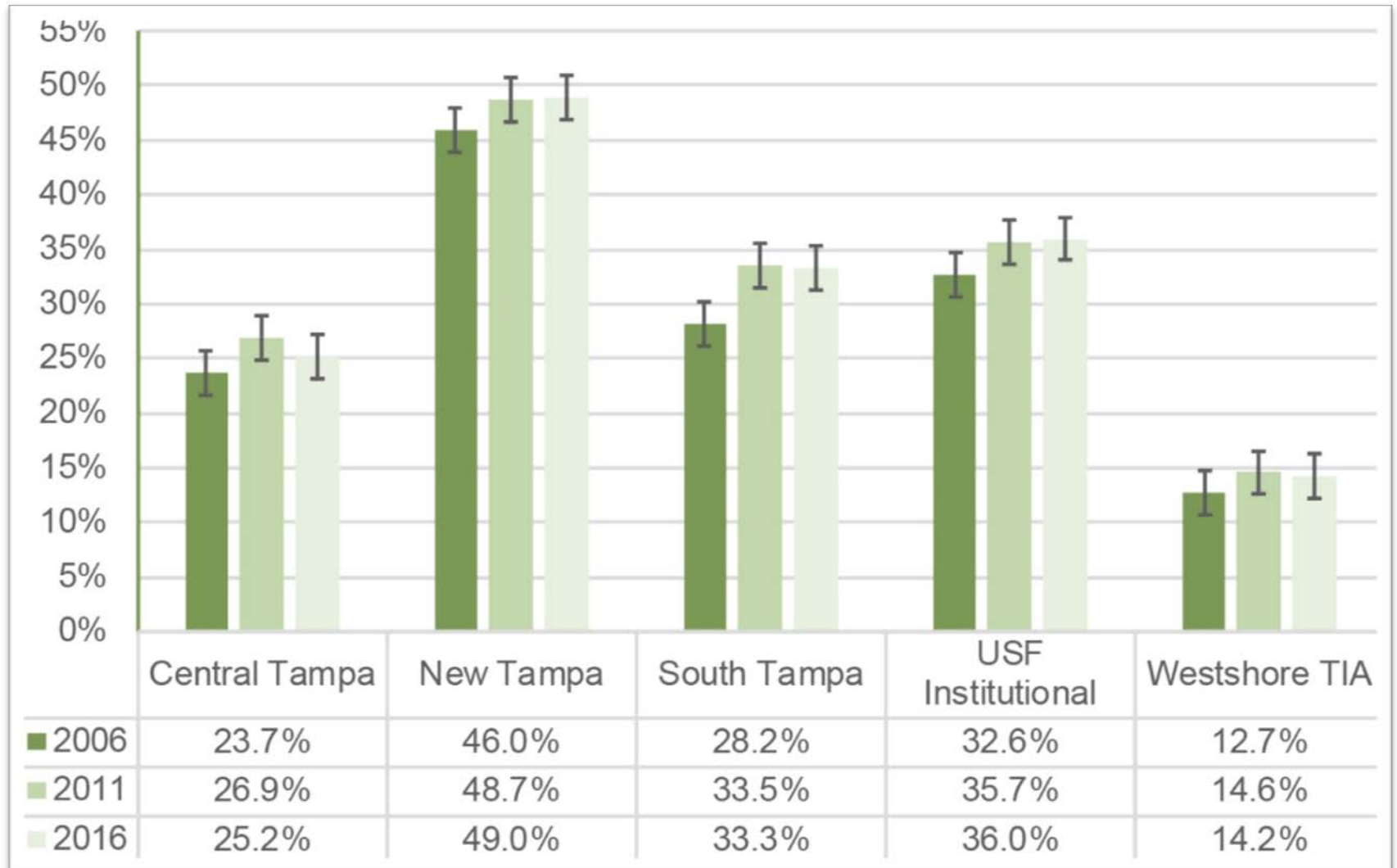
Consistency in Monitoring Quantity of Cover



9,294 dots per District achieve 95% confidence interval

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Key Objective: No net loss of canopy by Planning District

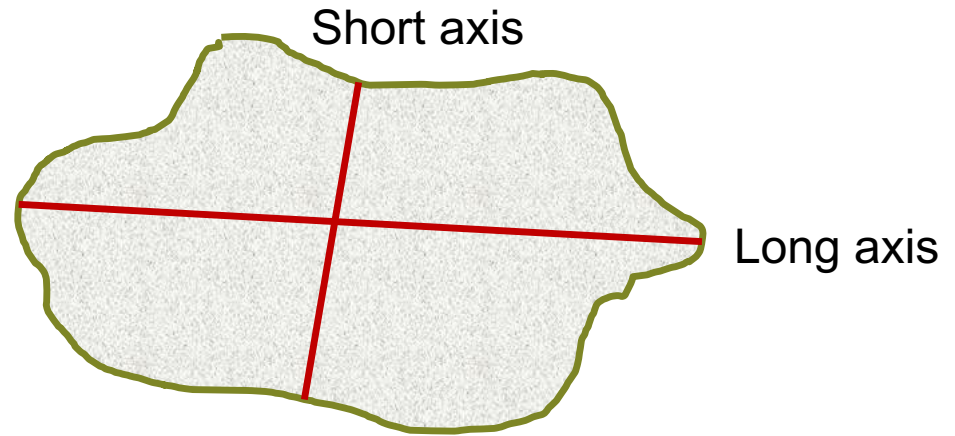


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Canopy Footprint Mitigation by Tree

Step #1: Crown footprint (ft²)

$$A = \pi r^2$$



Step #2: $A \times$ Species Rating for Urban Environments*

Step #3: X Condition Rating** (%) = **required replacement crown area**

Step #4: $/$ Tree Type*** = number of mitigation trees

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Canopy Mitigation by Tree – Example, Live oak

1. Canopy Radius = $(45 + 60 = 100) / 2 / 2 = \underline{26.25 \text{ ft}}$
2. Canopy footprint = $3.14 \times (26.25)^2 = \underline{2164 \text{ sq ft}}$
3. Required replacement =
 $2164 \text{ sq ft} \times (\text{Species Rating}) 0.9 \times (\text{condition class}) 0.9$
 $= \underline{1,753 \text{ sq ft}}$

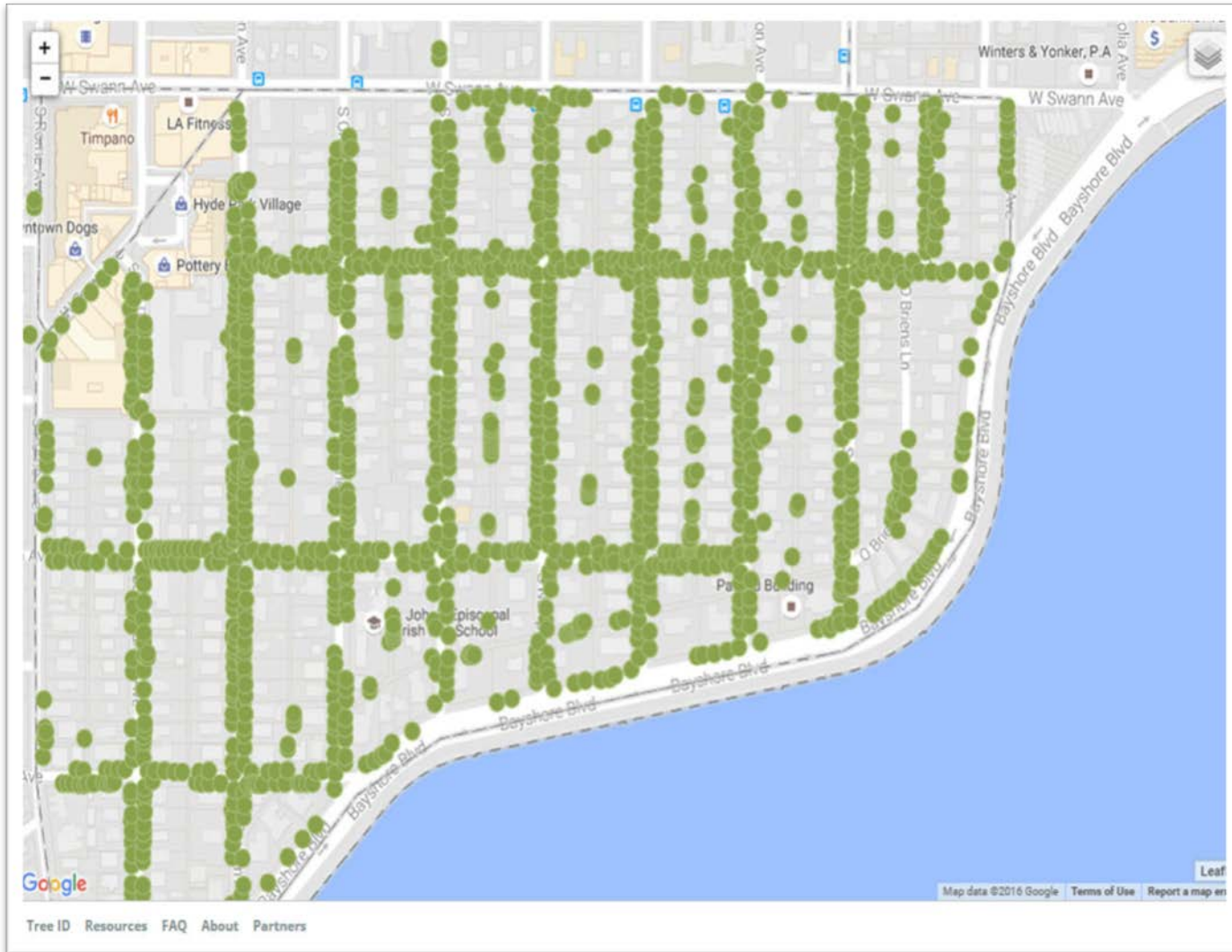
Live oak is a Type 1 tree**, so:

$$1,753/154 = \underline{\mathbf{11 \text{ trees (2.5'' caliper)}}}$$

** Type 1 tree = 154 sq ft canopy footprint (2.5" caliper nursery stock)

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Next steps: All Tree Removals are Mapped



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