# H-GAC'S Regional Urban Forestry Summit

## TREE INVENTORIES

## Estimating the Value and Importance Of Community Trees and Urban Forests

Charles Burditt
Urban and Community Forest Planner; *BURDITT*

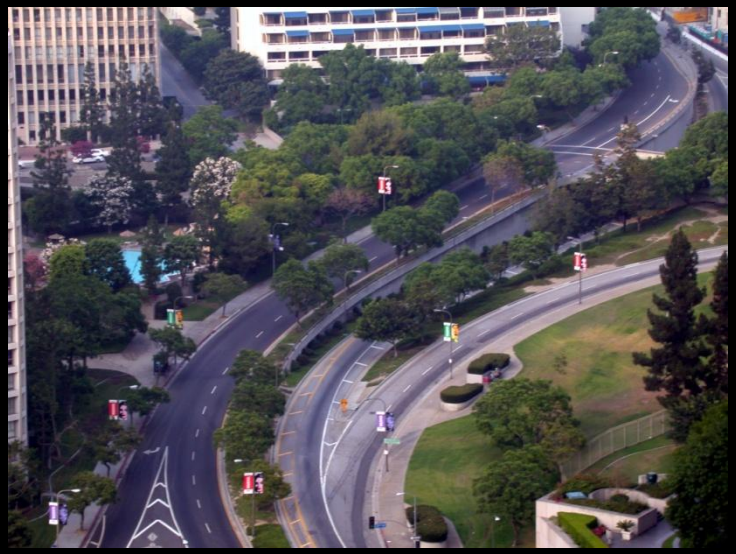
# TREE INVENTORIES
## The Foundation of Urban Forest Management

# Urban Forest (Schafer and Moeller)

"…..that portion of the urban ecosystem that consists of forest vegetation, water, soil, and wildlife in densely populated areas and adjacent lands."

# Urban Forest Includes

- Tree Lined Streets



- River Banks and Flood Control Canals

# Urban Forest Includes

- Golf Courses and Recreation Areas

- Cemeteries

# Urban Forest Management

- The establishment and care of the urban resource.
- The process through which urban forests are manipulated to provide multiple use and long term benefits to urban society.

# Urban Forestry Means Planning….

Urban forestry means the planning, establishment, protection and management of trees and associated plants, individually, in small groups, or under forest conditions within cities, their suburbs, and towns.

# Urban Foresters must have knowledge of the physiological needs of the tree and tree systems.

Forest violence

# Urban Foresters

- Must have experience with those urban activities that will impact trees.
- Must understand the sociological importance of trees and how they are managed within a municipal setting.
- Must communicate with people and also with “people” in power

# An Urban Forester Must COMMUNICATE, eh Mr. Hat?

# Who Might Practice as Urban Foresters?

- Urban Foresters
- Foresters
- Horticulturalists
- Landscape Architects
- Environmental Sciences
- Geographers (GIS & Remote Sensing)

# Why Conduct an Inventory?

- Management of any resource begins with an inventory of that resource.
- Urban Forest Management is no exception.
- Most Communities are managing a valuable urban asset without knowing what they have or what they are responsible for.

# How Does Your Community Measure Up?

- Houston – 30 % Canopy
- San Antonio – 20 % Canopy
- Garland – 11 % Canopy
- New Orleans – 24 % Canopy
- San Diego – 7 % Canopy
- Washington, DC – 21 % Canopy
- Buffalo, NY – 12 % Canopy

# Four Methods of Urban Tree Inventories

- Comprehensive (100 percent)
- Partial Sample or “Cruise”
- Remote Sensing
- Windshield Sample

# Inventory Method Depends on the Purpose

- Budget information to support a department's request for funding?
- Provide a baseline of information for extensive maintenance operations?
- Is it a snapshot of the community desired by a non-profit or public relations effort by the city?
- Permanent or transitory?
- Single issue or task?

# What Are Objectives of the Inventory

- Street Trees – Municipal Ownership
- Total Community Canopy
- Parkland and Natural Areas
- Special Projects – Task Oriented
- Disaster Losses
- Legal Matters (Actual and Ecological Damages)

# Park and Playground Safety

# Geographic Information Systems

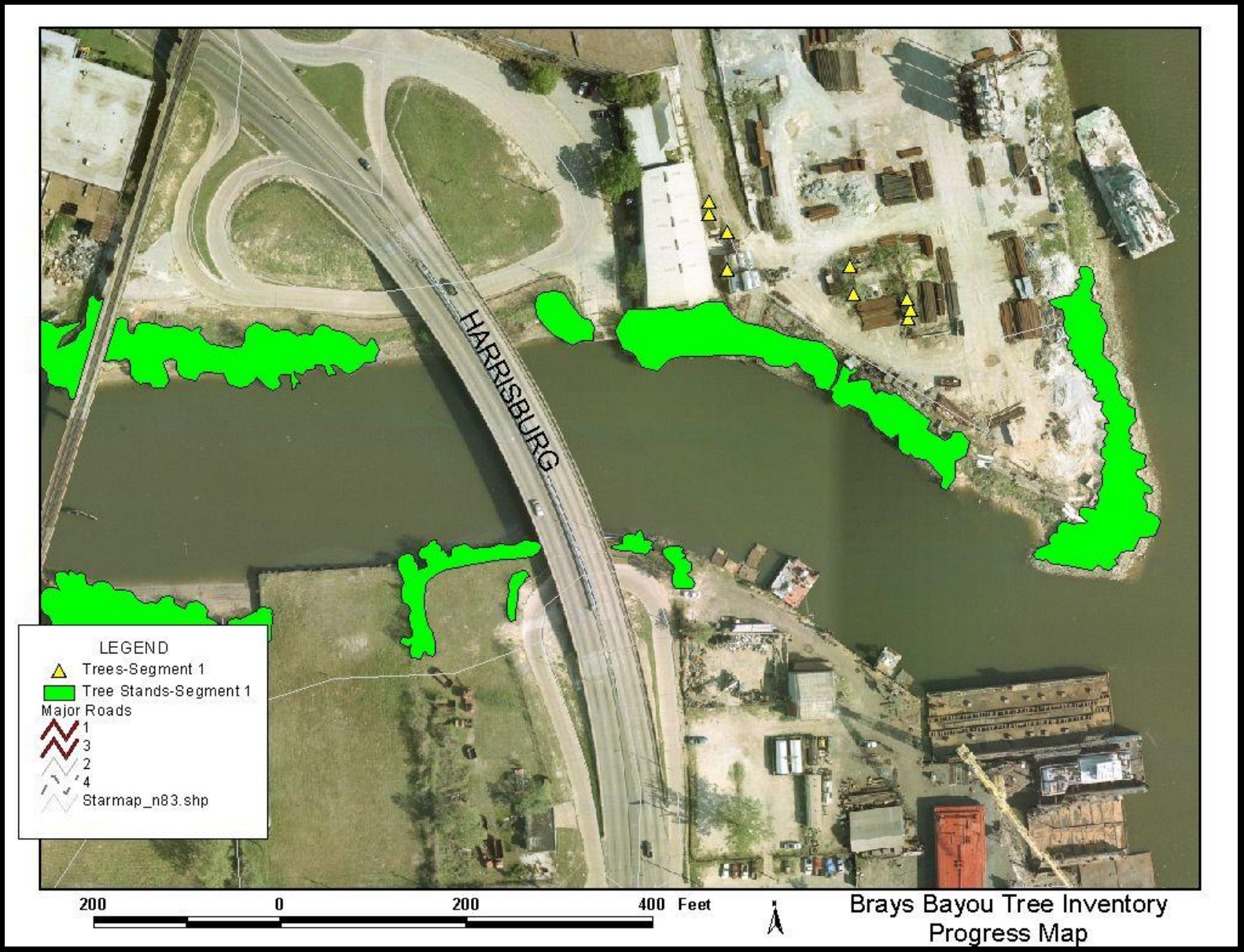
## *Project Brays*

**CAD data integration**

# Geographic Information Systems

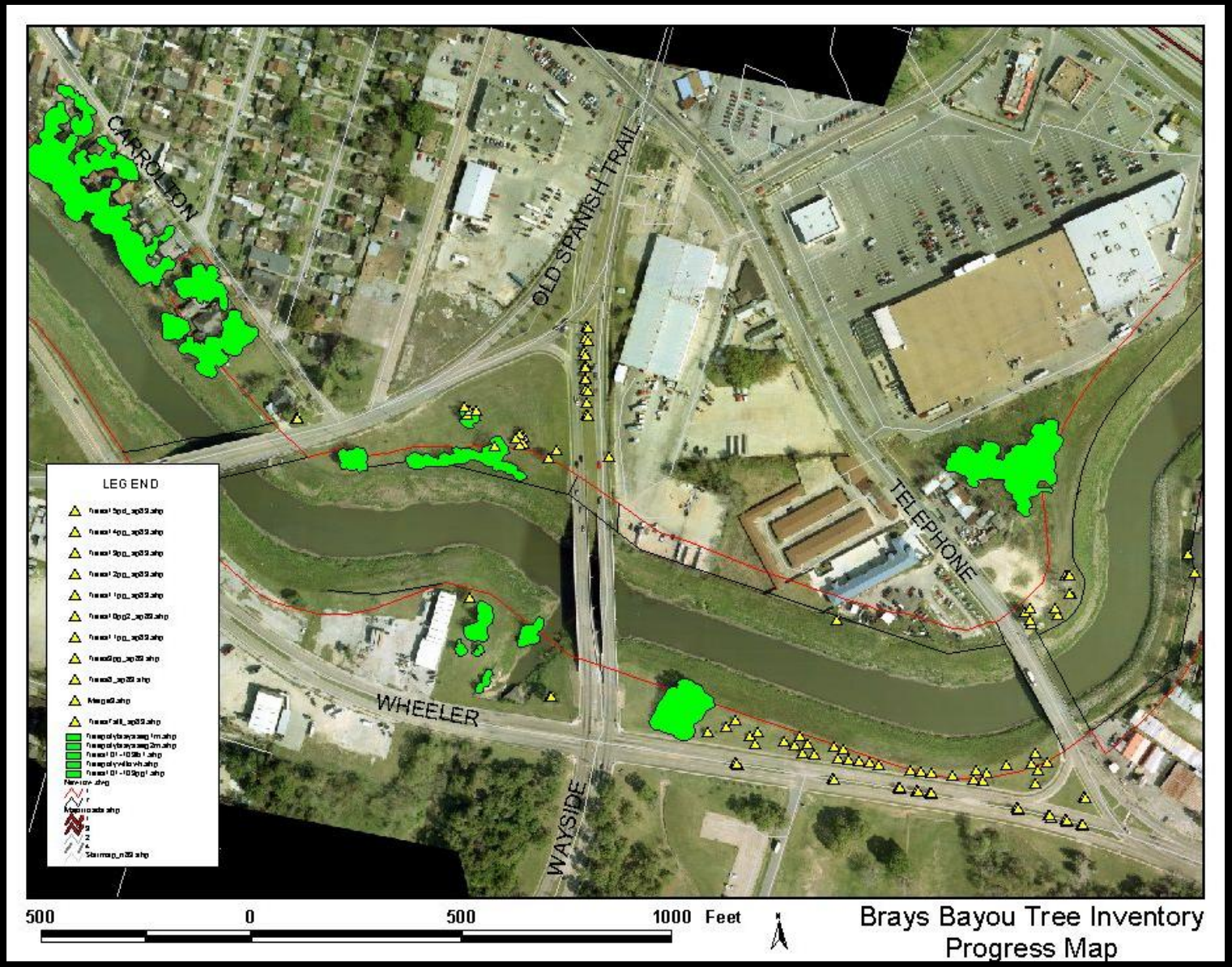
## *Project Brays*

**GIS for data display & integration**



# Geographic Information Systems

## *Project Brays*

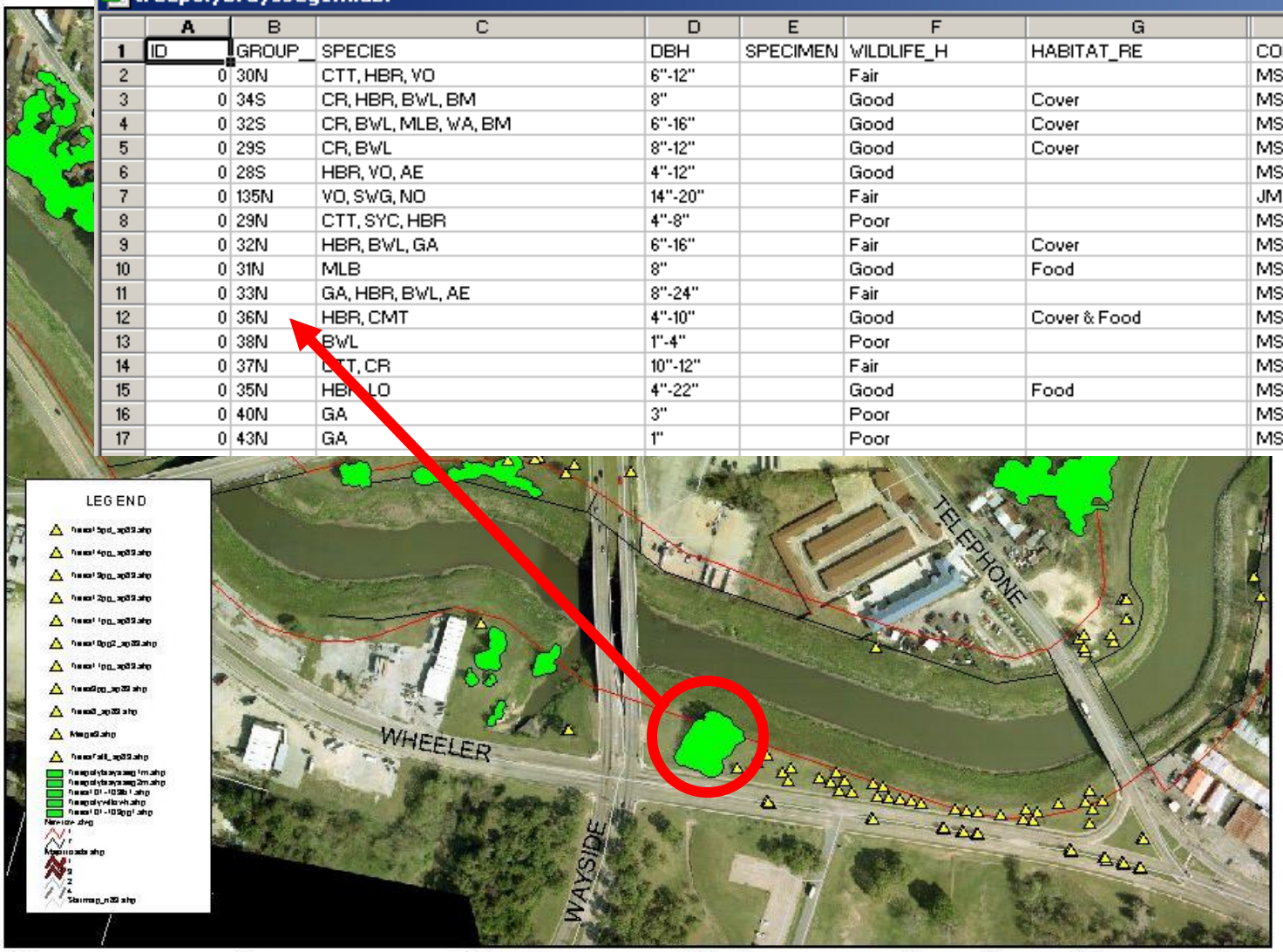


# Geographic Information Systems

## *Project Brays*

treepolybraysseg1m.dbf

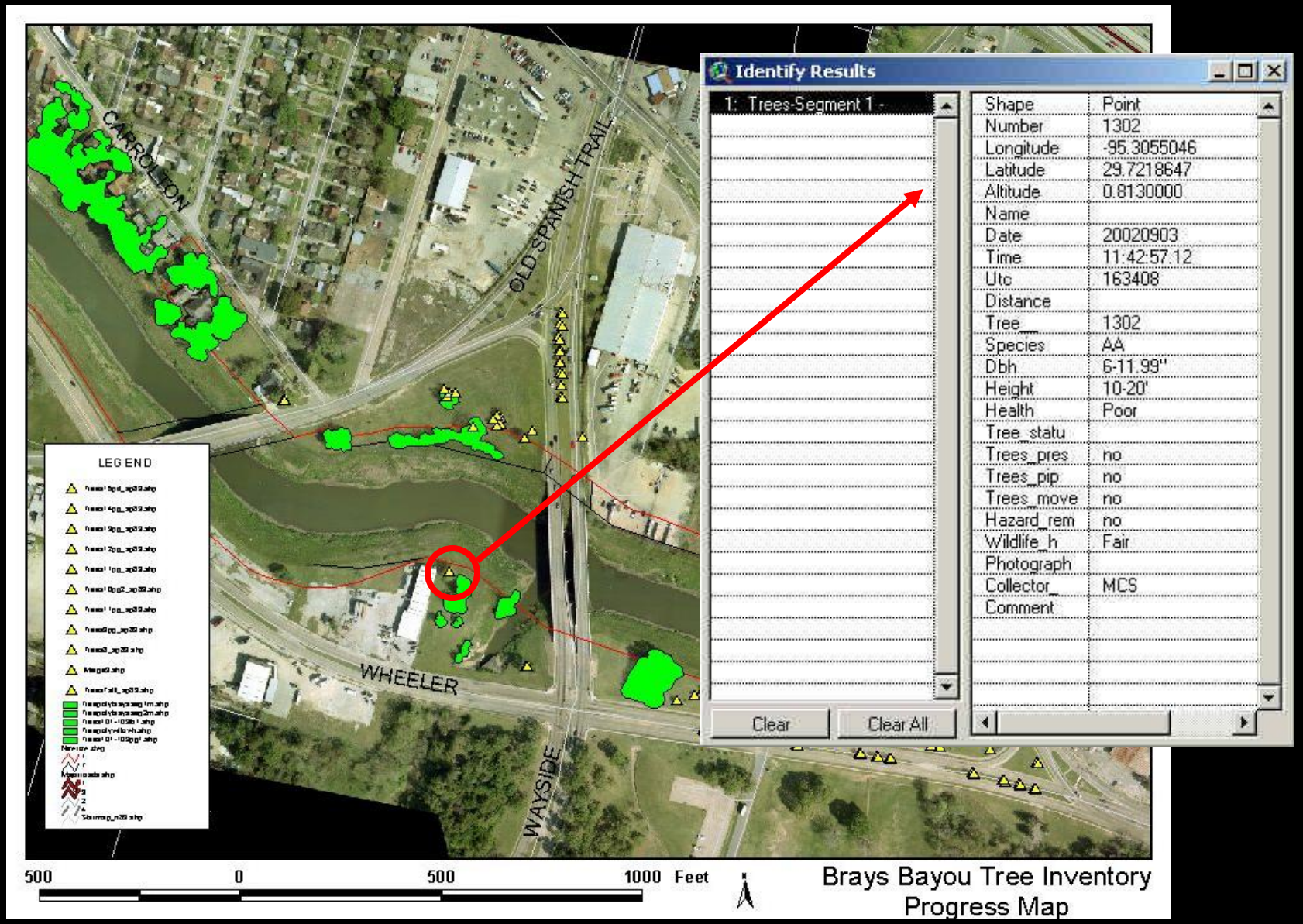
| | A | B | C | D | E | F | G | I |
|---|---|---|---|---|---|---|---|---|
| 1 | ID | GROUP_ | SPECIES | DBH | SPECIMEN | WILDLIFE_H | HABITAT_RE | COLLECTOR_ |
| 2 | 0 | 30N | CTT, HBR, VO | 6"-12" | | Fair | | MS |
| 3 | 0 | 34S | CR, HBR, BWL, BM | 8" | | Good | Cover | MS |
| 4 | 0 | 32S | CR, BWL, MLB, WA, BM | 6"-16" | | Good | Cover | MS |
| 5 | 0 | 29S | CR, BWL | 8"-12" | | Good | Cover | MS |
| 6 | 0 | 28S | HBR, VO, AE | 4"-12" | | Good | | MS |
| 7 | 0 | 135N | VO, SWG, NO | 14"-20" | | Fair | | JM |
| 8 | 0 | 29N | CTT, SYC, HBR | 4"-8" | | Poor | | MS |
| 9 | 0 | 32N | HBR, BWL, GA | 6"-16" | | Fair | Cover | MS |
| 10 | 0 | 31N | MLB | 8" | | Good | Food | MS |
| 11 | 0 | 33N | GA, HBR, BWL, AE | 8"-24" | | Fair | | MS |
| 12 | 0 | 36N | HBR, CMT | 4"-10" | | Good | Cover & Food | MS |
| 13 | 0 | 38N | BWL | 1"-4" | | Poor | | MS |
| 14 | 0 | 37N | CTT, CR | 10"-12" | | Fair | | MS |
| 15 | 0 | 35N | HBR, LO | 4"-22" | | Good | Food | MS |
| 16 | 0 | 40N | GA | 3" | | Poor | | MS |
| 17 | 0 | 43N | GA | 1" | | Poor | | MS |




Brays Bayou Tree Inventory Progress Map

# Geographic Information Systems

## *Project Brays*



# BROCK PARK TRESPASS
# Field Tree Inventory and CityGreen Analysis

CityGreen Land Cover & Stormwater Runoff Analysis

2002 Aerial Photo

# BROCK PARK TRESPASS
# Field Tree Inventory and CityGreen Analysis

CityGreen Land Cover & Stormwater Runoff Analysis

Shaded Relief DEM

# BROCK PARK TRESPASS
# Field Tree Inventory and CityGreen Analysis

CityGreen

Land Cover

&

Stormwater

Runoff

Analysis

Shaded Relief

2’ contours

# BROCK PARK TRESPASS
# Field Tree Inventory and CityGreen Analysis

CityGreen

Land Cover

&

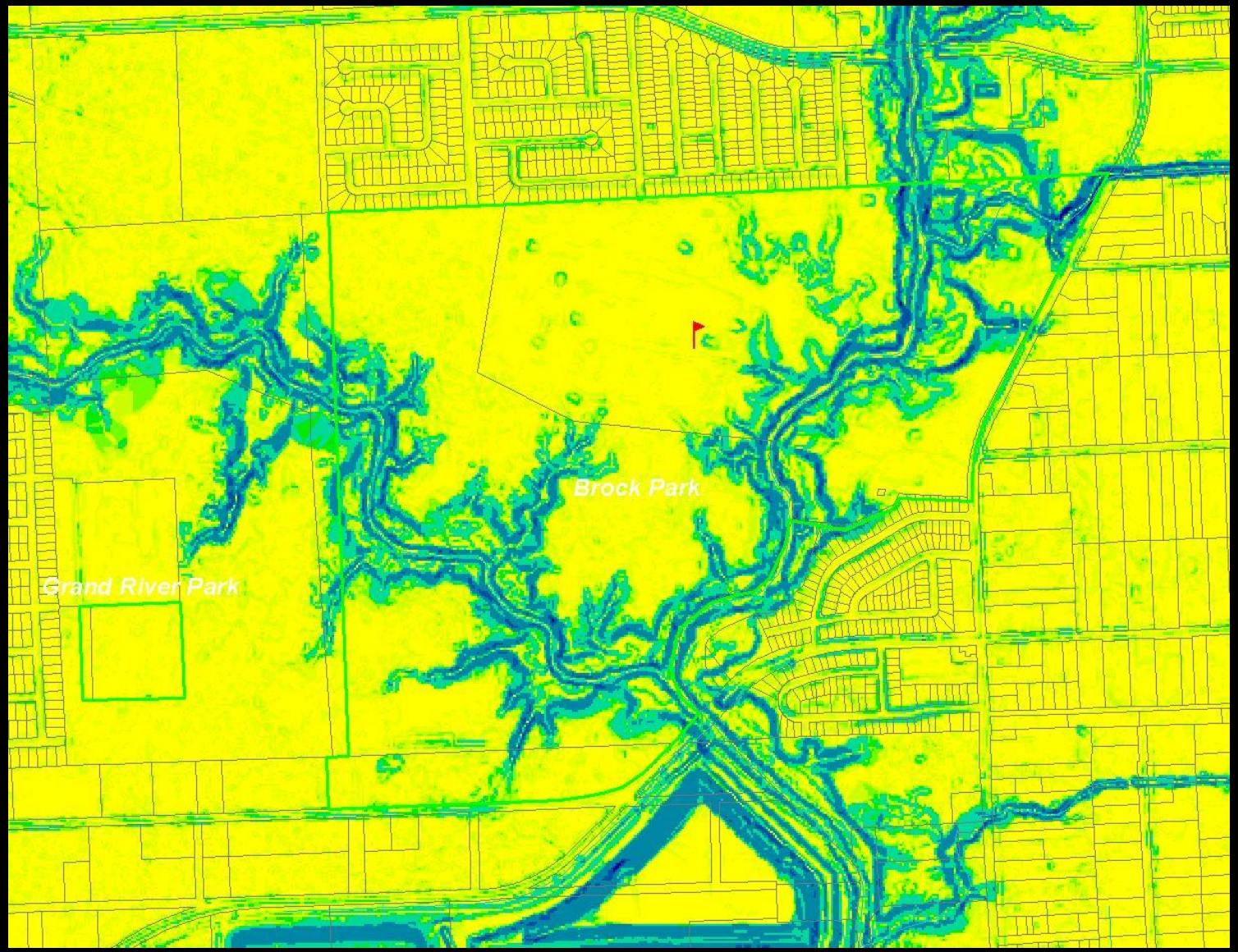
Stormwater

Runoff

Analysis

Slope

1% interval



# BROCK PARK TRESPASS
# Field Tree Inventory and CityGreen Analysis

CityGreen

Land Cover

&

Stormwater

Runoff

Analysis

DEM

FEMA

# Conventional Uses of a Tree Inventory

MAINTENANCE TASKS

- Plan
- Schedule
- Monitor

MANAGEMENT DECISIONS

- Develop Budgets
- Make Changes

# How To Get It Done?

Requires:

- Coordinated planning
- The support of political, civic, and business leaders
- A “champion” in city government
- An understanding by those in the professional community that it is important

# Backpack GPS

# Rugged Field Pen Based Computer

# What Assets Will Be Used?

- Satellite Imagery
- Aerial Photography
- Geographic Information Systems (GIS)
- Statistical Analysis
- Individual Tree Site Inspection
- Windshield Inspection
- Hardware and Software

# Comprehensive - 100 %

- Small communities and large
- Time constraints are not problematic
- Adequate budget for the project
- Data will be used for actual planning and maintenance operations
- Data will be updated
- Used in progressive communities with proactive management approach

# West University Place – Top 10 Species Found

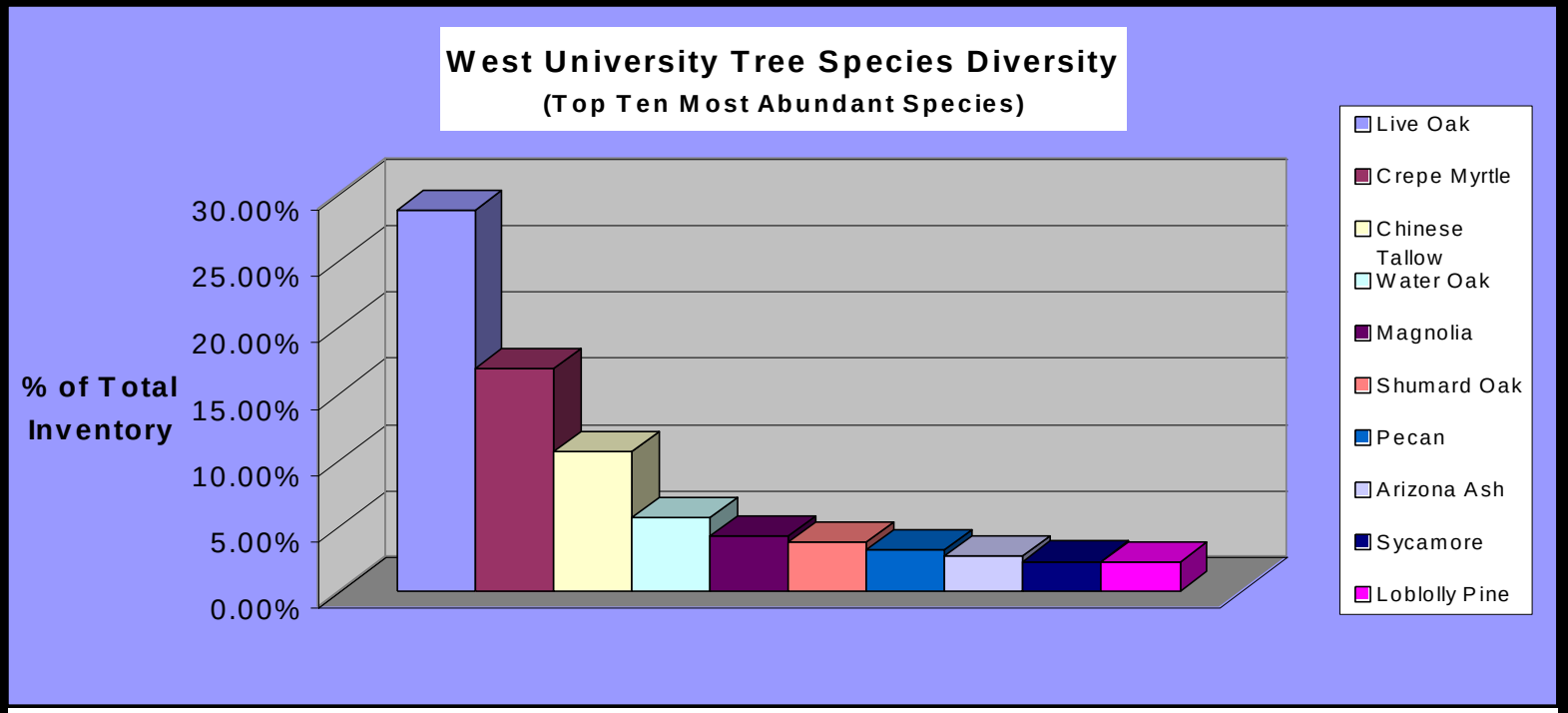



Figure 1 -Ten tree species comprise over 79% of the City's urban forest.

# West University Place – Graphic for Maintenance Needs

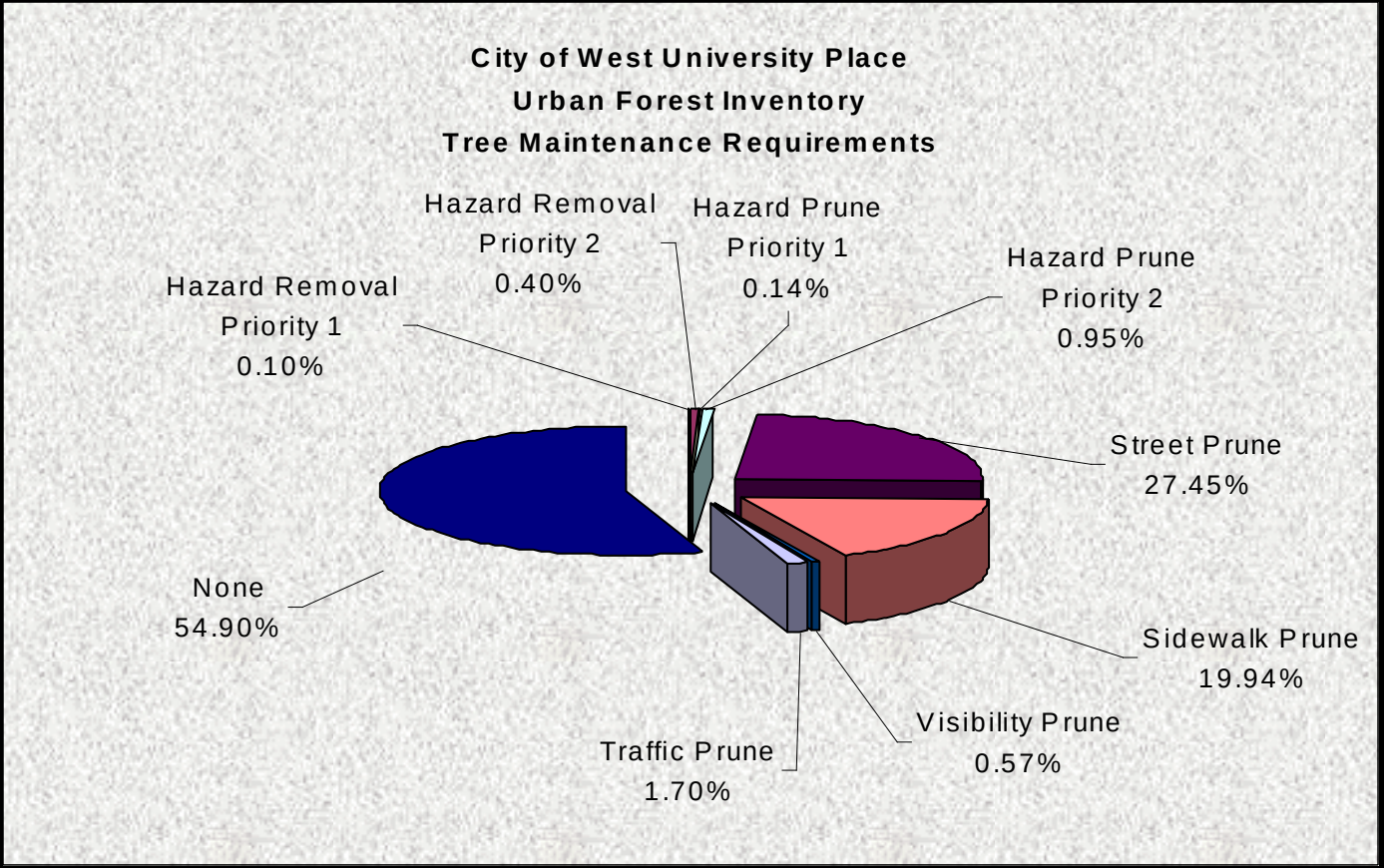
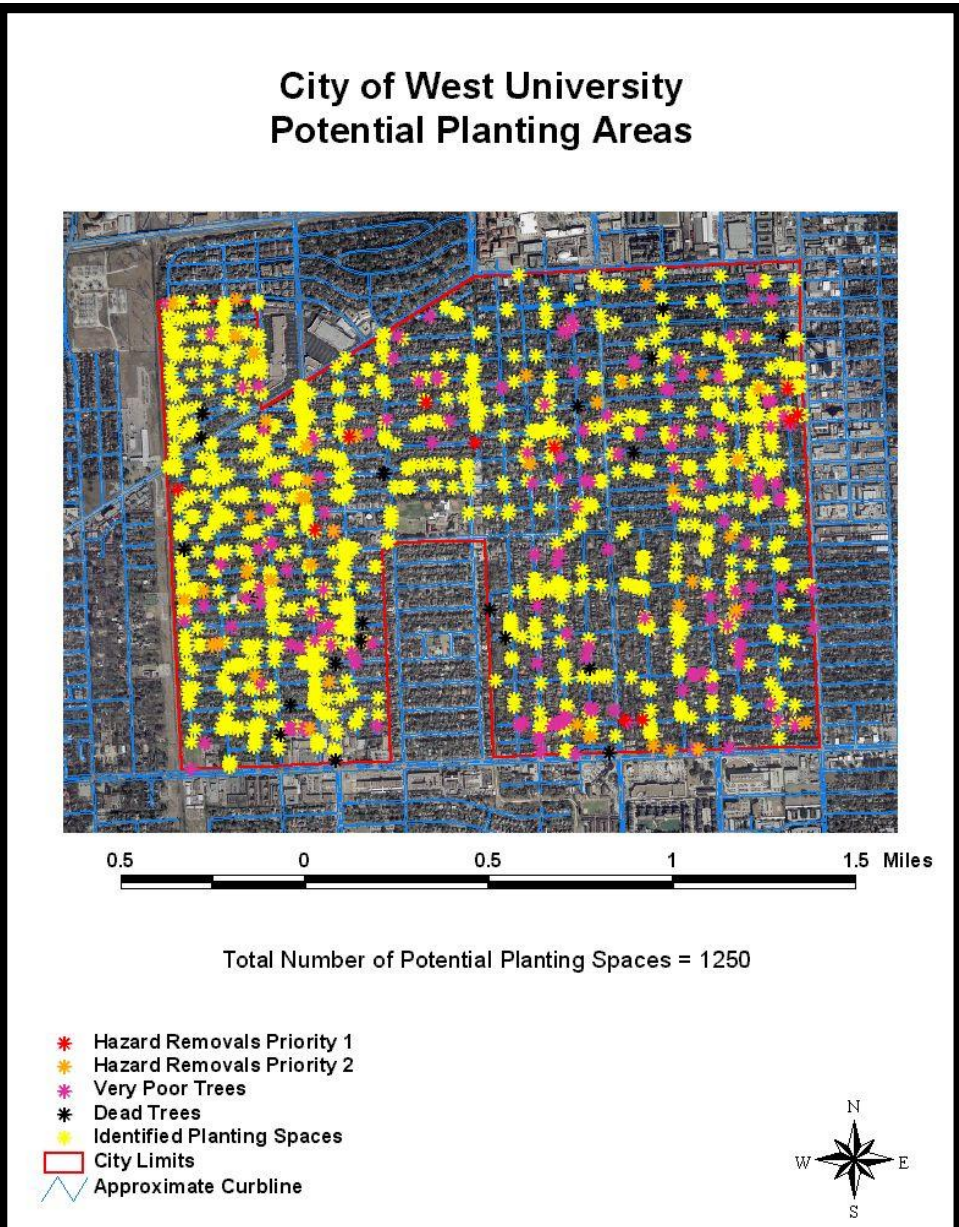
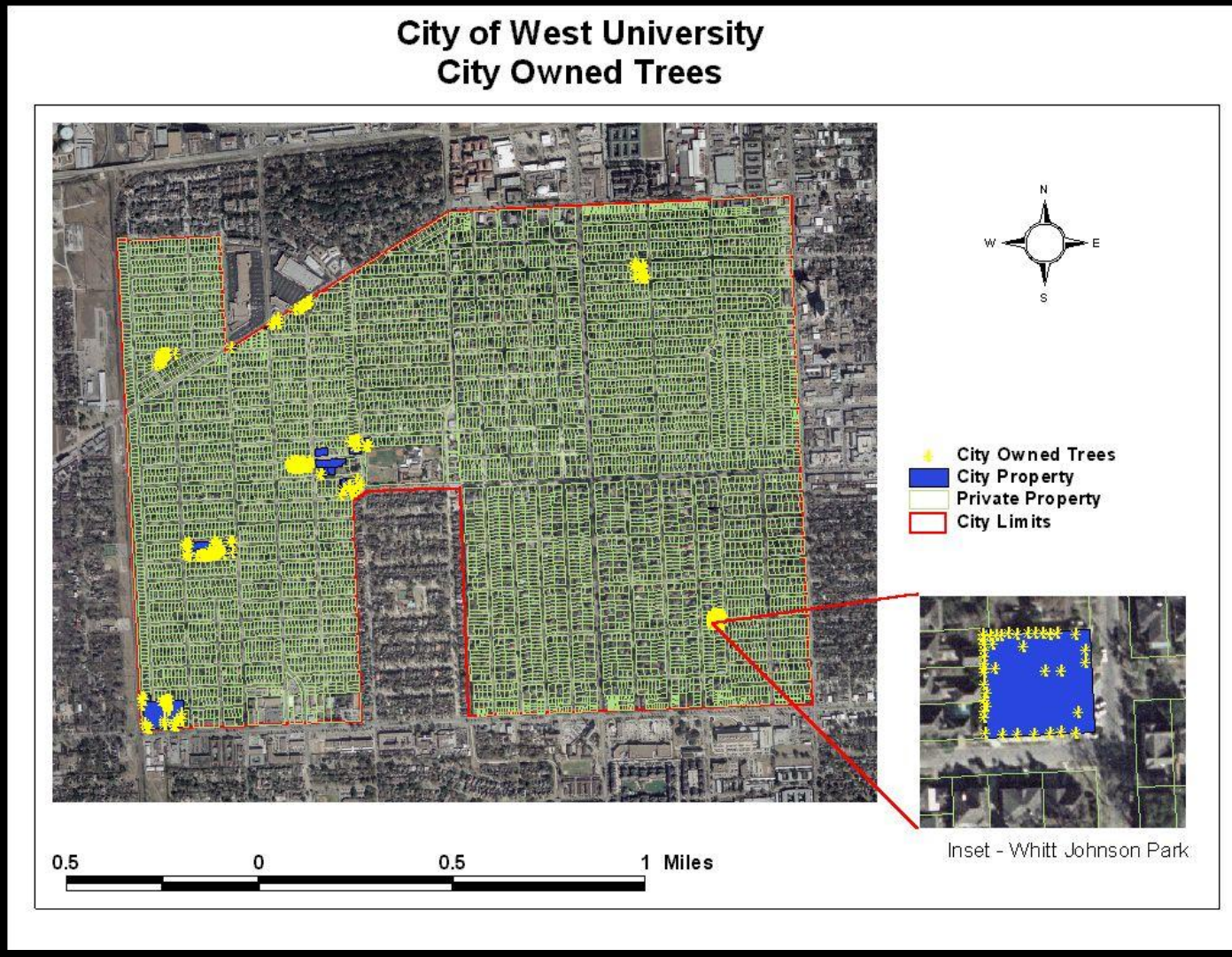



Figure 3 – Percentage of inventoried trees requiring maintenance treatments.

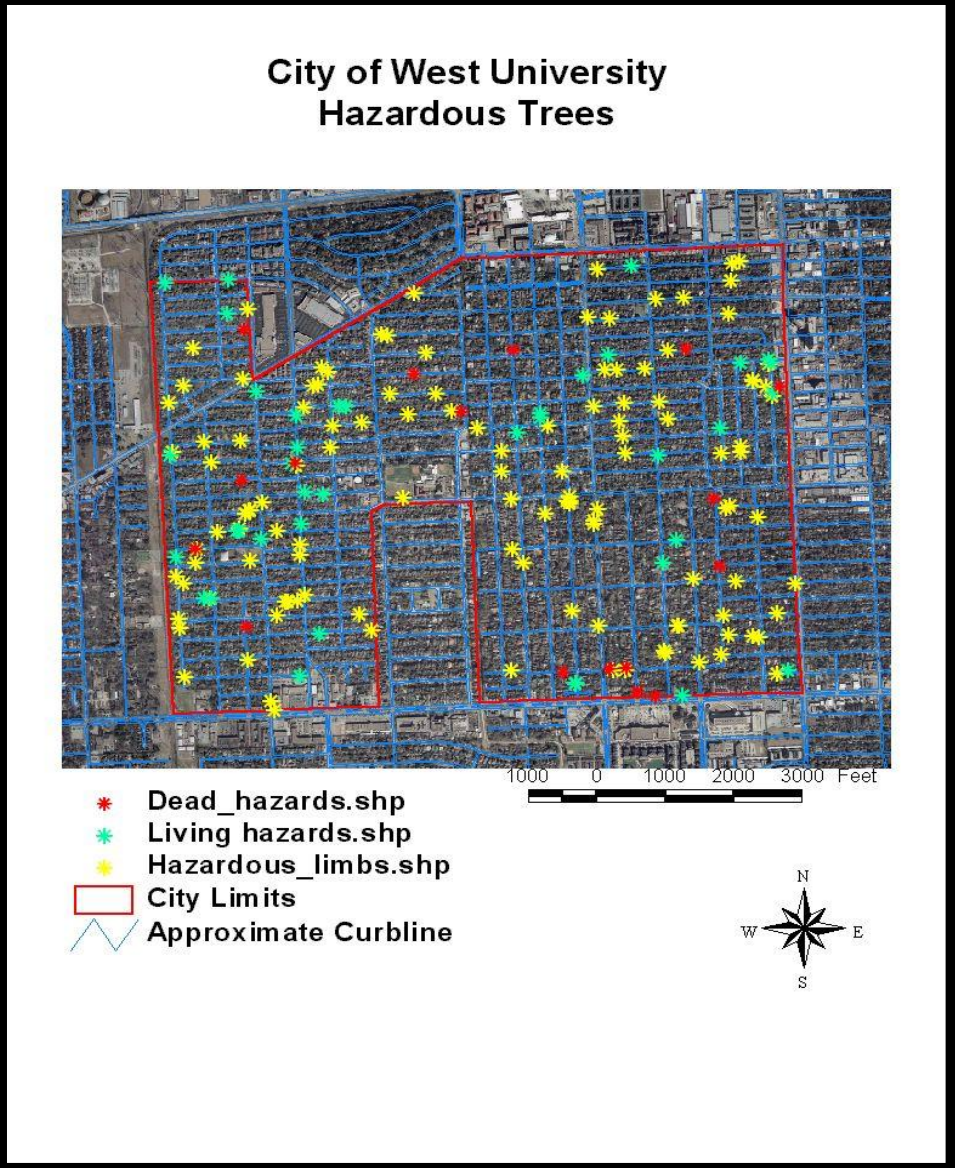
# West University Place – Locations for Planting



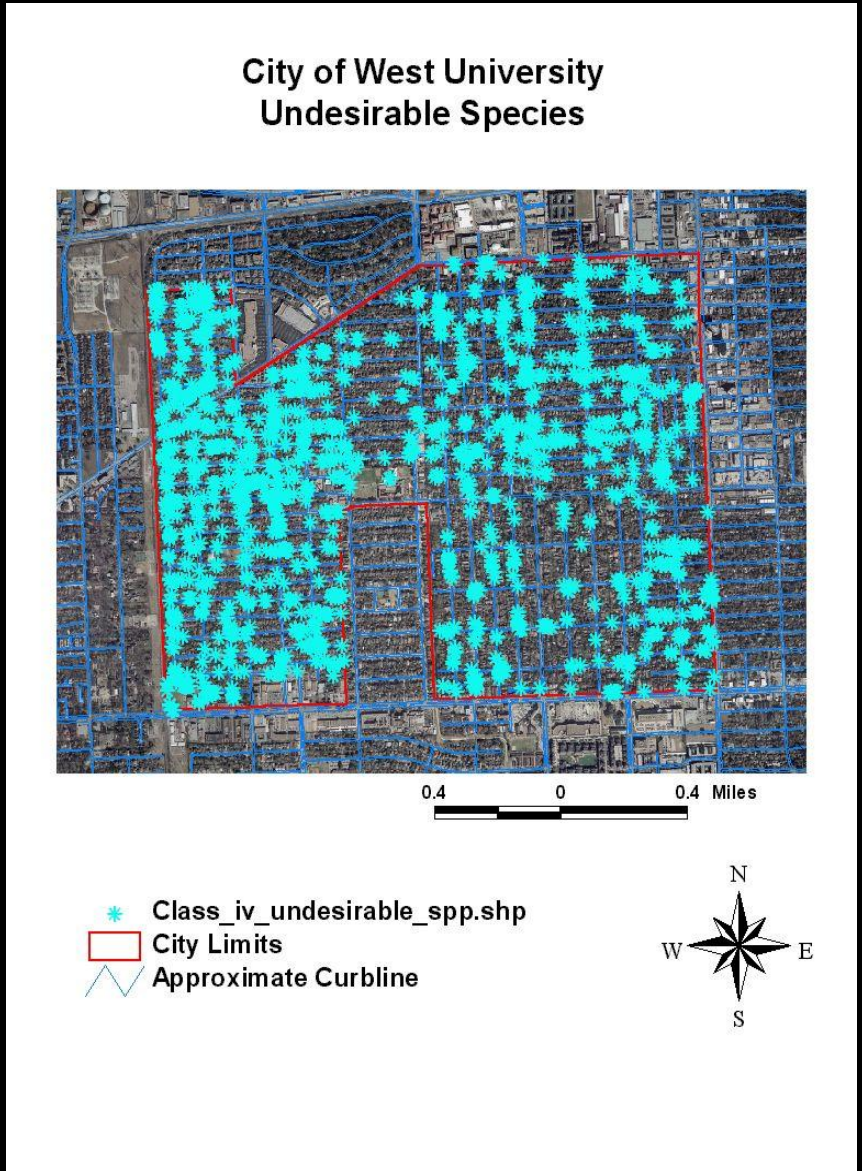
# West University Place – City Owned Canopy



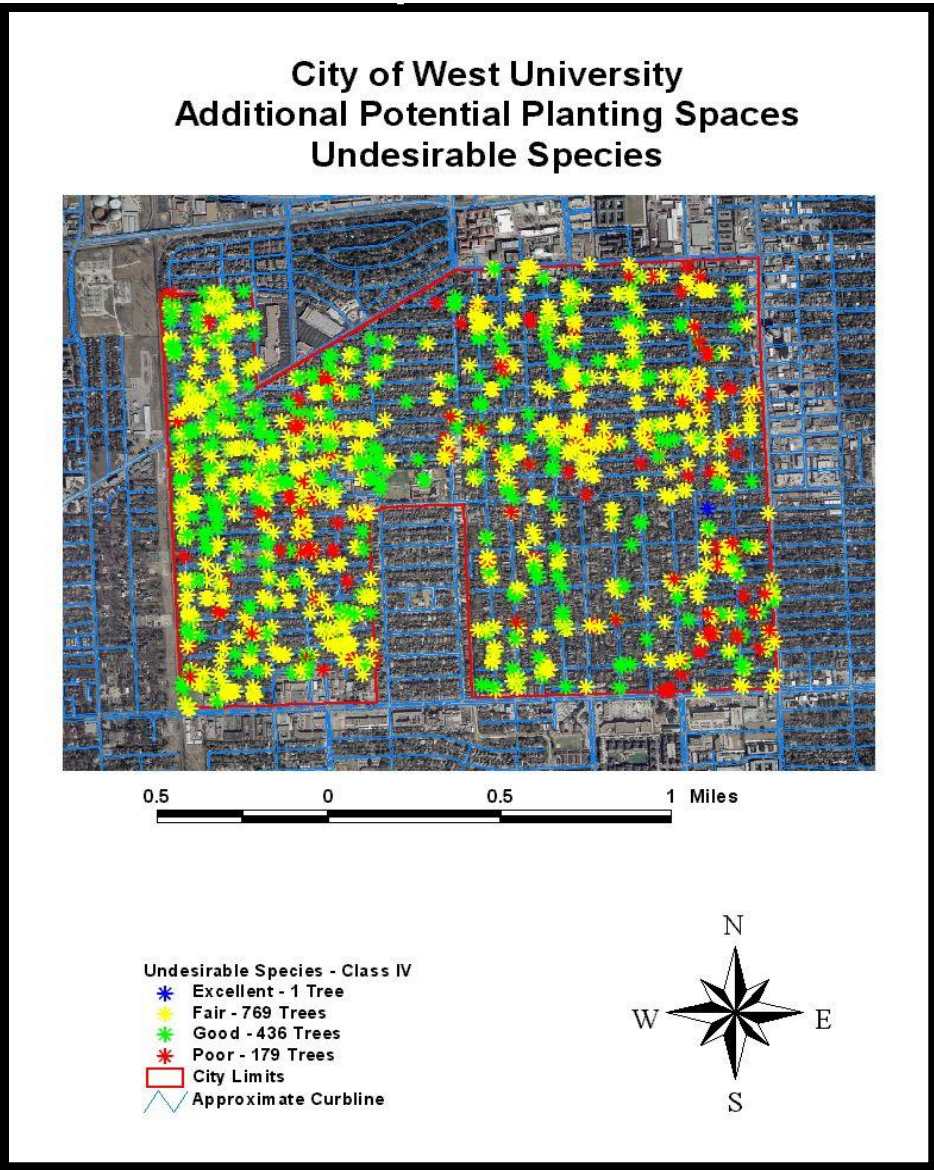
# West University Place – Hazardous Trees



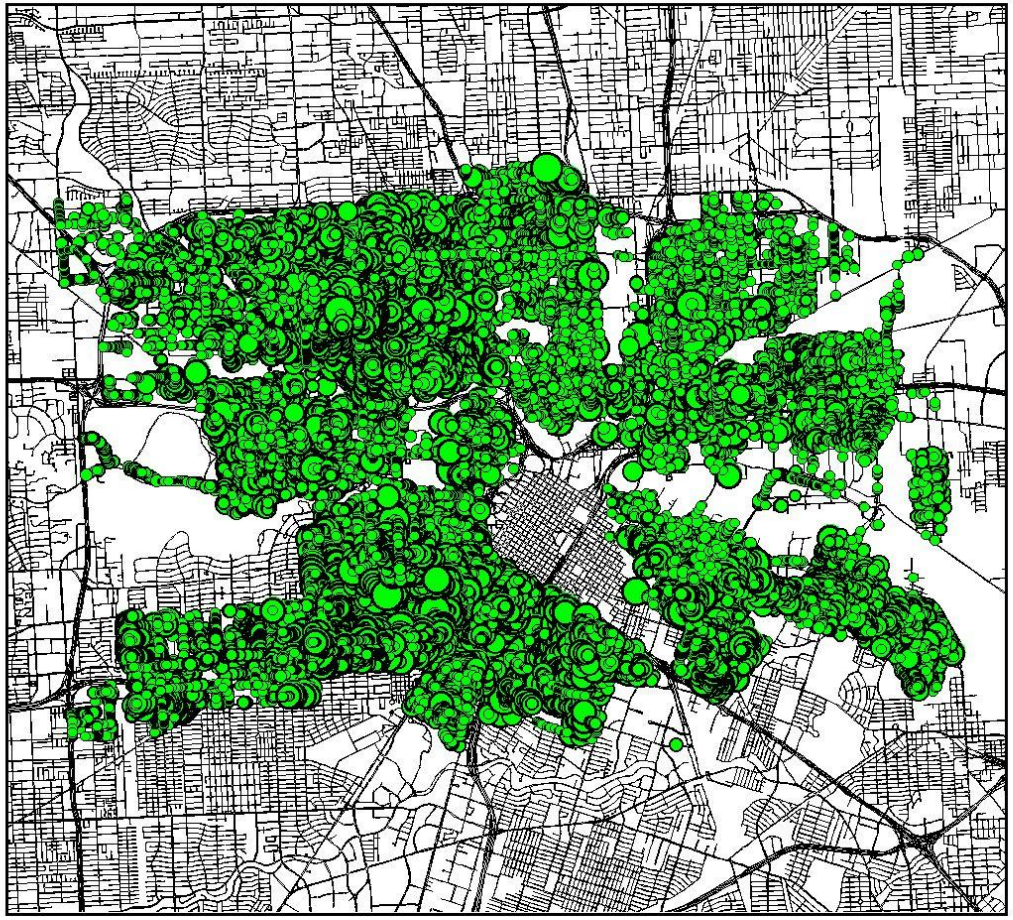
# West University Place – Undesirable Trees



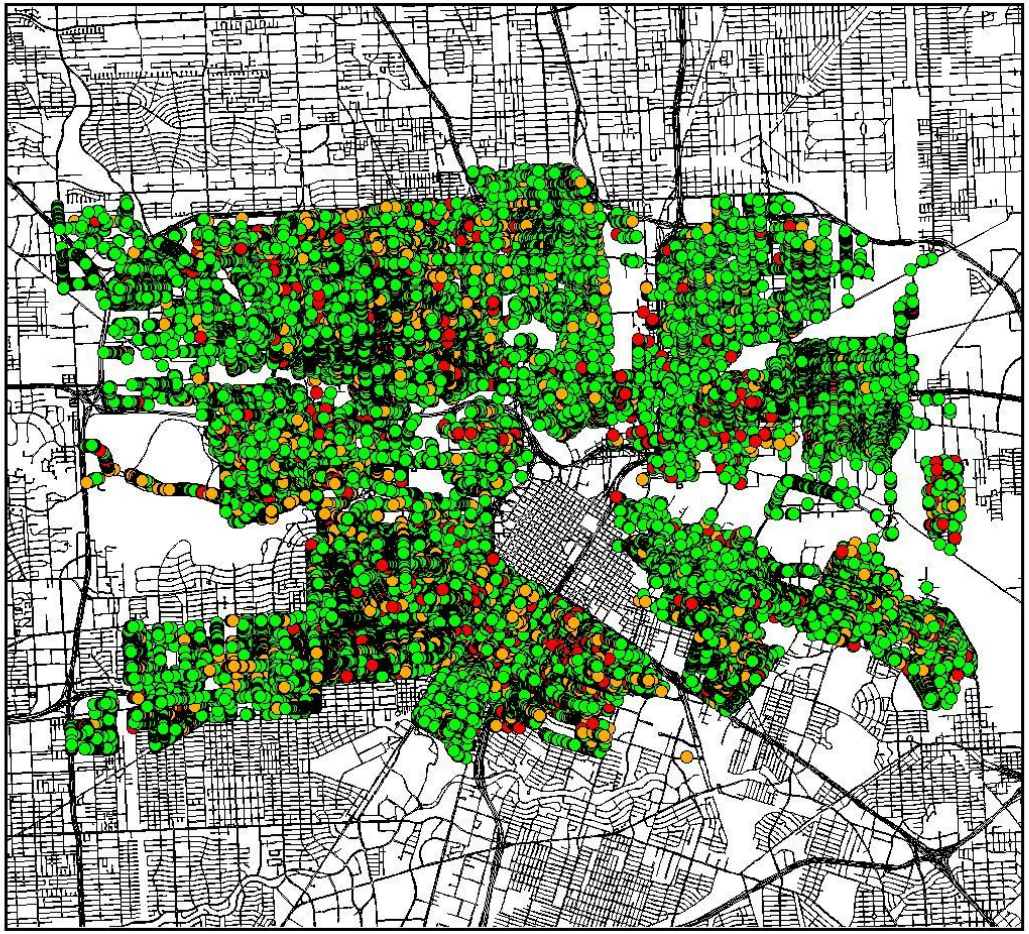
# West University Place -- Spaces + Potential Replacements



# Houston - Size Distribution



# Houston - Hazard Tree Categories



**City of Houston Tree Inventory**

Legend

Hazard Evaluation

- No Obvious Hazard
- Hazard Prune
- Hazard Removal

Pavement

N W E S

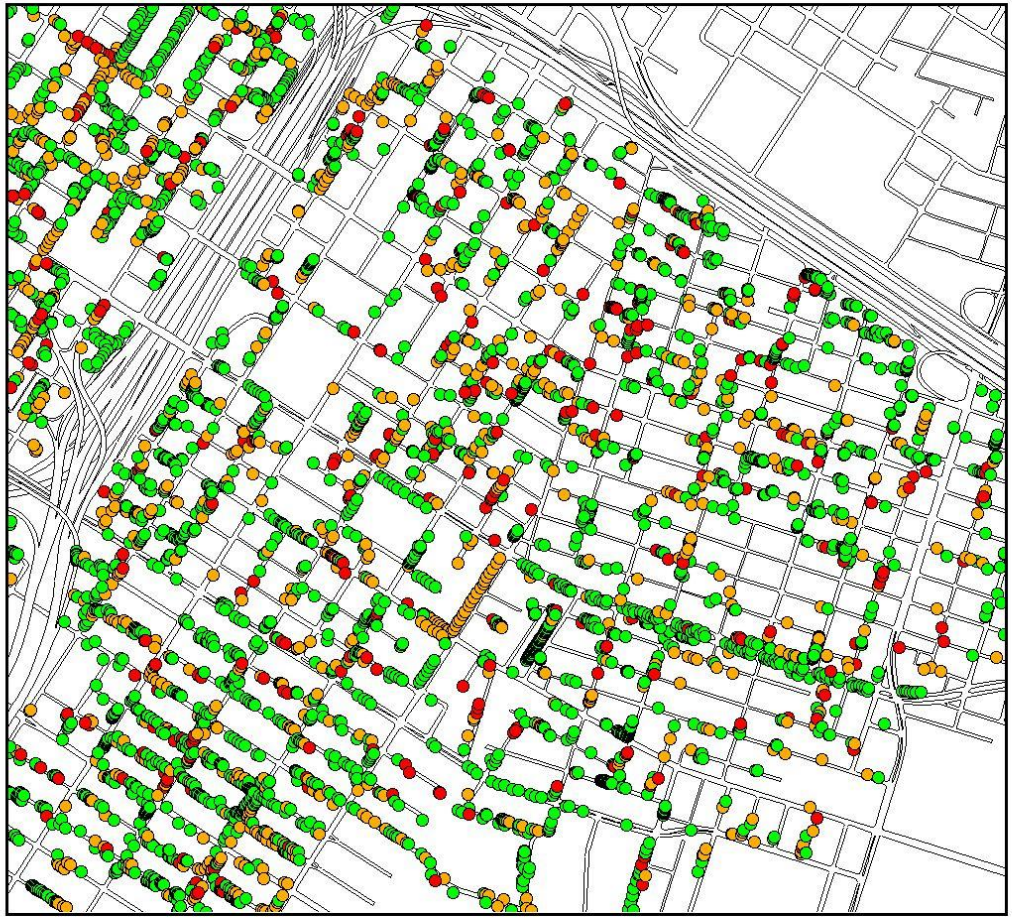
1 0 1 2 3 4 5 6 7 Miles

# Hazard Tree – Hermann Park - Houston

# If Hurricanes Don't Get Personal – Do Residents Listen?

# If Trees Don't Get Personal – Do City Leaders Listen?

# Houston – Neighborhood Level Hazard Trees



**City of Houston Tree Inventory**

Legend

Hazard Evaluation

- No Obvious Hazard
- Hazard Prune
- Hazard Removal

Pavement

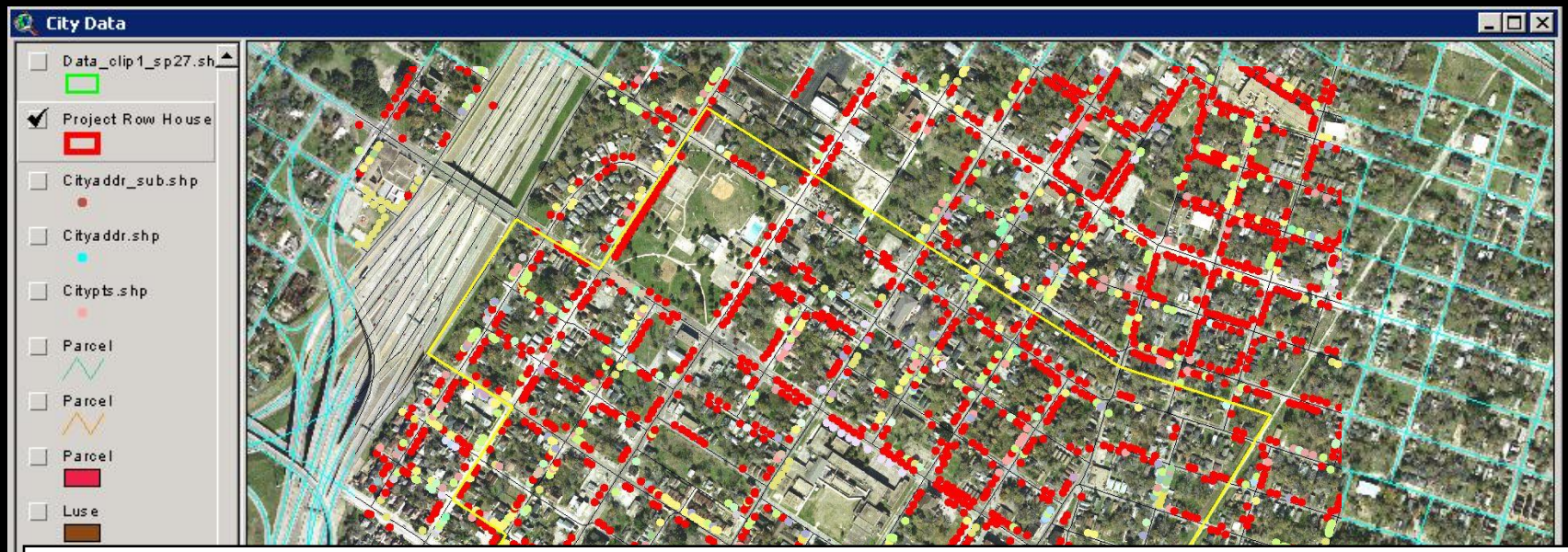
N W E S

0.25 0 0.25 0.5 0.75 1 Miles

# Houston – Planting Spaces vs. Stumps

# Houston – Neighborhood Level Planting Spaces

# Houston – Tree Attributes Collected




| Time | Species | DBH | Major Defects | Utilities | Condi | Maintenance | Notes | Inventory Area | Street/Park Name |
|---|---|---|---|---|---|---|---|---|---|
| 12:28:35.65 | Lagerstroemia indica (Crepe Myrtle) | 0-5.99 | No Obvious Defect | Overhead Utilities | Good | None | | Area 6 | BalconesA |
| 12:36:25.04 | Photinia fraseri (Red Tip Photinia) | 0-5.99 | No Obvious Defect | No Overhead Utilities | Fair | None | | Area 6 | San SabaA |
| 12:38:13.13 | Sapium sebiferum (Chinese Tallow) | 0-5.99 | No Obvious Defect | No Overhead Utilities | Good | None | | Area 6 | NavarroA |
| 12:40:50.66 | Pinus spp. (Pine Species) | 6-11.99 | No Obvious Defect | No Overhead Utilities | Good | None | | Area 6 | SanBenitoA |
| 12:42:28.15 | Celtis laevigata (Sugar Hackberry) | 0-5.99 | Major Defect Observed | Overhead Utilities | Fair | None | | Area 6 | SanBenitoA |
| 12:43:13.25 | Ulmus americana (American Elm) | 0-5.99 | No Obvious Defect | No Overhead Utilities | Good | None | | Area 6 | SanBenitoA |
| 12:47:17.66 | Quercus stellata (Post Oak) | 12-19.99 | No Obvious Defect | No Overhead Utilities | Fair | None | | Area 6 | DeaconA |
| 12:49:17.46 | Lagerstroemia indica (Crepe Myrtle) | 0-5.99 | No Obvious Defect | No Overhead Utilities | Good | None | | Area 6 | ValverdeA |
| 12:51:35.1 | Ulmus pumila (Siberian Elm) | 6-11.99 | Major Defect Observed | No Overhead Utilities | Fair | Routine Prune | | Area 6 | ValverdeA |
| 12:55:52.1 | Quercus virginiana (Live Oak) | 0-5.99 | Major Defect Observed | No Overhead Utilities | Poor | Routine Prune | | Area 6 | CimarronA |
| 12:58:19.74 | Celtis laevigata (Sugar Hackberry) | 0-5.99 | No Obvious Defect | No Overhead Utilities | Fair | None | | Area 6 | MescaleroA |
| 12:58:50.17 | Thuja Spp. (Arbovitae) | 0-5.99 | No Obvious Defect | No Overhead Utilities | Fair | None | | Area 6 | MescaleroA |
| 13:00:51.94 | Juniperus spp. (Juniper) | 0-5.99 | No Obvious Defect | No Overhead Utilities | Fair | None | | Area 6 | MescaleroA |
| 13:03:49.56 | Quercus nigra (Water Oak) | 0-5.99 | No Obvious Defect | No Overhead Utilities | Fair | Routine Prune | | Area 6 | SocorroA |

# Basic Tree Attributes or Descriptors

- Species
- Diameter
- Height
- Condition
- Location
- Critical Root Zone

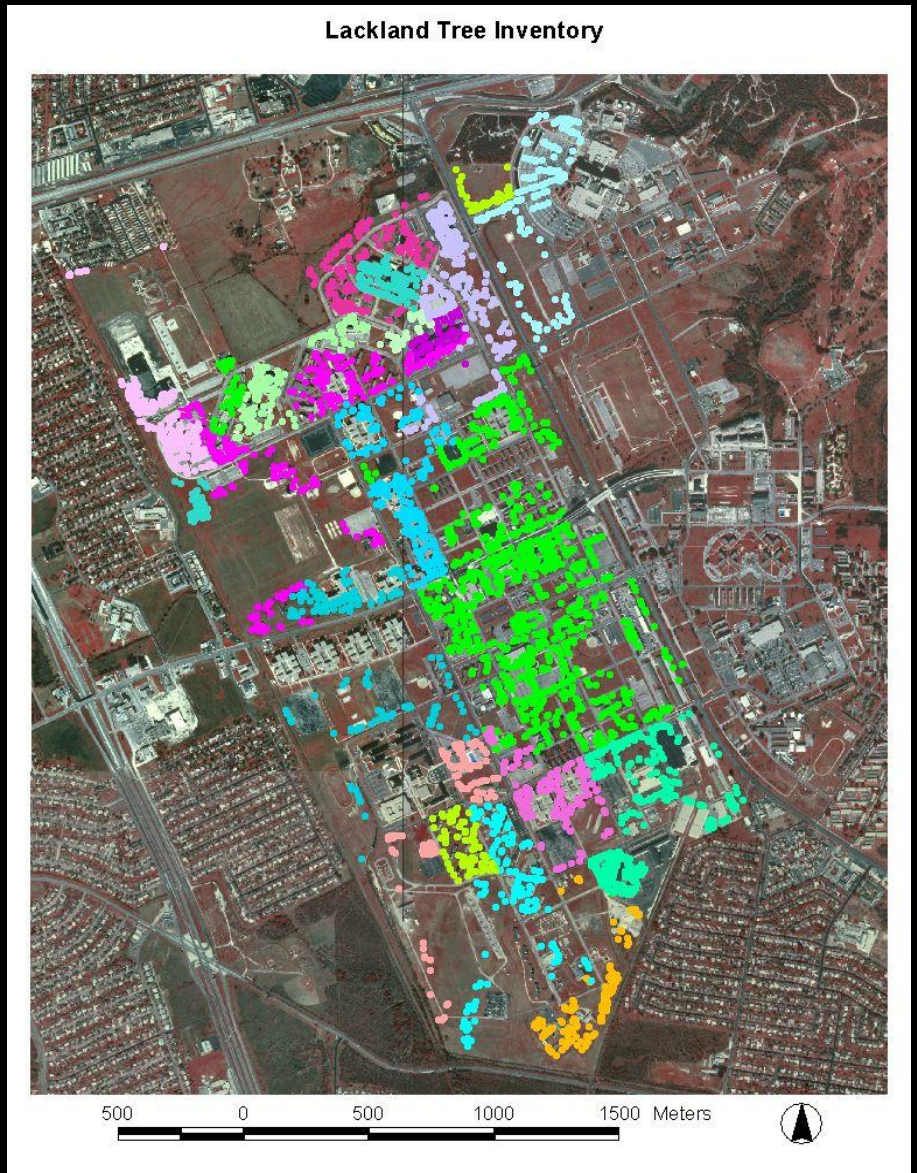
# Other Attributes

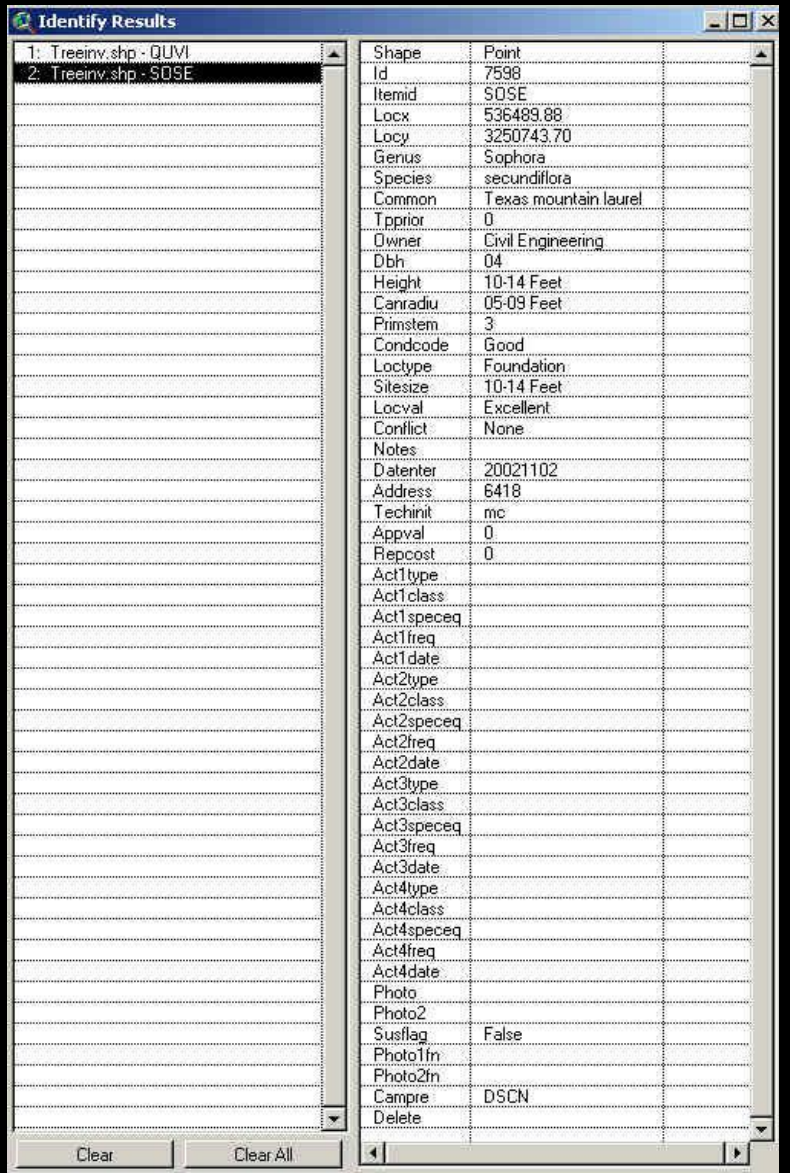
- Utilities
- Planting Spaces
- Stumps
- Canopy Spread
- Height to 1st Limb
- Memorial Trees
- Etc.

# Location, Location, Location

- Street
- Address
- Extension
- Quadrant
- Key Map
- Maintenance Zone
- Zip Code

# Lackland Air Force Base – San Antonio

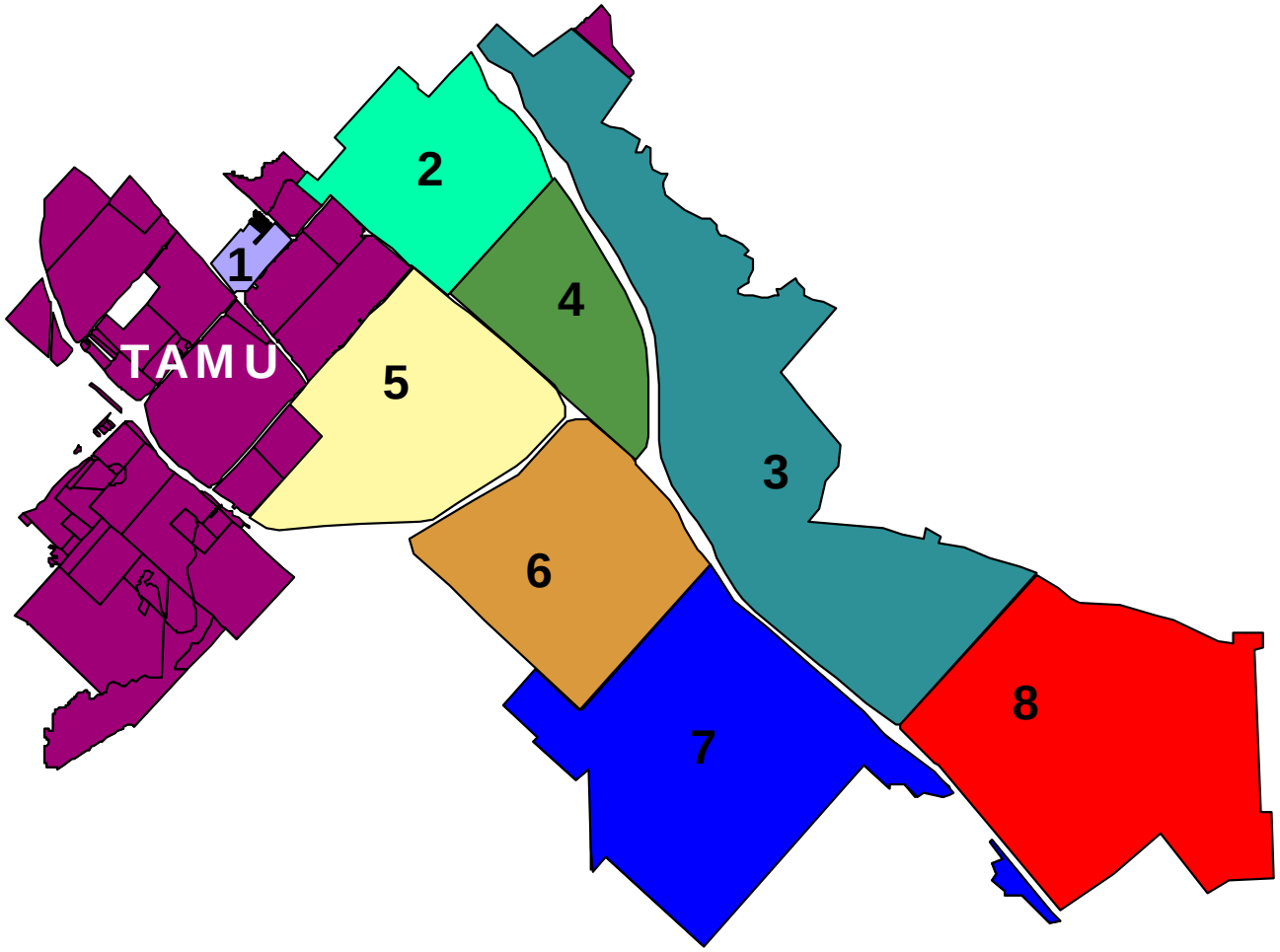


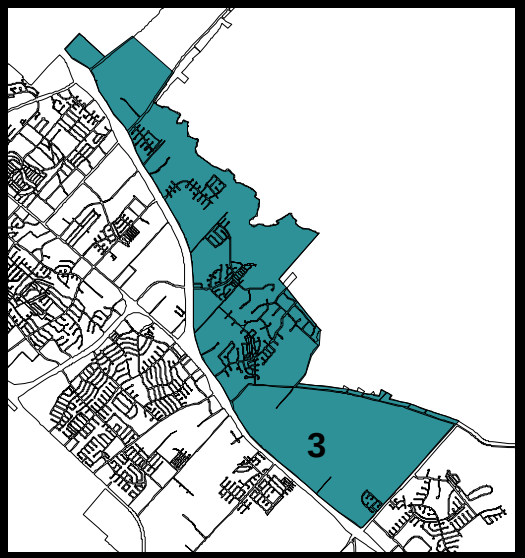
# Sample Inventory

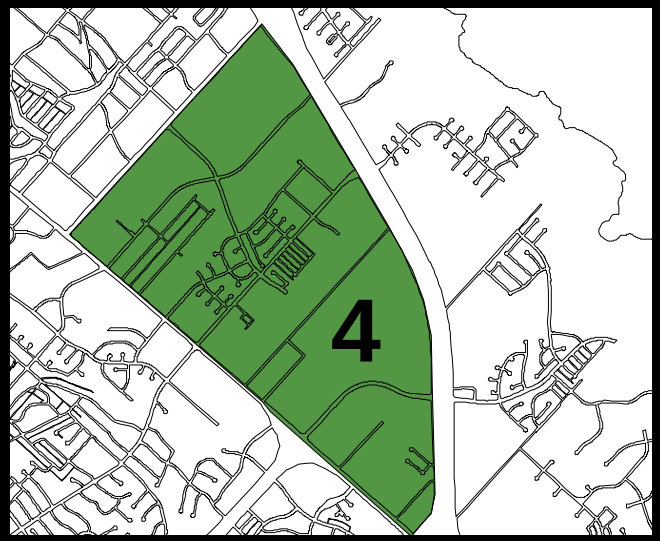
- Limited resources
- Time constraints
- To be used for general planning purposes only
- Not intended to be dynamic and updated
- Project too large for conventional 100 %
- For budget purposes or a special task

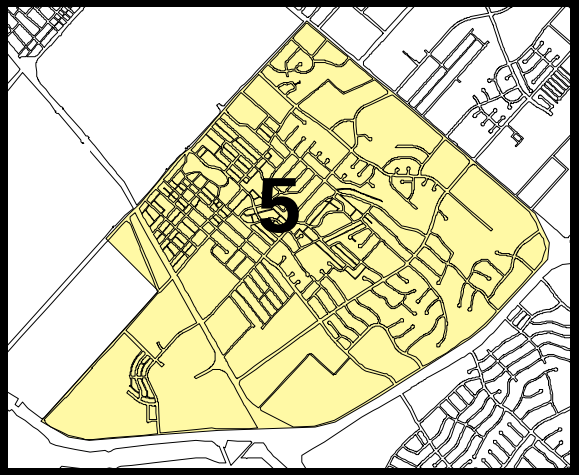
# City of College Station – Sample Inventory

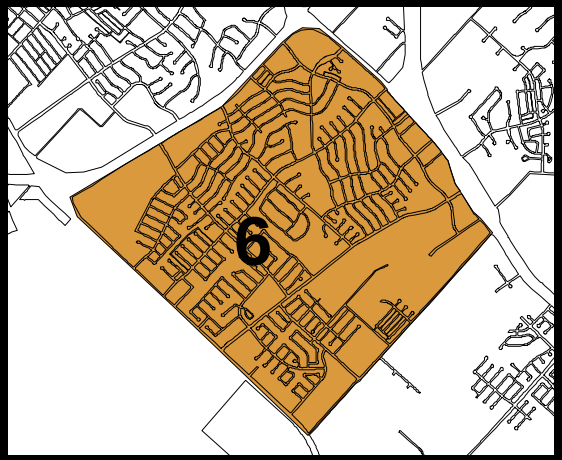


# Sample Areas

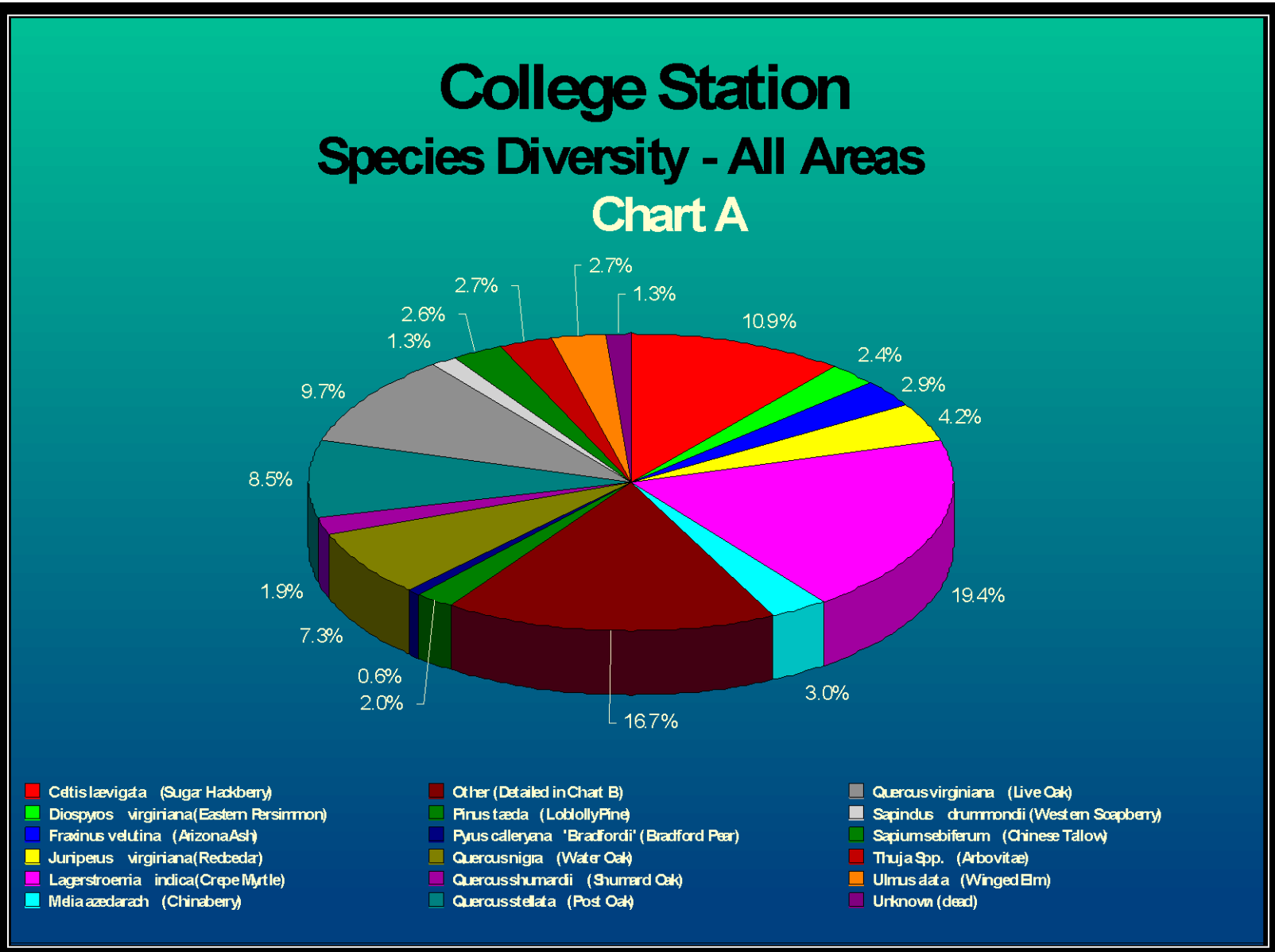


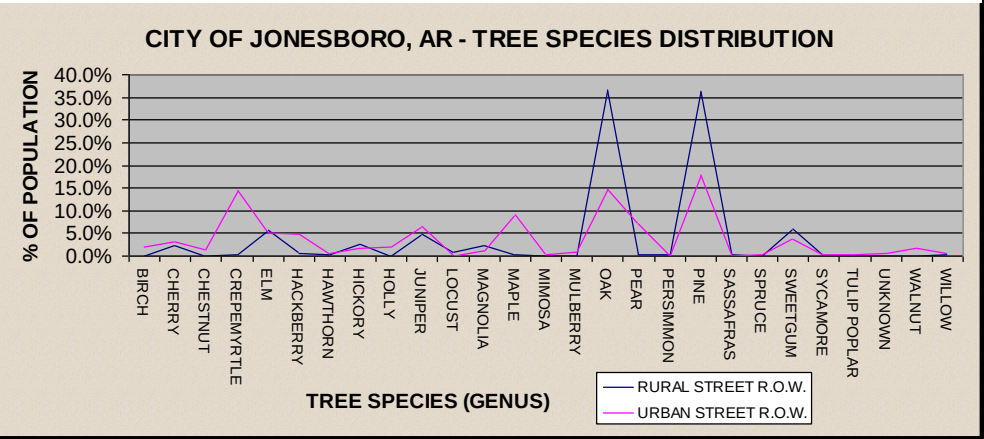



# College Station – Species Diversity



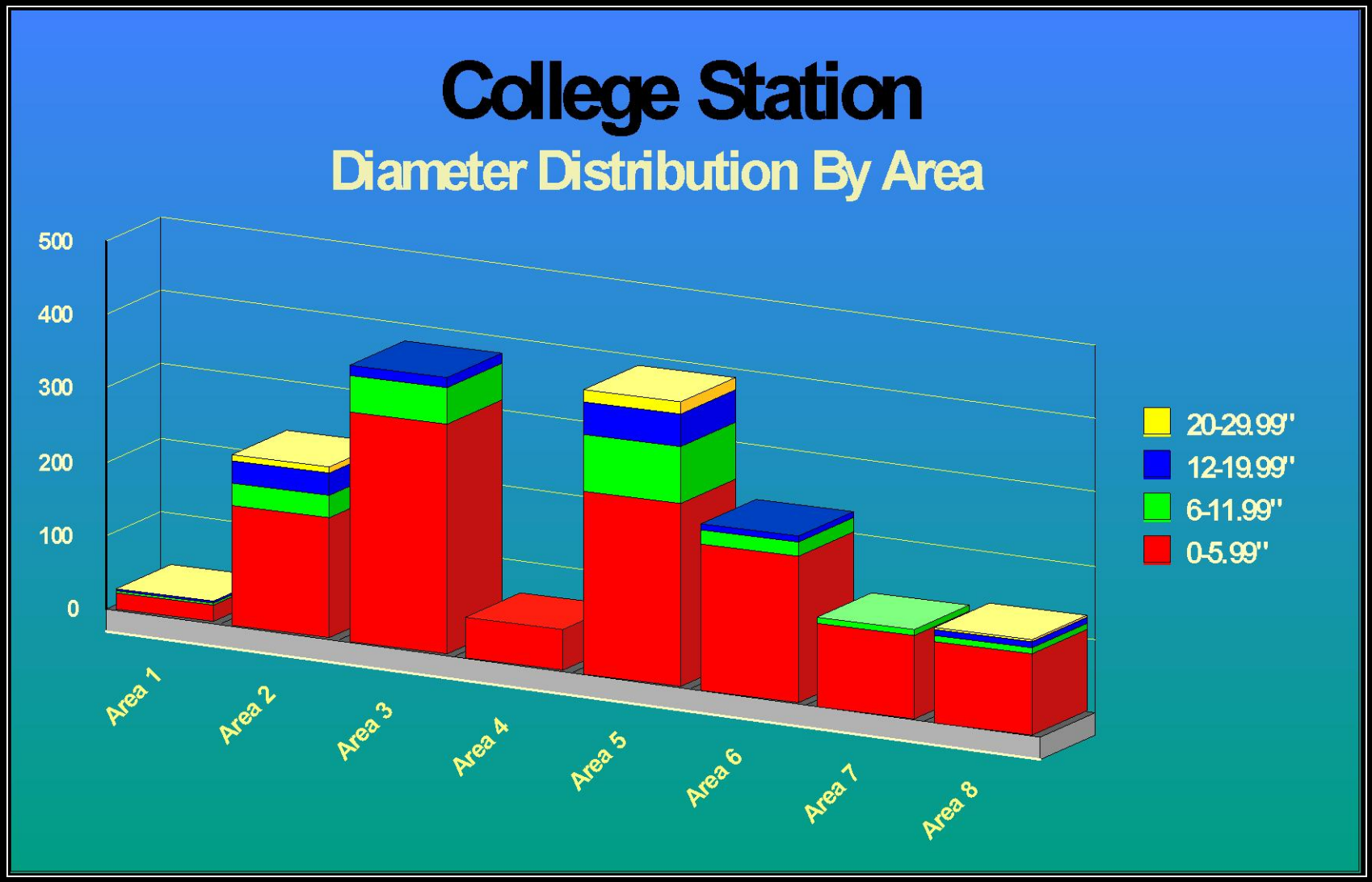
# Jonesboro, AR – Species Diversity

The inventory identified the following trees growing within the street rights-of-way of Jonesboro.

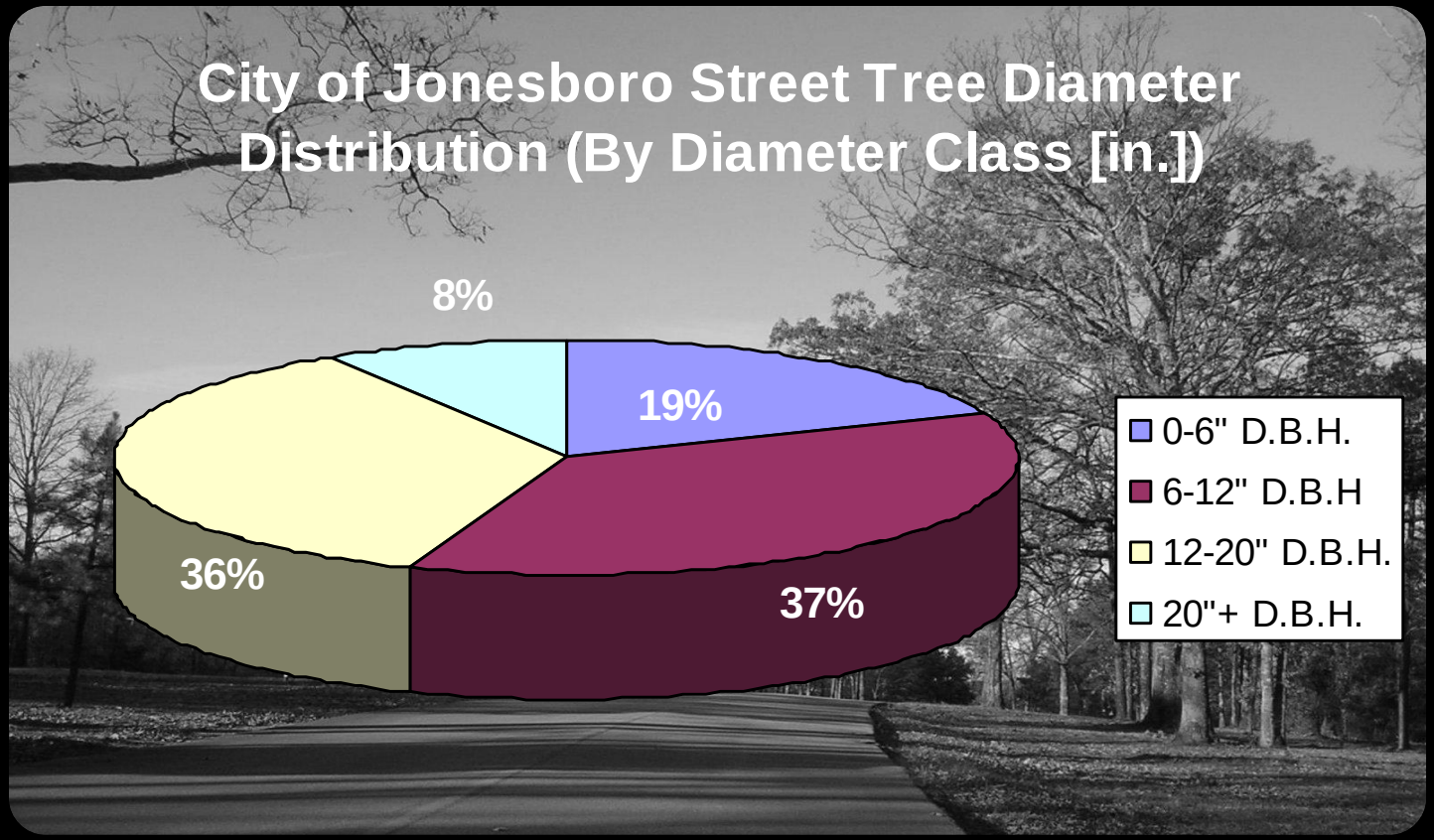



| TREE SPECIES (GENUS) | % OF TREES IN RURAL STREET R.O.W.'S | % OF TREES IN URBAN STREET |
|---|---|---|
| BIRCH | LESS THAN 1% | LESS THAN 1% |
| CHERRY | 2.3% | 3.0% |
| CHESTNUT | LESS THAN 1% | 1.4% |
| CREPEMYRTLE | LESS THAN 1% | 14.4% |
| ELM | 5.7% | 5.0% |
| HACKBERRY | LESS THAN 1% | 4.7% |
| HAWTHORN | LESS THAN 1% | LESS THAN 1% |
| HICKORY | 2.6% | 1.7% |
| HOLLY | LESS THAN 1% | 1.9% |
| JUNIPER | 4.9% | 6.6% |
| LOCUST | LESS THAN 1% | LESS THAN 1% |
| MAGNOLIA | 2.3% | 1.1% |
| MAPLE | LESS THAN 1% | 9.1% |
| MIMOSA | LESS THAN 1% | LESS THAN 1% |
| MULBERRY | LESS THAN 1% | LESS THAN 1% |
| OAK | 36.5% | 14.7% |
| PEAR | LESS THAN 1% | 7.2% |
| PERSIMMON | LESS THAN 1% | LESS THAN 1% |
| PINE | 36.2% | 18.0% |
| SASSAFRAS | LESS THAN 1% | LESS THAN 1% |
| SPRUCE | LESS THAN 1% | LESS THAN 1% |
| SWEETGUM | 6.0% | 3.6% |
| SYCAMORE | LESS THAN 1% | LESS THAN 1% |
| TULIP POPLAR | LESS THAN 1% | LESS THAN 1% |
| UNKNOWN | LESS THAN 1% | LESS THAN 1% |
| WALNUT | LESS THAN 1% | 1.7% |
| WILLOW | LESS THAN 1% | LESS THAN 1% |

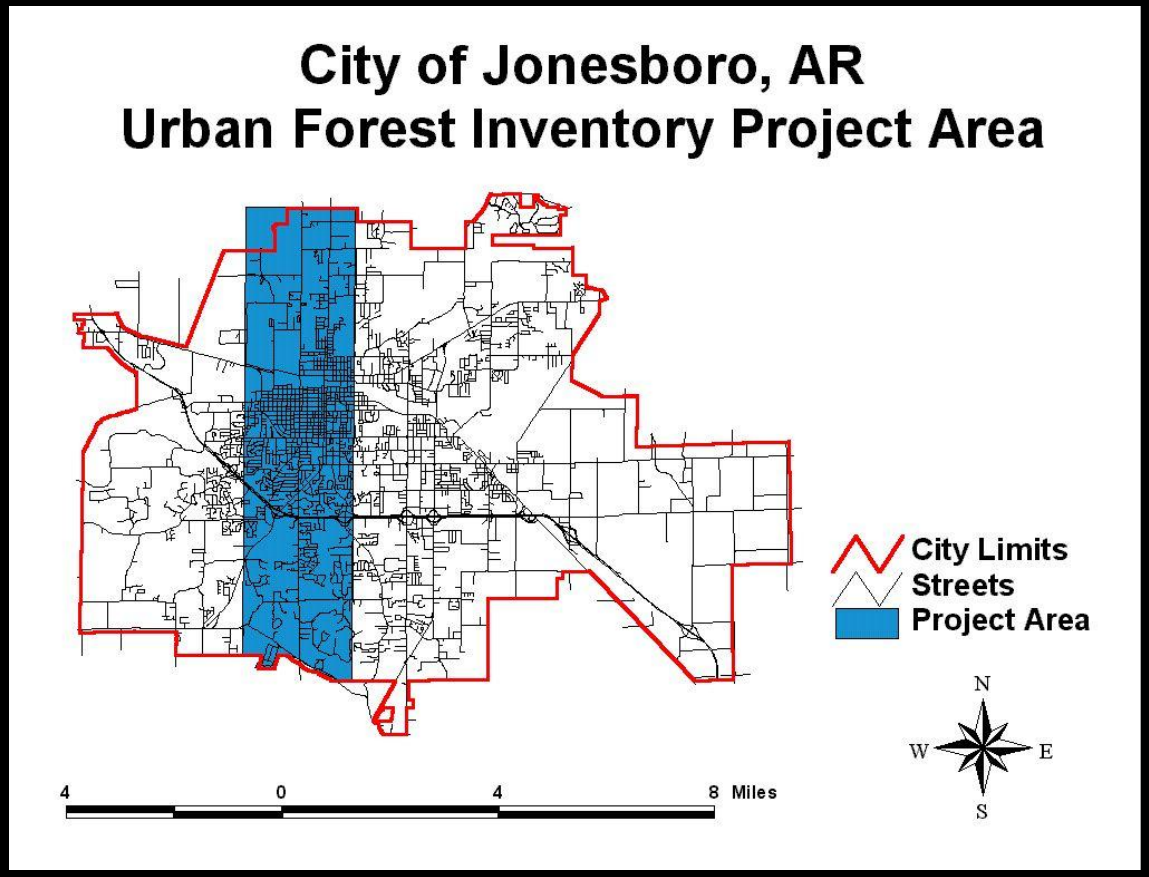
# College Station – Size Distribution



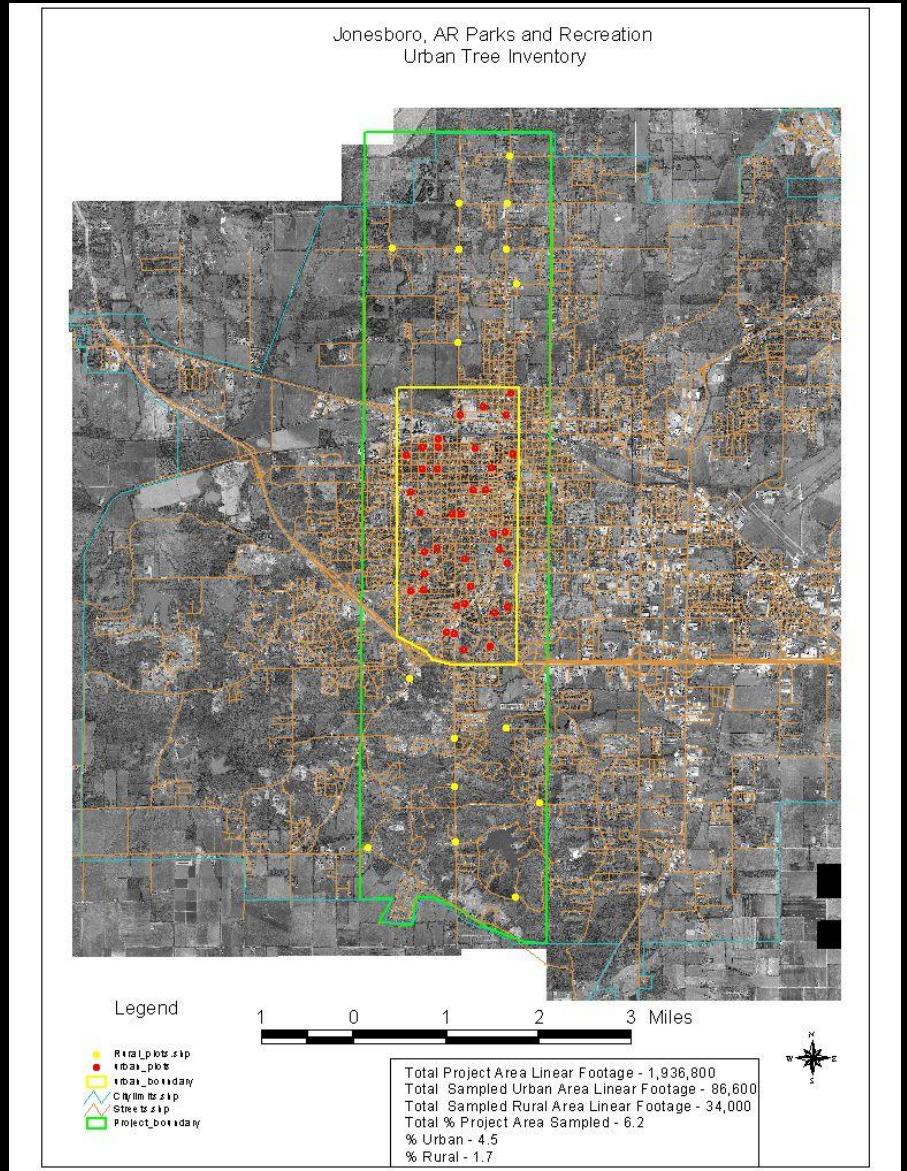
# Jonesboro, AR – Size Distribution



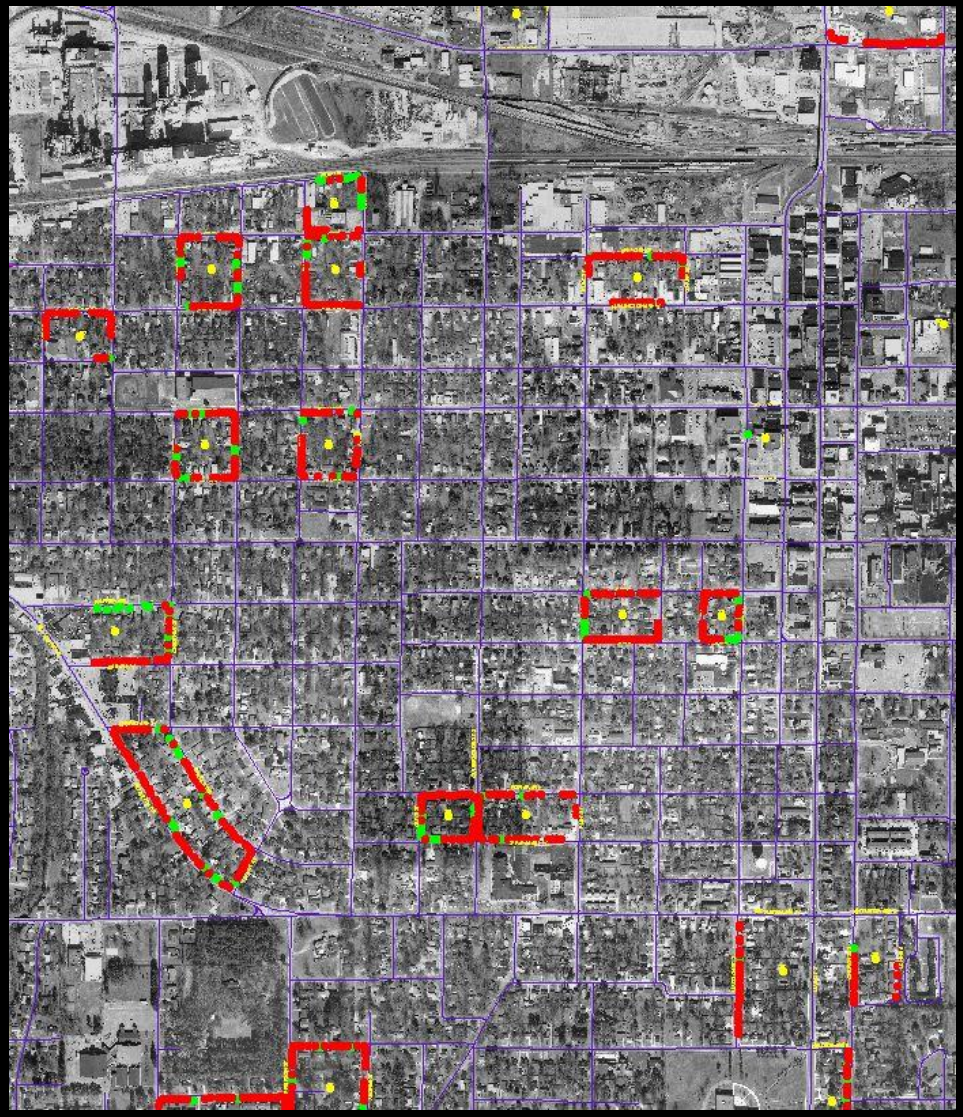
# Jonesboro – Sample Area



# Jonesboro - Sample Area Expanded

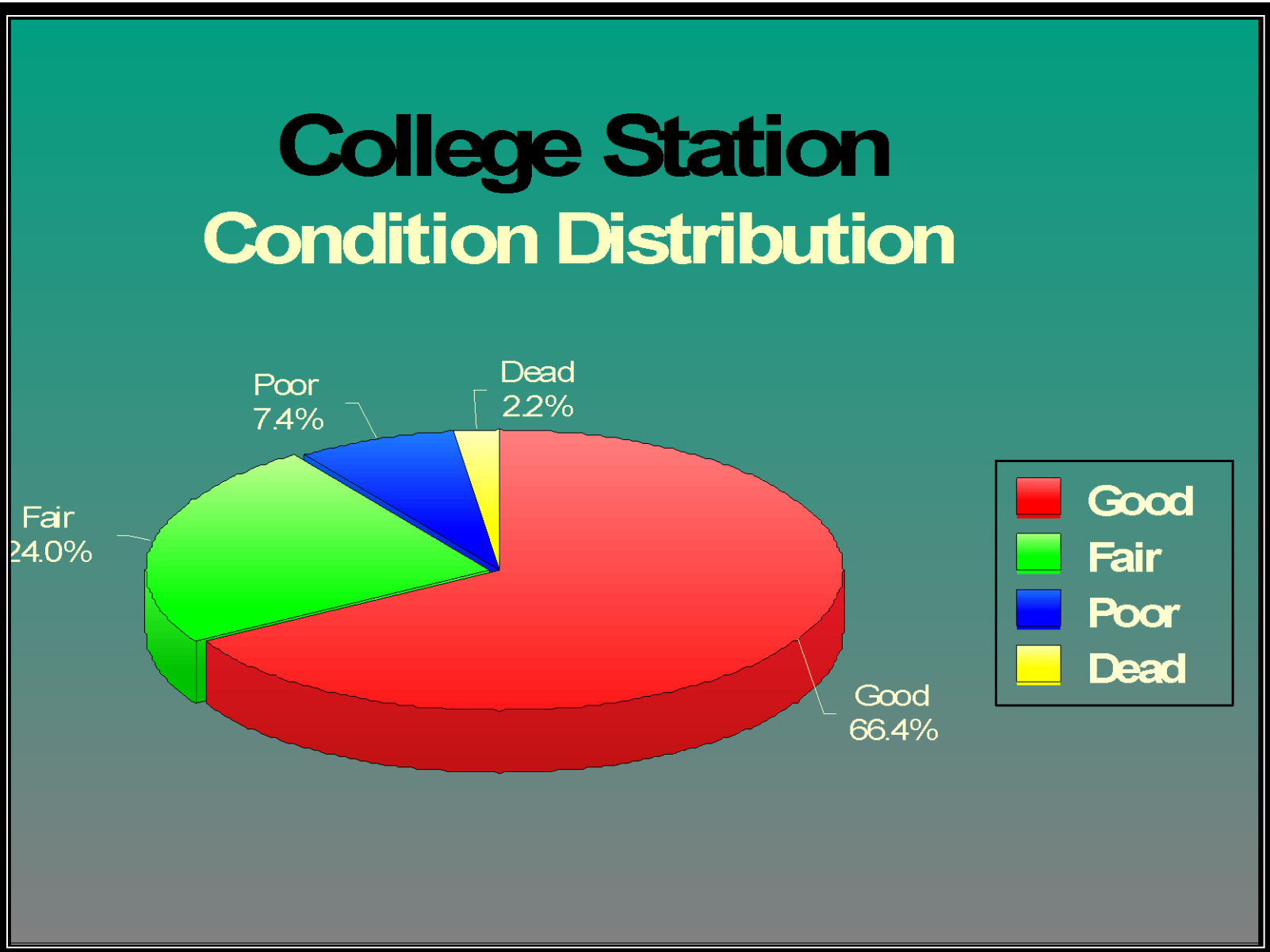


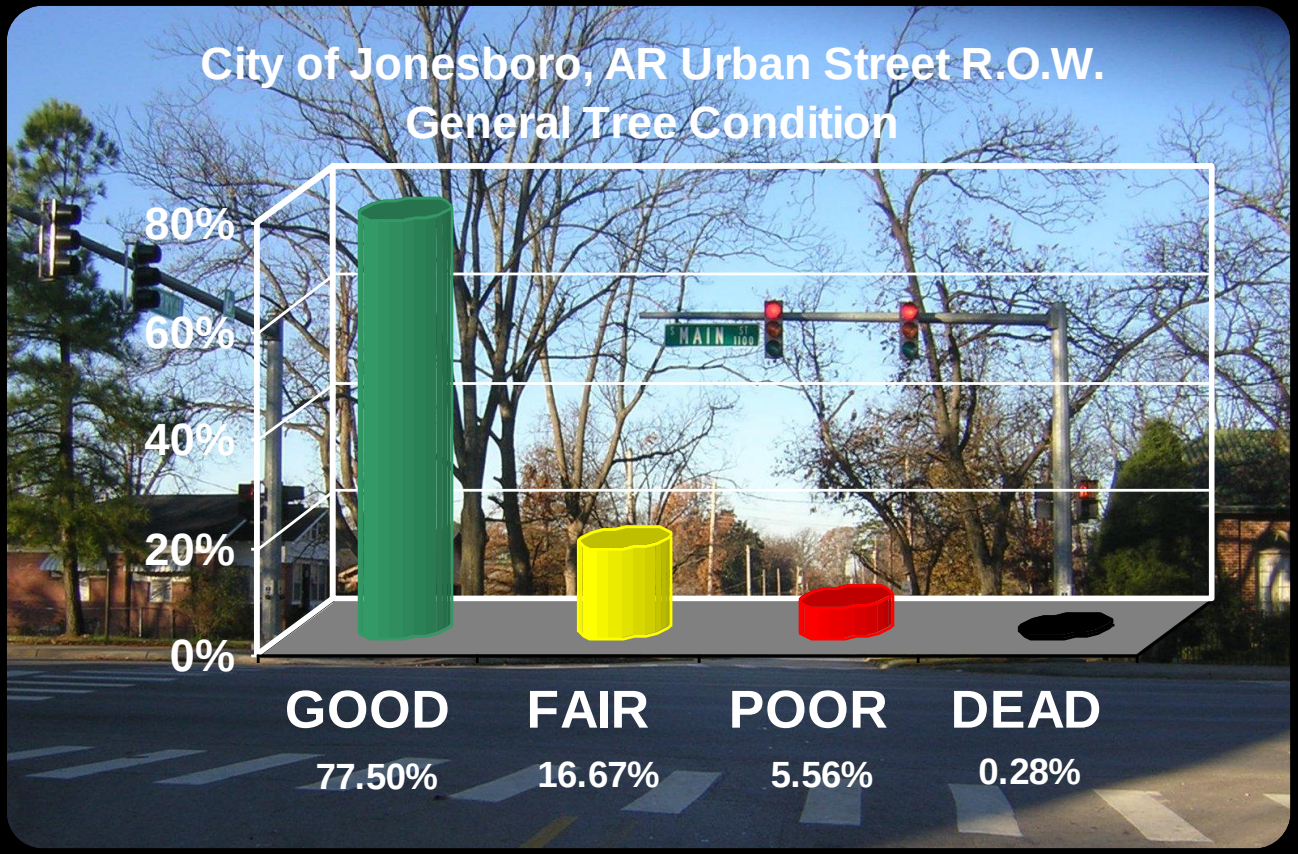
# Sample Areas – Jonesboro, AR



# Geographic Information Systems

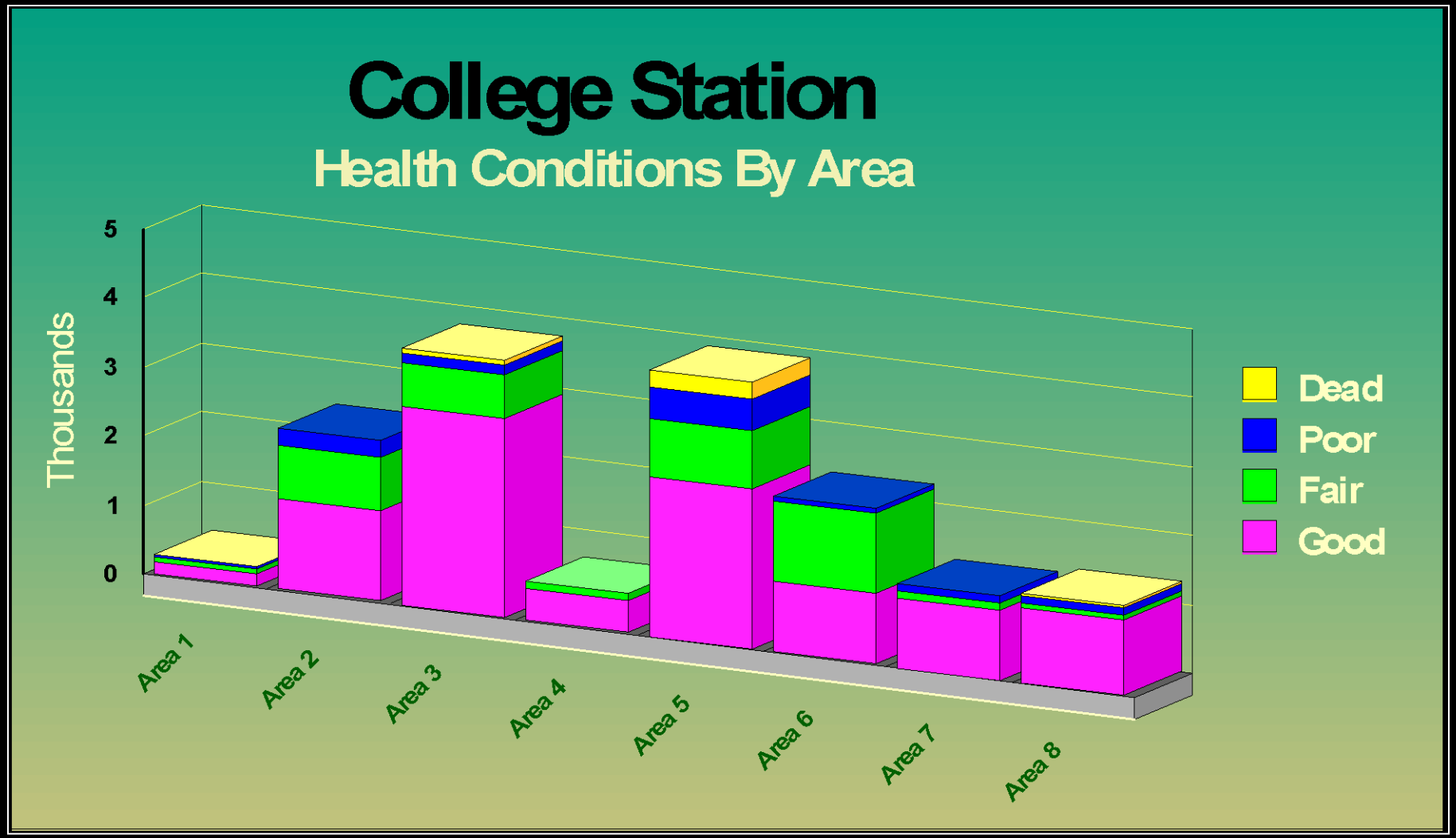
*City of College Station*




City of Jonesboro, AR Urban Street R.O.W.
General Tree Condition
80%
60%
40%
20%
0%
GOOD
77.50%
FAIR
16.67%
POOR
5.56%
DEAD
0.28%

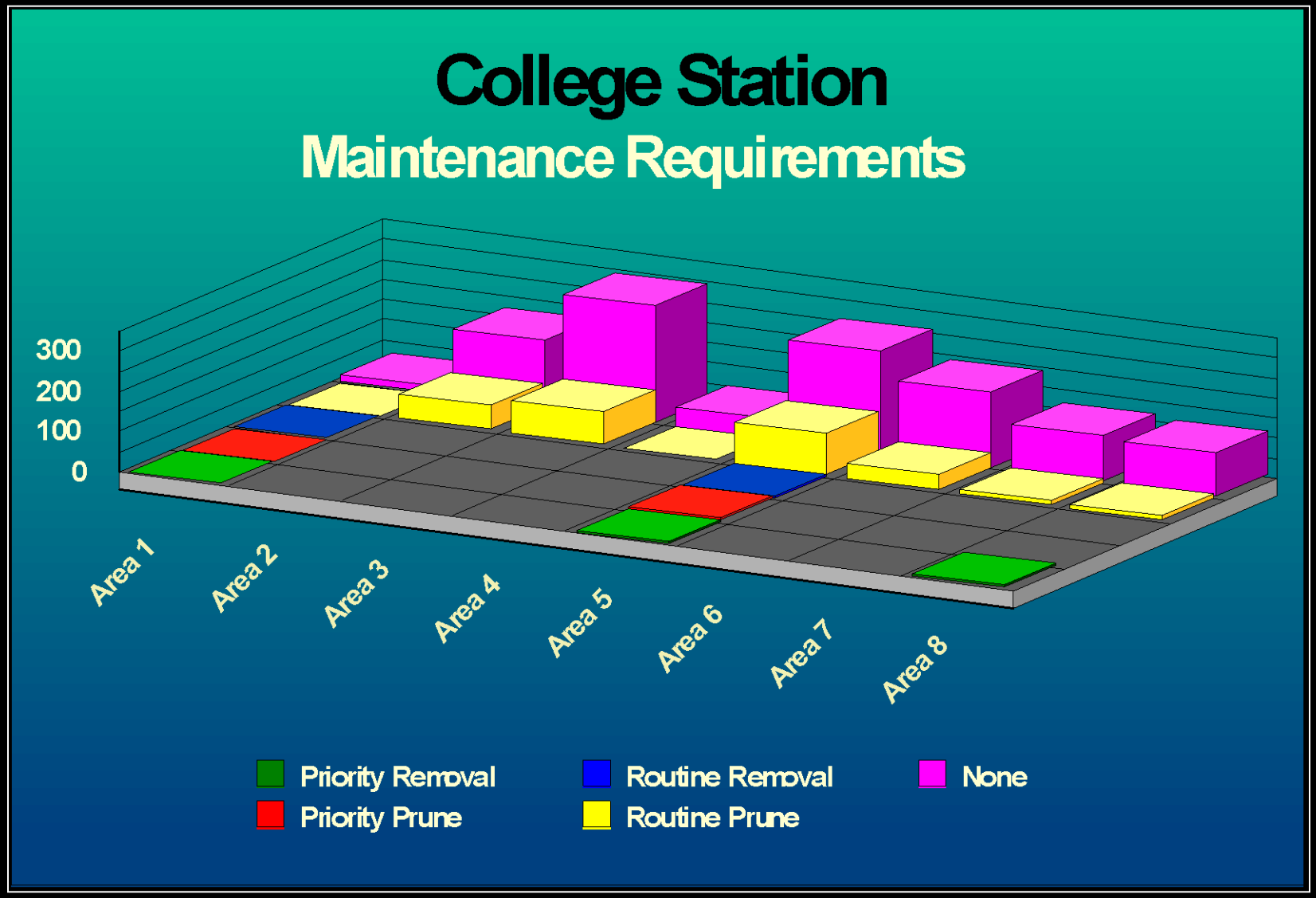
# Geographic Information Systems

*City of College Station*



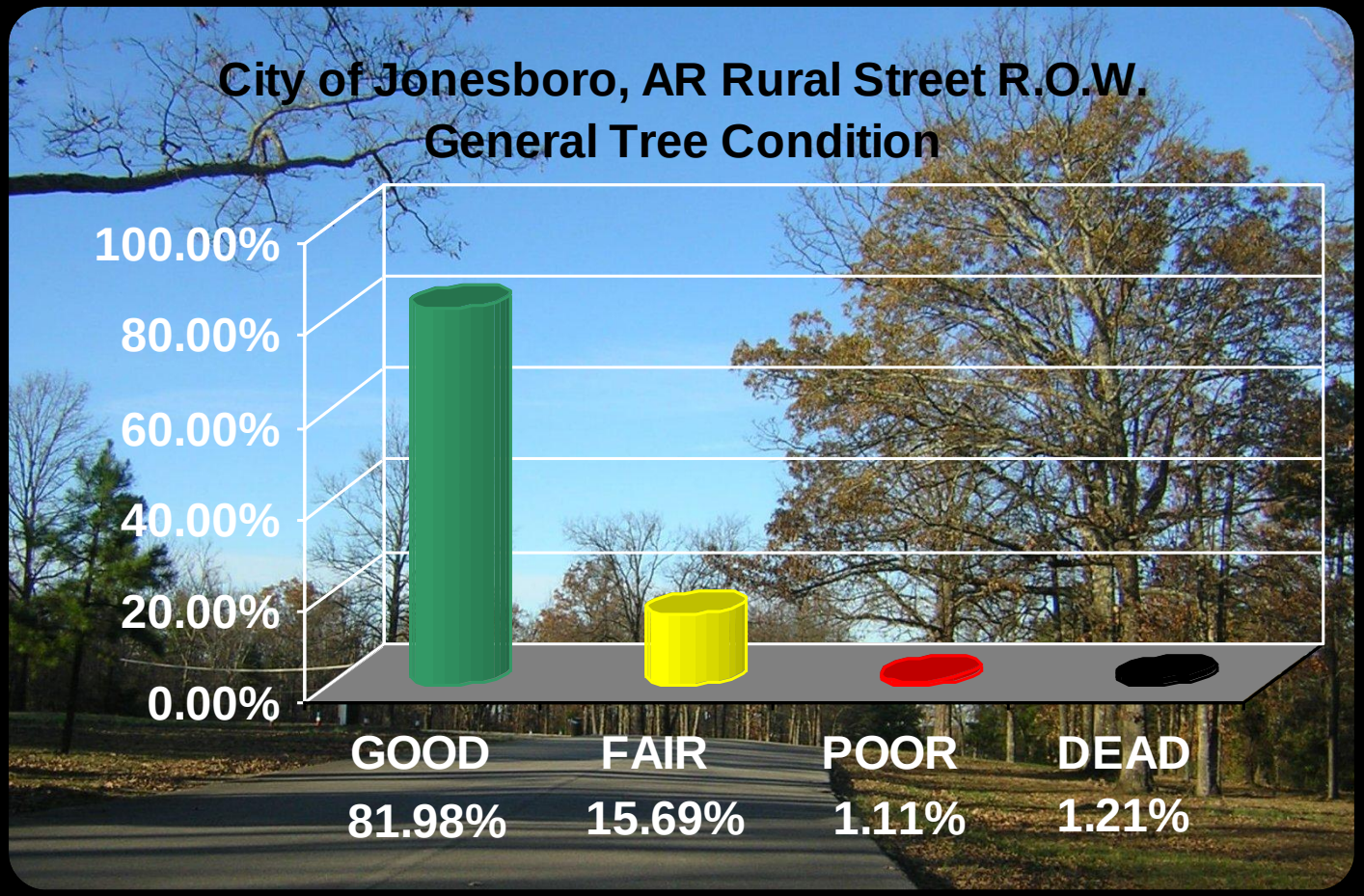
# Geographic Information Systems

## *City of College Station*

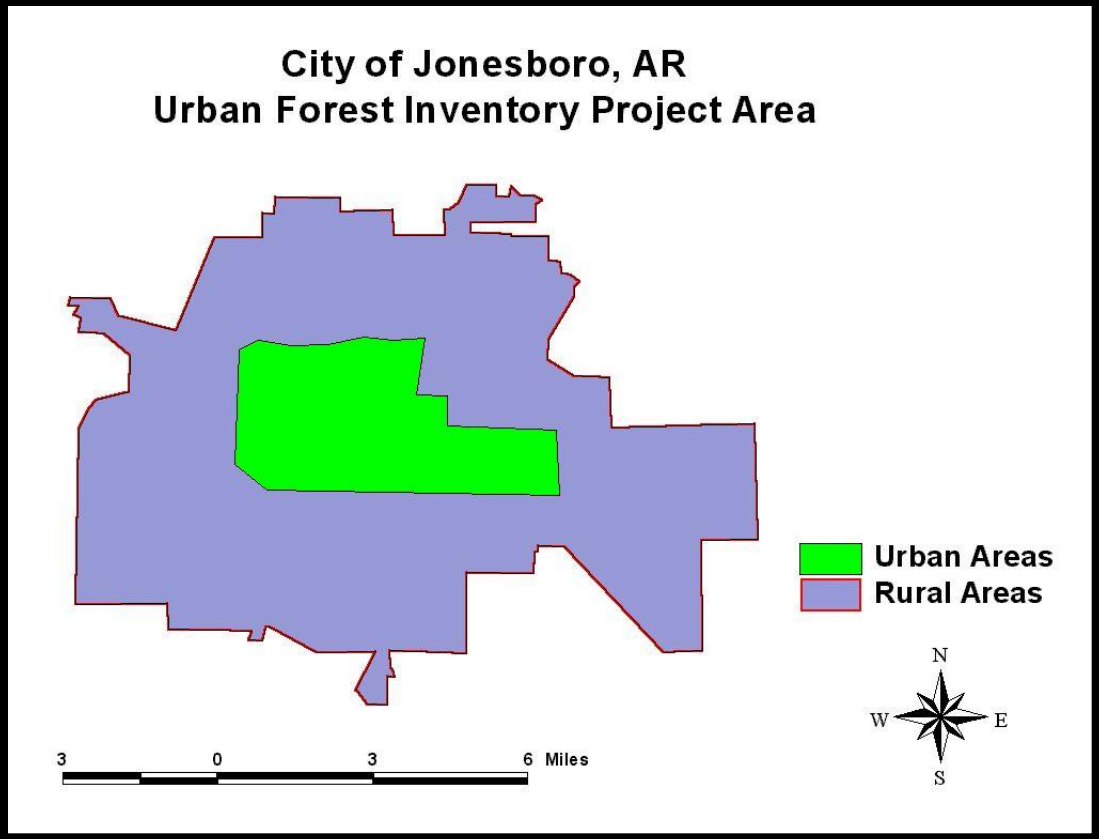


# Jonesboro - Rural Sample Image

# Jonesboro - Rural Sample Data



# Jonesboro – Economic Value



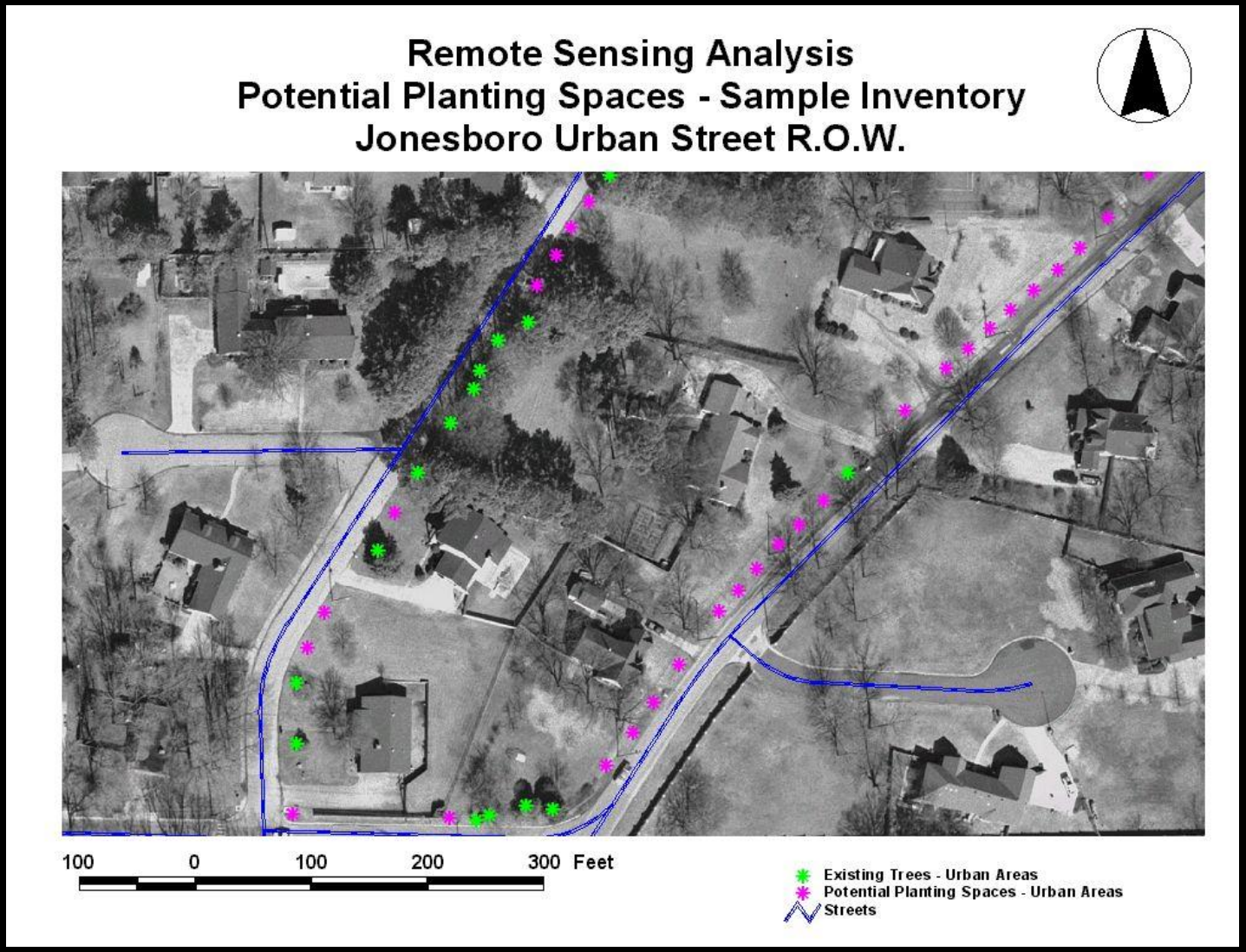

| Area Sampled | Total appraised value within sample areas | Total appraised value within City Limits |
|---|---|---|
| Urban Areas | $249,430.00 | $6,010,913.00 |
| Rural Areas | $209,000.00 | $25,667,457.00 |
| | Total | **$31,678,370.00** |

# Helotes Remote Sensing and Field Data Collection

# Vegetative Type and Significant Trees

# Vegetative Type and Significant Trees

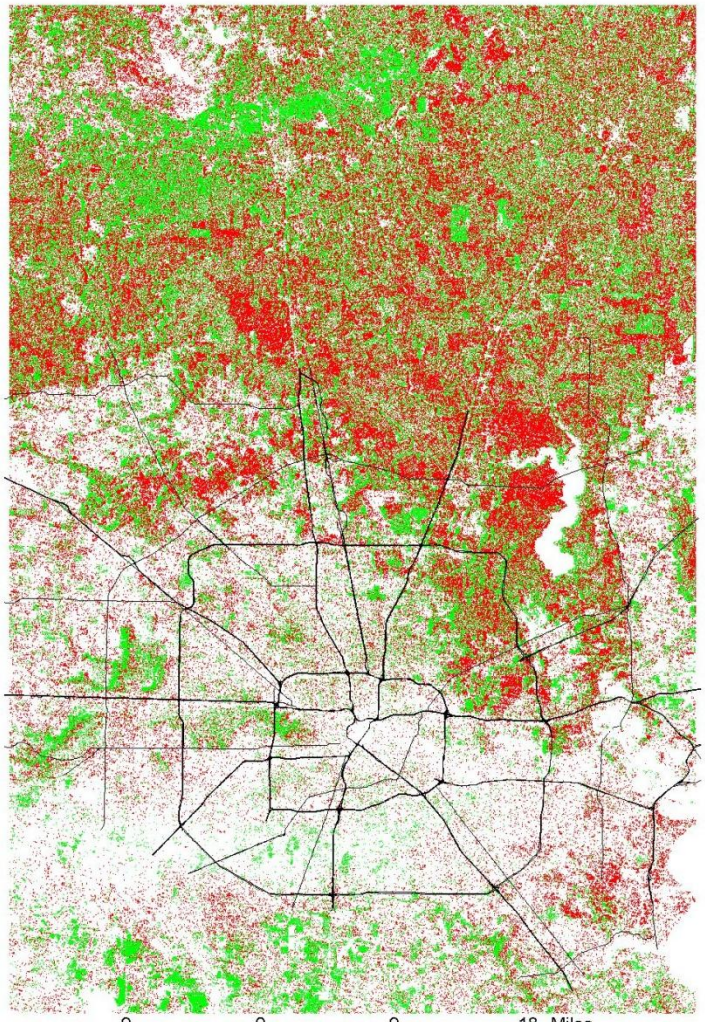
# Remote Sensing Methods



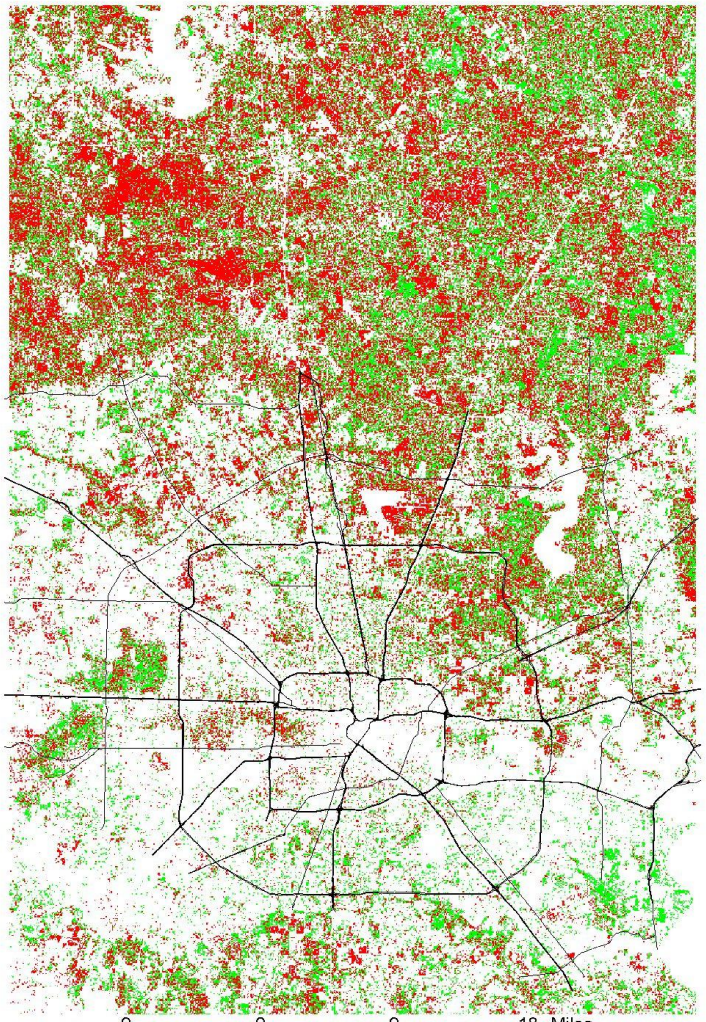
# Windshield Inventory

- Small communities, repeatable on a periodic basis
- Large communities for initial planning
- Usually by hand or hard copies
- Difficult to assess condition and particularly hazard issues

# Houston Tree Cover Change – American Forests Study 2000

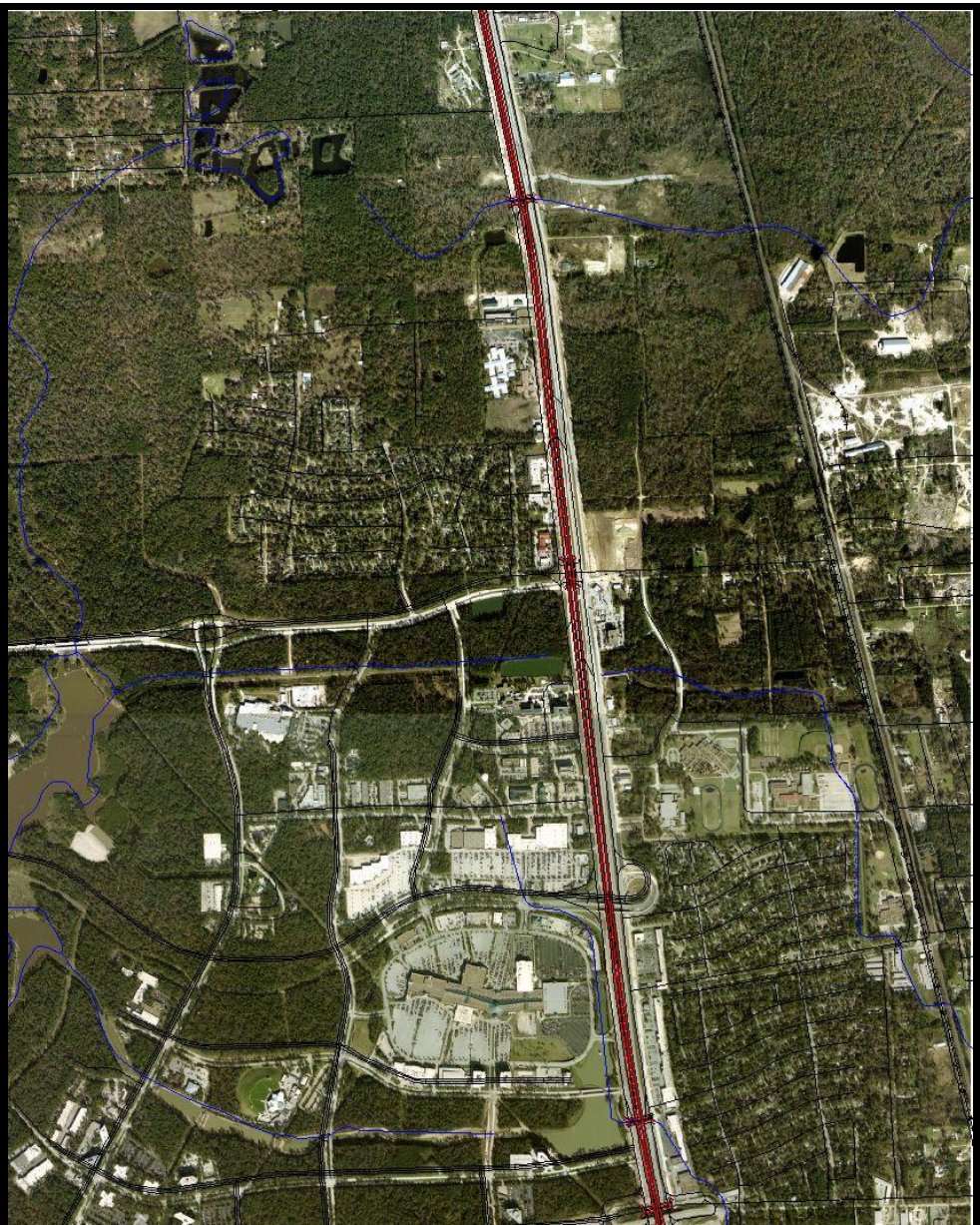



Tree Cover Change 1972-1984

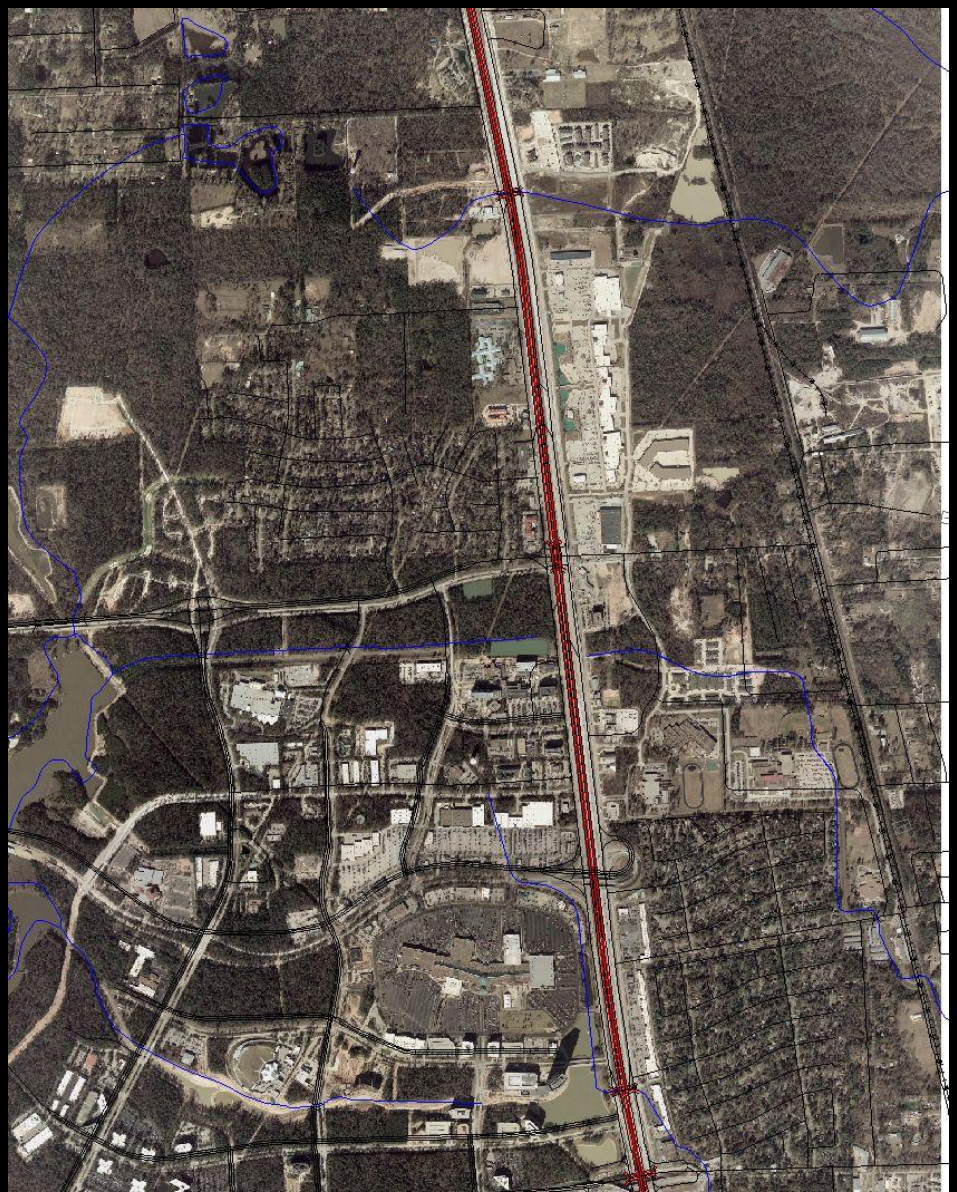



Tree Cover Change 1984-1999

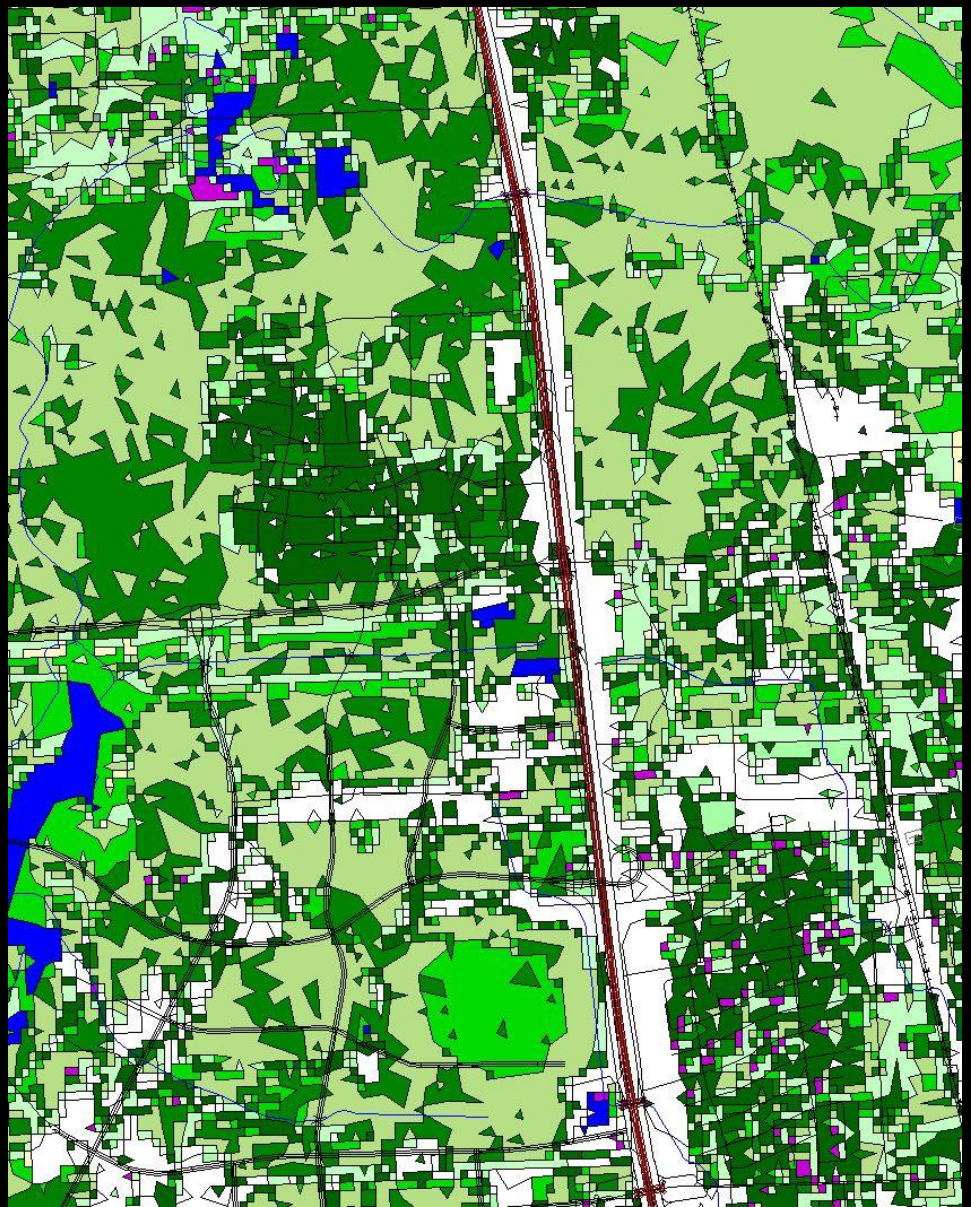
# Shenandoah 1999 Aerial Photo



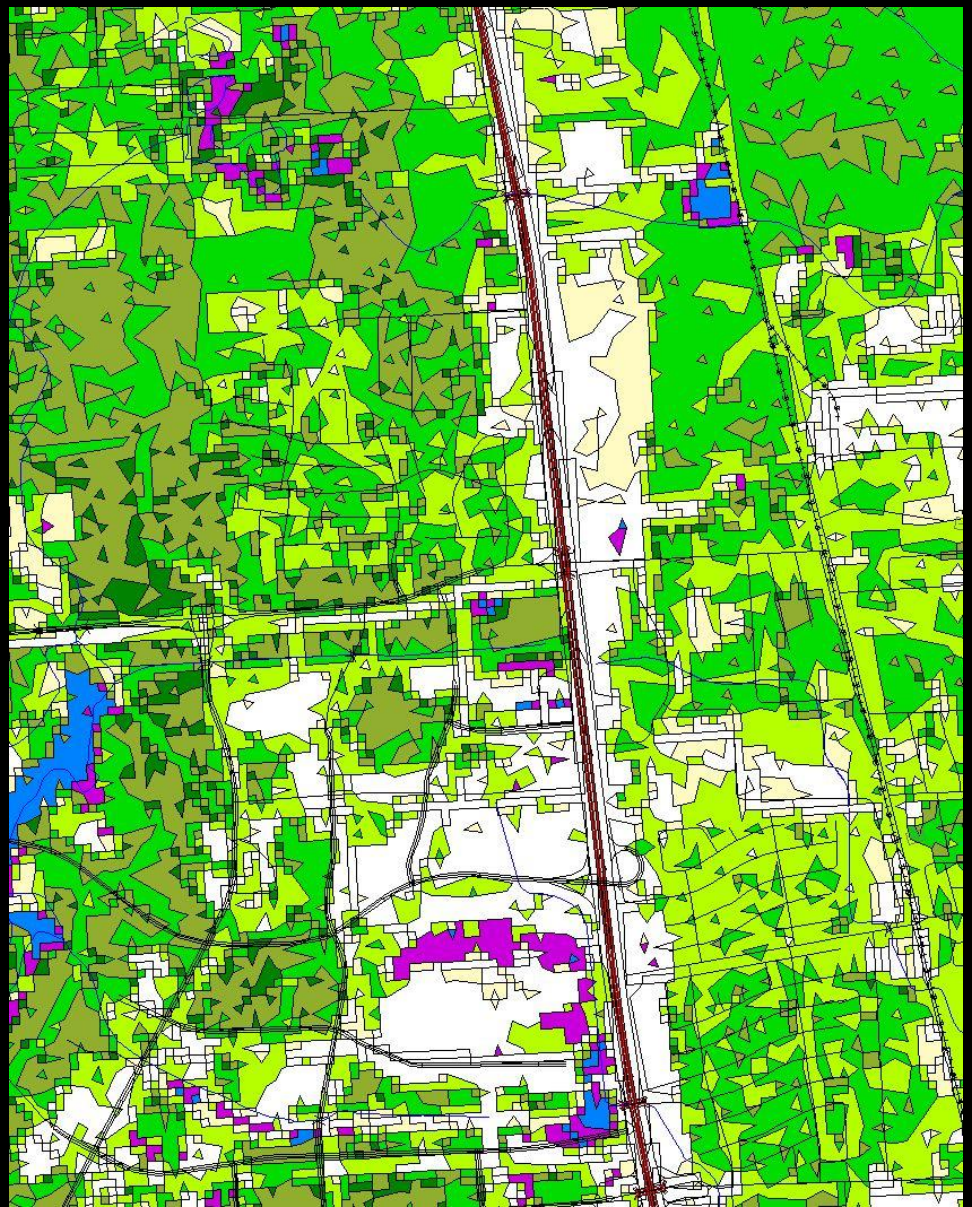
# Shenandoah 2002 Aerial Photo



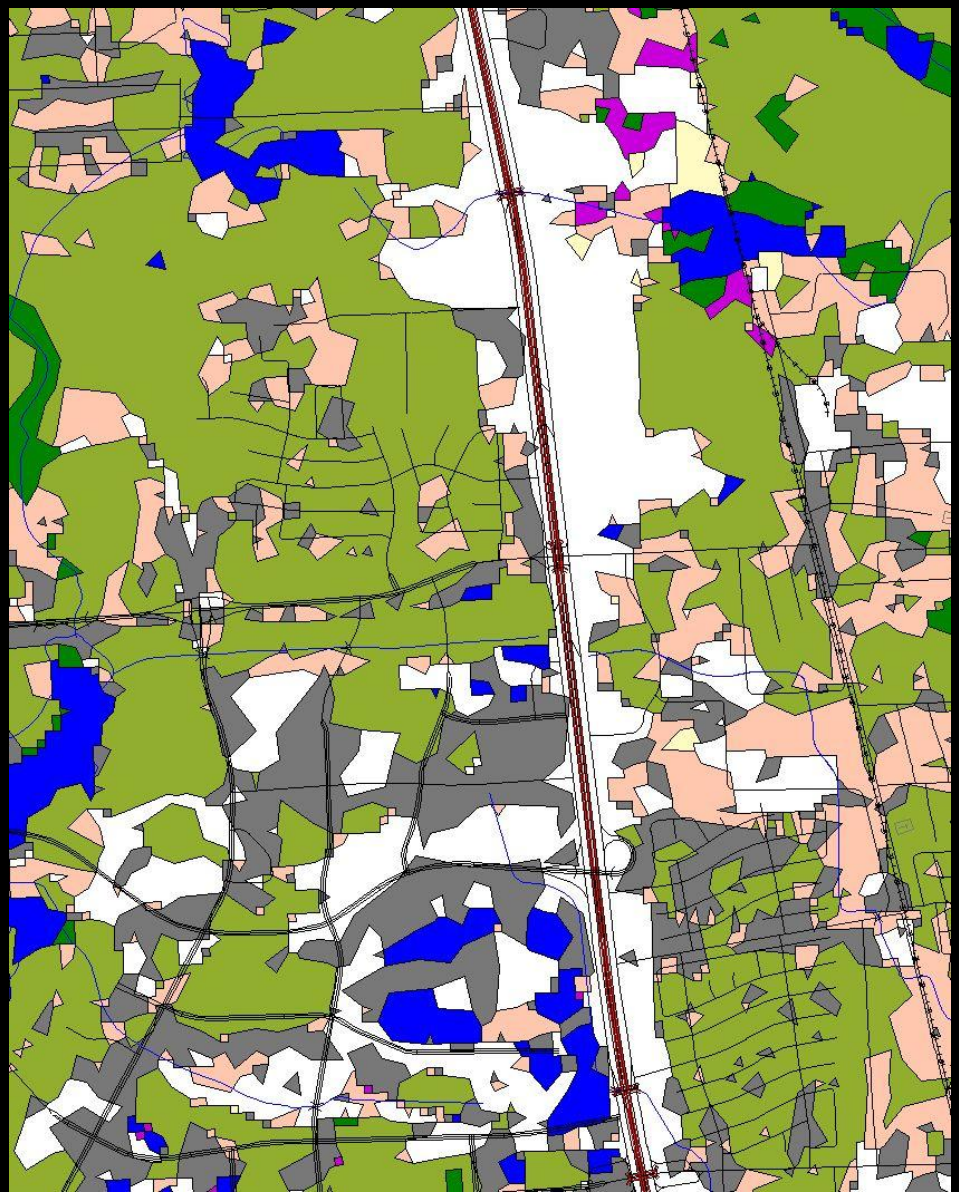
# Shenandoah 1993 Land Use Map



# Shenandoah 2000 Land Use Map



# Shenandoah 2001 Land Use Map



# What is needed?

American Forests recommends increase of canopy to the 40 percent level.

Why? …..Storm Water Reduction, Carbon Sequestration, Temperature Cooling, Energy Savings, Health…….

# More Questions

- What work is needed?
- Are planting spaces available?
- How often does pruning occur? Scheduled?
- How are priorities set? Crisis?
- How is work scheduled?
- Is the public satisfied or are there complaints?

# Questions For All

- What needs to be done?
- Who needs to do it?
- How will it be done?
- Who will pay for it?
- When will it be done?
- How will we know when we get there?

# Solutions for Greater Canopy

- More street trees
- More park trees
- More green space
- More trees in non-conventional locations, i.e., flood control easements
- Conservation easements

# After More Canopy is Created

- How are we going to maintain it?
- Who will maintain it?
- Who will pay for it?

Nice to have new greenspace, but who will “show up” for you at budget meetings?

# After We Have More Canopy
# New Questions for Community

AGAIN,

- Who should do it?

  Volunteers?
  Non-Profits?
  Municipal or Governmental Staff?
  Urban Forest Professionals?

  DEPENDS ON THE RESULTS YOU WANT AND HOW MUCH MONEY YOU HAVE

# Who Else Should Be Involved

- Engineers
- Architects
- Developers
- Planners
- Landscape Architects
- Municipal and county government department heads
- Environmental Professionals

# Process

- Professionals in city planning, management, and development all have a process that helps them accomplish community goals and expectations
- The inventory is just one ingredient in the recipe
- Using the data collaboratively is the key

# Why Plan?

- Remember, trees can't move; therefore they must adapt to new environments
- The questions is... can the tree adapt to its new environment fast enough?
- Will the adaptation be according to a specified plan?

# This Tree Could Not Adapt
## Improper Preservation Planning