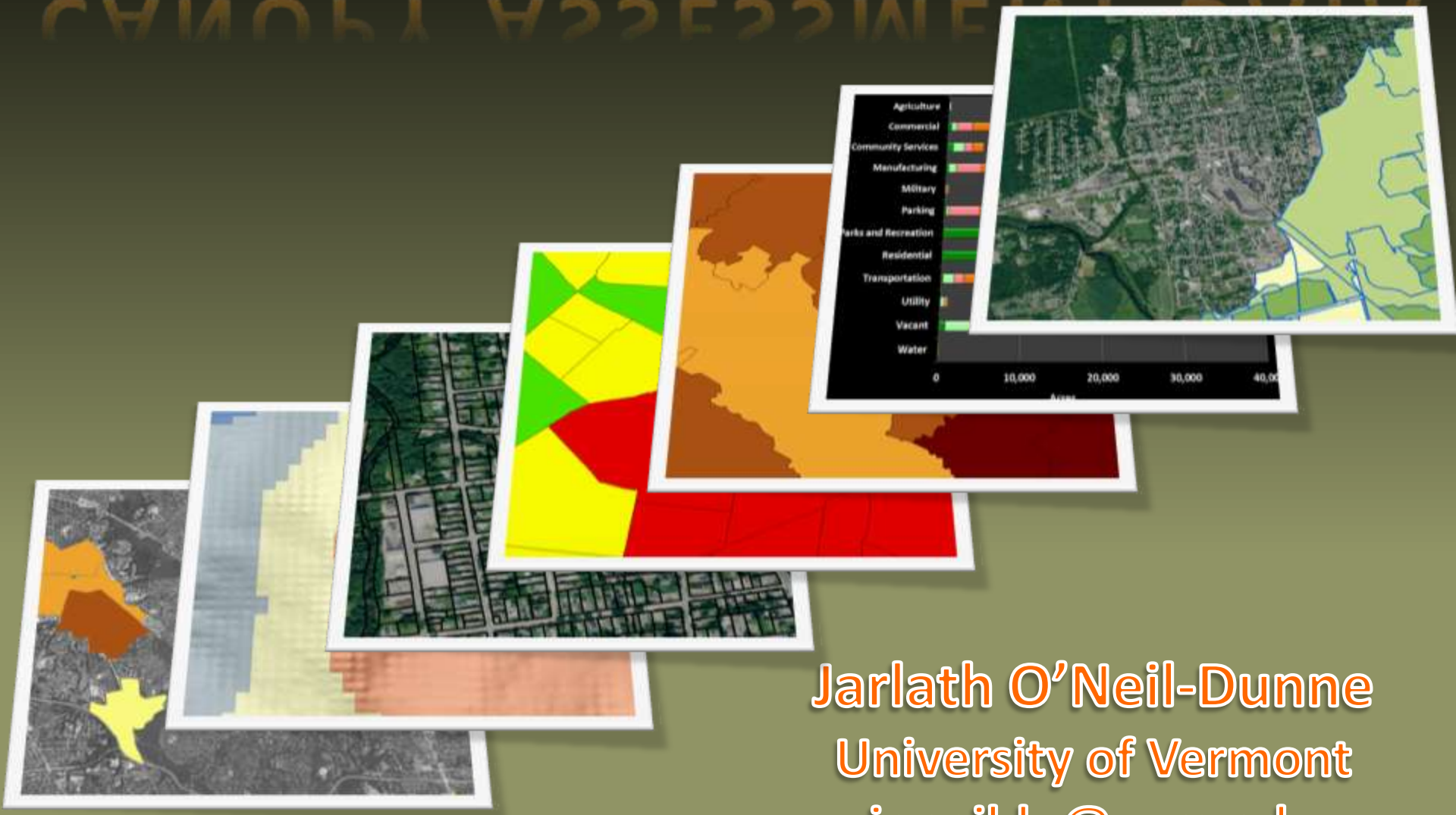
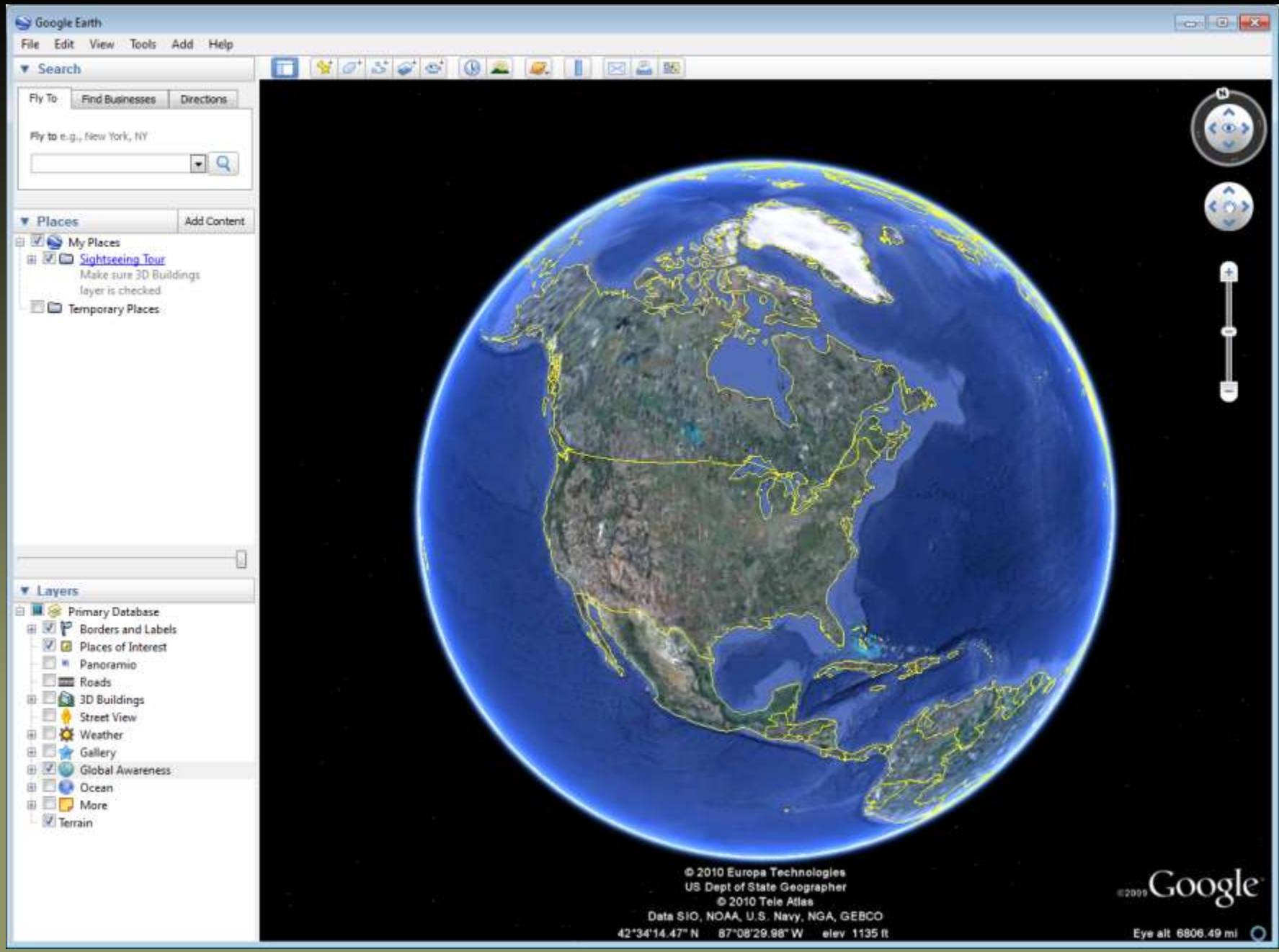
WORKING WITH YOUR TREE CANOPY ASSESSMENT DATA



Jarlath O'Neil-Dunne
University of Vermont
joneildu@uvm.edu


Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., New York, NY
Places
Add Content
My Places
Sightseeing Tour
Make sure 3D Buildings layer is checked
Temporary Places
Layers
Primary Database
Borders and Labels
Places of Interest
Panoramio
Roads
3D Buildings
Street View
Weather
Gallery
Global Awareness
Ocean
More
Terrain
© 2010 Europa Technologies
US Dept of State Geographer
© 2010 Tele Atlas
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
42°34'14.47" N 87°08'29.98" W elev 1135 ft
©2009 Google
Eye alt 6806.49 mi


Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., 37 25.818' N, 122 05.36' W
washington dc
washington dc
Places
Add Content
My Places
Sightseeing Tour
Make sure 3D Buildings layer is checked
Real-Time Track of LANDSAT_7
A continuously-updated, real-time track of the LANDSAT_7
Temporary Places
Layers
Primary Database
Borders and Labels
Places of Interest
Panoramio
Roads
3D Buildings
Street View
Weather
Gallery
Global Awareness
Ocean
More
Terrain
How much tree canopy do we have?
How much room is there to plant trees?
Image District of Columbia (DC GIS)
Google
Imagery Date: Mar 4, 2008
38°53'50.16" N 77°02'11.36" W elev 50 ft
Eye alt 4309 ft

- Comprehensive
- Scalable
- Meaningful
- Accurate
- Affordable

Annapolis HEADLINES...

Press Release for: 6/20/2006

Mayor Ellen Moyer agrees to a 50% Urban Tree Canopy in Annapolis by 2036

In January 2005 Mayor Ellen Moyer and The City of Annapolis agreed to cooperate with The Maryland Department of Natural Resources and participate in the Urban Tree Canopy (UTC) goal-setting process.

City Staff worked with MD DNR, the US Forest Service, and the University of Vermont's Spatial Analysis Lab to establish the methods for UTC analysis, and develop timelines for goal-setting completion.

GIS data, including high-resolution remote sensing data for trees and vegetation was combined with parcel inform from the Maryland Department of Planning to identify existing and possible UTC in Annapolis.

The report found that the existing Urban Tree Canopy in Annapolis stands at 41%. That, according to MD DNR, that the City is doing very well. One city of similar size in Maryland only has 13% tree cover.

The report recommends that the city adopt a goal of 50% UTC to be reached by 2036. Achieving this goal would Annapolis a leader in Urban Tree Canopy among US cities.

In her June 19th letter to Mike Galvin at the Maryland Department of Natural Resources, Mayor Moyer said,

"I'm very excited about the State's findings. This proves that our hard work in the field of arboriculture is paying City will adopt the 50% Urban Tree Canopy goal. We plan on achieving this goal by increasing the UTC by 23% adding this to a 50% total land area. Although, I truly believe we can surpass this goal, this will be a great starti point."

The City of Annapolis plans to partner with the State of Maryland to develop an implementation plan that include land; and to design educational, outreach and incentive programs to encourage private landowners to contribute UTC.

Urban Tree Canopy is essential to the health of the Chesapeake Bay and its tributaries. An UTC of 44.6 transl stream health rating of "good". As the tree cover increases, the health of surrounding waterways improves.

Studies also show that urban trees play an important role in providing a higher quality of life to urban residents enhance local economic development opportunities.

The complete Annapolis Urban Tree Canopy Report can be found on the city's web site here.

Ray Weaver
Public Information Officer
City of Annapolis
410/263-1183
410/693-8391cell

Mayor Ellen Moyer agrees to a 50% Urban Tree Canopy in Annapolis by 2036

Targeted Plantings

Environmental Justice

Prioritization

Stewardship

Awareness

Master Plans

Long Term Monitoring

Regulatory

Correlation

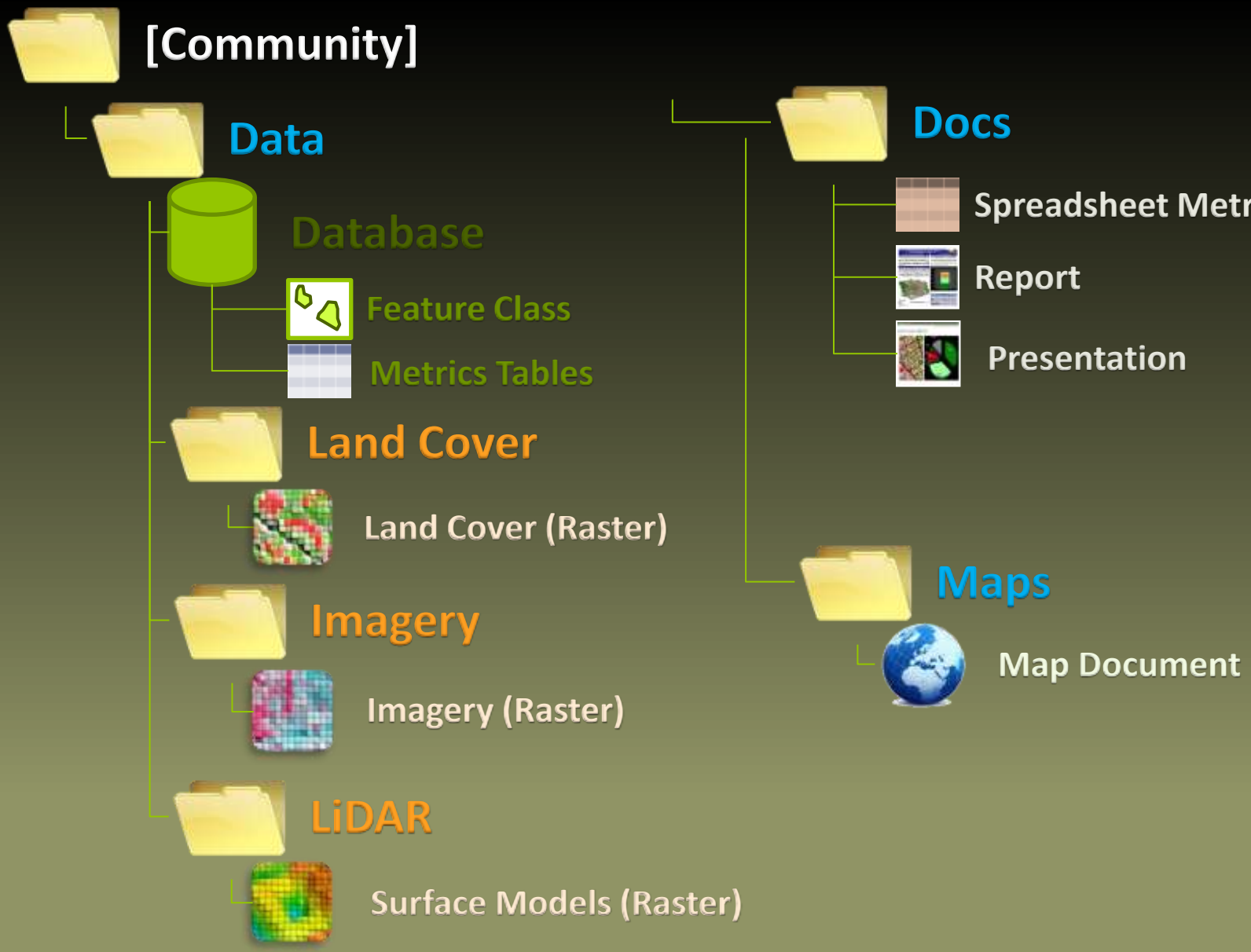
Goal Setting

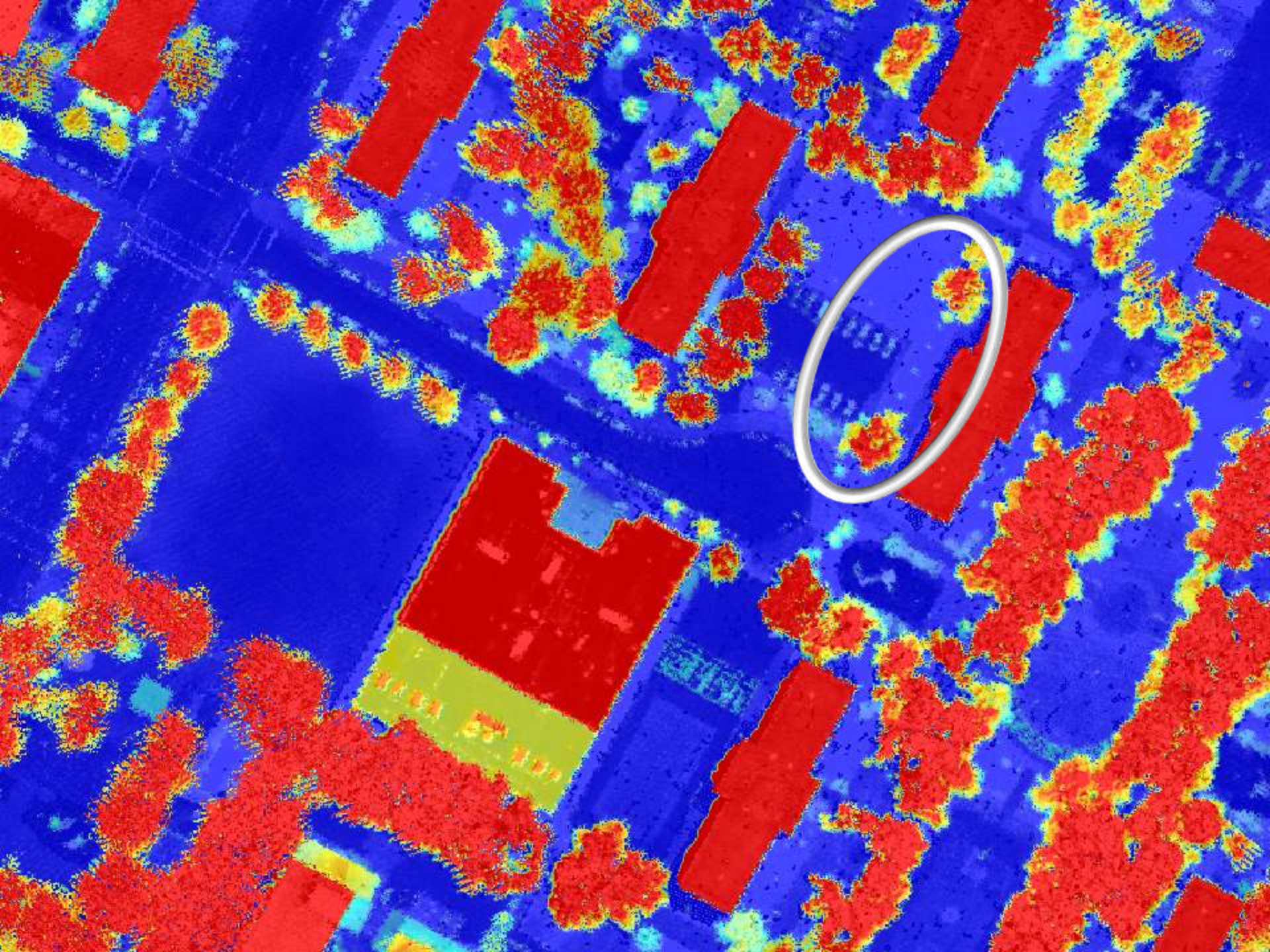
DBH

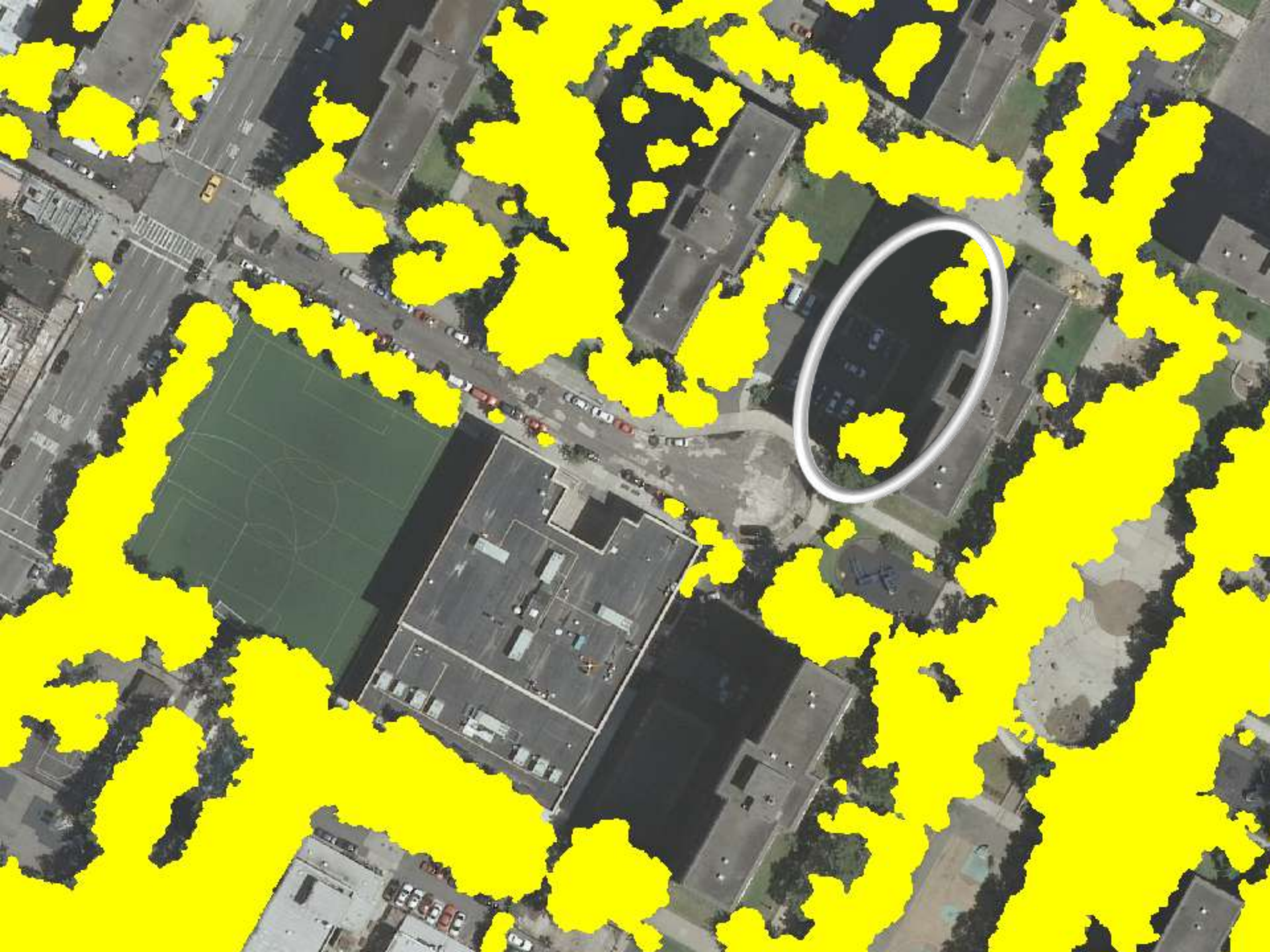
Species

Ecosystem Services

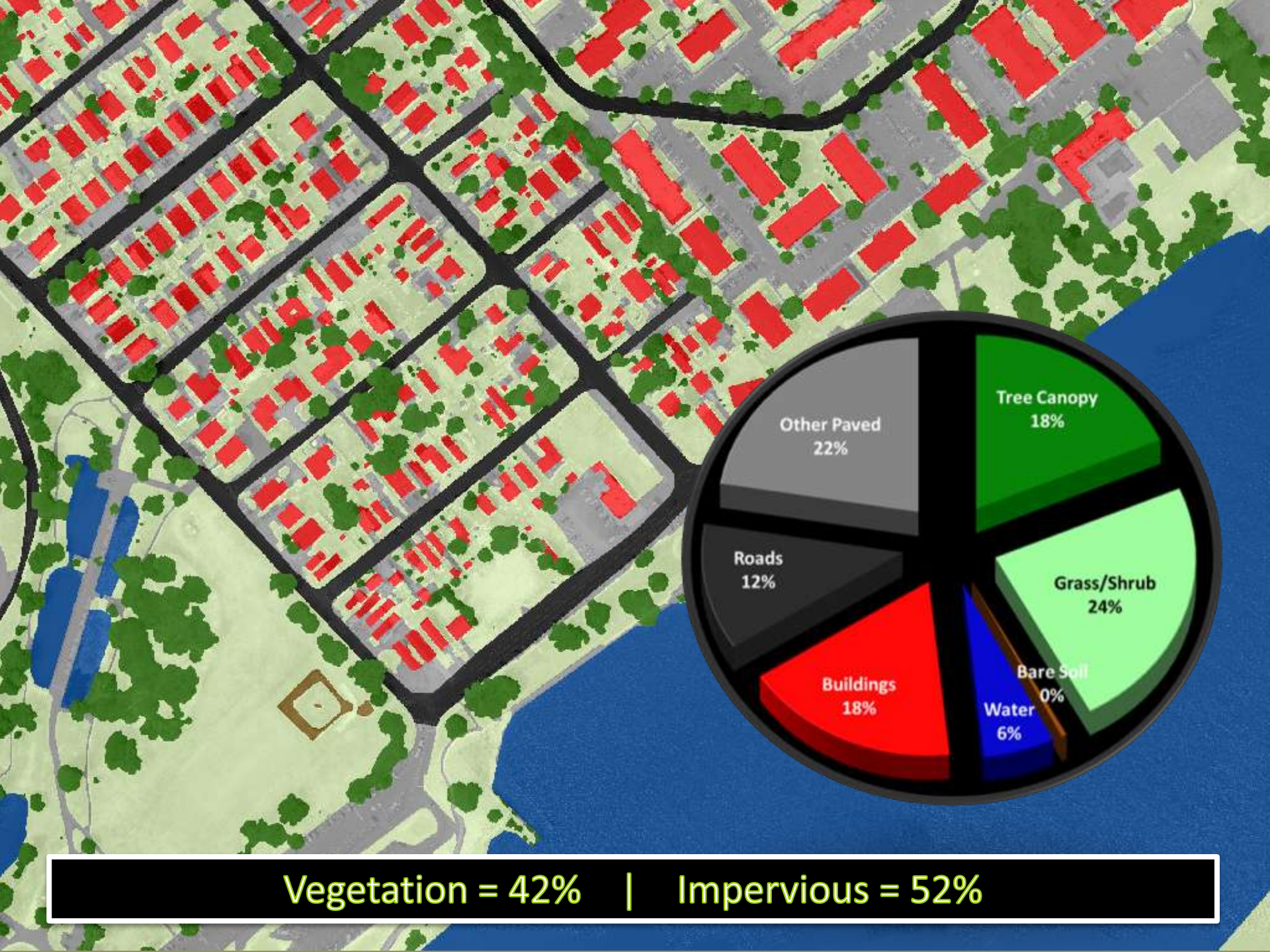
Condition


[Community]
Data
Database
Feature Class
Metrics Tables
Land Cover
Land Cover (Raster)
Imagery
Imagery (Raster)
LiDAR
Surface Models (Raster)
Docs
Spreadsheet Metrics
Report
Presentation
Maps
Map Document






Tree Canopy
Grass/Shrub
Bare Earth
Water
Buildings
Roads
Other Paved Surfac



Vegetation = 42% | Impervious = 52%

Impervious

Buildings

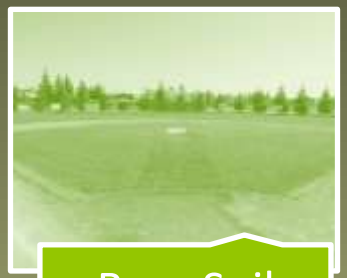
Roads/Railroads

Other Paved

Pervious

Tree Canopy

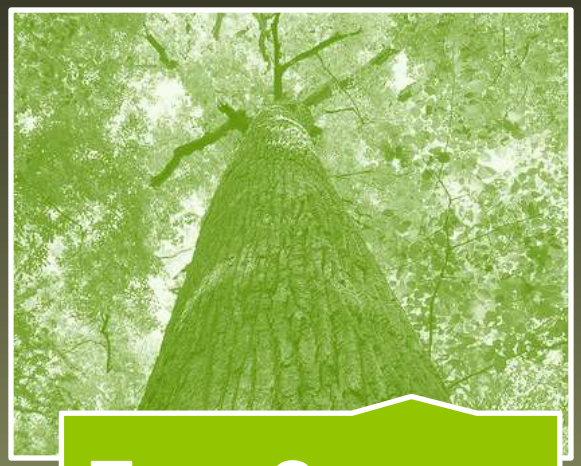
Grass/Shrub



Bare Soil

Water

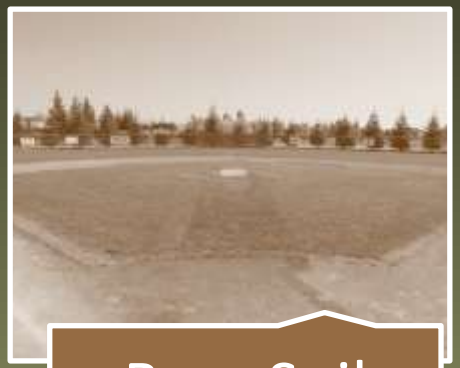
Existing



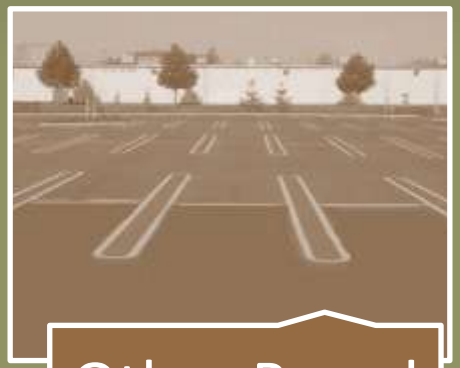
Tree Canopy

Possible

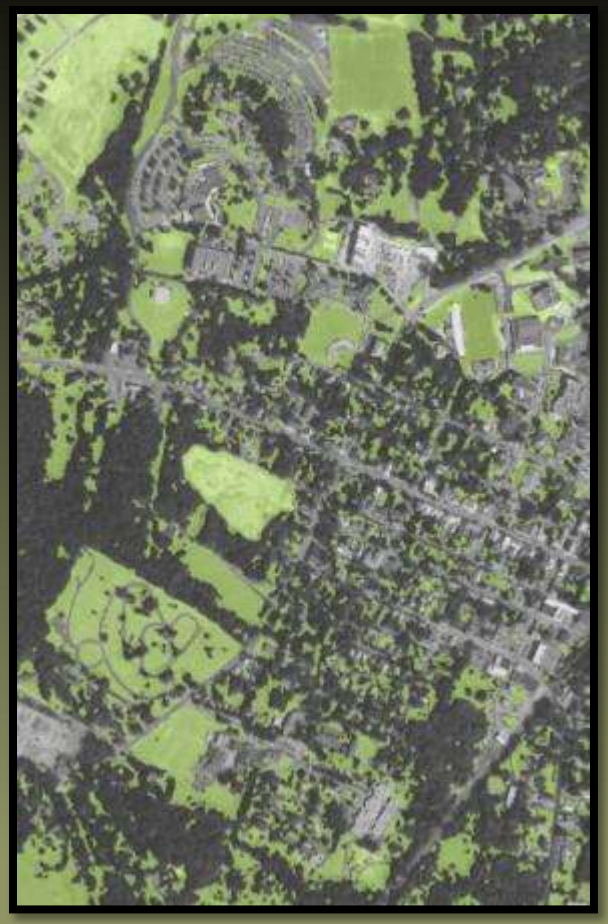
Grass/Shrub



Bare Soil



Other Paved

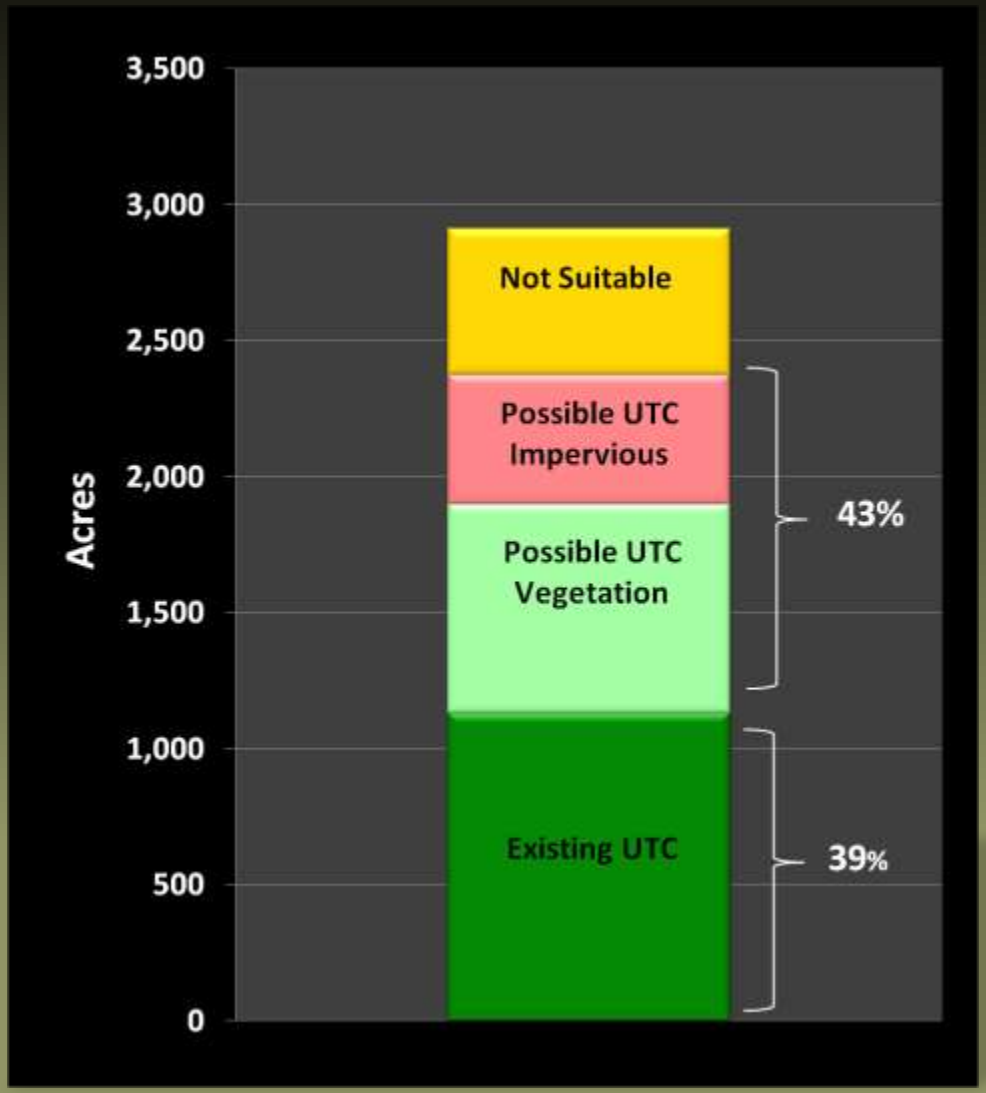


Existing

Vegetation

Impervious

Possible



- **2,907** acres of land (excludes water)
- **1,130**acres of Existing UTC
- **768** acres of Possible UTC that is grass/shrub
- **476** acres of Possible UTC that is impervious
- **534** acres is not suitable for tree canopy (buildings, roads)

Tree Canopy = 16%

Grass/Shrub= 32%

Bare Soil = 3%

Water = 11%

Buildings = 20%

Roads = 12%

Other Paved = 6%

Existing Tree Canopy = 18%

Possible Vegetation = 36%

Possible Impervious = 7%

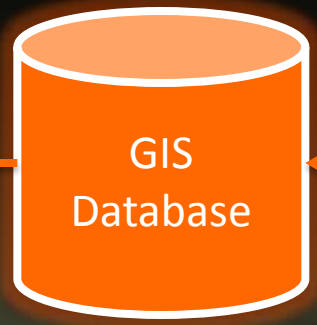
Possible Tree Canopy = 43%

Land Area = 89%

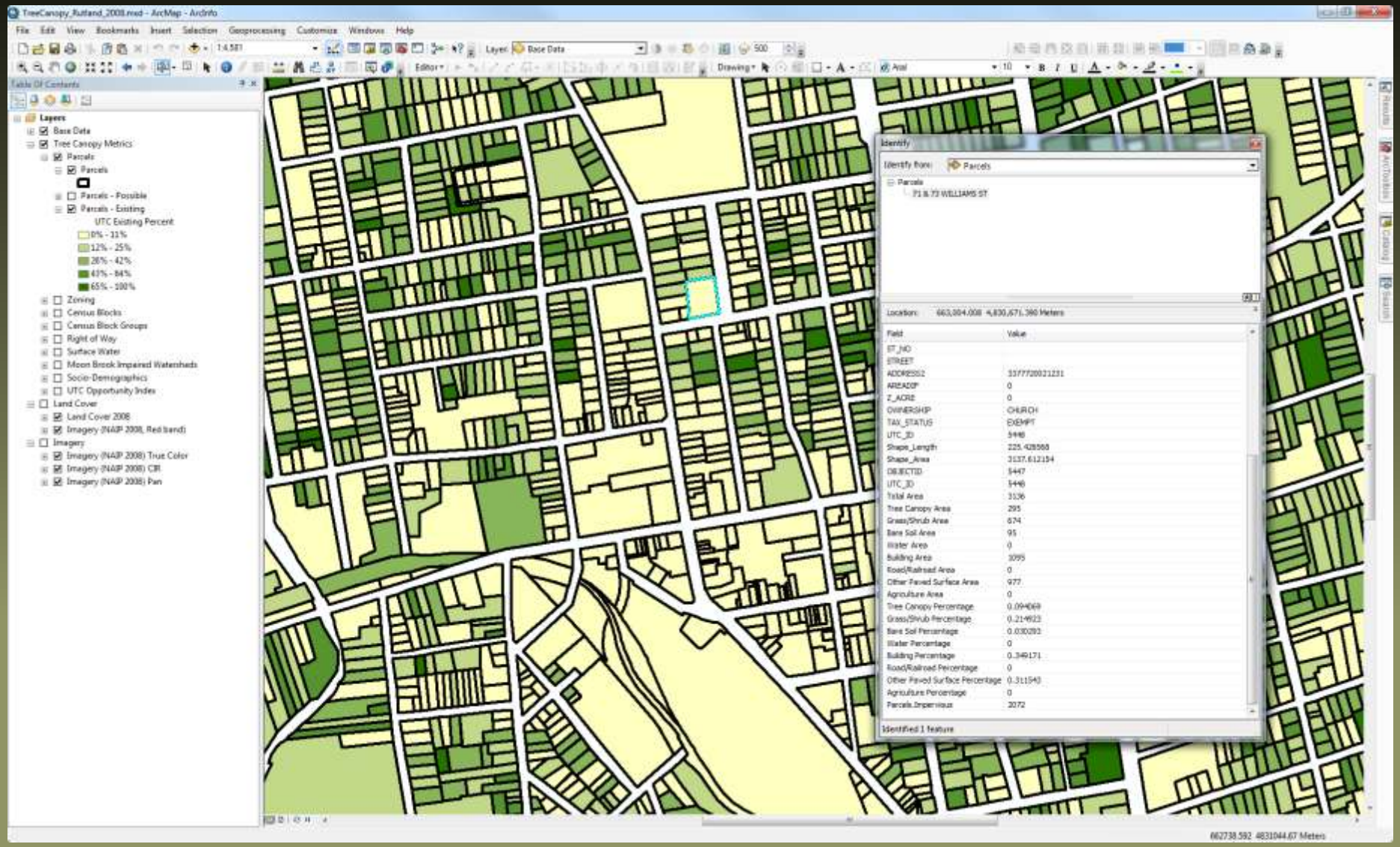
TAXPIN	005989667
Existing TC	18%
Possible TC Vegetation	36%
Possible TC Vegetation	43%
Possible TC	43%

TAXPIN	005989667
Land Use	Residential
Address	145 Oak Ave
Owner	Smith, P.
Building Value	$89,445
Land Value	$121,000
Hot Tubs	2

TAXPIN	005989667
Tree Canopy	16%
Grass/Shrub	32%
Bare Soil	3%
Water	11%
Buildings	20%
Roads	12%
Other Paved	6%



Attribute	Value
Building Description	Residential Condo
Address	8030 Ditman Street
TENCODE	2866008030
Existing TC	29%
Possible TC	31%
Possible TC – Vegetation	23%
Possible TC – Impervious	8%
Impervious	48%


TreeCanopy_Rutland_2008.mxd - ArcMap - ArcInfo
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
Table Of Contents
Layers
Base Data
Tree Canopy Metrics
Parcels
Parcels
Parcels - Possible
Parcels - Existing
UTC Existing Percent
0% - 11%
12% - 25%
26% - 42%
43% - 64%
65% - 100%
Zoning
Census Blocks
Census Block Groups
Right of Way
Surface Water
Moon Brook Impaired Watersheds
Socio-Demographics
UTC Opportunity Index
Land Cover
Land Cover 2008
Imagery (NAIP 2008, Red band)
Imagery
Imagery (NAIP 2008) True Color
Imagery (NAIP 2008) CIR
Imagery (NAIP 2008) Pan
Identify
Identify from: Parcels
Parcels
71 & 73 WILLIAMS ST
Location: 663,304.008 4,830,671.390 Meters
Field
Value
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STREET
ADDRESS2
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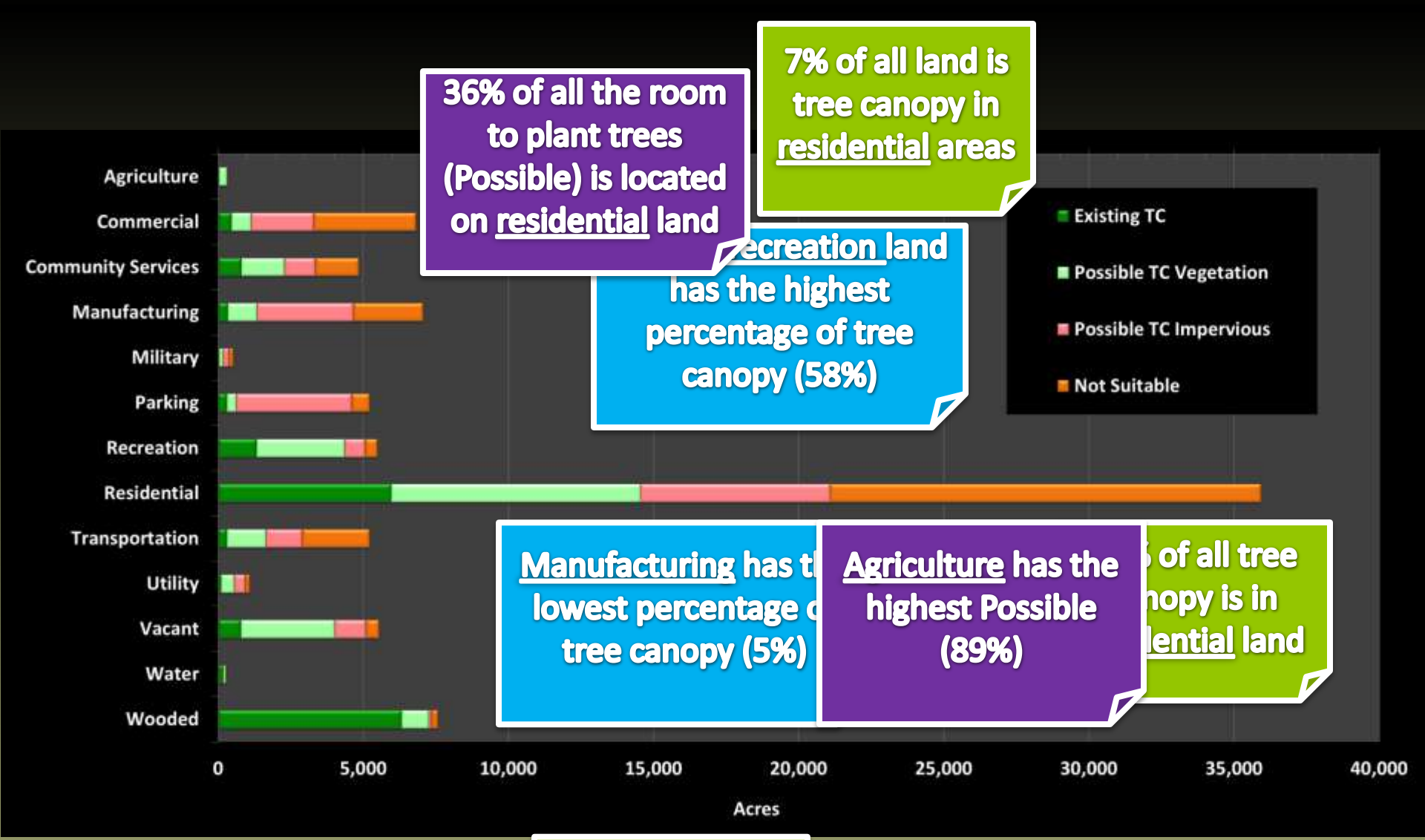
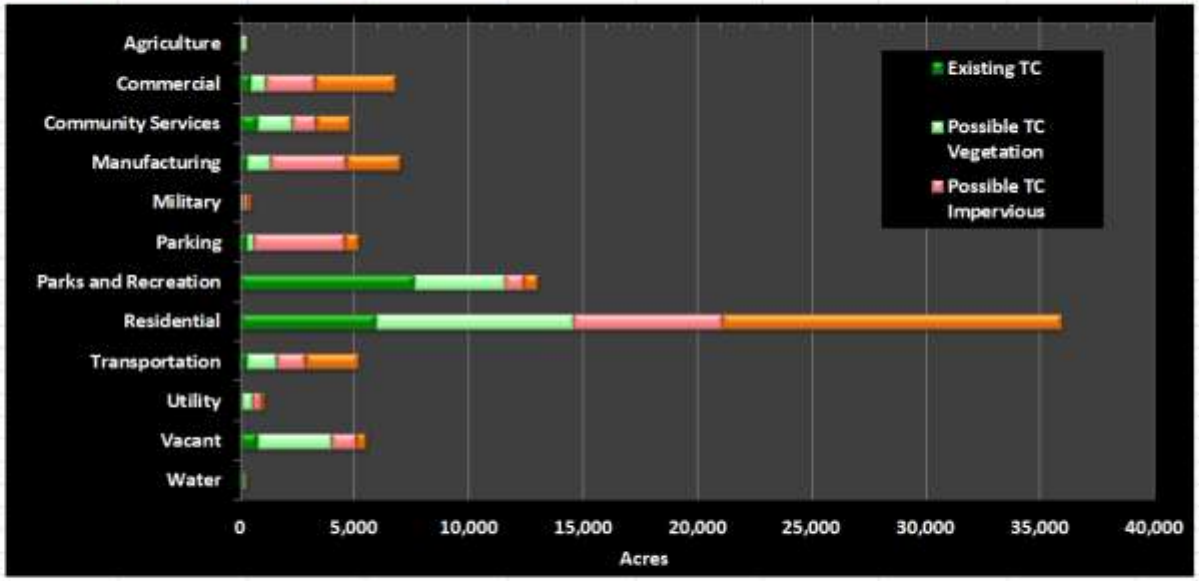
AREADIF
0
Z_ACRE
0
OWNERSHIP
CHURCH
TAX_STATUS
EXEMPT
UTC_ID
5448
Shape_Length
225.428568
Shape_Area
3137.612154
OBJECTID
5447
UTC_ID
5448
Total Area
3136
Tree Canopy Area
295
Grass/Shrub Area
674
Bare Soil Area
95
Water Area
0
Building Area
3095
Road/Railroad Area
0
Other Paved Surface Area
977
Agriculture Area
0
Tree Canopy Percentage
0.094069
Grass/Shrub Percentage
0.214923
Bare Soil Percentage
0.030293
Water Percentage
0
Building Percentage
0.349171
Road/Railroad Percentage
0
Other Paved Surface Percentage
0.311543
Agriculture Percentage
0
Parcels.Impervious
2072
Identified 1 feature
662738.592 4831044.67 Meters



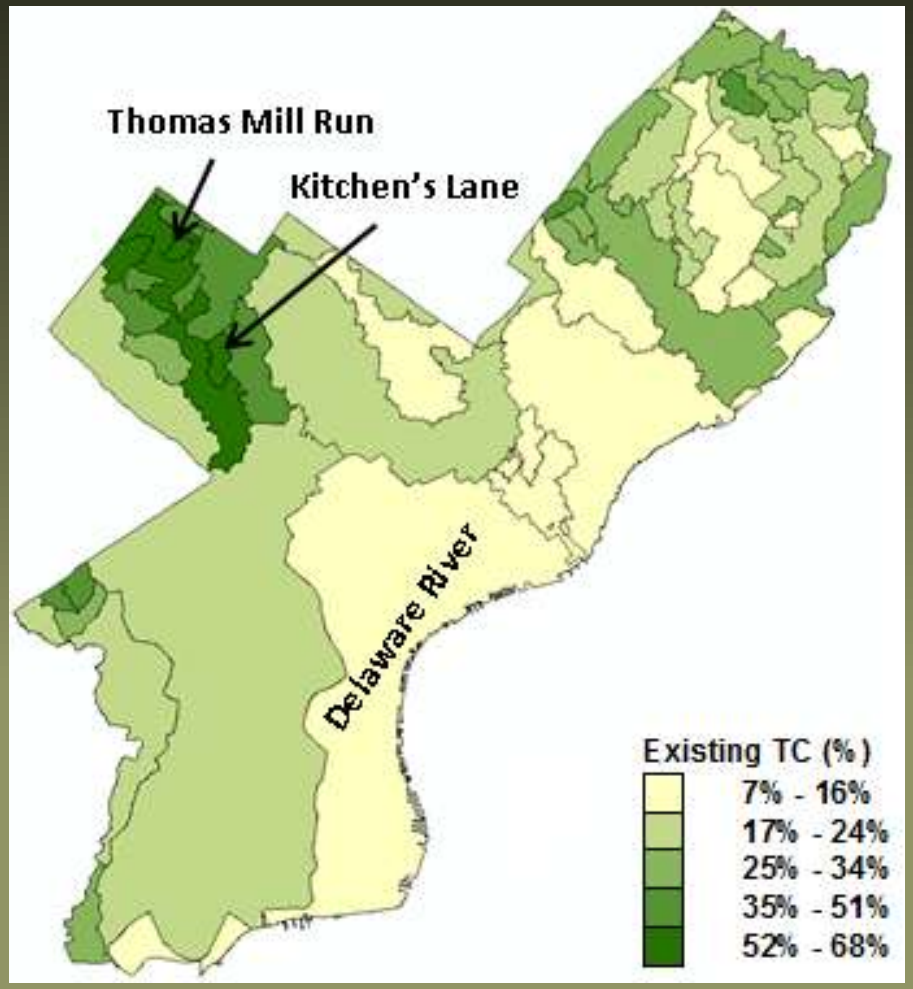
Philadelphia, PA

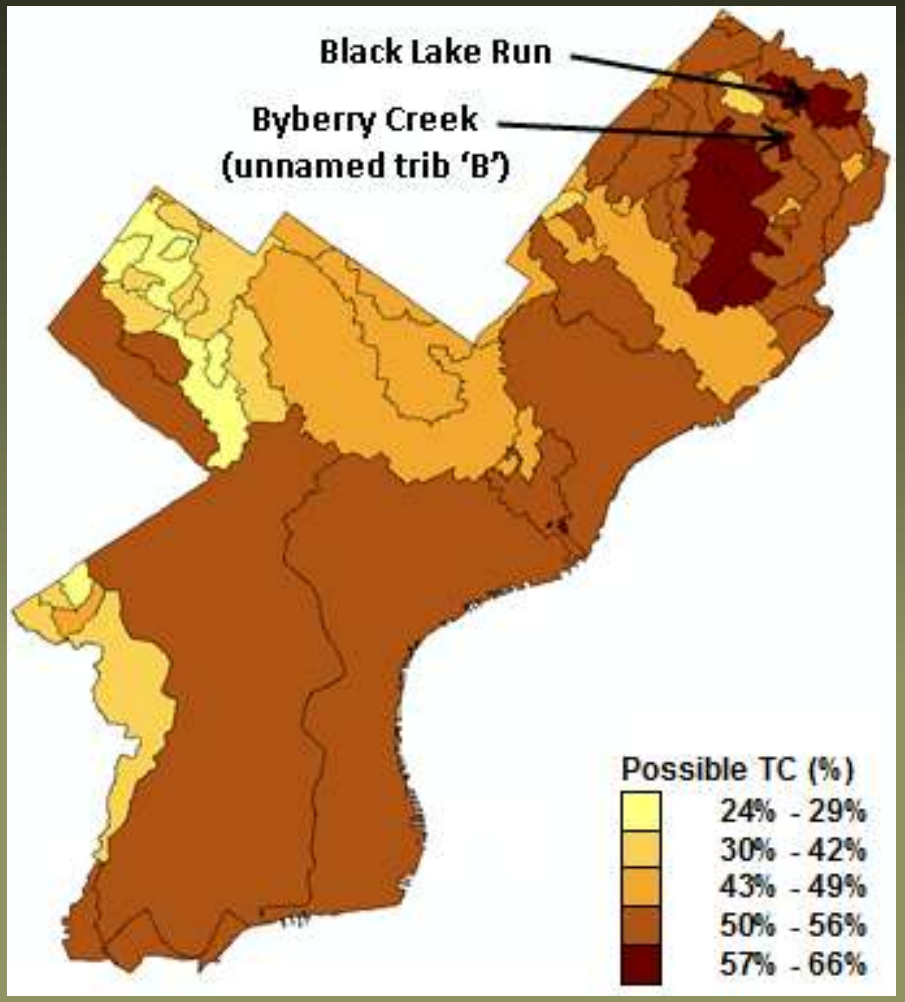
TreeCanopy_Metrics_Philadelphia.xlsx - Microsoft Excel

Land Use	Existing TC					Possible TC					
	Area (ft^2)	Area (acres)	% Land	% Category	% TC Type	Area (ft^2)	Area (acres)	% Land	% Category	% TC Type	Area (ft^2)
Agriculture	1423681.221	33	0%	10%	0%	12530717.48	288	0%	89%	1%	11743081.03
Commercial	19612084.99	450	1%	7%	3%	123480844.1	2835	3%	42%	7%	29628580.39
Community Services	34679246.11	796	1%	16%	5%	111030296.6	2549	3%	52%	6%	64663409.38
Manufacturing	14360462.48	330	0%	5%	2%	188427253.9	4326	5%	61%	10%	43684234.84
Military	1320723.215	31	0%	6%	0%	14471406.28	332	0%	64%	1%	6261967.419
Parking	12937711.07	297	0%	6%	2%	186917979.8	4291	5%	82%	10%	14020337.51
Parks and Recreation	332526877.6	7634	9%	58%	45%	207812646.2	4771	6%	37%	11%	172355413.7
Residential	259206400.9	5951	7%	17%	35%	658701116	15122	18%	42%	36%	374077333.3
Transportation	13019490.71	299	0%	6%	2%	112820311.6	2590	3%	50%	6%	58336432.96
Utility	4530818.7	104	0%	10%	1%	36049261.07	828	1%	76%	2%	19625182.37
Vacant	34236205.73	786	1%	14%	5%	187656032.2	4308	5%	78%	10%	140307736.2
Water	7403557.066	170	0%	58%	1%	4746799.498	109	0%	37%	0%	3774330.021



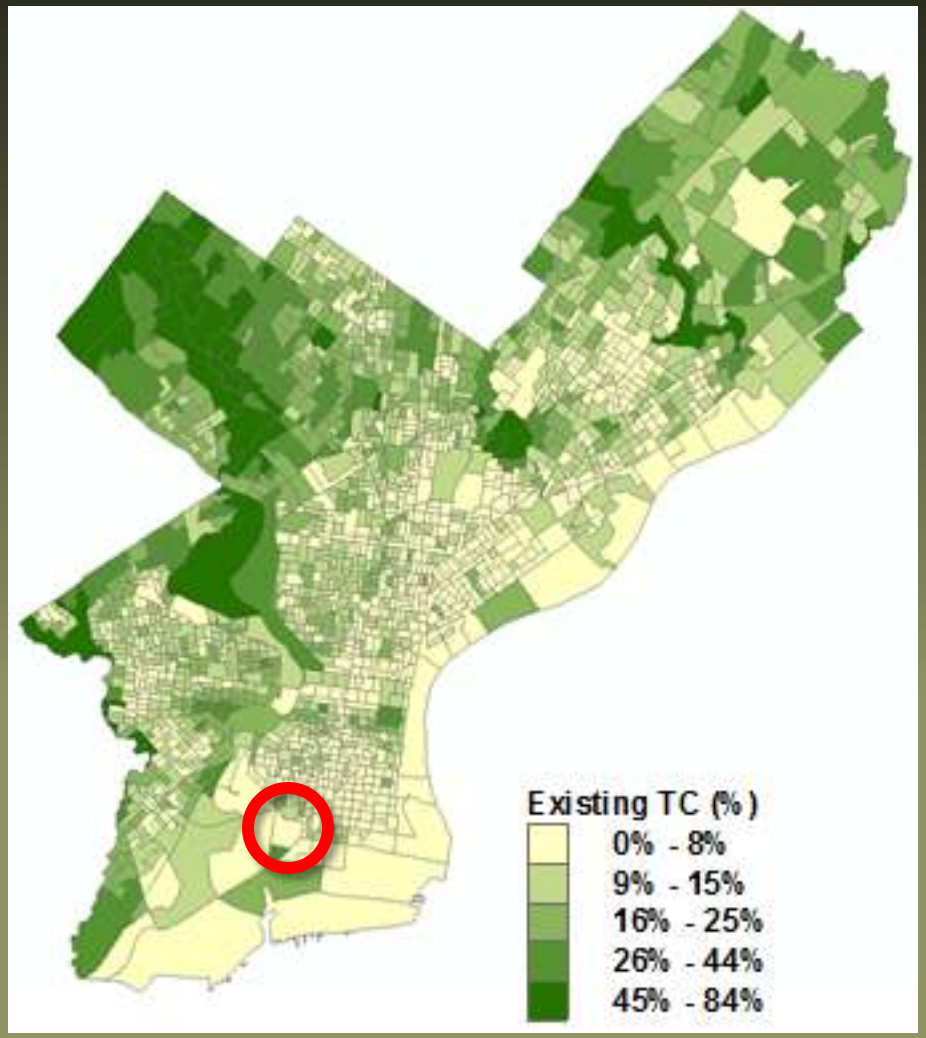
Subwatersheds

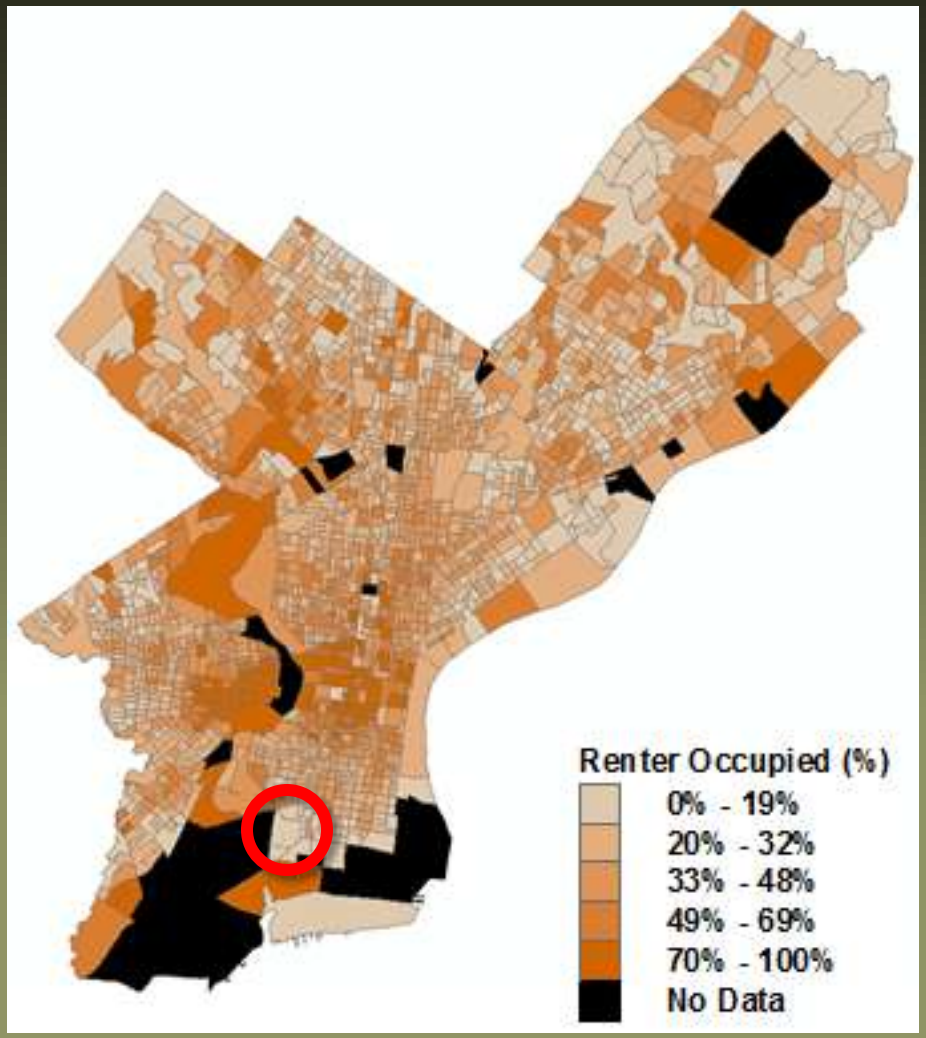




Philadelphia, PA

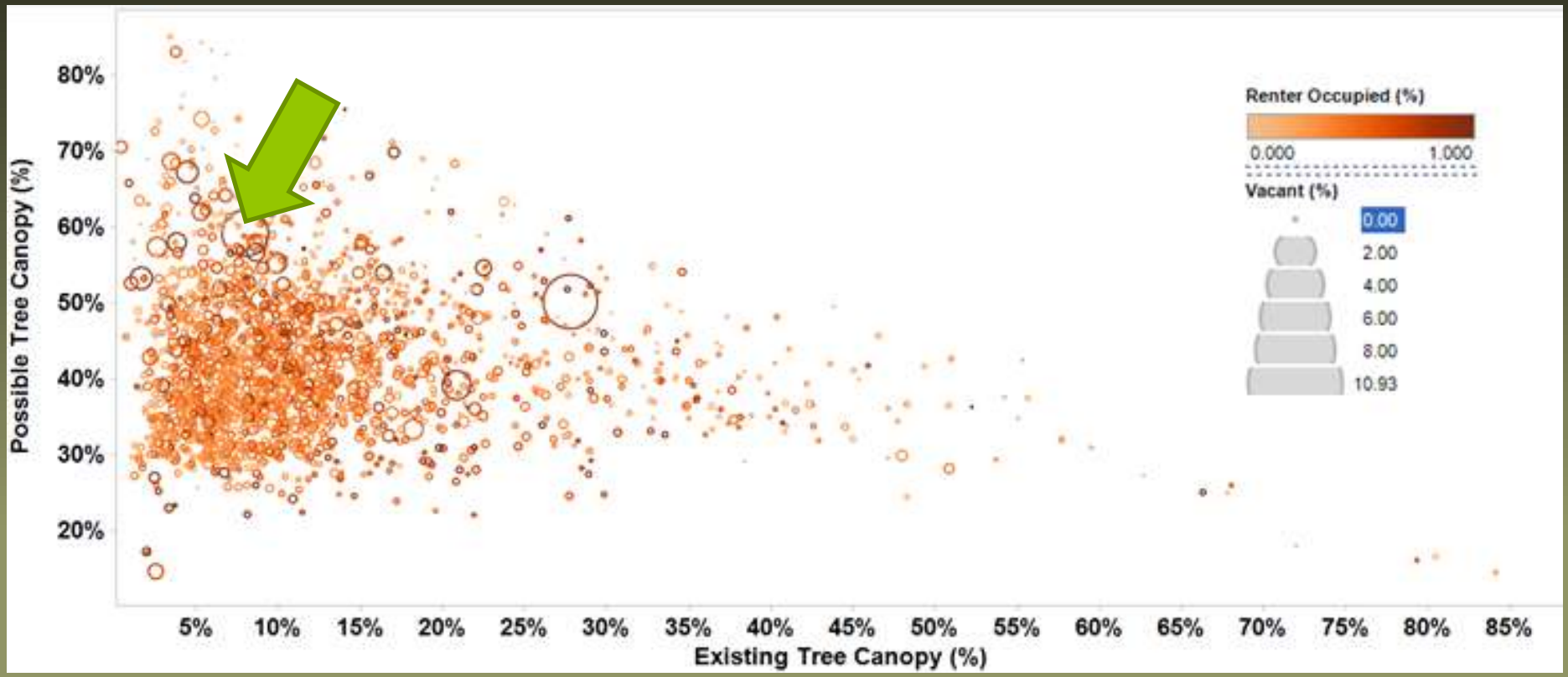
Socio-Demographic





Philadelphia, PA

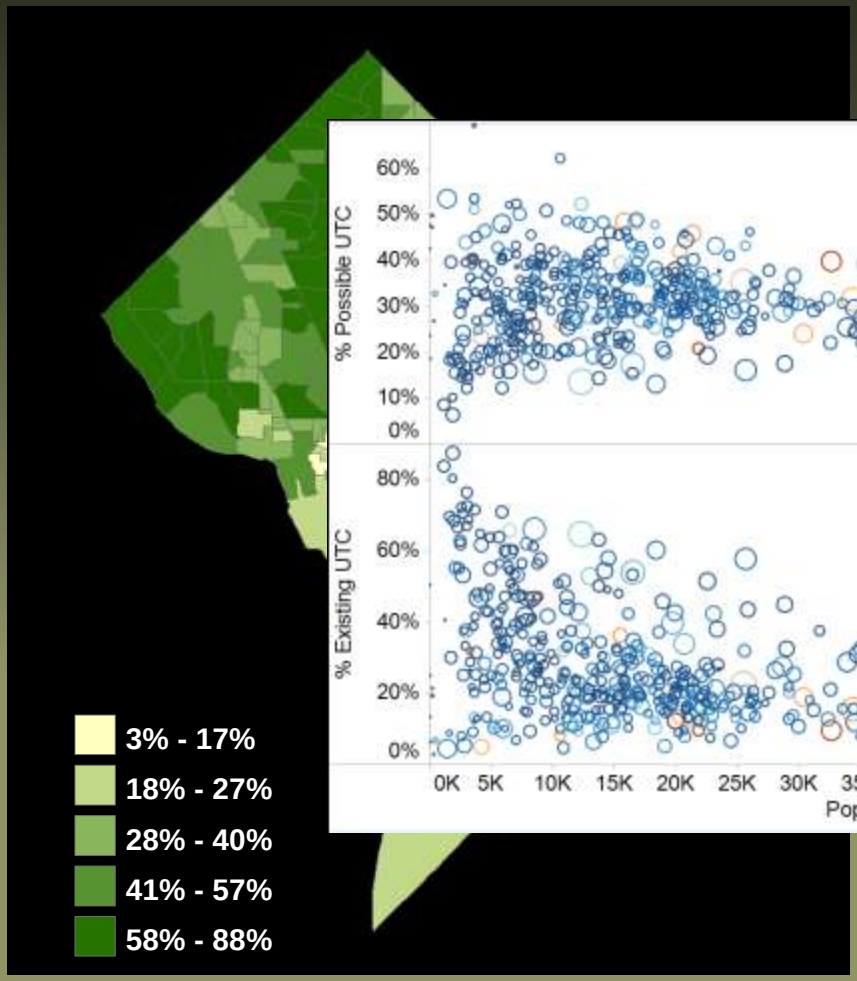
Socio-Demographic

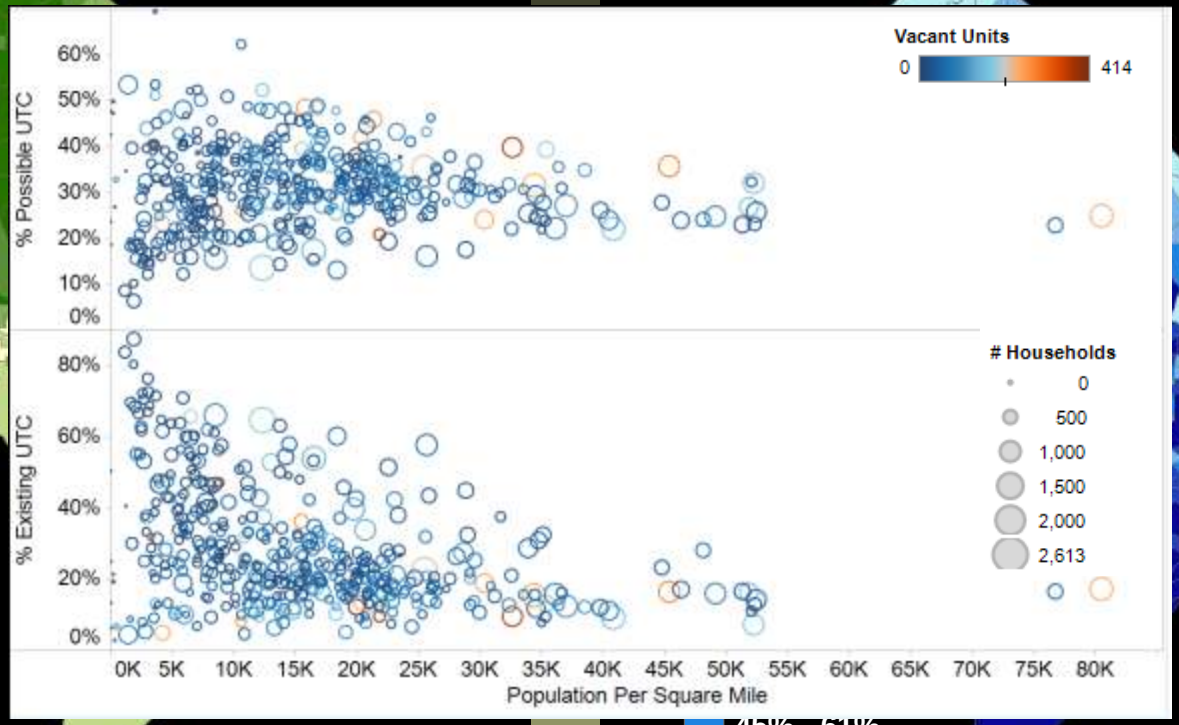


Philadelphia, PA

Percent Existing UTC

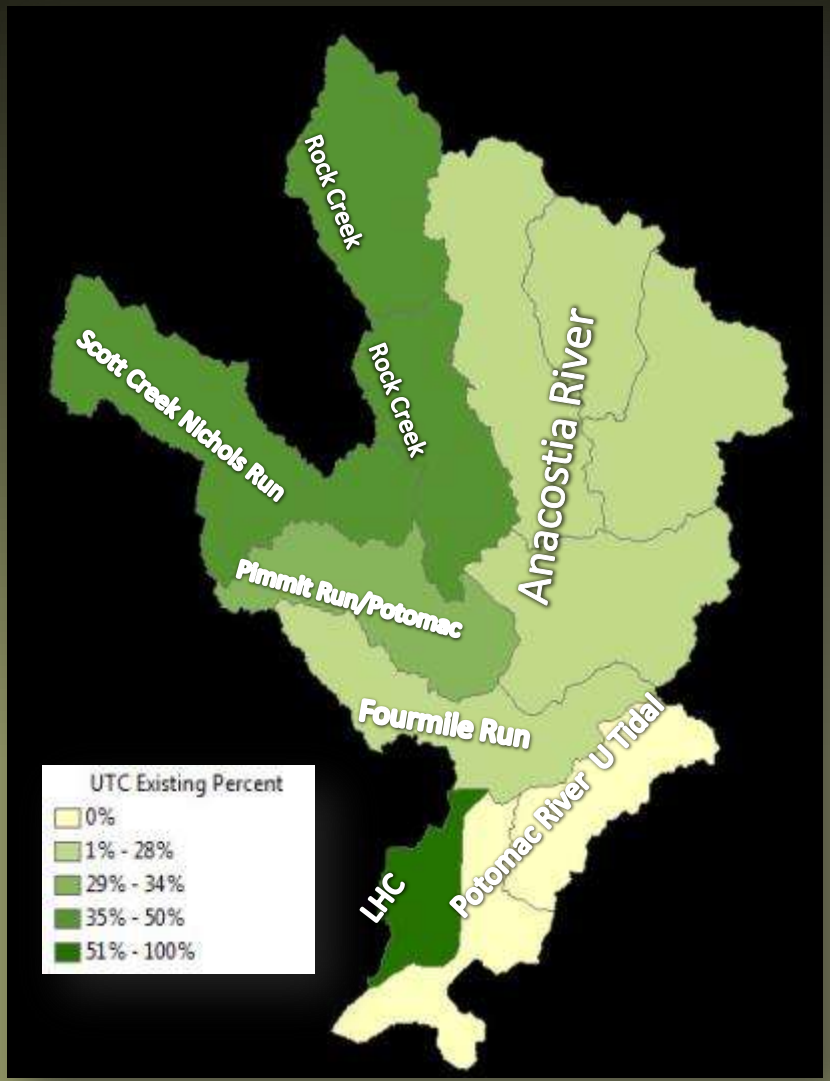
Percent Renter Occupied

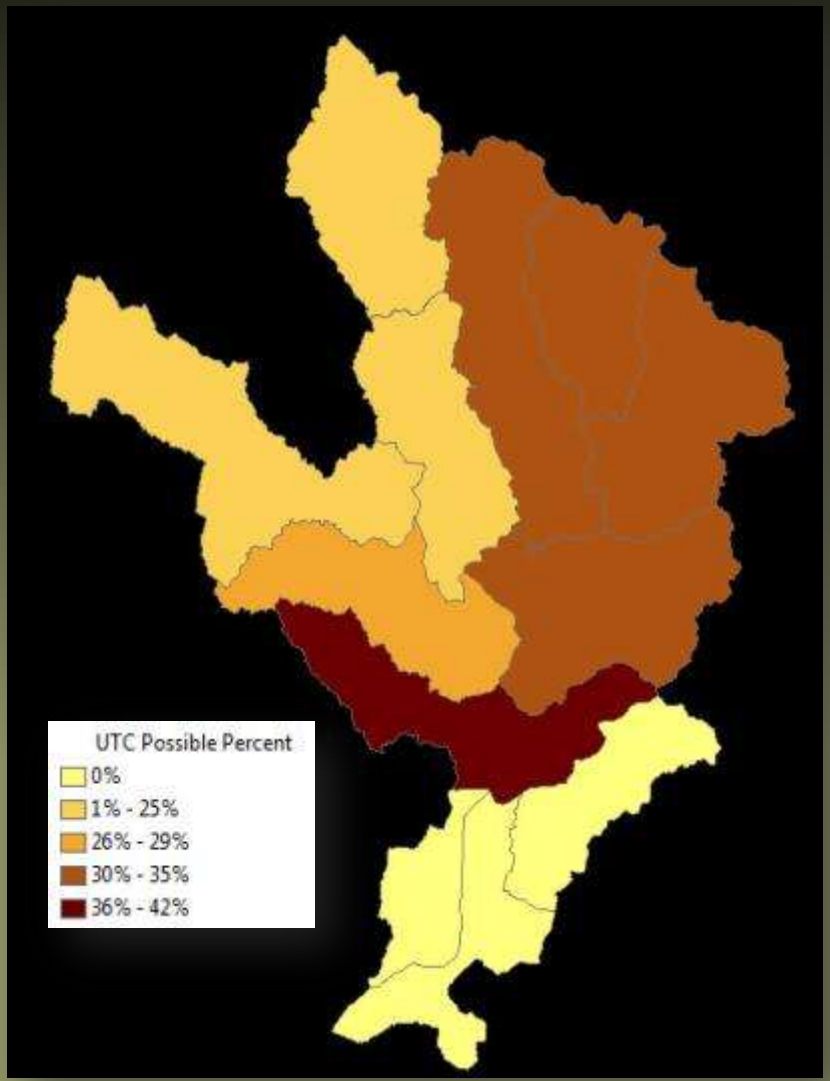


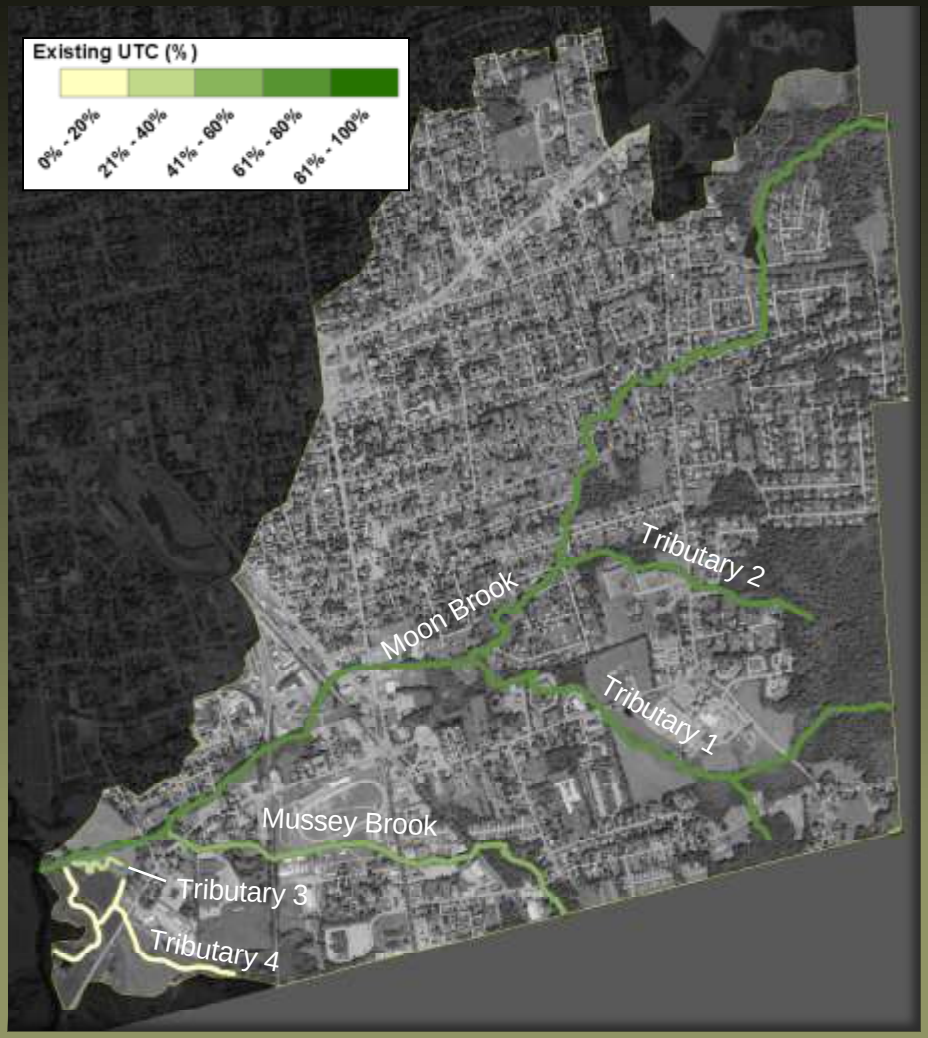


Washington, DC

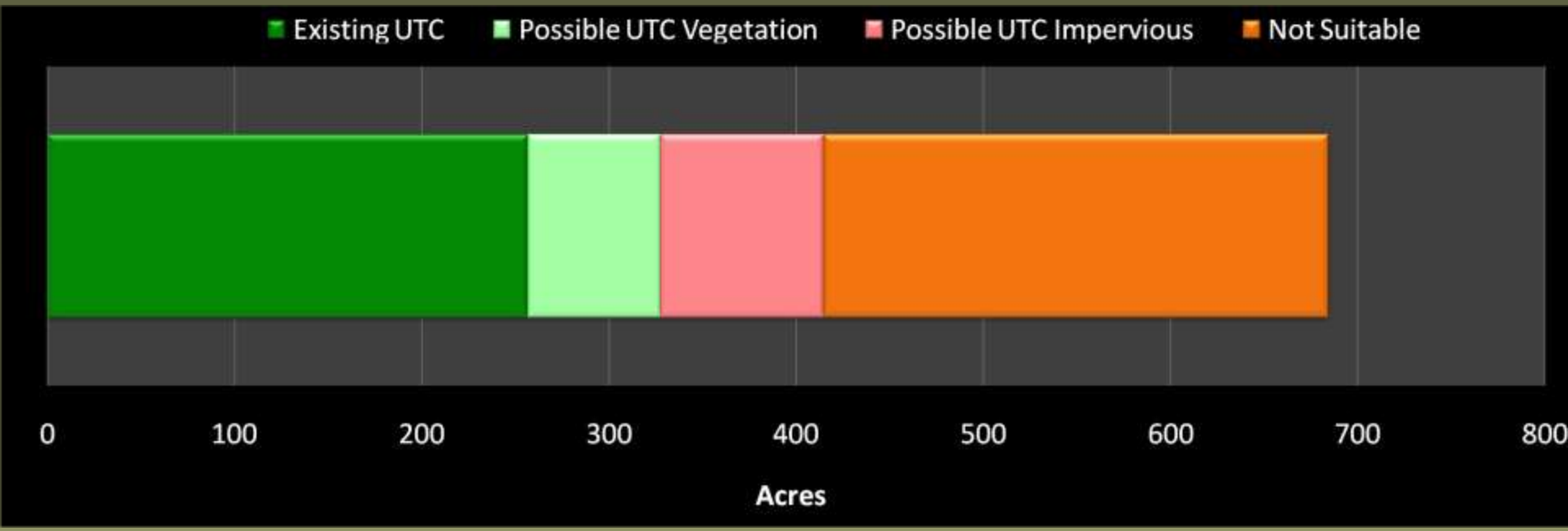
Washington DC





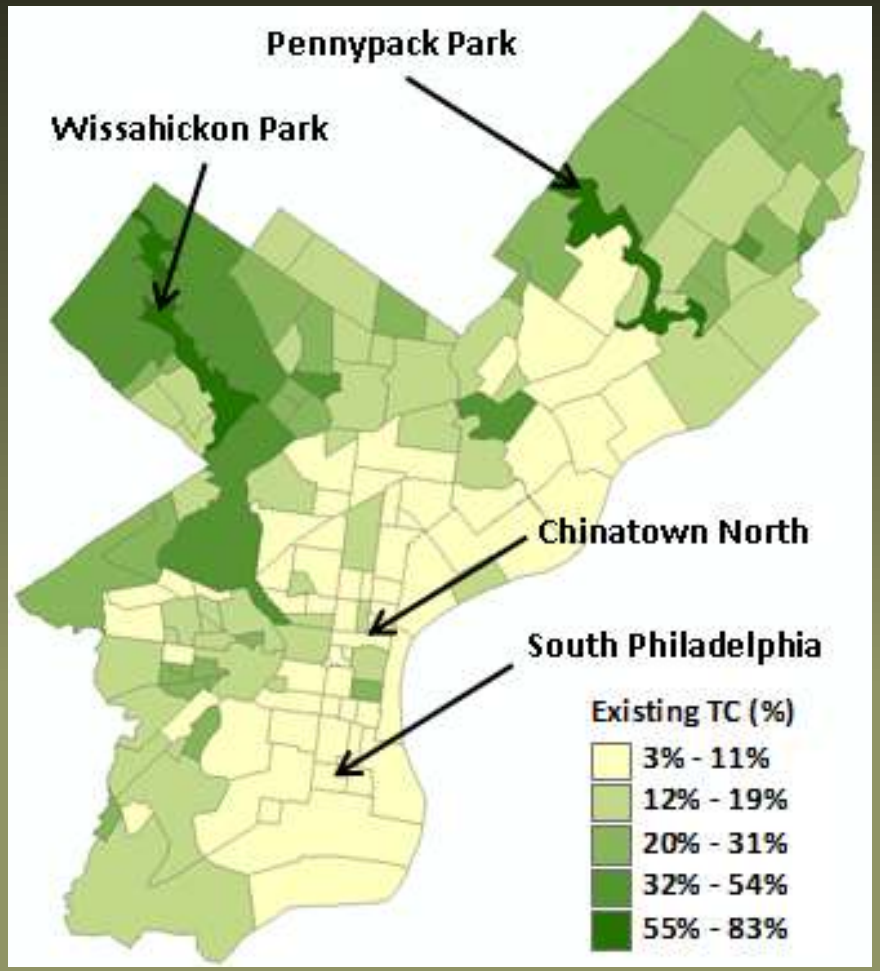

Existing UTC (%)
0% - 20%
21% - 40%
41% - 60%
61% - 80%
81% - 100%
Moon Brook
Tributary 2
Tributary 1
Mussey Brook
Tributary 3
Tributary 4

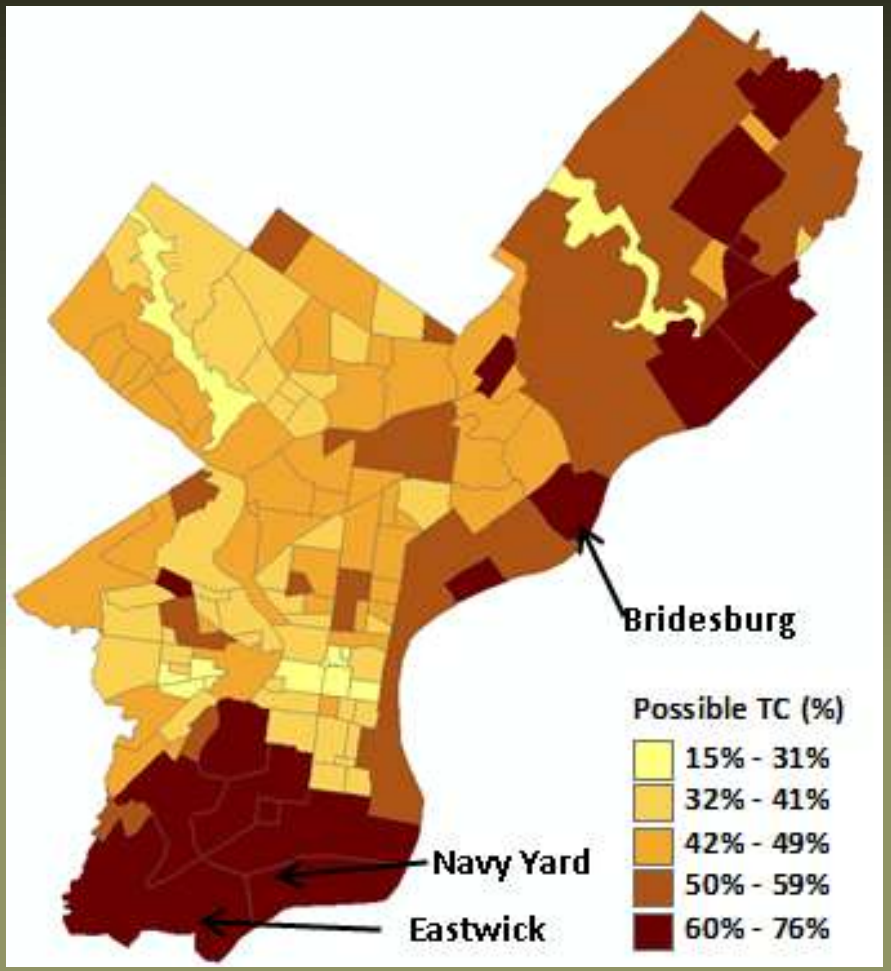

Possible UTC (%)
0% - 20%
21% - 40%
41% - 60%
61% - 80%
81% - 100%
Moon Brook
Tributary 2
Tributary 1
Mussey Brook
Tributary 3
Tributary 4



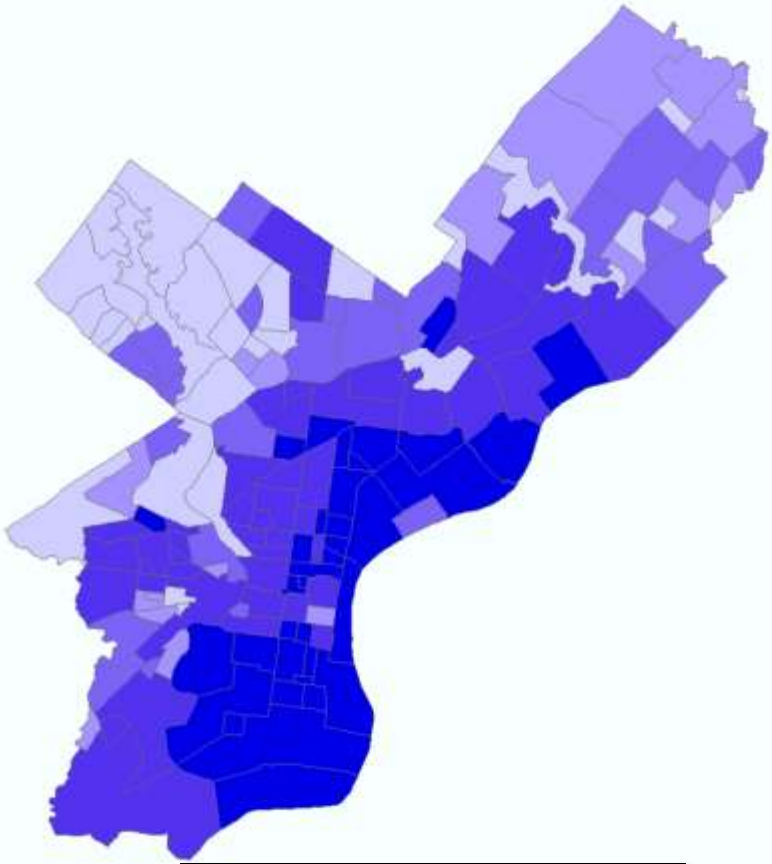
State College, PA

Neighborhoods

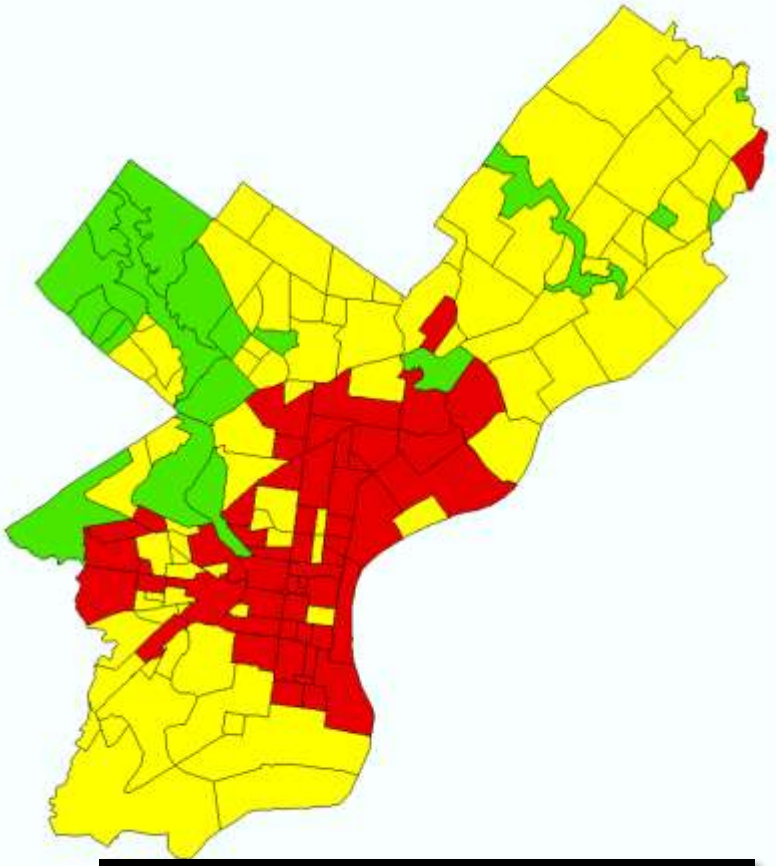




Neighborhoods – 30% Goal

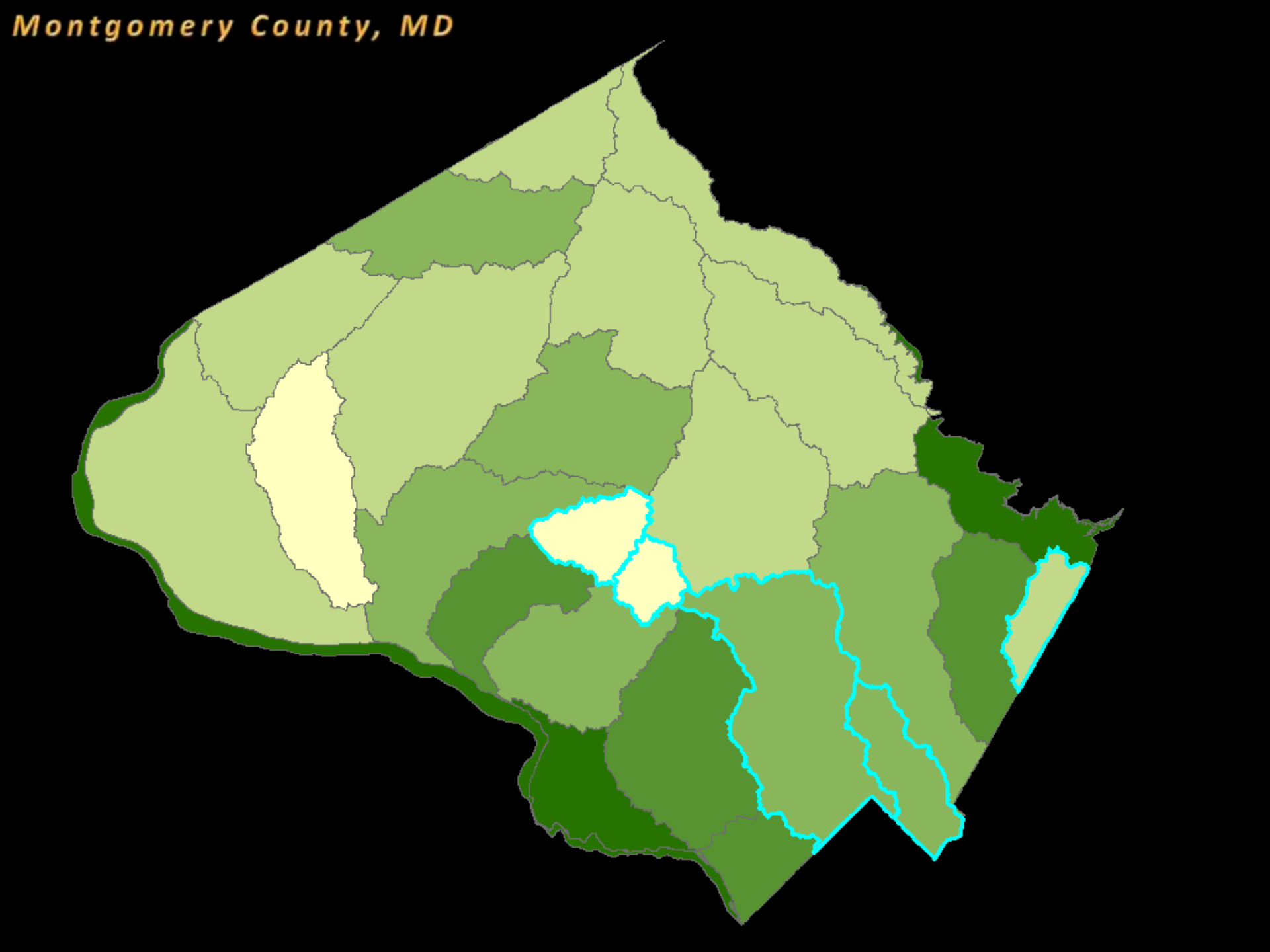


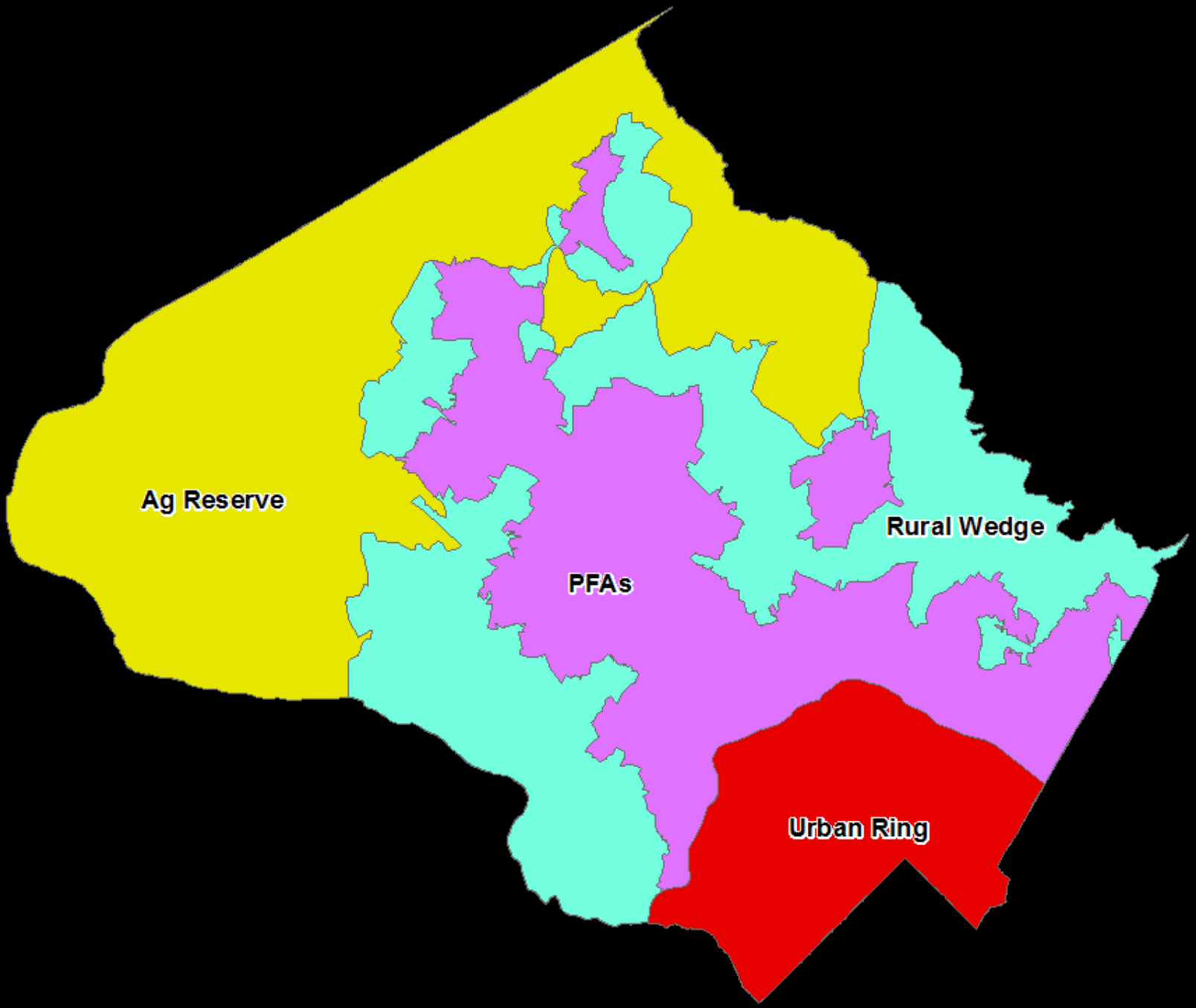
% Increase to Achieve Goal
- 0% - 5%
- 6% - 11%
- 12% - 16%
- 17% - 21%
- 22% - 27%

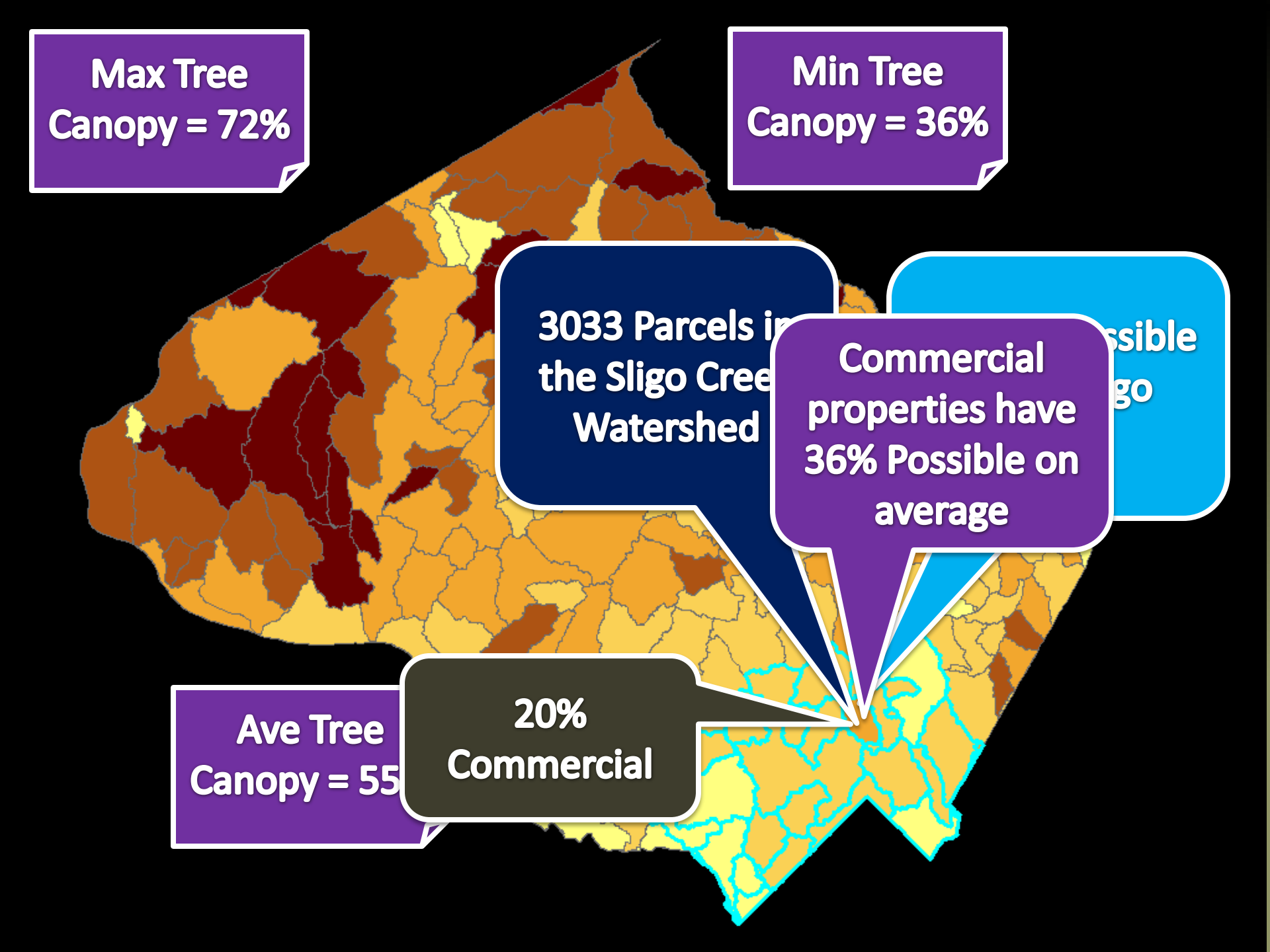


- At Goal
- Planting on Possilbe - Vegetation
- Planting on All Possible

Philadelphia, PA


Montgomery County, MD


Ag Reserve
PFAs
Rural Wedge
Urban Ring


Max Tree Canopy = 72%
Min Tree Canopy = 36%
3033 Parcels in the Sligo Cree Watershed
Commercial properties have 36% Possible on average
ssible
go
Ave Tree Canopy = 55
20% Commercial

A Report on the City of Philadelphia's Existing and Possible Tree Canopy

Why is Tree Canopy Important?

Tree canopy (TC) is the layer of leaves, branches, and stems of trees that cover the ground when viewed from above. Tree canopy provides many benefits to communities, improving water quality, saving energy, lowering city temperatures, reducing air pollution, enhancing property values, providing wildlife habitat, facilitating social and educational opportunities, and providing aesthetic benefits. Establishing a tree canopy goal is crucial for communities seeking to improve their green infrastructure. A tree canopy assessment is the first step in this goal-setting process, providing estimates for the amount of tree canopy currently present in a city as well as the amount of tree canopy that could theoretically be established.

How Much Tree Canopy Does Philadelphia Have?

An analysis of Philadelphia's tree canopy based on land cover data derived from high-resolution aerial imagery and LiDAR (Figure 1) found that 16,884 acres of the city were covered by tree canopy (termed Existing TC), representing 20% of all land in the city. An additional 49% (42,451 acres) of the city could theoretically be modified (termed Possible TC) to accommodate tree canopy (figure 2). In the Possible TC category, 24% (20,821 acres) of the city was classified as Impervious Possible TC and another 25% was Vegetated Possible TC (21,630 acres). Vegetated Possible TC, or grass and shrubs, is more conducive to establishing new tree canopy, but establishing tree canopy on areas classified as Impervious Possible TC will have a greater impact on water quality and summer temperatures.

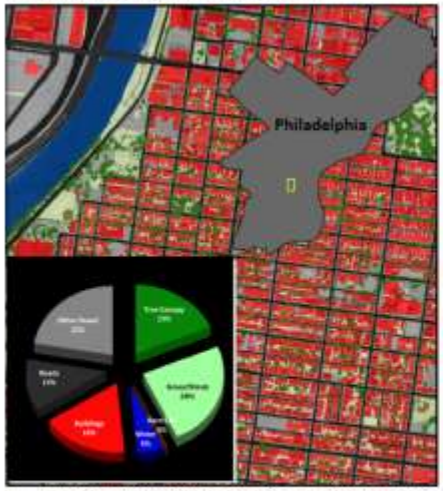


Figure 1: Land cover derived from high-resolution aerial imagery for the City of Philadelphia.

Project Background

The goal of the project was to apply the USDA Forest Service's TC assessment protocols to the City of Philadelphia. The analysis was conducted based on year 2008 data. This project was made possible by an America Recovery and Reinvestment Act (ARRA) grant through the USDA Forest Service's Northern Research Station. This analysis of Philadelphia's tree canopy (TC) was conducted in collaboration with Philadelphia Parks & Recreation and the Northern Research Station. The Spatial Analysis Laboratory (SAL) at the University of Vermont's Rubenstein School of the Environment and Natural Resources carried out the assessment.

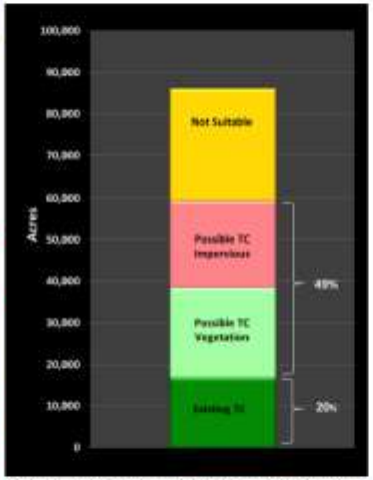


Figure 2: TC metrics for Philadelphia based on % of land area cov-

Key Terms

TC: Tree canopy (TC) is the layer of leaves, branches, and stems of trees that cover the ground when viewed from above.
Land Cover: Physical features on the earth mapped from aerial or satellite imagery, such as trees, grass, water, and impervious surfaces.
Existing TC: The amount of urban tree canopy present when viewed from above using aerial or satellite imagery.
Impervious Possible TC: Asphalt or concrete surfaces, excluding roads and buildings, that are theoretically available for the establishment of tree canopy.
Vegetated Possible TC: Grass or shrub area that is theoretically available for the establishment of tree canopy.

Mapping Philadelphia's Trees

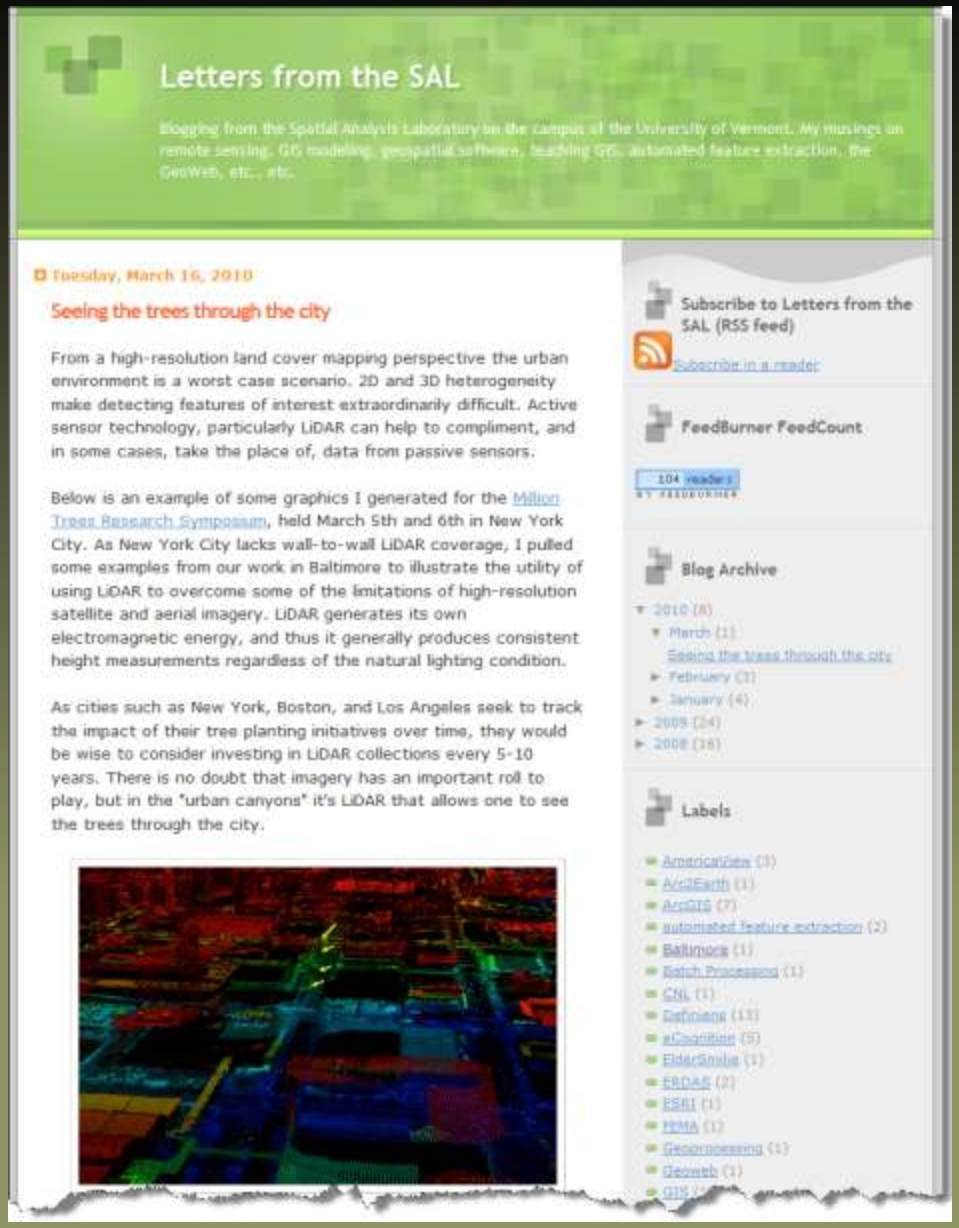
Prior to this study, the only comprehensive remotely-sensed estimates of tree canopy for Philadelphia was from the 2001 National Land Cover Database (NLCD 2001). While NLCD 2001 is valuable for analyzing land cover at the regional level, it is derived from relatively coarse, 30-meter resolution satellite imagery (Figure 3a). Using high-resolution aerial imagery and LiDAR acquired in 2008 (Figure 3b), in combination with advanced automated processing techniques, land cover for the city was mapped with such detail that trees as short as 6ft tall were detected (Figure 3c). NLCD 2001 estimated a mean percent tree canopy of 10% for Philadelphia largely because it failed to capture many isolated trees.

Figure 3a, 3b, 3c: Comparison of NLCD 2001 to high-resolution land cover.

Parcel Summary

After land cover was mapped city-wide, Tree Canopy (TC) metrics were summarized for each property in the city's parcel database (Figure 4). Existing TC and Possible TC metrics were calculated for each parcel, both in terms of total area and as a percentage of the land area within each parcel (TC area ÷ land area of the parcel).

Figure 4a, 4b, 4c: Parcel-based TC metrics. TC metrics are generated at the parcel level, allowing each property to be evaluated according to its Existing TC and Possible TC.



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