Urban Tree Canopy Goals: carpet bombing with trees?

The roles of management and protection in realizing urban tree canopy goals: UTC Best Practices

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Today's talk

- Urban Tree Canopy assessment process
- What does 10% mean? Relative versus absolute goals
- Scale: How it affects goal implementation
- New tools to assist in implementation
- The role of tree protection and management in reaching desired canopy cover

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The UTC Team

- Me
- J. Morgan Grove
  - Research Scientist and Team Leader, Baltimore Field Station and Baltimore Ecosystem Study (BES), Northern Research Station, USDA Forest Service
- Jarlath O'Neil-Dunne
  - Director, University of Vermont Spatial Analysis Laboratory
- Dexter Locke
  - Yale University, School of Forestry & Environmental Studies, Masters of Environmental Science Candidate

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Urban Tree Canopy Assessment

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How much and where

- How much tree canopy do we have?
  - Where is it located?
- How much more tree canopy could we have?
  - Where can I plant or grow it?

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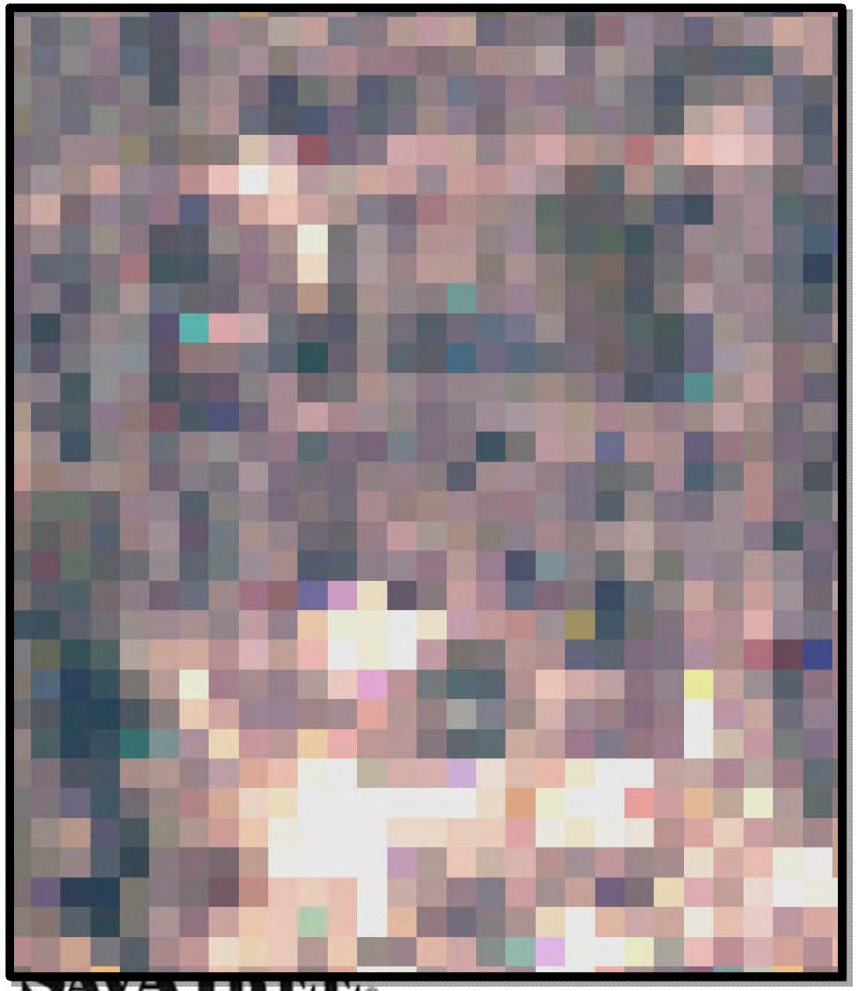
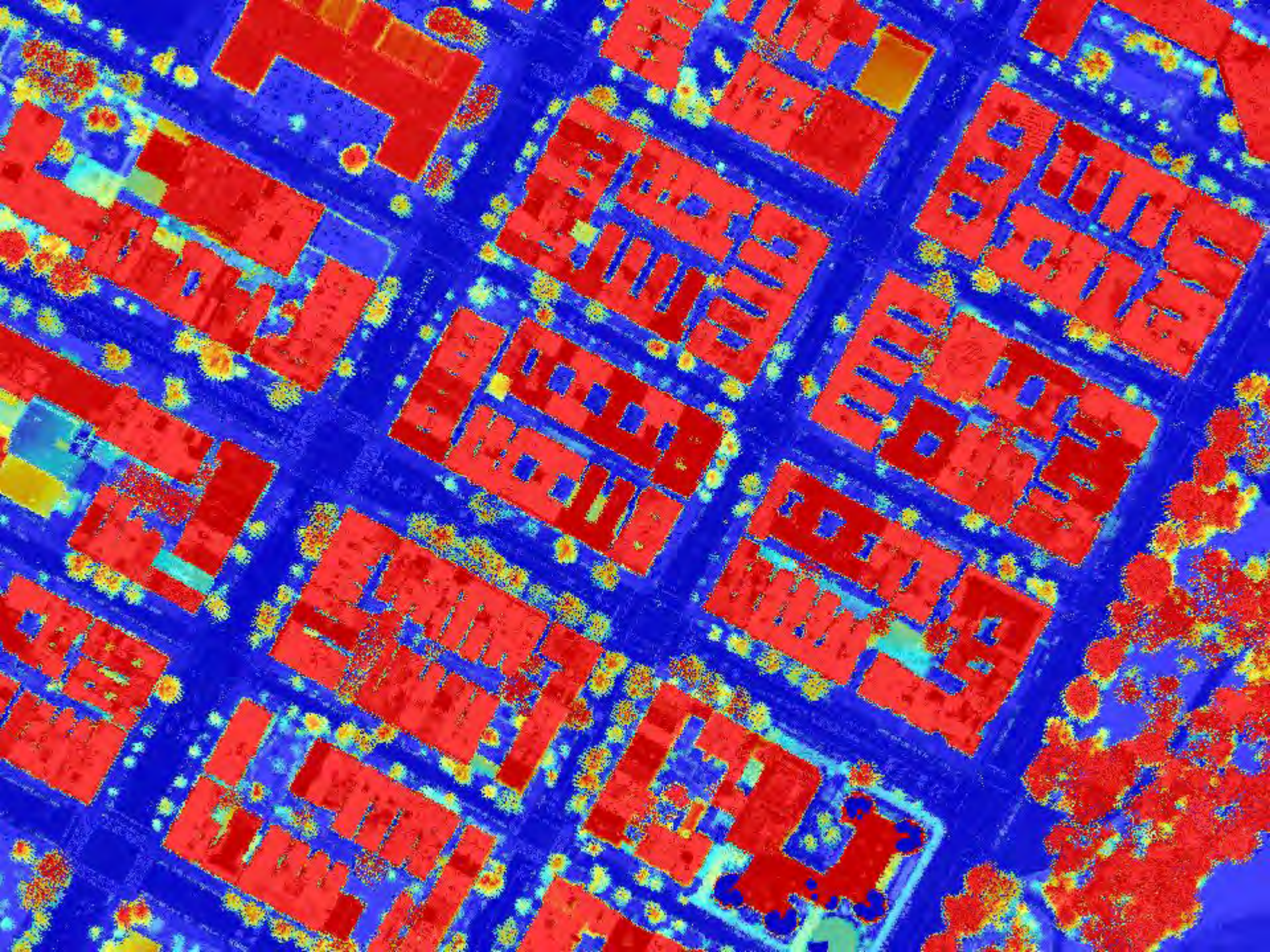
It’s all about scale

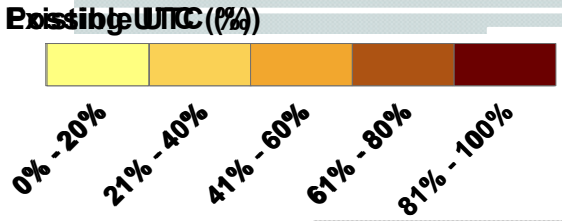


Landsat (30m)

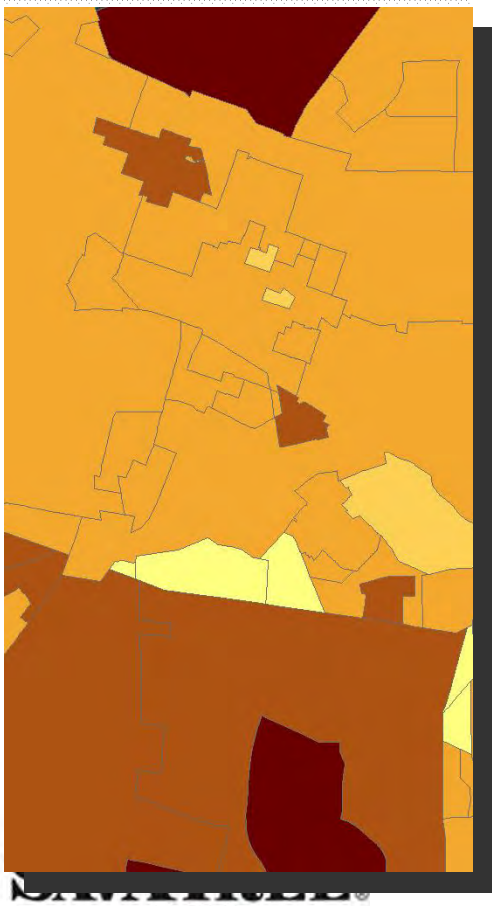
Aerial Imagery (0.16m)



Parcel Level Data



Zoning

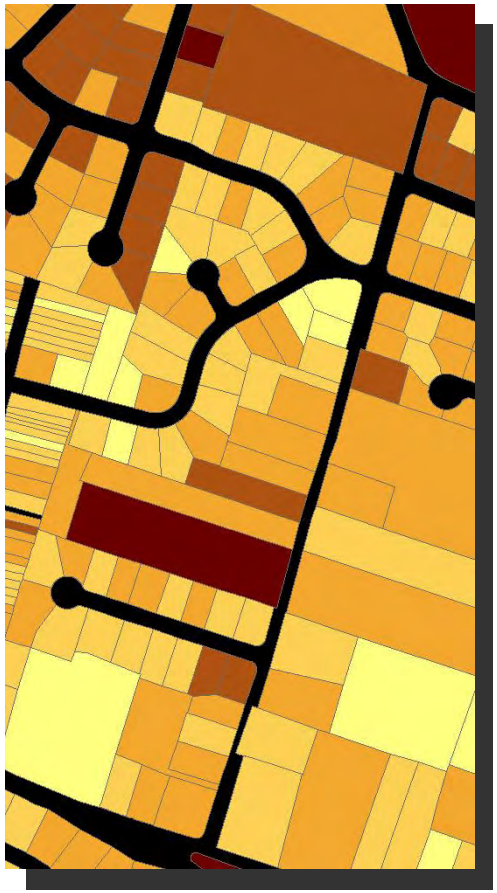


1:16,000 scale

Subdivisions

1:5,000 scale

Parcels



1:3,000 scale

Relative v Absolute

- Increase 10%
  - UTC = 35%
    - Is 10% increase 38.5% or 45%?
- No right answer; just know what you mean

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Variety of approaches

- NYC: 1,000,000 trees
- Boston: 100,000 trees
- Baltimore: Double tree canopy
- DC: 35% canopy cover to 40% canopy cover

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A Tale of Five Cities

Annapolis, MD; Baltimore, MD; Washington, DC; Boston, MA; New York, NY

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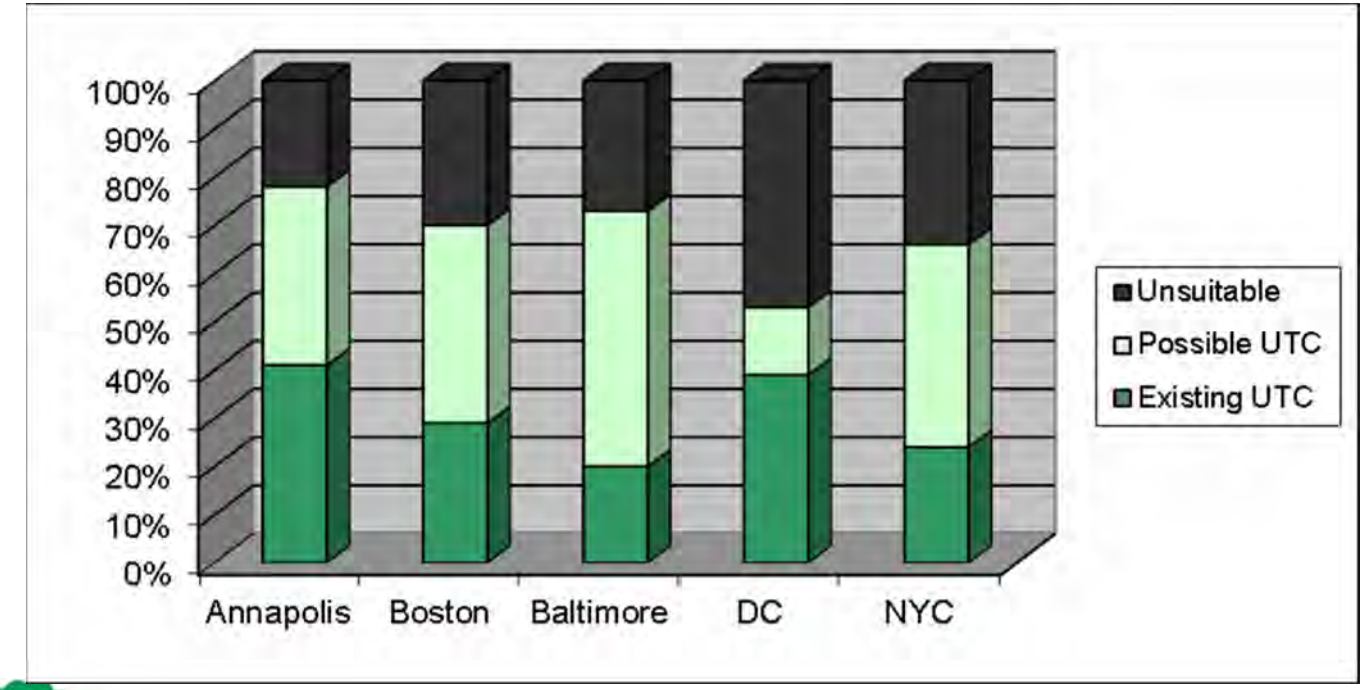
Existing and Possible UTC



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UTC Goal as % of City

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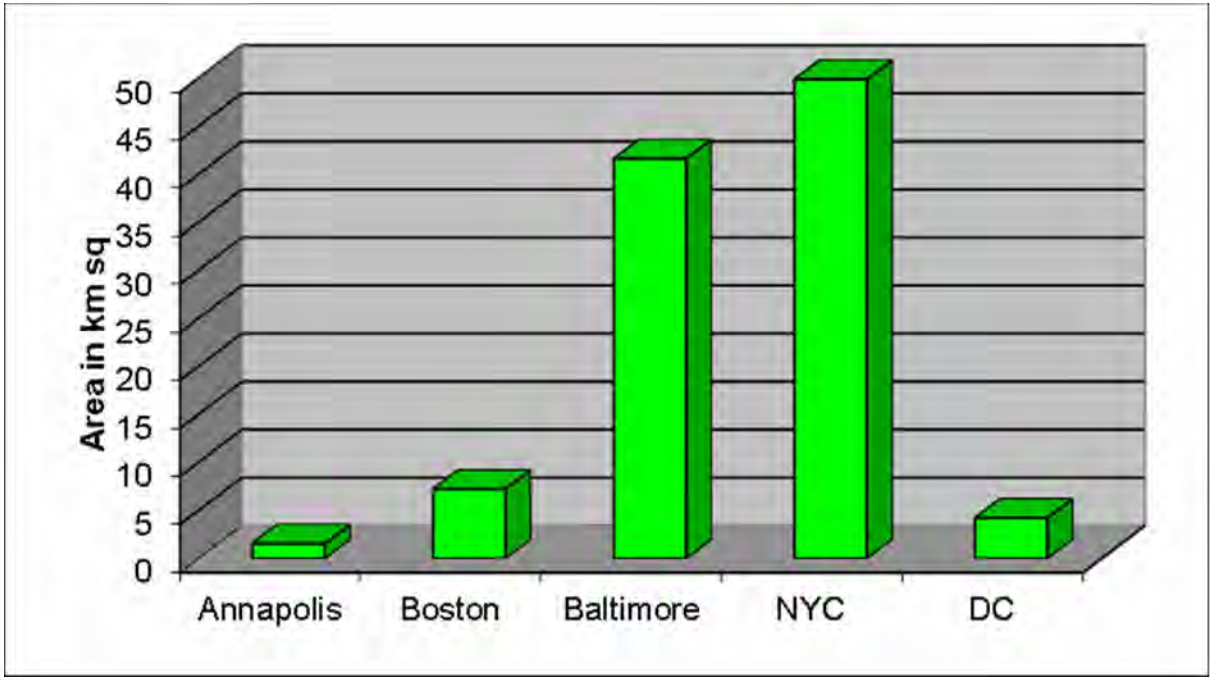
UTC Goal as Land Area



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UTC Prioritization

New tools for outcome-based collaboration

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What do you hope to accomplish?

Major Criteria	Criteria Variables	City Agencies	Sustainability Plan
Public Health & Saftey	Life expectancy, mortality rate, mortality rate from heart diesease, mortality rate from strokes, moratlity rate from respitory disease, mortatlity rate from diabetes, infant mortality rate	BCHD, Planning	Pollution Prevention Goals 2, 4 & 5
	Asthma by zipcode	BCHD, Planning	Pollution Prevention Goals 2, 4 & 5
	Dependency Ratio	BCHD, Planning	
	Urban Heat Island: surface temperature and solar exposure	BCHD, BCRP, Planning, DOT	Pollution Prevention Goal 2
	Crime: Personal, Property and Total	Police	
	Transportation Connections	BCHD, Planning, DOT	Transportation Goals 1, 2, 3 and 4
Environmental Justice	Toxic Releases Inventory	BCHD, Planning	Pollution Prevention Goals 2 & 4
	Brownfields	Planning, DPW	Cleanliness 3 Pollution Prevention Goal 4
	Poverty, Race, Home ownership	Planning	
	Percent Parks	BCRP	Greening Goal 3
Water Quality	Percent Impervious Surface	DPW, DOT, Planning	Pollution Prevention Goal 3
	Watershed H20 quality assesments???	DPW	Pollution Prevention Goal 3
	Stream corridors	DPW, BCRP	Greening Goal 4
	Flood Plains	DPW, BCRP, Planning	
	Critical Area	BCRP, Planning	Greening Goal 4
	Greenstreets	DPW, DOT, BCRP, Planning	Cleanliness Goal 1 Pollution Prevention Goal 3 Greening Goal 1
	Blue alleys	DPW, DOT, BCRP, Planning	Cleanliness Goal 1 Pollution Prevention Goal 3 Greening Goal 1
	Flooding	DPW, Planning	
Air Quality & Noise Pollut	(Major) Road Density	DOT	Pollution Prevention Goal 2
Crtitical Places	Schools, hostpitals, librarys, recreation centers, and elderly care facilites	BCPSS, DGS, BCRP, Planning	
	Population density (per square mile)	Planning, DPW	
Community Presence	Potential stewardship	BCRP, Planning	Education & Awareness Goals 3 & 4

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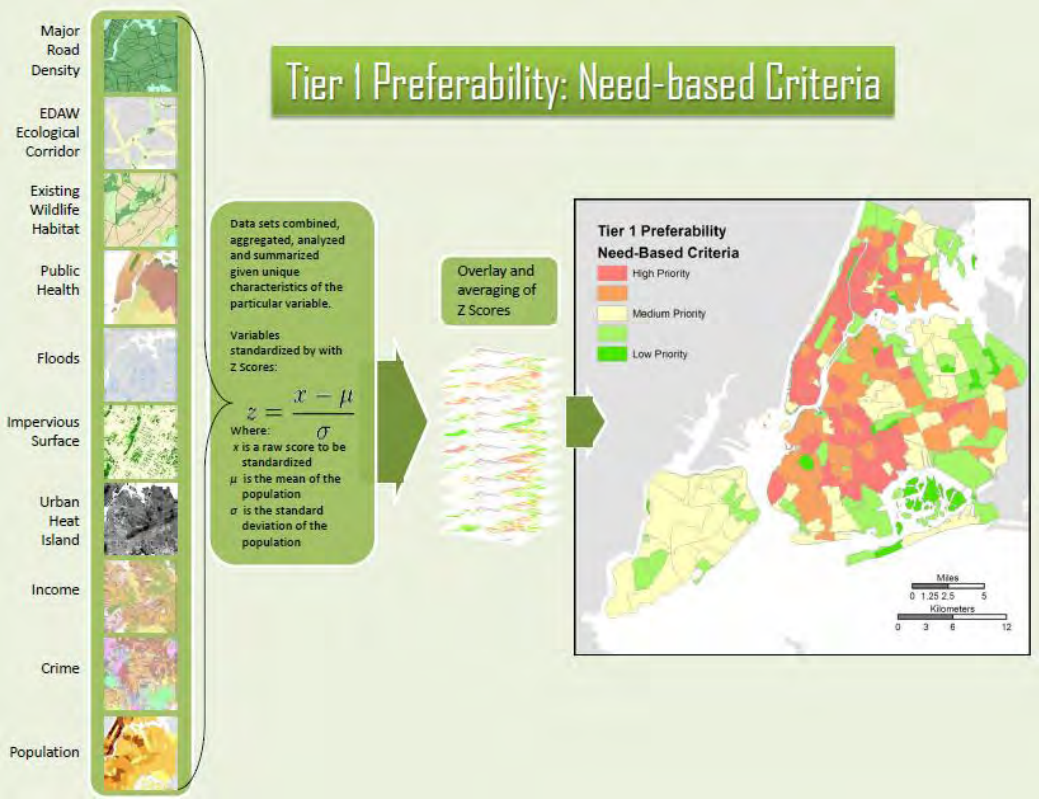
UTC Prioritization



From: NY Field Station, NRS, USFS et al.

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Individual and Summary Maps

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Outcome-based planning

- Big trees = quicker realization of desired outcomes
  - Heat island reduction
    - Mitigation of impacts to vulnerable communities
  - Stormwater management
    - TMDL compliance
      - MS4s, CSOs, NPDES

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Don’t forget your protection

It’s not all about carpet bombing with trees; tree protection is as or more important than planting in reaching UTC goals

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Nowak and Luley model (2002)

- Conceptual model of UTC management:
  - $C_T = C_B + C_N + C_G - C_M$
    - C_T = total canopy in 30 years
    - C_B = existing (base) canopy
    - C_N = new planting
    - C_G = growth of existing canopy
    - C_M = mortality and loss

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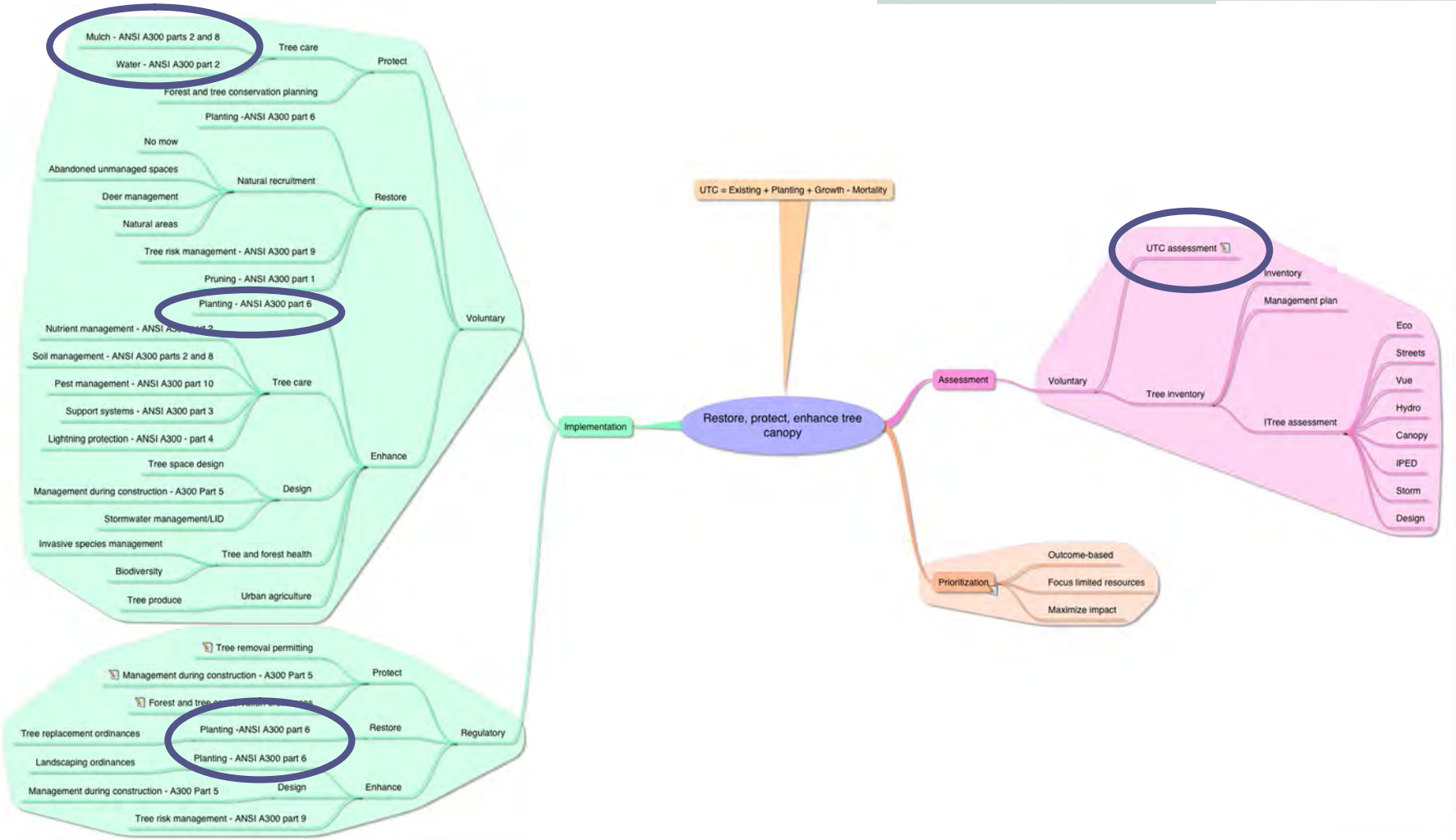

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UTC Assessment + CN

- A lot of other things we can do to grow and manage UTC
  - Tree care industry standard practices
    - Related industries
      - Design

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Why does it matter?

- Trees that are here are here!
- Already established
- Large trees provide much greater benefits (up to 8x) than small trees (CUFC PSWRS)
- Large trees provide greater ROI
- Large trees provide quicker ROI

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The Case for Big Trees

Large Trees vs. Small Trees

The city of Greentree chose planting scenario X. By year 20 it was already a $60,000 annual mistake (see discussion above).

	CHOICE X			CHOICE Y	
	Avg Ann. Benefit Avg Ann. Cost	# Trees	Total Benefit Total Cost	# Trees	Total Benefit Total Cost
Large Trees	$65.18 $13.72	259	$16,882 $3,553	1693	$110,350 $23,228
Medium Trees	$36.04 $6.87	753	$27,138 $5,173	753	$27,138 $5,173
Small Trees	$17.96 $6.23	1693	$30,406 $10,547	259	$4,652 $1,614
Total Trees		2705		2705	
Total Benefits Total Costs			$74,426 $19,273		$142,140 $30,015
Annual Net Value to Community			**$55,153**		**$112,125**

—adapted from McPherson, E.G.; et. al. 2002. Western Washington and Oregon Community Tree Guide: Benefits, Costs, and Strategic Planting. International Society of Arboriculture, Pacific Northwest Chapter: Silverton, OR. 76p.

From: Center for Urban Forest Research, PSWRS, USFS 2003

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How?

- Maintain big trees
- Protect big trees
- Plan for big trees

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Tree Maintenance

- ANSI A300: National industry consensus standards for tree care practices
  - ANSI A300 (Part 1) - 2008 Pruning
  - ANSI A300 (Part 2) - 2011 Soil Management (includes Fertilization)
  - ANSI A300 (Part 3) - 2006 Supplemental Support Systems
  - ANSI A300 (Part 4) - 2008 Lightning Protection Systems
  - ANSI A300 (Part 5) - 2005 Management of Trees and Shrubs During Site Planning, Site Development, and Construction
  - ANSI A300 (Part 6) - 2005 Transplanting (includes Planting)
  - ANSI A300 (Part 7) - 2006 Integrated Vegetation Management (IVM)
  - ANSI A300 (Part 9) - 2011 Tree Risk Assessment

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Tree Protection

- Require ANSI A300 (Part 5) - 2005 Management of Trees and Shrubs During Site Planning, Site Development, and Construction
- Historic, Heritage, Specimen, Memorial, and Champion tree designations
- Ordinances protecting or regulating certain trees

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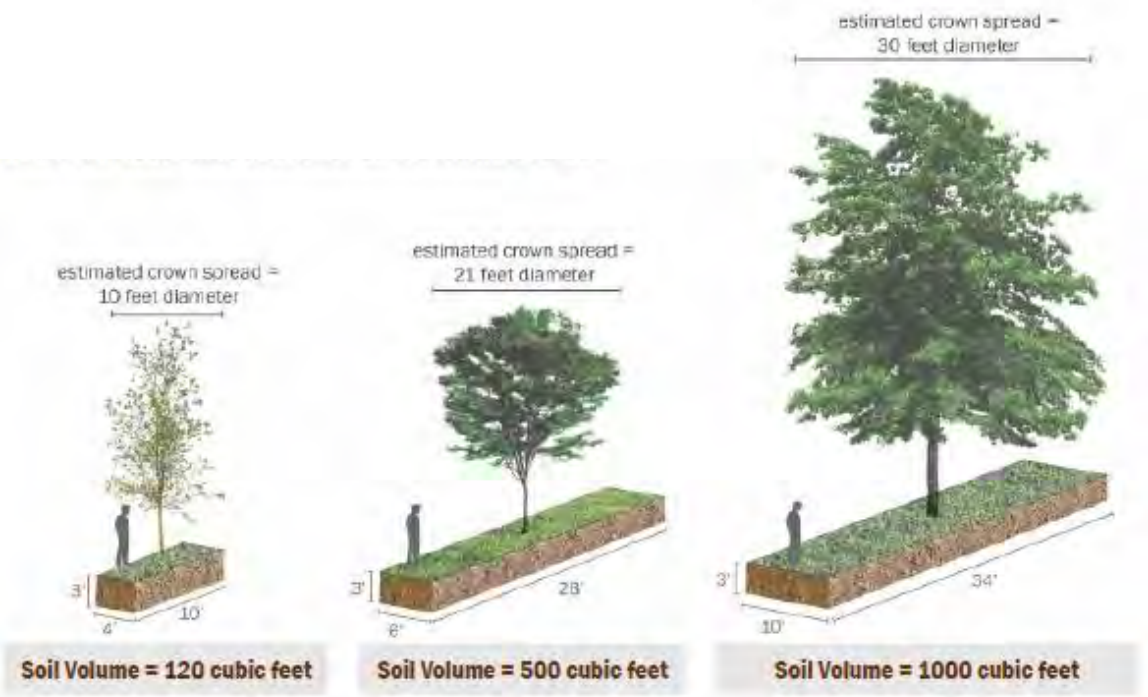
Tree design



From: Casey Trees 2008

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Time scale – it takes a while

- Even large-scale trees being planted today = small trees re: ecosystem services
  - 10-20 years to ROI?

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Summary

- Tree Canopy goals can help cities meet important sustainability and livability goals
- Size matters – frame your goal appropriately (# trees, # acres, % cover)
- Protect your large shade trees – most efficient way to reach canopy cover goals

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Thank You!

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