The Urban Tree Canopy Project

Maryland Department of Natural Resources

Larry Hogan	**Boyd K. Rutherford**	**Mark J. Belton**
Governor	*Lt. Governor*	*Secretary*

Maryland Department of Natural Resources-Forest Service

Urban and Community Forestry Program

580 Taylor Avenue, E-1
Annapolis, MD 21401

Internet: http://www.dnr.maryland.gov Phone: 410-260-8531

Chesapeake Bay

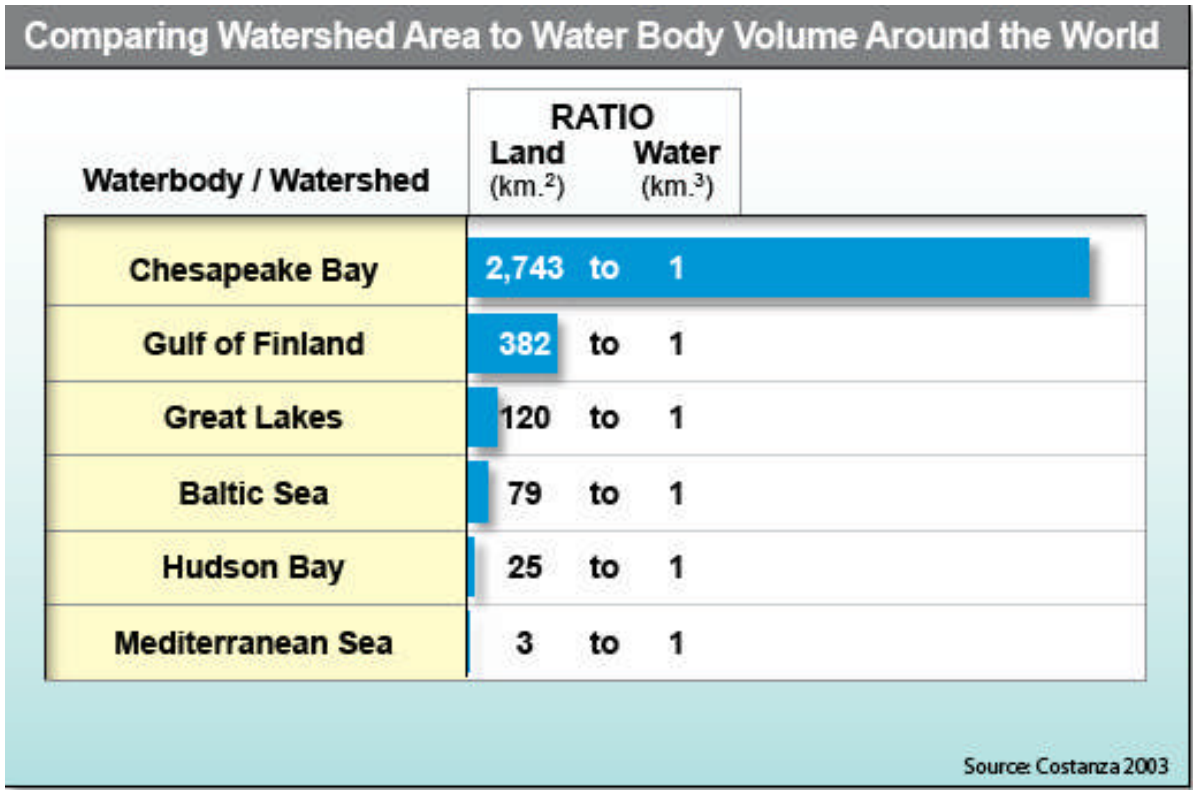
Chesapeake Bay Program

- Began 1983
- #1 Priority: restoration of living resources
  - Finfish
  - Shellfish
  - Grasses

1987 Agreement

- By 2000: 40% nutrient reduction to the Bay
  - Reduce N by 40%
  - Reduce P by 40%
- Both N and P declined significantly, but short of established goals

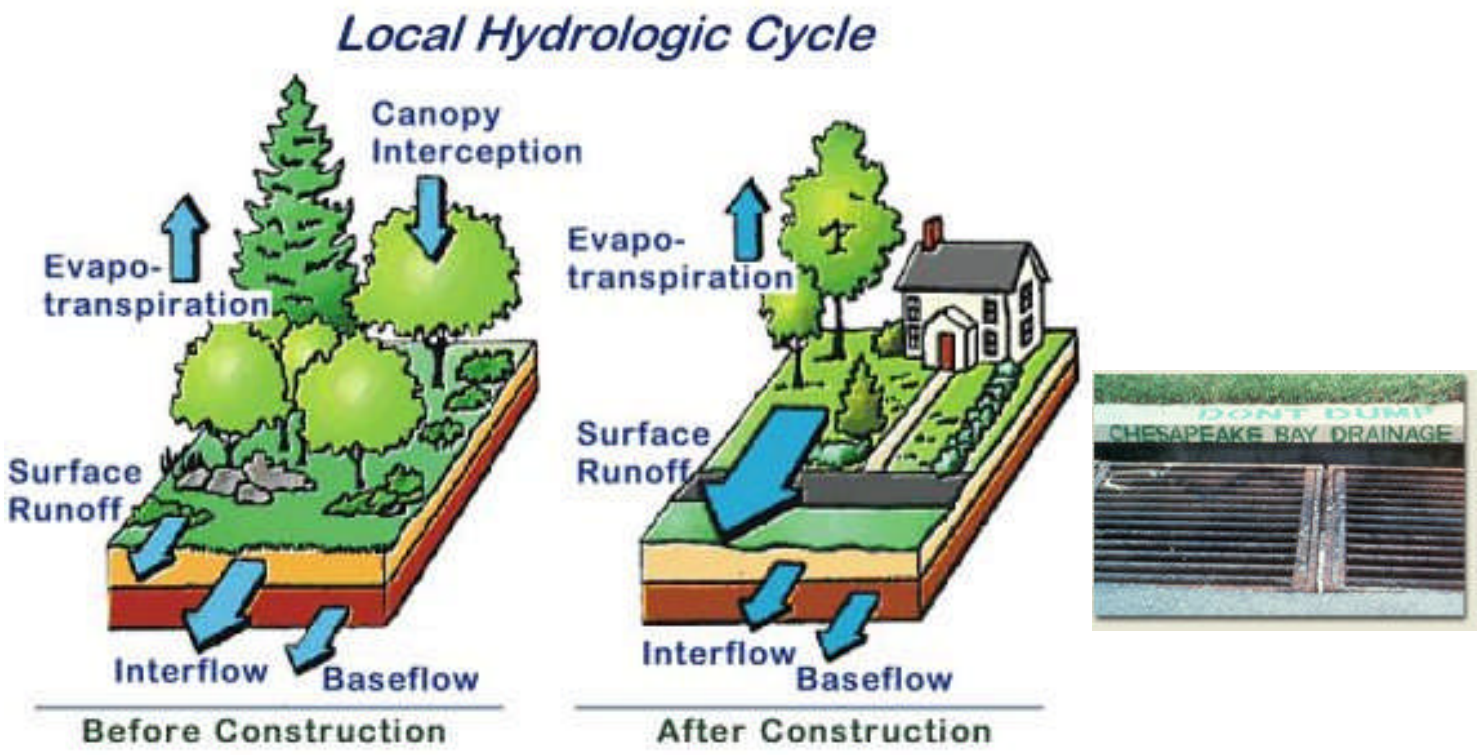
Bay uniqueness



Riparian Forest Buffer Goals

- 1996: Push on RFBs as part of Bay strategy
  - Target: 2,010 miles of forest buffers by the year 2010.
  - > 2,870 miles of riparian buffers established by August 2003
  - Early success led to expansion of buffer goal, including addition of UTC goals.

Water processing in urban areas

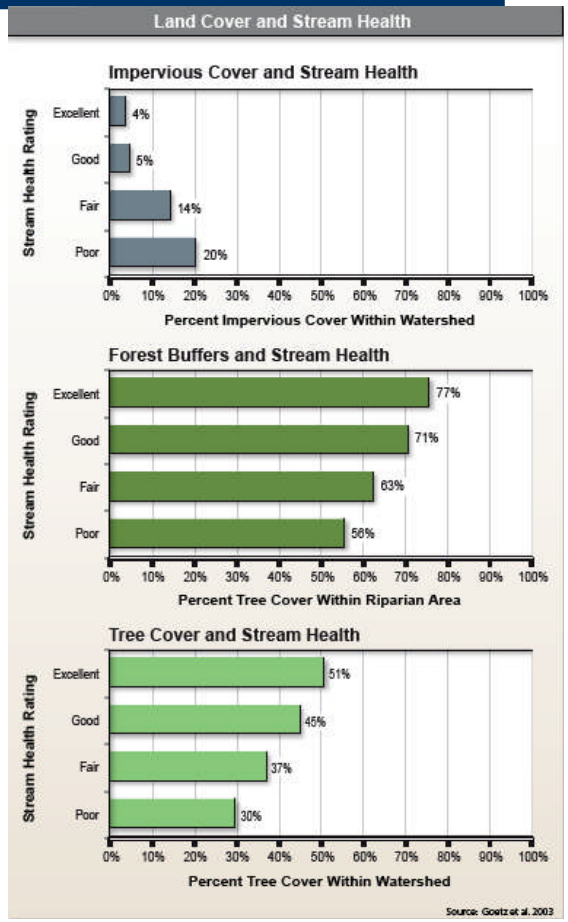


Must address land use/land cover

- LAND USE strategies in place
  - Planning and zoning, Critical Area, Forest Conservation. Etc.
- No comprehensive LAND COVER strategy in place, particularly to mitigate “improved” land / imperviousness.

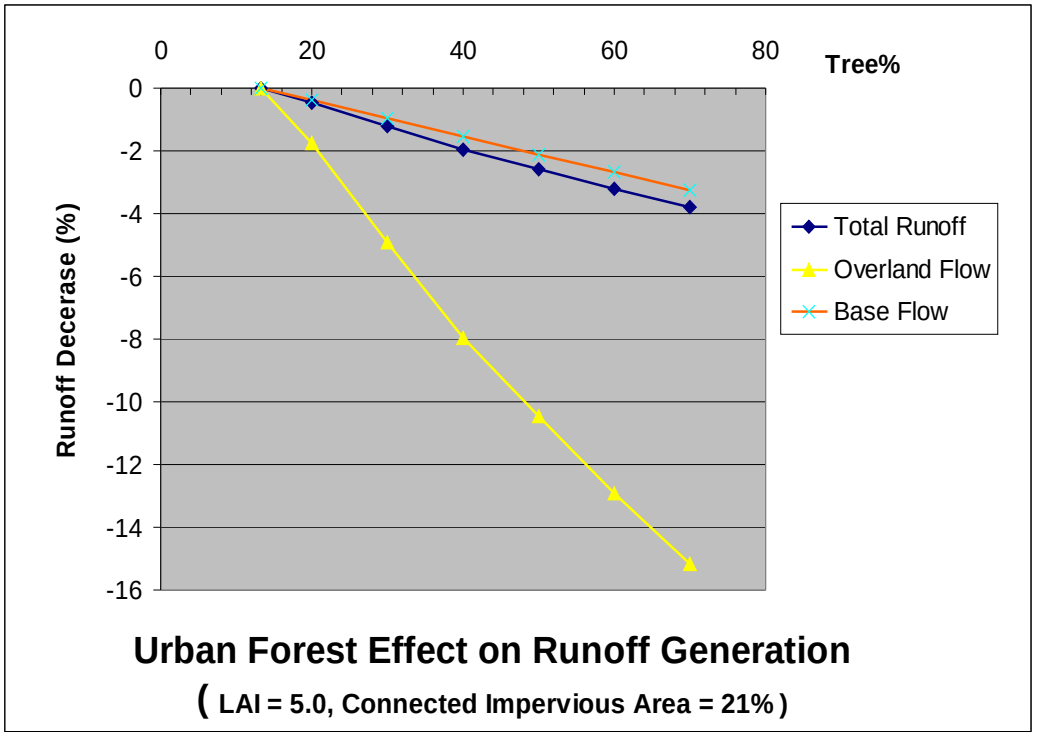
Canopy Cover and Water Quality

- Goetz et al. 2003; Tree cover, impervious surfaces, and riparian buffer analyses
  - Stream health steadily declines as the impervious cover increases and watershed tree cover and riparian buffer tree cover decrease.



UTC and Water Quality

- Nowak et al.



Urban Tree Canopy goals

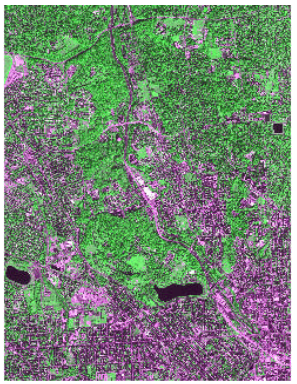
- Developed to address unique urban needs
- Environmental leadership opportunity in the place where most Marylanders (86%) live – urban areas.
- Protocols used for Bay UTC effort based on methods developed for Baltimore; helped form basis for UTC goal

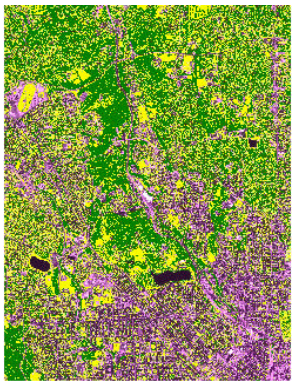
Urban Tree Canopy (UTC)

- What is it?
  - Urban tree canopy is the layer of leaves, branches, and stems of trees that cover the ground when viewed from above.
    - Top down look – how much is covered by UTC?

UTC methods

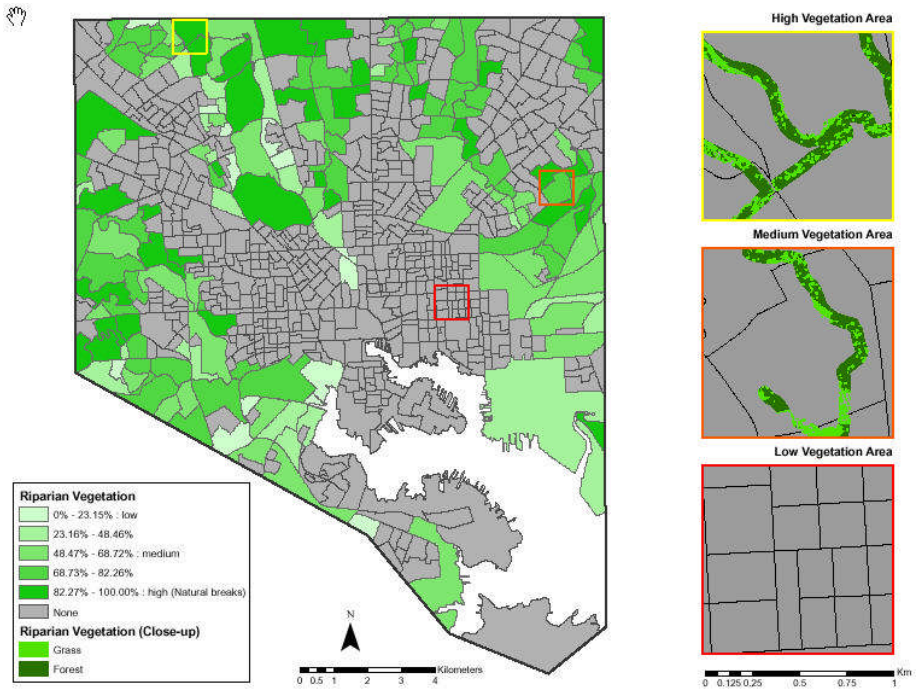
- Imagery: 4-meter multi-spectral to 1-meter resolution remote sensing data.
- Binary classification: Veg / Non-Veg
  - Vegetation mask from the NIR-to-Red, (Band4:Band3) ratio image.
- Binary classification: Tree / Non-Tree
  - Texture analysis of the ratioed image to separate tree canopy from vegetation pixels.





UTC Methods continued

- Tree and vegetation masks combined with Maryland Property View parcel data.
- Per parcel tree and vegetation statistics generated and aggregated up to Census block, tract, neighborhood, FOS type, etc.



CBP DIRECTIVE NO. 03-01

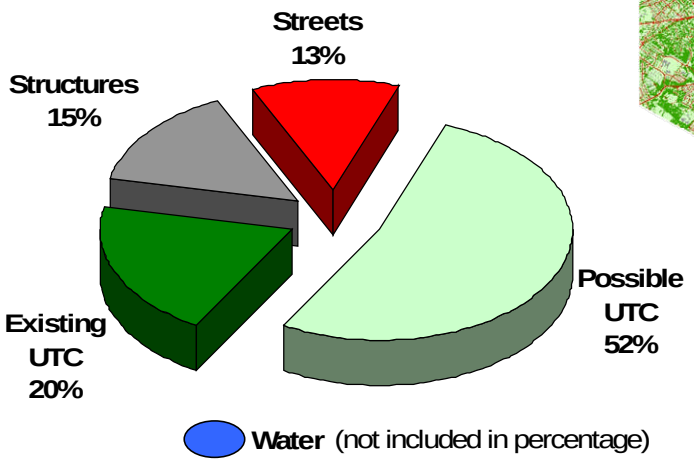
- EXPANDED RIPARIAN FOREST BUFFER GOALS
  - WE FURTHER RECOGNIZE THAT URBAN TREE CANOPY COVER offers stormwater control and water quality benefits for municipalities in the Chesapeake Bay watershed and can extend many riparian forest buffer functions to urban settings.

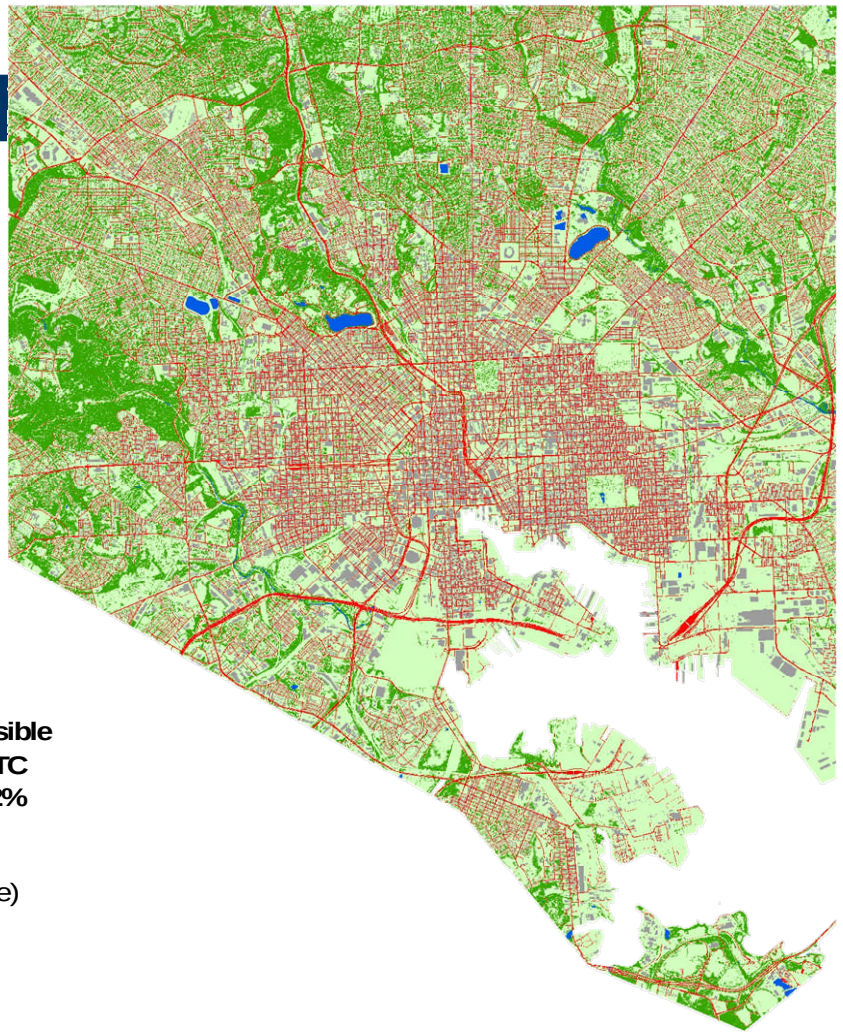
Expanded Bay Riparian Goal

- By 2010, work with at least 5 local jurisdictions and communities in each state to…adopt a local goal to increase urban tree canopy cover
- Encourage increases in the amount of tree canopy in all urban and suburban areas by promoting the adoption of tree canopy goals as a tool for communities in watershed planning.

Current Situation - Baltimore

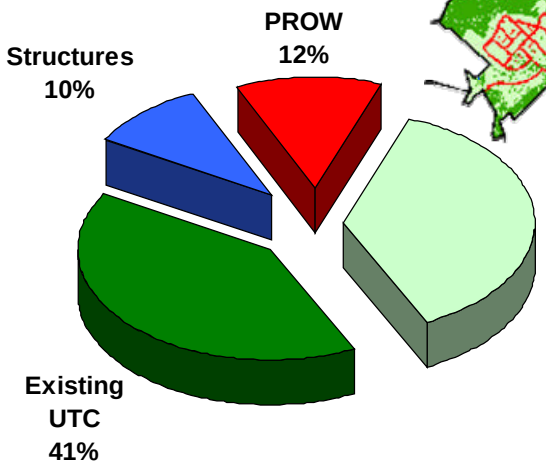
Goal: Double to
40% UTC by 2036

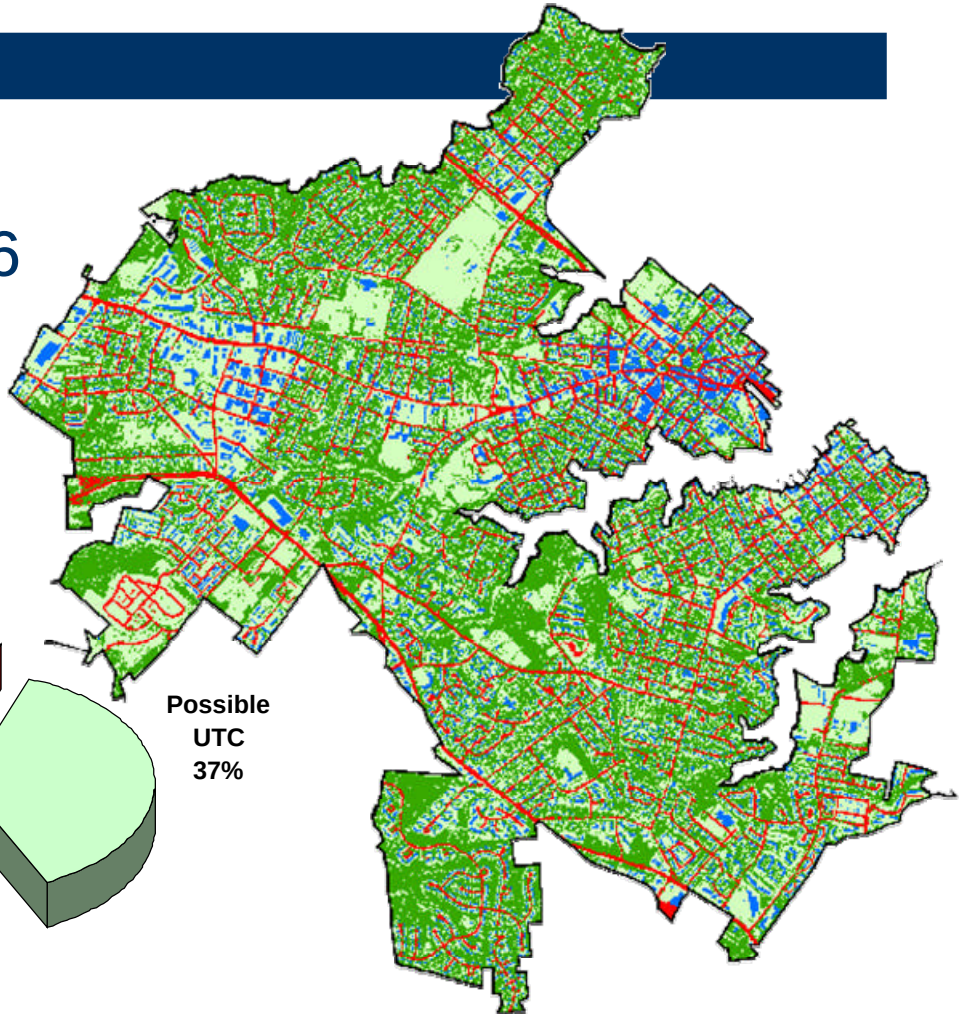




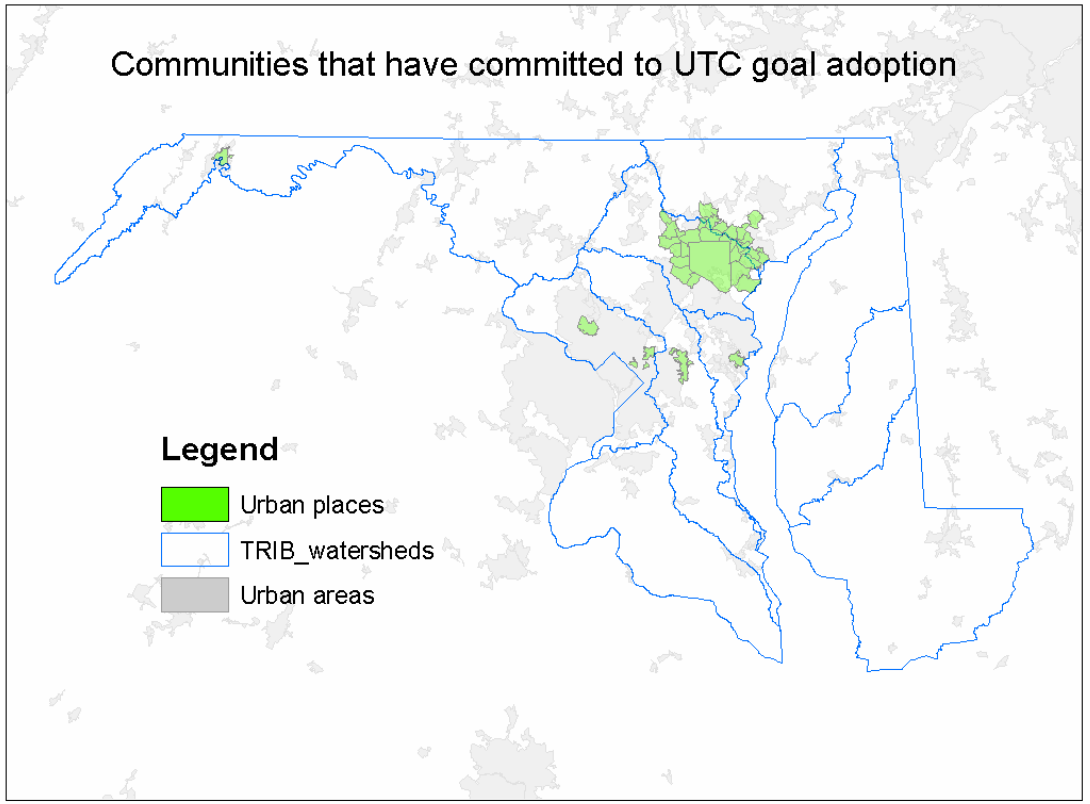
Current Situation - Annapolis

Goal: Increase to
50% UTC by 2036





UTC participation to date



Other applications

Clean Air Act

- Center for Chesapeake Communities is currently working with MDE, DNR, USFS, and UMD to model the air quality benefit of UTC in Baltimore and Washington.
- State of Chesapeake Forests Report: Use tree canopies to protect public health by incorporating forest benefits in air quality attainment strategies.
- MDE is planning to use UTC as a voluntary, emerging measure in the 2007 SIP for ozone non-attainment under the new 8-hour standard.

Air Quality Benefits of Urban Forests, Washington, D.C.

Emissions Filtered	Urban Forest Removes Pollution Equivalent to the Emissions of	
Pollutant	Automobiles	Single Family Homes
Particulate Matter (10 microns)	315,200	30,400
Sulfur Dioxide	82,400	1,400
Carbon	9,700	49,000
Nitrogen Dioxide	3,500	2,300
Carbon Monoxide	78	300

Source: Nowak et al. In Review

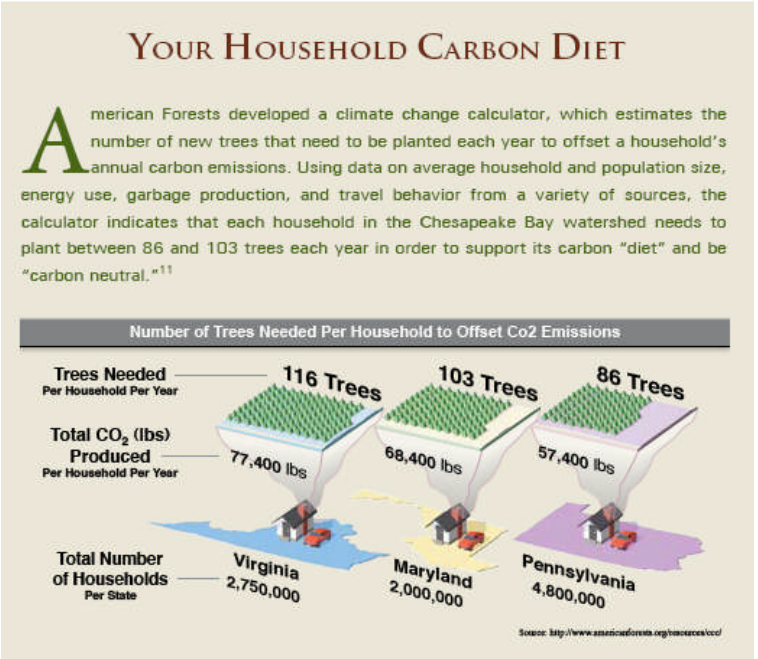
RGGI

Regional Greenhouse Gas Initiative

An Initiative of the Northeast & Mid-Atlantic States of the U.S.

RGGI

- Regional Greenhouse Gas Initiative. Nine states in the Northeast US planning to launch market by 2009. Would cut power plant emissions of global warming gases by 10% by 2020.
- UTC framework may be able to provide accounting structure for using trees in carbon trading scheme.



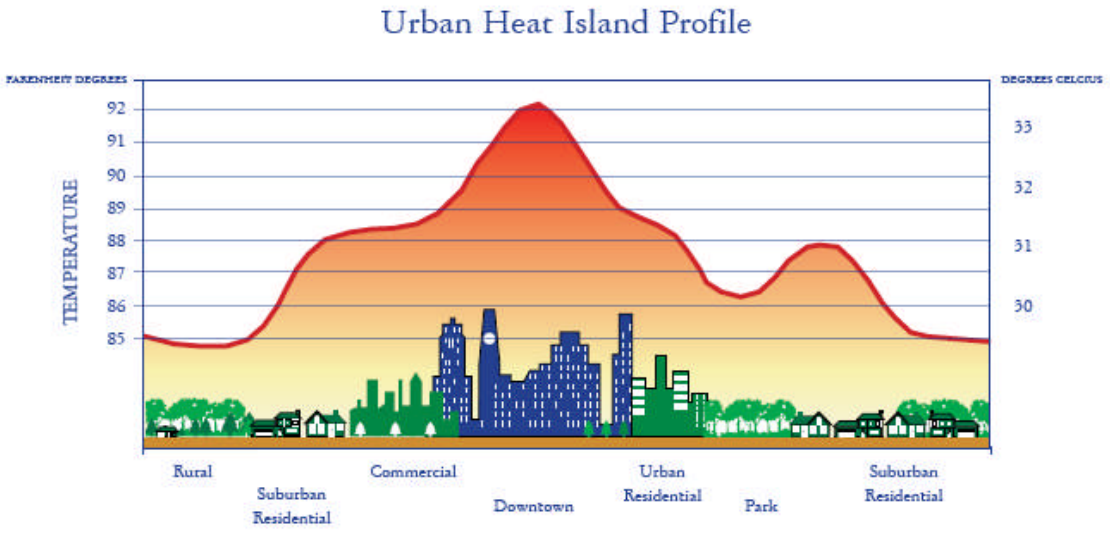
Urban area and tree cover in NE US

Table 10. Urban area, percent tree cover, and estimated carbon stock and sequestration, by state, Northeast.

State	Urban Area	Portion of state	Urban tree cover	Carbon stock	Carbon density	Annual Sequestration	
	km^2	*- - - Percent - - -*		*TgC*	*t/ha*	*t/ha/yr*	*t/ac/yr*
Connecticut	4,085	28.5	21.8	8.24	20.2	0.7	0.28
Delaware	566	8.8	46.3	2.42	42.8	1.4	0.57
Maine	2,887	3.1	47.7	12.74	44.1	1.4	0.57
Maryland	4,525	14.1	40.1	16.78	37.1	1.2	0.49
Massachusetts	6,893	25.2	25.3	16.13	23.4	0.8	0.32
New Hampshire	1,678	6.9	49.1	7.62	45.4	1.5	0.61
New Jersey	6,916	30.6	41.4	26.49	38.3	1.2	0.49
New York	10,127	7.2	26.3	24.64	24.3	0.8	0.32
Pennsylvania	8,363	7.0	34.4	26.61	31.8	1.0	0.40
Rhode Island	926	23.2	8.9	0.76	8.2	0.3	0.12
Vermont	416	1.7	36.0	1.39	33.3	1.1	0.45
Region	47,382	10.0		143.82	30.4		

Source: Nowak and Crane (2002)

Heat Island mitigation



PLANET ARK
world
Environment News

Story Date: 30/3/2007

California Being Warmed by Urbanization

REUTERS
KNOW. NOW.

LOS ANGELES - Average temperatures across California rose slightly from 1950 to 2000, with the greatest warming coming in the state's big cities and mostly caused by urbanization -- not greenhouse gases -- authors of a study released on Wednesday said.

The Urban Tree Canopy Project

Maryland Department of Natural Resources