THE TREE CANOPY AND AIR QUALITY CONNECTION & COG REGIONAL TREE CANOPY GOAL

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MWAQC - TECHNICAL ADVISORY COMMITTEE

November 12, 2024

Metropolitan Washington **Council of Governments**

Presentation Overview

- Council of Government tree initiatives - past and current
- Overview of "Conserving Trees and Forests in Metropolitan Washington"
- Benefits and Services of Trees and Forests
- Tree Canopy and Air Quality
- Current Tree Canopy Levels and Trends
- Projected Trends through 2025
- Tree Canopy loss has Consequences
- The Regional Tree Canopy Goal
- Where you can find the RTCS Tree Canopy Report

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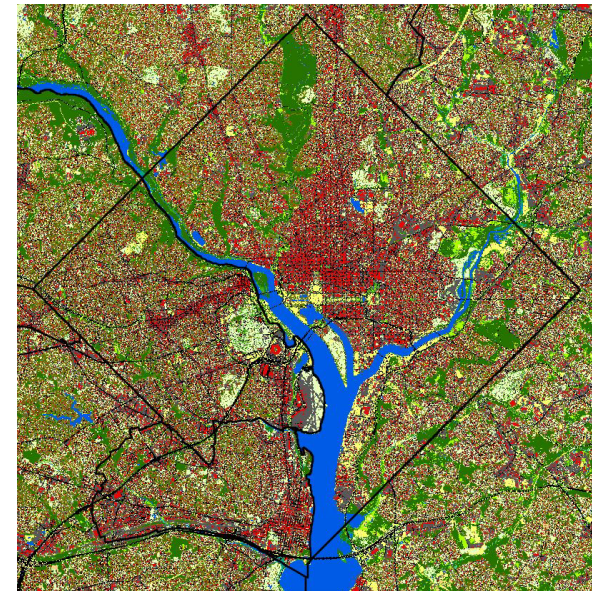
COG Tree Canopy Initiatives

Voluntary Air Quality State Implementation Plan Measure
- Tree measures included in voluntary 8-hr Ozone mitigation measures (2005)

Ad-hoc Regional Tree Canopy Workgroup formed (2012)
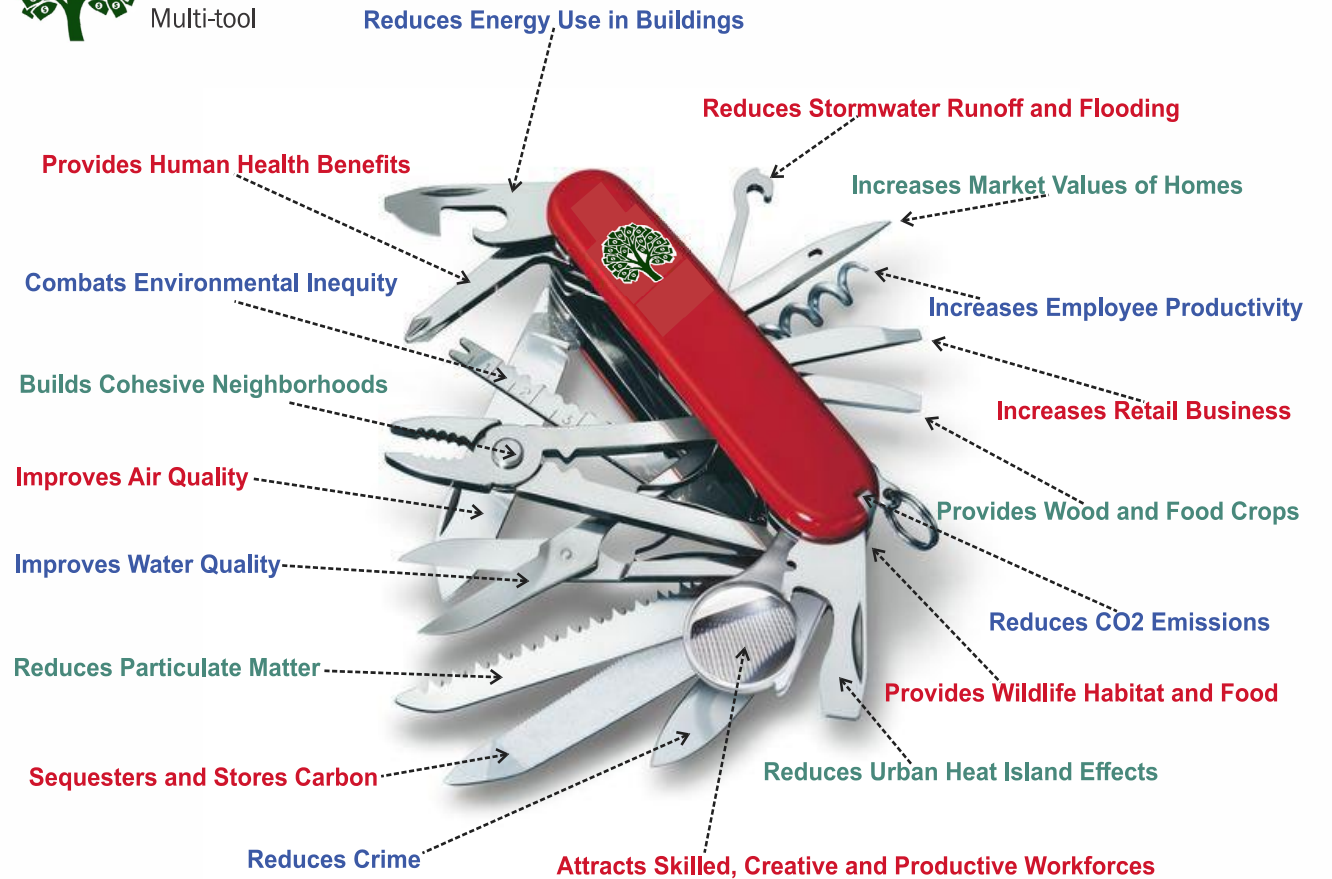- Tree Canopy Management Strategy (2018)

Regional Tree Canopy Subcommittee established (RTCS) (2019)

Deliverables include:
- Tree Conservation Cookbook – (2023)
- Regional Tree Canopy Goals in 3 Part Report (2024)
  - ✓ Regional Tree Canopy Goal and supporting Target Goals
- Current Focus: Regional Tree Action Plan (2025)

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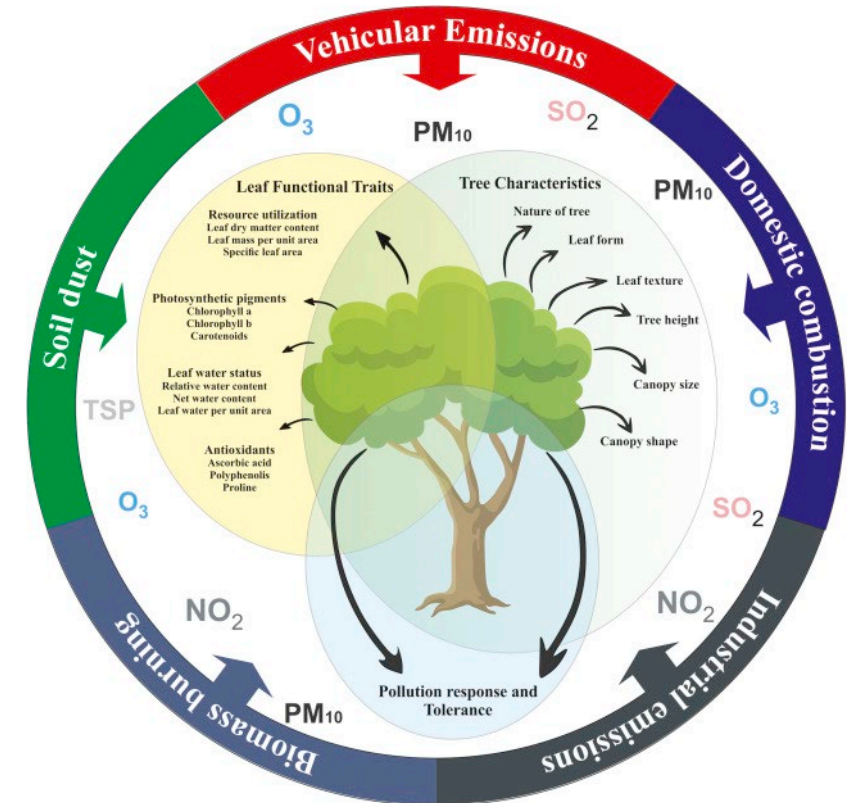
Benefits and Services of Trees and Forests

- Exposure to nature is critical to human health and quality of life
- Urban trees can be used to address environmental equity
- Trees can be used to build cohesive neighborhoods and reduce crime
- Trees can be used to increase local retail business and grow healthy economies
- Trees provide cost-effective solutions and great investments
- Trees and forests can be used to mitigate climate change
- Trees can help communities become more climate resilient
- Need to recognize and manage the costs, damages, and risks associated with trees
- Need to monitor threats to our regional tree canopy

Tree Canopy Multi-tool

Reduces Energy Use in Buildings
Reduces Stormwater Runoff and Flooding
Provides Human Health Benefits
Increases Market Values of Homes
Combats Environmental Inequity
Increases Employee Productivity
Builds Cohesive Neighborhoods
Increases Retail Business
Improves Air Quality
Provides Wood and Food Crops
Improves Water Quality
Reduces CO_2 Emissions
Reduces Particulate Matter
Provides Wildlife Habitat and Food
Sequesters and Stores Carbon
Reduces Urban Heat Island Effects
Reduces Crime
Attracts Skilled, Creative and Productive Workforces

Air quality and Trees, see : Conserving Trees and Forests in Metropolitan Washington, Pages 20 and 22

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Tree Canopy and Air Quality

Trees and Forests Impact Air Quality and Atmospheric Composition by:

1. directly absorbing pollutants from the air including
   - carbon monoxide
   - nitrogen dioxide
   - Ozone
   - coarse particulate matter (PM10),
   - fine particulate matter (PM2.5)
   - sulfur dioxide
2. reducing ambient air temperature via shade and evapotranspiration
3. reducing energy consumption in buildings which indirectly reduces emissions at power plants
4. emit biological volatile organic compounds such as isoprene and monoterpenes as part of their biological processes and protective systems – can contribute to formation of Ozone
5. sequestering carbon dioxide and storing it in wood tissues

Air quality and Trees, see : Conserving Trees and Forests in Metropolitan Washington, Pages 20 and 22

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Tree Canopy and Air Quality

Examples of air quality improvement services provided by the tree canopies of three COG member jurisdictions.

All data were generated using the iTree UFORE model developed by the U.S. Forest Service:

- The tree canopy of Washington D.C. trees is estimated to remove 619 tons of air pollutants* per year.

- The tree canopy of Fairfax County, Virginia is estimated to remove 4,538 thousand tons of air pollutants* per year.

- The trees of Prince George's County, Maryland are estimated to remove 5,100 metric tons of pollutants* annually.

   *carbon monoxide, nitrogen dioxide, Ozone, PM10, PM2.5, sulfur dioxide

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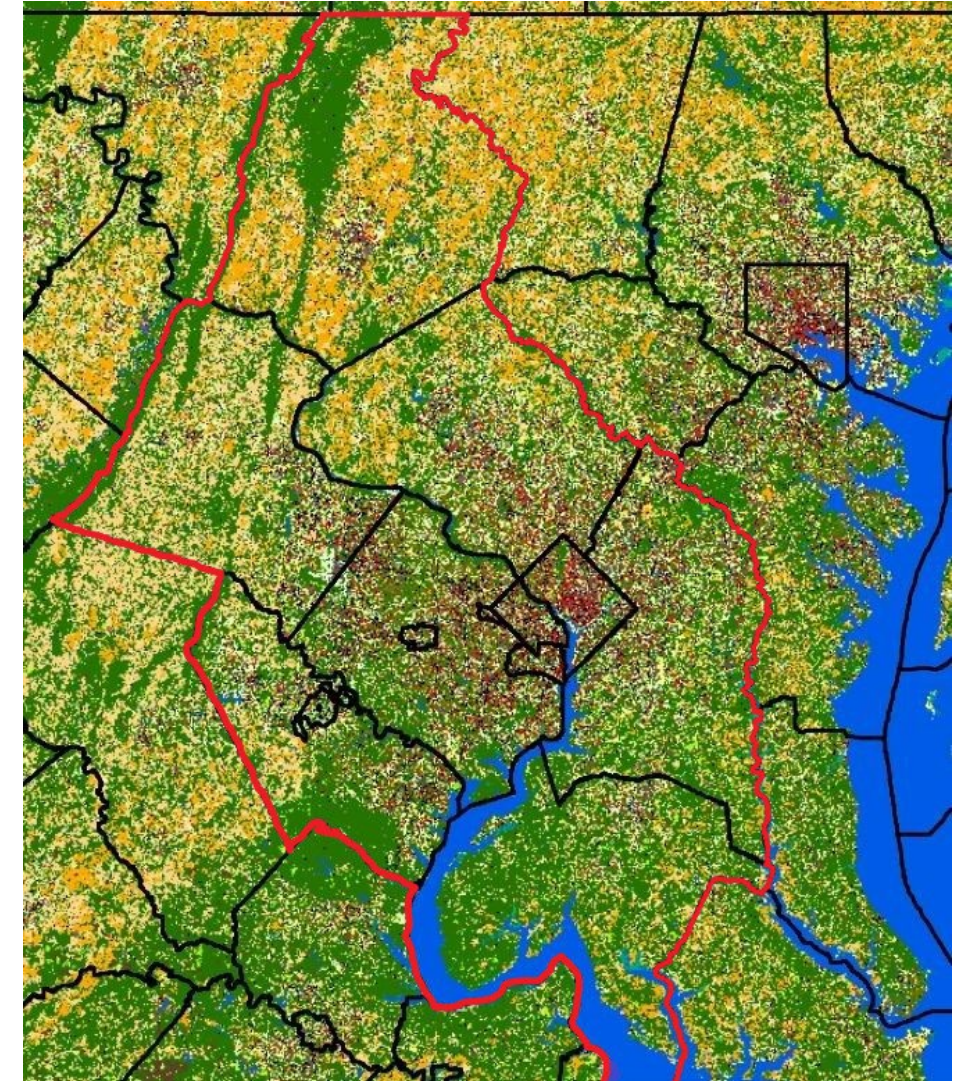
Tree Canopy and Air Quality

Specific Examples of Air Quality Services

- A recent iTree Landscape analysis of the 2018 tree canopy existing on the entire landmass of COG member jurisdictions estimates that regional tree and forest canopy sequesters approximately 1.42 million tons of carbon on an annual basis. The monetary equivalent using alternative carbon sequestration practices is valued at over $266 million dollars annually.

- The report *"i-Tree Ecosystem Analysis, Fairfax County 2017, Urban Forest Effects and Values"* estimated that the tree canopy of Fairfax County, VA reduced energy-related costs of residential buildings by $34,300,000 annually and acted to avoid 51,900 tons of carbon emissions annually that would have otherwise been released by fossil fuel-based power plants generating energy for that jurisdiction. This service was valued at $6,740,000.

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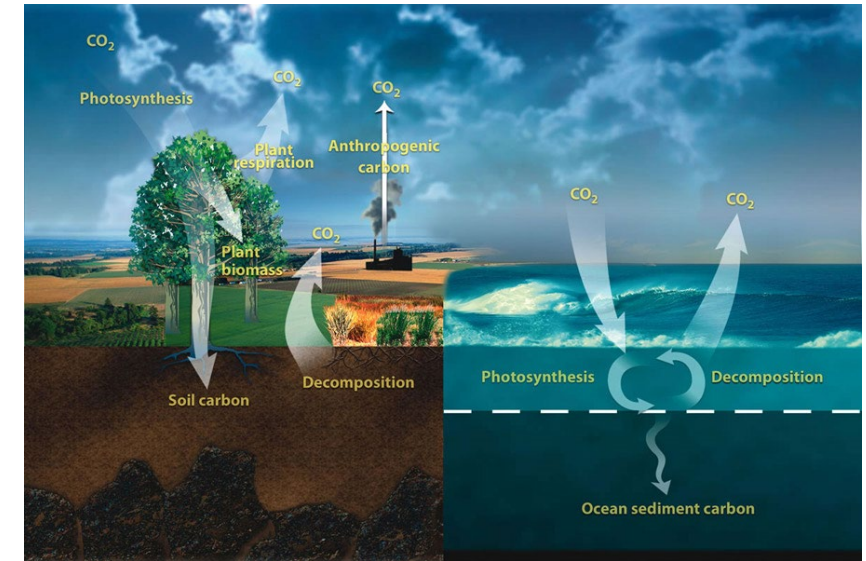
Tree Canopy and Air Quality

Tree Canopy and Heat Island Effects

- Trees and vegetation provide shade, which helps lower surface temperatures. They also help reduce air temperatures through a process called evapotranspiration, in which plants release water to the surrounding air, dissipating ambient heat.

- Reducing ambient temperatures through shade and evapotranspiration reduces the potential for formation of ground level ozone.

- A study comparing European urban areas with tree canopy to those lacking tree canopy found that Land Surface Temperatures observed for areas covered by tree canopy were on average 14.4° - 21.4°F lower, and that treeless urban green spaces are overall less effective (approx. 2-4 time lower) in reducing LSTs that areas covered by trees,
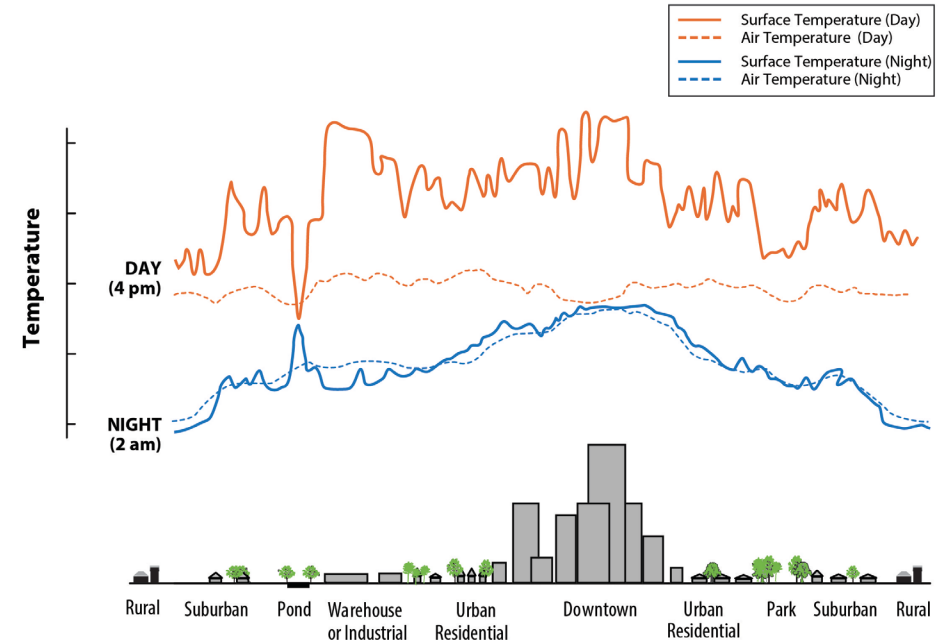

Source: U.S. EPA, Learn About Heat Islands

Tree Canopy and Air Quality

Airborne Pollutants and Trees

- Airborne pollutants may deposit on tree leaves, directly removing them from the air. These include particulate matter (PM) nitrogen oxides, sulfur dioxide, carbon monoxide, and ground-level ozone. Roadside vegetation that is tall and dense can lessen downwind pollutants by approximately 30%.

- Globally, PM is the air pollutant with the largest impact to public health. Causes a range of nonfatal health problems affecting tens of millions of people yearly.

- PM is removed by trees through a process called dry deposition which occurs when particles in the atmosphere deposit themselves on a surface decreasing the atmospheric concentration.
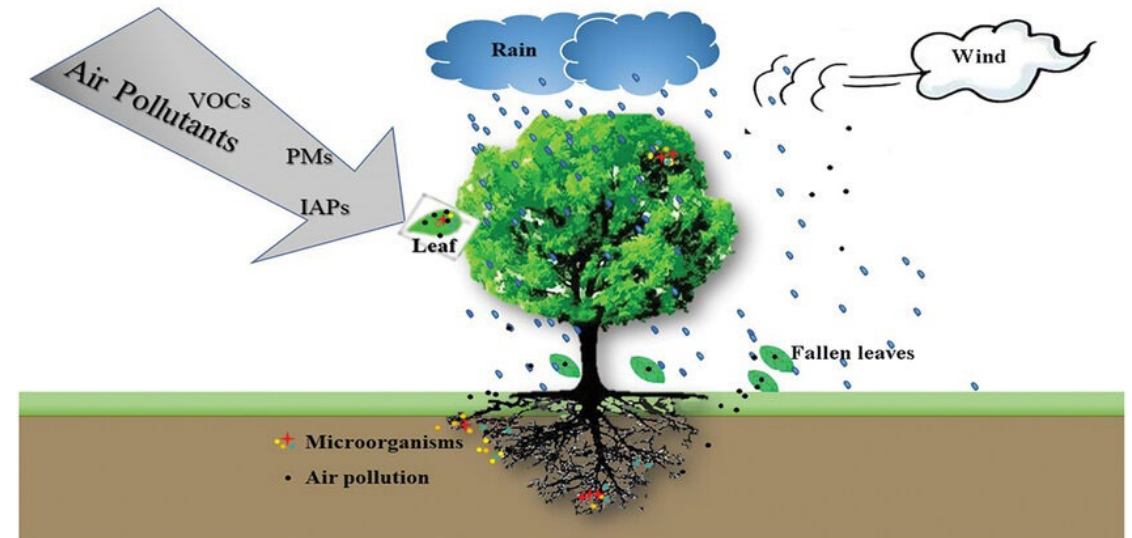
- Most of PM filtering and cooling effects created by trees are fairly localized, Densely populated cities with high pollution levels tend to see the highest overall return on investment from planting trees.

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Environmental Services and Benefits Associated with Current Regional Tree Canopy (1,098,132 acres)

	Annual Air Pollution Removal in LBS	Gallons of Stormwater Runoff Reduced Annually	Tons of Carbon Sequestered Annually
Service	79.837,100/year	6,161,715,761/year	1,418,420 tons/year
Monetary Benefit	$96,430.140/year	$55,790,993/year	$265,693,104 tons/year
Accumulated Service over 29-years	2,315,275,920 lbs.	178,689,756,991 gallons	35,460,512 tons
Monetary Benefit over 29-years	$2,796,474,152	$1,617,938,814	$7,705,100,014

Source: Understanding Your Canopy. Chesapeake Tree Canopy Network. **Services and monetary benefits determined using 2018 tree cover data using iTree Landscape software.** https://chesapeaketrees.net/understand-your-canopy/

https://www.itreetools.org/support/resources-overview/i-tree-methods-and-files

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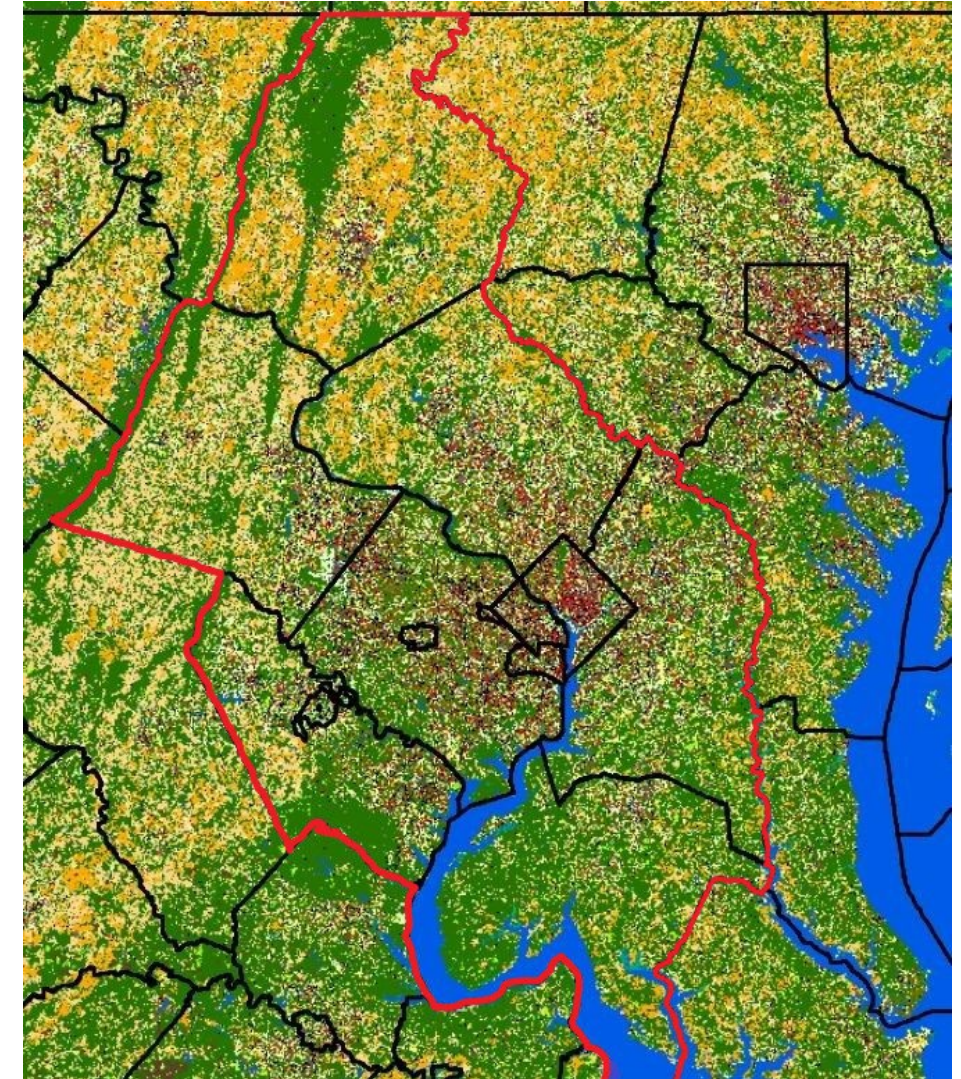
Current Tree Canopy Levels and Trends

Current tree canopy coverage for COG membership area (2,213,976 acres) is estimated at 49.6%*

Regional tree canopy loss between 2014 and 2018 was 17,133 acres, or average of 4,383 acres of tree canopy loss each year.*

Canopy losses represent a mixture of canopy types including intact native forest communities, fragmented remnants of forest communities, and planted and naturally generated urban tree canopy.

If 2014/2018 loss trend were to continue the total area canopy loss would equal 119,932 acres by 2050

*Chesapeake Bay Program Land Use/Land Cover Project (CBP 2022 LULC Project).

Current Tree Canopy Levels and Trends

	Jurisdiction	Total Acreage of Jurisdiction w/o bodies of water#	Acres of Tree Canopy 2014	Acres of Tree Canopy 2018	% Tree Cover 2014	% Tree Cover 2018	Acres of Tree Canopy Gain/Loss
1	Arlington County, Virginia	16,638.28	5,647.7	5,655.3	33.9%	34.0%	7.6
2	Charles County, Maryland	292,971.63	198,908.4	198,119.6	67.9%	67.6%	788.9
3	Fairfax County, Virginia	250,252.38	140,120.1	139,299.2	56.0%	55.7%	821.0
4	Frederick County, Maryland	422,776.31	179,592.1	181,709.0	42.5%	43.0%	2,116.8
5	Loudoun County, Virginia	330,071.15	147,938.1	145,075.4	44.8%	44.0%	2,862.7
6	Montgomery County, Maryland	315,589.05	153,264.0	147,479.5	48.6%	46.7%	5,784.4
7	Prince George's County, Maryland	308,890.48	168,099.1	160,808.4	54.4%	52.1%	7,290.7
8	Prince William County, Virginia	214,563.21	122,543.7	121,310.1	57.1%	56.5%	1,233.6
9	City of Alexandria, Virginia	9,558.58	2,639.3	2,658.1	27.6%	27.8%	18.8
10*	District of Columbia	39,120.61	15,235.8	14,760.3	38.9%	37.7%	475.5
11	City of Fairfax, Virginia	3,993.88	1,636.5	1,626.6	41.0%	40.7%	9.9
12	City of Falls Church, Virginia	1,309.72	541.1	536.4	41.3%	41.0%	4.6
13	City of Manassas, Virginia	6,299.49	1,502.4	1,498.9	23.8%	23.8%	3.5
14	City of Manassas Park, Virginia	1,941.63	426.0	424.6	21.9%	21.9%	1.4

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Projected Trends

The 2014/2018 trendline provides an opportunity to project future canopy levels and assess the impacts of different methods of tree conservation.

RTCS explored three scenarios involving different levels of tree preservation, tree planting*, and post-planting quality assurance and replacement practices.

- Scenario A uses 2014/2018 trendline to plot possible canopy trends through 2050. Projects 2050 canopy level at 44.4%

- Scenario B plots impact of planting 109,300 each year in GOG region and increasing tree preservation associated with land development by 5%.

- Scenario C plots impact of planting 206,000 trees planted each year and increasing tree preservation associated with land development by 10%

* Alternative methods of reforestation and costs are discussed on pages 59 thru 61 of *Conserving Trees and Forests in Metropolitan Washington*

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Projected Trends

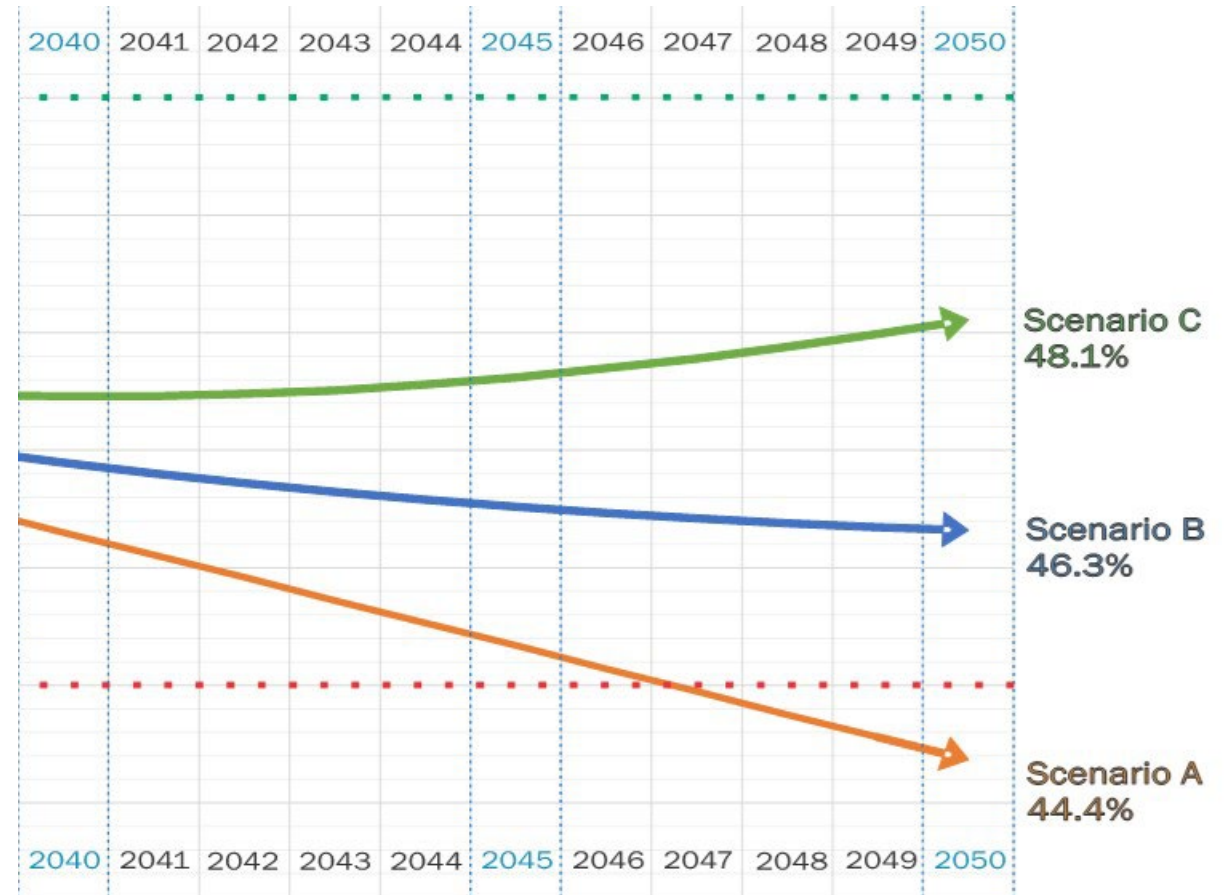## Graph 1: Projected Changes to COG Region Tree Canopy 2022 to 2050
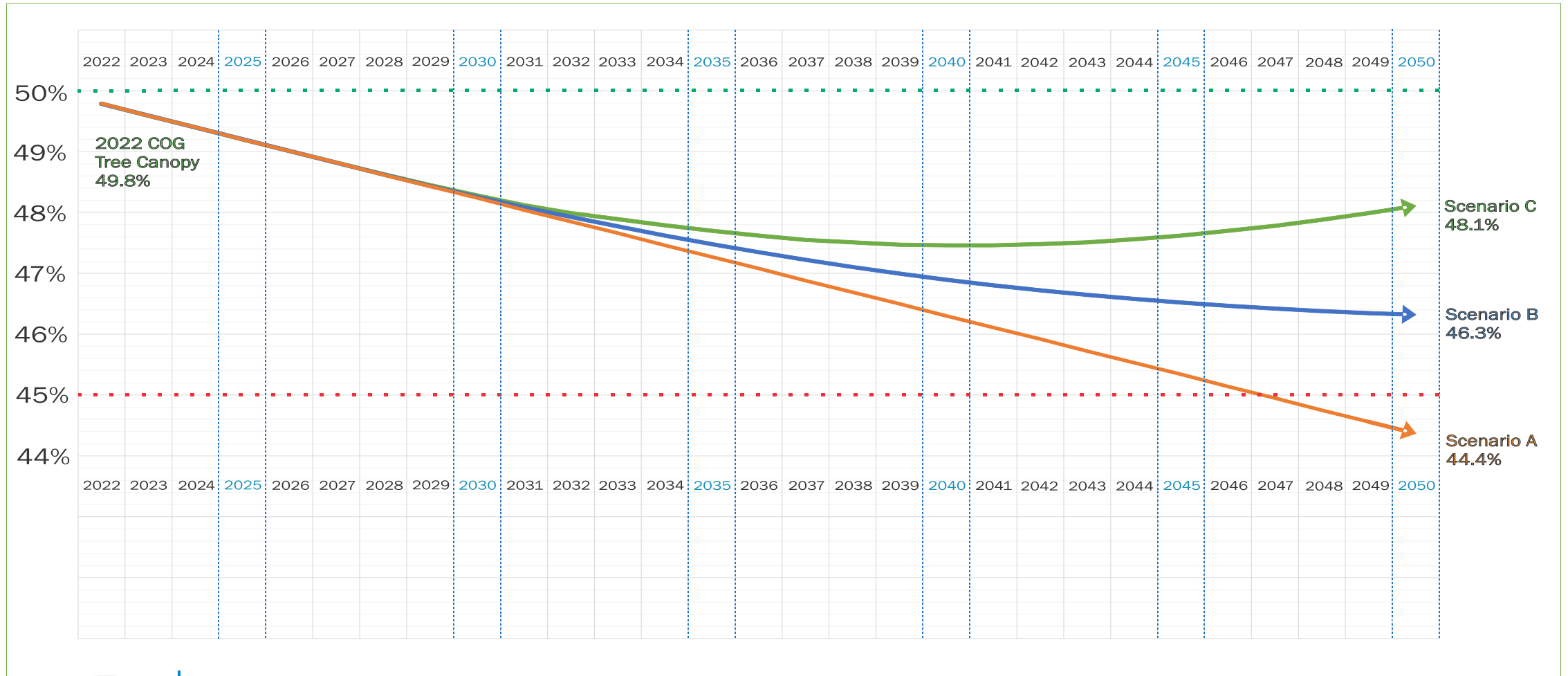
Projected Trends

Table 6. Acres of Tree Canopy Loss associated with Scenarios presented in Graph 1

Scenario	2022 Tree Canopy Coverage	2050 Tree Canopy Coverage	Offset by Tree Planting 2022 to 2050	Offset by Tree Preservation 2022 to 2050	Total Tree Canopy Loss 2022 to 2050
A	49.8 %	44.4%	N/A	N/A	119,932.4 acres
B	49.8 %	46.3%	39,019.2 acres	4,173.6 acres	76,739.6 acres
C	49.8 %	48.1%	74,136.5 acres	8,788.6 acres	37,007.4 acres

Efforts to offset tree canopy losses through tree planting is likely to involve a mixture of reforestation modes saplings, and seedlings. One possible mixture of reforestation practices applied to **Scenario B** involves 20 % 2-inch nursery stock trees, 35 % 1.5-inch nursery stock trees, 15 % saplings, 25 % seedlings, and 5 % no-mow/natural succession. This is mixture is estimated to cost $15.2 Million a year to implement with a total cost of $440 million over the life of Canopy Goal

Scenario C 48.1%

Scenario B 46.3%

Scenario A 44.4%

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Tree Canopy Loss has Consequences!

Environmental Services and Benefits Associated with a 10% loss of the current Tree Canopy

	Annual Air Pollution Removal in LBS	Gallons of Stormwater Runoff Reduced Annually	Tons of Carbon Sequestered Annually
Service	7,983,710/year	616,171,576/year	141,842 tons/year
Monetary Benefit	$9,643,014/year	$5,579,099/year	$26,569,310 tons/year
Accumulated Service over 29-years	231,527,592 lbs.	17,868,975,699 gallons	3,546,051 tons
Monetary Benefit over 29-years	$279,647,415	$161,793,881	$770,510,000

Source: Understanding Your Canopy. Chesapeake Tree Canopy Network. **Services and monetary benefits extrapolated from 10% of 2018 tree cover data using iTree Landscape software.** https://chesapeaketrees.net/understand-your-canopy/

https://www.itreetools.org/support/resources-overview/i-tree-methods-and-files

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16

The Regional Tree Canopy Goal

A detailed analysis of CBP 2022 LULC Project data, local comprehensive land use plans, transportation plans, local zoning maps, regional population projections and green infrastructure plans suggests that it is feasible to support tree canopy coverage in the 45% to 50% range over the next 25 years, and possibly more if COG jurisdictions chose to take steps to implement strong tree preservation and planting programs and other actions detailed in the report.

This amount of canopy could provide similar levels of public health, socioeconomic, environmental and ecological services to those provided by trees and forests in 2018; however, land cover changes could alter the type and level of tree services provided at specific locations as time passes.

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The Regional Tree Canopy Goal

The Overarching Regional Tree Canopy Goal of 50%. This identifies Represents the level of canopy that COG recommends the region strive to maintain through 2050

50% Tree Canopy Coverage represents 1.11 million acres of tree canopy distributed throughout 2.21 million acres of the combined landmass of 24 COG jurisdictions.

A 50% tree canopy goal likely represents the ceiling of what is practical to achieve within the COG region. Setting the goal at this level:
- Straddles the line between aspiration and pragmatism.
- Is compatible with a wide range of socioeconomic, environmental, and ecological concerns.
- Is similar to tree canopy levels found elsewhere in urbanized areas of the Eastern United States.
- Strikes a balance between enjoying the benefits and managing the risks of tree canopy.

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Target Goals supporting the Regional Goal

- *Intermediate Target Goals based on Population Density and Urbanization.* These goals are provided to help communities identify tree canopy goals for watersheds, planning districts, census tracts, and towns and smaller cities.

- *Smaller Scale Target Goals for General Land Use Categories:* These target goals identify mature canopy coverage levels that associated with 18 general classes of land use categories encountered in the COG region.

The inclusion of the intermediate and smaller scale target goals reflect a "*take care of the pennies and the dollars will take care of themselves*" approach to achieving and sustaining the regional goal.

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Conserving Trees and Forests in Metropolitan Washington

CONSERVING TREES AND FORESTS IN METROPOLITAN WASHINGTON

Report on the state of the region's tree canopy and its benefits, the development of new regional goals, and strategies for action at the local level

April 2024

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A three-part report that outlines various benefits and services offered by tree canopy as well as discussions on recognizing and managing tree risks and costs and the need to monitor and mitigate threats to trees and forests.

- Part 1: A Case for Conserving Trees and Forests in the Metropolitan Washington Region
- Part 2: Tree Canopy Goals for the Metropolitan Washington Region
- Part 3 Identifying the Right Level of Tree Canopy for Your Community

Heat Island Effects and Trees are discussed on pages: 19

Air Quality and Trees are discussed on pages: 19, 20 and 22

Trees and Climate Change are discussed on pages 16 through 19:

https://www.mwcog.org/documents/2024/04/10/conserving-trees-and-forests-in-metropolitan-washington-climate--energy-tree-canopy/

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