Proposed Land Use Methods and Metrics Outcome Indicators for 2022

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Healthy Watersheds Goal Implementation Team
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https://blog.nature.org/science/2016/09/08/energy-sprawl-is-the-largest-driver-of-land-use-change-in-the-u-s/

Goal: Conserve landscapes treasured by citizens in order to maintain water quality and habitat; sustain working forests, farms and maritime communities; and conserve lands of cultural, indigenous and community value.

Outcome: Assess and understand the impacts of land use change on watersheds, habitats, and communities at a scale relevant to county-level decision-makers.

Through the Chesapeake Bay Watershed Agreement, *the Chesapeake Bay Program has committed to...*

2020

2013 - 2017

1. Measure rate of farmland, forest and wetland conversion, and the extent and rate of change in impervious surface coverage.

2. Quantify the potential impacts of land conversion to water quality, healthy watersheds and communities.

3. Launch a public awareness campaign to share this information with citizens, local governments, elected officials and stakeholders.

Initial LUMM Indicators Proposed for Release in 2022

Impervious Cover[1] (2017/18) and Impervious Cover Change (2013-2017)
Percent and area (acres) of impervious cover and impervious cover change by catchment, watershed*, and county

Tree Cover[2] (2017/18) and Tree Cover Change (2013/14 – 2017/18)
Percent and area (acres) of tree cover and tree cover change by catchment, watershed, and county

Natural[3] Land (2017/18) and Natural Land Change (2013/14 – 2017/18)
Percent and area (acres) of natural land and natural land change by catchment, watershed, and county

Forest[4] (2017/18) and Forest Change (2013/14 – 2017/18)
Percent and area (acres) of forest and forest change by catchment, watershed, and county

Community Tree Cover[5] (2017/18) and Community Tree Cover Change (2013/14 – 2017/18)
Percent and area (acres) of developed tree cover and developed tree cover change by catchment, watershed, and county

[1] Impervious Cover = roads, structures, parking lots, and tree canopy overhanging such features
[2] Tree Cover = forests, forested wetlands, other tree canopy, tree canopy over turf grass, and tree canopy over impervious surfaces
[3] Natural land = forests, other tree canopy, all wetlands, and early-stage forests (areas recently harvested or undergoing succession
[4] Forests = patches of tree cover that are >= 1 acre in size with 240-ft (70m) minimum width somewhere within each patch.
[5] Developed Tree Cover = tree canopy over turf grass, and tree canopy over impervious surfaces

Initial LUMM Indicators Proposed for Release in 2022

Impervious Cover[1] (2017/18) and Impervious Cover Change (2013-2017)
Percent and area (acres) of impervious cover and impervious cover change by catchment, watershed*, and county

Tree Cover[2] (2017/18) and Tree Cover Change (2013/14 – 2017/18)
Percent and area (acres) of tree cover and tree cover change by catchment, watershed, and county

Natural[3] Land (2017/18) and Natural Land Change (2013/14 – 2017/18)
Percent and area (acres) of natural land and natural land change by catchment, watershed, and county

Forest[4] (2017/18) and Forest **Tree Canopy Outcome Indicator**
Percent and area (acres) of forest and forest change by catchment, watershed, and county

Community Tree Cover[2] (2017/18) and Community Tree Cover Change (2013/14 – 2017/18)
Percent and area (acres) of tree cover and tree cover change by 2010 Census Places and Urban Areas/Clusters

[1] Impervious Cover = roads, structures, parking lots, and tree canopy overhanging such features
[2] Tree Cover = forests, forested wetlands, other tree canopy, tree canopy over turf grass, and tree canopy over impervious surfaces

Percent Impervious Cover by Watershed

What?
Indicator of development and associated with the permanent conversion of pervious surfaces (e.g., farm fields, forests, and open space).
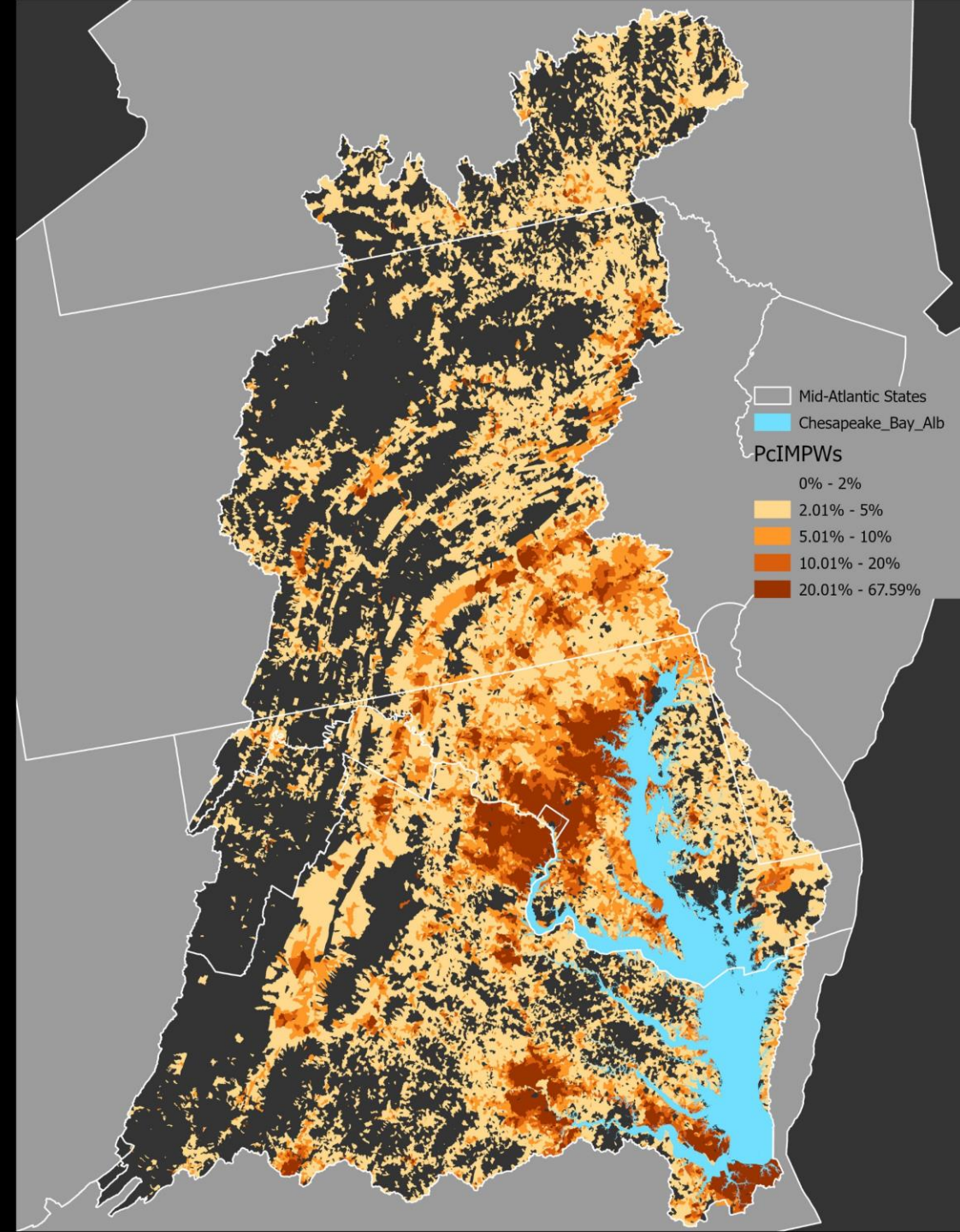
Applies to:
Watershed health, Water Quality, and Communities

Why?
Impervious surfaces can lead to water quality and watershed health degradation by altering stream flows, stream temperature, soil erosion, and the transport of nutrients, toxic chemicals, road salts, and sediment to streams.

While watersheds with less than 10% impervious cover are generally thought to be less impaired, the most sensitive taxa of stream macro-invertebrates can be adversely impacted at levels below 5% or less.

Impervious surfaces can also be viewed as an indicator of economic growth and investment benefiting the livelihoods of local communities.

Mid-Atlantic States
Chesapeake_Bay_Alb

PcIMPWs
0% - 2%
2.01% - 5%
5.01% - 10%
10.01% - 20%
20.01% - 67.59%

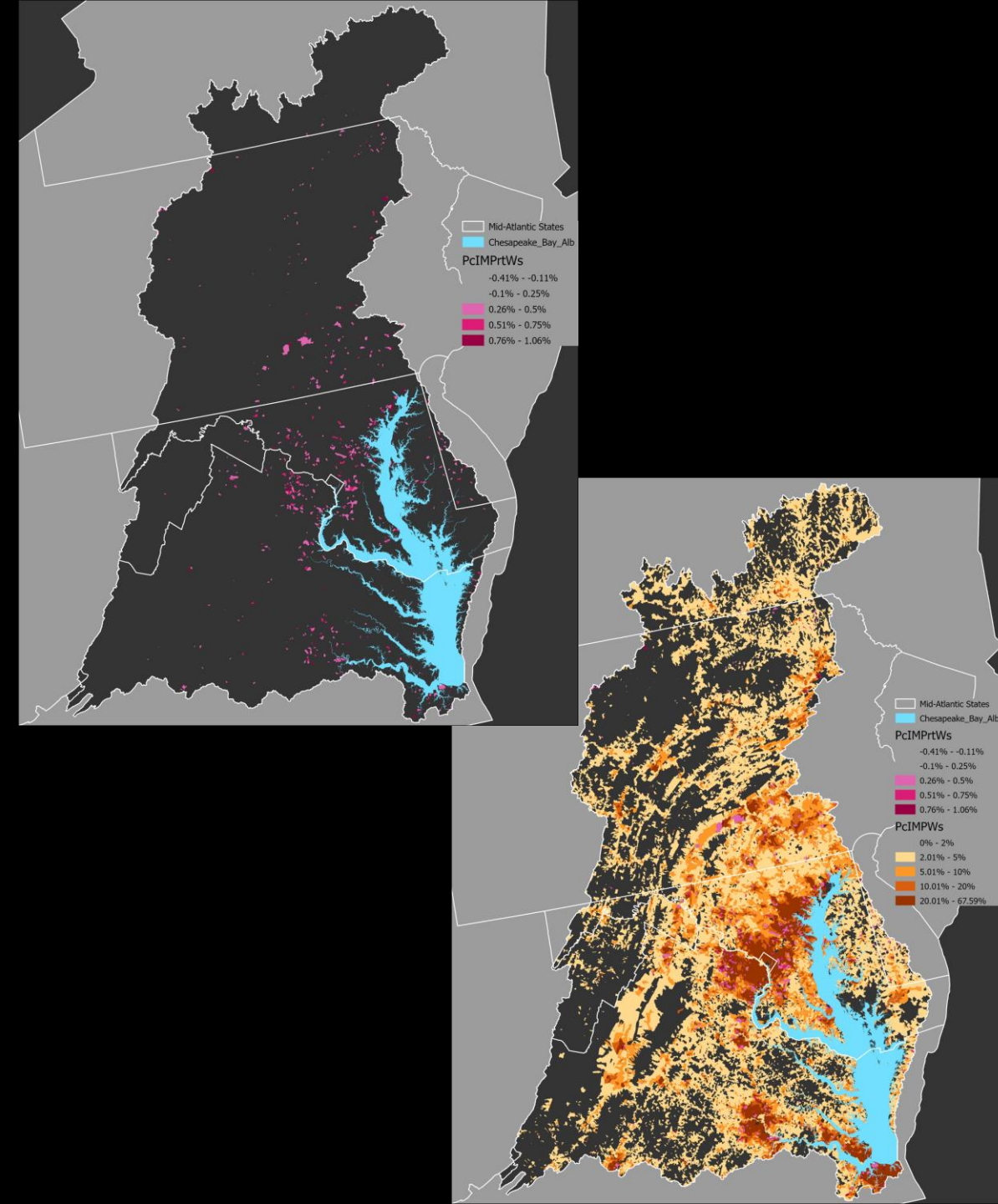# Percent Impervious Cover Change by Watershed

Interpretation

This indicator highlights where increases in impervious cover are occurring. The nature of development can vary greatly (e.g., roads, parking lots, poultry houses, warehouses, residential homes, industrial parks, etc.).   This information is provided with the anticipation that it will be used by states, localities, NGOs, and the public to ensure that sensitive and valued resources are protected, and impervious surfaces are minimized and mitigated through land use planning and the implementation of Best Management Practices.

Applies to:

Watershed health, Water Quality, and Communities

Notes

The human population of the Bay watershed has increased by over a million persons per decade since the 1950's. This trend is expected to continue at least through 2050. Development is associated with population growth among other factors and so increases in impervious cover are expected into the foreseeable future.
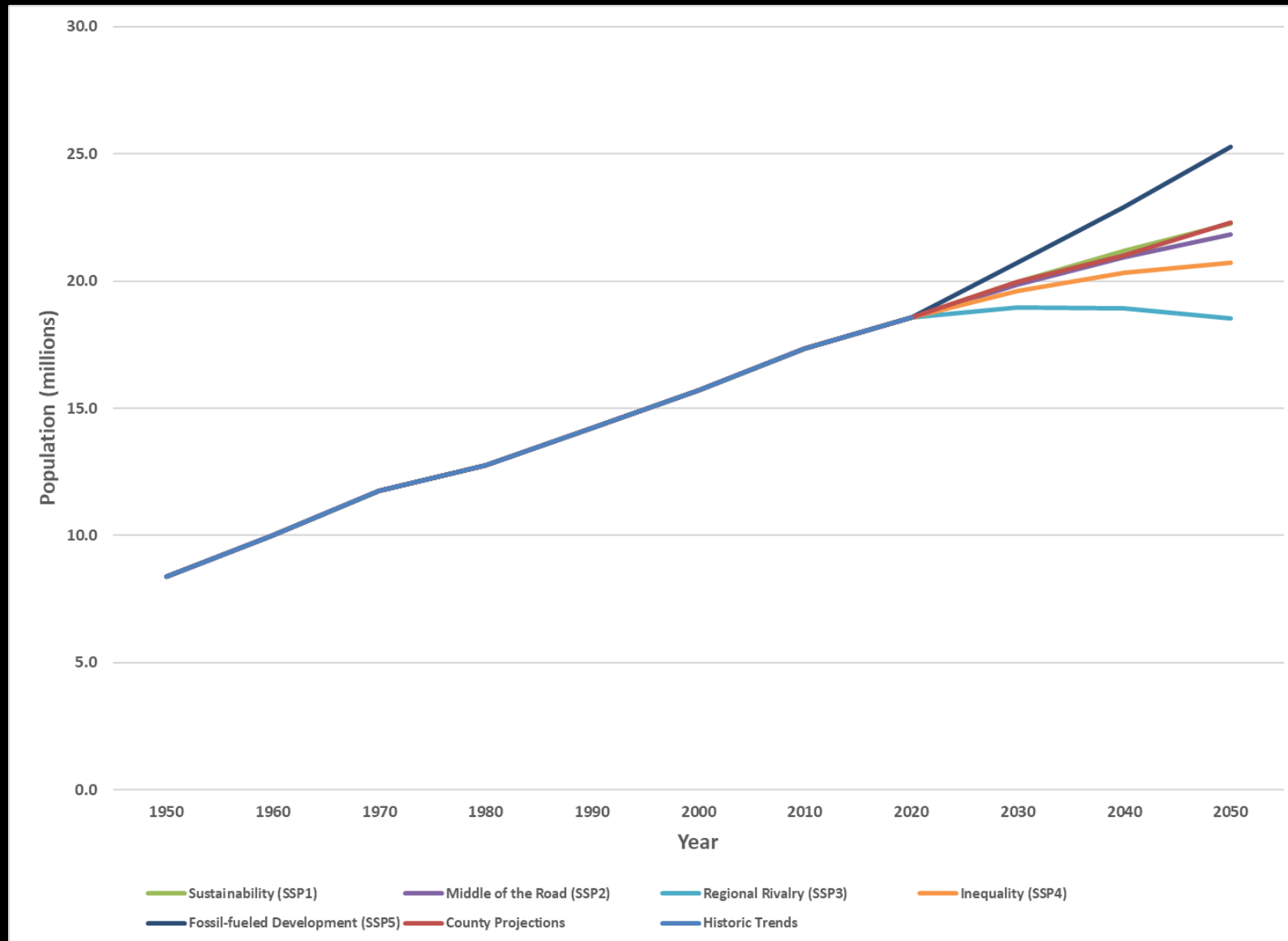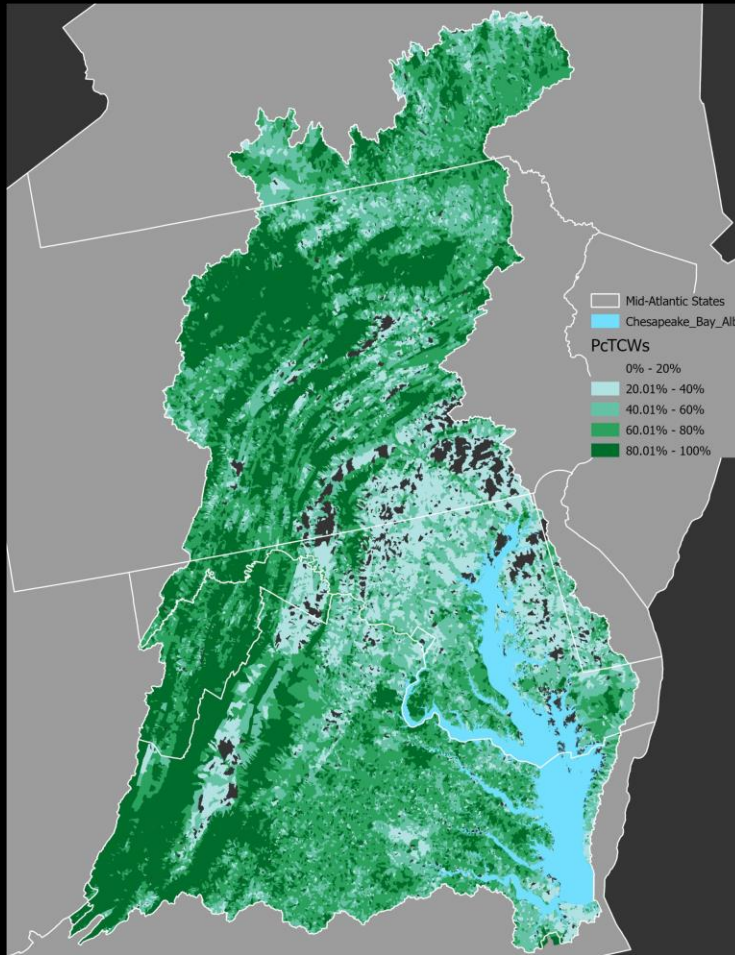
Impervious Surface Change: + 50,651 acres (x %)

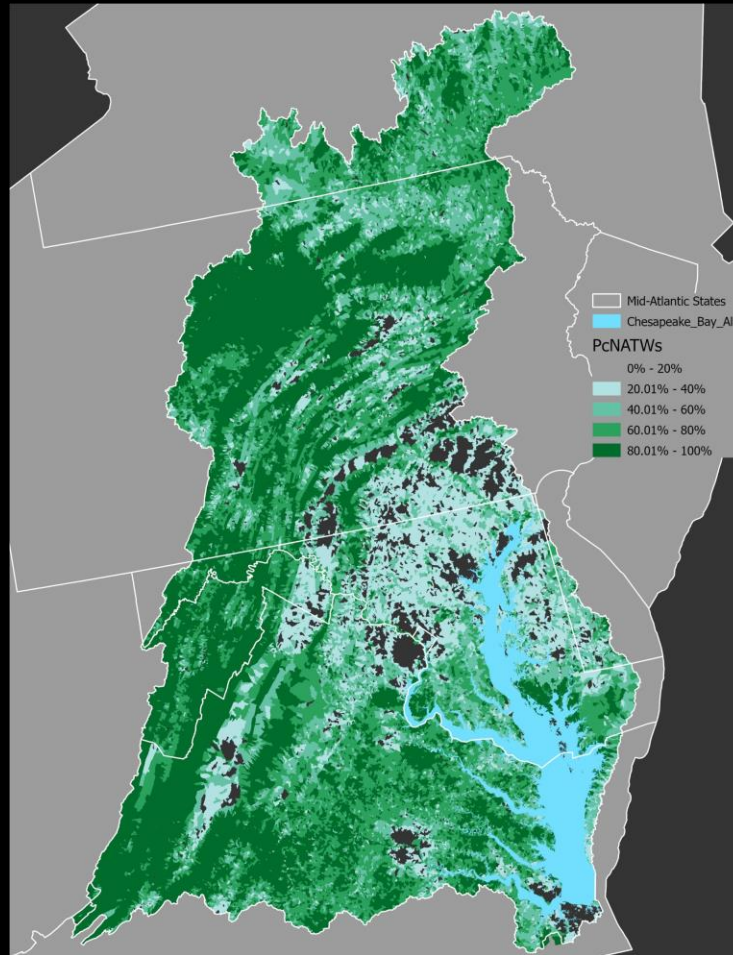| 2013/14-2017/18	ROAD	IMPS	IMPO	TCIS	TURF	TCTG	PDEV	FORE	TCOT	HARF	NATS	CROP	PAST	EXTR	TDLW	RIVW	TERW	WATR	Decrease
ROAD	-	13.6	338.5	696.1	73.6	65.6	205.6	137.8	74.6	1.2	17.2	11.2	13.6	3.9	0.2	1.7	0.0	2.3	1,656.6
IMPS	1.3	-	937.4	508.2	277.2	87.7	143.4	6.7	1.8	0.9	37.4	75.1	84.0	2.4	0.1	0.2	0.0	0.8	2,164.6
IMPO	515.9	3,173.2	-	1,587.1	4,334.1	304.6	1,288.5	165.6	60.1	102.4	784.9	652.1	1,331.0	1.5	20.6	25.0	4.6	34.6	14,385.6
TCIS	41.7	485.1	689.5	-	2,445.8	-	1,598.7	-	-	180.5	408.2	98.1	184.0	6.1	3.5	6.6	0.5	0.9	6,149.4
TURF	0.0	827.8	5,558.2	0.0	-	8,513.5	1,089.0	107.3	106.5	20.7	126.8	3.1	7.8	724.6	-	-	-	-	17,085.2
TCTG	13.5	929.8	4,143.3	10.6	11,096.1	-	783.1	-	-	92.6	421.7	245.7	538.9	9.0	-	-	-	2.1	18,286.4
PDEV	1,129.6	4,377.1	6,865.1	0.0	15,251.3	48.5	-	304.4	33.3	221.0	417.5	142.2	79.3	1,270.4	-	-	-	100.9	30,240.6
FORE	1,160.9	2,764.4	8,917.9	732.0	13,095.7	28,220.6	28,107.2	-	22,045.6	175,564.1	81,474.4	19,557.1	23,185.7	4,065.8	1,380.6	5,567.7	193.2	296.9	416,329.8
TCOT	122.7	951.7	2,338.9	0.0	2,068.1	2,031.5	2,341.2	-	-	788.2	2,277.8	3,075.5	4,566.3	386.3	108.3	250.3	26.6	42.2	21,375.5
HARF	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	-	0.2
NATS	63.1	148.9	476.6	0.4	3,481.5	370.7	825.6	76,425.3	4,388.8	4,294.5	-	545.9	356.2	500.6	-	-	-	1,089.7	92,967.7
CROP	500.4	3,018.3	8,368.9	0.2	4,030.5	165.3	2,513.9	11,299.2	3,088.3	1,367.3	2,068.6	-	125.9	1,182.5	-	-	-	779.8	38,508.9
PAST	307.3	2,252.7	9,606.9	0.1	6,561.6	184.7	3,857.2	13,162.5	8,983.8	1,631.2	4,035.2	122.6	-	1,232.2	-	-	-	401.7	52,339.8
EXTR	-	-	-	-	-	-	0.1	-	-	-	0.0	0.0	0.0	-	-	-	-	-	0.1
TDLW	2.4	4.2	91.5	0.0	1.0	-	-	1,745.6	161.6	7.6	0.0	-	-	0.2	-	-	-	72.7	2,086.8
RIVW	9.2	30.8	104.3	0.0	167.3	-	-	7,498.9	512.4	207.8	0.0	-	-	20.2	-	-	-	156.1	8,706.9
TERW	2.2	8.7	42.9	-	40.8	1.9	28.0	629.1	85.5	10.6	11.1	15.9	4.6	15.0	-	-	-	36.2	932.6
WATR	1.7	5.0	130.1	0.0	50.5	15.0	64.7	75.3	152.6	0.0	66.3	71.1	73.0	213.2	27.8	22.4	6.6	-	975.3
Increase	3,871.9	18,991.4	48,609.9	3,534.5	62,975.2	40,009.8	42,846.1	111,557.6	39,694.7	184,490.7	92,147.1	24,615.7	30,550.2	9,633.8	1,541.0	5,873.9	231.6	3,017.0	724,192.0
TotIncrease	3,871.9	18,991.4	48,609.9	3,534.5	62,975.2	40,009.8	42,846.1	111,557.6	39,694.7	184,490.7	92,147.1	24,615.7	30,550.2	9,633.8	1,541.0	5,873.9	231.6	3,017.0	
TotDecrease	1,656.6	2,164.6	14,385.6	6,149.4	17,085.2	18,286.4	30,240.6	416,329.8	21,375.5	0.2	92,967.7	38,508.9	52,339.8	0.1	2,086.8	8,706.9	932.6	975.3	
Net	2,215.3	16,826.7	34,224.3	(2,614.9)	45,890.0	21,723.3	12,605.5	(304,772.2)	18,319.3	184,490.6	(820.6)	(13,893.2)	(21,789.6)	9,633.7	(545.8)	(2,833.0)	(701.0)	2,041.8	

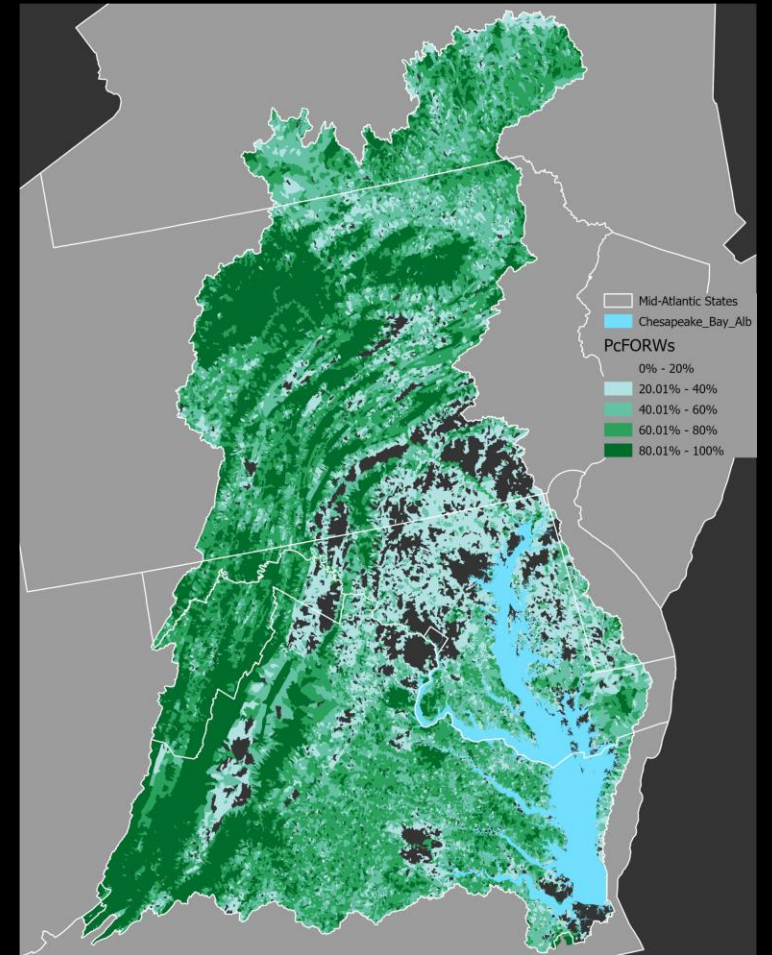# Impervious Cover Change Supporting Information: Population Growth in the Bay Watershed

Tree Cover, Natural Land, and Forest Cover Indicators

Tree Cover includes all standing trees, including those in developed areas
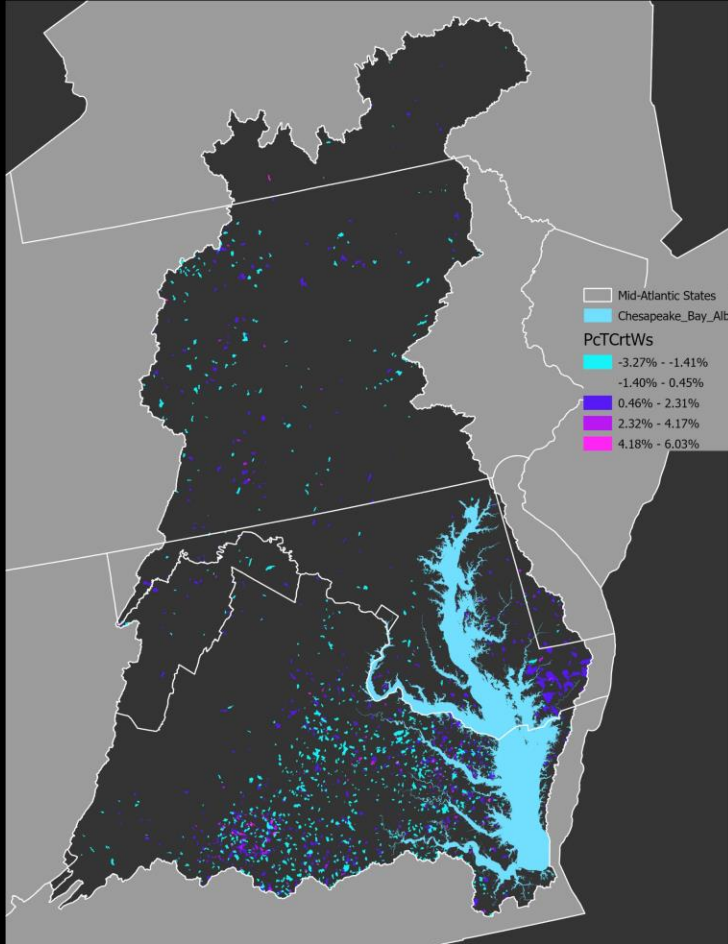
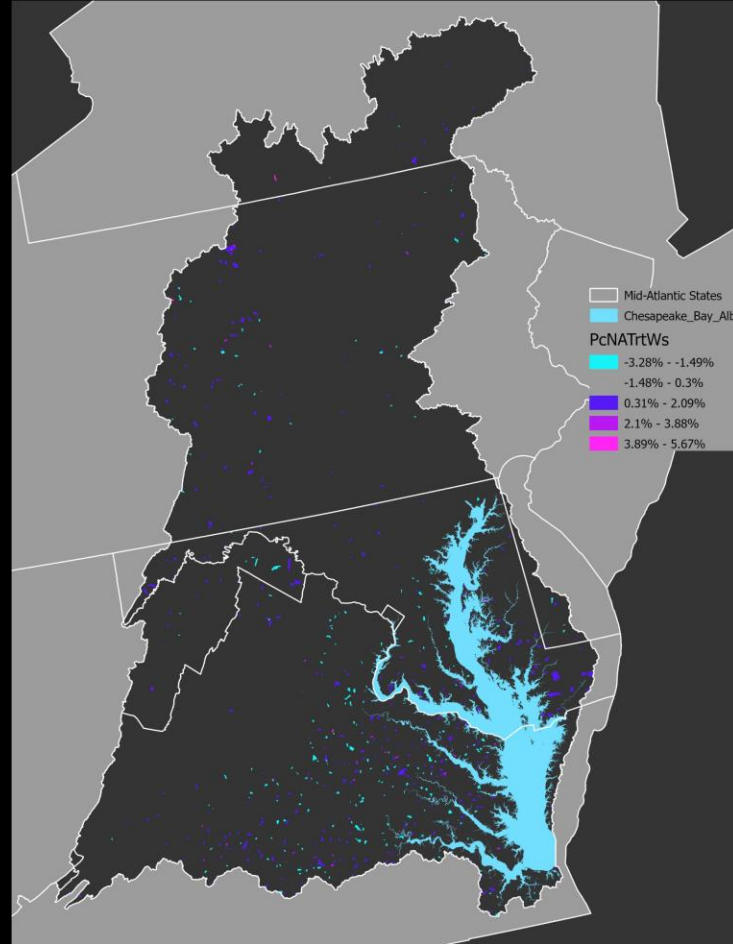Natural lands exclude trees in developed areas but includes successional lands

Forest cover is most restrictive, excluding timber harvests and trees in developed areas
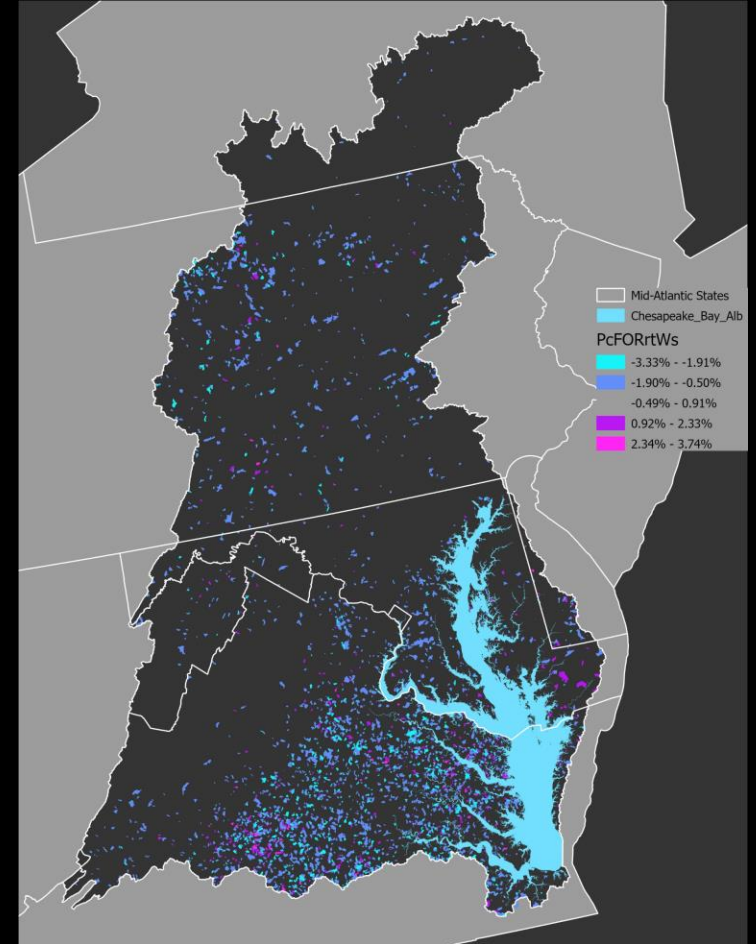
Tree Cover, Natural Land, and Forest Change Indicators

Tree cover change highlights changes due to forestry and urbanization, excluding fragmentation

Natural land change minimizes effects of forestry and urbanization but includes wetland change

Forest change highlights forestry and urbanization, including all change resulting in fragmentation

Tree Cover Status & Change
FOR CUMBERLAND COUNTY, PA

41.6%
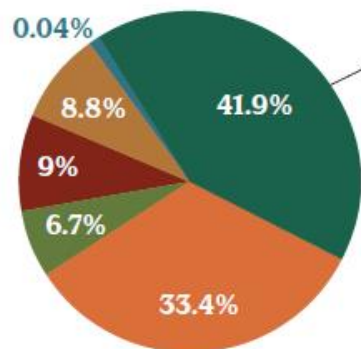**Total Percent** of County with Tree Cover

$14+ Million
Annual Benefits provided by Tree Cover
(in reduced air pollution, stormwater, & carbon dioxide)

433 Acres
Net Loss of Tree Cover on Developed Lands, 2013 to 2017

What is the land use/land cover breakdown in your county?

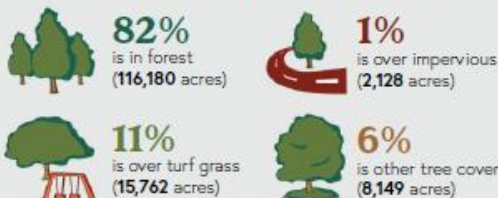**341,668 ACRES OF LAND AREA IN CUMBERLAND COUNTY**

- 0.04%
- 8.8%
- 9%
- 6.7%
- 41.9%
- 33.4%

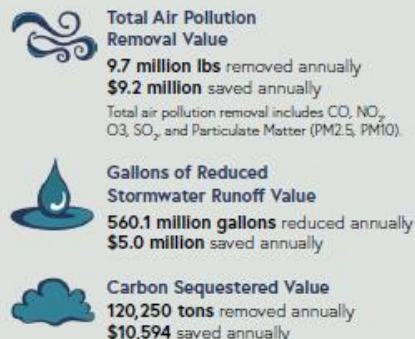|			
41.9% Tree Cover[1] 142,219 acres		**9% Impervious** (Buildings/Pavement) 30,882 acres	
33.4% Agriculture 113,222 acres		**8.8% Other[2]** 29,890 acres	
6.7% Turf Grass (Lawns) 22,569 acres		**0.04% Non-Forested Wetlands** 163 acres	

1. Tree cover includes all trees occurring on all land uses, such as individual trees found over turf, impervious, agricultural, wetlands, or other lands. It also includes areas of "forest," defined in this dataset as patches of tree cover 1 acre or greater, with a minimum patch width of 240 feet.

2. Other includes a mixture of non-treed land uses not captured in the main pie chart categories. See the Data Guide for detailed definitions of "other" and all the land use categories.

Land use/land cover statistics were generated using the 2022 edition of the *Chesapeake Bay Land Use and Land Cover Database.*
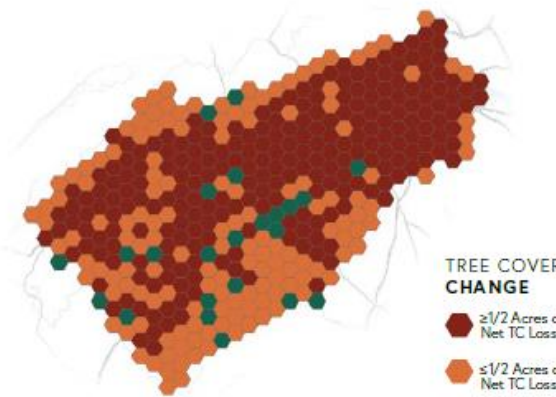
Where does tree cover occur in your county?

82% is in forest (116,180 acres)

1% is over impervious (2,128 acres)

11% is over turf grass (15,762 acres)

6% is other tree cover (8,149 acres)

What are some benefits of tree cover in your county?

Total Air Pollution Removal Value
9.7 million lbs removed annually
$9.2 million saved annually
Total air pollution removal includes CO, NO₂, O3, SO₂, and Particulate Matter (PM2.5, PM10).

Gallons of Reduced Stormwater Runoff Value
560.1 million gallons reduced annually
$5.0 million saved annually

Carbon Sequestered Value
120,250 tons removed annually
$10,594 saved annually

Calculated based on 2017 tree cover data using: *landscape.itreetools.org*

How is tree cover changing on developed and developing lands?

TREE COVER CHANGE
- ≥1/2 Acres of Net TC Loss
- ≤1/2 Acres of Net TC Loss
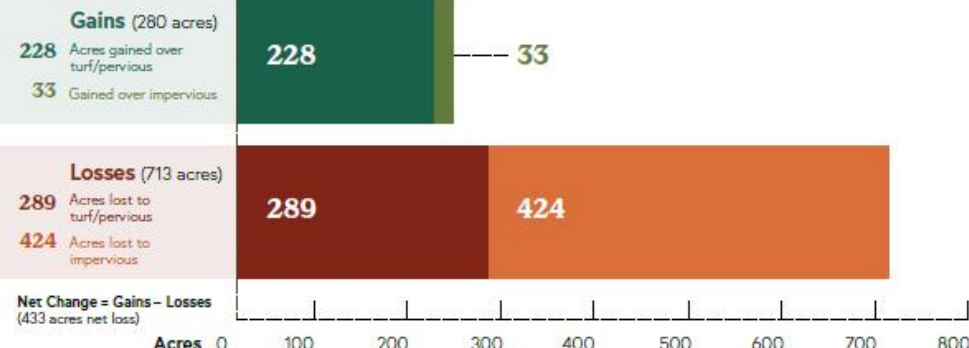- ≥0 Acres of Net TC Gain

Understanding how your tree cover changes over time can inform the sustainable management of forests and community trees. The map to the left shows where your county has lost and gained tree cover from 2013 to 2017, focusing on land that is already or newly developed.

Tree cover can be lost quickly due to human activities (e.g., construction) or natural events (e.g., severe weather).

Tree cover can be gradually increased through tree planting and natural regrowth, but maintaining this new growth requires long-term investments.

Since mature, healthy trees provide significantly greater community benefits than newly planted trees, it is important to both preserve existing tree cover and seek opportunities to grow new trees and forests. Local land use planning, ordinances, and tree programs play a critical role!

Tree Cover Change on developed/developing lands (2013–2017)

Gains (280 acres)
- 228 Acres gained over turf/pervious
- 33 Gained over impervious

Losses (713 acres)
- 289 Acres lost to turf/pervious
- 424 Acres lost to impervious

Net Change = Gains – Losses (433 acres net loss)

Acres 0 100 200 300 400 500 600 700 800

Learn More:

Chesapeake Tree Canopy Network
Links to county fact sheets, user guides, map viewers, datasets, and more

Tree Equity Score
Explore maps of how tree benefits are distributed across communities

Capitalizing on the Benefits of Trees
A slideshow for local leaders featuring tree benefits, case studies and resources

State Urban and Community Forestry Assistance
(State contact and website)

LUMM Indicators Planned for Release in 2023

Effective[1] Impervious Cover (2017/18) and Impervious Cover Change (2013/14 to 2017/18)
Percent and acres of effective impervious cover and impervious cover change by catchment and watershed

Farmland[2] Conversion to Development (2013/14 to 2017/18)
Acres of farmland converted to development by place and county

Forest[3] Land Conversion to Development (2013/14 to 2017/18)
Acres of natural land converted to development by place and county

Wetland[4] Land Conversion to Development (2013/14 to 2017/18)
Acres of natural land converted to development by place and county

Riparian[5] Natural Lands (2017/18) and Natural Land Change (2013/14 to 2017/18)
Percent and acres of riparian natural land and natural land change by catchment and watershed

[1] Effective Impervious Cover = impervious cover weighted by its proximity to streams relative to ridges.
[2] Farmland = cropland and/or pasture
[3] Forest = forest, other tree canopy, timber harvest, and natural succession.
[4] Wetland = tidal, riverine, and terrene wetlands
[5] Riparian = area within 30 meters of streams (lakes, ponds, and Bay shoreline excluded)

USGS

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