



Chesapeake Bay Forestry Workgroup: Climate Resiliency Indicators

Climate Resiliency Workgroup, January 2020



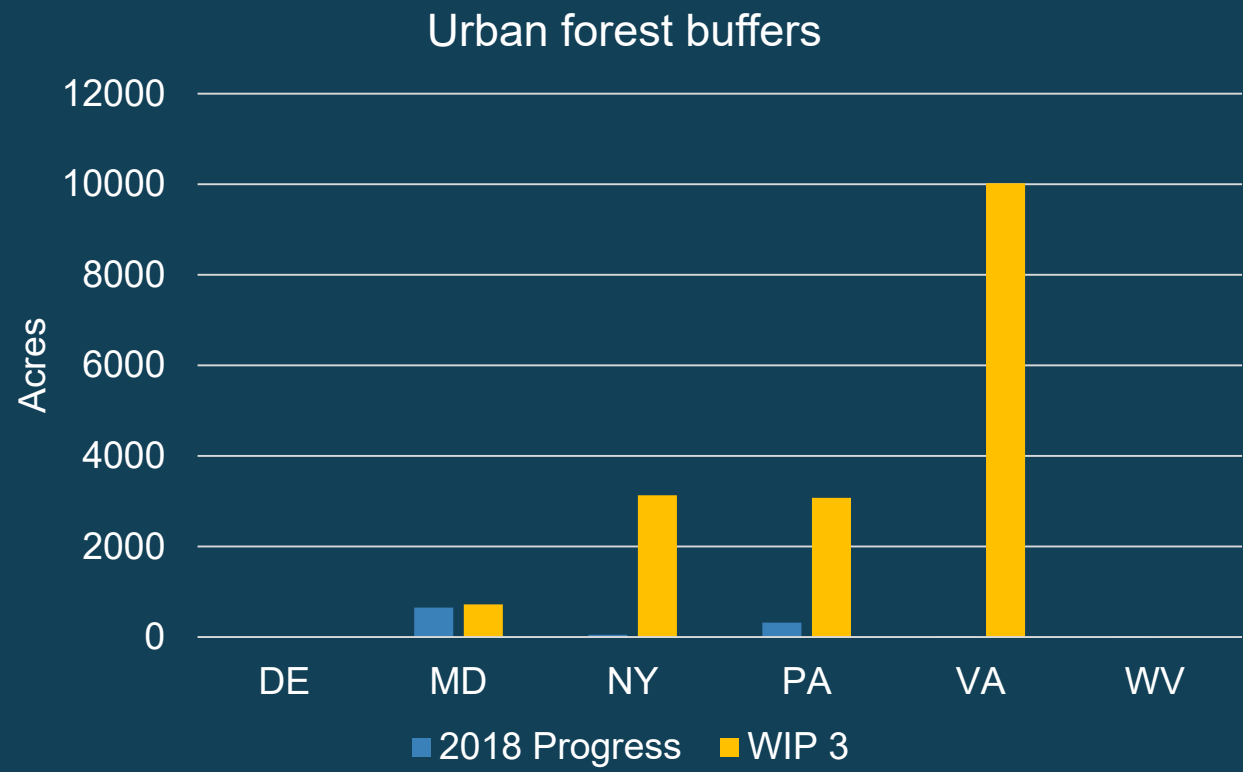
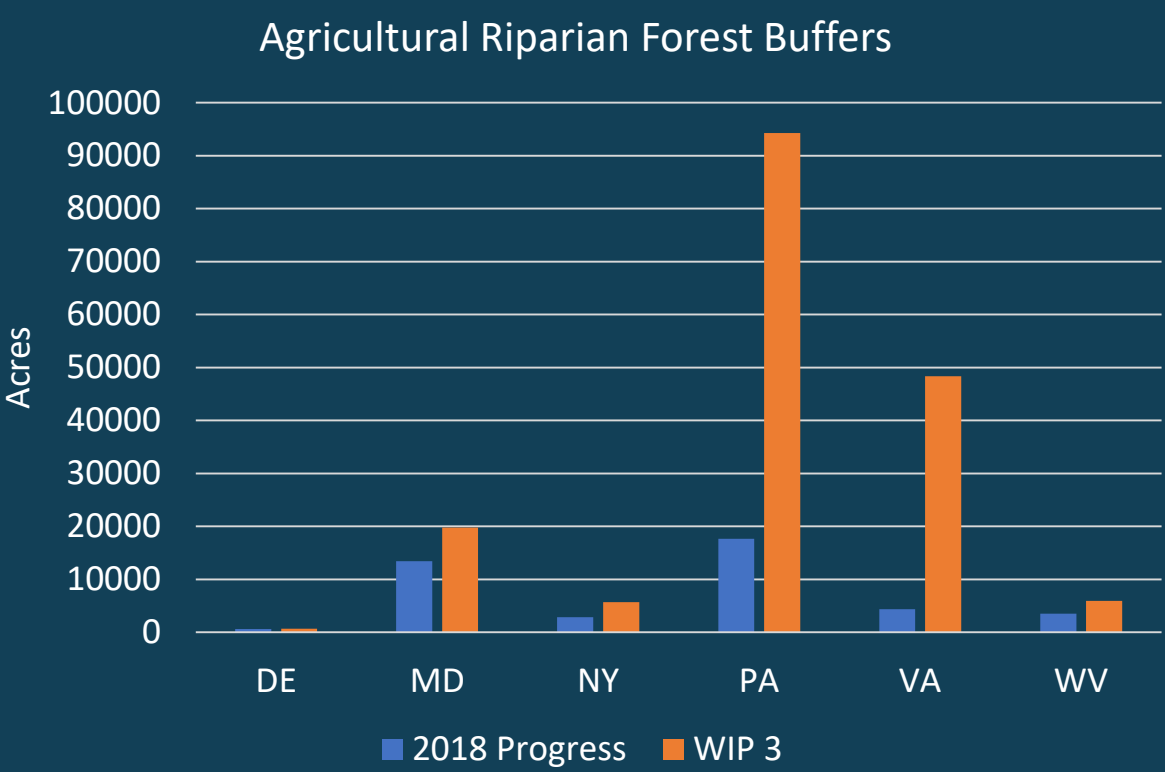
Through the Chesapeake Bay Watershed Agreement, the Chesapeake Bay Partners have committed to...



Vital Habitats Goal

Riparian Forest Buffer Outcome: *Restore 900 miles per year of riparian forest buffer and conserve existing buffers until at least 70 percent of riparian areas throughout the watershed are forested.*

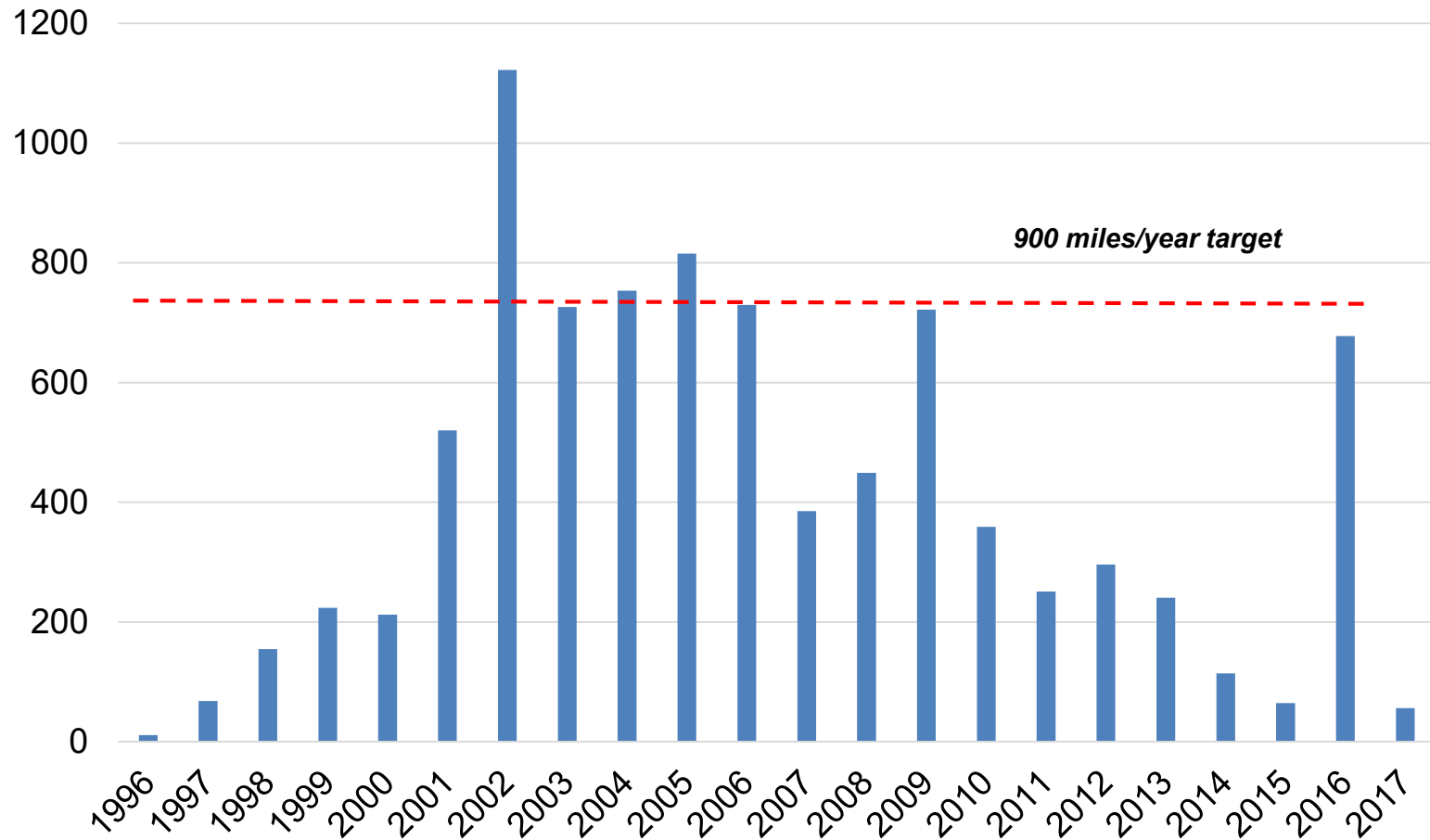
State Forest Buffer targets in Phase III WIPs



Tracking Riparian Forest Buffer Progress

- Jurisdictions report acres of forest buffers installed annually (both agricultural and urban)
- Forestry partners provide information about average buffer width for each state
- Data provided on width and acres are used to calculate miles
- Have to remove re-verified acres to capture new plantings

Miles of Riparian Forest Buffers Planted in the Chesapeake Bay Watershed, 1996-2017



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Vital Habitats Goal

Tree Canopy Outcome: Continually increase urban tree canopy capacity to provide air quality, water quality and habitat benefits throughout the watershed. **Expand urban tree canopy by 2,400 acres by 2025.**

State Targets set in Management Strategy

Jurisdiction	Annual Target (New Acres)	2025 Target (New Acres)
Delaware	5	60
DC	40	480
Maryland	45	540
New York	5	60
Pennsylvania	60	720
Virginia	40	480
West Virginia	10	120
TOTAL	205	2460

Outcome set based on targets provided by jurisdictions when Watershed Agreement was drafted

Defining & Measuring Tree Canopy

“In this Management Strategy, we use a broad definition of “urban” tree canopy that includes all sizes of communities. It is important to note that this goal is intended to reflect a *net gain* in acreage of tree canopy, after accounting for canopy losses due to various factors such as development, storms, pests/diseases, and natural mortality. Meeting the goal requires protecting as much of our existing tree canopy as possible and planting enough to both mitigate losses and expand the tree canopy cover by 2,400 acres.”

Tree Canopy Indicator-Measuring Progress

1) Reported Tree Plantings

- Track and total 3 Urban Tree BMPs reported to NEIEN
 - Urban Tree Planting
 - Urban Forest Planting
 - Urban Forest Buffer
- Report on annual progress, 2010 – present
- Still working with states on reviewing/improving BMP history on this, due to lack of reporting in the past; hope to report on this Indicator in May 2020

Tree Canopy Indicator Baseline & Progress 2) Land Cover Data

- CBP High Resolution Land Cover data provides best tracking of Tree Canopy gains and losses over time
- 2013 – Our Baseline Estimate
- Updates expected:
 - 2021 release, based on 2018-2019 imagery
 - 2025 release, based on 2023-2024 imagery

These updates will provide the best opportunities to evaluate progress and adapt our management strategies as needed.

Tree Canopy Indicator Baseline & Progress 2) Land Cover Data

What land classes we include as “Community Tree Canopy”

- Tree Canopy over Turf
- Tree Canopy over Impervious
- Urban Forest – only Forest that falls within Census Urban Areas & Clusters

What isn't included:

- Trees on agricultural land
- Forest outside of Census Urban Areas & Clusters

Tree Canopy Baseline (2013)

Jurisdictions	Total Tree Canopy (acres)	Forest in Urban Areas & Clusters (acres)	Tree Canopy + Urban Forest
Delaware	6,320	3,414	9,734
District of Columbia	8,073	4,477	12,550
Maryland	317,076	331,308	648,384
New York	50,840	22,058	72,898
Pennsylvania	293,821	148,724	442,545
Virginia	407,940	303,375	711,315
West Virginia	46,069	15,481	61,549
Watershed	1,130,139	828,837	1,958,976

Tree Canopy = Tree Canopy over Turf Grass and Tree Canopy over Impervious (both from Phase 6 land use)

Forest = Forest as defined in Phase 6 model land use, exclusive of tree canopy; filtered to only 2010 Census Urban Areas and Urban Clusters

Tree Canopy Indicator Baseline & Progress 2) Land Cover Data

When land cover is updated:

- All newly emergent “tree canopy over turf grass” and “tree canopy over impervious surfaces” that fall outside areas classed as forest in 2013/14 will be added to the total tree canopy
- Lands previously classed as Forest but now appearing as Tree Canopy (ie through development) will not count towards tree canopy expansion
- Tree canopy on land that converts from agriculture to developed will be counted as community tree canopy

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Land Conservation Goal



By 2025, protect an additional two million acres of lands throughout the watershed—currently identified as high conservation priorities at the federal, state or local level—including 225,000 acres of wetlands **and 695,000 acres of forest land of highest value** for maintaining water quality. (2010 baseline year)

Forestry Indicators: Climate Concerns

Physical stressors

- Average Air Temperature Increases
- Change in High Temperature Extremes
- Change in Total Annual Precipitation
- Relative Sea Level Rise
- River Flood Frequency
- River Flood Magnitude

Implications of climate change for forestry indicators

- Shifting tree species ranges
- Altered disturbance regimes (wildfire, flooding)
- Longer growing seasons (shifting planting schedules)
- Mortality from late-season “flash droughts”
- Increased pressure from invasive species, disease, pests
- Forest loss due to sea level rise and marsh migration

Resilience Indicator wish-list

- Overlay of tree canopy and urban heat island data to demonstrate priority areas to plant and conserve trees for public health
- Overlay of forest buffers and high-priority aquatic habitat areas
- Forest diversity (stand age, species composition)
- Forest fragmentation
- Forest migration corridors (coastal and inland)

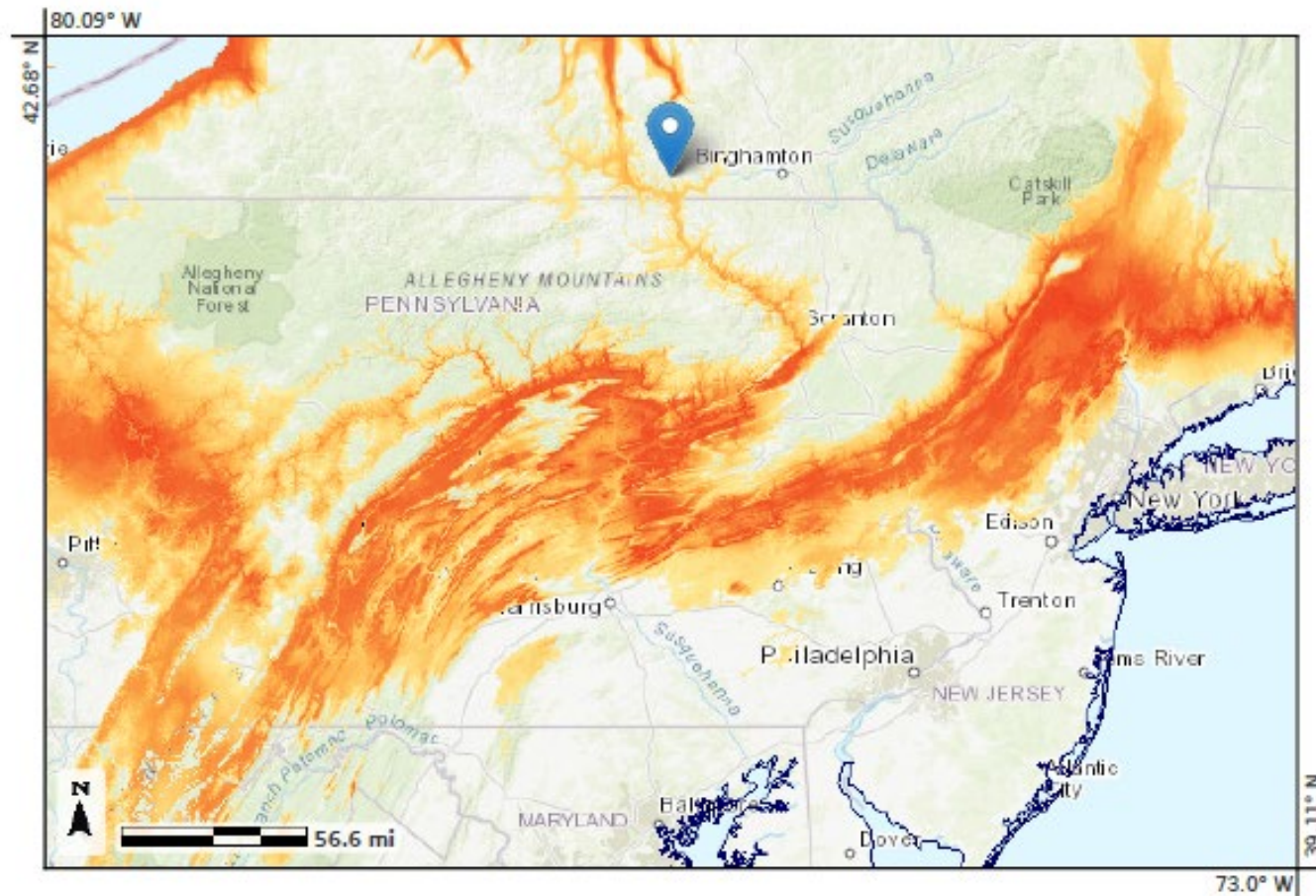
Implications of forestry practices for climate adaptation

- Air temperature -> urban heat island mitigation
- Stream temperature -> fish populations
- Flooding -> infrastructure protection

Data sources to aid in indicator development

- High-res LU/LC mapping
- USFS modeling for the Chesapeake
- [Seedlot Selection Tool](#)

Seedlot Selection Tool - 11/26/2019



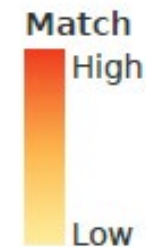
Objective: Find seedlots

Planting site location Lat: 42.0838°, Lon: -76.5499°
Elevation: 991.0 ft

Climate scenarios

Seedlot climate: 1981-2010

Planting site climate: 2011-2040 RCP4.5



CBW Coastal Plain

Chesapeake Bay Watershed Region

Climate Change Atlas Tree Species

Current and Potential Future Habitat, Capability, and Migration

Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCI45	ChngCI85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85
loblolly pine	Pinus taeda	WDH	High	68.1	2128.4	25.57	Sm. inc.	Sm. inc.	Medium	Abundant	Very Good	Very Good		
red maple	Acer rubrum	WDH	High	84.6	1074.85	10.13	No change	No change	High	Abundant	Very Good	Very Good		
sweetgum	Liquidambar styraciflua	WDH	High	81.8	1033.51	10.08	No change	Sm. inc.	Medium	Abundant	Very Good	Very Good		
yellow-poplar	Liriodendron tulipifera	WDH	High	66.7	886.95	10.4	Lg. dec.	Lg. dec.	High	Abundant	Good	Good		
white oak	Quercus alba	WDH	Medium	59.3	550.39	7.68	Sm. dec.	Sm. dec.	High	Abundant	Good	Good		
American holly	Ilex opaca	NSL	Medium	64.4	396.12	4.85	Sm. dec.	Sm. dec.	Medium	Common	Fair	Fair		
American beech	Fagus grandifolia	WDH	High	49.3	310.72	5.38	Lg. dec.	Lg. dec.	Medium	Common	Fair	Fair		
blackgum	Nyssa sylvatica	WDL	Medium	66.7	299.69	3.79	No change	No change	High	Common	Good	Good		
serviceberry	Amelanchier spp.	NSL	Low	1.1	1.59	0.72	Lg. dec.	Lg. dec.	Medium	Rare	Poor	Poor		
red mulberry	Morus rubra	NSL	Low	1.7	1.56	0.63	Lg. dec.	Lg. dec.	Medium	Rare	Poor	Poor		
black ash	Fraxinus nigra	WSH	Medium	1.6	1.55	2.78	Sm. dec.	Sm. dec.	Low	Rare	Poor	Poor		
overcup oak	Quercus lyrata	NSL	Medium	1.1	1.52	1.45	Lg. inc.	Lg. inc.	Low	Rare	Good	Good		
pecan	Carya illinoensis	NSH	Low	0.5	1.28	5.68	Sm. inc.	Lg. inc.	Low	Rare	Good	Good		
swamp white oak	Quercus bicolor	NSL	Low	1.6	1.18	1.67	Sm. dec.	Lg. dec.	Medium	Rare	Poor	Poor		
chinkapin oak	Quercus muehlenbergii	NSL	Medium	0.2	0.95	1.81	Sm. dec.	Sm. dec.	Medium	Rare	Poor	Poor		
pitch pine	Pinus rigida	NSH	High	0.5	0.88	1.05	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost		
slash pine	Pinus elliottii	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate
longleaf pine	Pinus palustris	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate
pond cypress	Taxodium ascendens	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate

Questions?