

Mapping Ecosystem Services: Examples from Chesapeake Tools and Projects

<u>John Wolf</u>, Fred Irani, Bailey Bosley U.S. Geological Survey, Lower Mississippi-Gulf Water Science Center, Chesapeake Bay Program Office

Chesapeake STAC Ecosystem Services Workshop March 16, 2023

From the workshop purpose...

• ... gain insights into the specific Ecosystem Services and use cases that are most important and provide recommendations for a strategic plan to more effectively use Ecosystem Services to address multiple CBP outcomes through 2025 and beyond.

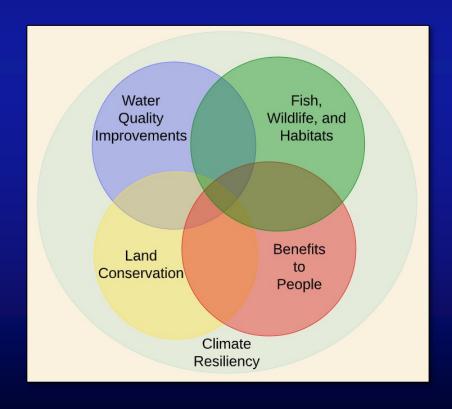
This information is preliminary or provisional and is subject to revision. It is being provided to meet the need for timely best science. The information has not received final approval by the U.S. Geological Survey (USGS) and is provided on the condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the information

Conservation and Restoration Targeting



Targeting Tools Portal launched in Summer 2022

 Identify opportunities to incorporate ecosystem services into geographic targeting



Tree Canopy Cooling Impact New York cooling F Pennsylvania Maryland Delaware West Virginia Virginia

County

- Outcome: Tree Canopy
- Management Question: Where does tree canopy lead to the greatest reduction in temperature?
- Tool/Data: <u>Final Ecosystem</u>
 <u>Goods and Service Mapper</u>
- Metric: Tree Canopy Cooling Impact

Rossi et al. 2022. Identifying and Aligning Ecosystem Services and Beneficiaries Associated with Best Management Practices in Chesapeake Bay Watershed

Tree Cover Status & Change

Impervious (Buildings/Pavement)

9,509 acres

4.436 acres

3.2% Other 2

FOR CALVERT COUNTY, MD

66.6% Total Percent of

\$27.5 Million

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

-1098 Acres

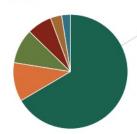
Net Loss of Tree Cover on Developed Lands, 2013 to 2018

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

136.623 ACRES OF LAND AREA

IN CALVERT COUNTY

County with Tree Cover



66.6% Tree Cover 1 90.951 acres

Agriculture

Turf Grass

13,380 acres

2.5% Non-Forested Wetlands 3,357 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-trend land uses not cantured 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 based on 2018 imagery using the 2022 edition of the Chesapeake Bay Land Use and Land Cover

Where does tree cover occur in your county?



16.3%

is over impervious (2,220 acres)

is over turf grass (14,824 acres)



How is tree cover changing on



What ar in your







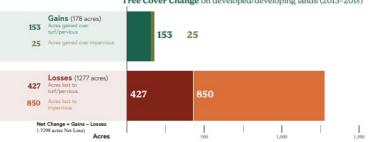
Understanding how your tree cover changes over time can inform the sustainable management of forests and community trees. The map to the left shows where your county has lost and gained tree cover from 2013 to 2018, focusing on land that is already or newly developed.

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 these gains may take 10-15 years to be detected in high resolution imagery.

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

Tree Cover Change on developed/developing lands (2013-2018)



County

- **Outcome: Tree Canopy**
- Management Question: What are the economic benefits of tree cover?
- Tool/Data: Chesapeake Tree Canopy Network
- Metric:
 - Air Pollution removal
 - Reduced stormwater
 - Carbon sequestration

Chesapeake Tree Canopy Network. 2023. https://chesapeaketrees.net/understand-your-canopy/

National 2016 - Percent land with any IUCN Percent land with any IUCN status .87 - 100.01 Maryland Delaware West Virginia

HUC 12

- Outcome: Protected Lands
- Management Question: Where are existing protected lands relative to a goal of 30% by 2030?
- Tool/Data: EnviroAtlas National
- Metric: Percent protected Land (% with any IUCN status)

United States Environmental Protection Agency. EnviroAtlas. Percent Protected Land. Retrieved: March 14, 2023, from epa.gov/enviroatlas

Anne Arundel Community Block Group metrics - Percent of residential population with views of water Percent of residential population with views of 7.99 - 98.46 0.01 - 1.09 0.00 Block Group Beyond Analysis Extent

Census Block Group

- Outcome: Public Access
- Management Question: Where are there limited opportunities to view water resources?
- Tool/Data: <u>EnviroAtlas</u> -Community
- Metric: Percent of residential population with views of the water

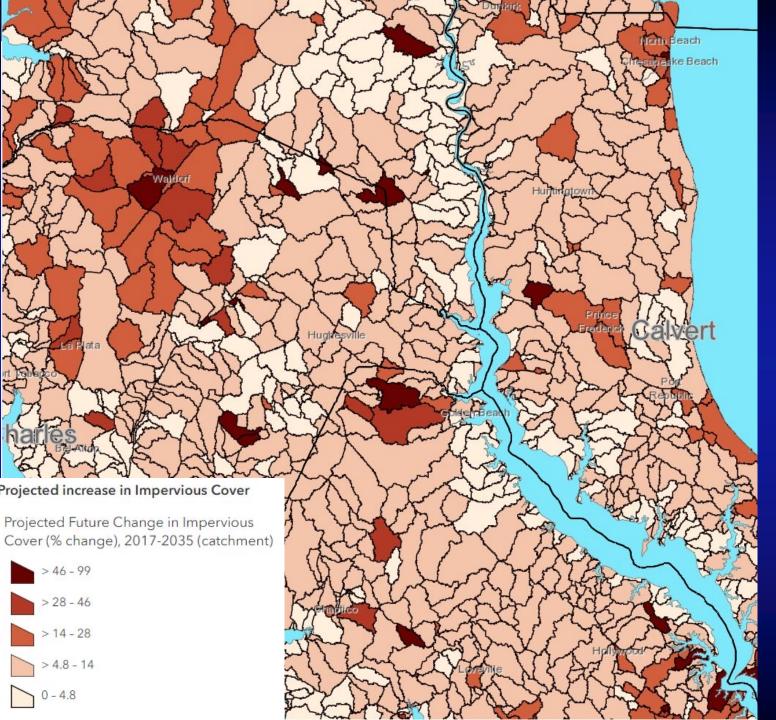
United States Environmental Protection Agency. EnviroAtlas. Percent of residential population with views of the water. Retrieved: March 14, 2023, from epa.gov/enviroatlas

Economic Value of Flooding and Stormwater -Catchment (derived from Maryland GreenPrint) Total Annual Economic Value of Flooding and Stormwater Mitigation Potential (Index Value) 1,269,328 - 8,350,844 > 746,322 - 1,269,328 > 237,036 - 746,322 0 - 237,036

NHD Catchment

- Outcome: Watershed Implementation Plans/ Stormwater
- Management Question: Where does the natural stormwater infrastructure provide protection from flooding?
- Tool/Data: Maryland Healthy Watershed Assessment*
- Metric: Economic value of flooding and stormwater

^{*} Catchment metric derived from Maryland GreenPrint aggregated to catchments



NHD Catchment

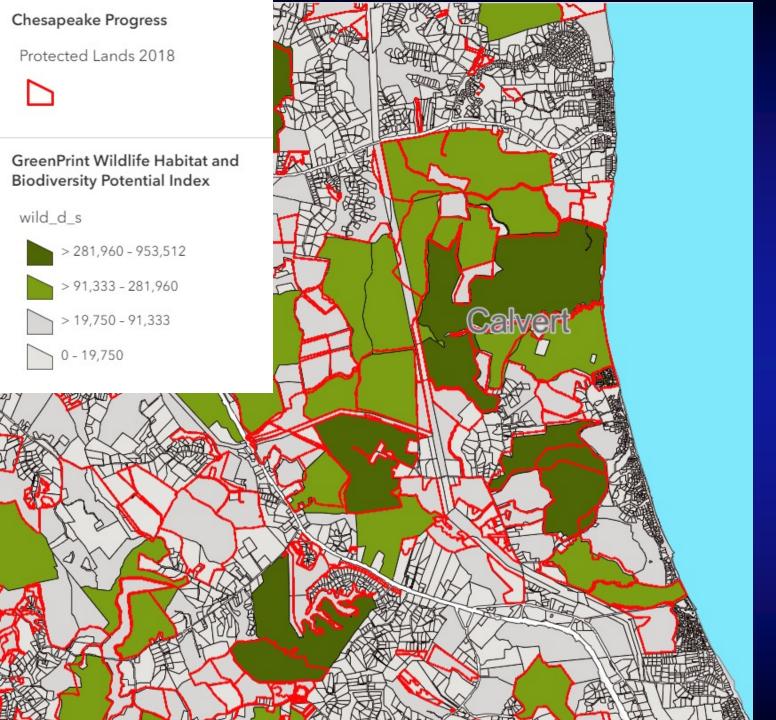
- Outcome: Land Use Methods and Metrics
- Management Question: Where are impervious surfaces expected to increase?
- Tool/Data: Maryland Healthy Watershed Assessment
- Metric: Projected increase in impervious cover

Chesapeake Bay Program. 2022. Maryland Healthy Watersheds Assessment. Tetra Tech

Economic Value of Flooding and Stormwater VS. Projected increase in Impervious Cover Relationship Total Annual Economic Value of Flooding and Stormwater Mitigation Potential (Index Value) Projected Future Change in Impervious Cover (% change), 2017-2035 (catchment) High - High

NHD Catchment

- Outcome: WIP/Stormwater & Land Use Methods and Metrics
- Management Question: Where is natural stormwater infrastructure threatened by increases in impervious surface?
- Tool/Data: Maryland Healthy Watershed Assessment
- Metric: Economic value of flooding and stormwater x projected increase in impervious cover



Parcel

- Outcome: Vital Habitats, Protected Lands
- Management Question: Are land conservation efforts protecting the best habitats?
- Tool/Data: <u>GreenPrint Parcel</u>
 <u>Evaluation Tool</u>
- Metric: Wildlife Habitat and Biodiversity Index Potential

Maryland Department of Natural Resources. 2018. Accounting for Maryland's Ecosystem Services

Habitat projections: Intermediate SLR Regional_Int_2104 TZ - Developed TZ - Agricultural/grassland Scrub/shrub Palustrine wetland Estuarine wetland Barren/open water Migrated coastal marsh nnected freshwater habitat Connectable freshwater habitat Drowned original coastal marsh iginal coastal marsh (low salinity) iginal coastal marsh (moderate salinity) ginal coastal marsh (high salinity) Accreting original coastal marsh migrated coastal marsh ded coastal marsh

Parcel/Local

- Outcome: Climate Resiliency, Wetlands, Black Duck
- Management Question: Where should we plan for future habitat migration?
- Tool/Data: <u>InVEST Coastal</u> <u>Ecosystem Services for Mid-</u> <u>Atlantic States</u>
- Metric/Data: Projected coastal habitat changes

Warnell, K., Olander, L., & Currin, C. (2022). Sea level rise drives carbon and habitat loss in the US mid-Atlantic coastal zone. *PLOS Climate*, *1*(6), e0000044.

Planning for 2025 and Beyond

Potential CBP GIS Team strategic directions

- Develop conservation and restoration data relevant at a parcel scale.
- "Operationalize" ecosystem services at multiple map scales.
- Incorporate ecosystem services into geographic targeting efforts.

Contact Information

John Wolf
Assistant Director, Land Change Research
Chesapeake Bay Program GIS Team Leader
USGS – Lower Mississippi-Gulf WSC
jwolf@chesapeakebay.net

410-980-9749