



High-resolution Land Use/Land Cover for the Chesapeake Bay Watershed

Sarah McDonald¹, Peter Claggett¹, Jarlath O'Neil-Dunne³, Sean MacFaden³, Katie Walker², Steven Guinn², Labeeb Ahmed¹, Ernie Buford³, Elliot Kurtz², Patrick McCabe², Jackie Pickford¹, Anna Royar³, Kelly Schulze³

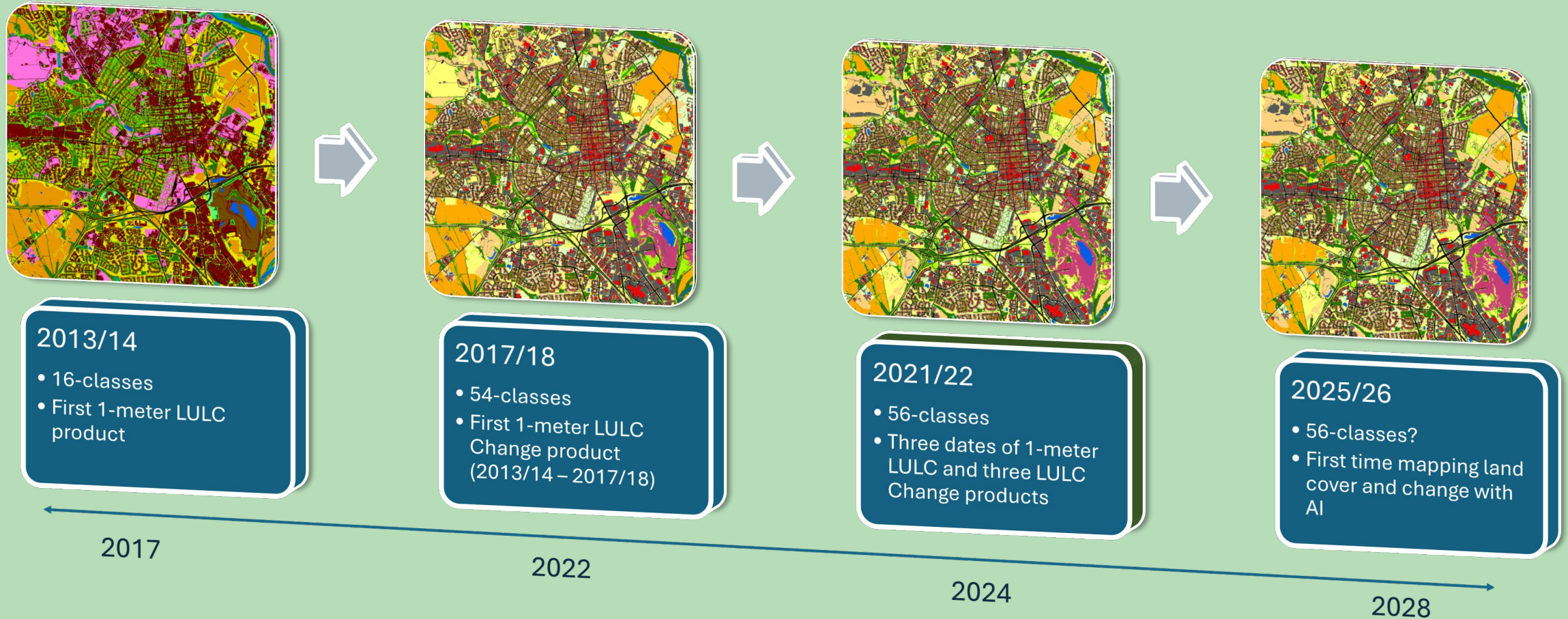
¹ Lower Mississippi-Gulf Water Science Center, U.S. Geological Survey

² Chesapeake Conservancy's Conservation Innovation Center

³ University of Vermont's Spatial Analysis Laboratory

Local Government Leadership Workgroup Meeting
Communicating Forest and Tree Canopy Trends Using High-Resolution Data
August 25, 2026

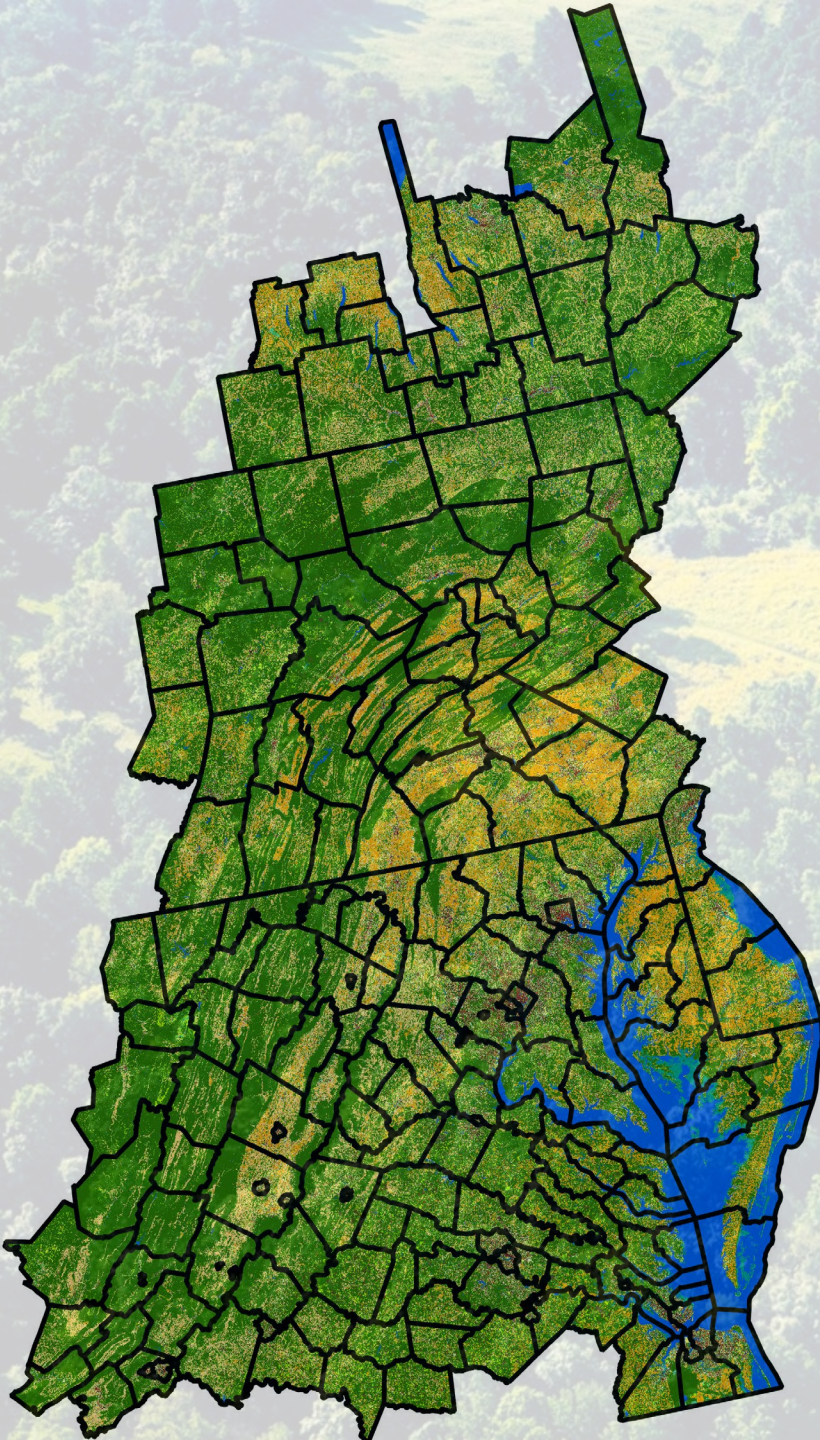
Chesapeake Bay Program Land Use/Land Cover (LULC) Project: A Brief History



Land Use/Land Cover Monitoring

With each newly mapped year, the previous year(s) are remapped using the same methods for consistent change detection

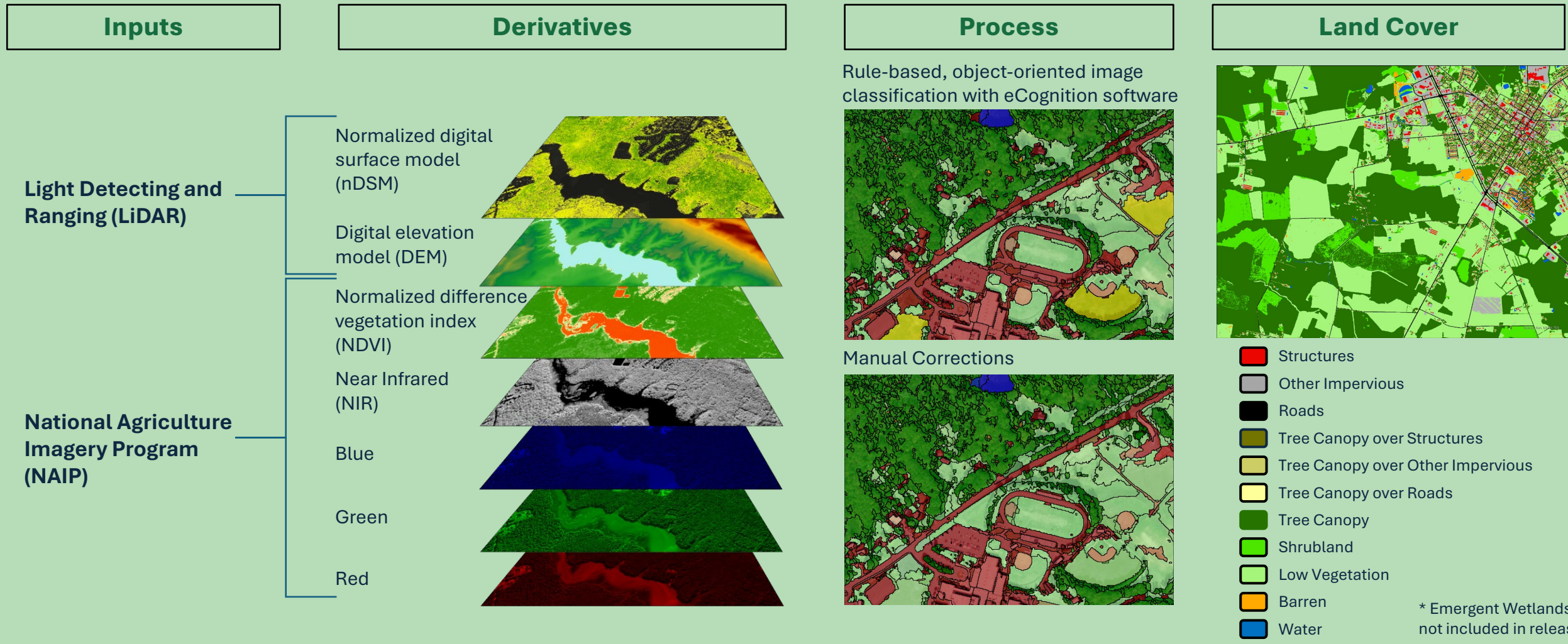
Spatial Extent and Resolution



- Mapped extent
 - 205 counties intersecting or adjacent to the Chesapeake Bay watershed
 - 99,000 square miles
- Spatial Resolution
 - 1-meter² cells
- Temporal Resolution
 - 2013/14, 2017/18, 2021/22
- Categorical Resolution
 - 56 Land Use/Land Cover classes

What is Land Cover?

The physical characteristics of the land surface (e.g., impervious, tree canopy, herbaceous)

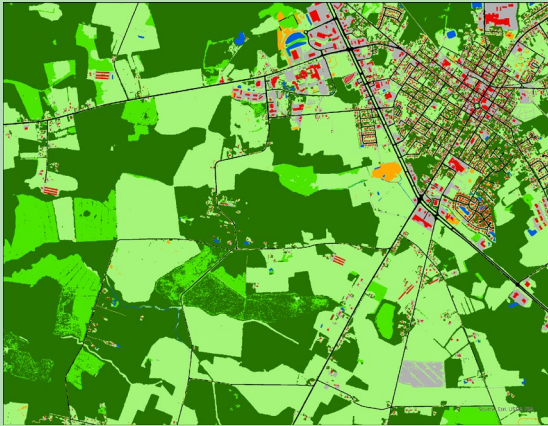


What is Land Use?

How humans use the land (e.g., residential, agriculture, recreation)

Inputs*

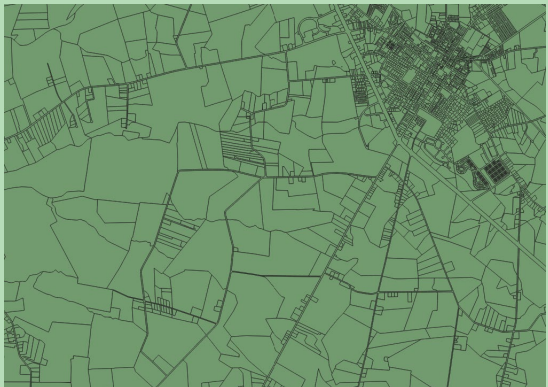
Land Cover



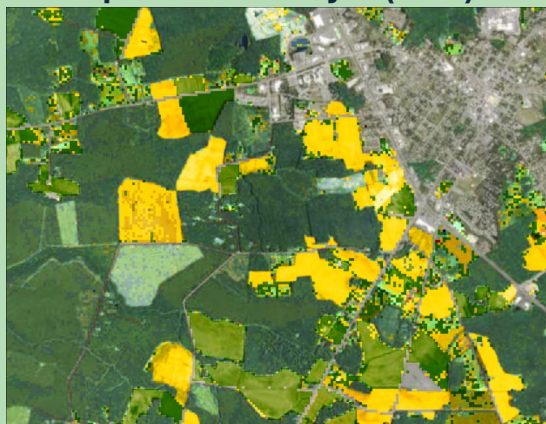
Timber Harvest



Parcels



Cropland Data Layer (CDL)

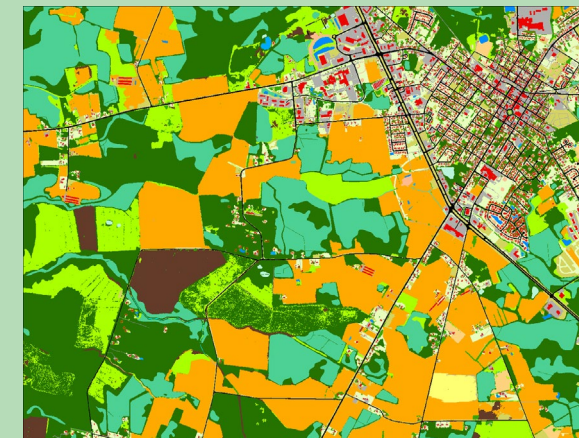


Process

Rule-based, geospatial model in open-source Python to produce vector overlays and reconcile them into a land use raster



Land Use



* Subset of inputs shown (over 25 ancillary datasets used)

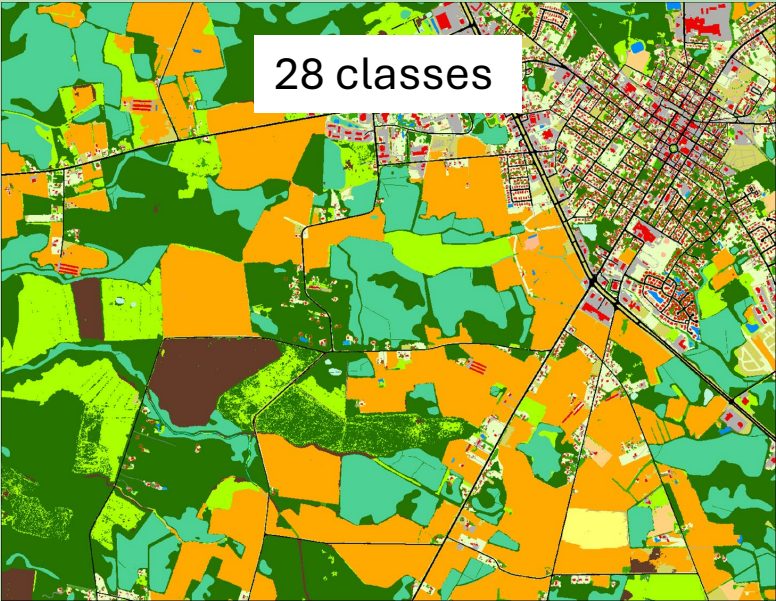
What is Land Use/Land Cover (LULC)?

The combination of land use and land cover, reflecting both the physical surface and how humans make use of the land.

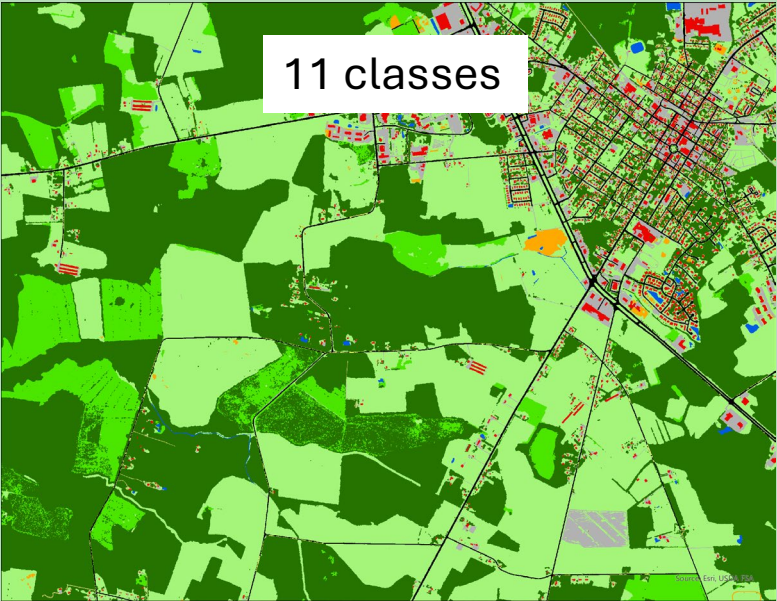
Land Use

Land Cover

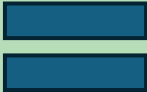
Land Use / Land Cover



28 classes



11 classes



56 Land Use/Land Cover Classes

Example

Natural Succession
+
Shrubland
=
Natural Succession Shrubland

Structures	TC over Structures	Bare Shore	Natural Succession
Other Impervious	TC over Impervious	Harvested Forest	Riverine Wetlands
Roads	TC over Roads	Terrene Wetlands	Tidal Wetlands
Turf Grass	TC over Turf	Cropland	Orchards and Vineyards
Developed	Extractive	Pasture and Hay	Tidal Waters
Solar Field	Suspended Succession	Riverine Ponds	Lakes and Reservoirs
Forest	Forested, Other	Terrene Ponds	Streams and Rivers

Structures	Tree Canopy
Other Impervious	Shrubland
Roads	Low Vegetation
Tree Canopy over Structures	Barren
Tree Canopy over Other Impervious	Water
Tree Canopy over Roads	

Land Use / Land Cover (LULC) 56-Class Schema

Development

Roads
Structures
Other Impervious
Solar Field Panel Arrays
TC over Roads
TC over Structures
TC over Other Impervious
Turf Grass
Tree Canopy over Turf Grass
Bare Developed
Solar Field Barren
Solar Field Herbaceous
Solar Field Shrubland
Suspended Succession Barren
Suspended Succession Herbaceous
Suspended Succession Shrubland
Extractive Barren
Extractive Impervious

Agricultural

Cropland Barren
Cropland Herbaceous
Orchards and Vineyards Barren
Orchards and Vineyards Herbaceous
Orchards and Vineyards Shrubland
Pasture and Hay Barren
Pasture and Hay Herbaceous

Water

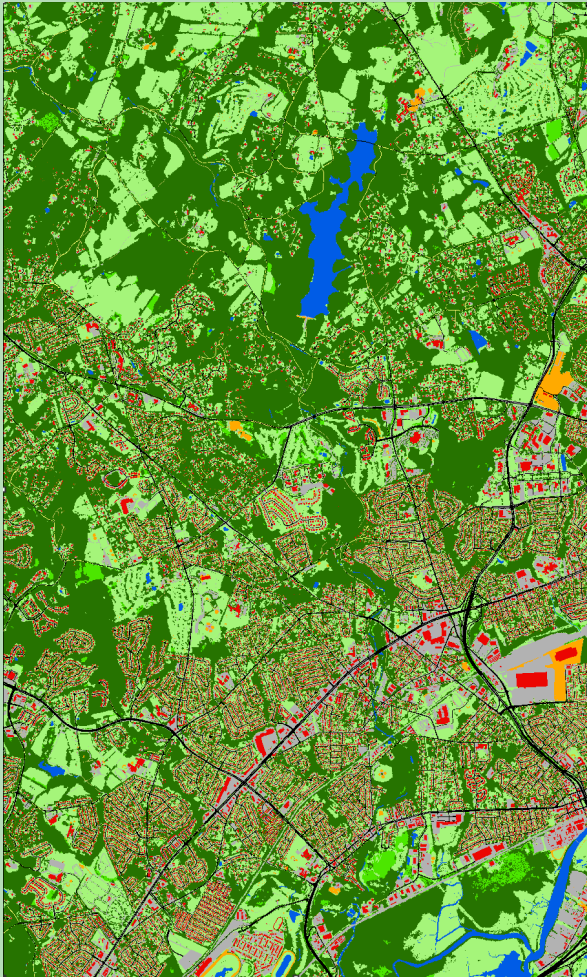
Tidal Waters
Lakes and Reservoirs
Riverine Ponds
Terrene Ponds
Streams and Rivers

Natural

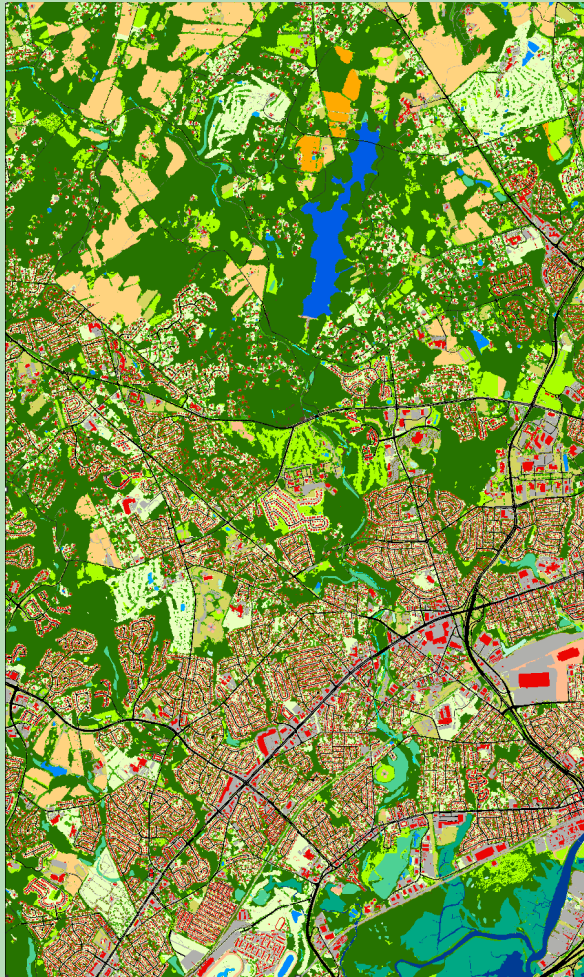
Forest
Riverine Wetlands Forest
Terrene Wetlands Forest
Tidal Wetlands Forest
Forested, Other
Riverine Wetlands Tree Canopy
Terrene Wetlands Tree Canopy
Tidal Wetlands Tree Canopy
Natural Succession Barren
Natural Succession Herbaceous
Natural Succession Shrubland
Bare Shore
Harvested Forest Barren
Harvested Forest Herbaceous
Riverine Wetlands Harvested Forest
Terrene Wetlands Harvested Forest
Tidal Wetlands Harvested Forest
Riverine Wetlands Barren
Riverine Wetlands Herbaceous
Riverine Wetlands Shrubland
Terrene Wetlands Barren
Terrene Wetlands Herbaceous
Terrene Wetlands Shrubland
Tidal Wetlands Barren
Tidal Wetlands Herbaceous
Tidal Wetlands Shrubland

Aggregating Land Use/Land Cover Classes

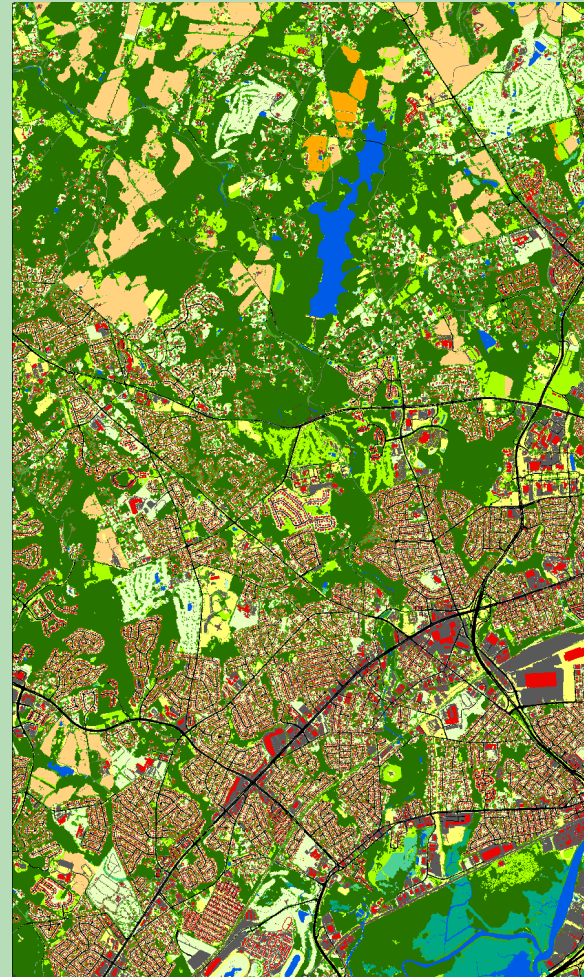
Land Cover (11)



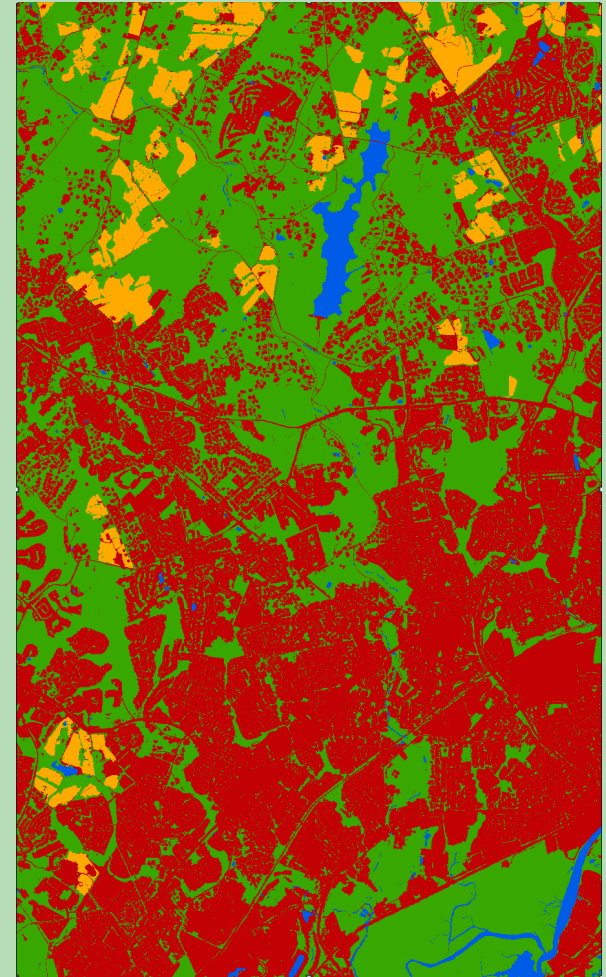
Land Use (28)



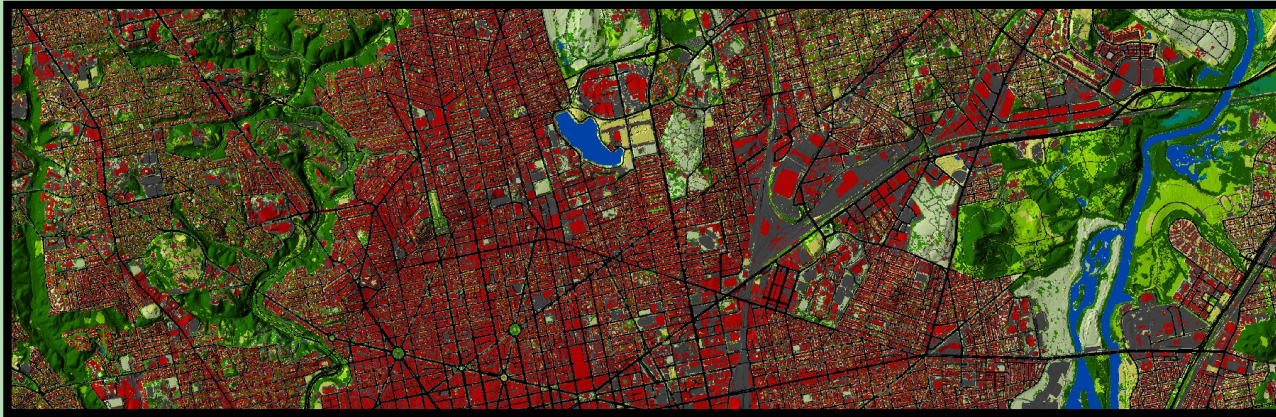
General Land Use (18)



Macro Land Use (4)



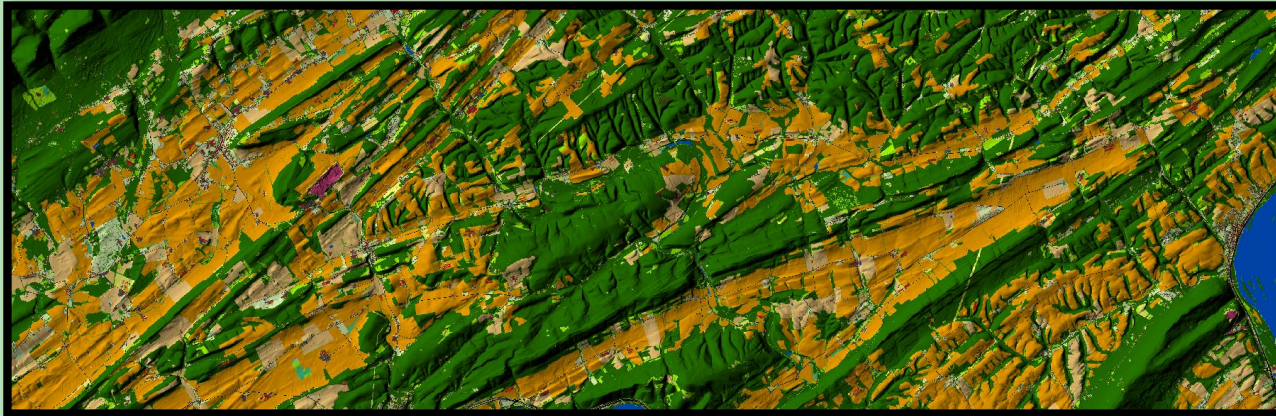
Land Use/Land Cover in the Chesapeake Bay Watershed 2021/22



Development

5,277,662 acres (13% of watershed land area)

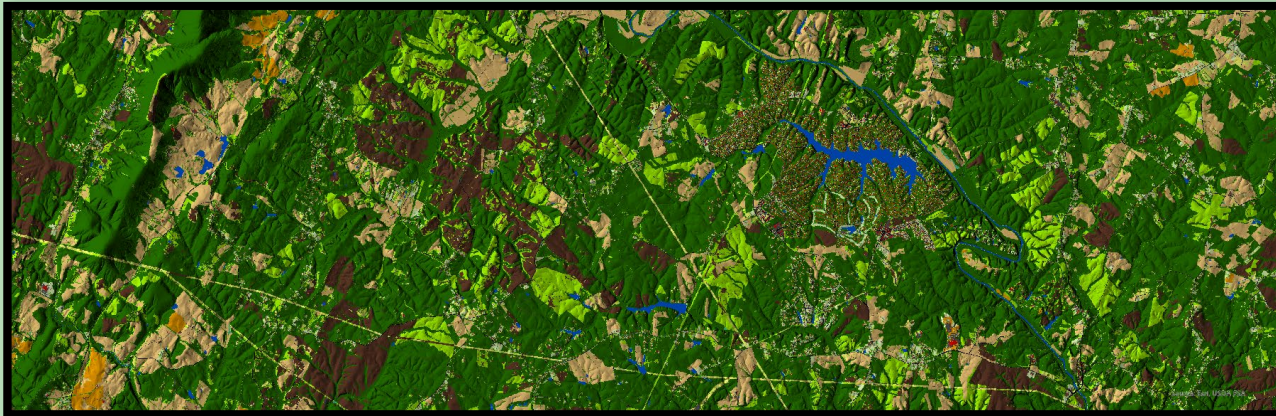
- 40% of the developed area is impervious (e.g., roads, structures, parking lots, solar panels, surface mines)
- 60% of the developed area is pervious (e.g., turf grass, trees over turf grass, transmission line and road rights of way, landfills)



Agriculture

7,868,667 acres (19% of watershed land area)

- 50% of the agricultural area is cropland (e.g. corn, soybeans, orchards, vineyards)
- 50% of the agricultural area is pasture and hay (e.g., lands used for grazing livestock or producing fodder)



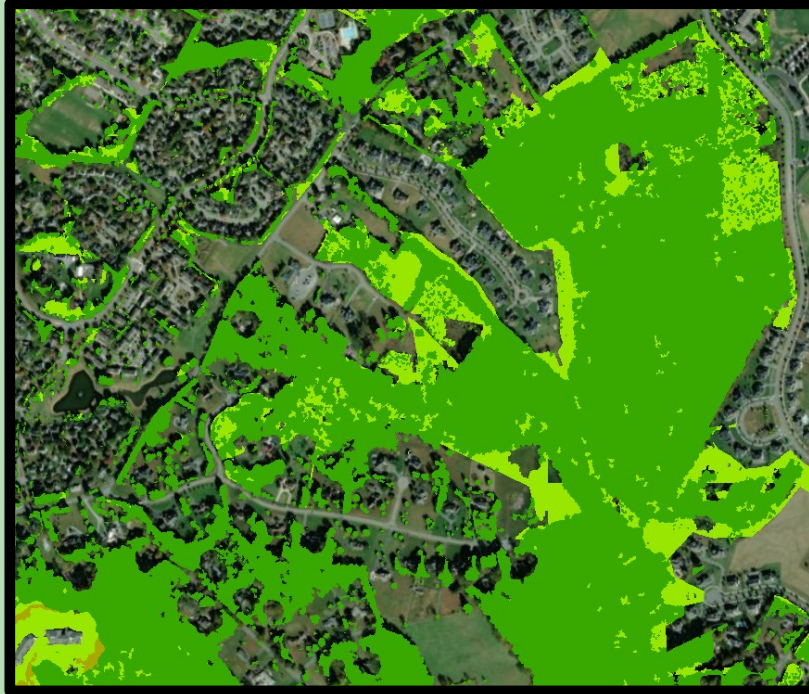
Natural

27,456,881 acres (68% of watershed land area)

- 85% of the natural area is forests outside of wetlands
- 9% of the natural area is successional lands (e.g. timber harvest regrowth)
- 4% of the natural area is forested wetlands
- 2% of the natural area is non-forested wetlands

Defining Tree Canopy and Forested Extent

Forested Extent



Tree canopy with an unmanaged understory (i.e. forest) and early successional forests, including recently harvested areas and areas undergoing natural succession

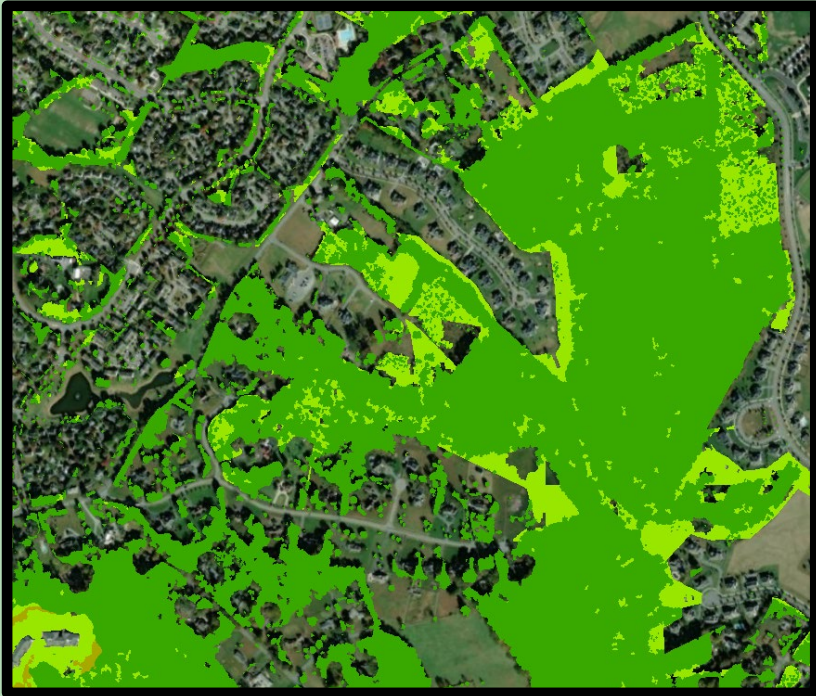
Tree Cover



All tree canopy cover including tree canopy over turf, tree canopy over impervious, and forested areas.

Tree Canopy and Forested Extent

Forested Extent



Tree canopy with an unmanaged understory (i.e. forest) and early successional forests, including recently harvested areas and areas undergoing natural succession.

Tree Cover



All tree canopy cover including tree canopy over turf, tree canopy over impervious, and forested areas.

State	% Total tree cover	% Total forested extent
DC	34.8%	23.3%
DE	43.5%	45.9%
MD	49.4%	50.1%
NY	62.9%	68.3%
PA	63.6%	68.0%
VA	64.0%	70.0%
WV	74.7%	79.0%
CBW	62.0%	66.5%

Thank you!



Check out the 2024 Edition LULC data release and the Chesapeake Conservancy's LULC Viewer:

