



 USGS



**Chesapeake Bay Program**  
*A Watershed Partnership*

# Land Use Data for Watershed Modeling

## A CBP Land Use Workgroup Presentation

Co-Chairs:

Karl Berger, Metropolitan Washington Council of Governments  
Jennifer Tribo, Hampton Roads Planning District Commission

Coordinator:

Peter Claggett, U.S. Geological Survey

# Significance of Land Use Data

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- Land use data are critical for establishing load allocations and guiding implementation of the Chesapeake Bay TMDL;
- Differences between local and CBP land use data have hampered planning and reporting of local implementation efforts in support of Watershed Implementation Plans (WIPs).



## Why all the fuss?

Model Version	Impervious Surface (circa 2001/02)	Pervious Surface (circa 2001/02)
<b>CBLCD (land cover)</b>	<b>809,318</b>	<b>2,341,577</b>
<b>Phase 5.3.2 (land use)</b>	<b>1,269,030</b>	<b>3,398,732</b>

**Source:**

Claggett, P. R., Irani, F. M., & Thompson, R. L., 2013. Estimating the extent of impervious surfaces and turf grass across large regions. *JAWRA Journal of the American Water Resources Association*, 49(5), 1057-1077.

# Land Use Workgroup (LUWG)

## Mission Statement

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By April 2015:

Ensure that scientifically and locally credible land use data inform the suite of Chesapeake Bay Program models and accounting systems.





# LUWG Priorities

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1. Improve the spatial, temporal, and categorical representation of urban, natural, and agricultural land uses on non-federal and federal lands.
2. Consider basing the Phase III WIPs on a year 2025 land use to facilitate crediting of water quality benefits derived from land conservation and land-use planning.
3. Investigate differential loading rates for new land use classes.

# Criteria for New Land Uses

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1. Does it have unique characteristics related to nutrient and sediment retention, transformation, and/or transport?
2. Is it needed to plan, track, and report Best Management Practices or other regulatory actions?
3. Is it needed to inform local restoration plans and decisions? Implementation Plans?
4. Can we accurately quantify and locate it at the scale of the watershed model segmentation?



# Local Land Use Data Request



## Phase 1 (Feb. 2013 – Sept. 2014)

- Collect readily available land use and related datasets from localities
- Evaluate similarities and differences among received datasets.

## Phase 2 (Oct. 2013 – Aug. 2014)

- Identify gaps in the types and locations of data received.
- CBP solicits local agencies directly for data

## Phase 3 (Aug. 2014 – Mar. 2015)

- Solicit and accept updates to data received from localities.

# Phase 1: Data Request



## Data informing current conditions

- **land use**, current and historic (1980+) with keys to interpret codes
- **land cover** (e.g., impervious surfaces, tree canopy, turf grass, herbaceous vegetation)
- **extractive areas** (e.g., quarries, active and reclaimed surface mines, shale gas pads and related pipelines and roads)
- **sewer service areas** (current and proposed)
- **stormwater regulated areas** (MS4's, CSO's), storm drain networks

## Data informing future conditions

- **zoning** (consistent with latest comprehensive plan) with keys to interpret codes, generalized as appropriate)
- **priority funding areas**, urban area demarcation lines, urban renewal/reinvestment zones, etc.
- **planned and/or permitted developments**
- **protected lands** (including parks, recreation areas, and other county-owned lands unavailable for future development)
- **special environmental protection areas\*** (e.g., Chesapeake Bay Critical Areas, riparian buffers, erosion prone soils, flood zones, habitat protection)
- **rail transit stations** (current and proposed)
- **conservation priority areas** (e.g., agricultural districts, large forest tracks)
- **planned transportation improvements**



# Phase 2: Filling the Gaps



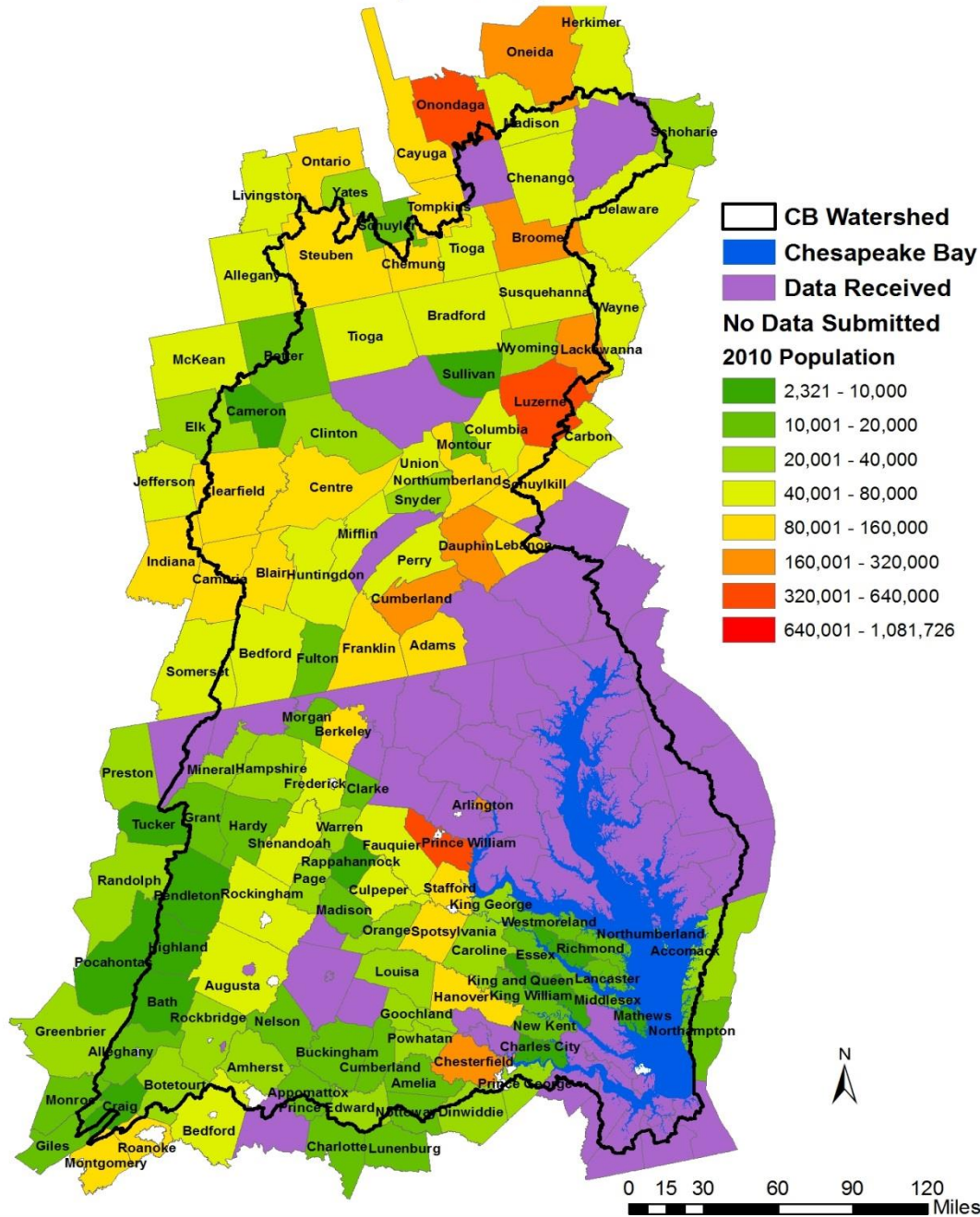
## Tetra Tech contract to collect data on:

- Land cover (e.g., impervious surfaces, tree canopy)
- Land use (e.g., residential, commercial, etc.)
- Parcel polygons (e.g., tax parcels)
- Sewer service areas & septic systems
- Zoning
- Stream centerlines (finer than 1:24,000 scale)

# Land Use, Land Cover, or Parcel Data Received to Date (March 2014)



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# Proposed Phase 6 Land Uses

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# Developed Land Uses (proposed)

## **Impervious surfaces**

Paved surfaces (e.g., roads, parking lots, driveways, and sidewalks), building footprints (e.g., houses, commercial/industrial, confined animal operations and other out-buildings), and rock outcrops.

## **Pervious developed surfaces**

Turf grass and herbaceous/woody landscaped areas within residential, commercial, industrial, and institutional parcels, cemeteries, and golf courses. All areas assumed to receive fertilizer inputs.

## **Mixed open (herbaceous/ woody)**

Lands undergoing secondary succession, fallow/idle/abandoned agricultural lands, landfills, grass highway medians/shoulders, and small patches of trees outside developed areas. All areas assumed to NOT receive fertilizer inputs.



# Developed Land Uses (proposed)

## **Construction**

Lands under construction and in the early process of becoming developed. These areas are reported by each state through their respective Erosion and Sediment Control permitting systems.

## **Dirt and Gravel Roads**

Unimproved roads and pathways with dirt or gravel substrate (e.g., logging roads, fire breaks, pipelines, etc.).

## **Extractive**

Surface mines, quarries, and gravel pits as reported by each state through their respective permit programs.

# Developed Land Uses (proposed)

## Urban Tree Canopy

Small patches of tree canopy (the area encompassed by the canopy of individual trees) within developed areas and assumed to have a managed understory consisting of turf grass, herbaceous vegetation, shrubs, and/or impervious surfaces.

## Urban Stream Corridor

Urban stream channels (potentially including adjacent riparian zone/floodplain).



# Land Use Overlays

## Hydrologic Connectivity

**Connected** = connected to stream channels via stormwater conveyance systems or spatial proximity combined with topographic position (e.g., dense urban areas).

**Disconnected** = runoff that is detained, retained, and/or dispersed over pervious surfaces on its pathway downslope to a stream channel.

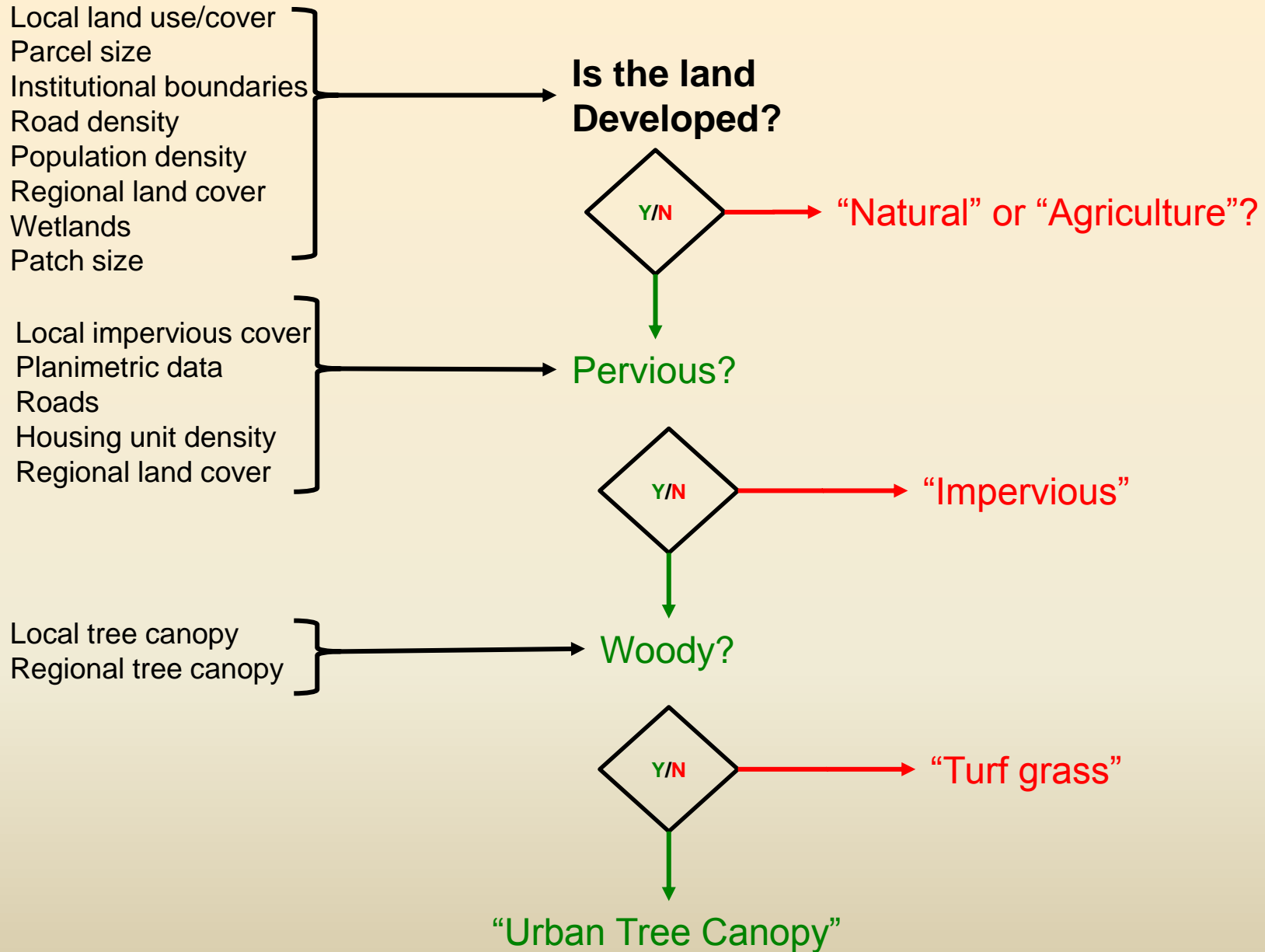
## Riparian areas

Areas immediately adjacent to and within some variable distance of stream channels depending on flow path characteristics.

## Floodplains

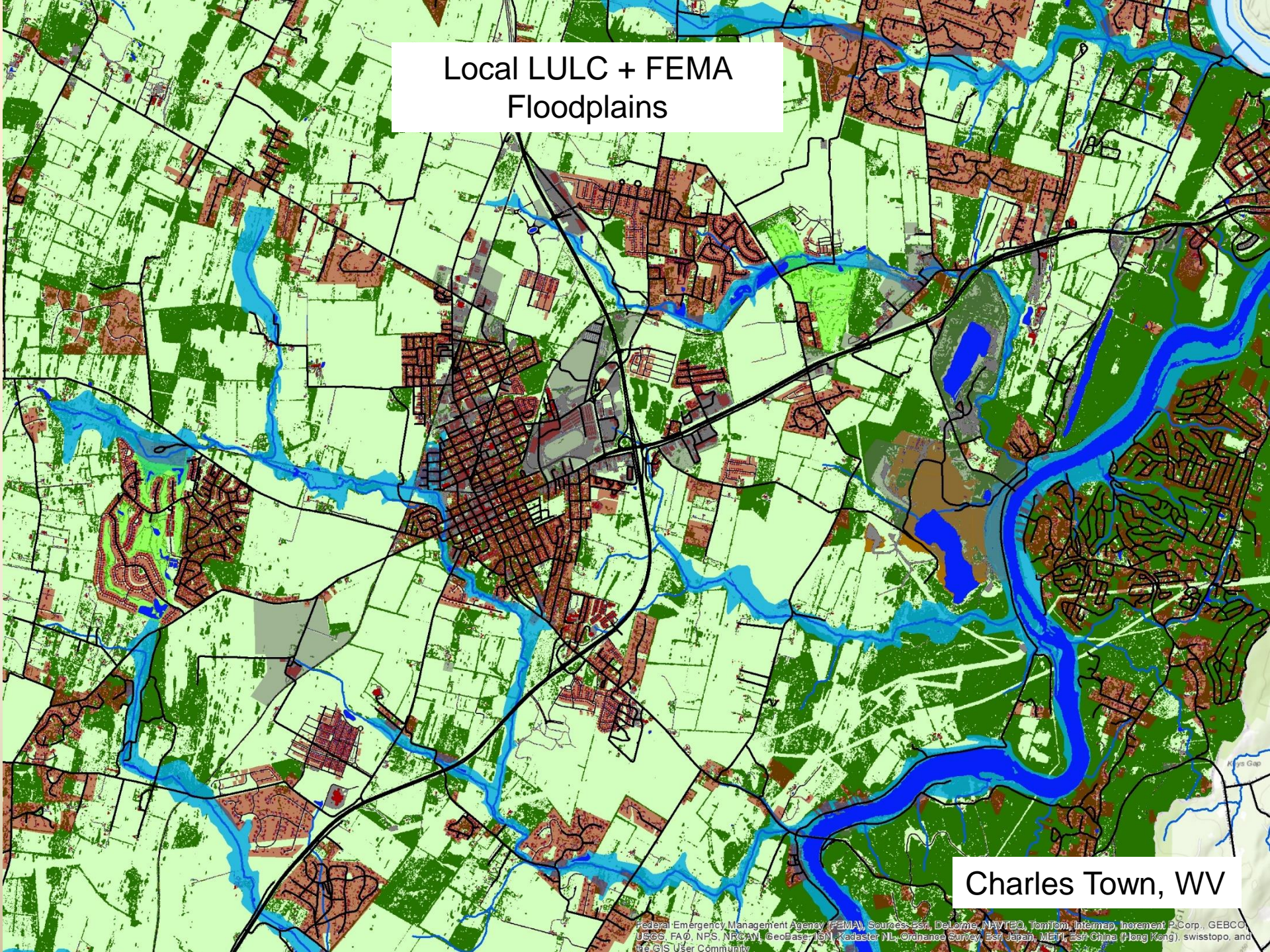
Flat valley bottom landforms adjacent to streams that are periodically inundated during storm events.

# “Pervious Developed” Decision Tree













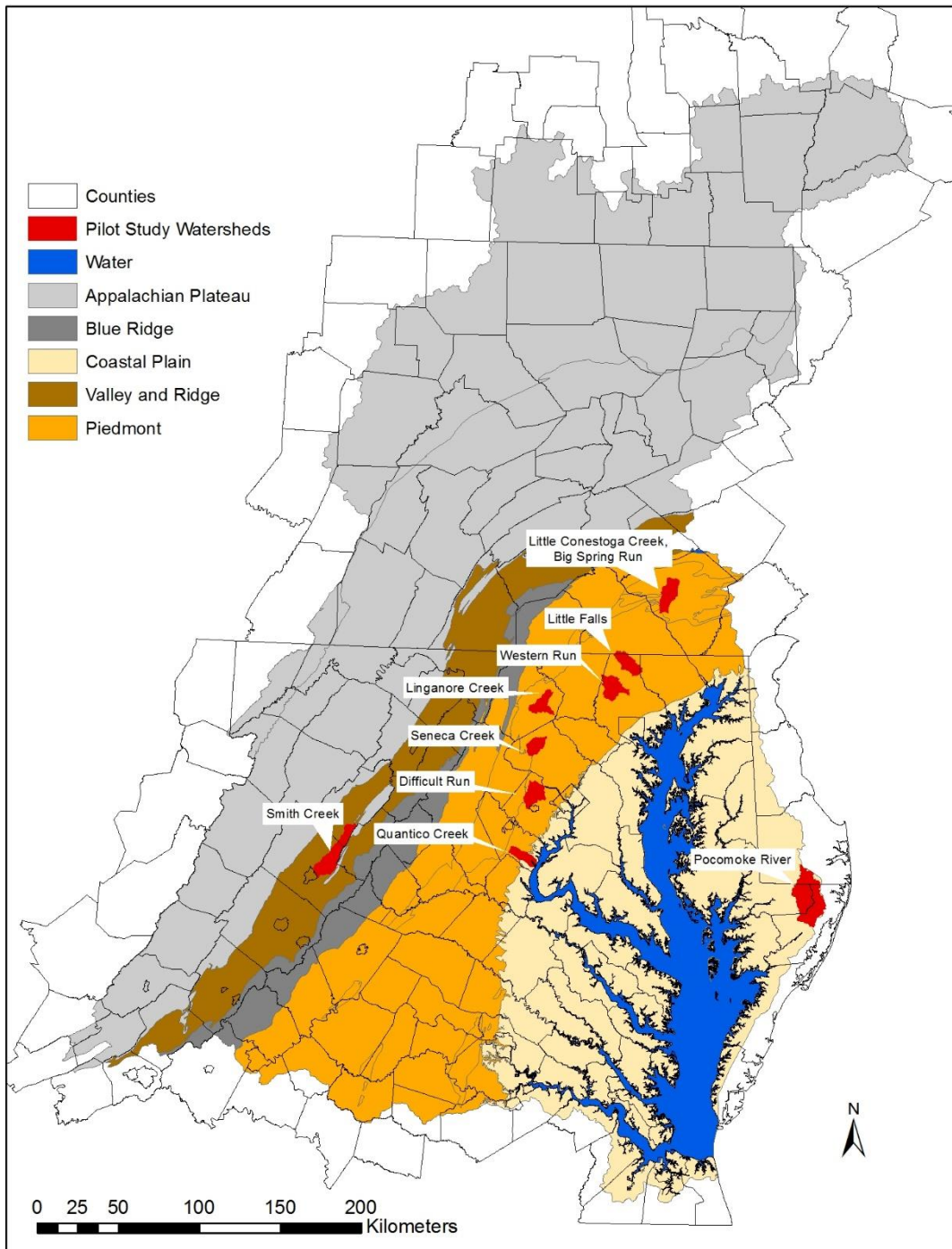
# Local LULC + FEMA Floodplains



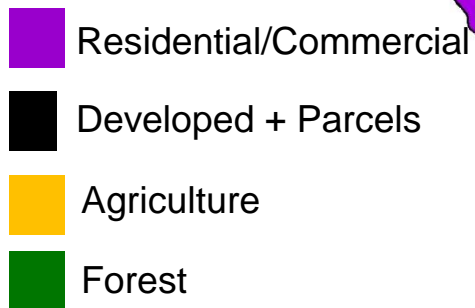
Charles Town, WV



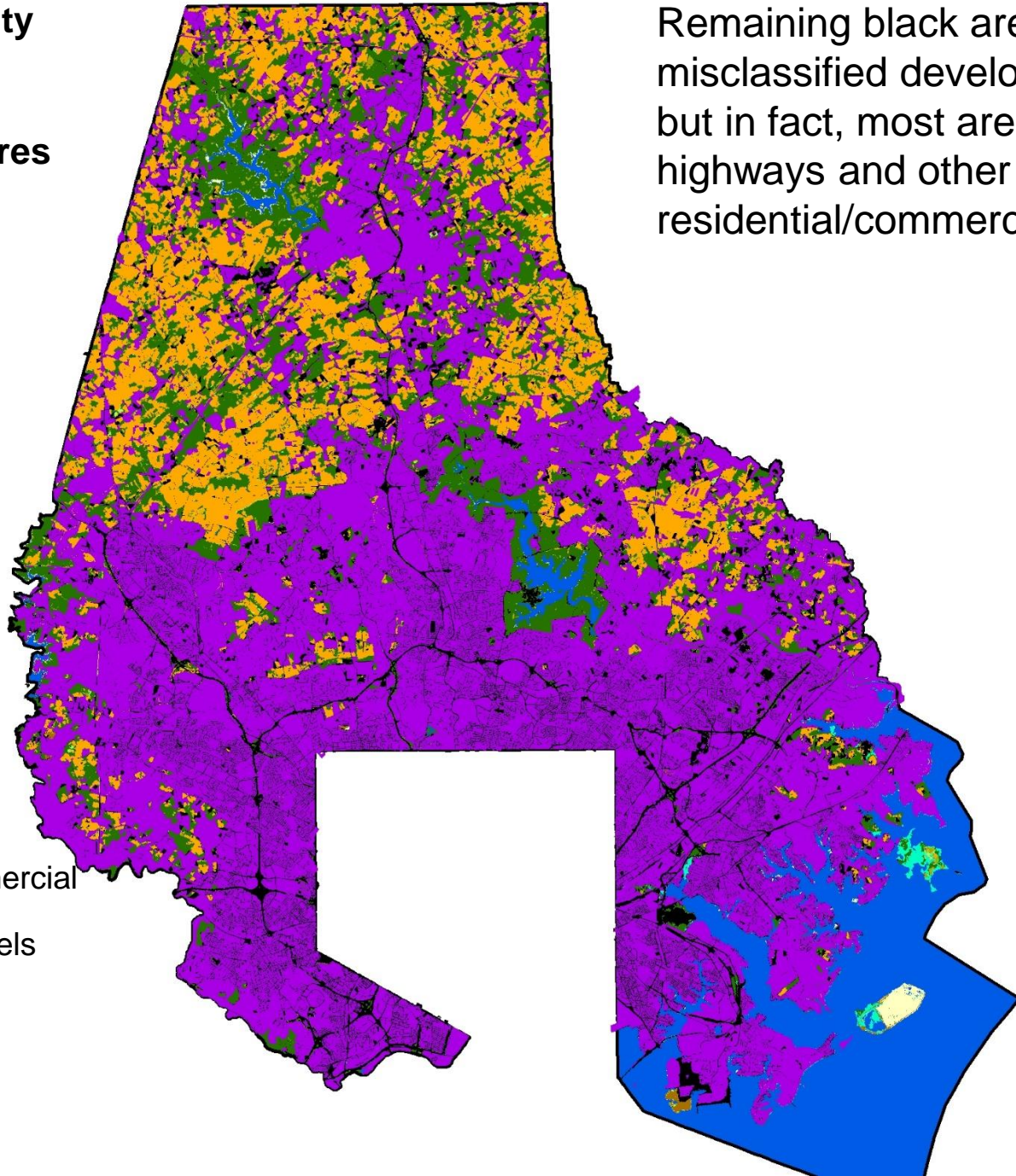
-  Counties
-  Pilot Study Watersheds
-  Water
-  Appalachian Plateau
-  Blue Ridge
-  Coastal Plain
-  Valley and Ridge
-  Piedmont



**Baltimore County  
Land Cover  
+  
Parcels  $\leq$  10 acres**



Remaining black areas could be misclassified developed lands, but in fact, most are likely highways and other non-residential/commercial uses.







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# “Floodplain forest” Decision Tree

