Proposed Change in Land Use True-Up Method for Forecast Period 2013 - 2025

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Calibration True-Up Method

1. Forecast urban growth and corresponding changes in forest and agriculture (using CBLCM).

2. Forecast agricultural change (extrapolating trends in Census of Agriculture).

3. Reconcile the above two land use estimates for 2025 by allowing all land uses to adjust in proportion to their relative mapping/reporting errors.

Proposed Forecast True-Up Method

1. Forecast urban growth and corresponding changes in forest and agriculture (using CBLCM).

2. Forecast agricultural change (extrapolating trends in Census of Agriculture).

3. Reconcile the above two land use estimates for 2025 by allowing only changes to open space to accommodate extrapolated changes in agriculture.

Calibration True-Up Rationale

1. Allows land use acres to adjust based on their relative errors focuses adjustments on the least accurate land uses and datasets.
2. Historic land use trends are grounded in reality by being interpolated between maps and surveys for multiple years* between 1984 – 2013.
3. Minimizes the magnitude of adjustments to any individual land use by distributing changes across all land uses. Developed, forest, and agricultural land uses were only changed 1-2% on average from their original values.

*Mapped and Surveyed Data

- Chesapeake Bay Land Cover Data Series: 1984, 1992, 2001, 2006, 2011.
- High-resolution Land Use: 2013
- Census of Agriculture: 1982, 1987, 1992, 1997, 2002, 2007, 2012
- Census of Population and Housing: 1990, 2000, 2010, 2013 (ACS)

Forecast True-Up Rationale

1. 2025 land uses are produced relative to 2013 conditions which have already been adjusted for mapping/ reporting errors.
2. Preserves the integrity of the intensively reviewed* developed land use forecast relative to the linearly extrapolated trends from the Census of Agriculture.
3. Eliminates illogical transitions:
   - agriculture to forest in 9-12 years in New York;
   - agriculture to turf grass independent of urbanization;
   - changes in open water due to farmland retirement.

*Developed Land Forecast Review

- Reviewed by LUWG, USWG, FWG and state and county agencies from August – December 2017.
- Model has been peer-reviewed in the scientific literature and accepted for publication (with minor revisions).

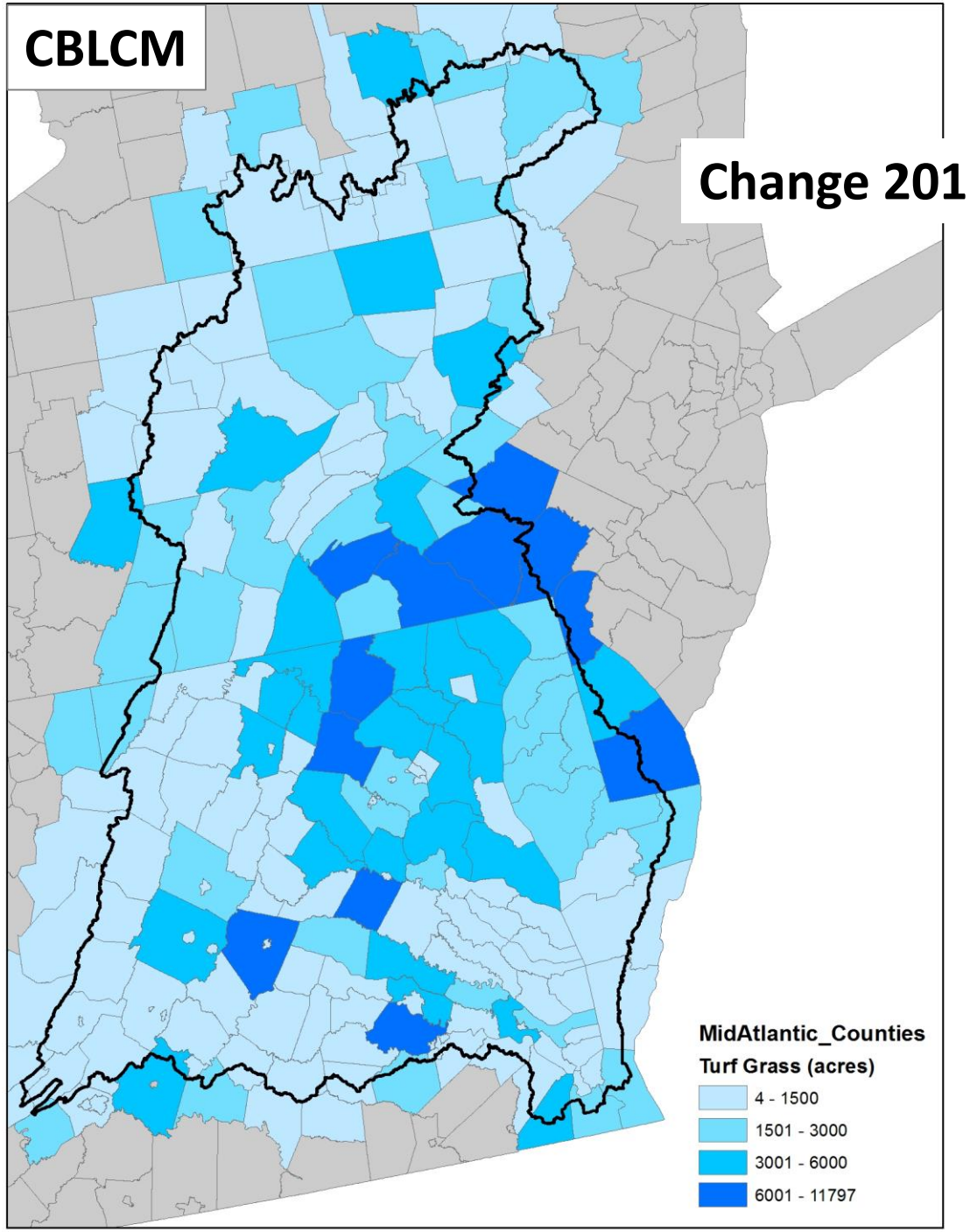
Phase 6 2025 Land Use, Post-True Up

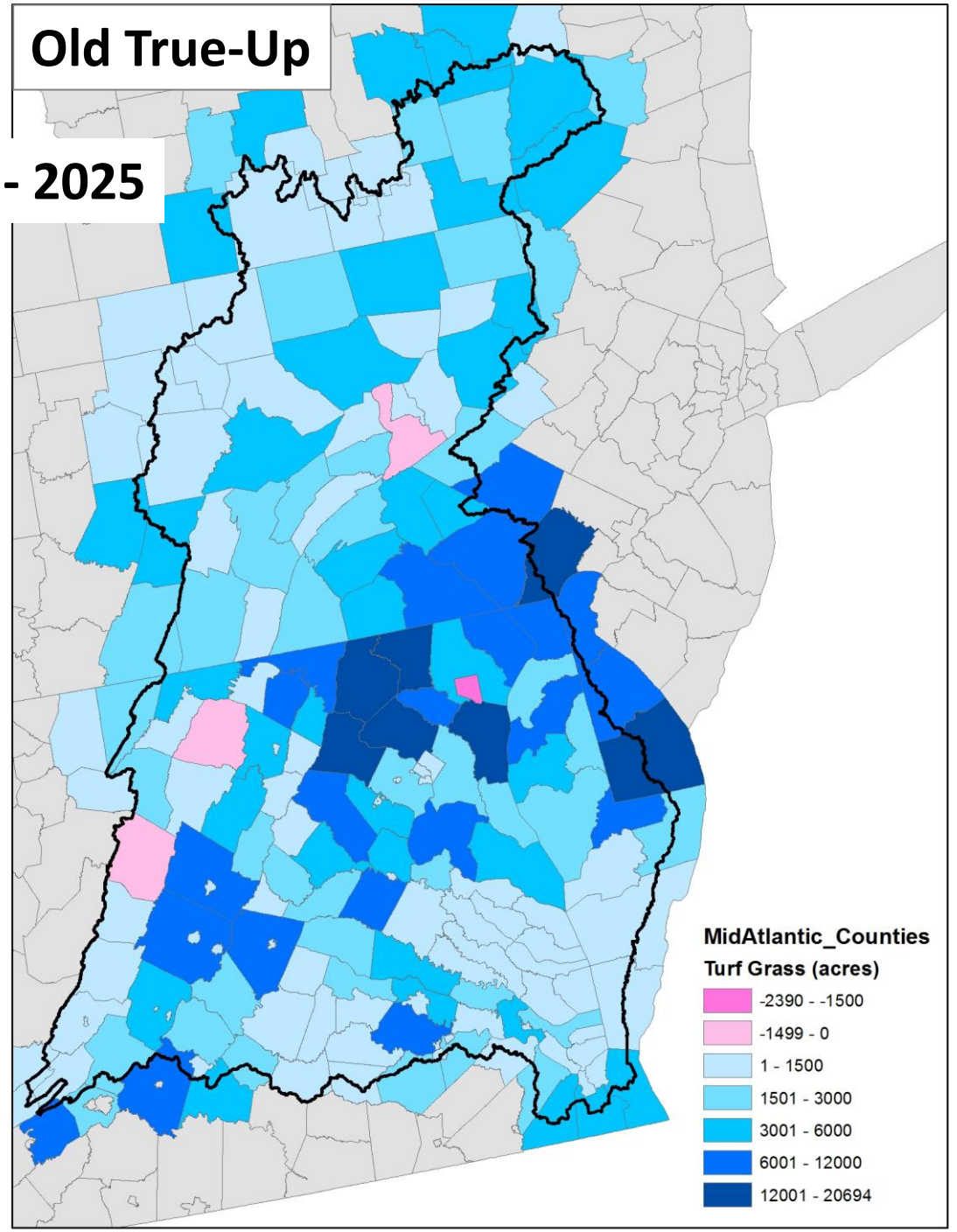
Jurisdiction	Impervious	Turf Grass	Forest	Agriculture	Open Space
Delaware	6,270	29,983	-4,640	-26,949	-3,618
District of Columbia	223	201	-193	0	0
Maryland	24,719	166,033	-43,026	-172,845	13,502
New York	7,949	16,857	65,690	-132,646	41,330
Pennsylvania	43,096	90,857	-15,882	-168,979	52,339
Virginia	45,001	157,181	-83,539	-138,820	11,421
West Virginia	11,917	14,323	-7,392	-17,190	2,964

Phase 6 2025 Land Use, CBLCM

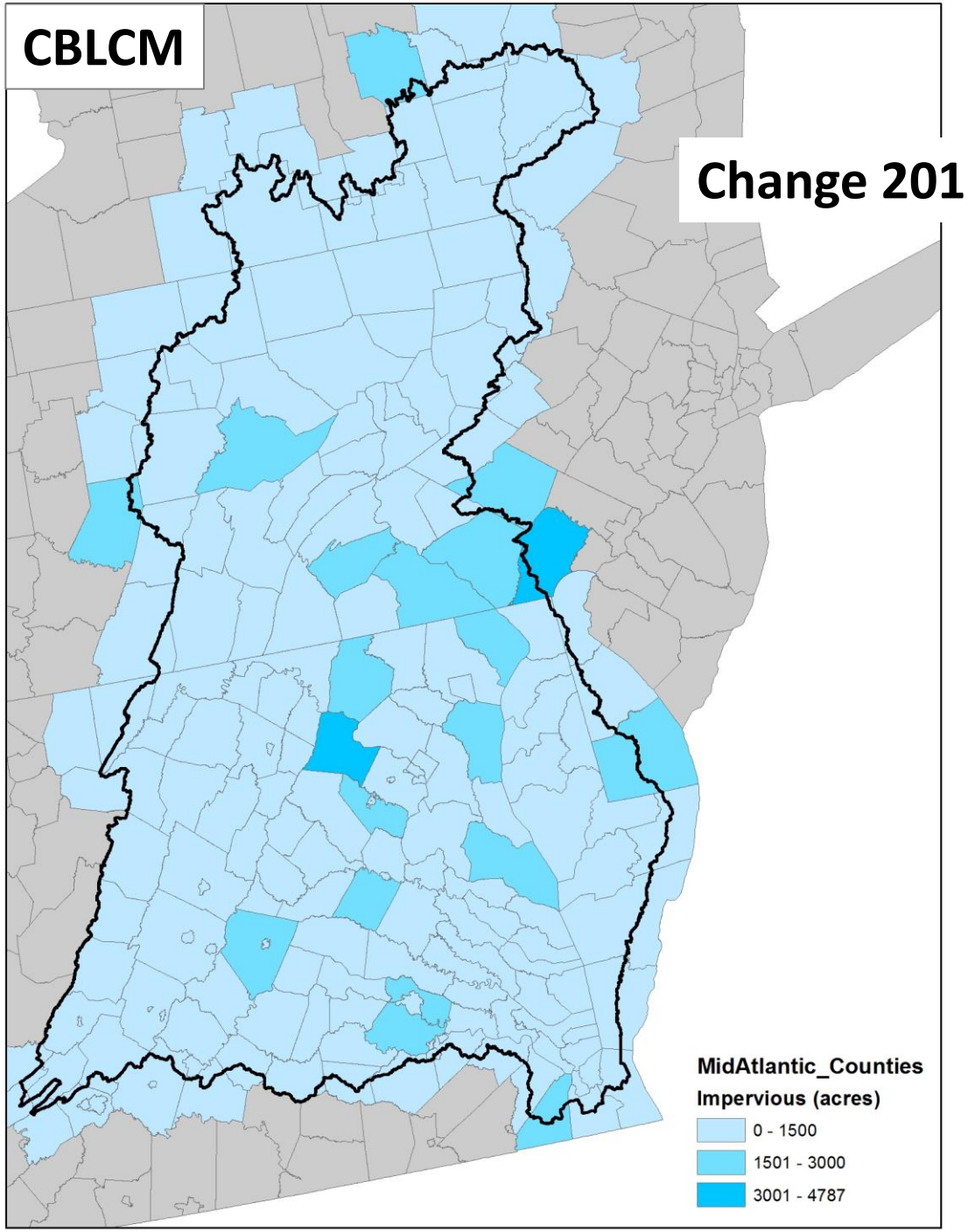
Jurisdiction	Impervious	Turf Grass	Forest	Agriculture	Open Space
Delaware	5,527	22,763	-4,556	-20,408	-3,326
District of Columbia	65	129	-194	0	0
Maryland	23,611	72,910	-39,970	-50,617	-5,933
New York	8,655	24,368	-12,918	-19,216	-890
Pennsylvania	34,091	100,927	-51,020	-75,448	-8,550
Virginia	49,917	132,313	-100,826	-72,403	-9,001
West Virginia	4,080	13,935	-7,106	-9,966	-944

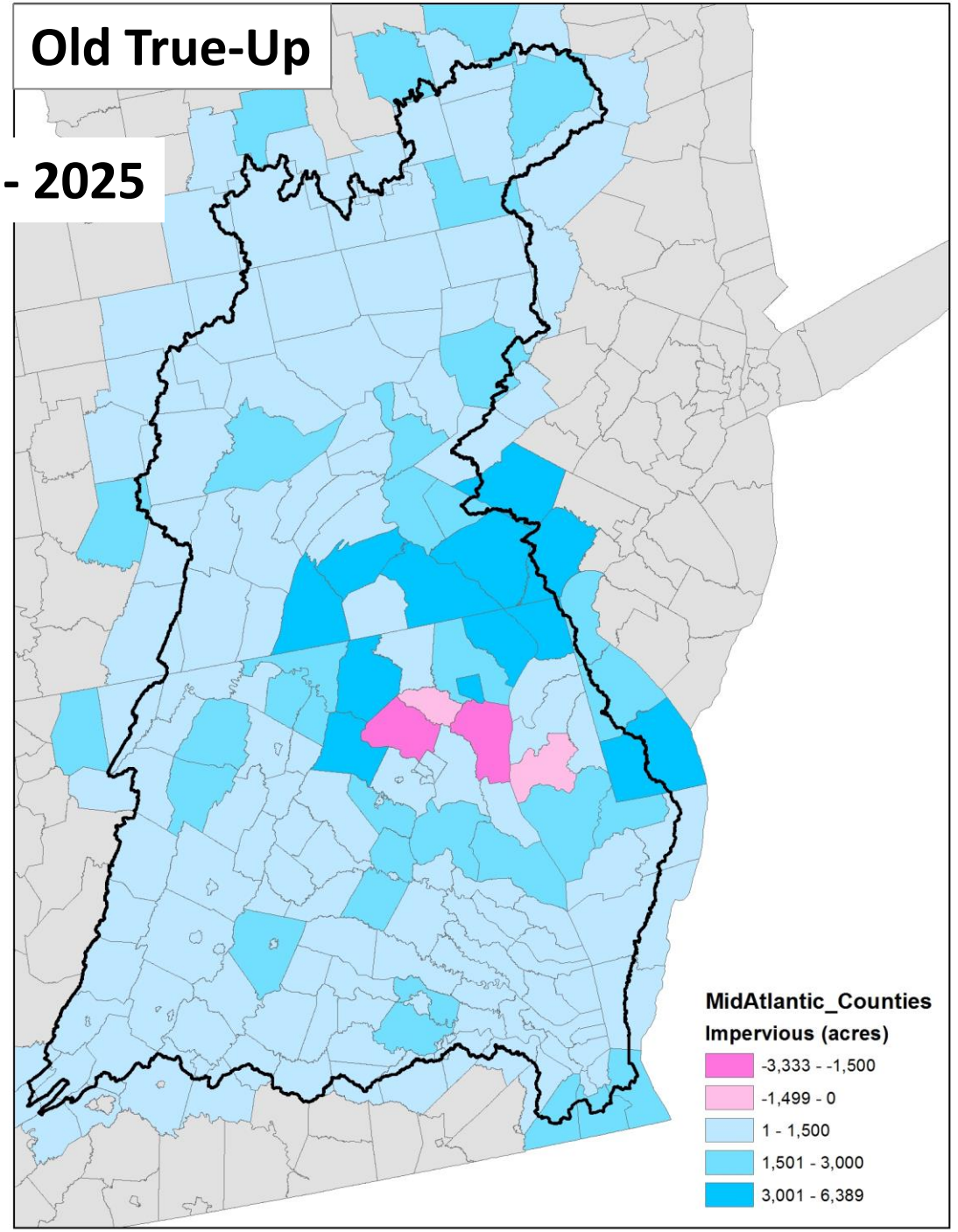
Change 2013 - 2025

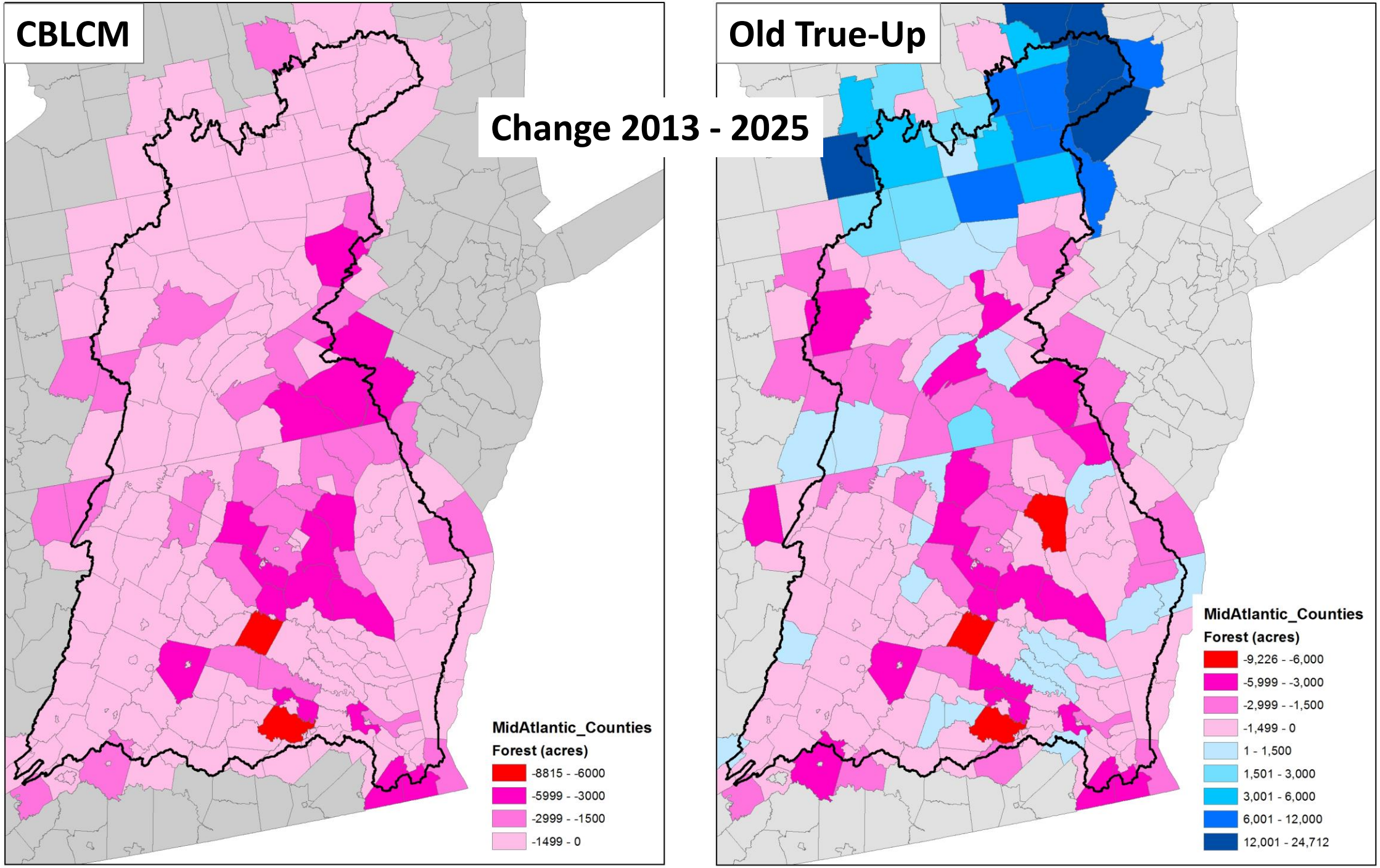




Change 2013 - 2025



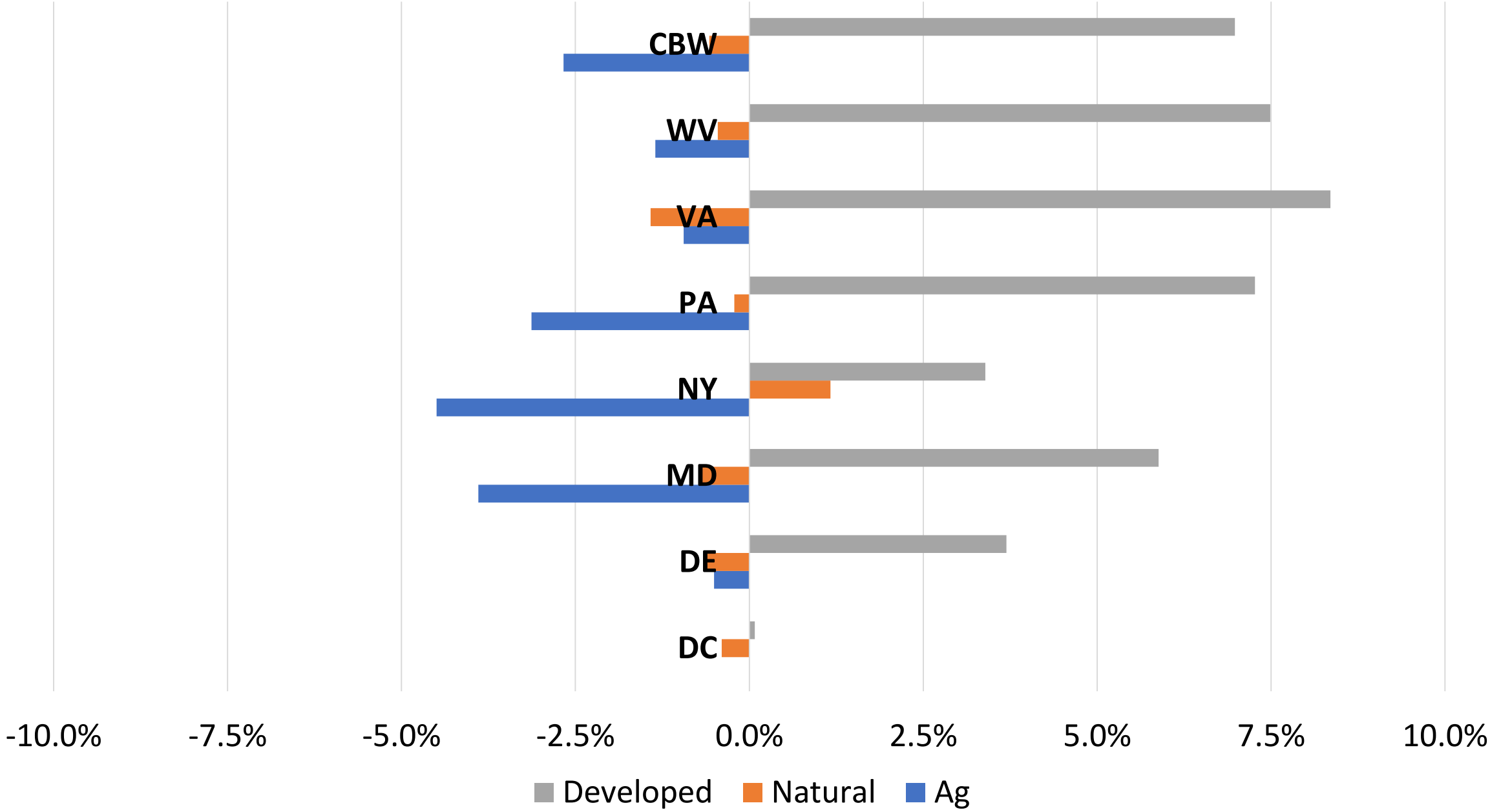



CBLCM
Change 2013 - 2025
Old True-Up
MidAtlantic_Counties
Forest (acres)
-8815 - -6000
-5999 - -3000
-2999 - -1500
-1499 - 0
MidAtlantic_Counties
Forest (acres)
-9,226 - -6,000
-5,999 - -3,000
-2,999 - -1,500
-1,499 - 0
1 - 1,500
1,501 - 3,000
3,001 - 6,000
6,001 - 12,000
12,001 - 24,712

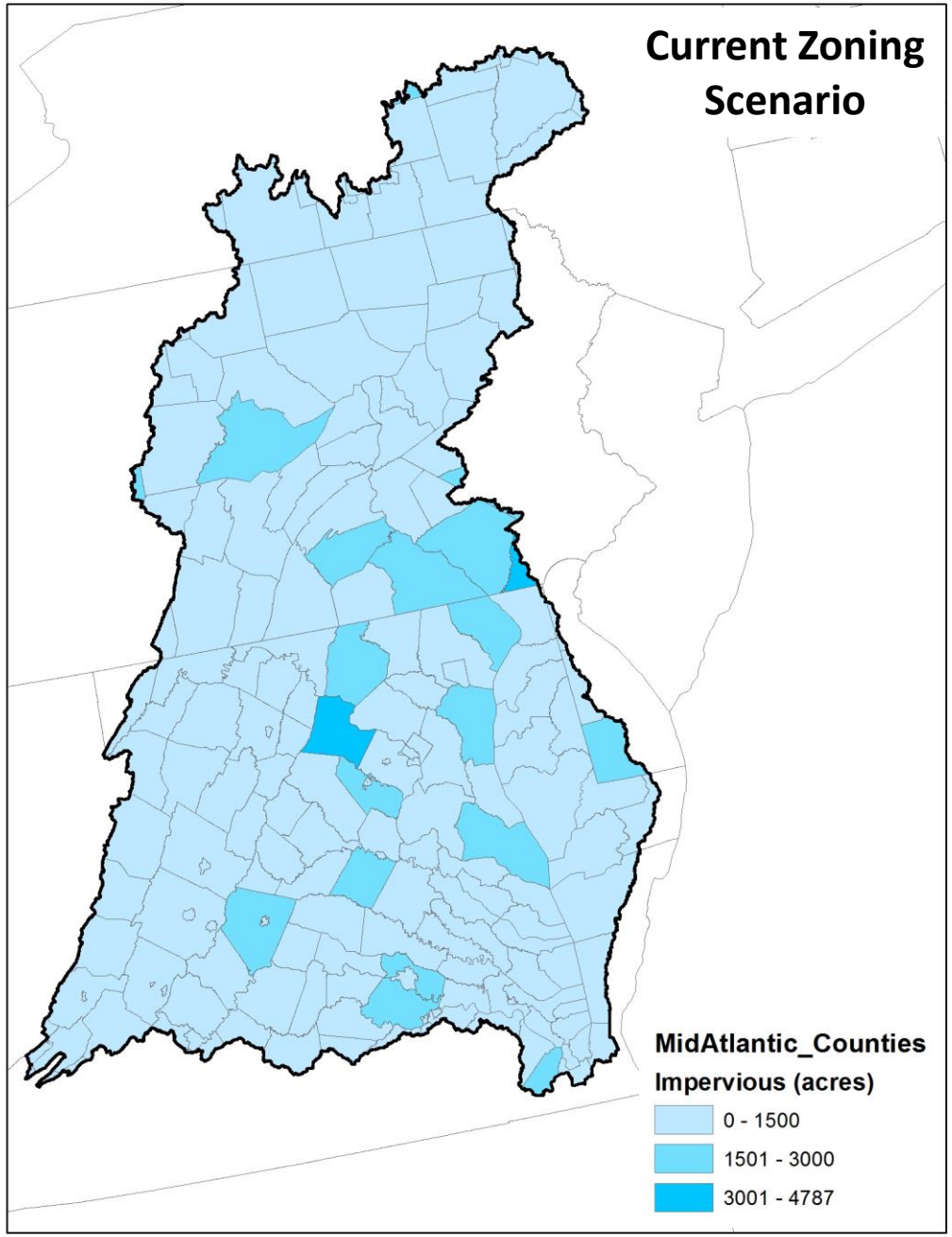
Results with New True-Up Methodology

CZ Change in Land Use: 2013-2025 (Census of AG + Construction + Harvested Forest)								
STATE	Impervious	Turf Grass	Construction	Developed	Forest_&_Wetlands	Agriculture	Open Space	Water
10	4,973	17,298	0	22,271	-4,747	-14,048	-3,476	0
11	218	177	-233	163	-285	0	123	0
24	20,648	59,501	1,213	81,362	-42,639	-74,771	36,051	-3
36	8,847	23,966	0	32,813	-13,680	-163,724	144,591	0
42	33,647	96,218	-6,421	123,444	-52,541	-165,953	95,049	0
51	43,392	104,029	-620	146,802	-107,774	-61,711	22,683	0
54	4,438	15,953	-5,816	14,575	-7,163	-9,585	2,173	0

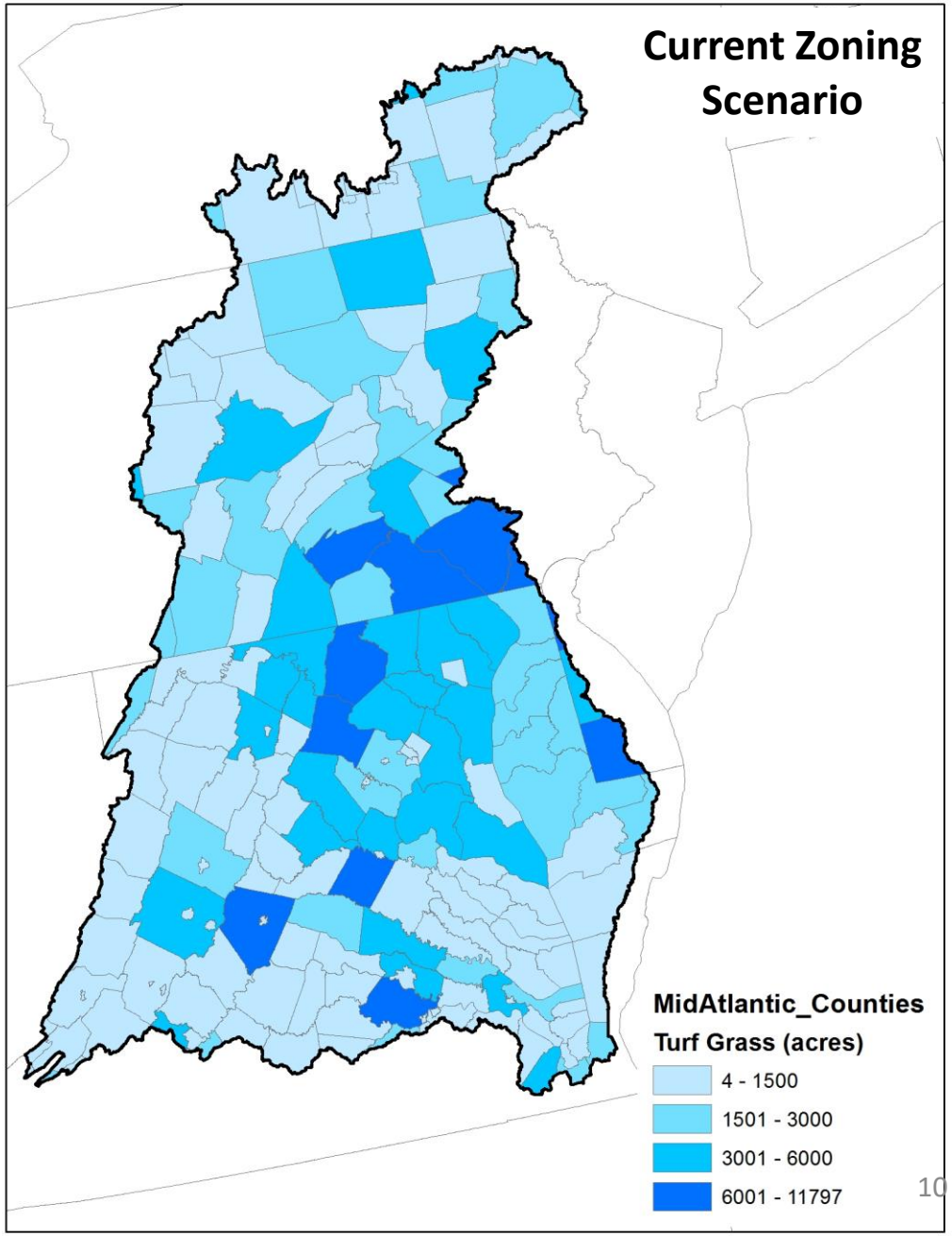
Estimated % Change in Sector Acres by Sector from 2013 through 2025



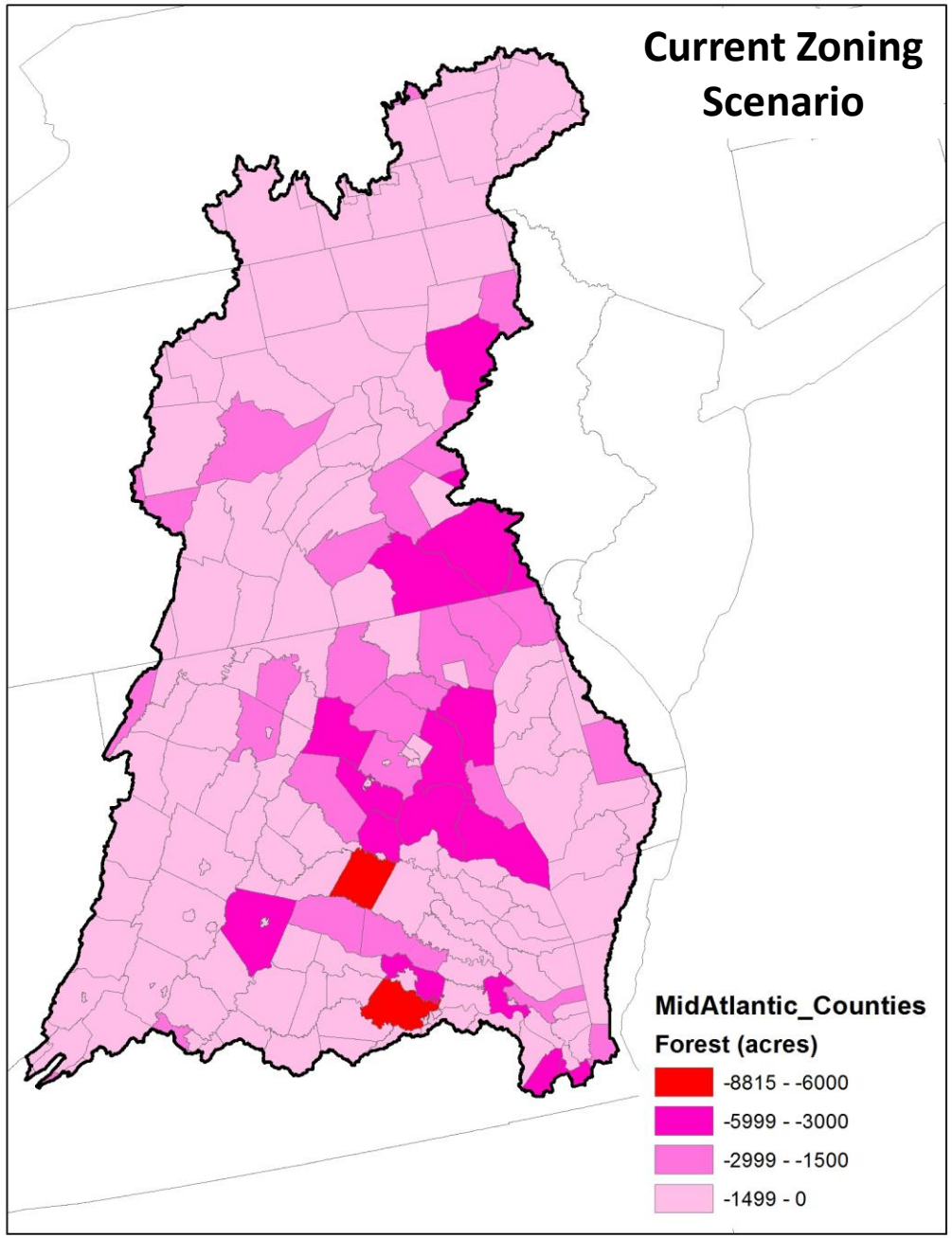
Increase in Impervious Surfaces



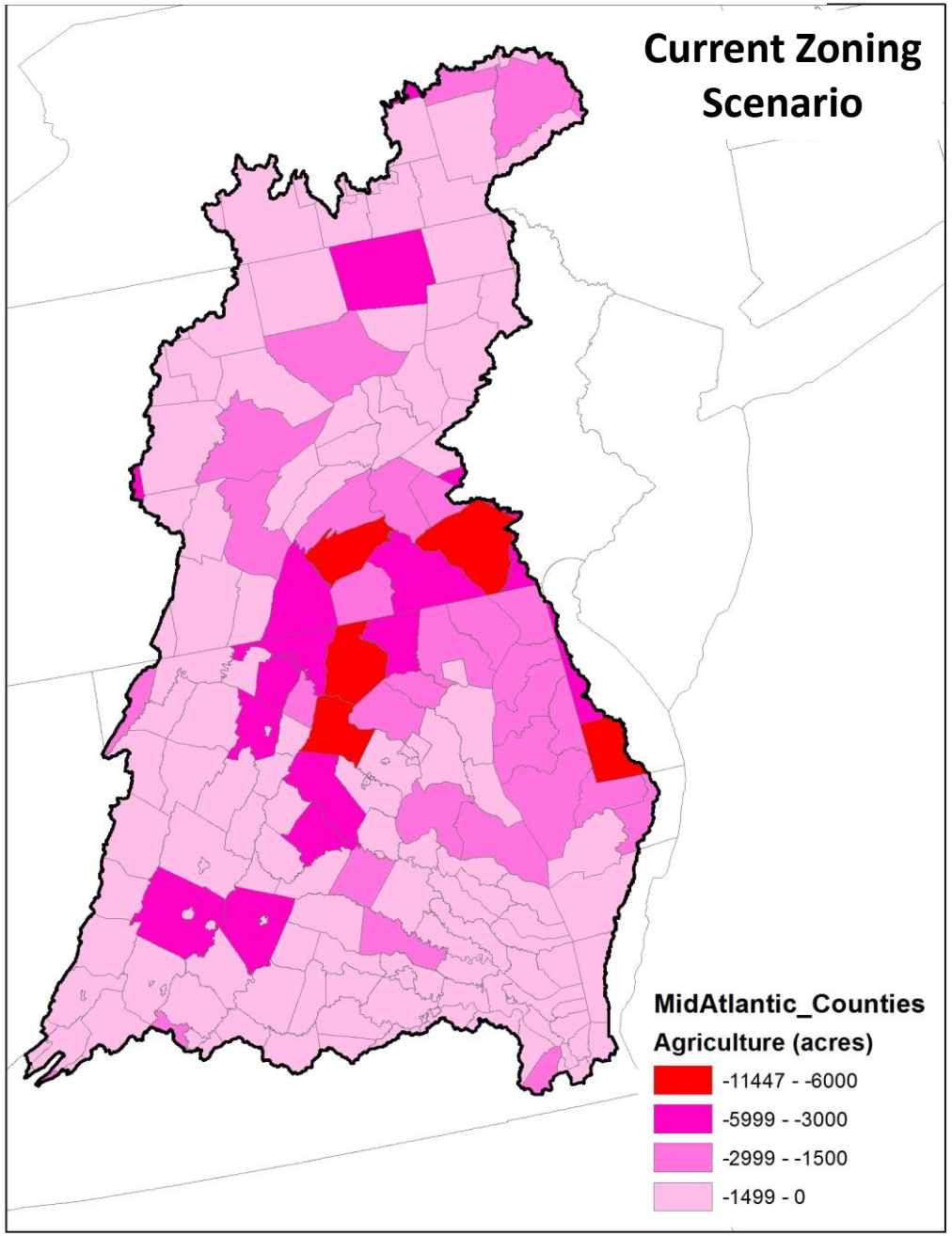
Increase in Turf Grass



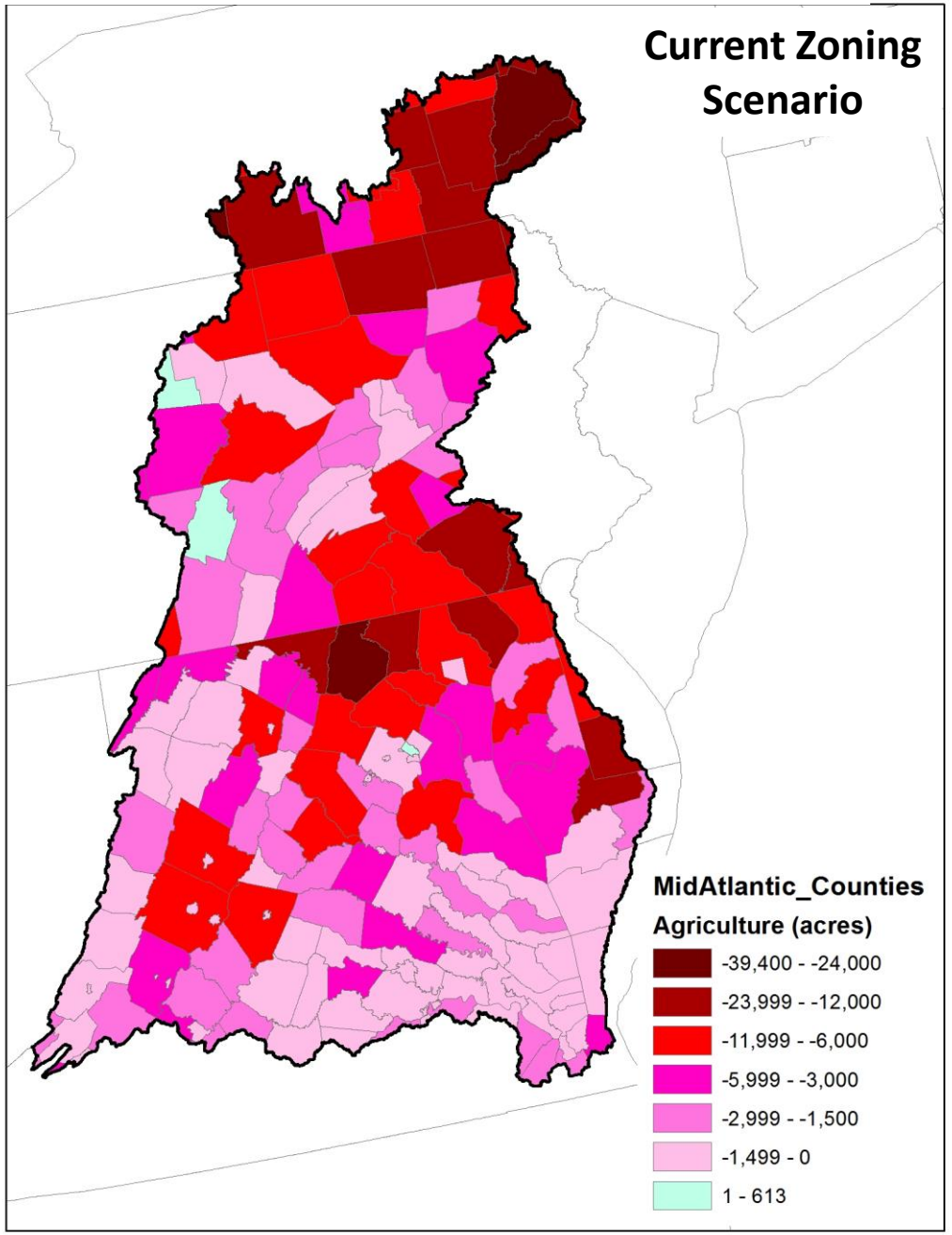
Forest Conversion to Development



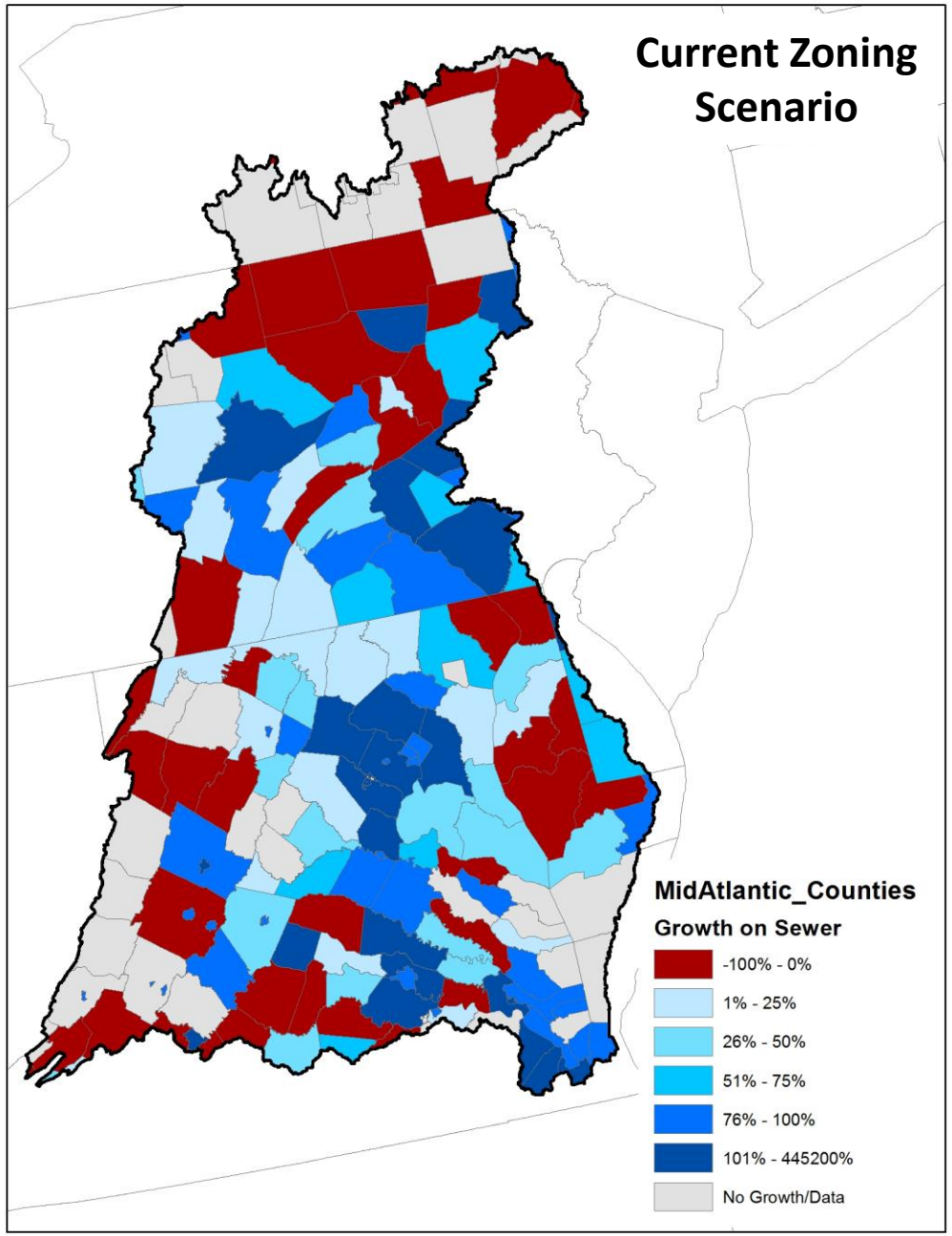
Farmland Conversion to Development



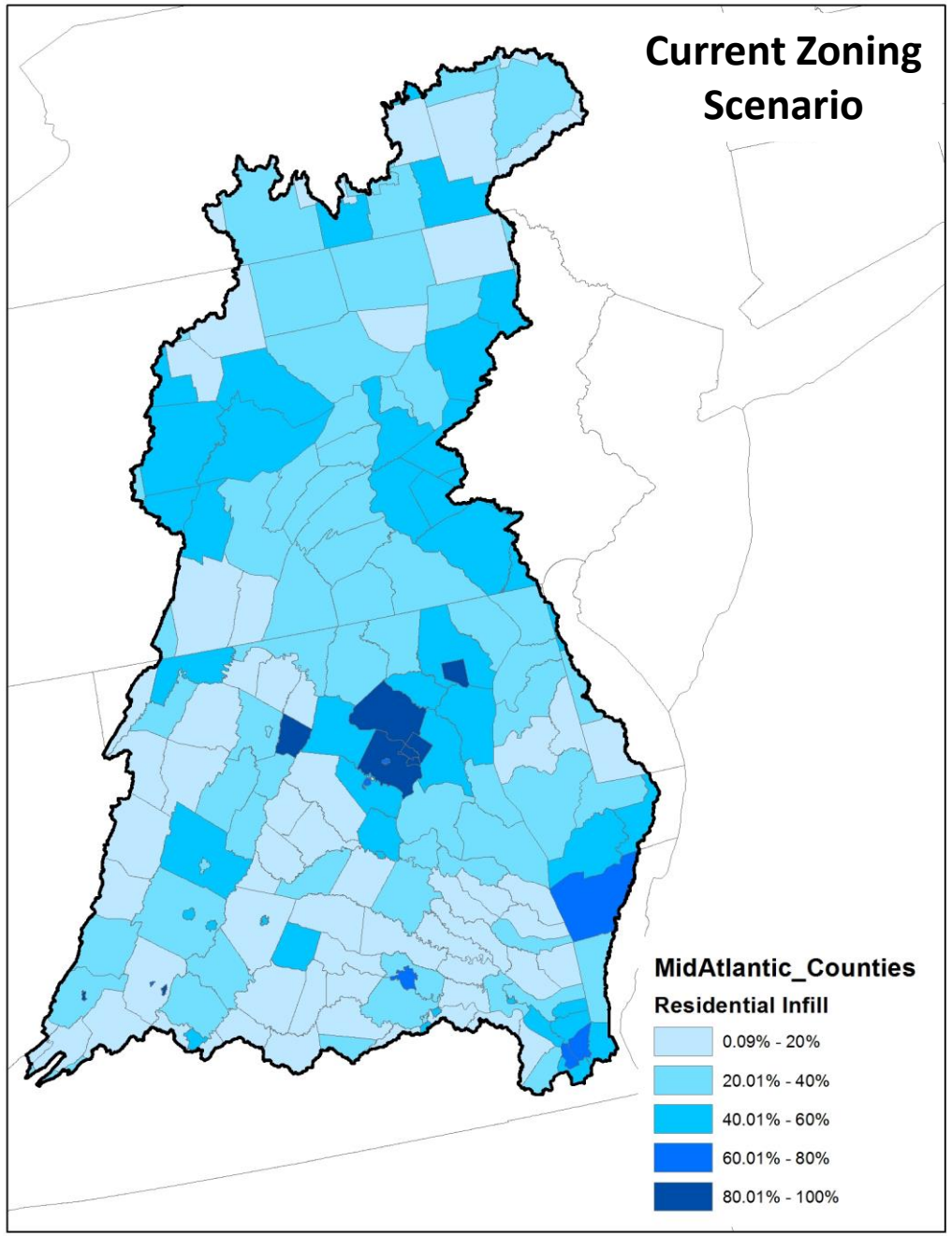
Farmland Conversion + Land Retirement



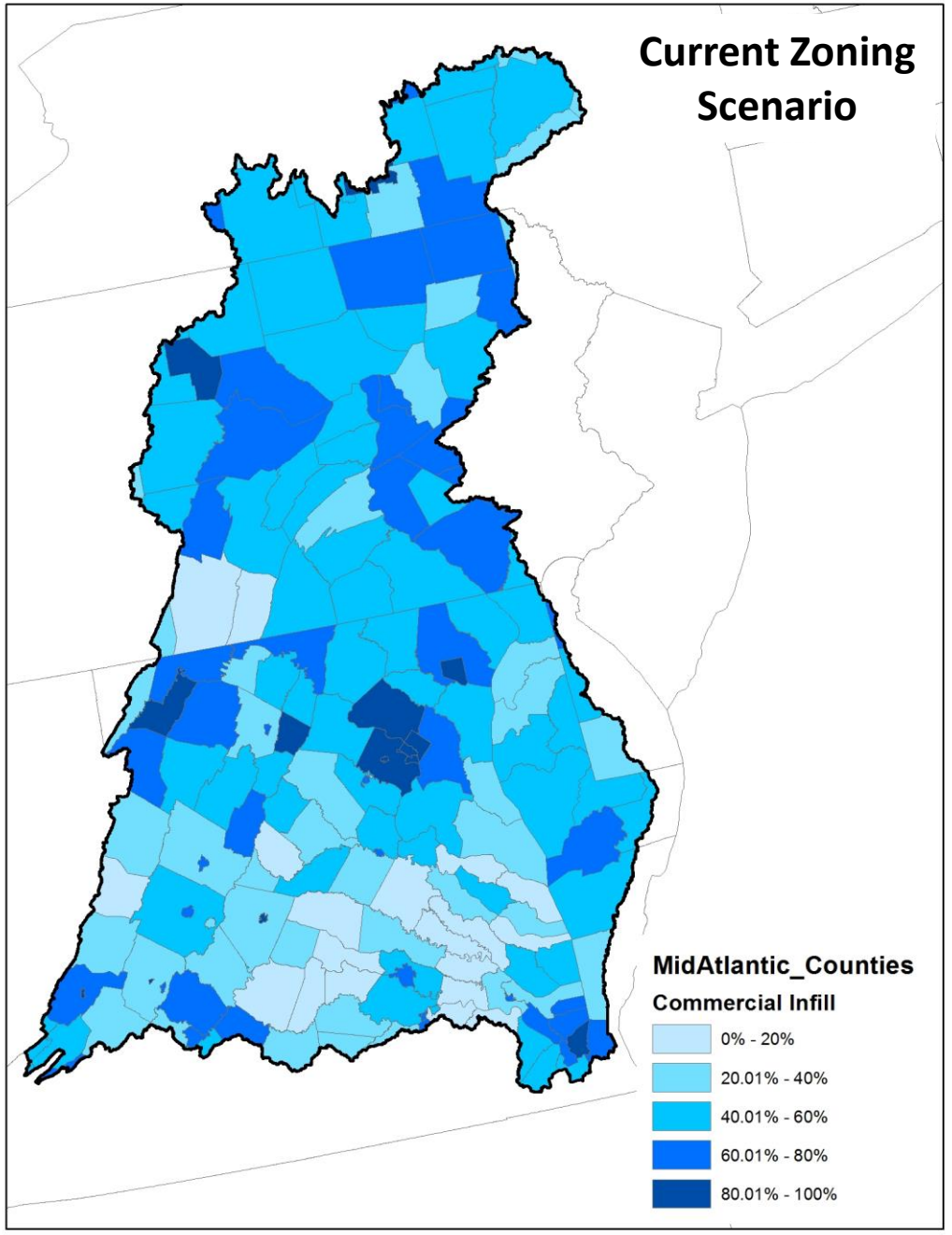
Growth on Sewer and Septic



Residential Infill/Redevelopment



Commercial Infill/Redevelopment



Future Growth Scenarios

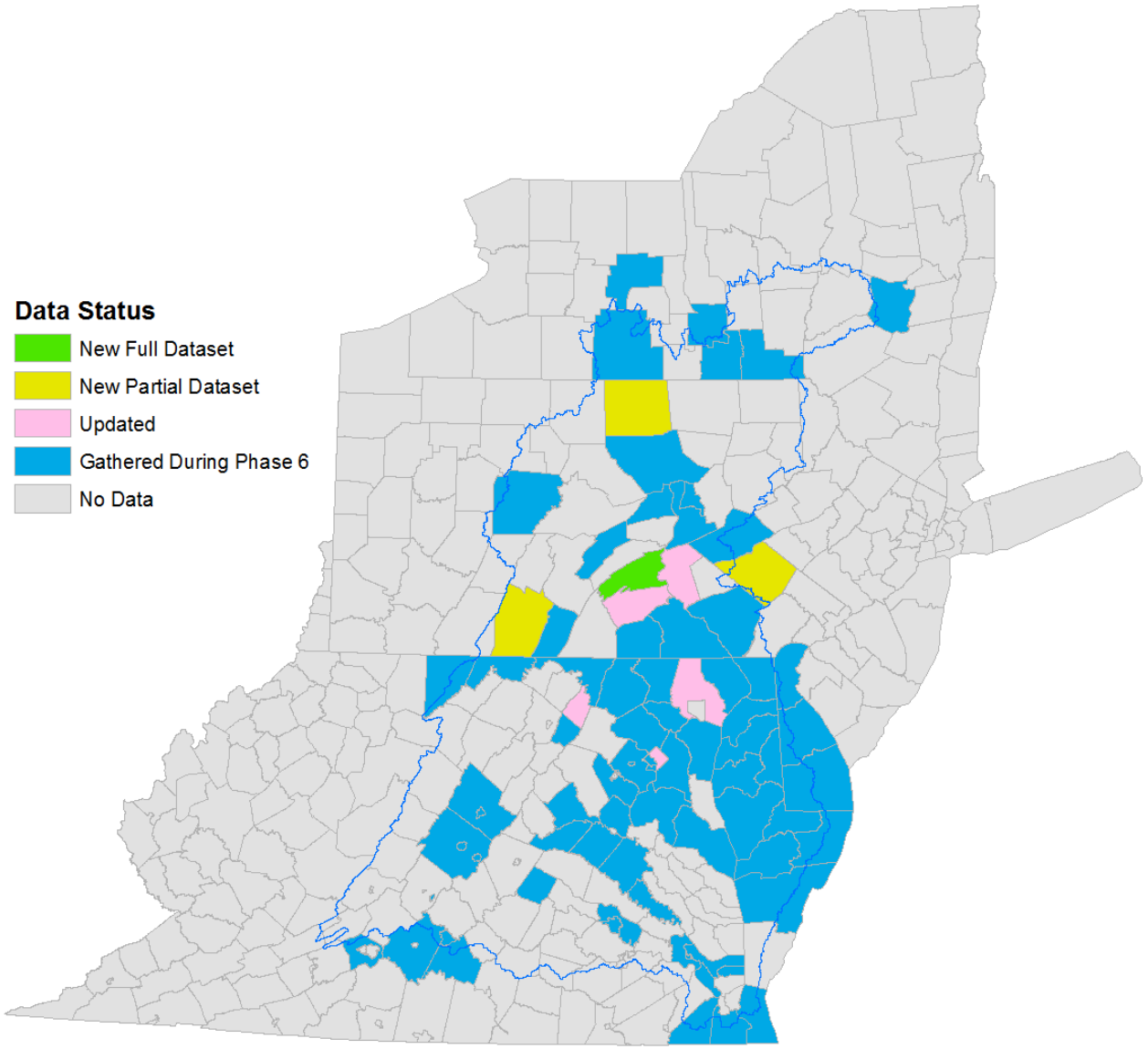
Purpose:

To provide information to state and local partners to account for the effects of land use planning and conservation actions for reducing future pollutant loads in their Phase III WIPs.

Scenarios:

- Current Zoning: 2025 Baseline for Phase III WIPs
- Conservation Plus: Package of Planning & Conservation “BMP’s”

REVIEW PERIOD CHANGES FOR “CURRENT ZONING” FUTURE 2025



COUNTY	COVERAGE	CLASSES
Bedford Co, PA *	Full	0
Chester Co, PA	Full	0,3
Cumberland Co, PA	Full	0,1,2,3
Dauphin Co, PA	Full	0,1,2,3
Jefferson Co, WV	Full	0,1,2,3
Perry Co, PA	Full	0,1,2,3
Baltimore Co, MD	Partial	0
Berks Co, PA	Partial	0
D.C.	Partial	0
Tioga Co, PA	Partial	0,1,2,3

* Submitted sewer data also

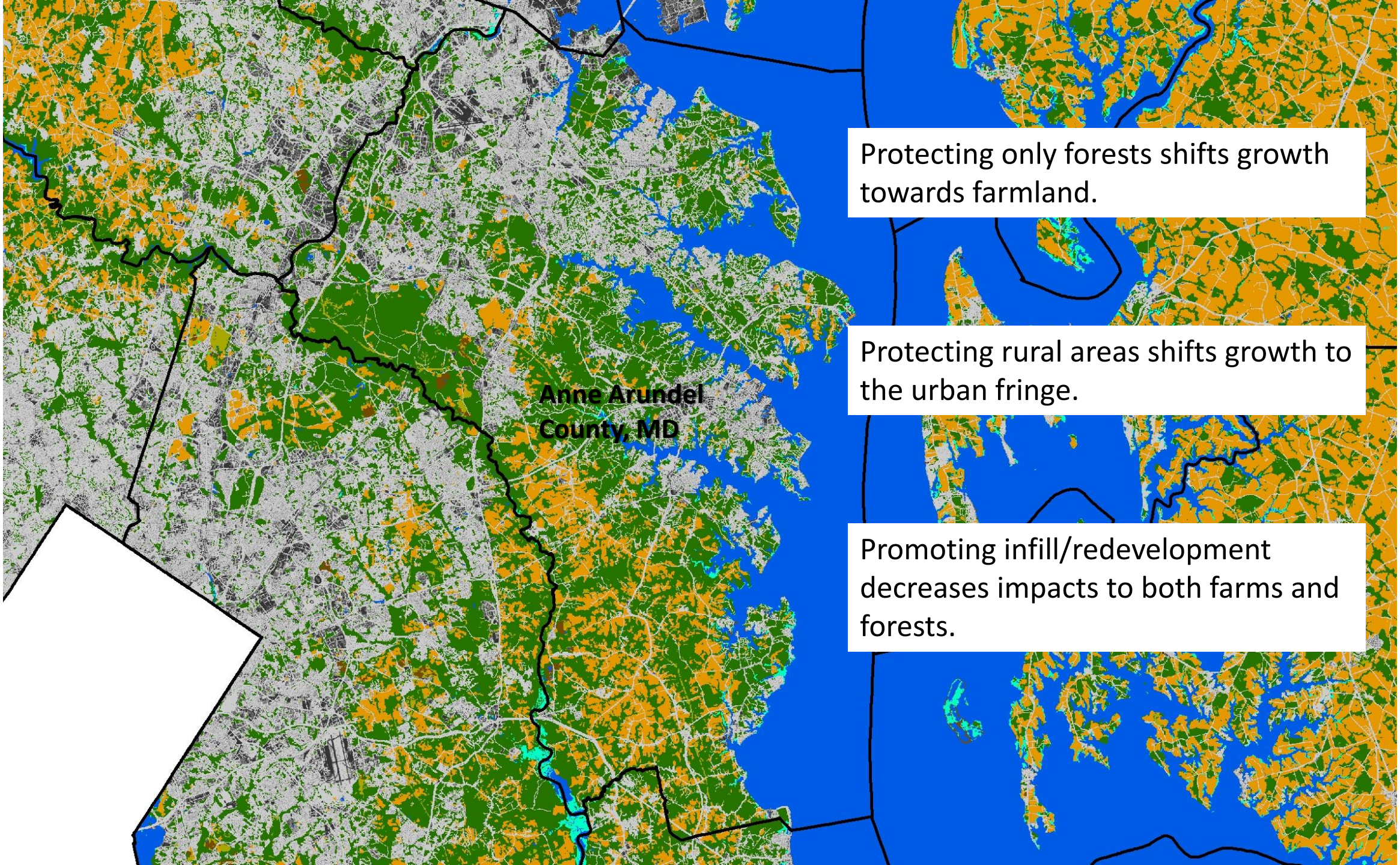
Future Growth Scenarios: 2025

Current Zoning Scenario: 2025 Baseline for Phase III WIPs

- continuation of historic trends constrained by existing local zoning. Includes the best available regional and local data representing current conditions

Conservation Plus Scenario: Package of Planning & Conservation "BMP's"

- Increase percent of infill/redevelopment by 10%
- Increase urban densities by 10%
- Increase proportion of urban vs rural growth by 10%
- Protect all designated Agricultural Districts and areas zoned rural agricultural
- Protect 100-year floodplain and frequently-flooded soils
- Protect riparian zones (100-ft)
- Expand sewer service areas layer by 1-mile (per decade)
- Protect wetlands (NWI, State Designated Wetlands, and Potential Wetlands)
- Avoid growth on soils unsuitable for septic systems
- Protect areas subject to a 1m-rise in sea levels by 2100 and within 1-mile of National Wildlife Refuges
- Protect prime farmlands and farmland of state importance
- Protect large forest tracts (250+ acres)
- Protect shoreline forests (all tracts adjacent to shoreline)



Protecting only forests shifts growth towards farmland.

Protecting rural areas shifts growth to the urban fringe.

Promoting infill/redevelopment decreases impacts to both farms and forests.

Land Use Planning and Conservation in CAST

- Components of the Conservation Plus scenario will be evaluated individually or in combination to quantify the water quality benefits of each particular action or collection of actions.

- Users of CAST will be able to:
  - Understand the effects of policy and conservation actions on local loads of N, P, and Sed.
  - Select policy and conservation actions as components of their WIPs.

- Planning and conservation actions will be simulated as changes in land use against which, CAST users can add other BMPs and estimate loads.

Land Use Scenario Timeline

Dec. 20th: Complete all edits* to the “Current Zoning” scenario and begin CBLCM runs.

Dec. 29th: Complete CBLCM runs of “Current Zoning” scenario.

Jan 5th: Deliver “Current Zoning” scenario to CBP modeling team (into CAST the following week); Begin CBLCM runs of “Conservation Plus” scenario.

Jan 15th: Deliver “Conservation Plus” scenario to CBP modeling team (into CAST by Jan 19th).

Jan – March: Deliver “Conservation Plus” derivative scenarios to CBP modeling team.

* Exclude FEMA floodway, zoning and sewer service area edits, and any other requested changes into