Chesapeake Bay TMDL Land Policy BMPs
Overview

Introduction

To support the jurisdictions' efforts to account for growth in loads due to changes in land use, the CBP partnership and the jurisdictions have developed a suite of future land use scenarios that are referred to as "Land Policy BMPs" and are available in the Chesapeake Assessment Scenario Tool (CAST)[1] for optional inclusion in each jurisdiction's Phase III WIP. The Land Policy BMPs currently in CAST include three developed for illustrative purposes ("Forest Conservation", "Growth Management", and "Agricultural Conservation") and will include at least one custom Land Policy BMP for jurisdictions that expressed interest in developing one (i.e., District of Columbia, Delaware, Maryland, Pennsylvania, Virginia, and West Virginia). Currently proposed custom Land Policy BMPs include a balanced mixture of forest and farmland conservation and growth management. New York has expressed interest in developing one but has not yet done so.

Land Policy BMPs represent aggregations of a variety of policy and programmatic actions implemented by a variety of organizations. The CBPO only has resources to simulate Land Policy BMPs in CAST that have been drafted by one or more of the Bay jurisdictions. The WIP leadership in each jurisdiction determines the policy and programmatic elements to be included in their Land Policy BMPs with input solicited from private industry, NGOs, academia, and others via the WIP development process. Jurisdictions can choose and/or design land conservation and growth management actions to include in their custom Land Policy BMPs. The proposed actions can reflect state-wide policies, programs, regulations, and investments or vary by county (i.e., a statewide dataset of zoning restrictions which includes data for select counties and relies on default values for all other counties). If a jurisdiction is interested in the effects of a single policy or program- like a cluster housing subdivision ordinance- they can develop a unique Land Policy BMP reflecting just that single practice to the CBPO under the condition that they also provide guidance on how the ordinance is expected to affect future land use conditions. For example, the CBPO would need to know how the ordinance is presumed to impact development densities and the geographic areas affected by it. Once finalized and approved by the jurisdictions that developed them, custom Land Policy BMPs will be included in CAST. While the custom Land Policy BMPs will be available to all users, their effects on land use will only apply to the jurisdiction for which they were developed.

When designing Land Policy BMPs, it's important to briefly consider how the CBLCM functions. The CBLCM simulates future residential and commercial development resulting from population growth. Projected growth for a county or city MUST be accommodated within that jurisdiction. No leapfrog development or migration is allowed because these phenomena are assumed to be already accounted for in each

[1] The CAST tool is available for use by the public following registration on the site and it has excellent documentation and help screens. For more information, see: https://cast.chesapeakebay.net/ and http://www.chesapeakeconservation.org/index.php/our-work/current-initiatives/conservation-plus/

jurisdictions' demographic projection. Growth can be accommodated through infill/redevelopment or greenfield development, the latter resulting in the conversion of forests and/or farmland to development. All infill/redevelopment is assumed to be served by sewer and result in no additional increase in developed land. Actions that increase infill/redevelopment directly reduce the footprint of future growth and reduce impacts to both forests and farmlands. Actions that increase development densities in high-probability residential or commercial areas have similar effects, but they are less direct compared to infill/redevelopment. Actions that prevent future development on a parcel of land serve to deflect growth to other areas, assuming there is enough suitable land remaining to accommodate growth. For example, protecting lands currently served by sewer could increase future nutrient loads if growth is deflected into areas served by septic. Land protection actions will have the greatest impact on the future footprint of development if they occur within jurisdictions with high population growth and limited land available for development.

Calculating Load Reductions from Land Policy BMPs

The effects of land use planning and land conservation actions on future development and septic systems and associated conversions of forests, cropland, and pasture are simulated by the CBPO using the CBLCM. Future estimates of developed land and land use conversions are combined in CAST with extrapolated trends in crops, hay, pasture, and animal populations from the Census of Agriculture[2] (1982 -2012), state-reported acres of harvested forest, and land under construction to form the final 2025 land use datasets associated with the 2025 Current Zoning baseline and each Land Policy BMP. Adjustments are made to the developed land use acres to accommodate reported construction acres, to the forest acres to accommodate harvested forest, and to both the mixed open land use and acreages reported in the Census of Agriculture to accommodate the Census of Agriculture.

Pollutant loads (pounds of nitrogen, phosphorus, and sediment) from Land Policy BMPs are estimated using CAST which has been designed to help jurisdictions develop their Phase III WIPs and estimate pollutant loads from all BMPs, including Land Policy BMPs. Pollutant loads resulting from Land Policy BMPs can be estimated on one of two base conditions: Historic Trends or Current Zoning. Because the "Current Zoning" base condition was accepted as the official 2025 baseline used by the CBP partnership to evaluate the effects of Land Policy BMPs on 2025 conditions, it is recommended that this baseline be chosen to estimate pollutant load reductions from Land Policy BMPs. When a jurisdiction develops its Phase III WIP with a specific Land Policy BMP, the net pollutant load reductions associated with that Land Policy BMP (compared to Current Zoning) count towards the jurisdiction's required reductions under its Phase III WIP planning targets. When counting reductions from Land Policy BMPs, it is important to remember that these reductions are derived from forecasted future conditions. The actual reductions associated with a Land Policy BMP may change over time as land use conditions are updated in CAST every two years.

[2] The 2017 Census of Agriculture is scheduled for release on April 11, 2019 and will incorporated into the CBP's extrapolations of trends in crops, hay, pasture, and animal populations in all 2025 projections produced from the summer of 2019 onward.

Expected changes in nitrogen, phosphorus, and sediment loads for each jurisdiction's custom Land Policy BMP compared to 2025 Current Zoning baseline loads are shown in Table 1. These custom, jurisdiction-specific, Land Policy BMPs may include unique mixtures of growth management, forest conservation, and farmland conservation actions. The effects of these collective actions on future land use conditions and septic systems were simulated using the CBLCM and then input to CAST to estimate their effects on pollutant loads. Negative values, i.e., reductions compared to the Current Zoning baseline, are in parentheses. As a percentage of the total needed load reductions required from 2018 – 2025 across all jurisdictions, Land Policy BMPs reduce nitrogen and phosphorus loads by <1% of what is required to meet the 2025 targets. While this contribution is relatively small, it is a contribution that is occurring and has not previously been accounted for in Watershed Implementation Plans. Moreover, Land Policy BMPs should be evaluated with the recognition that the impact of planning and land conversion actions will only increase over time as the population of the watershed continues to grow. This fact becomes increasingly relevant post-2025 when the pollution reduction targets must be maintained to prevent future water quality degradation.

The effects of Land Policy BMPs on nutrient loads are complex and can be counter-intuitive. Increases in pollutant loads may result from a Land Policy BMP with more, higher-loading land use acres (e.g., cropland) or fewer, lower-loading land use acres (e.g., forest) compared to the Current Zoning baseline. Land Policy BMPs may also decrease loads from one pollutant, e.g., phosphorus, while increasing loads from another, e.g., nitrogen. This occurs in the draft custom Land Policy BMP for Delaware because extrapolated changes in crop types from the Census of Agriculture lead to relatively large increases in nitrogen that counter the decreases in the developed sector due to growth management actions. These changes in crop type, however, cause only minor increases in phosphorus relative to the changes expected due to growth management actions, which is why the net change in phosphorus remains negative. Because the effects of Land Policy BMPs are complex, jurisdictions are encouraged to evaluate the effects and refine their Land Policy BMPs in ways that generate greater pollutant reductions while remaining realistic.

Table 1. Change in Total Pollutant Loads (Edge-of-Tide pounds of TN, TP, and TSS) associated with jurisdiction-specific Land Policy BMPs compared to the 2025 Current Zoning baseline.

Jurisdiction	TN	TP	TSS
District of Columbia	551	39	119,646
Delaware	30,365	(2,822)	(118,038)
Maryland	(69,433)	(4,949)	(3,494,531)
New York	-	-	-
Pennsylvania	(20,816)	(425)	(434,900)
Virginia	(283,782)	(14,159)	(10,231,241)
West Virginia	(890)	(146)	(74,279)

Current Land Policy BMPs in CAST

There are currently, as of April 2019, four Land Policy BMPs in CAST that include Forest Conservation, Growth Management, Agricultural Conservation, and Custom-Jurisdictional BMPs. The elements and assumptions composing each of these Land Policy BMPs are outlined below along with their expected impacts on land use nutrient sources from CAST.

Forest Conservation Land Policy BMP

Organizations and governments proactively pursuing a variety of actions to conserve forests and wetlands which provide the greatest benefits to wildlife, human safety, and water quality. Elements include:

- Conserve riparian zones (default width = 30m)
- Conserve wetlands (NWI, State Designated Wetlands, and Potential Conservable Wetlands (PA only))
- Conserve all lands subject to inundation due to sea level rise (default = 1m rise by the year 2100)
- Conserve all lands surrounding National Wildlife Refuges (default = 1 mile buffer)
- Conserve all large forest tracts (default >= 250 acres)
- Conserve Bay shorelines (default = 305m buffer (~1000-ft) of the tidal Bay and Atlantic shorelines)
- Conserve all high-value forest and forested wetlands identified by the Chesapeake Conservation Partnership

Growth Management Land Policy BMP

Organizations and governments proactively pursuing a variety of actions to encourage growth in areas with supporting infrastructure. Elements include:

- Increase proportion of growth occurring as infill/redevelopment (default = 10% per decade)
- Increase urban densities (default = 10% per decade)
- Increase proportion of urban vs rural growth (default = 10% per decade)
- Expand sewer service areas (default = ~1 mile))
- Avoid growth on all soils unsuitable for septic systems (based on depth to bedrock, drainage class, saturated hydraulic conductivity, and flood frequency)

Agricultural Conservation Land Policy BMP

Organizations and governments proactively pursuing a variety of actions to conserve farmland and productive soils. Elements include:

- Conserve all farmland within designated Agricultural Districts
- Conserve all lands within the floodplain (default = 100-year recurrence interval)
- Conserve all lands with flooded soils (default = frequently flooded)

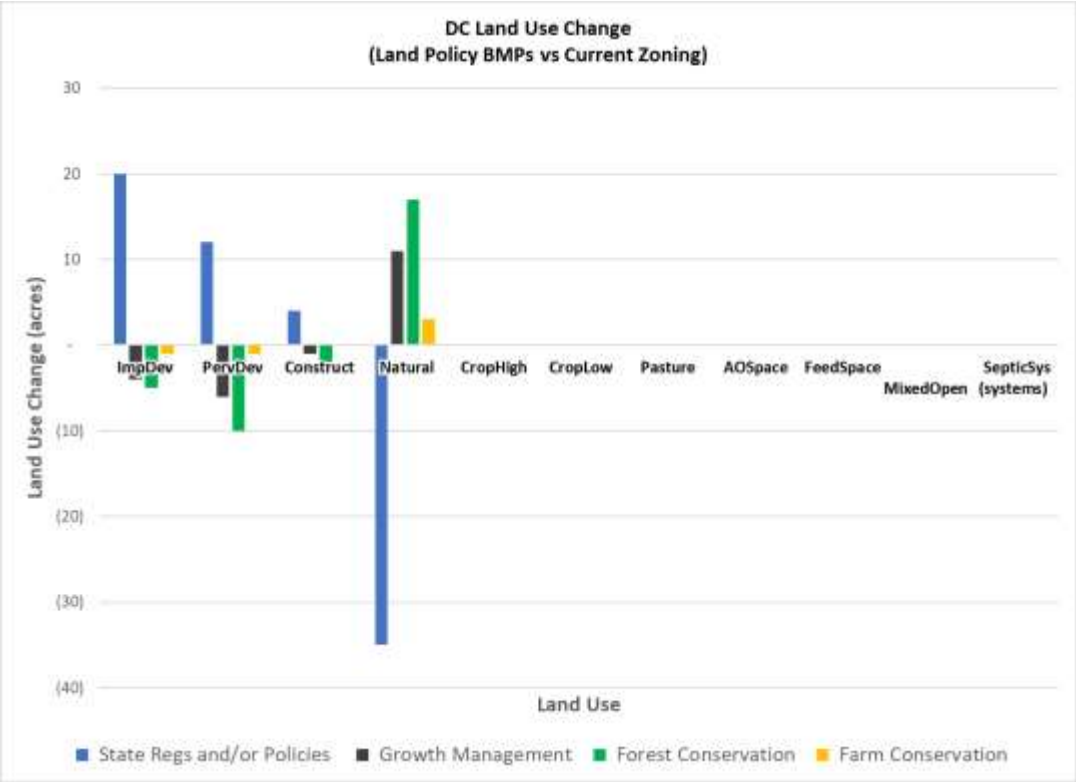
- Conserve all prime farmlands and farmland of state importance
- Conserve potential restorable wetlands (applies only to PA farmland)
- Conserve all high-value farmland identified by the Chesapeake Conservation Partnership

Custom-Jurisdictional Land Policy BMPs

Six of the seven Bay jurisdictions developed their own custom Land Policy BMPS which are described below along with the effects of nitrogen from all four Land Policy BMPs.

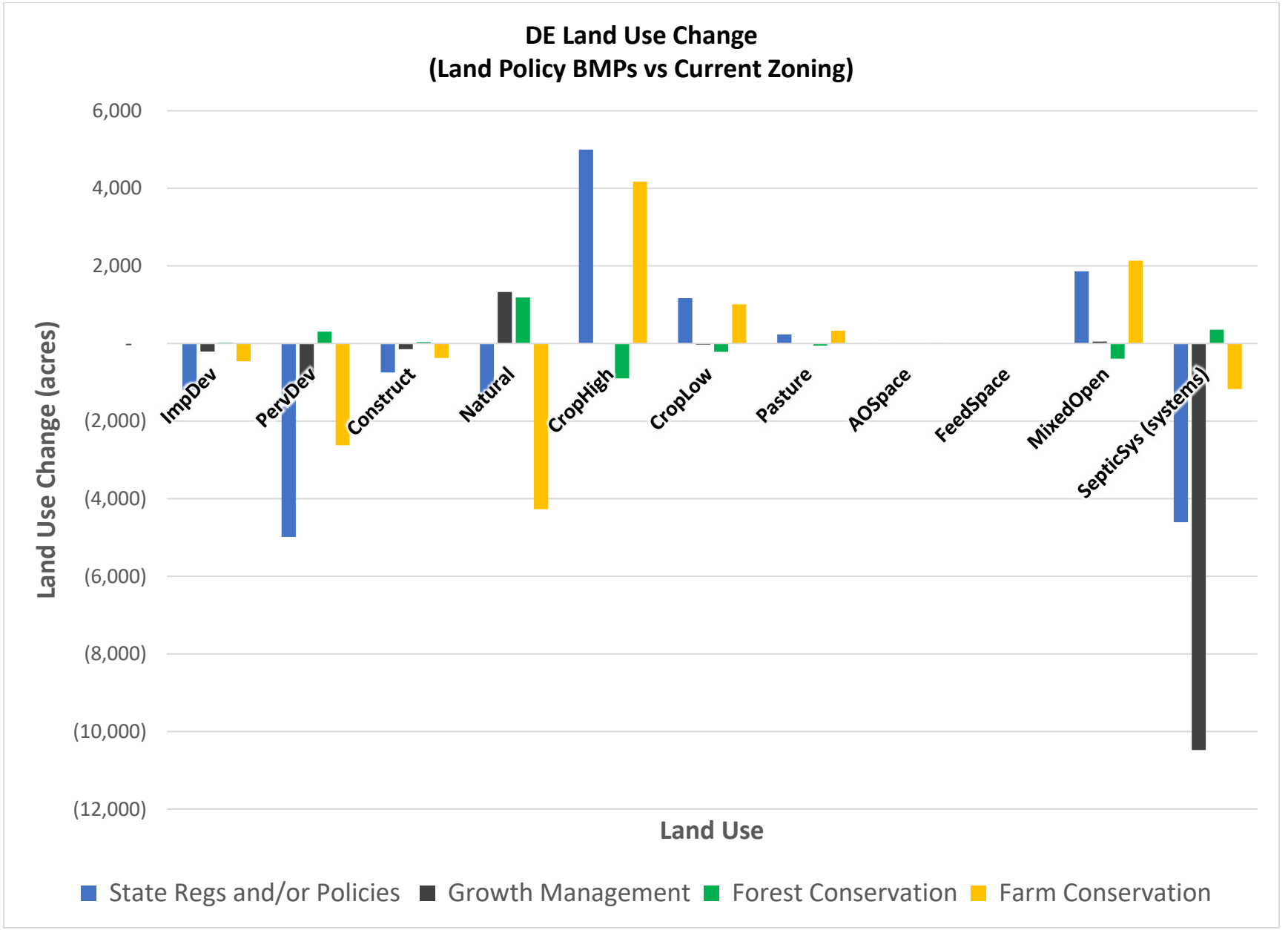
<u>District of Columbia</u>

- Restrict new development to areas where local forecasts indicate storm water management regulations will be triggered by future development and/or redevelopment activities.



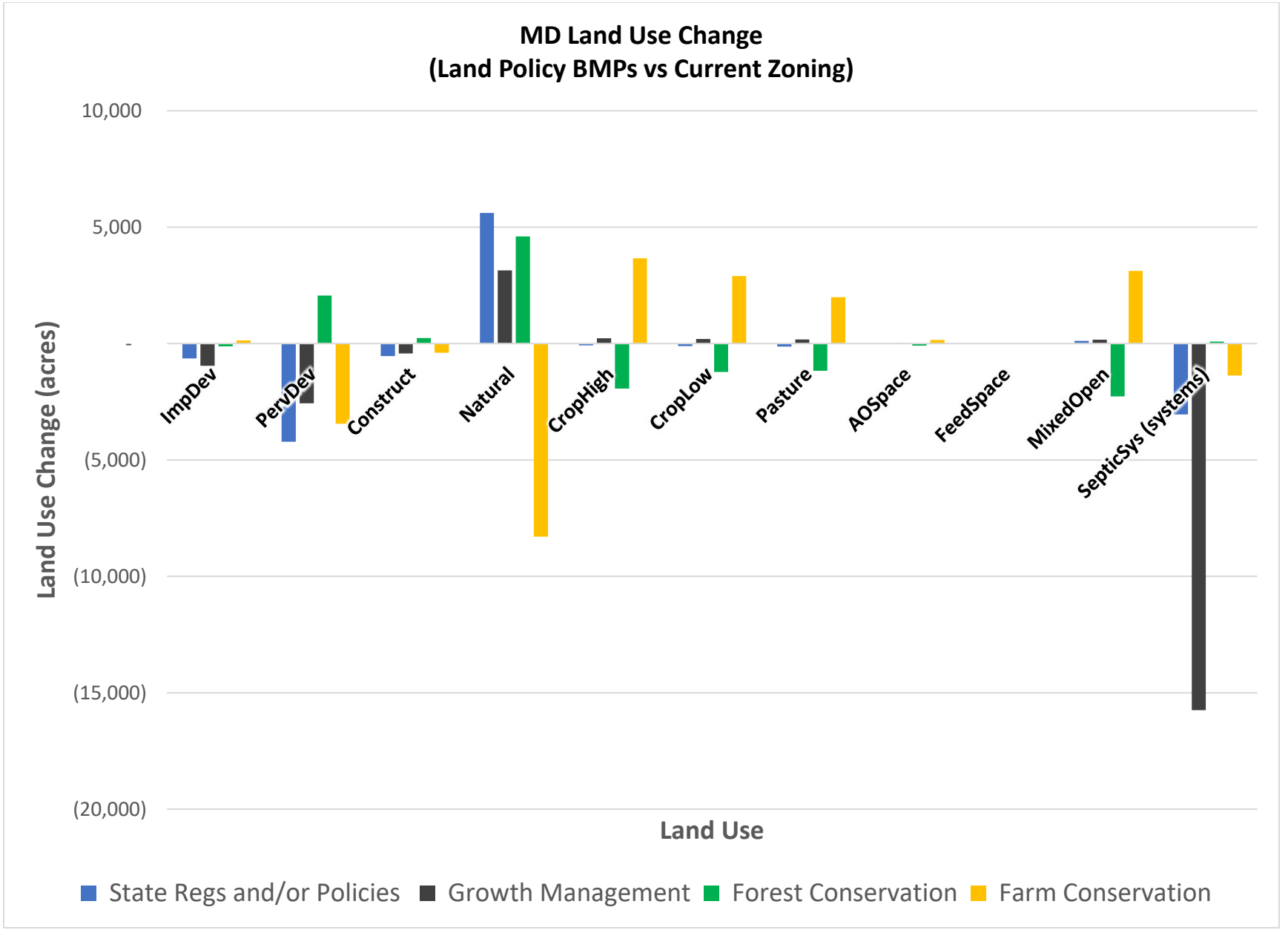
Delaware

- Conserve riparian zones excluding tax ditches (width = 30m)
- Conserve wetlands (NWI and State Designated Wetlands)
- Conserve all lands subject to inundation due to sea level rise (1m rise by the year 2100)
- Conserve all lands surrounding National Wildlife Refuges (0.5-mile buffer)
- Conserve all large forest tracts (>= 20 acres) in Legacy areas
- Conserve all Commercial Forest Plantation Areas
- Conserve all high-value forest and forested wetlands identified by the Chesapeake Conservation Partnership
- Increase proportion of growth occurring as infill/redevelopment (10% per decade)
- Increase urban densities (10% per decade)
- Increase proportion of urban vs rural growth (10% per decade)
- Expand sewer service areas in proportion to County-level demand for greenfield residential growth (i.e., 4-14%)
- Conserve all farmland within designated Agricultural Districts
- Conserve all lands within the floodplain (100-year recurrence interval)
- Conserve all lands with flooded soils (frequently flooded)
- Conserve all prime farmlands and farmland of state importance
- Conserve all center-pivot irrigated farmland parcels
- Conserve all high-value farmland identified by the Chesapeake Conservation Partnership


DE Land Use Change
(Land Policy BMPs vs Current Zoning)
6,000
4,000
2,000
-
(2,000)
(4,000)
(6,000)
(8,000)
(10,000)
(12,000)
Land Use Change (acres)
ImpDev
PervDev
Construct
Natural
CropHigh
CropLow
Pasture
AOSpace
FeedSpace
MixedOpen
SepticSys (systems)
Land Use
State Regs and/or Policies
Growth Management
Forest Conservation
Farm Conservation

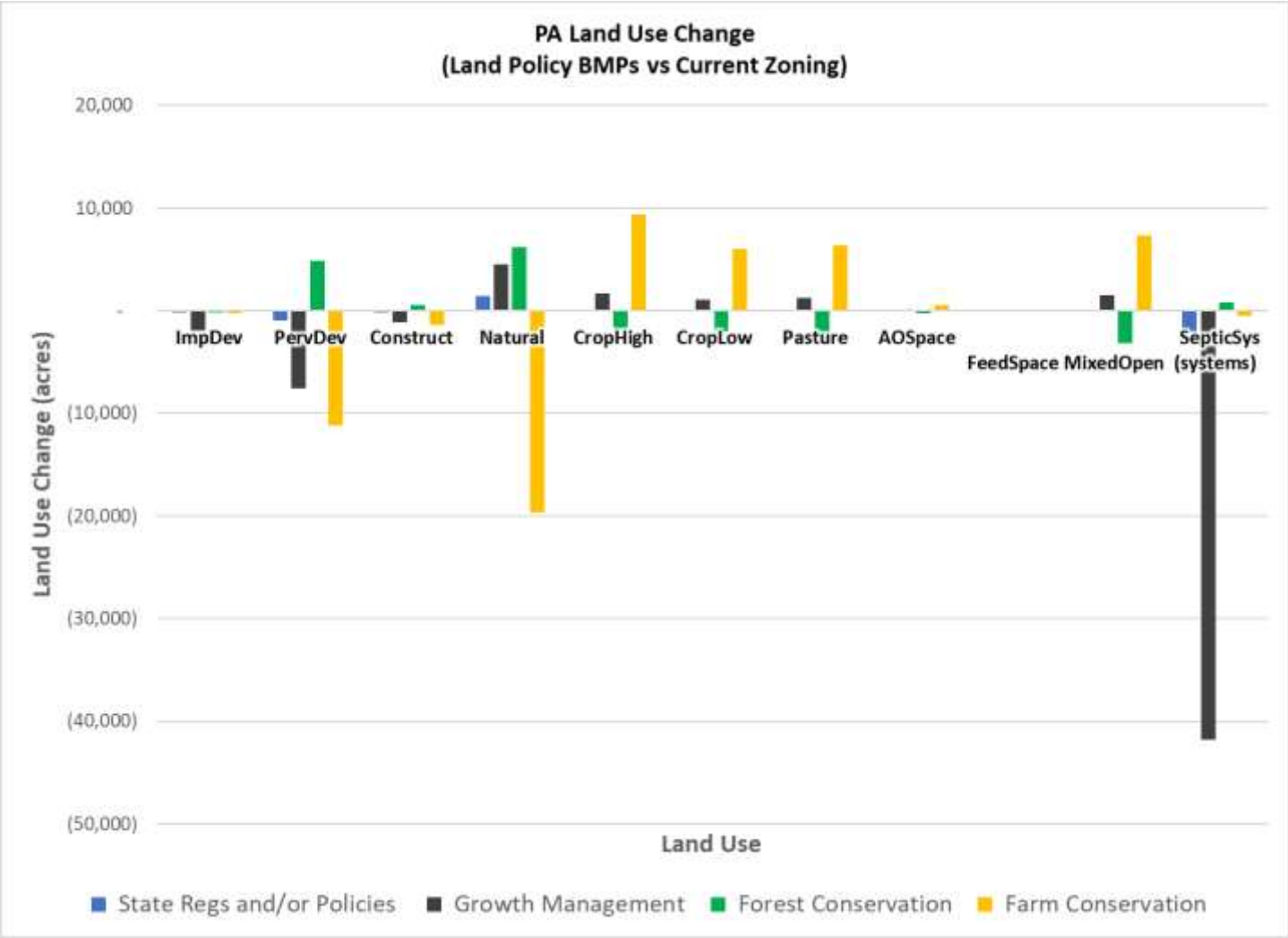
Maryland

- Reflect local and state regulations regarding maximum residential densities
- Update protected lands and include Resource Conservation Areas and Wetlands of Special State Concern thereby excluding them from growth
- Conserve forests within 100 ft riparian buffer zones
- Protect the shoreline (100-ft buffer)
- Stochastically simulate conservation within 100 ft riparian farmland buffers based on CREP acres per county using a simple random allocation
- Stochastically simulate conservation of 15% forest within CBLCM modeled "urban" septic areas, weighted allocation based on residential and commercial development probabilities.
- Conserve all P6 model wetlands
- Stochastically simulate rate of forest conservation by County based on participation in state programs and land trust activities using a simple random allocation
- Stochastically simulate rate of farmland conservation by County based on participation in state programs and land trust activities using a simple random allocation


MD Land Use Change
(Land Policy BMPs vs Current Zoning)
10,000
5,000
-
(5,000)
(10,000)
(15,000)
(20,000)
Land Use Change (acres)
ImpDev
PervDev
Construct
Natural
CropHigh
CropLow
Pasture
AOSpace
FeedSpace
MixedOpen
SepticSys (systems)
Land Use
State Regs and/or Policies
Growth Management
Forest Conservation
Farm Conservation

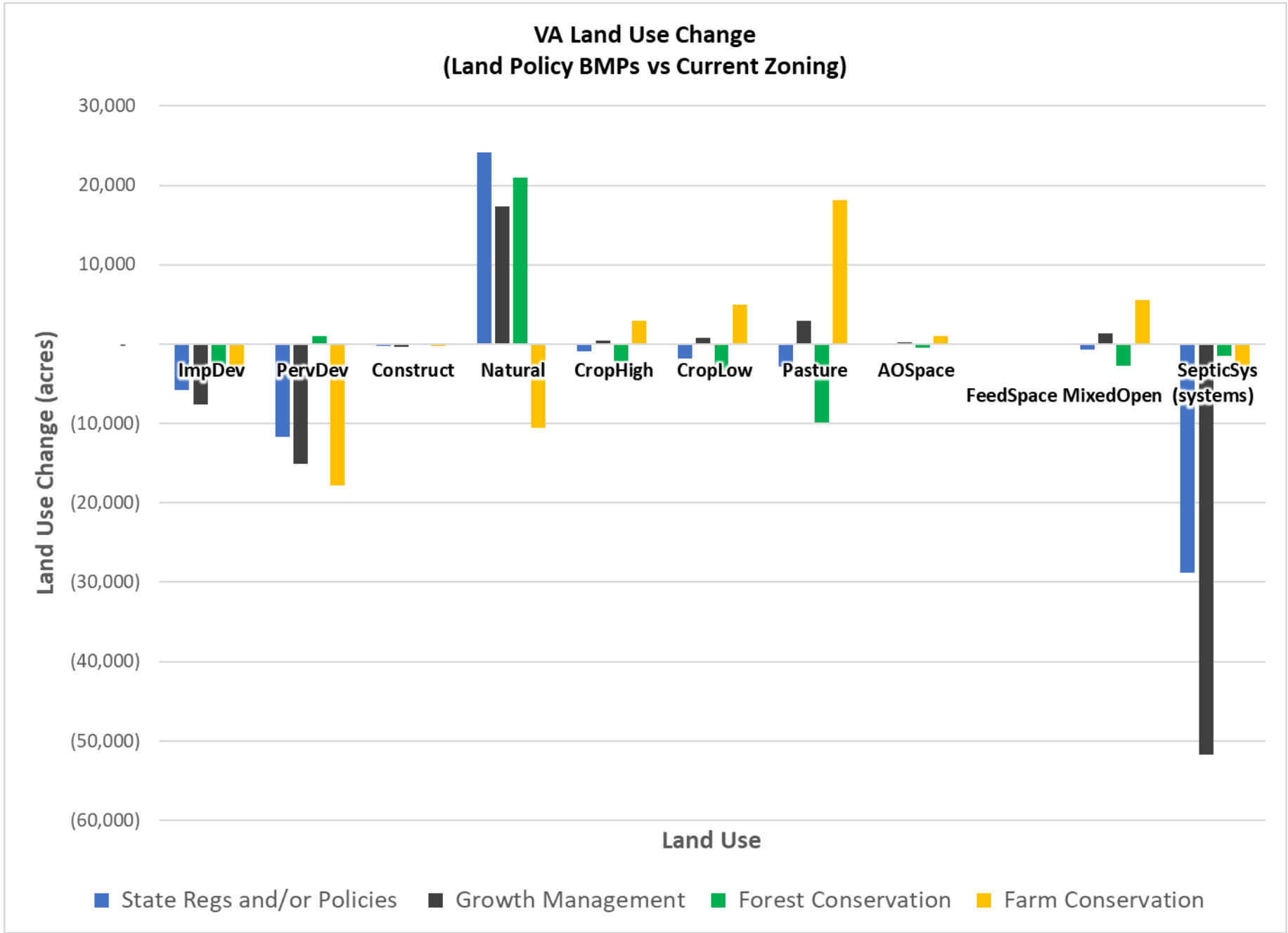
Pennsylvania

- Conserve wetlands (National Wetlands Inventory)
- Stochastically simulate rate of forest conservation by County based on participation in state programs and land trust activities.
- Stochastically simulate rate of farmland conservation by County on participation in state programs and land trust activities.



Virginia

- Conserve riparian zones (100-ft; 30m)
- Conserve shorelines (100-ft; 30m)
- Conserve wetlands (National Wetlands Inventory)
- Conserve all large forest tracts (>=100 acres with high conservation value)
- Increase proportion of growth in urban areas and sewer service areas by 10%
- Simulate a 10% increase in Census Urban Areas and Clusters and Sewer Service Areas
- Simulate a 10% increase in the amount of infill and redevelopment
- Simulate a 10% increase in the density of the Census Urban Areas and Clusters
- Conserve all designated Agricultural and Forestal Districts as defined by § 58.1-3230
- Conserve 100-year floodplain
- Conserve prime farmlands and farmland of state importance (100 acres or more)


VA Land Use Change
(Land Policy BMPs vs Current Zoning)
30,000
20,000
10,000
-
(10,000)
(20,000)
(30,000)
(40,000)
(50,000)
(60,000)
Land Use Change (acres)
ImpDev
PervDev
Construct
Natural
CropHigh
CropLow
Pasture
AOSpace
FeedSpace
MixedOpen
SepticSys (systems)
Land Use
State Regs and/or Policies
Growth Management
Forest Conservation
Farm Conservation

West Virginia

- Stochastically simulate rate of forest conservation by County based on public and private efforts (with updated County rates). Preferentially allocate conservation using Chesapeake Conservation Atlas forest priorities.
- Stochastically simulate rate of farmland conservation by County based on public and private efforts (with updated County rates). Preferentially allocate conservation using Chesapeake Conservation Atlas farmland priorities.