

CBP MODELING UPDATE

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WRTC Meeting
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Today's Presentation

- Showing Bay Program watershed model results through 2021
- All results use CAST 21 (Chesapeake Assessment Scenario Tool) model framework
 - Mostly focus on total nitrogen (TN) edge of tide (EoT) results
- Bay Program partners have disagreed on the use of CAST 21
 - Controversy over newly revised ag and urban fertilizer numbers using AAPFCO data (resulting in 6-million-pound TN load increase)
 - Emerging consensus to address these loads post 2025 using new watershed model -- Phase 7

Today's Themes

- CAST controversy largely about loads from agriculture
 - Wastewater loads are measured, not modeled
 - Urban runoff loads are not that different in the various CAST versions
- Agricultural load reductions are proving very difficult to achieve
 - Issues include scientific and economic considerations
- Need for urban regions to maintain consensus on what we have been doing:
 - Achieved wastewater reduction goals and continue stormwater BMP implementation while addressing new flood resilience issues

CAST 21 Versus CAST 19

- Newest version of CAST would correct for omissions in earlier versions

Change in Nutrient Loads to the Chesapeake Bay

Differences between CAST versions by source; 2021 Progress scenario

		Nitrogen Loads						
		CAST19	CAST19	CAST21	CAST19	CAST19 to CAST21	CAST19 to CAST21	
		Current	Corrected Fertilizer (2013-2014)	All Updates	Change w/ Corrected Fertilizer Data	Change From Other Data and Method Updates	Total Change From Updates	
		(M lbs)	(M lbs)	(M lbs)	(M lbs)	(M lbs)	(M lbs)	
CB Watershed	Agriculture	117.059	121.779	122.632	4.721	0.853	5.573	
CB Watershed	Developed	40.269	40.269	40.359	0	0.091	0.091	
CB Watershed	Wastewater	29.969	29.969	29.969	0	0	0	
CB Watershed	Septic	7.845	7.845	7.792	0	-0.053	-0.053	
CB Watershed	Natural	45.311	45.558	45.595	0.247	0.036	0.283	
CB Watershed	All Sources	240.454	245.421	246.348	4.967	0.927	5.894	
		Phosphorus Loads						
		CAST19	CAST19	CAST21	CAST19	CAST19 to CAST21	CAST19 to CAST21	
		Current	Corrected Fertilizer (2013-2014)	All Updates	Change w/ Corrected Fertilizer Data	Change From Other Data and Method Updates	Total Change From Updates	
		(M lbs)	(M lbs)	(M lbs)	(M lbs)	(M lbs)	(M lbs)	
CB Watershed	Agriculture	4.076	4.190	4.041	0.113	-0.149	-0.035	
CB Watershed	Developed	2.648	2.648	2.181	0	-0.467	-0.467	
CB Watershed	Wastewater	2.317	2.317	2.317	0	0	0	
CB Watershed	Septic	0.004	0.004	0.004	0	0	0	
CB Watershed	Natural	5.667	5.701	5.506	0.034	-0.195	-0.161	
CB Watershed	All Sources	14.713	14.860	14.050	0.147	-0.810	-0.663	

Slide courtesy of Chesapeake Bay Program



TN Rate of Progress

- Bay Program acknowledges its 2025 TN reduction target is “**off course**” in its latest Biennial Strategy review
- Currently predicting achievement of TN 2025 WIP target in 2033 -- **???** -- at current rate of progress

Modeled Nitrogen Loads to the Chesapeake Bay (1985-2021)

Loads simulated using CAST19 and jurisdiction-reported data on wastewater discharges. *The natural sector includes, in part, forests and wetlands which are preferable land use types with the lowest loading rates among sources.

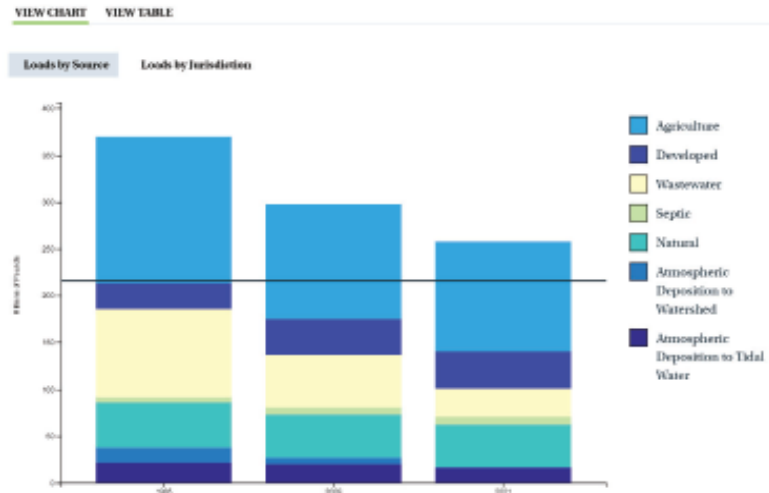
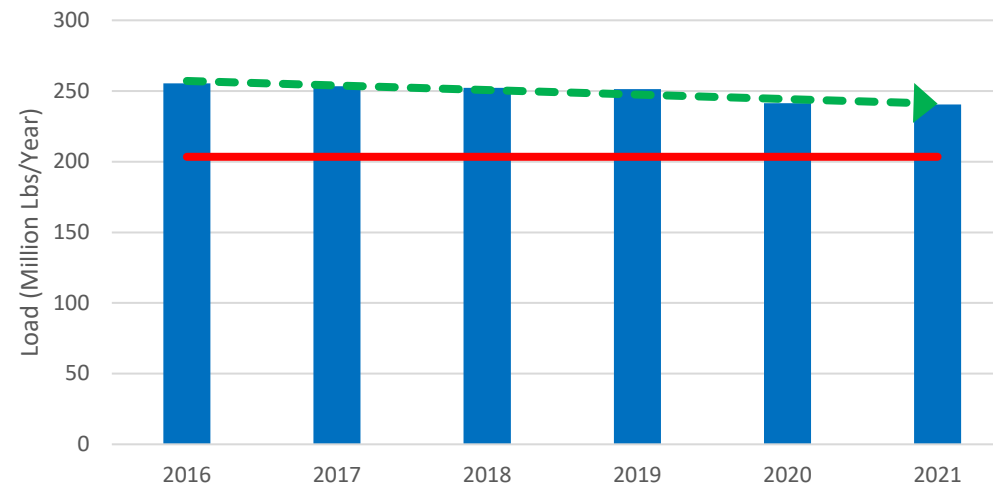
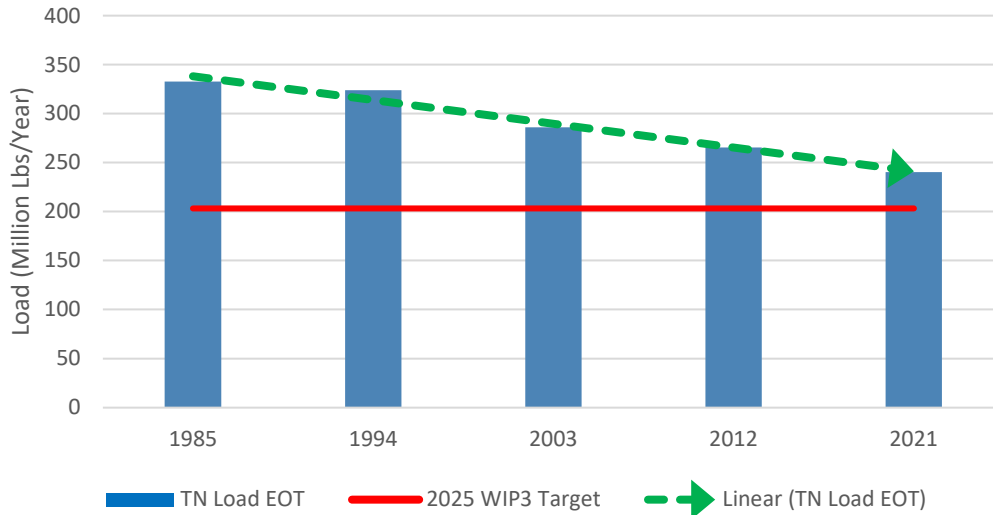


Figure 1. Modeled Nitrogen Loads to the Chesapeake Bay (1985-2021).
Source: [Chesapeake Progress](#).

Graphic from Bay Program’s Aug. 12 draft of Biennial Strategy Review

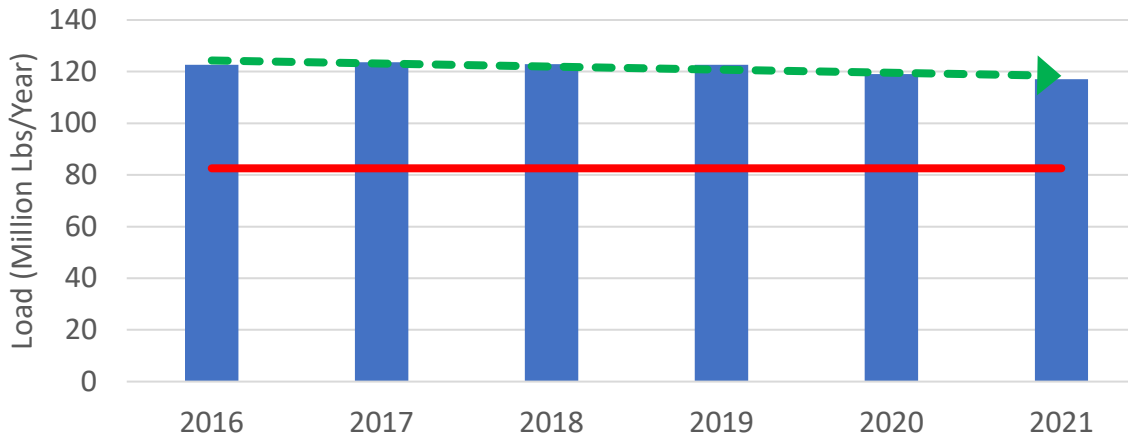
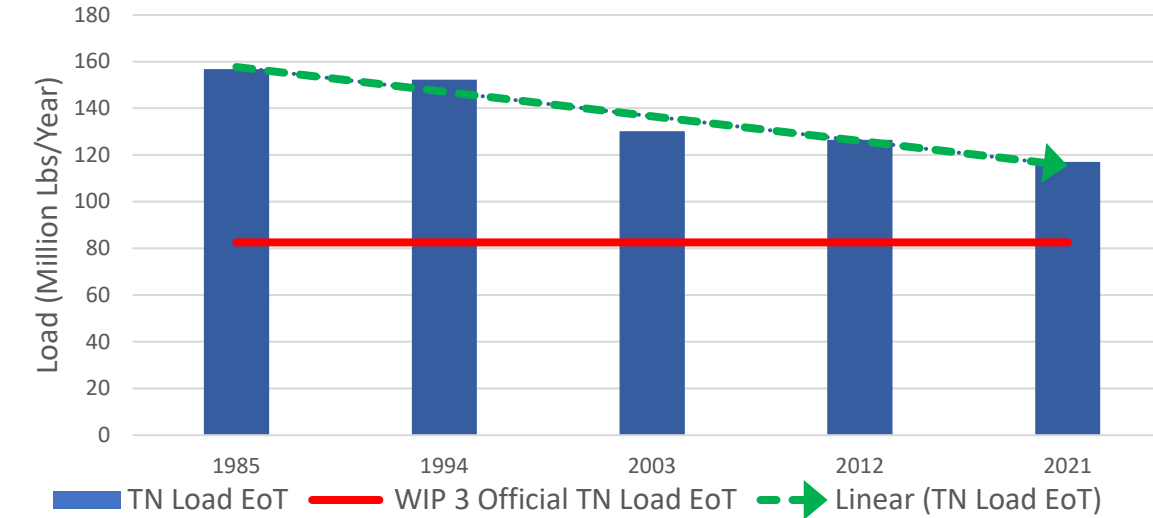
TN Long- and Short-Term Trends – All Sources



- Most of TN reduction from 1985 – 2015 came from wastewater
- Reduction trajectory in recent years much lower, reflecting little progress by other sectors



TN Long- and Short-Term Trends - Ag



- Much of Ag TN reduction from 1985-2015 was result of less acres
- Lower progress from 2016-2021 reflects difficulty of reducing ag loads



TP Rate of Progress

- Bay Program acknowledges “**off course**” for TP reduction by 2025
- Currently predicting achievement of TP 2025 WIP target in 2028 -- ??? -- at current rate of progress

Modeled Phosphorus Loads to the Chesapeake Bay (1985-2021)

Loads simulated using CAST10 and jurisdiction-reported data on wastewater discharges. *The natural sector includes, in part, forests and wetlands which are preferable land use types with the lowest loading rates among sources.

[VIEW CHART](#) [VIEW TABLE](#)

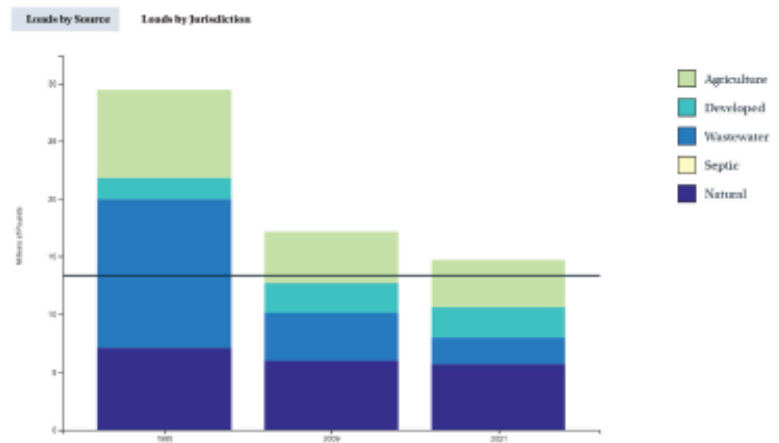
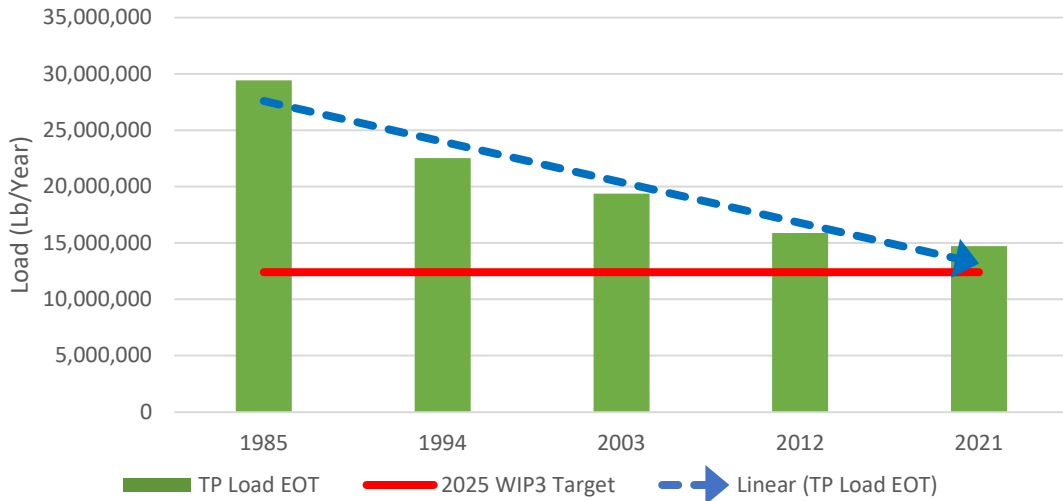


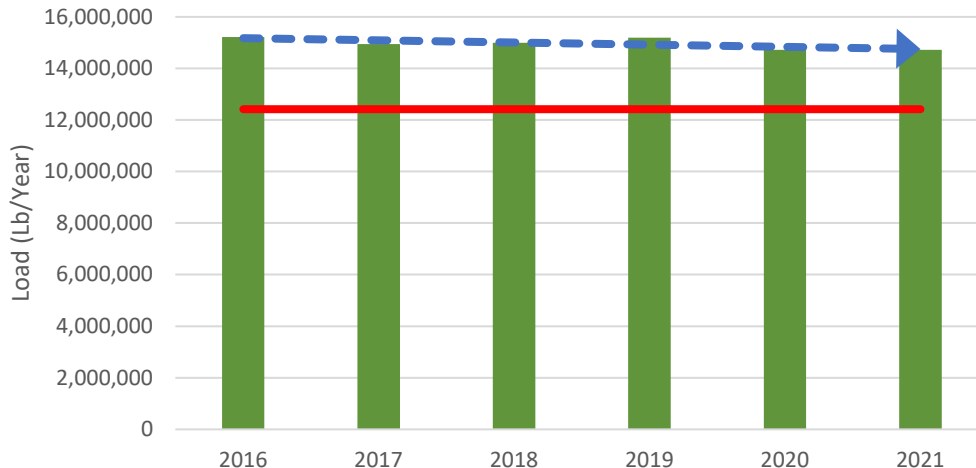
Figure 2. Modeled Phosphorus Loads to the Chesapeake Bay (1985-2021).
Source: [Chesapeake Progress](#).

Graphic from Bay Program’s Aug. 12 draft of Biennial Strategy Review

TP Long and Short-Term Trend – All Sources

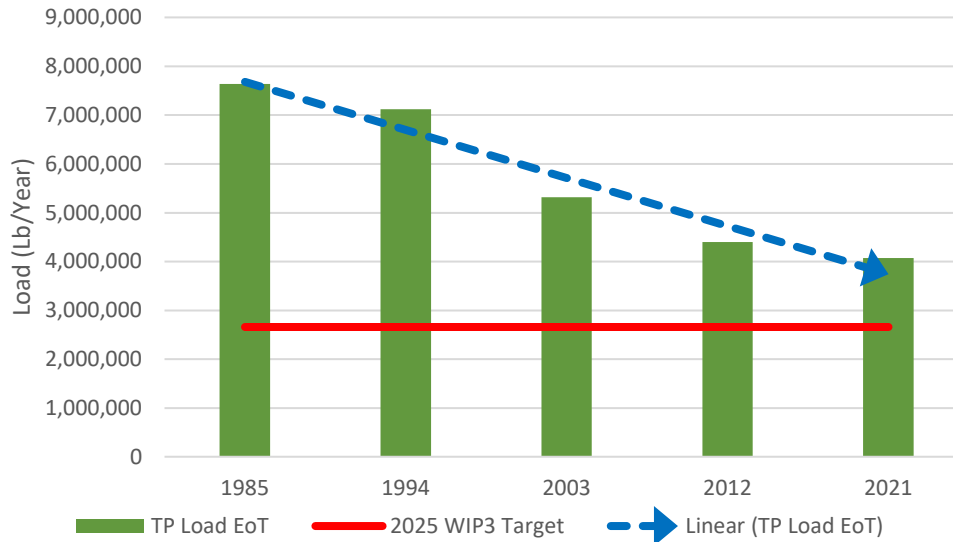


- Much of TP reduction from 1985 – 2015 came from wastewater, although ag also made progress



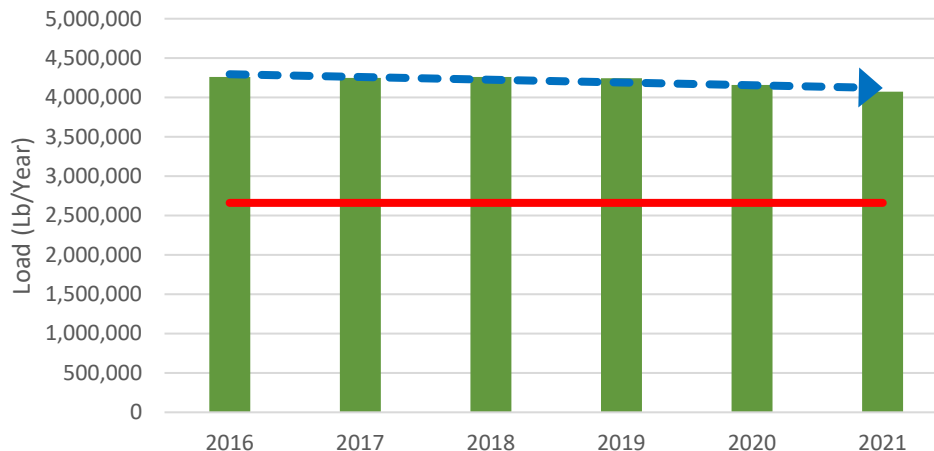
- Reduction trajectory in recent years is lower, but target is reachable

TP Long- and Short-Term Trends - Ag



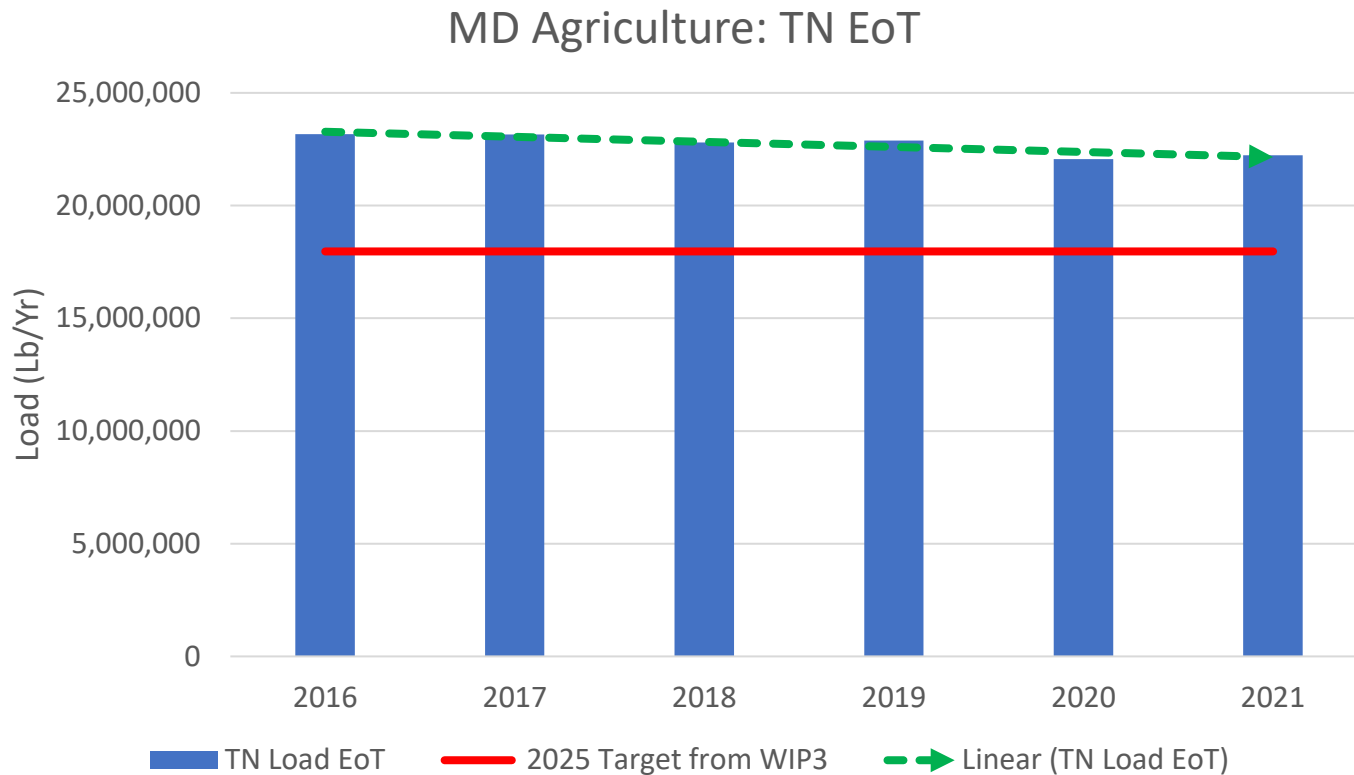
- Some of Ag TP reduction from 1985-2015 was result of less acres

- Although progress trajectory from 2016-2021 is lower than before, Ag may eventually reach 2025 WIP target



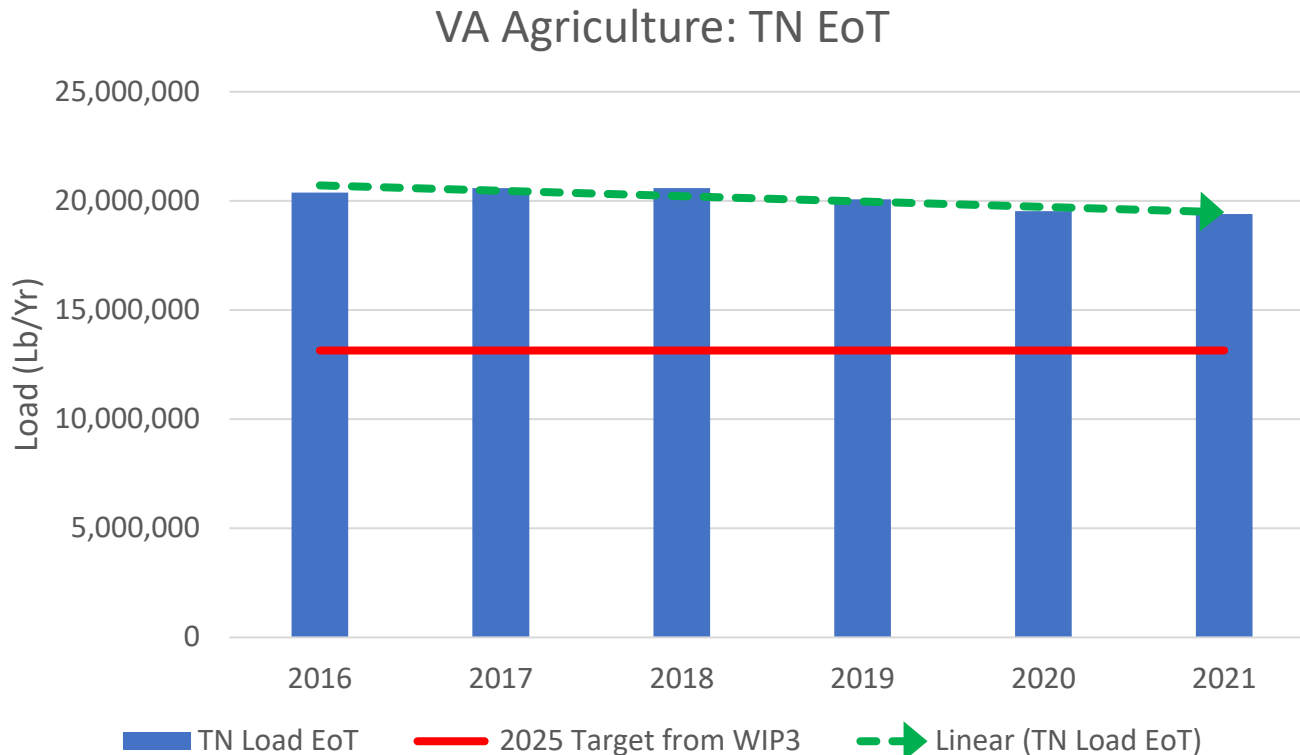
Recent Ag Trend - Maryland

Will not meet 2025 WIP target based on recent trajectory



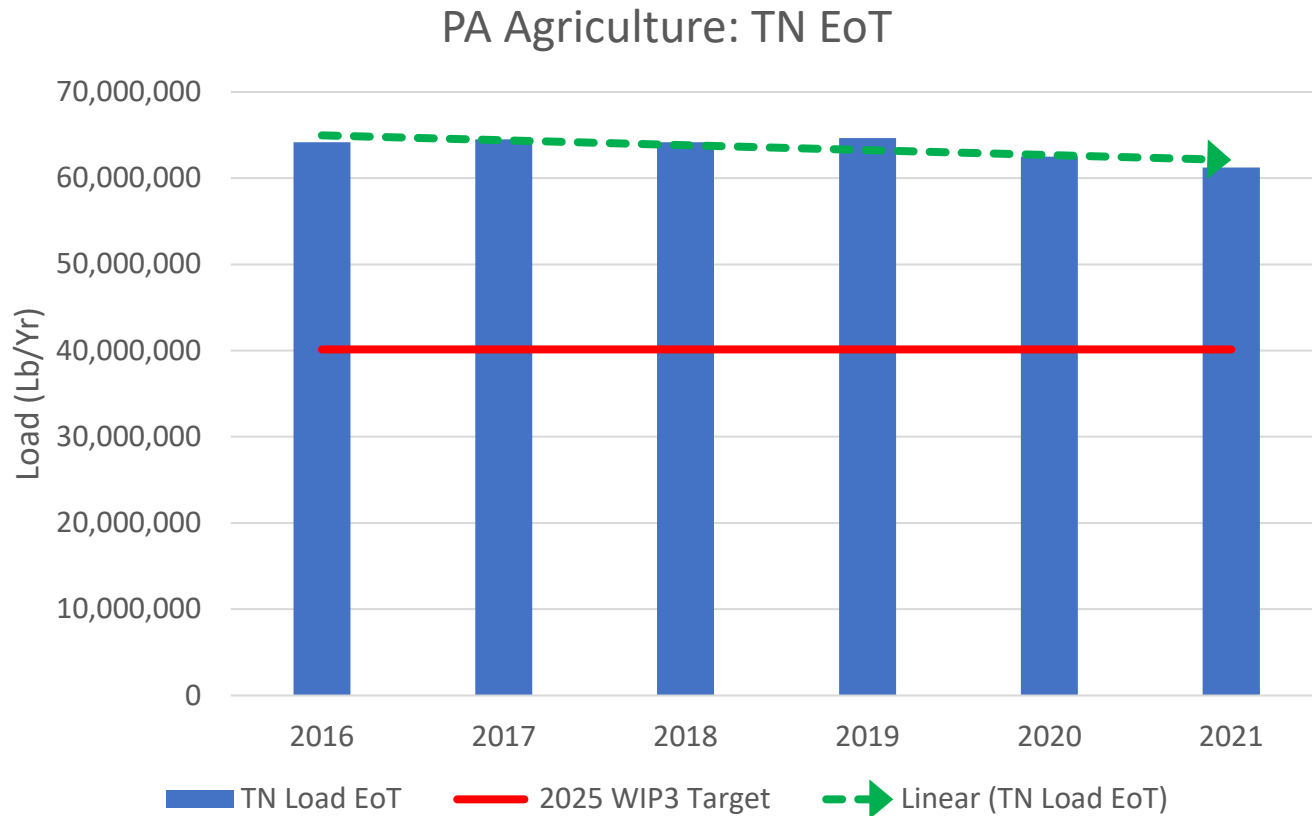
Recent Ag Trend - Virginia

Will not meet 2025 WIP target based on recent trajectory



Recent Ag Trend - Pennsylvania

Will not meet 2025 WIP target based on recent trajectory



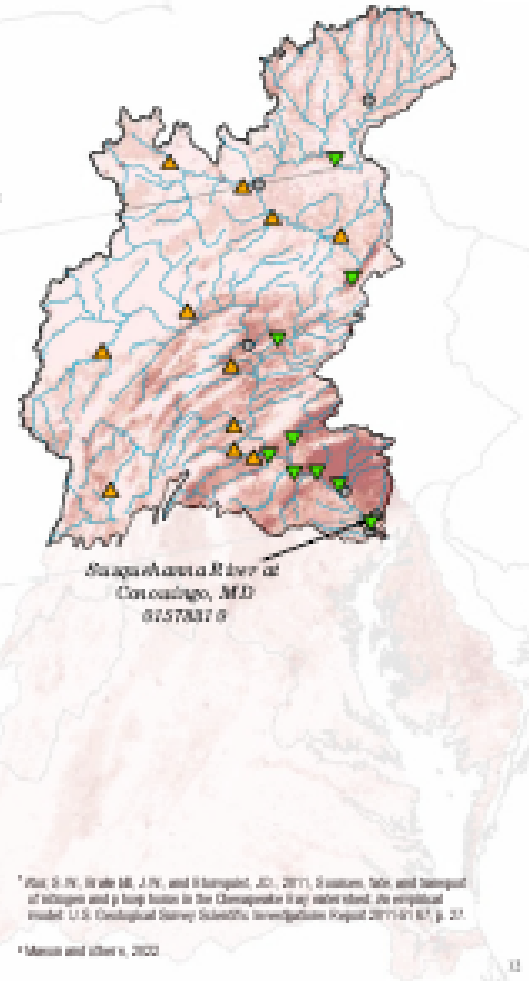
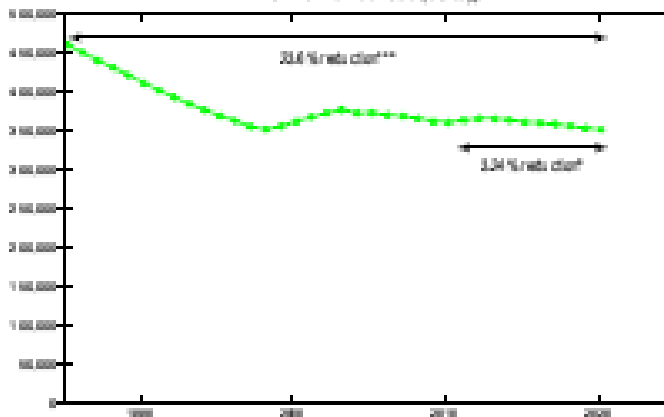
Monitoring Results - Pennsylvania

Trends in nitrogen loads result from changing nitrogen inputs or transport

The most recent ten year period in the Susquehanna Basin, 2011-2020¹



River Input Monitoring station
Susquehanna River at Conowingo, MD
Flow-normalized Load (kg/day)



Slide presented by Chris Mason of USGS showing most recent results from Bay Program's non-tidal monitoring network

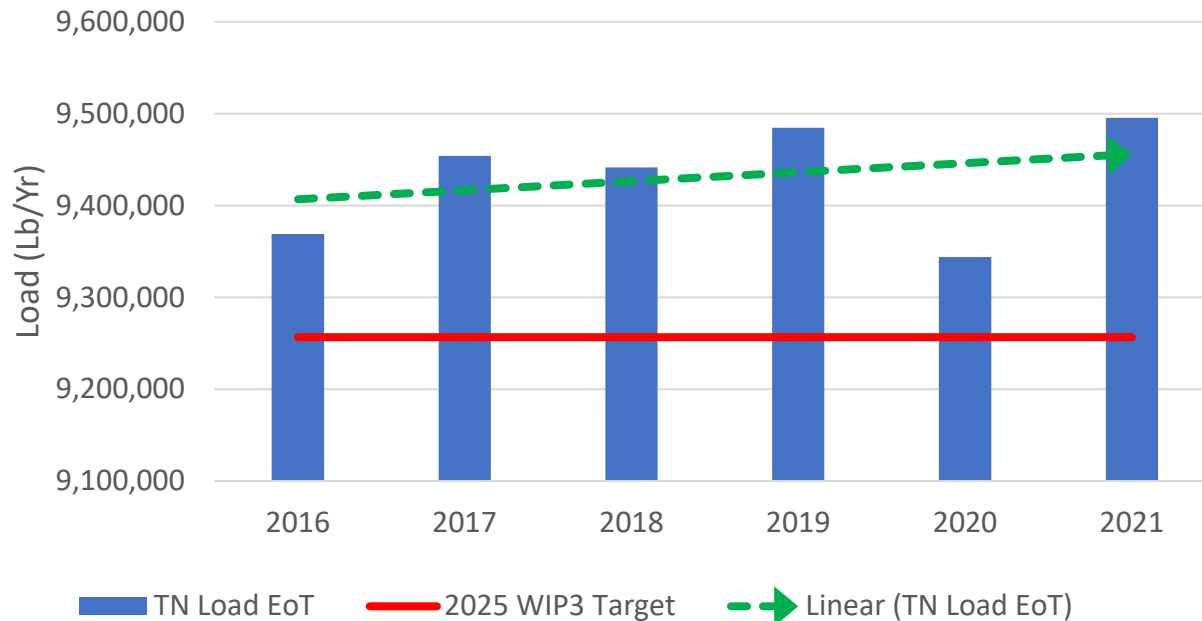
<https://www.usgs.gov/centers/chesapeake-bay-activities/science/chesapeake-bay>



Recent Developed Trend - Maryland

Loads continue to increase (up 1.3%)
slightly more than increase in acres (up 0.9%)

MD Developed: TN EoT

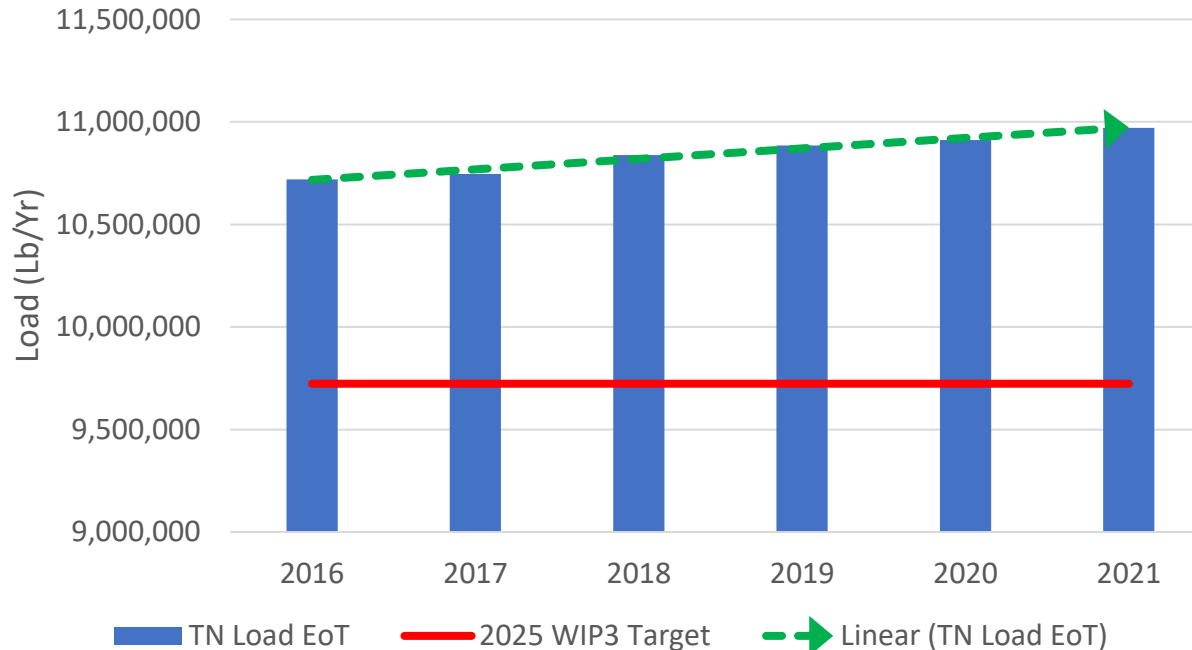


Caveat: load numbers do not include impact of stream restoration BMPs

Recent Developed Trend - Virginia

Loads continue to increase (up 2.3%)
slightly less than increase in acres (up 2.8%)

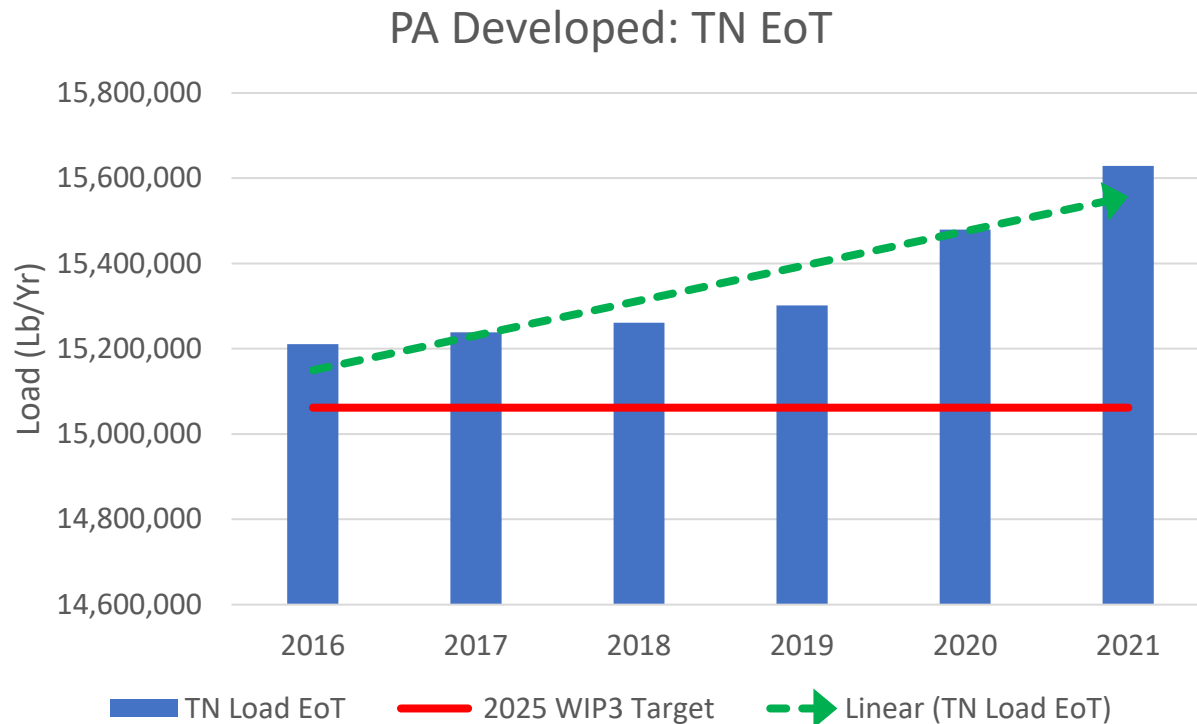
VA Developed: TN EoT



Caveat: load numbers do not include impact of stream restoration BMPs

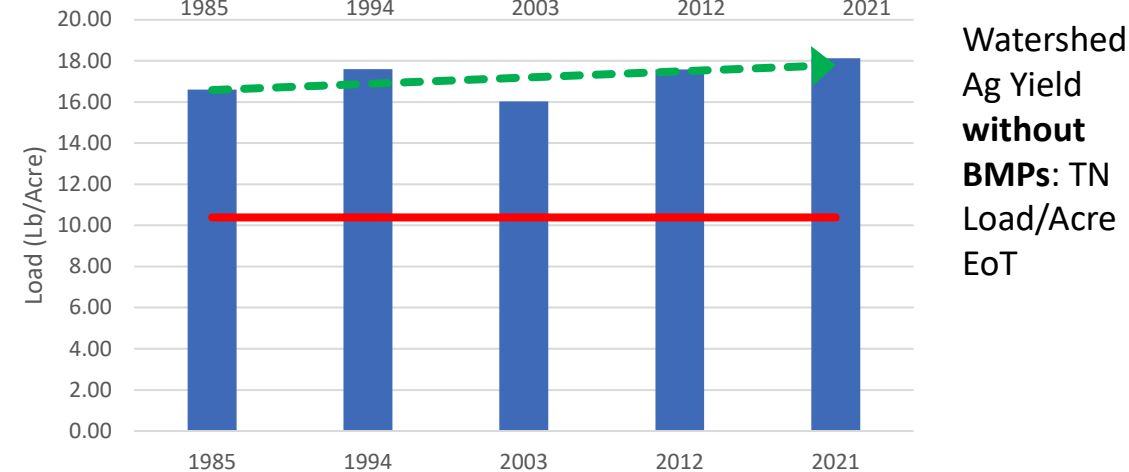
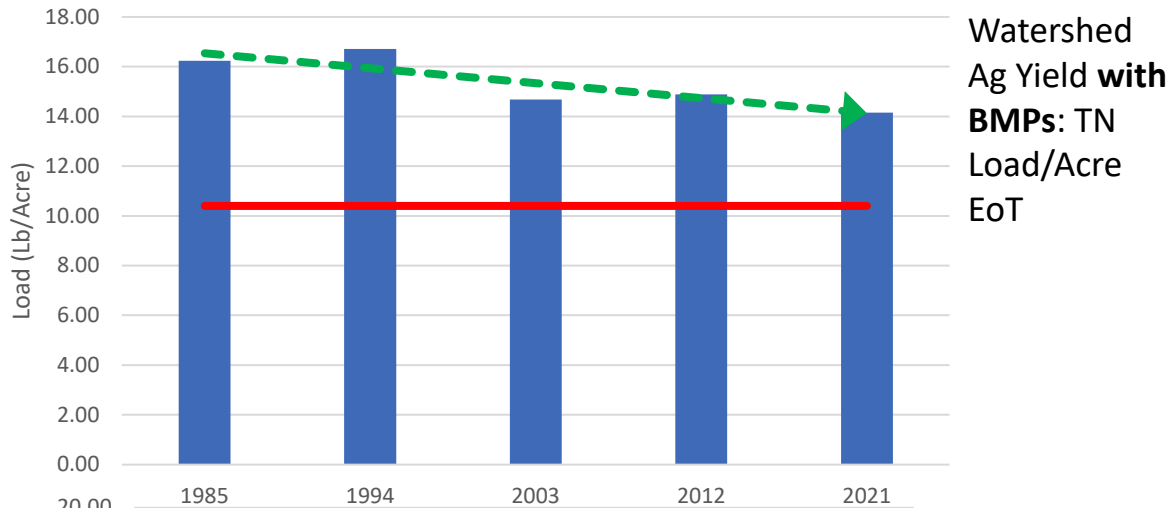
Recent Developed Trend - Pennsylvania

Loads continue to increase (up 2.7%)
slightly more than increase in acres (up 0.9%)



Caveat: load numbers do not include impact of stream restoration BMPs

Ag: A Closer Look



Ag is making progress if you consider increase in inputs of fertilizer and manure over time

■ TN Lb/Acre EoT — 2025 WIP3 Target - - - -> Linear (TN Lb/Acre EoT)



What's Happening with Ag

- Ag acres continue to decline across entire Bay watershed
 - Down 14.3 % from 1985 to 2021
- Manure inputs declined until about 2010, but have increased slightly since then
 - Total pounds of manure down 6.1 % from 1985 - 2021
 - But pounds of manure/acre up 10%
- Fertilizer input/acre has increased as yields have increased
- Ag BMPs have had an impact, but reductions have been offset by **increased intensity** of ag production

Take Home Points

- Restoration effort will not meet target reductions in 2025
 - Wastewater only sector that is meeting or exceeding 2025 WIP targets; attainment of 2025 WIP targets by MD, VA and DC all depend on wastewater sector exceeding its WIP goals
 - Urban stormwater loads have increased with increase in acres
 - Ag loads have not decreased with decrease in acres
- Climate change and dynamic equilibrium in lower Susquehanna dam system (aka: Conowingo) also make attainment harder to achieve (more reductions are needed)
- New accounting, new WIP likely in 2025-2027
 - EPA and state pressure to reduce urban loads will continue post 2025
 - Wastewater sector may face pressure to do more as capacity reserved for future growth is used post 2025

