

# Integrated Watershed TMDL Indicator and Dashboard Products

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STWG

03/13/2022

# Purpose of presentation

- Update on Integrated Watershed-Wide Indicator
  - TMDL-required Reduction of N and P separated into:
    - Implemented and realized
    - Implemented but lagged
    - Future Implementation
    - + other smaller categories
- Discussion of station-level dashboard products
  - Compare expectations to monitored trends

# WIP Indicator

We've almost hit the target level of implementation?



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

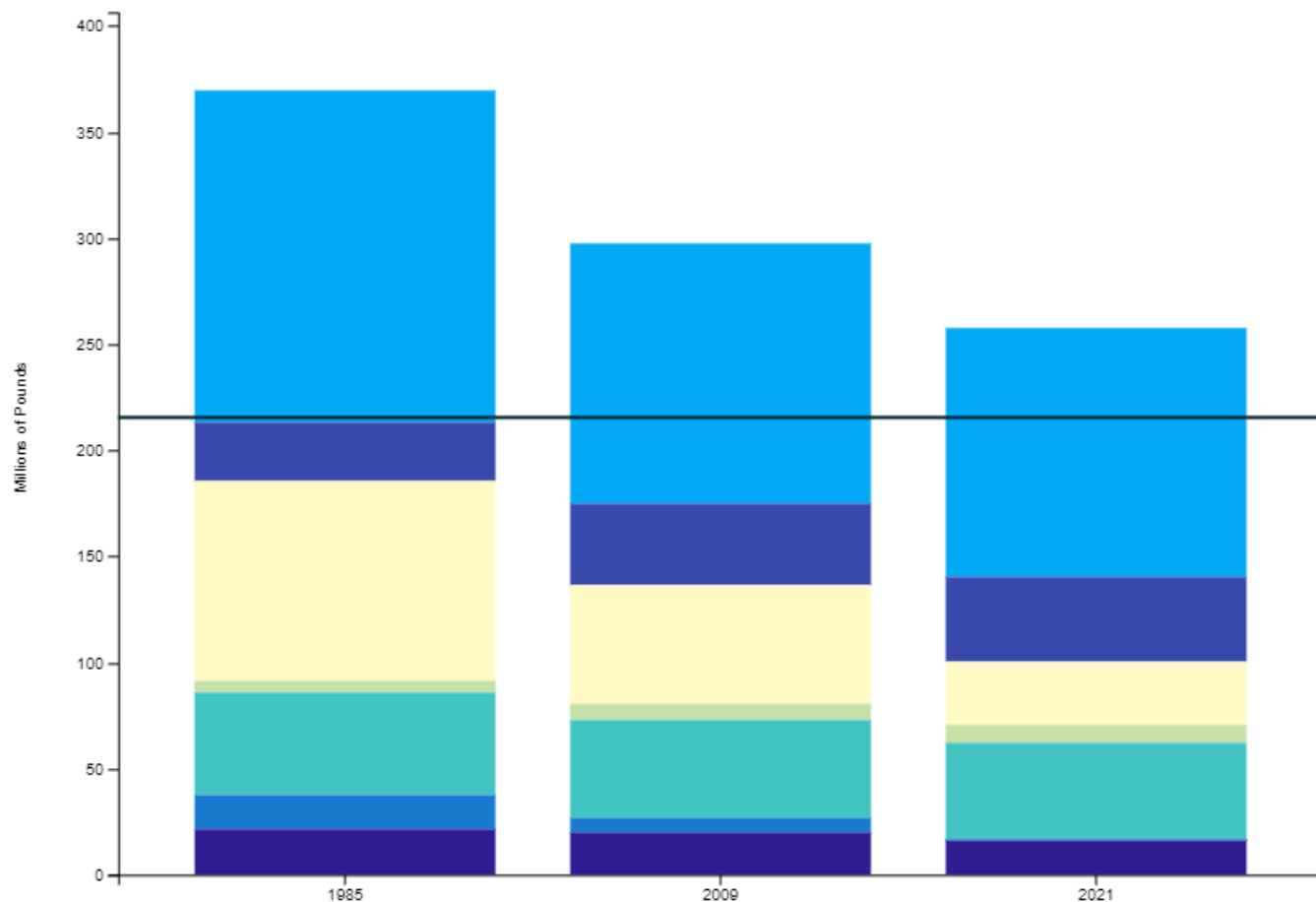
Loads simulated using CAST19 and jurisdiction-reported data on wastewater discharges. \*The natural sector wetlands which are preferable land use types with the lowest loading rates among sources.

[VIEW CHART](#)

[VIEW TABLE](#)

Loads by Source

Loads by Jurisdiction



# Nontidal Load Indicator

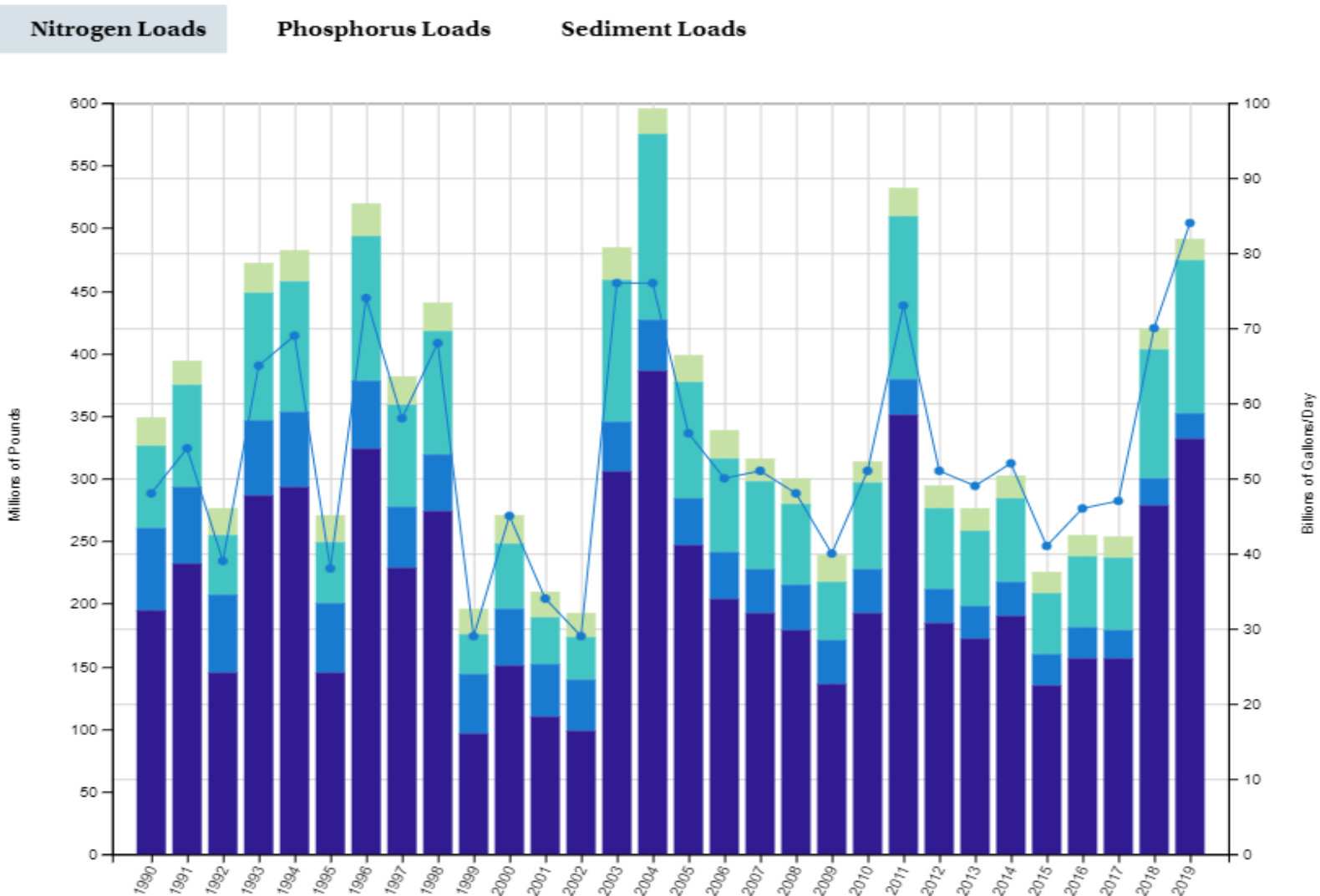
Extreme variability  
No Clear Trend

## Pollution Loads and River Flow to the Chesapeake Bay (1990-2019)

River and Watershed Input of Pollution Loads

[VIEW CHART](#)

[VIEW TABLE](#)



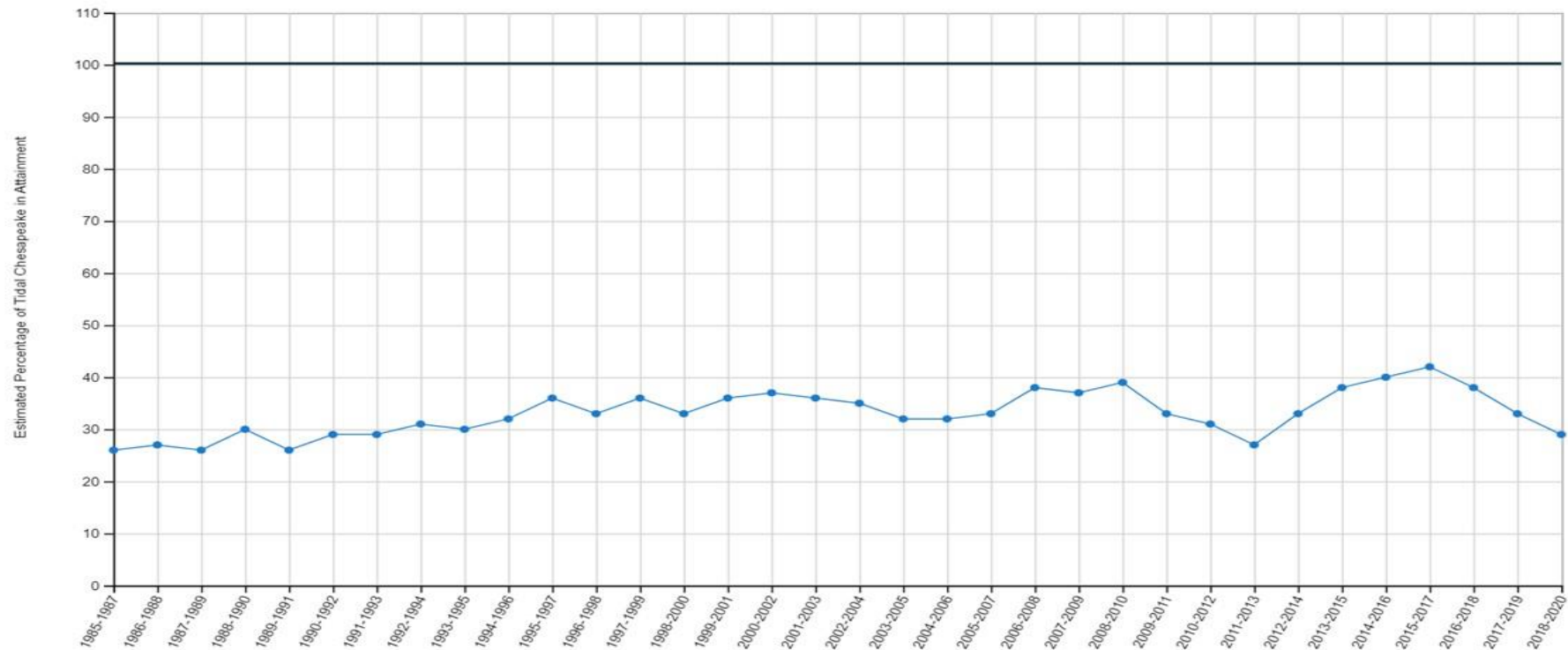
# Tidal Water TMDL Indicator

Very slow  
positive change

## Water Quality Standards Attainment (1985-2020) ▲

Water quality is evaluated using three parameters: dissolved oxygen, water clarity or underwater grass abundance, and chlorophyll a (a measure of algae growth).

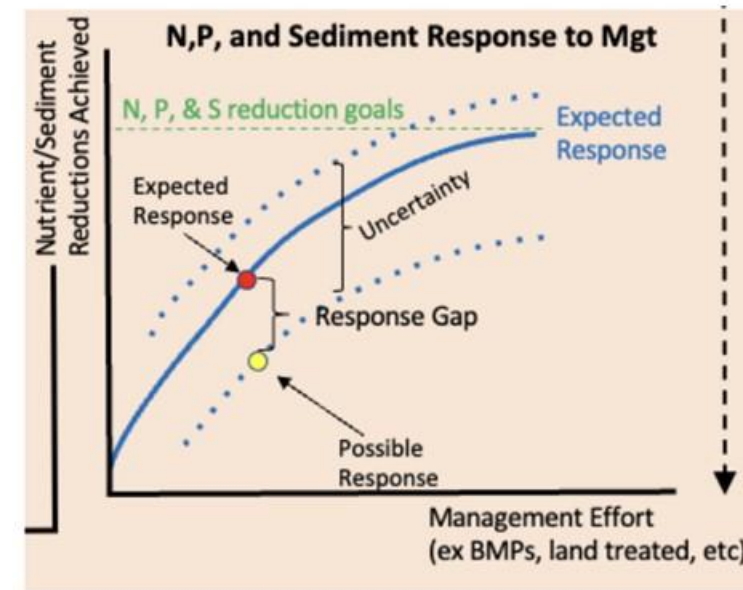
[VIEW CHART](#) [VIEW TABLE](#)



# STAC Comprehensive Evaluation of System Response Report

## Watershed Framing Questions

- Is the physical and social system responding to management efforts to meet TMDL N, P, and S goals in ways consistent with expectations?
- What are the major uncertainties in efforts to reduce N, P, and S stressors delivered to the Chesapeake Bay?
- What management actions/policy options could improve nutrient/sediment response or reduce response uncertainties? (see implications)

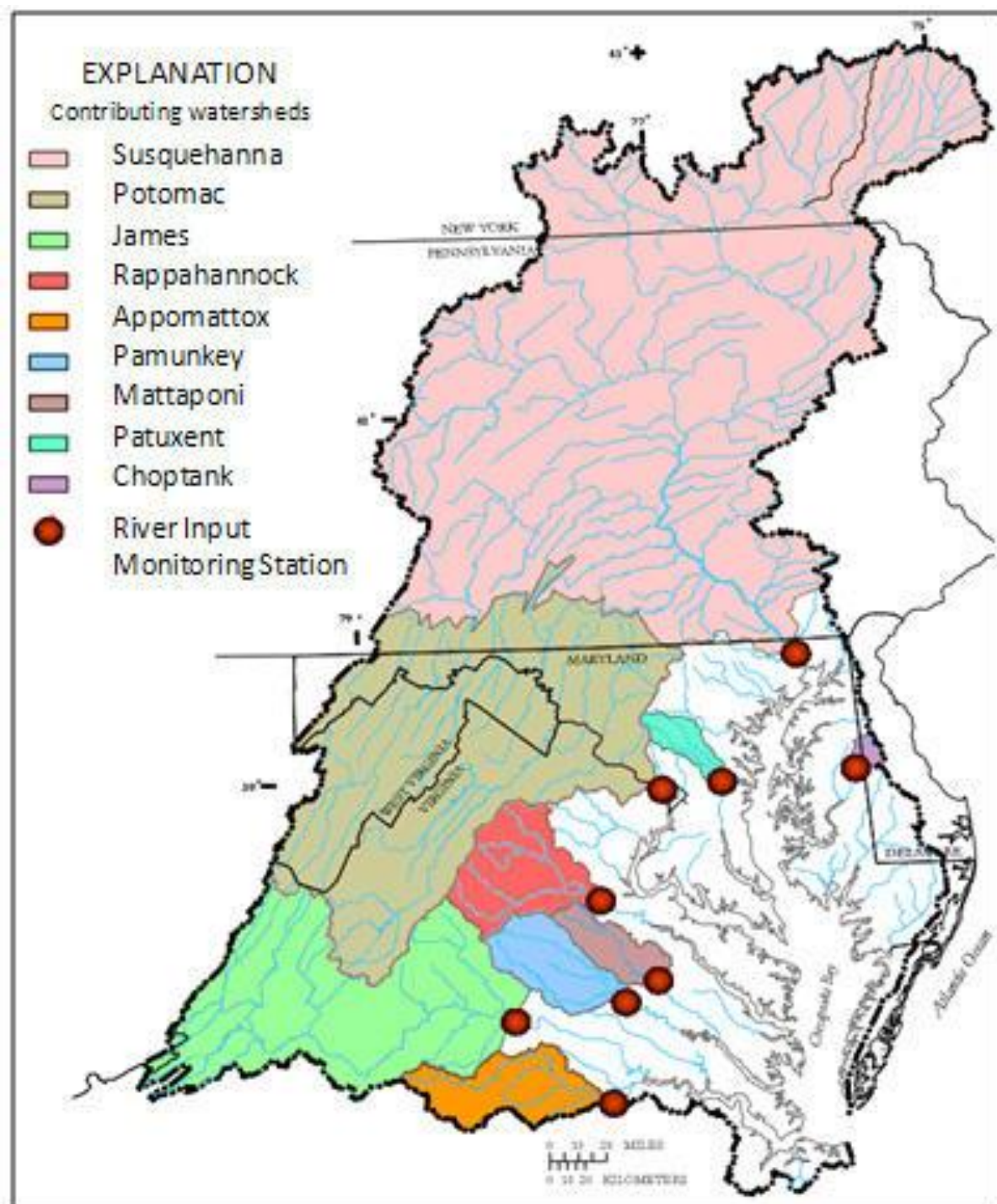


- Presented to WQGIT 10/26/2021
- [https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/cesrtowqgit10-26-2021\\_final.pdf](https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/cesrtowqgit10-26-2021_final.pdf)

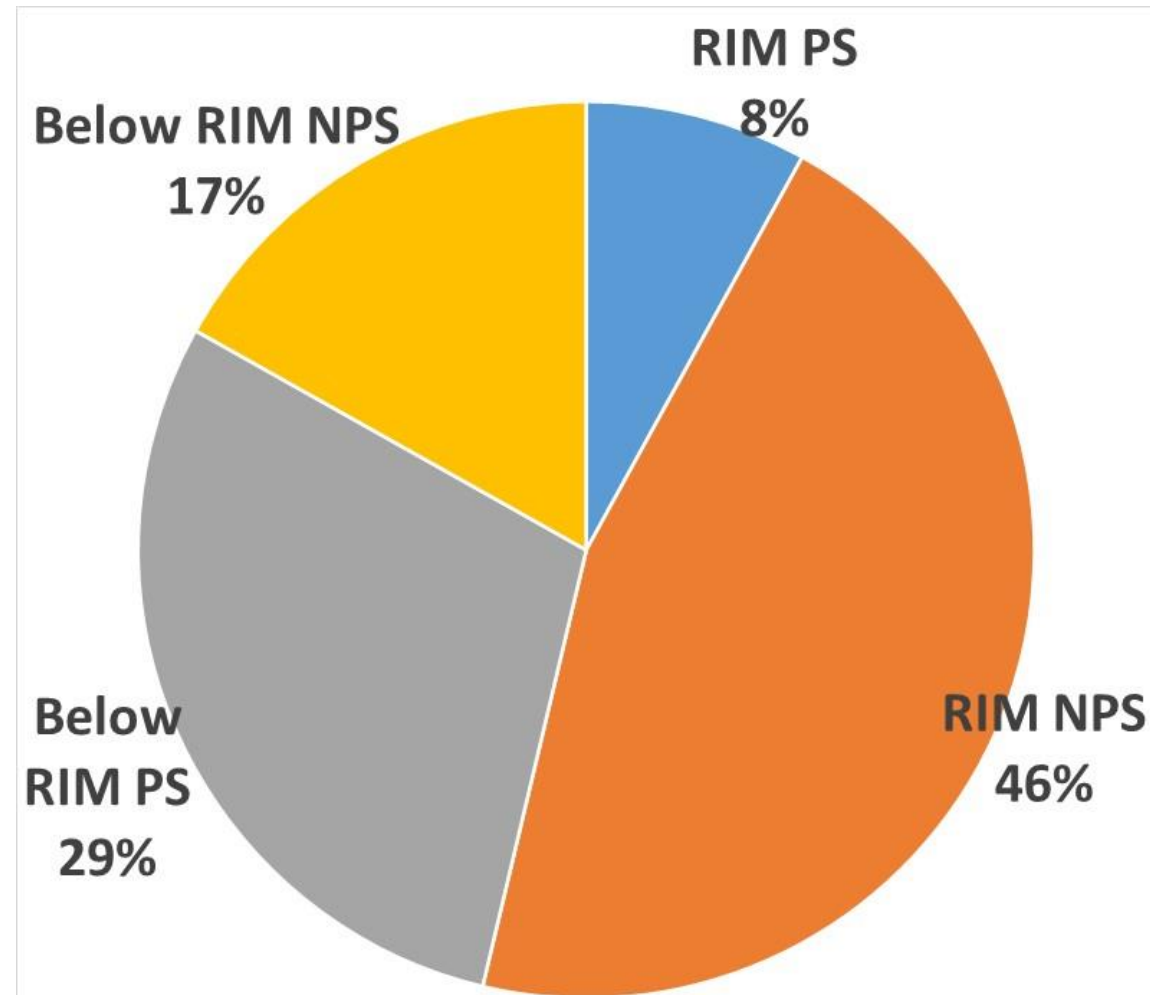
# Purpose: Build an indicator that is:

- Relevant to the TMDL
- Based on monitored changes in load to the extent possible
- Bridges monitoring and modeling by assessing lag time and other effects



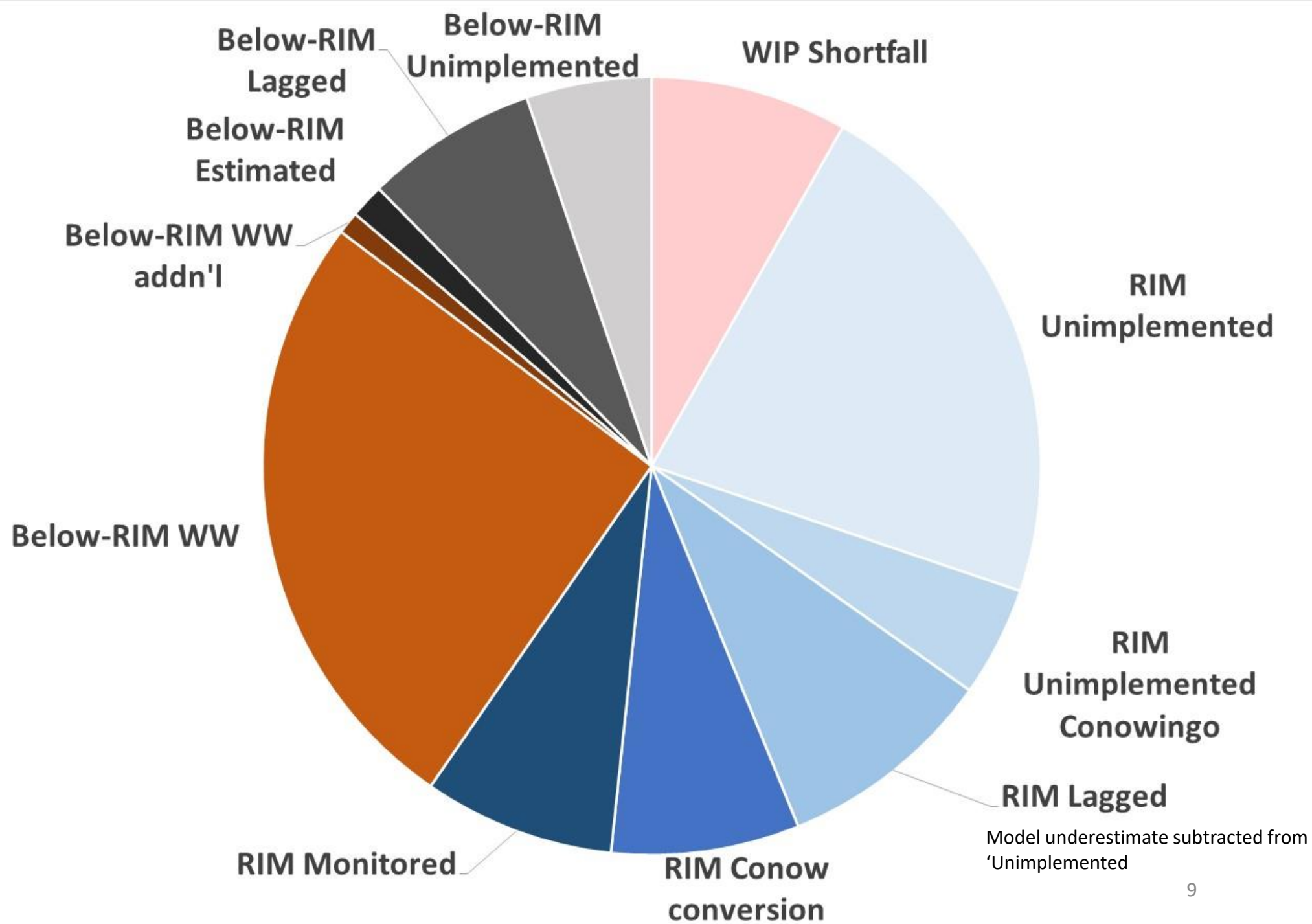


83% of Expected Reduction is Monitored





Overall  
indicator  
of TMDL N  
reductions

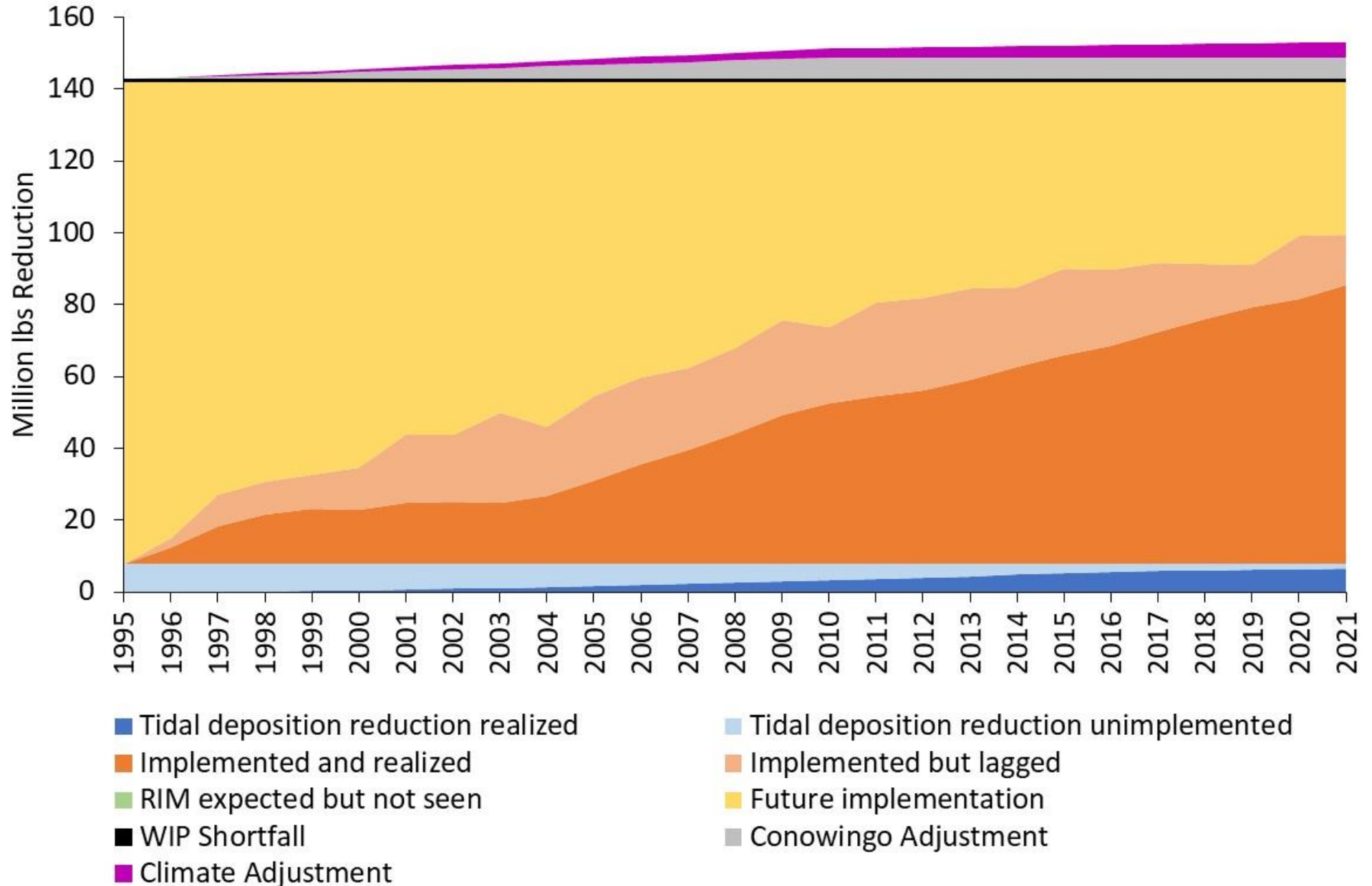


# Public Indicator

Updated Annually

Web team will reformat

## Chesapeake Bay TMDL Load Indicator Total Nitrogen

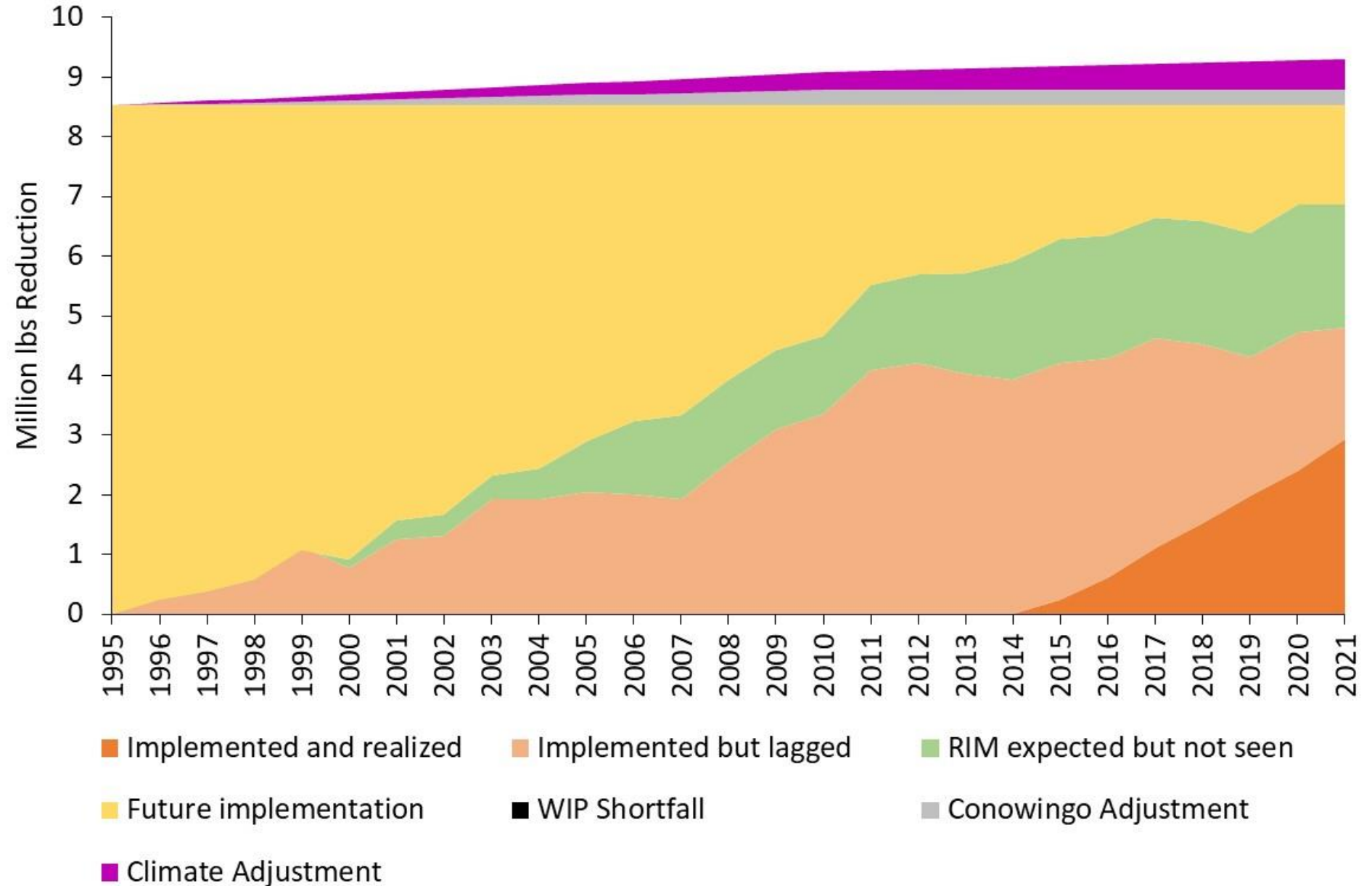


# Public Indicator

Updated Annually

Web team will reformat

## Chesapeake Bay TMDL Load Indicator Total Phosphorus



# Location: WIP 2025 outcome

CHESAPEAKE

PROGRESS

Abundant Life

Clean Water

Conserved Lands

Engaged Communities

Climate Change

About Us

WATER QUALITY GOAL >

2017 Watershed Implementation Plans (WIPs) Outcome

2025 Watershed Implementation Plans (WIPs) Outcome

Water Quality Standards Attainment and Monitoring Outcome

TOXIC CONTAMINANTS GOAL >

Toxic Contaminants Research Outcome

Toxic Contaminants Policy and Prevention Outcome

HEALTHY WATERSHEDS GOAL >

Healthy Watersheds Outcome

CHESAPEAKE

Helping federal, state, and local groups track the progress toward the goals and outcomes of the Chesapeake Bay Watershed Agreement.

**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.

VIEW CHART

VIEW TABLE

Loads by Source

Loads by Jurisdiction

This stacked bar chart displays nitrogen loads in millions of pounds for the years 1985, 2009, and 2021. The y-axis ranges from 0 to 400. The legend identifies the following sources from bottom to top: Agriculture (dark blue), Developed (light blue), Wastewater (yellow), Septic (light green), Natural (teal), Atmospheric Deposition to Watershed (dark blue), and Atmospheric Deposition to Tidal Water (dark blue). A horizontal line is drawn at approximately 210 million lbs.

Year	Agriculture	Developed	Wastewater	Septic	Natural	Atmospheric Deposition to Watershed	Atmospheric Deposition to Tidal Water
1985	~30	~20	~100	~10	~50	~50	~50
2009	~20	~10	~60	~10	~40	~40	~40
2021	~20	~10	~40	~10	~30	~40	~40

**Modeled Phosphorus 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.

VIEW CHART

VIEW TABLE

Loads by Source

Loads by Jurisdiction

This stacked bar chart displays phosphorus loads in millions of pounds for the years 1985, 2009, and 2021. The y-axis ranges from 0 to 30. The legend identifies the following sources from bottom to top: Agriculture (dark blue), Developed (light blue), Wastewater (yellow), Septic (light green), and Natural (teal). A horizontal line is drawn at approximately 13 million lbs.

Year	Agriculture	Developed	Wastewater	Septic	Natural
1985	~7	~13	~10	~8	~1
2009	~6	~5	~5	~4	~1
2021	~6	~2	~3	~4	~1

Chesapeake Bay TMDL Load Indicator  
Total Nitrogen

This area chart shows the TMDL load indicator for total nitrogen in millions of pounds from 1995 to 2021. The y-axis ranges from 0 to 160. The legend includes: Tidal deposition reduction realized (blue), Implemented and realized (orange), RIM expected but not seen (light green), Future implementation (yellow), WIP Shortfall (black), Conowingo Adjustment (grey), Tidal deposition reduction unimplemented (light blue), Implemented but lagged (light orange), and Climate Adjustment (purple). A horizontal line is drawn at approximately 140 million lbs.

Year	Implemented and realized	Implemented but lagged	RIM expected but not seen	Future implementation	WIP Shortfall	Conowingo Adjustment	Tidal deposition reduction unimplemented	Climate Adjustment
1995	~10	~10	~10	~110	~0	~0	~0	~0
2000	~20	~20	~20	~100	~0	~0	~0	~0
2005	~30	~30	~30	~90	~0	~0	~0	~0
2010	~40	~40	~40	~80	~0	~0	~0	~0
2015	~50	~50	~50	~70	~0	~0	~0	~0
2020	~60	~60	~60	~60	~0	~0	~0	~0
2021	~60	~60	~60	~60	~0	~0	~0	~0

Chesapeake Bay TMDL Load Indicator  
Total Phosphorus

This area chart shows the TMDL load indicator for total phosphorus in millions of pounds from 1995 to 2021. The y-axis ranges from 0 to 10. The legend includes: Implemented and realized (orange), Implemented but lagged (light orange), RIM expected but not seen (light green), Future implementation (yellow), WIP Shortfall (black), Conowingo Adjustment (grey), and Climate Adjustment (purple). A horizontal line is drawn at approximately 8.5 million lbs.

Year	Implemented and realized	Implemented but lagged	RIM expected but not seen	Future implementation	WIP Shortfall	Conowingo Adjustment	Climate Adjustment
1995	~0.5	~0.5	~0.5	~7.5	~0	~0	~0
2000	~1.0	~1.0	~1.0	~6.0	~0	~0	~0
2005	~2.0	~2.0	~2.0	~4.0	~0	~0	~0
2010	~3.0	~3.0	~3.0	~3.0	~0	~0	~0
2015	~4.0	~4.0	~4.0	~2.0	~0	~0	~0
2020	~5.0	~5.0	~5.0	~1.0	~0	~0	~0
2021	~5.0	~5.0	~5.0	~1.0	~0	~0	~0



# Partnership Product for Data Dashboard

Plus all years in between. Updated Annually

	Nitrogen					Phosphorus			
Category	1995	2005	2015	2021		1995	2005	2015	2021
WIP Shortfall	0.92	6.58	10.25	11.25		-0.87	-0.50	-0.21	-0.09
WIP Shortfall	0.92	0.92	0.92	0.92		-0.87	-0.87	-0.87	-0.87
Conowingo Adjustment	0.00	4.00	6.01	6.01		0.00	0.17	0.26	0.26
Climate Adjustment	0.00	1.66	3.32	4.32		0.00	0.20	0.40	0.52
RIM Unimplemented	68.30	43.75	26.73	26.65		6.33	4.28	2.18	1.77
RIM Unimplemented Conowingo	6.67	6.67	6.67	6.67		0.14	0.14	0.14	0.14
RIM expected but not seen	0.00	0.00	0.00	0.00		0.00	1.77	2.09	2.07
RIM Lagged	0.00	17.94	21.39	16.87		0.00	2.29	3.58	2.40
RIM Conowingo Conversion	0.00	8.81	11.81	11.26		0.00	1.86	2.95	2.30
RIM Monitored	0.00	-2.20	8.38	13.53		0.00	-3.88	-4.48	-2.21
Below-RIM PS Implemented	0.00	17.56	30.04	37.19		0.00	0.32	1.25	1.38
Below-RIM PS Unimplemented	37.41	19.85	7.38	0.22		1.57	1.25	0.32	0.19
Below-RIM Estimated	0.00	-1.11	7.85	15.67		0.00	0.79	0.52	1.48
Below-RIM Lagged	0.00	5.60	2.71	-2.95		0.00	-0.25	0.38	-0.55
Below-RIM Unimplemented	21.44	16.96	10.88	8.72		1.36	0.82	0.46	0.43
Tidal Deposition Reduction Realized	0.00	1.68	5.18	6.50					
Tidal Deposition Reduction Unimplemented	7.92	6.24	2.74	1.42					

# Station-level dashboard Product



Qian Zhang

Specify the water-quality parameter

Nitrogen

Specify the monitoring station

01576000 SUSQUEHANNA RIVER AT  
MARIETTA, PA

Download Data Table

Timeseries

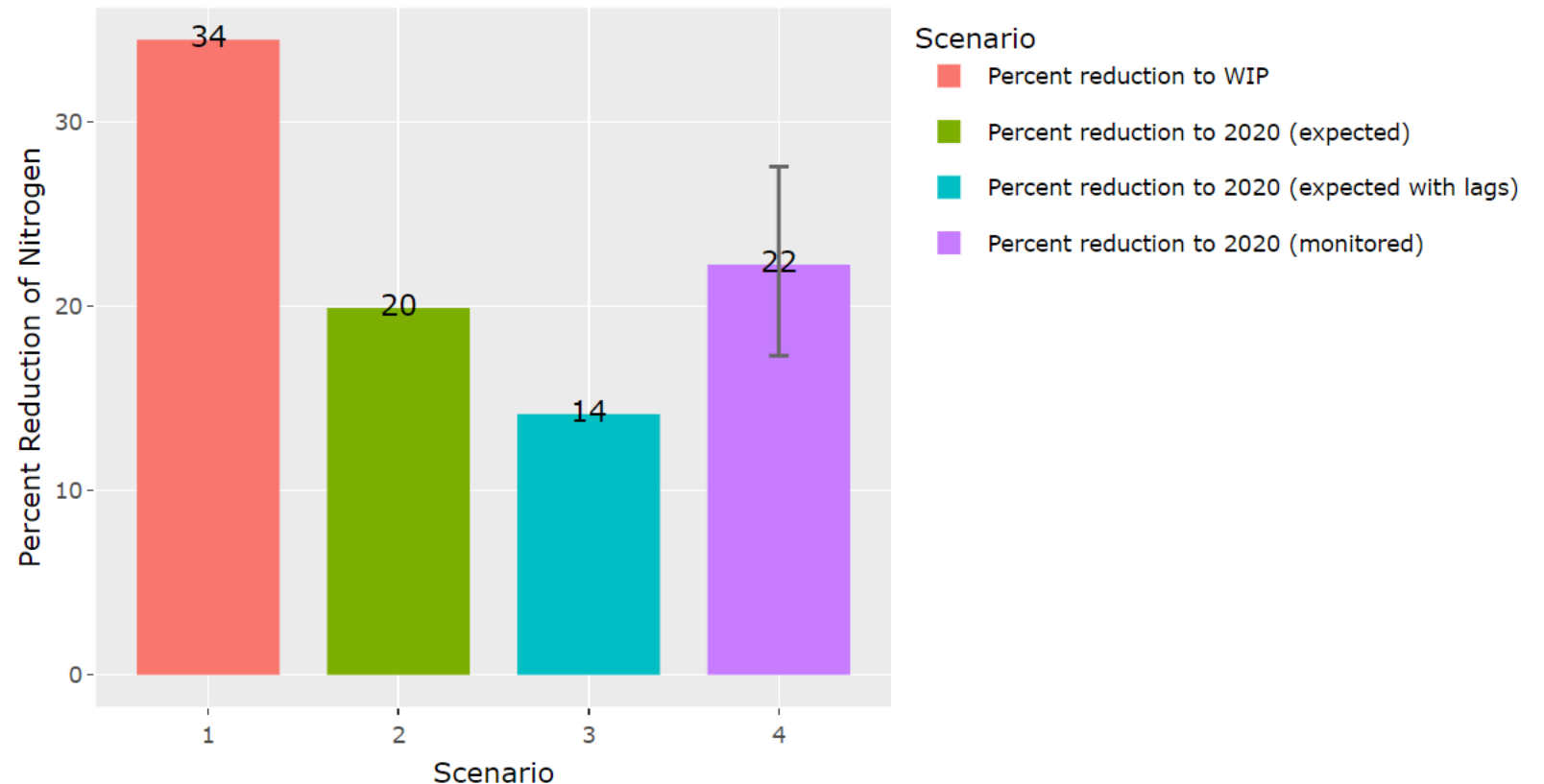
Barplot 1

Barplot 2

Data Table

About

01576000 SUSQUEHANNA RIVER AT MARIETTA, PA (1995-2020)



# Station-level dashboard Product



Qian Zhang

Specify the water-quality parameter

Phosphorus

Specify the monitoring station

01576000 SUSQUEHANNA RIVER AT  
MARIETTA, PA

Download Data Table

Timeseries

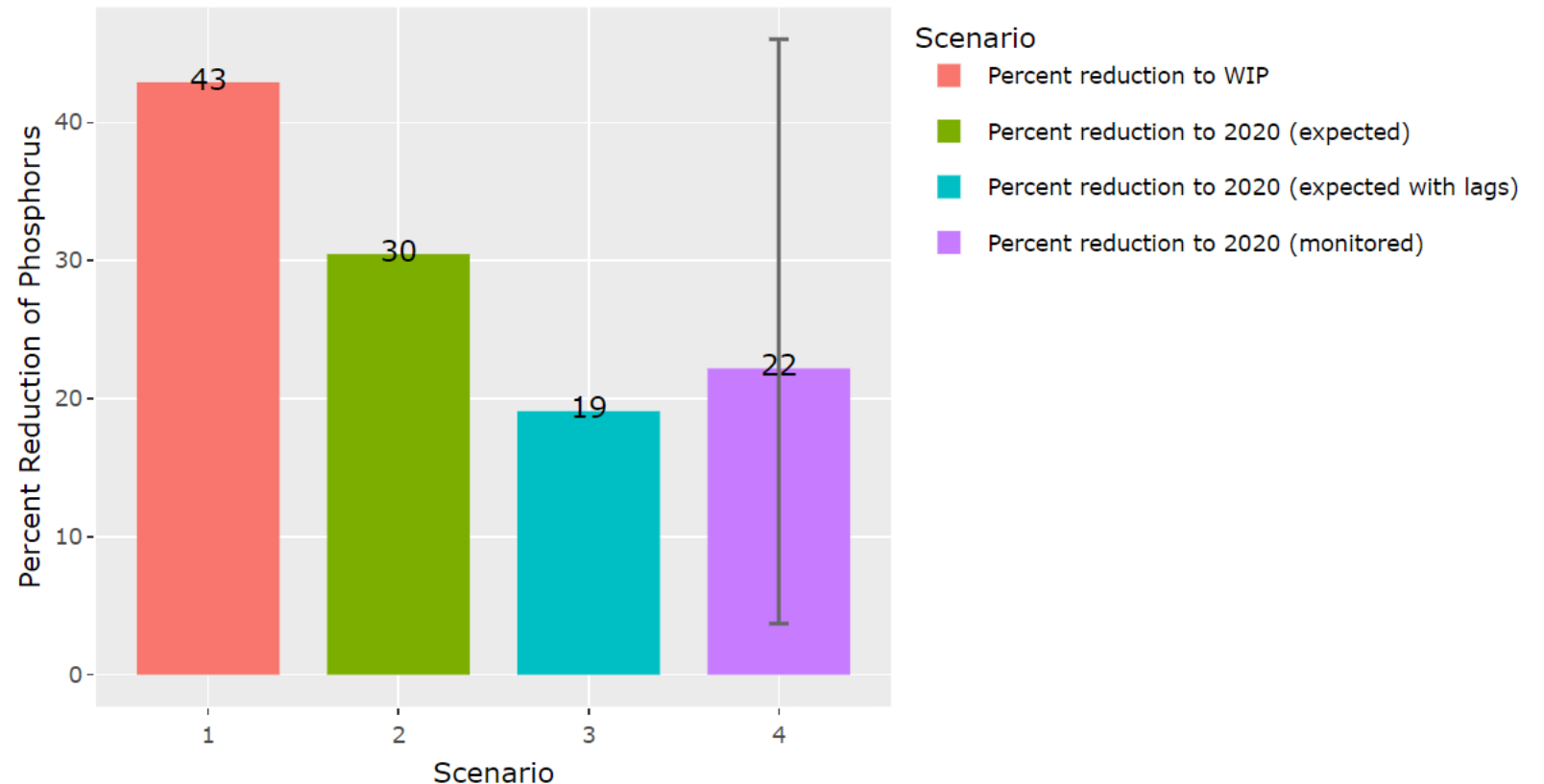
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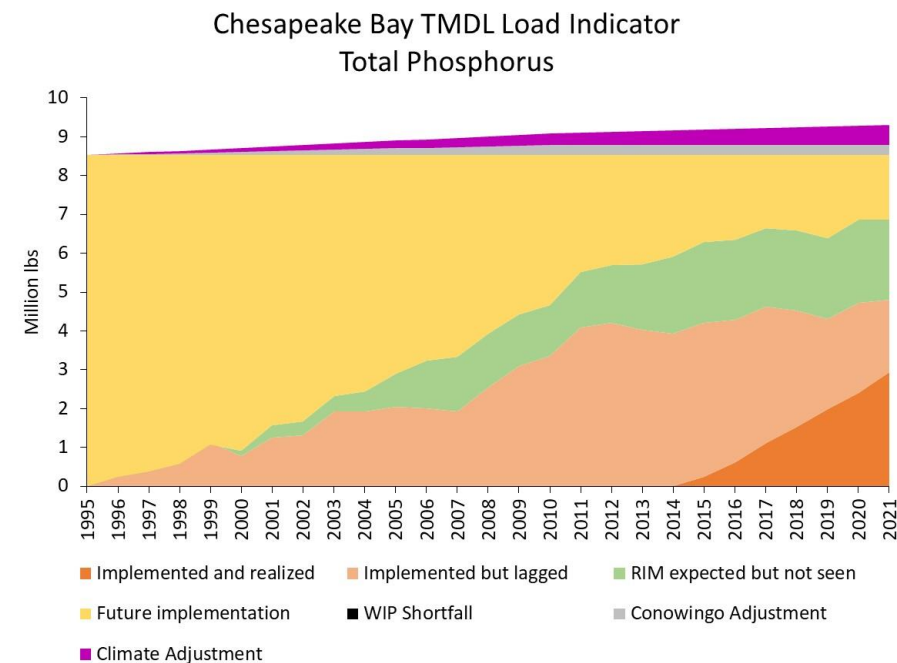
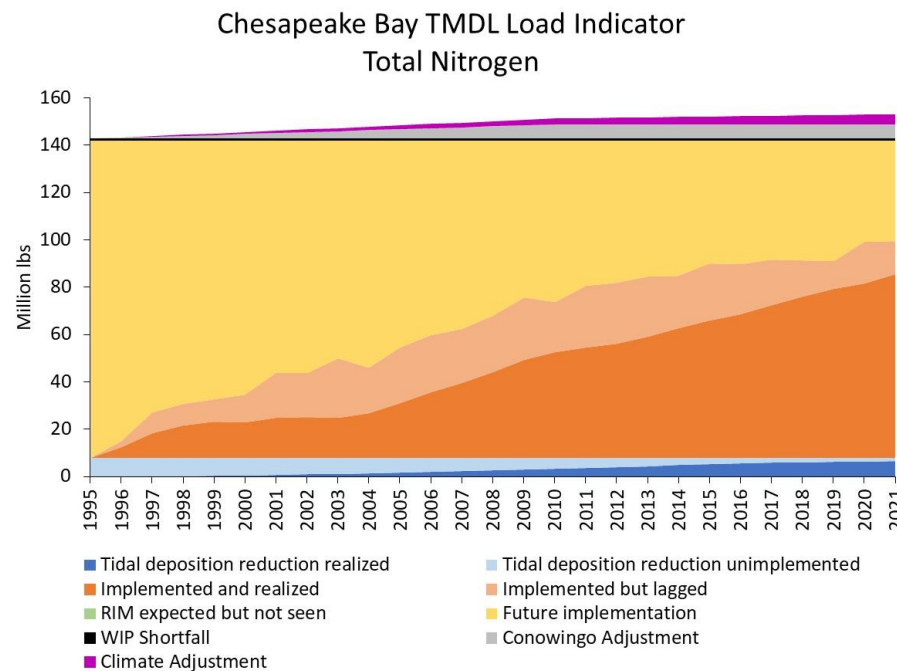


# Partnership Vetting

- 9/2021      CBPO discussions
  - 7/2022      USGS-led Factors Affecting Trends Group
  - 8/2022      Status and Trends Workgroup
  - 10/2022     Watershed Technical Workgroup
  - 11/2022     WQGIT
  - 3/2023      Status and Trends Workgroup
- 
- Each meeting produced recommendations that strengthened the product.

# Next Steps: Decision by WQGIT

- Ask to approve the Integrated Watershed TMDL Indicator as a supplemental indicator under the WIP 2025 Outcome



- Begin working with the STWG, CBP web and communications teams

# Next Steps

- Add the annual finer-category data to the nontidal data dashboard

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Tidal Deposition Reduction Realized	0.00	1.68	5.18	6.50					
Tidal Deposition Reduction Unimplemented	7.92	6.24	2.74	1.42					

# Next Steps

- Continue working on the station-level dashboard product



- Adding a clickable map

# Discussion