Chesapeake Bay Total Maximum Daily Load Indicator

WQGIT

1/22/2024

Photo credit: CBP

Natural System

Monitoring

Modeling

Photo credit: CBP

Natural System

Monitoring

Reality
But
Imprecise
Incomplete

Modeling

Photo credit: CBP

Natural System

Monitoring

Reality
But
Imprecise
Incomplete

Modeling

Precise
Complete
But
Not Reality

WIP Indicator

We've almost hit the target level of implementation?

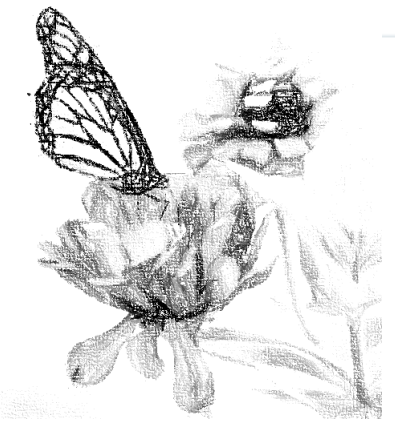
- Agriculture
- Developed
- Wastewater
- Septic
- Natural
- Atmospheric Deposition to Watershed
- Atmospheric Deposition to Tidal Water

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.

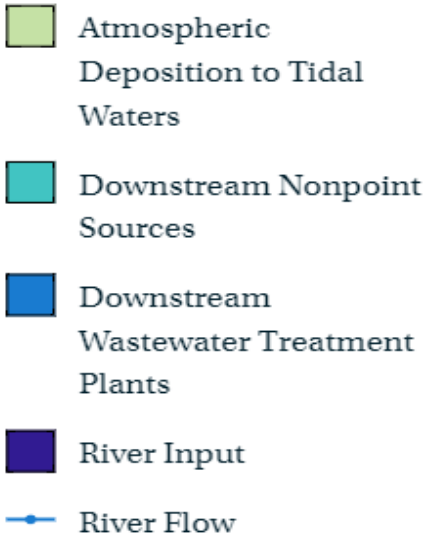
VIEW CHART VIEW TABLE

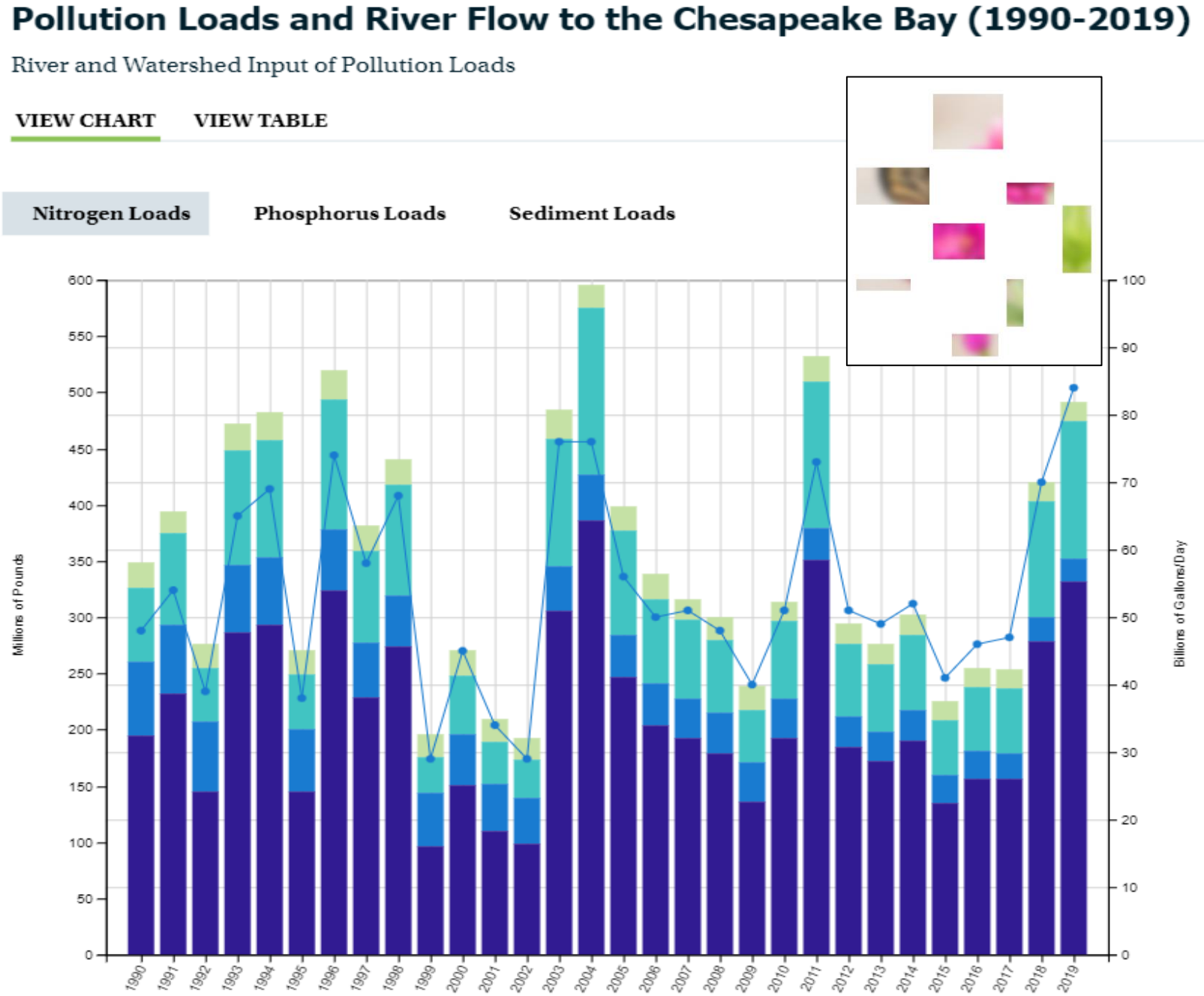
Loads by Source Loads by Jurisdiction



Nontidal Load Indicator

Extreme variability
No Clear Trend





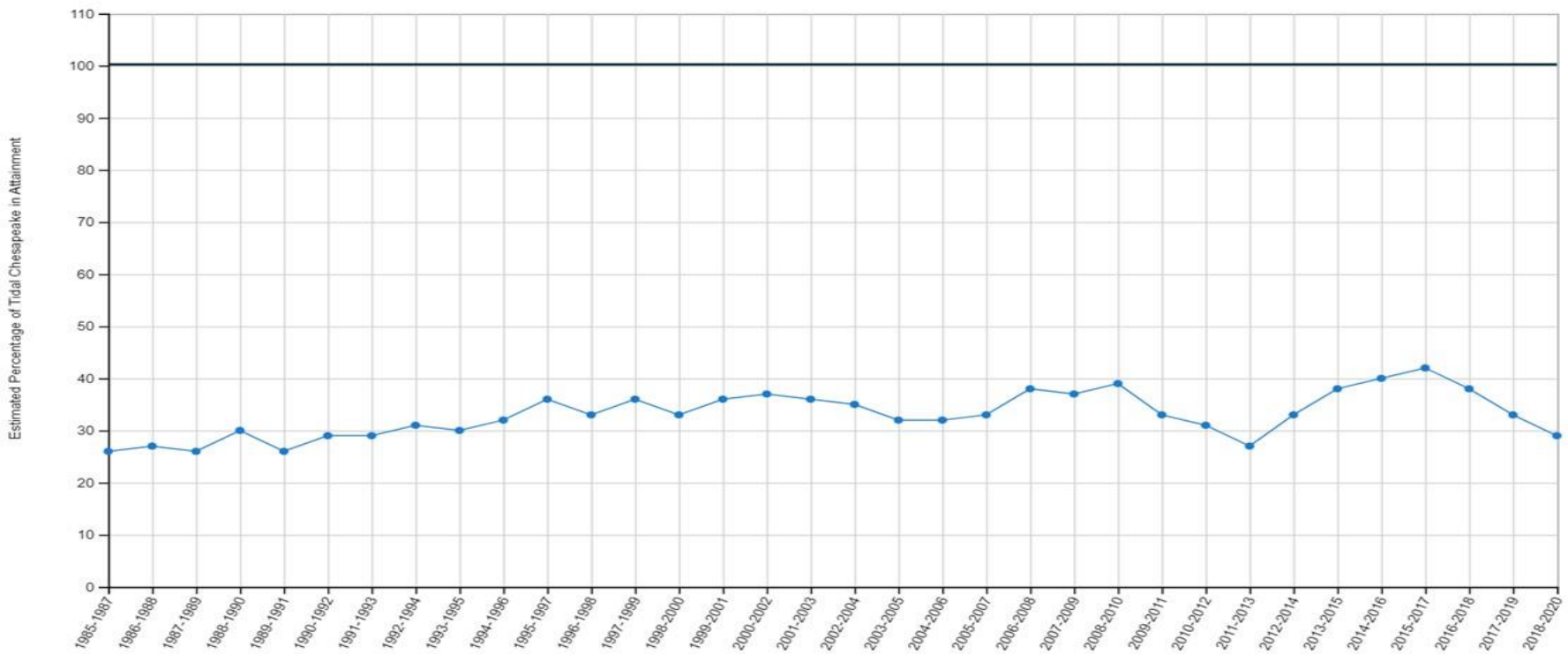
Tidal Water TMDL Indicator

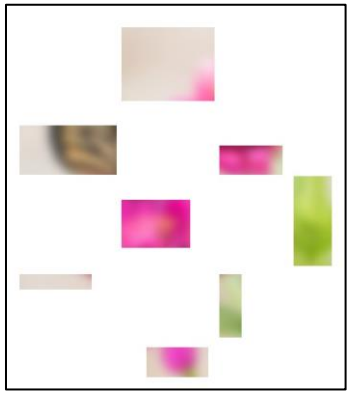
Very slow positive change

Water Quality Standards Attainment (1985-2020)

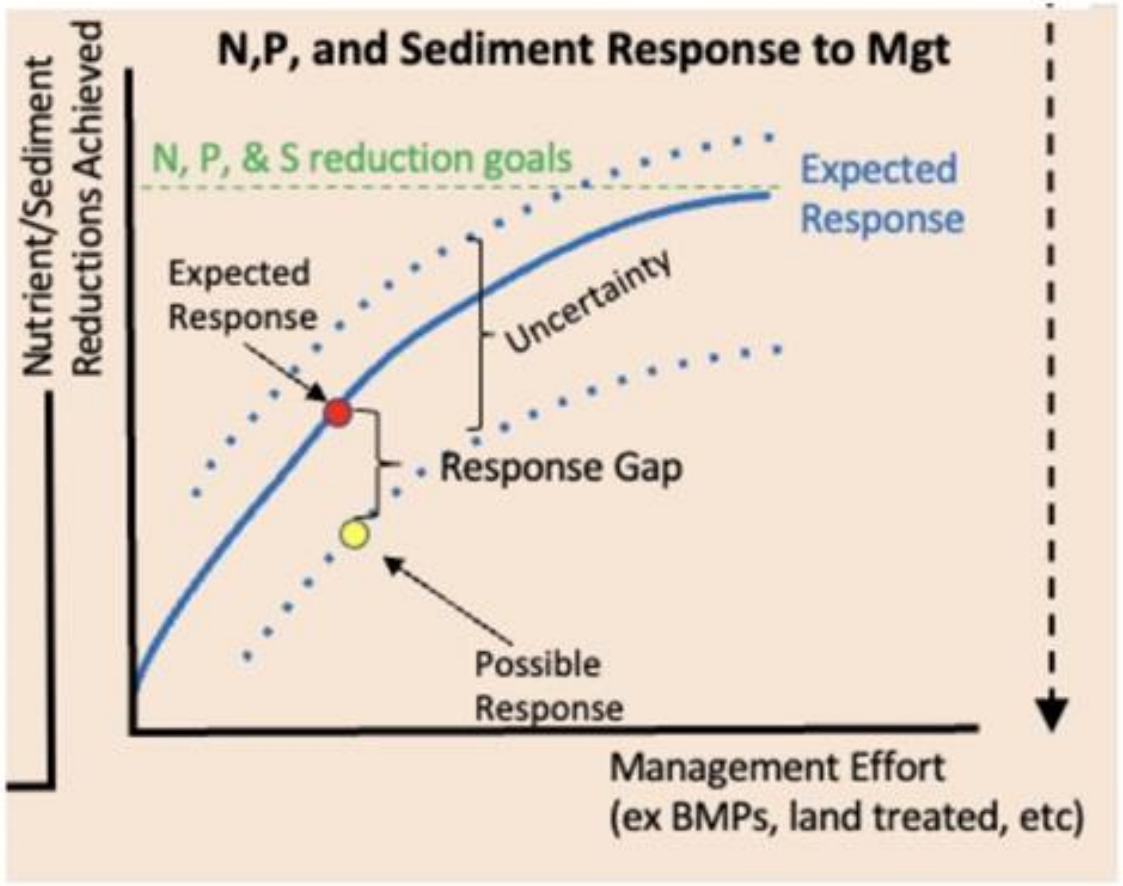
Water quality is evaluated using three parameters: dissolved oxygen, water clarity or underwater grass abundance, and chlorophyll a (a measure of algae growth).

VIEW CHART VIEW TABLE





STAC Comprehensive Evaluation of System Response Report



- Presented to WQGIT 10/26/2021
- https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/cesrtowqgit10-26-2021_final.pdf

Chesapeake Governance Study: Report of 2021 Decision Maker Interview Results D.G. Webster, Dartmouth College

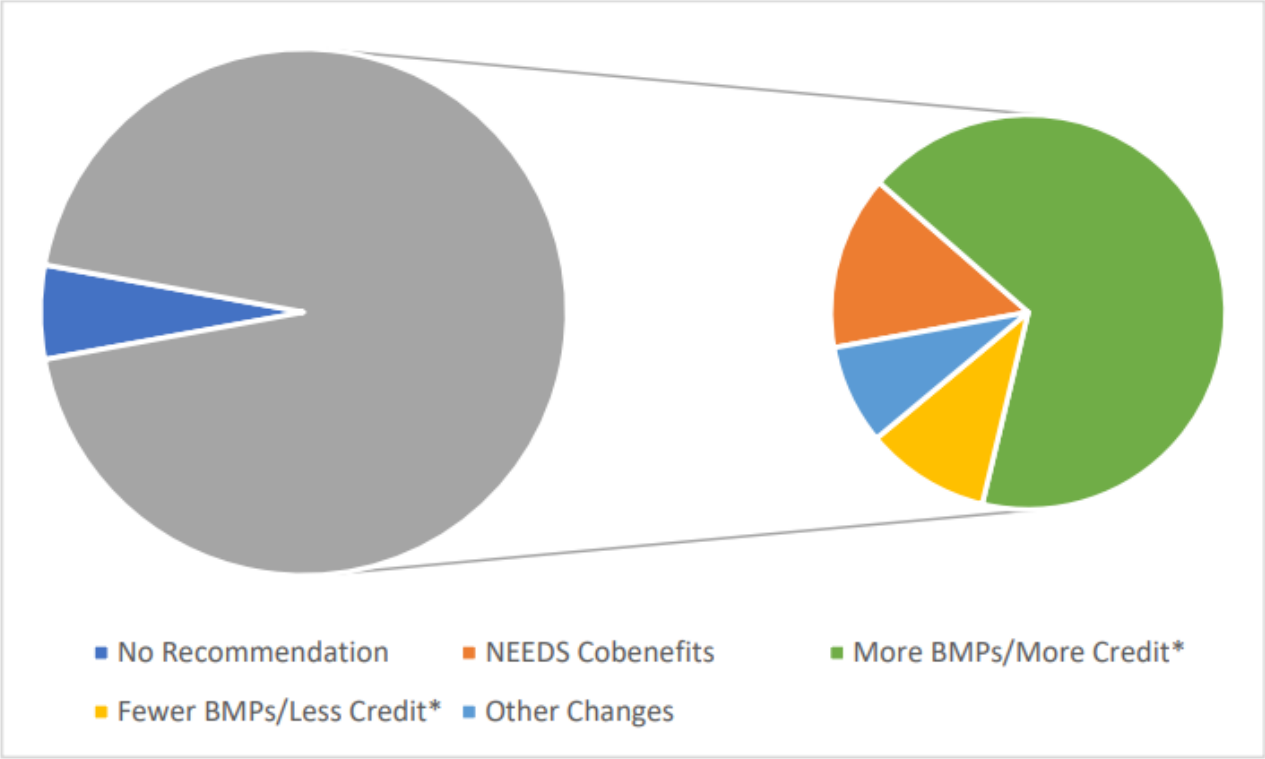


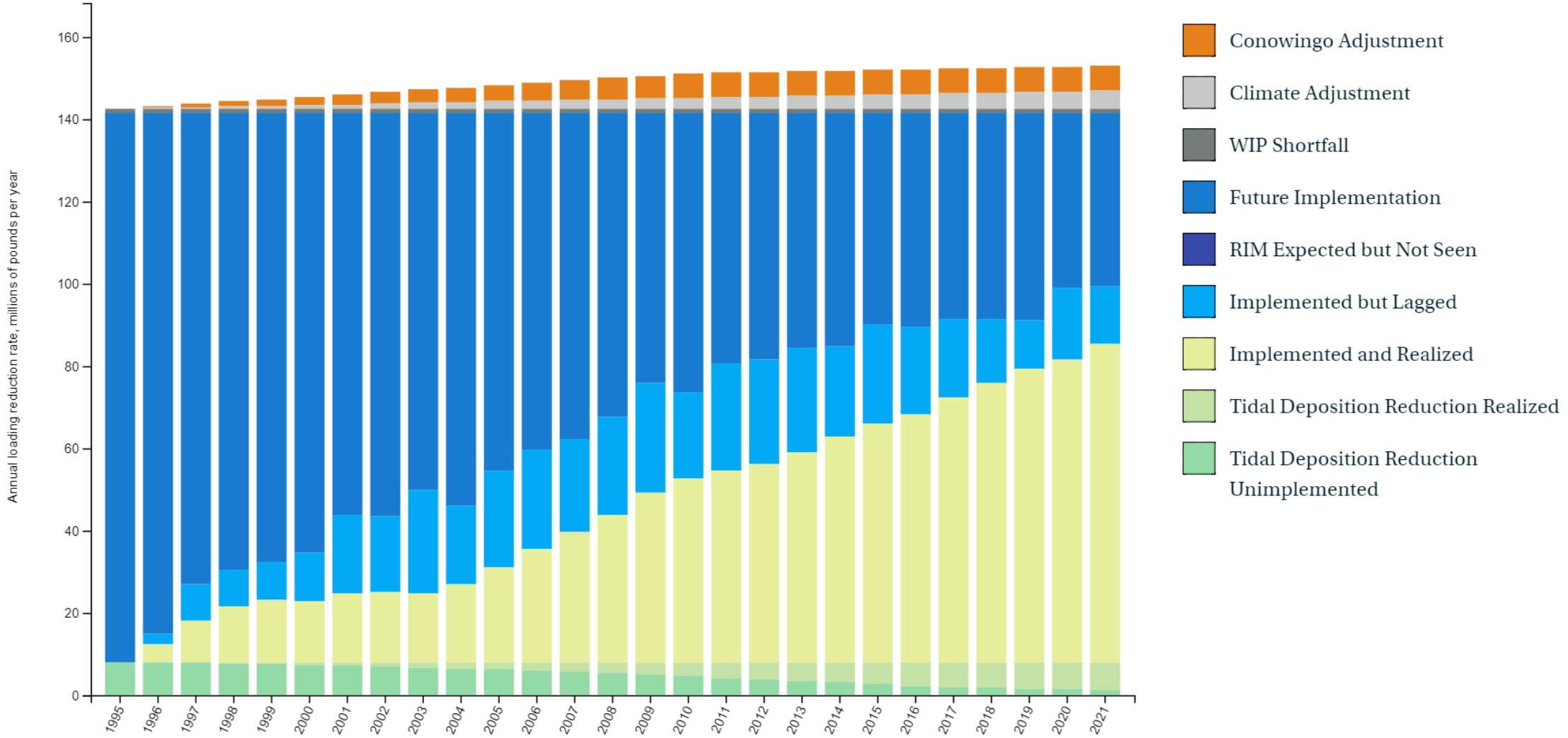
*Figure 71: Proposed "Improvements" to Models (# Mentions; * Indicates summary of information from previous sections). Most responses that criticized the Model also provided suggestions for changes that respondents deemed improving. Of these, adding more BMPs or giving existing BMPs more credit for load reductions was the most common. Many fewer responses indicated that CAST should include fewer BMPs or reduce credits for loading for some BMPs. Both of these categories are a reiteration from previous sections. Suggestions not covered elsewhere were less numerous. A number of responses did indicate that adding Co-benefits to CAST would be useful.*

Chesapeake Bay TMDL Indicator: Total Nitrogen

The Conowingo and Climate Adjustments were added after 2018.

Went live this morning!

VIEW CHART VIEW TABLE

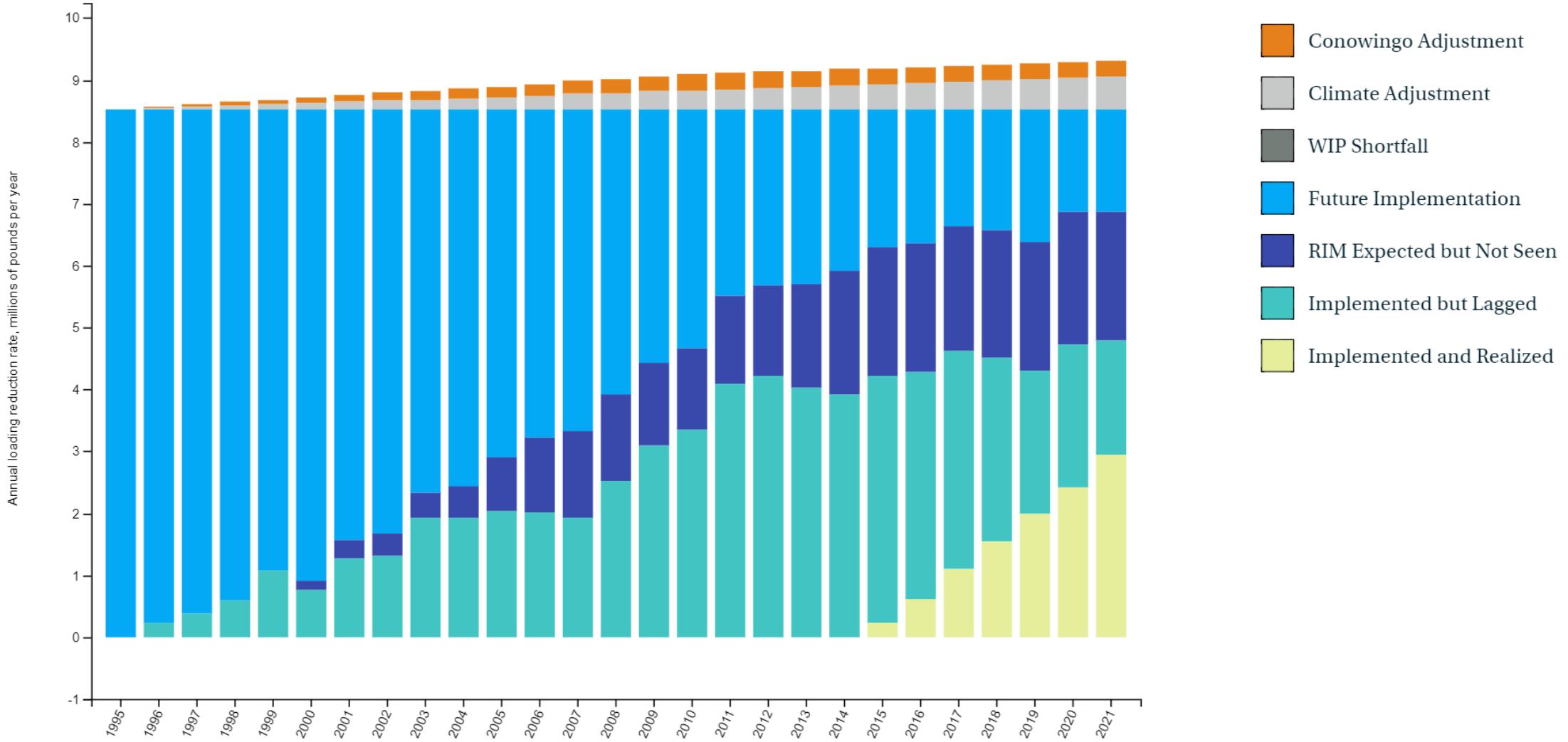


TMDL Total Phosphorus experiment

[Footnote about how Conowingo and Climate Adjustments are new after 2018.]

Went live this morning!

VIEW CHART VIEW TABLE



Individual station interface

https://zhangqian0324.shinyapps.io/CBNTN_TMDL_Indicator/

Chesapeake Bay TMDL Indicator (Non-Tidal Network Stations)

Purpose

* This app is designed for visualizing the monitored load trend and CAST-estimated load trend for the Chesapeake Bay Non-Tidal Network (NTN) stations.
* This app contains data for 83, 66, and 66 stations for Total Nitrogen (TN), Total Phosphorus (TP), and Suspended Sediment (SS), respectively.
* This app is frequently updated based on comments and suggestions received from the Chesapeake Bay Program partnership.

User selection

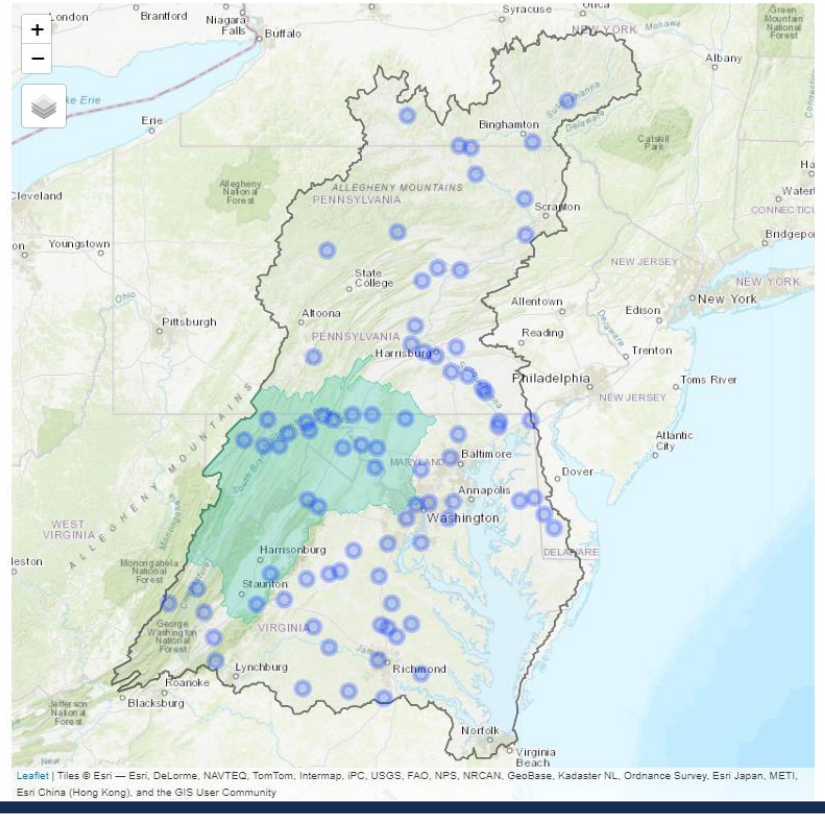
Step 1: Select the water-quality parameter:

(•) Total Nitrogen ( ) Total Phosphorus ( ) Suspended Sediment

Step 2: Select the monitoring station by clicking either Map or Table:

Map | Data Table

Tip: Move mouse cursor to any circle marker to show the station name.



Results

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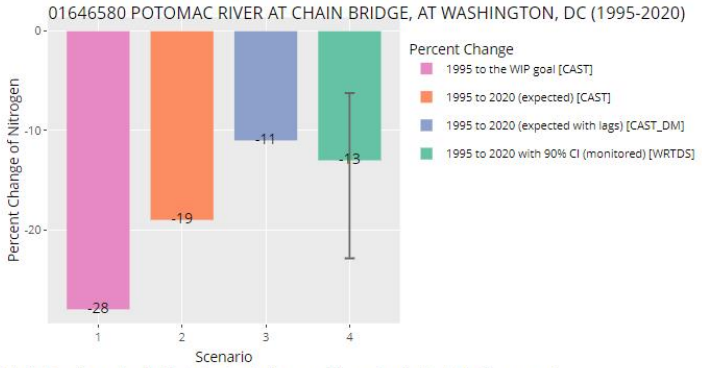
Interactive Plot



(Note 1: Negative values indicate load reductions; positive values indicate load increases.)

(Note 2: To obtain values in million pounds (Mlbs), multiply the percent change shown in this plot by the CAST load in the first year of the assessment period, which is available in the Data Table under the About tab.)

Data Type

WRTDS: Monitored load - computed using the USGS WRTDS flow-normalization method (source).

CAST: Expected load in the long term - computed using the Chesapeake Bay Program Watershed Model (source).

CAST_DM: Expected load with lags - computed using the Chesapeake Bay Program Watershed Model (source).

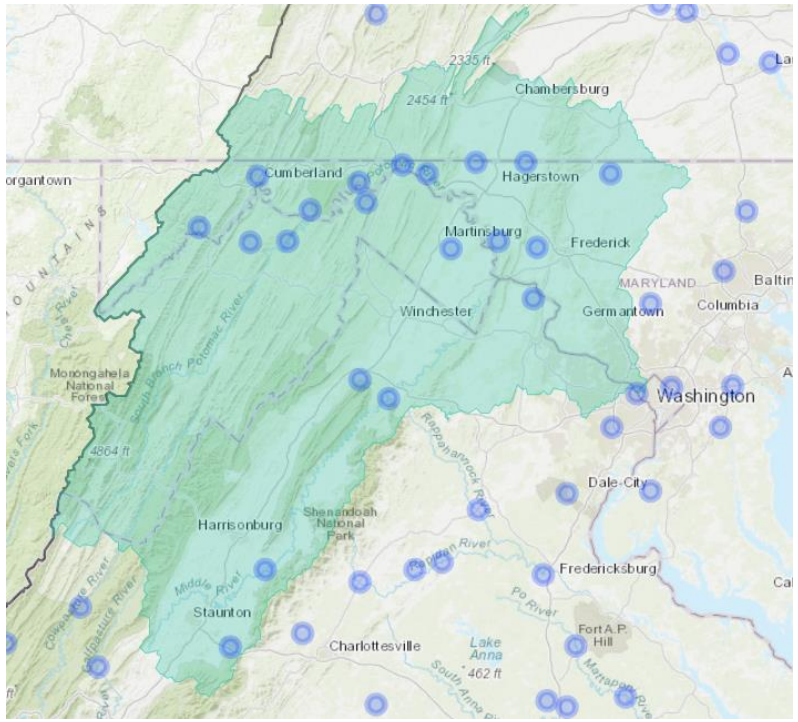
Interpretive Text

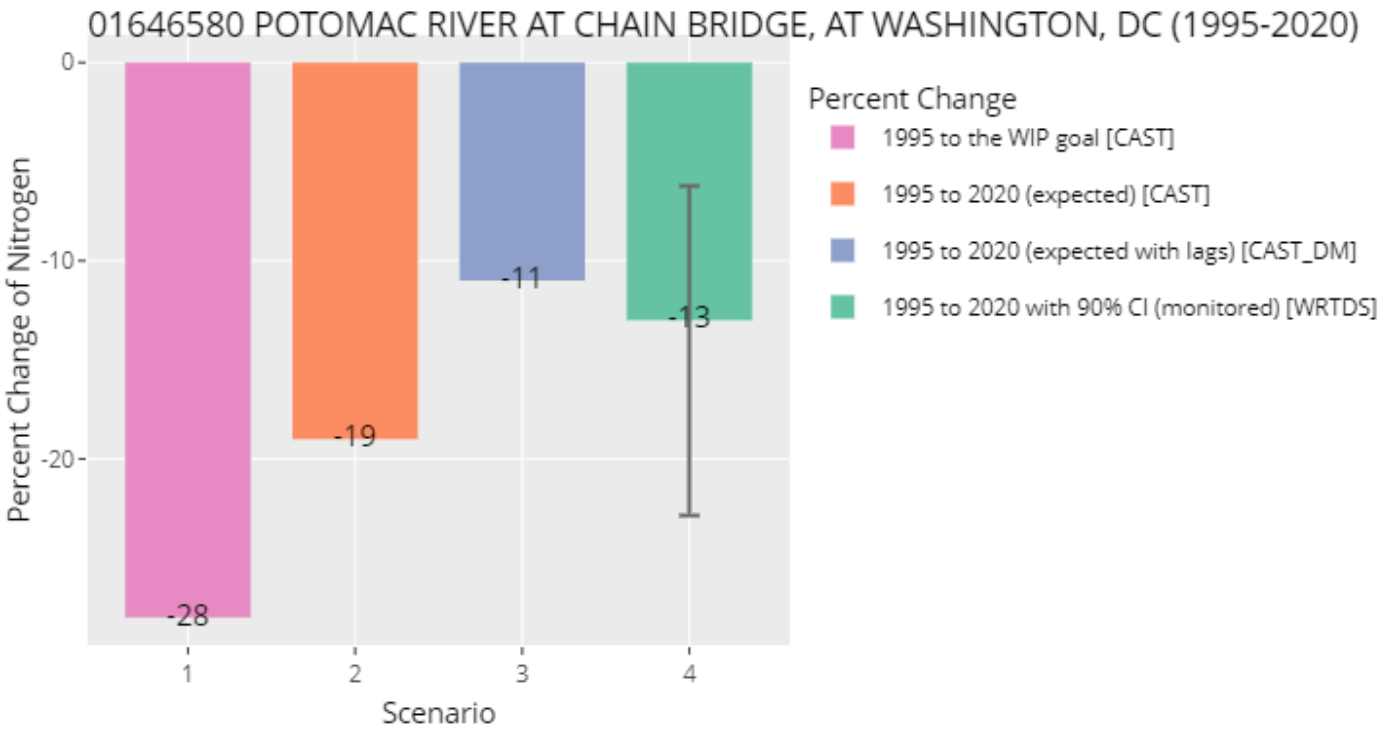
For Nitrogen at 01646580 POTOMAC RIVER AT CHAIN BRIDGE, AT WASHINGTON, DC, the period of analysis is 1995-2020.

1. Overall reduction - comparing the baseline year of 1995 with the WIP goal:
[Bar 1] CAST estimates a reduction of 28 percent in the long term from implementation of the WIP using 2025 land use and inputs.

2. Current progress - comparing the baseline year of 1995 with the current year of 2020:
[Bar 2] CAST estimates a reduction of 19 percent in the long term from 2020 land use, inputs, and management practices.
[Bar 3] The Dynamic Watershed Model (i.e., CAST_DM) estimates that a reduction of 11 percent would have been seen by 2020, accounting for lags, sampling frequency, and other factors.
[Bar 4] The river monitoring data (i.e., WRTDS) show a reduction of 13 percent with a 90% uncertainty range of (-23%, -6%).

Example 1: 01646580 Potomac River Total Nitrogen



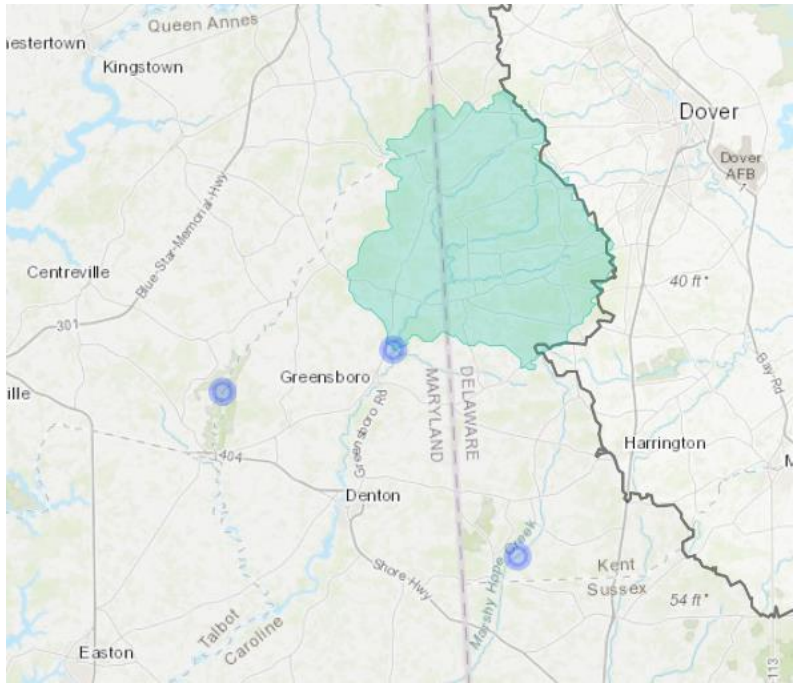


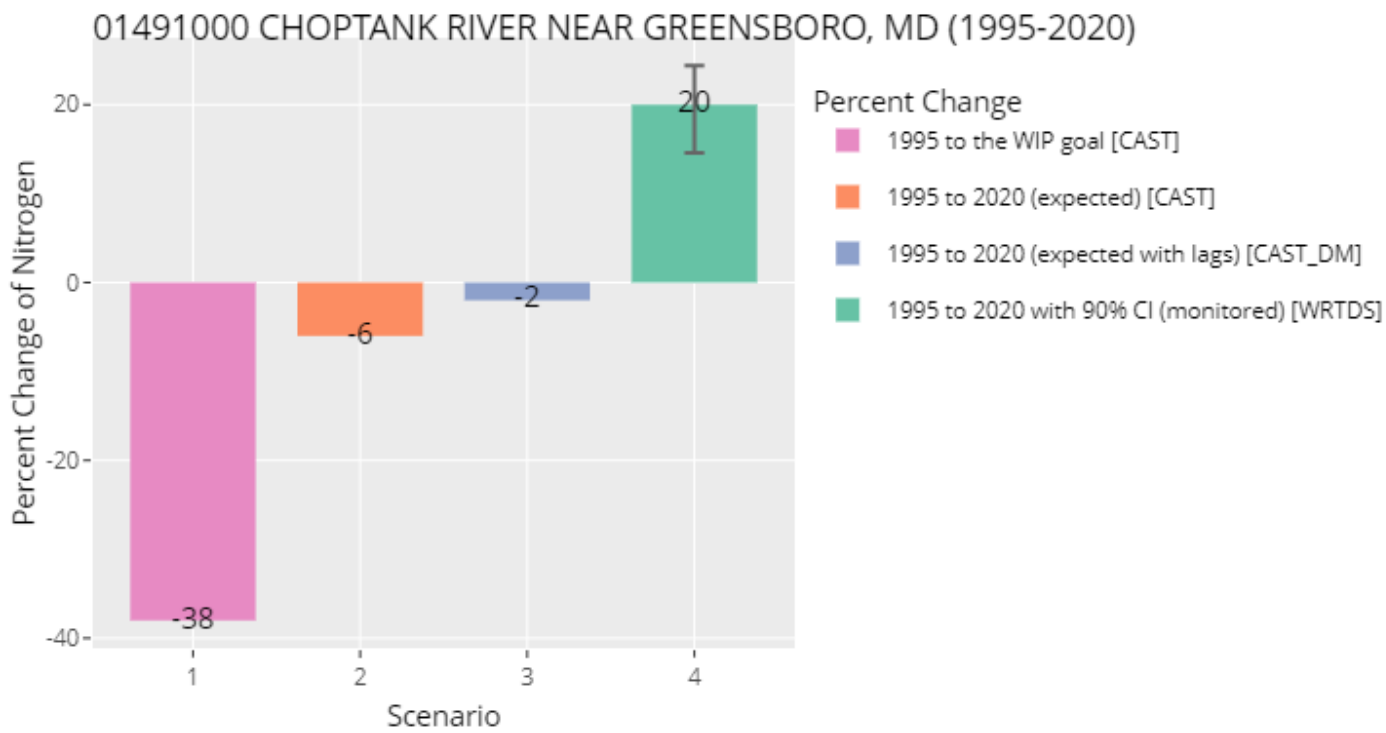
Interpretive Text

1. CAST estimates a 28 percent reduction in the long term from **implementation of the WIP** using 2025 land use and inputs.
2. CAST estimates a 19 percent reduction in the long term from **2020** land use, inputs, and management practices.
3. The Dynamic Watershed Model estimates that only a 11 percent reduction would have been seen by 2020, accounting for lags, sampling frequency, and other factors.
4. The river monitoring data show a 13 percent reduction with a 90% uncertainty range between 6 and 23 percent reduction.

Implication: The observed response is as expected over the period of 1995-2020.

Example 2: 01491000 Choptank River Total Nitrogen



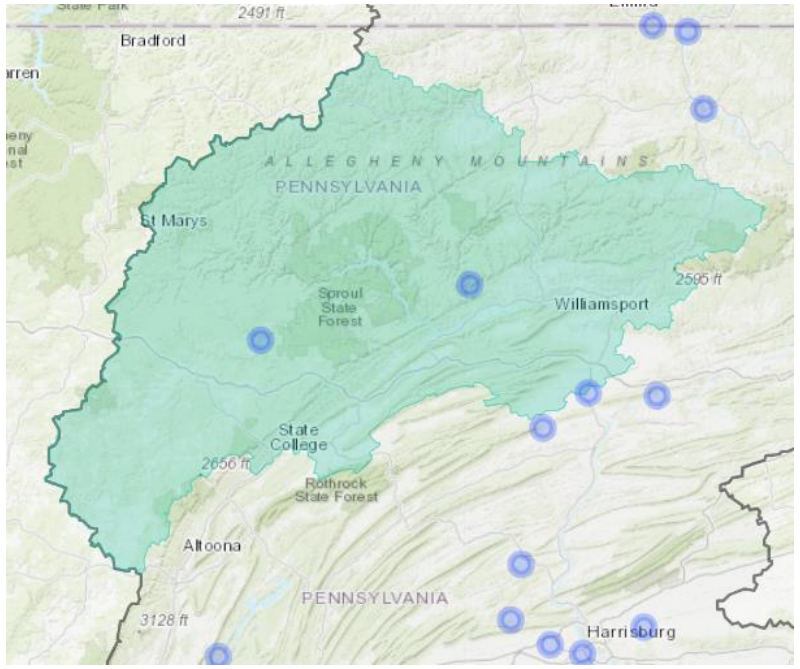


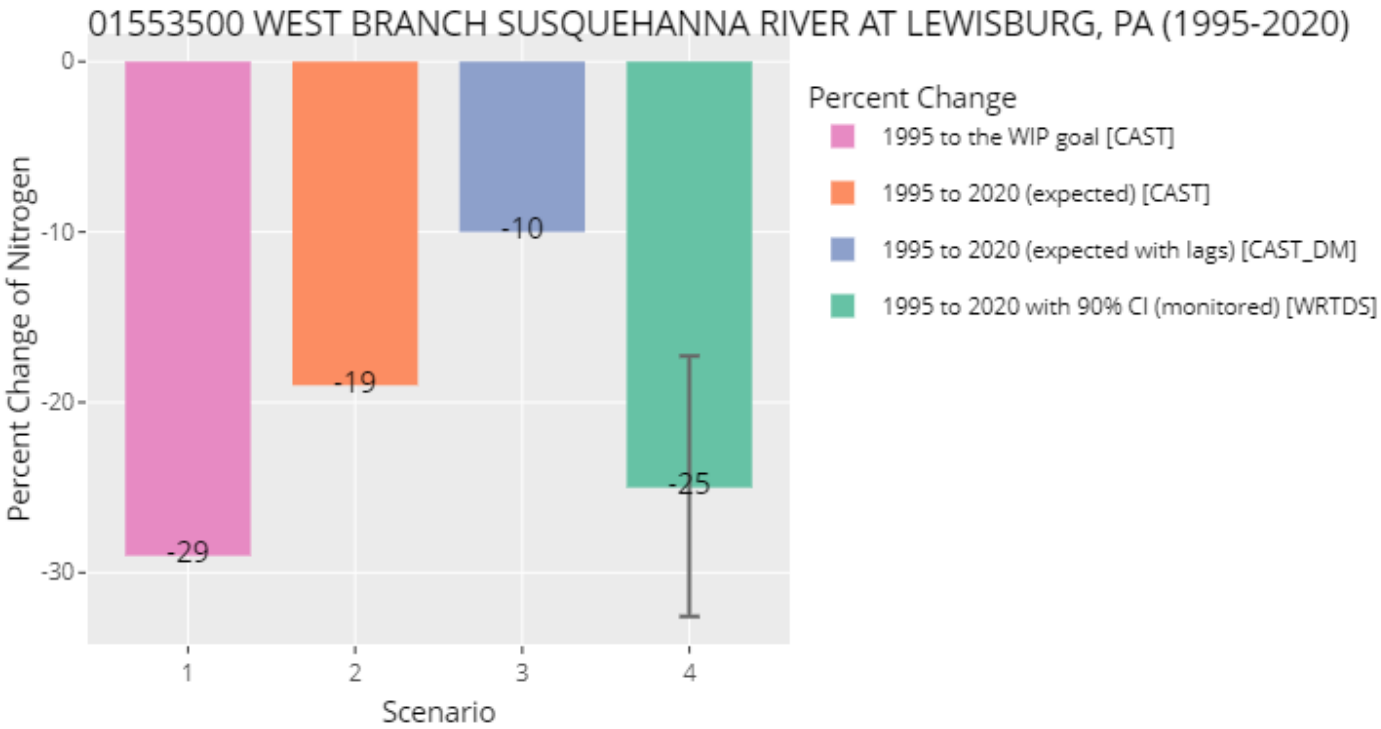
Interpretive Text

1. CAST estimates a 38 percent reduction in the long term from implementation of the **WIP** using 2025 land use and inputs.
2. CAST estimates a 6 percent reduction in the long term from **2020** land use, inputs, and management practices.
3. The Dynamic Watershed Model estimates that only a 2 percent reduction would have been seen by 2020, accounting for lags, sampling frequency, and other factors.
4. The river monitoring data show a 20 percent increase with a 90% uncertainty range between 15 and 24 percent increase.

Implication: The observed response is less than expected over the period of 1995-2020.

Example 3: 01553500 West Branch Susquehanna River Total Nitrogen





Interpretive Text

1. CAST estimates a 29 percent reduction in the long term from implementation of the WIP using 2025 land use and inputs.
2. CAST estimates a 19 percent reduction in the long term from 2020 land use, inputs, and management practices.
3. The Dynamic Watershed Model estimates that only a 10 percent reduction would have been seen by 2020, accounting for lags, sampling frequency, and other factors.
4. The river monitoring data show a 25 percent reduction with a 90% uncertainty range between 17 and 33 percent reduction.

Implication: The observed response is more than expected over the period of 1995-2020.

Results:
WIP Goal

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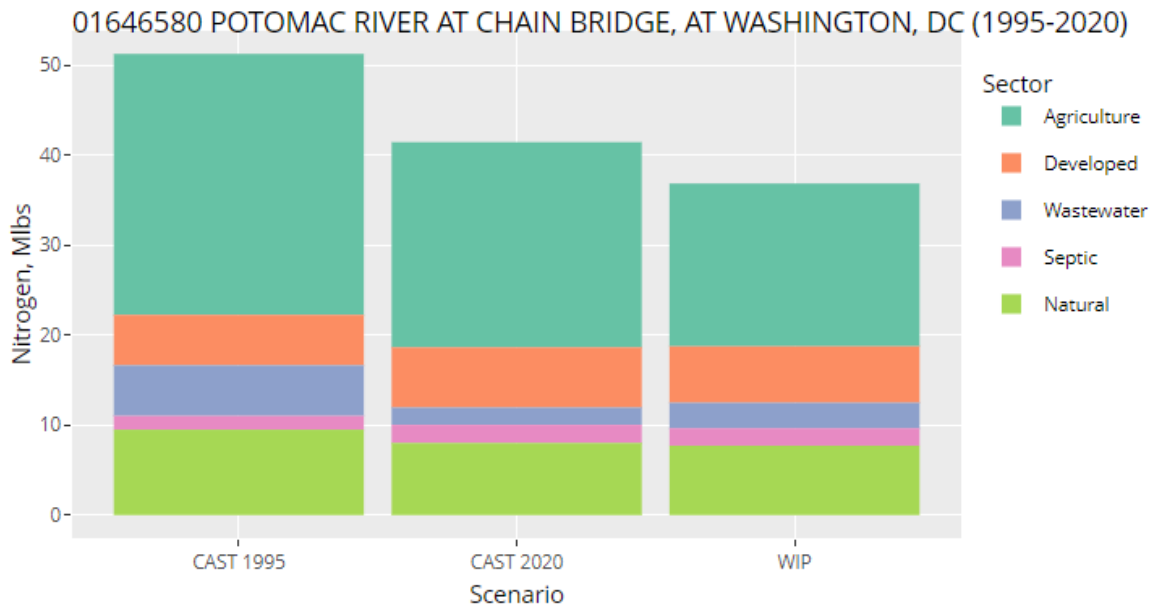
Interactive Plot



Data Type

CAST: Expected load in the long term - computed using the Chesapeake Bay Program Watershed Model (source).

Data Table

Show 50 entries Search:

	ID	Parameter	Scenario	Agriculture	Developed	Natural	Septic	Wastewater	Total
1	01646580	Nitrogen	CAST 1995	29	5.61	9.49	1.53	5.62	51.2
2	01646580	Nitrogen	CAST 2020	22.8	6.69	8.01	2.02	1.92	41.5
3	01646580	Nitrogen	WIP	18.1	6.27	7.71	1.94	2.83	36.9

Showing 1 to 3 of 3 entries Previous 1 Next

Partnership vetting (Thank you!)

- 09/2021 CBPO discussions
- 07/2022 USGS-led Factors Affecting Trends Group
- 08/2022 Status and Trends Workgroup
- 10/2022 Watershed Technical Workgroup
- 11/2022 WQGIT
- 03/2023 Status and Trends Workgroup
- 03/2023 WQGIT – Approved
- 04/2023 Modeling WQ
- 2023 various groups including USGS, NRCS, DEP, PA 4R Alliance
- 10/2023 Integrated Trends Analysis Team
- 11/2023 Peer-reviewed publication in Ecological Indicators

* Each meeting produced recommendations that strengthened the product.

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