



# Chesapeake Bay Restoration

## Path Forward on CAST

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# Partnership Decisions – Model Updates

- Beginning in 2014, the Milestone Workgroup conducted a year-long investigation and deliberation into how best to introduce new data and methods to the accounting tools.
  - The impetus for the investigation was new data from the 2012 Agricultural Census, the 2011 National Land Cover Dataset, and human population projection data from states.
- The Milestone Workgroup recommended to the WQGIT that jurisdictions be evaluated with the same model over a two-year milestone period that they used to develop their 2-year plans

In December 2015 and January 2016, the WQGIT and the Management Board, respectively, reached consensus on the Milestone Workgroup recommendations:

“Starting with the jurisdictions’ development of their 2017 milestones, the partnership will:

1. hold the assumptions set at the beginning of the milestone period constant over the two-year period and
2. at the end of the milestone period, the partners will factor in the new information, BMP efficiencies, and data previously approved by the partnership into the present and past history of progress runs, back through 2009.”

# Purpose for Today

- Highlight the changes between CAST updates, using current Progress (2021)
  - Review CAST19 in its current state
  - Changes to CAST19 with corrected 2013-2014 fertilizer data
  - What is included in CAST21 incorporating all data previously agreed to for use by the partnership and the jurisdiction updates
- Identify the path forward
  - What is happening with fertilizer data in both the Urban and Ag Sectors

# ➤ 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	AllSources	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	AllSources	14.713	14.860	14.050	0.147	-0.810	-0.663

# ➤ Change in Nutrient Loads to the Chesapeake Bay

Differences between CAST versions by jurisdiction; 2021 Progress scenario

	Nitrogen Loads					
	CAST19	CAST19	CAST21	CAST19	CAST19 to CAST21	CAST19 to CAST21
	Current	Corrected Fertilizer	All Updates	Change w/ Corrected	Change From Other	Total Change
		(2013-2014)		Fertilizer Data	Data and Method Updates	From Updates
	(M lbs)	(M lbs)	(M lbs)	(M lbs)	(M lbs)	(M lbs)
New York	12.611	12.889	13.360	0.279	0.471	0.750
Pennsylvania	104.495	106.852	107.393	2.357	0.541	2.898
Maryland	50.740	52.007	51.893	1.267	-0.114	1.153
Virginia	56.642	57.266	57.185	0.624	-0.081	0.543
West Virginia	7.925	8.003	7.753	0.079	-0.250	-0.172
Delaware	6.389	6.752	7.113	0.363	0.362	0.724
District of Columbia	1.652	1.652	1.651	0	-0.002	-0.002
CB Watershed	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	All Updates	Change w/ Corrected	Change From Other	Total Change
		(2013-2014)		Fertilizer Data	Data and Method Updates	From Updates
	(M lbs)	(M lbs)	(M lbs)	(M lbs)	(M lbs)	(M lbs)
New York	0.539	0.555	0.543	0.016	-0.011	0.005
Pennsylvania	3.715	3.776	3.681	0.061	-0.095	-0.034
Maryland	3.803	3.826	3.344	0.023	-0.482	-0.459
Virginia	6.028	6.068	5.769	0.040	-0.299	-0.259
West Virginia	0.438	0.442	0.503	0.004	0.061	0.065
Delaware	0.120	0.123	0.143	0.003	0.020	0.023
District of Columbia	0.070	0.070	0.067	0	-0.003	-0.003
CB Watershed	14.713	14.860	14.050	0.147	-0.810	-0.663

# Change in Nutrient Loads to the Chesapeake Bay

Differences between CAST versions by source; 2021 Progress scenario

		Nitrogen Loads					
		CAST19	CAST19 to CAST21	CAST19 to CAST21	CAST19	CAST19	CAST21
		Change w/ Corrected	Change From Other	Total Change	Current	Corrected Fertilizer	All updates
		Fertilizer Data	Data and Method Updates	From Updates	Percent Goal Achieved	Percent Goal Achieved	Percent Goal Achieved
		(M lbs)	(M lbs)	(M lbs)	(>=80% is on track)	(>=80% is on track)	(>=80% is on track)
CB Watershed	Agriculture	4.721	0.853	5.573	5%	1%	0%
CB Watershed	Developed	0	0.091	0.091	0%	0%	0%
CB Watershed	Wastewater	0	0	0.000	100%	100%	100%
CB Watershed	Septic	0	-0.053	-0.053	0%	0%	0%
CB Watershed	Natural	0.247	0.036	0.283	2%	1%	21%
CB Watershed	AllSources	4.967	0.927	5.894	42%	35%	33%
		Phosphorus Loads					
		CAST19	CAST19 to CAST21	CAST19 to CAST21	CAST19	CAST19	CAST21
		Change w/ Corrected	Change From Other	Total Change	Current	Corrected Fertilizer	All updates
		Fertilizer Data	Data and Method Updates	From Updates	Percent Goal Achieved	Percent Goal Achieved	Percent Goal Achieved
		(M lbs)	(M lbs)	(M lbs)	(>=80% is on track)	(>=80% is on track)	(>=80% is on track)
CB Watershed	Agriculture	0.113	-0.149	-0.035	9%	6%	20%
CB Watershed	Developed	0	-0.467	-0.467	0%	0%	100%
CB Watershed	Wastewater	0	0	0.000	94%	94%	94%
CB Watershed	Septic	0	0	0.000	0%	0%	0%
CB Watershed	Natural	0.034	-0.195	-0.161	5%	5%	55%
CB Watershed	AllSources	0.147	-0.810	-0.663	64%	60%	80%

# Change in Nutrient Loads to the Chesapeake Bay

Differences between CAST versions by jurisdiction; 2021 Progress scenario

	Nitrogen Loads					
	CAST19	CAST19 to CAST21	CAST19 to CAST21	CAST19	CAST19	CAST21
	Change w/ Corrected	Change From Other	Total Change	Current	Corrected Fertilizer	All updates
	Fertilizer Data	Data and Method Updates	From Updates	Percent Goal Achieved	Percent Goal Achieved	Percent Goal Achieved
	(M lbs)	(M lbs)	(M lbs)	(>=80% is on track)	(>=80% is on track)	(>=80% is on track)
New York	0.279	0.471	0.750	69%	58%	40%
Pennsylvania	2.357	0.541	2.898	22%	16%	13%
Maryland	1.267	-0.114	1.153	58%	48%	46%
Virginia	0.624	-0.081	0.543	75%	71%	72%
West Virginia	0.079	-0.250	-0.172	100%	100%	100%
Delaware	0.363	0.362	0.724	20%	4%	0%
District of Columbia	0	-0.002	-0.002	100%	100%	100%
CB Watershed	4.967	0.927	5.894	42%	35%	33%
	Phosphorus Loads					
	CAST19	CAST19 to CAST21	CAST19 to CAST21	CAST19	CAST19	CAST21
	Change w/ Corrected	Change From Other	Total Change	Current	Corrected Fertilizer	All updates
	Fertilizer Data	Data and Method Updates	From Updates	Percent Goal Achieved	Percent Goal Achieved	Percent Goal Achieved
	(M lbs)	(M lbs)	(M lbs)	(>=80% is on track)	(>=80% is on track)	(>=80% is on track)
New York	0.016	-0.011	0.005	76%	70%	74%
Pennsylvania	0.061	-0.095	-0.034	48%	44%	49%
Maryland	0.023	-0.482	-0.459	74%	69%	100%
Virginia	0.040	-0.299	-0.259	68%	65%	87%
West Virginia	0.004	0.061	0.065	97%	95%	64%
Delaware	0.003	0.020	0.023	52%	40%	0%
District of Columbia	0	-0.003	-0.003	100%	100%	100%
CB Watershed	0.147	-0.810	-0.663	64%	60%	80%

# CAST21 includes the following updates

- Jurisdiction reported BMP history during Progress assessments
- Incorporation of the Very High-Resolution Land Use Data into CAST
- Updated 2013 – 2025 land use acres, septic systems, and sewer service areas
- New Method for Computing agricultural land use total acres
- State Specific Updates
- BMP updates



# Summary of Topics from Updates

- Concerns raised about Fertilizer Data
  - Source of Fertilizer Data
  - Model Application Methods for Fertilizer Data
- Increased Level of Effort to Reach Planning Targets
  - Corrected CAST19 & CAST21 – transparency and meeting partnership processes and methods.
  - PSC approved 2025 Climate Change Loads
- Time Needed to Address the Load Increases from CAST updates
  - From WQGIT Presentation to MB – Would need additional time to address CAST Update Load Increase - Approximately 2 years

# Path Forward

- Addressing concerns about partnership approved methods and sources for Fertilizer data
  - Partnership focus to evaluate data and methods and updates on progress of these activities
  - Agriculture Workgroup to evaluate data sources to determine if better alternatives exist to our current data sources and methods
  - Urban Stormwater WG to evaluate fertilizer data sources and model application methods
- Focus on new expert panels
  - The CBPO set aside IIJA funds over the next 5 years (depending on appropriation)
- Consider what additional time would be needed to meet the increased level of effort by the partnership to meet the partnership goals and outcomes.

## Path Forward - Continued

- 1) Update the 2013-2014 Fertilizer Data to correct the error in CAST19
- 2) Discussion of CAST21 Release.
- 3) Request PSC direction to the WQGIT (and associated workgroups, Agriculture and Urban Stormwater) to focus time and effort on evaluating fertilizer source data, and the methods for incorporation of fertilizer data into CAST.

# Additional Slides

## CAST21 includes the following updates

- Jurisdiction reported BMP history during Progress assessments - the most current history is included in CAST21
- Incorporation of the Very High-Resolution Land Use Data into CAST
- Updated 2013 – 2025 land use acres, septic systems, and sewer service areas
- The agricultural land use total acres are now determined by change product from 2013 rather than USDA Agricultural Census total acres
- MD biosolids, PA combined sewer overflow reductions, VA non-significant wastewater data for 2014-2020, WV 2020 wastewater data
- VA, WV, and MD harvested forest acres updated for multiple years
- Construction acres are updated for most jurisdictions for multiple years
- PA permitted/nonpermitted feeding space split
- BMP updates for urban stream restoration, tree and forest planting, forest buffers, impervious disconnection, agricultural ditch management, water control structures, abandoned mine land reclamation, wetland creation and rehabilitation now available in progress scenarios

# ➤ Change in Nutrient Loads to the Chesapeake Bay

Differences between CAST versions with each update: 6.3M lbs. TN, -0.5M lbs. TP  
 By source sector; 2020 Progress scenario

Nitrogen							
		CAST19 to CAST21	CAST21	CAST21	CAST19 to CAST21	CAST19 TMDL Goal	CAST21 TMDL Goal
		Nov.	Effect of Broiler Data	Effect of Yield Data	All Effects	Achieved To-Date	Achieved To-Date
Jurisdiction	Source	(M lbs)	(M lbs)	(M lbs)	(M lbs)	(%)	(%)
CBW	Agriculture	4.056	0.024	1.863	5.943	10%	0%
CBW	Developed	0.177	0	0	0.177	0%	0%
CBW	Wastewater	0	0	0	0	100%	100%
CBW	Septic	-0.080	0	0	-0.080	0%	100%
CBW	Natural	0.120	0.001	0.094	0.215	23%	20%
CBW	AllSources	4.273	0.025	1.957	6.255	41%	35%

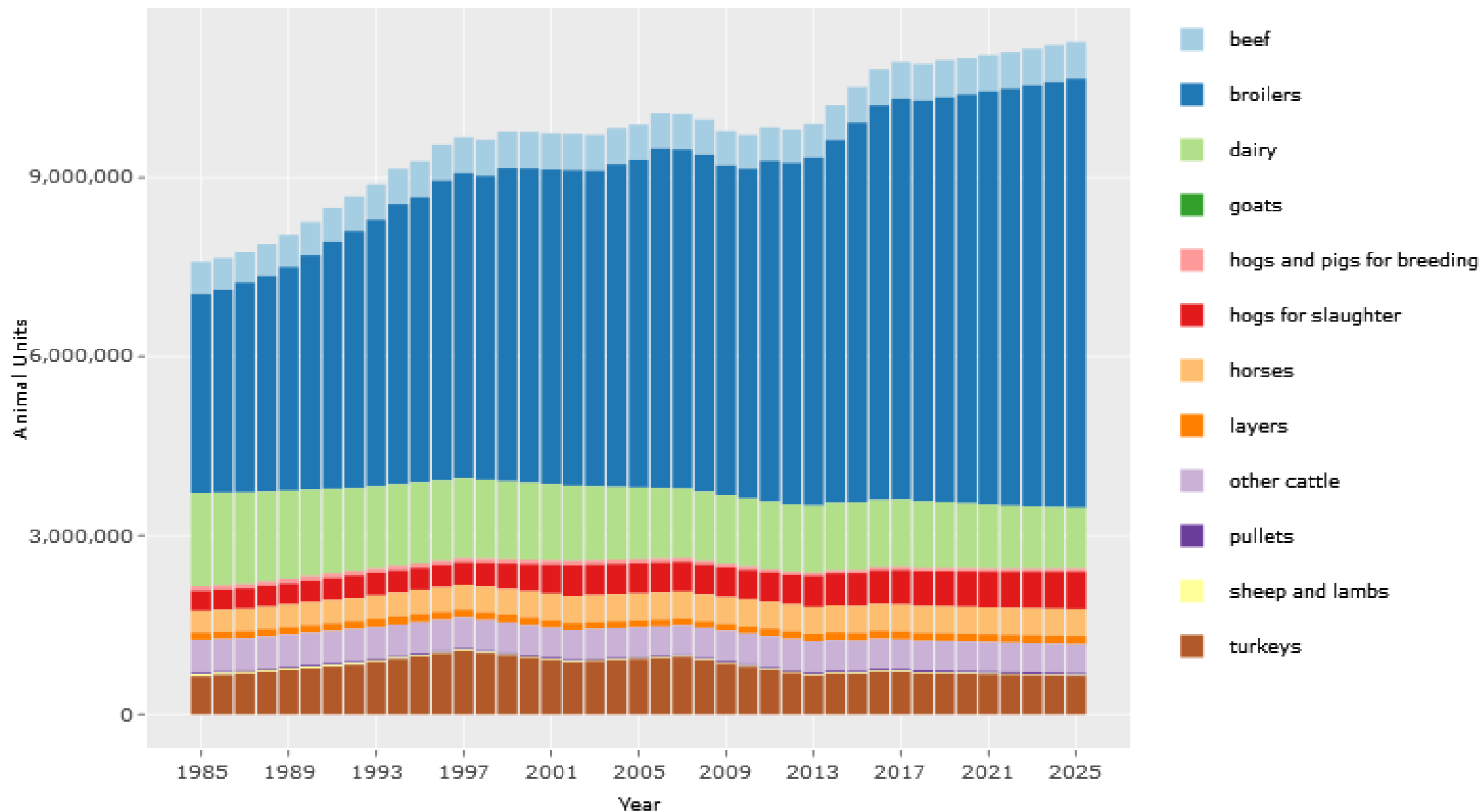
Phosphorus							
		CAST19 to CAST21	CAST21	CAST21	CAST19 to CAST21	CAST19 TMDL Goal	CAST21 TMDL Goal
		Nov.	Effect of Broiler Data	Effect of Yield Data	All Effects	Achieved To-Date	Achieved To-Date
Jurisdiction	Source	(M lbs)	(M lbs)	(M lbs)	(M lbs)	(%)	(%)
CBW	Agriculture	0.086	0.001	-0.029	0.058	17%	11%
CBW	Developed	-0.454	0	0	-0.454	0%	100%
CBW	Wastewater	0	0	0	0	97%	100%
CBW	Septic	-0.003	0	0	-0.003	0%	100%
CBW	Natural	-0.127	0.000	-0.006	-0.134	34%	50%
CBW	AllSources	-0.498	0.001	-0.036	-0.533	64%	78%

# ➤ Change in Nutrient Loads to the Chesapeake Bay

Nitrogen							
		CAST19 to CAST21	CAST21	CAST21	CAST19 to CAST21	CAST19 TMDL Goal	CAST21 TMDL Goal
		Nov.	Effect of Broiler Data	Effect of Yield Data	All Effects	Achieved To-Date	Achieved To-Date
Jurisdiction	Source	(M lbs)	(M lbs)	(M lbs)	(M lbs)	(%)	(%)
NY	AllSources	0.697	0.000	-0.042	0.655	45%	18%
PA	AllSources	1.772	0.124	0.868	2.764	18%	12%
MD	AllSources	1.017	-0.016	0.482	1.483	82%	73%
VA	AllSources	0.566	-0.015	0.434	0.985	66%	65%
WV	AllSources	-0.153	-0.016	-0.005	-0.173	100%	100%
DE	AllSources	0.374	-0.052	0.220	0.542	0%	0%
DC	AllSources	-0.002	0	0	-0.002	100%	100%
CBW	AllSources	4.273	0.025	1.957	6.255	41%	35%

Phosphorus							
		CAST19 to CAST21	CAST21	CAST21	CAST19 to CAST21	CAST19 TMDL Goal	CAST21 TMDL Goal
		Nov.	Effect of Broiler Data	Effect of Yield Data	All Effects	Achieved To-Date	Achieved To-Date
Jurisdiction	Source	(M lbs)	(M lbs)	(M lbs)	(M lbs)	(%)	(%)
NY	AllSources	0.004	0.000	-0.002	0.002	61%	60%
PA	AllSources	-0.027	0.004	-0.014	-0.036	46%	47%
MD	AllSources	-0.392	0.000	-0.014	-0.406	96%	100%
VA	AllSources	-0.159	0.001	-0.004	-0.163	65%	81%
WV	AllSources	0.067	0.000	0.000	0.067	94%	60%
DE	AllSources	0.013	-0.004	-0.001	0.008	47%	0%
DC	AllSources	-0.003	0	0	-0.003	100%	100%
CBW	AllSources	-0.498	0.001	-0.036	-0.533	64%	78%

Animal Units by Year and Animal





# USDA NASS Corn for Grain Yields (2010-2021)



https://quickstats.nass.usda.gov/results/22518199-8A05-3923-9006-7BC375910F78

USDA United States Department of Agriculture  
National Agricultural Statistics Service

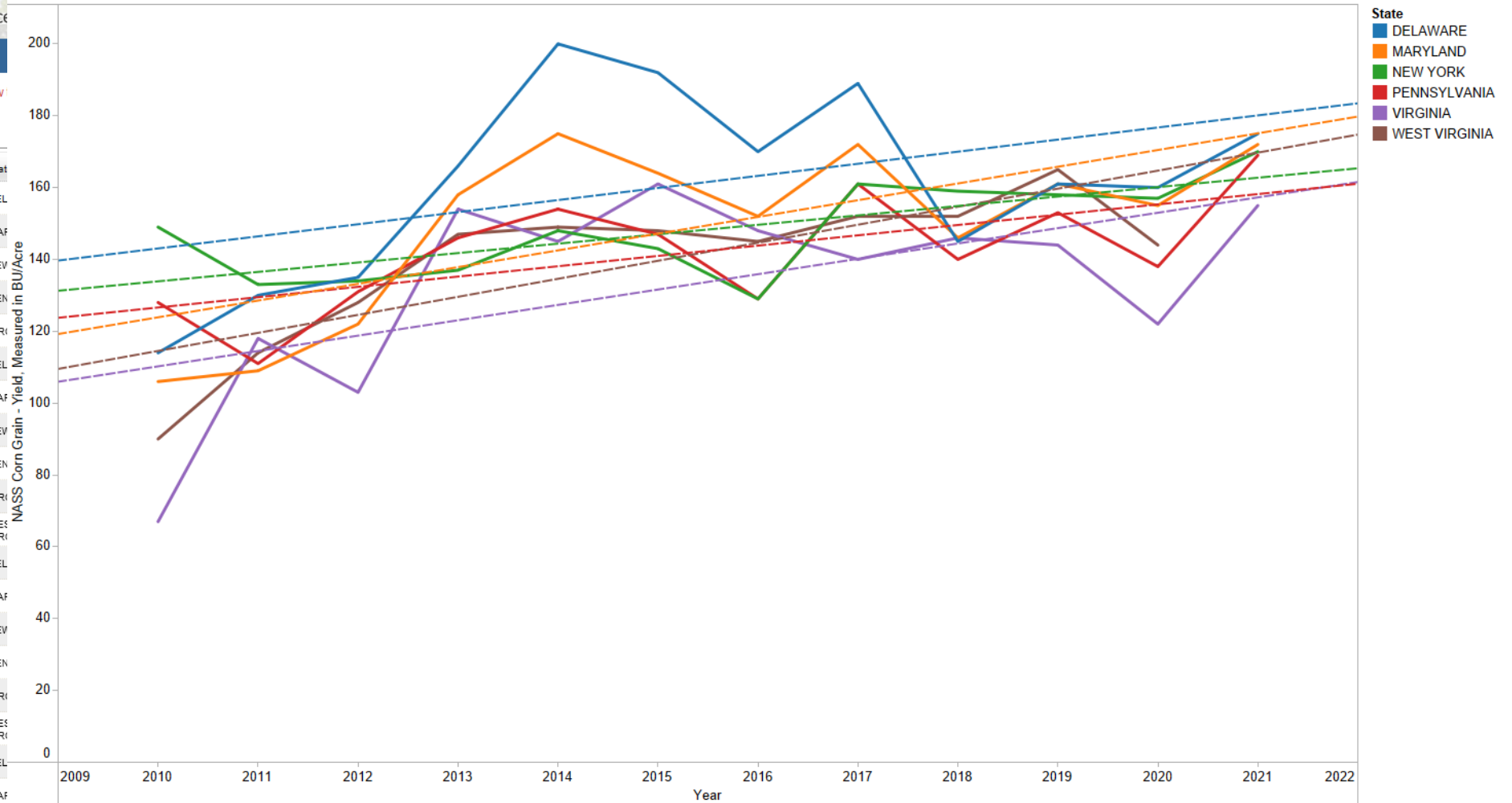
## Quick Stats

Navigation History: Data

Double click any cell below!

Program	Year	Period	Geo Level	State
SURVEY	2021	YEAR	STATE	DEL
SURVEY	2021	YEAR	STATE	MAR
SURVEY	2021	YEAR	STATE	NEW
SURVEY	2021	YEAR	STATE	PEN
SURVEY	2021	YEAR	STATE	VIR
SURVEY	2020	YEAR	STATE	DEL
SURVEY	2020	YEAR	STATE	MAR
SURVEY	2020	YEAR	STATE	NEW
SURVEY	2020	YEAR	STATE	PEN
SURVEY	2020	YEAR	STATE	VIR
SURVEY	2020	YEAR	STATE	WES VIR
SURVEY	2019	YEAR	STATE	DEL
SURVEY	2019	YEAR	STATE	MAR
SURVEY	2019	YEAR	STATE	NEW
SURVEY	2019	YEAR	STATE	PEN
SURVEY	2019	YEAR	STATE	VIR
SURVEY	2019	YEAR	STATE	WES VIR
SURVEY	2018	YEAR	STATE	DEL
SURVEY	2018	YEAR	STATE	MAR
SURVEY	2018	YEAR	STATE	NEW
SURVEY	2018	YEAR	STATE	PEN

NASS Trends



# ➤ CBW Change in Nutrient Applications to the Land

(2012 – 2016)

Nitrogen							
	Manure Applied	Biosolids Applied	Fertilizer Applied	Legume Fixed	Pasture Manure	Total Agriculture Applied/Fixed	Urban Fertilizer
2012-2016 Change (lbs)	14,460,000	-3,389,000	64,886,000	29,263,000	1,449,000	106,668,000	4,086,000
2012-2016 Change (%)	7%	-17%	16%	7%	1%	9%	6%
Phosphorus							
	Manure Applied	Biosolids Applied	Fertilizer Applied		Pasture Manure	Total Agriculture Applied	Urban Fertilizer
2012-2016 Change (lbs)	5,453,000	-1,616,000	5,581,000		681,000	10,098,000	6,643,000
2012-2016 Change (%)	9%	-15%	9%		2%	6%	62%

Friday, 2/18 - Release of revised CAST-21 with updated poultry, crop yields



Wednesday, 4/20 - Comments due from states

Monday, 5/13 - Response to comments, both those provided in November and those provided most recently.

Release of CAST-21 to occur after response to comments

## Draft Schedule for Deliberative Purposes