CBP Ammonia Data 101

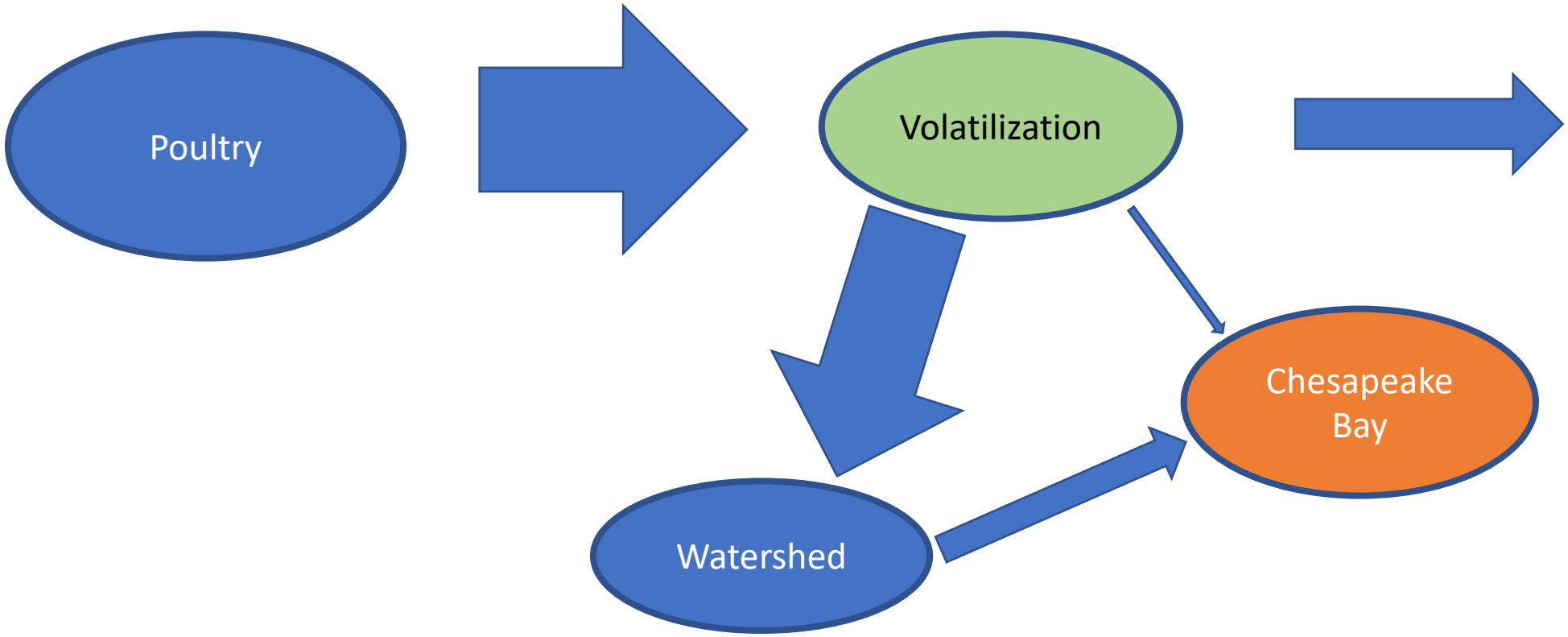
Gary Shenk – CBPO

5/4/2022

STAC workshop

Improving Modeling and Mitigation Strategies for Poultry Ammonia Emissions Across the Chesapeake Bay Watershed

The Chesapeake Bay Poultry Ammonia Issue

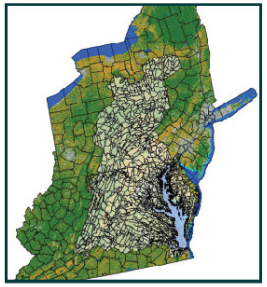


…along with other forms of nitrogen from ag, other sources of nitrogen, plus phosphorus and sediment

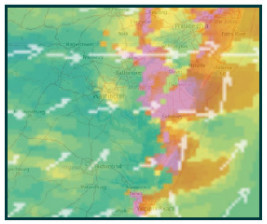
CBP Watershed Model

Data and Model Inputs

Pollution Control Data
Land Use Data
Point Sources Data
Septic Data
U.S. Census Data
Agricultural Data



Land Use Change Model



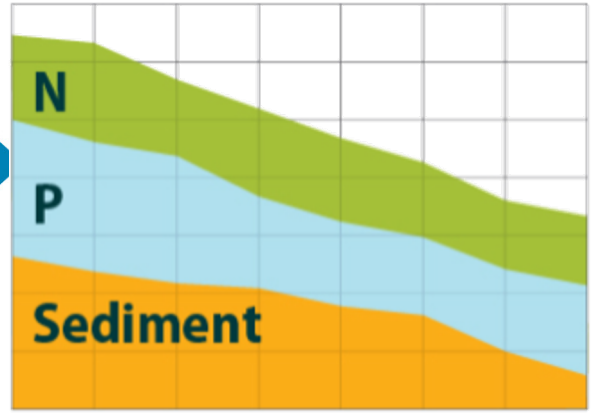
Airshed Model

Precipitation Data
Meteorological Data
Elevation Data
Soil Data

What are the load changes due to land use, BMPS, Wastewater

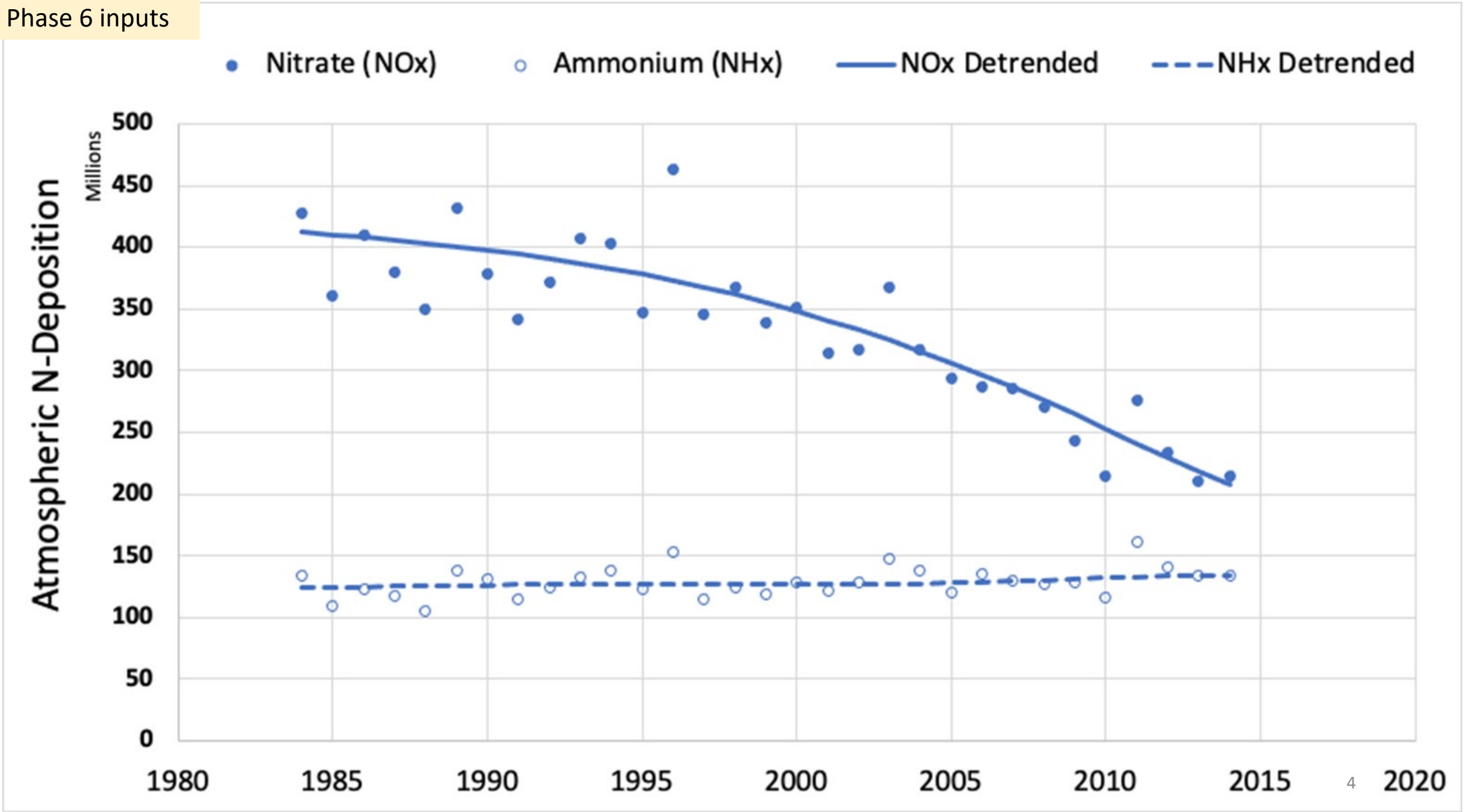
CAST

Nitrogen
Phosphorus
Sediment

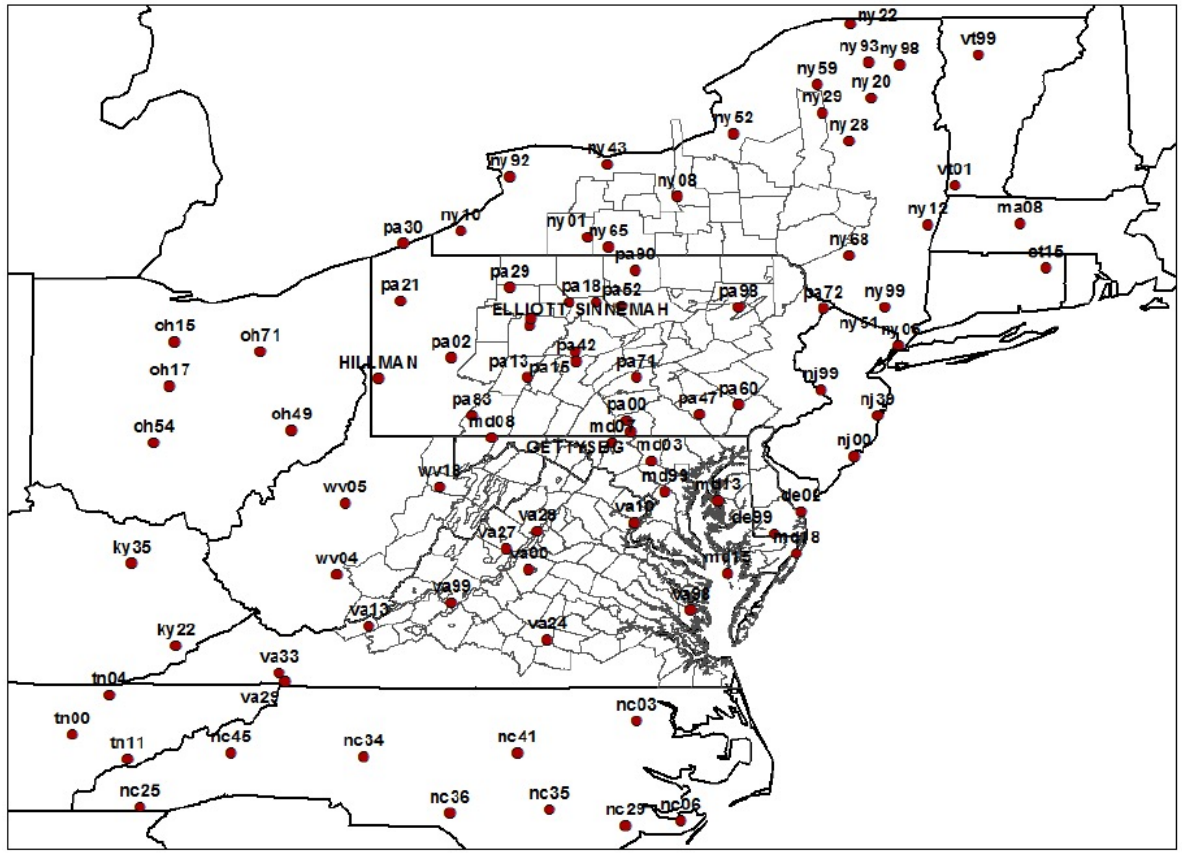


Background:
https://www.chesapeakebay.net/documents/Understanding_Chesapeake_Bay_Modeling_Tools.pdf

Phase 6 inputs



How does the CBP calculate deposition?

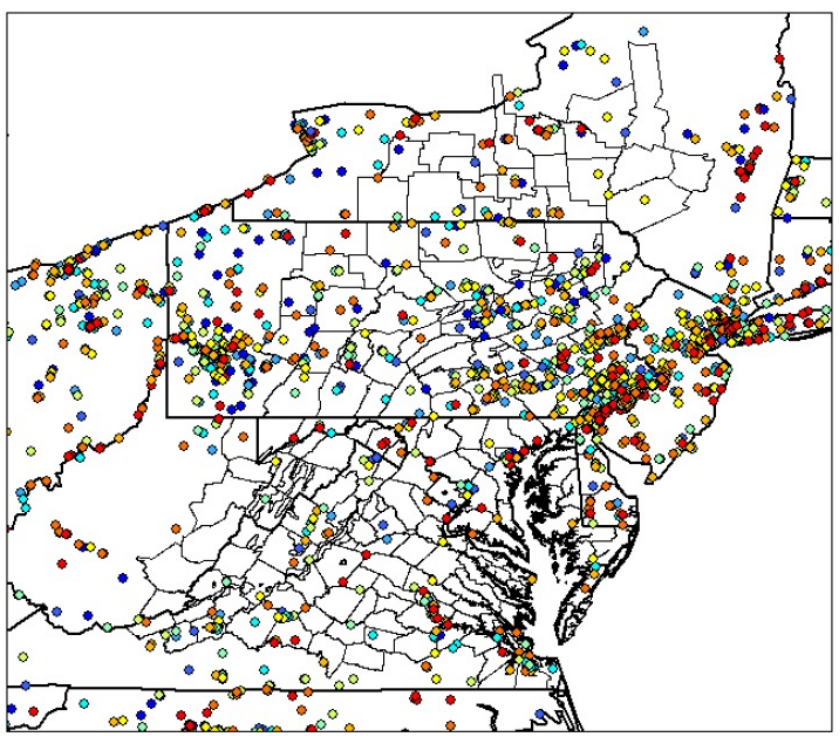


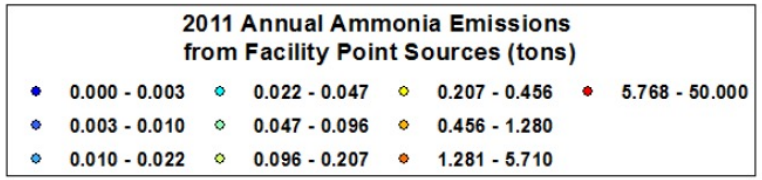
- Monitoring sites

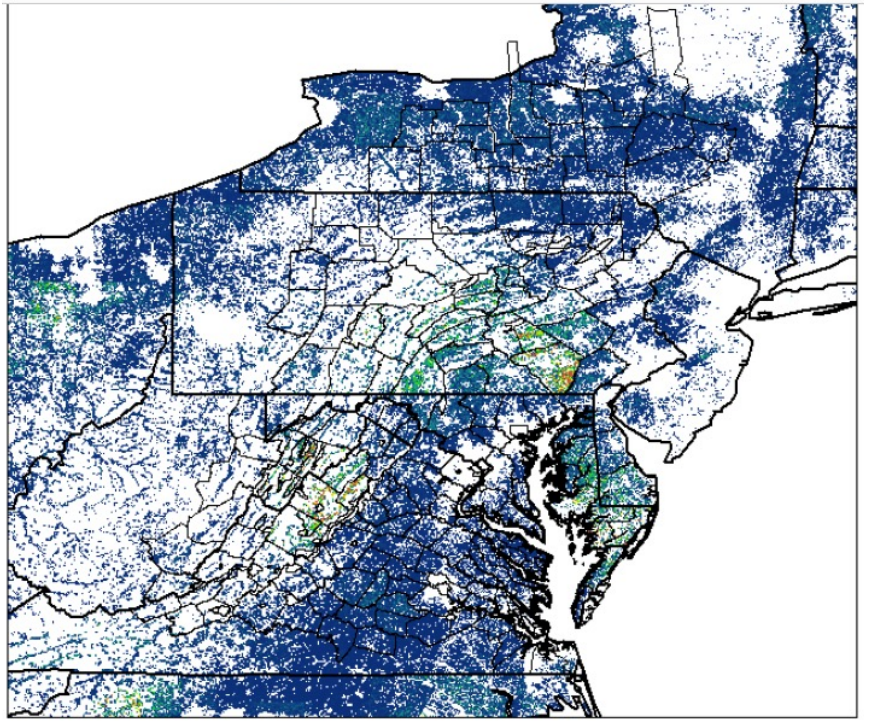
Source: Grimm 2017

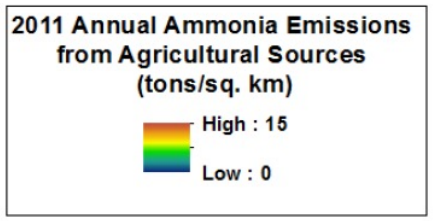
How does the CBP calculate deposition?

- Emission sources



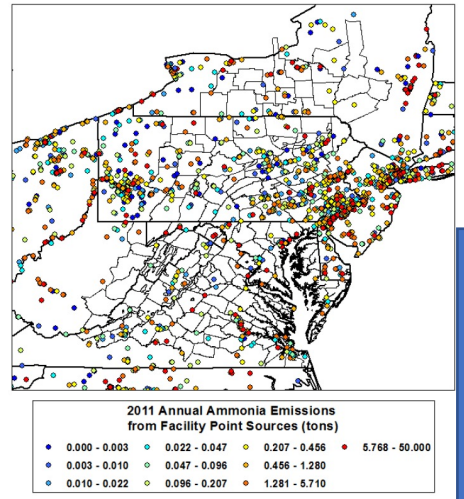


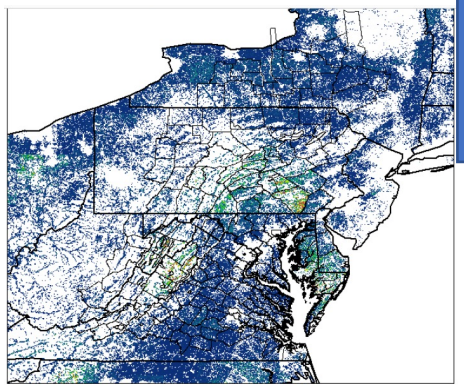




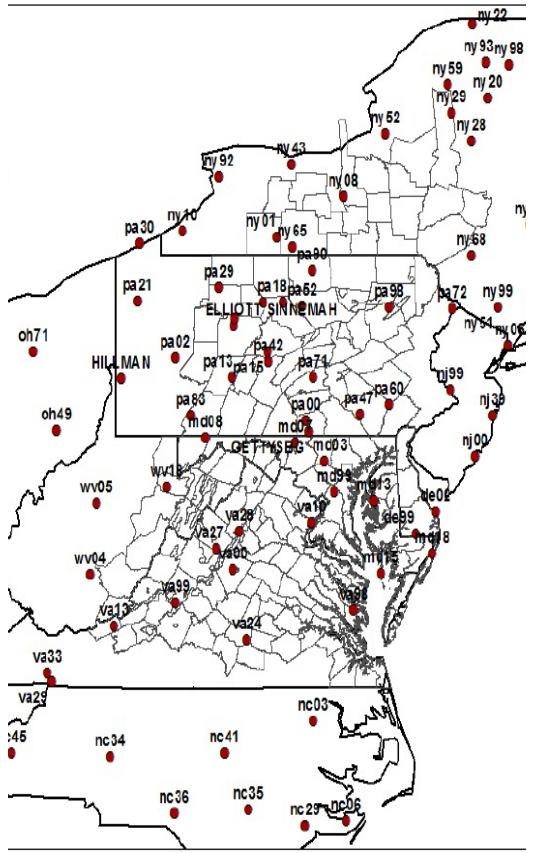
Source: Grimm 2017

How do we calculate deposition?



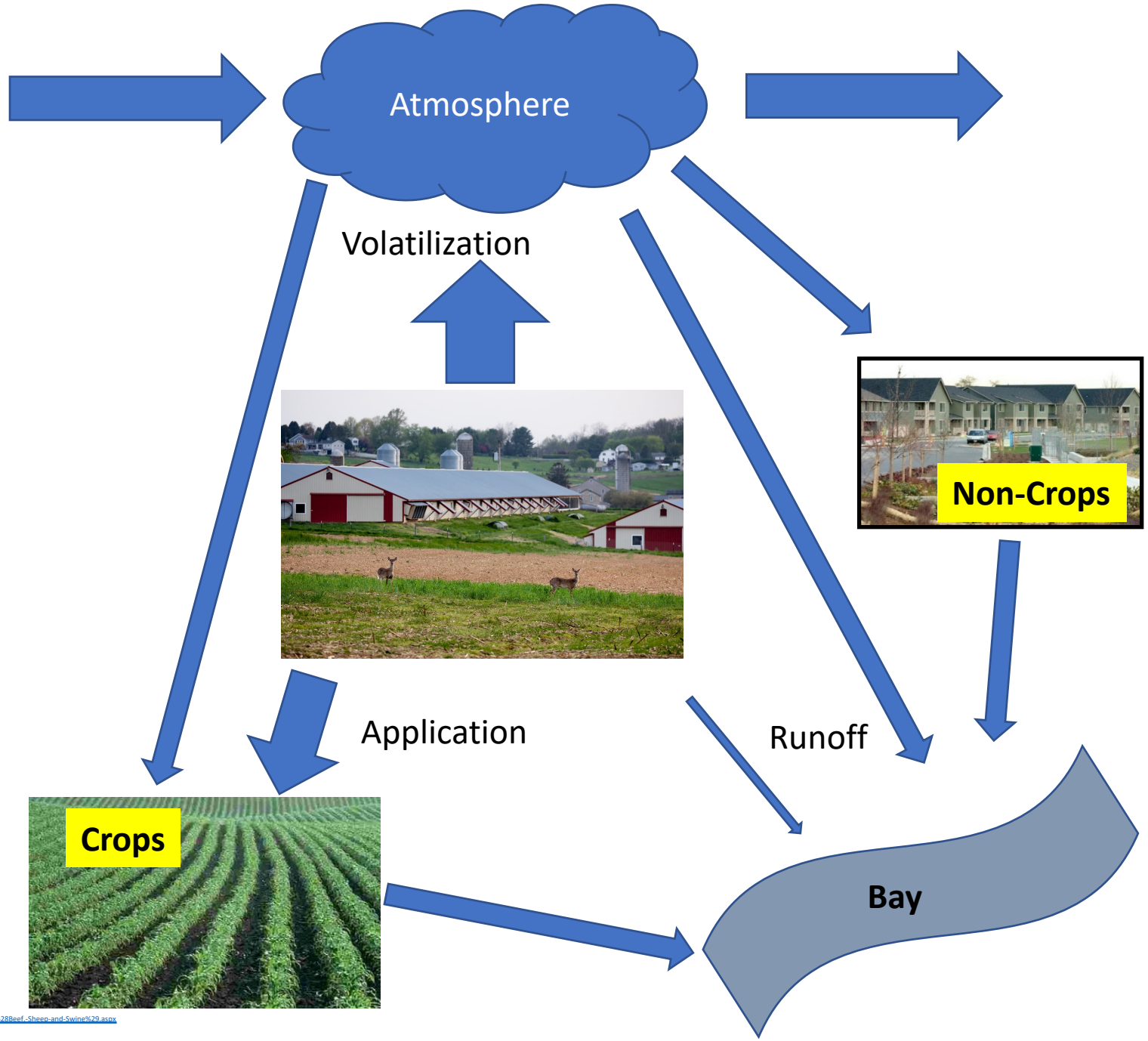


- Deposition in Rainfall
  - Statistical modeling
    - Sources
    - Rainfall
    - Wind direction
- Dry-weather deposition
  - CMAQ
- Future change in deposition
  - CMAQ



Source: Grimm 2017

Phase 6 Manure Conceptual Model



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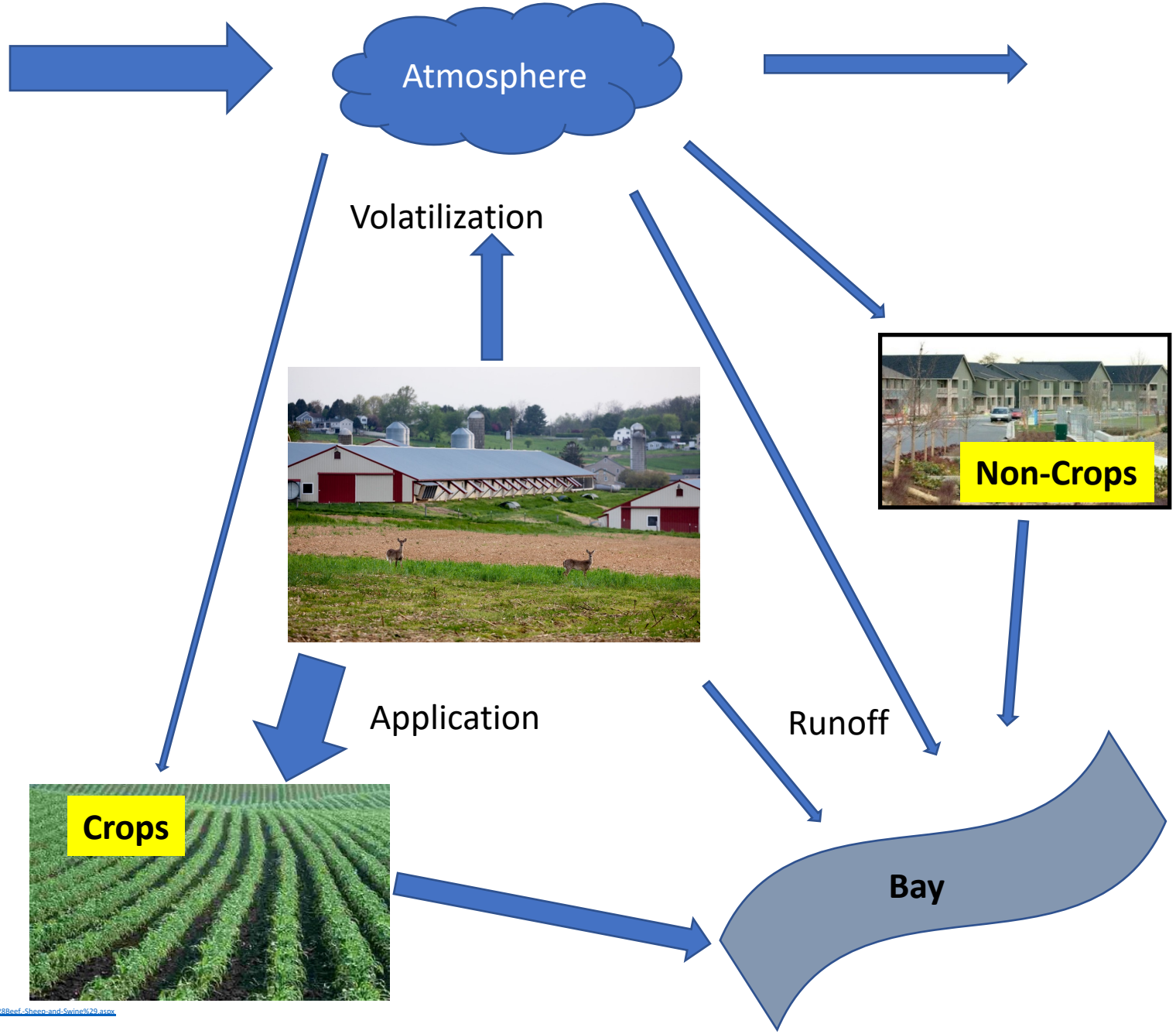
http://pubs.ext.vt.edu/442/442-308/442-308.html
http://nh.water.uses.gov/project/champlain_bmp/ag.htm

Phase 6 Manure Conceptual Model

Add volatilization ***filtering*** practices

Effect exaggerated



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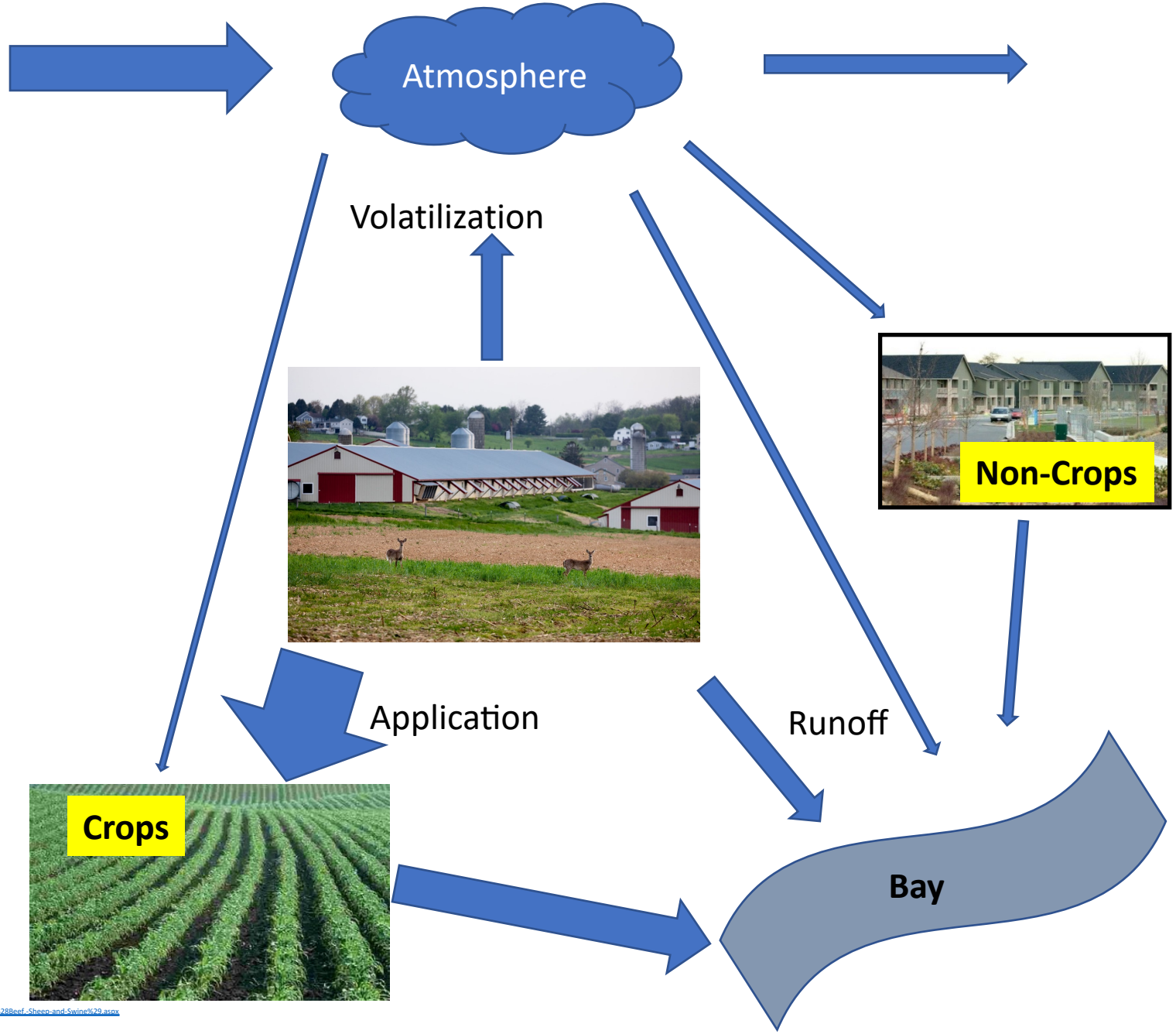
Phase 6 Manure Conceptual Model

Add volatilization ***restriction*** practices

Effect exaggerated



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Atmospheric path is not efficient

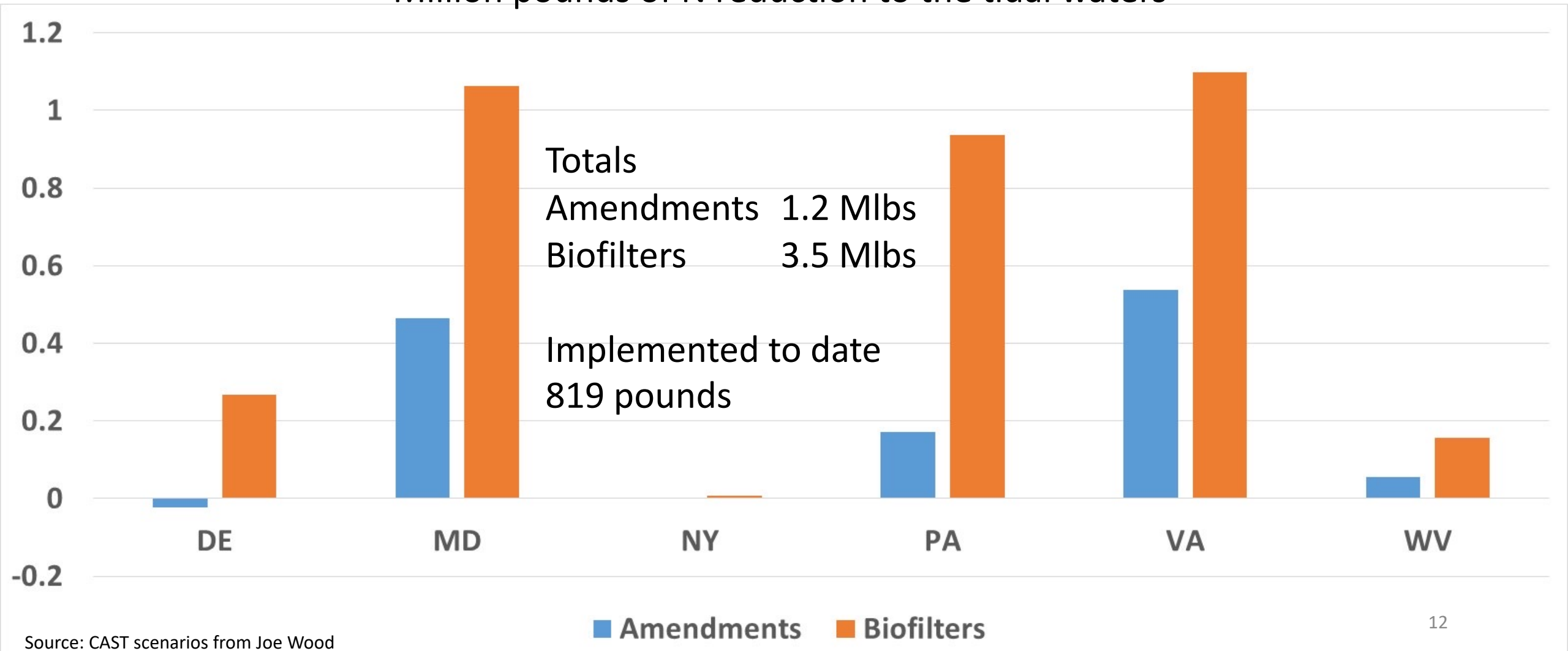
Reduced nitrogen: Ammonia

	Emitter DE	Emitter MD	Emitter NY	Emitter PA	Emitter VA	Emitter WV
To Watershed	24.0%	49.6%	13.7%	34.1%	41.8%	25.7%
Delivered	3.2%	6.8%	1.8%	5.1%	4.6%	3.2%
To Bay	2.0%	4.4%	0.6%	1.6%	4.4%	1.7%
Total Delivered	5.3%	11.2%	2.4%	6.7%	8.9%	5.0%

Source: Phase 6 documentation

Potential Reductions currently available in CAST

Million pounds of N reduction to the tidal waters



Source: CAST scenarios from Joe Wood

Note: known issue with low estimate of Maryland poultry emissions

Source Apportionment to Chesapeake Bay Watershed

Total **Reduced** N Deposition

Source Regions	Animal	CMV	EGU	Mobile	Nonroad	Poultry	
	35%	**0%**	**1%**	**4%**	**0%**	**14%**	
Central	7%	0%	0%	2%	0%	1%	**10%**
Central East	1%	0%	0%	0%	0%	0%	**1%**
Central West	4%	0%	0%	0%	0%	7%	**11%**
Delmarva	0%	0%	0%	0%	0%	2%	**2%**
Northeast	3%	0%	0%	0%	0%	0%	**3%**
Northwest	6%	0%	0%	0%	0%	1%	**7%**
Other	10%	0%	0%	1%	0%	2%	**13%**
South	3%	0%	0%	1%	0%	1%	**5%**
Southwest	1%	0%	0%	0%	0%	0%	**1%**

Emission Streams

Benish et al., 2022b *in prep*

Summary

- The CBP estimates total atmospheric deposition load
- The CBP estimates reductions in load to the Chesapeake from changes in volatilization
  - It's complicated
- Using the current model, almost 5 million pounds of reduction are available, but little used
- Improved transport estimates are on the way