

Poultry Sources in Chesapeake Bay Program Nitrogen Modeling

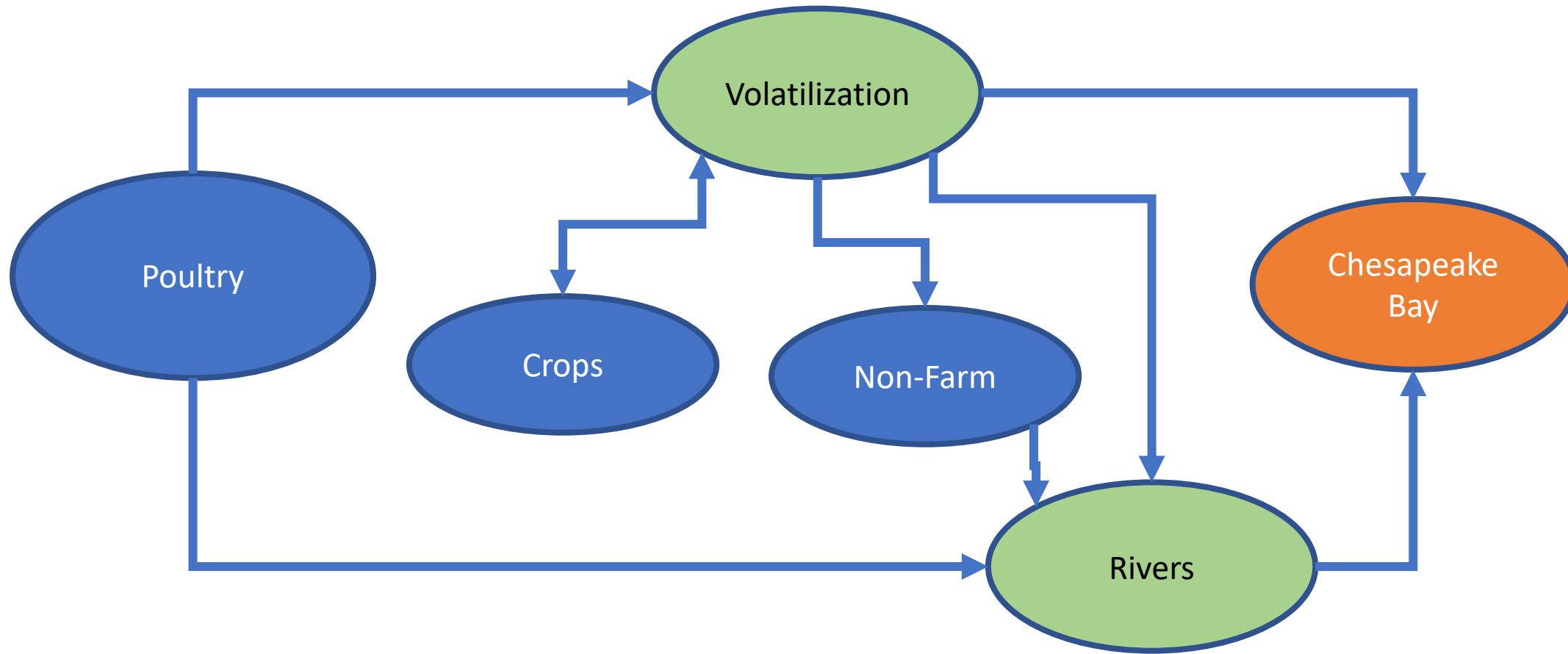
Gary Shenk – CBPO

04/20/2021

STAC workshop

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

The Chesapeake Bay Poultry Ammonia Issue

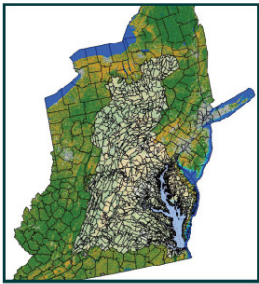


...along with other forms of nitrogen from ag, other sources of nitrogen, plus phosphorus and sediment

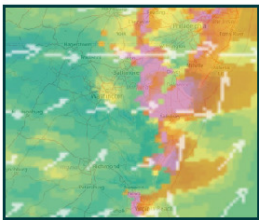
CBP TMDL Water Quality Models

Data and Model Inputs

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



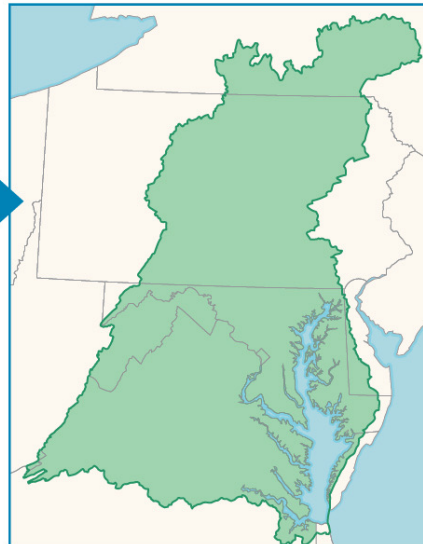
Land Use
Change
Model



Airshed
Model

Precipitation Data
Meteorological Data
Elevation Data
Soil Data

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



CAST and
Dynamic
Watershed Model

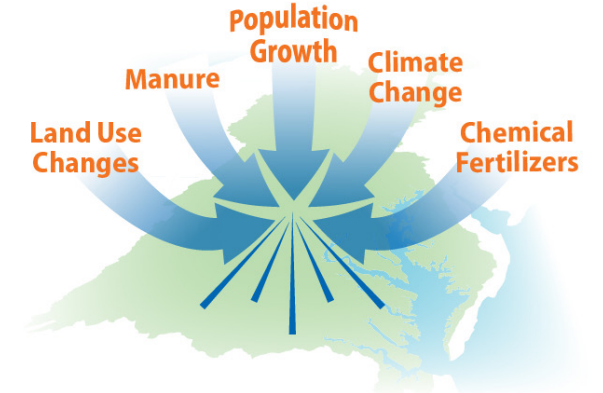
How do load
changes affect
dissolved oxygen



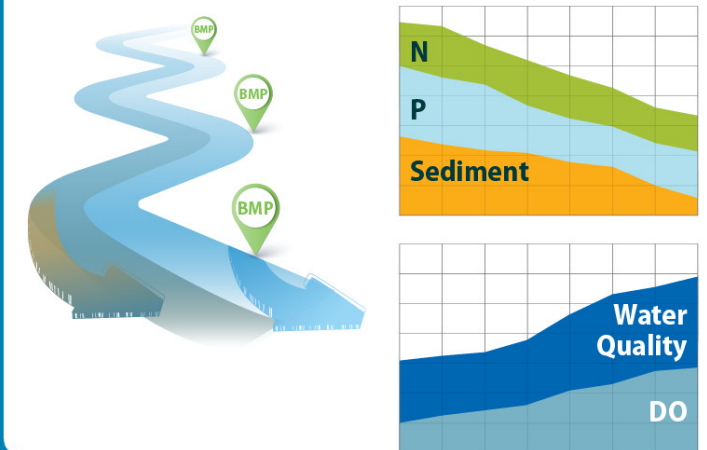
Estuary Model

Model Outputs

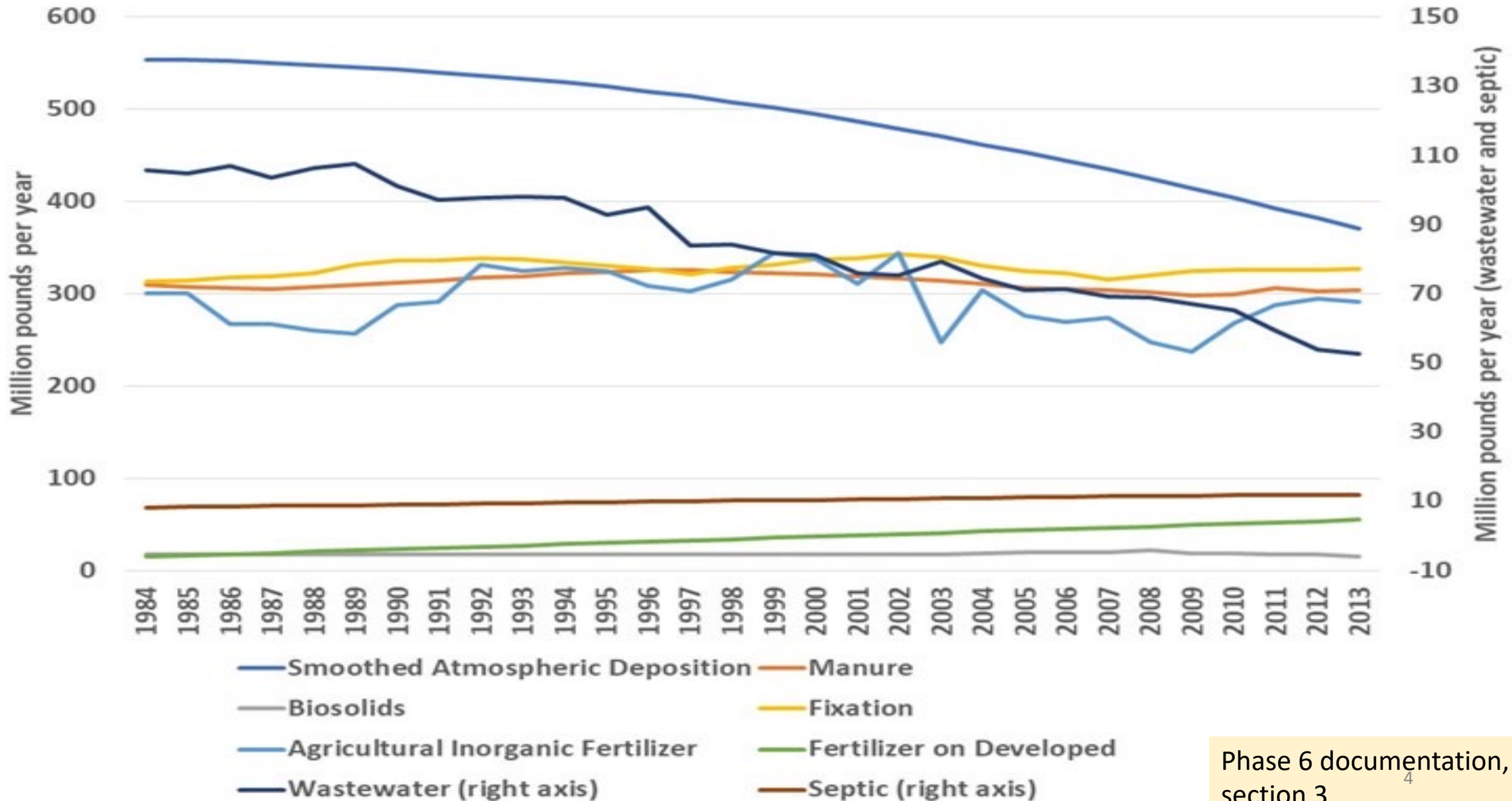
Prediction of Impacts



BMP Implementation Results

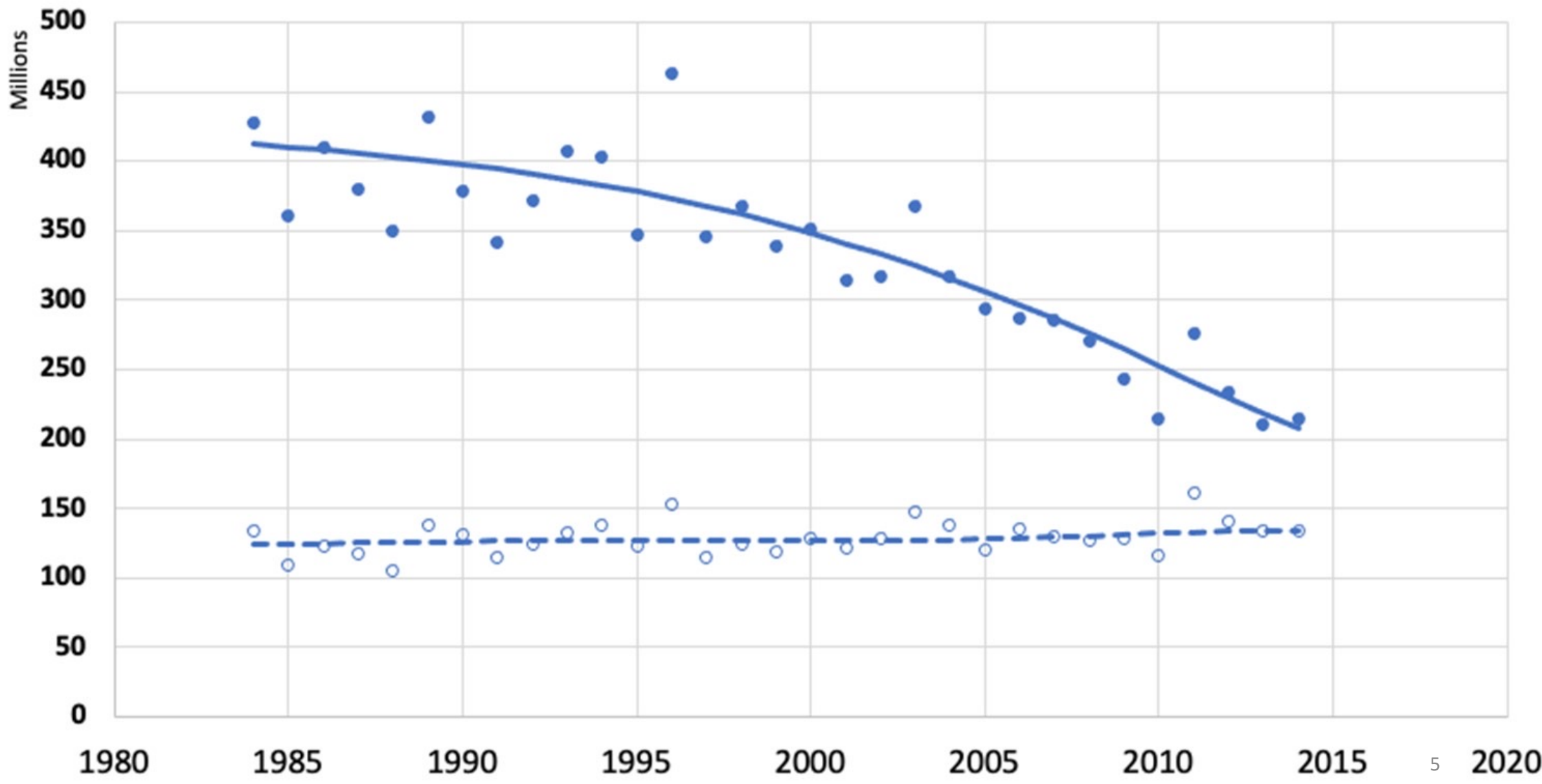


Nitrogen



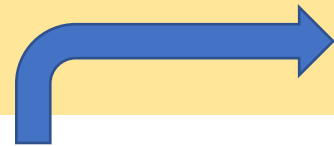
● Nitrate (NOx) ○ Ammonium (NHx) — NOx Detrended - - - NHx Detrended

Atmospheric N-Deposition

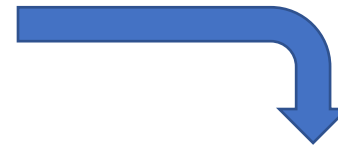
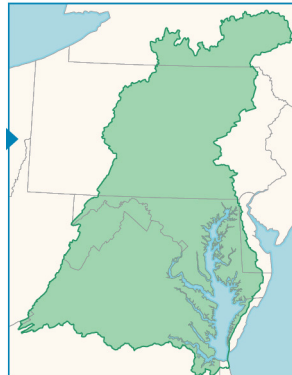


Use of CBP Watershed Model (CAST)

Organization that can pay for, encourage, and/or compel management



Phase 6 Watershed Model/CAST



Nitrogen, Phosphorus, Sediment

Proposed *Strategy*



Compare to goals





CAST Structure

**Inputs (Fertilizer, Manure,
Atmospheric Deposition,
Fixation, Wastewater)**



Land management



Watershed Delivery

Nitrogen for a land use in a geographic area

Nitrogen Sources to the Chesapeake

CAST Structure

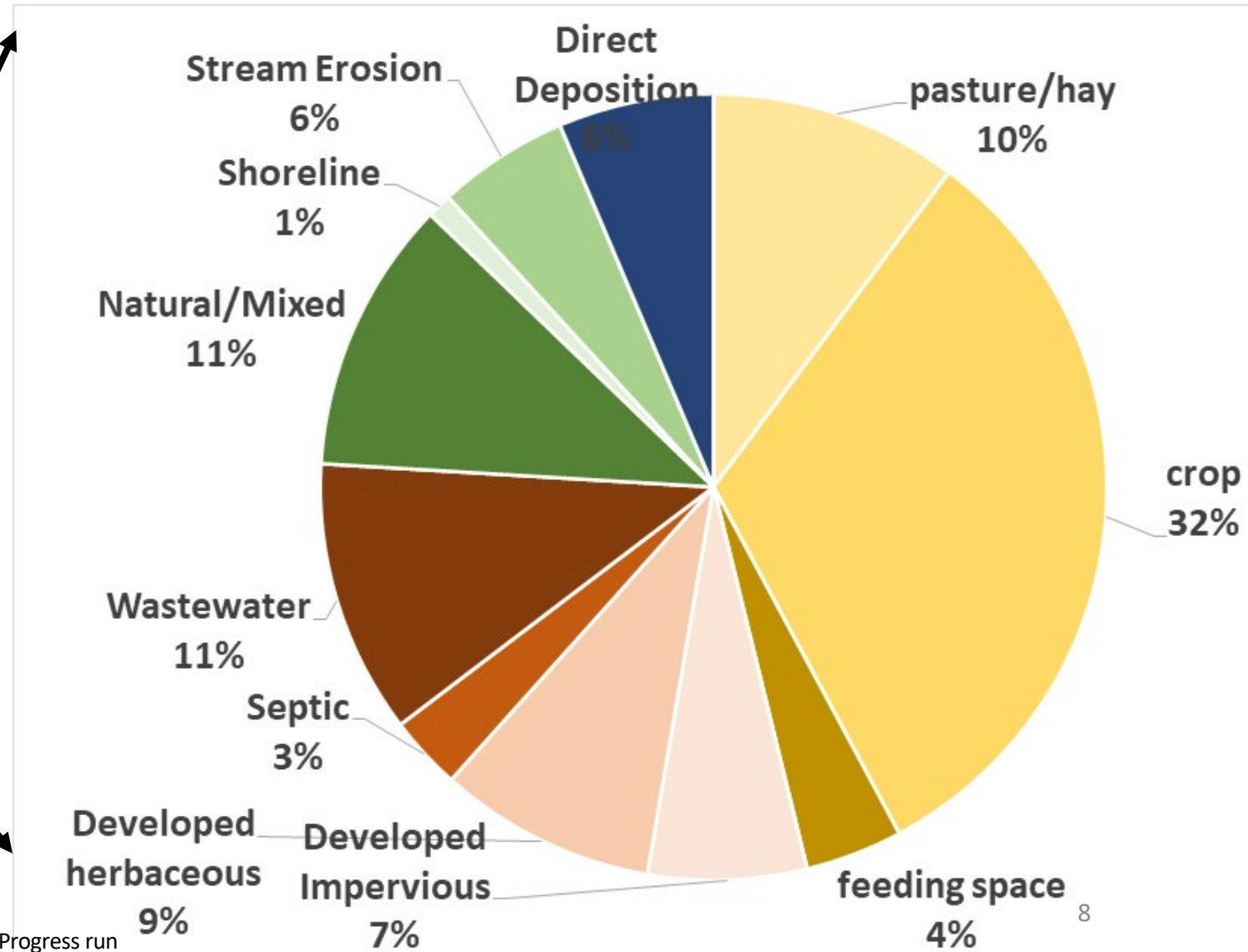
Inputs (Fertilizer, Manure, Atmospheric Deposition, Fixation, Wastewater)



Land management



Watershed Delivery



Nitrogen Sources to the Chesapeake

CAST Structure

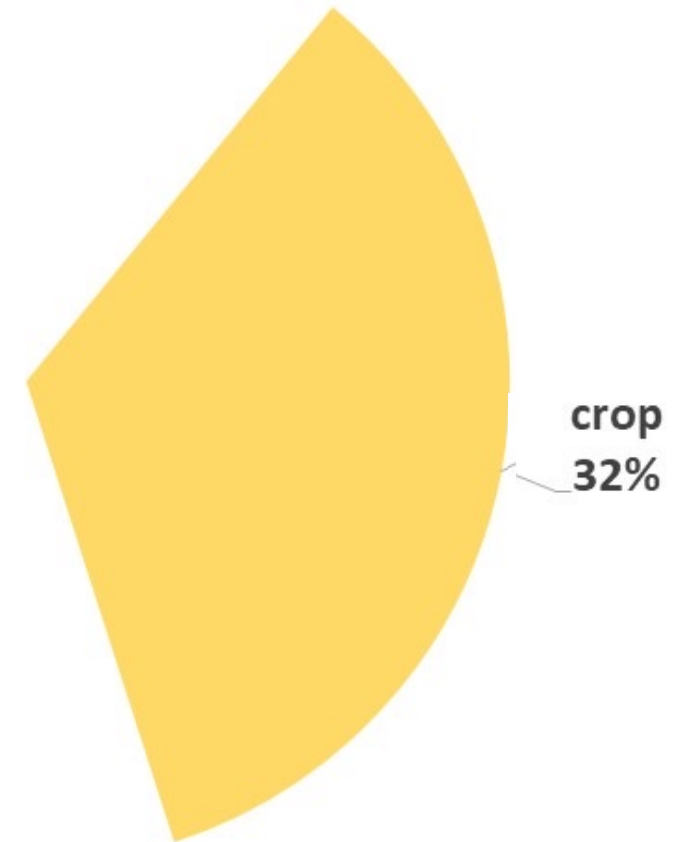
Inputs (Fertilizer, Manure,
Atmospheric Deposition,
Fixation, Wastewater)



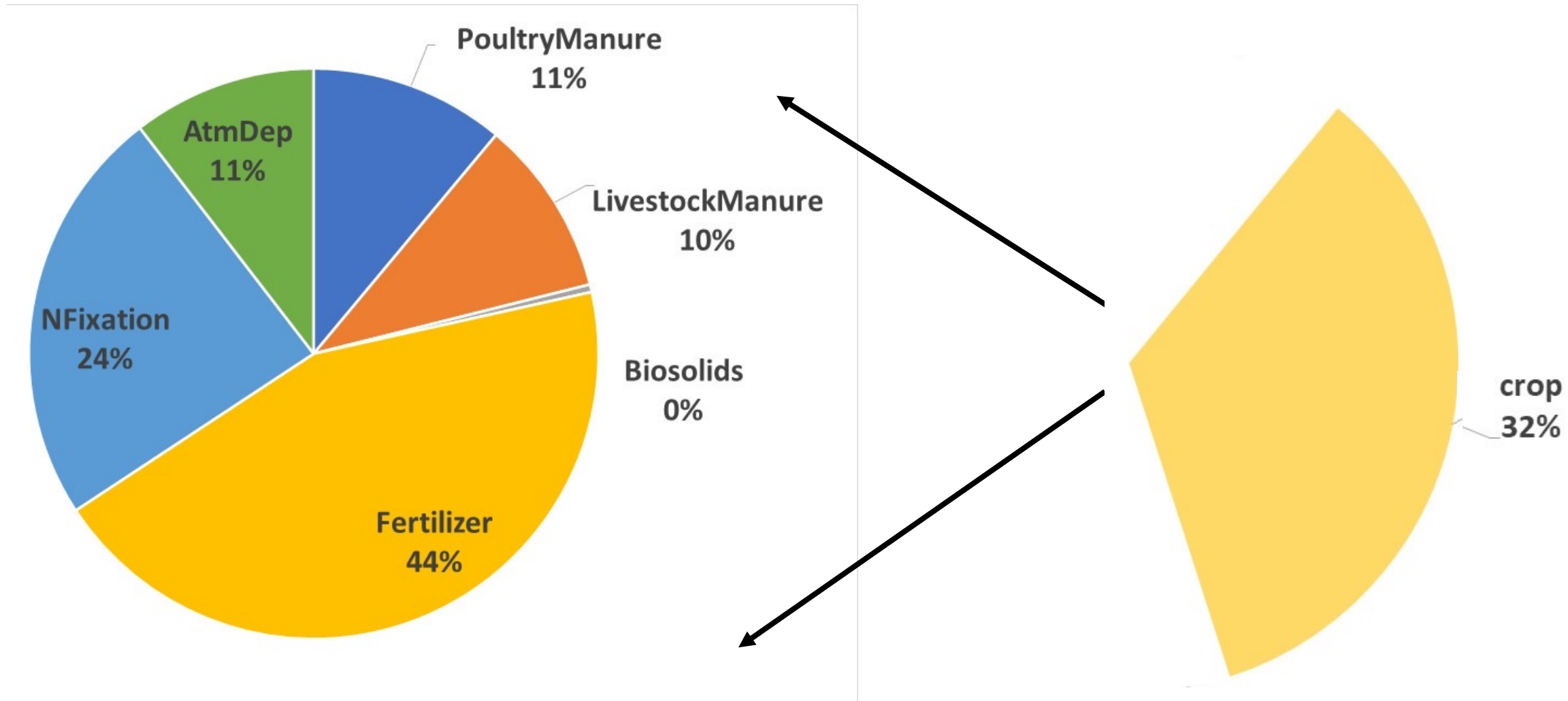
Land management

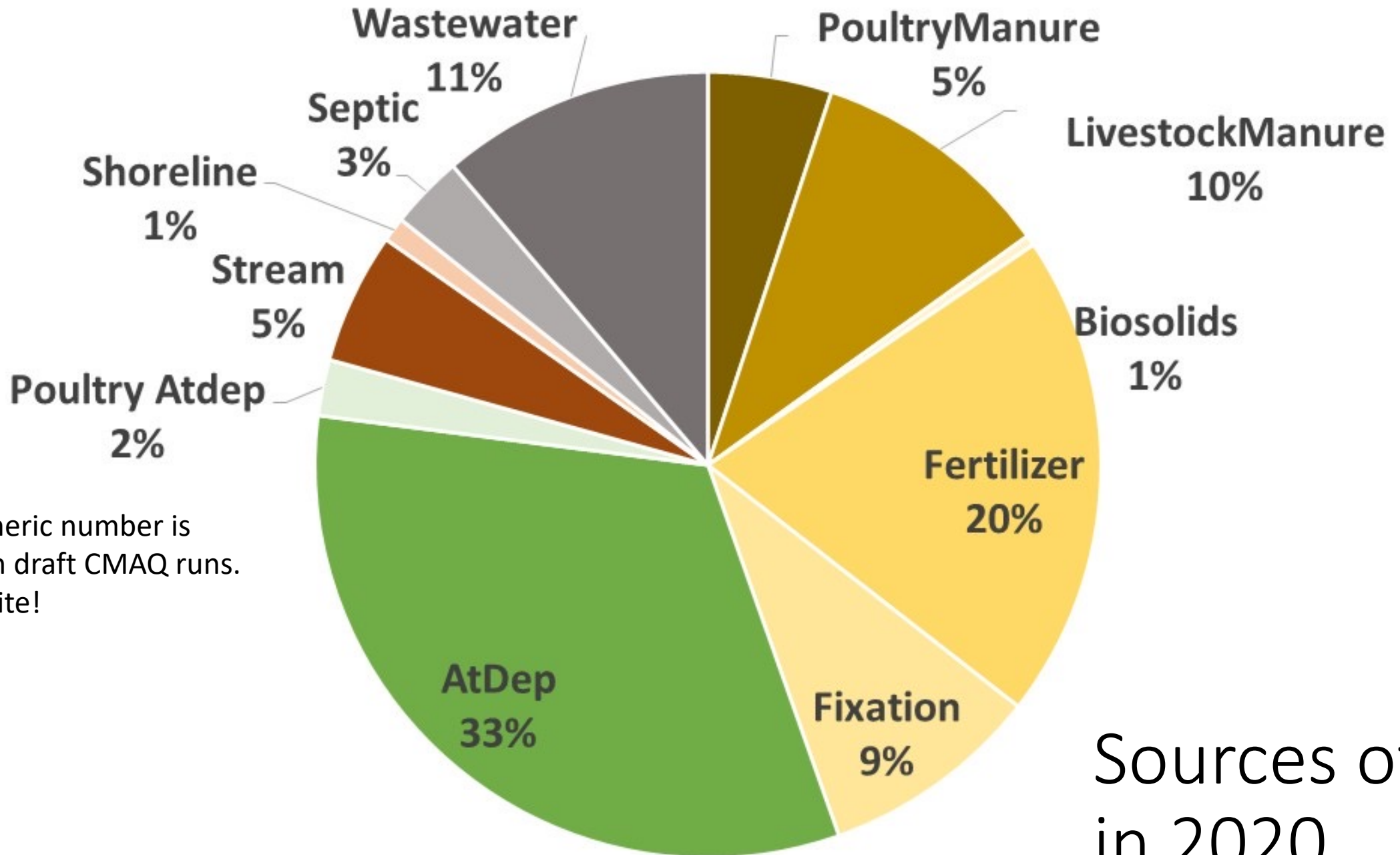


Watershed Delivery



Nitrogen Sources to the Chesapeake

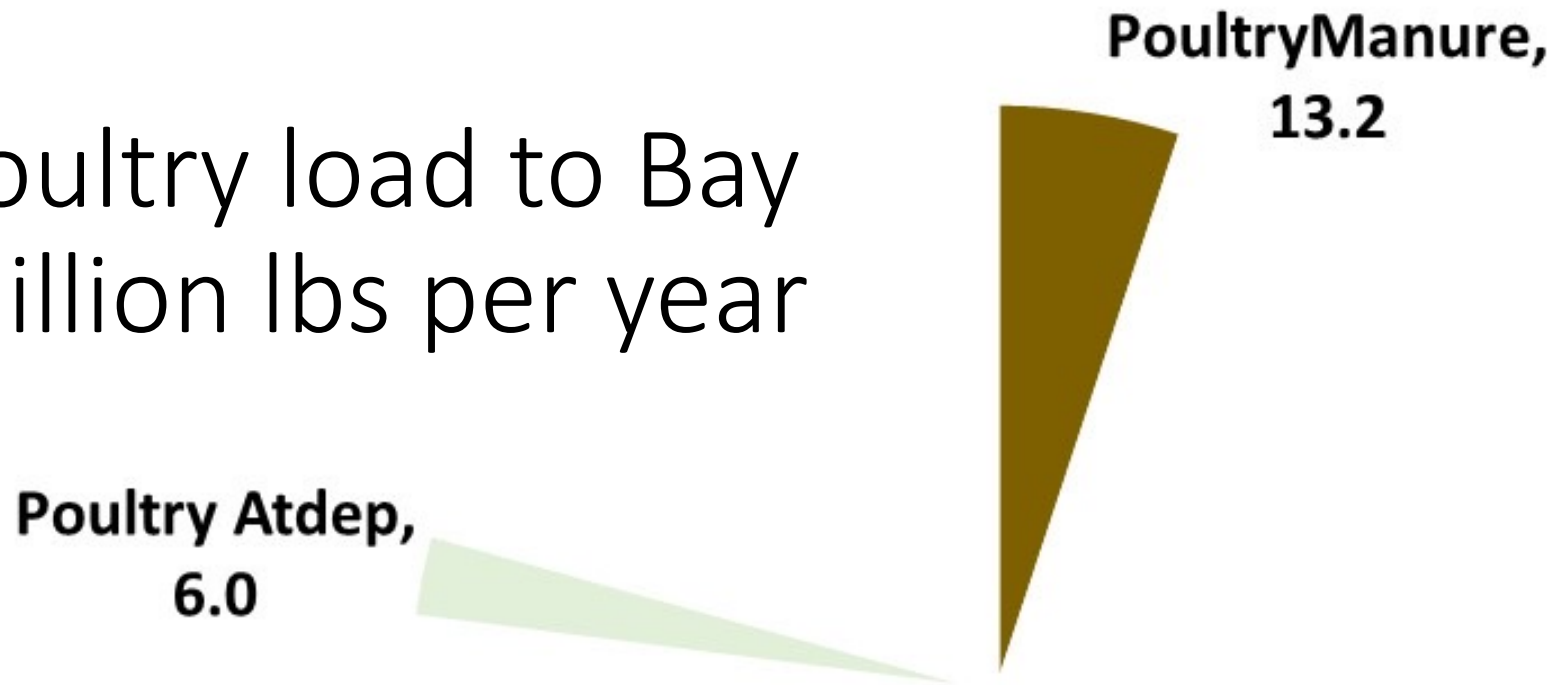




Atmospheric number is based on draft CMAQ runs. Do not cite!

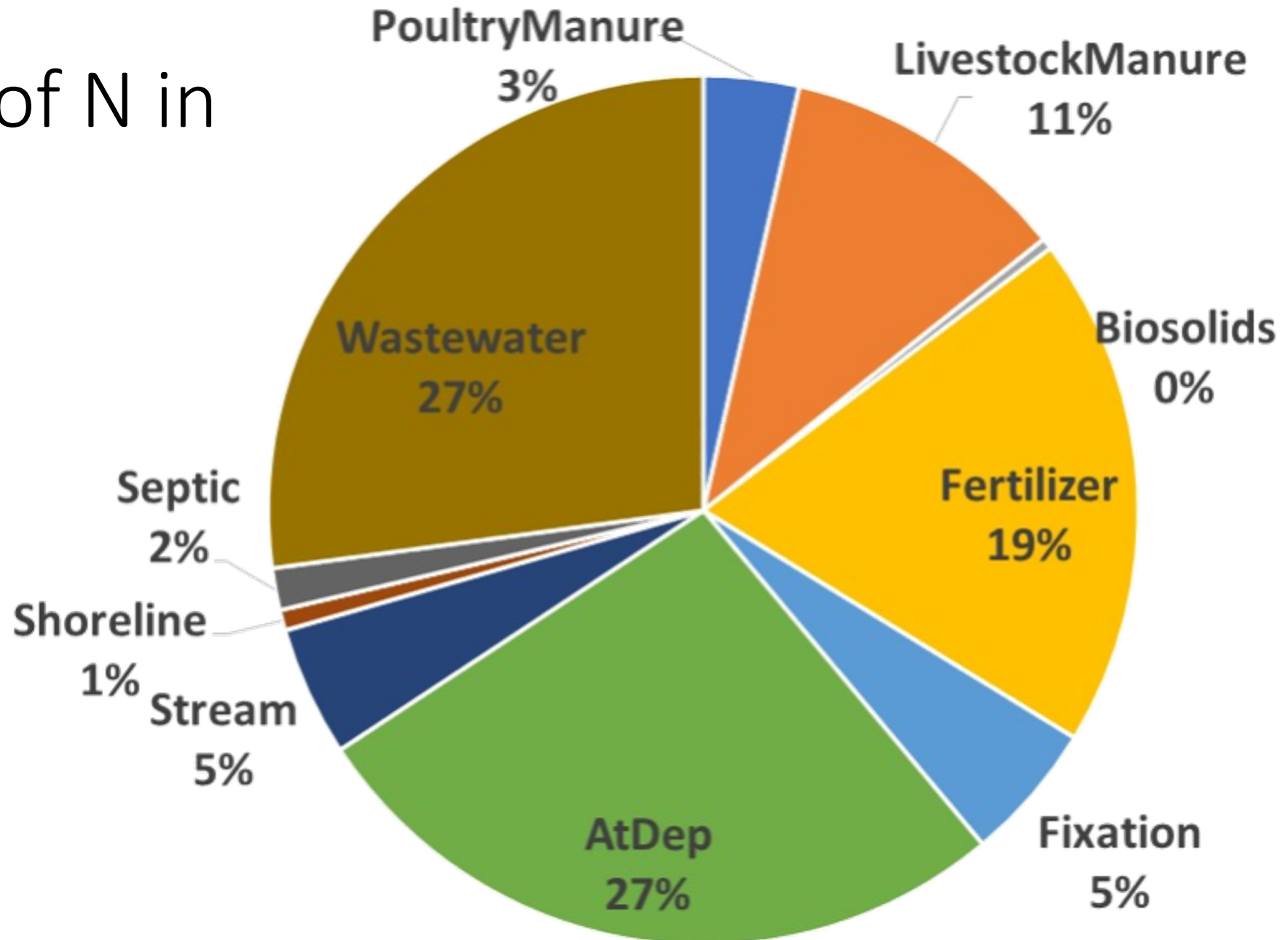
Sources of N in 2020

Poultry load to Bay million lbs per year



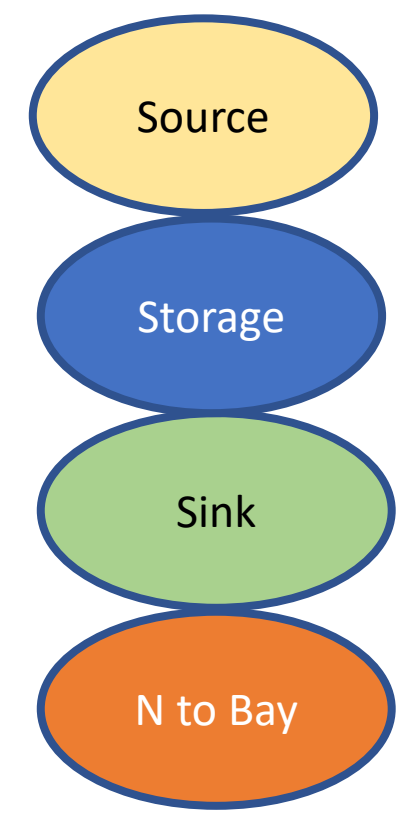
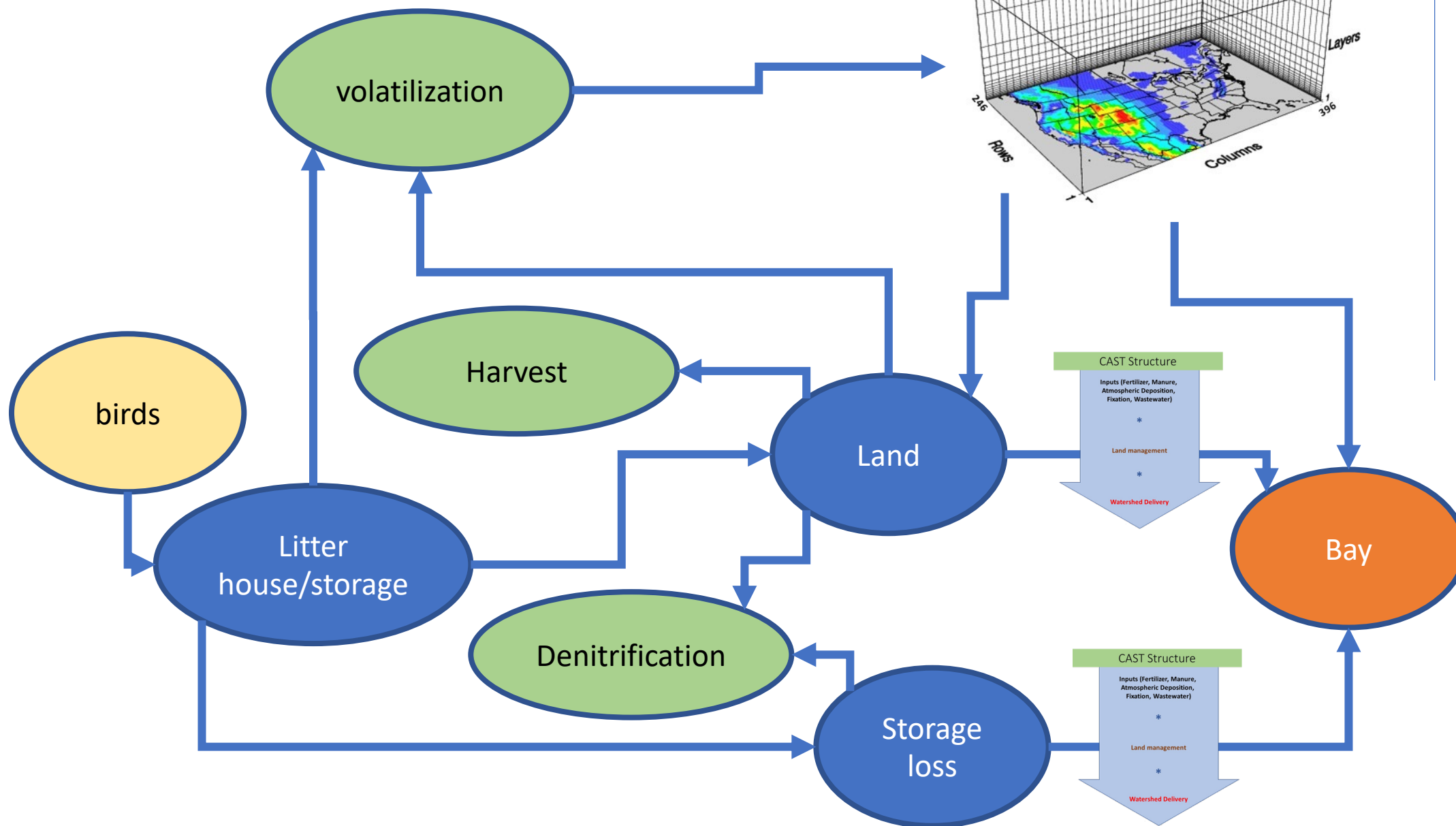
- Total = 19.2 million lbs nitrogen per year of 259 total
 - Atmospheric number is based on draft CMAQ runs. Do not cite!
- Other estimates of poultry atmospheric deposition are very similar
 - Joe Wood calculated 5.9 million based on the effectiveness of biofilters

Sources of N in 1985



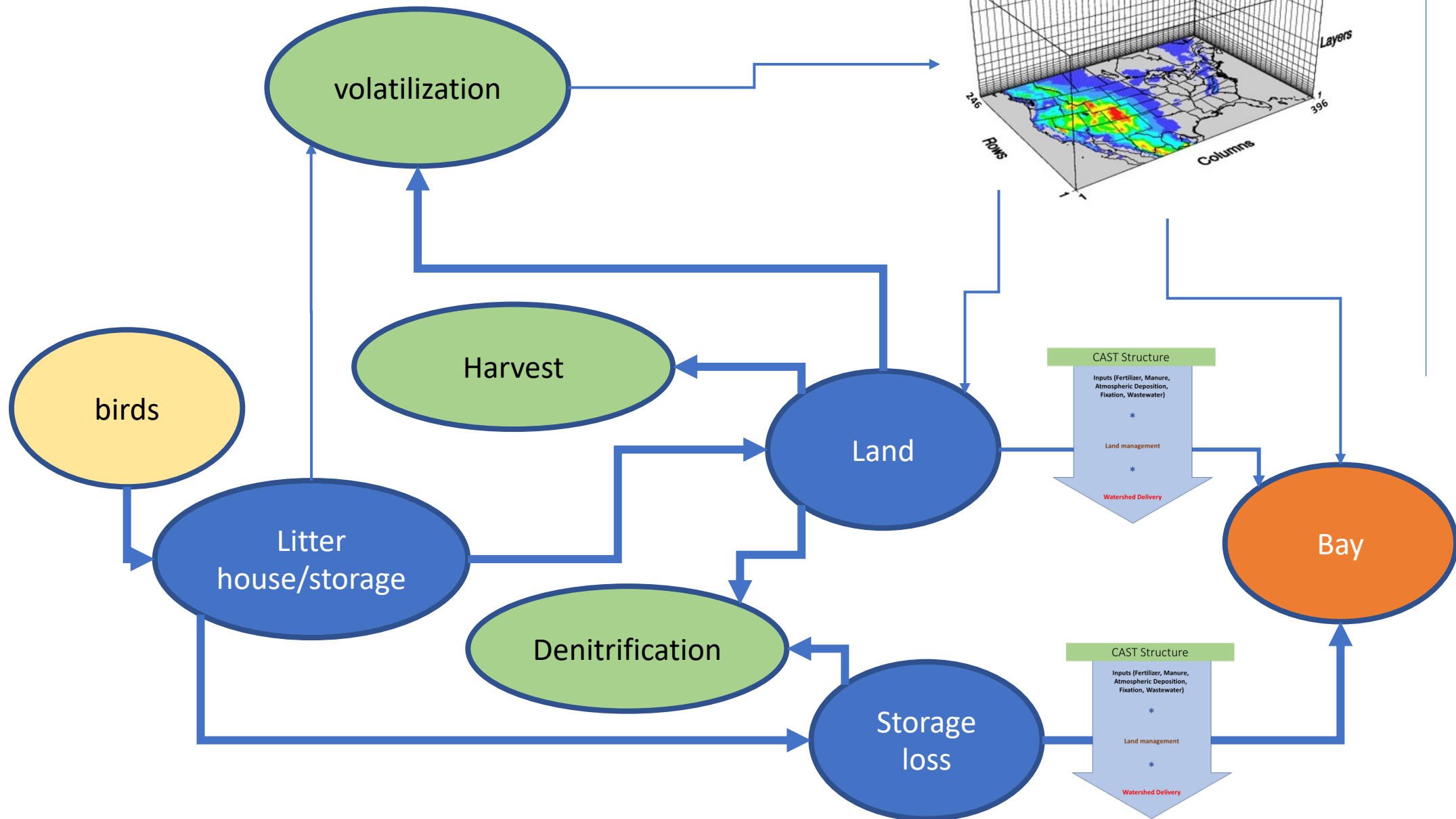
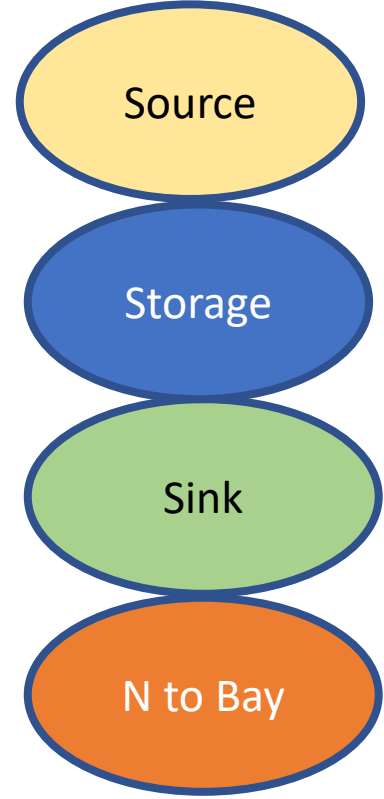
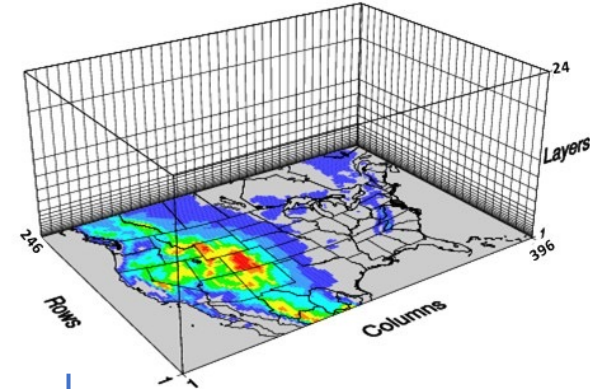
Fraction of atmospheric deposition from poultry is not available for 1985

N fate in CAST



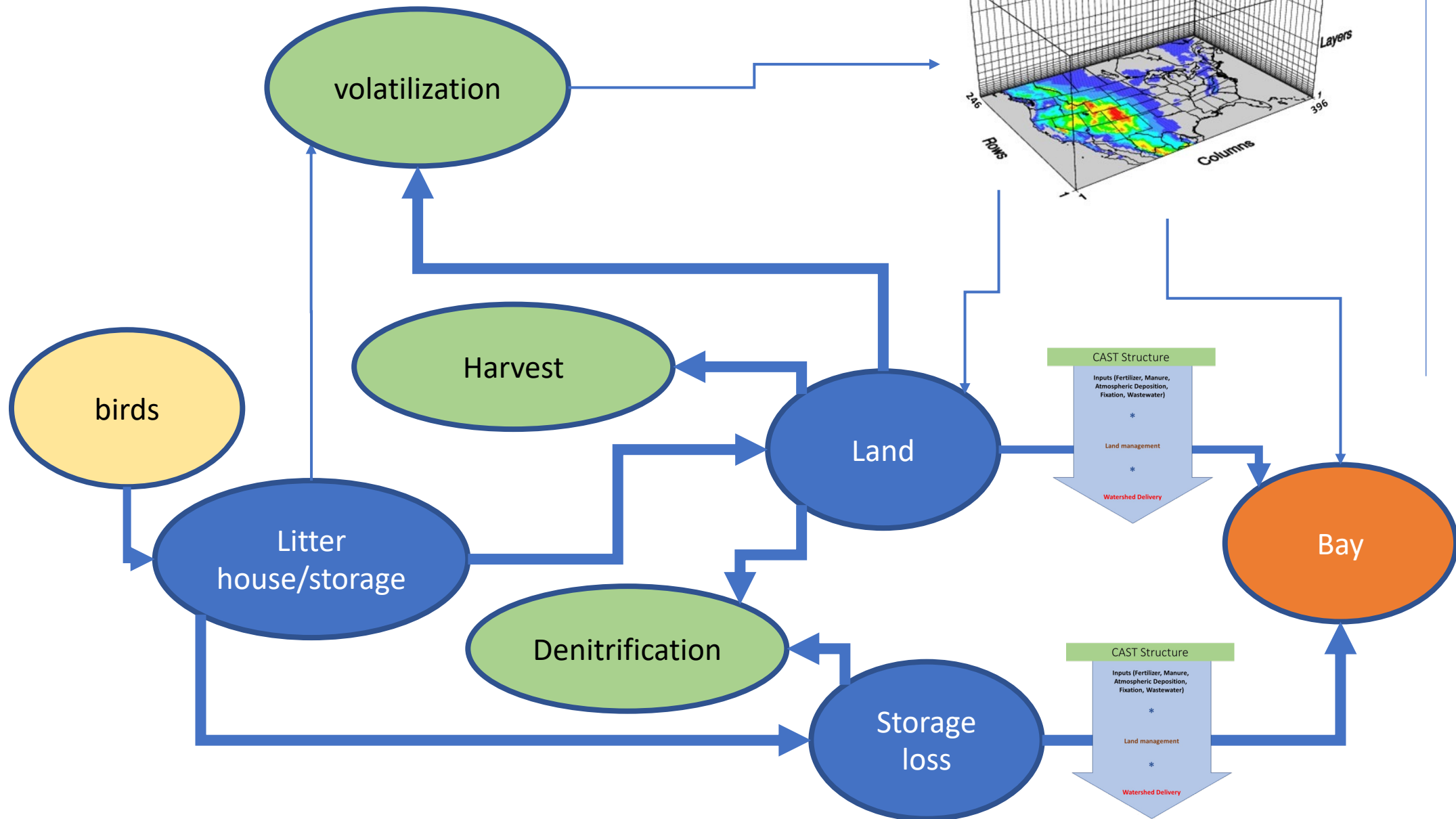
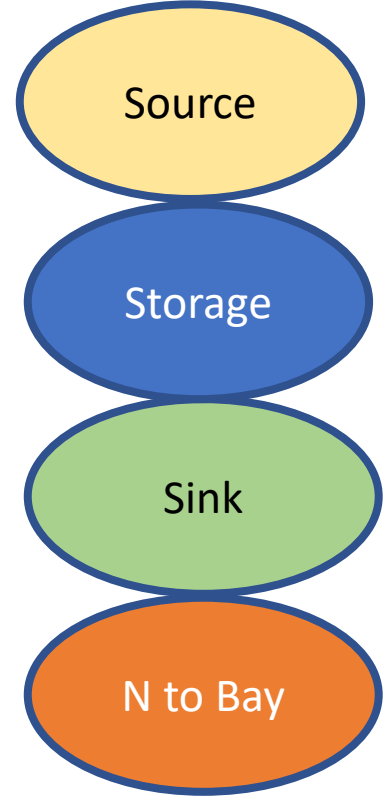
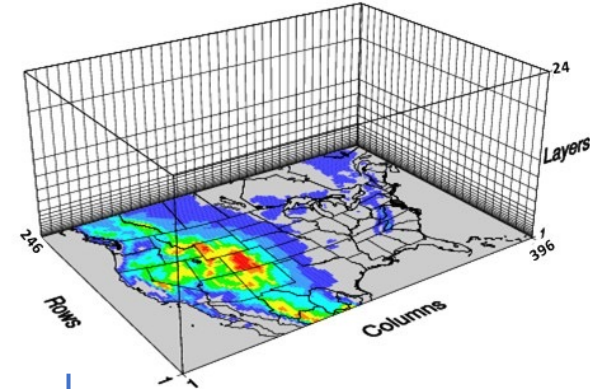
Filtered emissions

CMAQ



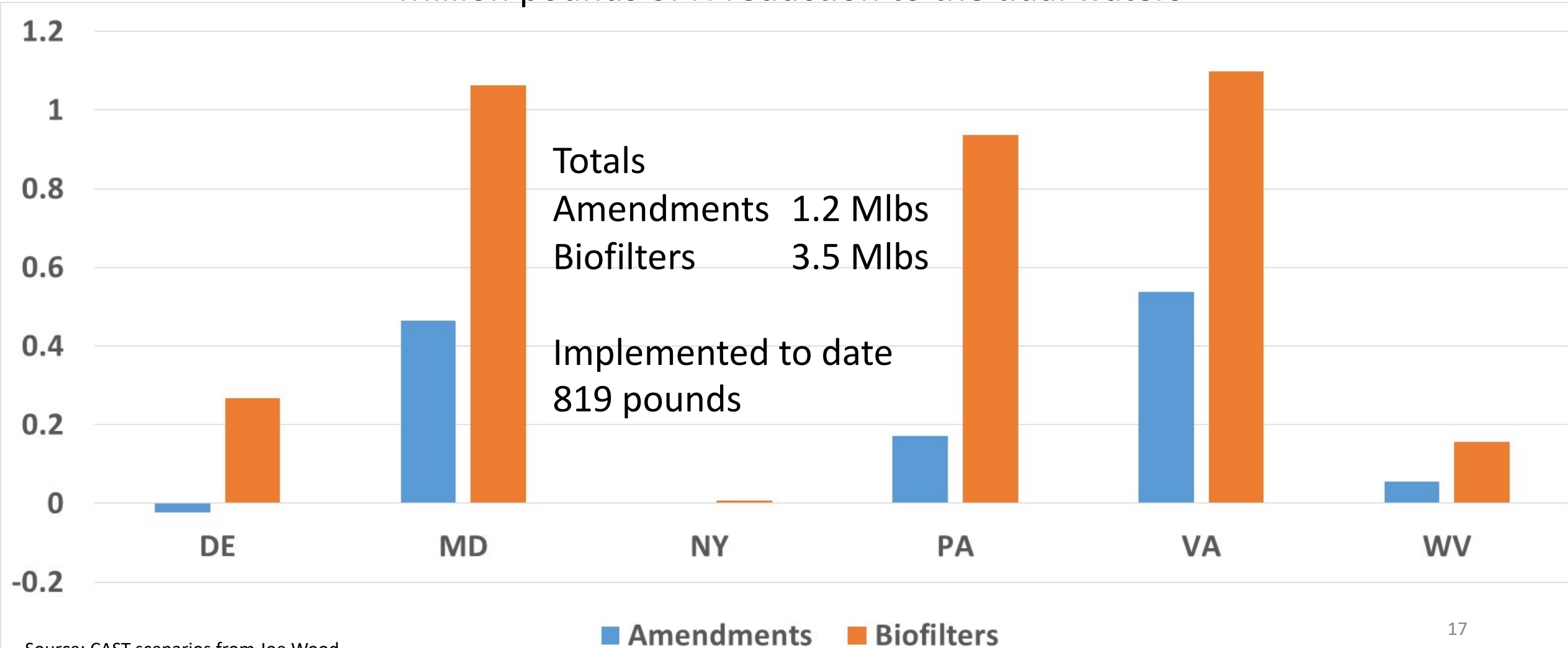
Restrict volatilization

CMAQ



Potential Reductions currently available in CAST

Million pounds of N reduction to the tidal waters



Summary

- The CBP tracks nitrogen loads to the Chesapeake from poultry litter
 - Land application
 - Atmospheric deposition
 - Storage losses
- Poultry litter accounts for 7% or so of nitrogen loads to the Chesapeake
 - The percentage has grown with increases in poultry and decreases in other sources
- Restricting or capturing ammonia emissions could reduce nitrogen to the Bay