Chesapeake Bay Program Incorporation of Lag Times into the Decision Process

Gary Shenk

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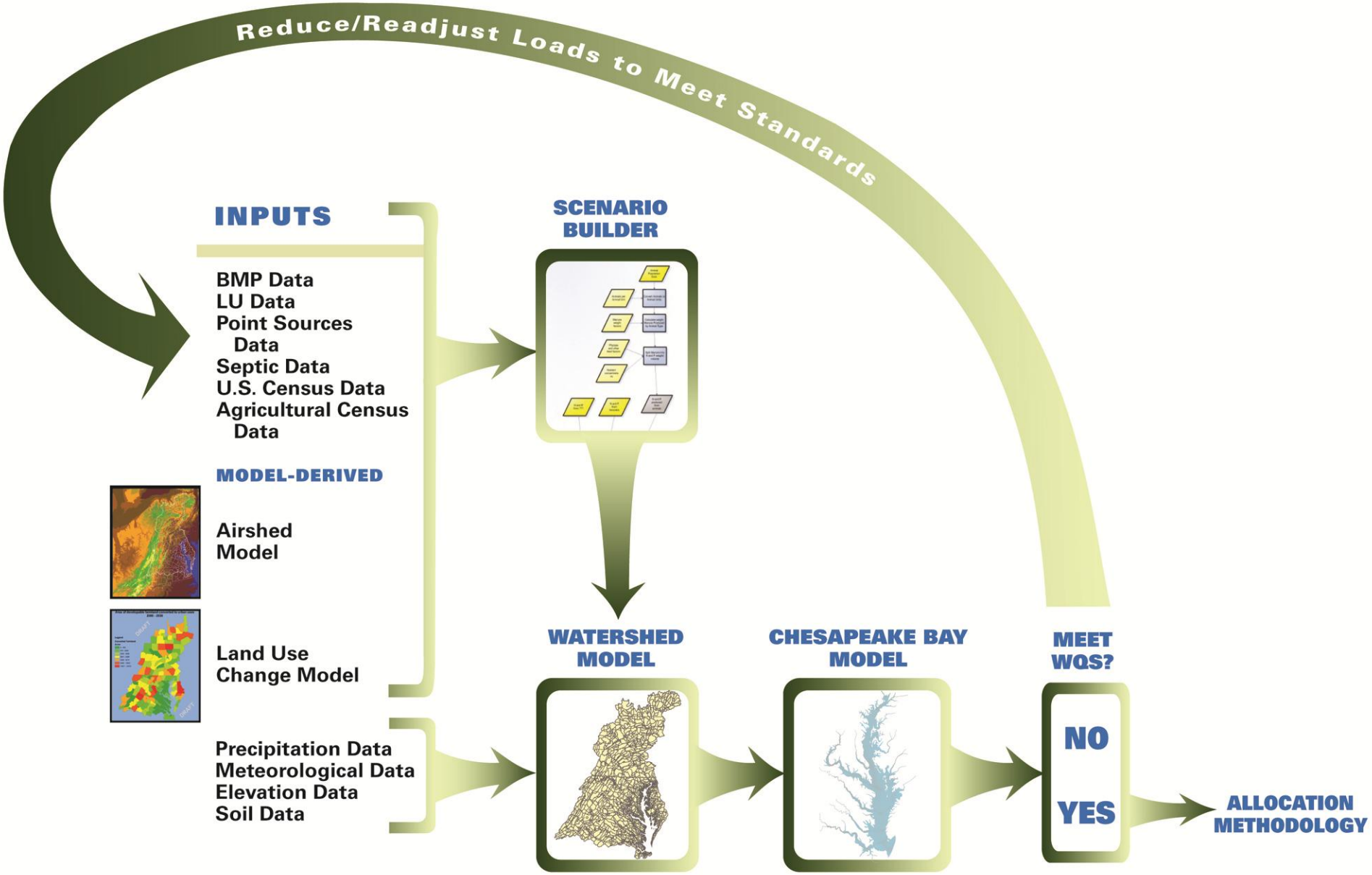
Chesapeake Bay Program Does Not Incorporate Lag Times into the Decision Process

No Lag in Model or TMDL

- The goal of the TMDL and the Watershed Implementation Plans is to have practices in place by 2025 that will eventually lead to meeting the water quality standards
- Watershed model scenario mode:
  - The long-term annual average loads given land use, land management, BMPs, point sources, atmospheric deposition, etc at steady state.

Chesapeake Bay Partnership Models

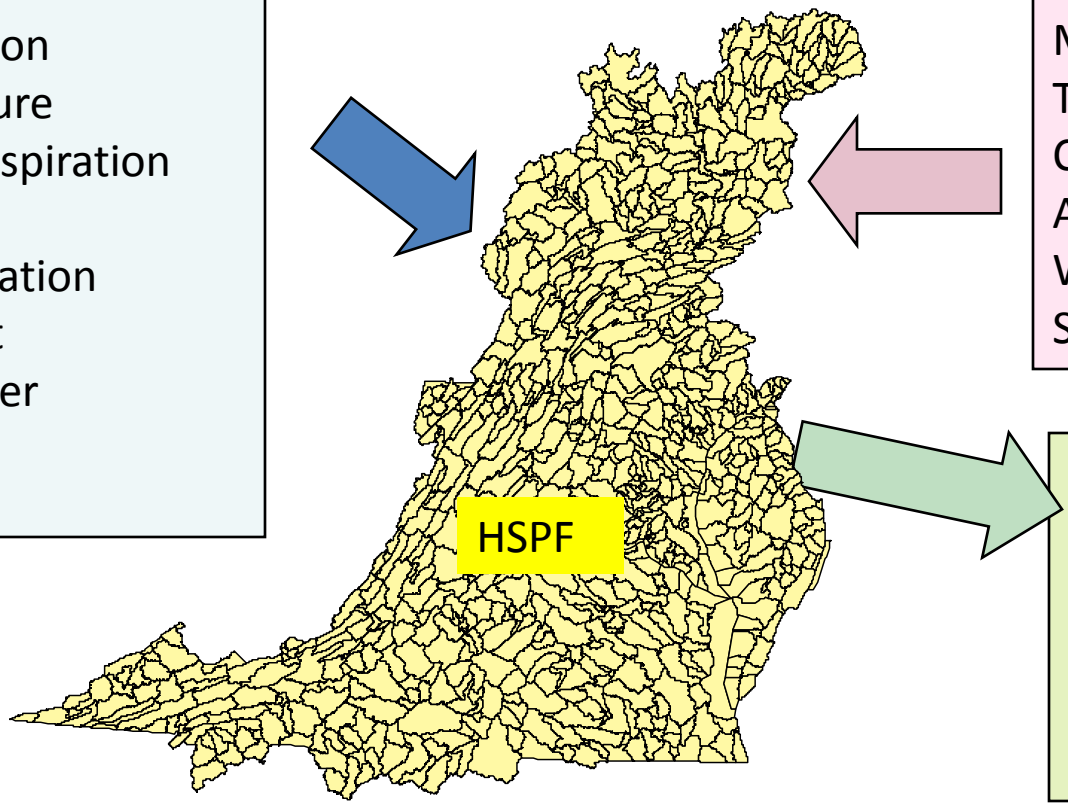


How the Watershed Model Works

Calibration Mode

Hourly or daily values of Meteorological factors:

Precipitation
Temperature
Evapotranspiration
Wind
Solar Radiation
Dew point
Cloud Cover



Annual, monthly, or daily values of anthropogenic factors:

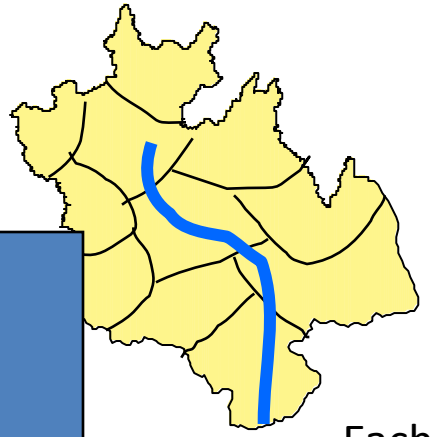
Land Use Acreage
BMPs
Fertilizer
Manure
Tillage
Crop types
Atmospheric deposition
Waste water treatment
Septic loads

Daily flow, nitrogen, phosphorus, and sediment compared to observations over 21 years

How the Watershed Model Works

Each segment consists of 30 separately-modeled land uses:

- Regulated Pervious Urban
- Regulated Impervious Urban
- Unregulated Pervious Urban
- Unregulated Impervious Urban
- Construction
- Extractive
- Combined Sewer System
- Wooded / Open
- Disturbed Forest



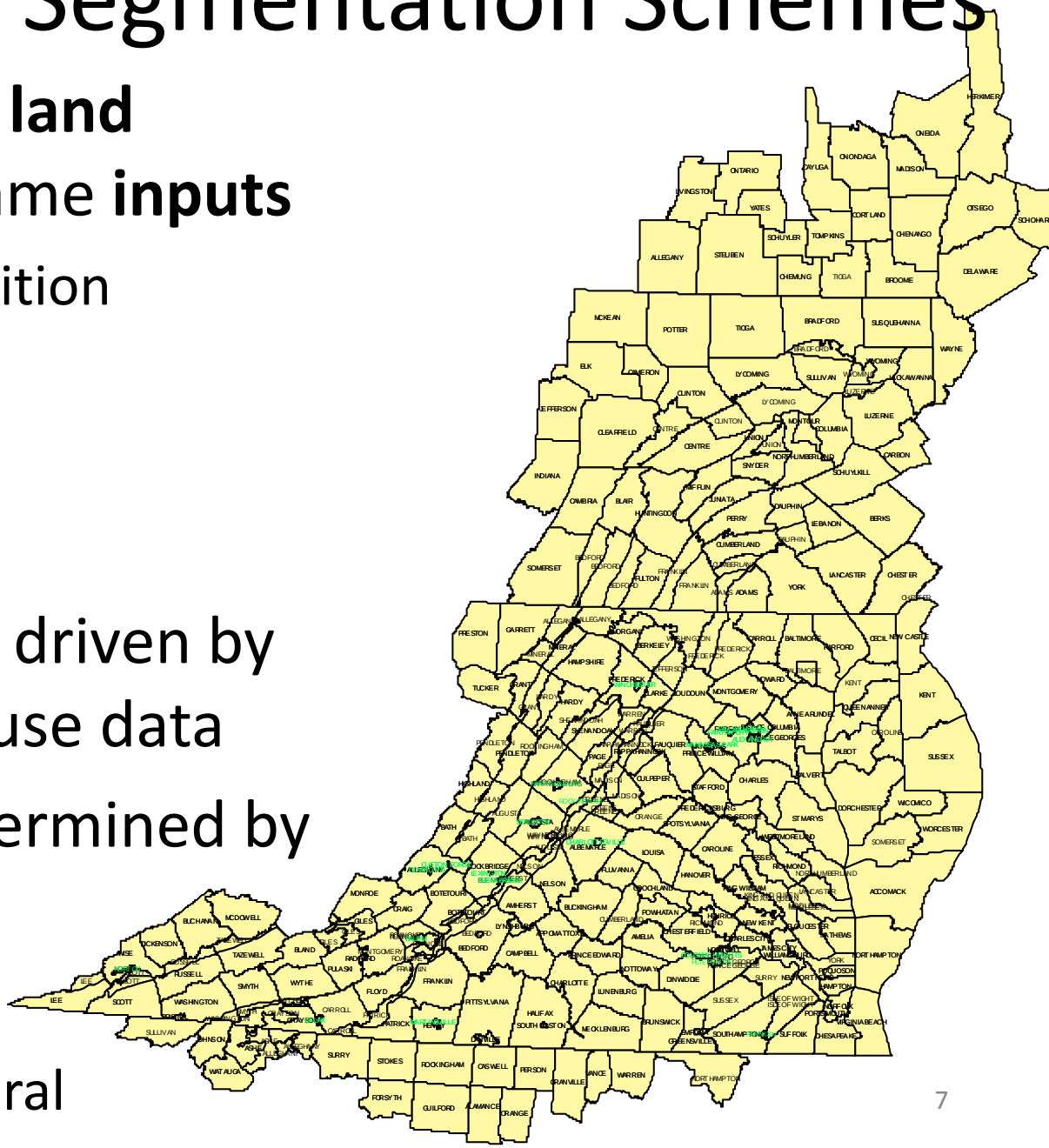
Plus: Point Source and Septic Loads, and Atmospheric Deposition Loads

- Corn/Soy/Wheat rotation (high till)
- Corn/Soy/Wheat rotation (low till)
- Other Row Crops
- Alfalfa
- Nursery
- Pasture
- Degraded Riparian Pasture
- Afo / Cafo
- Fertilized Hay
- Unfertilized Hay
  - Nutrient management versions of the above

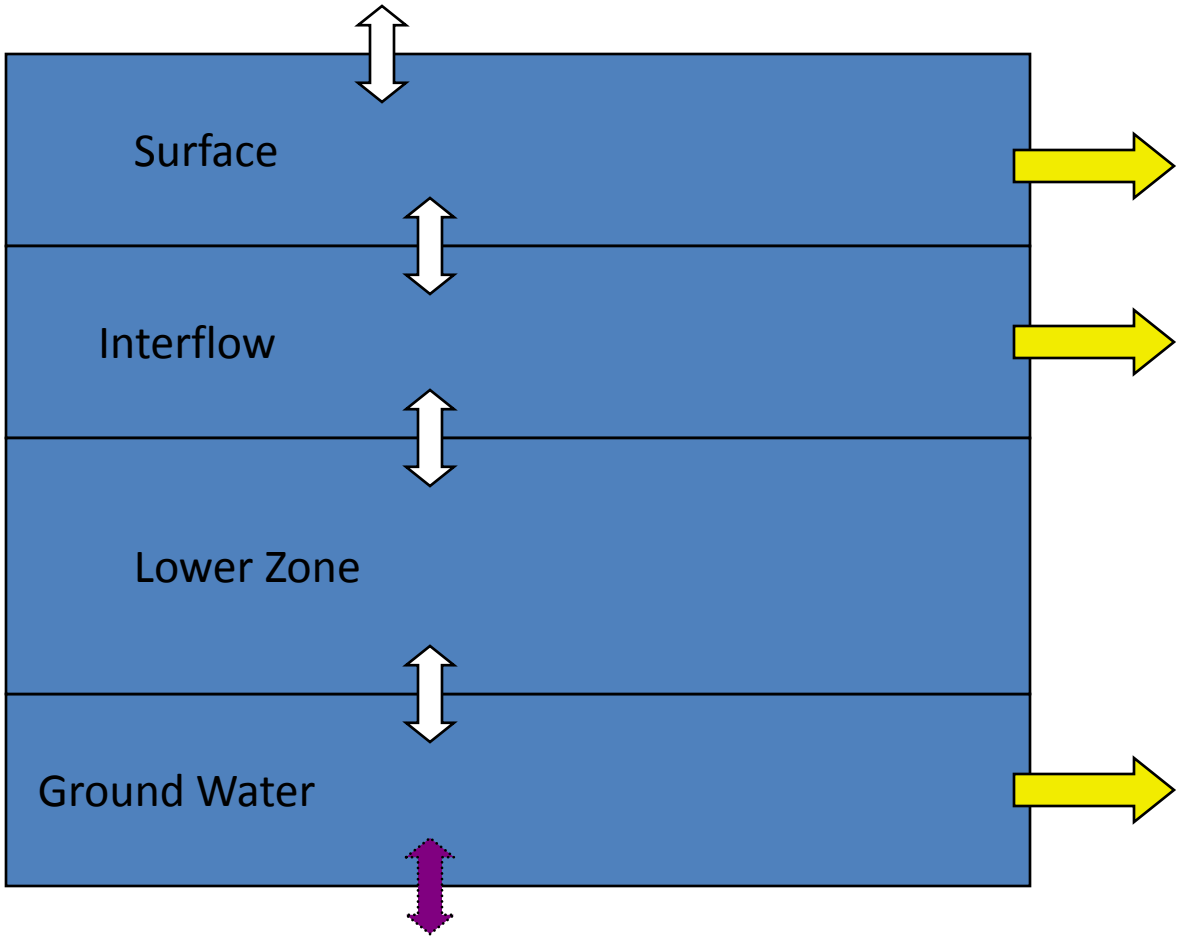
Each calibrated to nutrient and Sediment targets

Two Separate Segmentation Schemes

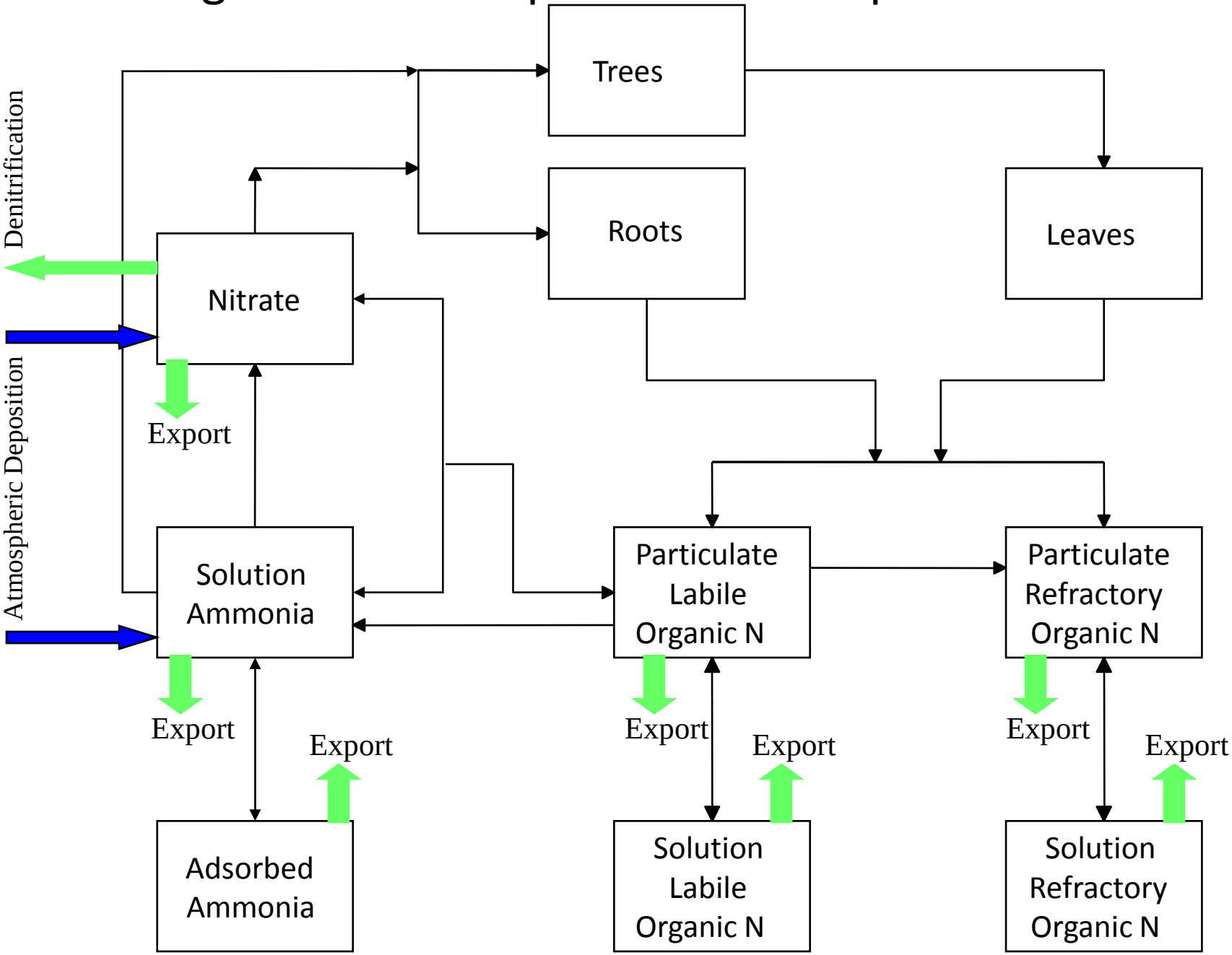
- A land use within a **land segment** has the same **inputs**
  - atmospheric deposition
  - fertilizer
  - manure
  - precipitation
- Land segmentation driven by availability of land use data
- Land segments determined by
  - County lines
  - Rainfall Variances
  - Federal / Non-Federal



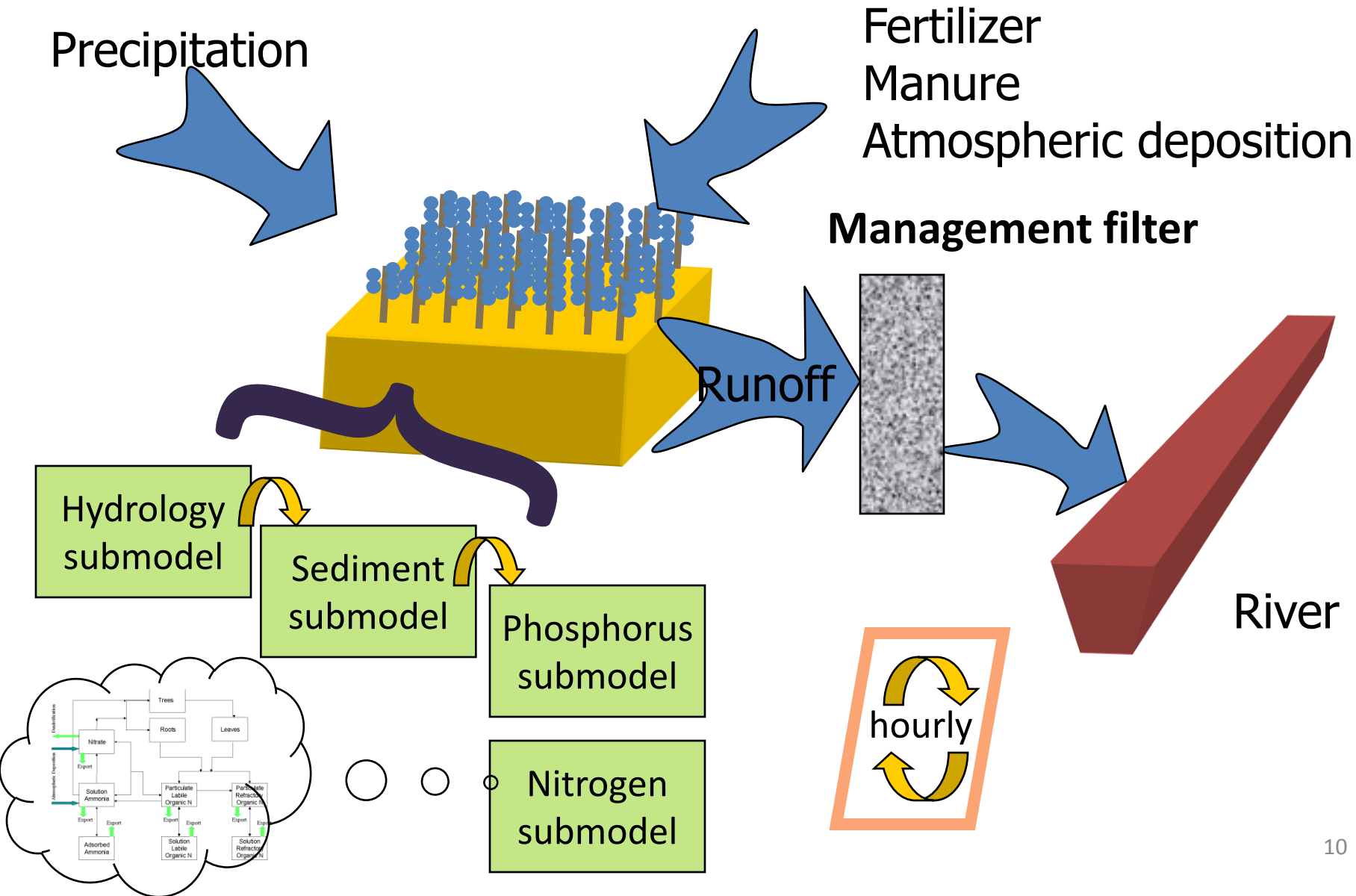
Land Simulation – 1 Acre
4 completely mixed soil layers



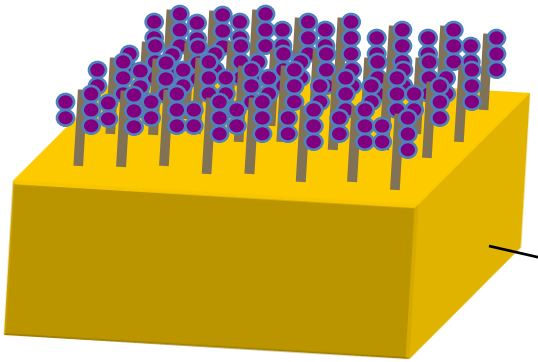
Storages can Build up in the landscape



How the Watershed Model Works



Scale in Phase 5 - Sediment



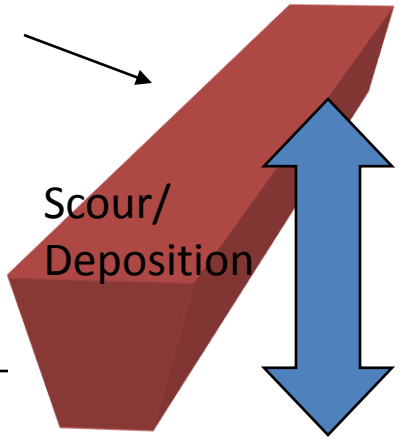
Edge of Field
Expected loads from one acre

BMP Factor

Land Acre Factor

Delivery Factor

Edge of Stream
60-100 sq miles

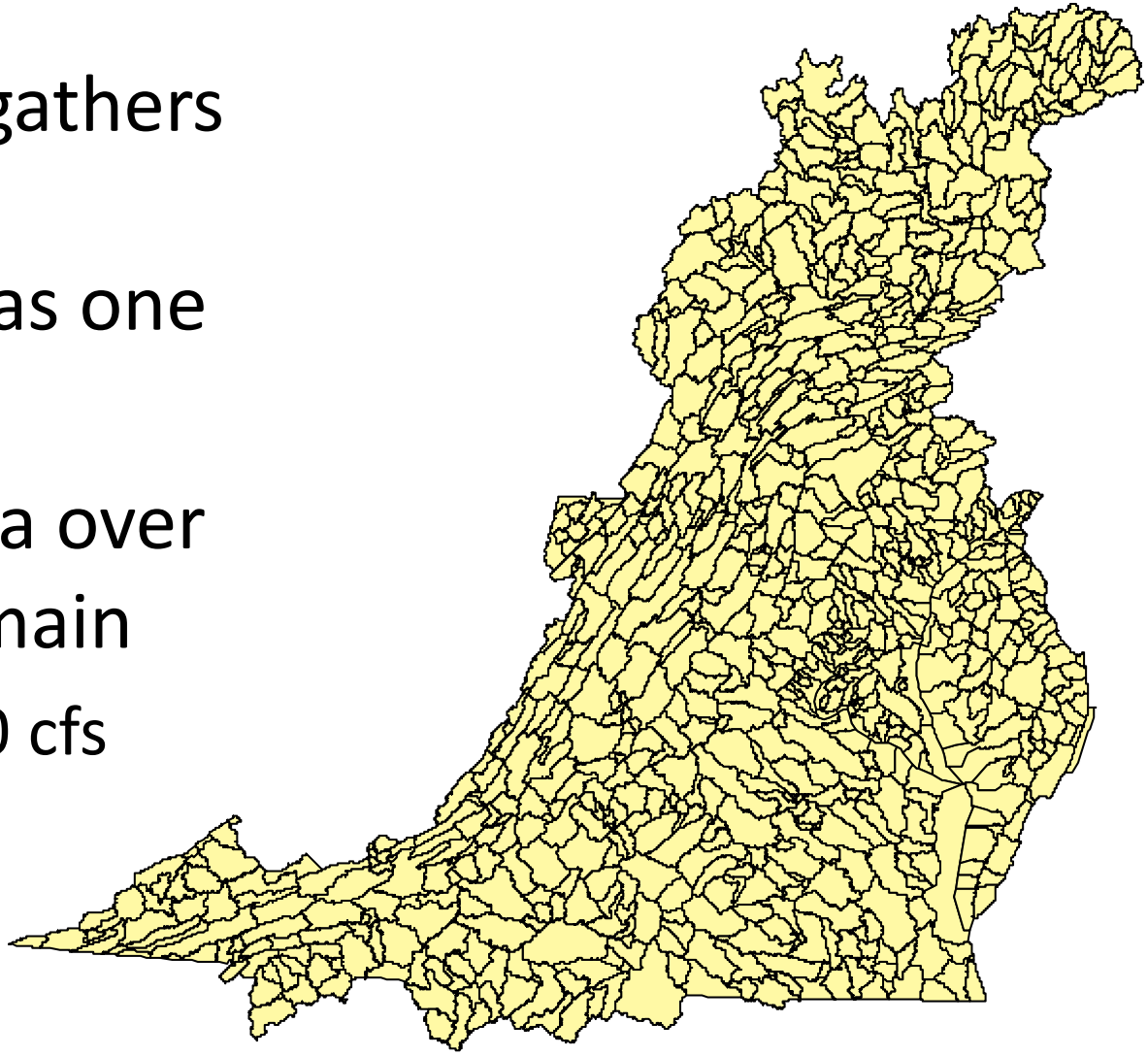


In Stream Concentrations

Phase 5 river segmentation

- A river segment gathers inputs from the watershed and has one simulated river
- Consistent criteria over entire model domain
  - Greater than 100 cfs

    or
  - Has a flow gage



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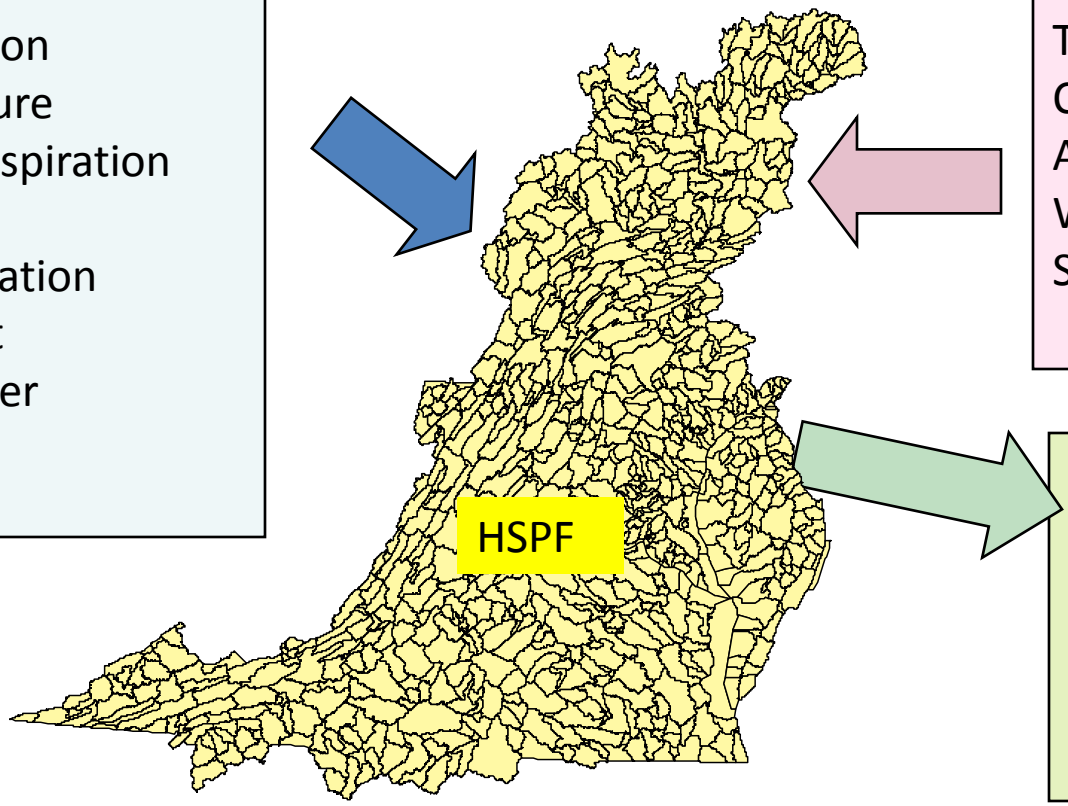

Constant values of anthropogenic factors:

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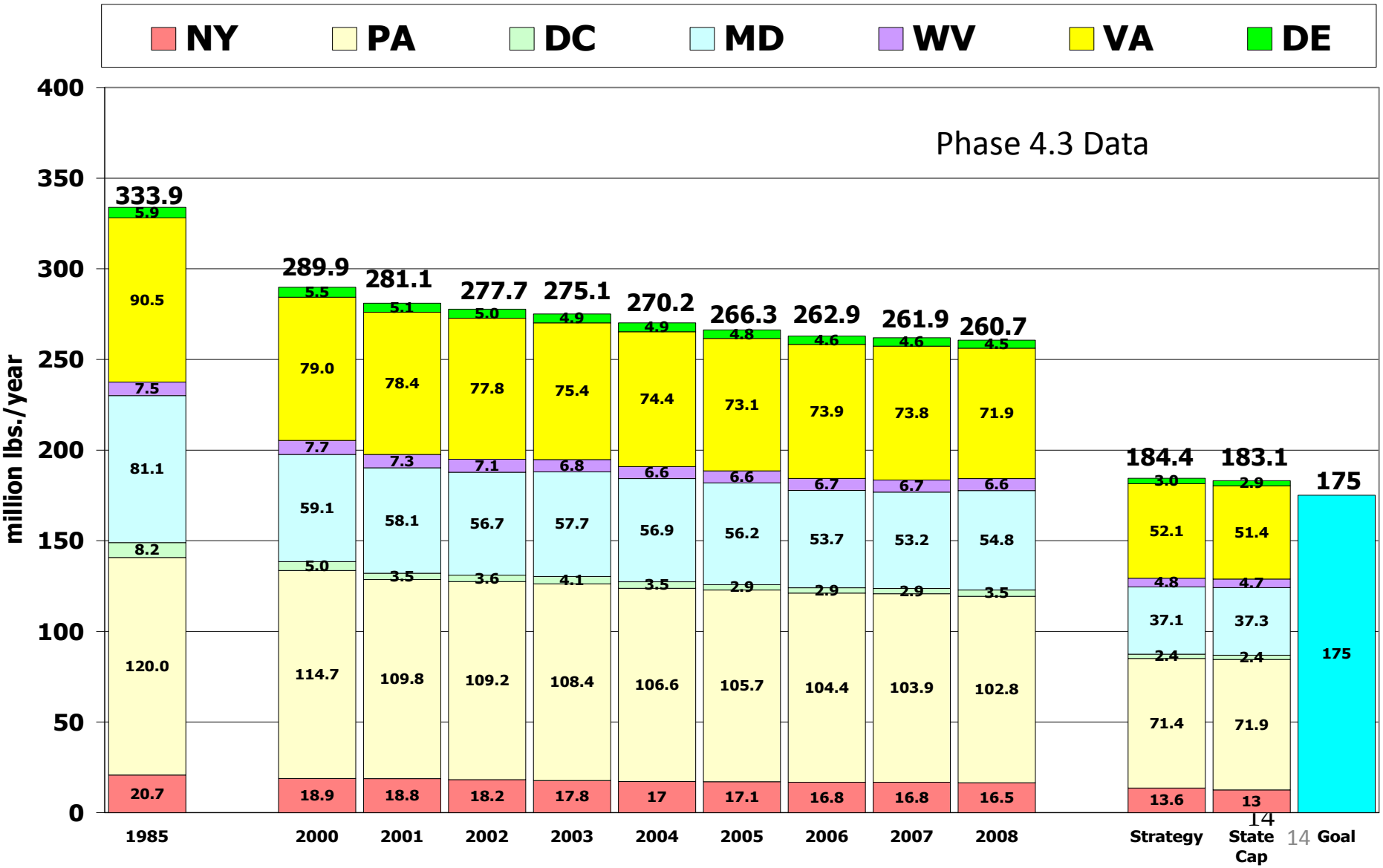
Run for 1984-2000
Average 1991-2000
For 'flow-normalized average annual loads'

Nitrogen Loads Delivered to the Chesapeake Bay By Jurisdiction

Point source loads reflect measured discharges while
nonpoint source loads are based on an average-hydrology year



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Lag Time

- Calibration – the WSM is calibrated to observed data, so including important lagged processes would improve calibration
- Validation of predictions – if the WSM is predicting changes in nutrient loads that are not seen in the monitoring data, would lags help to explain the difference.
- Communication – When will the Chesapeake Bay respond to management actions