“Most Effective Basins”

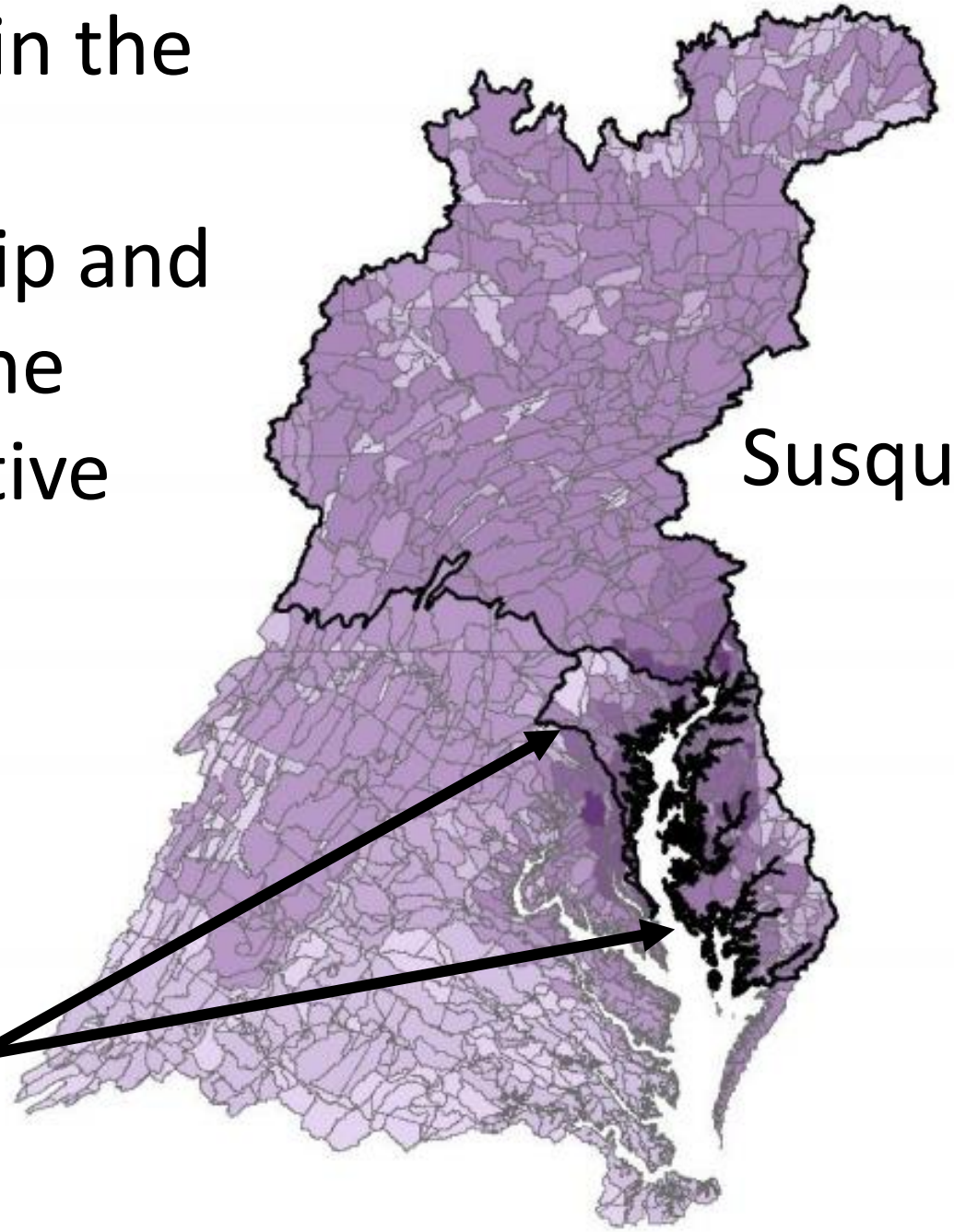
Where they came from & options moving forward for Conowingo WIP

Chesapeake Bay Program
Science. Restoration. Partnership.

Emily Trentacoste, PhD
US EPA CBPO

11/21/2019

These maps are referred to in the Conowingo WIP Framework developed by the partnership and are referred to as maps of the “Susquehanna + most effective basins”



Susquehanna

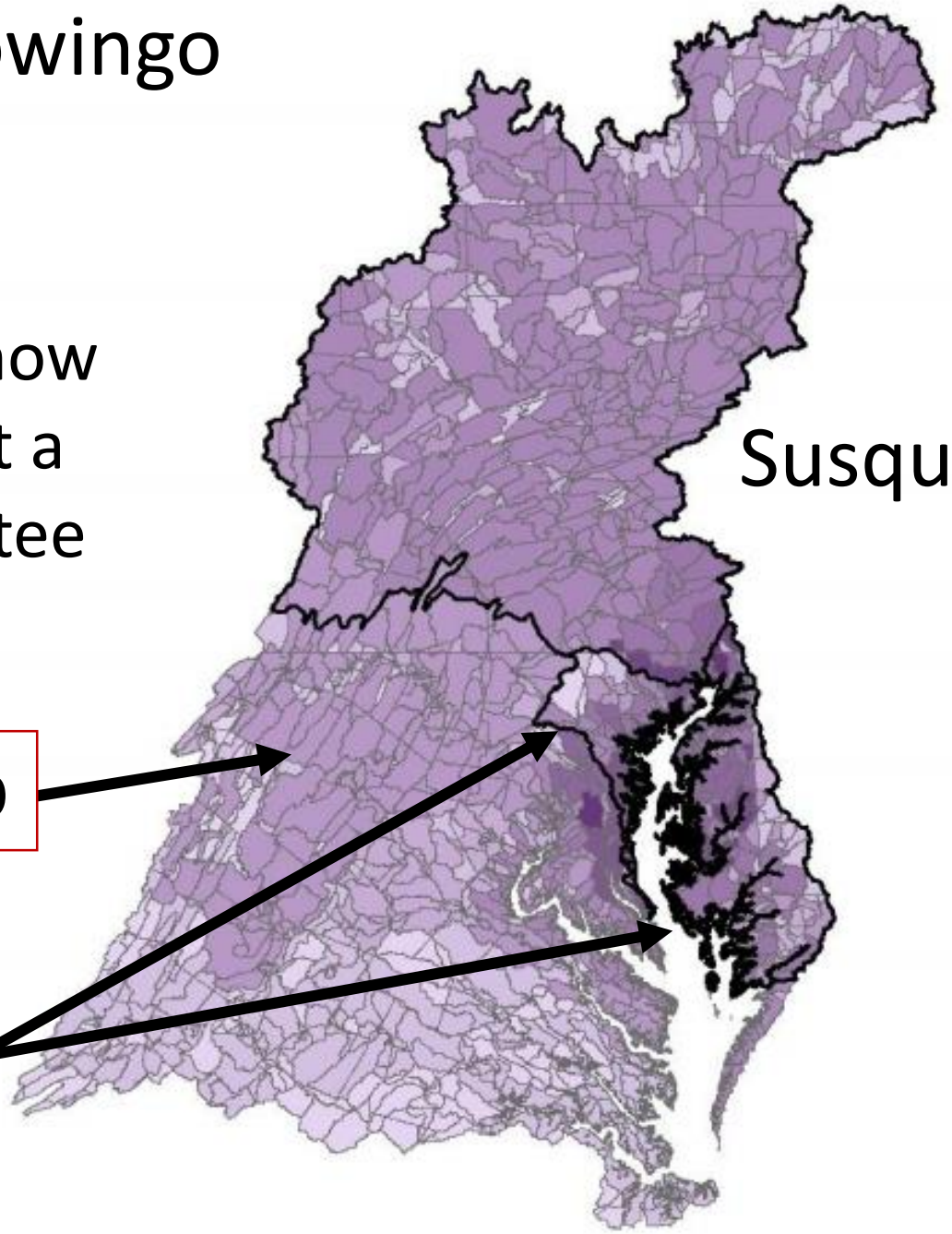
“Most effective basins”

From September 2019 Conowingo WIP SC meeting:

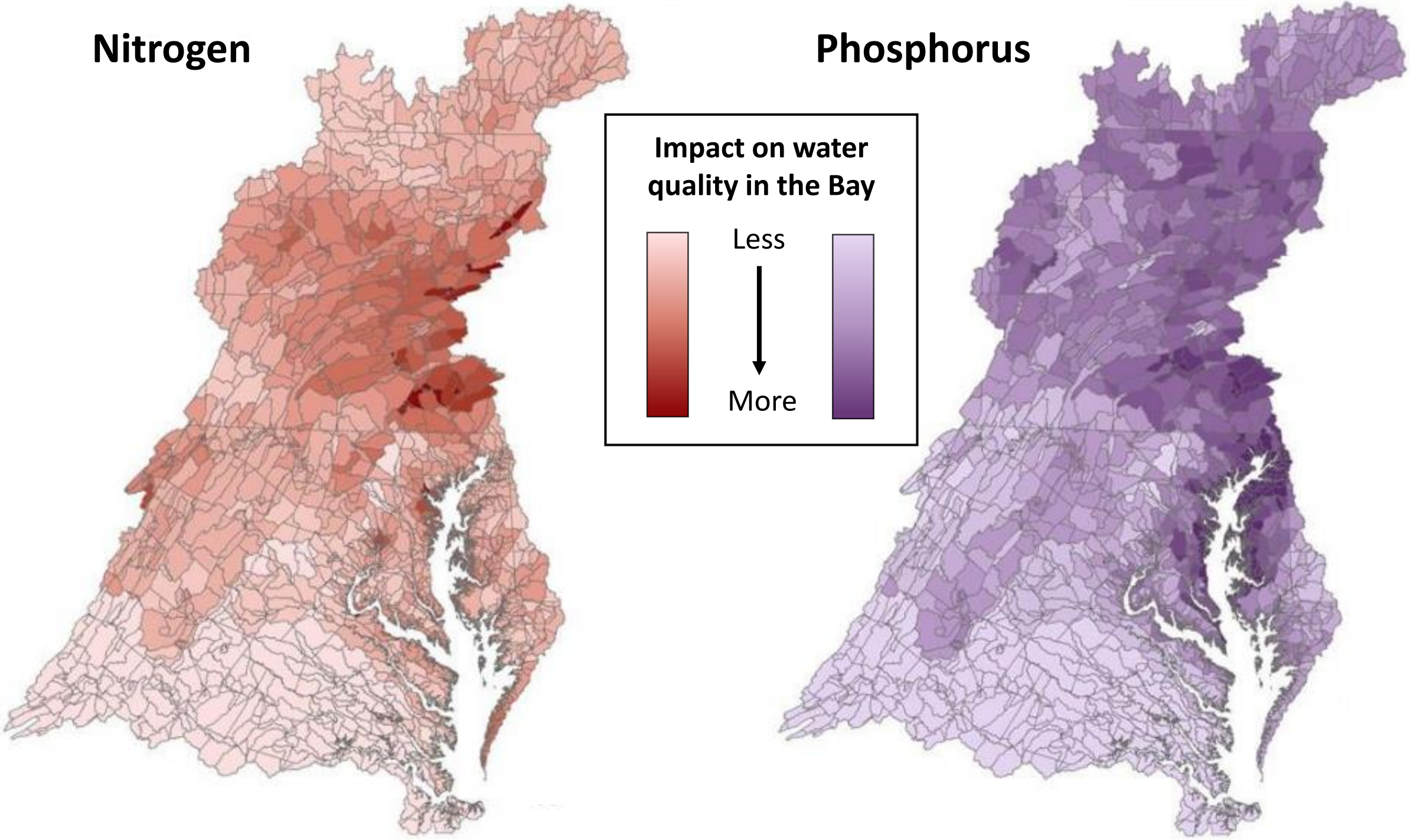
"**Action:** Gary Shenk will explain how effective basins are determined at a Conowingo WIP Steering Committee Meeting."

Relative effectiveness map

"Most effective basins"



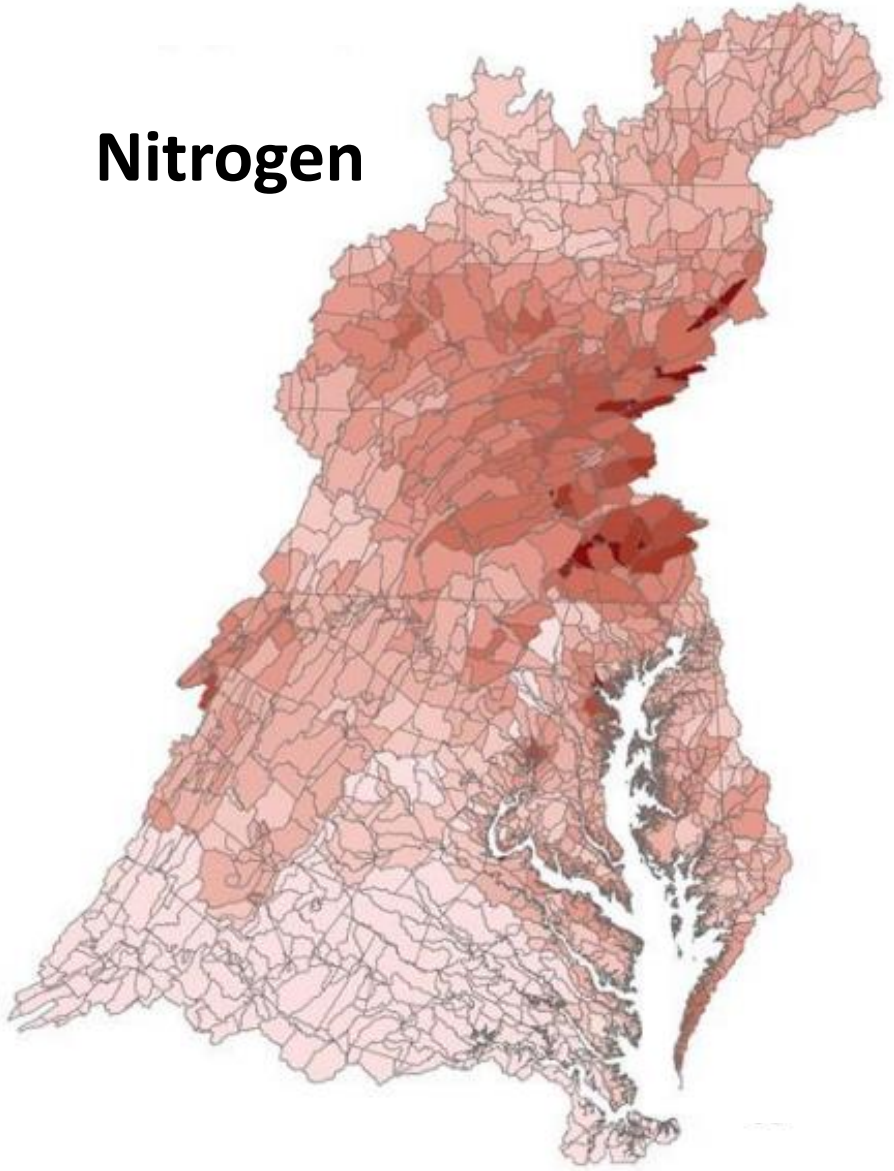
Susquehanna


Nitrogen
Phosphorus
Impact on water quality in the Bay
Less
More

Relative effectiveness: Estimating the effect of nutrient reductions

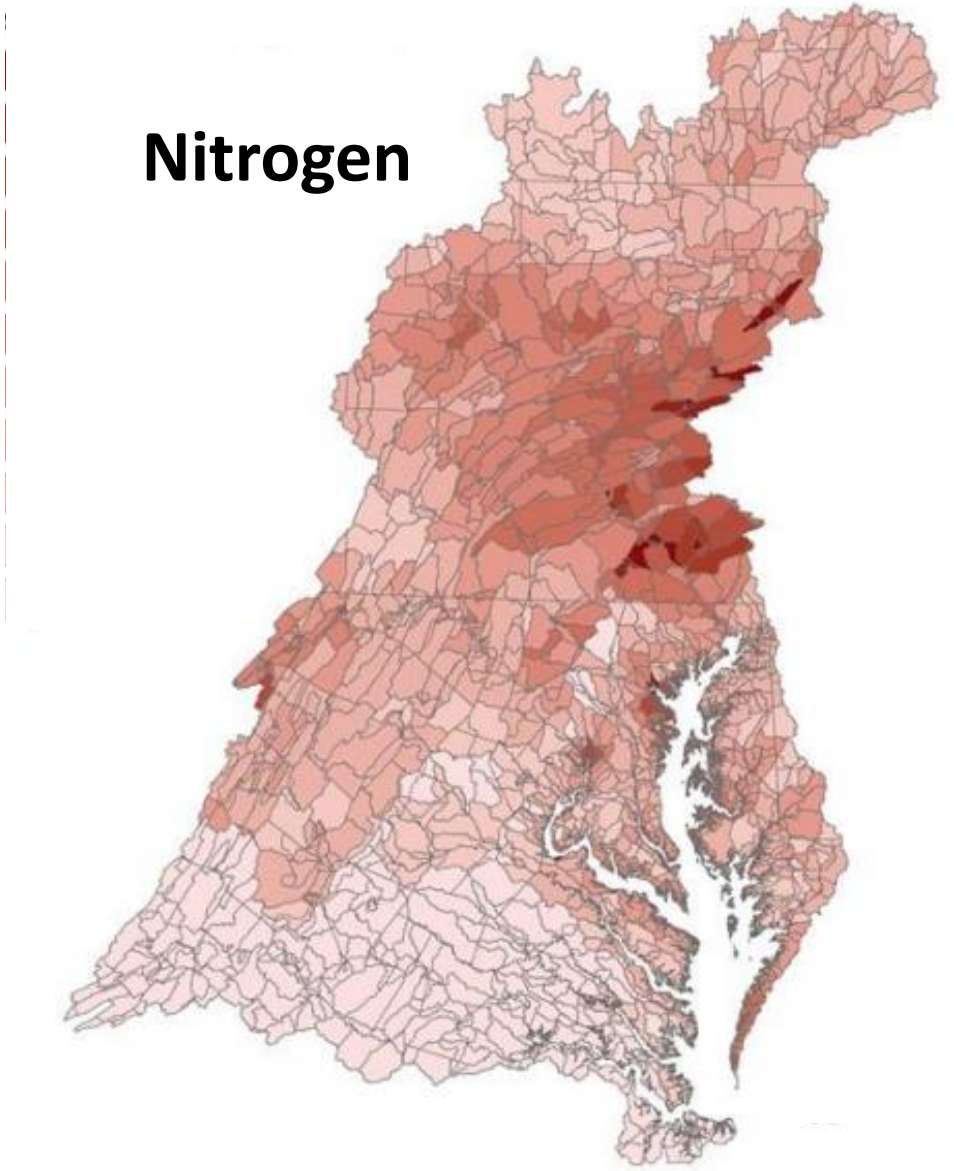
These maps represent the change in dissolved oxygen that occurs in the Bay per pound of nutrient changed locally in the watershed

E.g. increase in dissolved oxygen per lb reduced locally

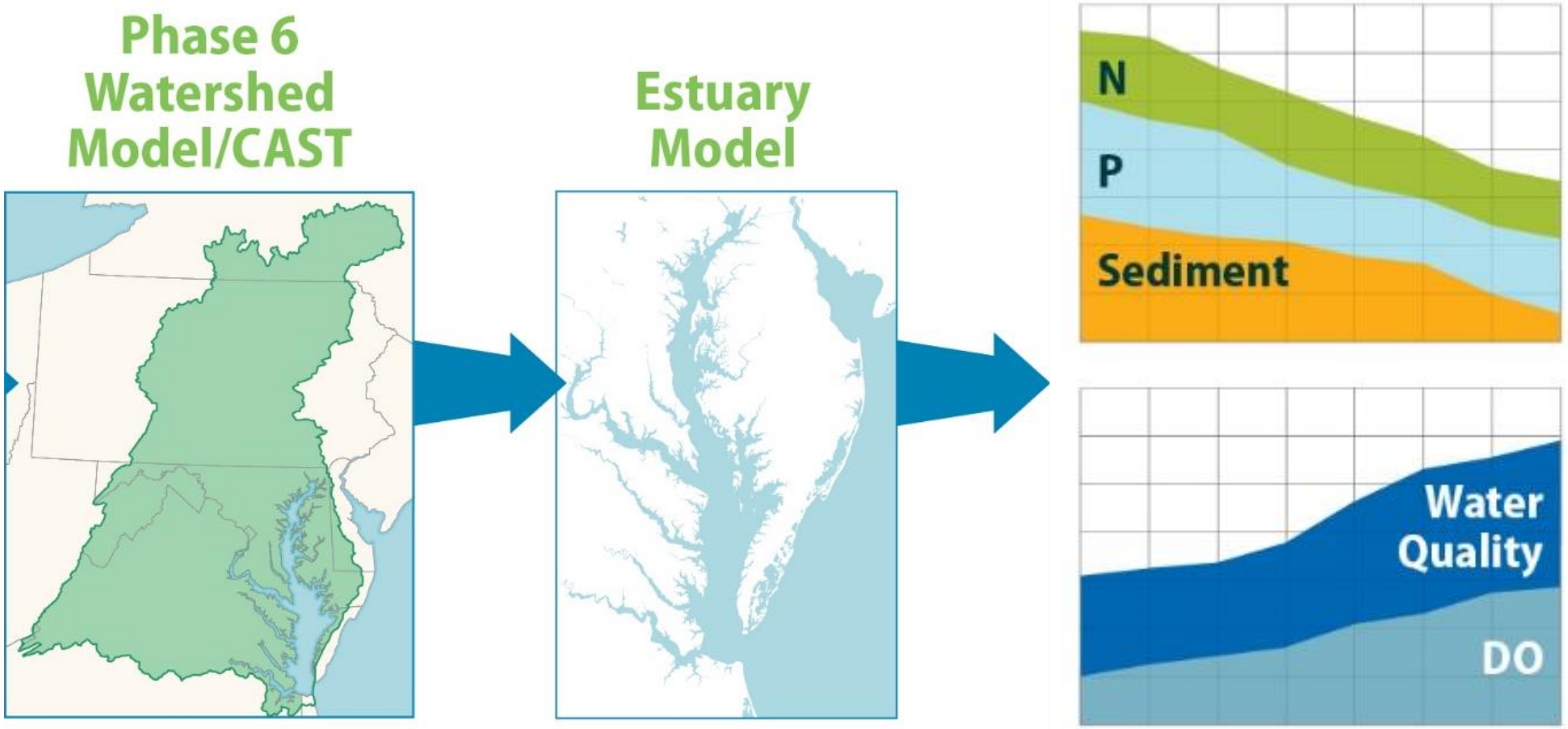


Relative effectiveness: Estimating the effect of nutrient reductions

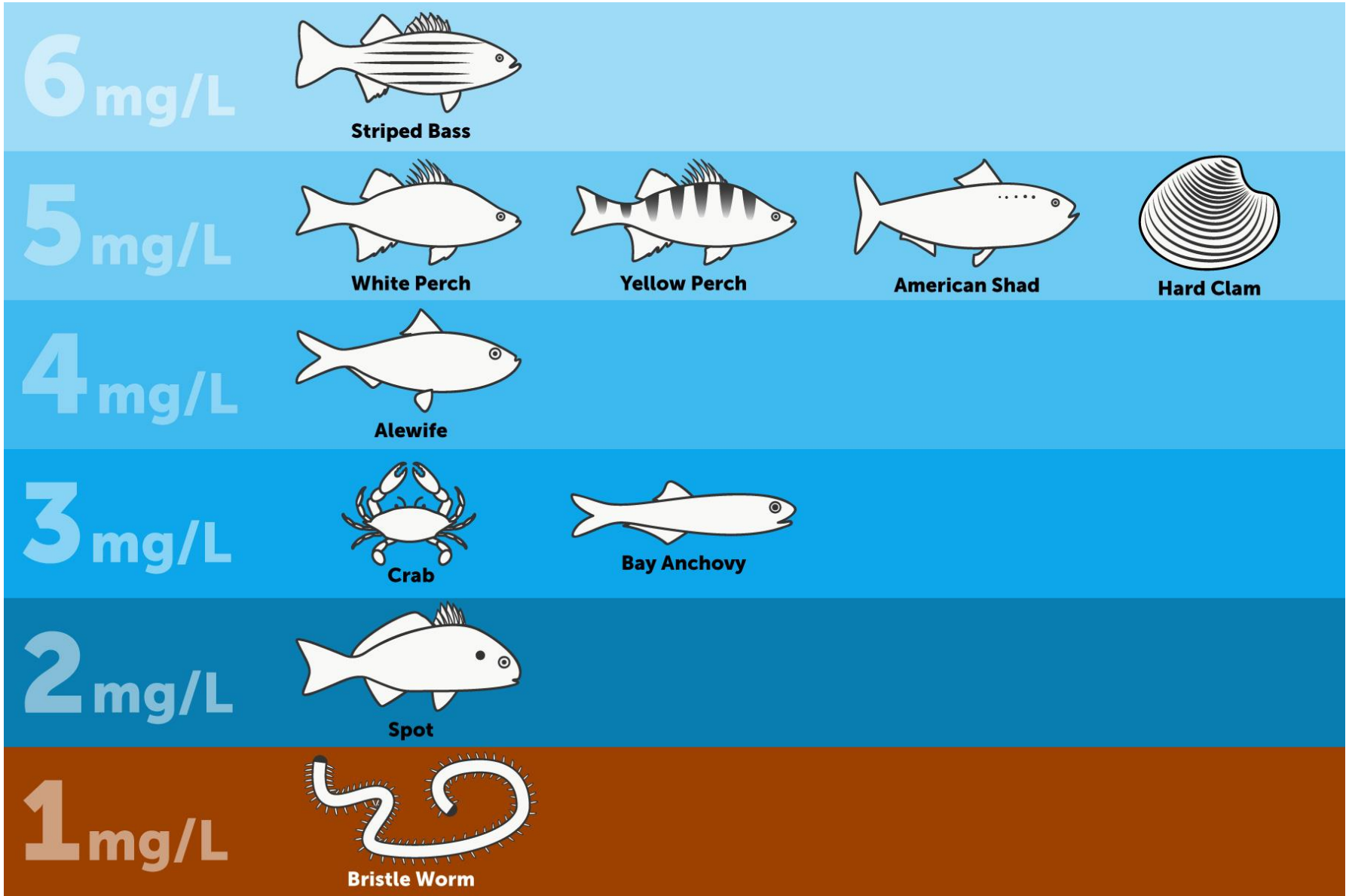
- Concept behind these maps is not new
- Methodology was developed by CBP Partnership and applied as part of original TMDL allocations in 2009
- Maps were updated with Phase 6 modeling suite for Partnership-approved Phase III planning targets in 2018



Estimating the effect of nutrient reductions

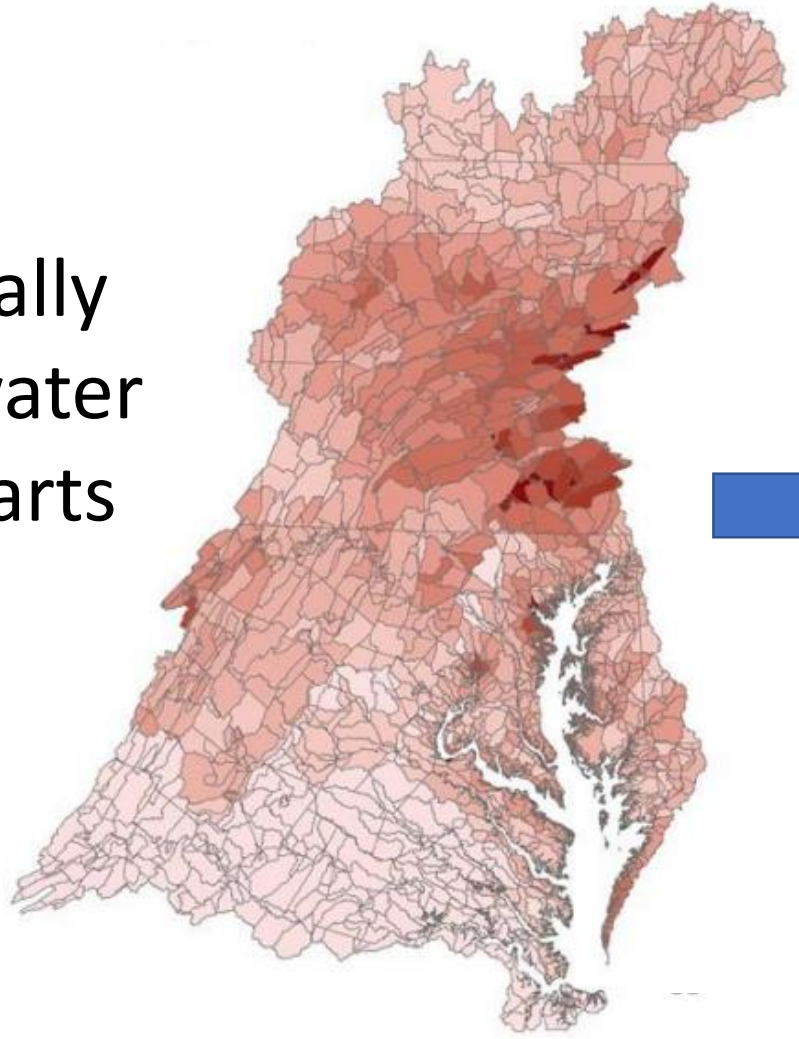


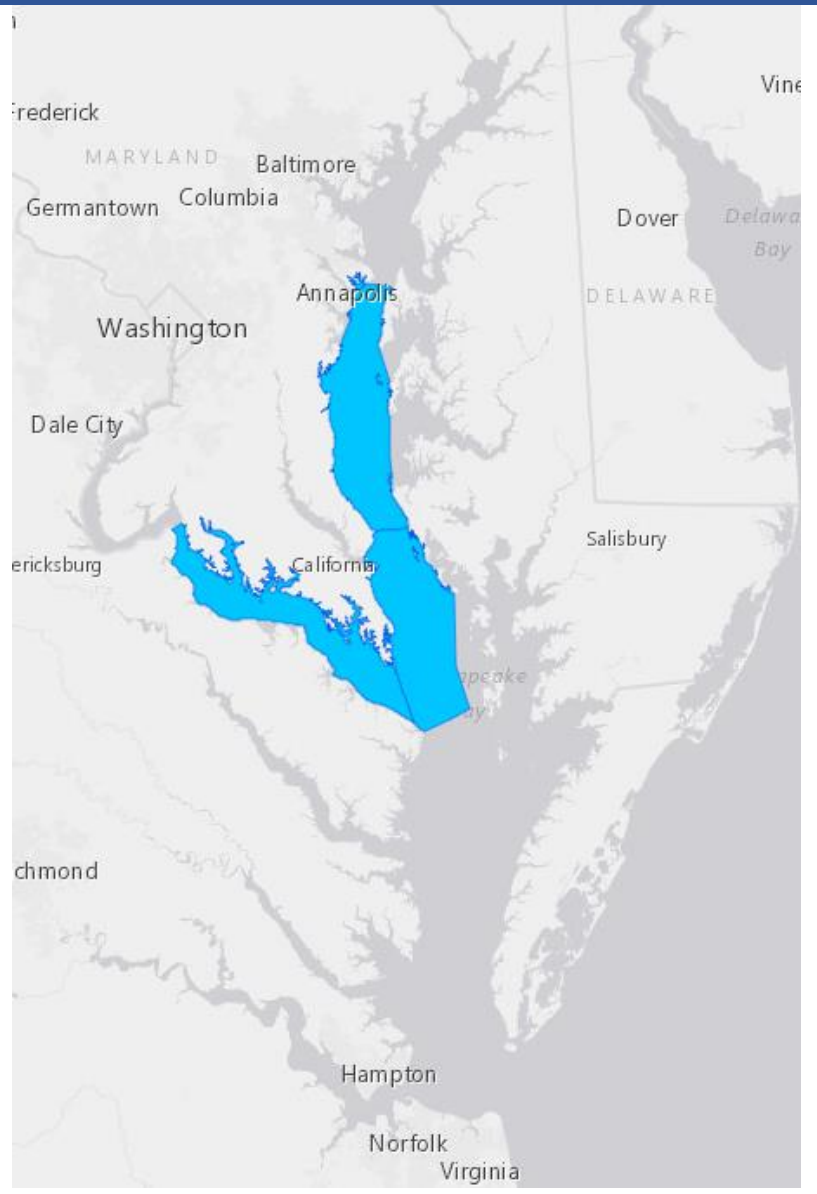
These maps represent the increase in **dissolved oxygen** that occurs in the Bay per pound of nutrient reduced in the watershed



These maps represent the increase in dissolved oxygen that occurs in **the Bay** per pound of nutrient reduced in the watershed

These maps specifically relate to the deep water and deep channel parts of the Bay

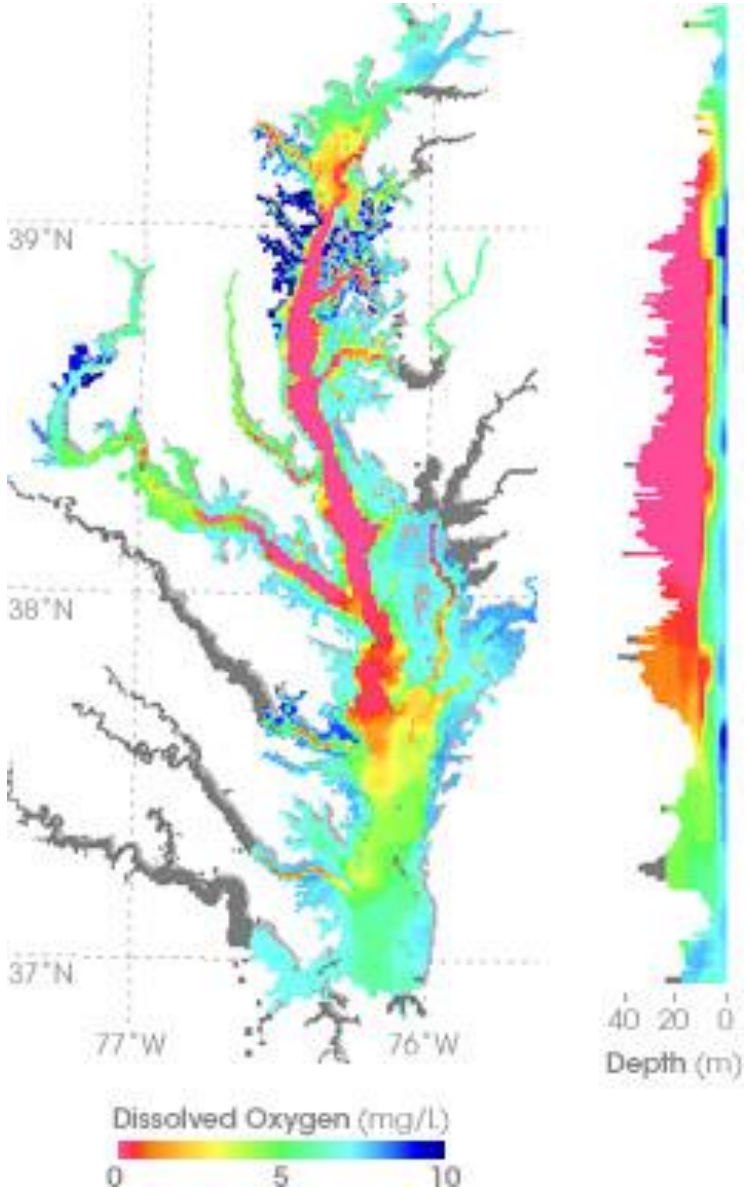




These maps represent the increase in dissolved oxygen that occurs in **the Bay** per pound of nutrient reduced in the watershed

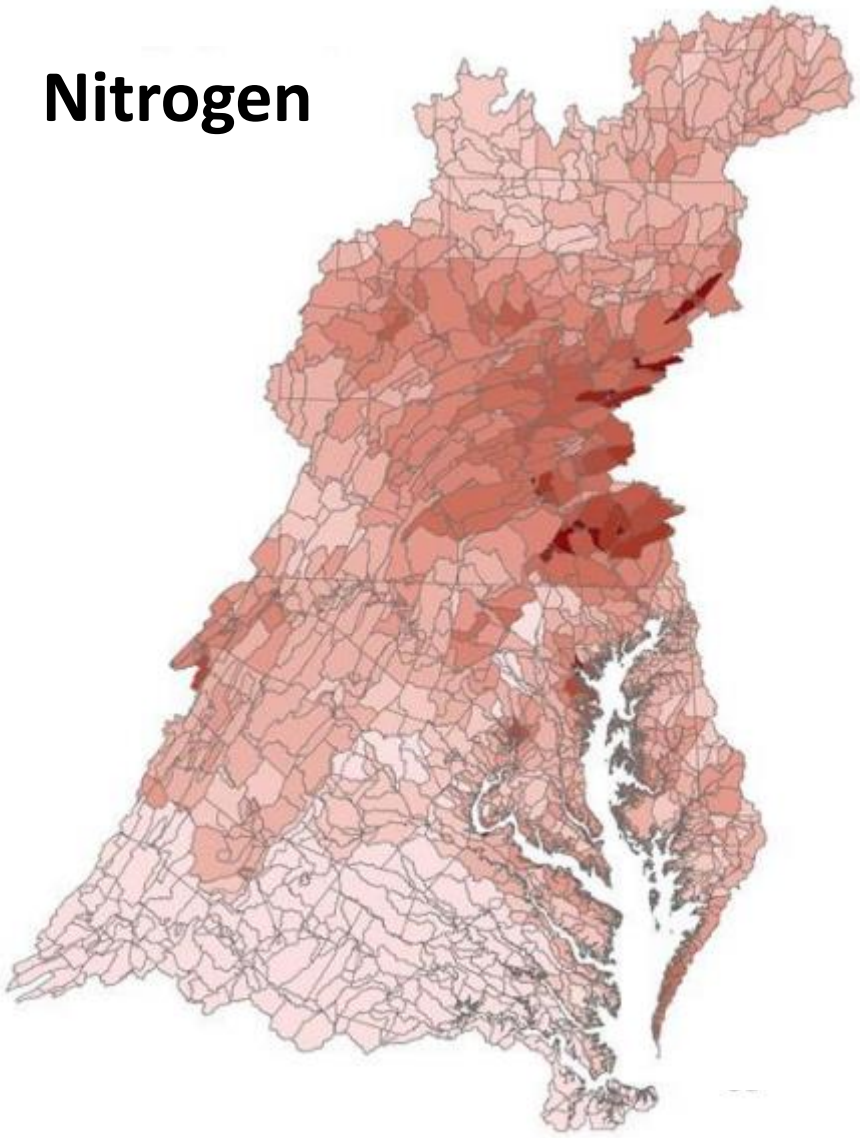
These parts of the Bay are affected by nutrients from all parts of Bay watershed and all sources

These parts of the Bay are considered to be most difficult areas to achieve water quality standards



Relative effectiveness: How these maps are generated

Nitrogen

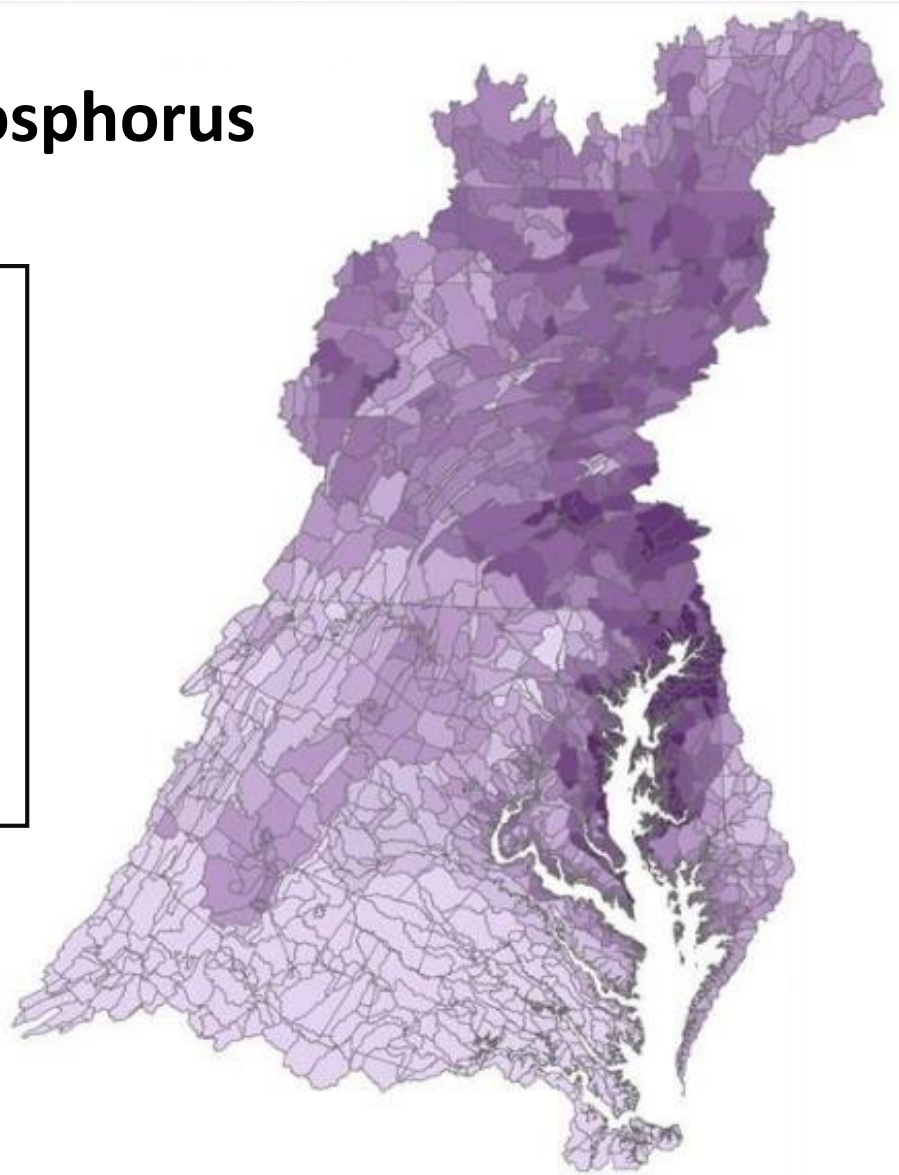


Impact on water quality in the Bay

Less

More

Phosphorus



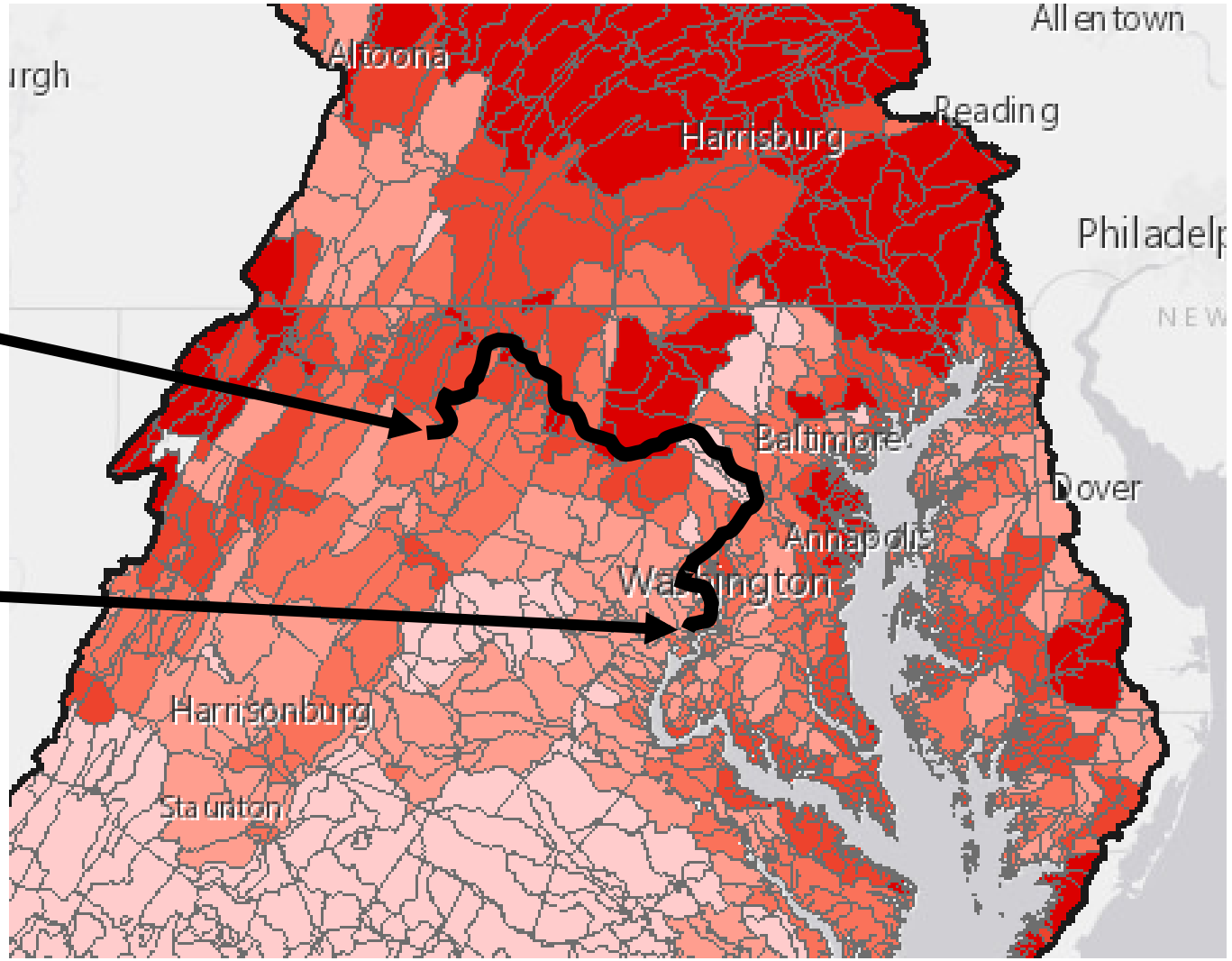
Key factors: transport through the watershed

E.g. Nitrogen watershed delivery factors

How much of the nutrients produced in this area

make it to the tidal waters

= watershed delivery



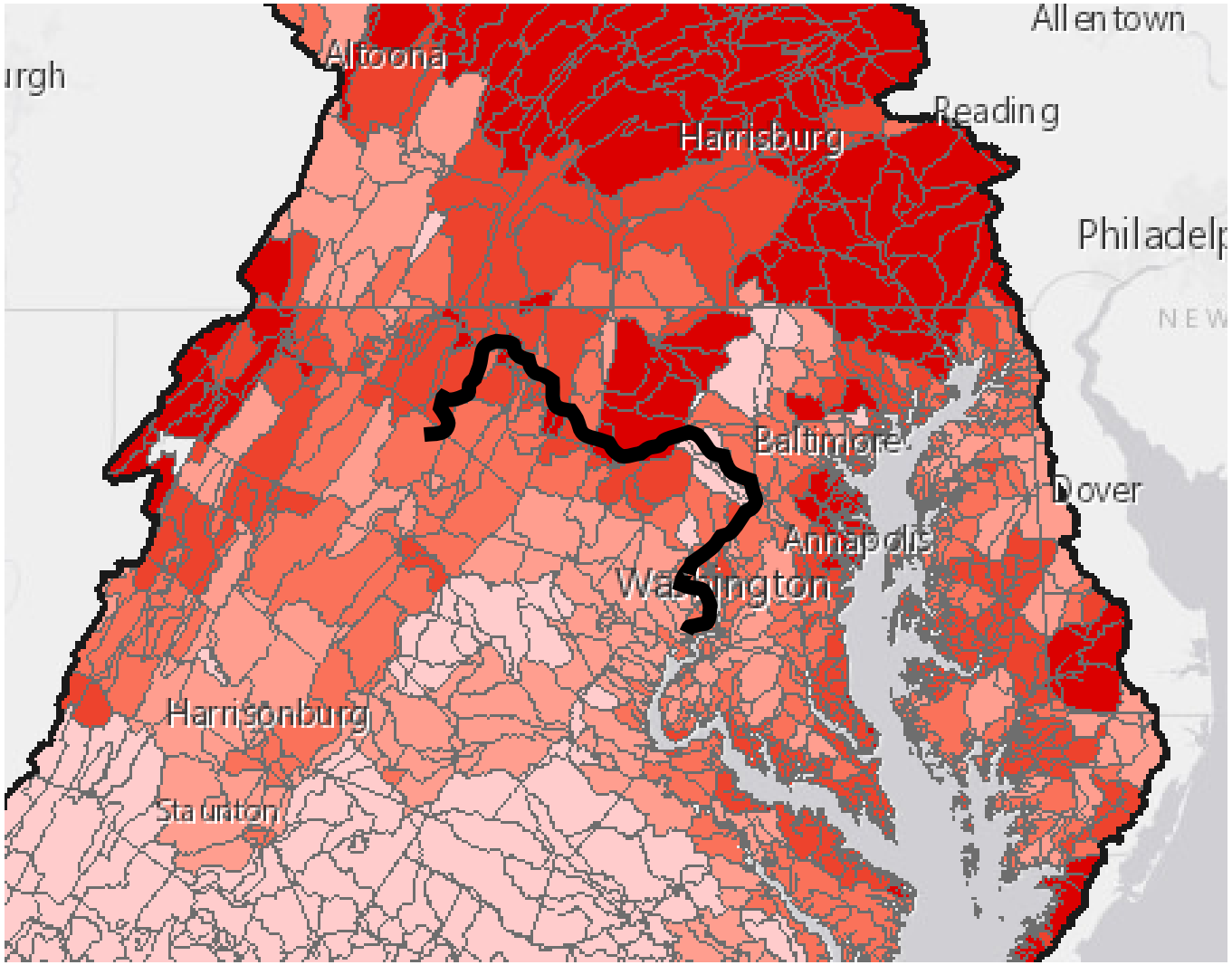
Key factors: transport through the watershed

Dependent on:

- Watershed characteristics
- Travel time
- Impoundments/dams

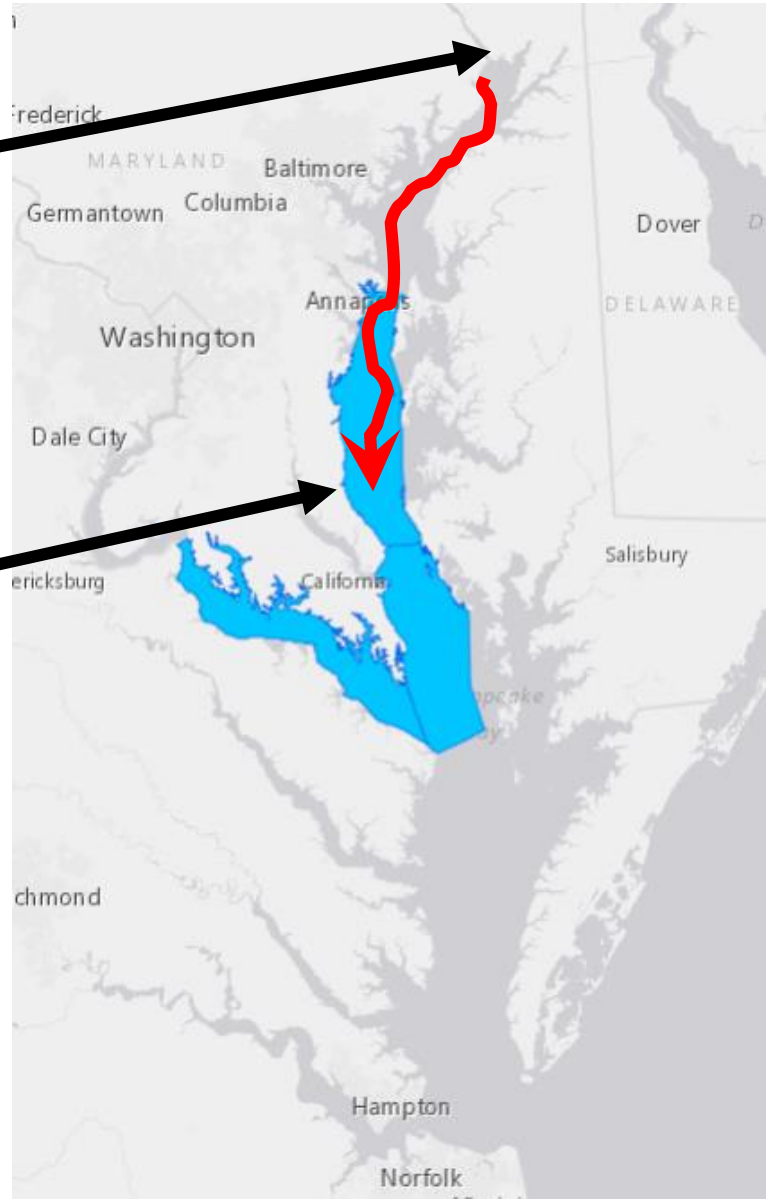
Derived from Phase 6 Watershed Model

E.g. Nitrogen watershed delivery factors



Key factors: transport through the estuary

How much do nutrients entering the Bay from this river



= estuarine delivery

impact dissolved oxygen in the deep parts of the Bay here

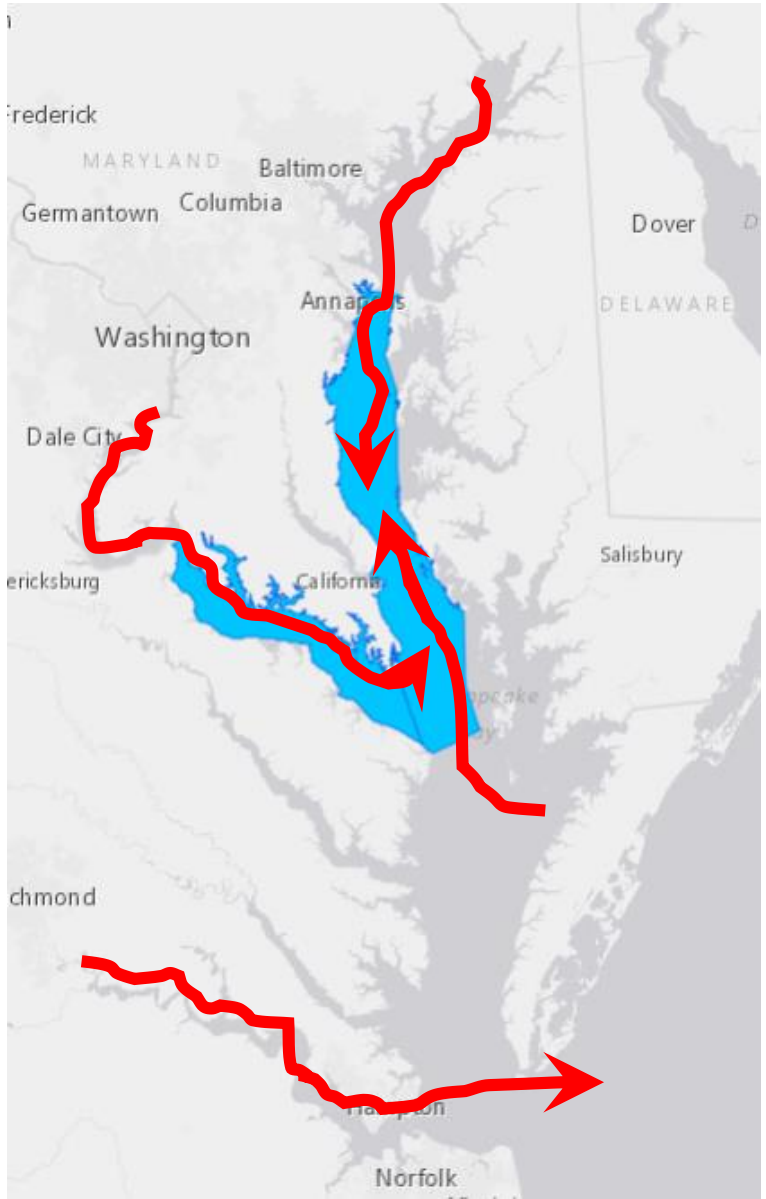
Key factors: transport through the estuary

Dependent on:

Bay's circulation (counter-clockwise)

Travel time in tidal tributary

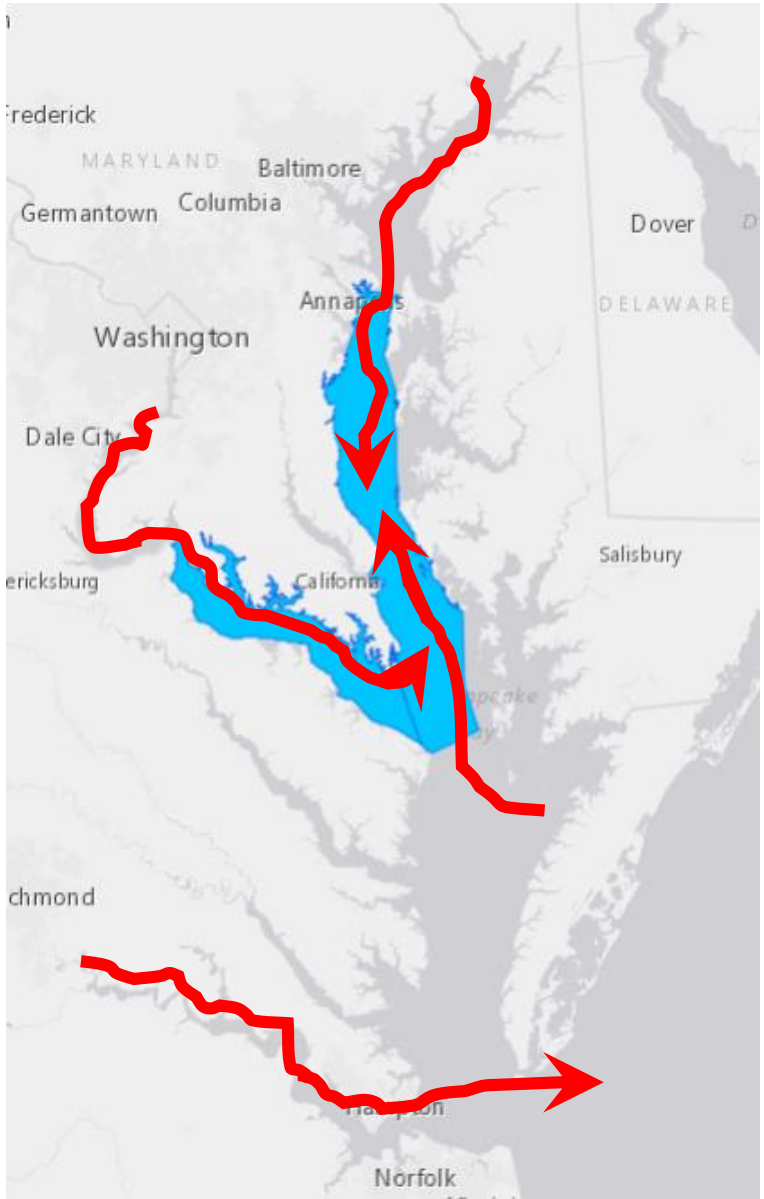
Proximity to mainstem vs. mouth



Key factors: transport through the estuary

Derived by using estuarine model

- Change amount of nutrients entering Bay from one river basin at a time in model
- Look at resulting change in dissolved oxygen in Bay

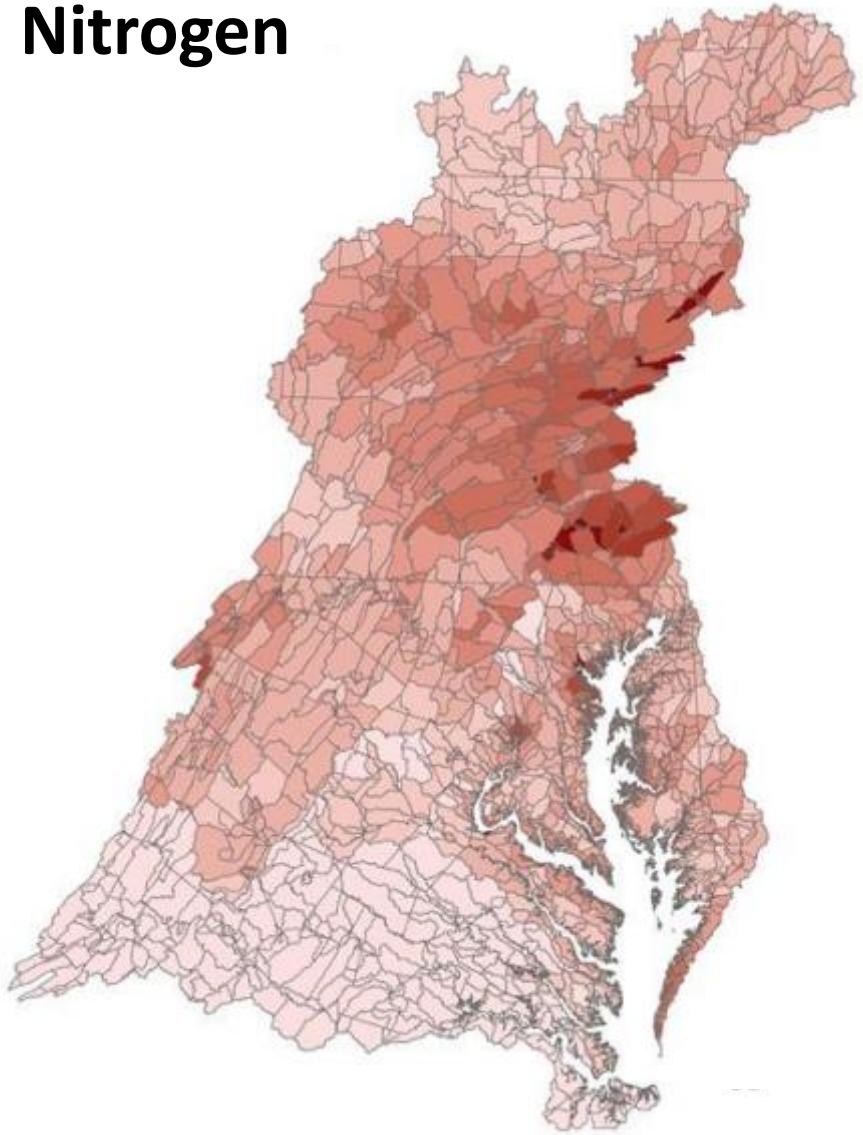


Putting it all together

Multiply estuarine and watershed factors

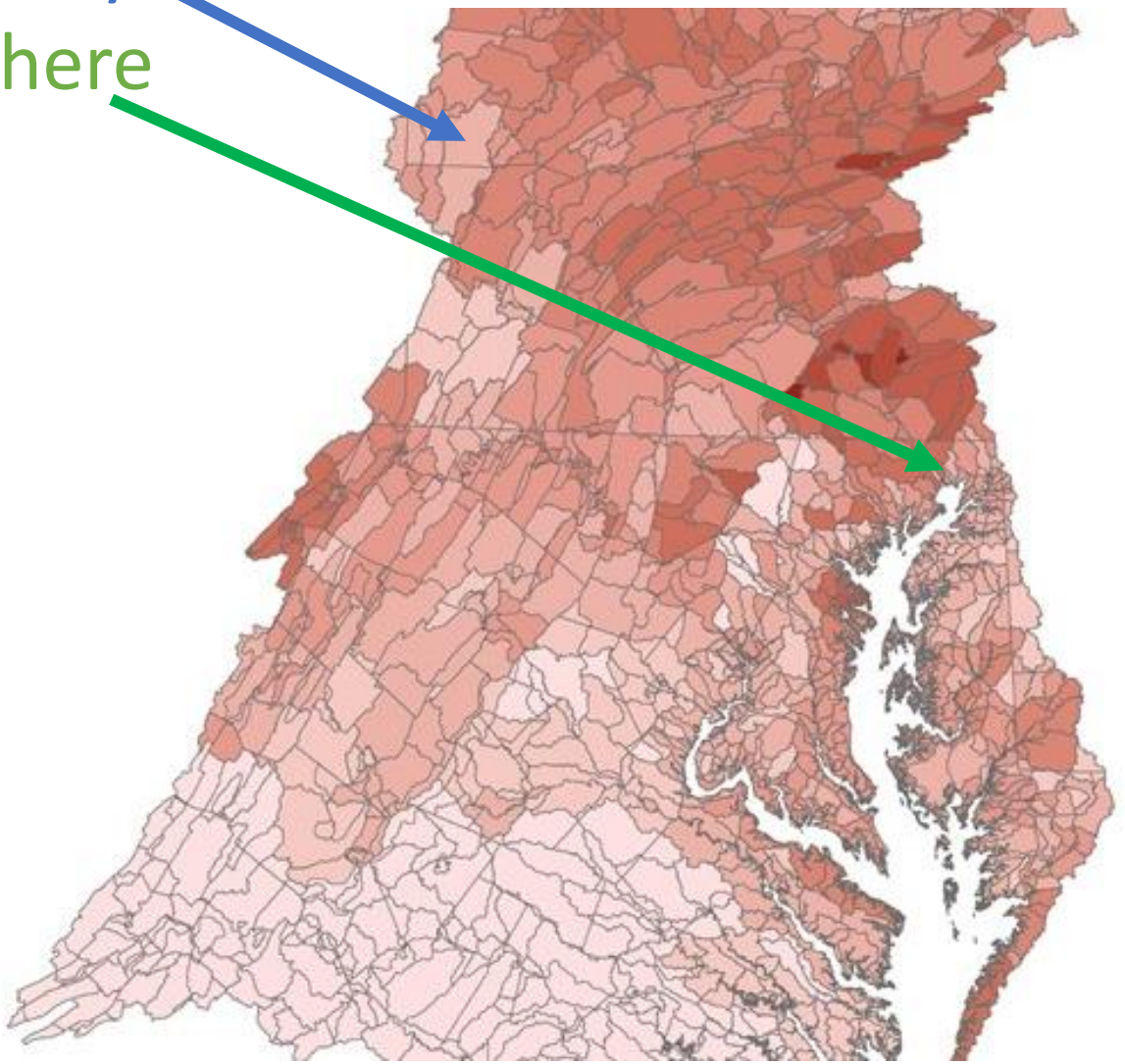
Result: change in dissolved oxygen in Bay per change in nutrients lbs in local watershed

Nitrogen



Putting it all together

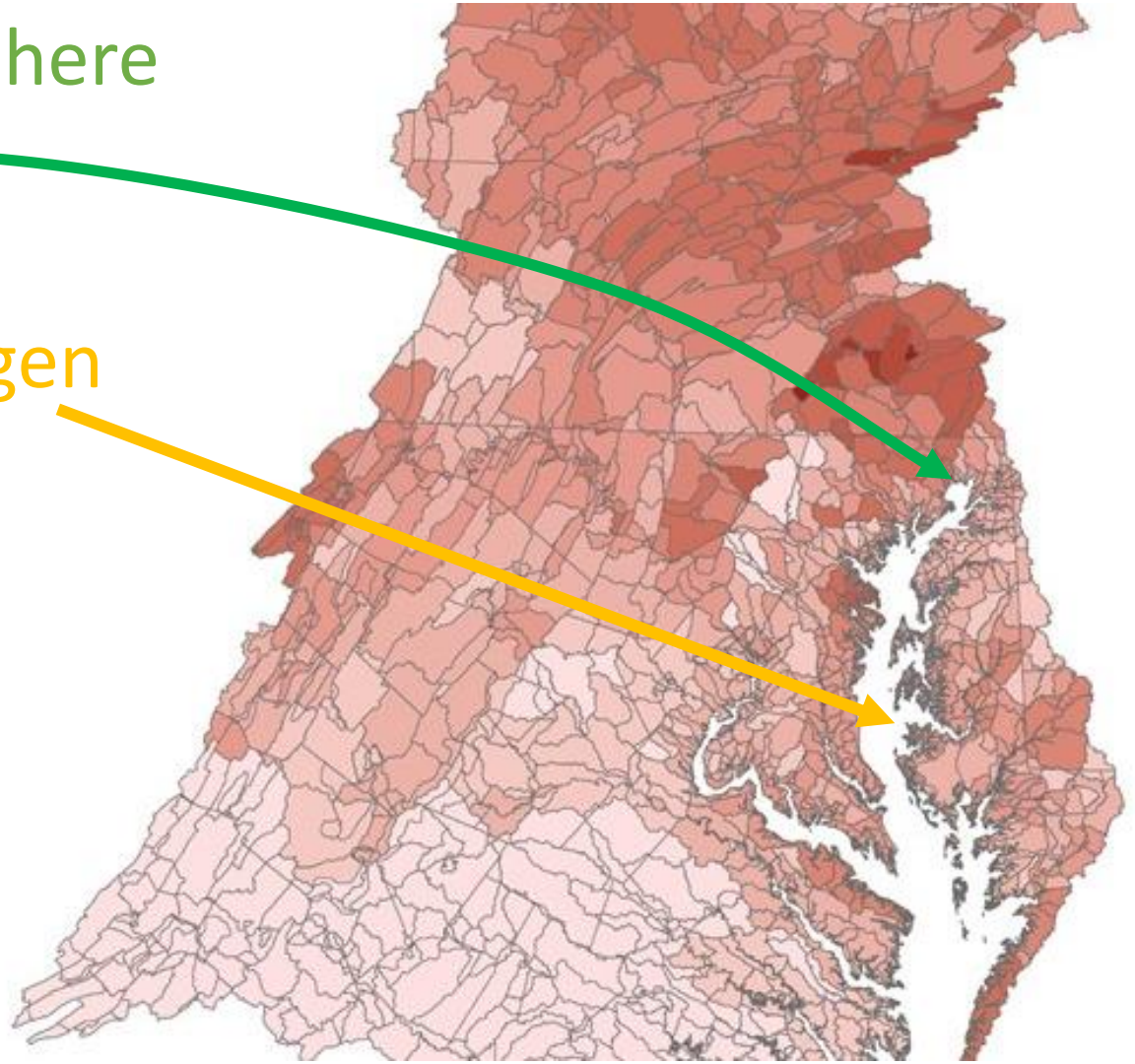
If we know how much of what is locally produced here actually makes it to here



Putting it all together

If we know how much of what is locally produced here actually makes it to here

And we know how much changing what makes it to here changes oxygen here

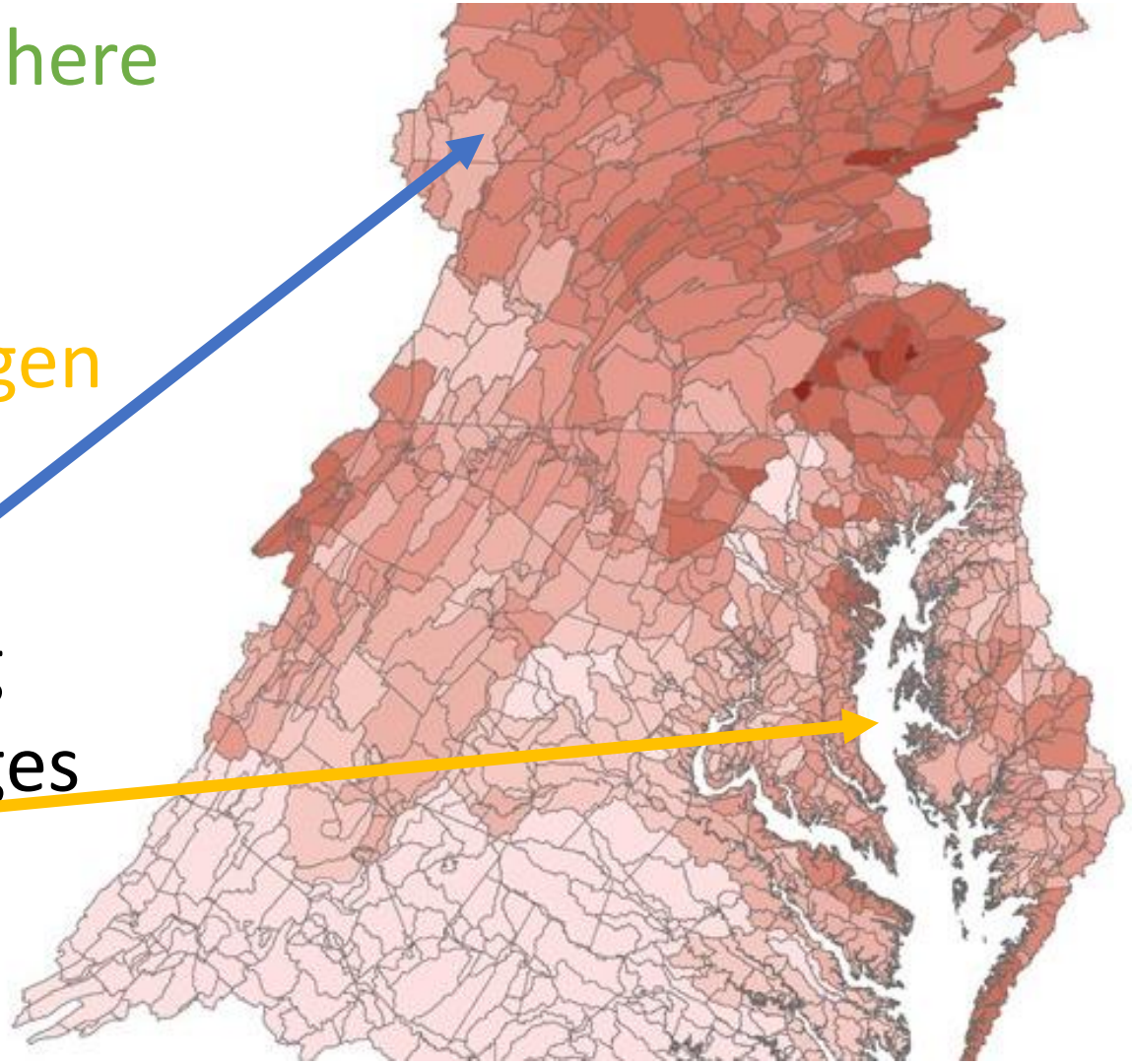


Putting it all together

If we know how much of what is locally produced here actually makes it to here

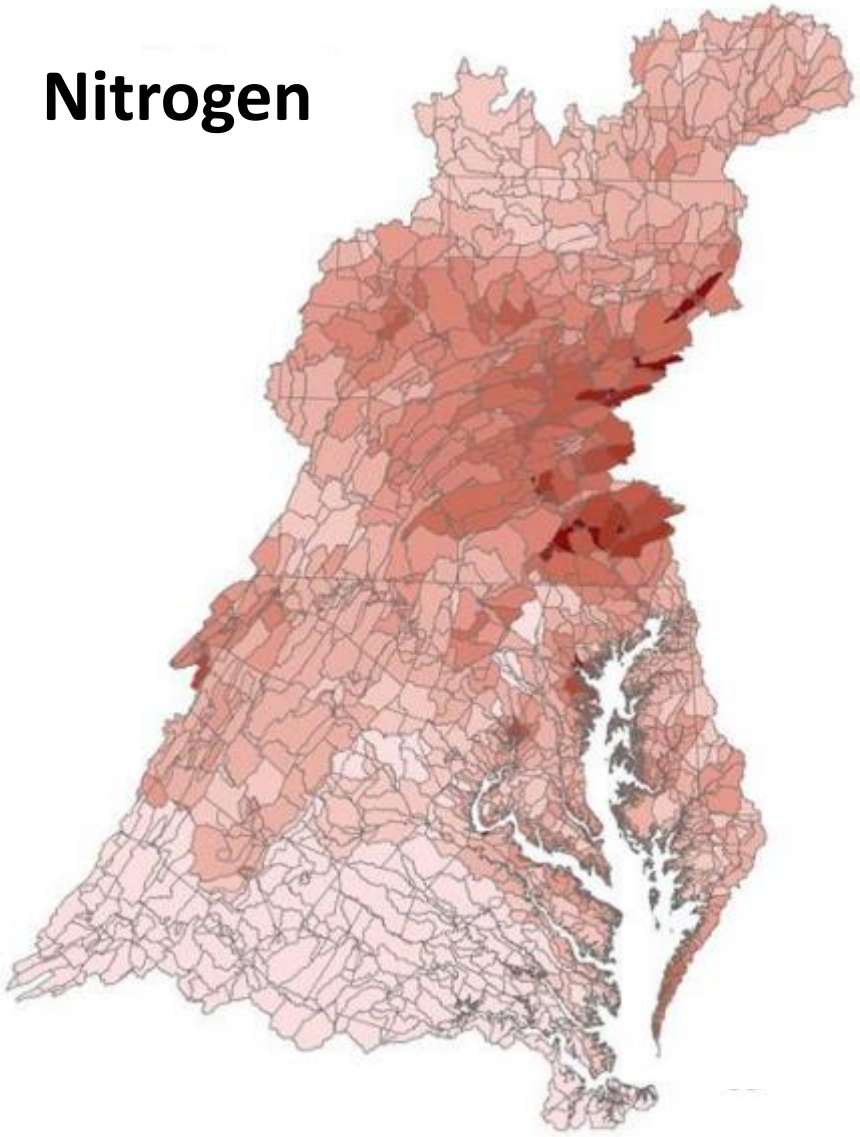
And we know how much changing what makes it to here changes oxygen here

Then we know how much changing what's locally produced here changes oxygen here

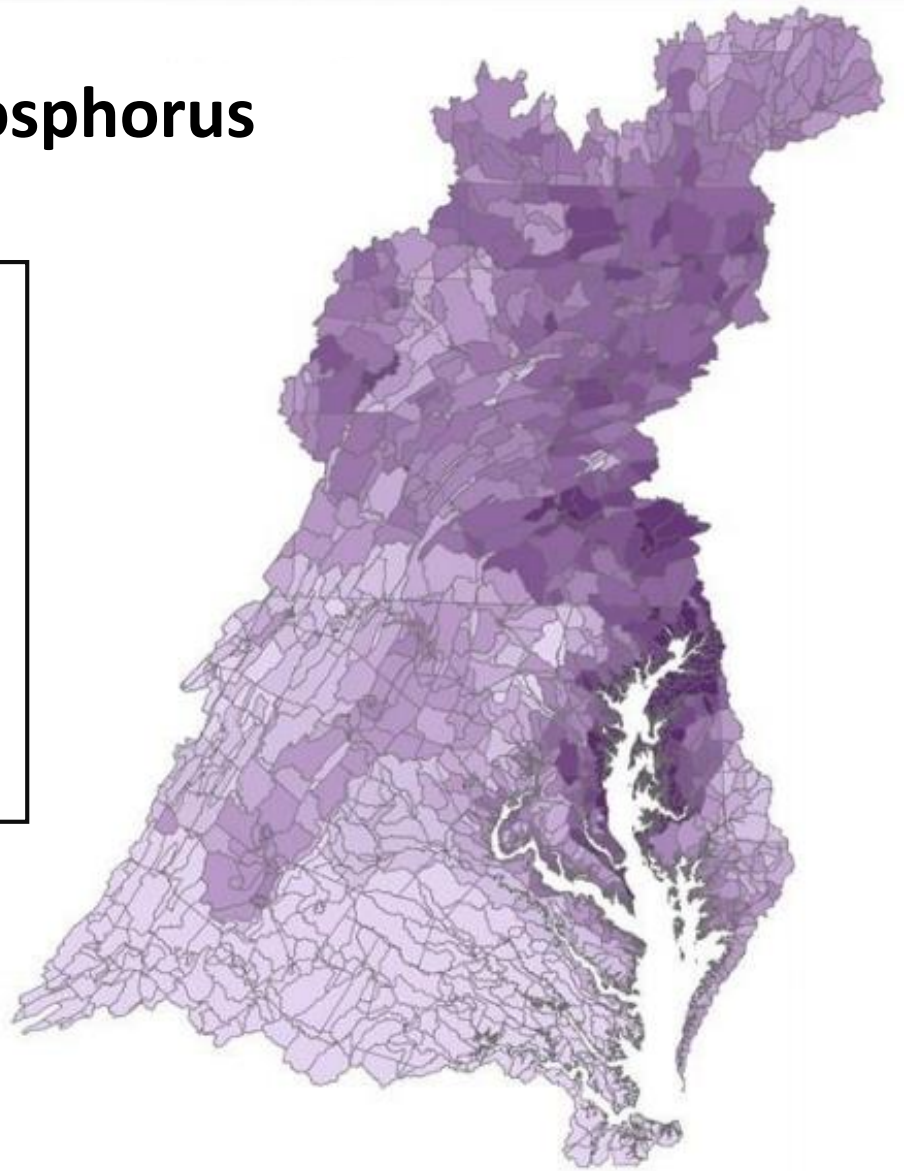


Relative effectiveness: Estimating the effect of nutrient reductions

Nitrogen



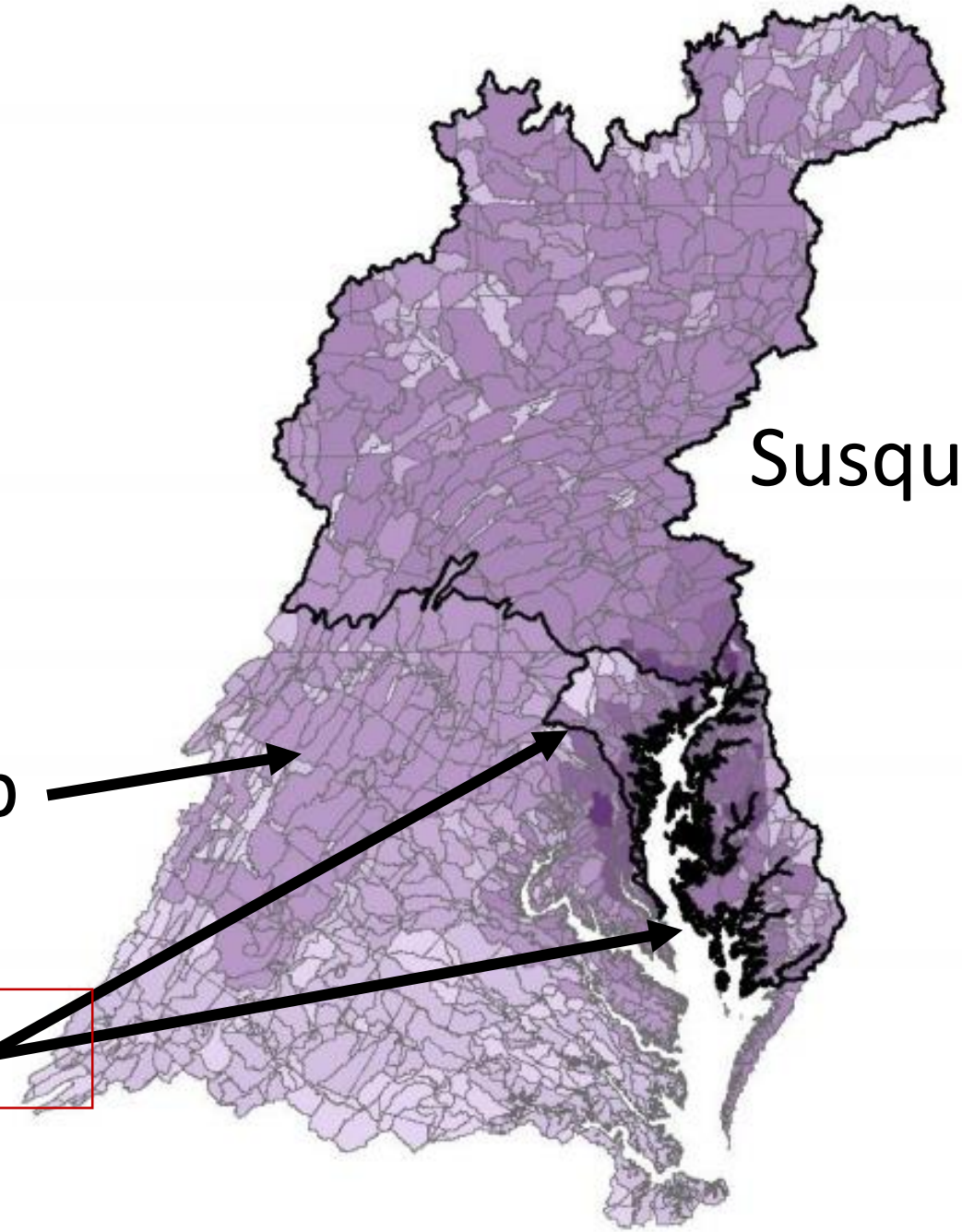
Phosphorus



Impact on water quality in the Bay

Less

More

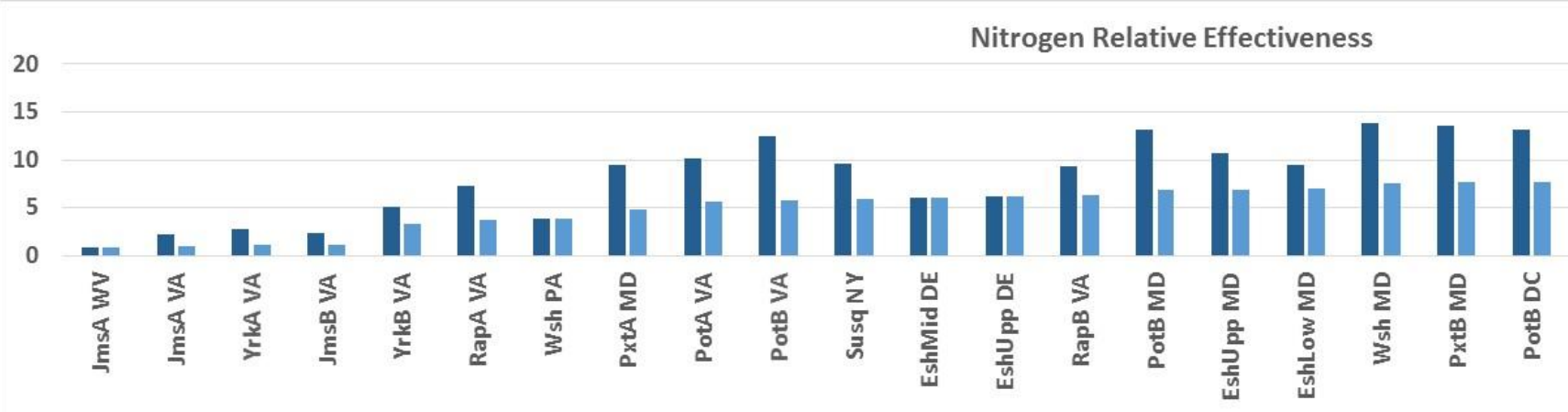


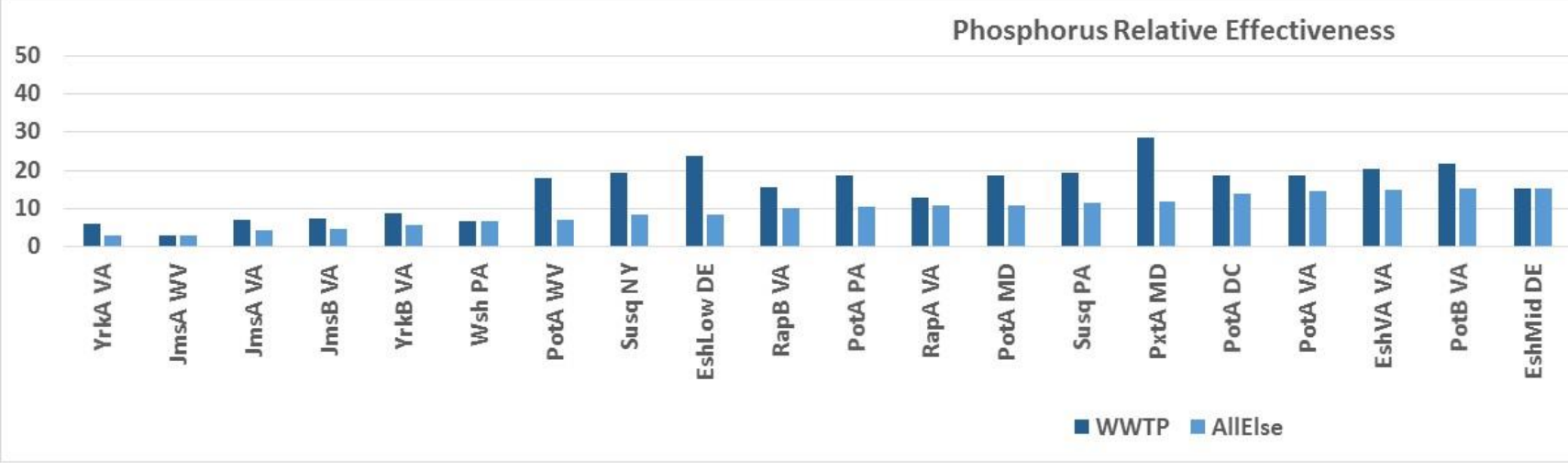
Relative effectiveness map

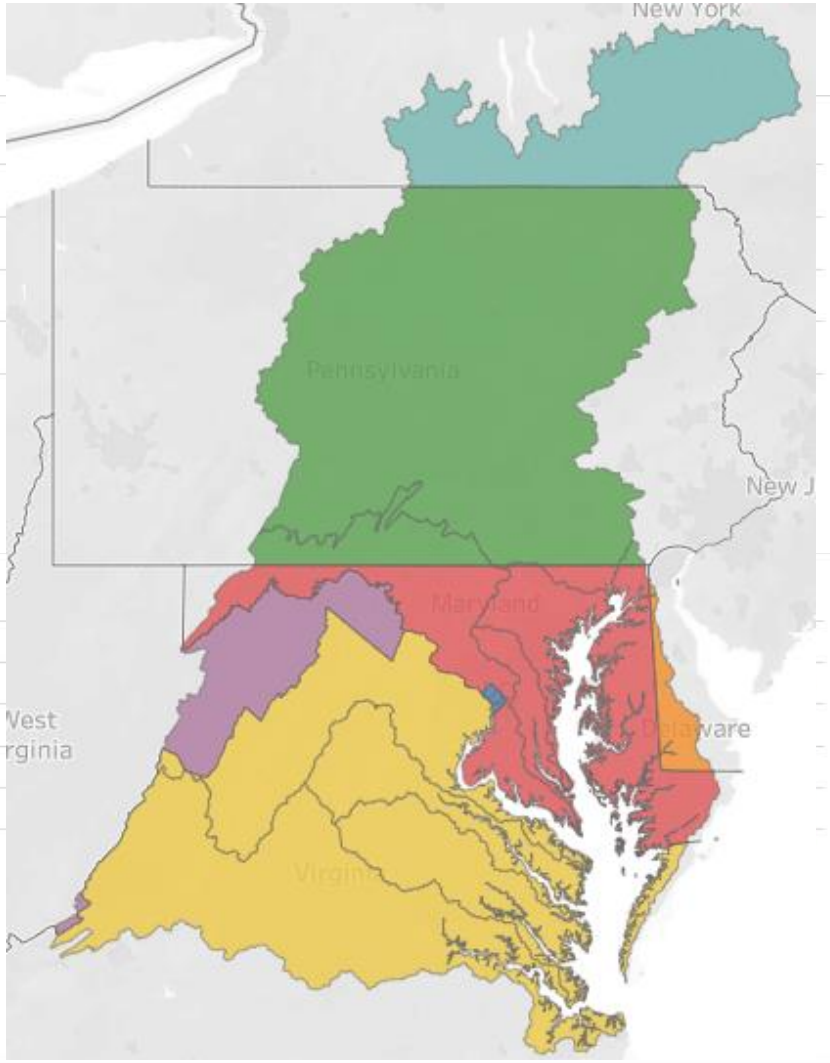
“Most effective basins”

Moving from maps to state basins

Relative effectiveness can be aggregated to state basin level and ranked

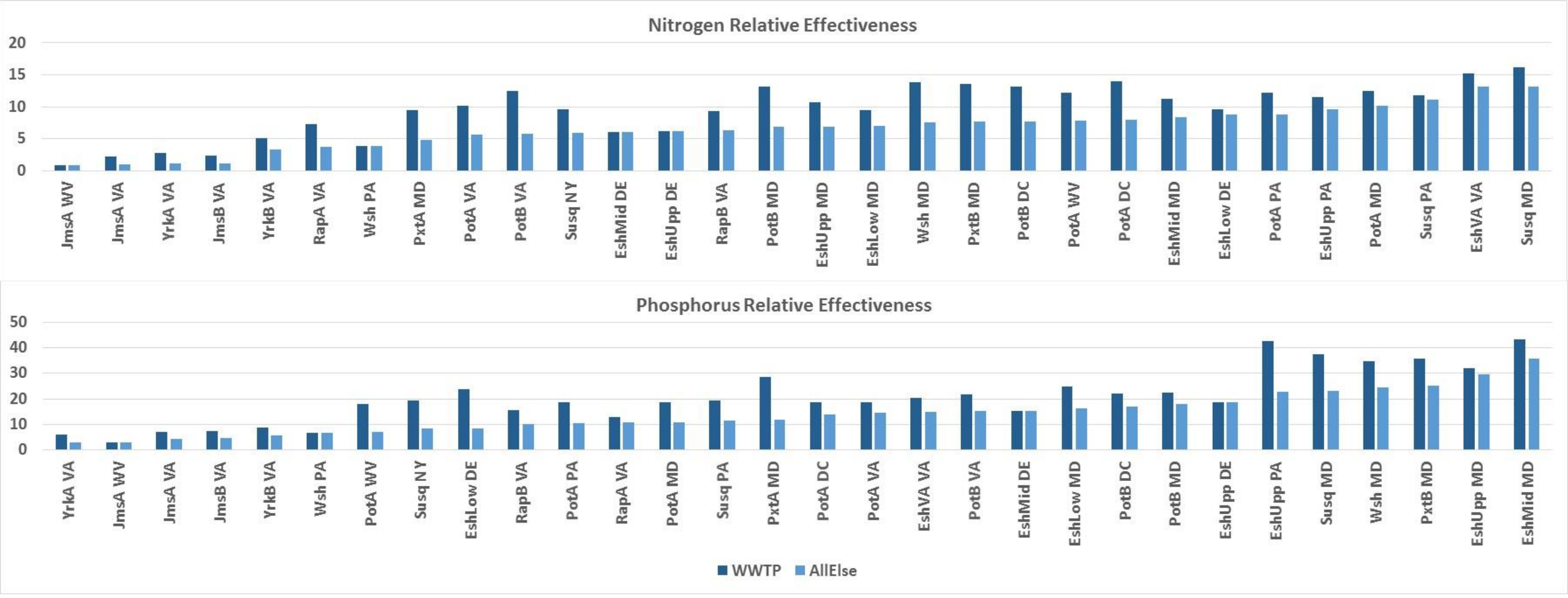






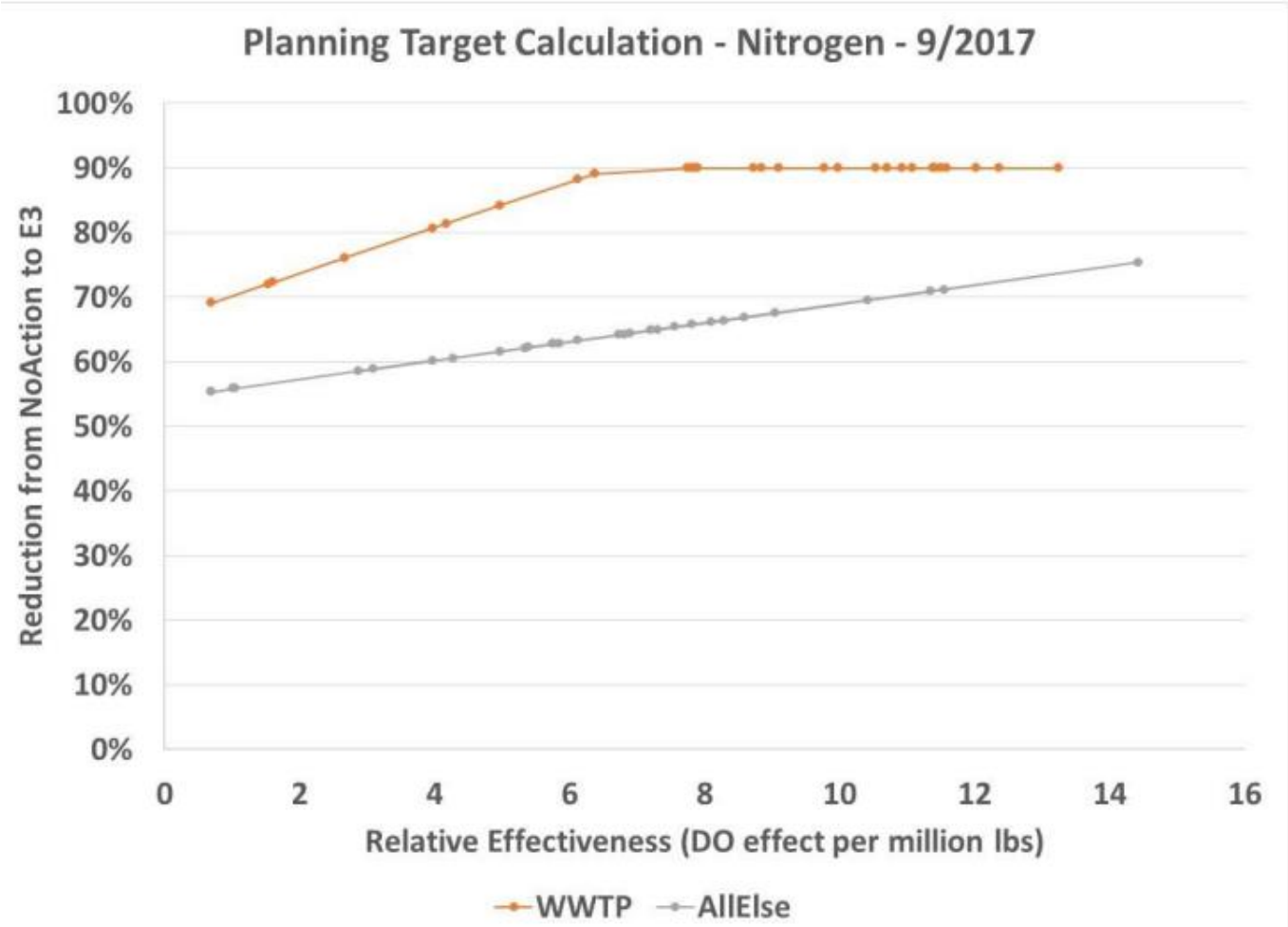
Moving from maps to state basins

Relative effectiveness with Conowingo at 1990s status used to generate planning targets – “more impact, do more”



Partnership-approved planning target methodology

Relative effectiveness with Conowingo at 1990s status used to generate planning targets – “more impact, do more”



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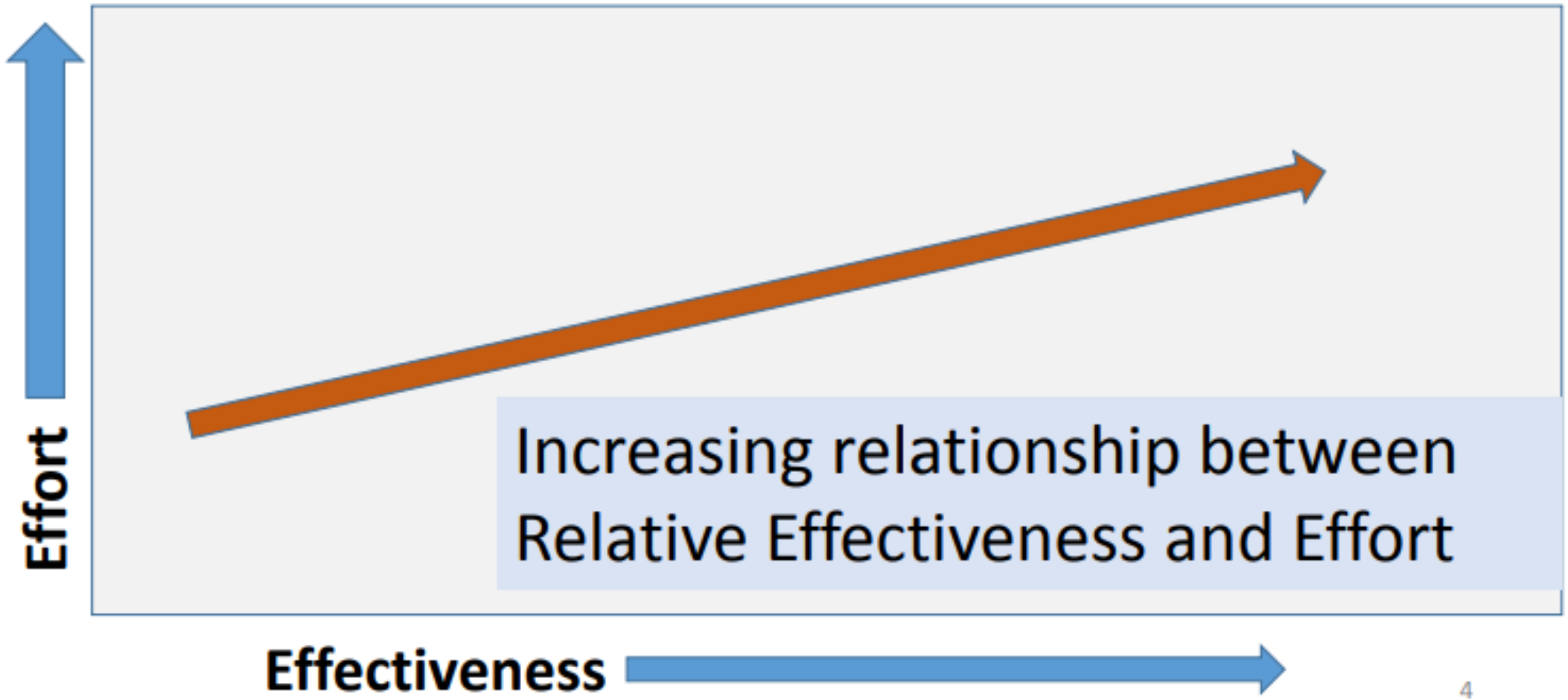
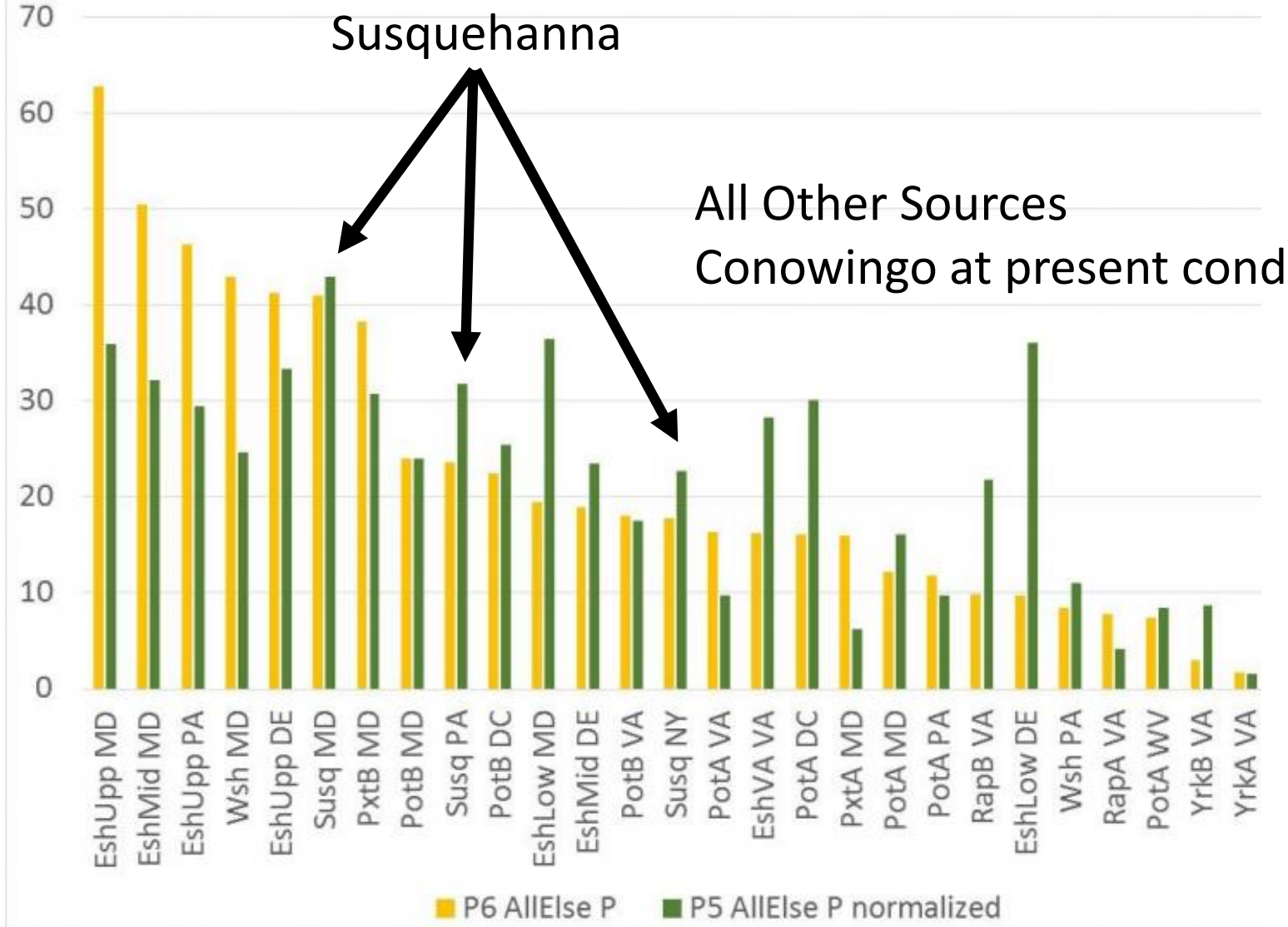
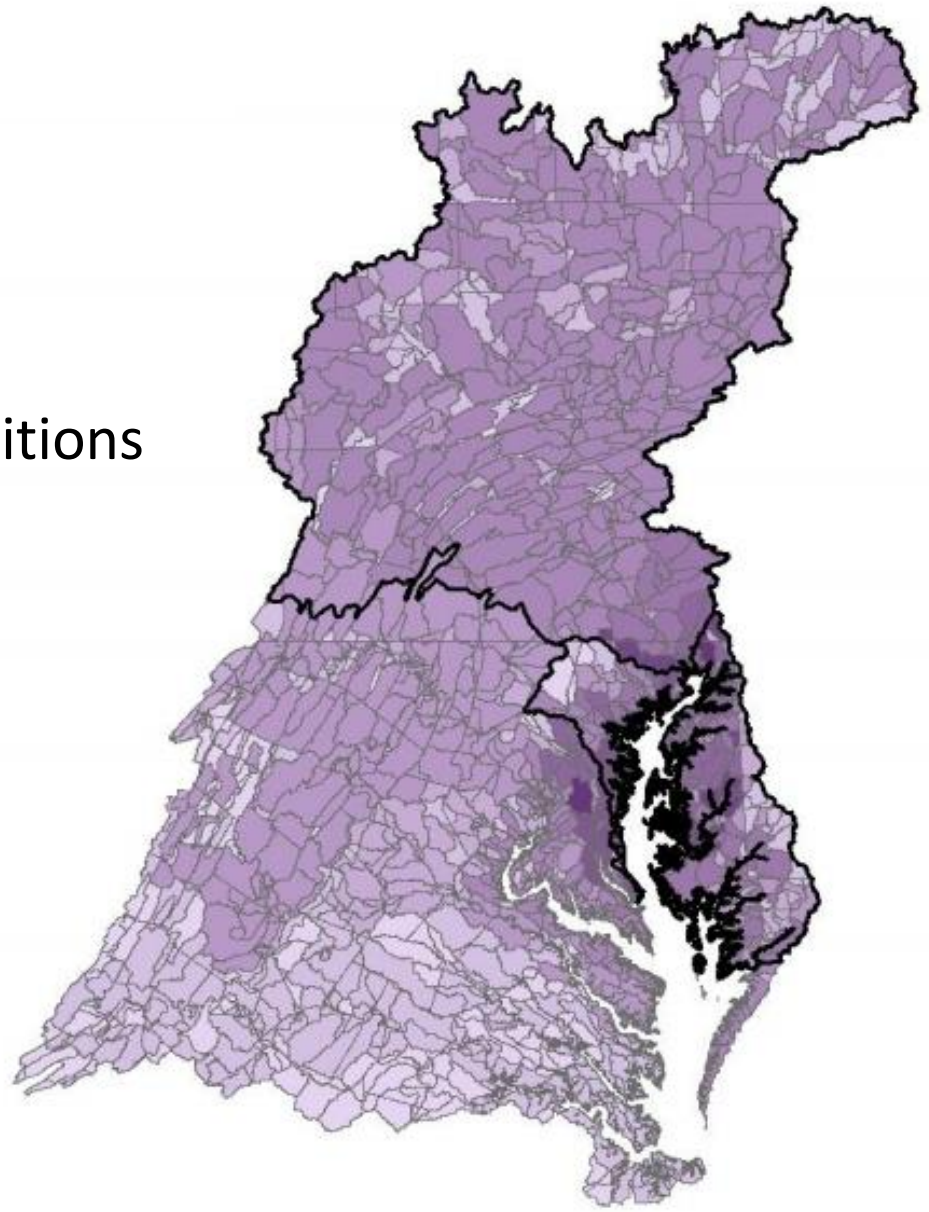


Susquehanna + “most effective basins”

Phosphorus relative effectiveness



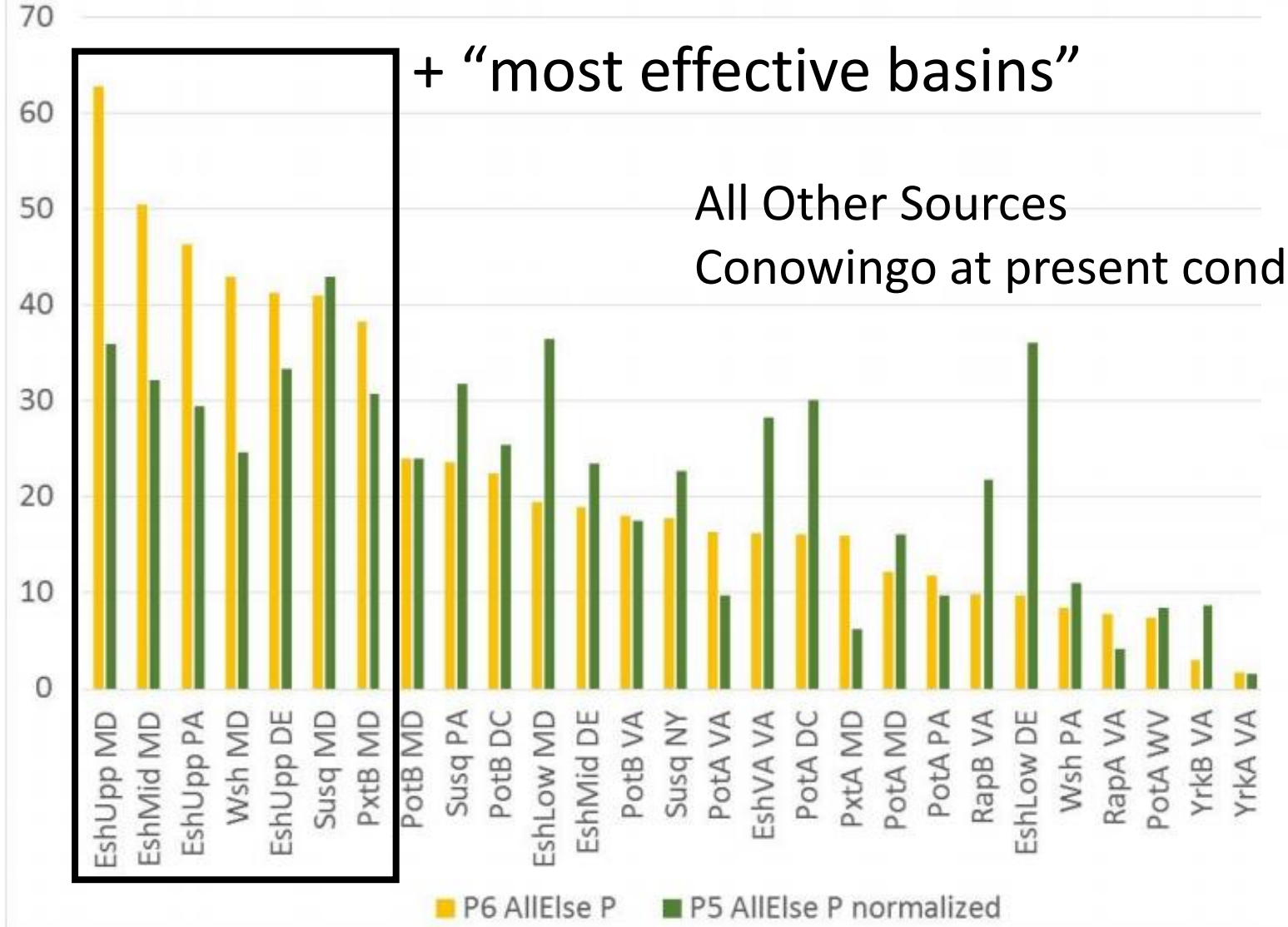


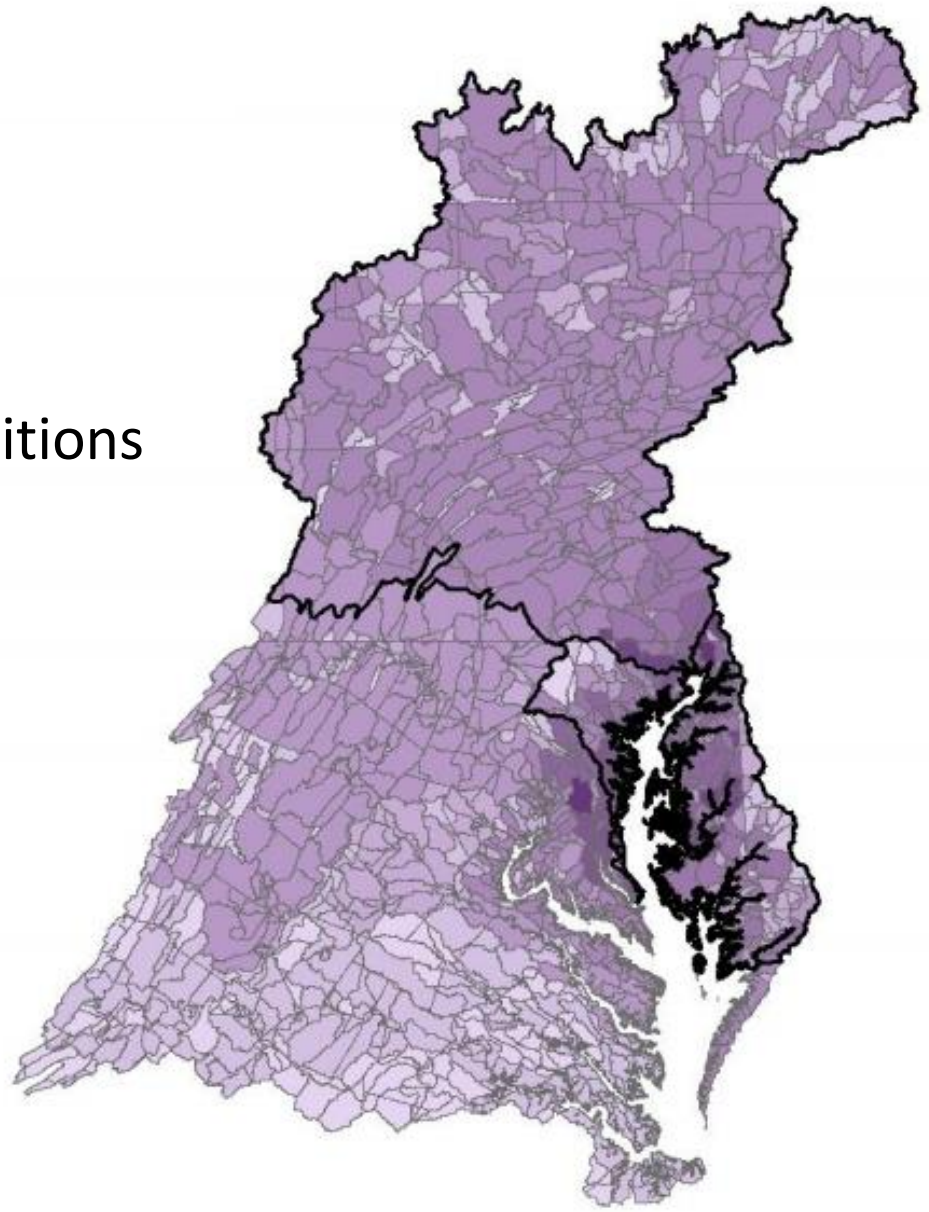
Susquehanna + “most effective basins”

Phosphorus relative effectiveness

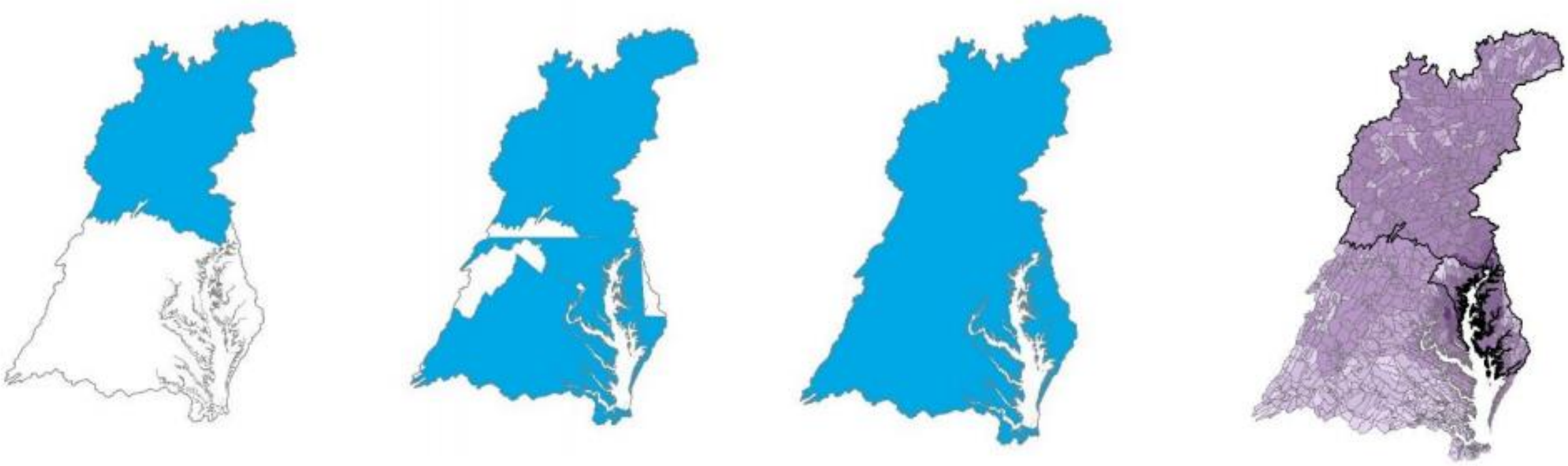
+ “most effective basins”

All Other Sources
Conowingo at present conditions





- Originally presented as one of the options for handling Conowingo to PSC
- PSC decided to instead do Conowingo WIP



Conowingo WIP Steering Committee September 2019 Decision

"The Steering Committee, in coordination with the grantees, decided that the Conowingo WIP will:

(1) focus solely nitrogen loads,

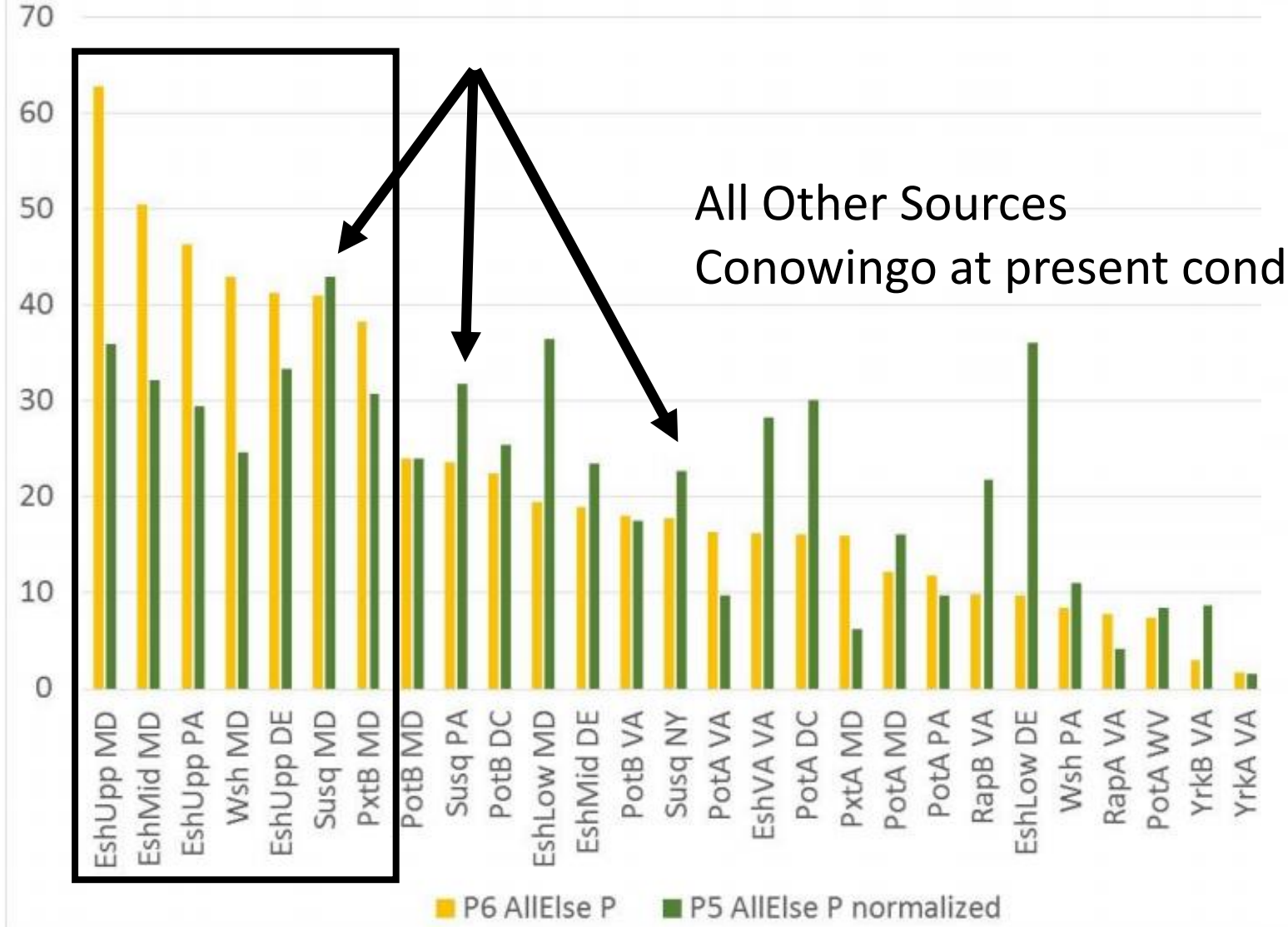
(2) focus on most-effective basins,

(3) map sector highest loading areas both individually and combined, and

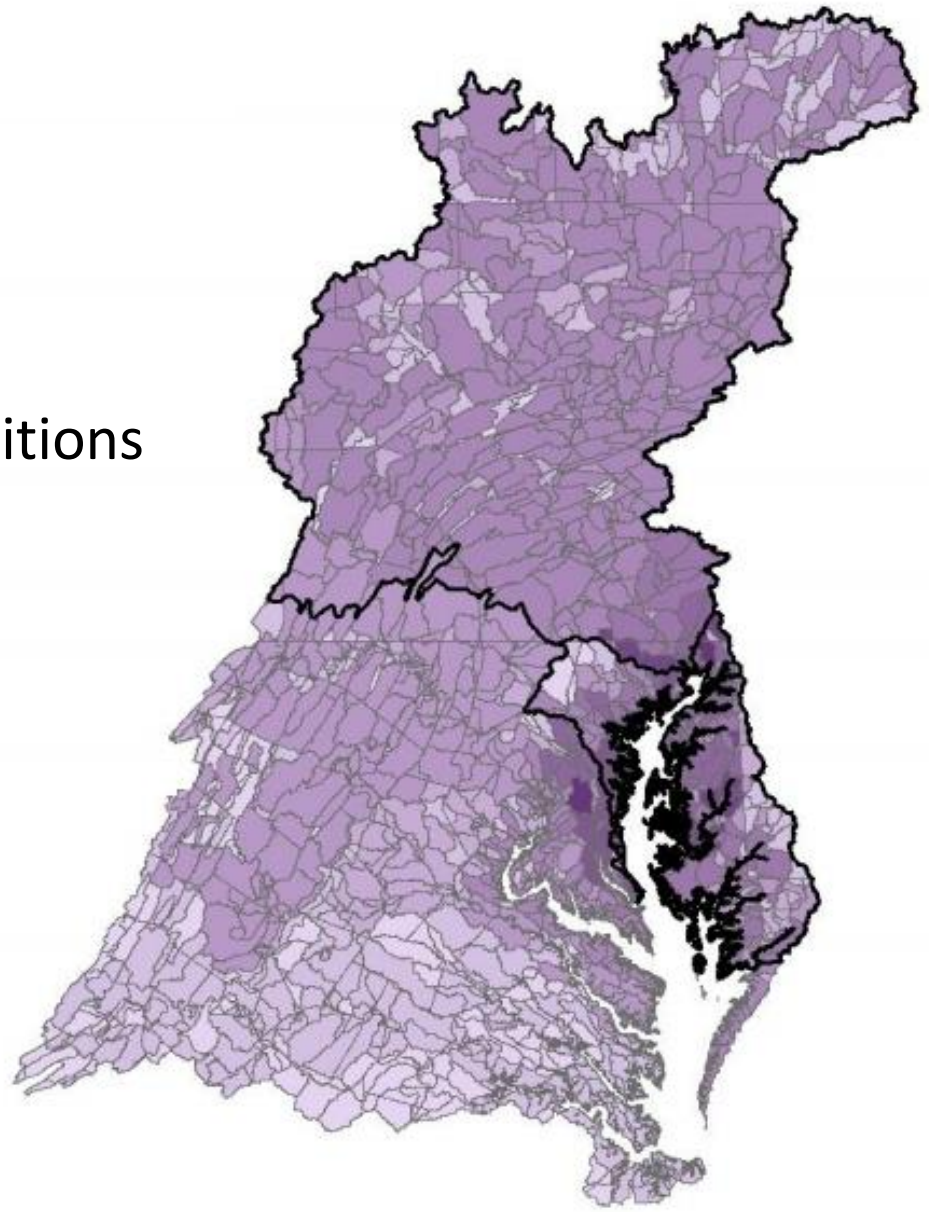
(4) focus on cover crops as a priority BMP instead of conservation tillage."

Susquehanna + “most effective basins”

Phosphorus relative effectiveness



All Other Sources
Conowingo at present conditions



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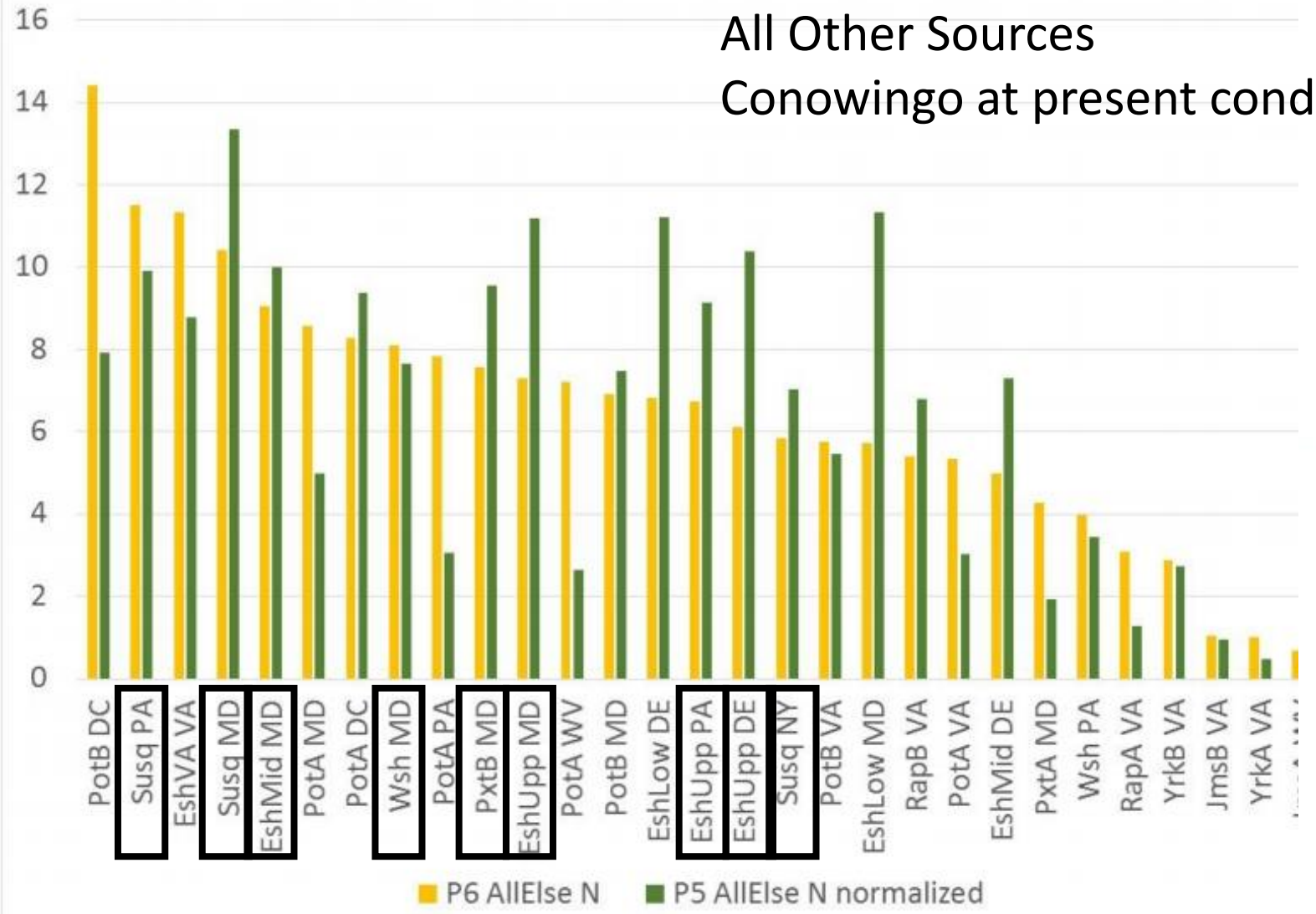

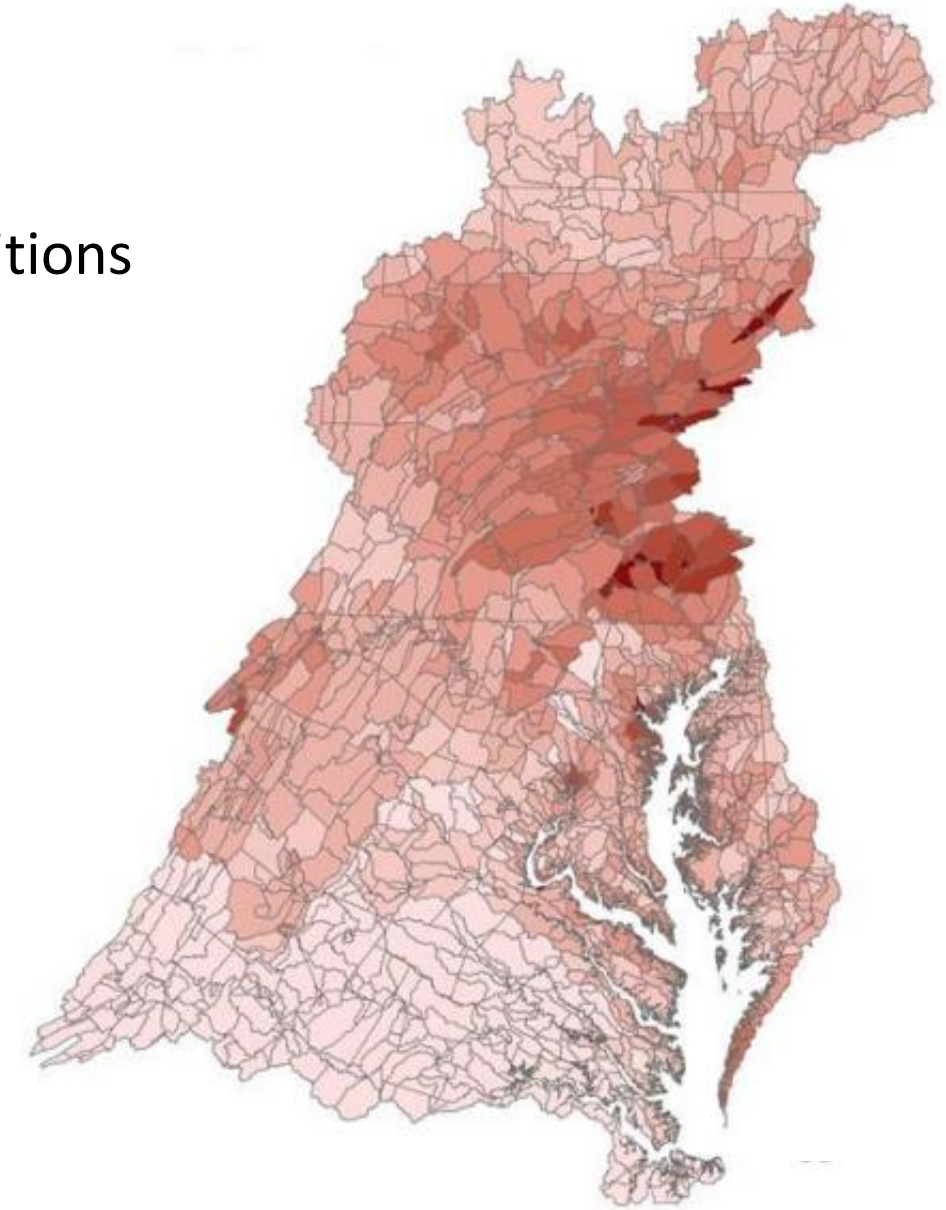

Conowingo WIP Draft Targeting Proposal to PSC May 2019

"The Steering Committee will submit a recommendation for final selection of a targeting approach to the Principals Staff Committee for approval. This recommendation will depend on the Steering Committee:

1. Getting a better understanding of how Criteria #2 is simulated in the Chesapeake Bay Watershed Model from the EPA Chesapeake Bay Program Office.
2. A revisit and further definition of the effective basins in the watershed as defined in the Framework document after this understanding is achieved.
3. The results of the Steering Committee's analysis of the modeled vs actual capacity to get practices implemented."

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Hopefully we did this today

Conowingo WIP Draft Targeting Proposal to PSC May 2019

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1. Getting a better understanding of how Criteria #2 is simulated in [illegible]shed Model from the EPA Chesapeake Bay Program Office.

Good idea to now do this

2. A revisit and further definition of the effective basins in the watershed as defined in the Framework document after this understanding is achieved.

3. The results of the Steering Committee's analysis of the modeled vs actual capacity to get practices implemented."