# Watershed Modeling Workplan Options

Gary Shenk – CBPO

10/25/2021

WQGIT

# Model Development Schedules

Phase 4
Combined phase 2 and phase 3 functionality
Longer simulation
Recalibration

- 1995 Development
- 1996 Development
- 1997 P4.1 application
- 1998 Development
- 1999 Development
- 2000 P4.3 application

Phase 5
Restructuring,
Resegmentation,
Automated calibration

- 2000 Ideation
- 2001 Development
- 2002-2004 WQS
- 2005 Development
- 2006 Development
- 2007 Development
- 2008 Development
- 2009 Development
- 2010 Review/application

Phase 6
Radical restructuring

- 2011 Ideation
- 2012 Priorities
- 2013 Development
- 2014 Development
- 2015 Development
- 2016 Development
- 2017 Review
- 2018 Apply

Phase 7
???

- 2019 Climate
- 2020 Climate
- 2021 Ideation
- 2022 Development
- 2023 Development
- 2024 Review
- 2025 Apply

2022
Development

2023
Development

2024
Review

2025
Apply

- WQGIT gives priorities – October 2021
- 2 important questions
  - What are we doing in 2025?
  - What modeling improvements will support 2025 and future decisions?
- Four Bins
  - Complete by 2023
  - Continue to work on for a later incorporation
  - Encourage research
  - Partnership does not want this done

# Existing Priorities – these are happening

- Land use change 1985-2035
  - Resources in place
  - Use land use directly rather than combining with other data sets
  - Consistent land use from meter-scale through watershed scale
- Estuarine model development
  - Much finer scale in shallow water
  - Allow analysis of local influence on water quality
  - Address climate change in the shallows

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| Spatially explicit CAST | Non-CB TMDL partners | | ✓ | Medium | Enables CAST output on a fine scale |
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# Transparency Topics

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# Transparency in NEIEN/CAST Progress data

## STATE

**Waste water**

- Municipal
- Industrial
- Spray Irrigation
- CSO
- RIB
- Large monitored septics
- Biosolids

**Nonpoint Source BMPs**

- Local governments
- Grantees
- Federal agencies and facilities
- Others-may be 100's of submitters

## Chesapeake Bay Program

**Waste water App**

**NEIEN**

**CAST**

**BMP and Loads Data Reports**

# Nutrient Applications

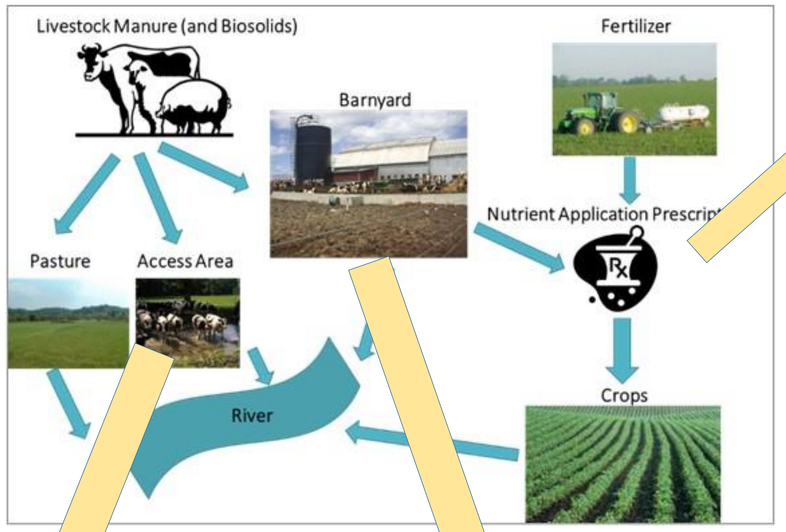
## Simulated BMPs vs Percent Reduction

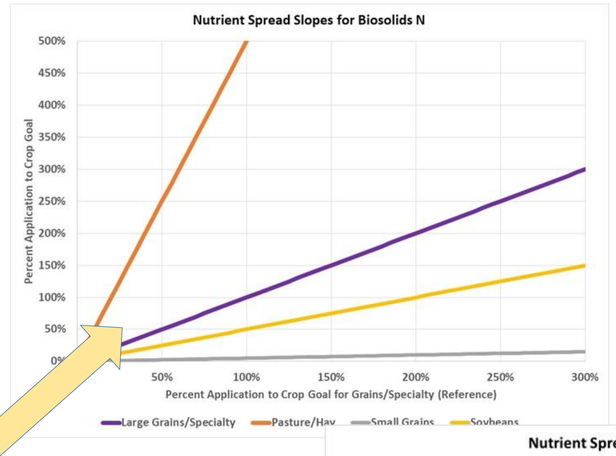
- **Which Description Works Best for Management?**
- **What's my reduction from Nutrient Management?**
  - Well, based on the rules developed by the partnership and the data supplied by national sources and the states, the balance of inputs and outputs for your land use is such that there is an overabundance of manure in your county, as opposed to the next county over where nutrient management has almost no effect. Now when you apply nutrient management, that will attract manure to the nutrient management land use, so it will have a higher load, but since it's pulling manure from other land uses, the total segment load will usually decrease, however in some circumstances when nutrient management is applied to pasture, it can push so much manure back on to other land uses, that the marginal effect …
- **What's my reduction from Cover Crops?**
  - Based on the Cover Crop Panel, who based their decision on multiple referenced data sources and models, your reduction for Early Drilled Barley in the Valley and Ridge Carbonate region is 38%

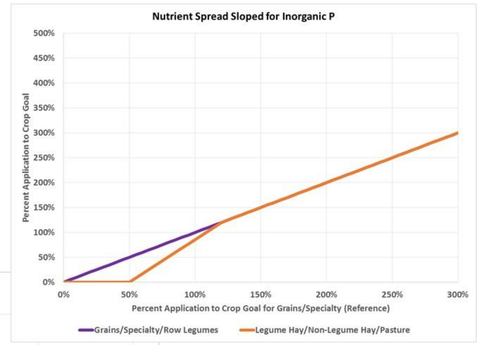
**Slide from 2012 – discussing the building of P6**

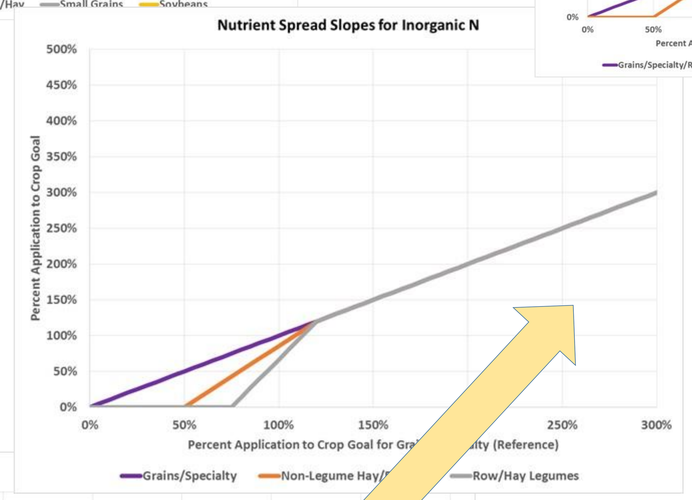
# Nutrient Applications

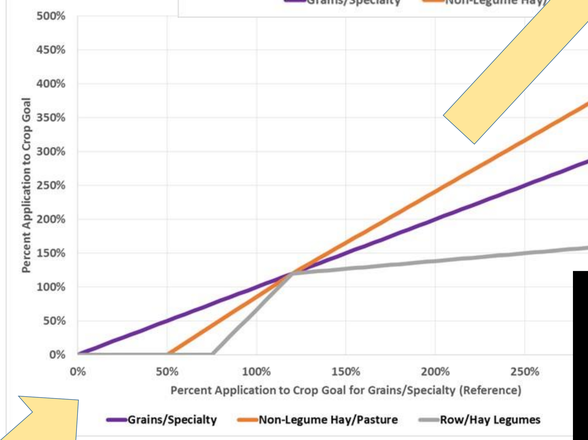
To be prioritized

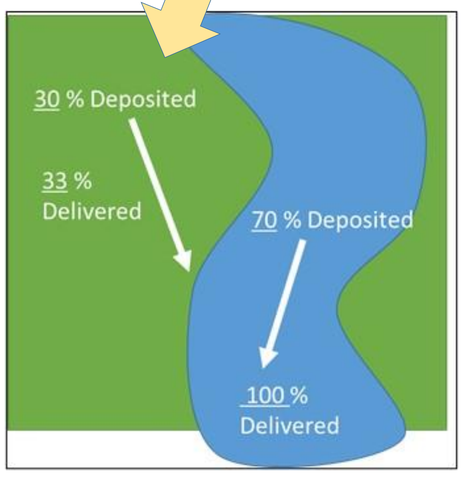


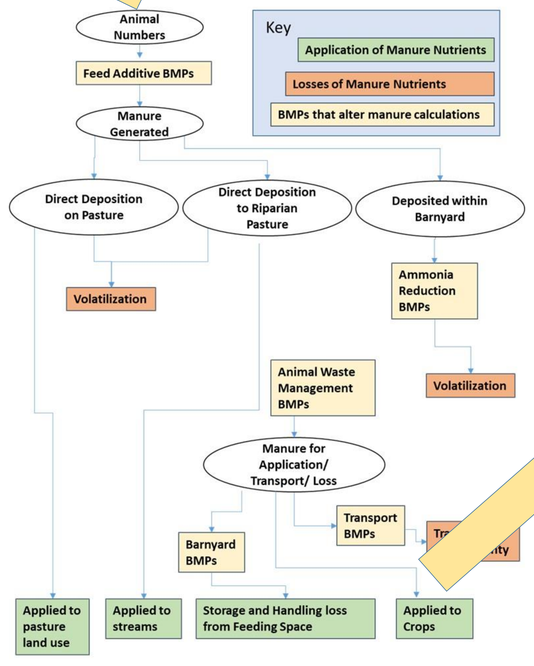



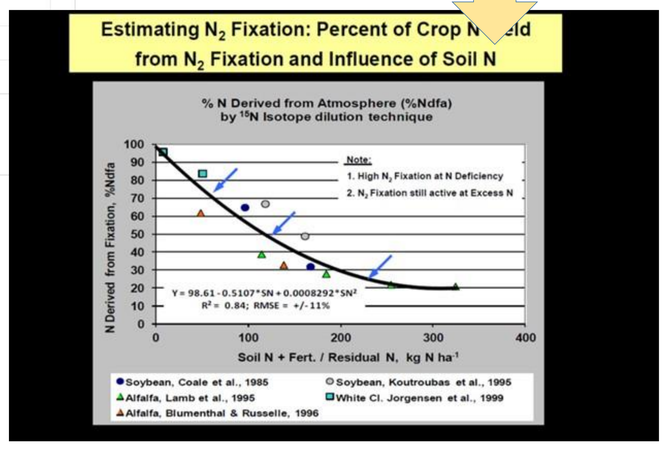



# Model Accuracy Topics

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# Physical Process Improvement

- Phosphorus simulation in urban areas
  - Only watershed modeling need identified in the STAR SRS science needs database
  - Fertilizer applications and runoff
  - Development on prior farmland
- Sediment Processes
  - Important for understanding nutrient lag times.
  - Affects health of non-tidal streams
  - Better data available
  - Accounting for erosive loads
    - As part of the upstream land use loads (phase 0-5)
    - As a separate source (phase 6)
    - As a separate source, separated into upstream sectors?
- Others as necessary to improve N, P, Sed, Temperature predictions

To be prioritized

# Improve Climate Change Modeling

- Only task specifically given by PSC
  - Thoroughly dealt with in the watershed model in 2019
  - Updated information for 2035 climate to be analyzed during 2024 and 2025

- Some improvements are still possible
  - Temperature
  - Stream erosion
  - Incorporate new literature
  - Changes in BMP effectiveness estimates may be out of reach

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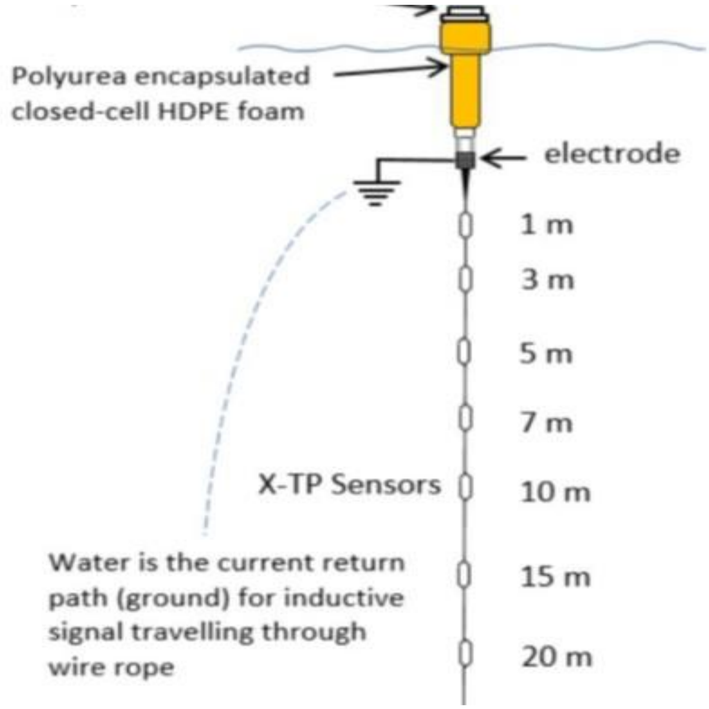
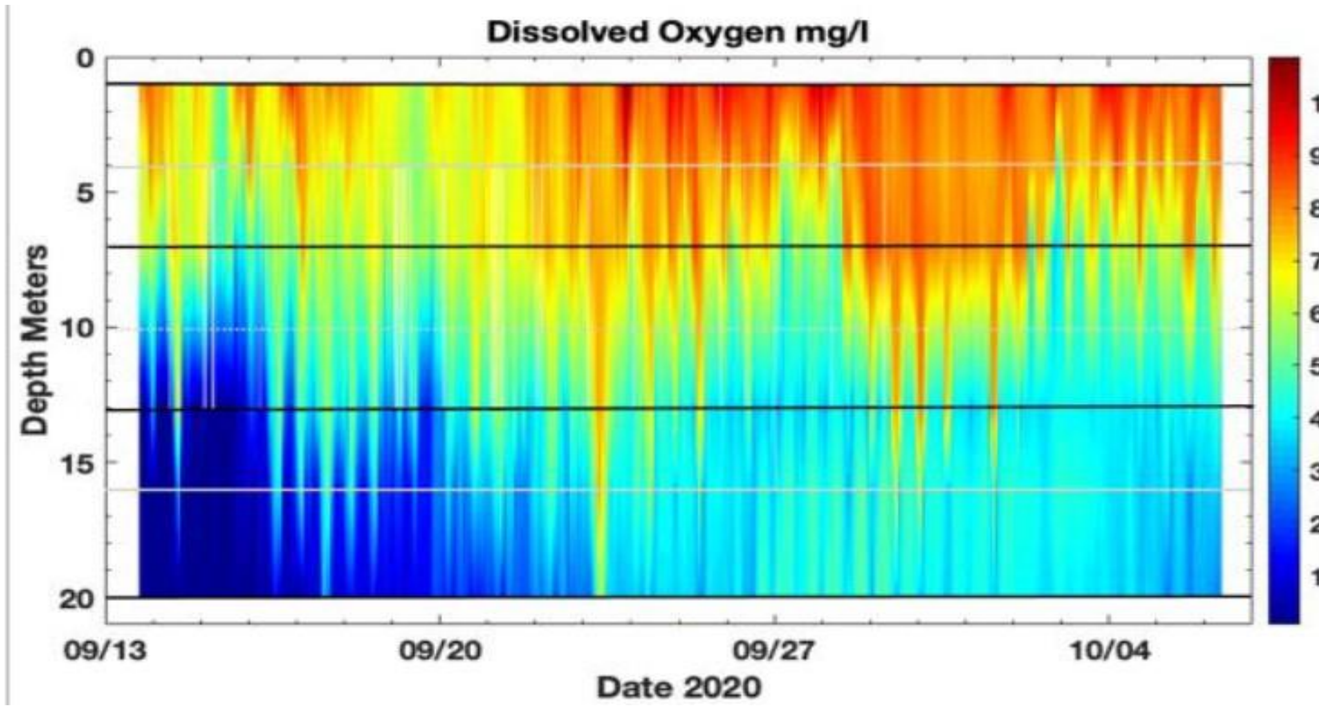
# WQ Standards Assessment




- Currently able to evaluate 8 of 22 WQ standards
  - Oxygen, Clarity/SAV, Chlorophyll
- Able to make TMDL decisions overall, but no segment can currently be taken off the TMDL 303d list for all relevant criteria
- Need monitoring and data analysis

To be prioritized

# Co-Benefits and Ecosystem Services


https://www.chesapeakeprogress.com/

- Co-Benefits are other CBP outcomes that could be affected by BMP implementation
- Ecosystem Services are anything that have a value to people
- Adding Co-Benefits would account for non-TMDL incentives to implementation

https://ecology.fnal.gov/wp-content/uploads/2017/08/Ecosystem-Services.jpg

To be prioritized

# Uncertainty Quantification

- Answers to the questions
  - How certain are we that we are getting the reductions we estimate?
  - What parts of the model have the largest impact on the nutrient load estimation?
- AgWG requested uncertainty quantification in Phase 6 review

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Scale Topics

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# Finer-Scale Modeling

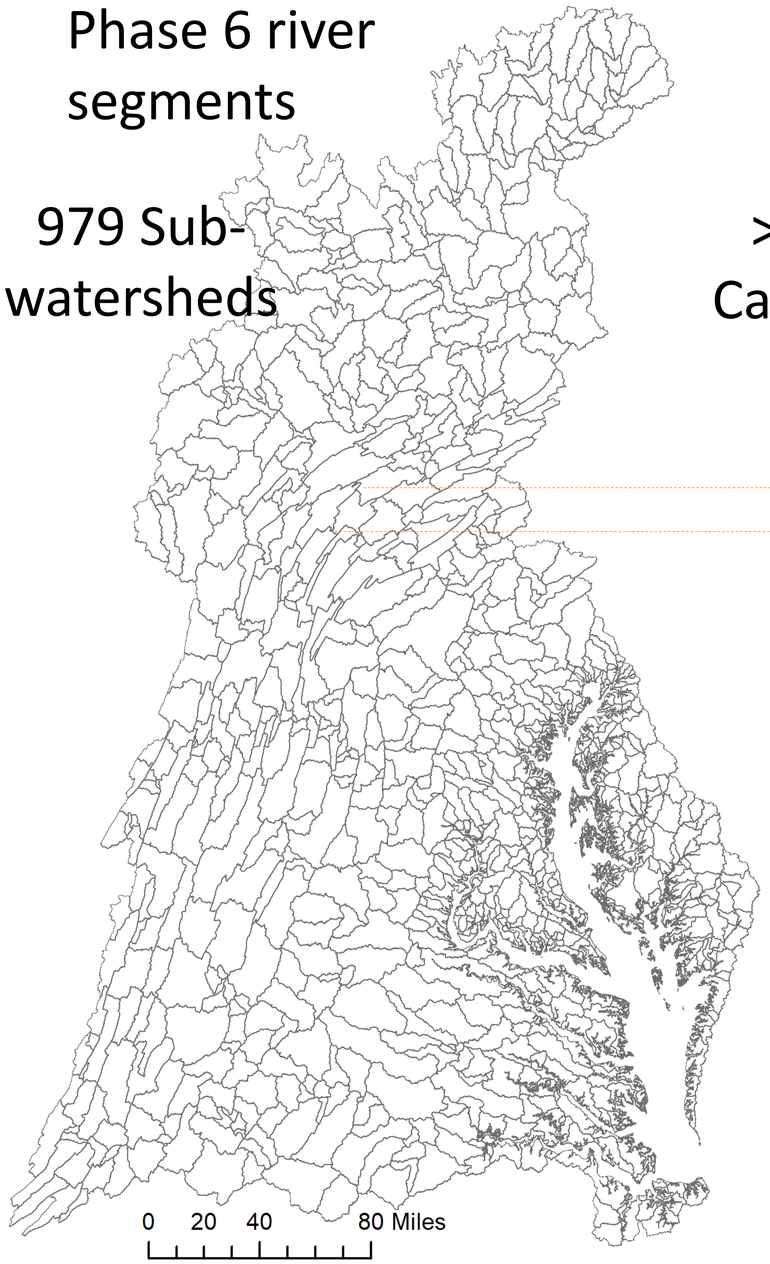
Transport information on a 10-meter scale

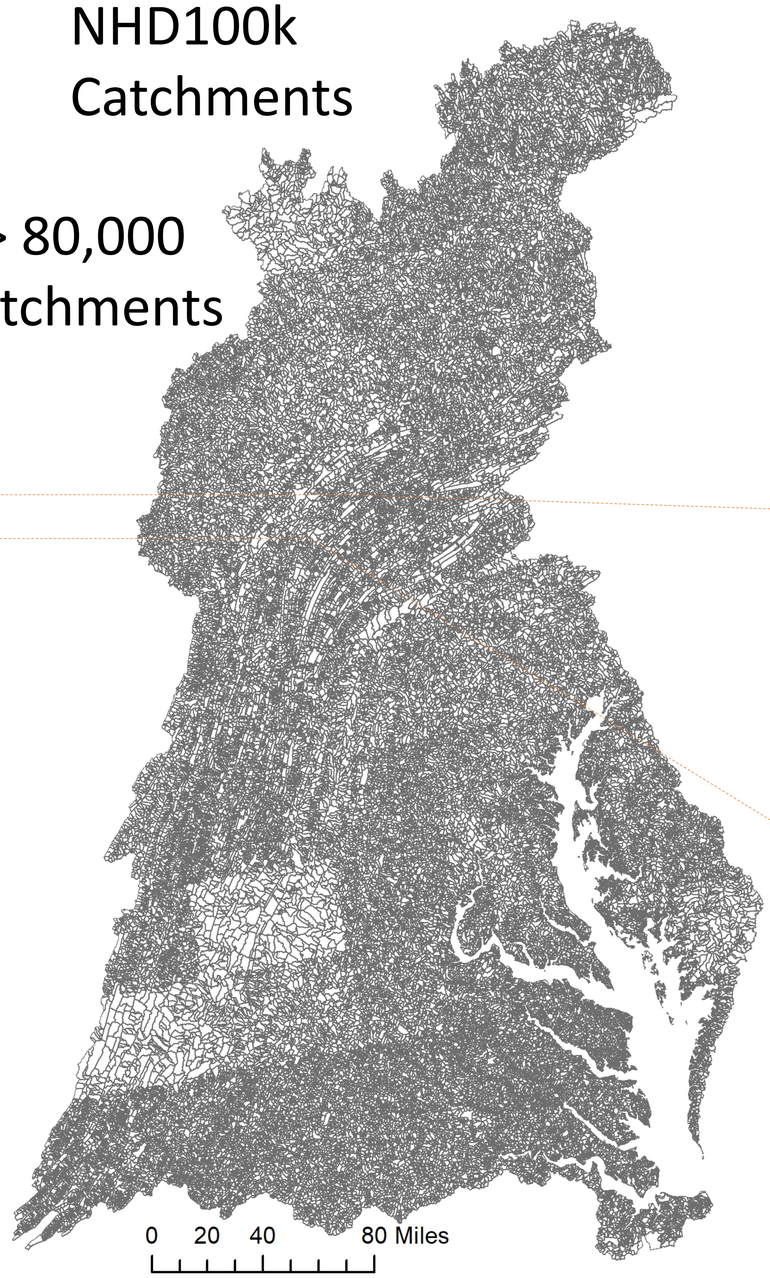
Phase 6 river segments

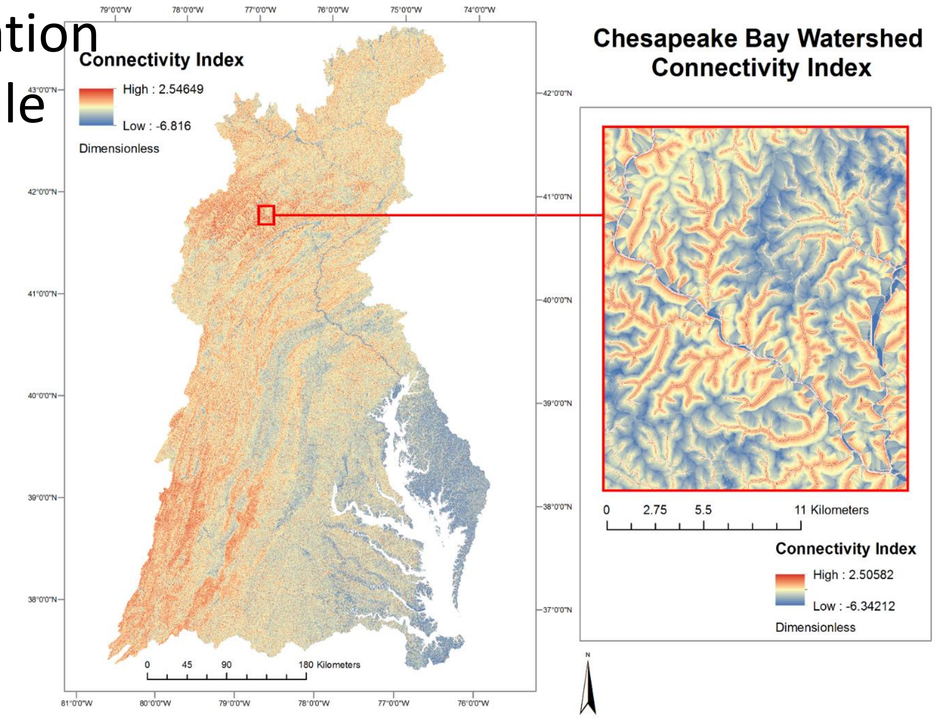
979 Sub-watersheds

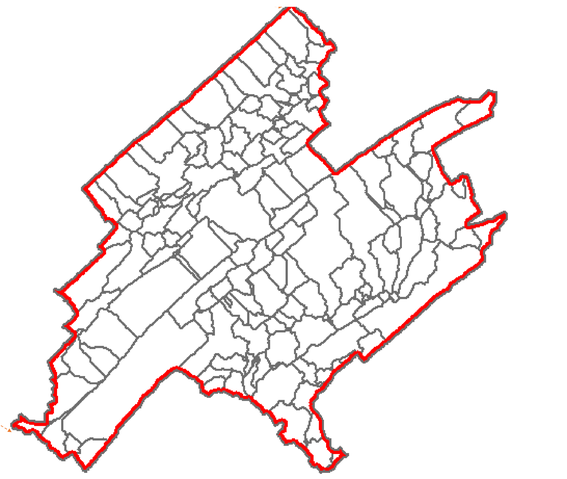
NHD100k Catchments

> 80,000 Catchments




**Greater accuracy at larger-scales;**

**Enables fine scale targeting of practices;**

**Needed for some co-benefits**

To be prioritized

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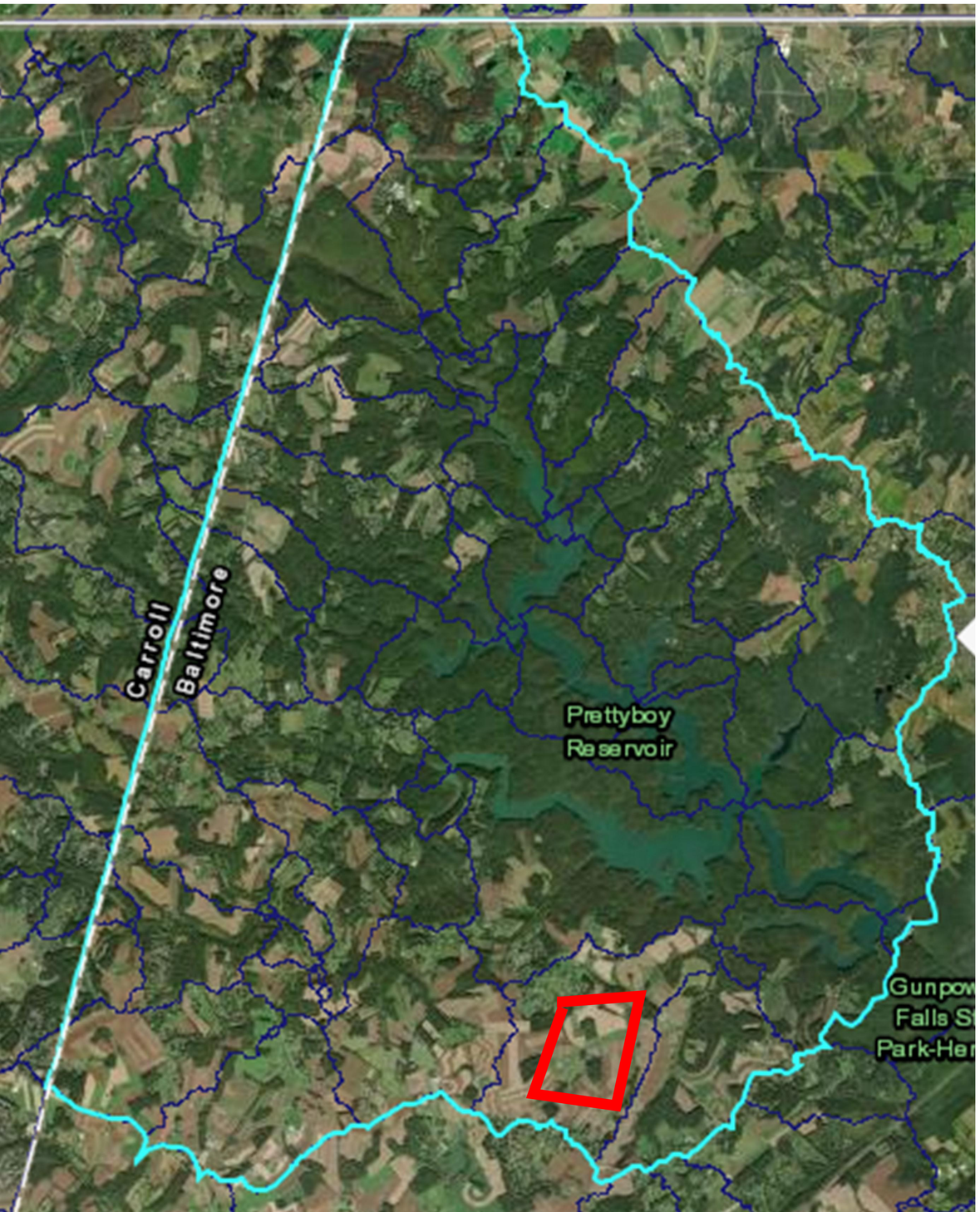
# Spatially Explicit CAST




- Allow calculation of load from within user-defined area
- based on broader-scale averages applied to the land uses in the area

To be prioritized

# Key Questions for scale

- What scales do you want available for CAST output of loads and co-benefits
  - Do you support the opportunity for downscaling?
- What is the minimum scale you would want for report BMPs and receive different credit based on location?
- What scale will you use for optimization?
- Would fine-scale applications be used for planning or for TMDL credit generation?
- What scale of output do we need for the estuarine model (CBPO recommendation NHD)

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