Phase 6 Modeling Updates – Beta 4

Modeling Workgroup Conference Call

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Beta 4 Work Agenda

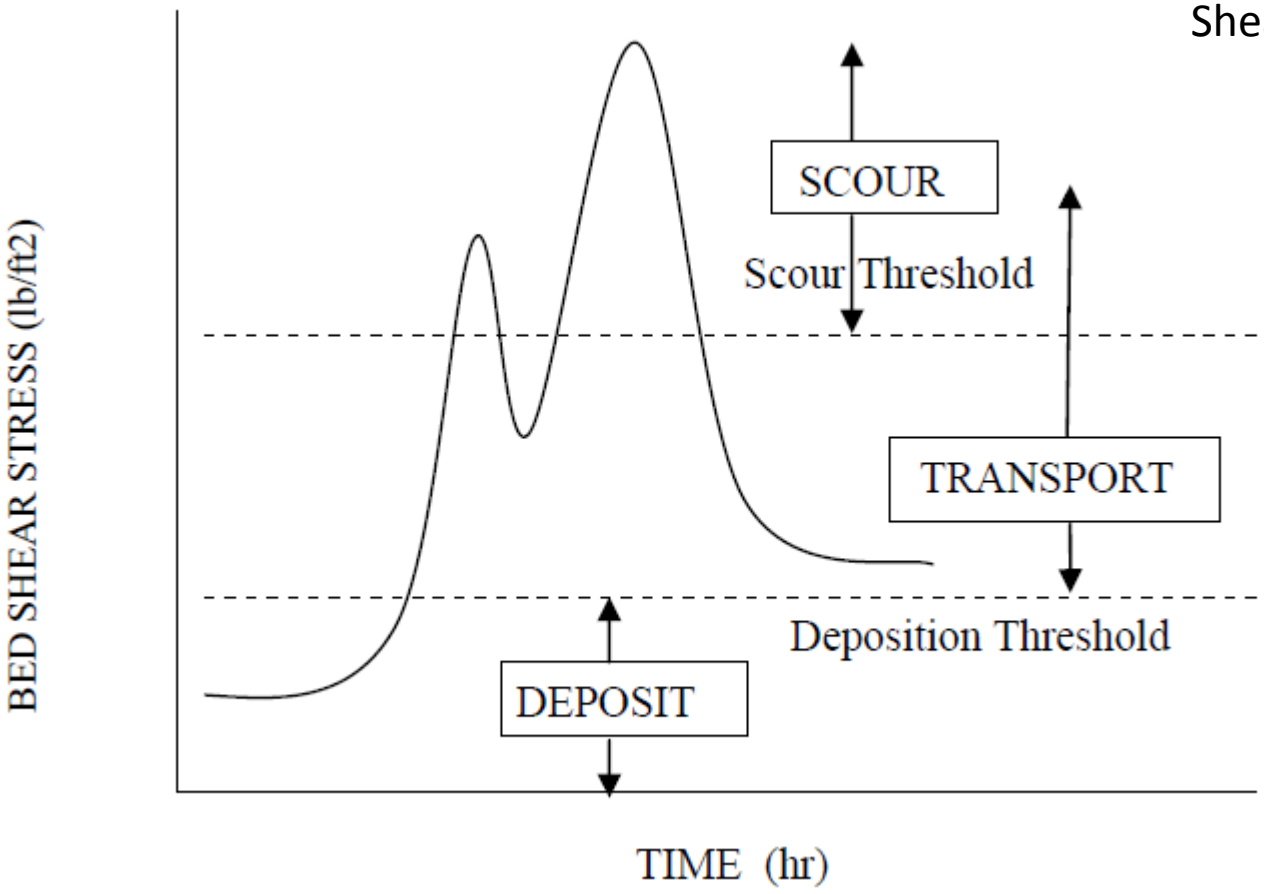
- Improve nitrogen calibration (denitrification)
- Investigate simulation of Chlorophyll in Beta 3
- Incorporation of Conowingo Infill in Phase 6
- Climate change: Year 2025 using long term trends

STAC Guidance on Conowingo Infill

Paraphrasing…

- Conowingo models should be evaluated based on the ability to “hindcast” data from observations and statistical analyses.
- Address the full range of flows
- Address bioavailability of sediment nutrients

HSPF SEDTRN simulation



Shear Stress

Erodibility

$(Tau/Tau_{CS}-1) * M$

Settling Velocity

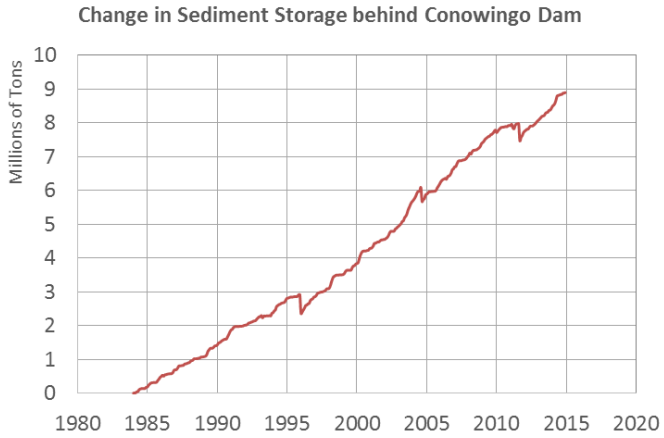
$(1-Tau/Tau_{CD}) * W/d$

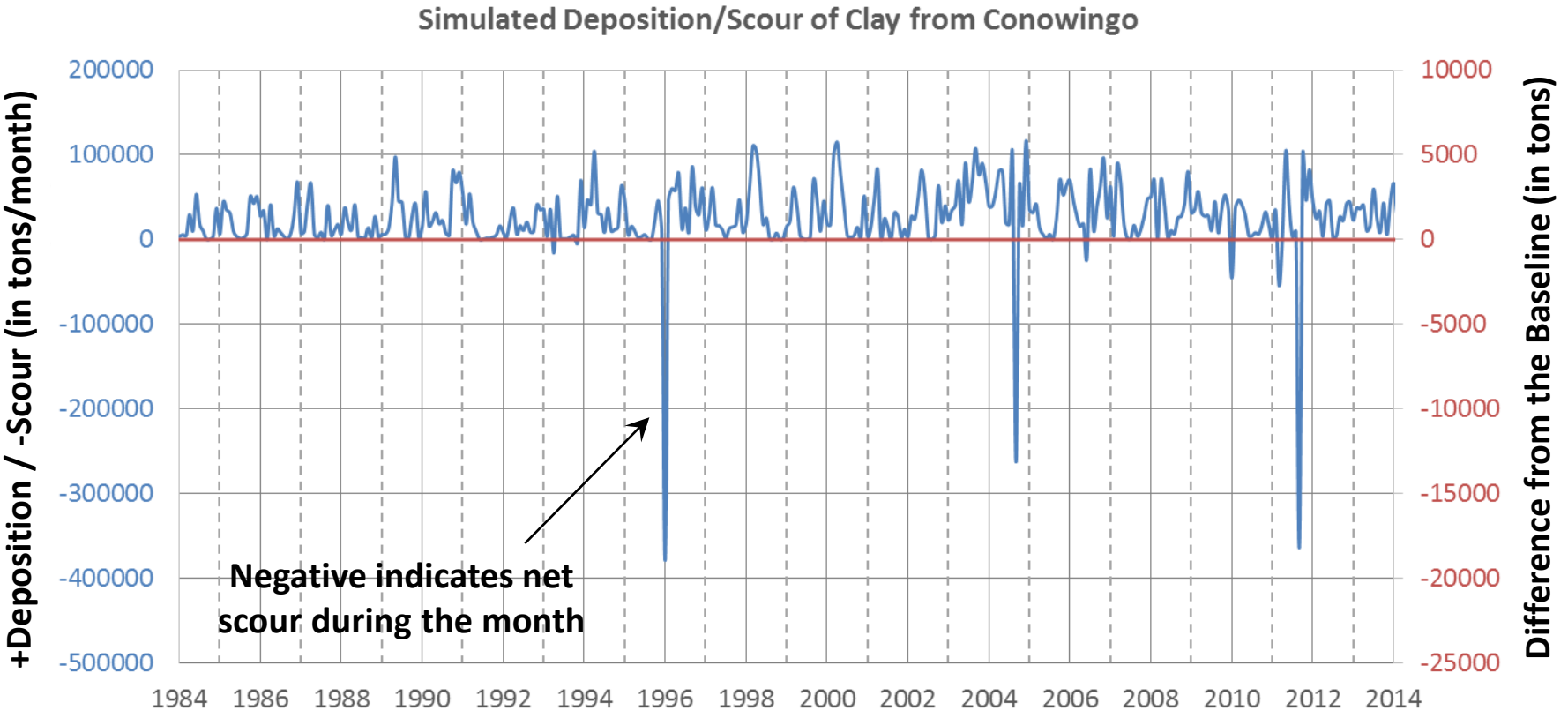
Actual equation expressed as exponential for concentration change

Depth

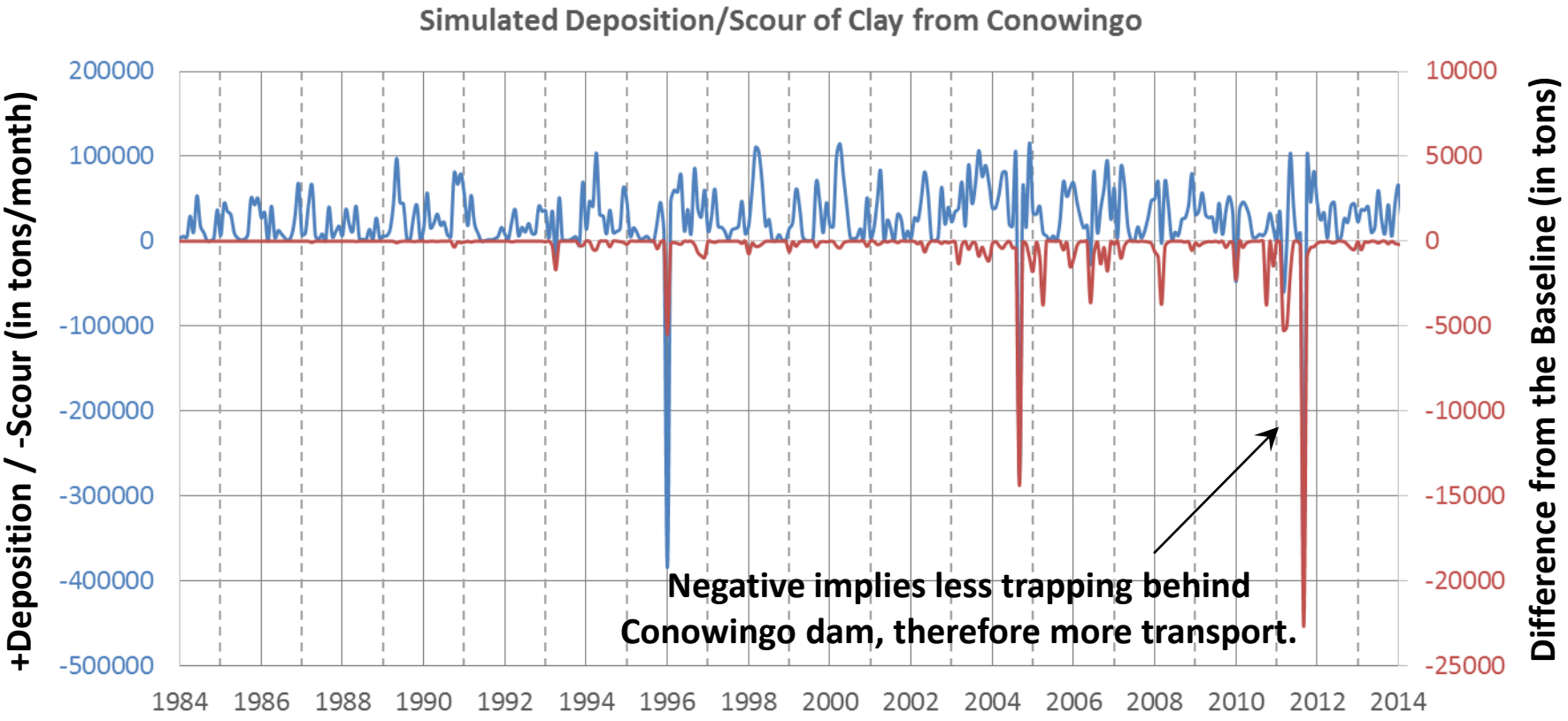
***Tau_{CD}*, *Tau_{CS}*, *Erodibility*, and *Settling Velocity* are all changeable through time.**

Baseline Calibration





Variable Critical Shear Stress for Clay Deposition Prototype



Next steps for Conowingo Infill

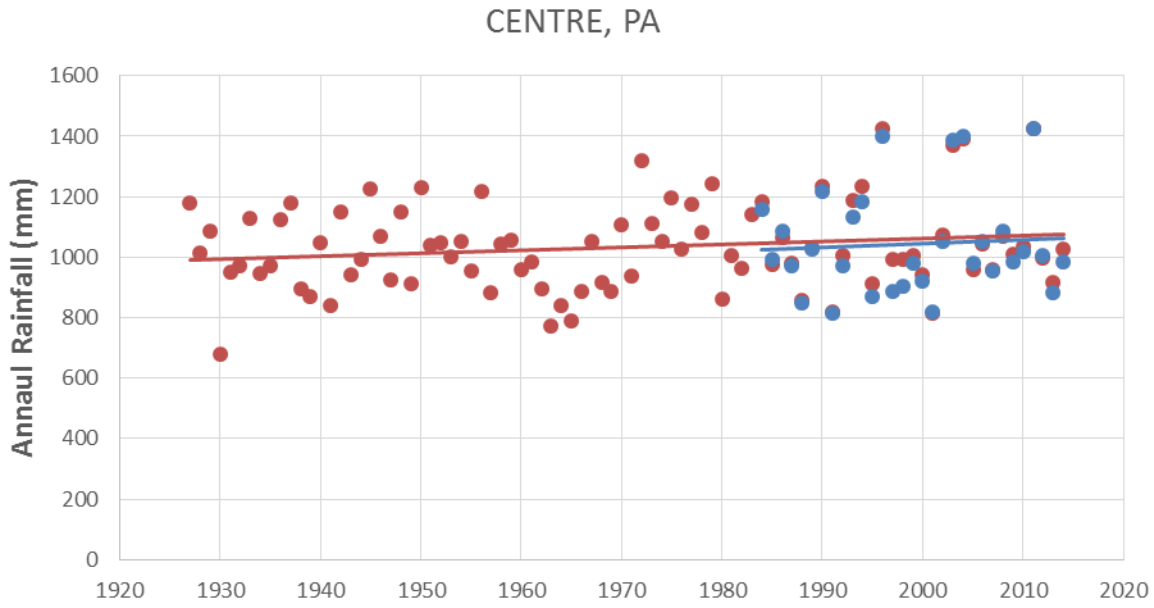
- Zhang et al. can be used to obtain WRTDS based analysis of percent change in sediment transport with Conowingo infill.

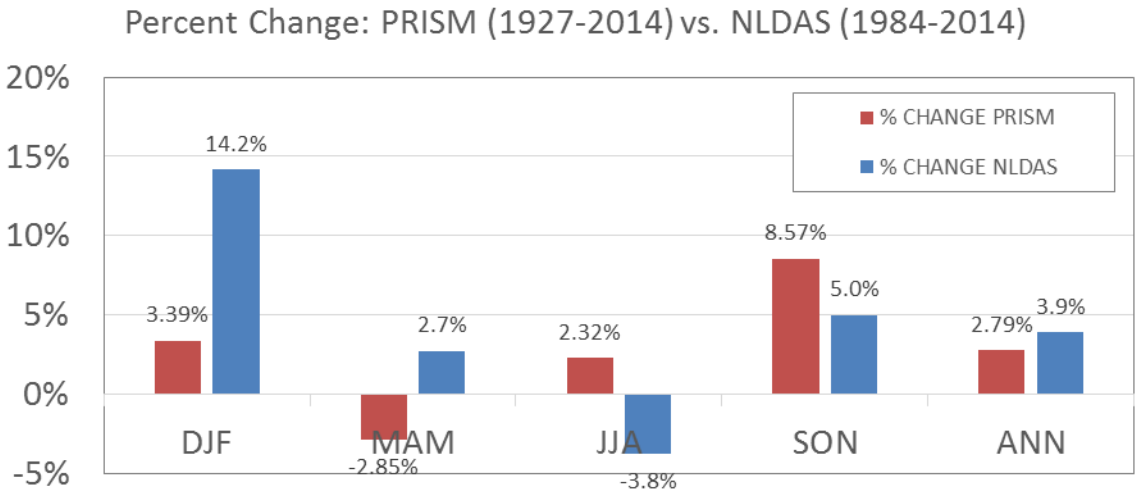
- Conowingo Pool Mass Balance Model (CPMBM/SFM) can potentially provide information on changes in transport mechanism (settling vs. scour) for sand/silt/clay.

Climate change: 2025 rainfall based on long term trends

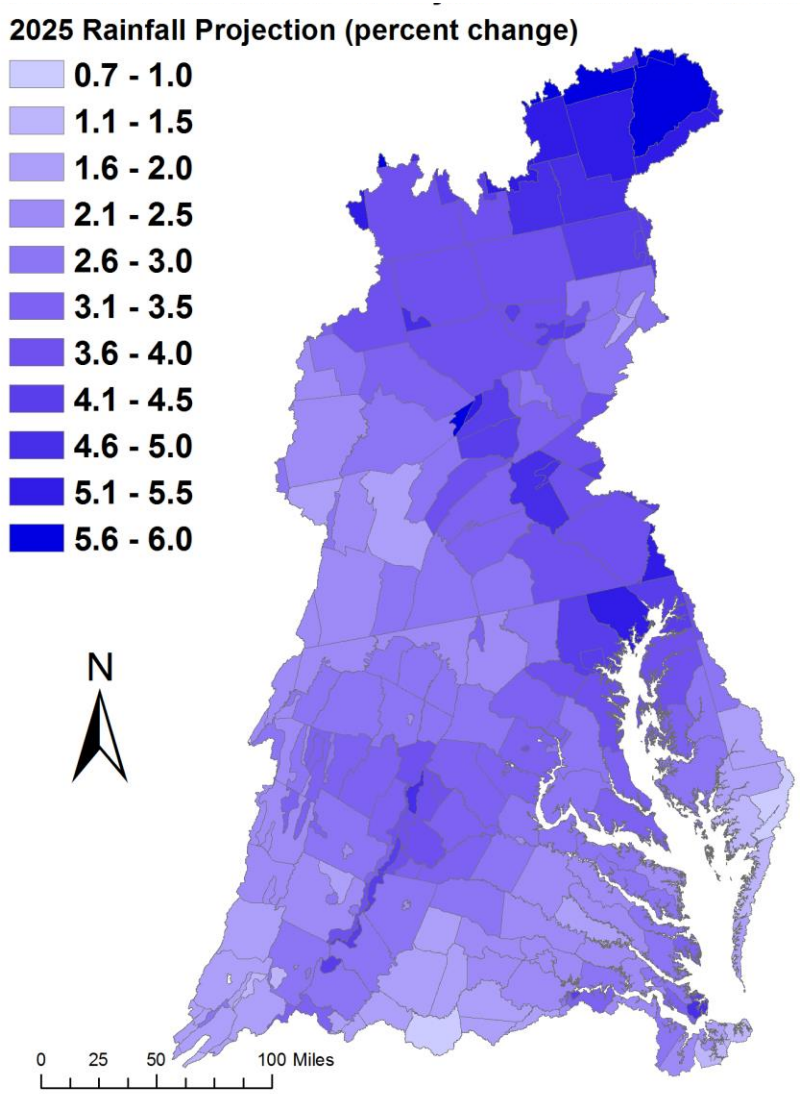
Kyle Hinson

- *STAC has recommended use of long-term trends for obtaining 2025 rainfall projections.*
- Monthly PRISM data is a reliable source of rainfall data.
- Aaron Mills (USGS) and Karen Rice (USGS) recommended using trends on annual PRISM data.


CENTRE, PA
Annaul Rainfall (mm)
1600
1400
1200
1000
800
600
400
200
0
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020


Percent Change: PRISM (1927-2014) vs. NLDAS (1984-2014)
20%
15%
10%
5%
0%
-5%
% CHANGE PRISM
% CHANGE NLDAS
3.39%
14.2%
-2.85%
2.7%
2.32%
-3.8%
8.57%
5.0%
2.79%
3.9%
DJF
MAM
JJA
SON
ANN

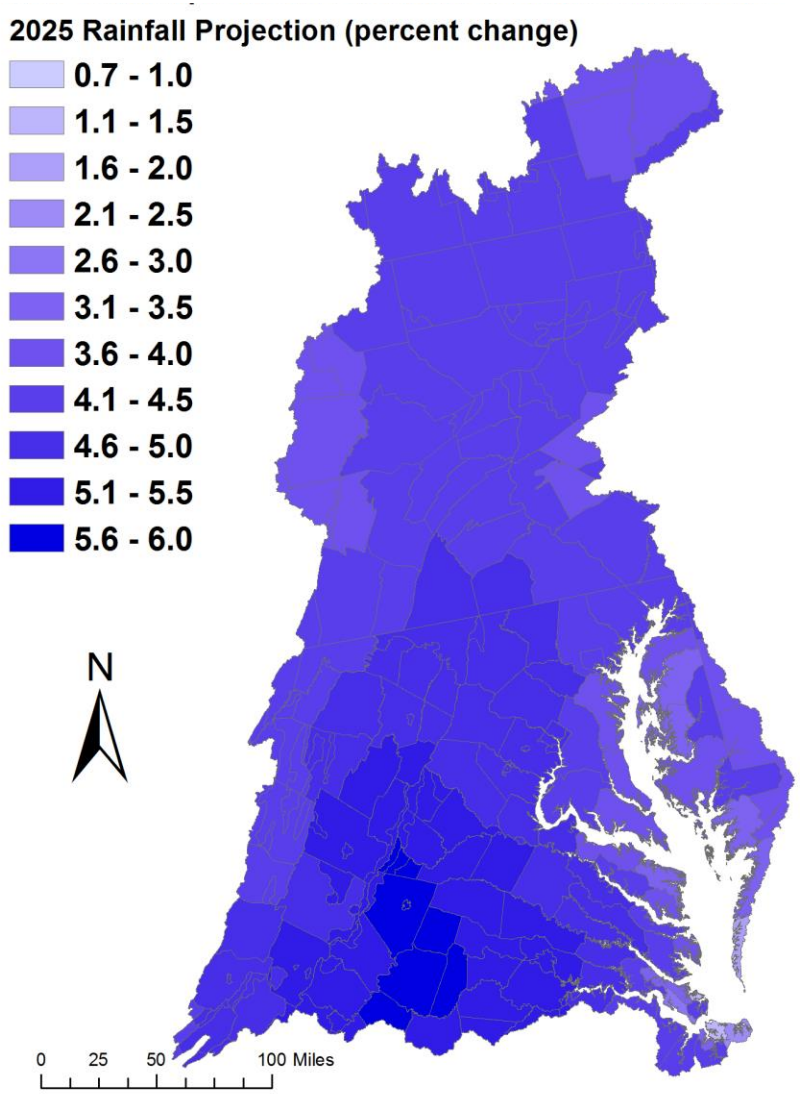
Change in Rainfall using Annual Trend in PRISM data (88 Years)



Change in Rainfall Volume 2021-2030 vs. 1991-2000

Major Basins	PRISM Trend
Youghiogheny River	2.1%
Patuxent River Basin	3.3%
Western Shore	4.1%
Rappahannock River Basin	3.2%
York River Basin	2.6%
Eastern Shore	2.5%
James River Basin	2.2%
Potomac River Basin	2.8%
Susquehanna River Basin	3.7%
Chesapeake Bay Watershed	**3.1%**

Change in Rainfall using Multiple Model Ensemble of Downscaled GCMs (RCP 4.5)



Change in Rainfall Volume 2021-2030 vs. 1991-2000

Major Basins	CMIP5
Youghiogheny River	4.1%
Patuxent River Basin	4.2%
Western Shore	4.2%
Rappahannock River Basin	4.9%
York River Basin	4.7%
Eastern Shore	3.7%
James River Basin	5.0%
Potomac River Basin	4.7%
Susquehanna River Basin	4.1%
Chesapeake Bay Watershed	**4.4%**

Next steps 2025 climate change

- Annual change from long term PRISM trend will be applied for each month.
- Two rainfall scenarios will be developed:
  - equal split of volume across intensity deciles
  - relative trends in rainfall intensity using Karl & Knight

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- More details at the October quarterly meeting