

# **Fine-scale Chesapeake Regional Hydrologic Model (CRHM) – Updates on the technical components**

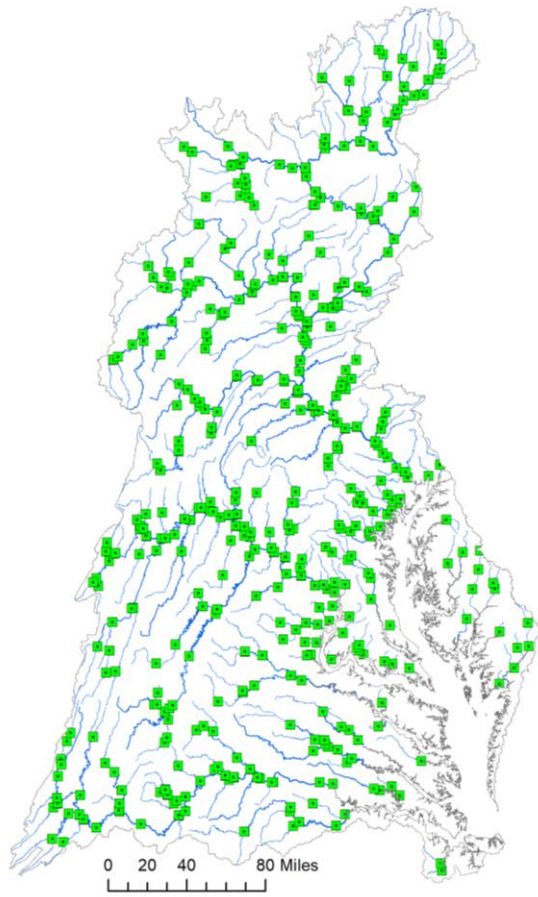
Modeling Workgroup Quarterly Meeting – October 2020

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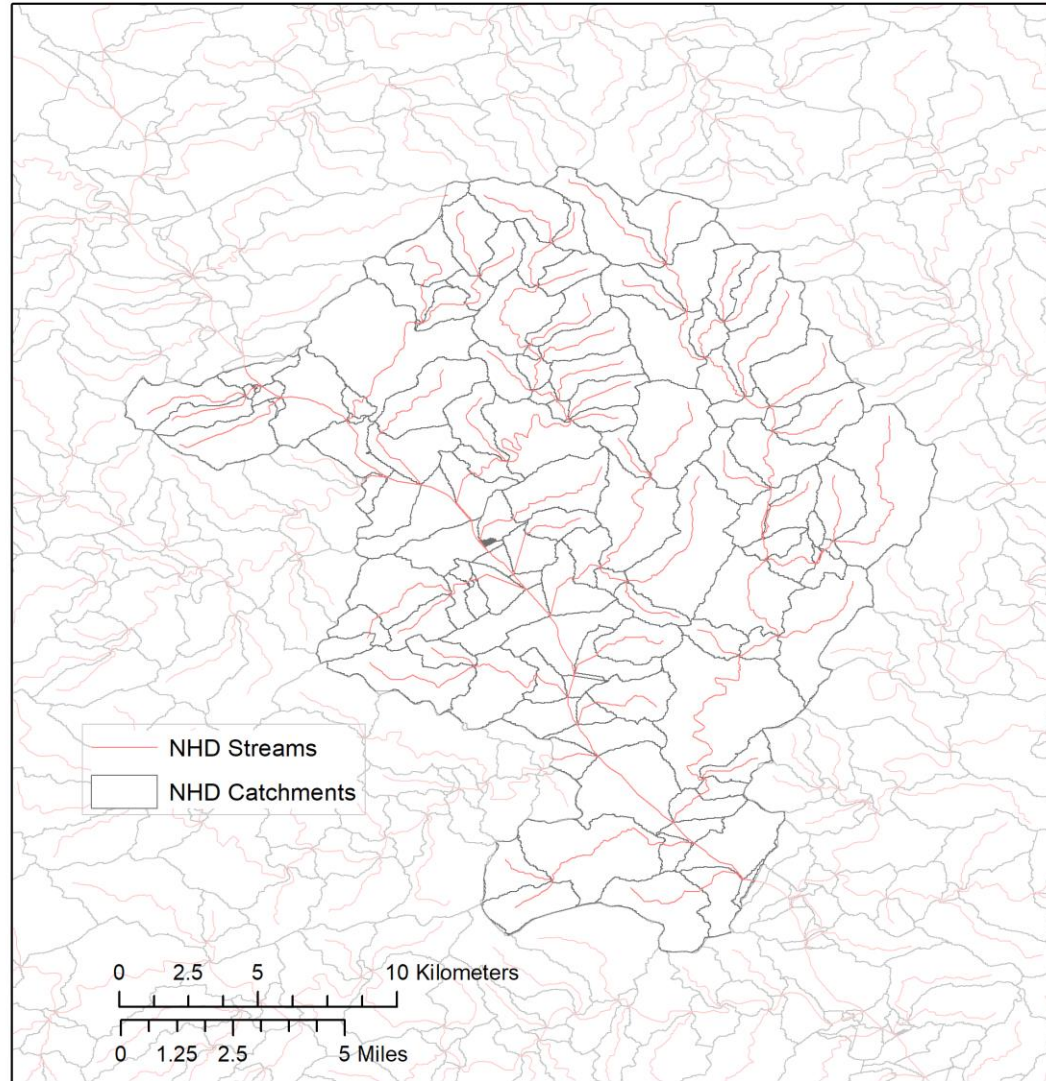
# Component #1

- Develop an operational NHDplus (1:100K) scale hydrology model using CBP HSPF simulation framework
  - Objectives: (a) an initial watershed scale prototype; (b) to provide a testing environment for other ongoing model-data developments and refinements.
  - Phase 6 Rivers → NHDplus streams: Nesting of P6 rivers and NHDplus streams will provide a foundation for the model development and a bridge between the scales.
  - HSPF RCHRES (river and reservoir) simulation for the NHDplus streams
    - Development of Hydraulic Function Tables, or FTables – first draft prototype using a simple method, or the method developed by Moyer et al. (2007).
    - Additional refinements over time using: (a) finer scale data, Floodplain and Channel Evaluation Tool (FACET) – Labeeb Ahmad, Peter Claggett et al., and (b) inputs from water supply partners (Rob Burgholzer, DEQ; Cherie Schultz & Sarah Ahmed, ICPRB, and John Balay & Liu Can, SRBC).
  - Future refinements would include improvements on data/inputs, spatial variability in hydrology through model parameters and/or other models, and calibration.



There are about 600 HSPF simulated rivers/reservoirs in Phase 6.

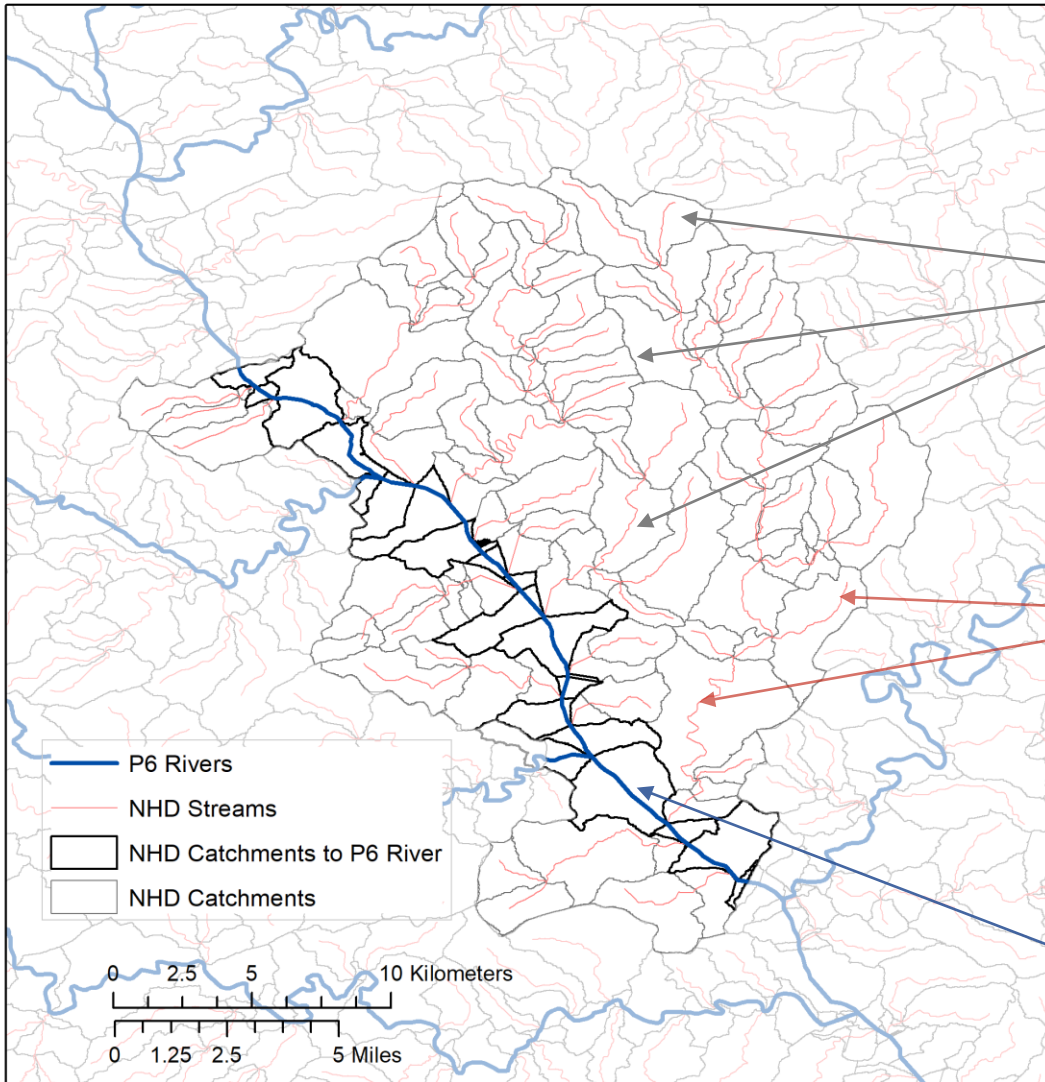
Figure in the middle shows one such Phase 6 river segment.



NHDplus segmentation will have about 80,000 streams.

However, modeling it as is would lead to fragmentation of P6 rivers into multiple segments.





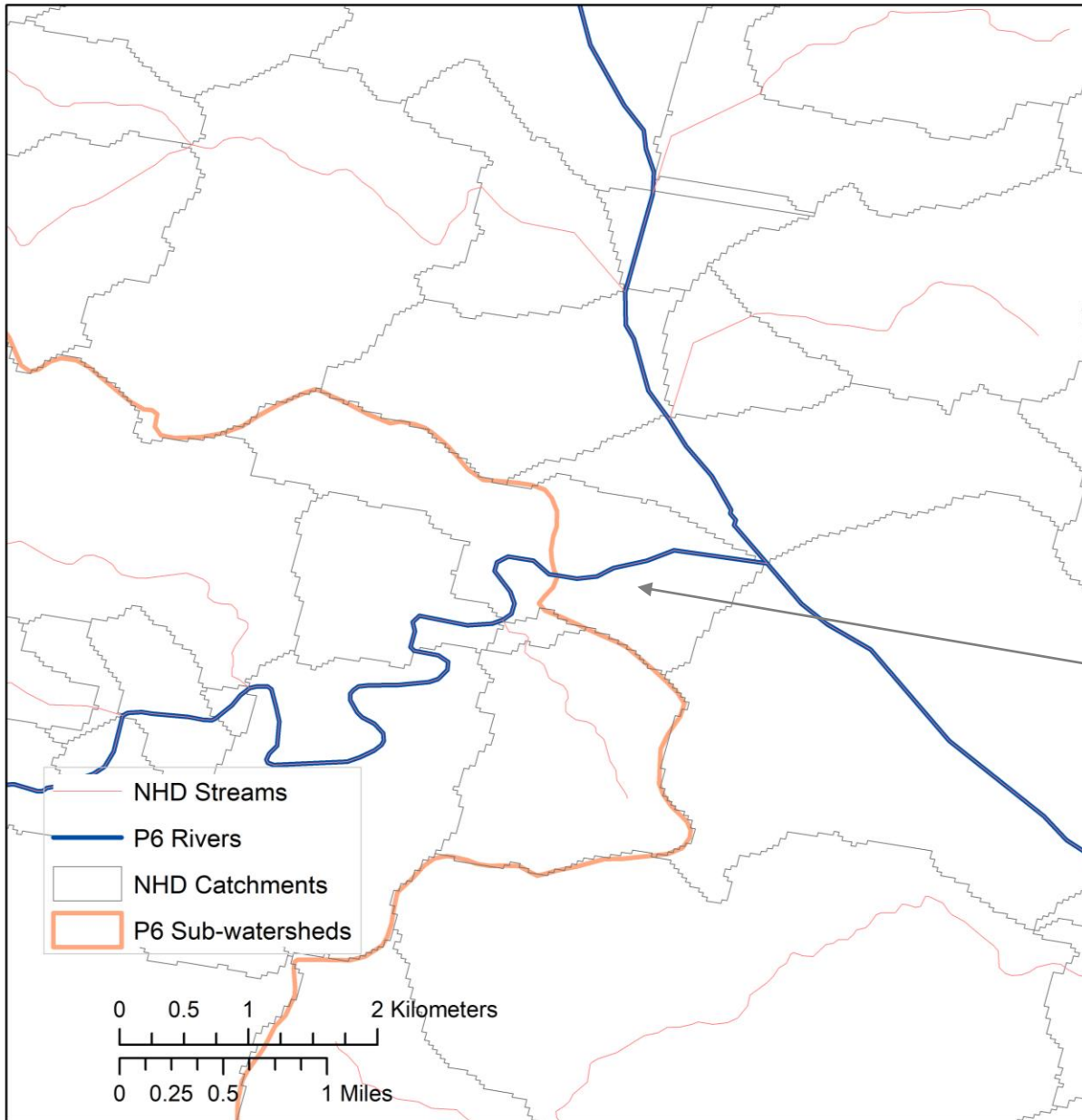
### **In a nested segmentation:**

Each NHDplus catchment is modeled as per its land use and other watershed characteristics.

NHDplus streams are simulated using CBP HSPF RCHRES framework and routed as per the topology.

Flow from (a) NHD streams and (b) adjacent NHD catchments are routed to the P6 River.

P6 Rivers are simulated using CBP HSPF RCHRES framework.

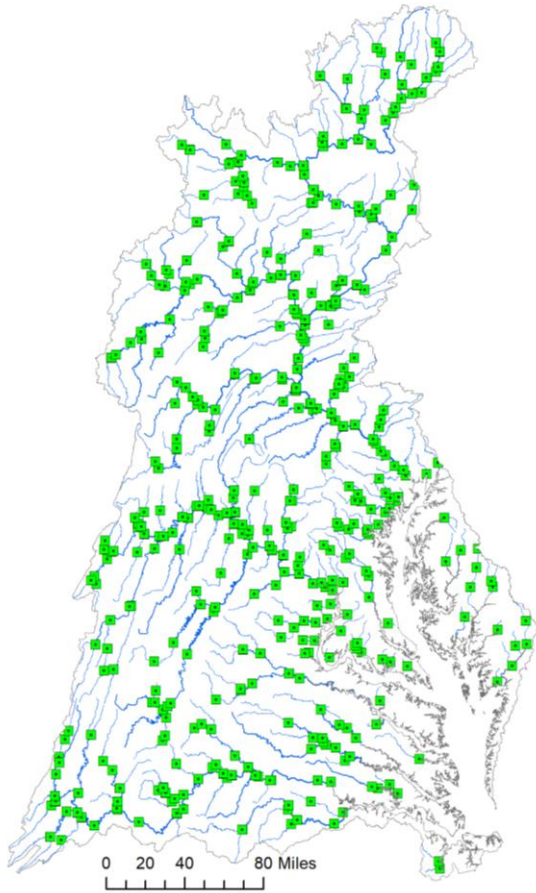


However, there are some complications due to misalignment of the P6 river segment (sub-watershed) boundaries and NHD catchments.

For example, figure shows a NHD catchment that is split in the middle by the P6 sub-watershed boundary.

## Component #2

- NHDplus segmentations for the CRHM development
  - Objective: enhanced attributes for supporting various modeling and data development processes.
  - USGS (Scott Ator and John Brakebill) has looked into it for SPARROW modeling and have made important refinements to the native NHDplus data.
  - CBPO Land use data team is developing ancillary tools for supporting various next gen modeling needs (Sarah McDonald, Labeeb Ahmad, Peter Claggett).
  - A critical next step for the CRHM development involve seeking assistance of the GIS Team (John Wolf).



Phase 6 river segment nomenclature provide meaningful information, e.g.,

**SL9\_2720\_0001**

Downstream river ID

Unique River ID

Mean streamflow size

Major-Minor Basin

Major Basin

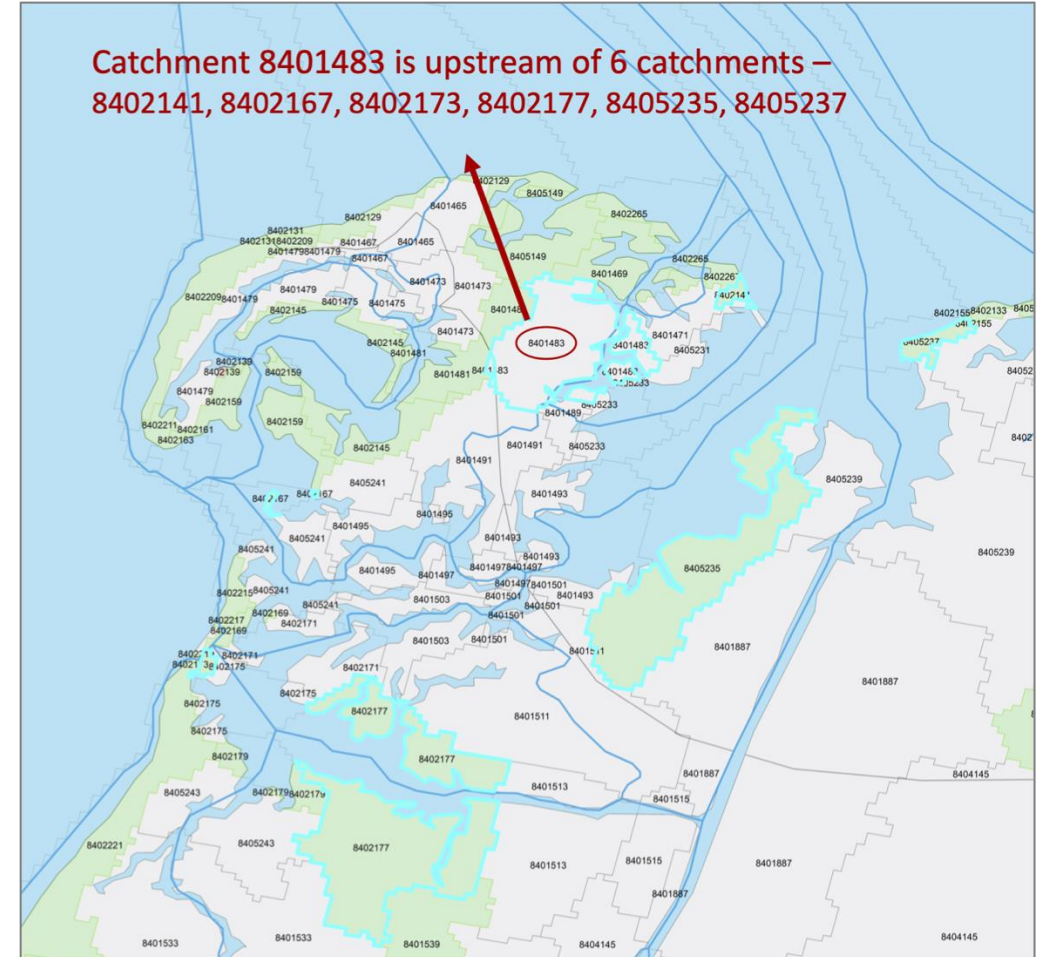
NHDplus catchment and/or stream IDs are numerical values (e.g., 8386229, 10064677) and does not provide meaningful insights as P6 segmentations.



# Quality assurance in the tidal watershed region



needed to remove the NHD catchments/streams that are in the main stem of the some of the rivers (e.g., NHD catchments fill all of the Potomac)



Verify the topology of the NHDplus streams as NHDplus catchments interest and overlap the estuarine domain.

## Component #3

- Common dataset for various data development and modeling efforts
  - Objective: to bring consistency among these efforts, and remove redundancies and duplications.
  - For example, Phase 6 land segmentations and 10-m Phase 6 sediment model (Claggett et al.) were developed using PRISM 30-year rainfall normals as compared to Phase 6 simulation period that was based on the NLDAS2 rainfall.
  - Evaluate some of the commonly used rainfall datasets for the HSPF hydrology simulation.

# Summary

- CBP Watershed modeling team will start working on developing an operational HSPF based simulation framework for CRHM.
  - Nesting of P6 rivers and NHDplus streams will provide a foundation and a bridge between these scales.
- GIS and Watershed modeling team will collaborate on developing meaningful attributes for the NHDplus streams and catchments that will aid in model development as well as provide multiple advantages.
- Watershed Modeling team will evaluate different rainfall data products for its applications in CRHM activities.