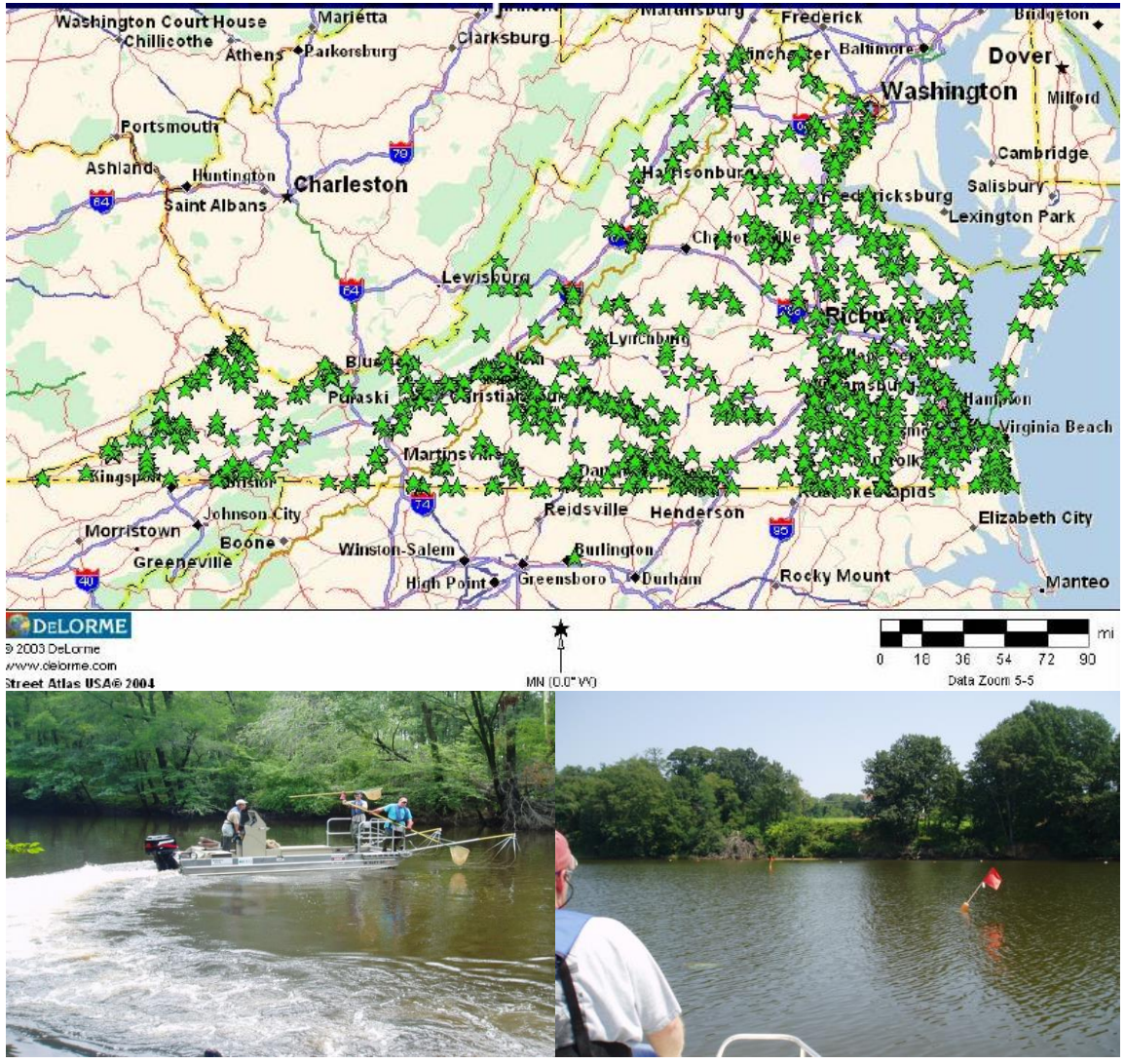
PCB TMDL Development History in Virginia

Mark Richards
TMDL Team Lead
Virginia Department of Environmental Quality
March 9, 2022

Fish Tissue Consumption Advisories

DEQ's Fish Tissue Monitoring Program



Leading Causes of Impairment in Virginia Waters			
	Rivers (mi)	**Lakes (acres)**	**Estuaries (sq mi)**
Total Impaired	15,871	94,789	2,137
Bacteria	11,960	2,276	139
Toxics in Fish Tissue	3,662	88,082	2,056
Dissolved Oxygen	705	12,379	1,656

Source: 2020 Integrated Report

Majority of toxic impairments due to PCBs and Mercury in fish; occasional pesticide, PAHs or heavy metal contamination

VA Water Quality Criterion-Total PCBs

- Water Quality - Acute/Chronic criterion
- Tissue and PWS - WQC represents concentration in the water column where the bioaccumulation of tPCBs in fish and drinking water is minimized for safe human consumption (**derived from fish tissue**)

Total PCB WQC

Consumption Advisories Fish Tissue (ppb)		Water Quality Criterion (ppb)
VDH (100)	DEQ (18)	0.00064

FDA Threshold for prohibition of interstate commerce in fish tissue = 2.0 ppm (or 2,000 ppb)

PCB Monitoring Approach for TMDL Development

- Fish tissue and sediment PCB data
  - Spatially and temporally available
  - Fill in data gaps where needed
    - sediment
- Ambient water data
  - Historically not collected
    - Detection an issue until mid 2000's

- Monitoring Objectives
  - Source identification
  - Fate and transport model calibration/validation
  - Assist in the development of site-specific PCB endpoints
- Use EPA Method 1668

Sample Collection (Grabs)

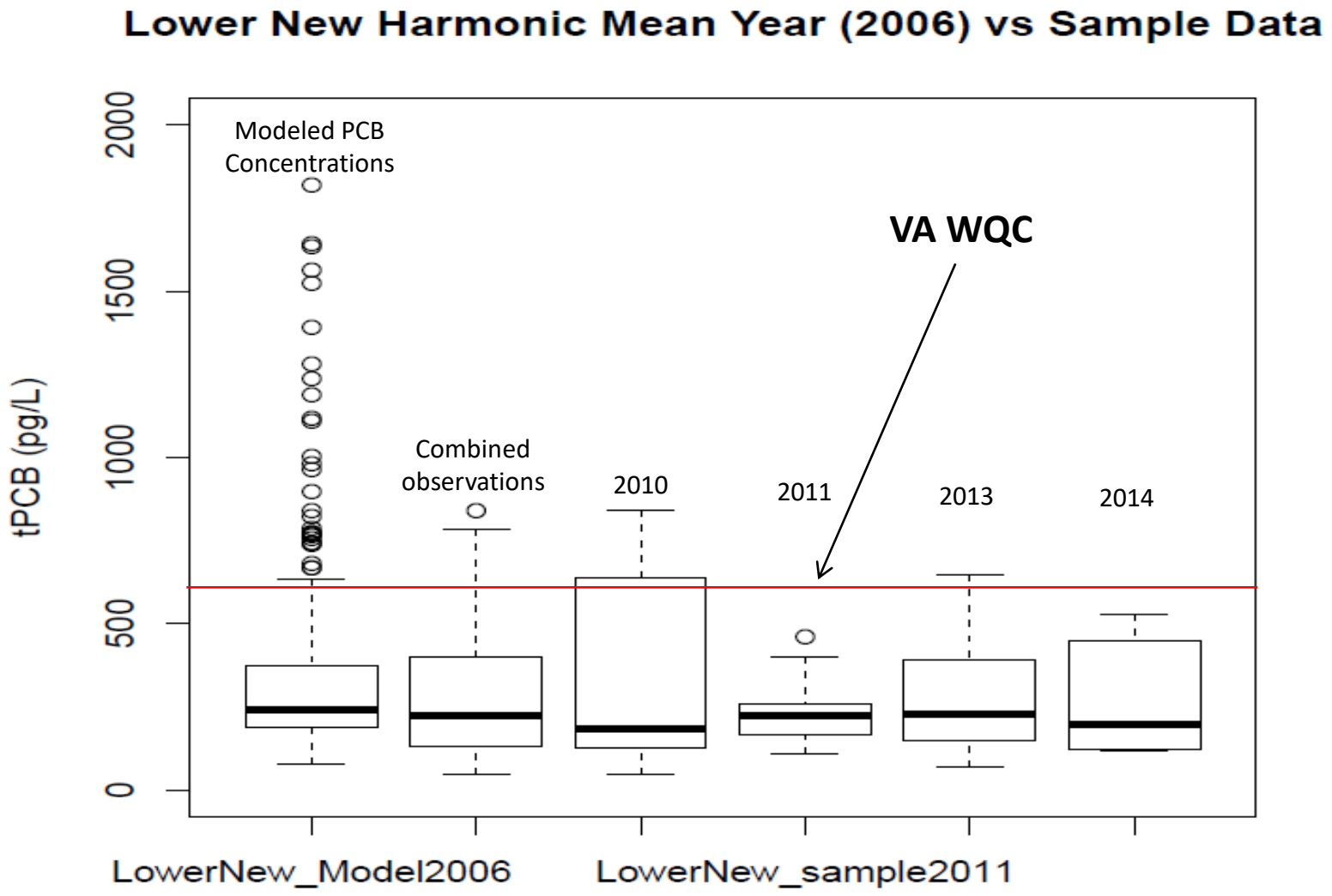
During base flow

During elevated or high flow

DEQ

Site Specific Endpoint (New River PCB TMDL)

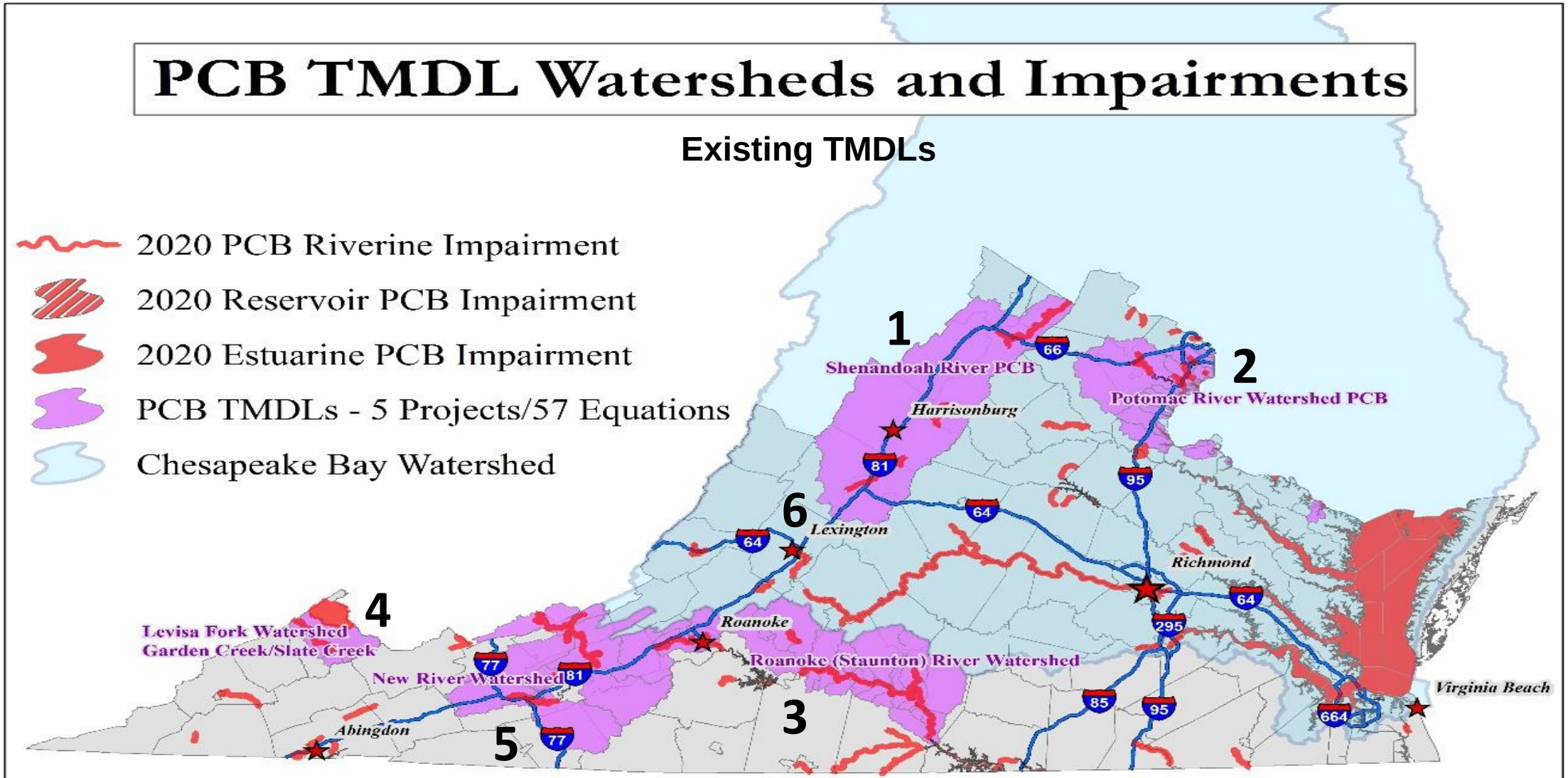
Bioaccumulation Factor or BAF



DEQ

PCB TMDL Watersheds and Impairments

Existing TMDLs



Numbered in sequence of completion

DEQ
Virginia Department of Environmental Quality

50 25 0 50 Miles

Data Sources: VA DCR, VA DEQ 2020 Water Quality Assessment.

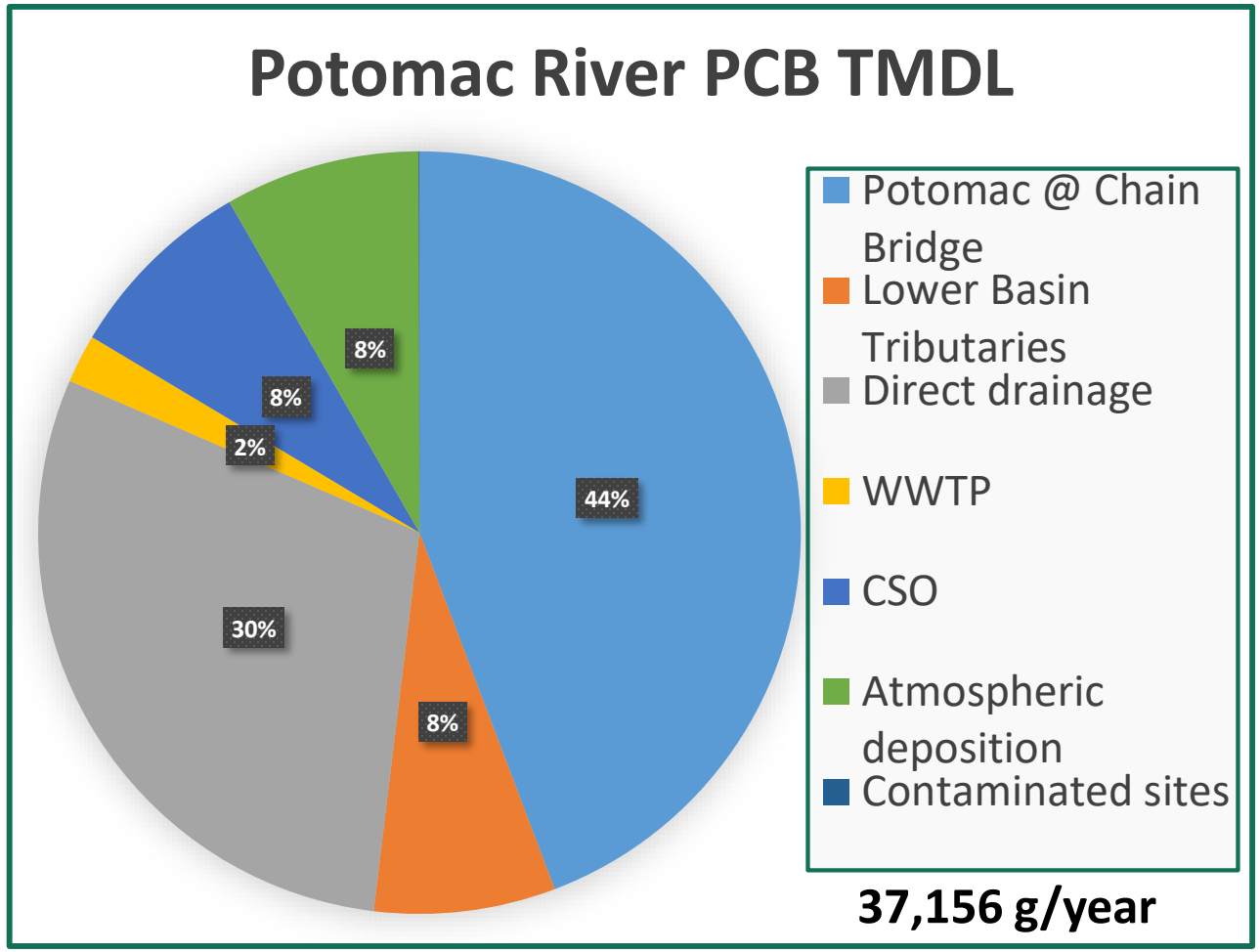
Map Updated by K.Woodall through August, 2021.

Total Maximum Daily Loads of Polychlorinated Biphenyls (PCBs) for Tidal Portions of the Potomac and Anacostia Rivers in the District of Columbia, Maryland, and Virginia (2007)

- **Multi-jurisdictional project**
  - VA, DC & MD
- **Model (integrated framework)**
  - Hydrodynamic (DYNHYD5) coupled with carbon based fate and transport (DELPCB) component
- **Endpoint**
  - Site-specific BAFs
- **TMDL Allocations**
  - WLA
    - VPDES WWTP Permits, MS4s, CSO
  - LA
    - Fall-line, Tributaries, Contam. Sites, Atmos. Deposition and Direct Drainage

Tidal Potomac River PCB TMDL & Allocations

Existing Load

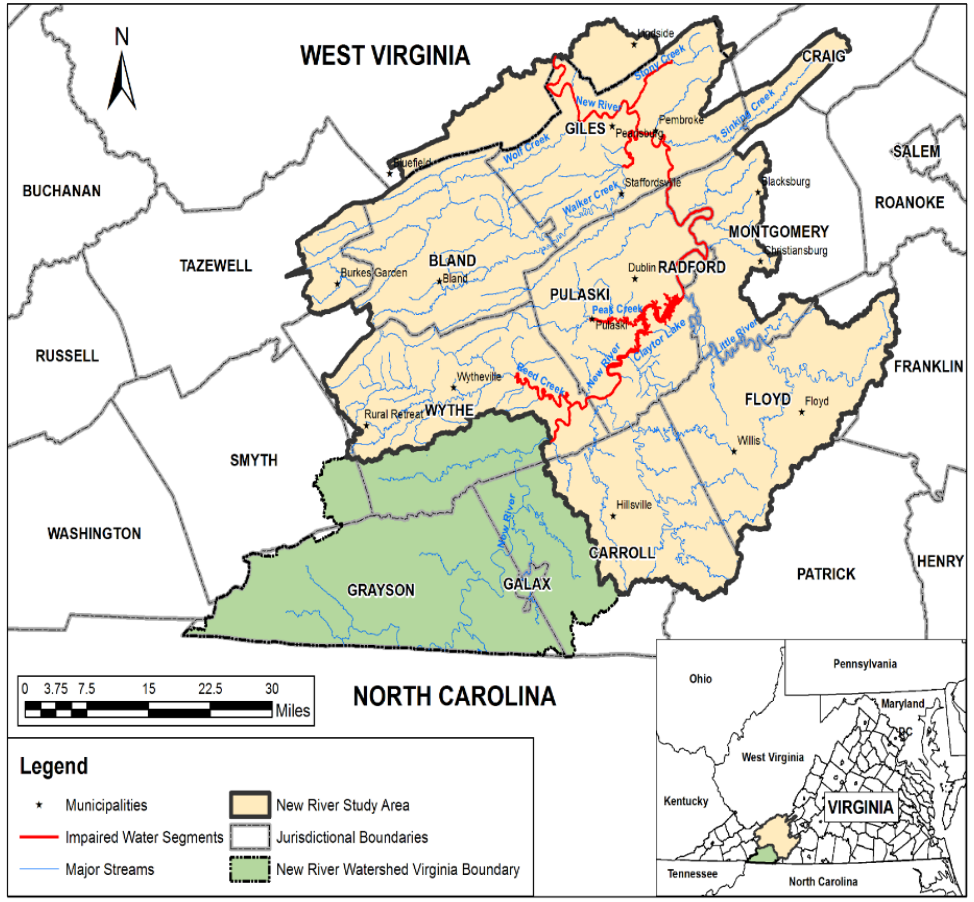


* MS4s a component of the Direct Drainage

Allocations

Source category	TMDL (g/year)	Reduction
Potomac @ Chain Bridge	312	98%
Lower Basin Tributaries	387	86%
Direct drainage	392	96%
WWTP	68.2	91%
CSO	58.1	98%
Atmospheric deposition	206	93%
Contaminated sites	10.3	32%
Margin of Safety (MOS)	71.9	
TOTAL	1,507	96%

New River PCB TMDL (2018)



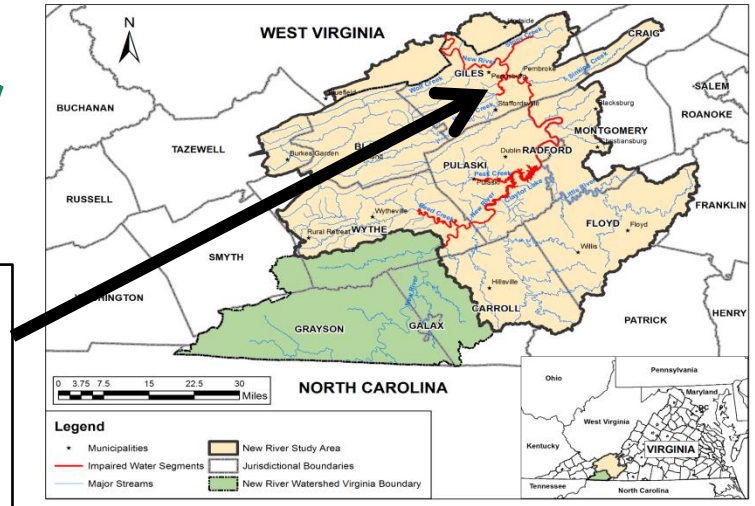
- **TMDL Model**
  - HSPF
    - Hydrologic, Sediment, Fate & Transport
- **TMDL Endpoints**
  - Site-specific BAFs (Five tributaries)
  - West Virginia WQC (Lower New River)
- **Allocations**
  - WLA
    - NPDES Indiv. Permits for WWTP and Industrial Facil., Indus. SW General Permits, MS4s
  - LA
    - Contaminated sites, Uncharacterized, Atmospheric Deposition

COLLEGE OF AGRICULTURE AND LIFE SCIENCES
BIOLOGICAL SYSTEMS ENGINEERING
VIRGINIA TECH.

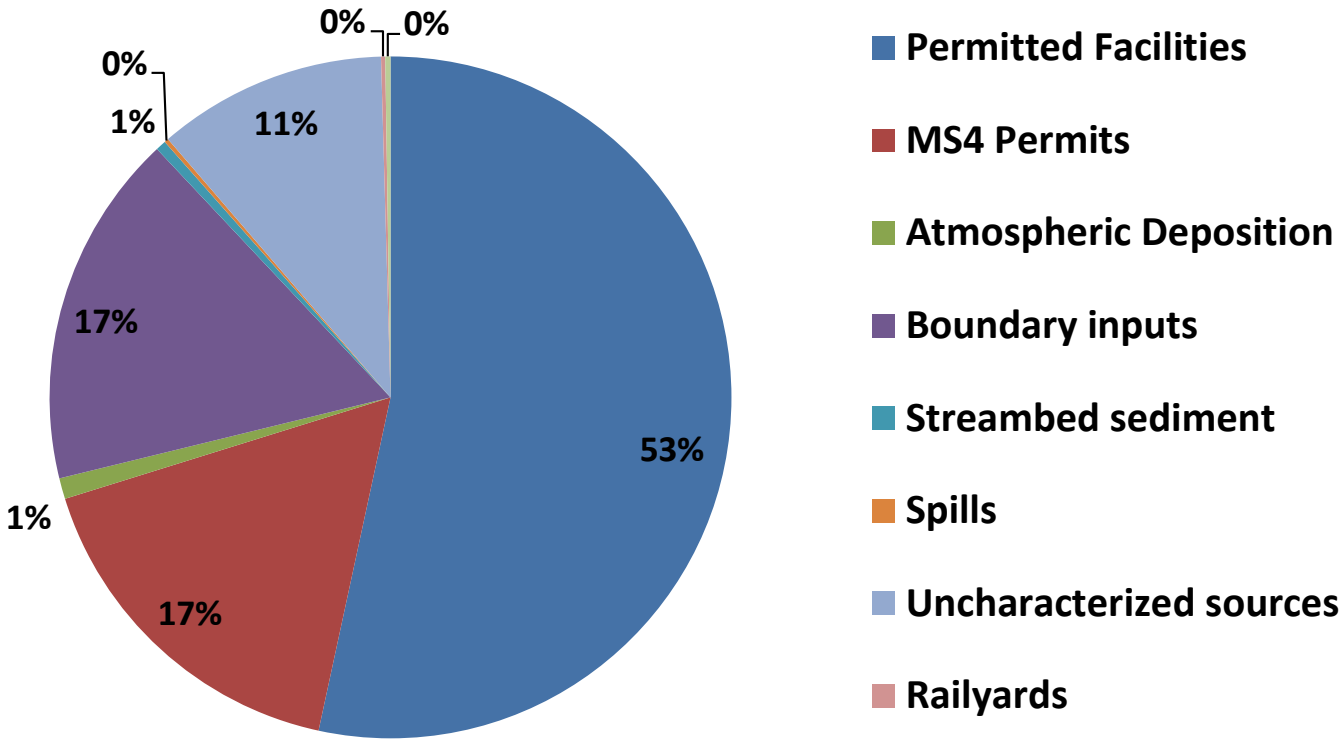
DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Virginia Cooperative Extension
Virginia Tech • Virginia State University

PCB TMDL - Lower New River



Relative Contribution (%) of different PCB sources to the Lower New River

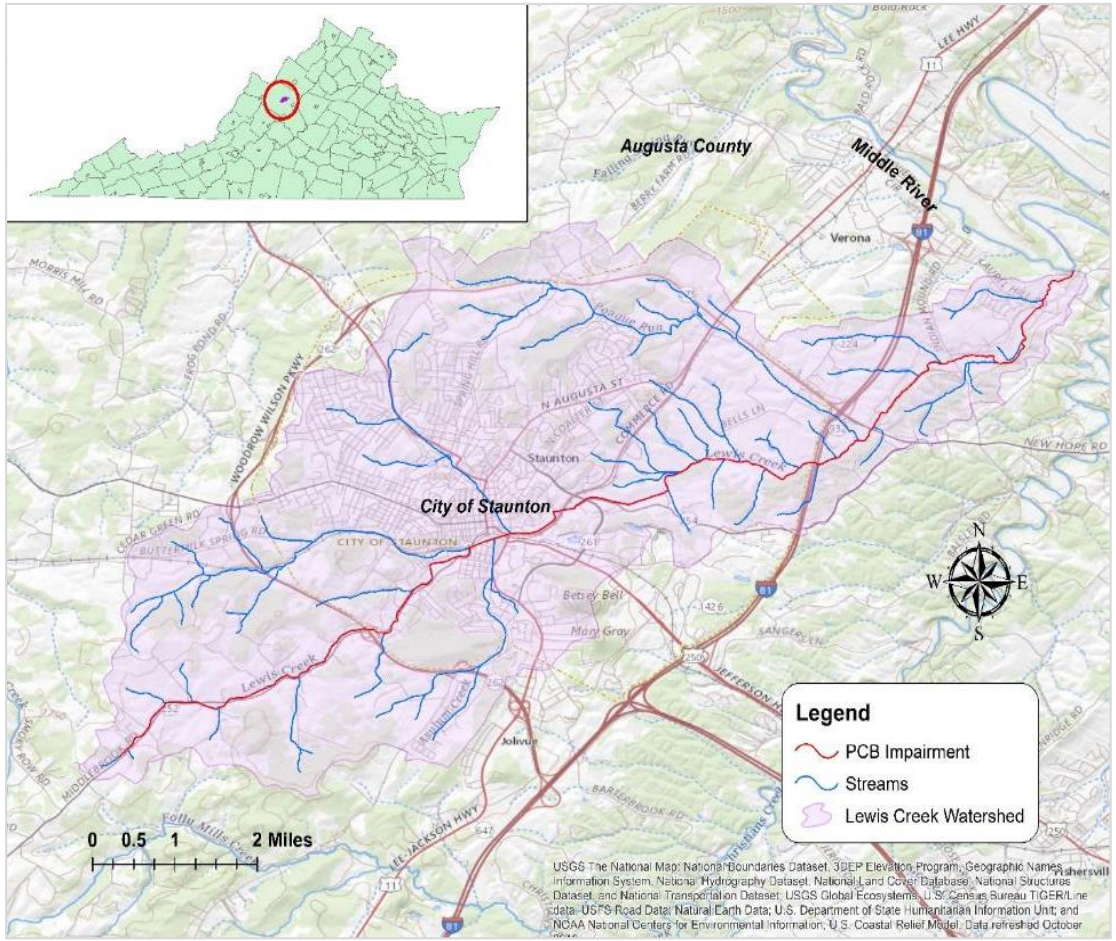


Existing Load = 2,097 g/yr

- **Phased implementation utilizes a BMP based approach**
- **Introduced a new concept**
  - Allows for potential load reallocation from municipal WWTP to MS4s
    - Part of same local government or share same spatial area
  - Example - WWTP has assigned load greater than existing load (i.e., no reductions needed)
  - Would occur through permitting process

TMDL = 178 g/yr 92.2% reduction (Based on WVA WQC 0.044 ng/L and 0% exceedance)

Lewis Creek (Staunton, Virginia) PCB TMDL



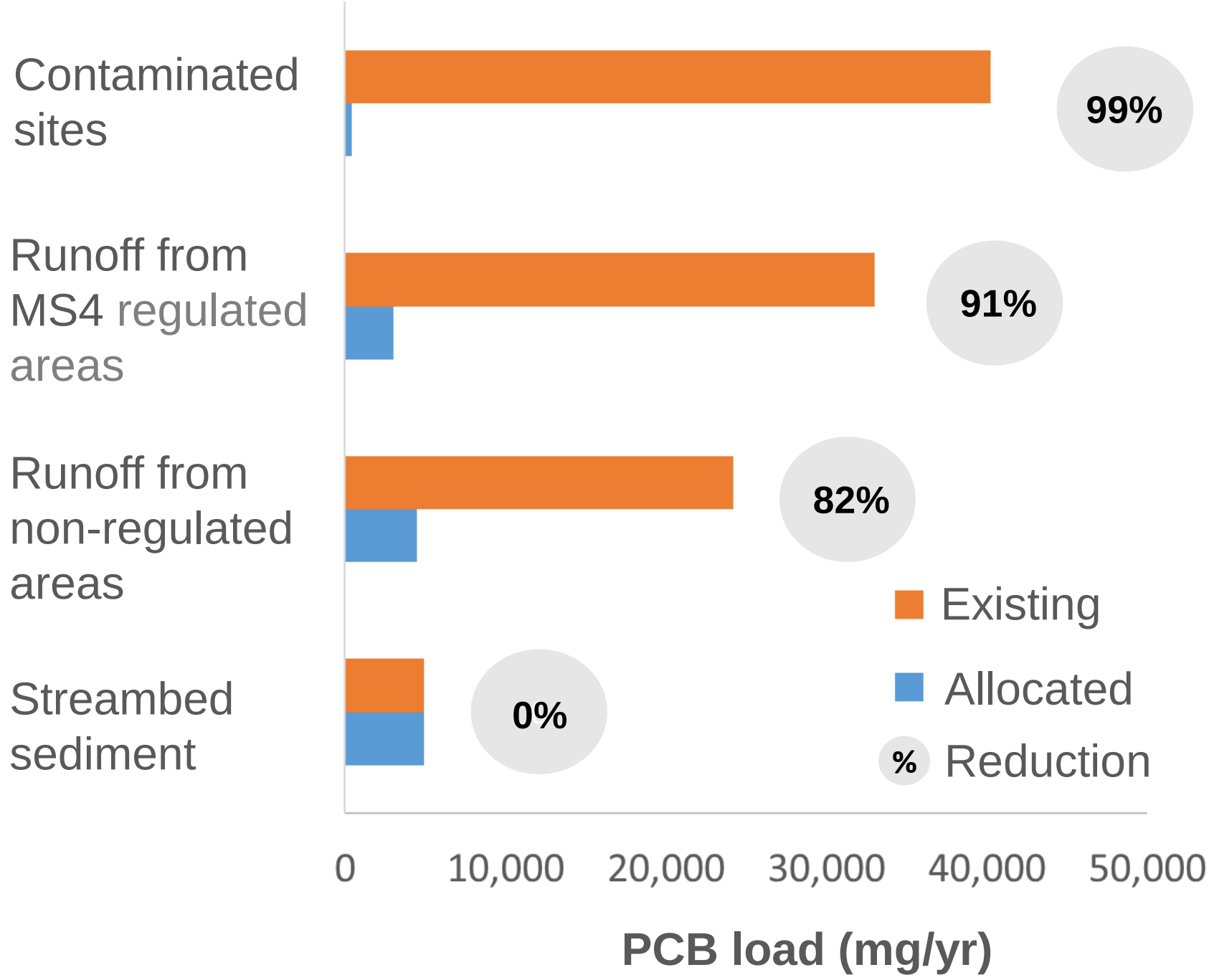
- **Model**
  - HSPF
    - Hydrodynamic, sediment, fate & transport
- **Site-specific BAF**
- **Allocations**
  - WLA
    - MS4s
  - LA
    - Contaminated sites, non-regulated SW (Direct Drainage), Bed sediment

Status: Out for Public Comment – Ends 9/17

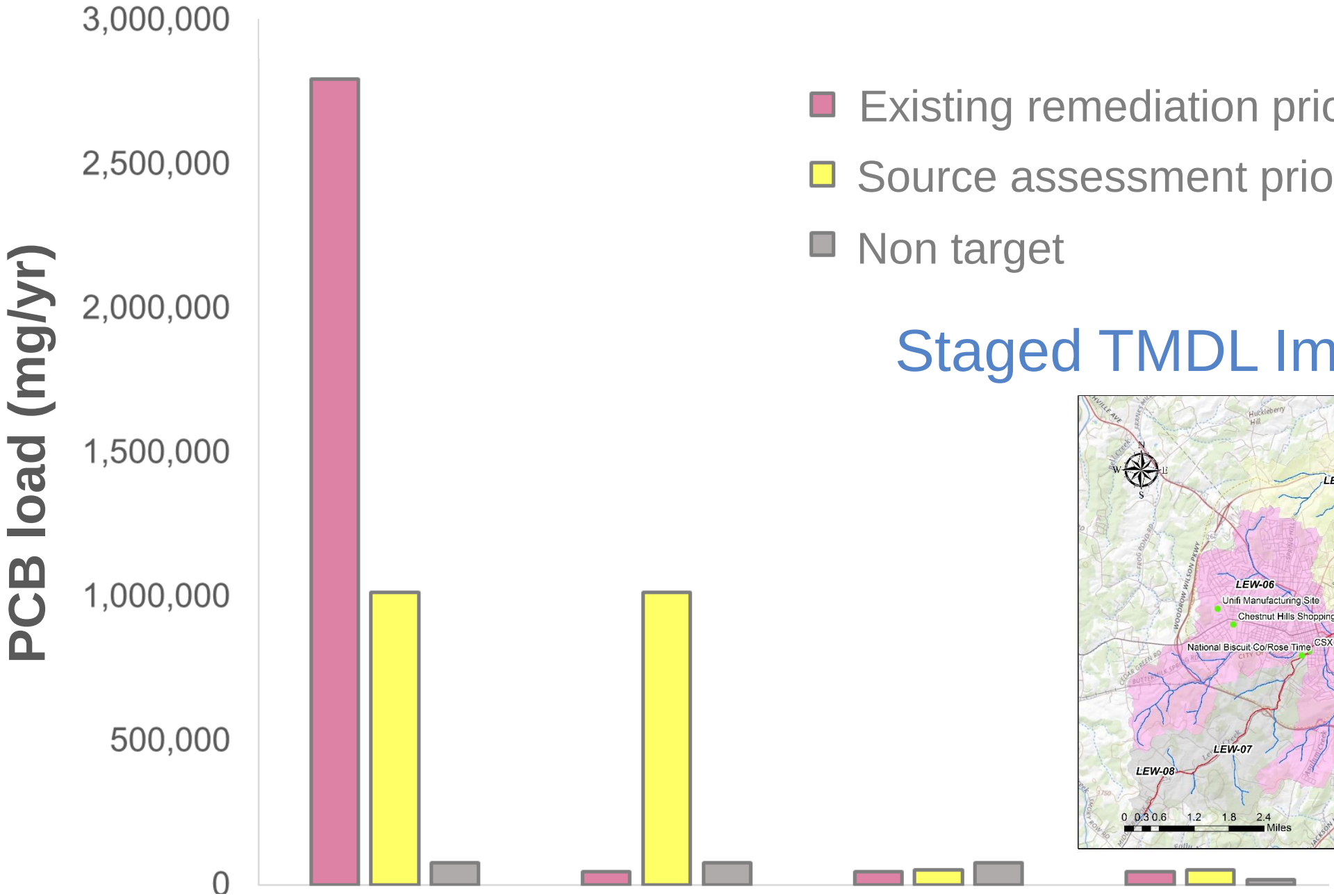
Lewis Creek PCB Source Loads

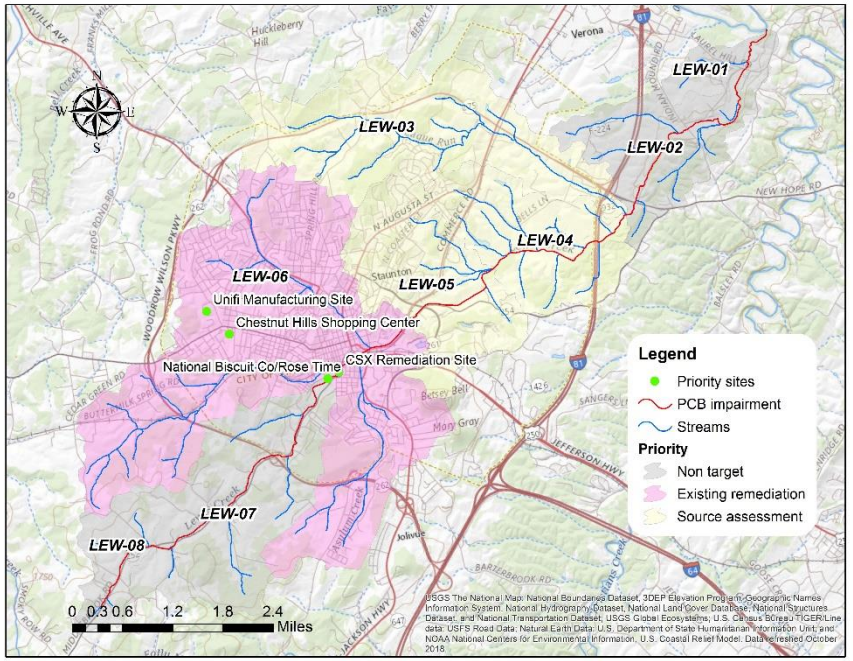
Existing Load = 102.3 g/yr)

TMDL – 12.8 g/year (88% reduction)



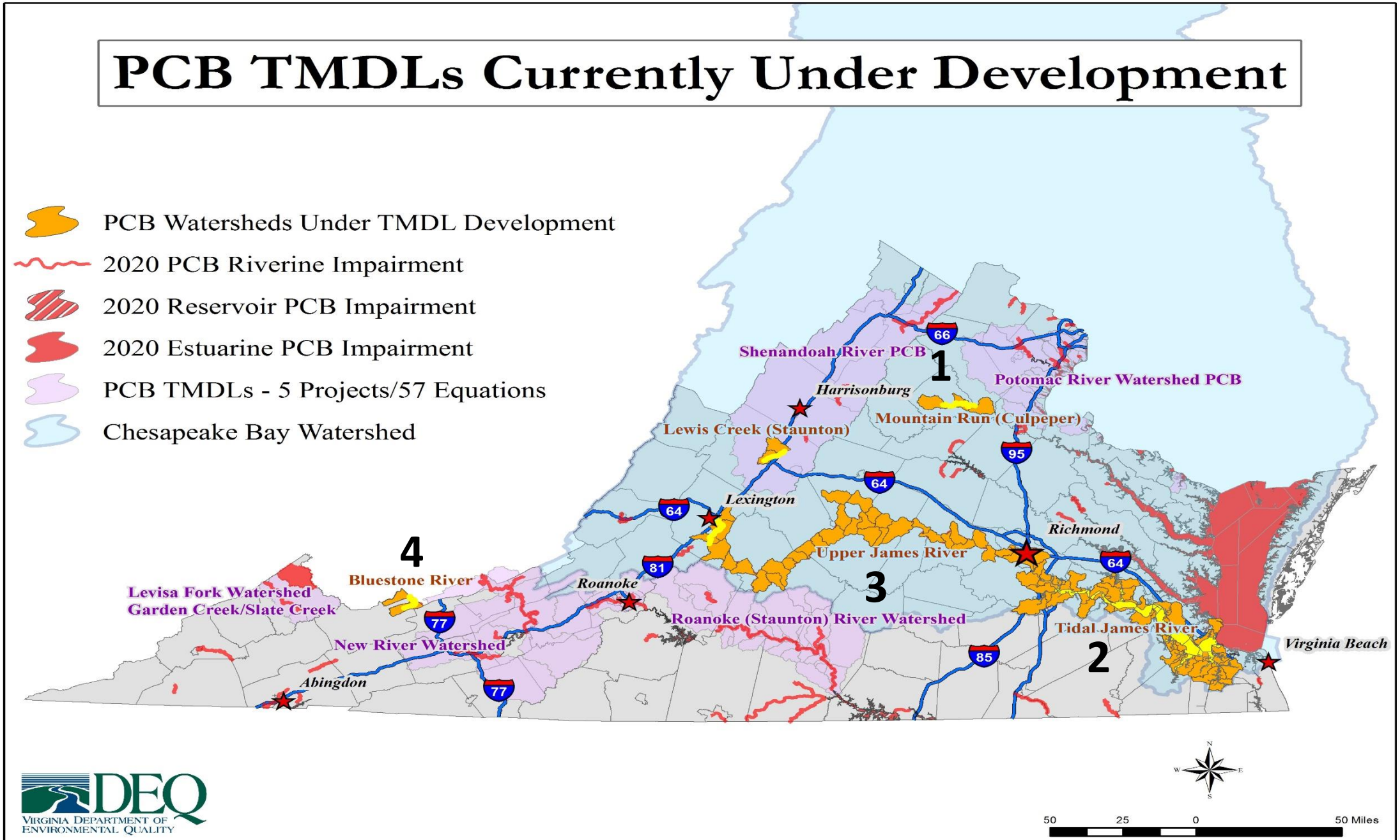
Staged TMDL Implementation





DEQ

PCB TMDLs Currently Under Development



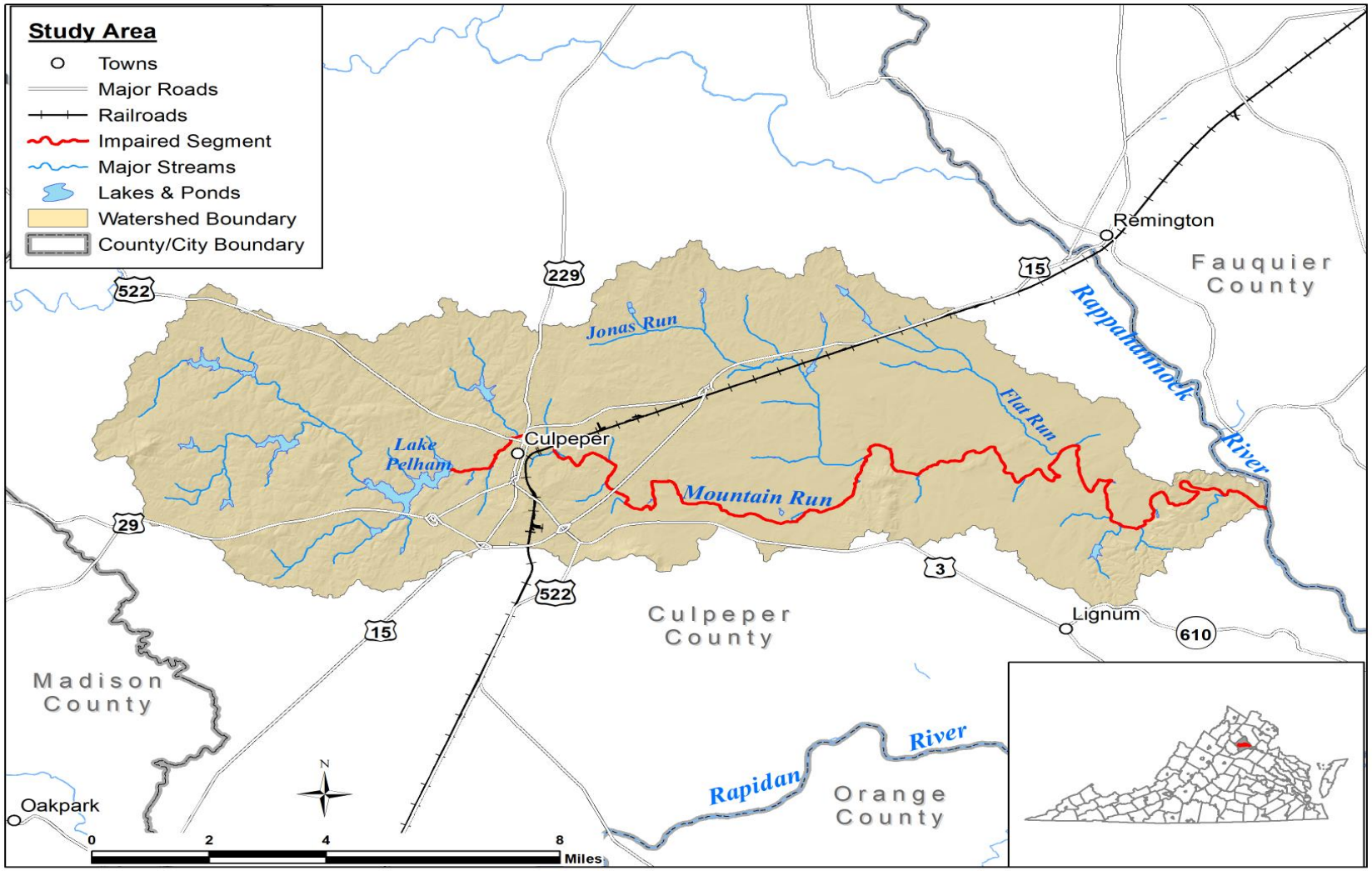
DEQ
Virginia Department of Environmental Quality

Data Sources: VA DCR, VA DEQ 2020 Water Quality Assessment.

Map Updated by K.Woodall through August, 2021.

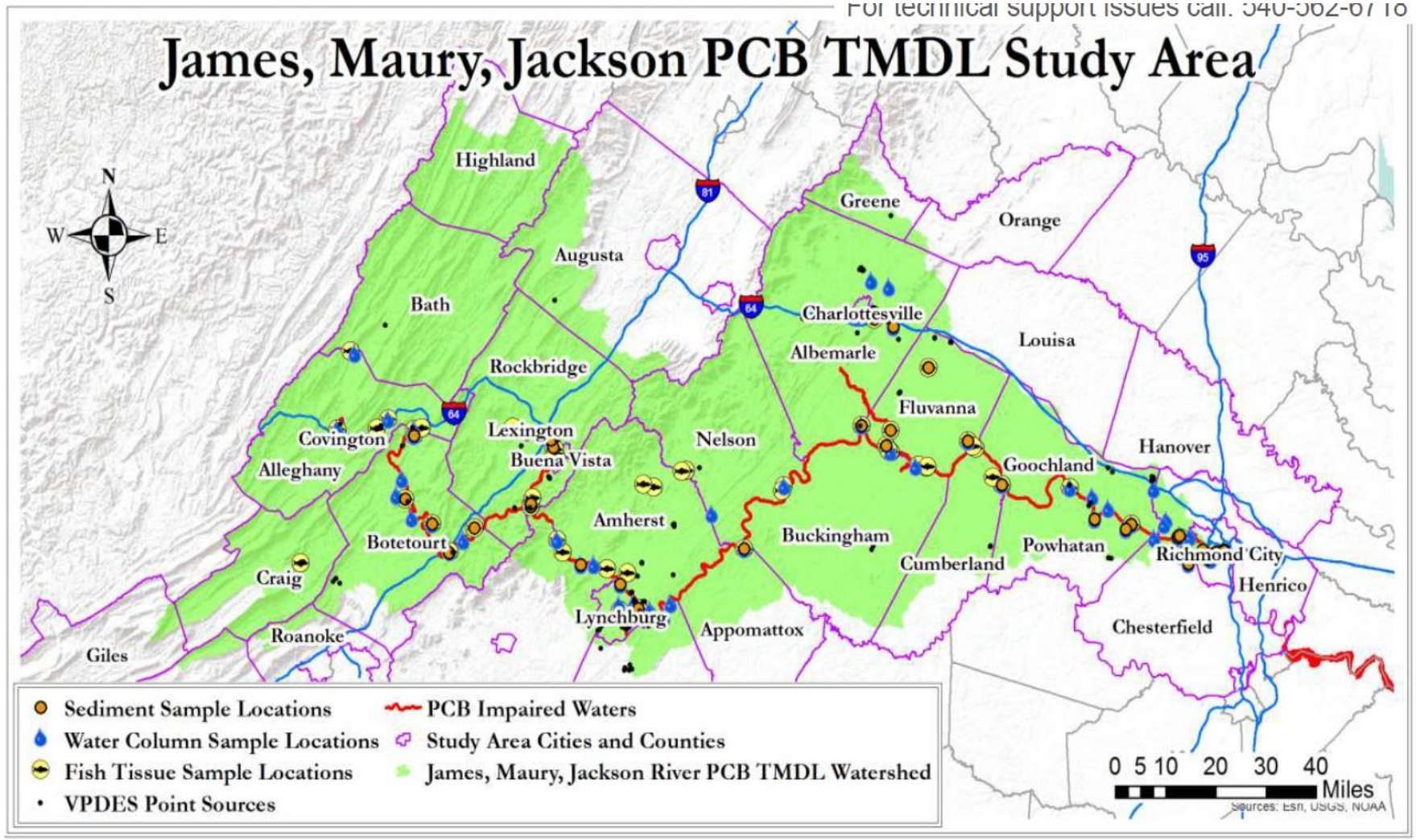
Mountain Run (Culpeper, VA) PCB TMDL

Under Development



James River, Maury River, Jackson River PCB TMDL

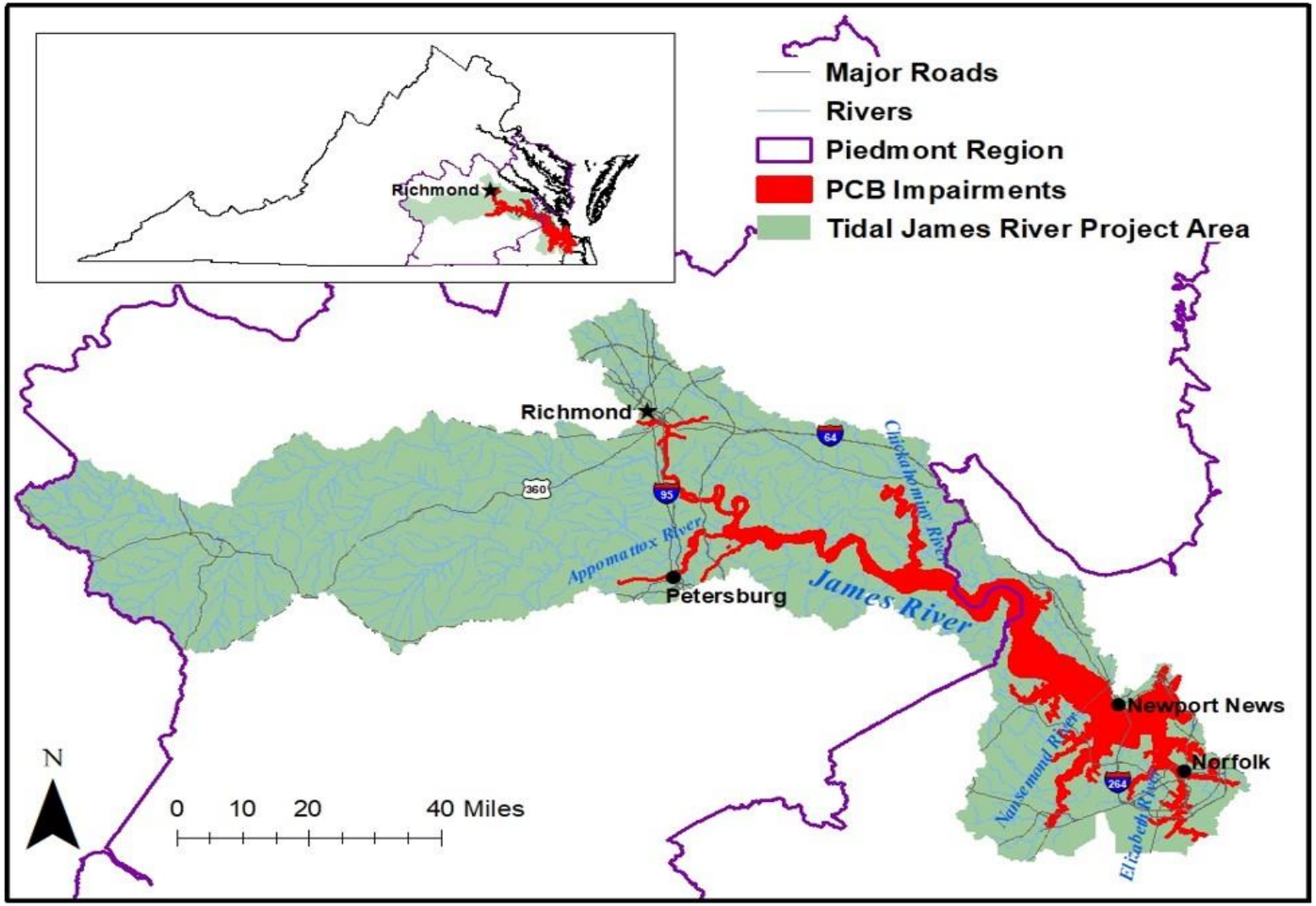
Under Development



DEQ

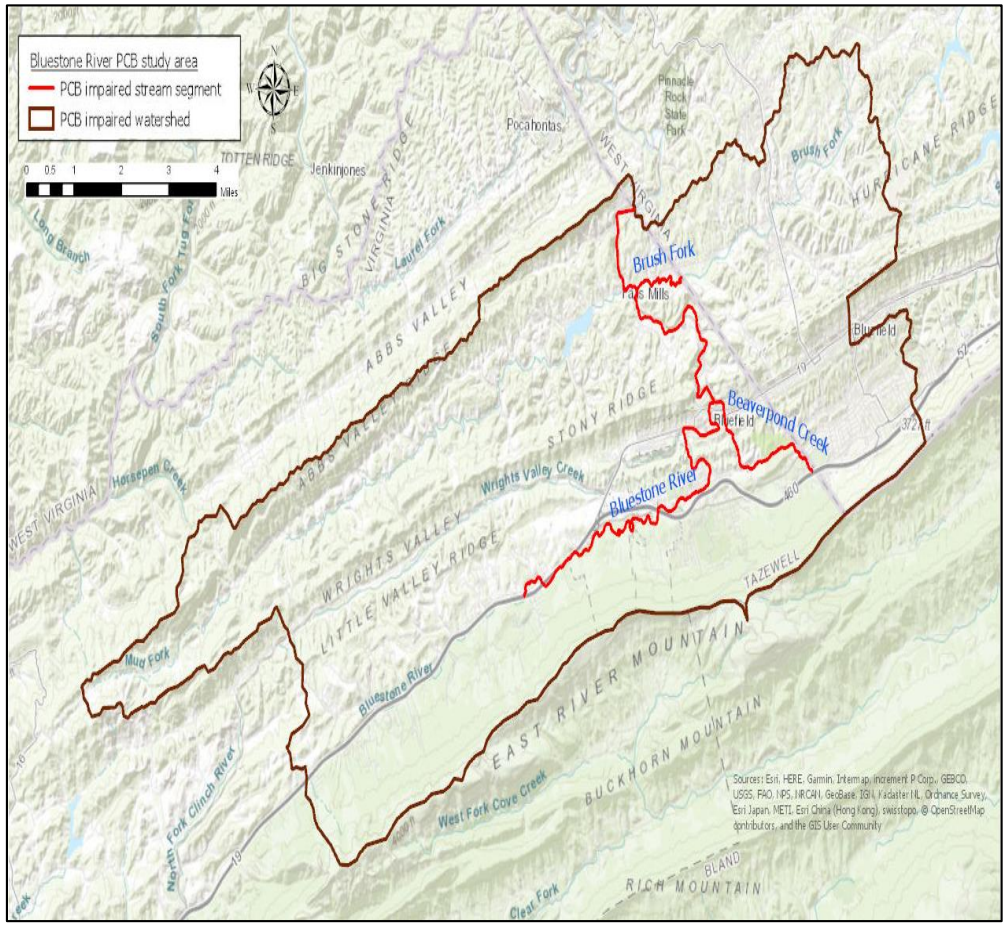
Tidal James River and Elizabeth River PCB TMDL

Under Development



DEQ

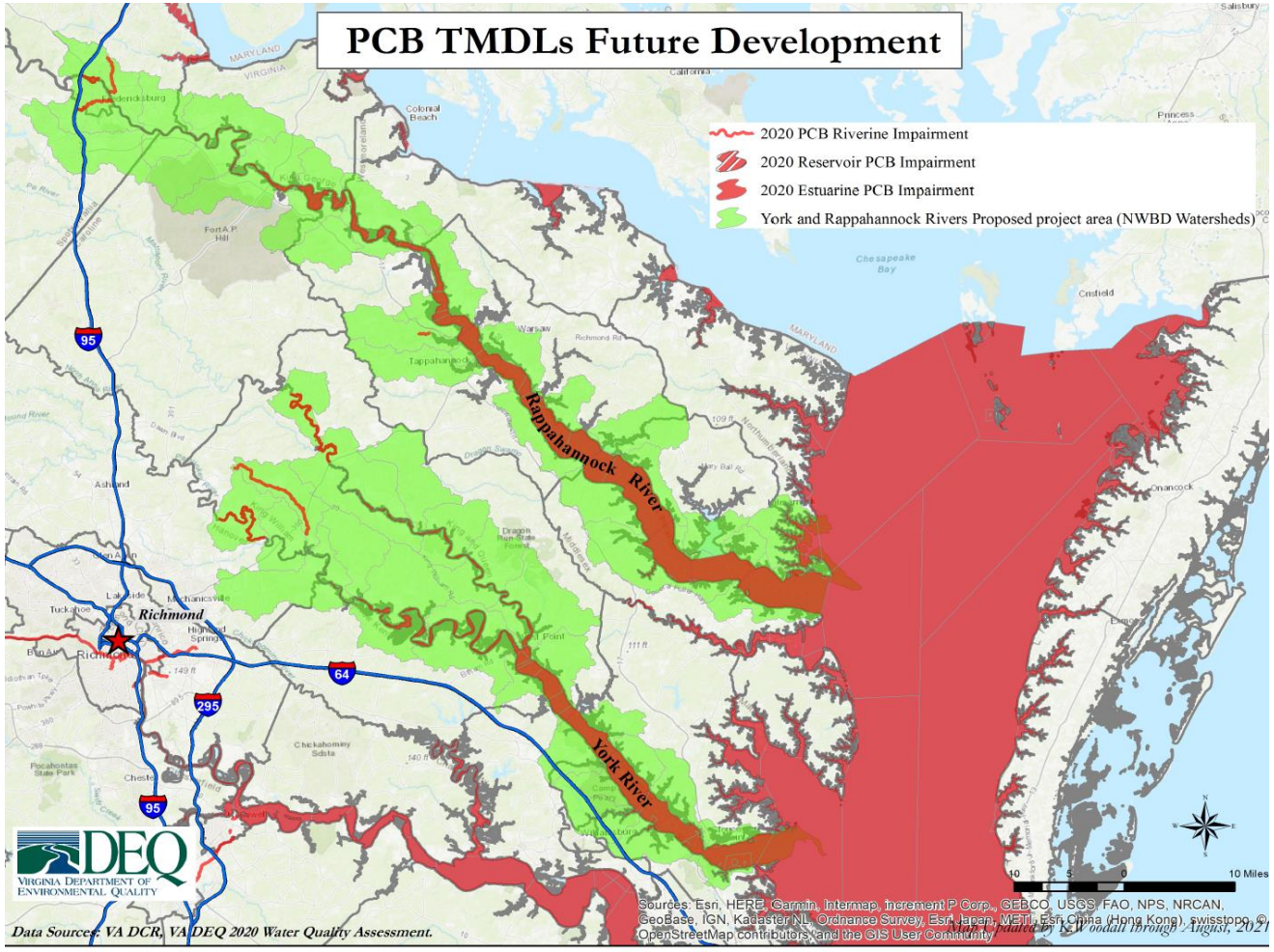
Bluestone River (Bluefield, VA) PCB TMDL



- Interstate TMDL
  - VA & WVA
- Initial stages
- Contamination originates from WVA and flows through 14 mi. portion of the VA Bluestone River where re-enters WVA

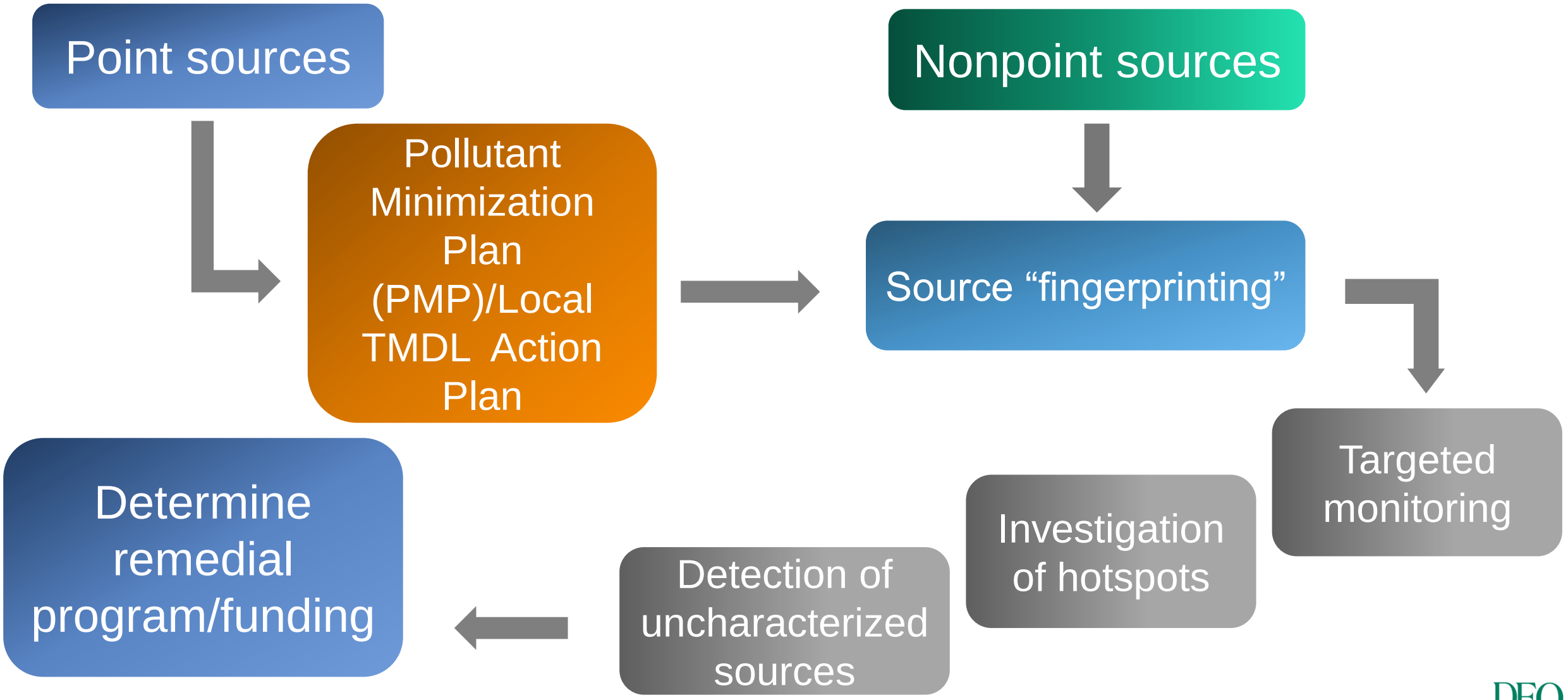
DEQ

Future PCB TMDL Development



- Tidal Rappahannock River and York River watersheds
  - PCB monitoring currently taking place
    - Study design includes water and sediment samples
    - From the fall-line to the mouth
    - Includes a seasonal component in water sample collection

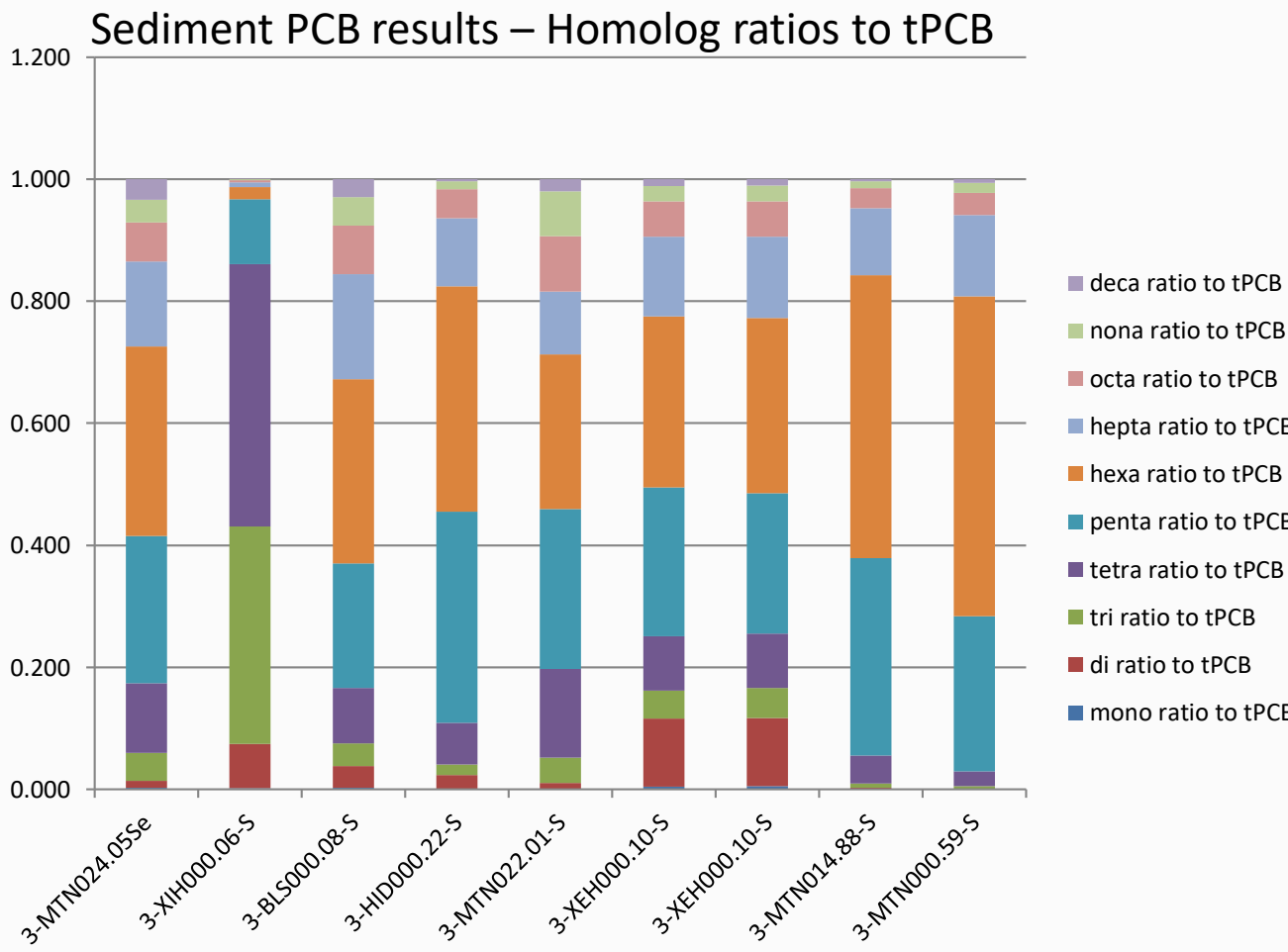
TMDL Implementation Process



DEQ

Fingerprinting Methods

- Approaches
  - Visual (homologs)
  - Principal Component Analysis (PCA)
  - Positive Matrix Factorization (PMF)
  - Cosine Similarity



Point Source PMP Guidance

- Under development

- PCB Track Down/Sampling Plan
  - Industrial, Municipal, MS4(?)
  - Source Identification (Site specific)
    - Includes a table offering a variety of PCB Analytical Methods (method pros/cons, relative cost, etc.)
    - Analytical Method selection optional based on study objective
      - **Method 1668 not required for track down**
  - Influent/Effluent, evaluate flows from pump stations
  - Fingerprinting techniques are an option (benefit of using more sensitive method)

Thank You!

Mark Richards
Virginia Department of Environmental Quality
Mark.richardss@deq.Virginia.gov