Setting the Stage
for the
Tidal Potomac PCB TMDL

Technical Advisory Committee Meeting
MWCOG
May 31, 2007

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Interstate Commission on the
Potomac River Basin

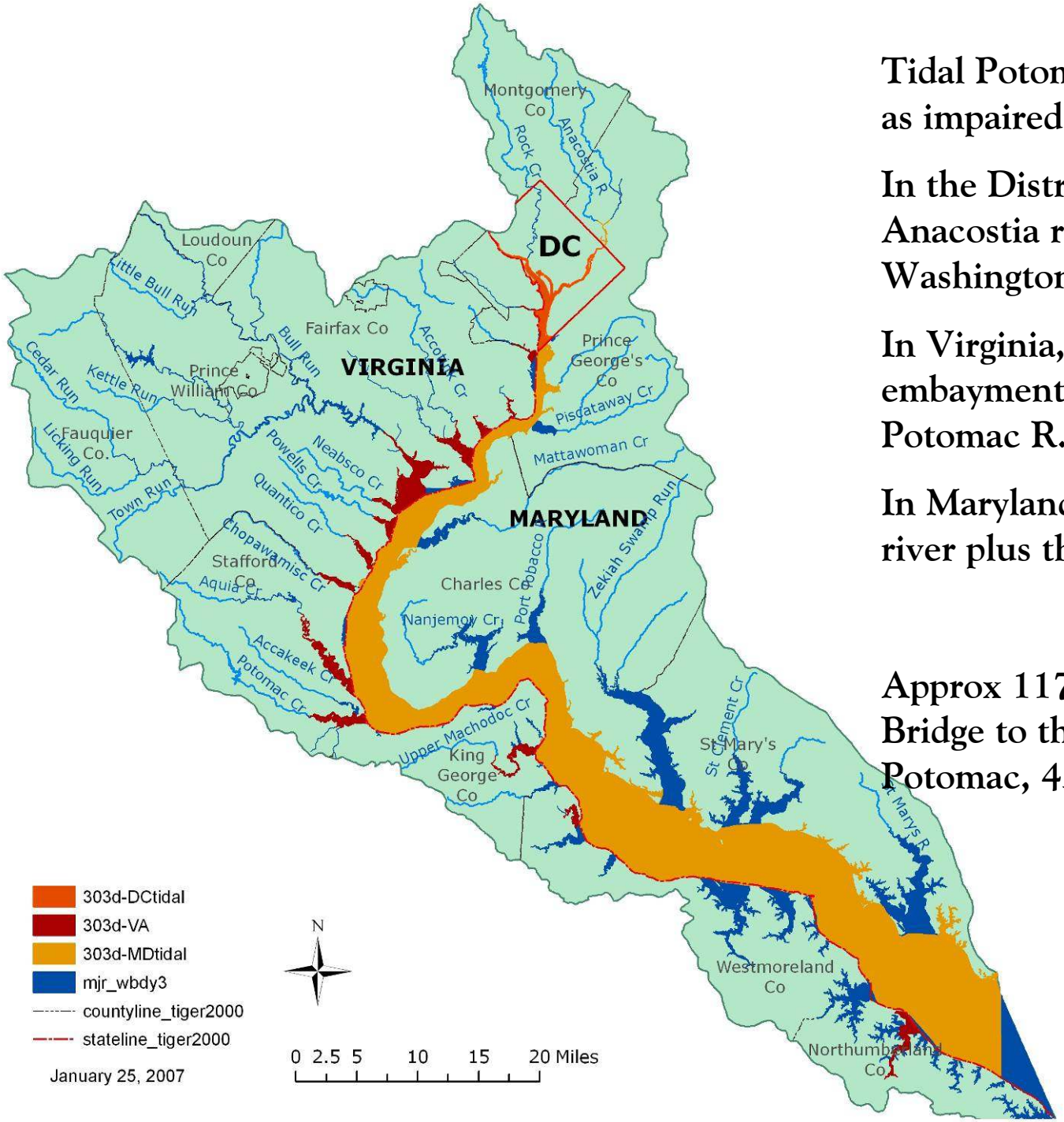
Topics

1) Scope, Process, Schedule
2) What do the ambient data tell us about PCB loads?
3) Estimates of external loads for current conditions.
4) The Potomac PCB model (POTPCB) final calibration.
5) Setting PCB targets for the TMDL.
6) Q & A

1) Potomac PCB TMDL: Scope, Approach, & Schedule

Scope of Project and Process

1) District of Columbia has a court ordered deadline of September 30, 2007 to complete their tidal Potomac PCB TMDL.
2) DC, MD, VA, EPA, ICPRB, and LTI working together to complete TMDL for all tidal waters by Sep., 2007, using common methodology.
3) Why are MD and VA completing their TMDLs on DC's schedule?
   a) Joint TMDL more cost effective to develop.
   b) Three independent TMDLs using potentially different models and assumptions and completed on different dates would be difficult to reconcile, potential for different conclusions with respect to PCB loads crossing state lines, difficult for the public to understand.
4) Scope of project:
   a) Collect and assess existing data sets.
   b) Collect new samples to provide better understanding of current conditions.
   c) Develop a framework for external PCB sources and estimate input loads.
   d) Build a model to simulate fate and transport of PCBs in the tidal Potomac.
   e) Run model scenarios to determine maximum loads that can meet water quality standards and fish tissue criteria.
   f) Write TMDL.



Tidal Potomac water bodies listed as impaired for PCBs in fish tissue.

In the District of Columbia, the Anacostia river, the Potomac river, Washington Ship Channel.

In Virginia, 19 separate embayments & one section of Potomac R.

In Maryland, the tidal Anacostia river plus the mainstem Potomac

Approx 117 miles from Chain Bridge to the mouth of the Potomac, 457 mi^2 tidal waters.

Table of listed water bodies

Virginia

In most embayments, the impairment covers all tidal waters.

Accotink Creek
Aquia Creek
Belmont Bay
Chopawamsic Creek
Coan River
Dogue Creek
Fourmile Run
Gunston Cove
Hooff Run
Hunting Creek
Little Hunting Creek
Monroe Creek/Bay
Neabsco Creek
Occoquan River
Pohick Creek
Potomac Creek
Powells Creek
Quantico Creek
Up. Machodoc Cr.

Potomac R. (Fairview Beach, King George Co.)

Maryland

Upper Tidal Potomac R.
Middle Tidal Potomac R.
Lower Tidal Potomac R.
Tidal Anacostia R.

District of Columbia

Upper Potomac R.
Middle Potomac R.
Lower Potomac R.
Upper Anacostia R.
Lower Anacostia R.

TMDL Development Schedule

• Compile historical data	2005
• Select modeling framework	2005
• New PCB samples in water, sediment, & WWTPs	2005-2006
• 1st Technical Advisory Committee (TAC) Meeting	Sep 2005
• 2nd TAC: Intro to model and load estimation methods	Jan 23, 2006
• Hydrodynamic / Salinity Model completed	Feb 2006
• 1st Round Public Stakeholder Meetings	Jun 2006
• 3rd TAC: Initial estimates external PCB loads by source	Oct 31, 2006
• Interim version of PCB model	Jan 31, 2007
• Draft loading summary document	Jan 27, 2006
• 4th TAC: Revised external PCB loads, Initial model runs	Jan 30, 2007

TMDL Development Schedule

• Meet with WWTP operators	Feb 23, 2007
• Closing date for comments on loadings report	Feb 28, 2007
• Final validated PCB model	mid-May, 2007
• **5th TAC: TMDL scenarios & model runs**	**May 31, 2007**
• Final report on PCB model calibration	Jul 11, 2007
• Draft TMDL report for public review	Jul 11, 2007
• 2nd Round public stakeholder mtgs (tentative)	Jul 11-17, 2007
• TMDL comment period (approx.)	Jul 11 – Aug 11
• TMDL report submitted to EPA	Sep 1, 2007
• EPA approval of TMDL	Sep 30, 2007

Public Meetings for PCB TMDL

Jul 11 – MWCOG, Washington, DC, 7-9 pm

Jul 12 – VA DEQ Northern Regional Office, Woodbridge, VA, 1-3 pm

Jul 12 – Town Hall, Occoquan, VA, 7-9 pm (location is tentative)

Jul 17 – Public Library, LaPlata, MD, 6:30 – 8:30 pm

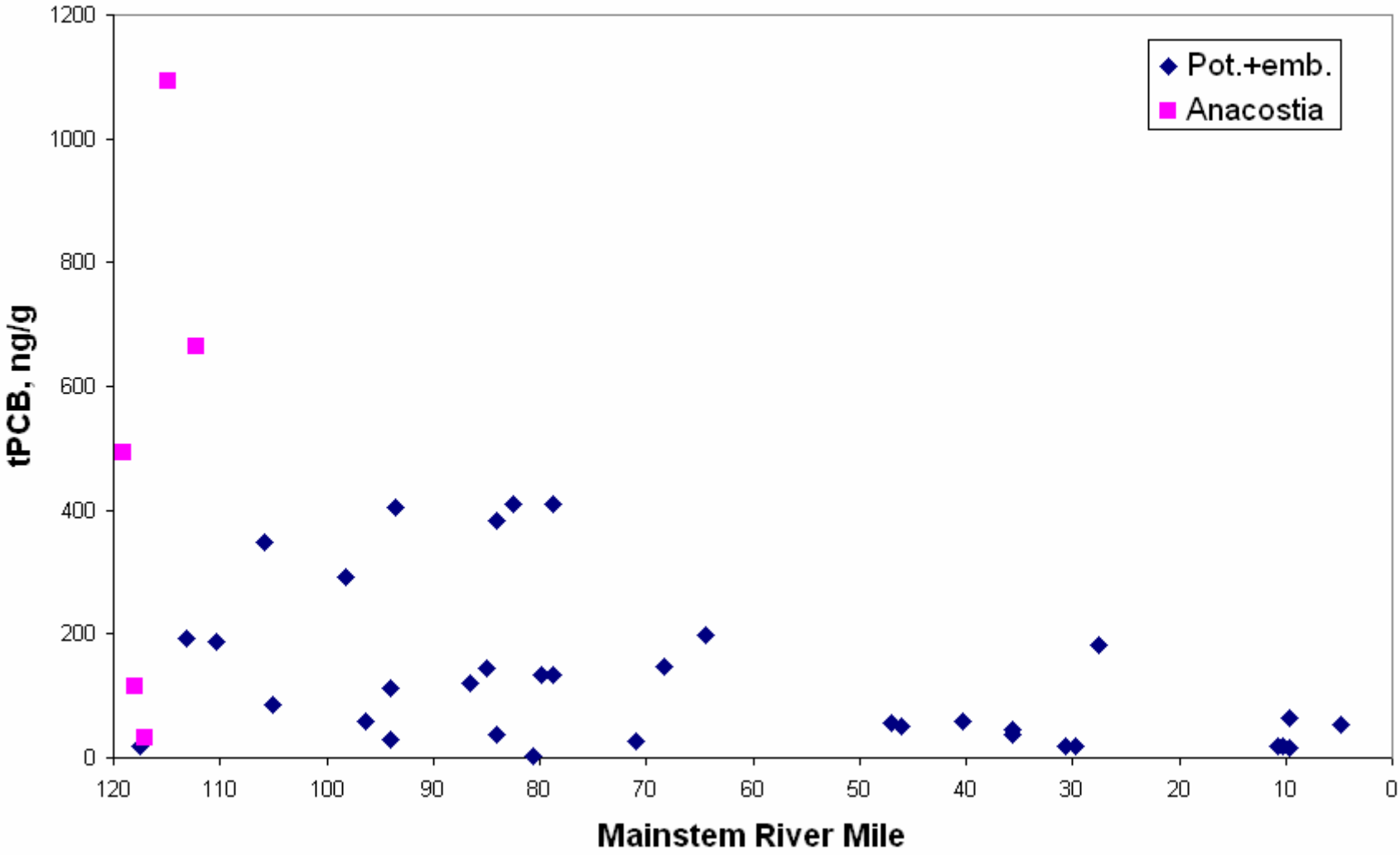
2) Ambient Data Patterns

State waterbody impairment criteria.

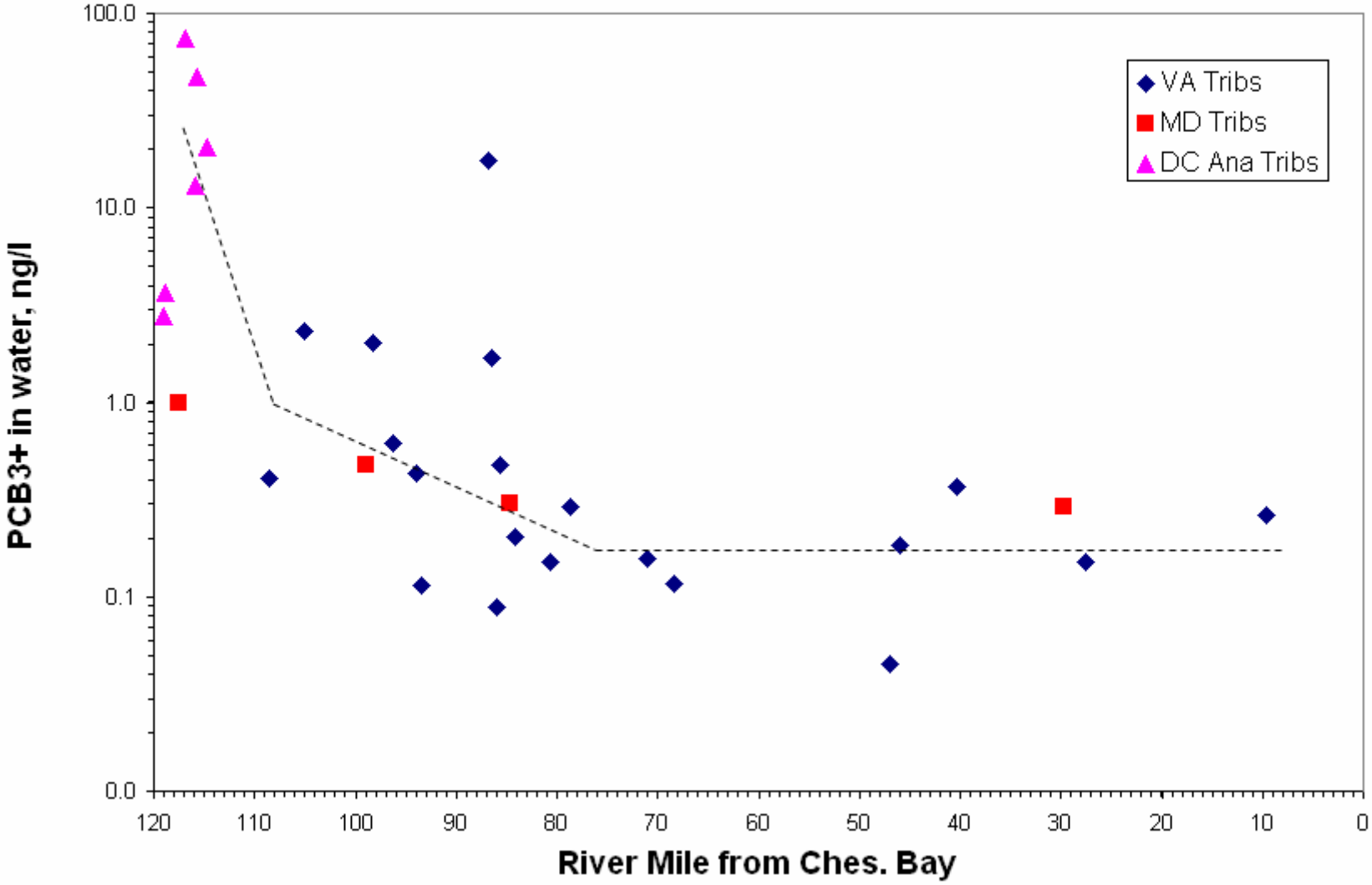
Both Fish Tissue Thresholds and WQ Standards apply.

	Fish Tissue Impairment Threshold (ppb)	Water Quality Standards (ng/l)
Dist. of Col.	20	0.064
Maryland	88	0.64
Virginia	54	1.70
	* Specific reason for 303(d) listing.	

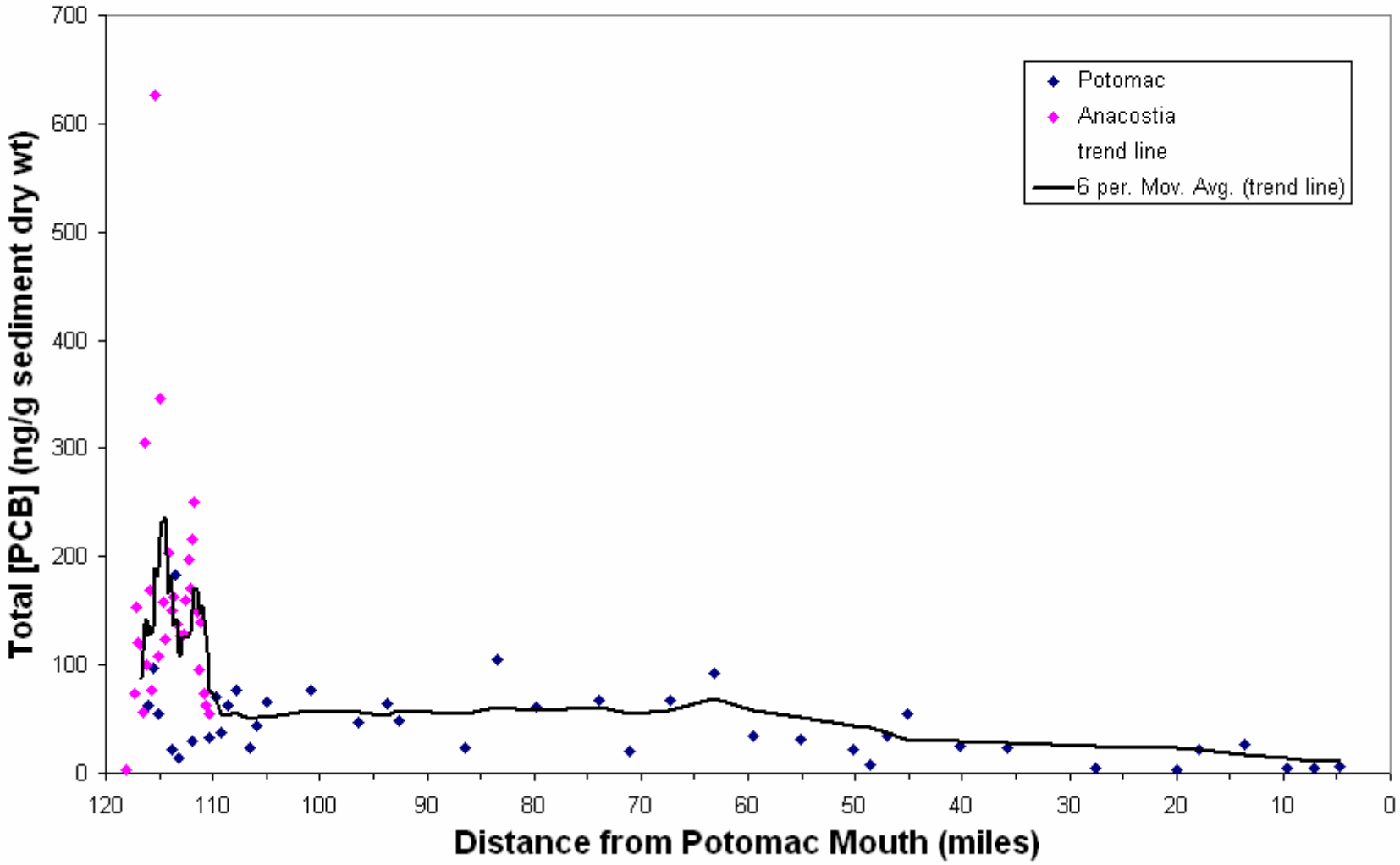
Median Fish tPCB by River Mile

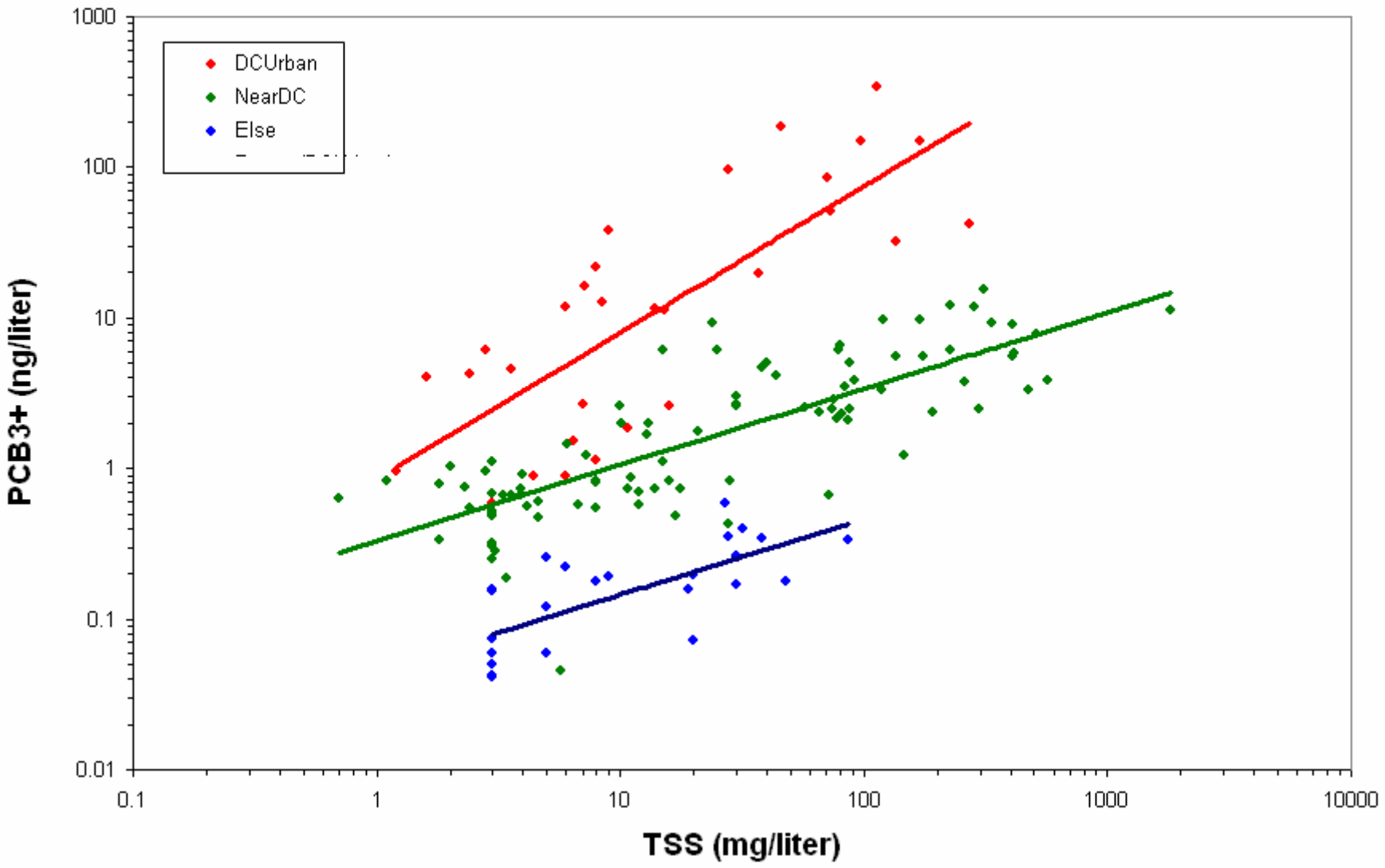


Average PCB3+ at/near mouths of Tributary Boundaries



Sediment [tPCB] by River Mile




[PCB] vs [TSS]
DCUrban
NearDC
Else
PCB3+ (ng/liter)
TSS (mg/liter)
1000
100
10
1
0.1
0.01
0.1
1
10
100
1000
10000

Summary Ambient Data Patterns

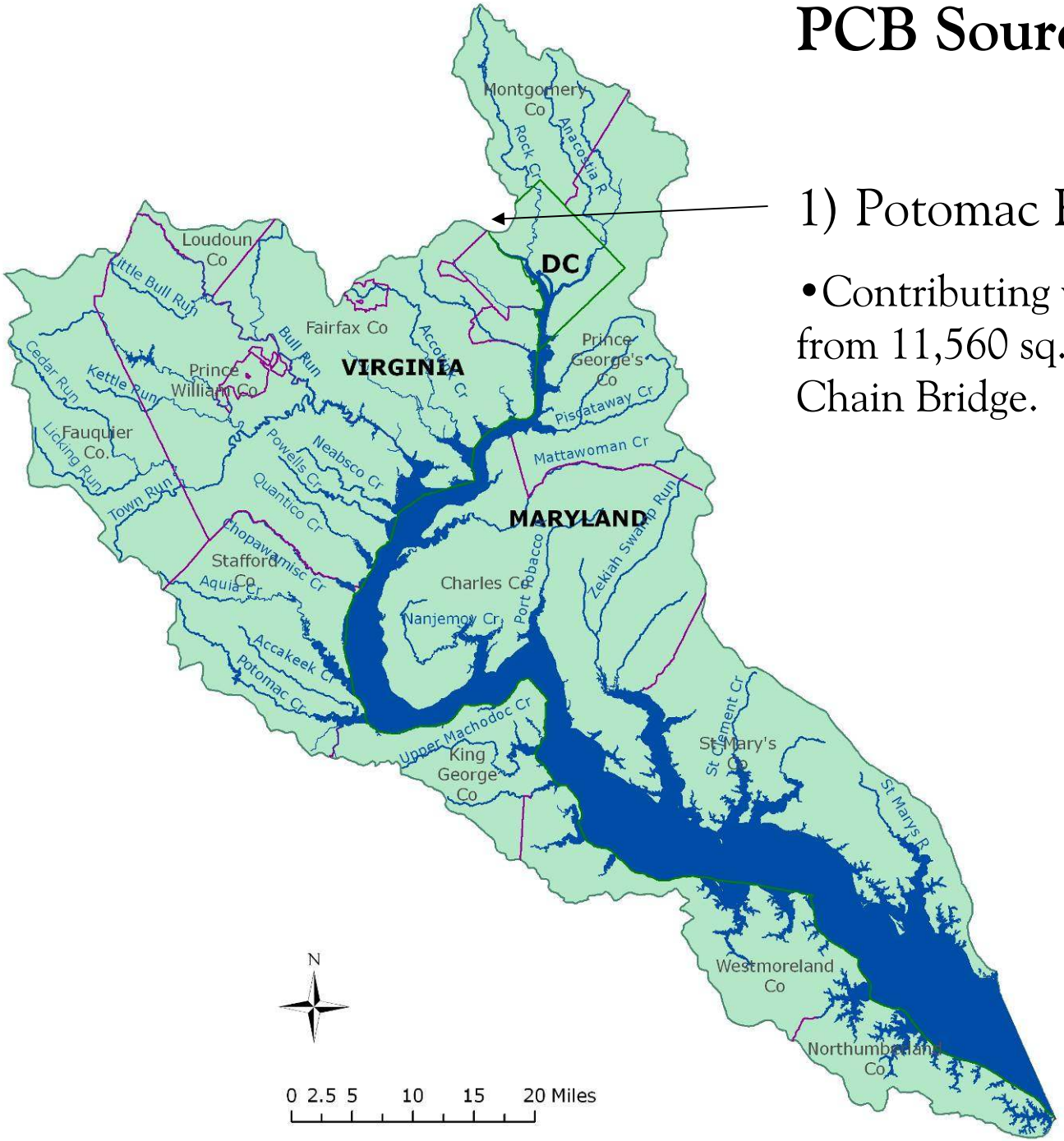
- Peak values (fish, water, sediment) in urban core, especially Anacostia river.
- Variability of several hundred percent in nearby sites.
- Several order of magnitude variation from top of estuary to bottom.
- Fish exceeding fish consumption thresholds even at bottom of estuary.

2) Estimating external PCB loads

PCB External Source Categories

1) Tributary input
   a) Potomac River
   b) Other tributaries
2) Direct Drainage (Non Point Source)
3) Contaminated Sites
4) Atmospheric deposition
5) Point Sources
6) Combined Sewer Overflows (CSO)

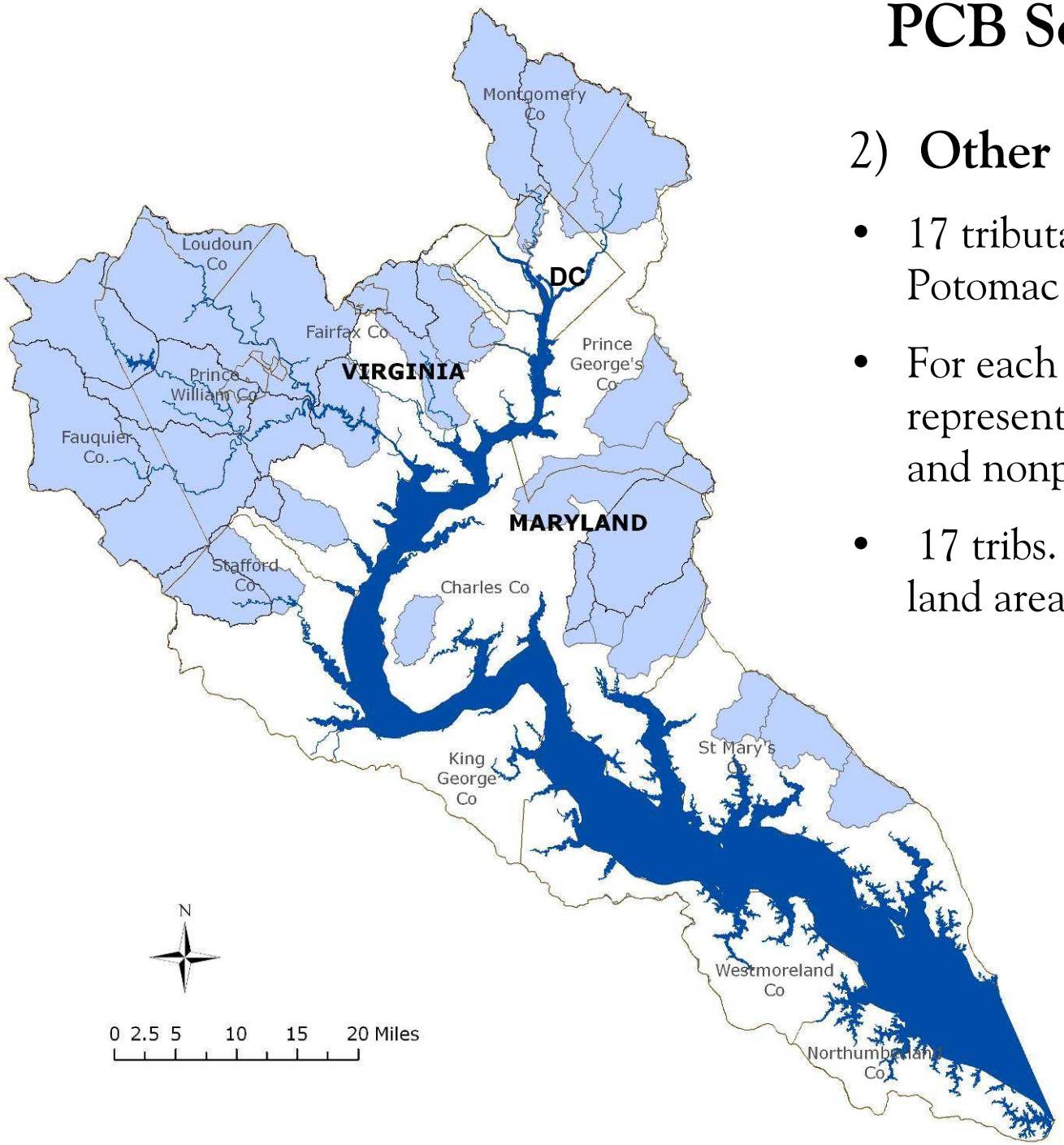
PCB Source Categories



1) Potomac River at Chain Bridge

- Contributing water and associated loads from 11,560 sq. mi. watershed upstream of Chain Bridge.

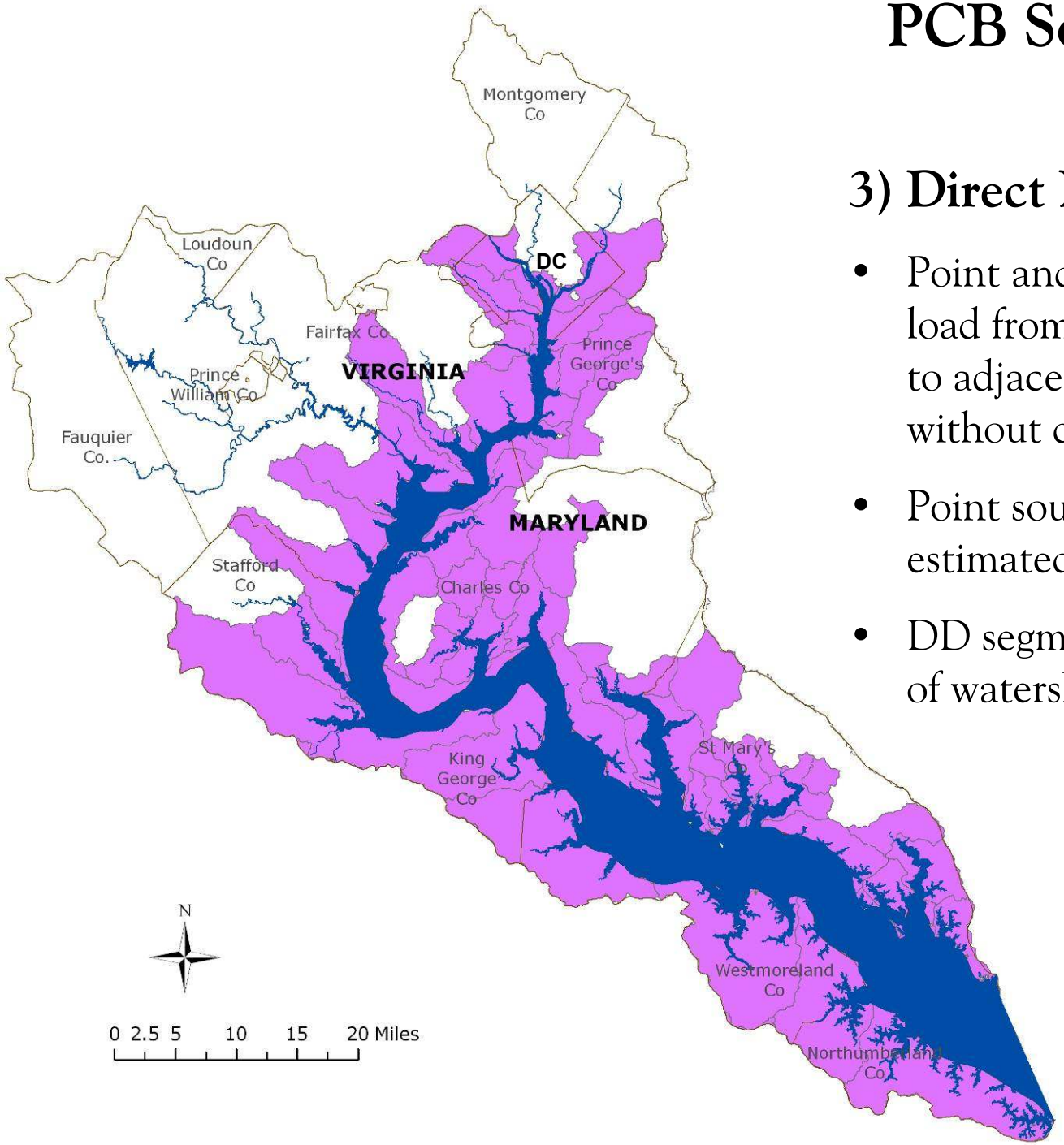
PCB Source categories



2) Other Tributaries

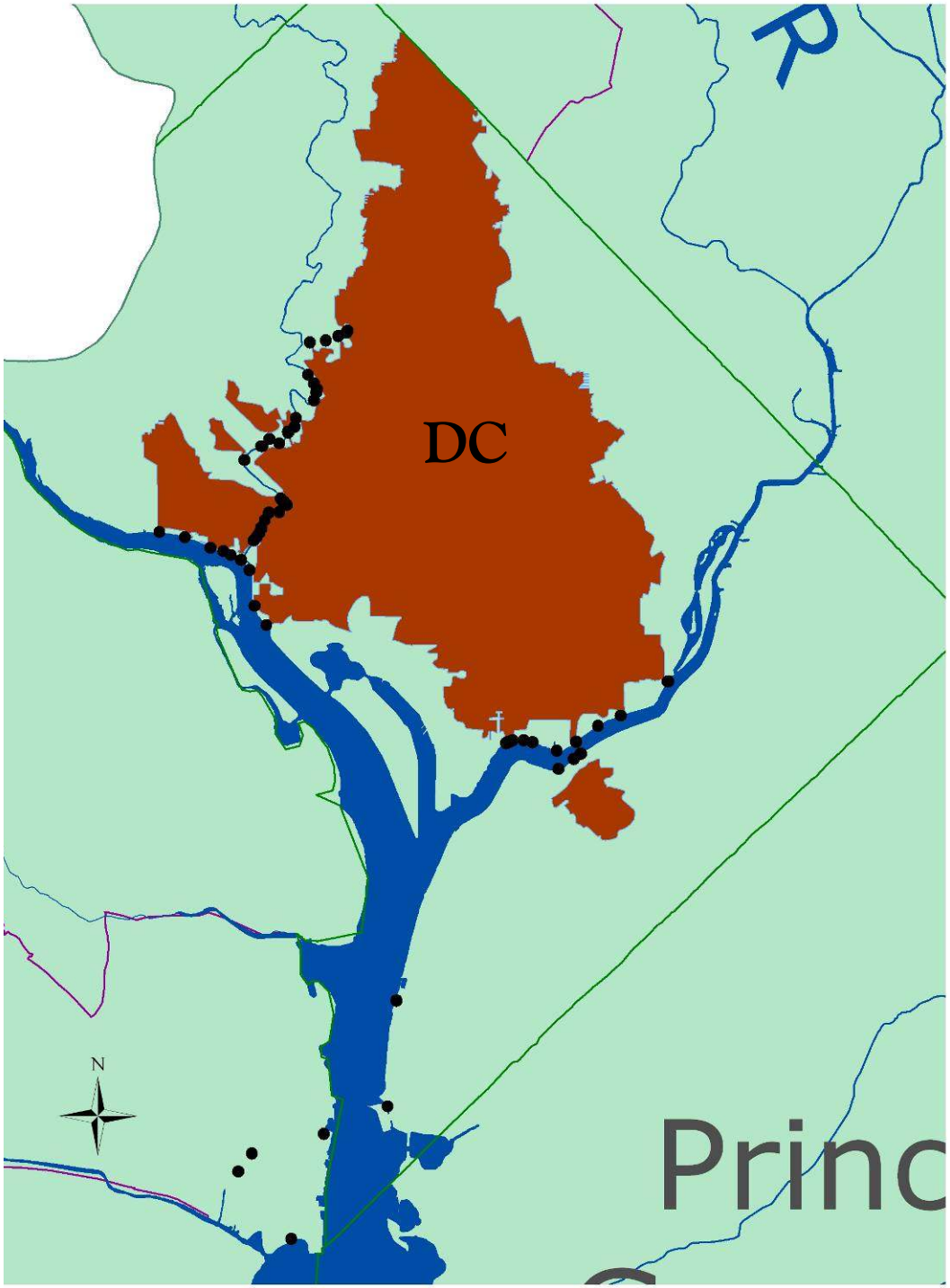
- 17 tributaries in addition to Potomac at Chain Bridge
- For each tributary, one load representing the sum of all point and nonpoint sources, is computed.
- 17 tribs. comprise about 44% of land area below Chain Bridge.

PCB Source categories



3) Direct Drainage areas.

- Point and nonpoint source flow and load from all DD area is delivered to adjacent estuarine model cells without decay or time lags.
- Point sources are individually estimated.
- DD segments comprise about 56% of watershed land area.

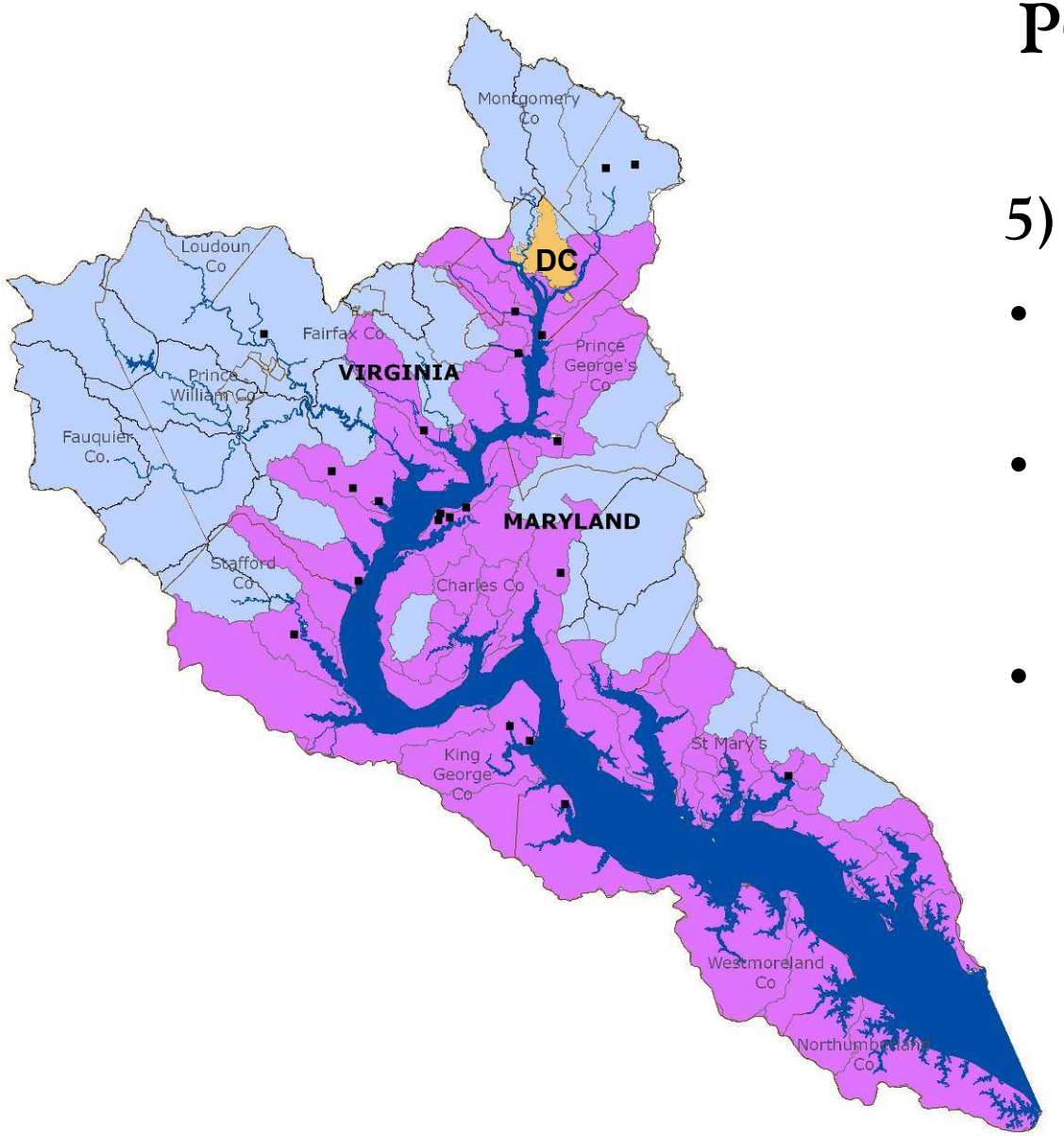


PCB Source categories

4) Combined Sewer Overflows

- 56 CSO outfalls, 12,750 acres, in DC on Anacostia, Rock Creek, and Potomac River.
- 4 CSO outfalls in Alexandria
- CBP Watershed Model has CSO watershed defined in DC in which all runoff presumed to go into CSO system.

PCB Source categories



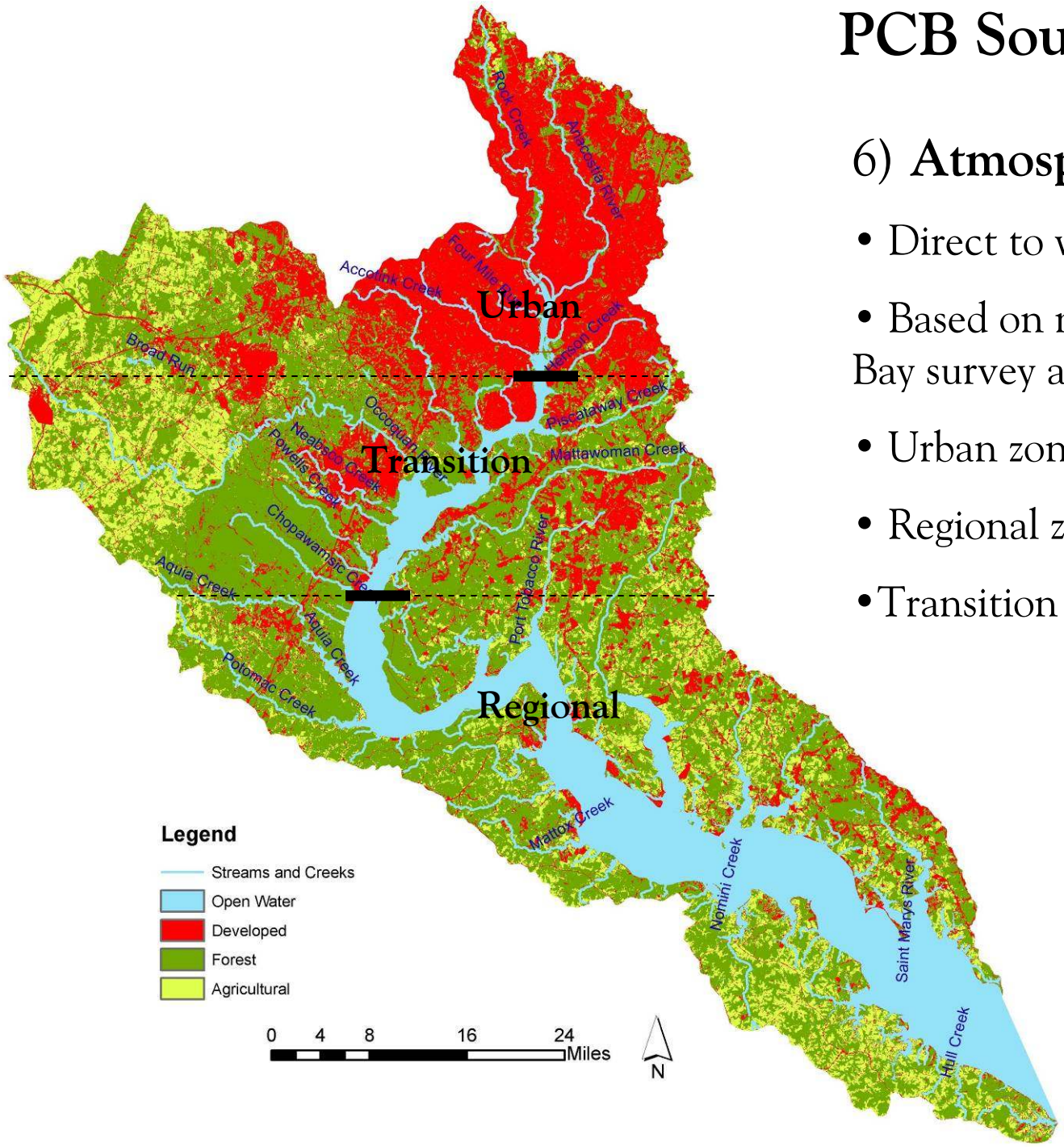
5) Point Sources

- Flow & load from 20 WWTPs input to model.
- These 20 comprise 95% of flow from all WWTPs in the watershed.
- Three additional WWTPs in trib. watershed are being tracked.

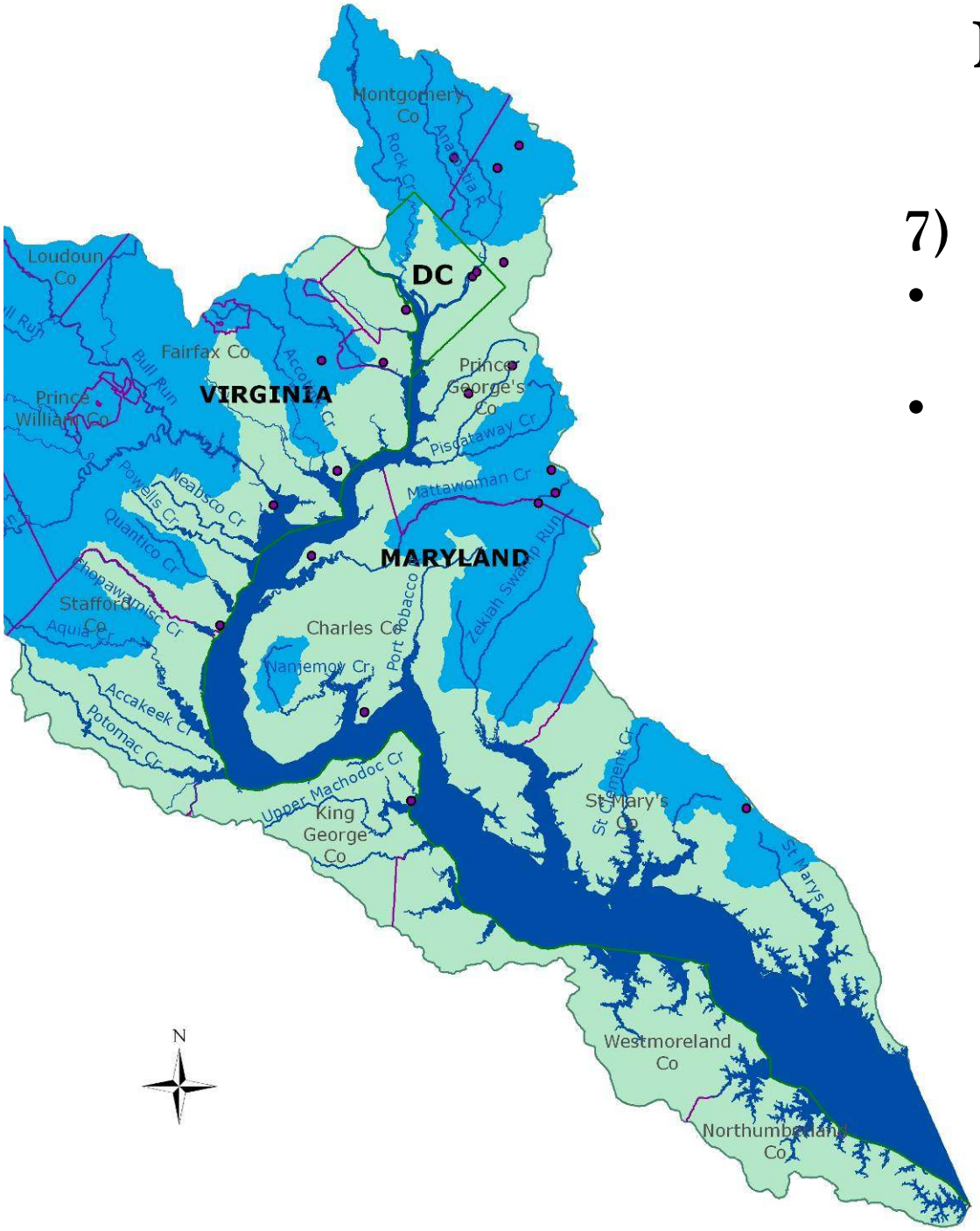
PCB Source categories

6) Atmospheric Deposition

- Direct to water surface only
- Based on mid '90s Chesapeake Bay survey and literature review.
- Urban zone 16.3 ug/m2/yr tPBC
- Regional zone 1.6 ug/m2/yr tPBC
- Transition zone interpolated



PCB Source categories



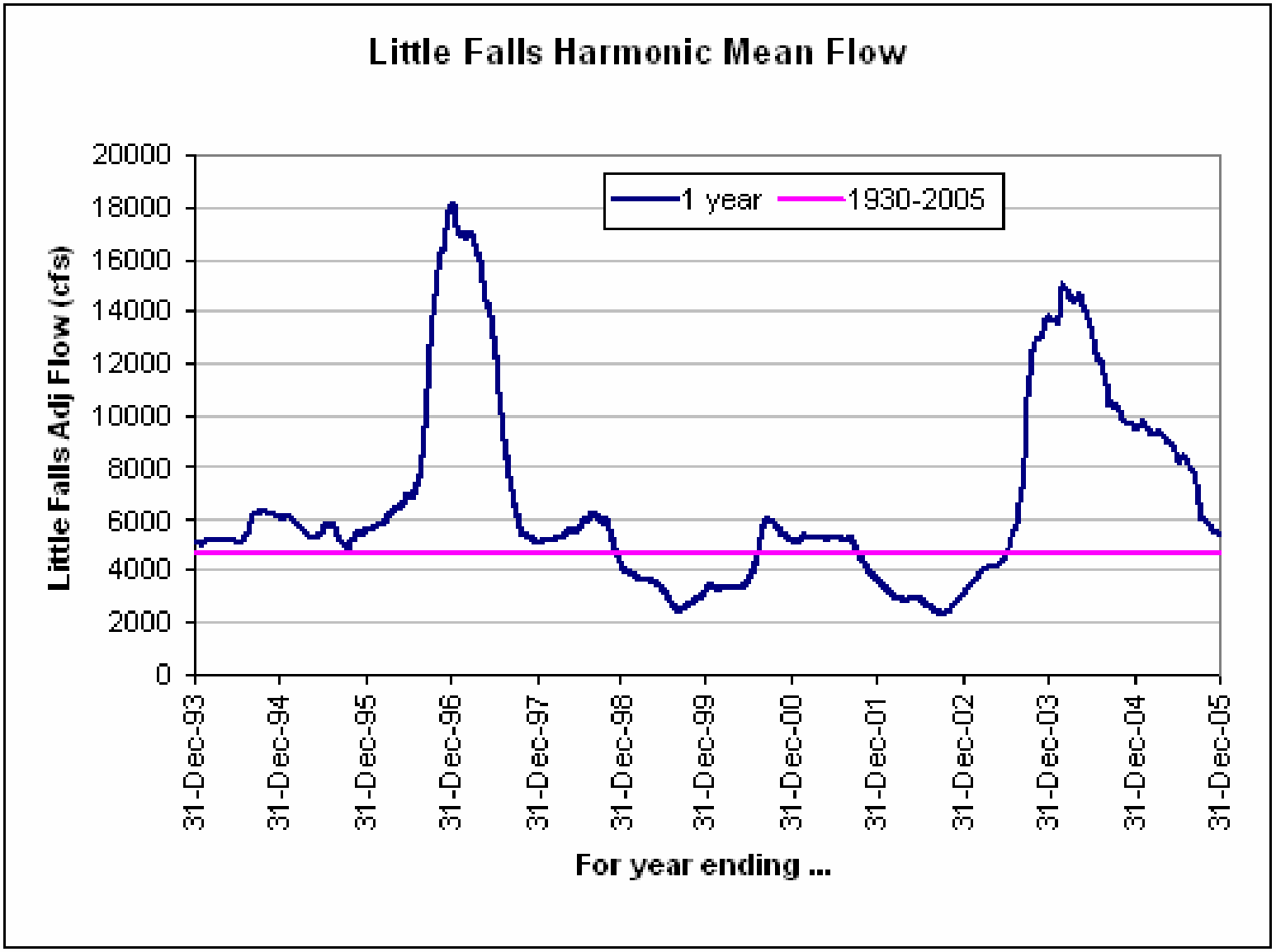
7) Contaminated Sites

- 13 sites contribute load to model
- 8 additional sites in trib. watersheds loads calculated and tracked (load implicit in trib.)

PCB Load Estimation Methods

Selecting a base flow year.

- EPA guidance and state regs recommend using harmonic mean flow for pollutants whose health impact is due to long term exposure.
- Data availability, required for calibration purposes, restricts choice to 2002-2005
- Calendar 2005 closest to long term harmonic mean.
  - ✓1931-2005 median flow (Little Falls Adj): 6,960 cfs
  - ✓1931-2005 harmonic mean flow: 4,760 cfs
  - ✓Calendar 2005 harmonic mean: 5,485 cfs


Little Falls Harmonic Mean Flow
Little Falls Adj Flow (cfs)
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1 year
1930-2005
31-Dec-93
31-Dec-94
31-Dec-95
31-Dec-96
31-Dec-97
31-Dec-98
31-Dec-99
31-Dec-00
31-Dec-01
31-Dec-02
31-Dec-03
31-Dec-04
31-Dec-05
For year ending ...

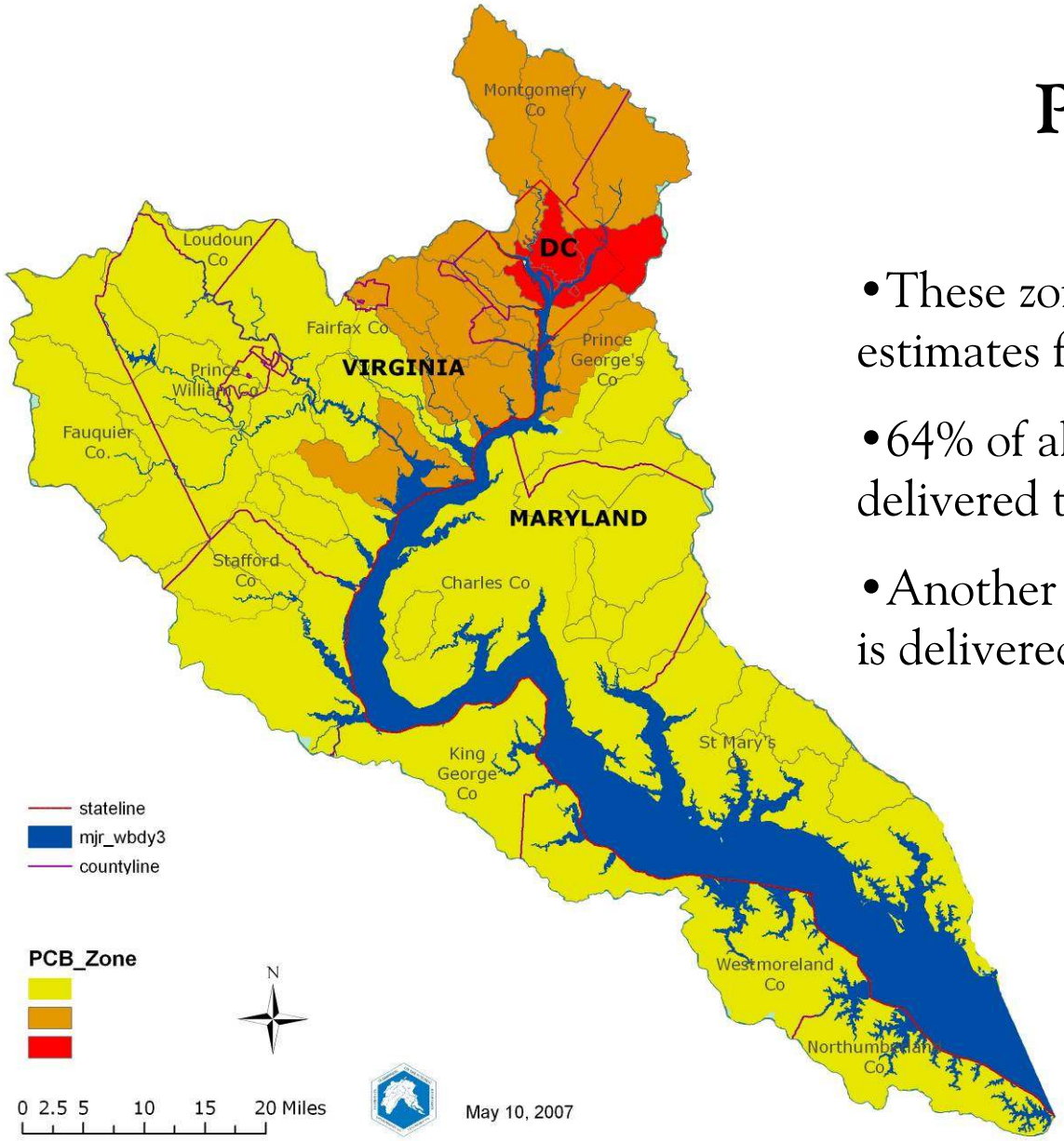
PCB Load Estimation Methods

- **Potomac River at Chain Bridge**
  - Flow = daily USGS gage flows
  - [PCB] = f(TSS), TSS = g(flow) regression model specific to Chain Bridge
- **Other Tribs, Direct Drain:**
  - [PCB] =f(TSS), TSS and flow estimated by CBP Watershed Model.
  - Different PCB:TSS relationships depending on distance, "PCB Loading Zones", from DC.
- **CSO:**
  - Very limited data, so [PCB]=f(TSS), DCUrban loading zone,
  - Constant TSS based on median from 2002-2005 sample programs,
  - Daily flow simulated by MOUSE and SWMM models.
- **Point Source:**
  - [PCB]= site specific mean of samples collected, flow based on DMRs.
- **Atmos. deposition:**
  - Mid '90s field study and literature based. PCB deposition at a constant rate in 3 deposition zones.
- **Contaminated Sites:**
  - Compute annual soil loss w/ RUSLE2. Multiply soil loss by [PCB] obtained from site specific soil samples. Annual loss rate converted to constant daily value.

PCB Load estimates for 2005 cycling year

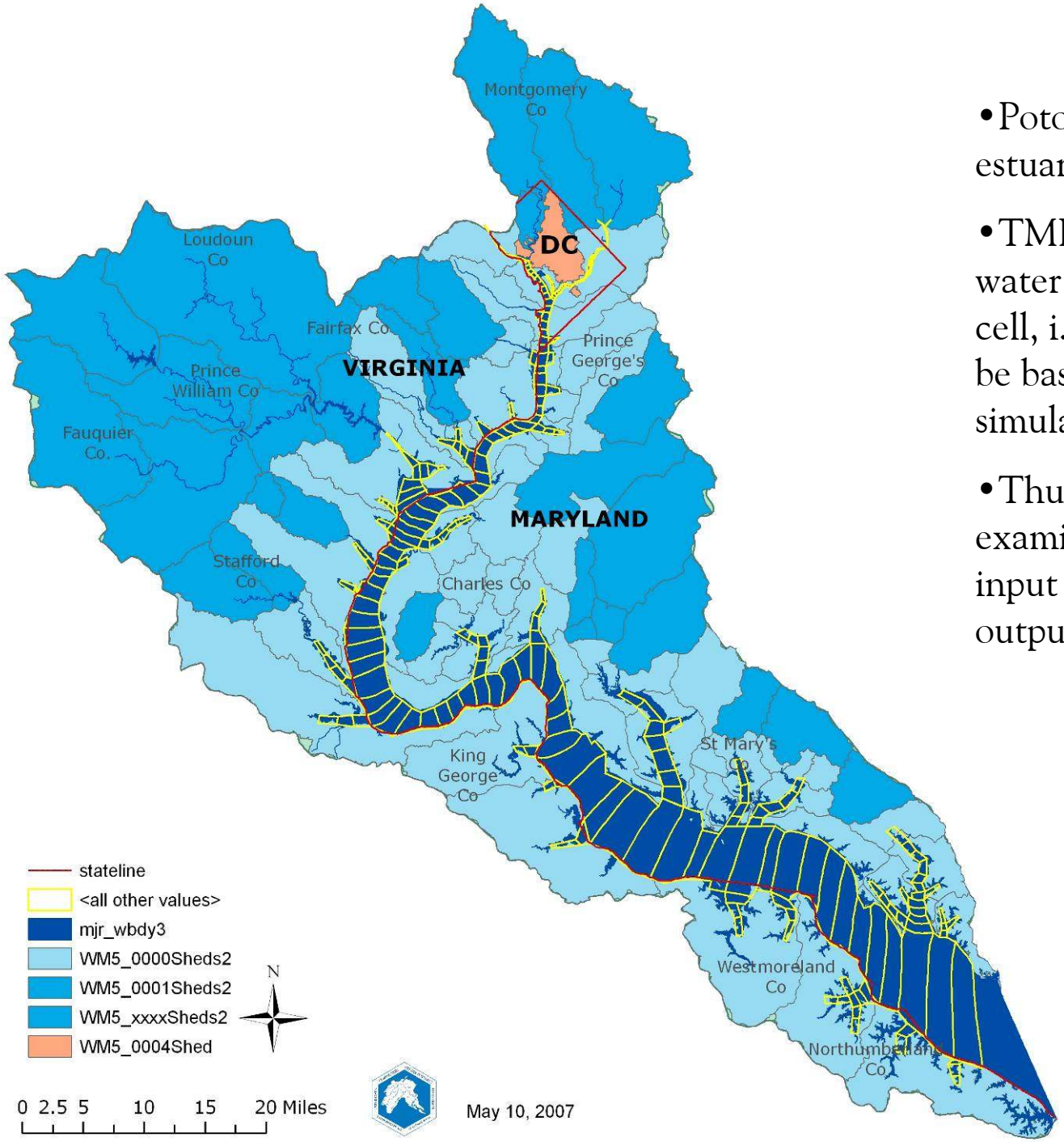
	g/yr PCB_{3-10}	%
Potomac R @ Chain Bridge	8,340	30 %
All other Tribs.	2,628	9.6%
Sum all Direct Drain Area	10,040	37 %
Combined Sewer Overflow	2,901	11 %
Point Sources (Blue Plains=644)	701	2.6%
Atmospheric Deposition	2,788	10 %
Contaminated sites	15	0.1%
Total	27,413	100 %

PCB:TSS Zones

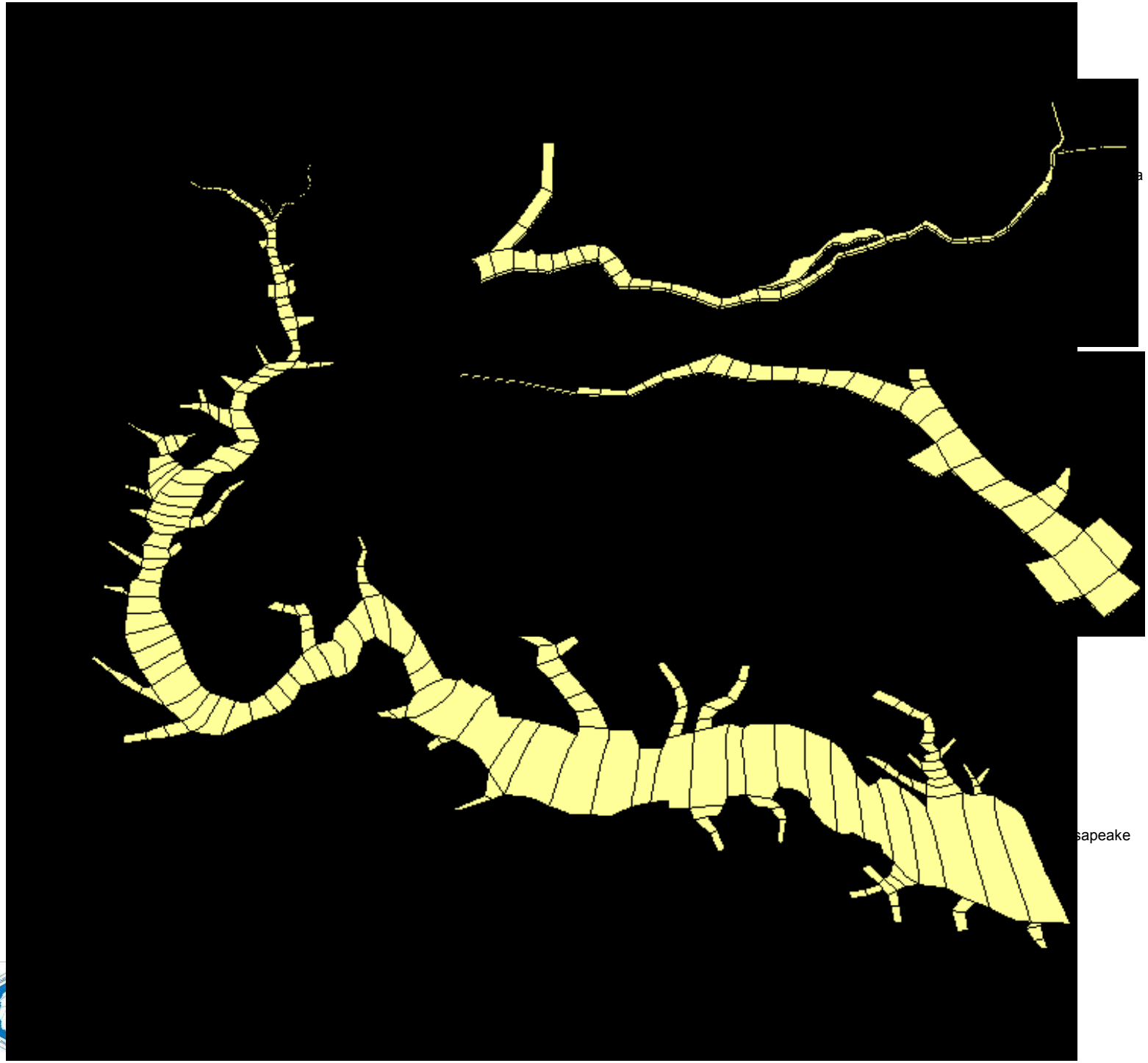


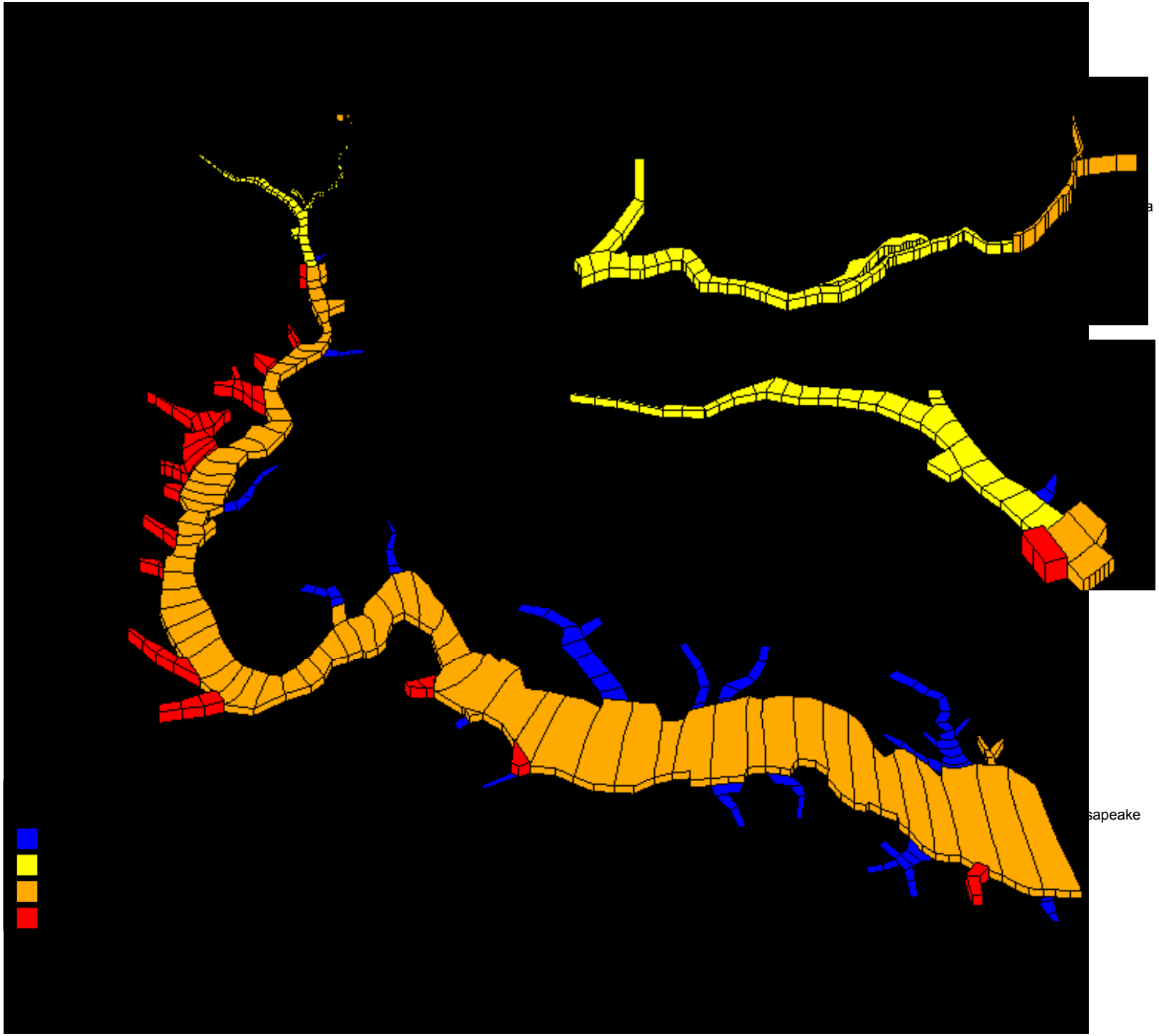
- These zones drive the nonpoint source load estimates for PCBs.
- 64% of all Direct Drain PCB load is delivered to the Anacostia
- Another 24% of all Direct Drain PCB load is delivered to Potomac in DC.

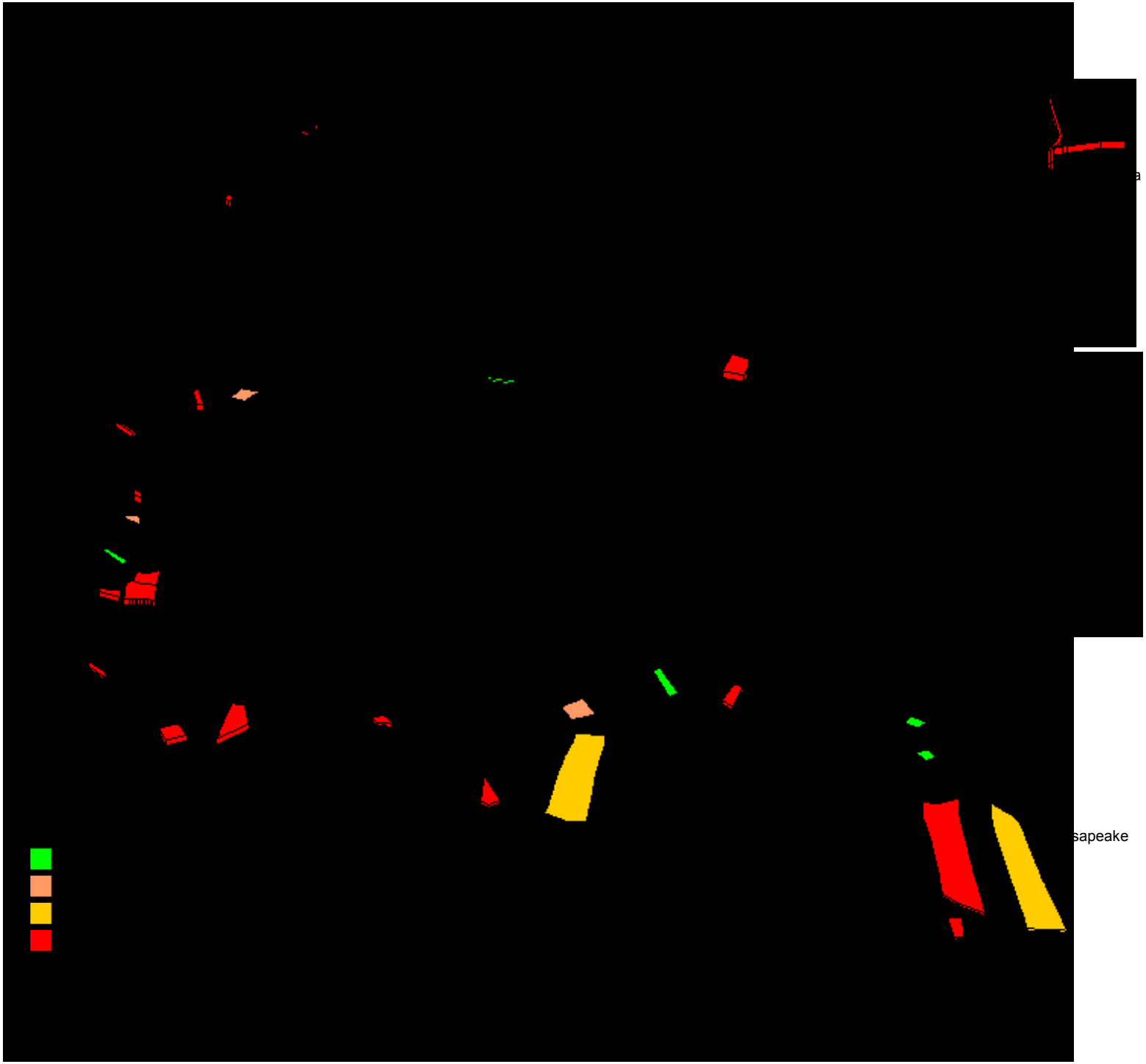
Another look at ambient data and loads, focusing on the estuary as represented by the POTPCB model.



- Potomac PCB Model divides estuary into 257 cells.
- TMDL based on meeting water quality targets in each cell, i.e. TMDL decisions will be based on the model simulation for each cell.
- Thus it can informative to examine ambient data and input loads, as well as model output, by model cell.



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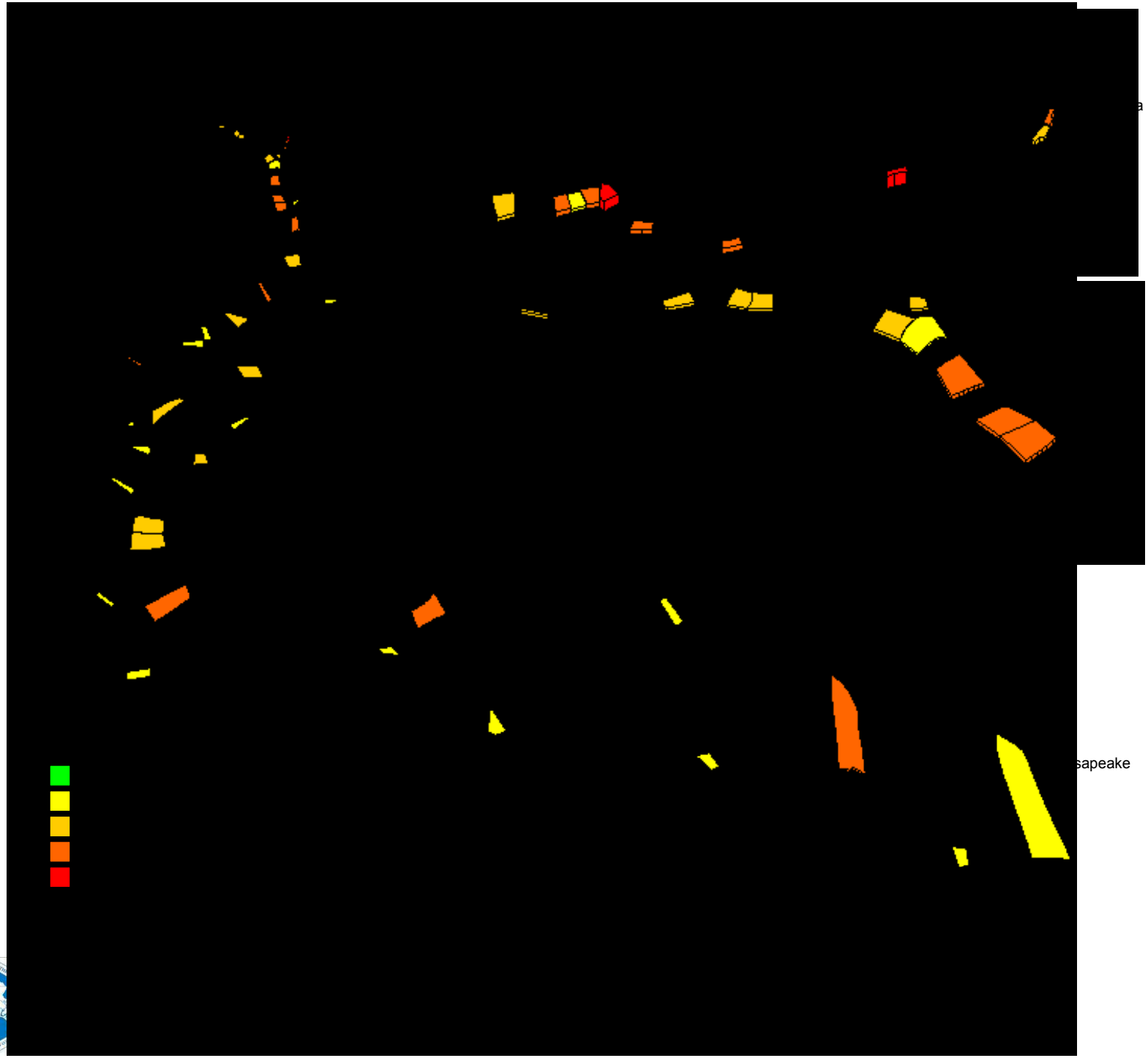
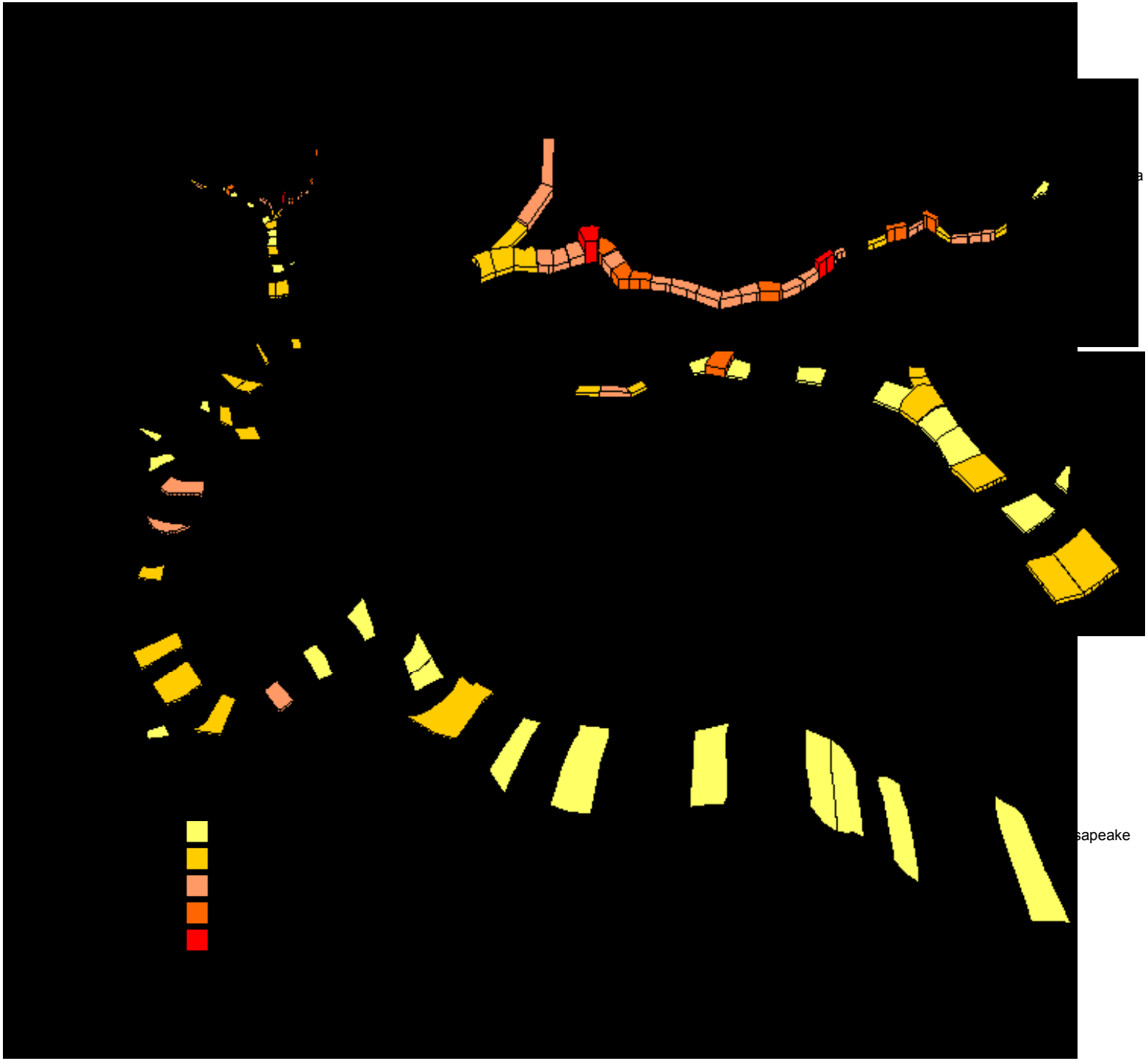
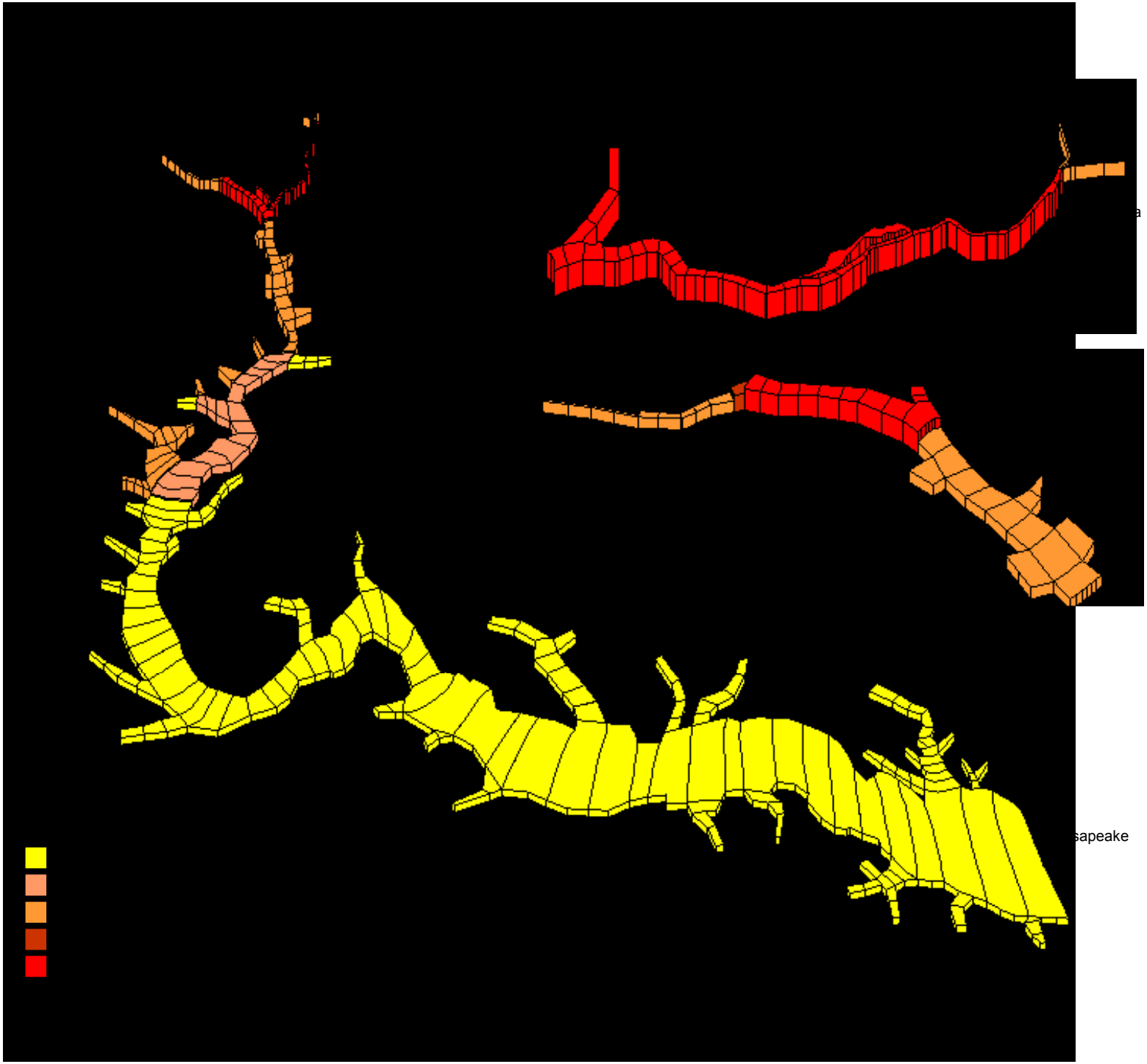
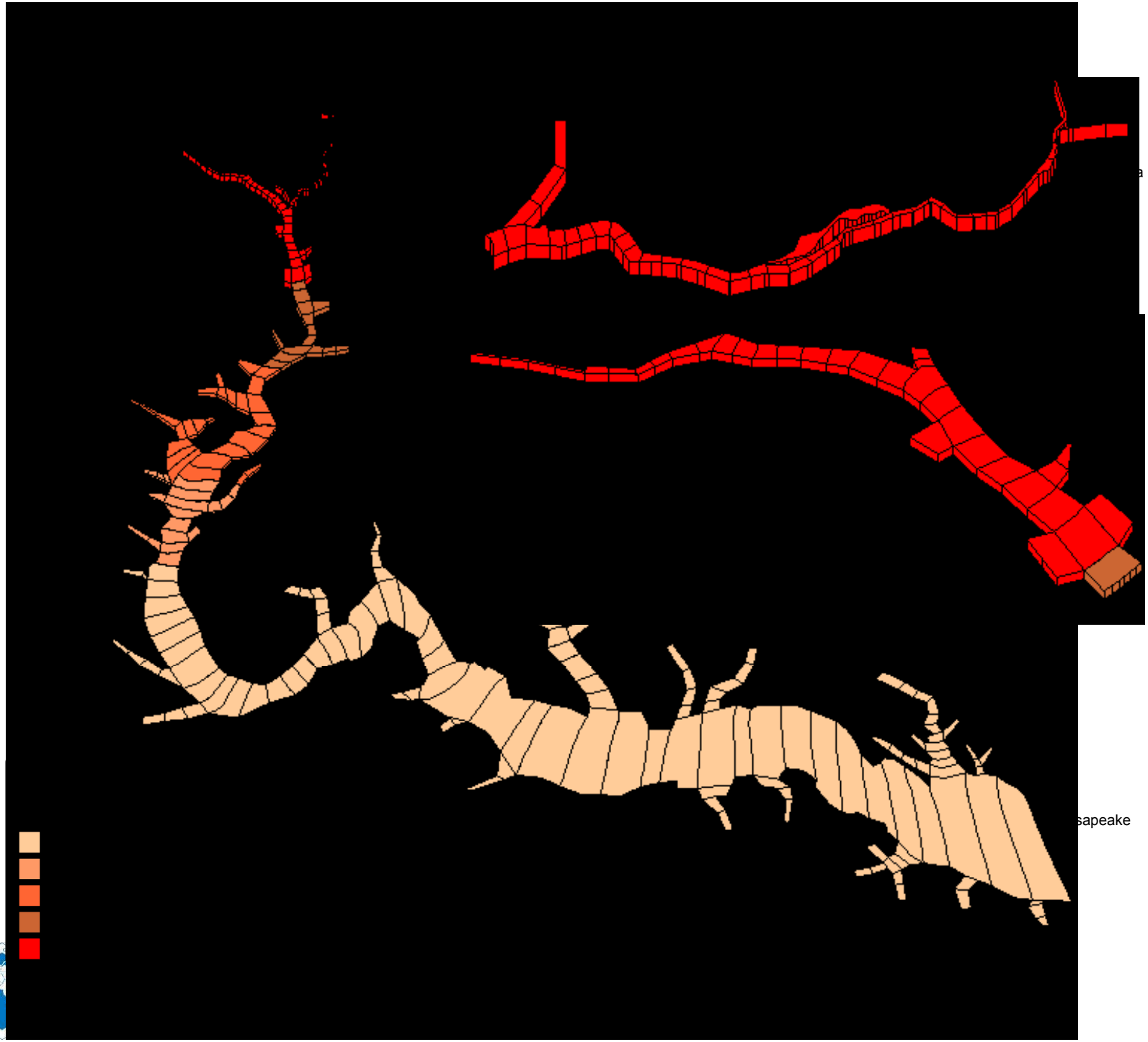
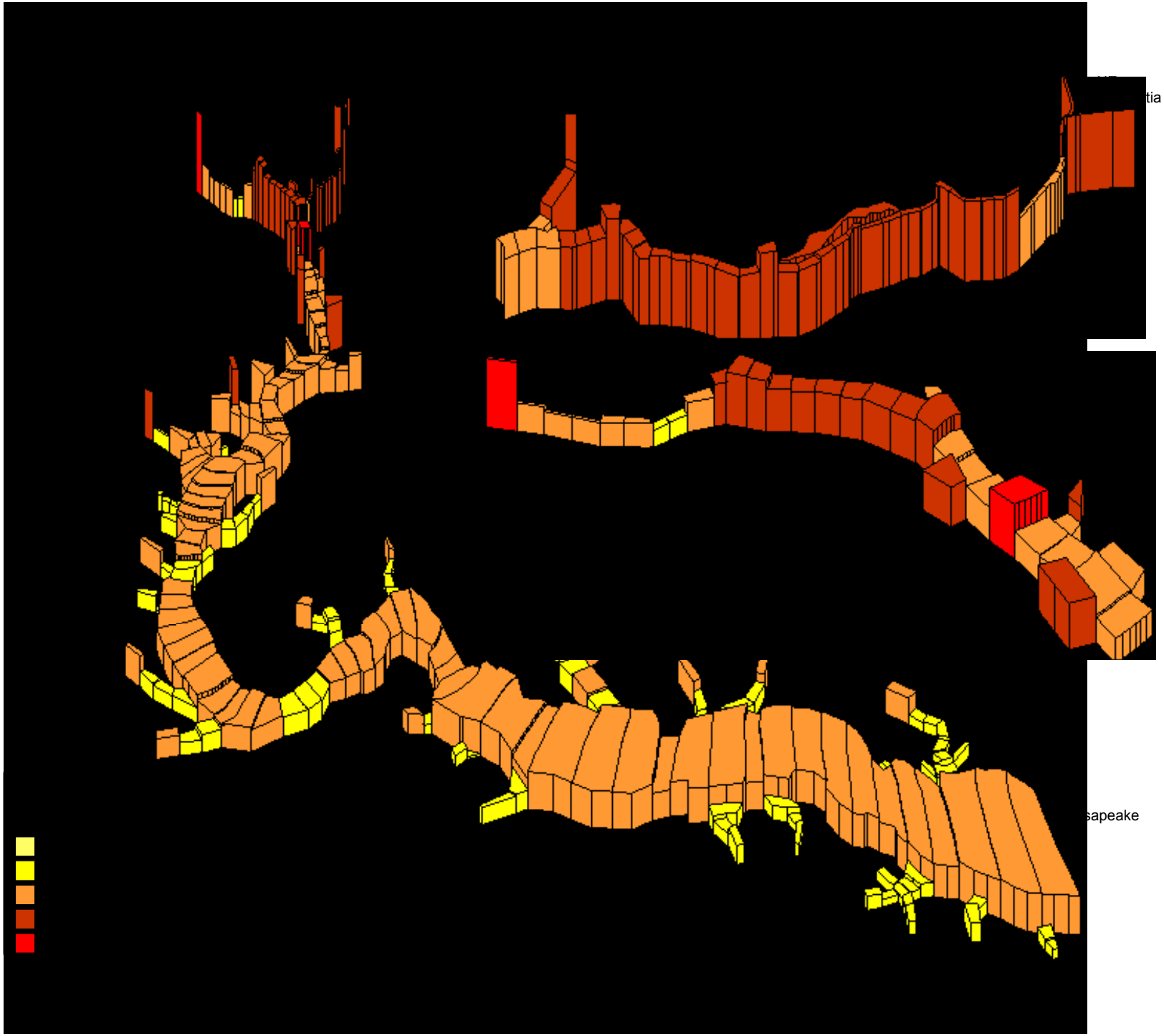
sapeake







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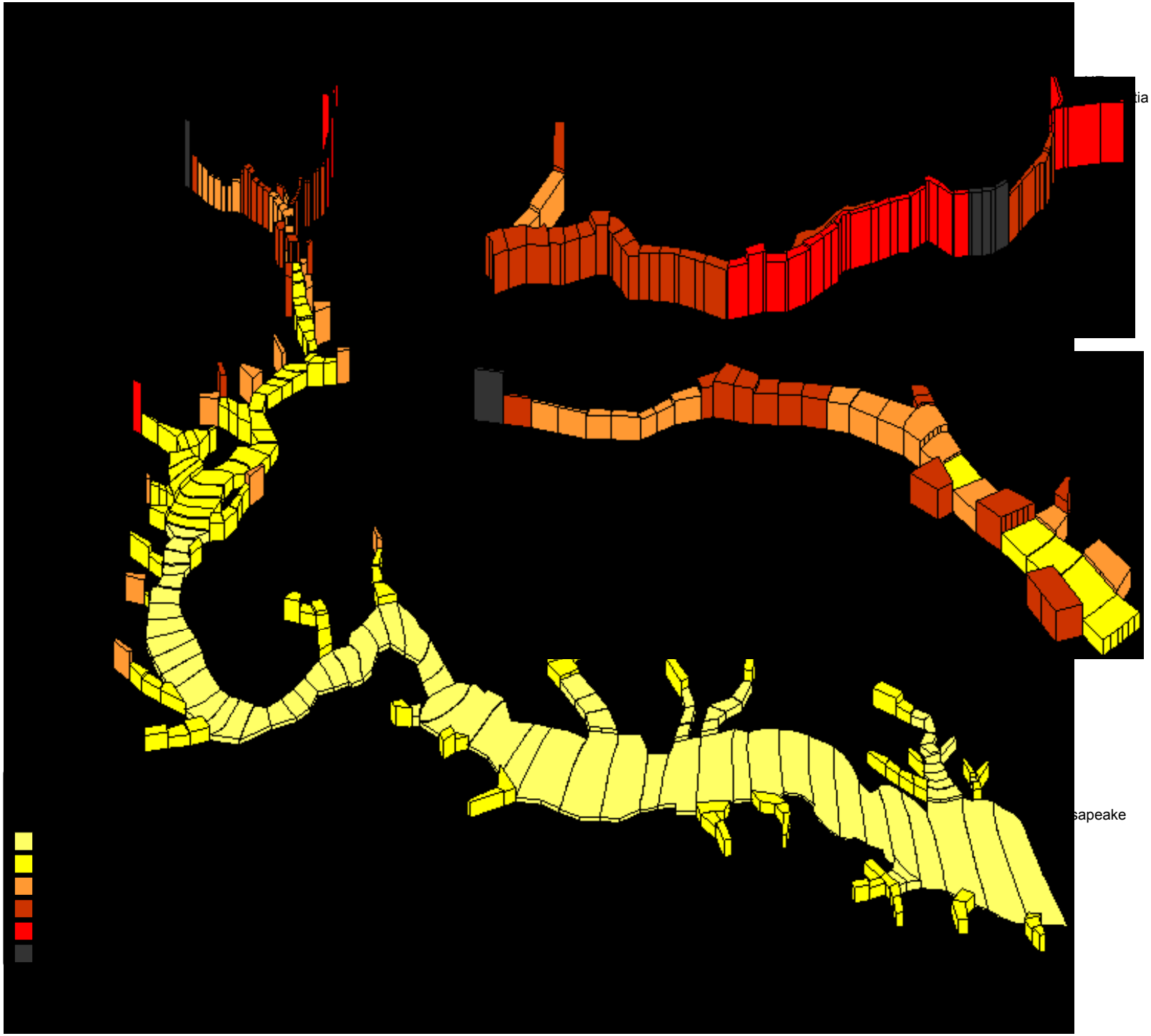
sapeake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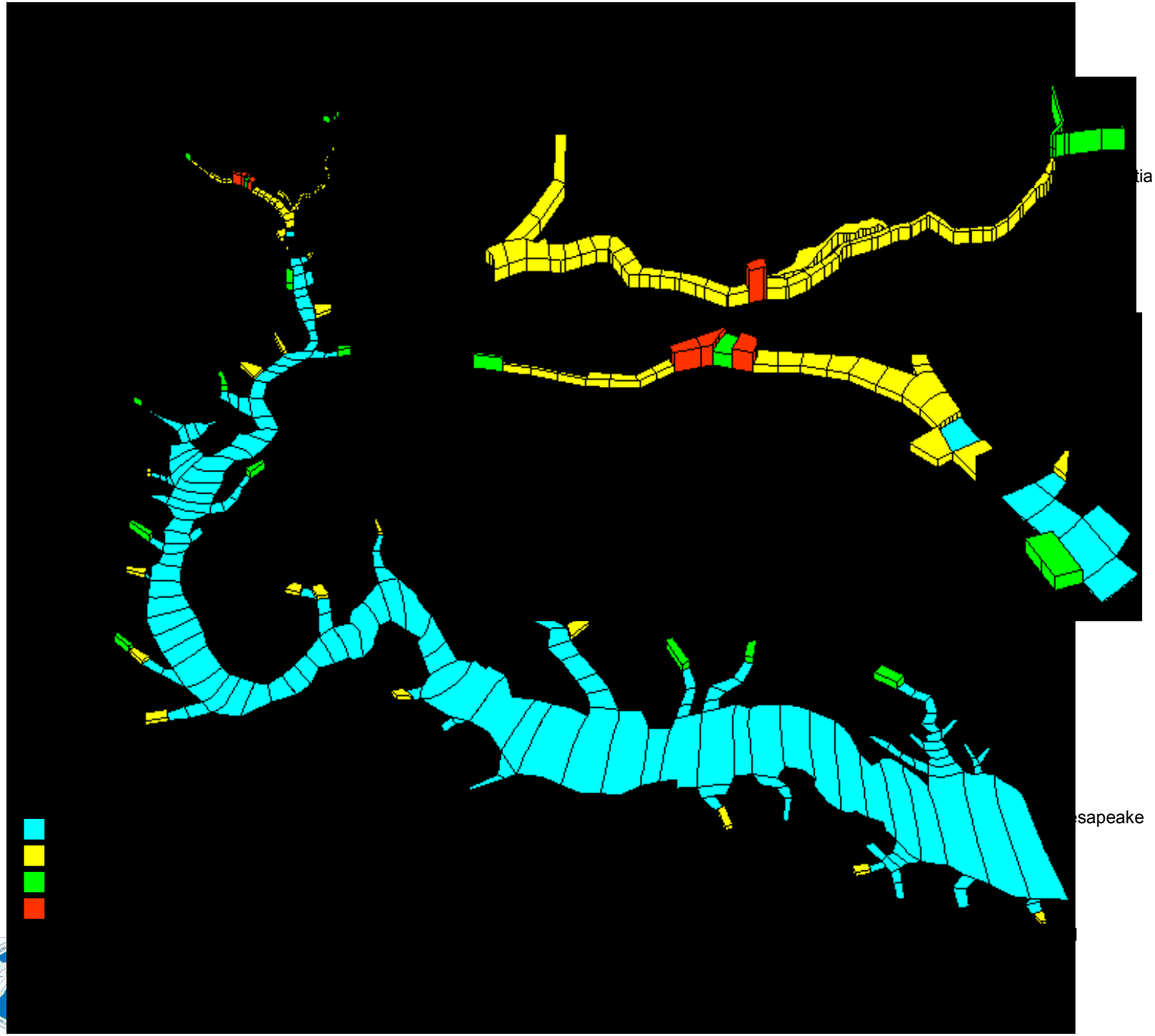
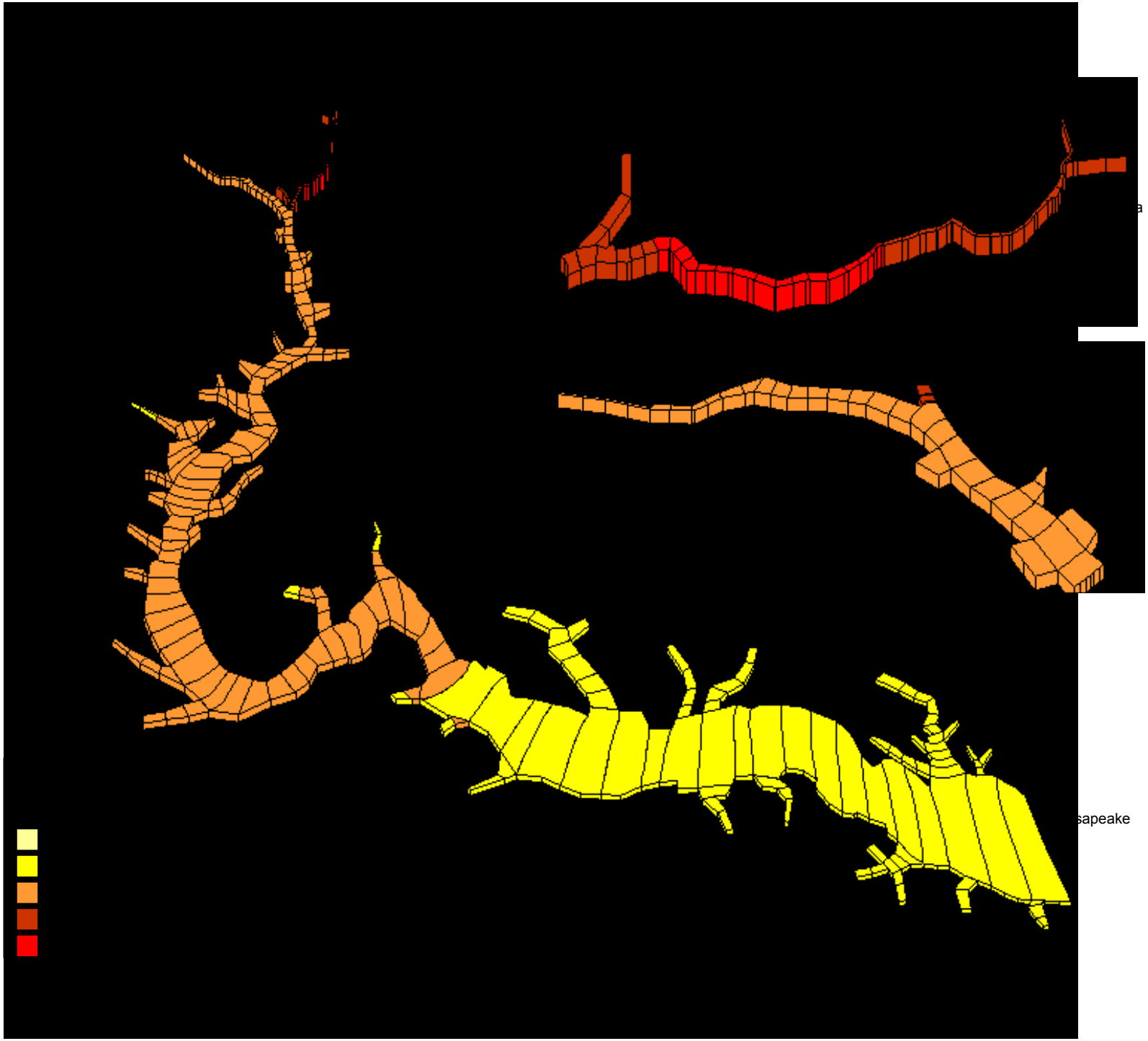
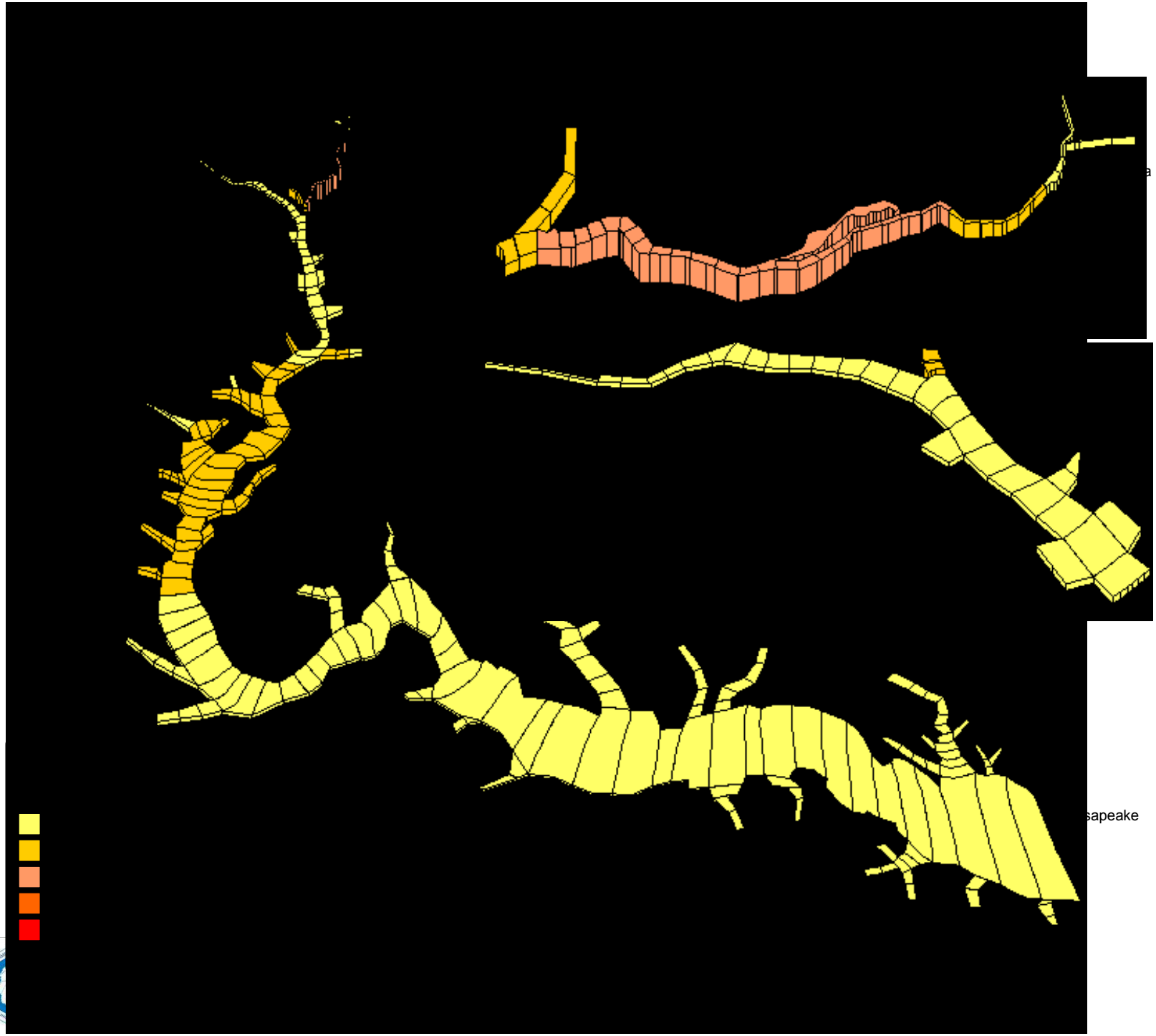
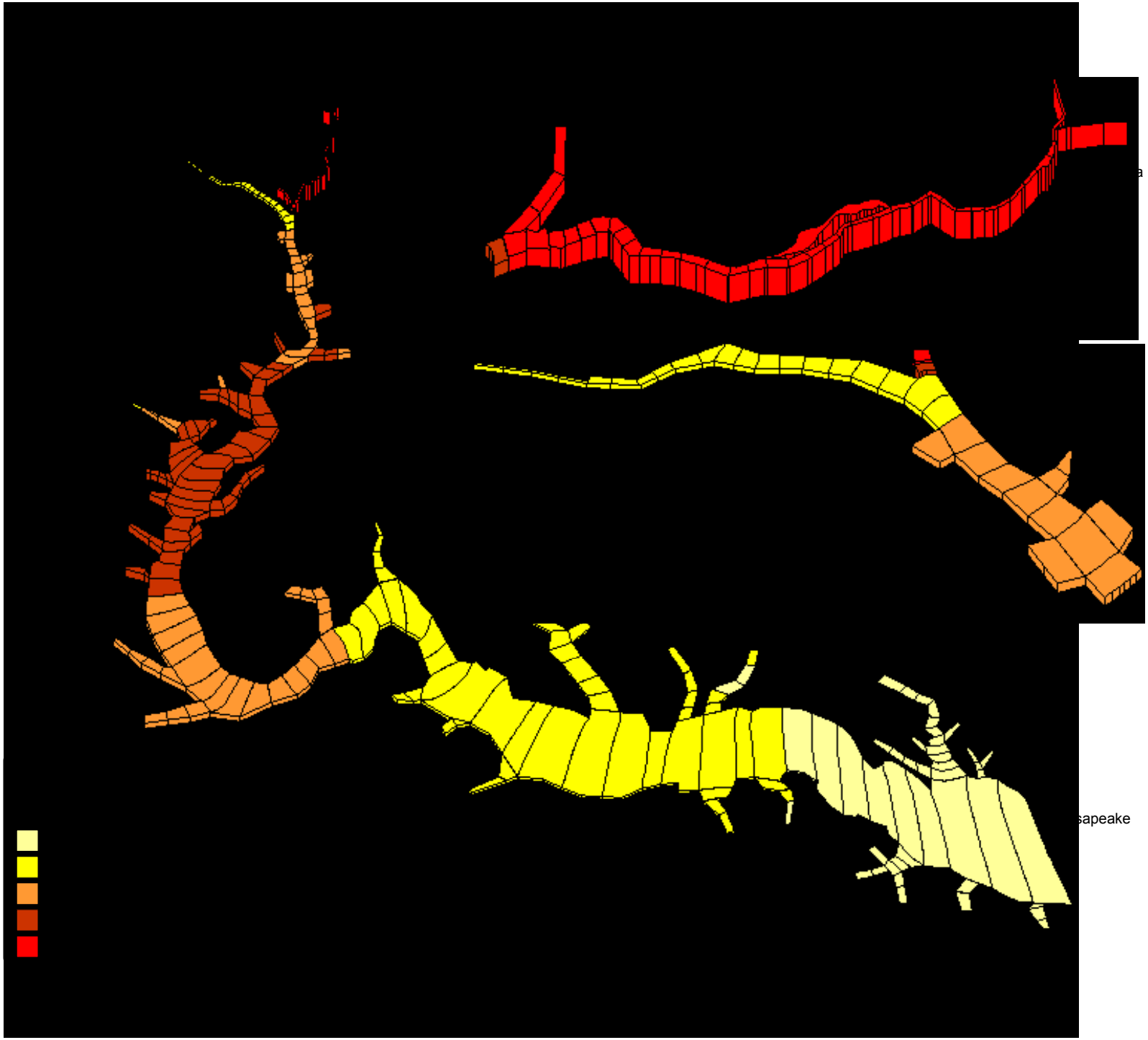








The Potomac PCB model final calibration

The PCB Target concentrations

The Potomac PCB TMDL must result in a load allocation that satisfies two benchmarks in all parts of the listed water bodies:

a. Water column concentrations less than jurisdiction-specific water quality standards; and

b. Water and sediment concentrations less than levels that result in fish consumption advisories.

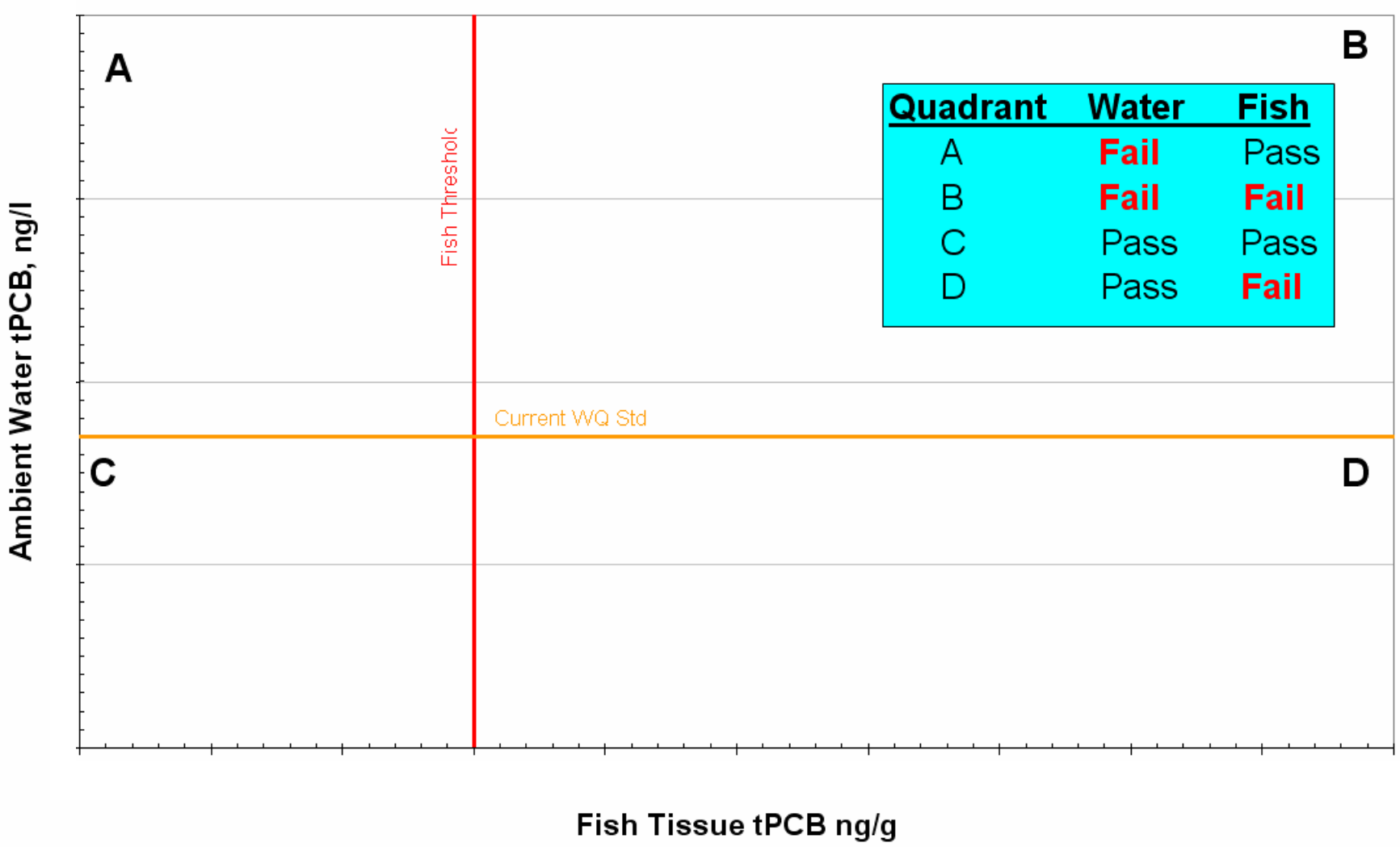
1) The TMDL will be based on a loading scenario that results in model-predicted water and sediment concentrations that, at equilibrium, are less than target concentrations in each model cell.

2) The water target will be the lessor of the jurisdiction water quality standard for total PCB or the value that, taking into account bioaccumulation, is expected to result in levels in fish that do not exceed the fish threshold.

3) The sediment target will be the value that, taking into account bioaccumulation, is expected to result in fish levels that do not exceed the fish threshold.

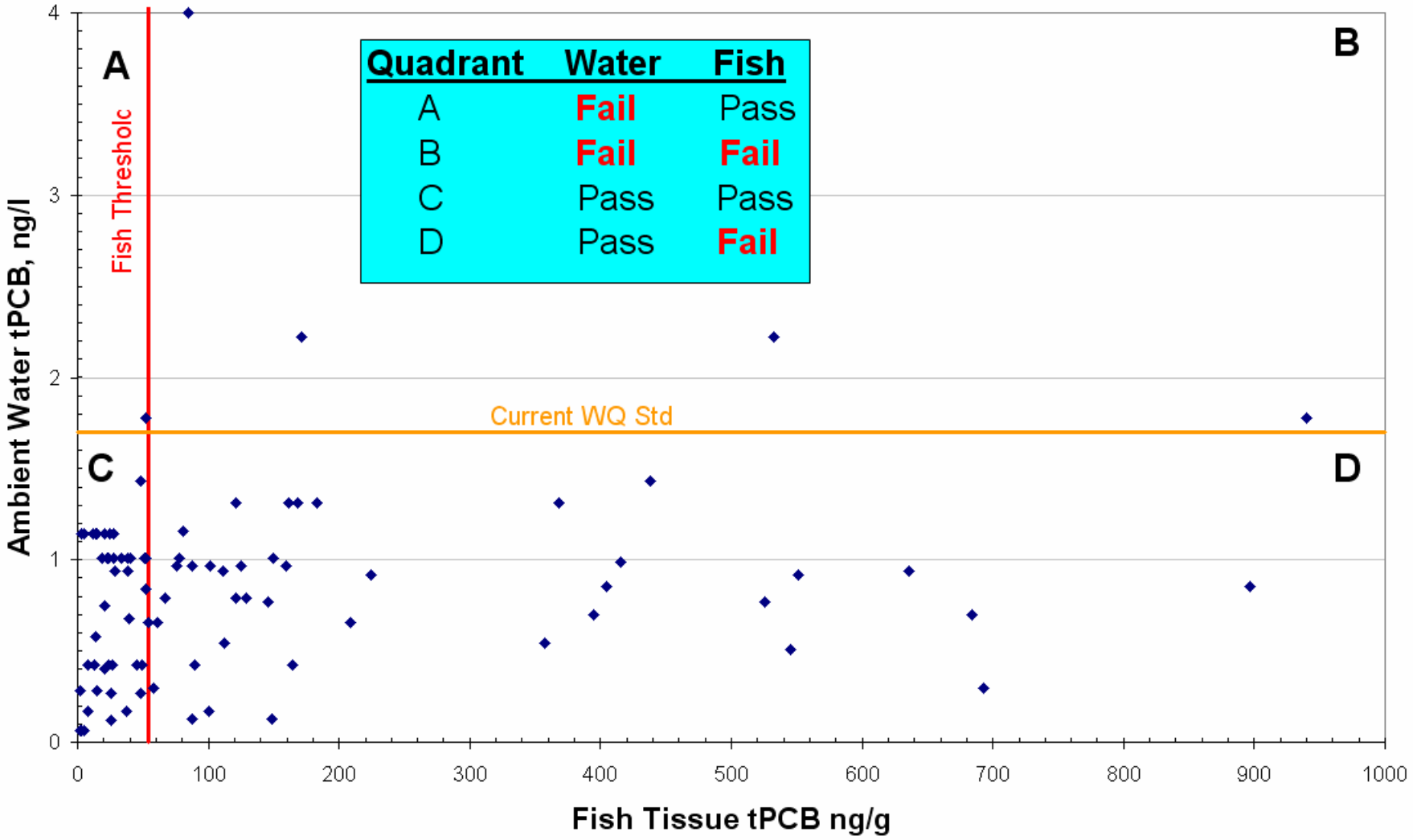
- Examination of fish and ambient water data suggest that a TMDL load scenario that meets current water quality standards may not meet [PCB] in fish screening thresholds.
- Following slides illustrate the problem.
- Jurisdictions are currently evaluating methods for setting water and sediment concentration targets that will be protective of fish thresholds.

Compare fish and ambient water tPCB



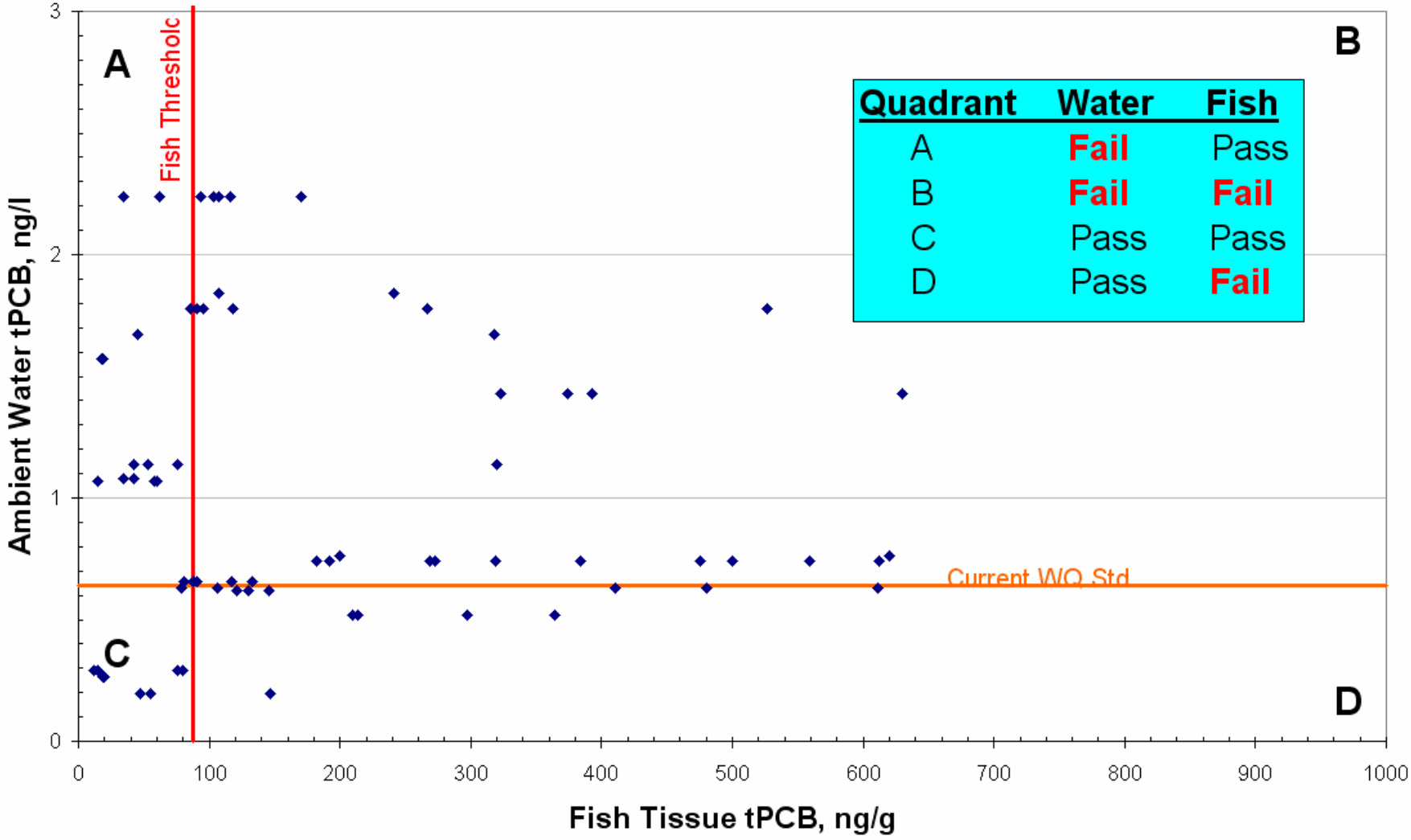
Quadrant	Water	Fish
A	Fail	Pass
B	Fail	Fail
C	Pass	Pass
D	Pass	Fail

Compare fish and ambient water tPCB in Virginia



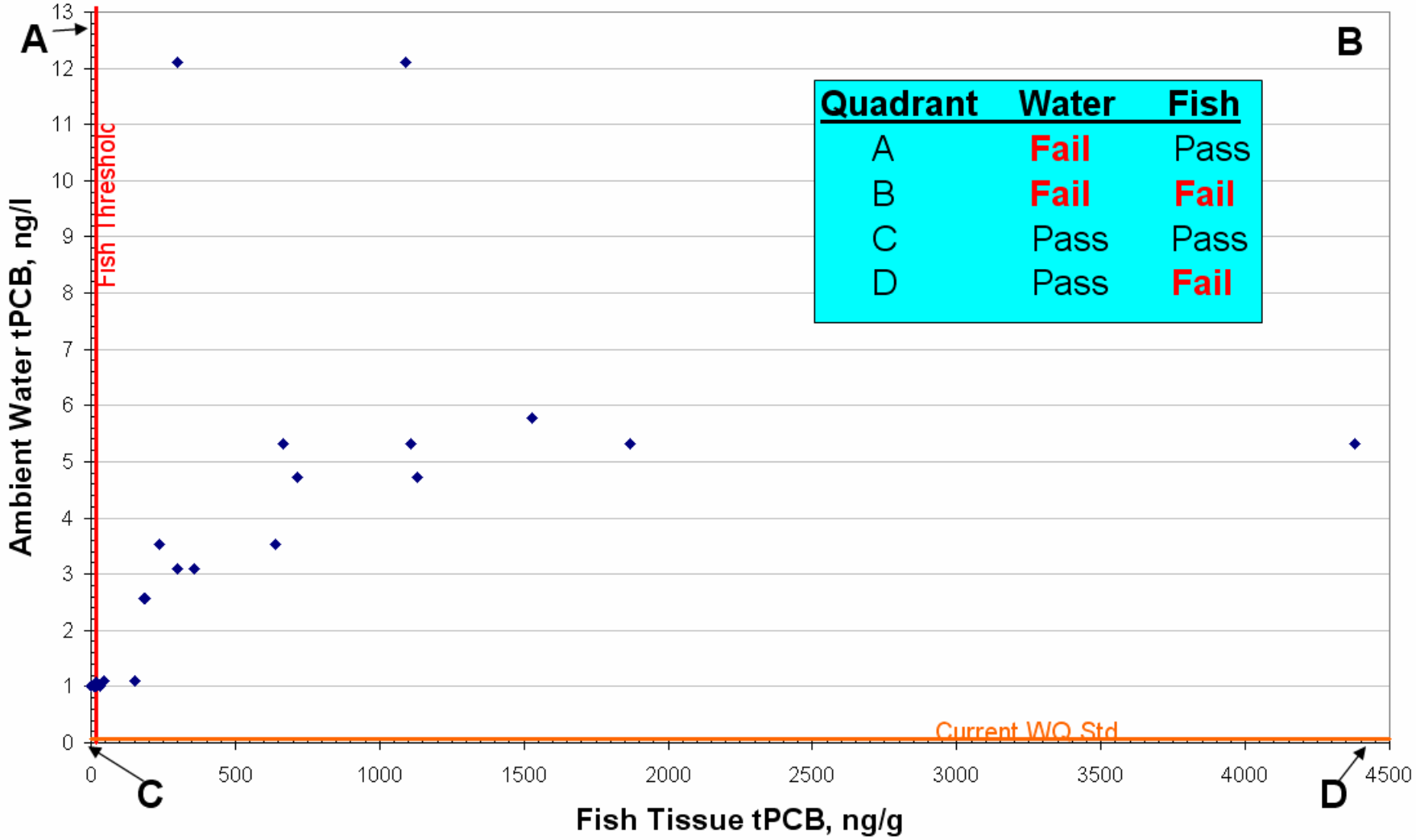
Compare fish and ambient water tPCB in Maryland

WQ Std: 0.64 ng/l Fish Screen Threshold: 88 ng/g



Compare fish and ambient water tPCB in District of Columbia

WQ Std: 0.064 ng/l Fish Screen Threshold: 20 ng/g



Quadrant	Water	Fish
A	Fail	Pass
B	Fail	Fail
C	Pass	Pass
D	Pass	Fail

Additional information about this TMDL,

including documents and copies of presentations from this and previous meetings, can be found at

http://potomacriver.org/water_quality/pcbtmdl.htm

Points of contact for the PCB TMDL

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Virginia: Mark Richards, marichards@deq.virginia.gov , (804)698-4392

EPA: Charles App, app.charles@epa.gov , (215)266-1928

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Questions?