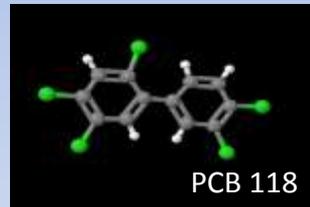


PCB TMDL Overview



Mark Richards

New River PCB TMDL TAC Meeting

May 26, 2016

Total PCB State Water Criteria

	Fish Tissue Threshold (ppb)	WQC (pg/l)
VDH	100 (Fish Consumption Advisory)	- -
DEQ	20 (Screening Value)	640

- DEQ's Water Quality Assessment (Integrated Report)
 - VDH - Consumption Advisory = impairment
 - DEQ - two or more fish samples exceed screening value at a site or two water samples exceed criterion at a site = impairment



Components of TMDL Study

Fish Consumption Advisory



Identify Problem

Underway



Source Assessment

- Identify sources
- Estimate source loading

Method 1668
Low Level PCB
Analysis

Link Sources to Targets

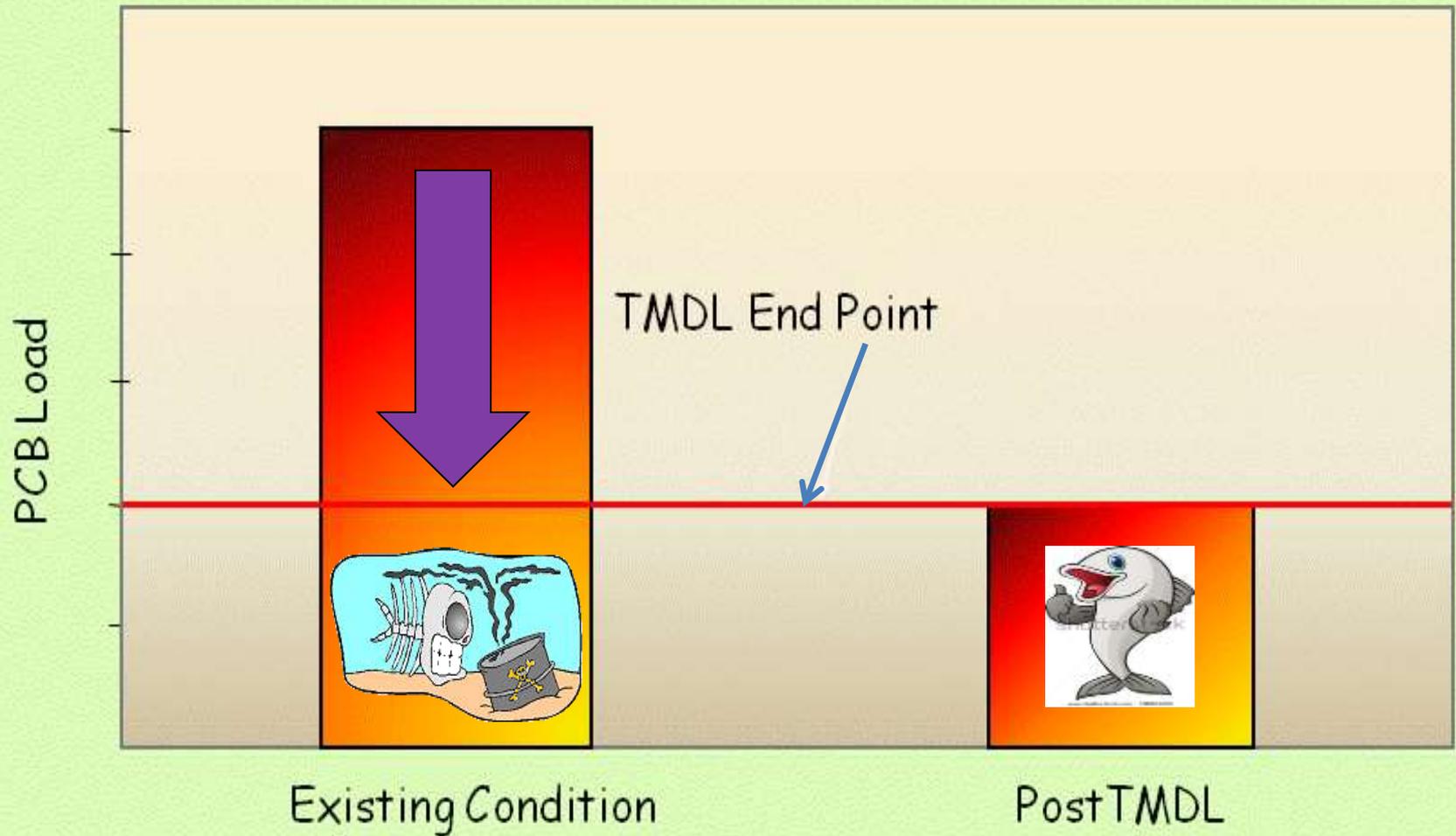
- Assess linkages
- Estimate total loading capacity

TMDL Allocations

- Reduce loads from sources
- Divide remaining loads among sources

An Example TMDL

Goal = Reduce existing PCB load to restore fish consumption use



TMDL Source Category – Point Sources

- Permitted facilities selected using DEQ's PCB Monitoring Guidance (TMDL GM 09-2001)
 - Municipal WWTP (10)
 - Individual Industrial Facilities (5)
 - Industrial Storm Water General Permitted Facilities (18)
- PCB effluent data collected from most facilities
 - Default tPCB values used when low level PCB data unavailable
 - Specific to Standard Industrial Classification (SIC)
 - Median tPCB concentrations derived from statewide database.



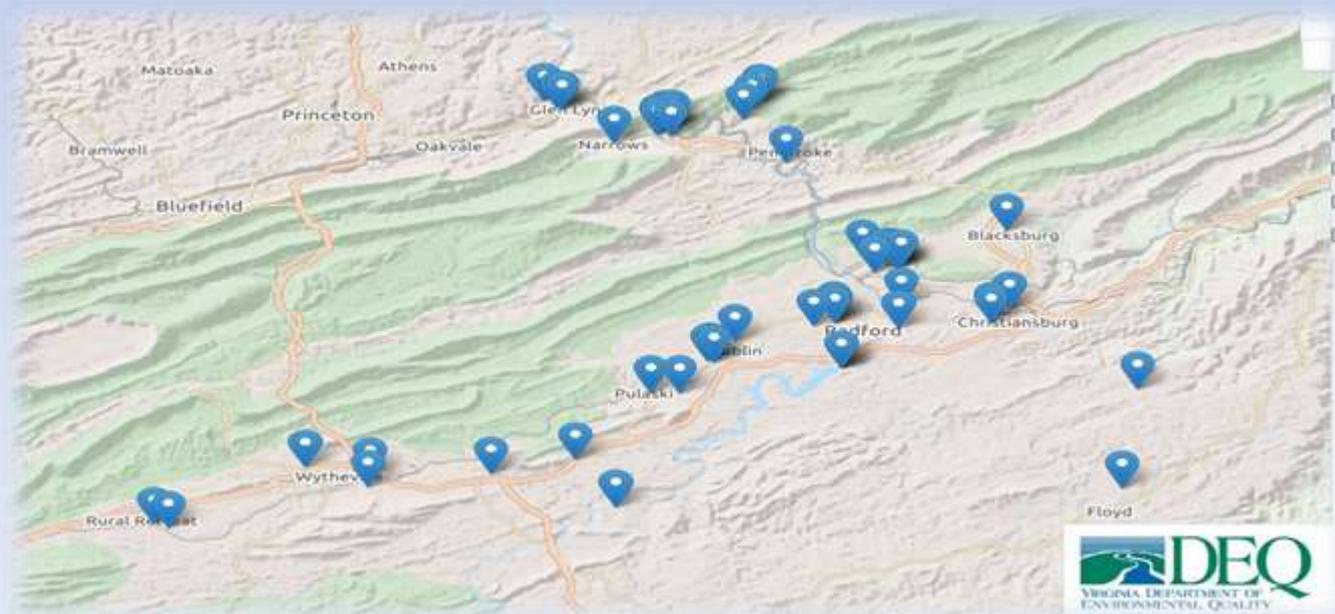
Point Source Flow Matrix

Wastewater Type		Discharge Flow <i>(Flow Used for Calculation of Baseline Loads & WLAs)</i>
Municipal		Design Flow (Used for WLA)
		10 yrs Monthly Ave Flow (Used for Baseline Load)
* Industrial Storm Water General Permits (ISWGPs)		Flow calculated from inputs including impervious acreage and industrial activity acreage
* Individual Industrial	Process Water	Baseline Load uses Mean of DMR monthly average flow WLA = Mean of DMR daily max flow
	Comingled (process water can't be separately measured from SW)	
	Storm Water	Acreage applicable to outfall drainage area (industrial activity acreage and impervious acreage)

***A single baseline load and WLA is calculated from each applicable facility regardless of the number of outfalls.**

TMDL Source Category – Point Sources

- Assigned Waste Load Allocations
 - Existing (baseline) condition calculated and compared to WLA
 - Existing condition > WLA will be assigned PCB Reductions



TMDL Source Category – Point Sources

- MS4s
 - Montgomery County (VAR040134)
 - Virginia Tech (VAR040049)
 - Town of Blacksburg (VAR040019)
 - Town of Christiansburg (VAR20025)
 - Radford City (VAR040135)
 - Radford University (VAR040136)
 - VDOT Roads
- Spatial acreage based on 2010 Urban Census area
- Loading estimates will be modeled



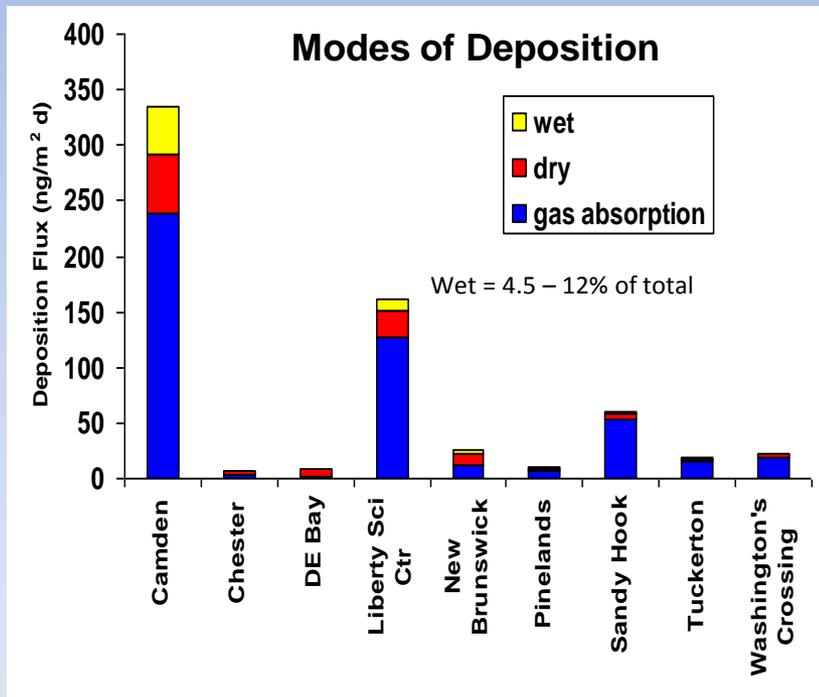
TMDL Source Category - Contaminated Sites

- RCRA Corrective Action Facilities
- Former Manufacturing Facilities (EPA Emergency Response)
- Voluntary Remediation Sites
- Landfills
- Rail Yards/Spurs
- Miscellaneous spill sites

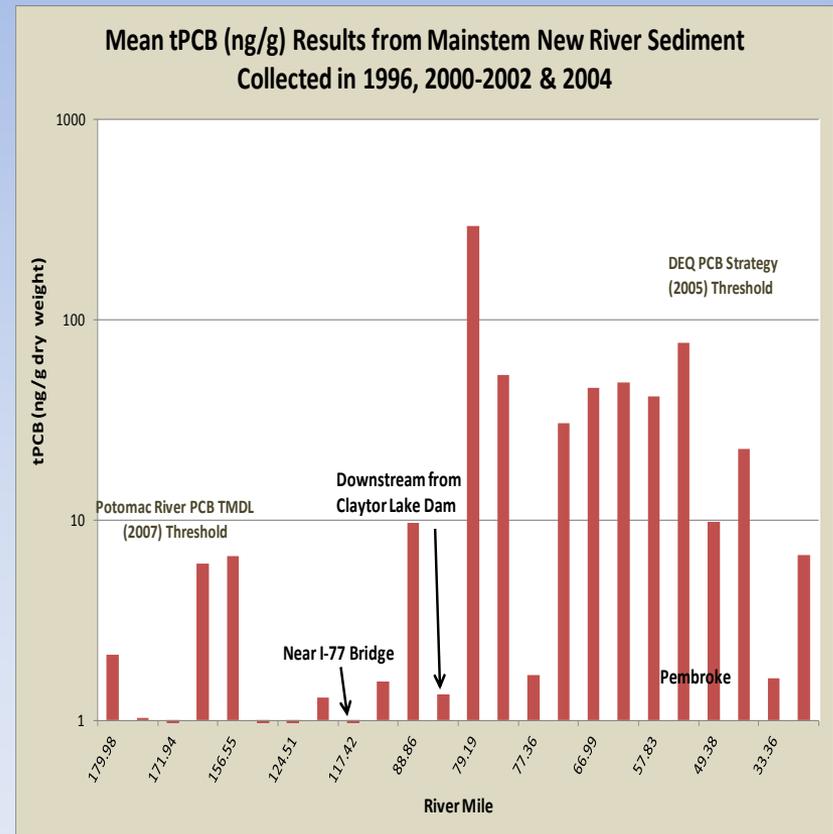


TMDL Source Categories

- Atmospheric Deposition
- Contaminated Sediment

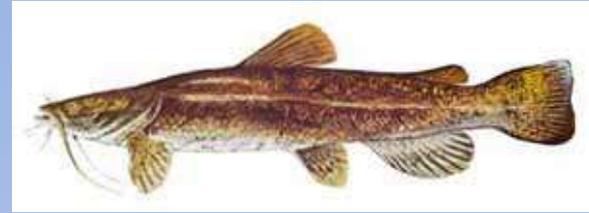


Rodenburg (Totten), L. A. et al., 2007. Rutgers University

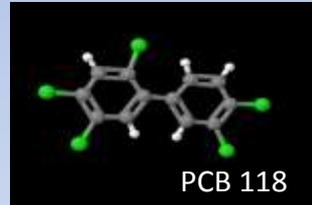


QUESTIONS





PCB TMDL Endpoints



Mark Richards

New River PCB TMDL TAC Meeting

May 26, 2016

State Water Criteria

TMDL has two endpoints

	Fish Tissue Threshold (ppb)	WQC (pg/l)
VDH	100 (Fish Consumption Advisory)	- -
DEQ	20 (Screening Value)	640

- DEQ's Water Quality Assessment (Integrated Report)
 - VDH - Consumption Advisory = impairment
 - DEQ - two or more fish samples exceed screening value at a site or two water samples exceed criterion at a site = impairment



VDH Threshold



- In 2012 increased fish tissue PCB threshold from 50 ppb to 100 ppb

VDH Changes -

- Increased body weight from 70 kg to 80 kg (176 lbs)
 - Changed life expectancy inc. from 70 yrs to 78 yrs & from 30 yrs to 32 yrs a person would live in the same residence
 - Decreased from four meals/month to two
- Designed to protect public health when contamination has been identified.
 - Risk Assessment calc. designed for known contamination in a finite geographical area (e.g., Superfund site).



Note: VDH is not required to go through administrative regulatory process to change threshold(s)

VA Water Quality Criterion

- VA PCB criterion based on EPA guidelines
- Fish Screening Value basis of criterion
 - Water concentration translated using a Bioconcentration Factor (BCF)
 - Lab derived translator developed in the early 80's
 - Assumes fish only obtain PCBs through gills from the water column (ratio of PCB conc. in fish to that in water)
 - **What about other exposure pathways?**

$$\text{Water Quality Criterion} = \frac{\text{RL} \times \text{BW}}{\text{CSF} \times (\text{CR} \times \text{BCF})} \quad \text{Fish Screening Value} = \frac{\text{RL} \times \text{BW}}{\text{CSF} \times \text{CR}}$$

Where:

BW = average adult body weight **70 kg** (154 lbs.)

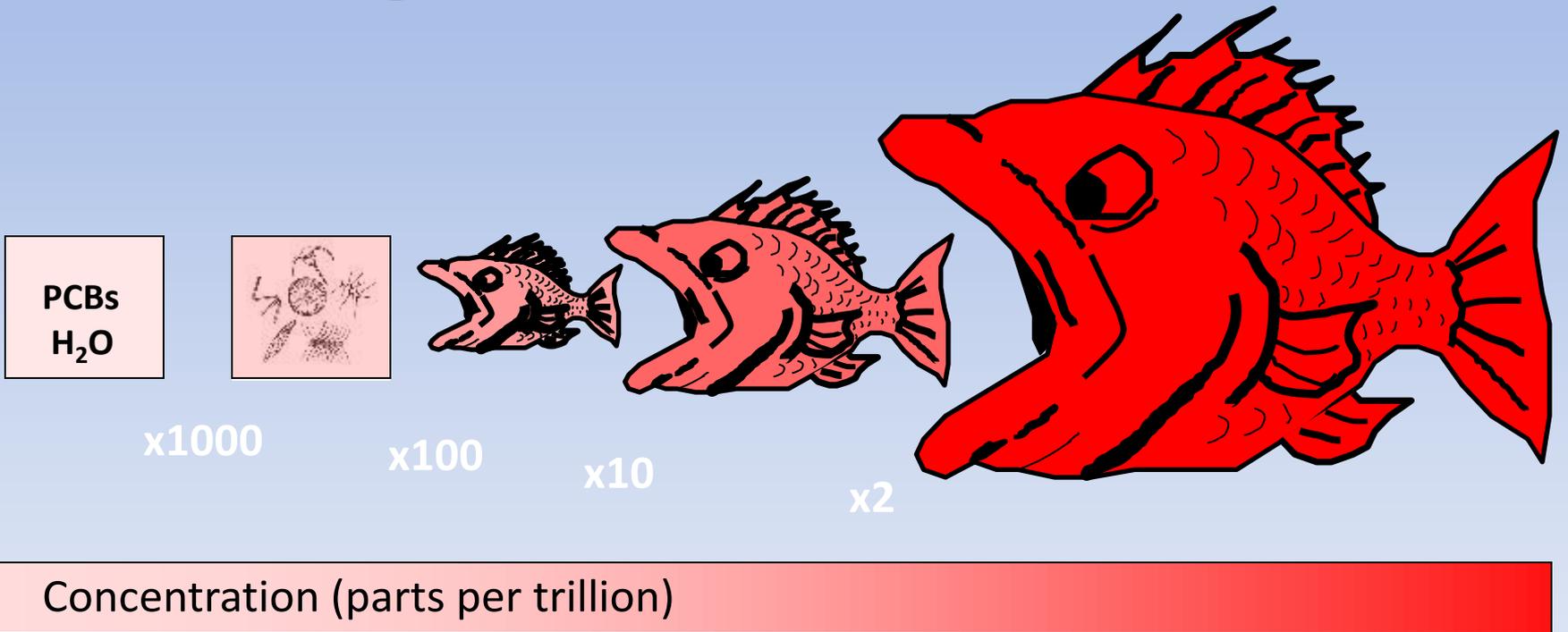
CR = fish consumption rate **0.0175 kg/day**.

BCF = bioconcentration factor **31,200** (recommended by EPA WQC, 1980)

RL = acceptable extra risk level for extra cancer risk. In Virginia WQC; 1 additional cancer in 100,000 population, or **0.00001**.

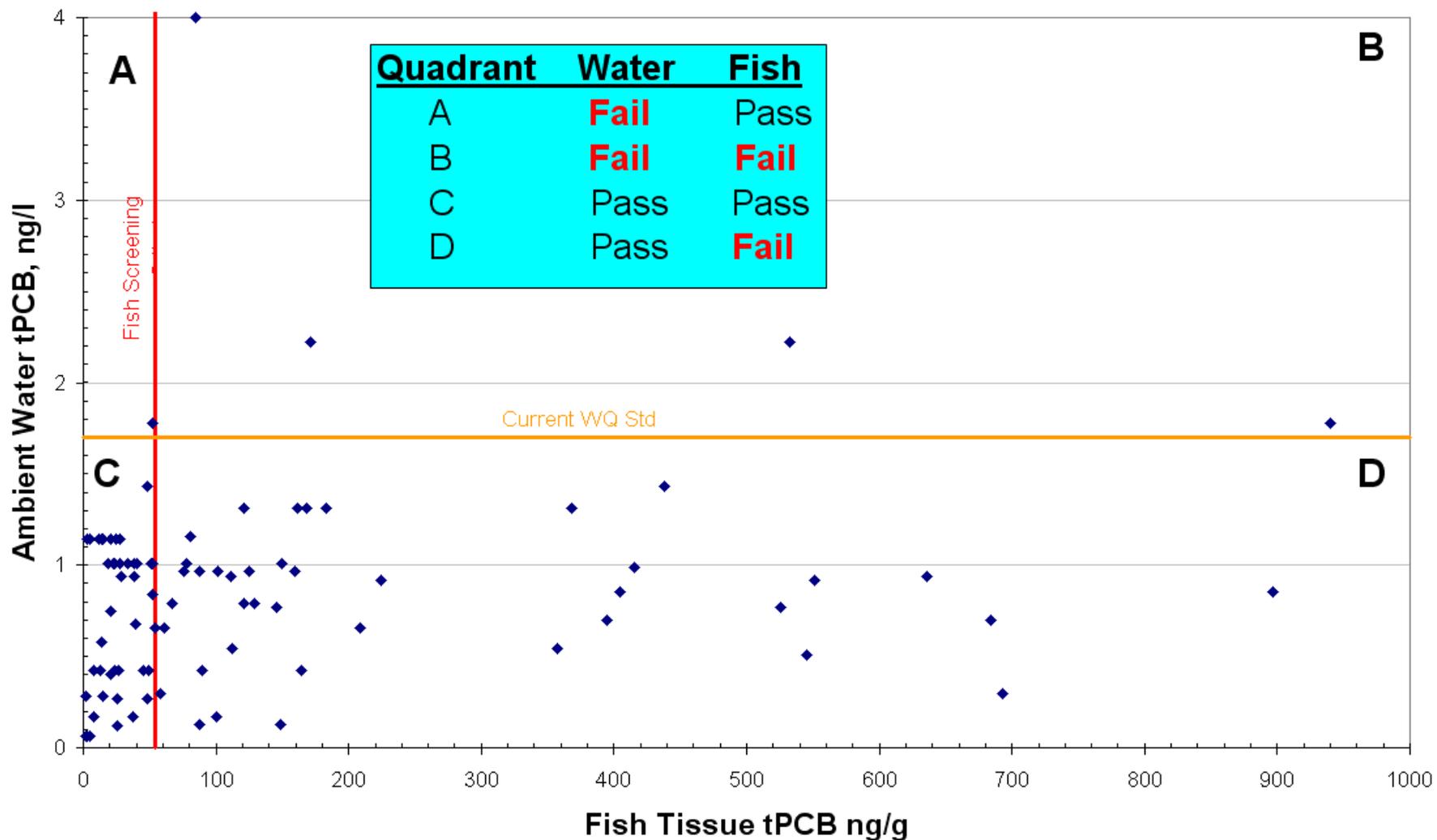
CSF = cancer slope factor **2** (or cancer potency factor) a measure of carcinogenicity (**updated in EPA-IRIS 1997**)

Biomagnification



Potomac River Example (2007)

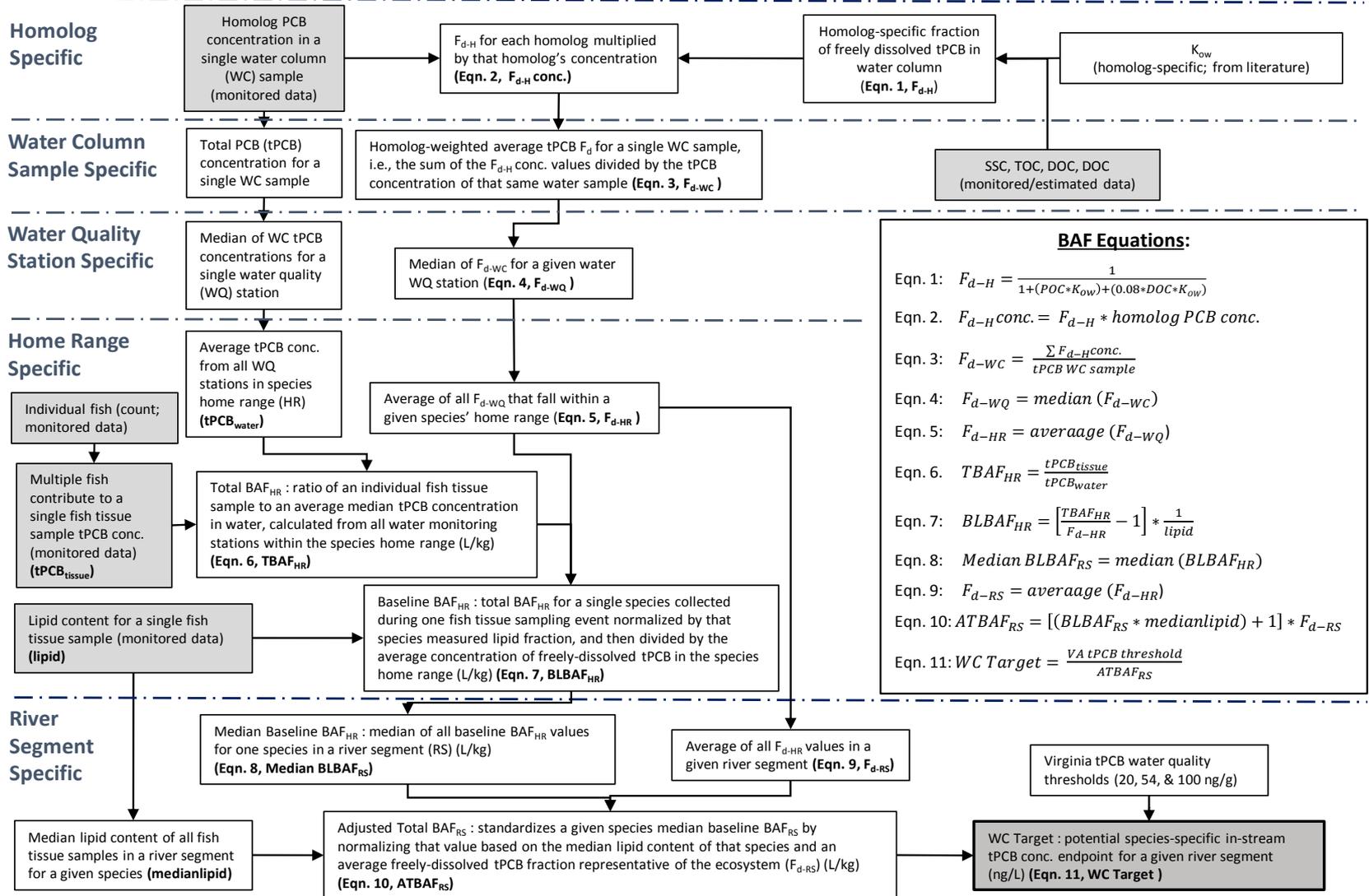
Compare fish and ambient water tPCB in Virginia



Bioaccumulation Factors (BAFs)

- EPA Method (EPA-822-03-030, 2003)
- Utilize site specific data (i.e., water data) to reflect exposure of fish and their food
 - Pathways of PCB exposure includes through gills, from food, and indirect ingestion of contaminated sediment
- More realistic
- Precedent established for the Potomac and Roanoke River PCB TMDLs

BAF Flow Chart

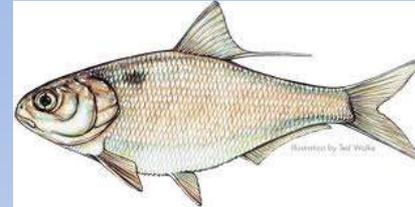


*Lightly shaded boxes indicate monitored data while the darker shaded box indicates the final produce (the water column target).

Site Specific TMDL Endpoints

- Potomac River

- Gizzard Shad used
- Water endpoint = 64 pg/L



- Roanoke River

- Upper Roanoke

- Carp used
- Water endpoint = 390 pg/L



- Lower Roanoke

- Striped Bass used
- Water endpoint = 140 pg/L



New River Applicability

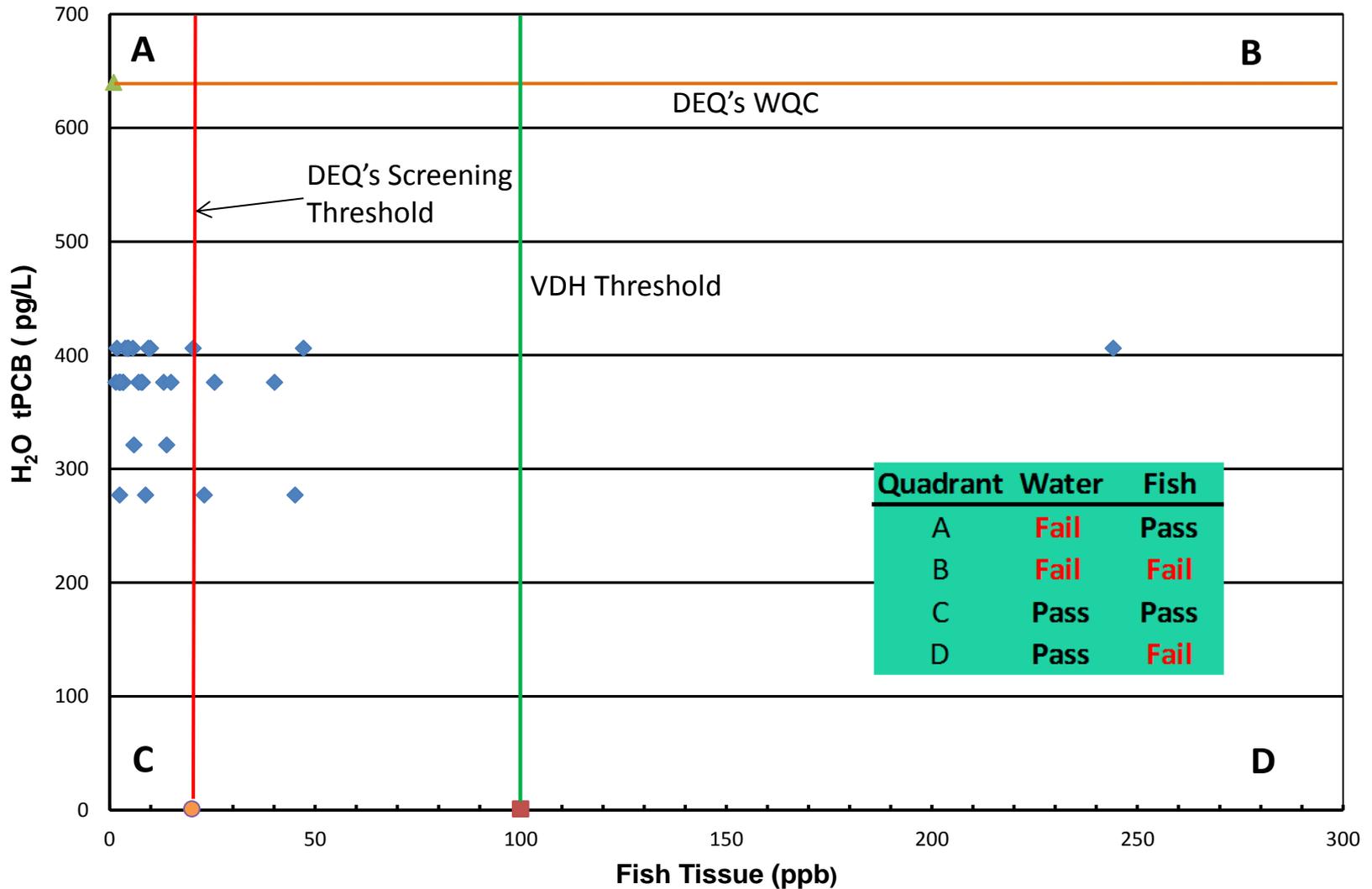
Objective: Determine if statewide WQC protects fish from bioaccumulating PCBs at levels that are unsafe for human consumption

- Scatter plots compare fish tPCB values versus water column tPCB values.
- Fish tPCB are individual fish samples.
- Water column tPCBs comprised of arithmetic mean of ambient water samples in fish home range area

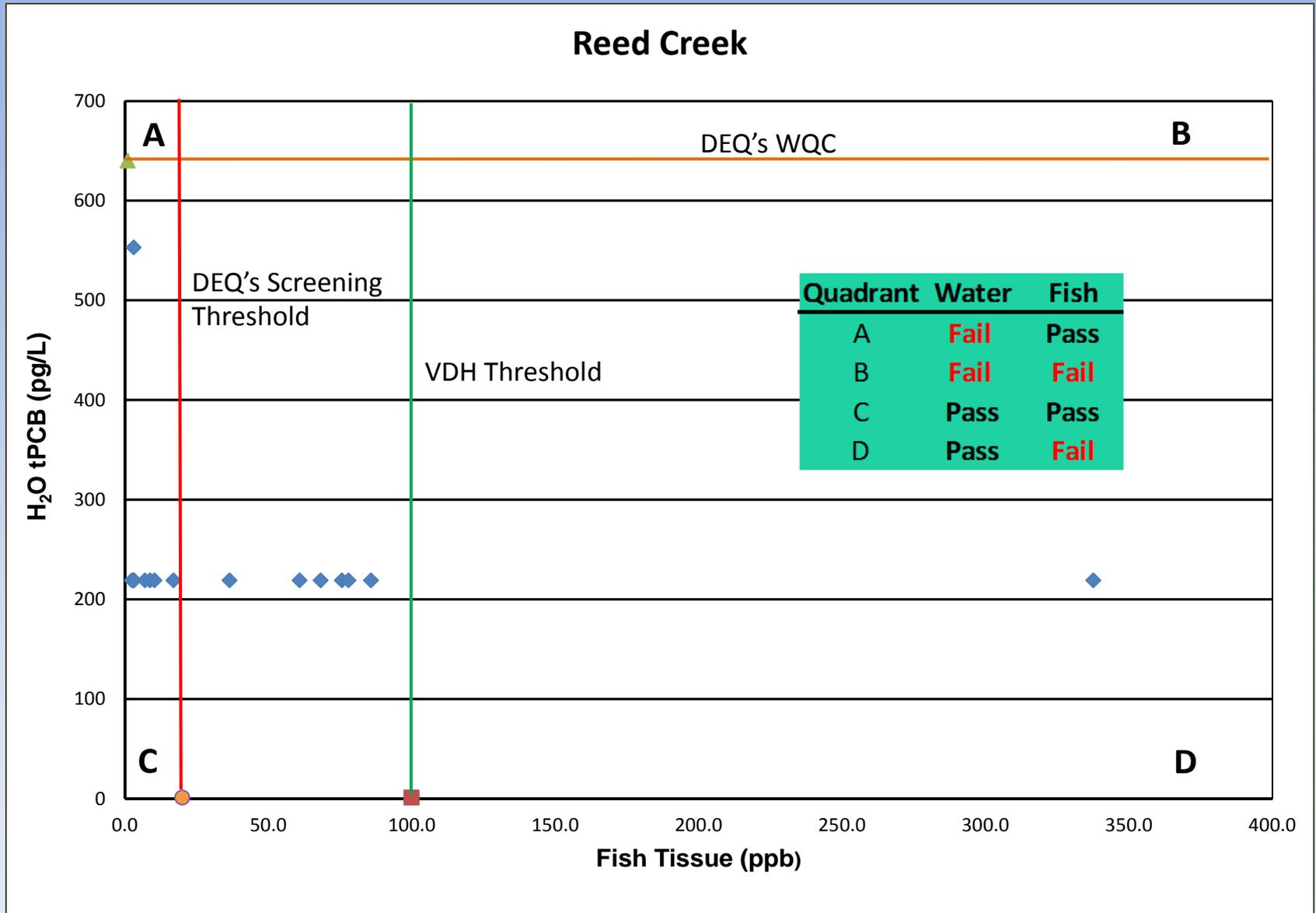


Includes fish data from 2004, 2012 and 2014; Water data from 2010 - 2014

Upper Mainstem New River

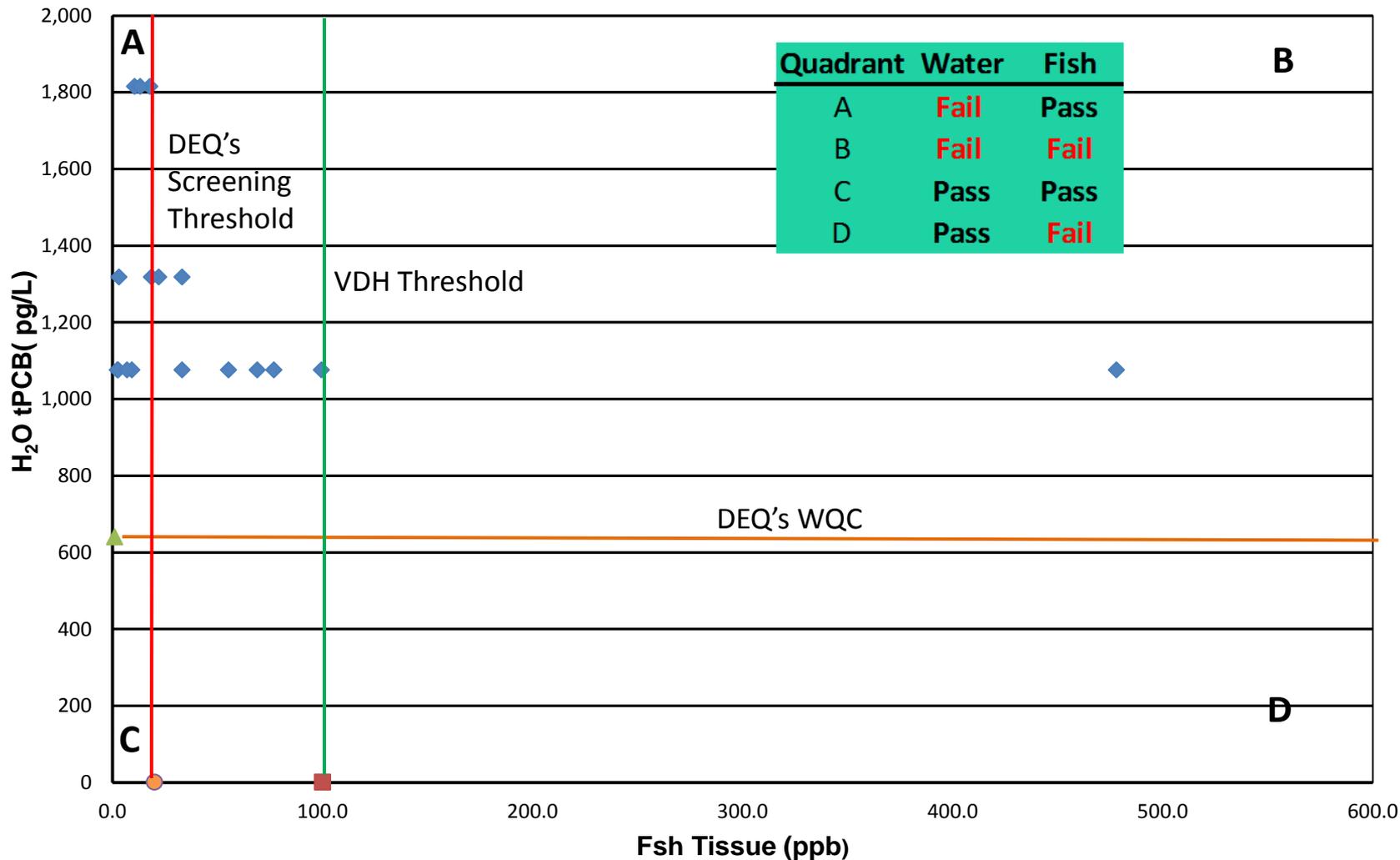


Includes fish data from 2004, 2012 and 2014; Water data from 2010 - 2014



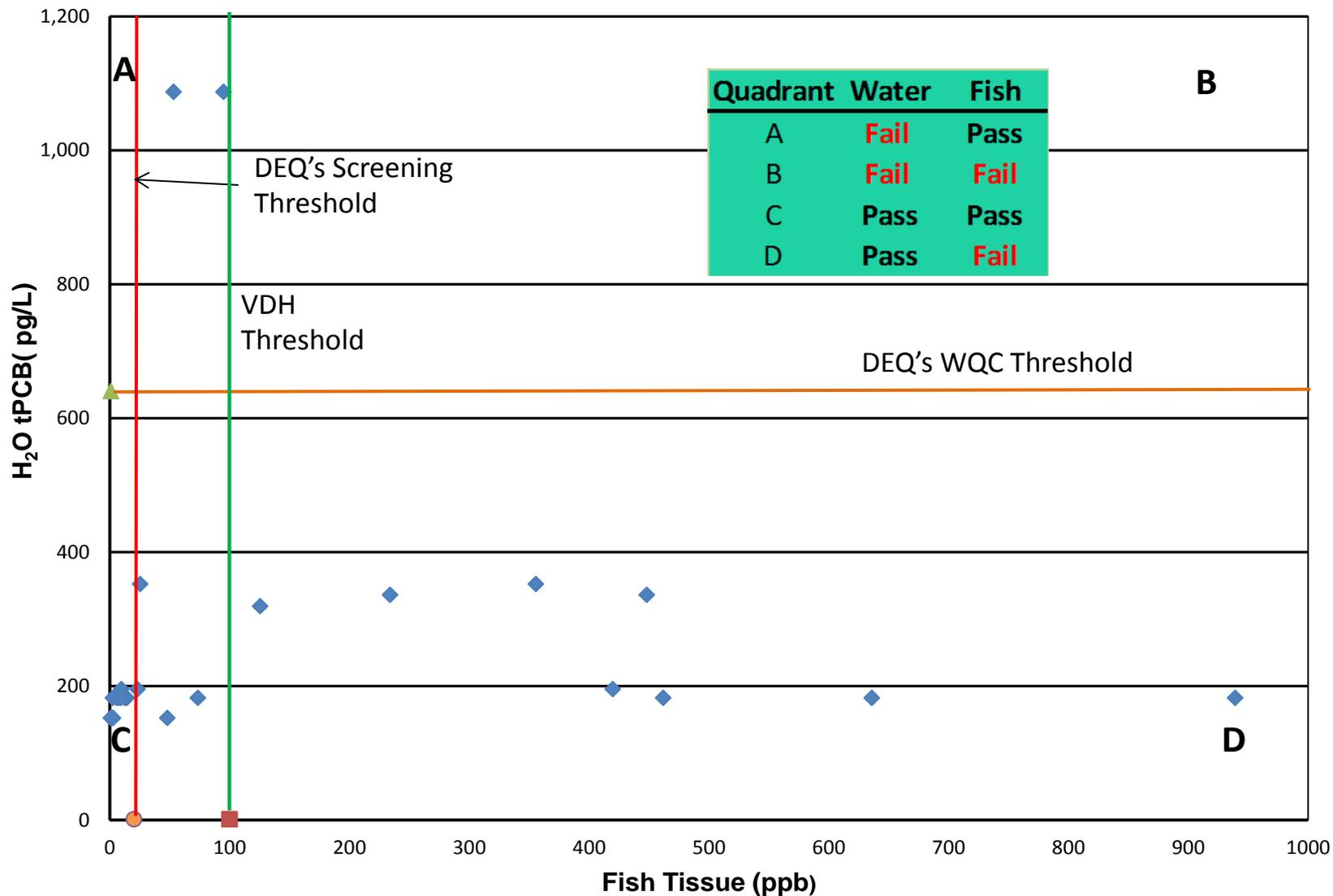
Includes fish data from 2004 and 2012; Water data from 2010 - 2014

Peak Creek



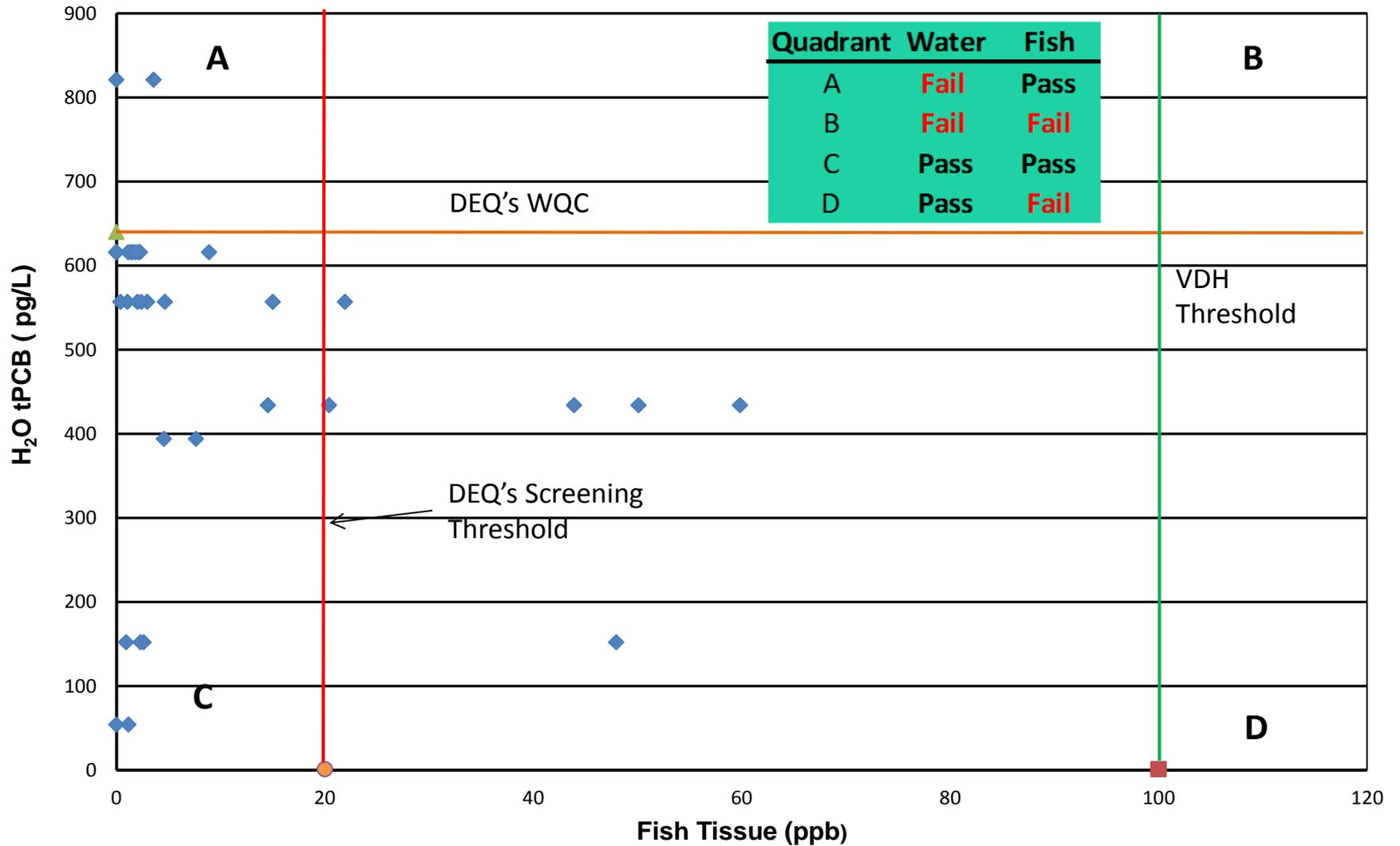
Includes fish data from 2004 and 2012; Water data from 2010 - 2014

Lower Mainstem New River



Includes fish data from 2004, 2012 and 2014; Water data from 2010 - 2014

New River Tributaries - Lower Mainstem



TMDL Endpoints

- Fish Tissue Threshold (20 ppb)
- Water endpoint – to be established:
 - Selection criteria based on:
 - Fish tissue data set robustness
 - EPA guidance recommends minimum sample size (n) of eight (8)
 - Species recreational/commercial value
 - Connectivity of the stream network (model to the endpoint)
 - Consistency of endpoints (i.e., do the values make sense?)

New River - Mainstem

- Upper New River

Species	n Total Number of Fish	Median BLBAF _{RS} (L/kg)	ATBAF _{RS} (L/kg)	WC Target (ng/L, or PPT)
Carp	21	2,817,823	79,540	0.251
Channel Catfish	3	1,440,766	81,763	0.245
Smallmouth Bass	12	1,030,935	13,253	1.509
Largemouth Bass	5	1,407,249	13,117	1.525
Rock Bass	10	1,594,325	12,998	1.539

New River Tributary

- Reed Creek

Species	n Total Number of Fish	Median BLBAF _{RS} (L/kg)	ATBAF _{RS} (L/kg)	WC Target (ng/L, or PPT)
Smallmouth Bass	18	1,204,033	13,002	1.538
Carp	19	4,002,195	276,425	0.072
Rock Bass	10	2,669,895	24,744	0.808
White Sucker	10	1,460,539	44,499	0.449

New River Tributaries

- Peak Creek

Species	n Total Number of Fish	Median BLBAF _{RS} (L/kg)	ATBAF _{RS} (L/kg)	WC Target (ng/L, or PPT)
Carp	11	1,194,946	46,339	0.432
Channel Catfish	2	629,966	35,550	0.563
Smallmouth Bass	4	1,149,909	11,613	1.722
Largemouth Bass	8	1,807,823	21,453	0.932
Rock Bass	10	1,383,666	10,679	1.873
Stoneroller	30	808,721	22,571	0.886
Redbreast Sunfish	5	441,689	2,717	7.360
Bluegill	19	3,108,628	22,949	0.871

New River - Mainstem

- Lower New River (below Claytor Lake Dam)

Species	n Total Number of Fish	Median BLBAF _{RS} (L/kg)	ATBAF _{RS} (L/kg)	WC Target (ng/L, or PPT)
Carp	26	7,570,865	576,408	0.035
Channel Catfish	1	3,411,268	119,459	0.167
Flathead catfish	8	3,790,887	142,674	0.140
Largemouth Bass	1	3,369,458	42,978	0.465
Smallmouth Bass	23	3,672,053	46,521	0.430
Northern Hog Sucker	4	1,853,170	31,543	0.634
Rock Bass	30	5,796,142	70,184	0.285
White Sucker	6	2,541,895	46,719	0.428

New River Tributaries

- Walker Creek

Species	n Total Number of Fish	Median BLBAF_{RS} (L/kg)	ATBAF_{RS} (L/kg)	WC Target (ng/L, or PPT)
Rock Bass	36	415,901	5,503	3.634
Stoneroller	10	97,934	3,422	5.844
Bluehead Chub	4	194,795	8,152	2.453
Smallmouth Bass	1	512,859	8,818	2.268
Redbreast Sunfish	8	406,189	7,172	2.789

New River Tributaries

- Stony Creek

Species	n Total Number of Fish	Median BLBAF _{RS} (L/kg)	ATBAF _{RS} (L/kg)	WC Target (ng/L, or PPT)
Smallmouth Bass	5	4,533,888	49,219	0.406
Rock Bass	20	3,657,363	51,543	0.388
White Sucker	1	3,412,874	86,617	0.231

QUESTIONS

