



Department of
Environmental
Conservation

Upper Hudson River Surface Water and Fish Data Overview

Hudson River Community Advisory Group

June 25, 2019

PCBs in Upper Hudson River Fish

Available Fish Data

GE collects five species of fish from fourteen locations between Fort Edward and Stillwater

To date this monitoring program does not capture fish PCB concentrations in the first four river reaches below Lock 4 (Stillwater).

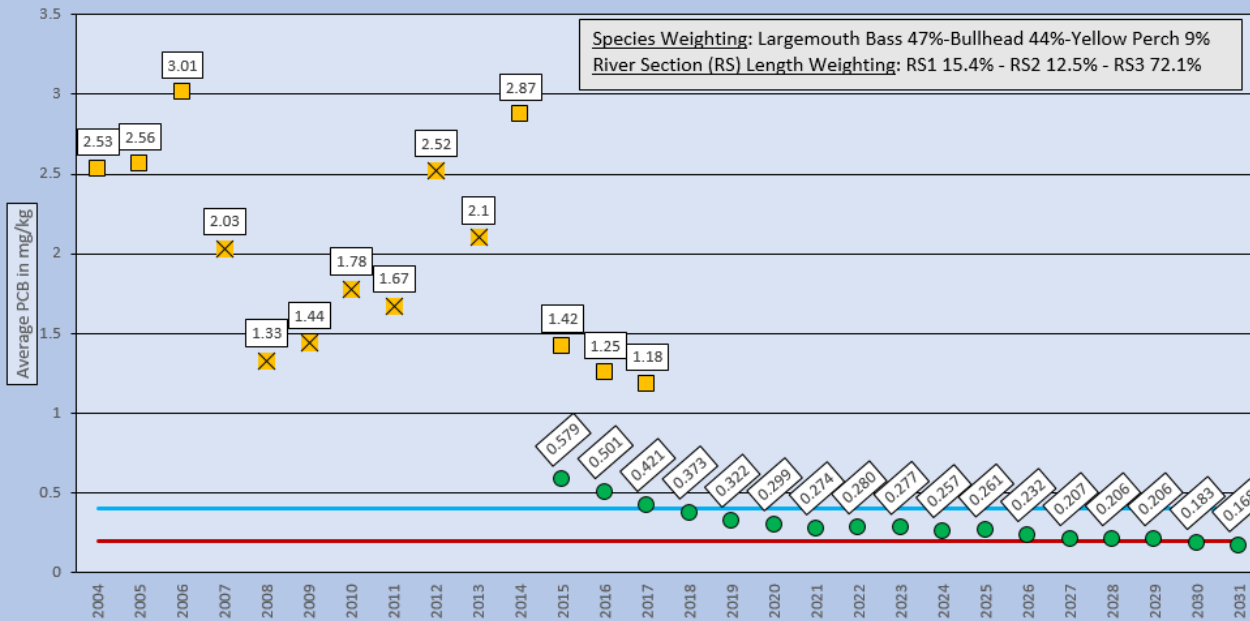


Available Fish Data

- The project baseline period was 2004 to 2008.
- Dredging began in 2009, and was completed in 2015.
- For areas dredged in Phase 1, there are eight years of post dredging data available.
- For other areas, there are two to seven years of data available.



Upper Hudson River Fish PCB Concentrations 2004 - 2017 Species Weighted and River Section Length Weighted Averages



Predredge Sampling
2004-2008

Dredging 2009; 2010-15

Year

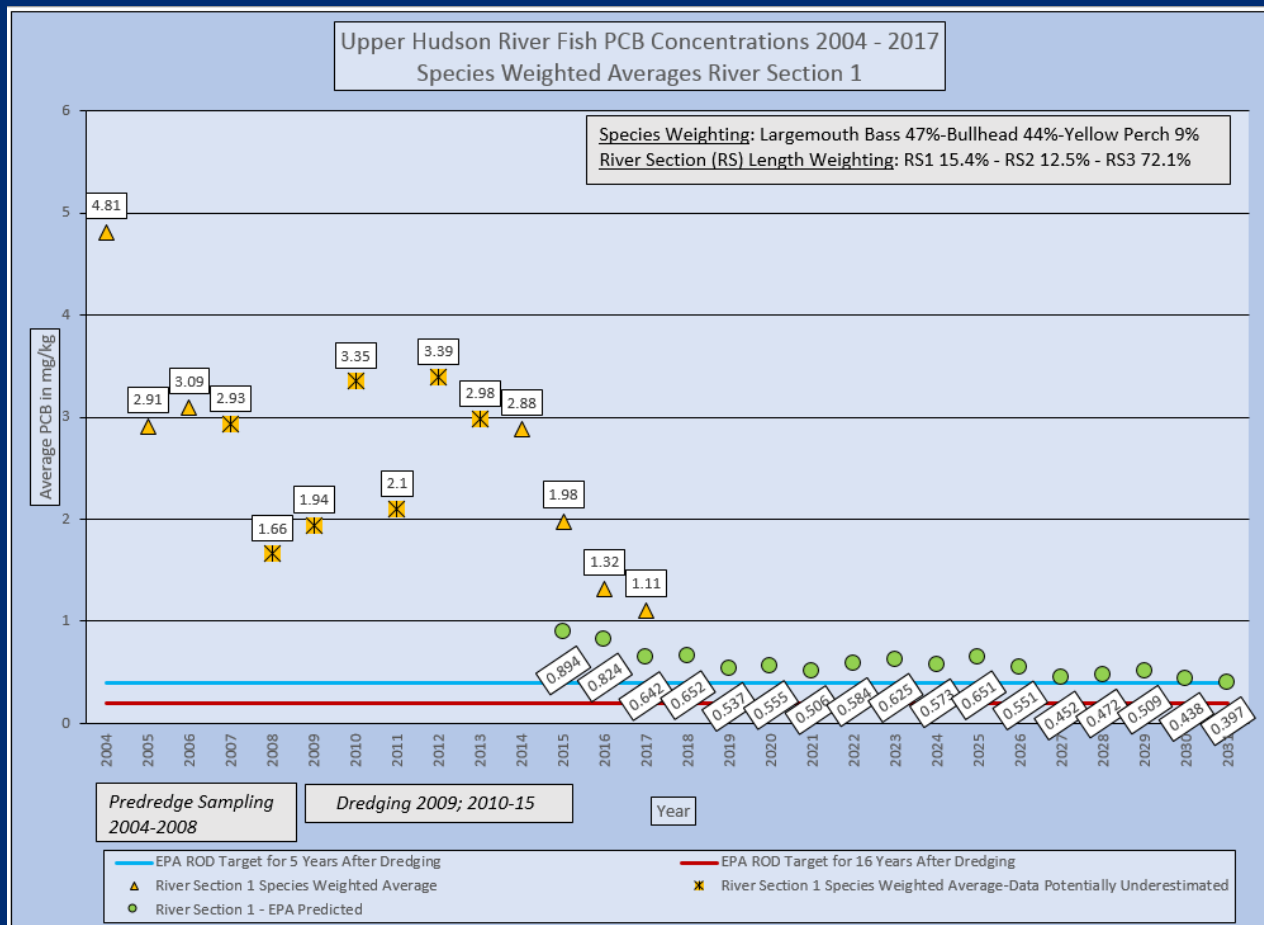
- Species Weighted/River Section Length Weighted Average
- ✕ Species Weighted/River Section Length Weighted-Data Potentially Underestimated
- Species Weighted/River Section Length Weighted (EPA FS)
- EPA ROD Target for 5 Years After Dredging
- EPA ROD Target for 16 Years After Dredging

Reach 8 / River Section 1 Thompson Island Pool

Dredging at these sampling locations:

2009 (*TD1*), 2011 (*TD1-TD2*), 2012 (*TD3-TD4*) and 2013 (*TD5*).

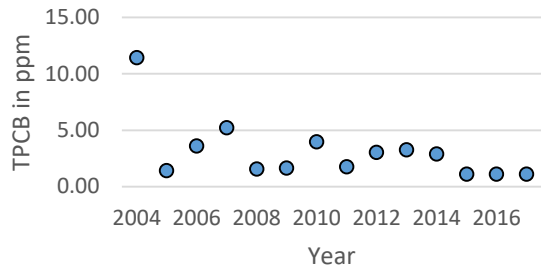




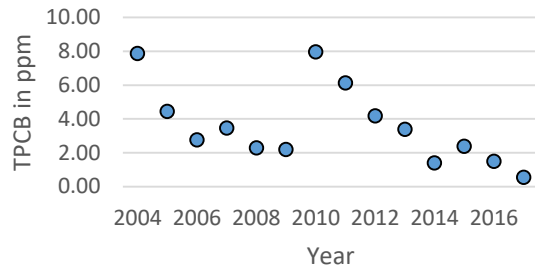
Bullhead in Thompson Island Pool (R8/RS1)



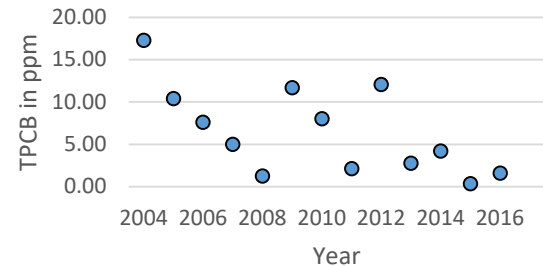
Annual Mean TPCB in Bullhead at TD1



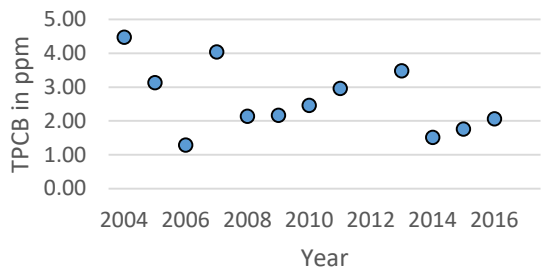
Annual Mean TPCB in Bullhead at TD2



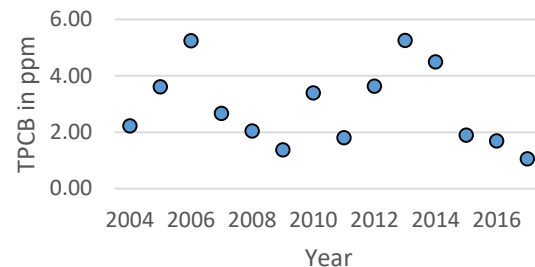
Annual Mean TPCB in Bullhead at TD3



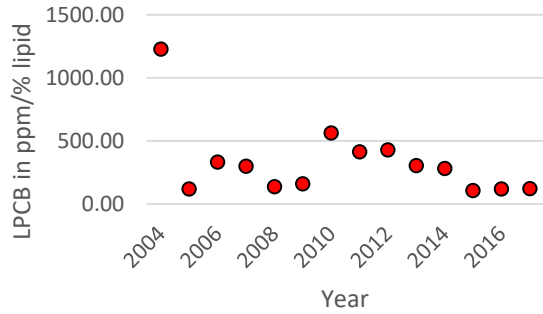
Annual Mean TPCB in Bullhead at TD4



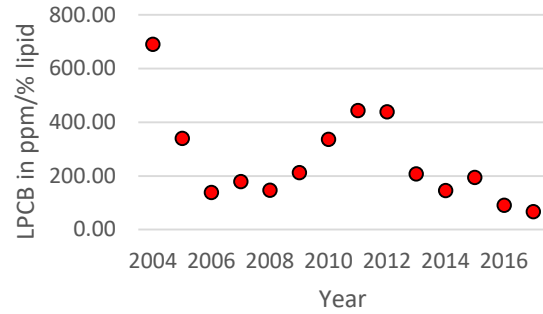
Annual Mean TPCB in Bullhead at TD5



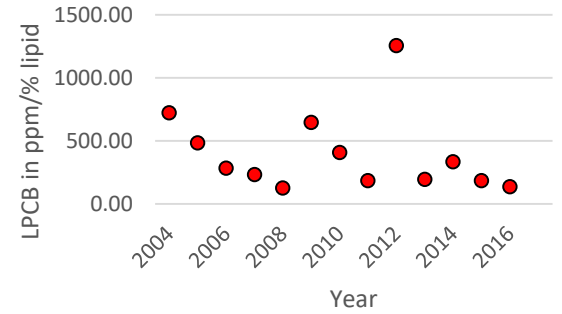
LPCB in Bullhead at TD1



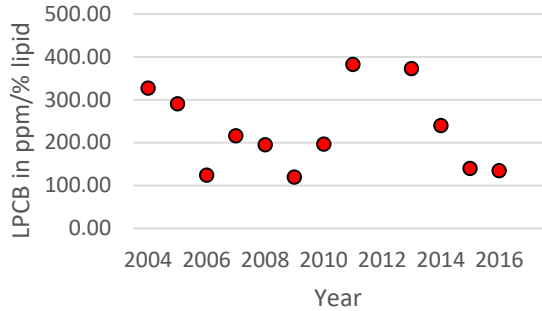
LPCB in Bullhead at TD2



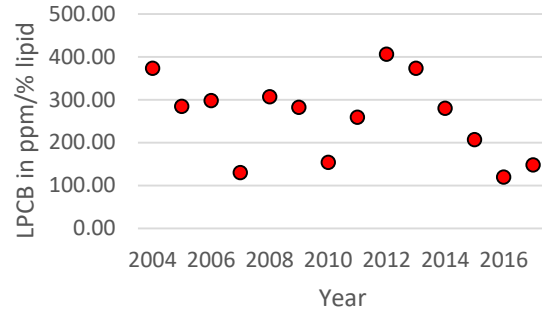
LPCB in Bullhead at TD3



LPCB in Bullhead at TD4



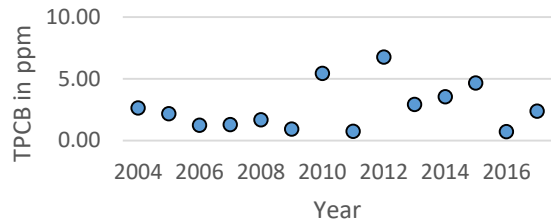
LPCB in Bullhead at TD5



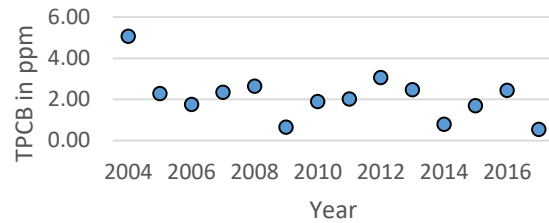
Black Bass in Thompson Island Pool (R8/RS1)



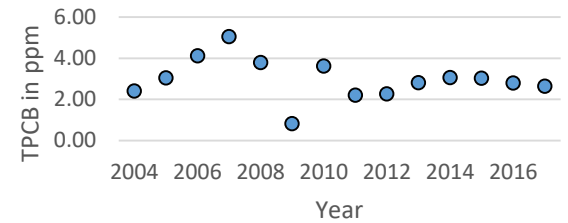
Annual Mean TPCB in
Large and Small Mouth Bass at
TD1



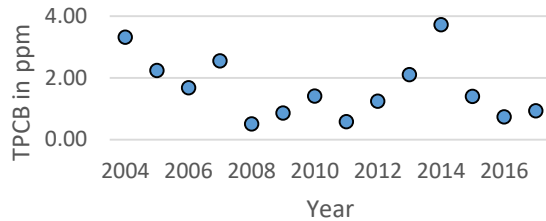
Annual Mean TPCB in
Large and Small Mouth Bass at
TD2



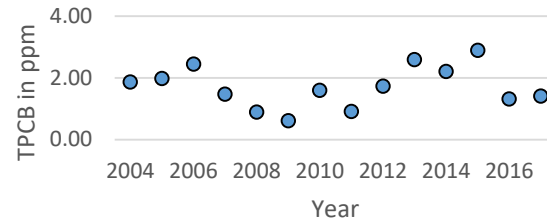
Annual Mean TPCB in
Large and Small Mouth Bass at
TD3



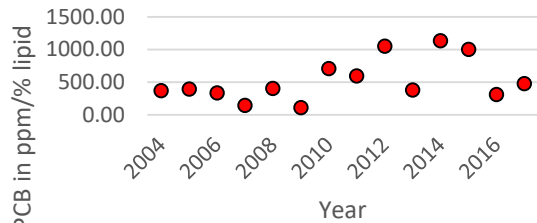
Annual Mean TPCB in
Large and Small Mouth Bass at
TD4



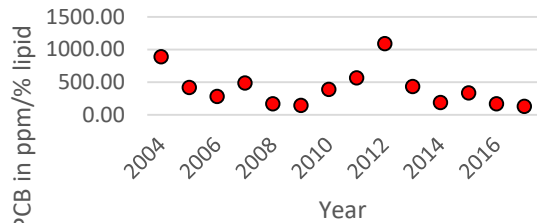
Annual Mean TPCB in
Large and Small Mouth Bass at
TD5



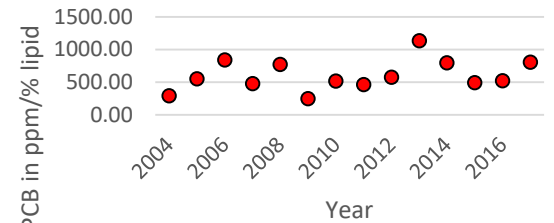
Annual Mean LPCB in Large and Small Mouth Bass at TD1



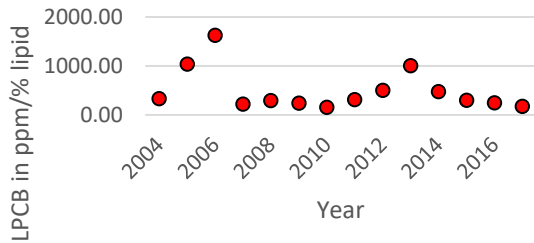
Annual Mean LPCB in Large and Small Mouth Bass at TD2



Annual Mean LPCB in Large and Small Mouth Bass at TD3



Annual Mean LPCB in Large and Small Mouth Bass at TD4



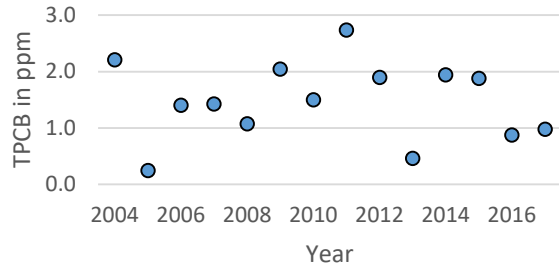
Annual Mean LPCB in Large and Small Mouth Bass at TD5



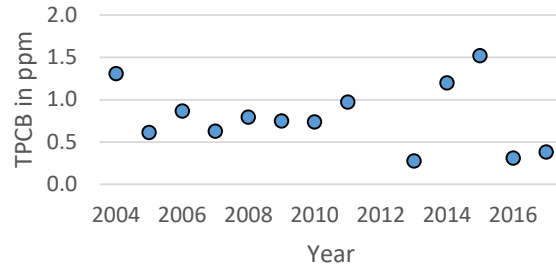
Perch in Thompson Island Pool (R8/RS1)



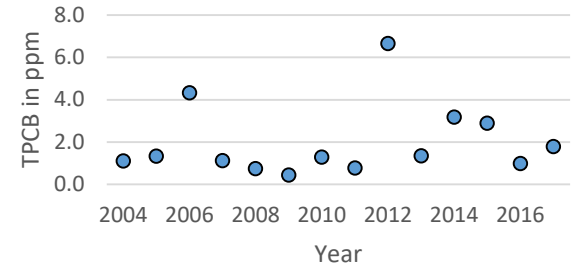
Annual Mean TPCB in Perch
2004-2015 at TD1



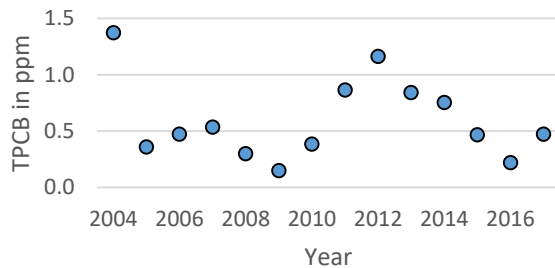
Annual Mean TPCB in Perch
2004-2015 at TD2



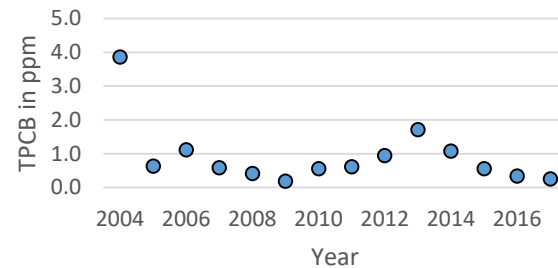
Annual Mean TPCB in Perch
2004-2015 at TD3



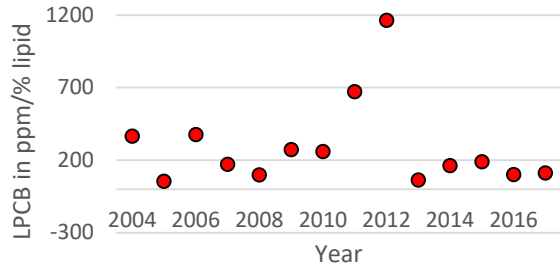
Annual Mean TPCB in Perch
2004-2015 at TD4



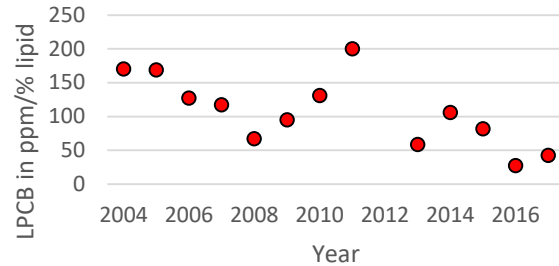
Annual Mean TPCB in Perch
2004-2015 at TD5



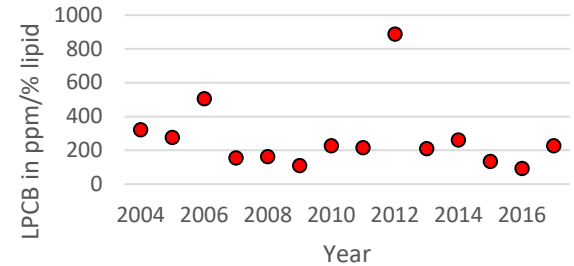
Annual Mean LPCB in Perch
2004-2015 at TD1



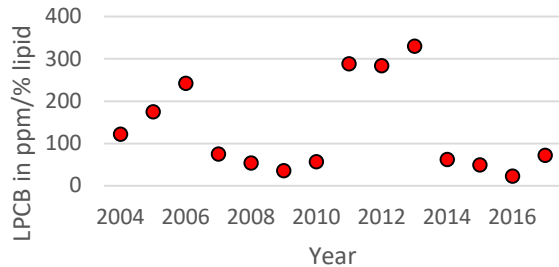
Annual Mean LPCB in Perch
2004-2015 at TD2



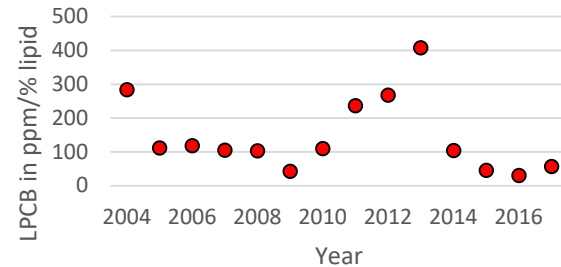
Annual Mean LPCB in Perch
2004-2015 at TD3



Annual Mean LPCB in Perch
2004-2015 at TD4

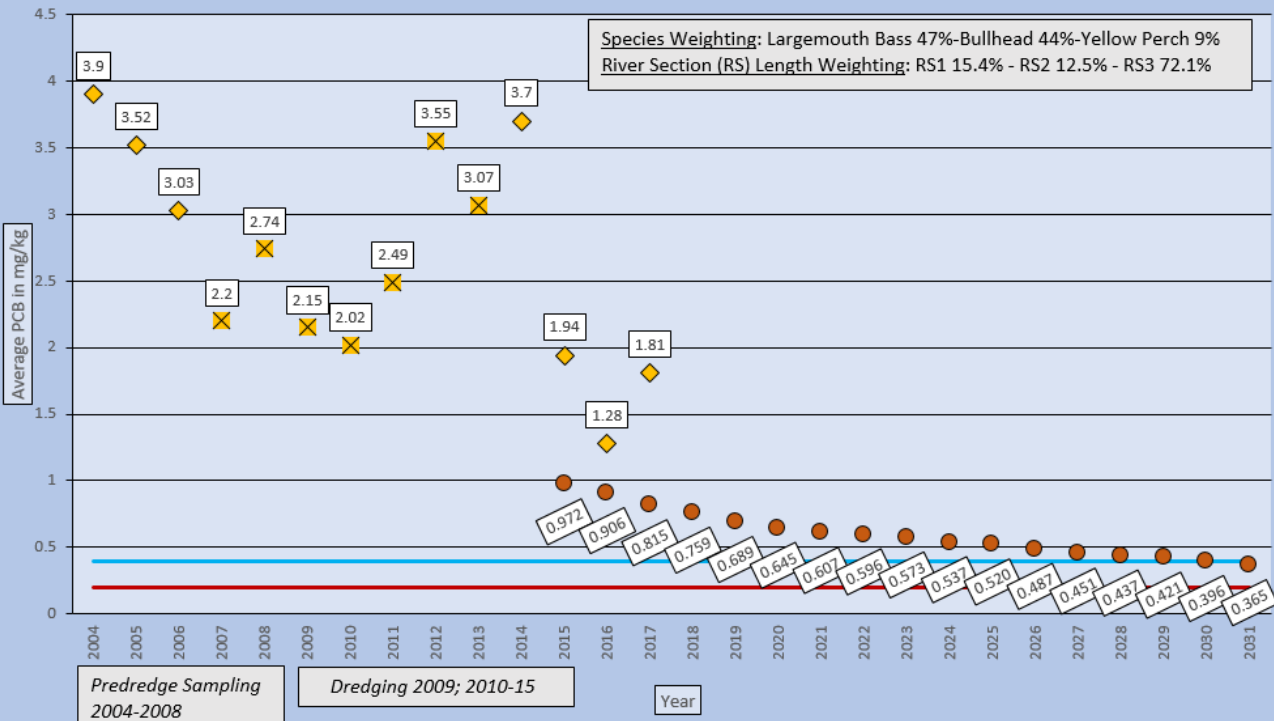


Annual Mean LPCB in Perch
2004-2015 at TD5



Upper Hudson River Fish PCB Concentrations 2004 - 2017 Species Weighted Averages River Section 2

Species Weighting: Largemouth Bass 47%-Bullhead 44%-Yellow Perch 9%
River Section (RS) Length Weighting: RS1 15.4% - RS2 12.5% - RS3 72.1%



Predredge Sampling
2004-2008

Dredging 2009; 2010-15

- EPA ROD Target for 5 Years After Dredging
- EPA ROD Target for 16 Years After Dredging
- ◆ River Section 2 Species Weighted Average
- ✕ River Section 2 Species Weighted Average-Data Potentially Underestimated
- River Section 2 - EPA Predicted

Reach 7 / River Section 2 “Landlocked” or Fort Miller Pool

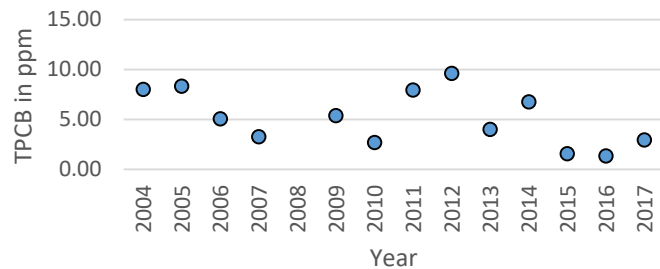
Locations ND1 – ND2 were dredged in 2014-15



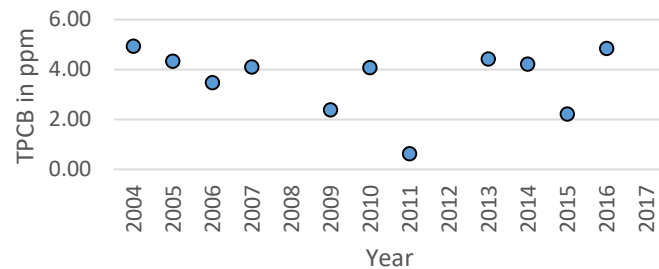
Bullhead in Land Locked Pool (R7/RS2)



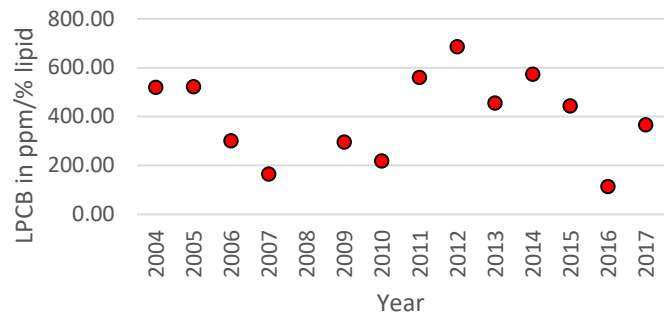
Annual Mean TPCB in Bullhead
at ND1



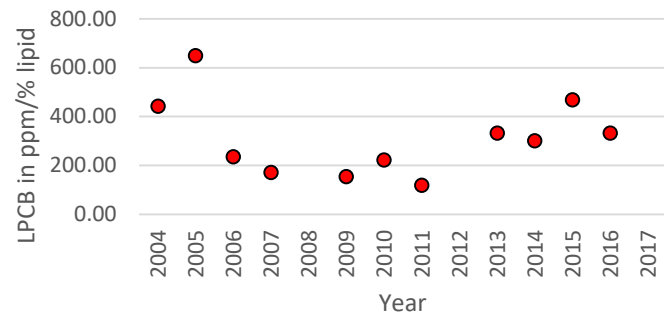
Annual Mean TPCB in Bullhead
at ND2



LPCB in Bullhead at ND1



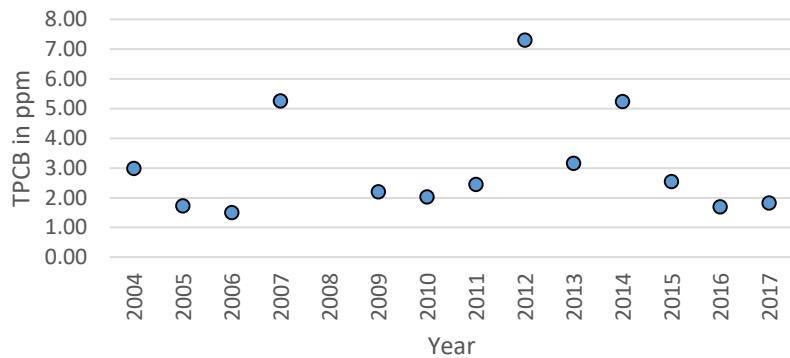
LPCB in Bullhead at ND2



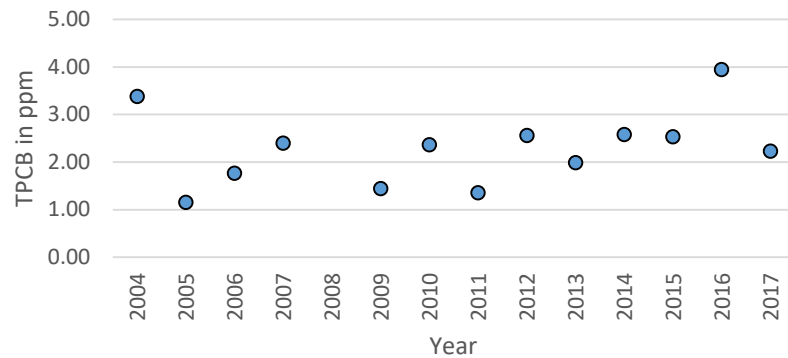
Black Bass in Land Locked Pool (R7/RS2)



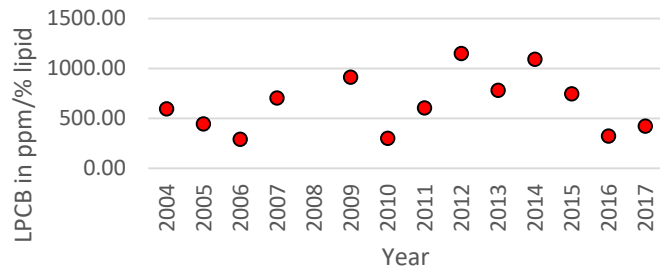
Annual Mean TPCB in
Large and Small Mouth Bass at ND1



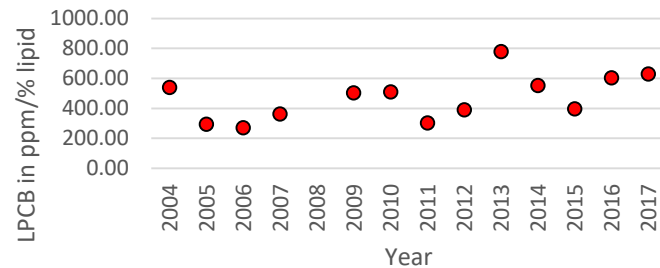
Annual Mean TPCB in
Large and Small Mouth Bass at ND2



Annual Mean LPCB in
Large and Small Mouth Bass at ND1



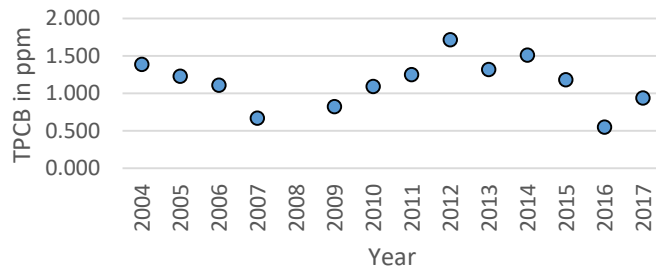
Annual Mean LPCB in
Large and Small Mouth Bass at ND2



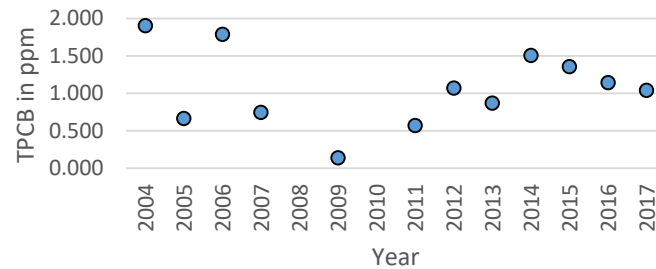
Perch in Land Locked Pool (R7/RS2)



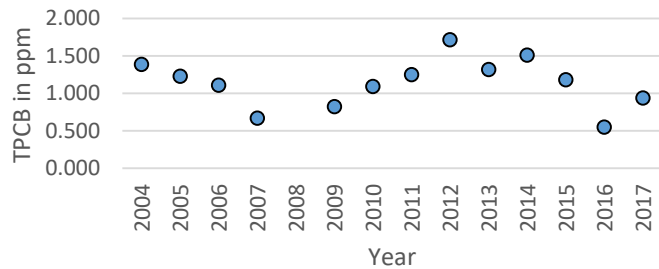
Annual Mean TPCB in Perch 2004-2017 at ND1



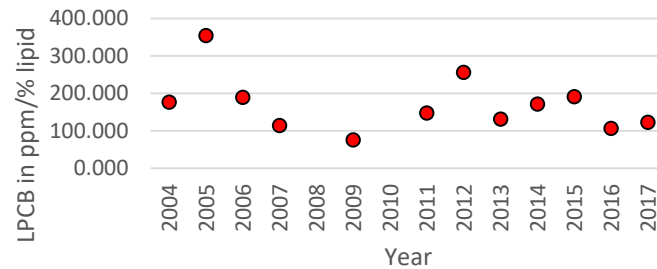
Annual Mean TPCB in Perch 2004-2017 at ND2



Annual Mean TPCB in Perch 2004-2017 at ND1



Annual Mean LPCB in Perch 2004-2017 at ND2



Reach 6 / River Section 2 Northumberland or Lock 5 Pool

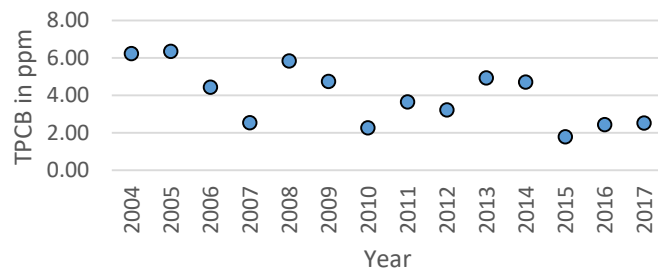
Locations ND3 and ND5 were dredged in 2013



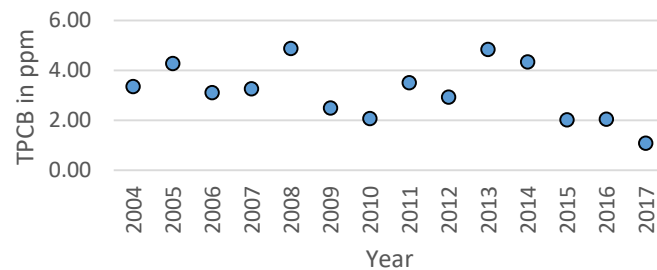
Bullhead in Northumberland Pool (R6/RS2)



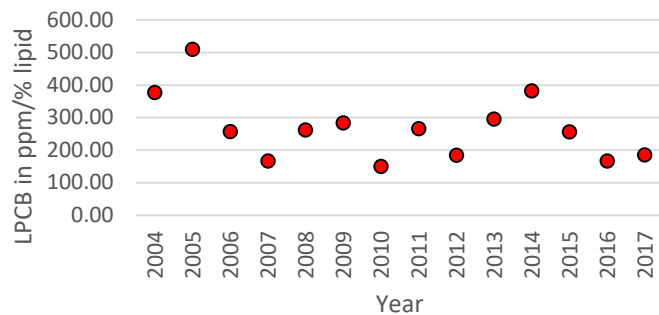
Annual Mean TPCB in Bullhead
at ND3



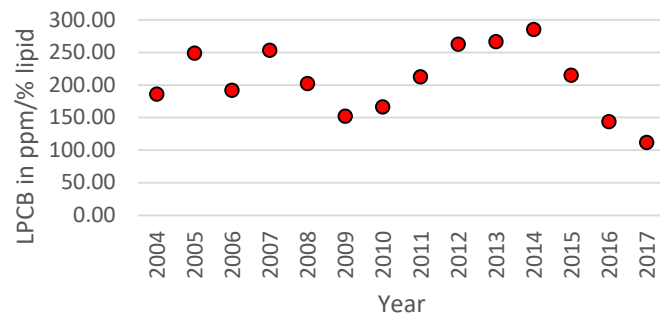
Annual Mean TPCB in Bullhead
at ND5



LPCB in Bullhead at ND3



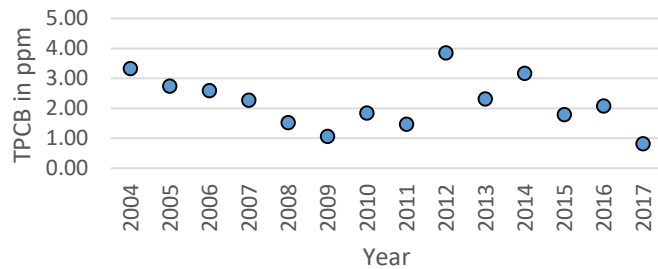
LPCB in Bullhead at ND5



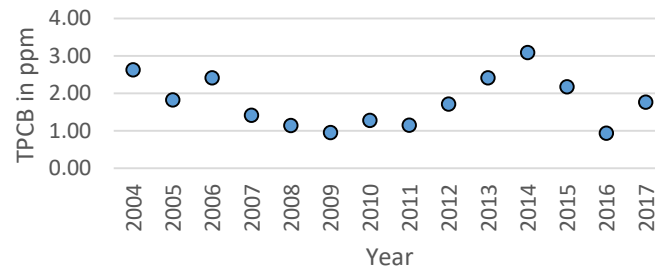
Black Bass in Northumberland Pool (R6/RS2)



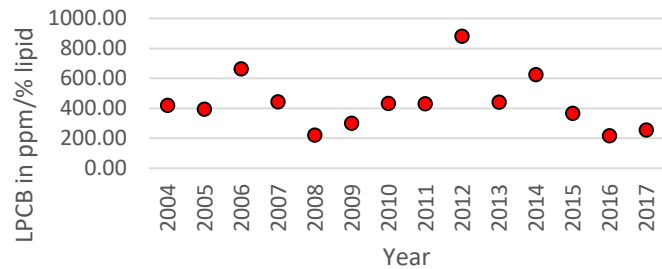
Annual Mean TPCB in
Large and Small Mouth Bass at ND3



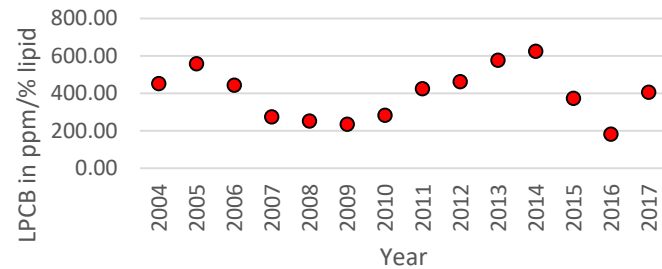
Annual Mean TPCB in
Large and Small Mouth Bass at ND5



Annual Mean LPCB in
Large and Small Mouth Bass at ND3



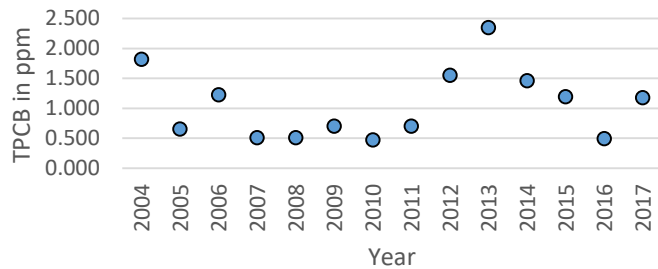
Annual Mean LPCB in
Large and Small Mouth Bass at ND5



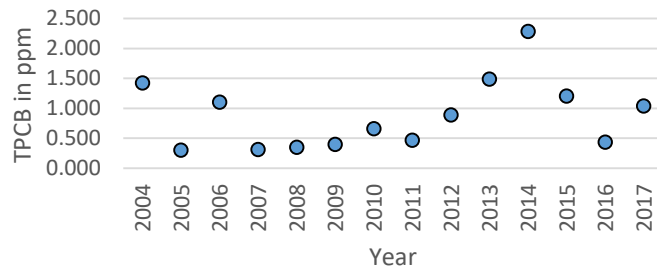
Perch in Northumberland Pool (R6/RS2)



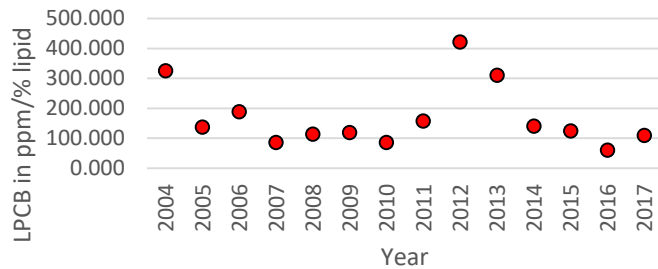
Annual Mean TPCB in Perch 2004-2017 at ND3



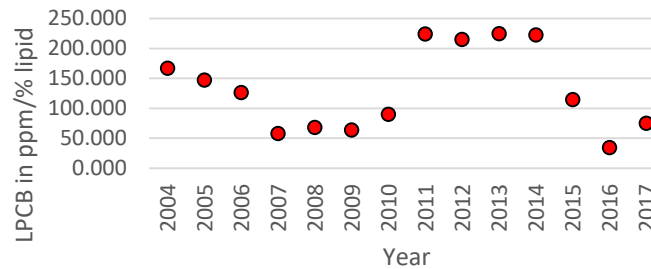
Annual Mean TPCB in Perch 2004-2017 at ND5



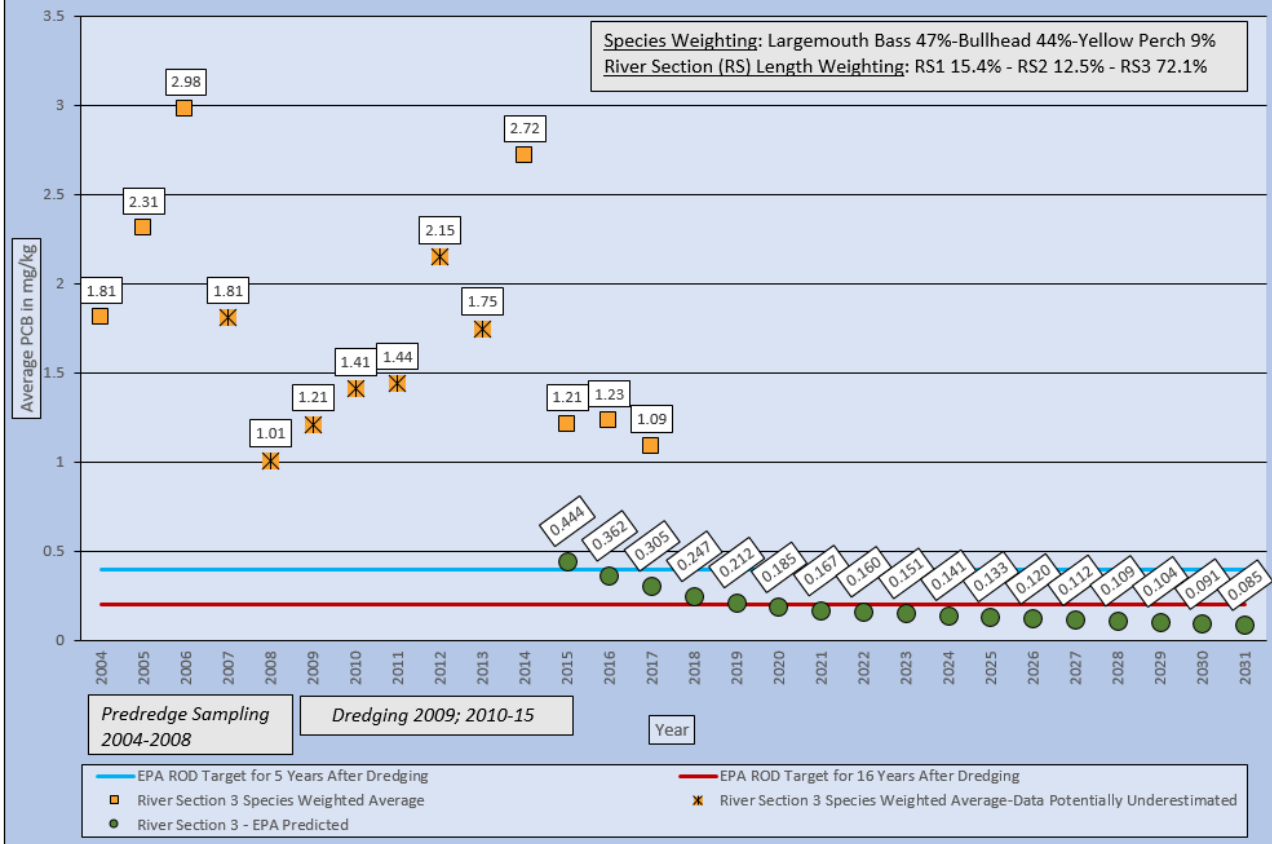
Annual Mean LPCB in Perch 2004-2017 at ND3



Annual Mean LPCB in Perch 2004-2017 at ND5



Upper Hudson River Fish PCB Concentrations 2004 - 2017 Species Weighted Averages River Section 3



Reach 5 / River Section 3 Stillwater Pool

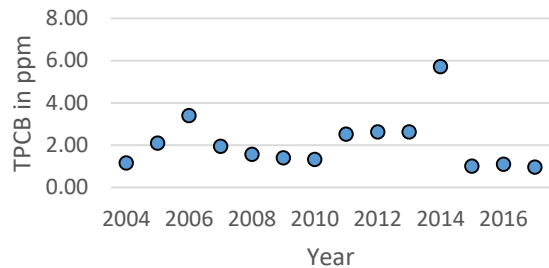
Dredging in Reach 5 / River Section 3:
2013 (SW1), 2014 (SW2 – SW 5)



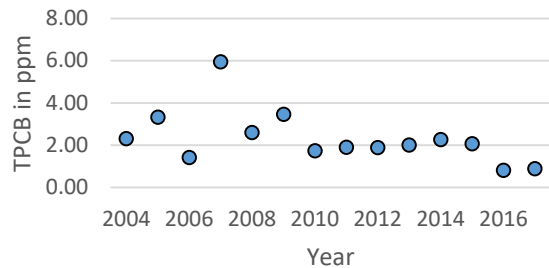
Bullhead in Stillwater Pool (R5/RS3)



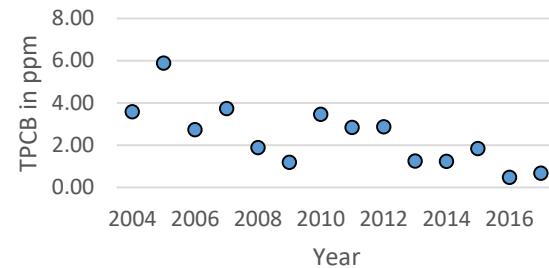
Annual Mean TPCB in Bullhead at SW3



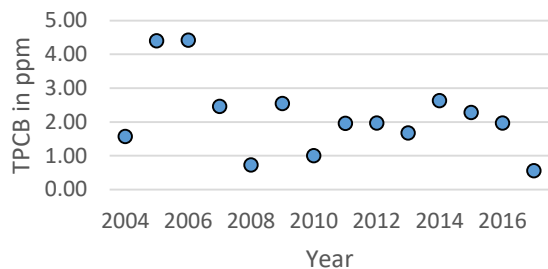
Annual Mean TPCB in Bullhead at SW2



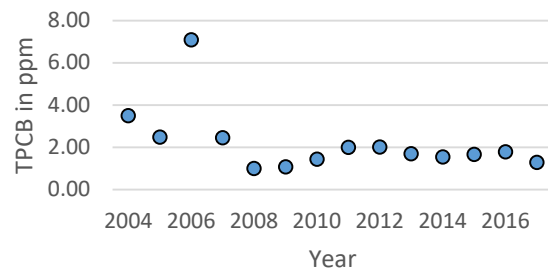
Annual Mean TPCB in Bullhead at SW1



Annual Mean TPCB in Bullhead at SW4



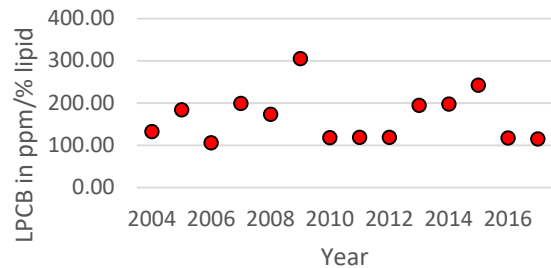
Annual Mean TPCB in Bullhead at SW5



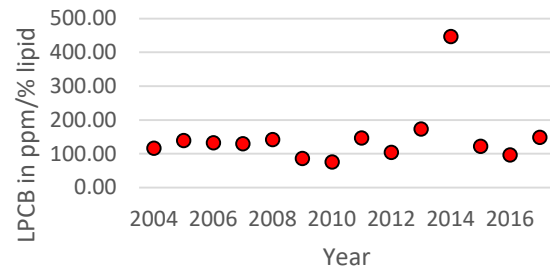
LPCB in Bullhead and/or Catfish at SW1



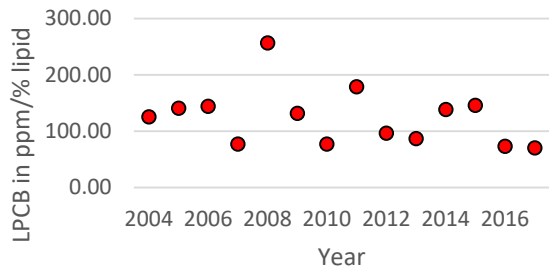
LPCB in Bullhead and/or Catfish at SW2



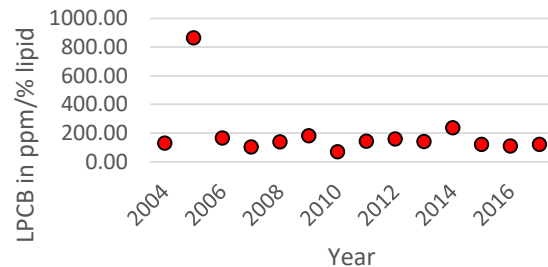
LPCB in Bullhead and/or Catfish at SW3



LPCB in Bullhead and/or Catfish at SW4



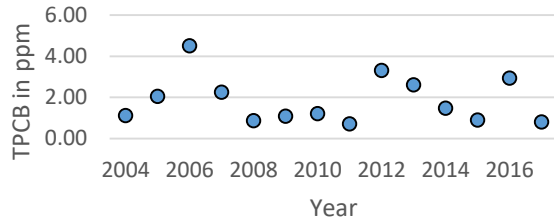
LPCB in Bullhead and/or Catfish at SW5



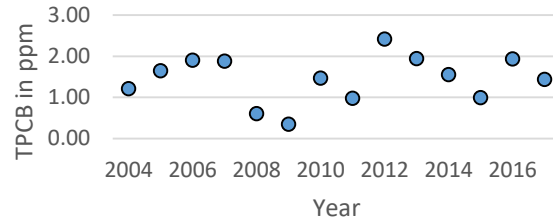
Black Bass in Stillwater Pool (R5/RS3)



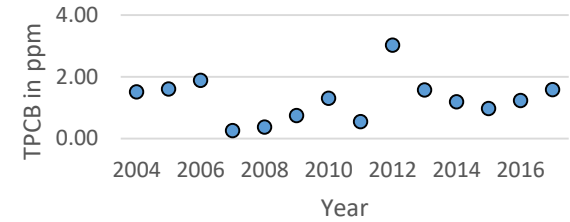
Annual Mean TPCB in Large and Small Mouth Bass at SW1



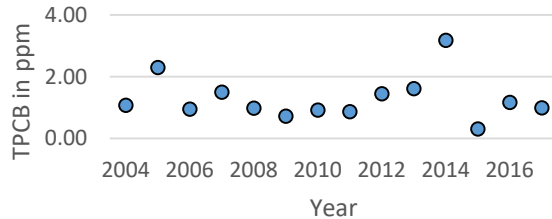
Annual Mean TPCB in Large and Small Mouth Bass at SW2



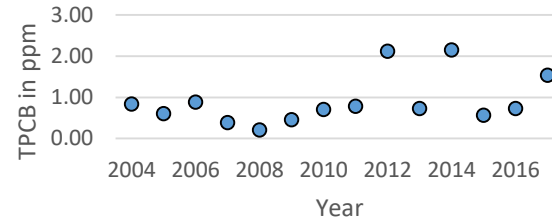
Annual Mean TPCB in Large and Small Mouth Bass at SW3



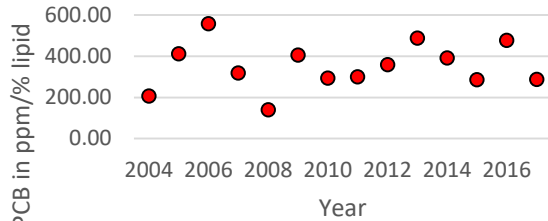
Annual Mean TPCB in Large and Small Mouth Bass at SW4



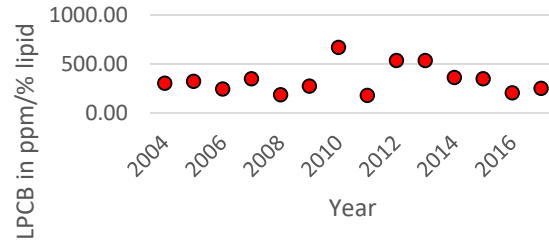
Annual Mean TPCB in Large and Small Mouth Bass at SW5



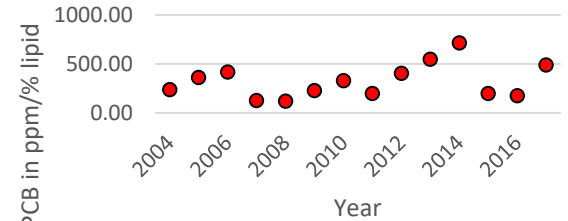
Annual Mean LPCB in Large and Small Mouth Bass at SW1



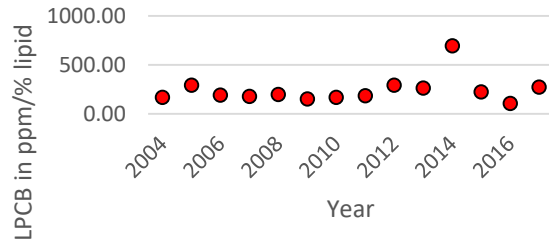
Annual Mean LPCB in Large and Small Mouth Bass at SW2



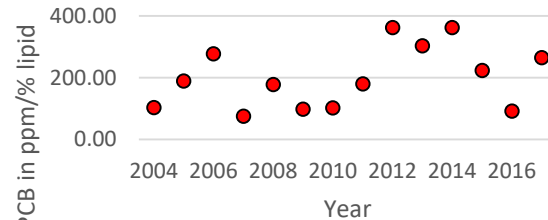
Annual Mean LPCB in Large and Small Mouth Bass at SW3



Annual Mean LPCB in Large and Small Mouth Bass at SW4



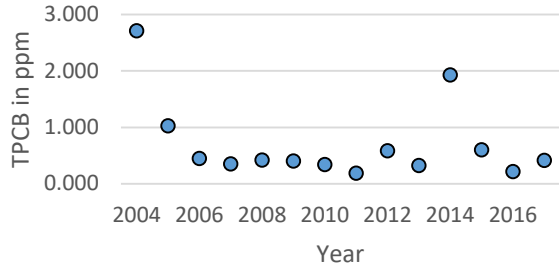
Annual Mean LPCB in Large and Small Mouth Bass at SW5



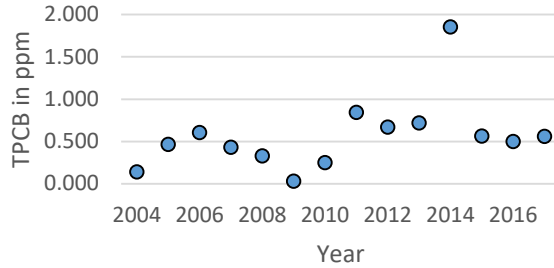
Perch in Stillwater Pool (R5/RS3)



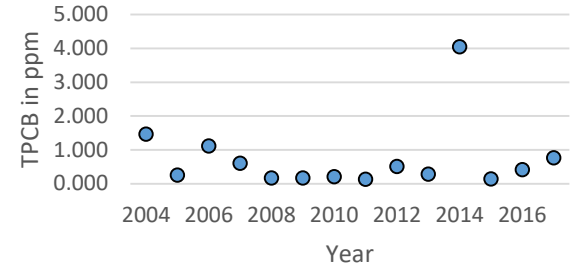
Annual Mean TPCB in Perch
2004-2017 at SW1



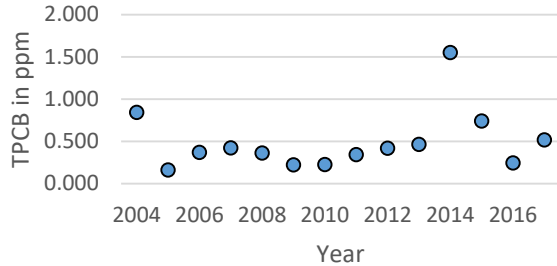
Annual Mean TPCB in Perch
2004-2017 at SW2



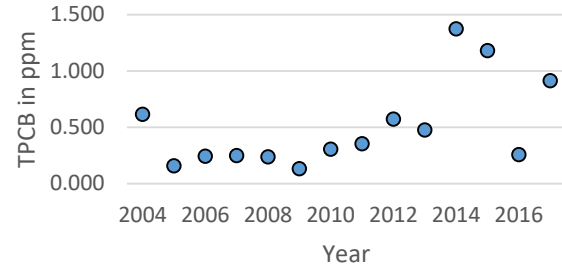
Annual Mean TPCB in Perch
2004-2017 at SW3



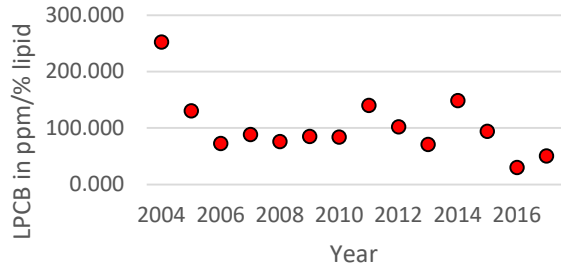
Annual Mean TPCB in Perch
2004-2017 at SW4



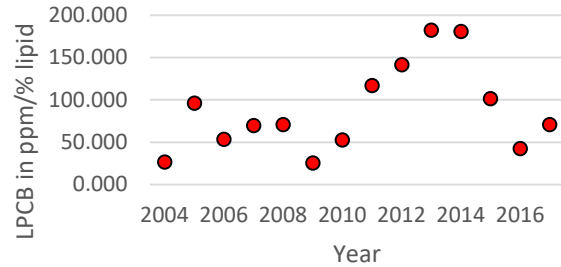
Annual Mean TPCB in Perch
2004-2017 at SW5



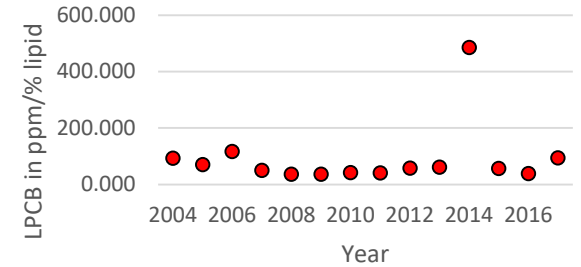
Annual Mean LPCB in Perch 2004-2017 at SW1



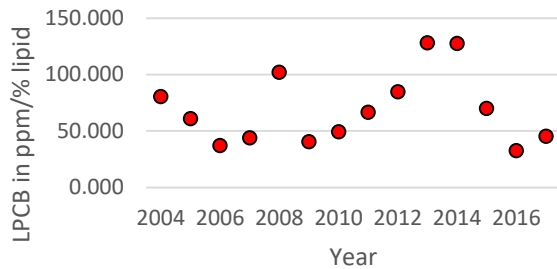
Annual Mean LPCB in Perch 2004-2017 at SW2



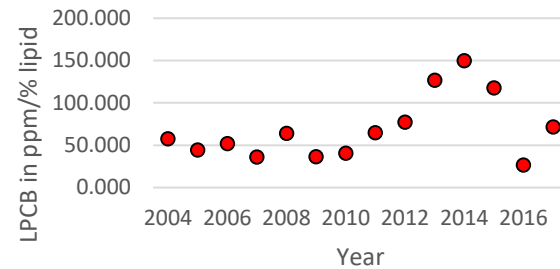
Annual Mean LPCB in Perch 2004-2017 at SW3



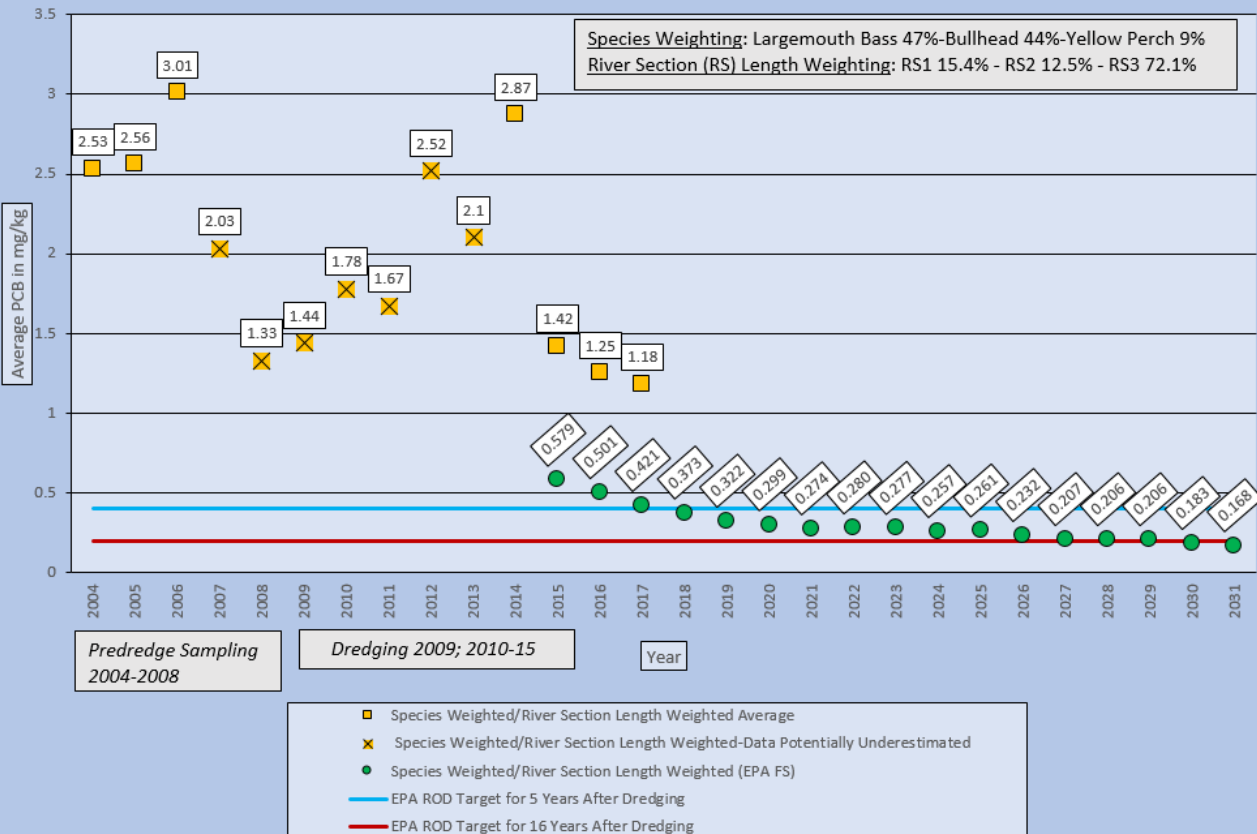
Annual Mean LPCB in Perch 2004-2017 at SW4



Annual Mean LPCB in Perch 2004-2017 at SW5



Upper Hudson River Fish PCB Concentrations 2004 - 2017 Species Weighted and River Section Length Weighted Averages



The overall weighted average fish PCB concentration is ~ 3X the target to be reached in 2020.



Current DEC Assessment – Fish PCB Data

The fish PCB concentrations in the upper Hudson do not appear to have declined as predicted by EPA in the ROD.

To achieve the RAOs for the site, the rate of decline would need to exceed 20% per year to reach the five year target of 0.4 ppm by 2020, and exceed 10% per year to reach the 16 year target of 0.2 ppm by 2031.



Current DEC Assessment – Fish PCB Data

The available fish data support a conclusion that the existing concentrations remain well above the EPA RAOs, that the rate of decline is slowing, and that it is unlikely that the RAOs will be met by the existing remedy.

It is likely that further remediation of contaminated sediments in the Upper Hudson will be required for the remedial action to meet the EPA ROD RAOs for protection of human health and the environment.



PCBs in Upper Hudson Surface Water



Available Surface Water Data

- GE weekly collections at Thompson Island, Schuylerville, and Waterford (weather allowing); less frequently at Bakers Falls, Rogers Island, Albany and Poughkeepsie
- High flow event sampling
- Three years of data since dredging ended



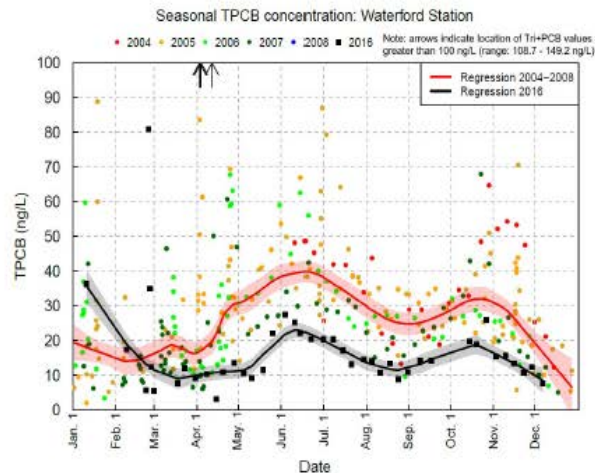
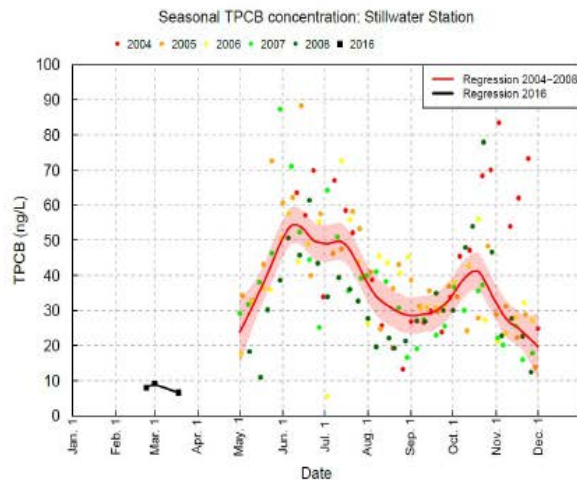
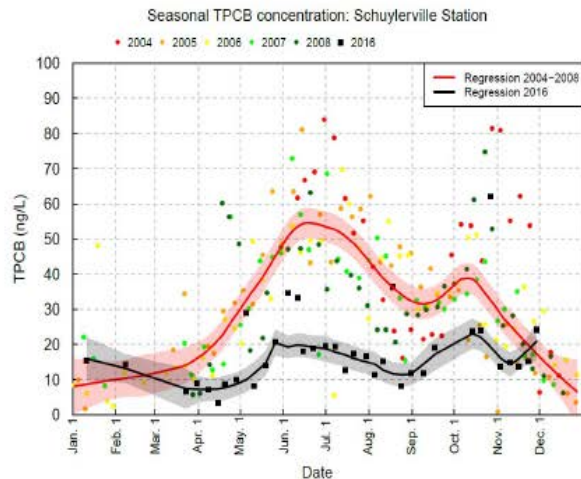
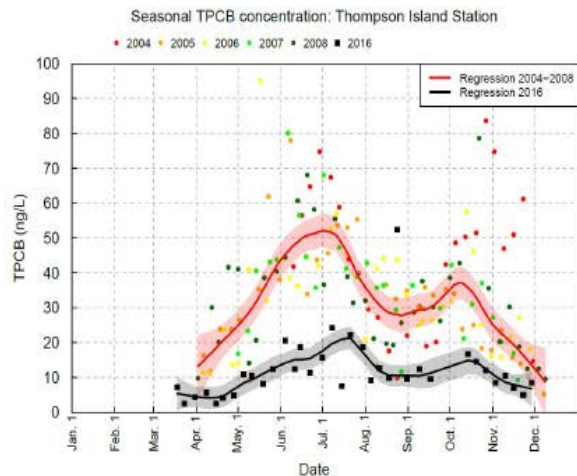
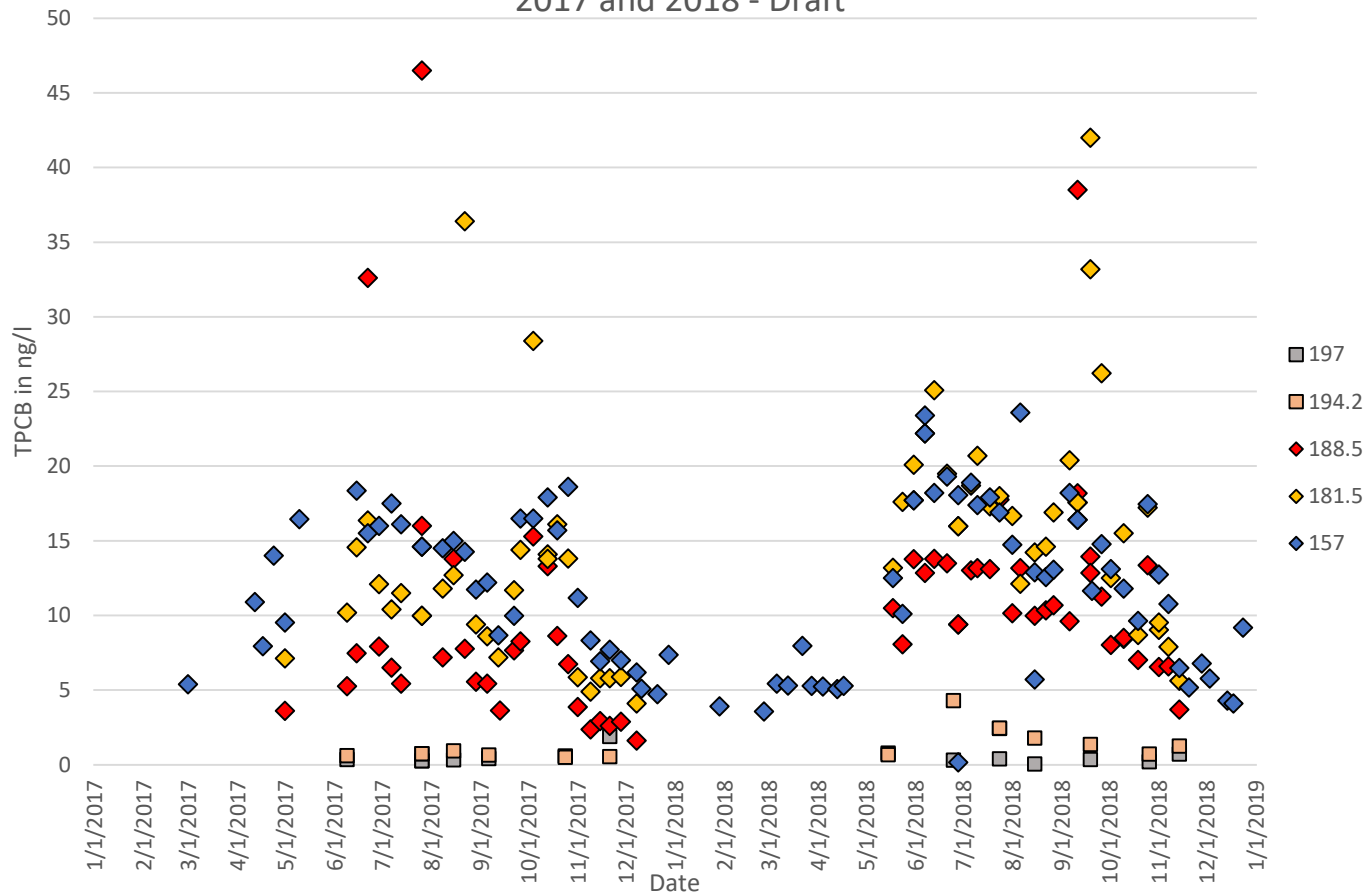


Figure A1-8
from EPA's
"Second Five
Year Review
Report",
Appendix 1

Total PCB in
surface water -
2016 vs baseline

Hudson River Surface Water Total PCB by River Mile 2017 and 2018 - Draft



Surface water
data from GE
Monthly
Reports

Total PCB by
River Mile -
2017 and 2018



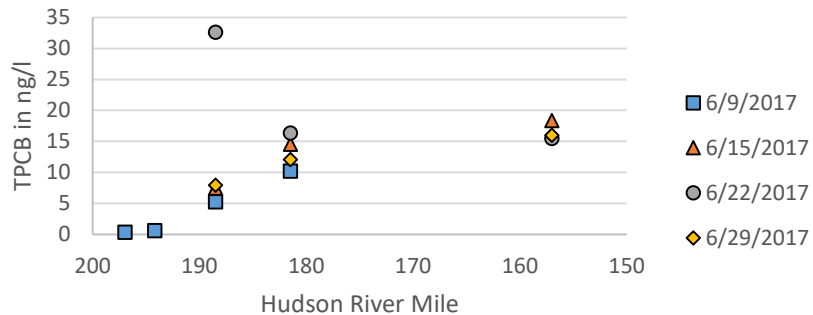
Total PCB concentration vs. mass flux

- GE's data set – PCB concentrations at multiple locations
- USGS flow data – Fort Edward, Thompson (Lock 5), and Lock 1 above Waterford
- Use flow rate and PCB concentration to calculate rate of PCB transport by surface water

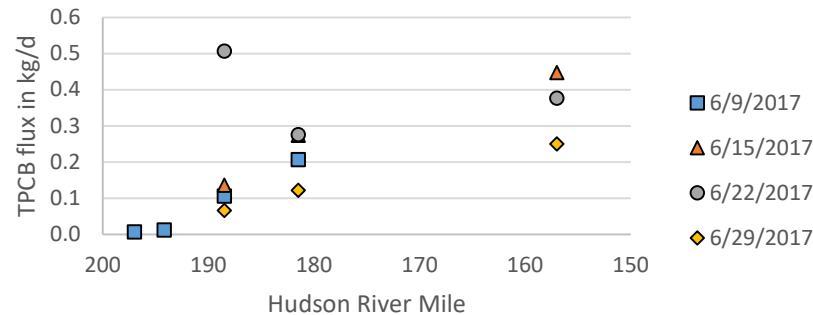
$$(Flow\ rate) \times (PCB\ conc.) \times (units\ factor) = PCB\ mass\ flux\ rate$$
$$CFS \times ng/l \times units\ factor = kg/day$$



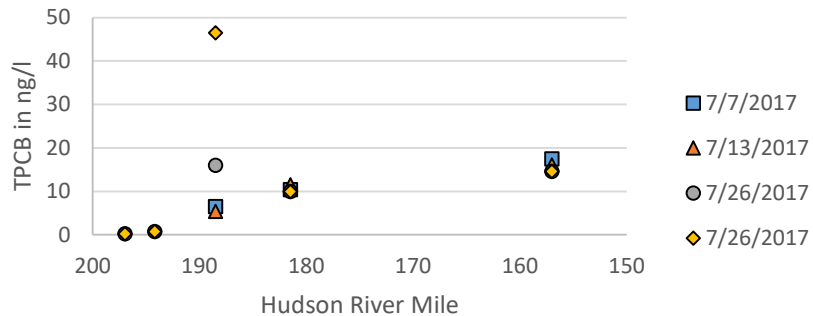
Surface Water Total PCB by River Mile
June 2017



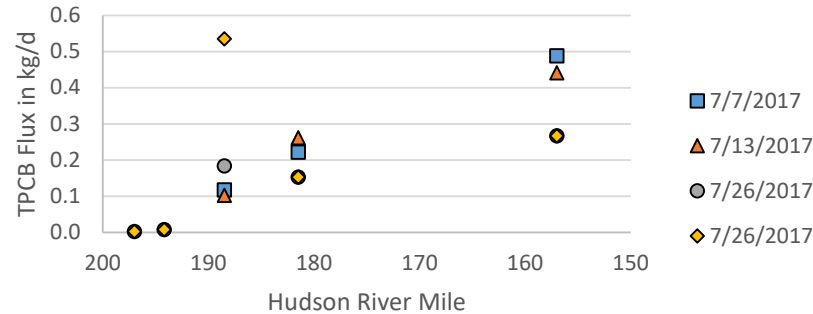
Surface Water Total PCB Mass Flux by River
Mile June 2017



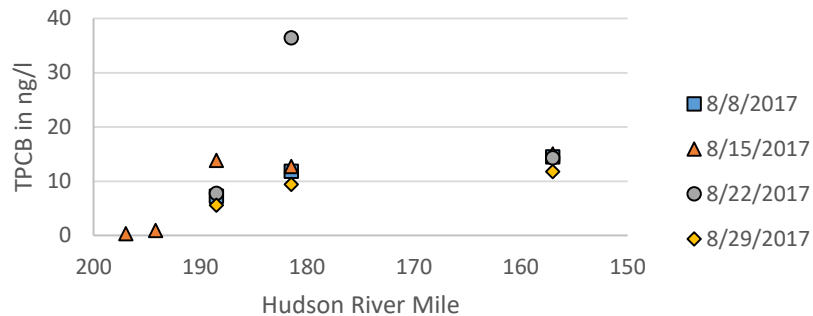
Surface Water Total PCB by River Mile
July 2017



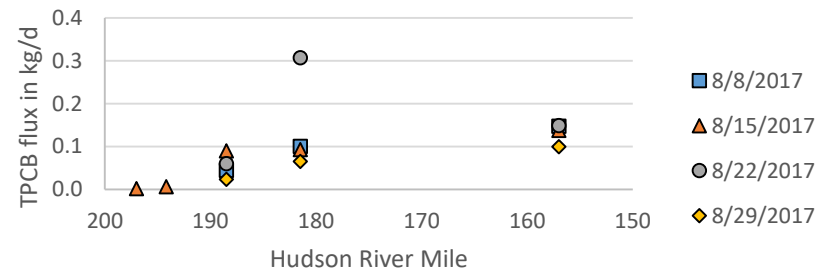
Surface Water Total PCB Mass Flux by River
Mile July 2017



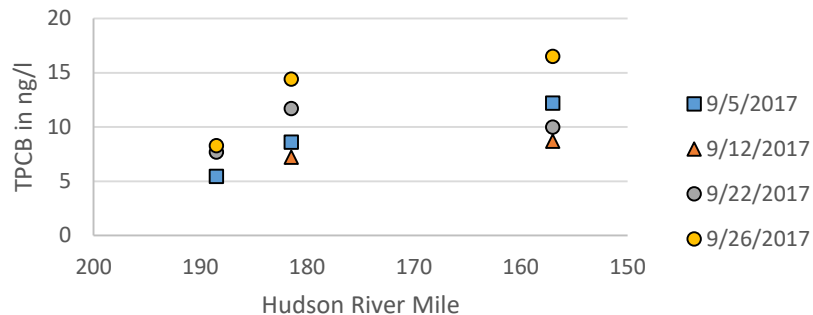
Surface Water Total PCB by River Mile
August 2017



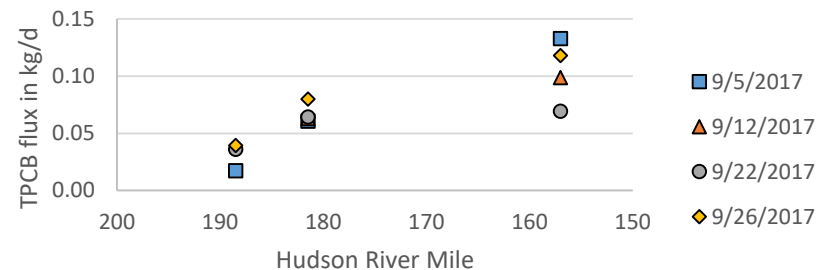
Surface Water Total PCB Mass Flux by River Mile
August 2017



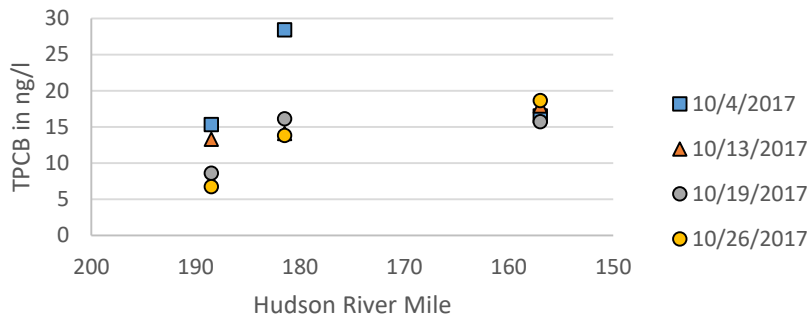
Surface Water Total PCB by River Mile
September 2017



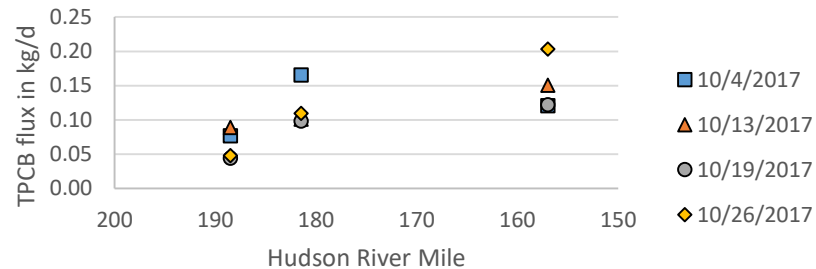
Surface Water Total PCB Mass Flux by River Mile
September 2017



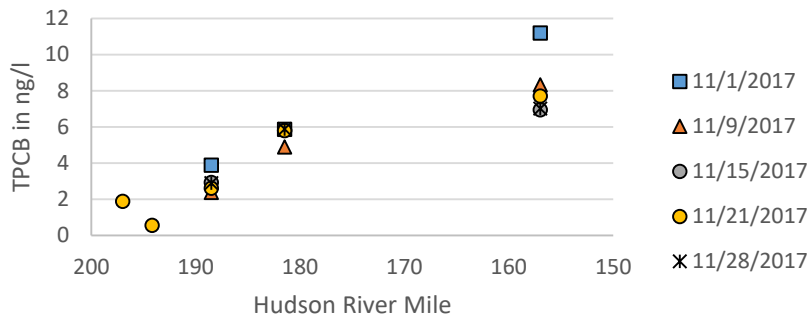
Surface Water Total PCB by River Mile
October 2017



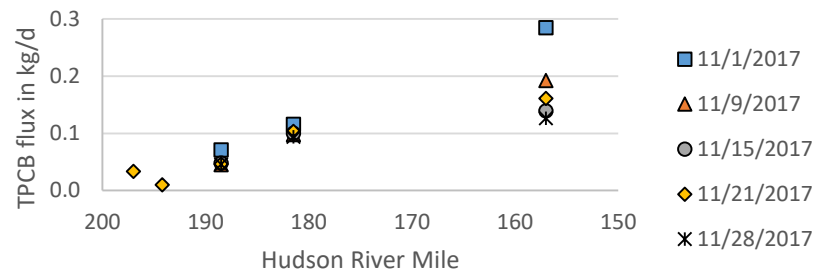
Surface Water Total PCB Mass Flux by River Mile
October 2017



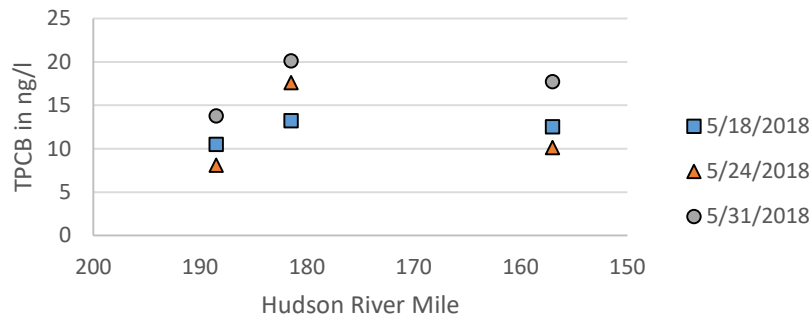
Surface Water Total PCB by River Mile
November 2017



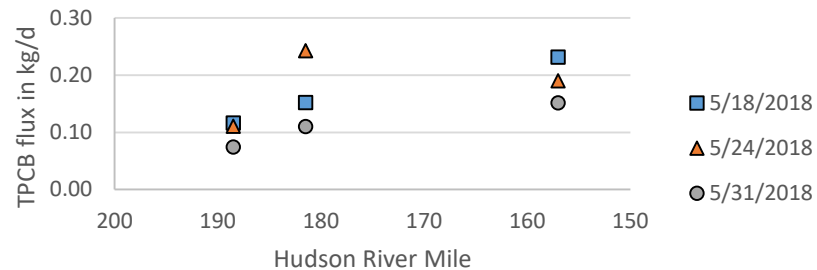
Surface Water Total PCB Mass Flux by River Mile
November 2017



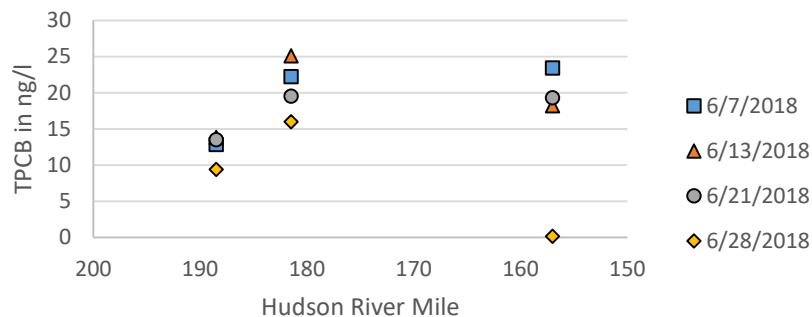
Surface Water Total PCB by River Mile
May 2018



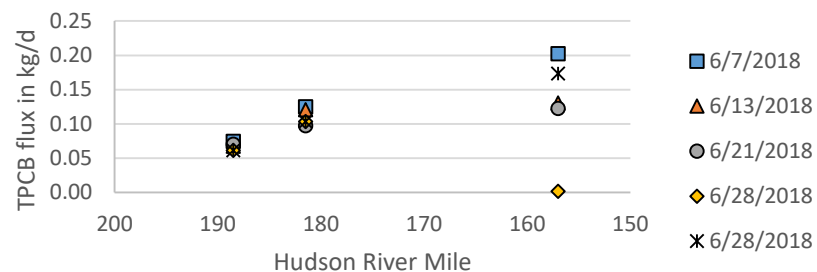
Surface Water Total PCB Mass Flux by River Mile
May 2018



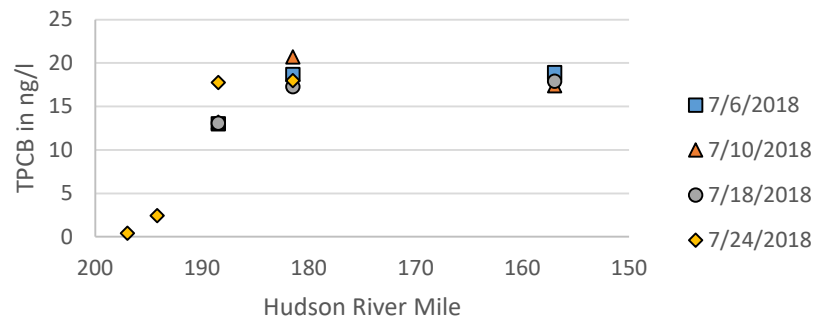
Surface Water Total PCB by River Mile
June 2018



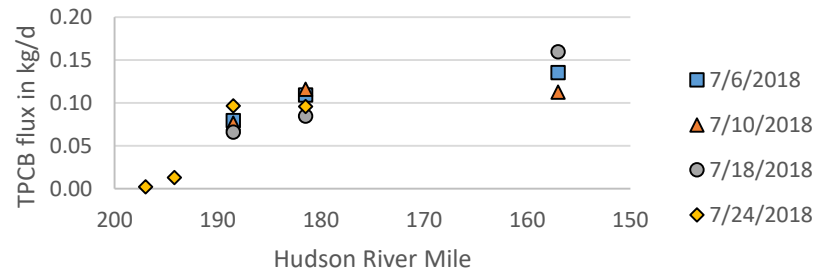
Surface Water Total PCB Mass Flux by River Mile
June 2018



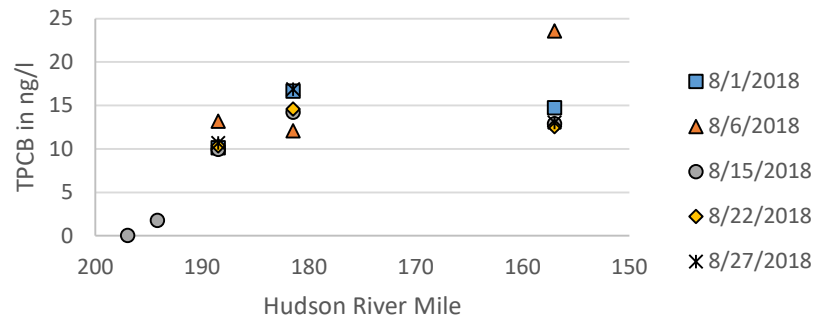
Surface Water Total PCB by River Mile
July 2018



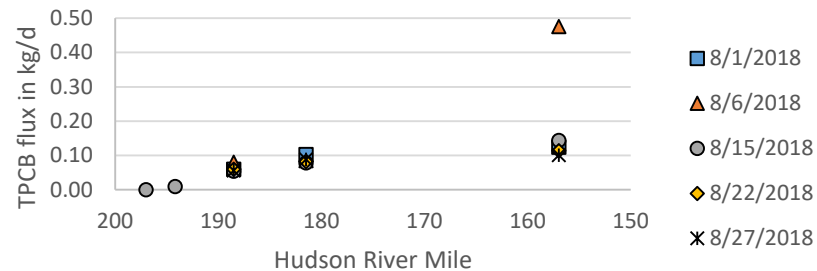
Surface Water Total PCB Mass Flux by River
Mile
July 2018



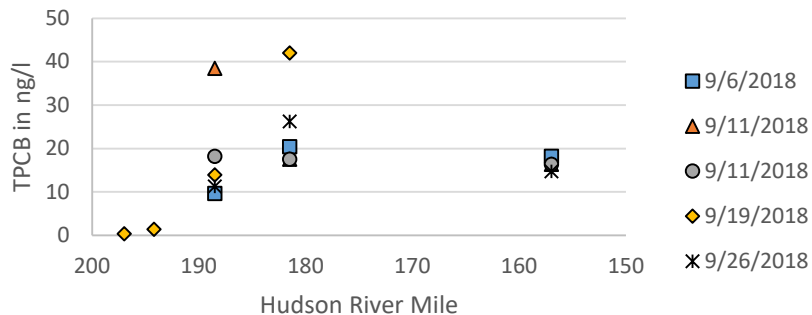
Surface Water Total PCB by River Mile
August 2018



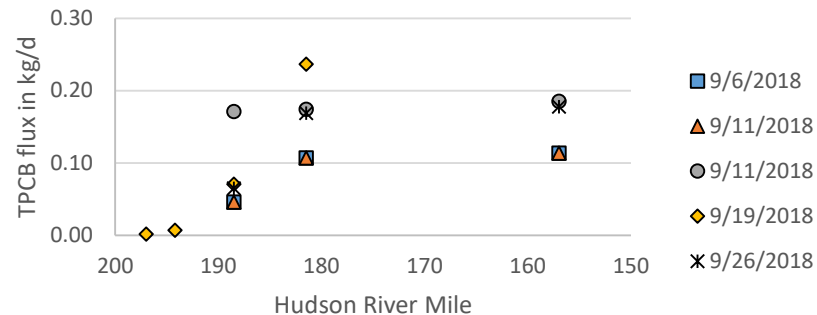
Surface Water Total PCB Mass Flux by River
Mile
August 2018



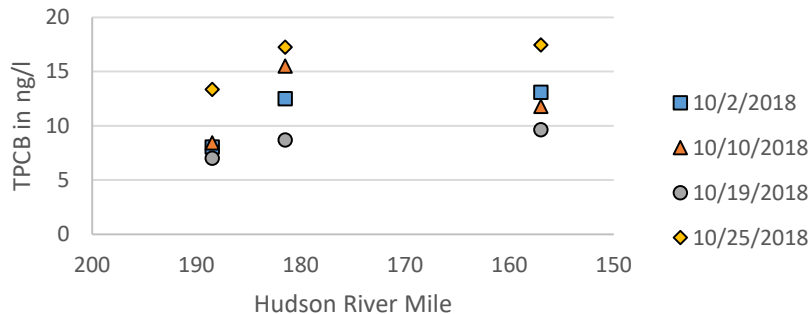
Surface Water Total PCB by River Mile
September 2018



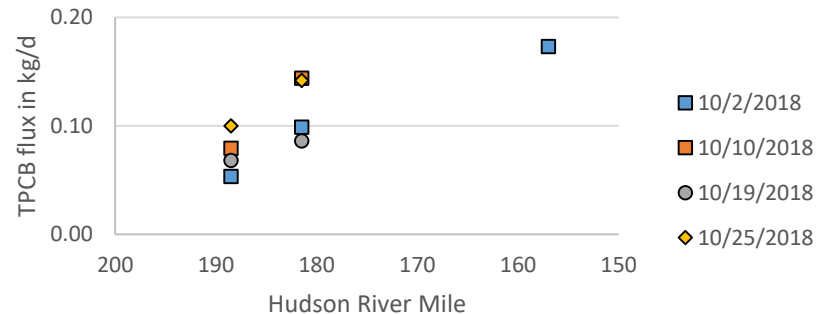
Surface Water Total PCB Mass Flux by River Mile
September 2018



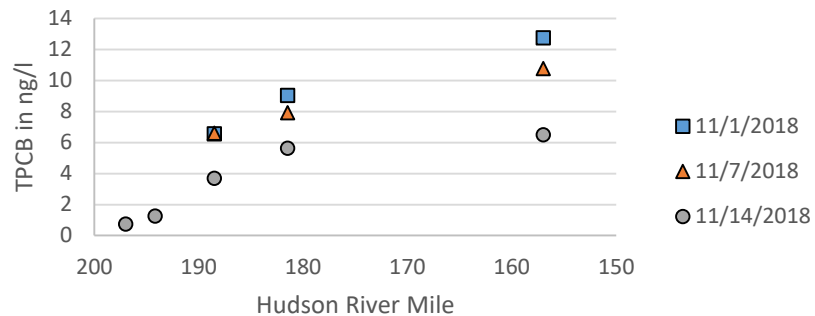
Surface Water Total PCB by River Mile
October 2018



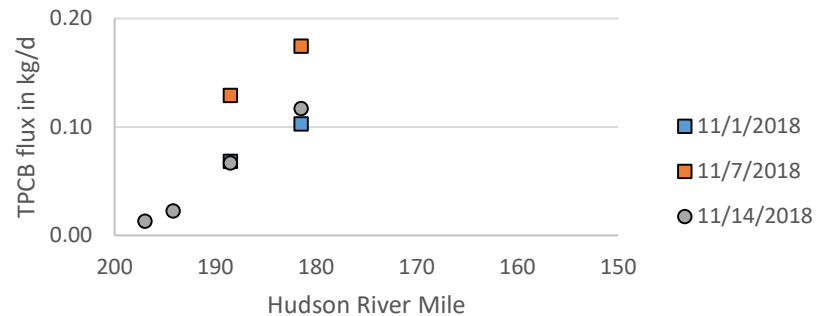
Surface Water Total PCB Mass Flux by River Mile
October 2018



Surface Water Total PCB by River Mile
November 2018



Surface Water Total PCB Mass Flux by River Mile
November 2018



Observations – Surface Water

- Surface Water Total PCB concentrations and mass flux- appear to be reduced by $\sim 2/3$ at Thompson Island and Schuylerville, and by $\sim 1/2$ at Waterford
- PCB mass flux continues to increase with distance downstream of Fort Edward – ongoing sources to water column
- 2019 – a “wet year” so far; first since end of dredging



Thank You

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NYSDEC

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Albany, NY 12233-7013

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518-402-9778

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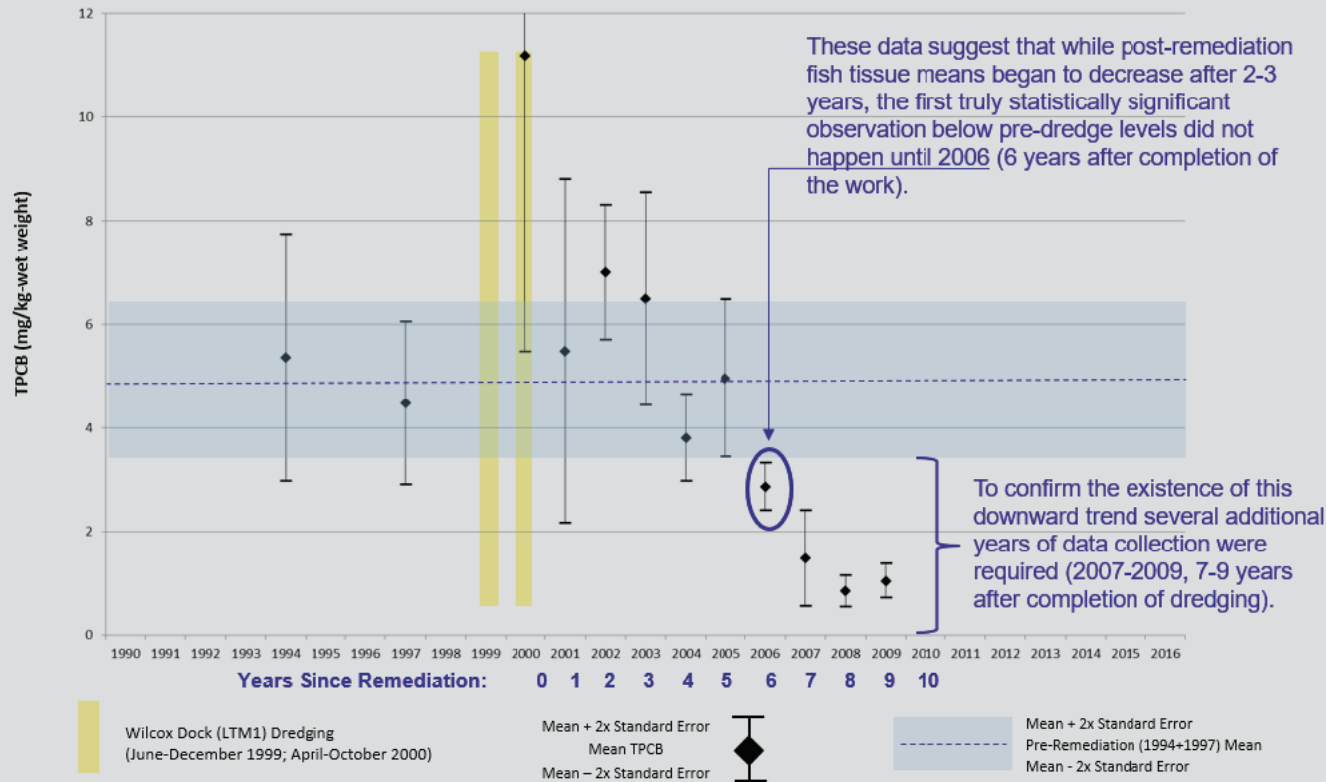
Twitter: twitter.com/NYSDEC

Flickr: www.flickr.com/photos/nysdec



Department of
Environmental
Conservation

Cumberland Bay-Wilcox Dock (LTM1-Source) Yellow Perch (TCPB, mg/kg-wet weight, NYSDEC data 1994-2009, Whole Body Samples, Fall Results)

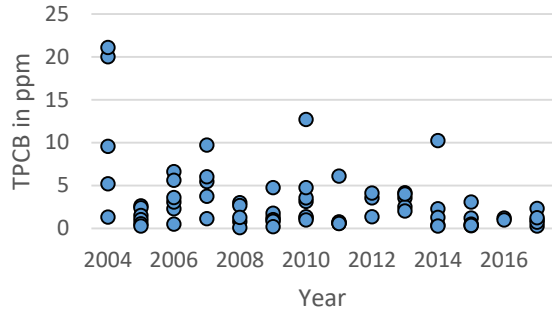


From 2019 Battelle Poster “PCBs in Fish Tissues at the Hudson River PCBs Site: Results of Remedial Action and Early Post-Construction Monitoring” (Greenberg et al)

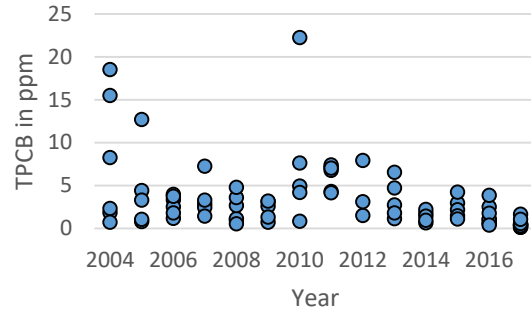
Bullhead in Thompson Island Pool (R8/RS1)



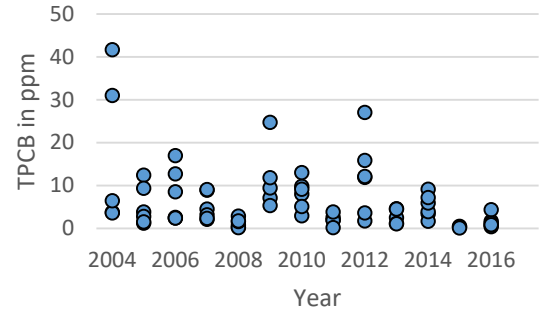
TPCB in Bullhead at TD1



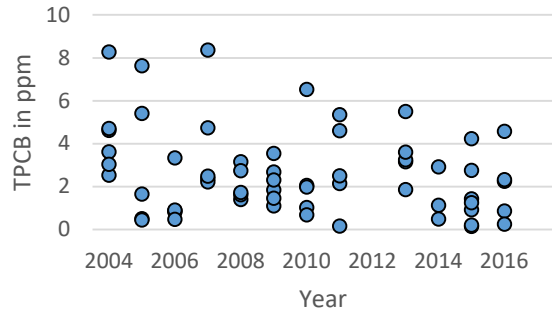
TPCB in Bullhead at TD2



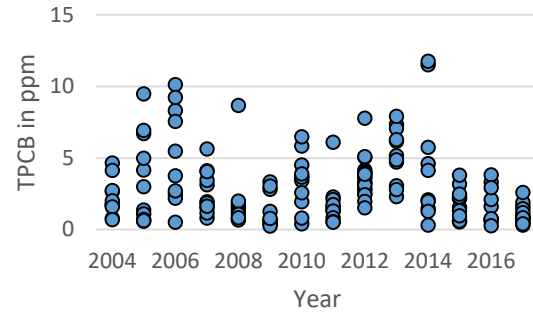
TPCB in Bullhead at TD3



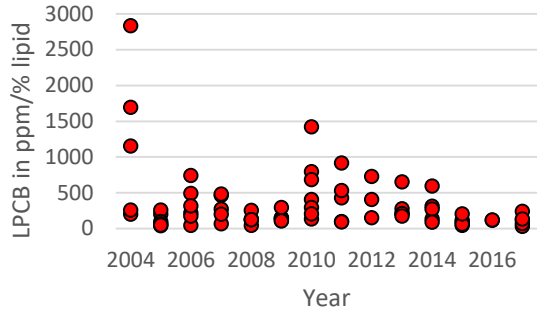
TPCB in Bullhead at TD4



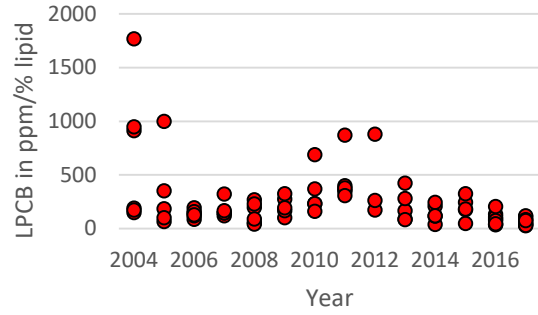
TPCB in Bullhead at TD5



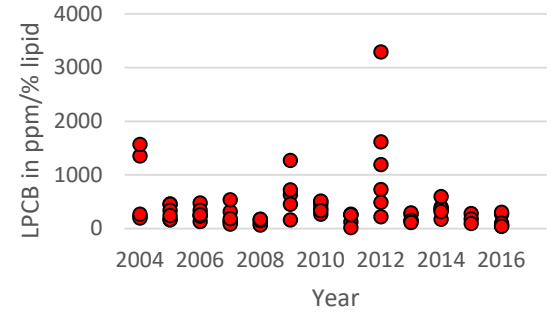
LPCB in Bullhead at TD1



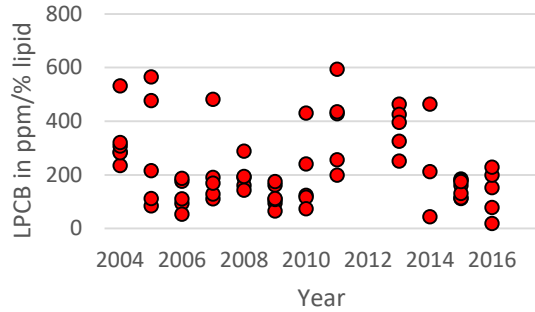
LPCB in Bullhead at TD2



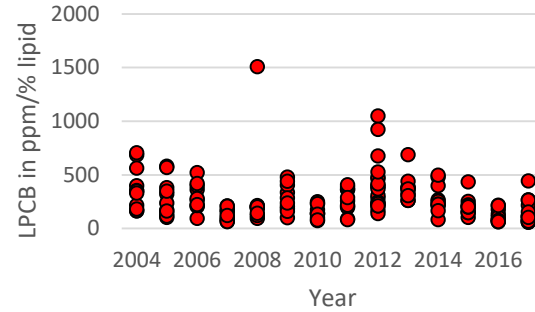
LPCB in Bullhead at TD3



LPCB in Bullhead at TD4



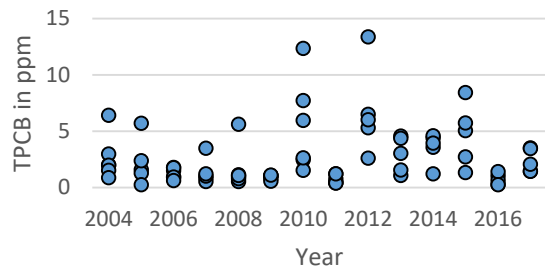
LPCB in Bullhead at TD5



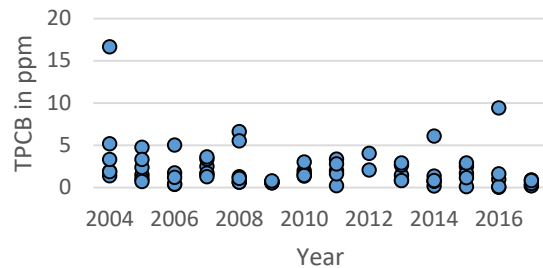
Black Bass in Thompson Island Pool (R8/RS1)



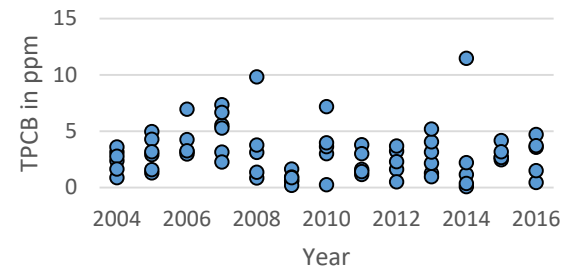
TPCB in Large and Small Mouth Bass at TD1



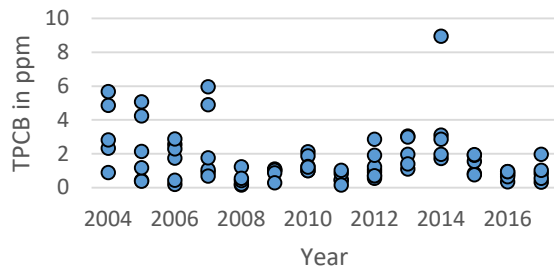
TPCB in Large and Small Mouth Bass at TD2



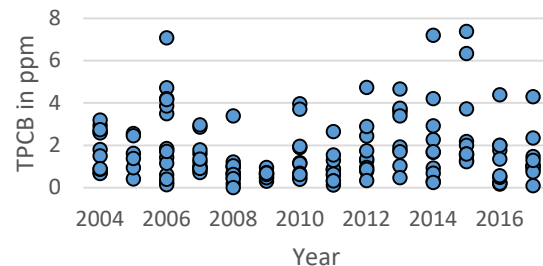
TPCB in Large and Small Mouth Bass at TD3



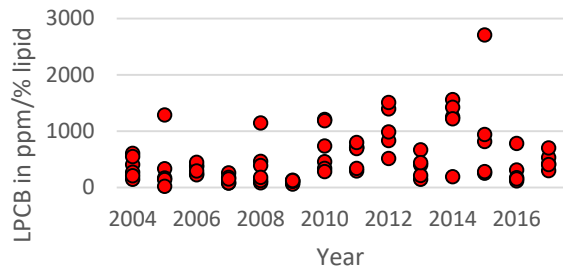
TPCB in Large and Small Mouth Bass at TD4



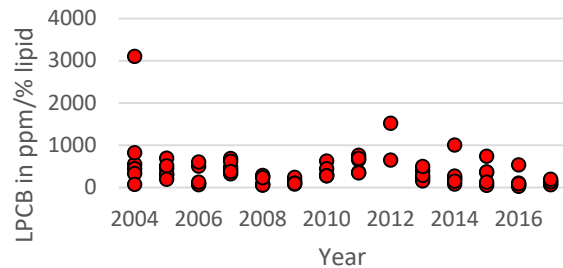
TPCB in Large and Small Mouth Bass at TD5



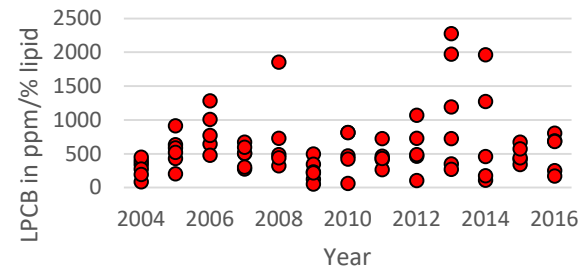
LPCB in Large and Small Mouth Bass at TD1



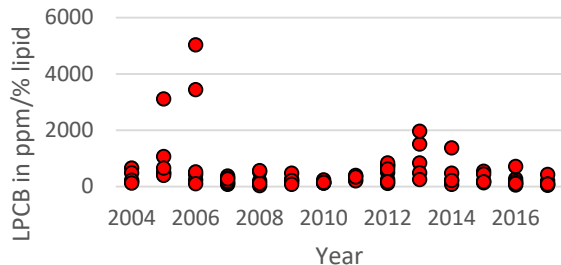
LPCB in Large and Small Mouth Bass at TD2



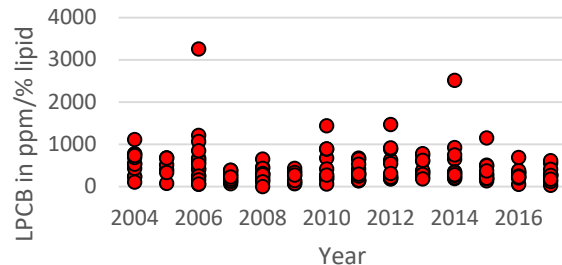
LPCB in Large and Small Mouth Bass at TD3



LPCB in Large and Small Mouth Bass at TD4



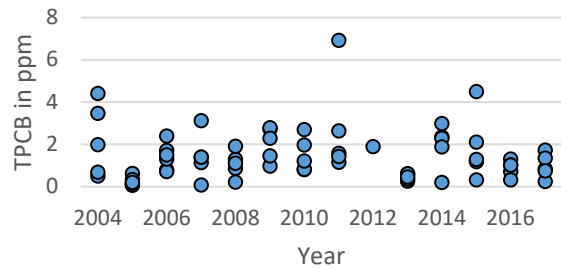
LPCB in Large and Small Mouth Bass at TD5



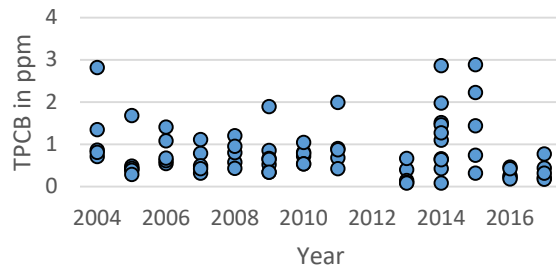
Perch in Thompson Island Pool (R8/RS1)



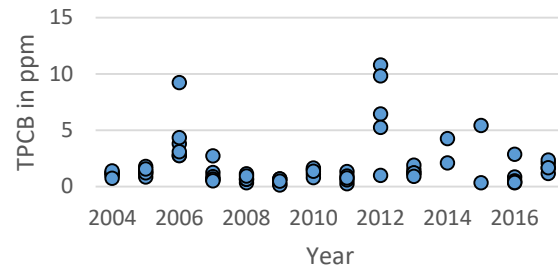
TPCB in Perch 2004-2015 at
TD1



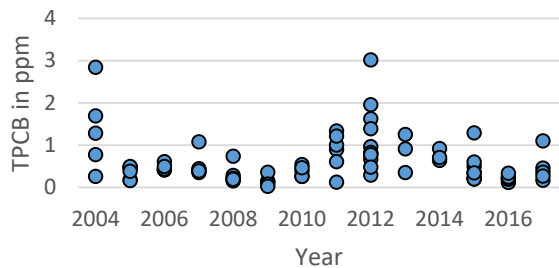
TPCB in Perch 2004-2015 at
TD2



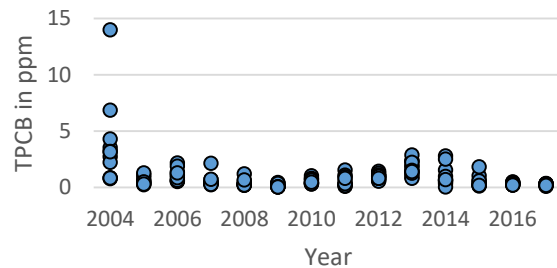
TPCB in Perch 2004-2015 at
TD3



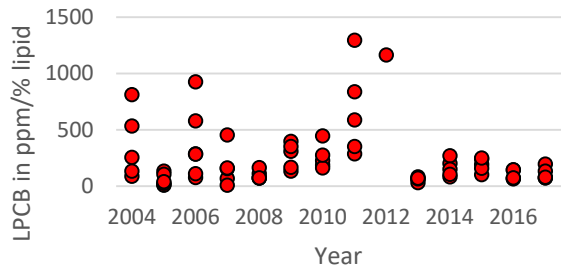
TPCB in Perch 2004-2015 at
TD4



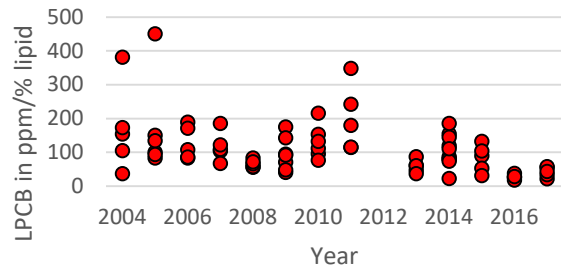
TPCB in Perch 2004-2015 at
TD5



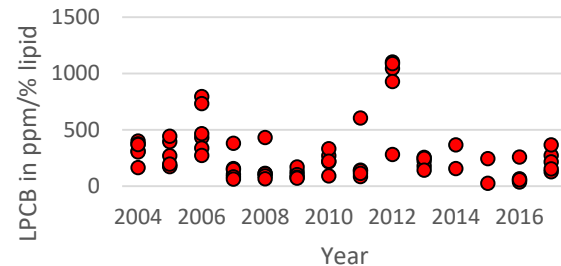
LPCB in Perch 2004-2015 at TD1



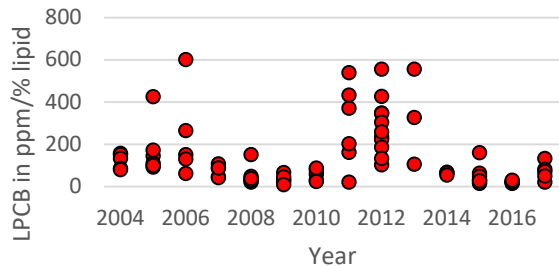
LPCB in Perch 2004-2015 at TD2



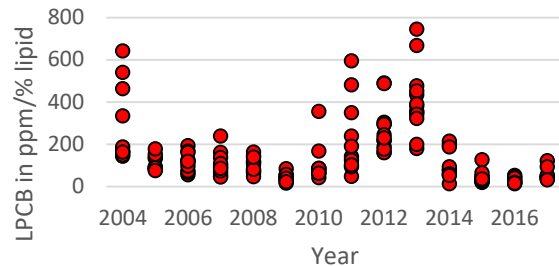
LPCB in Perch 2004-2015 at TD3



LPCB in Perch 2004-2015 at TD4



LPCB in Perch 2004-2015 at TD5



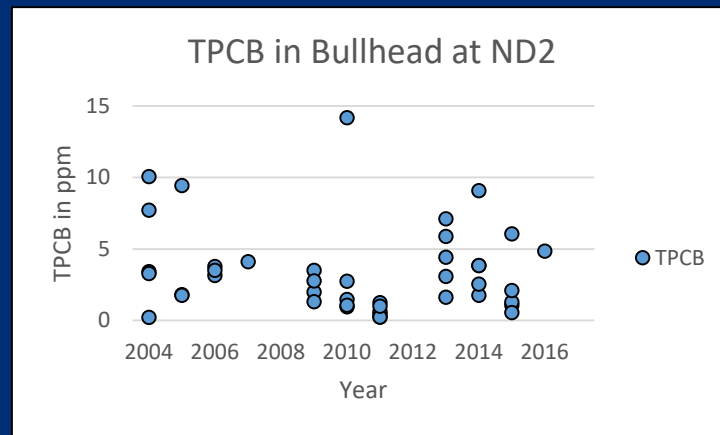
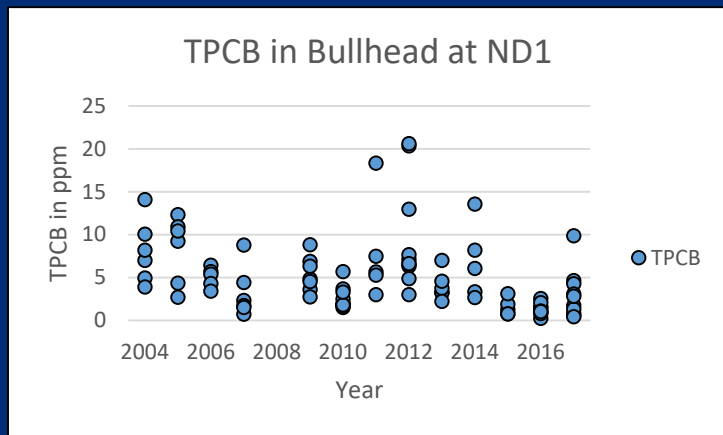
Reach 7 / River Section 2 “Landlocked” or Fort Miller Pool

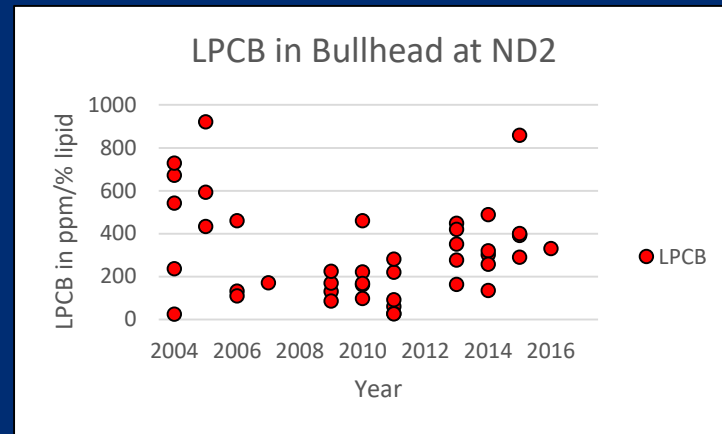
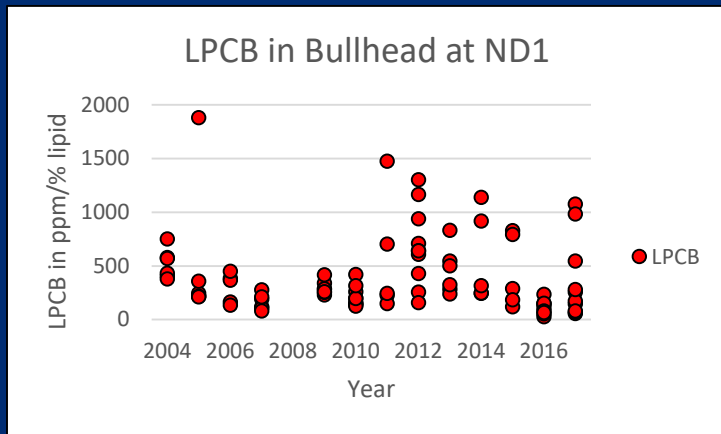
Locations ND1 – ND2 were dredged in 2014-15



Bullhead in Land Locked Pool (R7/RS2)



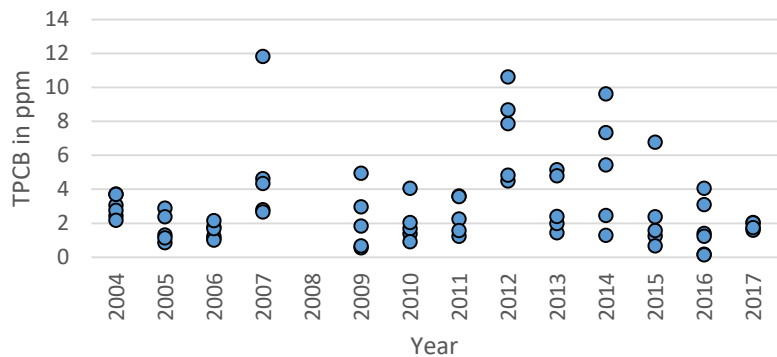




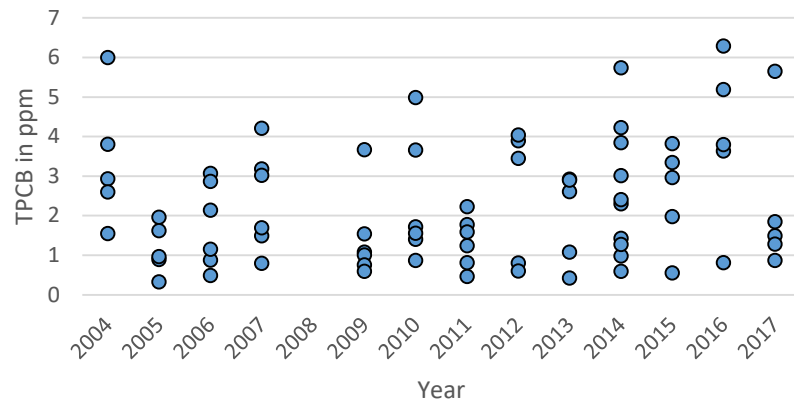
Black Bass in Land Locked Pool (R7/RS2)



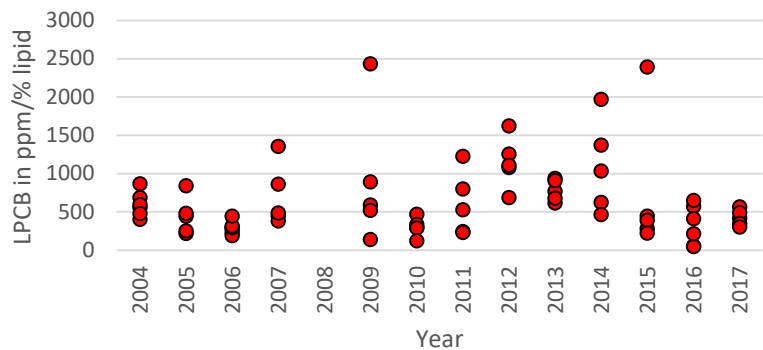
TPCB in Large and Small Mouth Bass at ND1



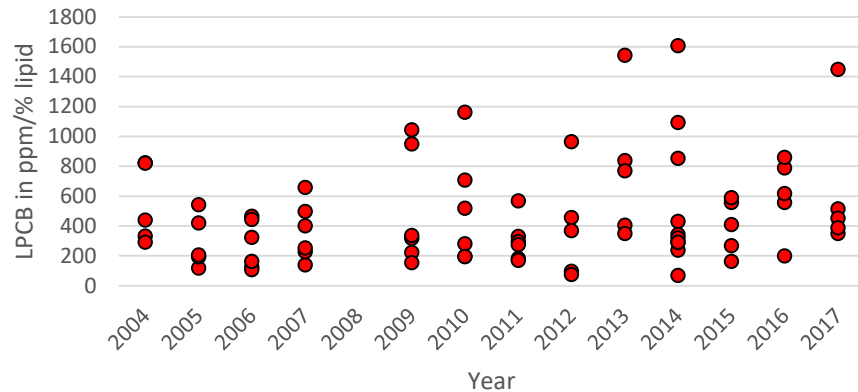
TPCB in Large and Small Mouth Bass at ND2



LPCB in Large and Small Mouth Bass at
ND1



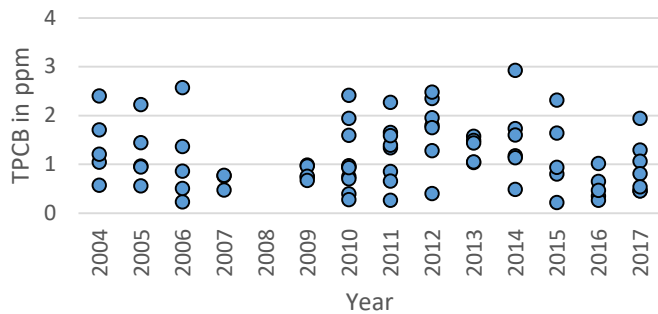
LPCB in Large and Small Mouth Bass at ND2



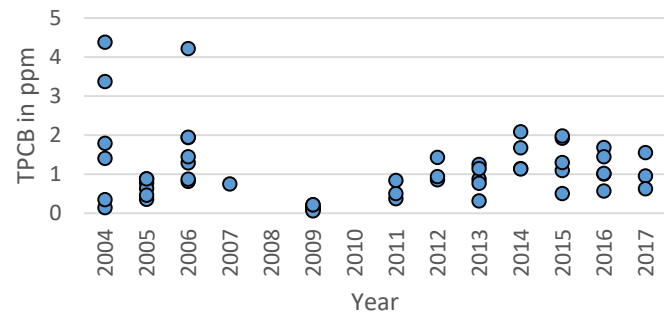
Perch in Land Locked Pool (R7/RS2)



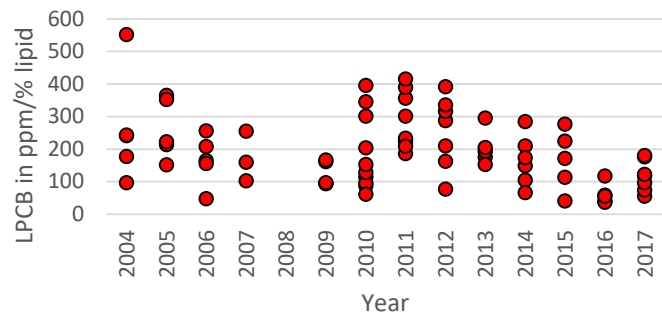
TPCB in Perch 2004-2017 at ND1



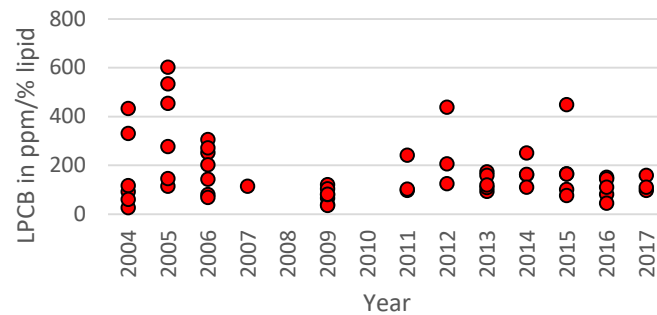
TPCB in Perch 2004-2017 at ND2



LPCB in Perch 2004-2017 at ND1



LPCB in Perch 2004-2017 at ND2



Reach 6 / River Section 2 Northumberland or Lock 5 Pool

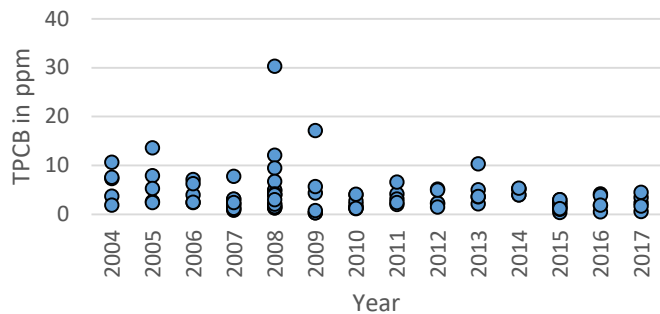
Locations ND3 and ND5 were dredged in 2013



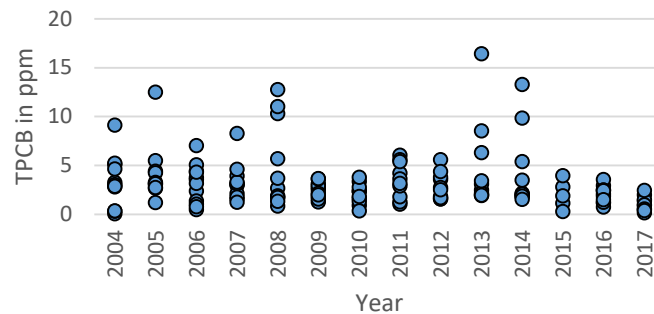
Bullhead in Northumberland Pool (R6/RS2)



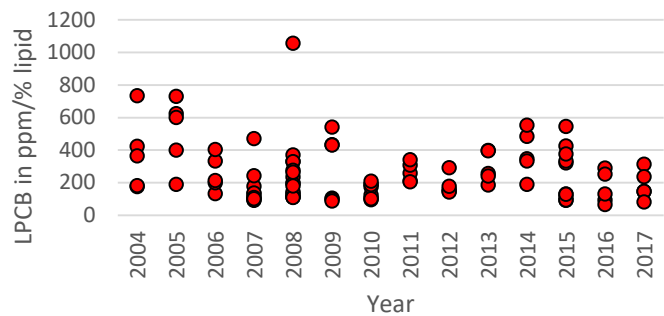
TPCB in Bullhead at ND3



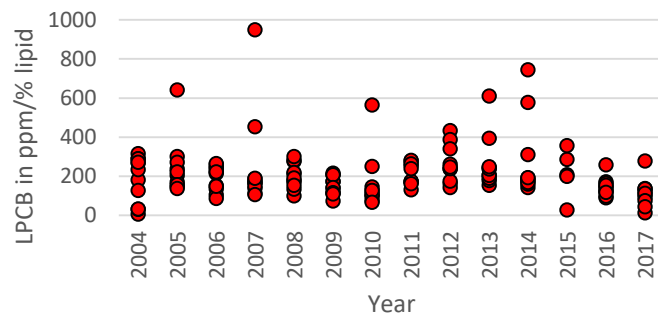
TPCB in Bullhead at ND5



LPCB in Bullhead at ND3



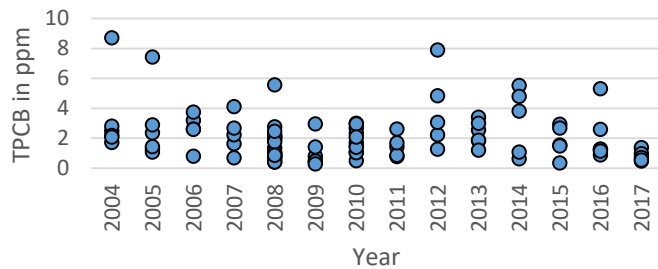
LPCB in Bullhead at ND5



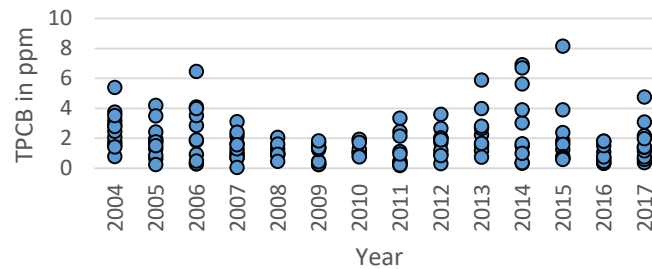
Black Bass in Northumberland Pool (R6/RS2)



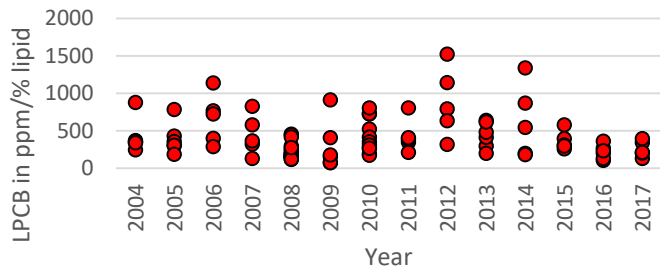
TPCB in Large and Small Mouth Bass
at ND3



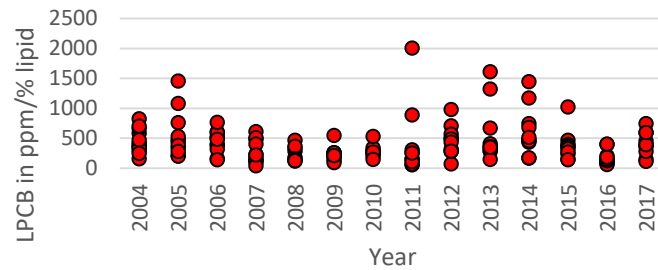
TPCB in Large and Small Mouth Bass
at ND5



LPCB in Large and Small Mouth Bass
at ND3



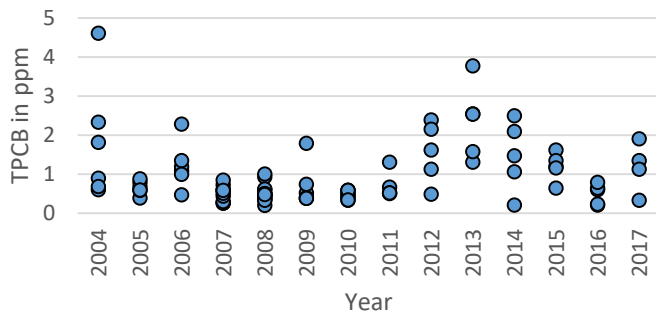
LPCB in Large and Small Mouth Bass
at ND5



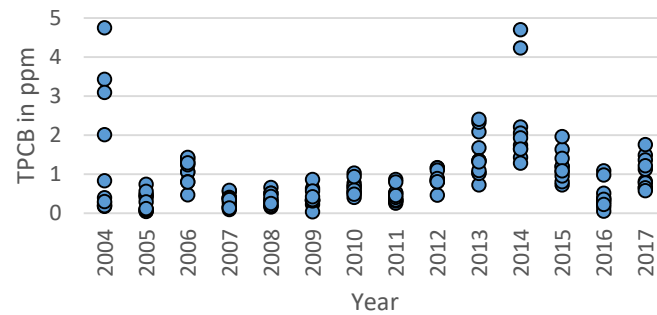
Perch in Northumberland Pool (R6/RS2)



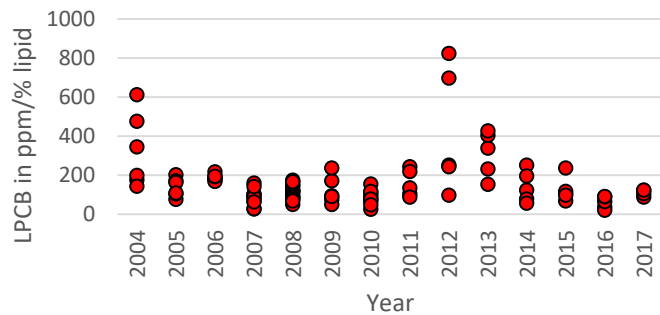
TPCB in Perch 2004-2017 at ND3



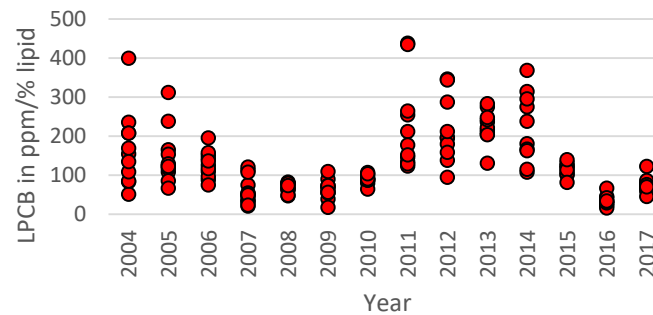
TPCB in Perch 2004-2017 at ND5



LPCB in Perch 2004-2017 at ND3



LPCB in Perch 2004-2017 at ND5



Reach 5 / River Section 3 Stillwater Pool

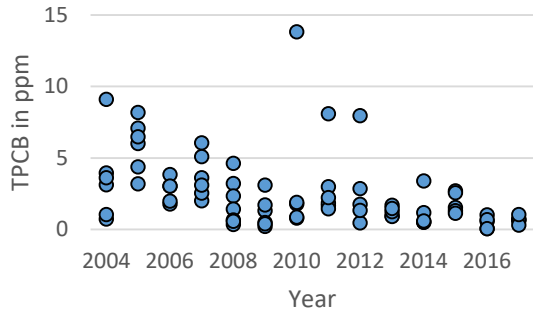
Dredging in Reach 5 / River Section 3:
2013 (SW1), 2014 (SW2 – SW 5)



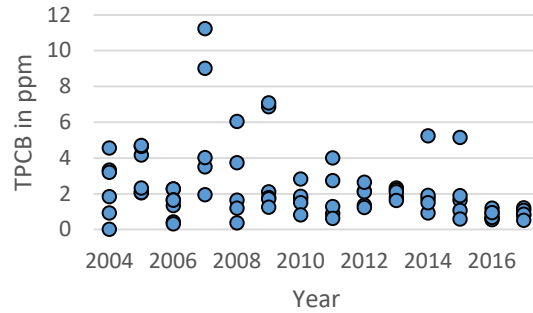
Bullhead in Stillwater Pool (R5/RS3)



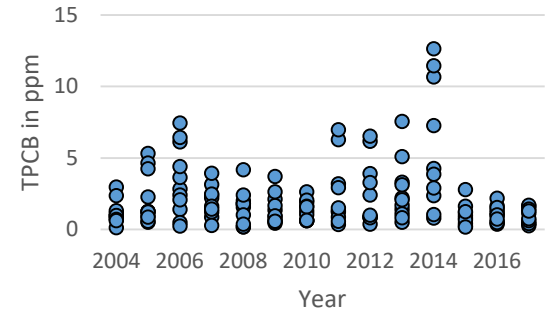
TPCB in Bullhead at SW1



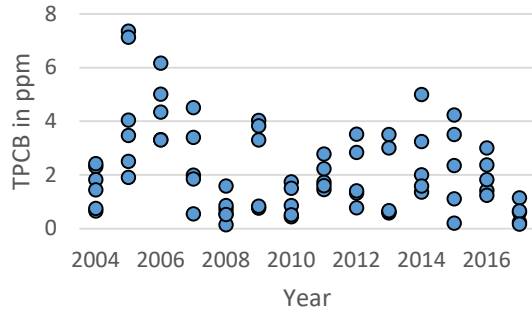
TPCB in Bullhead at SW2



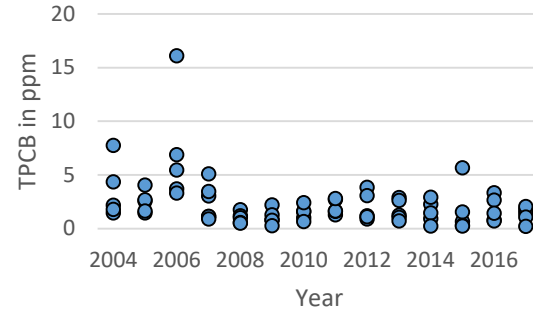
TPCB in Bullhead at SW3



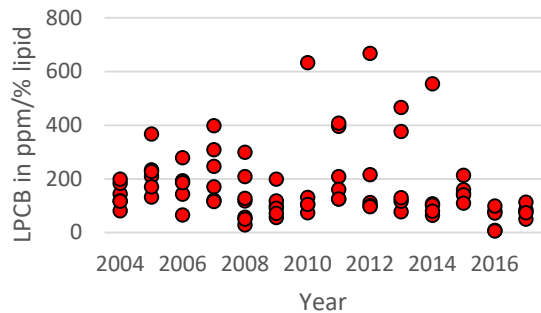
TPCB in Bullhead at SW4



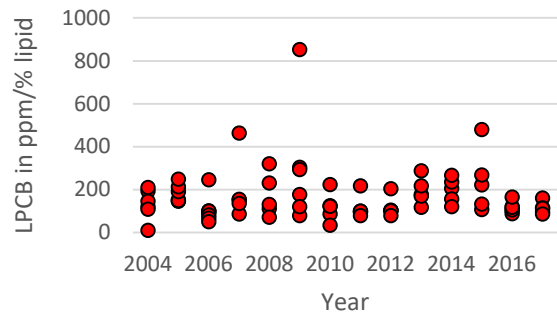
TPCB in Bullhead at SW5



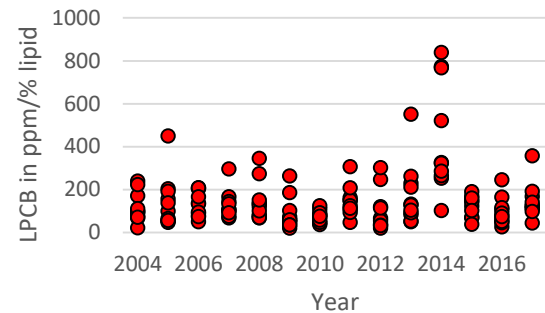
LPCB in Bullhead at SW1



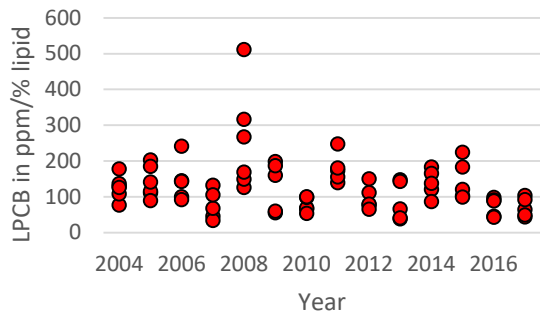
LPCB in Bullhead at SW2



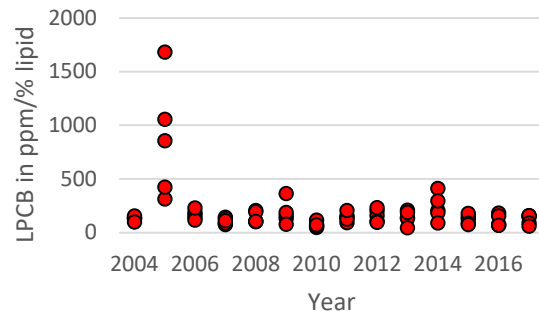
LPCB in Bullhead at SW3



LPCB in Bullhead at SW4



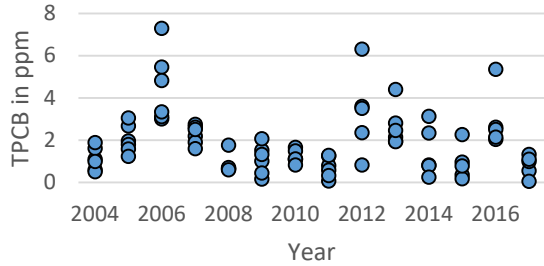
LPCB in Bullhead at SW5



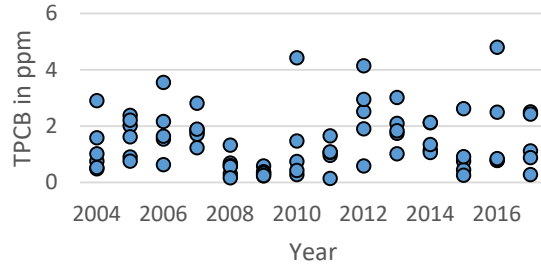
Black Bass in Stillwater Pool (R5/RS3)



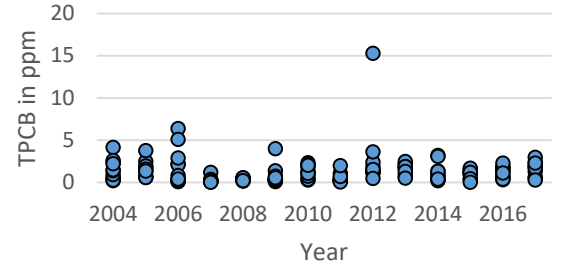
TPCB in Large and Small Mouth Bass at SW1



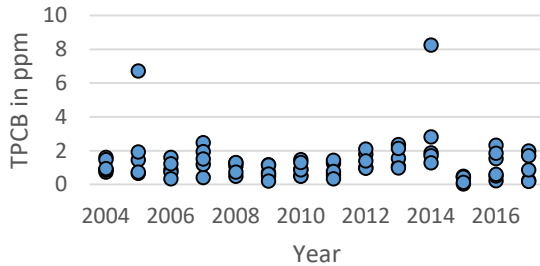
TPCB in Large and Small Mouth Bass at SW2



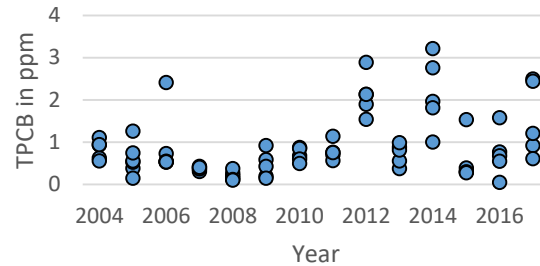
TPCB in Large and Small Mouth Bass at SW3



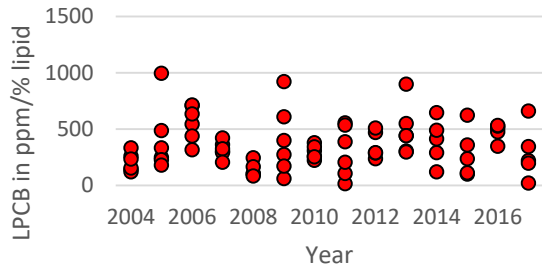
TPCB in Large and Small Mouth Bass at SW4



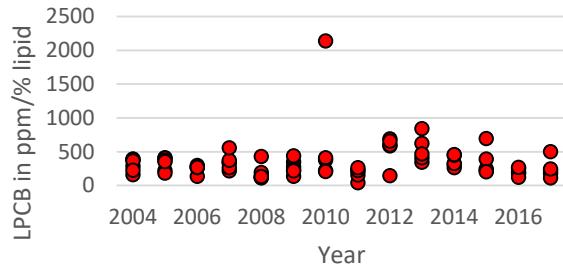
TPCB in Large and Small Mouth Bass at SW5



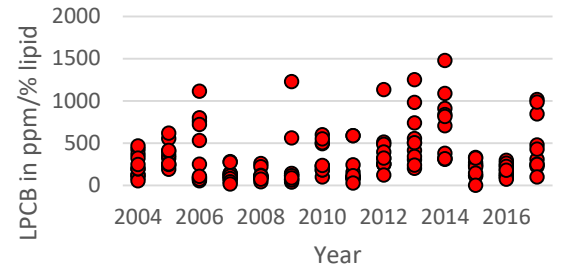
LPCB in Large and Small Mouth Bass at SW1



LPCB in Large and Small Mouth Bass at SW2



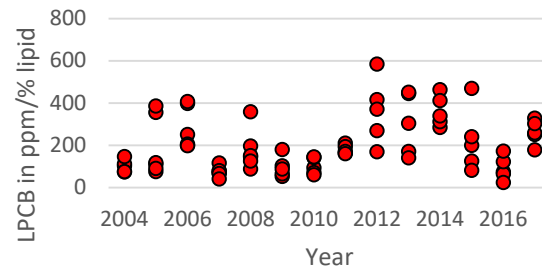
LPCB in Large and Small Mouth Bass at SW3



LPCB in Large and Small Mouth Bass at SW4



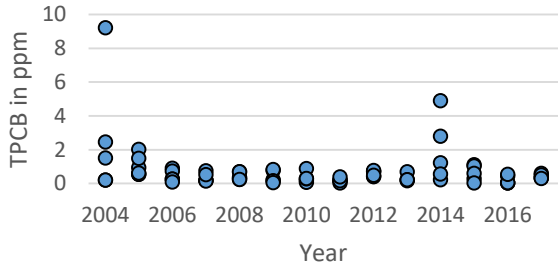
LPCB in Large and Small Mouth Bass at SW5



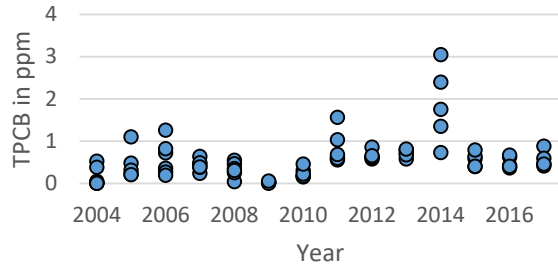
Perch in Stillwater Pool (R5/RS3)



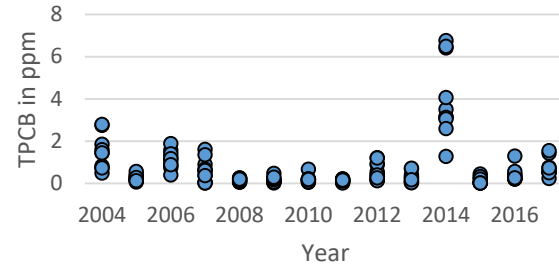
TPCB in Perch 2004-2017 at SW1



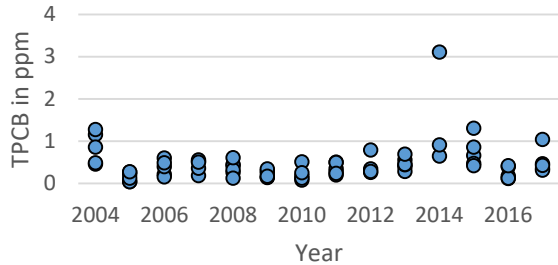
TPCB in Perch 2004-2017 at SW2



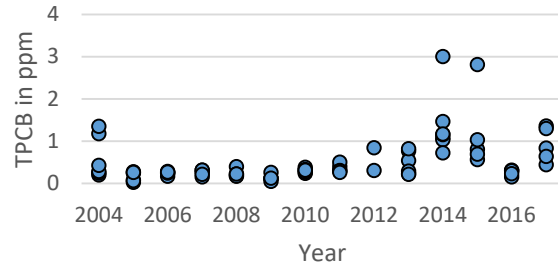
TPCB in Perch 2004-2017 at SW3



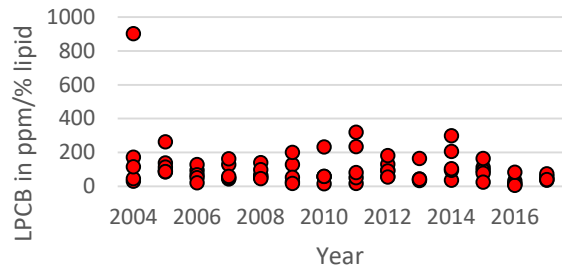
TPCB in Perch 2004-2017 at SW4



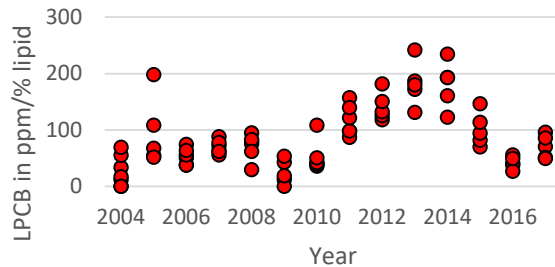
TPCB in Perch 2004-2017 at SW5



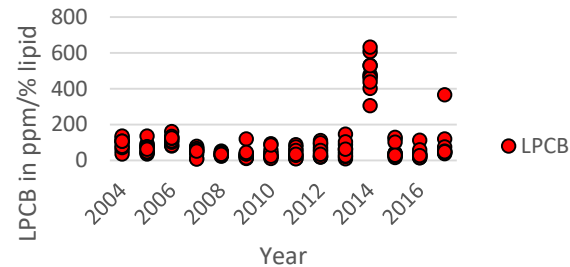
LPCB in Perch 2004-2017 at SW1



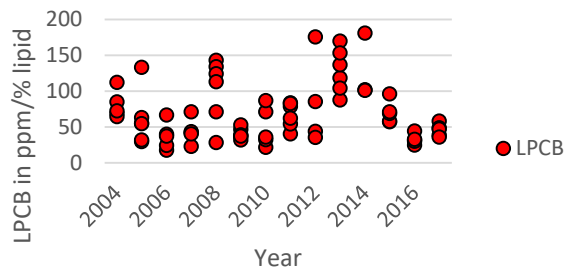
LPCB in Perch 2004-2017 at SW2



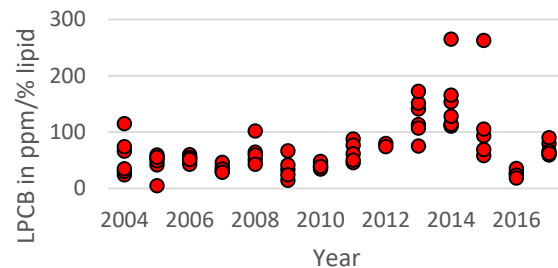
LPCB in Perch 2004-2017 at SW3



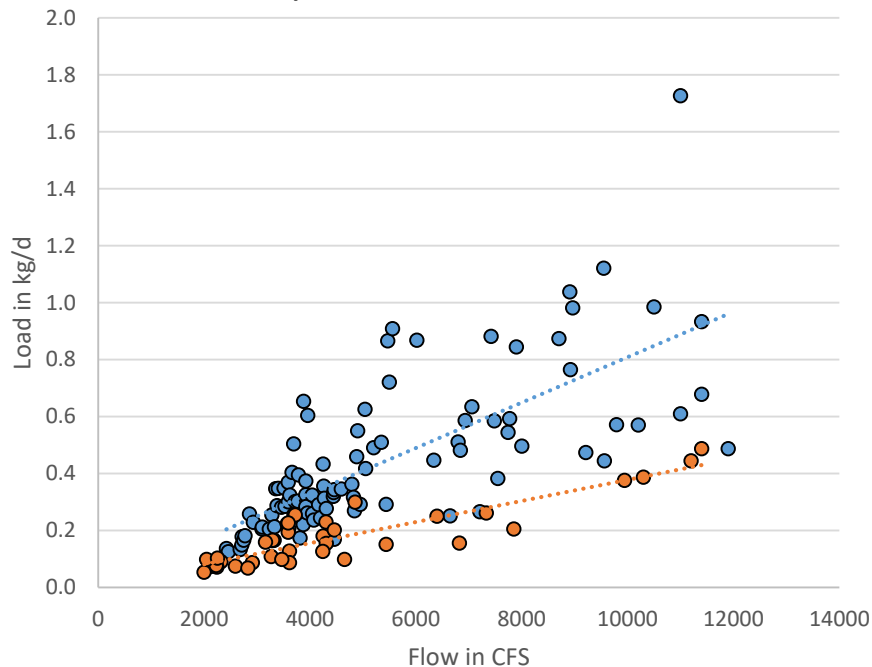
LPCB in Perch 2004-2017 at SW4



LPCB in Perch 2004-2017 at SW5



TPCB Load vs. Daily Flow at Waterford
BMP Years (2004-08) and Post Remedy (2016-17)
May - October, Flows < 12KCFS

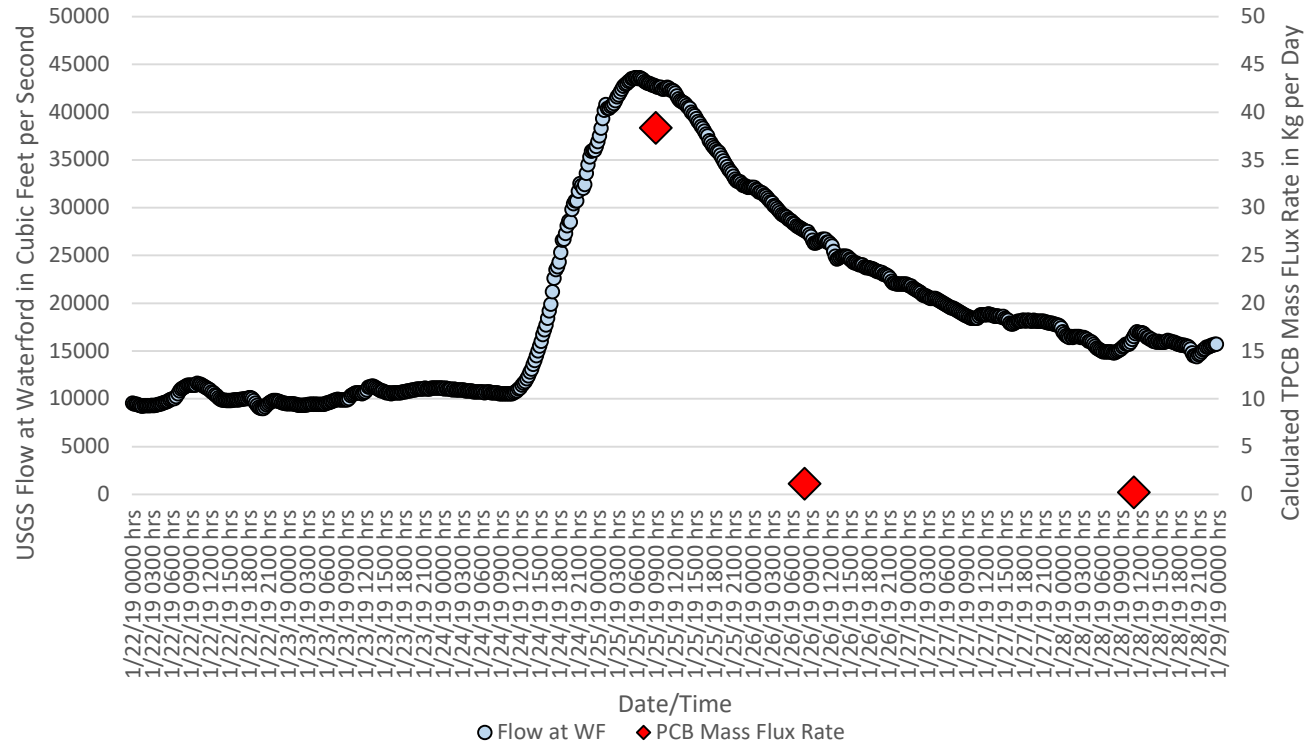


At Waterford, there may have been an overall reduction in PCB load, and a reduction in the degree to which increasing flow results in an increase in load.

(2016 and 2017 TPCB data from GE reports; flow from USGS)

Calculated Total PCB Mass Flux Rate During January 2019 High Flow Event

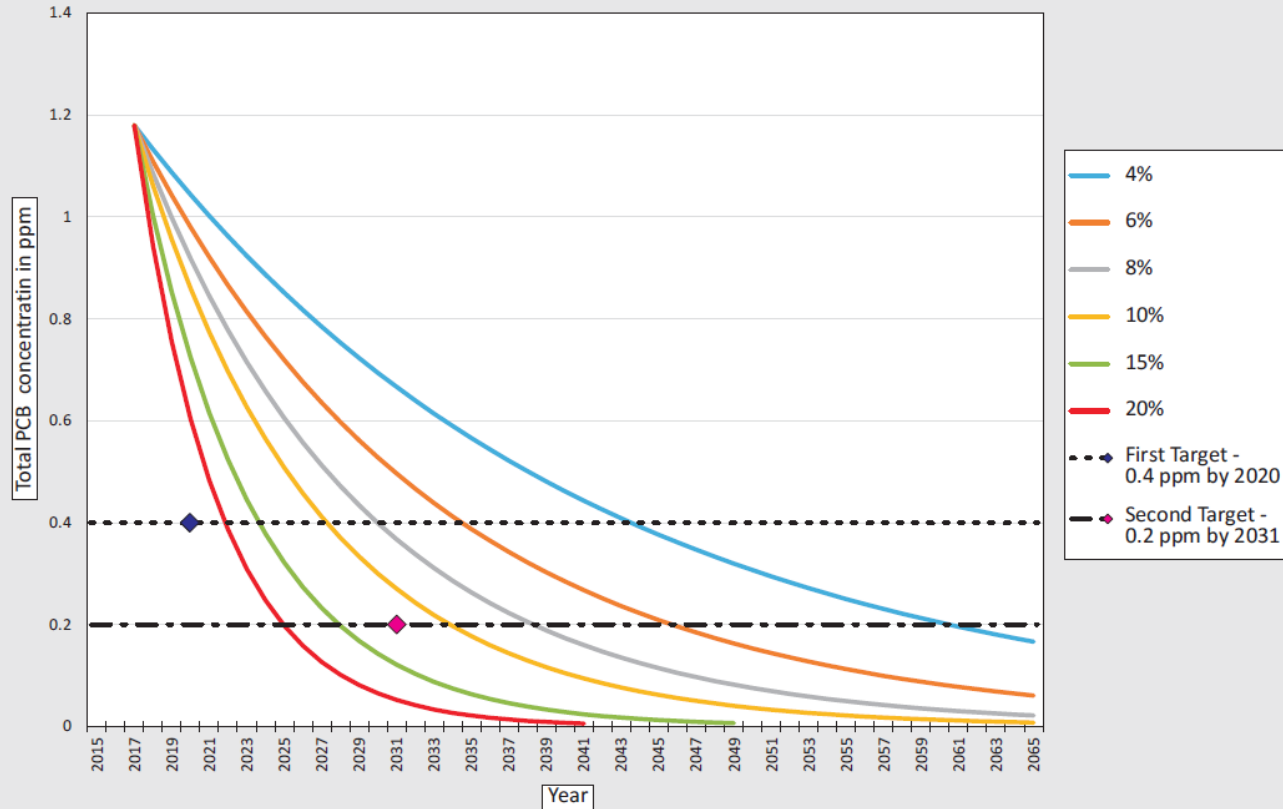
USGS Flow @ Hudson River Near Waterford - GE Preliminary High Flow Monitoring Data



The peak post-remedy high flow event occurred in January 2019.

Load calculated from a sample collected after the peak was ~38 kg/day Total PCB.

Species and River Section Length Weighted Average PCB concentrations
at Various Assumed Rates of Post Remedial Decline
2017 concentration = 1.18 parts per million



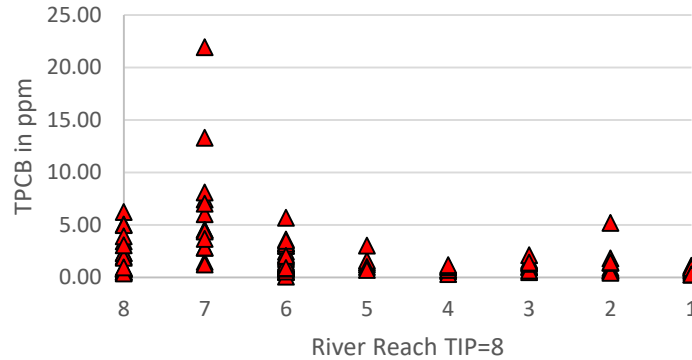
The rates of decline would need to exceed 20% per year to achieve the first target, and exceed 10% per year to achieve the second target.

2017 DEC Fall Fish Sampling

- DEC also conducted fish sampling in the fall of 2017.
- Sampling was performed in each pool of the upper Hudson for the first time.
- Fall sampling - forage fish and small sunfish.

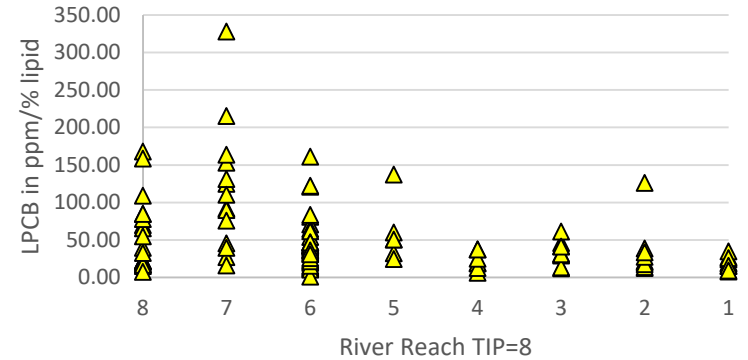


All Sunfish TPCB by Reach



Sunfish
collected
by size to
target
young of
year.

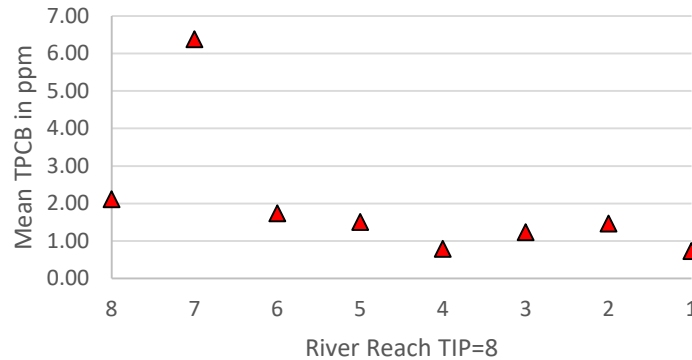
All Sunfish LPCB by Reach



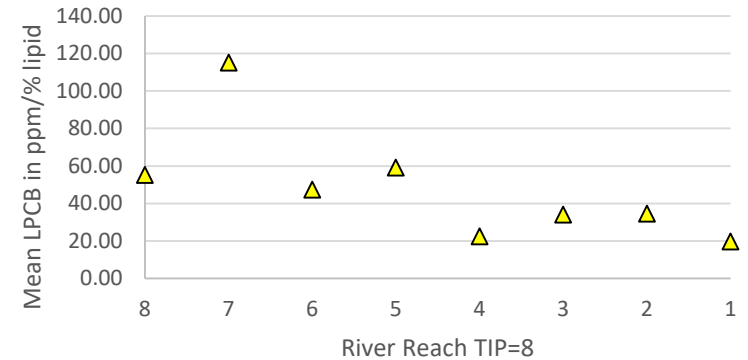
TPCB =
Total PCB

LPCB =
Lipid
Based PCB

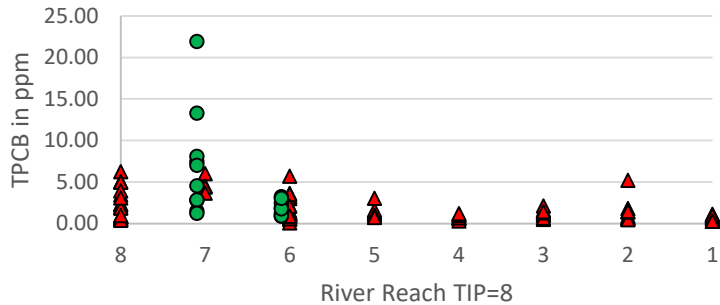
All Sunfish Mean TPCB by Reach



All Sunfish Mean LPCB by Reach

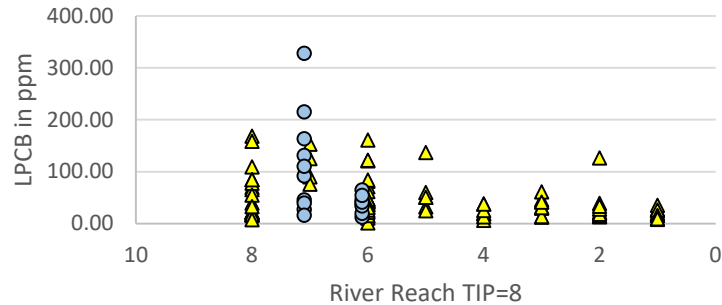


PKSD and RBRS TPCB by Reach



▲ PKSD TPCB by Reach ● RBRS TPCB by Reach

PKSD and RBRS LPCB by Reach

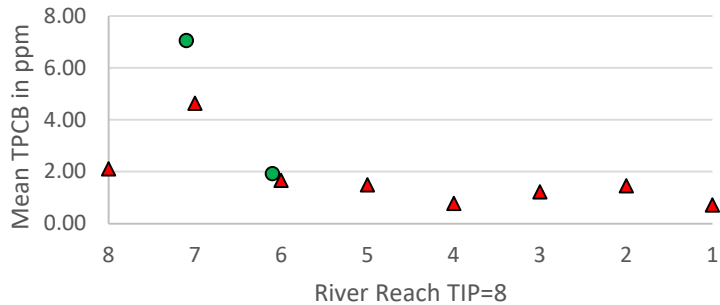


▲ PKSD LPCB by Reach ● RBRS LPCB by Reach

PKSD =
Pumpkin-
seed

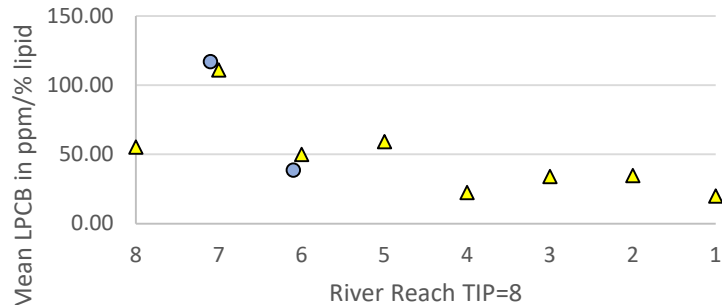
RBRS =
Redbreast
Sunfish

PKSD and RBRS Mean TPCB by Reach



▲ Mean PKSD TPCB by Reach ● RBRS Mean TPCB by Reach

PKSD and RBRS Mean LPCB by Reach



▲ Mean PKSD LPCB by Reach ● RBRS Mean LPCB by Reach