

*Community Advisory Group (CAG) Meeting
Hudson River PCBs Superfund Site
Schuylerville, NY, 30 October 2014*



PCBs in Fish Tissues at the Hudson River PCBs Superfund Site: *Update on Results of Baseline and Remedial Action Monitoring (2004-2013)*

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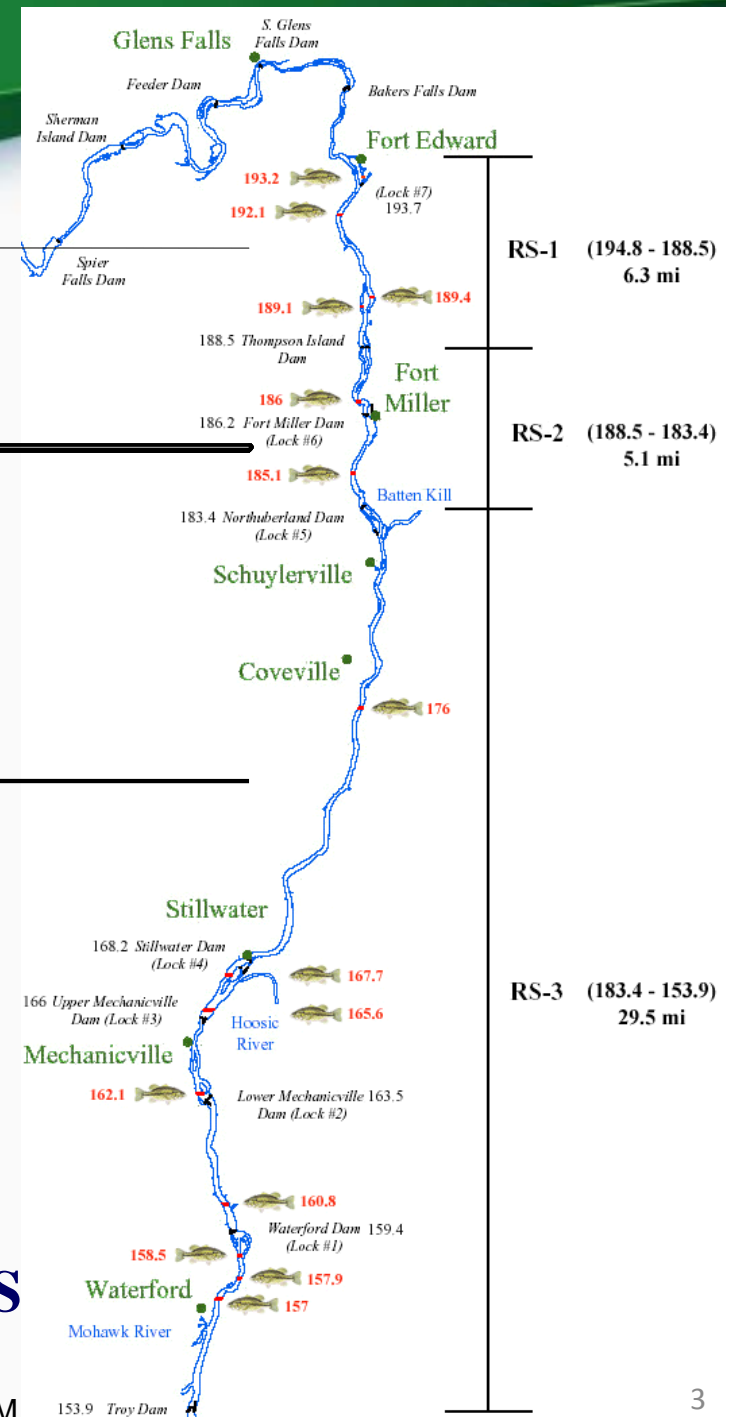
Background and Objectives



- Risk from fish consumption by humans and wildlife was the key driver for remediation
- Fish monitoring in the river since 1970s and will continue
- Since 2003: Baseline, remedial action, and post-remedy monitoring that was designed to provide statistical power to address both short- and long-term needs
 - Allows evaluation of annual (short term) changes *and* establishment of long-term trends
 - Allows documentation of interim risk reduction following the remedial action
 - We need to demonstrate that the remedy is moving toward, or achieving RAOs (remedy effectiveness)

Baseline, Remedial Action & Long Term* Fish Monitoring Plans for UHR

River Area	No. Spp. Groups	No. Individ/Spp Groups	Total Samples
Feeder Dam	4	20	80
RS-1	4	30	120
RS-2	4	25	100
RS-3	4	30	120
Albany/Troy	4	20	80



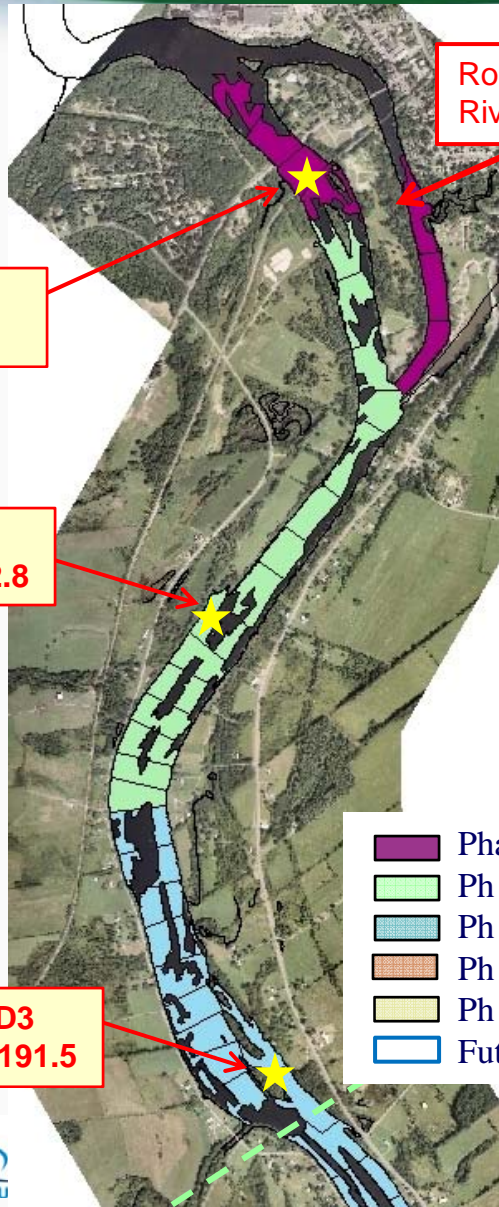
Four species/groups sampled ANNUALLY:

- Top-level pred: Blk Bass (LMB, SMB) SF
- Water col feeder: Perch (YP) SF
- Bottom-feeder: Bullhead (YB, BB) SF
- Yearling: Pumpkinseed WH

Annual composites of Forage Fish; n=10 per RS

* The LTMP may be modified after 3 years of OM&M

River Section 1 Fish Monitoring Stations and Dredging by Year



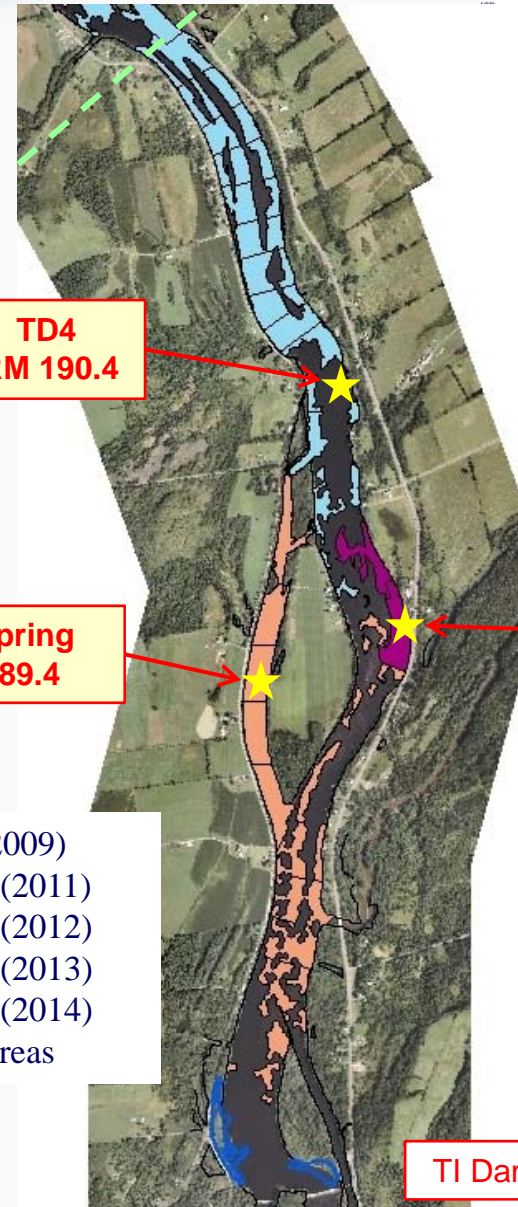
Roger's Island
River Mile 194

TD1
RM 194

TD2
RM 192.8

TD3
RM 191.5

- Phase 1 CU Boundaries (2009)
- Ph 2 Yr 1 CU Boundaries (2011)
- Ph 2 Yr 2 CU Boundaries (2012)
- Ph 2 Yr 3 CU Boundaries (2013)
- Ph 2 Yr 4 CU Boundaries (2014)
- Future (2015) Dredging Areas

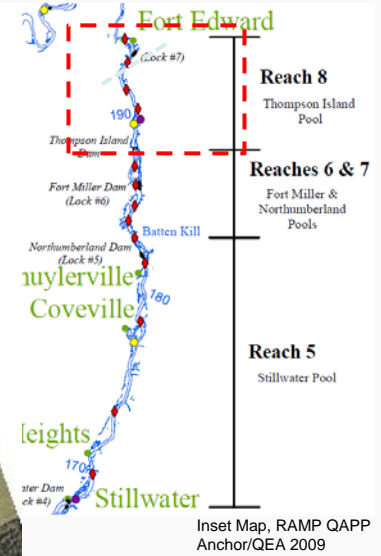


TD4
RM 190.4

TD5 Spring
RM 189.4

TD5 Fall
RM 189.4

TI Dam RM 188.5



Comparison of Baseline to 2009-2013



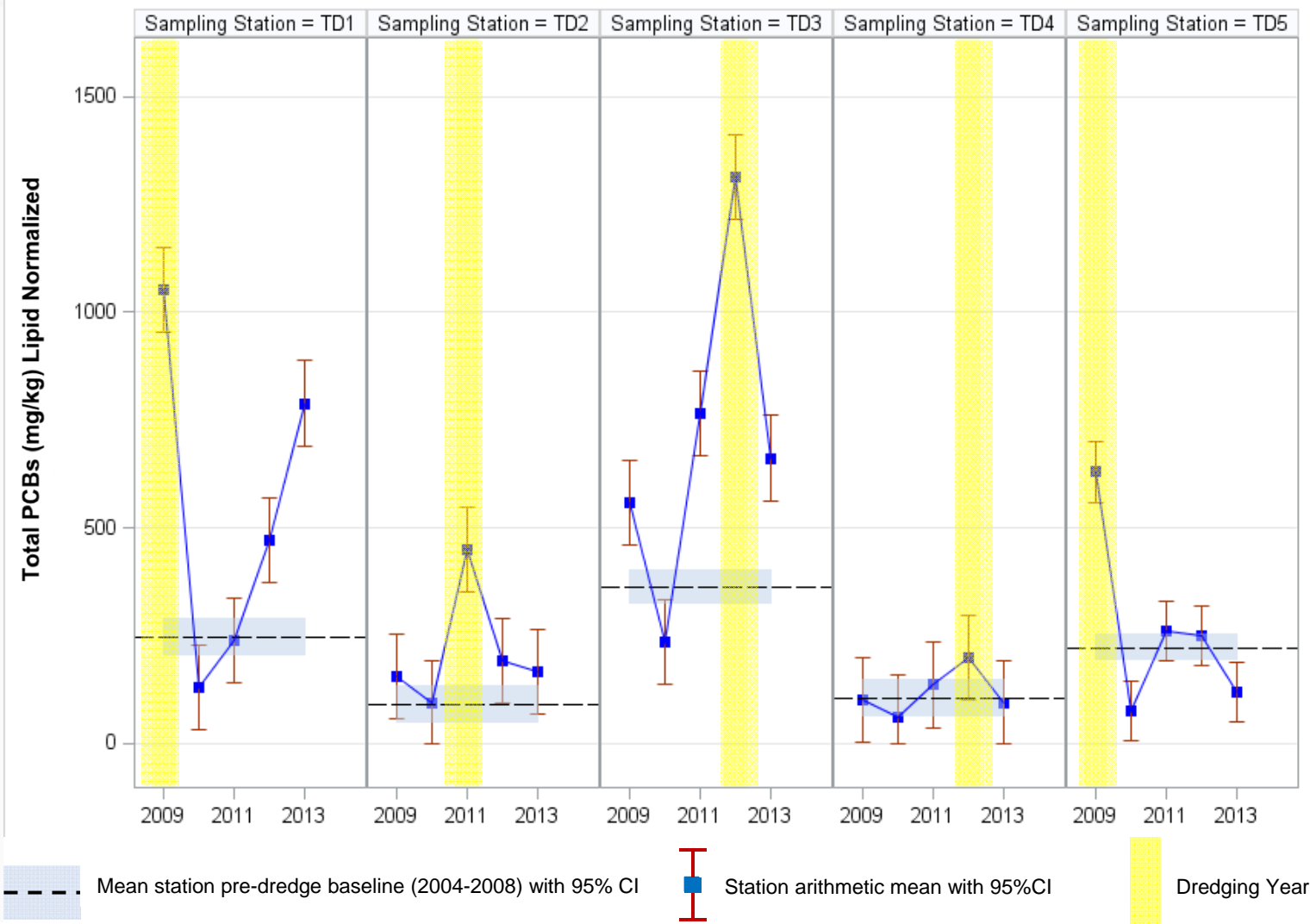
RS1 (Thompson Island Pool-TD) Black Bass



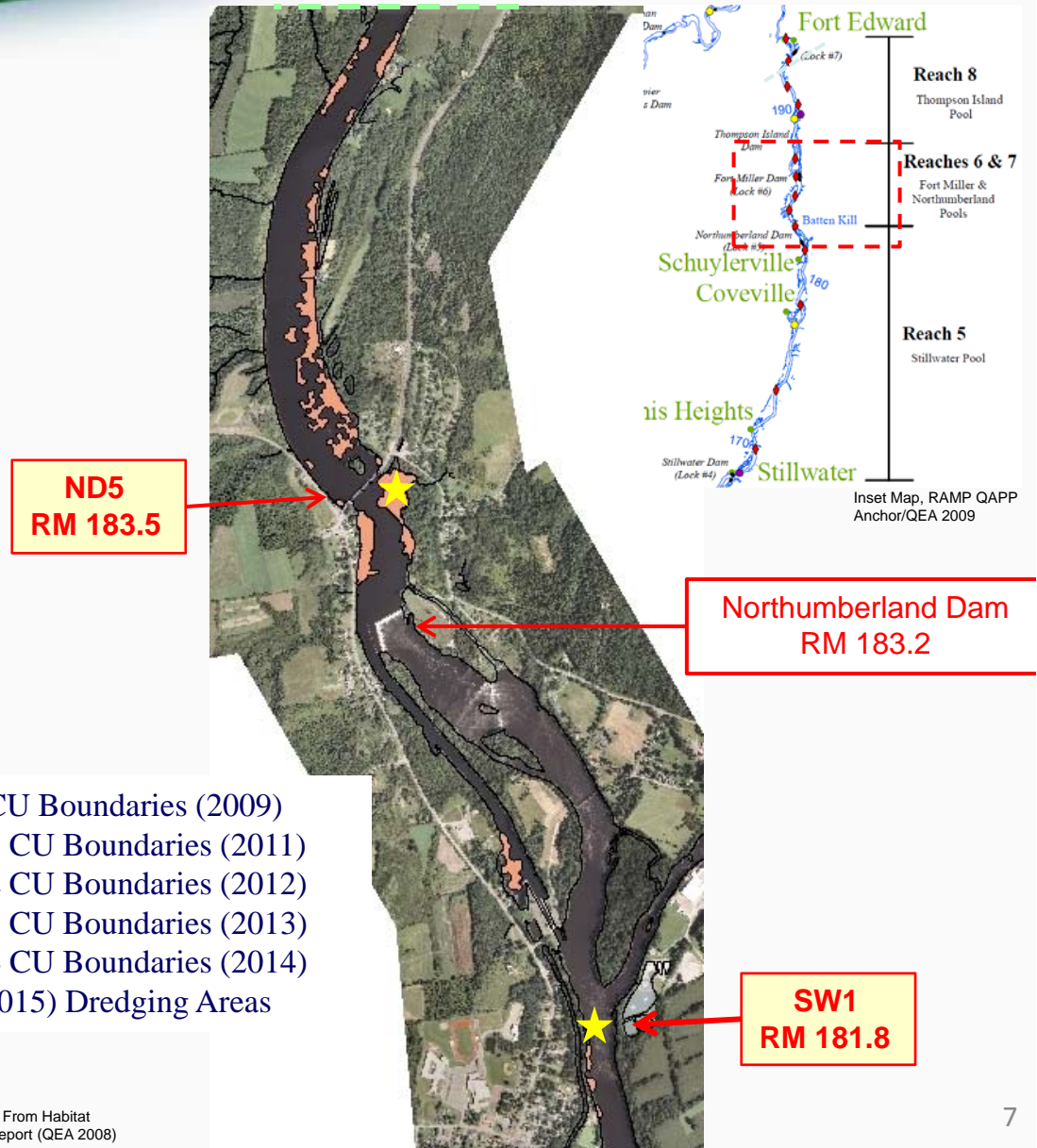
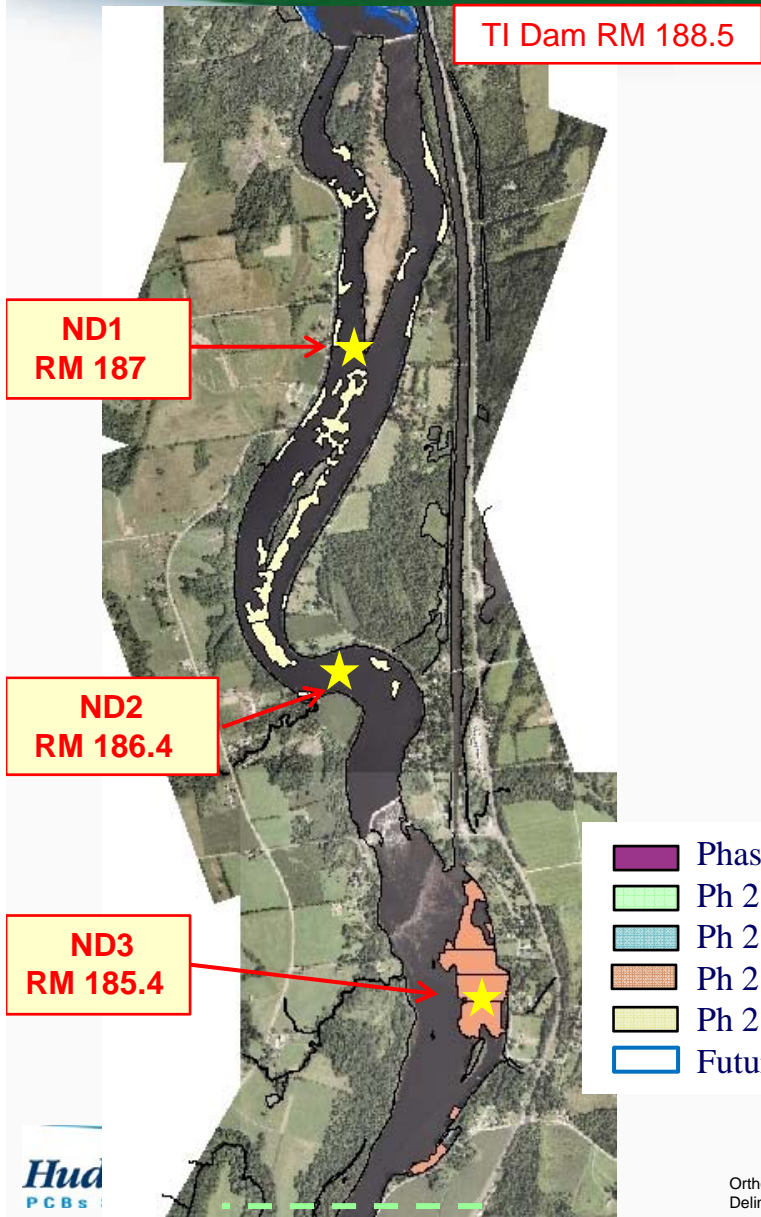
Comparison of Baseline to 2009-2013



RS1 (Thompson Island Pool-TD) Pumpkinseed—Fall Species



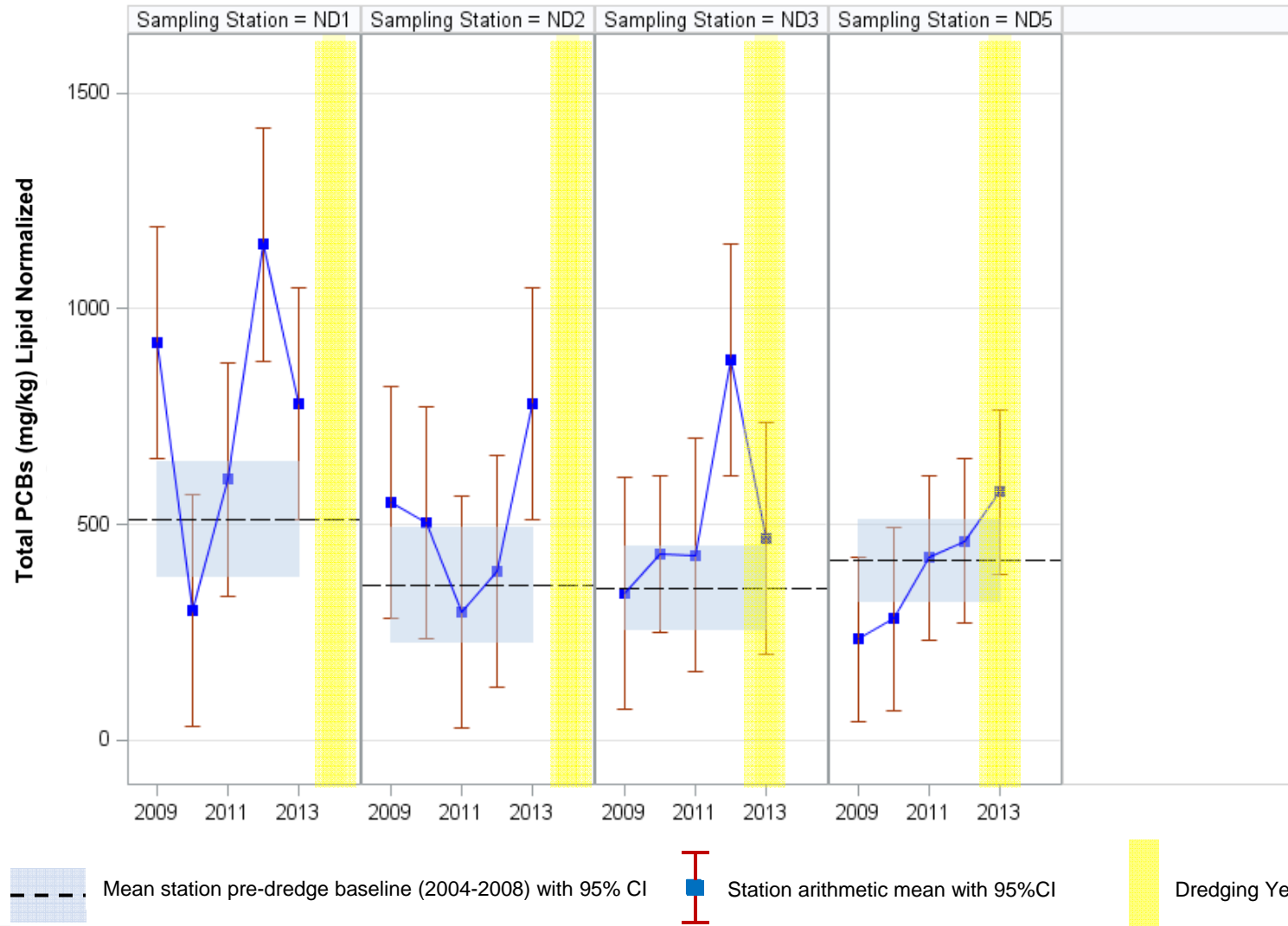
River Section 2 Fish Monitoring Stations and Dredging by Year



Comparison of Baseline to 2009-2013



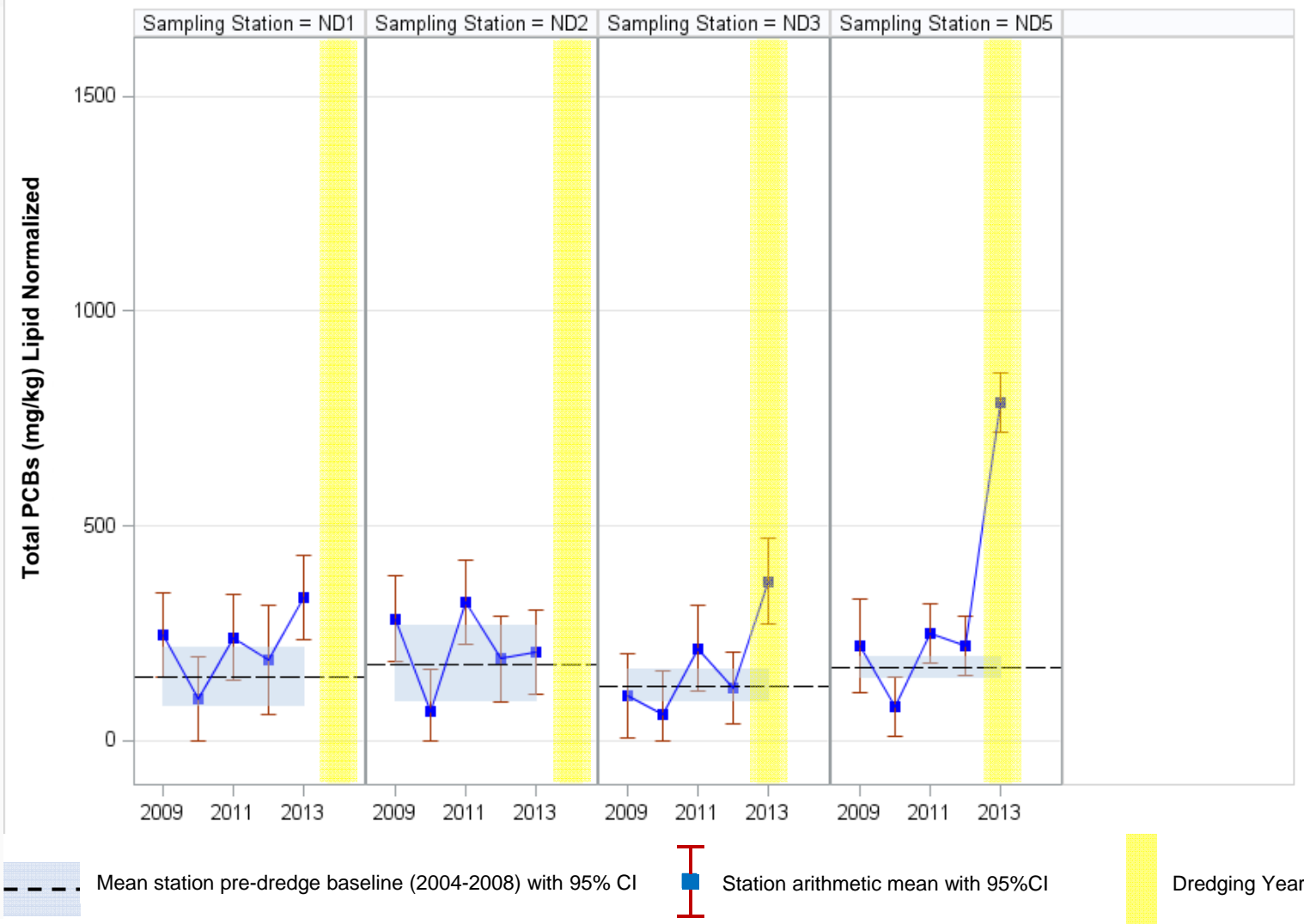
RS2 (Northumberland Pool-ND) Black Bass



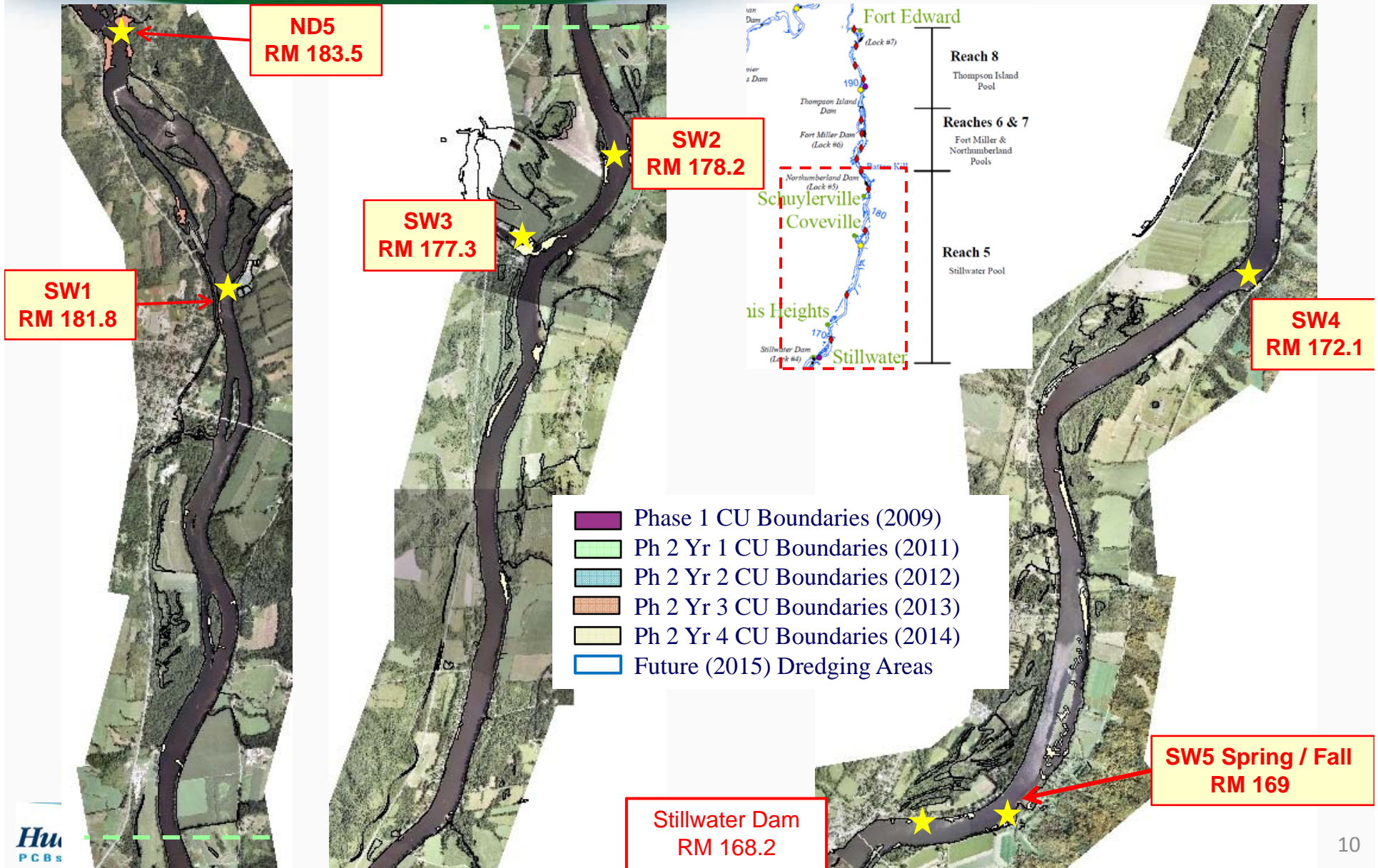
Comparison of Baseline to 2009-2013



RS2 (Northumberland Pool-ND) Pumpkinseed—Fall Species



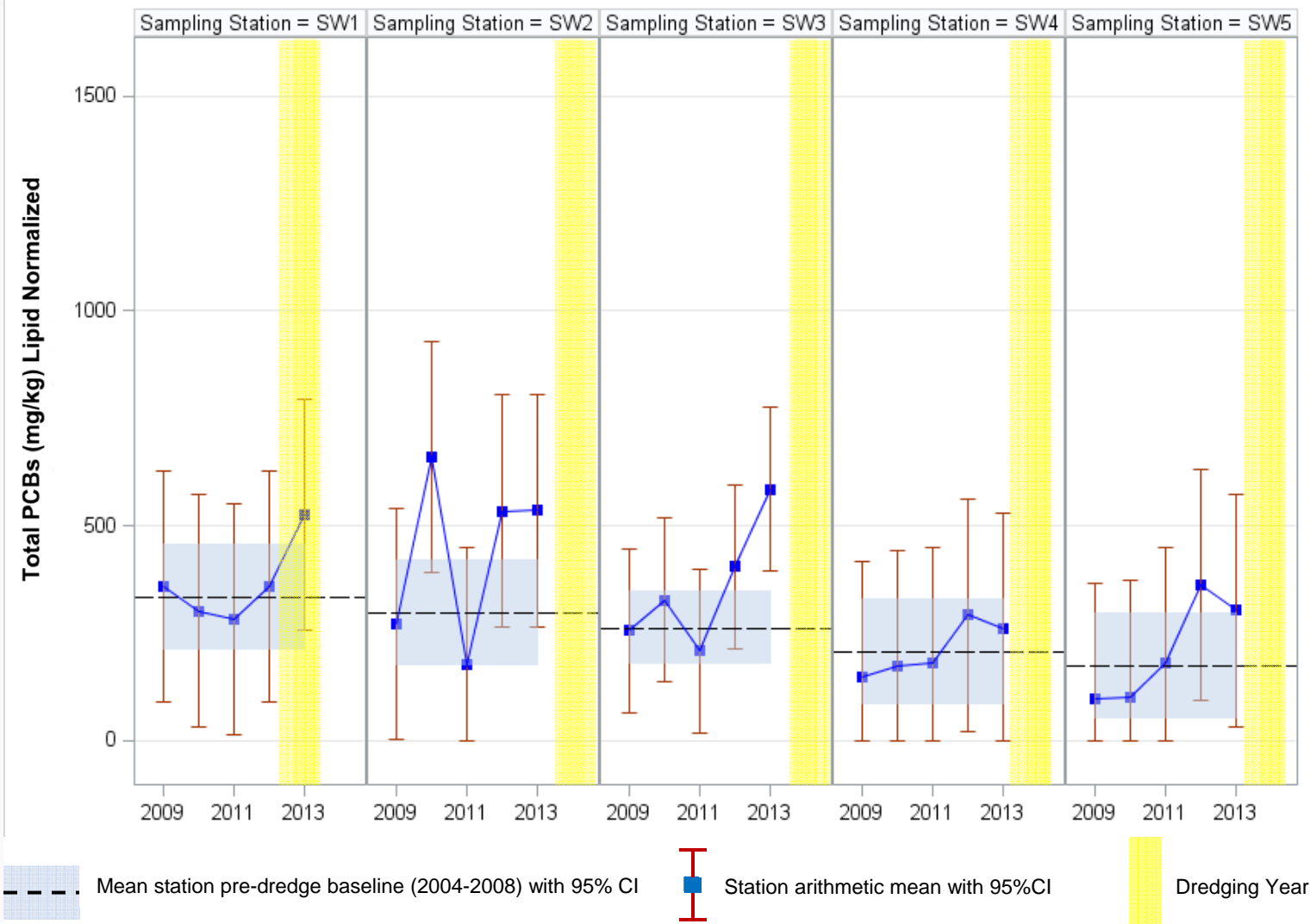
River Section 3 Fish Monitoring Stations and Dredging by Year



Comparison of Baseline to 2009-2013



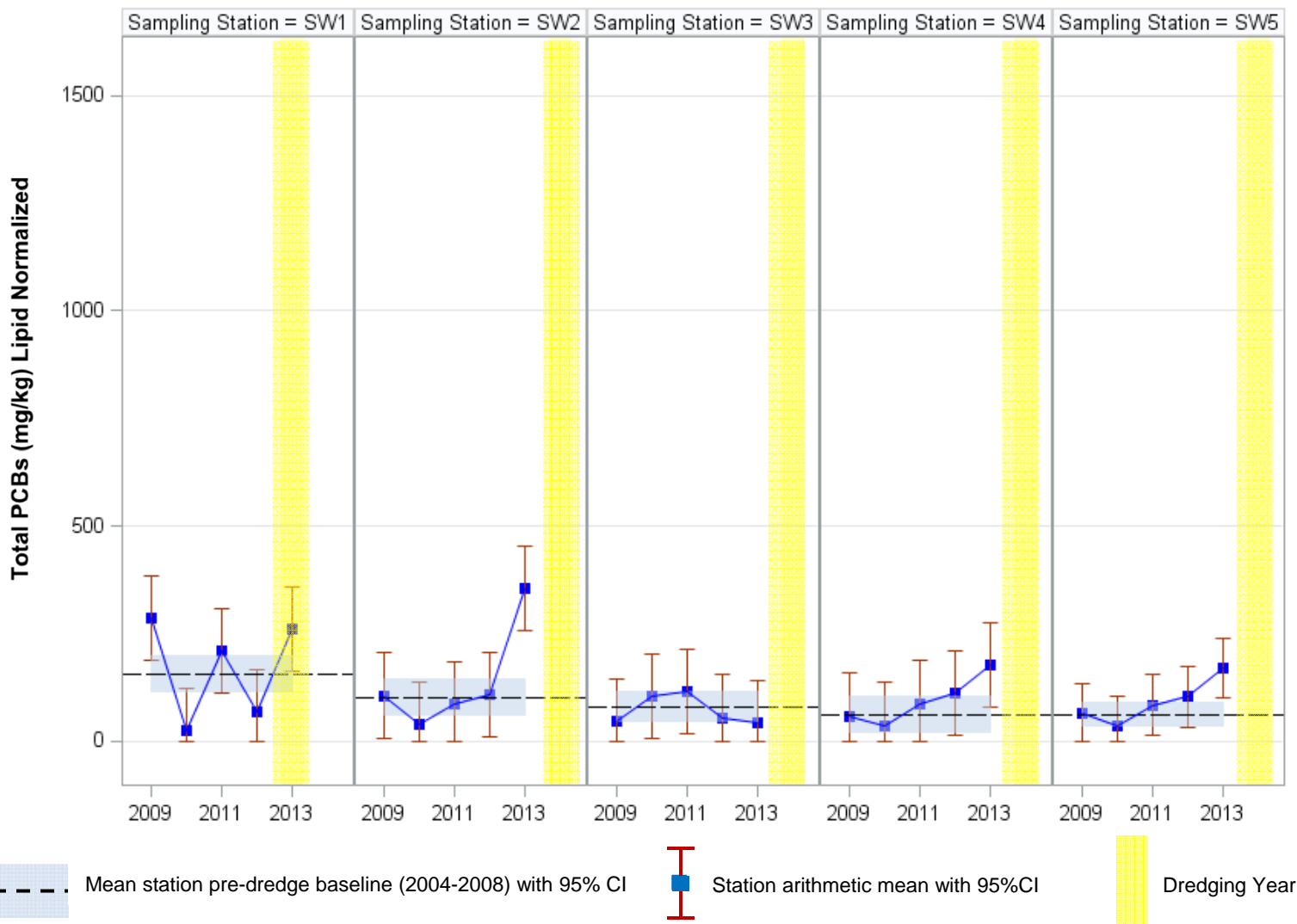
RS3 (Stillwater Pool-SW) Black Bass



Comparison of Baseline to 2009-2013



RS3 (Stillwater Pool-SW) Pumpkinseed—Fall Species



Total PCBs in Fish Tissues: Means Comparisons



Adjusted Geometric Mean TPCB in Fish Tissue Pre-Dredge (2004-2008 baseline) vs Post-Dredge (2009-2013)

River Section 1						
Species Group	2009: baseline	2010: 2009	2010: baseline	2011: baseline	2012: baseline	2013: baseline
Black Bass	-	+				
Bullhead					+	
Yellow Perch	-	+		+	+	+
Pumpkinseed	+	-	-	+	+	

Dredging Year

	Neutral $p > 0.10$	+	Increase Post Dredging; $p < 0.05$
-	Decrease Post Dredging; $p < 0.05$	()	$0.05 < p < 0.10$

Total PCBs in Fish Tissues: Means Comparisons



Adjusted Geometric Mean TPCB in Fish Tissue Pre-Dredge (2004-2008 baseline) vs Post-Dredge (2009-2013)

River Section 2						
Species Group	2009: baseline	2010: 2009	2010: baseline	2011: baseline	2012: baseline	2013: baseline
Black Bass	(-)	(+)				+
Bullhead			-		+	
Yellow Perch	-	(+)		+	+	+
Pumpkinseed	+	-	-	+	(+)	+

Dredging Year

	Neutral $p > 0.10$	+	Increase Post Dredging; $p < 0.05$
-	Decrease Post Dredging; $p < 0.05$	()	$0.05 < p < 0.10$

Total PCBs in Fish Tissues: Means Comparisons



Adjusted Geometric Mean TPCB in Fish Tissue Pre-Dredge (2004-2008 baseline) vs Post-Dredge (2009-2013)

River Section 3						
Species Group	2009: baseline	2010: 2009	2010: baseline	2011: baseline	2012: baseline	2013: baseline
Black Bass		(+)			+	+
Bullhead	-	(-)	-			
Yellow Perch	-					+
Pumpkinseed		-	-	+		+

Dredging Year

	Neutral $p > 0.10$	+	Increase Post Dredging; $p < 0.05$
-	Decrease Post Dredging; $p < 0.05$	()	$0.05 < p < 0.10$

Perspectives on Black Bass and Perch



- We have expected that short-term increases in fish PCB levels would occur during dredging
 - Since 2009 we have observed apparent dredging impacts within or immediately below dredge areas.
 - Black bass and perch have shown decreases in PCB levels at stations dredged before or during 2012.
 - We have also observed some increased PCB tissue levels in advance of Phase 2 dredging at some downstream stations.

Perspectives on Pumpkinseed



- We have expected that short-term increases in fish PCB levels would occur during dredging
 - For pumpkinseed (rapid integrators) PCB levels increased in the year of dredging at all stations in Phase 1 (2009), and Phase 2 (2011, 2012, and 2013)
 - Pumpkinseed also indicate some decreases of PCB levels in tissues after dredging:
 - PCB tissue decreases were observed in 2010 (no dredging) and again in 2011 and 2012 (after dredging at or near the station)

Perspective



- We anticipated that short-term, dredging related increases of PCBs in fish would rapidly return to baseline levels, and continue to decline thereafter following remediation
 - Exposures related to dredging were expected to be brief.
 - Dredging only occurs in a given area for single dredging season, or a portion thereof (weeks to months)
 - Tissue concentrations of PCBs in fish have been shown to decrease rapidly following spikes related to exposure events and environmental dredging at other sites

Spikes in tissue concentrations linked to dredging events have been observed to recover

Cumberland Bay Site, Plattsburgh, NY – Yellow Perch, Wilcox Dock

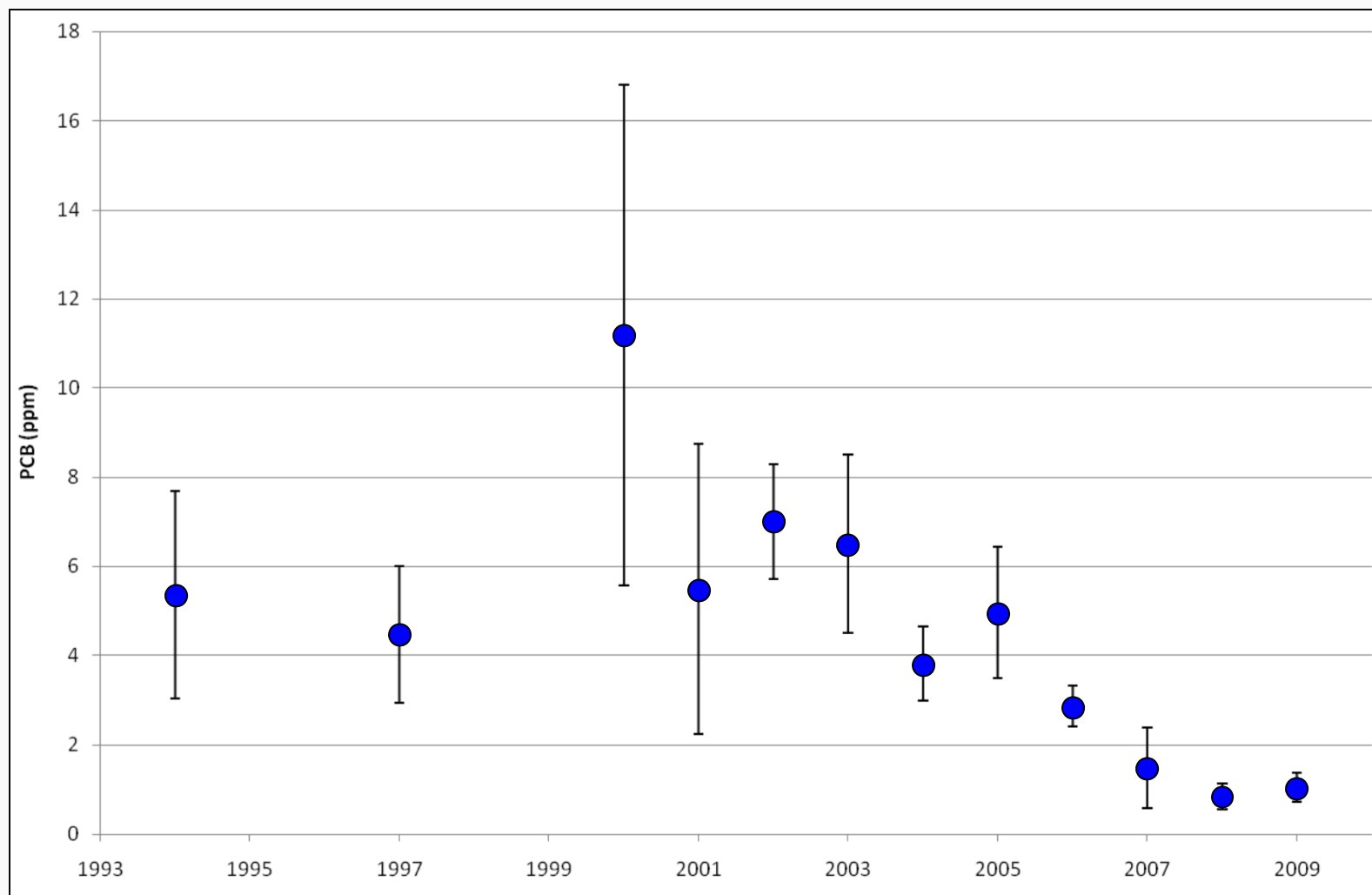


Figure courtesy of NYSDEC (2009)

Parting Thoughts



- Dredging program is not the only factor in this system influencing PCB concentrations in fish
 - Natural variability
 - Flooding, storms, flow conditions
- We have not observed changes in fish tissue concentrations that are outside of expectations.
- Special Study underway in 2014 regarding processing and filleting approaches comparison.
- Annual Monitoring will continue.