

2014 Biennial Assessment of Ohio River Water Quality Conditions



305B REPORT 2009-2013



Weight of Evidence Approach



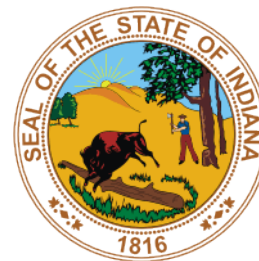
- Recommended by the Technical Committee and approved by the Commission, October 2011.
- Weight of evidence utilized in the 2014 assessments.
- US EPA's policy is the independent application approach.
- Weight of evidence had effects on aquatic life use, mercury fish consumption, and public water supply assessments.



2014 Assessment Summary



	States	Number Miles Use is Impaired				
		Aquatic Life	Contact Recreation	Public Water Supply	Fish Consumption for PCBs & Dioxin	Fish Consumption for Mercury
PA	0.0-40.2	0	40.2	0	40.2	0
OH-WV	40.2-317.1	0	242.2	0	276.9	0
OH-KY	317.1-491.3	0	65.0	0	174.2	0
IN-KY	491.3-848.0	0	242.5	0	356.7	0
IL-KY	848.0-981.0	0	40.6	0	133.0	0
TOTAL	981.0	0	630.5	0	981.0	0

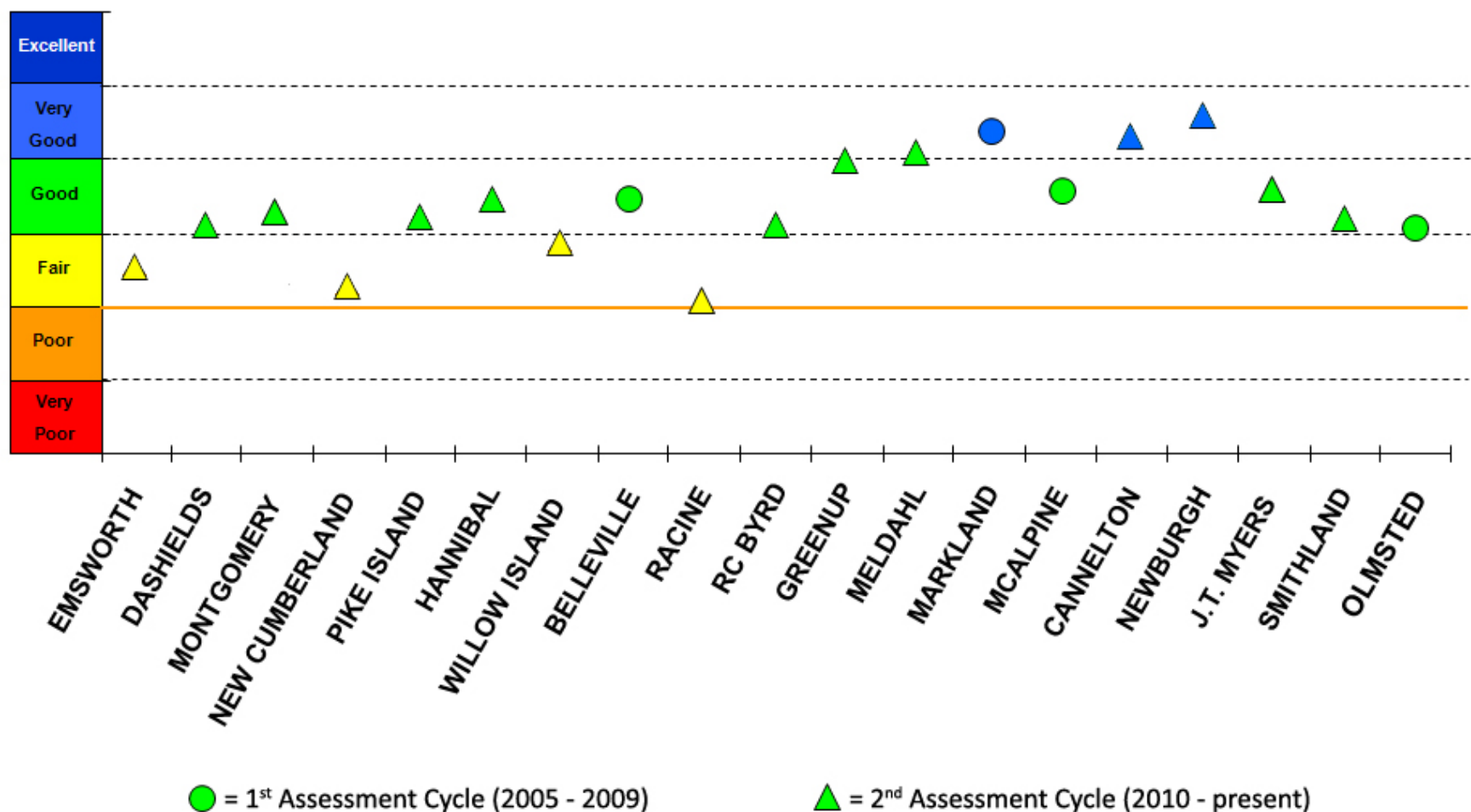


Aquatic Life Use Assessment



- Assessment includes fish population surveys and water chemistry data.
- Water data compared to applicable criteria.
- Criteria violations $> 10\%$ indicate impairment.
- Aquatic life criteria exceeded for:
 - ✦ Total iron
 - ✦ Dissolved oxygen
 - ✦ Temperature
- Fish population surveys indicate full support river-wide.
- Based on “WOE Approach”, entire Ohio River assessed as fully supporting aquatic life use.

Ohio River Fish Population Index Scores



Aquatic Life Water Criteria Violations

July 2008 – June 2013



Mile Point	SiteName	Criteria Type	Parameter	Criteria	Total Samples	WQC Violations	% Violation
84.2	Pike Island	Chronic AL	Fe (ug/l)	1500 ug/L	30	1	3%
126.4	Hannibal	Chronic AL	Fe (ug/l)	1500 ug/L	30	2	7%
161.8	Willow Is.	Chronic AL	Fe (ug/l)	1500 ug/L	30	3	10%
203.9	Belleville	Chronic AL	Fe (ug/l)	1500 ug/L	28	6	21%
279.2	R.C. Byrd	Chronic AL	Fe (ug/l)	1500 ug/L	30	1	3%
341	Greenup	Chronic AL	Fe (ug/l)	3500 ug/L	31	3	10%
436.2	Meldahl	Chronic AL	Fe (ug/l)	3500 ug/L	30	1	3%
477.5	Anderson Ferry	Chronic AL	Fe (ug/l)	3500 ug/L	18	1	6%
531.5	Markland	Chronic AL	Fe (ug/l)	2340 ug/L	30	2	7%
625.9	West Point	Chronic AL	Fe (ug/l)	2340 ug/L	18	7	39%
776	Newburgh	Chronic AL	Fe (ug/l)	2340 ug/L	30	6	20%
846	J.T. Myers	Chronic AL	Fe (ug/l)	2340 ug/L	30	7	23%
918.5	Smithland	Chronic AL	Fe (ug/l)	3500 ug/L	30	4	13%
938.9	L&D 52	Chronic AL	Fe (ug/l)	3500 ug/L	30	4	13%

2009-2013 Daily Dissolved Oxygen Data

Ohio River Station	Mile Point	2009 % Days Exceeding	2010 % Days Exceeding	2011 % Days Exceeding	2012 % Days Exceeding	2013 % Days Exceeding	2009-2013 % Days Exceeding
Montgomery	31.7	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hannibal	126.4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Racine	237.5	0.0%	1.9%	7.6%	2.6%	2.6%	3.0%
Greenup	341						
Upstream		4.7%	13.7%	2.7%	4.8%	0.0%	5.3%
Downstream		1.9%	6.3%	9.7%	2.0%	0.0%	4.8%
Markland	531.5						
DO #1-DS Hydro		screened data	screened data	0.9%	2.7%	0.0%	1.2%
DO #2-US Hydro		0.0%	NA	8.4%	10.0%	0.8%	6.2%
DO #3-DS Lock		NA	NA	0.0%	0.9%	0.0%	0.3%
DO #4-US Lock		NA	NA	0.0%	1.7%	0.8%	0.8%
McAlpine	606.8	NA	NA	0.0%	3.7%	0.0%	1.2%
Cannelton	720.7	0.0%	11.7%	NA	NA	NA	5.9%
Newburgh	776.1	0.0%	0.0%	NA	NA	NA	0.0%
John T. Myers	846	0.0%	12.9%	0.0%	0.0%	0.0%	3.7%
Smithland	919	5.0%	4.7%	36.8%	18.0%	0.0%	8.6%

Aquatic Life Violations: Temperature

2009-2013 Percent Daily Temperature Exceedances by Year								
Site	Montgomery	New Cumberland	Pike Island	Hannibal	Racine	Greenup US	Greenup DS	Renslar
River Mile	31.7	54.4	84.2	126.4	237.5	341.0	341.1	462.6
2009 Total	0.0%			0.0%	4.0%	0.0%		
2010 Total	0.0%			0.0%	0.0%	21.2%		
2011 Total	0.0%			0.0%	0.0%	0.0%	0.0%	
2012 Total	1.0%	0.0%	0.0%	0.5%	0.0%	0.0%	1.0%	3.4%
2013 Total	0.0%	14.2%	0.0%	0.0%	0.0%	0.0%	0.0%	
2009-2013 Total	0.2%	10.3%	0.0%	0.1%	0.8%	2.6%	0.4%	3.4%

2009-2013 Percent Daily Temperature Exceedances by Year									
Site	Markland US-Lock	Markland DS-Lock	Markland US-Hydro	Markland DS-Hydro	McAlpine	Cannelton	Newburgh	JT Myers	Smithland
River Mile	531.5	531.5	531.5	531.5	606.8	720.0	776.0	846.0	918.0
2009 Total	0.0%					0.0%	0.0%	0.0%	0.0%
2010 Total	0.0%					10.3%	19.8%	17.3%	13.0%
2011 Total		0.0%	0.0%	0.0%	0.0%			20.7%	19.3%
2012 Total		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.4%	2.5%
2013 Total		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2009- 2013 Total	0.0%	0.0%	0.0%	0.3%	0.0%	2.52%	5.1%	9.5%	7.6%

Contact Recreation Use Assessment



- **Assessment includes:**
 - ✦ Bacteria data from 15 historical river-wide longitudinal surveys.
 - ✦ Contact recreation data from the past 5 years collected seasonally in the 6 largest CSO communities.
 - ✦ Vast majority of river is assessed based on historical longitudinal surveys.
- **States' criteria used for assessment.**
- **Criteria violations > 10% indicate Partial Support.
> 25% indicate Not Supporting.**
- **Approximately $\frac{2}{3}$ of river impaired for contact recreation use: Consistent with past assessments.**



Public Water Supply Use Assessment



- Impairment based on finished water MCL violations caused by Ohio River water quality.
- Accessed USEPA data base of MCL violations and water utility surveys.
- Human health criteria violations in $> 10\%$ of samples indicates impairment.
- Several utilities had MCL violations for trihalomethanes & one for HAA5's, one for Fecal coliform.
- Utilizing “WOE Approach”, entire river assessed as fully supporting public water supply use.

Public Water Supply Use Assesment Summary								
Utility Location	State	Number of Intake Closures due to Ohio River Quality	Causes of Intake Closures	MCL Violation	Cause of MCL Viol.	Non-Routine Treatment Required?	Contaminants Resulting in Non-Routine Treatment	Source of Contaminants
West View	PA	0		No		No		
Robinson	PA	0		No		No		
Moon	PA			No				
Beaver Valley	PA	0		Yes	TTHM	No		
Midland	PA			Yes	TTHM			
East Liverpool	OH			No				
Buckeye	OH			No				
Toronto	OH			No				
Arcelor Mittal	WV			No				
Weirton	WV			No				
Steubenville	OH	0		No		No		
Follansbee	WV	2	Chromic Acid, Diesel Fuel	No				
Wheeling	WV			Yes	TTHM	No		
New Martinsville	WV	0		No		No		
Sistersville	WV			No				
Huntington	WV			No				
Ashland	KY			Yes	TTHM			

Public Water Supply Use Assesment Summary								
Utility Location	State	Number of Intake Closures due to Ohio River Quality	Causes of Intake Closures	MCL Violation	Cause of MCL Viol.	Non-Routine Treatment Required?	Contaminats Resulting in Non-Routine Treatment	Source of Contaminants
Ironton	OH			No				
Russell	KY			Yes	TTHM			
Portsmouth	OH			No		No		
Maysville	KY			No				
Cincinnati	OH	4		No		Yes	Sewage, 1,1-dichloroethene	Raw Sewage, Unknown
N.K. Water	KY			No		No		
Louisville	KY			No		No		
Evansville	IN	0		No		No		
Henderson	KY	0		No		No		
Mt Vernon	IN			Yes	TTHM, Coliform			
Morganfield	KY			No				
Sturgis	KY			Yes	TTHM, HAA5			
Paducah	KY			No				
Paducah (USEC)	KY			No				
Cairo	IL	0		No		No		

Water Quality Criteria Violations

July 2008 – June 2013

Mile Point	SiteName	Criteria Type	Parameter	Criteria	Total Samples	WQC Violations	% Violation
54.4	New Cumberland	Human Health	Phenolics (ug/L)	5.0 ug/L	30	2	7%
84.2	Pike Island	Human Health	Phenolics (ug/L)	5.0 ug/L	30	2	7%
126.4	Hannibal	Human Health	Phenolics (ug/L)	5.0 ug/L	30	1	3%
203.9	Belleville	Human Health	Phenolics (ug/L)	5.0 ug/L	30	2	7%
279.2	R.C. Byrd	Human Health	Phenolics (ug/L)	5.0 ug/L	30	2	7%
341	Greenup	Human Health	Phenolics (ug/L)	5.0 ug/L	30	2	7%
436.2	Meldahl	Human Health	Phenolics (ug/L)	5.0 ug/L	30	2	7%
531.5	Markland	Human Health	Phenolics (ug/L)	5.0 ug/L	30	1	3%
606.8	McAlpine	Human Health	Phenolics (ug/L)	5.0 ug/L	19	2	11%
625.9	West Point	Human Health	Thallium (ug/L)	0.24 ug/L	18	2	11%
720.7	Cannelton	Human Health	Phenolics (ug/L)	5.0 ug/L	30	2	7%
776	Newburgh	Human Health	Nitrate-Nitrite-N (mg/L)	10.0 mg/L	30	1	3%
		Human Health	Phenolics (ug/L)	5.0 ug/L	30	2	7%
846	J.T. Myers	Human Health	Phenolics (ug/L)	5.0 ug/L	30	2	7%
918.5	Smithland	Human Health	Phenolics (ug/L)	5.0 ug/L	30	2	7%
938.9	L&D 52	Human Health	Phenolics (ug/L)	5.0 ug/L	30	3	10%

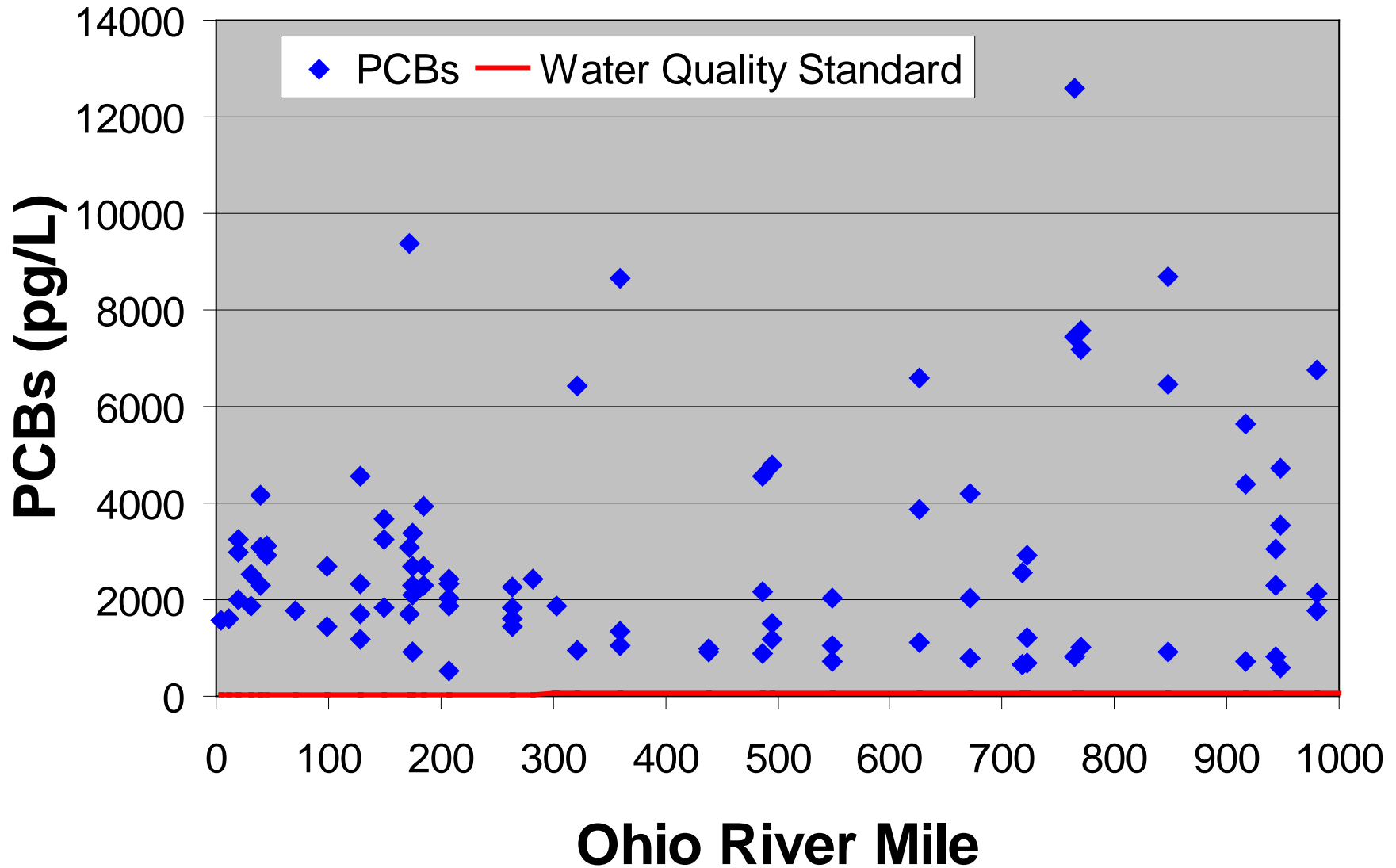
Fish Consumption Use Assessment



- The entire Ohio River is designated as partially supporting for PCBs and dioxin.
- ORSANCO directed by TEC to use US EPA's approach for determining impairment based on methylmercury fish tissue data.
- Collected data necessary to use EPA's methodology.
- Violations of mercury water quality criterion in $> 10\%$ of samples indicates impairment.
- Using "WOE Approach", entire river Full Support for fish consumption based on Methylmercury.

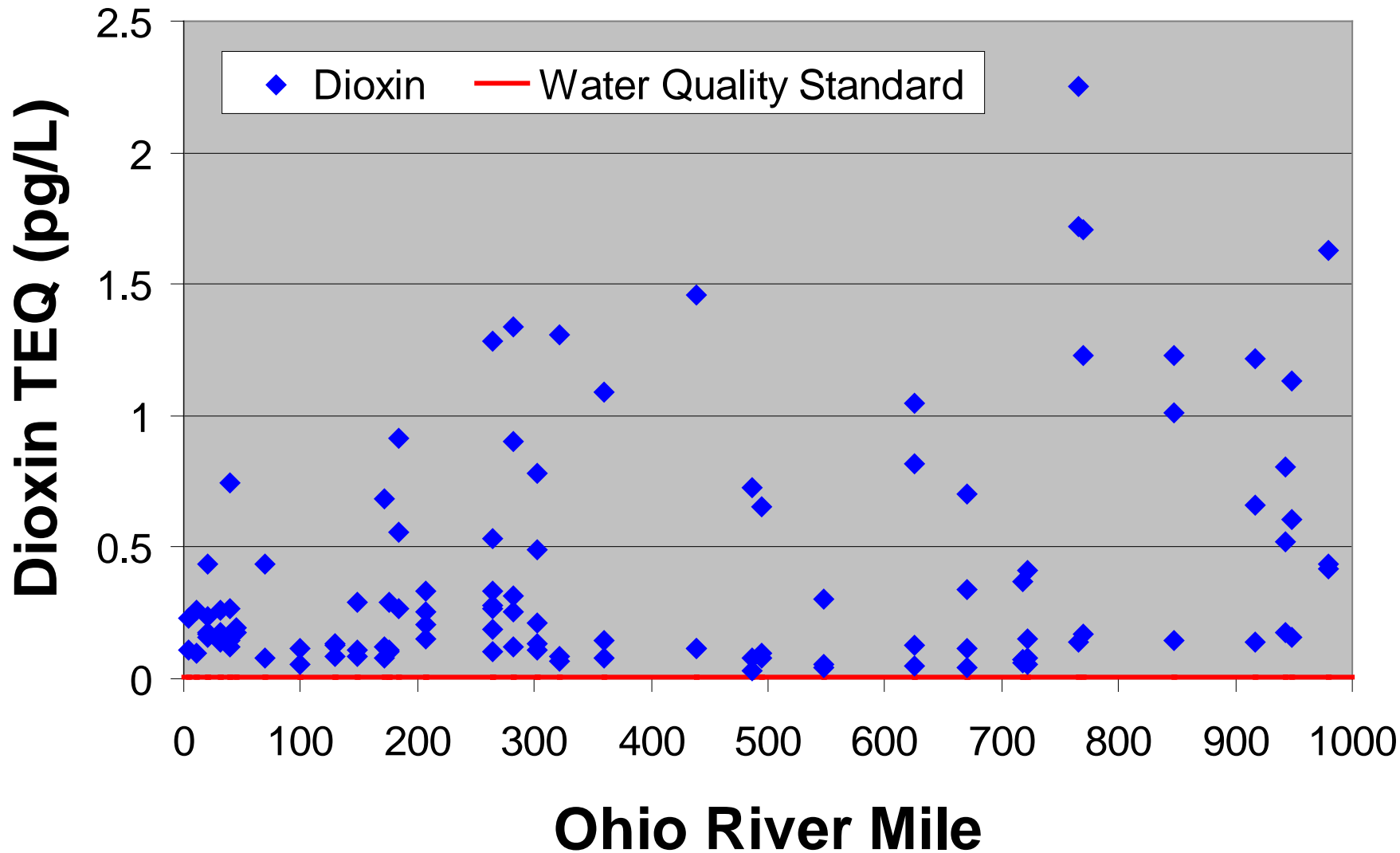
PCB Levels in the Ohio River

1997-2004



Dioxin Levels in the Ohio River

1997 - 2004



Total Mercury Water Violations

Mile Point	SiteName	Criteria Type	Parameter	Criteria	Total Samples	WQC Violations	% Violation
126.4	Hannibal	Human Health	Hg (ng/L)	0.012 ug/L	30	1	3%
341	Greenup	Human Health	Hg (ng/L)	0.012 ug/L	31	2	6%
436.2	Meldahl	Human Health	Hg (ng/L)	0.012 ug/L	29	1	3%
477.5	Anderson Ferry	Human Health	Hg (ng/L)	0.012 ug/L	18	2	11%
531.5	Markland	Human Health	Hg (ng/L)	0.012 ug/L	30	2	7%
600.6	Louisville	Human Health	Hg (ng/L)	0.012 ug/L	18	3	17%
606.8	McAlpine	Human Health	Hg (ng/L)	0.012 ug/L	19	2	11%
625.9	West Point	Human Health	Hg (ng/L)	0.012 ug/L	19	13	68%
776	Newburgh	Human Health	Hg (ng/L)	0.012 ug/L	30	5	17%
846	J.T. Myers	Human Health	Hg (ng/L)	0.012 ug/L	30	6	20%
918.5	Smithland	Human Health	Hg (ng/L)	0.012 ug/L	29	2	7%
938.9	L&D 52	Human Health	Hg (ng/L)	0.012 ug/L	29	5	17%

Averaging Data Across Trophic Levels



$$C_{\text{avg}} = \frac{3.8 * C_2 + 8.0 * C_3 + 5.7 * C_4}{(3.8 + 8.0 + 5.7)}$$

Where:

C_2 = average mercury concentration for trophic level 2

C_3 = average mercury concentration for trophic level 3

C_4 = average mercury concentration for trophic level 4

****Calculation is based on apportioning the 17.5 grams/day national default consumption rate for freshwater fish by trophic level**

5.7 grams/day of TL 4 fish

8.0 grams/day of TL 3 fish

3.8 grams/day of TL 2 fish



Fish Consumption-Weighted Methylmercury Fish Tissue Averages

Pool	# TL3 Samples	TL3 Concentration Range (ppm)	#TL4 Samples	TL4 Concentration Range (ppm)	MeHg Concentration (ppm)
Emsworth	6	0.0827 - 0.265	5	0.0776 - 0.187	0.131
Dashields	2	0.106 - 0.226	2	0.131 - 0.151	0.156
Montgomery	2	0.0922 - 0.167	3	0.123 - 0.145	0.132
New Cumberland	2	0.141 - 0.268	2	0.0622 - 0.257	0.186
Pike Island	2	0.0249 - 0.189	2	0.125 - 0.279	0.146
Hannibal	6	0.0711 - 0.297	4	0.152 - 0.644	0.214
Willow Island	10	0.027 - 0.241	2	0.135 - 0.214	0.136
Belleville	3	0.0856 - 0.202	2	0.134 - 0.403	0.189
Racine	5	0.0541 - 0.441	3	0.158 - 0.301	0.200
RC Byrd	3	0.125 - 0.242	3	0.00103 - 0.221	0.161
Greenup	6	0.0556 - 0.361	6	0.111 - 0.299	0.174
Meldahl	2	0.106 - 0.274	3	0.125 - 0.268	0.201
Markland	3	0.11 - 0.279	6	0.0396 - 0.386	0.233
McAlpine	2	0.148 - 0.213	5	0.169 - 0.452	0.196
Cannelton	3	0.0883 - 0.181	3	0.128 - 0.365	0.181
Newburgh	5	0.103 - 0.289	2	0.13 - 0.16	0.156
JT Myers	5	0.0609 - 0.357	5	0.0563 - 0.86	0.220
Smithland	7	0.0959 - 0.354	4	0.126 - 0.671	0.280
Olmsted	2	0.0494 - 0.0826	3	0.264 - 0.395	0.178

TEC Considerations



- 1) Need consideration by TEC for Approval of Assessments.
- 2) 305b Workgroup would like to have face-to-face meeting before 2016 assessment begins to continue refinement of methodologies (was cut from current budget; \$1,200 budget item).
- 3) Should continue collection of Methylmercury in fish tissue.