

Oceana County

Brook Trout

Carlton Creek

Oceana County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2021	2021	10	6.8	7.0	6.8	11.2
Datasets available: 2021						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.165	0.071	0.240	0.206	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.706	0.607				

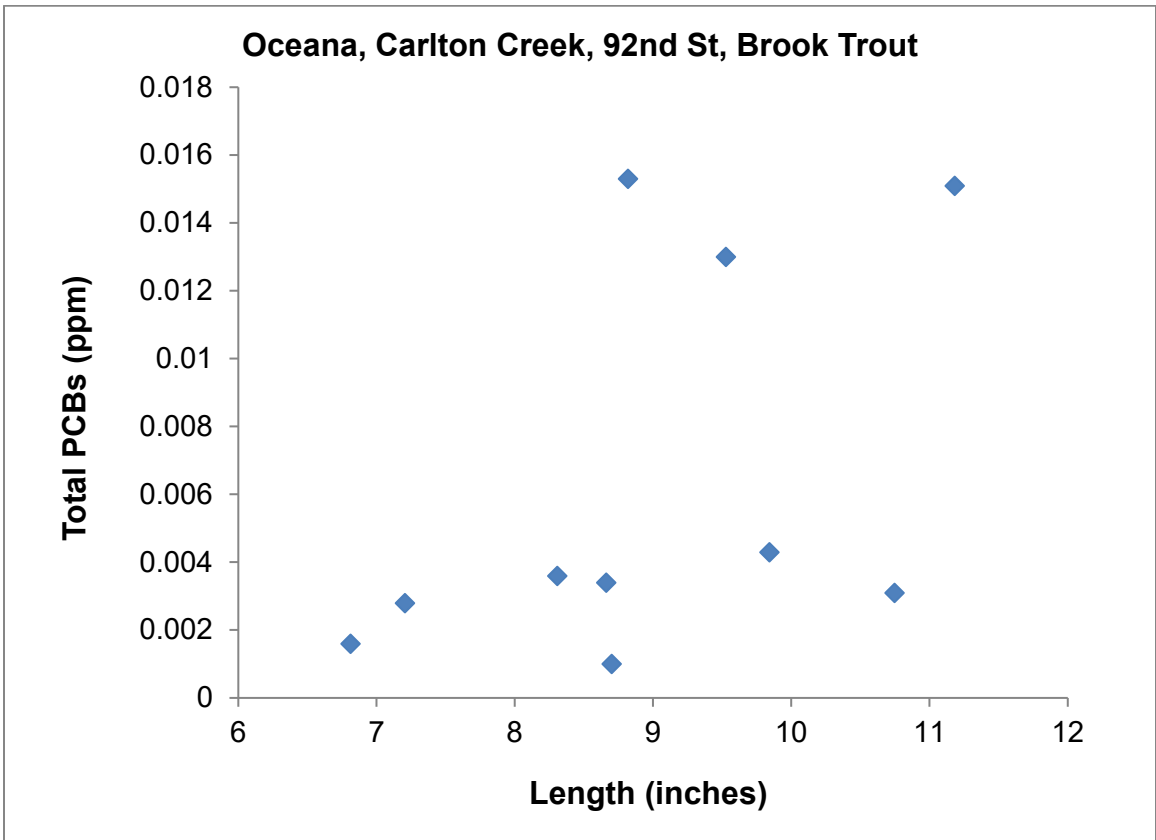
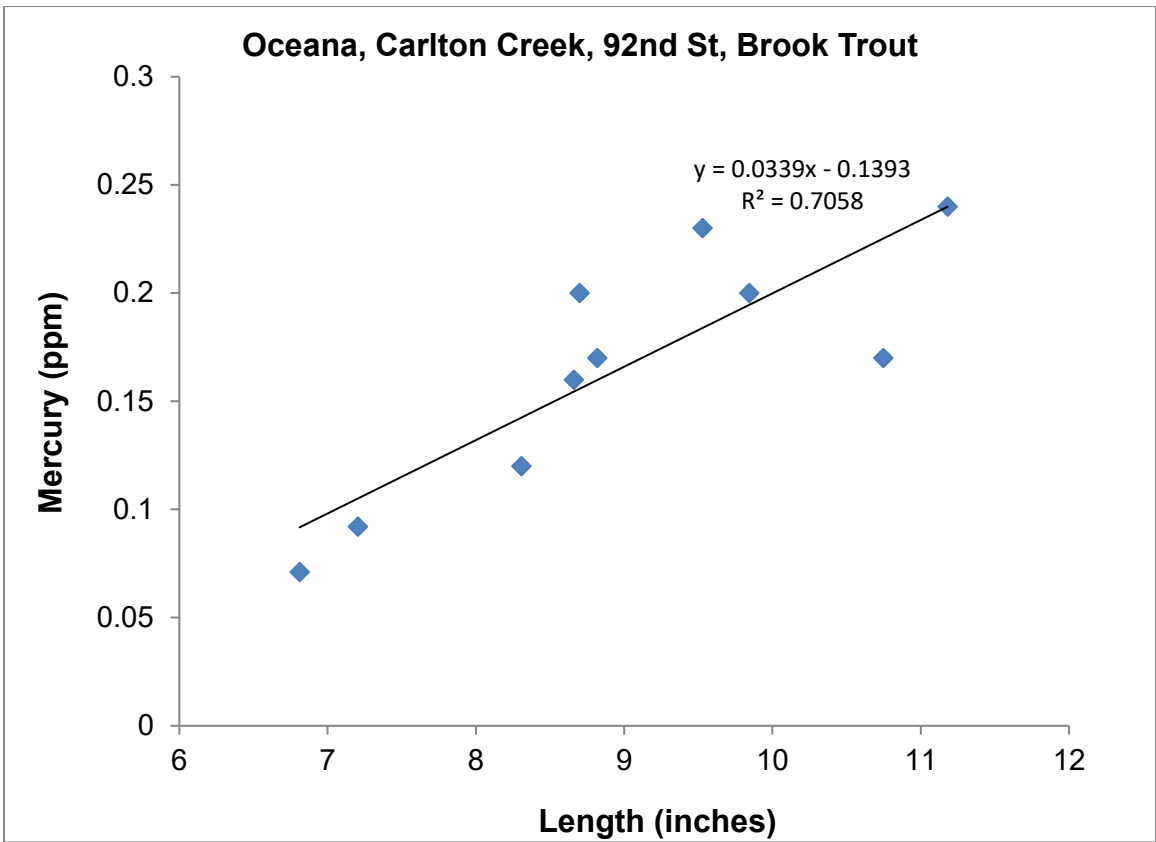
Organics Analysis:

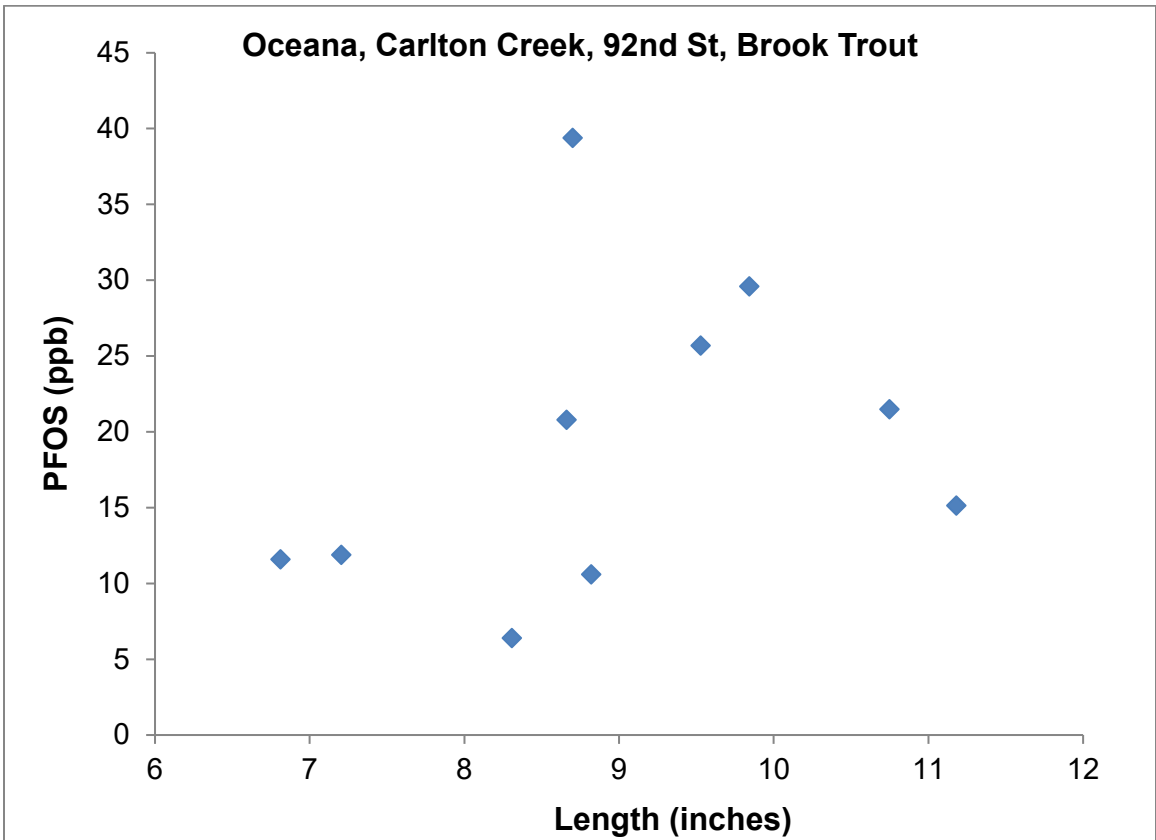
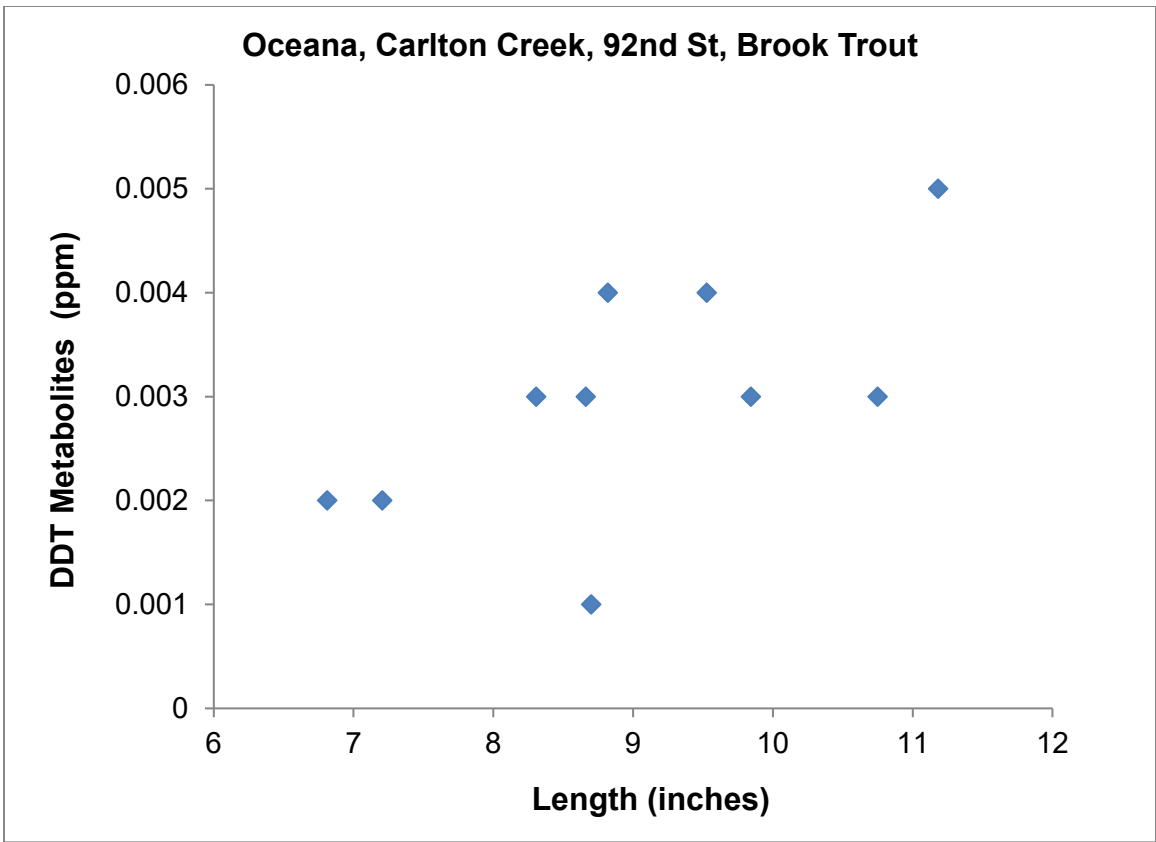
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2021	2021	10	6.8	7.0	6.8	11.2
Datasets available: 2021						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.006	<0.001	0.015	0.010	16
DDT	10	0.003	0.001	0.005	0.004	16
Chlordane	10	0.001	<0.001	0.001	0.001	16
Toxaphene	10	ND	--	--	--	--
PFOS	10	19.3 ppb	6.4 ppb	39.4 ppb	26.5 ppb	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.234	0.268				
DDT	0.4100	0.297				
Chlordane	0.000	0.000				
Toxaphene	--	--				
PFOS	0.103	0.159				
Final meal category based on UCL:						4

Existing MDHHS Advisory: Brook trout from Carlton Creek in Oceana County are not currently covered under any consumption guidance.

Recommendation: No one should eat more than 4 meals per month of brook trout of any size from Carlton Creek in Oceana County due to mercury and PFOS.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
7	0.098	8
8	0.132	4
9	0.166	4
10	0.200	4
11	0.234	4
12	0.268	4
<i>Shaded area denotes extrapolated estimates</i>		





Northern Pike

Pentwater Lake

Oceana County

Hg Analysis:

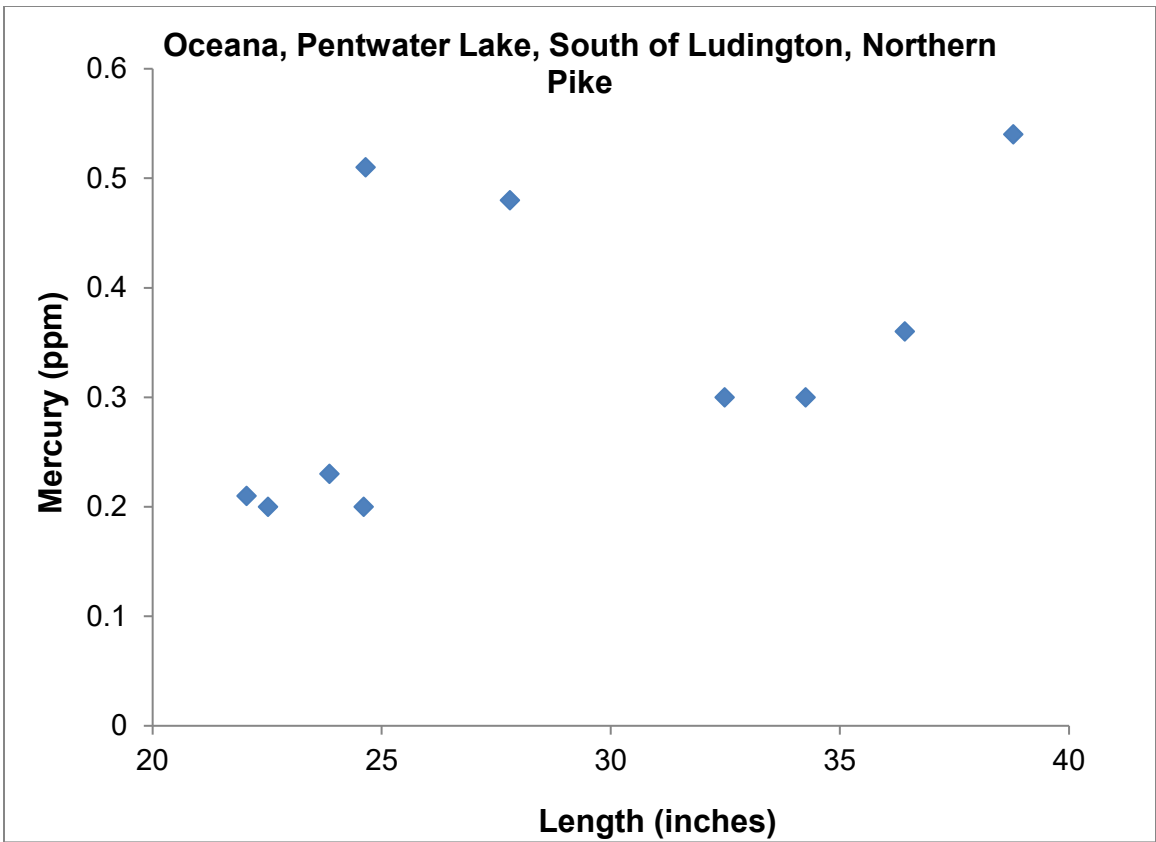
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent						
2016	2016	10	22.0	24	23.9	38.8	
Datasets available: 2016							
Chemical	Sample Size (Legal)	Mean (ppm)		Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	8	0.365		0.200	0.540	0.474	2
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
Mercury	0.264	0.327					

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent						
Datasets available:							
Chemical	Sample Size (Legal)	Mean (ppm)		Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--		--	--	--	--
DDT	0	--		--	--	--	--
Chlordane	0	--		--	--	--	--
Toxaphene	0	--		--	--	--	--
PFOS	0	--		--	--	--	--
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
PCB	--	--					
DDT	--	--					
Chlordane	--	--					
Toxaphene	--	--					
PFOS	--	--					
Final meal category based on UCL:							2

Existing MDHHS Advisory: Northern Pike from Pentwater Lake in Oceana County are covered under the statewide mercury guidance. No one should eat more than 2 meals per month of northern pike smaller than 30 inches in length or no more than 1 meal per month of fish larger than 30 inches in length due to mercury.

Recommendation: No one should eat more than 2 meals per month of northern pike of any size from Pentwater Lake in Oceana County due to mercury.



Ottawa County

Largemouth Bass

Crockery Lake

Ottawa County

Hg Analysis:

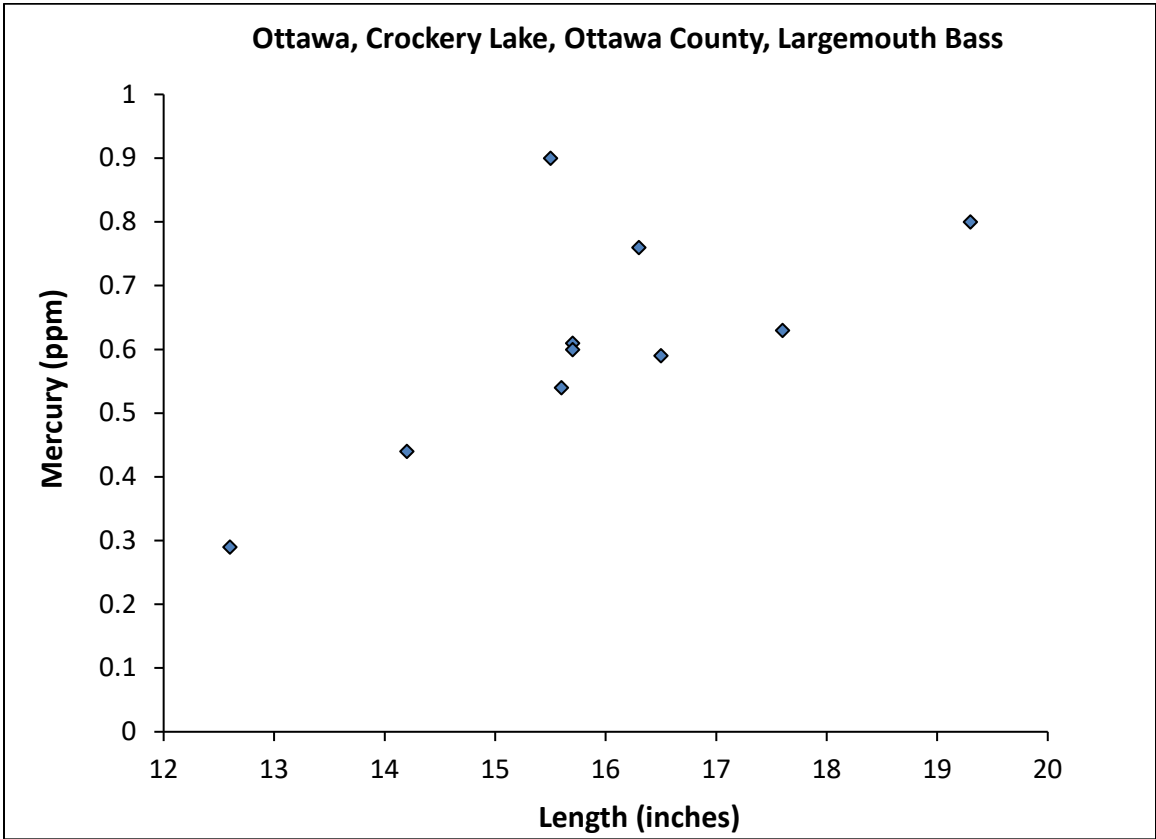
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2006	2006	10	12.6	14	14.2	19.3
Datasets available: 2006						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	9	0.65	0.44	0.90	0.76	1
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.482	0.568				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
--	--	0				
Datasets available: --						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						1

Existing Advisory: Crockery Lake largemouth bass are covered by the statewide mercury advisory.

Recommendation: No one should eat more than 1 meal per month of Crockery Lake largemouth or smallmouth bass smaller than 18 inches or more than 6 meals per year of those fish larger than 18 inches due to mercury. The statewide length break was applied as the size range of fish was limited.



Bluegill

Lake Macatawa

Ottawa County

Hg Analysis:

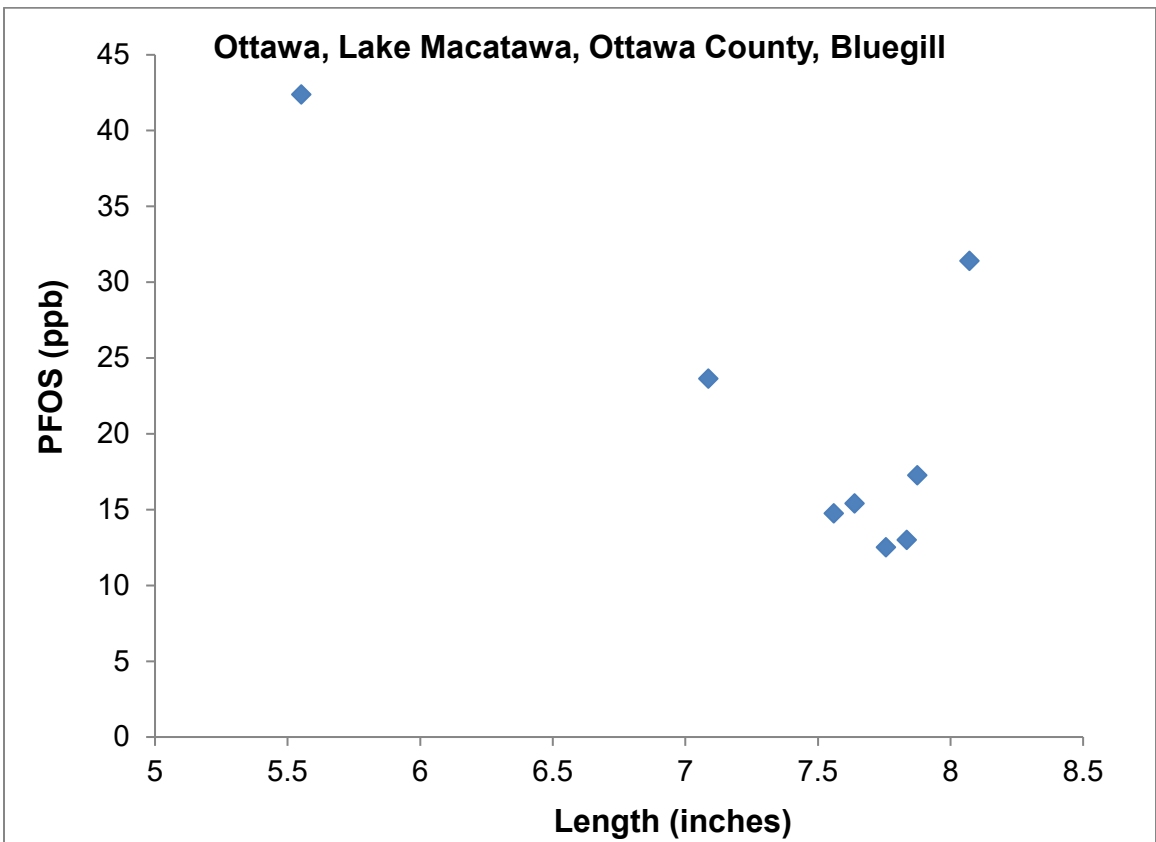
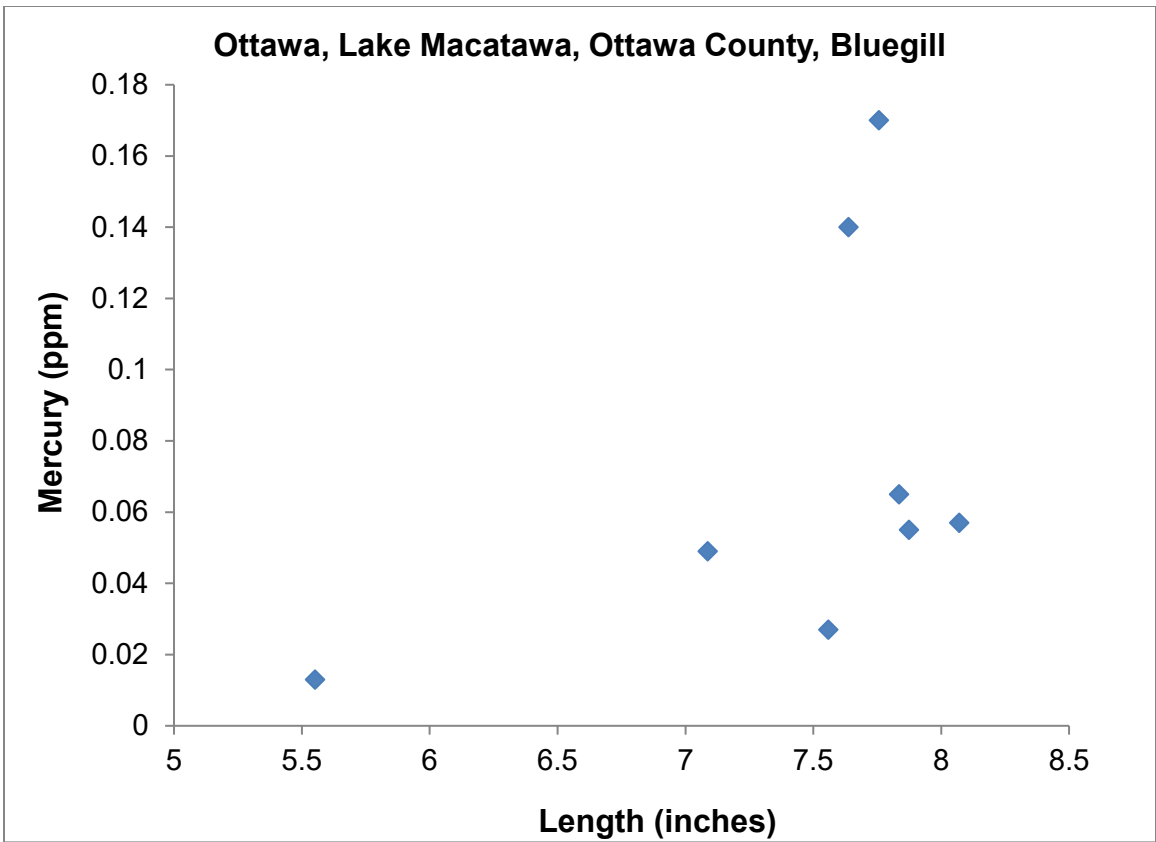
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2021	2021	8	5.6	NA	5.6	8.1
Datasets available: 2021						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	8	0.072	0.013	0.170	0.118	8
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.202	0.500				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2021	2021	8	5.6	NA	5.6	8.1
Datasets available: 2021						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
PFOS	8	21.3 ppb	12.5 ppb	42.4 ppb	30.2 ppb	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.534	0.441				
Final meal category based on UCL:						4

Existing MDHHS Advisory: Bluegill and sunfish from Lake Macatawa in Ottawa County are currently covered under the statewide mercury guidance. No one should eat more than 8 meals per month of bluegill or sunfish of any size.

Recommendation: No one should eat more than 4 meals per month of bluegill or sunfish of any size from Lake Macatawa in Ottawa County due to PFOS. Mercury causes less restrictive guidance.



Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent				Min	Max	
1984	2005	28	17	NA	17	30.9	
Datasets available: 1980, 1984, 1987, 1995, 2005							
Chemical	Sample Size (Legal)	Mean (ppm)		Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	28	0.13		0.05	0.26	0.15	4
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
Mercury	0.002	0.000					

Organics Analysis:

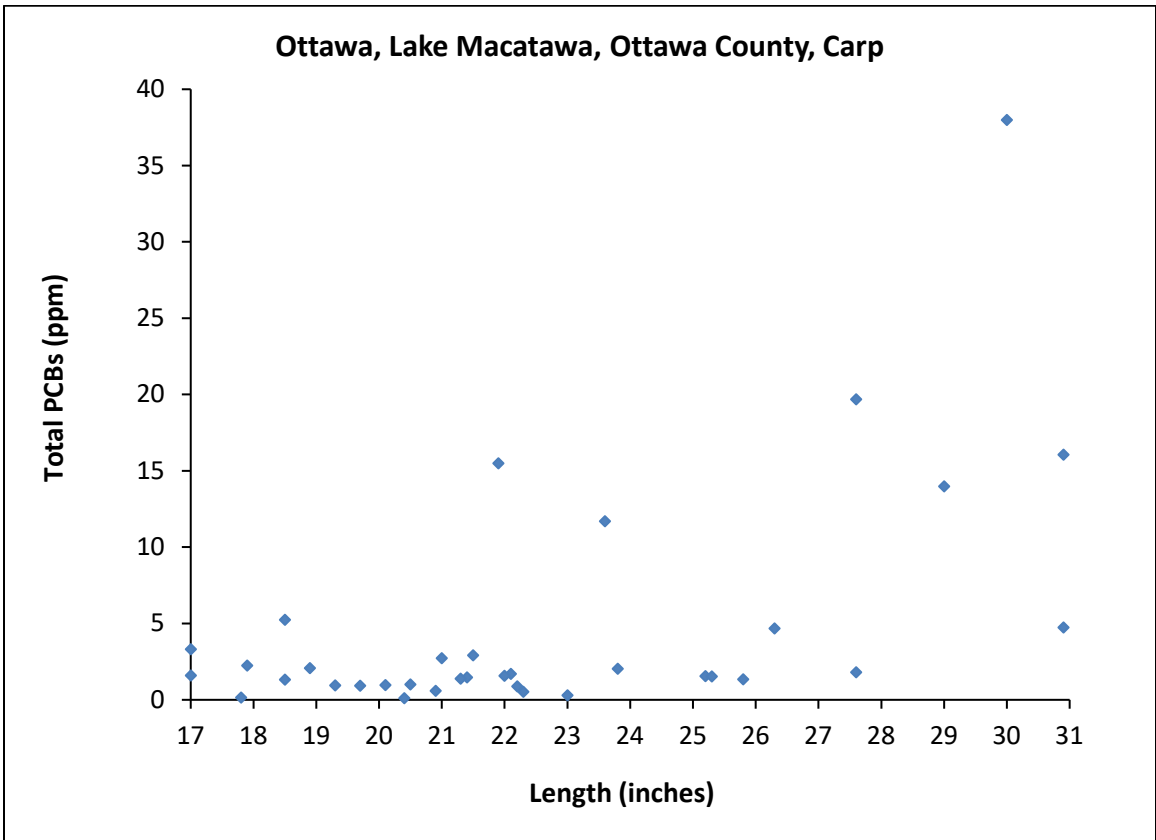
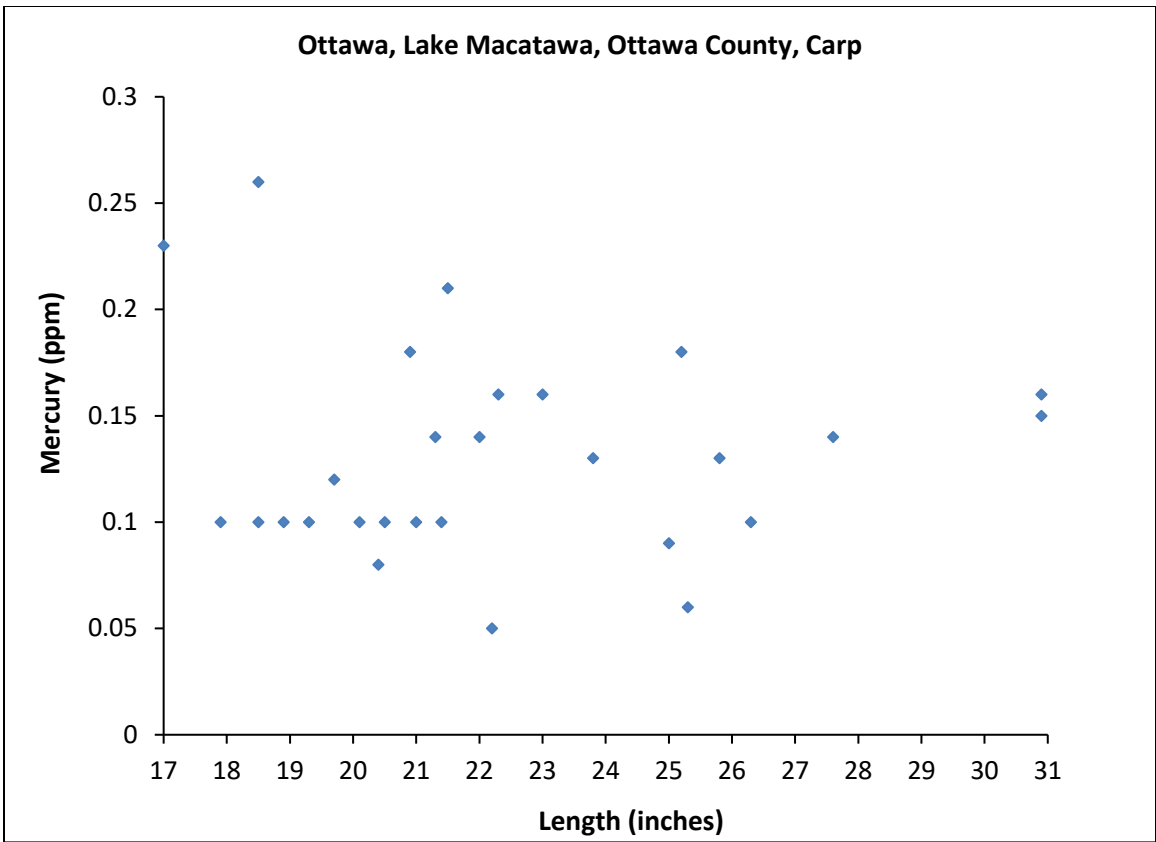
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent				Min	Max	
1995	2005	18	19.7	na	19.7	30.9	
Datasets available: 1980, 1984, 1987, 1995, 2005							
Chemical	Sample Size (Legal)	Mean (ppm)		Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	17	2.32		0.11	16.07	4.22	0
DDT	18	0.74		0.02	7.32	1.59	1
Chlordane	18	0.18		0.004	1.74	0.38	--
Toxaphene	18	ND		--	--	--	--
TEQ*	8	4.0 ppt		0.8 ppt	9.6 ppt	6.9 ppt	1
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
PCB	0.464	0.492					
DDT	0.475	0.570					
Chlordane	0.457	0.491					
Toxaphene	--	--					
TEQ*	0.010	0.007					
Final meal category based on UCL:							0

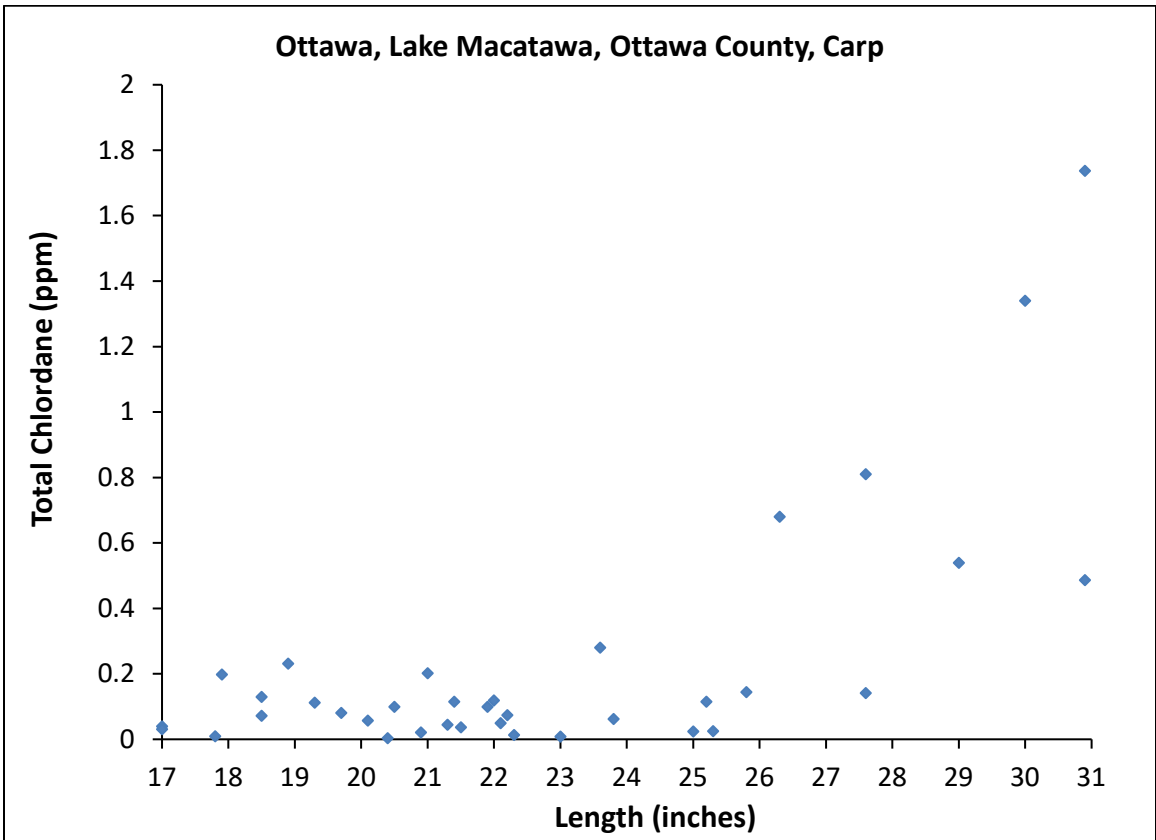
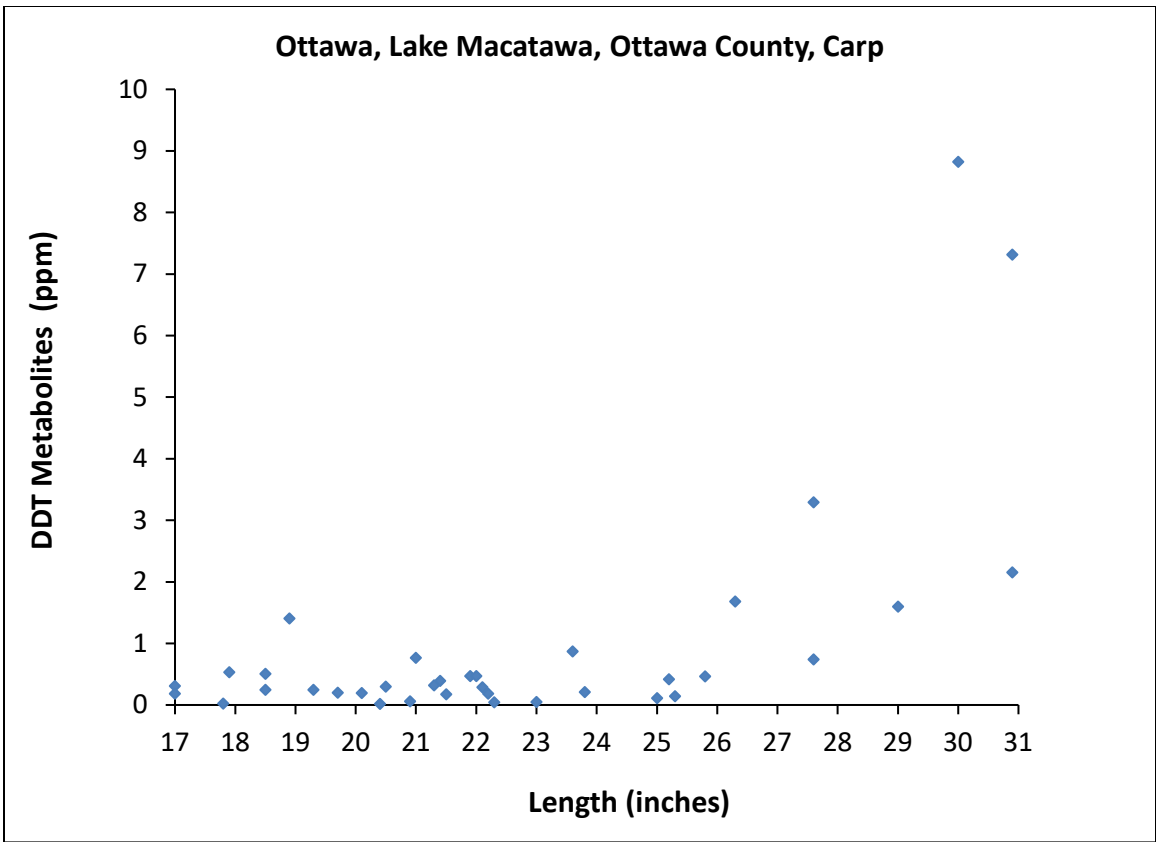
* WHO 2005 TEFs, no dioxin-like PCB data, only dioxins and furans

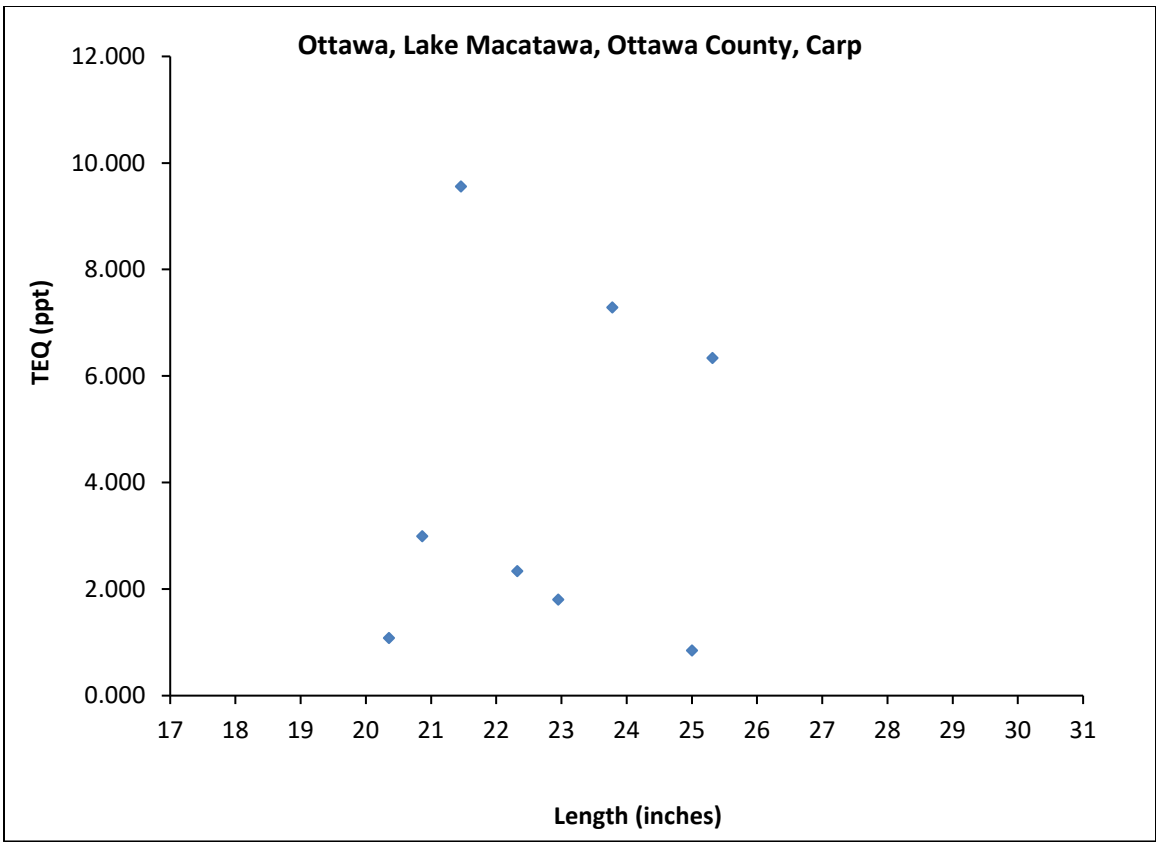
Existing Advisory: Due to elevated levels of PCBs; Women and children should not eat more than one meal per week of Lake Macatawa carp smaller than 14 inches in length, no more than one meal per month of Lake Macatawa carp between 14 and 22 inches in length and no more than six meals per year of Lake Macatawa carp greater than 22 inches in length due to PCBs.

Recommendation: No one should eat Lake Macatawa carp due to PCBs. Dioxins, mercury, and DDT would cause advisories.

Note: Excluding the 1995 data removes the carp larger than 25 inches and relaxes the advice to "Limited".







Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2021	2021	10	13.8	NA	13.8	24.8
Datasets available:		2021				
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.371	0.059	0.650	0.517	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.568	0.549				

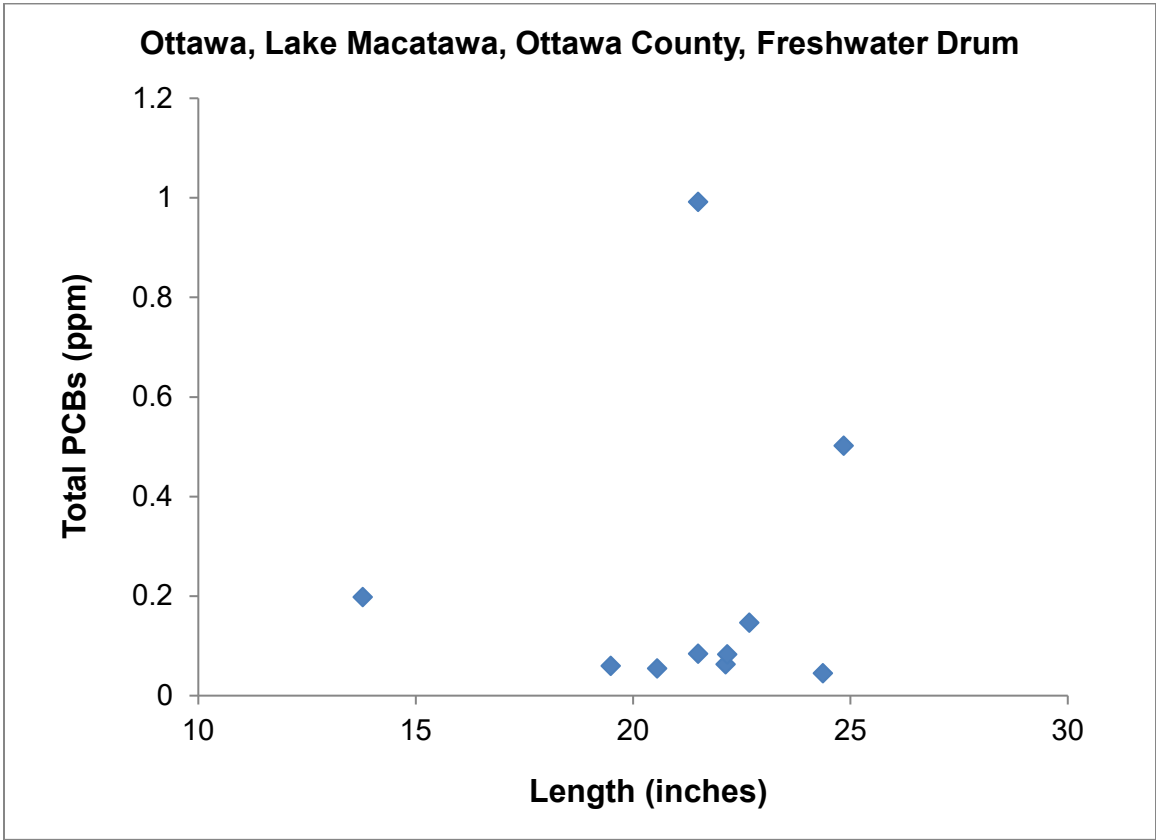
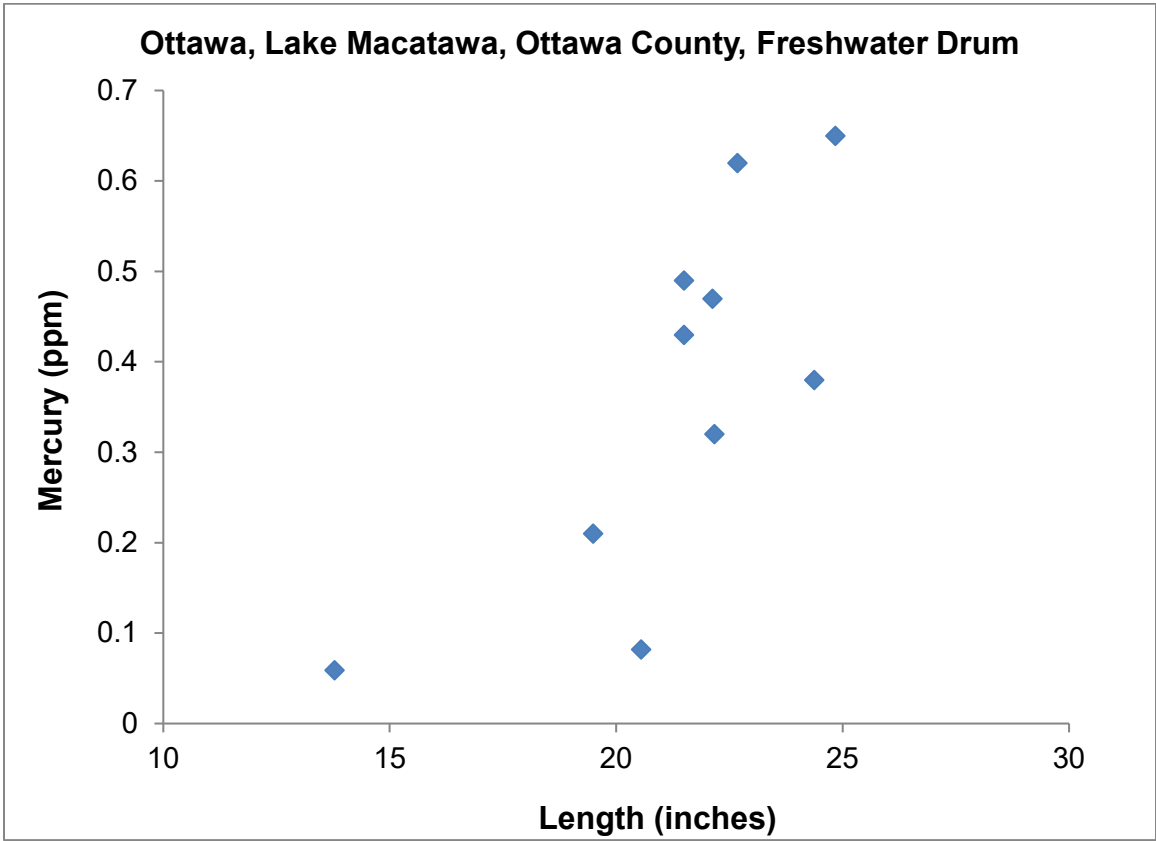
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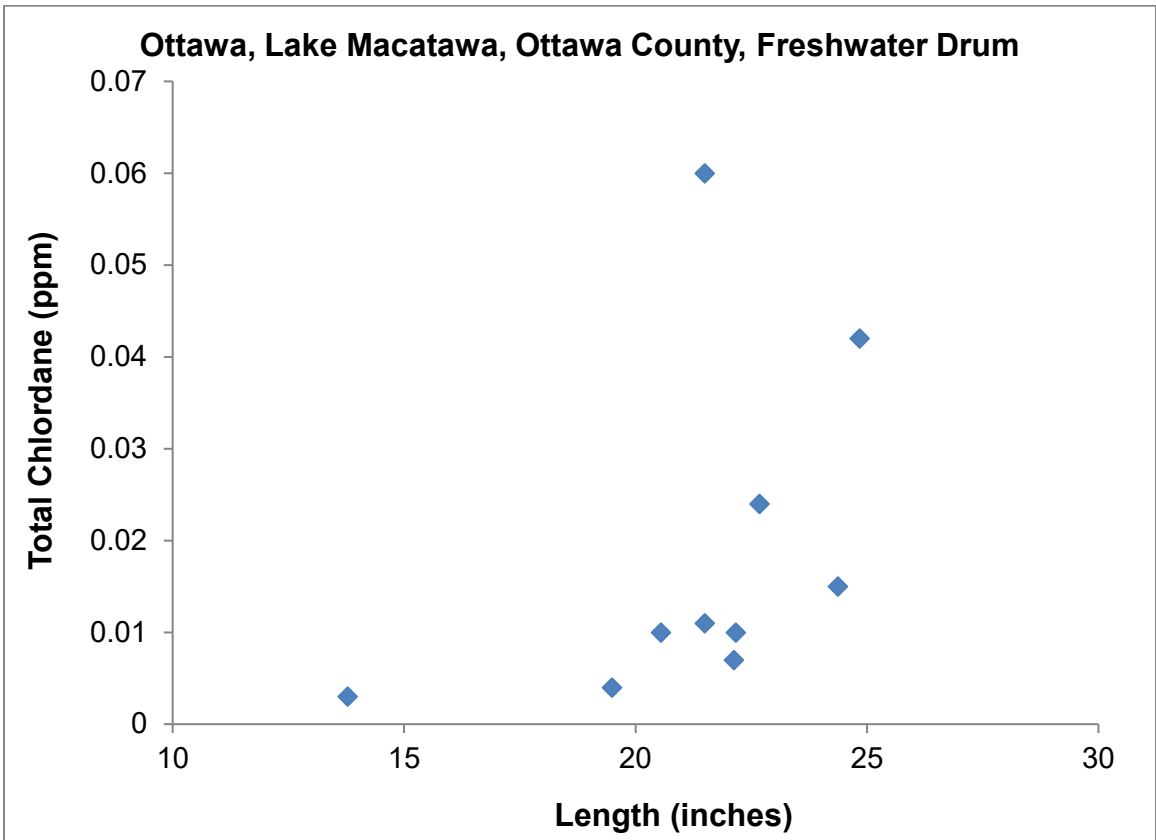
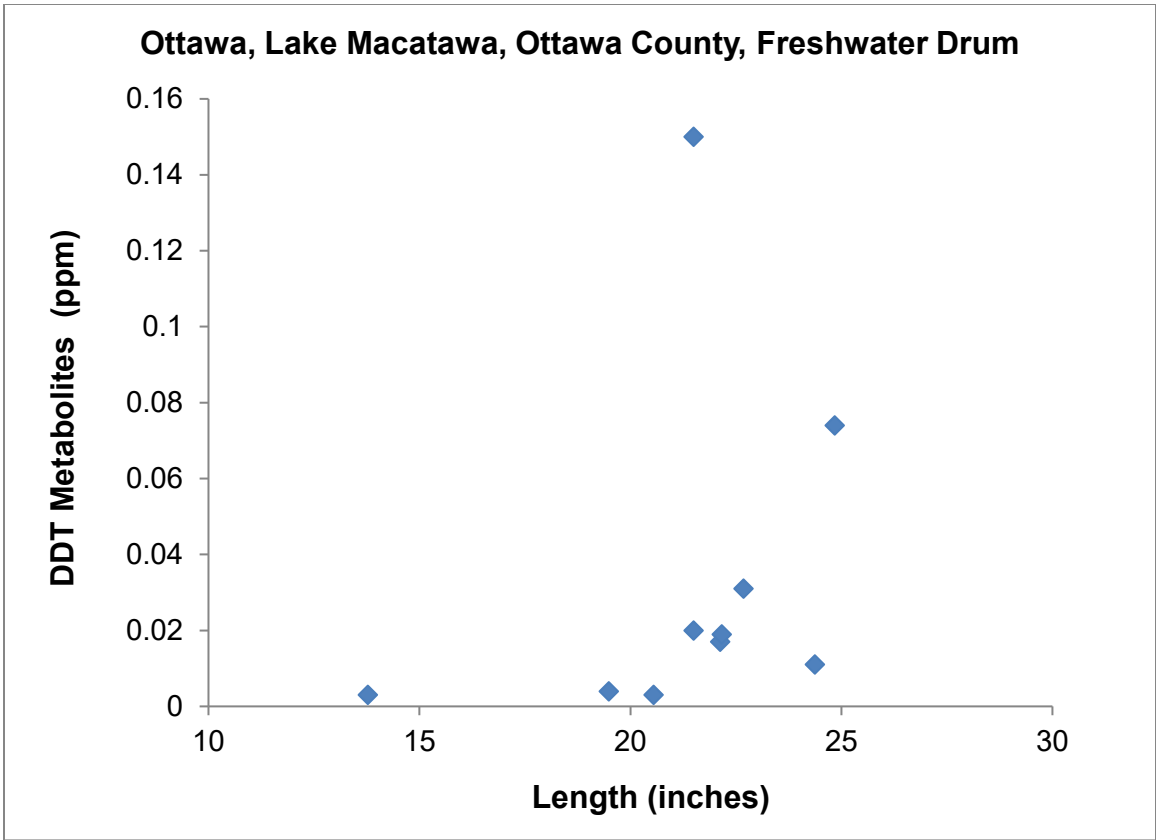
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2021	2021	10	13.8	NA	13.8	24.8
Datasets available:		2021				
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.223	0.045	0.992	0.439	Limited
DDT	10	0.033	0.003	0.150	0.066	16
Chlordane	10	0.019	0.003	0.060	0.032	16
Toxaphene	10	ND	--	--	--	--
PFOS	10	8.2 ppb	3.8 ppb	16.3 ppb	11.1 ppb	12
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.009	0.000				
DDT	0.084	0.371				
Chlordane	0.180	0.479				
Toxaphene	--	--				
PFOS	0.123	0.133				
Final meal category based on UCL:						Limited

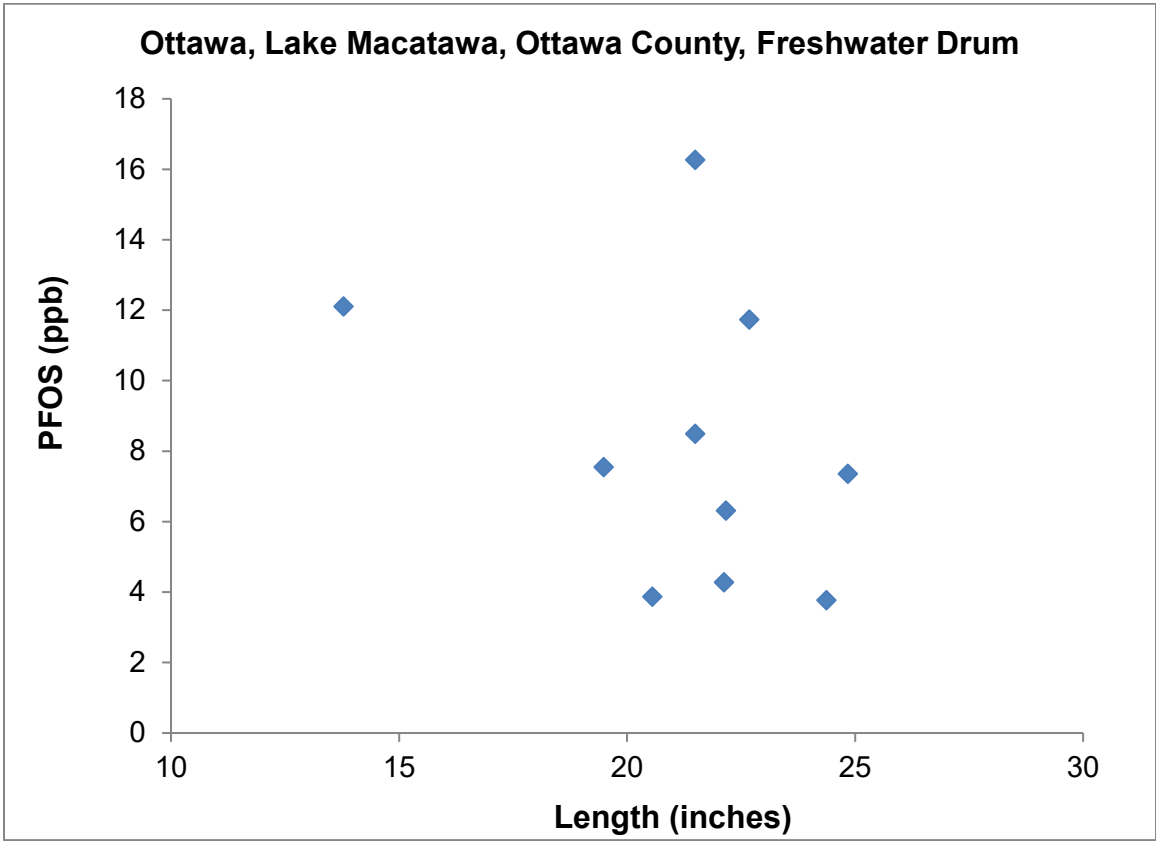
Existing MDHHS Advisory: Freshwater drum (also known as sheepshead) from Lake Macatawa are not currently covered under a consumption guideline.

Recommendation: Sensitive populations should not eat these fish. Healthy adults should not eat more than 1 or 2 meals per year of Lake Macatawa freshwater drum (also known as sheepshead) due to PCBs. Mercury and PFOS cause less restrictive guidance.

Note: Dioxins and dioxin-like chemicals were also analyzed in these samples. Those data were not available for this analysis but will be included once received from the analytical laboratory.







Largemouth/Smallmouth Bass

Lake Macatawa

Ottawa County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		Meal Category
Earliest	Most Recent				Min	Max	
2008	2021	20	14.3	14.0	14.3	18.2	
Datasets available: 2008, 2021							
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)		
Mercury	20	0.201	0.100	0.452	0.240	4	
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
Mercury	0.173	0.236					

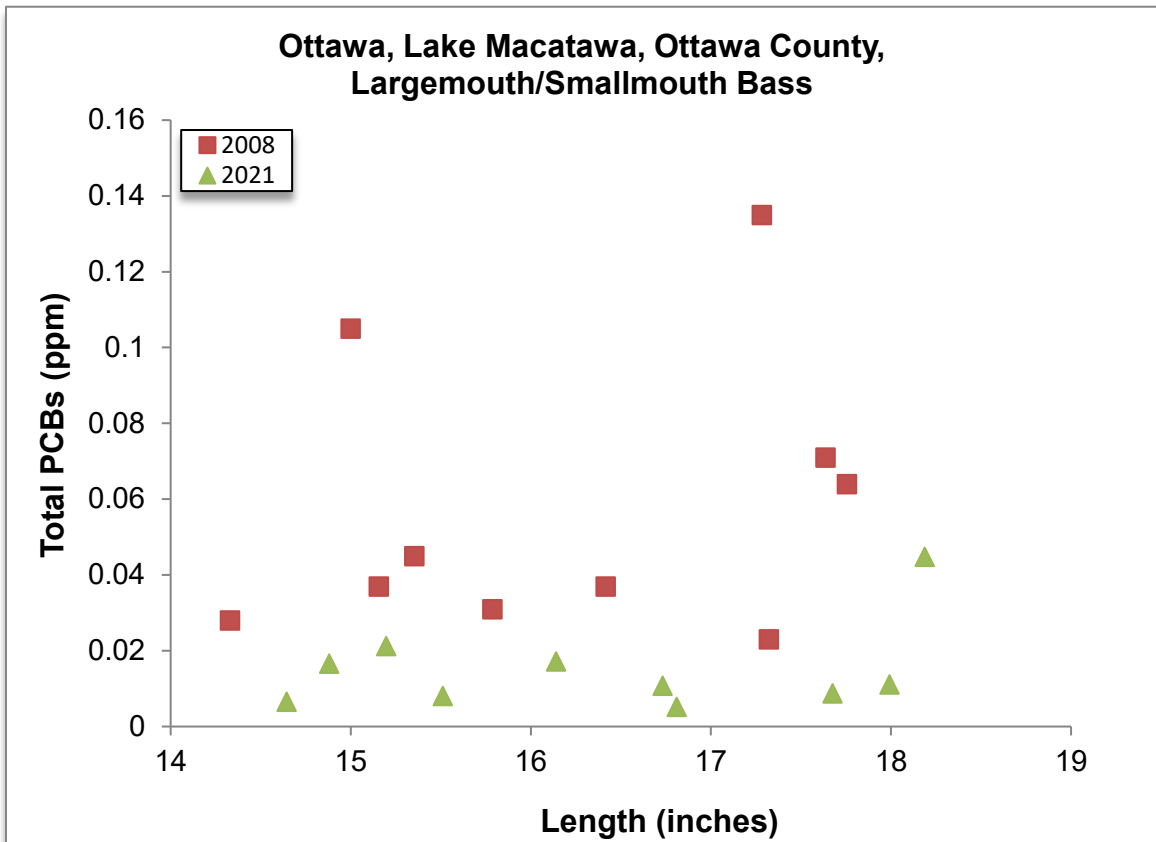
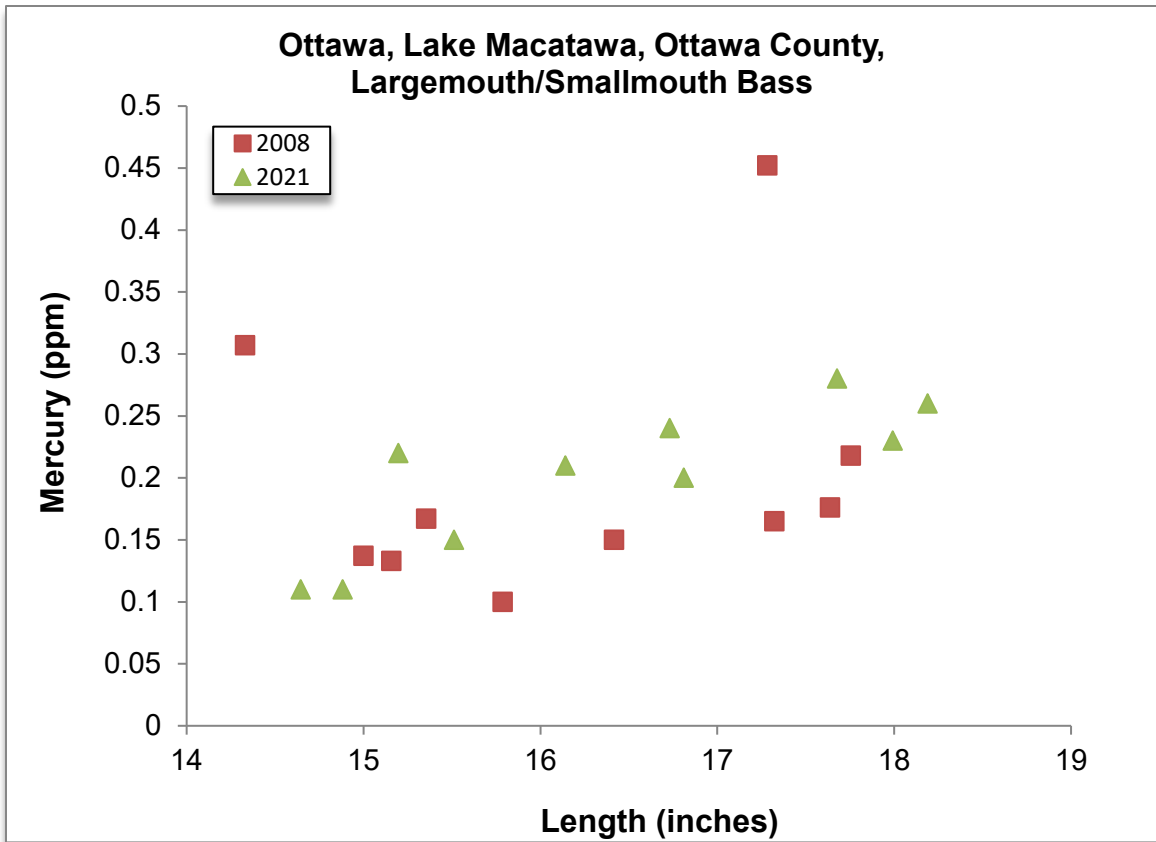
Organics Analysis:

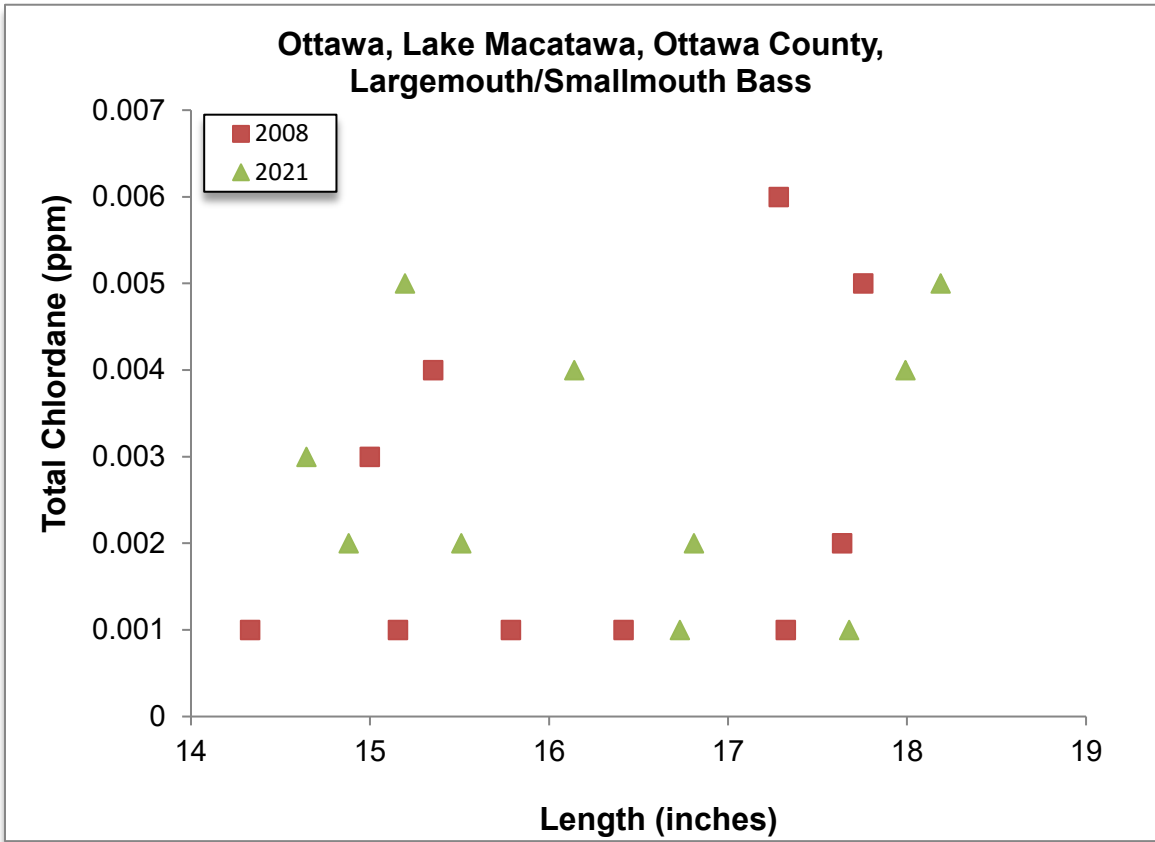
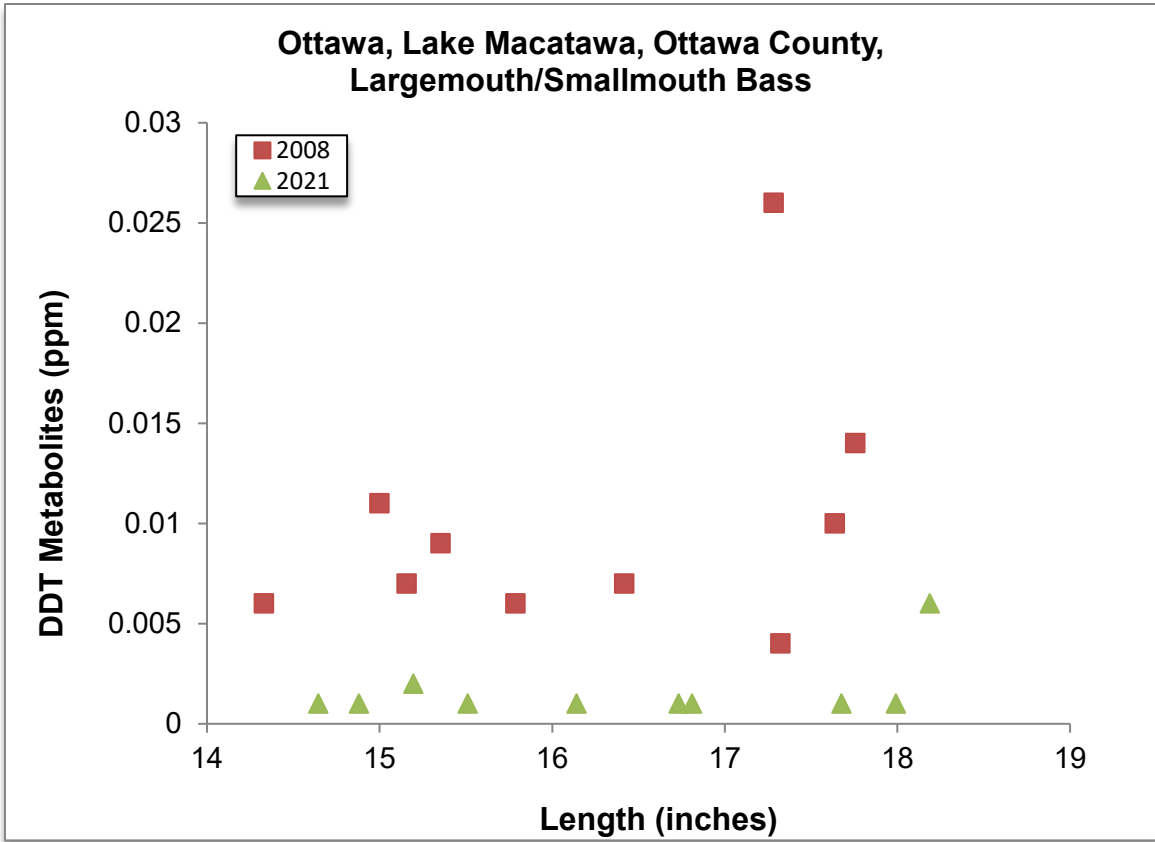
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		Meal Category
Earliest	Most Recent				Min	Max	
2008	2021	20	14.3	14.0	14.3	18.2	
Datasets available: 2008 (No PFOS), 2021							
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)		
PCB	20	0.036	0.005	0.135	0.052	2	
DDT	20	0.006	<0.001	0.026	0.009	16	
Chlordane	20	0.003	<0.001	0.006	0.003	16	
Toxaphene	20	ND	--	--	--	--	
PFOS	10	10.7 ppb	5.6 ppb	17.7 ppb	13.0 ppb	8	
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
PCB	0.021	0.010					
DDT	0.038	0.011					
Chlordane	0.059	0.031					
Toxaphene	--	--					
PFOS	0.065	0.139					
Final meal category based on UCL:							2

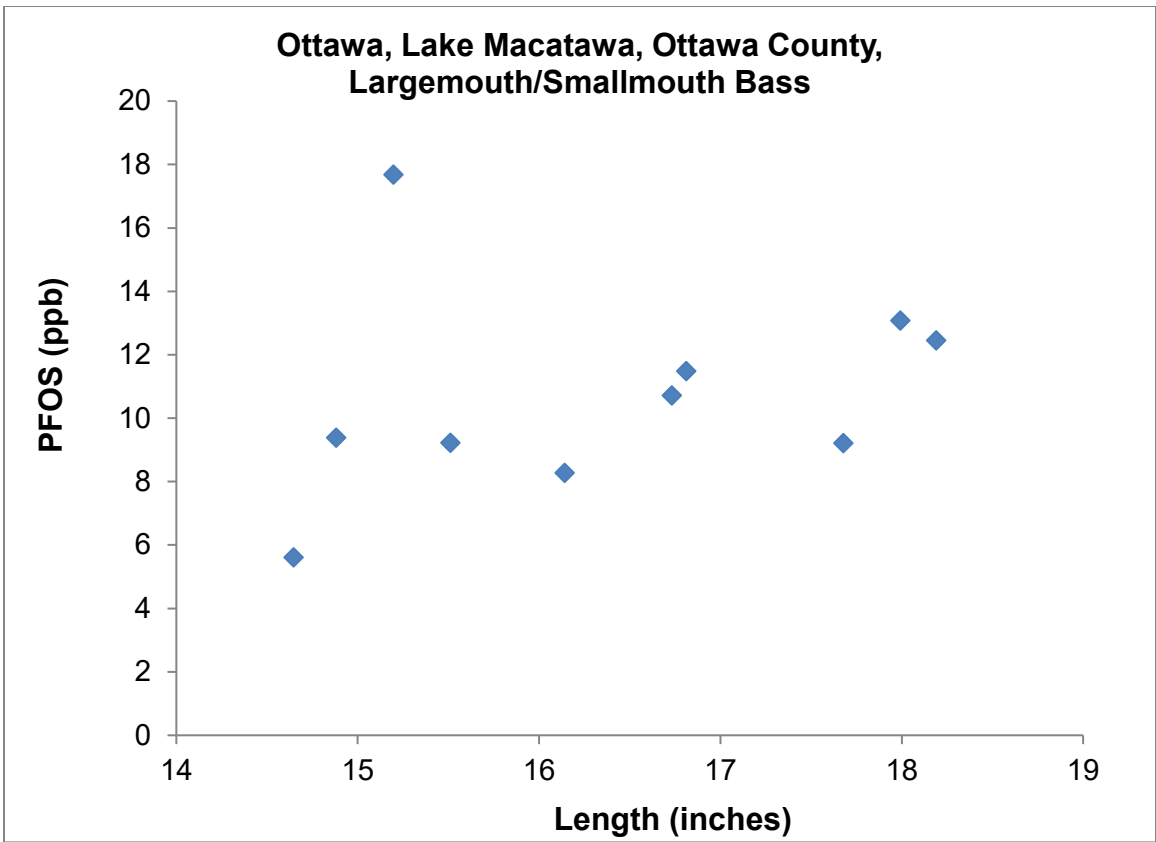
Existing MDHHS Advisory: No one should eat more than 2 meals per month of largemouth or smallmouth bass smaller than 18 inches from Lake Macatawa in Ottawa County due to PCBs and mercury or no more than 1 meal per month of these fish larger than 18 inches due to mercury.

Recommendation: No one should eat more than 2 meals per month of largemouth or smallmouth bass smaller than 18 inches from Lake Macatawa in Ottawa County or no more than 1 meal per month of these fish larger than 18 inches due to PCBs. Statewide length break applied given the limited size range of fish used in the analysis.

Note: The current recommendation will be re-evaluated in the next release of the Eat Safe Fish Guide.







Walleye

Lake Macatawa

Ottawa County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1984	2008	42	11.2	15	15	31.1
Datasets available: 1984, 1987, 1995, 2005, 2008						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	37	0.35	0.08	1.19	0.44	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.664	0.737				

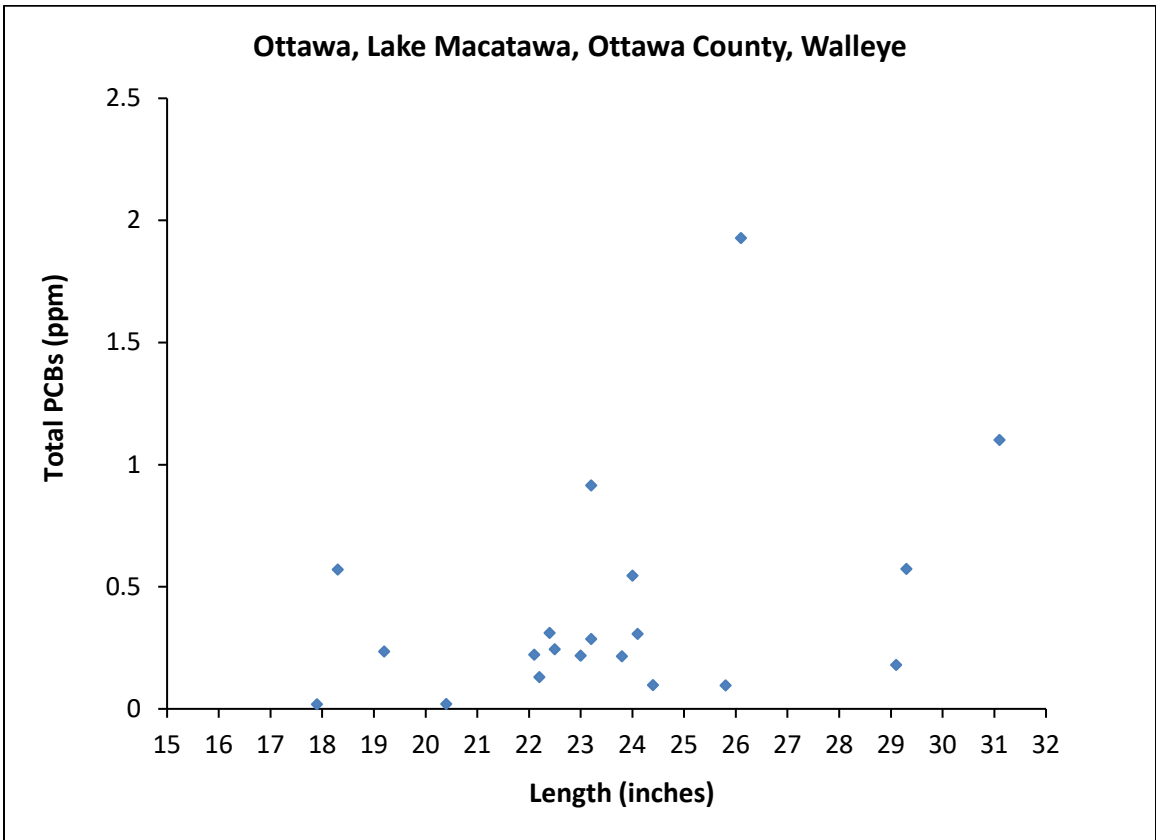
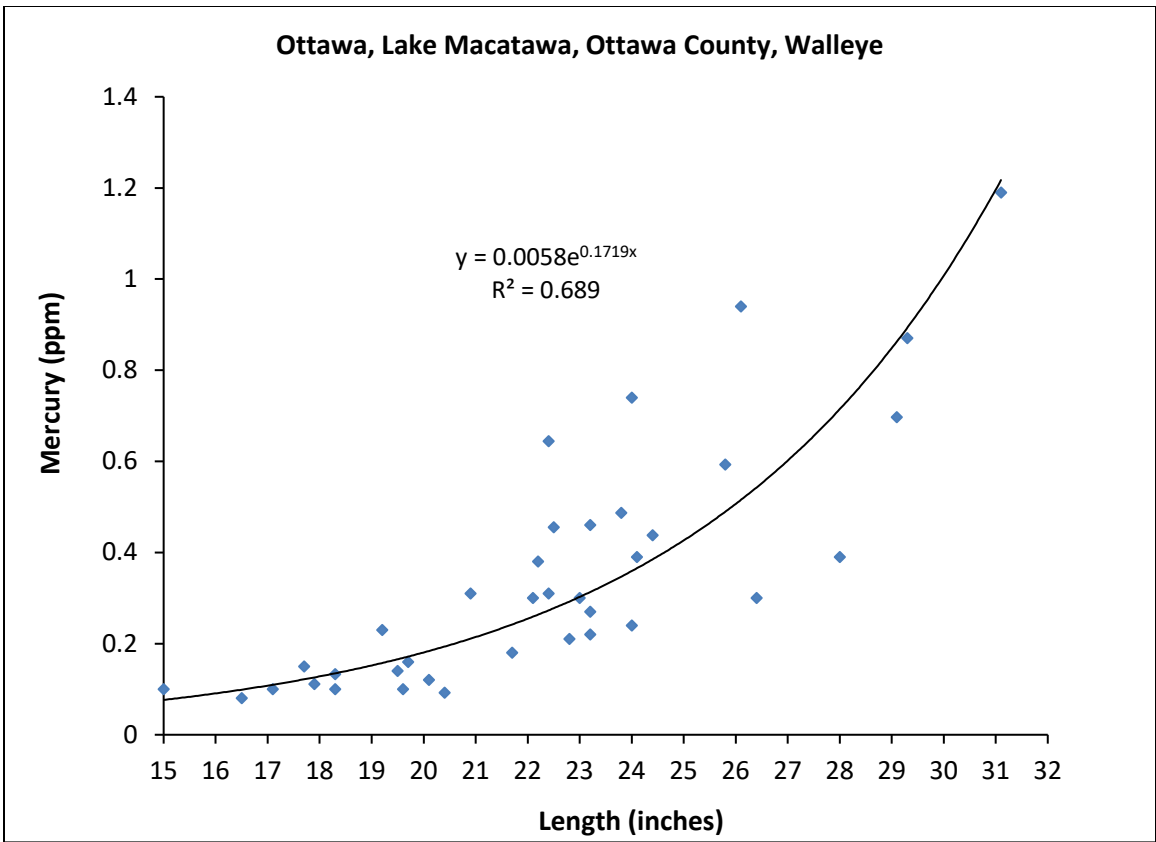
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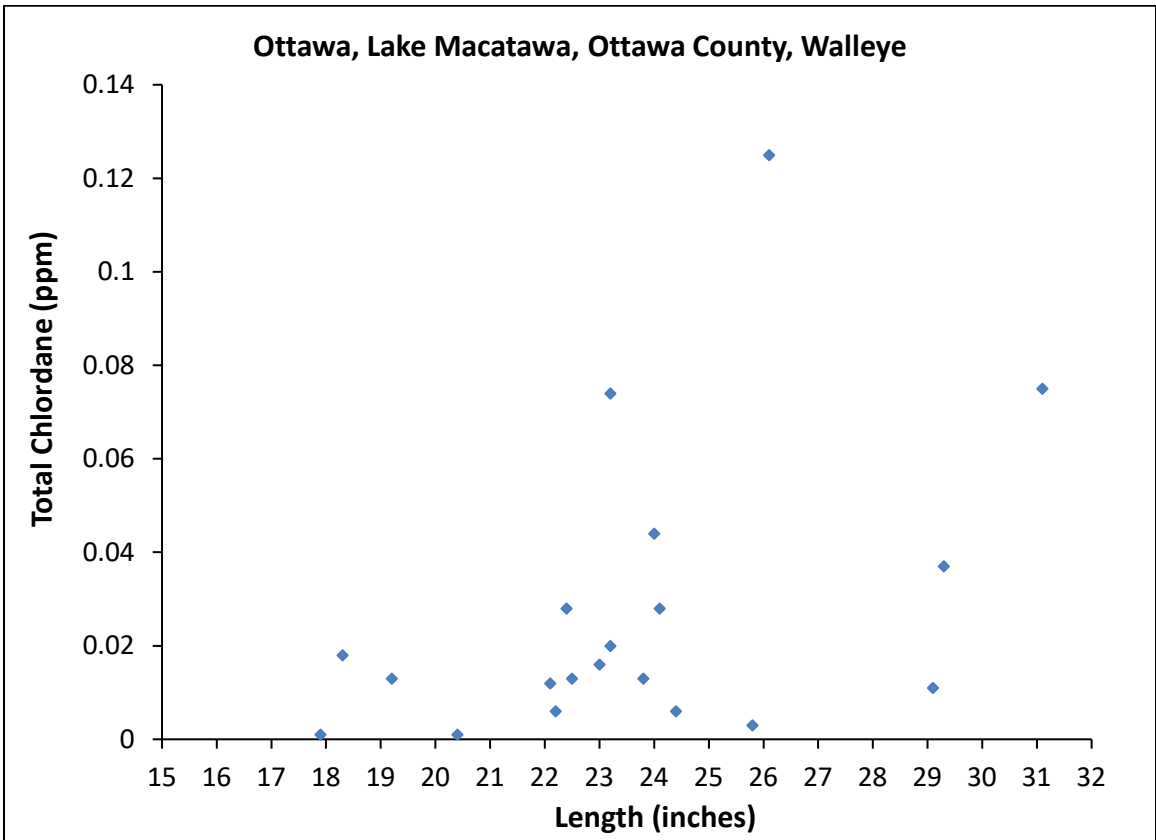
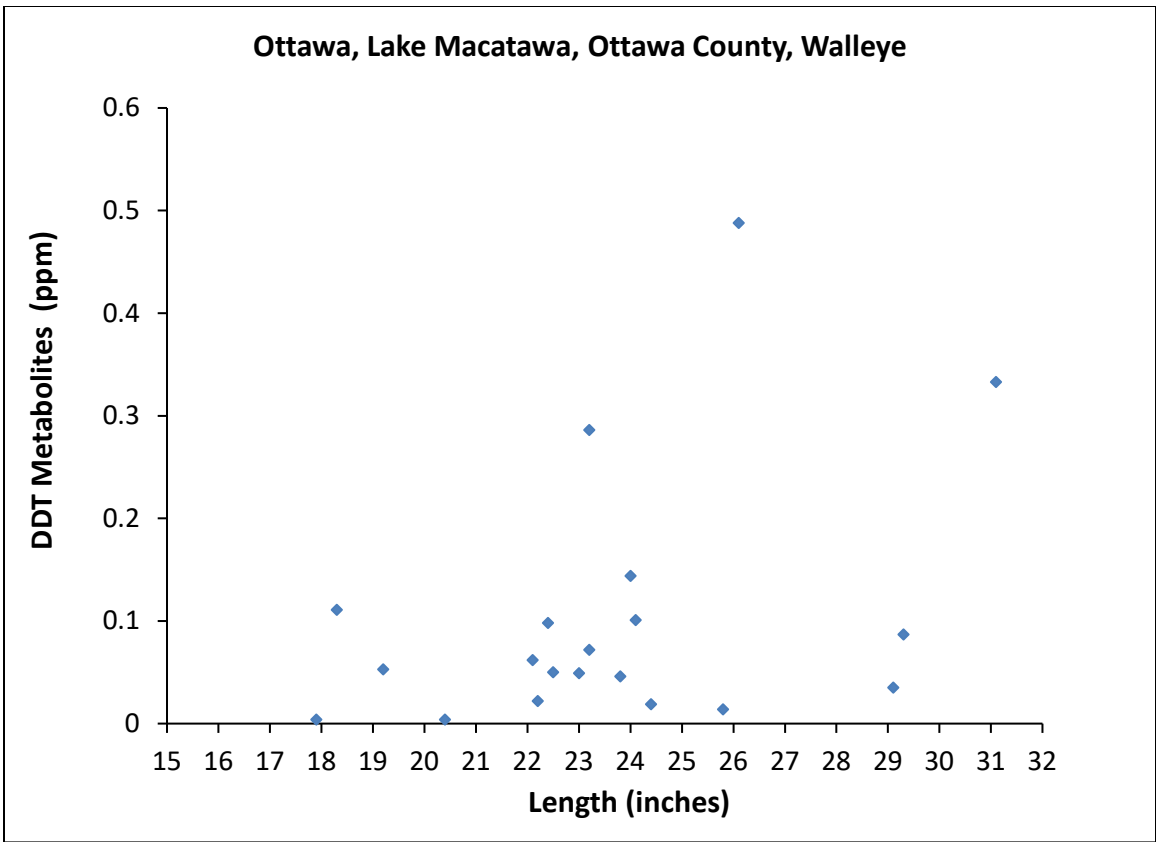
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2005	2008	20	17.9	15	17.9	31.1
Datasets available: 1984, 1987, 1995, 2005, 2008						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	20	0.41	0.02	1.93	0.62	Limited
DDT	20	0.10	0.004	0.49	0.16	8
Chlordane	20	0.03	0.001	0.12	0.04	--
Toxaphene	19	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.160	0.219				
DDT	0.154	0.177				
Chlordane	0.193	0.235				
Toxaphene	--	--				
Final meal category based on UCL:						Limited

Existing Advisory: Women and children should not eat more than one meal per month of Lake Macatawa walleye due to mercury and PCBs.

Recommendation: Sensitive populations should not eat these fish. Healthy adults should not eat more than 1 or 2 meals per year of Lake Macatawa walleye due to PCBs. Mercury and DDT would cause advisories.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
15	0.08	12
16	0.09	8
18	0.13	8
20	0.18	4
22	0.26	4
24	0.36	2
26	0.51	2
28	0.71	1
31	1.20	0.5
<i>Shaded area denotes extrapolated estimates</i>		





Yellow Perch

Lake Macatawa

Ottawa County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2021	2021	10	7.2	NA	7.2	9.9
Datasets available: 2021						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.052	0.016	0.130	0.077	12
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.841	0.861				

Organics Analysis:

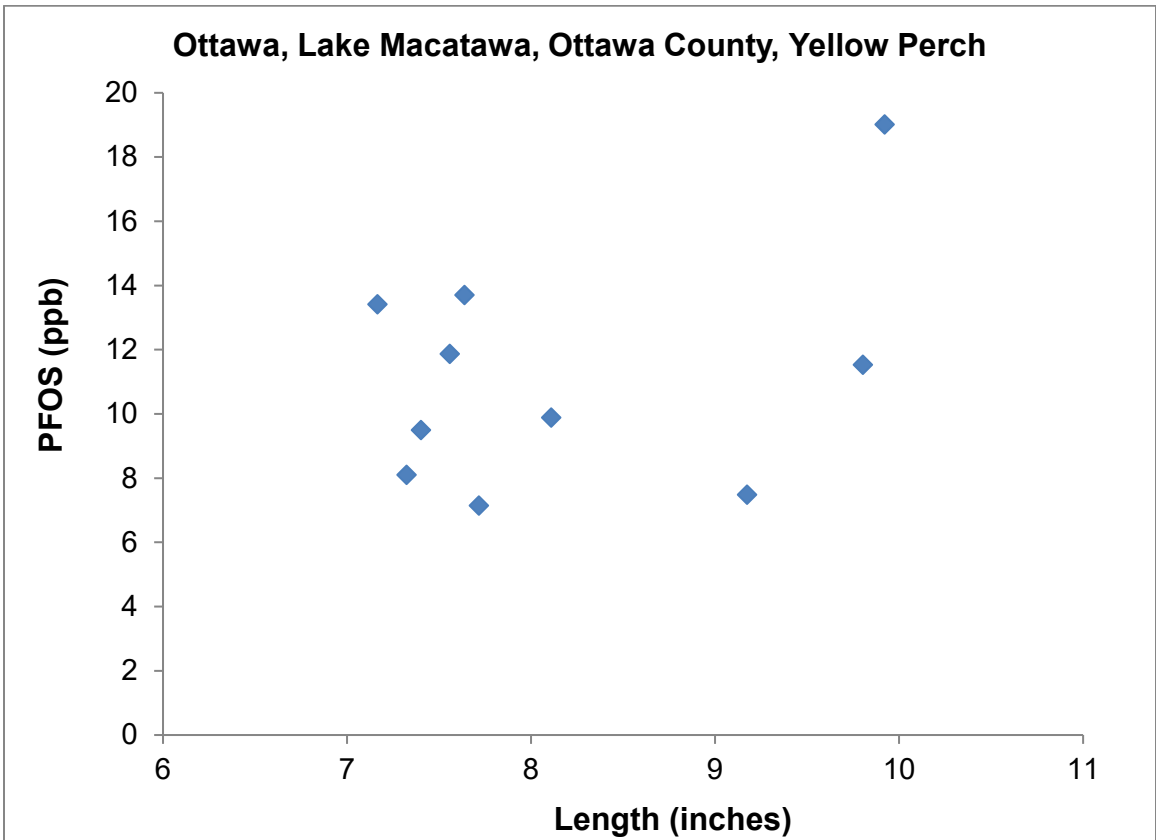
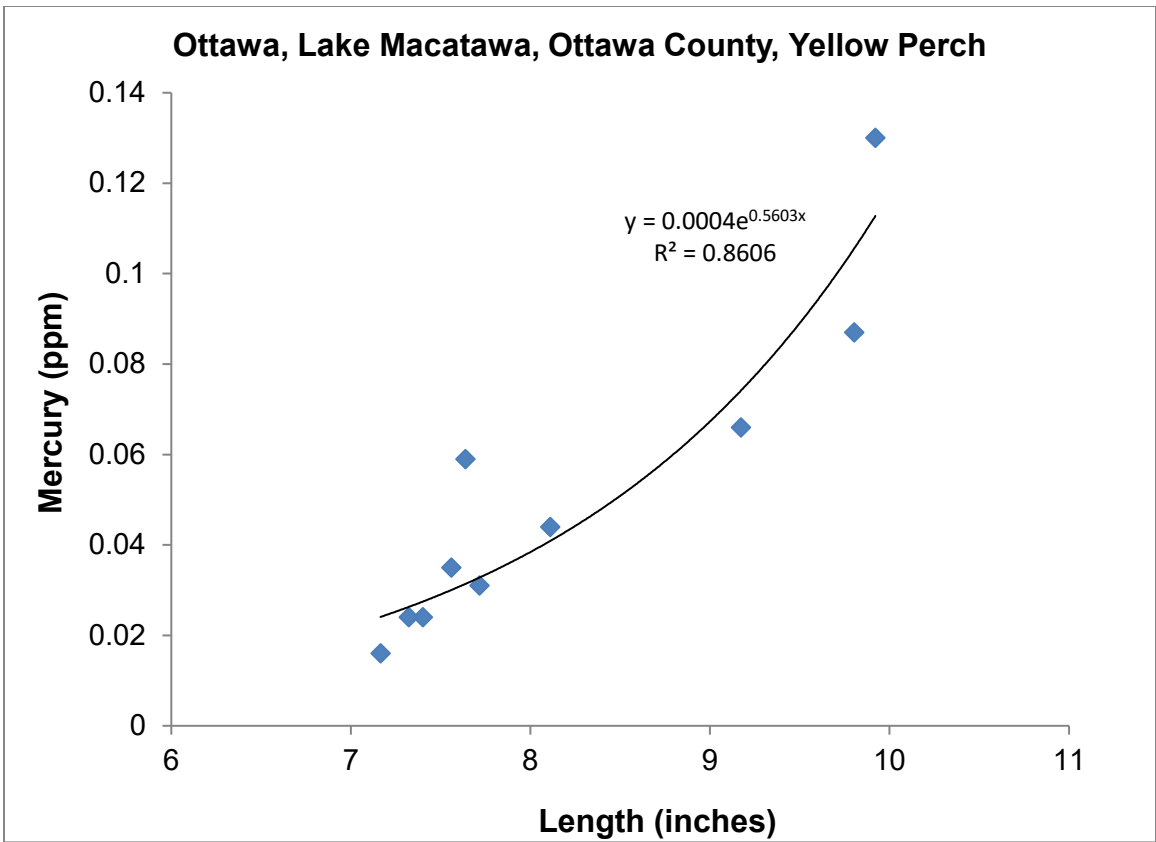
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2021	2021	10	7.2	NA	7.2	9.9
Datasets available: 2021						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
PFOS	10	11.2 ppb	7.2 ppb	19.0 ppb	13.8 ppb	8
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.132	0.089				
Final meal category based on UCL:						8

Existing MDHHS Advisory: Yellow perch from Lake Macatawa in Ottawa County are currently covered under the statewide mercury guidance. No one should eat more than 4 meals per month of yellow perch of any size.

Recommendation: No one should eat more than 8 meals per month of yellow perch smaller than 11 inches from Lake Macatawa in Ottawa County due to mercury and PFOS or no more than 4 meals per month of these fish larger than 11 inches due to mercury. Length break was applied at the upper end of the regression as the sample size range was limited.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
7	0.020	16
8	0.035	16
9	0.062	16
10	0.108	8
11	0.190	4
<i>Shaded area denotes extrapolated estimates</i>		

Note: The current recommendation will be re-evaluated in the next release of the Eat Safe Fish Guide.



White Sucker

Pigeon River

Ottawa County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2005	2005	10	9.8	NA	9.8	15
Datasets available: 2005						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.10	0.05	0.14	0.12	8
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.680	0.769				

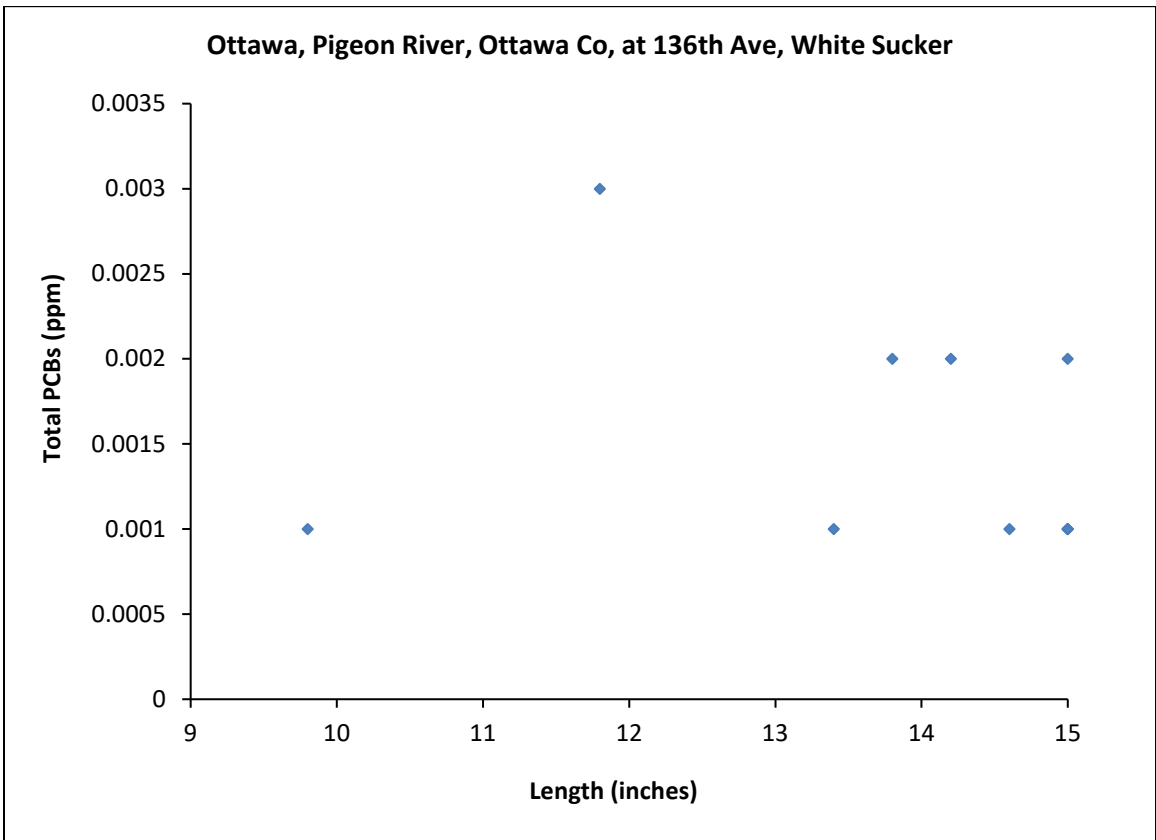
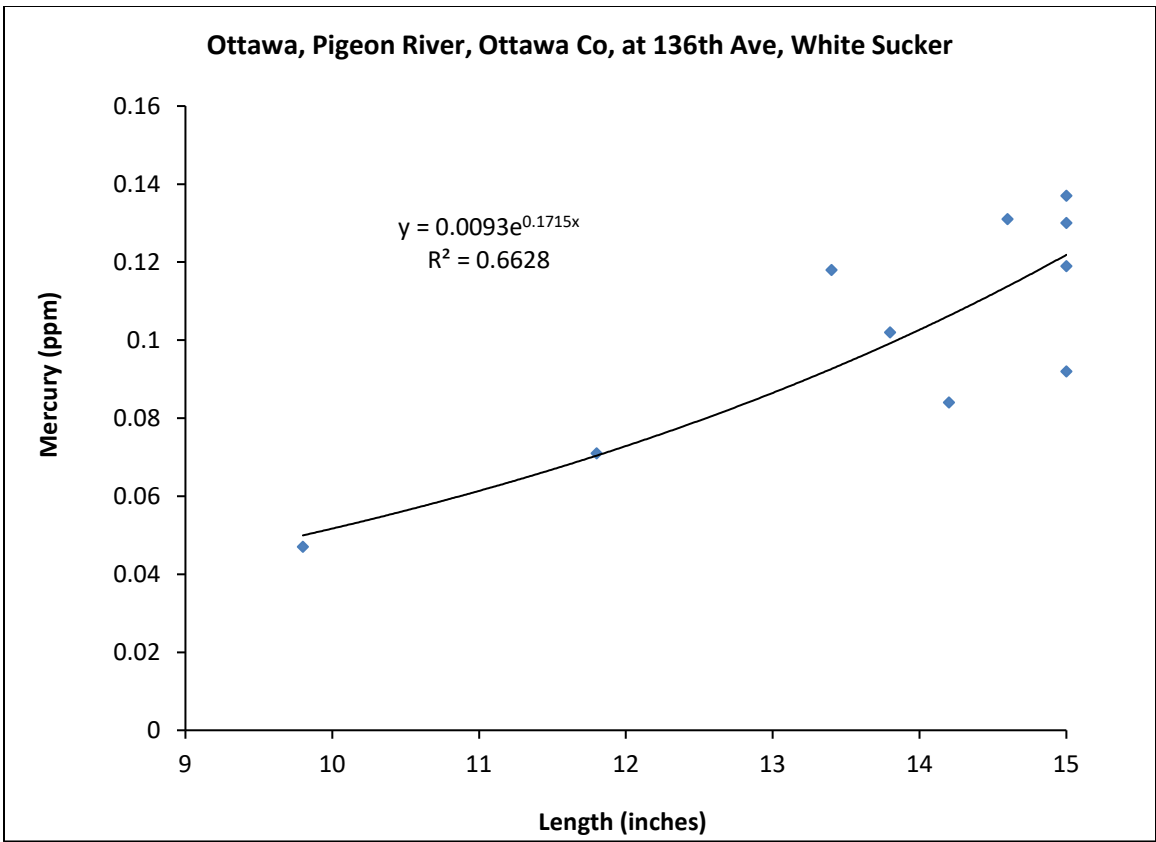
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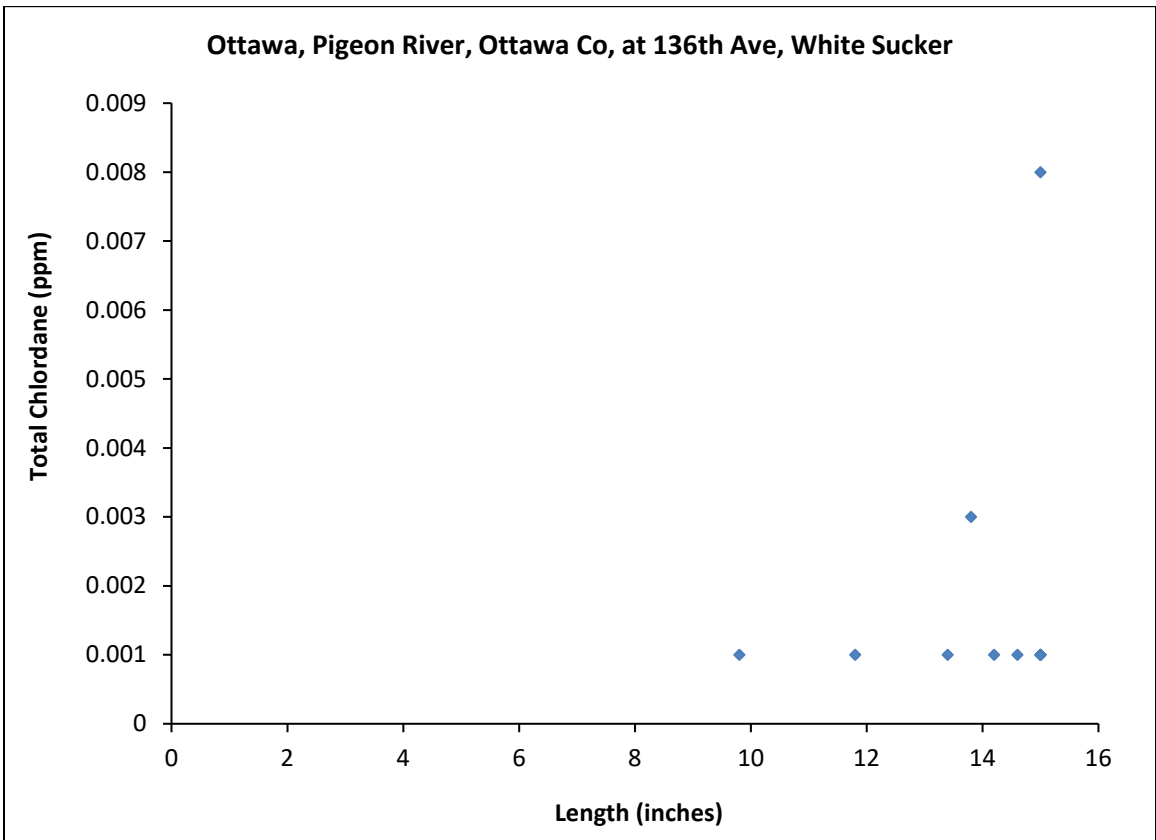
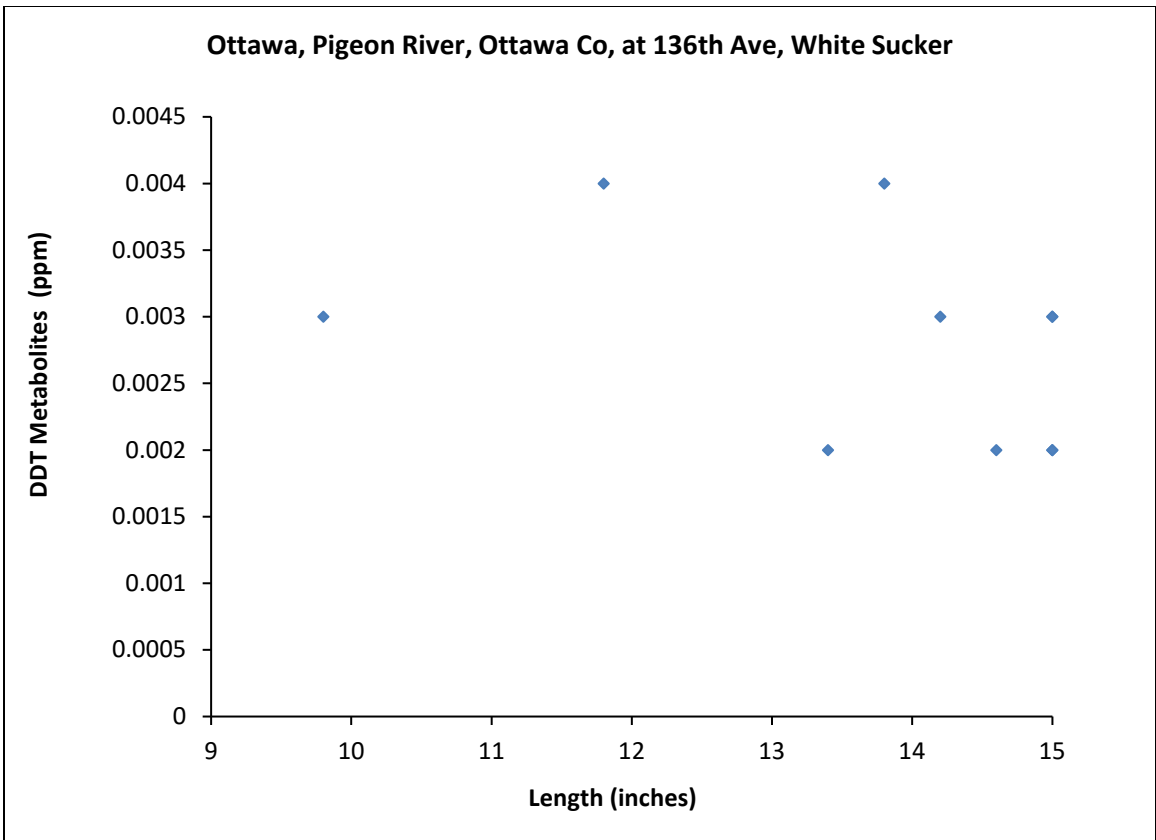
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2005	2005	10	9.8	NA	9.8	15
Datasets available: 2005						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.002	0.001	0.003	0.003	16
DDT	10	0.003	0.002	0.004	0.003	16
Chlordane	10	0.002	0.001	0.008	0.003	--
Toxaphene	10	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.040	0.021				
DDT	0.159	0.161				
Chlordane	0.064	0.057				
Toxaphene	--	--				
Final meal category based on UCL:						8

Existing Advisory: Women and children should not eat more than one meal per week of Pigeon River white sucker due to PCBs.

Recommendation: No one should eat more than 8 meals per month of Pigeon River sucker under 15 inches or more than 4 meals per month over 15 inches due to mercury. Length break based on upper end of the linear regression. Guideline for over 15 inches set to one meal category more protective.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
10	0.052	16
12	0.073	12
14	0.103	8
15	0.122	8
16	0.145	4
17	0.172	4
18	0.204	4
19	0.242	4
20	0.287	2
<i>Shaded area denotes extrapolated estimates</i>		





Pine River

Gratiot, Midland, and Montcalm Counties

Brown Trout

**Pine River
Upstream of Alma Impoundment**

**Gratiot &
Montcalm Counties**

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1986	1986	4	7.7	10	9.8	9.8
Datasets available: 1986						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	1	0.12	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.016	0.016				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1986	1986	4	7.7	10	9.8	9.8
Datasets available: 1986						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	1	0.16				
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.011	0.044				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						--

Existing Advisory: Currently there are no consumption advisories for fish taken from the Pine River upstream of the Alma Impoundment.

Recommendation: Dataset is insufficient for determining a guideline.

Carp

Pine River

**Gratiot & Montcalm
Counties**

Alma Impoundment

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent				Min	Max	
1995	2015	30	20.9	na	20.9	34.8	
Datasets available: 1995, 2010, 2015							
Chemical	Sample Size (Legal)	Mean (ppm)		Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	30	0.16		0.08	0.27	0.18	4
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
Mercury	0.251	0.277					

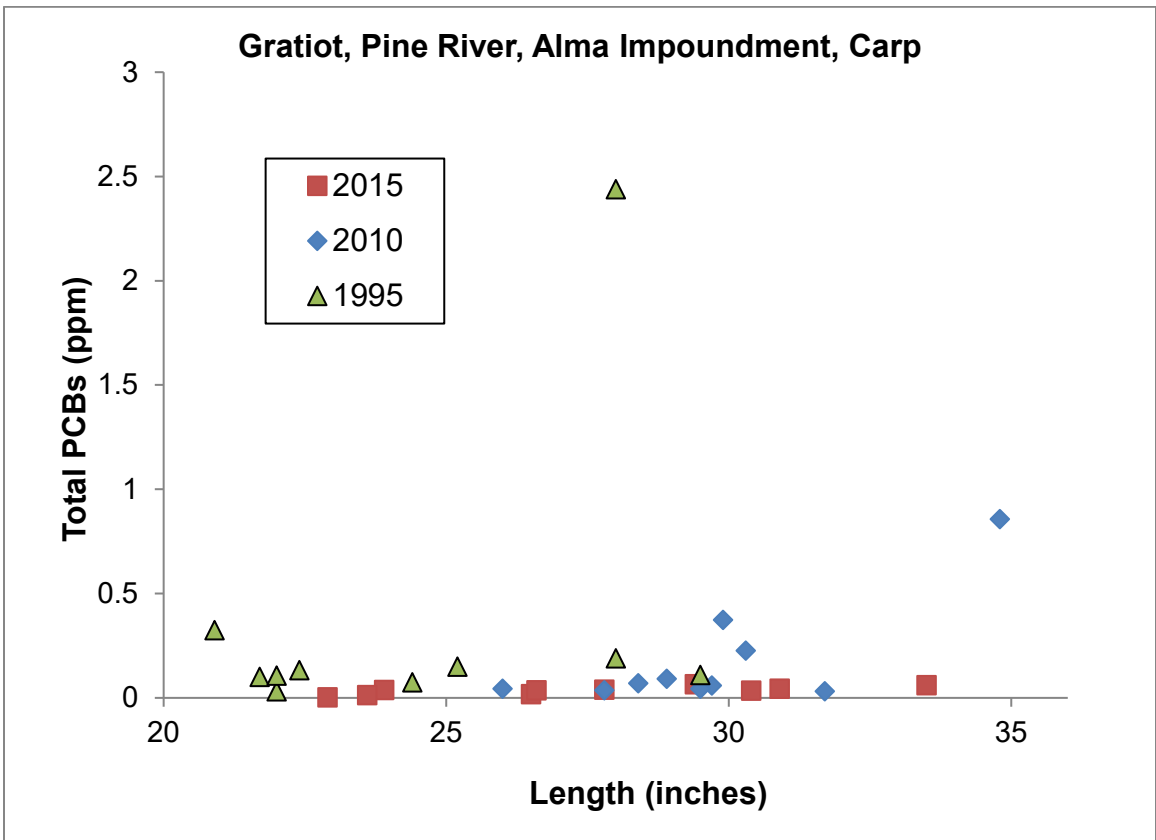
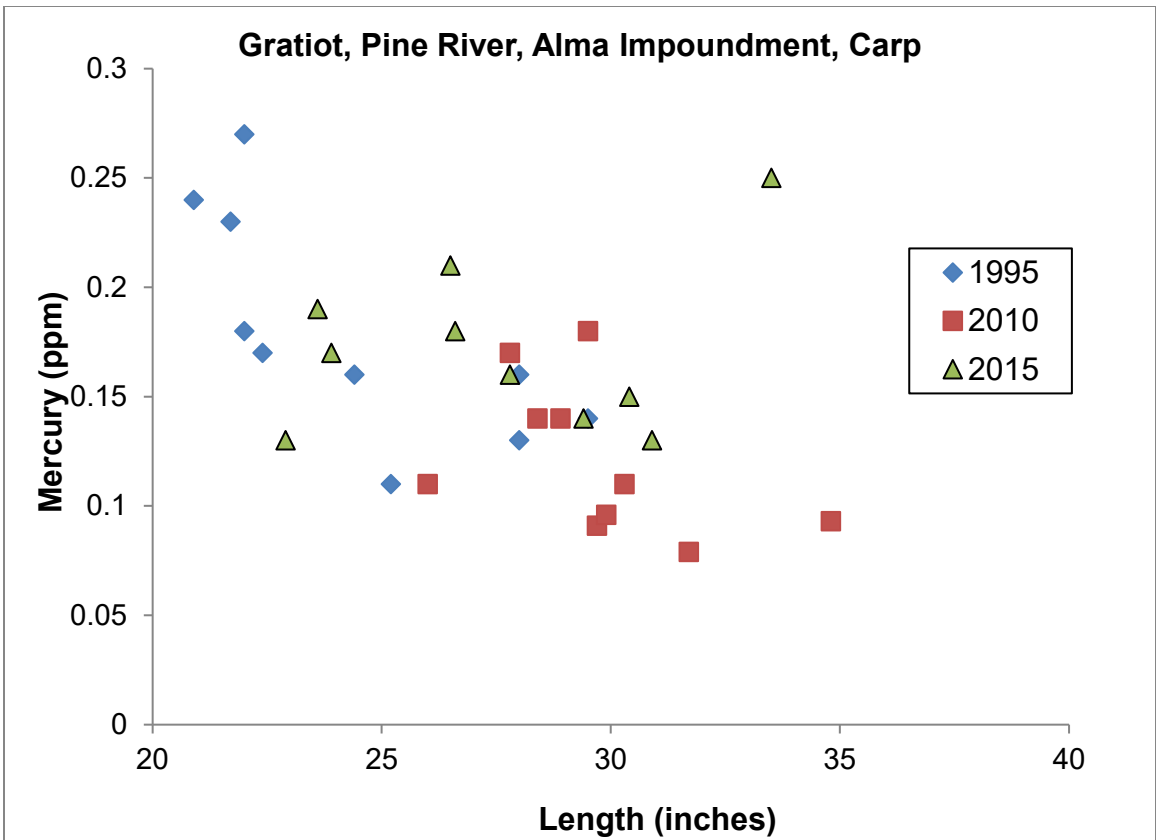
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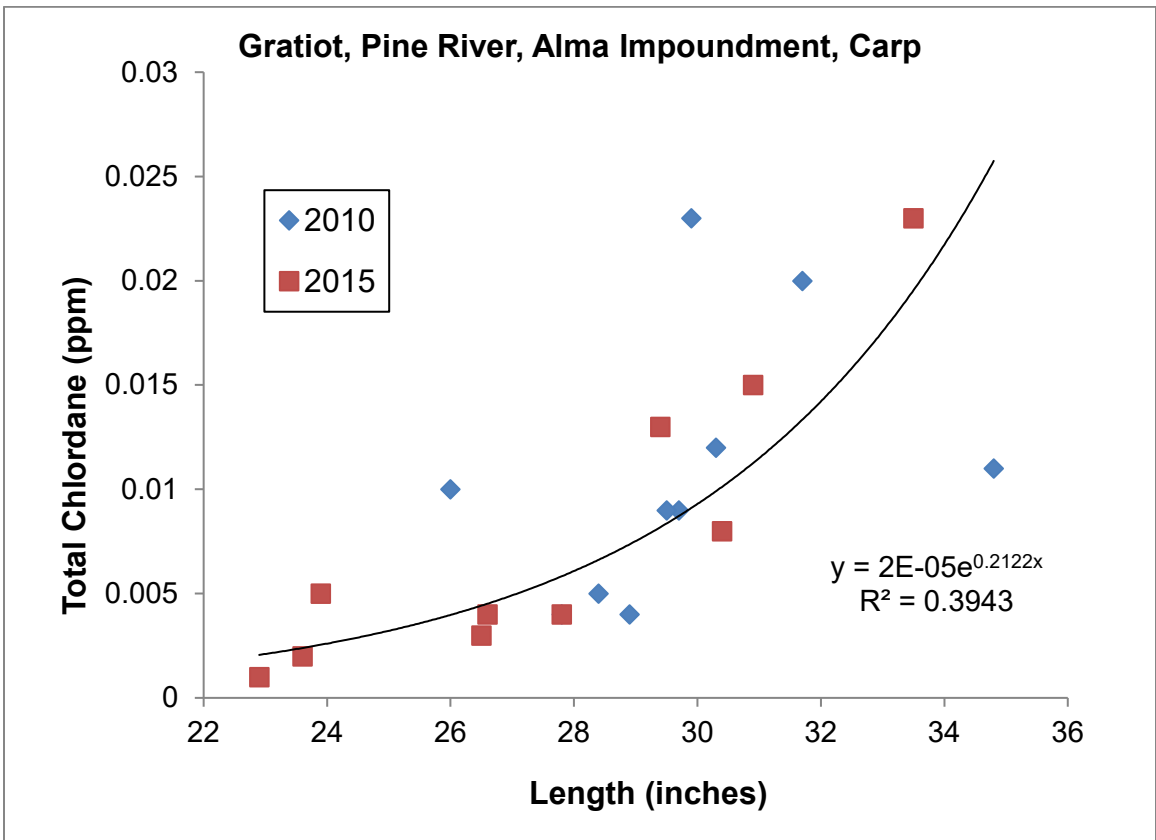
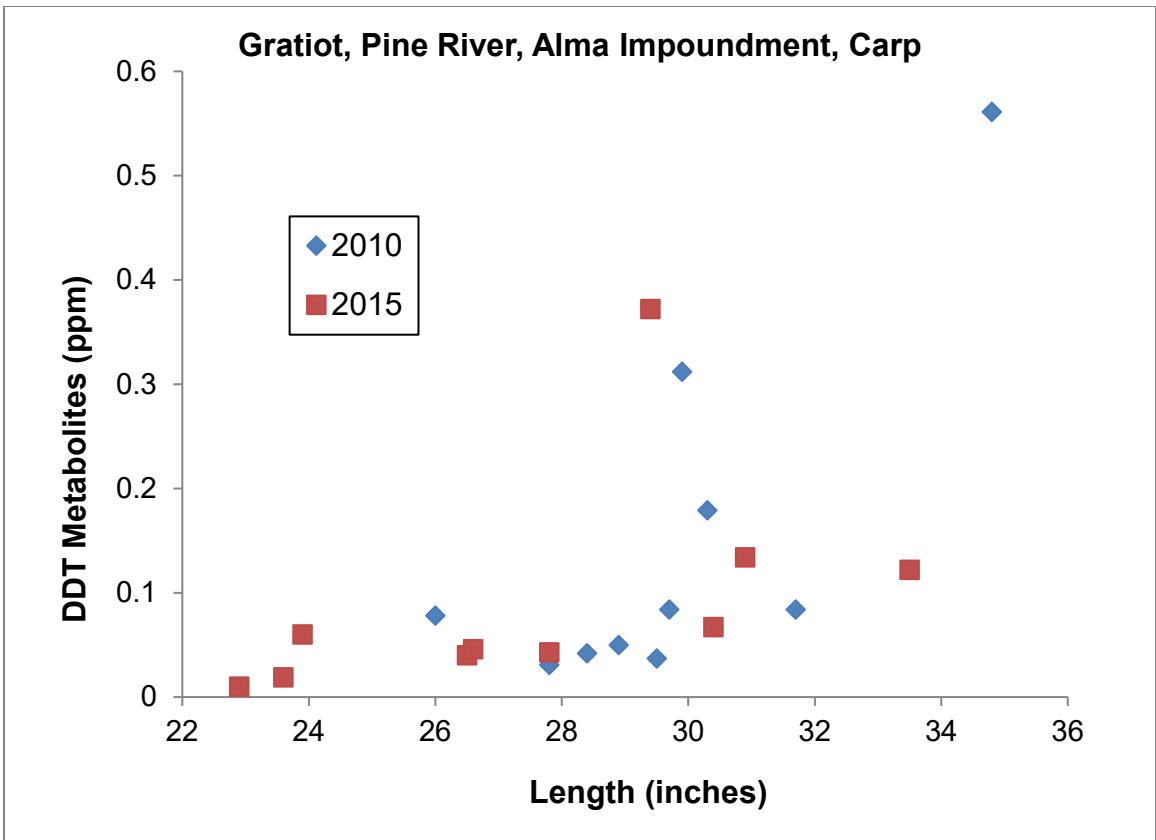
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent				Min	Max	
2010	2015	20	22.9	na	22.9	34.8	
Datasets available: 1995, 2010, 2015							
Chemical	Sample Size (Legal)	Mean (ppm)		Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	20	0.11		0.004	0.86	0.20	1
DDT	20	0.12		0.01	0.56	0.18	8
Chlordane	20	0.009		0.001	0.02	0.01	--
Toxaphene	20	ND		--	--	--	--
PBB	20	ND		--	--	--	--
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
PCB	0.300	0.502					
DDT	0.358	0.542					
Chlordane	0.496	0.627					
Toxaphene	--	--					
PBB	--	--					
TEQ	--	--					
Final meal category based on UCL:							1

Existing MDHHS Advisory: No one should eat more than 6 meals per year of carp from the Pine River upstream of the Alma Dam due to PCBs.

Recommendation: No change is recommended. An additional year of data is needed to relax the advisory. Mercury and DDT would also cause advisories.

Note: PCB data from 1995 was not included in the table but was presented in the graph to show the past variability.





Channel Catfish

Pine River

**Gratiot & Montcalm
Counties**

Alma Impoundment

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2015	2015	5	22.8	12	22.8	28.1
Datasets available: 2015						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	5	0.32	0.13	0.63	0.56	1
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.812	0.893				

Organics Analysis:

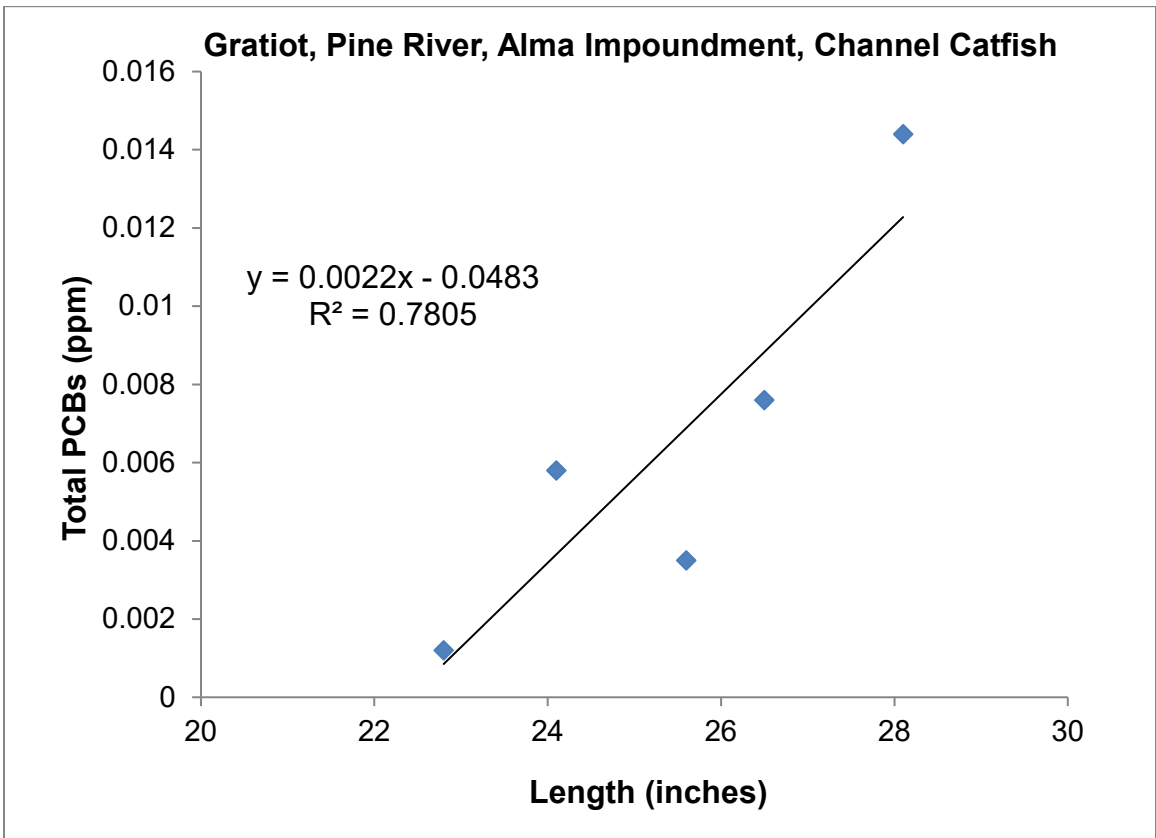
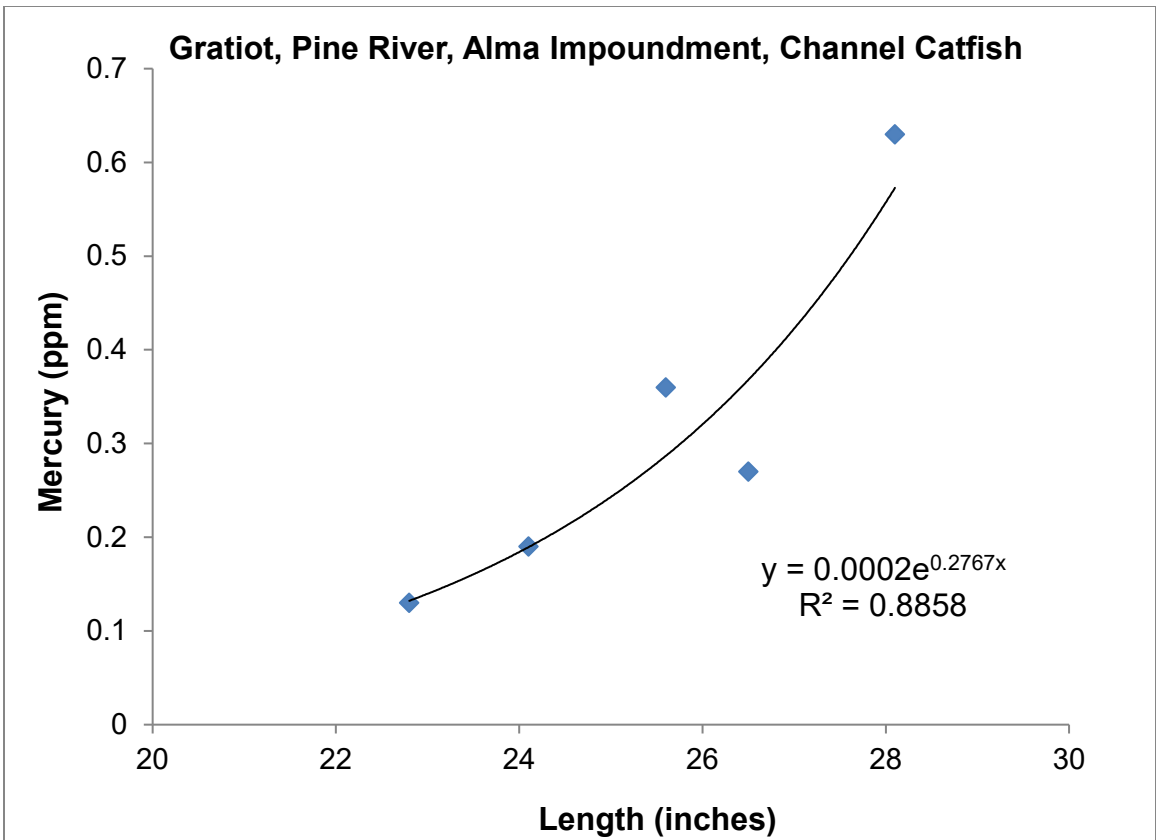
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2015	2015	5	22.8	12	22.8	28.1
Datasets available: 2015						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	5	0.007	0.001	0.014	0.013	12
DDT	5	0.015	0.005	0.03	0.03	16
Chlordane	5	0.002	0.001	0.004	0.003	--
Toxaphene	5	ND	--	--	--	--
PBB	5	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.780	0.775				
DDT	0.708	0.671				
Chlordane	0.391	0.300				
PBB	--	--				
TEQ	--	--				
Final meal category based on UCL:						1

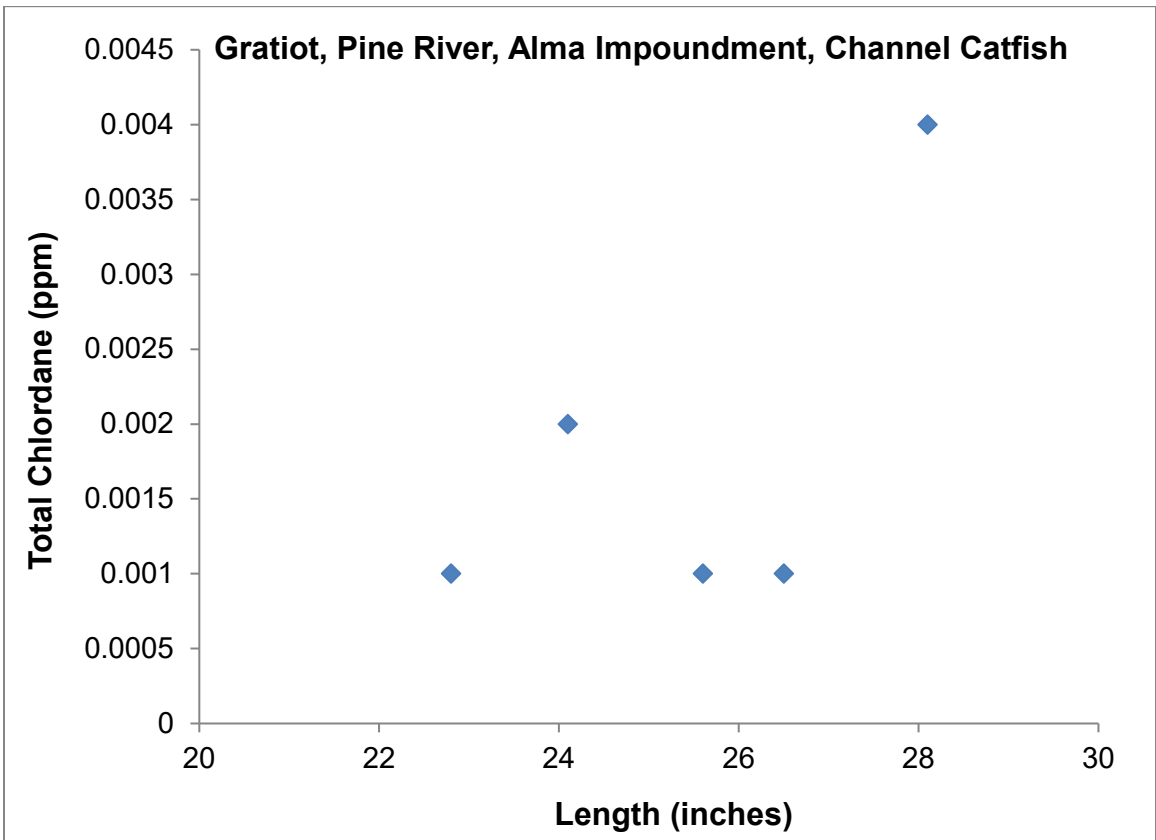
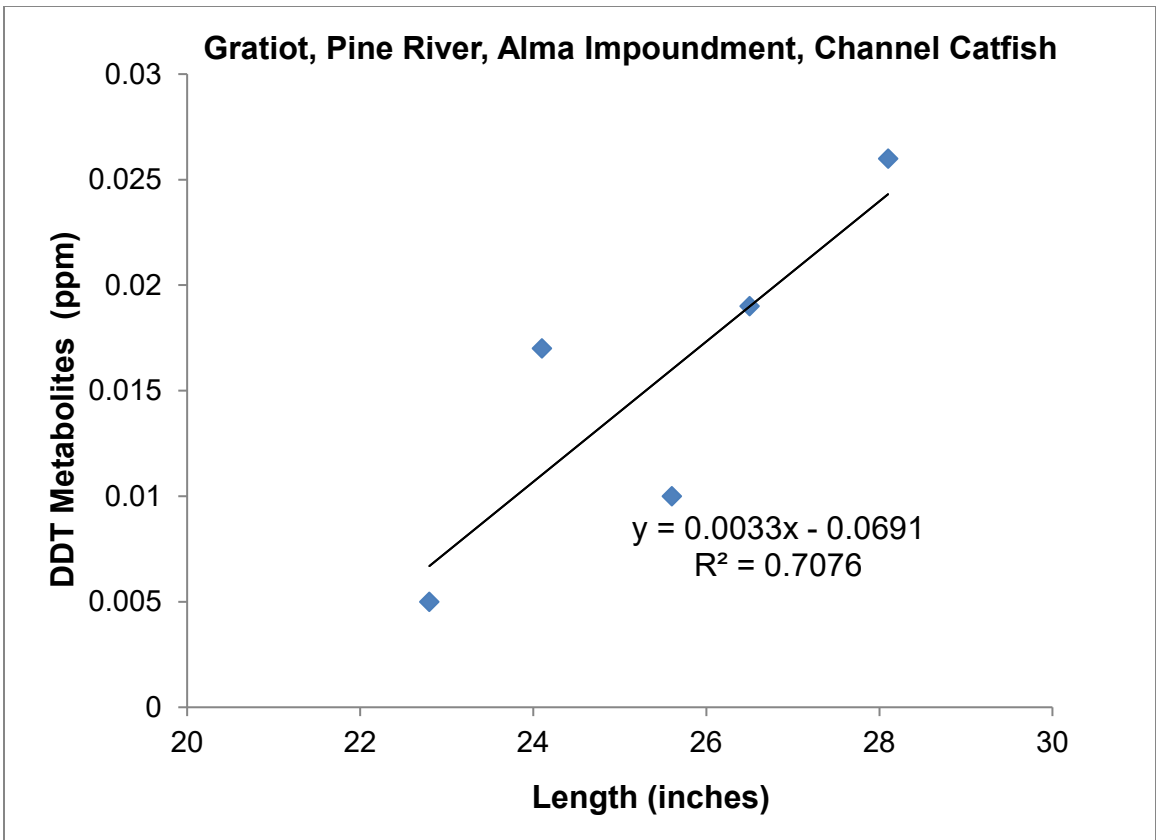
Existing MDHHS Advisory: Pine River, Alma Impoundment channel catfish are covered by the statewide advisory; no one should eat more than 4 meals per month due to mercury and PCBs.

Recommendation: No one should eat more than 4 meals per month of channel catfish from the Pine River upstream of the Alma Dam smaller than 26 inches or more than 2 meals per month of those fish larger than 26 inches due to mercury. PCBs would cause an advisory.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category	PCB Regression Equation Estimate (ppm)	Meal Category
14	0.01	16	-0.018	16
16	0.02	16	-0.013	16
18	0.03	16	-0.009	16
20	0.05	16	-0.004	16
22	0.09	12	0	16
24	0.15	4	0.005	16
26	0.27	4	0.009	16
28	0.46	2	0.013	12
30	0.81	1	0.018	12

Shaded area denotes extrapolated estimates





**Largemouth and
Smallmouth Bass**

**Pine River
Upstream of Alma Impoundment**

**Gratiot & Montcalm
Counties**

Hg Analysis:

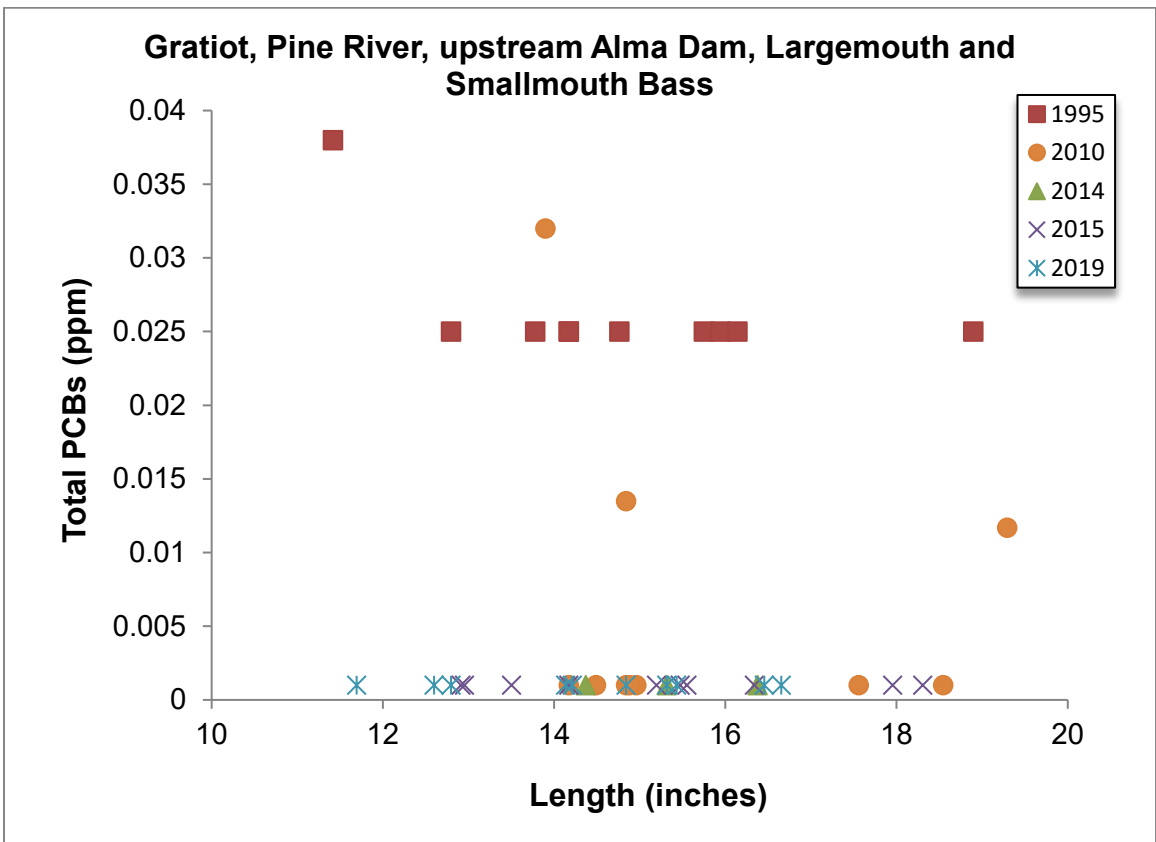
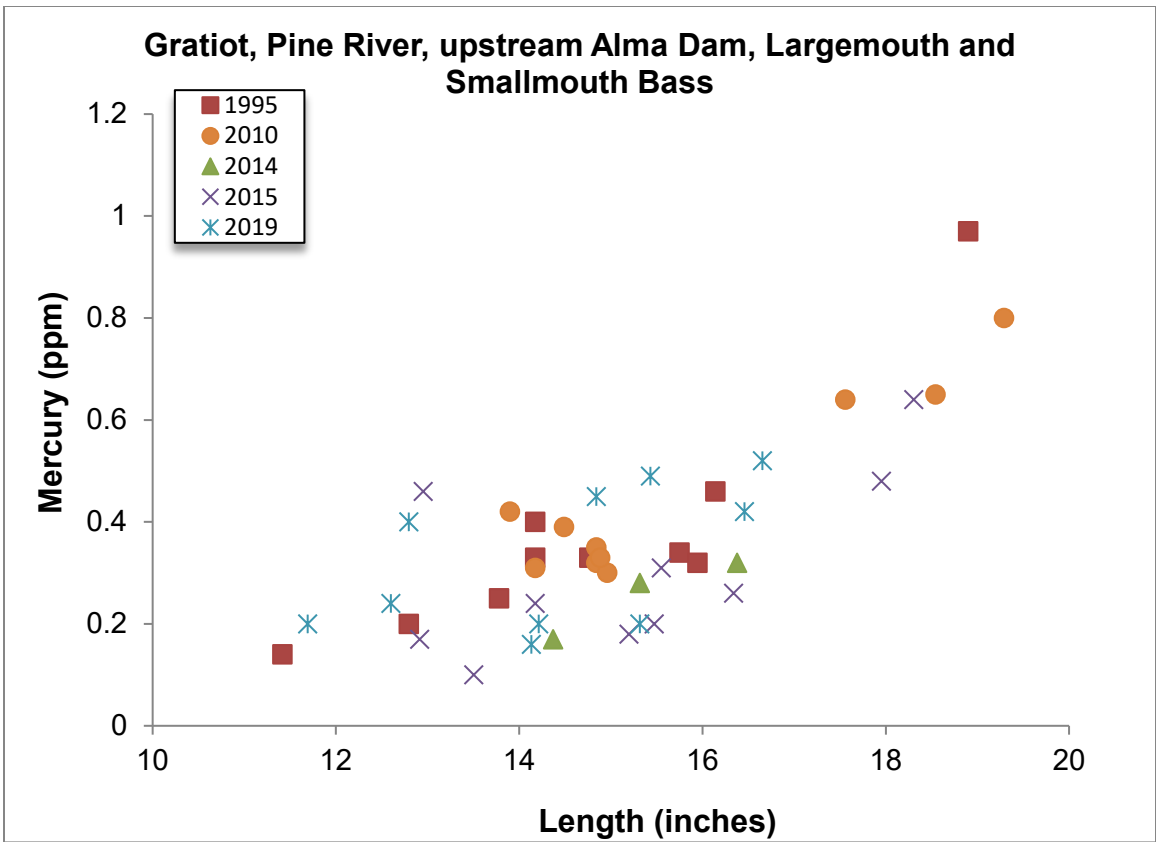
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent					
1995	2019	43	11.4	14.0	13.5	19.3
Datasets available: 1995, 2010, 2014, 2015, 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	30	0.362	0.100	0.800	0.424	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.561	0.498				

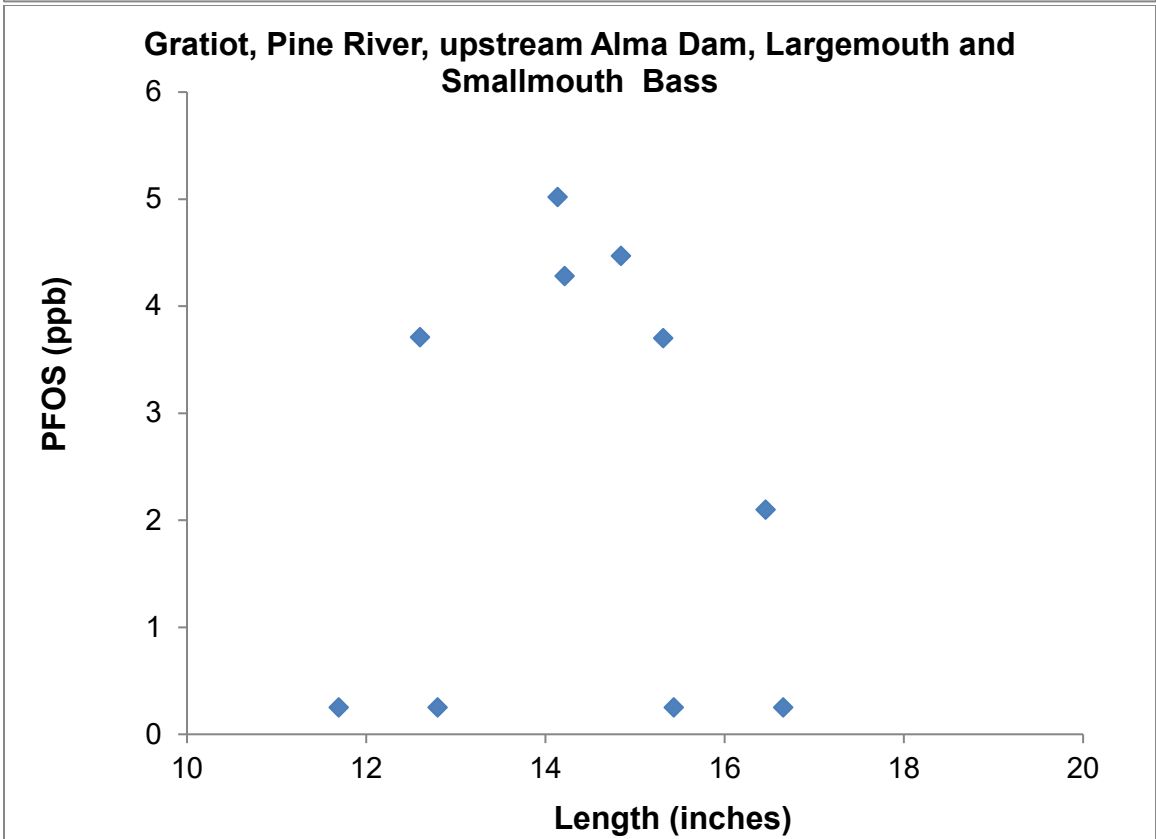
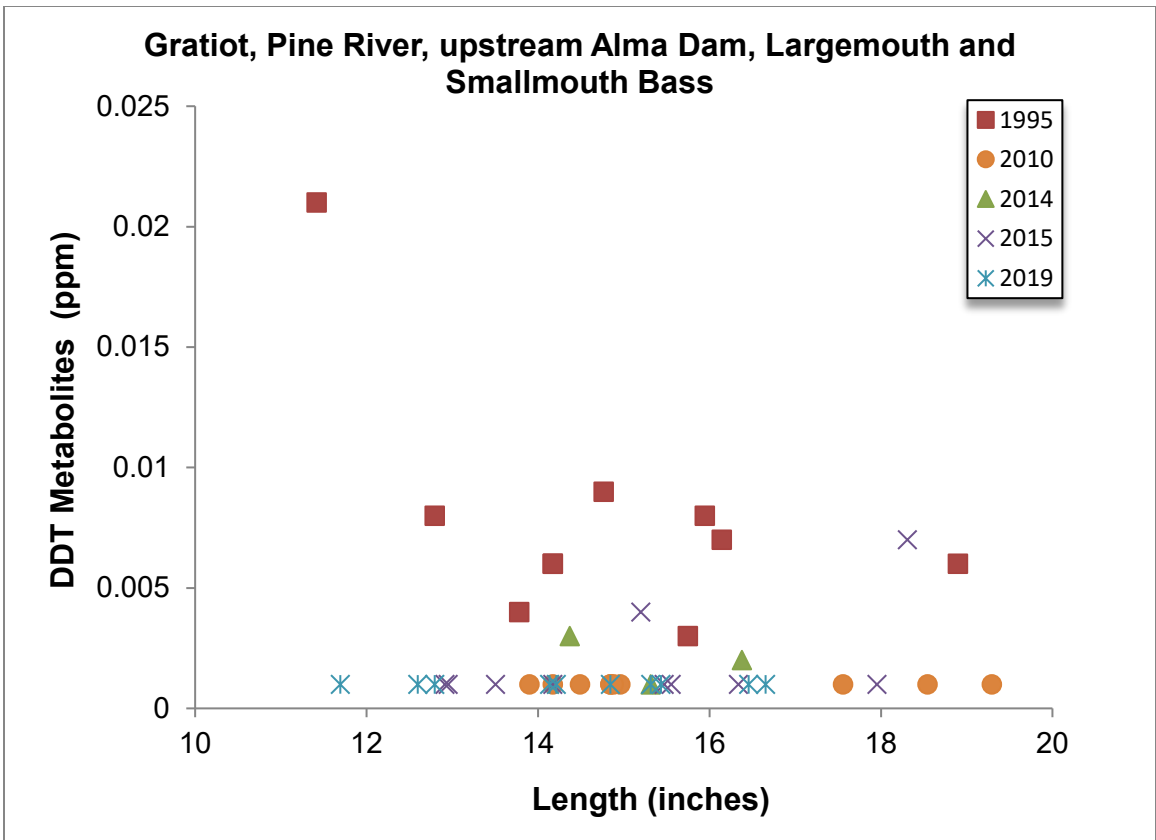
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent					
1995	2019	43	11.4	14.0	13.5	19.3
Datasets available: 1995 (No PFOS), 2010 (No PFOS), 2014 (No PFOS), 2015 (No PFOS), 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	30	0.004	< 0.001	0.032	0.008	16
DDT	30	0.002	< 0.001	0.007	0.002	16
Chlordane	30	ND	--	--	--	--
Toxaphene	30	ND	--	--	--	--
PFOS	7	2.9 ppb	<0.25 ppb	5.0 ppb	4.7 ppb	16
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.015	0.002				
DDT	0.031	0.002				
Chlordane	NA	NA				
Toxaphene	NA	NA				
PFOS	0.000	0.007				
Final meal category based on UCL:						2

Existing MDHHS Advisory: No one should eat more than 2 meals per month of largemouth or smallmouth bass smaller than 17 inches or no more than 1 meal per month of largemouth or smallmouth bass larger than 17 inches from the Pine River upstream of the Alma dam due to mercury.

Recommendation: No change to the advisory due to mercury is recommended. While the regression is no longer significant, no change is recommended until additional samples are evaluated for fish larger than 17 inches. PCBs no longer cause an advisory.





Northern Pike

**Pine River
Alma Impoundment**

Gratiot, Montcalm Counties

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2014	2014	5	20.9	24	25.4	26.5
Datasets available: 2014						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	3	0.25	0.23	0.26	0.28	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.897	0.904				

Organics Analysis:

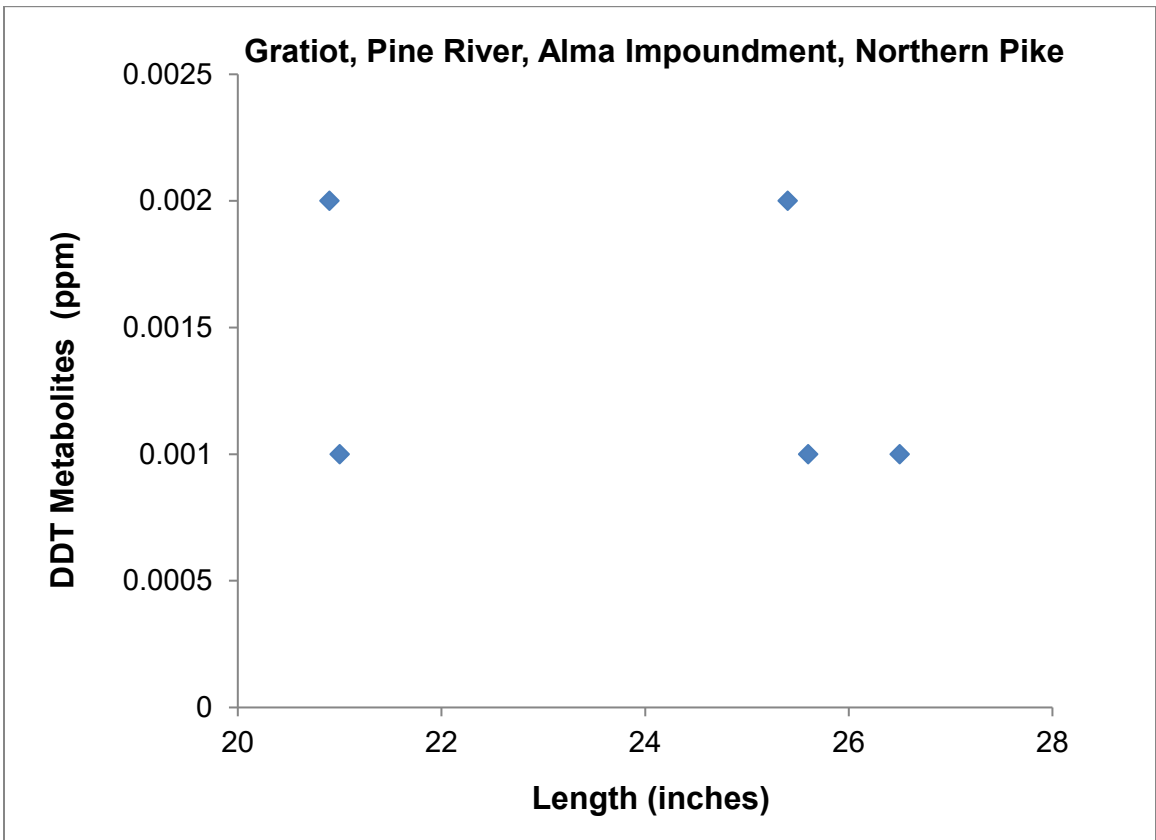
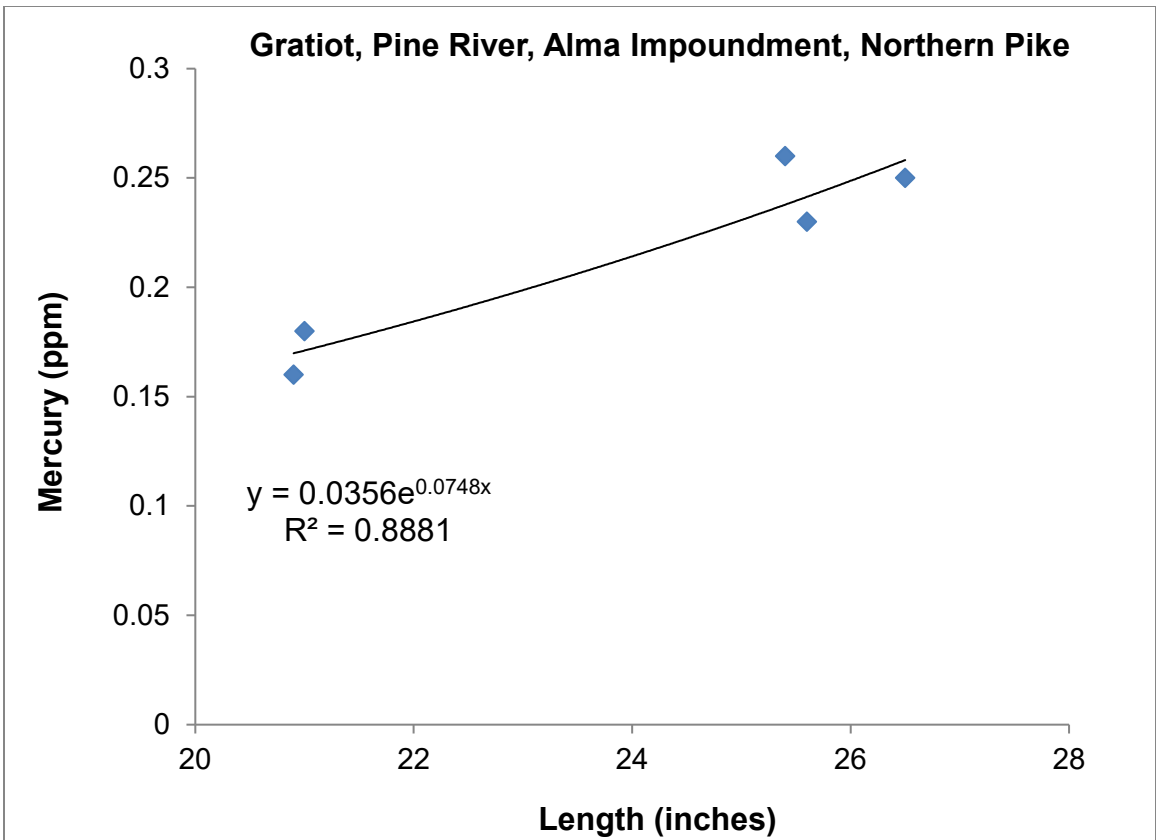
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2014	2014	5	20.9	24	25.4	26.5
Datasets available: 2014						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	3	ND	--	--	--	--
DDT	3	0.001	0.001	0.002	--	--
Chlordane	3	ND	--	--	--	--
Toxaphene	3	ND	--	--	--	--
PBB	3	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	0.061	0.061				
Chlordane	--	--				
Toxaphene	--	--				
PBB	--	--				
TEQ	--	--				
Final meal category based on UCL:						--

Existing MDHHS Advisory: Northern pike from the Pine River upstream of the Alma Dam, including the Alma Impoundment, are covered by the statewide advisory. No one should eat more than 2 meals per month of northern pike less than 30 inches or more than 1 meal per month of northern pike larger than 30 inches due to mercury.

Recommendation: No change is recommended. MDHHS requires a minimum of five legal size fish samples to evaluate the need for waterbody specific fish consumption advisories.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
22	0.18	4
24	0.21	4
25	0.23	4
26	0.25	4
27	0.27	4
28	0.29	2
30	0.34	2
32	0.39	2

Shaded area denotes extrapolated estimates



Pumpkinseed

**Pine River
Upstream of Alma Impoundment**

**Gratiot & Montcalm
Counties**

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent						
2015	2019	20	5.8	NA	5.8	8.5	
Datasets available: 2015, 2019							
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category	
Mercury	20	0.078	0.037	0.150	0.094	8	
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
Mercury	0.632	0.676					

Organics Analysis:

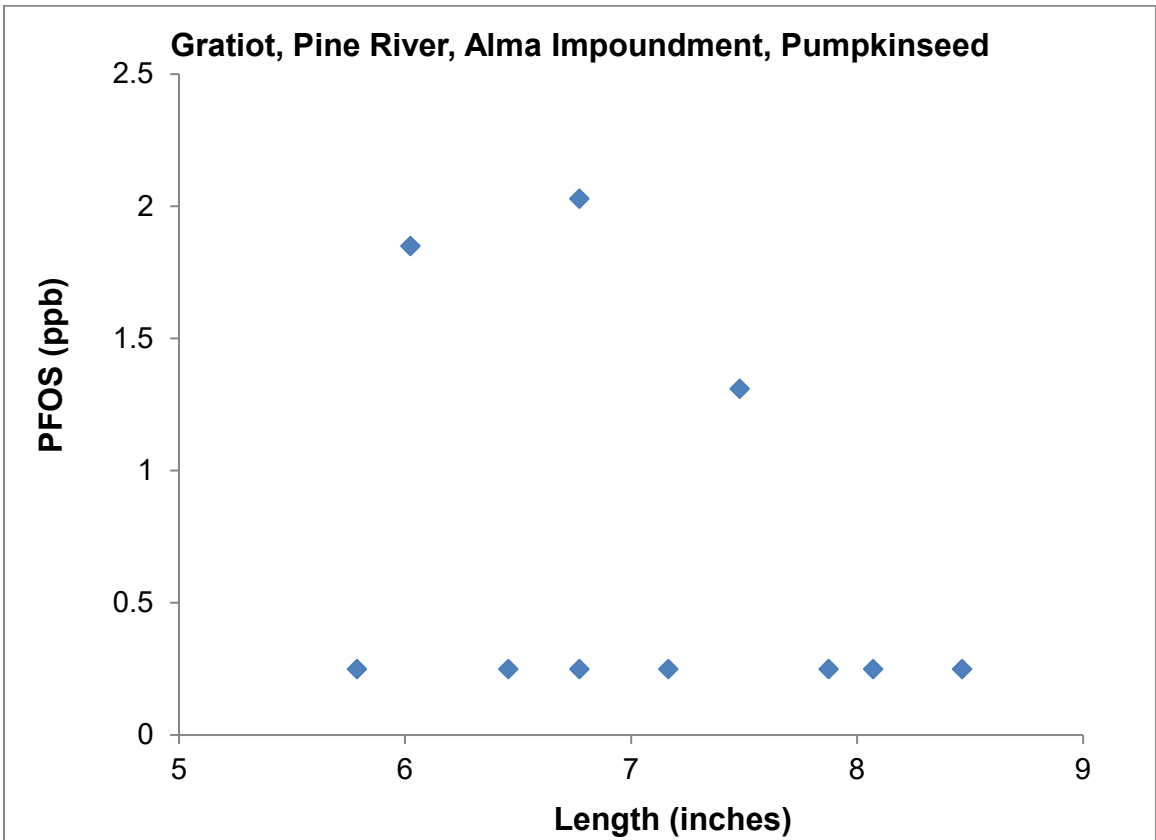
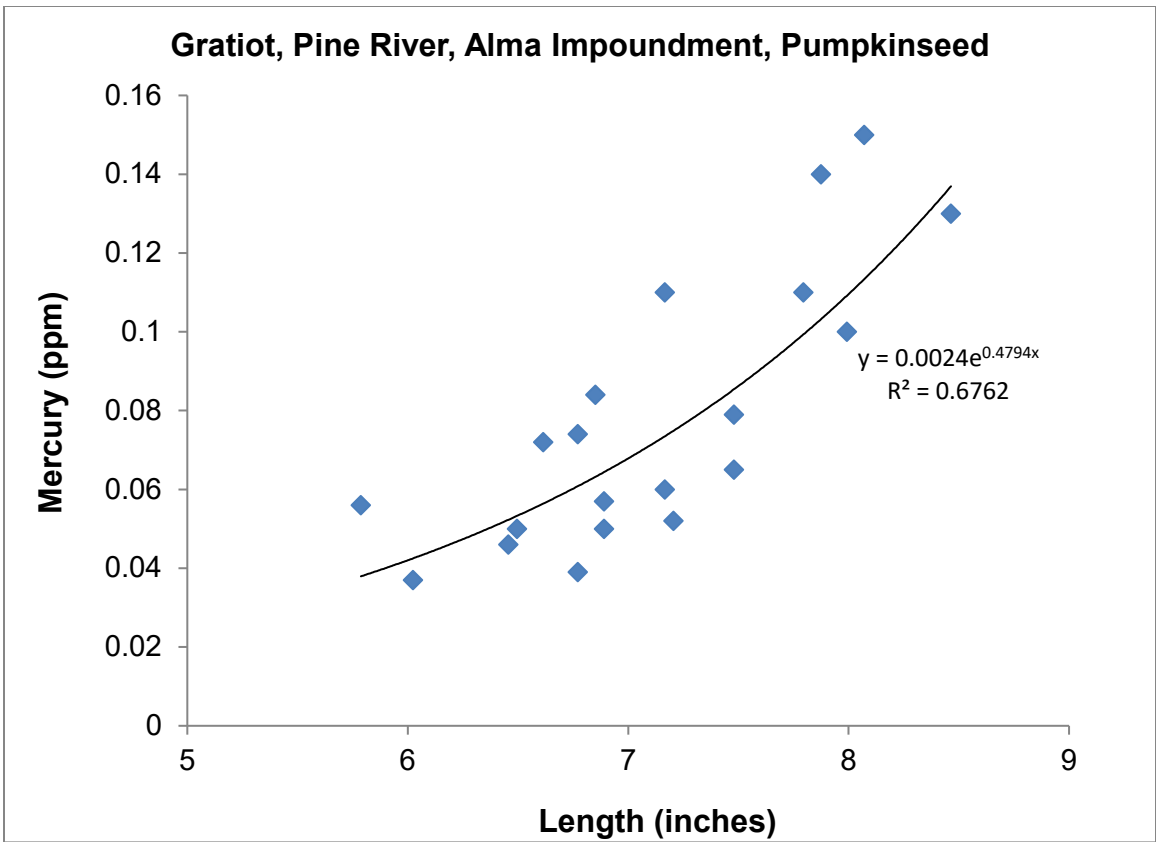
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent						
2015	2019	20	5.8	NA	5.8	8.5	
Datasets available: 2015 (No PFOS), 2019 (Only PFOS)							
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category	
PCB	10	ND	--	--	--	16	
DDT	10	0.001	< 0.001	0.003	0.002	16	
Chlordane	10	ND	--	--	--	--	
Toxaphene	10	ND	--	--	--	--	
PFOS	10	0.7 ppb	<0.25 ppb	2.0 ppb	1.2 ppb	16	
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
PCB	--	--					
DDT	--	--					
Chlordane	--	--					
Toxaphene	--	--					
PFOS	0.099	0.082					
Final meal category based on UCL:						8	

Existing MDHHS Advisory: No one should eat more than 8 meals per month of bluegill or sunfish of any size from the Pine River upstream of the Alma dam due to mercury.

Recommendation: No change to the advisory is recommended. Length-specific advice was not used due to the limited length of samples in the dataset.

Note: The current recommendation will be re-evaluated in the next release of the Eat Safe Fish Guide.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
5	0.026	16
6	0.043	16
7	0.069	16
8	0.111	8
9	0.179	4
10	0.290	2
<i>Shaded area denotes extrapolated estimates</i>		



Redhorse Sucker

**Pine River
Upstream of Alma Impoundment**

**Gratiot &
Montcalm Counties**

Hg Analysis:

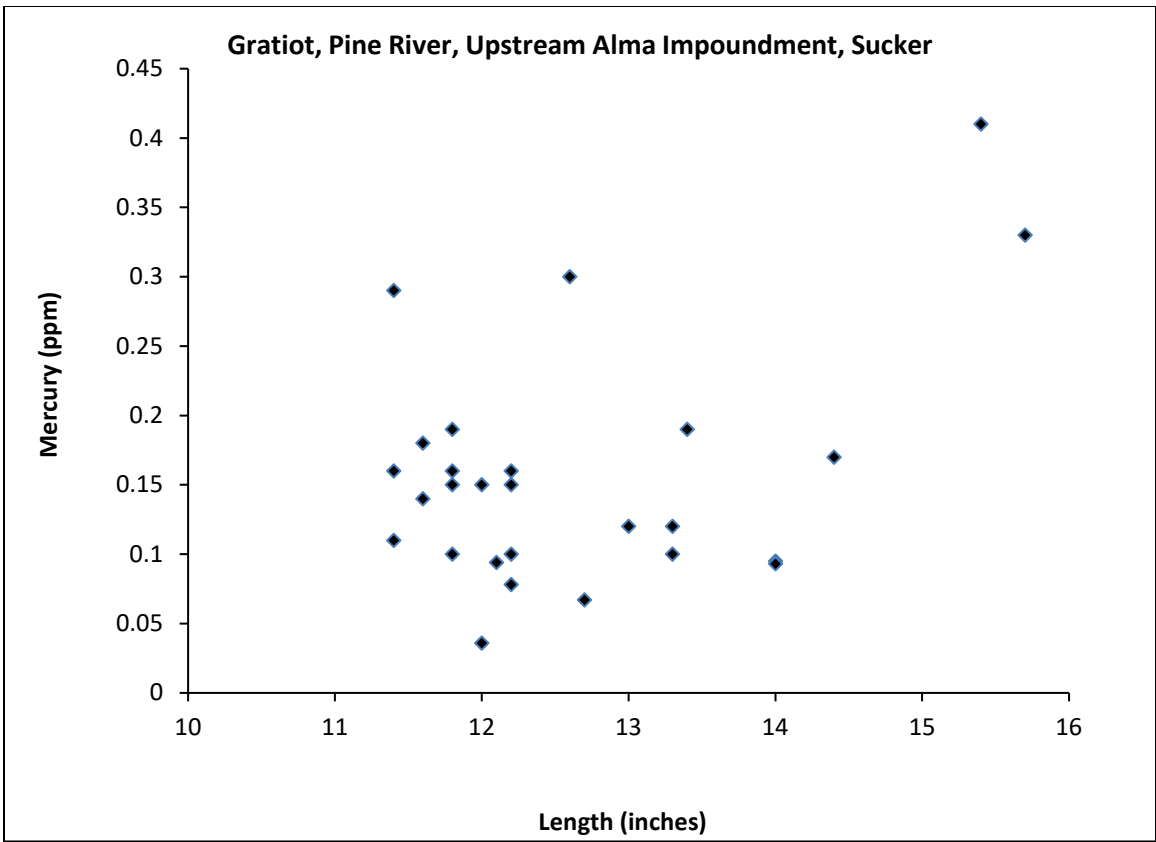
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1986	2010	27	11.4	na	11.4	15.7
Datasets available: 1986, 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	27	0.16	0.04	0.41	0.19	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.173	0.090				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	10	12.0	na	12.0	15.7
Datasets available: 1986, 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	ND	--	--	--	--
DDT	10	ND	--	--	--	--
Chlordane	10	ND	--	--	--	--
Toxaphene	10	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						4

Existing Advisory: Currently there are no consumption advisories for fish taken from the Pine River upstream of the Alma Impoundment.

Recommendation: No one should eat more than 4 meals per month of sucker from the Pine River upstream of the Alma Impoundment due to mercury.



Rock Bass

**Pine River
Upstream of Alma Impoundment**

**Gratiot & Montcalm
Counties**

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent						
1998	2019	30	5.4	NA	5.4	10.6	
Datasets available: 1998, 2015, 2019							
Chemical	Sample Size (Legal)	Mean (ppm)		Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	30	0.151		0.048	0.460	0.191	4
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
Mercury	0.778	0.827					

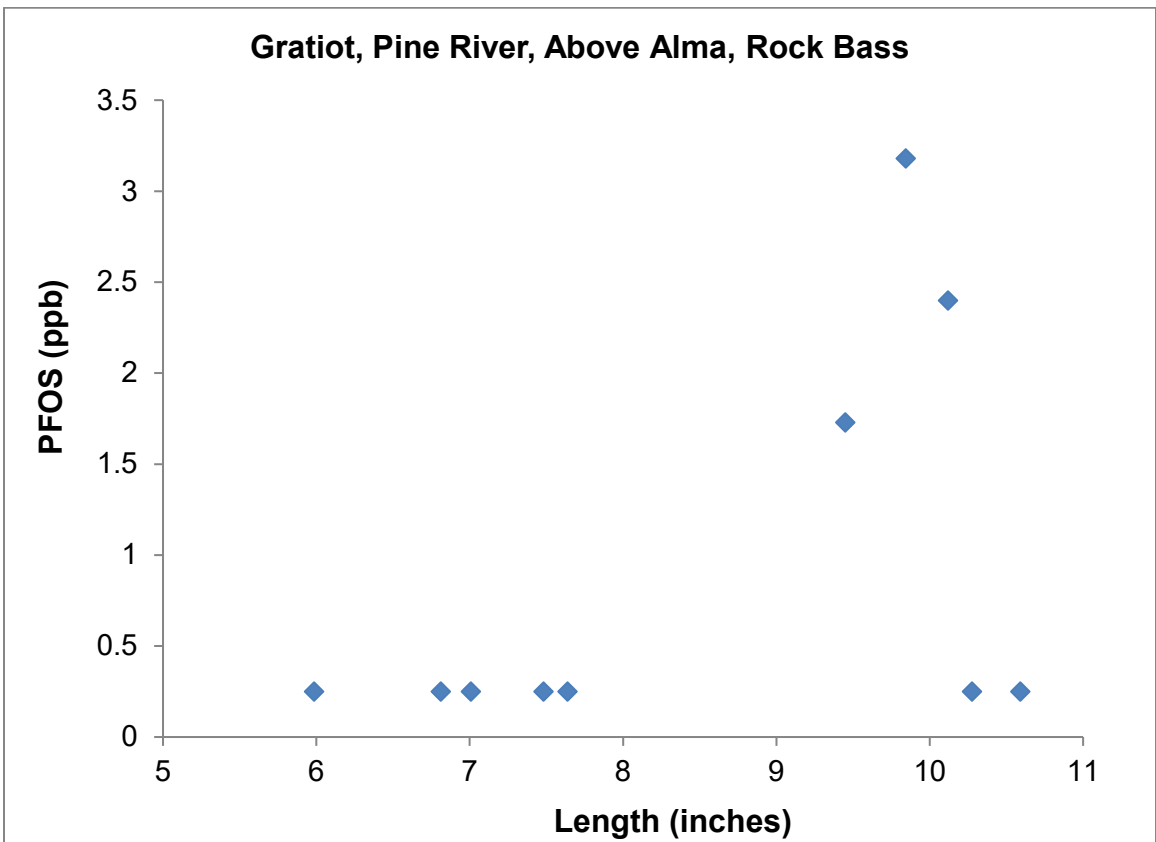
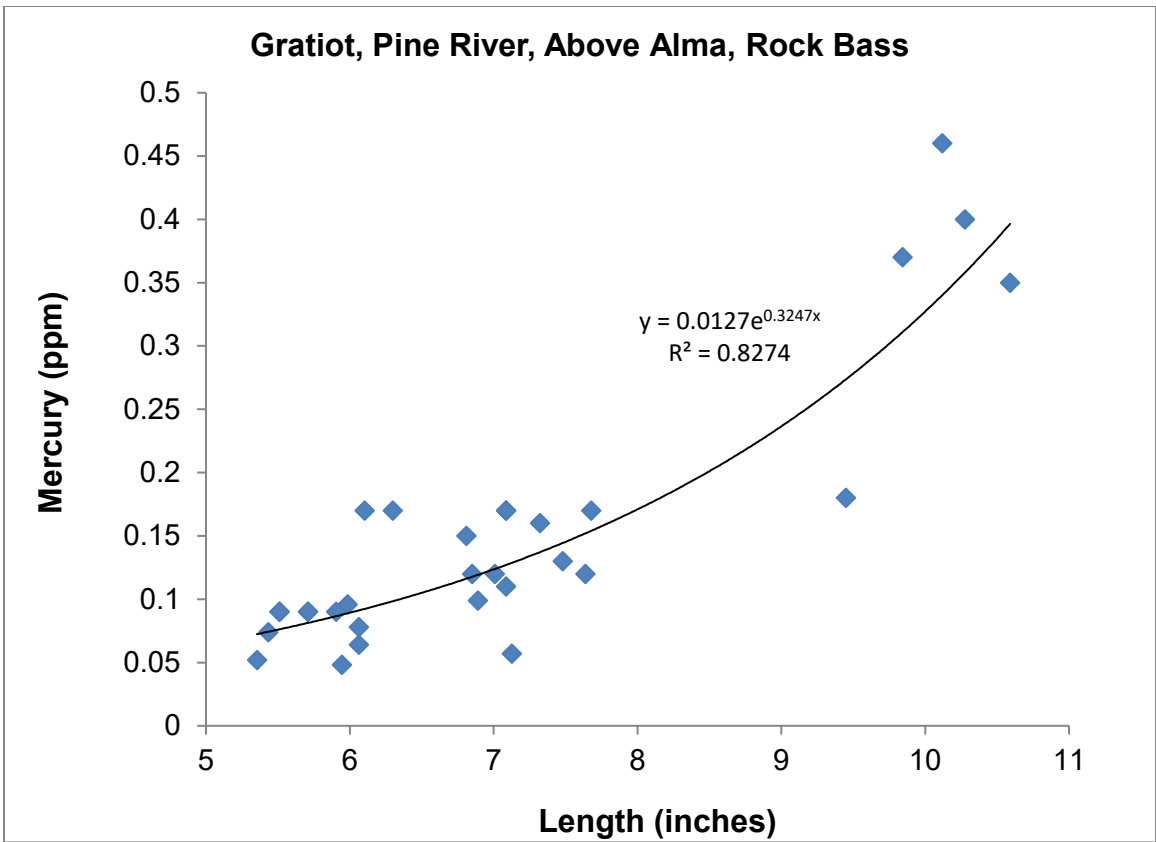
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent						
1998	2019	30	5.4	NA	5.4	10.6	
Datasets available: 1998, 2015, 2019 (Only PFOS)							
Chemical	Sample Size (Legal)	Mean (ppm)		Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	20	0.013		< 0.001	0.025	0.019	12
DDT	20	0.002		< 0.001	0.003	0.003	16
Chlordane	20	ND		--	--	--	--
Toxaphene	20	ND		--	--	--	--
PFOS	10	1.0 ppb		< 0.25 ppb	3.2 ppb	1.7 ppb	16
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
PCB	0.012	0.012					
DDT	0.004	0.002					
Chlordane	NA	NA					
Toxaphene	NA	NA					
PFOS	0.261	0.274					
Final meal category based on UCL:							4

Existing MDHHS Advisory: No one should eat more than 8 meals per month of rock bass of any size from the Pine River upstream of the Alma dam due to mercury.

Recommendation: No one should eat more than 4 meals per month of rock bass smaller than 10 inches or no more than 2 meals per month of rock bass larger than 10 inches from the Pine River upstream of the Alma Dam in Gratiot County due to mercury. PCBs cause a less restrictive advisory.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
6	0.089	12
7	0.123	8
8	0.171	4
9	0.236	4
10	0.327	2
11	0.452	2
<i>Shaded area denotes extrapolated estimates</i>		



Bluegill

**Pine River
St. Louis Impoundment**

Gratiot County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2018	30	5.6	na	5.6	7.7
Datasets available: 2010, 2015, 2018						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	30	0.06	0.03	0.15	0.07	16
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.183	0.141				

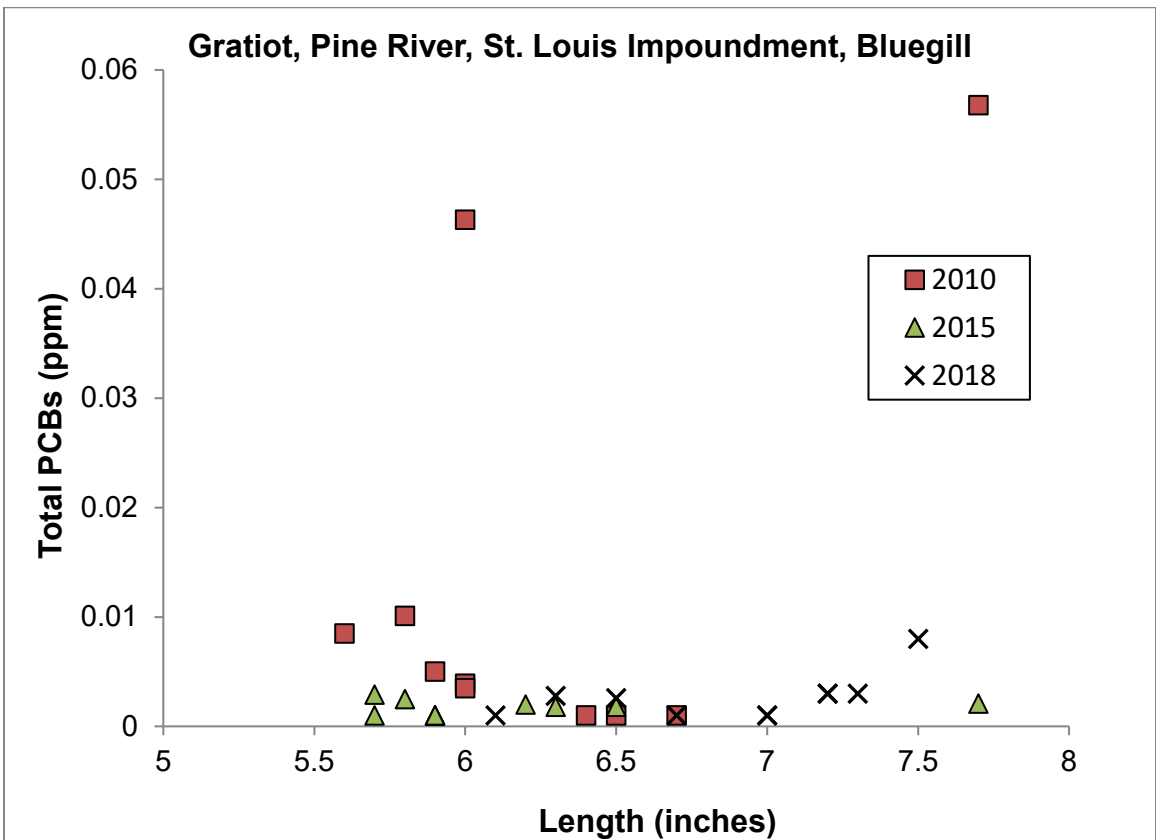
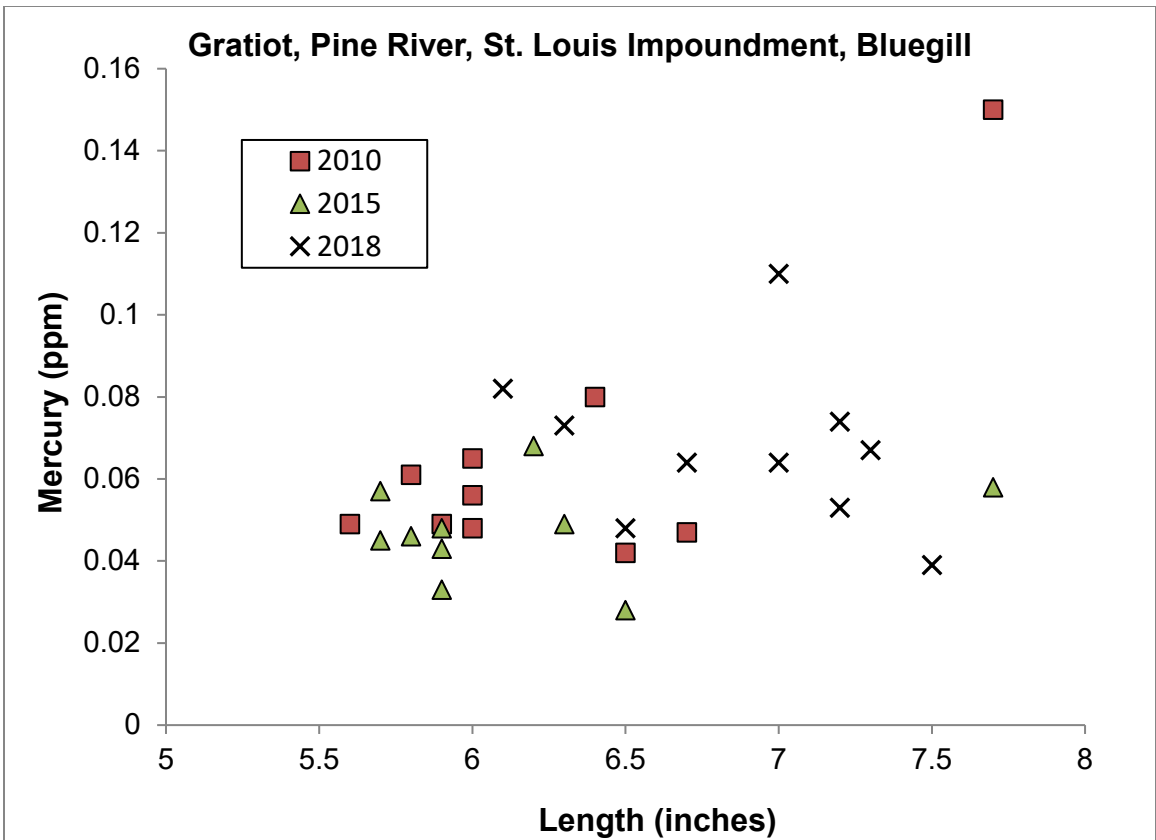
Organics Analysis:

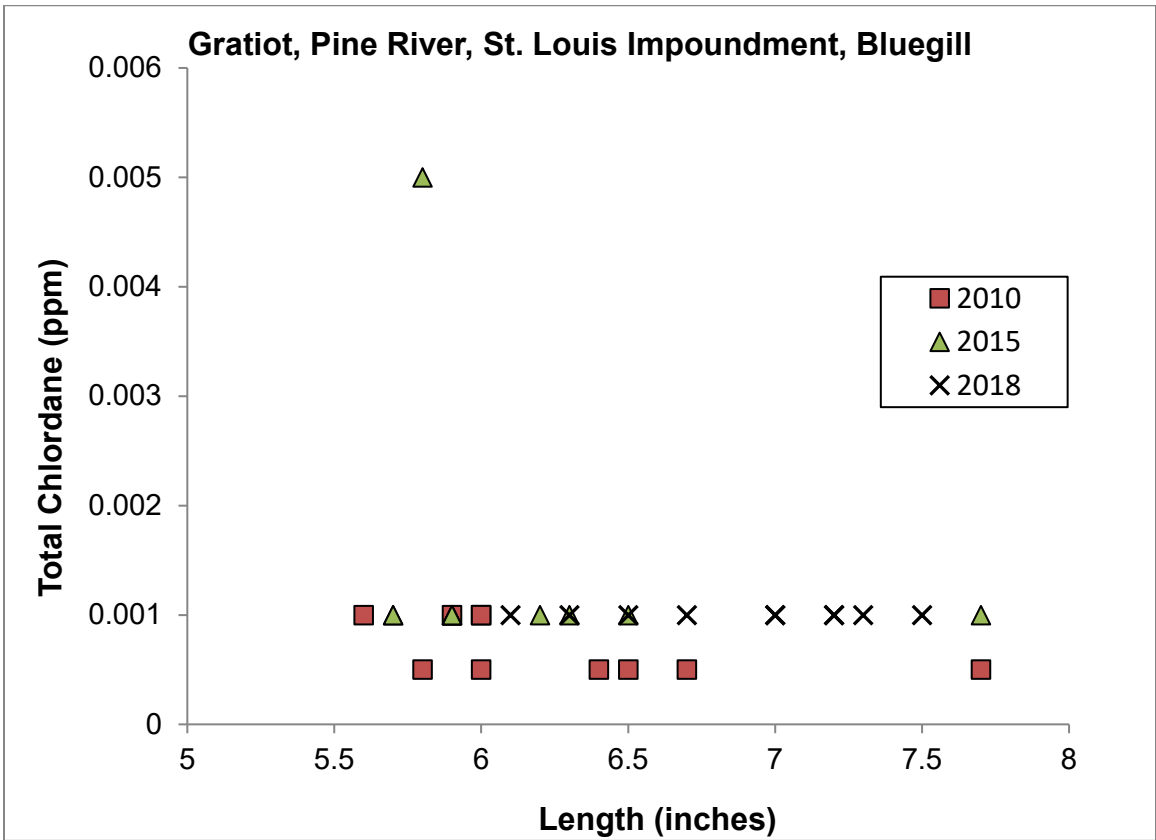
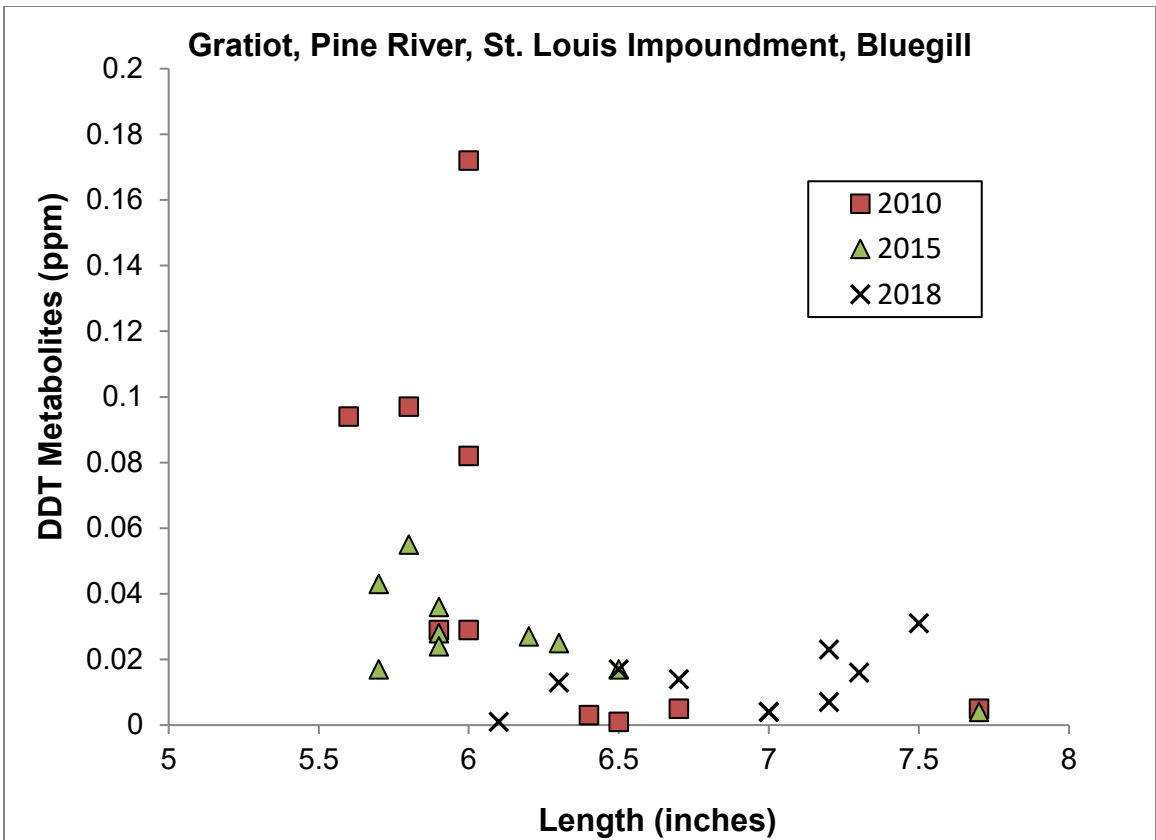
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2018	30	5.6	na	5.6	7.7
Datasets available: 2010, 2015, 2018						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	30	0.006	< 0.001	0.06	0.01	12
DDT	30	0.031	0.001	0.17	0.04	16
Chlordane	30	0.001	< 0.001	0.005	0.001	--
Toxaphene	30	ND	< 0.05	< 0.05	--	--
PFOS	10	2 ppb	< 0.25 ppb	4.6 ppb	3 ppb	16
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.038	0.015				
DDT	0.226	0.244				
Chlordane	0.038	0.031				
Toxaphene	--	--				
PFOS	0.225	0.037				
Final meal category based on UCL:						12

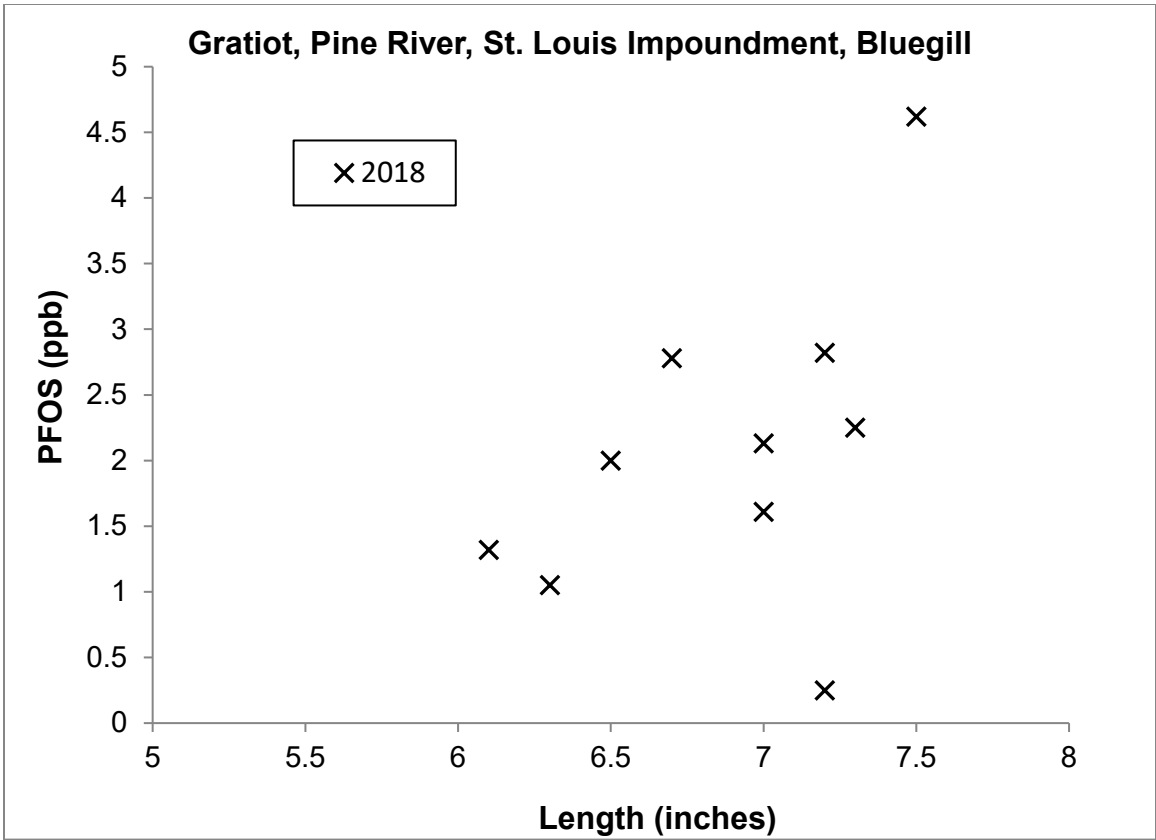
Existing MDHHS Advisory: No one should eat any fish from the St. Louis impoundment of the Pine River due to DDT.

Recommendation: No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. Significant sediment removal operations in the impoundment have been completed and additional remediation within the impoundment is not planned. In-ground remediation continues at the former Velsicol plant site.

PCBs would cause an advisory.







Carp

**Pine River
St. Louis Impoundment**

Gratiot County

Hg Analysis:

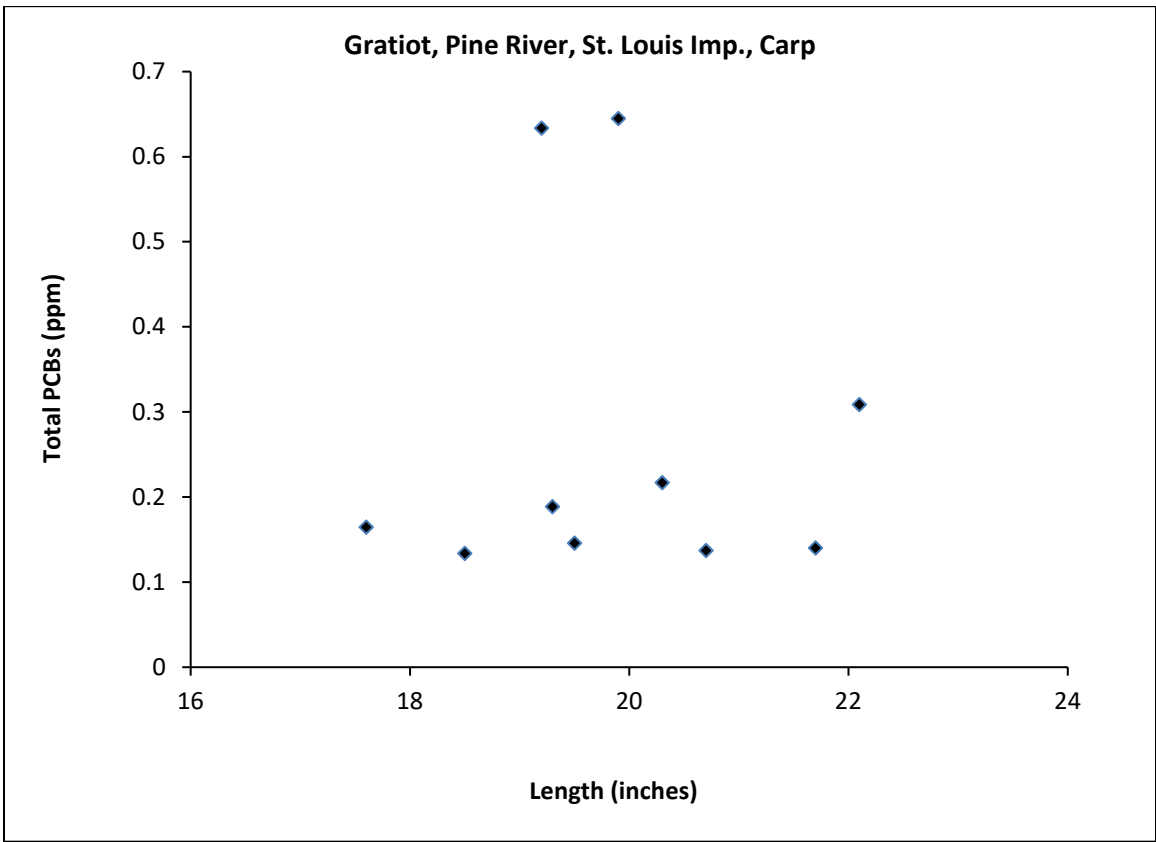
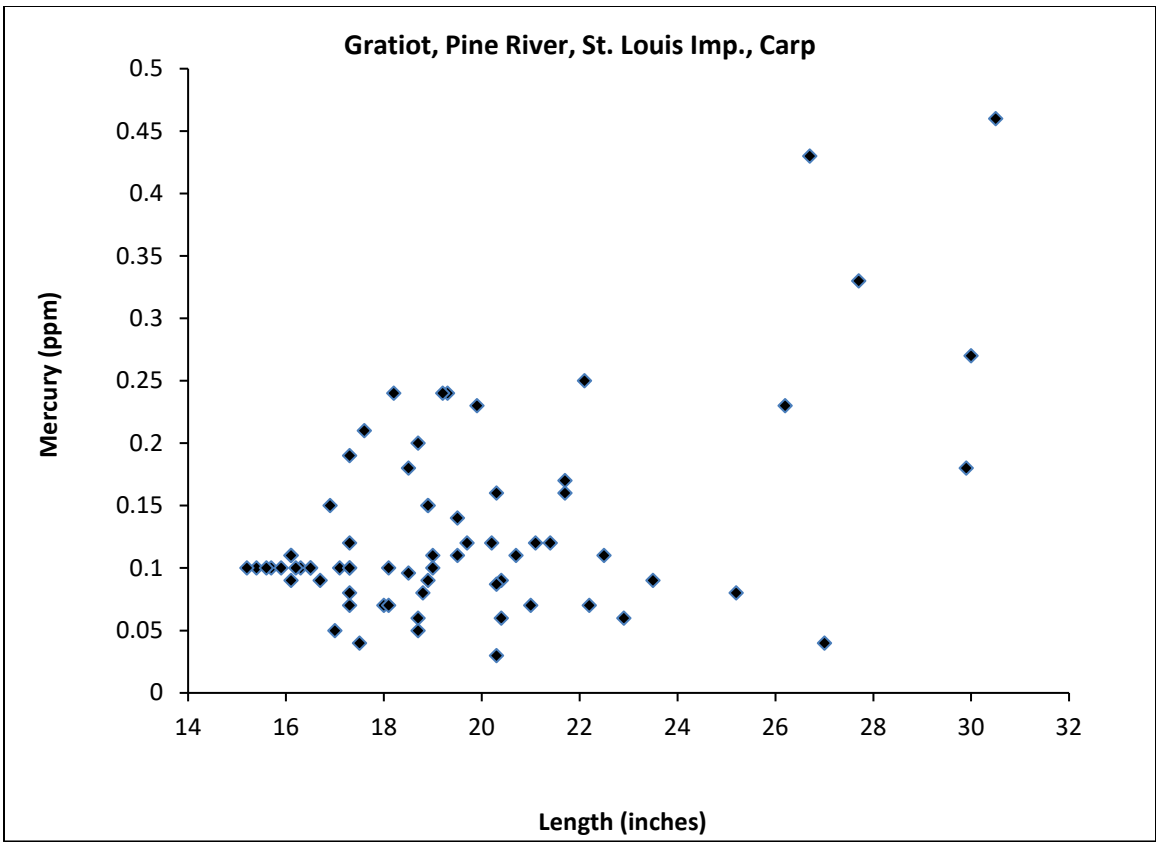
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1986	2010	70	15.2	na	15.2	30.5
Datasets available: 1986, '89, '95, '97, 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	70	0.13	0.03	0.46	0.15	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.276	0.142				

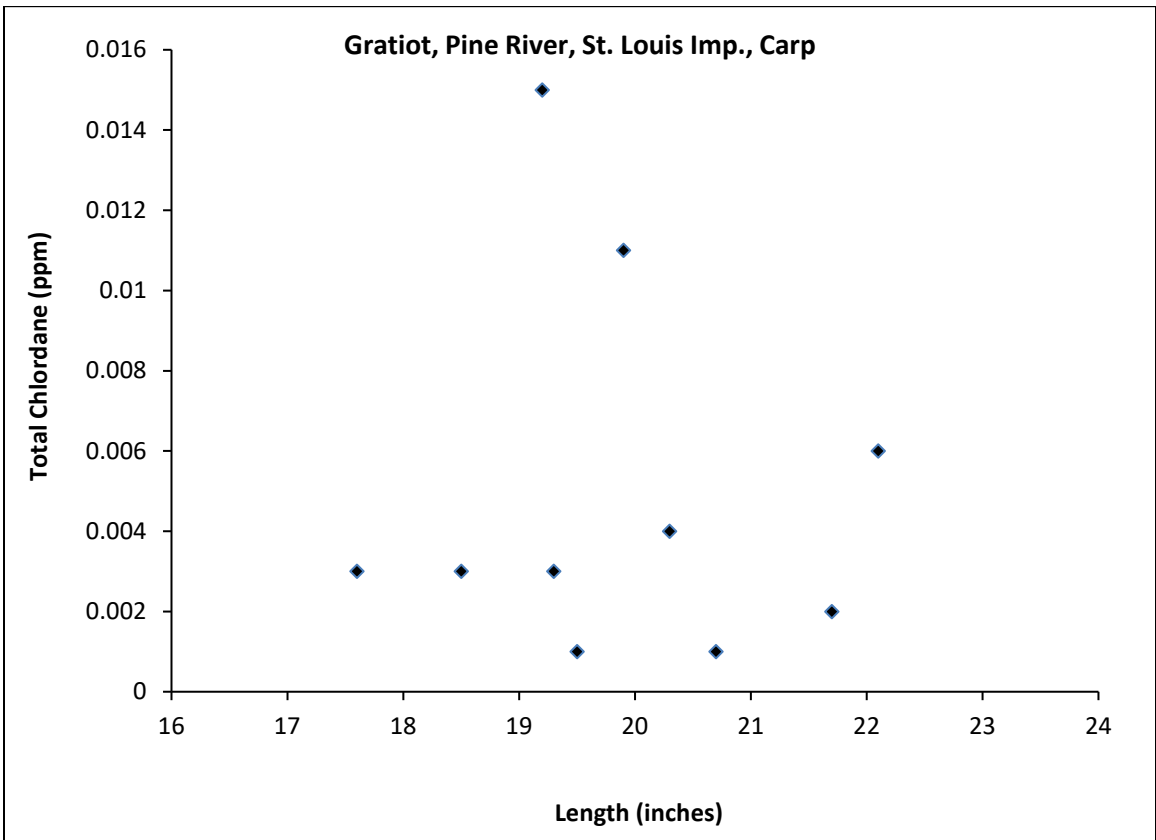
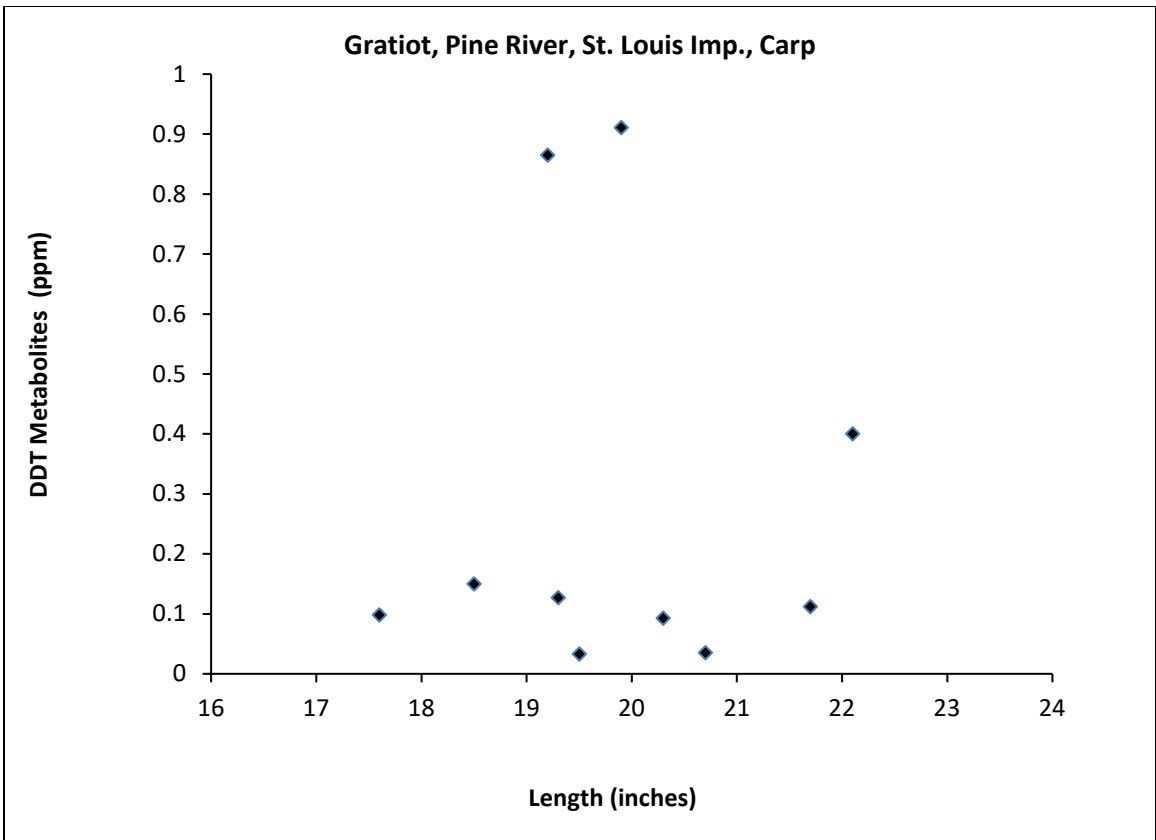
Organics Analysis:

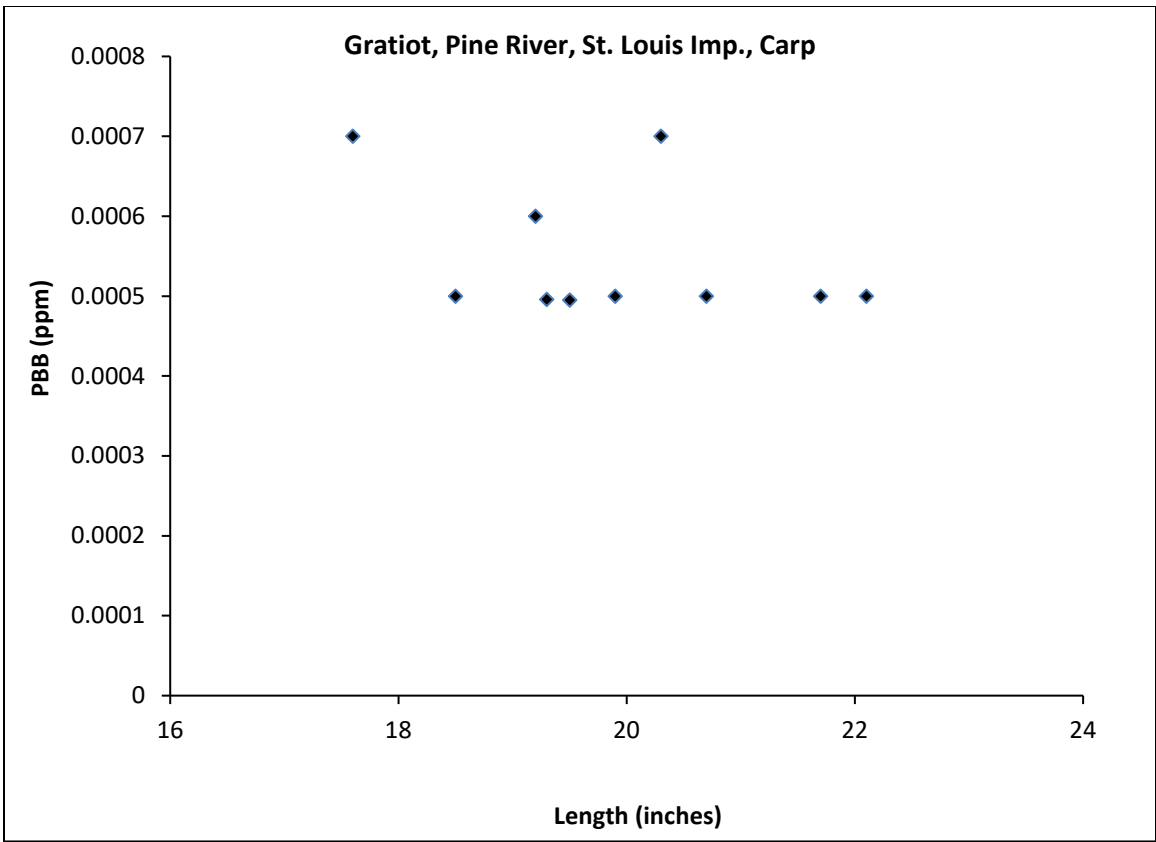
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	10	17.6	na	17.6	22.1
Datasets available: 1986, '89, '95, '97, 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.271	0.134	0.645	0.415	0.5
DDT	10	0.282	0.033	0.911	0.522	2
Chlordane	10	0.005	0.001	0.015	0.008	--
Toxaphene	10	ND	--	--	--	--
PBB	10	0.001	0.001	0.001	0.001	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.000	0.003				
DDT	0.000	0.003				
Chlordane	0.004	0.003				
Toxaphene	0.258	0.258				
PBB	0.168	0.169				
Final meal category based on UCL:						0.5

Existing Advisory: No one should eat any fish of any species from the Pine River downstream of the Alma Dam due to DDT and PBB.

Recommendation: No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. Significant sediment removal operations in the impoundment have been completed and additional remediation within the impoundment is not planned. In-ground remediation continues at the former Velsicol plant site.







Channel Catfish

**Pine River
St. Louis Impoundment**

Gratiot County

Hg Analysis:

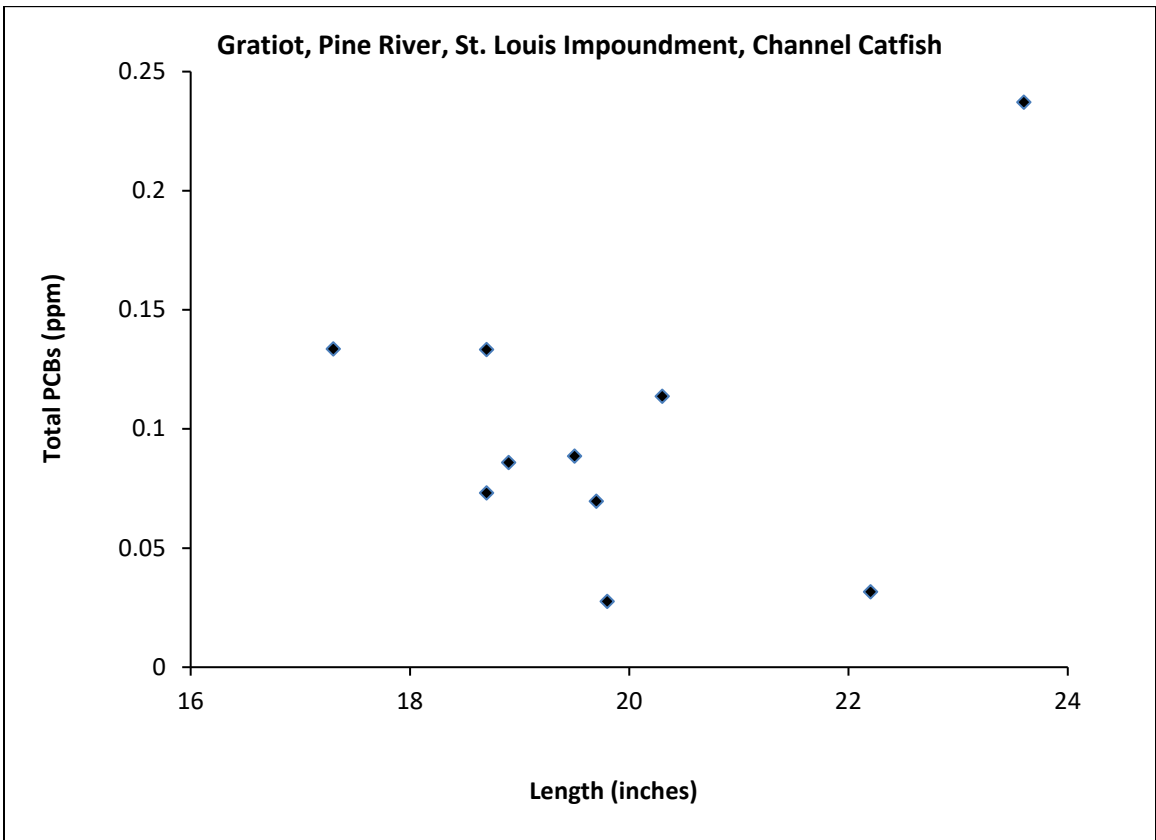
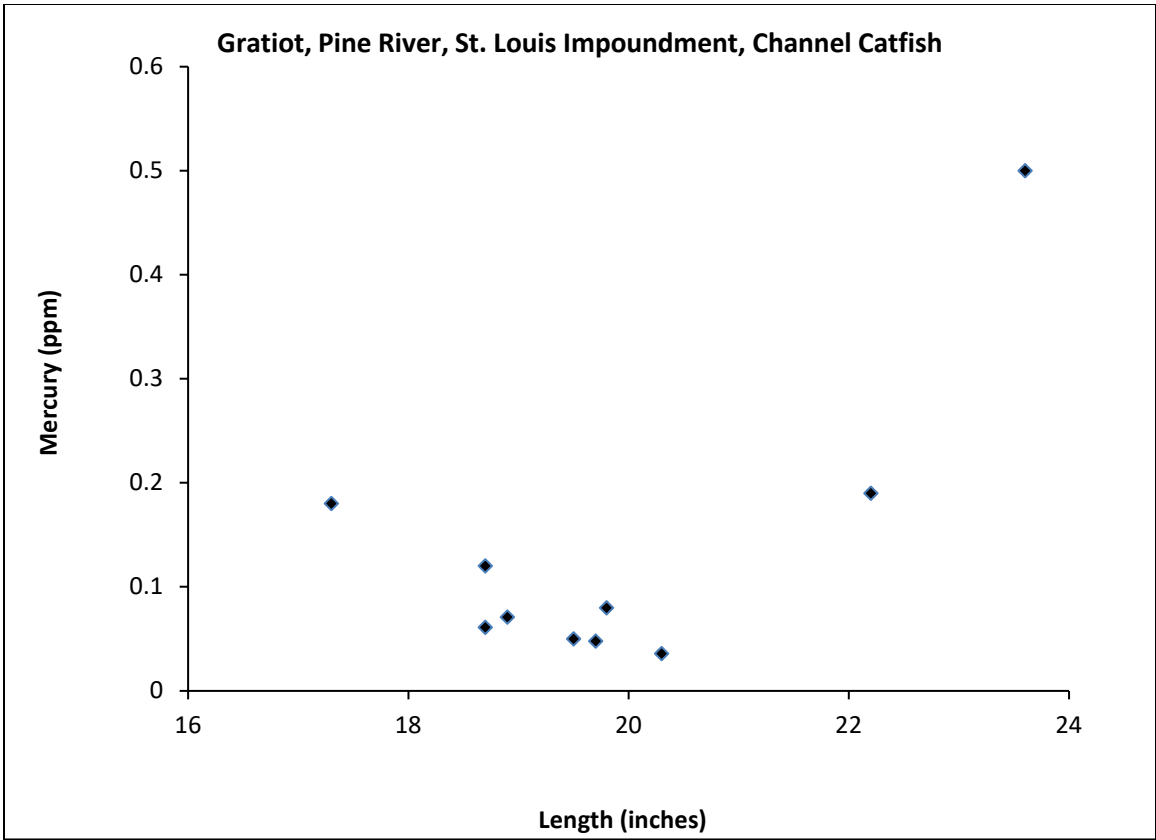
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	10	17.3	12	17.3	23.6
Datasets available: 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.13	0.04	0.50	0.23	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.455	0.252				

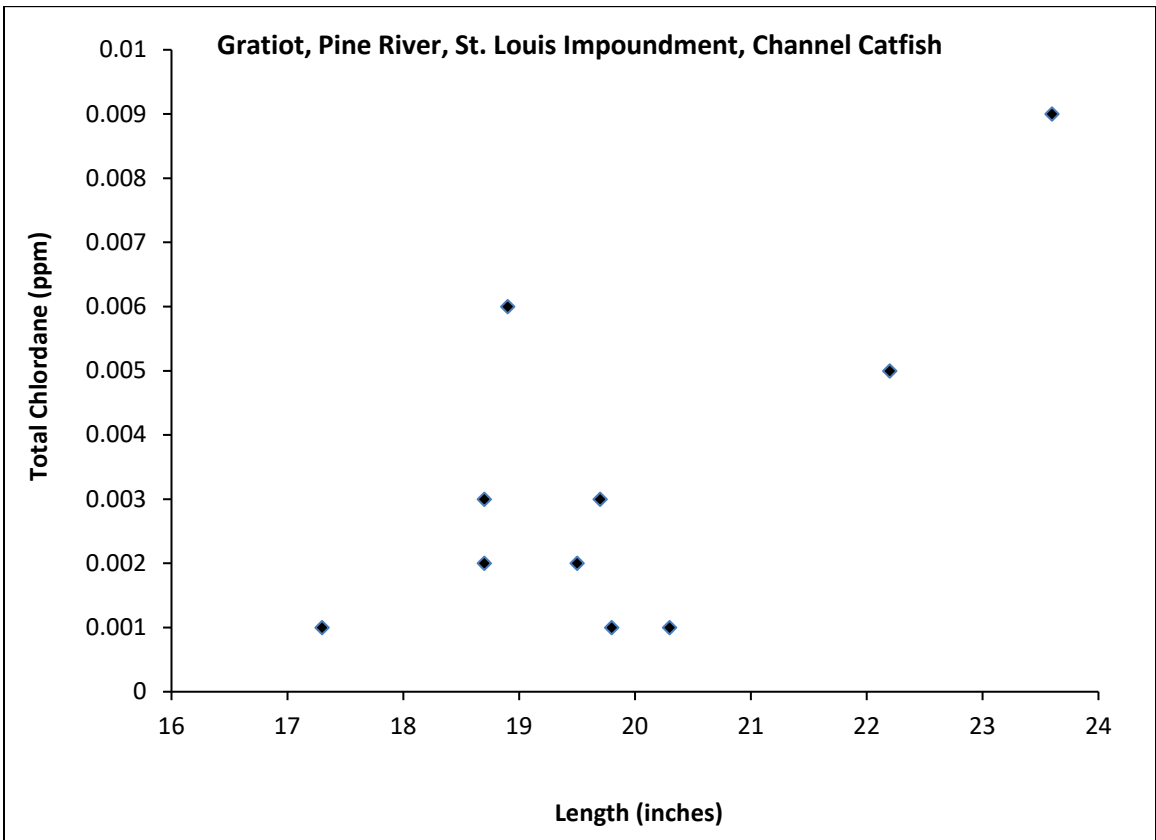
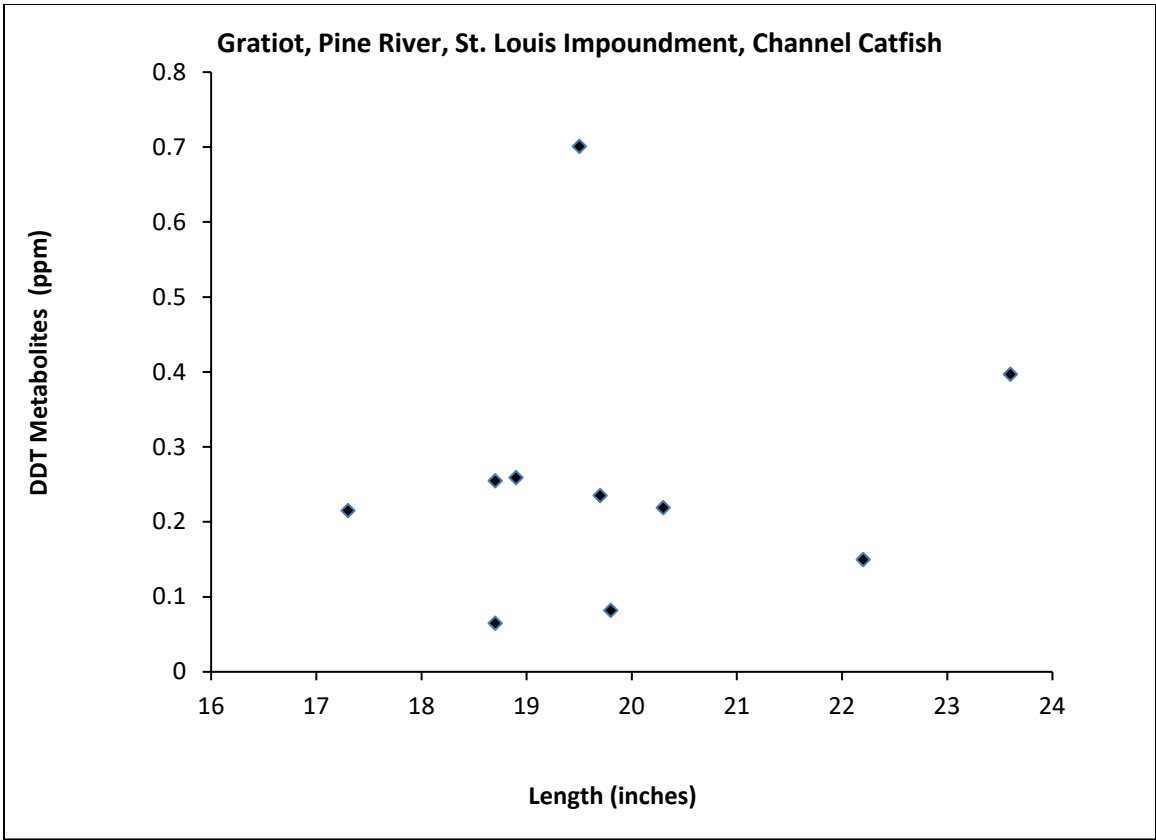
Organics Analysis:

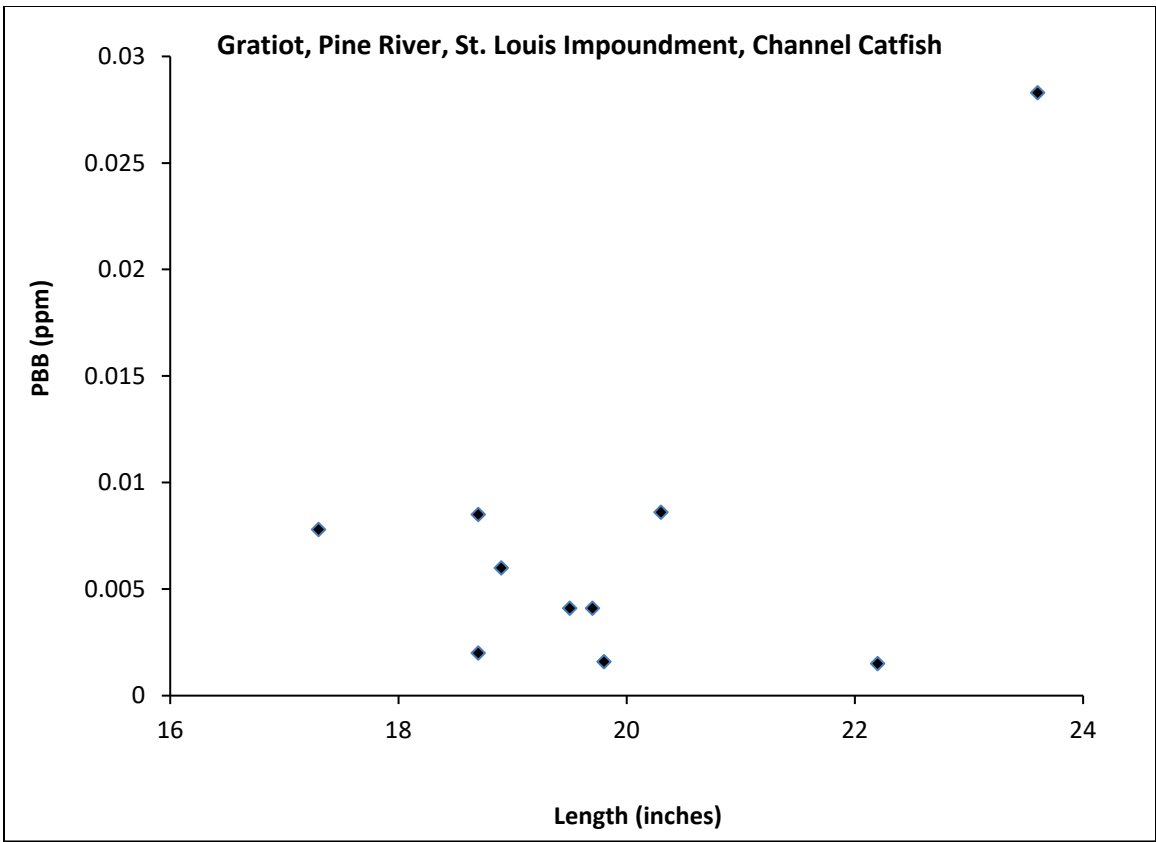
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	10	17.3	12	17.3	23.6
Datasets available: 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.099	0.028	0.237	0.143	1
DDT	10	0.258	0.065	0.701	0.388	4
Chlordane	10	0.003	0.001	0.009	0.005	--
Toxaphene	10	ND	--	--	--	--
PBB	10	0.007	0.002	0.028	0.013	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.086	0.000				
DDT	0.022	0.034				
Chlordane	0.486	0.352				
Toxaphene	--	--				
PBB	0.311	0.046				
Final meal category based on UCL:						1

Existing Advisory: No one should eat any fish of any species from the Pine River downstream of the Alma Dam due to DDT and PBB.

Recommendation: No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. Significant sediment removal operations in the impoundment have been completed and additional remediation within the impoundment is not planned. In-ground remediation continues at the former Velsicol plant site.







Crappie

**Pine River
St. Louis Impoundment**

Gratiot County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1986	2010	39	5.8	na	5.8	12.4
Datasets available: 1986, '89, '95, 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	39	0.14	0.04	0.33	0.17	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.701	0.837				

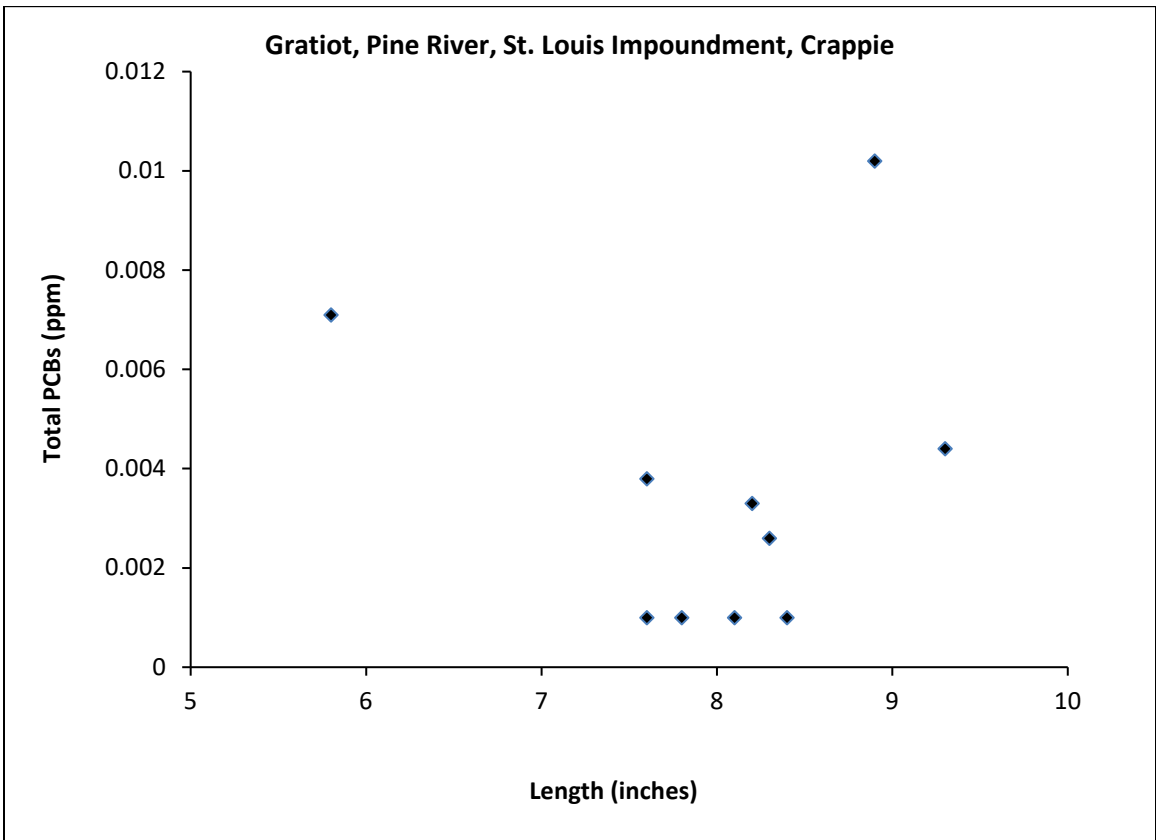
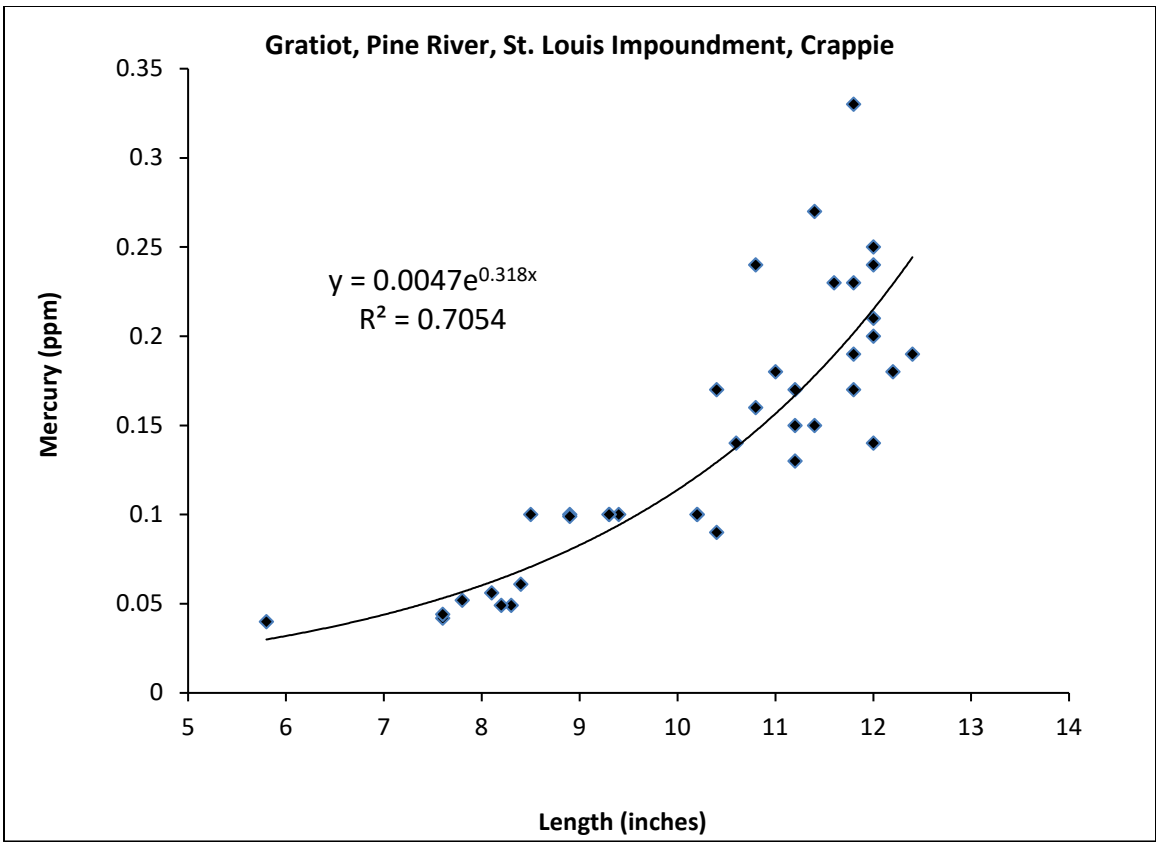
Organics Analysis:

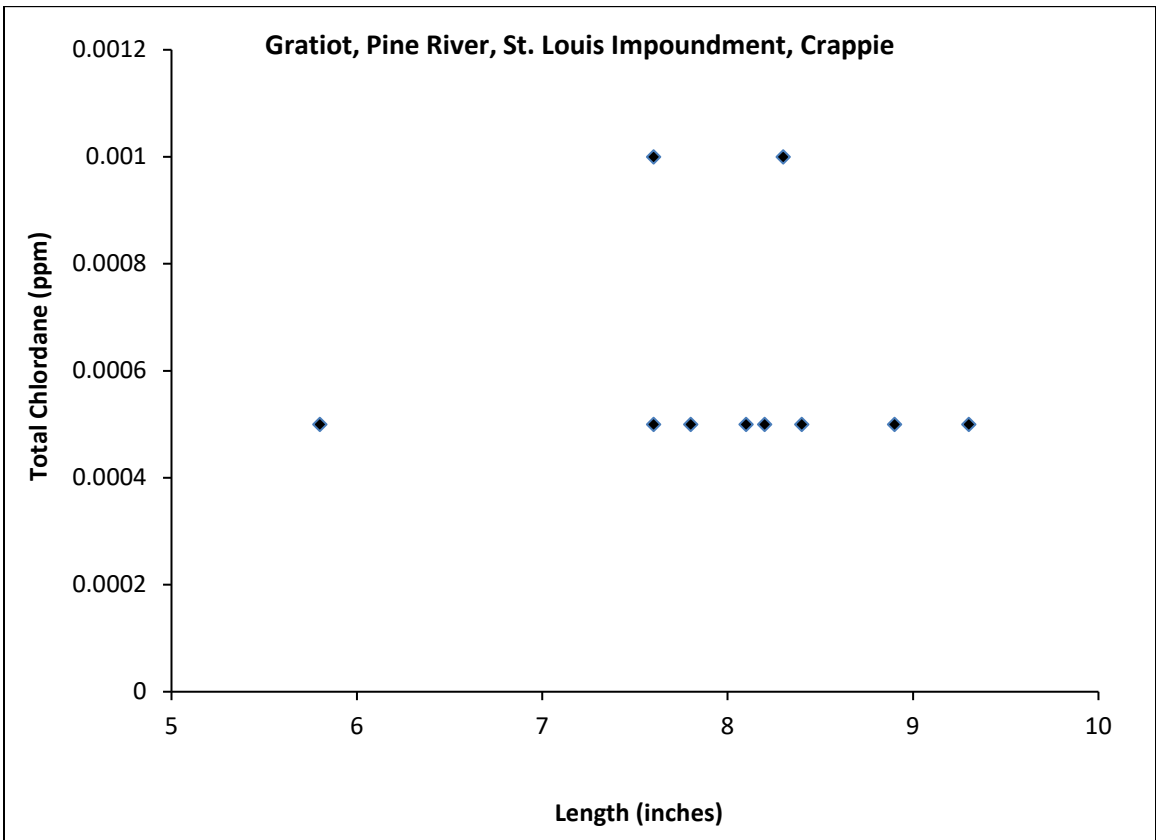
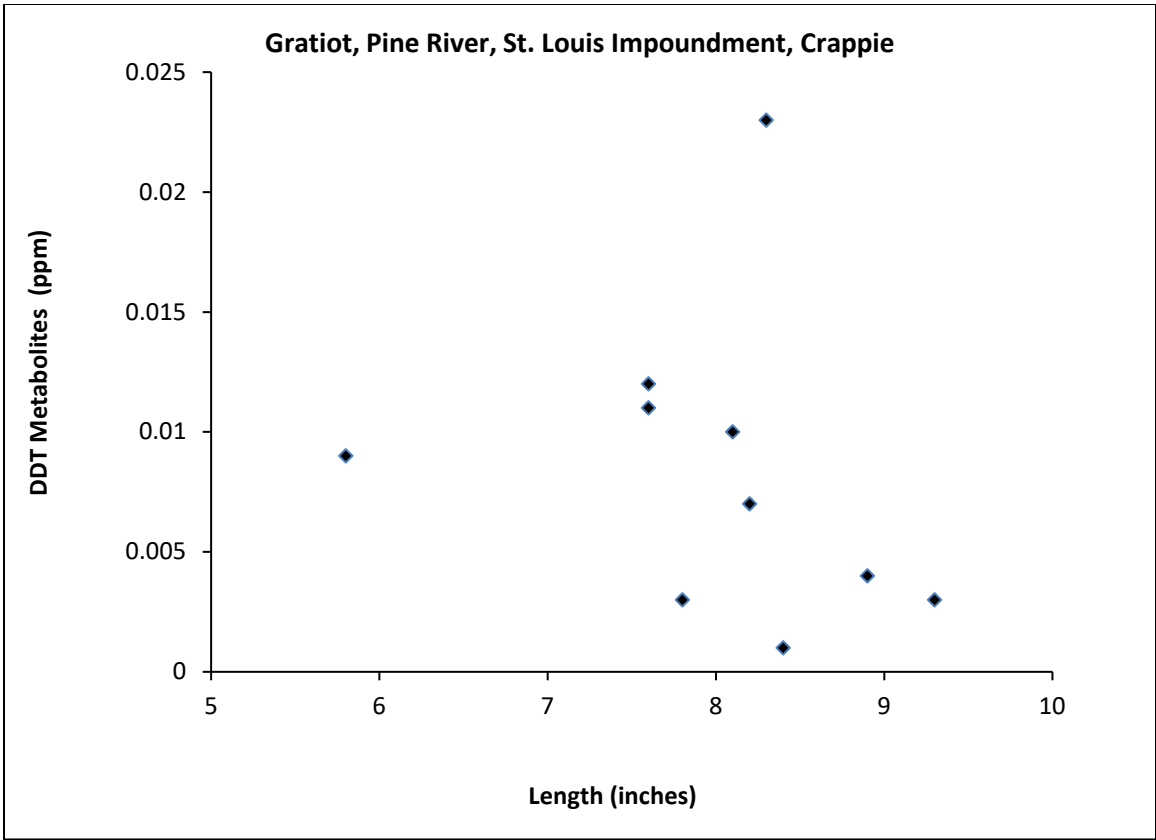
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	10	5.8	na	5.8	9.3
Datasets available: 1986, '89, '95, 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.004	0.001	0.010	0.006	16
DDT	10	0.008	0.001	0.023	0.013	16
Chlordane	10	0.001	0.001	0.001	0.001	--
Toxaphene	10	ND	--	--	--	--
PBB	10	0.001	0.001	0.001	0.001	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.001	0.002				
DDT	0.052	0.129				
Chlordane	0.001	0.001				
Toxaphene	--	--				
PBB	0.387	0.363				
Final meal category based on UCL:						4

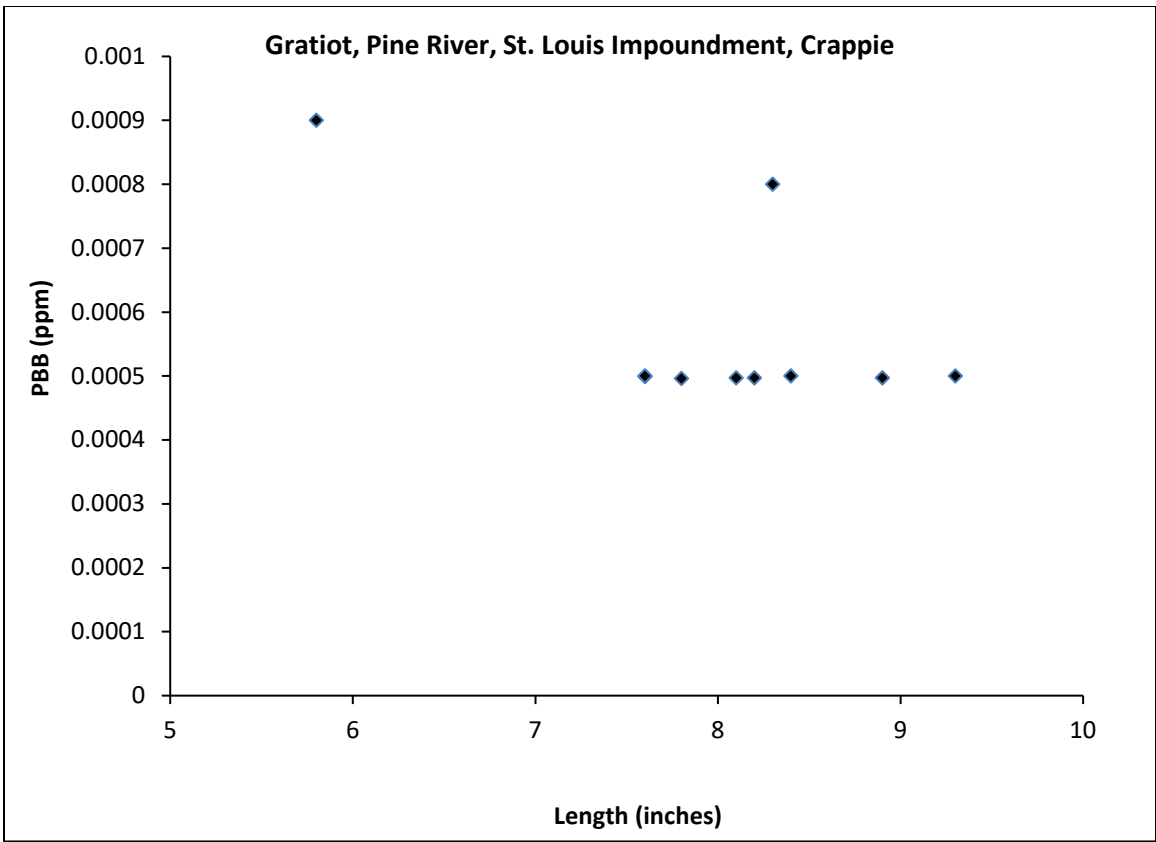
Existing Advisory: No one should eat any fish of any species from the Pine River downstream of the Alma Dam due to DDT and PBB.

Recommendation: No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. Significant sediment removal operations in the impoundment have been completed and additional remediation within the impoundment is not planned. In-ground remediation continues at the former Velsicol plant site.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
5	0.02	16
6	0.03	16
7	0.04	16
8	0.06	16
9	0.08	12
10	0.11	8
12	0.21	4
13	0.29	2
14	0.4	2
<i>Shaded area denotes extrapolated estimates</i>		







**Largemouth Bass and
Smallmouth Bass**

**Pine River
St. Louis Impoundment**

Gratiot County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1986	2018	72	9	14	13.6	17.9
Datasets available: 1986, 1989, 1997, 2010, 2015, 2018						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	39	0.33	0.09	0.65	0.38	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.620	0.682				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2018	40	9	14	13.7	17.9
Datasets available: 1989, 1997, 2010, 2015, 2018						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	21	0.01	< 0.001	0.04	0.01	12
DDT	21	0.04	< 0.001	0.15	0.05	16
Chlordane	21	ND	< 0.001	< 0.001	--	--
Toxaphene	21	ND	< 0.05	< 0.05	--	--
PFOS	5	6 ppb	2 ppb	10 ppb	9.6 ppb	12
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.008	0.001				
DDT	0.039	0.018				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.276	0.331				
Final meal category based on UCL:						2

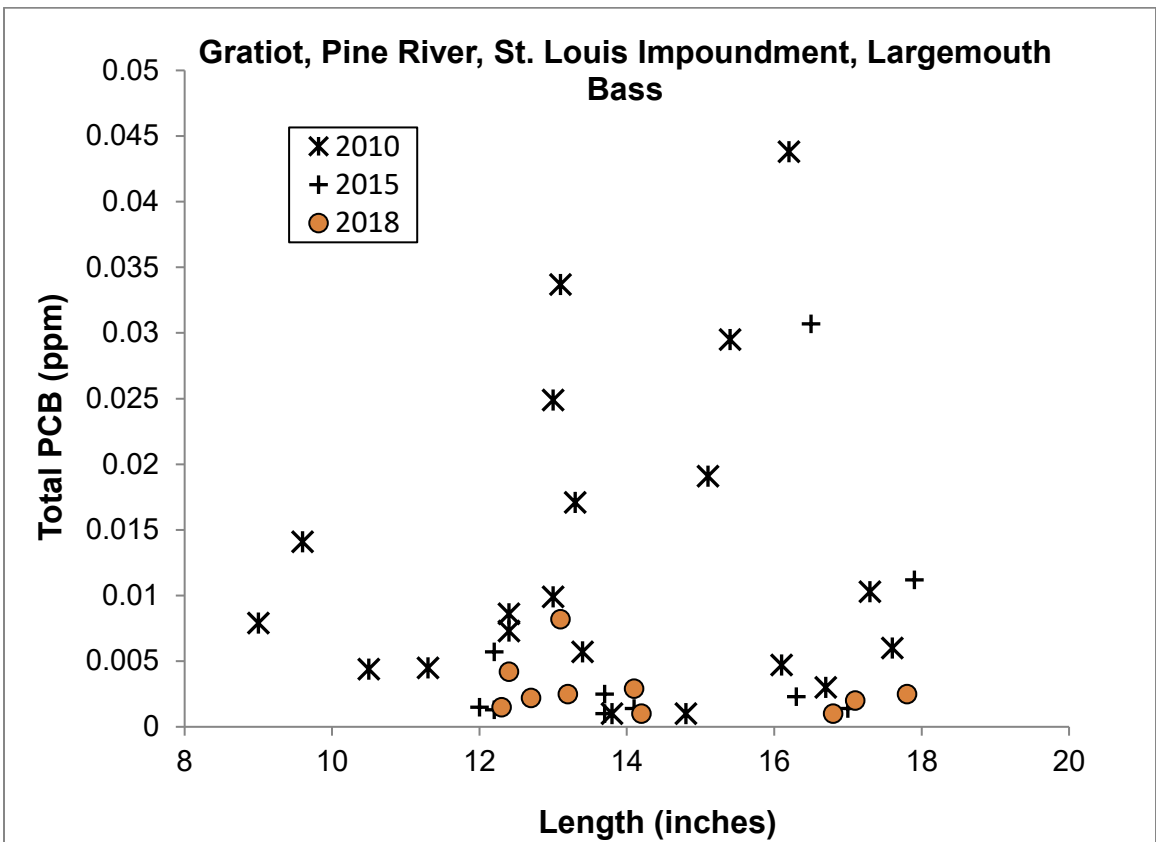
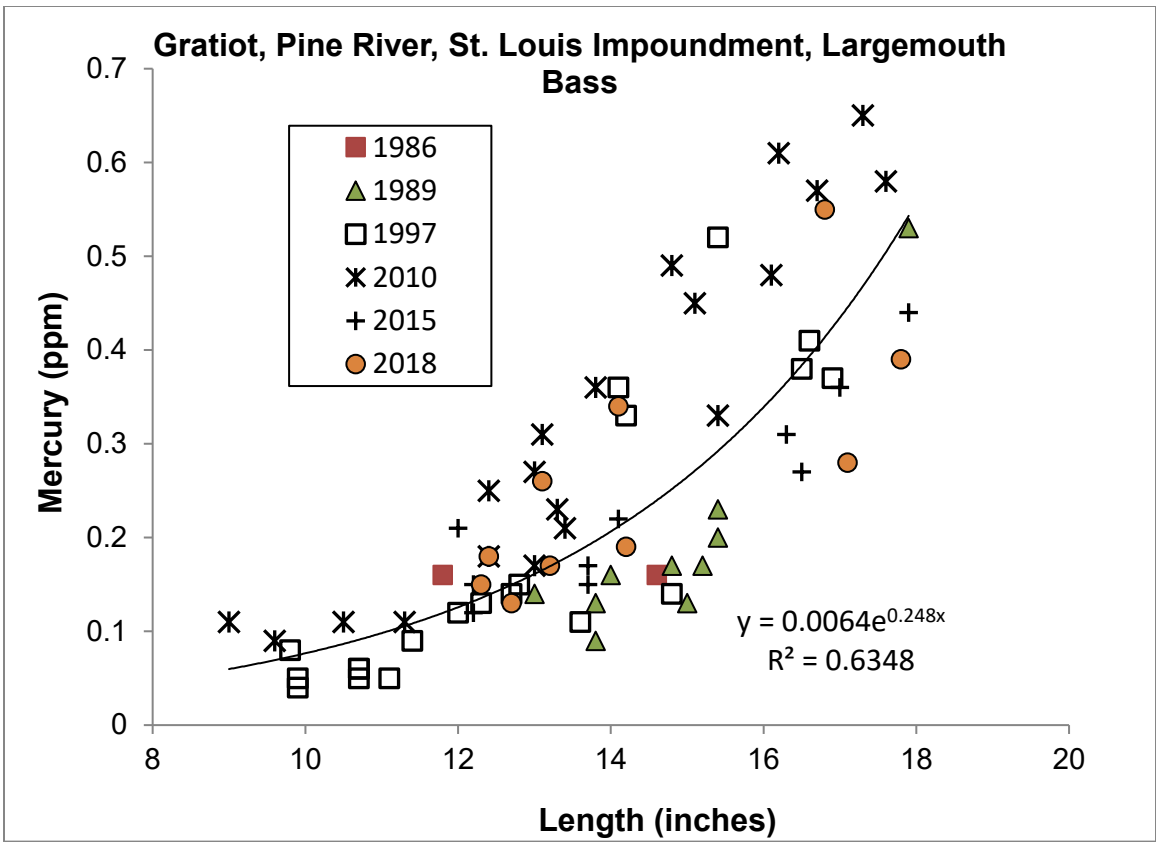
Existing MDHHS Advisory: No one should eat any fish from the St. Louis impoundment of the Pine River due to DDT.

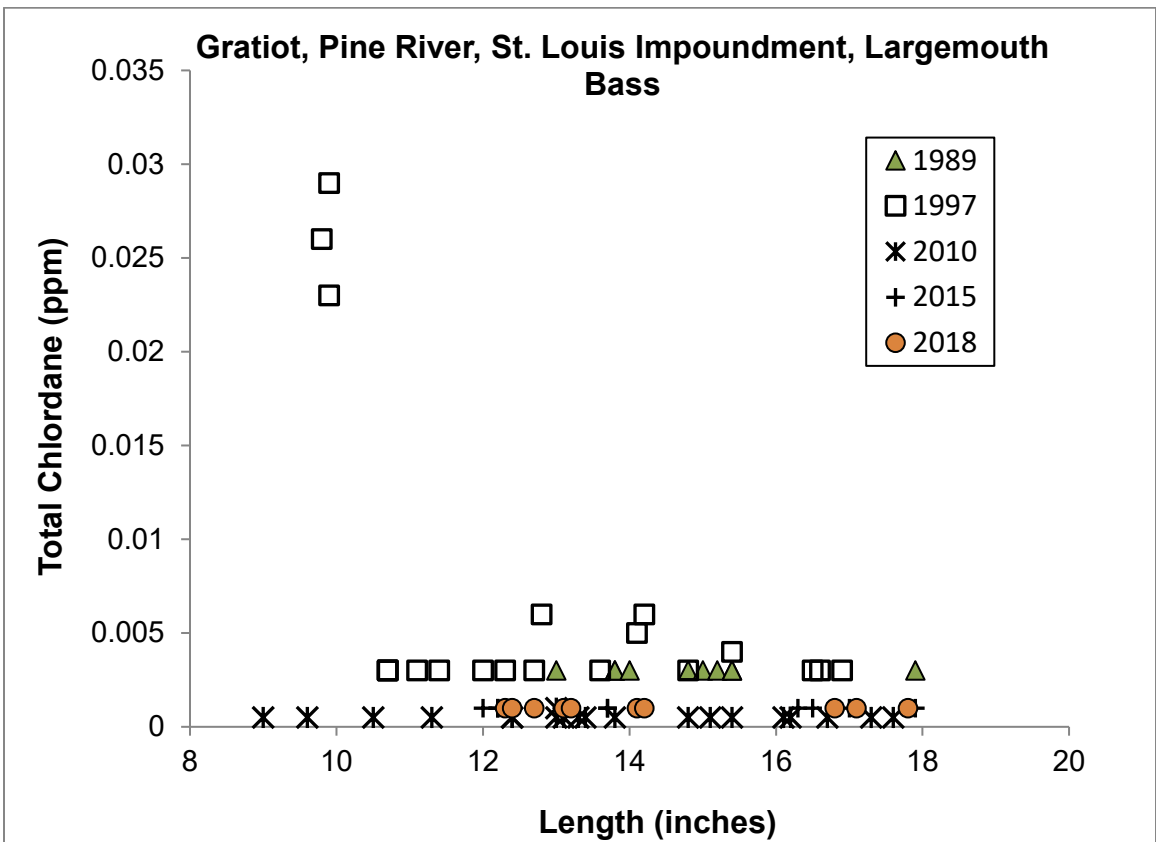
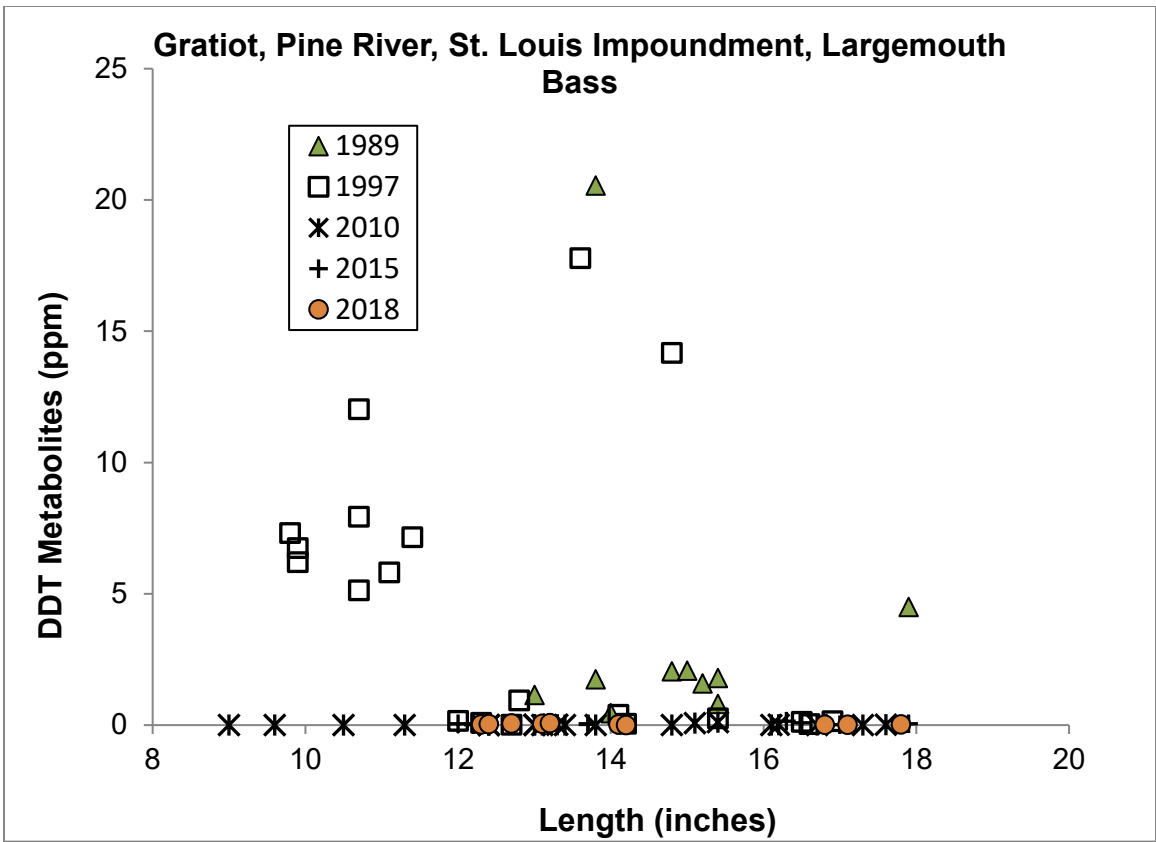
Recommendation: No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. Significant sediment removal operations in the impoundment have been completed and additional remediation within the impoundment is not planned. In-ground remediation continues at the former Velsicol plant site.

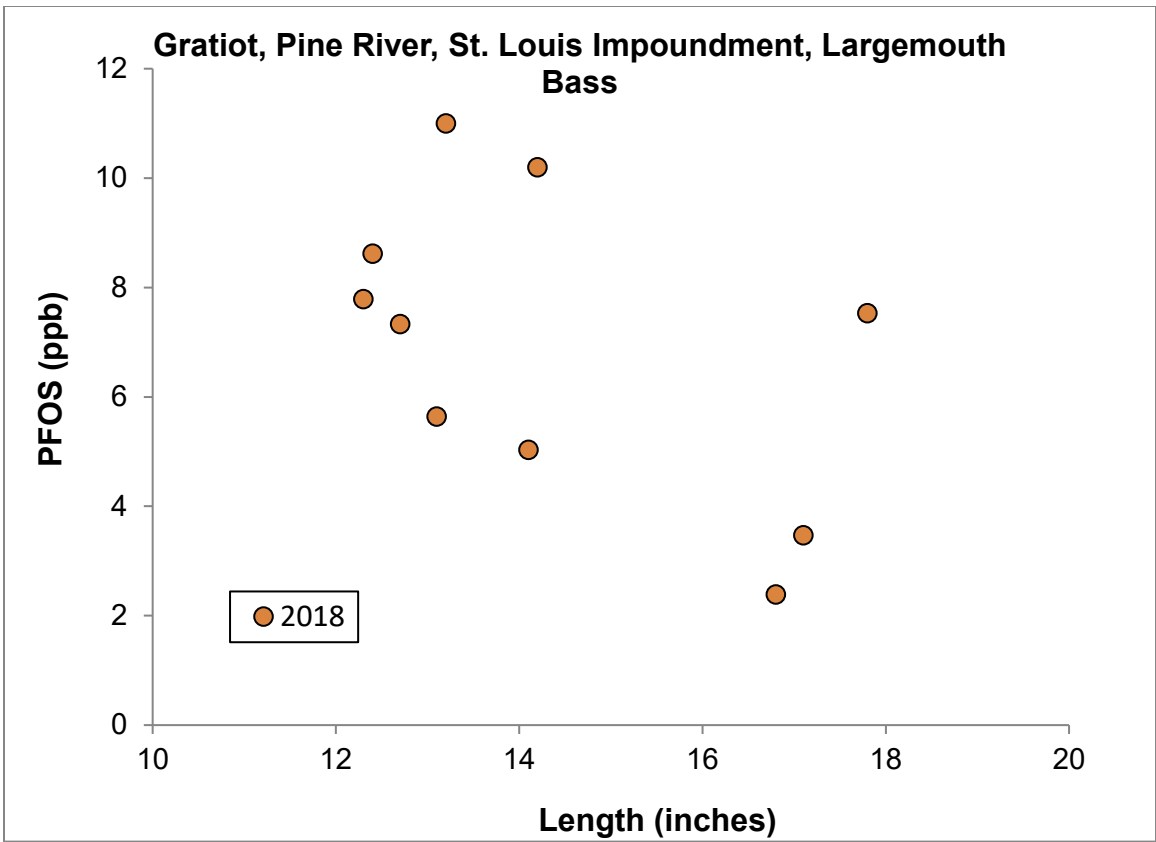
Mercury, PCBs, and PFOS would cause an advisory.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
14	0.21	4
15	0.26	4
16	0.34	2
17	0.43	2
18	0.56	1
19	0.71	1
20	0.91	1

Shaded area denotes extrapolated estimates







Northern Pike

**Pine River
St. Louis Impoundment**

Gratiot County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1986	2010	3	18.7	24	28.8	28.8
Datasets available: 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	1	0.58	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	--	--				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	1	28.8	24	28.8	28.8
Datasets available: 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	1	0.002	--	--	--	--
DDT	1	0.003	--	--	--	--
Chlordane	1	ND	--	--	--	--
Toxaphene	1	ND	--	--	--	--
PBB	1	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
PBB	--	--				
Final meal category based on UCL:						--

Existing Advisory: No one should eat any fish of any species from the Pine River downstream of the Alma Dam due to DDT and PBB.

Recommendation: No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. Significant sediment removal operations in the impoundment have been completed and additional remediation within the impoundment is not planned. In-ground remediation continues at the former Velsicol plant site.

Rock Bass

**Pine River
St. Louis Impoundment**

Gratiot County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	10	6.1	na	6.1	8.7
Datasets available: 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.11	0.05	0.24	0.16	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.575	0.635				

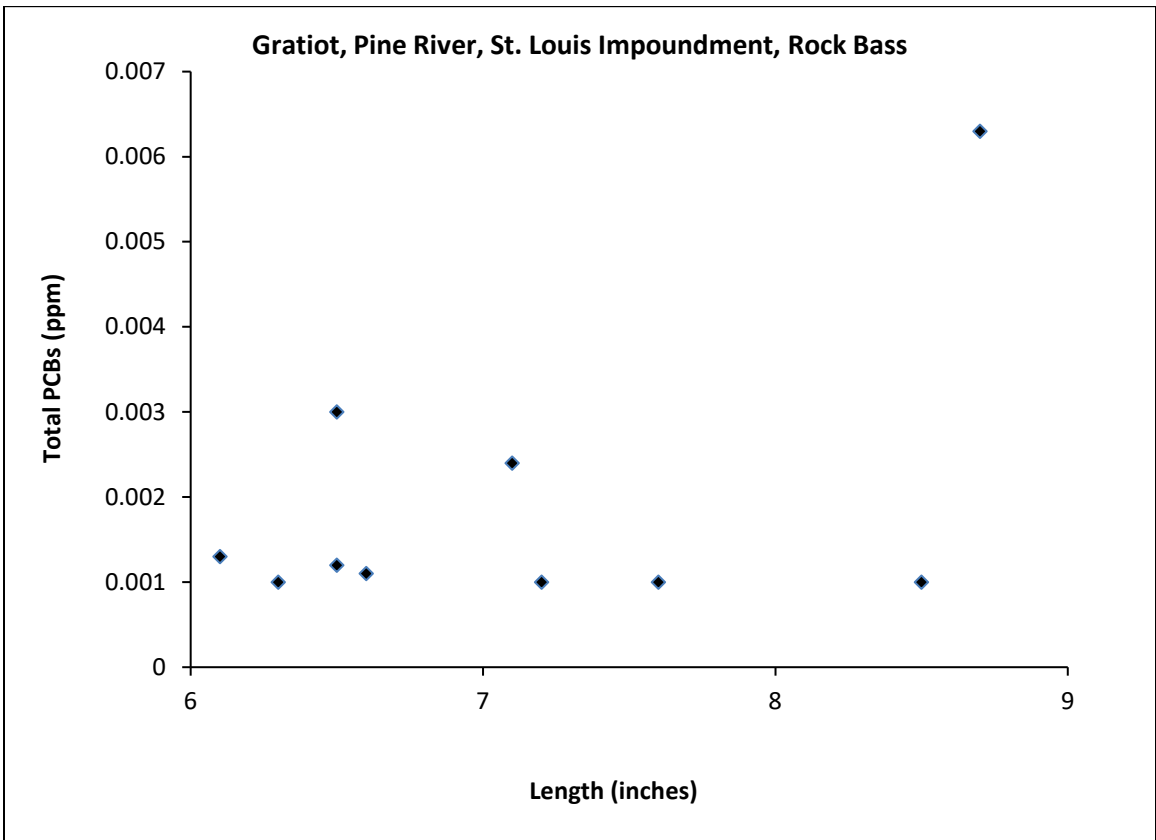
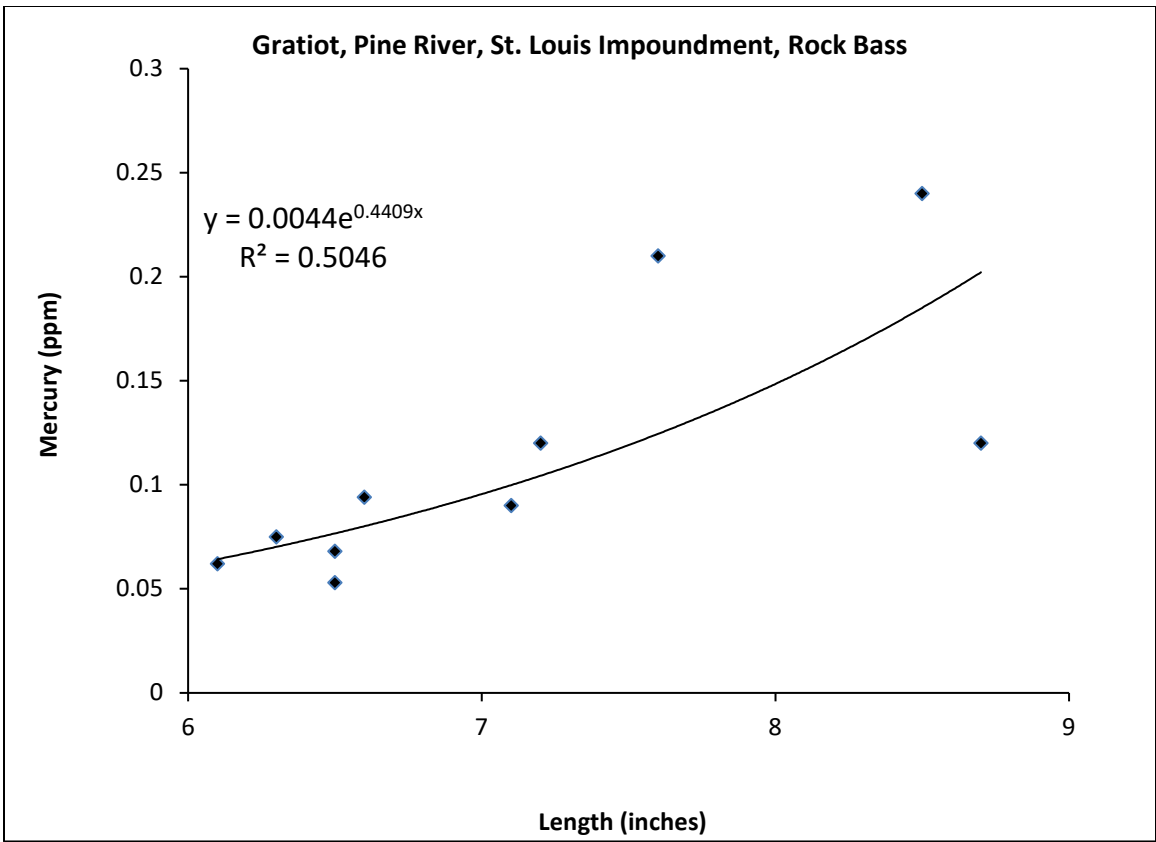
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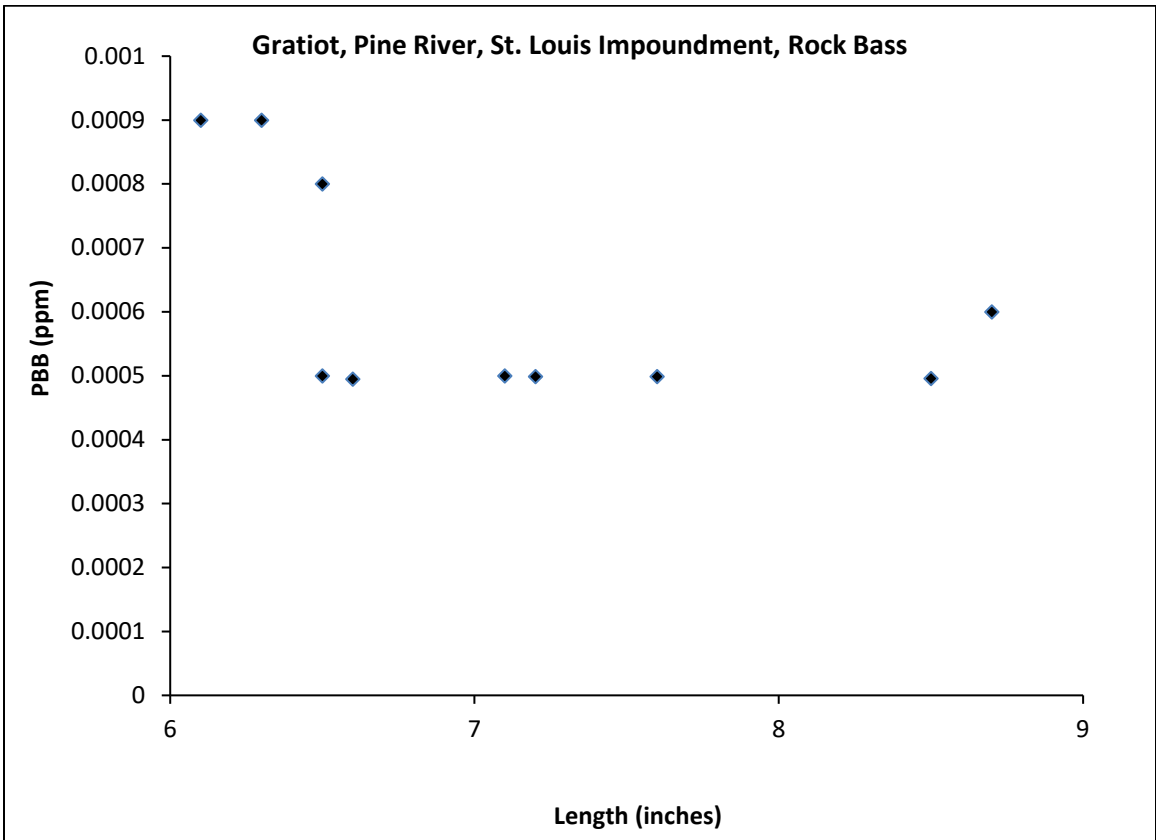
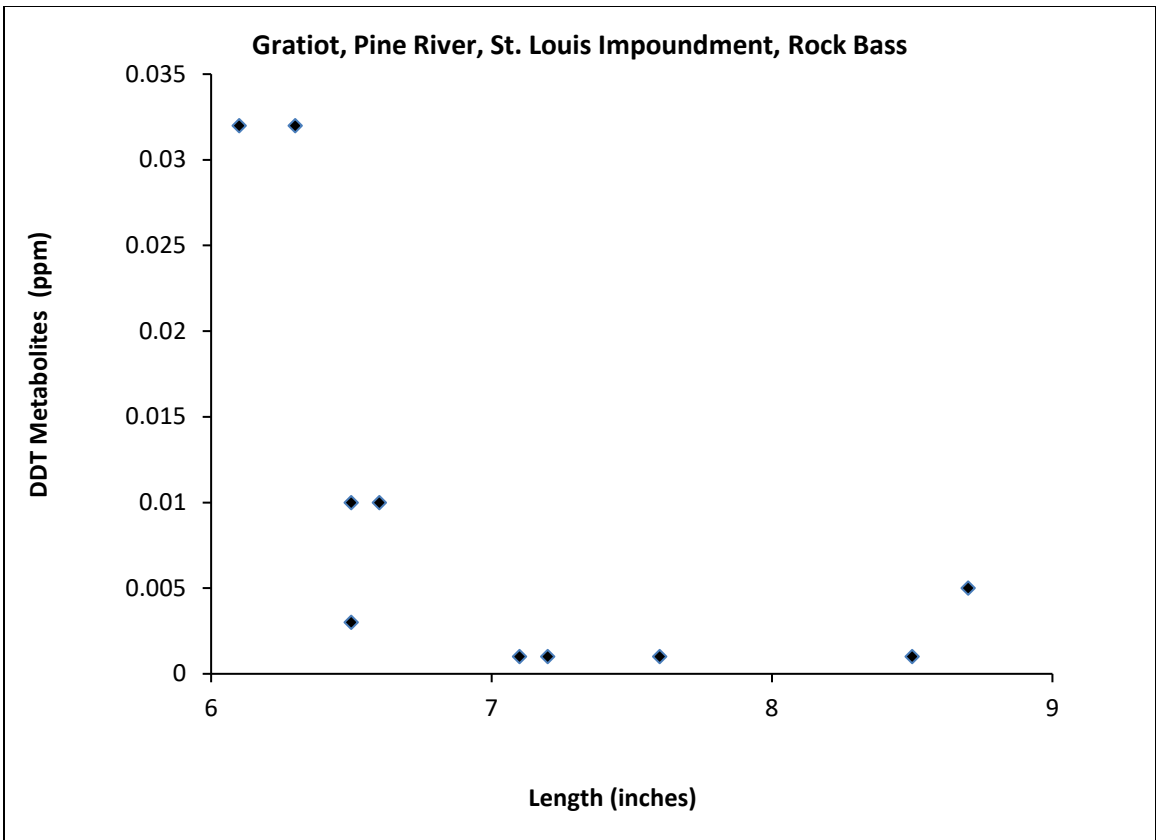
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	10	6.1	na	6.1	8.7
Datasets available: 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.002	0.001	0.006	0.003	16
DDT	10	0.01	0.001	0.032	0.020	16
Chlordane	10	ND	--	--	--	--
Toxaphene	10	ND	--	--	--	--
PBB	10	0.001	0.001	0.001	0.001	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.239	0.126				
DDT	0.373	0.365				
Chlordane	--	--				
Toxaphene	--	--				
PBB	0.277	0.252				
Final meal category based on UCL:						4

Existing Advisory: No one should eat any fish of any species from the Pine River downstream of the Alma Dam due to DDT and PBB.

Recommendation: No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. Significant sediment removal operations in the impoundment have been completed and additional remediation within the impoundment is not planned. In-ground remediation continues at the former Velsicol plant site.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
5	0.04	16
6	0.06	16
7	0.1	8
8	0.15	4
9	0.23	4
10	0.36	2
11	0.56	1
12	0.87	1
13	1.36	0.5
<i>Shaded area denotes extrapolated estimates</i>		





White Sucker

**Pine River
St. Louis Impoundment**

Gratiot County

Hg Analysis:

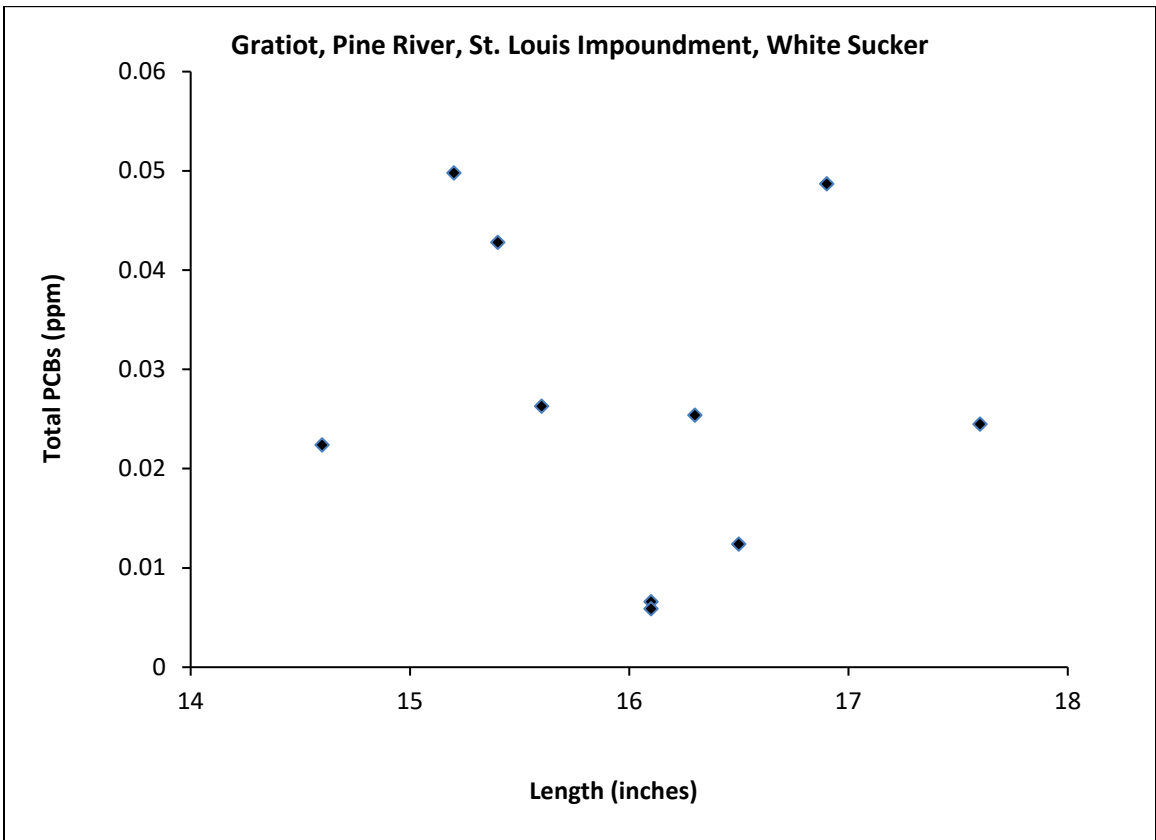
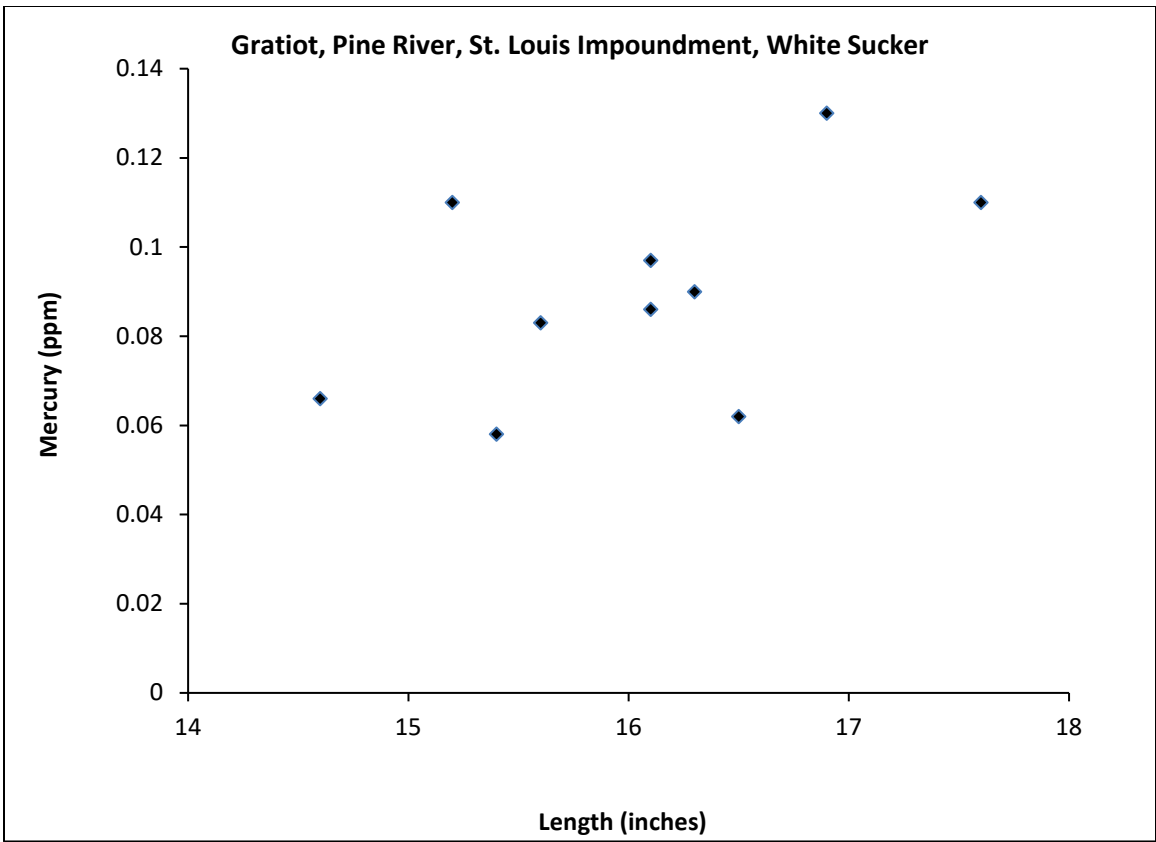
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	10	14.6	na	14.6	17.6
Datasets available: 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.09	0.06	0.13	0.11	8
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.265	0.251				

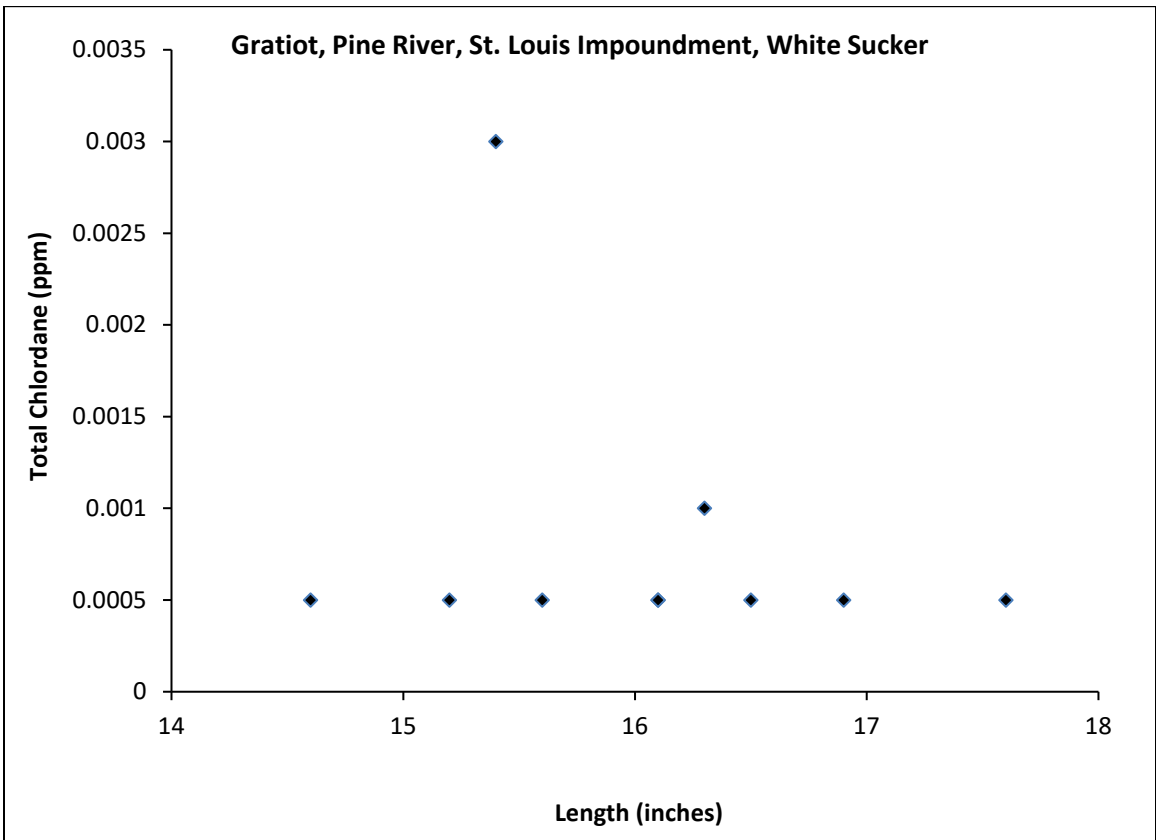
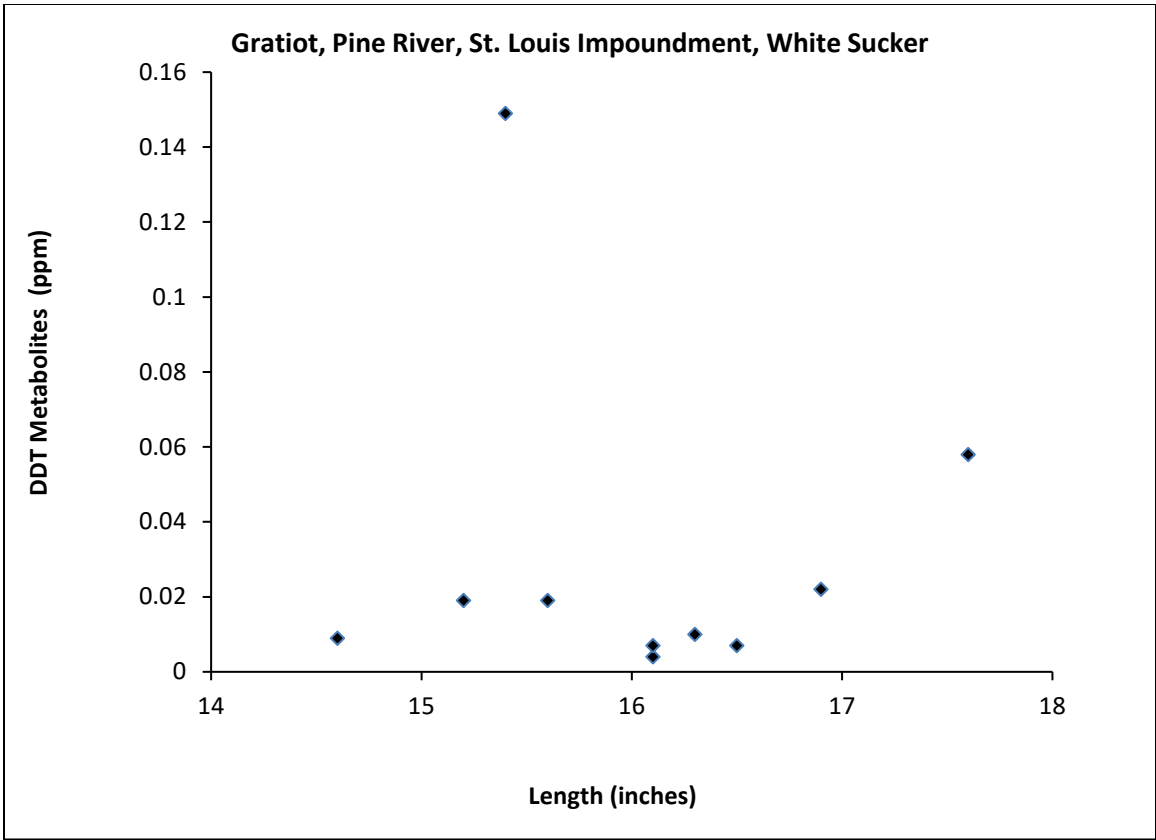
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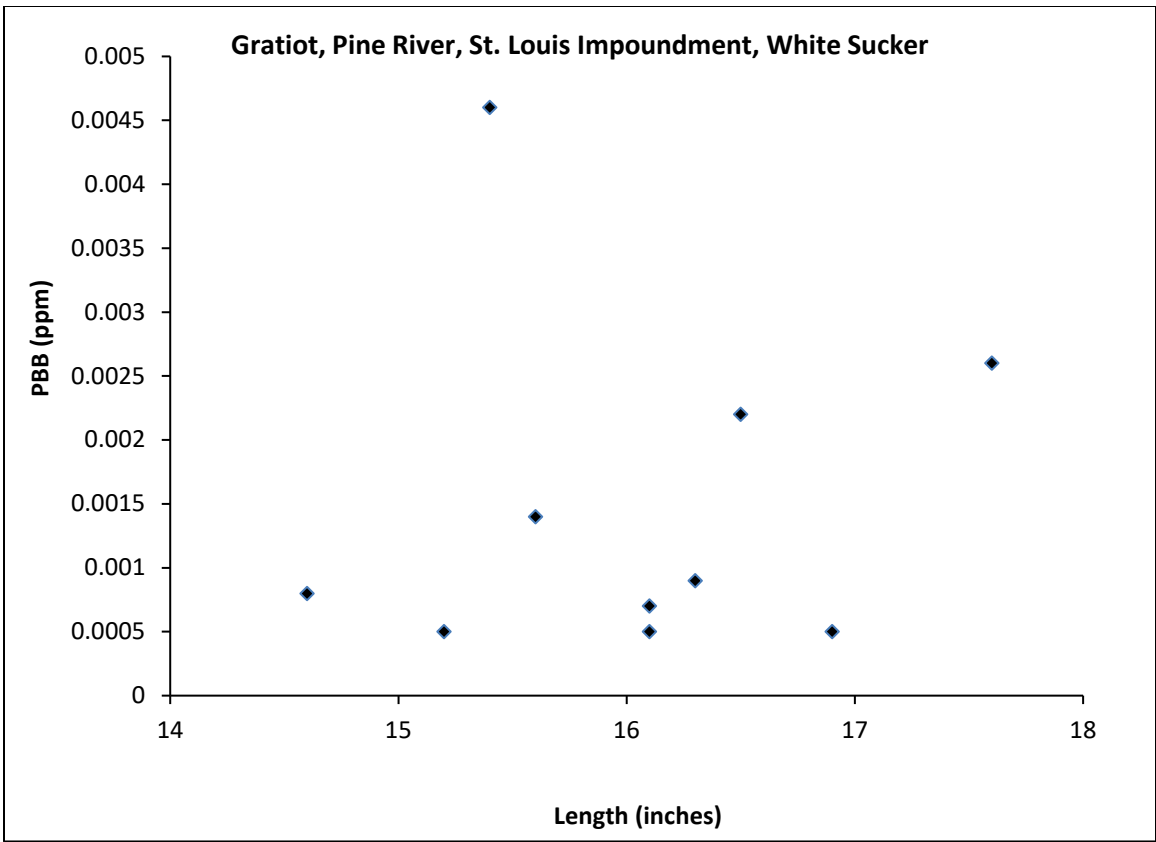
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	10	14.6	na	14.6	17.6
Datasets available: 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.026	0.006	0.050	0.038	4
DDT	10	0.030	0.004	0.149	0.062	16
Chlordane	10	0.001	0.001	0.003	0.001	--
Toxaphene	10	ND	--	--	--	--
PBB	10	0.001	0.001	0.005	0.002	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.265	0.251				
DDT	0.019	0.015				
Chlordane	0.002	0.009				
Toxaphene	0.054	0.042				
PBB	0.006	0.024				
Final meal category based on UCL:						4

Existing Advisory: No one should eat any fish of any species from the Pine River downstream of the Alma Dam due to DDT and PBB.

Recommendation: No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. Significant sediment removal operations in the impoundment have been completed and additional remediation within the impoundment is not planned. In-ground remediation continues at the former Velsicol plant site.







Carp

**Pine River
Downstream of St. Louis Dam**

**Gratiot &
Midland Counties**

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1985	2010	50	16	na	16	28.7
Datasets available: 1985, '94, '97, 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	50	0.19	0.08	0.76	0.23	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.413	0.421				

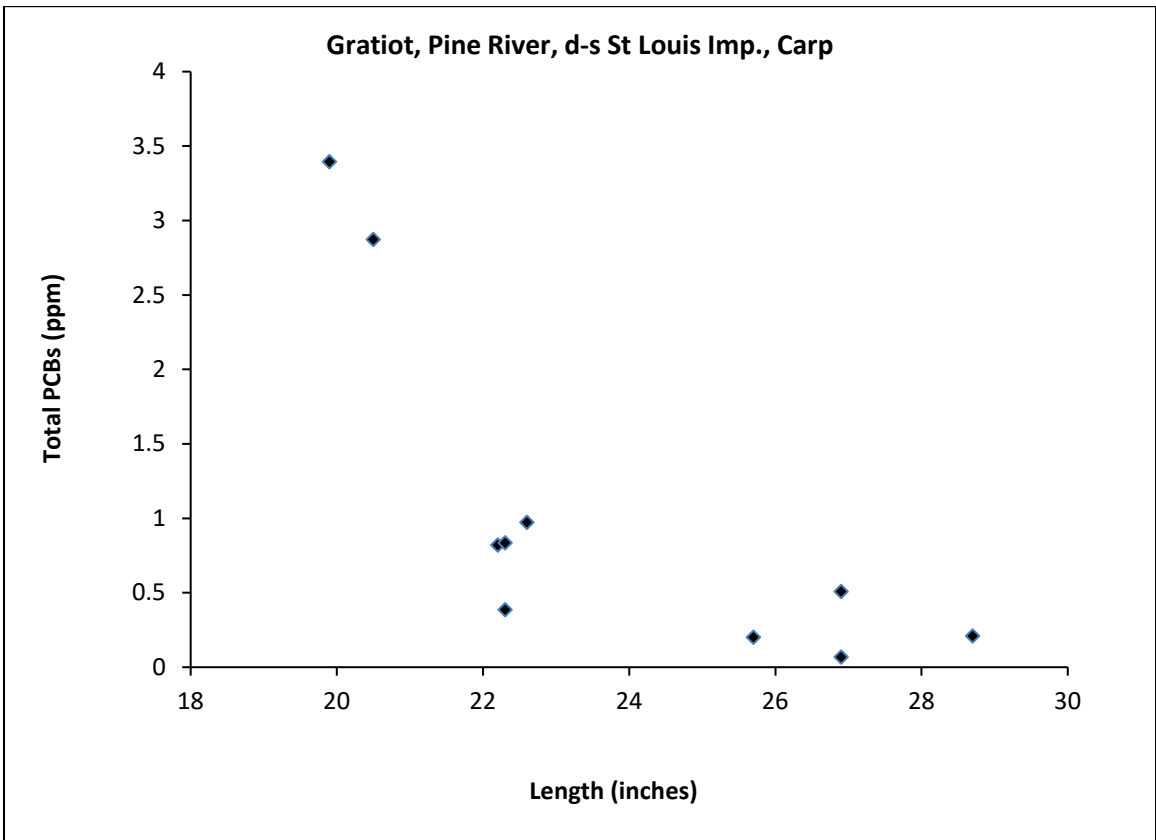
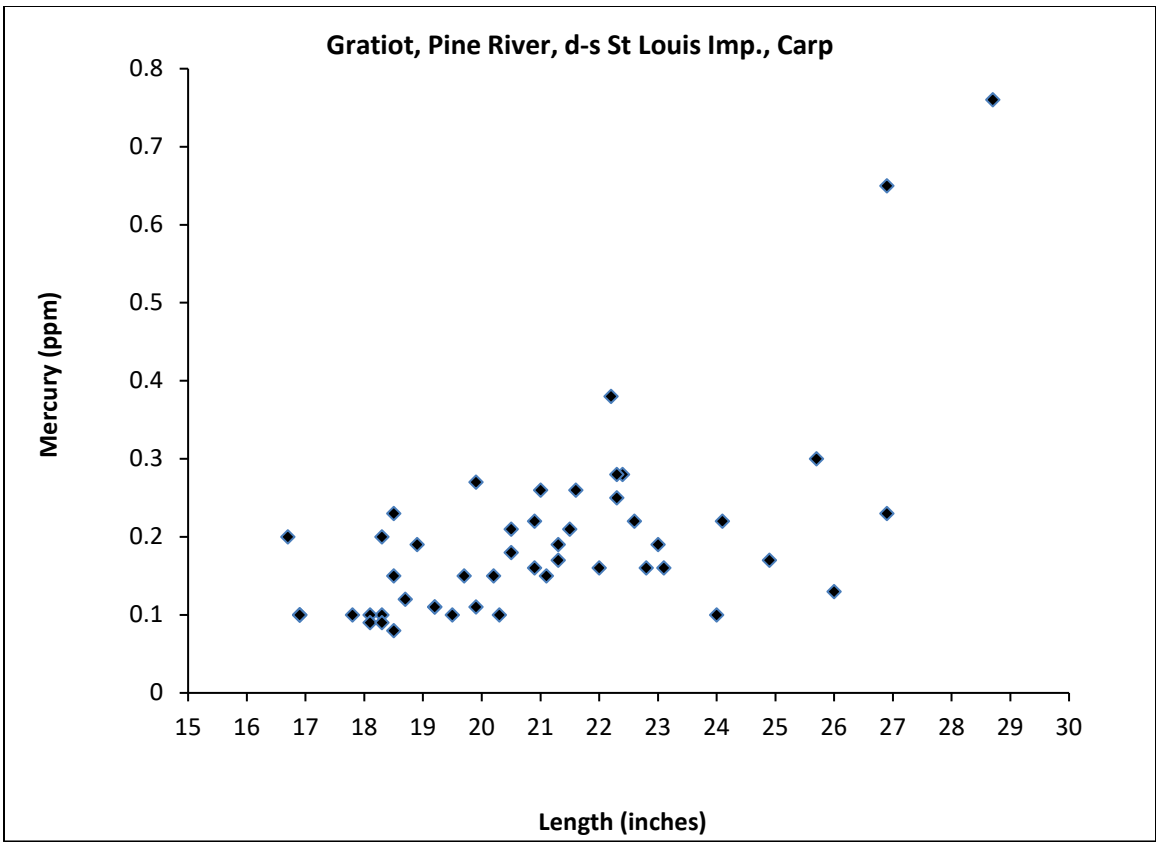
Organics Analysis:

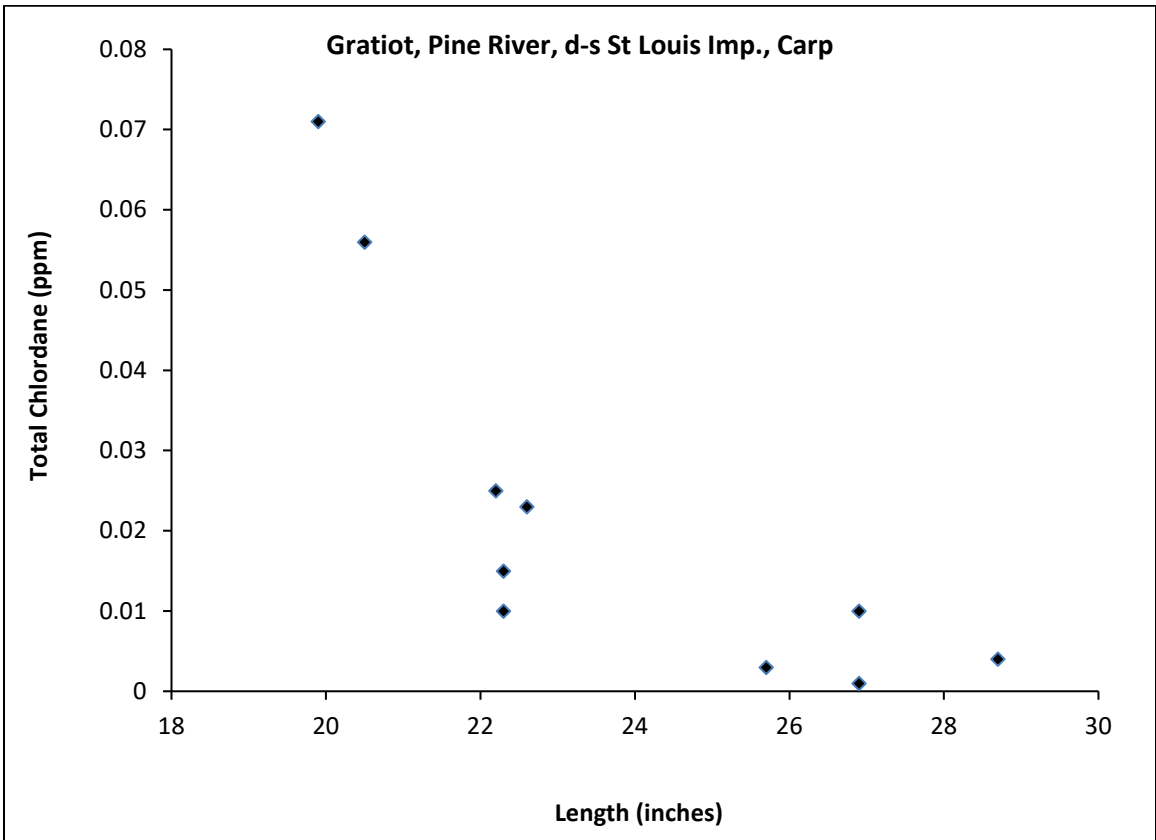
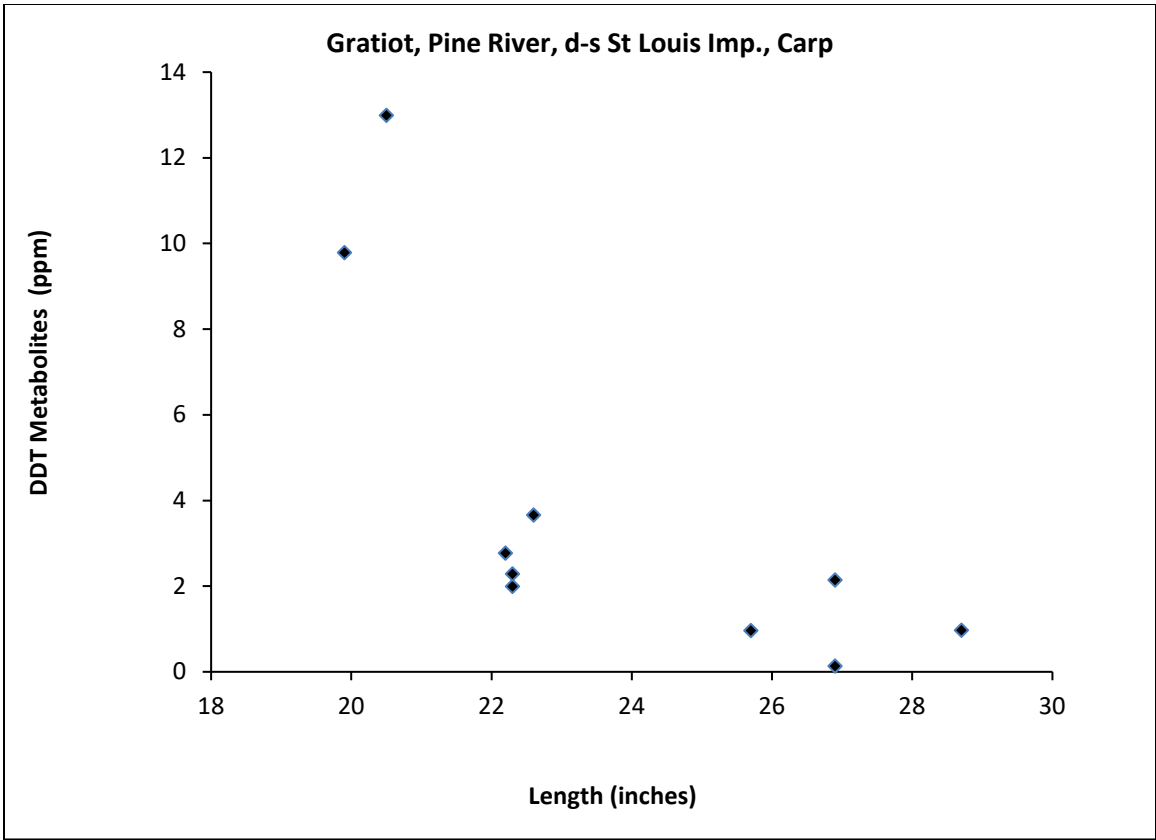
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	10	19.9	na	19.9	28.7
Datasets available: 1983, '85, '94, '97, 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	1.027	0.068	3.396	1.860	Limited
DDT	10	3.770	0.132	12.988	6.780	Limited
Chlordane	10	0.022	0.001	0.071	0.040	--
Toxaphene	10	ND	--	--	--	--
PBB	10	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.579*	0.698*				
DDT	0.527*	0.598*				
Chlordane	0.629*	0.710*				
Toxaphene	--	--				
PBB	--	--				
Final meal category based on UCL:						Limited

* - regression line has negative slope

Existing Advisory: No one should eat any fish of any species from the Pine River downstream of the Alma Dam due to DDT and PBB.

Recommendation: No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. Significant sediment removal operations in the impoundment have been completed and additional remediation within the impoundment is not planned. In-ground remediation continues at the former Velsicol plant site.





**Redhorse
& White Sucker**

**Pine River
Downstream of St. Louis Dam**

**Gratiot &
Midland Counties**

Hg Analysis:

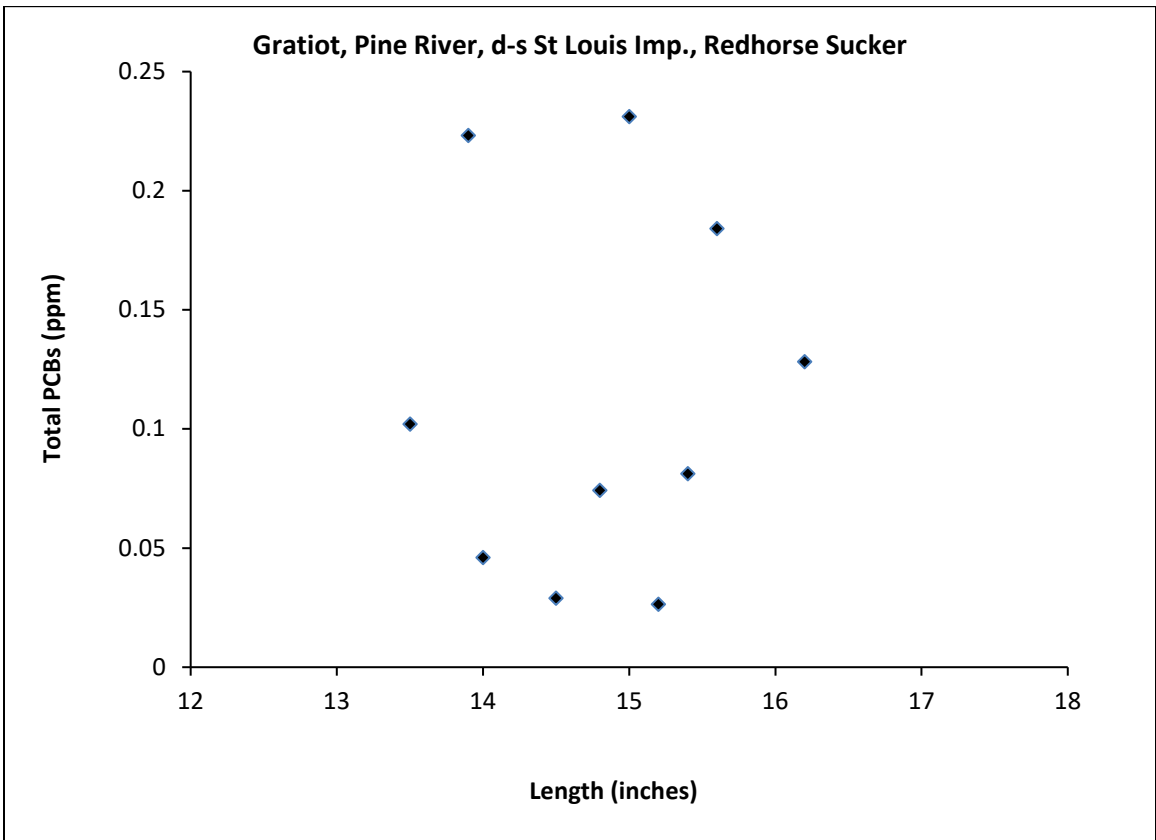
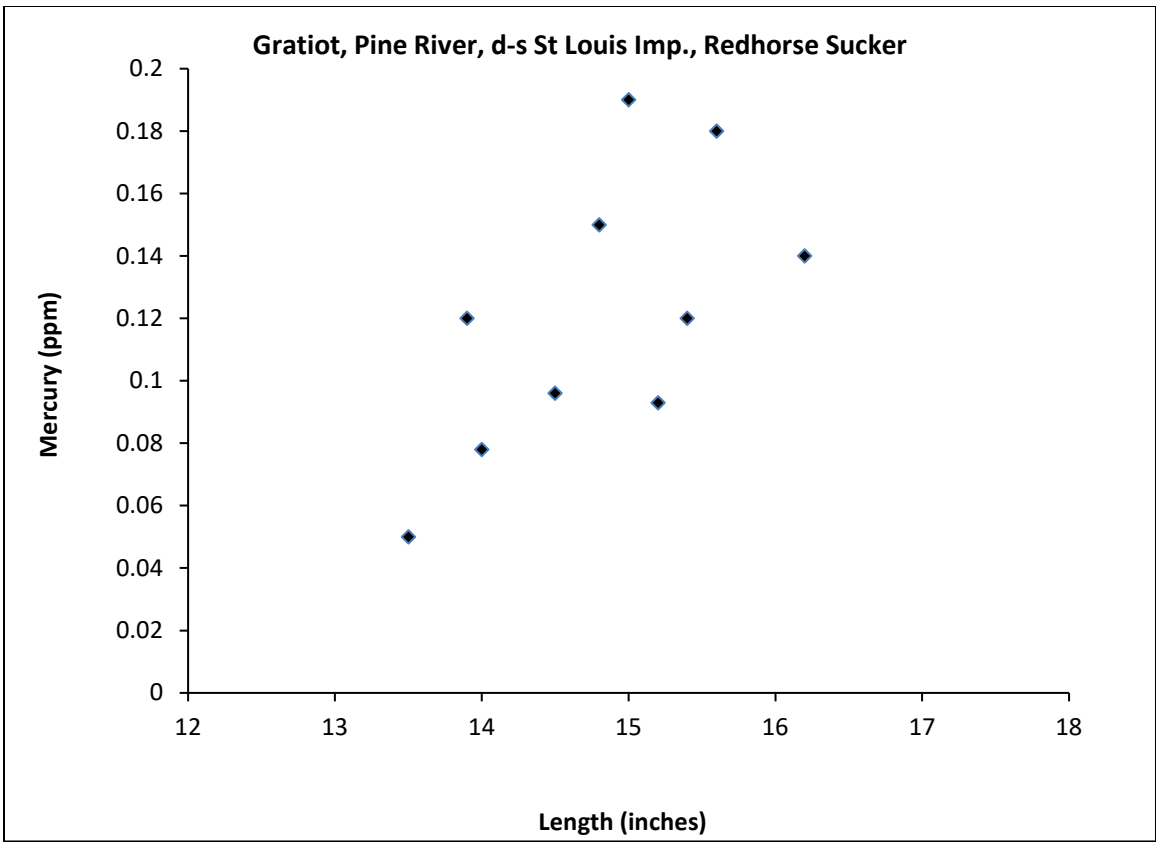
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	10	13.5	na	13.5	16.2
Datasets available: 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.12	0.05	0.19	0.15	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.392	0.458				

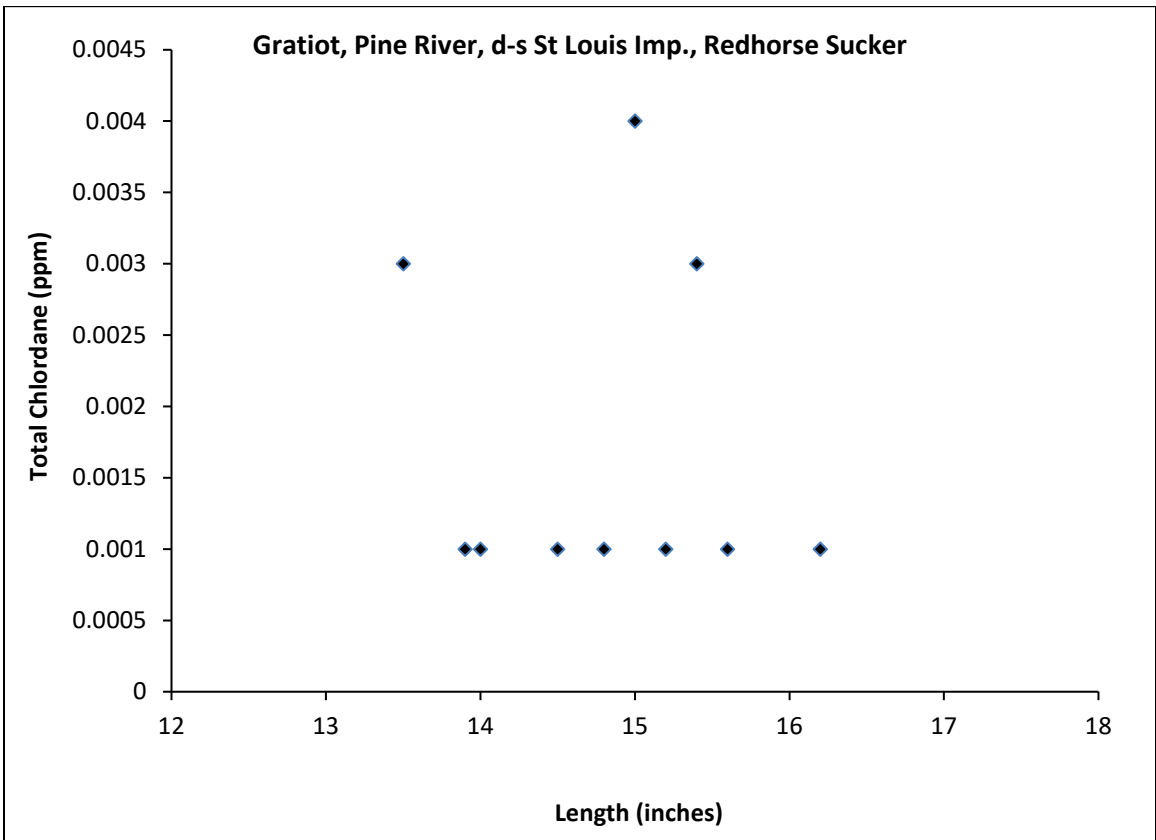
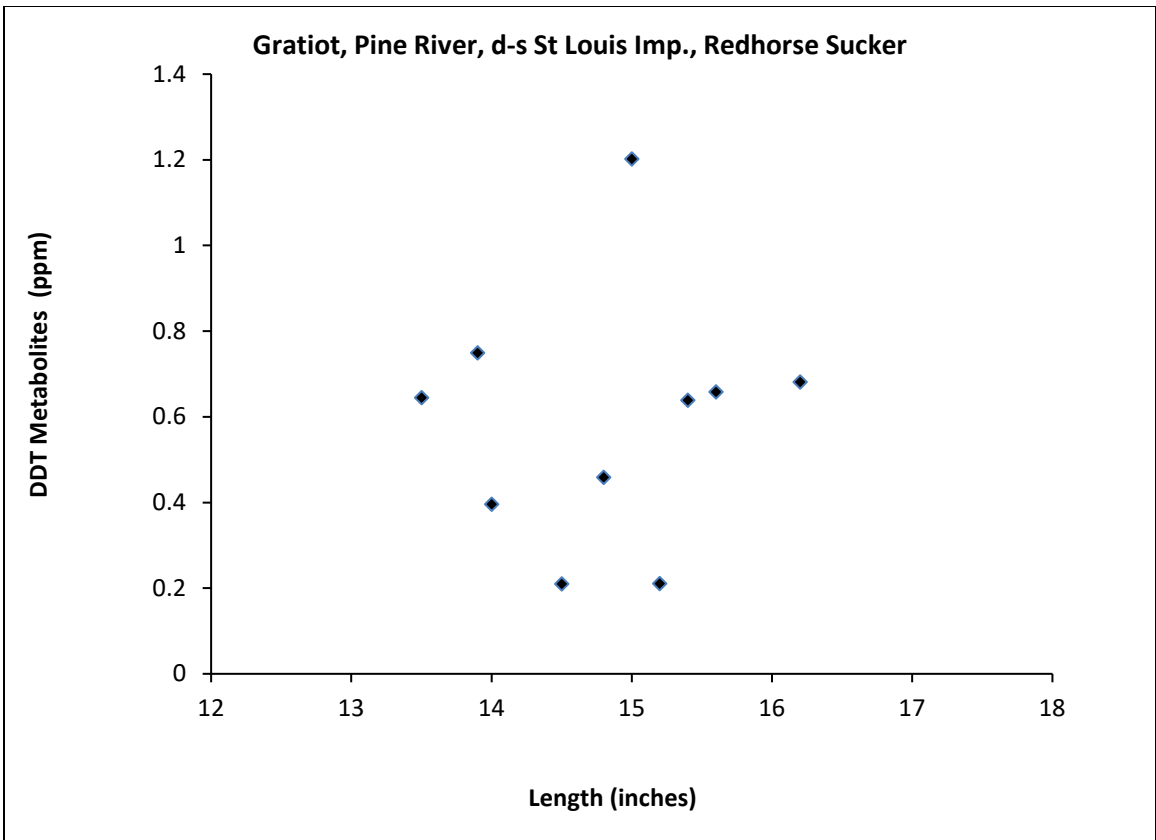
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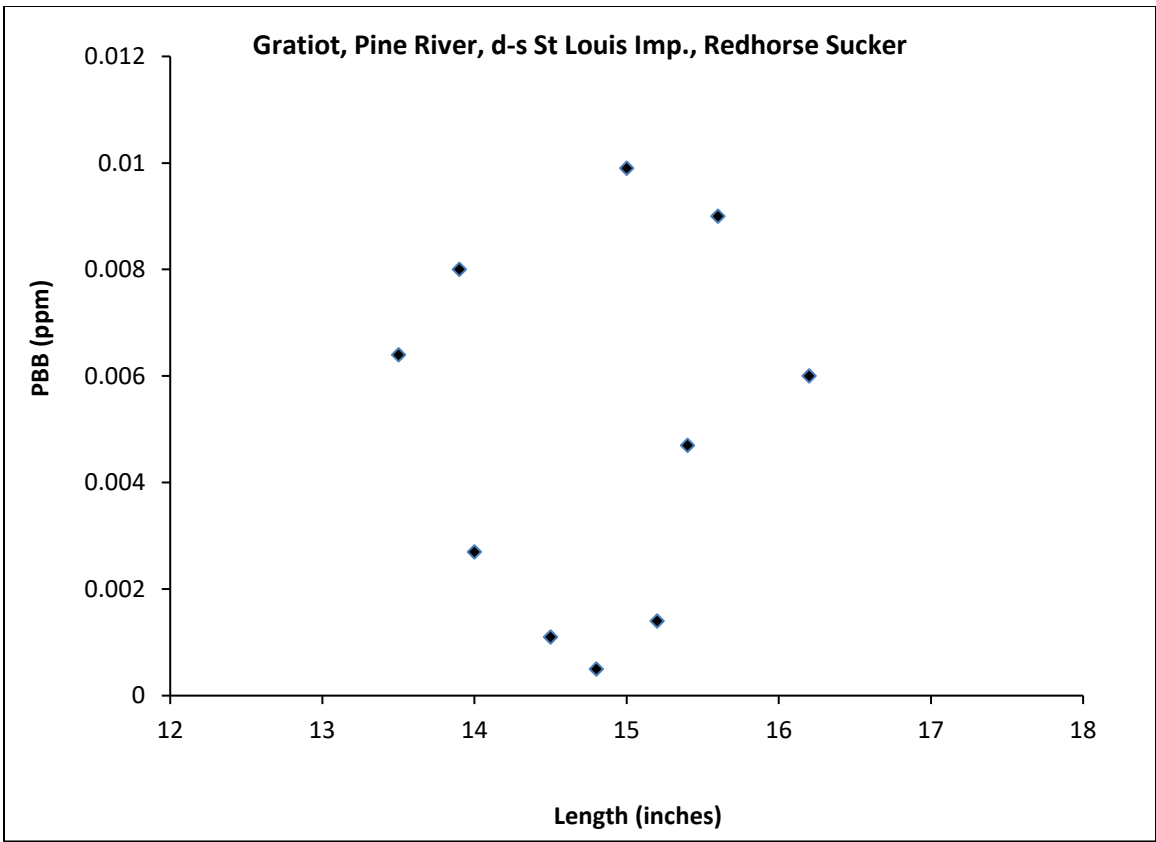
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	10	13.5	na	13.5	16.2
Datasets available: 1983, 1985, 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.113	0.027	0.231	0.170	1
DDT	10	0.585	0.210	1.202	0.790	2
Chlordane	10	0.002	0.001	0.004	0.000	--
Toxaphene	10	ND	--	--	--	--
PBB	10	0.005	0.001	0.010	0.010	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.005	0.010				
DDT	0.012	0.008				
Chlordane	0.010	0.014				
Toxaphene	--	--				
PBB	0.009	0.005				
Final meal category based on UCL:						1

Existing Advisory: No one should eat any fish of any species from the Pine River downstream of the Alma Dam due to DDT and PBB.

Recommendation: No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. Significant sediment removal operations in the impoundment have been completed and additional remediation within the impoundment is not planned. In-ground remediation continues at the former Velsicol plant site.







Smallmouth Bass

**Pine River
Downstream of St. Louis Dam**

**Gratiot &
Midland Counties**

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	10	13.0	14	13.7	17.9
Datasets available: 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	9	0.32	0.12	0.73	0.46	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.767	0.721				

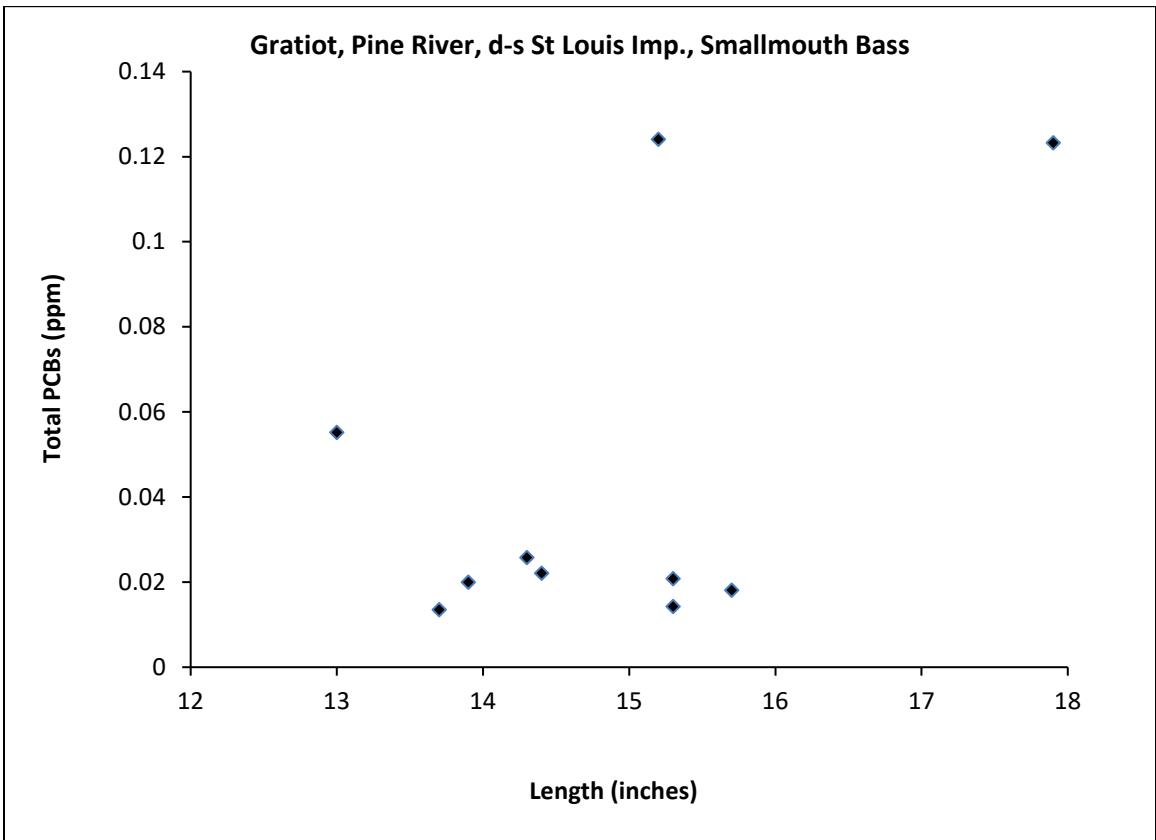
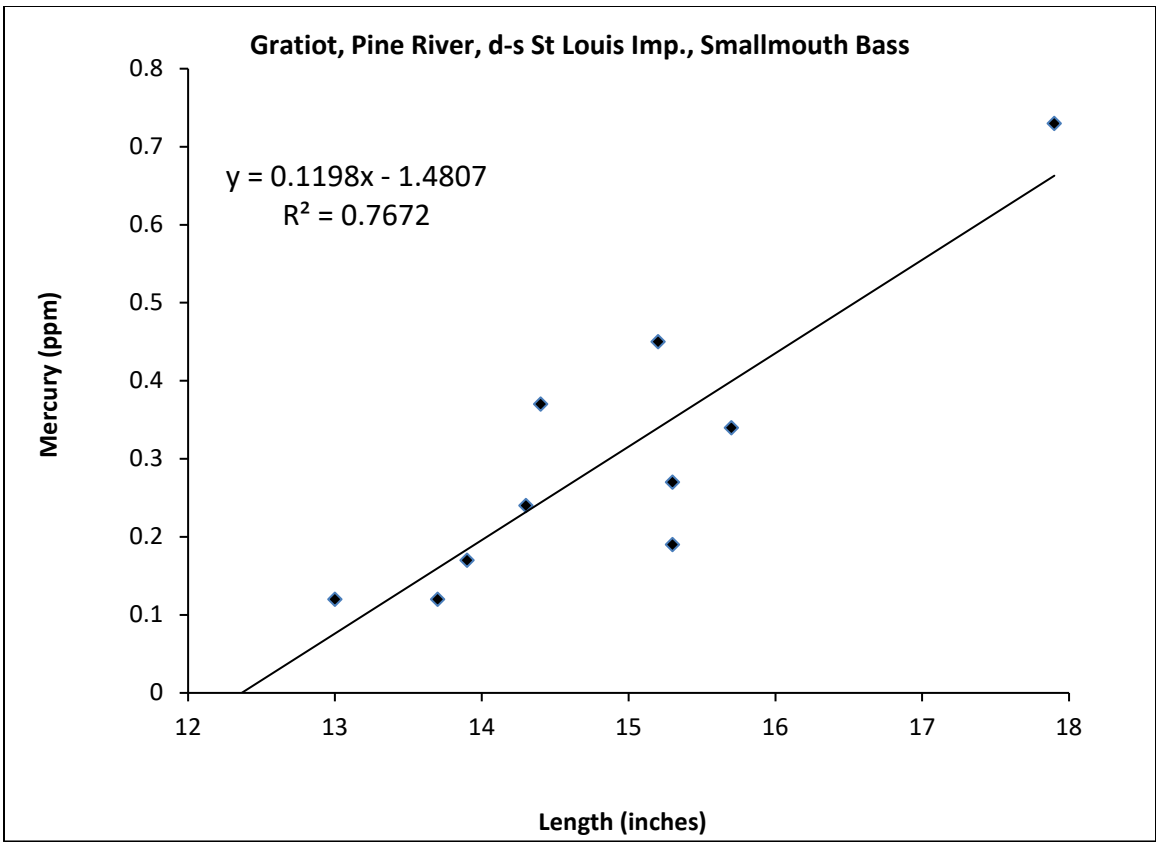
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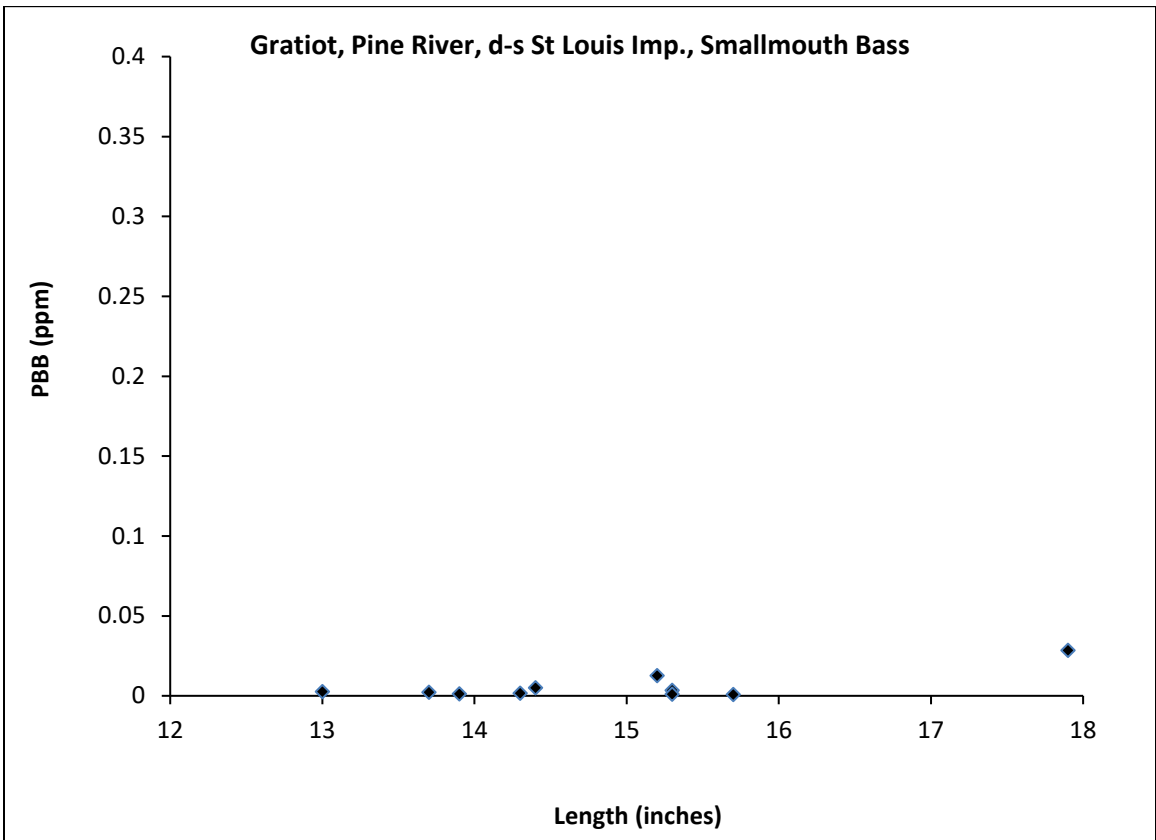
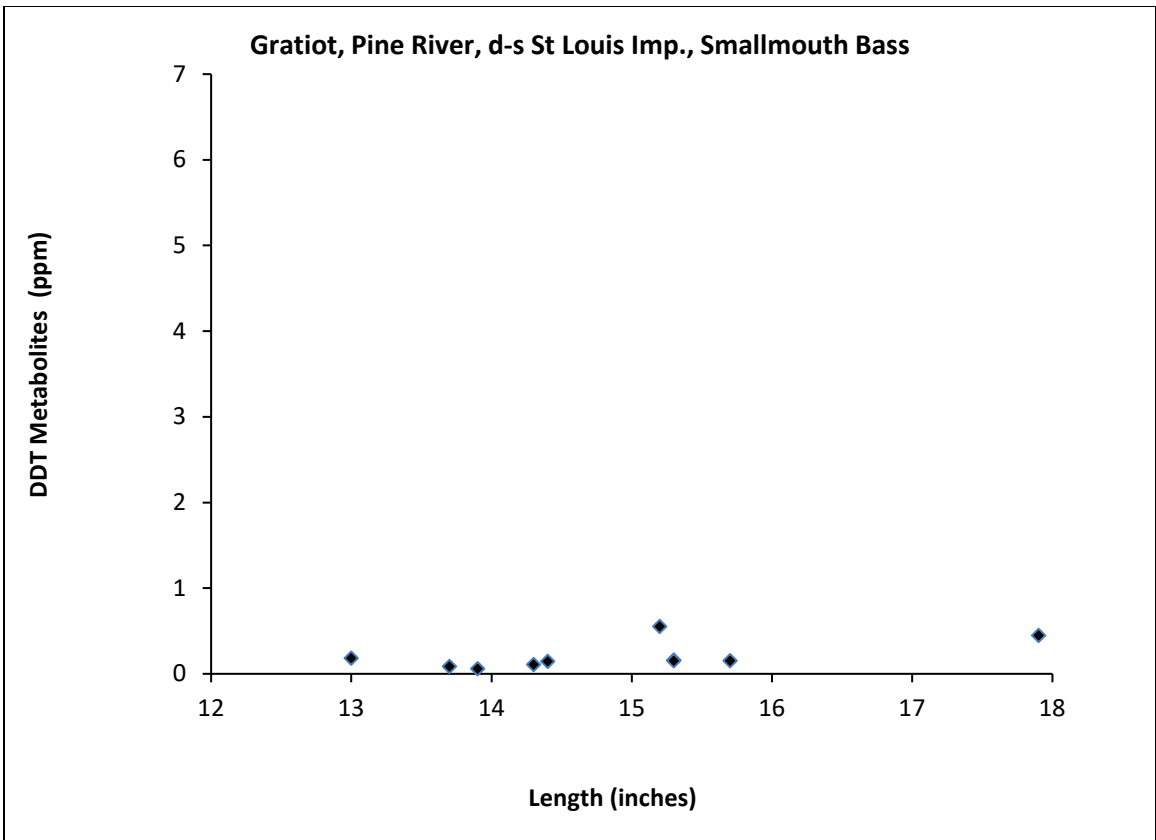
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	10	13.0	14	13.7	17.9
Datasets available: 1983, 1985, 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	9	0.042	0.014	0.124	0.078	2
DDT	9	0.207	0.059	0.551	0.339	4
Chlordane	9	ND	--	--	--	--
Toxaphene	9	ND	--	--	--	--
PBB	9	0.006	0.001	0.029	0.013	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.275	0.175				
DDT	0.352	0.390				
Chlordane	--	--				
Toxaphene	--	--				
PBB	0.424	0.541				
Final meal category based on UCL:						2

Existing Advisory: No one should eat any fish of any species from the Pine River downstream of the Alma Dam due to DDT and PBB.

Recommendation: No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. No change is recommended until additional sampling verifies that the apparent decline in DDT concentrations is significant and widespread within the impoundment. Significant sediment removal operations in the impoundment have been completed and additional remediation within the impoundment is not planned. In-ground remediation continues at the former Velsicol plant site.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
12	0	16
13	0.08	12
14	0.2	4
15	0.32	2
16	0.44	2
17	0.56	1
18	0.68	1
19	0.8	1
20	0.92	1
<i>Shaded area denotes extrapolated estimates</i>		





Rabbit River Allegan County

Carp

**Rabbit River
At Hamilton**

Allegan County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	20	20.1	Na	20.1	29.7
Datasets available: 2003						
Chemical	Sample Size (Legal)	Mean Conc. (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	20	0.25	0.08	0.39	0.29	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.003	0.001				

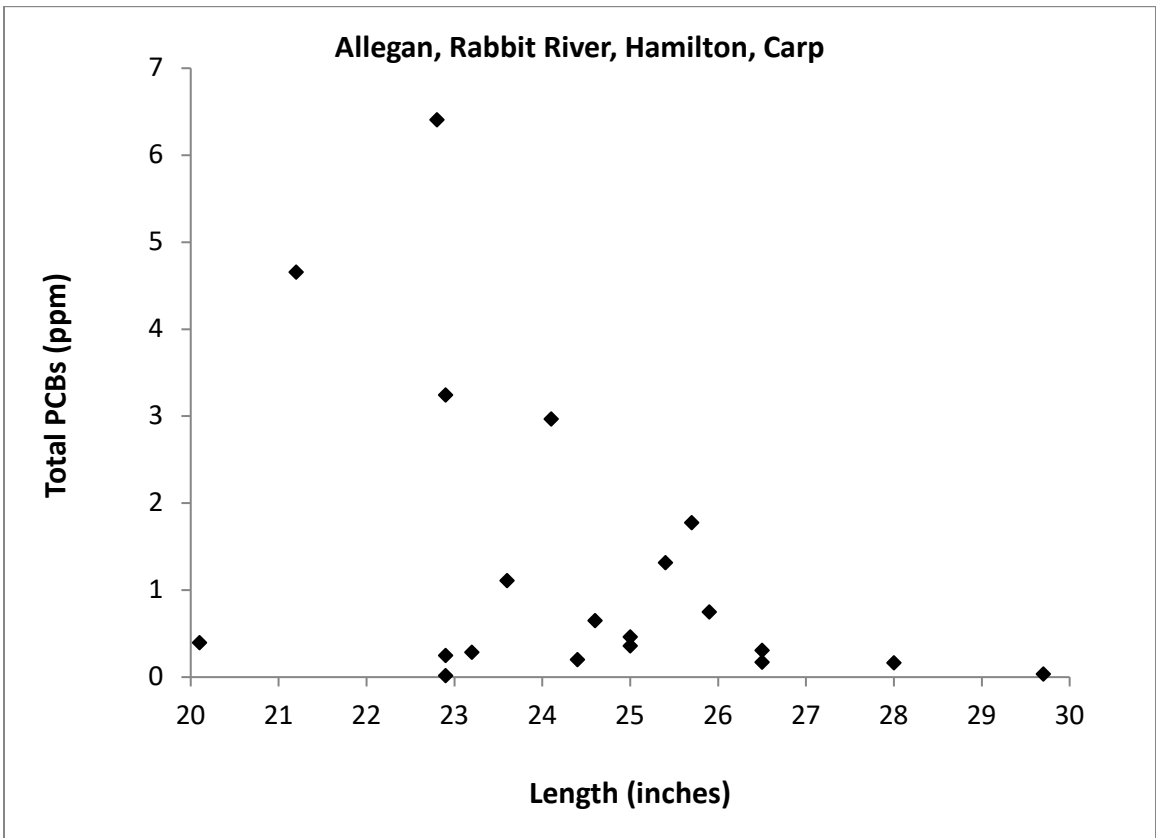
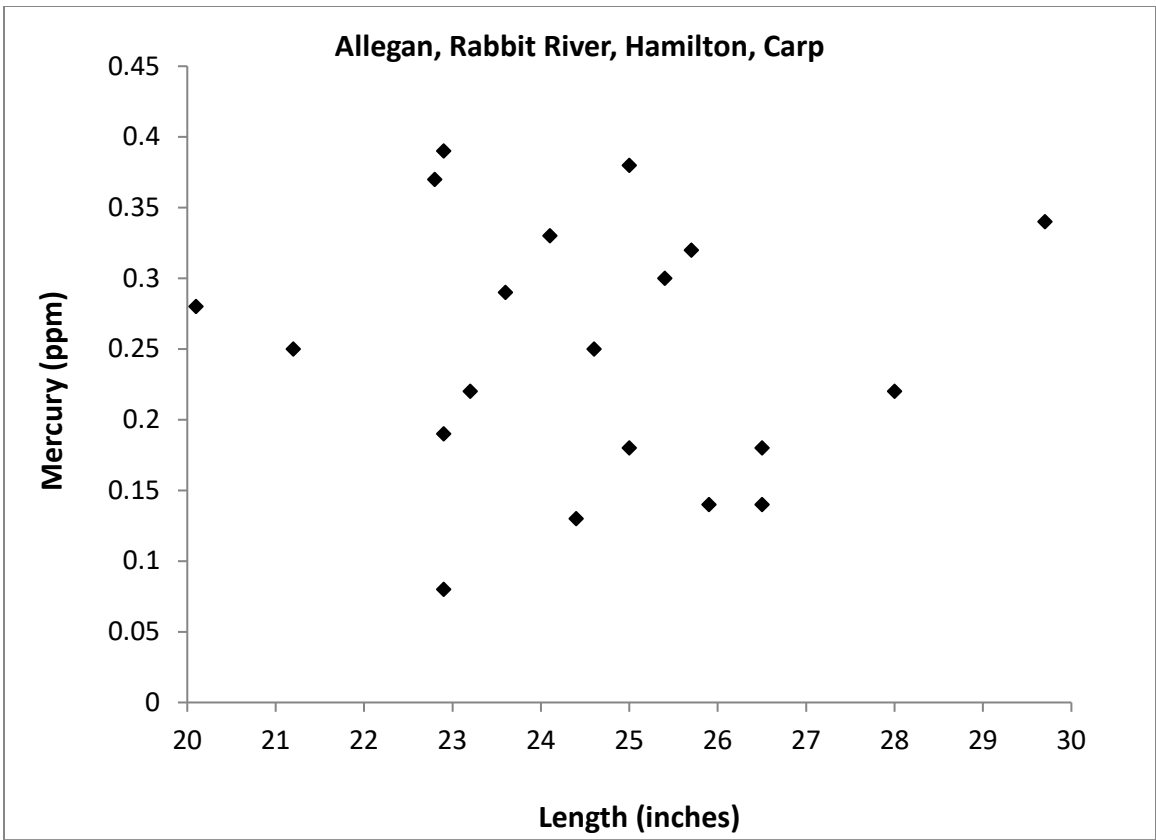
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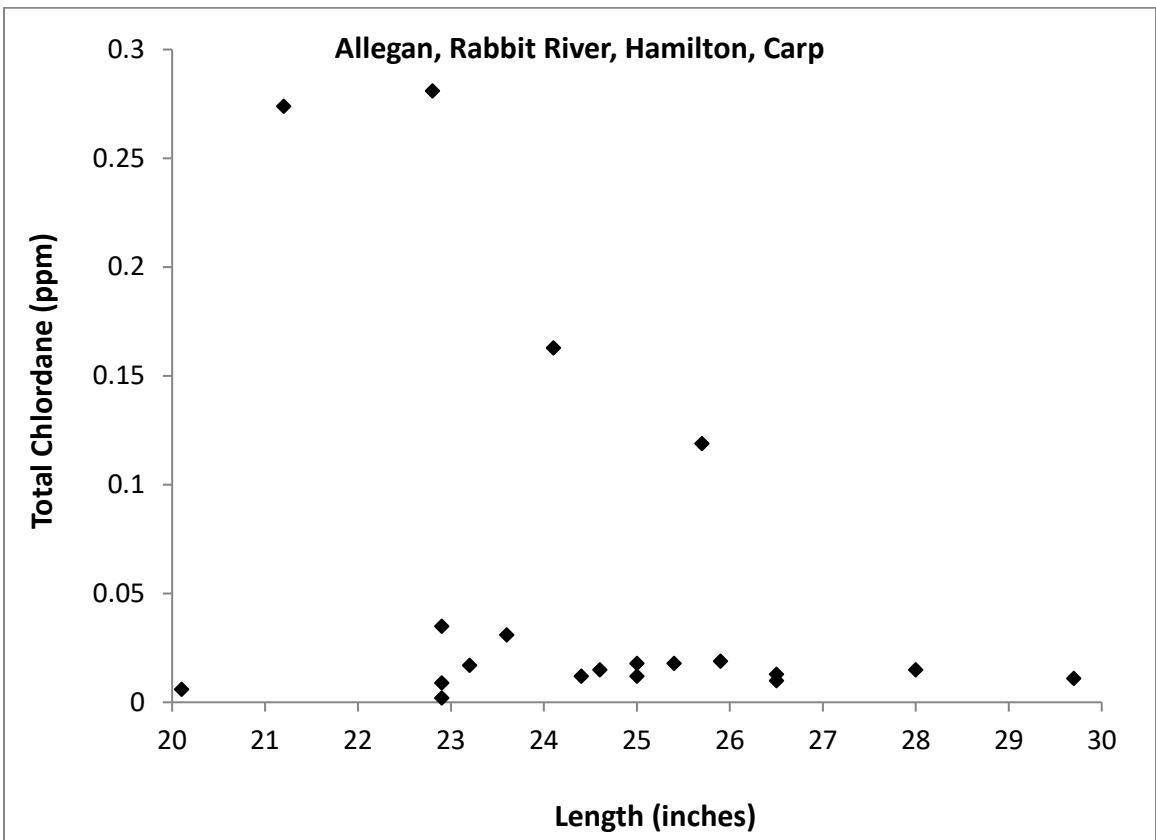
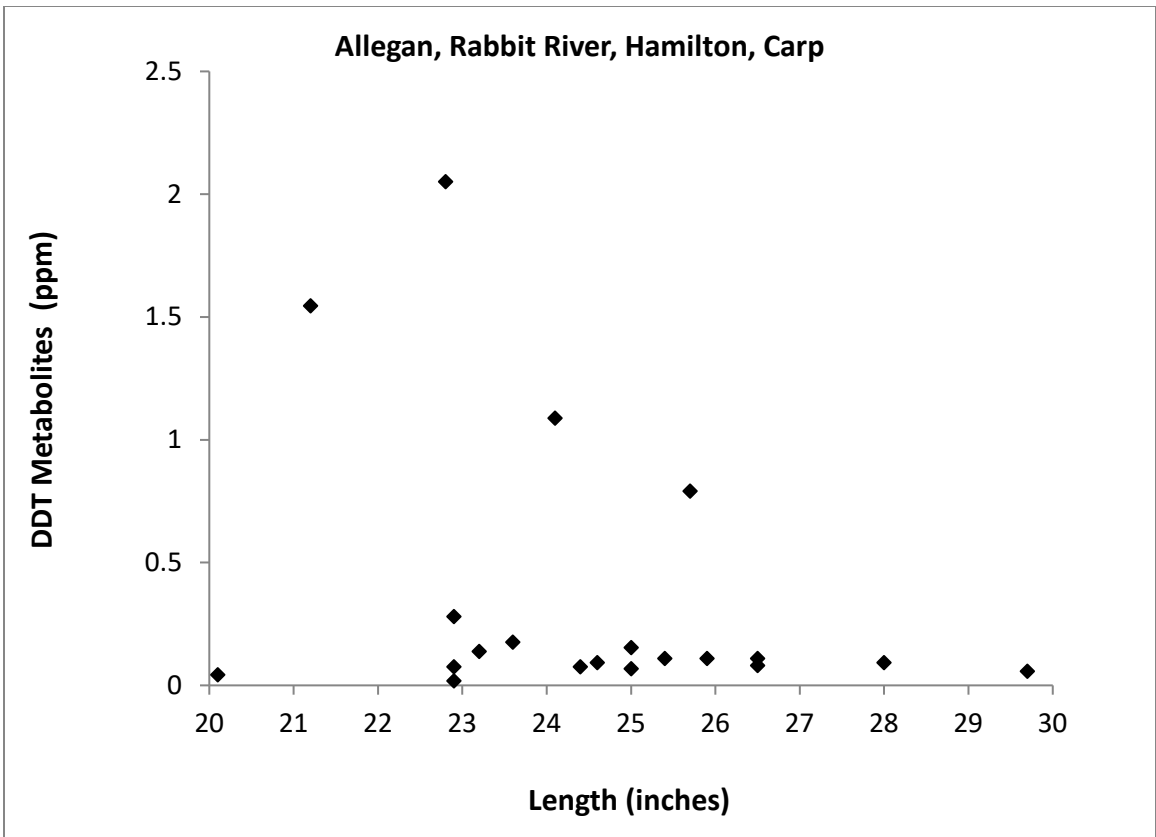
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	20	20.1	Na	20.1	29.7
Datasets available: 2003						
Chemical	Sample Size (Legal)	Mean Conc. (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	20	1.28	0.02	6.41	2.09	Limited
DDT	20	0.36	0.02	2.05	0.62	2
Chlordane	20	0.05	0.002	0.28	0.09	--
Toxaphene	20	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.166	0.157				
DDT	0.109	0.048				
Chlordane	0.118	0.031				
Toxaphene	--	--				
Final meal category based on UCL:						Limited

Existing Advisory: Sensitive populations should not eat these fish. Healthy adults should not eat more than 1 or 2 meals per year of Hamilton Impoundment carp due to PCBs. Mercury would cause an advisory.

Recommendation: No change. DDT should be added to the contaminant list.

Note: Samples collected downstream of the Hamilton Dam were not included in the original evaluation. The dam is no longer a significant impediment to fish passage, and this evaluation includes fish collected near Hamilton but downstream of the dam site on the same date as those collected from the impoundment.





Largemouth Bass

Rabbit River
At Hamilton

Allegan County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	8	10.4	14	14.4	16
Datasets available: 2003						
Chemical	Sample Size (Legal)	Mean Conc. (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	4	0.62	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.786	0.846				

Organics Analysis:

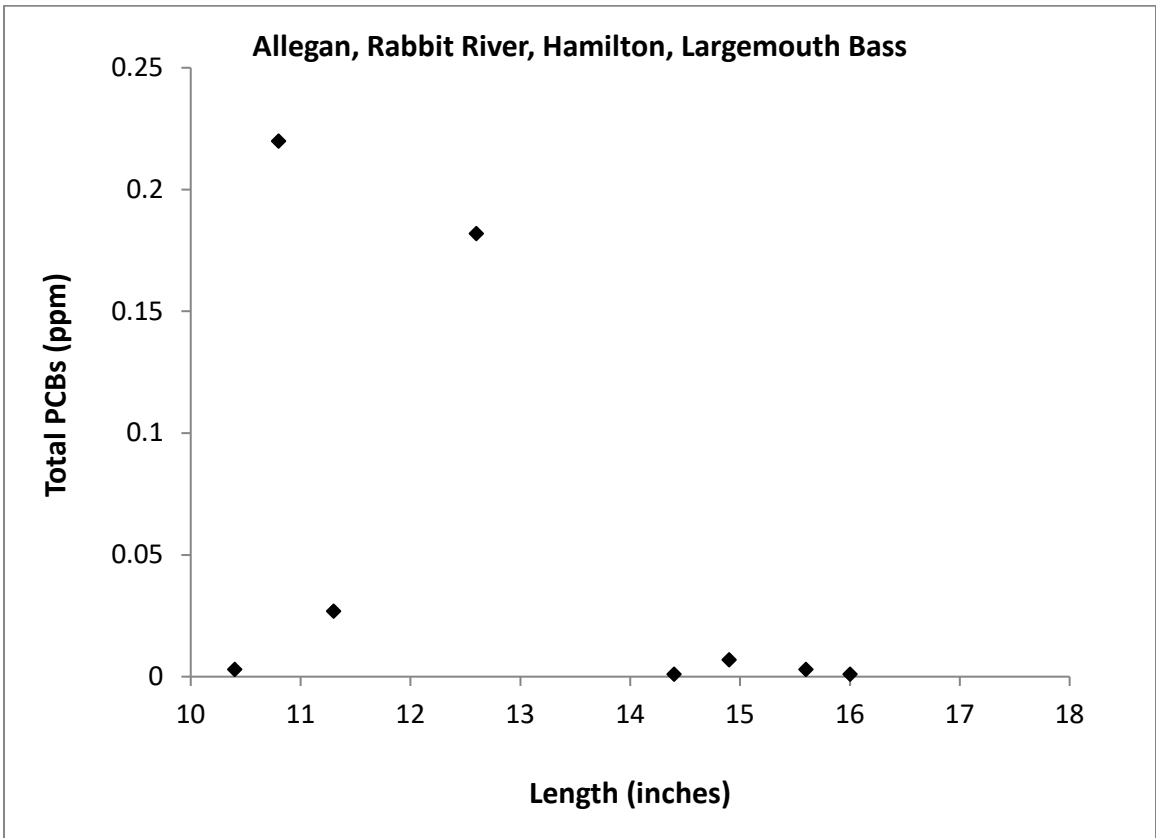
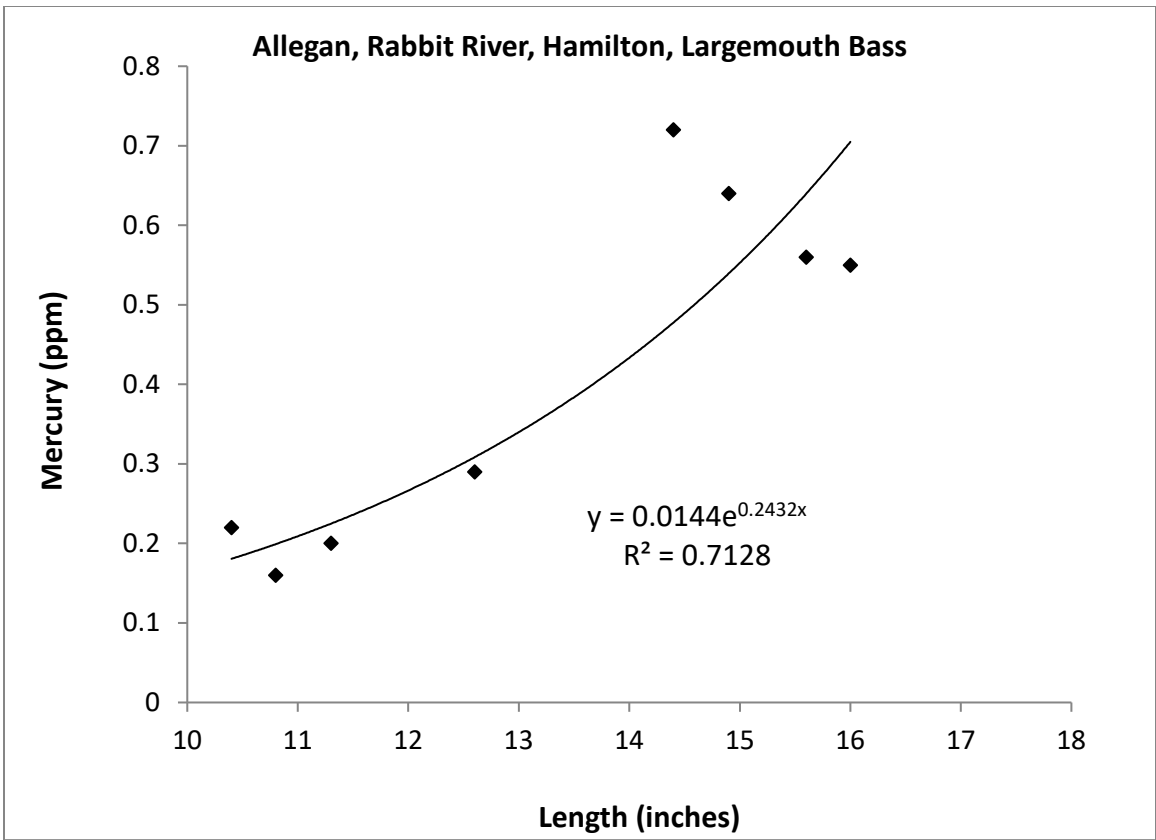
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	8	10.4	14	14.4	16
Datasets available: 2003						
Chemical	Sample Size (Legal)	Mean Conc. (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	4	0.003	--	--	--	--
DDT	4	0.005	--	--	--	--
Chlordane	4	0.001	--	--	--	--
Toxaphene	4	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.237	0.359				
DDT	0.197	0.309				
Chlordane	0.014	0.014				
Toxaphene	--	--				
Final meal category based on UCL:						--

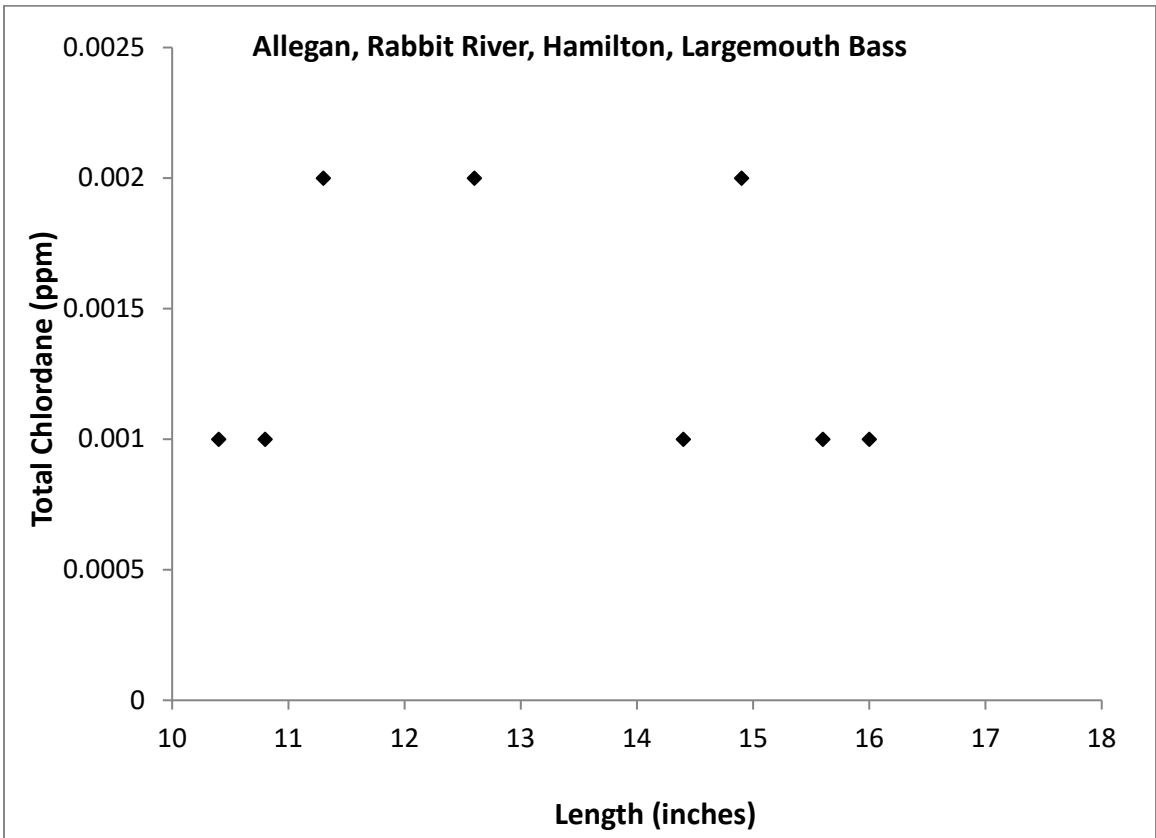
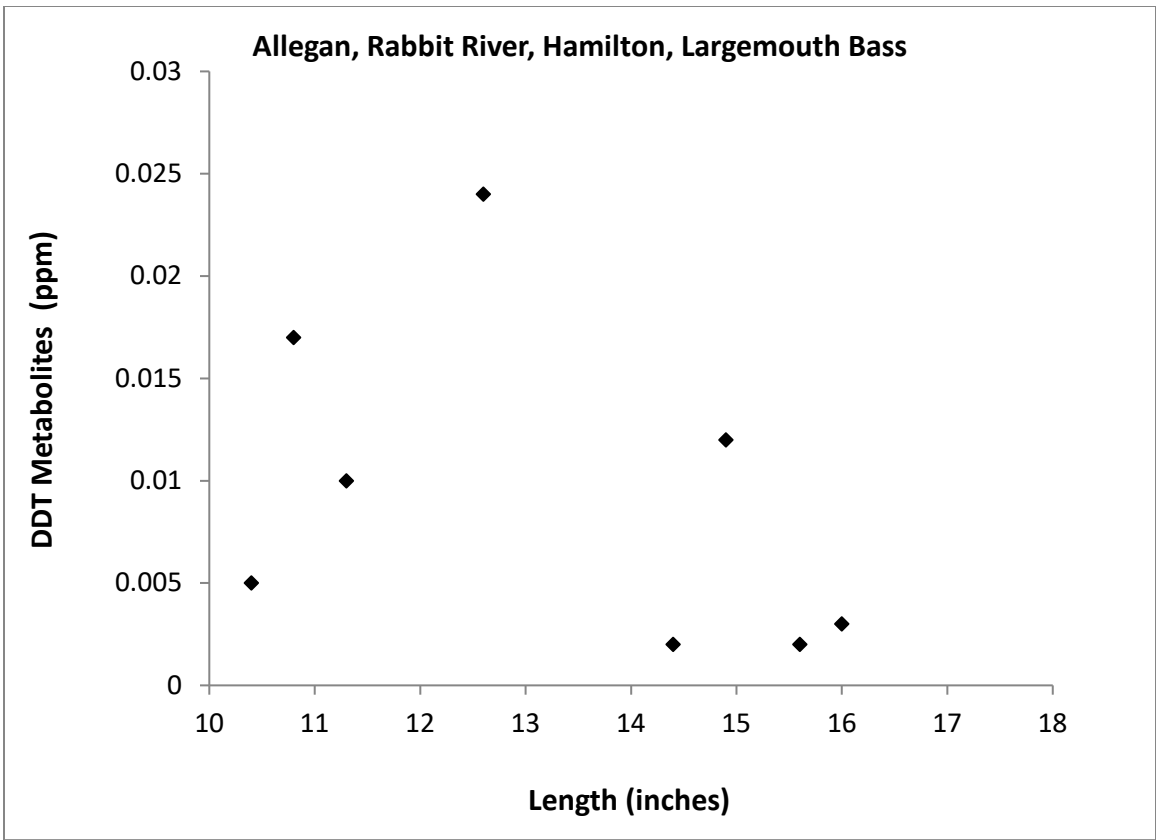
Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
10	0.16	4
12	0.27	4
14	0.43	2
16	0.71	1
18	1.15	0.5
20	1.87	0.5
<i>Shaded area denotes extrapolated estimates</i>		

Existing Advisory: Statewide guidelines were applied due to insufficient sample size: no one should eat more than 2 meals per month of legal size largemouth bass under 18 inches or more than 1 meal per month of those fish larger than 18 inches.

Recommendation: No change. As the size range of the fish was limited and there was not a sufficient number of fish to calculate a UCL, the Statewide guidelines were retained.

Note: Samples collected downstream of the Hamilton Dam were not included in the original evaluation. The dam is no longer a significant impediment to fish passage, and this evaluation includes fish collected near Hamilton but downstream of the dam site on the same date as those collected from the impoundment.





Northern Pike

**Rabbit River
At Hamilton**

Allegan County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	7	17.7	24	17.7	28.3
Datasets available: 2003						
Chemical	Sample Size (Legal)	Mean Conc. (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	2	0.44	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.057	0.052				

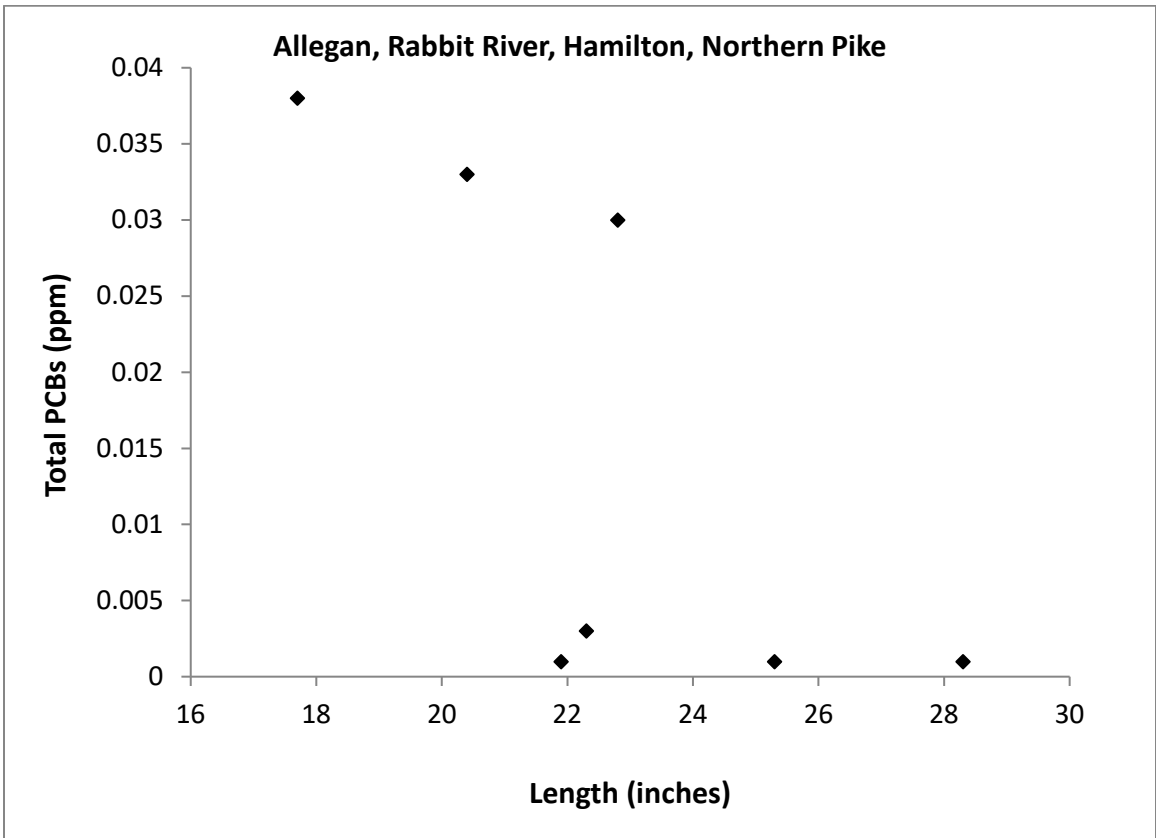
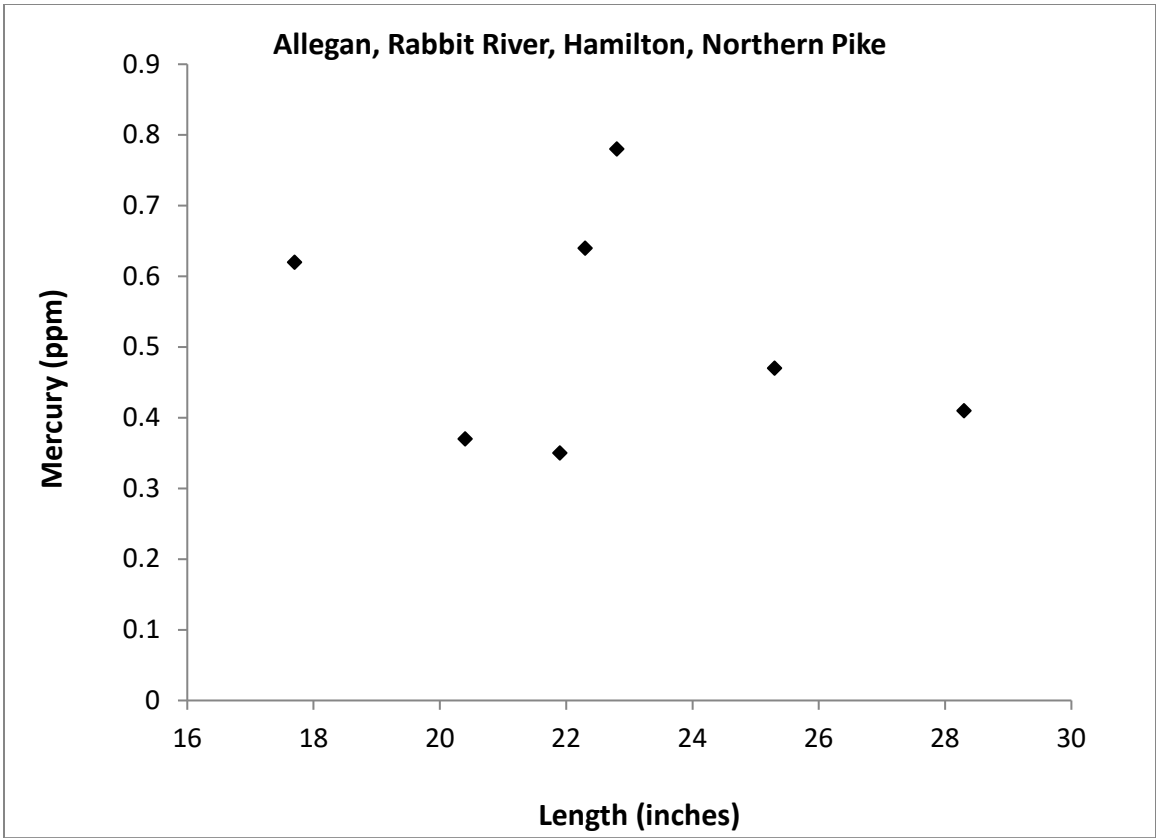
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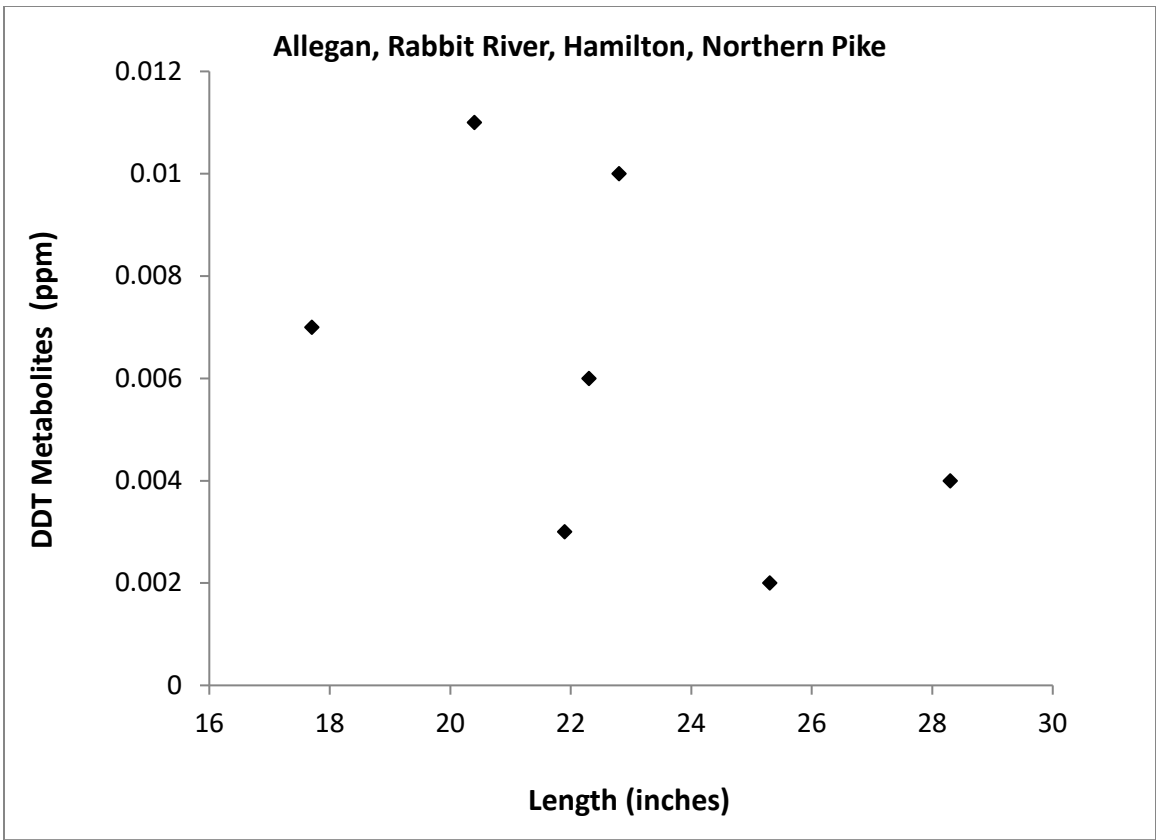
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	7	17.7	24	17.7	28.3
Datasets available: 2003						
Chemical	Sample Size (Legal)	Mean Conc. (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	2	ND	--	--	--	--
DDT	2	0.003	--	--	--	--
Chlordane	2	ND	--	--	--	--
Toxaphene	2	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.514	0.517				
DDT	0.254	0.273				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						--

Existing Advisory: Statewide guidelines were applied due to insufficient sample size: no one should eat more than 2 meals per month of northern pike under 30 inches or more than 1 meal per month of those fish larger than 30 inches.

Recommendation: No change.

Note: Samples collected downstream of the Hamilton Dam were not included in the original evaluation. The dam is no longer a significant impediment to fish passage, and this evaluation includes fish collected near Hamilton but downstream of the dam site on the same date as those collected from the impoundment.





Redhorse Sucker

**Rabbit River
At Hamilton**

Allegan County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	20	10.1	na	10.1	19.3
Datasets available: 2003						
Chemical	Sample Size (Legal)	Mean Conc. (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	20	0.18	0.04	0.53	0.25	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.559	0.422				

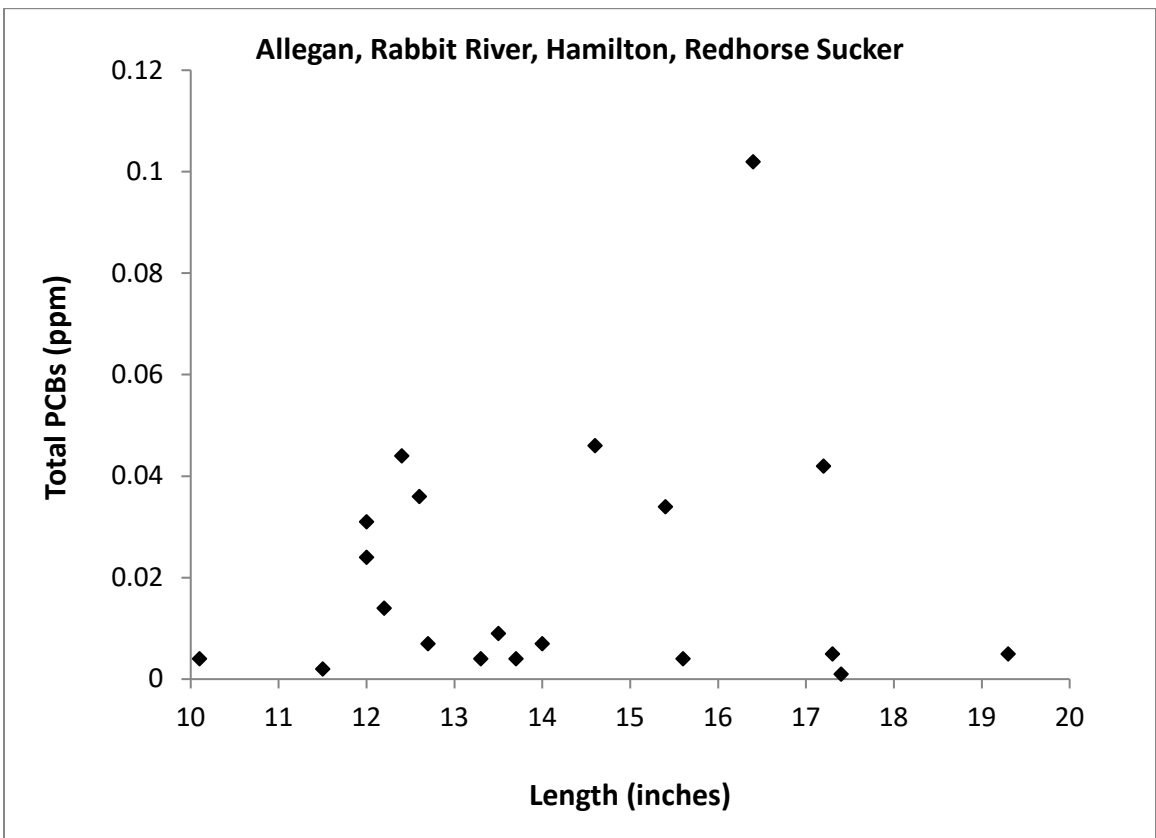
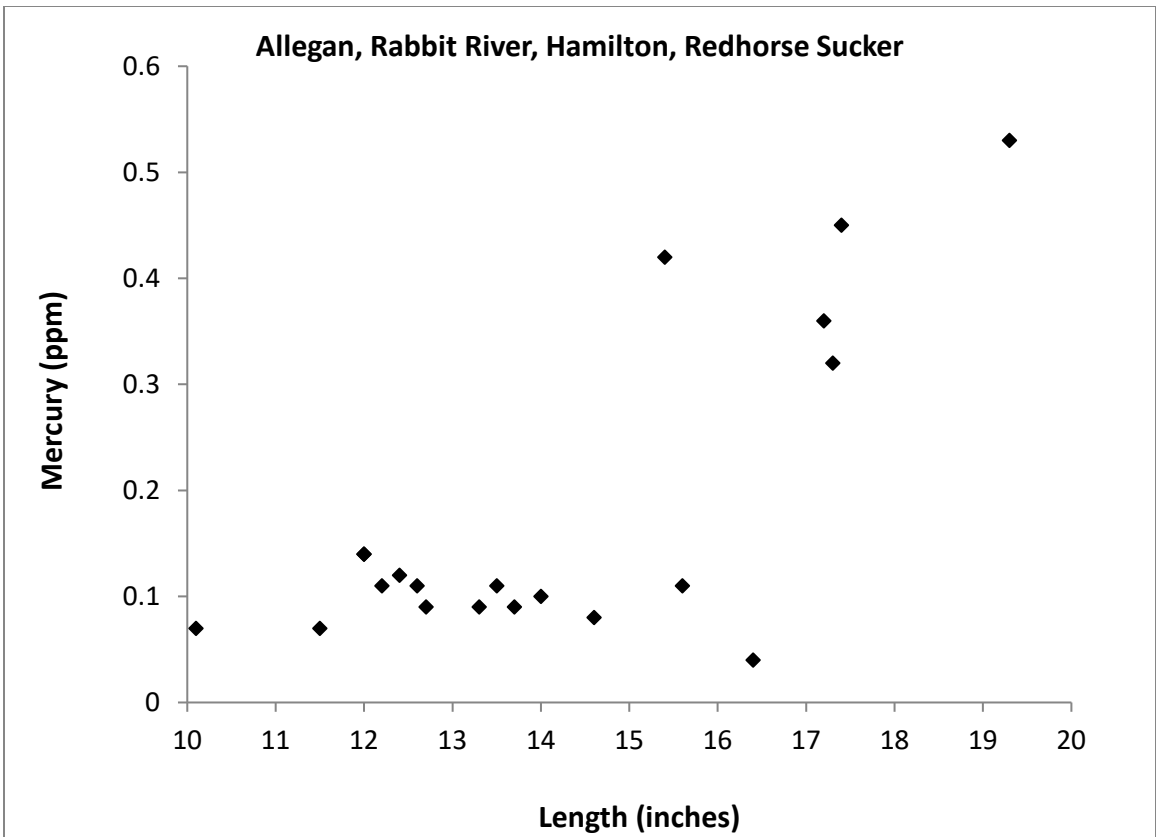
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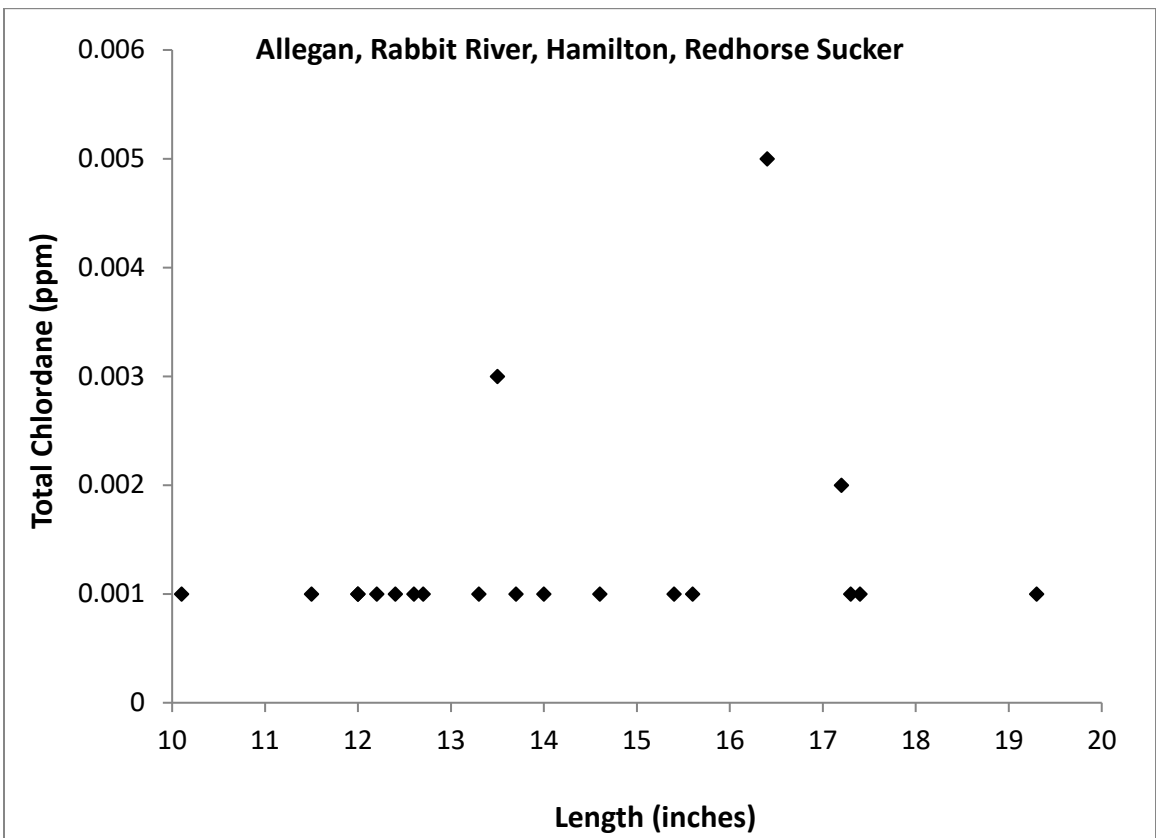
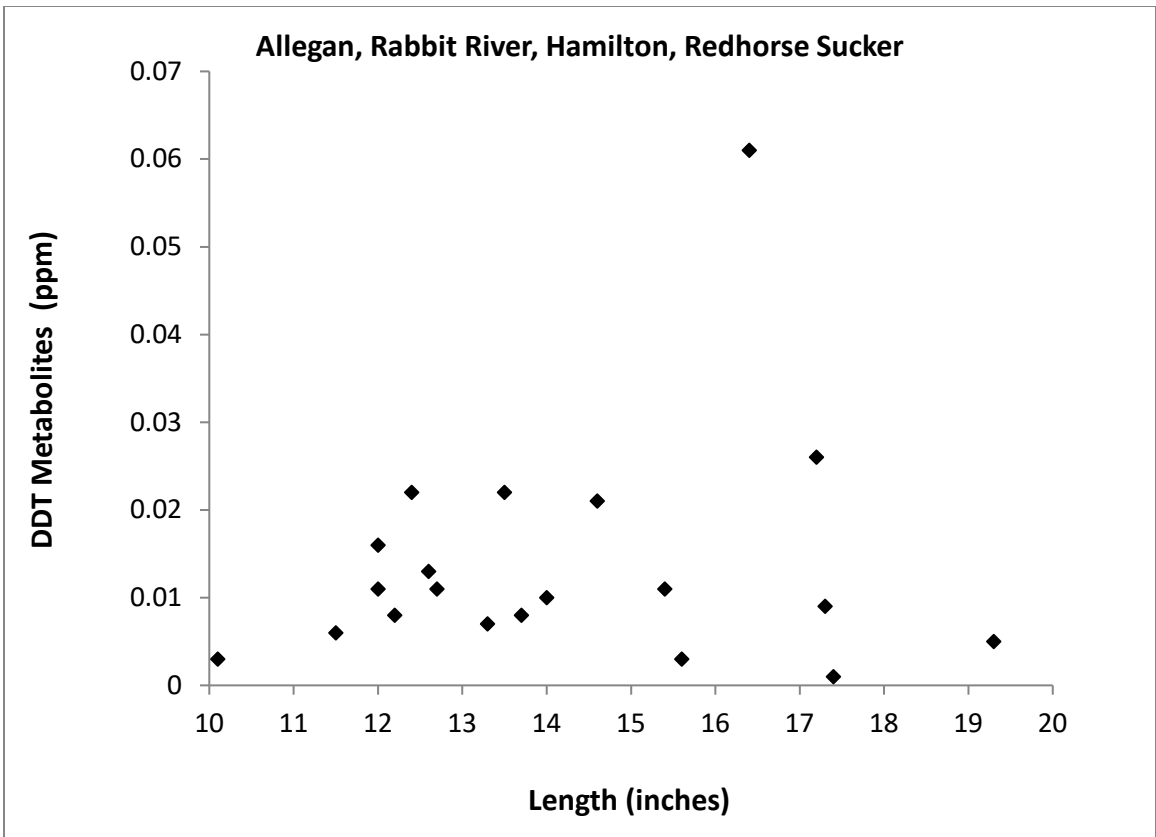
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	20	10.1	na	10.1	19.3
Datasets available: 2003						
Chemical	Sample Size (Legal)	Mean Conc. (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	20	0.02	0.001	0.10	0.03	4
DDT	20	0.01	0.001	0.06	0.02	16
Chlordane	20	0.001	0.001	0.005	0.002	--
Toxaphene	20	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.016	0.002				
DDT	0.026	0.003				
Chlordane	0.056	0.061				
Toxaphene	--	--				
Final meal category based on UCL:						4

Existing Advisory: No one should eat more than 4 meals per month of Hamilton Impoundment suckers less than 16 inches in length or more than 2 meals per month of those fish larger than 16 inches due to mercury. PCBs would cause an advisory.

Recommendation: No change.

Note: Samples collected downstream of the Hamilton Dam were not included in the original evaluation. The dam is no longer a significant impediment to fish passage, and this evaluation includes fish collected near Hamilton but downstream of the dam site on the same date as those collected from the impoundment.





Rock Bass

**Rabbit River
At Hamilton**

Allegan County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	5	7	na	7	8.3
Datasets available: 2003						
Chemical	Sample Size (Legal)	Mean Conc. (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	5	0.19	0.13	0.21	0.23	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.022	0.021				

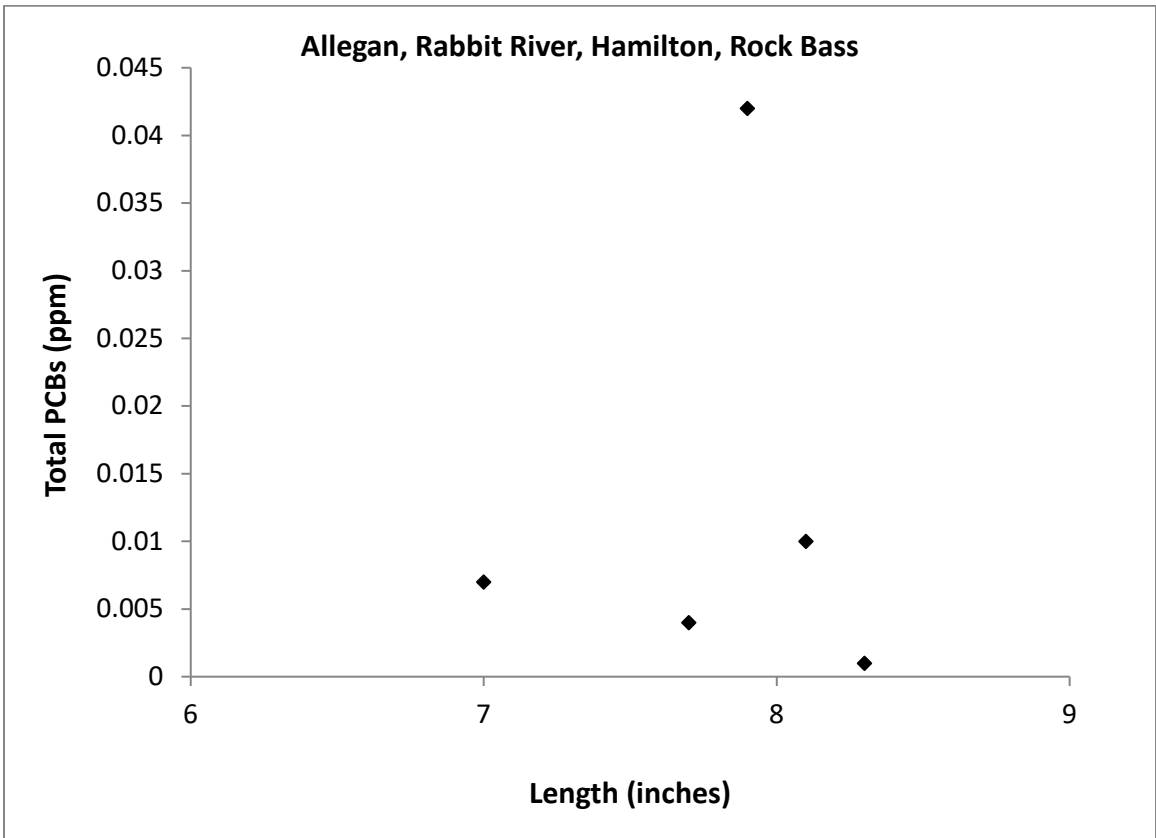
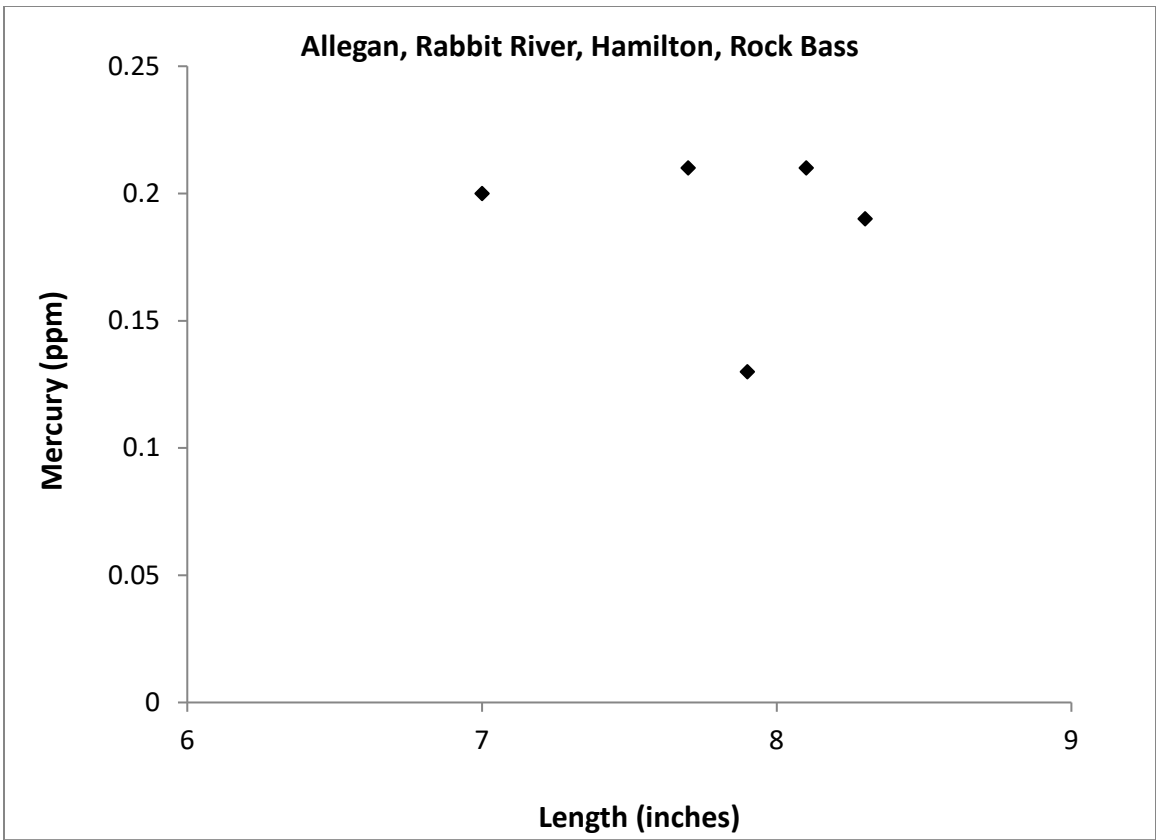
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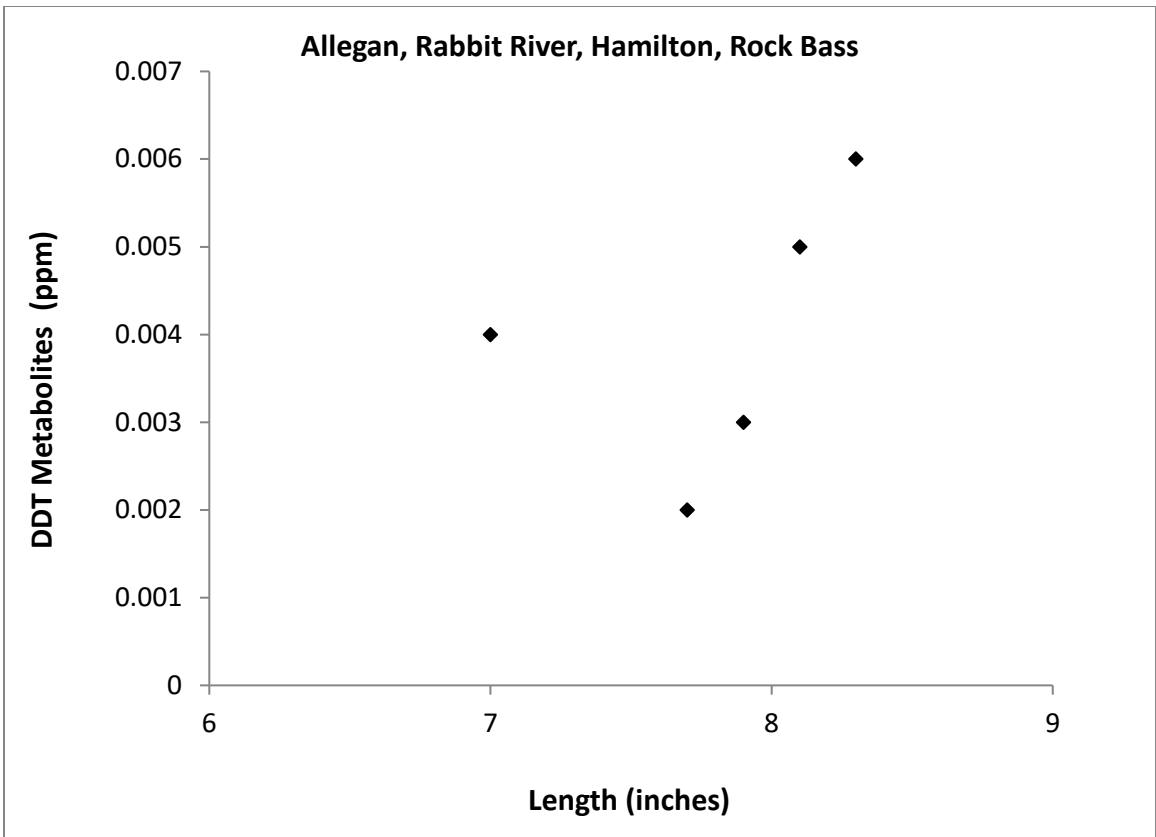
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	5	7	na	7	8.3
Datasets available: 2003						
Chemical	Sample Size (Legal)	Mean Conc. (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	5	0.013	0.001	0.042	0.033	4
DDT	5	0.004	0.002	0.006	0.006	16
Chlordane	5	ND	--	--	--	--
Toxaphene	5	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.003	0.054				
DDT	0.196	0.128				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						4

Existing Advisory: No one should eat more than 4 meals per month of Rabbit River rock bass downstream of the Hamilton Dam.

Recommendation: No one should eat more than 4 meals per month of Rabbit River rock bass due to mercury and PCBs.

Note: The dam is no longer a significant impediment to fish passage.





Rogue River Kent County

Brown Trout

**Rogue River
Downstream of Rockford Dam**

Kent County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2019	2019	10	7.6	10.0	9.9	15.7
Datasets available: 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	5	0.13	0.05	0.20	0.19	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.635	0.586				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2019	2019	10	7.6	10.0	7.6	15.7
Datasets available: 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	--	--	--	--	--	--
DDT	--	--	--	--	--	--
Chlordane	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--
PFOS	10*	46.8 ppb	20.3 ppb	91.8 ppb	64.1 ppb	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	-	-				
DDT	-	-				
Chlordane	-	-				
Toxaphene	-	-				
PFOS	0.348	0.359	Final meal category based on UCL:			2

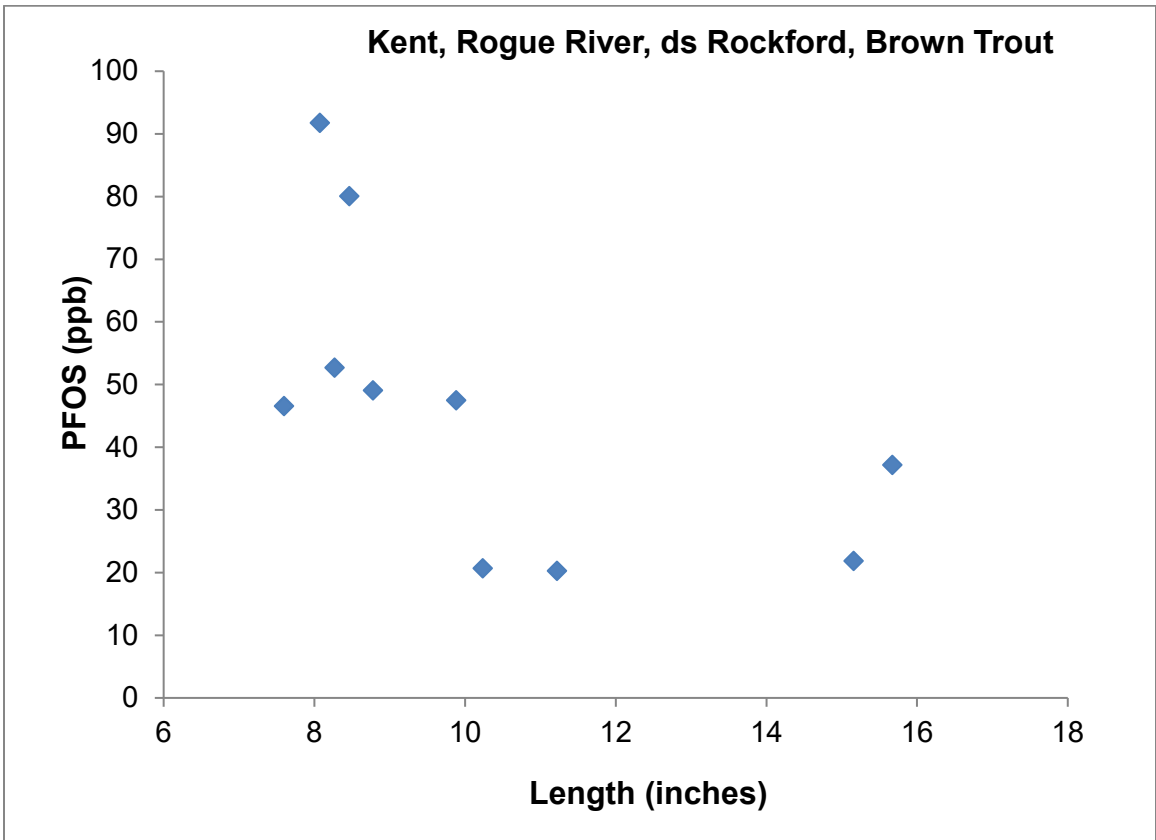
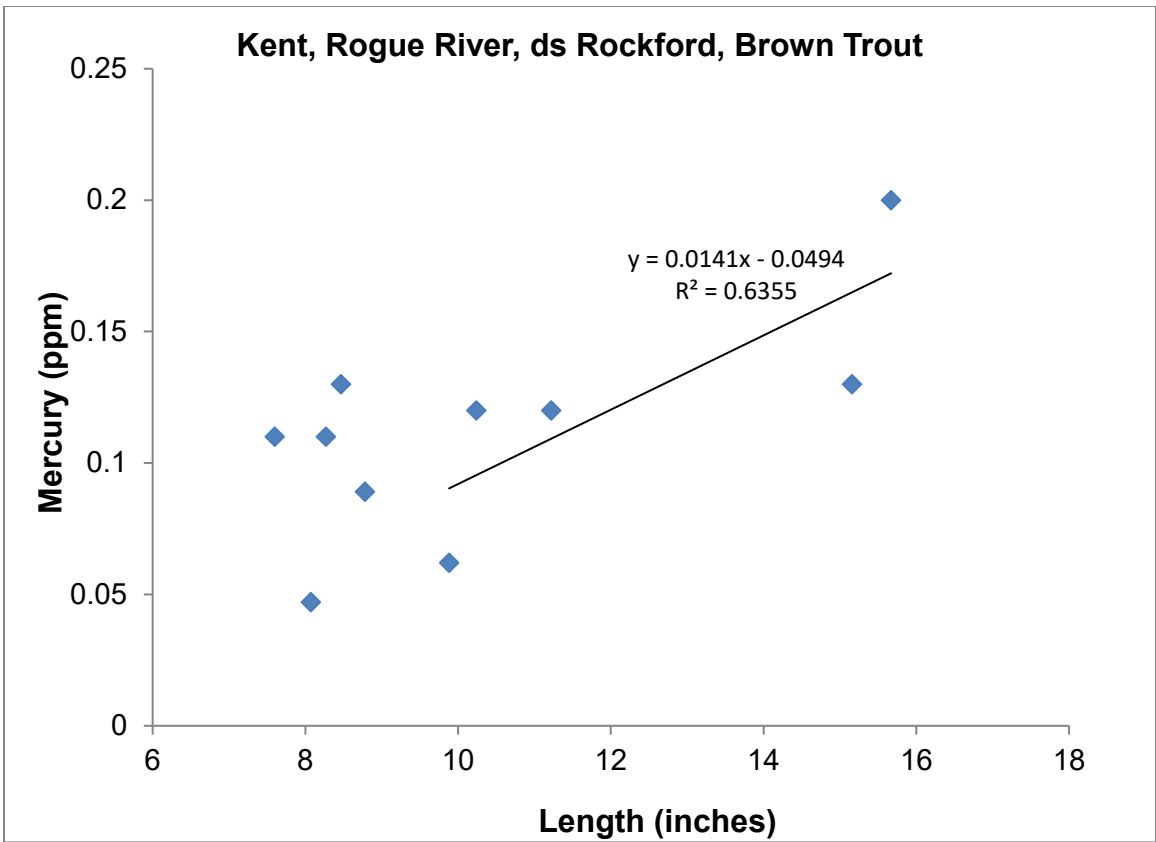
*Sub-legal sized fish used in the PFOS analysis as no correlation between fish size and PFOS has been observed in the statewide dataset.

Existing MDHHS Advisory: Brown trout from the Rogue River are covered by the statewide advisory due to mercury: No one should eat more than 4 meals per month of brown trout of any size.

Recommendation: No one should eat more than 2 meals per month of brown trout from the Rogue River downstream of the Rockford Dam due to PFOS. This guidance also applies to brown trout from the Grand River near the Rogue River confluence. Mercury would cause an advisory; however, PFOS causes more restrictive advice.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
6	0.035	16
8	0.063	16
10	0.092	8
12	0.120	8
14	0.148	4
16	0.176	4
18	0.204	4
20	0.233	4

Shaded area denotes extrapolated estimates



**Northern Clearwater
Crayfish**

**Rogue River
Downstream of Rockford Dam**

Kent County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		Meal Category
Earliest	Most Recent				Min	Max	
2021	2021	1*	2.2	NA	2.2	3.5	
Datasets available: 2021							
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)		
Mercury	1	0.110	--	--	--	8	
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
Mercury	--	--					

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		Meal Category
Earliest	Most Recent				Min	Max	
2021	2021	1*	2.2	NA	2.2	3.5	
Datasets available: 2021							
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)		
PCB	0	--	--	--	--	--	
DDT	0	--	--	--	--	--	
Chlordane	0	--	--	--	--	--	
Toxaphene	0	--	--	--	--	--	
PFOS	1	2.5 ppb	--	--	--	16	
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
PCB	--	--					
DDT	--	--					
Chlordane	--	--					
Toxaphene	--	--					
PFOS	--	--					
Final meal category based on UCL:							8

*In order to obtain enough tissue mass for the chemical analysis, 53 northern clearwater crayfish were collected from the river downstream of the dam. Tail meat was removed from each individual and composited into a single sample.

Existing MDHHS Advisory: Crayfish are not currently under any consumption guideline.

Recommendation: No one should eat more than 8 meals per month of crayfish tail meat from the Rogue River downstream of the Rockford Dam due to mercury.

Note: An MDHHS technical memo is available that provides further details on this recommendation.

Rock Bass

**Rogue River
Downstream of Rockford Dam**

Kent County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2018	2018	7	4.5	na	4.5	6.7
Datasets available: 2018						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	7	0.11	0.09	0.13	0.13	8
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.862	0.864				

Organics Analysis:

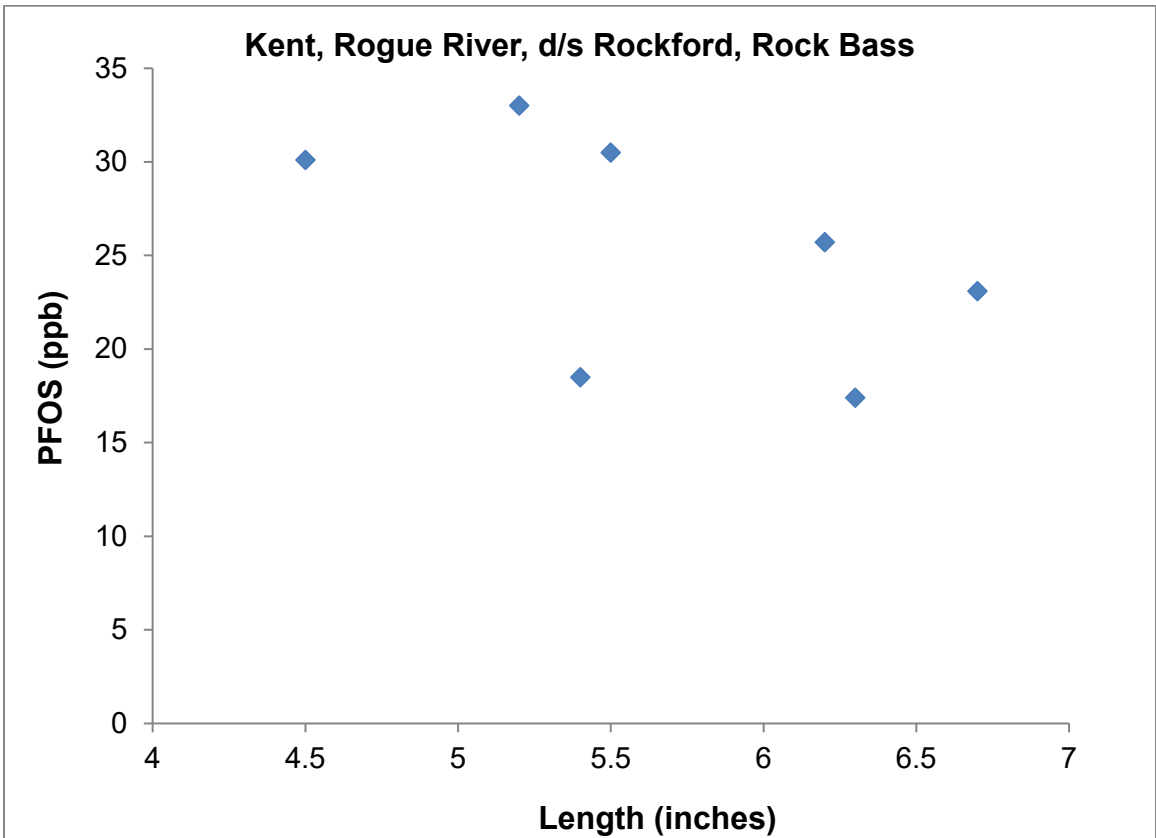
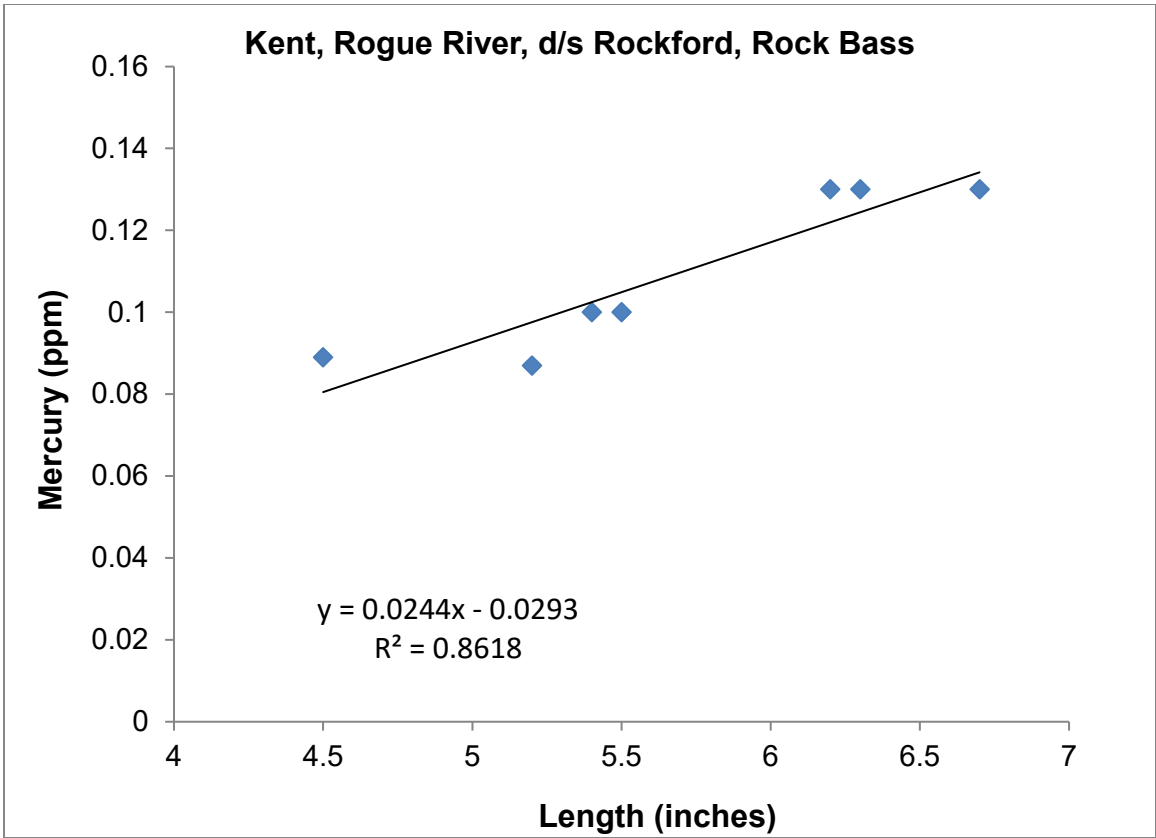
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2018	2018	7	4.5	na	4.5	6.7
Datasets available: 2018						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
PFOS	7	25 ppb	17 ppb	33 ppb	31 ppb	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.308	0.271				
Final meal category based on UCL:						4

Existing MDHHS Advisory: Rogue River rock bass are covered by the statewide advisory due to mercury: no one should eat more than 4 meals per month of rock bass of any size due to mercury.

Recommendation: No one should eat more than 4 meals per month of Rogue River rock bass of any size due to PFOS. Mercury would cause an advisory.

Note: The current recommendation will be re-evaluated in the next release of the Eat Safe Fish Guide.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
4	0.07	16
5	0.09	12
6	0.12	8
7	0.14	4
8	0.17	4
9	0.19	4
10	0.21	4
<i>Shaded area denotes extrapolated estimates</i>		



Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent				Min	Max	
2019	2019	17	6.3	10.0	10.0	19.6	
Datasets available: 1998*, 2019							
Chemical	Sample Size (Legal)	Mean (ppm)		Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury (all)	9	0.20		0.05	0.57	0.32	2
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
Mercury	0.076	0.163					

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent				Min	Max	
2019	2019	17	6.3	10.0	10.0	19.6	
Datasets available: 1998*, 2019 (No PCBs/Pesticides in 2019)							
Chemical	Sample Size (Legal)	Mean (ppm)		Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB*	9*	0.03		--	--	--	--
DDT*	9*	0.05		--	--	--	--
Chlordane*	9*	ND		--	--	--	--
Toxaphene*	9*	ND		--	--	--	--
PFOS (all)	17**	28.3 ppb		1.4 ppb	117.0 ppb	44.8 ppb	2
PFOS (impoundment)	7**	53.3 ppb		10.1 ppb	117.0 ppb	88.0 ppb	1
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
PCB	--	--					
DDT	--	--					
Chlordane	--	--					
Toxaphene	--	--					
PFOS	0.398	0.775***					
Final meal category based on UCL:							2****

* 9 fish analyzed as 2 fillet composites in 1998 not used in analyses.

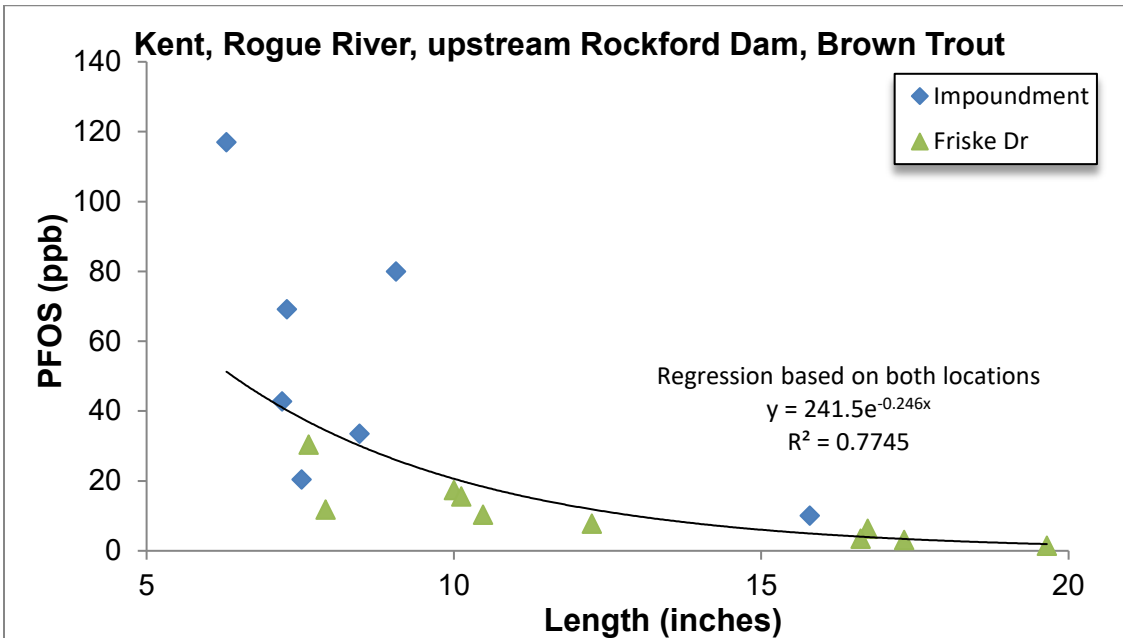
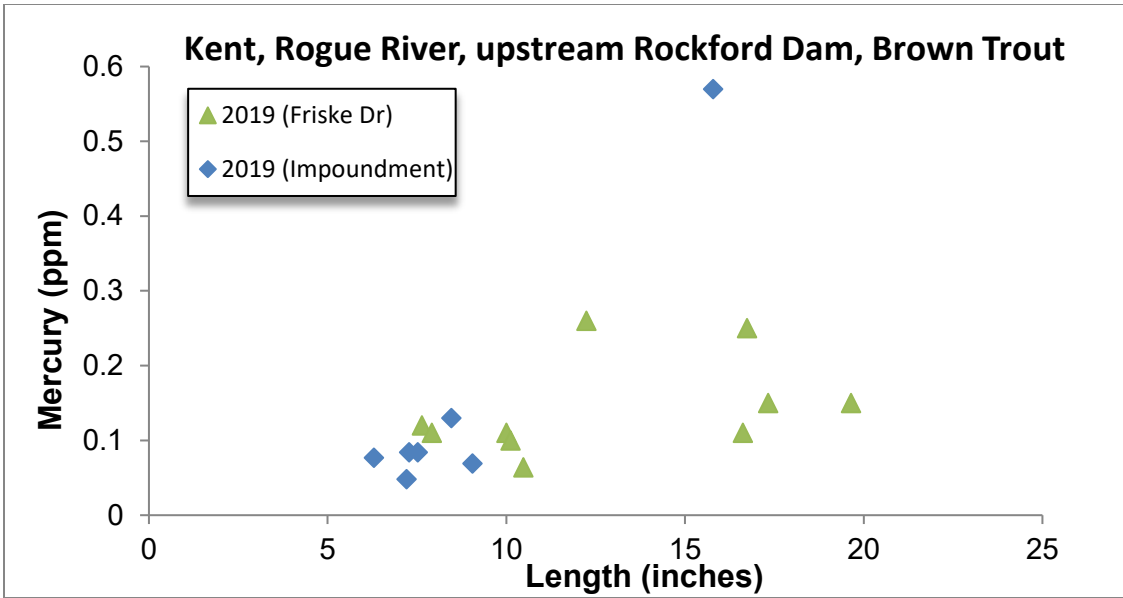
** Sub-legal sized individuals were used in the PFOS data summary.

*** While there was a significant negative correlation between trout size and PFOS concentration, it is not recommended to implement a size-based advisory unless additional data are available providing a biological reason for the negative correlation.

**** The fish collected from the impoundment immediately upstream of the dam had higher PFOS concentrations than those collected further upstream in the Rogue River between US-131 and Friske Drive (approx. 4 to 5 river miles upstream of the Rockford Dam). There are no physical barriers restricting fish movement upstream of the Rockford Dam and brown trout are likely to migrate between the impoundment and further upstream. The river reaches sampled are potentially affected by PFOS contaminated groundwater and/or sediment.

Existing MDHHS Advisory: Brown trout from the Rogue River are covered by the statewide advisory due to mercury: No one should eat more than 4 meals per month of brown trout of any size.

Recommendation: No one should eat more than 2 meals per month of brown trout from the Rogue River upstream of the Rockford Dam due to PFOS and mercury.



Largemouth Bass

**Rogue River
Upstream of Rockford Dam**

Kent County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2013	2019	18	10.8	14	13.5	19.3
Datasets available: 2013, 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.586	0.340	0.930	0.740	1
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.72	0.72				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2013	2019	18	10.8	14	13.5	19.3
Datasets available: 2013, 2019 (Only PFAS in 2019)						
Chemical	Sample Size (All*)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.001	< 0.001	0.004	0.002	16
DDT	10	0.009	< 0.001	0.065	0.023	16
Chlordane	10	ND	--	--	--	--
Toxaphene	10	ND	--	--	--	--
PFOS (all)	18	49.7 ppb	5.6 ppb	116.0 ppb	66.5 ppb	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.229	0.229				
DDT	0.379	0.621				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.244	0.175				
Final meal category based on UCL:						1

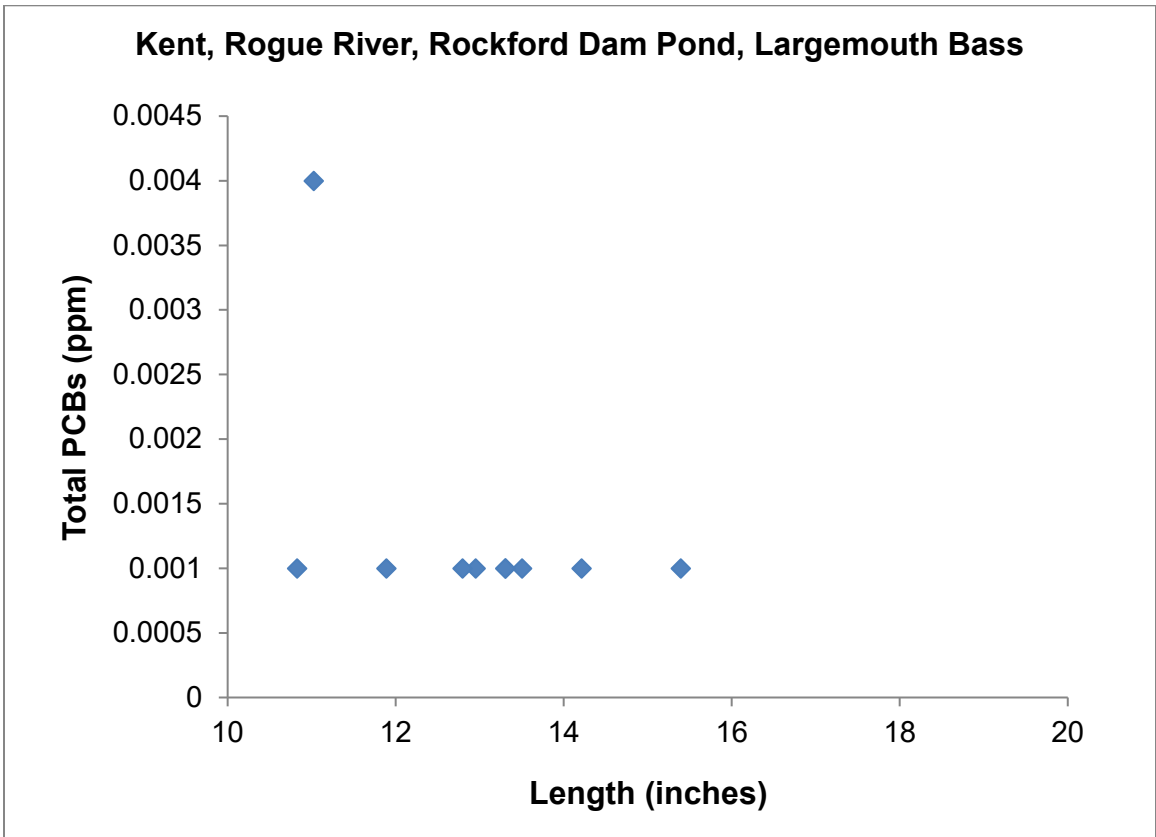
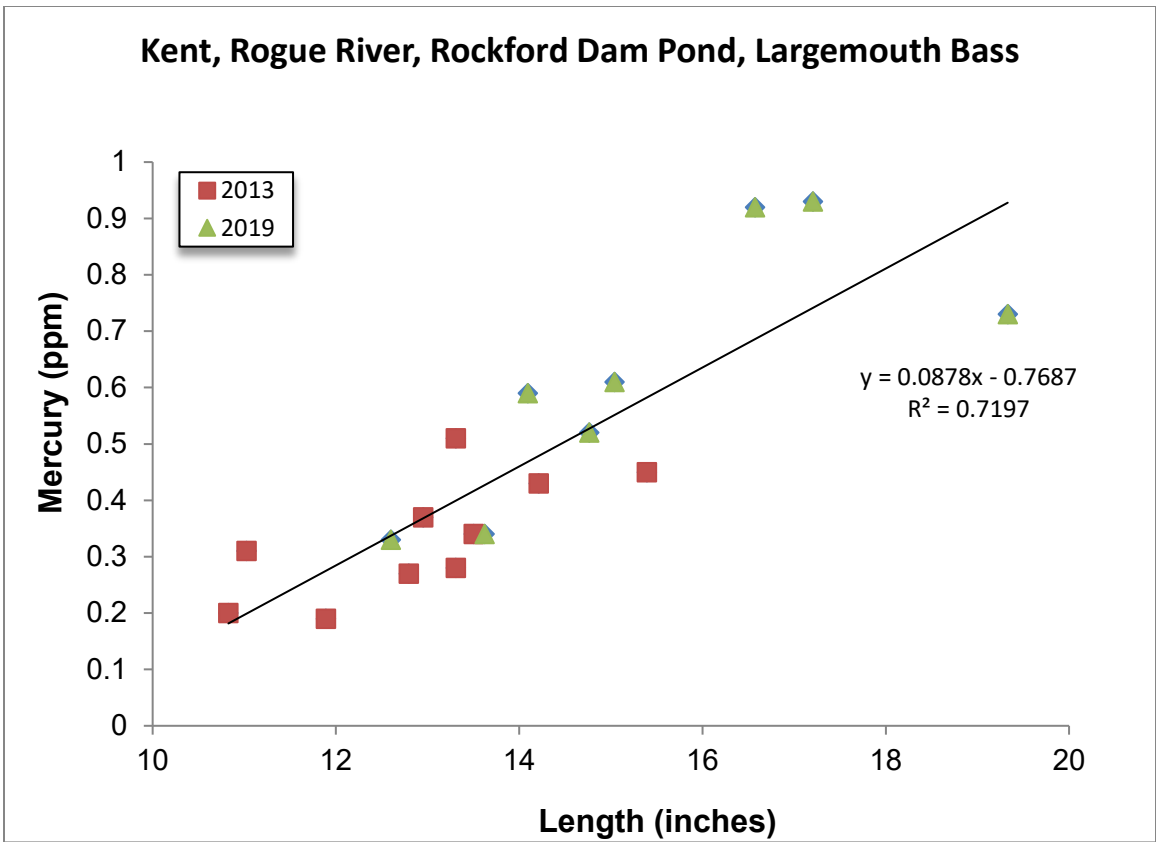
* Only 3 legal fish were collected in 2013; therefore, the values displayed include sub-legal sized individuals. No size relationship has been found in the statewide data for PFOS; therefore, sub-legal fish were used in the analysis.

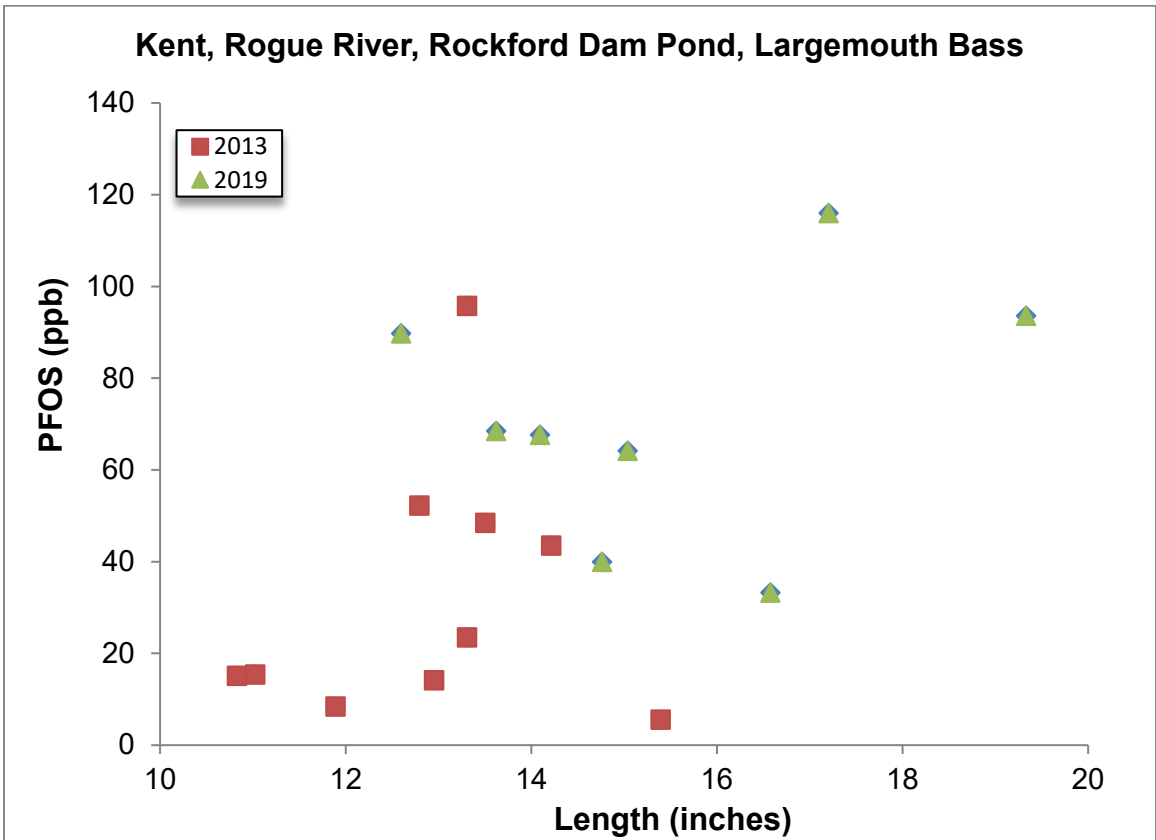
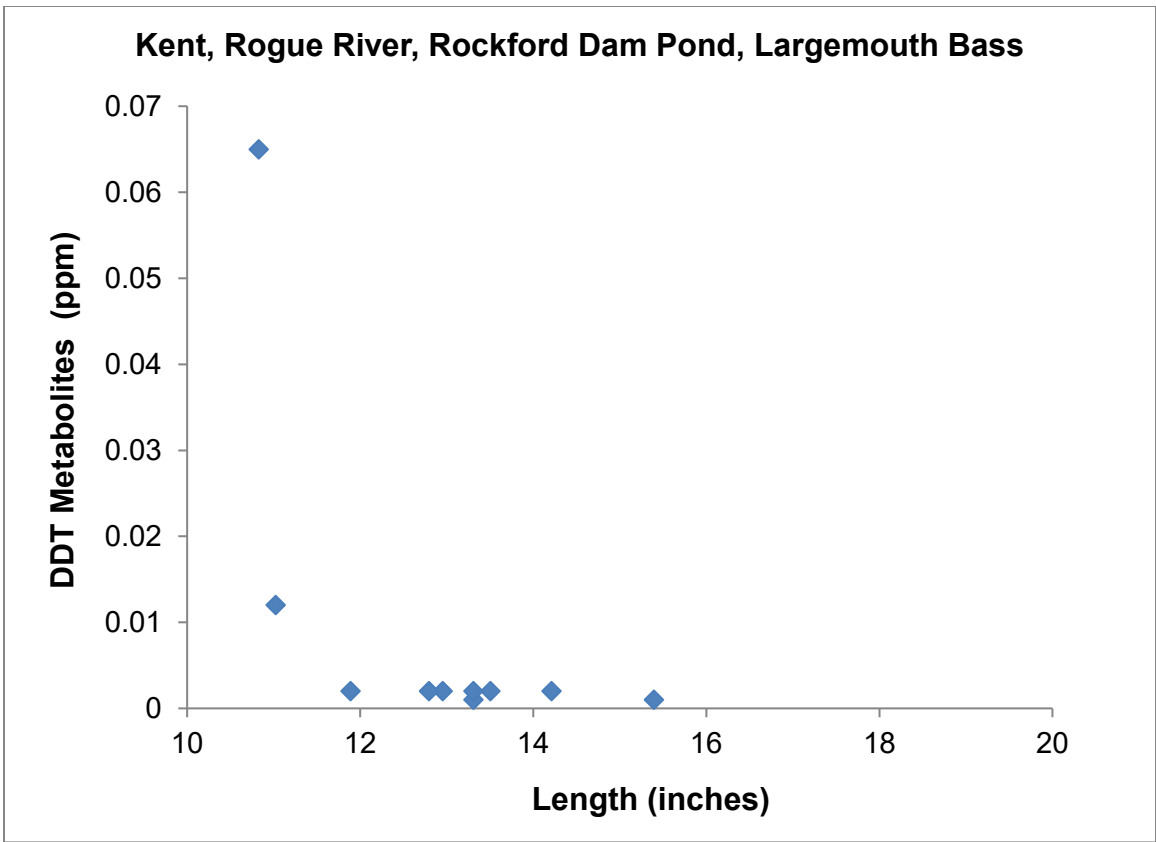
Existing MDHHS Advisory: No one should eat more than 2 meals per month of largemouth bass under 18 inches due to mercury and PFOS and no one should eat more than 1 meal per month of largemouth bass over 18 inches due to mercury.

Recommendation: No one should eat more than 1 meal per month of largemouth bass of any size due to mercury. PFOS would cause an advisory.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
14	0.461	2
15	0.548	1
16	0.636	1
17	0.724	1
18	0.812	1
19	0.900	1
20	0.987	1

Shaded area denotes extrapolated estimates





White Sucker

**Rogue River
Upstream of Rockford Dam**

Kent County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent				Min	Max	
2013	2019	20	14.6	NA	14.6	21.1	
Datasets available: 1993*, 1998*, 2013, 2019							
Chemical	Sample Size (Legal)	Mean (ppm)		Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	20	0.246		0.057	0.400	0.288	2
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
Mercury	0.248	0.206					

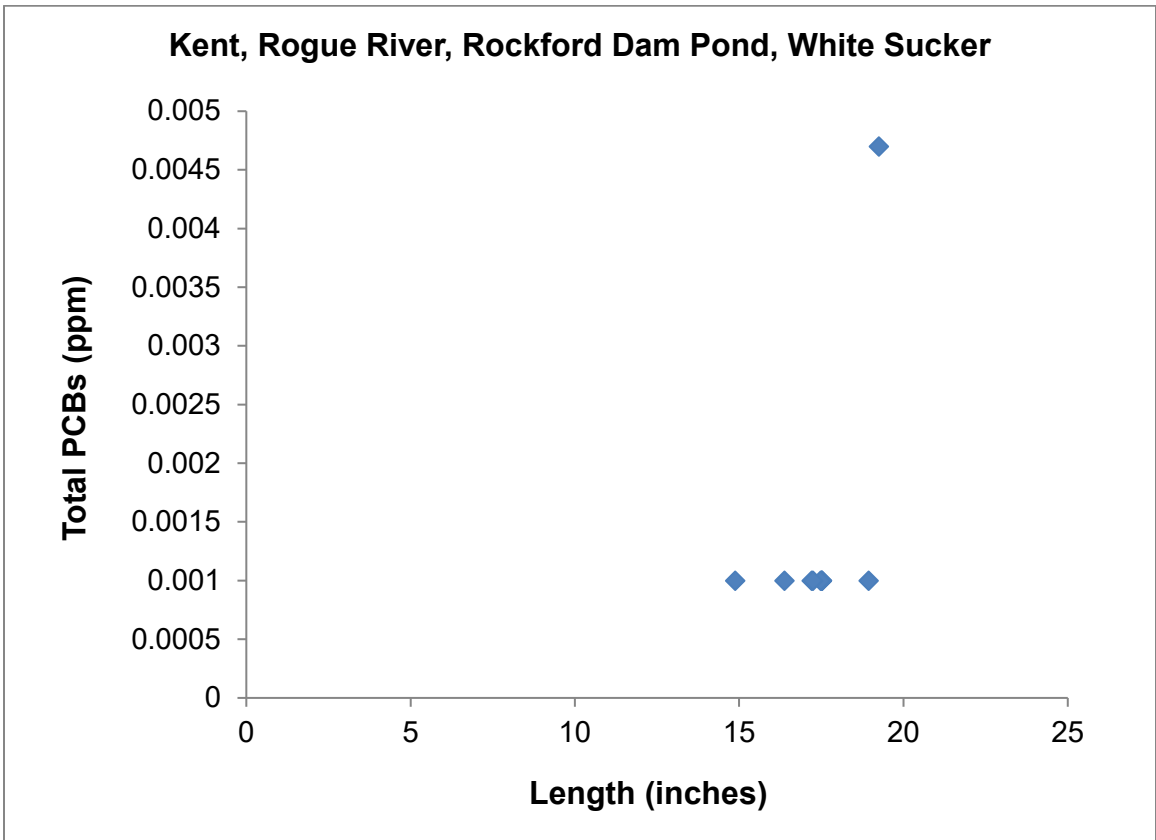
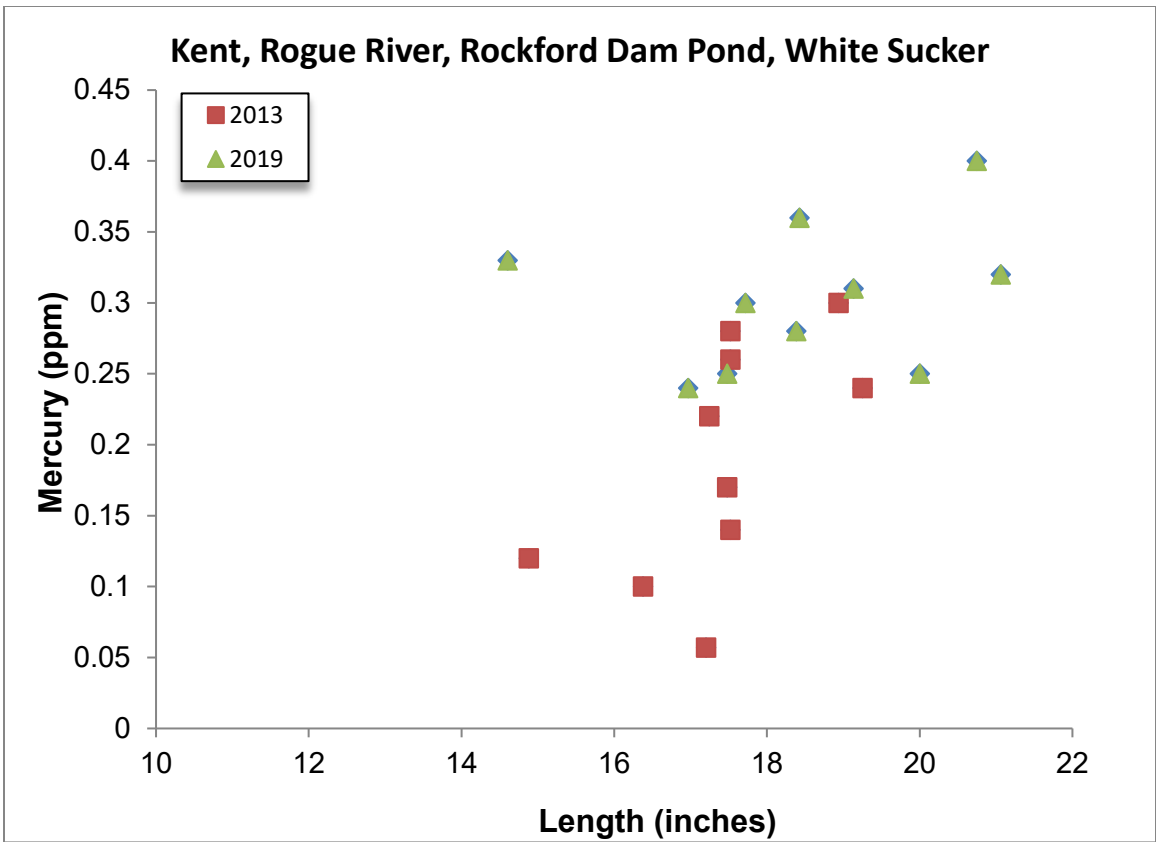
Organics Analysis:

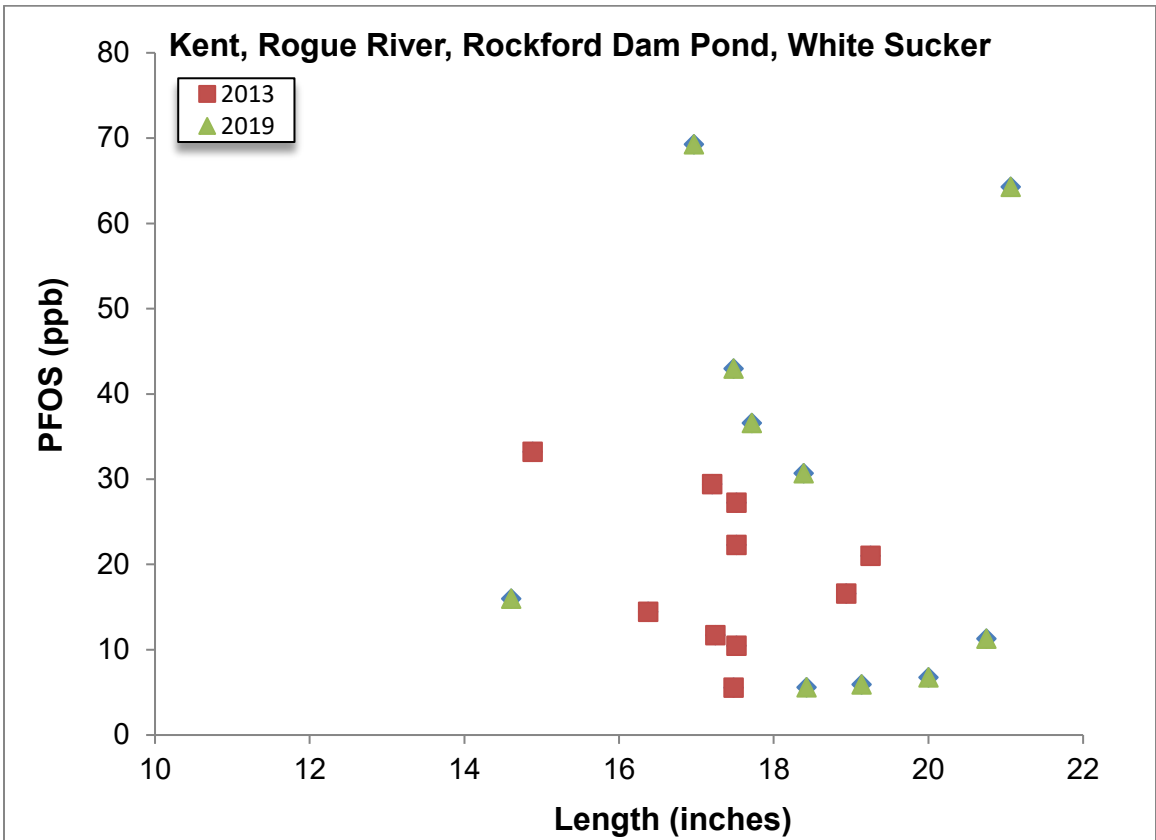
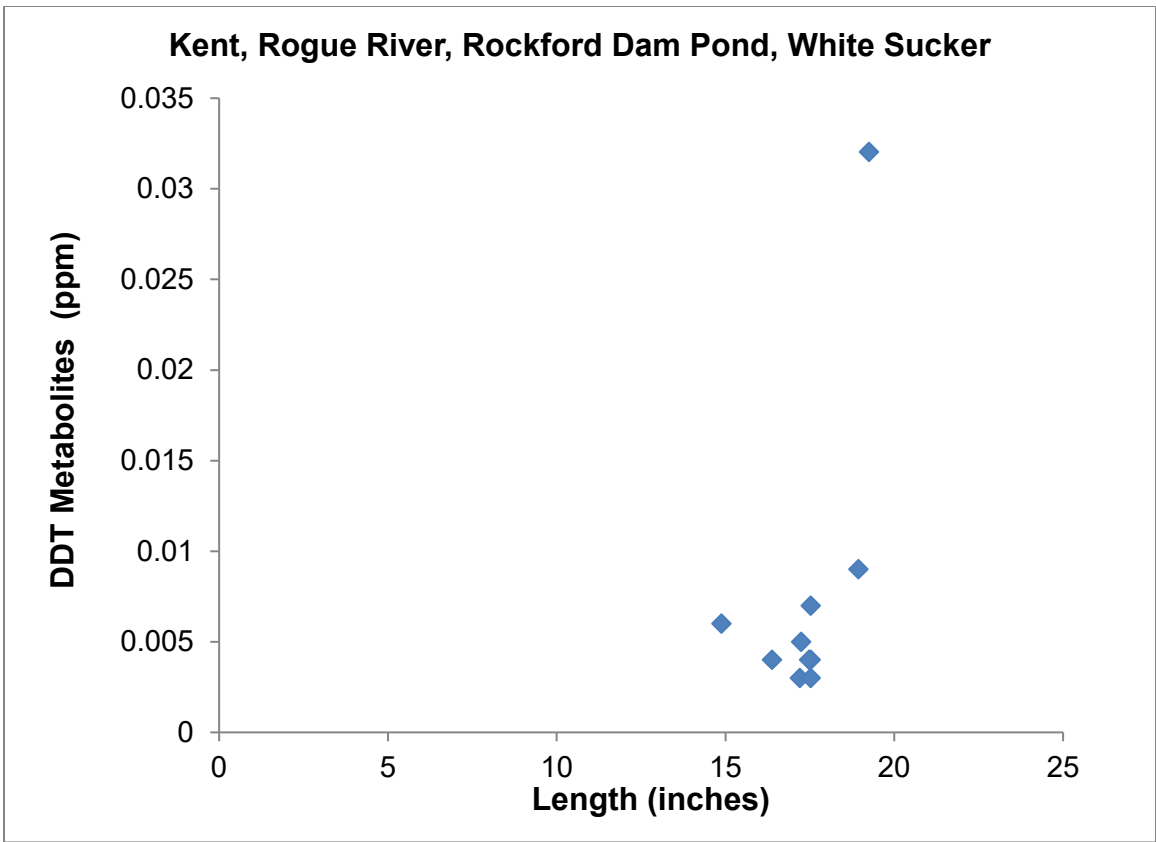
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent				Min	Max	
2013	2019	20		NA	14.6	21.1	
Datasets available: 1993*, 1998*, 2013, 2019 (PFAS Only)							
Chemical	Sample Size (All*)	Mean (ppm)		Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.001		< 0.001	0.005	0.002	16
DDT	10	0.008		< 0.001	0.032	0.014	16
Chlordane	10	ND		--	--	--	--
Toxaphene	10	ND		--	--	--	--
PFOS	20	24.1 ppb		5.6 ppb	69.3 ppb	32.7 ppb	4
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
PCB	0.289	0.289					
DDT	0.331	0.292					
Chlordane	--	--					
Toxaphene	--	--					
PFOS	0.000	0.020					
Final meal category based on UCL:							2

*Samples collected in 1993 and 1998 were composite fillets and therefore not used in this analysis.

Existing MDHHS Advisory: No one should eat more than 4 meals per month of Rogue River sucker upstream of the Rockford Dam due to PFOS and mercury.

Recommendation: No one should eat more than 2 meals per month of Rogue River sucker of any size upstream of the Rockford Dam due to mercury. PFOS would cause an advisory.





St. Joseph County

Northern Pike

Clear Lake

St. Joseph County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2009	2009	10	19.7	24	24.8	32.9
Datasets available: 2009						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	7	0.51	0.33	0.88	0.71	1
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.835	0.875				

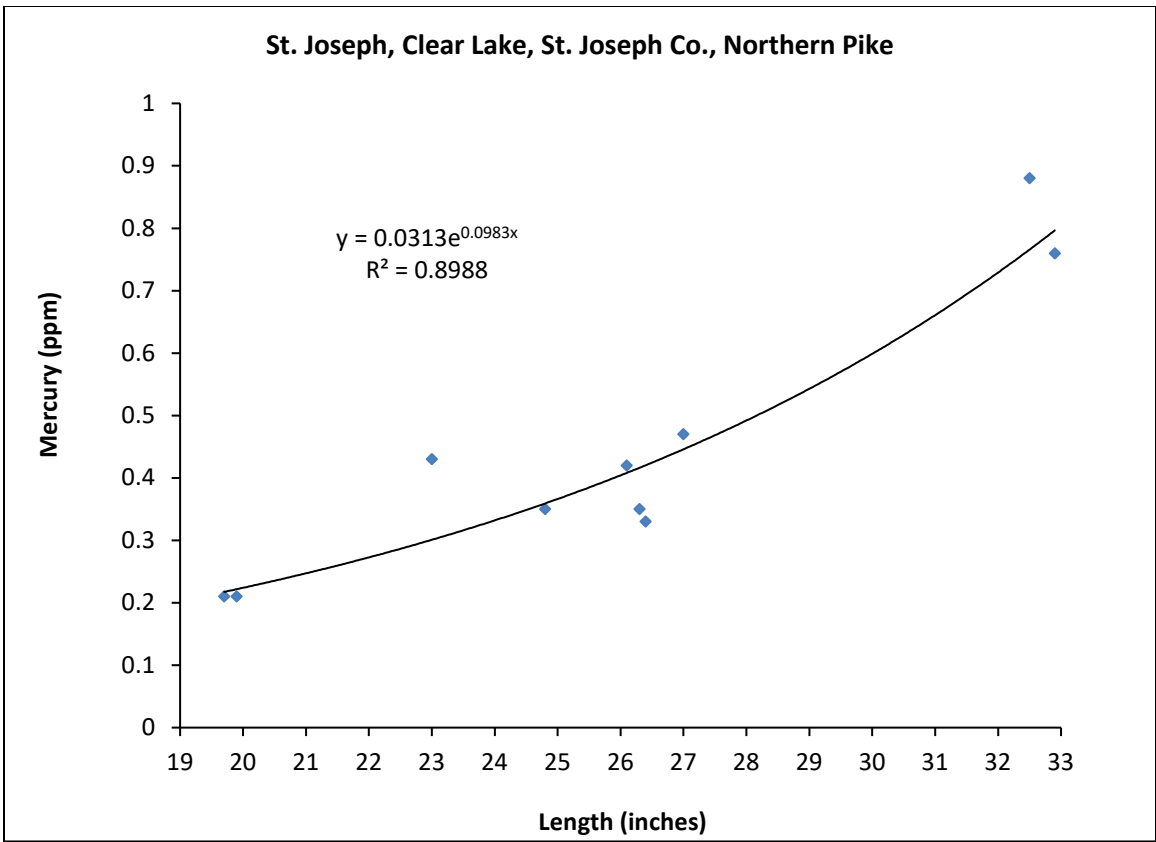
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
--	--	0				
Datasets available: --						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						1

Existing Advisory: Clear Lake northern pike are covered by the statewide mercury consumption advisory.

Recommendation: No one should eat more than 1 meal per month of Clear Lake northern pike over 28 inches or more than 2 meals per month of northern pike under 28 inches in length due to mercury. Length break based on regression.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
24	0.331	2
25	0.365	2
26	0.403	2
27	0.445	2
28	0.491	2
29	0.541	1
30	0.597	1
31	0.659	1
32	0.727	1
<i>Shaded area denotes extrapolated estimates</i>		



Carp

**Fawn River
Stubey Road**

St. Joseph County

Hg Analysis:

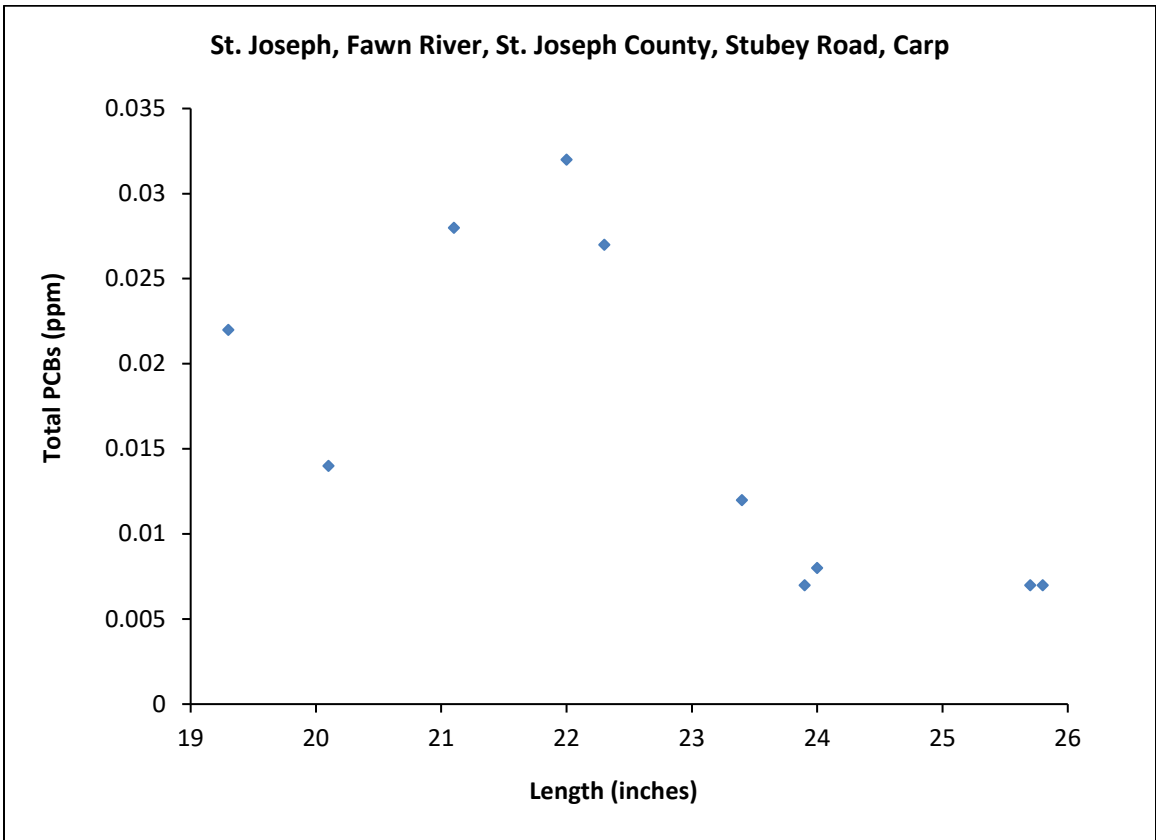
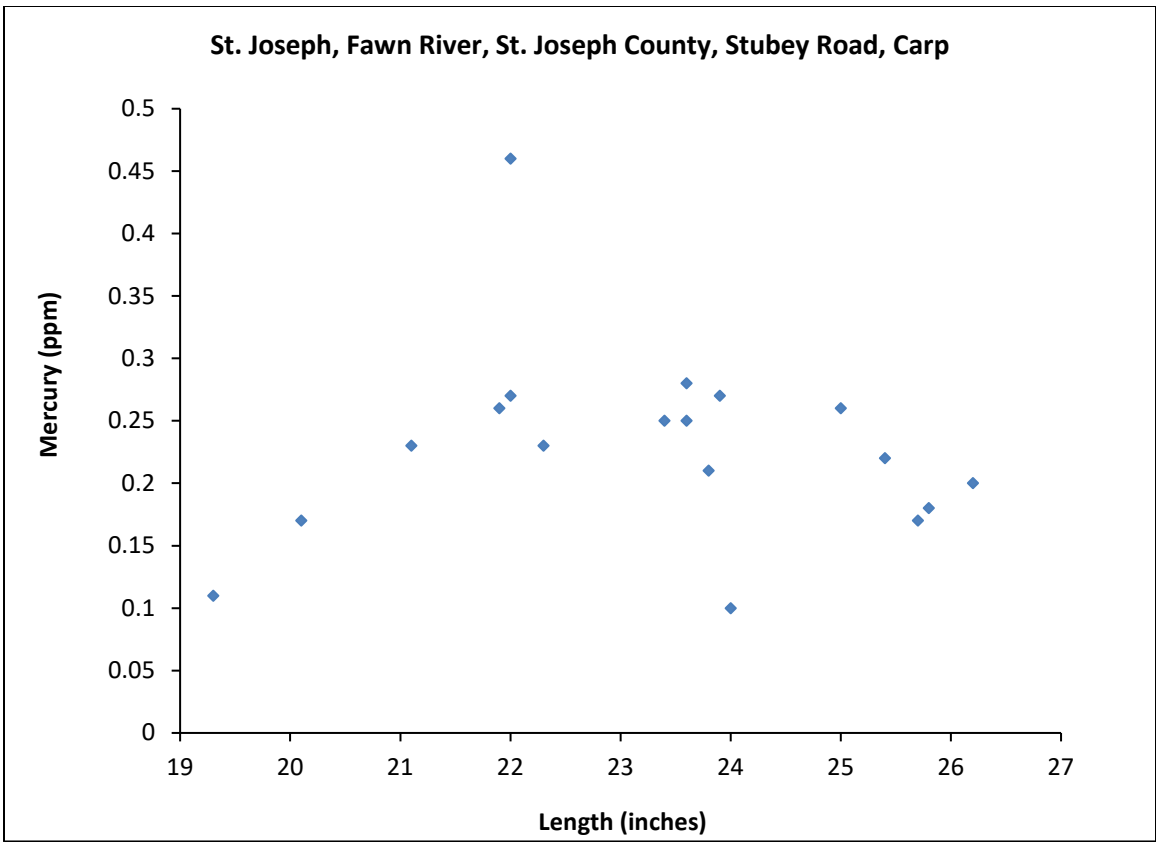
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1990	2005	18	19..3	na	19.3	26.2
Datasets available: 1990, 2005						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	18	0.23	0.10	0.46	0.27	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.001	0.002				

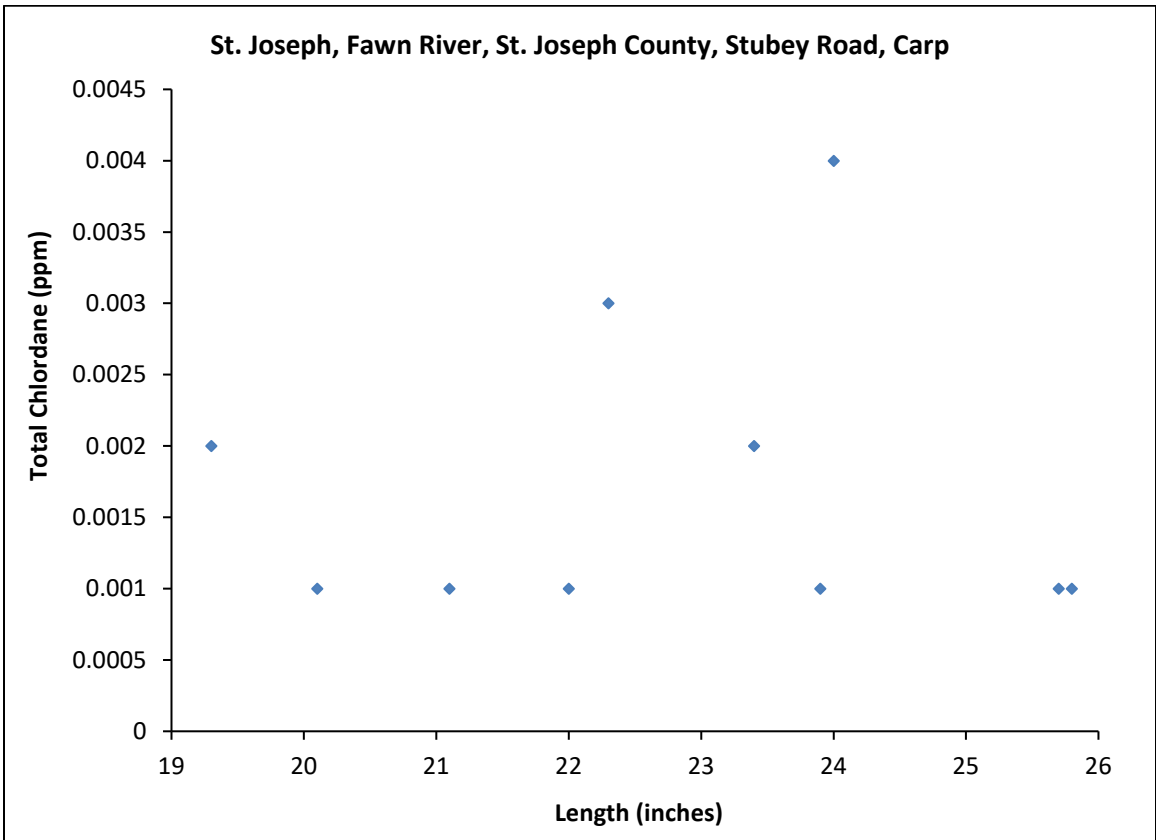
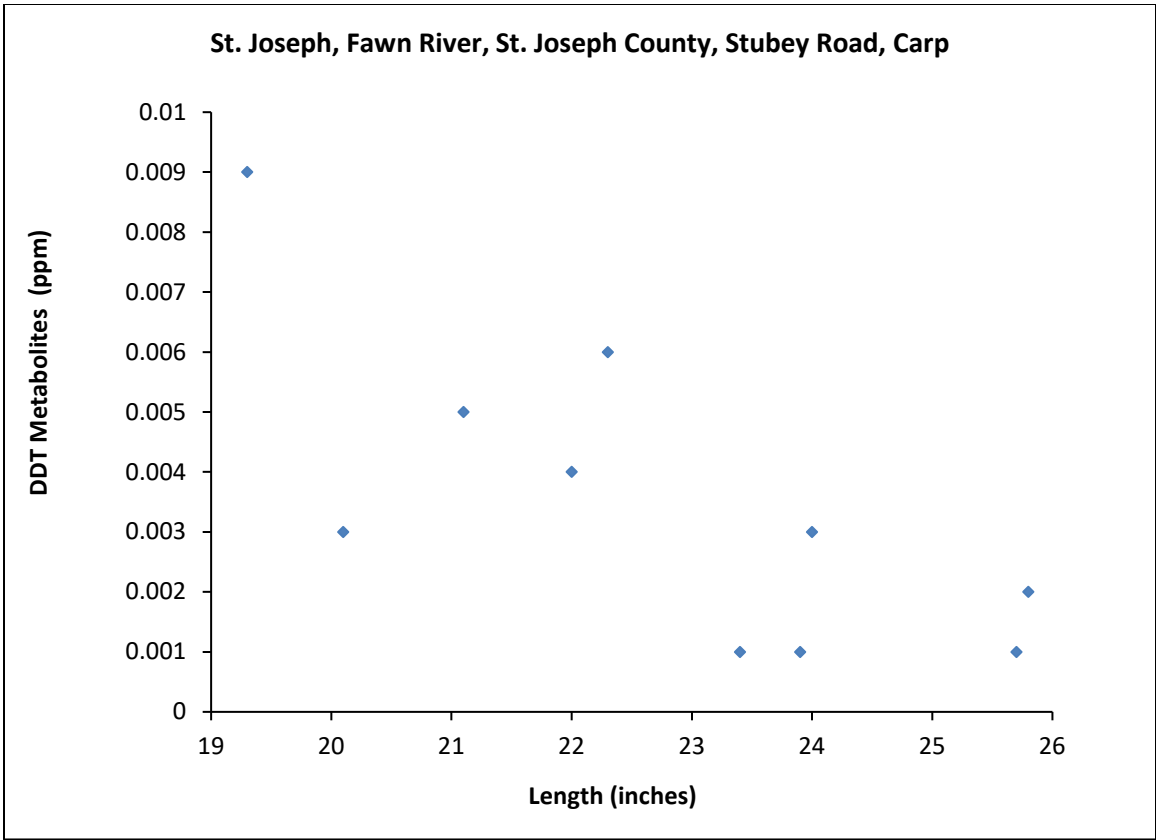
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2005	2005	18	19..3	NA	19.3	25.8
Datasets available: 1990, 2005						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.016	0.007	0.03	0.02	12
DDT	10	0.004	0.001	0.009	0.01	16
Chlordane	10	0.002	0.001	0.004	0.003	--
Toxaphene	10	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.432	0.562				
DDT	0.566	0.541				
Chlordane	0.000	0.005				
Toxaphene	--	--				
Final meal category based on UCL:						4

Existing Advisory: Women and children should not eat more than one meal per week of Fawn River carp greater than 22 inches in length due to PCBs.

Recommendation: No one should eat more than 4 meals per month of Fawn River carp due to mercury. PCBs would cause an advisory.





Rock Bass

**Fawn River
Stubey Road**

St. Joseph County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2000	2000	10	6.4	na	6.4	8.3
Datasets available: 2000						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.11	0.06	0.24	0.15	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.593	0.658				

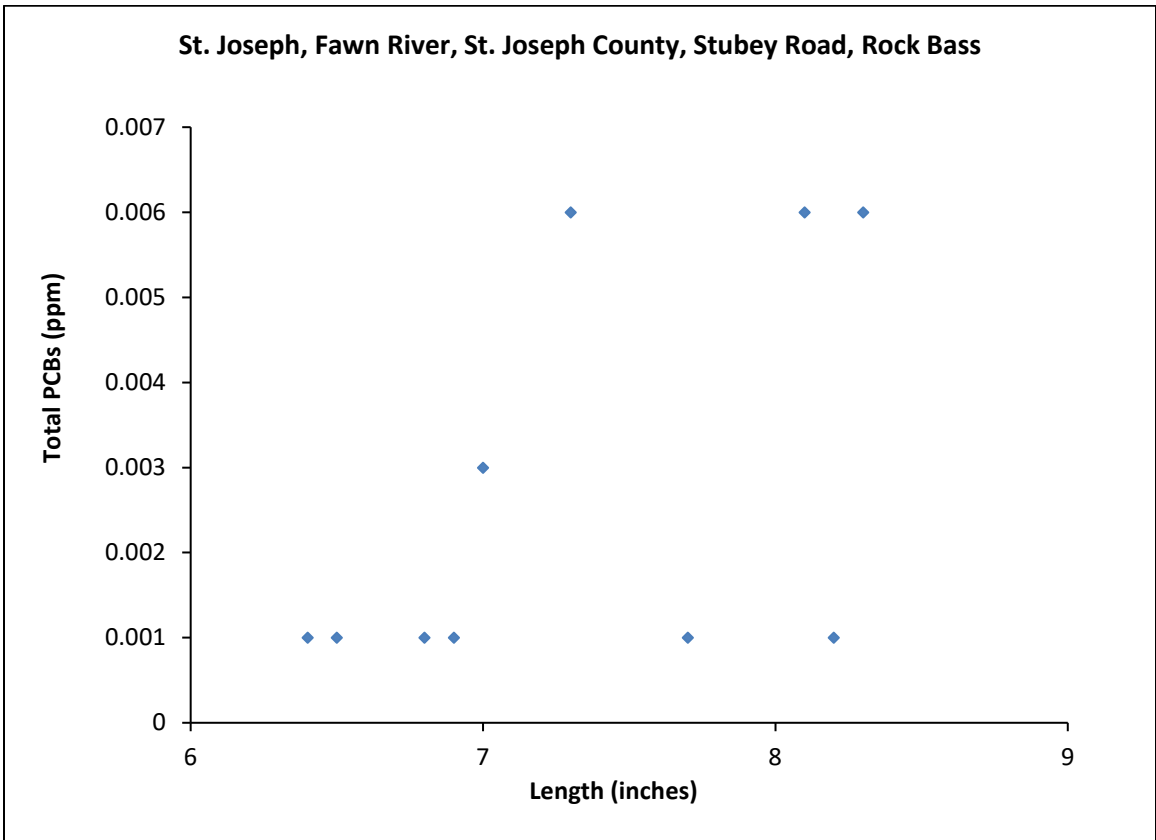
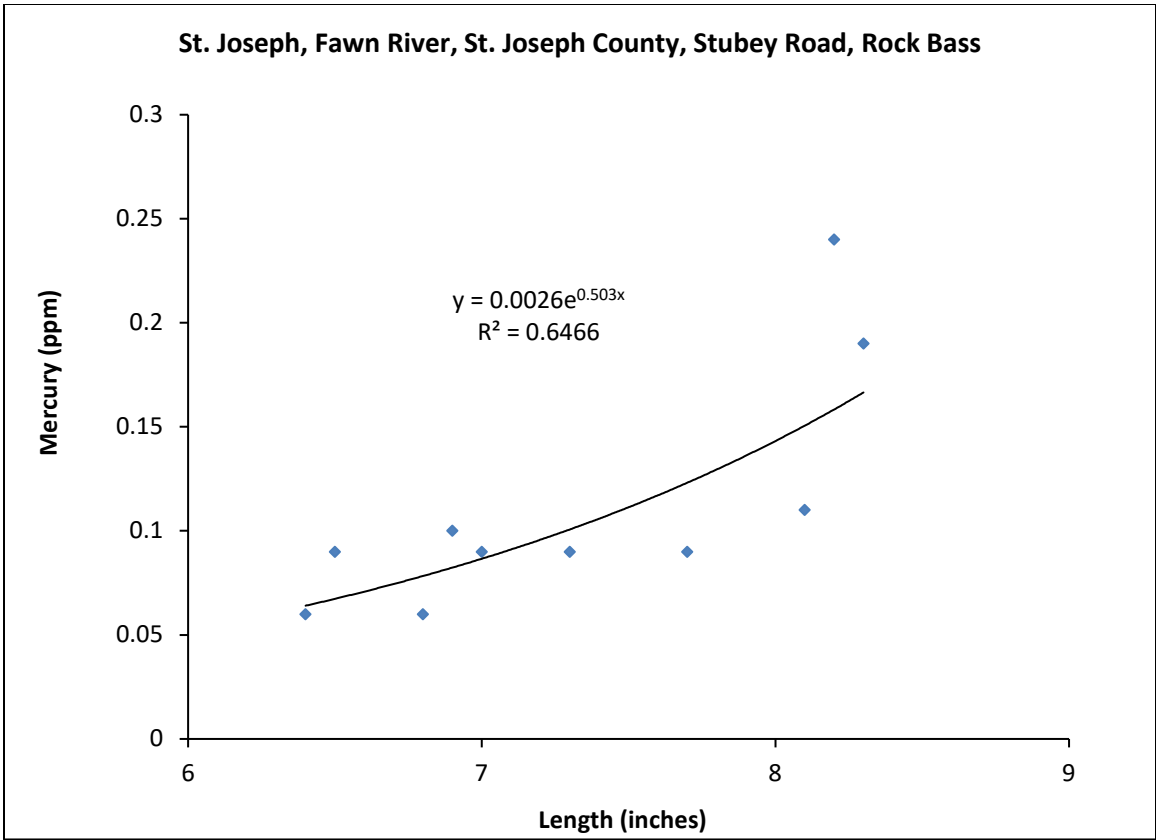
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2000	2000	10	6.4	na	6.4	8.3
Datasets available: 2000						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.003	0.001	0.006	0.004	16
DDT	10	ND	--	--	--	--
Chlordane	10	ND	--	--	--	--
Toxaphene	10	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.285	0.253				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						4

Existing Advisory: Fawn River rock bass are not covered by a consumption advisory.

Recommendation: No one should eat more than 4 meals per month of Fawn River rock bass larger than 7 inches or 12 meals per month of those less than 7 inches due to mercury.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
6	0.053	16
7	0.088	12
8	0.145	4
9	0.240	4
10	0.398	2
11	0.658	1
12	1.087	1
<i>Shaded area denotes extrapolated estimates</i>		



Smallmouth Bass

**Fawn River
Stubey Road**

St. Joseph County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1990	2005	11	10.6	14	14.4	17.1
Datasets available: 1990, 2005						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	7	0.51	0.29	0.60	0.61	1
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.891	0.903				

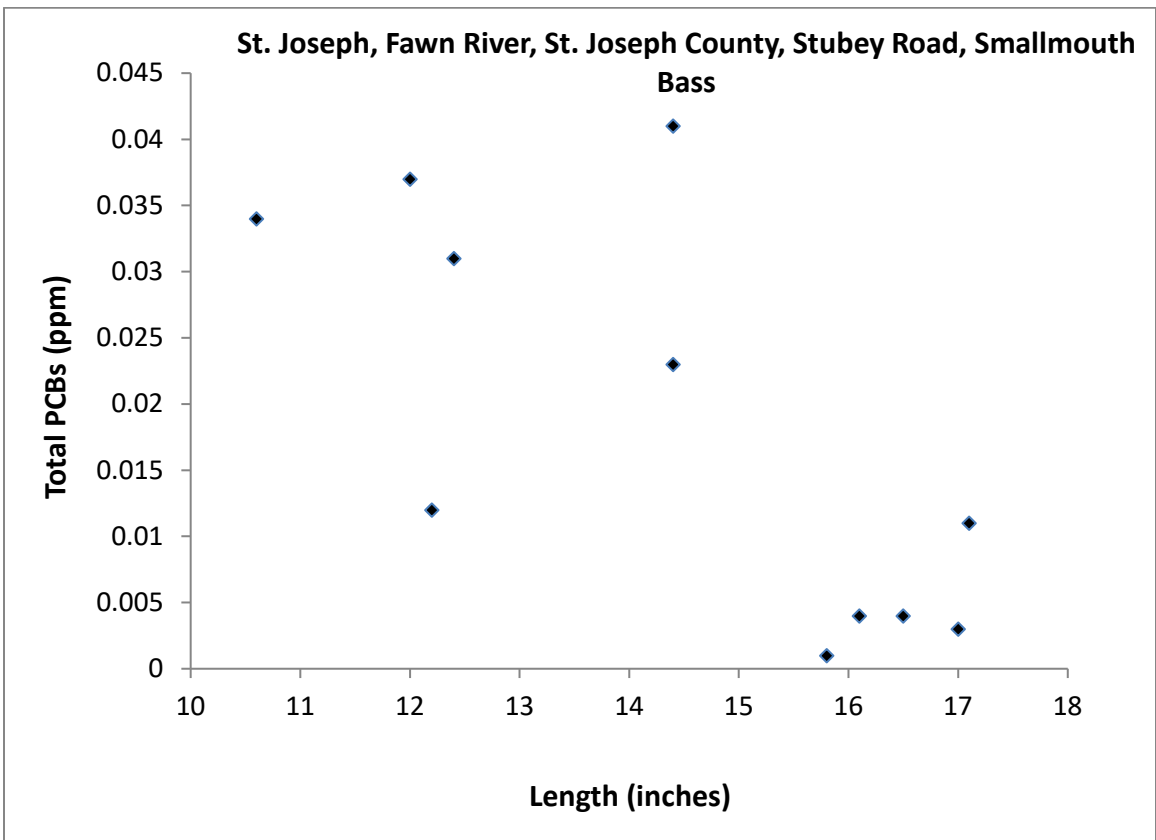
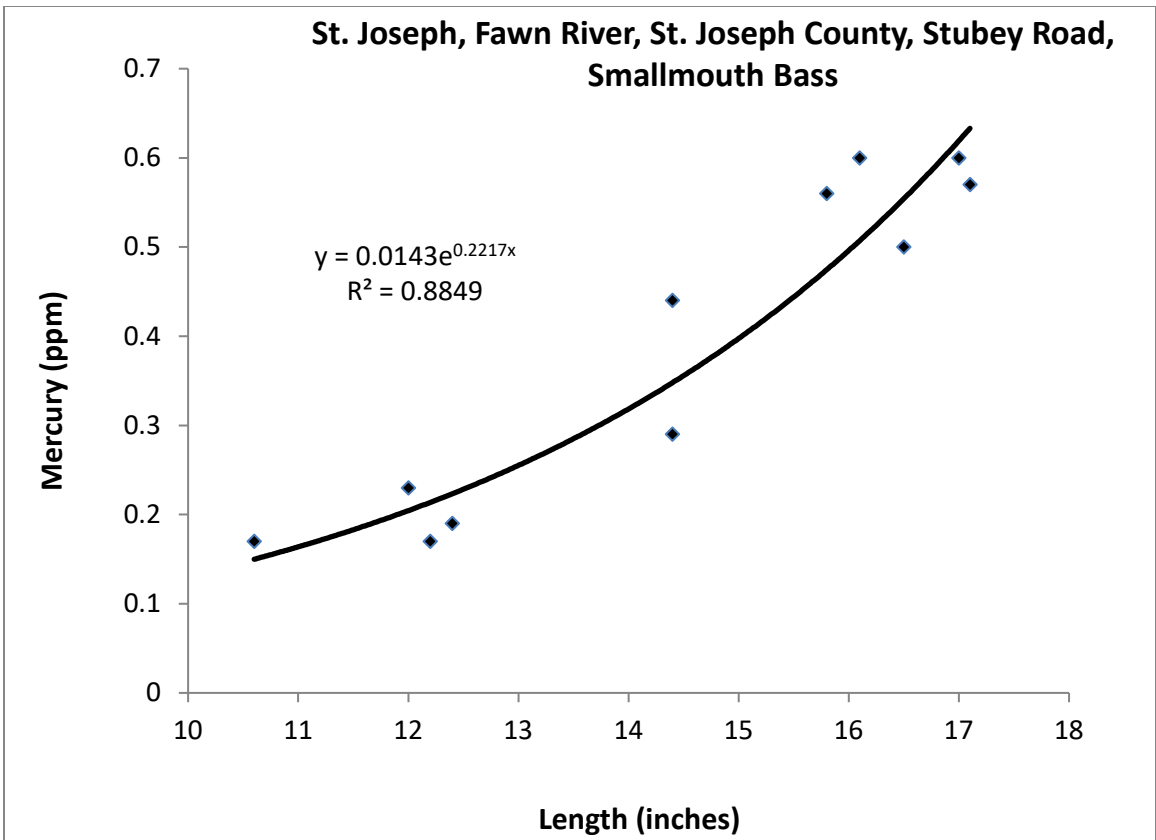
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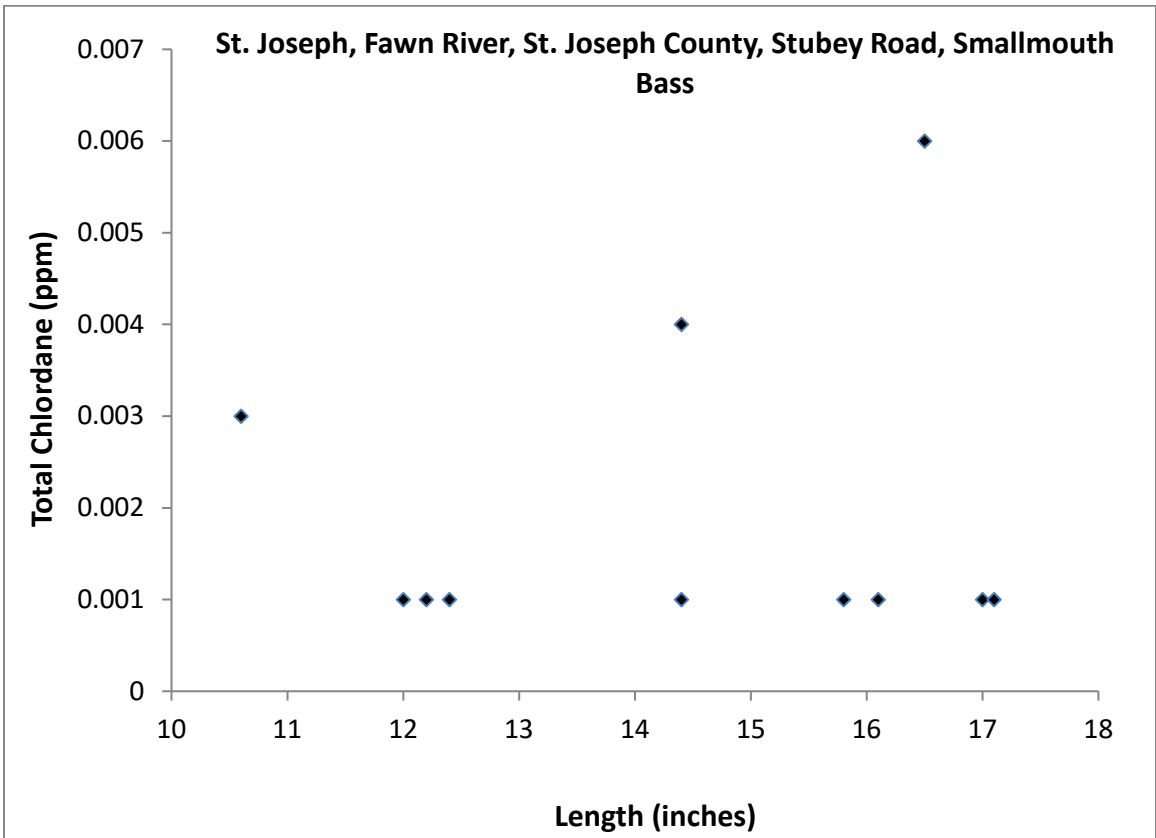
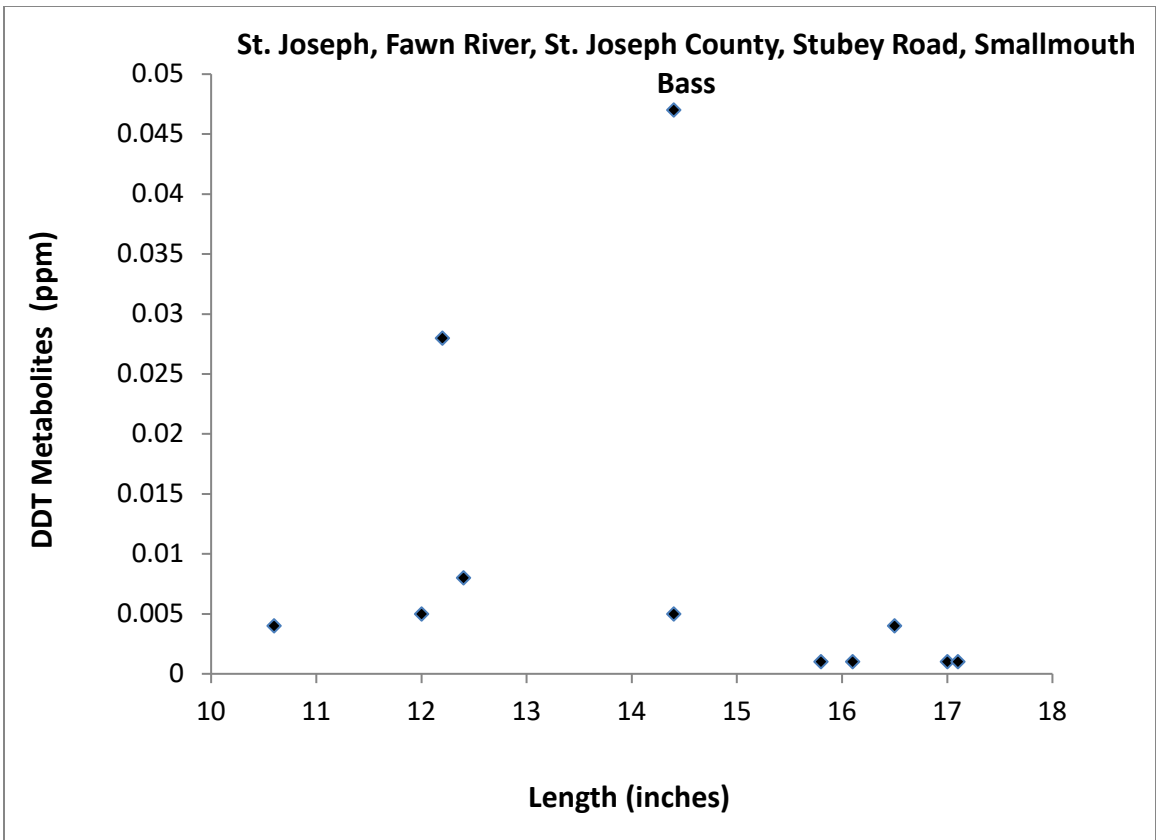
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2005	2005	10	12	14	14.4	17.1
Datasets available: 1990, 2005						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	7	0.01	0.001	0.04	0.03	8
DDT	7	0.009	0.001	0.05	0.02	16
Chlordane	7	0.002	0.001	0.006	0.003	--
Toxaphene	7	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.473	0.451				
DDT	0.164	0.483				
Chlordane	0.054	0.042				
Toxaphene	--	--				
Final meal category based on UCL:						1

Existing Advisory: Women and children should not eat more than 1 meal per month of Fawn River smallmouth bass due to mercury.

Recommendation: No one should eat more than 2 meals per month of legal size largemouth or smallmouth bass from the Fawn River less than 16 inches or more than 1 meal per month of those fish larger than 16 inches due to mercury. Length break based on regression.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
14	0.319	2
15	0.398	2
16	0.496	2
17	0.620	1
18	0.773	1
19	0.965	1
20	1.205	0.5
21	1.504	0.5
22	1.877	0.5
<i>Shaded area denotes extrapolated estimates</i>		





**Redhorse Sucker
White Sucker**

**Fawn River
Stubey Road**

St. Joseph County

Hg Analysis:

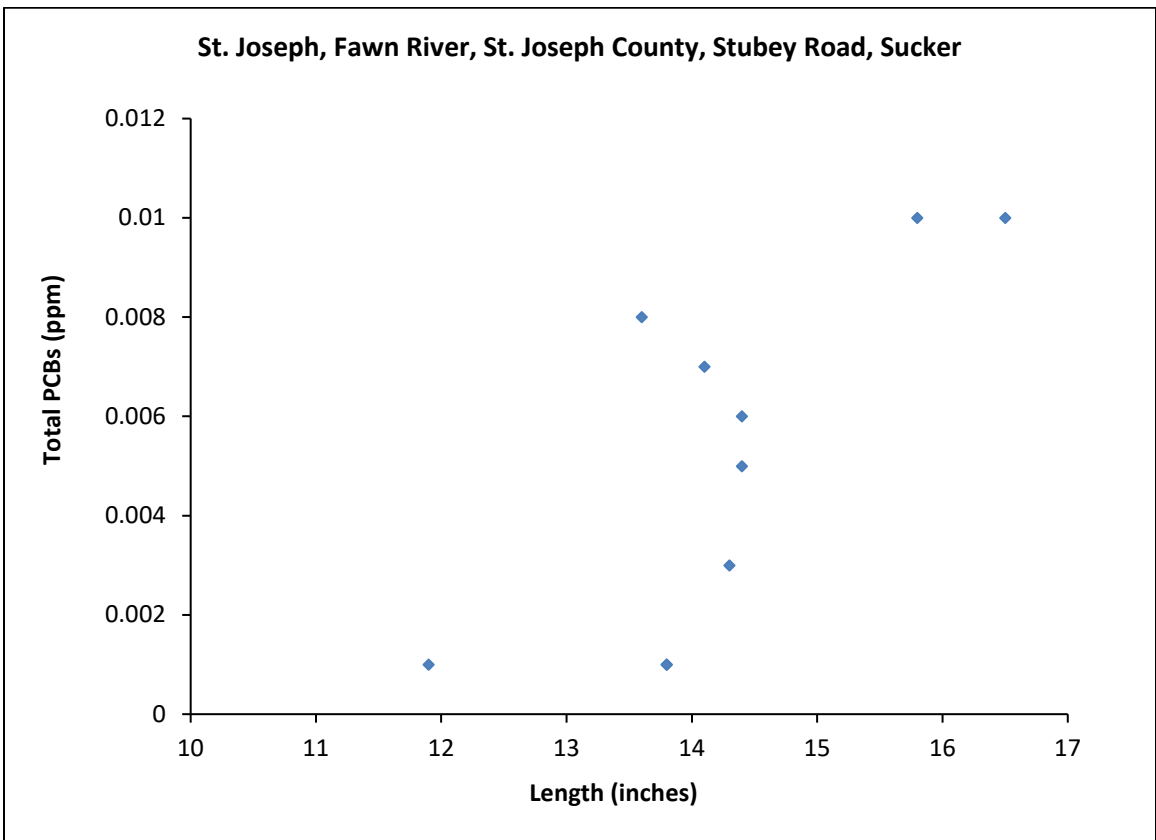
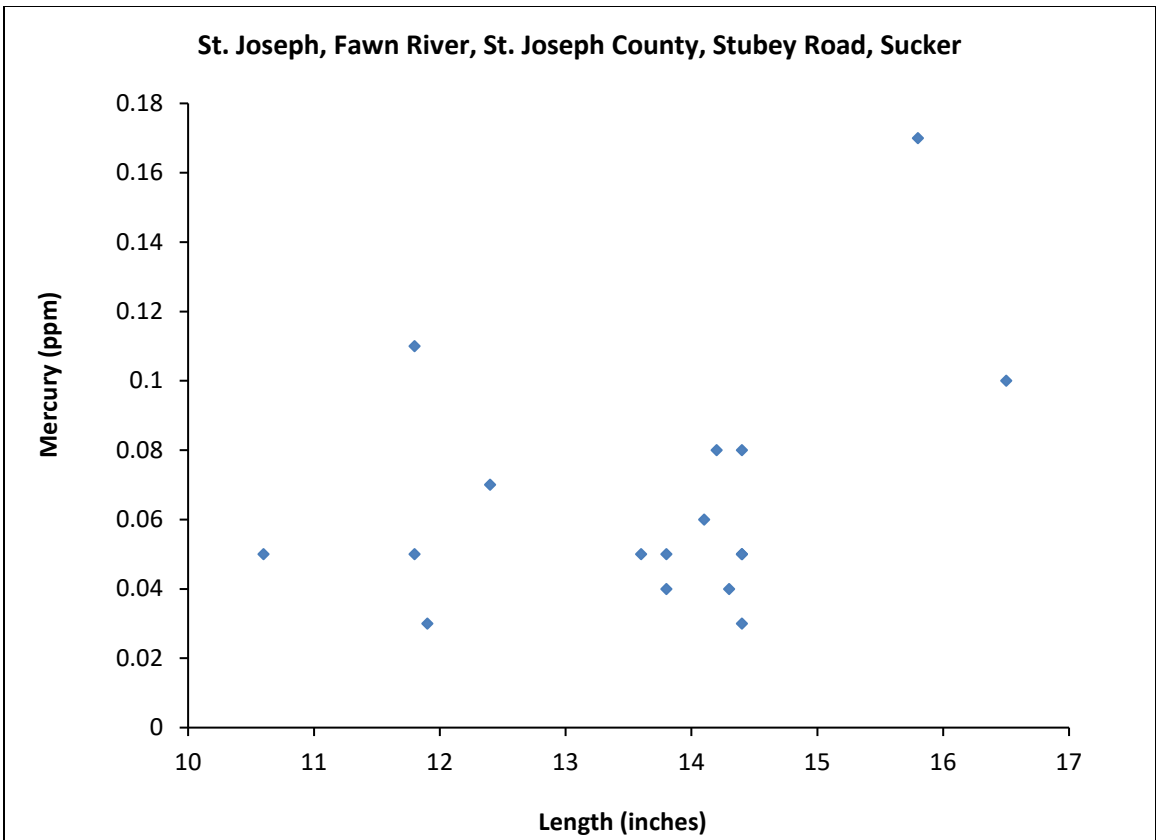
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1990	2000	17	10.6	na	10.6	16.5
Datasets available: 1990, 2000						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	17	0.06	0.03	0.17	0.08	12
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.139	0.112				

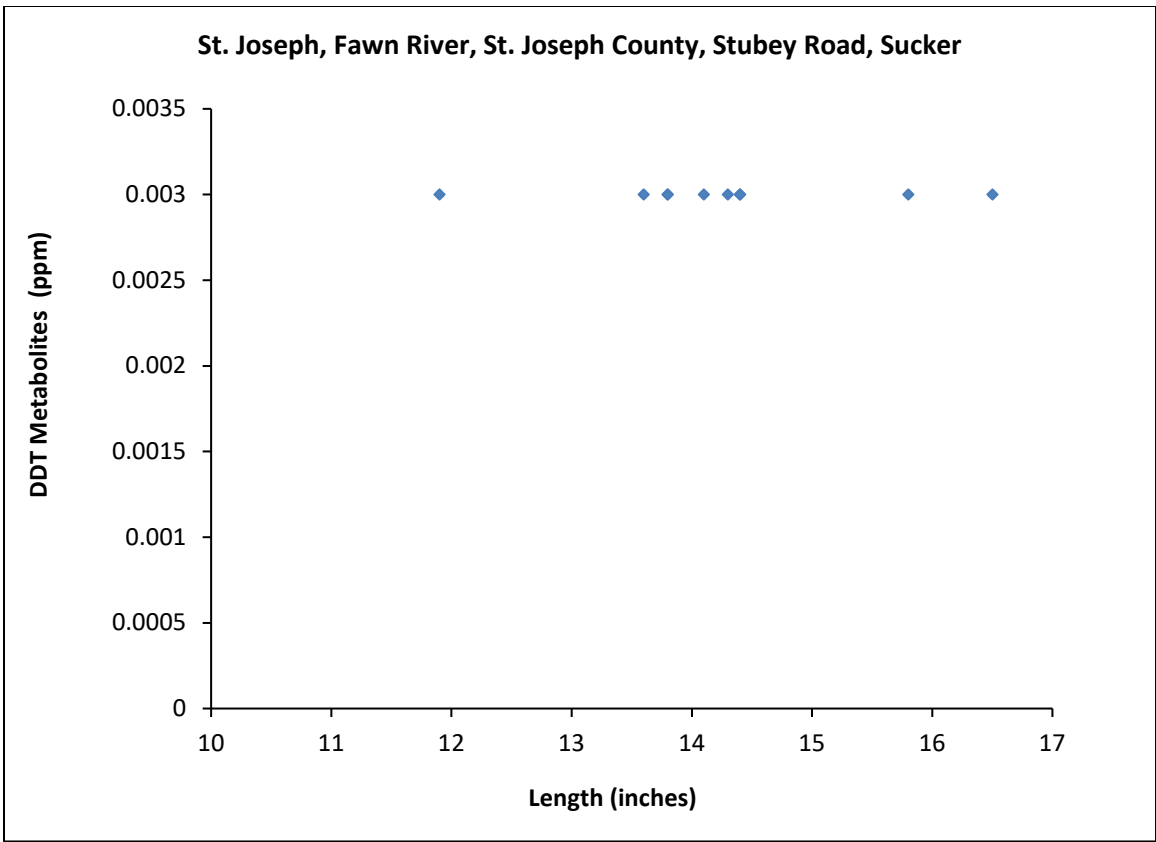
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2000	2000	10	10.6	na	10.6	16.5
Datasets available: 1990, 2000						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.005	0.001	0.008	0.010	16
DDT	10	0.003	0.003	0.003	0.004	16
Chlordane	10	ND	--	--	--	--
Toxaphene	10	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.553	0.483				
DDT	0.000	0.000				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						12

Existing Advisory: Fawn River sucker are not covered by a consumption advisory.

Recommendation: No one should eat more than 12 meals per month of Fawn River sucker due to mercury.





Hg Analysis:

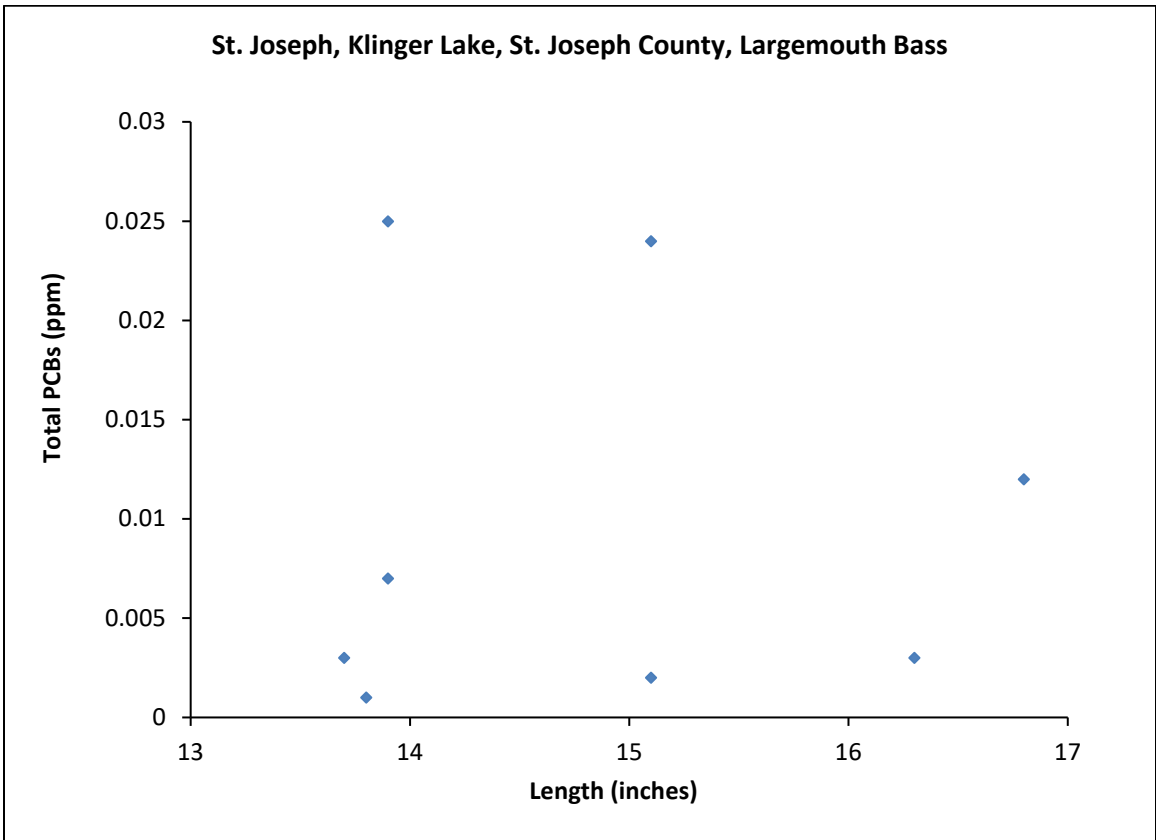
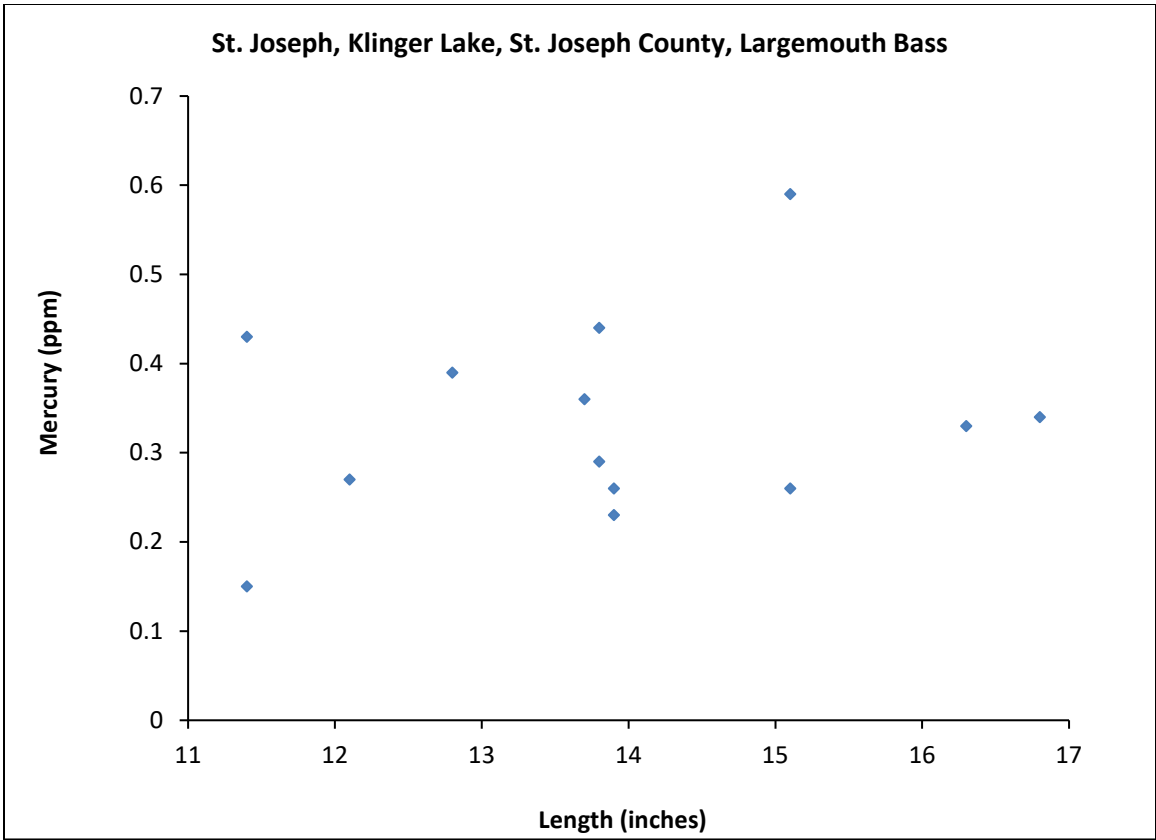
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1990	2001	13	11.4	14	13.7	16.8
Datasets available: 1990, 2001						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	9	0.34	0.23	0.44	0.43	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.046	0.076				

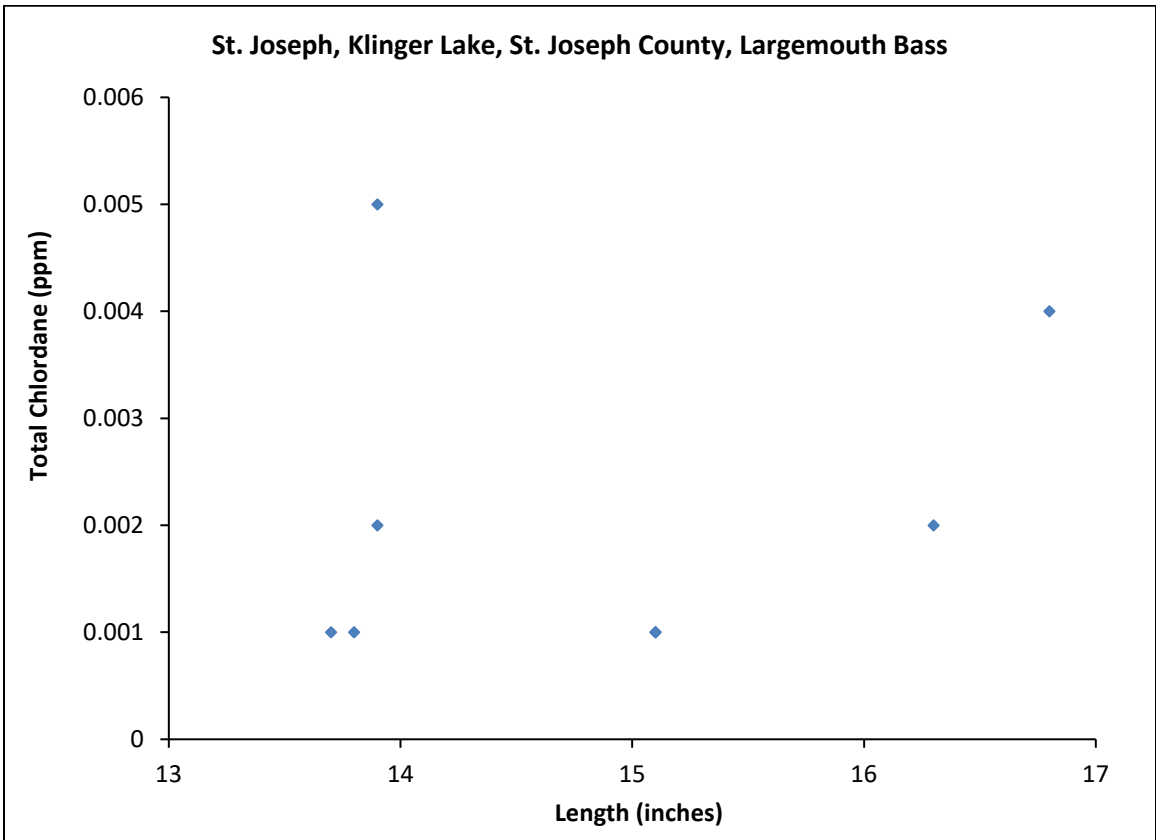
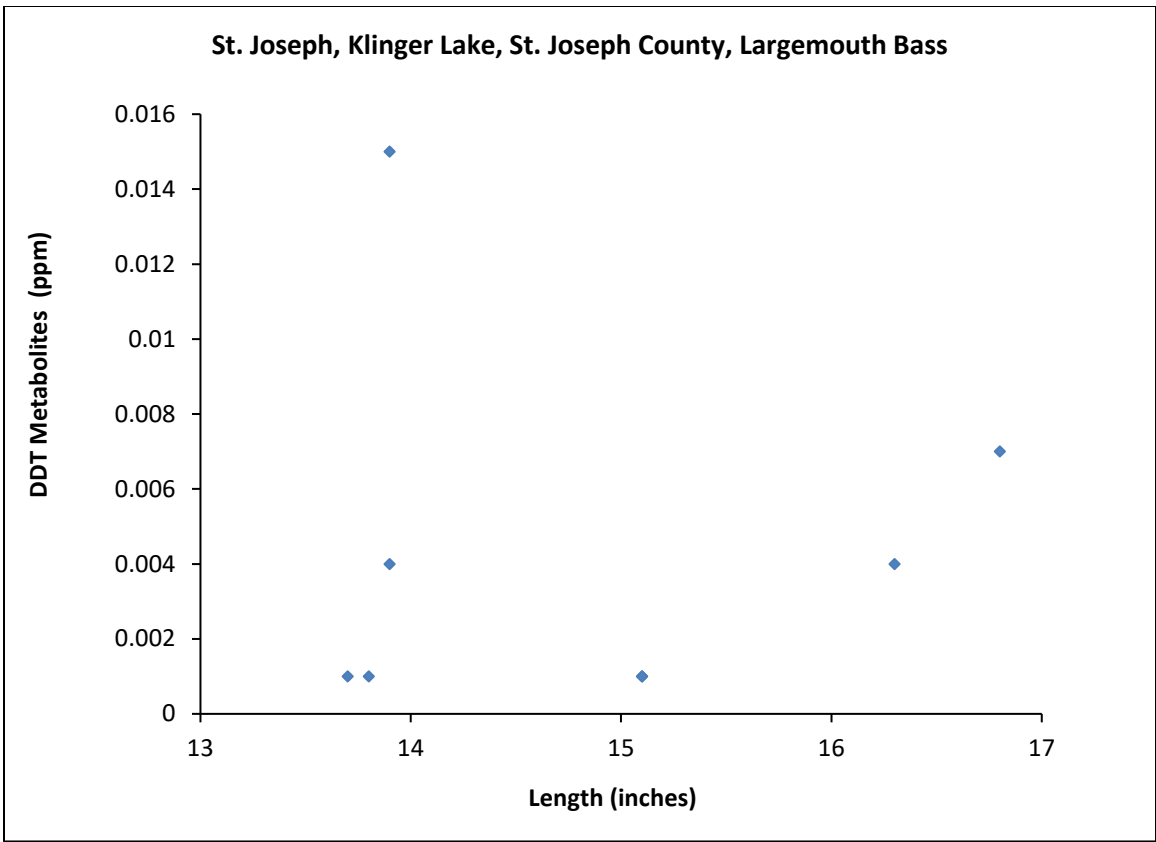
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2001	2001	8	13.7	14	13.7	16.8
Datasets available: 1990, 2001						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	8	0.01	0.001	0.02	0.02	12
DDT	8	0.004	0.001	0.02	0.01	16
Chlordane	8	0.002	0.001	0.005	0.003	16
Toxaphene	8	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.000	0.025				
DDT	0.000	0.053				
Chlordane	0.044	0.084				
Toxaphene	--	--				
Final meal category based on UCL:						2

Existing Advisory: Women and children should not eat more than one meal per month of Klinger Lake largemouth bass larger than 18 inches due to mercury.

Recommendation: No one should eat more than 2 meals per month of legal size Klinger Lake largemouth or smallmouth bass less than 18 inches or more than 1 meal per month of those larger than 18 inches due to mercury. Statewide guidelines length break. PCBs would cause an advisory.





Northern Pike

Klinger Lake

St. Joseph County

Hg Analysis:

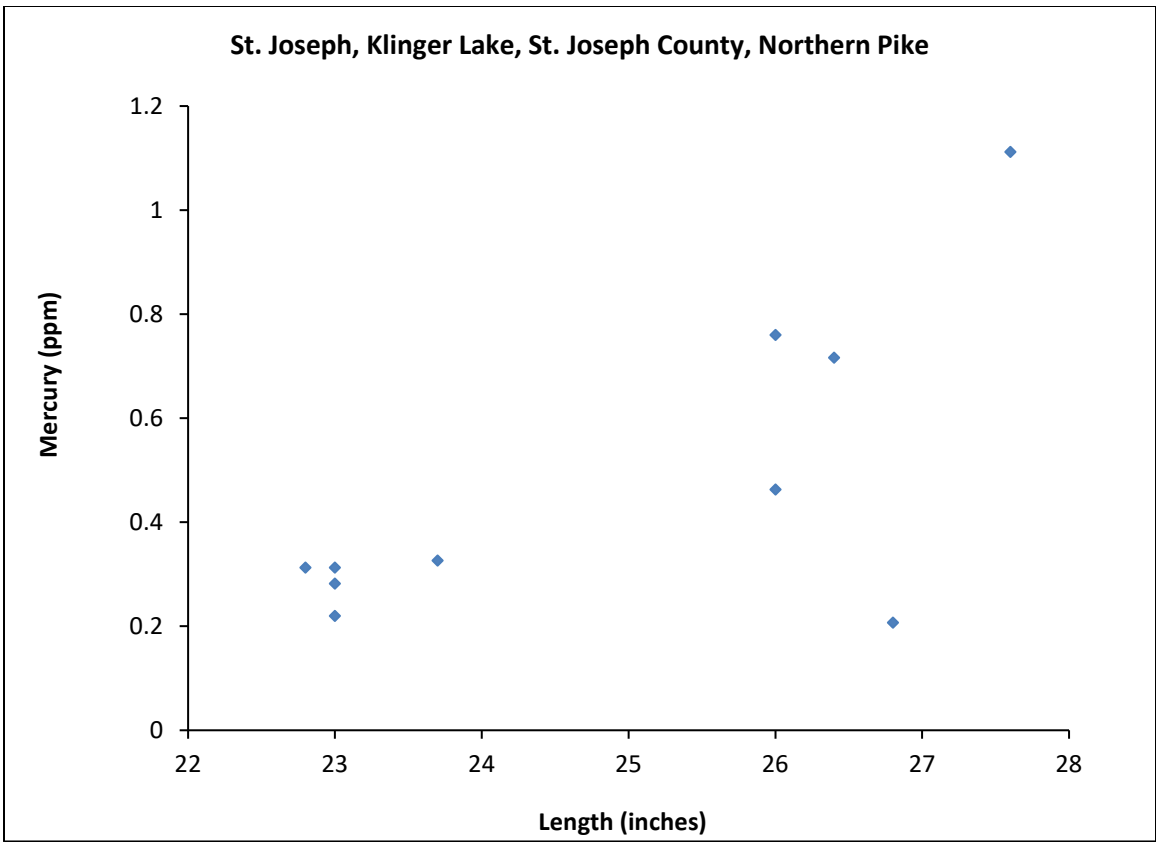
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2006	2006	10	22.8	24	23.7	27.6
Datasets available: 2006						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	6	0.60	0.21	1.11	0.95	1
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.046	0.076				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
--	--	0				
Datasets available: --						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						1

Existing Advisory: Klinger Lake northern pike are covered under the statewide mercury consumption advisory

Recommendation: No one should eat more than 1 meal per month of Klinger Lake northern pike less than 30 inches or more than 6 meals per year of those greater than 30 inches due to mercury. Statewide length break applied.



Bluegill

Long Lake

St. Joseph County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2018	2018	10	6.2	na	6.2	7.4
Datasets available: 2018						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.06	0.04	0.10	0.07	12
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.327	0.266				

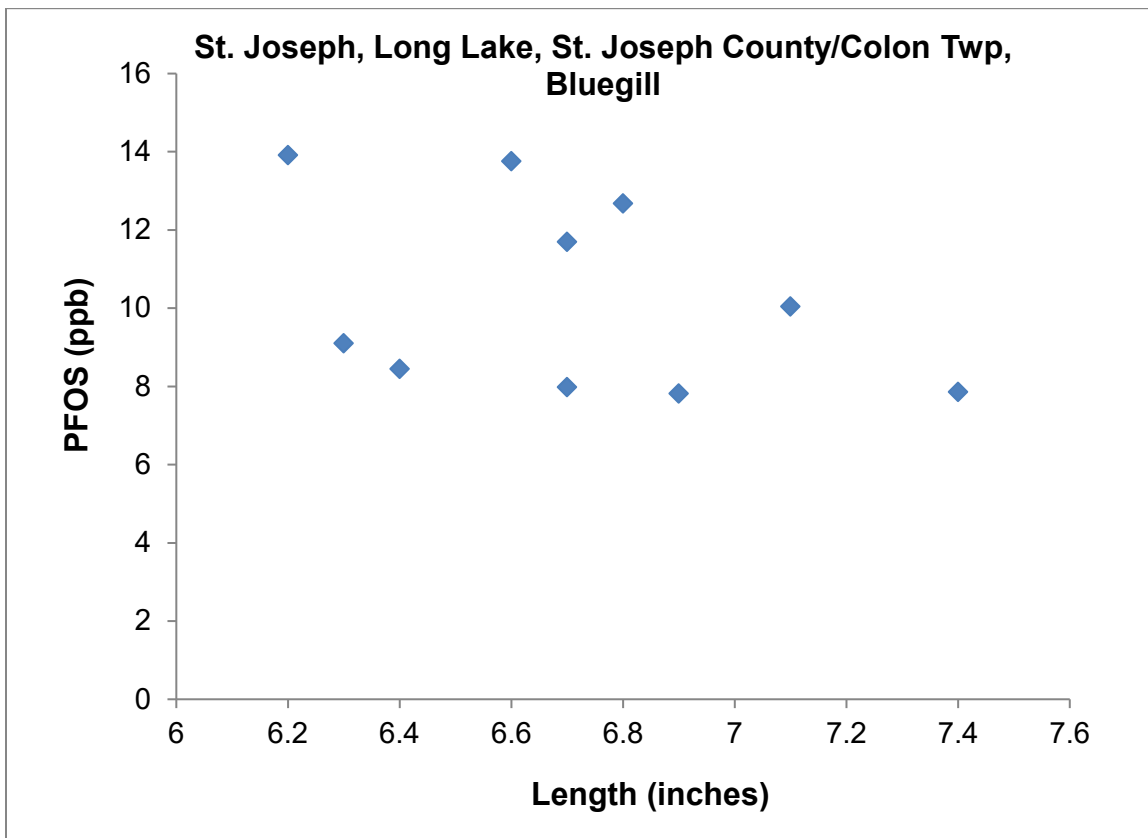
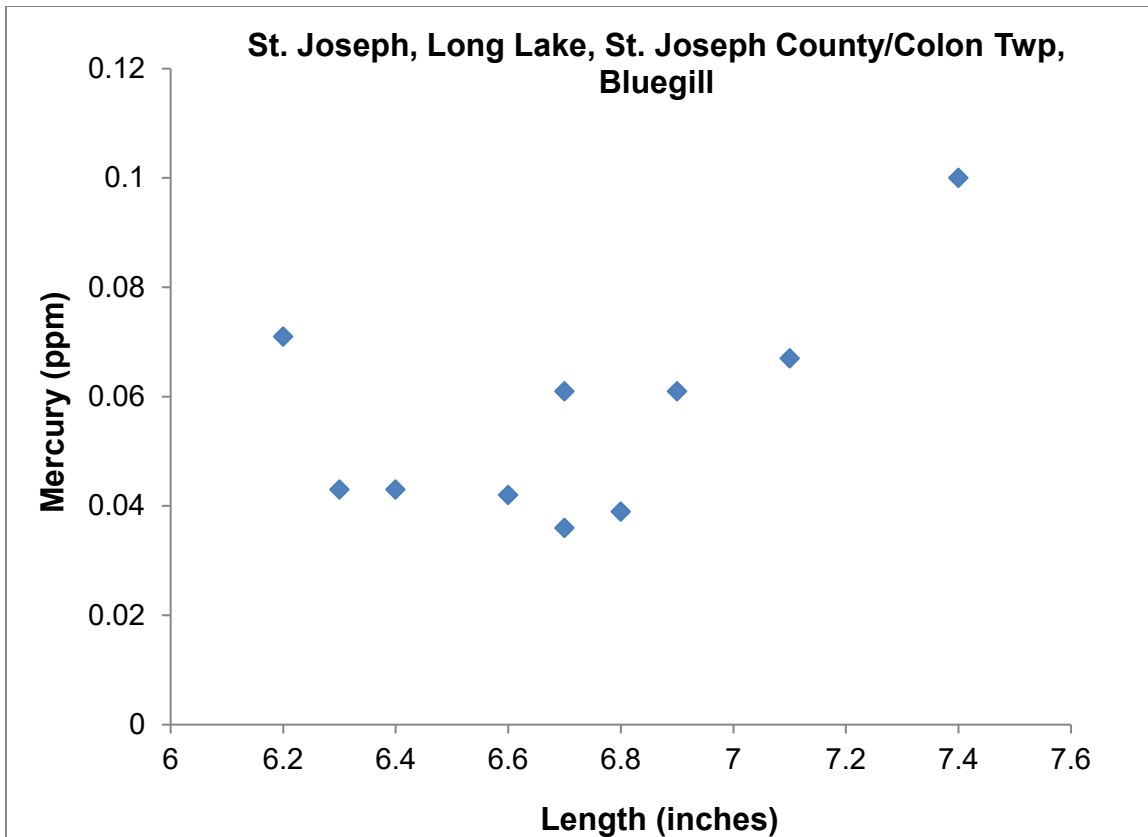
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2018	2018	10	6.2	na	6.2	7.4
Datasets available: 2018						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
PFOS	10	10 ppb	8 ppb	14 ppb	12 ppb	12
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.327	0.151	Final meal category based on UCL:			12

Existing MDHHS Advisory: Long Lake bluegill and sunfish are covered by the statewide advisory due to mercury: No one should eat more than 8 meals of bluegill or sunfish of any size.

Recommendation: No one should eat more than 12 meals of Long Lake bluegill or sunfish of any size due to mercury and PFOS.

Note: Bluegill collected at the same time from adjacent and connected Palmer Lake also had mercury concentrations below the statewide average.



Brown Bullhead

Long Lake

St. Joseph County

Hg Analysis:

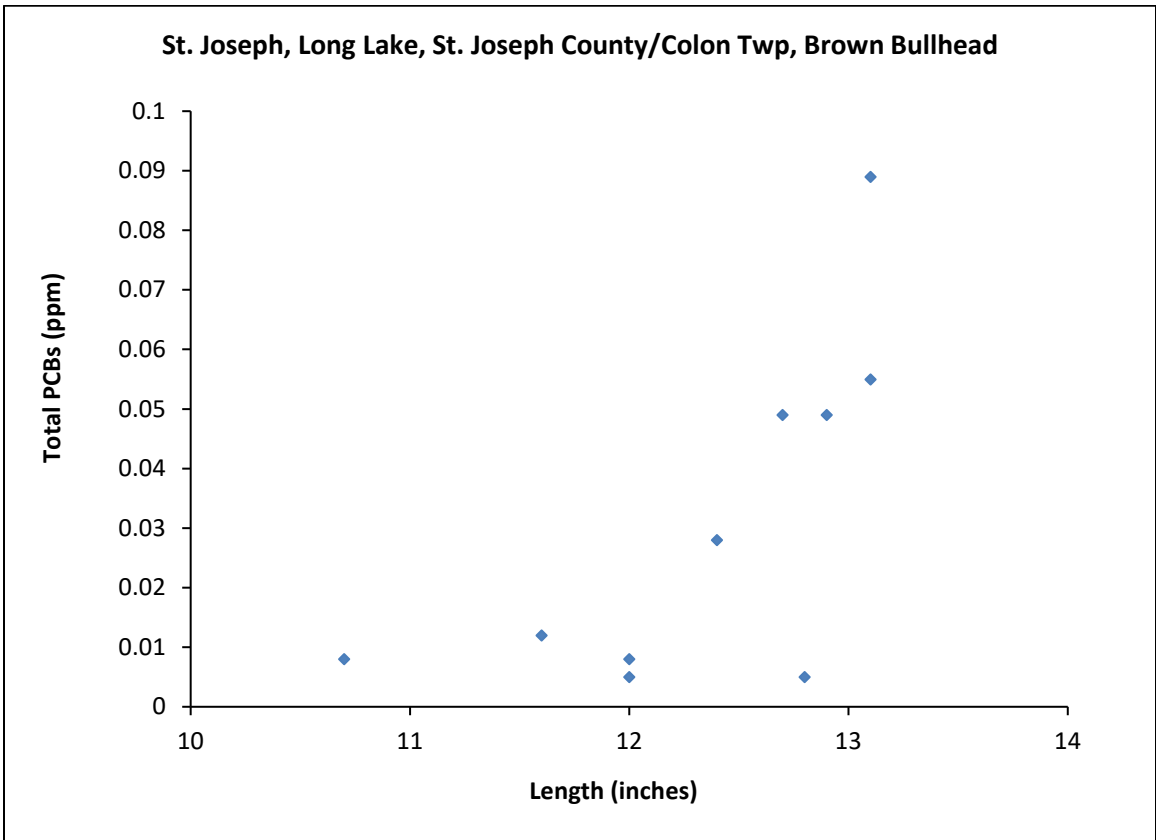
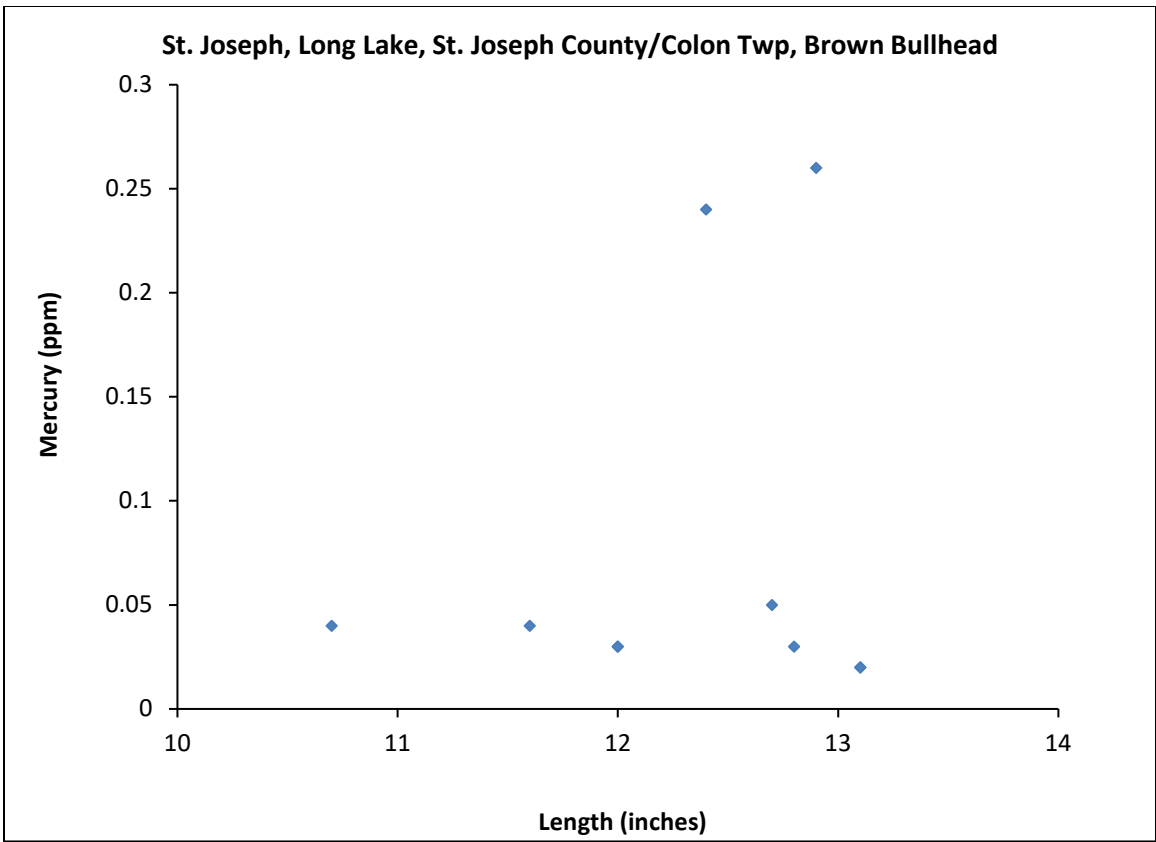
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2001	2001	10	10.7	na	10.7	13.1
Datasets available: 2001						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.08	0.02	0.26	0.14	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.032	0.032				

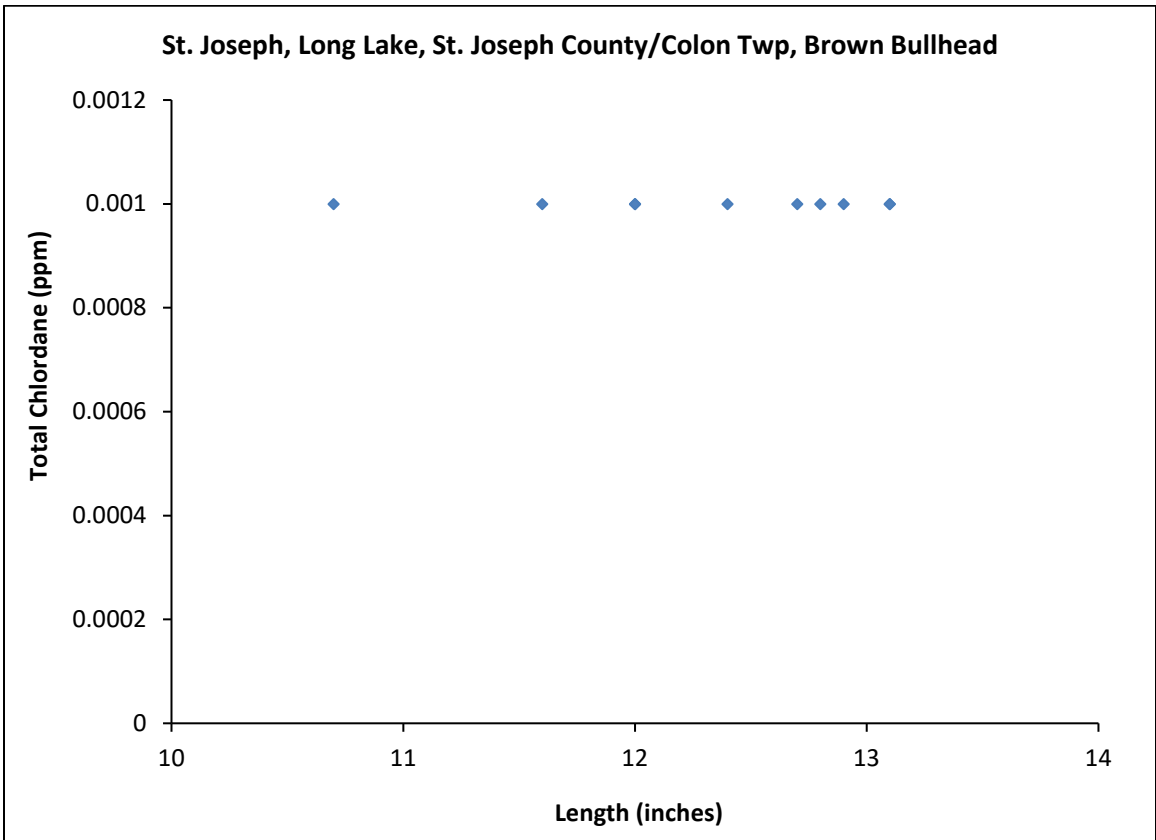
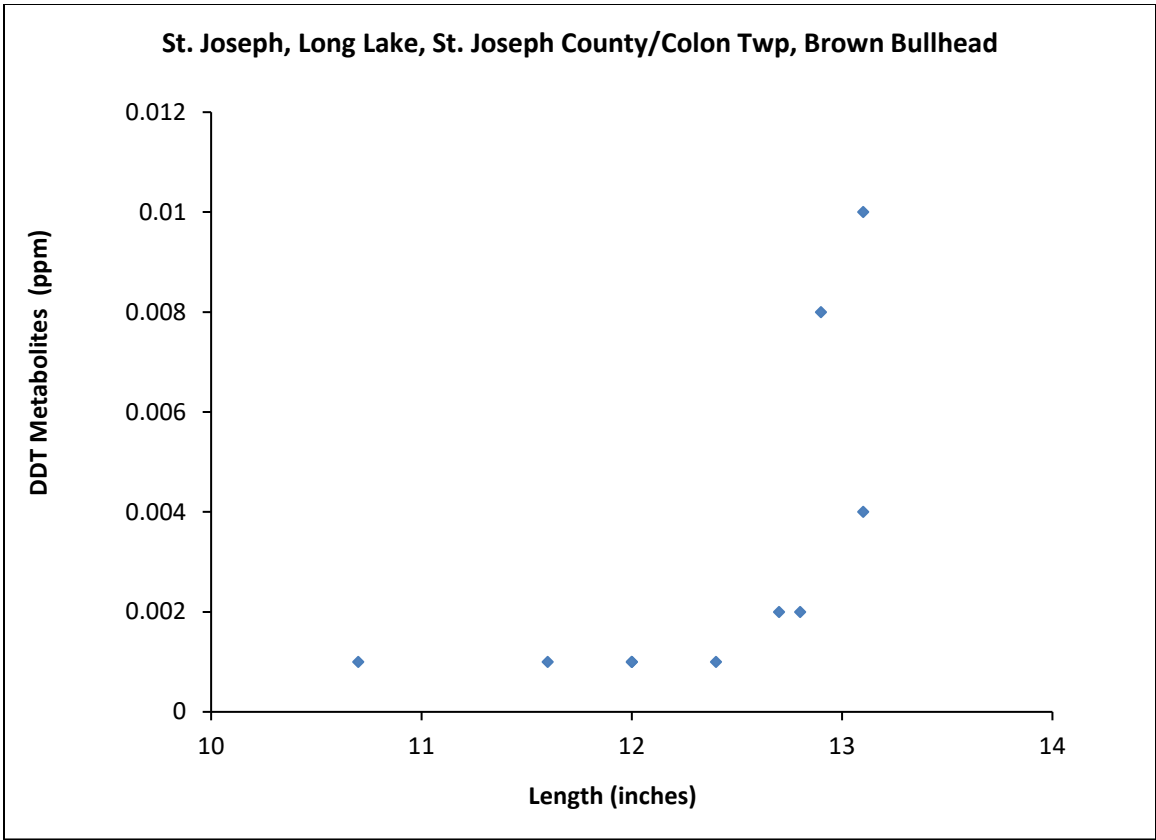
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2001	2001	10	10.7	na	10.7	13.1
Datasets available: 2001						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.03	0.005	0.09	0.05	4
DDT	10	0.003	0.001	0.008	0.01	16
Chlordane	10	0.001	0.001	0.001	0.002	--
Toxaphene	10	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.470	0.401				
DDT	0.387	0.544				
Chlordane	0.000	--				
Toxaphene	--	--				
Final meal category based on UCL:						4

Existing Advisory: There are no current consumption advisories for Long Lake brown bullhead.

Recommendation: No one should eat more than 4 meals per month of Long Lake bullhead due to mercury and PCBs.





Largemouth Bass

Long Lake

St. Joseph County

Hg Analysis:

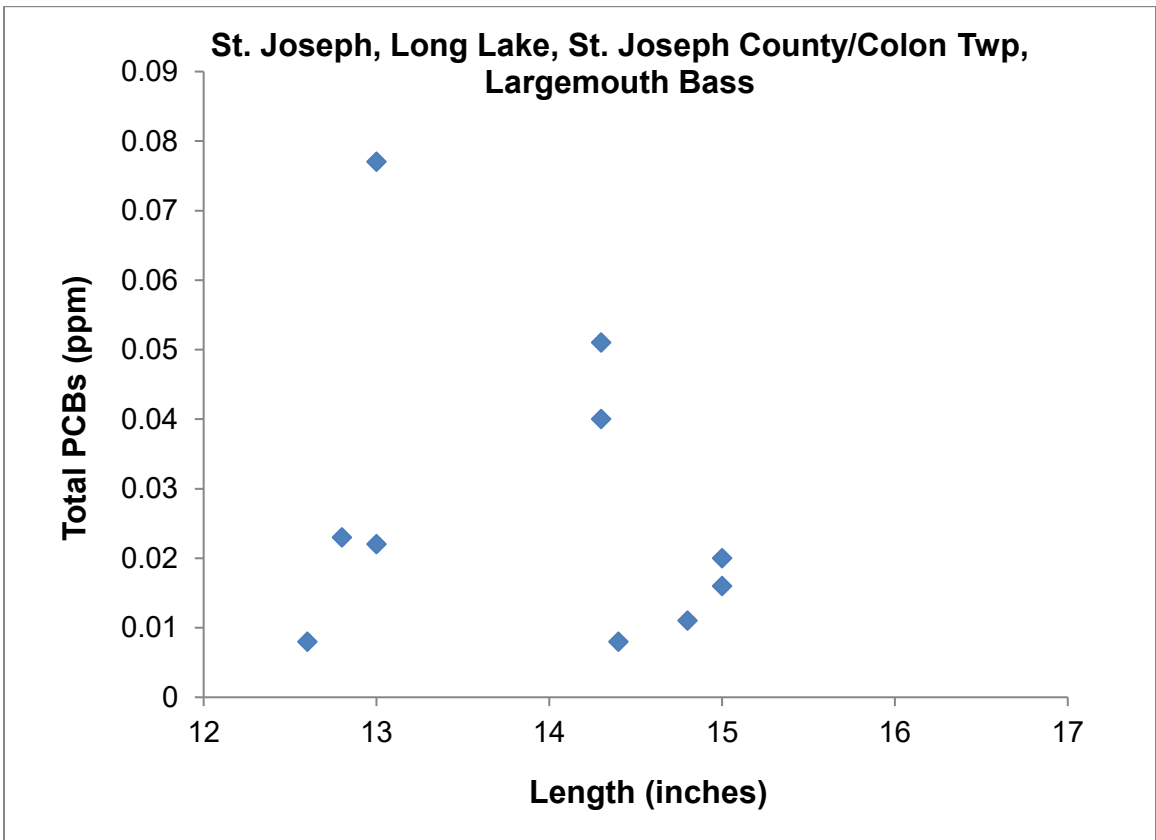
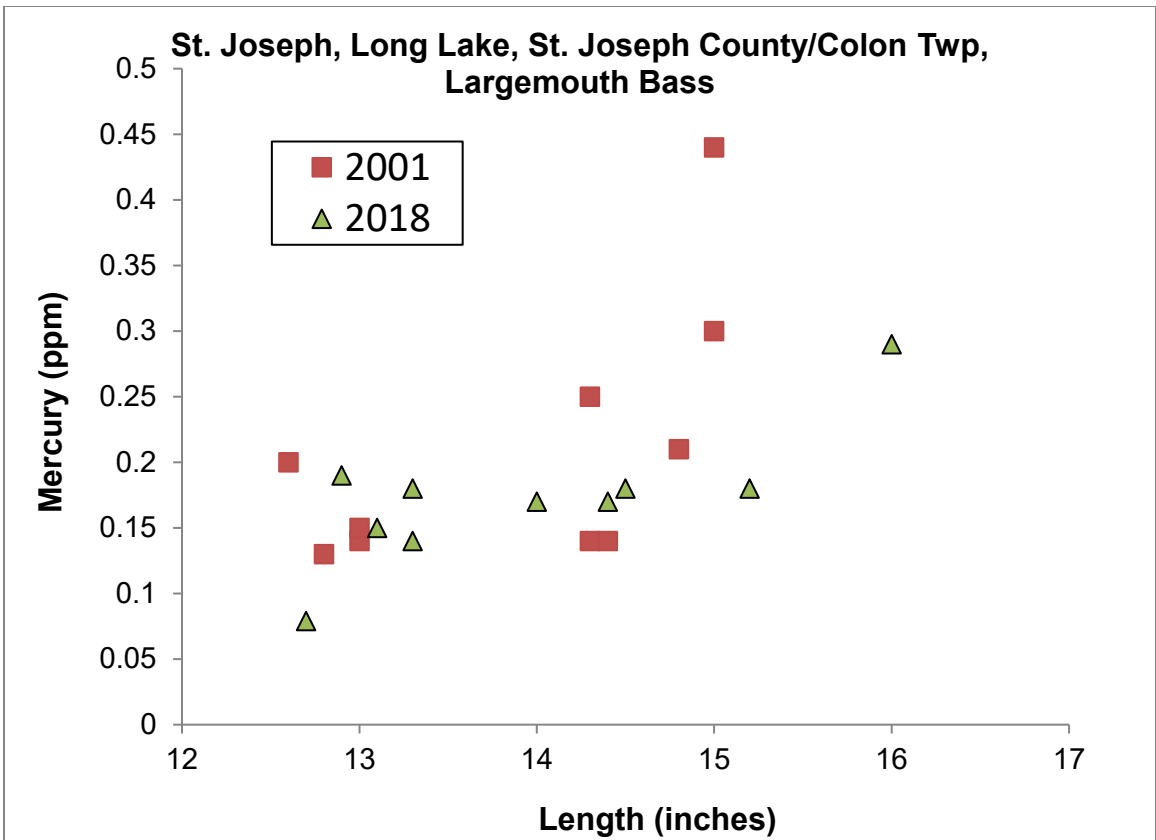
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2001	2018	20	12.6	14	14	16
Datasets available: 2001, 2018						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	11	0.22	0.14	0.44	0.28	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.367	0.405				

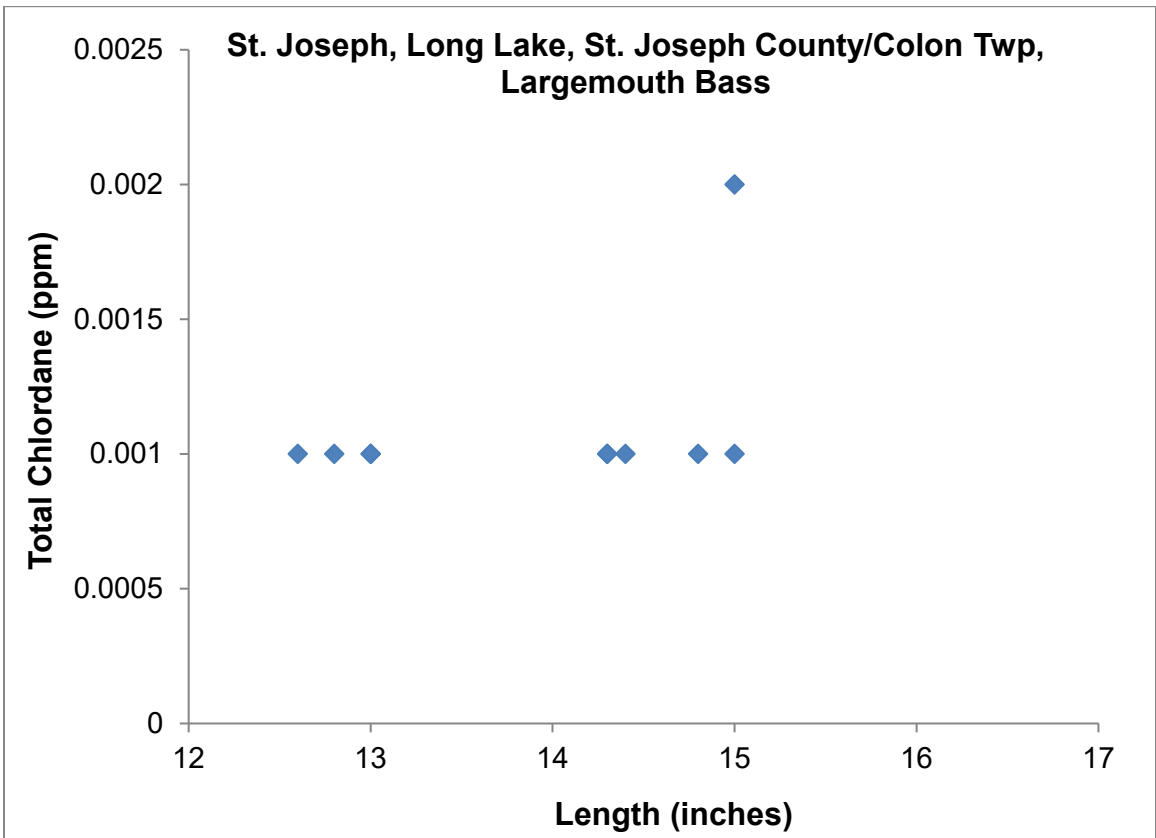
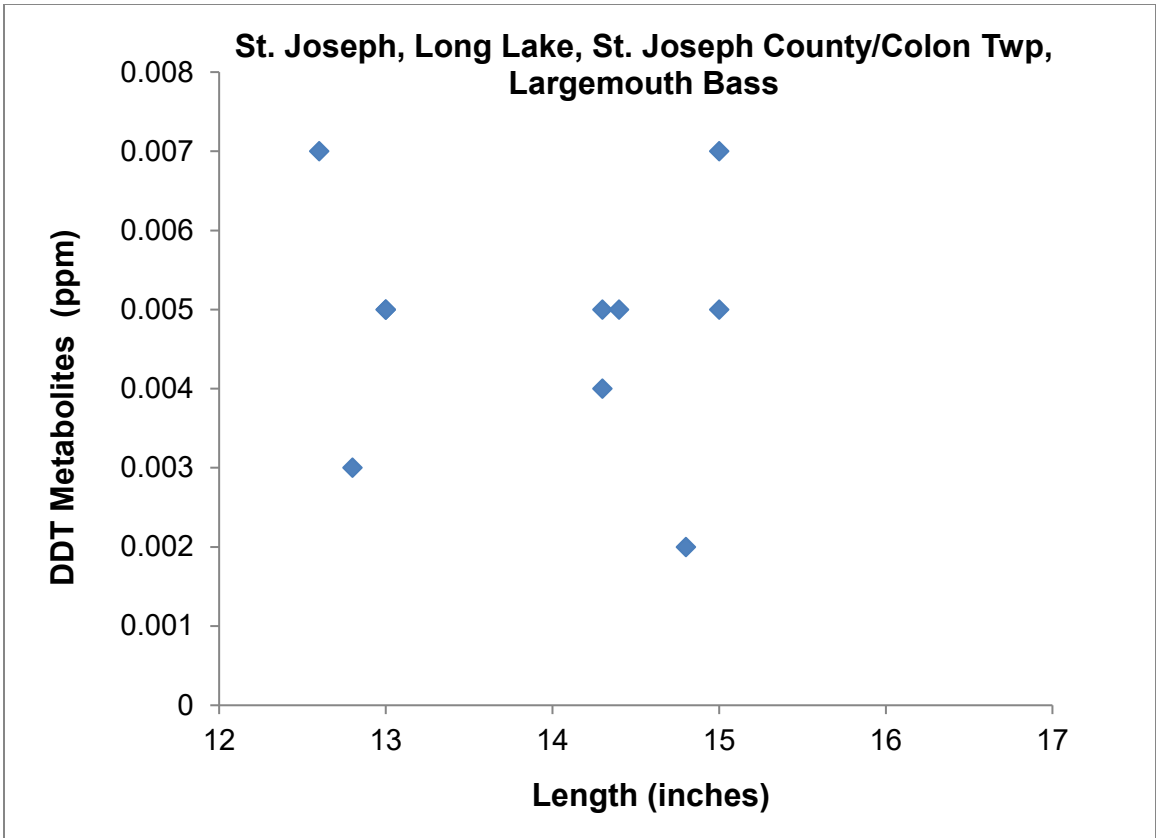
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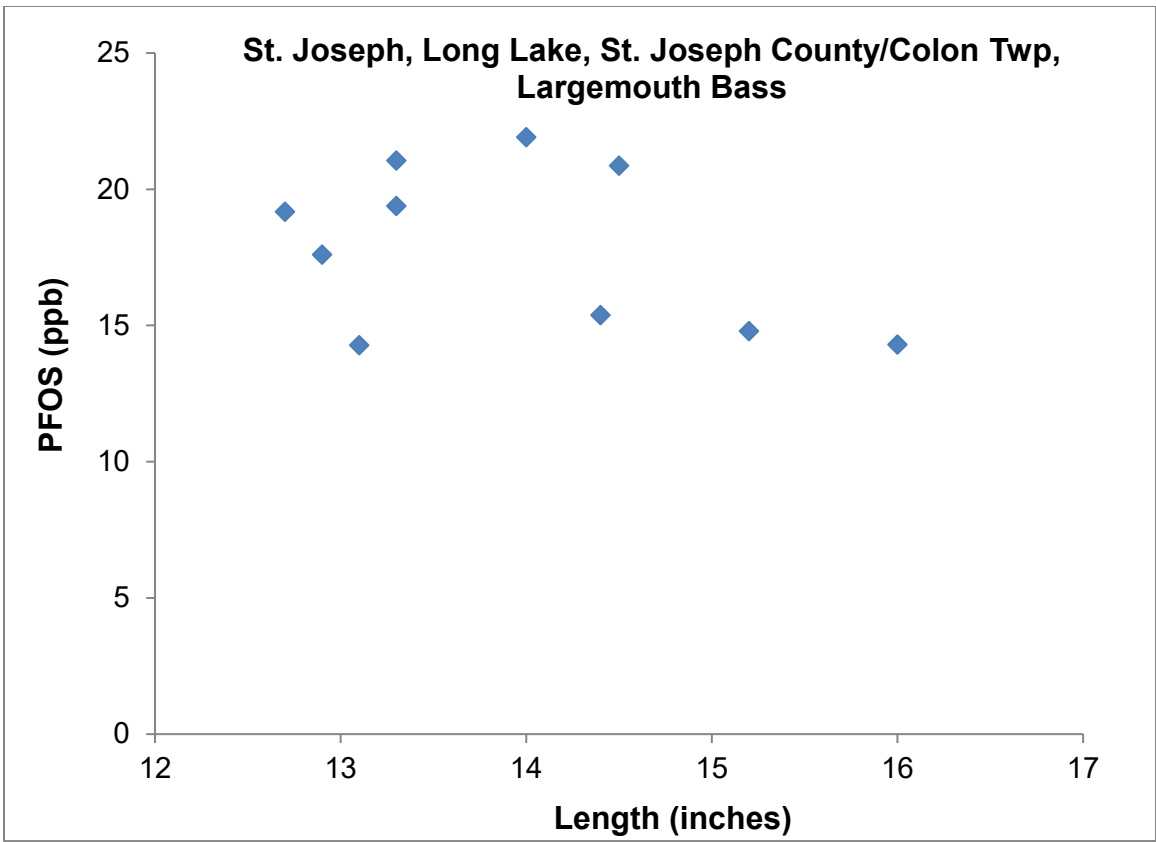
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
PCBs	2001	10	12.6	14	14.3	15
PFOS	2018	10	12.7	14	14	16
Datasets available: 2001-chlorinated organics; 2018-PFOS						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	6	0.024	0.008	0.05	0.04	4
DDT	6	0.005	0.002	0.007	0.006	16
Chlordane	6	0.001	0.001	0.002	0.002	--
Toxaphene	6	ND	< 0.05	< 0.05	< 0.05	--
PFOS	5	17 ppb	14 ppb	22 ppb	22 ppb	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.044	0.017				
DDT	0.009	0.015				
Chlordane	0.156	0.156				
Toxaphene	--	--				
PFOS	0.163	0.182				
Final meal category based on UCL:						2

Existing MDHHS Advisory: No one should eat more than 2 meals per month of legal size Long Lake largemouth or smallmouth bass smaller than 18 inches or more than 1 meal per month of those fish larger than 18 inches due to mercury. The statewide length break was applied as the size range of the fish was limited.

Recommendation: No change in the advisory is recommended. PCBs and PFOS would cause an advisory.







Bluegill

Palmer Lake

St. Joseph County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2018	2018	10	6.3	na	6.3	8
Datasets available: 2018						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.05	0.02	0.11	0.07	12
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.241	0.253				

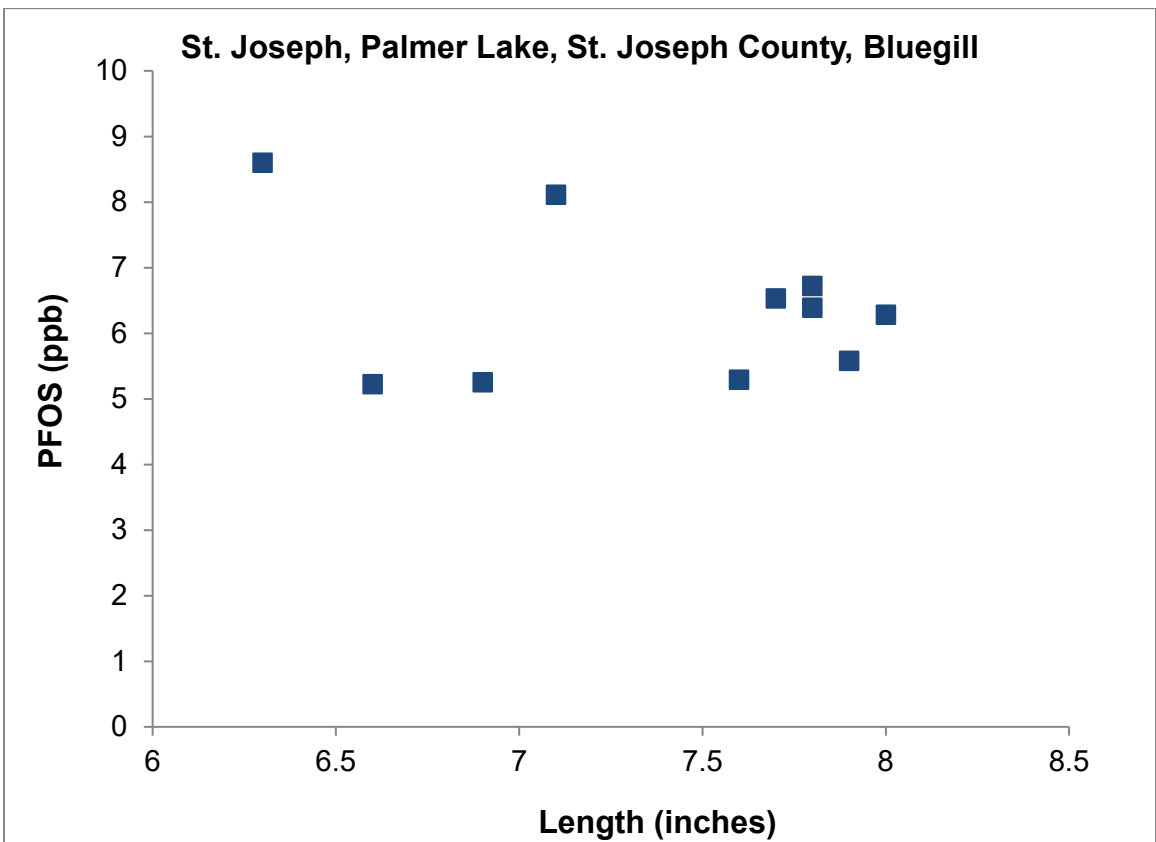
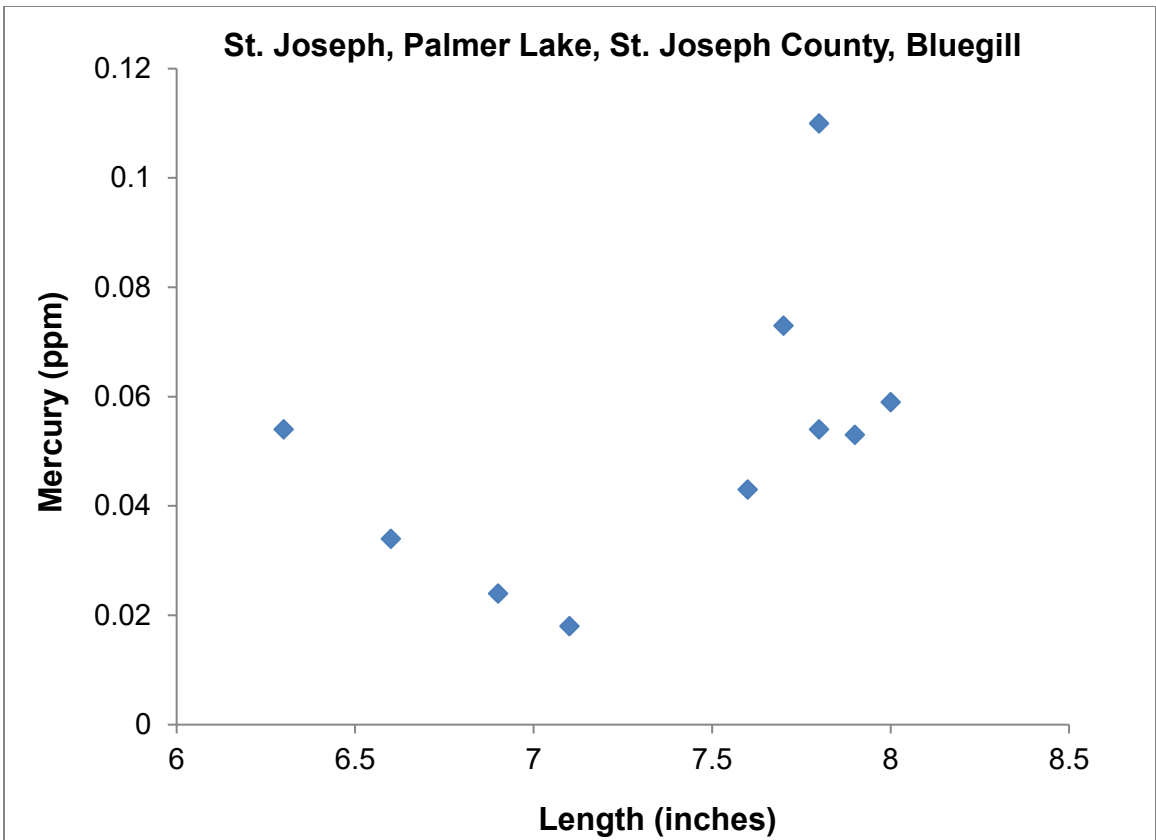
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2018	2018	10	6.3	na	6.3	8
Datasets available: 2018						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
PFOS	10	6 ppb	5 ppb	9 ppb	7 ppb	16
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.094	0.059				
Final meal category based on UCL:						12

Existing MDHHS Advisory: Palmer Lake bluegill and sunfish are covered by the statewide advisory due to mercury: No one should eat more than 8 meals per month of bluegill or sunfish of any size.

Recommendation: No one should eat more than 12 meals per month of Palmer Lake bluegill or sunfish of any size due to mercury.

Note: Bluegill collected at the same time from adjacent and connected Long Lake also had mercury concentrations below the statewide average.



Largemouth Bass

Palmer Lake

St. Joseph County

Hg Analysis:

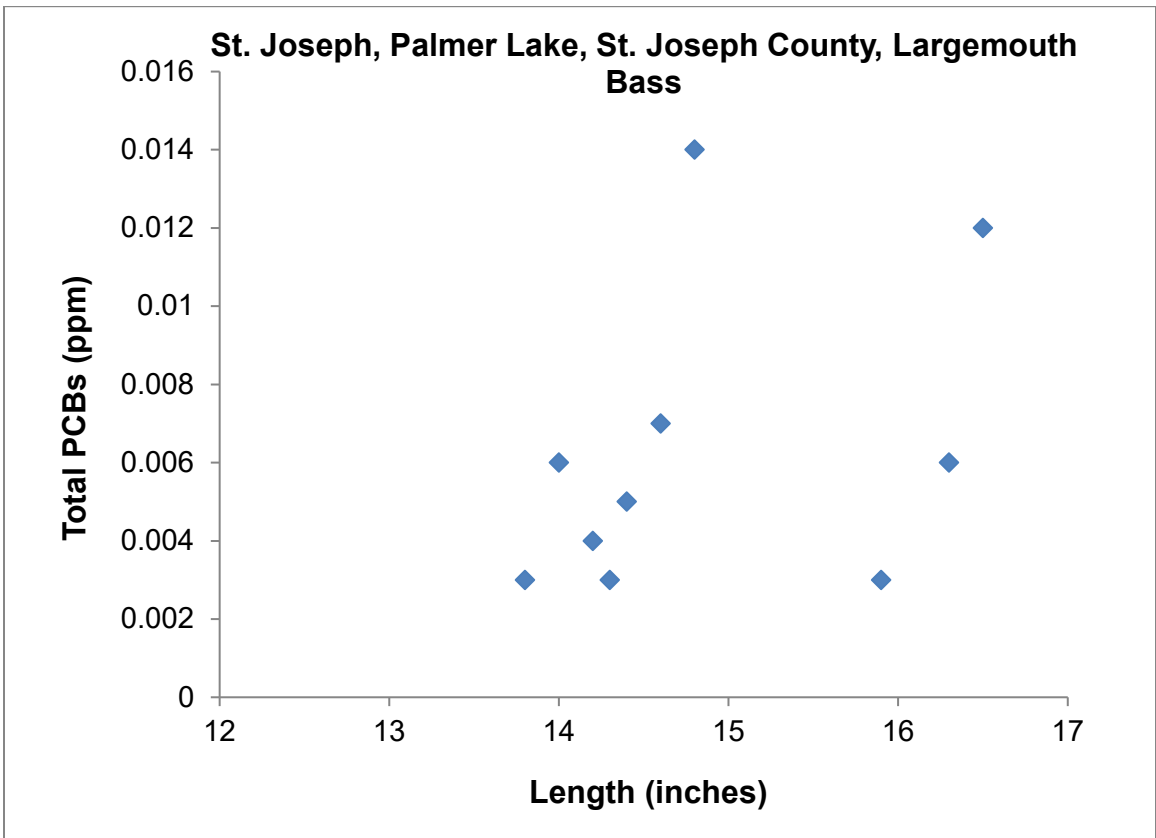
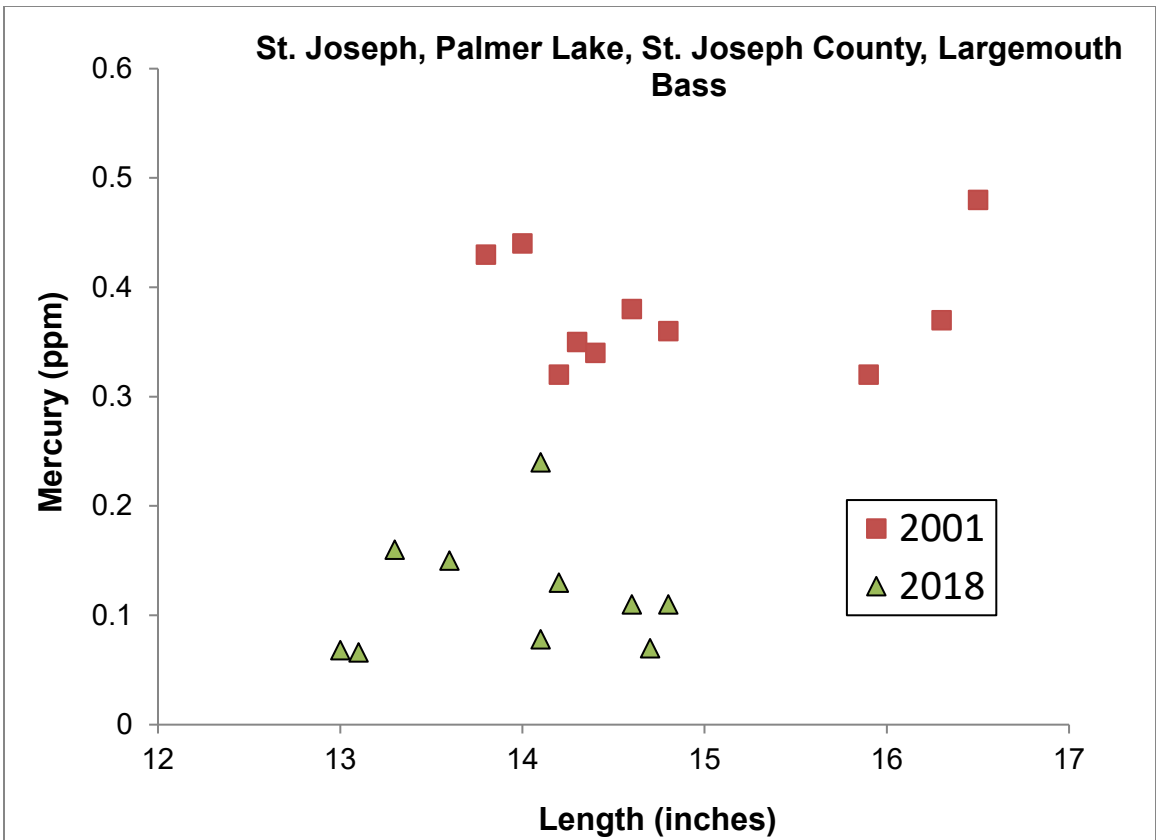
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2001	2018	20	13	14	13.6	16.5
Datasets available: 2001, 2018						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	17	0.28	0.07	0.48	0.35	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.249	0.236				

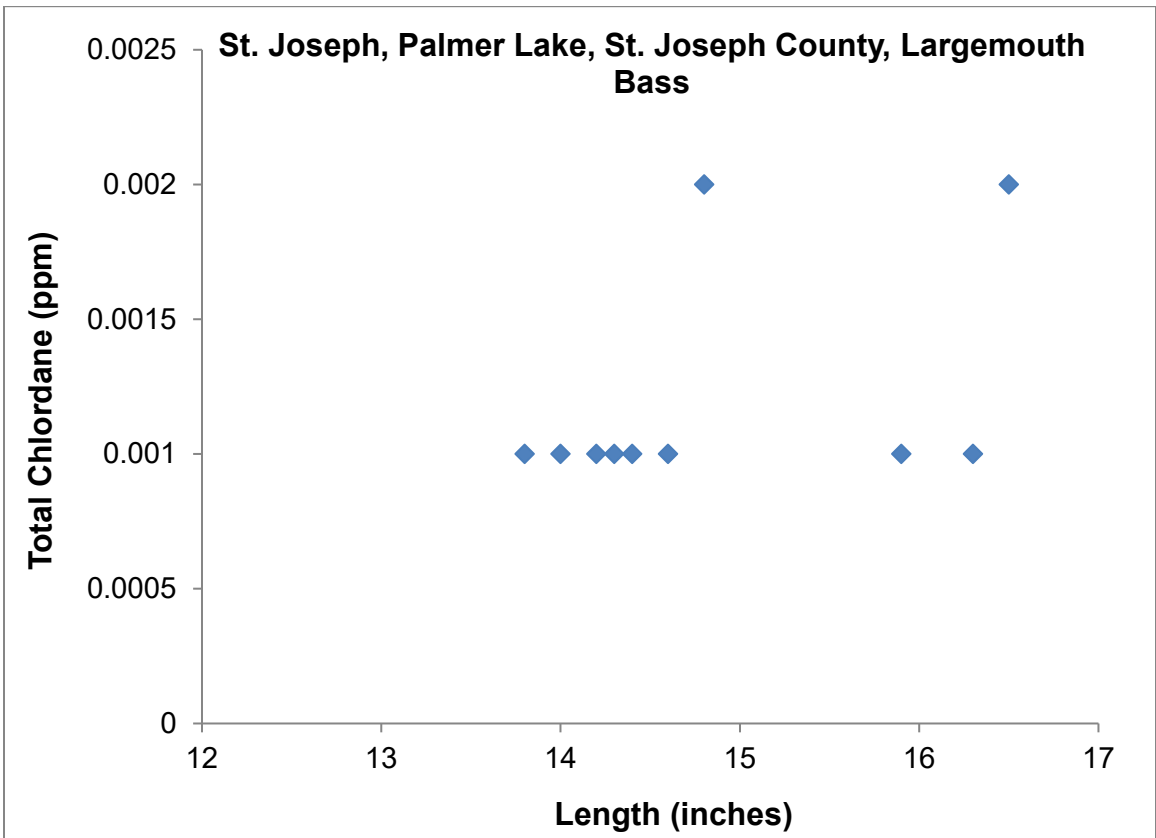
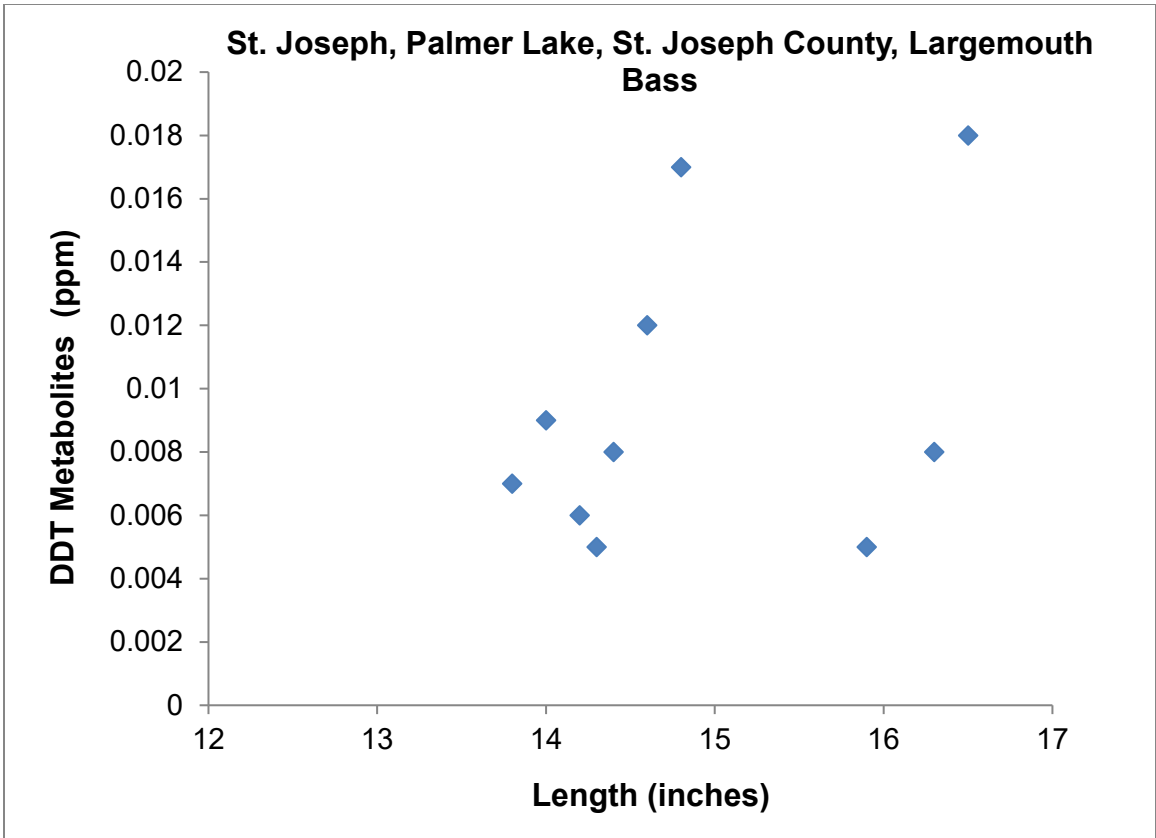
Organics Analysis:

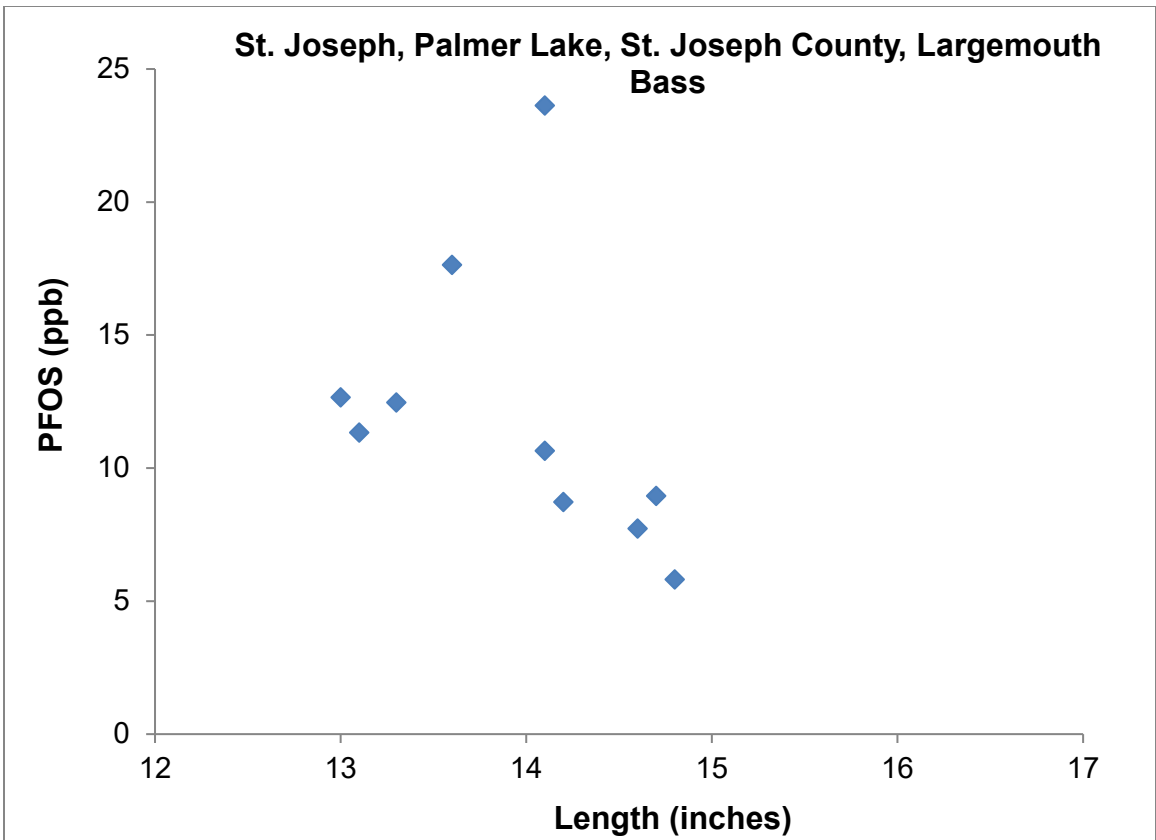
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
PCBs 2001	2001	10	13.8	14	13.8	16.5
PFOS 2018	2018	10	13.0		13.6	14.8
Datasets available: 2001-chlorinated organics; 2018-PFOS						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.006	0.003	0.014	0.009	16
DDT	10	0.01	0.005	0.018	0.013	16
Chlordane	10	0.001	0.001	0.002	0.002	--
Toxaphene	10	ND	< 0.05	< 0.05	--	--
PFOS	7	12 ppb	6 ppb	24 ppb	18 ppb	8
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.137	0.137				
DDT	0.123	0.083				
Chlordane	0.170	0.170				
Toxaphene	--	--				
PFOS	0.145	0.279				
Final meal category based on UCL:						2

Existing MDHHS Advisory: No one should eat more than 2 meals per month of legal size Palmer Lake largemouth or smallmouth bass smaller than 18 inches or more than 1 meal per month of those fish larger than 18 inches. The statewide length break was applied as the size range of the fish was limited.

Recommendation: No change in the advisory is recommended. PFOS would cause an advisory.







Redhorse Sucker

**Pigeon River
Vistula Road**

St. Joseph County

Hg Analysis:

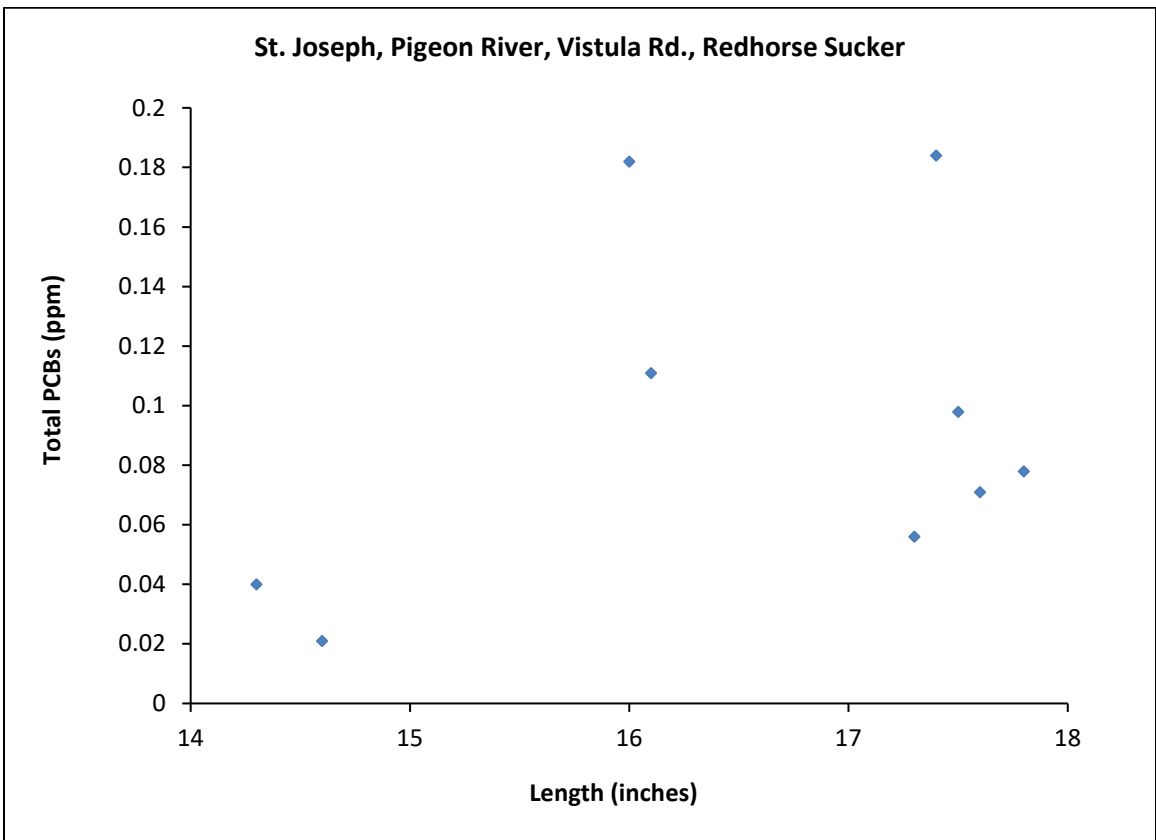
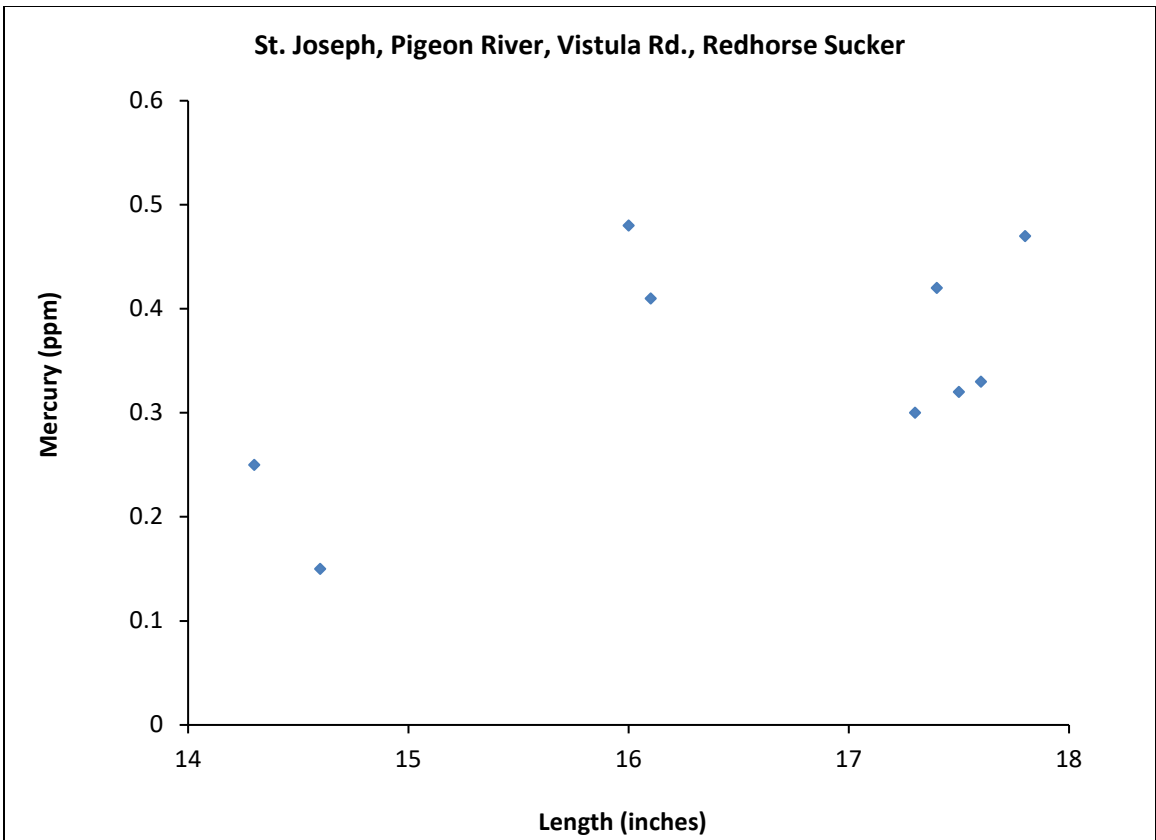
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2005	2005	10	14.3	na	14.3	18.2
Datasets available: 2005						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.357	0.150	0.480	0.430	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.357	0.417				

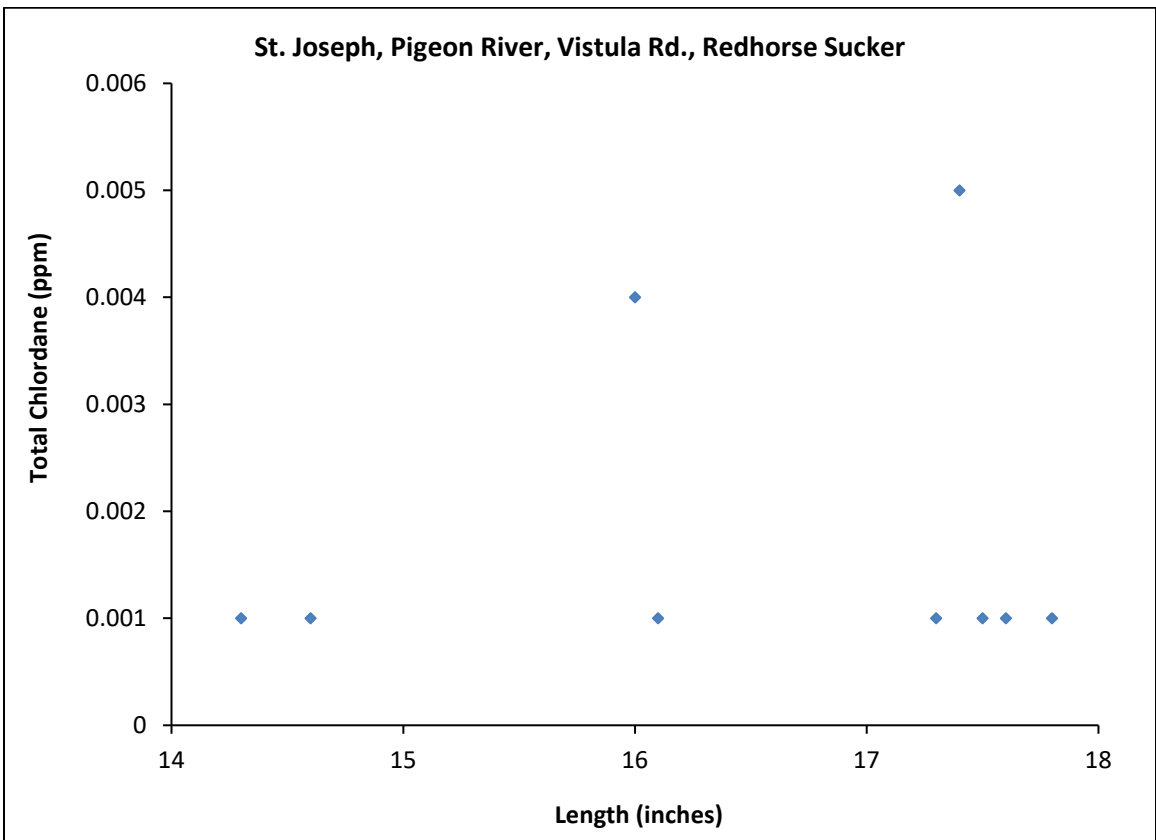
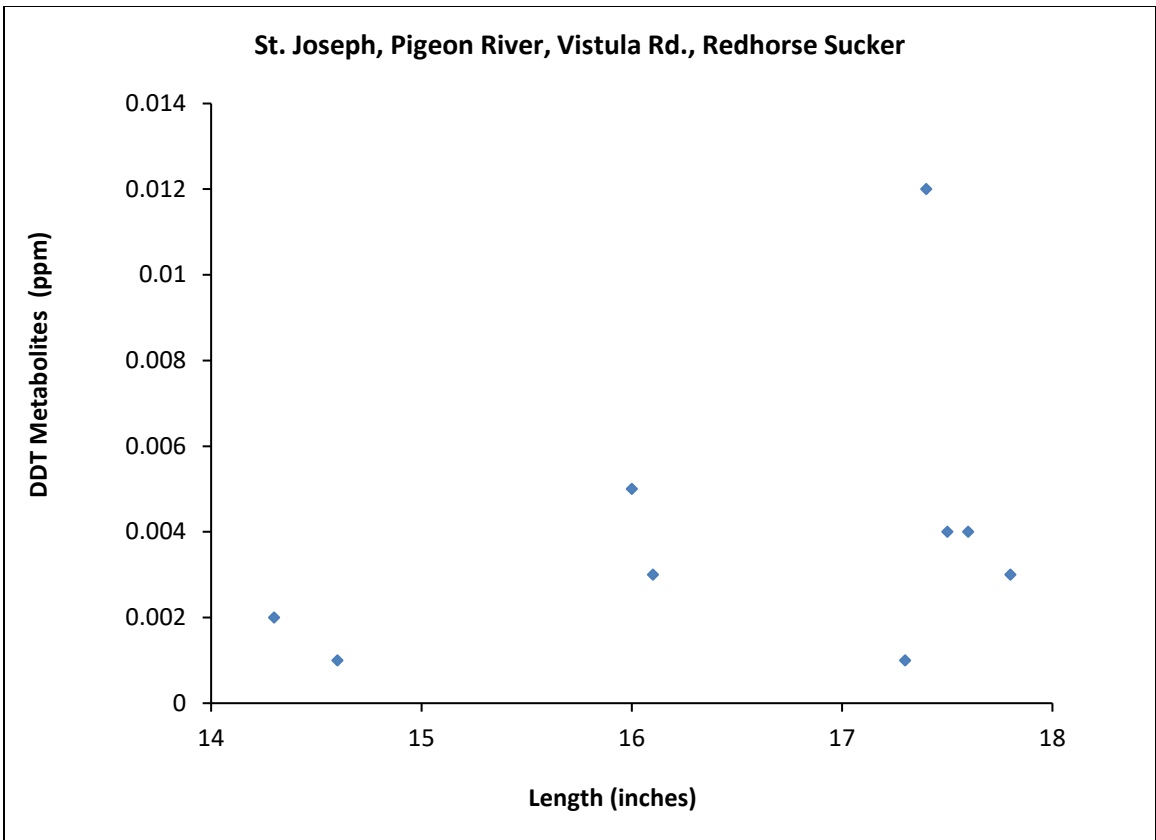
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2005	2005	10	14.3	na	14.3	18.2
Datasets available: 2005						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.09	0.02	0.18	0.13	1
DDT	10	0.004	0.001	0.01	0.01	16
Chlordane	10	0.002	0.001	0.005	0.003	16
Toxaphene	10	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.116	0.297				
DDT	0.098	0.168				
Chlordane	0.002	0.001				
Toxaphene	--	--				
Final meal category based on UCL:						1

Existing Advisory: Women and children should not eat more than one meal per week of Pigeon River sucker due to PCBs.

Recommendation: No one should eat more than 1 meal per month of Pigeon River sucker due to PCBs. Mercury would cause an advisory.





Rock Bass

Pigeon River

St. Joseph County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2005	2021	20	5.0	NA	5.0	9.3
Datasets available: 2005, 2021						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	20	0.271	0.140	0.560	0.330	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.613	0.708				

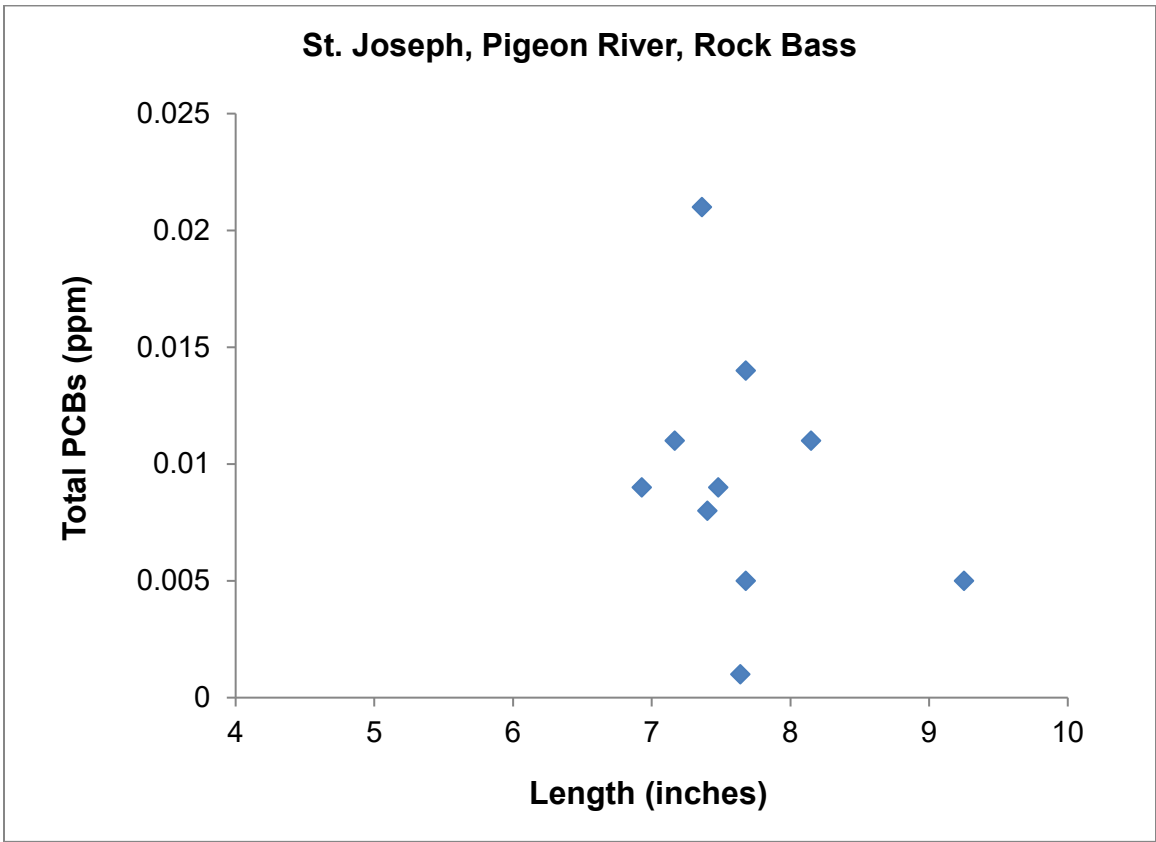
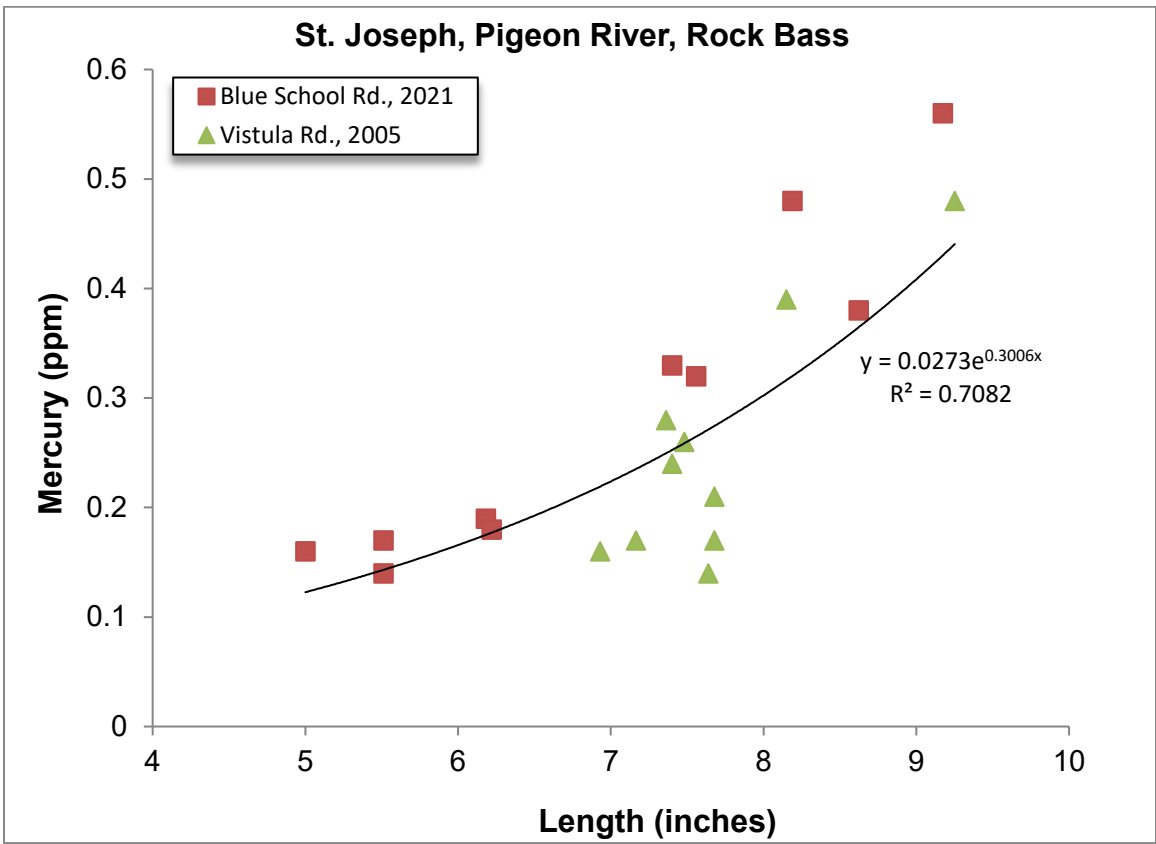
Organics Analysis:

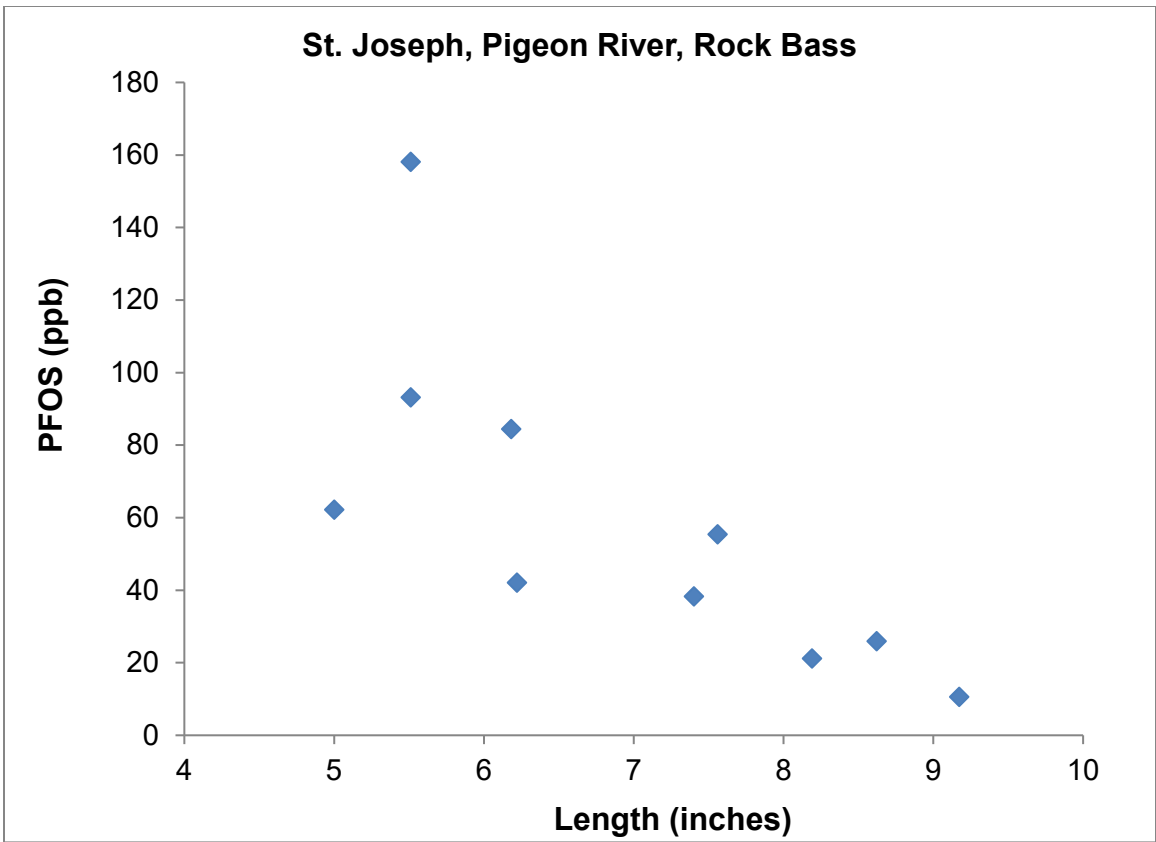
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2005	2021	20	5.0	NA	5.0	9.3
Datasets available: 2005 (No PFOS); 2021 (Only PFOS)						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.009	0.001	0.021	0.013	12
DDT	10	0.001	<0.001	0.001	0.001	16
Chlordane	10	ND	--	--	--	16
Toxaphene	10	ND	--	--	--	--
PFOS	10	59.2 ppb	10.6 ppb	158.1 ppb	90.5 ppb	1
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.090	0.051				
DDT	0.000	0.000				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.558	0.748				
Final meal category based on UCL:						1

Existing MDHHS Advisory: No one should eat more than 4 meals per month of rock bass smaller than 7 inches from the Pigeon River in St. Joseph County due to mercury or no more than 2 meals per month of these fish greater than 7 inches due to mercury.

Recommendation: No one should eat more than 1 meal per month of rock bass from the Pigeon River in St. Joseph County smaller than 10 inches due to PFOS or no more than 1 meal per month of these fish larger than 10 inches due to mercury and PFOS. Length break was applied at the upper end of the regression as the sample size range was limited. PCBs cause less restrictive advice.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
6	0.166	4
7	0.224	4
8	0.302	2
9	0.408	2
10	0.552	1
11	0.745	1
<i>Shaded area denotes extrapolated estimates</i>		





Smallmouth Bass

**Pigeon River
Vistula Road**

St. Joseph County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2005	2005	10	12.4	14	14.0	17.9
Datasets available: 2005						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	7	0.35	0.22	0.60	0.47	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.960	0.891				

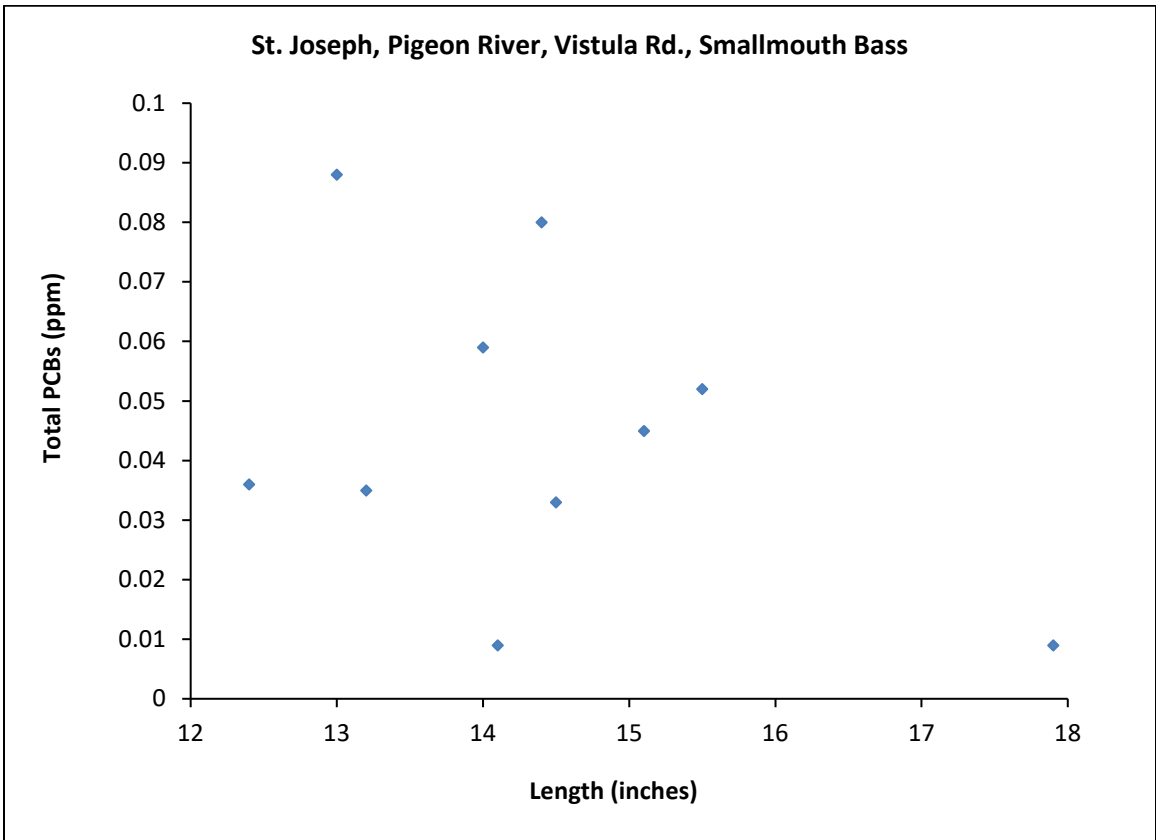
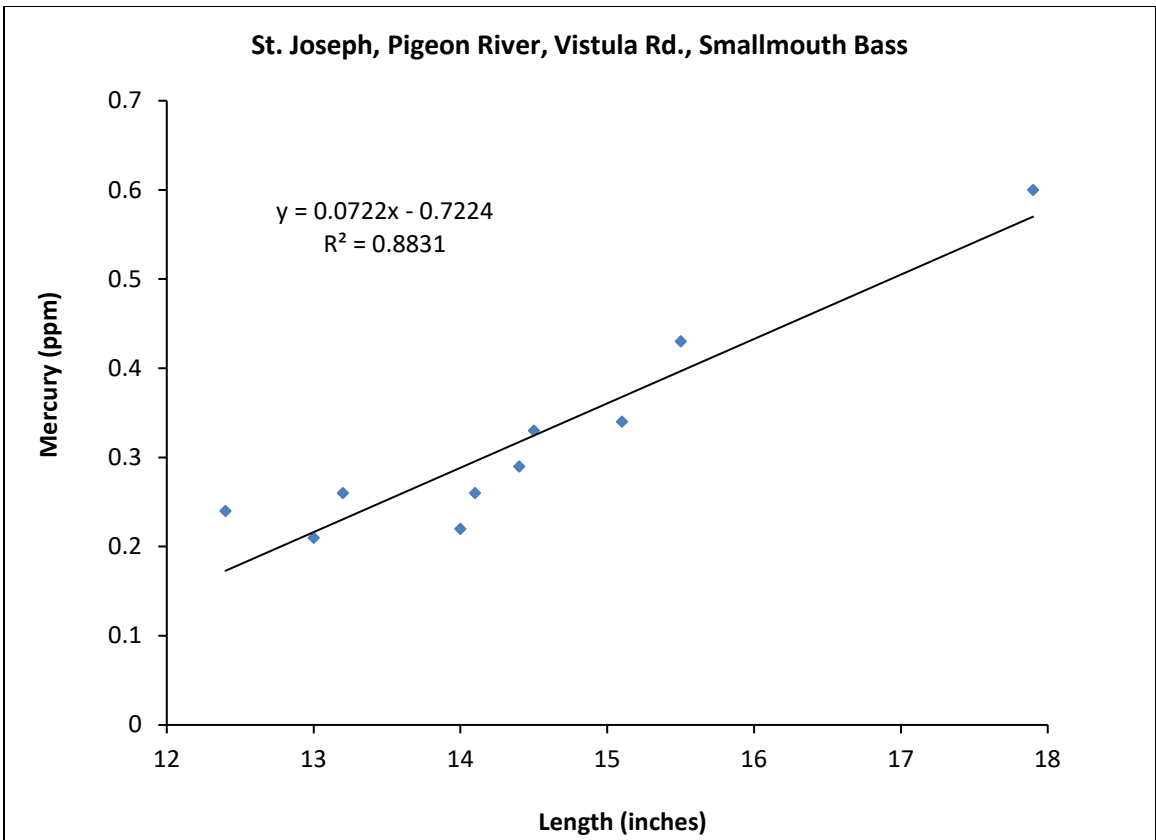
Organics Analysis:

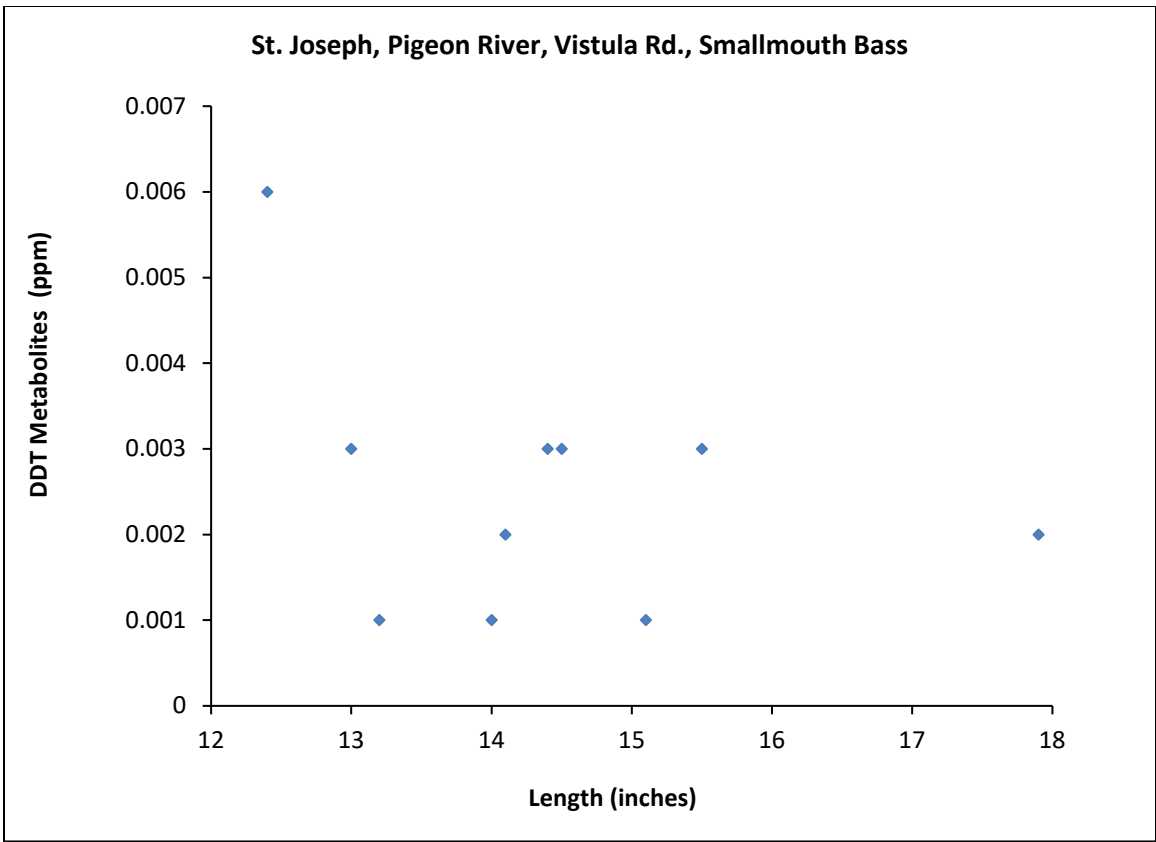
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2005	2005	10	12.4	14	14.0	17.9
Datasets available: 2005						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	7	0.04	0.009	0.06	0.07	2
DDT	7	0.002	0.001	0.003	0.003	16
Chlordane	7	ND				
Toxaphene	7	ND				
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.202	0.222				
DDT	0.001	0.010				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						2

Existing Advisory: Due to elevated levels of mercury; women and children should eat no more than one meal per month, while the general population should eat no more than one meal per week of Pigeon River smallmouth bass between 18 and 30 inches in length.

Recommendation: No one should eat more than 2 meals per month of legal size Pigeon River largemouth or smallmouth bass smaller than 18 inches or more than 1 meal per month of those fish larger than 18 inches due to mercury. PCBs would cause an advisory. Statewide length break was applied.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
14	0.29	2
15	0.36	2
16	0.43	2
17	0.50	2
18	0.58	1
19	0.65	1
20	0.72	1
21	0.79	1
22	0.87	1
<i>Shaded area denotes extrapolated estimates</i>		





Hg Analysis:

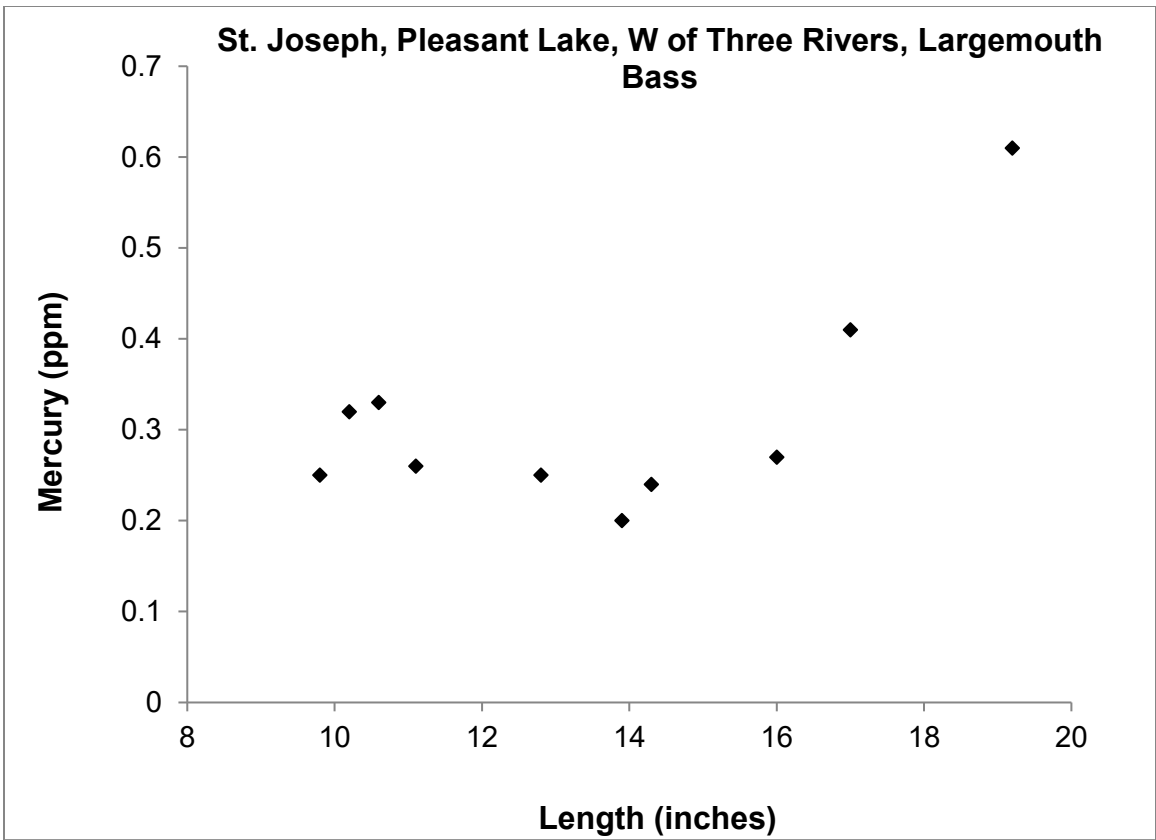
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		Meal Category
Earliest	Most Recent				Min	Max	
2014	2014	10	9.8	14	13.9	19.2	
Datasets available: 2014							
Chemical	Sample Size (Legal)	Mean	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category	
Mercury	5	0.35	0.20	0.61	0.55	1	
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
Mercury	0.396	0.319					

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		Meal Category
Earliest	Most Recent				Min	Max	
Datasets available:							
Chemical	Sample Size (Legal)	Mean	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category	
PCB	--	--	--	--	--	--	--
DDT	--	--	--	--	--	--	--
Chlordane	--	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--	--
TEQ	--	--	--	--	--	--	--
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
PCB	--	--					
DDT	--	--					
Chlordane	--	--					
Toxaphene	--	--					
TEQ	--	--					
Final meal category based on UCL:						1	

Existing Advisory: Pleasant Lake largemouth bass are covered by the statewide mercury advisory: No one should eat more than 2 meals per month of largemouth or smallmouth bass smaller than 18 inches or more than 1 meal per month of those fish larger than 18 inches.

Recommendation: No one should eat more than 1 meal per month of largemouth or smallmouth bass smaller than 18 inches or more than 6 meals per year of those fish larger than 18 inches due to mercury. The statewide length break was applied as the size range of the fish was limited.



Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1986	2010	12	12	14	14.2	20.4
Datasets available: 1986, 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	8	0.66	0.33	0.94	0.83	1
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.870	0.831				

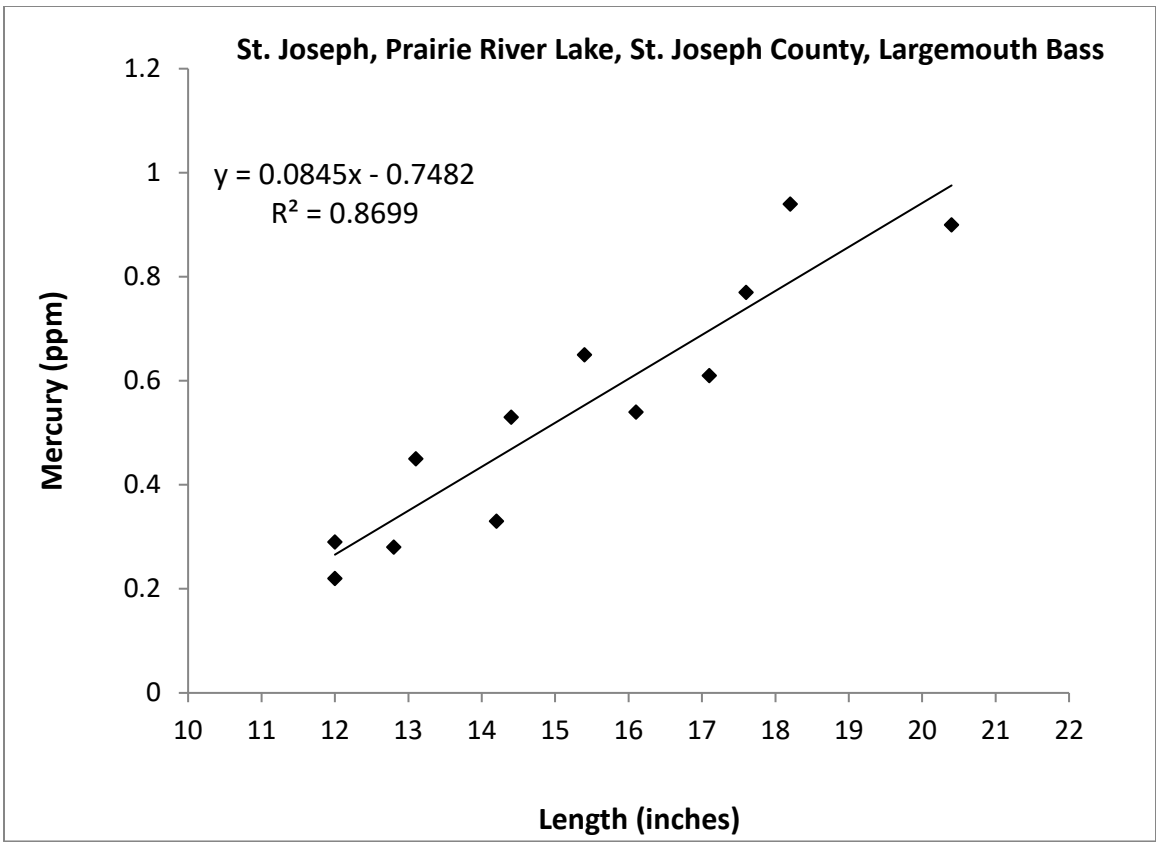
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1986	1986	2	12	14	12	12
Datasets available: 1986						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	2	0.02	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						1

Existing Advisory: Prairie lake largemouth bass are covered by the statewide mercury advisory.

Recommendation: No one should eat more than 1 meal per month of Prairie Lake largemouth or smallmouth bass smaller than 20 inches or more than 6 meals per year of those fish larger than 20 inches due to mercury.

Length (Inches)	Regression Equation Estimate (ppm)	Meal Category
12	0.27	4
14	0.43	2
16	0.6	1
18	0.77	1
20	0.94	1
22	1.11	0.5
24	1.28	0.5
<i>Shaded area denotes extrapolated estimates</i>		



Northern Pike

Prairie River Lake

St. Joseph County

Hg Analysis:

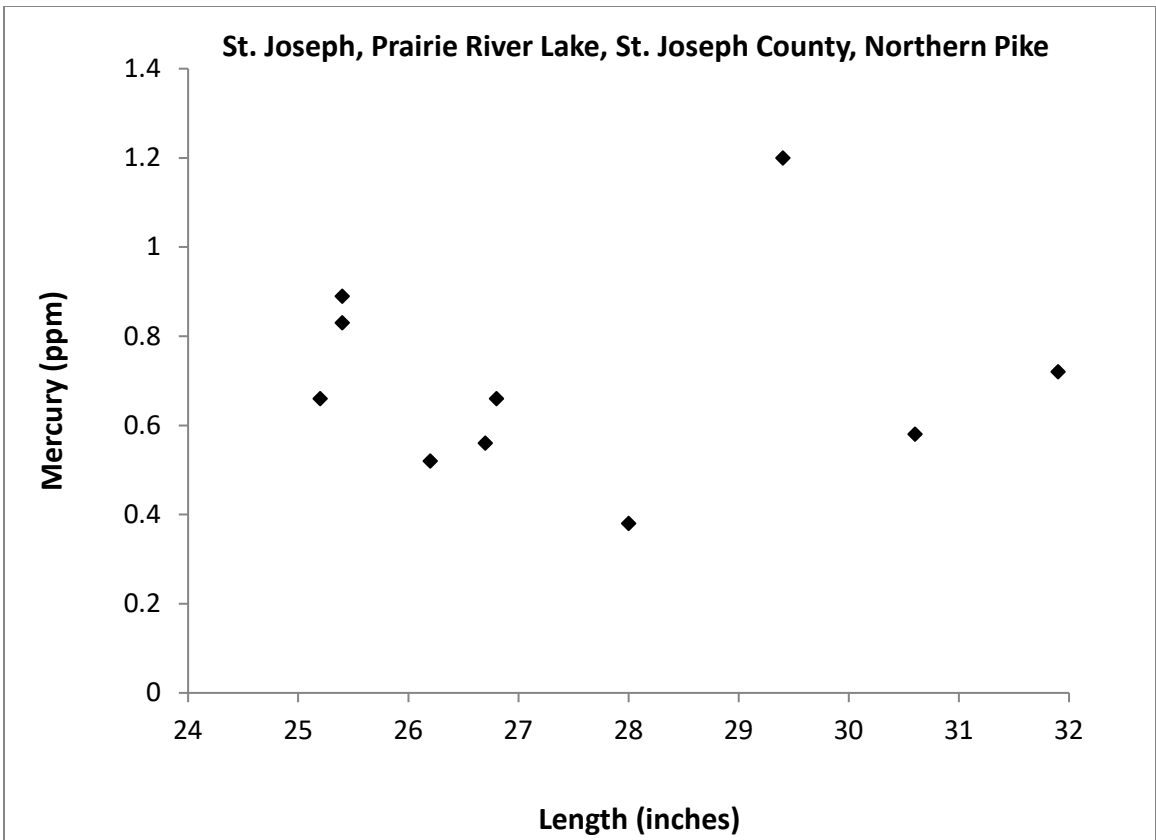
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2010	2010	10	25.2	24	25.2	31.9
Datasets available: 2010						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.70	0.38	1.20	0.86	1
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.004	0.001				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
--	--	0				
Datasets available: --						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						1

Existing Advisory: Prairie River Lake northern pike are covered by the statewide mercury advisory.

Recommendation: No one should eat more than 1 meal per month of Prairie River Lake northern pike smaller than 30 inches or more than 6 meals per year of those fish larger than 30 inches due to mercury. The statewide length break was applied as the size range of fish was limited.



Northern Pike

Sturgeon Lake

St. Joseph County

Hg Analysis:

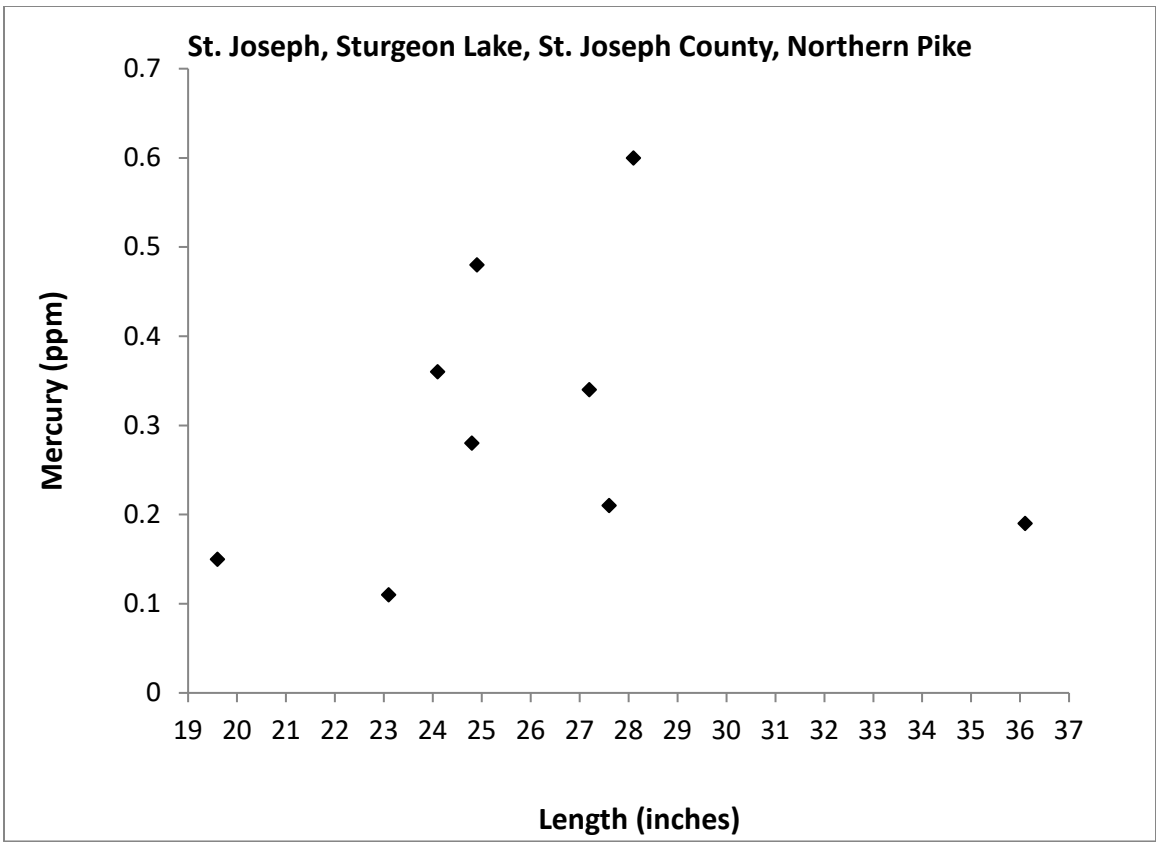
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2011	2011	9	19.6	24	24.1	36.1
Datasets available: 2011						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	7	0.35	0.19	0.60	0.49	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.156	0.266				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
--	--	0				
Datasets available: --						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						2

Existing Advisory: Sturgeon Lake northern pike are covered by the statewide mercury advisory.

Recommendation: No one should eat more than 2 meals per month of Sturgeon Lake northern pike smaller than 30 inches or more than 1 meal per month of those fish larger than 30 inches due to mercury. The statewide length break was applied as the size range of fish was limited.



Hg Analysis:

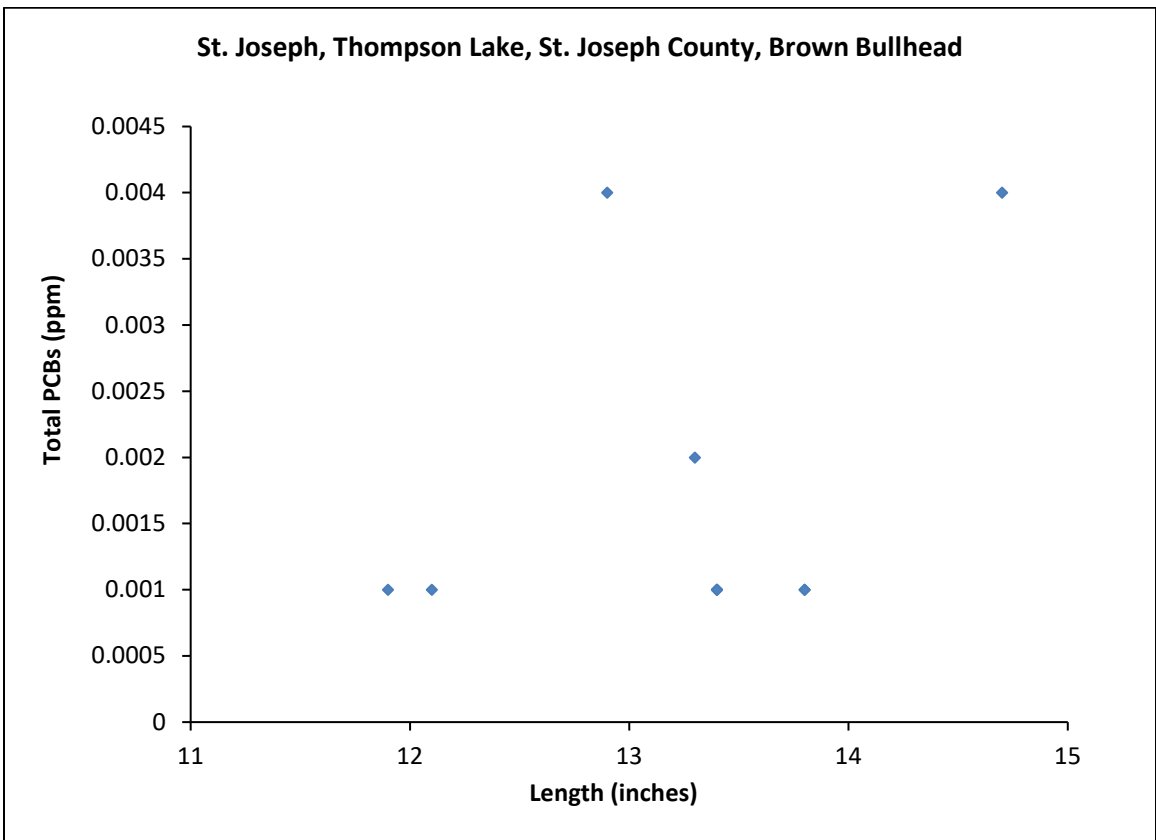
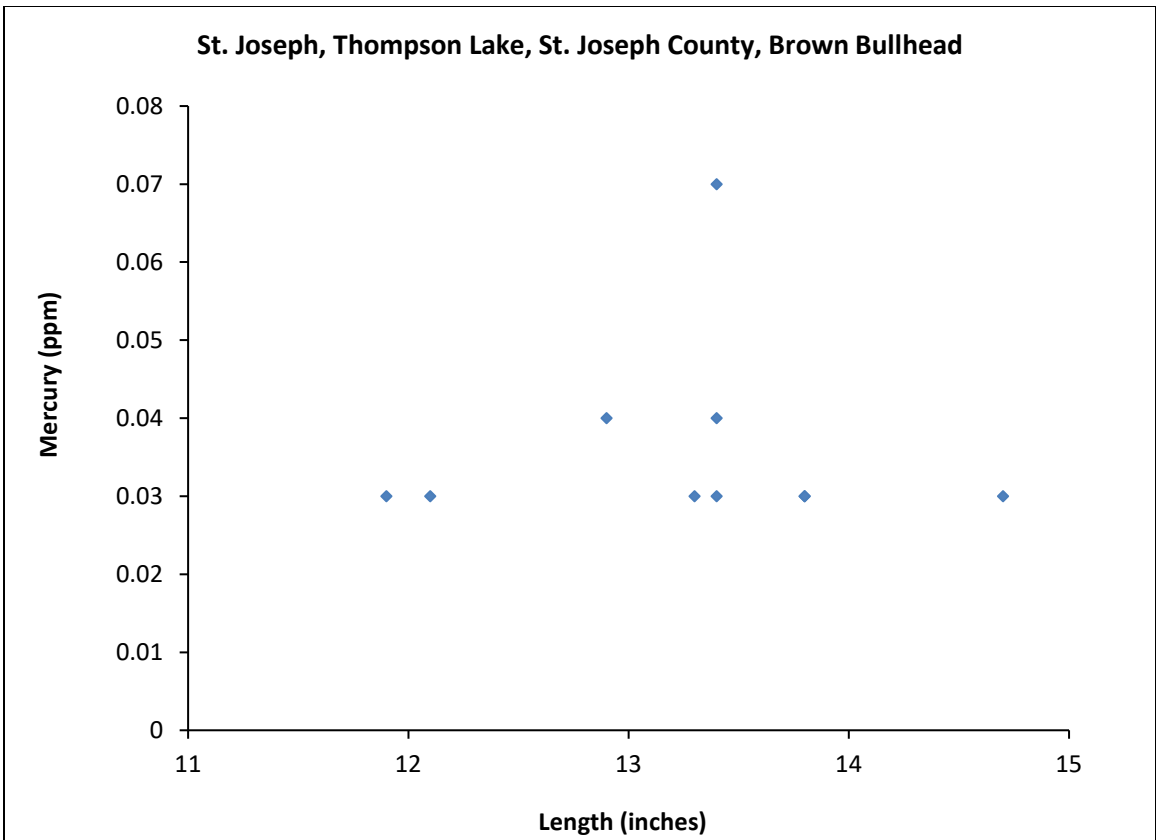
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2002	2002	10	11.9	NA	11.9	14.7
Datasets available: 2002						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.04	0.03	0.07	0.05	16
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.001	0.000				

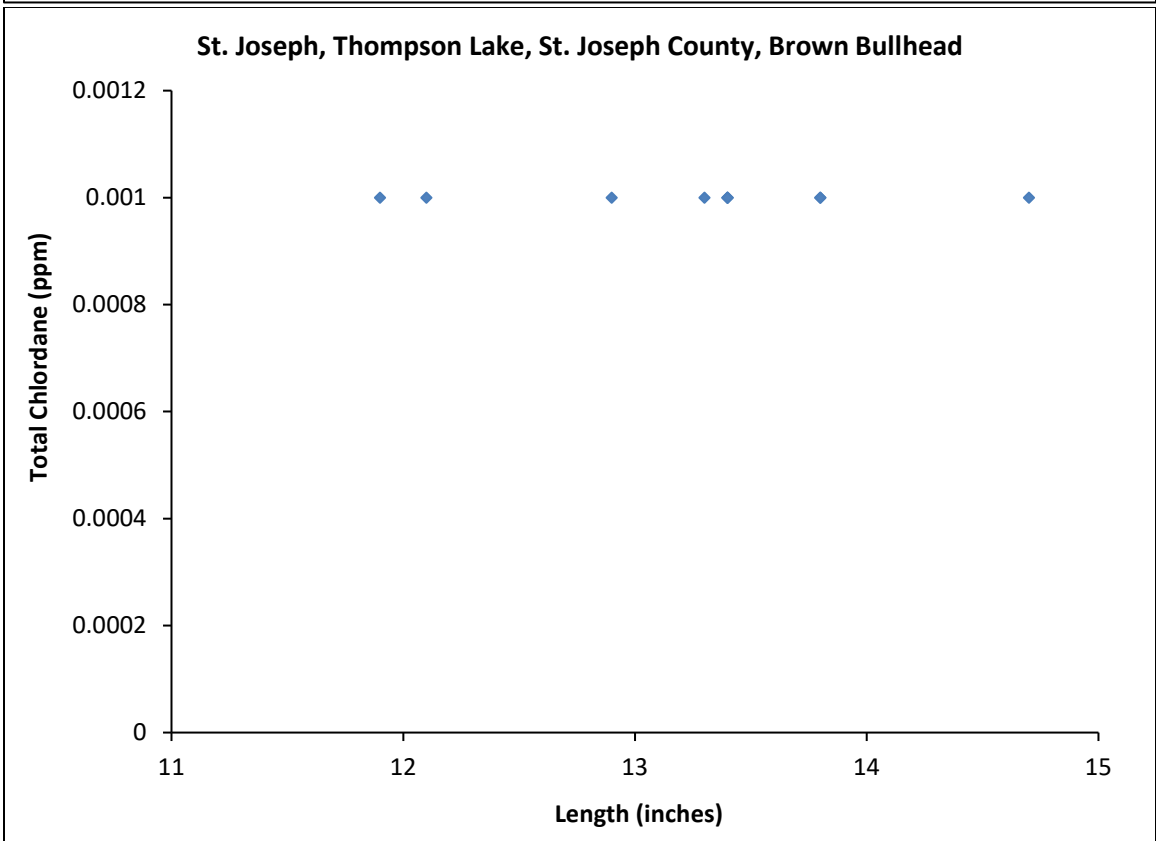
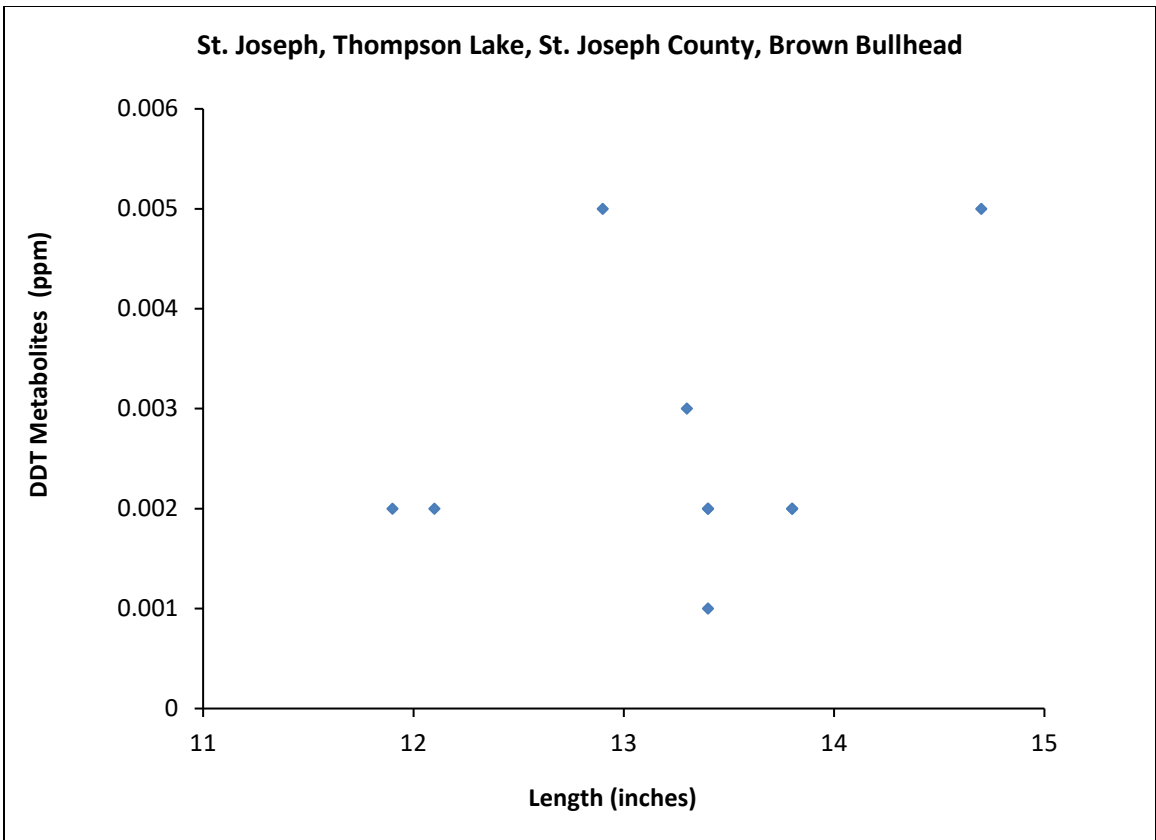
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2002	2002	10	11.9	NA	11.9	14.7
Datasets available: 2002						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.002	0.001	0.004	0.003	16
DDT	10	0.003	0.001	0.002	0.004	16
Chlordane	10	0.001	0.001	0.001	0.002	16
Toxaphene	10	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.121	0.118				
DDT	0.096	0.063				
Chlordane	0.000	--				
Toxaphene	--	--				
Final meal category based on UCL:						16

Existing Advisory: There are no current consumption advisories for Thompson Lake brown bullhead.

Recommendation: Thompson Lake bullhead will be listed at 16 meals per month as the upper limit of the assessment and chemical contamination is minimal.





Largemouth Bass

Thompson Lake

St. Joseph County

Hg Analysis:

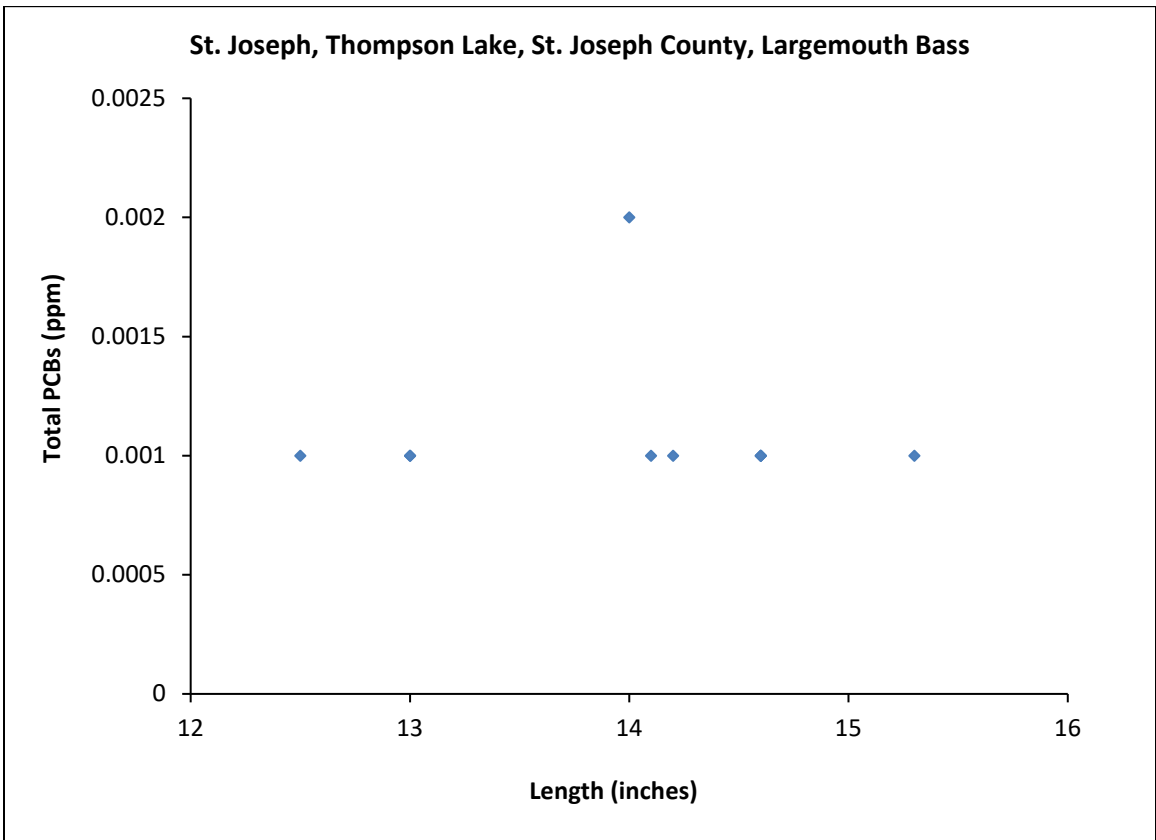
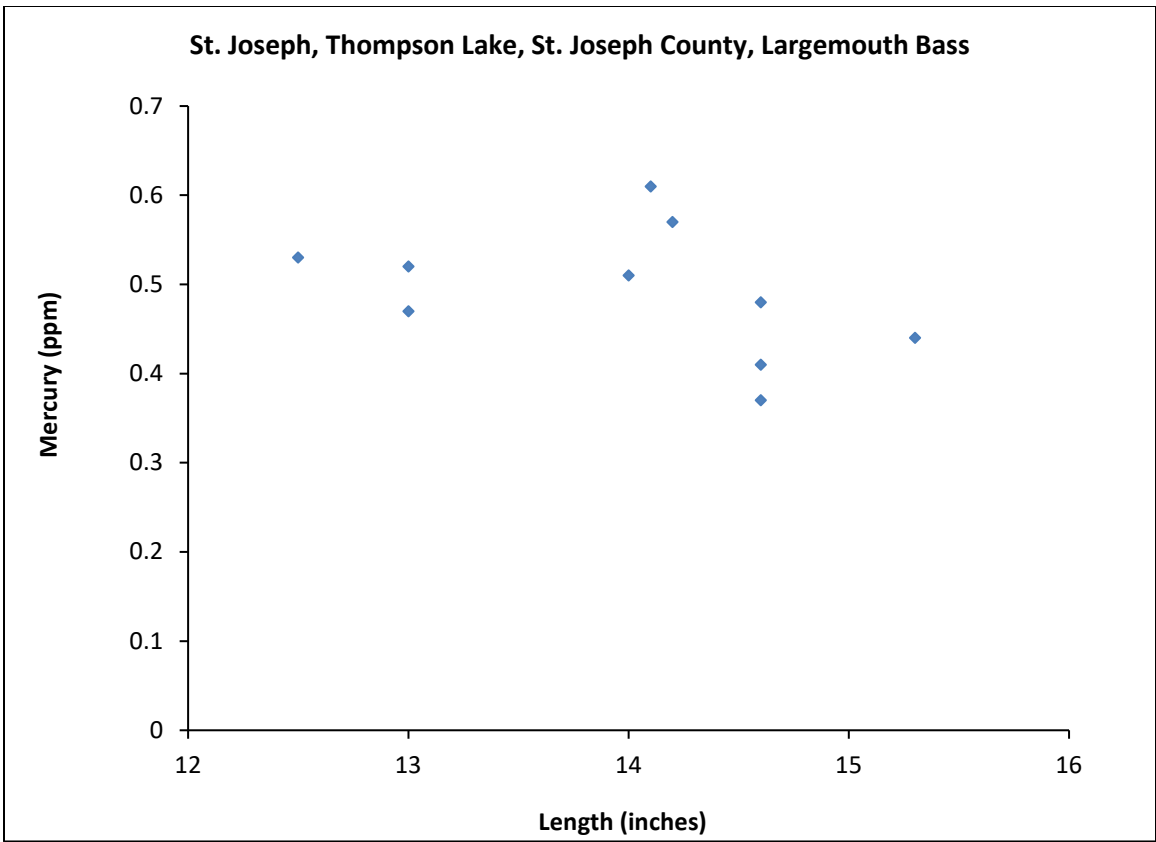
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2002	2002	10	12.5	14	14	15.3
Datasets available: 2002						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	7	0.48	0.37	0.61	0.56	1
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.162	0.180				

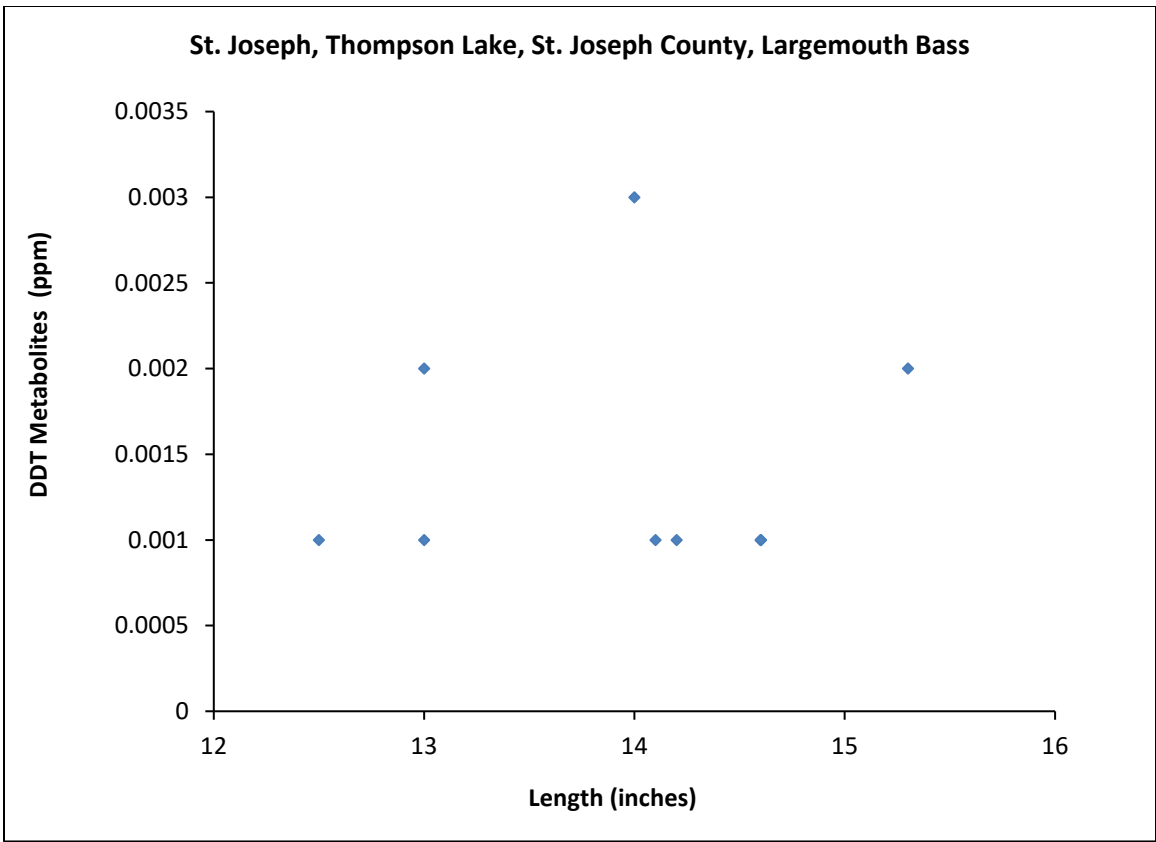
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2002	2002	10	12.5	14	14	15.3
Datasets available: 2002						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	7	0.001	0.001	0.002	0.003	16
DDT	7	0.001	0.001	0.003	0.002	16
Chlordane	7	ND	--	--	--	--
Toxaphene	7	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.000	0.000				
DDT	0.004	0.005				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						1

Existing Advisory: Thompson Lake largemouth bass are covered under the statewide mercury consumption advisory.

Recommendation: No one should eat more than 1 meal per month of Thompson Lake largemouth or smallmouth bass smaller than 18 inches or more than 6 meals per year of those fish larger than 18 inches due to mercury. Statewide length break was applied.





St Joseph River
Berrien, Branch, Cass, and St Joseph
Counties

Black Crappie

**St. Joseph River
Union Lake**

Branch County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1991	1991	2	10.4	na	10.4	10.4
Datasets available: 1991						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	2	0.14	0.12	0.17	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	--	--				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1991	1991	2	10.4	na	10.4	10.4
Datasets available: 1991						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	2	0.03	0.03	0.03	--	--
DDT	2	0.009	0.008	0.01	--	--
Chlordane	2	ND	--	--	--	--
Toxaphene	2	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						--

Existing Advisory: Union Lake black crappie are covered under the statewide mercury consumption advisory.

Recommendation: There are insufficient data available to develop specific advice for Union Lake crappie. The statewide consumption guidelines recommend that no one eat more than 4 meals per month of crappie from inland waters.

Carp

**St. Joseph River
Union Lake**

Branch County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1991	2003	15	18.5	na	18.5	28.7
Datasets available: 1991, 2003						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	15	0.14	0.02	0.35	0.19	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.422	0.582				

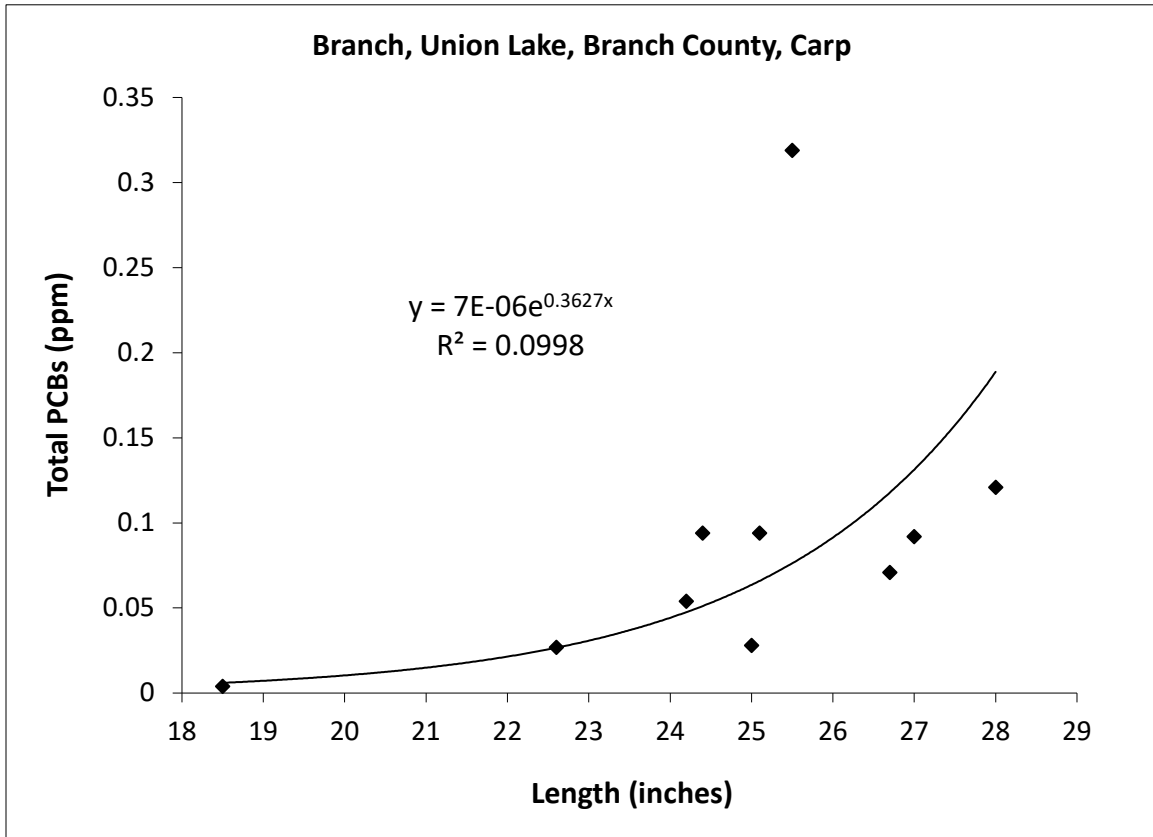
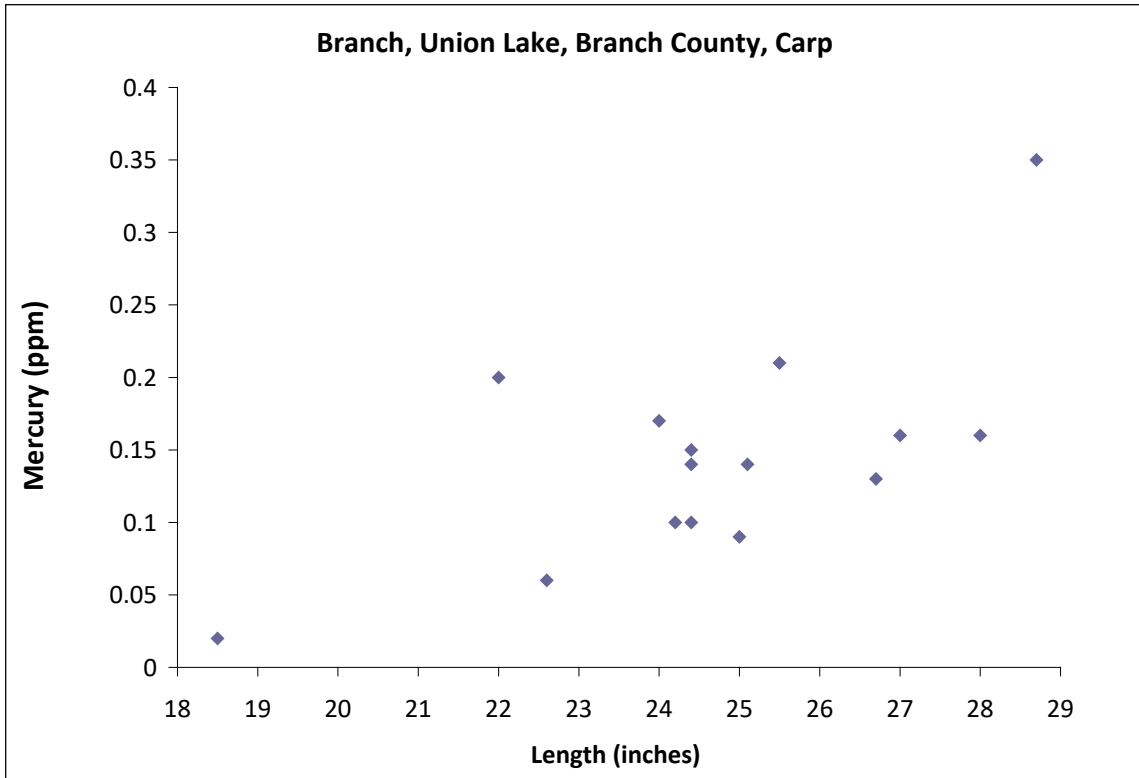
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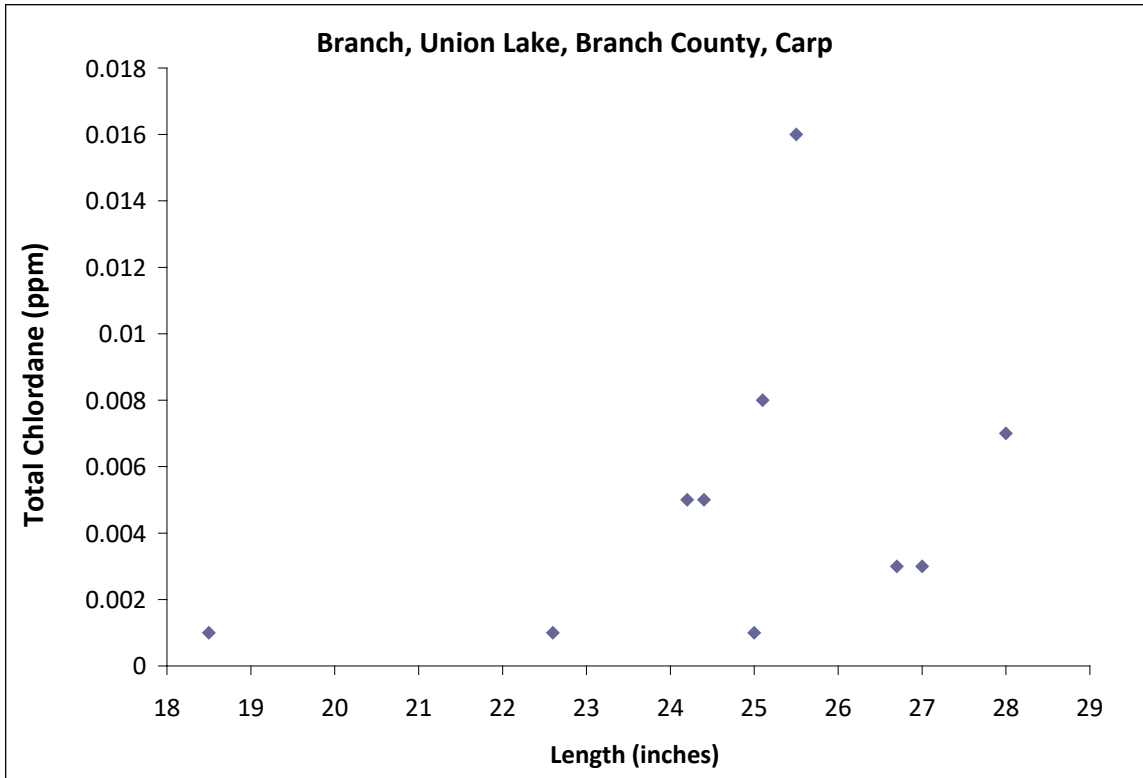
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	10	18.5	na	18.5	28
Datasets available: 1991, 2003						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.09	0.004	0.32	0.15	1
DDT	10	0.03	0.004	0.10	0.05	16
Chlordane	10	0.005	0.001	0.02	0.01	--
Toxaphene	10	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.186	0.680				
DDT	0.184	0.566				
Chlordane	0.131	0.306				
Toxaphene	--	--				
Final meal category based on UCL:						1

Existing Advisory: Due to elevated levels of PCBs; women and children should eat no more than one meal per week of Union Lake carp of any size.

Recommendation: No one should eat more than 4 meals per month of carp smaller than 24 inches from Union Lake or the St. Joseph River upstream of Union Lake due to mercury and PCBs or more than 1 meal per month of those fish larger than 24 inches due to PCBs.

Length (Inches)	PCB Regression Equation Estimate (ppm)	Meal Category
14	0.001	16
16	0.002	16
18	0.005	16
20	0.01	16
22	0.02	12
24	0.042	4
26	0.087	2
28	0.18	1
30	0.372	0.5
<i>Shaded area denotes extrapolated estimates</i>		





Channel Catfish

**St. Joseph River
Union Lake**

Branch County

Hg Analysis:

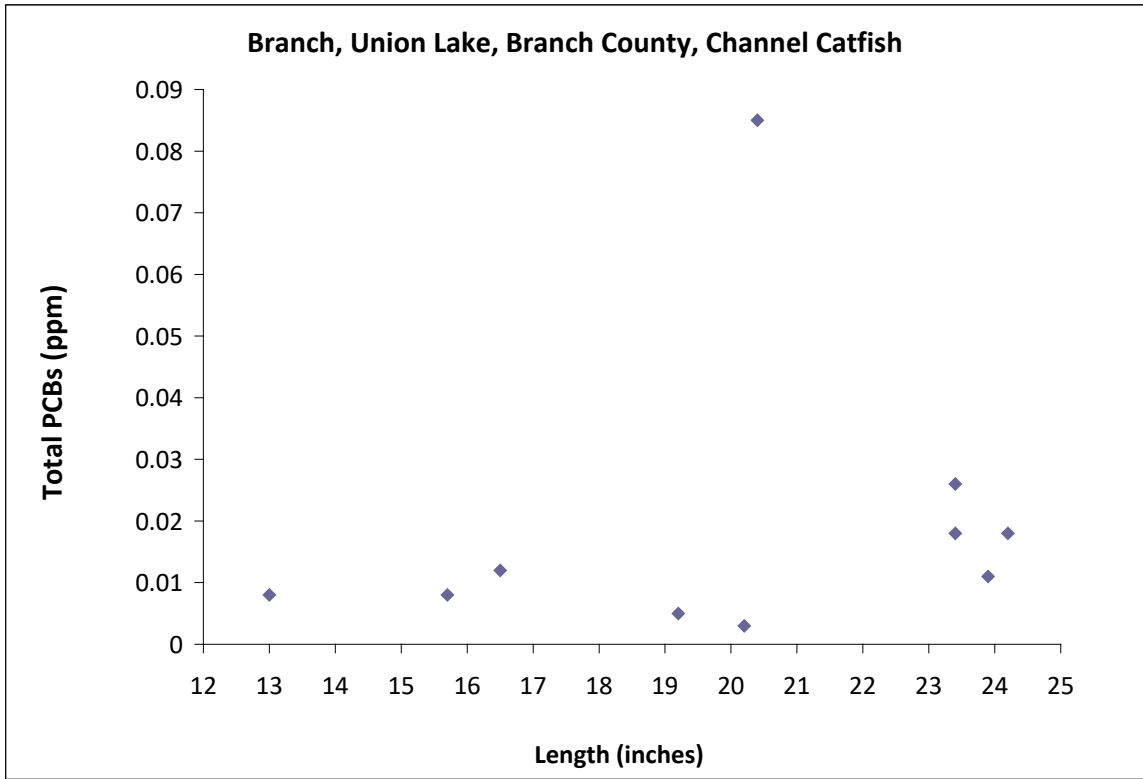
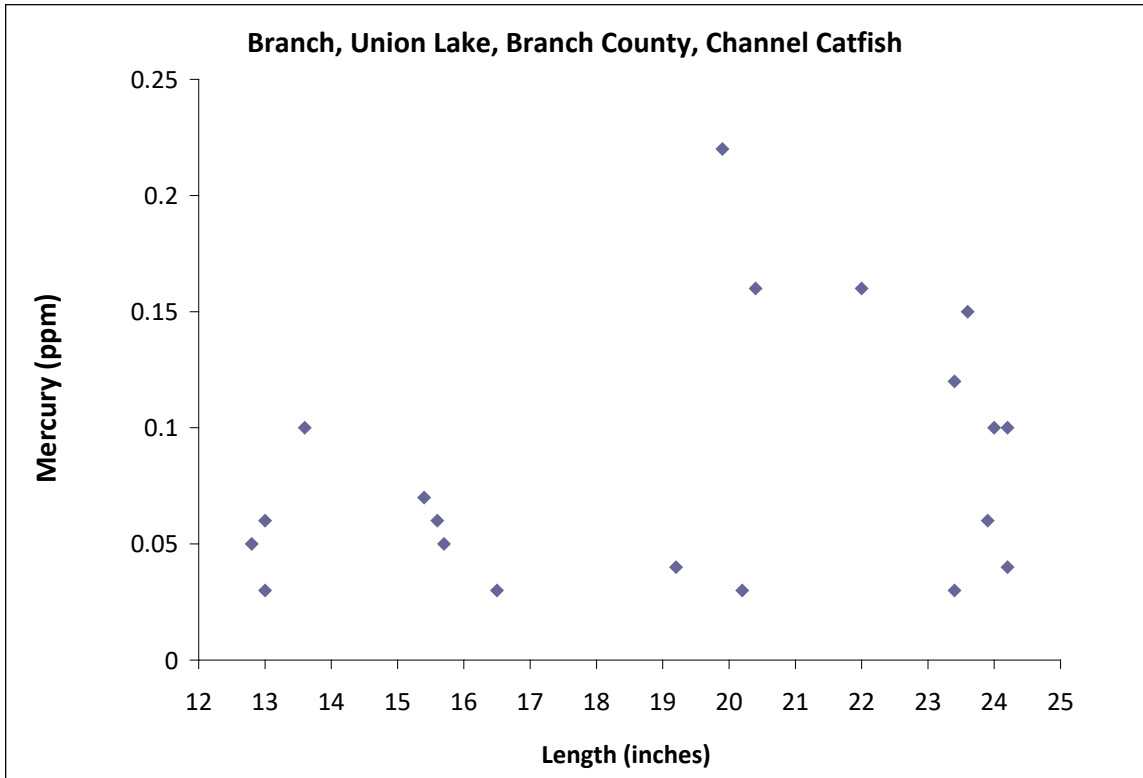
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1991	2003	20	12.8	12	12.8	24.2
Datasets available: 1991, 2003						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	20	0.08	0.03	0.22	0.11	8
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.098	0.089				

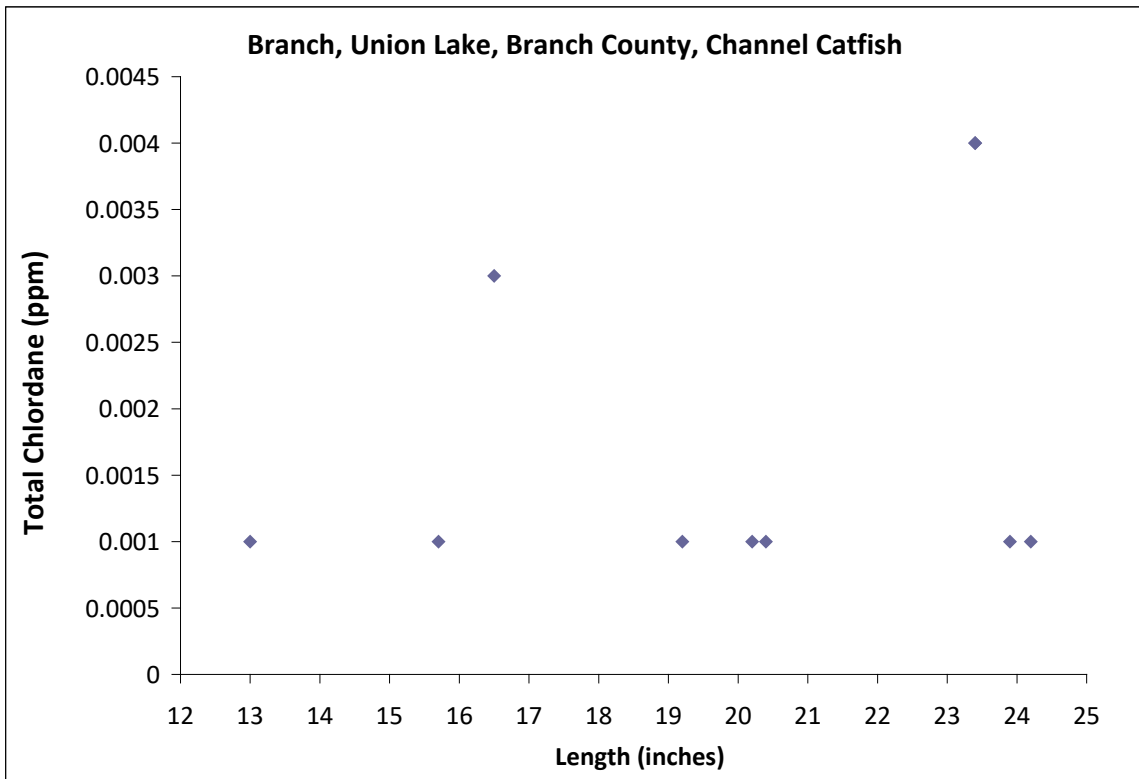
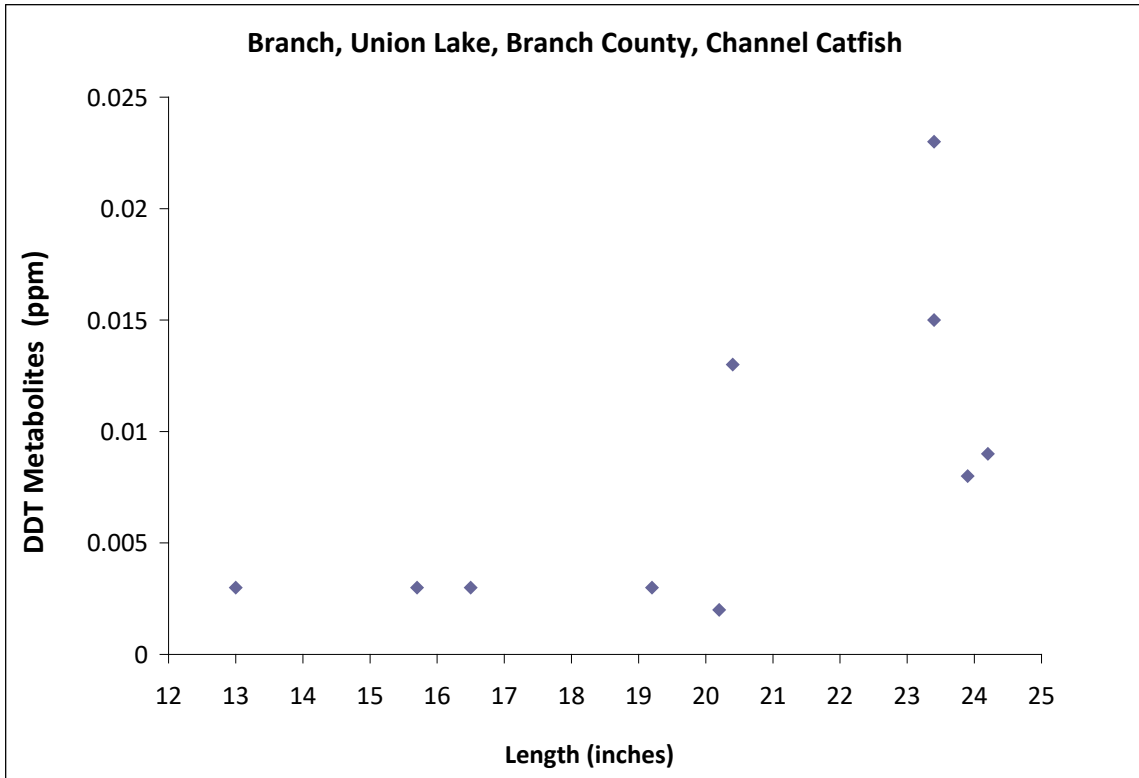
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	10	12.8	12	12.8	24.2
Datasets available: 1991, 2003						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.02	0.003	0.08	0.04	4
DDT	10	0.008	0.002	0.01	0.01	16
Chlordane	10	0.002	0.001	0.004	0.003	--
Toxaphene	10	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.040	0.117				
DDT	0.419	0.507				
Chlordane	0.085	0.065				
Toxaphene	--	--				
Final meal category based on UCL:						4

Existing Advisory: Due to elevated levels of PCBs; women and children should eat no more than one meal per week of Union Lake channel catfish of any size.

Recommendation: No one should eat more than 4 meals per month of channel catfish from Union Lake or from the St. Joseph River upstream of Union Lake due to PCBs. Mercury would cause an advisory.





Largemouth Bass

**St. Joseph River
Union Lake**

Branch County

Hg Analysis:

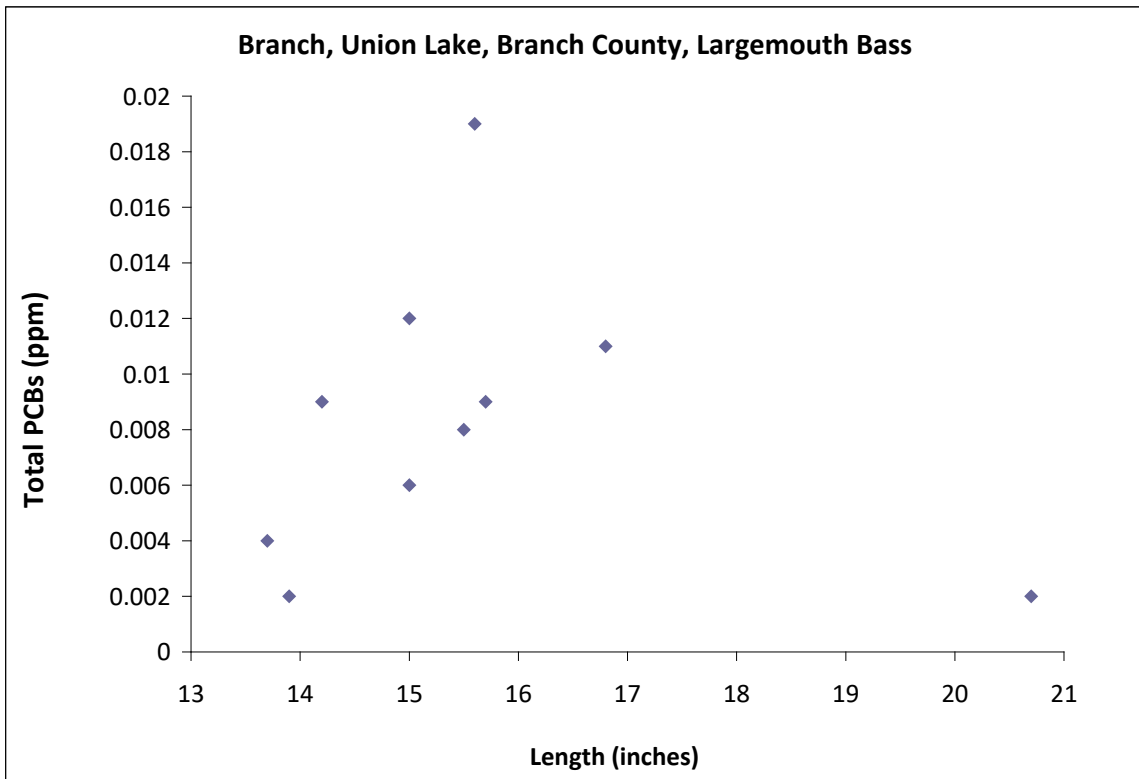
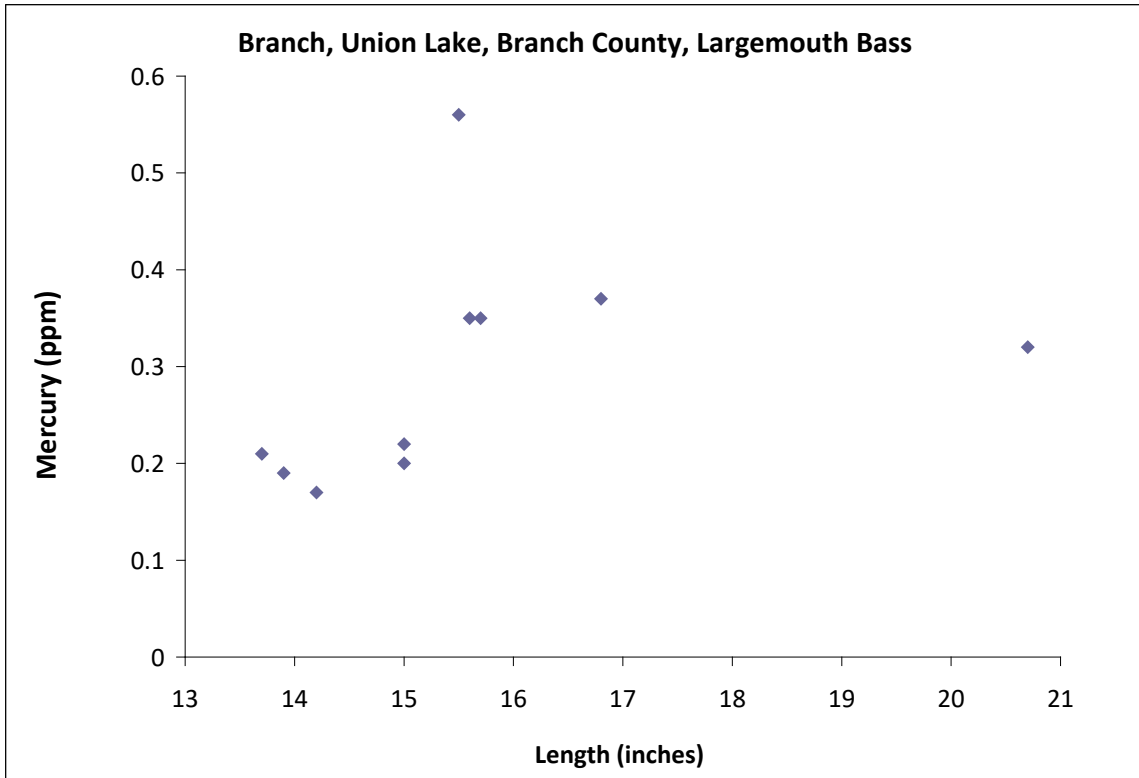
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	10	13.7	14	13.7	20.7
Datasets available: 2003						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.29	0.17	0.56	0.38	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.138	0.214				

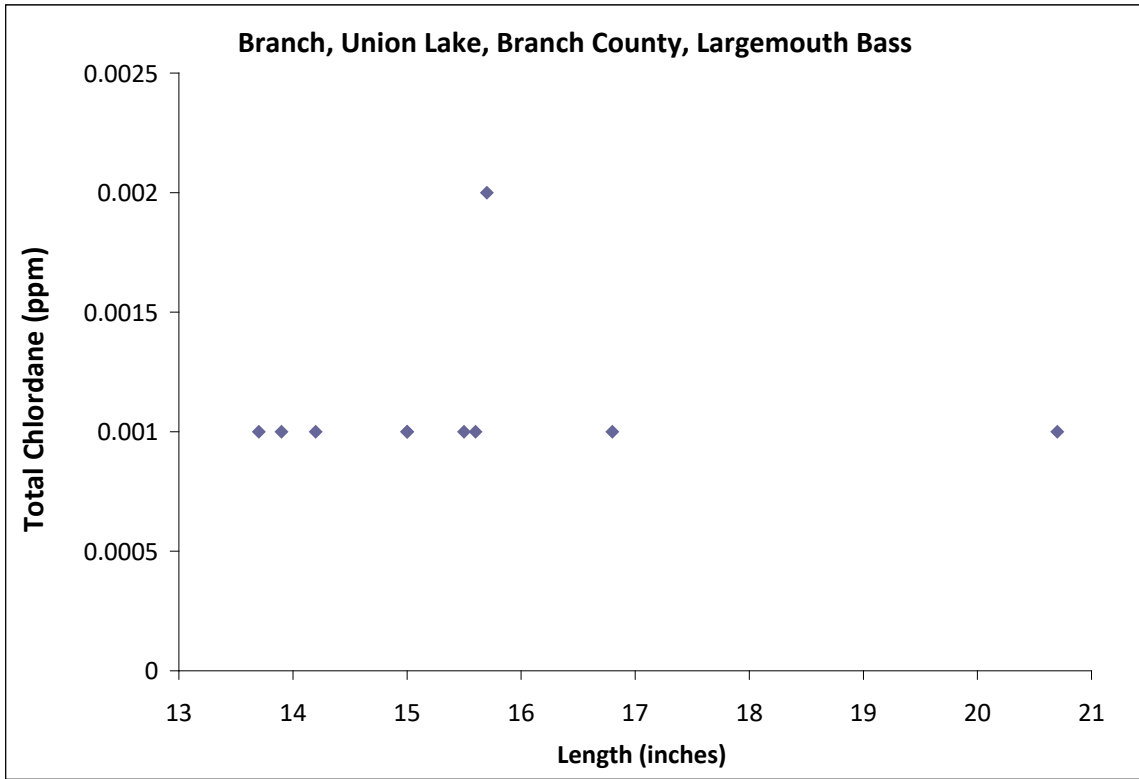
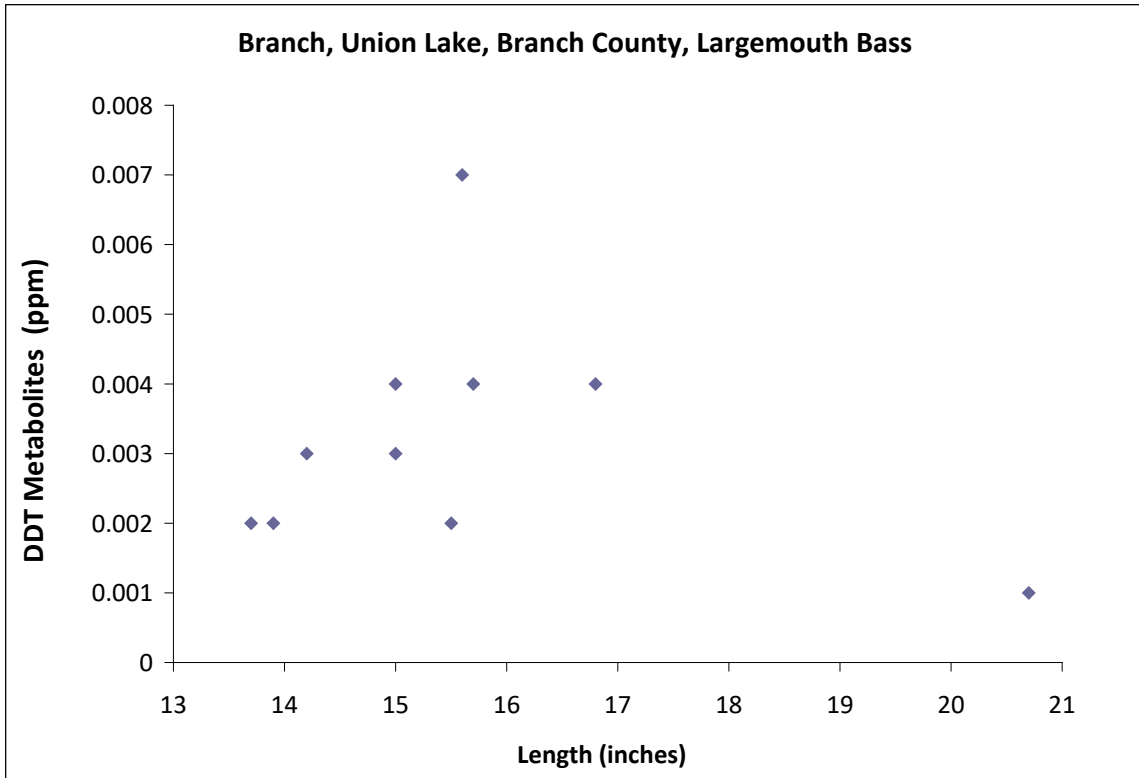
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	10	13.7	14	13.7	20.7
Datasets available: 2003						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.008	0.002	0.02	0.01	16
DDT	10	0.003	0.001	0.007	0.003	16
Chlordane	10	0.001	0.001	0.002	0.003	--
Toxaphene	10	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.016	0.056				
DDT	0.036	0.157				
Chlordane	0.000	0.000				
Toxaphene	--	--				
Final meal category based on UCL:						2

Existing Advisory: Union Lake largemouth bass are covered under the statewide mercury consumption advisory.

Recommendation: No one should eat more than 2 meals per month of largemouth or smallmouth bass under 18 inches from Union Lake or from the St. Joseph River upstream of Union Lake or 1 meal per month of those larger than 18 inches due to mercury. The statewide length break was used as the size range of the fish was limited.





Northern Pike

**St. Joseph River
Union Lake**

Branch County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1991	1991	3	21.7	24	21.7	25
Datasets available: 1991						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	3	0.14	0.11	0.16	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	--	--				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1991	1991	3	21.7	24	21.7	25
Datasets available: 1991						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	3	0.03	0.03	0.04	--	--
DDT	3	0.01	0.008	0.01	--	--
Chlordane	3	ND	--	--	--	--
Toxaphene	3	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.028	0.009				
DDT	0.017	0.027				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						--

Existing Advisory: Union Lake northern pike are covered under the statewide mercury consumption advisory.

Recommendation: There are insufficient data available to develop specific advice for Union Lake northern pike. The statewide consumption guidelines recommend that no one eat more than 1 meal per month of northern pike over 30 inches or more than 2 meals per month of northern pike under 30 inches in length.

Walleye

**St. Joseph River
Union Lake**

Branch County

Hg Analysis:

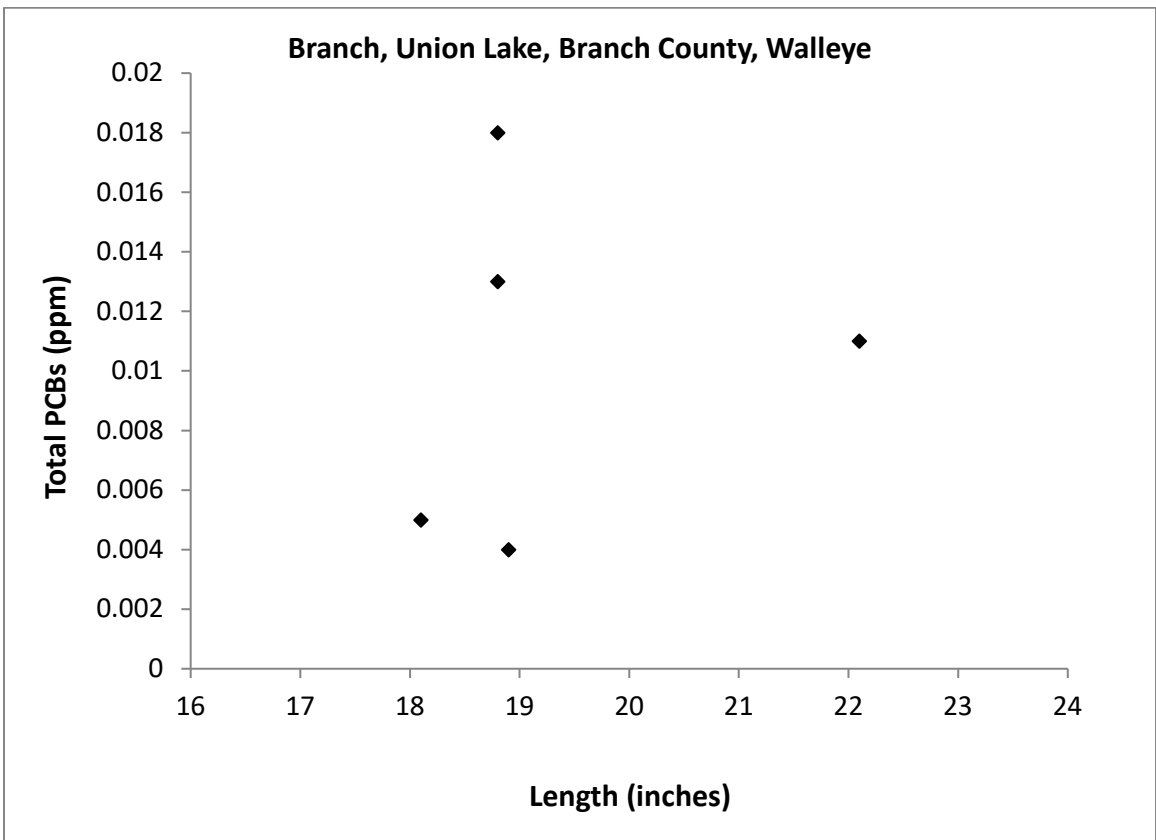
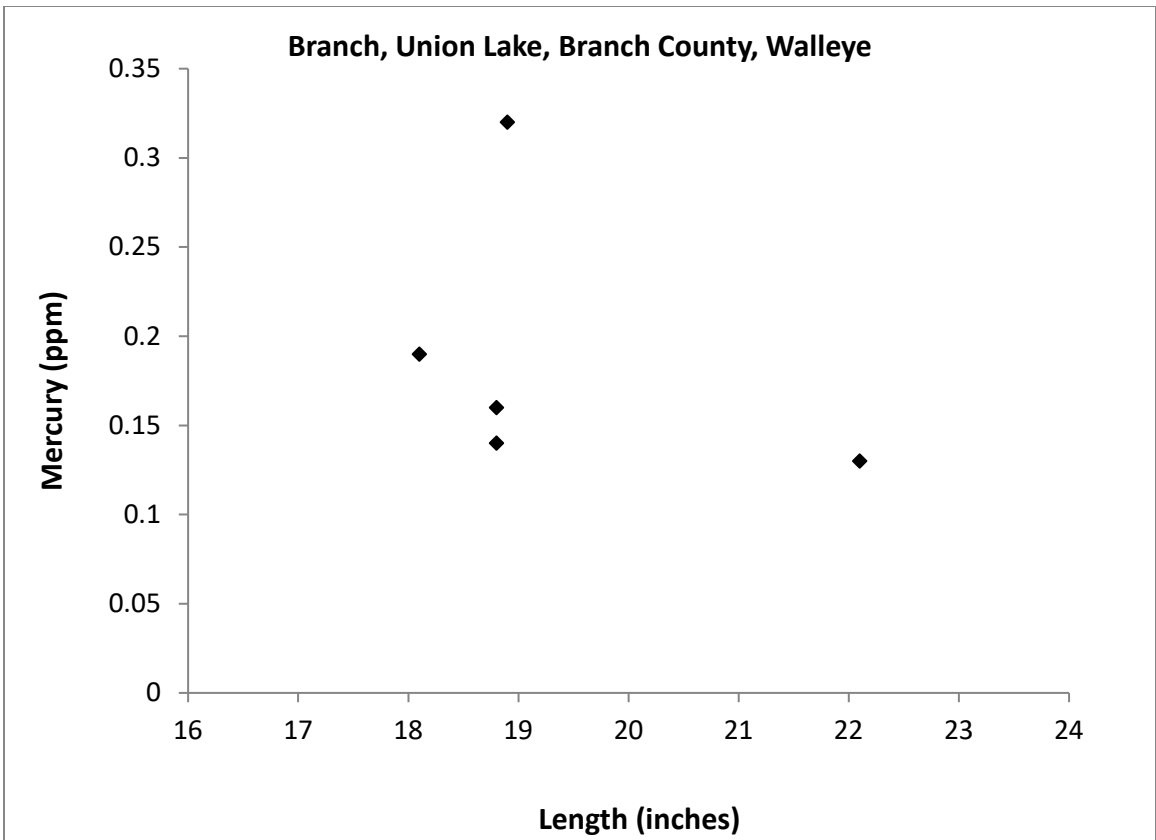
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	5	18.1	15	18.1	22.1
Datasets available: 2003						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	5	0.19	0.13	0.32	0.28	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.136	0.203				

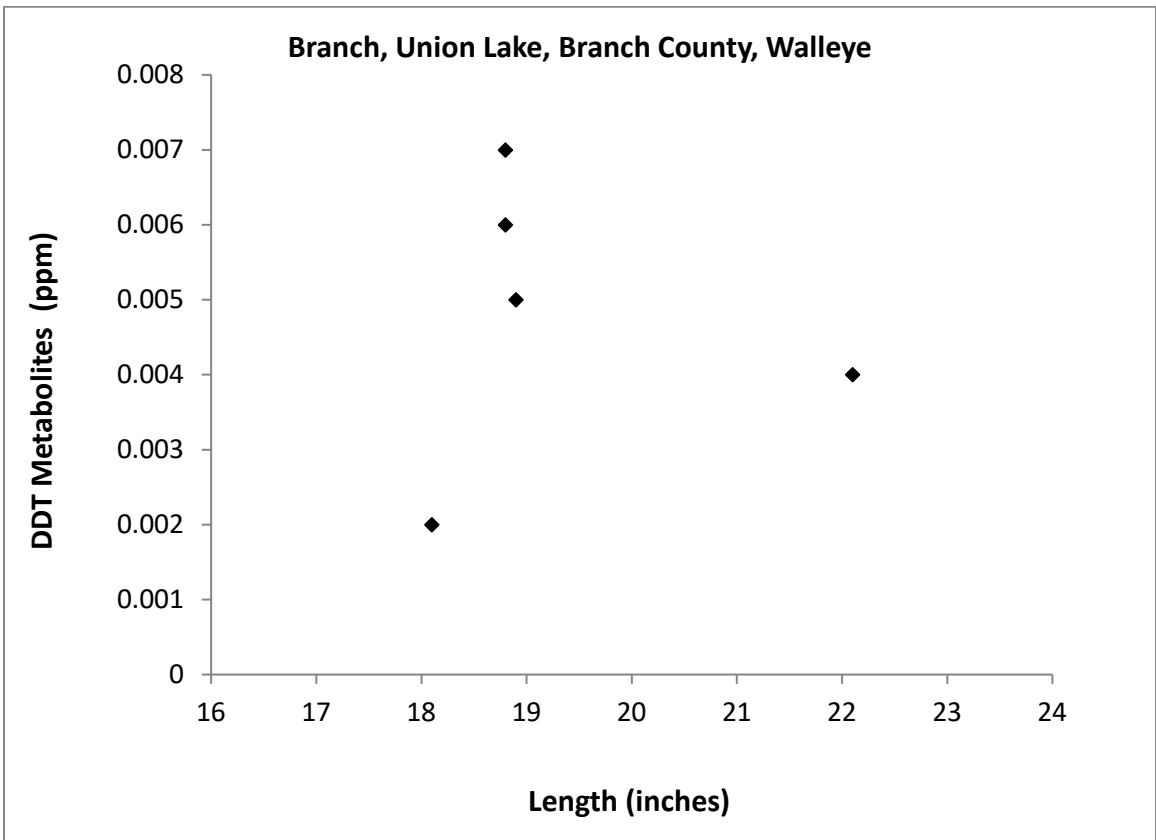
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2003	2003	5	18.1	15	18.1	22.1
Datasets available: 2003						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	5	0.01	0.004	0.02	0.02	12
DDT	5	0.005	0.002	0.007	0.01	16
Chlordane	5	ND	--	--	--	--
Toxaphene	5	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.024	0.069				
DDT	0.003	0.006				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						2

Existing Advisory: Union Lake walleye are covered under the statewide mercury consumption advisory.

Recommendation: No one should eat more than 2 meals per month of walleye less than 20 inches from Union Lake or from the St. Joseph River upstream of Union Lake or 1 meal per month of those fish greater than 20 inches due to mercury. PCBs would cause an advisory. Statewide length break was applied as the sample size was limited.





**Bluegill and
Pumpkinseed**

**St. Joseph River
Between Mottville Dam & Union
Lake Dam**

**St. Joseph
& Branch Counties**

Hg Analysis:

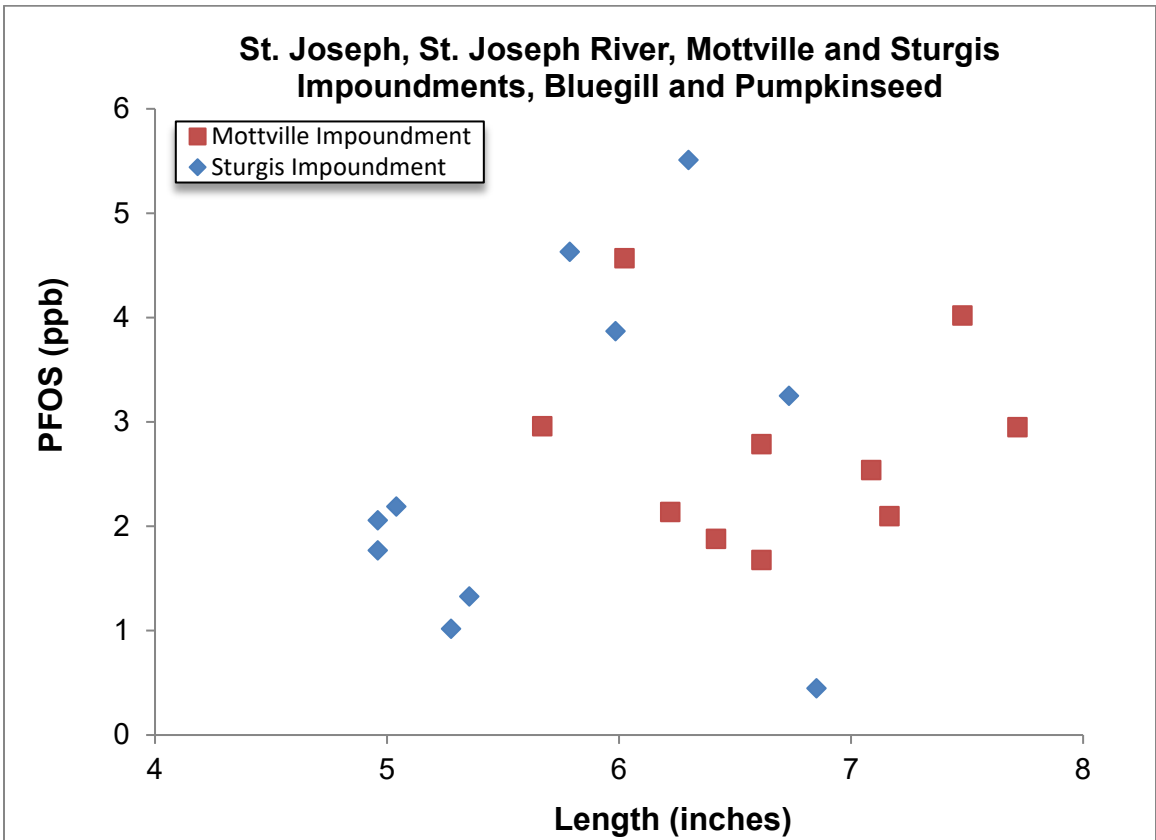
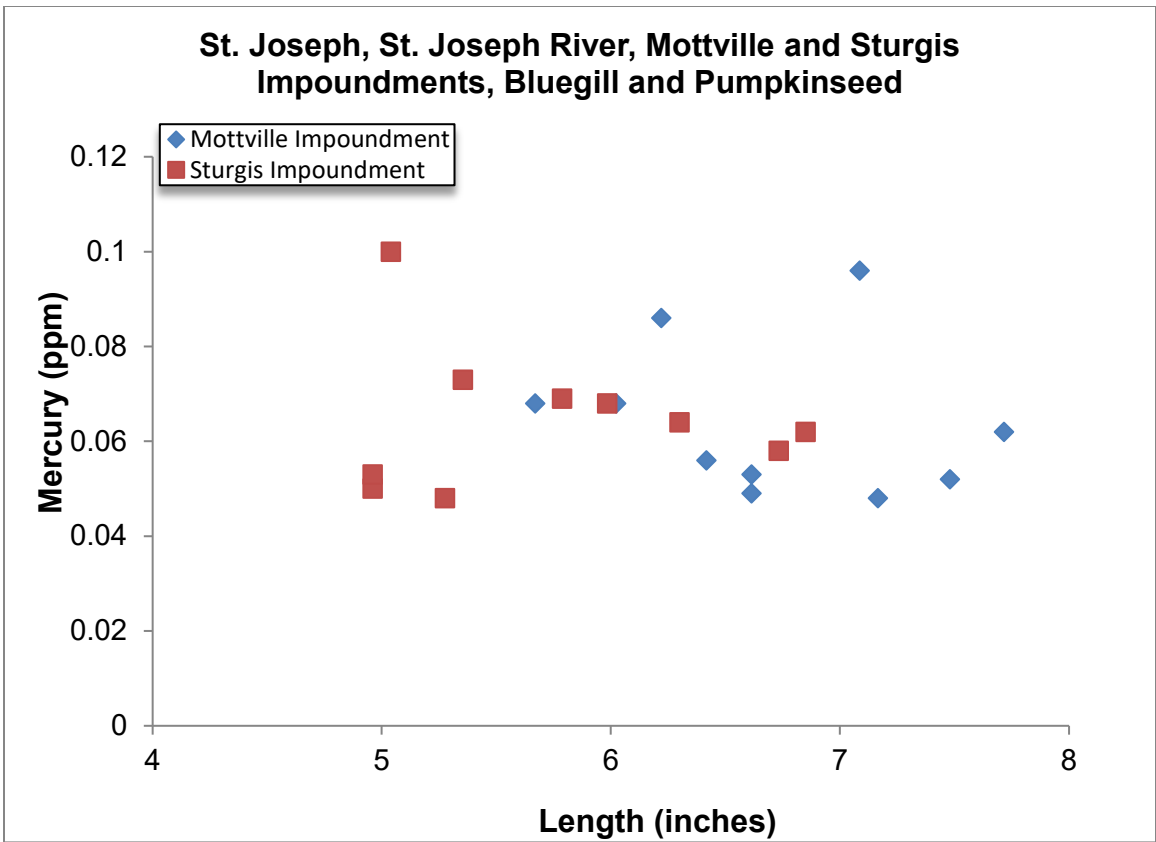
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2019	2019	20	5.0	NA	5.0	7.7
Datasets available: 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	20	0.064	0.048	0.100	0.071	12
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.017	0.015				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2004	2019	20	5.0	NA	5.0	7.7
Datasets available: 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
PFOS	20	2.7 ppb	0.5 ppb	5.5 ppb	3.3 ppb	16
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.030	0.019				
Final meal category based on UCL:						12

Existing MDHHS Advisory: Bluegill and sunfish from the St. Joseph River between the Riley dam and the Mottville dam (includes the Mottville Impoundment, Sturgis Impoundment, Three Rivers Impoundment, Constantine Impoundment, and Sturgeon Lake) are currently covered under the statewide mercury guidance. No one should eat more than 8 meals per month of bluegill or sunfish of any size due to mercury.

Recommendation: No one should eat more than 12 meals per month of bluegill or sunfish of any size from the St. Joseph River between the Union Lake Dam (Riley Dam) and Mottville dam due to mercury.



Carp

**St. Joseph River
Between Mottville Dam & Union Lake Dam**

**St. Joseph
& Branch Counties**

Hg Analysis:

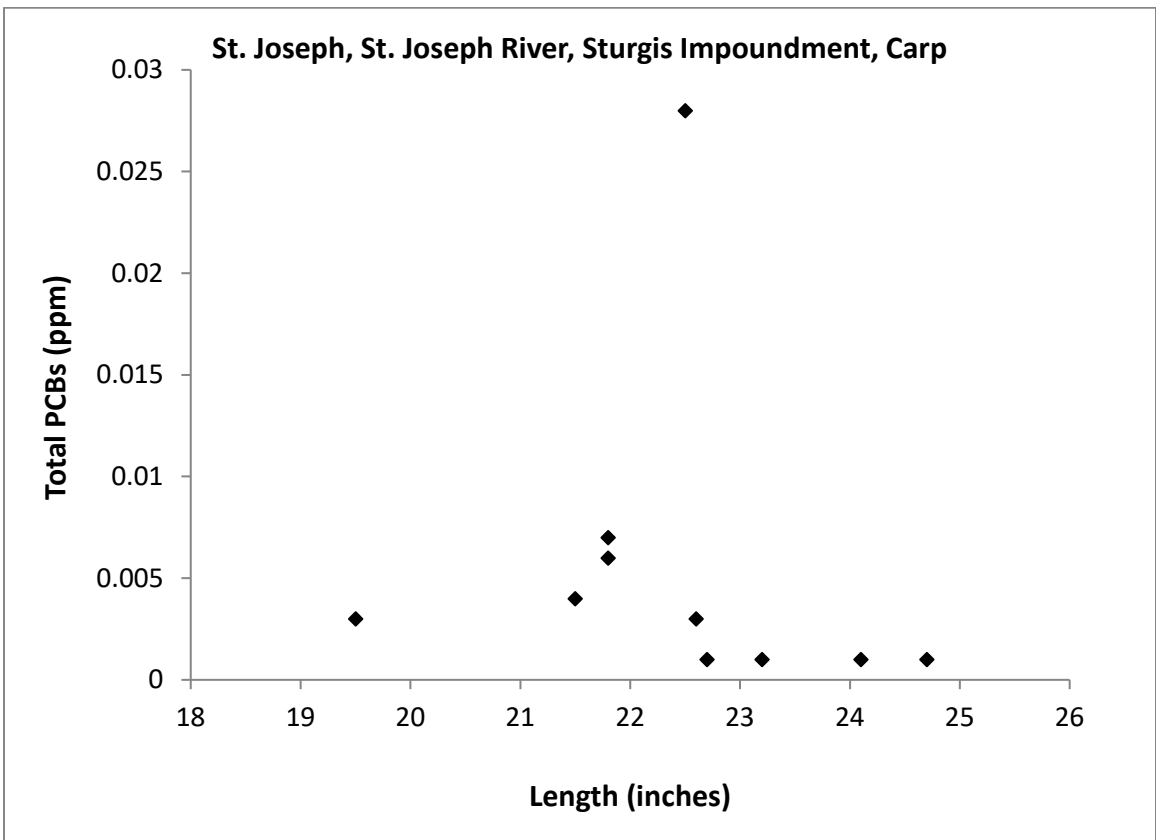
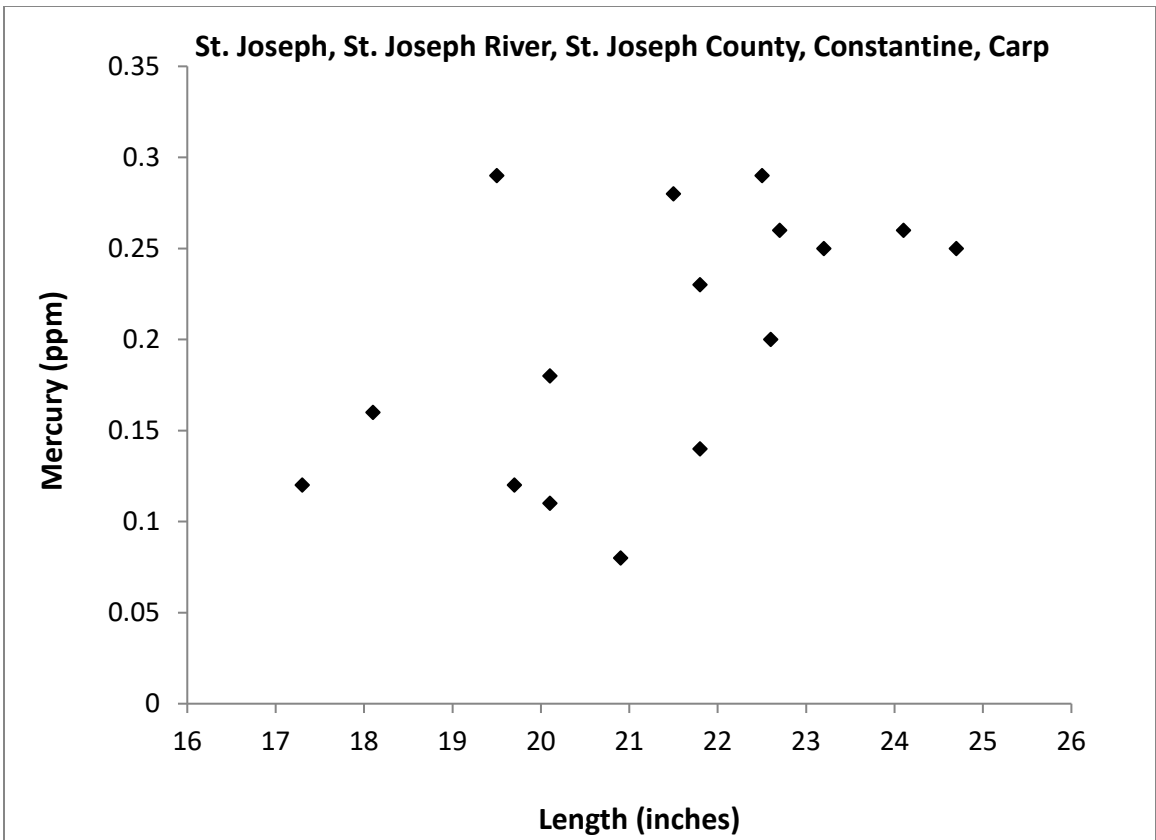
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1992	2004	16	17.3	na	17.3	24.7
Datasets available: 1992, 2004						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	16	0.20	0.08	0.29	0.24	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.305	0.291				

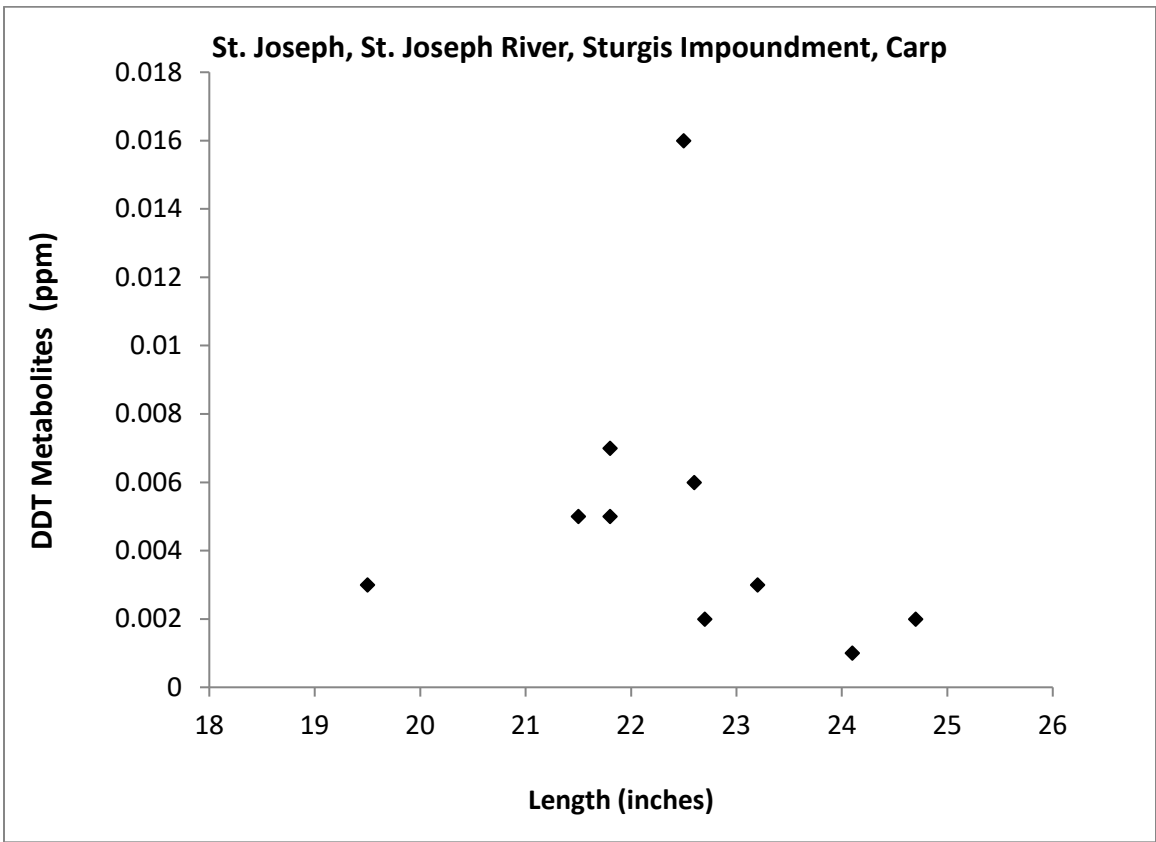
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2004	2004	10	19.5	na	19.5	24.7
Datasets available: 1992, 2004						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.006	0.001	0.03	0.01	16
DDT	10	0.005	0.001	0.02	0.01	16
Chlordane	10	ND	--	--	--	--
Toxaphene	10	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.017	0.205				
DDT	0.033	0.152				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						4

Existing Advisory: Women and children should not eat more than 1 meal per month of carp less than 26 inches from the St. Joseph River between the Constantine and Sturgis Dams and should not eat any carp larger than 26 inches from the river between the Constantine Dam and Union Lake due to PCBs.

Recommendation: No one should eat more than 4 meals per month of carp from the St. Joseph River between the Mottville Dam and Union Lake Dam (Riley Dam) due to mercury.





Channel Catfish

**St. Joseph River
Between Mottville Dam & Union Lake Dam**

**St. Joseph
& Branch Counties**

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1998	1998	9	16.9	12	16.9	23.6
Datasets available: 1998						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	2*	0.08	0.06	0.10	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	--	--				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1998	1998	9	16.9	12	16.9	23.6
Datasets available: 1998						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	2*	0.09	0.09	0.10	--	--
DDT	2*	0.008	0.008	0.008	--	--
Chlordane	2*	0.003	0.003	0.003	--	--
Toxaphene	2*	ND			--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						--

* - 9 fish were analyzed as 2 composite samples

Existing Advisory: Women and children should not eat more than 1 meal per week of channel catfish from the St. Joseph River upstream of the Constantine Dam due to PCBs.

Recommendation: A dataset of less than five data points for a given chemical, species and waterbody is considered insufficient for evaluation using the standard evaluation method. The statewide advice for channel catfish applies: No one should eat more than 4 meals per month of channel catfish from any river or inland lake.

Largemouth Bass

**St. Joseph River
Between Mottville Dam & Union
Lake Dam**

**St. Joseph
& Branch Counties**

Hg Analysis:

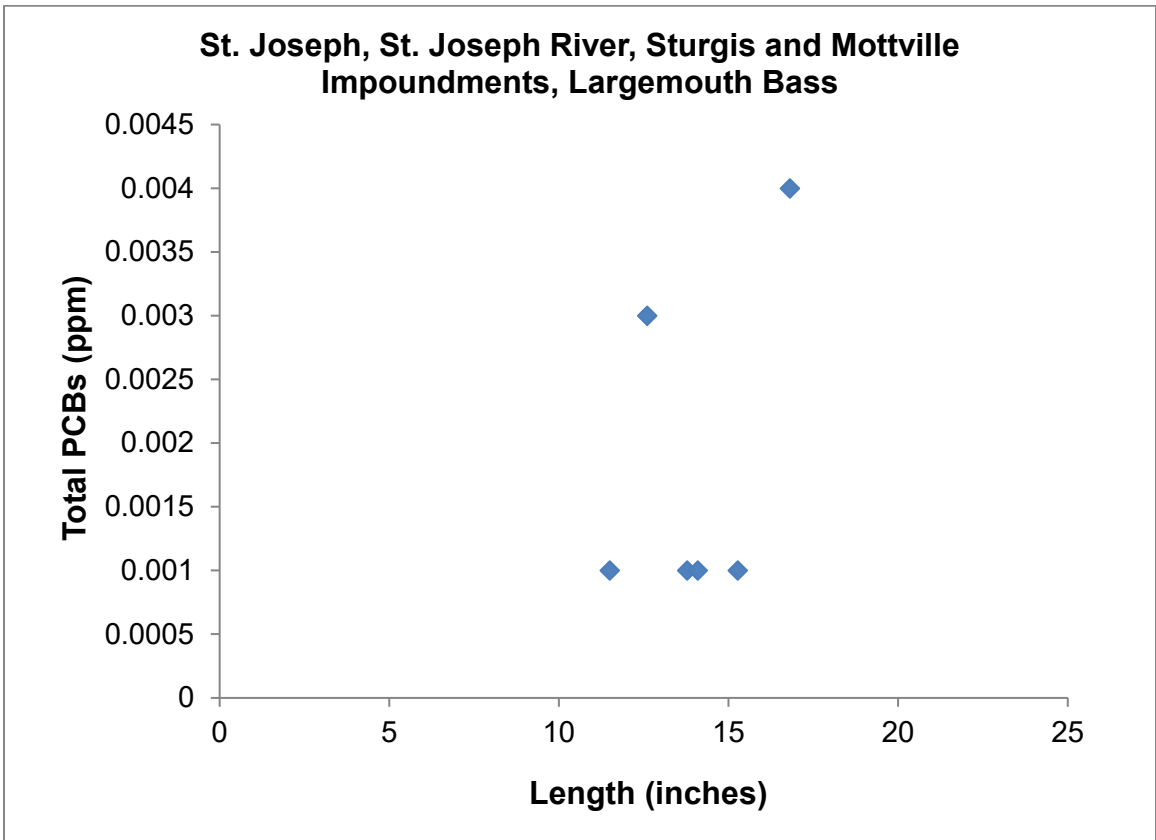
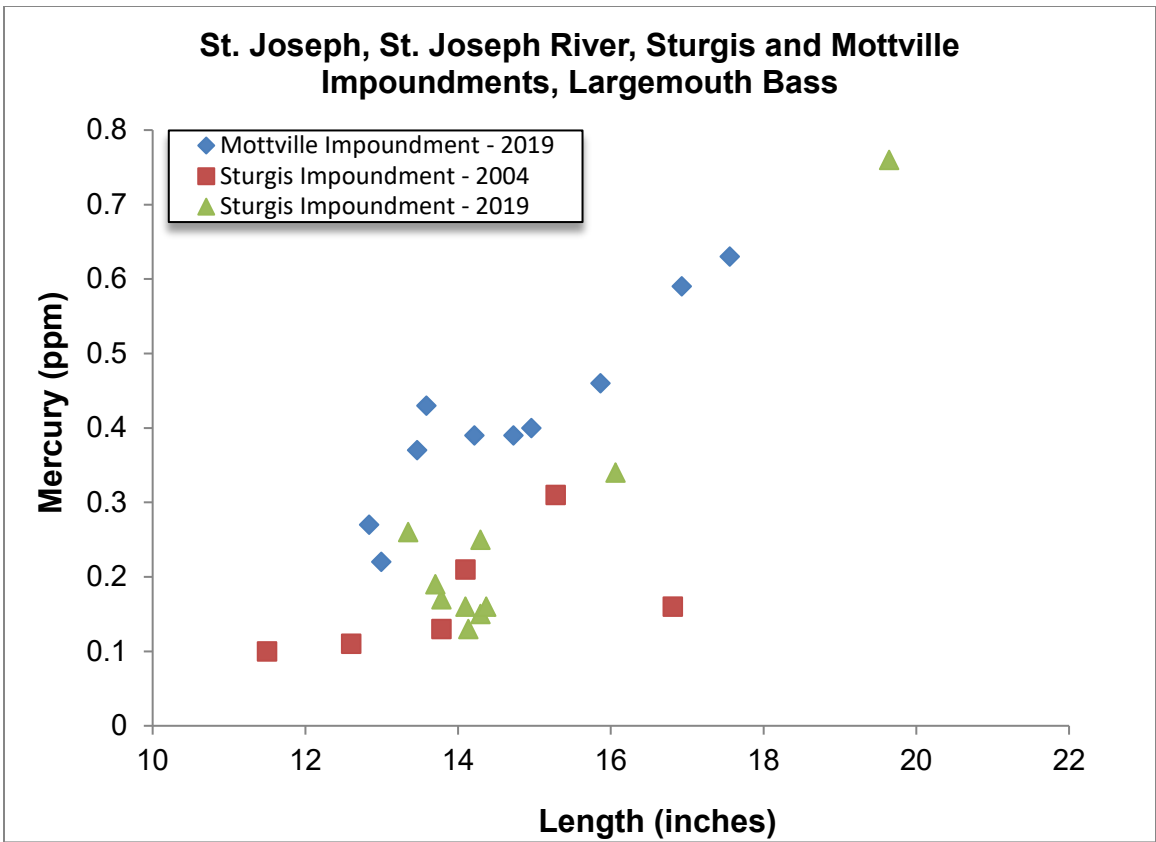
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2004	2019	26	11.5	14.0	13.6	19.6
Datasets available: 2004; 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	20	0.321	0.130	0.760	0.407	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.559	0.445				

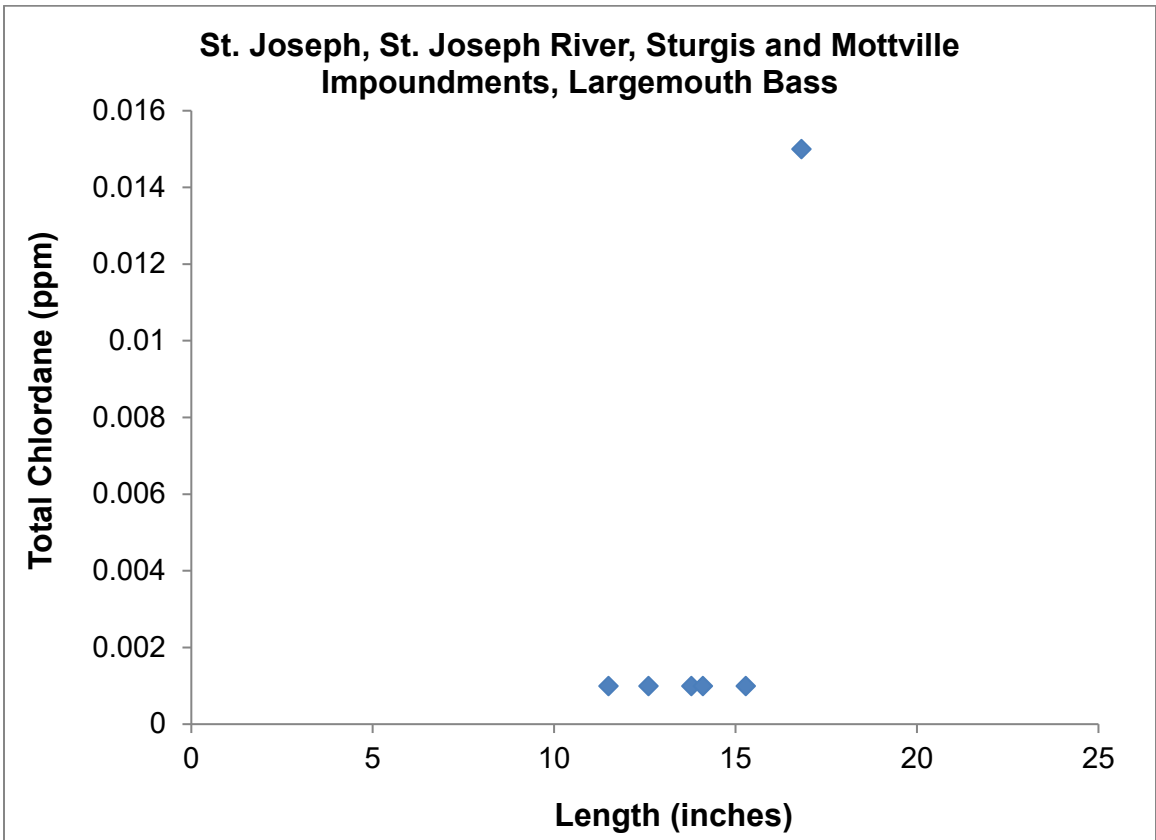
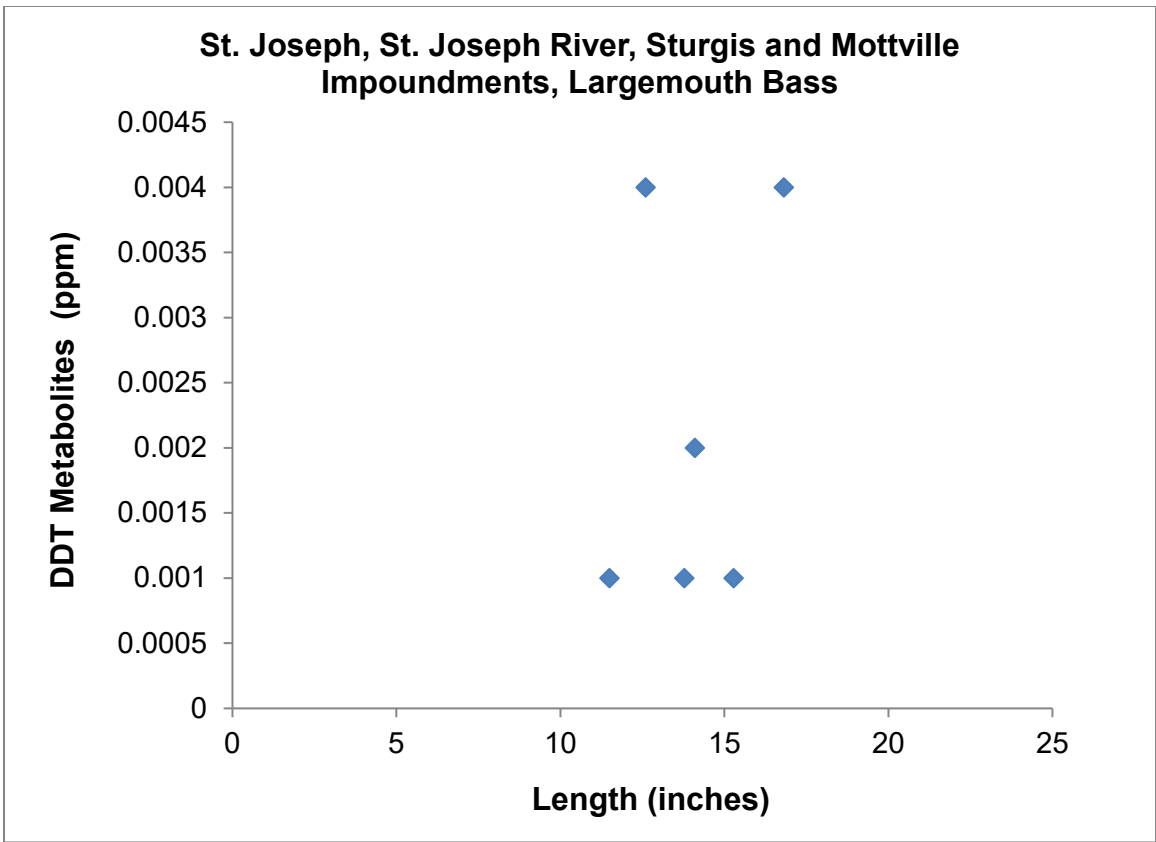
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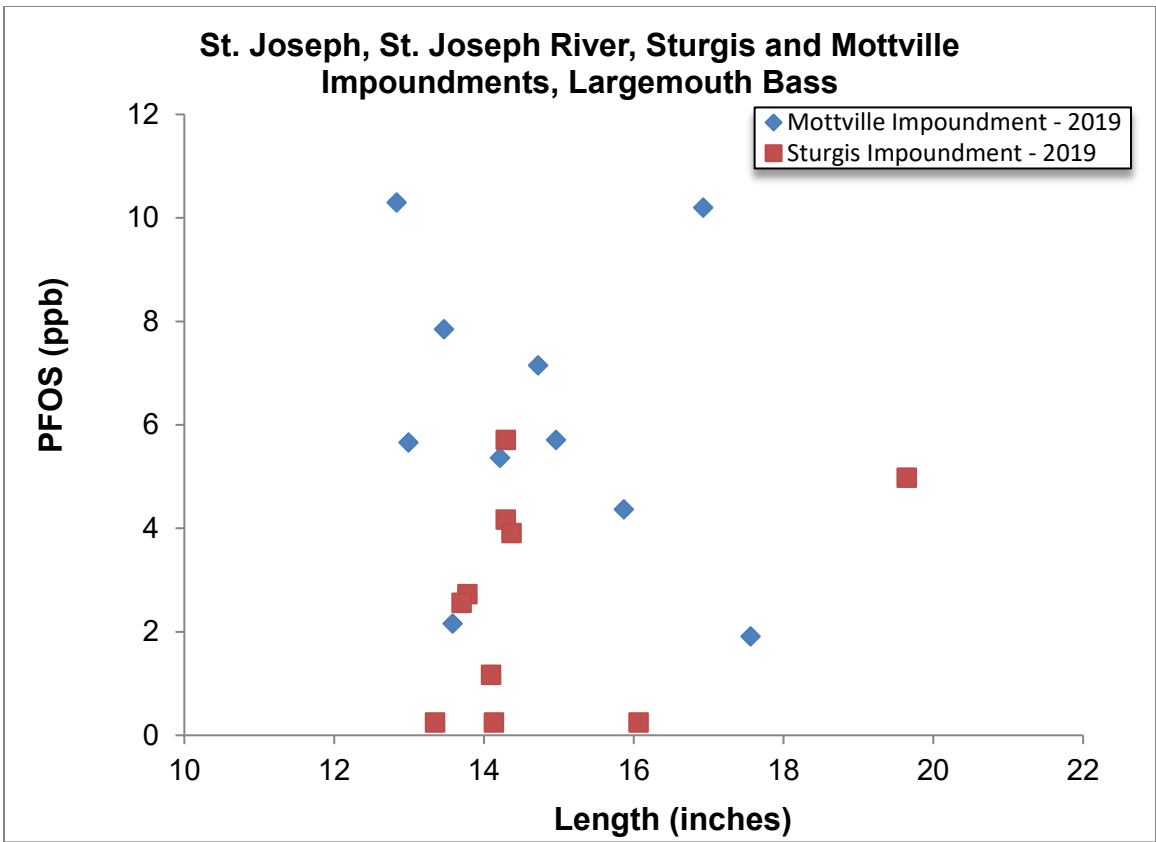
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2004	2019	26	11.5	14.0	13.6	19.6
Datasets available: 2004 (no PFOS); 2019 (PFOS only)						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	4	0.002	<0.001	0.004	0.004	16
DDT	4	0.002	<0.001	0.004	0.004	16
Chlordane	4	0.005	<0.001	0.015	0.016	16
Toxaphene	4	ND	--	--	--	--
PFOS	16	3.9	<0.25 ppb	10.2 ppb	5.3 ppb	16
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.198	0.146				
DDT	0.094	0.095				
Chlordane	0.529	0.529				
Toxaphene	--	--				
PFOS	0.000	0.002				
Final meal category based on UCL:						2

Existing MDHHS Advisory: No one should eat more than 4 meals per month of largemouth or smallmouth bass smaller than 18 inches or more than 2 meals per month of those fish larger than 18 inches between the Mottville Dam and Riley Dam (Union Lake Dam) due to mercury. Statewide size break was applied as the length range was limited.

Recommendation: No one should eat more than 2 meals per month of largemouth or smallmouth bass smaller than 18 inches or more than 1 meals per month of those fish larger than 18 inches between the Mottville Dam and Riley Dam (Union Lake Dam) due to mercury. Statewide size break was applied as the length range was limited.







Redhorse Sucker

**St. Joseph River
Between Mottville Dam & Union Lake Dam**

**St. Joseph
& Branch Counties**

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1998	1998	10	16.1	na	16.1	19.4
Datasets available: 1998						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	2*	0.16	0.16	0.17	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	--	--				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1998	1998	10	16.1	na	16.1	19.4
Datasets available: 1998						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	2*	0.04	0.04	0.04	--	--
DDT	2*	0.008	0.007	0.008	--	--
Chlordane	2*	0.003	0.003	0.003	--	--
Toxaphene	2*	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						--

* - 10 fish analyzed as 2 composite samples

Existing Advisory: St. Joseph River sucker are not covered by a consumption advisory.

Recommendation: A dataset of less than five data points for a given chemical, species and waterbody is considered insufficient for evaluation using the standard evaluation method. The statewide advice applies: No one should eat more than 8 meals per month of sucker from inland waters.

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1992	1992	10	16.5	15	16.5	20.1
Datasets available: 1992						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.22	0.11	0.36	0.28	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.603	0.506				

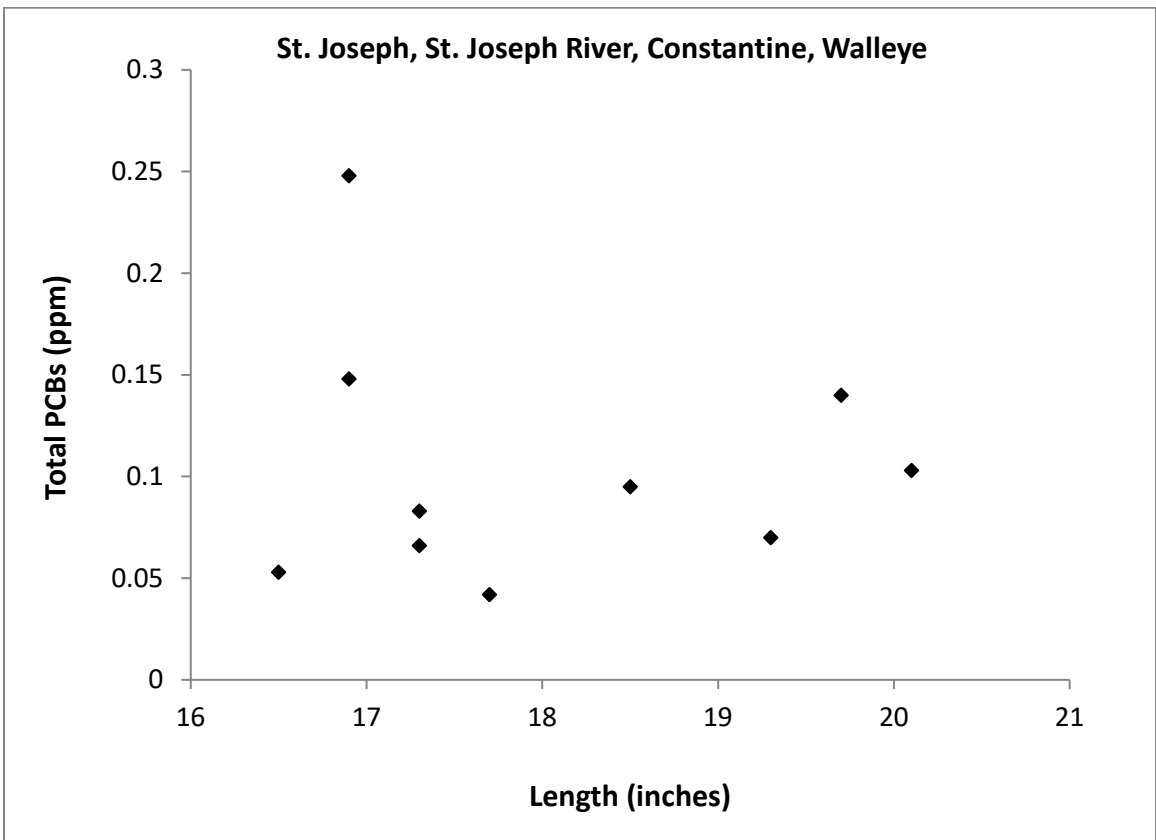
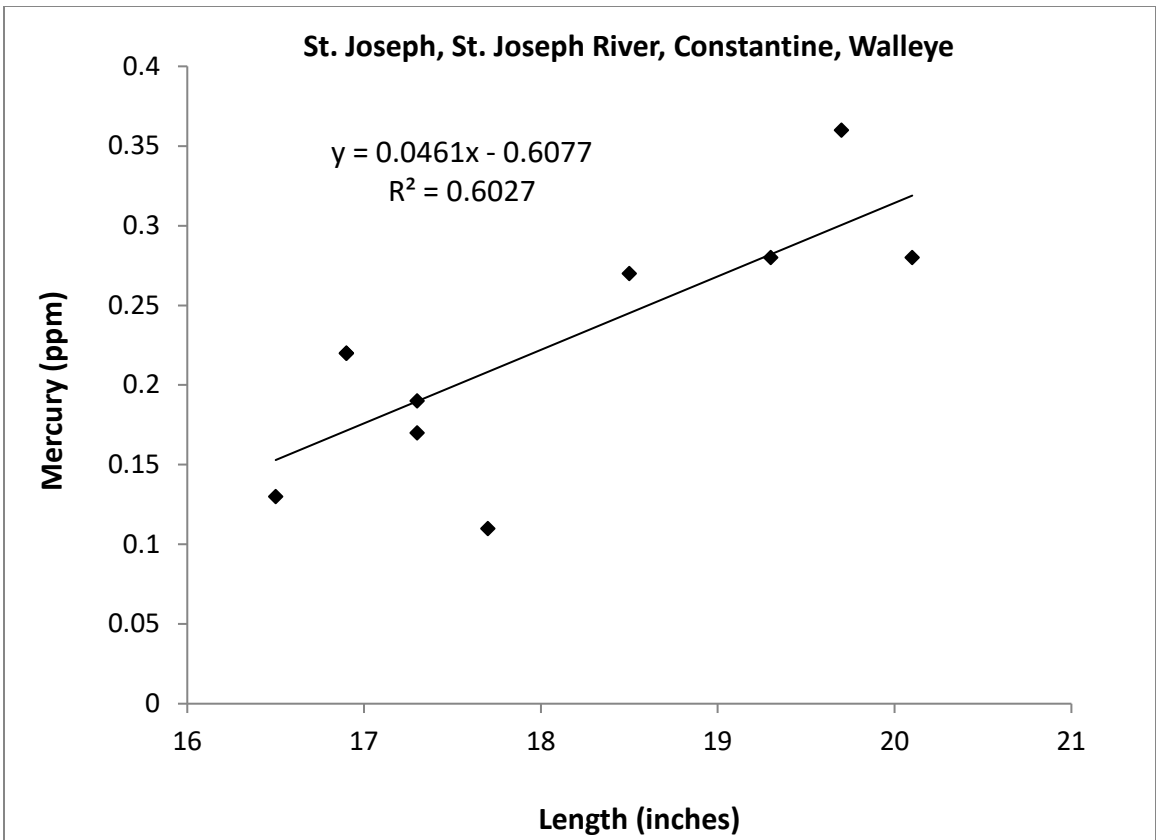
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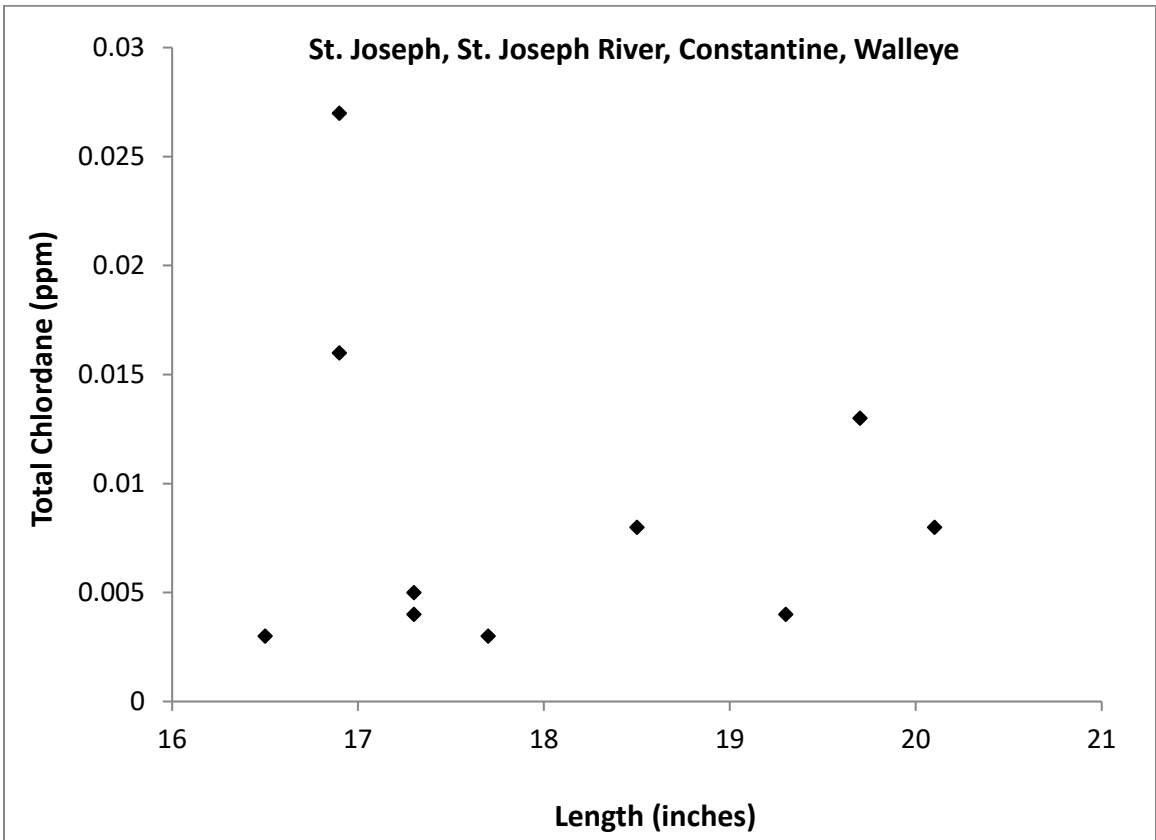
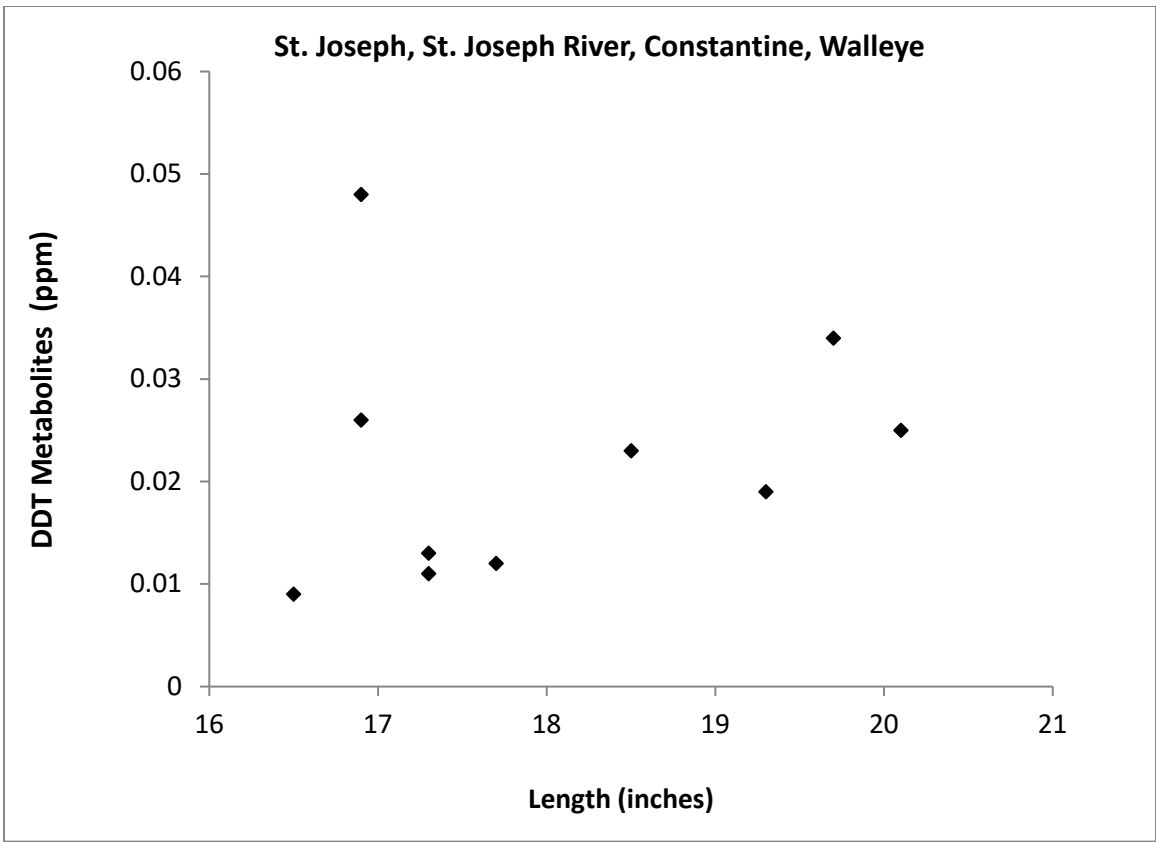
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1992	1992	10	16.5	15	16.5	20.1
Datasets available: 1992						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.10	0.04	0.25	0.15	1
DDT	10	0.02	0.009	0.05	0.03	16
Chlordane	10	0.009	0.003	0.03	0.02	--
Toxaphene	10	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.007	0.004				
DDT	0.036	0.124				
Chlordane	0.020	0.002				
Toxaphene	--	--				
Final meal category based on UCL:						1*

Existing Advisory: Women and children should not eat more than 1 meal per week of walleye from the St. Joseph River upstream of the Constantine Dam due to PCBs.

Recommendation: No one should eat more than 2 meals per month of walleye less than 20 inches from the St. Joseph River between Mottville Dam and Union Lake Dam (Riley Lake Dam) due to PCBs and mercury or 1 meal per month of those greater than 20 inches due to mercury. The quality of this dataset is limited due to the age of the data. *Based on the EGLE Fish Contaminant Monitoring Program, PCB concentrations ≥ 15 years old are expected to have declined to a concentration that allows a less restrictive meal category. Statewide length break was applied as the size range of the dataset was limited.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
14	0.04	16
15	0.08	12
16	0.13	8
18	0.22	4
20	0.31	2
22	0.41	2
24	0.5	2
26	0.59	1
<i>Shaded area denotes extrapolated estimates</i>		





Bluegill and Longear Sunfish

**St. Joseph River
Between Berrien Springs Dam &
Mottville Dam**

Berrien, Cass, & St. Joseph Counties

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2019	2019	16	4.3	NA	4.3	7.0
Datasets available: 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	16	0.081	0.052	0.150	0.100	8
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.066	0.036				

Organics Analysis:

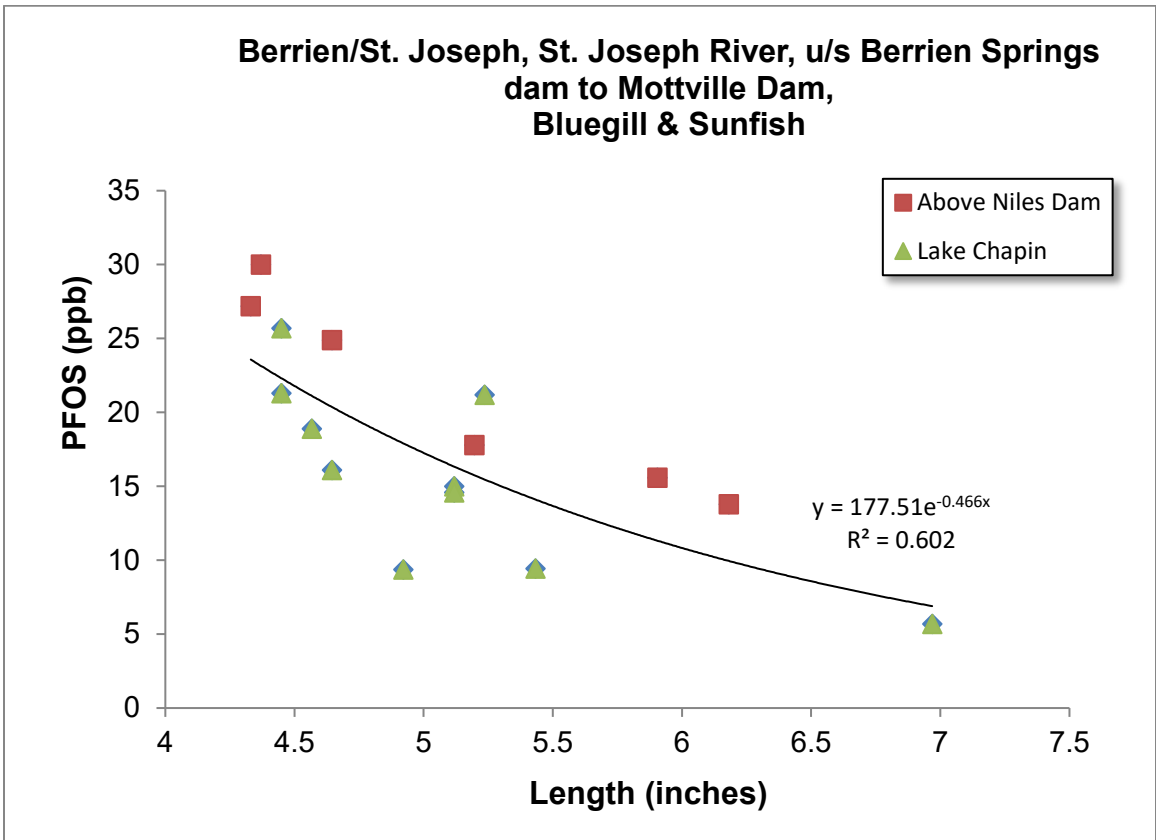
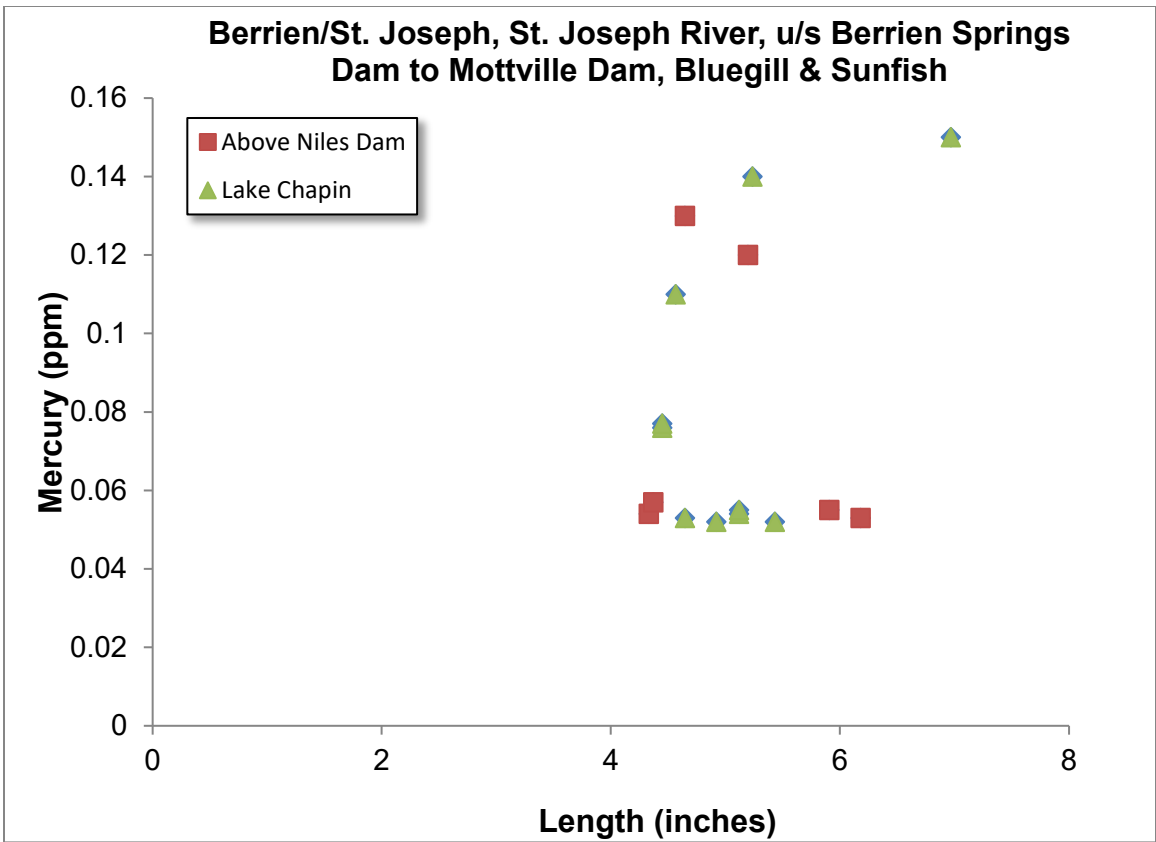
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2019	2019	16	4.3	NA	4.3	7.0
Datasets available: 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB*	0	--	--	--	--	--
DDT*	0	--	--	--	--	--
Chlordane*	0	--	--	--	--	--
Toxaphene*	0	--	--	--	--	--
PFOS (all)	16	17.9 ppb	5.7 ppb	30.0 ppb	21.6 ppb	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.551	0.600**				
Final meal category based on UCL:						4

Existing MDHHS Advisory: Bluegill and sunfish species from the St. Joseph River downstream of the Mottville dam to the Berrien Springs Dam, including Lake Chapin, are currently covered under the statewide mercury consumption advisory. No one should eat more than 8 meals per month of bluegill or sunfish of any size due to mercury.

Recommendation: No one should eat more than four meals per month of bluegill or sunfish species from the St. Joseph River downstream of the Mottville dam to the Berrien Springs Dam including Lake Chapin due to PFOS. Mercury would cause an advisory.

Note: This summary includes data from two sampling locations (Lake Chapin upstream of the Berrien Springs dam and above the dam in Niles). Other dams in the river exist within the section of the river located in the State of Indiana. Since fish contaminant data for that section of the river are not available, it is recommend that the advisory cover the entire length of the river from Lake Chapin up to the next fish barrier located in Michigan (the Mottville dam).

**While there was a significant negative correlation between fish length and PFOS concentration, it is not recommended to implement a size-based advisory unless additional data are available providing a biological reason for the negative correlation.



Carp

**St. Joseph River
Between Berrien Springs Dam & Mottville Dam**

**Berrien, Cass,
& St. Joseph Counties**

Hg Analysis:

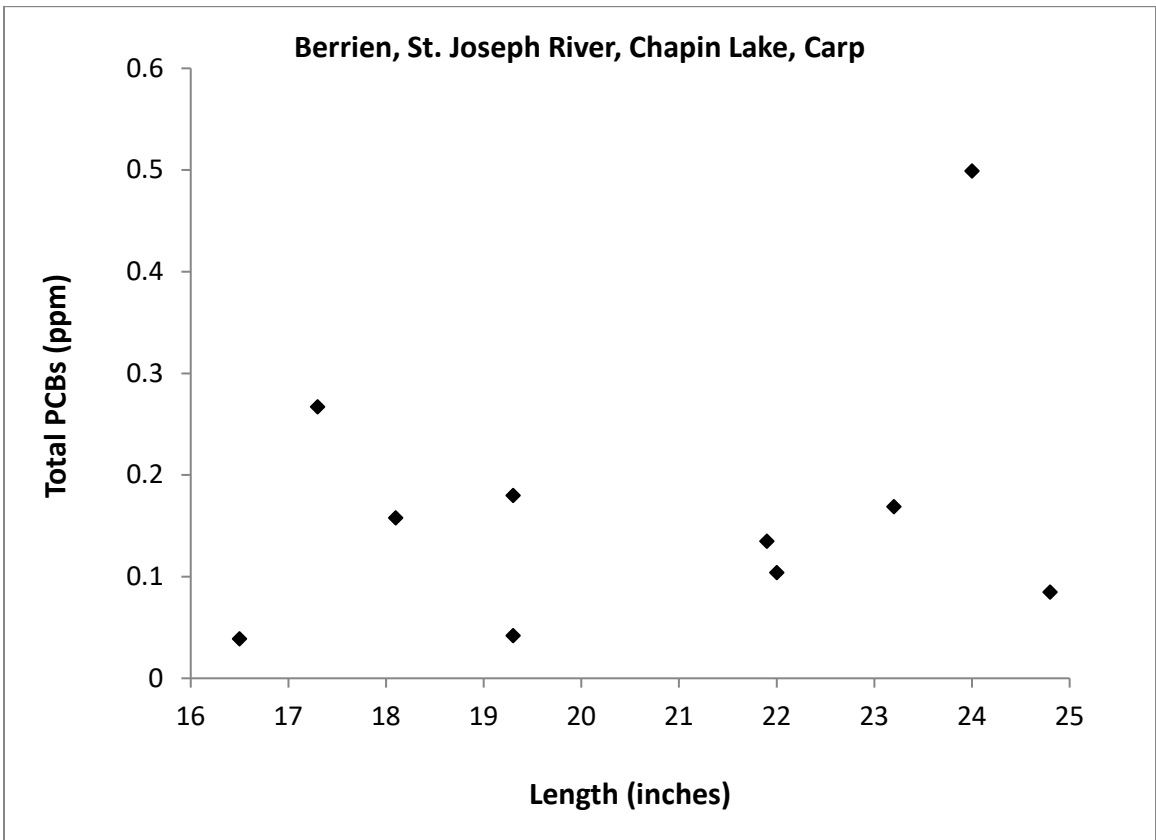
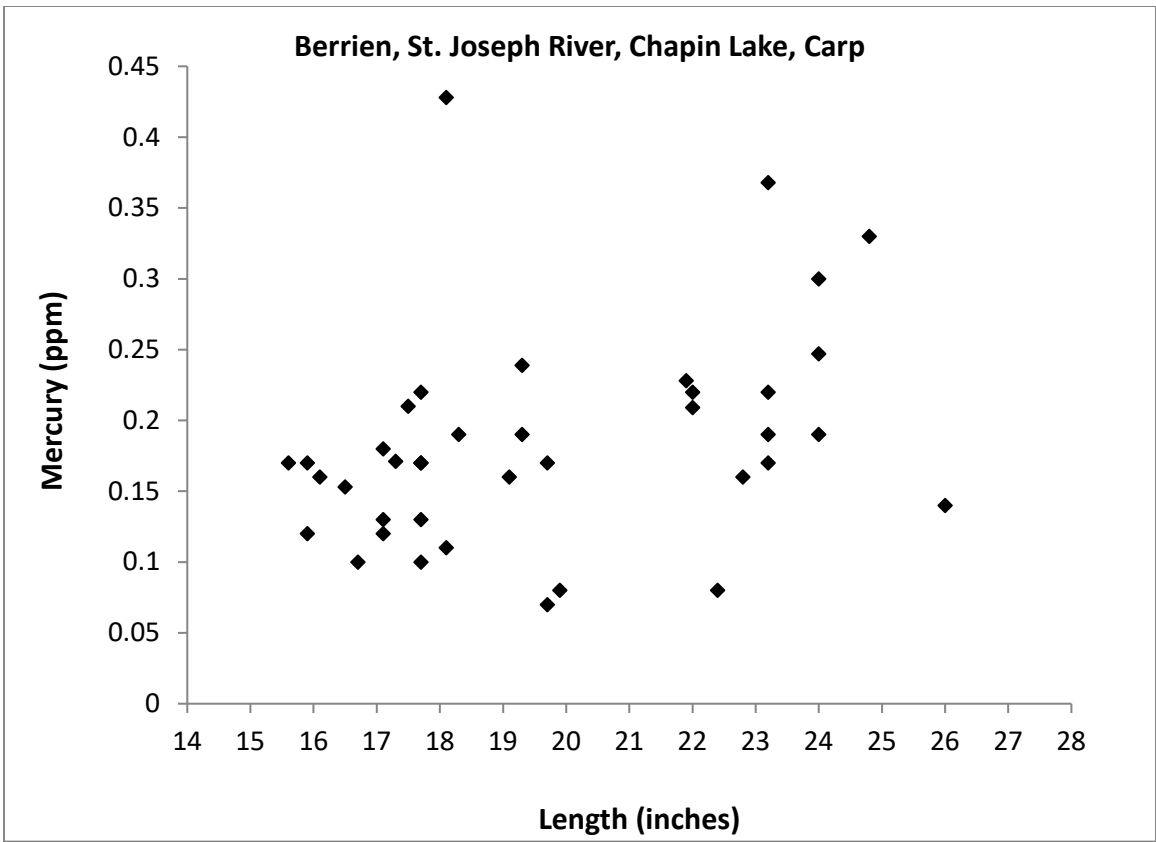
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1987	2005	39	15.6	na	15.6	26
Datasets available: 1987, 1995, 2005						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	39	0.18	0.07	0.43	0.21	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.116	0.103				

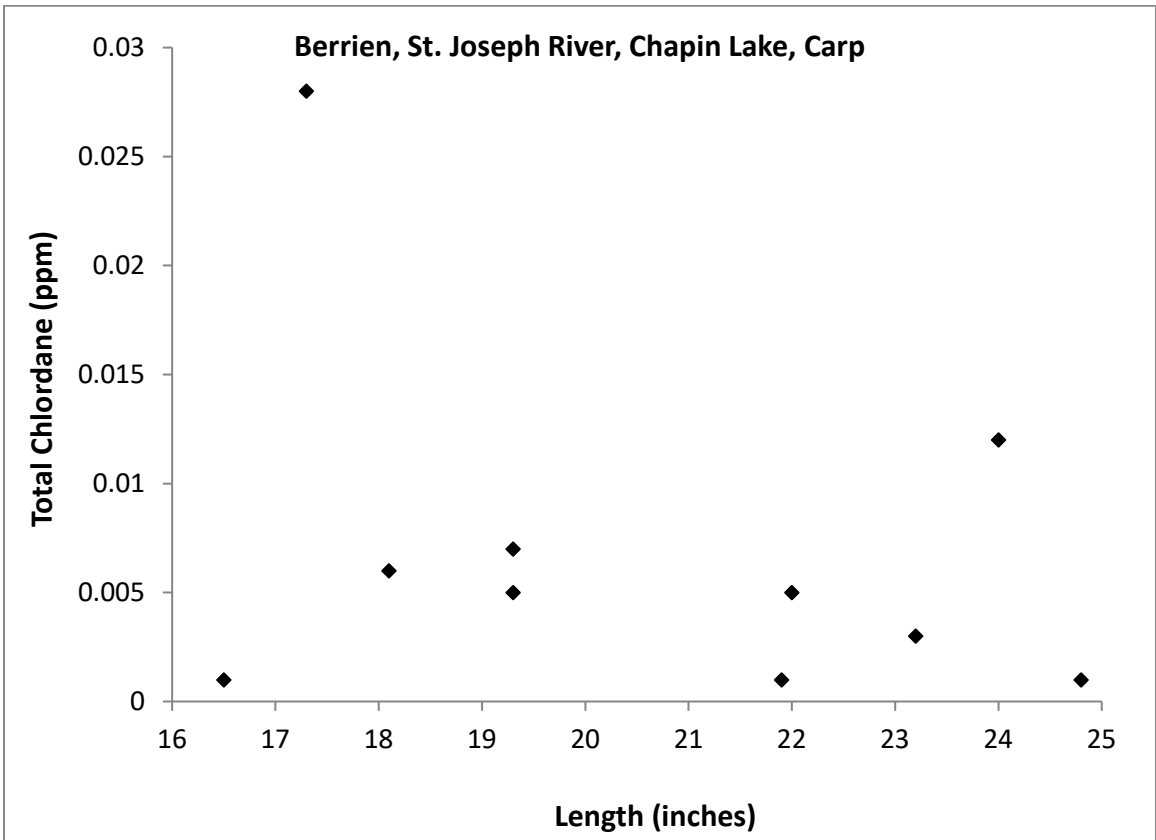
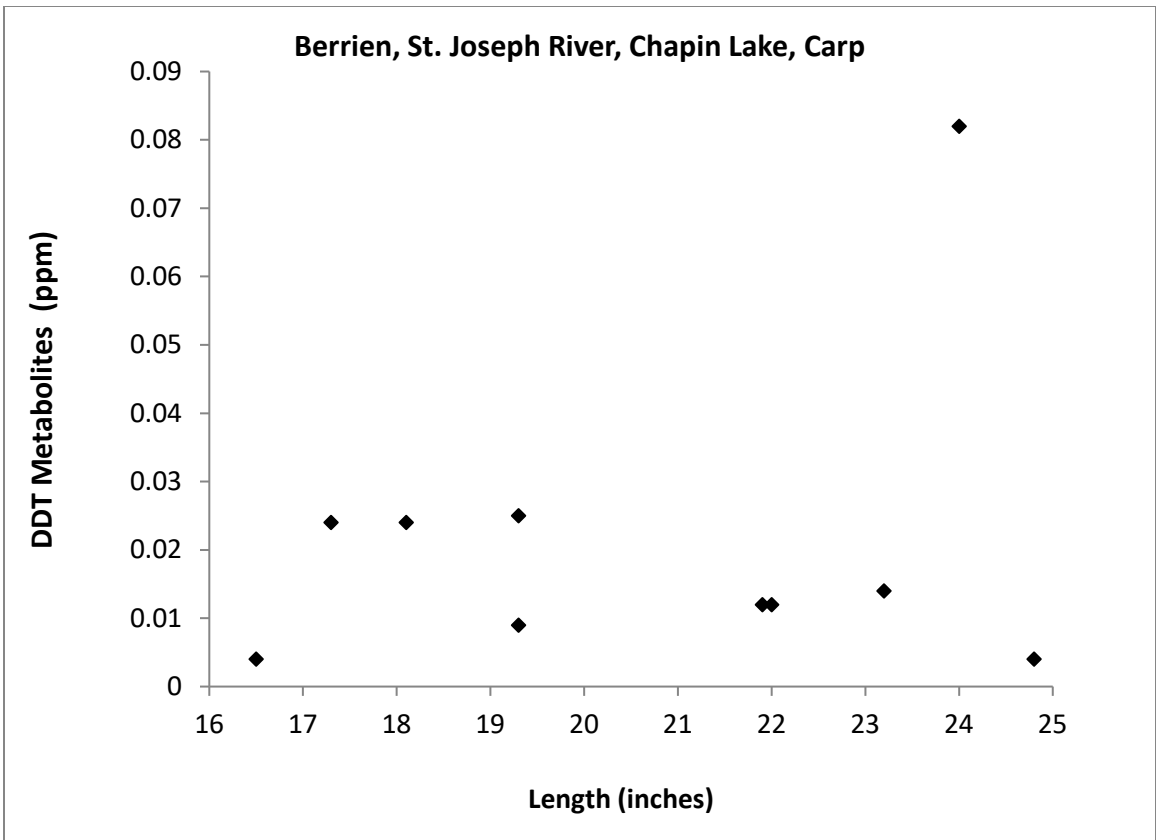
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2005	2005	10	16.5	na	16.5	24.8
Datasets available: 1987, 1995, 2005						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.17	0.04	0.50	0.26	0.5
DDT	10	0.02	0.004	0.08	0.04	16
Chlordane	10	0.007	0.001	0.03	0.01	--
Toxaphene	10	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.083	0.095				
DDT	0.068	0.008				
Chlordane	0.103	0.057				
Toxaphene	--	--				
Final meal category based on UCL:						0.5

Existing Advisory: Women and children should not eat more than 1 meal per month of carp from the St. Joseph River between Berrien Springs and Constantine due to PCBs.

Recommendation: No one should eat more than 6 meals per year of carp from the St. Joseph River between the Berrien Springs Dam and Mottville Dam due to PCBs. Mercury would cause an advisory.





**Largemouth and
Smallmouth Bass**

**St. Joseph River
Chapin Lake and Above Niles**

Berrien County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1987	2019	54	9.7	14.0	13.7	19.3
Datasets available: 1987, 1995, 2005, 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	22	0.284	0.062	0.650	0.343	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.463	0.308				

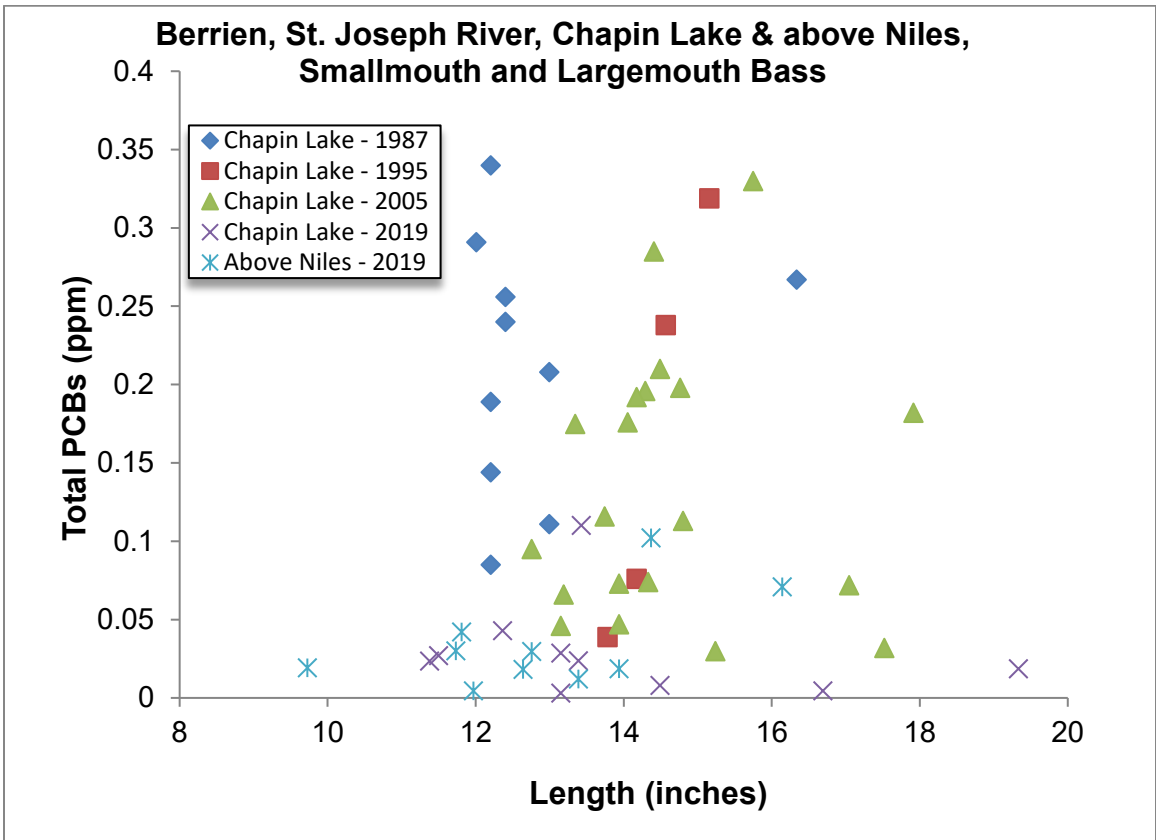
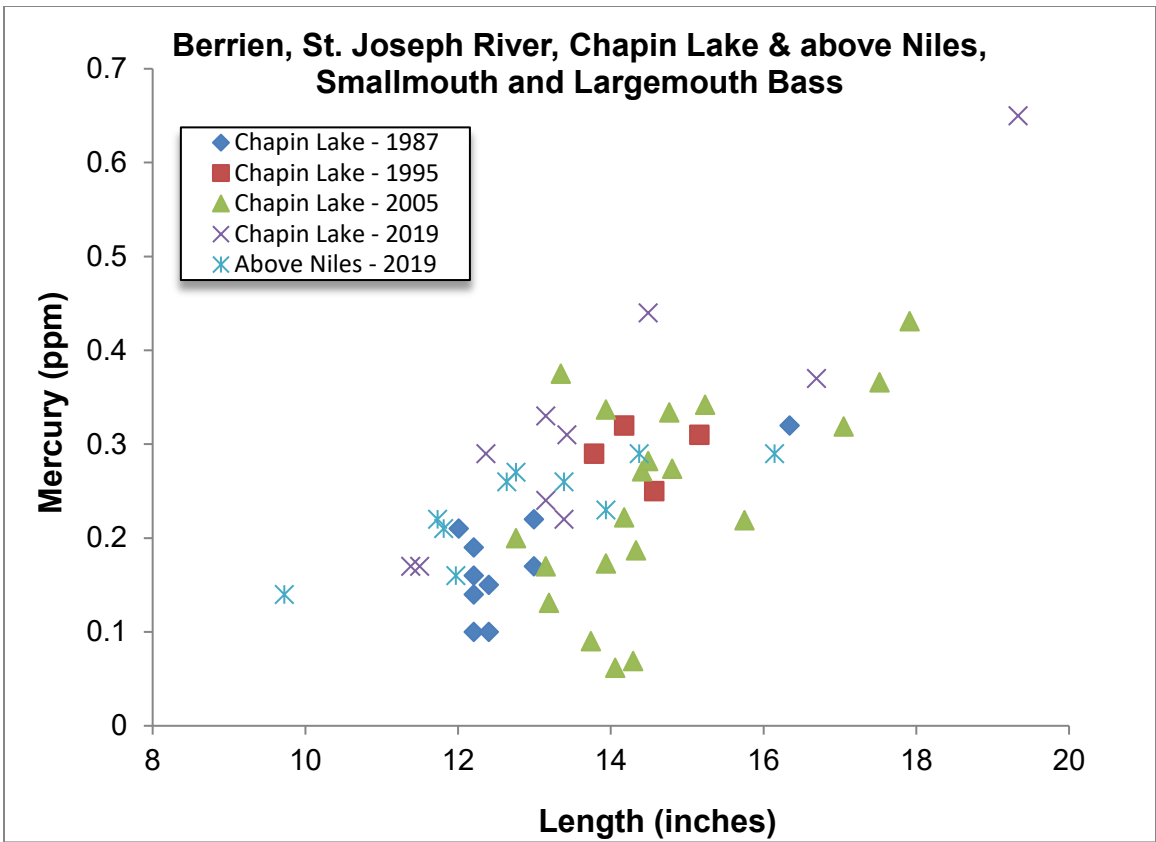
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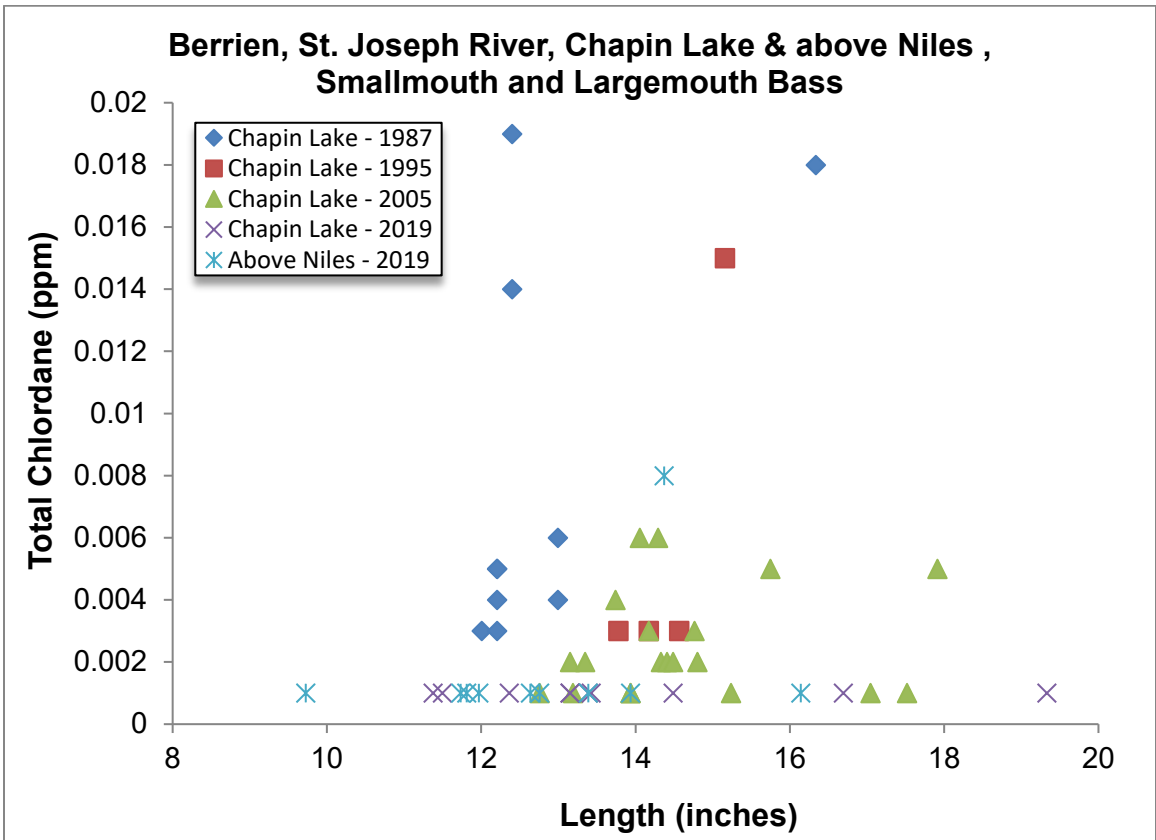
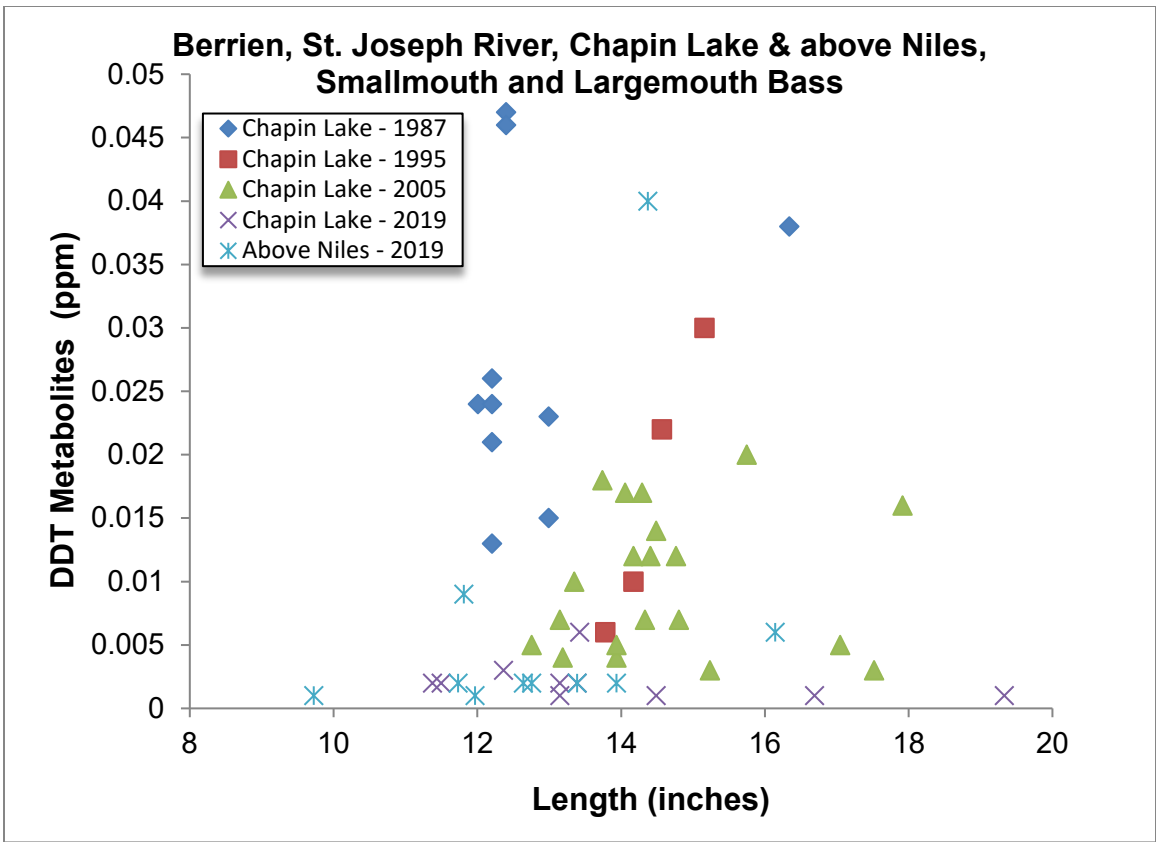
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2005	2019	54	9.7	14.0	13.7	19.3
Datasets available: 1987, 1995, 2005, 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	22	0.116	0.005	0.330	0.157	1
DDT	22	0.010	<0.001	0.040	0.014	16
Chlordane	22	0.003	<0.001	0.008	0.004	16
Toxaphene	22	ND	--	--	--	--
PFOS	20*	18.2 ppb	5.5 ppb	34.1 ppb	22.5 ppb	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.007	0.005				
DDT	0.000	0.001				
Chlordane	0.004	0.004				
Toxaphene	--	--				
PFOS	0.104	0.162				
Final meal category based on UCL:						1

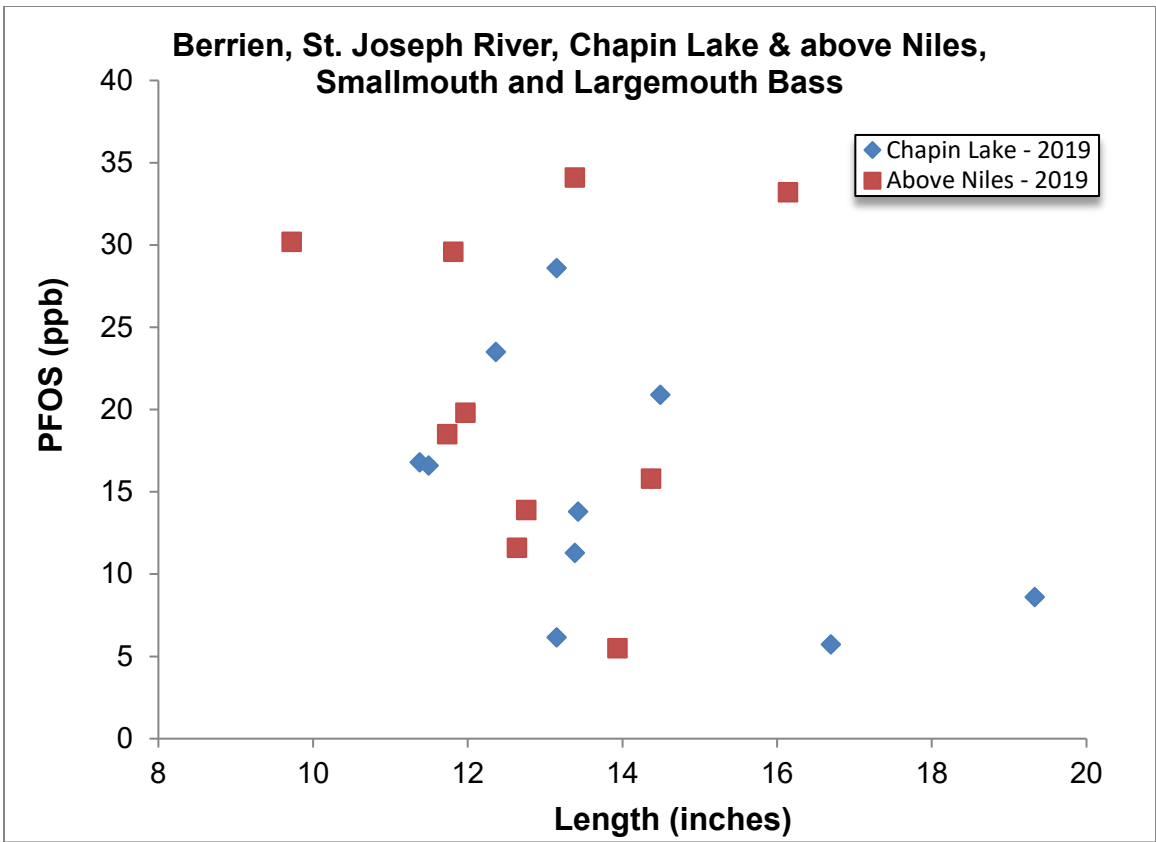
*Sub-legal sized fish were used in the PFOS analysis as no correlation between PFOS concentrations and fish size has been observed in the statewide dataset. PFOS only assessed in 2019.

Existing MDHHS Advisory: No one should eat more than 1 meal per month largemouth or smallmouth bass less than 18 inches from the St. Joseph River between the Berrien Springs Dam and Mottville Dam due to PCBs, or more than 1 meal per month of those greater 18 inches due to mercury and PCBs. Statewide length break applied as the size range of the fish was limited.

Recommendation: No change to the advisory is warranted. PFOS should be added to the list of chemicals causing an advisory.







Carp

**St. Joseph River
Downstream Berrien Springs Dam**

Berrien County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1987	2013	20	18.7	na	18.7	25.4
Datasets available: 1987, 1993*, 2013						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	20	0.16	0.10	0.27	0.19	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.078	0.077				

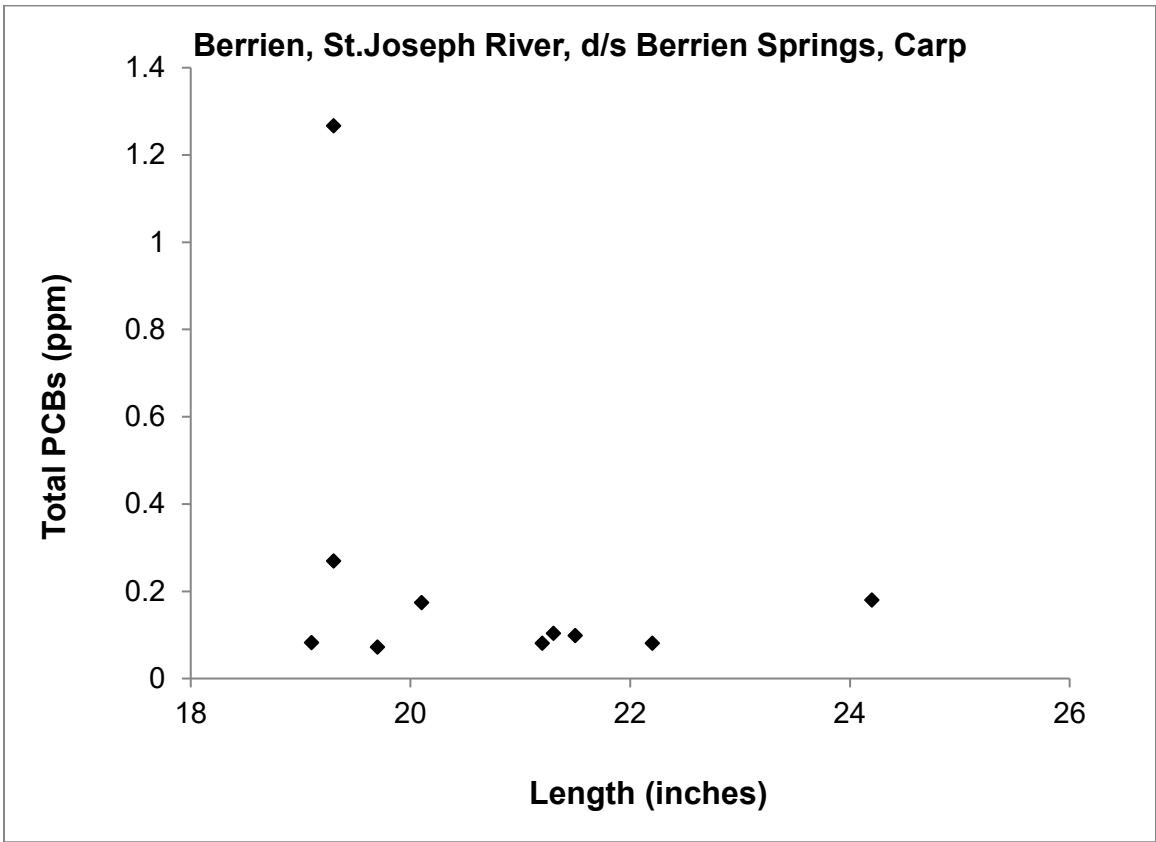
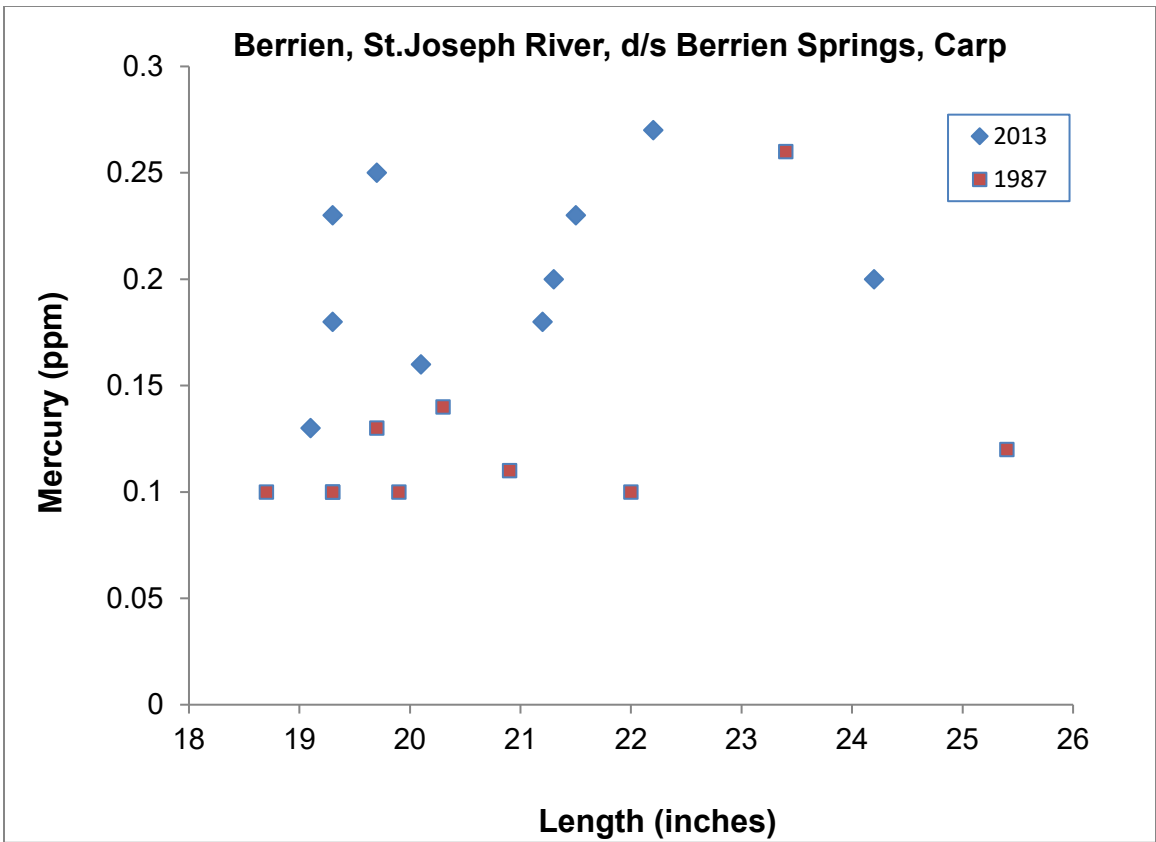
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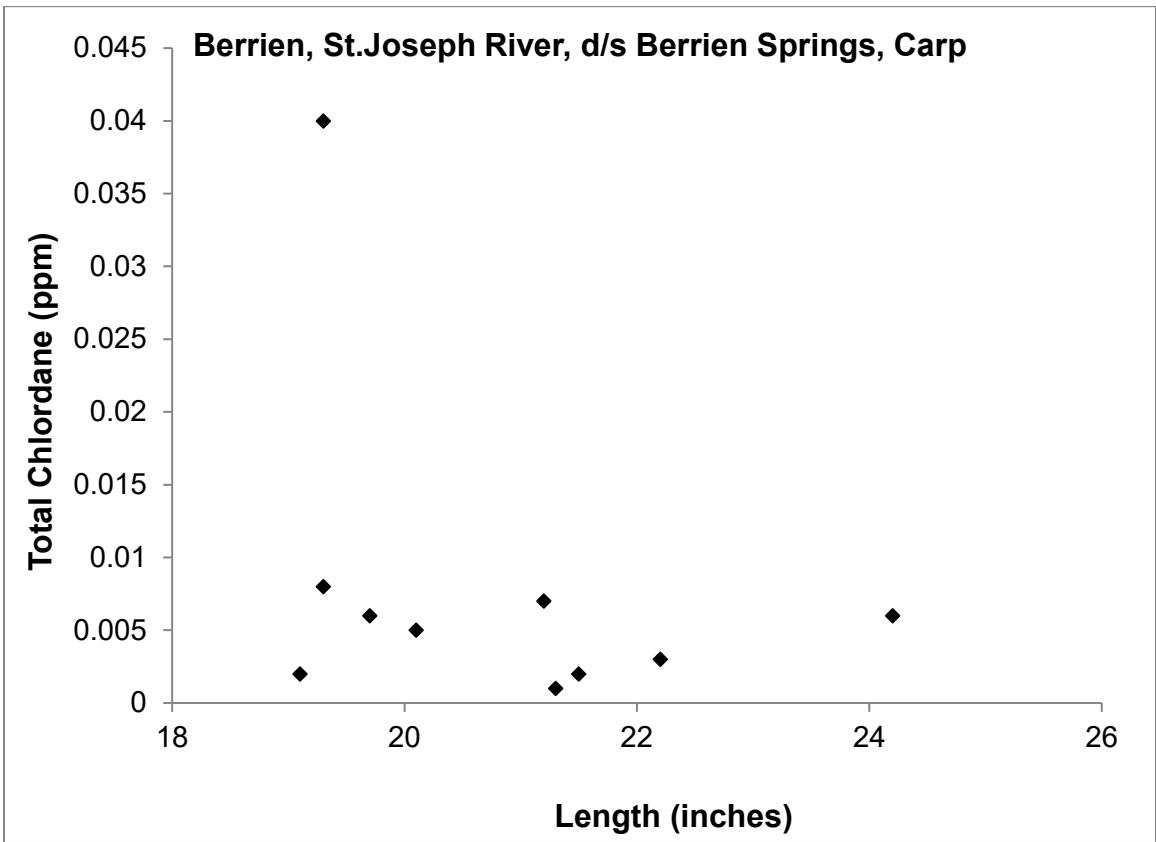
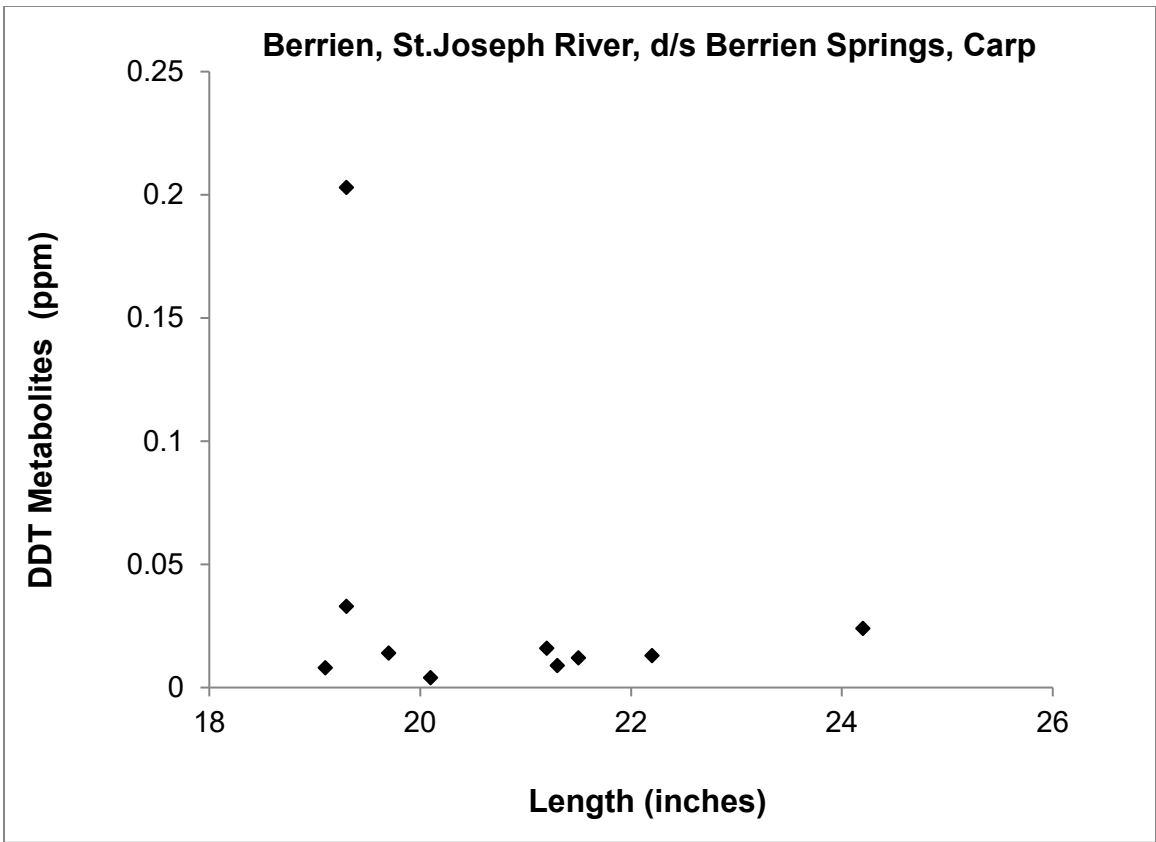
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2013	2013	10	19.1	na	19.1	24.2
Datasets available: 1984, 1987, 1993*, 2013						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.24	0.07	1.27	0.50	Limited
DDT	10	0.03	0.004	0.20	0.08	16
Chlordane	10	0.01	0.001	0.04	0.02	--
Toxaphene	10	ND	--	--	--	--
PFOS	10	21 ppb	9 ppb	29 ppb	25 ppb	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.107	0.068				
DDT	0.091	0.017				
Chlordane	0.110	0.070				
Toxaphene	--	--				
PFOS	0.003	0.017				
Final meal category based on UCL:						Limited

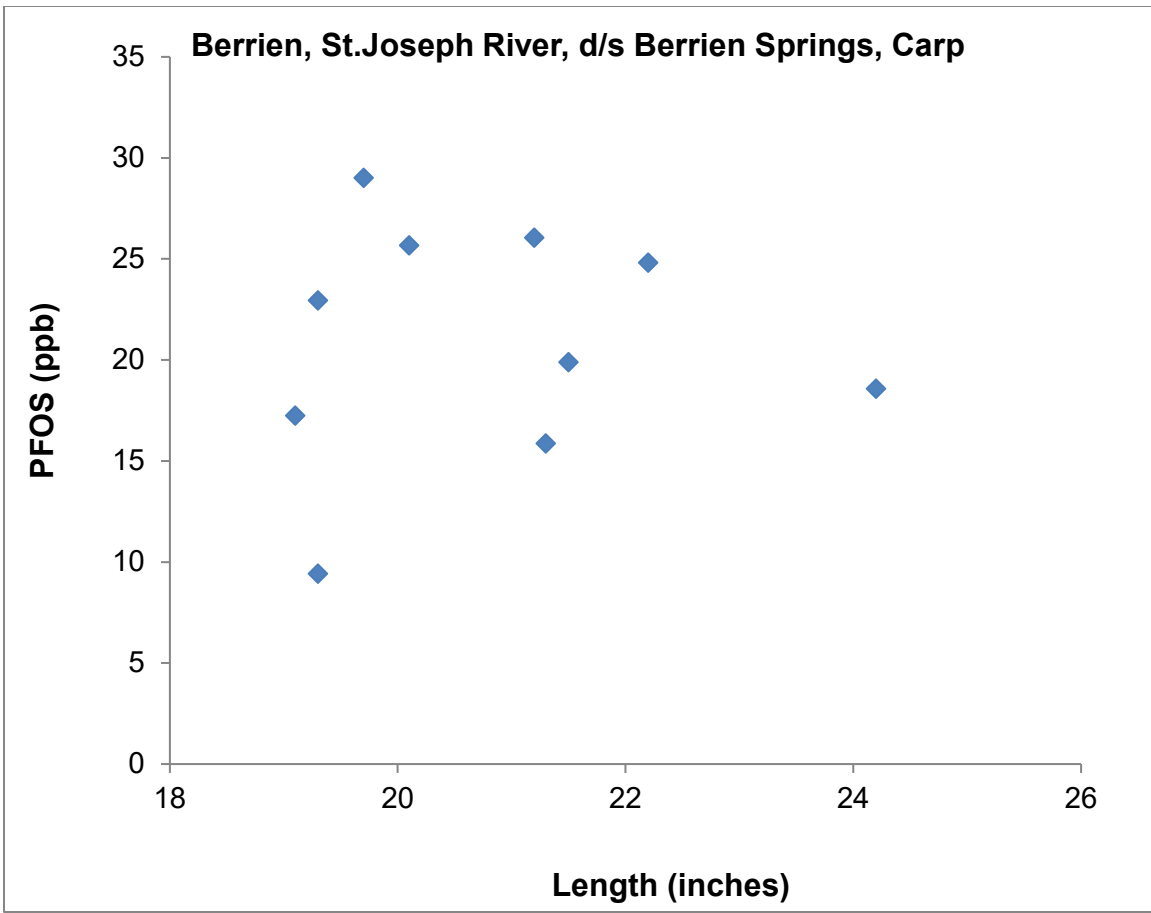
* - composite samples; not used in evaluation

Existing Advisory: Sensitive populations should not eat carp from the St. Joseph River downstream of the Berrien Springs Dam due to PCBs. Healthy adults should not eat more than 1 or 2 meals per year of these fish.

Recommendation: No change is recommended. PFOS should be added to the list of contaminants causing an advisory.







**Largemouth
and Smallmouth Bass
Hg Analysis:**

**St. Joseph River
Downstream Berrien Springs Dam**

Berrien County

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		Meal Category
Earliest	Most Recent				Min	Max	
1987	2013	18	8.9	14	13.8	16.5	
Datasets available: 1987, 2013							
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category	
Mercury	5	0.28	0.14	0.44	0.45	2	
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
Mercury	0.402	0.347					

Organics Analysis:

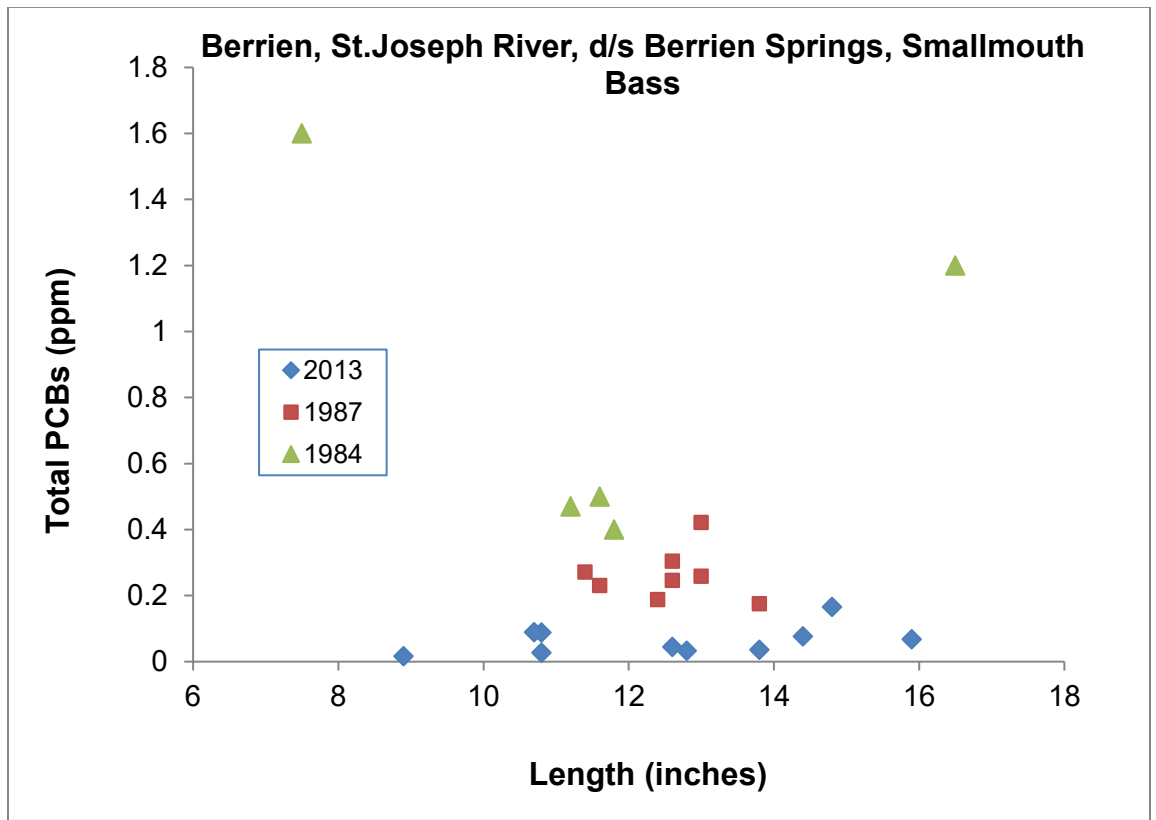
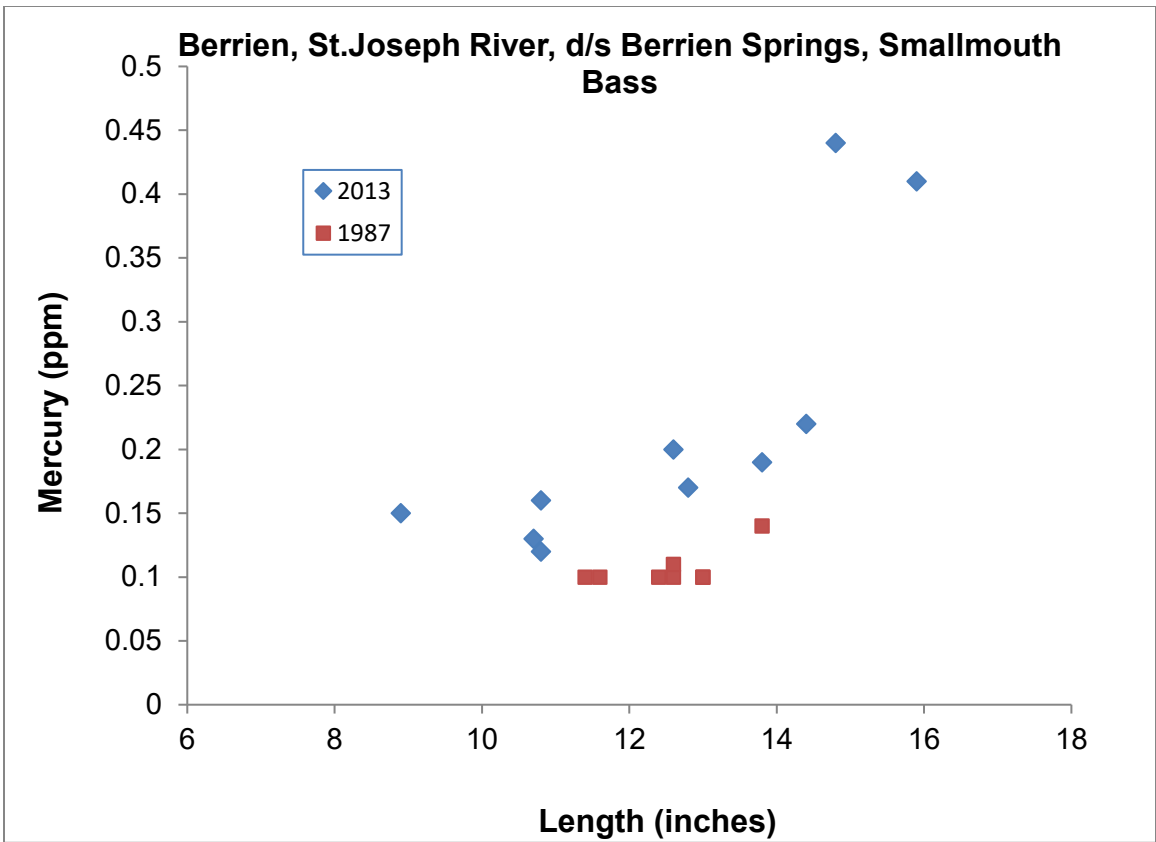
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		Meal Category
Earliest	Most Recent				Min	Max	
1987	2013	23	7.5	14	13.8	16.5	
Datasets available: 1984, 1987, 2013							
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category	
PCB	6	0.29	0.04	1.2	0.76	Limited	
DDT	6	0.05	0.004	0.21	0.13	12	
Chlordane	6	0.01	0.001	0.07	0.04	--	
Toxaphene	6	ND	--	--	--	--	
PFOS	10*	22 ppb	10 ppb	36 ppb	28 ppb	4	
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
PCB	0.033	0.000					
DDT	0.012	0.011					
Chlordane	0.120	0.029					
Toxaphene	--	--					
PFOS	0.264	0.265					
						Final meal category based on UCL:	Limited*

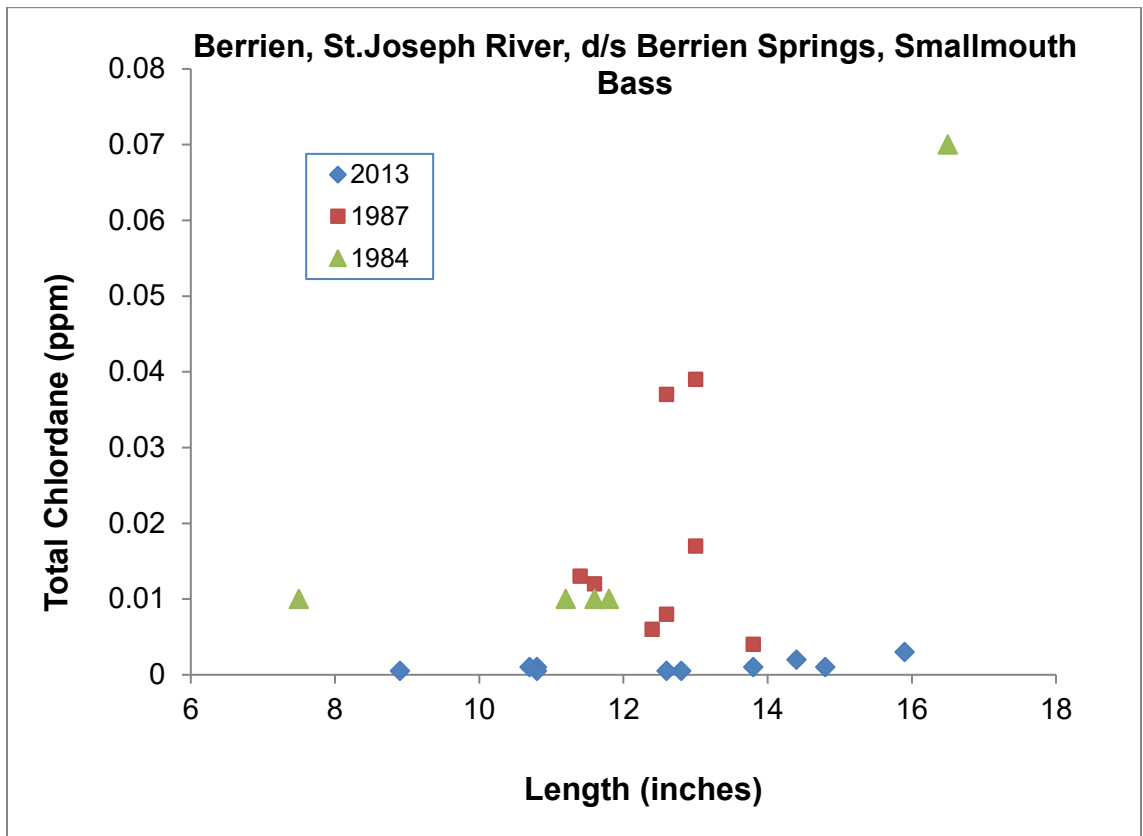
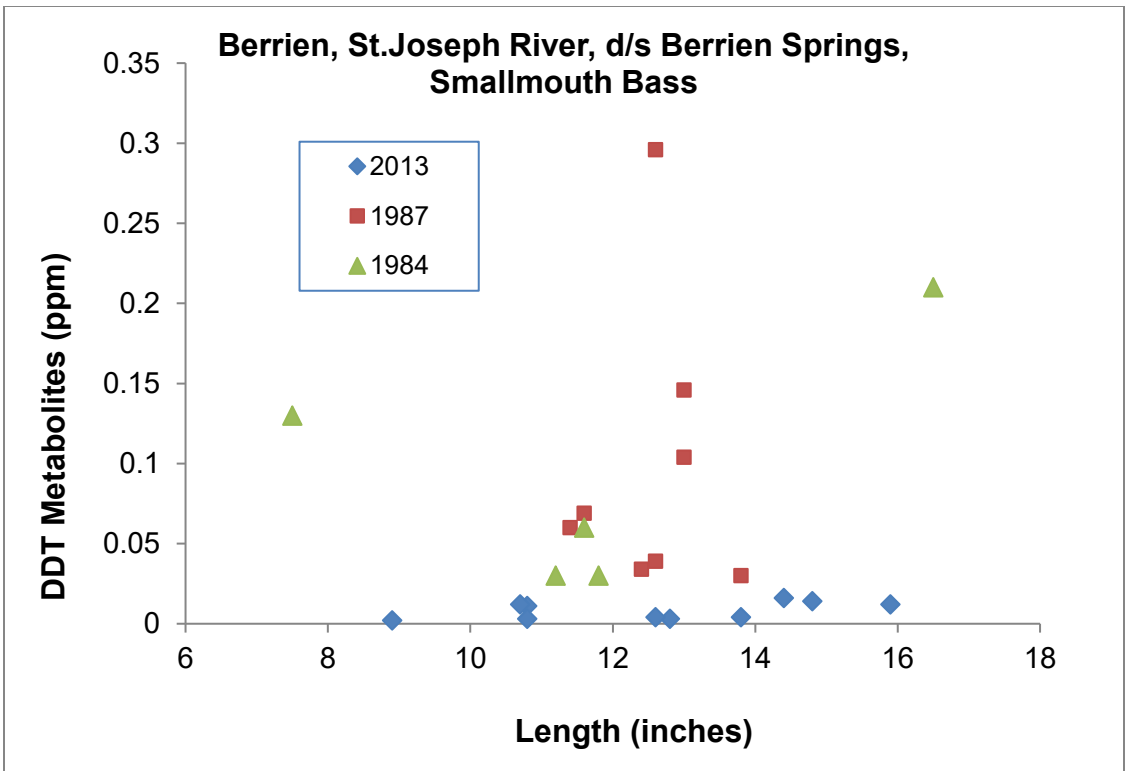
* - PFOS concentrations higher with all samples included

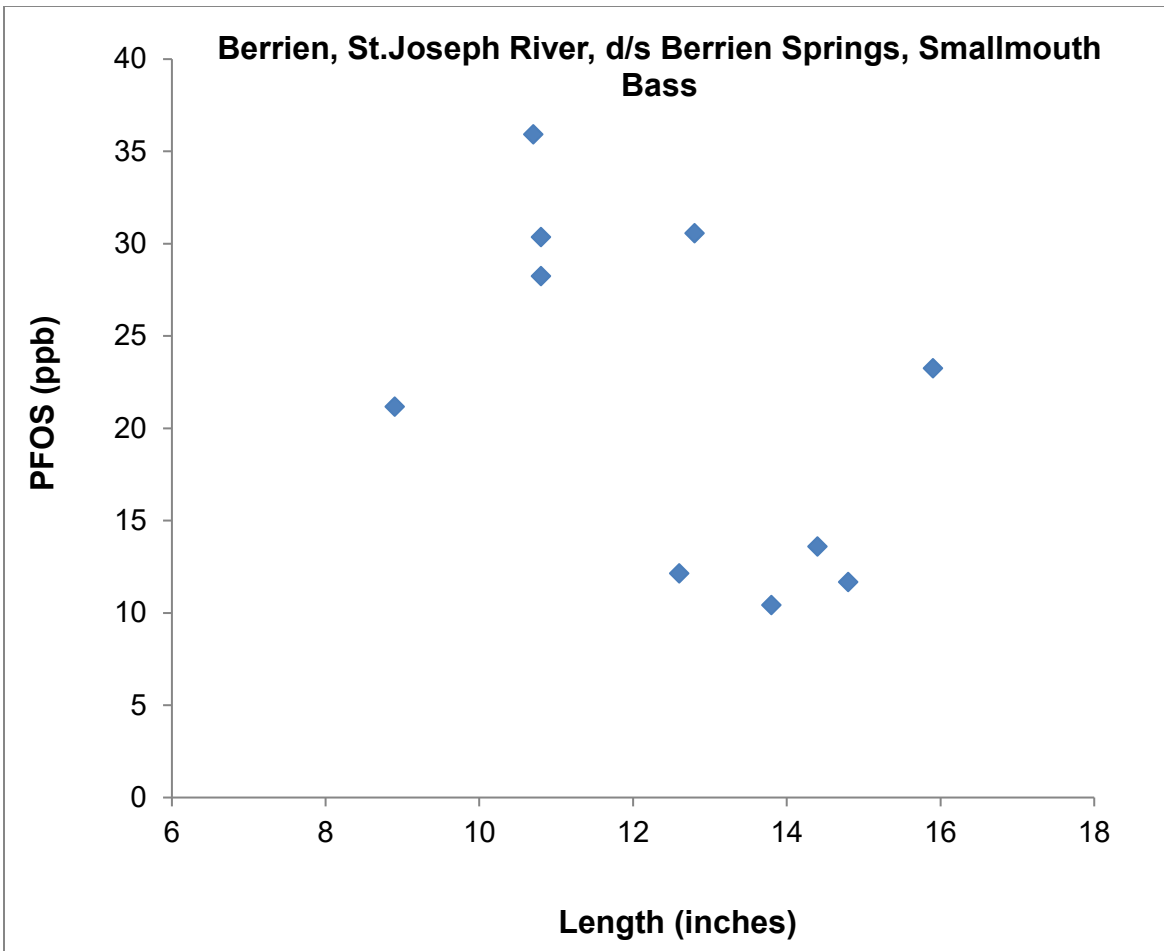
Existing Advisory: No one should eat more than 6 meals per year of largemouth or smallmouth bass from the St. Joseph River downstream of the Berrien Springs Dam due to PCBs.

Recommendation: No change is recommended. Mercury, PFOS, and DDT would cause advisories.

The quality of this dataset is limited due to the age of the data and size of the samples. *Based on the EGLE Fish Contaminant Monitoring Program, PCB concentrations ≥15 years old are expected to have declined to a concentration that allows a less restrictive meal category than determined by the standard evaluation method. The 95% UCL in of the 4 legal size fish collected in 2013 is 0.18 ppm.







Rock Bass

**St. Joseph River
Downstream Berrien Springs Dam**

Berrien County

Hg Analysis:

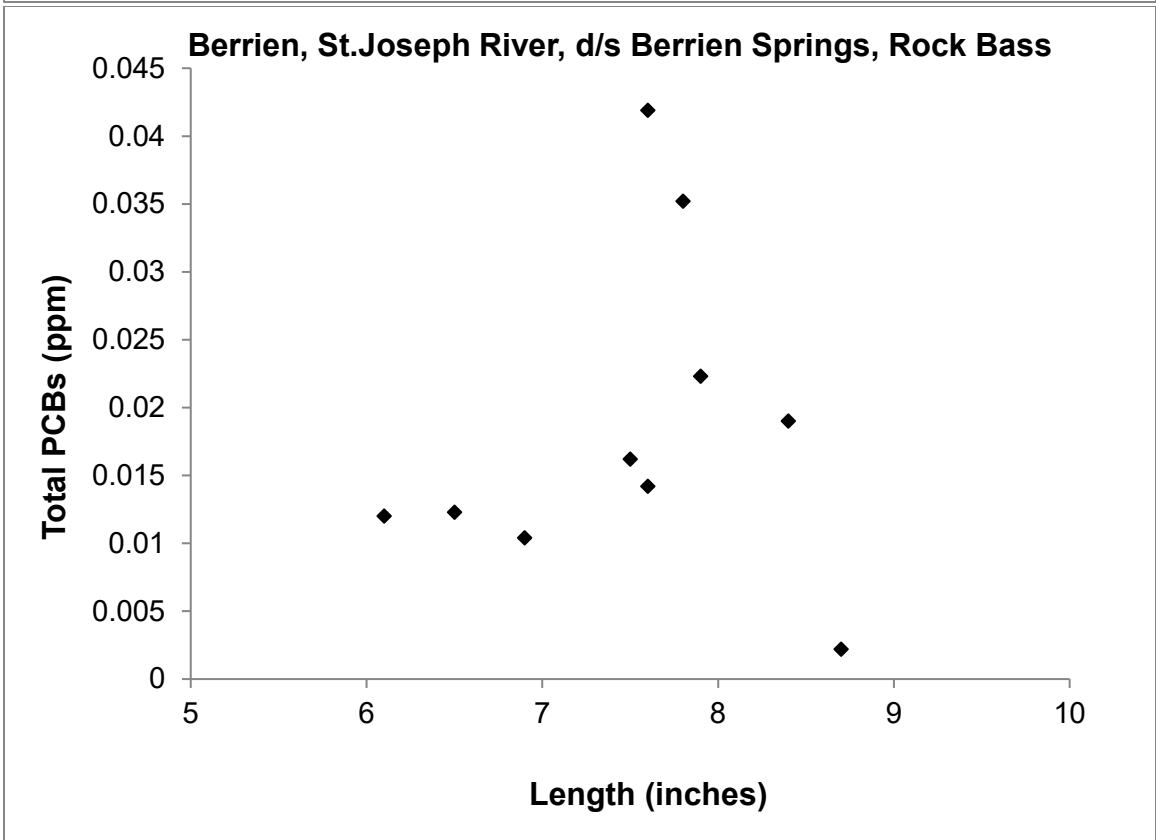
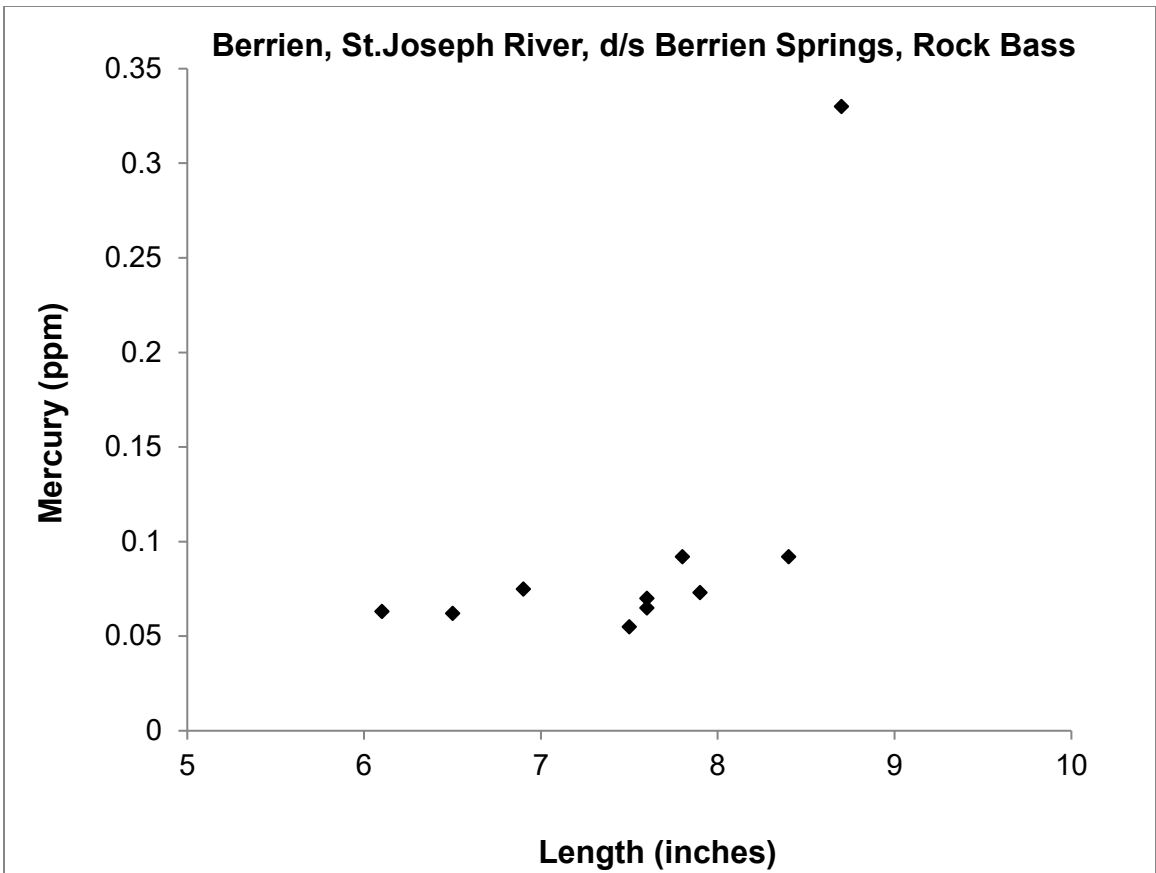
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2013	2013	10	6.1	na	6.1	8.7
Datasets available: 2013						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.10	0.06	0.33	0.16	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.350	0.425				

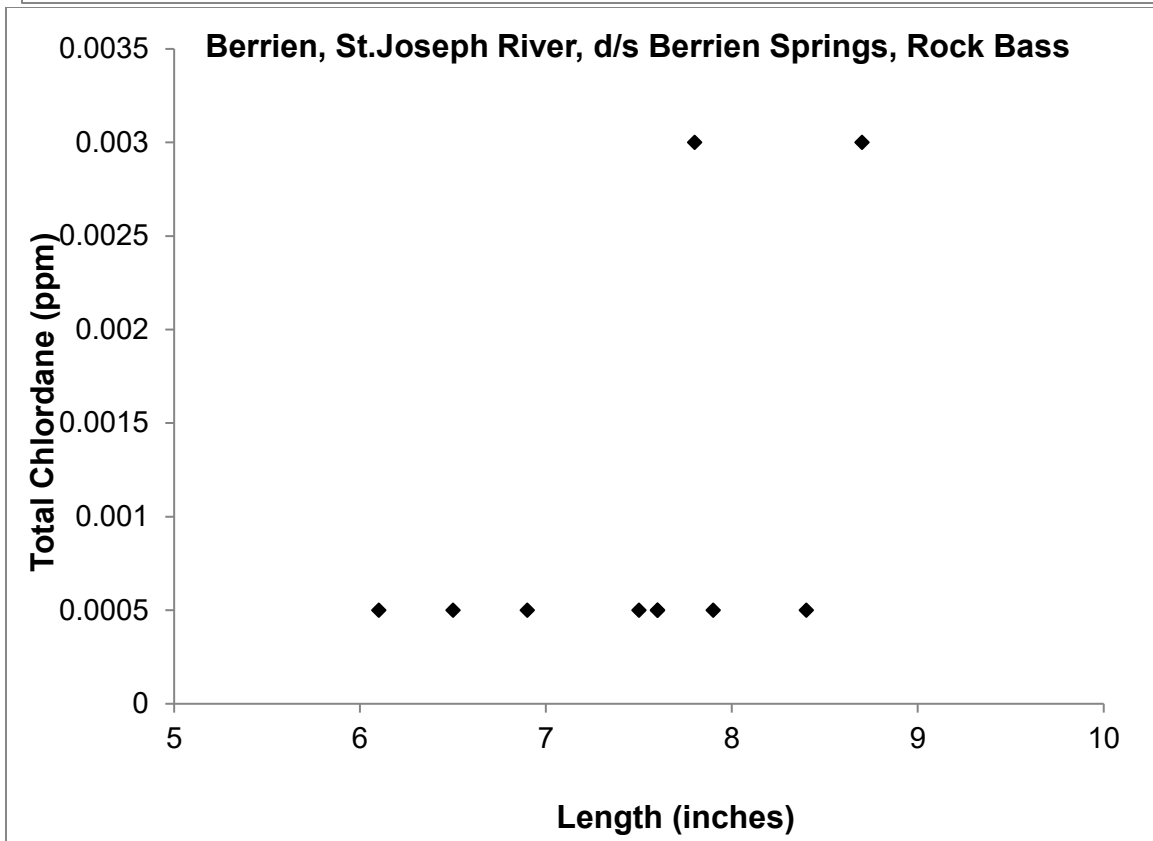
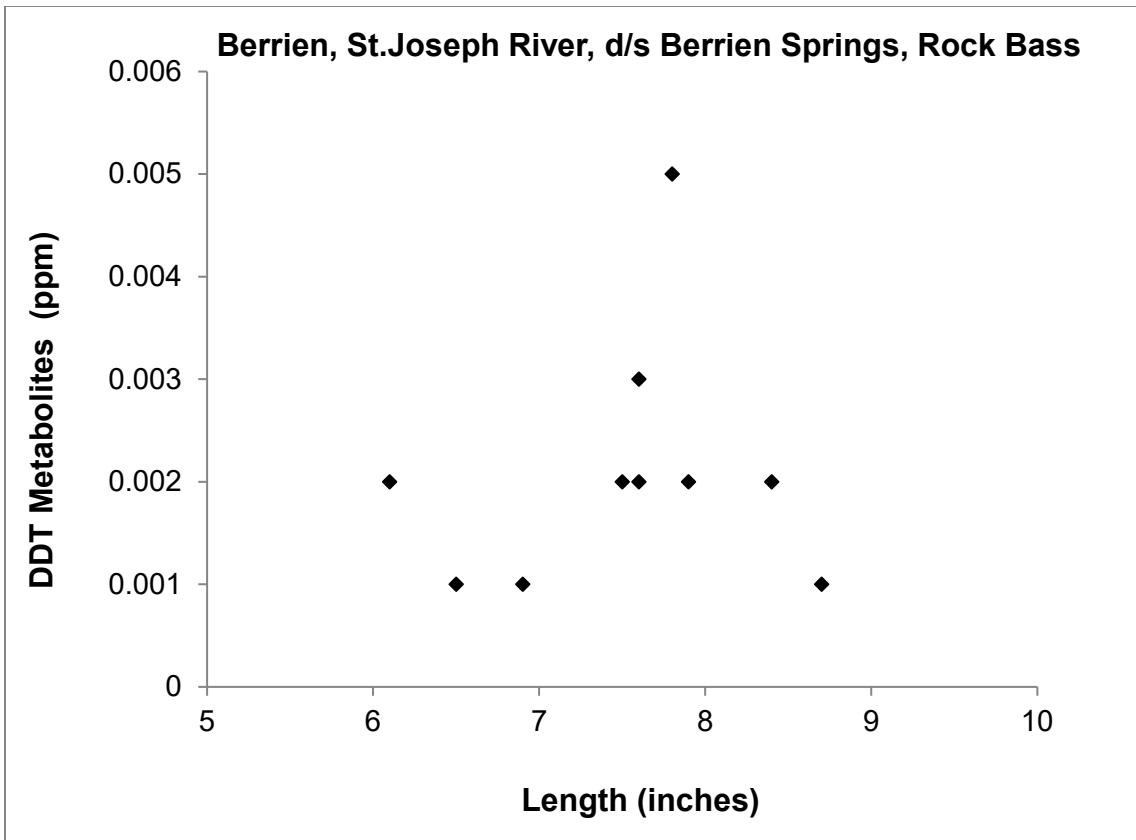
Organics Analysis:

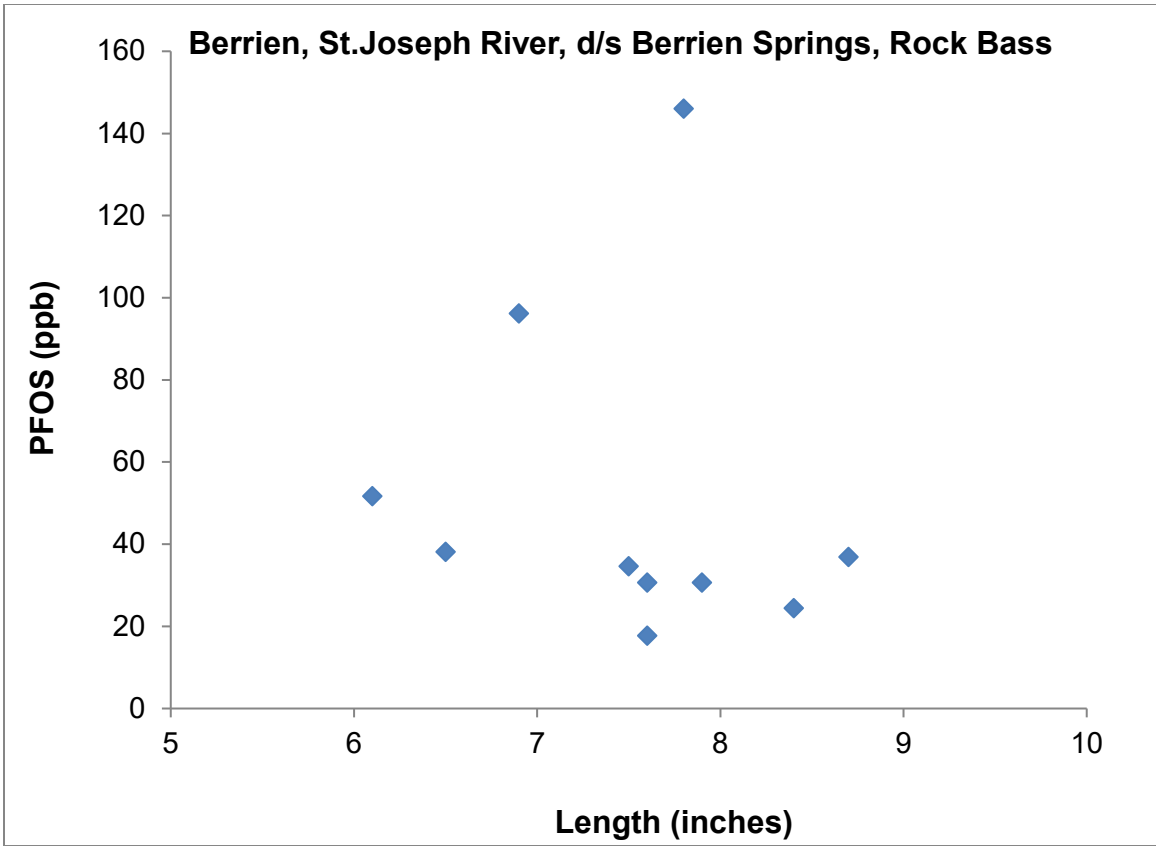
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2013	2013	10	6.1	na	6.1	8.7
Datasets available: 2013						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	10	0.02	0.0022	0.0419	0.027	8
DDT	10	0.002	0.001	0.005	0.003	16
Chlordane	10	0.001	0.0005	0.003	0.002	--
Toxaphene	10	ND	--	--	--	--
PFOS	10	51 ppb	18 ppb	146 ppb	80 ppb	1
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.012	0.021				
DDT	0.026	0.025				
Chlordane	0.241	0.241				
Toxaphene	--	--				
PFOS	0.020	0.069				
Final meal category based on UCL:						1

Existing Advisory: No one should eat more than 1 meal per month of rock bass from the St. Joseph River downstream of the Berrien Springs Dam due to PFOS.

Recommendation: No change is recommended. Mercury and PCBs would cause advisories.







Walleye

**St. Joseph River
Downstream Berrien Springs Dam**

Berrien County

Hg Analysis:

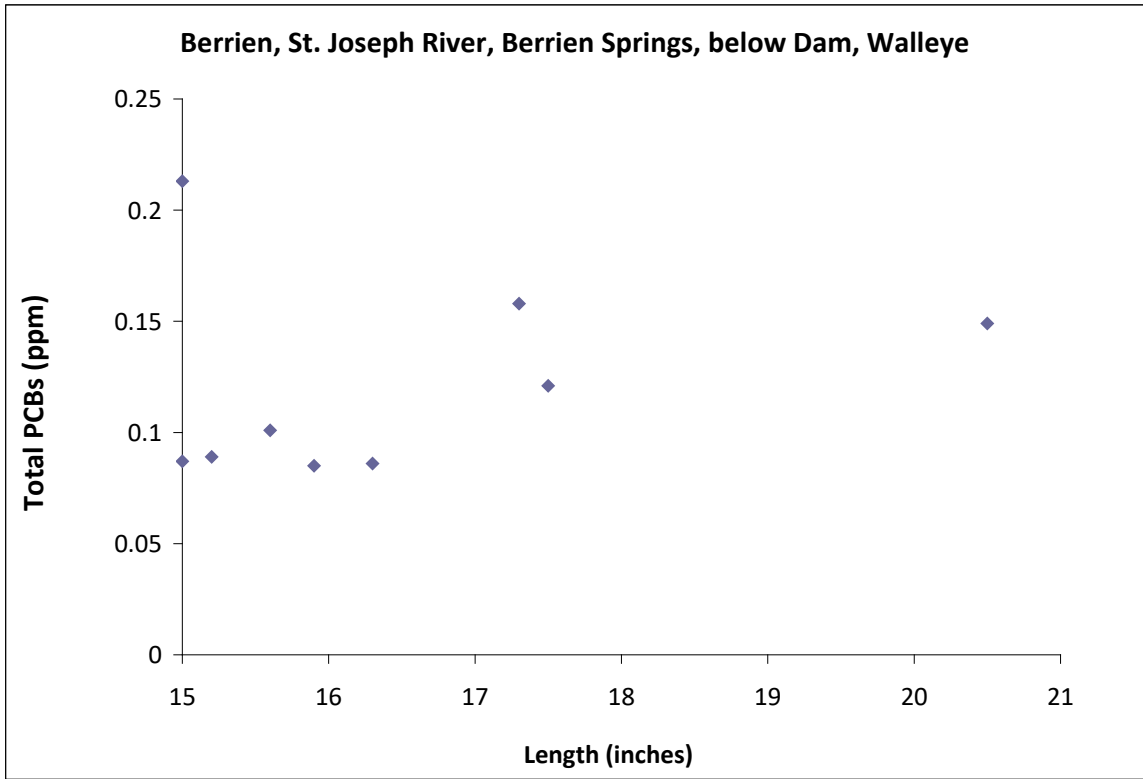
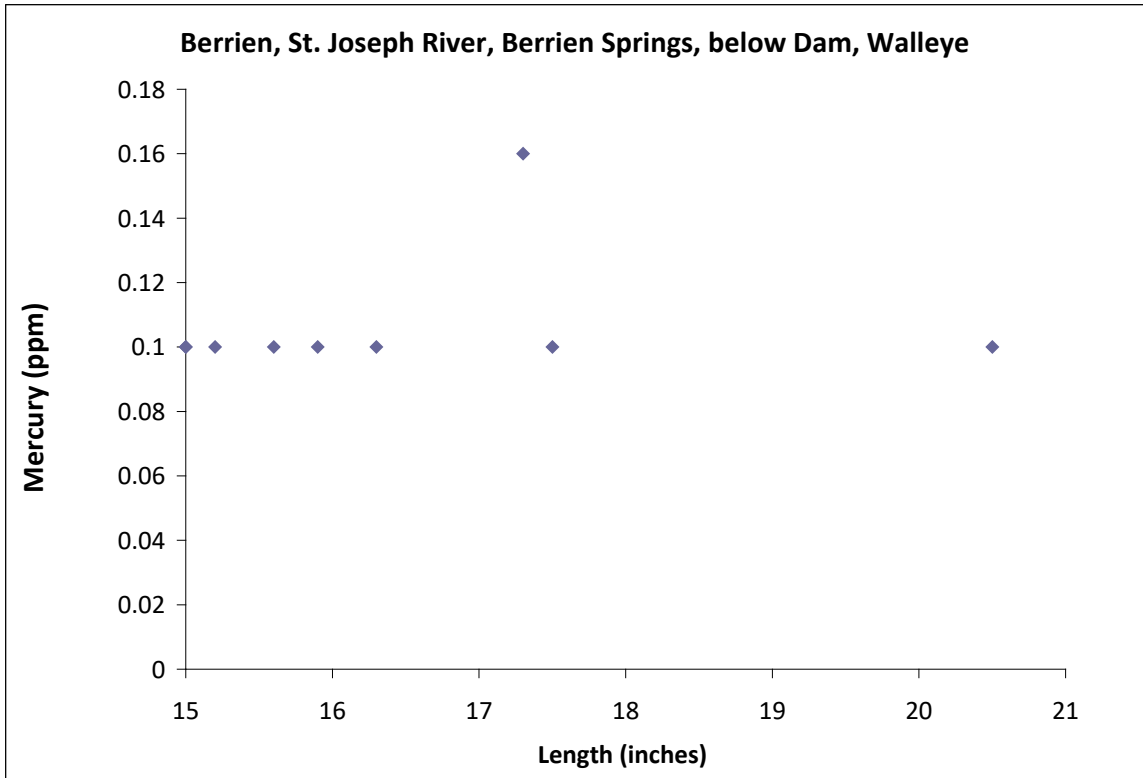
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1987	1987	9	15	15	15	20.5
Datasets available: 1987						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	9	0.11	0.10	0.16	0.12	8
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.436	0.433				

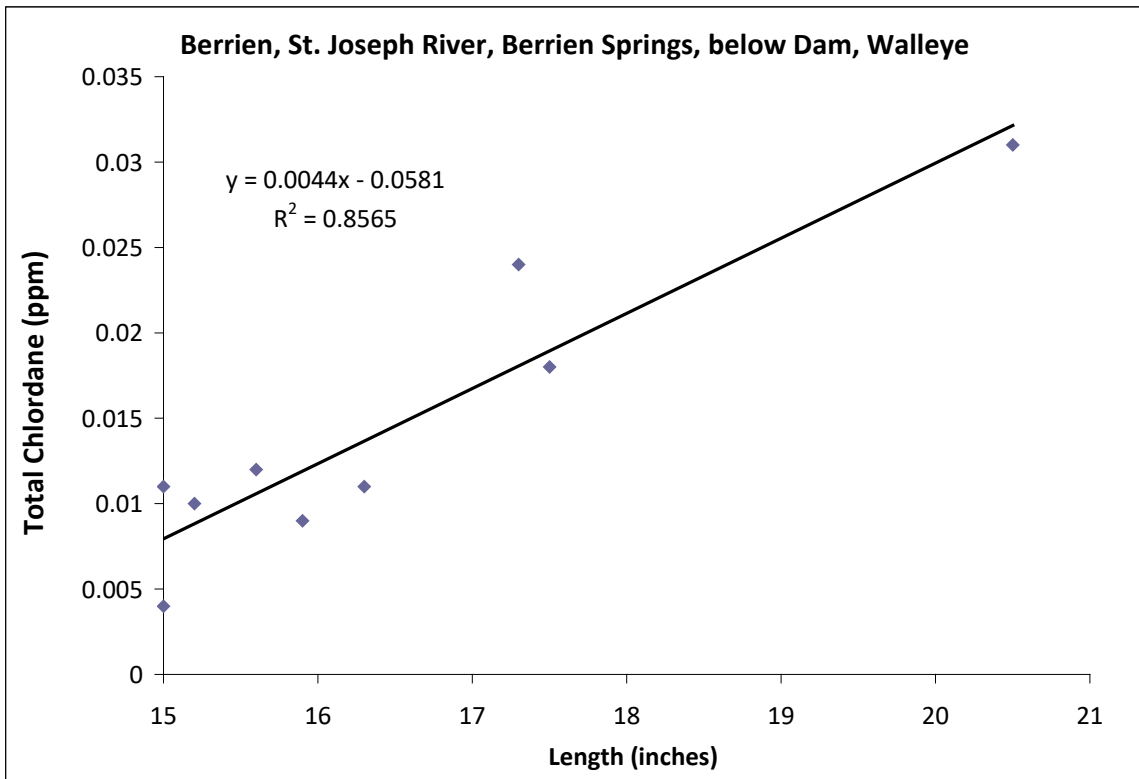
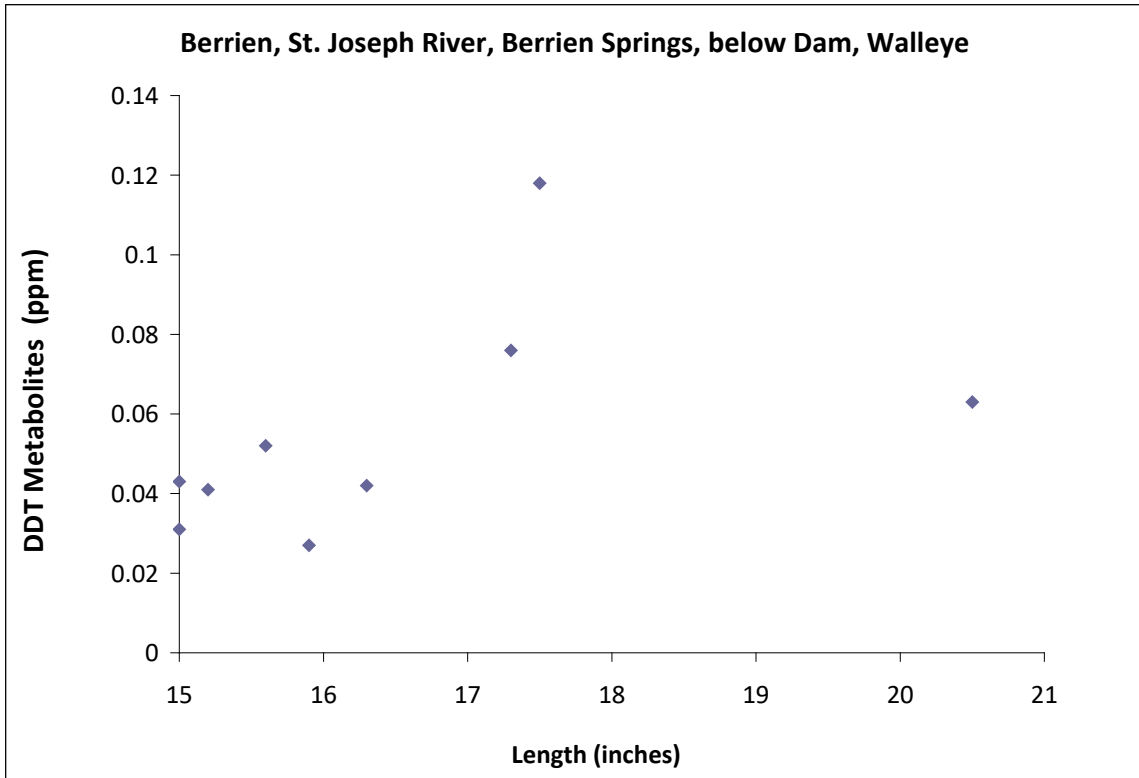
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1987	1987	9	15	15	15	20.5
Datasets available: 1987						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	9	0.12	0.08	0.21	0.16	1
DDT	9	0.06	0.03	0.12	0.08	16
Chlordane	9	0.01	0.004	0.03	0.02	--
Toxaphene	9	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.052	0.105				
DDT	0.267	0.326				
Chlordane	0.857	0.675				
Toxaphene	--	--				
Final meal category based on UCL:						1*

Existing Advisory: St. Joseph River (Berrien Springs) walleye are covered under the statewide mercury consumption advisory.

Recommendation: No one should eat more than 2 meals per month of walleye from the St. Joseph River at Berrien Springs due to PCBs. Mercury would cause an advisory. The quality of this dataset is limited due to the age of the data. *Based on the EGLE Fish Contaminant Monitoring Program, PCB concentrations ≥15 years old are expected to have declined to a concentration that allows a less restrictive meal category than determined by the standard evaluation method.





Thornapple River Barry, Eaton, and Kent Counties

Largemouth Bass

Thornapple River and

**Barry & Eaton
Counties**

Thornapple Lake

Hg Analysis:

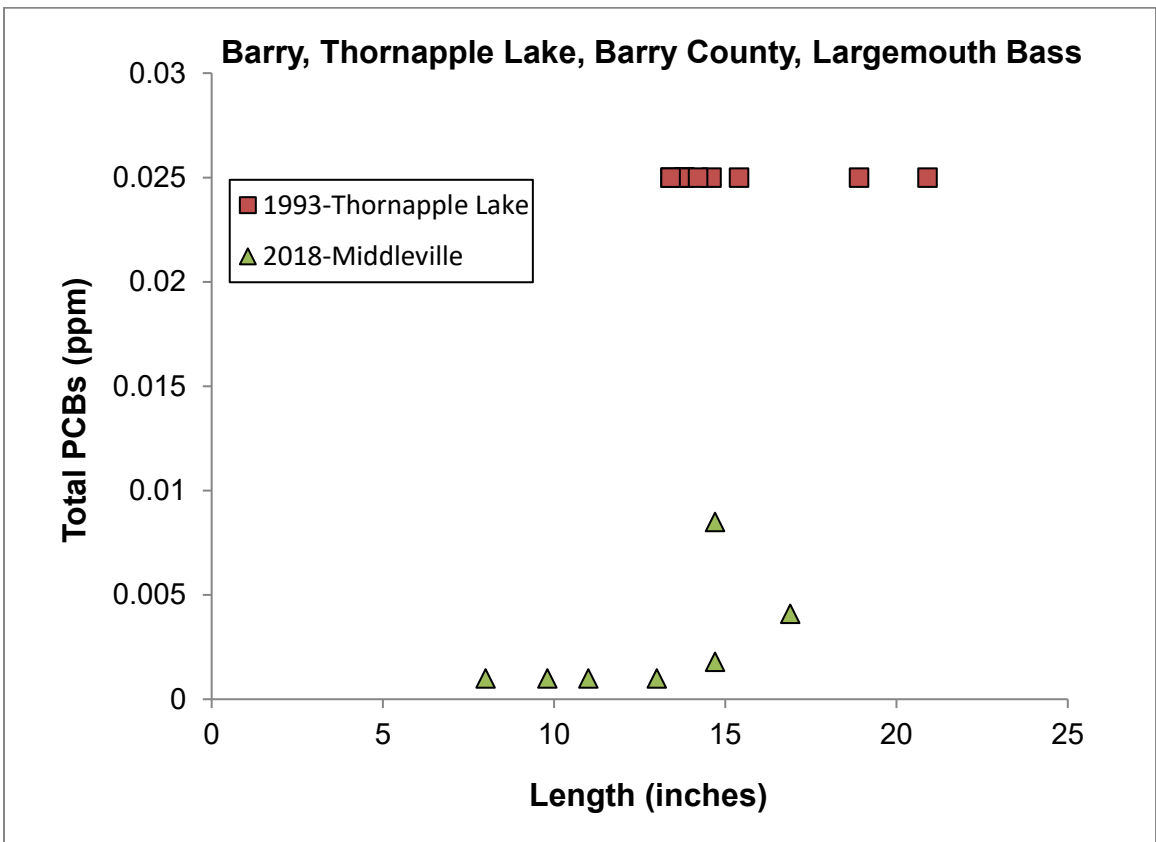
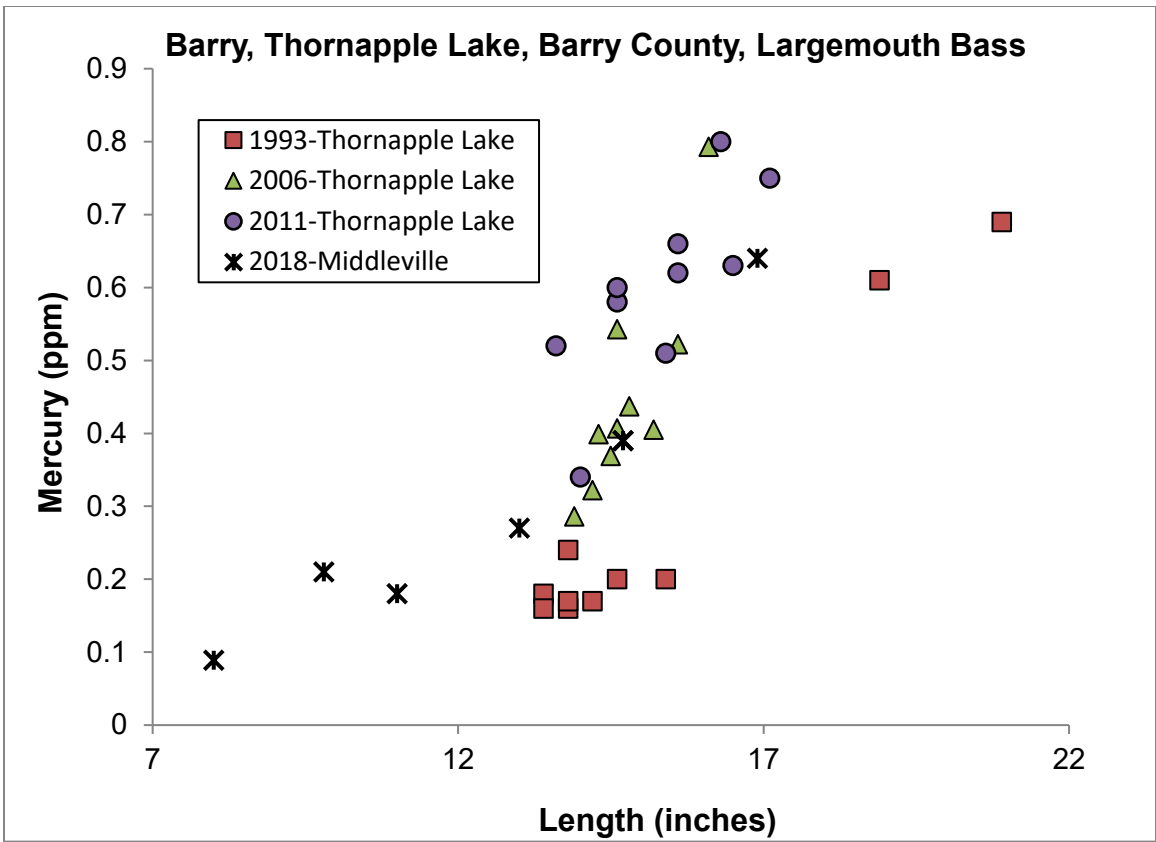
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1993	2018	37	8	14	13.6	20.9
Datasets available: 1993, 2006, 2011, 2018						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	31	0.46	0.16	0.80	0.53	1
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.509	0.540				

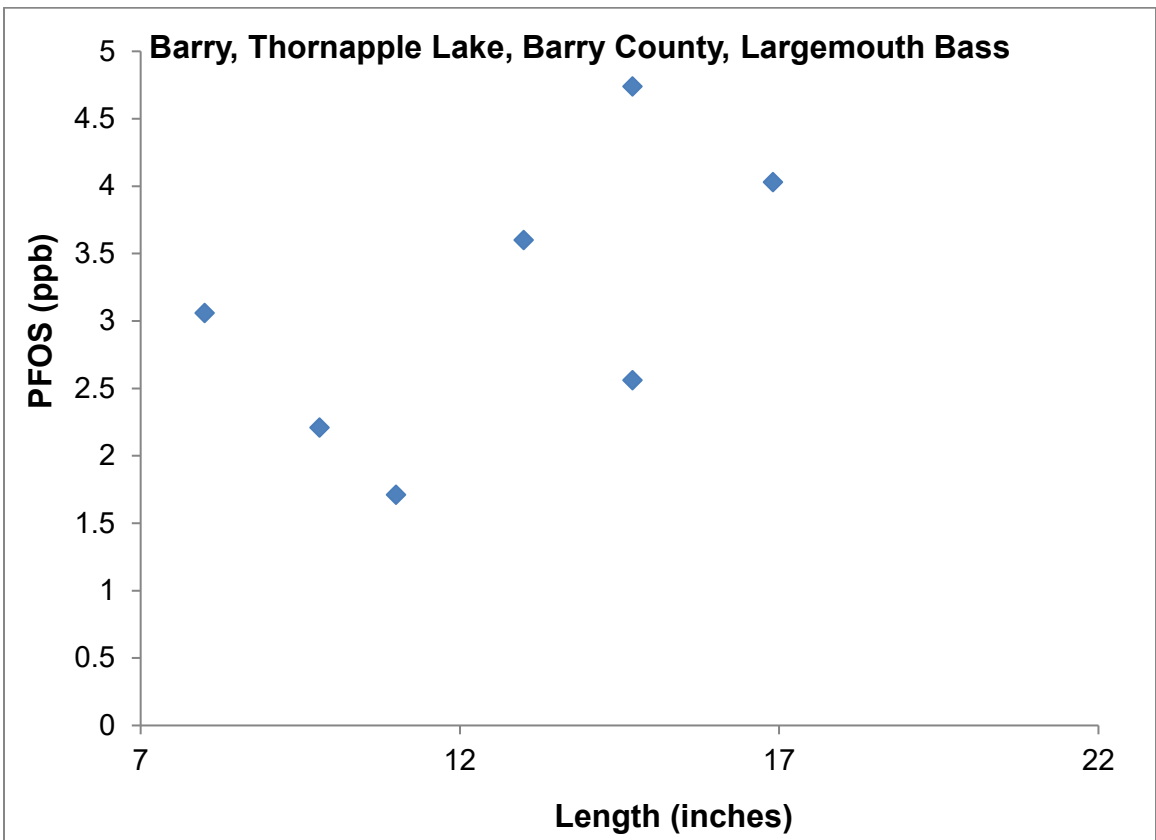
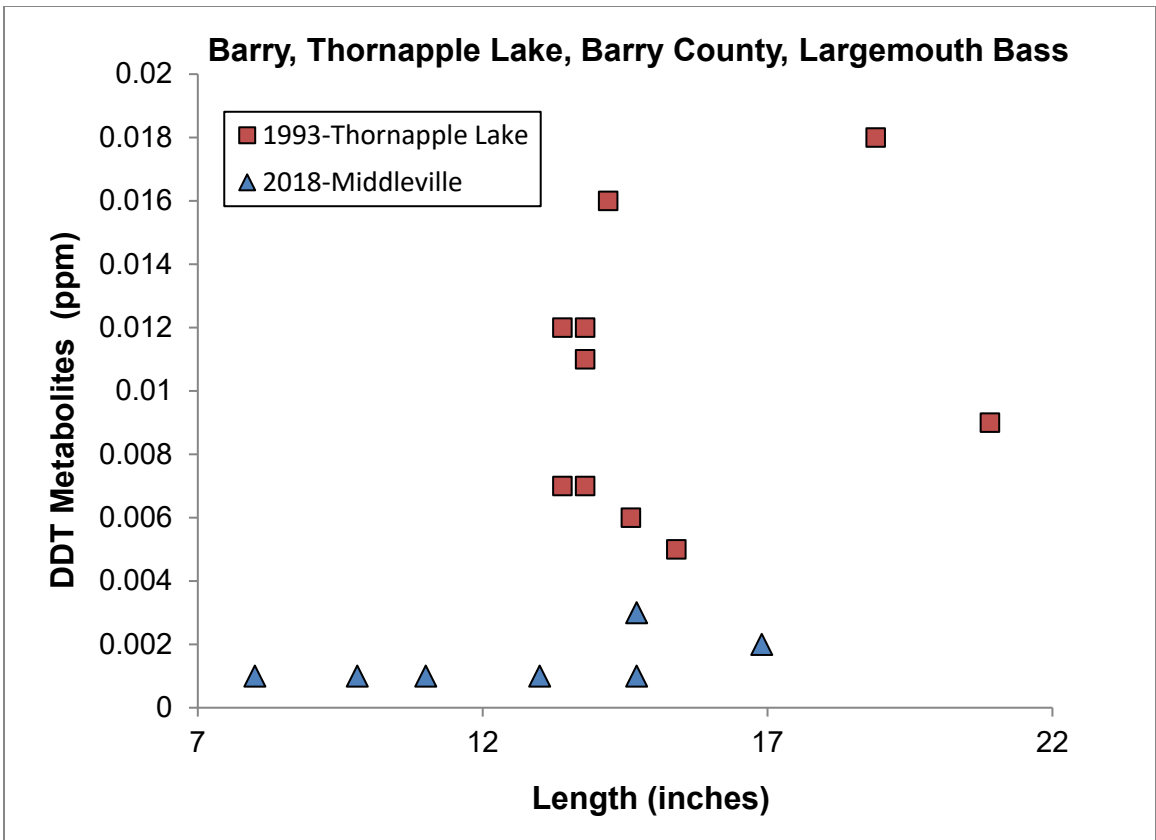
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2018	2018	37	8	14	14.7	20.9
Datasets available: 1993, 2018						
Chemical	Sample Size (ALL)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	7	0.003	< 0.001	0.01	0.005	16
DDT	7	0.001	< 0.001	0.003	0.002	16
Chlordane	7	ND	< 0.001	< 0.001	--	--
Toxaphene	7	ND	< 0.05	< 0.05	--	--
PFOS	7	3 ppb	2 ppb	5 ppb	4 ppb	16
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.338	0.533				
DDT	0.216	0.289				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.324	0.293				
Final meal category based on UCL:						1

Existing MDHHS Advisory: No one should eat more than 1 meal per month of largemouth or smallmouth bass less than 18 inches from Thornapple Lake or the Thornapple River upstream of the Middleville Dam, or more than 6 meals per year of those fish larger than 18 inches due to mercury.

Recommendation: No change is recommended. The length break in the previous advice is based on a significant regression for mercury using the pre-2018 results.





Bluegill/Pumpkinseed

**Thornapple River
u/s Middleville Dam**

**Barry & Eaton
Counties**

Hg Analysis:

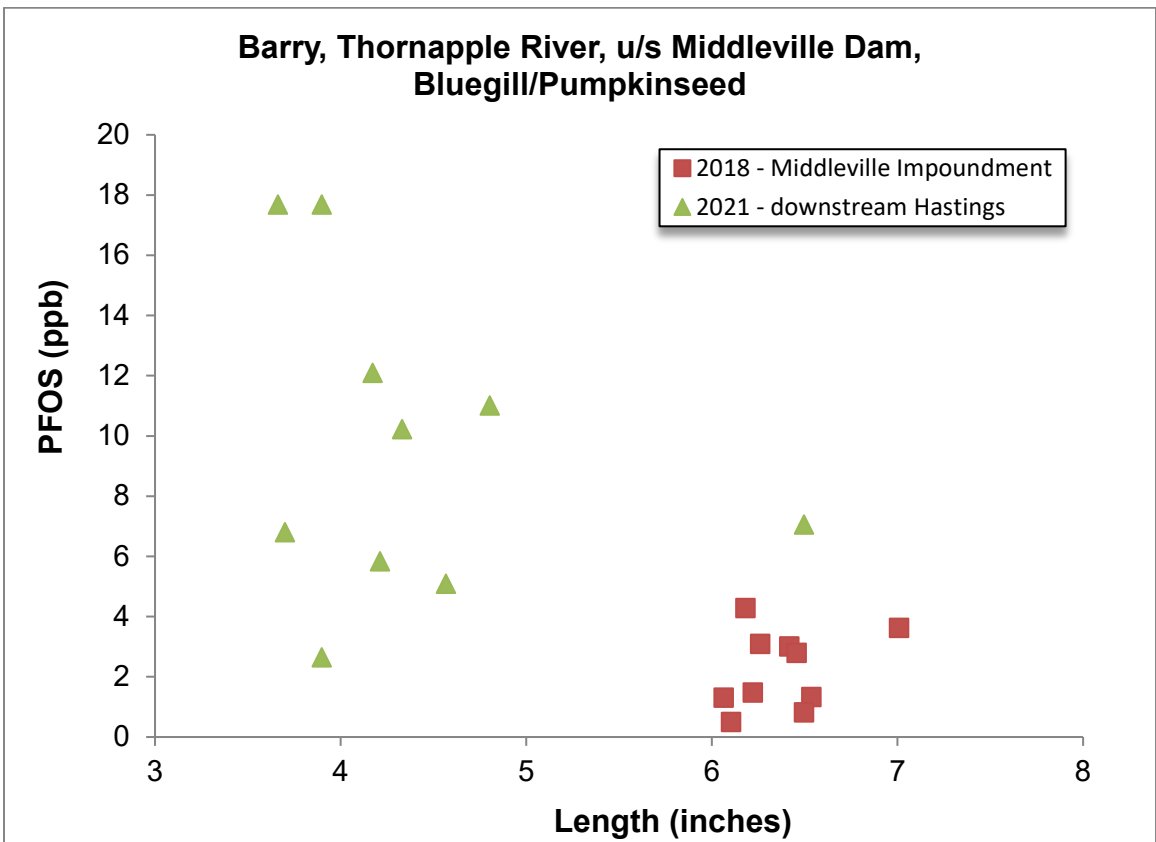
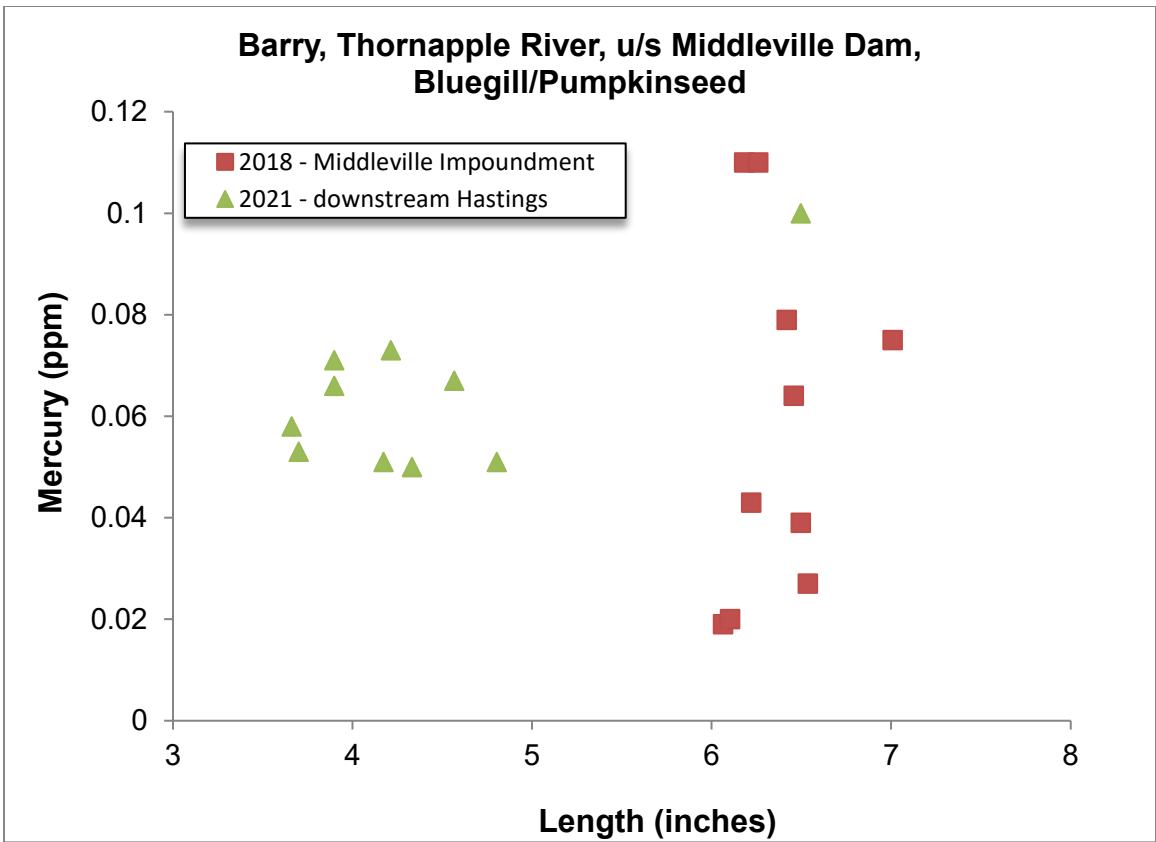
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2018	2021	20	3.7	NA	3.7	7.0
Datasets available: 2018, 2021						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	20	0.061	0.019	0.110	0.074	12
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.005	0.007				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2018	2021	20	3.7	NA	3.7	7.0
Datasets available: 2018, 2021						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
PFOS	20	5.9 ppb	0.5 ppb	17.7 ppb	8.4 ppb	16
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.487	0.444				
Final meal category based on UCL:						12

Existing MDHHS Advisory: No one should eat more than 8 meals per month of bluegill or sunfish of any size from the Thornapple River upstream of the Middleville Dam or Thornapple Lake due to mercury.

Recommendation: No change to the advisory is warranted. Additional fish should be collected from further upstream in Thornapple Lake before the advisory can be relaxed.



Largemouth/Smallmouth Bass

Thornapple River u/s Middleville Dam

Barry & Eaton Counties

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1993	2021	44	8.0	14.0	13.6	20.9
Datasets available: 1993, 2006, 2011, 2018, 2021						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	34	0.447	0.160	0.800	0.514	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.375	0.443				

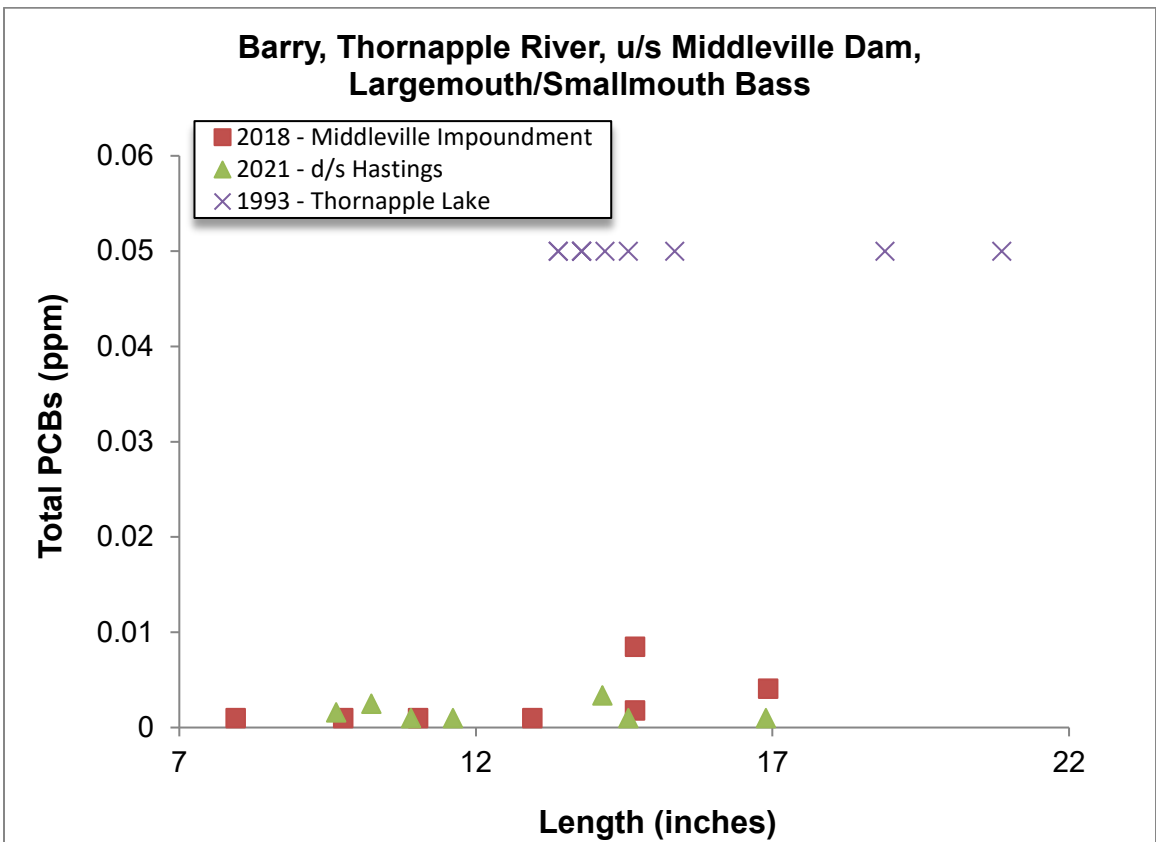
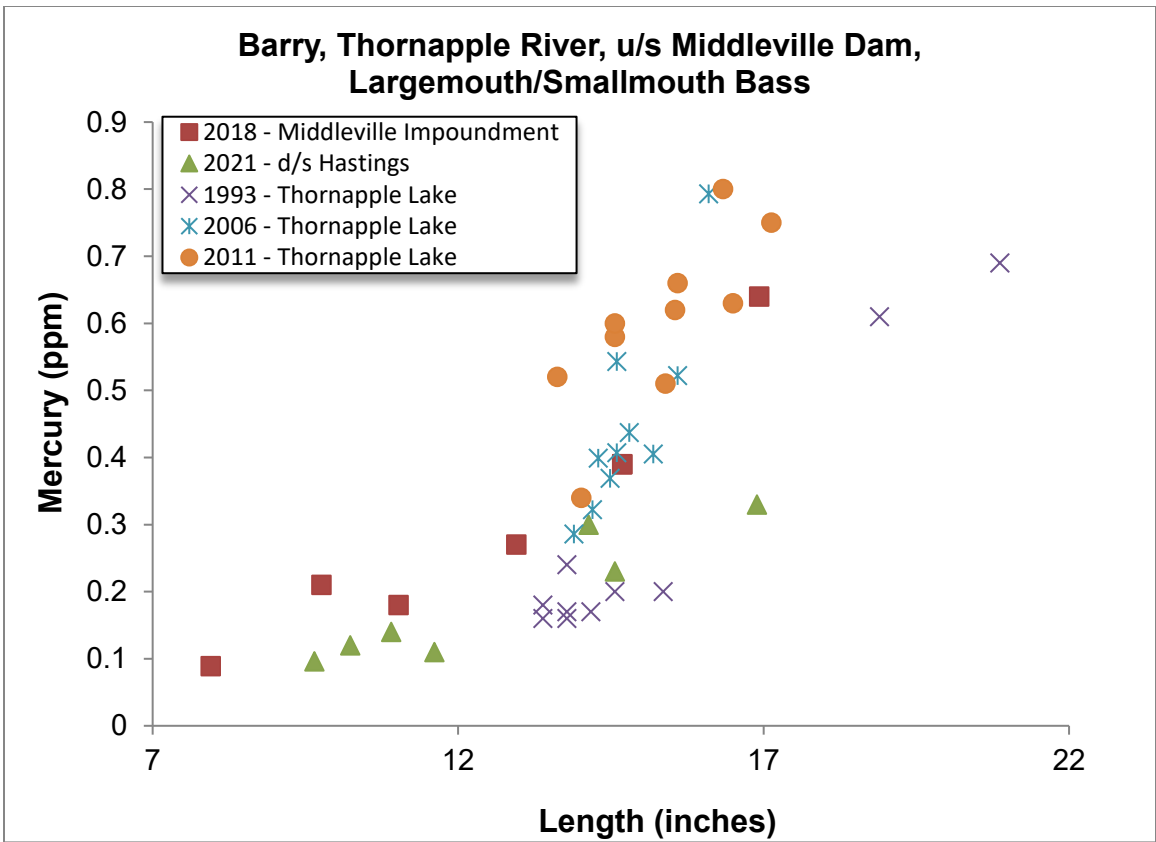
Organics Analysis:

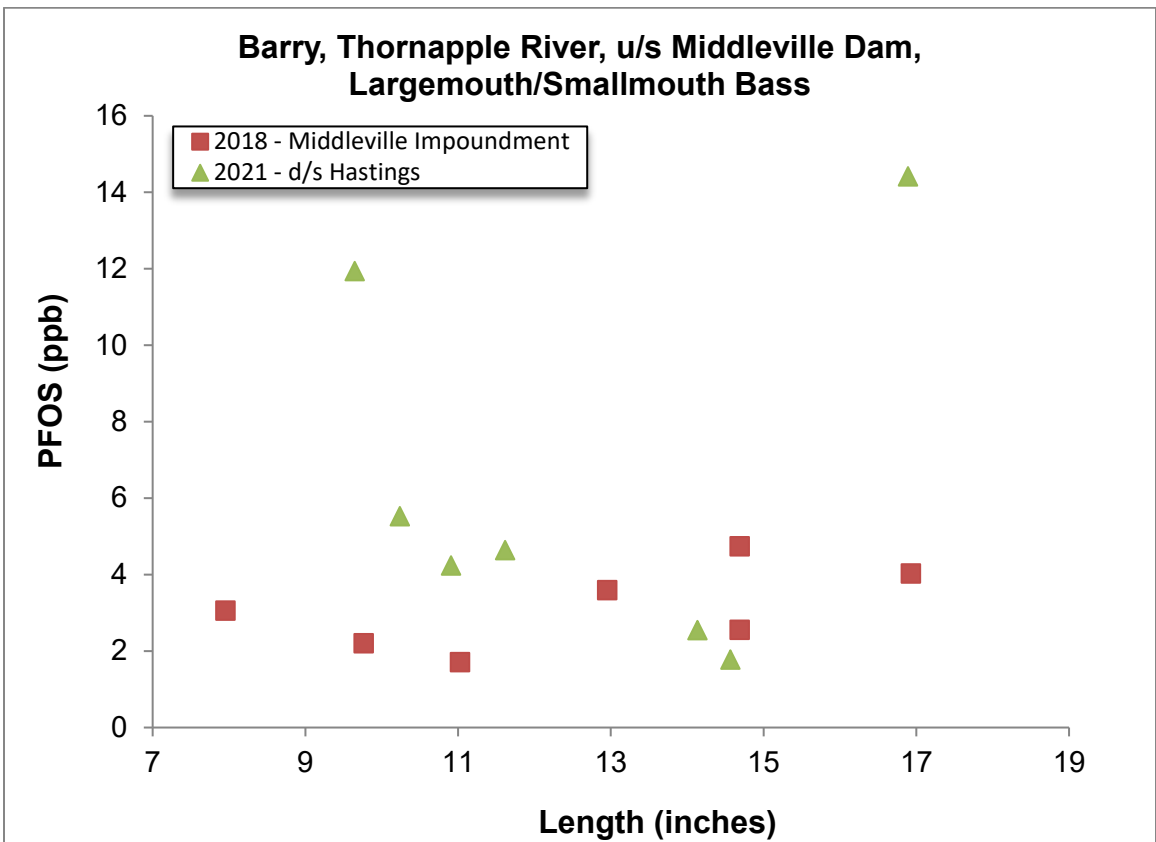
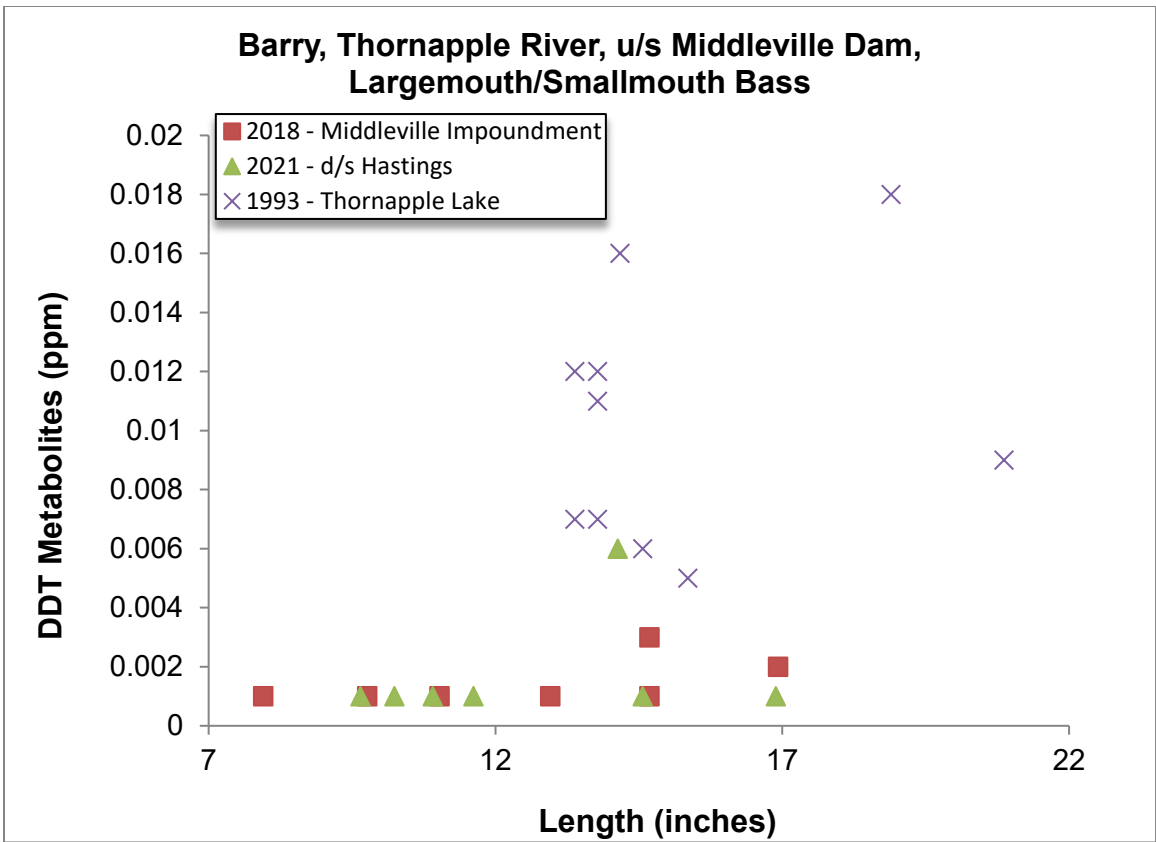
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2018	2021	14	8.0	14.0	14.1	16.9
Datasets available: 1993 (No PFOS), 2018, 2021						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	6	0.003	<0.001	0.009	0.006	16
DDT	6	0.002	<0.001	0.006	0.004	16
Chlordane	6	0.001	<0.001	0.001	0.001	16
Toxaphene	6	ND	--	--	--	--
PFOS	14*	4.8 ppb	1.7 ppb	14.4 ppb	7.0 ppb	16
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.150	0.167				
DDT	0.103	0.163				
Chlordane	0.000	0.000				
Toxaphene	--	--				
PFOS	0.025	0.013				
Final meal category based on UCL:						2

* Sub-legal sized fish were used in the analysis as no correlation has been observed between fish size and PFOS concentration in the statewide dataset.

Existing MDHHS Advisory: No one should eat more than 1 meal per month of largemouth or smallmouth bass less than 18 inches from Thornapple Lake or the Thornapple River upstream of the Middleville Dam, or more than 6 meals per year of those fish larger than 18 inches due to mercury.

Recommendation: No change to the advisory is recommended. Additional fish should be collected from the Irving and Thornapple Lake impoundments to determine if mercury concentrations have decreased in this stretch of the river.





Rock Bass

**Thornapple River
u/s Middleville Dam**

**Barry & Eaton
Counties**

Hg Analysis:

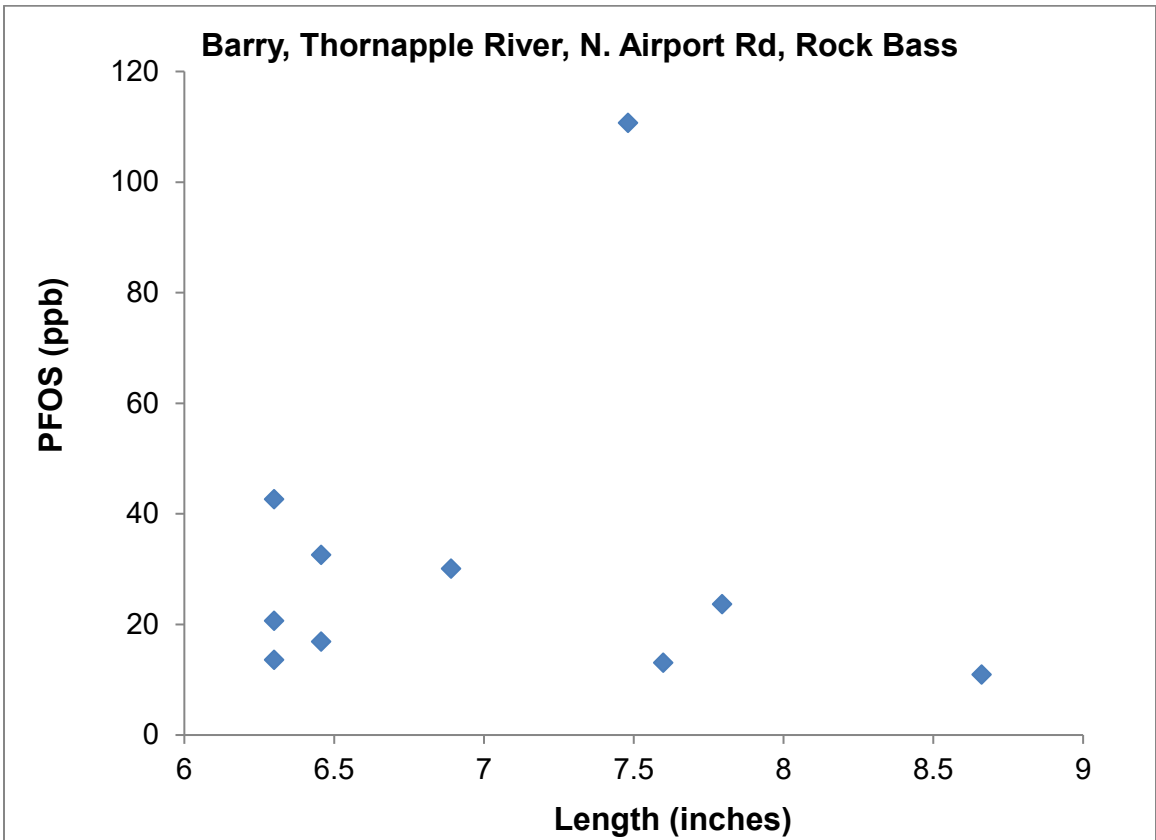
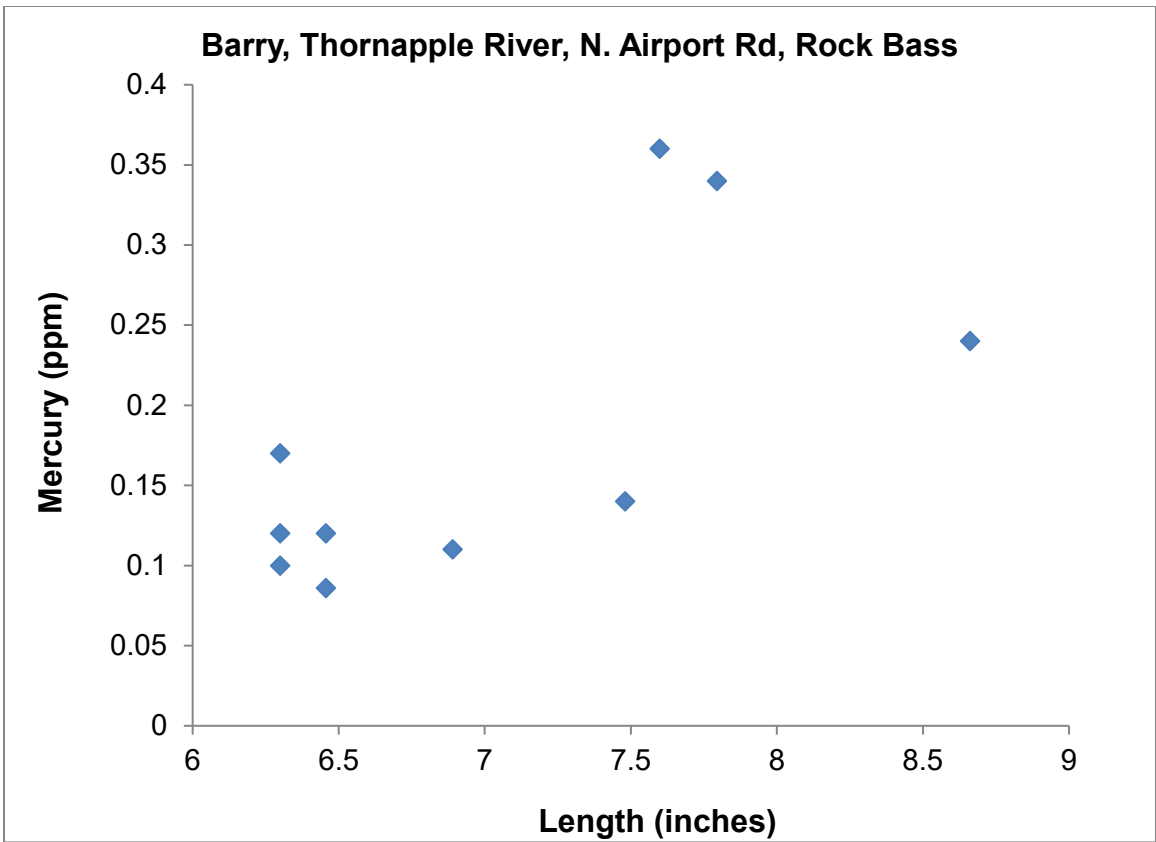
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2021	2021	10	6.3	NA	6.3	8.7
Datasets available: 2021						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.179	0.086	0.360	0.250	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.479	0.527				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2021	2021	10	6.3	NA	6.3	8.7
Datasets available: 2021						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
PFOS	10	31.5 ppb	11.0 ppb	110.7 ppb	52.7 ppb	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.001	0.028				
Final meal category based on UCL:						2

Existing MDHHS Advisory: Rock bass from the Thornapple River upstream of the Middleville Dam, including the Middleville Impoundment and Thornapple Lake, are currently covered under the statewide mercury guidance. No one should eat more than 4 meals per month of rock bass of any size.

Recommendation: No one should eat more than 2 meals per month of rock bass of any size from the Thornapple River upstream of the Middleville Dam, including the Middleville Impoundment and Thornapple Lake, due to PFOS. Mercury causes less restrictive advice.



**Suckers
Redhorse and White
Hg Analysis:**

**Thornapple River
u/s Middleville Dam**

**Barry & Eaton
Counties**

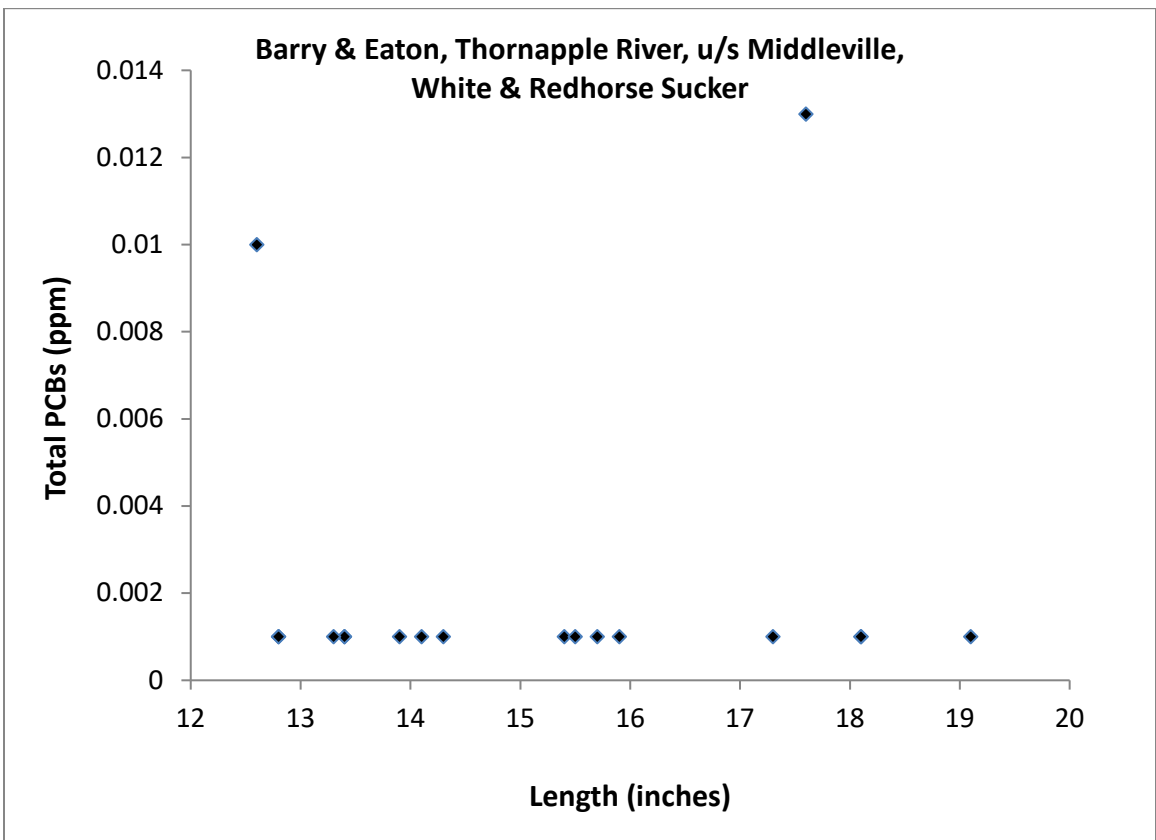
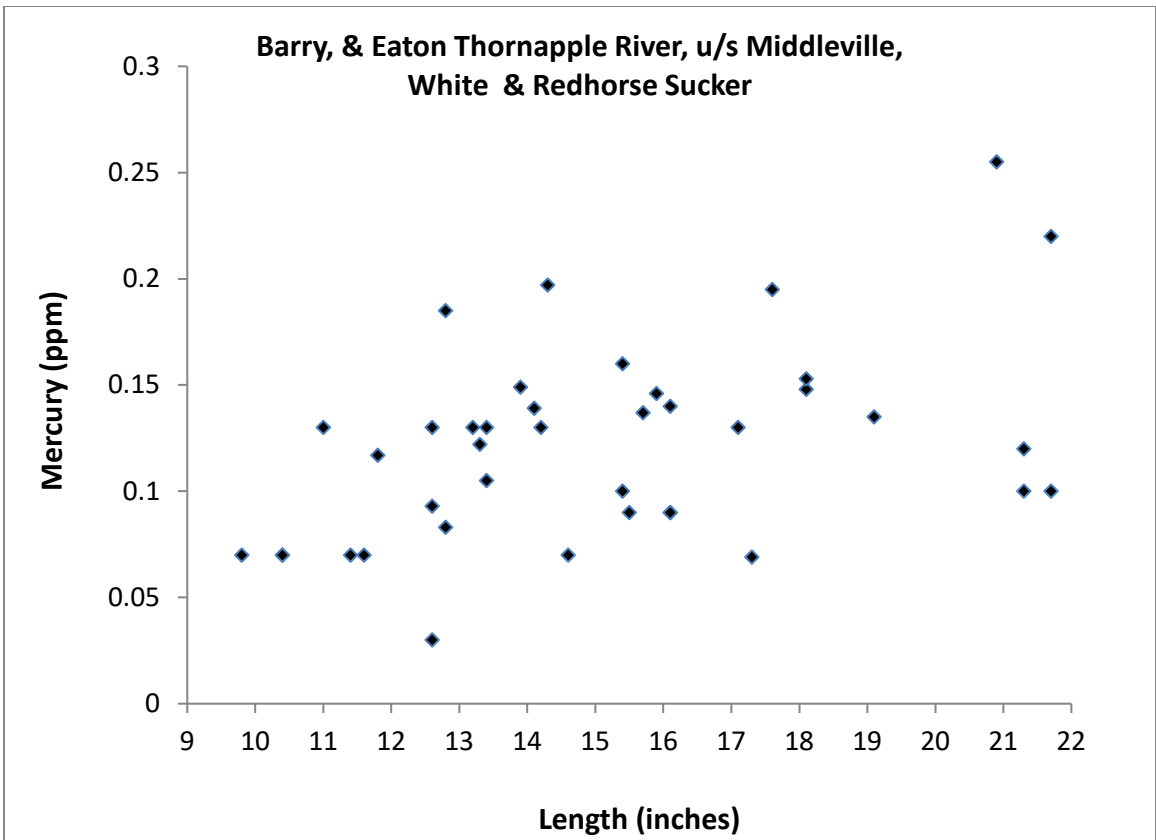
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1993	2006	40	9.8	na	9.8	21.7
Datasets available: 1993, 1998, 2006						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	40	0.12	0.03	0.26	0.14	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.203	0.186				

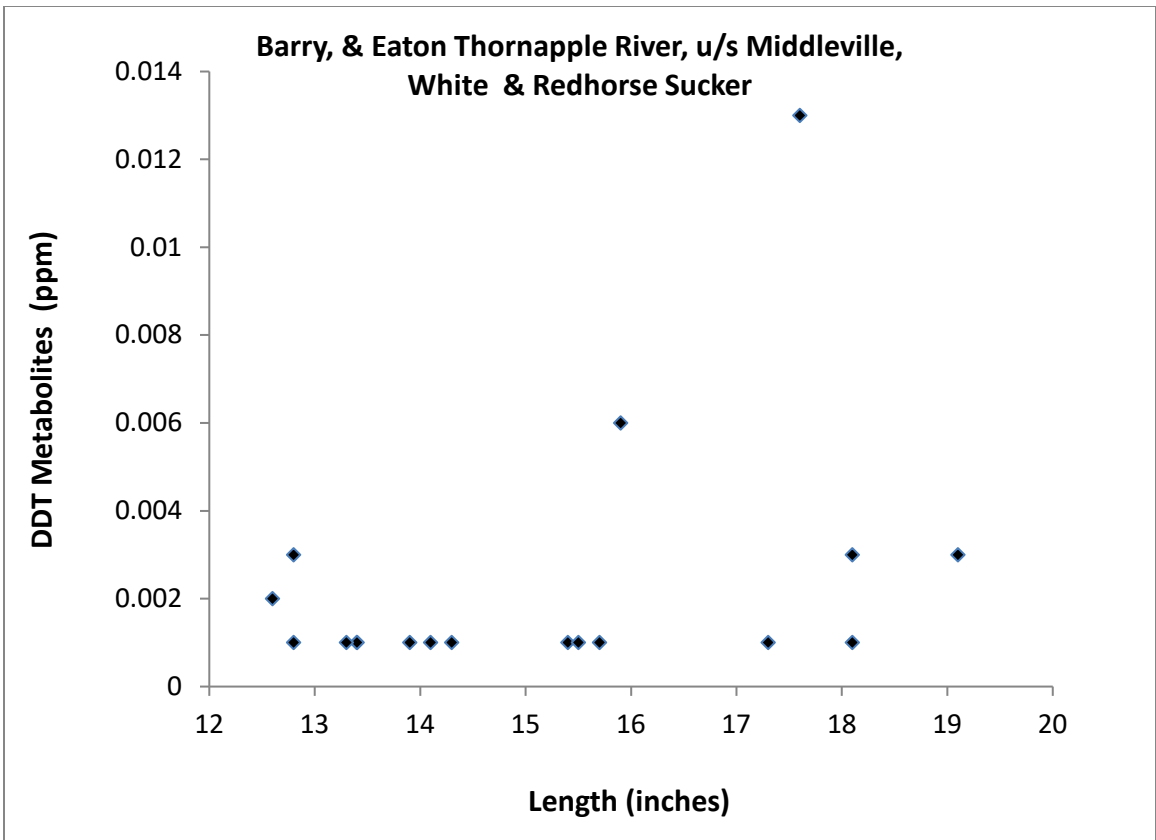
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2006	2006	20	11.8	na	11.8	20.9
Datasets available: 1993, 1998, 2006						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	20	0.002	0.001	0.01	0.004	16
DDT	20	0.003	0.001	0.01	0.004	16
Chlordane	20	ND	--	--	--	--
Toxaphene	20	ND	--	--	--	--
Chemical	Line10ar Regression	Exponential Regression				
	R ²	R ²				
PCB	0.038	0.062				
DDT	0.260	0.297				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						4

Existing Advisory: Thornapple River sucker are not covered by an advisory.

Recommendation: No one should eat more than 4 meals per month of sucker from the Thornapple River upstream of the Middleville Dam due to mercury.





Bluegill

Thornapple River – Ada and Cascade Impoundments

Kent County

Hg Analysis:

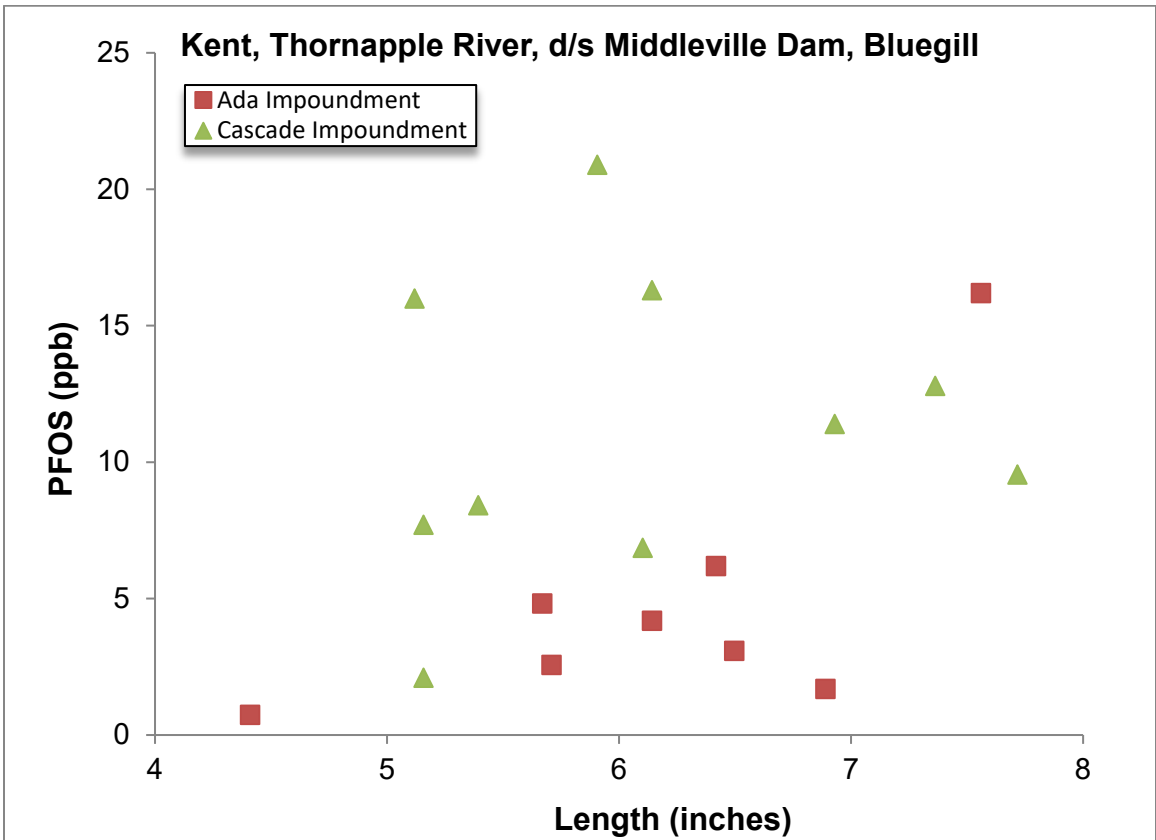
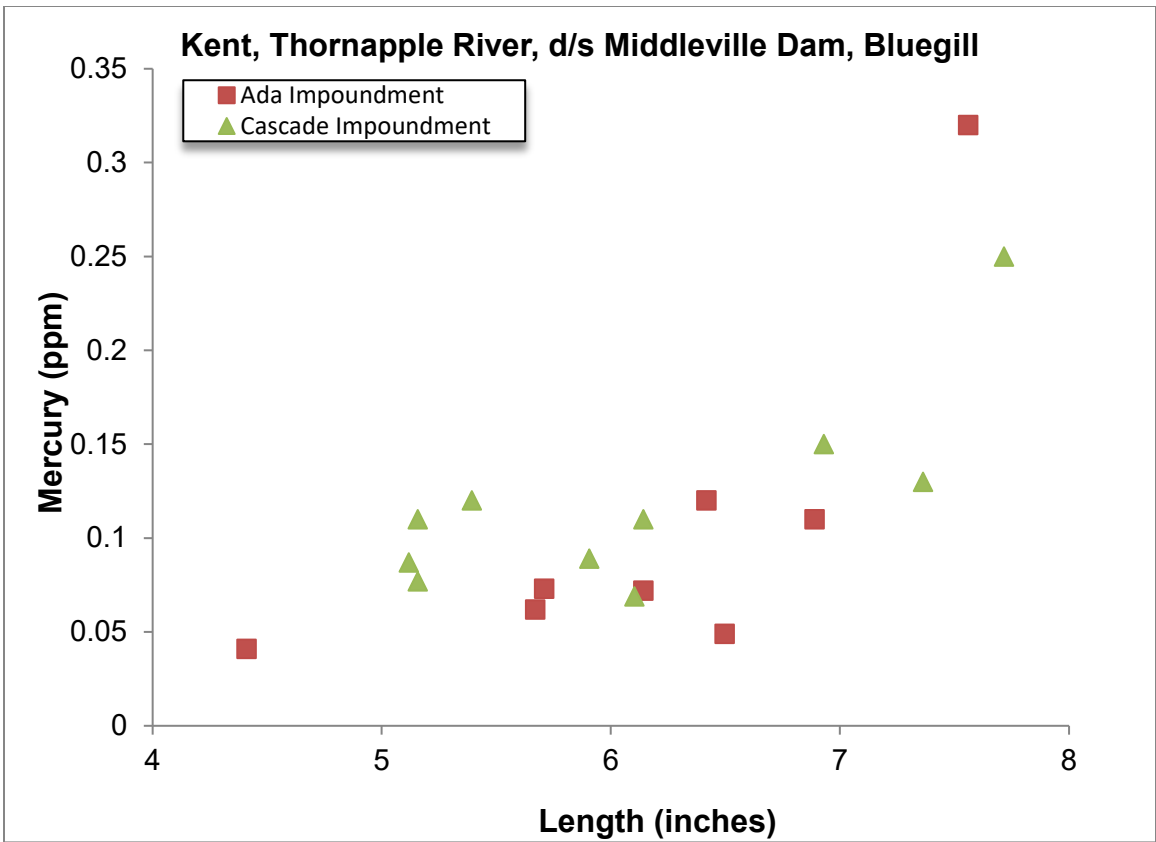
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2019	2019	18	4.4	NA	4.4	7.7
Datasets available: 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	18	0.113	0.041	0.320	0.148	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.496	0.506				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2019	2019	18	4.4	NA	4.4	7.7
Datasets available: 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	0	--	--	--	--
DDT	0	0	--	--	--	--
Chlordane	0	0	--	--	--	--
Toxaphene	0	0	--	--	--	--
PFOS	18	8.4 ppb	0.7 ppb	20.9 ppb	11.4 ppb	12
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.082	0.159				
Final meal category based on UCL:						4

Existing MDHHS Advisory: No one should eat more than 12 meals per month of bluegill or pumpkinseed sunfish from the Thornapple River downstream of Middleville less than 6 inches due to mercury and PFOS, or more than 4 meals per month of those fish larger than 6 inches due to mercury.

Recommendation: No one should eat more than 4 meals per month of bluegill or sunfish of any size from the Thornapple River downstream of the Middleville Dam (includes the LaBarge, Cascade, and Ada Impoundments) due to mercury. PFOS also causes a less-restrictive consumption advisory.



Carp

**Thornapple River – Ada, Cascade,
and LaBarge Impoundments**

Kent County

Hg Analysis:

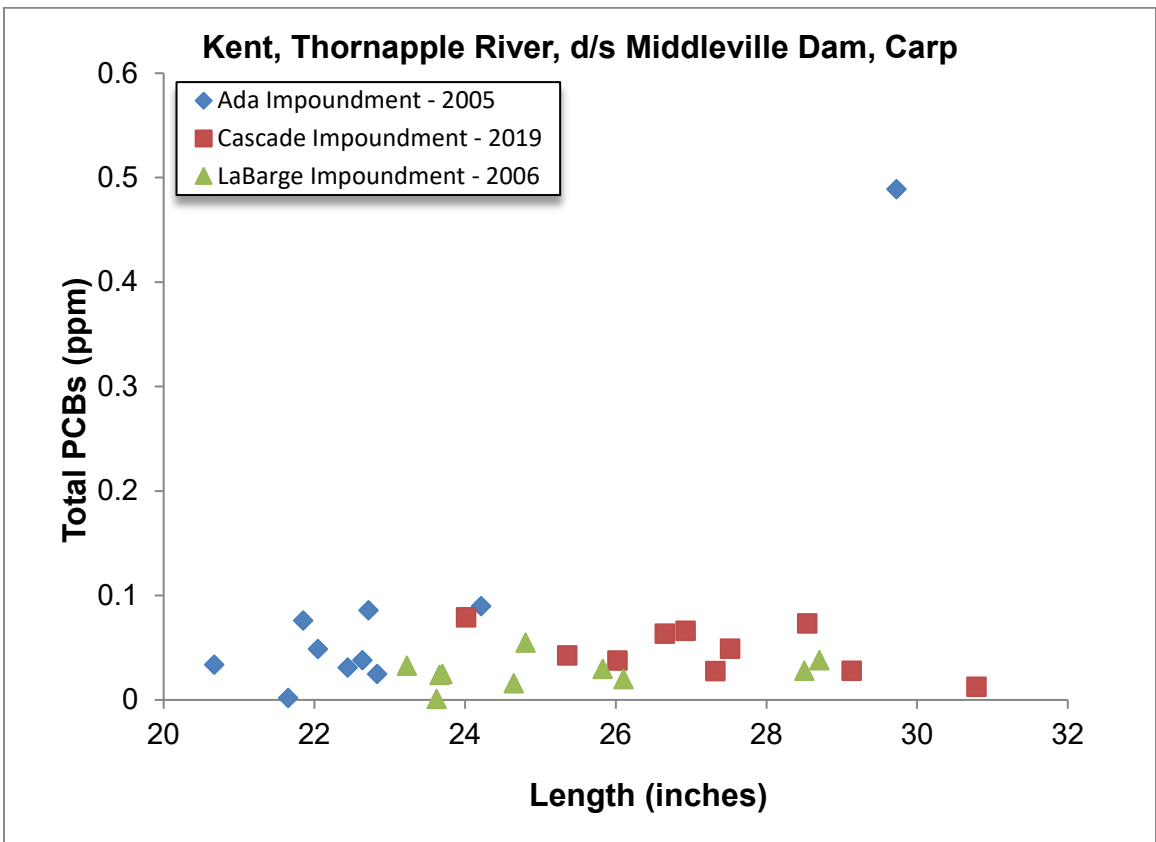
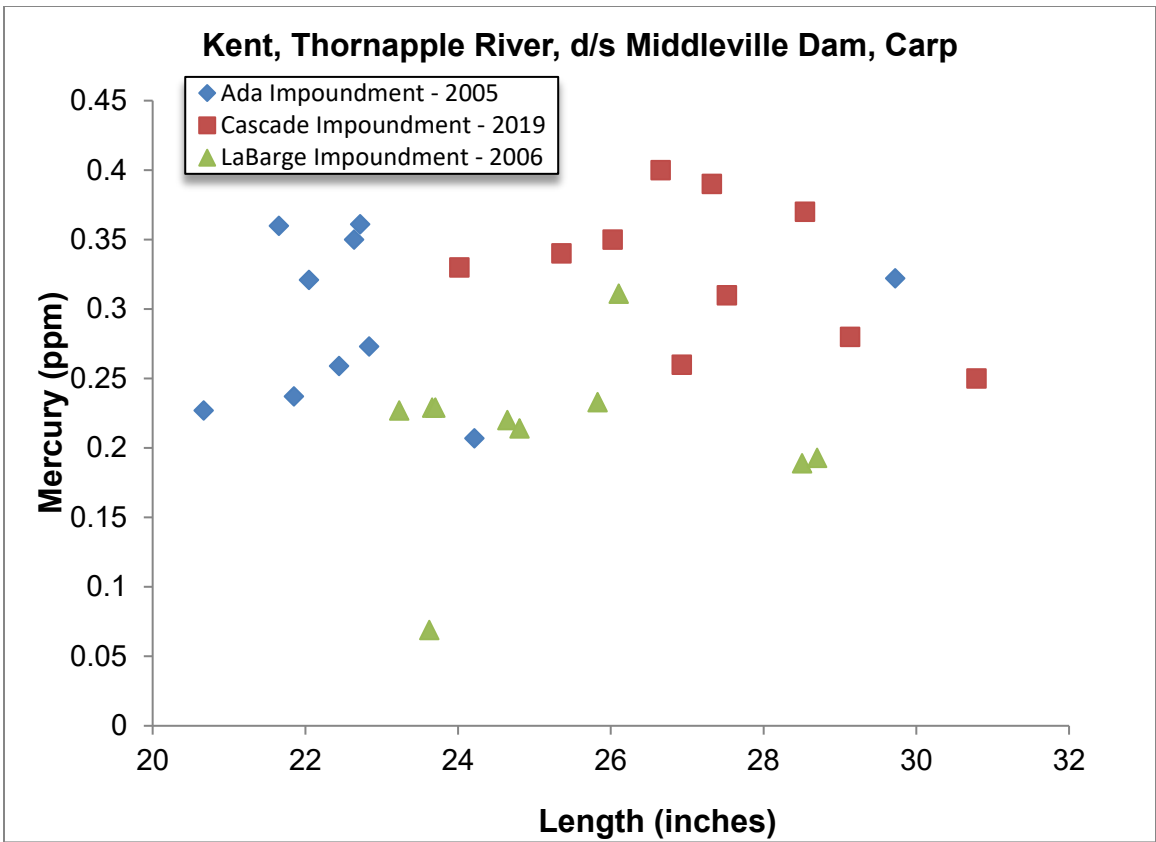
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent				Min	Max	
2005	2019	30	20.7	NA	20.7	30.8	
Datasets available: 2005, 2006, 2019							
Chemical	Sample Size (Legal)	Mean (ppm)		Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	30	0.277		0.069	0.400	0.305	2
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
Mercury	0.009	0.010					

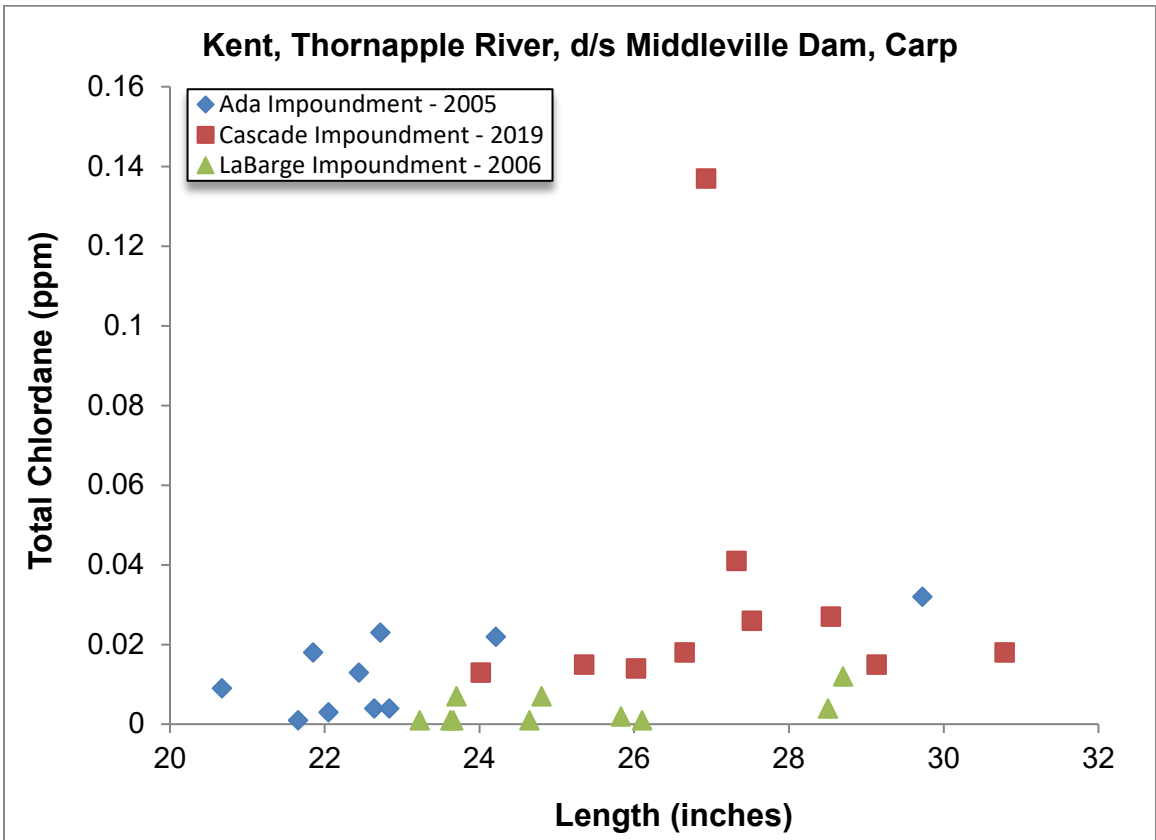
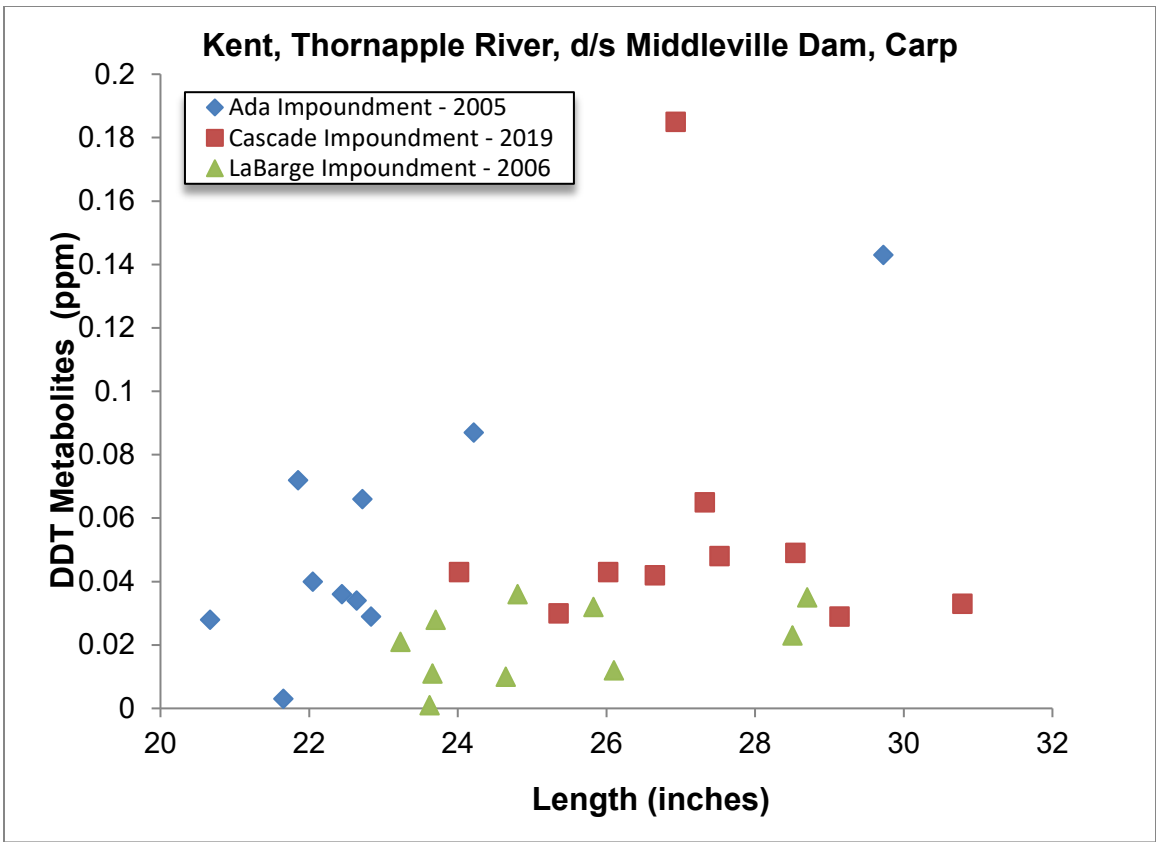
Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples		
Earliest	Most Recent				Min	Max	
2005	2019	30	20.7	NA	20.7	30.8	
Datasets available: 2005, 2006, 2019							
Chemical	Sample Size (Legal)	Mean (ppm)		Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	30	0.056		<0.001	0.489	0.087	2
DDT	30	0.044		<0.001	0.185	0.058	16
Chlordane	30	0.016		<0.001	0.137	0.026	16
Toxaphene	30	ND		--	--	--	--
PFOS	0	--		--	--	--	--
Chemical	Linear Regression	Exponential Regression					
	R ²	R ²					
PCB	0.085	0.052					
DDT	0.076	0.086					
Chlordane	0.092	0.174					
Toxaphene	--	--					
PFOS	--	--					
Final meal category based on UCL:							2

Existing MDHHS Advisory: No one should eat more than 2 meals per month of carp from Thornapple River downstream of the Middleville Dam (includes the LaBarge, Cascade, and Ada Impoundments) due to PCBs and mercury

Recommendation: No change to the advisory is recommended.





**Largemouth and
Smallmouth Bass**

**Thornapple River – Ada and
Cascade Impoundments**

Kent County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2005	2019	31	10.0	14.0	13.6	17.6
Datasets available: 2005, 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	21	0.432	0.262	0.661	0.481	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.200	0.243				

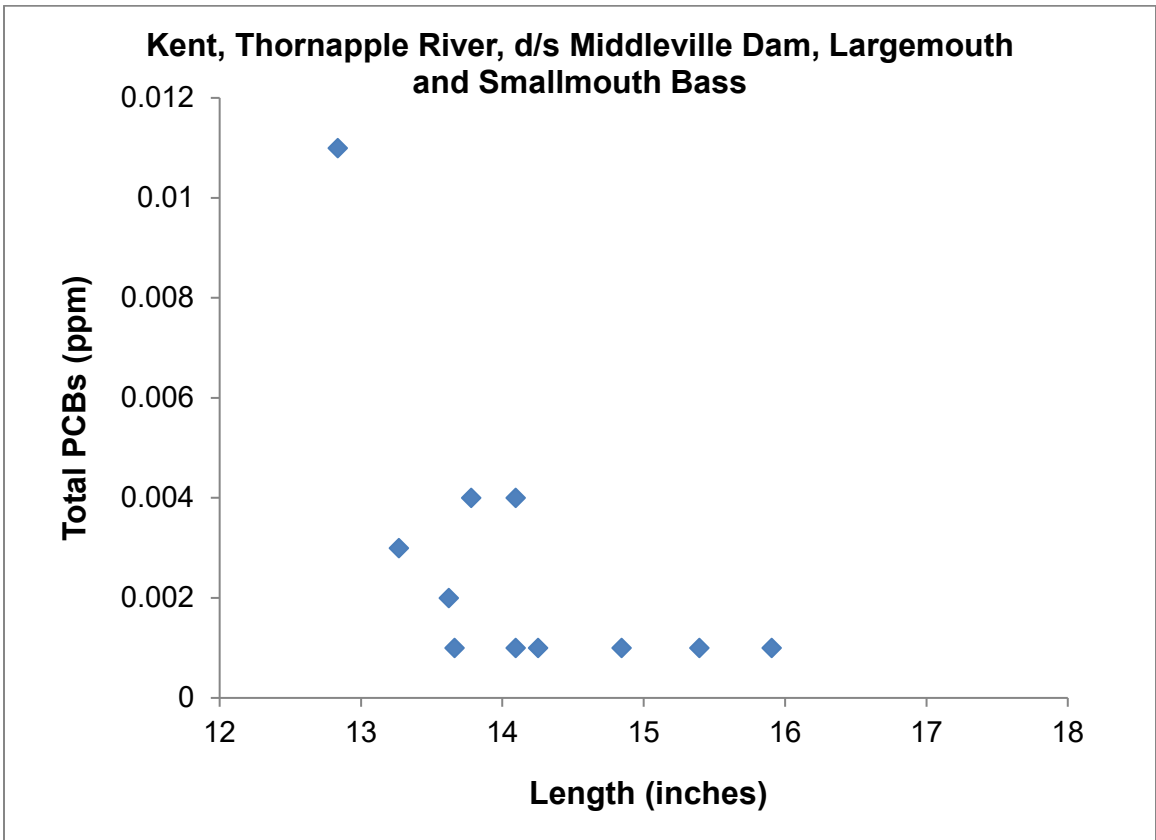
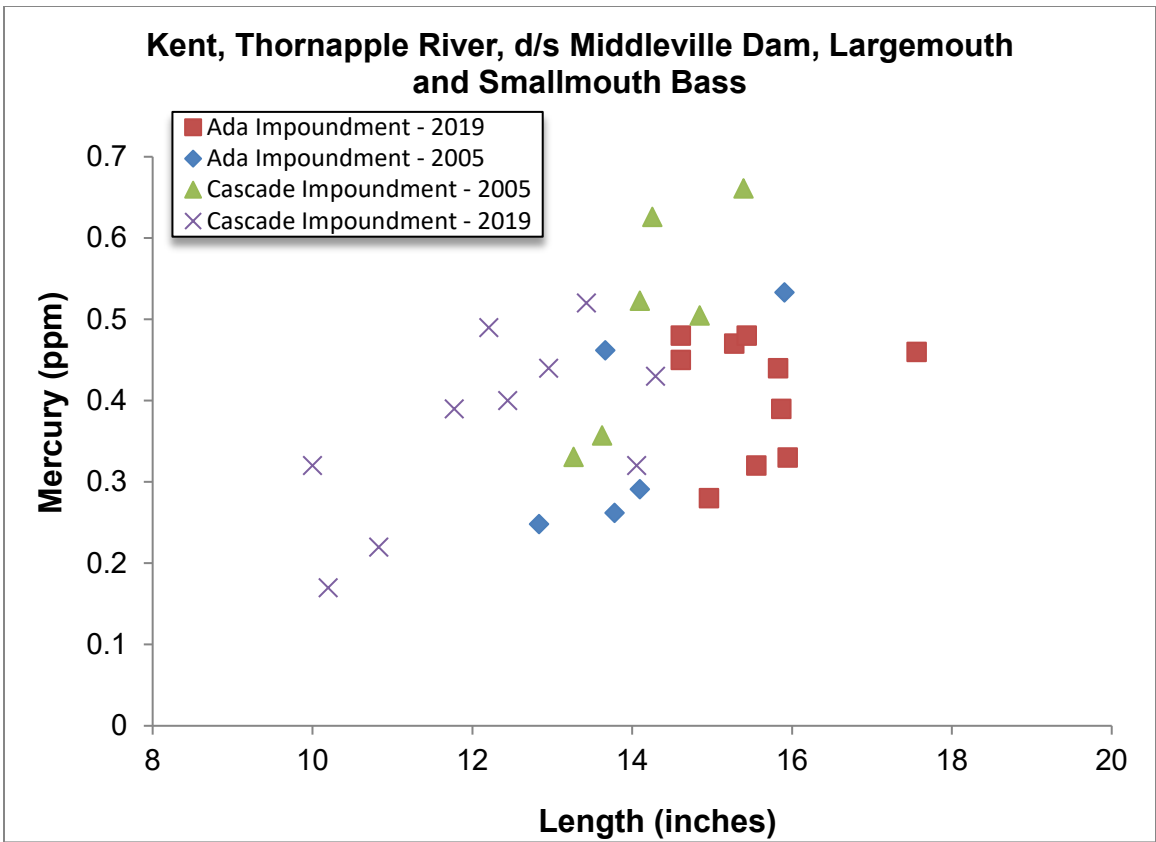
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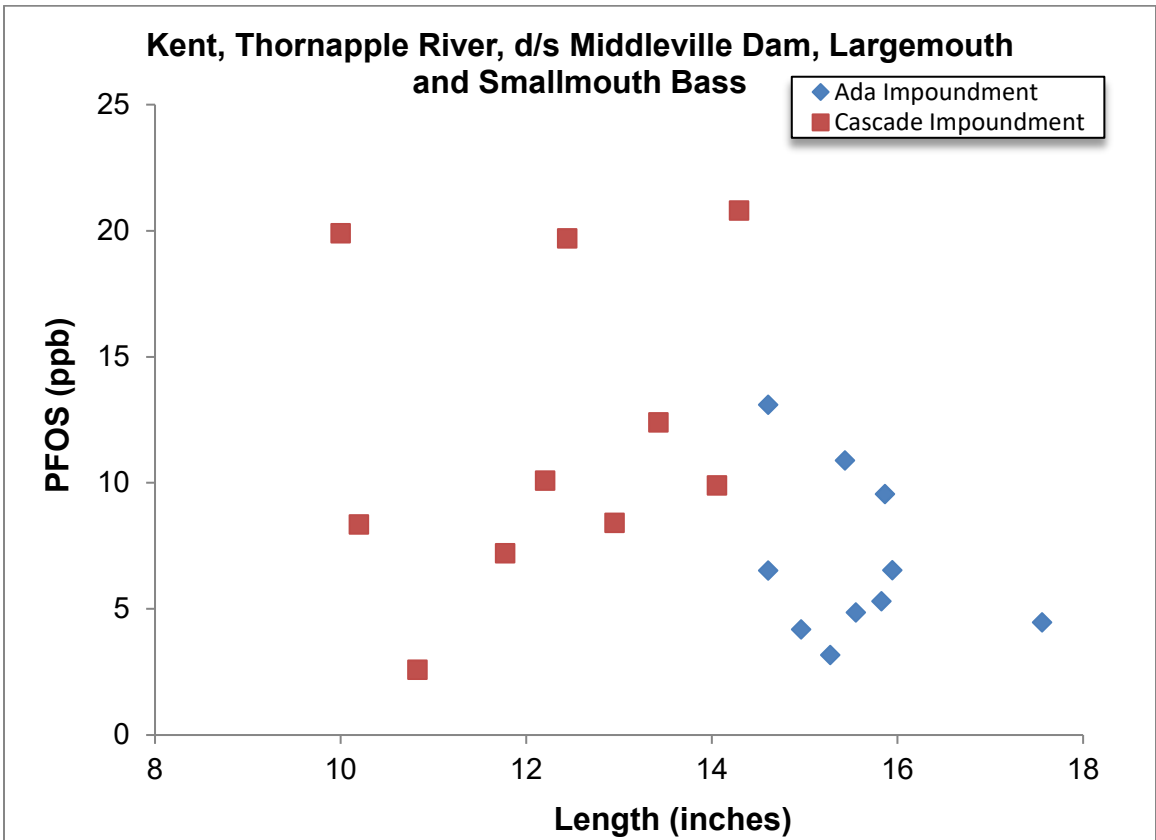
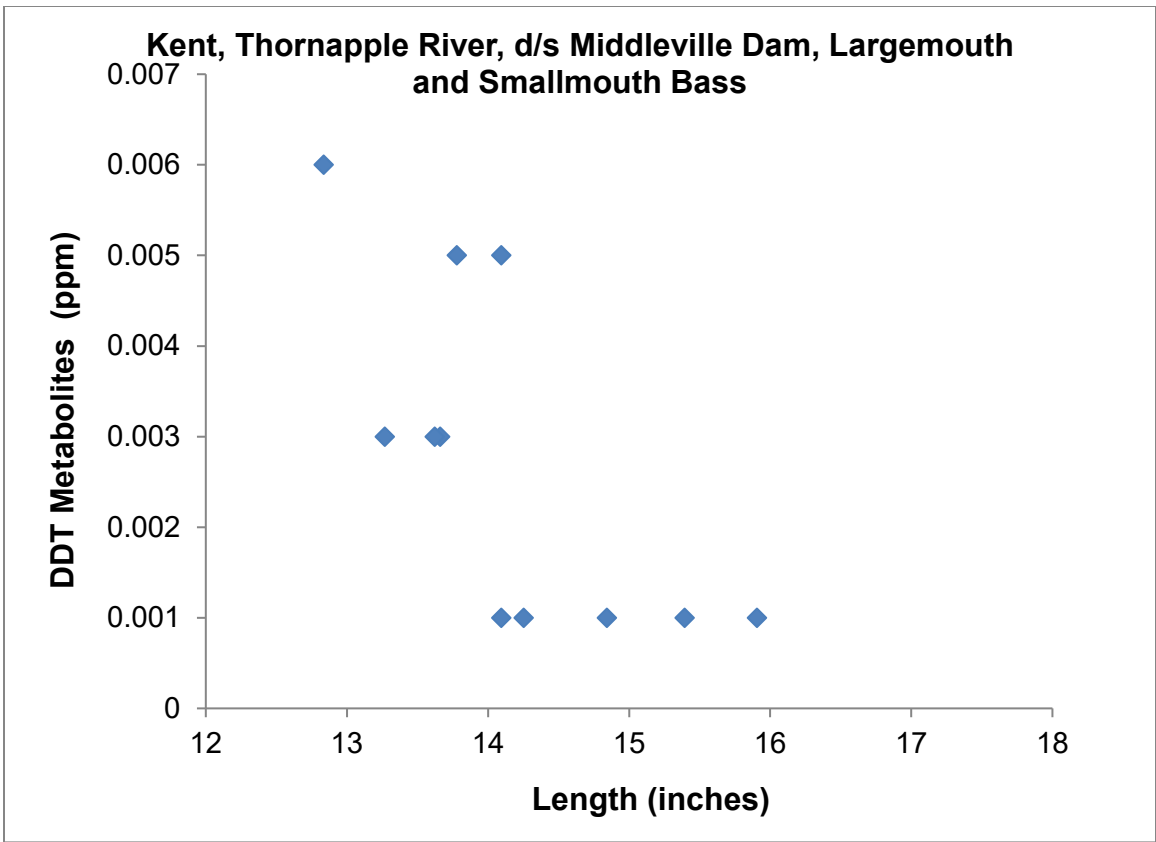
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2005	2019	18	1.0	14	13.6	17.6
Datasets available: 2005 (No PFOS); 2019 (PFOS Only)						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	9	0.002	<0.001	0.004	0.003	16
DDT	9	0.002	<0.001	0.005	0.004	16
Chlordane	9	0.001	<0.001	0.001	0.001	16
Toxaphene	9	ND	--	--	--	--
PFOS	20*	9.4 ppb	2.6 ppb	20.8 ppb	12.0 ppb	12
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.382	0.464				
DDT	0.500	0.569				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.115	0.081				
Final meal category based on UCL:						2

*Sub-legal sized fish were used in the PFOS analysis as no correlation between PFOS concentration and fish size has been observed in the statewide dataset.

Existing MDHHS Advisory: No one should eat more than 2 meals per month of largemouth bass or smallmouth bass smaller than 18 inches from the Thornapple River downstream of the Middleville Dam (includes the LaBarge, Cascade, and Ada Impoundments) or more than 1 meal per month of those fish larger than 18 inches due to mercury. PFOS would cause an advisory. The statewide length break was applied as the size range of the fish was limited.

Recommendation: No change to the advisory is recommended.





Rock Bass

**Thornapple River
Ada Impoundment**

Kent County

Hg Analysis:

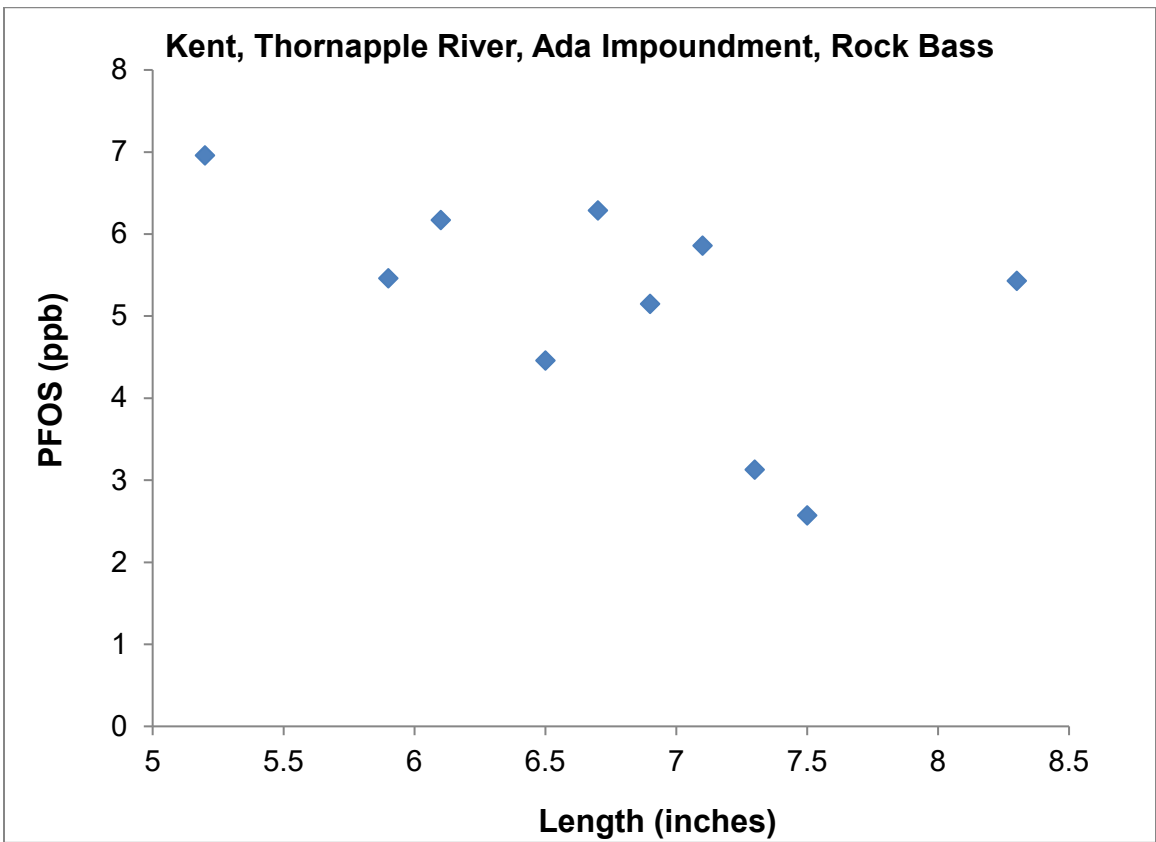
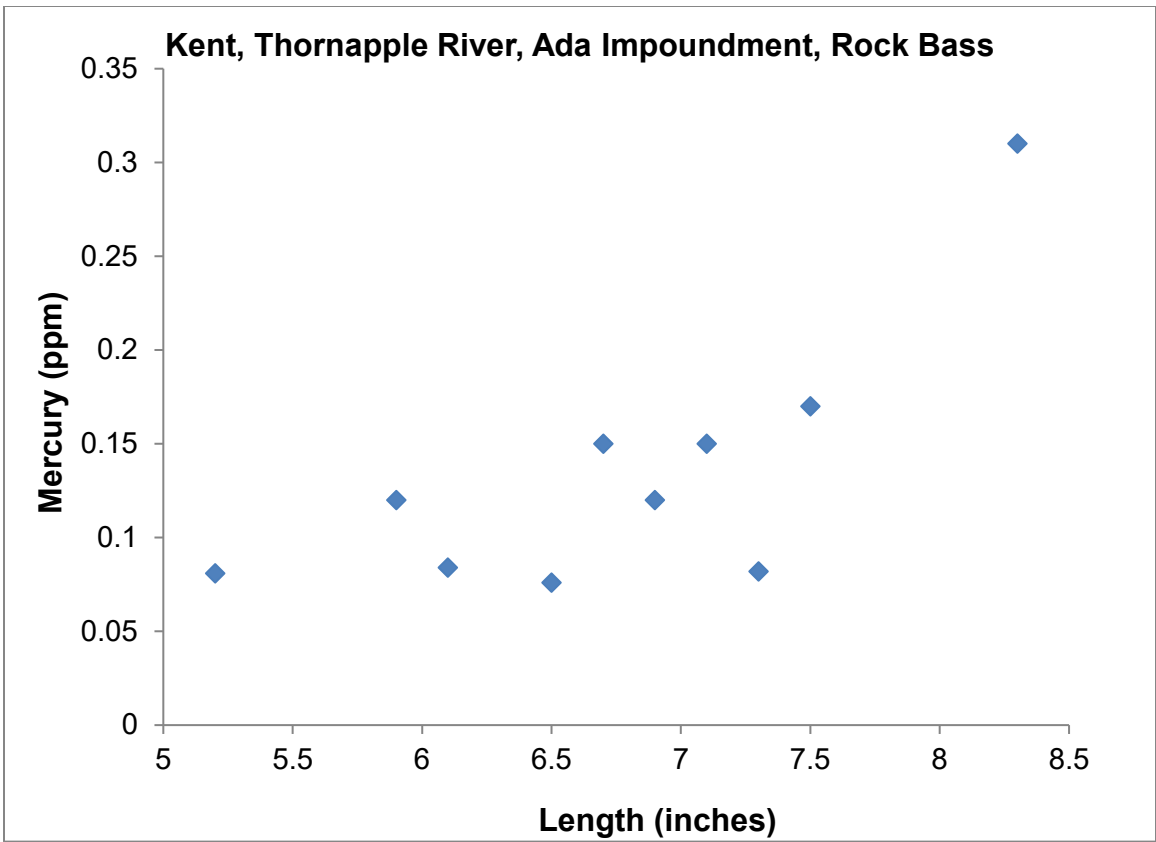
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2019	2019	10	5.2	na	5.2	8.3
Datasets available: 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.13	0.08	0.31	0.18	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.550	0.526				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2019	2019	10	5.2	na	5.2	8.3
Datasets available: 2019						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
PFOS	10	5 ppb	3 ppb	7 ppb	6 ppb	16
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
PFOS	0.291	0.252				
Final meal category based on UCL:						4

Existing MDHHS Advisory: Thornapple River rock bass are covered by the statewide advisory due to mercury: No one should eat more than 4 meals per month of rock bass of any size.

Recommendation: No one should eat more than 4 meals per month of rock bass of any size from the Thornapple River downstream of the Middleville Dam (includes the LaBarge, Cascade, and Ada Impoundments) due to mercury.



Van Buren County

Largemouth Bass

Big Crooked Lake

Van Buren County

Hg Analysis:

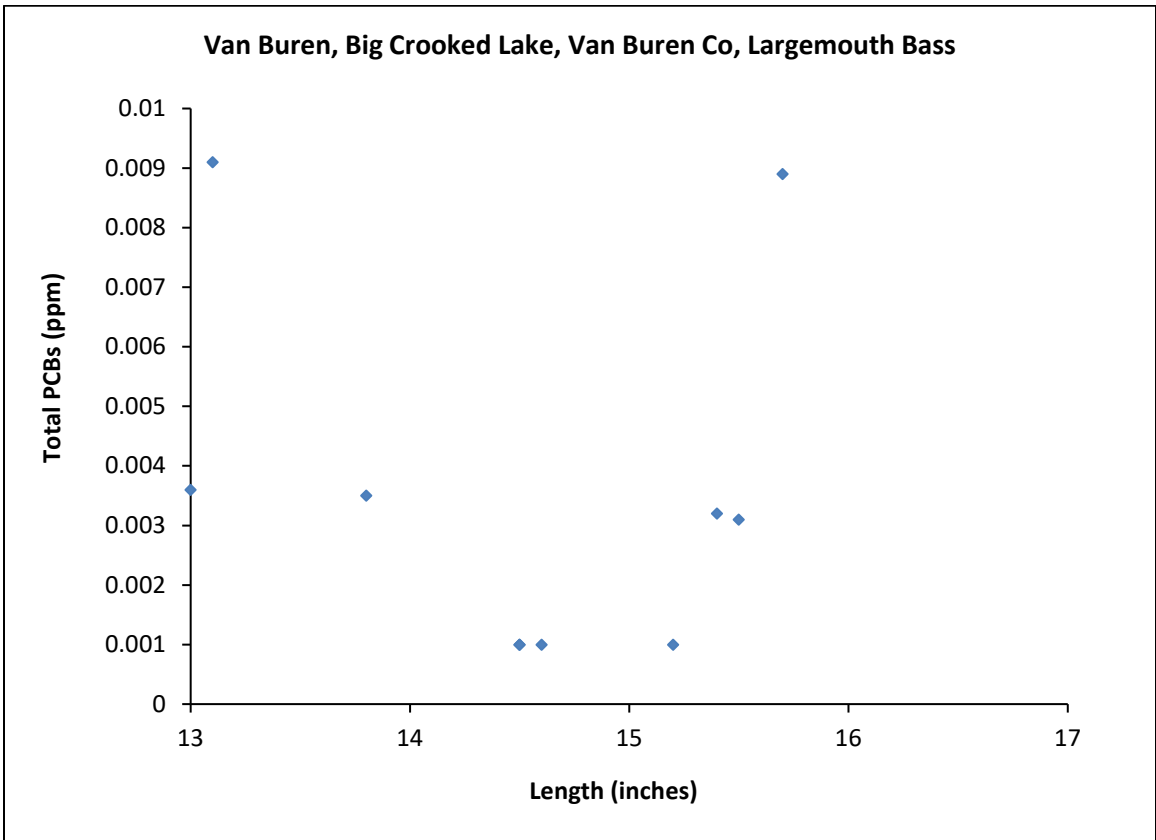
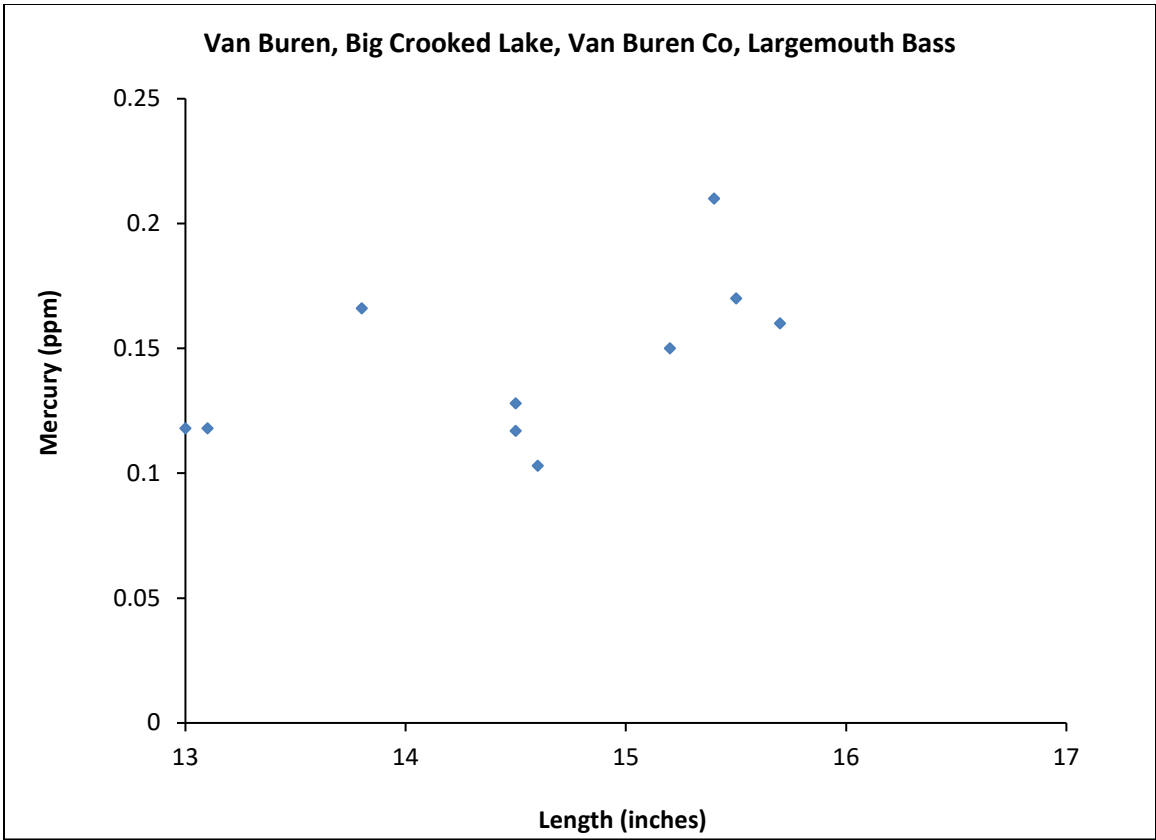
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2009	2009	10	13	14	13.8	15.7
Datasets available: 2009						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	8	0.15	0.10	0.17	0.18	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.327	0.328				

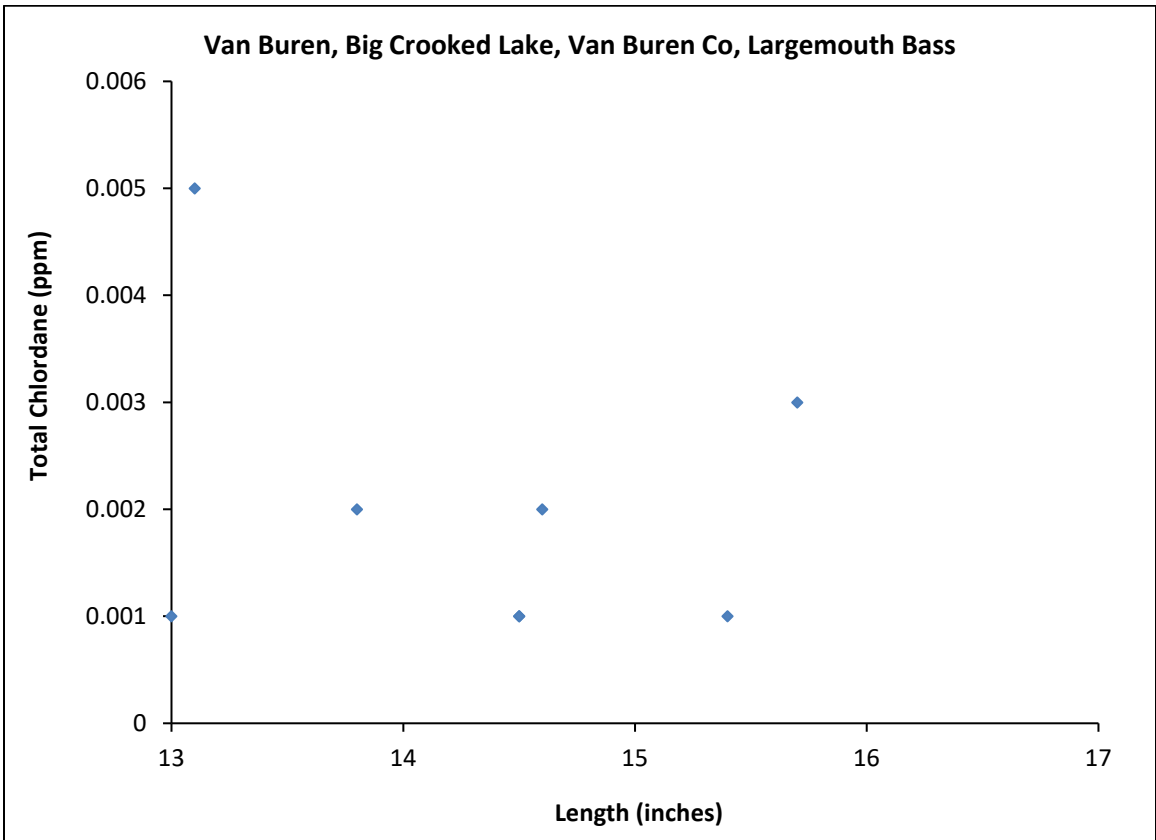
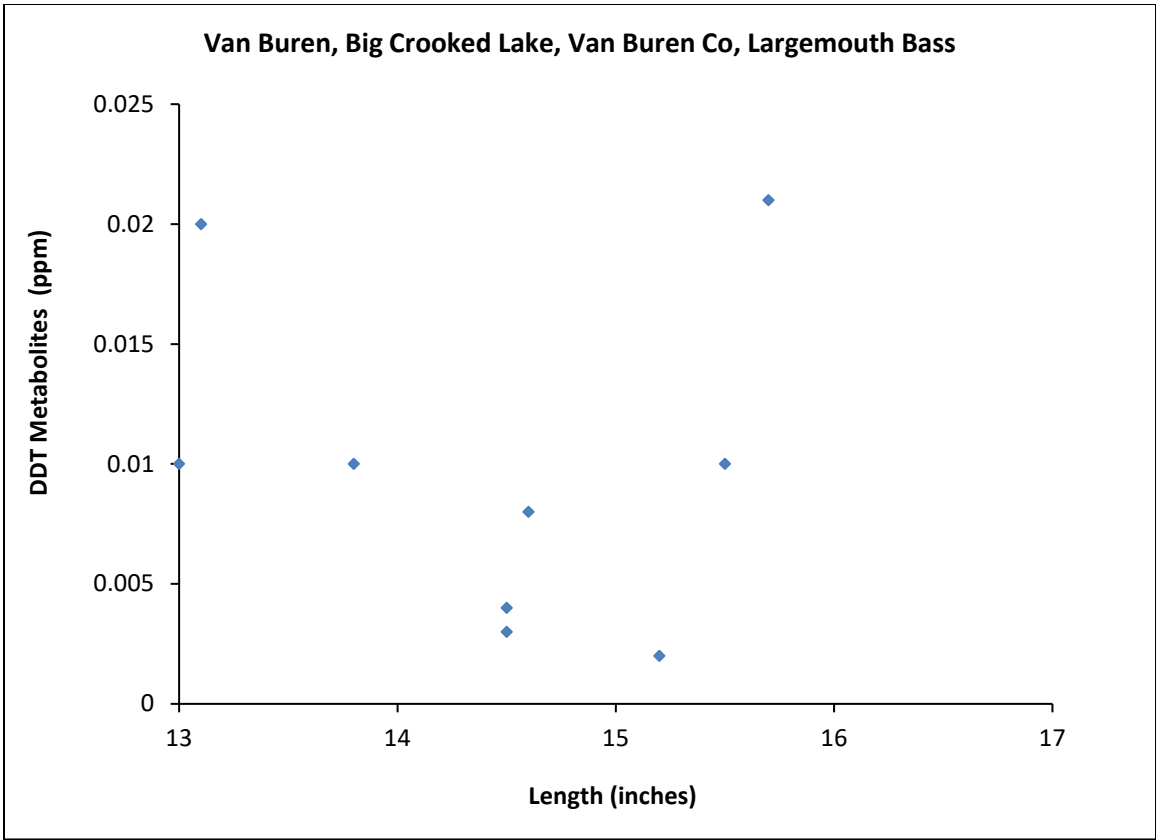
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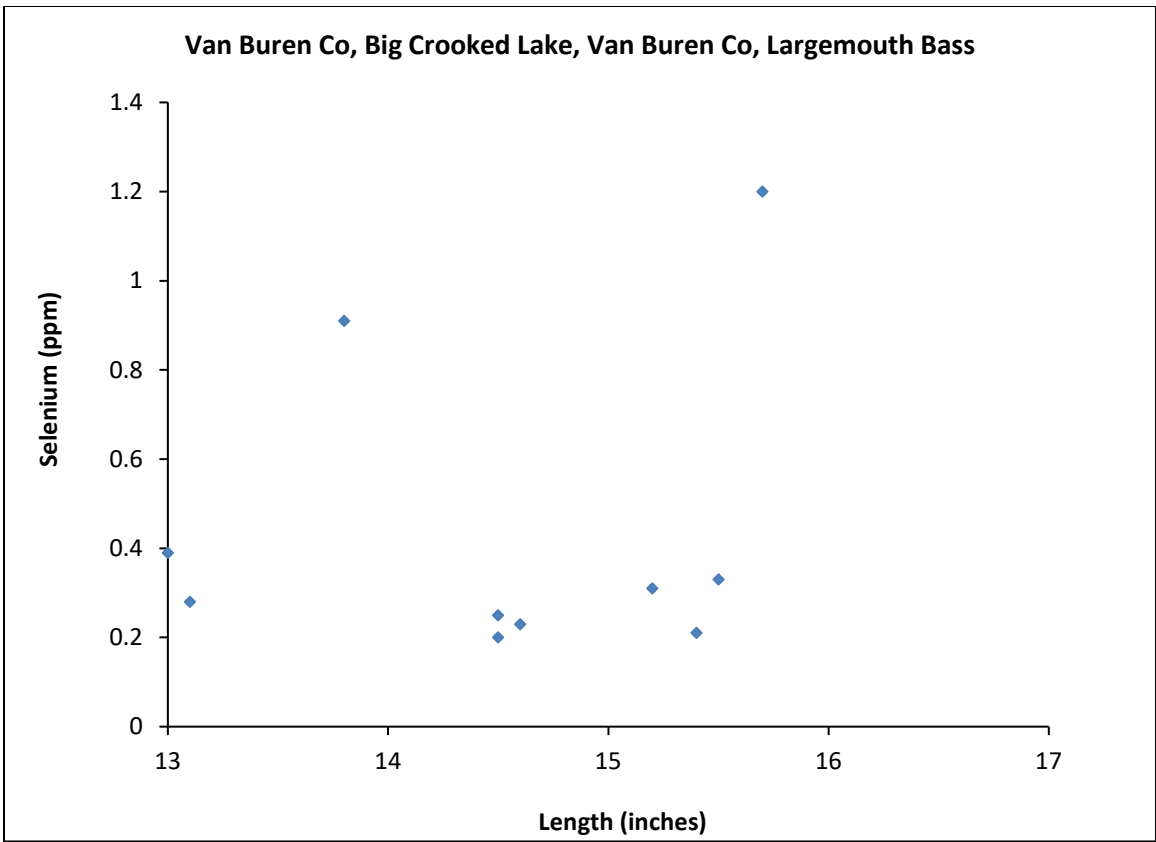
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2009	2009	10	13	14	13.8	15.7
Datasets available: 2009						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	8	0.003	0.001	0.009	0.01	16
DDT	7	0.008	0.002	0.021	0.01	16
Chlordane	6	0.002	0.001	0.003	0.003	--
Toxaphene	7	ND	--	--	--	--
Selenium	8	0.46	0.20	1.20	0.77	16
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.024	0.032				
DDT	0.016	0.049				
Chlordane	0.061	0.022				
Toxaphene	--	--				
Selenium	0.024	0.003				
Final meal category based on UCL:						4

Existing Advisory: Big Crooked Lake largemouth bass are covered under the statewide mercury consumption advisory.

Recommendation: No one should eat more than 4 meals per month of legal size Big Crooked Lake largemouth or smallmouth bass less than 18 inches or more than 2 meals per month of those fish larger than 18 inches. Statewide length break applied.







Carp

**Black River
River Mouth & S. Branch at Bangor**

Van Buren County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1989	2002	32	18.9	na	18.9	28
Datasets available: 1989, 1992, 2002						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	32	0.22	0.05	0.48	0.24	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.118	0.050				

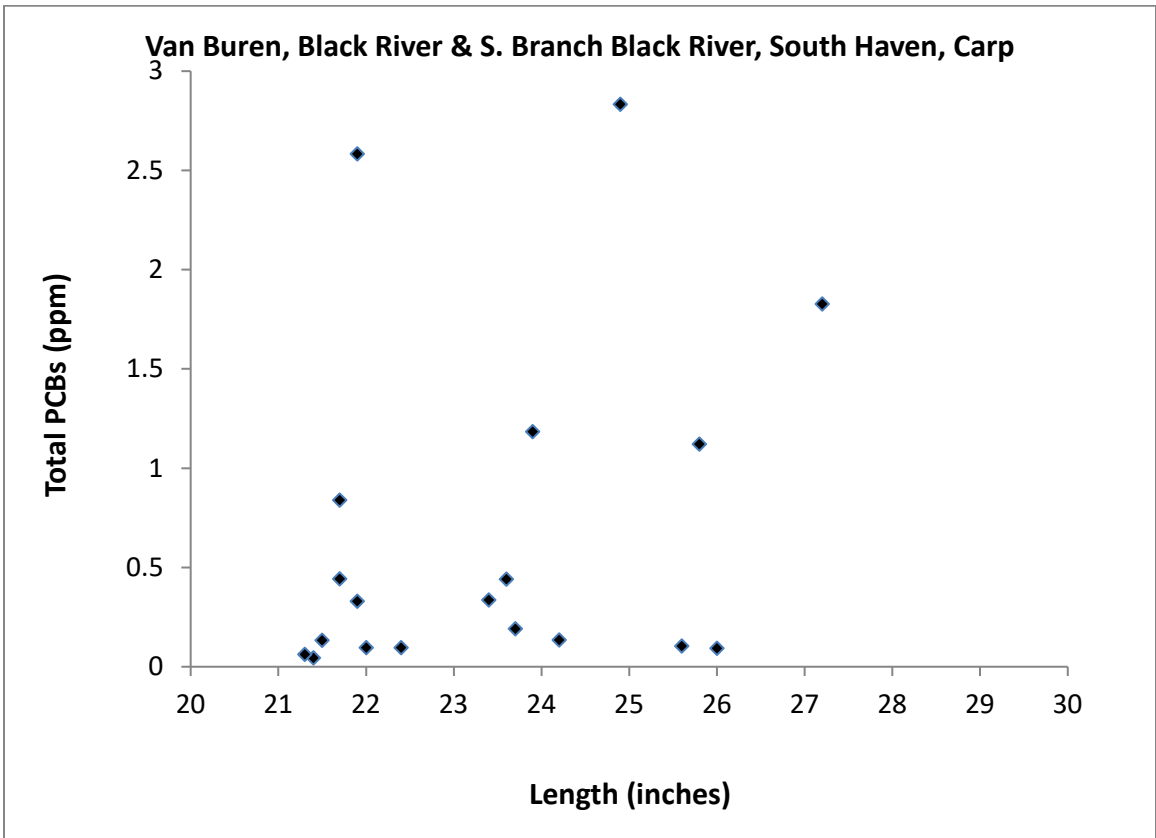
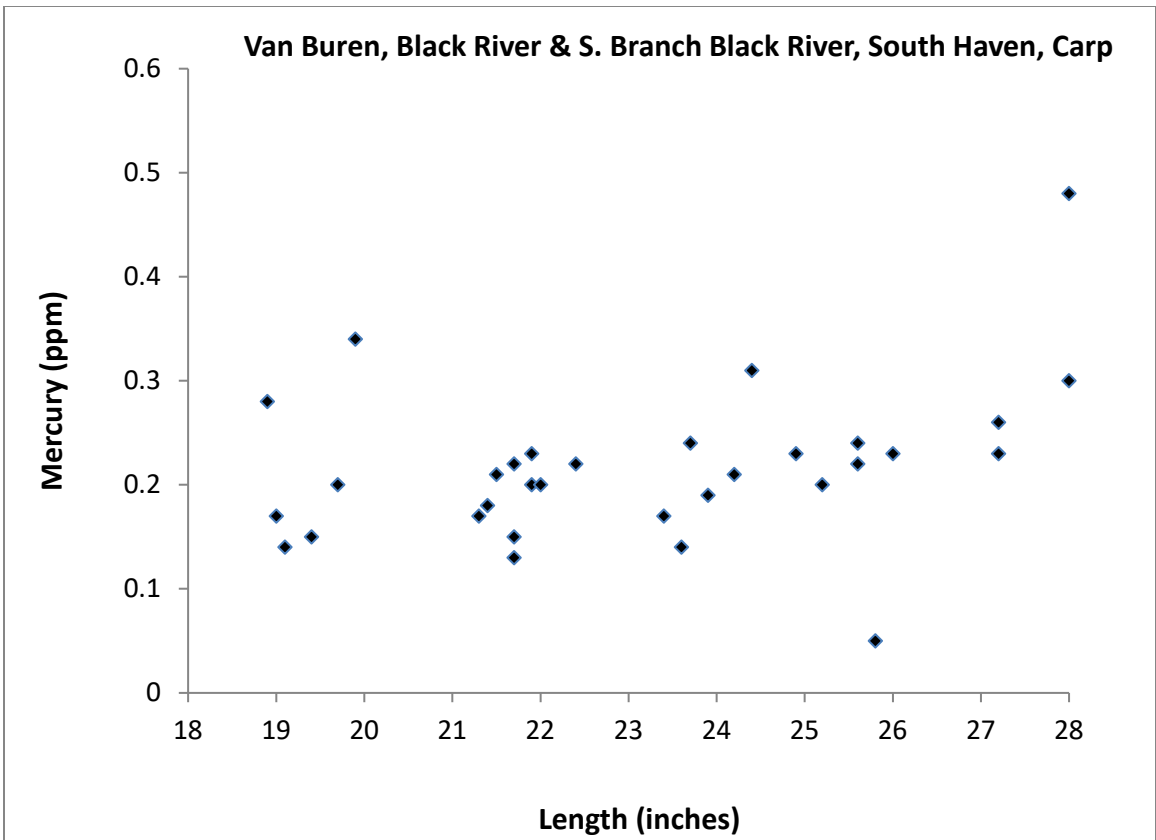
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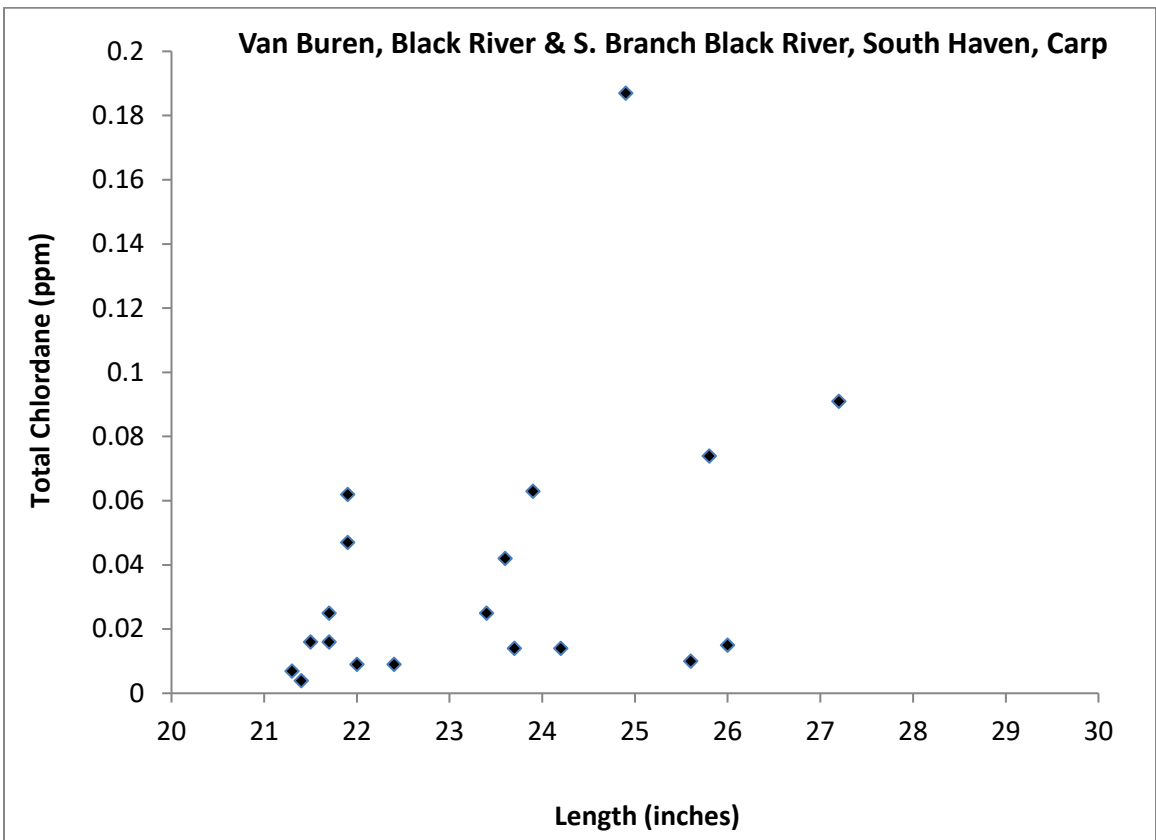
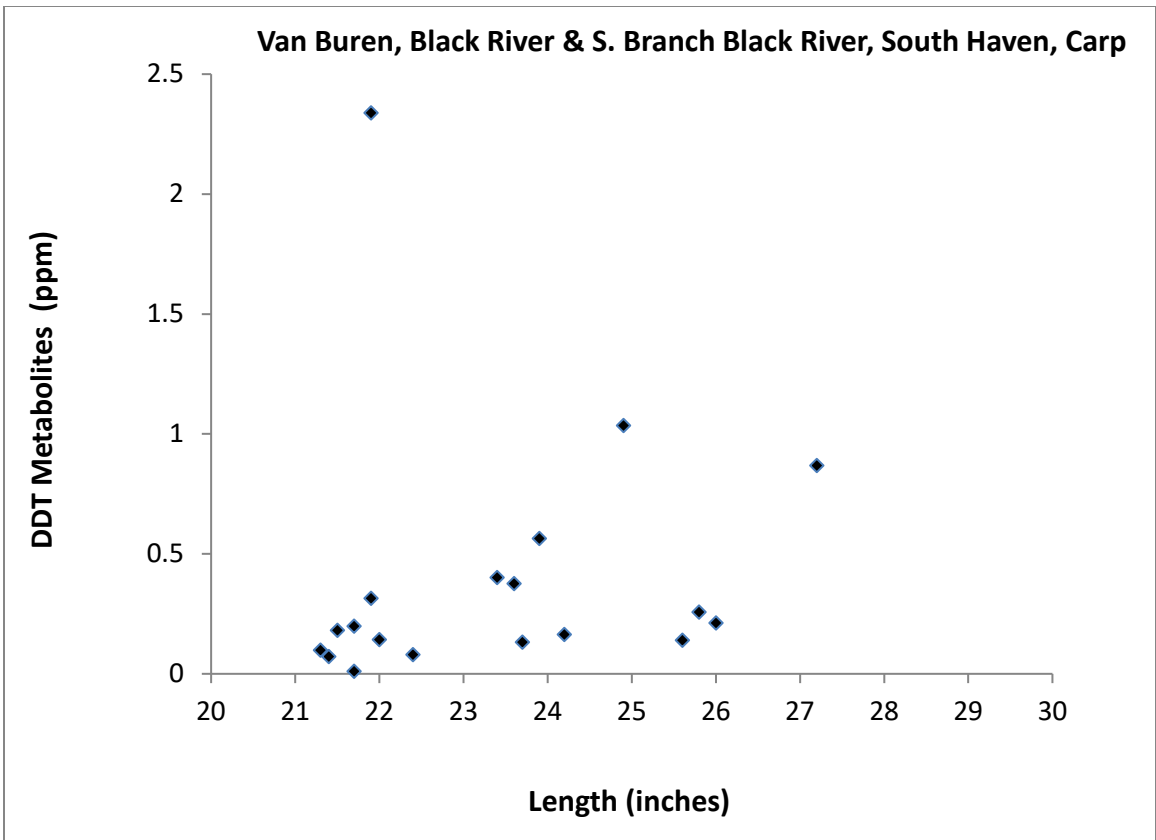
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2002	2002	19	21.3	na	21.3	27.2
Datasets available: 1989, 1992, 2002						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	19	0.68	0.05	2.83	1.09	Limited
DDT	19	0.40	0.01	2.34	0.66	2
Chlordane	19	0.038	0.004	0.19	0.06	--
Toxaphene	19	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.085	0.100				
DDT	0.010	0.135				
Chlordane	0.188	0.207				
Toxaphene	--	--				
Final meal category based on UCL:						Limited

Existing Advisory: No one should eat carp from the Black River or the South Branch Black River downstream of the Bangor Dam. Women and children should not eat more than 1 meal per week of carp from the South Branch Black River upstream of the Bangor Dam due to PCBs.

Recommendation: Sensitive populations should not eat these fish. Healthy adults should limit consumption of carp from the Black River or any branch of the Black River due to PCBs. DDT and mercury would cause advisories.

Note: The Bangor Dam is no longer a significant impediment to fish passage. All samples from the Black River and its tributaries were used for this analysis.





Largemouth Bass

**Black River
River Mouth & S. Branch at Bangor**

Van Buren County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1989	1989	1	12.2	14	12.2	12.2
Datasets available:		1989				
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	1	0.320	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	--	--				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1989	1989	1	12.2	14	12.2	12.2
Datasets available:		1989				
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	1	ND	--	--	--	--
DDT	1	ND	--	--	--	--
Chlordane	1	ND	--	--	--	--
Toxaphene	1	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						--

Existing Advisory: There are no current consumption advisories for South Branch Black River largemouth bass.

Recommendation: Insufficient dataset. Statewide guidelines apply. No one should eat more than 2 meals per month of largemouth or smallmouth bass smaller than 18 inches or more than 1 meal per month of those fish larger than 18 inches.

Note: The Bangor Dam is no longer a significant impediment to fish passage. All samples from the Black River and its tributaries were used for this analysis.

Northern Pike

**Black River
River Mouth & S. Branch at Bangor**

Van Buren County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1989	2002	12	18.5	24	24.6	32.3
Datasets available: 1989, 1992, 2002						
Chemical	Sample Size (All)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	4	0.46	0.30	0.82	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.030	0.055				

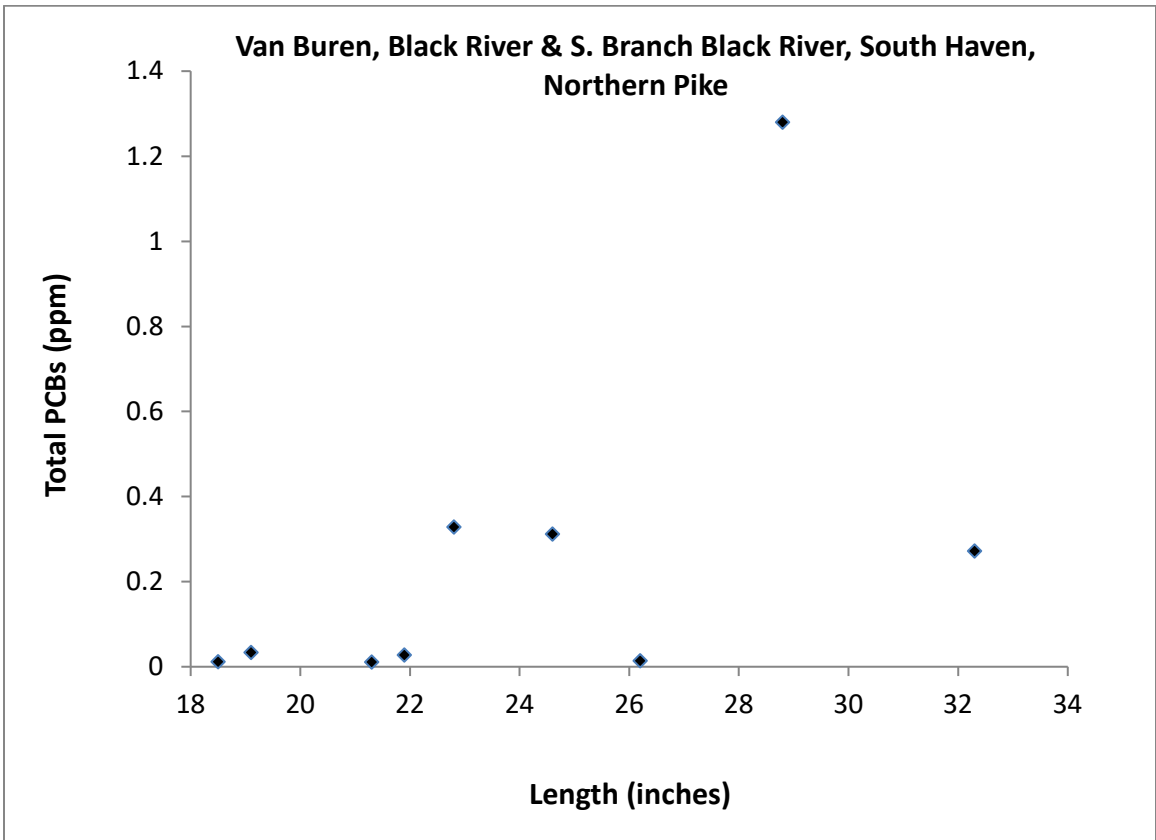
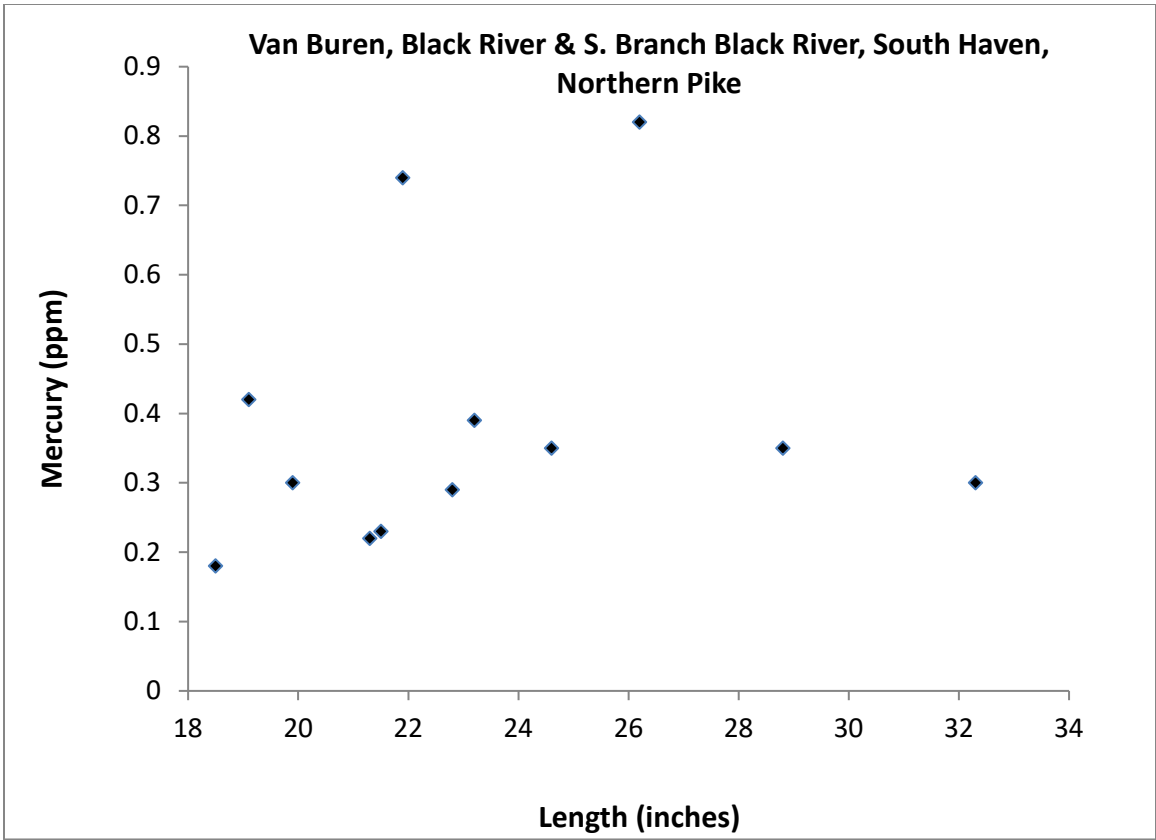
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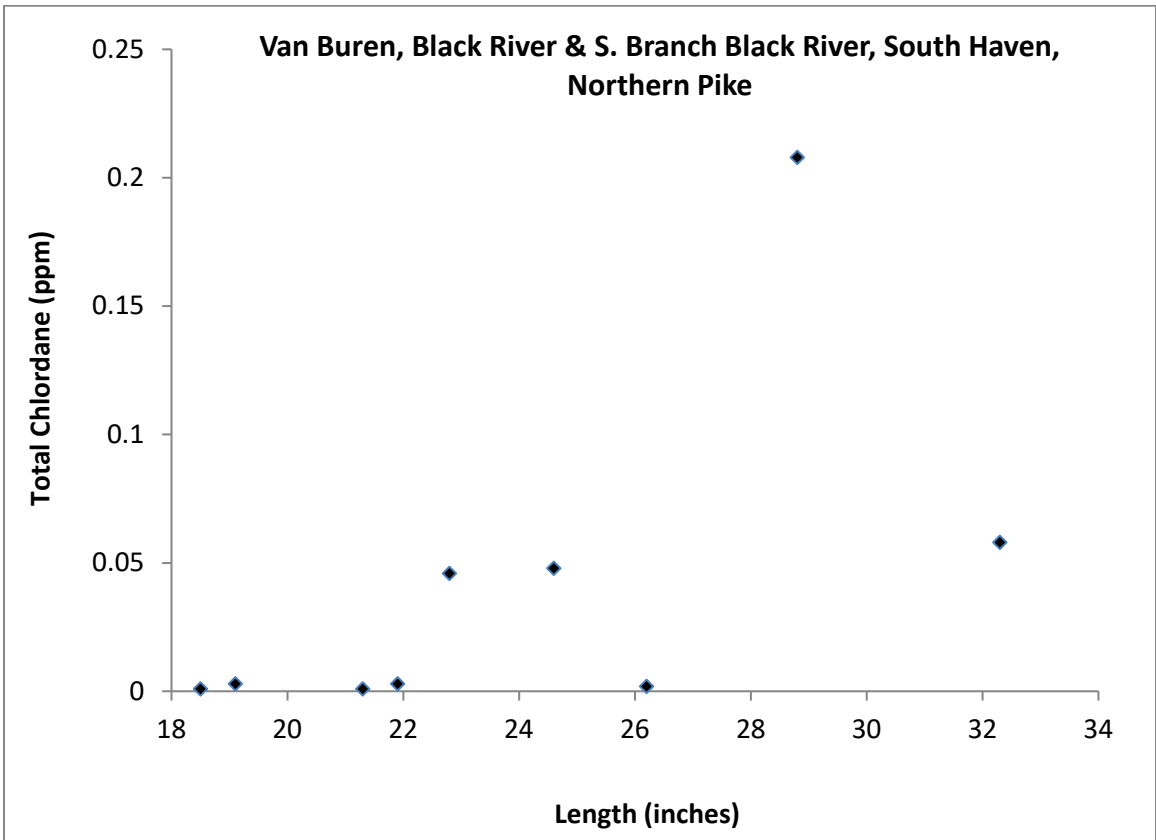
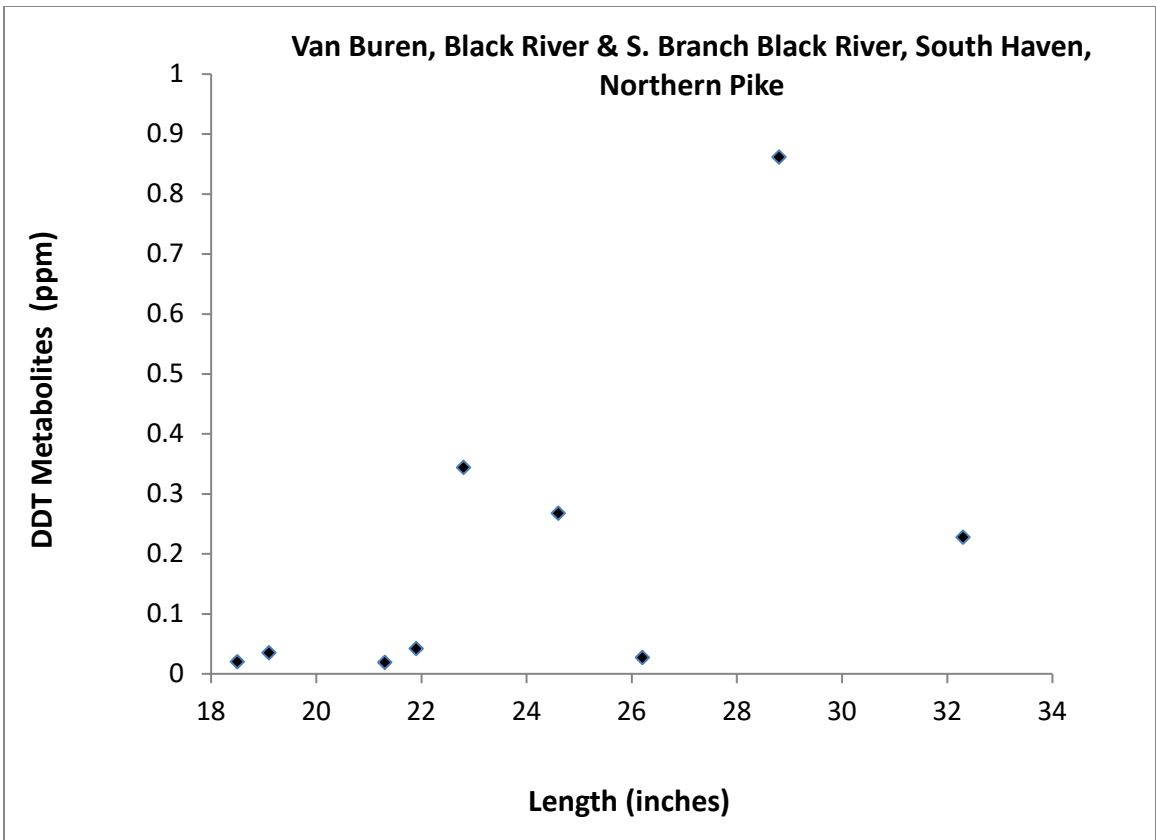
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1992	2002	9	18.5	24	24.6	32.3
Datasets available: 1989, 1992, 2002						
Chemical	Sample Size (All)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	4	0.47	0.01	1.28	--	--
DDT	4	0.35	0.03	0.86	--	--
Chlordane	4	0.08	0.002	0.21	--	--
Toxaphene	4	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.293	0.401				
DDT	0.303	0.416				
Chlordane	0.356	0.496				
Toxaphene	--	--				
Final meal category based on UCL:						--

Existing Advisory: There are no current consumption advisories for South Branch Black River northern pike.

Recommendation: Insufficient dataset to set a waterbody-species specific guideline due to sublegal lengths and 8 of the 9 samples for organics are from 1992. Statewide guidelines apply. No one should eat more than 1 meal per month of northern pike larger than 30 inches or more than 2 meals per month of northern pike smaller than 30 inches in length.

Note: The Bangor Dam is no longer a significant impediment to fish passage. All samples from the Black River and its tributaries were used for this analysis.





Rock Bass

**Black River
River Mouth & S. Branch at Bangor**

Van Buren County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1989	1989	1	9.4	na	9.4	9.4
Datasets available:		1989				
Chemical	Sample Size (All)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	1	0.430	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	--	--				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1989	1989	1	9.4	na	9.4	9.4
Datasets available:		1989				
Chemical	Sample Size (All)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	1	0.025	--	--	--	--
DDT	1	0.104	--	--	--	--
Chlordane	1	0.006	--	--	--	--
Toxaphene	1	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						--

Existing Advisory: There are no current consumption advisories for South Branch Black River rock bass.

Recommendation: Insufficient dataset to set a guideline. Statewide guidelines apply, which are: No one should eat more than 4 meals per month of rock bass from inland waters.

Note: The Bangor Dam is no longer a significant impediment to fish passage. All samples from the Black River and its tributaries were used for this analysis.

White Sucker

**Black River
River Mouth & S. Branch at Bangor**

Van Buren County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
1989	2002	21	13.3	na	13.3	17.9
Datasets available: 1989, 2002						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	21	0.18	0.08	0.35	0.22	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.622	0.609				

Organics Analysis:

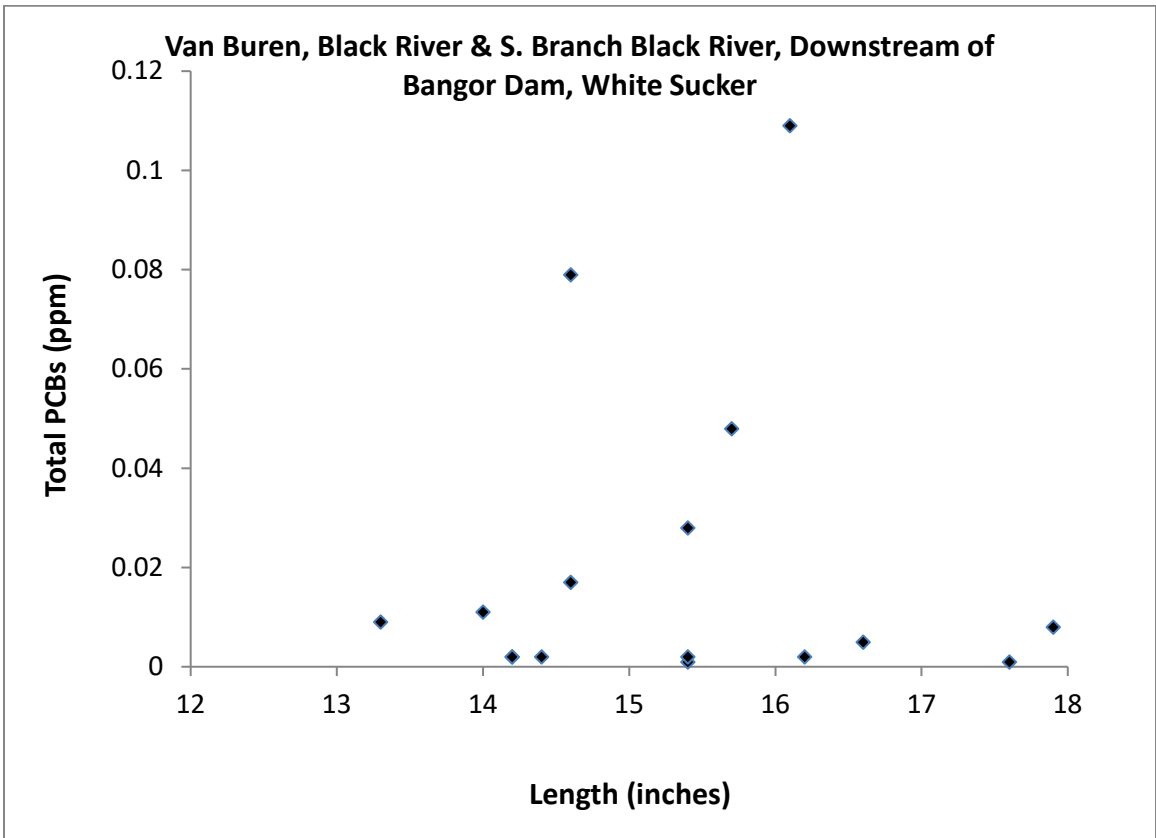
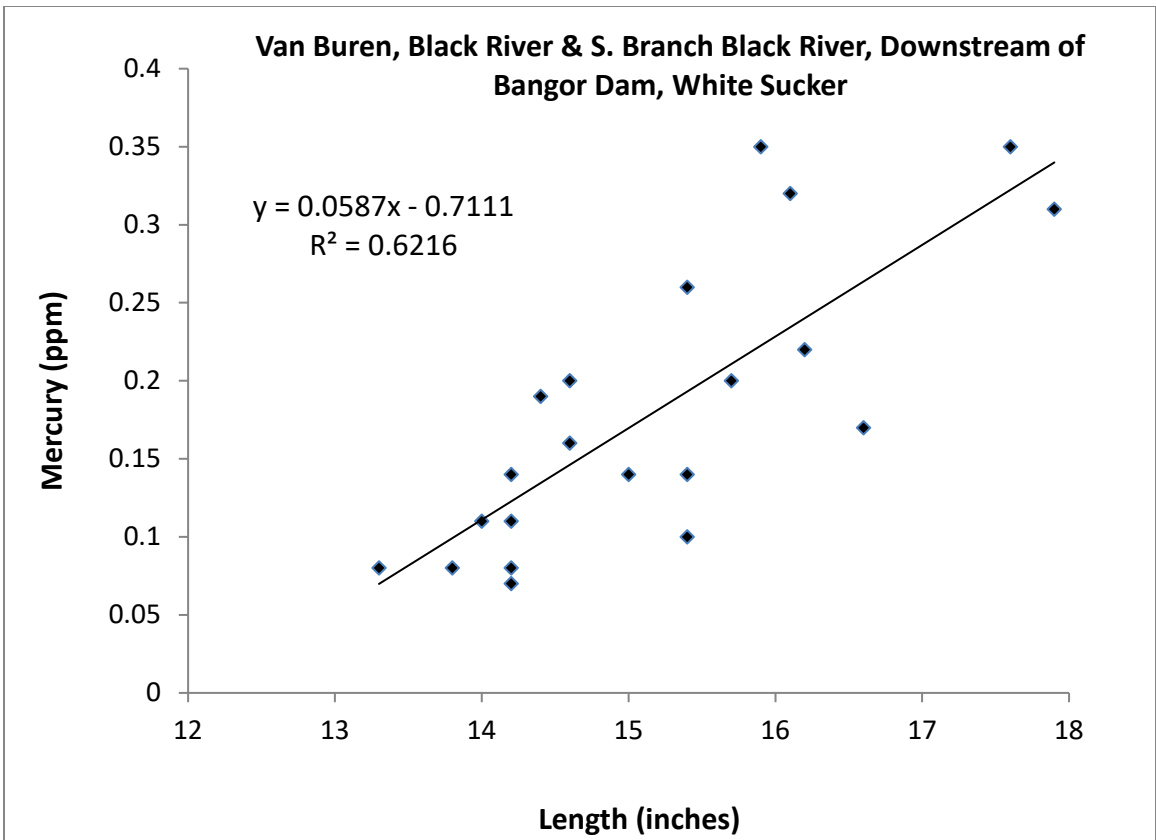
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2002	2002	10	13.3	na	13.3	17.9
Datasets available: 1989, 2002						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	16	0.02	0.001	0.109	0.04	4
DDT	16	0.03	0.007	0.09	0.04	16
Chlordane	16	0.002	0.001	0.01	0.003	16
Toxaphene	16	ND	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.001	0.006				
DDT	0.000	0.009				
Chlordane	0.008	0.003				
Toxaphene	--	--				
Final meal category based on UCL:						4

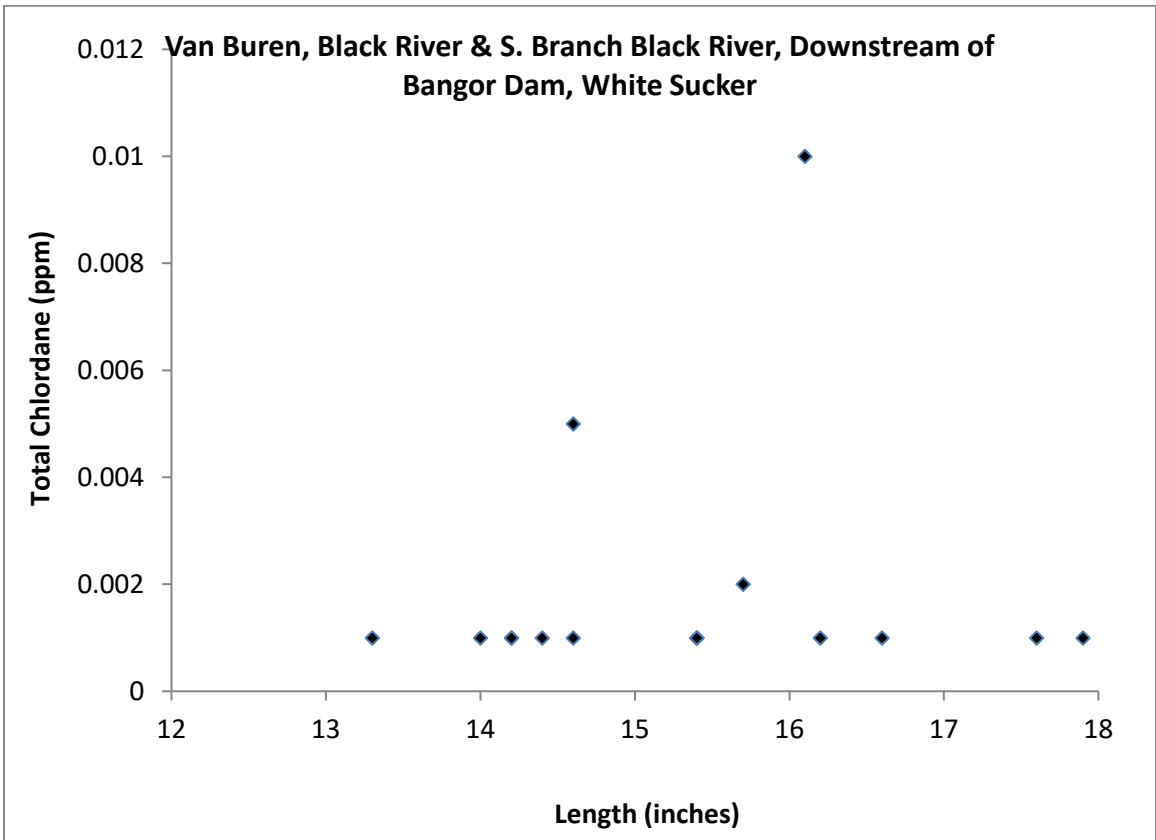
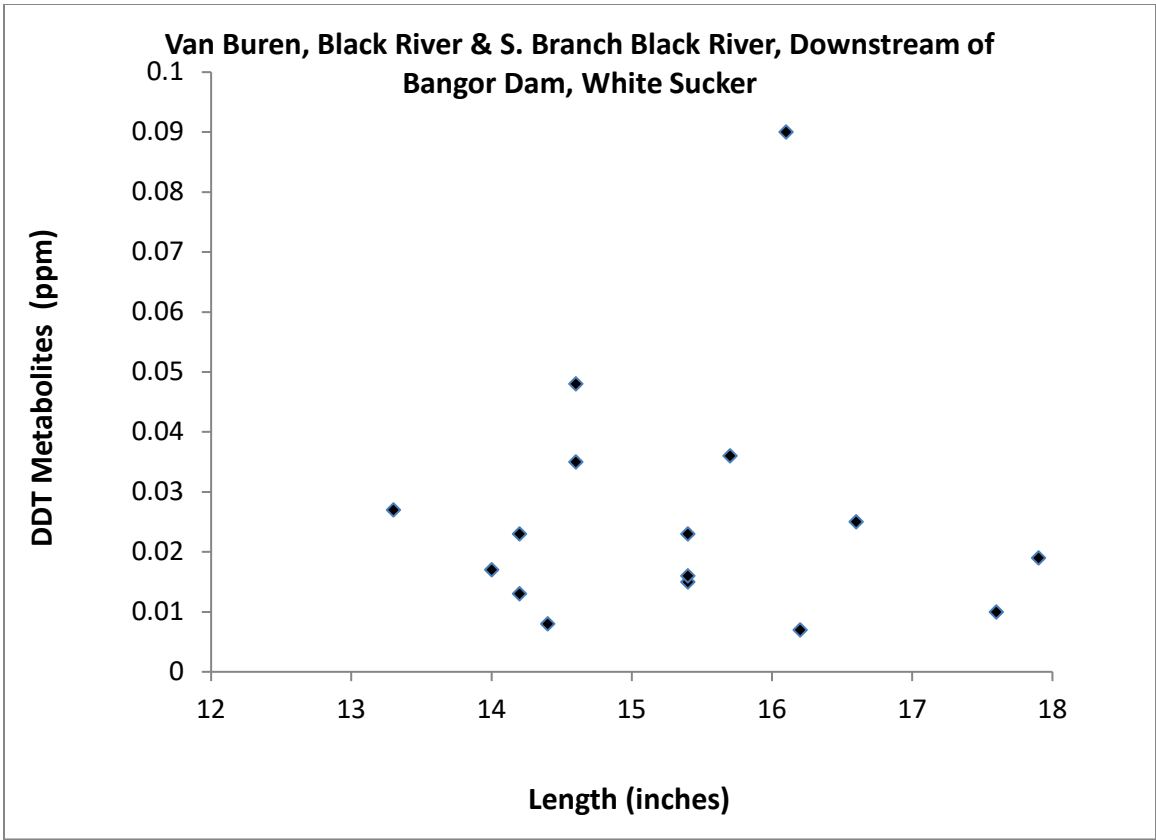
Existing Advisory: Women and children should not eat more than 1 meal per week of suckers from any branch of the Black River other than upstream of the Bangor Dam on the South Branch Black River due to PCBs.

Recommendation: No one should eat more than 4 meals per month of sucker smaller than 16 inches from the Black River or any branch of the Black River due to PCBs and mercury or more than 2 meals per month of those fish larger than 16 inches due to mercury.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
12	0	16
13	0.05	16
14	0.11	8
15	0.17	4
16	0.23	4
17	0.29	2
18	0.35	2
19	0.40	2
20	0.46	2
<i>Shaded area denotes extrapolated estimates</i>		

Note: The Bangor Dam is no longer a significant impediment to fish passage. All samples from the Black River and its tributaries were used for this analysis.





Carp

**Maple Lake
Paw Paw River**

Van Buren County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2006	2018	17	15.9	na	15.9	37
Datasets available: 2006, 2018						
Chemical	Sample Size (Legal)	Mean	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	17	0.07	0.01	0.16	0.10	8
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.240	0.335				

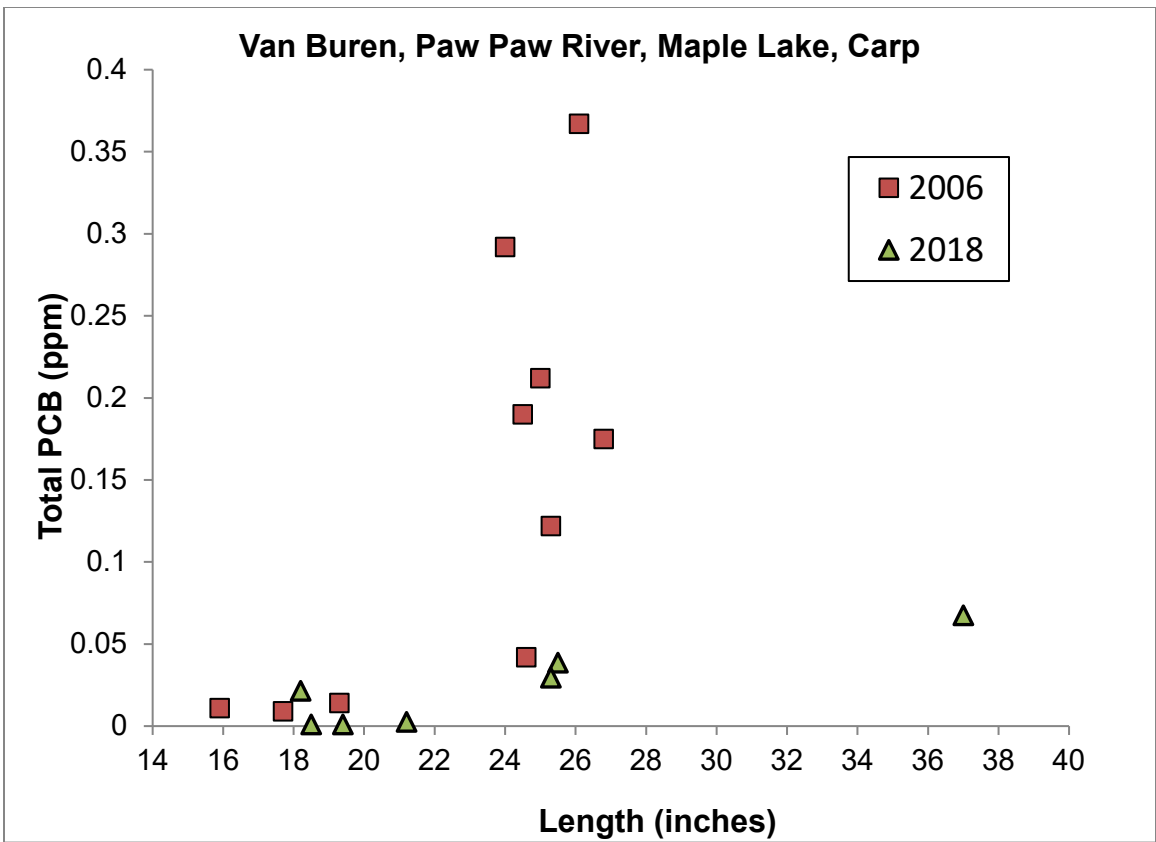
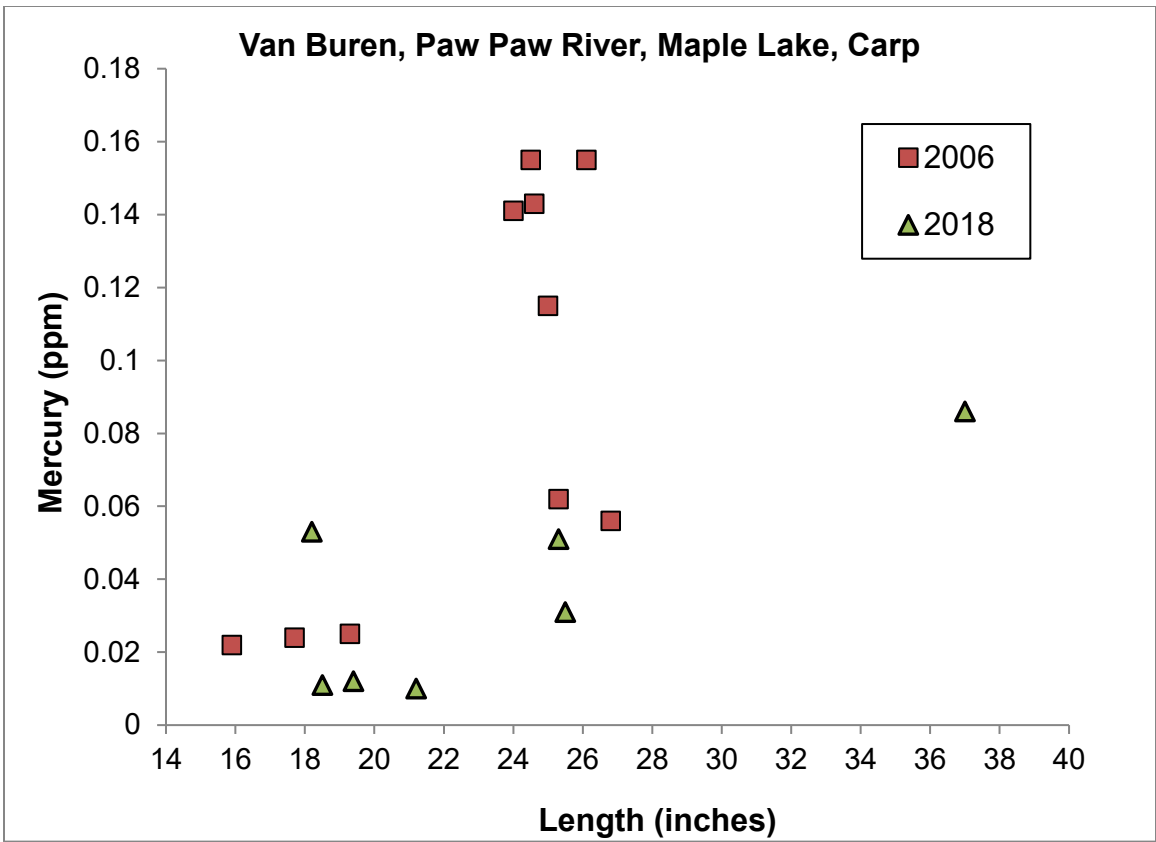
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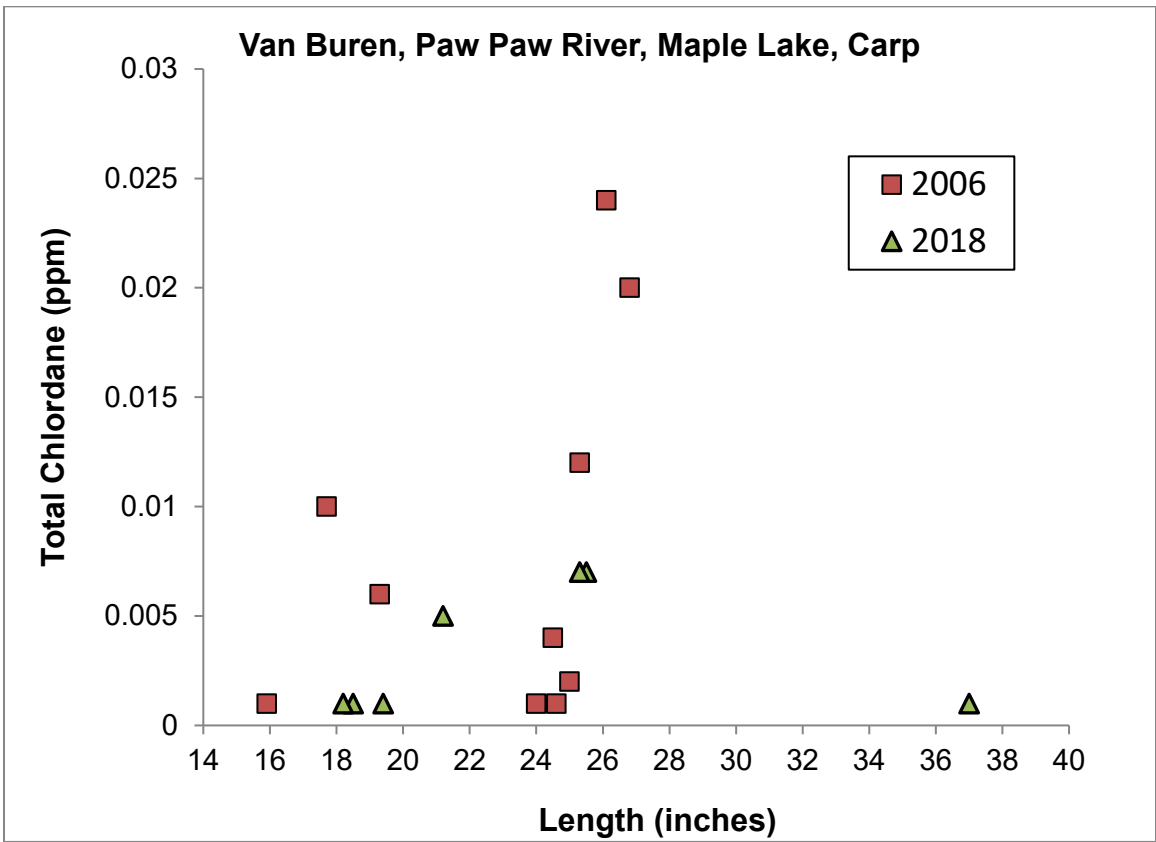
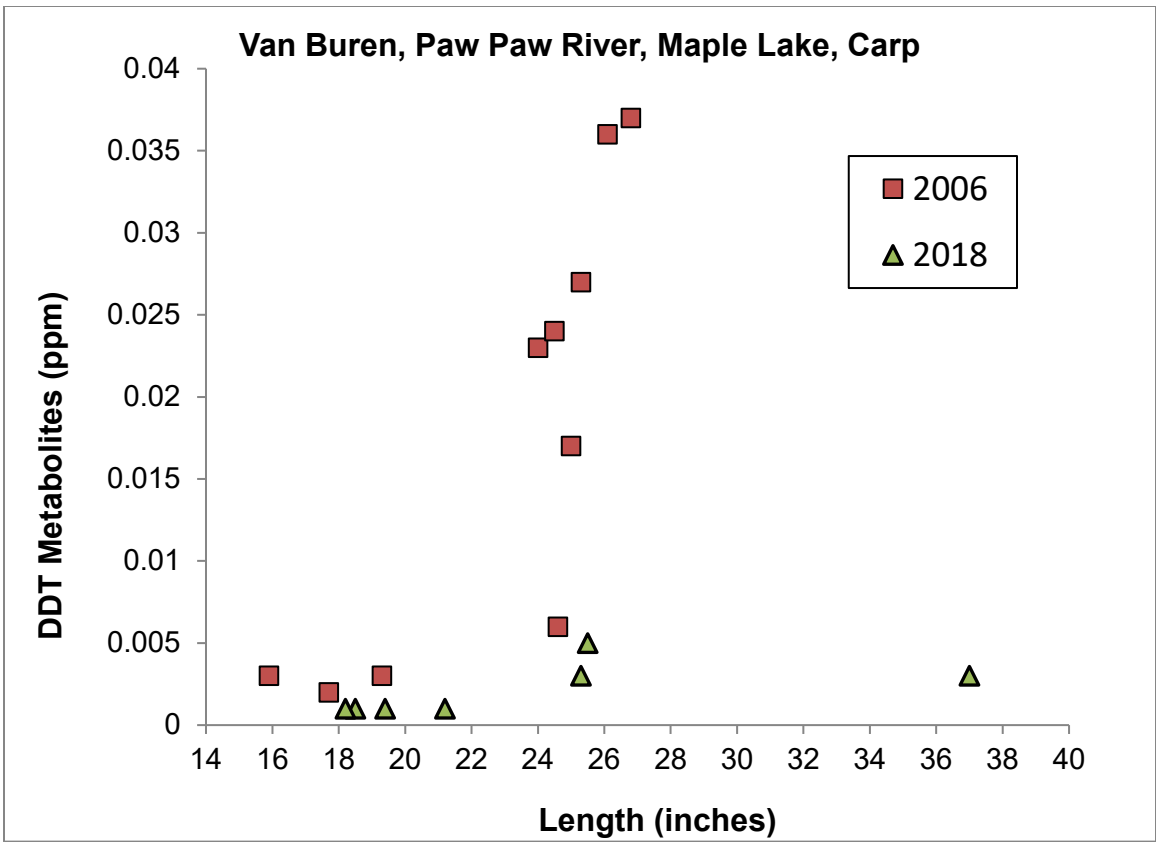
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2006	2018	17	15.9	na	15.9	37
Datasets available: 2006, 2018						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	17	0.09	< 0.001	0.37	0.15	1
DDT	17	0.01	< 0.001	0.04	0.02	16
Chlordane	17	0.006	< 0.001	0.02	0.01	--
Toxaphene	17	ND	< 0.05	< 0.05	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.163	0.349				
DDT	0.137	0.213				
Chlordane	0.042	0.023				
Toxaphene	--	--				
Final meal category based on UCL:						1

Existing MDHHS Advisory: No one should eat more than 12 meals per month of Maple Lake carp under 20 inches, more than 1 meal per month of those fish between 20 and 26 inches, or more than 6 meals per year of those fish larger than 26 inches due to PCBs.

Recommendation: No change to the advisory is recommended. The length breaks are based on significant regressions for 2006 Hg & PCBs. Additional samples may indicate the advice can be changed.

Note: The current recommendation will be re-evaluated in the next release of the Eat Safe Fish Guide.





Largemouth Bass

**Maple Lake
Paw Paw River**

Van Buren County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2006	2018	20	12.9	14	13.5	21.4
Datasets available: 2006, 2018						
Chemical	Sample Size (Legal)	Mean	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	18	0.22	0.13	0.38	0.26	4
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.659	0.511				

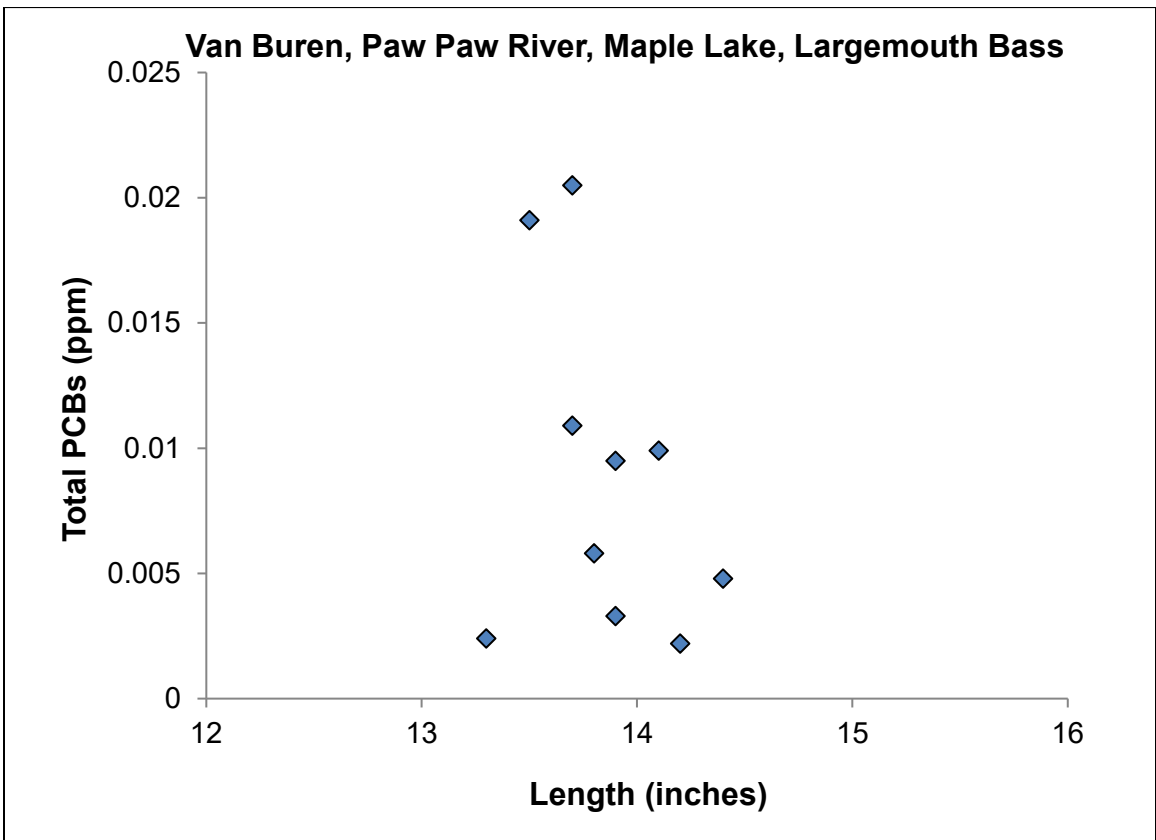
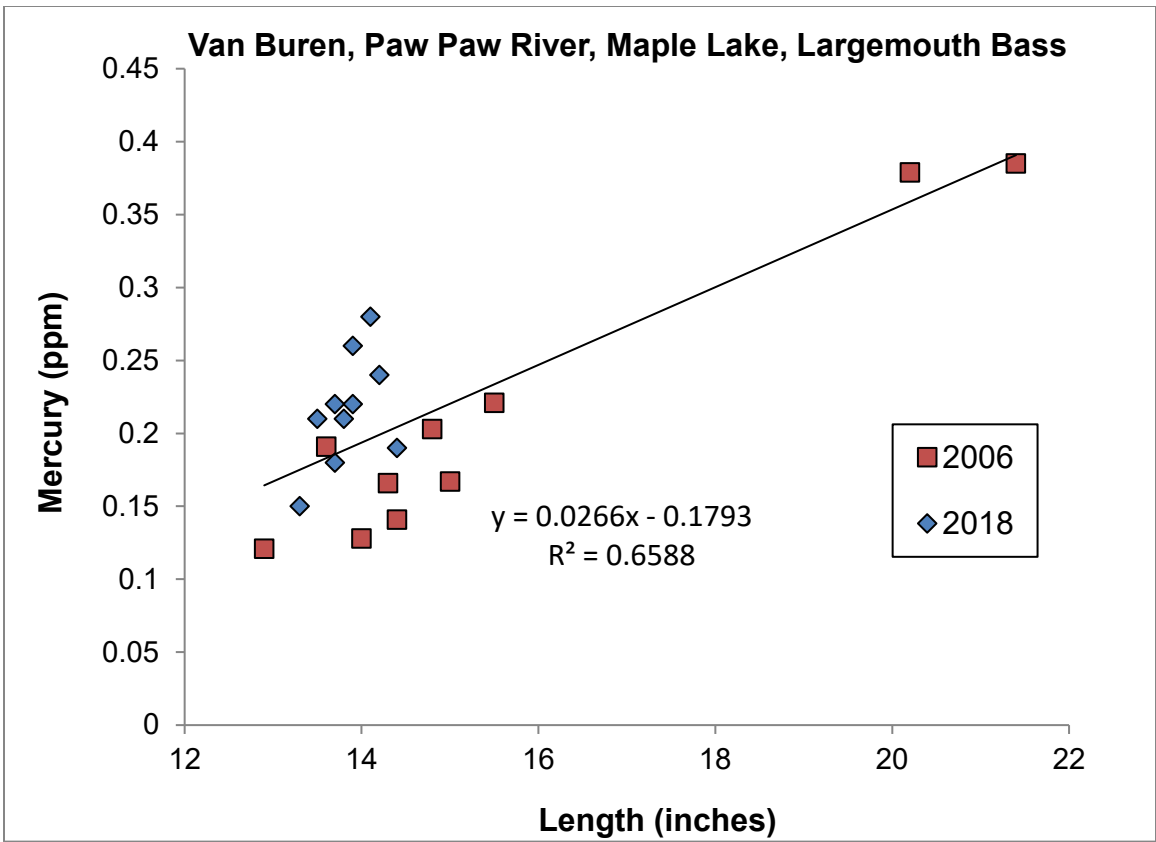
Organics Analysis:

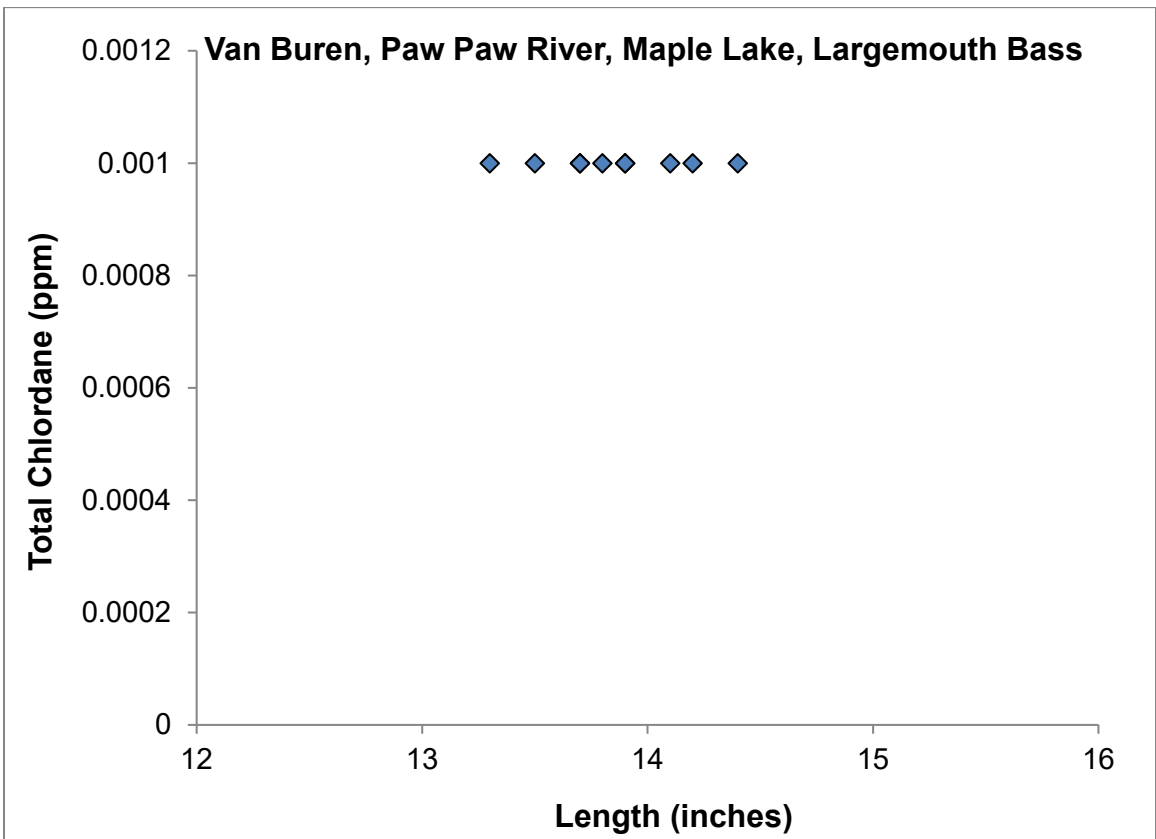
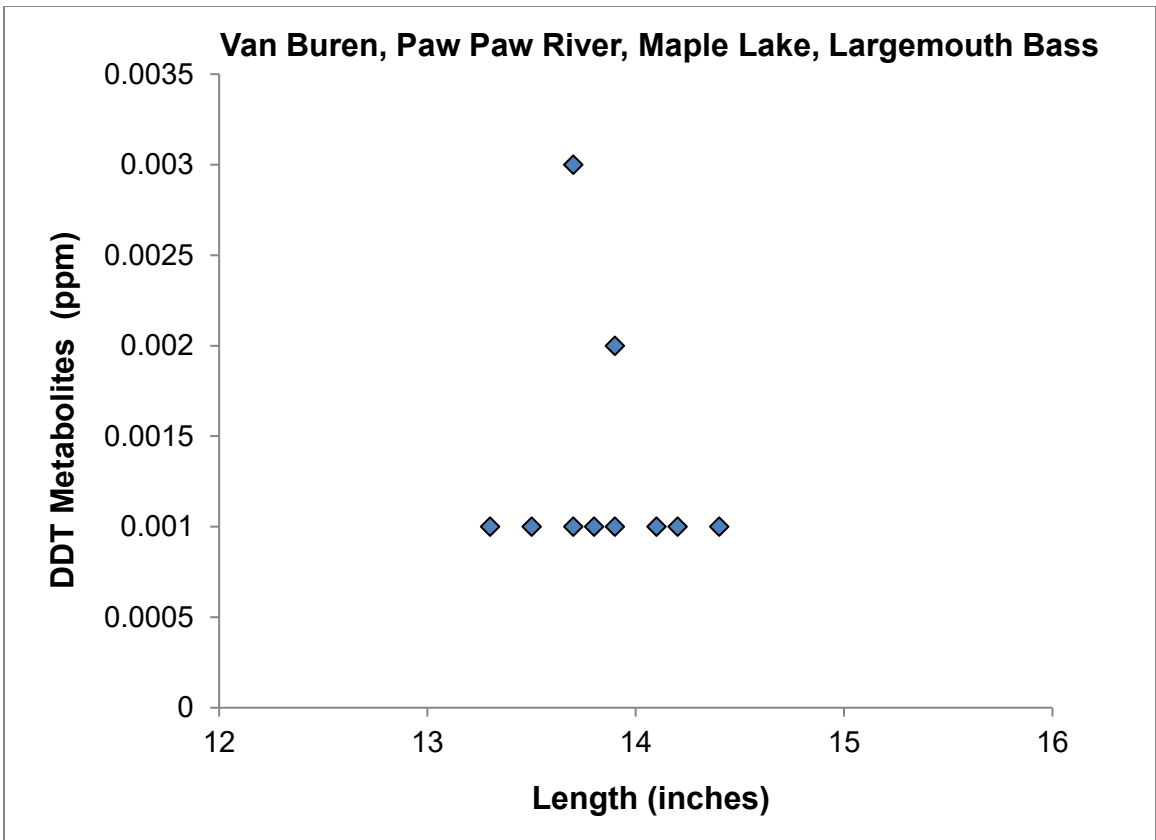
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2018	2018	10	13.3	14	13.5	14.4
Datasets available: 2018						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	9	0.01	0.002	0.02	0.02	12
DDT	9	0.001	< 0.001	0.003	0.002	16
Chlordane	9	0.001	< 0.001	0.001	0.001	--
Toxaphene	9	ND	< 0.05	< 0.05	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	0.112	0.050				
DDT	0.016	0.013				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						4

Existing MDHHS Advisory: No one should eat more than 4 meals per month of Maple Lake smallmouth or largemouth bass smaller than 18 inches or more than 2 meals per month of those fish larger than 18 inches due to mercury.

Recommendation: No change is recommended. PCBs would cause an advisory.

Length (Inches)	Hg Regression Equation Estimate (ppm)	Meal Category
12	0.14	4
14	0.19	4
15	0.22	4
16	0.25	4
18	0.3	2
20	0.35	2
22	0.41	2
<i>Shaded area denotes extrapolated estimates</i>		





Northern Pike

North Scott Lake

Van Buren County

Hg Analysis:

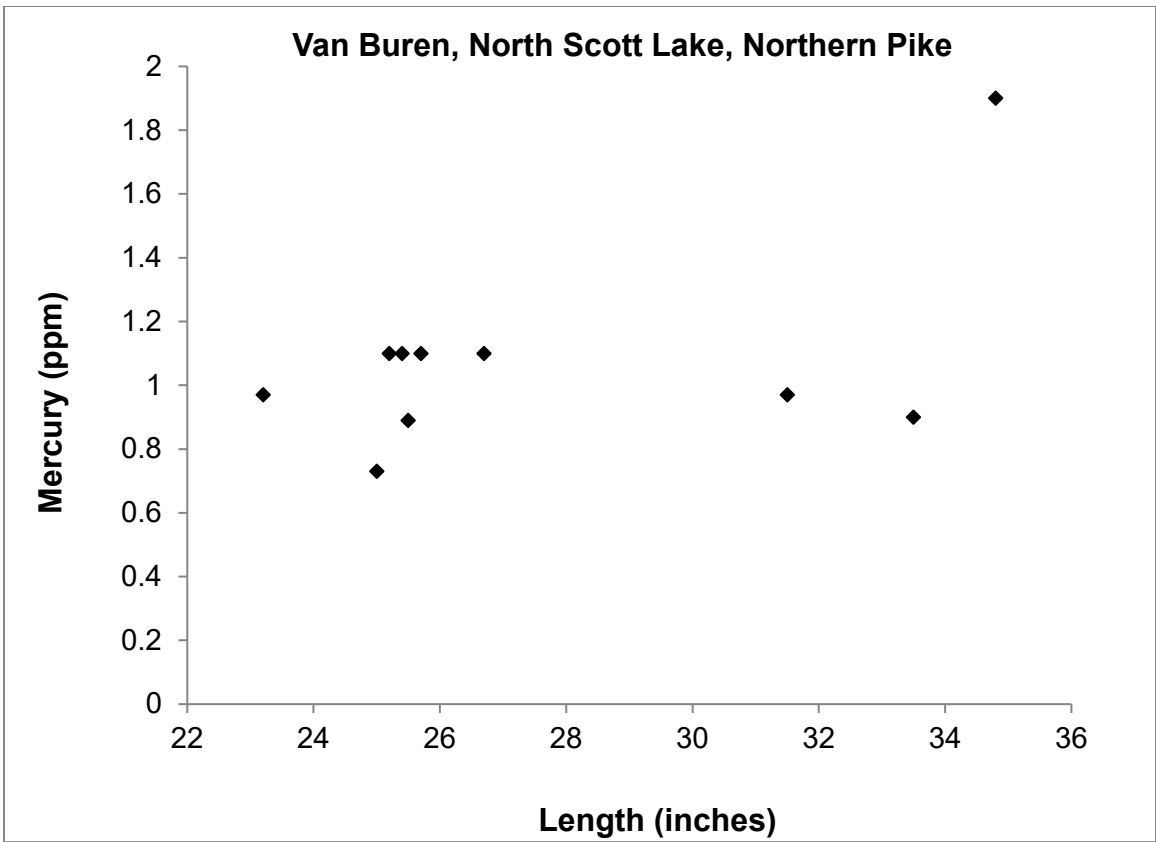
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2013	2013	10	23.2	24	25	34.8
Datasets available: 2013						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	9	1.1	0.73	1.9	1.34	0.5
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.280	0.231				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
--	--	0	--	--	--	--
Datasets available: --						
Chemical	Sample Size (Legal)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	--	--	--	--	--	--
DDT	--	--	--	--	--	--
Chlordane	--	--	--	--	--	--
Toxaphene	--	--	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						0.5

Existing Advisory: North Scott Lake northern pike are covered under the Statewide Guidelines. No one should eat more than 2 meals per month of northern pike under 30 inches or more than 1 meal per month of those fish over 30 inches in length due to mercury.

Recommendation: No one should eat more than 6 meals per year of North Scott Lake northern pike due to mercury.



Northern Pike

Rush Lake

Van Buren County

Hg Analysis:

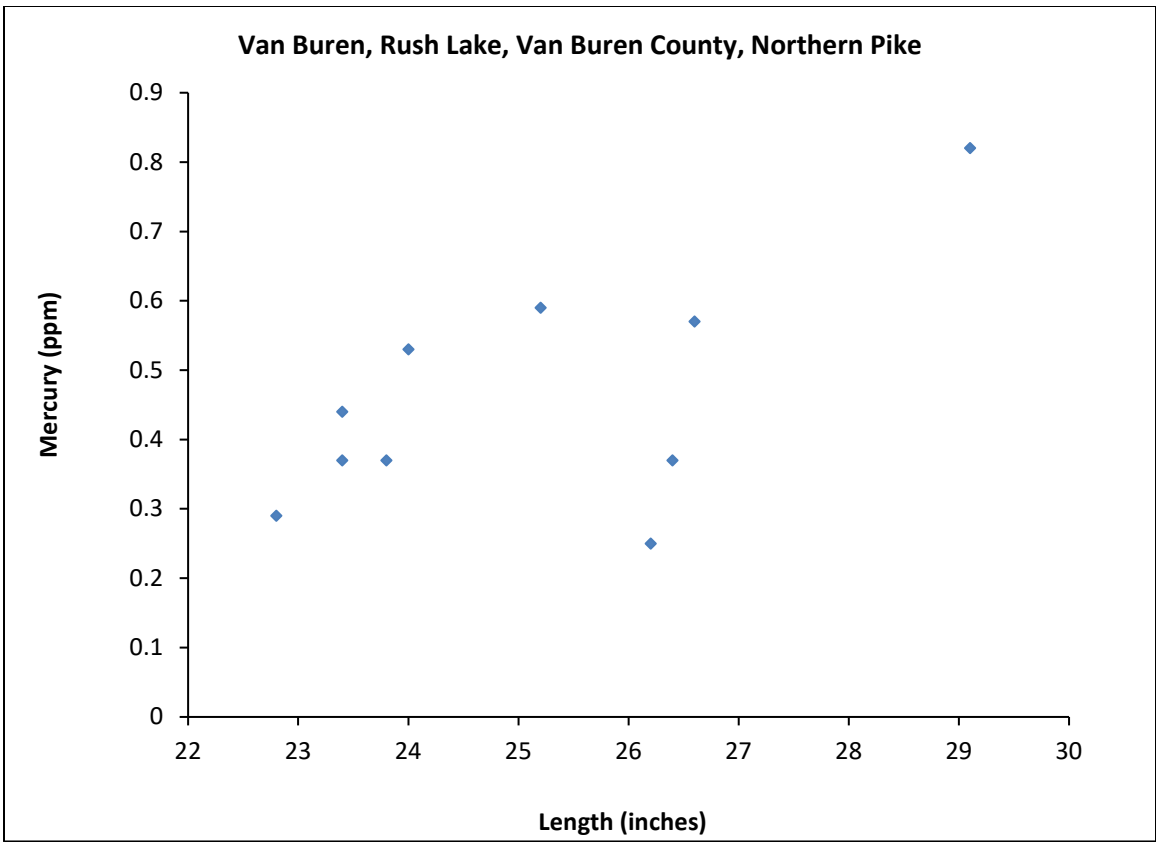
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2004	2004	10	22.8	24	23.8	29.1
Datasets available: 2004						
Chemical	Sample Size (All)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	7	0.50	0.25	0.82	0.67	1
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.388	0.273				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
--	--	0				
Datasets available: --						
Chemical	Sample Size (All)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						1

Existing Advisory: Rush Lake northern pike are covered under the statewide mercury consumption advisory.

Recommendation: No one should eat more than 1 meal per month of Rush Lake northern pike less than 30 inches or 6 meals per year of those greater than 30 inches due to mercury. Statewide length break added.



Northern Pike

Three Mile Lake

Van Buren County

Hg Analysis:

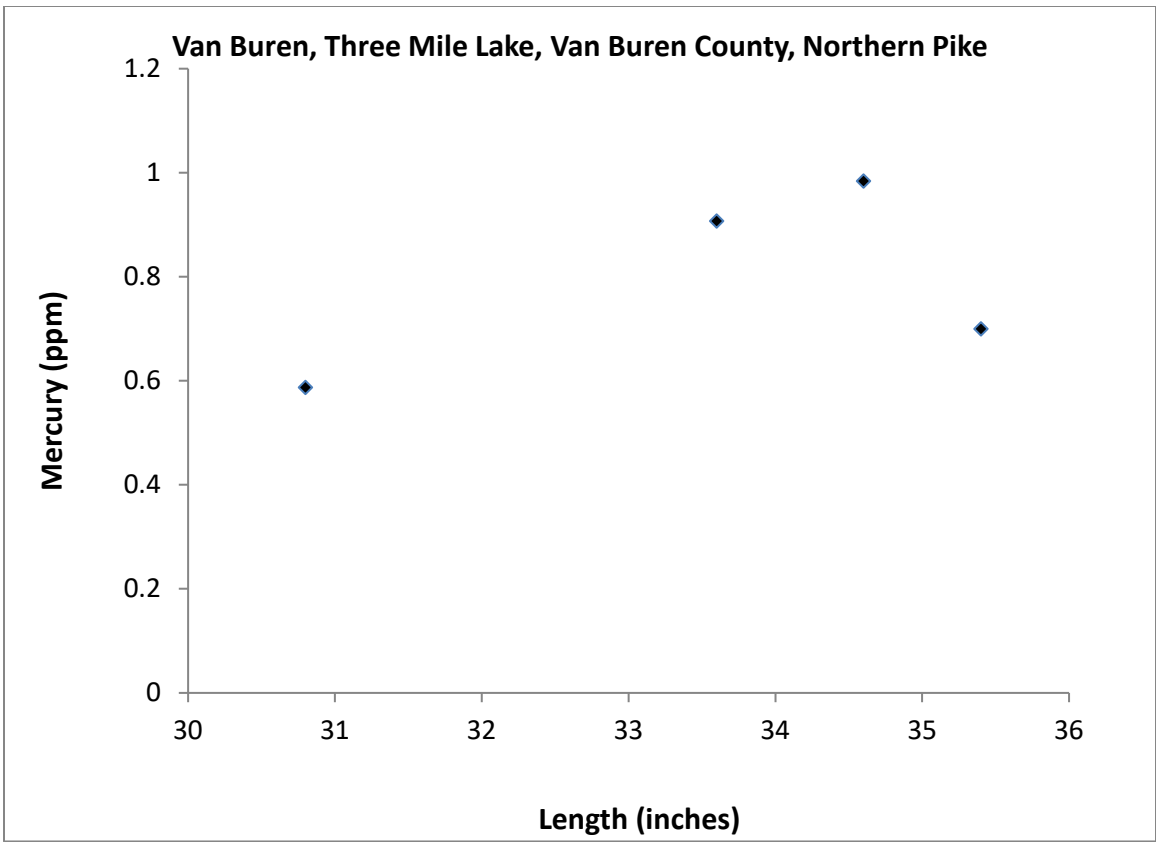
Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2007	2007	4	30.8	24	30.8	35.4
Datasets available: 2007						
Chemical	Sample Size (All)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	4	0.80	0.59	0.98	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	--	--				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
--	--	0				
Datasets available: --						
Chemical	Sample Size (All)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						--

Existing Advisory: Three Mile Lake northern pike are covered under the statewide mercury consumption advisory.

Recommendation: Insufficient sample size to set a waterbody-species specific guideline. Statewide guidelines apply, that recommend no one should eat more than 1 meal per month of Three Mile Lake northern pike larger than 30 inches or more than 2 meals per month of those fish smaller than 30 inches in length.



Northern Pike

Van Auken Lake

Van Buren County

Hg Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
2004	2004	10	23.8	24	23.8	26.4
Datasets available: 2004						
Chemical	Sample Size (All)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
Mercury	10	0.37	0.14	0.56	0.47	2
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
Mercury	0.000	0.003				

Organics Analysis:

Range of Years Used		N (All)	Overall Min Length	Legal Min (Inches)	Range of Legal Sized Samples	
Earliest	Most Recent				Min	Max
--	--	0				
Datasets available: --						
Chemical	Sample Size (All)	Mean (ppm)	Min. Conc. (ppm)	Max Conc. (ppm)	95%UCL (ppm)	Meal Category
PCB	0	--	--	--	--	--
DDT	0	--	--	--	--	--
Chlordane	0	--	--	--	--	--
Toxaphene	0	--	--	--	--	--
Chemical	Linear Regression	Exponential Regression				
	R ²	R ²				
PCB	--	--				
DDT	--	--				
Chlordane	--	--				
Toxaphene	--	--				
Final meal category based on UCL:						2

Existing Advisory: Women and children should eat no more than one meal per month of Van Auken Lake northern pike larger than 26 inches in length or more than 1 meal per week of those fish smaller than 26 inches due to mercury.

Recommendation: No one should eat more than 1 meal per month of Van Auken Lake northern pike larger than 30 inches or more than 2 meals per month of those fish smaller than 30 inches due to mercury. Statewide length break applied.

