

Fish Consumption BUI Assessment for Toronto AOC

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November 2016



Acknowledgements

Rex Tang, U of Windsor

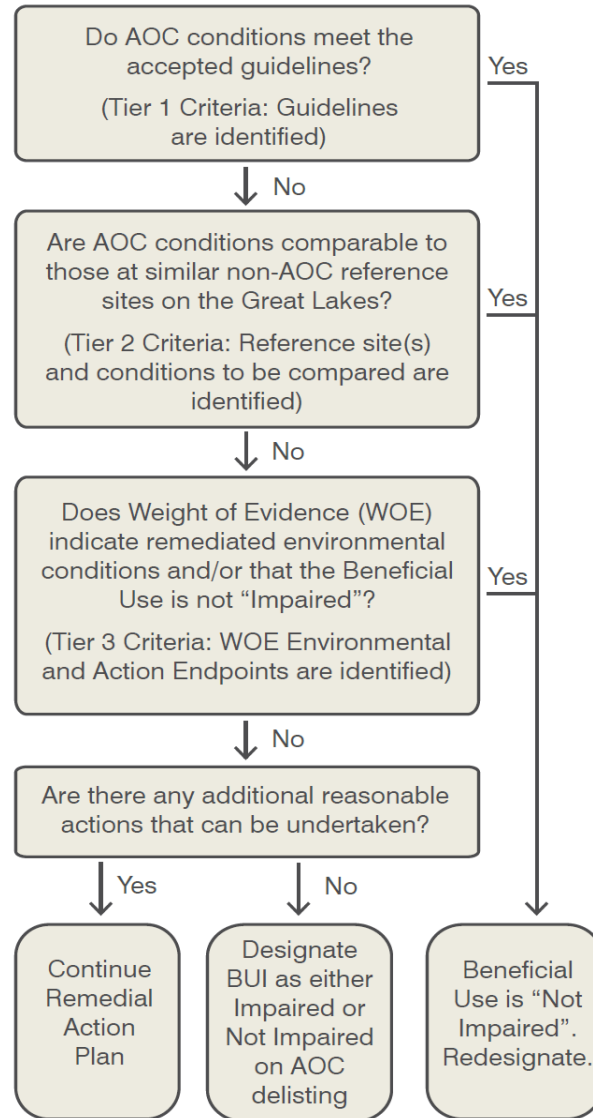
Margaret Neff, U of Toronto, MOECC

Ken Drouillard, U of Windsor

Donald Jackson, U of Toronto

Jennifer Robinson, U of Toronto

BUI Assessment Framework (TO AOC)



Data Source

- * Ontario's Fish Contaminant Monitoring Program
- * Monitors contaminants
 - * in Sport fish & Juvenile fish
 - * Since 1970s
 - * Various contaminants
 - * Partnership with MNRF
 - * >2300 locations across Ontario and Canadian Great Lakes
- * Assesses health risk
 - * Partnership with Health Canada
 - * Develop fish advisories based on most restrictive contaminant
- * Communicates risk to stakeholders

Contaminants considered

- * **PCB**

- * including dioxin-like PCBs

- * **Mercury**

- * Dioxins/furans

- * DDT

- * Toxaphene

- * Mirex, photomirex

- * Chlorinated phenols

- * Chlorinated benzenes

- * Other pesticides

- * PAHs

- * Emerging contaminants

Advisory benchmarks (2015)

Meals per month	Hg (ug/g)		PCB	Dioxin/Furan/ dlPCB TEQ	Mirex	Photomirex	Toxaphene
	Sensitive	General	ng/g	pg/g	ng/g	ng/g	ng/g
0	>0.5	>1.8	>844	>21.6	>657	>122	>1877
1			422-844	10.8-21.6	329-657	61-122	939-1877
2		1.2-1.8	211-422	5.4-10.8	164-329	31-61	469-939
4	0.25-0.5	0.6-1.2	105-211	2.7-5.4	82-164	15-31	235-469
8	0.16-0.25	0.4-0.6	70-105	1.8-2.7	55-82	10-15	156-235
12	0.12-0.16	0.3-0.4	53-70	1.3-1.8	41-55	8-10	117-156
16	0.06-0.12	0.15-0.3	26-53	0.7-1.3	21-41	4-8	59-117
32	<0.06	<0.15	<26	<0.7	<21	<4	<59

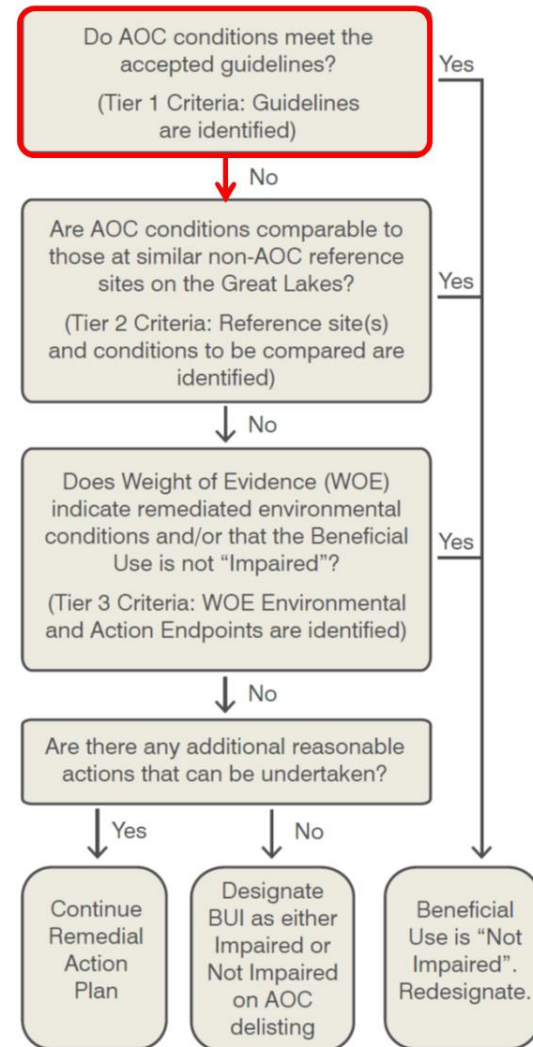
Advisory categories and classification

General Population		Sensitive Population	
Meals per month	Classification	Meals per month	Classification
0	Do not eat	0	Do not eat
1	Partially restricted	4	Partially restricted
2			
4			
8	Not considered restrictive (Unrestricted)	8	Not considered restrictive (Unrestricted)
12		12	
16		16	
32		32	

Framework Application: Tier 1

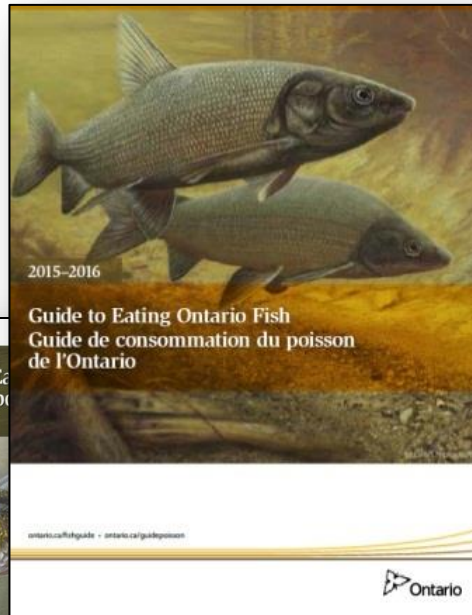
Length • Longueur

	15	20	25	30	35	40	45	50	55	60	65	70	75+cm
	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"	26"	28"	30"
Lake Ontario 4a - Toronto Waterfront Area • Lac Ontario 4a - Secteur riverain de Toronto													
nearshore area from the west side of Humber Bay Park to the east side of Ashbridges Bay Park • zone littorale entre le secteur ouest du parc Humber Bay et le secteur est du parc Ashbridges Bay													
Bluegill ^{1,2}	16												
Crapet arlequin ^{1,2}	16	12											
Brown Bullhead ^{1,2}	32	16	12	8									
Barbotte brune ^{1,2}	32	16	12	8									
Brown Trout ^{2,3}		12	8	4		2			1			0	
Truite brune ^{2,3}		12	8	4					0				
Coho Salmon ²									0				
Saumon coho ²									0				
Common Carp ^{2,3}					2				0				
Carpe ^{2,3}									0				
Freshwater Drum ^{1,2}								1					
Malachigan ^{1,2}								0					
Gizzard Shad ²					0								
Alose à gésierée ²					0								
Lake Trout ^{2,13}			1						0				
Truite de lac ^{2,13}									0				
Lake Whitefish ²			1		0								
Grand corégone ²					0								
Largemouth Bass ^{1,2}	16			12		8	4						
Achigan à grande bouche ^{1,2}	16	8		4		0							
Northern Pike ^{1,2}						16				12		4	
Brochet ^{1,2}						16			12	8		4	
Pumpkinseed ¹	16												
Crapet-soleil ¹	12												
Rainbow Smelt ²	1	0											
Eperlan arc-en-ciel ²	0												
Rainbow Trout ²		2		1	0								
Truite arc-en-ciel ²					0								
Redhorse Sucker ²							2	1					
Succeur rouge ²							0						
Rock Bass ^{1,2}	16	12											
Crapet de roche ^{1,2}	16	12											
Round Whitefish ²				2	1	0							
Ménomini rondeee ²						0							
Walleye ^{1,2}										12	8	4	
Doré ^{1,2}										4		0	
White Bass ^{1,2}			0										
Bar blanc ^{1,2}			0										
White Perch ²	4	1											
Bar-perche ²	4	0											
White Sucker ²	16	12	8		4			2					
Meunier noir ²	16	12	8		4			0					
Yellow Perch ^{1,2}	32	16	12										
Perchaude ^{1,2}		16	4										



Guide to Eating Ontario Fish

www.ontario.ca/fishguide

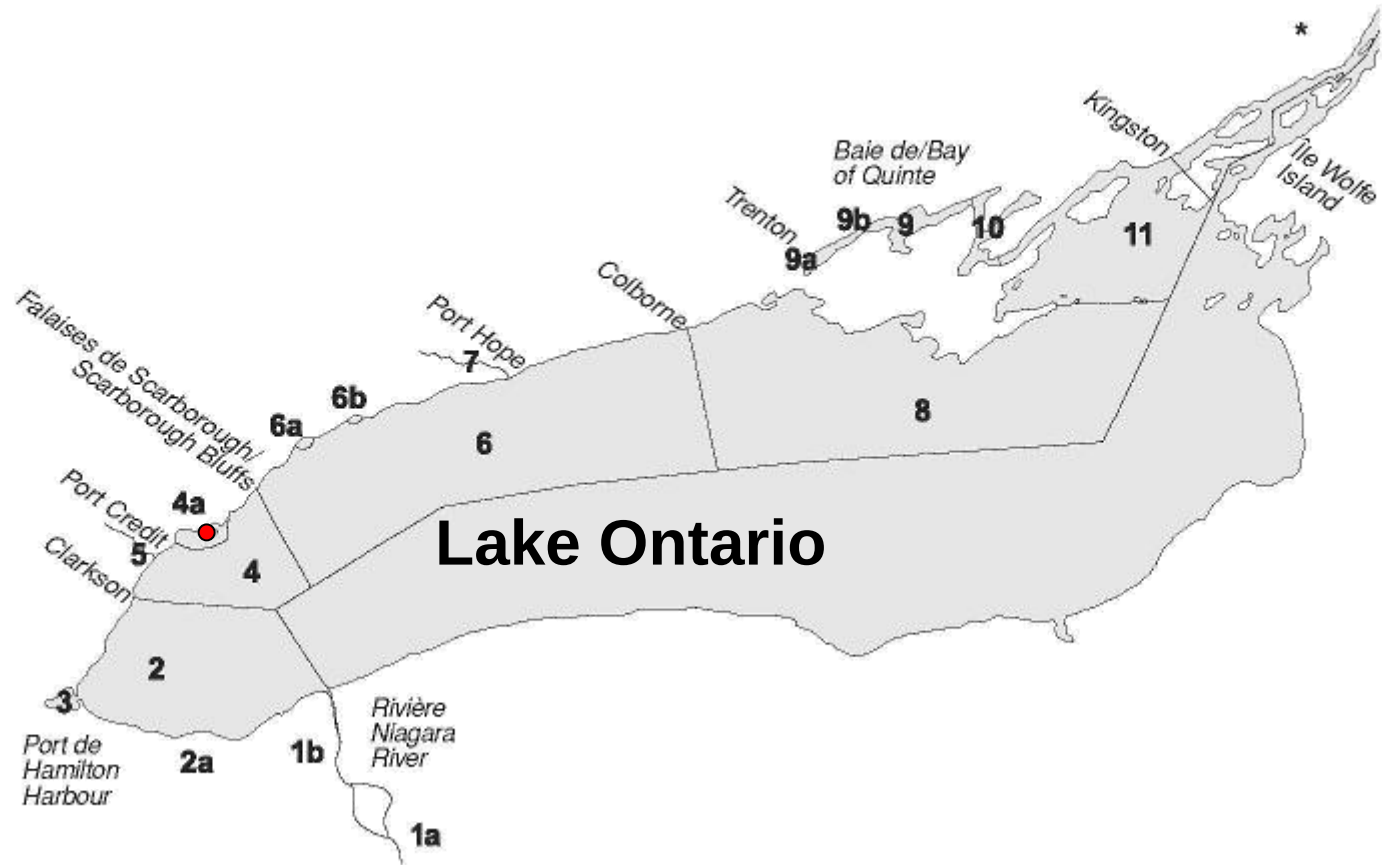


2013-2014
Guide to Eating Ontario Fish

2011-2012
Guide to Eating Ontario Fish



Lake Ontario advisory blocks



● Toronto Waterfront

Recent advisories: AOC vs Ref (2005+)

Bluegill

General Population														
Species	Location	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75+
Bluegill	02a - Jordan Harbour	12												
	02z - Martindale Pond	32												
	03 - Hamilton Harbour	4												
	04a - Humber Bay	16	12											
	04a - Tommy Thompson Park	16	12											
	04a - Toronto Waterfront Area	16	12											
	08x - Presquile Bay	32												
	09 - Upper Bay of Quinte	32	16											
	09a - U. B. Quinte - Trenton	16												
	09b - U B of Q Belleville	16												
	10 - Deseronto	4												
	10 - Middle B of Q	4												

Sensitive Population														
Species	Location	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75+
Bluegill	02a - Jordan Harbour	4												
	02z - Martindale Pond	16												
	03 - Hamilton Harbour	4												
	04a - Humber Bay	12	8											
	04a - Tommy Thompson Park	12	8											
	04a - Toronto Waterfront Area	12	8											
	08x - Presquile Bay	16												
	09 - Upper Bay of Quinte	16	12											
	09a - U. B. Quinte - Trenton	16												
	09b - U B of Q Belleville	16												
	10 - Deseronto	4												
	10 - Middle B of Q	4												

Recent advisories: AOC vs Ref (2005+)

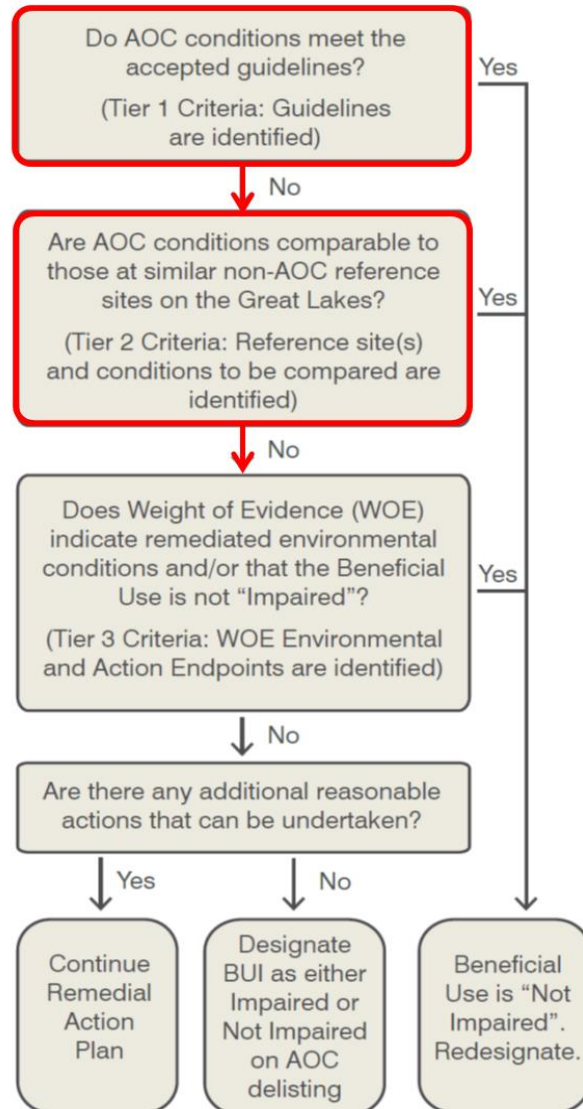
■ Unrestricted

■ Restricted but comparable

■ More restrictive

		General Population													Sensitive Population												
Sp	Location	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75+	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75+
Northern Pike	01a - Upper Niagara River					32	32	16	16	16	16								16	16	12	8	8	4			
	01b - Lower Niagara River								12	12	12	12	8	8								12	8	8	8	8	4
	02z - Martindale Pond					32	32	32	8	4	4	4							16	16	12	8	4	4	4		
	03 - Hamilton Harbour								4	4	4	4	4	4								4	4	4	4	4	
	04 - Toronto Offshore Area			8	8	8	8	8	8	8	8	8	8	8			8	8	8	8	8	8	8	8	8	8	4
	04a - Humber Bay		16	16	16	12	12	12	12	8	8	8	8	4		16	16	16	12	12	12	12	8	8	8	8	4
	04a - Tommy Thompson Park		16	16	16	12	12	12	12	8	8	8	8	4		16	16	16	12	12	12	12	8	8	8	8	4
	04a - Toronto Waterfront Area		16	16	16	12	12	12	12	8	8	8	8	4		16	16	16	12	12	12	12	8	8	8	8	4
	06a - Frenchman Bay						16	12	12	12	8	8	8	8						16	12	12	12	8	8	8	4
	06b - Whitby Harbour				4	4	4	4	4	4	4	4	4	4					4	4	4	4	4	4	4	4	4
	06w - Oshawa Harbour		32	32	32	32	16	16	16	16	16					16	16	16	12	12	8	8	8	4			
	06x - McLaughlin Bay								8	8	8	8	8	8													
White Sucker	06y - Westside Marsh									16	16											8	8	4			
	06z - Bowmanville Creek Marsh							16	12	8	8	4	4								8	8	4	4	4	4	
	08y - West Lake				32	16	16	16	12	12	8	8	8	8					12	8	8	4	4	4	0	0	0
	08z - East Lake						16	12	12	8	8	4	4								8	4	4	4	0	0	0
	09 - Upper Bay of Quinte					32	32	16	16	16	16	16	12	8					16	12	12	8	8	4	4	4	0
	10 - Deseronto						16	16	16	16	16	16	12	8						8	8	4	4	4	4	4	4
	10 - Middle B of Q						16	16	16	16	16	12	8	8						8	8	4	4	4	4	4	4
	11 - L B of Q/ELO								16	16	12	12	8	4								8	4	4	4	4	4
	01a - Upper Niagara River		32	16	16	12	8	8									32	16	16	12	8	8					
	02z - Martindale Pond					12													8								
	03 - Hamilton Harbour						2	2												0	0						
	04 - Toronto Offshore Area		16	12	12	8	8	4	4	4	4					16	12	12	8	8	4	4	4	4			
	04a - Humber Bay		16	12	8	4	4	4	2	2	2					16	12	8	4	4	4	0	0	0			
	04a - Tommy Thompson Park		16	12	8	4	4	4	2	2	2					16	12	8	4	4	4	0	0	0			
	04a - Toronto Waterfront Area		16	12	8	4	4	4	2	2	2					16	12	8	4	4	4	0	0	0			
	06 - Northwestern Lake Ontario			16	16	16	12	12	12								16	16	16	12	12	12					
	06a - Frenchman Bay			32	16	12	8	8	4								32	16	12	8	8	4					
	06b - Whitby Harbour			16	8	4	4	2	2								16	8	4	4	0	0					
	06w - Oshawa Harbour				16																						
	06z - Bowmanville Creek Marsh						4													4							
Common Carp	01a - Upper Niagara River							4	4	4	4	4	4	4							4	4	4	4	4	4	4
	01b - Lower Niagara River							4	4	4	2	2	1	0							4	4	4	0	0	0	0
	02a - Jordan Harbour				16	8	8	8	8	4	4	4							16	8	8	8	4	4	4	4	0
	02z - Martindale Pond							4	4	2	2	2	1	0							4	4	0	0	0	0	0
	03 - Hamilton Harbour					2	2	2	1	1	1	1	1	0						0	0	0	0	0	0	0	0
	04 - Toronto Offshore Area					12	8	4	4	2	2	1	1	0					12	8	4	4	0	0	0	0	0
	04a - Humber Bay						0	0	0	0	0	0	0	0							0	0	0	0	0	0	0
	04a - Tommy Thompson Park						0	0	0	0	0	0	0	0							0	0	0	0	0	0	0
	04a - Toronto Waterfront Area						0	0	0	0	0	0	0	0							0	0	0	0	0	0	0
	05z - Rattray Marsh						16	8	4	4	4	2									16	8	4	4	4	0	0
	06a - Frenchman Bay							4	2	2	1	1	0	0							4	0	0	0	0	0	0
	06b - Whitby Harbour		16	12	4	4	2	2	1	1	1	0	0	0			16	12	4	4	0	0	0	0	0	0	0
	06w - Lynde Creek Marsh									1	1	1	1	0								0	0	0	0	0	0
	06w - Oshawa Harbour		32	32	16	12	8	4	4	4	2	2	2	2			32	32	16	12	8	4	4	0	0	0	0
	06x - McLaughlin Bay							4	4	4	4	4	4	4							4	4	4	4	4	4	0
	06y - Westside Marsh		32	32	32	32	32	32	32	32						32	32	32	32	32	16	16	16	16			

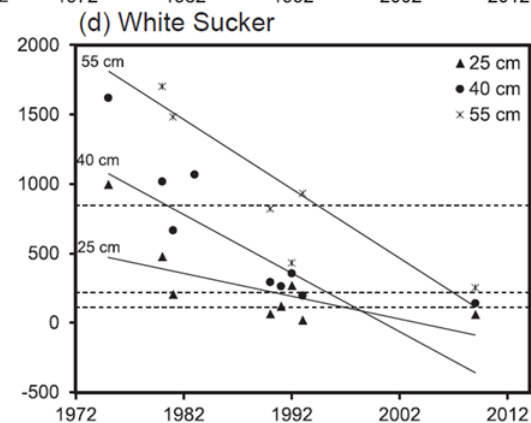
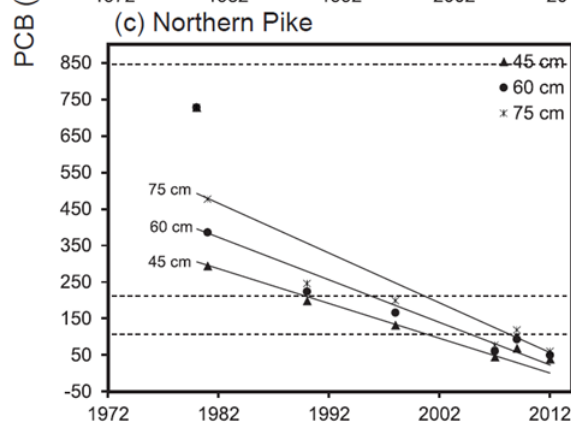
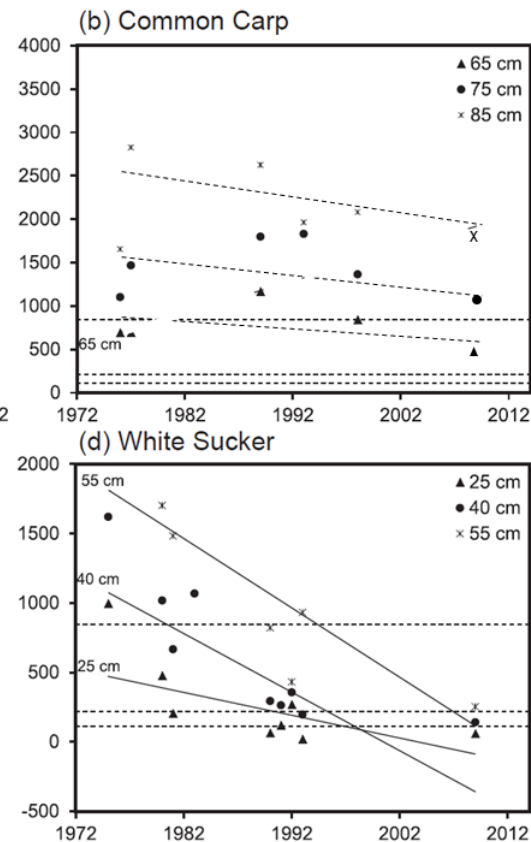
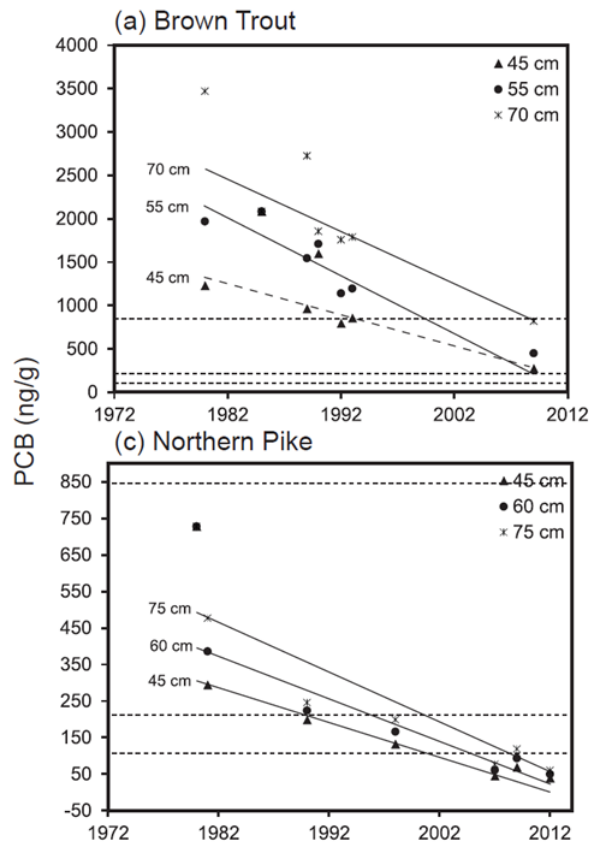
Framework Application: Tier 2



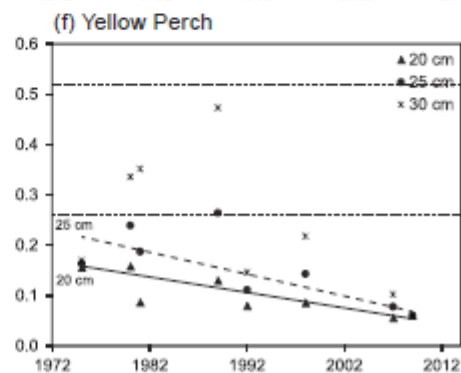
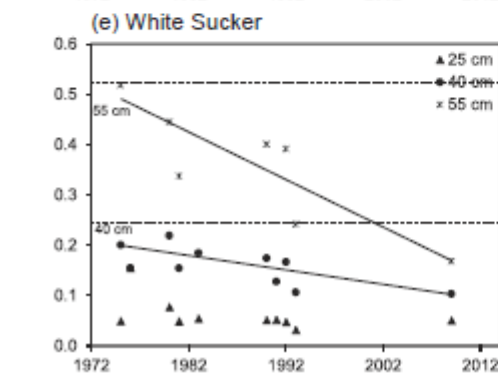
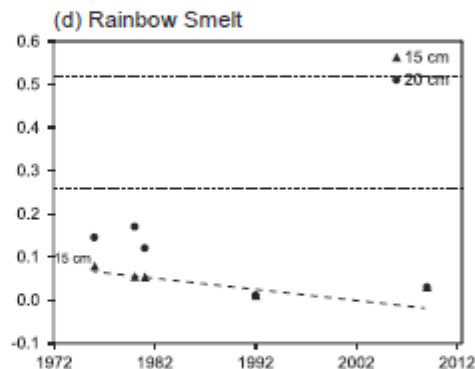
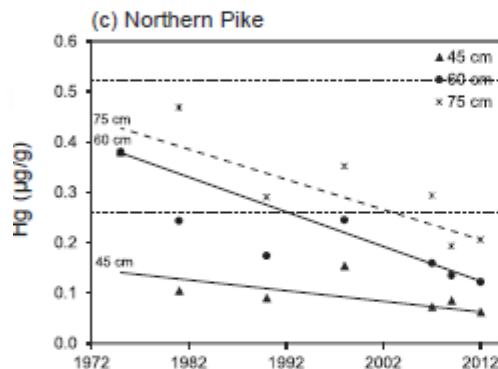
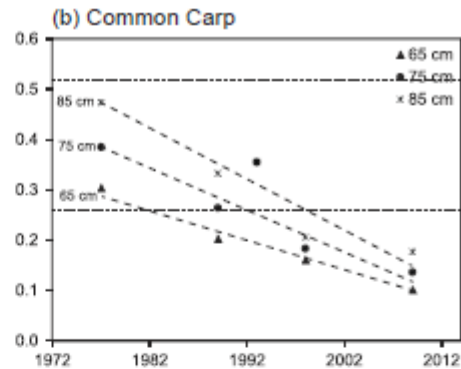
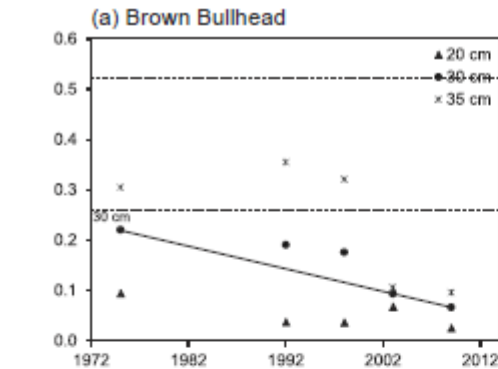
Weight of Evidence Assessment

- Fish Contaminant trends for the AOC
- Time to reach target
- PCB in sediment
- Levels and trends for Young-of-the-Year (YOY) or forage fish
- Possible changes in food web structure
- Rate of fish consumption
- Preferred species for consumption
- Risk communication

Temporal trends for AOC: PCB



Temporal trends for AOC: Mercury



Time to reach target

PCB levels in all species and all sizes examined, with an exception of Brown Trout, are estimated to be within the “unrestricted” advisory category (<105 ng/g) within 8-14 years.

However, Brown Trout will require approximately 26 years to decline to these desired levels.

Weight of Evidence (WoE): Tier 3

positive

Favours “Not Impaired”

neutral

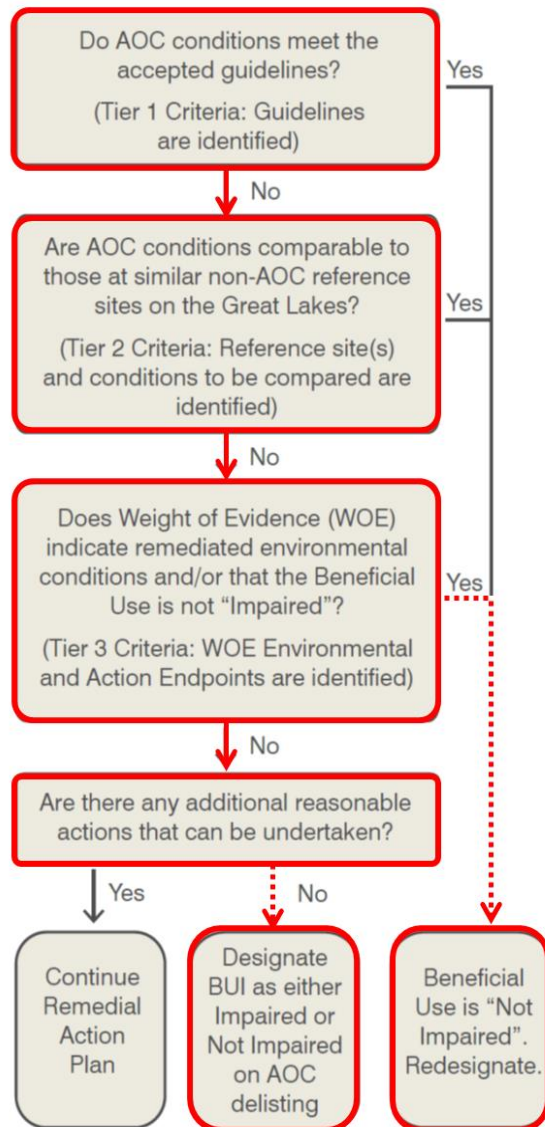
Not conclusive – Requires further assessment

negative

Favours “Impaired”

Quantitative Measures	Qualitative measures
Fish Contaminant trends for the AOC	Preferred species for consumption
Levels and trends for contaminant in forage fish from the GTA tributaries	Risk communication
Projected time for contaminant levels in fish to decline to reference/target levels	Possible changes in AOC food web structure & impact on contaminant accumulation in fish
Rate of fish consumption for the area	
Contaminant levels and trends for the AOC sediments	

Framework Application: Tier 3



Outcome and next steps

- Consumption of most resident fish species → “Not Impaired”
- Continued high PCB in Carp and larger sizes of White Sucker → consumption remains impaired
- Take a precautionary approach → consider the BUI “requires further assessment”
- Gather new data in 2017/18 to ensure continued declines in fish contaminant levels and improvements in the advisories
- Examine if there is any additional action that can be undertaken to improve the BUI
- Gather the most up-to-date information on potential contaminant loading to the AOC from the major tributaries

