



Fish Consumption Restrictions Advisory Rating Scale

Formerly Indicator # 4201

Overall Assessment

Status: Fair

Trend: Undetermined

Rationale: **U.S. Overall Average Score – 4.02, Ontario MOE Overall Average Score – 3.74.** The Fish Consumption Advisory Rating Scale Indicator was created to categorize the different levels of risk to sensitive populations (children under 15 and women of child bearing age) from consuming certain fish species in each of the Great Lakes. The Indicator involves a five-level, Consumption Advisory Rating Scale that corresponds to the current contaminant levels in Great Lakes fish. Protective measures associated with each consumption advisory rating scale allows a flexible, graduated and appropriate response to the level of risk from consumption. The information used to conduct this analysis demonstrates that there are consumption advisories in all of the Great Lakes for a variety of species of fish that are driven by PCBs, mercury, dioxin, chlordane, mirex and toxaphene (Table 1). The level of the advisory varies according to the species, size and location of the fish. The average score for Lake Trout and Walleye (Lake Erie) (Figure 1 & 2) in the Great Lakes basin falls into the one meal per month to six meals per year category (Tables 2 & 3). Some locations and size classes allow for unlimited or 1 meal per week consumption of these fish while others are under do not eat advisories. Contaminant trends cannot be identified through this type of assessment.

Lake-by-Lake Assessment

Lake Superior

Status: Fair

Trend: Undetermined

Rationale: **U.S. Lake Average Score - 2.67, Ontario MOE Lake Average Score - 2.81.** The U.S. States of Minnesota, Wisconsin, and Michigan and the Province of Ontario issue consumption advice for fish from the waters of Lake Superior. Advisories in Lake Superior are driven by PCBs, dioxin, mercury, chlordane, and toxaphene with PCBs continuing to be the largest contributor (Table 1). Lake Superior fish consumption advisories for Lake Trout range between unrestricted or 1 meal per week for some small fish to do not eat for some large fish (Tables 2 & 3).

Lake Michigan

Status: Fair

Trend: Undetermined

Rationale: **U.S. Lake Average Score – 3.95.** The U.S. States of Michigan, Wisconsin, Illinois, and Indiana issue consumption advice for fish consumed from the waters of Lake Michigan. Advisories in Lake Michigan are driven by PCBs and chlordane with PCBs continuing to be the largest contributor (Table 1). Lake Michigan fish consumption advisories for Lake Trout range from 1 meal per month to do not eat (Tables 2 & 3).

Lake Huron

Status: Poor to Fair

Trend: Undetermined

Rationale: **U.S. Lake Average Score – 5, Ontario MOE Lake Average Score - 3.70.** The U.S. State of Michigan and the Province of Ontario issue consumption advice for fish consumed from the waters of Lake Huron. Advisories in Lake Huron are driven by PCBs, dioxin, and mercury with PCBs continuing to be the largest contributor (Table 1). Lake Huron fish consumption advisories for Lake Trout range between unrestricted or 1 meal per week in small fish to do not eat in large fish (Tables 2 & 3). Please note that a far less diverse data set was used in the creation of a lake average, for the U.S., due to the fact that only the state of Michigan borders Lake Huron.

Lake Erie

Status: Fair

Trend: Undetermined

Rationale: **U.S. Lake Average Score - 3.5, Ontario MOE Lake Average Score – 3.74 (Lake Trout) 1.86 (Walleye).** The U.S. States of Michigan, Ohio, and Pennsylvania and the Province of Ontario issue consumption advice for fish consumed from the waters of Lake Erie. Advisories in Lake Erie are driven by PCBs, dioxin, and mercury with PCBs continuing to be the largest contributor (Table 1). Lake Erie fish consumption advisories for Lake Trout in both the U.S. and Canada range between the 1 meal per month advice category to 6 meals per year (Tables 2 & 3).

Lake Ontario

Status: Poor

Trend: Undetermined

Rationale: **U.S. Lake Average Score – 5, Ontario MOE Lake Average Score 4.54.** The U.S. State of New York and the Province of Ontario issue consumption advice for fish consumed from the waters of Lake Ontario. Advisories in Lake Ontario are driven by PCBs, dioxin, mercury and mirex with PCBs continuing to be the largest contributor (Table 1). Lake Ontario fish consumption advisories for Lake Trout range between unrestricted or 1 meal per week for some small fish in Ontario to do not eat (Tables 2 & 3). Please note that a far less diverse data set was used in the creation of a lake average, for the U.S., due to the fact that only the state of New York borders Lake Ontario.

For more information on the fish consumption advice for species not included in this assessment, please visit:

<http://water.epa.gov/scitech/swguidance/fishshellfish/fishadvisories/states.cfm> or
www.ontario.ca/fishguide

Purpose

- To assess the restrictive nature of fish consumption advisories issued in the Great Lakes.
- To determine what contaminants are driving consumption advisories in the Great Lakes.
- To infer potential effects to human health through consumption of contaminated fish.
- The Fish Consumption Restrictions indicator is used in the Great Lakes indicators suite as an impacts indicator in the Human top level reporting category.

Ecosystem Objective

Fish in the Great Lakes ecosystem should be safe to eat and consumption should not be limited by contaminants of human origin. Reductions in the number and severity of fish consumption restrictions will reflect an improvement in environmental quality and the potential for reduced exposure to contaminants from consumption of Great Lakes fish. This indicator supports Annexes 1, 2 and 12 of the GLWQA.

Ecological Condition

History and Background

Since the 1970s, there have been declines in the levels of many PBT chemicals in the Great Lakes basin due to bans on the use and/or production of harmful substances and restrictions on emissions. However, because of their ability to bioaccumulate and persist in the environment, PBT chemicals continue to be a significant concern. Historically, PCBs have been the contaminant that most frequently limited the consumption of Great Lakes sport fish. In some areas, dioxins/furans, mercury, and toxaphene (Lake Superior) do contribute to restrictive fish consumption advisories.

Annex 2 of the Great Lakes Water Quality Agreement (United States and Canada 1987) requires Lakewide Management Plans (LaMPs) to define "...the threat to human health posed by critical pollutants... including their contribution to the impairment of beneficial uses." Both the Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory (Great Lakes Sport Fish Advisory Task Force, 1993) and the Guide to Eating Ontario Sport Fish (OMOE 2007) are used to assess the status of the ecosystem by comparing contaminant concentrations in fish to levels that result in consumption advice. Contaminants upon which consumption advisories are based in Canada and the U.S. include PCBs, dioxin/furans, mercury, toxaphene, chlordane and mirex (Tables 2 & 3).

Contaminant concentrations in sport fish from both the OMOE program and the U.S. Great Lakes State programs determine the advised maximum consumption frequency of fish meals. Both countries calculate and issue their own advice (Tables 2 & 3). In 2009, the Great Lakes National Program Office's Great Lakes Fish Monitoring and Surveillance Program eliminated the sport fish analysis portion of its program and refocused its efforts on identifying emerging chemicals in whole fish. In lieu of trend monitoring data, both countries are presenting information on the number and level of Fish Consumption Advisories. The tracking of the number of advisories for common species, Lake Trout and Walleye, and chemicals over time will allow for sufficient identification of the status of the environment over time.

Measure

To numerically quantify fish consumption advisories in the Great Lakes, a metric was created that scores the level of advisories. Scores on a scale of 1 to 5 were given based on the level of consumption advisories for the sensitive population (women of child-bearing age and children under 15) across all size classes of Lake Trout in each state and province (Table 4). Lake Trout was chosen because it is a top predator fish and represents a 'worst case scenario' for fish consumption advisories. The average score across all states and provinces for a lake was used as the measure.

To increase uniformity between advisories issued by the states and Canada, advisories were broken down by fish length and scored in increments of 2". For states that do not specify a minimum or maximum class size in their advice, information was broken out into sizes according to that state's fish regulations between 6 and 30 inches.

The status of each lake was determined based on the average lakewide score. Good is a lakewide score of <2. Fair is a lakewide score of 2 to 4. Poor is a lakewide score >4. The target for this indicator is a lakewide score of 1 for each lake and for the entire Great Lakes basin, indicating that there are no fish consumption advisories.

Fish Consumption Restrictions in the Great Lakes

Fish consumption advisories for Lake Trout and Walleye in the Great Lakes range from unrestricted consumption to do not eat advisories. Although U.S. and Canadian data cannot be directly compared due to differences in the way consumption advisories are issued, they do follow similar patterns in terms of the levels of consumption restrictions in the individual Great Lakes. Consumption advisories for Lake Trout are most restrictive in Lakes Ontario and Huron and least restrictive in Lake Superior (Figures 1 & 2). All lakes have do not eat advisories for at least some size classes of Lake Trout.

Differences in advisories within and between lakes reflect different levels of contaminant concentration in the air and sediment as well as differences in sampling regimes and locations between the states and Ontario. PCBs continue to drive most fish advisories despite the fact that they were banned in the U.S. and Canada in the 1970s. This is likely due to large amounts of PCBs still persisting in the environment and being released from old electrical equipment. However, it is noteworthy that the PCB levels in Great Lakes fish have declined substantially since the 1970s (Figure 3).

Linkages

Fish consumption restrictions may be the result of pressures such as contamination in sediment, atmospheric deposition, pesticides in tributaries and industrial loadings. Contaminants from these sources bioaccumulate in fish and can result in restrictive fish consumption advisories. The number and level of restrictive fish consumption advisories may decrease over time as the result of sediment remediation and industrial efficiencies or may increase as a result of, for example, higher contaminant levels and/or changes in methods of calculating advisories (e.g., incorporation of new science on toxicity of contaminants).

Management Challenges/Opportunities

Health risk communication is a crucial component to the protection and promotion of human health in the Great Lakes. Enhanced partnerships between states and tribes involved in the issuing of fish consumption advice and U.S. EPA headquarters will improve U.S. commercial and non-commercial fish advisory coordination. In Canada, acceptable partnerships exist between the federal and provincial agencies responsible for providing fish consumption advice to the public.

At present, PCBs, mercury, and chlordane are the only PBT chemicals that have uniform fish advisory protocols across the U.S. Great Lakes basin. The Great Lakes Sport Fish Advisory Task Force is currently drafting additional uniform PBT advisories in order to limit confusion of the public that results from issuing varying advisories for the same species of sport fish across the basin.

In order to best protect human health, increased monitoring and reduction of PBT chemicals need to be made a priority. In particular, monitoring of contaminant levels in environmental media and biomonitoring of human tissues need to be addressed, as well as assessments of frequency and type of fish consumed. In addition, improved understanding of the potential negative health effects from exposure to PBT chemicals is needed.

Comments from the author(s)

Differences in the way consumption advisories are developed in the U.S. and Canada means that data cannot be directly compared between the two countries. Differences exist in terms of the contaminant concentrations used to determine consumption restrictions, the number of sample sites, frequency of sampling, and years of data that advisories are based on. For example, sample collection and release of advice for the Ontario MOE and the Great Lakes States may be on different schedules. Lake Trout were selected for this indicator as they are top predator fish and therefore reflect a 'worst case scenario' for fish consumption restrictions and are not representative of all fish. Collection and analysis, for both countries, are subject to availability of funds and change with time.

An increased focus on emerging chemicals is occurring in monitoring programs in the United States and Canada. While the Great Lakes National Program Office no longer collects or analyzes sport fish fillets, the Office has instituted an Emerging Chemicals Surveillance Program in whole fish that looks to identify the presence or absence of emerging chemicals of interest and will inform State monitoring and advisory programs. 2011 will be the first year of this program and results will be shared through various outlets, including SOLEC, as they are received.

The Ontario Ministry of the Environment continues to monitor contaminants of long term concern such as PCBs, dioxins/furans, mercury and organochlorine pesticides. Recently, the ministry has started analyzing some chemicals of emerging concern for the Great Lakes environment such as polybrominated diphenylethers (PBDEs), perfluorinated compounds (PFCs) and polychlorinated naphthalene (PCNs) in selected fish samples.

Assessing Data Quality

Insert "x" under the statement that best corresponds with each data characteristic

Data Characteristics	Strongly Agree	Agree	Neutral or Unknown	Disagree	Strongly Disagree	Not Applicable
1. Data are documented, validated, or quality-assured by a recognized agency or organization		X				
2. Data are traceable to original sources		X				
3. The source of the data is a known, reliable and respected generator of data		X				
4. Geographic coverage and scale of data are appropriate to the Great Lakes basin		X				

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5. Data obtained from sources within the U.S. are comparable to those from Canada					X	
6. Uncertainty and variability in the data are documented and within acceptable limits for this indicator report		X				
Clarifying Notes:						

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Information Sources

Sport Fish Consumption Advisory Programs

Minnesota Department of Health - <http://www.health.state.mn.us/divs/eh/fish/index.html>

Wisconsin Department of Natural Resources - <http://dnr.wi.gov/fish/consumption/>

Illinois Department of Public Health - <http://www.idph.state.il.us/envhealth/factsheets/fishadv.htm>

Indiana Department of Health - <http://www.idph.state.il.us/envhealth/factsheets/fishadv.htm>

Michigan Department of Community Health - http://www.michigan.gov/mdch/0,1607,7-132-54783_54784_54785--00.html

Ohio Environmental Protection Agency - <http://www.epa.state.oh.us/dsw/fishadvisory/index.aspx>

Pennsylvania Department of Environmental Protection - http://www.portal.state.pa.us/portal/server.pt/community/fish_consumption/10560

New York Department of Environmental Conservation - <http://www.dec.ny.gov/outdoor/7736.html>

Ontario Ministry of the Environment - www.ontario.ca/fishguide

Great Lakes Sport Fish Advisory Task Force. 1993. Protocol for a uniform Great Lakes sport fish consumption advisory. <http://fn.cfs.purdue.edu/anglingindiana/HealthRisks/TaskForce.pdf>, last accessed July 22, 2005.

United States and Canada. 1987. Great Lakes Water Quality Agreement of 1978, as amended by Protocol signed November 18, 1987. Ottawa and Washington. <http://www.on.ec.gc.ca/glwqa/>.

Bhavsar, S.P., D.A. Jackson, A. Hayton, E.J. Reiner, T. Chen, and J. Bodnar. 2007. Are PCB levels in fish from the Canadian Great Lakes still declining? *Journal of Great Lakes Research* 33(3): 592-605.

Stow, C.A., E.C. Lamon, S.S. Qian, and C.S. Schrank. 2004. Will Lake Michigan lake trout meet the Great lakes strategy 2002 PCB reduction goal? *Environmental Science & Technology* 38(2): 359-363.

List of Tables

Table 1. Contaminants on which the fish advisories are based on by lake for Canada and the United States.

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Source: Compiled by U.S. EPA, Great Lakes National Program Office

Table 2. Consumption limits set by the Guide to Eating Ontario Sport Fish (based on Health Canada TDIs).

* Women of childbearing age and children under 15

Source: Ontario Ministry of the Environment (2011)

Table 3. Consumption limits set by the Great Lakes Sport Fish Advisory Task force. *Women of childbearing age and children under 15

Source: Great Lakes Sport Fish Advisory Task Force (PCB Protocol 1993, Mercury Protocol 2007, Chlordane Discussion Paper)

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Source: U.S. State Consumption Advisory Programs. Compiled by U.S. EPA, Great Lakes National Program Office

Figure 2. Canada Fish Consumption Advisory Rating Scale

Source: Ontario Ministry of the Environment. Compiled by U.S. EPA, Great Lakes National Program Office

Figure 3. Long-term trends of total-PCB in Great Lakes lake trout. Data were adopted for skin-on lake trout fillets samples from Lake Michigan from Stow et al. 2004 and for skin-off lake trout fillet samples from the other lakes from Bhavsar et al. 2007.

Last Updated

State of the Great Lakes 2009 report

Lake	State/Province	Contaminants Responsible for Advisories*					
		PCB	Dioxin	Mercury	Chlordane	Mirex	Toxaphene
Superior	Michigan	x		x	x		
	Wisconsin	x	x	x			
	Minnesota	x		x			
	Ontario	x	x	x			x
Huron	Michigan	x	x				
	Ontario	x	x	x			
Erie	New York	x					
	Ohio	x					
	Pennsylvania	x					
	Michigan	x					
Ontario	Ontario	x	x			x	
	Ontario	x	x	x			
Michigan	Illinois	x			x		
	Michigan	x			x		
	Indiana	x					
	Wisconsin	x					

*Not all states/provinces issue advisories for all of the listed contaminants

Table 1. Contaminants on which the fish advisories are based on by lake for Canada and the United States.

Source: Compiled by U.S. EPA, Great Lakes National Program Office

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Advised meals per month		PCBs (ppm)		Mercury (ppm)		Chlordane (ppm)		Mirex (ppm)	
General	Sensitive*	General	Sensitive*	General	Sensitive*	General	Sensitive*	General	Sensitive*
8	8	<0.105	<0.105	<0.61	<0.26	<0.059	<0.059	<0.082	<0.082
4	4	0.105-0.211	0.105 - 0.211	0.61-1.23	0.26-0.52	0.059 - 0.117	0.059 - 0.117	0.082-0.164	0.082 - 0.164
2	Do not eat	0.211-0.422	>0.211	1.23-1.84	>0.52	0.117 - 0.235	>0.117	0.164-0.329	>0.164
1	Do not eat	0.422-0.844	>0.211	-	-	0.235 - 0.469	>0.117	0.329-0.657	>0.164
Do not eat	Do not eat	>0.844	>0.211	>1.84	>0.52	>0.469	>0.117	>0.657	>0.164
Advised meals per month		Photomirex (ppm)		Toxaphene (ppm)		PFOS (ppm)		Dioxin/DL-PCBs (ppt)	
General	Sensitive*	General	Sensitive*	General	Sensitive*	General	Sensitive*	General	Sensitive*
8	8	<0.015	<0.015	<0.235	<0.235	<0.080	<0.080	<2.7	<2.7
4	4	0.015-0.031	0.015 - 0.031	0.235-0.469	0.235 - 0.469	0.080 - 0.160	0.080 - 0.160	2.7 - 5.4	2.7 - 5.4
2	Do not eat	0.031-0.061	>0.031	0.469-0.939	>0.469	0.160 - 0.320	>0.160	5.4 - 10.8	>5.4
1	Do not eat	0.061-0.122	>0.031	0.939-1.877	>0.469	0.320 - 0.640	>0.160	10.8 - 21.6	>5.4
Do not eat	Do not eat	>0.122	>0.031	>1.877	>0.469	>0.640	>0.160	>21.6	>5.4

*Women of child-bearing age and children under 15.

Table 2. Consumption limits set by the Guide to Eating Ontario Sport Fish (based on Health Canada TDI's).

* Women of childbearing age and children under 15

Source: Ontario Ministry of the Environment (2011)

Consumption Advice Groups*	Concentration of PCBs (ppm)	Concentration of Hg (ppm)	Concentration of Chlordane (ppm)
Unrestricted Consumption	0 – 0.05	0 <= 0.05	0 - 0.15
2 meals/ week		> 0.05 <= 0.11	
1 meal/ week	0.06 – 0.2	>0.11 <= 0.22	0.16 - 0.65
1 meal/ month	0.21 – 1.0	>.22 <= 0.95	0.66 - 2.82
6 meals/ year	1.1 – 1.9		2.82 - 5.62
Do not eat	>1.9	>0.95	>5.62

* Women of childbearing age and children under 15

Table 3. Consumption limits set by the Great Lakes Sport Fish Advisory Task force.

Consumption Advisory	Score
Unrestricted (8 meals / month)	1
1 meal/week (4 meals / month)	2
1 meal/month	3
6 meals/year	4
Do not eat	5

Table 4. Consumption advisory scores used to calculate metric for the Fish Consumption Restrictions Indicator

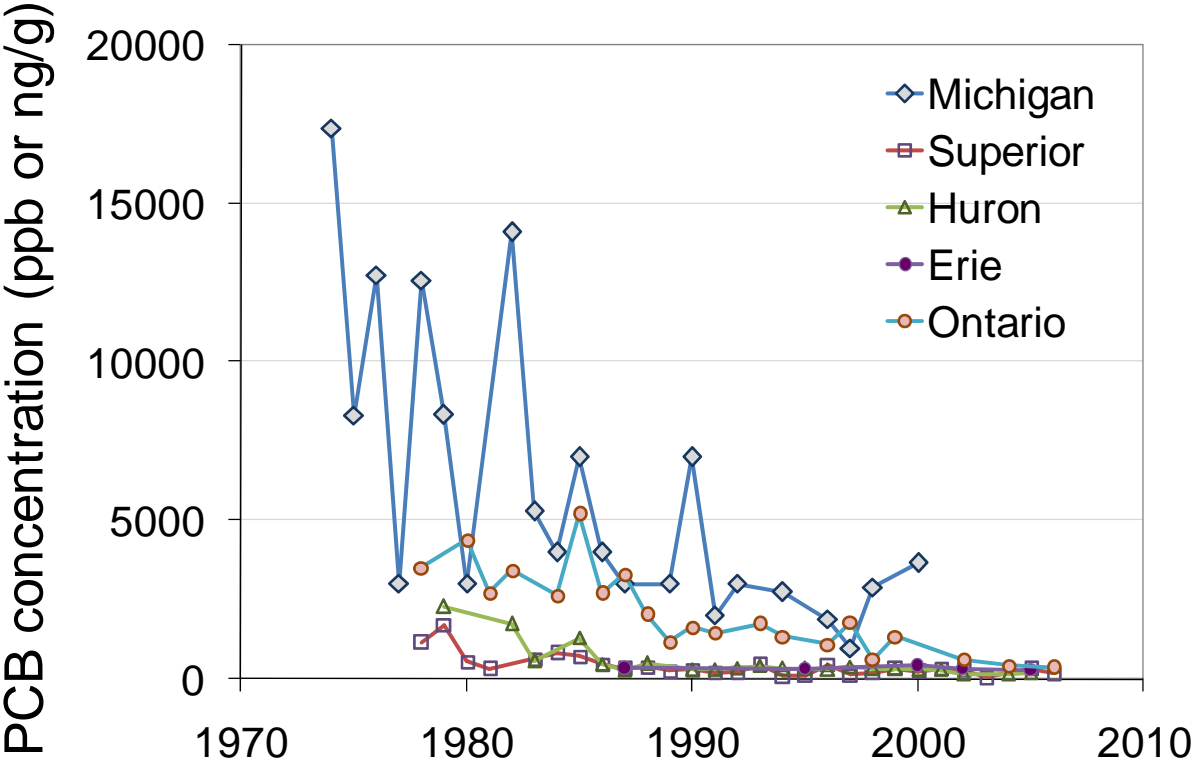


Figure 3. Long-term trends of total-PCB in Great Lakes lake trout. Data were adopted for skin-on lake trout fillets samples from Lake Michigan from Stow et al. 2004 and for skin-off lake trout fillet samples from the other lakes from Bhavsar et al. 2007.