Section

E

Evaluating Beneficial Use:
Human Health (Fish Consumption)

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E1. Background

The State of Ohio has operated a formal Fish Consumption Advisory (FCA) Program since 1993. Since July 2002, the program's technical and decision-making expertise has been housed at the Ohio Environmental Protection Agency (Ohio EPA). The risk assessment protocols used were developed in the early 1990s under the auspices of the Great Lakes Governors Association.

Ohio has adopted human health water quality standards (WQS) criteria to protect the public from adverse impacts, both carcinogenic and non-carcinogenic, due to exposure via drinking water (applicable at public water supply intakes) and to exposure from the contaminated flesh of sport fish (applicable in all surface waters). The purpose of the water quality criteria for the protection of human health [fish consumption] is to ensure levels of a chemical in water do not bioaccumulate in fish to levels harmful to people who catch and eat the fish. The relationship of the fish consumption human health criterion to the FCA risk assessment protocols is explained below.

E2. Rationale and Evaluation Method

U.S. EPA's guidance for preparing the 2006 Integrated Report (IR) states:

> *Although the CWA [Clean Water Act] does not explicitly direct the use of fish and shellfish consumption advisories or NSSP [National Shellfish Sanitation Program] classifications to determine attainment of water quality standards, states are required to consider all existing and readily available data and information to identify impaired segments on their section 303(d) lists. For purposes of determining whether a segment is impaired and should be included on a section 303(d) list, EPA considers a fish or shellfish consumption advisory, a NSSP classification, and the supporting data to be existing and readily available data and information that demonstrates non-attainment of a section 101(a) "fishable" use when:*
>
> - *the advisory is based on fish and shellfish tissue data,*
> - *a lower than "Approved" NSSP classification is based on water column and shellfish tissue data (and this is not a precautionary "Prohibited" classification or the state water quality standard does not identify lower than "Approved" as attainment of the standard),*
> - *the data are collected from the specific segment in question, and*
> - *the risk assessment parameters (e.g., toxicity, risk level, exposure duration and consumption rate) of the advisory or classification are cumulatively equal to, or less protective than those in the State's WQS" (U.S. EPA, 2005).*

Ohio's WQS regulations do not describe human consumption of sport fish as an explicit element of aquatic life protection. However, the WQS do include human health criteria that are applicable to all surface waters of the State. Certain of these criteria are derived using assumptions about the bioaccumulation of chemicals in the food chain, and the criteria are intended to protect people from adverse health impacts that could arise from consuming fish caught in Ohio's waters. To determine when and how waters should be listed as impaired because of FCAs, the risk assessment parameters on which the human health WQS criteria are based were compared with those used in the Ohio FCA program. If the State has issued an advisory for a specific water body and that advisory is equal to or less protective than the State's WQS, then one can assume there is an exceedance of the WQS. On the other hand, if the advisory is more protective than the WQS, one cannot assume that the issuance of the advisory indicates an exceedance of the WQS. Figure E-1 illustrates this point.

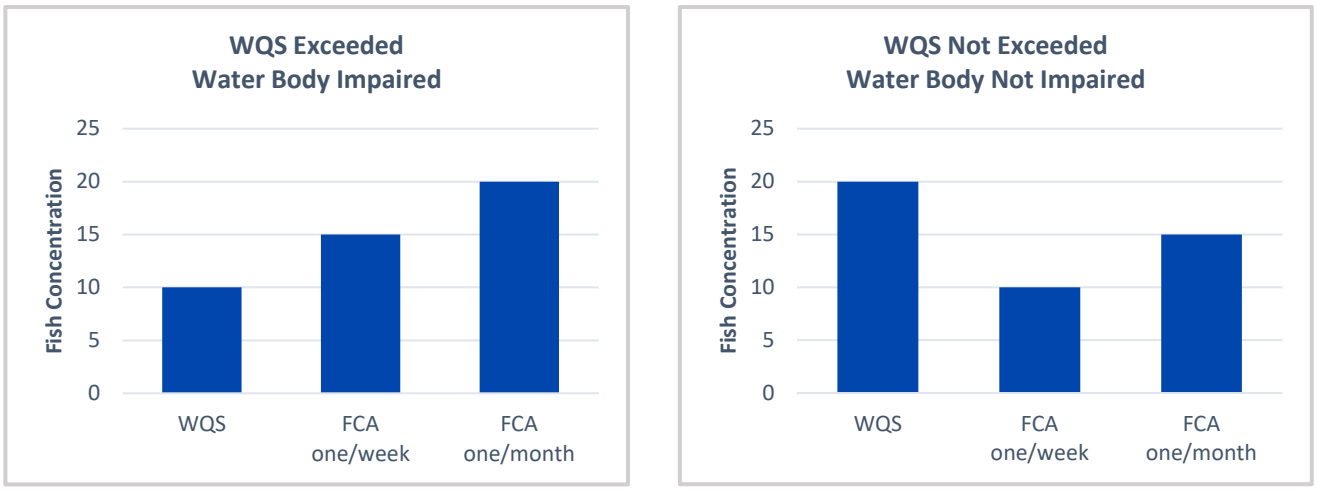


Figure E-1 — Illustration of the relationship among the WQS values, the values that trigger issuance of FCAs and the resulting decision regarding water body impairment associated with an FCA.

A fish consumption advisory is determined based on the quantity of a chemical in fish, such as micrograms of chemical per kilogram of fish tissue (µg/kg). WQS, on the other hand, are expressed as the quantity of chemical in water, such as micrograms of chemical per liter of water (µg/L). The information used to calculate the human health fish consumption WQS criterion can be used to calculate a maximum safe fish concentration. The fish concentration value can then be directly compared to the FCA program values to determine whether the advisory is less or more protective than the WQS criterion. The values in Table E-1 make this comparison for chemicals for which there are both an FCA and an Ohio human health fish consumption water criterion. Because Ohio human health criteria differ between the Lake Erie and Ohio River basins, separate comparisons are presented.

The constituents shown in Table E-1 were chosen based on U.S. EPA's recommendations on page 53 of its 2006 IR Guidance (***epa.gov/sites/production/files/2015-10/documents/2006irg-report.pdf***; U.S. EPA, 2006a). Hexachlorobenzene and mirex were added because of historic fish tissue contamination with those contaminants.

Table E-1 demonstrates that the levels of fish tissue contaminants that trigger a fish advisory have little obvious relation to the levels of fish tissue contaminants on which the WQS criteria are based. This discrepancy exists because different assumptions about fish consumption rates are made in calculating water quality standards than in issuing fish advisories. For example, the fish consumption rate used to calculate the Ohio River Basin WQS criteria is 17.5 grams per day. The fish consumption rate used to calculate a “one meal per week” advisory recommendation is 32.6 grams per day. These values are not the same because the WQS criteria fish consumption rates are based on nutritional studies that attempt to capture approximately how much sport caught fish people are eating, whereas the fish consumption advisory rates are meant to advise people how much fish they can safely consume.

Table E-1 — Comparison between fish concentration values and FCA program values.

Basin/Parameter	Fish concentration on which the WQS is based [1]	Range of fish concentrations triggering an "eat no more than one meal per week" advisory	Range of fish concentrations triggering an "eat no more than one meal per month" advisory
Lake Erie/PCB	23 µg/kg	**50 - 220 µg/kg**	**221 - 1,000 µg/kg**
Ohio River/PCB	54 µg/kg	**50 - 220 µg/kg**	**221 - 1,000 µg/kg**
Lake Erie/mercury	350 µg/kg	110 - 220 µg/kg	221 - 1,000 µg/kg
Ohio River/mercury	1,000 µg/kg	110 - 220 µg/kg	221 - 1,000 µg/kg
Lake Erie/DDT	140 µg/kg	**500 - 2,188 µg/kg**	**2,189 – 9,459 µg/kg**
Ohio River/DDT	320 µg/kg	**500 - 2,188 µg/kg**	**2,189 – 9,459 µg/kg**
Lake Erie/Chlordane	130 µg/kg	**500 - 2,188 µg/kg**	**2,189 – 9,459 µg/kg**
Ohio River/Chlordane	310 µg/kg	**500 - 2,188 µg/kg**	**2,189 – 9,459 µg/kg**
Lake Erie/Hexachlorobenzene	29 µg/kg	**800 - 3,499 µg/kg**	**3,500 - 15,099 µg/kg**
Ohio River/hexachlorobenzene	67 µg/kg	**800 - 3,499 µg/kg**	**3,500 - 15,099 µg/kg**
Lake Erie/mirex	88 µg/kg	**200 - 874 µg/kg**	**875 - 3,783 µg/kg**
Ohio River/mirex	200 µg/kg	**200 - 874 µg/kg**	**875 - 3,783 µg/kg**

Key	
Values	Advisory is less protective than the WQS criterion, WQS exceeded, water body impaired
Values	Advisory is more protective than WQS criterion, WQS not exceeded, no impairment from FCA
Values	Advisory may be more, or less, protective than WQS criterion

U.S. EPA stipulates that the risk assessment parameters used to categorize fish tissue contaminant data must be at least as protective as those used in the WQS-based fish concentrations. Fish advisory contaminant levels are not directly related to the WQS criteria contaminant levels and, in some cases, are not as protective. Therefore, Ohio EPA has elected to directly compare fish tissue data with the WQS criteria calculations shown in the above table, instead of using advisory-based categorizations.

The following steps were utilized to determine a 303(d) list category for waters based on fish tissue contaminant data.

Step 1: Determine available data

All data in the fish tissue database were evaluated for the 2020 IR. The most recent 10-years of data collections, 2009-2018, were used for making category 1 (unimpaired) and category 5 (impaired) determinations. In cases where multiple years of data were available in that 10-year window, all data were weighted equally. In cases where the only data available were older than 2009, the category of the assessment unit was retained and the most recent year of data was noted.

Ohio's Credible Data Law states that all data greater than five years in age will be considered historical and that it can be used if the director has identified compelling reasons as to why the data are credible. In the case of fish tissue, the use of data older than five but ten or fewer years old is necessary. This is because not enough fish tissue samples are gathered from enough locations each year to conduct a thorough assessment of contaminant levels in fish tissue across the state. Frequently, multiple sampling years are needed to determine whether to issue or rescind an advisory. Owing to limited staff time and budget resources, it sometimes takes more than five years to revisit a location and collect more fish tissue samples. A more complete picture of contaminants in fish tissue is presented when data are utilized that reach back 10 years.

[1] See Section E4 for an explanation of how these concentrations were calculated.

Step 2: Determine fish tissue contaminant concentrations

For streams in each assessment unit (AU)[2], a weighted average based on species and trophic level was calculated for each contaminant. One year of data was considered adequate to categorize the fish as category 5 (impaired) or category 1 (unimpaired). Inland lakes are considered a component of the assessment unit(s) in which they are geographically located, so sample results may affect the assessment status of the AU(s) and the index scores for the AU(s). Inland lakes are also analyzed individually; results are displayed in Table E-10.

Step 3: Determine adequate species data

In order to assess an AU as category 1 or 5, at least four samples from that AU are needed, with at least two samples from each of trophic levels three and four. An exception was made for AUs with 10 or more samples from one trophic level and only one sample from the other trophic level.

A geometric mean was calculated for each species and then a weighted average was calculated for each trophic level. A weighted average for each AU was then calculated using the consumption rates found in the water quality criteria calculations. That weighted average was then compared against the contaminant levels listed in Table E-1 and categorized as category 1 or 5.

In cases where those data requirements were not met, an AU was classified as category 3. In cases where no data were available, an AU was also classified as category 3.

This calculation methodology is derived from the methodology described in Section 4.3.2 of the document *Guidance for Implementing the January 2001 Methylmercury Water Quality Criterion*, Final, U.S. EPA Office of Science and Technology, EPA-823-R-09-002, January 2009 (***epa.gov/wqc/human-health-criteria-methylmercury***).

Table E-2 — Example data for calculating a weighted average fish tissue value.

Species	Trophic Level	Number of Samples	Geometric mean mercury concentration (mg/kg)
Black Crappie (*Pomoxis nigromaculatus*)	3	1	0.085
Bluegill Sunfish (*Lepomis macrochirus*)	3	2	0.098
Channel Catfish (*Ictalurus punctatus*)	3	2	0.145
Common Carp (*Cyprinus carpio*)	3	3	0.120
Largemouth Bass (*Micropterus salmoides*)	4	3	0.212
Smallmouth Bass (*Micropterus dolomieu*)	4	1	0.421
Spotted Bass (*Micropterus punctulatus*)	4	1	0.347

[2] Assessment units include watershed assessment units (12-digit hydrologic units); large river assessment units (generally rivers that drain more than 500 square miles of landscape); and Lake Erie assessment units.

For the Lake Erie Basin:

$$C_{avgLEB} = \frac{3.6*C_3+11.4*C_4}{15} = 0.27\ mg/kg$$

For the Ohio River Basin:

$$C_{avgORB} = \frac{11.8*C_3+5.7*C_4}{17.5} = 0.18\ mg/kg$$

Where:

C_3 = average concentration for trophic level 3

C_4 = average concentration for trophic level 4

Step 4: Determine appropriate assessment unit divisions

It should be recognized that in determining impairment status based on AUs instead of individual water bodies, extrapolations to water bodies without data are made. In some cases, water bodies that have no data will be categorized as impaired if they are within an impaired AU.

Inland lakes are treated as individual water bodies for impairment purposes regardless of whether they are entirely contained within an AU or straddle more than one AU and results for individual lakes are shown in Table E-10. In addition, any AU containing all or part of an impaired inland lake was considered to be not supporting the beneficial use (see Step 2 above for further explanation).

Step 5: Categorize water bodies within assessment units

Category 5 – Impaired

Any AU meeting the data requirements in step 3 with a weighted average fish tissue concentration of PCBs, mercury, DDT, chlordane, mirex or hexachlorobenzene above the WQS-based fish tissue concentration is placed into category 5. When the data indicating impairment are older than 10 years, the AU remains impaired (5).

Category 1 – Not Impaired

To be categorized as category 1, not impaired, an AU must meet the data requirements in step 3 and the weighted average concentration of a contaminant must be below the threshold that would trigger an impairment. AUs that had previously been considered category 1, but with no data since 2007, remains unimpaired (1).

Category 3 – Insufficient or No Data

Any AU in which current data are available but those data are insufficient according to step 3 (to categorize the AU as category 1 or 5), the AU is listed as category 3. If no data is available for an AU, the category is listed as 3.

E3. Results

Fish tissue data for six contaminants were reviewed to determine an IR attainment status. The methodology for selecting, reviewing and categorizing fish tissue data is given in Section E2. The six parameters monitored were mercury, PCBs, chlordane, DDT, mirex and hexachlorobenzene. These parameters were chosen for review based on current and recent fish consumption advisories in Ohio caused by these contaminants, as well as existing human health WQS criteria for the six parameters.

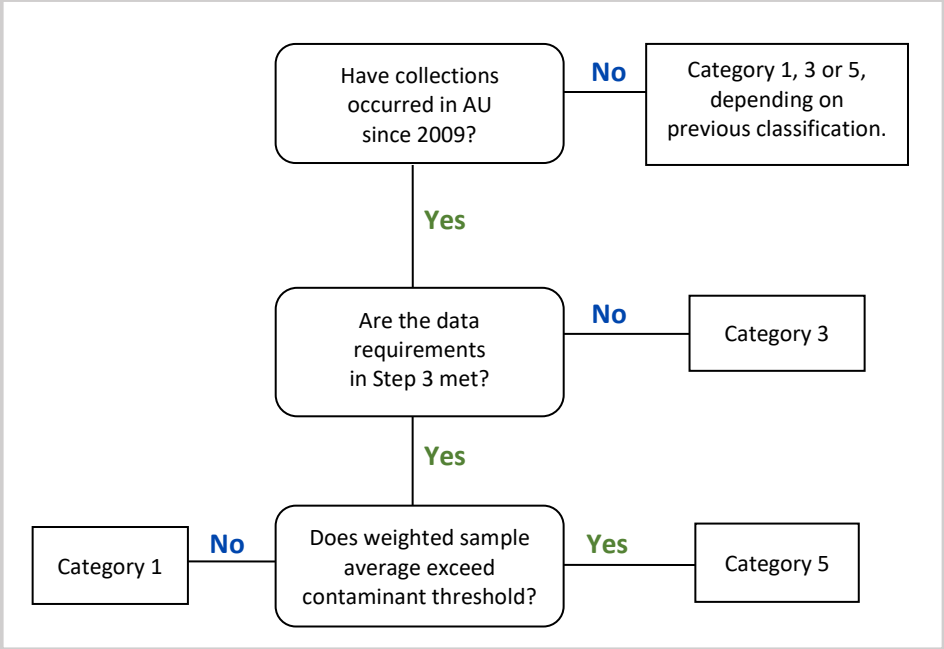


Figure E-2 — Flow chart for the categorization of fish tissue data for the IR.

There was a total of 59 changes to the human health attainment statuses of assessment units for the 2020 IR which are summarized in Table E-3. The primary reasons for change in status include data having become historical and the collection and analysis of new information.

Table E-3 — A summary of changes in attainment status from 2018 to 2020 IR.

Reason for change		Changes	
Data have become historical (older than 2009)			45
	Category 1	14	
	Category 3	10	
	Category 5	21	
New data			14
	Category 1 to 5	0	
	Category 5 to 1	5	
	Category 3 to 5	0	
	Category 3 to 1	6	
	Remained Category 3	3	
Total changes			59

Detailed results are presented in Table E-4 through Table E-11. Please note that the year of most recent data may not have contained adequate sample sizes for each trophic level, resulting in no change of categorization. Detailed information on specific fish consumption advisories including geographic extent of the advisory; type and size of fish affected; and consumption advice can be found at ***epa.ohio.gov/dsw/fishadvisory/index.aspx***.

Table E-4 lists waters impaired because fish tissue levels of PCBs or mercury exceed the threshold level upon which the WQS criterion is based, while Table E-5 includes those not impaired. Table E-6 lists water bodies identified as impaired for this use on a previous 303(d) list that are no longer considered impaired,

either because of new data or the updated methodology described in Section E1. There are nine WAUs in Ohio with significant pollution resulting in 303(d) listings from other contaminants that affect fish tissue, as shown in Table E-7. Table E-8 lists waters with fish tissue data, both current and historical, where inadequate samples exist to determine level of impairment. Table E-9 lists large rivers and their impairment status. Table E-10 lists inland lake impairment status. Table E-11 lists Lake Erie assessment units and their impairment status.

Table E-4 — Waters not supporting the human health use because levels of PCBs or mercury in fish tissue exceed the threshold level upon which the WQS criterion is based. These waters are category 5.

Water Body	Assessment Unit	Impairment Cause	Most Recent Data
Shantee Creek	04100001 03 01	Historical	1993
Halfway Creek	04100001 03 02	Historical	1993*
Prairie Ditch	04100001 03 03	Historical	1993*
North Tenmile Creek	04100001 03 05	Historical	1993
Tenmile Creek	04100001 03 06	Historical	2011
Heldman Ditch-Ottawa River	04100001 03 07	PCBs	2011
Sibley Creek-Ottawa River	04100001 03 08	PCBs	2016
West Branch St Joseph River	04100003 02 04	PCBs	2018
Cogswell Cemetery-St Joseph River	04100003 03 02	PCBs	2013
Eagle Creek	04100003 03 03	Historical	1995*
Village of Montpelier-St Joseph River	04100003 03 04	Historical	1995
Bear Creek	04100003 03 05	Historical	1995*
West Buffalo Cemetery-St Joseph River	04100003 03 06	Historical	2013
Bluff Run-St Joseph River	04100003 05 01	Historical	1995*
Big Run	04100003 05 02	Historical	1995*
Russell Run-St Joseph River	04100003 05 03	Historical	2013
Willow Run-St Joseph River	04100003 05 05	PCBs, Mercury	2013
Sol Shank Ditch-St Joseph River	04100003 05 06	Historical	1995*
Muddy Creek	04100004 01 01	Historical	1999*
Center Branch St Marys River	04100004 01 02	Historical	1999*
East Branch St Marys River	04100004 01 03	Historical	1999*
Kopp Creek	04100004 01 04	Historical	1999*
Sixmile Creek	04100004 01 05	Historical	1999*
Fourmile Creek-St Marys River	04100004 01 06	PCBs	2015
Hussey Creek	04100004 02 01	Historical	1999*
Eightmile Creek	04100004 02 02	Historical	1999*
Blierdofer Ditch	04100004 02 03	Historical	1999*
Twelvemile Creek	04100004 02 04	Historical	1999*
Prairie Creek-St Marys River	04100004 02 05	PCBs	2015
Little Black Creek	04100004 03 01	Historical	1999*
Black Creek	04100004 03 02	Historical	1999*
Yankee Run-St Marys River	04100004 03 03	PCBs	2015
Duck Creek	04100004 03 04	Historical	1999*
Leatherwood Creek	04100006 03 02	Historical	1997*
Flat Run-Tiffin River	04100006 03 03	Mercury	2013
Beaver Creek	04100006 05 01	Historical	2000*
Brush Creek	04100006 05 02	Historical	2013
Village of Stryker-Tiffin River	04100006 05 03	PCBs	2013
Buckskin Creek-Tiffin River	04100006 06 04	PCBs	2002*
Headwaters Auglaize River	04100007 01 01	Historical	2000*
Blackhoof Creek	04100007 01 02	Historical	2000*
Wrestle Creek-Auglaize River	04100007 01 03	Historical	2000*

Water Body	Assessment Unit	Impairment Cause	Most Recent Data
Pusheta Creek	04100007 01 04	Historical	2000*
Two Mile Creek	04100007 02 01	Historical	2000*
Sixmile Creek-Auglaize River	04100007 02 04	PCBs	2014
Upper Hog Creek	04100007 03 01	Historical	2004*
Middle Hog Creek	04100007 03 02	Historical	2004*
Little Hog Creek	04100007 03 03	Historical	2004*
Lower Hog Creek	04100007 03 04	Historical	2004*
Lima Reservoir-Ottawa River	04100007 03 06	PCBs	2009
Little Ottawa River	04100007 04 01	Historical	1994*
Dug Run-Ottawa River	04100007 04 02	Historical	2009
Honey Run	04100007 04 03	Historical	1994
Pike Run	04100007 04 04	Historical	1994*
Leatherwood Ditch	04100007 04 05	Historical	1994*
Beaver Run-Ottawa River	04100007 04 06	Historical	2009
Sugar Creek	04100007 05 01	Historical	2000
Plum Creek	04100007 05 02	Historical	2000*
Village of Kalida-Ottawa River	04100007 05 03	Historical	2009
Dog Creek	04100007 08 01	PCBs	2014
Lower Town Creek	04100007 08 04	PCBs	2014
Upper Jennings Creek	04100007 09 01	Historical	2000*
West Jennings Creek	04100007 09 02	Historical	2000*
Lower Jennings Creek	04100007 09 03	Historical	2000*
Prairie Creek	04100007 09 06	Historical	2000*
Big Run-Flatrock Creek	04100007 12 06	PCBs	2014
Cessna Creek	04100008 01 01	Historical	2005*
Headwaters Blanchard River	04100008 01 02	Historical	2005*
The Outlet-Blanchard River	04100008 01 03	Historical	2005*
Potato Run	04100008 01 04	Historical	2005*
Ripley Run-Blanchard River	04100008 01 05	Historical	2005
Brights Ditch	04100008 02 01	Historical	2005*
The Outlet	04100008 02 02	Historical	2005*
Findlay Upground Reservoirs-Blanchard River	04100008 02 03	Historical	2005
Lye Creek	04100008 02 04	Historical	2005*
City of Findlay Riverside Park-Blanchard River	04100008 02 05	PCBs	2015
Upper Eagle Creek	04100008 03 01	PCBs	2005*
Lower Eagle Creek	04100008 03 02	Historical	1996
Aurand Run	04100008 03 03	PCBs	2005*
Howard Run-Blanchard River	04100008 03 04	PCBs	2005
Tiderishi Creek	04100008 05 01	Historical	2005*
Ottawa Creek	04100008 05 02	Historical	2005*
Moffitt Ditch	04100008 05 03	Historical	2005*
Dukes Run	04100008 05 04	Historical	2005*
Dutch Run	04100008 05 05	Historical	2005*
Cutoff Ditch	04100009 05 07	PCBs	2015
Lower Beaver Creek	04100009 05 09	PCBs	2015
Heilman Ditch-Swan Creek	04100009 08 04	PCBs	2017
Rhodes Ditch-South Branch Portage River	04100010 02 04	PCBs	2010
North Branch Portage River	04100010 03 01	PCBs	2015
Town of Pemberville-Portage River	04100010 03 02	Historical	2000*
Sugar Creek	04100010 04 01	Historical	2006
Larcarpe Creek Outlet #4-Portage River	04100010 04 02	Historical	2006*
Little Portage River	04100010 05 01	Historical	1994*

Water Body	Assessment Unit	Impairment Cause	Most Recent Data
Portage River	04100010 05 02	PCBs	2008
Upper Tousant Creek	04100010 06 01	Historical	2008
Packer Creek	04100010 06 02	Historical	1997*
Lower Toussaint Creek	04100010 06 03	PCBs	2008
Headwaters Paramour Creek-Sandusky River	04100011 04 01	Historical	2005*
Loss Creek-Sandusky River	04100011 04 02	Historical	2005*
Headwaters Middle Sandusky River	04100011 04 03	PCBs	2005
Grass Run	04100011 04 04	Historical	2005*
Headwaters Lower Sandusky River	04100011 04 05	Historical	2014
Town of Upper Sandusky-Sandusky River	04100011 07 02	PCBs	2001
Negro Run	04100011 07 03	Historical	2004*
Cranberry Run-Sandusky River	04100011 07 04	Historical	2004*
Sugar Run-Sandusky River	04100011 07 05	Historical	2014
Town of Lindsey-Muddy Creek	04100011 14 04	PCBs	2009
Clear Creek-Vermilion River	04100012 01 01	Historical	1998
Buck Creek	04100012 01 02	Historical	1998*
Southwest Branch Vermilion River	04100012 01 03	Historical	1998*
Indian Creek-Vermilion River	04100012 01 05	Historical	1997
East Branch Vermilion River	04100012 02 01	Historical	1997*
East Fork Vermilion River	04100012 02 02	Historical	1974
Town of Wakeman-Vermilion River	04100012 02 03	Historical	1997
Mouth Vermilion River	04100012 02 04	PCBs	2015
Mouth West Branch Huron River	04100012 05 06	PCBs	2016
Mouth East Branch Huron River	04100012 06 04	PCBs	2016
Huron River-Frontal Lake Erie	04100012 06 06	PCBs	2016
Plum Creek	04110001 01 01	Historical	2000*
North Branch West Branch Rocky River	04110001 01 02	Historical	2000*
Headwaters West Branch Rocky River	04110001 01 03	Historical	2000*
Mallet Creek	04110001 01 04	Historical	2000*
Plum Creek	04110001 01 07	Historical	2000*
Baker Creek-West Branch Rocky River	04110001 01 08	PCBs	2014
Rocky River	04110001 02 03	PCBs	2014
East Fork of East Branch Black River	04110001 03 01	Historical	2000*
Headwaters West Fork East Branch Black River	04110001 03 02	Historical	2000*
Salt Creek-East Branch Black River	04110001 04 02	Mercury	2014
Willow Creek	04110001 04 03	Historical	2010
Jackson Ditch-East Branch Black River	04110001 04 04	Mercury	2012
Upper West Branch Black River	04110001 05 02	Historical	2012
Middle West Branch Black River	04110001 05 04	Historical	2012
Plum Creek	04110001 05 05	Historical	2002*
Lower West Branch Black River	04110001 05 06	PCBs	2012
French Creek	04110001 06 01	Historical	2014
Black River	04110001 06 02	PCBs	2012
West Branch Cuyahoga River	04110002 01 02	Historical	2002*
Tare Creek-Cuyahoga River	04110002 01 03	Historical	2002*
Black Brook	04110002 01 05	Historical	2002*
Potter Creek-Breakneck Creek	04110002 02 01	Historical	2005*
Feeder Canal-Breakneck Creek	04110002 02 02	Historical	2018
Lake Rockwell-Cuyahoga River	04110002 02 03	PCBs	2018
Plum Creek	04110002 03 01	Historical	2005*
City of Akron-Little Cuyahoga River	04110002 03 04	Historical	2018
Fish Creek-Cuyahoga River	04110002 03 05	PCBs	2018

Water Body	Assessment Unit	Impairment Cause	Most Recent Data
Yellow Creek	04110002 04 02	Historical	2005*
Furnace Run	04110002 04 03	Historical	2005*
Brandywine Creek	04110002 04 04	Historical	2005*
Boston Run-Cuyahoga River	04110002 04 05	PCBs	2008
Pond Brook	04110002 05 01	Historical	2005*
Headwaters Tinkers Creek	04110002 05 02	Historical	2005*
Headwaters Chippewa Creek	04110002 05 03	Historical	2005*
Town of Twinsburg-Tinkers Creek	04110002 05 04	Historical	2018
East Branch Ashtabula River	04110003 01 01	Historical	2002*
West Branch Ashtabula River	04110003 01 02	Historical	2002*
Upper Ashtabula River	04110003 01 03	Historical	2014
Lower Ashtabula River	04110003 01 05	PCBs	2011
Griswold Creek-Chagrin River	04110003 04 02	PCBs, DDT	2008
Dead Branch	04110004 01 01	Historical	2004*
Headwaters Grand River	04110004 01 02	Historical	2004
Baughman Creek	04110004 01 03	Historical	2004*
Swine Creek	04110004 01 06	Historical	2004*
Upper Rock Creek	04110004 02 01	Historical	2004*
Lower Rock Creek	04110004 02 03	Historical	2004*
Phelps Creek	04110004 03 01	Historical	2004*
Hoskins Creek	04110004 03 02	Historical	2004*
Mill Creek-Grand River	04110004 03 03	Historical	2004
Mud Creek	04110004 03 04	Historical	2004*
Plumb Creek-Grand River	04110004 03 05	Mercury	2018
Town of Jefferson-Mill Creek	04110004 04 03	Mercury	2007
Three Brothers Creek-Grand River	04110004 05 01	Historical	2003
Bronson Creek-Grand River	04110004 05 02	PCBs, Mercury	2016
East Branch Middle Fork Little Beaver Creek	05030101 04 01	Historical	1990
Headwaters Middle Fork Little Beaver Creek	05030101 04 02	Mirex	2010
Stone Mill Run-Middle Fork Little Beaver Creek	05030101 04 03	Mirex	2010
Lisbon Creek-Middle Fork Little Beaver Creek	05030101 04 04	Historical	1987
Elk Run-Middle Fork Little Beaver Creek	05030101 04 05	PCBs	2005
Longs Run	05030101 06 01	Historical	2001*
Honey Creek	05030101 06 02	Historical	2001*
Headwaters North Fork Little Beaver Creek	05030101 06 03	Historical	2001*
Little Bull Creek	05030101 06 04	Historical	1985
Headwaters Bull Creek	05030101 06 05	Historical	2001*
Leslie Run-Bull Creek	05030101 06 06	Historical	2001*
Dilworth Run-North Fork Little Beaver Creek	05030101 06 07	Historical	1999
Brush Run-North Fork Little Beaver Creek	05030101 06 08	Historical	1997
Rough Run-Little Beaver Creek	05030101 06 09	PCBs	2001
Bieler Run-Little Beaver Creek	05030101 06 10	PCBs	2001
Headwaters Yellow Creek	05030101 07 01	Historical	2005*
Elkhorn Creek	05030101 07 02	Historical	2005*
Upper North Fork	05030101 07 03	Historical	2005*
Long Run-Yellow Creek	05030101 07 04	PCBs	2007
Headwaters North Fork Yellow Creek	05030101 08 02	Historical	2005*
Salt Run-North Fork Yellow Creek	05030101 08 03	Historical	2005
Hollow Rock Run-Yellow Creek	05030101 08 04	PCBs	2007
Upper Cross Creek	05030101 10 01	Historical	2000*
Salem Creek	05030101 10 02	Historical	2000*
Middle Cross Creek	05030101 10 03	Historical	2014

Water Body	Assessment Unit	Impairment Cause	Most Recent Data
Lower Cross Creek	05030101 10 05	PCBs	2010
Willow Creek	05030103 02 02	Historical	2006*
Mill Creek	05030103 02 03	Historical	2006*
Island Creek-Mahoning River	05030103 02 04	PCBs	2006
Kale Creek	05030103 03 01	Historical	2006*
Headwaters West Branch Mahoning River	05030103 03 02	Historical	2006*
Barrel Run	05030103 03 03	Historical	2006*
Kirwin Reservoir-West Branch Mahoning River	05030103 03 04	PCBs	2008
Charley Run Creek-Mahoning River	05030103 03 06	PCBs	2008
Headwaters Eagle Creek	05030103 04 01	Historical	1995*
South Fork Eagle Creek	05030103 04 02	Historical	1995
Camp Creek-Eagle Creek	05030103 04 03	Historical	2012
Tinkers Creek	05030103 04 04	Historical	1995*
Lower Mosquito Creek	05030103 05 03	PCBs	2015
Burgess Run-Yellow Creek	05030103 08 06	PCBs	1999
Coffee Run-Mahoning River	05030103 08 09	PCBs	2013
Frontal Pymatuning Reservoir	05030102 01 04	Historical	1998*
Fish Creek-Mahoning River	05030103 01 03	PCBs	2007
Dry Fork-Short Creek	05030106 02 07	PCBs	2009
Crabapple Creek	05030106 03 01	Historical	1998*
Headwaters Wheeling Creek	05030106 03 02	Historical	1998*
Cox Run-Wheeling Creek	05030106 03 03	PCBs	2009
Flat Run-Wheeling Creek	05030106 03 04	Historical	2009
Lower McMahon Creek	05030106 07 04	PCBs	2009
Pea Vine Creek-Captina Creek	05030106 09 05	PCBs	2009
Eightmile Creek-Little Muskingum River	05030201 07 05	PCBs	2015
Buffalo Run-West Fork Duck Creek	05030201 09 02	Historical	2006*
New Years Creek-Duck Creek	05030201 09 03	Historical	2009
Sugar Creek-Duck Creek	05030201 09 04	PCBs	2009
Horse Cave Creek	05030202 03 01	Historical	1997*
Headwaters East Branch Shade River	05030202 03 02	Historical	1997*
Big Run-East Branch Shade River	05030202 03 03	Historical	1997*
Spruce Creek-Shade River	05030202 03 04	Historical	2015
Baldwin Run	05030204 04 02	Historical	2004*
Pleasant Run	05030204 04 03	Historical	2004*
Tarhe Run-Hocking River	05030204 04 04	PCBs	2004
Scott Creek	05030204 06 02	Historical	2004*
Oldtown Creek	05030204 06 03	Historical	2004*
Fivemile Creek	05030204 06 04	Historical	2004*
Headwaters Tuscarawas River	05040001 01 01	Historical	2004
Pigeon Creek	05040001 01 02	Historical	2004*
Hudson Run	05040001 01 03	Historical	1994
Wolf Creek	05040001 01 04	Historical	1994
Portage Lakes-Tuscarawas River	05040001 01 05	PCBs	2016
Headwaters Chippewa Creek	05040001 02 01	Historical	2015
Hubbard Creek-Chippewa Creek	05040001 02 02	Historical	2004*
Little Chippewa Creek	05040001 02 03	Historical	2004*
River Styx	05040001 02 04	Historical	2004*
Tommy Run-Chippewa Creek	05040001 02 05	Historical	2004*
Red Run	05040001 02 06	Historical	2004*
Silver Creek-Chippewa Creek	05040001 02 07	Hexachlorobenzene	2004*
Pancake Creek-Tuscarawas River	05040001 03 01	PCBs	2017

Water Body	Assessment Unit	Impairment Cause	Most Recent Data
Lake Lucern-Nimisila Creek	05040001 03 03	Historical	2007*
Fox Run	05040001 03 04	Historical	2004*
Headwaters Newman Creek	05040001 03 06	Historical	2004*
Town of North Lawrence-Newman Creek	05040001 03 07	Historical	2004*
Conser Run	05040001 04 01	Historical	1998
Middle Branch Sandy Creek	05040001 04 02	Historical	1998*
Pipes Fork-Still Fork	05040001 04 03	Historical	1998*
Muddy Fork	05040001 04 04	Historical	1998*
Reeds Run-Still Fork	05040001 04 05	Historical	2010
Headwaters Sandy Creek	05040001 04 06	PCBs	2010
Swartz Ditch-Middle Branch Nimishillen Creek	05040001 05 01	Historical	2000*
East Branch Nimishillen Creek	05040001 05 02	Historical	1993
West Branch Nimishillen Creek	05040001 05 03	Historical	2000
City of Canton-Middle Branch Nimishillen Creek	05040001 05 04	PCBs	2015
Sherrick Run-Nimishillen Creek	05040001 05 05	PCBs	2015
Town of East Sparta-Nimishillen Creek	05040001 05 06	PCBs	2015
Hugle Run	05040001 06 01	Historical	1997*
Pipe Run	05040001 06 02	Historical	1997*
Black Run	05040001 06 03	Historical	1997*
Little Sandy Creek	05040001 06 04	Historical	1997*
Armstrong Run-Sandy Creek	05040001 06 05	PCBs	2010
Indian Run-Sandy Creek	05040001 06 06	Historical	1997
Beal Run-Sandy Creek	05040001 06 07	PCBs, Hexachlorobenzene	2010
Village of Pavonia-Black Fork Mohican River	05040002 02 01	Historical	1997*
Headwaters Rocky Fork	05040002 02 03	Historical	1997
Outlet Rocky Fork	05040002 02 04	Historical	2010
Charles Mill-Black Fork Mohican River	05040002 02 05	PCBs	2015
Headwaters Clear Fork Mohican River	05040002 03 01	PCBs	2008
Switzer Creek-Clear Fork Mohican River	05040002 04 05	PCBs	2014
Headwaters Wakatomika Creek	05040004 01 01	Historical	2003*
Winding Fork	05040004 01 02	Historical	2003*
Brushy Fork	05040004 01 03	Historical	2003*
Black Run-Walatomika Creek	05040004 02 01	Historical	2003
Mill Fork	05040004 02 02	Historical	2003*
Little Wakatomika Creek	05040004 02 03	Historical	2003
Claylick Creek	05040006 05 01	Historical	2002*
Lost Run	05040006 05 02	Historical	2002*
Dudley Run-Rush Creek	05060001 02 03	PCBs	2005
Rock Fork	05060001 03 01	Historical	1992*
Honey Creek-Little Scioto River	05060001 03 04	Historical	1992
Panther Creek	05060001 04 02	Historical	2004*
Wolf Creek-Scioto River	05060001 04 03	Historical	2004
Wildcat Creek	05060001 04 04	Historical	2004*
Glade Run-Scioto River	05060001 04 06	Historical	2009
Mud Run	05060001 08 02	Historical	2001*
Flat Run	05060001 08 03	Historical	2001*
Town of Caledonia-Olentangy River	05060001 08 04	Historical	2012
Shaw Creek	05060001 09 01	Historical	2004*
Otter Creek-Olentangy River	05060001 10 01	Historical	2004*
Grave Creek	05060001 10 02	Historical	2004*
Qu Qua Creek	05060001 10 04	Historical	2004*
Pawpaw Creek	05060001 17 01	Historical	2007

Water Body	Assessment Unit	Impairment Cause	Most Recent Data
Poplar Creek	05060001 17 03	Historical	2005*
Sycamore Creek	05060001 17 04	Historical	2005*
Georges Creek	05060001 18 01	Historical	2005*
Tussing Ditch-Walnut Creek	05060001 18 02	PCBs	2005
Turkey Run	05060001 18 03	Historical	2005*
Little Walnut Creek	05060001 18 04	Historical	2005*
Big Run-Walnut Creek	05060001 18 05	PCBs	2007
Mud Run-Walnut Creek	05060001 18 06	PCBs	2005
Headwaters Big Darby Creek	05060001 19 01	Historical	2002*
Buck Run	05060001 19 03	Historical	2002*
Sugar Run	05060001 19 04	Historical	2002*
Headwaters Treacle Creek	05060001 20 01	Historical	1997*
Proctor Run-Treacle Creek	05060001 20 02	Historical	2012
Headwaters Little Darby Creek	05060001 20 03	Historical	1997
Spring Fork	05060001 20 04	Historical	1997*
Gay Run-Big Darby Creek	05060001 22 02	Historical	2014
Greenbrier Creek-Big Darby Creek	05060001 22 03	PCBs	2014
Lizard Run-Big Darby Creek	05060001 22 04	PCBs	2014
Grove Run-Scioto River	05060001 23 04	Historical	1999*
Hargus Creek	05060002 04 01	Historical	2014
Yellowbud Creek	05060002 04 02	Historical	2001*
Congo Creek	05060002 04 04	Historical	2001*
Scippo Creek	05060002 04 05	PCBs	2011
Lick Run-Scioto River	05060002 05 03	PCBs	2011
Beech Fork	05060002 06 01	Historical	1995*
Headwaters Salt Creek	05060002 06 02	Historical	1995*
Laurel Run	05060002 06 03	Historical	1995*
Pine Creek	05060002 06 04	Historical	1995*
Sour Run-Little Salt Creek	05060002 08 05	PCBs	2007
East Fork Queer Creek	05060002 09 01	Historical	2005*
Queer Creek	05060002 09 02	PCBs	2007
Pretty Run	05060002 09 03	Historical	2005*
Pike Run	05060002 09 04	Historical	2005*
Village of Eagle Mills-Salt Creek	05060002 09 05	Historical	2005
Poe Run-Salt Creek	05060002 09 06	PCBs	2007
Indian Creek	05060002 10 01	Historical	2002*
Dry Run	05060002 10 02	Historical	2002*
Headwaters Walnut Creek	05060002 10 03	Historical	2002*
Lick Run-Walnut Creek	05060002 10 04	Historical	2011
Pee Pee Creek	05060002 11 04	PCBs	2014
Leeth Creek-Sunfish Creek	05060002 12 06	PCBs	2011
Big Run-Scioto River	05060002 16 02	PCBs	2011
Headwaters Paint Creek	05060003 01 01	Historical	1974*
East Fork Paint Creek	05060003 01 02	Historical	1974
Indian Creek-Paint Creek	05060003 06 01	Historical	2006
Farmers Run-Paint Creek	05060003 06 02	Historical	2006
Cherokee Mans Run	05080001 03 01	Historical	1993*
Rennick Creek-Great Miami River	05080001 03 02	Historical	2008
Rum Creek	05080001 03 03	Historical	1993*
Blue Jacket Creek	05080001 03 04	Historical	1993*
Bokengehalas Creek	05080001 03 05	Historical	1993*
Brandywine Creek-Great Miami River	05080001 03 06	Historical	2008

Water Body	Assessment Unit	Impairment Cause	Most Recent Data
McKees Creek	05080001 04 01	Historical	2000*
Lee Creek	05080001 04 02	Historical	2012
Indian Creek	05080001 04 04	Historical	2000*
Plum Creek	05080001 04 05	Historical	2000*
Turkeyfoot Creek-Great Miami River	05080001 04 06	Historical	2008
Dividing Branch-Greenville Creek	05080001 11 03	PCBs	2013
Machochee Creek	05080001 15 01	Historical	2003*
Headwaters Mad River	05080001 15 02	Historical	2003*
Kings Creek	05080001 15 03	Historical	2000
Glady Creek-Mad River	05080001 15 04	Historical	2003
Muddy Creek	05080001 16 01	Historical	1994*
Dugan Run	05080001 16 02	Historical	1994*
Nettle Creek	05080001 16 03	Historical	1974
Anderson Creek	05080001 16 04	Historical	1994*
Storms Creek	05080001 16 05	Historical	1994*
Chapman Creek	05080001 16 06	Historical	1994
Bogles Run-Mad River	05080001 16 07	Historical	2016
Moore Run	05080001 18 01	Historical	2003*
Pondy Creek-Mad River	05080001 18 02	Historical	2016
Mill Creek	05080001 18 03	Historical	2003*
Donnels Creek	05080001 18 04	Historical	2003*
Rock Run-Mad River	05080001 18 05	Historical	2003
Jackson Creek-Mad River	05080001 18 06	Historical	2003*
Mud Creek	05080001 19 01	Historical	2003*
Mud Run	05080001 19 02	Historical	2003*
Poplar Creek-Great Miami River	05080001 20 05	PCBs	2008
North Branch Wolf Creek	05080002 01 01	Historical	2002*
Headwaters Wolf Creek	05080002 01 02	Historical	2002*
Dry Run-Wolf Creek	05080002 01 03	PCBs	2009
Holes Creek	05080002 01 04	Historical	2009
Millers Fork	05080002 02 01	Historical	2004*
Headwaters Twin Creek	05080002 02 02	Historical	1986
Swamp Creek	05080002 02 03	Historical	2004*
Price Creek	05080002 02 04	Historical	2004*
Bantas Fork	05080002 03 01	Historical	2004*
Aukerman Creek	05080002 03 02	Historical	2004*
Toms Run	05080002 03 03	Historical	2004*
Little Twin Creek	05080002 03 05	Historical	2004*
Elk Creek	05080002 07 01	Historical	2002*
Shaker Creek	05080002 07 03	Historical	2002*
Dicks Creek	05080002 07 04	PCBs	2010
Gregory Creek	05080002 07 05	Historical	2002*
Beals Run-Indian Creek	05080002 08 03	PCBs	2005
Pleasant Run	05080002 09 01	Historical	1989*
Paddys Run	05080002 09 03	Historical	1989*
Taylor Creek	05080002 09 05	Historical	1989
Ice Creek	05090103 01 03	PCBs	2010
Hales Creek	05090103 02 01	Historical	1995*
Headwaters Pine Creek	05090103 02 02	Historical	1995*
Little Pine Creek	05090103 02 03	Historical	1995*
Wards Run-Little Scioto River	05090103 06 05	PCBs	2010
Soldiers Run-Ohio Brush Creek	05090201 05 06	PCBs	2007

Water Body	Assessment Unit	Impairment Cause	Most Recent Data
Big Threemile Creek	05090201 06 04	Historical	1998*
Headwaters Little Miami River	05090202 01 01	Historical	1993*
North Fork Little Miami River	05090202 01 02	Historical	1993*
Buffenbarger Cemetery-Little Miami River	05090202 01 03	Historical	1993*
Yellow Springs Creek-Little Miami River	05090202 01 04	Historical	2011
North Fork Massies Creek	05090202 02 01	Historical	1996*
South Fork Massies Creek	05090202 02 02	Historical	1996*
Massies Creek	05090202 02 03	Historical	2011
Little Beaver Creek	05090202 02 04	Historical	1996*
Beaver Creek	05090202 02 05	Historical	1996*
Shawnee Creek-Little Miami River	05090202 02 06	Historical	1996*
Sugar Creek	05090202 05 01	Historical	2006
Town of Bellbrook-Little Miami River	05090202 05 02	Historical	1993*
Glady Run	05090202 05 03	Historical	1993*
Newman Run-Little Miami River	05090202 05 04	PCBs	2007
East Fork Mill Creek-Mill Creek	05090203 01 01	Historical	2002*
West Fork Mill Creek	05090203 01 02	Historical	2002
Sharon Creek-Mill Creek	05090203 01 03	Historical	2014
Congress Run-Mill Creek	05090203 01 04	Historical	2010
West Fork-Mill Creek	05090203 01 05	PCBs	2010
Chickasaw Creek	05120101 02 01	Historical	1998*
Headwaters Beaver Creek	05120101 02 02	Historical	1998*
Coldwater Creek	05120101 02 03	Historical	1998
Grand Lake-St Marys	05120101 02 04	PCBs	2008

Years with asterisks (*) indicate that the analysis was completed before 2010, when using larger assessment units, and these sections may not have actual data within these units.

Table E-5 — Waters fully supporting the human health use because fish tissue levels of PCBs or mercury are below the threshold level upon which the WQS criterion is based. These waters are category 1.

Water Body (Category 1: Unimpaired)	Assessment Unit	Most Recent Data
Clear Fork-East Branch St Joseph River	04100003 01 06	2012
Nettle Creek	04100003 03 01	2013
Town of Willshire-St Marys River	04100004 03 05	2015
Bates Creek-Tiffin River	04100006 03 01	2013
Village of Buckland-Auglaize River	**04100007 02 02**	**2012**
Sims Run-Auglaize River	04100007 02 03	2012
Lost Creek	04100007 03 05	2010
Wolf Ditch-Little Auglaize River	04100007 06 03	2014
Dry Fork-Little Auglaize River	04100007 06 04	2014
West Branch Prairie Creek	04100007 07 02	2014
Prairie Creek	04100007 07 03	2014
Burt Lake-Little Auglaize River	04100007 08 06	2014
Big Run-Auglaize River	**04100007 09 04**	**2014**
Lower Bad Creek	04100009 03 02	2015
North Turkeyfoot Creek	04100009 04 02	2015
East Branch Portage River	04100010 02 02	2017
Green Creek	04100011 12 03	2009
New London Upground Reservoir-Vermilion River	04100012 01 04	2016
Walnut Creek-West Branch Huron River	04100012 04 03	2016
Peru Township-West Branch Huron River	04100012 04 05	2016
City of Medina-West Branch Rocky River	04110001 01 05	2014
Cossett Creek-West Branch Rocky River	**04110001 01 06**	**2014**

Water Body (Category 1: Unimpaired)	Assessment Unit	Most Recent Data
Baldwin Creek-East Branch Rocky River	04110001 02 02	2014
Town of Litchfield-East Branch Black River	**04110001 04 01**	**2014**
Wellington Creek	04110001 05 03	2013
East Branch Reservoir-East Branch Cuyahoga River	04110002 01 01	2010
Ladue Reservoir-Bridge Creek	04110002 01 04	2010
Headwaters West Fork Little Beaver Creek	05030101 05 02	2017
Town Fork	05030101 08 01	2014
Town of Newton Falls-West Branch Mahoning River	05030103 03 05	2012
Mouth Eagle Creek	**05030103 04 05**	**2012**
Middle Mosquito Creek	05030103 05 02	2013
Lower Meander Creek	05030103 07 03	2015
Andersons Run-Mill Creek	05030103 08 03	2013
Upper McMahon Creek	05030106 07 02	2016
South Fork Captina Creek	05030106 09 02	2010
Wingett Run-Little Muskingum River	05030201 07 03	2015
Headwaters Little Rush Creek	05030204 02 01	2016
Buck Run-Hocking River	05030204 04 05	2018
Clear Fork	05030204 06 01	2015
Sippo Creek	05040001 03 08	2015
McGuire Creek	05040001 07 06	2018
Pleasant Valley Run-Indian Fork	05040001 08 02	2016
Brandywine Creek-Sugar Creek	05040001 11 05	2017
Buttermilk Creek-Stillwater Creek	05040001 13 04	2013
Brushy Fork	05040001 14 02	2013
Craborchard Creek-Stillwater Creek	05040001 14 03	2012
Upper Little Stillwater Creek	05040001 15 03	2013
Weaver Run-Stillwater Creek	05040001 16 03	2012
Town of Perrysville-Black Fork Mohican River	05040002 08 02	2015
Big Run-Black Fork Mohican River	05040002 08 03	2015
East Branch Kokosing River	05040003 01 02	2015
Delano Run-Kokosing River	05040003 03 04	2018
Indianfield Run-Kokosing River	05040003 03 07	2016
Big Run-Killbuck Creek	05040003 08 04	2009
Bucklew Run-Killbuck Creek	05040003 08 05	2009
Reasoners Run-Olive Green Creek	05040004 11 04	2012
Trail Run-Wills Creek	05040005 02 07	2014
Beeham Run-Salt Fork	05040005 04 06	2014
Wills Creek Dam-Wills Creek	05040005 06 04	2014
Rocky Fork	05040006 05 03	2014
Town of La Rue-Scioto River	05060001 04 05	2009
Lower Mill Creek	05060001 06 04	2012
Brush Run-Bokes Creek	05060001 07 02	2015
Smith Run-Bokes Creek	05060001 07 03	2015
Indian Run-Olentangy River	05060001 10 06	2018
O'Shaughnessy Dam-Scioto River	05060001 12 02	2010
Hayden Run-Scioto River	05060001 12 04	2014
Hoover Reservoir-Big Walnut Creek	05060001 13 08	2013
Alum Creek Dam-Alum Creek	05060001 14 04	2013
Town of Carroll-Walnut Creek	05060001 17 05	2012
Spain Creek-Big Darby Creek	05060001 19 02	2014
Robinson Run-Big Darby Creek	05060001 19 05	2014
Barron Creek-Little Darby Creek	05060001 20 05	2014

Water Body (Category 1: Unimpaired)	Assessment Unit	Most Recent Data
Thomas Ditch-Little Darby Creek	05060001 20 06	2014
Worthington Ditch-Big Darby Creek	05060001 21 01	2014
Silver Ditch-Big Darby Creek	05060001 21 02	2014
Richmond Ditch-Deer Creek	05060002 01 02	2011
Turkey Run-Deer Creek	05060002 01 06	2011
Town of Mount Sterling-Deer Creek	05060002 02 04	2011
Deer Creek Lake-Deer Creek	05060002 02 05	2011
Stony Creek-Scioto River	05060002 10 05	2011
Headwaters Morgan Fork	05060002 12 02	2011
Rocky Fork Lake-Rocky Fork	05060003 05 04	2017
Cliff Creek-Paint Creek	05060003 06 03	2014
Indian Lake-Great Miami River	05080001 01 03	2017
Stoney Creek	05080001 04 03	2012
Lake Loramie-Loramie Creek	05080001 05 03	2016
Mosquito Creek	05080001 07 02	2014
Headwaters Greenville Creek	05080001 10 04	2013
Bridge Creek-Greenville Creek	05080001 11 02	2014
Town of Covington-Stillwater River	05080001 12 05	2015
Ludlow Creek	05080001 14 02	2015
Sinking Creek	05080001 17 03	2018
Rush Run-Sevenmile Creek	05080002 05 04	2014
Acton Lake Dam-Four Mile Creek	05080002 06 04	2015
Howard Creek-Dry Fork Whitewater River	05080003 08 08	2017
Jameson Creek-Whitewater River	05080003 08 10	2017
Robinson Run-Raccoon Creek	05090101 05 04	2016
Barren Creek-Raccoon Creek	05090101 06 02	2018
Camp Creek-Symmes Creek	05090101 09 03	2014
Pigeon Creek-Symmes Creek	05090101 10 03	2012
Aaron Creek-Symmes Creek	05090101 10 04	2016
Storms Creek	05090103 01 04	2017
Howard Run-Pine Creek	05090103 02 04	2010
Lick Run-Pine Creek	05090103 02 05	2010
Headwaters Turkey Creek	05090201 02 01	2014
Middle Caesar Creek	05090202 04 04	2011
Lower Caesar Creek	05090202 04 06	2013
Wilson Creek-Cowan Creek	05090202 06 05	2013
Headwaters East Fork Little Miami River	05090202 10 02	2012
Lucy Run-East Fork Little Miami River	05090202 12 03	2013
Headwaters Stonelick Creek	05090202 13 01	2018
Lick Fork-Stonelick Creek	05090202 13 04	2012
Salt Run-East Fork Little Miami River	05090202 13 05	2012

BOLD rows indicate WAUs that would be impaired if the U.S. EPA mercury criterion of 0.3 mg/kg were effective.

Table E-6 — Waters fully supporting the human health use because fish tissue levels of PCBs or mercury are below the threshold level upon which the WQS criterion is based, and which were categorized as impaired in the 2018 IR. These waters have become category 1

Water Body (Newly Unimpaired for 2020)	Assessment Unit	Reason for delisting	Most Recent Data
Ladue Reservoir-Bridge Creek	04110002 01 04	Reevaluation	2010
Buck Run-Hocking River	05030204 04 05	New data	2018
Town of Perrysville-Black Fork Mohican River	05040002 08 02	Reevaluation	2015
Big Run-Black Fork Mohican River	05040002 08 03	Reevaluation	2015
Delano Run-Kokosing River	05040003 03 04	New data	2018

Table E-7 — Waters with contaminants other than PCBs and mercury that affect fish tissue (included on the 303(d) list). These waters are category 5.

Water Body (Impaired by Other Pollutants)	Assessment Unit	Pollutant(s)	Most Recent Data
Willow Run-St Joseph River	04100003 05 05	PCBs, Mercury	2013
Griswold Creek-Chagrin River	04110003 04 02	PCBs, DDT	2008
Bronson Creek-Grand River	04110004 05 02	PCBs, Mercury	2016
Headwaters Middle Fork Little Beaver Creek	05030101 04 02	Mirex	2010
Stone Mill Run-Middle Fork Little Beaver Creek	05030101 04 03	Mirex	2010
Tuscarawas River Mainstem (Chippewa Creek to Sandy Creek)	05040001 09 01	PCBs, Hexachlorobenzene	2017
Tuscarawas River Mainstem (Sandy Creek to Stillwater Creek)	05040001 09 02	PCBs, Hexachlorobenzene	2017
Silver Creek-Chippewa Creek	05040001 02 07	Hexachlorobenzene	2004*
Beal Run-Sandy Creek	05040001 06 07	PCBs, Hexachlorobenzene	2010

Years with asterisks (*) indicate that the analysis was completed before 2010, when using larger assessment units, and these sections may not have actual data within these units.

Table E-8 — Waters with current fish tissue data where inadequate samples exist to determine impairment status. These waters are category 3.

Water Body (Category 3: Insufficient Data)	Assessment Unit	Most Recent Data
Cornell Ditch-Fish Creek	04100003 04 06	2013
Lower Lick Creek	04100006 04 04	2013
Dry Run-Auglaize River	04100007 01 05	2012
Middle Creek	04100007 08 05	2014
Lower Blue Creek	04100007 10 04	2012
Upper Powell Creek	04100007 11 02	2012
Lower Powell Creek	04100007 11 03	2012
Middle South Turkeyfoot Creek	04100009 01 04	2015
Lower South Turkeyfoot Creek	04100009 01 06	2015
Lower Yellow Creek	04100009 05 06	2015
Middle Beaver Creek	04100009 05 08	2015
Haskins Road Ditch-Maumee River	04100009 06 03	2017
Crooked Creek-Maumee River	04100009 09 03	2017
Otter Creek-Frontal Lake Erie	04100010 07 06	2018
Pipe Creek-Frontal Sandusky Bay	04100011 01 02	2018
Mills Creek	04100011 01 03	2009
Pickerel Creek	04100011 02 03	2009
Raccoon Creek	04100011 02 04	2009
Beaver Creek	04100011 12 02	2009
Muskellunge Creek	04100011 13 01	2009
Red Creek-Grand River	04110004 06 07	2009

Water Body (Category 3: Insufficient Data)	Assessment Unit	Most Recent Data
Piney Creek-Captina Creek	05030106 09 04	2009
Cat Run-Captina Creek	05030106 09 06	2009
Lower Sunfish Creek	05030201 01 04	2009
Wolfpen Run-Little Muskingum River	05030201 06 03	2015
Dog Run-Conotton Creek	05040001 08 05	2016
Boggs Fork	05040001 13 03	2013
Town of Uhrichsville-Stillwater Creek	05040001 16 04	2012
Evans Creek	05040001 19 01	2009
Jennings Ditch-Killbuck Creek	05040003 06 04	2009
Buckeye Fork	05040004 04 04	2009
Painter Creek-Jonathon Creek	05040004 04 07	2009
Chapman Run	05040005 02 06	2010
Salt Fork Lake-Sugartree Fork	05040005 04 05	2014
Sarchet Run-Wills Creek	05040005 05 04	2014
Headwaters Little Scioto River	05060001 03 02	2009
City of Marion-Little Scioto River	05060001 03 03	2009
Eversole Run	05060001 12 01	2009
Deer Creek Dam-Deer Creek	05060002 02 07	2011
State Run-Deer Creek	05060002 03 04	2011
Big Branch-Rattlesnake Creek	05060003 04 07	2014
Dismal Creek	05080001 10 01	2012
Town of New Miami-Great Miami River	05080002 07 06	2010
Banklick Creek-Great Miami River	05080002 09 02	2010
Lee Creek-Dry Fork Whitewater River	05080003 08 09	2017
Flat Run-Raccoon Creek	05090101 03 04	2016
Meadow Run-Little Raccoon Creek	05090101 04 03	2016
Deer Creek-Little Raccoon Creek	05090101 04 04	2016
Flatlick Run-Raccoon Creek	05090101 05 03	2016
McKinney Creek-Symmes Creek	05090101 10 05	2016
East Fork Todd Fork	05090202 07 01	2009

Table E-9 — Large rivers and their impairment status.

Water Body (Large Rivers)	Assessment Unit	Impairment Status
Maumee River Mainstem (IN border to Tiffin River)	**04100005 90 01**	**Impaired (PCBs, Mercury)**
Tiffin River Mainstem (Brush Creek to mouth)	**04100006 90 01**	**Impaired (PCBs)**
Auglaize River Mainstem (Ottawa River to mouth); excluding Defiance Power Dam Reservoir	**04100007 90 01**	**Impaired (PCBs)**
Blanchard River Mainstem (Dukes Run to mouth)	**04100008 90 01**	**Impaired (historical)**
Maumee River Mainstem (Tiffin River to Beaver Creek)	**04100009 90 01**	**Impaired (PCBs)**
Maumee River Mainstem (Beaver Creek to Maumee Bay)	**04100009 90 02**	**Impaired (PCBs)**
Sandusky River Mainstem (Tymochtee Creek to Wolf Creek)	**04100011 90 01**	**Impaired (PCBs, Mercury)**
Sandusky River Mainstem (Wolf Creek to Sandusky Bay)	**04100011 90 02**	**Impaired (PCBs)**
Cuyahoga River Mainstem (Brandywine Cr. to mouth); including old channel	**04110002 90 01**	**Impaired (PCBs)**
Grand River Mainstem (Mill Creek to mouth)	**04110004 90 01**	**Impaired (PCBs)**
Mahoning River Mainstem (Eagle Creek to Pennsylvania Border)	**05030103 90 01**	**Impaired (PCBs)**
Hocking River Mainstem (Scott Creek to Margaret Creek)	05030204 90 01	Not impaired
Hocking River (Margaret Creek to Ohio River)	05030204 90 02	Not impaired

Water Body (Large Rivers)	Assessment Unit	Impairment Status
Tuscarawas River Mainstem (Chippewa Creek to Sandy Creek)	**05040001 90 01**	**Impaired (PCBs, Hexachlorobenzene)**
Tuscarawas River Mainstem (Sandy Creek to Stillwater Creek)	**05040001 90 02**	**Impaired (PCBs, Hexachlorobenzene)**
Tuscarawas River Mainstem (Stillwater Creek to Muskingum River)	**05040001 90 03**	**Impaired (PCBs)**
Mohican River Mainstem (entire length)	**05040002 90 01**	**Impaired (historical)**
Walhonding River Mainstem (entire length)	05040003 90 01	Not impaired
Muskingum River Mainstem (Tuscarawas/Walhonding confluence to Licking River)	**05040004 90 01**	**Impaired (PCBs)**
Muskingum River Mainstem (Licking River to Meigs Creek)	**05040004 90 02**	**Impaired (PCBs)**
Muskingum River Mainstem (Meigs Creek to Ohio River)	**05040004 90 03**	**Impaired (PCBs)**
Wills Creek Mainstem (Salt Fork to mouth); excluding Wills Creek Lake	05040005 90 01	Not impaired
Licking River Mainstem (entire length); excluding Dillon Lake	**05040006 90 01**	**Impaired (PCBs)**
Scioto River Mainstem (L. Scioto R. to Olentangy R.); excluding O'Shaughnessy and Griggs reservoirs	**05060001 90 01**	**Impaired (PCBs)**
Scioto River Mainstem (Olentangy River to Big Darby Creek)	**05060001 90 02**	**Impaired (PCBs)**
Scioto River Mainstem (Big Darby Creek to Paint Creek)	**05060002 90 01**	**Impaired (PCBs)**
Scioto River Mainstem (Paint Creek to Sunfish Creek)	**05060002 90 02**	**Impaired (PCBs)**
Scioto River Mainstem (Sunfish Creek to Ohio River)	**05060002 90 03**	**Impaired (PCBs)**
Paint Creek Mainstem (Rocky Fork to mouth)	**05060003 90 01**	**Impaired (historical)**
Great Miami River Mainstem (Tawawa Creek to Mad River)	**05080001 90 01**	**Impaired (historical)**
Stillwater River Mainstem (Greenville Creek to mouth)	05080001 90 02	Not impaired
Mad River Mainstem (Donnels Creek to mouth)	**05080001 90 03**	**Impaired (PCBs)**
Great Miami River Mainstem (Mad River to Four Mile Creek)	**05080002 90 01**	**Impaired (PCBs)**
Great Miami River Mainstem (Four Mile Creek to Ohio River)	**05080002 90 02**	**Impaired (PCBs)**
Whitewater River Mainstem (entire length)	**05080003 90 01**	**Impaired (PCBs)**
Raccoon Creek Mainstem (Little Raccoon Creek to mouth)	05090101 90 01	Not impaired
Little Miami River Mainstem (Caesar Creek to O'Bannon Creek)	**05090202 90 01**	**Impaired (historical)**
Little Miami River Mainstem (O'Bannon Creek to Ohio River)	**05090202 90 02**	**Impaired (historical)**

BOLD text indicates impaired rivers.

Table E-10 — Inland lakes and their impairment status.

Water Body (Inland Lakes)	Impairment Status	Most Recent Data
Acton Lake	Not impaired	2015
Adams Lake	Insufficient information	2014
Alum Creek Lake	Not impaired	2013
Apple Valley Lake	Not impaired	2007
Archibold Reservoir #2	Insufficient information	2013
Atwood Lake	Not impaired	2016
Barnesville Reservoir #1	Insufficient information	2010
Barnesville Reservoir #2	Insufficient information	2010
Barnesville Reservoir #3	Insufficient information	2010
Belmont Lake	Not impaired	2016
Buckeye Lake	Not impaired	2008
Caesar Creek Lake	Not impaired	2013
Caldwell Lake	Insufficient information	2011

Water Body (Inland Lakes)	Impairment Status	Most Recent Data
Charles Mill Lake	Insufficient information	2014
Chippewa Lake	Insufficient information	2015
CJ Brown Reservoir	Insufficient information	2014
Clark Lake	Not impaired	2018
Clear Fork Reservoir	**Impaired (PCBs)**	**2008**
Clendening Lake	Not impaired	2013
Cowan Lake	Not impaired	2013
Cutler Lake	Insufficient information	2008
Deer Creek Lake	Not impaired	2011
Delaware Lake	Not impaired	2018
Delphos Reservoir	Insufficient information	2014
Delta Reservoir #2	Not impaired	2015
Dillon Lake	Not impaired	2008
East Branch Reservoir	Not impaired	2010
East Fork Lake	Not impaired	2013
East Reservoir	Insufficient information	2008
Ferguson Reservoir	Not impaired	2010
Findley Lake	Not impaired	2013
Findley Reservoir #2	**Impaired (PCBs)**	**2015**
Friendship Park Lake	Insufficient information	2008
Grand Lake St Marys	Insufficient information	2014
Griggs Reservoir	Not impaired	2014
Guilford Lake	Not impaired	2017
Hammertown Lake	Insufficient information	2007
Hargus Lake	Insufficient information	2014
Hinckley Lake	Insufficient information	2008
Hoover Reservoir	Not impaired	2013
Indian Lake	Not impaired	2017
Jackson Lake	Insufficient information	2007
Jefferson Lake	Not impaired	2014
Kiser Lake	Insufficient information	2014
Knox Lake	Not impaired	2015
LaDue Reservoir	Not impaired	2010
Lake Glacier	Not impaired	2013
Lake Isabella	Insufficient information	2009
Lake Jisco	Insufficient information	2007
Lake Katherine	Insufficient information	2007
Lake La Su An	Not impaired	2018
Lake Logan	Not impaired	2015
Lake Loramie	Not impaired	2016
Lake Milton	**Impaired (PCBs)**	**2008**
Lake Nesmith	**Impaired (PCBs)**	**2016**
Lake Olander	Insufficient information	2011
Lake Rockwell	**Impaired (PCBs)**	**2010**
Lake Vesuvius	Not impaired	2017
Lake White	Not impaired	2014
Leesville Lake	Not impaired	2018
Long Lake	Insufficient information	2007
Madison Lake	Insufficient information	2011
Marysville Reservoir	Insufficient information	2009
Meadowbrook Lake	Insufficient information	2012
Metzger Reservoir	Insufficient information	2010

Water Body (Inland Lakes)	Impairment Status	Most Recent Data
Mogadore Reservoir	Not impaired	2007
Mosquito Creek Lake	Not impaired	2013
Nettle Lake	Insufficient information	2013
New London Reservoir	Not impaired	2016
Nimisila Reservoir	Not impaired	2007
North Fork Kokosing Reservoir	Not impaired	2007
O'Shaughnessy Reservoir	Not impaired	2010
Paint Creek Lake	Not impaired	2014
Piedmont Lake	Not impaired	2013
Pike Lake	Not impaired	2011
Pleasant Hill Lake	Insufficient information	2014
Pymatuning Reservoir	Not impaired	2008
Rocky Fork Lake	Not impaired	2017
Rose Lake	Insufficient information	2011
Rush Creek Lake	Not impaired	2016
Rush Run Lake	Not impaired	2014
Salt Fork Reservoir	Not impaired	2014
Seneca Lake	Insufficient information	2007
Sippo Lake	Not impaired	2015
Stewart Lake	Insufficient information	2011
Stonelick Lake	Not impaired	2018
Summit Lake	**Impaired (PCBs)**	**2016**
Swift Run Lake	Insufficient information	2009
Tappan Lake	Not impaired	2013
Turkey Creek Lake	Not impaired	2014
Tycoon Lake	Not impaired	2018
Van Wert Reservoir #1	Insufficient information	2014
Van Wert Reservoir #2	Insufficient information	2014
Veteran's Memorial Reservoir	Not impaired	2017
Wellington Upground Reservoir	Insufficient information	2013
West Branch Reservoir	**Impaired (PCBs)**	**2008**
Westville Lake	**Impaired (PCBs)**	**2007**
Wills Creek Reservoir	Not impaired	2014
Wingfoot Lake	Not impaired	2007

BOLD text indicates impaired lakes.

Table E-11 — Lake Erie assessment units and their impairment status.

Lake Erie Assessment Unit	Assessment Unit	Impairment Status
LE Central Basin Shoreline	**041202000203**	**Impaired (PCBs)**
LE Central Basin Open Water	**041202000303**	**Impaired (PCBs)**
LE Islands Shoreline	**041202000101**	**Impaired (PCBs)**
LE Sandusky Basin Shoreline	**041202000202**	**Impaired (PCBs)**
LE Sandusky Basin Open Water	**041202000302**	**Impaired (PCBs)**
LE Western Basin Shoreline	**041202000201**	**Impaired (PCBs)**
LE Western Basin Open Water	**041202000301**	**Impaired (PCBs)**

BOLD text indicates impaired units.

E4. Supplemental Information

Calculation of Fish Concentrations from Water Quality Standards Inputs

For carcinogens:

$$Fish\ Concentration\ (mg/kg) = \frac{\left[\frac{Cancer\ Risk\ Level}{q1^{*}\left((mg/kg/d)^{-1}\right)}\right] \times Body\ Weight\ (kg)}{Fish\ Consumption\ (kg/d)}$$

For noncarcinogens:

$$Fish\ Concentration\ (mg/kg) = \frac{RfD\ (mg/kg/d) \times Body\ Weight\ (kg) \times\ RSC}{Fish\ Consumption\ (kg/d)}$$

For wildlife:

$$Fish\ Concentration\ (mg/kg) = Wildlife\ WQC\ (mg/L) \times BAF\ TL_{n}\ (L/kg)$$

Lake Erie Drainage Basin

	Mercury	Chlordane	DDT	PCBs	Hexachloro-benzene	Mirex
HHWQC	3.1 ng/L	2.4 µg/L	0.15 ng/L	0.026 ng/L	0.45 ng/L	0.074 ng/L
Wildlife Criteria	1.3 ng/L	N/A	0.011 ng/L	0.12 ng/L	N/A	N/A
The following inputs on which the WQS are based are used to calculate fish concentrations:						
Reference Dose (RfD)	1E-04 mg/kg/d	N/A	N/A	N/A	N/A	N/A
Slope Factor (q1*)	N/A	0.35 $(mg/kg/d)^{-1}$	0.34 $(mg/kg/d)^{-1}$	2.0 $(mg/kg/d)^{-1}$	1.6 $(mg/kg/d)^{-1}$	0.53 $(mg/kg/d)^{-1}$
Cancer Risk Level	N/A	1E-05	1E-05	1E-05	1E-05	1E-05
Body Weight	65 kg	70 kg	70 kg	70 kg	70 kg	70 kg
Trophic Level Three Bioaccumulation Factor (BAF TL^3)	27,900	116,600	376,400	520,900	43,690	353,000
Trophic Level Four Bioaccumulation Factor (BAF TL^4)	140,000	154,200	1,114,000	1,871,000	71,080	1,461,000
Fish Consumption	0.015 kg/d	0.015 kg/d	0.015 kg/d	0.015 kg/d	0.015 kg/d	0.015 kg/d
Relative Source Contribution Factor (RSC)	0.8	N/A	N/A	N/A	N/A	N/A

Source: U.S. EPA. 1995. Great Lakes Water Quality Initiative Criteria Documents for the Protection of Human Health. EPA-820-B-95-006. March 1995.

Derivation of Concentrations

Lake Erie Drainage Basin Mercury Human Health Fish Concentration

$$\frac{1E-04\,(mg/kg/d)\times 65\,(kg)\times 0.8}{0.015\,(kg/d)} = 0.35\,(mg/kg) = 350\,(\mu g/kg)$$

Lake Erie Drainage Basin Mercury Wildlife Fish Concentration

Trophic Level 3:

$$1.3E-06\,(mg/L)\times 27{,}900\,(L/kg) = 0.036\,(mg/kg) = 36\,(\mu g/kg)$$

Trophic Level 4:

$$1.3E-06\,(mg/L)\times 140{,}000\,(L/kg) = 0.18\,(mg/kg) = 180\,(\mu g/kg)$$

Lake Erie Drainage Basin Chlordane Human Health Fish Concentration

$$\frac{\left[\frac{1E-05}{0.35\,(mg/kg/d)^{-1}}\right]\times 70\,(kg)}{0.015\,(kg/d)} = 0.13\,(mg/kg) = 130\,(\mu g/kg)$$

Lake Erie Drainage Basin DDT Human Health Fish Concentration

$$\frac{\left[\frac{1E-05}{0.34\,(mg/kg/d)^{-1}}\right]\times 70\,(kg)}{0.015\,(kg/d)} = 0.14\,(mg/kg) = 140\,(\mu g/kg)$$

Lake Erie Drainage Basin DDT Wildlife Fish Concentration

Trophic Level 3:

$$1.1E-08\,(mg/L)\times 376{,}400\,(L/kg)=0.0041\,(mg/kg)=4.1\,(\mu g/kg)$$

Trophic Level 4:

$$1.1E-08\,(mg/L)\times 1{,}140{,}000\,(L/kg)=0.012\,(mg/kg)=12\,(\mu g/kg)$$

Lake Erie Drainage Basin PCB Human Health Fish Concentration

$$\frac{\left[\frac{1E-05}{2.0\,(mg/kg/d)^{-1}}\right]\times 70\,(kg)}{0.015\,(kg/d)}=0.023\,(mg/kg)=23\,(\mu g/kg)$$

Lake Erie Drainage Basin PCB Wildlife Fish Concentration

Trophic Level 3:

$$1.2E-07\,(mg/L)\times 520{,}900\,(L/kg)=0.062\,(mg/kg)=62\,(\mu g/kg)$$

Trophic Level 4:

$$1.2E-07\,(mg/L)\times 1{,}871{,}000\,(L/kg)=0.22\,(mg/kg)=220\,(\mu g/kg)$$

Lake Erie Drainage Basin Hexachlorobenzene Human Health Fish Concentration

$$\frac{\left[\frac{1E-05}{1.6\,(mg/kg/d)^{-1}}\right]\times 70\,(kg)}{0.015\,(kg/d)}=0.029\,(mg/kg)=29\,(\mu g/kg)$$

Lake Erie Drainage Basin Mirex Human Health Fish Concentration

$$\frac{\left[\frac{1E-05}{0.53\,(mg/kg/d)^{-1}}\right]\times 70\,(kg)}{0.015\,(kg/d)}=0.088\,(mg/kg)=88\,(\mu g/kg)$$

Ohio River Drainage Basin

	Mercury	Chlordane	DDT	PCBs	Hexachloro-benzene	Mirex
HHWQC	12 ng/L*	21 ng/L	5.9 ng/L	1.7 ng/L	7.5 ng/L	0.11 ng/L
The following inputs on which the WQS are based are used to calculate fish concentrations:						
Reference Dose (RfD)	N/A	N/A	N/A	N/A	N/A	N/A
Slope Factor (q1*)	N/A	0.35 $(mg/kg/d)^{-1}$	0.34 $(mg/kg/d)^{-1}$	2.0 $(mg/kg/d)^{-1}$	1.6 $(mg/kg/d)^{-1}$	0.53 $(mg/kg/d)^{-1}$
Cancer Risk Level	N/A	1E-05	1E-05	1E-05	1E-05	1E-05
Body Weight	N/A	70 kg	70 kg	70 kg	70 kg	70 kg
Fish Consumption	N/A	0.0175 kg/d	0.0175 kg/d	0.0175 kg/d	0.0175 kg/d	0.0175 kg/d
Relative Source Contribution Factor (RSC)	N/A	N/A	N/A	N/A	N/A	N/A

* Based on the FDA action level of 1 mg/kg divided by the BCF of 83,333 L/kg.

Ohio River Drainage Basin Mercury Fish Concentration

1 mg/kg based on FDA action level

Ohio River Drainage Basin Chlordane Fish Concentration

$$\frac{\left[\frac{1E-05}{0.35\left(mg/kg/d\right)^{-1}}\right]\times 70\left(kg\right)}{0.0065\left(kg/d\right)}=0.31\left(mg/kg\right)=310\left(\mu g/kg\right)$$

Ohio River Drainage Basin DDT Fish Concentration

$$\frac{\left[\frac{1E-05}{0.34\left(mg/kg/d\right)^{-1}}\right]\times 70\left(kg\right)}{0.0065\left(kg/d\right)}=0.32\left(mg/kg\right)=320\left(\mu g/kg\right)$$

Ohio River Drainage Basin PCB Fish Concentration

$$\frac{\left[\frac{1E-05}{2.0\left(mg/kg/d\right)^{-1}}\right]\times 70\left(kg\right)}{0.0065\left(kg/d\right)}=0.054\left(mg/kg\right)=54\left(\mu g/kg\right)$$

Ohio River Drainage Basin Hexachlorobenzene Fish Concentration

$$\frac{\left[\frac{1E-05}{1.6\left(mg/kg/d\right)^{-1}}\right]\times 70\left(kg\right)}{0.0065\left(kg/d\right)}=0.067\left(mg/kg\right)=67\left(\mu g/kg\right)$$

Ohio River Drainage Basin Mirex Fish Concentration

$$\frac{\left[\frac{1E-05}{0.53\left(mg/kg/d\right)^{-1}}\right]\times 70\left(kg\right)}{0.0065\left(kg/d\right)}=0.20\left(mg/kg\right)=200\left(\mu g/kg\right)$$

Fish Tissue Concentrations for Determining Impairment for the 2020 IR (µg/kg)

	Lake Erie HH	Lake Erie – wildlife TL3	Lake Erie – wildlife TL4	Ohio River
Mercury	350	36	180	1000
Chlordane	130	N/A	N/A	310
DDT	140	4.1	12	320
PCBs	23	62	220	54
Hexachlorobenzene	29	N/A	N/A	67
Mirex	88	N/A	N/A	200

What's the difference between the Fish Consumption Advisory decision and the impairment decision?

Some question may arise as to how the methodology for determining impairment status for the 2020 IR for fish tissue relates to the fish advisories issued by the State of Ohio. Rather than building on FCA decisions, the revised methodology draws directly from the fish tissue contaminant database. This change was possible because of better accessibility to the raw data.

In short, the basis for determining impairment for the IR for fish tissue is similar but unrelated to the basis for determining advisories. The WQS calculations assume a certain amount of fish consumption and ensure that level of consumption is safe. The advisory calculations determine what level of fish consumption is safe. Therefore, both are protective of human health. However, advisories and IR impairment status are not directly related.

Advisory thresholds are given as one meal per week, one meal per month, one meal every other month and do not eat. Each threshold is associated with a particular contaminant concentration that is based on consuming an 8-ounce meal. For both PCBs and mercury, those thresholds are 50 parts per billion (ppb) for one meal per week, 220 ppb for one meal per month, 1,000 ppb for one meal every other month and 2,000 ppb for do not eat.

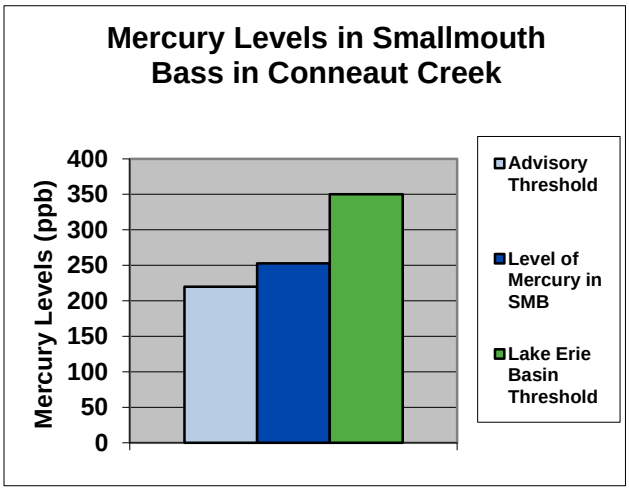
The thresholds used for determining IR categories are based on water quality standards for human health. The water quality standards assume that people are eating a certain quantity of different types of fish over time. The Lake Erie basin WQS calculations for mercury and PCBs assume that people are eating 15 grams of fish per day. The Ohio River basin calculations for PCBs and mercury assume that people are eating 17.5 grams of fish per day.

Advisory thresholds are prescriptive, indicating to people how much fish is safe to eat given a certain level of fish contamination. Water quality standard-based thresholds are descriptive, indicating how much contamination is acceptable in fish given that people are eating a certain amount of certain types of fish. In other words, the advisories tell people how much fish they can safely eat and the water quality standards assume how much fish people are eating and use that information to calculate a "safe" level of contamination in fish.

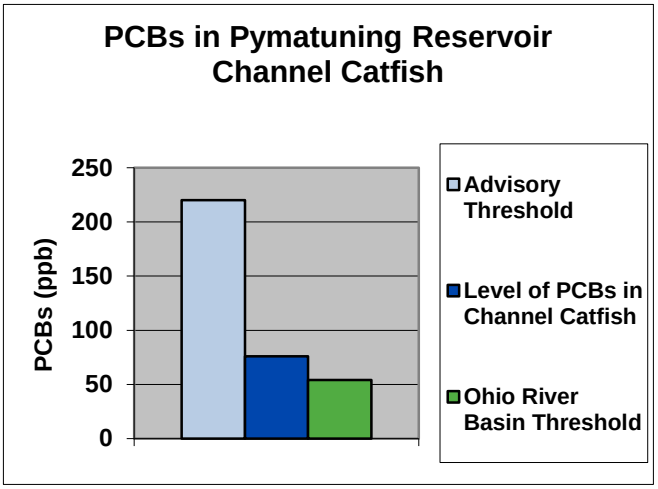
U.S. EPA, in its guidance on developing the IR, indicates that water quality standards are to be used as the basis for determining impairment categories for fish tissue. Because the assumptions used to calculate the advisories are different than the assumptions used to calculate the WQS, this results in cases where some water bodies have advisories against fish consumption, but are not listed as impaired; and some water bodies are listed as impaired, but no fish advisory is in place. This situation is demonstrated in the following table:

Parameter	Lake Erie Basin	Ohio River Basin	One meal per week advisory	One meal per month advisory
Fish Consumed	15 grams/day	17.5 grams/day	32.6 grams/day	7.6 grams/day
Maximum Allowable Fish Concentration				
PCB Threshold	23 ppb	54 ppb	50 ppb	220 ppb
Mercury Threshold	350 ppb	1000 ppb	50 ppb	220 ppb

The reason the thresholds are different between the two basins is that the assumed fish consumption levels are different. And the reason the water quality standard thresholds are different from the advisory thresholds is both because the fish consumption levels are different, and because for PCBs, a cancer slope factor is used to calculate the water quality standard criteria, which is stricter than the health protection value used to calculate the advisory threshold.



Data for smallmouth bass in Conneaut Creek provide an example where there is an advisory, but the water body is not impaired.



Channel catfish in Pymatuning Reservoir show a case where there is no advisory, but the water is listed as impaired.