

**A Summary of Mercury Concentrations in Fish (edible portions) from Wisconsin Waters
1990-2005**

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BACKGROUND

This document presents a summary of mercury (Hg) concentrations in edible portions of fish collected from Wisconsin's waters from 1990 to 2005 (those results available and field verified as of 2007). Edible portions include skin-on fillets, skin-off fillets, and fillet sections. The Hg concentrations are broken out by three groups:

- Table 1 – Hg results by species collected at sites **without** site-specific special, Hg-based fish consumption advice for the fish species;
- Table 2 - Hg results by species collected at sites **with** special, Hg-based fish consumption advice (more stringent than the statewide general advisory);
- Table 3 - Hg results by species of samples collected at Great Lakes sites (where PCB-based special advice applies).

The information presented summarizes 11,289 Hg results. The dataset described in the attached tables also includes results for fish collected by the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) from 1996 to 2005 (after the WIDNR and GLIFWC entered into a memorandum of understanding regarding Hg analysis methods and data sharing). The Wisconsin Department of Natural Resources' (WIDNR) fish contaminant database contains a total of 18,223 Hg results for fish collected at 1,593 sites (some sites sampled multiple times) including samples comprised of whole fish and other tissues.

As a brief background, the Wisconsin Department of Natural Resources (WIDNR) began in the 1970s to evaluate Hg concentrations in fish from rivers receiving treated wastewater from facilities that used Hg-based slimicides. Monitoring designs evolved over time as more was learned about environmental contaminants and risks to human health from consumption of contaminated fish. In the 1980s, scientists became aware of atmospheric transport and deposition of Hg to remote waters, methylation processes, and bioaccumulation of Hg in the food chain. After elevated Hg concentrations in fish from northern latitudes were found, WIDNR's focus shifted to lakes in northern Wisconsin. In the 1990s, fish contaminant monitoring was conducted at surveillance sites in selected watersheds throughout the state. These sites were selected based on the potential for pollution, the amount of fishing pressure the site receives, and their potential as an "indicator" for a watershed. Since 2000, sampling of fish for Hg has focused on waters with special Hg-based advisories, popular fishing lakes, and other waters where fishery surveys are being conducted. Top-level predator species are collected because they reach the highest Hg concentrations but other species popular with anglers are collected as well. Fish contaminant data are collected for other purposes, including trend monitoring or assessment of clean-up efforts. Thus, overtime, statewide Hg monitoring in Wisconsin fish was generally not conducted under a single study design. Overall, the main purpose of monitoring focused on determining appropriate advice for human consumption of fish.

WIDNR staff collected most samples using typical fisheries survey methods, including electrofishing and netting. After collection and labeling, samples were frozen and later transported to a processing facility where they were measured, weighed, and filleted. Fillet or fillet sections were homogenized and sub-samples placed in glass jars. Samples were analyzed for total Hg content according to the methods described in Sullivan and Delfino (1982). Results were reported to two significant digits and the level of detection was 0.03 µg/g for samples analyzed prior to June 1994 and 0.004 µg/g after that date.

Table 1. Statewide Summary of Mercury Concentrations in Fillets - Species from Sites Without Special Advice

9,874 results from 712 sampling locations collected 1990-2005 with results verified as of 2007

Fish Type Name	Sum of Individual Fish	Length (inches)		Mercury Concentration (ppm)			
		Minimum	Maximum	Count	Average	Minimum	Maximum
INLAND TROUT				19	0.102	0.026	0.410
BROOK TROUT	1	9.5	9.5	1	0.050	0.050	0.050
BROWN TROUT	23	9.4	22.5	18	0.104	0.026	0.410
ALL PANFISH				976	0.137	0.016	1.200
PUMPKINSEED	37	5.0	9.0	36	0.099	0.016	0.280
BLUEGILL	412	4.8	10.2	396	0.123	0.017	0.510
BLACK CRAPPIE	338	5.0	13.2	315	0.149	0.021	0.540
YELLOW PERCH	253	4.8	13.2	228	0.153	0.018	1.200
GREEN SUNFISH	1	8.8	8.8	1	0.170	0.170	0.170
ALL BOTTOM FISH				897	0.212	0.005	1.100
GOLDFISH	1	8.3	8.3	1	0.047	0.047	0.047
YELLOW BASS	2	9.5	10.4	2	0.092	0.085	0.099
NORTHERN HOG SUCKER	2	13.8	13.8	1	0.100	0.100	0.100
BIGMOUTH BUFFALO	6	13.0	24.0	6	0.121	0.038	0.280
BLACK BULLHEAD	45	7.3	14.2	37	0.164	0.031	0.540
DRUM, FRESHWATER (SHEEPSHEAD)	9	10.0	18.5	8	0.167	0.077	0.480
WHITE SUCKER	145	8.7	22.4	120	0.179	0.008	0.470
REDHORSE, SHORTHEAD	38	7.9	24.2	25	0.181	0.017	0.600
YELLOW BULLHEAD	19	8.8	13.1	19	0.192	0.041	0.580
CARP	342	6.9	33.1	321	0.192	0.005	1.100
CHANNEL CATFISH	220	10.0	32.5	216	0.219	0.028	1.100
FLATHEAD CATFISH	10	13.5	38.0	10	0.231	0.120	0.630
BULLHEAD	3	10.6	13.0	3	0.253	0.150	0.440
REDHORSE, GOLDEN	43	14.8	23.9	40	0.266	0.059	0.620
SMALLMOUTH BUFFALO	10	19.2	38.0	10	0.279	0.150	0.450
REDHORSE, SILVER	45	6.2	23.6	34	0.308	0.049	1.100
REDHORSE, GREATER	7	13.8	20.8	4	0.340	0.160	0.560
REDHORSE	50	12.2	24.9	40	0.374	0.030	0.800
ALL GAME FISH (except Muskies)				7794	0.358	0.000	3.100
STURGEON, SHOVELNOSE	5	24.7	25.8	5	0.075	0.061	0.095
WHITE CRAPPIE	10	6.7	12.1	6	0.120	0.060	0.230
WHITE PERCH	18	5.4	13.2	18	0.201	0.056	0.430
WHITE BASS	79	9.7	17.2	78	0.228	0.040	0.710
ROCK BASS	134	4.5	11.9	128	0.248	0.040	0.790
LAKE STURGEON	48	28.0	63.0	48	0.278	0.055	0.910
SAUGER	11	12.5	20.8	11	0.279	0.081	1.400
NORTHERN PIKE	1281	11.7	36.8	1279	0.317	0.030	1.600
SMALLMOUTH BASS	447	7.8	19.6	439	0.345	0.000	1.100
LARGEMOUTH BASS	1568	5.7	21.5	1564	0.349	0.031	1.300
WALLEYE	4215	8.8	30.2	4216	0.383	0.022	3.100
LAKE TROUT	2	27.0	32.7	2	0.420	0.320	0.520
MUSKY	188	13.1	50.5	188	0.744	0.063	2.900
Grand Total	10068	4.5	63.0	9874	0.330	0.000	3.100

Table 2. Summary of Mercury Concentrations in Fillets - Species at Sites with Special Mercury-based Advice

828 results from 61 sampling locations collected 1990-2005 with results verified as of 2007

Fish Type Name	Sum of Individual Fish	Length (inches)		Mercury Concentration (ppm)			
		Minimum	Maximum	Count	Average	Minimum	Maximum
BLACK CRAPPIE	102	6.5	13.2	98	0.401	0.110	1.100
BLUEGILL	19	6.3	8.7	19	0.284	0.130	0.580
CHANNEL CATFISH	14	13.5	32.0	14	0.785	0.340	2.400
LARGEMOUTH BASS	66	9.9	21.3	66	0.768	0.290	2.000
NORTHERN PIKE	12	13.0	44.0	12	0.981	0.180	1.900
PUMPKINSEED	5	6.1	7.2	5	0.230	0.140	0.320
ROCK BASS	1	8.9	8.9	1	0.690	0.690	0.690
SMALLMOUTH BASS	8	11.9	15.8	8	0.538	0.300	0.930
WALLEYE	589	10.7	30.0	586	0.742	0.137	2.400
YELLOW PERCH	19	6.7	10.2	19	0.390	0.150	0.960
Grand Total	835	6.1	44.0	828	0.684	0.110	2.400

Table 3. Summary of Mercury Concentrations in Fillets - Species from Great Lakes Waters

587 results from 44 sampling locations collected 1990-2005 with results verified as of 2007

Fish Type Name	Sum of Individual Fish	Length (inches)		Mercury Concentration (ppm)			
		Minimum	Maximum	Count	Average	Minimum	Maximum
RAINBOW TROUT	31	9.5	30.2	31	0.108	0.012	0.430
WHITE SUCKER	8	6.2	18.5	8	0.055	0.018	0.110
CISCO/LAKE HERRING	43	7.4	15.4	19	0.074	0.023	0.190
LAKE WHITEFISH	30	17.2	22.8	30	0.061	0.028	0.098
LAKE STURGEON	20	24.3	54.3	20	0.151	0.038	0.310
COHO SALMON	38	13.8	30.3	38	0.151	0.044	0.340
YELLOW PERCH	31	7.4	11.4	23	0.147	0.049	0.440
CHANNEL CATFISH	5	11.7	17.3	5	0.071	0.051	0.091
BLOATER CHUB	16	8.8	10.0	16	0.079	0.053	0.093
SISCOWETT LAKE TROUT	95	14.8	32.1	90	0.402	0.053	1.000
BROOK TROUT	3	10.1	10.8	3	0.080	0.060	0.100
BROWN TROUT	25	10.5	24.8	25	0.113	0.060	0.220
LAKE TROUT	51	19.2	36.1	51	0.303	0.064	1.100
DRUM, FRESHWATER (SHEEPSHEAD)	5	13.3	16.5	5	0.108	0.069	0.170
WALLEYE	70	9.8	29.5	70	0.329	0.069	1.300
WHITE PERCH	19	7.5	14.1	19	0.201	0.070	0.420
CHINOOK SALMON	97	15.6	41.1	97	0.256	0.076	0.510
BURBOT	30	13.5	31.0	30	0.335	0.097	0.860
CARP	5	22.5	25.2	5	0.232	0.120	0.330
NORTHERN PIKE	2	22.5	28.4	2	0.305	0.180	0.430
Grand Total	624	6.2	54.3	587	0.238	0.012	1.300