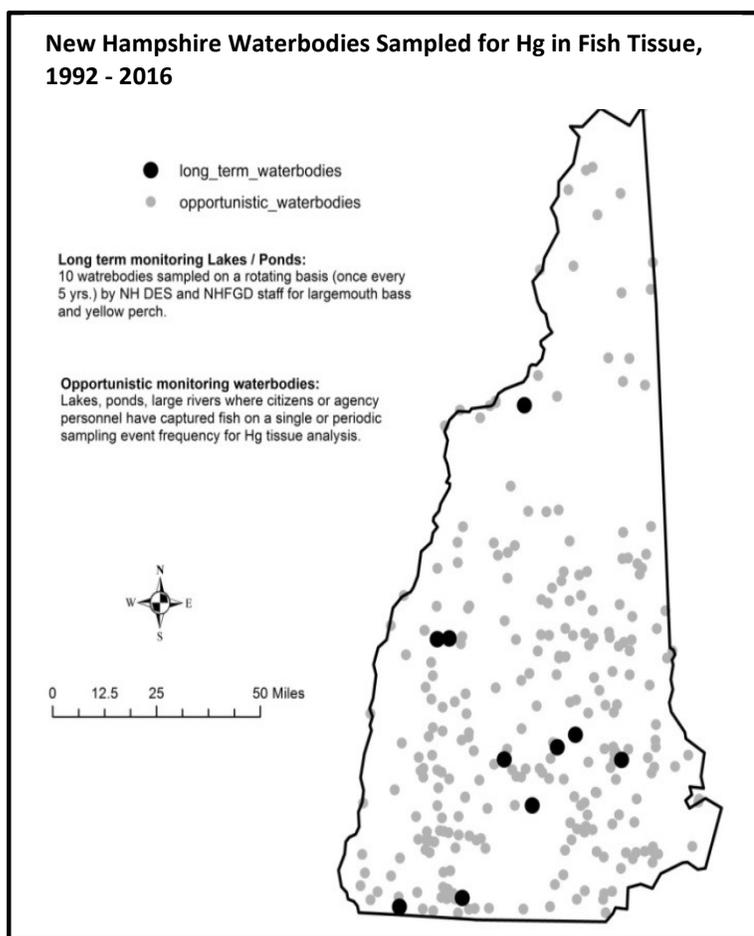


Status and Trends of Mercury in Freshwater Fish Tissue for New Hampshire, 1992 – 2016



The New Hampshire Department of Environmental Services (NHDES) has monitored total mercury concentrations in the tissue of freshwater fish species for 24 years. The goal of this work has been to assess the public health risk of mercury in the tissue of individual fish species and track trends over time. From 1992 - 2016, the NHDES completed mercury analysis on the muscle tissue of 4,100 fish representing 26 species collected from 227 waterbodies.



Mercury (Hg) is a naturally occurring element. It enters the atmosphere by burning fossil fuels, trash, and medical waste. Once deposited on the landscape, some portion is biologically transformed into a highly toxic form known as methyl-mercury. Methyl-mercury occurs in low concentrations in surface waters; however, it moves up the food chain and can result in high concentrations in fish consumed by humans and wildlife. To protect human health, New Hampshire has established statewide advisories to limit consumption.

<https://www.des.nh.gov/organization/commissioner/pip/factsheets/ard/documents/ard-ehp-25.pdf>

Status Report

Human health risks were evaluated by comparing average mercury concentrations in fish tissue for individual species to a common benchmark concentration of 0.70 mg

Hg/kg fish tissue. The benchmark concentration was used to develop the statewide fish consumptive guidelines. A fish tissue mercury concentration above or near the benchmark represents a potential human health risk based on the current consumptive limits. For predatory species such as **smallmouth bass, largemouth bass, yellow perch, and white perch, Eastern chain pickerel, and other commonly consumed species**, a statistic known as the upper 95% confidence interval (95UCL) was compared to the benchmark to determine if current size-restricted consumption limits were still applicable.

Analysis outcome:

- The average concentration of mercury in all fish tissue collectively was 0.33 mg Hg/kg tissue which is below the benchmark concentration.

- 95UCL concentrations of mercury in fish tissue for **smallmouth bass, largemouth bass, white perch, yellow perch, and Eastern chain pickerel** between 8 – 12 inches in length were below the benchmark indicating that the current size-restricted consumptive advisory is still protective of human health.
- New size-restricted consumptive limits are recommended for **walleye** because the 95UCL concentration of 0.86 mg Hg / kg tissue was higher than the benchmark concentration.
- New size-restricted consumptive limits are recommended for **lake trout** because the 95UCL of 0.68 mg Hg / kg tissue was near the benchmark concentration.
- New size-restricted consumptive limits are recommended for **northern pike**. The two individuals tested by the NHDES had an average mercury tissue concentration of 0.60 mg Hg / kg tissue and a previous New England study of over 1,000 fish reported a similar concentration of 0.63 mg Hg / kg tissue. These averages are approaching the benchmark concentration.
- NHDES will pursue adding species that new size-restricted consumption limits are recommended in consultation the New Hampshire Fish and Game Department and the Department of Health and Human Services.

Trend Report (Figures 1 & 2)

Since 1990, mercury emissions into the atmosphere in the United States have decreased by approximately 80%. In New Hampshire, atmospheric mercury emissions were estimated to have dropped 99% from 1,109 pounds / year in 1997 to 11 pounds / year in 2016. Data from **yellow perch** (Figure 1) and **largemouth bass** (Figure 2) were used to determine if lower mercury emissions resulted in lower concentrations of mercury in fish tissue as these were the species sampled most frequently over time.

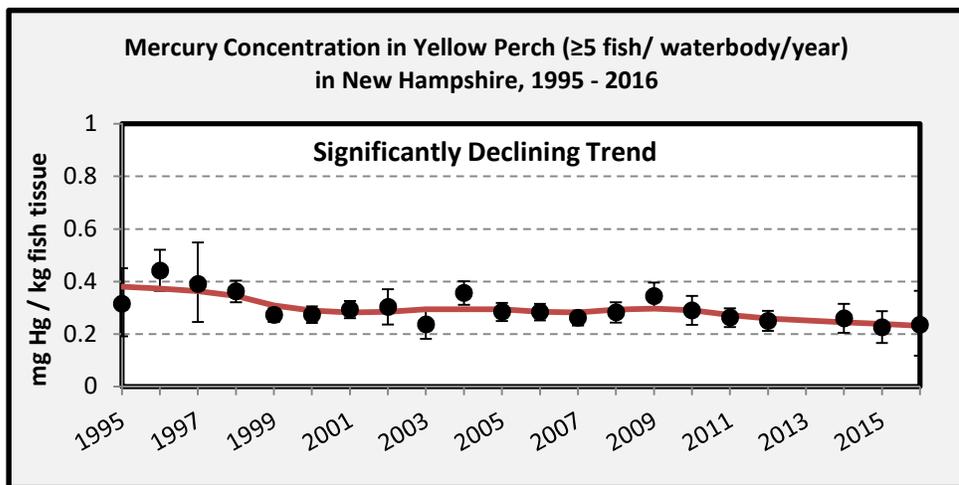
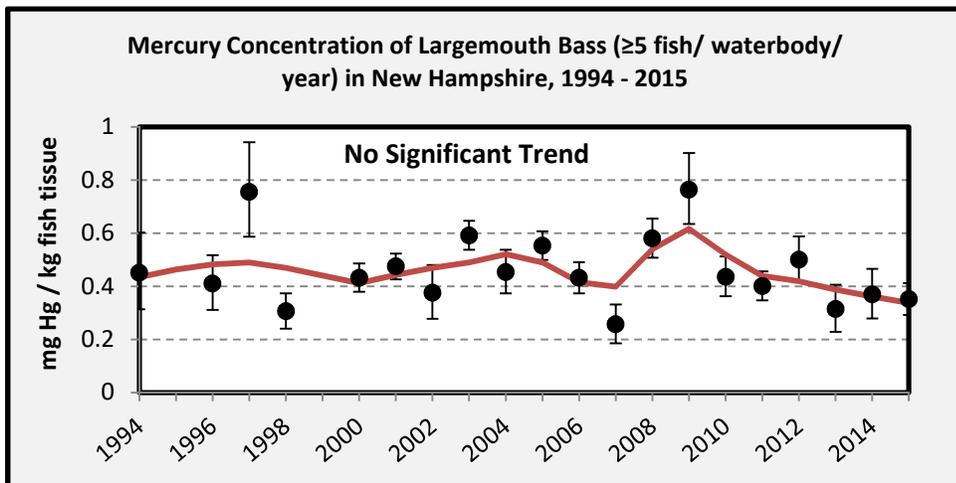


Figure 1. Annual mean mercury concentration in yellow perch, 1995 – 2016. Solid line is LOESS smoothed line.

Figure 2. Annual mean mercury concentration in largemouth bass, 1994 – 2015. Solid line is LOESS smoothed line.



Analysis outcome:

- In **yellow perch**, mercury concentrations declined significantly from 1995 to 2016 from 0.40 to 0.24 mg Hg/kg tissue.
- In **largemouth bass**, mercury concentrations have not changed significantly from 1994 to 2015, but a tendency towards declining mercury tissue concentrations has been observed since 2009. Additional data are required to verify this trend.

Supplemental Information

Summary of fish species tissue mercury concentrations (mg Hg/kg tissue)

Fish species	Length-based consumption restriction in place (Y/N)	All lengths			8 - 12 inch length			>12 inch length		
		Average	Upper 95% confidence interval	Number of fish	Average	Upper 95% confidence interval	Number of fish	Average	Upper 95% confidence interval	Number of fish
Alewife	N	0.20	n/a	3						
Atlantic salmon	N	0.23	0.27	28						
Black crappie	N	0.44	0.50	59						
Bluegill	N	0.29	0.34	29						
Brook trout	N	0.07	0.10	91						
Brown bullhead	N	0.15	0.18	152						
Brown trout	N	0.11	n/a	8						
Cusk	N	0.31	0.35	29						
Eastern chain pickerel	Y	0.64	0.70	253	0.33	0.39	39	0.71	0.77	211
Fallfish	N	0.36	0.43	27						
Golden shiner	N	0.15	n/a	1						
Lake trout	N	0.44	0.63	40				0.49	0.68	37
Lake whitefish	N	0.10	n/a	1						
Largemouth bass	Y	0.56	0.59	632	0.39	0.42	245	0.70	0.74	366
Northern pike	N	0.60	n/a	2				0.60	n/a	2
Pumpkinseed	N	0.27	0.32	57						
Rainbow trout	N	0.08	0.09	300						
Rock bass	N	0.34	0.41	21						
Smallmouth bass	Y	0.67	0.71	411	0.43	0.47	186	0.90	0.96	211
Smelt	N	0.17	n/a	1						
Sunfish (Iepomis sp)	N	0.19	0.26	13						
Walleye	N	0.66	0.86	11				0.66	0.86	11
White perch	Y	0.49	0.53	210	0.45	0.49	151	0.67	0.73	44
White sucker	N	0.23	0.28	52						
Yellow bullhead	N	0.43	0.73	10						
Yellow perch	Y	0.35	0.36	1,659	0.41	0.42	814	0.91	1.10	60
Total		0.33		4,100						
Benchmark Concentration for Consumptive Limits		0.70			0.70			0.70		

Shaded rows indicates species recommended for a size-restricted consumptive limit

For more information contact David Neils at david.neils@des.nh.gov or (603) 271-8865