Supporting Information

A Protocol to Reconstruct Historical Contaminant Loading to Large Lakes: The Lake Michigan Sediment Record for Mercury

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Table S1. Summary of core physical characteristics as reported by Robbins et al. (*36*).

Station	Mass Sedimentation Rate ($g/cm^2/y$)	Mass Sedimentation Rate Error ($\pm$ $g/cm^2/y$)	Mixed Depth (cm)	Cs-137 Focusing Factor	Pb-210 Focusing Factor	This Work Core Surface Resolution (y)
7	0.0906	0.0026	0	0.96	1.03	8.9
9	0.1781	0.0122	0	4.316	2.25	0.91
11	0.0151	0.0014	1	0.503	0.428	7.0
13	0.0375	0.0025	3	1.553	1.09	17
15	0.2235	0.0128	0	5.603	2.72	0.68
17	0.0095	0.0004	5	1.02	0.997	79
18	0.0177	0.0008	2	0.955	0.74	18
19	0.0954	0.0024	0	1.864	1.32	3.0
21	0.0181	0.0012	5	1.523	1.13	46
22	0.1322	0.0049	0	3.568	2.59	0.73
24	0.0668	0.0014	4	2.281	1.84	14
25	0.0362	0.0006	5	2.006	1.59	24
26	0.0194	0.0005	3	0.969	0.875	26
27	0.0309	0.0014	3	1.168	1.15	13
31	0.0292	0.0009	4	1.702	1.33	24
33	0.0170	0.0003	5	1.265	1.23	53.
34	0.0255	0.0007	4	1.586	1.28	27
36	0.0566	0.0021	5	2.491	1.77	20
37	0.0263	0.0012	7	2.437	1.64	63
39	0.0395	0.0012	4	1.637	1.57	14
41	0.2135	0.0084	0	3.927	2.8	1.1
46	0.0506	0.0017	0	1.217	1.1	3.6
48	0.0150	0.0009	3	1.131	0.915	34
53	0.0130	0.0008	6	1.84	1.29	61
54	0.0077	0.0002	1	0.613	0.443	62

Table S1. Continued.

Station	Mass Sedimentation Rate ($g/cm^2/y$)	Mass Sedimentation Rate Error ($\pm$ $g/cm^2/y$)	Mixed Depth (cm)	Cs-137 Focusing Factor	Pb-210 Focusing Factor	This Work Core Surface Resolution (y)
55	0.2049	0.0116	3	5.119	3.36	3.1
58	0.0357	0.0010	6	2.532	1.94	29
61	0.1064	0.0026	5	4.278	3.04	8.8
62	0.0101	0.0006	4	1.38	0.821	50
63	0.0289	0.0006	5	2.36	1.58	29
65	0.0107	0.0006	4	1.081	0.973	62
66	0.0359	0.0012	5	1.742	1.4	30
70	0.0885	0.0029	7	4.304	2.94	13
78	0.0196	0.0006	3	1.281	1.06	22
80	0.0243	0.0005	4	0.991	1.14	20
82	0.0926	0.0038	0	2.579	2.26	1.8
83	0.0364	0.0011	0	0.981	1.2	2.8
85	0.0262	0.0007	3	1.348	1.2	17
86	0.0312	0.0007	3	1.513	1.44	15
87	0.1160	0.0021	4	4.449	3.36	5.2
97	0.0219	0.0013	4	1.493	1.15	31
99	0.0399	0.0010	5	1.714	1.62	12
101	0.0570	0.0017	4	2.009	1.75	12
103	0.0266	0.0008	4	1.469	1.38	25
107	0.0432	0.0019	5	1.82	1.86	16
108	0.0511	0.0018	5	2.035	2.75	18
110	0.0261	0.0007	4	1.466	1.4	26
112	0.0747	0.0026	4	3.113	2.77	6.9
120	0.0727	0.0014	5	3.662	3.16	8.6

Table S2. Apparent mercury focusing factors (Hg FF) calculated for the Lake Michigan stations.

Station	Hg FF	Station	Hg FF	Station	Hg FF
7	1.62	36	3.05	80	0.802
9	8.13	37	1.14	82	3.47
11	0.187	39	1.49	83	1.16
13	1.17	41	12.9	85	0.972
15	12.2	46	3.00	86	0.985
17	0.430	48	0.488	87	5.28
18	0.465	53	0.679	97	0.967
19	4.60	54	0.182	99	1.29
21	0.600	55	8.33	101	2.19
22	6.41	58	1.32	103	0.957
24	3.45	61	5.17	107	1.72
25	1.36	62	0.369	108	1.74
26	0.537	63	1.10	110	1.06
27	1.06	65	0.417	112	2.38
31	0.958	66	0.958	120	1.88
33	0.740	70	3.16		
34	0.962	78	0.606		

Table S3. Characteristics of cores from stations considered for derivation of a mercury load function for Lake Michigan.

Station	Mass Sedimentation Rate ($g/cm^2/y$)	Resolution Based on Core Section and Mixed Layer Thicknesses (y)	Years Delay in Delivery of Contaminant to Station Based on Historic Maximum Peak
9	0.1781	0.91	-6, 12
15	0.2235	0.68	0
22	0.1322	0.73	5
41	0.2135	1.1	0
55	0.2049	3.1	-3
61	0.1064	8.8	19
87	0.1160	5.2	19

Table S4. Loads to Lake Michigan based on the core from station 41. Bold values are linear interpolations of dates on either side of the interpolated values.

Date	Total Hg Loaded (kg/y)	Anthropogenic Hg Loaded (kg/y)
1994	1156.57	972.57
1993	1090.91	906.91
1992	1097.71	913.71
1991	**1100.22**	**916.22**
1990	1102.72	918.72
1989	1203.35	1019.35
1988	**1210.46**	**1026.46**
1987	1217.57	1033.57
1986	**1209.43**	**1025.43**
1985	1201.29	1017.29
1984	**1224.19**	**1040.19**
1983	1247.09	1063.09
1982	**1263.85**	**1079.85**
1981	**1280.60**	**1096.60**
1980	1297.36	1113.36
1979	**1345.48**	**1161.48**
1978	1393.61	1209.61
1977	**1495.53**	**1311.53**
1976	1597.46	1413.46
1975	**1787.05**	**1603.05**
1974	1976.63	1792.63
1973	**1947.43**	**1763.43**
1972	1918.22	1734.22
1971	**1899.08**	**1715.08**
1970	1879.94	1695.94
1969	**1949.98**	**1765.98**
1968	2020.01	1836.01

Table S4. Continued.

Date	Total Hg Loaded (kg/y)	Anthropogenic Hg Loaded (kg/y)
1967	**2181.17**	**1997.17**
1966	**2342.32**	**2158.32**
1965	2503.48	2319.48
1964	**2458.44**	**2274.44**
1963	2413.41	2229.41
1962	**2514.93**	**2330.93**
1961	**2616.46**	**2432.46**
1960	2717.98	2533.98
1959	**2612.61**	**2428.61**
1958	2507.24	2323.24
1957	**2396.99**	**2212.99**
1956	2286.75	2102.75
1955	**2435.32**	**2251.32**
1954	2583.90	2399.90
1953	**2621.41**	**2437.41**
1952	**2658.91**	**2474.91**
1951	2696.42	2512.42
1950	**2779.39**	**2595.39**
1949	2862.35	2678.35
1948	**2869.48**	**2685.48**
1947	**2876.61**	**2692.61**
1946	2883.73	2699.73
1945	**2771.42**	**2587.42**
1944	2659.12	2475.12
1943	**2681.57**	**2497.57**
1942	**2704.03**	**2520.03**
1941	2726.48	2542.48
1940	**2779.30**	**2595.30**

Table S4. Continued.

Date	Total Hg Loaded (kg/y)	Anthropogenic Hg Loaded (kg/y)
1939	2832.12	2648.12
1938	**2795.39**	**2611.39**
1937	**2758.65**	**2574.65**
1936	2721.92	2537.92
1935	**2556.79**	**2372.79**
1934	2391.67	2207.67
1933	**2417.79**	**2233.79**
1932	**2443.91**	**2259.91**
1931	2470.03	2286.03
1930	**2497.49**	**2313.49**
1929	2524.95	2340.95
1928	**2485.35**	**2301.35**
1927	**2445.76**	**2261.76**
1926	2406.16	2222.16
1925	**2337.24**	**2153.24**
1924	2268.32	2084.32
1923	**2283.83**	**2099.83**
1922	**2299.33**	**2115.33**
1921	2314.84	2130.84
1920	**2203.42**	**2019.42**
1919	**2091.99**	**1907.99**
1918	1980.57	1796.57
1917	**2002.87**	**1818.87**
1916	**2025.17**	**1841.17**
1915	2047.47	1863.47
1914	**1937.60**	**1753.60**
1913	**1827.73**	**1643.73**
1912	1717.86	1533.86

Table S4. Continued.

Date	Total Hg Loaded (kg/y)	Anthropogenic Hg Loaded (kg/y)
1911	**1806.37**	**1622.37**
1910	1894.88	1710.88
1909	**1947.15**	**1763.15**
1908	**1999.41**	**1815.41**
1907	2051.68	1867.68
1906	**2018.52**	**1834.52**
1905	**1985.37**	**1801.37**
1904	1952.21	1768.21
1903	**2017.71**	**1833.71**
1902	**2081.91**	**1897.91**
1901	2146.76	1962.76
1900	**1963.66**	**1779.66**
1899	**1780.56**	**1596.56**
1898	1597.46	1413.46
1897	**1537.38**	**1353.38**
1896	**1477.30**	**1293.30**
1895	1417.22	1233.22
1894	**1332.21**	**1148.21**
1893	**1247.21**	**1063.21**
1892	1162.20	978.20
1891	**1052.63**	**868.63**
1890	**943.05**	**759.05**
1889	833.48	649.48
1888	**877.25**	**693.25**
1887	**621.02**	**437.02**
1886	964.79	780.79
1885	**846.87**	**662.87**
1884	**728.94**	**544.94**

Table S4. Continued.

Date	Total Hg Loaded (kg/y)	Anthropogenic Hg Loaded (kg/y)
1883	611.02	427.02
1882	**551.27**	**367.27**
1881	**491.52**	**307.52**
1880	**431.77**	**247.77**
1879	372.02	188.02
1878	**351.77**	**167.77**
1877	**331.53**	**147.53**
1876	311.28	127.28
1875	**297.95**	**113.95**
1874	**284.62**	**100.62**
1873	**271.30**	**87.30**
1872	257.97	73.97
1871	**248.49**	**64.49**
1870	**239.00**	**55.00**
1869	229.52	45.52
1868	**218.88**	**34.88**
1867	**208.23**	**24.23**
1866	197.59	13.59
1865	**197.66**	**13.66**
1864	**197.72**	**13.72**
1863	**197.79**	**13.79**
1862	197.86	13.86
1861	**197.89**	**13.89**
1860	**197.92**	**13.92**
1859	197.95	13.95
1858	**190.29**	**6.29**
1857	**182.62**	**-1.38**
1856	174.96	-9.04

Table S4. Continued.

Date	Total Hg Loaded (kg/y)	Anthropogenic Hg Loaded (kg/y)
1855	**173.04**	**-10.96**
1854	**171.12**	**-12.88**
1853	**169.19**	**-14.81**
1852	167.27	-16.73
1851	**167.18**	**-16.82**
1850	**167.09**	**-16.91**
1849	**167.00**	**-17.00**
1848	166.91	-17.09

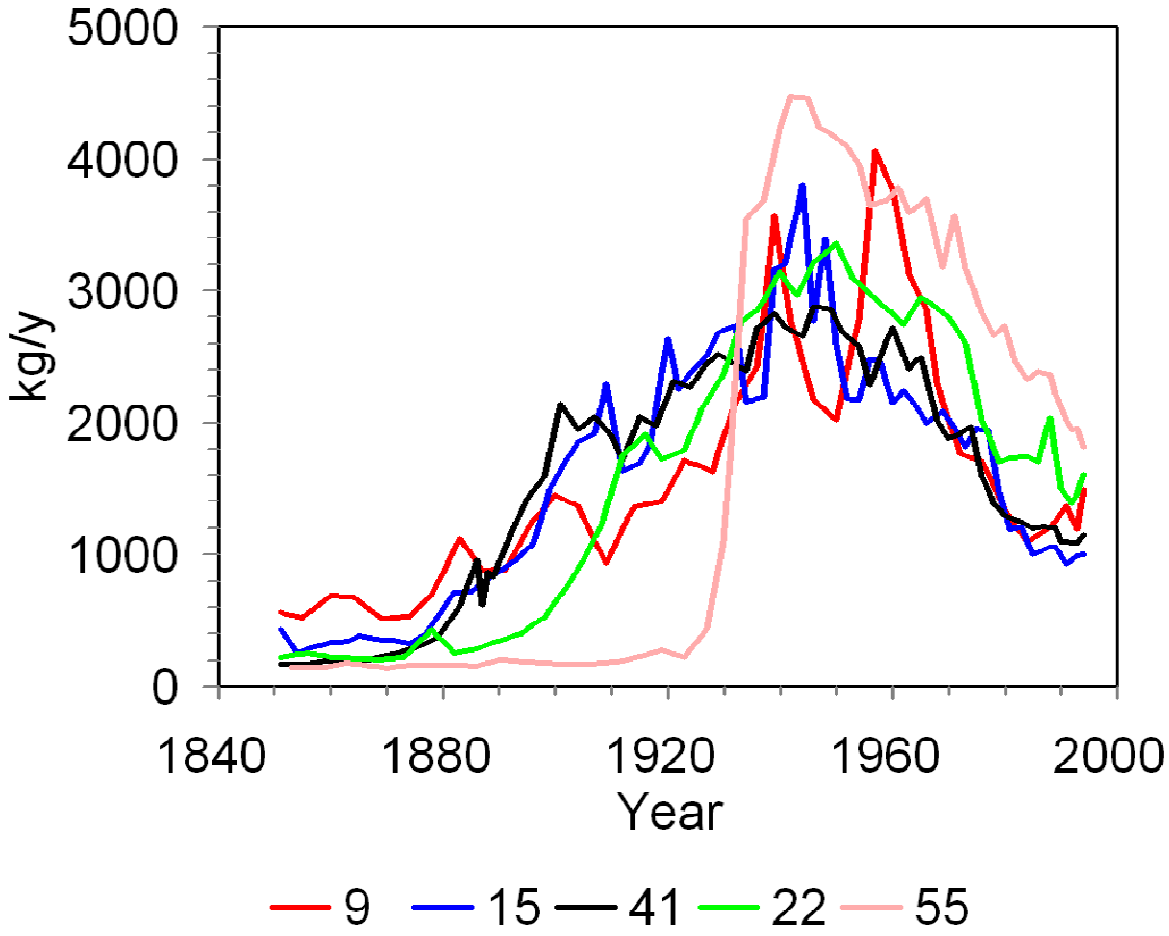

Figure S1. Cores considered for construction of a Lake Michigan mercury load function. Core 41 was selected to represent annual loads to the lake.

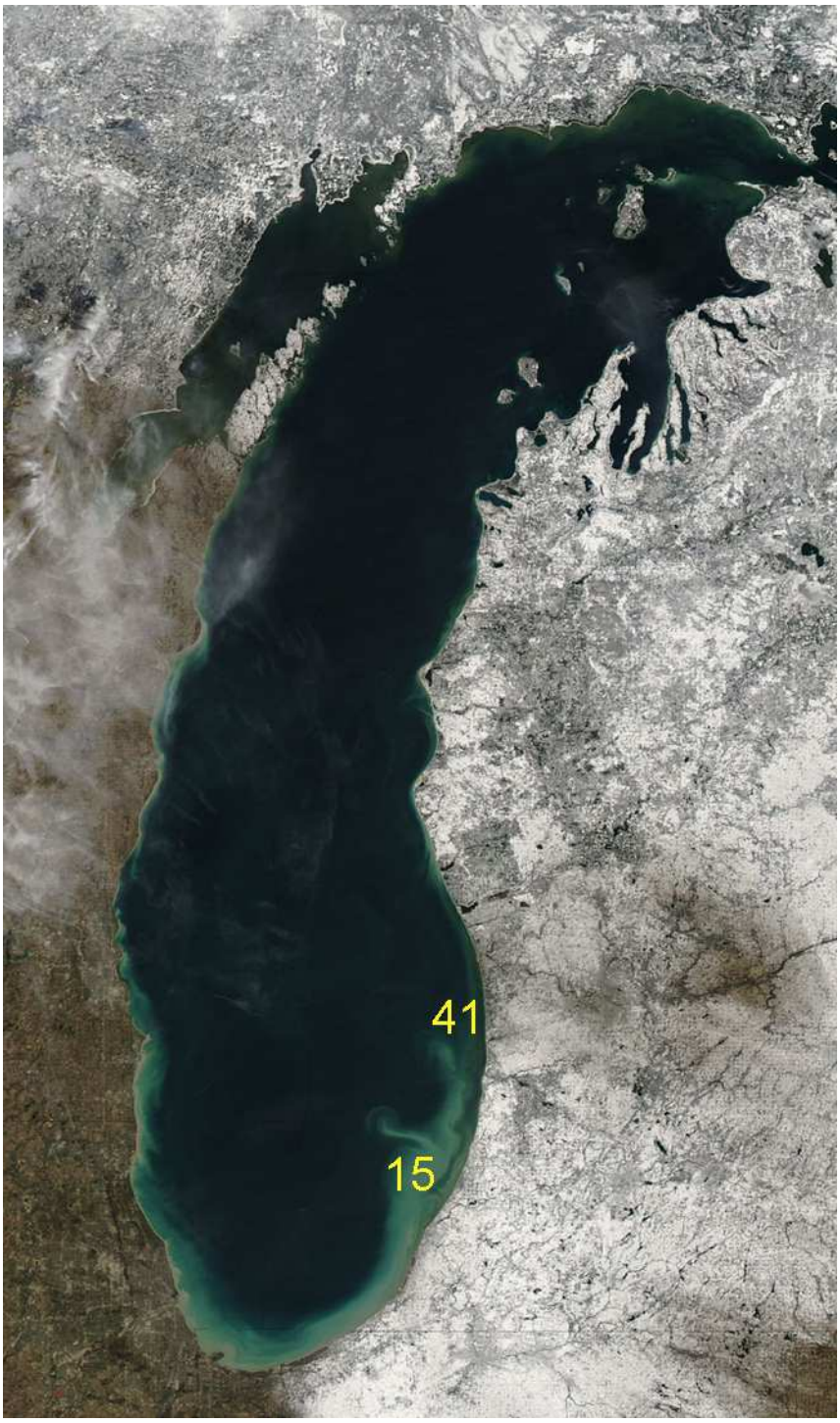

Figure S2. Locations of high resolution stations having the earliest maximum peak mercury flux relative to the recurring resuspended sediment plume in Lake Michigan as captured by NASA/GSFC MODIS Rapid Response satellite imagery.

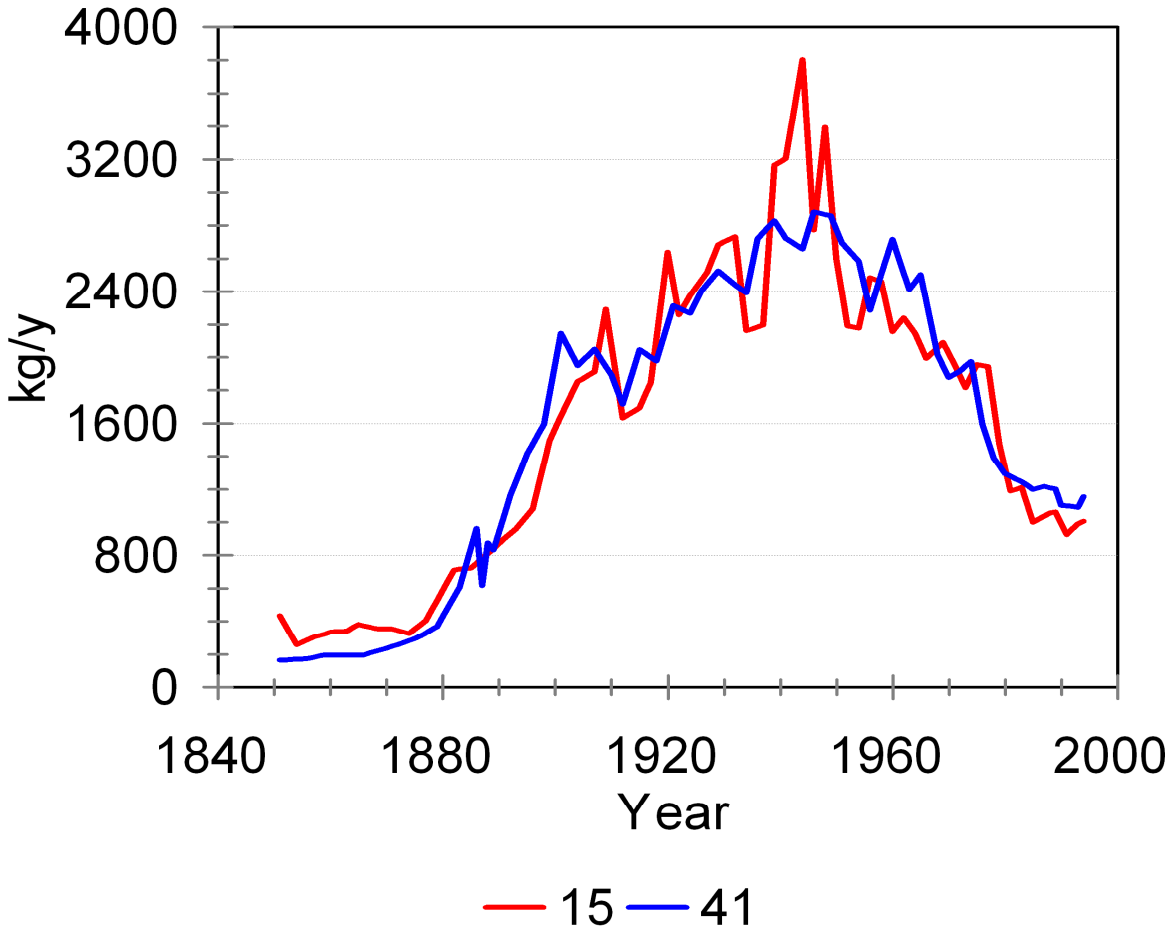

Figure S3. Comparison of the time variation of mercury loads (kg/y) to Lake Michigan for the highest quality cores collected between 1994 and 1996.

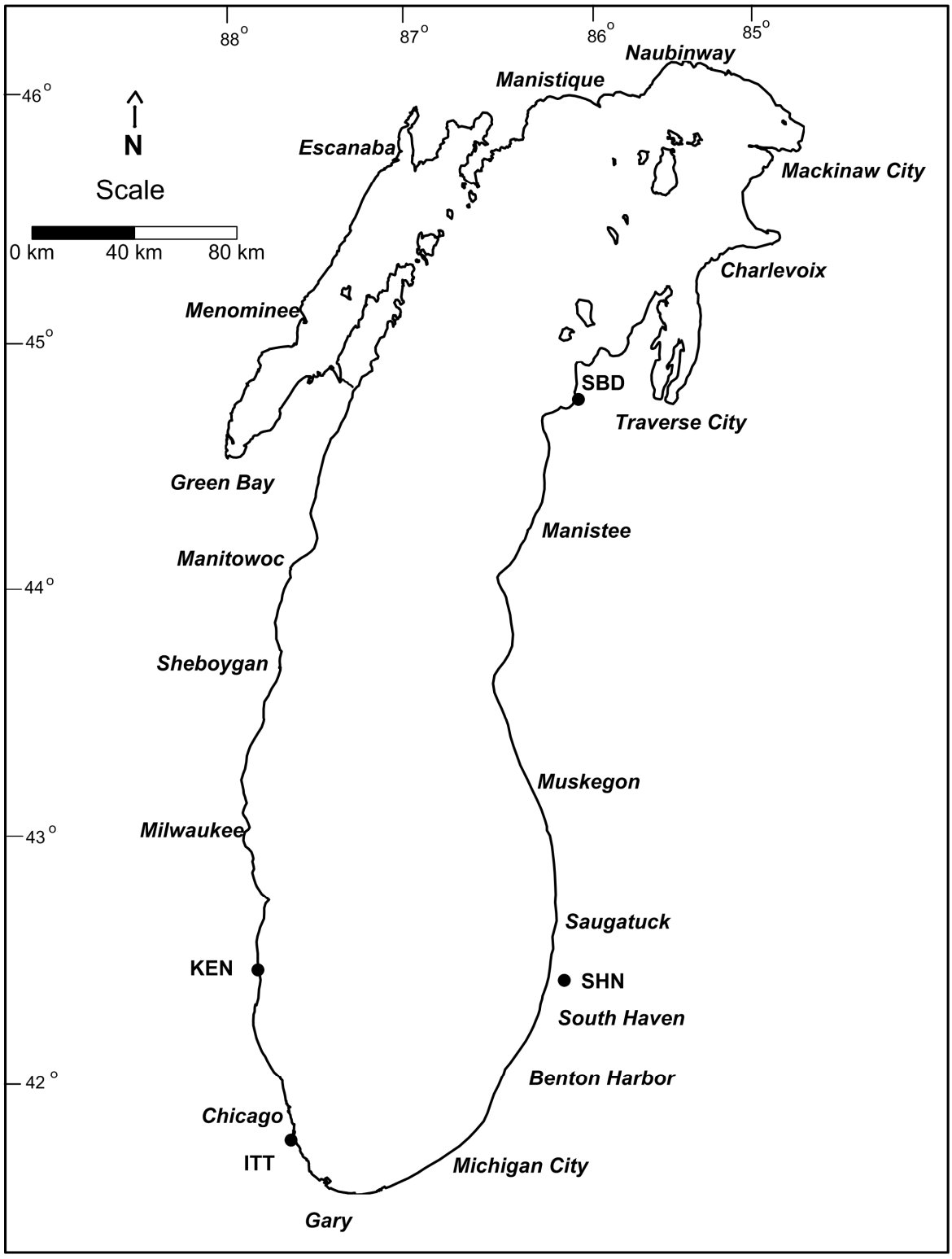

Figure S4. Locations of stations used by Landis and Keeler (*43*) to estimate atmospheric mercury fluxes to Lake Michigan. A station in east-central Illinois at Bondville is not shown.