MI/DEQ/WRD-11/026

Inland Lakes Sediment Trends: Sediment Analysis Results for Six Michigan Lakes

Final report: 2007-2008
Thompson Lake
Whitmore07 Lake
Gratiot07 Lake
Emily Lake
Lake Gogebic
Platte Lake

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Introduction

Contaminated sediments can directly impact bottom-dwelling organisms and represent a continuing source of toxic substances in aquatic environments that may impact wildlife and humans through food or water consumption (Catallo *et al.*, 1995). Therefore, an understanding of the trends of toxic chemical (e.g., polychlorinated biphenyls (PCBs), lead) accumulation in the environment is necessary to assess the current state of Michigan's surface water quality and to identify potential future problems. A common fate of chemicals in a lake is to associate with fine-grained particulate matter and settle to the bottom (Evans and Rigler, 1983). As this deposition occurs over time, sediments in lakes become a chemical tape recorder of the temporal trends of toxic chemicals in the environment as well as of general environmental change over time (von Guten *et al.*, 1997). Sediment trend monitoring is consistent with the framework for statewide surface water quality monitoring outlined in the January 1997 report prepared by the Michigan Department of Environmental Quality entitled, "A Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters". A key goal of the monitoring program is to measure trends in the quality of Michigan's surface waters, and one activity designed to examine these trends is the collection and analysis of high-quality sediment cores. This report details the activities and findings of the ninth year of the sediment trend component of the Strategy, and builds upon the results from the five lakes sampled in 1999 (Year 1)(Simpson *et al.*, 2000), two lakes sampled in 2000 (Year 2) (Yohn *et al.*, 2001), five lakes sampled in 2001 (Year 3) (Yohn *et al.*, 2002b), six lakes sampled in 2002 (Year 4) (Yohn *et al.*, 2003), five lakes sampled in 2003 (Year 5) (Parsons *et al.*, 2004), five lakes sampled in 2004 (Year 6) (Parsons *et al.*, 2007), five lakes sampled in 2005 (Year 7) (Parsons *et al.,* 2008), and two lakes sampled in 2006 (Year 8) (Parsons *et al.,* 2008).

Summary

Sediment cores were collected from six lakes in 2007 to evaluate the spatial and temporal variations in lake sediment quality in Michigan, and as a continuation of the trend monitoring component of the monitoring program (Simpson *et al.*, 2000). The lakes included in this study in the order of completion were: Thompson Lake (Livingston County), Whitmore07 Lake (Livingston County), Gratiot07 Lake (Keweenaw County), Emily Lake (Houghton County), Lake Gogebic (Gogebic County), and Platte Lake (Benzie County). Lakes with similar names will include an abbreviation of the county in which it is located (e.g., Round D, D for Delta County). Lakes that have been revisited will include the year of resampling (e.g. Gratiot07 is Gratiot Lake in Keweenaw County sampled in 2007). Sediment cores were collected from a single location in each lake, dated with 210-lead (^{210}Pb) and 137-cesium (^{137}Cs), and analyzed for a suite of metals and organic compounds. Analysis for a suite of metals rather than just target anthropogenic metals (e.g., Pb, Cu) allows for interpretations about the sources of different chemicals. With the exception of Whitmore Lake, porewater was collected from each of the lakes and analyzed for a similar suite of metals. Porewater was not collected from Whitmore Lake due to the fact that analysis of porewater has been completed during a previous sampling effort at Whitmore Lake and results are available in the 2000-2001 Sediment Chemistry Trend Report.

Key findings in this report include:

- Platte and Whitmore Lakes exhibited a high sedimentation rate and did not reach background values of anthropogenic elements; however, older sediment in Whitmore Lake appeared to show stable low concentrations and was used as background concentrations for anthropogenic accumulation calculations. Results from both lakes should be interpreted with care.
- Platte Lake mercury concentration trends appear to be increasing to the surface sediments.
- Surface sediment concentrations of mercury collected from Gratiot Lake have been reduced since previous sediment samples were collected in 1999.
- Arsenic and lead concentrations in Gratiot Lake have increased significantly from background and remain at elevated concentrations to recent sediment.
- Nitrogen values for Gratiot Lake were the highest of the lakes studied.
- Thompson Lake results showed historically elevated PCB's, particularly in ^{210}Pb dated 1970's and 1980's sediment.
- Thompson Lake exhibited the highest concentration of arsenic measured in surface concentrations to date exceeding the PEC threshold with a value of 108.6 mg/kg averaged in the top 1.5 cm of sediment.
- Lake Gogebic showed increasing trends to the top of the core in several elements, notably arsenic, cadmium, and phosphorus. Several other elements showed increasing trends to 1970, followed by a slight decrease but maintained concentrations significantly higher than background to the top of the core. These elements include copper, lead, and zinc.
- Lake Gogebic remains largely free of organic contaminants despite its large lake and watershed area. However, trends in pesticides and DDTs appear to be increasing in recent sediments.
- Whitmore Lake exhibited elevated concentrations of PAHs in recent sediments.
- Emily Lake exceeded the PEC for copper in the top 1.5 cm of sediment.

Methods

Sediment cores were collected from Thompson Lake (Livingston County), Whitmore Lake (Livingston County), Gratiot07 (Keweenaw County), Emily Lake (Houghton County), Lake Gogebic (Gogebic County), and Platte Lake (Benzie County). (Figure 1, Table 1). Sediment cores were collected from the deepest portion of each lake using an MC-400 Lake/Shelf Multi-corer deployed from the Monitoring Vessel Nibi. The M/V Nibi was designed and has successfully provided access to both major and remote inland lakes throughout Michigan. Collected sediment cores were described and examined for color, texture, and signs of zoobenthos. Cores were then extruded and sectioned at 0.5 cm intervals for the top 8 cm, and at 1 cm intervals for the remainder of the core.

Table 1. Physical characteristics of study lakes. Lakes sampled for this report are highlighted.

Lake	Sampling year	Counties of watershed	Lake area (km^2)	Sampling depth (m)	Watershed area (km^2)
Avalon	2003	Montmorency	1.5	21.3	2
Birch	2003	Cass	1.2	29.6	2.2
Cadillac	2001,2005	Wexford, Missaukee	4.7	8.2	48
Campau	2005	Kent	0.5	16.2	4.7
Cass	1999	Oakland	5.2	36.6	9.1
Charlevoix	2005	Antrim, Charlevoix, Ottawa, Emmitt	69.8	33.5	765
Crystal B	2001	Benzie	39.3	49.7	106
Crystal M	2000,2004	Montcalm	2.9	16.8	12
Elk	1999	Grand Traverse, Antrim, Kalkaska	31.3	58.8	217
Emily	2007	Houghton	0.22	27.9	0.97
George	2004	Ogemaw	0.7	26.2	5.1
Gogebic	2007	Gogebic	51.8	7.62	361
Gratiot	1999, 2007	Keweenaw	5.8	23.8	31
Gull	1999,2005	Kalamazoo, Barry	8.2	33.5	61
Hackert	2004	Mason	0.5	15.5	1.5
Higgins	1999	Roscommon, Missaukee, Crawford	38.9	41.5	108
Houghton	2002	Roscommon	81.2	5.5	450
Hubbard*	2001	Alcona	37.9	29.3	
Imp	2002	Gogebic	0.3	28.0	2.1
Littlefield	2000	Isabella	0.7	21.3	17
Mullett	2001	Cheboygan, Otsego	70.3	35.7	718
Muskegon	2003,2006	Muskegon, Newaygo	16.8	14.5	53
Nichols	2005	Newaygo	0.64	19.1	0.95
Otter	2004	Genesee, Lapeer, Tuscola	0.3	36.9	3.4
Paw Paw	2001	Berrien, VanBuren	3.7	27.7	30
Platte Lake	2007	Benzie County	10.2	28.8	384
Round	2002	Luce	7.0	13.7	22
Round D	2004	Delta	1.8	16.0	2.0
Sand	2003	Lenawee	1.8	17.3	24.5
Shupac	2003	Crawford	0.4	30.4	2.2
Thompson	2007	Livingston	0.61	17.0	55.5
Torch	2002	Antrim, Kalkaska	76.0	86.0	198
Whitmore	2001, 2007	Washtenaw, Livingston	2.7	20.8	5.6
White*	2006	Muskegon	10.4	21.6	
Witch	2002	Marquette	0.9	31.1	13

* A watershed was not delineated for Hubbard Lake or White Lake.

^{210}Pb was measured on one sub-core from each lake to determine porosity, accumulated dry mass, sedimentation rates, sediment ages and focusing factors (Freshwater Institute in Winnipeg, Manitoba, Canada). Dating models were verified using ^{137}Cs, stable Pb peak and presence of excess ^{210}Pb.

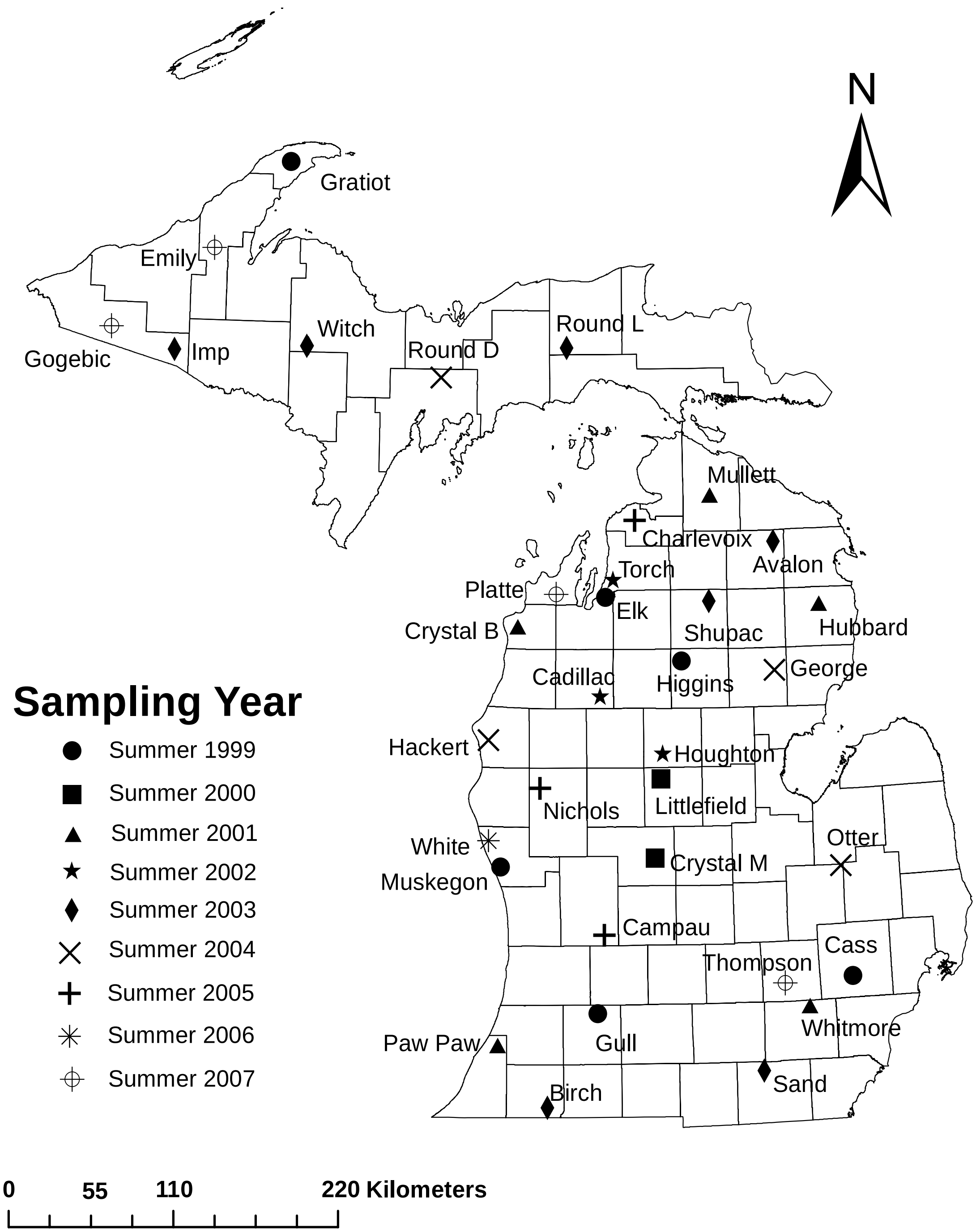
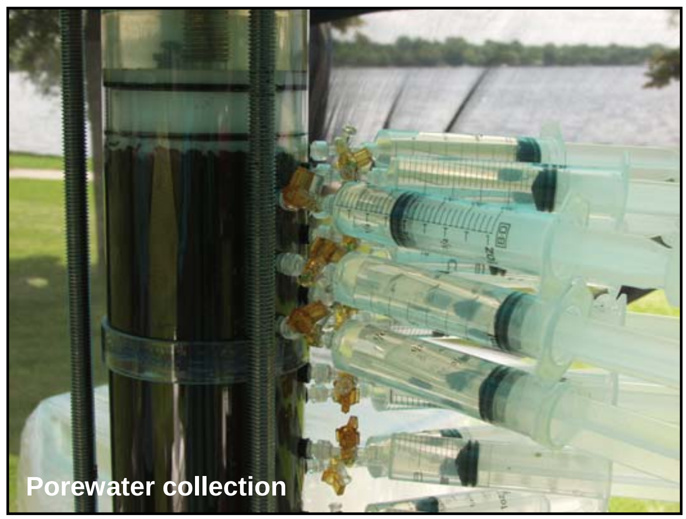


Figure 1. Inland lakes sediment trend monitoring program sample lakes.

Sediments were frozen, freeze-dried and digested by nitric acid in a CEM-MDS-81D microwave (Hewitt and Renyolds, 1990). Standard reference material (NIST RM 8704 Buffalo River Sediment) and procedural blanks were processed to test for accuracy and contamination. The concentrated-acid digests were filtered through an acid-washed, e-pure (Barnstead) rinsed 0.40 μm polycarbonate filter. Samples were then analyzed using a Micromass Platform inductively coupled, plasma, mass spectrometer with hexapole technology (ICP-MS-HEX). Sediments were analyzed for a suite of metals and metalloids including Mg, Al, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Sr, Mo, Cd, Ba, Pb, and U.

Another sub-core was sectioned and submitted to Michigan State Universities Aquatic Toxicology Laboratory for analysis of organic contaminants. Unlike the metals and ^{210}Pb sub-cores, the organics core was sectioned at 1 cm increments for the entire core length. There was insufficient material for analysis in the topmost sediments, so the first two sections were combined, and the third and fourth sections were combined. The combined samples were analyzed for PCBs, PAHs, and pesticides (Khim *et al.*, 1999a, Khim *et al.*, 1999b). A portion of the sediment was dried at 100°C to determine moisture content.

The fourth sub-core was used for the collection of porewater. The sediment core was squeezed 5-6 cm, forcing water through 70 μm Porex™ into syringes placed every 1 cm (10 samples) then 2 cm (18 samples) from the top. The collected water was filtered through an acid washed, DDW rinsed 0.45 μm filter and preserved with Optima™ nitric acid and a gold preservative for mercury analysis. These solutions were analyzed on the ICP-MS-HEX in a similar fashion as the digested sediments. It should be noted that porewater was not collected from Whitmore Lake due to prior collection and analysis in 2000.


Porewater collection

Descriptions of the calculations for data analysis follow this section.

^{210}Pb and sedimentation rates

The radioactive isotope ^{210}Pb was used to date sediments from each lake. Several models exist to determine sediment ages from ^{210}Pb activities, and sediments were dated using the constant flux: constant sedimentation rate model (CF:CS) (Golden *et al.*, 1993), segmented CF:CS (SCF:CS) (Heyvaert *et al.*, 2000), rapid steady state mixing model (RSSM) (Robbins, 1982), and the constant rate of supply model (CRS) (Sanchez-Cabeza *et al.*, 2000). The CF:CS model assumes a constant sedimentation rate throughout the core. The RSSM model also assumes a constant sedimentation rate, but also allows for a mixed zone. The SCF:CS model allows for more than one sedimentation rate, and accounts for a mixed zone. The CRS model determines a different sedimentation rate for each sample based on the inventory of excess-^{210}Pb. Further description of each of the models can be found in the 2001-2002 year end report (Yohn *et al.*, 2002b).

For all models, only sediment layers containing excess-^{210}Pb could be dated. The ages of sediment slices not containing excess-^{210}Pb were estimated. This occurred in Emily (28 slices), Gogebic (20), Gratiot07 (17), Thompson (15) and Whitmore (1). The age of these slices was determined by extrapolation using the assumption that sedimentation rates remain constant below the existence of excess ^{210}Pb. For the RSSM, CF:CS, and SCF:CS model, the sedimentation rate in the lower portion of the core was used to extrapolate dates. For the CRS model, the average sedimentation rate in the last five samples containing excess-^{210}Pb was used. The sedimentation rate used for extrapolation has a significant effect on the resulting dates, and all dates prior to 1850 should be considered estimations that are reported primarily for graphing purposes.

Sedimentation rates in each lake were determined using all models possible for that lake, and then the models were evaluated to ascertain which was the most appropriate for determining sediment ages. There is no consensus as to which model is more appropriate in all cases (Oldfield and Appleby, 1984), and several factors were considered when choosing a model. Visual examination of the ^{210}Pb profile gave some insight into the most appropriate model to be used. The RSSM or CRS models are more appropriate for lakes with large mixing zones, and the SCF:CS or CRS models are more appropriate for lakes with clear changes in sedimentation. Additionally, this study uses two other indicators to determine the most appropriate model to use: profiles of ^{137}Cs activity and stable lead concentration profiles. ^{137}Cs is an artificial radionuclide that was produced by atmospheric testing of nuclear weapons in the late 1950s and early 1960s. The peak level of fallout occurred in 1963, and therefore the peak activity in the sediment should occur in the early 1960s (Walling and Qingping, 1992). The second indicator is the stable lead peak. Stable lead has an historical pattern of deposition that is very consistent among lakes, with lead concentrations increasing from the mid-1800s to the early to mid-1970s, and decreasing to the present. The peak in lead concentrations in the mid-1970s is consistent enough to use for dating verification (Alfaro-De la Torre and Tessier, 2002, Callender and vanMetre, 1997). Excess-^{210}Pb should not be present in sediment slices older than ca. 1850, therefore, dating models that place sediment slices, containing excess ^{210}Pb, older than ca. 1850 are suspect. The dating model with the most appropriate date for both the ^{137}Cs peak (1963-64), stable lead peak (early to mid-1970s), and assigned appropriate dates to the presence of excess ^{210}Pb is chosen.

Focusing factors were also determined from ^{210}Pb analysis. Sediment focusing occurs when fine-grained sediments in a lake are eroded from higher energy erosional zones near the shore of the lake, transported through transitional zones (where deposition and erosion occur episodically) and deposited in depositional zones (Downing and Rath, 1988, Hakanson, 1977). This process of focusing occurs to different extents among lakes, and must be accounted for by using the focusing factor before comparing inventories and accumulation rates among lakes. A complete explanation of the focusing factor can be found in the 2001-2002 year end report (Yohn *et al.*, 2002b). Focusing factors and sedimentation rates are summarized in Table 2.

Table 2. Select data from ^{210}Pb analysis, including the model used for dating, mixed depth, surficial sedimentation rate, focusing factor (FF) and the age of the oldest section in the sediment core. Lakes sampled for this report are highlighted.

Lake	Model	Approximate mixed depth (cm)	Surficial Sedimentation rate (g/m^2/y)	FF	Oldest section	Report#
Avalon	CRS	4	296	1.5	1790[a]	MI/DEQ/WB-06/003
Birch	CRS	3	540	1.7	1824[a]	MI/DEQ/WB-06/003
Cadillac	CRS	14	117	1.7	1829[a]	MI/DEQ/SWQ-03/052
Cadillac05	CRS	17	396	1.8	1825[a]	MI/DEQ/WB-09/069
Campau	SCF:CS	4.5	2100	1.6	1848[a]	MI/DEQ/WB-09/069
Cass	CF:CS	3	3480	6.0[c]	1971	MI/DEQ/SWQ-01/030
Charlevoix	CRS	1.5	707	2.0	1653[a]	MI/DEQ/WB-09/069
Crystal B	CRS	4	624	2.9	1516[a]	MI/DEQ/SWQ-03/052
Crystal M00	CRS	6	465	1.7	1732[a]	MI/DEQ/WD-02/115
Crystal M04	CRS	0	559	1.6	1804	MI/DEQ/WB-07/078
Elk	SCF:CS	1	337	2.1	1279[a]	MI/DEQ/SWQ-01/030
Emily	CRS	0	104	2.7	1800 [a]	This Report
George	CF:CS	9	417	2.1	1932	MI/DEQ/WB-07/078
Gogebic	CF:CS	4	337	1.3	1611[a]	This Report
Gratiot	CF:CS	5	255	2.5	1823[a]	MI/DEQ/SWQ-01/030
Gratiot07	CF:CS	4	444	1.5	1837[a]	This Report
Gull	SCF:CS	3	404	1.8	1496[a]	MI/DEQ/SWQ-01/030
Gull05	CRS	0	423	1.7	1674[a]	MI/DEQ/WB-09/069
Hackert	CRS	0	451	1.9	1840	MI/DEQ/WB-07/078
Higgins	CF:CS	3	232	2.0	1729[a]	MI/DEQ/SWQ-01/030
Houghton	SCF:CS	8	165	1.2	1715[a]	MI/DEQ/WB-04/066
Hubbard	NA	NA	NA	NA	NA	MI/DEQ/WB-04/066
Imp	CRS	3	119	1.5	1745[a]	MI/DEQ/WB-04/066
Littlefield	Pb	NA	444	2.0[b]	1732[a]	MI/DEQ/WD-02/115
Mullett	SCF:CS	4	801	3.6	1708[a]	MI/DEQ/SWQ-03/052
Muskegon	CF:CS	3	1711	2.8[c]	1956	MI/DEQ/WB-06/003
Muskegon06	CF:CS	3	1607	2.9[c]	1965	MI/DEQ/WB-09/069
Nichols	CRS[d]	0	193	2.3[c]	1972[d]	MI/DEQ/WB-09/069
Otter	CF:CS	8	933	3.5	1945	MI/DEQ/WB-07/078
Paw Paw	CF:CS	3	828	2.7[c]	1923	MI/DEQ/SWQ-03/052
Platte	CF:CS	6	1885	3.4	1910	This Report
Round	CRS	7	317	2.3	1851	MI/DEQ/WB-04/066
Round D	CRS	9	270	2.4	1852	MI/DEQ/WB-07/078
Sand	CRS	0	441	1.8	1864	MI/DEQ/WB-06/003
Shupac	CRS	1	261	2.0	1829[a]	MI/DEQ/WB-06/003
Thompson	CRS	8	815	1.5	1698[a]	This Report
Torch	CRS	0	365	2.4	1493[a]	MI/DEQ/WB-04/066
Whitmore	SCF:CS	6	556	2.8[c]	1887	MI/DEQ/SWQ-03/052
Whitmore07	SCF:CS	3	534	2.3	1876	This Report
White	SCF:CS	3	977	1.5[c]	1873	MI/DEQ/WB-09/069
Witch	CRS	6	269	1.7	1767[a]	MI/DEQ/WB-04/066

a. Estimated dates based on extrapolation
b. A focusing factor could not be calculated for Littlefield Lake, so the average focusing factor of all lakes sampled previously (except Cass Lake) was used
c. Estimated focusing factor based on extrapolation
d. An extrapolation of the ^{210}Pb integral was used

Results

Radiometric Dating

Lake Thompson

Excess ^{210}Pb activities in the Lake Thompson core showed clear changes in the sedimentation rate over time suggesting that the CRS and SCF:CS would be most appropriate for dating the sediment core. The excess ^{210}Pb displayed a large, approximately 8.0 cm, mixing zone (Figure 2). *Daphnia* were noted at the top of sediment core and provide evidence for a biologically-active zone at the sediment-water interface. Only the CRS model placed the ^{137}Cs peak appropriately during the late 1950s to early 1960s. The SCF:CS model assigned a date that was too old for both the ^{137}Cs peak and the bottom-most sediment slice containing excess ^{210}Pb. The CRS models provided a more appropriate age for the ^{137}Cs peak and the bottom-most sediment slice containing excess ^{210}Pb, however the stable Pb peak is placed a little late, possible due to the large mixing zone. The CRS model was chosen for data presentation as it was the most accurate model.

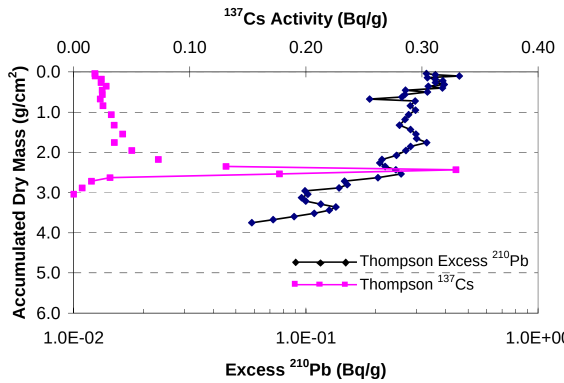


Figure 2. Lake Thompson radiochemical dating results.

Whitmore07 Lake

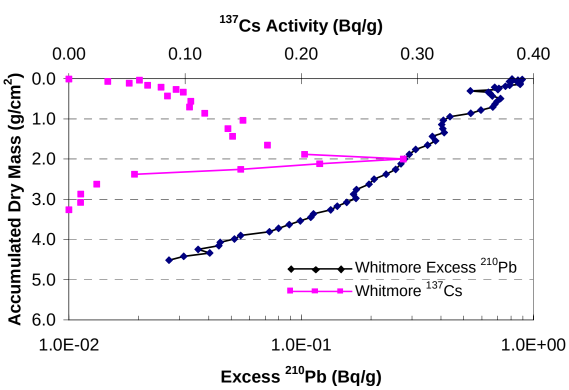


Figure 3. Whitmore Lake radiochemical dating results.

Activities of excess ^{210}Pb showed a mixing zone extending from the sediment water interface to a depth of approximately 2.5 cm. Excess ^{210}Pb did not decay log-linearly in the sediment core from Whitmore Lake (Figure 3). Sedimentation rates measured in the Whitmore Lake sediment core were generally high resulting in excess-^{210}Pb activities in every sediment slice and making the CRS model inappropriate to use for dating. Both the SCF:CS and RSSM models placed the peak ^{137}Cs activities and the stable Pb peaks in the correct position. In addition, the age calculations remained close allowing either to be used appropriately for the sediment core dating. The SCF:CS was chosen as the peak ^{137}Cs was slightly more appropriate at the year 1960 compared to 1966 with the RSSM model. Sediment core results from Whitmore Lake collected in 2001 (Yohn *et al*, 2002b) show similar results with the exception of a decrease in mixing zone depth of 6 cm to 3 cm in the 2001 versus 2007 samples, respectively. However, this may be an artifact of the precise location of the sample core collection.

Gratiot07 Lake

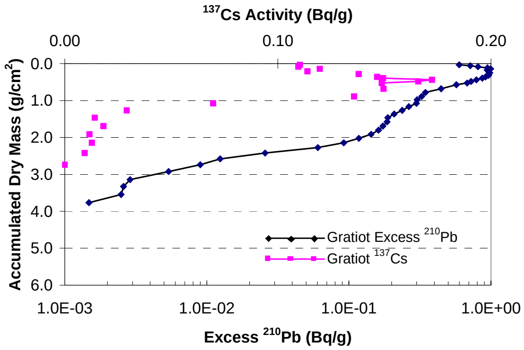


Figure 4. Gratiot Lake radiochemical dating results.

The sediment core from Gratiot07 Lake did show some deviation from log-linear behavior in the excess-^{210}Pb profile that suggested some change in sedimentation rate over time (Figure 4). Thus the CRS and SCF:CS dating model results were compared and both models showed the peak in ^{137}Cs activity and the peak in stable Pb to be placed late. For the CRS model, ^{137}Cs activity peaked in 1989 with a stable Pb peak in 1987. The SCF:CS model was ultimately used to date the core because the independent dating tracers were slightly more realistic with the ^{137}Cs activity peaking in 1978 and the stable Pb (^{208}Pb) peaked in 1975. Measurements from sediment cores collected in the initial Gratiot Lake assessment in 1999 (Simpson *et al*, 2000) were comparable. However, some increase in sedimentation rate was noted in the 2007 Gratiot Lake sample core compared to the Gratiot Lake core collected in 1999.

Emily Lake

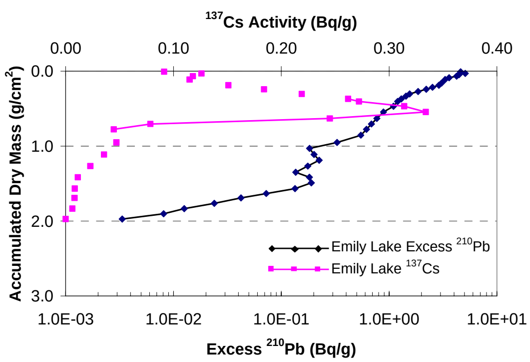


Figure 5. Emily Lake radiochemical dating results.

The sediment core from Emily Lake did show significant deviation from log-linear behavior in the excess-^{210}Pb profile that suggested changes in sedimentation rate over time (Figure 5). Comparison of the independent dating tracers were similar in both the CRS and SCF:CS dating models. The peak in ^{137}Cs activity for the CRS model was placed in was placed in the early 1960s versus the late-1950s for the SCF:CS model. This pointed to a lightly better fit for the CRS model when compared to the SCF:CS. Likewise, the CRS model placed the stable Pb peak in the early to mid-1970s, whereas the SCF:CS model placed this peak in the late 1960s. These results suggest that either model would be appropriate; however, the SCF:CS model placed the date of ^{210}Pb equilibrium in the late 1700s, which is too early. Thus the CRS model was used to date the Emily Lake sediment core.

Lake Gogebic

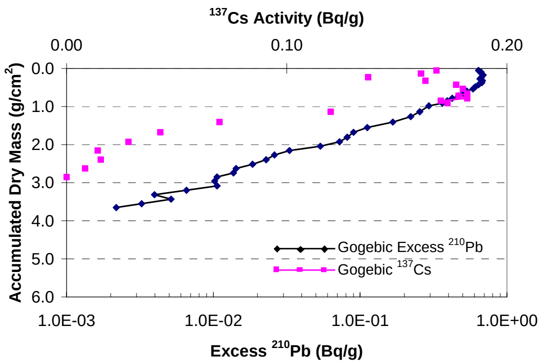


Figure 6. Lake Gogebic radiochemical dating results.

The sediment core from Lake Gogebic showed little deviation from the log-linear behavior in the excess-^{210}Pb profile. The profile displayed a moderately sized, approximately 3.5 cm, mixing zone (Figure 6). The linear model exhibited an excellent fit with the independent dating tracers, placing the ^{137}Cs activity and the stable Pb peaks at 1969 and 1972, respectively. Examination of the other models showed a later (mid to late 1970's) fit to the independent dating tracers and, thus, the linear model was used for this lake.

Platte Lake

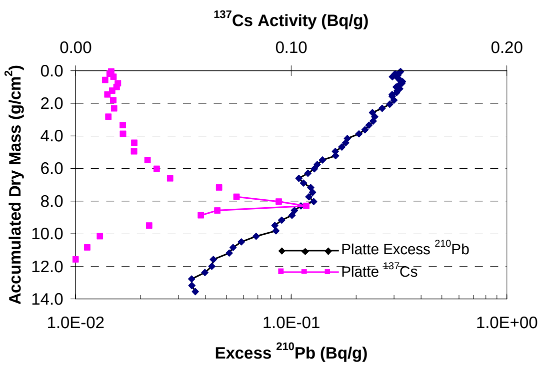


Figure 7. Platte Lake radiochemical dating results.

Sedimentation rates measured in the Platte Lake sediment core were generally high resulting in excess-^{210}Pb activities in every sediment slice and making the CRS model inappropriate to use for dating (Figure 7). In addition, the lake had a relatively large mixing zone spanning the top 6 cm of the core, evidence of extensive bioturbation. The linear model places the ^{137}Cs peak in 1964 which agrees with the expected behavior of this particular radionuclide. Stable Pb (^{208}Pb) results from Platte Lake shows a concentration maxima in 1970, also in general acceptance with its expected behavior.

Organics

Sediment collected from the 2007-2008 sampling campaign was analyzed for trace organic contaminants including a suite of polychlorinated biphenyls (PCBs), a suite of polycyclic aromatic hydrocarbons (PAHs) and a suite of organochlorine pesticides. Organic contaminants were found in the surficial sediment (0-4 cm) of each lake sampled during the 2007-2008 sampling campaign, with the exceptions of PCBs and PAHs in Lake Gogebic. In these lakes concentrations of their respective contaminants were below the detection limit (Table 3). PCB congener sums were greatest in the 23-24 cm depth in Thompson Lake reflecting an approximate date of 1960 via ^{210}Pb analysis (see Radiometric Dating, above). This lake exhibited PCB results many times that of the other lakes sampled in the 2007-2008 sample season. PCB congener sum results have shown a significant decrease to the surface (recent) sediments but were still present in concentrations above the detection limit (see Table 3a). Similarly, Gratiot07 Lake showed a decreasing trend of PCB congener sums to the present. Whitmore07, Emily, and Big Platte Lake PCB results all exhibited recent increasing trends possibly suggesting new sources for PCBs in these watersheds. The sum of PAH concentrations were greatest in Whitmore Lake at 31-32 cm depth. PAH sums were also notably high in Thompson Lake with a peak at 25-26 cm depth. PAH sums showed a general decrease to surficial sediment in all lakes sampled in the 2007-2008 sample season (see Table 3c). Pesticides were detected in the surface samples of all lakes sampled during the 2007-2008 sample season. The greatest concentrations of pesticides were found in Whitmore Lake (DDD at 27-28 cm depth). All lakes exhibited a generally decreasing trend of pesticides to recent sediments with the exception of DDT and DDE in Emily Lake and Heptachlor in Thompson Lake (see Table 3a). Care should be taken when comparing concentrations of organic contaminants among lakes. Due to the low amount of sediment in the top-most sections of the core, the top two slices were combined, and slices 3 and 4 were combined, to create two samples. As a result of combination and variable sedimentation rates among lakes, each sample represents a range of deposition years. For example, Torch Lake (sampled in 2002), had a low sedimentation rate, therefore a sediment slice represents a broader range of sediment ages and might be expected to have higher concentrations of organic contaminants than Cass Lake (sampled in 1999).

Compared to those collected from Gratiot in 1999 and from Whitmore in 2001, the 2007 (Simpson *et al*, 2000; Yohn *et al*, 2002b) lake cores showed similar results for PCBs (minimal concentrations in both cases). Pesticides appear to have increased; however, this is due to the increase in the number of compounds screened by the pesticide analyses between the earlier years of the Sediment Trends Project and more recent pesticide analyses. PAHs were noted to increase substantially in the recent sediment of the 2007 Whitmore Lake core. This is owing to an increase in the compounds noted to be present in the initial, 2001 Whitmore Lake core, pointing to increasing pollution from the same or similar source.

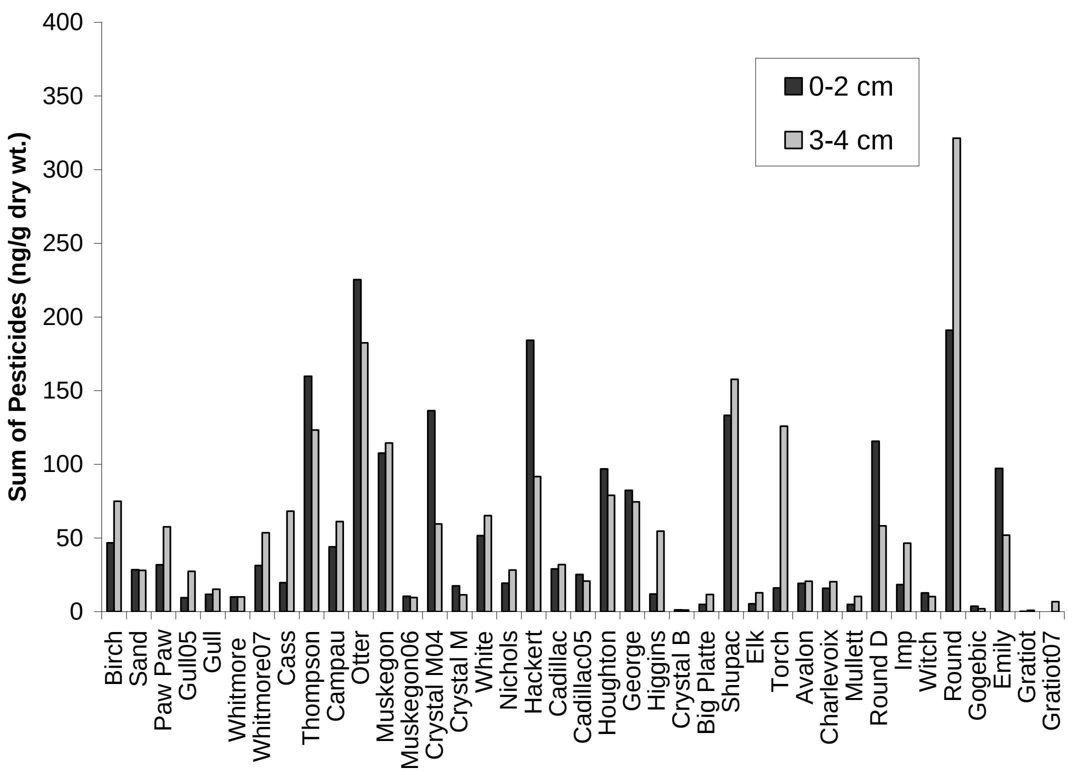


Figure 8: Total pesticides concentration (ng/g dry weight) for select inland lakes of Michigan. Slices 1 and 2 (0-2 cm) and 3 and 4 (3-4 cm) were combined.

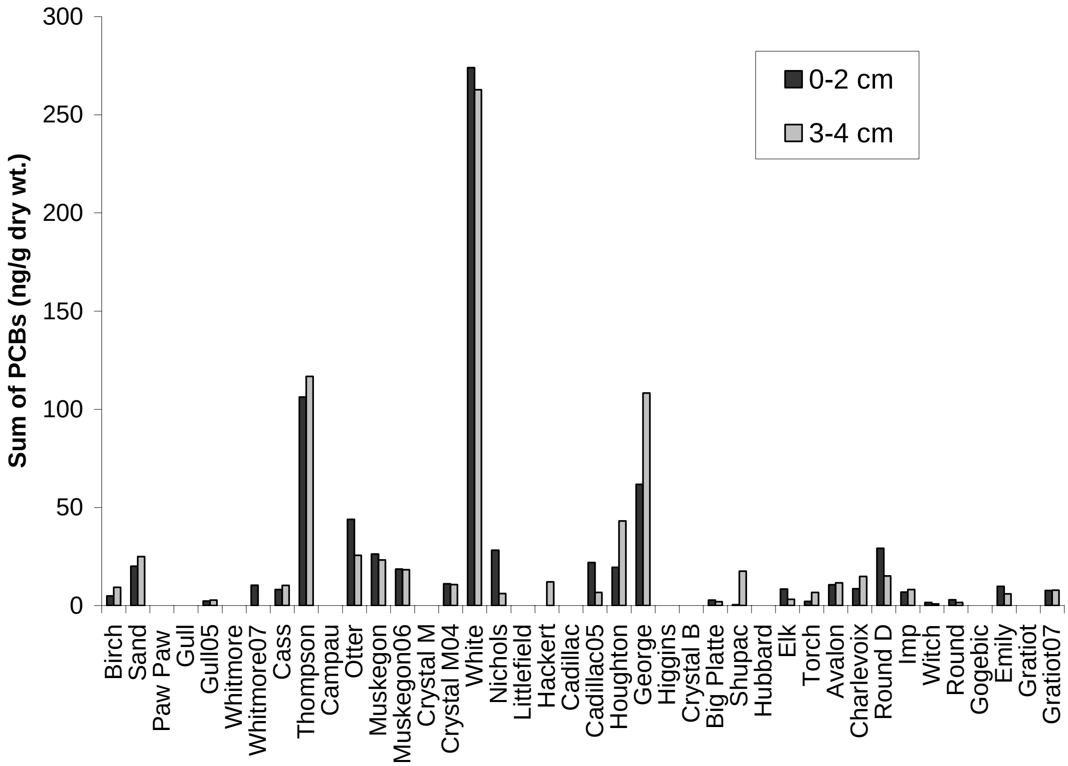


Figure 9: Sum of PCB congeners concentration (ng/g dry wt) for select inland lakes of Michigan. Slices 1 and 2 (0-2 cm) and 3 and 4 (3-4 cm) were combined.

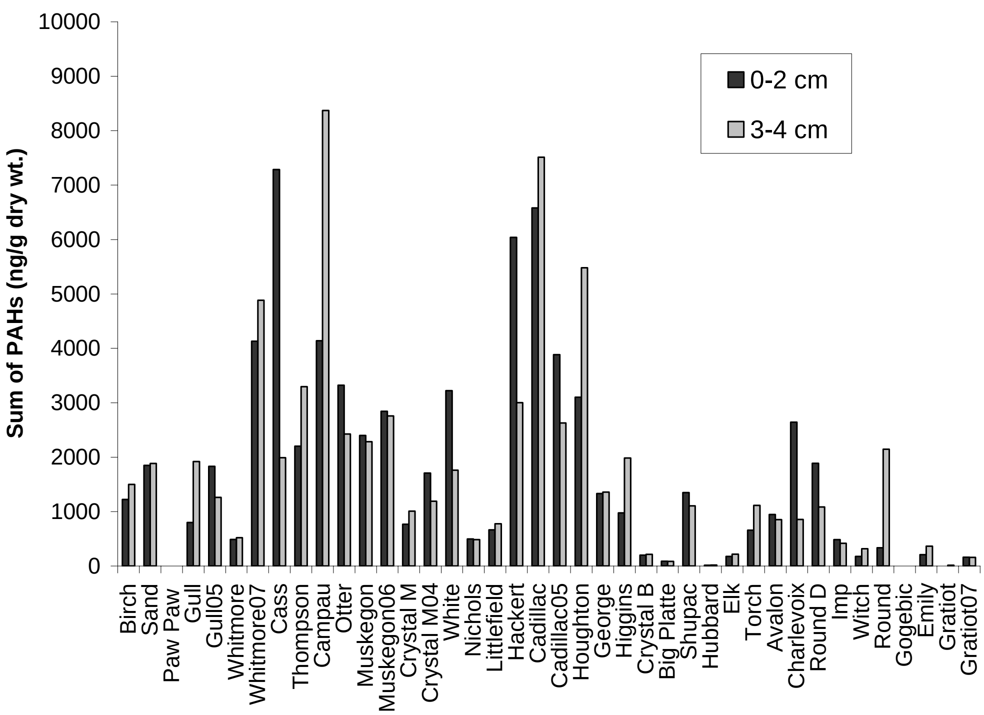


Figure 10: Total PAHs concentration (ng/g dry wt) for select inland lakes of Michigan. Slices 1 and 2 (0-2 cm) and 3 and 4 (3-4 cm) were combined.

Table 3a. Pesticide concentrations (ng/g dry wt) for 2007-2008 lakes.

Sample	Total Pesticides	alpha BHC	beta BHC	Lindane	gamma BHC	Heptachlor	Aldrin	Hept-Epox	cis Chlordane	trans Chlordane	DDE	DDD	DDT	Methoxychlor
Platte Lake														
CRB0701+CRB0702	5.01	**BDL**	**BDL**	*NR*	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	5.01	**BDL**	**BDL**	**BDL**
CRB0703+CRb0704	11.65	**BDL**	**BDL**	*NR*	**BDL**	**BDL**	2.08	**BDL**	**BDL**	**BDL**	5.23	1.09	**BDL**	3.25
Emily Lake														
EM07-1+EM07-2	97.22	**BDL**	**BDL**	*NR*	**BDL**	12.90	**BDL**	**BDL**	**BDL**	**BDL**	32.48	**BDL**	51.84	**BDL**
EM07-3+EM07-4	51.89	**BDL**	**BDL**	*NR*	**BDL**	12.04	**BDL**	**BDL**	**BDL**	**BDL**	3.73	**BDL**	31.73	4.39
Lake Gogebic														
GB07-1 + GB07-2	0.83	**BDL**	**BDL**	*NR*	**BDL**	0.36	**BDL**	**BDL**	**BDL**	**BDL**	0.47	**BDL**	**BDL**	**BDL**
GB07-3 + GB07-4	0.45	**BDL**	**BDL**	*NR*	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	0.45	**BDL**	**BDL**	**BDL**
Gratiot07														
GR07-1 + GR07-2	0.00	**BDL**	**BDL**	*NR*	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
GR07-3 + GR07-4	6.44	**BDL**	**BDL**	*NR*	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	6.44
Thompson Lake														
TH07-1 + TH07-2	159.76	**BDL**	**BDL**	*NR*	**BDL**	144.82	**BDL**	**BDL**	**BDL**	**BDL**	9.27	1.89	**BDL**	3.79
TH07-3 + TH07-4	123.21	**BDL**	**BDL**	*NR*	**BDL**	106.38	**BDL**	**BDL**	**BDL**	**BDL**	10.51	2.12	**BDL**	4.19
Whitmore07														
WM07-1 + WM07-2	31.28	**BDL**	**BDL**	*NR*	**BDL**	**BDL**	**BDL**	**BDL**	BDL	**BDL**	18.36	12.92	*NR*	*NR*
WM07-3 + WM07-4	53.60	**BDL**	**BDL**	*NR*	**BDL**	**BDL**	20.93	**BDL**	BDL	**BDL**	22.08	10.59	*NR*	*NR*

All concentrations in ng/g dry weight

BDL indicates below detection limit

NR indicates analyte not reported due to technical difficulties

Table 3b. Polychlorinated biphenyl concentrations (ng/g dry wt) for 2007-2008 lakes. EM07-1+EM07-2 is the combined sample mass of the first and second 1 cm slices for Emily Lake, EM07-3+EM07-4 is the combined sampled for the third and fourth 1 cm slices. This naming and sample combination convention was used for all lakes.

Sample	Total PCBs	5+8	18	28	52	44	66+95	77+110	90+101	118	105+132	178+129+126	153	138	128	187+159	180	170	195	206	209
Platte Lake																					
CRB07-1+CRB07-2	2.77	**BDL**	**BDL**	**BDL**	*NR*	**BDL**	2.77	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
CRB0703+CRb0704	1.98	**BDL**	**BDL**	**BDL**	*NR*	**BDL**	1.98	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
Emily Lake																					
EM07-1+EM07-2	9.79	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	9.79	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
EM07-3+EM07-4	5.97	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	5.97	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
Lake Gogebic																					
GB07-1 + GB07-2	0.00	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
GB07-3 + GB07-4	0.00	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
Gratiot07																					
GR07-1 + GR07-2	7.69	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	4.02	3.67	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
GR07-3 + GR07-4	7.82	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	4.20	3.52	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
Thompson Lake																					
TH07-1 + TH07-2	106.22	**BDL**	**BDL**	**BDL**	4.81	**BDL**	7.01	**BDL**	17.61	13.92	4.61	**BDL**	19.15	17.15	4.50	3.43	5.94	3.74	4.30	**BDL**	**BDL**
TH07-3 + TH07-4	116.71	**BDL**	**BDL**	**BDL**	6.82	1.80	5.25	**BDL**	16.55	14.57	4.56	**BDL**	22.22	20.74	5.35	4.24	7.01	4.70	2.86	**BDL**	**BDL**
Whitmore07																					
WM07-1+WM07-2	10.40	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	3.47	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	3.07	3.78	**BDL**	**BDL**	**BDL**	**BDL**	*NR*	**BDL**	**BDL**
WM07-3+WM07-4	0.00	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	*NR*	**BDL**	**BDL**

All concentrations in ng/g dry weight
BDL indicates below detection limit
NR indicates analyte not reported due to technical difficulties

Table 3c. Polycyclic aromatic hydrocarbon (ng/g dry wt) for 2007-2008 lakes. EM07-1+EM07-2 is the combined sample mass of the first and second 1 cm slices for Emily Lake, EM07-3+EM07-4 is the combined sampled for the third and fourth 1 cm slices. This naming and sample combination convention was used for all lakes.

Sample	Total PAHs	Acen	Acenap	Fluor	Phenan	Anth	Fluoran	Pyr	Benzo-A	Chry	Benzo-B/K	Benzo-pyr	Indeno-pyr	DBA	B-ghi-pery
Platte Lake															
CRB07-1+CRB07-2	87.65	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	34.16	**BDL**	**BDL**	**BDL**	27.64	**BDL**	**BDL**	**BDL**	25.89
CRB07-3+CR07-4	86.04	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	32.73	**BDL**	**BDL**	**BDL**	26.44	**BDL**	**BDL**	**BDL**	26.87
Emily Lake															
EM07-1+EM07-2	208.45	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	127.92	**BDL**	80.53	**BDL**	**BDL**
EM07-3+EM07-4	363.04	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	71.68	**BDL**	**BDL**	86.42	141.67	**BDL**	63.28	**BDL**	**BDL**
Lake Gogebic															
GB07-1 + GB07-2	0.00	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	*NR*	**BDL**	**BDL**	**BDL**	**BDL**	*NR*	**BDL**
GB07-3 + GB07-4	0.00	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	*NR*	**BDL**	**BDL**	**BDL**	**BDL**	*NR*	**BDL**
Gratiot07															
GR07-1 + GR07-2	164.29	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	81.86	**BDL**	**BDL**	**BDL**	82.43	**BDL**	**BDL**	**BDL**	**BDL**
GR07-3 + GR07-4	159.73	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	79.96	**BDL**	**BDL**	**BDL**	79.77	**BDL**	**BDL**	**BDL**	**BDL**
Thompson Lake															
TH07-1 + TH07-2	2,204.66	**BDL**	**BDL**	**BDL**	161.25	**BDL**	387.15	346.51	152.39	316.51	840.85	**BDL**	**BDL**	**BDL**	**BDL**
TH07-3 + TH07-4	3,298.23	**BDL**	**BDL**	**BDL**	183.27	**BDL**	435.22	381.19	161.37	324.18	755.93	83.15	316.71	247.29	409.96
Whitmore07															
WM07-1+WM07-2	4,131.76	**BDL**	**BDL**	**BDL**	228.29	**BDL**	659.34	460.36	175.89	477.62	925.53	269.42	416.31	**BDL**	518.91
WM07-3+WM07-4	4,886.27	**BDL**	**BDL**	**BDL**	277.17	**BDL**	726.47	518.69	206.12	606.12	1106.20	355.75	484.20	**BDL**	605.46

All concentrations in ng/g dry weight
BDL indicates below detection limit
NR indicate analyte not reported due to technical difficulties
Abbreviations: Acen = Acenaphthylene, Acenap = Acenaphthene, Fluor = Fluorene, Phenan = Phenanthrene, Anth = Anthracene, Fluoran = Fluoranthene, Pyr = Pyrene, Benzo-A = Benzo-A-anthracene, Chry = Chrysene, Benzo-B/K- = Sum of Benzo-B-fluoranthene and Benzo-K-fluoranthene, Indeno-pyr = Indeno -1,2,3,-CD-pyrene, DBA = Dibenz-a,h-anthracene, B-ghi-pery = Benzo-G,H,I-perylene

Focusing-corrected anthropogenic accumulation rates

Concentrations of metals in the sediment have important implications on bottom-dwelling organisms; however, they do not provide insight into how much of the element is present due to human actions. For example, Gratiot Lake has high copper concentrations even in deep sediments because the lake is located in an area that is naturally rich in copper. Therefore, in addition to the interpretation of the total concentration profiles, focusing corrected anthropogenic accumulation rates were calculated and compared among lakes. These calculations take into account the natural inputs of elements of interest as well as the process of sediment focusing, and provide the best estimate of the actual rate of input of that element to the lake due to human actions. The calculations are described further in the 2001-2002 year end report (Yohn *et al.*, 2002b).

Some difficulties were encountered in the determination of anthropogenic inputs. Sediment cores taken from Platte and Whitmore Lakes were not deep enough to reach background sediments (oldest sections are 1945 and 1879, respectively). To estimate background concentrations, the concentrations of two major sediment components, aluminum and calcium, were compared to those of other lakes. For both Platte and Whitmore07 Lakes, Thompson Lake had the most similar major sediment component chemistry. Therefore the background metal: aluminum ratio from Thompson Lake was used to calculate anthropogenic inputs. However, the copper profile in Whitmore07 Lake does appear to reach constant low concentrations in lower portion of the core in the late 1800s (Figure 12). This is reasonable because other lakes approach or reach background concentrations by the late 1800s, and therefore the actual Cu:Al ratio of the older sediment in Whitmore07 Lake was used. This method results in lower anthropogenic accumulation rates than using the Cu:Al ratio from Thompson Lake, and may underestimate the human inputs. All anthropogenic accumulation rates from Platte and Whitmore07 Lakes should be interpreted with care, as there could be considerable error in this estimation technique.

In general, anthropogenic accumulation rates of elements in the 2007-2008 study lakes do not vary appreciably to other lakes from previous studies. Of notable mention amongst the 2007-2008 profiles are mercury concentrations in Emily, Gogebic, Gratiot, and Platte lakes appear to remain elevated in the surface sediment relative to background.

Accumulation rates of copper and zinc in Platte Lake are characterized by two distinct events within its geochemical history. Peaks appear to occur both in the early 1970's and, more recently, in the late 1990's or early 2000's. However, recent trends for both elements appear to be decreasing in this lake. Lead in Platte Lake appears to peak once during the early 1970's which is typical for most lakes sampled to date for this project. This suggests a separate source in the recent trends of copper and zinc from lead in the Platte Lake watershed.

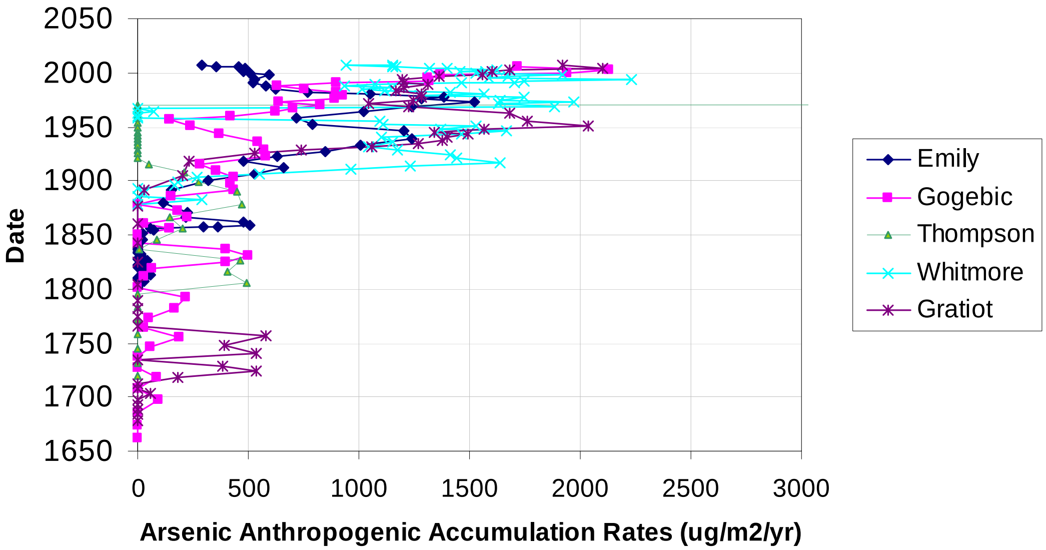
Anthropogenic accumulation rate of lead in Emily Lake show a peak value in the early 1970's followed by a decreasing trend to the recent sediments. For many lakes, the dominant source of lead in the 1930-1980s was atmospheric deposition of lead released to the environment through the burning of leaded gasoline (Graney *et al.*, 1995, Yohn *et al.*, 2002a), with the largest input to the environment occurring in 1972 (United States. Bureau of Mines). The 1973 peak probably corresponds to the peak use of leaded gasoline in the vicinity of the Emily Lake watershed. The similarity of anthropogenic accumulation profiles of lead during this time period to those of cadmium, copper and zinc suggest that the influence on their profiles is related (i.e. automobile use in the watershed). Anthropogenic accumulation of zinc in Emily Lake also exhibits an older secondary peak during the mid-1850's which is larger than the more recent 1970's peak. It is difficult to interpret this peak as it appears to only affect zinc amongst the trace metals in the Emily Lake sediment, however, an elevated trend of phosphorus in the same time period could allow us to conclude that a change in nutrient inputs to the lake had occurred, possibly linked to regional deforestation.

Lake Gogebic accumulation rates of arsenic, copper, and lead are increasing to the surface of the sediment. All three elements begin their increase at separate dates (1955, 1936, and 1878, respectively) suggesting separate sources at least initially. Further, arsenic has a secondary peak in 1929 dissimilar to the other elements save phosphorus, which also exhibits a secondary peak in the late 1800's. Due to the separation in peak dates, changes in nutrient availability are likely not related to arsenic accumulation and arsenic likely has a separate source from the other elements measured.

Trace metal accumulation rates in Gratiot07 Lake exhibit three separate peaks. The first peak shows relatively low values and is associated with the deepest section of the core dated to pre-1800. An increasing trend is shown beginning in the late-1800's and peaks in the early-1950's followed by a decreasing trend to the mid-1980's to the early 1990's (different dates for separate trace metals). Finally, the trends of the trace metals examined increases to the surface and show the highest concentrations in the cores for cadmium, lead, and zinc. These trends are not appreciably different than those from sediment sampled from Gratiot07 Lake in 1999, but the shorter sediment cores formerly used only allowed for data to be collected through ^{210}Pb date 1823.

Thompson Lake exhibited some of the highest historical trace metal accumulation rates of the lakes studied during the 2007-2008 sampling year. Trends for copper, lead and zinc showed a single peak in the years 1987, 1964, and 1961, respectively. Arsenic and cadmium also showed a single elevated value during this frame of time (1973 and 1961, respectively) but since they were a single data point, it is difficult to determine if the values are real or an artifact of an error in the digestion and analysis process. Arsenic and cadmium also exhibited another set of elevated anthropogenic accumulation values both peaking in 1817. Historical records of Thompson Lake have revealed completion of a dam construction project on the lake in 1836 and that Thompson Lake was originally a much smaller group of lakes prior to this (Pless, 1975). The arsenic and cadmium peak observed during this time is likely an artifact of anthropogenic activity in the area including construction of the dam.

Most trace metal anthropogenic accumulation profiles for Whitmore07 Lake show a decreasing trend to present. Accumulation rates are relatively noisy in comparison with other lake data but appear to show peaks in the late-1970's to the early-1990's. Copper is the only trace metal with a continual increasing accumulation rate since the late 1800's. Arsenic exhibits four separate accumulation profile peaks in 1917, 1946, 1973, and 1994. Given the span of time, it is likely that some, if not all, of these arsenic peaks originated from separate sources. The trace metal anthropogenic accumulation observations for Whitmore07 Lake generally agree with those of the previous samples collected from this lake in the 2001-2002 sample year.



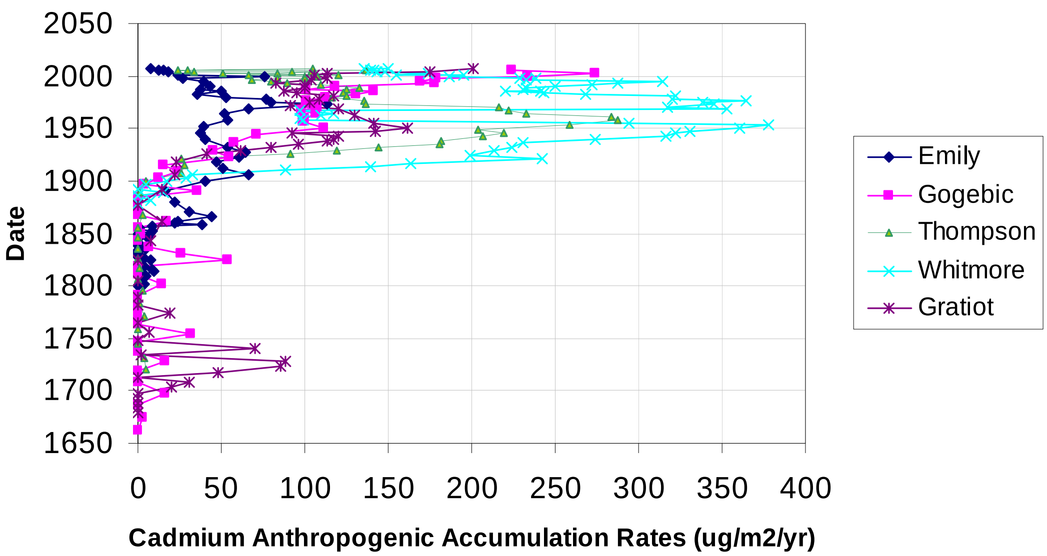
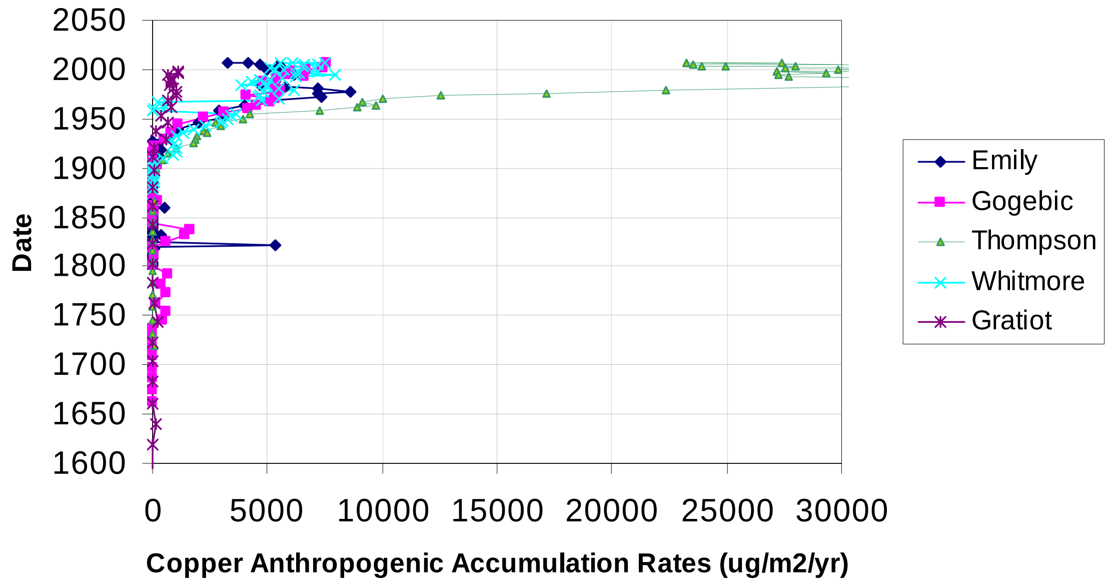


Fig. 11. Arsenic and cadmium focusing corrected anthropogenic accumulation rates (µg/m^2/y) for 2007-2008 study lakes in Michigan.



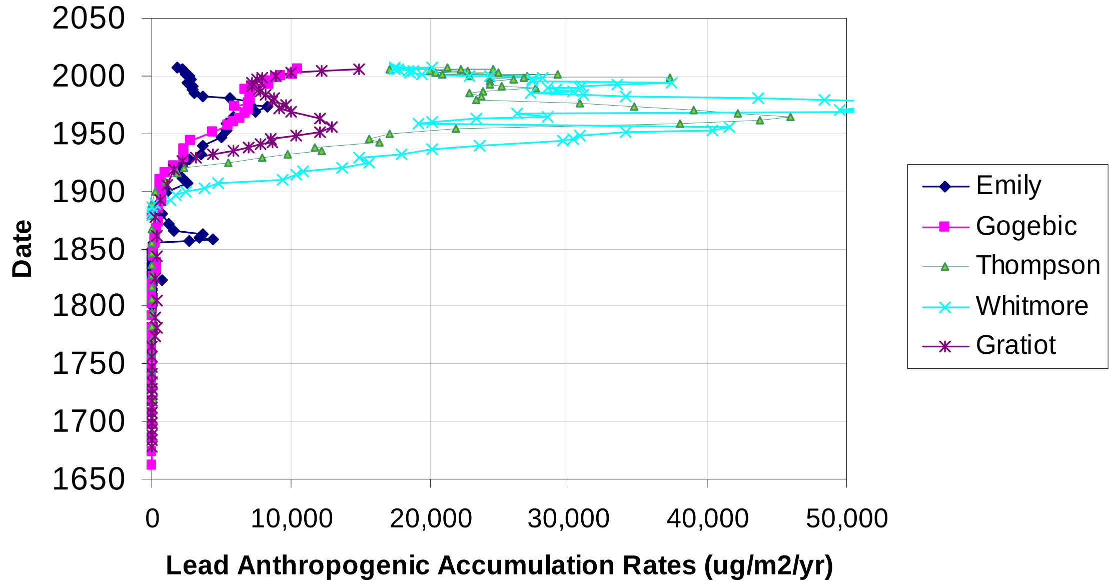


Fig. 12. Copper and lead focusing corrected anthropogenic accumulation rates (µg/m^2/y) for 2007-2008 study lakes in Michigan. Lead accumulation rates for Thompson Lake are greater than the scale used.

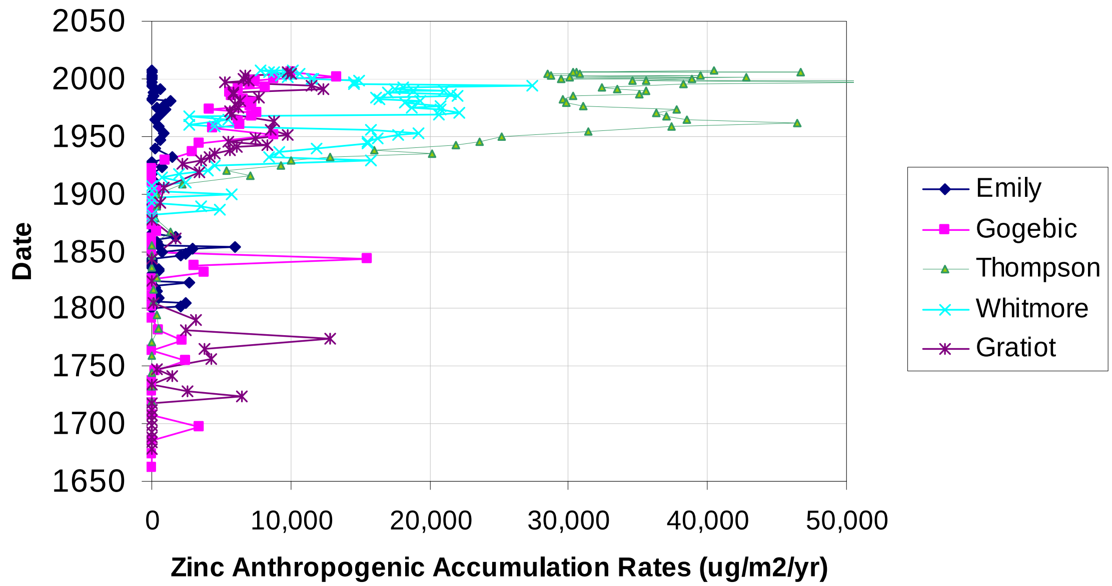


Fig. 13. Zinc focusing corrected anthropogenic accumulation rates (µg/m^2/y) for study lakes in Michigan. Zinc accumulation rates for Thompson Lake are greater than the scale used.

Surface Concentrations

While high concentrations of some contaminants may exist in sediments deposited in the 1960s and 70s, the concentrations in the surface sediments are of more concern to the health of aquatic organisms. The top three samples, 1.5 cm, have been averaged to represent the surface samples. Three samples were averaged to reduce the possible effects of one anomalous sample. These concentrations were compared among lakes, and compared to sediment quality guidelines (Table 5) (MacDonald *et al.*, 2000). MacDonald et al. (2000) define a threshold effect concentration (TEC) and a probable effect concentration (PEC). The TEC is the concentration below which harmful effects on sediment dwelling organisms are unlikely to be observed, while the PEC is the concentration above which harmful effects are likely to be observed. Surface concentrations of arsenic, cadmium, copper, lead and zinc are presented. These are considered the critical inorganic contaminants (except for mercury) in the Great Lakes (US EPA, 1995) . Only 2005-2007 study lakes will be discussed, but data from all study lakes are presented for comparison. Discussion of previous lakes can be found in previous year-end reports (Parsons *et al.*, 2004, Yohn *et al.*, 2002b). The concentrations reported are total concentrations, and represent both the human-influence and natural component.

For the 2007-2008 sampling year, the surface concentrations of arsenic were greatest in Thompson Lake and least in Platte Lake (Table 5, 14). The arsenic TEC was exceeded in all of the sample year lakes except for Platte Lake. Thompson was the only sample year lakes to have exceeded the PEC for arsenic.

Cadmium surface concentrations were greatest in Gogebic Lake and least in Platte Lake (Table 5, Figure 15). All lakes for the 2007-2008 sample year exceeded the TEC for cadmium save Platte and Thompson, while no lake had sediment concentrations that exceeded the PEC.

Emily Lake had the greatest surface sediments concentration of copper and was the only lake to exceed the PEC for this element. All other lakes exceeded the TEC for copper with the exception of Platte, which had the lowest concentration of the lakes sampled in the 2007-2008 sample year (Table 5, Figure 16).

The concentration of lead was greatest in Whitmore Lake and least in Platte Lake (Table 5, Figure 17). Emily, Gogebic, Gratiot07 and Whitmore07 lakes had lead concentrations that exceeded the TEC and no lakes exceeded the PEC.

Lake Gogebic had the greatest concentration of zinc in the surface sediments and Platte Lake had the least (Table 5, Figure 18). None of the 2007-2008 sample lakes had surface concentrations that exceeded the PEC, but lakes Gogebic and Whitmore exceeded the TEC.

Mercury concentrations in the surface sediments were greatest in Emily Lake and least in the sediments of Thompson and Whitmore lakes (Table 5, Figure 19). For the 07-08 sample year, the TEC was exceeded only in Emily Lake. None of the 2005-2007 sample lakes exceeded the PEC for mercury.

Comparing the 2007 results for Gratiot Lake with those samples collected previously in 1999 (Simpson *et al*, 2000) show increasing surficial sediment concentrations in Gratiot Lake for arsenic, cadmium, copper, lead, and zinc and a decreasing surface concentrations for mercury. The increase is noted as resulting in recent surface sediment concentrations above the TEC values for arsenic, cadmium, copper and lead. When compared with 2001 results for Whitmore Lake (Yohn *et al*, 2002b), Whitmore07 results show moderate decreasing values of surface sediments with respect to arsenic, cadmium, copper, and lead and substantial decreases in both mercury and zinc (Table 5).

Table 5. Average surface concentration for select metals and metalloids found in lake sediment of Michigan lakes, the top 1.5 cm (3 sediment slices) were averaged. Sediment values that exceed the TEC are italic and those that exceed the PEC are bold.

Lake	Arsenic	Cadmium	Copper	Lead	Zinc	Mercury
Avalon	4.2	*1.1*	**606.7**	*70.9*	93.5	0.05
Birch	8.0	0.3	11.2	22.5	68.2	0.05
Cadillac	*16.0*	*2.2*	**417.2**	**190.5**	*265.7*	*0.34*
Cadillac05	*12.6*	*2.1*	**386.1**	**210.4**	*272.9*	*0.22*
Campau	*12.8*	0.4	**140.6**	25.2	80.6	0.04
Cass	*30.8*	0.3	15.4	*53.7*	85.4	0.11
Charlevoix	*10.1*	0.5	14.3	33.4	77.8	0.07
Crystal B	4.4	*1.1*	18	*56.1*	106.7	0.09
Crystal M	7.3	0.9	21.9	*78.9*	106.5	0.12
Crystal M04	*11.0*	0.8	*31.8*	*88.6*	*151.7*	0.08
Elk	*23.9*	0.3	8.8	29.9	38.4	0.10
Emily	*14.5*	*1.1*	**152.2**	*66.5*	98.0	*0.33*
George	*17.7*	0.5	*39.7*	*47.9*	*132.8*	0.07
Gogebic	*13.1*	*1.8*	*63.9*	*43.9*	*153.6*	0.18
Gratiot	6.6	0.8	60.9	39.5	82.4	*0.54*
Gratiot07	*11.9*	*1.3*	*69.6*	*52.7*	103.6	0.14
Gull	7.6	0.1	11.6	32.4	52.4	0.06
Gull05	9.2	0.3	14.1	32.7	62.7	0.04
Hackert	*10.7*	*1*	*45.4*	*65.1*	*160.3*	0.10
Higgins	*10.5*	*1.2*	21.1	*109.1*	*122.1*	*0.28*
Houghton	*23.9*	*1.2*	**175.0**	*67.9*	*159.6*	0.15
Imp	*10.6*	*1.8*	*61.3*	*102.1*	*137.4*	*0.27*
Littlefield	*11.5*	0.5	12.2	30.1	49.0	0.06
Mullett	4.9	0.4	12.7	26.6	57.9	0.07
Muskegon	*15.7*	*2.0*	*52.7*	*58.0*	*146.9*	0.14
Muskegon06	*22.5*	*1.6*	*46.5*	*48.6*	*139.6*	0.16
Nichols	*29.9*	*1.0*	*57.9*	*63.5*	*158.6*	0.14
Otter	**42.2**	*1.3*	*54.2*	*85.3*	*207.0*	0.12
Paw Paw	*19.2*	0.6	*43.7*	*49.7*	*151.8*	*0.45*
Platte	2.7	0.3	6.3	12.4	28.1	0.06
Round	4.7	*1.0*	15.1	*68.4*	98	0.08
Round D	**44.9**	*1.9*	*64.8*	*70.5*	*174.9*	0.15
Sand	*16.9*	*1.7*	*43.0*	*126.4*	*185.4*	0.10
Shupac	9.5	0.3	15.8	26.6	65.4	*0.20*
Thompson	**108.6**	0.4	*42.7*	31.1	73.1	0.06
Torch	3.9	0.6	13.1	*43.3*	57.9	0.07
White	*15.1*	0.7	30.5	*63.2*	96.8	*0.21*
Whitmore	*16.1*	*1.5*	*49.7*	**143.9**	*229.0*	*0.21*
Whitmore07	*14.1*	*1.3*	*51.9*	*114.3*	*123.2*	0.06
Witch	**51.9**	0.7	22.7	23.4	106.2	0.14

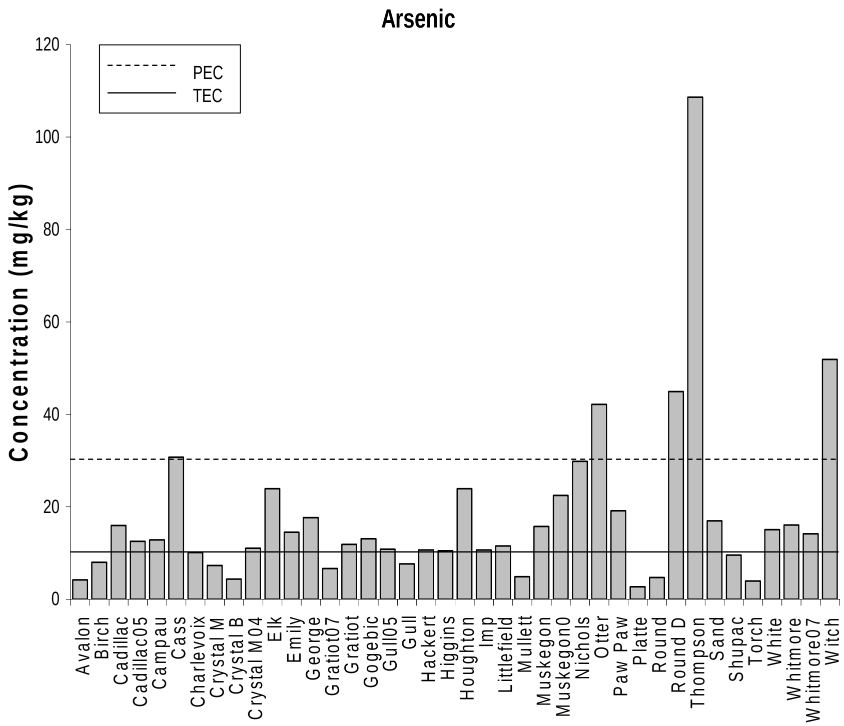


Figure 14. Average surface concentrations (average of top 1.5 cm, mg/kg dry wt) of arsenic from select Michigan inland lakes. The TEC (solid line) and PEC (dashed line) are shown.

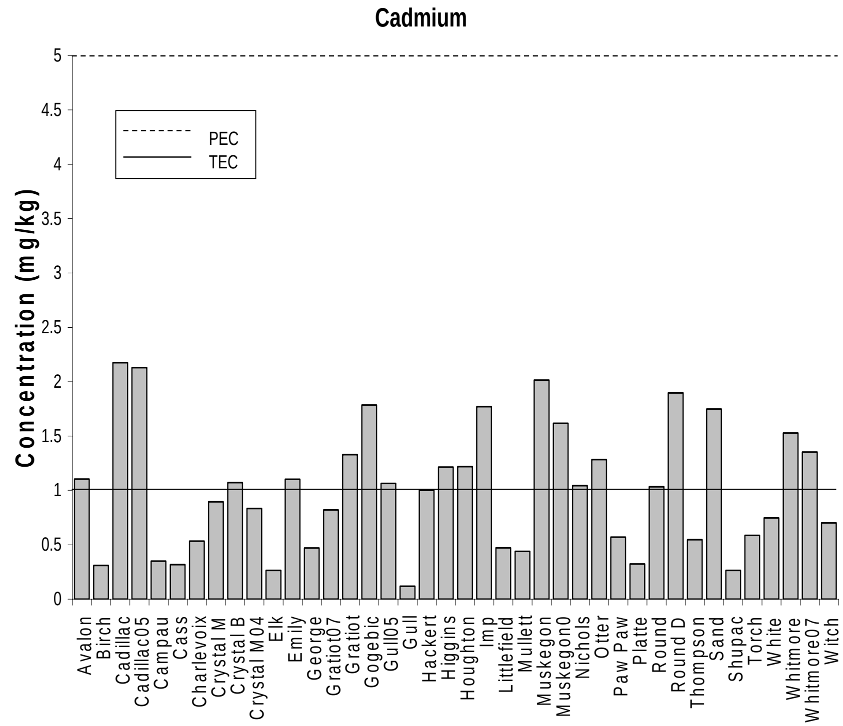


Figure 15. Average surface concentrations (average of top 1.5 cm, mg/kg dry wt) of cadmium from select Michigan inland lakes. The TEC (solid line) and PEC (dashed line) are shown.

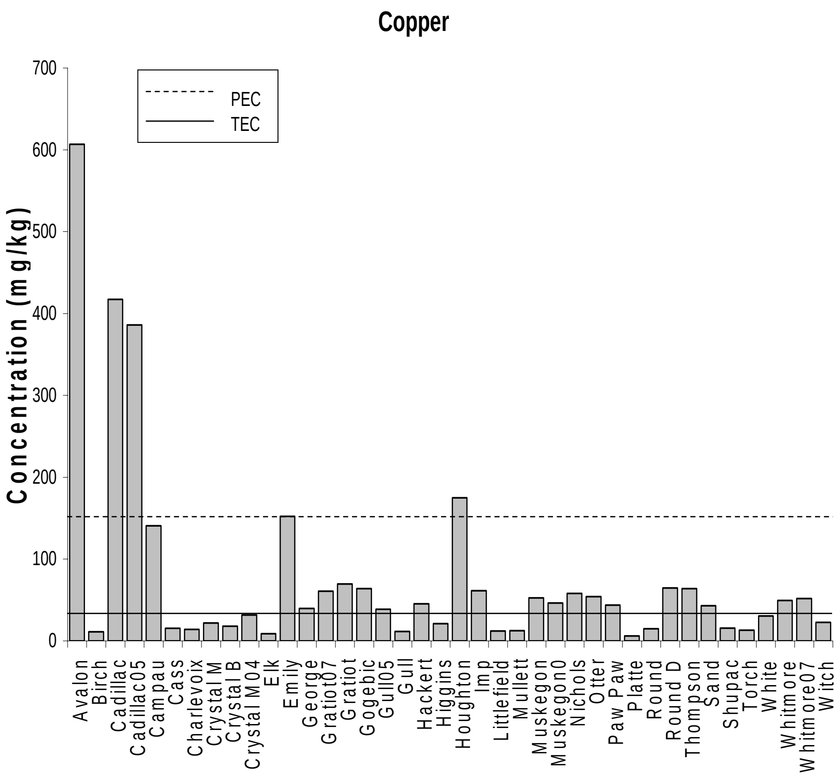


Figure 16. Average surface concentrations (average of top 1.5 cm, mg/kg dry wt) of copper from select Michigan inland lakes. The TEC (solid line) and PEC (dashed line) are shown.

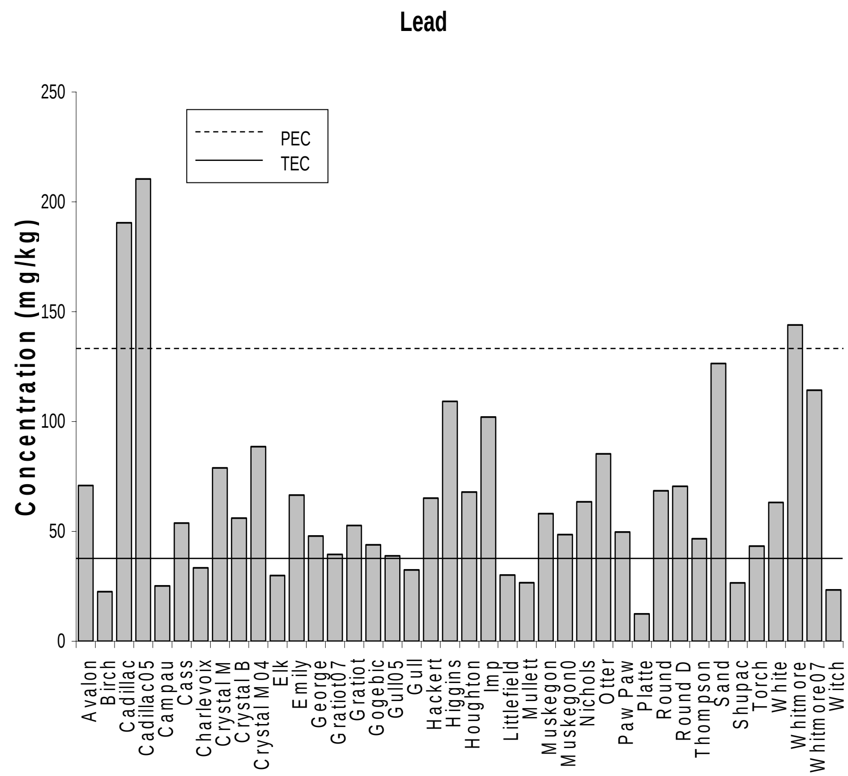


Figure 17. Average surface concentrations (average of top 1.5 cm, mg/kg dry wt) of lead from select Michigan inland lakes. The TEC (solid line) and PEC (dashed line) are shown.

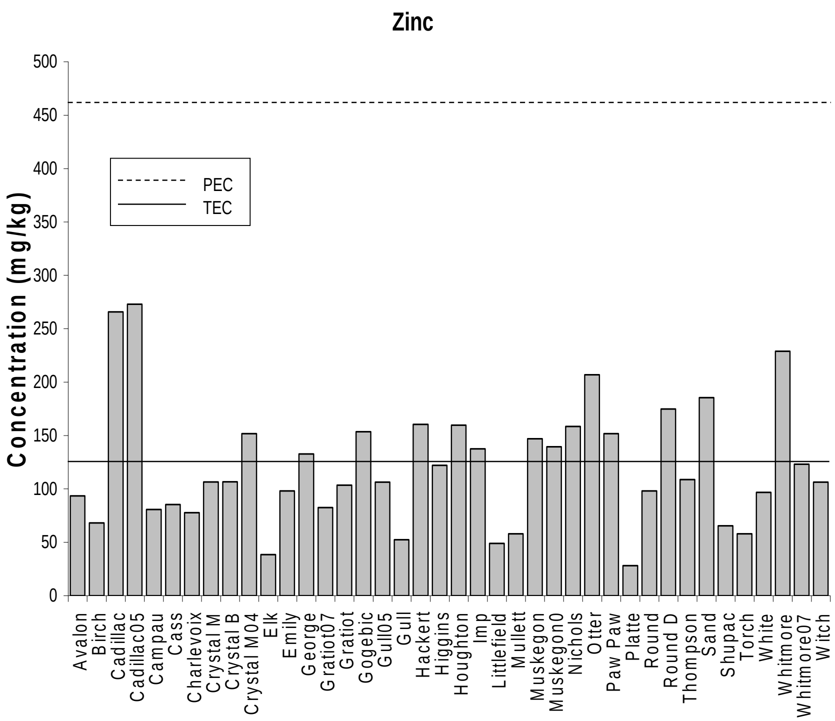


Figure 18. Average surface concentrations (average of top 1.5 cm, mg/kg dry wt) of zinc from select Michigan inland lakes. The TEC (solid line) and PEC (dashed line) are shown.

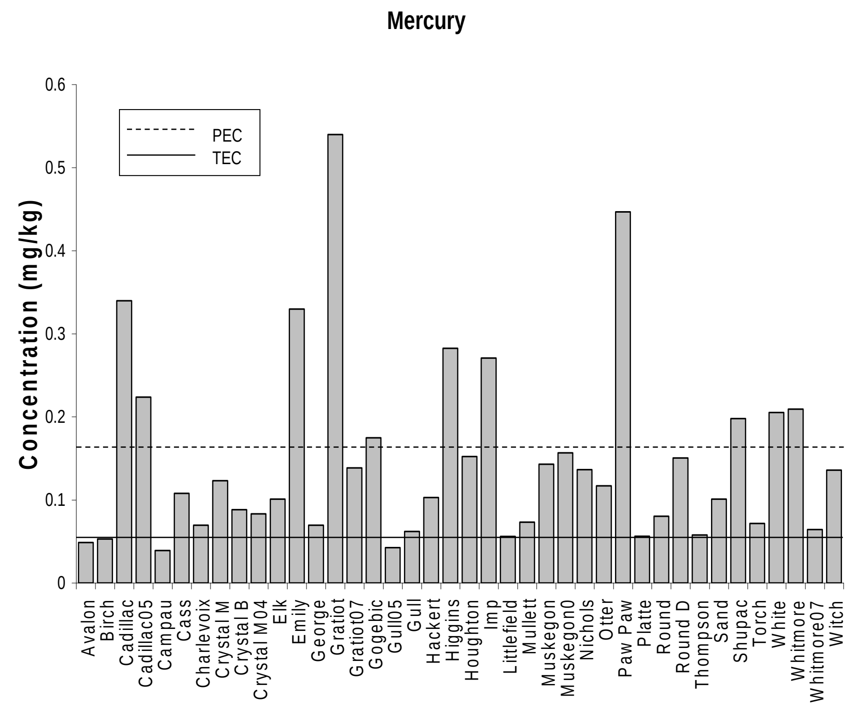


Figure 19. Average surface concentrations (average of top 1.5 cm, mg/kg dry wt) of mercury from select Michigan inland lakes. The TEC (solid line) and PEC (dashed line) are shown.

Nitrogen

Nitrogen is regarded as a key nutrient to all living organisms and is commonly viewed as one of the nutrients limiting organic productivity in lakes. Nitrogen accumulates in lake sediment from a combination of both terrestrial and lake-derived organic matter. This organic matter is sedimented in the form of partially decomposed biota and inorganic and organic nitrogen compounds adsorbed to inorganic particulate matter. Loss of nitrogen from the lake to the sediment represents a significant percentage of the annual nitrogen budget of many lakes (Likens, 1985). Likewise, sediment can serve as a source to the water column as well. The loss of N to the overlying water is a function of biotic processes, such as bacterial decomposition of organic sediments, and abiotic processes, such as chemical reduction during anoxic conditions (Ignatieva, 1996).

The laboratory method used for determination of N in the lake sediment is the Micro-Kjeldahl digestion with Lachat Flow Injection analysis by Salicylate method (Bradstreet, 1965). Interpretation of the data is difficult to perform on its own due to a variety of biogeochemical processes affecting the lake's sedimented fraction of N and the numerous N sources. Used in combination with other sediment data, however, some interpretations are able to be made.

The lakes sampled during the 2007 field study show an increase in N to the surface of the sediments of all lakes except Lake Gogebic (Figure 20). Lake Gogebic maintained relatively stable N concentrations throughout its core, even when other productivity indictors showed large increases (P and Ca). Gratiot Lake exhibited the highest observed N concentrations and Platte Lake showed the lowest concentrations. It should be noted that nitrogen analysis was not performed on previous studies of Gratiot Lake (1999) or Whitmore Lake (2001).

Platte Lake's increase to the surficial sediments was also reflected in erosive indicators (Al, Mg, and Ca) and shared a peak concentration in the mid-1970's with indicators typically attributed to anthropogenic pollution (Pb, Hg, and Cd). Emily Lake exhibited a large drop in N in the mid-1800's. This drop coincides with a substantial increase in other elements and probably reflects dilution of N in the lake sediment due to the erosive events associated with deforestation. Gratiot Lake also shows a similar profile but this drop occurs notably earlier in the ^{210}Pb interpreted date. Whitmore lake N profiles show considerable similarity to P and both nutrients are interpreted as likely originating from a similar source (e.g. agricultural practices). Finally, Lake Gogebic N data shows similarity to those elements often interpreted as diagenetically controlled (Mo and U) suggesting similar behaviors of N in the sediment. It is noted that P in Lake Gogebic sediment has increased substantially from background and this large increase is not reflected in the N data, suggesting separate sources.

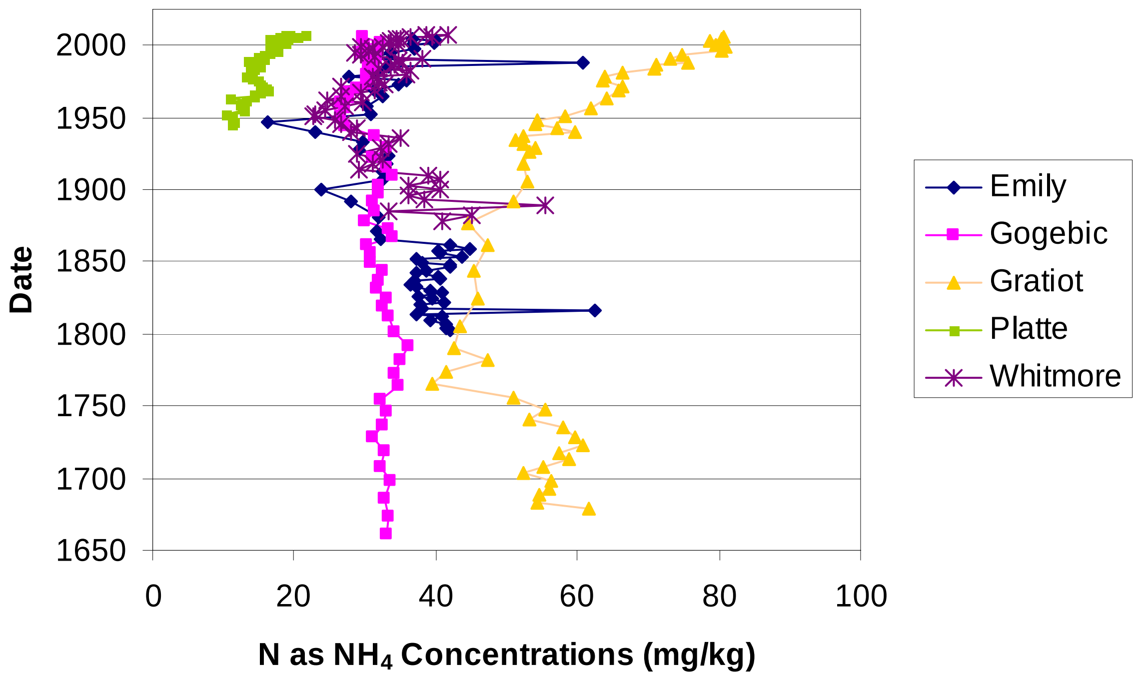


Fig. 20. Sediment nitrogen concentrations (mg/kg) for study lakes in Michigan.

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Inland Lakes Sediment Trends: Sediment Analysis Results for Six Michigan Lakes 2007

Appendix A

Background Concentrations
Anthropogenic Inventories
Watershed Characteristics

Background Concentrations

Concentrations in mg/kg dry weight

Lake	Cadmium	Copper	Lead	Zinc
Avalon	-	-	-	-
Birch	-	-	-	-
Cadillac	1.0	19.9	8.0	108.9
Cadillac05	15.7	179.3	0.8	6.0
Campau	0.6	71.2	0.6	71.2
Cass	-	-	-	-
Charlevoix	3.4	2.9	0.1	1.2
Crystal B	-	-	-	-
Crystal M	0.2	8.1	3.6	-
Crystal M04	0.3	14.1	6.7	54.0
Elk	BDL	3.0	0.3	4.4
Emily	0.8	38.9	9.0	114.2
George	-	-	-	-
Gogebic	0.9	27.7	124.9	35.6
Gratiot	0.6	46.0	3.0	53.0
Gratiot07	0.7	178.0	3.1	62.7
Gull	BDL	1.3	0.2	4.6
Gull05	2.0	2.3	0.1	1.1
Hackert	0.7	13.0	12.7	68.2
Higgins	0.3	15.0	8.2	48.0
Houghton	0.6	14.6	7.4	99.9
Imp	0.8	-	6.1	-
Littlefield	0.2	-	0.1	-
Mullett	0.2	8.6	3.2	27.9
Muskegon	-	-	-	-
Muskegon0	-	-	-	-
Nichols	-	-	-	-
Otter	-	-	-	-
Paw Paw	-	-	-	-
Platte	-	-	-	-
Round	0.4	-	4.4	-
Round D	0.9	21.6	3.6	87.0
Sand	-	-	-	-
Shupac	-	-	-	-
Thompson	0.4	5.5	2.3	27.1
Torch	0.1	-	1.6	-
White	-	-	-	-
Whitmore	-	23.2	-	-
Whitmore07	0.7	22.2	28.9	82.1
Witch	-	13.5	-	-

- indicates that background levels could not be determined
BDL indicates that values were below detection limits

Inland Lakes Sediment Trends: Sediment Analysis Results for Six Michigan Lakes
2007

Appendix B

Fact Sheets

Core logs

^{210}Pb Data

Metals Concentrations

Porewater Metals Concentrations

Inland Lakes Sediment Trends: Sediment Analysis Results for Six Michigan Lakes 2007

Appendix A

Background Concentrations
Watershed Characteristics
Anthropogenic Inventories

Geological Sciences
Michigan State University

Background Concentrations

Concentrations in mg/kg dry weight

Lake	Cadmium	Copper	Lead	Zinc
Avalon	-	-	-	-
Birch	-	-	-	-
Cadillac	1.0	19.9	8.0	108.9
Cadillac05	15.7	179.3	0.8	6.0
Campau	0.6	71.2	0.6	71.2
Cass	-	-	-	-
Charlevoix	3.4	2.9	0.1	1.2
Crystal B	-	-	-	-
Crystal M	0.2	8.1	3.6	-
Crystal M04	0.3	14.1	6.7	54.0
Elk	BDL	3.0	0.3	4.4
Emily	0.8	38.9	9.0	114.2
George	-	-	-	-
Gogebic	0.9	27.7	124.9	35.6
Gratiot	0.6	46.0	3.0	53.0
Gratiot07	0.7	178.0	3.1	62.7
Gull	BDL	1.3	0.2	4.6
Gull05	2.0	2.3	0.1	1.1
Hackert	0.7	13.0	12.7	68.2
Higgins	0.3	15.0	8.2	48.0
Houghton	0.6	14.6	7.4	99.9
Imp	0.8	-	6.1	-
Littlefield	0.2	-	0.1	-
Mullett	0.2	8.6	3.2	27.9
Muskegon	-	-	-	-
Muskegon0	-	-	-	-
Nichols	-	-	-	-
Otter	-	-	-	-
Paw Paw	-	-	-	-
Platte	-	-	-	-
Round	0.4	-	4.4	-
Round D	0.9	21.6	3.6	87.0
Sand	-	-	-	-
Shupac	-	-	-	-
Thompson	0.4	5.5	2.3	27.1
Torch	0.1	-	1.6	-
White	-	-	-	-
Whitmore	-	23.2	-	-
Whitmore07	0.7	22.2	28.9	82.1
Witch	-	13.5	-	-

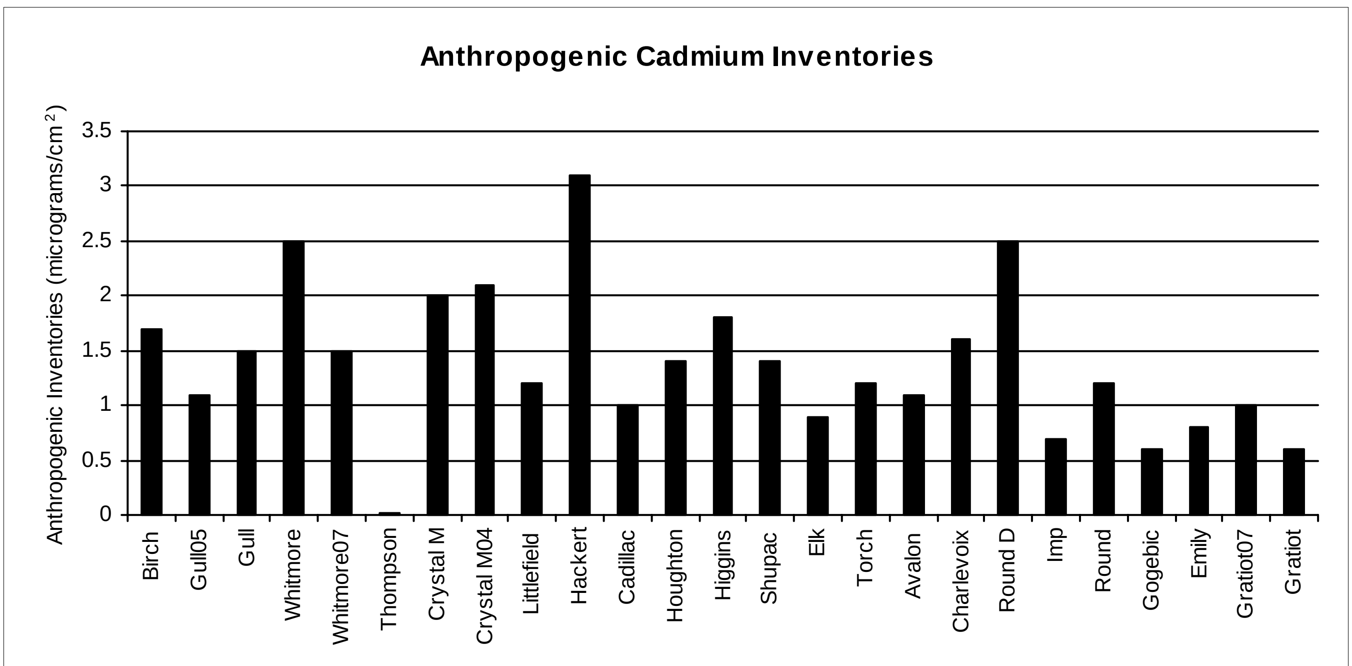
- indicates that background levels could not be determined
BDL indicates that values were below detection limits

Anthropogenic Cadmium Inventories

Cadmium (microgram/sq. centimeter)

Lake	Constant BG	Constant BG FC	Wshed	Wshed FC
Avalon			1.6	1.1
Birch	3.2	1.9	2.9	1.7
Cadillac	1.6	1	1.7	1
Charlevoix	3.7	1.8	3.2	1.6
Crystal M	3.2	1.9	3.3	2
Crystal M04	2.4	1.5	3.2	2.1
Elk	1.8	0.9	1.8	0.9
Emily	1.8	0.7	2.1	0.8
Gogebic	1.2	1	0.8	0.6
Gratiot	1.3	0.5	1.5	0.6
Gratiot07	1.4	0.9	1.7	1
Gull	2.7	1.5	2.7	1.5
Gull05	3.1	1.8	1.9	1.1
Hackert	1.7	0.9	5.9	3.1
Higgins	3.4	1.7	3.5	1.8
Houghton	1.5	1.3	1.6	1.4
Imp	1.2	0.8	1.1	0.7
Littlefield	3	1.5	2.4	1.2
Round	2.8	1.2	2.8	1.2
Round D	2.8	1.2	6	2.5
Shupac	3.2	1.6	2.8	1.4
Thompson	2.2	1.5	0.03	0.02
Torch	3.1	1.3	2.8	1.2
Whitmore	7.2	2.6	7	2.5
Whitmore07	4.9	2.1	3.4	1.5

Inventories and focusing corrected anthropogenic inventories were calculated with a constant background concentration (Constant BG and Constant BG FC), and watershed correction technique (Wshed, Wshed FC). Some inventories from earlier years are slightly different than reported previously. Data were recalculated to correct errors and improve the consistency of the calculation. The watershed focusing corrected inventories (Wshed FC) are the best estimation of true anthropogenic inputs, and are graphed below. If lakes did not contain sediment of adequate age to determine the contribution of human-activities, an anthropogenic inventory could not be calculated.

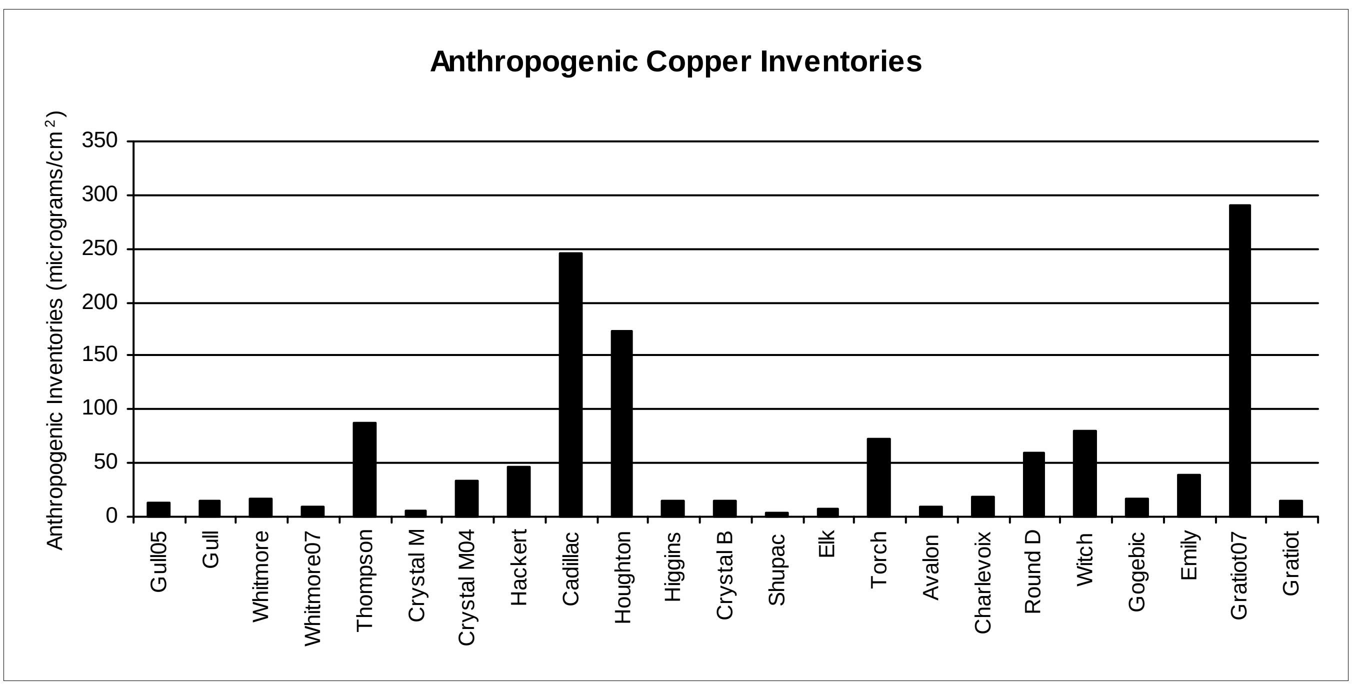


Anthropogenic Copper Inventories

Copper (microgram/sq. centimeter)

Lake	Constant BG	Constant BG FC	Wshed	Wshed FC
Avalon	52	15	30	8.5
Cadillac	419	245	421	246
Charlevoix	56	27	39	19
Crystal B			40	14
Crystal M	13	8	11	6
Crystal M04	27	17	53	34
Elk	27	13	14	7
Emily	96	36	107	40
Gogebic	37	30	21	17
Gratiot	57	23	38	15
Gratiot07	20	13	500	291
Gull	49	27	25	14
Gull05	45	26	22	13
Hackert	23	12	90	47
Higgins	17	8	29	14
Houghton	197	171	199	173
Round D	63	26	145	60
Shupac	19	9.7	5.5	2.8
Thompson	190	127	131	87
Torch			110	72
Whitmore	68	24	46	17
Whitmore07	59	25	19	8.4
Witch	214	129	133	80

Inventories and focusing corrected anthropogenic inventories were calculated with a constant background concentration (Constant BG and Constant BG FC), and watershed correction technique (Wshed, Wshed FC). Some inventories from earlier years are slightly different than reported previously. Data were recalculated to correct errors and improve the consistency of the calculation. The watershed focusing corrected inventories (Wshed FC) are the best estimation of true anthropogenic inputs, and are graphed below. If lakes did not contain sediment of adequate age to determine the contribution of human-activities, an anthropogenic inventory could not be calculated..

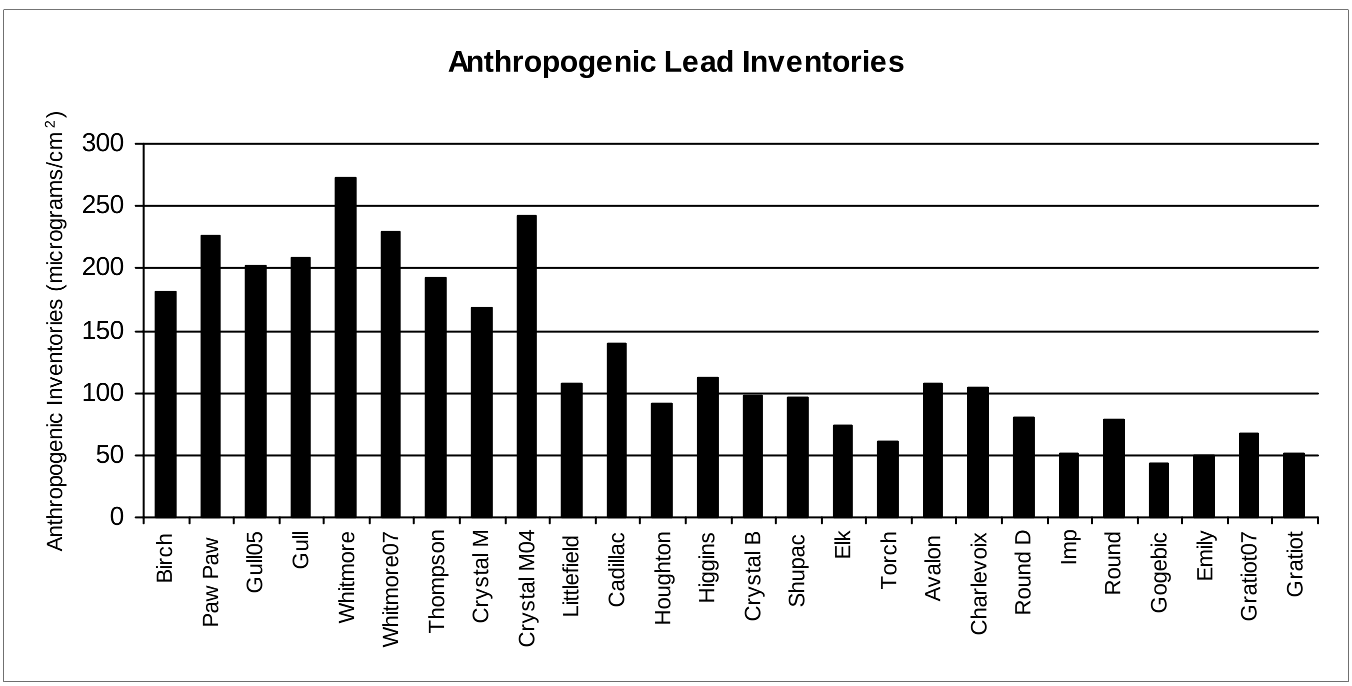


Anthropogenic Lead Inventories

Lead (microgram/sq. centimeter)

Lake	Constant BG	Constant BG FC	Wshed	Wshed FC
Avalon			164	107
Birch	305	183	304	182
Cadillac	238	139	239	140
Charlevoix	221	108	216	105
Crystal B			279	98
Crystal M	286	168	288	169
Crystal M04	356	230	375	242
Elk	153	75	152	74
Emily	129	48	133	50
Gogebic	57	46	54	44
Gratiot	128	51	128	51
Gratiot07	166	111	114	67
Gull	378	210	375	208
Gull05	363	211	348	202
Higgins	219	108	225	112
Houghton	105	91	106	92
Imp	76	51	75	51
Littlefield	216	108	215	108
Paw Paw	597	221	613	227
Round	179	78	179	78
Round D	179.8	75	193	80.5
Shupac	194.2	99.6	188	96.4
Thompson	316	211	287	192
Torch	152	64	145	61
Whitmore	760	272	763	272
Whitmore07	590	254	531	229

Inventories and focusing corrected anthropogenic inventories were calculated with a constant background concentration (Constant BG and Constant BG FC), and watershed correction technique (Wshed, Wshed FC). Some inventories from earlier years are slightly different than reported previously. Data were recalculated to correct errors and improve the consistency of the calculation. The watershed focusing corrected inventories (Wshed FC) are the best estimation of true anthropogenic inputs, and are graphed below. If lakes did not contain sediment of adequate age to determine the contribution of human-activities, an anthropogenic inventory could not be calculated..

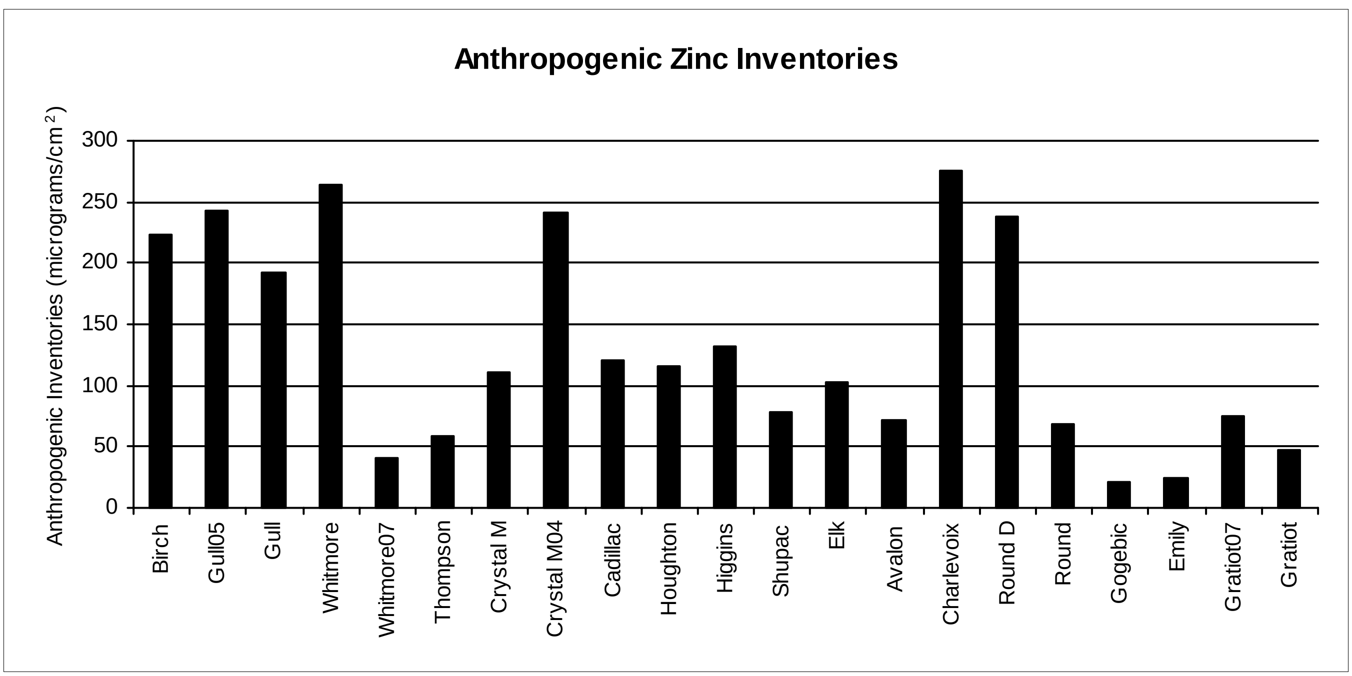


Anthropogenic Zinc Inventories

Zinc (microgram/sq. centimeter)

Lake	Constant BG	Constant BG FC	Wshed	Wshed FC
Avalon			111	72
Birch			372	223
Cadillac	199	116	207	121
Charlevoix	580	283	563	275
Crystal M			189	111
Crystal M04	269	173	375	242
Elk	237	115	210	103
Emily	34	13	65	24
Gogebic	70	57	26	21
Gratiot	105	42	121	48
Gratiot07	213	143	129	75
Gull	435	241	348	193
Gull05	450	262	417	243
Higgins	227	113	266	132
Houghton	116	100	133	116
Round			159	69
Round D	246	102	572	238
Shupac	207	106	152	78
Thompson	402	268	89	59
Whitmore	757	270	740	264
Whitmore07	260	112	94	40

Inventories and focusing corrected anthropogenic inventories were calculated with a constant background concentration (Constant BG and Constant BG FC), and watershed correction technique (Wshed, Wshed FC). Some inventories from earlier years are slightly different than reported previously. Data were recalculated to correct errors and improve the consistency of the calculation. The watershed focusing corrected inventories (Wshed FC) are the best estimation of true anthropogenic inputs, and are graphed below. If lakes did not contain sediment of adequate age to determine the contribution of human-activities, an anthropogenic inventory could not be calculated.



Watershed Characteristics

Lake	Watershed County/Counties	Watershed Area (km2)	Lake Area (km2)	WA:LA	k-factor	k-factor slope corrected	Average Slope (degrees)
Avalon	Montmorency	3	1.51	2.0	0.13	0.05	1.92
Birch	Cass	3	1.19	2.2	0.17	0.09	3.74
Cadillac	Wexford, Missaukee	48	4.7	10.2	0.15	0.14	2.62
Campau	Kent	5	0.51	9.3	0.24	0.08	1.60
Cass	Oakland	47	5.2	9.0	0.22	0.11	0.96
Charlevoix	Antrim, Charlevoix, Emmett, Otsego	765	69.8	11.0	0.17	0.19	4.10
Crystal B	Benzie	106	39.3	2.7	0.16	0.18	4.82
Crystal M	Montcalm	12	2.9	4.1	0.25	0.15	2.11
Elk	Grand Traverse, Antrim, Kalkaska	131	31.3	4.2	0.19	0.27	3.38
Emily	Houghton	1	0.22	3.6	0.175	0.09	4.61
George	Ogemaw	5	0.8	6.7	0.22	0.04	1.95
Gogebic	Gogebic, Ontonagon	454	51.8	8.8	0.18	0.11	5.57
Gratiot	Keweenaw	27	5.8	4.6	0.16	0.12	5.32
Gull	Kalamazoo, Barry	62	8.2	7.5	0.26	0.12	1.96
Hackert	Mason	2	0.5	3.0	0.26	0.03	3.31
Higgins	Roscommon, Missaukee, Crawford	109	38.9	2.8	0.12	0.08	2.46
Houghton	Roscommon	461	81.2	5.7	0.13	0.06	1.87
Imp	Gogebic	2	0.3	6.1	0.31	0.2	3.77
Littlefield	Isabella	17	0.7	23.0	0.21	0.09	3.20
Muskegon	Muskegon, Newaygo	885	16.8	52.7	0.21	0.1	2.48
Nichols	Newaygo	1	0.7	1.5	0.17	0.09	0.00
Otter	Genesee, Lapeer, Tuscola	3	0.3	12.0	0.212	0.1	3.33
Paw Paw	Berrien, Van Buren	30	3.7	7.9	0.28	0.08	1.99
Platte	Benzie, Leelanau	375	10.18	36.8	0.15	0.07	3.96
Round	Luce	22	7	32.0	0.18	0.12	2.74
Round D	Alger, Delta	2	1.8	1.1	0.15	0.14	2.40
Sand	Lenawee	3	1.8	1.5	0.2	0.2	4.50
Shupac	Crawford, Otsego	11	0.4	24.5	0.12	0.04	1.36
Thompson	Livingston, Washtenaw	39	1.06	36.8	0.15	0.05	3.14
Torch	Antrim, Kalkaska	192	76	2.5	0.19	0.29	4.31
Whitmore	Washtenaw, Livingston	11	2.7	4.2	0.23	0.14	1.10
Witch	Marquette	12	0.9	14.0	0.29	0.16	2.90

1970s IFMAP Land Use (Percentage)

Lake	Urban	Agriculture	Forest	Range	Wetland
Avalon	2.9	70.0	25.7	1.2	0.1
Birch	2.2	33.0	42.2	19.9	2.8
Cadillac	19.9	41.1	24.6	10.3	4.2
Campau	17.8	28.1	22.2	27.2	1.9
Cass	62.0	2.5	8.8	14.3	12.5
Charlevoix	4.0	20.5	57.0	15.7	2.0
Crystal B	12.4	13.0	52.1	21.3	1.2
Crystal M	11.1	58.6	17.0	5.0	8.3
Elk	6.4	28.2	41.4	20.0	4.0
Emily	0.0	0.0	93.2	0.0	5.5
George	9.7	23.1	40.0	24.3	2.8
Gogebic	1.2	0.0	92.1	0.5	5.0
Gratiot	0.9	0.0	98.5	0.0	0.6
Gull	10.0	61.1	14.6	8.2	6.0
Hackert	21.5	31.9	28.5	16.0	2.1
Higgins	15.0	0.5	77.6	3.5	3.4
Houghton	7.2	1.6	75.8	5.4	10.0
Imp	7.1	0.0	88.1	0.0	4.8
Littlefield	1.9	9.4	70.5	14.0	4.3
Mullett	3.0	7.4	71.4	15.3	2.9
Muskegon	11.4	71.0	4.1	13.2	0.3
Nichols	7.3	0.0	84.2	0.0	1.6
Otter	9.3	8.3	50.3	17.3	14.8
Paw Paw	17.8	30.8	35.8	13.5	2.1
Platte	2.3	9.9	63.5	22.0	1.2
Round	4.8	13.9	68.9	11.5	1.0
Round_D	9.9	0.0	89.1	0.0	1.0
Sand	20.5	11.8	50.2	15.2	2.3
Shupac	0.9	0.5	83.6	13.9	1.1
Thompson	22.9	25.7	17.4	29.8	3.8
Torch	7.4	23.6	45.1	22.0	1.9
White	3.3	24.2	58.9	9.5	2.8
Whitmore	22.4	23.9	24.1	20.8	8.8
Witch	1.8	3.0	81.8	6.8	6.6

1990s IFMAP Land Use (Percentage)

Lake	Urban %	Agriculture %	Upland %	Forest %	Wetland %	Barren %
Avalon	8.8	0.0	12.2	71.2	1.2	0.2
Birch	6.4	48.3	7.8	27.8	4.4	0.1
Cadillac	10.7	26.6	18.8	35.1	5.7	1.7
Campau	10.4	31.9	13.7	32.7	9.2	0.0
Cass	24.8	0.5	18.9	37.5	11.0	0.1
Charlevoix	3.4	17.3	14.8	61.0	2.3	0.3
Crystal B	5.5	9.4	22.3	60.0	0.9	0.3
Crystal M	20.0	56.7	3.5	13.7	3.3	0.1
Elk	4.2	20.4	18.6	53.6	1.8	0.2
Emily	1.8	0.0	0.6	89.5	2.1	0.0
George	5.0	6.3	17.4	59.9	9.4	0.2
Gogebic	1.2	0.0	1.8	86.6	8.4	0.2
Gratiot	0.9	0.0	6.2	89.3	3.0	0.1
Gull	5.6	59.8	6.1	21.0	4.9	0.1
Hackert	5.9	33.8	10.2	42.3	4.3	0.2
Higgins	6.9	0.2	15.8	72.2	3.7	0.2
Houghton	3.7	0.8	14.6	62.2	16.4	0.2
Imp	3.5	0.0	0.6	89.2	0.5	0.3
Littlefield	2.9	2.3	12.6	75.6	4.6	0.1
Mullett	2.8	7.2	17.7	68.1	3.2	0.2
Muskegon	7.0	17.2	18.0	47.4	7.0	0.4
Nichols	0.9	0.0	2.0	86.4	5.4	0.2
Otter	8.3	4.8	16.7	49.6	17.9	0.0
Paw Paw	9.2	38.6	13.2	31.6	6.4	0.0
Platte	2.6	8.7	19.6	66.7	1.3	0.2
Round	0.4	7.2	9.2	72.9	9.3	0.3
Sand	8.5	6.9	13.4	62.6	7.0	0.0
Shupac	2.8	0.0	18.5	74.8	2.8	0.0
Thompson	17.4	26.3	15.7	32.0	0.4	0.3
Torch	4.2	18.6	19.4	54.3	1.5	0.2
White	3.0	17.4	16.2	58.1	0.3	4.1
Whitmore	7.6	35.9	12.5	32.7	10.4	0.0
Witch	3.0	0.0	2.8	87.2	0.0	2.1

Inland Lakes Sediment Trends: Sediment Analysis Results for Six Michigan Lakes 2007

Appendix B

Fact Sheets
Core logs
^{210}Pb Data
Metals Concentrations
Porewater Metals Concentrations

Geological Sciences
Michigan State University

Emily Lake Sediment Fact Sheet

Date sampled: 7 June 2007
Location: Houghton County
Sampling site: 46º 51.506' N
88º 51.324' W
Lake surface area: 53.5 acres

Sampling site water depth: 91.4 ft
Depth of core: 57 cm
Sedimentation rate: 130 $g/m^2/y$
Age of oldest section: 1643
Focusing factor: 2.68

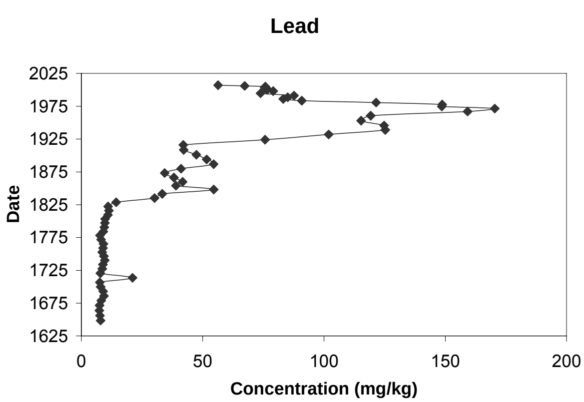
Emily Lake showed elevated concentrations of Cu, Cd, and Hg results from the early 1900's to the top of the core. However, a decreasing trend is noted from these elevated concentrations in recent sediments.

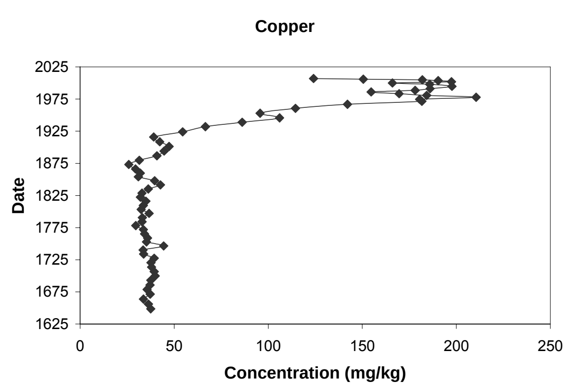
Recent sediments showed an increase in pesticides, in particular DDT and heptachlor.

	Surface Concentration	Background Concentration	Trends
Cadmium (mg/kg)	1.1	0.77	Decreasing
Copper (mg/kg)	152.2	38.91	Decreasing
Lead (mg/kg)	66.53	9	Decreasing
Mercury (mg/kg)	0.33	0.16	Decreasing
Zinc (mg/kg)	98.04	114.22	Decreasing
Total PCBs (µg/kg)	7.9		Increasing
Total PAHs (µg/kg)	285.7		Decreasing
Total Pesticides (µg/kg)	74.6		Increasing
DDTs (µg/kg)	59.9		Increasing

Trends for organic contaminants are taken from only two data points and should be interpreted with care.

Example profiles





A Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters: Sediments

Lake: Emily **Water Depth (m):** 27.9

Sampling Date: 6/7/2007 **Latitude (N):** 46.8584 **Longitude (W):** -88.8589

Core Description: ~ 57 cm total, 0-8 cm alternating layers of brown and black sediment about 0.3-0.4 cm thick transitioning into brown sediment for the remainder of the core; gas bubbles present for top 18 cm and dispersed throughout the core

Sample Number	Jar Number	Thickness (cm)	Total Thickness (cm)	Description
Emily 1	1	0.5	0.5	watery mix of large black and brown grains
Emily 2	2	0.5	1.0	watery mix of large black and brown grains
Emily 3	3	0.5	1.5	watery mix of small black and brown grains
Emily 4	4	0.5	2.0	watery mix of small black and brown grains
Emily 5	5	0.5	2.5	watery mix of small black and brown grains
Emily 6	6	0.5	3.0	mostly dark brown sediments with small black grains
Emily 7	7	0.5	3.5	brownish-black gooey sediment
Emily 8	8	0.5	4.0	brown and black streaky sediments, fine grained
Emily 9	9	0.5	4.5	brown and black streaky sediments, fine grained
Emily 10	10	0.5	5.0	brown and black streaky sediments, fine grained
Emily 11	11	0.5	5.5	brown and black streaky sediments, fine grained
Emily 12	12	0.5	6.0	brown and black streaky sediments, fine grained
Emily 13	13	0.5	6.5	brown and black streaky sediments, fine grained
Emily 14	14	0.5	7.0	brown and black streaky sediments, fine grained
Emily 15	15	0.5	7.5	brown and black streaky sediments, fine grained
Emily 16	16	0.5	8.0	mostly dark brown fine grain sediments
Emily 17	17	1.0	9.0	mostly dark brown fine grain sediments
Emily 18	18	1.0	10.0	mostly dark brown fine grain sediments
Emily 19	19	1.0	11.0	mostly dark brown fine grain sediments
Emily 20	20	1.0	12.0	dark brown fine-grained sediments
Emily 21	21	1.0	13.0	dark brown fine-grained sediments
Emily 22	22	1.0	14.0	dark brown fine-grained sediments
Emily 23	23	1.0	15.0	dark brown fine-grained sediments
Emily 24	24	1.0	16.0	dark brown fine-grained sediments
Emily 25	25	1.0	17.0	dark brown fine-grained sediments
Emily 26	26	1.0	18.0	dark brown fine-grained sediments
Emily 27	27	1.0	19.0	dark brown fine-grained sediments
Emily 28	28	1.0	20.0	dark brown fine-grained sediments
Emily 29	29	1.0	21.0	dark brown fine-grained sediments
Emily 30	30	1.0	22.0	dark brown fine-grained sediments
Emily 31	31	1.0	23.0	dark brown fine-grained sediments
Emily 32	32	1.0	24.0	dark brown fine-grained sediments
Emily 33	33	1.0	25.0	dark brown fine-grained sediments
Emily 34	34	1.0	26.0	dark brown fine-grained sediments

Sample Number	Jar Number	Thickness (cm)	Total Thickness (cm)	Description
Emily 35	35	1.0	27.0	dark brown fine-grained sediments
Emily 36	36	1.0	28.0	dark brown fine-grained sediments
Emily 37	37	1.0	29.0	dark brown fine-grained sediments
Emily 38	38	1.0	30.0	dark brown fine-grained sediments
Emily 39	39	1.0	31.0	dark brown fine-grained sediments
Emily 40	40	1.0	32.0	dark brown fine-grained sediments
Emily 41	41	1.0	33.0	dark brown fine-grained sediments
Emily 42	42	1.0	34.0	dark brown fine-grained sediments
Emily 43	43	1.0	35.0	dark brown fine-grained sediments
Emily 44	44	1.0	36.0	dark brown fine-grained sediments
Emily 45	45	1.0	37.0	dark brown fine-grained sediments
Emily 46	46	1.0	38.0	dark brown fine-grained sediments
Emily 47	47	1.0	39.0	dark brown fine-grained sediments
Emily 48	48	1.0	40.0	dark brown fine-grained sediments
Emily 49	49	1.0	41.0	dark brown fine-grained sediments
Emily 50	50	1.0	42.0	dark brown fine-grained sediments
Emily 51	51	1.0	43.0	dark brown fine-grained sediments
Emily 52	52	1.0	44.0	dark brown fine-grained sediments
Emily 53	53	1.0	45.0	dark brown fine-grained sediments
Emily 54	54	1.0	46.0	dark brown fine-grained sediments
Emily 55	55	1.0	47.0	dark brown fine-grained sediments
Emily 56	56	1.0	48.0	dark brown fine-grained sediments
Emily 57	57	1.0	49.0	dark brown fine-grained sediments
Emily 58	58	1.0	50.0	dark brown fine-grained sediments
Emily 59	59	1.0	51.0	dark brown fine-grained sediments
Emily 60	60	1.0	52.0	dark brown fine-grained sediments, dry
Emily 61	61	1.0	53.0	dark brown fine-grained sediments, dry
Emily 62	62	1.0	54.0	dark brown fine-grained sediments, dry
Emily 63	63	1.0	55.0	dark brown fine-grained sediments, dry
Emily 64	64	0.3	55.3	dark brown fine-grained sediments, dry, puck sample

210-Pb Analysis: Emily Lake

Data provided by Paul Wilkinson, Freshwater Institute, Manitoba, Canada

Sample	Dry Weight (g)	Accumulated Dry Weight (g/sq. cm)	Porosity	Percent Water	Excess Pb-210 (Bq/g)	Activity Bq/g +/- 2SD Pb-210	+/- Error	Activity Bq/g +/- 2SD Cs-137	+/-	Error
Emily 1	0.49	0.0069	1.00	99.3	4.61E+00	4.64E+00	2.07E-01	9.13E-02	+/-	2.38E-02
Emily 2	0.79	0.0181	0.99	98.3	4.61E+00	4.64E+00	2.06E-01			
Emily 3	0.79	0.0292	0.99	97.7	5.09E+00	5.12E+00	2.30E-01	1.26E-01	+/-	1.49E-02
Emily 4	1.24	0.0467	0.99	97.1	4.45E+00	4.48E+00	1.99E-01			
Emily 5	1.37	0.0660	0.99	96.5	4.22E+00	4.25E+00	1.89E-01	1.18E-01	+/-	9.34E-03
Emily 6	1.43	0.0862	0.99	96.1	3.60E+00	3.63E+00	1.62E-01			
Emily 7	1.72	0.1105	0.98	95.6	3.31E+00	3.34E+00	1.49E-01	1.15E-01	+/-	7.49E-03
Emily 8	3.35	0.1577	0.98	94.9	3.07E+00	3.10E+00	1.38E-01			
Emily 9	2.10	0.1874	0.98	94.3	2.89E+00	2.92E+00	1.30E-01	1.51E-01	+/-	6.97E-03
Emily 10	1.89	0.2140	0.98	94.3	2.53E+00	2.56E+00	1.15E-01			
Emily 11	1.93	0.2413	0.98	94.3	2.21E+00	2.24E+00	1.01E-01	1.84E-01	+/-	8.55E-03
Emily 12	2.09	0.2707	0.98	94.1	1.86E+00	1.89E+00	8.50E-02			
Emily 13	2.26	0.3026	0.98	93.9	1.55E+00	1.59E+00	7.17E-02	2.19E-01	+/-	7.44E-03
Emily 14	2.15	0.3330	0.98	93.6	1.43E+00	1.46E+00	6.64E-02			
Emily 15	2.55	0.3689	0.98	93.2	1.30E+00	1.33E+00	6.06E-02	2.62E-01	+/-	7.02E-03
Emily 16	2.46	0.4036	0.97	93.1	1.20E+00	1.23E+00	5.64E-02	2.72E-01	+/-	7.63E-03
Emily 17	4.47	0.4667	0.98	93.1	1.10E+00	1.14E+00	5.20E-02	3.14E-01	+/-	6.52E-03
Emily 18	5.46	0.5437	0.97	92.7	8.87E-01	9.19E-01	4.19E-02	3.34E-01	+/-	5.97E-03
Emily 19	6.19	0.6311	0.97	91.7	7.71E-01	8.03E-01	3.68E-02	2.45E-01	+/-	5.41E-03
Emily 20	5.18	0.7041	0.97	92.7	6.86E-01	7.19E-01	3.31E-02	7.86E-02	+/-	3.81E-03
Emily 21	5.08	0.7758	0.97	92.3	6.17E-01	6.49E-01	3.02E-02	4.47E-02	+/-	3.19E-03
Emily 22	5.52	0.8537	0.97	92.2	5.46E-01	5.78E-01	2.69E-02			
Emily 23	6.89	0.9509	0.97	91.2	3.29E-01	3.61E-01	1.70E-02	4.71E-02	+/-	3.75E-03
Emily 24	5.62	1.0302	0.97	91.4	1.83E-01	2.16E-01	1.07E-02			
Emily 25	5.83	1.1124	0.97	91.4	2.01E-01	2.33E-01	1.17E-02	3.56E-02	+/-	3.83E-03
Emily 26	5.40	1.1886	0.97	91.5	2.24E-01	2.56E-01	1.22E-02			
Emily 27	5.54	1.2668	0.97	91.6	1.76E-01	2.09E-01	1.01E-02	2.29E-02	+/-	1.76E-03
Emily 28	5.84	1.3492	0.97	92.0	1.36E-01	1.68E-01	9.73E-03			
Emily 29	4.77	1.4165	0.97	92.2	1.82E-01	2.15E-01	1.07E-02	1.13E-02	+/-	2.87E-03
Emily 30	5.21	1.4900	0.97	92.6	1.90E-01	2.23E-01	1.09E-02			
Emily 31	5.45	1.5669	0.97	92.6	1.34E-01	1.67E-01	8.29E-03	8.53E-03	+/-	2.28E-03
Emily 32	4.64	1.6323	0.97	92.8	7.25E-02	1.05E-01	5.63E-03			
Emily 33	4.27	1.6926	0.97	92.8	4.23E-02	7.48E-02	4.14E-03	8.23E-03	+/-	2.90E-03
Emily 34	5.11	1.7647	0.97	92.7	2.39E-02	5.64E-02	3.18E-03			

Sample	Dry Weight (g)	Accumulated Dry Weight (g/sq. cm)	Porosity	Percent Water	Excess Pb-210 (Bq/g)	Activity Bq/g +/- 2SD Pb-210 +/- Error		Activity Bq/g +/- 2SD Cs-137 +/- Error
Emily 35	4.89	1.8337	0.97	92.5	1.26E-02	4.51E-02	2.48E-03	6.30E-03 +/- 2.59E-03
Emily 36	4.96	1.9036	0.98	93.2	8.10E-03	4.06E-02	2.30E-03	
Emily 37	4.92	1.9731	0.98	93.2	3.35E-03	3.58E-02	2.38E-03	0.00E+00 +/- 0.00E+00
Emily 38	4.88	2.0419	0.98	93.3		3.28E-02	2.27E-03	
Emily 39	4.83	2.1100	0.98	93.6		3.06E-02	2.12E-03	
Emily 40	5.26	2.1843	0.98	94.1		3.13E-02	2.33E-03	
Emily 41	4.41	2.2465	0.97	92.1		3.00E-02	2.14E-03	
Emily 42	5.14	2.3190	0.97	92.0		3.25E-02	2.38E-03	
Emily 43	5.03	2.3900	0.97	91.9		3.40E-02	2.48E-03	
Emily 44	4.71	2.4564	0.97	91.9		3.33E-02	2.47E-03	
Emily 45	4.64	2.5219	0.97	91.8		3.30E-02	2.40E-03	
Emily 46	5.18	2.5949	0.97	91.7		3.26E-02	2.37E-03	
Emily 47	5.02	2.6658	0.97	91.6		3.21E-02	2.14E-03	
Emily 48	4.71	2.7322	0.97	91.4		3.09E-02	2.12E-03	
Emily 49	4.76	2.7994	0.97	91.4		2.98E-02	1.97E-03	
Emily 50	4.80	2.8671	0.97	91.3		3.09E-02	2.14E-03	
Emily 51	5.06	2.9385	0.97	91.2		3.43E-02	2.33E-03	
Emily 52	4.74	3.0054	0.97	91.0		3.24E-02	2.42E-03	
Emily 53	5.24	3.0793	0.97	91.1		3.25E-02	2.50E-03	
Emily 54	5.31	3.1542	0.97	90.9		3.06E-02	2.24E-03	
Emily 55	5.45	3.2311	0.97	91.0		3.26E-02	2.48E-03	
Emily 56	5.27	3.3054	0.97	91.0		3.29E-02	2.06E-03	
Emily 57	5.23	3.3792	0.97	90.7		3.45E-02	2.33E-03	
Emily 58	5.31	3.4541	0.96	90.4		3.26E-02	2.19E-03	
Emily 59	5.86	3.5368	0.96	90.4		3.14E-02	2.41E-03	
Emily 60	5.04	3.6079	0.97	90.6		3.07E-02	2.33E-03	
Emily 61	6.08	3.6937	0.97	90.6		3.10E-02	2.62E-03	
Emily 62	5.92	3.7772	0.97	91.0		3.22E-02	2.58E-03	
Emily 63	6.08	3.8630	0.97	90.7		3.73E-02	2.71E-03	
Emily 64	5.40	3.9392	0.97	90.7		3.43E-02	2.68E-03	

Metal Concentration in the Sediment: Emily Lake

Concentration in mg/kg dry weight

Sample	Mg	Al	K	Ca	Fe	Ti	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Sn	Ba	Pb	U
Emily 1	160	1572	195	560	2139	122.4	35.3	17.05	145	15.3	124.1	112.3	11.81	6.51	23.3	1.21	0.98	0.23	266.7	56.4	0.60
Emily 2	115	1308	117	940	1770	93.0	42.2	19.59	129	16.7	150.6	85.0	13.67	5.22	24.6	1.34	1.09	0.17	176.4	67.3	0.66
Emily 3	206	1951	143	576	2591	132.0	53.2	23.80	151	20.1	181.9	96.8	18.04	6.69	28.0	1.67	1.24	0.19	187.7	75.9	0.74
Emily 4	227	2315	157	690	2870	126.4	55.7	24.06	149	20.6	190.3	104.3	17.69	6.65	26.5	1.54	1.28	0.08	173.7	75.6	0.75
Emily 5	193	2008	136	503	2413	119.5	56.3	23.47	141	22.1	197.4	110.5	17.69	6.11	25.0	1.64	1.46	0.10	155.9	76.4	0.77
Emily 6	193	1821	124	437	2074	111.0	53.1	22.13	130	20.4	166.1	97.9	17.19	6.71	22.4	1.59	2.72	0.51	153.0	76.6	0.77
Emily 7	247	2257	151	512	2671	117.4	54.0	22.49	145	21.5	185.8	94.8	19.06	7.20	23.4	1.53	1.45	0.06	171.2	79.1	0.76
Emily 8	208	1719	146	484	1926	128.1	51.0	22.45	144	22.5	197.7	109.5	17.91	7.63	23.3	1.73	1.79	0.11	179.6	73.8	0.72
Emily 9	220	1985	144	520	2504	122.5	52.1	21.60	134	22.0	186.1	129.3	18.54	7.23	24.0	1.76	1.94	0.40	196.4	87.7	0.71
Emily 10	188	1569	126	699	1866	103.3	49.5	23.30	134	22.0	178.2	115.9	19.31	8.21	23.8	1.36	1.75	0.08	189.6	85.1	0.67
Emily 11	213	1704	136	462	1920	95.3	45.0	21.27	129	19.6	154.7	117.5	19.60	8.03	24.0	1.40	2.01	0.17	187.7	83.2	0.66
Emily 12	166	1483	129	399	1636	122.1	47.6	21.66	128	20.9	169.6	109.8	21.44	7.83	24.1	1.25	1.58	0.04	190.7	90.9	0.63
Emily 13	174	1847	132	572	2490	99.1	54.3	23.10	139	23.0	184.2	141.2	25.44	6.83	26.7	1.73	1.85	0.17	189.3	121.5	0.77
Emily 14	168	1772	137	627	2274	137.9	59.6	24.97	144	23.6	210.5	132.1	31.78	7.77	27.3	1.91	2.30	0.22	223.5	148.7	0.85
Emily 15	172	1721	130	478	2273	103.0	55.2	22.98	132	21.8	180.5	120.2	29.32	7.90	25.7	1.84	2.34	0.22	228.6	148.6	0.83
Emily 16	187	1846	139	480	2257	113.2	55.8	23.24	132	23.4	181.7	134.0	33.84	8.55	26.2	2.08	2.98	0.35	217.9	170.4	0.81
Emily 17	159	1709	150	434	1919	88.9	53.9	22.39	124	20.9	142.1	126.2	29.25	7.82	26.1	1.83	2.12	0.23	201.9	159.2	0.83
Emily 18	146	1620	129	617	1409	75.0	52.4	21.77	120	19.1	114.5	119.1	23.57	8.87	25.1	1.46	1.75	0.16	197.0	119.3	0.78
Emily 19	115	1278	104	351	1342	61.2	49.7	20.98	119	18.4	95.7	122.5	18.38	7.84	25.6	1.32	1.84	0.16	193.0	115.3	0.74
Emily 20	206	2031	139	699	1861	71.9	54.2	23.29	135	19.4	106.1	133.2	21.14	8.60	28.4	1.24	1.61	0.06	233.5	124.8	0.78
Emily 21	172	1955	157	508	1818	131.6	61.6	26.33	144	23.9	86.2	127.4	32.14	11.47	30.3	1.47	1.63	0.06	247.5	125.2	0.84
Emily 22	116	1723	115	454	1996	119.7	62.3	24.71	136	18.9	66.6	120.7	35.38	8.24	30.7	1.55	1.79	0.27	265.2	101.9	0.82
Emily 23	182	2217	174	821	2026	90.7	59.0	25.94	137	21.6	54.6	142.5	23.26	10.92	30.3	1.14	1.80	0.37	229.0	75.8	0.84
Emily 24	181	1830	161	402	1513	95.3	48.3	24.19	119	20.0	39.1	113.8	14.81	13.31	25.4	0.83	1.57	0.00	187.4	42.0	0.80
Emily 25	156	1790	149	416	1237	117.7	53.2	25.75	124	21.9	42.3	124.5	14.08	12.75	27.8	1.17	1.71	0.11	205.8	42.2	0.85
Emily 26	173	2294	148	592	1534	83.8	52.3	23.80	116	20.5	47.3	111.1	13.99	9.60	27.0	1.15	1.74	0.09	216.3	47.5	0.81
Emily 27	180	2506	160	822	1598	114.8	55.7	23.80	119	21.1	44.7	116.6	16.95	9.63	29.1	1.28	1.75	0.08	242.8	51.6	0.77
Emily 28	153	2197	133	1105	1475	80.2	49.7	22.90	119	19.4	40.8	119.5	13.55	8.50	29.0	0.97	1.93	0.02	242.2	54.5	0.77
Emily 29	140	1702	127	572	1114	91.4	41.2	20.61	105	17.2	31.5	105.2	13.30	9.09	29.9	1.00	1.93	0.07	209.6	41.1	0.72

Metal Concentration in the Sediment: Emily Lake

Concentration in mg/kg dry weight

Sample	Mg	Al	K	Ca	Fe	Ti	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Sn	Ba	Pb	U
Emily 30	116	1507	116	419	976	69.0	32.2	17.14	88	13.6	25.9	85.4	10.11	7.23	21.0	0.67	1.42	0.00	196.1	34.3	0.58
Emily 31	132	1692	112	470	1055	63.8	29.7	19.98	104	17.1	29.5	98.9	8.81	8.01	25.8	0.63	1.65	0.00	244.3	38.2	0.67
Emily 32	144	1822	126	587	1165	83.7	30.7	20.99	108	20.4	32.0	114.0	10.60	8.93	27.0	0.80	1.63	0.00	272.8	41.8	0.72
Emily 33	124	1503	120	685	968	70.7	26.1	20.43	103	17.0	31.0	108.9	8.52	8.29	26.5	0.68	1.63	0.00	273.5	39.0	0.68
Emily 34	93	1673	102	810	1109	101.5	32.9	19.69	121	20.6	39.6	135.1	10.16	6.43	34.6	0.89	1.07	0.00	381.4	54.6	0.80
Emily 35	97	2028	110	733	1278	124.2	38.6	22.00	136	23.7	42.7	93.0	7.83	5.83	42.0	1.29	0.92	0.02	522.3	33.4	0.88
Emily 36	90	1973	95	775	1136	88.6	32.1	20.94	127	20.8	36.3	115.3	5.98	4.93	39.8	1.05	0.96	0.02	445.1	30.2	0.74
Emily 37	113	2031	86	644	1038	95.9	30.9	20.77	118	17.1	32.9	104.2	4.85	6.12	36.4	0.67	0.79	0.06	473.0	14.4	0.75
Emily 38	156	2245	105	729	1228	123.1	30.6	21.82	118	17.3	32.1	120.9	5.10	7.56	34.1	0.77	0.79	0.11	453.6	11.0	0.77
Emily 39	172	2354	109	743	1320	126.8	30.9	22.97	125	18.3	35.0	206.5	5.42	7.81	36.3	0.63	0.76	0.11	513.0	11.4	0.78
Emily 40	131	1854	75	638	998	94.9	27.3	22.08	119	17.6	33.6	158.5	4.53	7.00	36.6	0.67	0.90	0.11	525.7	11.0	0.76
Emily 41	157	2166	111	682	1157	110.2	28.2	22.18	121	16.7	32.5	124.3	4.09	7.94	35.8	0.49	0.73	0.09	452.6	9.8	0.73
Emily 42	171	2678	101	988	1477	81.8	28.7	22.53	127	18.6	36.7	151.1	3.92	5.98	47.8	0.57	0.74	0.11	528.0	9.7	0.78
Emily 43	137	2127	94	804	1140	104.9	27.4	22.18	119	18.3	33.1	145.7	4.59	6.53	38.8	0.69	0.86	0.10	502.8	9.5	0.78
Emily 44	132	2063	104	968	1065	95.5	28.1	21.31	116	17.3	33.0	113.0	3.76	6.33	37.9	0.56	0.69	0.04	497.2	9.1	0.75
Emily 45	120	1913	93	792	968	103.6	27.2	19.80	101	15.2	29.6	80.5	3.62	5.72	33.7	0.69	0.71	0.06	484.7	7.7	0.69
Emily 46	137	2126	86	1106	1106	103.4	29.8	21.53	109	17.1	33.7	88.1	3.74	6.16	36.4	0.57	0.64	0.00	552.8	8.2	0.72
Emily 47	127	1987	79	837	1079	89.5	31.7	22.36	119	17.8	34.2	102.2	3.68	6.06	41.3	0.62	0.74	0.04	630.2	9.1	0.78
Emily 48	143	2253	87	885	1196	93.1	33.1	22.99	117	17.5	35.9	95.7	4.19	6.48	40.7	0.76	0.85	0.08	656.4	8.9	0.81
Emily 49	138	2041	98	766	1153	120.7	38.6	22.87	120	17.8	35.3	120.5	4.24	7.87	43.0	0.74	0.72	0.06	649.0	8.6	0.85
Emily 50	216	2908	145	1044	1541	117.1	40.5	23.12	120	18.8	44.4	121.4	4.44	8.40	40.9	0.77	0.69	0.10	652.9	9.3	0.83
Emily 51	191	2470	130	928	1370	130.2	39.5	22.54	122	17.2	33.5	98.8	4.48	8.41	40.2	0.70	0.70	0.07	560.9	9.6	0.80
Emily 52	146	2092	98	884	1134	84.2	39.0	21.69	116	17.4	33.7	84.3	3.91	6.73	40.6	0.71	0.65	0.08	580.2	8.9	0.81
Emily 53	144	2098	107	837	1298	129.1	42.4	23.32	129	21.8	39.4	102.1	4.88	7.74	45.8	1.14	0.84	0.09	676.3	8.6	0.86
Emily 54	154	2553	118	574	1363	117.1	37.3	23.85	125	19.9	37.7	99.0	4.84	6.69	47.0	0.93	0.88	0.16	747.1	7.8	0.82
Emily 55	142	2705	88	417	1431	100.6	35.7	22.55	120	128.9	121.8	155.6	4.21	5.54	46.4	0.84	0.77	0.17	709.3	21.1	0.79
Emily 56	130	2211	118	579	1183	76.3	32.4	21.76	112	19.0	39.4	94.3	3.73	5.66	42.2	0.82	0.80	0.19	611.1	7.6	0.76
Emily 57	152	2584	172	905	1352	121.7	37.1	24.27	123	20.1	39.9	118.2	4.71	7.32	47.1	0.76	0.83	0.07	725.5	8.0	0.83
Emily 58	164	2450	104	588	1317	101.4	36.8	24.12	123	21.9	37.6	118.7	5.06	9.46	46.5	0.80	0.91	0.13	722.2	9.0	0.86
Emily 59	189	2656	99	591	1438	91.3	38.5	24.12	125	20.1	37.2	116.6	5.09	11.41	47.0	0.85	0.92	0.21	730.5	9.3	0.92
Emily 60	180	2684	138	971	1310	129.5	40.2	25.59	123	19.7	35.6	119.1	4.76	9.40	46.5	0.81	0.83	0.08	722.4	8.2	0.85

Metal Concentration in the Sediment: Emily Lake

Concentration in mg/kg dry weight

Sample	Mg	Al	K	Ca	Fe	Ti	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Sn	Ba	Pb	U
Emily 61	127	2210	84	864	1044	96.8	37.6	24.04	114	20.0	37.3	122.1	4.25	6.28	44.7	0.92	0.85	0.17	676.2	7.5	0.83
Emily 62	227	2487	131	1084	1292	130.9	38.6	23.19	118	18.6	33.6	101.0	4.70	7.73	40.6	0.86	0.80	0.14	530.2	7.4	0.82
Emily 63	146	2181	91	878	1122	89.2	37.2	23.41	116	19.6	36.3	152.1	4.31	6.89	43.8	0.79	0.81	0.10	664.7	7.7	0.83
Emily 64	136	2400	82	1003	1274	88.4	36.7	22.93	112	20.4	37.6	145.9	3.98	6.04	45.5	0.74	0.83	0.11	703.3	7.9	0.83
Emily 65	84	1418	65	632	732	79.0	26.1	14.92	70	11.9	24.2	85.0	2.93	4.10	27.7	0.47	0.47	0.09	443.4	6.6	0.49

Metal Concentration in the Porewater: Emily Lake

Concentration in ng/mL, 0.0 Depth is the topwater sample

Sample	Depth	Mg	K	Ca	Mn	Fe	P	V	Cr	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Ba	Pb	U	B	Al
Emily 0	0.0	61.8	70.2	305	11.1	799.1	178.7	4.49	1.35	4.17	3.34	1988.9	2.16	2.86	32.6	0.44	0.31	63.3	1.3	0.03	20.89	170.4
Emily 1	0.5	50.1	129.7	321	9.7	696.5	1072.7	5.98	1.93	7.04	12.26	3895.0	7.22	2.76	43.1	0.63	0.52	126.9	3.4	0.05	28.17	590.8
Emily 2	1.5	50.6	77.6	289	10.7	818.8	1064.5	5.72	1.59	7.23	6.48	3631.6	7.15	2.25	45.9	0.51	0.37	118.6	3.2	0.04	24.28	543.3
Emily 3	2.5	59.1	99.8	368	11.8	929.1	310.8	5.20	1.05	2.13	2.88	1268.7	8.39	1.92	20.0	0.33	0.16	28.5	2.9	0.03	13.21	226.5
Emily 4	3.5	58.7	93.7	384	12.0	930.6	280.8	5.34	0.96	1.76	2.05	1401.8	8.79	1.98	19.9	0.38	0.19	36.0	3.1	0.04	14.43	202.9
Emily 5	5.5	55.4	86.0	341	11.7	920.6	251.8	6.56	0.92	1.76	1.50	2497.8	8.15	1.76	16.9	0.39	0.17	42.8	2.5	0.03	12.58	169.4
Emily 6	6.5	55.3	85.9	348	11.8	831.4	229.2	5.33	1.04	1.98	4.55	734.5	9.71	1.94	19.9	0.43	0.20	29.3	4.7	0.04	14.23	286.5
Emily 7	7.5	57.0	86.0	382	11.8	851.6	204.9	4.70	0.94	2.29	2.84	637.4	9.53	1.84	18.2	0.29	0.10	29.1	4.7	0.02	10.60	214.4
Emily 8	8.5	3.2	3.8	14	0.9	2.5	1798.3	6.12	2.18	8.61	4.53	10170.3	11.22	4.00	56.3	1.06	0.86	61.1	6.1	0.10	55.92	737.4
Emily 9	9.5	57.6	90.8	420	12.5	961.8	111.1	4.93	0.70	1.58	1.41	1203.3	8.47	1.84	19.0	0.17	0.02	36.5	2.6	0.02	8.12	163.7
Emily 10	11.5	60.6	94.1	452	12.5	707.3	45.8	4.91	0.77	1.49	1.17	864.2	10.79	2.01	19.4	0.40	0.17	36.7	2.2	0.03	11.51	141.4
Emily 11	13.5	58.7	115.4	489	11.9	684.7	83.3	5.16	1.00	1.8	3.07	1611.2	7.32	1.85	19.8	0.31	0.13	30.1	3.9	0.02	10.81	170.9
Emily 12	15.5	69.2	100.6	533	14.4	1006.4	194.5	5.38	0.74	1.79	0.70	989.7	5.17	2.22	23.7	0.20	0.10	40.8	0.9	0.02	9.92	166.9
Emily 13	17.5	63.5	142.9	532	12.4	661.4	128.5	3.50	0.98	2.63	2.48	721.0	3.55	2.14	22.6	0.29	0.20	35.2	1.8	0.03	14.95	167.8
Emily 14	19.5	67.9	99.3	590	13.9	770.3	107.8	4.96	0.93	2.62	0.97	1143.8	4.13	2.37	25.4	0.34	0.18	42.9	1.2	0.03	13.14	162.6
Emily 15	21.5	71.3	100.4	688	14.4	793.1	105.2	4.14	0.81	3.29	0.56	624.0	3.98	2.27	25.5	0.22	0.14	44.0	1.0	0.03	10.31	148.7
Emily 16	23.5	66.2	95.1	617	13.1	653.2	84.8	3.74	0.93	2.76	1.41	746.3	3.06	2.22	25.2	0.22	0.14	48.0	1.1	0.03	11.14	148.2
Emily 17	25.5	65.7	95.6	662	12.9	549.9	234.1	3.57	1.77	3.83	2.30	2317.7	2.52	2.52	33.6	0.31	0.22	85.0	1.4	0.02	26.35	212.3
Emily 18	27.5	69.8	102.8	664	13.5	618.4	50.7	3.16	0.67	2.08	0.41	961.3	2.09	2.31	26.8	0.15	0.08	53.0	0.5	0.01	11.41	99.4
Emily 19	29.5	70.9	111.4	695	13.2	533.2	86.7	2.48	0.83	1.93	1.01	1044.8	1.81	2.64	29.4	0.26	0.20	87.6	0.8	0.04	19.33	154.5
Emily 20	31.5	71.3	98.0	691	13.0	497.1	96.0	3.36	0.86	1.94	0.88	505.9	2.00	2.24	27.4	0.16	0.07	50.2	0.8	0.02	12.23	123.2
Emily 21	35.5	71.4	101.8	710	12.7	542.3	103.9	2.93	0.75	2.47	1.61	722.7	1.54	2.47	31.2	0.23	0.16	50.3	0.4	0.02	13.27	115.9
Emily 22	37.5	74.8	104.4	849	12.3	455.2	68.1	3.45	1.08	1.5	1.31	762.3	1.48	2.38	28.6	0.23	0.14	62.0	0.8	0.02	11.46	130.2
Emily 23	39.5	71.7	118.2	762	11.9	444.9	63.8	3.62	0.85	1.29	0.82	847.2	1.48	2.35	28.7	0.16	0.07	68.9	0.4	0.01	9.99	123.8
Emily 24	41.5	73.3	104.0	754	11.9	405.3	56.3	3.74	0.66	1.36	0.63	1121.4	1.71	2.41	29.0	0.26	0.23	64.2	0.4	0.02	10.98	110.9
Emily 25	43.5	66.1	96.0	689	10.7	368.9	318.5	2.29	0.75	2.08	3.15	75.9	1.77	1.13	11.3	0.18	0.18	10.1	4.9	0.02	8.53	263.2
Emily 26	45.3	71.6	105.2	769	11.4	361.7	118.5	4.17	1.00	2.22	2.08	995.9	1.62	2.65	33.9	0.31	0.23	52.2	1.4	0.03	14.12	159.3
Emily 27	47.5	77.3	107.8	876	11.9	407.4	130.4	3.90	1.05	1.58	1.03	1240.6	1.45	2.58	31.7	0.27	0.16	62.8	0.4	0.02	13.02	120.3

Lake Gogebic Sediment Fact Sheet

Date sampled: 13 June 2007
Location: Gogebic and Ontonagon Counties
Sampling site: 46º 32.277' N
89º 35.531' W
Lake surface area: 12,800 acres

Sampling site water depth: 25 ft
Depth of core: 49 cm
Sedimentation rate: 193 $g/m^2/y$
Age of oldest section: 1650
Focusing factor: 1.23

Lake Gogebic showed increasing trends to the top of the core in several elements, notably As, Cd, and P. Several other elements showed increasing trends to 1970, followed by a slight decrease but maintained concentrations significantly higher than background to the top of the core. These elements include Cu, Pb, and Zn.

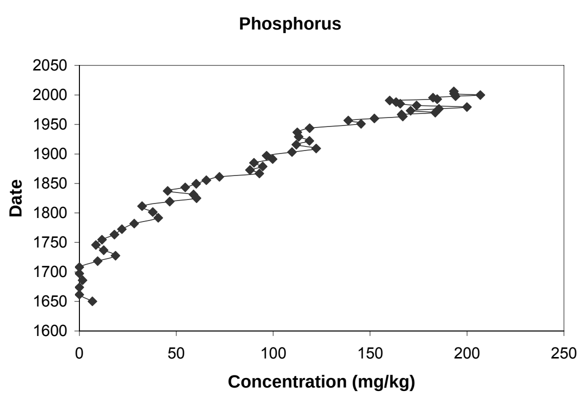
Lake Gogebic remains largely free of organic contaminants despite its large lake and watershed area. However, trends in pesticides and DDTs appear to be increasing in recent sediments.

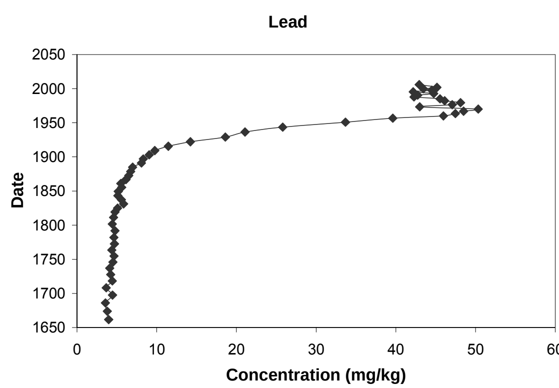
	Surface Concentration	Background Concentration	Trends
Cadmium (mg/kg)	1.78	0.83	Increasing
Copper (mg/kg)	63.94	35.63	Decreasing
Lead (mg/kg)	43.85	4.29	Increasing
Mercury (mg/kg)	0.18	0.11	Decreasing
Zinc (mg/kg)	153.6	111.17	Increasing
Total PCBs (µg/kg)	0.0		-
Total PAHs (µg/kg)	0.0		-
Total Pesticides (µg/kg)	0.6		Increasing
DDTs (µg/kg)	0.5		Increasing

- indicates that slope is not able to be determined

Trends for organic contaminants are taken from only two data points and should be interpreted with care.

Example profiles





A Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters: Sediments

Lake: Gogebic **Water Depth (m):** 7.6

Sampling Date: 6/13/2007 **Latitude (N):** 46.538 **Longitude (W):** -89.5922

Core Description: ~ 51 cm total, worm tubes ~1 cm long exposed at sediment/water interface, zooplankton evident in top water, some channelization of water along core sides in top 6 cm, gas bubbles present in last 5 cm, sediment is brown from top to bottom

Sample Number	Jar Number	Thickness (cm)	Total Thickness (cm)	Description
Gogebic 1	1	0.5	0.5	fine-grained brown sediments
Gogebic 2	2	0.5	1.0	fine-grained brown sediments
Gogebic 3	3	0.5	1.5	fine-grained brown sediments
Gogebic 4	4	0.5	2.0	fine-grained brown sediments
Gogebic 5	5	0.5	2.5	fine-grained brown sediments
Gogebic 6	6	0.5	3.0	fine-grained brown sediments
Gogebic 7	7	0.5	3.5	fine-grained brown sediments, worm tube
Gogebic 8	8	0.5	4.0	fine-grained brown sediments
Gogebic 9	9	0.5	4.5	fine-grained brown sediments
Gogebic 10	10	0.5	5.0	fine-grained brown sediments, worm tube
Gogebic 11	11	0.5	5.5	fine-grained brown sediments
Gogebic 12	12	0.5	6.0	fine-grained brown sediments
Gogebic 13	13	0.5	6.5	fine-grained brown sediments
Gogebic 14	14	0.5	7.0	fine-grained brown sediments
Gogebic 15	15	0.5	7.5	fine-grained brown sediments
Gogebic 16	16	0.5	8.0	fine-grained brown sediments
Gogebic 17	17	1.0	9.0	fine-grained brown sediments
Gogebic 18	18	1.0	10.0	fine-grained brown sediments
Gogebic 19	19	1.0	11.0	fine-grained brown sediment, drier, more sandy
Gogebic 20	20	1.0	12.0	fine-grained brown sediment, drier, more sandy
Gogebic 21	21	1.0	13.0	fine-grained brown sediment
Gogebic 22	22	1.0	14.0	fine-grained brown sediment
Gogebic 23	23	1.0	15.0	fine-grained brown sediment
Gogebic 24	24	1.0	16.0	fine-grained brown sediment
Gogebic 25	25	1.0	17.0	fine-grained brown sediment
Gogebic 26	26	1.0	18.0	fine-grained brown sediment
Gogebic 27	27	1.0	19.0	fine-grained brown sediment, dry
Gogebic 28	28	1.0	20.0	fine-grained brown sediment, dry
Gogebic 29	29	1.0	21.0	fine-grained brown sediment, dry
Gogebic 30	30	1.0	22.0	fine-grained brown sediment, dry
Gogebic 31	31	1.0	23.0	fine-grained brown sediment, dry
Gogebic 32	32	1.0	24.0	fine-grained brown sediment, dry
Gogebic 33	33	1.0	25.0	fine-grained brown sediment, dry
Gogebic 34	34	1.0	26.0	fine-grained brown sediment, dry

Sample Number	Jar Number	Thickness (cm)	Total Thickness (cm)	Description
Gogebic 35	35	1.0	27.0	fine-grained brown sediment, dry
Gogebic 36	36	1.0	28.0	fine-grained brown sediment, dry
Gogebic 37	37	1.0	29.0	fine-grained brown sediment, dry
Gogebic 38	38	1.0	30.0	fine-grained brown sediment, dry
Gogebic 39	39	1.0	31.0	fine-grained brown sediment, dry
Gogebic 40	40	1.0	32.0	fine-grained brown sediment, dry
Gogebic 41	41	1.0	33.0	fine-grained brown sediment, dry
Gogebic 42	42	1.0	34.0	fine-grained brown sediment, dry
Gogebic 43	43	1.0	35.0	fine-grained brown sediment, dry
Gogebic 44	44	1.0	36.0	fine-grained brown sediment, dry
Gogebic 45	45	1.0	37.0	fine-grained brown sediment, dry
Gogebic 46	46	1.0	38.0	fine-grained brown sediment, dry
Gogebic 47	47	1.0	39.0	fine-grained brown sediment, dry
Gogebic 48	48	1.0	40.0	fine-grained brown sediment, dry
Gogebic 49	49	1.0	41.0	fine-grained brown sediment, dry
Gogebic 50	50	1.0	42.0	fine-grained brown sediment, very dry
Gogebic 51	51	1.0	43.0	fine-grained brown sediment, very dry
Gogebic 52	52	1.0	44.0	fine-grained brown sediment, very dry
Gogebic 53	53	1.0	45.0	fine-grained brown sediment, very dry
Gogebic 54	54	1.0	46.0	fine-grained brown sediment, very dry
Gogebic 55	55	1.0	47.0	fine-grained brown sediment, very dry
Gogebic 56	56	1.0	48.0	fine-grained brown sediment, very dry
Gogebic 57	57	1.0	49.0	fine-grained brown sediment, very dry
Gogebic 58	58	1.0	50.0	fine-grained brown sediment, very dry
Gogebic 59	59	1.0	51.0	fine-grained brown sediment, very dry
Gogebic 60	60	0.5	51.5	fine-grained brown sediment, very dry, puck sample

210-Pb Analysis: Gogebic Lake

Data provided by Paul Wilkinson, Freshwater Institute, Manitoba, Canada

Sample	Dry Weight (g)	Accumulated Dry Weight (g/sq. cm)	Porosity	Percent Water	Excess Pb-210 (Bq/g)	Activity Bq/g +/- 2SD Pb-210 +/- Error	Activity Bq/g +/- 2SD Cs-137 +/- Error
Gogebic 1	3.77	0.0532	0.98	94.0	6.41E-01	6.58E-01 +/- 3.05E-02	1.68E-01 +/- 5.99E-03
Gogebic 2	3.26	0.0992	0.97	90.8	6.68E-01	6.85E-01 +/- 3.17E-02	
Gogebic 3	2.68	0.1370	0.96	90.0	6.71E-01	6.88E-01 +/- 3.17E-02	1.61E-01 +/- 6.88E-03
Gogebic 4	2.72	0.1754	0.96	89.3	6.89E-01	7.06E-01 +/- 3.23E-02	
Gogebic 5	3.94	0.2310	0.95	86.7	6.71E-01	6.88E-01 +/- 3.08E-02	1.37E-01 +/- 6.58E-03
Gogebic 6	2.94	0.2724	0.96	90.4	6.55E-01	6.72E-01 +/- 3.06E-02	
Gogebic 7	3.56	0.3227	0.96	88.8	6.81E-01	6.98E-01 +/- 3.14E-02	1.63E-01 +/- 6.72E-03
Gogebic 8	3.57	0.3730	0.94	85.1	6.74E-01	6.92E-01 +/- 3.20E-02	
Gogebic 9	4.08	0.4306	0.96	88.0	6.41E-01	6.59E-01 +/- 3.01E-02	1.77E-01 +/- 5.74E-03
Gogebic 10	3.66	0.4822	0.97	91.9	6.10E-01	6.27E-01 +/- 2.95E-02	
Gogebic 11	3.95	0.5380	0.96	89.2	5.87E-01	6.04E-01 +/- 2.76E-02	1.80E-01 +/- 5.89E-03
Gogebic 12	3.98	0.5941	0.96	88.9	5.33E-01	5.51E-01 +/- 2.57E-02	
Gogebic 13	4.74	0.6610	0.96	88.5	5.01E-01	5.19E-01 +/- 2.43E-02	1.82E-01 +/- 5.62E-03
Gogebic 14	3.98	0.7171	0.95	87.6	4.69E-01	4.86E-01 +/- 2.29E-02	1.78E-01 +/- 5.10E-03
Gogebic 15	4.74	0.7840	0.95	87.6	4.24E-01	4.41E-01 +/- 2.09E-02	1.82E-01 +/- 5.96E-03
Gogebic 16	4.69	0.8502	0.95	87.3	3.92E-01	4.10E-01 +/- 2.00E-02	1.70E-01 +/- 5.14E-03
Gogebic 17	4.48	0.9134	0.95	86.8	3.63E-01	3.81E-01 +/- 1.80E-02	1.73E-01 +/- 4.85E-03
Gogebic 18	4.97	0.9835	0.95	86.7	2.94E-01	3.11E-01 +/- 1.48E-02	
Gogebic 19	10.84	1.1364	1.00	86.7	2.55E-01	2.72E-01 +/- 1.30E-02	1.20E-01 +/- 4.77E-03
Gogebic 20	9.14	1.2654	1.00	87.2	2.21E-01	2.38E-01 +/- 1.17E-02	
Gogebic 21	10.21	1.4094	0.95	87.8	1.67E-01	1.84E-01 +/- 8.70E-03	6.95E-02 +/- 2.59E-03
Gogebic 22	10.15	1.5526	1.00	88.5	1.12E-01	1.29E-01 +/- 6.35E-03	
Gogebic 23	8.77	1.6764	1.00	88.8	9.01E-02	1.07E-01 +/- 5.36E-03	4.26E-02 +/- 4.09E-03
Gogebic 24	9.10	1.8047	0.96	89.0	8.16E-02	9.90E-02 +/- 5.36E-03	
Gogebic 25	8.59	1.9259	1.00	88.8	7.24E-02	8.98E-02 +/- 4.88E-03	2.81E-02 +/- 3.66E-03
Gogebic 26	8.27	2.0426	1.00	88.9	5.35E-02	7.09E-02 +/- 3.91E-03	
Gogebic 27	8.06	2.1563	0.96	88.9	3.30E-02	5.04E-02 +/- 3.25E-03	1.42E-02 +/- 3.53E-03
Gogebic 28	8.19	2.2719	0.96	89.0	2.61E-02	4.35E-02 +/- 2.91E-03	
Gogebic 29	8.78	2.3957	1.00	89.5	2.29E-02	4.03E-02 +/- 2.81E-03	1.56E-02 +/- 4.52E-03
Gogebic 30	8.43	2.5147	1.00	89.4	1.85E-02	3.59E-02 +/- 2.72E-03	
Gogebic 31	7.80	2.6247	0.96	89.5	1.43E-02	3.17E-02 +/- 2.33E-03	8.43E-03 +/- 3.24E-03
Gogebic 32	8.28	2.7415	1.00	89.3	1.37E-02	3.11E-02 +/- 2.46E-03	
Gogebic 33	7.66	2.8496	1.00	89.2	1.06E-02	2.80E-02 +/- 2.04E-03	0.00E+00 +/- 0.00E+00
Gogebic 34	7.82	2.9599	0.96	89.1	1.02E-02	2.76E-02 +/- 2.00E-03	

Sample	Dry Weight (g)	Accumulated Dry Weight (g/sq. cm)	Porosity	Percent Water	Excess Pb-210 (Bq/g)	Activity Bq/g +/- 2SD Pb-210 +/- Error	Activity Bq/g +/- 2SD Cs-137 +/- Error
Gogebic 35	8.61	3.0814	1.00	88.9	1.06E-02	2.80E-02 +/- 1.87E-03	
Gogebic 36	8.22	3.1974	1.00	88.9	6.57E-03	2.40E-02 +/- 1.47E-03	
Gogebic 37	8.23	3.3135	0.96	88.9	3.97E-03	2.14E-02 +/- 1.49E-03	
Gogebic 38	8.45	3.4327	0.96	88.7	5.15E-03	2.26E-02 +/- 1.54E-03	
Gogebic 39	8.46	3.5521	1.00	88.6	3.25E-03	2.06E-02 +/- 2.11E-03	
Gogebic 40	7.20	3.6536	1.00	88.6	2.18E-03	1.96E-02 +/- 1.88E-03	
Gogebic 41	9.28	3.7846	0.96	88.5		1.70E-02 +/- 1.71E-03	
Gogebic 42	8.35	3.9024	0.96	88.7		1.90E-02 +/- 1.62E-03	
Gogebic 43	9.26	4.0330	0.96	89.0		1.81E-02 +/- 1.79E-03	
Gogebic 44	8.32	4.1504	0.96	89.4		1.66E-02 +/- 1.83E-03	
Gogebic 45	8.49	4.2702	1.00	89.5		1.76E-02 +/- 1.76E-03	
Gogebic 46	7.81	4.3804	1.00	89.6		1.90E-02 +/- 2.01E-03	
Gogebic 47	7.87	4.4914	0.96	89.3		1.83E-02 +/- 2.18E-03	
Gogebic 48	8.02	4.6045	0.96	89.0		1.80E-02 +/- 1.56E-03	
Gogebic 49	8.14	4.7194	1.00	88.5		1.91E-02 +/- 1.62E-03	
Gogebic 50	8.19	4.8349	1.00	87.6		1.75E-02 +/- 1.62E-03	
Gogebic 51	8.63	4.9567	0.95	86.7		1.80E-02 +/- 1.57E-03	
Gogebic 52	9.54	5.0913	1.00	86.0		1.64E-02 +/- 1.28E-03	
Gogebic 53	9.77	5.2291	1.00	85.6		1.54E-02 +/- 1.30E-03	
Gogebic 54	10.61	5.3788	0.95	86.2		1.59E-02 +/- 1.23E-03	
Gogebic 55	11.21	5.5370	0.95	86.6		1.71E-02 +/- 1.86E-03	
Gogebic 56	10.70	5.6879	0.95	86.8		1.66E-02 +/- 1.66E-03	
Gogebic 57	9.79	5.8260	0.95	86.9		1.67E-02 +/- 1.56E-03	
Gogebic 58	9.82	5.9646	0.95	86.4		1.66E-02 +/- 1.72E-03	
Gogebic 59	10.15	6.1078	1.00	86.0		1.78E-02 +/- 1.70E-03	
Gogebic 60	10.14	6.2508	1.00	84.7		5.86E-02 +/- 4.08E-03	

Metal Concentration in the Sediment: Gogebic Lake

Concentration in mg/kg dry weight

Sample	Mg	Al	K	Ca	Fe	Ti	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Sn	Ba	Pb	U
Gogebic 1	531	2223	134	1151	2976	133.2	56.1	31.38	1535	29.5	63.2	148.0	11.75	15.03	26.8	0.75	1.64	0.20	189.8	42.9	3.42
Gogebic 2	511	2166	125	876	3120	114.2	61.8	33.40	2157	31.8	65.2	164.6	13.96	15.59	27.4	0.93	1.91	0.32	215.9	45.2	3.64
Gogebic 3	498	2060	109	888	3165	0.0	58.2	30.23	1686	29.2	63.5	148.2	13.58	13.56	24.9	0.75	1.80	0.25	195.8	43.5	3.54
Gogebic 4	493	1980	95	1089	2958	0.0	53.2	29.38	1340	28.4	62.6	145.1	11.60	12.48	24.1	0.65	1.63	0.15	182.6	44.5	3.54
Gogebic 5	497	2112	116	926	2875	67.4	53.5	31.08	1096	29.2	62.7	144.2	11.52	14.52	24.3	0.84	1.60	0.24	175.2	42.2	3.50
Gogebic 6	528	2249	128	854	3033	127.9	57.6	33.87	1119	30.4	67.0	150.8	11.75	16.09	25.5	0.89	1.67	0.27	183.8	44.8	3.74
Gogebic 7	458	1920	96	850	2605	10.6	51.2	30.67	1058	28.4	63.9	144.5	10.18	13.82	23.8	0.59	1.44	0.16	172.3	42.7	3.52
Gogebic 8	465	1928	92	840	2624	0.0	47.4	29.41	948	28.6	62.4	143.1	9.00	12.84	22.8	0.54	1.38	0.15	162.2	42.3	3.39
Gogebic 9	451	1871	83	847	2571	0.0	49.5	30.37	1040	29.5	66.3	144.6	9.79	12.87	22.9	0.68	1.63	0.37	171.4	45.5	3.59
Gogebic 10	497	2086	104	825	2906	8.5	51.3	31.03	1038	29.3	67.1	150.0	10.78	13.88	23.4	0.78	1.59	0.34	172.8	46.1	3.58
Gogebic 11	534	2299	118	877	3114	38.1	54.0	33.11	1098	30.9	69.8	155.7	11.19	15.05	24.1	0.58	1.51	0.24	182.9	48.1	3.67
Gogebic 12	540	2406	136	824	3116	173.5	54.8	33.83	1050	30.4	68.7	155.2	10.91	16.34	24.3	0.61	1.44	0.25	180.5	47.1	3.55
Gogebic 13	460	1941	89	1006	2664	0.0	44.8	28.00	883	26.6	61.4	137.8	9.51	12.20	20.2	0.63	1.47	0.31	156.9	43.0	3.16
Gogebic 14	520	2248	110	801	3046	87.9	52.7	33.19	934	31.3	70.7	160.9	10.89	15.08	23.6	0.56	1.53	0.22	184.4	50.3	3.63
Gogebic 15	506	2244	117	756	2905	149.6	54.2	33.55	821	30.6	69.0	158.5	10.06	15.78	22.7	0.54	1.46	0.21	179.1	48.5	3.51
Gogebic 16	483	2122	101	721	2744	62.2	51.8	31.55	767	29.9	66.5	154.2	9.70	14.15	21.3	0.64	1.55	0.26	173.1	47.5	3.42
Gogebic 17	483	2176	108	749	2602	92.1	53.6	32.67	662	30.8	64.9	155.9	8.43	15.09	21.5	0.63	1.52	0.24	175.8	46.0	3.46
Gogebic 18	411	1851	77	713	2027	0.0	46.8	29.60	573	28.1	55.4	139.8	6.41	12.45	19.3	0.34	1.45	0.32	161.2	39.6	3.27
Gogebic 19	438	2006	78	720	2099	0.0	50.6	30.53	536	29.9	50.4	169.9	7.09	12.24	20.4	0.38	1.56	0.18	162.3	33.7	3.44
Gogebic 20	388	1829	73	620	1921	93.5	50.5	29.89	491	28.6	43.8	136.9	8.18	11.80	20.2	0.41	1.35	0.13	149.6	25.8	3.26
Gogebic 21	382	1846	73	643	1969	151.3	52.3	31.07	491	29.4	41.7	132.2	9.35	12.16	21.1	0.46	1.23	0.12	150.5	21.1	3.39
Gogebic 22	356	1715	66	638	1820	124.6	48.3	28.80	435	27.2	38.7	117.8	8.96	11.08	19.3	0.50	1.10	0.08	137.4	18.6	3.16
Gogebic 23	380	1845	67	682	1902	92.6	48.0	28.45	431	27.4	36.1	110.5	9.00	10.15	19.5	0.70	1.15	0.13	134.9	14.2	3.27
Gogebic 24	360	1735	50	647	1808	13.4	46.1	27.57	414	26.7	35.0	103.4	7.36	9.13	18.7	0.50	0.92	0.08	133.0	11.5	3.31
Gogebic 25	396	1972	83	650	2003	215.0	48.5	28.64	393	26.6	34.1	111.3	8.13	10.75	19.3	0.62	1.00	0.07	130.1	9.8	3.24
Gogebic 26	375	1804	57	640	1879	108.1	51.8	30.28	419	29.2	37.0	114.4	8.42	10.37	20.2	0.65	0.91	0.08	139.3	9.1	3.67
Gogebic 27	360	1746	57	614	1802	141.5	50.7	29.10	396	27.8	35.3	107.9	7.58	10.26	19.8	0.67	0.84	0.07	131.8	8.3	3.48
Gogebic 28	368	1764	57	627	1812	156.8	51.3	29.62	390	28.5	35.1	112.0	7.46	10.60	19.7	0.85	0.99	0.32	132.2	8.1	3.54
Gogebic 29	330	1583	40	587	1641	58.2	49.0	27.67	370	26.5	33.4	99.1	6.18	9.12	18.1	0.59	0.80	0.06	125.6	7.0	3.50

Metal Concentration in the Sediment: Gogebic Lake

Concentration in mg/kg dry weight

Sample	Mg	Al	K	Ca	Fe	Ti	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Sn	Ba	Pb	U
Gogebic 30	373	1771	54	649	1824	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0.00	0.0	0.00	0.00	0.00	0.0	0.0	0.00
Gogebic 31	357	1723	46	612	1771	102.0	52.0	29.06	381	27.6	35.7	101.7	6.16	9.96	18.8	0.61	0.78	0.06	129.8	6.5	3.61
Gogebic 32	443	2276	127	608	2060	226.8	57.0	31.85	402	29.3	36.6	113.0	6.36	11.09	20.5	0.74	0.80	0.02	137.8	6.2	3.90
Gogebic 33	396	1978	81	546	1858	132.3	52.3	28.92	383	28.1	34.7	106.0	5.60	9.26	19.3	0.74	0.88	0.10	131.5	5.5	3.80
Gogebic 34	407	2038	94	541	1919	198.4	55.9	31.43	396	30.2	36.0	110.0	6.00	10.59	19.7	0.66	0.78	0.02	135.0	5.6	3.83
Gogebic 35	386	1911	75	531	1826	138.6	51.2	28.58	367	27.5	33.8	106.1	5.42	9.11	17.9	0.68	0.83	0.08	126.7	5.2	3.69
Gogebic 36	375	1870	74	522	1801	159.6	54.2	30.36	395	29.2	35.7	155.2	5.44	9.88	22.7	0.60	0.78	0.06	134.2	5.1	3.94
Gogebic 37	377	1883	87	490	1803	226.0	59.0	33.60	420	31.4	38.5	117.3	6.22	11.73	21.5	0.66	0.83	0.02	144.9	5.6	4.17
Gogebic 38	420	2115	107	565	2029	266.0	61.2	34.49	424	33.7	39.2	121.1	6.75	12.50	22.1	0.72	0.89	0.06	147.5	5.9	4.26
Gogebic 39	394	1952	85	540	1892	186.1	55.7	30.95	395	29.8	36.6	109.6	6.17	10.60	20.0	0.78	0.91	0.12	136.4	5.1	4.01
Gogebic 40	379	1844	74	512	1793	162.6	53.2	29.71	379	28.4	35.5	111.0	5.57	9.84	19.3	0.63	0.78	0.04	128.7	4.8	3.84
Gogebic 41	335	1598	64	467	1614	149.5	53.2	29.12	375	28.1	36.1	100.9	5.61	9.47	18.5	0.70	0.76	0.04	125.8	4.6	3.88
Gogebic 42	348	1647	60	489	1671	114.4	51.2	27.75	360	27.6	35.3	103.7	5.35	8.48	18.0	0.92	0.88	0.27	120.0	4.4	3.88
Gogebic 43	398	1895	81	556	1903	201.3	57.4	30.86	382	29.8	38.6	111.3	6.41	10.33	19.9	0.98	0.80	0.02	129.9	4.8	4.14
Gogebic 44	364	1815	73	559	1763	197.4	55.2	29.87	361	29.1	37.3	113.8	6.19	10.15	19.7	0.99	0.78	0.58	126.2	4.6	4.07
Gogebic 45	371	1729	62	490	1751	156.6	55.0	30.18	360	29.4	38.2	120.7	5.71	9.35	20.4	0.96	0.78	0.06	130.3	4.7	4.21
Gogebic 46	357	1661	63	473	1713	174.8	53.5	28.57	338	27.5	36.3	104.5	5.60	9.36	17.9	0.93	0.77	0.02	123.0	4.4	3.96
Gogebic 47	353	1663	63	563	1765	204.2	57.2	30.62	355	29.0	38.0	121.7	6.28	10.00	20.2	1.09	0.95	0.46	131.0	4.7	4.19
Gogebic 48	357	1729	66	470	1800	219.7	56.9	30.78	350	28.9	37.5	112.7	5.73	10.14	19.3	0.87	0.82	0.31	133.1	4.5	4.02
Gogebic 49	316	1514	49	450	1558	147.5	52.2	28.18	334	26.9	35.1	104.9	4.57	8.60	18.6	0.63	0.77	0.02	126.1	4.1	3.82
Gogebic 50	349	1699	55	493	1761	163.5	52.6	28.82	339	27.7	34.3	105.7	5.44	8.91	18.4	0.80	0.89	0.16	128.3	4.2	3.83
Gogebic 51	364	1778	75	484	1863	269.7	56.2	31.05	346	28.2	35.4	111.2	5.85	10.55	20.2	0.72	0.80	0.02	133.1	4.4	3.90
Gogebic 52	286	1314	42	408	1399	127.4	46.5	25.31	296	24.3	31.0	97.2	4.57	7.36	16.3	0.72	0.82	0.20	111.2	3.7	3.48
Gogebic 53	310	1431	48	630	1520	217.1	54.1	30.02	337	28.9	35.6	125.9	5.90	9.69	20.2	0.93	0.89	0.10	125.7	4.5	3.90
Gogebic 54	310	1417	39	445	1530	124.4	45.4	25.05	290	24.0	30.8	91.7	4.19	7.27	16.0	0.65	0.69	0.13	109.8	3.6	3.44
Gogebic 55	313	1435	37	768	1580	137.9	48.8	26.56	305	25.9	32.9	108.2	5.09	7.63	17.0	0.91	0.83	0.10	115.4	3.8	3.69
Gogebic 56	294	1351	33	411	1483	134.2	51.0	27.59	321	27.1	34.6	102.8	4.79	7.97	17.8	0.81	0.78	0.04	122.7	4.0	3.98
Gogebic 57	341	1564	51	522	1767	160.7	50.7	28.88	393	28.4	39.1	142.7	6.11	9.50	21.2	0.70	0.97	0.37	132.0	12.5	3.85

Metal Concentration in the Porewater: Gogebic Lake

Concentration in ng/mL, 0.0 Depth is the topwater sample

Sample	Depth	Mg	K	Ca	Mn	Fe	P	V	Cr	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Ba	Pb	U	B	Al
Gogebic 0	0.0	205.0	55.5	750	6.0	9.6	0.0	0.87	0.17	1.55	0.33	158.4	0.47	0.74	20.2	0.11	0.11	17.7	1.0	0.03	13.64	12.8
Gogebic 1	0.5	205.6	66.2	819	4.0	14.0	6.9	1.62	0.29	1.71	0.40	551.3	0.52	1.05	22.5	0.12	0.12	34.0	0.3	0.03	20.41	66.5
Gogebic 2	1.5	224.3	68.3	916	2.7	11.8	5.3	1.25	0.33	1.67	0.41	599.6	0.56	1.01	23.8	0.14	0.14	33.7	0.3	0.03	18.50	28.2
Gogebic 3	2.5	239.2	74.4	928	2.5	8.7	2.1	1.17	0.26	1.84	0.41	597.8	0.56	1.21	25.2	0.13	0.13	31.2	0.2	0.02	17.60	23.4
Gogebic 4	3.5	403.0	76.4	939	2.7	25.3	1.4	1.14	0.24	1.65	0.38	555.9	0.52	0.98	23.5	0.11	0.11	30.3	0.2	0.02	17.74	26.4
Gogebic 5	5.5	186.5	65.7	805	5.3	18.0	5.9	1.52	0.27	1.38	0.37	447.2	0.47	0.82	20.7	0.08	0.08	32.5	0.4	0.02	18.45	41.9
Gogebic 6	6.5	220.6	67.9	854	2.8	15.6	0.0	1.22	0.27	1.43	0.39	838.9	0.49	0.94	22.9	0.09	0.09	35.0	0.3	0.02	18.17	34.4
Gogebic 7	7.5	194.2	72.0	785	16.3	18.2	15.4	1.98	0.21	1.31	0.42	452.3	0.91	1.15	20.7	0.10	0.10	29.3	0.4	0.02	20.42	36.3
Gogebic 8	8.5	178.8	77.7	741	28.6	25.8	47.7	2.63	0.35	1.09	0.54	647.7	1.63	1.30	19.7	0.13	0.13	39.5	0.6	0.03	22.75	67.9
Gogebic 9	9.5	192.8	76.7	802	33.9	40.7	109.4	2.30	0.30	0.55	0.67	282.9	2.18	1.35	20.7	0.14	0.14	31.2	0.4	0.04	23.29	41.4
Gogebic 10	11.5	195.1	79.0	811	40.6	71.0	118.6	2.16	0.37	0.36	0.77	456.4	2.21	1.53	21.7	0.17	0.17	33.6	0.3	0.04	24.20	55.7
Gogebic 11	13.5	204.7	82.7	847	43.2	78.1	153.8	2.38	0.36	0.26	0.70	294.8	2.12	1.71	23.5	0.14	0.14	34.6	0.2	0.04	25.56	35.6
Gogebic 12	15.5	212.6	83.6	876	37.7	89.6	210.8	2.31	0.53	0.32	0.74	706.9	1.67	1.84	25.2	0.17	0.17	36.6	0.4	0.05	25.92	66.0
Gogebic 13	17.5	249.2	93.9	1041	43.1	104.5	260.2	2.62	0.50	0.33	0.70	543.8	2.12	1.80	26.7	0.20	0.20	43.3	0.2	0.05	23.35	50.0
Gogebic 14	19.5	269.9	93.1	1105	47.8	131.9	295.2	2.22	0.51	0.24	0.78	511.2	1.84	1.84	29.8	0.20	0.20	45.7	0.2	0.06	22.58	43.7
Gogebic 15	21.5	315.8	117.3	1290	52.6	125.3	274.6	2.73	0.55	0.41	0.72	604.0	1.76	1.83	29.5	0.25	0.25	46.5	0.2	0.06	23.54	49.0
Gogebic 16	23.5	292.2	96.4	1169	55.2	255.5	414.6	2.34	0.63	0.28	0.89	575.0	1.83	1.70	32.2	0.22	0.22	39.8	0.2	0.06	23.40	37.7
Gogebic 17	25.5	304.5	98.7	1286	61.4	335.8	525.5	2.57	0.77	0.51	0.99	746.4	1.79	1.65	32.5	0.23	0.23	39.0	0.2	0.07	24.43	38.4
Gogebic 18	27.5	292.8	98.3	1197	58.7	265.3	440.6	2.55	0.70	0.26	0.95	398.0	1.63	1.71	32.7	0.21	0.21	42.7	0.2	0.07	24.96	34.9
Gogebic 19	29.5	294.9	97.6	1199	60.4	303.6	502.2	2.76	0.77	0.35	1.00	609.2	1.76	1.72	33.0	0.28	0.28	42.5	0.2	0.08	26.56	36.3
Gogebic 20	31.5	312.0	101.0	1278	62.7	382.4	501.4	2.64	0.85	0.53	1.07	962.3	1.78	1.69	34.1	0.27	0.27	43.1	0.2	0.08	28.10	49.3
Gogebic 21	35.5	318.8	95.9	1287	67.1	407.0	612.7	2.48	0.85	0.41	1.23	801.0	1.83	1.78	35.9	0.27	0.27	41.5	0.3	0.08	28.69	30.4
Gogebic 22	37.5	327.7	101.5	1364	64.8	510.9	746.5	2.38	0.89	0.46	1.19	655.4	1.85	1.73	37.4	0.27	0.27	39.9	0.2	0.08	30.33	43.9
Gogebic 23	39.5	319.0	95.0	1307	59.8	556.8	827.8	2.45	0.92	0.6	1.16	560.1	1.72	1.69	38.9	0.21	0.21	36.3	0.1	0.07	29.26	30.2
Gogebic 24	41.5	332.8	99.6	1443	60.8	531.9	665.1	3.51	1.00	0.68	1.19	1254.3	1.80	1.70	40.0	0.23	0.23	42.6	0.4	0.08	30.63	37.8
Gogebic 25	43.5	343.8	104.1	1420	61.2	391.7	409.6	4.56	0.88	0.63	1.16	633.1	1.80	1.76	38.5	0.30	0.30	45.5	0.2	0.10	31.73	44.1
Gogebic 26	45.5	375.2	119.0	1544	66.4	665.5	831.9	2.80	0.93	0.52	1.24	509.6	1.76	1.68	40.6	0.26	0.26	35.7	0.1	0.09	32.26	33.2
Gogebic 27	47.5	364.9	102.4	1498	63.8	595.8	691.1	3.20	1.07	0.85	1.26	890.4	1.74	1.74	42.1	0.22	0.22	42.9	0.2	0.09	33.88	40.8
Gogebic 28	49.5	375.5	103.3	1528	66.0	660.2	758.6	2.52	1.05	0.74	1.23	615.3	1.65	1.74	43.1	0.21	0.21	35.0	0.2	0.08	35.51	33.0

Gratiot Lake Sediment Fact Sheet

Date sampled: 7 June 2007
Location: Keweenaw County
Sampling site: 47º 21.924' N
88º 07.352' W
Lake surface area: 1,438 acres

Sampling site water depth: 78.0 ft
Depth of core: 47 cm
Sedimentation rate: 212 g/m^2/y
Age of oldest section: 1678
Focusing factor: 1.49

Surface sediment concentrations of mercury have been reduced since previous sediment samples were collected from Gratiot Lake in 1999.

Arsenic and lead have increased significantly from background and remain at elevated concentrations to recent sediment.

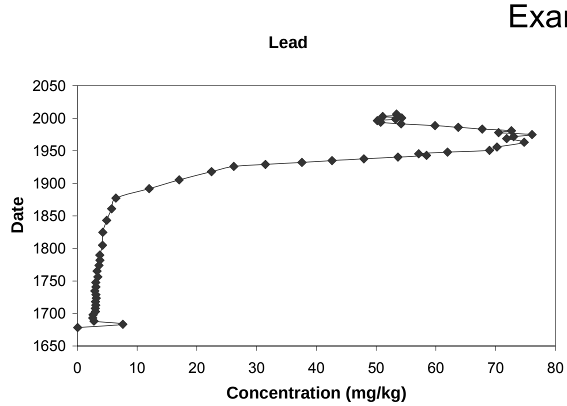
Nitrogen values for Gratiot Lake were the highest of the lakes studied in the 07-08 sample year.

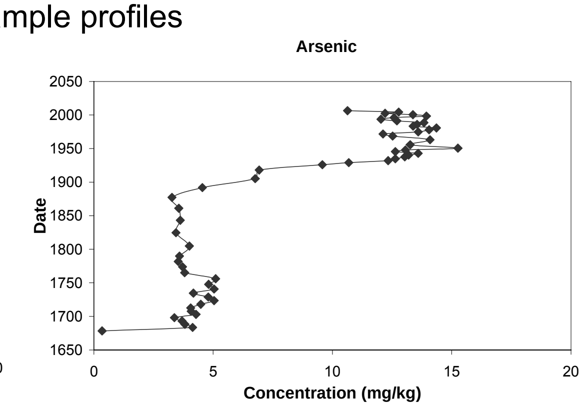
	Surface Concentration	Background Concentration	Trends
Cadmium (mg/kg)	1.3	0.7	Increasing
Copper (mg/kg)	69.6	133.2	Decreasing
Lead (mg/kg)	52.7	3.0	Increasing
Mercury (mg/kg)	0.1	0.1	Increasing
Zinc (mg/kg)	103.6	67.1	Decreasing
Total PCBs (µg/kg)	7.8		Decreasing
Total PAHs (µg/kg)	162.0		Increasing
Total Pesticides (µg/kg)	3.4		Decreasing
DDTs (µg/kg)	0.0		-

- indicates that slope was not able to be determined

Trends for organic contaminants are taken from only two data points and should be interpreted with care.

Example profiles





A Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters: Sediments

Lake: Gratiot07 **Water Depth (m):** 23.8

Sampling Date: 6/6/2007 **Latitude (N):** 47.21924 **Longitude (W):** -88.12253

Core Description: ~ 48 cm total, Daphnia, copepods, nematodes, other zooplankton in top water; top 4-5 cm brown sediment with mottled black organic-like features, 5-13 cm blackish sediment, dark brown sediments from 13-41 cm, and 41 cm to bottom of core mottled light brown/dark brown sediment

Sample Number	Jar Number	Thickness (cm)	Total Thickness (cm)	Description
Gratiot07 1	1	0.5	0.5	fine grain brown sediment, zooplankton
Gratiot07 2	2	0.5	1.0	fine grain brown sediment, black specks
Gratiot07 3	3	0.5	1.5	mostly brown with black specks and a red streak
Gratiot07 4	4	0.5	2.0	mostly brown with black specks and a red streak
Gratiot07 5	5	0.5	2.5	mostly brown with black specks, orange/red sediments more
Gratiot07 6	6	0.5	3.0	mostly brown with black specks, orange/red sediments more
Gratiot07 7	7	0.5	3.5	brownish-orange sediments with black streak
Gratiot07 8	8	0.5	4.0	brown sediments with large streaks of black
Gratiot07 9	9	0.5	4.5	brown sediments with large streaks of black
Gratiot07 10	10	0.5	5.0	brown sediments with large streaks of black
Gratiot07 11	11	0.5	5.5	brown sediments with large streaks of black, small piece of bi
Gratiot07 12	12	0.5	6.0	brown sediments with streaks of black
Gratiot07 13	13	0.5	6.5	brown sediments with streaks of black
Gratiot07 14	14	0.5	7.0	brown sediments with streaks of black
Gratiot07 15	15	0.5	7.5	darker brown with less black sediment
Gratiot07 16	16	0.5	8.0	darker brown with very little black sediement
Gratiot07 17	17	1.0	9.0	dark brown with light brown mottling
Gratiot07 18	18	1.0	10.0	dark brown with light brown mottling
Gratiot07 19	19	1.0	11.0	dark brown with light brown mottling
Gratiot07 20	20	1.0	12.0	dark brown with light brown mottling
Gratiot07 21	21	1.0	13.0	dark brown sediments
Gratiot07 22	22	1.0	14.0	dark brown sediments
Gratiot07 23	23	1.0	15.0	dark brown sediments
Gratiot07 24	24	1.0	16.0	dark brown sediments
Gratiot07 25	25	1.0	17.0	dark brown sediments
Gratiot07 26	26	1.0	18.0	dark brown sediments
Gratiot07 27	27	1.0	19.0	dark brown sediments
Gratiot07 28	28	1.0	20.0	dark brown sediments
Gratiot07 29	29	1.0	21.0	dark brown sediments
Gratiot07 30	30	1.0	22.0	dark brown sediments
Gratiot07 31	31	1.0	23.0	dark brown sediments
Gratiot07 32	32	1.0	24.0	dark brown sediments
Gratiot07 33	33	1.0	25.0	dark brown sediments
Gratiot07 34	34	1.0	26.0	dark brown sediments

Sample Number	Jar Number	Thickness (cm)	Total Thickness (cm)	Description
Gratiot07 35	35	1.0	27.0	dark brown sediments, drier
Gratiot07 36	36	1.0	28.0	dark brown sediments, drier
Gratiot07 37	37	1.0	29.0	dark brown sediments, very dry
Gratiot07 38	38	1.0	30.0	dark brown sediments, very dry
Gratiot07 39	39	1.0	31.0	dark brown sediments, very dry
Gratiot07 40	40	1.0	32.0	dark brown sediments, very dry
Gratiot07 41	41	1.0	33.0	dark brown sediments, very dry
Gratiot07 42	42	1.0	34.0	dark brown sediments, very dry
Gratiot07 43	43	1.0	35.0	dark brown sediments, very dry
Gratiot07 44	44	1.0	36.0	dark brown sediments, very dry
Gratiot07 45	45	1.0	37.0	grayish-brown sediments, not as dry
Gratiot07 46	46	1.0	38.0	grayish-brown sediments, not as dry
Gratiot07 47	47	1.0	39.0	grayish-brown sediments, not as dry, pieces of leaf
Gratiot07 48	48	1.0	40.0	grayish-brown sediments, not as dry, pieces of leaf
Gratiot07 49	49	1.0	41.0	dark brown, mottled with light brown
Gratiot07 50	50	1.0	42.0	dark brown, mottled with light brown
Gratiot07 51	51	1.0	43.0	dark brown, mottled with light brown
Gratiot07 52	52	1.0	44.0	dark brown, mottled with light brown
Gratiot07 53	53	1.0	45.0	dark brown, mottled with light brown
Gratiot07 54	54	1.0	46.0	dark brown, mottled with light brown
Gratiot07 55	55	1.0	47.0	dark brown, mottled with light brown
Gratiot07 56	56	1.0	48.0	dark brown, mottled with light brown, drier
Gratiot07 57	57	1.0	49.0	dark brown, mottled with light brown, drier, puck sample

210-Pb Analysis: Gratiot07 Lake

Data provided by Paul Wilkinson, Freshwater Institute, Manitoba, Canada

Sample	Dry Weight (g)	Accumulated Dry Weight (g/sq. cm)	Porosity	Percent Water	Excess Pb-210 (Bq/g)	Activity Bq/g +/- 2SD Pb-210 +/- Error	Activity Bq/g +/- 2SD Cs-137 +/- Error
Gratiot07 1	2.33	0.0329	0.99	96.4	5.98E-01	6.08E-01 +/- 2.84E-02	1.10E-01 +/- 9.79E-03
Gratiot07 2	1.67	0.0564	0.98	94.4	7.14E-01	7.24E-01 +/- 3.35E-02	
Gratiot07 3	1.98	0.0844	0.98	93.8	8.12E-01	8.22E-01 +/- 3.92E-02	1.10E-01 +/- 1.02E-02
Gratiot07 4	2.21	0.1155	0.98	93.8	9.46E-01	9.55E-01 +/- 4.45E-02	
Gratiot07 5	1.94	0.1429	0.98	93.2	9.95E-01	1.00E+00 +/- 4.60E-02	1.20E-01 +/- 8.87E-03
Gratiot07 6	2.38	0.1765	0.97	91.8	9.42E-01	9.52E-01 +/- 4.36E-02	
Gratiot07 7	2.34	0.2095	0.97	92.1	9.59E-01	9.68E-01 +/- 4.49E-02	1.14E-01 +/- 8.69E-03
Gratiot07 8	2.85	0.2497	0.97	91.6	9.81E-01	9.91E-01 +/- 4.46E-02	
Gratiot07 9	2.44	0.2841	0.97	91.9	9.65E-01	9.74E-01 +/- 4.39E-02	1.38E-01 +/- 7.39E-03
Gratiot07 10	2.61	0.3210	0.97	92.0	9.63E-01	9.73E-01 +/- 4.56E-02	
Gratiot07 11	2.76	0.3599	0.97	92.6	9.18E-01	9.27E-01 +/- 4.25E-02	1.47E-01 +/- 8.64E-03
Gratiot07 12	2.52	0.3955	0.97	92.2	8.68E-01	8.78E-01 +/- 3.98E-02	1.49E-01 +/- 7.17E-03
Gratiot07 13	3.08	0.4389	0.96	90.1	7.91E-01	8.00E-01 +/- 3.65E-02	1.72E-01 +/- 7.93E-03
Gratiot07 14	2.99	0.4811	0.97	91.5	7.25E-01	7.34E-01 +/- 3.33E-02	1.66E-01 +/- 8.41E-03
Gratiot07 15	3.18	0.5260	0.97	91.7	6.80E-01	6.90E-01 +/- 3.18E-02	1.49E-01 +/- 8.39E-03
Gratiot07 16	3.23	0.5715	0.97	91.5	5.72E-01	5.81E-01 +/- 2.73E-02	
Gratiot07 17	7.67	0.6797	0.96	89.7	4.46E-01	4.56E-01 +/- 2.19E-02	1.50E-01 +/- 8.96E-03
Gratiot07 18	7.23	0.7817	0.96	89.8	3.46E-01	3.55E-01 +/- 1.73E-02	
Gratiot07 19	7.65	0.8897	0.96	89.4	3.26E-01	3.35E-01 +/- 1.65E-02	1.36E-01 +/- 8.34E-03
Gratiot07 20	6.38	0.9797	0.97	90.9	3.02E-01	3.12E-01 +/- 1.54E-02	
Gratiot07 21	6.87	1.0766	0.97	91.1	2.99E-01	3.08E-01 +/- 1.50E-02	6.96E-02 +/- 7.40E-03
Gratiot07 22	6.42	1.1672	0.97	91.3	2.65E-01	2.74E-01 +/- 1.30E-02	
Gratiot07 23	6.99	1.2658	0.97	90.5	2.37E-01	2.47E-01 +/- 1.16E-02	2.91E-02 +/- 3.59E-03
Gratiot07 24	7.00	1.3646	0.96	90.2	2.08E-01	2.18E-01 +/- 1.03E-02	
Gratiot07 25	7.16	1.4656	0.96	90.3	1.88E-01	1.97E-01 +/- 1.01E-02	1.41E-02 +/- 5.74E-03
Gratiot07 26	7.90	1.5770	0.96	89.9	1.86E-01	1.95E-01 +/- 9.96E-03	
Gratiot07 27	8.14	1.6919	0.96	89.5	1.74E-01	1.83E-01 +/- 9.18E-03	1.81E-02 +/- 5.78E-03
Gratiot07 28	7.87	1.8029	0.96	89.4	1.62E-01	1.71E-01 +/- 8.94E-03	
Gratiot07 29	7.84	1.9135	0.96	89.2	1.43E-01	1.53E-01 +/- 7.94E-03	1.16E-02 +/- 4.26E-03
Gratiot07 30	7.69	2.0220	0.96	89.2	1.18E-01	1.27E-01 +/- 6.85E-03	
Gratiot07 31	8.64	2.1439	0.96	88.9	9.22E-02	1.02E-01 +/- 5.71E-03	1.27E-02 +/- 5.06E-03
Gratiot07 32	9.22	2.2740	0.96	88.3	6.05E-02	7.00E-02 +/- 4.52E-03	
Gratiot07 33	10.49	2.4220	0.95	85.8	2.57E-02	3.52E-02 +/- 2.33E-03	9.36E-03 +/- 4.21E-03
Gratiot07 34	11.25	2.5807	0.94	85.5	1.24E-02	2.19E-02 +/- 1.76E-03	

Sample	Dry Weight (g)	Accumulated Dry Weight (g/sq. cm)	Porosity	Percent Water	Excess Pb-210 (Bq/g)	Activity Bq/g +/- 2SD Pb-210 +/- Error	Activity Bq/g +/- 2SD Cs-137 +/- Error
Gratiot07 35	11.28	2.7398	0.94	84.5	9.00E-03	1.85E-02 +/- 1.50E-03	0.00E+00 +/- 0.00E+00
Gratiot07 36	13.03	2.9237	0.94	83.3	5.38E-03	1.49E-02 +/- 1.34E-03	
Gratiot07 37	15.46	3.1418	0.93	82.4	2.88E-03	1.24E-02 +/- 1.01E-03	
Gratiot07 38	13.13	3.3270	0.93	82.0	2.59E-03	1.21E-02 +/- 1.10E-03	
Gratiot07 39	15.47	3.5453	0.93	81.3	2.49E-03	1.20E-02 +/- 1.06E-03	
Gratiot07 40	15.71	3.7669	0.92	80.1	1.48E-03	1.10E-02 +/- 1.02E-03	
Gratiot07 41	16.59	4.0010	0.92	79.3		1.09E-02 +/- 9.88E-04	
Gratiot07 42	13.51	4.1916	0.93	82.7		1.12E-02 +/- 1.10E-03	
Gratiot07 43	11.26	4.3505	0.95	85.8		1.24E-02 +/- 1.23E-03	
Gratiot07 44	10.94	4.5048	0.95	86.4		9.81E-03 +/- 9.87E-04	
Gratiot07 45	9.52	4.6391	0.95	87.3		1.04E-02 +/- 1.12E-03	
Gratiot07 46	10.07	4.7812	0.95	87.2		9.78E-03 +/- 9.45E-04	
Gratiot07 47	9.60	4.9166	0.95	87.6		1.23E-02 +/- 1.33E-03	
Gratiot07 48	9.25	5.0471	0.96	88.3		9.64E-03 +/- 1.05E-03	
Gratiot07 49	8.45	5.1663	0.96	88.6		9.30E-03 +/- 8.98E-04	
Gratiot07 50	8.85	5.2912	0.96	88.1		8.61E-03 +/- 8.50E-04	
Gratiot07 51	8.86	5.4162	0.96	88.4		9.45E-03 +/- 1.02E-03	
Gratiot07 52	8.72	5.5392	0.96	88.8		7.77E-03 +/- 7.42E-04	
Gratiot07 53	8.60	5.6606	0.96	88.8		8.06E-03 +/- 7.88E-04	
Gratiot07 54	8.88	5.7858	0.96	88.4		8.75E-03 +/- 8.58E-04	
Gratiot07 55	9.18	5.9153	0.95	87.6		9.87E-03 +/- 1.36E-03	
Gratiot07 56	10.93	6.0696	0.95	86.4		2.76E-02 +/- 2.39E-03	
Gratiot07 57	2.59	6.1061	0.94	85.1		1.43E-01 +/- 7.66E-03	

Metal Concentration in the Sediment: Gratiot07 Lake

Concentration in mg/kg dry weight

Sample	Mg	Al	K	Ca	Fe	Ti	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Sn	Ba	Pb	U
Gratiot07 01	600	1484	134	866	1896	72.3	65.2	22.04	543	24.0	71.6	101.0	10.64	6.14	18.6	0.72	1.36	0.17	65.7	53.4	1.04
Gratiot07 02	524	1386	136	820	1693	116.9	67.0	22.19	437	23.3	69.0	109.2	12.78	7.16	17.1	0.85	1.40	0.24	60.5	53.6	1.03
Gratiot07 03	500	1329	133	718	1716	98.1	65.3	21.55	496	22.4	68.2	100.5	12.21	6.78	16.9	0.63	1.23	0.11	60.4	51.1	0.98
Gratiot07 04	604	1628	165	891	2068	104.6	68.1	22.60	444	23.6	71.2	106.1	13.38	7.16	17.8	0.67	1.29	0.15	62.0	54.3	1.05
Gratiot07 05	501	1404	142	698	1731	98.3	68.2	22.16	417	23.5	71.1	112.3	13.94	7.09	16.9	0.83	1.39	0.22	61.0	53.3	1.07
Gratiot07 06	488	1323	127	789	1630	91.3	64.0	20.89	368	21.4	66.3	101.0	12.59	6.43	15.3	0.78	1.33	0.15	56.4	50.2	1.00
Gratiot07 07	550	1499	140	773	1770	88.2	60.4	20.33	321	20.6	1707.9	144.0	12.03	6.31	21.7	0.60	1.22	0.08	53.8	50.8	0.98
Gratiot07 08	500	1349	119	705	1604	96.2	62.5	21.26	317	21.9	793.3	155.4	12.70	6.47	15.9	0.59	1.39	0.65	55.5	54.2	1.00
Gratiot07 09	545	1432	121	849	1755	101.3	65.0	22.18	311	23.1	71.4	111.2	13.84	6.68	16.2	0.73	1.42	0.19	56.1	59.8	1.03
Gratiot07 10	578	1499	114	845	1817	103.4	66.2	23.10	313	25.3	71.7	113.7	13.55	6.82	16.8	0.55	1.36	0.12	57.6	63.7	1.07
Gratiot07 11	457	1177	86	571	1426	99.1	67.9	23.60	313	24.9	73.6	129.3	13.39	6.79	17.2	0.59	1.44	0.20	58.9	67.8	1.10
Gratiot07 12	555	1461	109	859	1748	107.9	70.8	24.78	326	25.6	76.9	118.6	14.36	7.40	17.7	0.75	1.61	0.71	61.6	72.6	1.17
Gratiot07 13	534	1391	99	670	1693	97.4	68.4	23.49	321	25.9	74.0	114.8	14.06	6.85	16.6	0.74	1.52	0.17	58.5	70.5	1.13
Gratiot07 14	537	1367	96	652	1657	83.0	68.3	23.42	310	25.0	76.6	115.8	13.60	6.60	16.7	0.59	1.46	0.12	59.7	76.1	1.15
Gratiot07 15	526	1325	84	670	1598	68.7	64.3	21.86	289	23.3	72.0	110.8	12.12	5.98	15.4	0.54	1.38	0.10	54.9	73.0	1.08
Gratiot07 16	534	1332	86	674	1594	71.2	62.7	21.44	276	23.1	70.4	107.5	12.53	6.05	15.3	0.67	1.50	0.17	53.9	71.8	1.11
Gratiot07 17	537	1416	102	694	1693	102.7	67.1	23.82	288	38.7	77.5	120.1	14.09	7.27	16.9	0.58	1.45	0.12	57.9	74.8	1.14
Gratiot07 18	521	1307	78	849	1605	77.5	63.0	21.74	275	23.3	72.3	112.3	13.26	6.22	15.8	0.57	1.41	0.09	54.5	70.2	1.11
Gratiot07 19	457	1227	87	654	1470	106.3	67.1	23.49	282	25.0	78.2	121.4	15.26	7.53	17.2	0.79	1.57	0.19	57.4	69.0	1.13
Gratiot07 20	523	1332	82	642	1595	71.1	62.4	21.34	264	23.3	69.9	110.6	13.06	6.23	15.6	0.67	1.49	0.16	52.8	61.9	1.08
Gratiot07 21	492	1281	83	700	1511	83.3	62.1	20.98	256	21.9	77.6	103.2	12.64	6.52	15.4	0.53	1.26	0.09	51.6	57.1	1.02
Gratiot07 22	509	1341	87	618	1532	97.4	65.1	22.46	268	24.0	69.7	120.9	13.59	7.08	19.9	0.66	1.44	0.18	54.1	58.4	1.09
Gratiot07 23	511	1223	72	665	1437	66.2	62.2	21.29	265	24.4	67.7	107.5	13.19	5.89	18.1	0.61	1.44	0.17	51.9	53.7	1.07
Gratiot07 24	553	1366	87	660	1584	104.9	65.2	22.95	269	24.4	67.1	104.7	13.03	6.74	17.6	0.66	1.41	0.16	53.2	48.0	1.09
Gratiot07 25	526	1291	76	637	1489	82.0	65.3	21.83	267	23.8	63.0	98.8	12.64	6.00	16.8	0.45	1.33	0.09	51.8	42.6	1.05
Gratiot07 26	557	1352	78	664	1540	106.4	70.0	23.53	277	25.3	62.4	100.4	12.33	6.30	17.9	0.45	1.30	0.04	53.4	37.6	1.07
Gratiot07 27	534	1231	67	641	1399	104.4	70.6	23.72	276	25.7	81.1	99.8	10.69	5.72	18.0	0.44	1.23	0.02	52.4	31.5	1.12
Gratiot07 28	549	1304	72	666	1440	106.3	72.8	23.73	273	25.2	397.0	91.1	9.58	5.77	18.9	0.46	1.11	0.06	52.1	26.2	1.09
Gratiot07 29	501	1143	49	708	1174	54.8	67.3	21.55	259	23.8	221.6	108.3	6.93	4.34	24.5	0.41	0.96	0.02	48.8	22.4	1.04

Metal Concentration in the Sediment: Gratiot07 Lake

Concentration in mg/kg dry weight

Sample	Mg	Al	K	Ca	Fe	Ti	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Sn	Ba	Pb	U
Gratiot07 30	527	1276	61	780	1289	101.1	76.9	24.56	284	25.6	353.4	79.5	6.77	5.37	19.6	0.64	0.96	0.04	53.6	17.0	1.11
Gratiot07 31	602	1346	62	969	1347	99.0	74.3	24.86	281	26.1	51.9	75.9	4.55	4.61	19.1	0.43	0.88	0.06	57.3	12.0	1.05
Gratiot07 32	564	1205	46	650	1189	98.0	67.5	23.97	263	25.6	139.9	68.4	3.28	4.25	18.3	0.34	0.66	0.34	50.0	6.4	0.99
Gratiot07 33	620	1346	53	703	1337	123.7	67.3	25.07	268	27.1	50.3	80.1	3.56	4.82	19.8	0.52	0.79	0.41	51.2	5.7	1.04
Gratiot07 34	580	1234	52	765	1170	87.6	65.2	24.34	263	26.8	146.5	66.6	3.63	4.26	19.5	0.52	0.72	0.00	51.6	4.9	1.02
Gratiot07 35	644	1362	55	699	1283	72.7	63.8	23.21	253	26.2	906.9	62.1	3.44	4.00	18.2	0.51	0.67	0.00	50.1	4.3	0.98
Gratiot07 36	650	1447	75	731	1428	146.8	67.2	26.18	268	28.5	53.2	68.8	4.00	5.32	19.9	0.57	0.67	0.00	55.0	4.2	1.05
Gratiot07 37	681	1482	73	748	1465	143.3	69.0	26.85	275	29.4	53.3	72.4	3.59	5.33	21.1	0.38	0.60	0.62	55.8	3.8	1.04
Gratiot07 38	618	1300	57	624	1271	123.6	69.1	26.64	275	30.1	73.2	71.4	3.53	5.01	21.5	0.35	0.58	0.00	56.2	3.8	1.07
Gratiot07 39	680	1402	65	717	1392	149.9	65.6	26.00	264	30.5	51.6	84.0	3.72	4.90	20.6	0.51	0.71	0.02	54.7	3.6	1.02
Gratiot07 40	720	1469	69	878	1500	137.8	69.7	26.21	263	29.5	53.5	71.2	3.81	5.04	20.3	0.36	0.57	0.00	53.7	3.3	1.06
Gratiot07 41	759	1662	86	907	1728	134.4	87.2	28.69	278	30.6	883.8	75.1	5.11	5.82	23.2	0.55	0.70	0.00	56.4	3.4	1.33
Gratiot07 42	633	1409	75	710	1424	107.8	89.6	26.81	258	28.4	66.0	68.9	4.81	5.34	22.9	0.56	0.67	0.00	52.0	3.1	1.34
Gratiot07 43	612	1395	80	716	1375	104.6	90.8	27.45	262	28.8	67.8	70.7	5.04	5.54	25.1	0.73	0.79	0.02	54.2	3.1	1.42
Gratiot07 44	649	1389	69	792	1393	97.5	90.9	26.70	253	28.0	65.8	68.0	4.17	4.88	23.2	0.51	0.69	0.00	49.8	2.9	1.38
Gratiot07 45	685	1514	84	850	1498	122.4	97.0	28.05	258	29.0	69.8	72.4	4.79	5.66	24.8	0.74	0.82	0.02	50.6	3.1	1.48
Gratiot07 46	623	1405	86	738	1396	126.8	93.8	28.76	255	29.7	87.2	78.6	5.04	6.03	25.4	0.76	0.82	0.02	51.1	3.2	1.49
Gratiot07 47	586	1299	75	742	1277	109.8	90.3	27.02	239	28.1	68.3	65.1	4.48	5.43	26.5	0.72	0.76	0.04	48.1	3.0	1.44
Gratiot07 48	629	1384	82	753	1371	118.1	91.5	28.05	241	28.9	69.3	68.3	4.06	5.61	29.5	0.54	0.64	0.00	48.8	3.1	1.43
Gratiot07 49	610	1323	66	727	1265	86.3	89.3	25.84	225	27.8	73.4	67.9	4.08	4.81	25.3	0.67	0.73	0.02	46.5	3.0	1.37
Gratiot07 50	575	1317	79	779	1269	116.7	90.6	25.85	216	27.5	121.8	62.8	4.28	5.48	25.7	0.70	0.72	0.61	45.6	3.0	1.33
Gratiot07 51	542	1233	64	748	1173	80.5	86.0	23.46	195	23.7	105.6	60.7	3.37	4.59	25.0	0.45	0.51	0.00	42.8	2.6	1.26
Gratiot07 52	478	1154	64	738	1085	92.4	82.1	22.85	183	22.3	69.1	53.7	3.70	4.86	24.9	0.63	0.65	0.02	42.3	2.6	1.22
Gratiot07 53	496	1169	71	691	1108	96.5	80.3	23.35	181	22.9	63.2	55.7	3.82	4.96	27.5	0.62	0.68	0.04	43.3	2.8	1.22
Gratiot07 54	551	1237	64	759	1189	92.3	83.8	25.02	200	25.6	63.3	63.7	4.14	5.10	27.6	0.46	0.67	0.32	47.7	7.6	1.30
Gratiot07 55	525	1234	67	675	1288	0.9	0.2	0.00	0	0.0	920.4	0.0	0.35	0.04	0.0	0.15	0.07	0.00	0.0	0.0	0.02

Metal Concentration in the Porewater: Gratiot07 Lake

Concentration in ng/mL, 0.0 Depth is the topwater sample

Sample	Depth	Mg	K	Ca	Mn	Fe	P	V	Cr	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Ba	Pb	U	B	Al
Gratiot07 0	0.0	194.7	42.1	767	31.1	47.0	28.7	1.20	0.14	0.88	0.39	54.2	1.23	0.60	15.4	0.08	0.01	7.5	1.4	0.01	20.62	4.4
Gratiot07 1	0.5	201.0	82.3	1013	59.7	64.3	623.6	4.13	0.49	0.76	0.61	425.0	4.21	1.38	21.3	0.22	0.03	24.3	0.5	0.02	43.10	22.0
Gratiot07 2	1.5	197.0	75.1	1075	75.7	183.4	216.7	3.22	0.50	1.15	0.74	235.9	5.07	1.27	21.8	0.27	0.04	24.0	0.8	0.02	64.70	22.7
Gratiot07 3	2.5	207.8	86.0	1096	47.2	296.8	55.5	2.44	0.34	1.4	0.62	365.1	5.58	1.28	21.7	0.44	0.05	32.0	1.0	0.01	131.51	52.8
Gratiot07 4	3.5	229.4	82.6	1157	69.3	318.8	798.8	4.94	0.52	1	0.74	328.4	5.51	1.43	24.0	0.20	0.05	19.9	0.7	0.02	38.89	43.4
Gratiot07 5	5.5	233.9	93.1	1133	57.1	375.9	819.3	3.18	0.51	0.73	0.64	85.4	3.66	1.47	22.3	0.23	0.11	19.7	0.4	0.03	42.04	17.1
Gratiot07 6	6.5	240.0	99.1	1121	53.8	245.4	777.6	4.94	0.48	1.11	0.62	324.4	4.58	1.64	23.2	0.19	0.04	20.5	0.9	0.02	44.43	22.8
Gratiot07 7	7.5	231.5	94.0	1096	58.3	284.6	742.5	4.06	0.44	0.74	0.62	199.7	4.45	1.59	22.6	0.16	0.04	18.4	0.9	0.02	45.51	25.7
Gratiot07 8	8.5	232.5	99.8	1129	49.4	141.8	636.0	5.50	0.54	7.35	0.64	464.8	4.82	1.82	25.0	0.22	0.04	26.7	1.1	0.02	49.11	33.7
Gratiot07 9	9.5	272.7	103.3	1206	52.8	278.1	1014.3	4.30	0.46	0.56	0.68	94.9	3.91	1.75	26.8	0.17	0.08	17.2	0.5	0.02	47.95	19.1
Gratiot07 10	11.5	247.3	98.3	1146	51.8	187.4	650.7	4.55	0.50	4.2	0.65	333.7	3.90	1.67	24.3	0.25	0.10	23.4	0.8	0.03	48.50	26.3
Gratiot07 11	13.5	291.0	106.4	1276	55.8	326.9	1038.5	4.15	0.47	0.71	0.70	124.8	3.67	1.73	28.9	0.19	0.04	20.3	0.4	0.02	47.93	22.0
Gratiot07 12	15.5	292.4	104.5	1267	54.8	328.2	919.6	4.05	0.46	0.58	0.72	147.1	3.33	1.66	30.3	0.18	0.05	18.8	0.3	0.02	54.48	16.1
Gratiot07 13	17.5	287.2	102.9	1258	49.4	143.0	512.5	4.94	0.49	0.84	0.81	295.6	3.01	1.58	29.7	0.17	0.04	28.1	0.5	0.02	58.25	27.5
Gratiot07 14	19.5	291.4	102.4	1247	51.2	209.9	551.3	4.89	0.55	1.03	0.68	438.0	2.94	1.57	31.5	0.21	0.04	25.6	0.4	0.02	67.93	30.3
Gratiot07 15	21.5	274.0	97.0	1207	48.0	134.3	385.2	5.47	0.48	0.88	0.65	211.2	1.61	1.45	31.7	0.16	0.03	28.5	0.2	0.02	74.91	34.6
Gratiot07 16	23.5	280.8	99.1	1278	47.8	130.1	284.0	5.96	0.53	0.74	0.63	230.7	1.36	1.42	32.3	0.18	0.04	28.4	0.2	0.02	83.84	38.5
Gratiot07 17	25.5	284.2	101.6	1203	46.7	123.6	265.0	5.22	0.50	0.72	0.61	404.6	1.04	1.42	33.9	0.14	0.04	37.4	0.1	0.03	100.02	43.7
Gratiot07 18	27.5	277.0	97.9	1199	45.4	128.4	200.2	6.63	0.50	0.73	0.64	443.7	1.07	1.37	34.7	0.17	0.04	36.6	0.1	0.03	104.00	43.9
Gratiot07 19	29.5	288.0	98.3	1281	46.1	209.0	249.4	6.61	0.64	0.89	0.75	379.8	1.03	1.43	38.3	0.17	0.05	34.5	0.2	0.03	126.15	49.7
Gratiot07 20	31.5	262.1	100.0	1140	41.1	182.4	186.4	8.69	1.18	4.68	0.81	336.9	1.13	1.51	37.8	0.28	0.09	49.6	0.5	0.08	130.89	924.7
Gratiot07 21	35.5	273.1	98.1	1230	41.2	159.0	126.9	8.29	0.59	4.02	0.62	339.0	0.95	1.35	39.1	0.19	0.05	39.4	0.2	0.03	142.06	79.2
Gratiot07 22	37.5	292.4	93.6	1255	43.6	221.5	202.5	9.36	0.56	0.92	0.73	245.4	1.12	1.34	44.0	0.24	0.12	31.4	0.1	0.04	145.86	66.4
Gratiot07 23	39.5	316.8	92.9	1328	43.6	292.2	257.1	7.73	0.63	1.19	0.73	186.8	1.16	1.27	48.2	0.32	0.12	26.8	0.2	0.05	149.59	99.8
Gratiot07 24	41.5	322.4	91.8	1380	41.4	200.6	144.1	7.85	0.64	1.44	0.74	253.3	0.94	1.24	51.3	0.18	0.05	30.3	0.1	0.04	157.04	87.1
Gratiot07 25	43.5	348.4	94.6	1484	39.9	280.7	266.8	6.62	8.96	1.39	0.81	224.8	0.87	1.27	59.6	0.25	0.07	31.5	0.1	0.04	173.45	77.9
Gratiot07 26	45.5	386.4	101.6	1636	37.5	185.6	130.0	5.63	0.49	0.7	0.86	316.1	0.96	1.28	69.6	0.27	0.12	24.7	0.1	0.04	190.09	38.8

Platte Lake Sediment Fact Sheet

Date sampled: 7 July 2007
Location: Benzie County
Sampling site: 45º 06.172' N
83º 57.378' W
Lake surface area: 2,516 acres

Sampling site water depth: 94.5 ft
Depth of core: 44 cm
Sedimentation rate: 1885 g/m^2/y
Age of oldest section: 1945
Focusing factor: 3.44

Platte lake had a high sedimentation rate and elemental reference values were not able to be determined.

Anthropogenic accumulation rate trends for mercury appear to be increasing to the surface sediments.

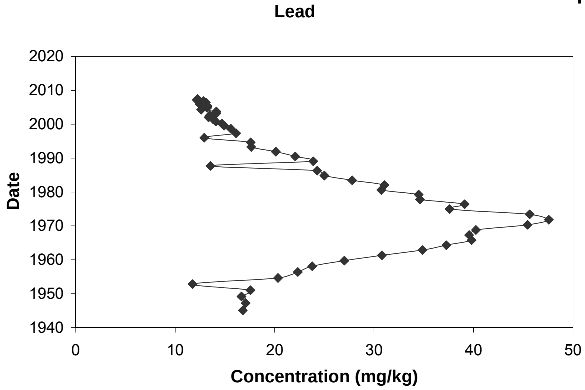
Accumulation rates of copper and zinc in Platte lake are characterized by two distinct events within its geochemical history. Peaks appear to occur both in the early 1970's and, more recently, in the late 1990's or early 2000's. However, recent trends for both elements appear to be decreasing in this lake.

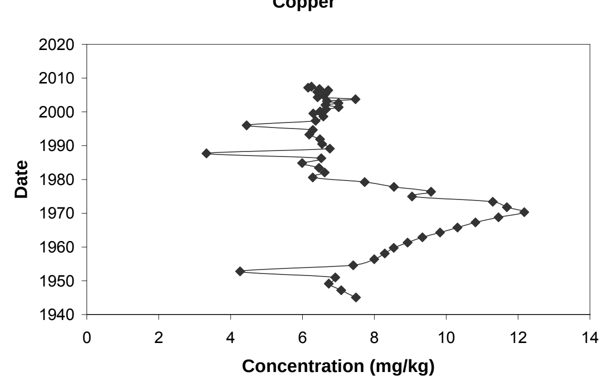
	Surface Concentration	Background Concentration	Trends
Cadmium (mg/kg)	0.32		Decreasing
Copper (mg/kg)	6.29		Decreasing
Lead (mg/kg)	12.43		Decreasing
Mercury (mg/kg)	0.06		Increasing
Zinc (mg/kg)	28.1		Decreasing
Total PCBs (µg/kg)	2.4		Increasing
Total PAHs (µg/kg)	86.8		Increasing
Total Pesticides (µg/kg)	8.3		Decreasing
DDTs (µg/kg)	5.7		Decreasing

Background Concentrations for Platte Lake could not be determined.

Trends for organic contaminants are taken from only two data points and should be interpreted with care.

Example profiles





A Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters: Sediments

Lake: Platte **Water Depth (m):** 28.8

Sampling Date: 7/11/2007 **Latitude (N):** 44.7011 **Longitude (W):** -86.113

Core Description: Zooplankton evident in top water; worm tubes (~2 mm) at sediment/water interface; top 3.5 cm light brown sediment, followed by 9-10 cm of grayish sediment (dark gray to gray transition extending from 3.5 cm-21 cm); grayish-black sediment from 21-39 cm; lighter gray sediemnt with numerous small (2 mm) gas pockets for remainder of core length

Sample Number	Jar Number	Thickness (cm)	Total Thickness (cm)	Description
Platte 1	1	0.5	0.5	watery light brown sediment
Platte 2	2	0.5	1.0	watery light brown sediment
Platte 3	3	0.5	1.5	light brown with streaks of gray
Platte 4	4	0.5	2.0	light brown with more streaks of gray
Platte 5	5	0.5	2.5	brownish gray sediments with heavy streak of black
Platte 6	6	0.5	3.0	brownish gray sediments with several heavy streaks of black
Platte 7	7	0.5	3.5	grayish sediment with heavy black streaks
Platte 8	8	0.5	4.0	grayish sediment with few black streaks
Platte 9	9	0.5	4.5	grayish sediment with few black streaks
Platte 10	10	0.5	5.0	grayish sediment with few black streaks
Platte 11	11	0.5	5.5	grayish and blackish sediments (50/50)
Platte 12	12	0.5	6.0	mottled gray and black sediments
Platte 13	13	0.5	6.5	mottled gray and black sediments
Platte 14	14	0.5	7.0	mottled gray and black sediments
Platte 15	15	0.5	7.5	mottled gray and black sediments
Platte 16	16	0.5	8.0	dark gray sediment, streaks of gray and black
Platte 17	17	1.0	9.0	dark gray sediment, streaks of gray and black
Platte 18	18	1.0	10.0	dark gray sediment, streaks of gray and black
Platte 19	19	1.0	11.0	dark gray sediment, streaks of gray and black
Platte 20	20	1.0	12.0	dark gray, streaks of black, segmented worms
Platte 21	21	1.0	13.0	dark gray, streaks of black, thick
Platte 22	22	1.0	14.0	dark gray sediment
Platte 23	23	1.0	15.0	dark gray sediment
Platte 24	24	1.0	16.0	dark gray sediment
Platte 25	25	1.0	17.0	dark gray sediment
Platte 26	26	1.0	18.0	dark gray sediment
Platte 27	27	1.0	19.0	dark gray sediment, several gas pockets
Platte 28	28	1.0	20.0	dark gray sediment, several gas pockets
Platte 29	29	1.0	21.0	dark gray sediment, several gas pockets
Platte 30	30	1.0	22.0	dark gray sediment, several gas pockets, few streaks of brown
Platte 31	31	1.0	23.0	dark gray sediment, several gas pockets, few streaks of brown
Platte 32	32	1.0	24.0	dark gray sediment, several gas pockets, few streaks of brown
Platte 33	33	1.0	25.0	blackish-gray sediment, streaks of brown and black, gas pock
Platte 34	34	1.0	26.0	blackish-gray sediment, streaks of brown and black, gas pock

Sample Number	Jar Number	Thickness (cm)	Total Thickness (cm)	Description
Platte 35	35	1.0	27.0	blackish-gray sediment, streaks of brown and black, gas pock
Platte 36	36	1.0	28.0	blackish-gray sediment, streaks of brown and black, gas pock
Platte 37	37	1.0	29.0	sediment lighter gray than above, streaks of brown and black,
Platte 38	38	1.0	30.0	sediment lighter gray than above, streaks of brown and black,
Platte 39	39	1.0	31.0	dark gray sediment, gas pockets, streaks of brown and black
Platte 40	40	1.0	32.0	dark gray sediment, gas pockets, streaks of brown and black
Platte 41	41	1.0	33.0	dark gray sediment, gas pockets
Platte 42	42	1.0	34.0	dark gray sediment, gas pockets
Platte 43	43	1.0	35.0	dark gray sediment, gas pockets
Platte 44	44	1.0	36.0	dark gray sediment, gas pockets
Platte 45	45	1.0	37.0	dark gray sediment, gas pockets
Platte 46	46	1.0	38.0	dark gray, fewer gas pockets
Platte 47	47	1.0	39.0	dary gray, fewer gas pockets, but large
Platte 48	48	1.0	40.0	dark gray, few gas pockets
Platte 49	49	1.0	41.0	dark gray, few gas pockets
Platte 50	50	1.0	42.0	dark gray, few gas pockets, very thick
Platte 51	51	1.0	43.0	dark gray, thick
Platte 52	52	1.0	44.0	dark gray, some gas pockets, very thick
Platte 53	53	1.0	45.0	dark gray, some gas pockets, very thick
Platte 54	54	1.0	46.0	dark gray, some gas pockets, very thick
Platte 55	55	1.0	47.0	dark gray, some gas pockets, very thick
Platte 56	56	1.0	48.0	dark gray, some gas pockets, very thick

210-Pb Analysis: Platte Lake

Data provided by Paul Wilkinson, Freshwater Institute, Manitoba, Canada

Sample	Dry Weight (g)	Accumulated Dry Weight (g/sq. cm)	Porosity	Percent Water	Excess Pb-210 (Bq/g)	Activity Bq/g +/- 2SD Pb-210 +/- Error	Activity Bq/g +/- 2SD Cs-137 +/- Error
Platte 1	3.73	0.0526	0.98	94.2	3.21E-01	3.36E-01 +/- 1.69E-02	1.65E-02 +/- 3.27E-03
Platte 2	3.99	0.1089	0.95	86.8	3.18E-01	3.33E-01 +/- 1.61E-02	
Platte 3	5.60	0.1879	0.93	82.9	3.04E-01	3.19E-01 +/- 1.63E-02	1.58E-02 +/- 3.15E-03
Platte 4	5.24	0.2619	0.94	83.3	3.13E-01	3.28E-01 +/- 1.58E-02	
Platte 5	7.95	0.3740	0.93	82.9	2.94E-01	3.09E-01 +/- 1.61E-02	1.76E-02 +/- 2.60E-03
Platte 6	6.72	0.4688	0.93	83.1	3.13E-01	3.28E-01 +/- 1.71E-02	
Platte 7	7.34	0.5724	0.93	81.4	3.19E-01	3.34E-01 +/- 1.63E-02	1.37E-02 +/- 2.80E-03
Platte 8	7.11	0.6727	0.93	81.2	3.28E-01	3.43E-01 +/- 1.66E-02	
Platte 9	7.49	0.7784	0.92	80.9	3.26E-01	3.41E-01 +/- 1.74E-02	1.96E-02 +/- 2.92E-03
Platte 10	7.37	0.8823	0.92	79.6	3.16E-01	3.31E-01 +/- 1.57E-02	
Platte 11	8.11	0.9968	0.92	80.4	3.07E-01	3.22E-01 +/- 1.54E-02	1.90E-02 +/- 2.42E-03
Platte 12	8.07	1.1106	0.92	80.2	3.18E-01	3.33E-01 +/- 1.57E-02	
Platte 13	8.10	1.2249	0.92	79.4	3.11E-01	3.26E-01 +/- 1.55E-02	1.70E-02 +/- 2.50E-03
Platte 14	8.43	1.3438	0.92	79.8	3.08E-01	3.23E-01 +/- 1.64E-02	
Platte 15	8.28	1.4606	0.92	79.3	2.94E-01	3.09E-01 +/- 1.45E-02	1.47E-02 +/- 2.58E-03
Platte 16	7.80	1.5707	0.92	79.5	2.94E-01	3.09E-01 +/- 1.47E-02	
Platte 17	16.93	1.8095	0.92	78.8	3.00E-01	3.15E-01 +/- 1.48E-02	1.74E-02 +/- 2.36E-03
Platte 18	17.56	2.0573	0.91	78.3	2.86E-01	3.01E-01 +/- 1.46E-02	
Platte 19	18.11	2.3128	0.91	77.2	2.64E-01	2.79E-01 +/- 1.33E-02	1.79E-02 +/- 2.56E-03
Platte 20	18.09	2.5680	0.91	76.9	2.38E-01	2.53E-01 +/- 1.24E-02	
Platte 21	18.22	2.8251	0.90	76.4	2.44E-01	2.59E-01 +/- 1.25E-02	1.52E-02 +/- 2.32E-03
Platte 22	19.19	3.0958	0.90	76.2	2.40E-01	2.55E-01 +/- 1.24E-02	
Platte 23	17.98	3.3495	0.90	76.4	2.29E-01	2.44E-01 +/- 1.18E-02	2.19E-02 +/- 2.43E-03
Platte 24	19.32	3.6220	0.90	75.8	2.20E-01	2.35E-01 +/- 1.18E-02	
Platte 25	17.91	3.8747	0.90	75.6	2.06E-01	2.21E-01 +/- 1.03E-02	2.20E-02 +/- 2.71E-03
Platte 26	20.02	4.1572	0.90	75.3	1.82E-01	1.97E-01 +/- 9.52E-03	
Platte 27	18.92	4.4241	0.90	75.2	1.79E-01	1.94E-01 +/- 9.40E-03	2.73E-02 +/- 3.28E-03
Platte 28	18.20	4.6809	0.90	75.3	1.72E-01	1.87E-01 +/- 9.11E-03	
Platte 29	19.24	4.9523	0.90	75.1	1.60E-01	1.75E-01 +/- 8.69E-03	2.71E-02 +/- 2.98E-03
Platte 30	18.98	5.2201	0.89	74.5	1.61E-01	1.76E-01 +/- 8.61E-03	
Platte 31	18.02	5.4743	0.89	74.6	1.40E-01	1.55E-01 +/- 7.52E-03	3.34E-02 +/- 3.30E-03
Platte 32	19.84	5.7542	0.89	74.4	1.32E-01	1.47E-01 +/- 7.12E-03	
Platte 33	18.64	6.0172	0.89	74.2	1.28E-01	1.43E-01 +/- 7.05E-03	3.76E-02 +/- 3.06E-03
Platte 34	19.11	6.2868	0.89	73.1	1.19E-01	1.34E-01 +/- 6.68E-03	

Sample	Dry Weight (g)	Accumulated Dry Weight (g/sq. cm)	Porosity	Percent Water	Excess Pb-210 (Bq/g)	Activity Bq/g +/- 2SD Pb-210 +/- Error	Activity Bq/g +/- 2SD Cs-137 +/- Error
Platte 35	22.24	6.6006	0.88	71.6	1.09E-01	1.24E-01 +/- 6.31E-03	4.39E-02 +/- 3.11E-03
Platte 36	20.64	6.8918	0.88	72.2	1.14E-01	1.29E-01 +/- 6.31E-03	
Platte 37	19.64	7.1689	0.89	72.8	1.23E-01	1.38E-01 +/- 7.00E-03	6.66E-02 +/- 3.10E-03
Platte 38	20.74	7.4615	0.89	73.2	1.26E-01	1.41E-01 +/- 7.07E-03	
Platte 39	19.30	7.7338	0.89	73.1	1.21E-01	1.36E-01 +/- 6.85E-03	7.47E-02 +/- 3.45E-03
Platte 40	20.87	8.0282	0.89	73.6	1.27E-01	1.42E-01 +/- 7.05E-03	9.42E-02 +/- 3.54E-03
Platte 41	18.70	8.2920	0.89	73.6	1.11E-01	1.26E-01 +/- 6.36E-03	1.07E-01 +/- 4.05E-03
Platte 42	19.81	8.5715	0.89	73.0	1.04E-01	1.19E-01 +/- 5.77E-03	6.57E-02 +/- 3.11E-03
Platte 43	21.12	8.8695	0.88	72.3	1.01E-01	1.16E-01 +/- 5.71E-03	5.81E-02 +/- 3.30E-03
Platte 44	21.22	9.1689	0.88	71.2	9.03E-02	1.05E-01 +/- 5.32E-03	
Platte 45	22.90	9.4920	0.87	70.5	8.39E-02	9.89E-02 +/- 5.23E-03	3.41E-02 +/- 1.29E-03
Platte 46	22.99	9.8163	0.87	70.4	8.49E-02	9.99E-02 +/- 5.74E-03	
Platte 47	23.95	10.1542	0.87	69.6	6.88E-02	8.38E-02 +/- 4.38E-03	1.13E-02 +/- 2.19E-03
Platte 48	24.26	10.4965	0.86	68.8	5.87E-02	7.37E-02 +/- 4.19E-03	
Platte 49	24.22	10.8382	0.86	68.4	5.38E-02	6.88E-02 +/- 3.81E-03	5.41E-03 +/- 1.58E-03
Platte 50	24.41	11.1826	0.86	67.6	5.15E-02	6.65E-02 +/- 3.98E-03	
Platte 51	27.87	11.5758	0.85	66.4	4.35E-02	5.85E-02 +/- 3.81E-03	0.00E+00 +/- 0.00E+00
Platte 52	29.76	11.9956	0.85	65.3	4.29E-02	5.79E-02 +/- 3.53E-03	
Platte 53	26.85	12.3744	0.84	65.0	3.98E-02	5.48E-02 +/- 3.47E-03	
Platte 54	28.02	12.7698	0.84	64.5	3.45E-02	4.95E-02 +/- 3.27E-03	
Platte 55	28.95	13.1782	0.84	64.6	3.46E-02	4.96E-02 +/- 2.86E-03	
Platte 56	26.43	13.5511	0.84	63.7	3.59E-02	5.09E-02 +/- 3.13E-03	

Metal Concentration in the Sediment: Platte Lake

Concentration in mg/kg dry weight

Sample	Mg	Al	K	Ca	Fe	Ti	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Sn	Ba	Pb	U
Platte 1	743	201	36	41500	1257	14.0	6.3	4.77	692	3.3	6.3	31.6	3.21	1.73	224.1	0.48	0.35	0.13	106.0	12.3	0.23
Platte 2	874	221	28	50002	1289	18.4	5.7	4.81	619	2.0	6.2	24.1	2.45	1.65	229.4	0.38	0.30	0.12	101.9	12.2	0.20
Platte 3	0	0	0	0	2	13.4	5.9	5.26	595	2.4	6.5	28.6	2.46	1.71	242.7	0.35	0.31	0.10	104.7	12.8	0.23
Platte 4	649	186	20	36162	888	16.6	6.3	5.49	573	2.8	6.7	29.2	2.35	1.99	246.7	0.41	0.32	0.11	104.7	13.1	0.26
Platte 5	755	218	26	42675	1056	15.6	6.1	5.20	530	2.9	6.4	27.6	2.30	1.85	232.0	0.40	0.30	0.10	97.9	12.5	0.26
Platte 6	562	147	20	32464	756	13.9	6.1	5.20	548	3.0	6.6	29.2	2.39	1.73	245.1	0.47	0.35	0.06	100.6	13.3	0.29
Platte 7	513	142	18	29714	705	15.8	6.3	5.22	543	2.1	6.6	64.5	2.34	1.81	243.2	0.48	0.31	0.11	99.7	13.2	0.28
Platte 8	548	142	19	31889	751	13.4	5.9	5.34	526	2.5	6.4	31.3	2.42	1.62	233.3	0.50	0.37	0.35	95.3	12.6	0.27
Platte 9	589	177	28	34136	794	19.1	7.1	5.92	587	3.1	7.5	42.3	3.15	2.19	263.0	0.68	0.45	0.17	106.2	14.1	0.31
Platte 10	571	156	24	33154	772	14.8	6.3	5.63	559	2.4	6.7	35.8	2.58	1.81	247.0	0.50	0.36	0.27	100.7	14.1	0.29
Platte 11	539	154	27	31140	715	16.0	6.4	6.00	558	3.5	7.0	35.7	2.42	1.93	249.9	0.39	0.27	0.06	100.6	13.5	0.25
Platte 12	500	145	24	28710	672	16.7	6.3	5.28	542	2.5	6.6	30.2	2.80	1.94	241.4	0.54	0.36	0.10	97.9	13.4	0.26
Platte 13	119	32	11	6912	167	13.8	6.3	12.93	538	4.1	7.0	32.5	2.79	1.77	242.0	0.65	0.37	0.10	97.3	13.8	0.31
Platte 14	553	163	27	32206	796	16.8	6.4	5.20	533	2.6	6.7	27.5	2.89	1.87	235.8	0.59	0.42	0.34	97.3	14.1	0.30
Platte 15	511	136	22	29871	736	18.4	6.2	5.11	522	2.0	6.5	85.2	2.33	1.62	233.1	0.36	0.23	0.04	94.6	14.7	0.27
Platte 16	558	143	43	32764	778	10.5	5.9	4.80	506	1.9	22.2	43.0	2.43	1.51	230.2	0.44	0.31	0.18	92.0	14.9	0.26
Platte 17	506	146	25	29596	689	13.5	6.4	5.04	507	2.5	6.6	56.4	2.68	1.76	228.7	0.48	0.38	0.08	105.0	15.6	0.26
Platte 18	482	135	20	28501	632	12.1	6.1	4.87	498	2.2	6.4	50.2	2.48	1.64	225.4	0.38	0.42	0.06	90.0	16.1	0.24
Platte 19	386	119	18	22423	487	11.0	4.8	3.98	377	1.2	4.4	30.5	1.43	1.43	173.2	0.19	0.17	0.00	70.3	12.9	0.17
Platte 20	486	157	25	28257	588	16.0	6.3	5.11	494	2.2	6.3	34.7	2.41	1.97	223.7	0.37	0.34	0.06	89.8	17.6	0.24
Platte 21	497	148	22	29128	591	12.0	5.8	4.98	467	2.3	6.2	121.1	2.40	1.69	214.6	0.39	0.37	0.11	85.2	17.6	0.22
Platte 22	512	162	26	29971	630	14.6	6.3	5.06	490	2.5	6.5	48.5	2.64	1.93	227.1	0.42	0.41	0.08	89.8	20.1	0.25
Platte 23	532	179	28	31387	676	17.2	6.6	5.02	501	2.2	6.5	34.2	2.63	2.10	231.6	0.42	0.40	0.04	91.7	22.1	0.21
Platte 24	506	167	25	30028	669	16.5	6.7	5.17	513	2.5	6.8	40.4	2.80	2.05	239.5	0.54	0.44	0.54	94.0	23.9	0.23
Platte 25	277	91	20	16371	368	8.8	3.7	2.87	289	0.3	3.3	19.4	0.64	1.17	133.7	0.05	0.37	0.40	53.5	13.5	0.13
Platte 26	526	157	21	31204	668	11.5	6.1	4.77	480	2.9	6.5	33.3	3.01	1.76	229.4	0.64	0.54	0.19	88.2	24.3	0.28
Platte 27	502	168	26	30341	674	13.8	6.1	4.52	455	2.1	6.0	33.7	2.33	1.86	218.9	0.43	0.48	0.12	84.8	25.0	0.25
Platte 28	499	154	21	30125	700	11.4	5.9	4.49	460	3.5	6.5	30.5	2.84	1.71	224.2	0.58	0.43	0.11	84.7	27.8	0.28
Platte 29	488	164	27	29311	752	13.8	6.2	4.67	481	2.1	6.6	39.6	2.87	1.86	231.5	0.62	0.41	0.13	88.6	31.0	0.32

Metal Concentration in the Sediment: Platte Lake

Concentration in mg/kg dry weight

Sample	Mg	Al	K	Ca	Fe	Ti	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Sn	Ba	Pb	U
Platte 30	501	162	25	30495	752	12.5	6.0	4.46	465	2.0	6.3	33.1	2.62	1.78	225.8	0.53	0.35	0.07	85.7	30.7	0.29
Platte 31	487	146	23	29631	678	12.3	6.2	5.02	501	4.2	7.7	51.6	3.18	1.75	242.5	0.65	0.54	0.22	91.3	34.5	0.32
Platte 32	487	144	9	29240	638	13.0	6.1	4.91	495	2.6	8.5	45.9	3.17	1.72	246.6	0.63	0.65	0.89	93.2	34.6	0.30
Platte 33	549	176	15	32387	732	15.4	6.8	5.35	526	3.9	9.6	48.5	3.45	1.94	258.9	0.60	0.56	0.12	98.0	39.1	0.34
Platte 34	490	166	19	28725	651	18.4	6.6	5.16	494	2.6	9.0	45.6	3.08	1.96	239.3	0.56	0.50	0.18	91.3	37.6	0.34
Platte 35	563	213	22	32352	867	20.9	7.9	6.53	530	3.6	11.3	58.7	3.92	2.42	255.1	0.86	0.65	0.15	100.0	45.6	0.44
Platte 36	535	218	23	30540	933	19.6	7.9	6.24	498	3.0	11.7	62.0	3.71	2.47	244.4	0.91	0.57	0.42	97.4	47.6	0.51
Platte 37	544	196	18	31612	1026	15.0	7.4	6.19	488	3.5	12.2	62.8	4.25	2.10	242.6	1.23	0.73	0.23	94.1	45.4	0.58
Platte 38	509	227	27	29701	995	23.5	8.1	6.33	499	4.7	11.5	69.1	4.12	2.59	235.7	1.21	0.98	0.55	95.4	40.2	0.57
Platte 39	504	212	20	29678	861	17.2	7.8	6.61	501	3.3	10.8	76.6	3.74	2.22	244.1	0.98	0.67	0.16	95.2	39.6	0.47
Platte 40	558	221	27	32490	894	19.8	7.9	6.15	493	3.0	10.3	56.0	3.46	2.46	245.7	0.76	0.61	0.10	95.9	39.8	0.43
Platte 41	515	196	25	30446	802	19.5	7.6	6.01	491	3.2	9.8	58.8	3.36	2.40	250.6	0.82	0.63	0.13	96.6	37.3	0.48
Platte 42	519	185	28	30246	758	15.9	7.1	5.90	475	3.0	9.3	53.0	3.11	2.33	246.7	0.72	0.86	0.10	94.9	34.9	0.42
Platte 43	555	195	26	33099	868	15.7	6.8	5.48	464	3.0	8.9	48.7	3.37	2.17	243.7	0.83	0.69	0.14	92.5	30.8	0.43
Platte 44	513	167	24	31080	750	15.4	6.4	5.26	470	3.0	8.5	60.4	2.99	1.98	251.9	0.61	0.58	0.08	93.2	27.0	0.38
Platte 45	503	166	24	30573	698	16.4	6.3	5.11	470	2.6	8.3	48.9	3.26	2.06	251.7	0.66	0.70	0.14	92.9	23.8	0.37
Platte 46	541	179	29	32593	703	16.8	6.3	5.22	471	2.7	8.0	39.9	3.08	2.13	255.9	0.63	0.67	0.80	94.3	22.3	0.37
Platte 47	541	250	29	32550	679	13.9	5.9	4.85	462	2.8	7.4	55.1	3.20	1.93	254.2	0.64	0.71	0.17	92.8	20.3	0.31
Platte 48	353	116	21	21306	428	10.8	3.7	2.77	291	0.6	4.3	29.4	1.00	1.34	163.0	0.13	0.21	0.26	59.6	11.7	0.15
Platte 49	513	178	29	30753	616	18.6	6.2	4.84	452	2.6	6.9	31.2	3.02	2.37	252.7	0.68	0.70	0.17	92.7	17.6	0.32
Platte 50	531	194	36	31686	629	19.8	6.4	4.93	456	2.3	6.7	33.2	2.56	2.47	254.1	0.44	0.53	0.09	93.0	16.7	0.29
Platte 51	530	197	31	31879	612	20.5	6.7	5.19	472	3.0	7.1	31.9	3.29	2.53	267.0	0.63	0.70	0.17	97.2	17.1	0.30
Platte 52	530	173	31	32074	615	17.7	6.2	4.83	465	2.4	7.5	30.5	2.74	2.21	259.1	0.49	0.60	0.11	95.1	16.8	0.28

Metal Concentration in the Porewater: Platte Lake

Concentration in ng/mL, 0.0 Depth is the topwater sample

Sample	Depth	Mg	K	Ca	Mn	Fe	P	V	Cr	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Ba	Pb	U	B	Al
Platte 0	0.0	1153.6	73.5	4651	13.1	9.9	0.0	0.11	0.00	0	0.01	112.1	0.00	0.51	105.2	0.54	0.00	25.1	0.2	0.21	0.16	4300.0
Platte 1	0.5	1147.6	95.1	5017	53.5	121.2	9.4	0.67	0.30	0.07	0.37	562.4	2.05	0.88	127.8	0.79	0.11	62.4	0.2	0.16	8.43	10645.4
Platte 2	1.5	1280.1	119.4	5749	45.9	481.6	104.0	0.82	0.13	0.2	0.29	543.1	3.89	0.98	139.0	0.50	0.08	63.2	0.1	0.06	14.02	14093.7
Platte 3	2.5	1328.9	121.9	6035	43.6	215.4	126.2	0.84	0.17	0.44	0.46	784.0	2.39	1.02	139.6	0.33	0.07	62.4	0.0	0.05	21.15	14511.2
Platte 4	3.5	1320.7	122.3	6188	44.9	155.3	93.6	0.53	0.11	0	0.37	458.0	1.92	1.00	140.6	0.22	0.02	68.8	0.0	0.03	13.91	14889.4
Platte 5	5.5	1494.4	141.2	7216	57.0	196.5	124.1	0.88	0.14	0.03	0.23	1024.8	1.63	1.03	143.0	0.20	0.03	51.6	0.0	0.05	10.06	15413.6
Platte 6	6.5	1313.3	126.9	6653	53.0	243.9	145.9	0.55	0.10	0	0.18	290.2	1.06	1.03	142.8	0.15	0.03	41.0	0.0	0.03	4.73	15923.8
Platte 7	7.5	1339.2	136.8	7133	56.7	218.2	204.8	0.88	0.18	0	0.34	594.0	0.88	1.19	160.5	0.14	0.03	46.5	0.0	0.03	13.38	18354.2
Platte 8	8.5	1548.4	159.3	8549	68.1	388.5	460.5	0.71	0.16	0	0.22	518.1	0.87	1.19	160.7	0.15	0.04	44.3	0.0	0.03	3.88	18579.0
Platte 9	9.5	1313.5	135.2	7364	58.3	238.5	254.4	0.76	0.22	0.18	0.32	685.8	1.09	1.23	160.1	0.21	0.09	61.0	0.0	0.03	3.67	18846.8
Platte 10	11.5	1419.8	149.0	8104	62.4	375.2	544.3	0.54	0.16	0.15	0.48	253.2	1.14	1.34	170.1	0.23	0.10	40.6	0.0	0.02	5.81	19956.4
Platte 11	13.5	1412.4	148.5	8174	62.7	159.3	206.6	1.26	0.24	0.31	0.64	1243.9	1.12	1.39	172.9	0.24	0.06	52.1	0.0	0.04	5.41	20342.8
Platte 12	15.5	1433.3	157.4	8416	65.0	304.4	352.6	0.83	0.27	0.56	0.42	648.7	1.21	1.52	180.8	0.19	0.07	56.0	0.0	0.02	4.53	20964.5
Platte 13	17.5	1475.3	163.3	8807	68.4	421.0	611.5	0.67	0.15	0.56	0.62	525.9	1.27	1.62	187.2	0.22	0.09	46.2	0.0	0.02	1.10	21457.5
Platte 14	19.5	1544.1	173.5	9301	71.8	453.6	643.3	0.61	0.15	0.22	0.30	345.2	1.07	1.56	186.6	0.12	0.03	45.5	0.0	0.01	1.81	21070.7
Platte 15	21.5	1629.7	184.1	9898	78.7	479.1	691.4	0.62	0.21	0.55	1.06	243.2	1.21	1.63	195.4	0.17	0.05	88.2	0.1	0.02	5.67	21809.6
Platte 16	23.5	1647.7	189.1	10151	80.7	531.5	707.8	0.51	0.19	0.43	0.40	168.8	1.14	1.73	202.1	0.15	0.06	45.6	0.0	0.01	1.27	22236.4
Platte 17	25.5	1674.3	193.1	10343	83.8	502.0	588.0	0.75	0.19	0.51	0.35	532.7	1.32	1.72	200.2	0.18	0.06	53.9	0.0	0.02	6.43	21566.9
Platte 18	27.5	1625.7	188.7	10156	82.7	712.2	1023.2	0.56	0.40	0.98	0.53	254.1	1.45	1.79	207.9	0.25	0.14	53.8	0.0	0.02	3.72	22091.8
Platte 19	29.5	1519.2	176.2	9472	79.9	447.9	452.7	1.10	0.32	0.61	0.43	1181.6	1.40	1.77	204.2	0.19	0.06	119.2	0.0	0.02	4.22	21509.6
Platte 20	31.5	1577.4	186.7	9965	82.5	582.2	659.4	0.64	0.23	0.65	0.38	355.8	1.35	1.78	206.4	0.19	0.07	49.5	0.0	0.01	2.84	21710.1
Platte 21	35.5	1608.3	192.9	10172	85.4	634.8	719.9	0.88	0.44	2.66	8.39	559.7	1.57	1.92	218.8	0.23	0.11	58.5	0.5	0.02	7.63	22922.6
Platte 22	37.5	1678.6	195.3	10752	90.9	709.0	755.3	0.73	0.30	0.84	0.50	440.3	1.79	1.94	219.8	0.27	0.11	54.2	0.0	0.02	2.91	22659.2
Platte 23	39.5	1655.0	192.9	10546	88.2	781.9	812.6	0.79	0.29	0.58	0.36	556.2	1.10	1.82	215.0	0.13	0.02	82.4	0.0	0.01	2.70	22009.3
Platte 24	41.5	1732.5	202.1	11223	94.9	950.6	1343.2	0.57	0.28	0.88	0.55	269.5	1.67	2.00	230.4	0.25	0.14	70.4	0.0	0.01	2.30	22923.7
Platte 25	43.5	1697.8	199.7	11097	93.2	944.5	1112.3	0.75	0.38	1.2	0.77	466.7	1.83	2.02	230.1	0.28	0.14	59.0	0.0	0.02	3.42	22485.6
Platte 26	45.3	1655.4	195.1	10802	90.3	877.3	970.0	0.74	0.29	0.9	0.43	637.4	1.41	1.93	222.4	0.21	0.07	58.3	0.0	0.01	3.68	21670.6
Platte 27	47.5	1691.8	199.9	11167	91.9	889.5	907.2	0.73	0.41	0.94	0.49	553.3	1.62	1.98	229.6	0.20	0.09	77.3	0.0	0.01	5.06	22100.8
Platte 28	49.4	1780.6	211.5	11705	96.9	1110.9	1548.5	0.63	0.34	1.06	0.60	244.6	1.83	2.09	241.5	0.28	0.17	72.3	0.0	0.02	2.41	22963.7
Platte 29	51.4	1783.2	214.6	11797	95.1	1038.1	1219.6	0.63	0.38	1.04	0.55	274.7	1.72	2.09	240.7	0.34	0.15	61.2	0.0	0.01	2.94	22773.3
Platte 30	53.4	1689.6	200.4	11145	89.9	822.0	593.7	0.66	0.38	1.15	0.60	285.2	1.65	2.04	231.1	0.33	0.14	49.9	0.0	0.01	3.01	22068.7

Thompson Lake Sediment Fact Sheet

Date sampled: 22 May 2007
Location: Livingston County
Sampling site: 42º 36.858' N
83º 54.941' W
Lake surface area: 150 acres

Sampling site water depth: 55.8 ft
Depth of core: 54 cm
Sedimentation rate: 449 $g/m^2/y$
Age of oldest section: 1708
Focusing factor: 1.5

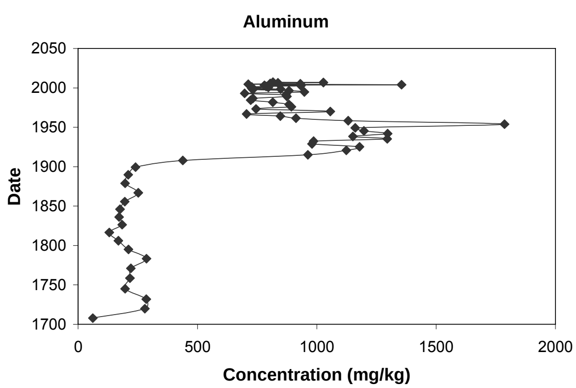
Thompson Lake exhibited the highest concentration of arsenic measured in surface concentrations to date exceeding the PEC threshold with a value of 108.6 mg/kg averaged in the top 1.5 cm of sediment.

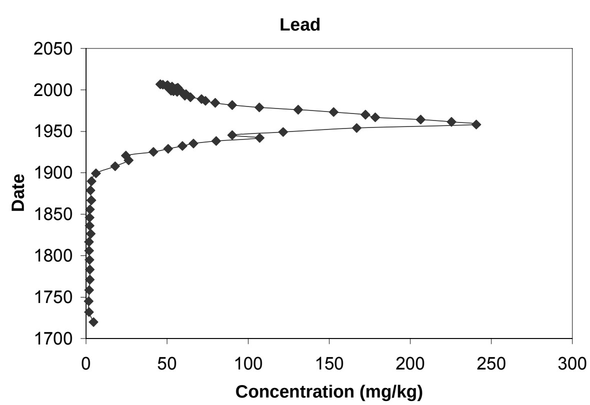
Thompson Lake results showed historically elevated PCB's, particularly in ^{210}Pb dated 1970's and 1980's sediment.

	Surface Concentration	Background Concentration	Trends
Cadmium (mg/kg)	0.55	0.4	Decreasing
Copper (mg/kg)	64.04	5.48	Decreasing
Lead (mg/kg)	46.59	2.32	Decreasing
Mercury (mg/kg)	0.06	0.03	Decreasing
Zinc (mg/kg)	108.64	27.12	Decreasing
Total PCBs (µg/kg)	111.5		Decreasing
Total PAHs (µg/kg)	2751.4		Decreasing
Total Pesticides (µg/kg)	141.5		Increasing
DDTs (µg/kg)	11.9		Decreasing

Trends for organic contaminants are taken from only two data points and should be interpreted with care.

Example profiles





A Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters: Sediments

Lake: Thompson **Water Depth (m):** 17.0

Sampling Date: 5/22/2007 **Latitude (N):** 42.6143 **Longitude (W):** -83.9164

Core Description: ~ 54.5 cm total, 0-3 cm grainy unconsolidated sediment, large (~1 cm) gas pockets at 20 cm and smaller gas pockets (~0.1 cm) from 20 cm down to the bottom of the core; black sediments throughout core; Daphnia present in top water

Sample Number	Jar Number	Thickness (cm)	Total Thickness (cm)	Description
Thompson 1	1	0.5	0.5	unconsolidated black sediment
Thompson 2	2	0.5	1.0	unconsolidated black sediment
Thompson 3	3	0.5	1.5	grayish-black fluffy sediment
Thompson 4	4	0.5	2.0	firmer grayish-black sediment
Thompson 5	5	0.5	2.5	firmer grayish-black sediment
Thompson 6	6	0.5	3.0	firmer grayish-black sediment
Thompson 7	7	0.5	3.5	firmer grayish-black sediment
Thompson 8	8	0.5	4.0	dark brown and black sediments
Thompson 9	9	0.5	4.5	dark brown, black and gray sediments
Thompson 10	10	0.5	5.0	dark brown, black and gray sediments
Thompson 11	11	0.5	5.5	dark brown, black and gray sediments
Thompson 12	12	0.5	6.0	grayish brown sediments
Thompson 13	13	0.5	6.5	grayish brown sediments
Thompson 14	14	0.5	7.0	grayish brown sediments
Thompson 15	15	0.5	7.5	brown with black sediment
Thompson 16	16	0.5	8.0	brown with black sediment
Thompson 17	17	1.0	9.0	brown with black sediment
Thompson 18	18	1.0	10.0	brown with black sediment
Thompson 19	19	1.0	11.0	dark brown sediment with black streaks
Thompson 20	20	1.0	12.0	dark brown sediment with black streaks
Thompson 21	21	1.0	13.0	dark brown sediment with black streaks
Thompson 22	22	1.0	14.0	brownish-gray sediments
Thompson 23	23	1.0	15.0	brownish-gray sediments
Thompson 24	24	1.0	16.0	brownish-gray sediments
Thompson 25	25	1.0	17.0	brownish-gray sediments
Thompson 26	26	1.0	18.0	brownish-gray sediments
Thompson 27	27	1.0	19.0	brownish-gray sediments
Thompson 28	28	1.0	20.0	brownish-gray sediments
Thompson 29	29	1.0	21.0	brownish-gray sediments
Thompson 30	30	1.0	22.0	brownish-gray sediments
Thompson 31	31	1.0	23.0	brownish-gray sediments
Thompson 32	32	1.0	24.0	brownish-gray sediments
Thompson 33	33	1.0	25.0	grayish-black sediments
Thompson 34	34	1.0	26.0	grayish-black sediments, sediments more chunky, gassy

Sample Number	Jar Number	Thickness (cm)	Total Thickness (cm)	Description
Thompson 35	35	1.0	27.0	black sediments, chunky, gassy
Thompson 36	36	1.0	28.0	black sediments, chunky, gassy
Thompson 37	37	1.0	29.0	black sediments, chunky, gassy
Thompson 38	38	1.0	30.0	black sediments, chunky, gassy
Thompson 39	39	1.0	31.0	black sediments, chunky, gassy
Thompson 40	40	1.0	32.0	black sediments, chunky, gassy
Thompson 41	41	1.0	33.0	black sediments, chunky, gassy
Thompson 42	42	1.0	34.0	black sediments, chunky, gassy
Thompson 43	43	1.0	35.0	black sediments, chunky, gassy
Thompson 44	44	1.0	36.0	black sediments, chunky, gassy
Thompson 45	45	1.0	37.0	black sediments, less gassy
Thompson 46	46	1.0	38.0	black sediments, less gassy
Thompson 47	47	1.0	39.0	black sediments
Thompson 48	48	1.0	40.0	black and brown sediments
Thompson 49	49	1.0	41.0	black and brown sediments
Thompson 50	50	1.0	42.0	black and brown sediments
Thompson 51	51	1.0	43.0	black and brown sediments
Thompson 52	52	1.0	44.0	black and brown sediments
Thompson 53	53	1.0	45.0	black and brown sediments
Thompson 54	54	1.0	46.0	black and brown sediments
Thompson 55	55	1.0	47.0	black and brown sediments
Thompson 56	56	1.0	48.0	black and brown sediments
Thompson 57	57	1.0	49.0	black and brown sediments
Thompson 58	58	1.0	50.0	black and brown sediments
Thompson 59	59	1.0	51.0	black and brown sediments
Thompson 60	60	1.0	52.0	dark brown streaks in black sediments
Thompson 61	61	1.0	53.0	dark brown streaks in black sediments
Thompson 62	62	1.0	54.0	dark brown streaks in black sediments
Thompson 63	63	0.5	54.5	dark brown streaks in black sediments, puck sample

210-Pb Analysis: Thompson Lake

Data provided by Paul Wilkinson, Freshwater Institute, Manitoba, Canada

Sample	Dry Weight (g)	Accumulated Dry Weight (g/sq. cm)	Porosity	Percent Water	Excess Pb-210 (Bq/g)	Activity Bq/g +/- 2SD Pb-210 +/- Error	Activity Bq/g +/- 2SD Cs-137 +/- Error
Thompson 1	2.89	0.0408	0.99	96.0	3.31E-01	3.77E-01 +/- 1.81E-02	1.85E-02 +/- 4.06E-03
Thompson 2	1.98	0.0687	0.98	94.2	3.61E-01	4.07E-01 +/- 1.95E-02	
Thompson 3	2.44	0.1031	0.98	93.3	4.58E-01	5.04E-01 +/- 2.31E-02	1.86E-02 +/- 4.95E-03
Thompson 4	2.91	0.1442	0.97	92.6	3.34E-01	3.80E-01 +/- 1.81E-02	
Thompson 5	2.69	0.1821	0.97	91.6	3.61E-01	4.07E-01 +/- 1.89E-02	2.40E-02 +/- 5.30E-03
Thompson 6	2.83	0.2221	0.97	91.2	3.89E-01	4.35E-01 +/- 2.04E-02	
Thompson 7	3.03	0.2648	0.97	91.5	3.62E-01	4.08E-01 +/- 1.90E-02	2.37E-02 +/- 3.92E-03
Thompson 8	3.35	0.3121	0.97	90.6	3.94E-01	4.40E-01 +/- 2.07E-02	
Thompson 9	3.30	0.3586	0.97	91.2	3.37E-01	3.83E-01 +/- 1.80E-02	2.81E-02 +/- 4.43E-03
Thompson 10	3.00	0.4010	0.97	91.3	3.88E-01	4.34E-01 +/- 2.03E-02	
Thompson 11	3.87	0.4556	0.96	89.7	2.69E-01	3.15E-01 +/- 1.51E-02	2.47E-02 +/- 3.45E-03
Thompson 12	3.26	0.5016	0.96	89.4	3.34E-01	3.80E-01 +/- 1.76E-02	
Thompson 13	4.43	0.5641	0.96	88.3	2.67E-01	3.13E-01 +/- 1.50E-02	2.48E-02 +/- 3.27E-03
Thompson 14	4.18	0.6230	0.96	89.2	2.59E-01	3.05E-01 +/- 1.47E-02	
Thompson 15	3.68	0.6749	0.96	88.1	1.88E-01	2.34E-01 +/- 1.12E-02	2.30E-02 +/- 4.14E-03
Thompson 16	3.59	0.7256	0.96	88.9	2.96E-01	3.42E-01 +/- 1.57E-02	
Thompson 17	8.31	0.8428	0.96	89.1	2.82E-01	3.28E-01 +/- 1.52E-02	2.53E-02 +/- 3.74E-03
Thompson 18	7.71	0.9516	0.96	88.9	2.97E-01	3.43E-01 +/- 1.61E-02	
Thompson 19	8.14	1.0665	0.96	88.3	2.77E-01	3.23E-01 +/- 1.50E-02	3.26E-02 +/- 3.68E-03
Thompson 20	8.31	1.1837	0.96	88.2	2.67E-01	3.13E-01 +/- 1.48E-02	
Thompson 21	10.07	1.3258	0.95	86.9	2.53E-01	2.99E-01 +/- 1.41E-02	3.50E-02 +/- 3.85E-03
Thompson 22	7.76	1.4352	0.95	87.9	2.82E-01	3.28E-01 +/- 1.54E-02	
Thompson 23	8.04	1.5487	0.96	88.1	2.98E-01	3.44E-01 +/- 1.64E-02	4.23E-02 +/- 4.45E-03
Thompson 24	7.73	1.6577	0.96	88.3	3.00E-01	3.46E-01 +/- 1.64E-02	
Thompson 25	7.18	1.7590	0.96	88.9	3.31E-01	3.77E-01 +/- 1.80E-02	3.52E-02 +/- 3.65E-03
Thompson 26	6.84	1.8555	0.96	89.2	2.82E-01	3.28E-01 +/- 1.59E-02	
Thompson 27	6.99	1.9541	0.96	89.2	2.70E-01	3.16E-01 +/- 1.53E-02	5.01E-02 +/- 4.81E-03
Thompson 28	8.69	2.0767	0.95	87.6	2.46E-01	2.92E-01 +/- 1.41E-02	
Thompson 29	7.34	2.1803	0.96	89.4	2.13E-01	2.59E-01 +/- 1.26E-02	7.31E-02 +/- 5.60E-03
Thompson 30	5.94	2.2641	0.97	91.1	2.08E-01	2.54E-01 +/- 1.26E-02	
Thompson 31	6.32	2.3533	0.97	90.7	2.19E-01	2.78E-01 +/- 1.31E-02	1.31E-01 +/- 6.61E-03
Thompson 32	5.72	2.4340	0.97	91.2	2.44E-01	3.03E-01 +/- 1.49E-02	3.29E-01 +/- 7.67E-03
Thompson 33	7.33	2.5374	0.96	89.9	2.57E-01	3.16E-01 +/- 1.45E-02	1.77E-01 +/- 5.07E-03
Thompson 34	6.57	2.6301	0.96	89.9	2.04E-01	2.63E-01 +/- 1.25E-02	3.15E-02 +/- 3.52E-03

Sample	Dry Weight (g)	Accumulated Dry Weight (g/sq. cm)	Porosity	Percent Water	Excess Pb-210 (Bq/g)	Activity Bq/g +/- 2SD Pb-210 +/- Error	Activity Bq/g +/- 2SD Cs-137 +/- Error
Thompson 35	6.20	2.7176	0.96	90.0	1.47E-01	2.06E-01 +/- 9.87E-03	1.55E-02 +/- 3.38E-03
Thompson 36	6.10	2.8036	0.97	90.8	1.51E-01	2.10E-01 +/- 1.01E-02	
Thompson 37	5.84	2.8860	0.97	91.0	1.39E-01	1.98E-01 +/- 9.68E-03	7.57E-03 +/- 2.29E-03
Thompson 38	5.07	2.9575	0.97	91.6	9.92E-02	1.58E-01 +/- 7.92E-03	
Thompson 39	6.10	3.0436	0.97	90.8	1.02E-01	1.61E-01 +/- 8.28E-03	0.00E+00 +/- 0.00E+00
Thompson 40	6.07	3.1292	0.97	90.6	9.59E-02	1.55E-01 +/- 7.80E-03	
Thompson 41	6.01	3.2140	0.97	91.0	9.99E-02	1.59E-01 +/- 8.06E-03	
Thompson 42	5.39	3.2901	0.97	91.8	1.16E-01	1.75E-01 +/- 8.38E-03	
Thompson 43	5.12	3.3623	0.97	91.7	1.35E-01	1.94E-01 +/- 9.66E-03	
Thompson 44	5.58	3.4410	0.97	91.6	1.26E-01	1.85E-01 +/- 9.44E-03	
Thompson 45	5.47	3.5182	0.97	91.3	1.09E-01	1.68E-01 +/- 8.63E-03	
Thompson 46	5.72	3.5989	0.97	91.4	8.91E-02	1.48E-01 +/- 7.12E-03	
Thompson 47	5.54	3.6771	0.97	91.8	7.24E-02	1.31E-01 +/- 7.00E-03	
Thompson 48	5.24	3.7510	0.97	91.8	5.86E-02	1.18E-01 +/- 6.33E-03	
Thompson 49	5.32	3.8260	0.97	91.9		1.10E-01 +/- 5.92E-03	
Thompson 50	5.46	3.9031	0.97	92.1		1.13E-01 +/- 5.92E-03	
Thompson 51	5.36	3.9787	0.97	92.1		1.09E-01 +/- 5.76E-03	
Thompson 52	5.40	4.0549	0.97	92.0		1.15E-01 +/- 5.88E-03	
Thompson 53	5.55	4.1332	0.97	90.9		1.17E-01 +/- 6.24E-03	
Thompson 54	6.12	4.2195	0.97	91.4		1.27E-01 +/- 6.27E-03	
Thompson 55	6.08	4.3053	0.97	90.6		1.32E-01 +/- 7.05E-03	
Thompson 56	6.86	4.4021	0.96	89.7		1.23E-01 +/- 5.99E-03	
Thompson 57	6.59	4.4951	0.96	90.3		1.36E-01 +/- 6.73E-03	
Thompson 58	7.35	4.5988	0.96	89.2		1.29E-01 +/- 6.58E-03	
Thompson 59	7.40	4.7032	0.96	88.3		1.23E-01 +/- 6.39E-03	
Thompson 60	7.17	4.8043	0.96	89.7		1.37E-01 +/- 7.09E-03	
Thompson 61	6.27	4.8928	0.96	88.1		1.28E-01 +/- 6.31E-03	
Thompson 62	7.00	4.9915	0.96	89.6		1.29E-01 +/- 6.81E-03	
Thompson 63	4.24	5.0514	0.95	87.1		2.00E-01 +/- 1.02E-02	

Metal Concentration in the Sediment: Thompson Lake

Concentration in mg/kg dry weight

Sample	Mg	Al	K	Ca	Fe	Ti	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Sn	Ba	Pb	U
Thompson 1	679	816	112	15467	1607	0.0	0.0	0.00	0	0.0	0.0	2.0	2.03	0.00	0.0	0.00	0.00	0.00	0.0	0.0	0.00
Thompson 2	891	1028	142	17224	2639	23.2	18.1	16.95	1339	15.4	61.5	109.8	109.75	9.52	142.2	5.11	0.61	0.36	210.7	45.8	2.07
Thompson 3	870	837	105	18102	2394	15.3	14.6	15.29	1216	14.4	66.6	107.5	107.54	7.56	142.9	4.86	0.48	0.26	198.0	47.4	1.96
Thompson 4	810	805	96	16452	2538	14.7	16.5	57.00	1185	25.6	64.2	118.3	118.25	8.33	141.8	4.77	0.67	0.54	205.9	50.2	1.71
Thompson 5	769	931	111	15921	1835	22.0	15.6	17.07	1108	13.9	71.5	92.3	92.26	9.57	144.2	4.03	0.45	0.19	204.0	50.0	1.62
Thompson 6	709	713	87	15598	1963	15.5	16.1	15.07	1047	12.9	60.9	99.7	99.72	7.55	140.4	4.80	0.48	0.22	193.0	49.6	1.83
Thompson 7	1084	1355	94	2958	3627	20.0	16.2	16.47	1097	13.5	58.9	90.6	90.61	9.16	144.2	3.31	0.61	0.27	202.8	53.0	1.33
Thompson 8	680	781	92	15921	1569	21.5	15.7	16.17	1111	13.8	67.6	98.7	98.72	8.64	141.8	6.41	0.66	0.29	196.2	53.2	2.02
Thompson 9	802	934	114	17087	2227	19.7	17.6	17.48	1128	14.5	66.4	112.9	112.90	9.40	138.8	4.52	0.58	0.25	201.7	56.6	1.77
Thompson 10	653	788	96	15404	1570	23.8	15.7	16.83	1110	12.9	76.0	104.2	104.17	9.43	144.0	4.81	0.53	0.30	200.6	55.8	1.64
Thompson 11	689	727	129	16510	1798	14.6	14.7	16.89	1150	13.5	69.4	104.6	104.63	8.18	149.5	4.01	0.62	0.26	211.2	55.2	1.40
Thompson 12	744	797	91	18398	1711	15.4	13.9	16.35	1157	13.3	74.2	94.8	94.80	8.18	148.0	4.04	0.55	0.39	204.0	54.9	1.31
Thompson 13	653	727	89	17206	1554	18.4	15.6	16.26	1109	15.2	63.4	100.2	100.25	8.30	148.2	4.09	0.60	0.32	201.3	53.2	1.42
Thompson 14	693	730	80	18407	1473	18.4	12.9	15.98	1118	12.2	76.3	91.8	91.78	7.83	151.0	4.18	0.59	0.22	201.3	52.4	1.24
Thompson 15	741	849	91	16171	1935	14.5	15.6	16.64	1031	15.4	90.3	104.4	104.42	8.29	126.8	3.70	0.54	0.28	193.5	54.0	1.32
Thompson 16	649	732	78	16026	1696	14.4	14.5	16.12	1086	14.6	65.7	106.0	105.99	7.98	135.9	3.72	0.59	0.19	197.6	56.1	1.44
Thompson 17	661	884	99	15055	1884	19.4	18.1	18.98	1100	16.6	69.8	142.8	142.79	10.29	136.6	3.44	0.55	0.20	211.0	59.4	1.49
Thompson 18	647	948	111	13792	2042	21.9	19.8	19.34	1023	16.3	71.9	120.4	120.44	11.19	123.8	4.69	0.59	0.26	202.4	61.7	1.63
Thompson 19	616	698	74	15471	1749	15.2	14.5	16.98	1085	15.0	72.2	105.1	105.06	8.07	136.8	3.97	0.62	0.31	202.4	61.0	1.48
Thompson 20	676	870	94	16528	1907	20.4	16.2	19.08	1075	15.1	85.1	109.5	109.54	9.43	134.9	4.63	0.67	0.23	204.6	64.4	1.68
Thompson 21	692	875	88	15940	1918	16.7	15.2	19.46	1036	14.7	93.0	115.8	115.80	9.25	134.5	4.08	0.73	0.25	205.8	71.2	1.62
Thompson 22	636	732	73	14996	1701	16.2	15.0	18.58	992	17.7	124.7	131.8	131.83	7.95	129.8	6.44	0.77	0.28	192.3	73.6	2.16
Thompson 23	601	723	76	13736	1751	17.3	16.2	19.54	964	14.5	134.0	129.8	129.78	8.39	124.5	6.62	0.82	0.35	189.8	79.6	1.99
Thompson 24	635	816	86	13758	2066	17.8	17.0	21.34	1007	17.0	118.9	136.8	136.79	9.16	123.1	6.95	0.86	0.40	190.6	90.2	2.37
Thompson 25	663	884	91	14874	2401	20.3	18.5	20.06	1035	18.2	105.4	160.7	160.73	9.38	124.4	8.35	0.92	0.34	194.1	106.9	2.64
Thompson 26	645	893	98	12751	2386	16.4	18.4	22.78	962	18.6	76.9	156.2	156.23	9.94	111.8	8.66	0.97	0.36	195.6	130.8	2.50
Thompson 27	632	745	75	12911	2176	14.5	16.7	23.02	985	16.0	59.8	191.0	190.95	8.53	117.8	10.25	0.99	0.58	194.7	152.7	2.52
Thompson 28	666	1057	101	9098	3018	13.3	756.0	28.47	949	24.6	49.3	185.3	16.25	12.57	86.9	5.85	1.34	1.04	230.9	172.4	2.10
Thompson 29	530	706	63	10343	2556	13.0	536.0	29.98	843	17.5	43.6	181.7	14.09	7.72	97.5	10.41	1.33	1.76	185.0	178.4	2.05

Metal Concentration in the Sediment: Thompson Lake

Concentration in mg/kg dry weight

Sample	Mg	Al	K	Ca	Fe	Ti	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Sn	Ba	Pb	U
Thompson 30	471	847	88	7306	2282	21.5	668.9	71.50	767	20.7	48.5	198.3	16.20	11.57	87.0	13.59	1.43	1.17	193.8	206.4	2.41
Thompson 31	560	913	94	7185	2652	17.7	716.8	150.67	772	25.2	51.0	263.8	18.75	11.46	76.5	13.23	1.85	1.48	204.6	225.5	2.65
Thompson 32	567	1131	111	5185	3746	18.4	841.9	35.02	763	26.4	51.1	261.4	23.12	14.19	58.1	9.74	2.20	0.95	228.8	240.7	3.04
Thompson 33	613	1786	187	3948	5994	27.6	0.0	28.11	717	29.6	37.2	263.5	29.49	20.18	45.0	7.38	2.35	0.93	266.5	167.0	2.68
Thompson 34	431	1161	122	4161	3786	22.2	0.0	23.79	734	25.6	32.6	202.3	23.66	17.64	57.3	7.39	1.82	0.66	270.3	121.6	2.67
Thompson 35	565	1197	136	8961	3548	27.7	0.0	18.78	965	19.7	20.9	159.4	21.76	14.57	91.5	5.83	1.63	0.58	266.5	90.2	2.38
Thompson 36	527	1297	143	6113	4435	22.8	0.0	19.96	802	22.9	24.8	167.8	26.67	16.56	65.4	6.97	1.73	0.58	267.9	107.1	2.35
Thompson 37	545	1151	123	6528	5745	19.2	0.0	16.52	845	19.7	20.3	133.6	28.19	13.29	64.7	5.10	1.60	0.68	265.3	80.3	1.85
Thompson 38	501	1295	140	5824	5572	32.7	15.0	18.10	958	20.2	18.0	131.9	27.01	16.57	64.1	4.73	1.34	0.43	282.6	66.2	1.81
Thompson 39	459	986	97	5542	5046	16.3	0.0	15.90	1006	18.8	16.9	102.6	23.30	13.55	62.9	4.04	1.25	0.30	291.3	59.5	1.46
Thompson 40	446	980	94	4924	5888	14.6	0.0	15.12	954	19.3	16.7	88.3	25.04	12.88	52.5	5.12	1.13	0.27	281.4	50.6	1.38
Thompson 41	381	1179	129	3902	5893	35.7	0.0	19.00	1424	21.6	18.1	94.1	37.72	18.65	54.9	6.22	1.06	0.37	297.2	41.5	1.48
Thompson 42	367	1124	111	3331	8616	29.5	0.0	16.54	2098	19.4	15.7	78.5	38.09	14.52	41.6	6.00	0.65	0.17	272.4	24.6	1.18
Thompson 43	379	963	126	4539	12700	37.6	0.0	12.70	2698	20.9	14.2	120.2	41.85	10.46	50.1	6.41	0.77	0.41	279.4	26.3	0.98
Thompson 44	278	439	53	3704	13151	43.3	0.0	8.65	2639	15.4	12.3	61.4	44.48	5.69	48.0	6.43	0.81	0.38	263.6	18.0	0.73
Thompson 45	241	240	32	4395	15918	38.5	0.0	6.38	2476	11.9	7.6	32.8	46.03	3.22	52.4	4.34	0.48	0.17	265.4	6.1	0.40
Thompson 46	238	210	24	4365	16412	37.2	0.0	6.57	2815	11.2	6.4	33.9	49.81	2.78	53.4	3.79	0.42	0.11	278.7	3.4	0.34
Thompson 47	227	197	27	4256	17285	42.7	7.1	5.51	2803	11.2	5.7	31.9	51.54	2.56	51.6	3.50	0.41	0.09	271.6	2.8	0.30
Thompson 48	237	252	32	4154	16034	53.4	333.3	6.55	2513	11.6	7.3	62.8	45.00	3.11	50.3	2.98	0.47	0.22	290.6	3.2	0.30
Thompson 49	242	196	25	5581	15635	42.3	0.0	5.36	2650	9.8	5.8	26.7	45.08	2.56	58.8	3.23	0.40	0.08	308.7	2.4	0.28
Thompson 50	265	176	25	6379	17916	34.8	0.0	4.63	2476	9.0	5.3	25.3	42.86	1.81	62.4	3.15	0.33	0.04	295.1	2.2	0.27
Thompson 51	220	172	51	5100	14755	30.2	0.0	4.77	2592	8.8	4.8	23.5	41.40	2.26	60.0	2.91	0.34	0.10	296.1	2.2	0.26
Thompson 52	227	184	24	4654	16318	36.3	255.0	5.14	2485	10.4	5.9	33.5	50.18	2.46	51.8	4.25	0.41	0.10	297.5	2.9	0.30
Thompson 53	246	131	18	7610	11482	25.0	0.0	4.04	2428	9.3	5.6	29.3	49.00	1.96	84.1	5.39	0.42	0.09	343.4	1.8	0.33
Thompson 54	237	169	22	6021	14524	37.9	0.0	4.52	2592	9.0	5.5	30.2	50.70	2.03	65.0	5.07	0.38	0.04	320.7	1.9	0.32
Thompson 55	312	211	24	8840	13813	29.8	0.0	4.98	2380	9.3	5.6	35.2	40.23	2.42	75.9	3.38	0.45	0.09	333.9	2.1	0.32
Thompson 56	354	287	38	10805	13185	31.1	0.0	5.63	2239	9.5	5.8	35.5	38.39	3.36	86.2	3.21	0.41	0.11	359.0	2.3	0.32
Thompson 57	296	221	28	9378	10755	30.8	0.0	5.58	2252	9.3	5.3	25.4	36.84	3.01	88.3	2.97	0.47	0.12	358.7	2.3	0.33
Thompson 58	344	217	28	11672	10765	28.7	0.0	4.79	2300	8.9	5.2	18.2	33.20	2.65	95.2	2.55	0.33	0.04	378.9	2.0	0.29
Thompson 59	339	197	27	11125	10004	27.9	41.1	4.16	2225	8.6	4.5	21.0	30.75	2.38	89.8	2.44	0.31	0.15	361.0	1.6	0.26
Thompson 60	388	286	40	12085	15476	36.0	15.5	4.98	2526	9.4	5.6	24.1	39.05	2.96	85.2	3.21	0.48	0.14	408.3	1.8	0.34

Metal Concentration in the Sediment: Thompson Lake

Concentration in mg/kg dry weight

Sample	Mg	Al	K	Ca	Fe	Ti	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Sn	Ba	Pb	U
Thompson 61	328	280	36	9594	13745	33.8	0.0	5.40	2501	9.6	6.4	24.5	37.79	3.11	77.9	3.38	0.49	0.17	385.2	4.6	0.37
Thompson 62	483	738	80	8574	6921	24.5	0.0	45.20	1442	15.3	33.4	139.0	21.89	8.13	79.9	7.89	0.85	1.10	261.3	120.2	1.56

Metal Concentration in the Porewater: Thompson Lake

Concentration in ng/mL, 0.0 Depth is the topwater sample

Sample	Depth	Mg	K	Ca	Mn	Fe	P	V	Cr	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Ba	Pb	U	B	Al
Thompson 0	0.0	1930.0	408.6	6356	247.7	12.2	97.8	1.02	0.17	0.58	0.36	137.5	3.08	1.48	183.5	1.13	0.28	104.7	0.3	0.68	29.49	2.5
Thompson 1	0.5	1840.3	481.8	6635	356.8	10.4	221.6	2.91	0.61	0.73	0.77	675.6	13.16	2.47	212.0	4.74	0.31	190.1	0.3	0.86	67.48	10.0
Thompson 2	1.5	1651.8	446.9	5873	354.4	14.6	595.6	2.99	0.74	0.72	0.78	752.4	8.32	2.44	206.2	1.96	0.25	182.4	0.4	0.68	63.59	8.7
Thompson 3	2.5	1749.3	482.2	6207	310.1	25.6	635.0	2.66	0.72	0.57	0.82	481.5	5.60	2.62	204.4	1.65	0.23	172.8	0.2	0.45	74.39	8.3
Thompson 4	3.5	1957.7	517.5	6879	273.5	26.2	629.1	2.74	0.67	0.6	1.03	401.2	5.90	2.85	214.1	2.03	0.25	183.4	0.1	0.53	77.85	7.6
Thompson 5	5.5	1669.2	423.3	5774	224.0	8.1	488.7	2.90	0.92	0.94	0.76	758.0	3.36	2.41	174.8	2.24	0.10	143.3	4.4	0.41	67.33	49.8
Thompson 6	6.5	1920.2	479.4	6625	256.3	14.1	819.3	2.70	0.68	0.67	1.21	532.7	4.84	2.69	201.0	2.27	0.24	168.4	0.1	0.38	77.97	6.5
Thompson 7	7.5	1824.8	437.4	6283	246.8	14.7	883.7	2.58	1.49	0.72	1.09	439.5	4.00	2.39	178.8	1.20	0.20	150.4	0.1	0.26	69.65	2.7
Thompson 8	8.5	2051.0	477.8	7099	282.0	10.6	1044.1	3.11	0.66	1.67	1.35	1276.8	4.32	2.53	194.6	1.04	0.12	167.7	0.1	0.23	73.68	17.6
Thompson 9	9.5	1851.0	438.9	6410	260.0	10.9	968.2	2.11	0.68	2.18	1.19	541.5	5.77	2.37	172.4	0.87	0.10	153.2	0.2	0.19	72.97	36.7
Thompson 10	11.5	2097.2	485.9	7259	296.1	29.3	1358.4	2.29	0.50	1.78	1.57	328.6	4.83	2.53	187.0	0.64	0.18	162.7	0.0	0.18	75.03	5.5
Thompson 11	13.5	2154.9	472.9	7500	309.2	24.6	1049.0	2.26	0.67	3.24	1.78	514.8	5.05	2.61	187.7	1.77	0.26	157.6	0.1	0.28	83.31	5.0
Thompson 12	15.5	2037.6	429.2	7034	296.4	56.9	1131.0	2.22	0.70	2.66	1.83	375.5	4.59	2.58	185.3	0.96	0.07	159.7	0.0	0.35	83.59	21.0
Thompson 13	17.5	2012.7	424.0	7005	293.9	50.7	653.9	2.29	0.76	3.21	1.64	590.8	5.45	2.47	166.1	1.85	0.16	141.5	0.1	0.42	81.60	22.7
Thompson 14	19.5	2304.8	464.1	7982	343.4	142.0	333.6	2.34	0.88	3.79	2.06	683.1	6.16	2.80	180.8	2.60	0.27	165.9	0.1	0.37	87.49	8.4
Thompson 15	21.5	2278.2	449.9	7841	346.6	261.1	119.1	1.90	1.17	3.48	2.12	635.7	4.77	2.86	180.0	2.22	0.23	174.9	0.1	0.19	82.45	8.0
Thompson 16	23.5	2003.0	412.2	6973	313.5	465.5	94.5	1.72	1.16	3.21	1.80	570.6	4.87	2.72	160.6	2.68	0.14	189.9	0.2	0.15	78.00	4.8
Thompson 17	25.5	2299.3	465.8	8066	367.4	679.1	66.4	1.52	0.80	3.73	2.37	353.4	5.95	3.05	180.4	0.42	0.19	205.9	0.0	0.07	83.14	23.9
Thompson 18	27.5	2290.4	456.9	8167	374.0	966.7	55.6	1.35	0.62	3.93	2.57	762.7	11.03	3.10	184.4	0.29	0.20	252.3	0.0	0.05	85.11	4.2
Thompson 19	29.5	2234.8	437.2	7995	370.9	892.3	41.8	0.99	0.55	3.66	2.52	790.3	14.33	3.05	180.6	0.24	0.21	276.2	0.0	0.03	82.20	8.9
Thompson 20	31.5	2160.8	396.9	7777	361.3	1147.4	60.5	0.75	0.54	3.58	2.46	558.4	16.77	2.74	173.8	0.28	0.14	330.3	0.1	0.03	78.10	5.2
Thompson 21	35.5	2109.9	390.5	7737	357.2	1332.2	61.4	0.88	0.53	3.71	2.58	764.9	18.43	2.78	174.6	0.24	0.23	359.4	0.1	0.03	84.07	4.2
Thompson 22	37.5	2089.7	374.4	7598	361.6	2070.6	141.1	1.00	0.59	4.11	2.66	429.1	22.29	2.70	174.1	0.34	0.27	390.9	0.1	0.04	82.95	2.8
Thompson 23	39.5	1994.8	341.0	7284	347.6	1937.4	120.6	1.06	0.52	3.84	2.79	540.7	18.86	2.67	181.5	0.47	0.29	438.0	0.1	0.05	84.05	3.3
Thompson 24	41.5	1924.7	319.6	7062	337.8	2253.1	127.7	0.84	0.42	3.57	2.50	282.9	14.23	2.34	172.1	0.06	0.14	532.8	0.0	0.02	85.12	0.9
Thompson 25	43.5	2039.1	340.3	7821	357.6	2271.1	104.9	0.96	0.42	3.57	2.72	981.8	14.13	2.43	178.5	0.11	0.23	608.4	0.1	0.02	83.17	1.6
Thompson 26	45.3	1981.3	324.0	7535	355.9	2682.3	92.4	0.91	0.54	3.6	2.66	770.6	15.41	2.37	181.5	0.13	0.26	701.0	0.1	0.02	82.41	9.8
Thompson 27	47.5	1887.9	315.7	7243	343.4	2538.6	76.8	0.94	0.45	3.59	2.43	915.9	13.58	2.32	178.0	0.21	0.19	773.8	0.1	0.03	79.13	4.2

Whitmore Lake Sediment Fact Sheet

Date sampled: 23 May 2007
Location: Washtenaw and Livingston Counties
Sampling site: 42º 26.118' N
83º 44.822' W
Lake surface area: 677 acres

Sampling site water depth: 68.2 ft
Depth of core: 52 cm
Sedimentation rate: 328 $g/m^2/y$
Age of oldest section: 1879
Focusing factor: 2.32

Whitmore Lake exhibited a high sedimentation rate and did not reach background values of anthropogenic elements; however, older sediment in Whitmore Lake appeared to show stable low concentrations and was used as background concentrations for anthropogenic accumulation calculations. Results from both lakes should be interpreted with care.

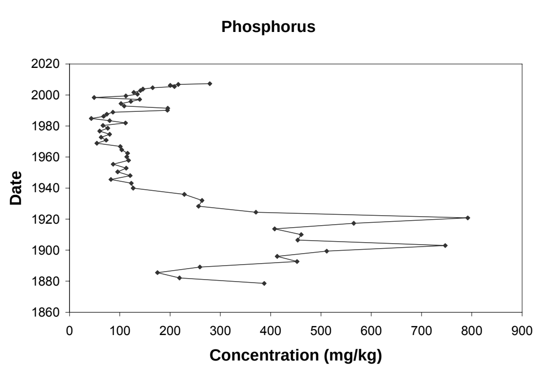
Whitmore Lake exhibited elevated concentrations of PAHs in recent sediments.

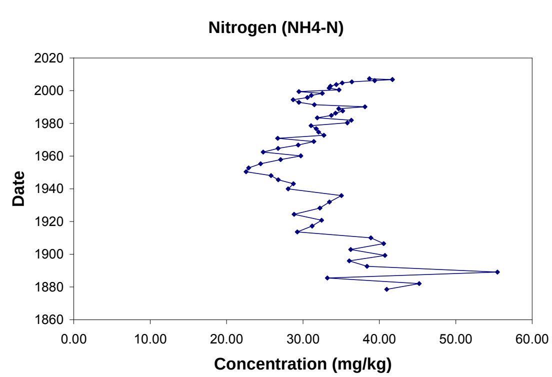
Nutrient concentrations appear to have generally decreased in comparison with older sediments but appear to be increasing in recent trends.

	Surface Concentration	Background Concentration	Trends
Cadmium (mg/kg)	1.35	0.7	Decreasing
Copper (mg/kg)	51.9	22.26	Increasing
Lead (mg/kg)	114.28	27.41	Decreasing
Mercury (mg/kg)	0.06	0.44	Decreasing
Zinc (mg/kg)	123.16	77.86	Decreasing
Total PCBs (µg/kg)	5.2		Increasing
Total PAHs (µg/kg)	4509.0		Decreasing
Total Pesticides (µg/kg)	42.4		Decreasing
DDTs (µg/kg)	32.0		Decreasing

Trends for organic contaminants are taken from only two data points and should be interpreted with care.

Example profiles





A Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters: Sediments

Lake: Whitmore07 **Water Depth (m):** 20.8

Sampling Date: 5/23/2007 **Latitude (N):** 42.4353 **Longitude (W):** -83.74703

Core Description: ~ 51.5 cm total, 0-5 cm grayish sediment, 5-15 cm grayish-black sediment, 15-32 cm brownish-gray sediment, abrupt black sediment area from 33-43 cm, followed by brown sediment the rest of the core length

Sample Number	Jar Number	Thickness (cm)	Total Thickness (cm)	Description
Whitmore07 1	1	0.5	0.5	unconsolidated gray-black sediment
Whitmore07 2	2	0.5	1.0	unconsolidated gray-black sediment
Whitmore07 3	3	0.5	1.5	unconsolidated gray-black sediment
Whitmore07 4	4	0.5	2.0	unconsolidated gray-black sediment, becoming firmer
Whitmore07 5	5	0.5	2.5	dark brownish-gray sediments
Whitmore07 6	6	0.5	3.0	dark brownish-gray sediments
Whitmore07 7	7	0.5	3.5	dark brownish-gray sediments
Whitmore07 8	8	0.5	4.0	dark brownish-gray sediments
Whitmore07 9	9	0.5	4.5	dark brown sediments with black grains
Whitmore07 10	10	0.5	5.0	dark brown sediments with black grains
Whitmore07 11	11	0.5	5.5	dark brown sediments with black grains
Whitmore07 12	12	0.5	6.0	dark brown sediments with black grains
Whitmore07 13	13	0.5	6.5	dark brown sediments with black grains
Whitmore07 14	14	0.5	7.0	dark brown sediments with black grains
Whitmore07 15	15	0.5	7.5	dark brown sediments with black grains
Whitmore07 16	16	0.5	8.0	dark brown sediments with black grains
Whitmore07 17	17	1.0	9.0	dark brown sediments with black grains
Whitmore07 18	18	1.0	10.0	dark brown sediments with black grains
Whitmore07 19	19	1.0	11.0	dark brown sediments with black grains
Whitmore07 20	20	1.0	12.0	dark brown sediments with black grains
Whitmore07 21	21	1.0	13.0	dark brown sediments with black grains
Whitmore07 22	22	1.0	14.0	dark brown sediments with black grains
Whitmore07 23	23	1.0	15.0	dark brown sediments with black grains
Whitmore07 24	24	1.0	16.0	dark brown sediments with black grains
Whitmore07 25	25	1.0	17.0	dark brown sediments with black grains
Whitmore07 26	26	1.0	18.0	dark brown sediments with black grains
Whitmore07 27	27	1.0	19.0	dark brown sediments with black grains
Whitmore07 28	28	1.0	20.0	dark brown sediments with black grains
Whitmore07 29	29	1.0	21.0	dark brown sediments with black grains
Whitmore07 30	30	1.0	22.0	dark brown sediments with black grains
Whitmore07 31	31	1.0	23.0	dark brown sediments with black grains
Whitmore07 32	32	1.0	24.0	dark brown sediments with black grains
Whitmore07 33	33	1.0	25.0	dark brown sediments with black grains
Whitmore07 34	34	1.0	26.0	dark brown sediments with black grains

Sample Number	Jar Number	Thickness (cm)	Total Thickness (cm)	Description
Whitmore07 35	35	1.0	27.0	gooey dark brown sediment
Whitmore07 36	36	1.0	28.0	gooey dark brown sediment
Whitmore07 37	37	1.0	29.0	gooey dark brown sediment
Whitmore07 38	38	1.0	30.0	gooey dark brown sediment
Whitmore07 39	39	1.0	31.0	gooey dark brown sediment
Whitmore07 40	40	1.0	32.0	gooey brownish-black sediments
Whitmore07 41	41	1.0	33.0	gooey brownish-black sediments
Whitmore07 42	42	1.0	34.0	blackish gray gooey sediments, gassy
Whitmore07 43	43	1.0	35.0	black sediments, gassy
Whitmore07 44	44	1.0	36.0	black sediments, gassy
Whitmore07 45	45	1.0	37.0	black sediments, gassy
Whitmore07 46	46	1.0	38.0	black sediments, gassy
Whitmore07 47	47	1.0	39.0	black sediments, gassy
Whitmore07 48	48	1.0	40.0	black sediments, gassy
Whitmore07 49	49	1.0	41.0	black sediments, gassy
Whitmore07 50	50	1.0	42.0	brownish-black sediments, less gassy
Whitmore07 51	51	1.0	43.0	brownish-black sediments, less gassy
Whitmore07 52	52	1.0	44.0	brownish-black sediments, less gassy
Whitmore07 53	53	1.0	45.0	brownish-black sediments, gassy
Whitmore07 54	54	1.0	46.0	brownish-black sediments, gassy
Whitmore07 55	55	1.0	47.0	brownish-black sediments, gassy
Whitmore07 56	56	1.0	48.0	dark brown with black streaks
Whitmore07 57	57	1.0	49.0	dark brown with black streaks
Whitmore07 58	58	1.0	50.0	dark brown with black streaks, dry
Whitmore07 59	59	1.0	51.0	dark brown with black streaks, dry
Whitmore07 60	60	0.3	51.3	dark brown with black streaks, dry, puck sample

210-Pb Analysis: Whitmore07 Lake

Data provided by Paul Wilkinson, Freshwater Institute, Manitoba, Canada

Sample	Dry Weight (g)	Accumulated Dry Weight (g/sq. cm)	Porosity	Percent Water	Excess Pb-210 (Bq/g)	Activity Bq/g +/- 2SD Pb-210 +/- Error	Activity Bq/g +/- 2SD Cs-137 +/- Error
Whitmore07 1	0.70	0.0099	1.00	98.8	8.09E-01	8.49E-01 +/- 4.16E-02	1.41E-01 +/- 4.59E-03
Whitmore07 2	0.81	0.0213	0.99	97.2	8.95E-01	9.35E-01 +/- 4.34E-02	
Whitmore07 3	1.18	0.0380	0.99	96.5	8.58E-01	8.98E-01 +/- 4.19E-02	1.71E-01 +/- 4.47E-03
Whitmore07 4	1.07	0.0530	0.99	96.3	8.08E-01	8.48E-01 +/- 4.11E-02	
Whitmore07 5	1.38	0.0725	0.99	96.1	7.89E-01	8.29E-01 +/- 3.89E-02	2.03E-01 +/- 5.21E-03
Whitmore07 6	1.36	0.0917	0.98	95.7	8.56E-01	8.96E-01 +/- 4.16E-02	2.88E-01 +/- 5.64E-03
Whitmore07 7	1.65	0.1150	0.98	95.3	8.76E-01	9.16E-01 +/- 4.26E-02	2.16E-01 +/- 4.60E-03
Whitmore07 8	1.93	0.1422	0.98	95.1	8.76E-01	9.16E-01 +/- 4.36E-02	1.48E-01 +/- 4.27E-03
Whitmore07 9	1.70	0.1662	0.98	94.9	7.90E-01	8.30E-01 +/- 4.04E-02	5.65E-02 +/- 3.27E-03
Whitmore07 10	1.68	0.1899	0.98	94.6	7.57E-01	7.97E-01 +/- 3.76E-02	
Whitmore07 11	1.66	0.2133	0.98	94.7	6.81E-01	7.21E-01 +/- 3.44E-02	2.40E-02 +/- 2.78E-03
Whitmore07 12	2.08	0.2427	0.98	93.6	7.10E-01	7.50E-01 +/- 3.47E-02	
Whitmore07 13	2.06	0.2717	0.97	92.3	7.03E-01	7.43E-01 +/- 3.40E-02	1.02E-02 +/- 2.28E-03
Whitmore07 14	2.32	0.3045	0.97	92.9	5.35E-01	5.75E-01 +/- 2.61E-02	
Whitmore07 15	2.38	0.3380	0.97	92.7	6.39E-01	6.79E-01 +/- 3.08E-02	1.01E-02 +/- 2.51E-03
Whitmore07 16	2.18	0.3688	0.98	93.5	6.51E-01	6.91E-01 +/- 3.13E-02	
Whitmore07 17	4.34	0.4300	0.97	91.9	6.65E-01	7.05E-01 +/- 3.40E-02	0.00E+00 +/- 0.00E+00
Whitmore07 18	4.55	0.4942	0.98	93.4	7.21E-01	7.61E-01 +/- 3.55E-02	
Whitmore07 19	5.07	0.5657	0.97	92.6	6.97E-01	7.37E-01 +/- 3.44E-02	
Whitmore07 20	4.94	0.6354	0.97	92.4	6.82E-01	7.22E-01 +/- 3.41E-02	
Whitmore07 21	4.97	0.7056	0.97	92.4	6.68E-01	7.08E-01 +/- 3.34E-02	
Whitmore07 22	5.43	0.7822	0.97	92.3	5.94E-01	6.34E-01 +/- 2.86E-02	
Whitmore07 23	5.62	0.8615	0.97	91.7	5.37E-01	5.77E-01 +/- 2.65E-02	
Whitmore07 24	6.09	0.9474	0.97	91.4	4.37E-01	4.77E-01 +/- 2.26E-02	
Whitmore07 25	6.39	1.0375	0.97	91.0	4.09E-01	4.49E-01 +/- 2.20E-02	
Whitmore07 26	7.49	1.1432	0.96	90.3	4.03E-01	4.43E-01 +/- 2.18E-02	
Whitmore07 27	7.11	1.2435	0.96	89.8	4.07E-01	4.47E-01 +/- 2.17E-02	
Whitmore07 28	6.93	1.3413	0.96	89.9	4.13E-01	4.53E-01 +/- 2.27E-02	
Whitmore07 29	6.74	1.4364	0.96	90.1	3.67E-01	4.07E-01 +/- 2.01E-02	
Whitmore07 30	7.87	1.5474	0.96	89.2	3.79E-01	4.19E-01 +/- 2.18E-02	
Whitmore07 31	7.58	1.6543	0.96	89.0	3.50E-01	3.90E-01 +/- 1.99E-02	
Whitmore07 32	7.57	1.7611	0.96	88.9	3.11E-01	3.51E-01 +/- 1.75E-02	
Whitmore07 33	8.55	1.8818	0.96	88.4	2.92E-01	3.32E-01 +/- 1.85E-02	
Whitmore07 34	8.37	1.9999	0.96	88.5	2.79E-01	3.19E-01 +/- 1.56E-02	

Sample	Dry Weight (g)	Accumulated Dry Weight (g/sq. cm)	Porosity	Percent Water	Excess Pb-210 (Bq/g)	Activity Bq/g +/- 2SD Pb-210 +/- Error	Activity Bq/g +/- 2SD Cs-137 +/- Error
Whitmore07 35	8.39	2.1182	0.95	87.7	2.69E-01	3.09E-01 +/- 1.55E-02	
Whitmore07 36	9.77	2.2561	0.95	87.1	2.55E-01	2.95E-01 +/- 1.43E-02	
Whitmore07 37	8.74	2.3794	0.95	87.1	2.32E-01	2.72E-01 +/- 1.28E-02	
Whitmore07 38	8.47	2.4989	0.95	87.6	2.06E-01	2.46E-01 +/- 1.21E-02	
Whitmore07 39	8.92	2.6247	0.95	87.2	1.96E-01	2.36E-01 +/- 1.14E-02	
Whitmore07 40	9.37	2.7569	0.95	87.1	1.73E-01	2.13E-01 +/- 1.12E-02	
Whitmore07 41	8.33	2.8744	0.95	87.5	1.68E-01	2.08E-01 +/- 1.03E-02	
Whitmore07 42	7.25	2.9767	0.96	88.6	1.72E-01	2.12E-01 +/- 1.05E-02	
Whitmore07 43	7.15	3.0776	0.96	89.7	1.57E-01	1.97E-01 +/- 9.88E-03	
Whitmore07 44	6.76	3.1730	0.96	90.2	1.43E-01	1.83E-01 +/- 9.07E-03	
Whitmore07 45	6.48	3.2644	0.96	90.3	1.34E-01	1.74E-01 +/- 8.94E-03	
Whitmore07 46	7.03	3.3636	0.96	89.7	1.13E-01	1.53E-01 +/- 7.65E-03	
Whitmore07 47	6.06	3.4491	0.96	90.5	1.10E-01	1.50E-01 +/- 7.31E-03	
Whitmore07 48	6.46	3.5402	0.96	90.4	9.91E-02	1.39E-01 +/- 6.53E-03	
Whitmore07 49	6.32	3.6294	0.96	90.0	8.89E-02	1.29E-01 +/- 6.69E-03	
Whitmore07 50	6.57	3.7221	0.96	90.4	7.99E-02	1.20E-01 +/- 6.18E-03	
Whitmore07 51	6.10	3.8081	0.97	90.7	7.30E-02	1.13E-01 +/- 5.47E-03	
Whitmore07 52	6.59	3.9011	0.96	90.3	5.49E-02	9.49E-02 +/- 5.42E-03	
Whitmore07 53	6.20	3.9886	0.97	90.6	5.16E-02	9.16E-02 +/- 4.79E-03	
Whitmore07 54	5.75	4.0697	0.97	90.7	4.48E-02	8.48E-02 +/- 4.59E-03	
Whitmore07 55	6.15	4.1565	0.96	90.4	4.42E-02	8.42E-02 +/- 4.76E-03	
Whitmore07 56	6.29	4.2452	0.96	90.4	3.60E-02	7.60E-02 +/- 4.77E-03	
Whitmore07 57	6.52	4.3372	0.96	90.4	4.04E-02	8.04E-02 +/- 4.49E-03	
Whitmore07 58	5.79	4.4189	0.97	90.6	3.12E-02	7.12E-02 +/- 4.65E-03	
Whitmore07 59	6.73	4.5138	0.97	90.7	2.70E-02	6.70E-02 +/- 3.90E-03	
Whitmore07 60	3.91	4.5690	0.96	88.7		2.09E-01 +/- 1.16E-02	

Metal Concentration in the Sediment: Whitmore07 Lake

Concentration in mg/kg dry weight

Sample	Mg	Al	K	Ca	Fe	Ti	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Sn	Ba	Pb	U
Whitmore07 1	1960	1215	313	5499	2929	0.4	25.4	18.41	559	25.6	48.6	126.1	14.20	12.68	68.1	7.72	1.35	0.60	163.8	116.7	2.23
Whitmore07 2	1525	706	186	4071	2227	0.2	21.2	16.11	582	23.8	49.4	120.1	13.76	9.74	59.9	7.40	1.35	0.48	120.0	114.1	2.14
Whitmore07 3	1464	812	204	3573	2144	0.3	24.4	18.00	563	25.2	57.7	123.3	14.60	12.00	59.6	8.17	1.35	0.37	111.3	112.1	2.47
Whitmore07 4	1606	786	194	4396	2299	0.3	21.9	16.88	520	24.4	51.9	119.6	14.40	10.76	56.3	8.58	1.33	0.70	97.3	106.9	2.51
Whitmore07 5	1429	796	201	3301	2057	0.3	24.8	18.28	480	25.8	53.9	129.0	15.00	12.36	52.3	9.12	1.35	0.32	92.6	111.8	2.53
Whitmore07 6	1474	756	168	3309	2209	0.2	23.7	17.48	457	28.1	54.0	129.4	15.96	11.33	49.2	11.17	1.39	0.37	86.9	118.5	2.78
Whitmore07 7	1517	896	180	3714	2353	0.3	26.4	19.00	450	27.0	55.1	128.7	17.37	12.58	47.5	12.46	1.58	0.60	85.7	122.5	3.17
Whitmore07 8	1405	723	144	3573	2253	0.2	23.9	18.00	433	27.0	48.5	132.2	16.68	11.01	46.0	11.12	1.49	0.33	82.4	128.7	2.79
Whitmore07 9	1619	948	184	3863	2715	0.3	25.1	19.17	436	28.3	49.1	135.9	16.57	12.34	47.9	9.59	1.62	0.35	87.0	136.3	2.71
Whitmore07 10	1371	770	144	3196	2405	0.2	24.6	17.94	393	26.8	46.6	135.1	16.17	11.08	41.0	13.59	1.55	0.34	80.8	139.9	3.03
Whitmore07 11	1894	1145	189	3931	3255	0.3	26.3	19.61	399	28.6	52.3	144.2	17.18	12.73	39.9	16.94	1.69	0.48	85.3	145.9	3.49
Whitmore07 12	1869	1093	194	3723	3162	0.2	25.6	20.11	402	30.0	50.5	146.3	16.56	12.51	39.3	15.70	1.71	0.35	86.5	149.5	3.53
Whitmore07 13	1671	918	160	3825	2828	0.2	24.2	18.83	401	29.0	50.0	146.6	16.25	11.25	41.0	15.42	1.73	0.34	84.5	150.4	3.47
Whitmore07 14	1404	870	166	3105	2418	0.3	26.4	20.52	394	30.0	49.5	176.1	16.85	13.30	40.1	12.78	1.78	0.28	87.7	157.3	3.23
Whitmore07 15	1619	1149	205	3690	2773	0.3	27.3	21.35	387	30.7	48.2	157.9	16.51	14.10	41.2	10.59	1.90	0.32	89.3	168.9	3.05
Whitmore07 16	1585	1208	231	4030	2737	0.4	29.7	22.15	446	29.8	46.5	157.7	16.57	15.22	46.2	9.72	1.88	0.36	96.2	162.6	3.01
Whitmore07 17	1777	1221	204	4271	3153	0.3	26.6	20.09	435	29.6	45.8	178.5	15.91	13.45	43.6	10.53	1.85	0.33	91.4	170.3	3.01
Whitmore07 18	1406	929	158	3436	2475	0.3	26.0	19.92	387	29.6	46.5	179.9	14.77	13.59	41.9	10.98	1.91	0.75	88.6	177.1	2.76
Whitmore07 19	1468	934	156	3576	2620	0.2	25.2	19.27	366	28.7	45.0	171.9	14.13	12.75	40.4	7.58	1.91	0.33	88.2	182.8	2.28
Whitmore07 20	1347	902	154	3157	2422	0.3	27.9	21.17	376	30.8	48.4	199.5	15.45	14.50	41.4	8.72	2.01	0.28	93.5	194.2	2.49
Whitmore07 21	1183	694	113	2944	2135	0.2	24.8	18.87	348	28.9	43.9	205.1	14.87	12.22	40.6	8.15	1.93	0.29	88.8	181.6	2.38
Whitmore07 22	1560	953	156	4596	3083	0.2	24.3	18.51	339	29.4	48.4	167.2	15.04	11.38	38.5	12.00	1.98	0.38	109.3	192.2	2.66
Whitmore07 23	1842	1582	260	4479	3661	0.3	31.3	22.08	342	31.2	47.0	163.9	16.26	16.05	40.9	13.74	2.04	0.28	101.0	199.7	3.16
Whitmore07 24	1382	971	154	3167	2724	0.2	27.9	19.31	327	29.7	45.7	164.5	15.87	12.62	37.7	11.22	2.07	0.38	89.3	215.2	2.51
Whitmore07 25	1380	783	119	3006	2606	0.2	23.5	17.13	314	29.4	48.2	158.4	14.55	10.63	33.7	12.95	2.04	0.36	83.2	231.9	2.59
Whitmore07 26	1665	875	146	4870	2822	0.2	25.2	17.79	397	30.7	43.4	173.3	16.87	11.68	46.8	10.83	2.30	0.31	92.9	282.6	2.74
Whitmore07 27	1730	1051	165	4868	3292	0.2	24.6	17.75	395	29.5	44.2	170.3	16.92	12.21	43.7	12.25	2.29	0.34	93.3	289.7	2.65
Whitmore07 28	1627	1244	213	4267	3211	0.4	32.4	21.73	401	31.3	45.7	188.4	19.24	16.46	45.3	11.37	2.46	0.32	106.2	293.9	2.84
Whitmore07 29	1536	887	134	3733	2764	0.2	25.7	19.10	388	32.7	48.8	189.1	17.07	12.23	40.7	12.29	2.23	0.37	94.3	267.9	3.05

Metal Concentration in the Sediment: Whitmore07 Lake

Concentration in mg/kg dry weight

Sample	Mg	Al	K	Ca	Fe	Ti	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Mo	Cd	Sn	Ba	Pb	U
Whitmore07 30	1558	931	142	3490	2925	0.2	26.6	20.13	398	31.4	47.6	193.5	19.31	13.43	37.3	11.27	2.60	0.82	99.5	316.8	2.94
Whitmore07 31	2006	1349	211	4713	4011	0.1	13.7	10.08	190	15.5	23.3	96.8	9.18	6.90	17.7	5.83	1.22	0.13	50.4	169.2	1.38
Whitmore07 32	2074	1340	190	4574	4241	0.1	13.6	10.21	183	15.9	25.8	110.2	9.58	6.57	16.9	7.16	1.29	0.15	51.7	173.6	1.67
Whitmore07 33	1603	1074	163	3492	3035	0.1	13.8	10.47	189	14.7	25.2	106.1	8.72	6.94	17.9	6.70	1.26	0.55	50.0	150.1	1.64
Whitmore07 34	1811	1023	156	3631	3374	0.1	12.4	9.16	190	12.8	22.5	96.3	8.05	6.02	16.6	5.80	1.22	0.13	45.7	137.2	1.35
Whitmore07 35	1940	1165	180	4529	4047	0.1	12.9	9.52	170	12.9	21.9	107.7	9.02	6.43	14.0	4.92	1.25	0.16	46.3	137.4	1.33
Whitmore07 37	1535	823	124	2845	3132	0.2	22.9	17.47	300	26.4	43.8	175.4	15.66	11.19	27.4	8.19	2.44	0.58	91.8	275.2	2.40
Whitmore07 38	1966	1305	208	4028	4224	0.2	22.1	18.15	299	26.3	42.5	195.9	15.79	12.14	28.1	6.33	2.95	0.64	98.8	268.5	2.20
Whitmore07 39	1650	1006	154	2925	4117	0.3	25.8	19.59	299	27.0	41.0	184.1	18.00	15.05	30.7	7.01	2.77	0.75	107.1	225.5	2.39
Whitmore07 40	2184	1481	251	4005	4631	0.2	23.4	21.51	295	28.1	40.5	180.6	17.48	14.01	29.3	7.08	2.70	0.88	112.9	215.2	2.52
Whitmore07 41	1280	965	155	2429	3533	0.4	28.0	20.80	291	28.5	39.6	173.2	19.00	16.96	31.9	9.65	2.59	0.49	113.6	207.1	3.16
Whitmore07 42	1523	1154	178	2906	5350	0.3	24.9	18.46	268	27.0	36.5	178.8	18.34	14.99	29.9	8.00	2.67	0.86	112.6	213.7	2.65
Whitmore07 43	1317	1029	165	2574	4942	0.2	22.6	16.38	255	24.0	34.6	165.1	16.94	13.78	27.2	6.09	2.62	0.94	109.2	195.0	2.47
Whitmore07 44	1537	1173	174	2917	5196	0.2	21.8	14.84	247	21.6	31.4	146.6	17.24	12.76	24.8	5.74	2.31	0.64	99.4	170.0	2.44
Whitmore07 45	1248	973	146	2608	4514	0.3	20.9	14.39	271	23.3	29.2	140.3	16.41	11.93	26.6	5.50	2.25	0.74	108.8	153.4	2.21
Whitmore07 46	1170	883	138	2064	3857	0.3	20.7	13.87	306	22.7	27.9	194.3	17.51	12.19	23.9	6.08	2.21	0.57	97.5	134.5	2.25
Whitmore07 47	1095	919	137	1889	4079	0.3	22.5	14.95	331	21.9	27.9	111.0	18.34	13.07	24.7	6.42	1.98	0.45	97.1	130.4	2.33
Whitmore07 48	1639	1554	237	2876	6683	0.4	22.1	14.94	395	22.5	29.4	109.4	18.99	13.54	24.6	6.73	2.34	0.57	102.7	122.2	2.15
Whitmore07 49	1161	901	135	2285	4767	0.6	24.7	15.70	446	23.1	29.2	95.5	20.06	14.75	24.6	7.55	1.78	0.65	100.6	101.5	2.28
Whitmore07 50	1073	813	126	1863	3437	0.5	19.9	12.77	448	20.7	27.8	87.1	17.06	11.52	22.8	7.06	1.59	1.14	91.9	95.1	1.87
Whitmore07 51	1192	930	148	2000	3470	0.5	21.0	13.85	399	21.4	25.0	97.4	15.16	12.43	23.7	6.73	1.25	0.45	91.4	87.5	1.81
Whitmore07 52	1112	813	124	1937	3161	0.5	21.6	14.32	351	21.0	22.6	64.9	12.52	12.95	23.0	6.80	0.89	0.29	86.8	58.1	1.66
Whitmore07 53	1139	834	111	1928	4064	0.4	19.8	13.20	350	20.4	22.4	72.2	10.49	11.61	22.2	8.22	0.84	0.86	85.8	47.3	1.55
Whitmore07 54	1078	860	126	2162	3158	0.6	18.8	12.67	384	20.2	21.3	109.8	10.06	10.00	21.3	7.56	0.78	0.46	86.2	40.5	1.41
Whitmore07 55	1109	826	121	1950	2811	0.5	19.6	13.61	330	20.9	21.9	58.1	9.91	11.93	22.2	6.11	0.72	0.96	90.9	36.2	1.48
Whitmore07 56	1332	1045	157	2339	3126	0.4	18.9	13.40	302	20.8	22.1	60.2	9.02	11.54	21.8	5.15	0.67	0.19	91.9	35.3	1.42
Whitmore07 57	967	693	102	1873	2132	0.4	21.1	14.49	300	21.8	22.6	95.8	9.30	13.18	23.6	5.51	0.76	0.20	93.5	30.1	1.51
Whitmore07 58	1133	955	155	2150	2209	0.3	19.0	13.25	260	21.3	22.7	104.5	8.18	11.13	23.1	5.93	0.64	0.26	90.4	27.0	1.39
Whitmore07 59	1334	1225	196	2353	2576	0.3	21.9	13.72	203	21.0	21.5	67.9	10.26	12.80	24.3	5.60	0.73	0.47	92.5	23.3	1.60
Whitmore07 60	849	683	99	1504	2489	0.3	22.5	14.10	189	21.4	22.3	60.9	9.20	13.20	23.4	4.59	0.76	0.40	95.8	21.3	1.62