Seasonal Summary

For The Great Lakes

Winter 2007-2008

Produced by the North American Ice Service
August 2008

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General Overview of the 2007-2008 Season

Reported temperatures were colder than normal in late November until about mid-December. The following 4 weeks were characterized by above, and in some locations, well above normal temperatures (Figure 1). This was followed by near normal temperatures until mid-February after which time temperatures cooled to below normal values for an extended period of time (Figure 2). Temperatures returned to near seasonal values during the first half of April and warmed to above normal during the second half of the month. Observed temperatures during the first half of May, which coincided with the end of the ice season in the Great Lakes, were close to normal. Figure 3 indicates the temperature anomaly during the entire ice season.

The ice development followed closely the temperature trend that was described above. Ice formed in bays and coastal areas in the northern lakes about 2 weeks earlier than normal. At mid-December freeze-up in the lakes was, in general, 1 to 2 weeks ahead of normal (Figure 4). The period of above normal temperatures that followed prevented any significant ice development and at mid-January the ice cover in the lakes was the third lowest on record since 1973 (Figure 5). While remaining below normal, the ice extent did partly recover between mid-January and mid-February due mainly to a return to near normal temperature values. However ice conditions at mid-February were still below normal.

During the following six weeks below normal temperatures were generally observed (Figure 2) and the ice cover continues to increase until mid-March. Normally the ice cover reaches its maximum during the third week in February after which time it begins to decrease. At near mid-March the ice cover was the second highest over the last 11 years as illustrated in Figure 6. At that time the ice cover in the lakes was above normal and remained so until the end of the ice season. Break-up was in general a week to 10 days late compared to the normal.

Figure 7 shows the TAC (total area coverage) for the Great Lakes for the 2007/08 ice season. The TAC is defined as the sum of the weekly ice coverage over the entire ice season. It indicates that the TAC was below normal for the last ice season. The main reason for this is the delay in the freeze-up due to an extended period of above to well above normal temperatures in parts of December and January (Figure 1).

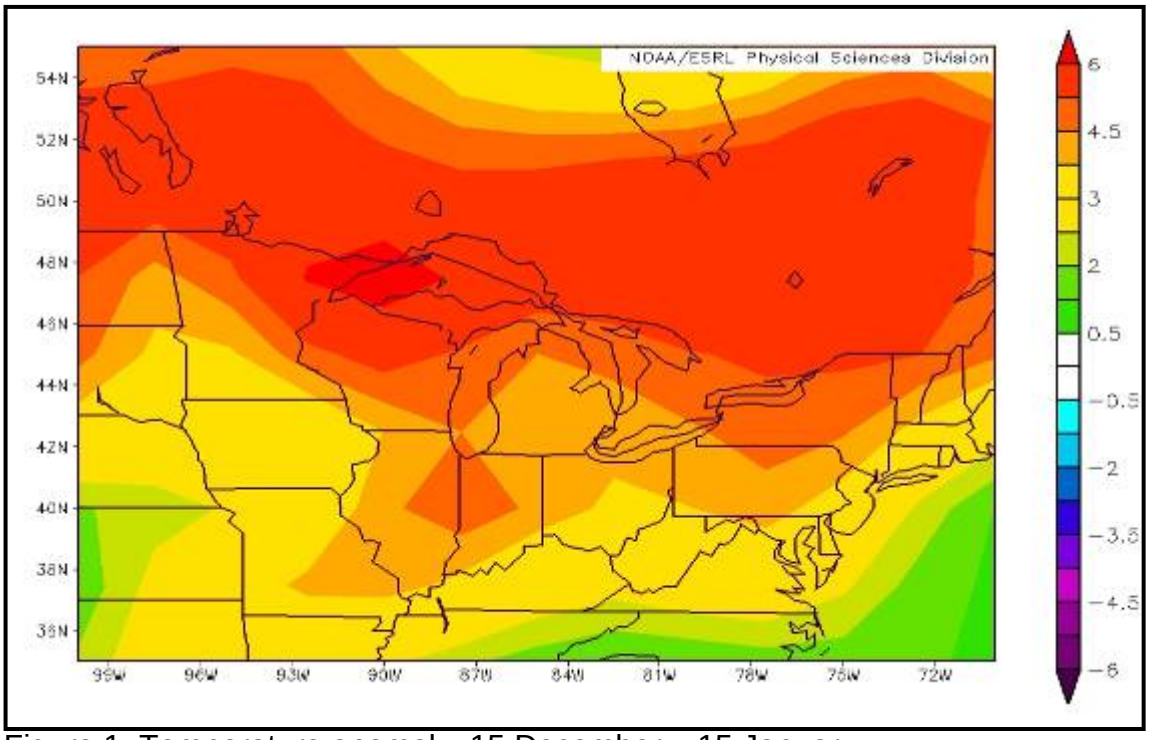


Figure 1: Temperature anomaly, 15 December – 15 January

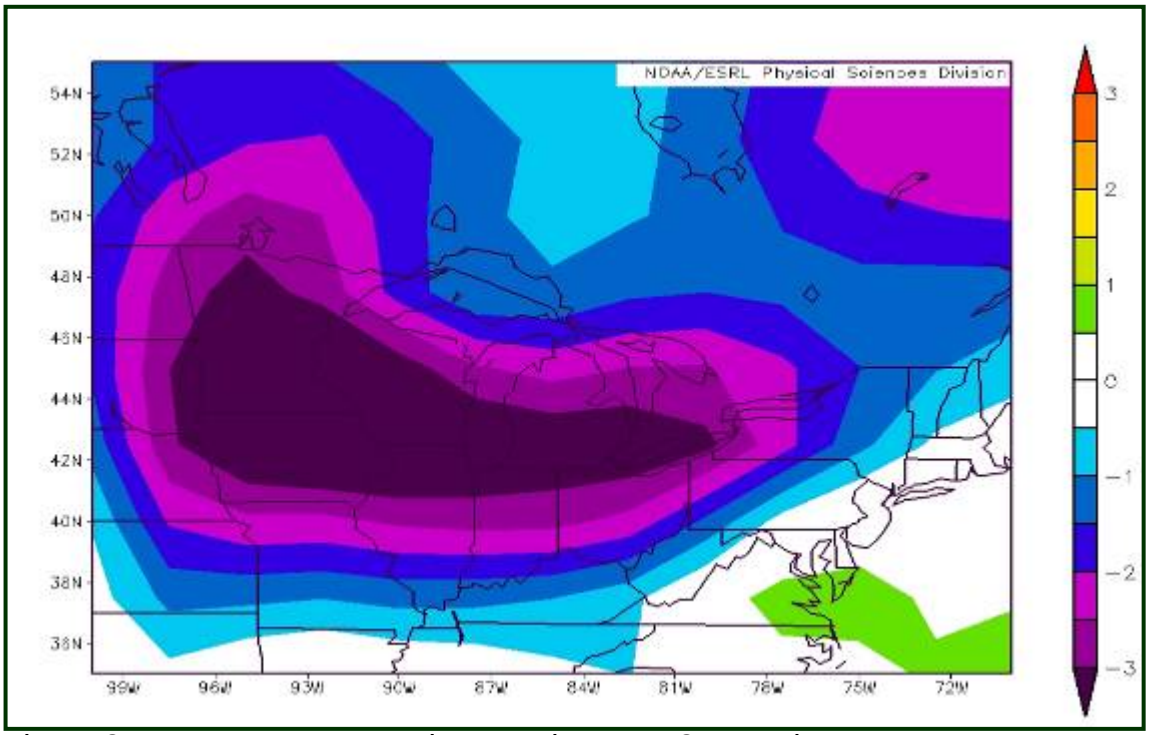


Figure 2: Temperature anomaly, 15 February – 31 March

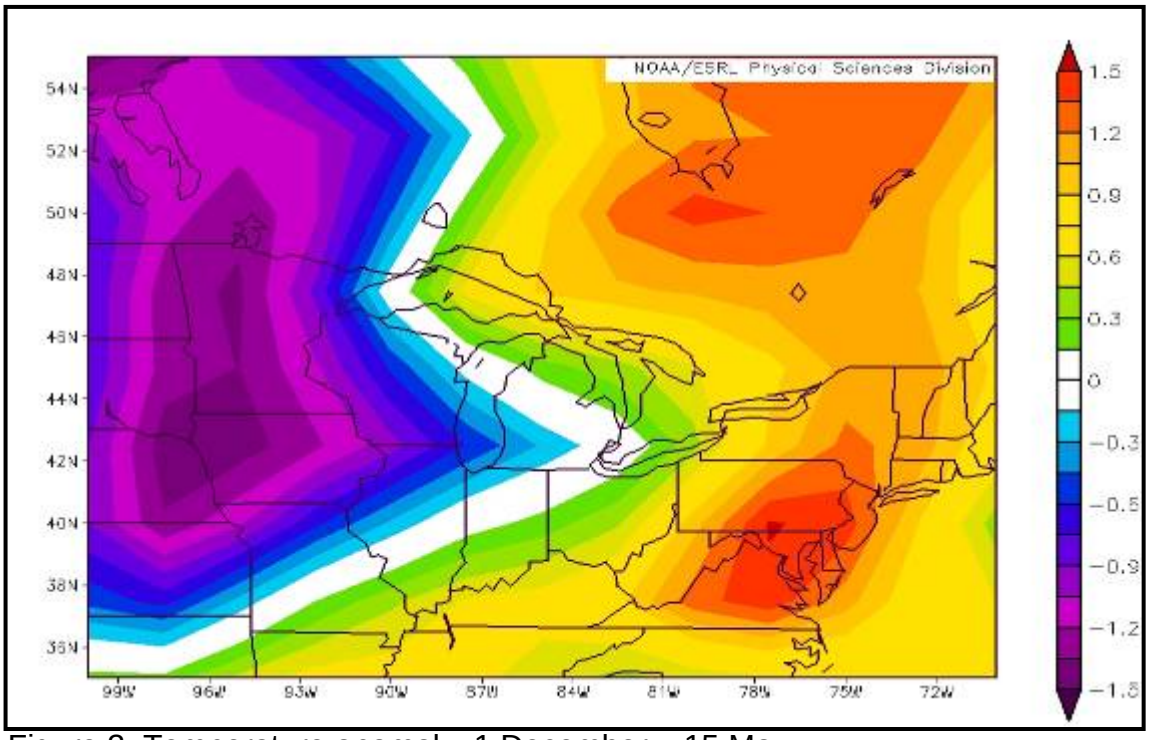


Figure 3: Temperature anomaly, 1 December – 15 May

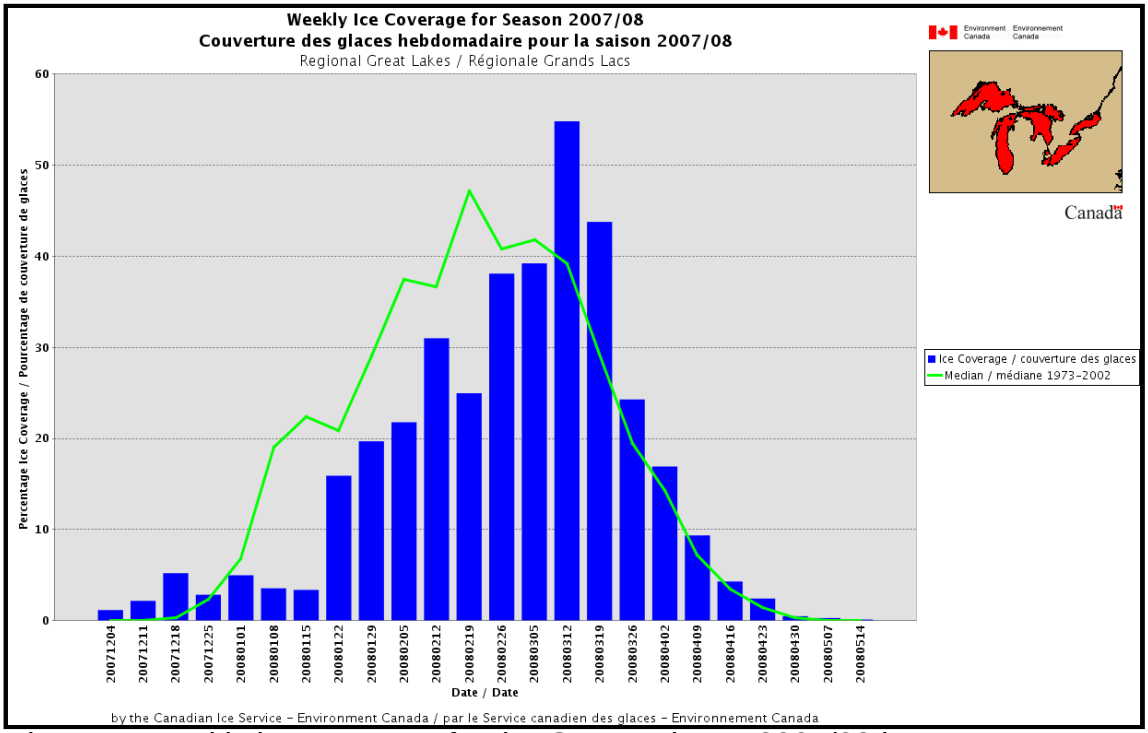


Figure 4: Weekly ice coverage for the Great Lakes – 2007/08 ice season.

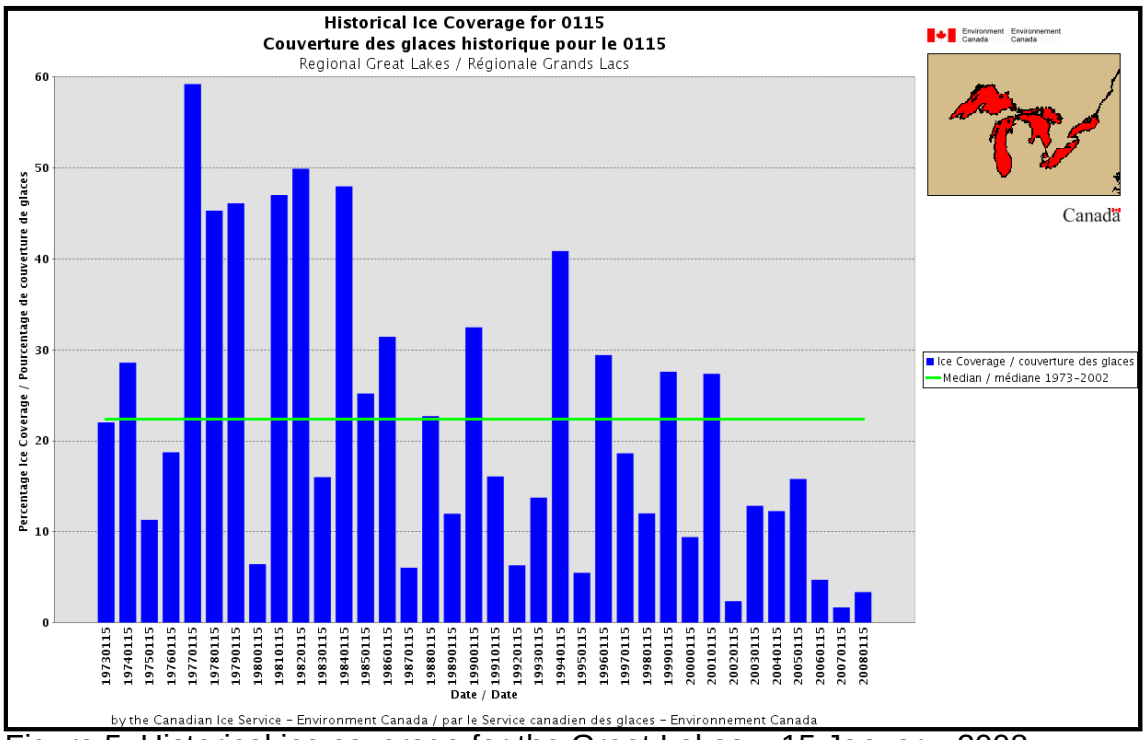


Figure 5: Historical ice coverage for the Great Lakes – 15 January, 2008

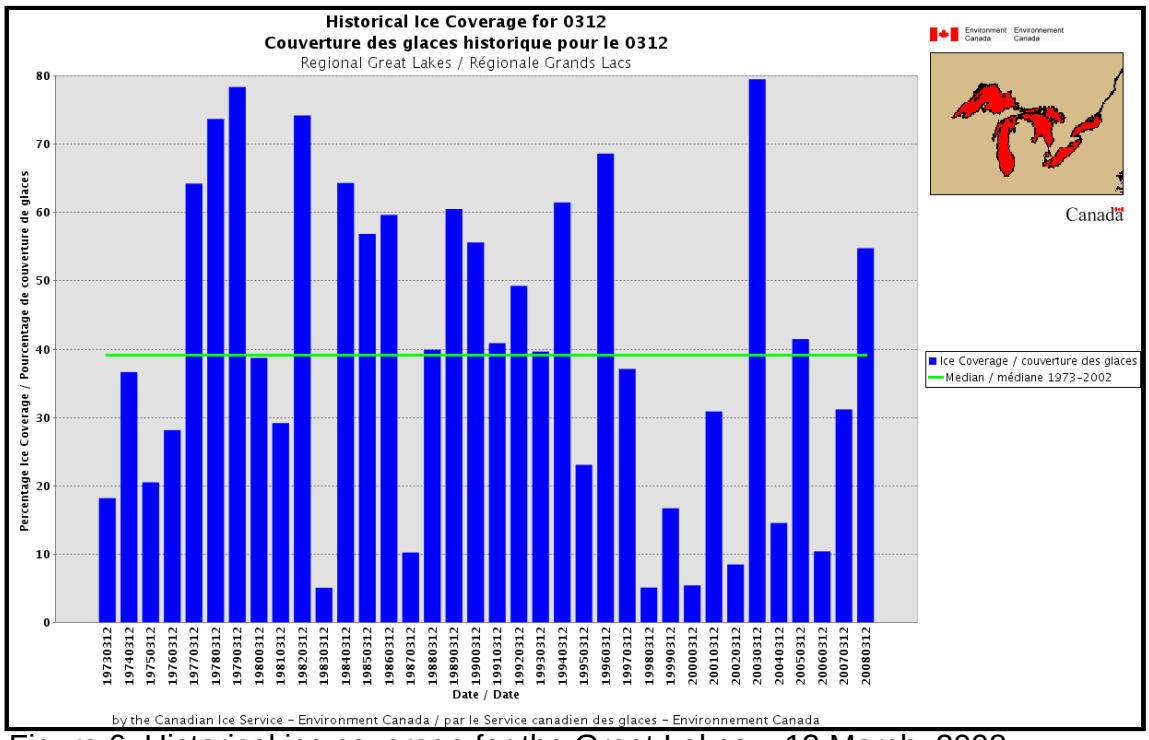


Figure 6: Historical ice coverage for the Great Lakes – 12 March, 2008

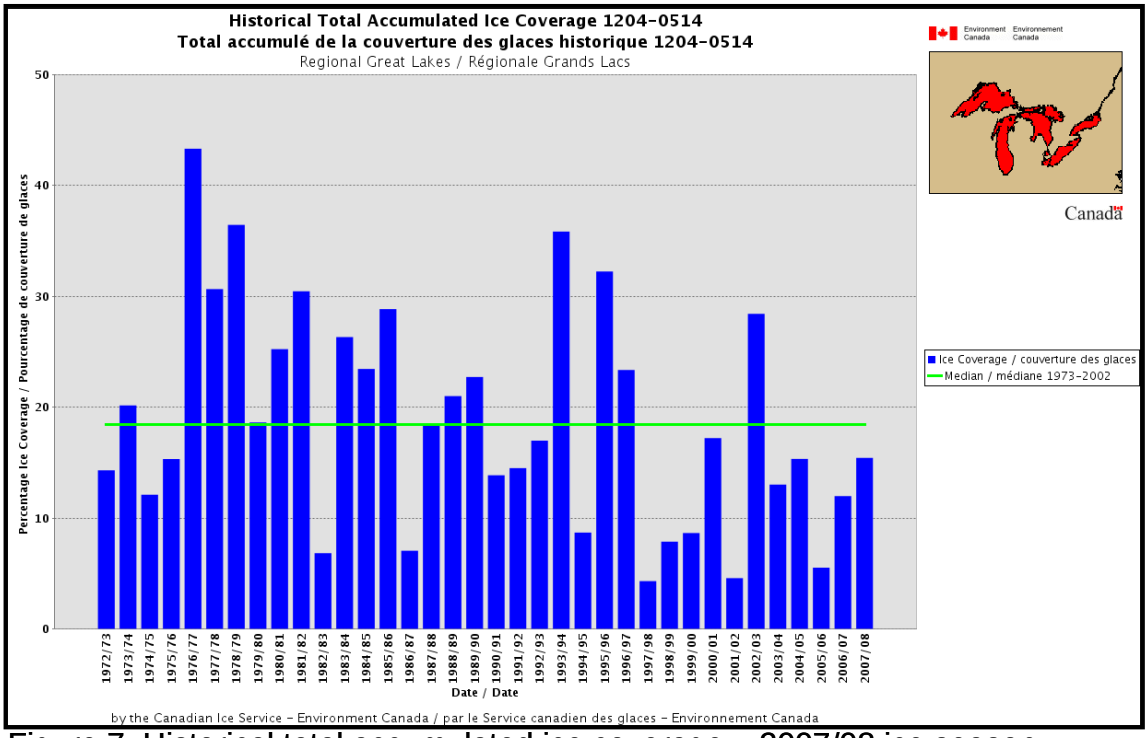


Figure 7: Historical total accumulated ice coverage – 2007/08 ice season

Lake Superior

Colder than normal temperatures were generally observed during the second half of November resulting in the formation of new ice in Black Bay during the last week of the month which is about two weeks earlier than normal. Ice condition and departure from normal concentration, at the beginning of December are illustrated in Figure 18.

The colder than normal temperatures that prevailed during the second half of November intensified and well below normal temperatures were reported during the first 2 weeks of December. Ice spread rapidly in Black and Nipigon Bays and both bays were covered with consolidated medium and thick lake ice at mid-month. New and thin lake ice formed along the western shore of Thunder Bay early in December but this ice was rapidly destroyed during the passage of an intense low pressure system. New lake ice reformed along the western shore of the bay towards mid-month. Ice condition and departure from normal concentration near mid-December are illustrated in Figure 20. A drastic change in the temperature pattern was observed during the second half of December. Well below normal temperatures gave way to well above normal temperatures. As a result little ice development occurred during that time except for coastal ice developing locally late in the month. Despite an early start to ice formation, ice development at the end of 2007 was a few days late (Figure 9).

The mild spell that started near mid-December continued into the first half of January. Well above normal temperatures were the norm during the first 2 weeks of 2008 and again no significant ice development was observed. The ice along the southwestern shore of Lake Superior was pushed offshore by strong southerly winds and melted rapidly. Hence, ice conditions at mid-January (Figure 9) were 2 weeks behind normal. Of note, is Whitefish Bay and Thunder Bay which were still mainly in open water at mid-January, but are normally filled with thin and medium lake ice. The second half of January was characterized by below normal temperatures except slightly above normal over the eastern section of the lake. The return to more seasonable temperature values allowed the ice to develop at a moderate pace. Thunder Bay became consolidated with thin and medium lake ice during the third week of January. Very little ice was found in Whitefish Bay at month's end. Near the end of January ice conditions were 2 to 3 weeks behind normal in many locations in terms of ice development. Figure 26 shows the ice condition and departure from normal ice concentration near the end of the month.

Near to below normal temperatures were generally reported during the first half of February. Some ice development was observed during that time, especially in Whitefish Bay which became entirely covered with medium lake ice and along the southern shore of the lake, but ice conditions near mid-February were in general significantly less than normal as illustrated in Figure 29. Below normal temperatures were reported everywhere around Lake Superior area during the second half of February allowing ice to develop at a moderate to rapid pace. In fact, the ice extent doubled in size between the second and the third week of the month. The ice development was more apparent along the southern shore and in the western third of the lake. Despite the ice recovery, conditions were still 1 to 2 weeks behind normal. See Figure 30 for ice condition and departure from normal concentration near the end of February.

The temperature trend that was observed in the last half of the previous month persisted through the first 2 weeks of March and ice continued to develop and expand. Normally the ice cover in Lake Superior is at its maximum during the first week of March then starts to decrease. This year, however, the maximum cover was reached near mid-March. At that time the ice cover in Lake Superior had surpassed the norm. In fact only once during the last 11 years had the ice cover been greater than this year's (Figure 8). Ice thicknesses were in general close to normal but thicker than normal in the southeast section of the lake. See Figure 33 for ice condition and departure from normal concentration near mid-March.

Colder than normal temperatures have persisted through the second half of March. However days were getting longer and with the normal increase in average temperatures ice melted at a rapid pace. Lake Superior lost half of its ice cover during the third week of the month. At the end of March almost all of the mobile ice had melted but Whitefish Bay and Thunder Bay were still consolidated with thick and very thick lake ice. Break-up was therefore a week later than normal. Figure 35 shows the ice condition and departure from normal concentration at the end of March.

A return to near normal temperatures was observed during the first half of April. The rest of the mobile ice melted and bays around the lake started to fracture. Ice condition and departure from normal concentration at mid-April are illustrated on Figure 37. Slightly above normal temperatures prevailed during the last 2 weeks of April and the only ice remaining at the end of the month was found in bays along the northern shore of Lake Superior as illustrated in Figure 39.

The ice in bays along the northern shore of Lake Superior had all melted by mid-May. Normally the last of the ice in Lake Superior melts a week earlier.

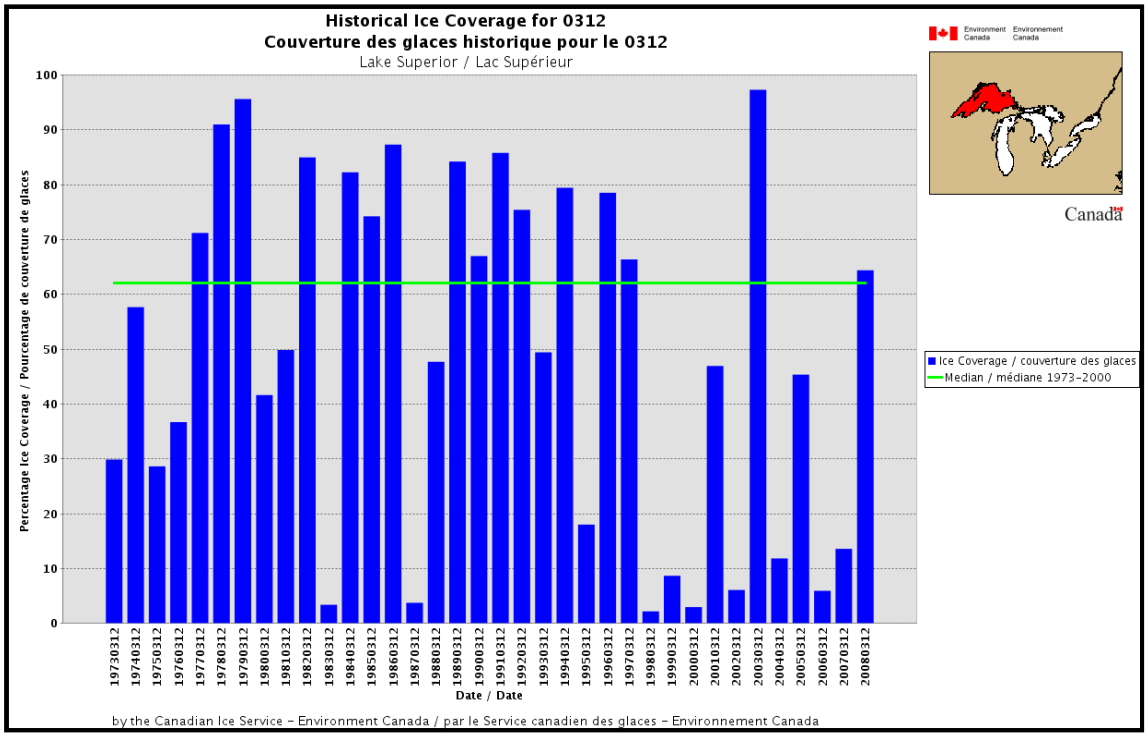


Figure 8: Historical Ice Coverage for Lake Superior for March 12th

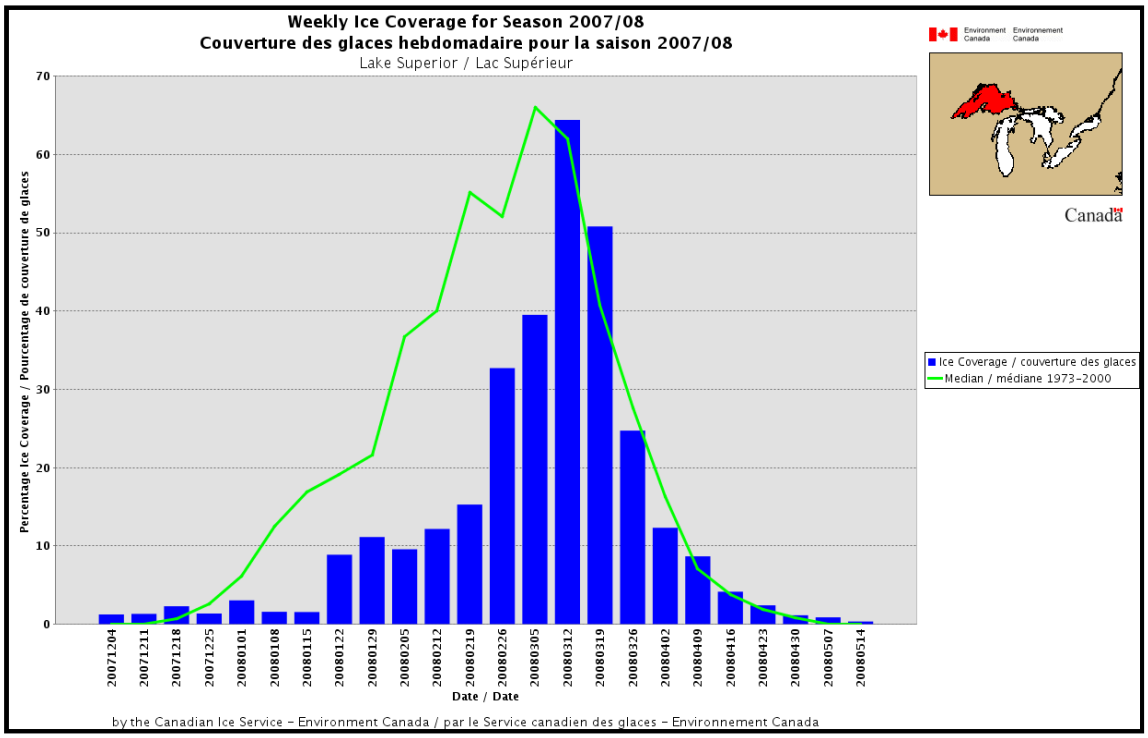


Figure 9: Weekly ice coverage for Lake Superior – 2007/08 season.

Lake Michigan

Below normal temperatures were observed late November through the first half of December resulting in early ice formation across Lake Michigan. During the first week of December, new lake ice was already developing along the southern shoreline of Green Bay and within Bays de Noc. In terms of ice formation, Green Bay was about a week to 10 days earlier than normal. The ice conditions and its departure from normal near mid-December are illustrated in Figure 20. The colder than normal temperatures that prevailed during the first part of December was followed by above to much above normal temperatures during the second half of the month. As a result, little ice formation was reported during this period, however ice conditions in Green Bay as well as along the northern shoreline of Lake Michigan continued to be a few days ahead of normal. Ice conditon and its departure from the normal on December 31st are illustrated in Figure 22.

Observed temperatures across Lake Michigan continued to be well above normal for the first half of January. Maximum air temperatures reached upwards to 6.0C in and around the Green Bay area on January 7th. Normal maximum temperature values for this area are around -3C for this time peroid. Due to above normal temperatures there was no new ice development. In fact a decrease in the ice coverage extent was observed. This was evident along the northern shoreline of Lake Michigan as well as in the Green Bay region during the December 31st to January 14th time period. Ice conditions near mid-January for each are illustrated in Figures 24. These conditions midway through January were close to 2 weeks behind normal for the entire Lake. The second half of the month, temperatures dropped to below normal values which enabled moderate to rapid ice development. By the end of January, consilidated medium lake ice covered all of Green Bay, which was typical for this time of year, and most coastal regions were reporting ice accumulations along the shorelines. Ice condition and its departure from normal at the end of January are illustrated in Figure 26.

The first week of February slightly warmer than normal temperatures prevailed, however by the second week, cooler air filtered into the region bringing the average temperature for the two weeks near normal for that time of year. During this period ice developed and expanded significantly across the Lake. Areas such as Milwaukee southward down to Chicago saw significant amounts of ice accumulating along the coastline. By mid February, Lake Michigan saw higher ice concentration values than normal within southern portions of the Lake, however lower concentration values were evident within northern portions of the Lake, including both the Lower and Grand Traverse Bay areas. The ice condition and its departure from normal are shown in Figure 29. The second half of February below normal temperatures were recorded permitting ice development at a moderate pace. At this time ice has encompised Beaver Island and coastal ice around the lake is expanding further offshore. At this point of the season, the coverage of ice across Lake Michigan is greater than the long term average (Figure 11).

The colder than normal temperatures that prevailed during the second half of February, persisted through the first half of March extending the duration of greater than

normal ice coverage throughout the Lake . Usually the first half of March represents a time of ice break up and decay, however new and continual ice growth occurred this year, especially over northern portions of the Lake. At this point in the season the ice located in the extreme northeast quadrant of the Lake near the Straits of Mackinac became completely fasted and ice extended south of Beaver Island into both the Little and Grand Traverse Bays, as shown in Figure 33. The cooler air around the region continued to be locked in place for the remainder of March with slightly below normal temperatures reported. Despite below normal conditions, the ice around the Lake at this point was beginging to decay and break up due to normal temperatures increasing with each passing day. This is clearly evident within the southern portions of the Lake which shows only open water by the end of March. Also contributing to ice decay was the shifting of the ice off the western coastline into warmer, inner portions of the Lake due to persistent winds out of the northwest. Ice condition were normal to slighlty heavier than normal at the end of March (Figure 35).

The first half of April temperatures were near normal across the Lake Michigan area. Ice break-up and decay continued to be a few days later than usual at the end of the first week, however by the end of week two Green Bay mainly saw open water conditions with higher concentrations toward the southern tier of the Bay. The Straits of Mackinac were melting out nicely as well. (Figure 37) With the help of above normal temperatures during week 3 only the Big Bay de Noc and extreme north-eastern portions of the Lake saw any remaining ice. By the end of April the Lake was ice free.

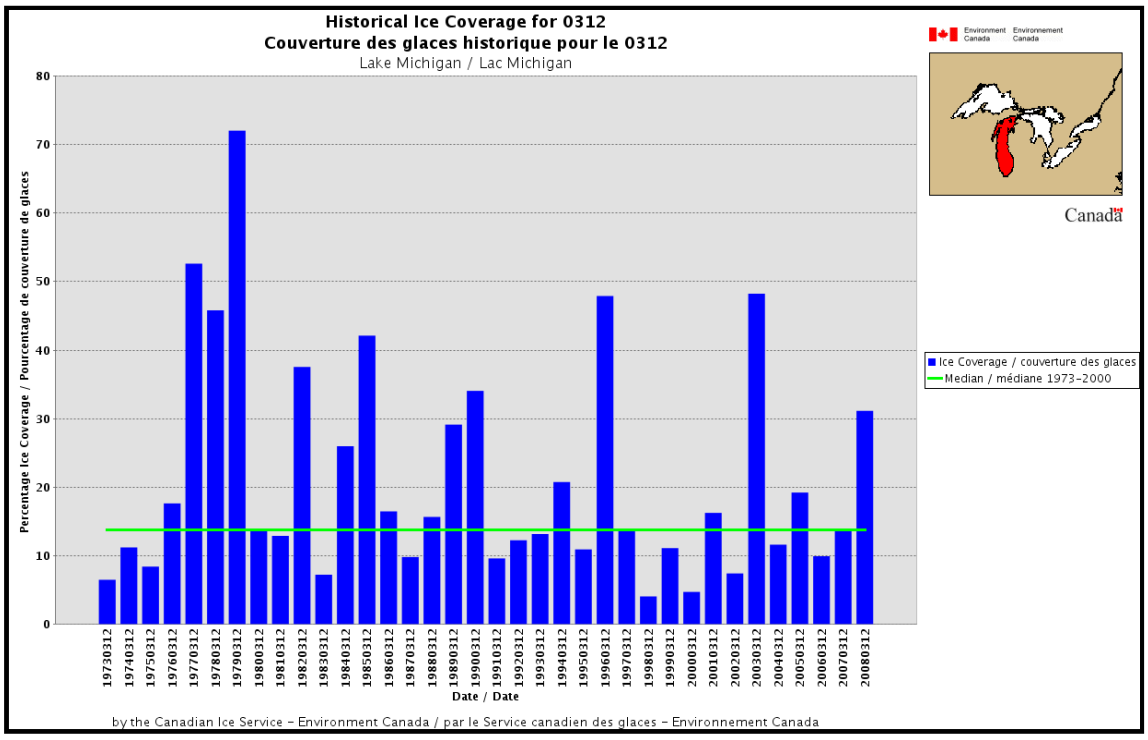


Figure 10: Historical Ice Coverage for Lake Michigan for March 12th.

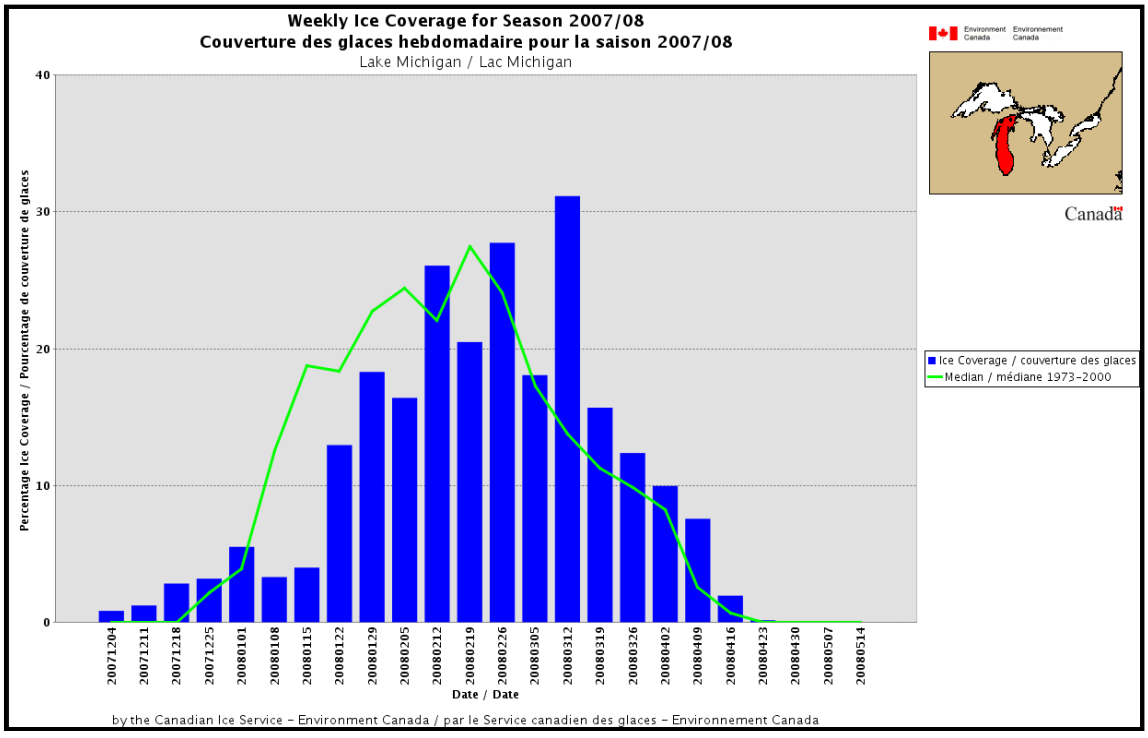


Figure 11: Weekly ice coverage for Lake Michigan – 2007/08 ice season.

Lake Huron and Georgian Bay

Below normal temperatures generally prevailed during the last 2 weeks of November as well as the first half of December. As a result new ice started to develop much earlier than normal. During the first week of December new lake ice was already developing in St Mary's River and along sections of the shore of Saginaw Bay and Georgian Bay. The ice conditions near mid-December are shown in Figure 20. Freeze-up was 2 weeks earlier than normal. The colder than normal temperatures that prevailed during the first part of December was followed by above to much above normal temperatures during the second half of the month. As a result little or no ice formation was reported during that period. In fact, during the second half of December Lake Huron lost almost 50% of its ice coverage (Figure 13).

During the first 2 weeks of 2008 reported temperatures were well above normal. As a result little ice development occurred during that time period. In terms of ice development and despite an early start to ice formation ice conditions at mid-January were 10 days to 2 weeks behind normal (Figure 13). Temperatures dropped to near normal values during the third week of January permitting the ice to develop at a moderate to rapid pace. Ice conditions at the end of the week are shown on Figure 25. A return to above to well above normal temperatures during the last week of the month slowed down the ice development process considerably and ice conditions at the end of January were very similar to those a week earlier. Ice conditions at that time remained 10 days to 2 weeks behind normal.

A return to near normal temperatures was observed during the first 2 weeks of February. Ice did develop and expand significantly during the first week of the month but a major wind storm during the second week destroyed a good portion of the new and thin lake ice. Consequently, at near mid-February the ice extent in Lake Huron was less than that a month or so ago and well below normal (Figure 13). The North Channel was finally entirely consolidated. Normally the Channel is consolidated 3 weeks earlier. Of note is the fact that Georgian Bay, which is normally almost all ice covered with medium lake ice at mid-February, was still mainly open water (Figure 29). While there was ice along most of the shore of Lake Huron, its seaward extent was much less than normal. Generally speaking ice conditions at mid-February was then 2 weeks behind normal. Temperatures turned much colder over the second half of February permitting the ice to develop at a moderate to rapid pace. As it can be seen in Figure 30, ice has spread over most of Georgian Bay and the coastal ice around the lake expanded seaward. In fact ice conditions, in term of coverage, were approaching the long term average. The theoretical ice thicknesses however were less than normal.

The colder than normal temperatures that prevailed during the second half of February, persisted through the first half of March. Normally during the first half of March break-up is beginning but this year the ice extent increased considerably during that period. The increase in the ice coverage was the most pronounced in the north-western section of the lake. In fact at mid-March the ice coverage over Lake Huron was about 33% more than normal (Figure 13). Colder than normal temperatures has continued to predominate during the last 2 weeks of March. Despite colder than normal temperatures a significant decrease

in ice coverage was noticed during the third week of the month. The main reason was the fact that a moderate to strong north-westerly wind event pushed the ice that was along the western shore of the lake towards the warmer waters of the central portion of the lake where it melted. Also the ice that was along the eastern shore was crushed against it leading to a further decrease in the ice extent. Temperatures during the last week of March continued to be below normal but as the days were getting longer and with the normal increase in average temperatures conditions were not conducive to ice formation. At the end of March despite the sharp decrease, the ice extent was still higher than normal (Figure 13) and break-up was 2 weeks late compared to the long term average. Ice condition and departure from normal concentration, at the end of March, are illustrated in Figure 35.

Temperatures during the first 2 weeks of April were slightly above normal over the Lake Huron area. With the normal increase in average temperatures the ice melted rapidly. At the end of the first week of April most of the mobile ice had melted. During the second week the consolidated ice along the northeast shore of Georgian Bay and in the central section of the North Channel has fractured (Figure 37). Above to well above normal temperatures were reported during the second half of April. The rest of the ice in Georgian Bay had melted by the end of the third week of the month. Most of the ice in the North Channel had also melted but very loose areas of very thick lake ice were still present in the channel at the end of the month. Ice conditions near the end of April are shown in Figure 39.

The North Channel became open water in early May which is a week to 10 days late compared to the normal.

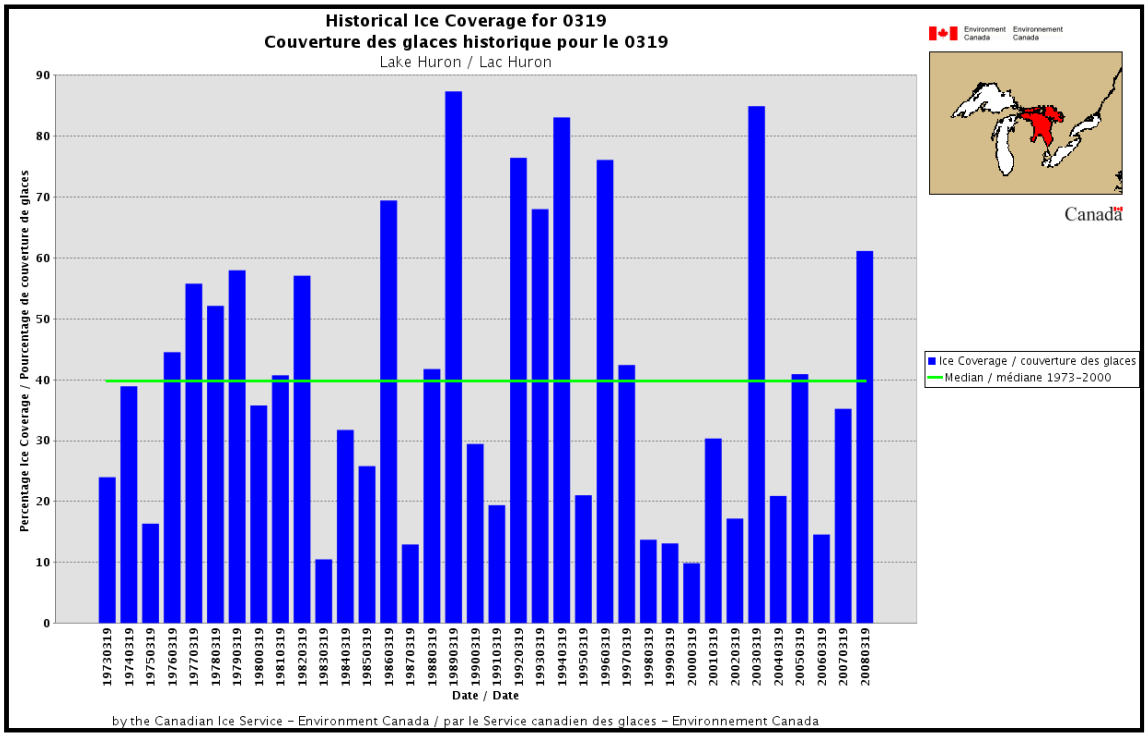


Figure 12: Historical Ice Coverage for Lake Huron for March 19th.

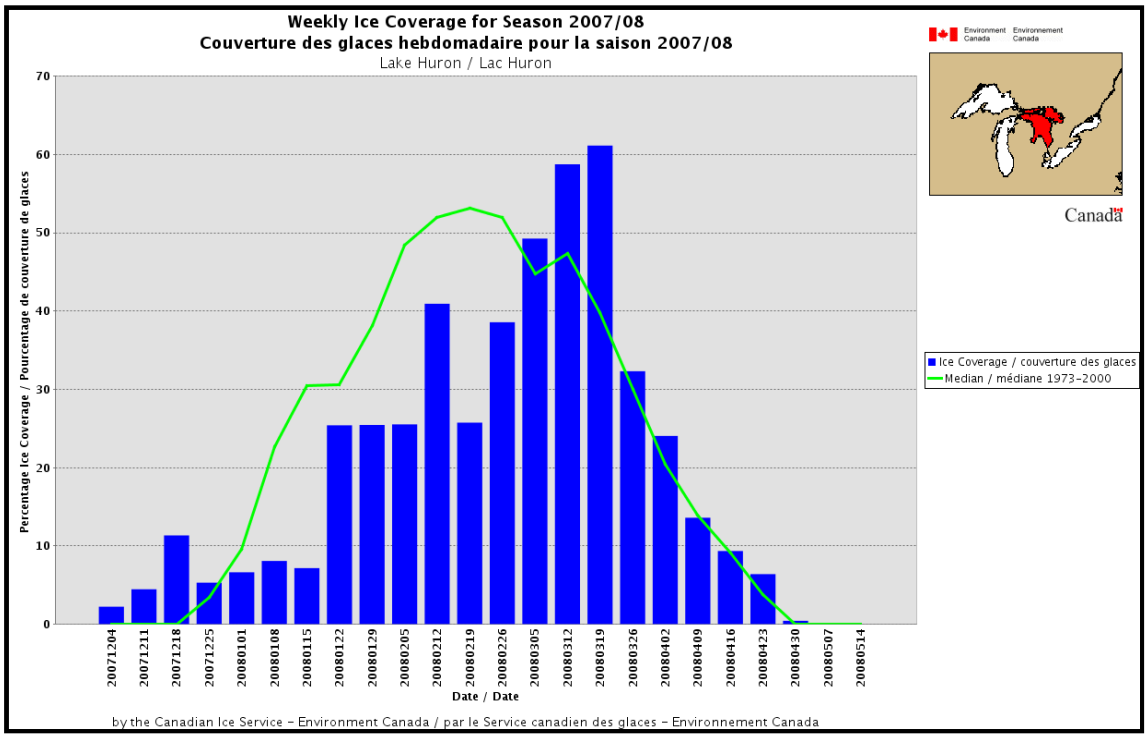


Figure 13: Weekly ice coverage for Lake Huron – 2007/08 ice season.

Lake Erie and Lake St. Clair

Below normal temperatures during the first half of December led to the formation of new lake ice in Lake St Clair and in coastal areas of the Western Basin during the second week of the month which is about 2 weeks earlier than normal (Figure 20). Temperatures warmed to above normal over the entire area during the last 2 weeks of the year. As a result most of the ice melted during the third week of the month. However new ice did reform towards the end of December as temperatures dropped to more seasonal values. Ice condition and departure from normal concentration at the end of December are illustrated in Figure 22.

The first two weeks of 2008 were exceptionally mild, one of the warmest on record. As a result most of the ice in the area melted during the first week of January. At mid-January ice conditions were one of the lightest on record and, in terms of freeze-up, were about 3 weeks late compared to the normal (figure 15). Temperatures cooled to more seasonal values in the second half of January and this permitted the ice to develop at a moderate to rapid pace. At the end of the month the ice cover was approaching the normal as it can be seen on Figure 15. However due to the much later than normal freeze-up, ice thicknesses were less than normal. Ice conditions and departure from normal concentration, towards the end of January, are illustrated on figure 26.

Despite warmer than normal temperatures during the first half of February, significant ice development was observed especially during the second week of the month. At mid-month the ice extent remained closed to the normal (figure 15) but ice thicknesses in general were still less than what could be normally expected. Figure 28 shows ice conditions and departure from normal concentration near mid-February.
The second half of February was characterized by a return to below normal temperatures. Ice spread to all areas of the lake during the third week of the month. At month's end Lake Erie and Lake St. Clair remained entirely ice covered (figure 30). Normally the maximum ice extent in Lake Erie is reached near mid-February after which time a steady decrease is observed (figure 15). This year, however, the extent continued to increase during the second half of February. Consequently, the ice cover at the end of February was greater than normal (Figure 15).

Below normal temperatures were generally reported in the first two weeks of March. Due to the colder than normal temperatures the decrease in the ice cover that normally occurs during the first half of March has not been observed this year. In fact the lake remained almost entirely ice covered until mid-March which is highly unusual. Ice thicknesses recovered due to persistent below normal temperatures over the last month and was near their normal values. Figure 14 shows that the ice extent near mid-March was the second highest since 1997. Ice conditions and departure from normal concentration at the middle of March are illustrated on figure 33.

Little change in the temperature pattern was observed during the second half of March as colder than normal temperatures continued to predominate. However with longer days and the normal increase in average temperatures break-up started just after mid-

month and Lake Erie lost about half of its ice cover during the last 2 weeks of March. This rapid reduction in the ice cover could also be partly explained by the passage of an intense Winter storm and associated north-westerly winds which destroyed most of the thinner ice as well as compacting the thicker ice along the southern shore of the lake. Figure 15 indicates that at the end of March there was still significantly more ice than normal. Ice conditions and departure from normal concentration are illustrated on figure 35.

After 6 weeks of below normal values, temperature rose to slightly above normal during the first half of April. Ice melted at a rapid pace and at mid-month the only ice remaining was found in the eastern end of the lake near Buffalo (Figure 37). Ten days later Lake Erie was entirely ice free. Break-up was in general 2 to 3 weeks later than normal.

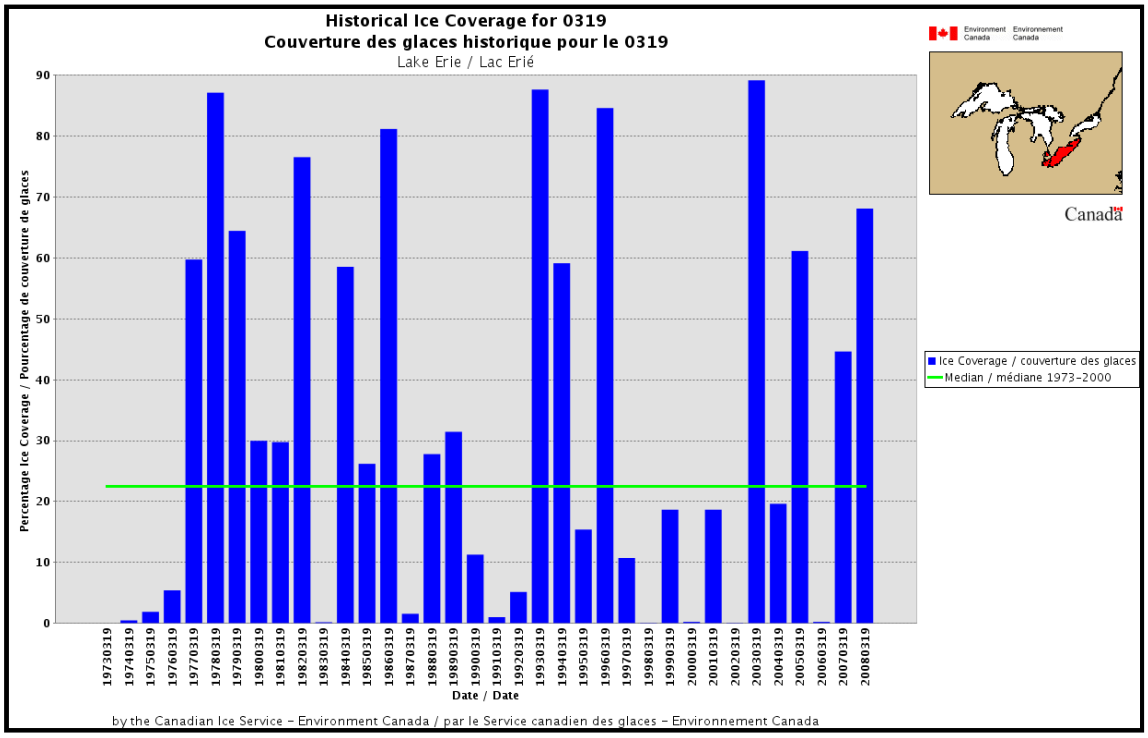


Figure 14: Historical Ice Coverage for Lake Erie for March 19th.

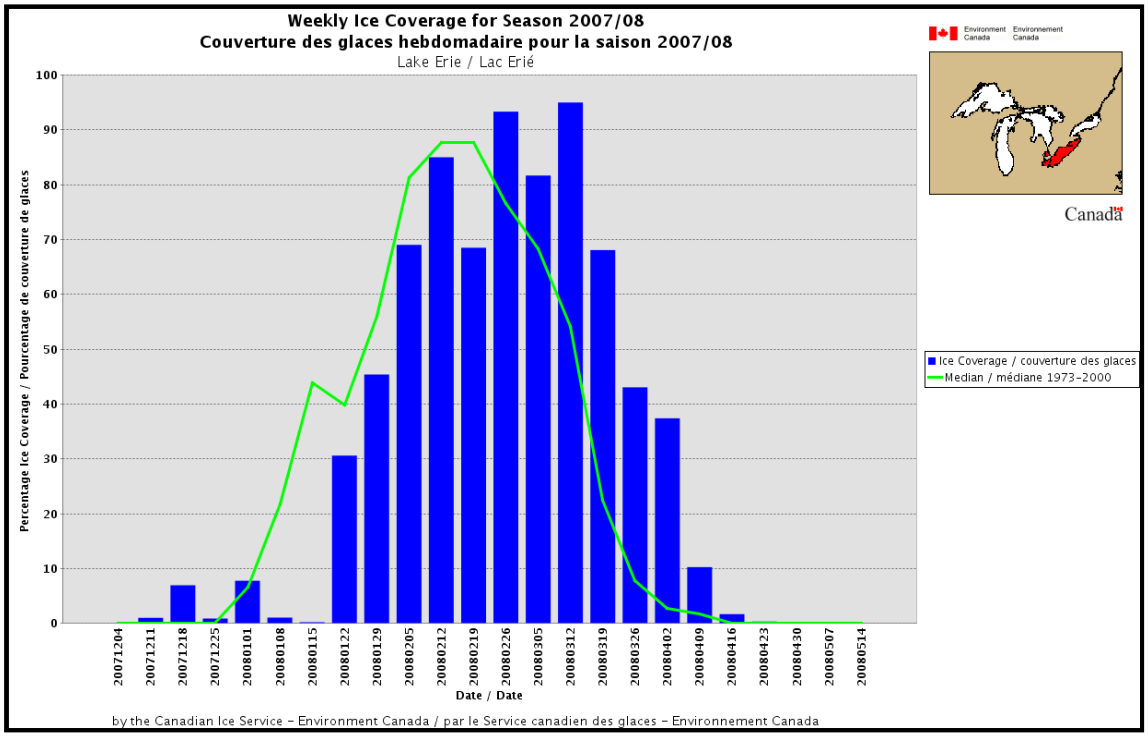


Figure 15: Weekly ice coverage for Lake Erie – 2007/08 ice season.

Lake Ontario

Below normal temperatures during the first half of December permitted new ice to form in Bay of Quinte and in the western section of the St Lawrence Seaway which is 3 weeks earlier than normal. Above normal temperatures the following 2 weeks prevented any significant new ice development and ice conditions at the end of 2008 were similar to those observed at mid-December. Ice condition and departure from normal concentration, at the end of 2007, are illustrated in figure 22.

Well above normal temperatures invaded the Lake Ontario area during the first 2 weeks of 2008, again preventing any significant ice development. The only noticeable exception was the thickening of the ice in inner bays along the northeast shore of the lake which reached the medium lake ice stage. Despite an early start to the ice season ice conditions at mid-January were far less than normal (Figure 17). Ice conditions and departure from normal concentration are illustrated in Figure 24. Above normal temperatures persisted through the second half of January, although not as much above as the previous 2 weeks. Some ice development was observed in bays along the northeast shore but the lake itself was still open water or ice free at month's end. Freeze-up was 2 weeks behind normal. See Figure 26, for ice condition and departure from normal concentration near the end of January.

Above normal temperatures continued to predominate during the first half of February. The only change that occurred during that time period was the formation of new and thin lake ice in the northeast section of the lake. A band of new ice formed along the shores of the lake but had melted by mid-month. The second half of February saw an end to the above normal temperature trend and below normal values were generally observed during that time period. The only noticeable change regarding the ice conditions during the last 2 weeks of February was the thickening of the ice in the northeast section. The ice cover did not change significantly. Ice condition at the end of February was close to normal (Figure 17). Ice condition and departure from normal concentration are shown in figure 30.

Below normal temperatures during the first half of March allowed for some ice development in the eastern section of the lake. Normally during that time period break-up is well under way and the ice cover diminishes rapidly. At near mid-month the ice cover was above normal (Figure 17). Despite colder than normal temperatures in the second half of March much of the mobile ice that was present in the northeast section of the lake had melted. At the end of the month the ice cover was near normal (Figure 17). Ice condition and departure from normal concentration are shown on Figure 35.

A return to above normal temperatures was observed during the first half of April. Little change in the ice conditions took place during the first week in April. All the ice melted during the second week. Break-up was in general one week late.

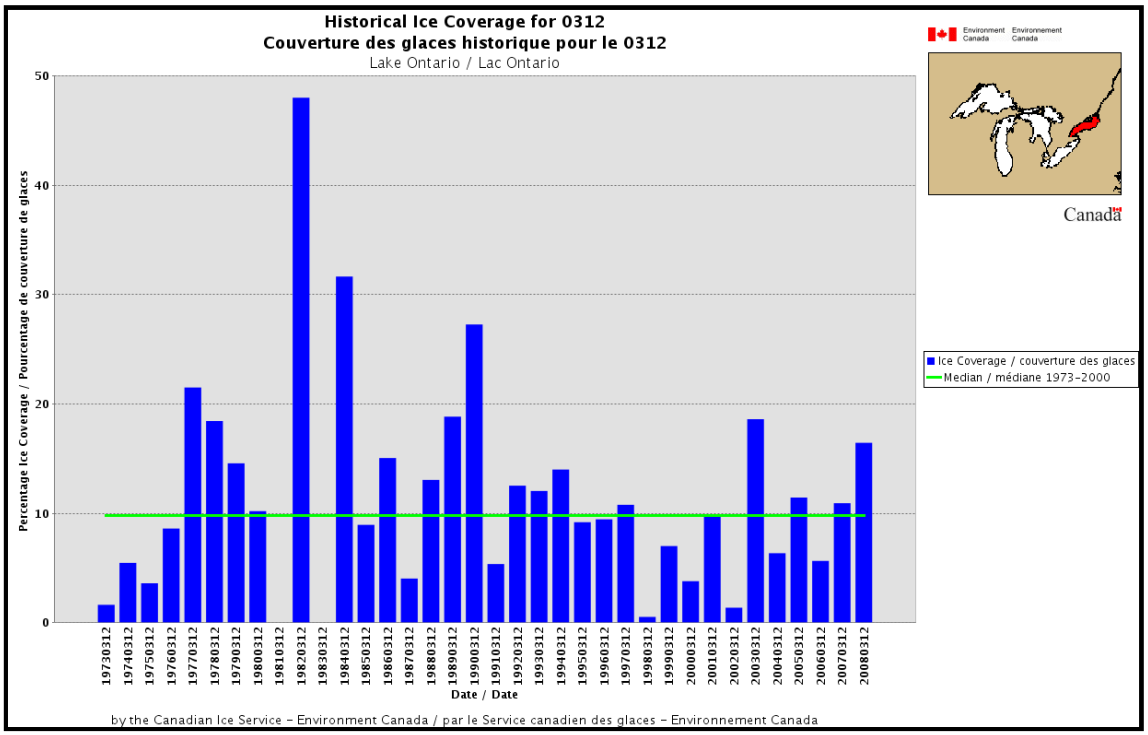


Figure 16: Historical Ice Coverage for Lake Ontario for March 12th.

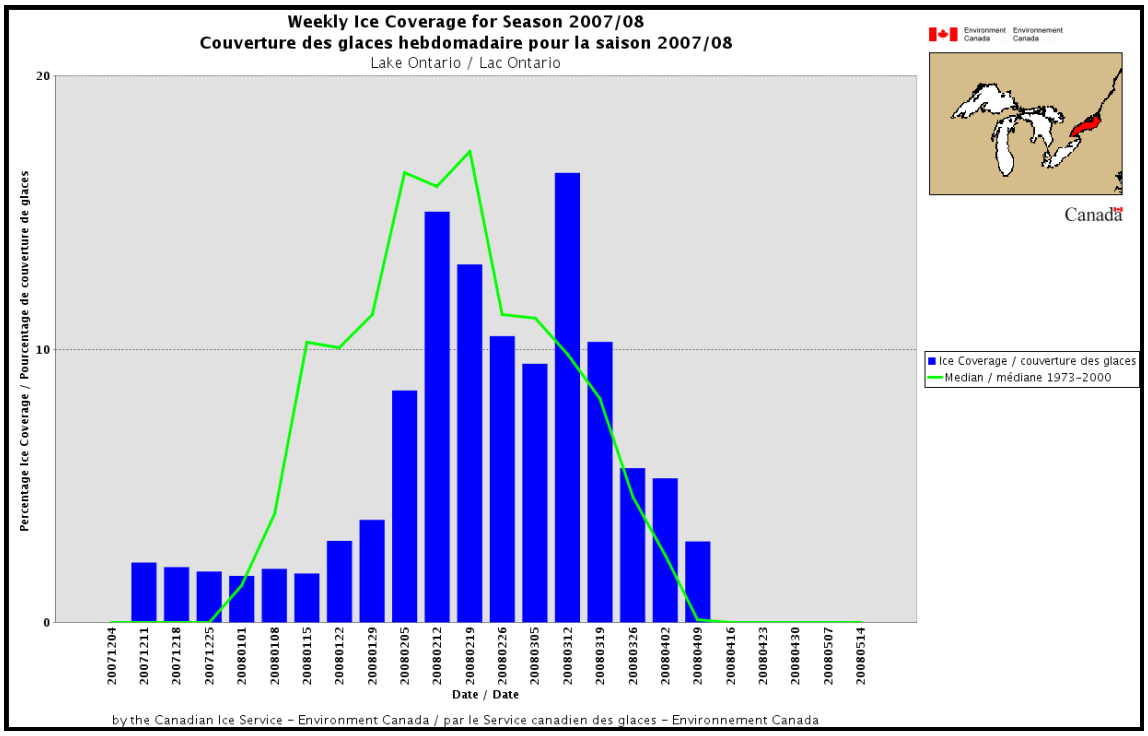


Figure 17: Weekly ice coverage for Lake Ontario – 2007/08 ice season.

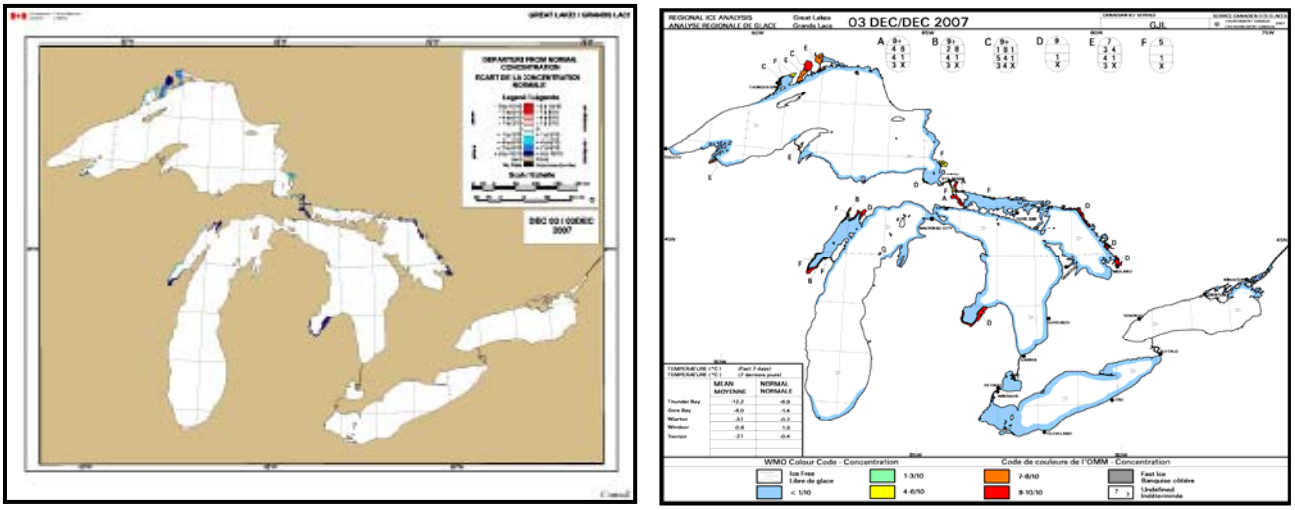


Figure 18: Departure from normal concentration and ice conditions – December 03rd, 2007

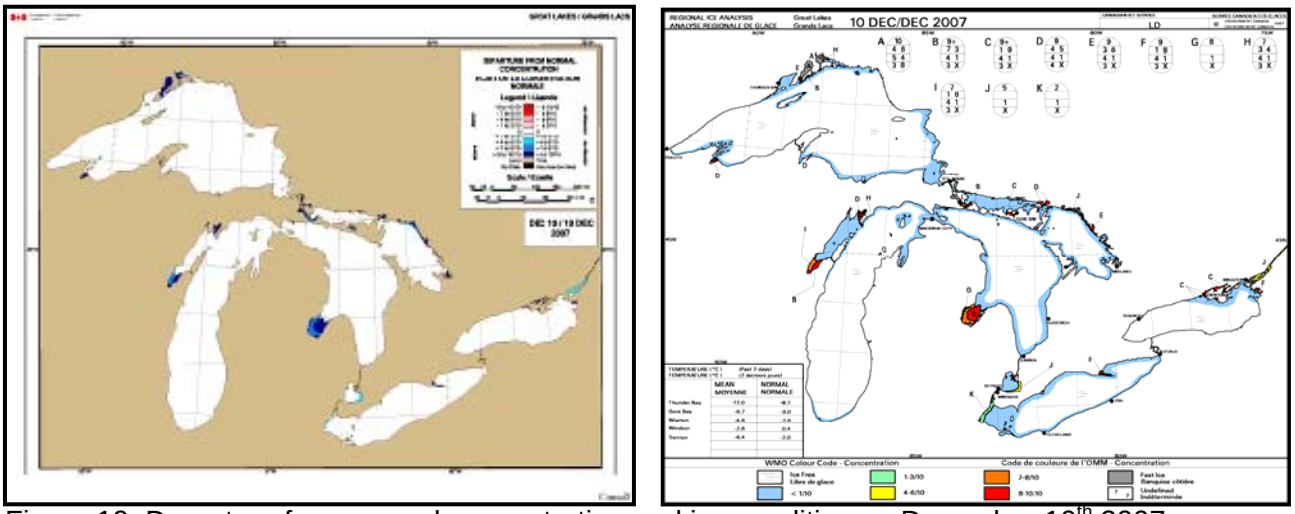


Figure 19: Departure from normal concentration and ice conditions – December 10th 2007

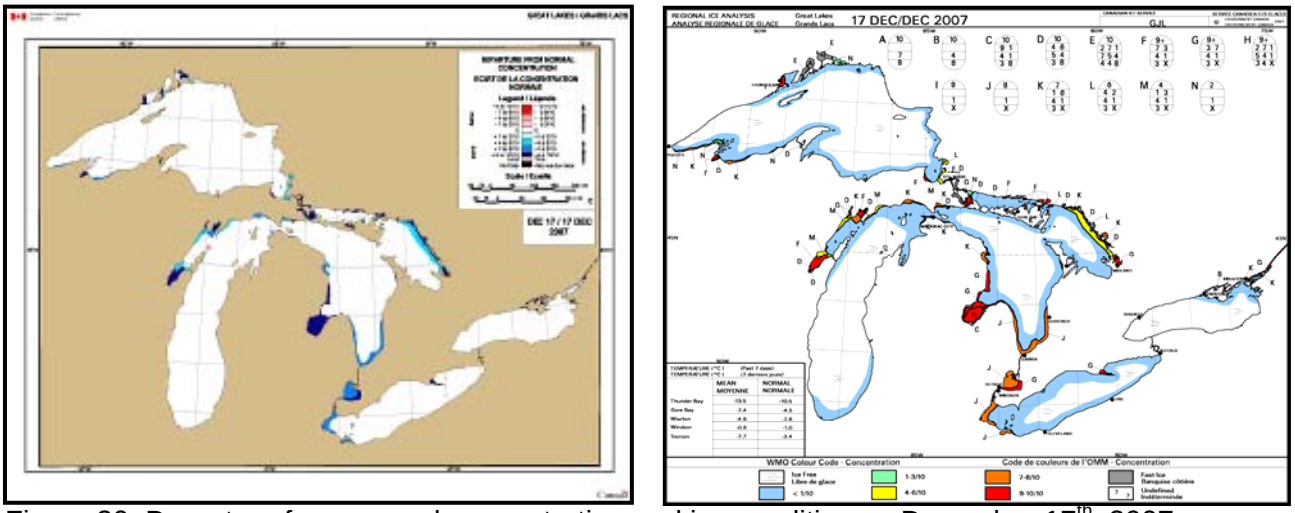


Figure 20: Departure from normal concentration and ice conditions – December 17th, 2007

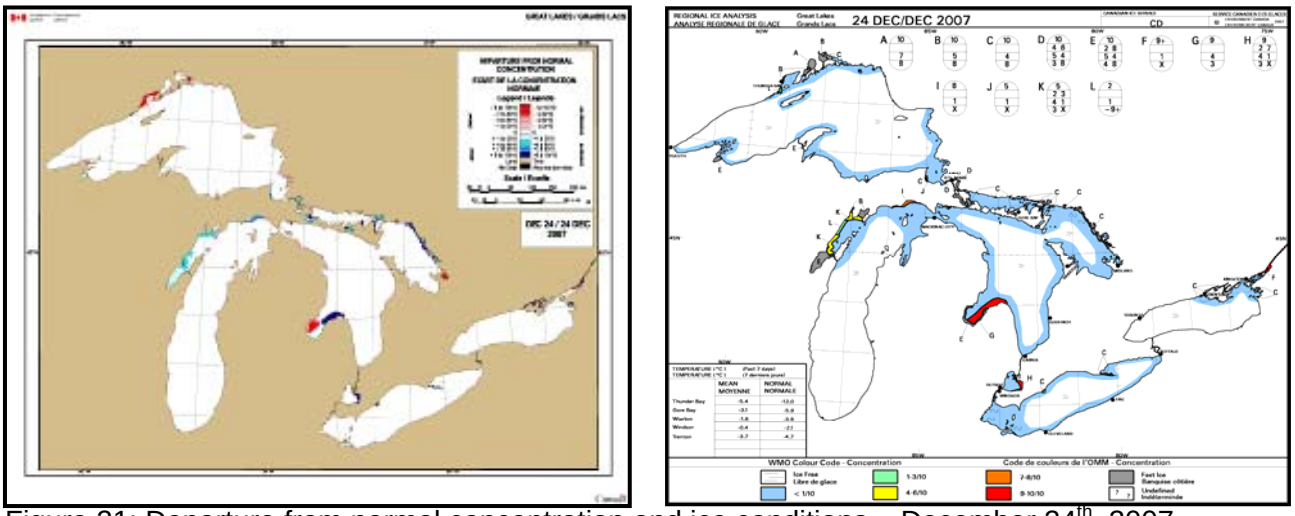


Figure 21: Departure from normal concentration and ice conditions – December 24th, 2007

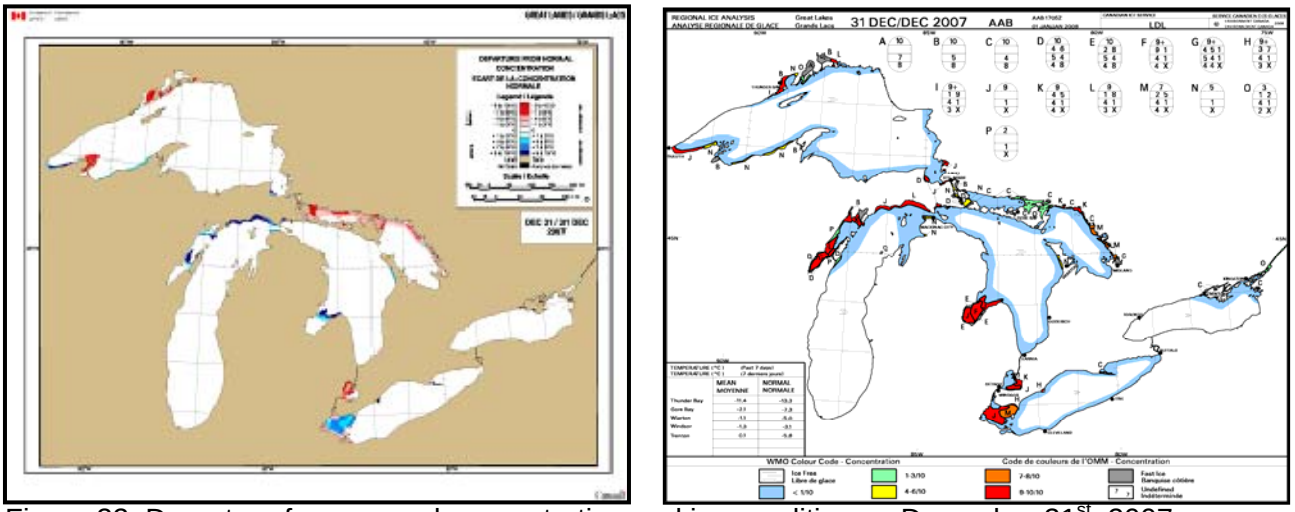


Figure 22: Departure from normal concentration and ice conditions – December 31st, 2007

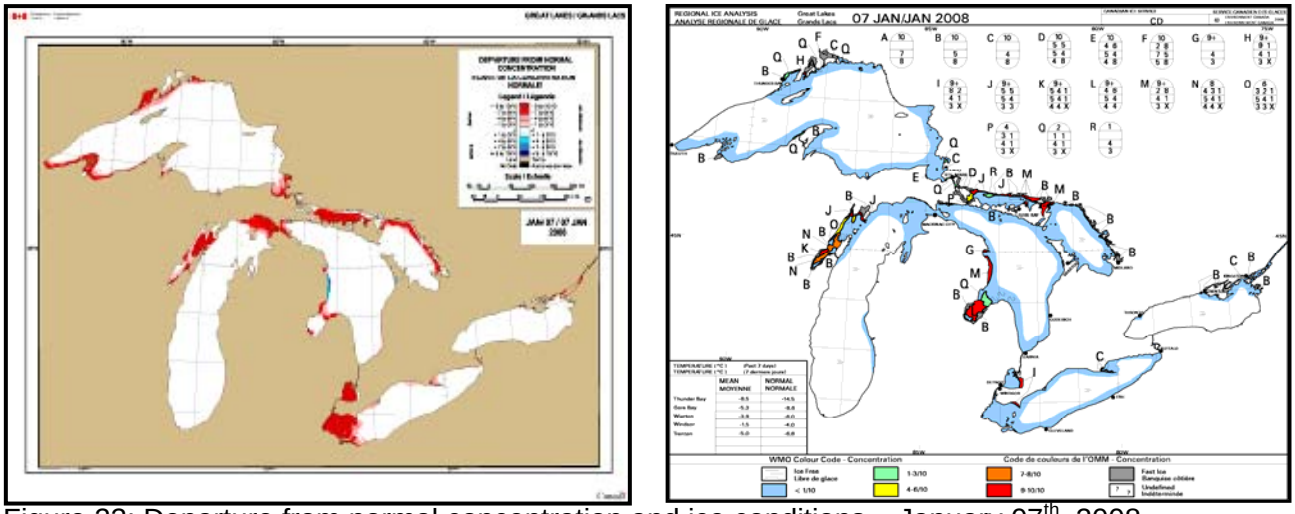
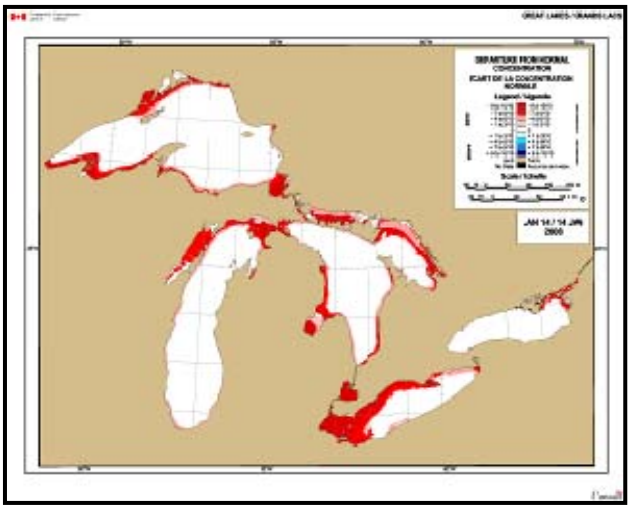


Figure 23: Departure from normal concentration and ice conditions – January 07th, 2008



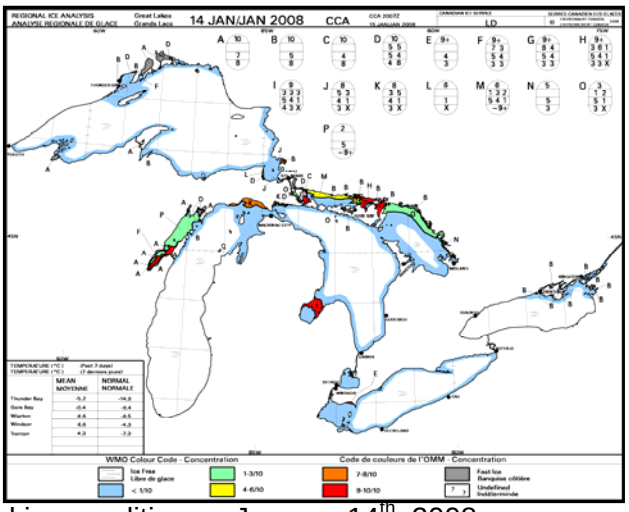
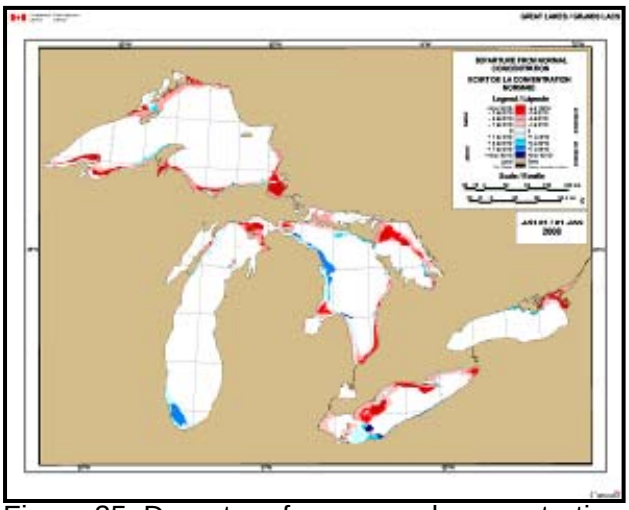


Figure 24: Departure from normal concentration and ice conditions – January 14th, 2008



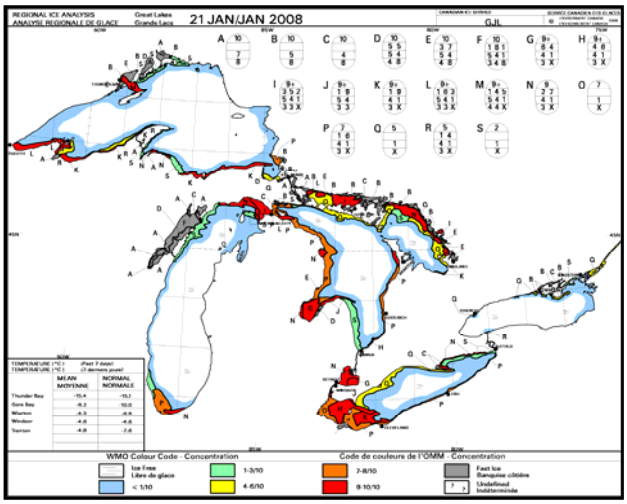
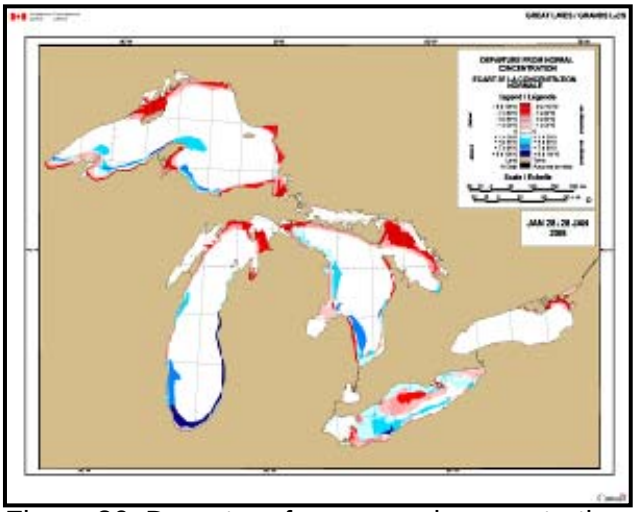


Figure 25: Departure from normal concentration and ice conditions January 21st, 2008



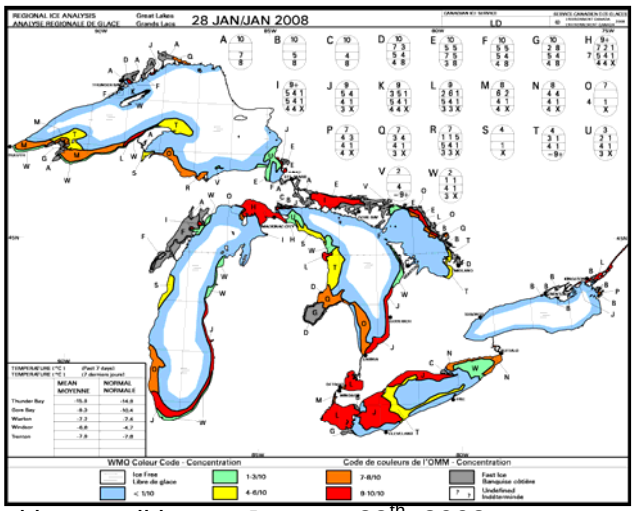
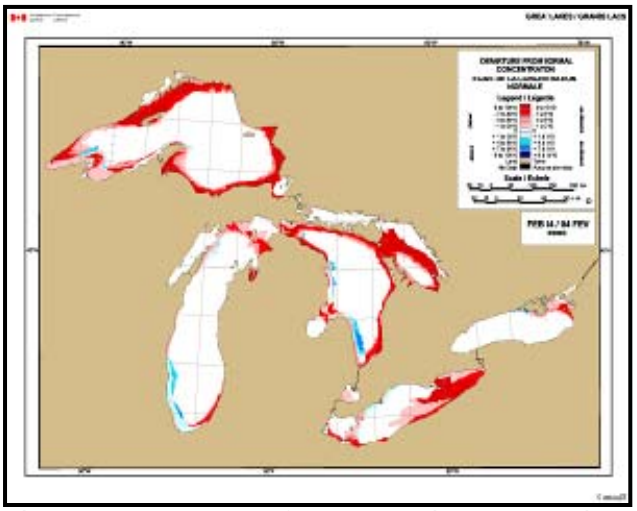


Figure 26: Departure from normal concentration and ice conditions – January 28th, 2008



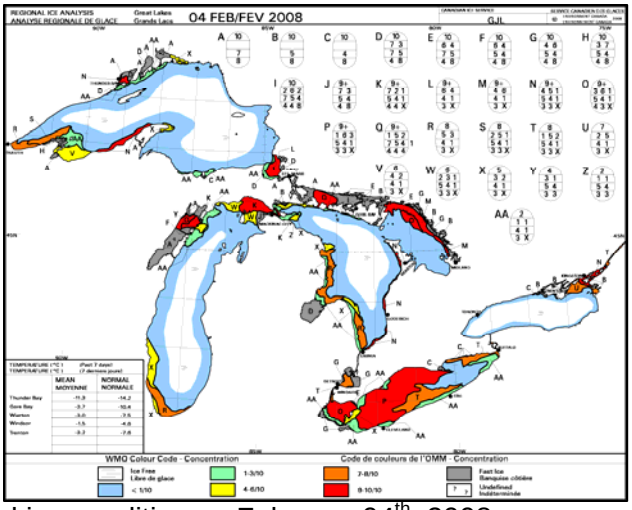
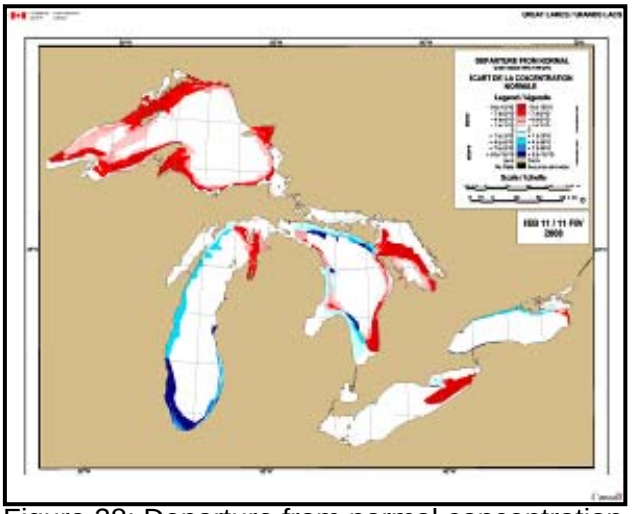


Figure 27: Departure from normal concentration and ice conditions – February 04th, 2008



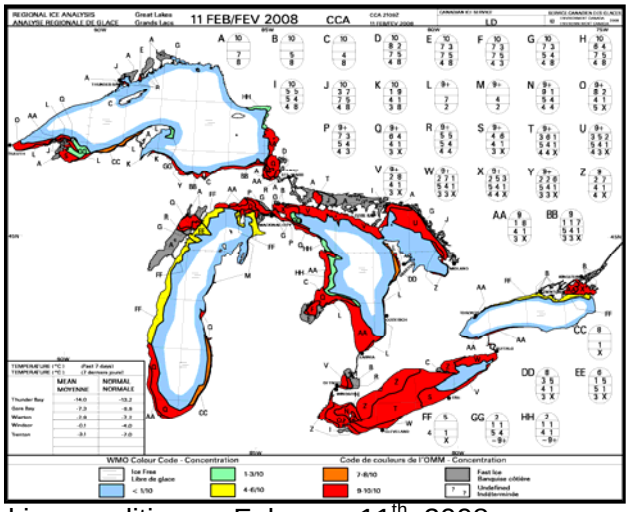
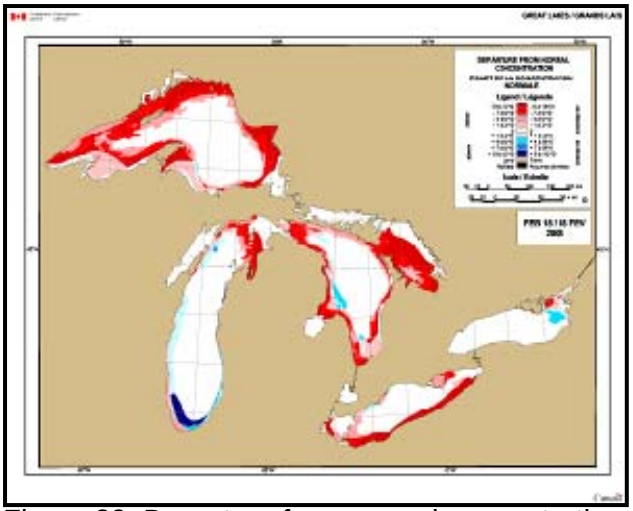


Figure 28: Departure from normal concentration and ice conditions – February 11th, 2008



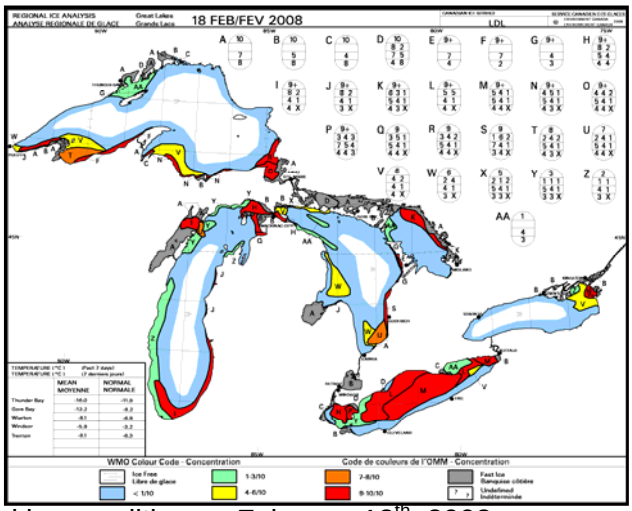
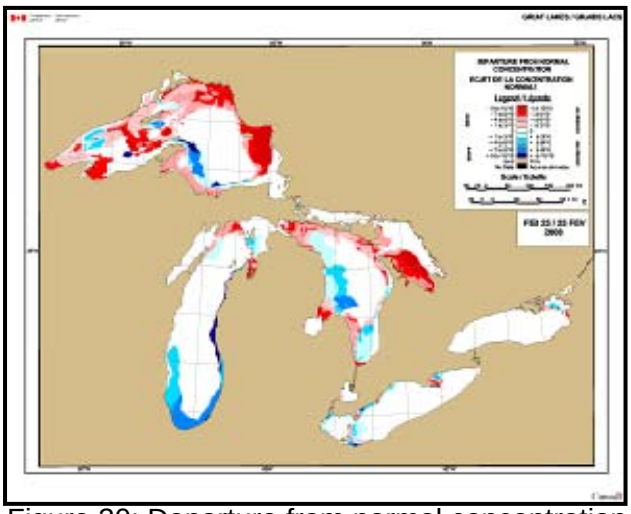


Figure 29: Departure from normal concentration and ice conditions – February 18th, 2008



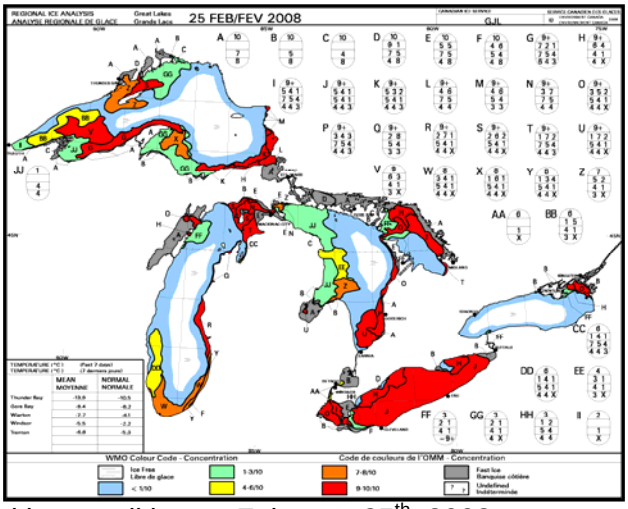
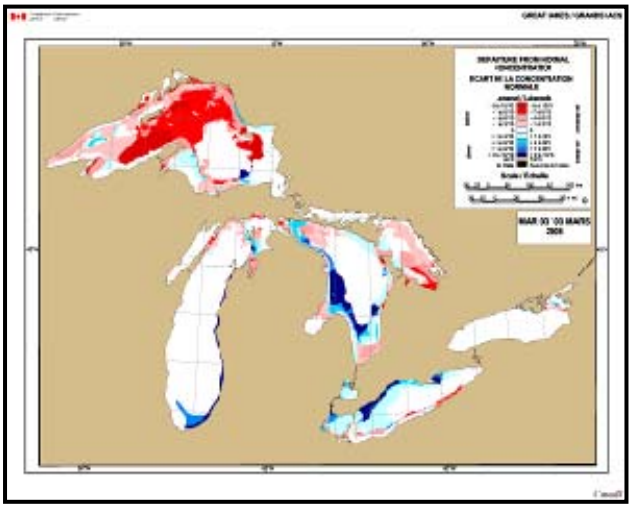


Figure 30: Departure from normal concentration and ice conditions – February 25th, 2008



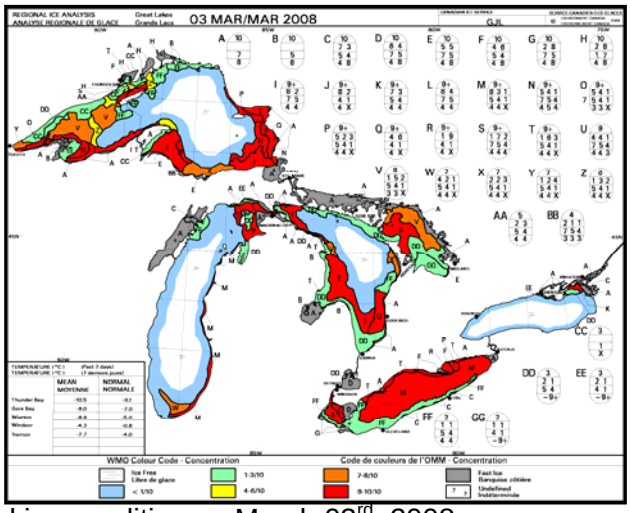
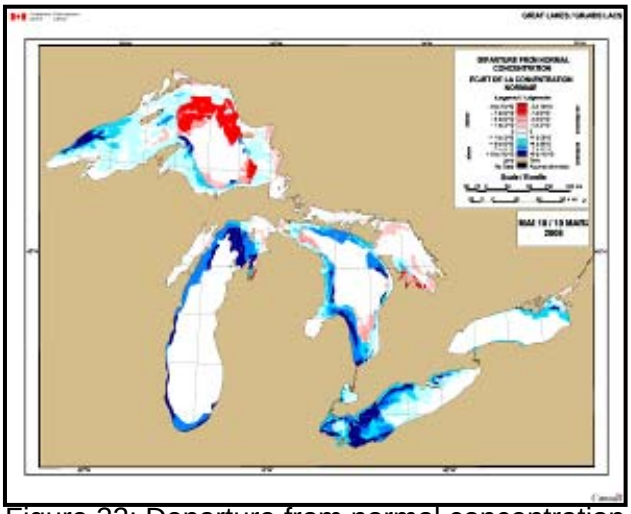


Figure 31: Departure from normal concentration and ice conditions – March 03rd, 2008



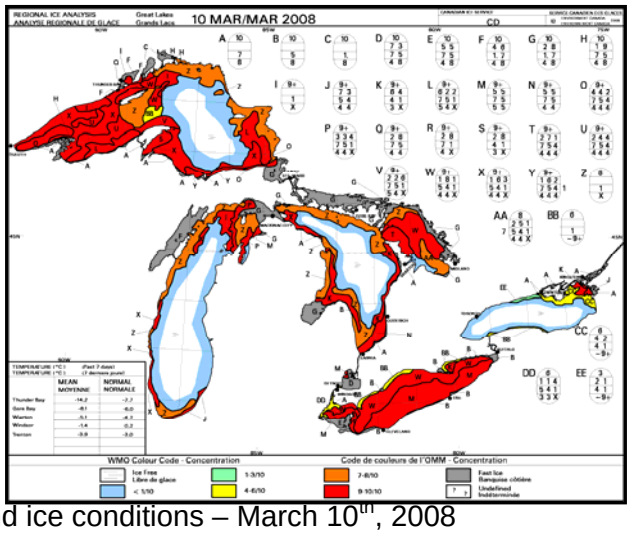


Figure 32: Departure from normal concentration and ice conditions – March 10th, 2008

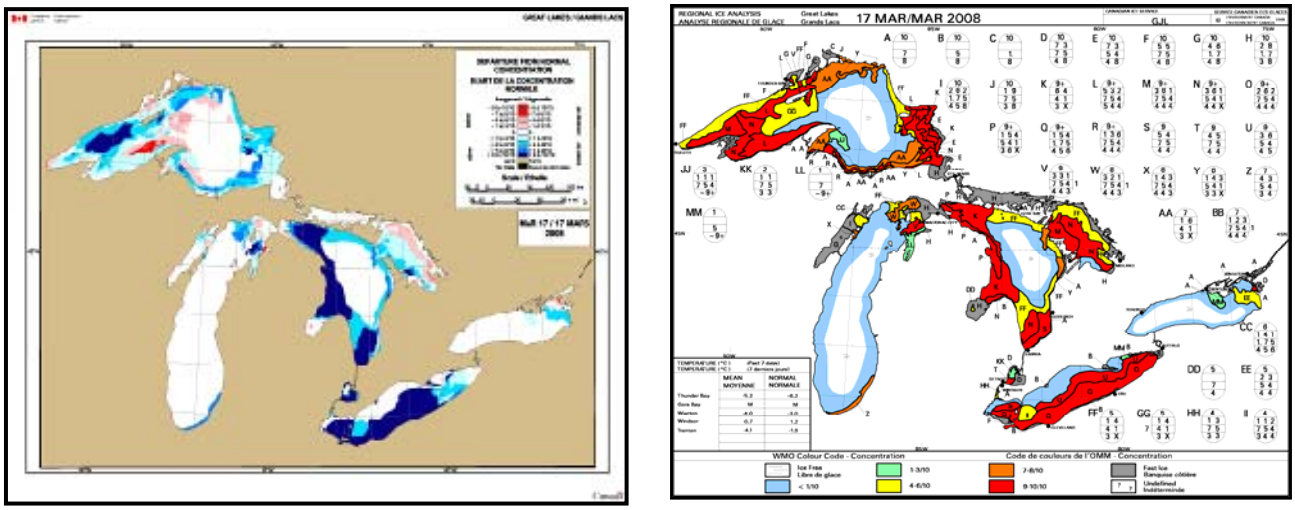


Figure 33: Departure from normal concentration and ice conditions – March 17th, 2008

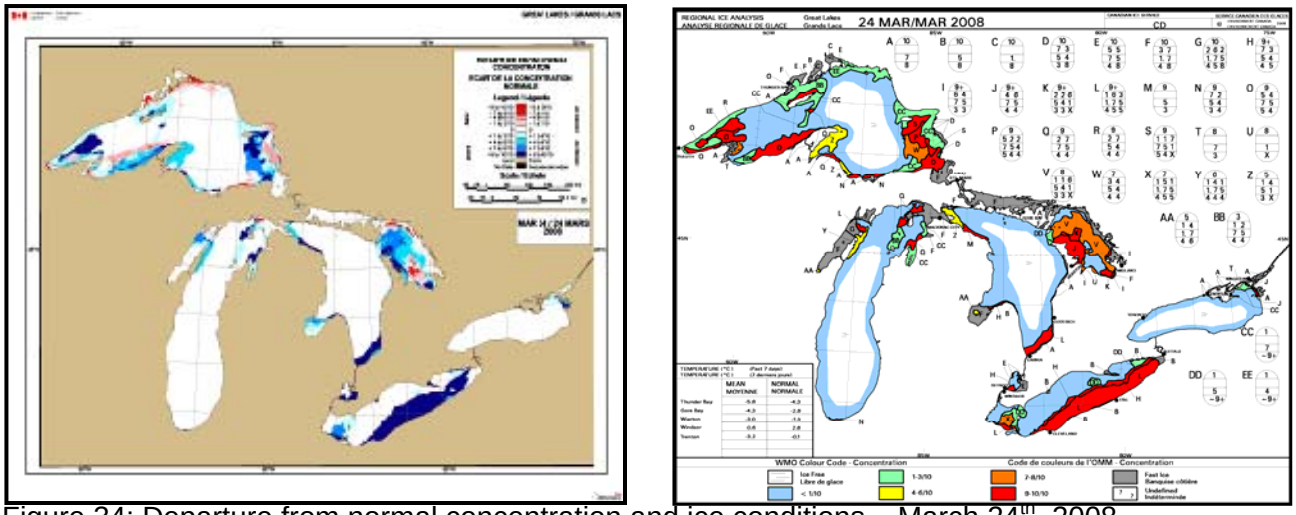


Figure 34: Departure from normal concentration and ice conditions – March 24th, 2008

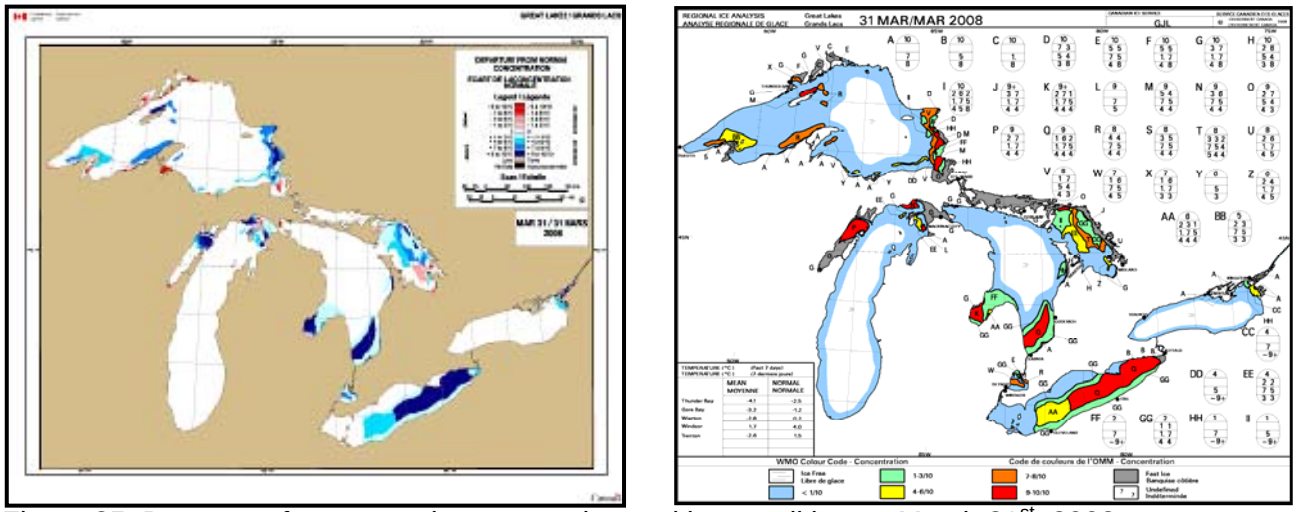
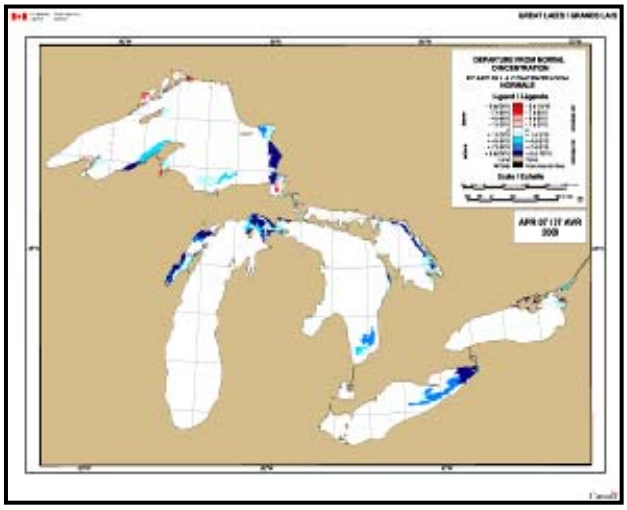


Figure 35: Departure from normal concentration and ice conditions – March 31st, 2008



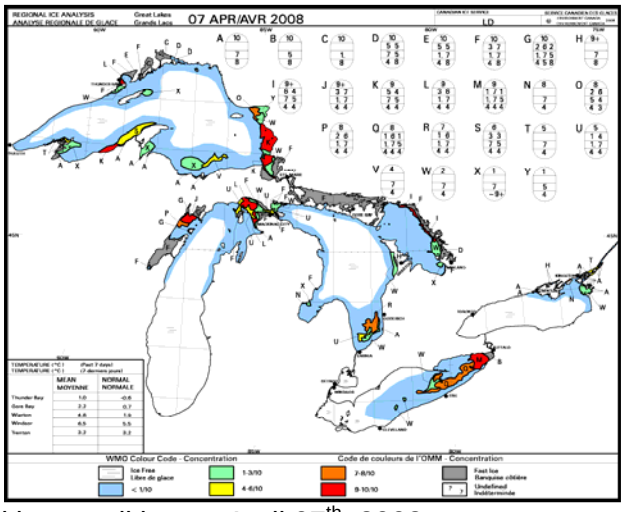
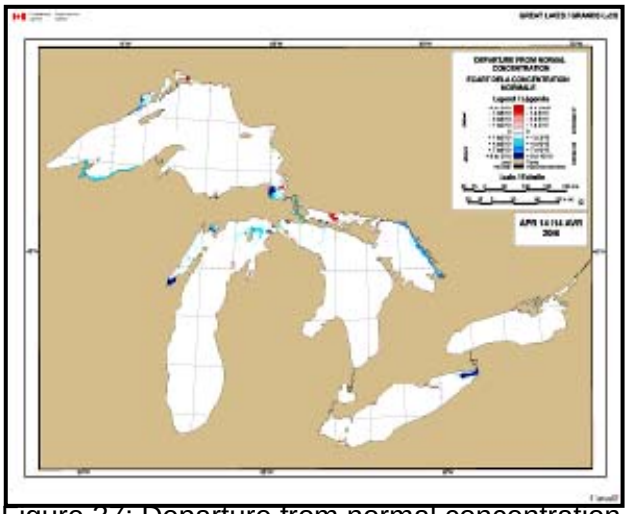


Figure 36: Departure from normal concentration and ice conditions – April 07th, 2008



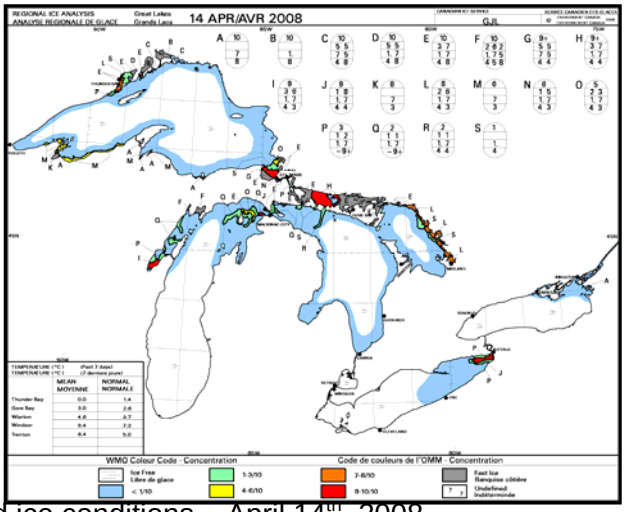
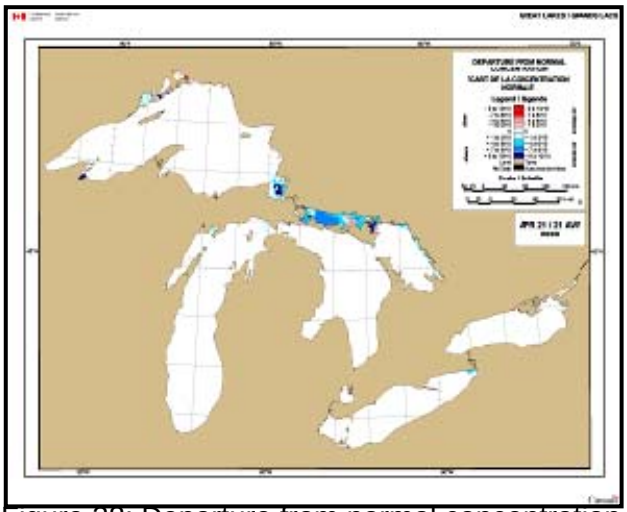


Figure 37: Departure from normal concentration and ice conditions – April 14th, 2008



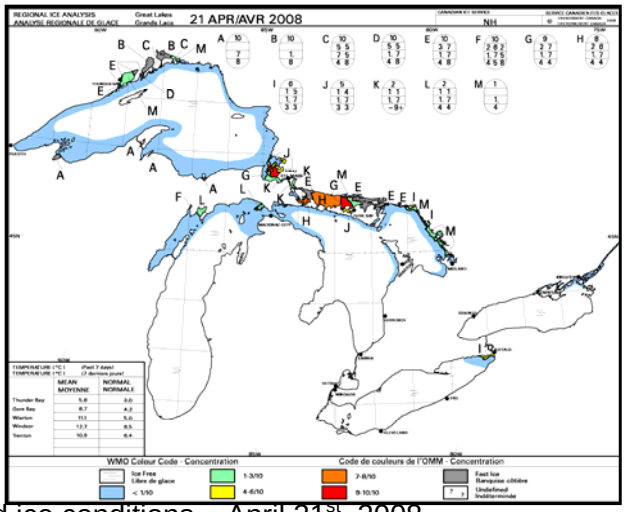
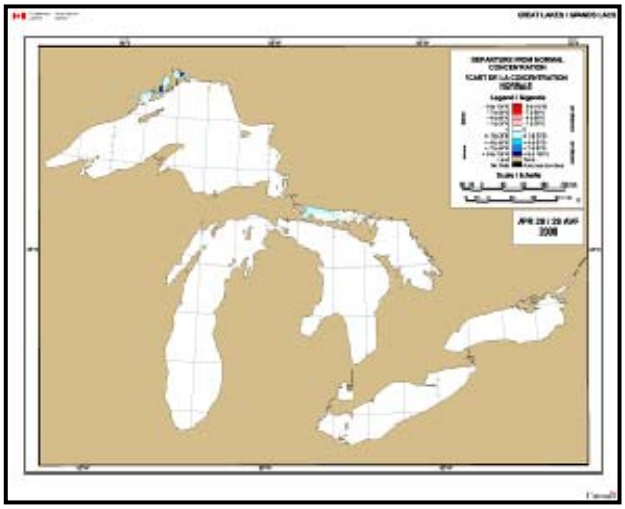


Figure 38: Departure from normal concentration and ice conditions – April 21st, 2008



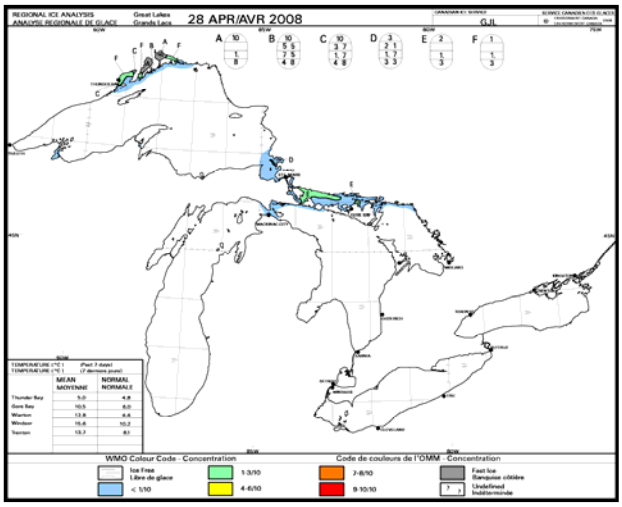
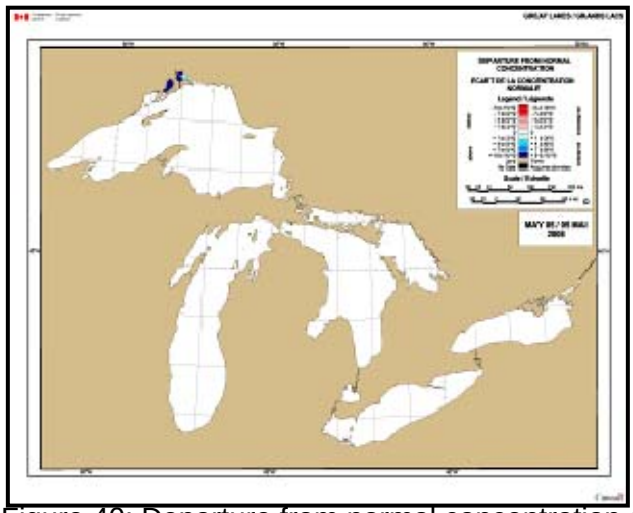


Figure 39: Departure from normal concentration and ice conditions – April 28th, 2008



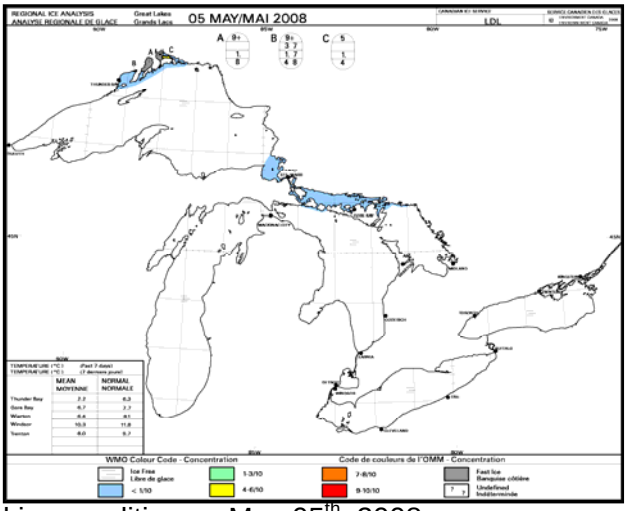
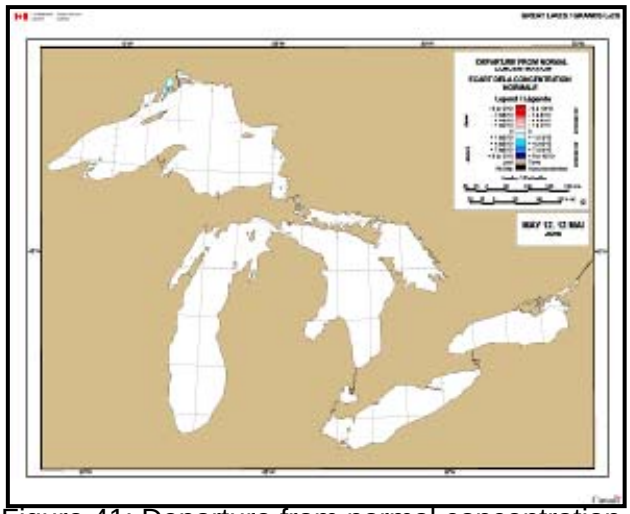


Figure 40: Departure from normal concentration and ice conditions – May 05th, 2008



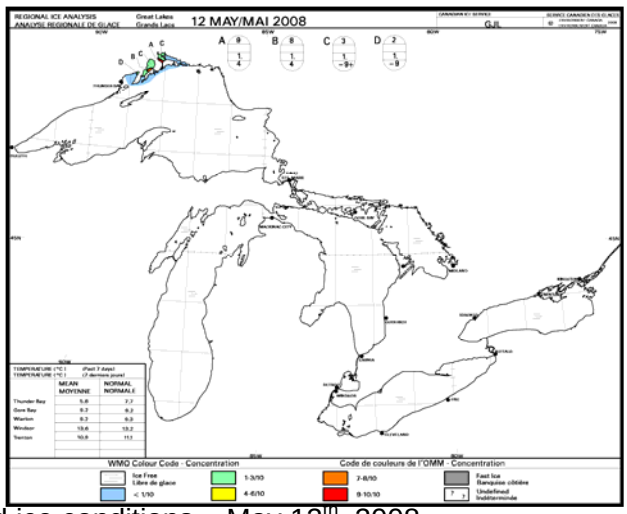


Figure 41: Departure from normal concentration and ice conditions – May 12th, 2008