

Seasonal Summary
For The Great Lakes
Winter 2006-2007



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June 14th , 2007

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General Overview of the Past Ice Season

This year's ice season began like so many others before; cool spell to begin the month of December followed by an extended period of warmer than normal temperatures for the balance of December and into January. However by mid-January, the mercury finally dipped below normal and persisted well into February. By the month of March, temperatures moderated to above normal values over most of the Great Lakes with the exception of Lake Ontario where temperatures were near normal. A significant set back was observed during the first part of April where temperatures dropped into much below normal values. These colder temperatures caused a return to ice formation during a period where ice usually is melting or retreating. For the balance of April and for all of May temperatures returned to generally normal or above normal values.

As indicated above, the winter season began when temperatures plunged to below normal for the first 10 days of December. However, the subsequent five weeks saw temperatures generally remain above or much above normal over the entire Great Lakes Basin. The end result of all this warmth is depicted in Figure 1. The areas in red indicate regions which had less than normal ice coverage; the darker the red hue, the greater the concentration of ice missing from a particular area. To no ones surprise, the middle of January had a significant deficit in terms of ice coverage. The only area that had near normal ice conditions were the Black and Nipigon Bays. As a whole, the Great Lakes region had two weeks of record setting minimum ice coverage during the first half of January. On January 1st, the Great Lakes registered only 0.61% ice coverage (2nd lowest next to 1991 (0%)). The following week (January 8th) the ice coverage had decreased to 0.3% which was the second lowest ice concentration recorded on this date since 1983 (1.33%). And finally, the next week (January 15th) also set a record as only 1.69% of the lakes were ice covered.

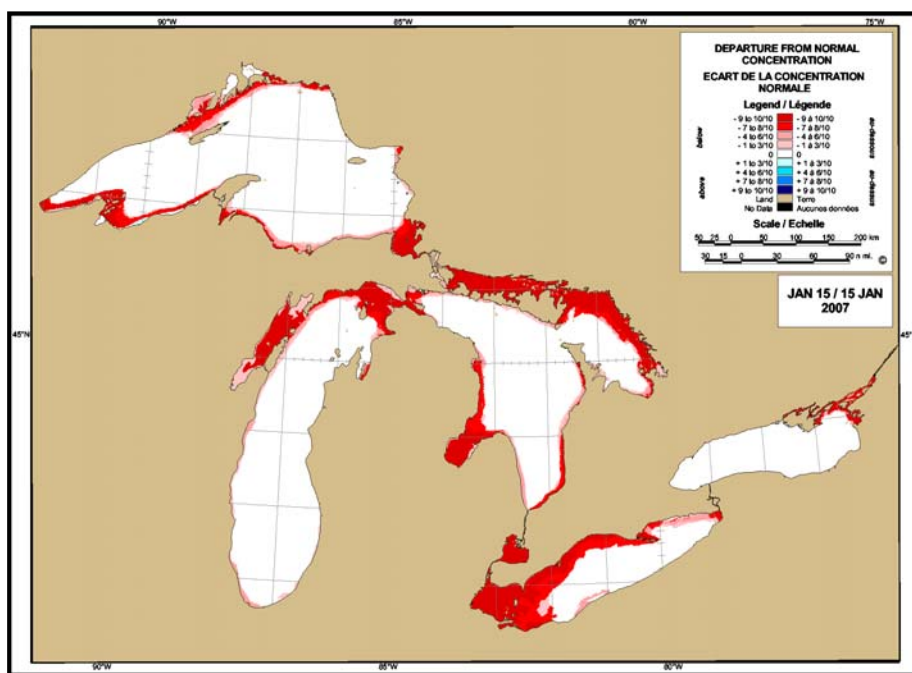


Figure 1: Departure from normal ice concentration – January 15th, 2007.

However soon after the middle of January, the temperature regime shifted significantly to the cold side. In fact, the temperatures were 1.2°C to 3.7°C below normal for the period running from mid-January to the end of February. Despite these colder readings, the temperatures for this winter season (December, January and February) still ran between 0.6°C to 2.4°C above normal over the Great Lakes region.

What effect did this swing to colder temperatures have on this ice season? Up to mid-January, some of the lakes were running record or near record minimum ice coverage. However, once the colder temperatures became entrenched, the ice coverage for all lakes began to increase and trended towards normal values and eventually surpassed the mean ice coverage on February 19 (Figure 3). In fact, it was only the second time since 1997 in which the ice coverage had gone above the normal ice extent for February 19th (Figure 4). Lake Erie responded the fastest to the colder temperatures. By the first week of February, the ice coverage was already above normal and remained that way for the next 9 weeks (Figure 2).

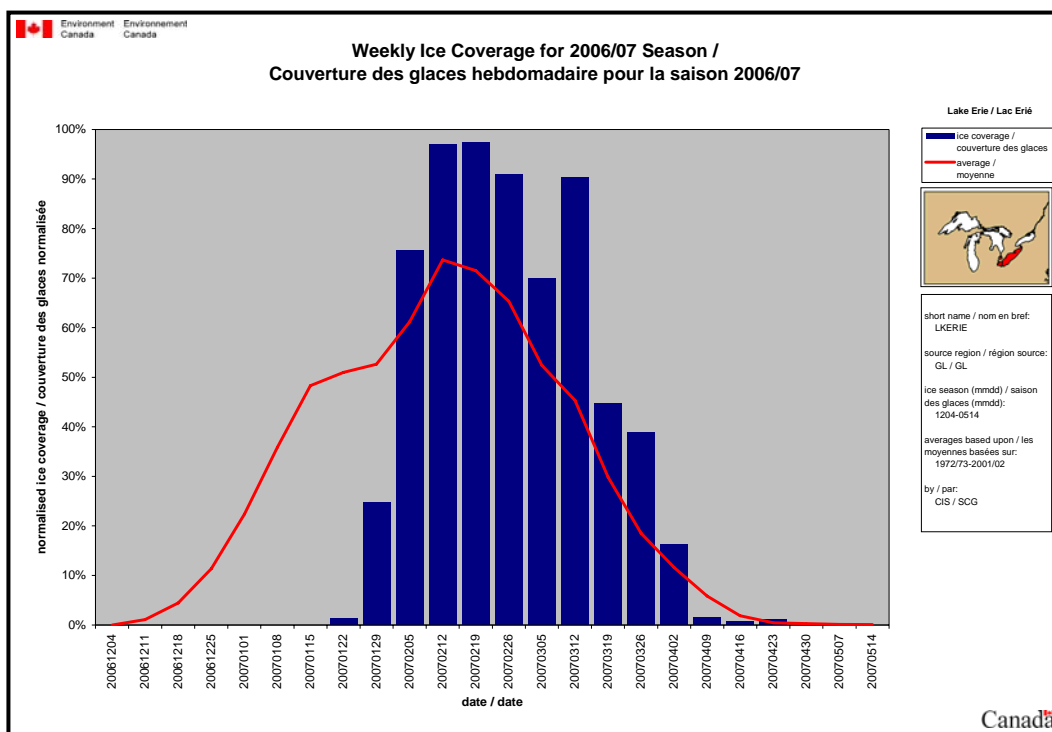


Figure 2: Weekly ice coverage for the Lake Erie - 2006-07 season.

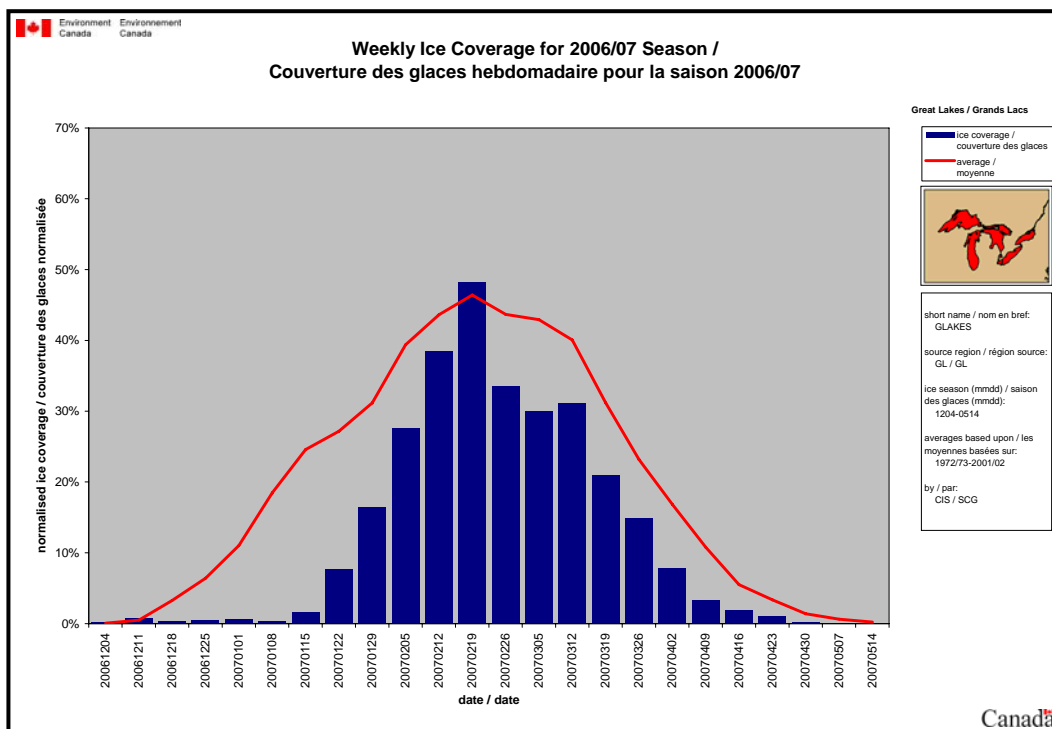


Figure 3: Weekly ice coverage for the Great Lakes - 2006-07 season.

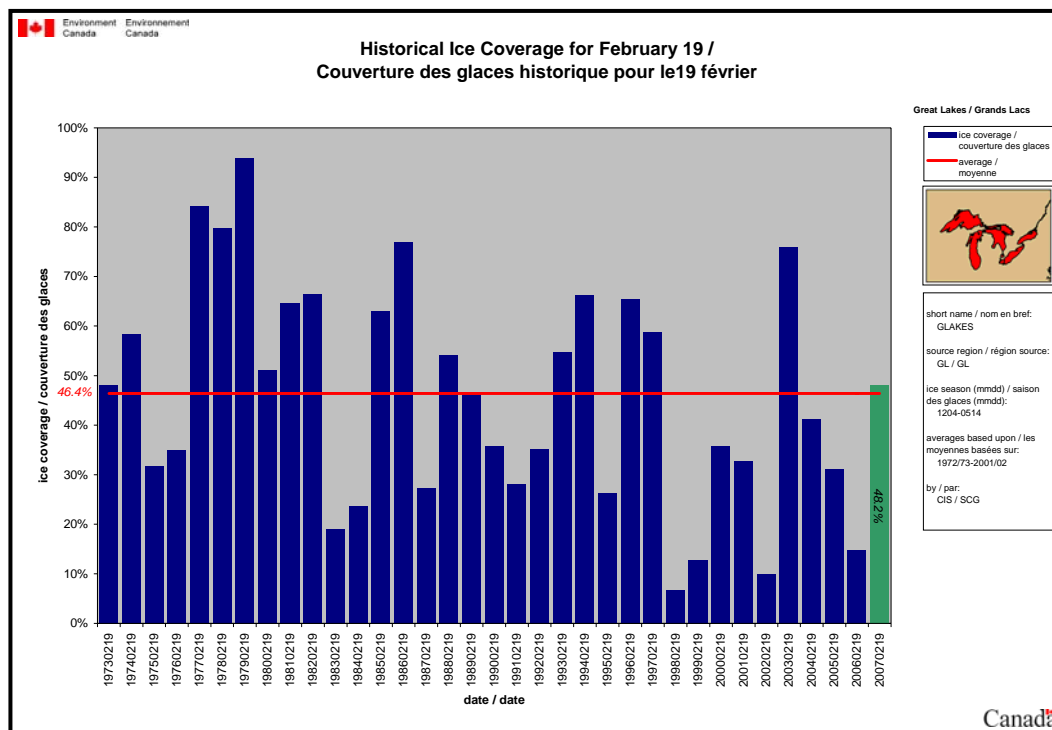


Figure 4: Historical ice coverage for the Great Lakes on February 19th.

Lake Superior

Temperatures during the first part of November were near normal over the eastern part of the lake and above normal over the west. However the second half of the month saw temperatures soar up to much or very much above normal except for the last few days of the month when the temperature dropped below normal. No ice formed over most of the region with the exception of Black Bay and northern Nipigon Bay where some new and thin lake ice formed during the last few days of the month.

The cool trend that began at the end of November continued into the first week of December and continued the formation of new and thin lake ice in Black and Nipigon Bays. As well, the coastal area of Thunder Bay, Whitefish Bay and the southern shore of Lake Superior witnessed the formation of bands of new and thin lake ice. Soon after the beginning of the second week of December until the end of the month, temperatures remained very much above normal of the entire area. In fact during this three week period, temperatures averaged over 9°C above normal for the Thunder Bay area. By the end of the month, ice conditions were later than normal in terms of extent especially in Thunder Bay and around the Apostle Islands (Figure 19).

The mild temperature trend from the second half of December continued into the first 12 days of January and exacerbated the deficit in ice extent throughout the area. The very mild conditions culminated in setting record minimum ice coverage for the week of January 8th. Usually at that time of year, 14.7% of the lake would be covered with ice; however this year only 0.9% of the lake had any ice. By the middle of January, Black and Nipigon Bays had thin and medium lake ice, most of it consolidated. Thunder Bay has some new and thin lake ice with very small patches of consolidated thin lake ice in a few locations. Some isolated bands of new and thin lake ice had formed along the southern shore of Lake Superior mostly west of the Keweenaw Peninsula by the middle of January. The rest of the lake was open water along the shore and ice edge and ice free toward the middle of the lake.

During the second half of January, temperatures moderated so as to float around the normal mark over the entire Lake Superior region. Ice growth continued during the second half of the month at the end of the month. Black and Nipigon Bays were consolidated with medium lake ice with some mobile medium and thin lake ice near the entrances to the bays. Along the shore from the entrance to Nipigon Bay to just west of Thunder Bay, a 5 mile band of new and thin lake ice covered the area. In the meantime, Thunder Bay had consolidated medium lake ice in the eastern reaches of the bay while the rest of the bay was covered with thin and medium lake ice. Along the southern shore of Lake Superior, mostly new and thin lake ice covered the area and extended about 2 to 5 miles from the shore at the end of January. Some consolidated thin lake ice was present around the Apostle Islands. Most of Whitefish Bay was open water except for some new and thin lake ice along the shore. Elsewhere in the bay, mainly open water conditions prevailed. Open water to ice free covered the rest of the lake.

Although the temperature regime changed to below normal near the middle of January, Lake Superior was still behind its normal ice extent at the end of the month with the exception of a few isolated locations (Figure 23).

The first half of February marked the first time this year that the temperature regime was significantly below normal. In fact temperatures were between 5 to 8°C below normal for this period across Lake Superior. The ice coverage expanded accordingly. At mid-month, all of the consolidated ice in Nipigon and Black Bays and northern part of Thunder Bay had thickened to medium and thick lake ice. A band of ice between 10 and 25 miles wide covered the area that ran from the entrance to Nipigon Bay to Grand Marais. Along the southern side of Lake Superior a band of ice 5 to 20 miles wide, composed of mostly thin and new lake ice with some medium lake ice, covered the area. At the same time, mostly consolidated medium lake ice encased the Apostle Islands. Most of Whitefish Bay was covered with consolidated medium lake ice. The exception was the north-western portion of the bay which remained mobile with thin and medium lake ice. Along the eastern shore from north of Whitefish Bay to just south of Michipicoten Bay, a band of thin and new lake ice extended about 5 miles from the shore. Elsewhere, the lake was mostly open water.

The temperature regime during the last two weeks of February had moderated somewhat. The western part of Lake Superior had above normal temperatures while the central and eastern sections had near normal values. By the end of the month, all of Nipigon and Black Bays as well as the northern half of Thunder Bay remained consolidated with medium and thick lake ice. Meanwhile, a narrow band of medium and thick lake ice was observed between the entrance to Nipigon Bay and Grand Marais. The western part of the lake, west of a line from the Keweenaw Peninsula to Ile Royale, was covered with loose medium and new lake ice with some consolidated thin and medium lake ice in the Duluth area. The Apostle Islands remained consolidated with medium and thick lake ice. The coastal area east of the Keweenaw Peninsula to the entrance to Whitefish Bay had a 10 to 20 miles wide band of loose medium and thin lake ice. Most of Whitefish Bay was consolidated with medium and thick lake ice. Meanwhile the coastal area from north of Whitefish Bay to Michipicoten Bay had loose new lake ice. The remainder of Lake Superior at the end of February had mainly open water conditions except for ice free in the east-central part of the lake.

Despite the cold temperatures registered during the first half of February, the deficit in terms of ice coverage increased significantly by the end of the month (Figure 27).

The mercury was generally near normal over the entire region during the first half of March. No appreciable change was observed to the consolidated ice in Black and Nipigon Bays. However most of Thunder Bay was covered with consolidated medium and thick lake ice except for the southern entrance to the bay where mostly loose new lake ice and open water prevailed. A band of thin and medium lake ice about 5 to 12 miles wide was located along the shore from Marathon to Grand Marais. The southern part of Lake Superior was covered with loose thin and medium

lake ice within 5 to 15 miles of the shore. No significant change was observed to the consolidated medium and thick lake ice in Whitefish Bay. A narrow band of looser thin and medium lake ice hugged the shore from north of Whitefish Bay to Michipicoten Bay. Elsewhere in Lake Superior, mainly open water prevailed with ice free conditions in the east-central part of the lake.

The stage was set for change to the ice coverage when above or much above normal temperatures blanketed the area during the last half of March. During this period, no change to the consolidated ice was observed for Black and Nipigon Bays however some signs of fracture were seen in Thunder Bay. By the end of the month, only the eastern part of Thunder Bay had consolidated medium and thick lake ice while the rest of the bay had some mobile medium and thick lake ice. A few patches of rotten medium lake ice floated along the southern shore of Lake Superior however the consolidated medium and thick lake ice around the Apostle Islands was still holding fast at the end of March. The consolidated ice in Whitefish Bay fractured during the last week of March and signs of open water developed at the end of the month. There was still a band of medium lake ice present from Whitefish Bay to just south of Michipicoten Bay. Elsewhere along the coastal area of Lake Superior, mainly open water except ice free conditions in the central part of the lake (Figure 31).

The maximum ice extent for Lake Superior usually occurs around March 5th however the very mild conditions during most of the winter have caused the ice coverage to fall well short of its normal extent. The lake is usually 53.6% ice covered on March 5th however only 15.6% of the lake had ice this year (Figure 5).

The Lake Superior region was plunged into much below normal temperatures during the first half of April. Midway through the first week of April, some new lake ice began to form along the shore. By the middle of the second week, temperatures moderated to the point where the average was above freezing mark causing the new lake ice to melt. However, the remainder of the ice coverage didn't change significantly. At mid-April, both Black and Nipigon Bays remained consolidated with thick and very thick lake ice. The north-eastern part of Thunder Bay also preserved the consolidated thick and very thick lake ice while some isolated patches of thick and very thick lake ice floated around the remainder of the bay. The southern shore of Lake Superior harboured some thick and medium lake ice especially in the smaller bays and around the Duluth area. The Whitefish Bay area had some thick and very thick lake ice along the southern shore as well as in the smaller bays along the eastern shore. The rest of the lake was generally ice free with some open water along the shore and near the ice edge.

A reverse in temperature trend occurred during the second half of April relative to the first half. Generally above or much above normal values were recorded. The consolidated ice in Black, Nipigon and Thunder Bay fractured during the last week of April. At the end of the month, the western part of Nipigon Bay and the north-eastern part of Black Bay had thick and very thick lake ice while the rest of the bays had open water. At the same time, the extreme north-eastern part of Thunder Bay also had thick and very thick lake ice while the rest of the eastern part

of the bay had open water. Ice free conditions blanketed the western half of the bay. The ice in the Duluth area melted during the last week and was open water at the end of the month. Most of the southern shore of Lake Superior was open water to ice free except for isolated patches of rotten medium lake ice in the smaller bays. Most of Whitefish bay was open water except in the extreme south-eastern portion of the bay where some rotten thick and very thick lake ice still prevailed. The rest of the lake was open water.

For the most part, the ice region for the month of April exhibited more normal ice conditions. At the end of the month, only Nipigon and Black Bays showed signs of less than normal ice conditions (Figure 36).

Mild temperatures continued into the first half of May as generally above normal values covered the Lake Superior area. The ice in Thunder Bay melted during the first week of May and gave way to ice free conditions by the end of the first week of the month. As for Black and Nipigon Bay, the area became open water during the second week. At mid-month all of the waters in Lake Superior were ice free (Figure 38).

gives a good overview of how the ice coverage over Lake Superior evolved during the winter. At no time did the ice coverage surpass the normal ice coverage. In fact, the break-up began about two weeks earlier than normal.

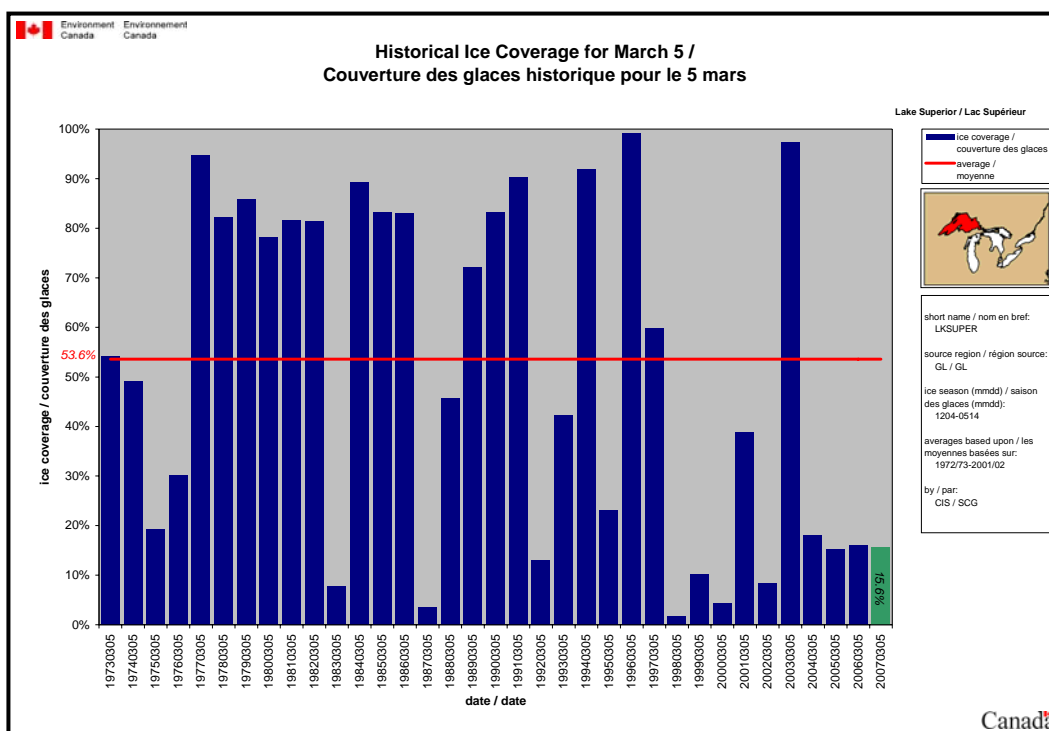


Figure 5: Historical Ice Coverage for Lake Superior for March 5th

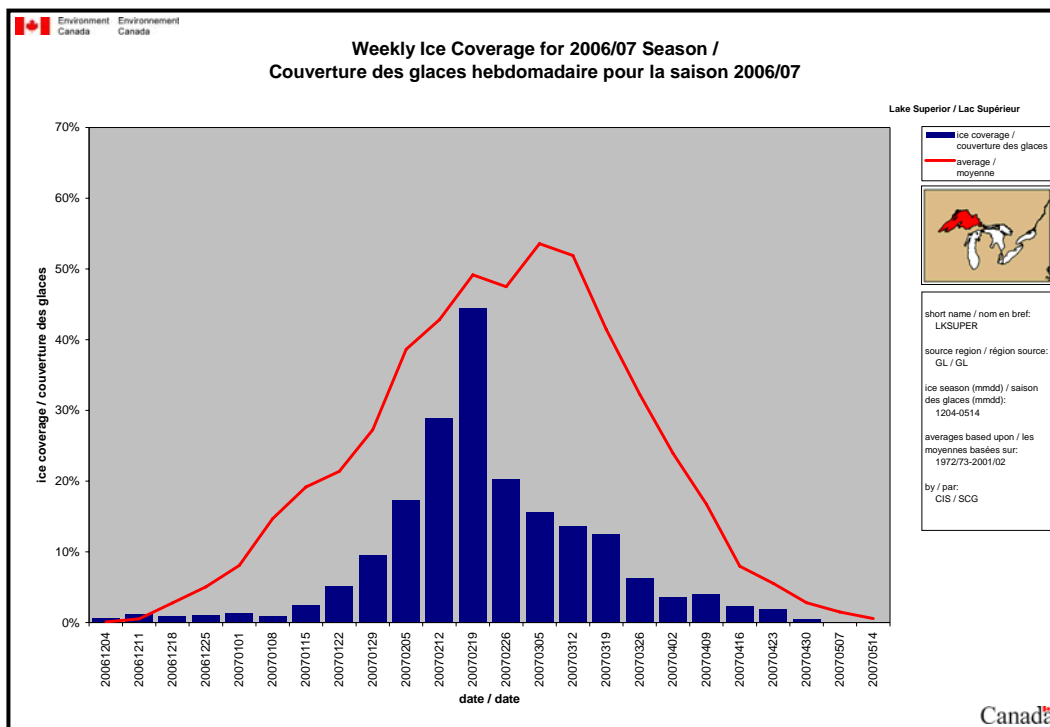


Figure 6: Weekly ice coverage for Lake Superior - 2006-07 season.

Lake Michigan

Temperatures during the first two weeks of November over Lake Michigan were generally near normal however the second half of the month saw much above normal temperatures blanket the area. Hence, no ice formation had occurred during the month.

For the first half of December, temperatures were below normal over southern Lake Michigan and above normal over northern sections. Despite the warmer than normal temperatures over the northern region, some new and thin lake ice had formed over the southern part of Green Bay as well as in the Little and Big Bay de Noc during the second week. The rest of the lake was ice free except open water near the ice edge.

The last two weeks of December had very much above normal temperatures. In fact, the temperatures were so warm during this period that the average temperature remained above the freezing mark for the entire period. The ice extent from the middle of December to the end of the month had shrunk significantly so that only a few strips of new and thin lake ice remained in the southern part of Green Bay as well as the Little and Big Bay de Noc. Elsewhere over the lake mainly ice free conditions prevailed except open water near the ice edge (Figure 19).

Ice conditions at the end of December were well below normal in terms of ice coverage. Normally 8.3% of the lake would be ice covered but only 0.3% had any ice. This represented the third lowest ice coverage for January 1st since 1973.

The very much above normal temperatures prevailed into the first part of January. All but the northern portion of the lake remained above freezing in terms of average temperature for the period. Thin and new lake ice continued to form during the first week of January in the northern portion of Little and Big Bay de Noc. All of Lake Michigan and the rest of the Green Bay area remained open water to ice free. By the end of the second week of the month, the southern portion of Green Bay was covered with thin and new lake ice with a thin band of new lake ice along the western shore of Green Bay. The Little and Big Bay de Noc were covered with thin and new lake ice as well. And finally, the coastal area approaching the Strait of Mackinaw was covered with new lake ice. Elsewhere, Lake Michigan was mainly open water with ice free conditions in the central part of the lake.

During the second half of January, temperatures cooled off to near normal values. Consequently, ice growth continued. During the third week, central part of Green Bay became covered with thin and new lake ice while the ice in the southern portion of the bay thickened to thin and medium lake ice. Some new and thin lake ice formed along the southwestern shore of Lake Michigan while the northern shore of Lake Michigan was covered with a narrow band of thin and new lake ice from the Straits of Mackinaw to the northern entrance to Green Bay. By the end of January, the southern part of Green Bay and both the Little and Big Bay de Noc were covered with consolidated medium and thin lake ice. The rest of Green Bay had thin and new

lake ice with some medium lake ice. Along the western shore of Lake Michigan south of the entrance to Green Bay, a narrow band of mainly new with some thin lake ice was observed. The northern portion of Lake Michigan was filled with thin and new lake ice with some medium lake ice northeast of Beaver Island. Some patches of consolidated medium and thick lake ice were seen along the north shore and near the Straits of Mackinaw (Figure 23).

Although the gap between the normal ice extent and the observed ice extent decreased since the end of December, the ice extent was still running below normal at the end of January. Despite the deficit, there were a few areas which indicated a greater than normal ice extent and concentration (areas with blue hues). In particular, the western and southern shore of Lake Michigan had bands of ice which are normally smaller and looser (Figure 23).

The first half of February marked the period with the coldest temperatures recorded during this winter season. In fact, the first two weeks of February saw temperatures that were 8.8°C below normal in Chicago. In general, temperatures were very much below normal over the entire area during this two week period. Ice growth was certainly enhanced due to the cold. By the middle of February, most of Green Bay was covered with consolidated medium lake ice. The exception was the northern section of the bay where mobile medium lake ice was present. Most of the western shore of Lake Michigan had a band of ice 5 to 18 miles wide while the eastern shore had bands of ice that extended about 3 to 12 miles from the shore. Most of the ice along the shores was thin and new however there were a few patches of medium lake ice along the western shore. At the end of the first week of February, the area of ice northeast of Beaver Island and into the Straits of Mackinaw became consolidated with medium lake ice which prevailed to mid-month. Southwest of the consolidated ice edge, mostly thin and new lake ice with some medium lake ice extended 2 to 5 miles southwest of the southern shore of Beaver Island. Elsewhere in Lake Michigan, mainly open water conditions were observed except ice free in the central part of the lake.

The temperatures were generally above normal over the northern tier of Lake Michigan but were near or slightly below normal for the middle and southern section of the lake during the second half of February. The southern two thirds of Green Bay remained consolidated with medium and thick lake ice while the northern portion of the bay continued to be covered with mobile medium and new lake ice. The Little and Big Bay de Noc remained consolidated with medium and thick lake ice. The consolidated ice northeast of Beaver Island fractured during the last week of February. At the end of the month, the northern portion of Lake Michigan was covered with medium lake ice however some areas were somewhat looser due to winds in the area. The Straits of Mackinaw remained consolidated during the last half of February. The coastal area along the western and eastern shore were generally open water except for a few patches of new ice. Down in the southern part of the lake, a mixture of new and medium lake ice remained within 10 to 25 miles of the shore. Open water prevailed along the shore and ice edge while the central part of Lake Michigan was still exhibiting ice free conditions (Figure 27).

During the month of February, the ice coverage over Lake Michigan came close to its normal extent for the first and only time this past winter (Figure 8). By the time the end of the month arrived, the northern portion of the lake had generally less than normal ice extent while the south had greater than normal area coverage (Figure 27).

For the first half of March, the temperature pattern was actually reversed compared to the last half of February. The northern third of the lake had below normal temperatures while the rest of the lake had near normal values. Generally ice did expand during the first part of the first week of the month however strong northwesterly winds at the end of the first week significantly decreased the ice extent over the entire area. Despite the strong winds no change occurred to the consolidated medium and thick lake ice in the southern two-thirds of Green Bay as well as the Little and Big Bay de Noc at the middle of March. The northern portion of Green Bay had loose medium and thick lake ice. The area north of Beaver Island and along the northwest coast north of Bailey Harbour had medium and thick lake ice with some very thick lake ice in the extreme northern part of the lake near the entrance to the Straits of Mackinaw. The consolidated medium and thick lake ice in the Straits of Mackinaw had fractured early in the first week of March. At mid-March, the rest of the lake was ice free except along the western shore where a narrow band of medium lake ice was still observed.

The back half of March saw temperatures that were very much above normal over the entire lake. Not surprisingly, a significant reduction in ice extent occurred during the period. During the last few days of March the consolidated ice in Green Bay as well as the Little and Big Bay de Noc fractured. At the end of March, looser areas of thick lake ice with some open water prevailed over the area. In the northern portion of Lake Michigan, only a few strips and patches of thick or very thick lake ice remained. The rest of the lake was generally ice free (Figure 32).

The first half of April saw a plunge in temperature to below or much below normal values over Lake Michigan. The patches of thick lake ice in Green Bay as well as the Little and Big Bay de Noc melted during the first week of April. However below freezing temperatures at the end of the first week of April caused some new lake ice to form along the northern shore of Lake Michigan as well as in Green Bay. However, by the middle of April, generally open water to ice free conditions prevailed over the entire Lake Michigan region (Figure 34).

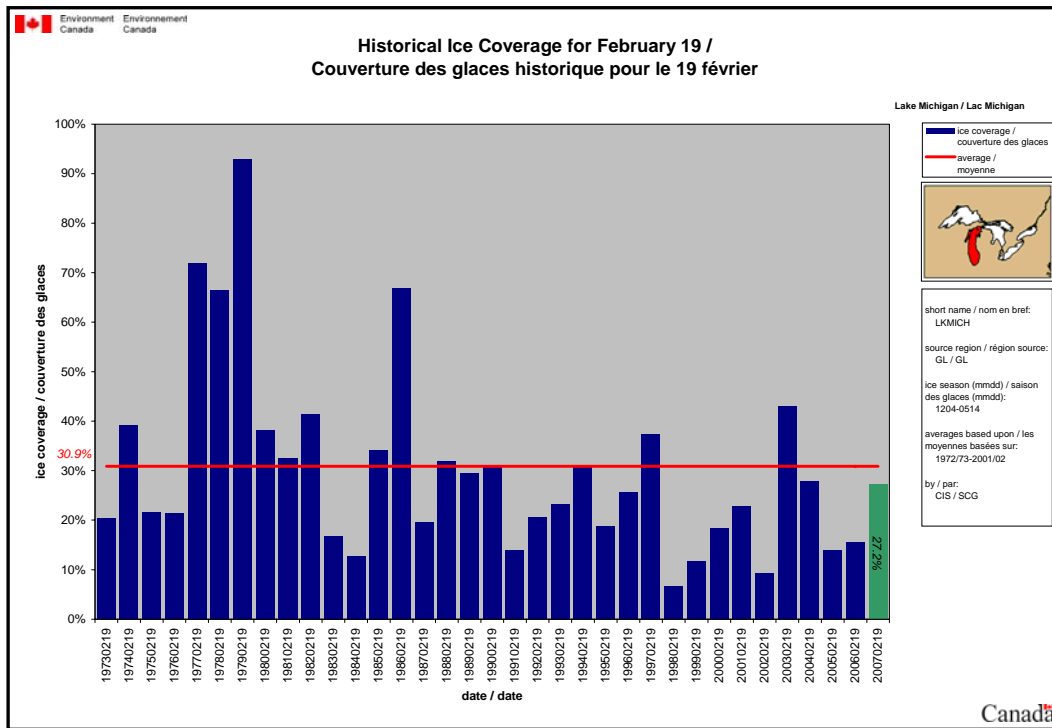


Figure 7: Historical Ice Coverage for Lake Michigan for February 19th.

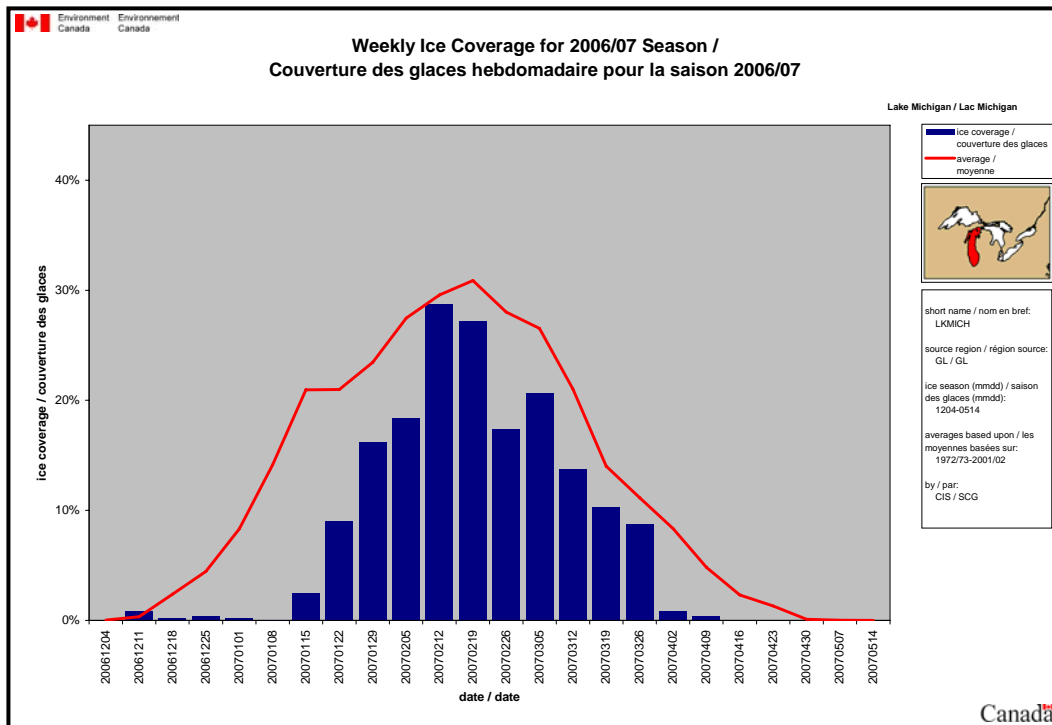


Figure 8: Weekly ice coverage for Lake Michigan - 2006-07 season.

Lake Huron and Georgian Bay

The unofficial start of winter had temperatures near to slightly above normal during the first half of December. With the mercury below freezing mark, some new and thin lake ice began to appear near the end of the first week and into the second week of the month in the St Mary's river as well as the coastal area of the North Channel. Some patches of new and thin lake ice also formed along the shore of Saginaw Bay. Elsewhere in Lake Huron and in Georgian Bay, mainly ice free conditions prevailed with open water near the shore and ice edge.

The second half of December saw temperatures climb into much above normal values. Hence some of the new and thin lake ice melted during the period. In fact, all the ice in Saginaw Bay melted entirely during the third week of December. By the end of December, there was still some new and thin lake ice in the St Mary's river while the coastal area of the North Channel had some patches of new lake ice. A very small patch of thin lake ice was observed along the south-eastern shore of Saginaw Bay while some of the smaller bays along the north-eastern shore of Georgian Bay had some new lake ice. Otherwise mainly open water along the shore and near the ice edge and ice free towards the central part of Lake Huron and Georgian Bay (Figure 19).

The early part of December showed some promise for an early start to the ice season however the warm spell from the middle of December onwards caused most of the ice to melt. The ice situation, in terms of ice extent, was running near record levels at the end of December. Indeed, this year's ice extent on January 1st was the third lowest since 1973. Only 1991 and 1995 had less ice than this year.

During the first part of January, temperatures were still very much above normal. The patches of ice over the region essentially melted during the first week of January so that mainly open water to ice free conditions prevailed. However by the middle of January some new and thin lake ice formed in the St Mary's river with a few patches of consolidated thin lake ice along the length of the river. The North Channel was still ice free to open water. The northwestern section of Lake Huron, near the Straits of Mackinaw, as well as the western shore had a few patches of new lake ice at mid-month. Some small areas of consolidated thin lake ice was present in the small bays along the shore near the Straits of Mackinaw. A few isolated patches of new lake ice were observed in the small bays along the northeastern shore of Georgian Bay. Elsewhere in the Lake Huron and Georgian Bay, conditions were mainly open water to ice free.

A significant switch to the temperatures occurred during the second half of January which had signaled the beginning of a six week period of colder than normal values. However for the second half of January, the mercury was generally slightly below to below normal over the entire area. Soon into the third week of the month, new and thin lake ice began to form in earnest in the North Channel and the coastal area of Lake Huron and Georgian Bay. At the same time, the St Mary's river became consolidated. By the end of the month, the St Mary's river was consolidated with thin

and medium lake ice. The northern portion of the North Channel was covered with mostly thin and new lake ice while the south had some medium lake ice. In northern Lake Huron from the south-eastern tip of Manitoulin Island to the Straits of Mackinaw, a 5 mile wide band of new with some thin lake ice covered this area at the end of January. Most of the western shore of Lake Huron also had a 5 mile wide band of new and thin lake ice. In Saginaw Bay, generally thin and new with some medium lake ice covered the entire bay while some consolidated thin and medium lake ice covered the south-eastern shore of the bay. The south-eastern shore of Lake Huron, south of Kincardine, had a very narrow band of new and thin lake ice. A narrow band of consolidated thin lake ice was observed along the western shore of the Bruce Peninsula. And finally, the northern part of Georgian Bay had thin and medium lake ice with consolidated thin and medium lake ice in the small bays of Georgian Bay.

At the end of January, Lake Huron had a mix of more and less than normal ice extent along the shore. As for Georgian Bay, a net deficit was observed (Figure 23).

The cool trend that began in the last half of January continued and intensified for the first two weeks of February. Generally, much or very much below normal temperatures blanketed the region. Ice growth accelerated in terms of ice extent during this period. Consolidated medium and thin lake ice formed in the eastern and western end of the North Channel during the first week of February. By mid-month, all of the St Mary's River and the North Channel were covered with consolidated medium lake ice. A narrow band of new and thin lake ice ran from the south-eastern tip of Manitoulin Island to just east of the Strait of Mackinaw. The area from the Straits of Mackinaw to just south of Bois Blanc Island was consolidated with medium lake ice. The western shore of Lake Huron had a region of new and thin lake ice which extended eastward between 5 to 25 miles from the shore. All of Saginaw Bay was consolidated with medium lake ice. The eastern side of Lake Huron was covered with a 5 to 10 mile wide band of medium and thin lake ice. In Georgian Bay, the smaller bays along the north-eastern shore were consolidated with medium lake ice while a 10 mile wide band of medium and thin lake ice extended from the consolidated ice edge toward the central part of the bay. Along the ice edge generally open water conditions prevailed with ice free in the central part of Lake Huron.

Temperatures moderated somewhat during the second half of February however the average was still below normal for this time of year. During this two week period, a few storms had passed through the area and caused the destruction of thinner ice. At the end of the month, the consolidated ice in the North Channel, the area between the Straits of Mackinaw and Bois Blanc Island as well as Saginaw Bay had thickened to medium and thick lake ice. A narrow band of new lake ice was still present along the southern shore of Manitoulin Island and extended westward along the shore to the Straits of Mackinaw. The north-western shore of Lake Huron from the straits to north of Thunder Bay was open water however Thunder Bay was covered with thin and new lake ice. The southern part of Lake Huron, south of

Saginaw Bay, was covered with medium and thick lake ice with a band of new lake ice along the eastern shore at the end of February. A very narrow band of consolidated medium and thick lake ice ran along the eastern shore to about halfway up the Bruce Peninsula. The north-eastern shore of Georgian Bay was covered with consolidated medium and thick lake ice. The eastern half of Georgian Bay was covered with new and thin lake ice while the western half had thin and medium lake ice. The remainder of the area had open water (Figure 27).

Significant gains were observed during the month of February as the ice extent neared its normal extent. Actually, on February 19th, the extent surpassed the normal for the first time this year (Figure 10).

The cool temperature trend observed since the midway point of January continued into the first week of March. Temperatures were much below normal for that time. By the time the second week rolled around, the mercury finally popped up to above normal values. With the warmer temperatures recorded during the second week, the ice coverage had changed somewhat at mid-month. No change occurred to the consolidated medium and thick lake ice in the North Channel and the north-eastern shore of Georgian Bay however the central part of Saginaw fractured during the middle part of the second week. At mid-month, only a narrow band of thin and new lake ice hugged the south-eastern shore of Manitoulin Island. The north-western part of Lake Huron was covered with looser medium lake ice which extended along the western shore of the lake to just south of Thunder Bay. The northern approach to Saginaw Bay was mainly open water with the eastern approach having looser medium lake ice. In southern Lake Huron, the western shore had open water with close pack medium and thick with some very thick lake ice in the central and eastern part. A narrow band of consolidated medium and thick lake ice was still present along the southern shore of Lake Huron just east of Sarnia. Another band of consolidated medium and thick lake ice about 2 to 5 miles wide was located between Saugeen Shores and the western shore of the Bruce Peninsula. In Georgian Bay, the higher concentration of medium and thin lake ice was located in the eastern half of the bay due to westerly winds earlier in the second week of March. The western half of the bay had looser medium lake ice. Elsewhere mainly open water except for ice free in the north central part of Lake Huron.

Above or much above normal temperatures blanketed the area and continued to accelerate the break-up of the ice coverage over the region during the second half of March. The consolidated ice from the Straits of Mackinaw to Bois Blanc Island fractured during the third week of March. By the end of the month, the central part of the North Channel fractured while some of the consolidated ice in the St Mary's river also broke and gave way to open water over certain section of the river. The area south of Manitoulin Island westwards towards the north-western part of the lake was generally open water except for some isolated patches of rotten consolidated medium and thick lake ice in the smaller bays. The north-western shore from Bois Blanc Island to Saginaw Bay became ice free at the end of the month. The southern part of Lake Huron had loose rotten thick and very thick lake ice with open water along the south-eastern shore. The east-central part of Lake Huron also had very

loose thick and very thick lake ice. Meanwhile in Georgian Bay, open water covered the western portion of the bay while loose medium and thick lake ice was observed in the central and eastern part of the bay. No significant change to the consolidated medium and thick lake ice. Elsewhere open water along the ice edge to ice free in the northern portion of Lake Huron (Figure 32).

Despite the warmer temperatures for most of March, the ice extent was still tracking just slightly below its normal extent. March also marked the second time this ice season the ice extent had surpassed the normal curve (Figure 10). Looking closer to the weekly regional charts and Departure from normal ice concentration charts, we can see that most of the month of March had areas which had greater than normal ice extent and concentrations; in particular the southern part of Lake Huron and parts of Georgian Bay (Figure 28 to Figure 32)

The temperature took a sharp turn during the first half of April. This period was plagued by much below normal temperatures. Despite the colder than normal temperatures, break-up and clearing continued. The consolidated ice in the North Channel as well as the north-eastern shore of Georgian Bay fractured during the first week of April. Most of the floating ice in both Lake Huron and Georgian Bay had melted leaving only a few bands of ice along the shores. By the middle of April, all of the consolidated ice in the St Mary's river was fractured with some sections having open water. The north-central part of the North Channel was open water with the rest of the channel covered with thick lake ice. Most of Lake Huron was open water to ice free except for isolated bands of thick first year ice along the Bruce Peninsula. The north-eastern shore of Georgian Bay still had some medium and thick lake ice. The rest of the bay was open water to ice free.

The mercury rebounded nicely during the second half of April as above to much above normal values flooded the region. As a consequence almost all of Lake Huron was ice free at the end of the third week; the exception was a very small patch of medium lake ice near Sauble Beach. Similarly, the great majority of Georgian Bay was ice free with only a few patches of medium and thick lake ice in the south-eastern reaches of the bay at the end of the third week. However, at the same time, there were still some areas of thick and very thick lake ice along the coastal area of the North Channel with open water towards the centre of the channel. By the end of the month, all of Lake Huron and Georgian Bay were ice free. Most of the North Channel was ice free in the eastern two-thirds while the west third was open water. The St Mary's river still had very loose patches of thick while very thick lake ice was seen in the small bays of Georgian Bay. The river soon became ice free during the first week of May.

Once the month of April rolled along, and despite the colder than normal temperatures during the first half of the month, break-up occurred sooner than normal for the North Channel area. However some areas had ice longer than normal especially in the eastern and western end of the channel as well as the south-eastern part of Georgian Bay (Figure 33 to Figure 36).

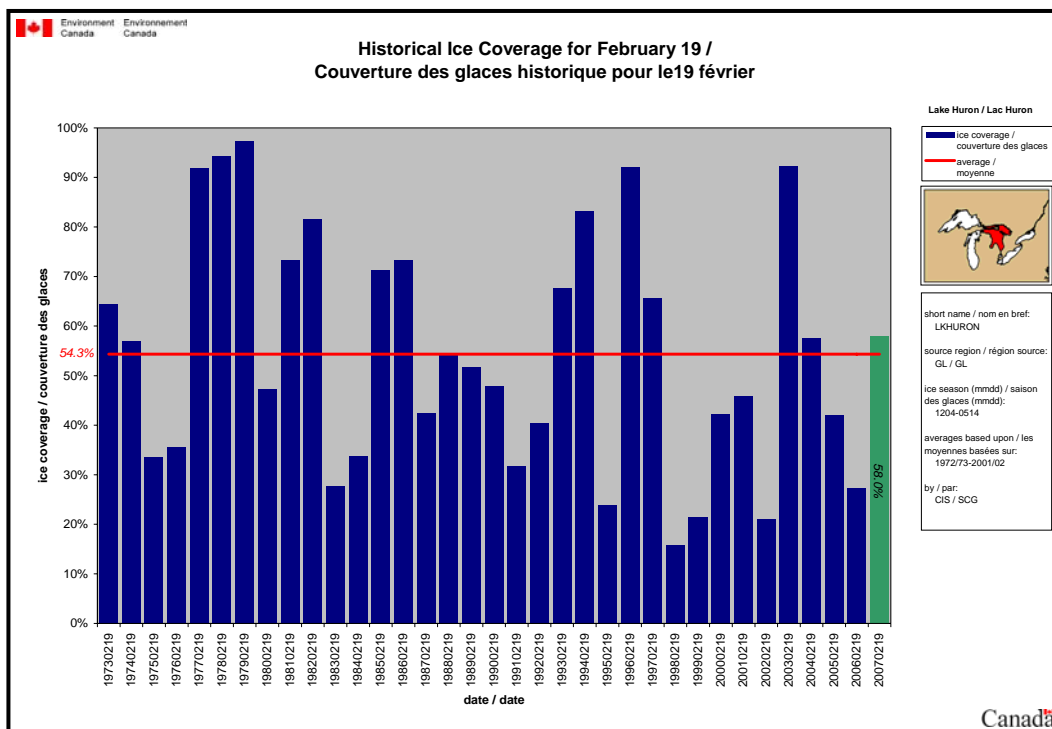


Figure 9: Historical Ice Coverage for Lake Huron for February 19th.

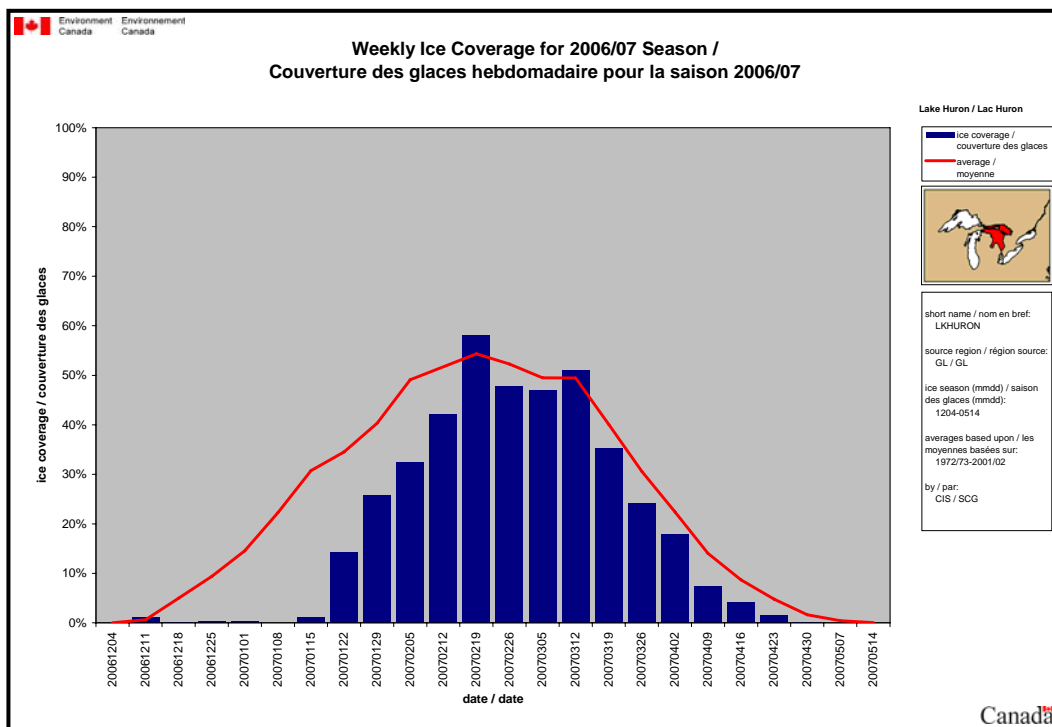


Figure 10: Weekly ice coverage for Lake Huron - 2006-07 season.

Lake Erie and Lake St. Clair

Temperatures were above normal over the entire lake which delayed the formation of ice. At mid-December, generally open water to ice free prevailed over the entire area.

During the second half of December, temperatures were very much above normal (as much as 7°C above normal in certain areas). Hence, no ice formation was again observed except for some isolated patches of new ice in the shallower sections of the lakes (Figure 19).

The incredibly warm temperatures continued into the first half of January. The departure from normal were in the range of 7°C above normal for the period. No ice formation was observed during the period.

The second half of January marked the first time the average temperature went to near or slightly below normal values this winter season. As a consequence, some new lake ice began to form in the northern portion of Lake St Clair as well as the coastal area of the Western Basin and in Long Point Bay during the third week of January. By the end of the month, all of Lake St Clair and the Western Basin were covered with medium and thin lake ice. New and thin lake ice covered the western part of Lake Erie just east of the Western Basin. Meanwhile, a narrow band of new and thin lake ice covered the rest of the coastal area of Lake Erie. Elsewhere, open water prevailed along the ice edge with ice free conditions over most of the east-central part of Lake Erie.

The colder temperatures during the second half of January was not enough to erase the deficit, in terms of ice coverage, since the beginning of December. As a consequence, most of Lake Erie registered less than normal ice coverage and concentration (Figure 23).

The cooler temperatures observed during the last half of January was a precursor for temperatures during the first two weeks of February. The mercury dropped significantly during this period and reached very much below normal values. In fact during the first 14 days of February, Cleveland recorded a mean air temperature of -10.9 °C which was 8.3°C colder than normal! During the first week of February, all of Lake Erie became covered with ice. Early in the second week of February, Lake St Clair became consolidated with medium and thin lake ice. At mid-month, both Lake St Clair and the Western Basin were consolidated with medium and thick lake ice. The rest of Lake Erie was covered with medium and thin lake ice with some thick lake ice along the southern half of the lake while a narrow band along the northern portion shore of Lake Erie had mostly thin and new lake ice with some medium lake ice.

Cooler temperatures continued during the last half of February however the intense cold observed during the first two weeks of the month moderated somewhat to below normal values. Normally , the mercury would begin to edge above the

freezing mark at the end of February over the western part of Lake Erie and Lake St Clair. Although temperatures were cooler than normal, some signs of break began to appear in these areas. A significant portion of Lake St Clair as well as the northern half of the Western Basin had fracture during the last week of February. Looser conditions or open water leads had formed along the northern shore as well as the area just east of the Western Basin. By the end of the month, all of the consolidated ice in Lake St Clair fractured so that mobile medium and thick lake ice covered the area. The Western Basin still had consolidated medium and thick lake ice in the southern portion of the basin while the northern half had mobile medium and thick lake ice. The vast majority of Lake Erie was covered with medium and thick lake ice with some patches of consolidated ice in the extreme eastern portion of the lake. Similarly, patches of consolidated medium and thick lake ice covered Long Point Bay as well as portion of the southern shore. The exception was the western part of the lake east of the Western Basin where looser thin and medium lake ice with some thick lake ice covered the area.

The overall ice extent evolved closer to normal during the month of February (Figure 24 to Figure 27).

During the first half of March, temperatures were generally near or slightly below normal over the region. A significant wind event during the first week caused the ice pack in Lake Erie to drift eastward. At the end of the first week of March, the thicker medium and thick lake ice was located in the eastern half of Lake Erie and the Western Basin while thin and new lake ice covered the western portion of the lake and basin. Lake St Clair also had thinner ice in the west with thicker ice in the east. By the middle of March, the thinner ice in western Lake St Clair, the Western Basin and the western part of Lake Erie gave way to mostly open water. The rest of the areas had medium and thick lake ice. An area of consolidated medium and thick lake ice had formed in the extreme eastern end of Lake Erie due to strong and persistent westerly winds.

Above or much above normal temperatures invaded the southern Great Lakes region during the second half of March. General deterioration and ice melt characterized the period. Lake St Clair and the Western Basin became open water midway through the last week of March. The consolidated ice in the extreme part of Lake Erie had fractured during the last few days of the month. By the end of the month, ice free conditions covered Lake St Clair and the western half of Lake Erie including the Western Basin. The eastern half of the lake still had floating ice however the general concentration of the ice had decreased from very close pack to open drift or close pack (Figure 32).

Despite the warmer temperatures during the second half of March, the ice cover prevailed longer than usual during all of March. The determining events which caused the greater than normal ice coverage was the cold temperatures from mid-January to the end of February and the strong westerly winds during the first week of March. The cold temperatures permitted the ice to thicken sufficiently to resist any ice destruction due to winds. The strong winds at the beginning of March

concentrated the ice in the eastern end of Lake Erie. It also caused significant ridges. These ridges took longer to melt despite the temperatures going over the freezing mark. The end result was an ice situation that went from slightly greater than normal ice concentration in parts of Lake Erie at the beginning of March to much greater than normal ice concentration at the end of March (Figure 28 to Figure 32 depicted the departure from normal concentration).

A return to cooler temperatures invaded the Lake Erie area during the first half of April. Below or much below normal temperatures were recorded during the period. The area of ice in the eastern part of the lake continued to shrink however at mid-month a narrow band of rotten thick and very thick lake ice along the shore east of Silver Creek was still present. The rest of the lake was ice free.

The second half of April had above normal temperatures in the western part of the lake and near normal in the central and eastern part of Lake Erie. The ice in extreme eastern Lake Erie survived until the very last few days of April when finally it had melted entirely giving way to ice free conditions at the end of April for the entire Lake Erie region.

The ice formation during this pass winter season took a while to begin but once it started, a run of nine weeks of above normal ice coverage was recorded from February 5th to April 2nd (Figure 12). The prolonged ice season, as indicated earlier, was due to the strong winds at the beginning of March which caused significant ridging of the ice. Despite warmer than normal temperatures during the second half of April, the ice took longer to melt. Normally by the middle of April, the area is ice free.

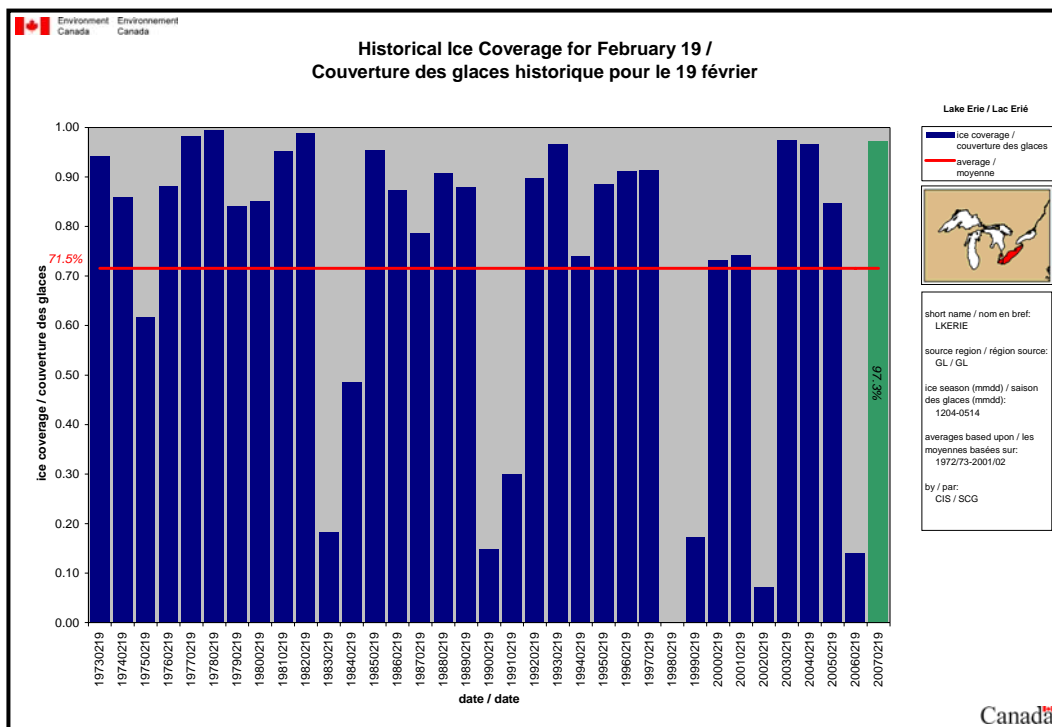


Figure 11: Historical Ice Coverage for Lake Erie for February 12th.

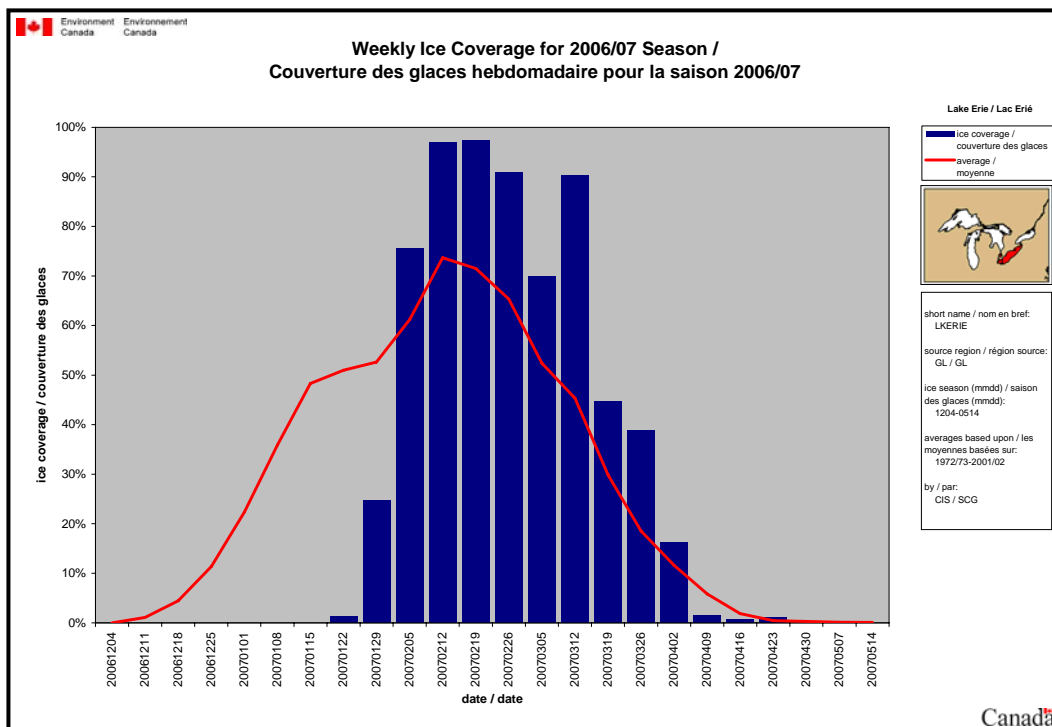


Figure 12: Weekly ice coverage for Lake Erie - 2006-07 season.

Lake Ontario

Above or much above normal temperatures blanketed the Lake Ontario region during the first half of December. Hence, very little in the way of ice formation occurred during the period.

The second half of December saw an even greater departure in term of temperatures. Much to very much above normal temperatures washed over the area keeping ice formation next to nil (Figure 19).

The same trend observed during the last half of December continued into the first half of January. Very much above normal temperatures continued. In fact, Kingston normal has a mean temperature of -7.2°C however the mean for the first 15 days of January was $+1.5^{\circ}\text{C}$ (8.7°C warmer than normal). No ice had formed at mid-January.

Finally temperatures started to resemble winter values during the last half of January. Below or much below normal values invaded the Lake Ontario area. Early in the third week, new and thin lake ice began to form in the St Lawrence River as well as the coastal area of the northeastern shore of Lake Ontario. By the end of the month, all of the St Lawrence River and the Bay of Quinte were consolidated with thin lake ice while nearly all the coastal area of Lake Ontario had a narrow band of new and thin lake ice. The exception was the extreme western part of the lake which remained open water. Elsewhere in Lake Ontario, mainly ice free conditions prevailed.

A deficit was still recorded at the end of January despite the colder than normal during the second half of January (Figure 23).

The trend that began in the last half of January continued into the first two weeks of February. Much or very much below normal temperatures covered the Lake Ontario region. At the middle of February, the consolidated ice in the St Lawrence River and the Bay of Quinte thickened to medium and thick lake ice. Meanwhile the eastern part of Lake Ontario also had some consolidated medium and thick lake ice near the shore. The northeastern part of the lake became covered with thin and medium lake ice. Looser new and thin lake ice along the shore was still present in narrow bands.

Temperatures remained below normal for the second half of February. Consequently, ice conditions continued to remain greater than normal in terms of ice extent during most of the period. At the end of the third week, a narrow band of new and thin lake ice was present along most of the southern and eastern shore of Lake Ontario with some new lake ice along the shore of Prince Edward County. During the last week of February, most of the new and thin lake ice melted or was destroyed due to a storm passing through the area. By the end of the month, the St Lawrence river as well as the Bay of Quinte were still consolidated with medium and thick lake ice. The eastern part of Lake Ontario still had a patch of medium lake ice

floating in the area. Elsewhere along the shore, mainly open water with ice free towards the central part of the lake.

A wind event during the last week of February helped to decrease the ice concentration and shrink the extent (Figure 14). Hence, it temporarily caused the northeastern part of Lake Ontario go from greater than normal ice extent to less than normal ice extent during the last half of February (Figure 26 and Figure 27).

A moderation trend developed during the first half of March as temperature were generally near or slightly below normal over the period. No dramatic change in ice extent occurred however a strong wind event during the first week caused some ice movement in the eastern part of the lake. By the middle of March, the St Lawrence river, the Bay of Quinte as well as the smaller bays along the shore of Prince Edward County were still covered with consolidated medium and thick lake ice. The northeastern part of Lake Ontario, northeast of a line from Prince Edward County to Oswego, was covered with looser medium and thick lake ice with some new ice in the southern section. Mainly open water was observed along the shore of the remainder of the lake with ice free conditions in central Lake Ontario.

For the first time since mid-January, average temperatures were above normal for the second half of March. As a result, signs of break-up began to appear. During the latter part of the third week of March, large sections of the St Lawrence river fractured and began to clear. By the end of the month, most of the river was open water except for a few patches of rotten consolidated medium and thick lake ice. Meanwhile, the consolidated ice in Bay of Quinte, the smaller bays along the eastern shore of Lake Ontario and the shore of Prince Edward County remained intact. The ice in Northeastern Lake Ontario also shrunk so that by the end of March, loose rotten thick lake ice covered the area.

As the month of March evolved, the ice concentration went from a below normal ice situation to a near or above normal ice coverage (Figure 28 to Figure 32).

The first part of April was characterized by a return to cooler than normal temperatures. In fact, the Lake Ontario region was covered with much below normal temperatures. Despite the cooler temperatures, the mercury still averaged above the freezing mark. The looser ice in Northeastern Lake Ontario melted during the first week of April. The consolidated ice in the Bay of Quinte as well as the eastern shore of Lake Ontario fractured and melted during the first week as well. By the middle of April, all of ice had melted and mainly ice free conditions prevailed throughout the entire region.

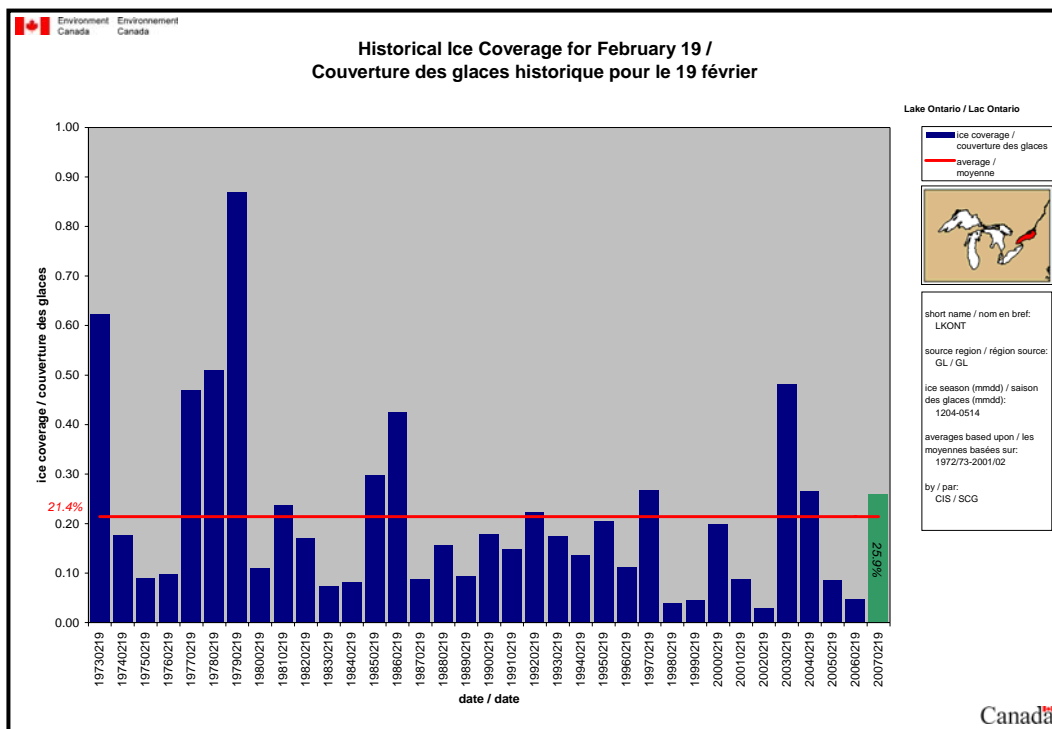


Figure 13: Historical Ice Coverage for Lake Ontario for February 19th.

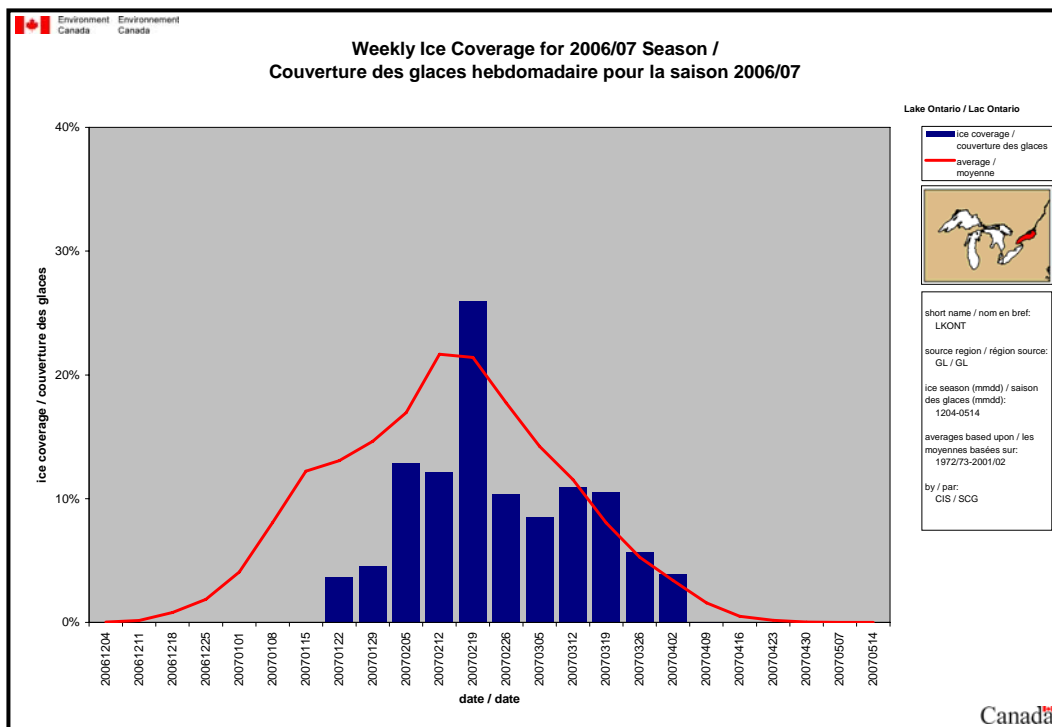


Figure 14: Weekly ice coverage for Lake Ontario - 2006-07 season.

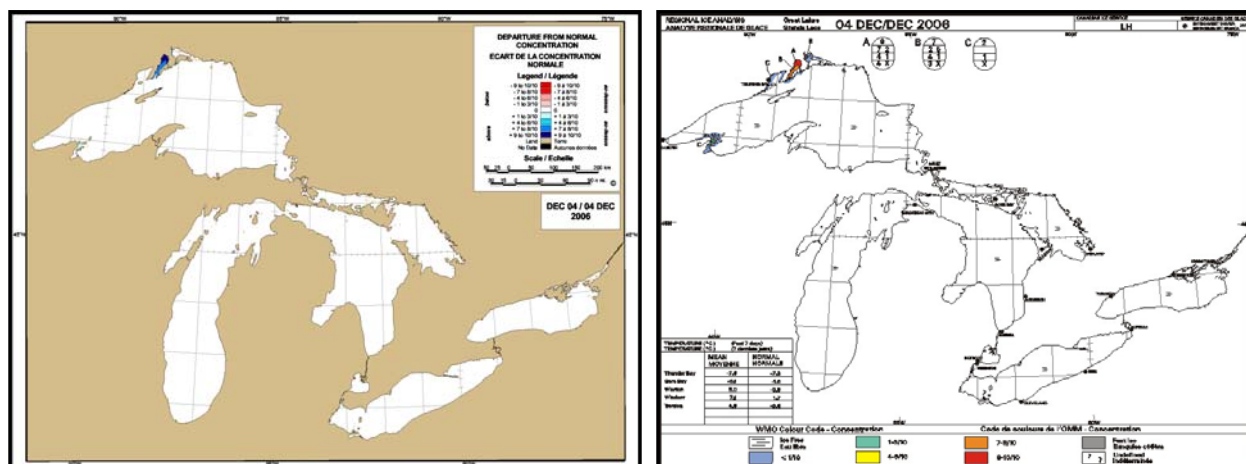


Figure 15: Departure from normal concentration and observed ice situation – December 4th, 2006.

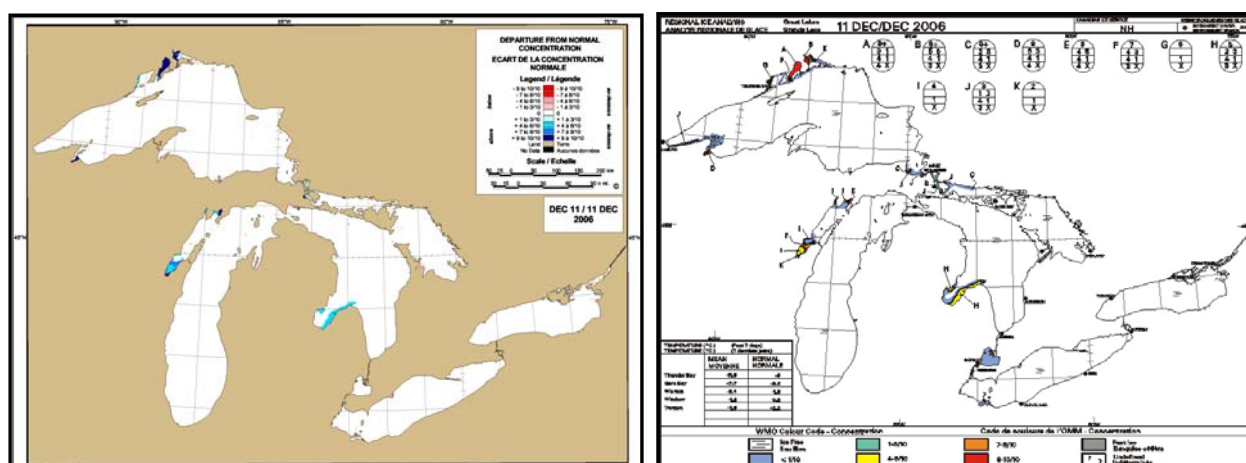


Figure 16: Departure from normal concentration and observed ice situation – December 11th, 2006.

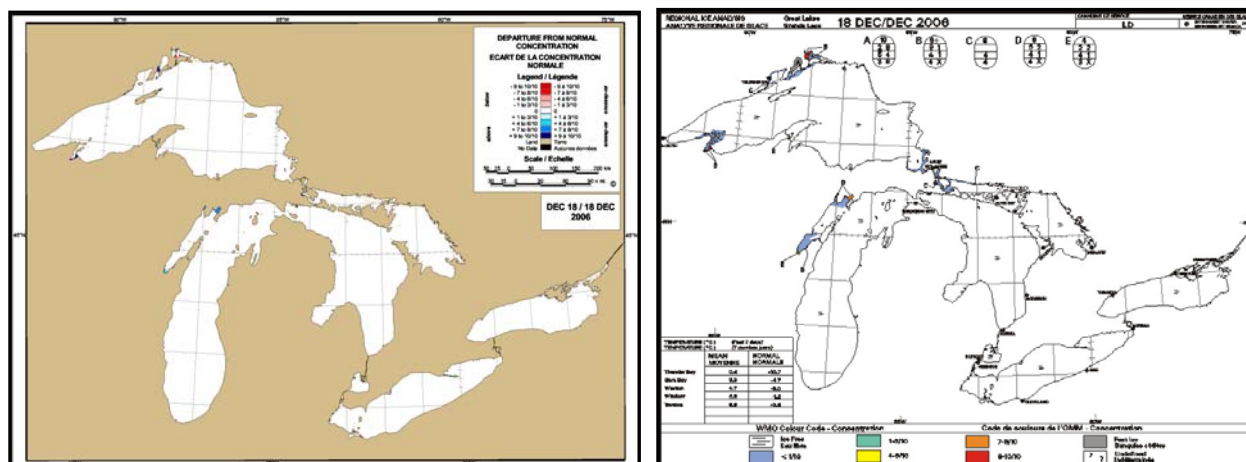


Figure 17: Departure from normal concentration and observed ice situation – December 18th, 2006.

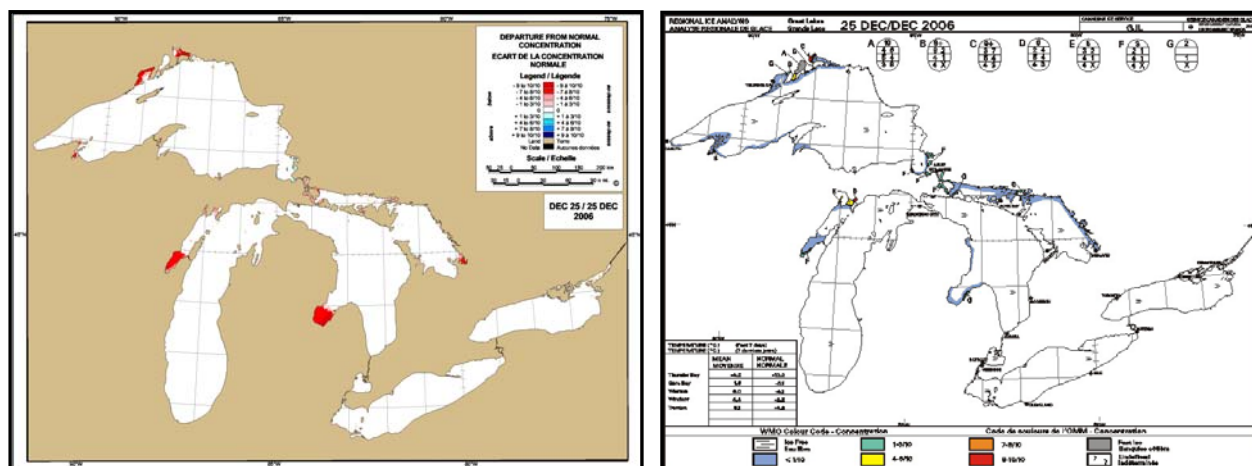


Figure 18: Departure from normal concentration and observed ice situation – December 25th, 2006.

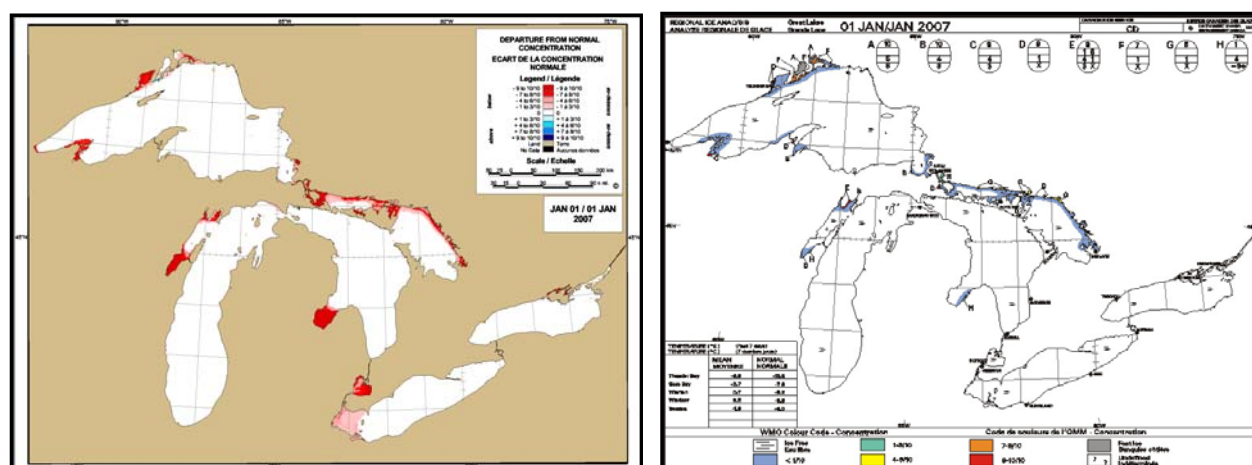


Figure 19: Departure from normal concentration and observed ice situation – January 1st, 2007.

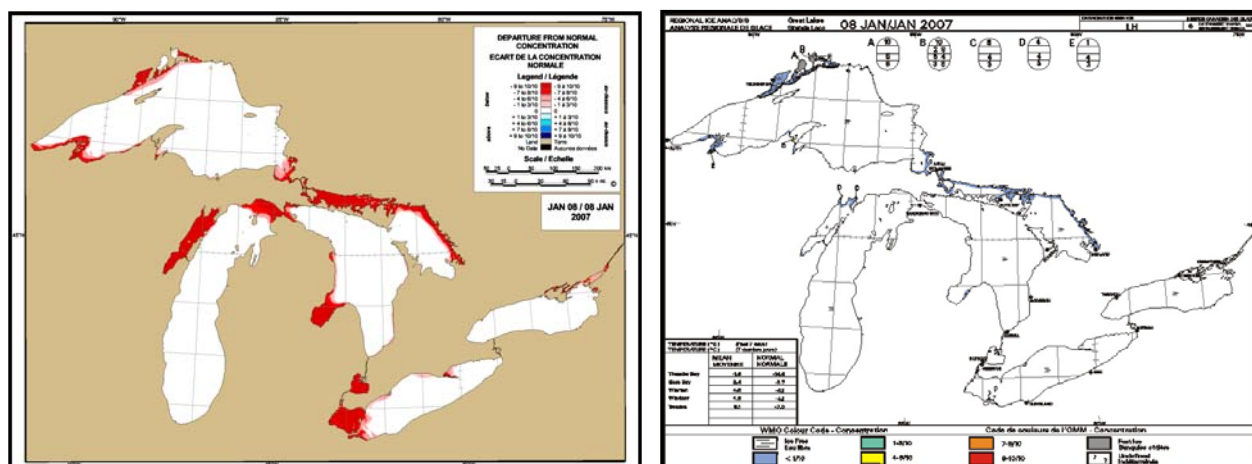


Figure 20: Departure from normal concentration and observed ice situation – January 8th, 2007.

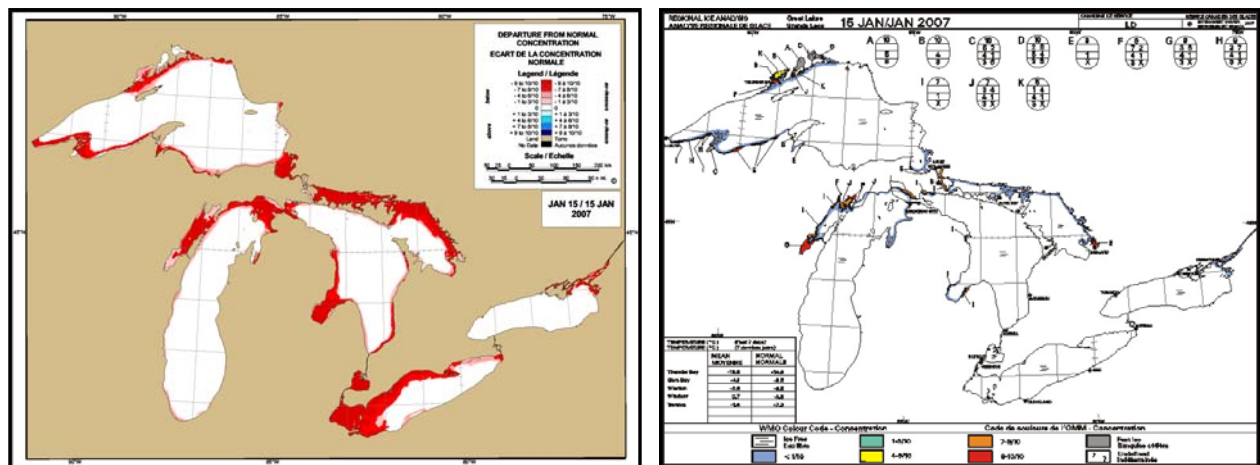


Figure 21: Departure from normal concentration and observed ice situation – January 15th, 2007.

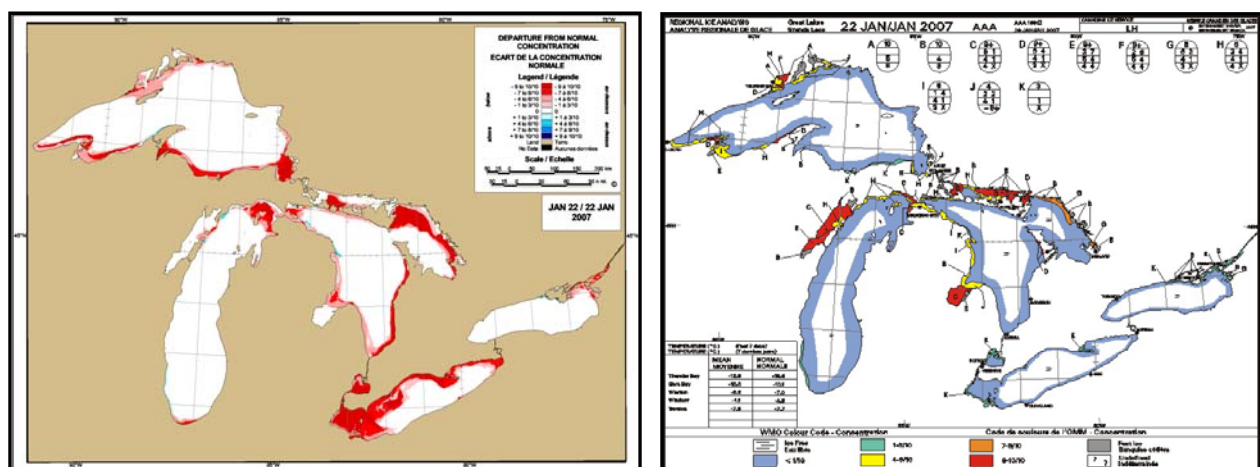


Figure 22: Departure from normal concentration and observed ice situation – January 22nd, 2007.

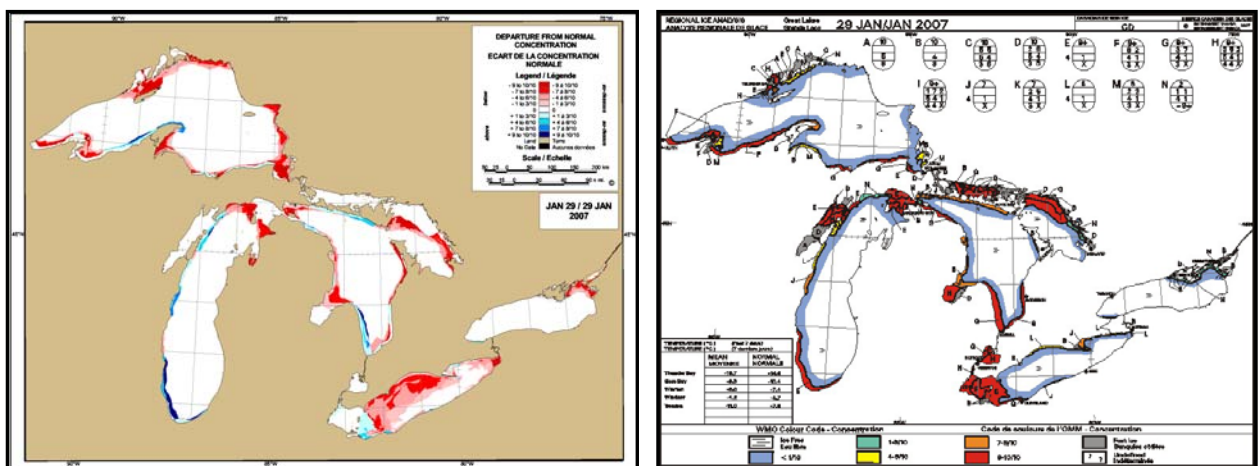


Figure 23: Departure from normal concentration and observed ice situation – January 29th, 2007.

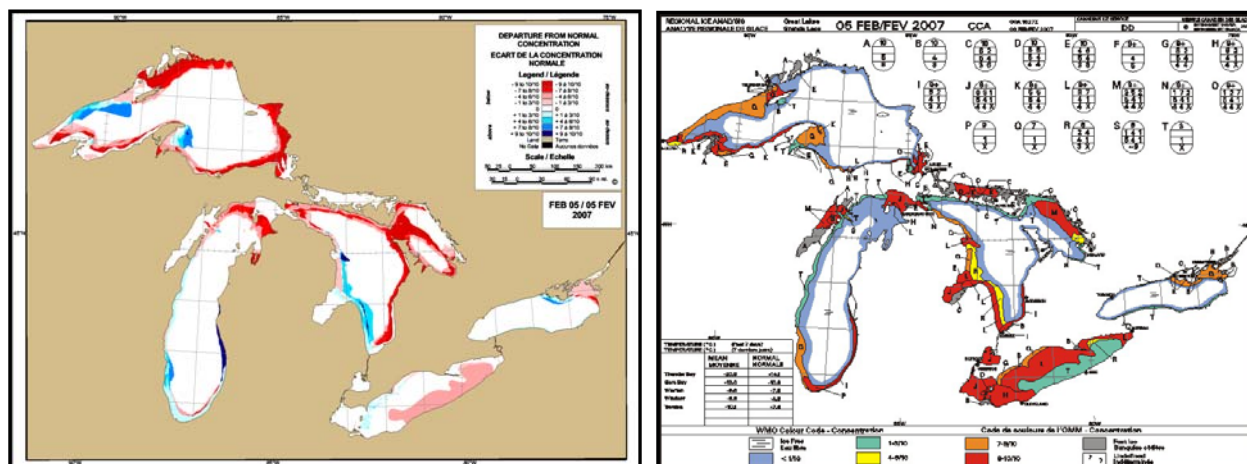


Figure 24: Departure from normal concentration and observed ice situation – February 5th, 2007.

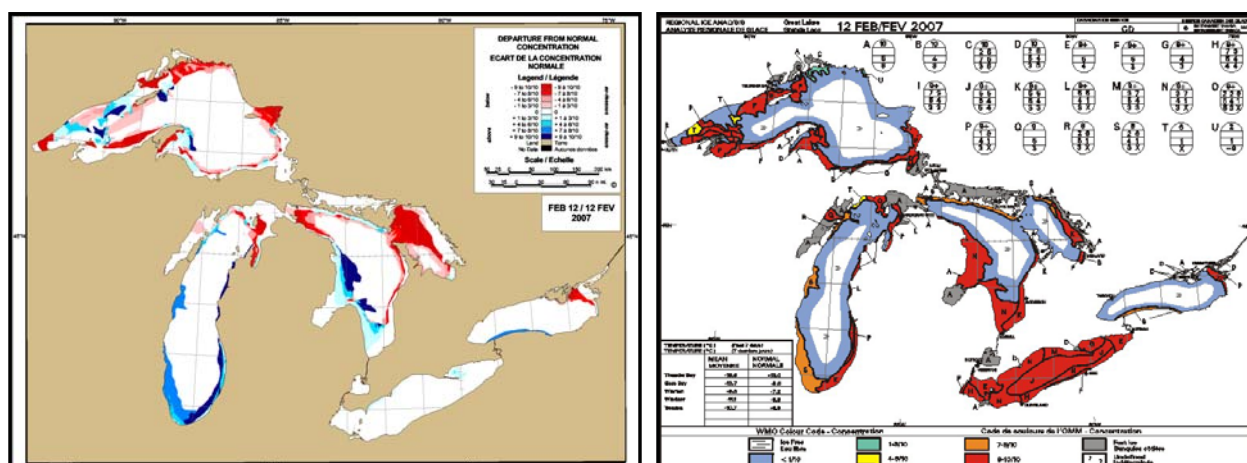


Figure 25: Departure from normal concentration and observed ice situation – February 12th, 2007.

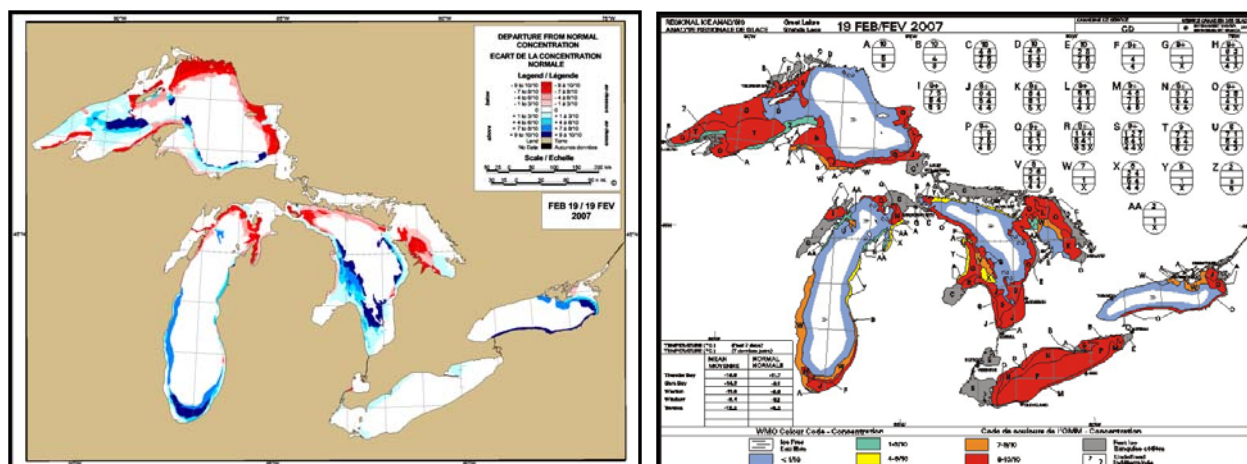


Figure 26: Departure from normal concentration and observed ice situation – February 19th, 2007.

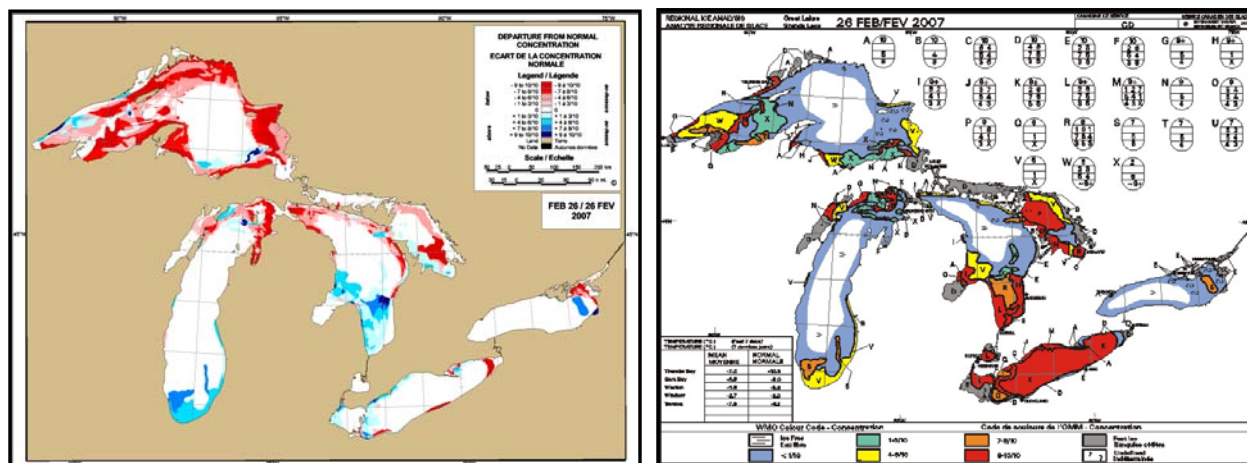


Figure 27: Departure from normal concentration and observed ice situation – February 26th, 2007.

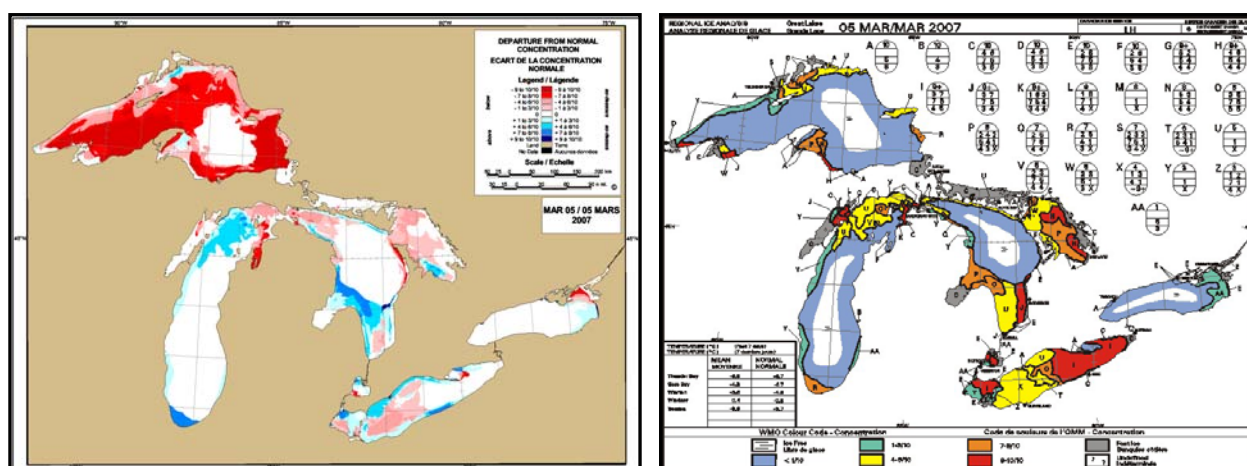


Figure 28: Departure from normal concentration and observed ice situation – March 5th, 2007.

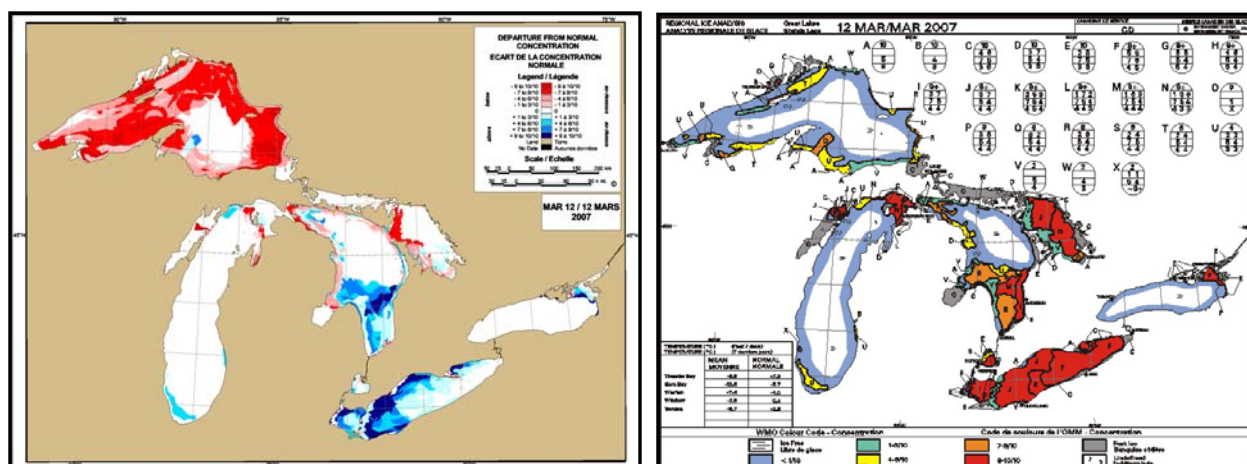


Figure 29: Departure from normal concentration and observed ice situation – March 12th, 2007.

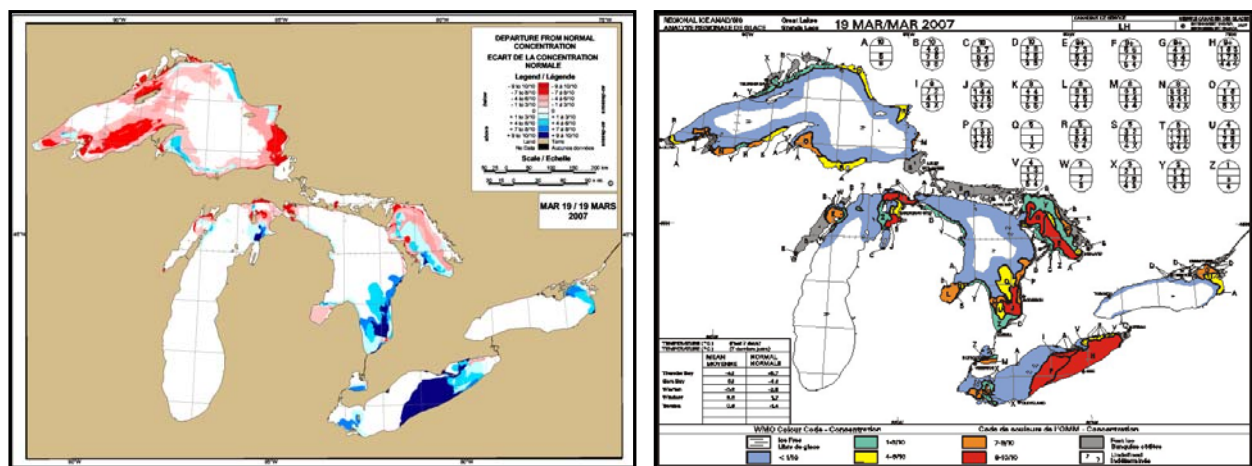


Figure 30: Departure from normal concentration and observed ice situation – March 19th, 2007.

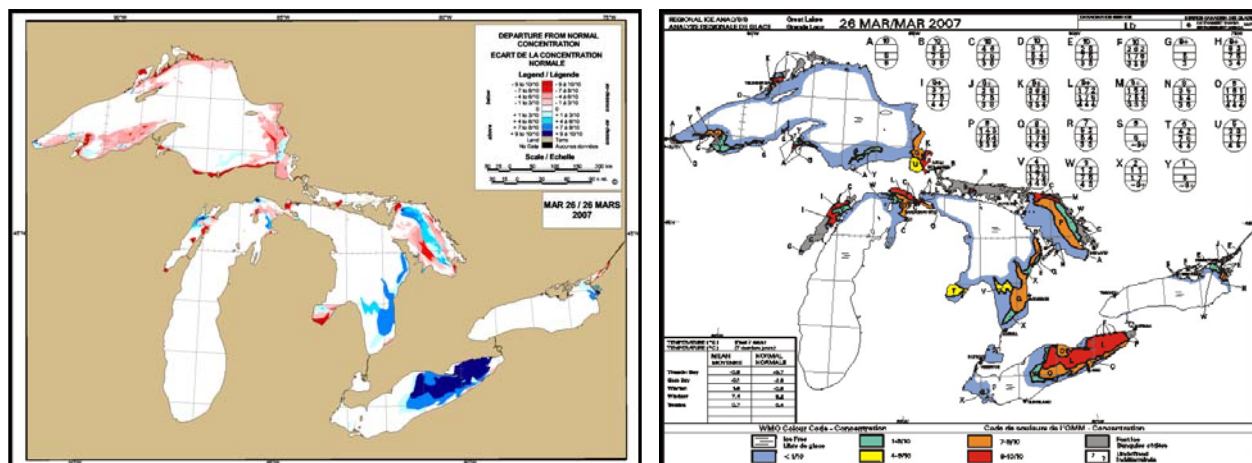


Figure 31: Departure from normal concentration and observed ice situation – March 26th, 2007.

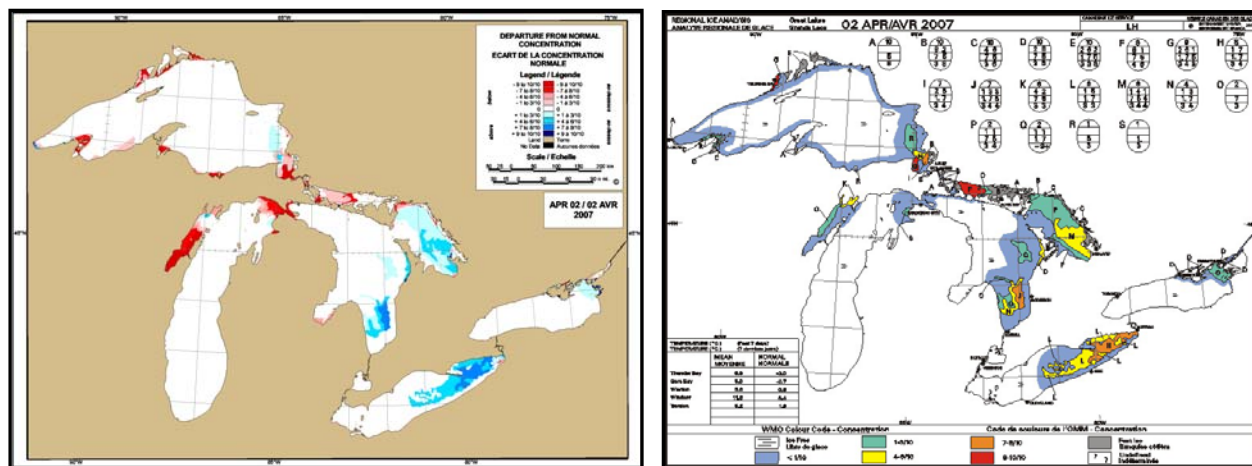


Figure 32: Departure from normal concentration and observed ice situation – April 2nd, 2007.

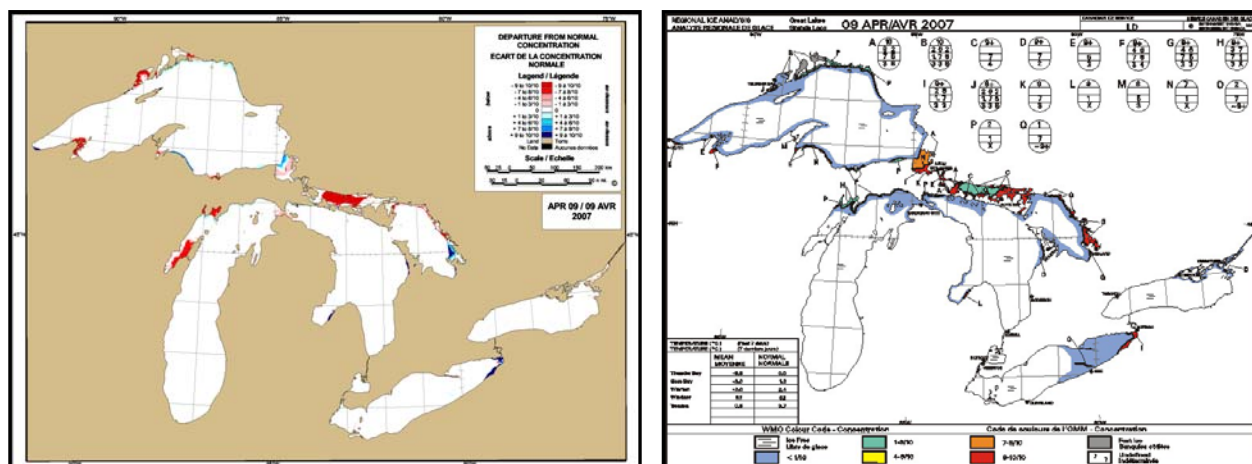


Figure 33: Departure from normal concentration and observed ice situation – April 9th, 2007.

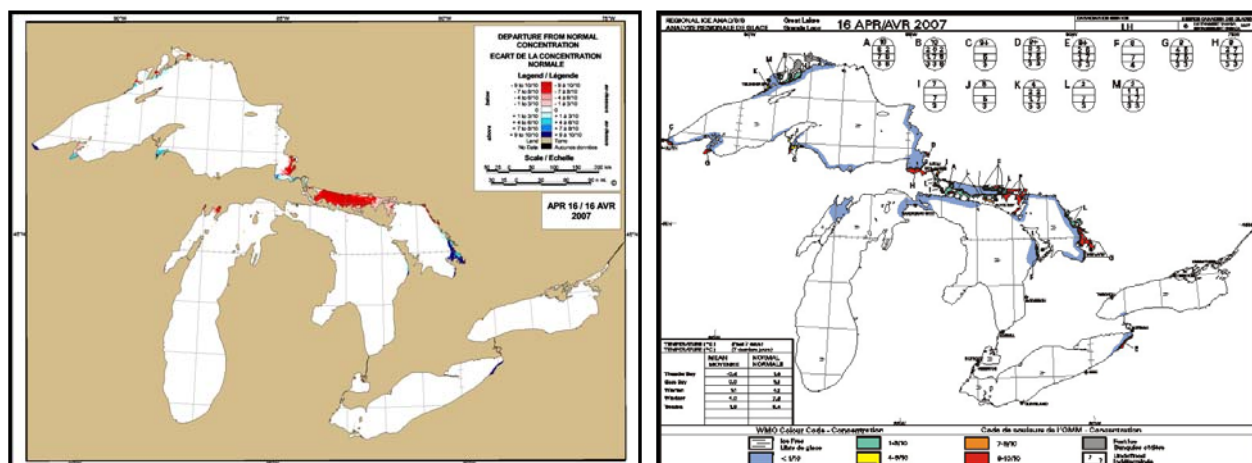


Figure 34: Departure from normal concentration and observed ice situation – April 16th, 2007.

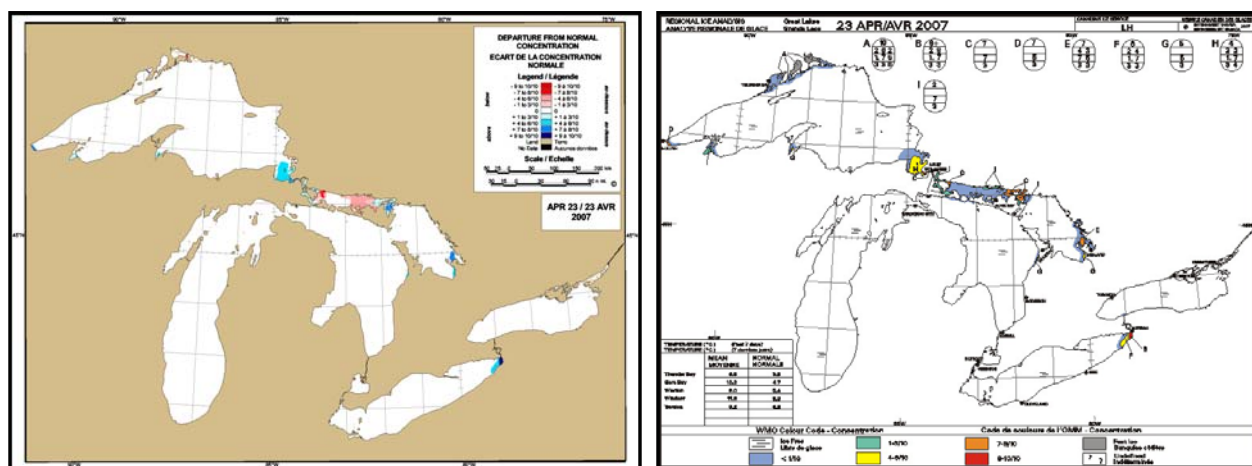


Figure 35: Departure from normal concentration and observed ice situation – April 23rd, 2007.

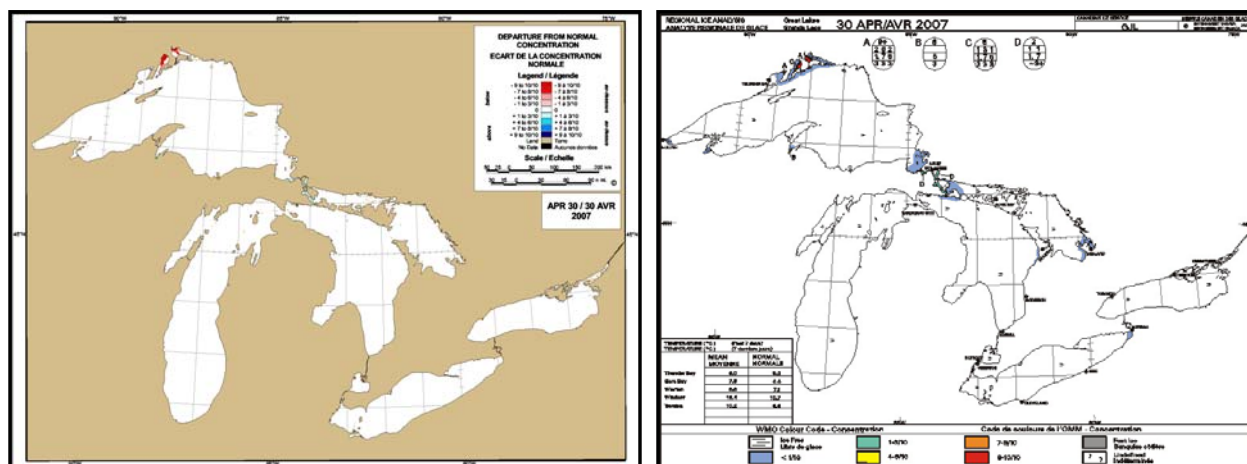


Figure 36: Departure from normal concentration and observed ice situation – April 30th, 2007.

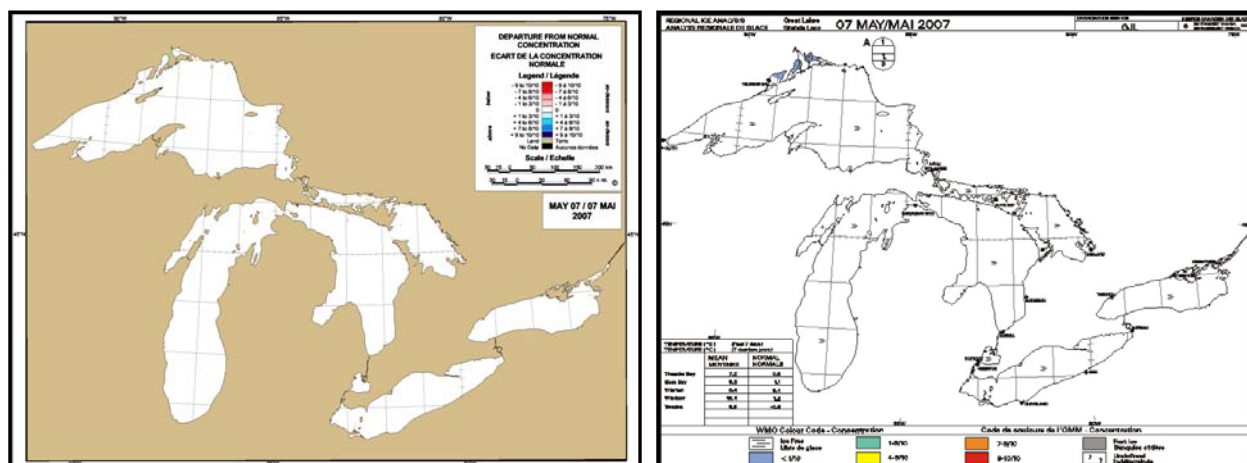


Figure 37: Departure from normal concentration and observed ice situation – May 7th, 2007.

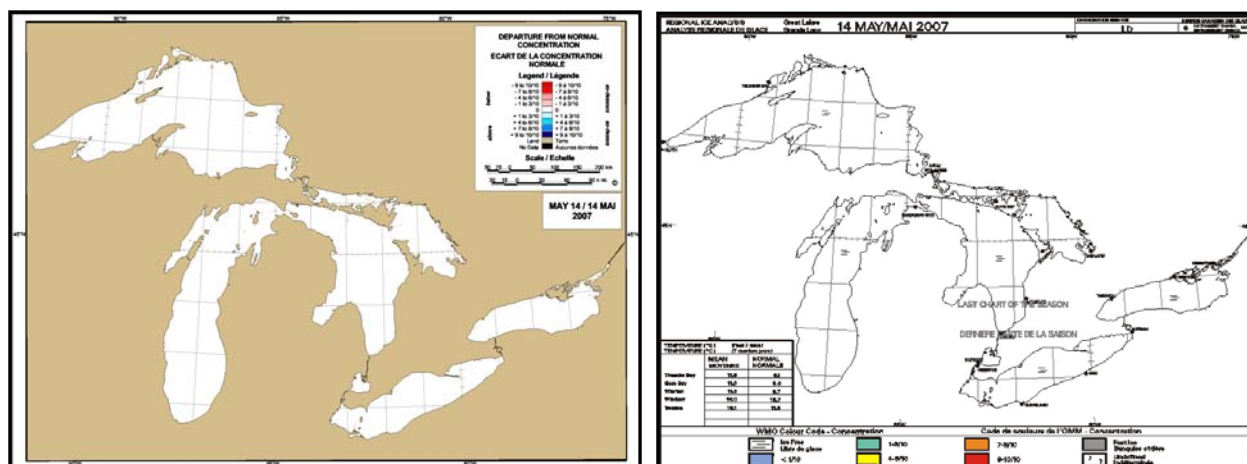


Figure 38: Departure from normal concentration and observed ice situation – May 14th, 2007.