

**Prepared by the North American Ice Service**

**A collaboration of the Canadian Ice Service and  
the National/Naval Ice Center**

**1 December 2011**

**Seasonal Outlook  
Great Lakes  
Winter 2011-2012**



## North American Ice Service

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**Great Lakes**

**WINTER 2011-2012**

**Introduction**

This outlook of the expected pattern, timing, and the extent of ice growth has been developed through an analysis of the oceanographic and meteorological parameters for the summer and the fall before the beginning of the ice season. These conditions are compared with earlier years then further analysed using the December wind and temperature forecasts plus the seasonal temperature outlook. Significant variations from these wind and temperature conditions will have an impact on the timing and extent of ice formation.

Throughout the winter, this outlook will be updated by a twice monthly issue of the 30-day forecasts. These forecasts will also indicate the beginning of the spring break-up process.

Mariners planning operations in waters impacted by hazardous ice conditions may obtain more details regarding ice conditions by consulting the CIS website at <http://www.ec.gc.ca/glaces-ice/>, or by contacting their regional MCTS centre ([http://www.ccg-gcc.gc.ca/eng/Ccg/mcts\\_Home](http://www.ccg-gcc.gc.ca/eng/Ccg/mcts_Home)).

### **General Seasonal Outlook**

Air temperatures over the Great Lakes during the summer 2011 were above normal except near normal over most of Lake Superior. Up to the end of November 2011 air temperatures have been above normal over the Great Lakes. La Nina conditions are now occurring in the Pacific Ocean and are forecast to persist through the winter. Typically La Nina brings more severe ice conditions than the average ice conditions seen since 2000.

Air temperatures are forecast to be normal over the Great Lakes this winter except above normal over the eastern lakes in December.

The surface water temperature anomalies over the Great Lakes on November 23<sup>rd</sup> are depicted in Figure 3. Water temperatures were in general near normal.

In the beginning of December, ice free conditions will prevail on the Great Lakes except for new and thin lake ice in Black Bay.

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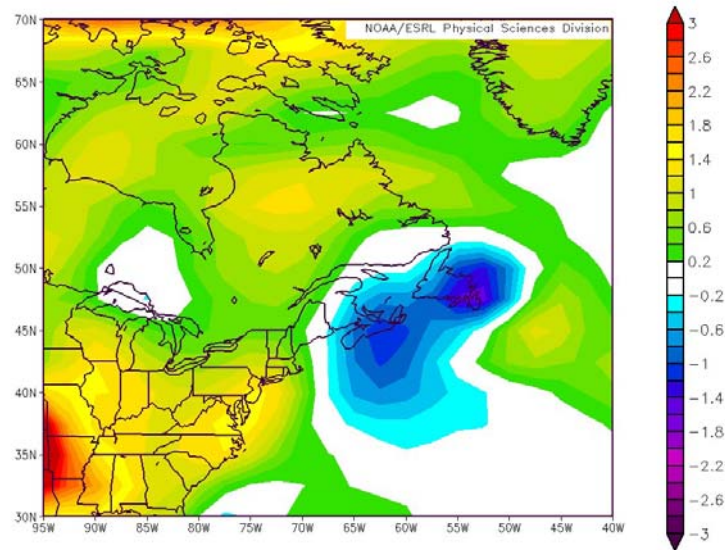


Figure 1: Surface air temperature anomaly, June to August 2011 (NOAA)

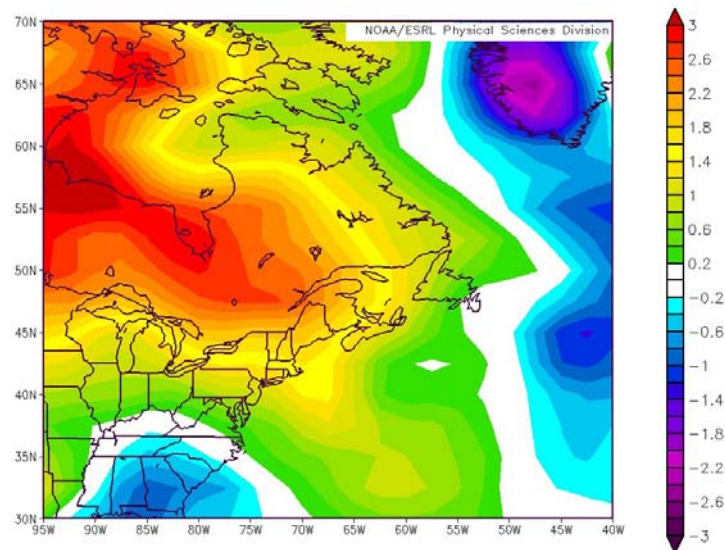


Figure 2: Surface air temperature anomaly, September 1<sup>st</sup> to November 26<sup>th</sup> 2011 (NOAA)

Seasonal Outlook - Great Lakes - Winter 2011-2012

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Table 1: Departure from normal air temperatures November 1<sup>st</sup> to November 28)

	Normal Temperatures	Observed	Departure
Duluth	-2.1	0.9	3.0
Thunder Bay	-2.6	0.1	2.7
Gore Bay	1.9	2.2	0.3
Sault Ste Marie	0.7	4.1	3.4
Chicago	4.6	7.5	2.9
Wiaraton	2.8	6.1	3.3
Windsor	4.8	8	3.2
Buffalo	4.8	8.1	3.3
Toronto	3.3	6.9	3.6
Trenton	2.7	5.9	3.2
Average	2.1	5.0	2.9

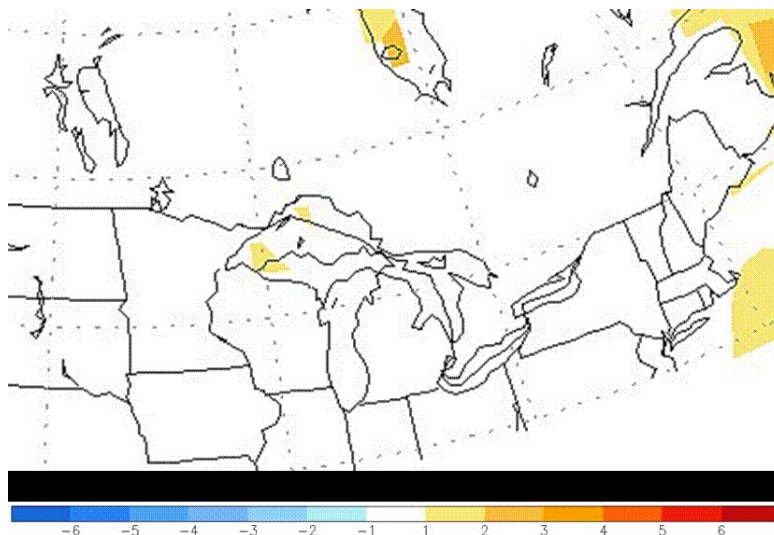


Figure 3: Water temperature anomaly - 23 November 2011 (NOAA)

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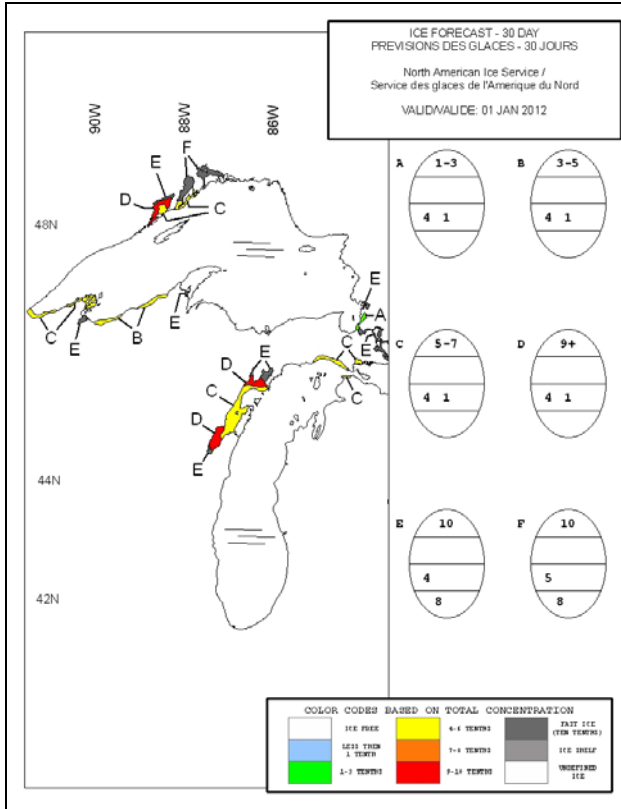


Figure 4: Expected ice conditions - western Great Lakes - 1 January 2012

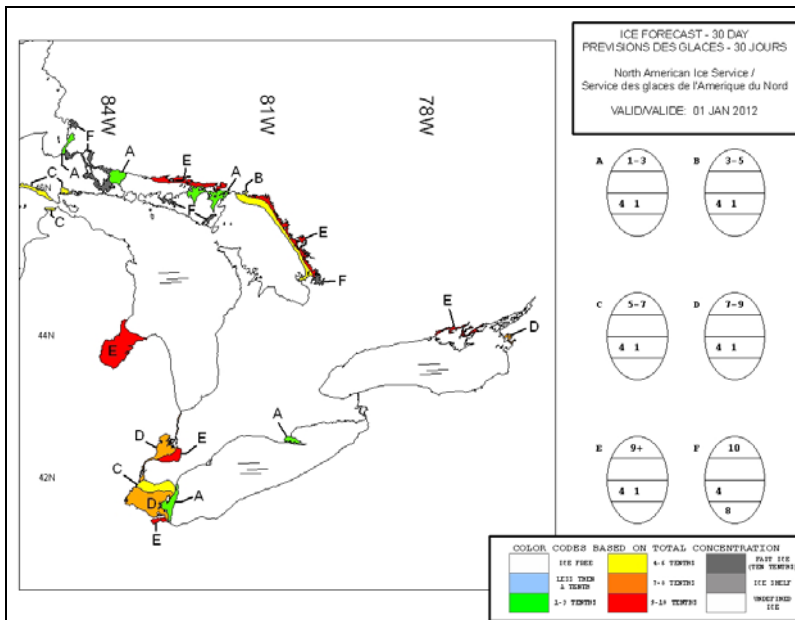


Figure 5: Expected ice conditions - eastern Great Lakes - 1 January 2012

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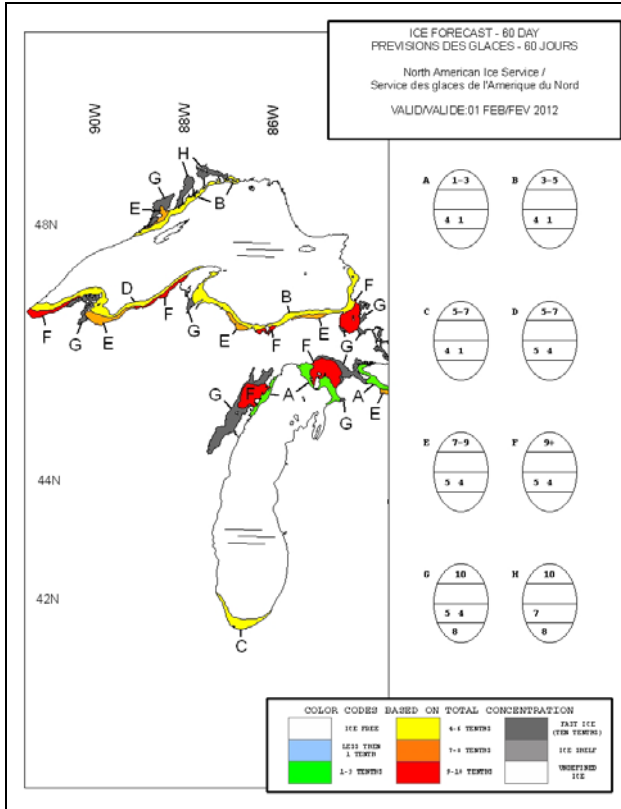


Figure 6: Expected ice conditions - western Great Lakes - 1 February 2012

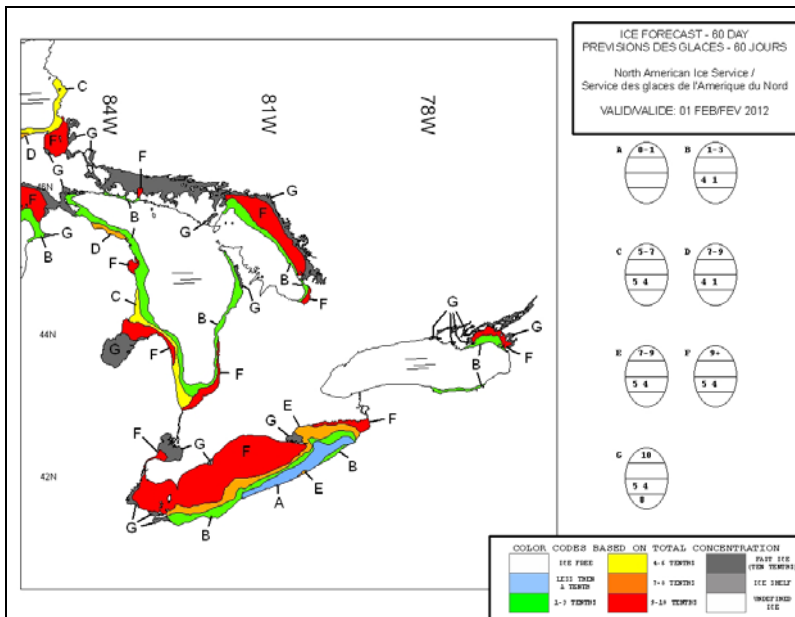


Figure 7: Expected ice conditions - eastern Great Lakes - 1 February 2012



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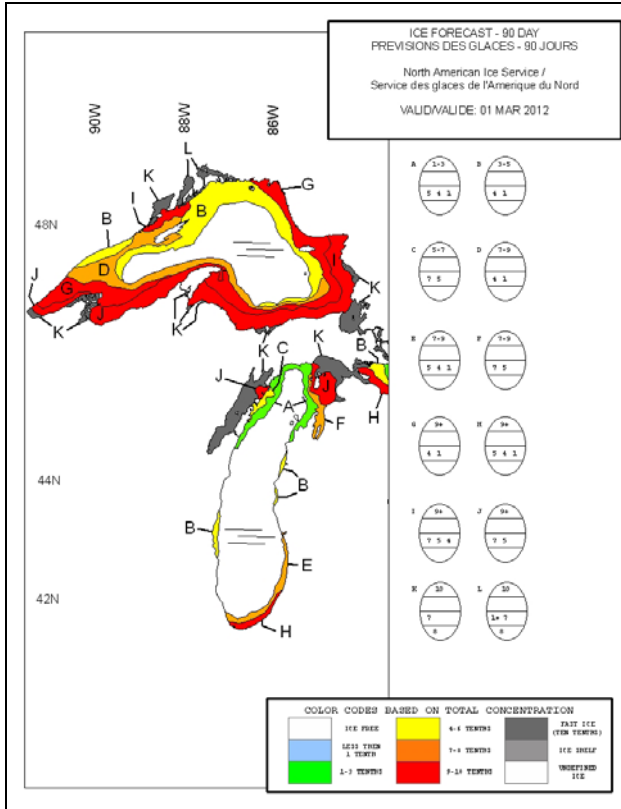


Figure 8: Expected ice conditions - western Great Lakes - 1 March 2012

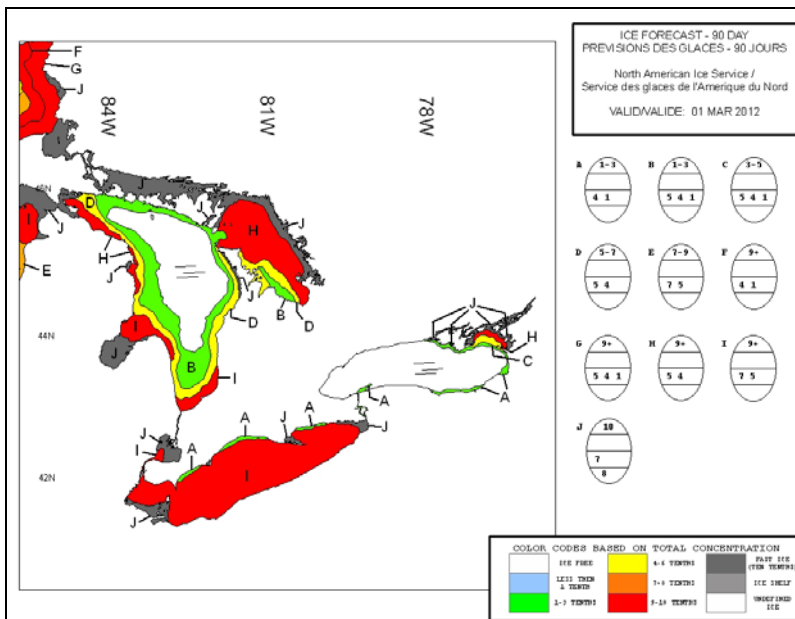


Figure 9: Expected ice conditions - eastern Great Lakes - 1 March 2012

## **Lake Superior**

At the end of November 2011 water temperatures in Lake Superior were near normal (Figure 3). Near normal air temperatures are expected in December.

New and thin lake ice will be present in Black Bay at the beginning of December. New and thin lake ice will develop in Nipigon and Chequamegon Bay near the end of the first week of December. Fast ice will develop in Black Bay in the second week of the month. At that time, new and thin lake ice will start developing in St. Mary's river. In the third week of December, fast ice will develop in the western half of Nipigon Bay, in Chequamegon Bay and in the shallower bays of St. Mary's River. In the last week of the month, Chequamegon Bay will be consolidated with thin lake ice, as well as portions of St. Mary's river. Consolidated medium lake ice will cover Black and Nipigon Bays. Also in the last week of December, fast ice will appear along the shores of Thunder Bay, and some new lake ice will at times be present in the middle of the Bay. At that time, some new and thin lake ice will develop along the shores of Whitefish Bay. Near the end of the month, Thunder Bay will be covered with thin and new lake ice and some shore fast ice will develop in Eastern Whitefish Bay. New and thin lake ice will appear along the south shore of the lake west of the Keweenaw Peninsula, around the Apostle Islands and near Duluth. Figure 4 indicates expected conditions on January 1<sup>st</sup>, 2012.

Normal to below normal air temperatures are forecast for January and February over Lake Superior. Most of St. Mary's river will become consolidated in the first week of January 2012 and shore fast ice will continue to develop in eastern Whitefish Bay. Early in the second week of the month Thunder Bay will be covered with medium lake ice, fast ice will appear in the eastern end of Thunder Bay and from Pie Island to the western shore of the bay. St. Mary's river and Chequamegon Bay will be consolidated with medium lake ice. At that time, thin and medium lake ice from Duluth to the western shore of the Keweenaw Peninsula will extend to 5 to 15 nautical miles offshore and some new and thin lake ice will be present from the eastern portion of Whitefish Bay to Michipicoten Bay. Also in the second week of January, some new and thin lake ice will occasionally be present from Grand Marais Minnesota to Marathon Ontario and from Whitefish Bay to the Keweenaw Peninsula before being destroyed by storms that commonly occur in January. Around mid-month, medium lake ice will consolidate around the Apostle Islands. Most of Thunder Bay will become consolidated with medium lake ice except for an opening at the entrance to the bay east of Pie Island. At that time Black and Nipigon Bays will be consolidated with thick lake ice. In the third week of January, consolidated medium lake ice will be found along the shores of Whitefish Bay and the rest of the bay will be completely covered with thin lake ice. By the end of January, Whitefish Bay will be covered with medium lake ice and more medium lake ice will develop along

the south shore of Lake Superior. Forecast conditions for February 1<sup>st</sup>, 2012 are shown in Figure 6.

In the first week of February, ice development will continue at a near normal pace and consolidated ice in Thunder Bay, around the Apostle Islands and in the shallower portions of eastern Whitefish Bay will thicken to the thick lake ice stage. At that time, some thick lake ice will also be present along the south shore of the lake. In the second week of February consolidated thick lake ice will cover most of Whitefish Bay. A mixture of thin, medium and thick lake ice will extend up to 20 nautical miles off the south shore and new and thin lake ice will at times be present from Grand Marais Minnesota to Marathon Ontario. After mid-month, ice in Lake Superior will extend rapidly offshore and the western section of the lake will be mostly ice covered; thin lake ice will be found offshore while a mixture of thin, medium and thick lake ice will be present within 20 nautical miles of the south shore. At that time, the eastern section of Lake Superior will be mostly open water but thin and medium lake ice will extend 15 to 30 nautical miles off the southern and eastern shores of the lake, while consolidated thick lake ice will be found along portions of the shore. Little change is expected until the end of the month. During February, pieces of thick lake ice could break off the fast ice in Thunder Bay and drift towards Isle Royale. Ice conditions on March 1<sup>st</sup> 2012 are depicted in Figure 8.

Maximum ice extent in Lake Superior will be reached in the first two weeks of March; at times, the only open water area remaining will be in the southeastern portion of the lake. A mixture of thin, medium and thick lake ice will cover the lake. Ice concentration and extent will start decreasing rapidly after mid-March.

| Assuming near normal air temperature in the second half of March, break-up should proceed at a close to normal pace.

### **Lake Michigan**

Water temperatures at the end of November in Lake Michigan were near normal (Figure 3). Air temperatures for the month of December will be near normal.

Patches of new and thin lake ice will develop in Little and Big Bay de Noc as well as in southern Green Bay late in the second week of December. Ice will continue to develop in these areas and around Christmas Day, Little and Big Bay de Noc will be consolidated with thin lake ice. Elsewhere open water to ice free conditions will prevail in Lake Michigan except for areas of thin lake ice covering the southern third of Green Bay. Near the end of the year, most of Green Bay will be covered with open drift to close pack new and thin lake ice except for an open

water area in the northern half of the bay. New and thin lake ice will develop along the shores near the Straits of Mackinac. Ice conditions on January 1<sup>st</sup> are depicted in Figure 4.

Normal air temperatures are expected in January. Early in the second week of the month the Straits of Mackinac and portions of the shore north of Beaver Island will be covered with new and thin lake ice. Most of Green Bay will be covered with thin lake ice except for medium lake ice in the southern third of the bay. Consolidated ice in the Bays de Noc will thicken to the medium lake ice stage. The lower third of Green Bay will consolidate with medium lake ice near mid-month. In the third week of January, most of Green Bay, except for a portion of the northern half, will consolidate with medium lake ice and consolidated medium lake ice will also be found in the Straits of Mackinac. At that time, close pack thin and medium lake ice will be present along the northern shore of the lake north of Beaver Island. Some new lake ice will form in Little Traverse Bay. Also in the third week of January, some new and thin lake ice will develop along the southern shores of Lake Michigan. Near the end of the month, consolidated medium lake ice in the Straits of Mackinac will extend westward and cover portions of the north shore of the lake. Consolidated medium lake ice will be found in Little Traverse Bay. Figure 6 indicates the expected ice conditions on February 1<sup>st</sup>, 2012.

Normal air temperatures are forecast for February. Consolidated ice in the Bays de Noc, Green Bay, the Straits of Mackinac and in Little Traverse Bay will thicken to the thick lake ice stage in the first week of the month. At that time, fast ice will extend from the Straits of Mackinac to Beaver Island. Thin to medium lake ice will be found elsewhere along the northern shore of the lake, near the Straits of Mackinac and at times into Grand Traverse Bay. In the first half of the month, new and thin lake ice will often be present along the shores elsewhere in Lake Michigan before being destroyed by passing storms. By mid-month, thin and medium lake ice will persist along the southern shore of the lake. In the second half of February thin and medium lake ice will linger along the greater part of the southern and eastern shores of the lake but medium and thick lake ice will be found from near Grand Traverse Bay northward. New and thin lake ice will occasionally be present along the western shore of the lake. Most of Lake Michigan will be open water. Clearing in Lake Michigan should occur at a near normal pace. Figure 8 indicates the expected ice conditions on March 1<sup>st</sup>, 2012.

### **Lake Huron and Georgian Bay**

In late November, normal water temperatures were observed in Lake Huron and Georgian Bay (Figure 3). Air temperatures are forecast to be slightly above normal in December and near normal in January and February.

New and thin lake ice will develop in narrow bands along the coast in Saginaw Bay, in shallow bays in the North Channel and along the eastern shores of Georgian Bay late in the second week of December. Most of Saginaw Bay will be covered with new and thin lake ice in the third week of December. At that time, consolidated thin lake ice will be present in shallow bays around the North Channel and in eastern and northern Georgian Bay. Narrow bands of new and thin lake ice will also be present along the shores of the North Channel and in eastern and northern Georgian Bay. These conditions will persist into the last week of December. A map of the expected ice conditions on January 1<sup>st</sup> 2012 is shown in figure 5.

Ice will continue to develop at a normal pace in January and February. Consolidated thin lake ice will appear in shallow coastal areas of Saginaw Bay in the first week of January. New and thin lake ice will also form along portions of the western shore of Lake Huron, from Saginaw Bay to west of Bois Blanc Island, in the first week of the month. At that time, consolidated medium lake ice will be present in both ends of the North Channel while its central portion will be covered with thin lake ice. Consolidated medium lake ice will also be found in Eastern and northern Georgian Bay, with a narrow band of thin and medium lake ice extending offshore from the fast ice. In the second week of January, narrow bands of new and thin lake ice will develop along the shores of eastern and southern Lake Huron. Saginaw Bay will be covered with medium lake ice. The North Channel will consolidate with medium and thin lake ice shortly after mid-month. At that time, thin and medium lake ice will extend 5 to 15 nautical miles offshore around Lake Huron and 10 to 25 nautical miles offshore in eastern and northern Georgian Bay. Saginaw Bay will consolidate with medium lake ice at the end of January. The expected ice conditions on February 1<sup>st</sup> are shown in Figure 7.

Consolidated lake ice in Saginaw Bay, in the North Channel and in Georgian Bay will thicken to the thick lake ice stage in the first week of February. At that time, thin to medium lake ice will extend 10 to 20 nautical miles off the shores around Lake Huron. Thin to medium lake ice will cover most of Georgian Bay except for an open water area generally present in the southwest portion of the Bay. In the second half of February, most of Georgian Bay will be covered with medium lake ice except for an open water area at times present in the southwest portion of the bay. A mixture of new, thin and thick lake ice will be found within 10 to 20 nautical miles of the shores of Lake Huron. A map of the expected ice conditions on March 1<sup>st</sup> is shown in figure 9.

Late February conditions will persist into the first week of March. More thick lake ice will be found near the southern and eastern shores of Lake Huron near mid-March. At that time, some thick lake ice will be present in the pack ice in Georgian Bay.

Break-up will start shortly after mid-March. Assuming near normal air temperatures for the month of March break-up will follow a near normal pattern.

### **Lake Erie and Lake St Clair**

Water temperatures near the end of November were near normal. Slightly above normal air temperatures are expected in December and normal air temperatures are forecast for January and February.

Patchy areas of new and thin lake ice will develop in Lake St Clair shortly after mid-December. Near the end of December, Lake St Clair, the Western Basin and Sandusky Bay will be covered with new and thin lake ice. Patches of new lake ice will be found in Long Point Bay. Stormy weather could destroy a lot of the ice and reduce ice coverage. The rest of Lake Erie will be ice free. Expected conditions on January 1<sup>st</sup> are shown in Figure 5.

Near normal air temperatures are expected in January. In the second week of the month, the shallower areas of eastern and northern Lake St Clair, portions of the western shore of the Western Basin and Sandusky Bay will become consolidated with thin lake ice. The rest of Lake St Clair and the Western Basin, as well as Long Point Bay will be covered with thin lake ice. Also in the second week of January, narrow bands of new and thin lake ice will develop along the northern shore of Lake Erie; they could be destroyed by passing storms. Some new lake ice will at times be present along the southern shore. Shortly after mid-January, Lake St Clair and almost all the western half of Lake Erie will be covered with thin and some medium lake ice. A mixture of new, thin and medium lake ice will be found elsewhere along the northern shore of the lake and near Buffalo. By the end of the month, consolidated medium lake ice will cover the greater portion of Lake St Clair, while most of Lake Erie will be covered with thin and medium lake ice, except for a large open water area in the southeast portion of the lake. Expected conditions on February 1<sup>st</sup> are shown in Figure 7.

Near normal air temperatures are forecast for February. Lake Erie will become completely ice covered early in the second week of the month. Medium lake ice will be present in the southern half of the lake with thin and medium lake ice found in the northern half. By mid-February consolidated medium to thick lake ice will be present in the greater part of Lake St Clair, in the Western Basin south of Pelee Island and in Long Point Bay. The rest of the Western Basin and Lake St Clair will be covered with medium to thick lake ice. Also near mid-February, consolidated thick lake ice will be found off Buffalo. Large amounts of thick lake ice will develop in the eastern end of Lake Erie and in the Western Basin in the second half of the month while the rest of Lake Erie will be covered mostly with medium lake ice. Consolidated thick lake ice will be found south of Pelee Island; ice in the rest of the Western Basin will generally remain mobile but might consolidate for brief periods. Open water leads will develop along the northern

shore of the lake late in the month as north winds typically prevail over the area. Figure 9 indicates the expected ice conditions on March 1<sup>st</sup> 2012.

Breakup will start in the last week of February.

## **Lake Ontario**

At the end of November water temperatures were generally near normal (Figure 3). Air temperatures over Lake Ontario are forecast to be slightly above normal in December and near normal for the rest of the winter.

Lake Ontario will remain ice free in the first three weeks of December. New and thin lake ice will form in Bay of Quinte late in the third week of December. The bay will be covered with thin lake ice near the end of the month. Otherwise at the end of December ice free conditions will prevail in Lake Ontario except open water along the northeast shore. Figure 5 indicates the expected ice conditions on January 1<sup>st</sup> 2012.

Normal air temperatures are expected in January. Patches of new and thin lake ice will form in the western end of the Seaway and in shallower bays of the northeast shore in the first week of January. At that time, the Bay of Quinte will become consolidated with thin lake ice. In the third week of January, the western end of the Seaway will consolidate with medium lake ice and consolidated ice in the Bay of Quinte will thicken to the medium lake ice stage. Also in the third week of January, the coastal ice in the north-eastern section of the lake will gradually expand to about 10 to 20 nautical miles offshore. By the end of the month, most of the north-eastern portion of the lake, from Long Point and eastward, will be covered with thin with some medium lake ice. New and thin lake ice will occasionally form elsewhere around the shores but will melt rapidly as it is pushed offshore by passing storms. Figure 7 indicates the expected ice conditions on February 1<sup>st</sup>, 2012.

The ice in the western end of the Seaway and in Bay of Quinte will reach the thick lake ice stage near mid-February. At that time thin and medium lake ice will be found in the north-eastern portion of the lake. Narrow bands of new and thin lake ice will be found at times along the shores of the rest of the lake but will be blown offshore and melt rapidly. Conditions on March 1<sup>st</sup> 2012 are shown in figure 9.

Break-up will occur at a near normal pace.

## **Appendix**

### **Appendix A - Stages of Development of Lake Ice and Egg Code**

For more information on this section, please refer to the following web link on the Canadian Ice Service web site:

<http://www.ec.gc.ca/glaces-ice/default.asp?lang=En&n=84F6AA59-1&wsdoc=FE5C2688-21A8-4165-8FFB-5D28B2A1D943>

or on the National Ice Center web site:

[http://www.natice.noaa.gov/products/egg\\_code.html](http://www.natice.noaa.gov/products/egg_code.html)

### **Appendix B - General information from the Canadian Coast Guard**

General information regarding transmission times for bulletins and charts from various radio broadcast stations:

[http://www.ccg-gcc.gc.ca/eng/CCG/MCTS\\_Radio\\_Aids](http://www.ccg-gcc.gc.ca/eng/CCG/MCTS_Radio_Aids)

### **Appendix C - WMO (World Meteorological Organization) Colour Code**

Information regarding the ice chart colour code using the WMO standard could be found at the link below:



<http://www.ec.gc.ca/glaces-ice/default.asp?lang=En&n=D5F7EA14-1&offset=1&toc=show>

## **Appendix D - Ice Services for Canadian Great Lakes Waters**

In Canada, ice services are provided to shipping, fishing and in-lake operators by a co-operative effort of Environment Canada and the Department of Fisheries and Oceans. Department of Fisheries and Oceans, through the Canadian Coast Guard, provides icebreaker services and operates a seasonal Ice Operations Office at Sarnia. Canadian Ice Service of the Meteorological Service of Canada (division of Environment Canada) is responsible for gathering and generating ice information services and forecasts.

### **The following forecasts are issued:**

Great Lakes Ice Hazard Bulletin (FICN19): A general ice description of conditions in each of the Great Lakes and, if required, a warning of hazardous ice conditions for the next 36 hours.

Ice Charts produced at least twice a week and a weekly Regional Ice Chart covering all five lakes are issued by the North American Ice Service. The Great Lakes Ice Charts are issued in two sections: the western portion of the Great Lakes which includes Lake Superior and Lake Michigan and the eastern portion of the Great Lakes which includes Lake Huron, Lake St Clair, Lake Erie and Lake Ontario. In addition to the distribution outlined in Appendix B, ice forecasts and bulletins and the Seasonal Outlook are available from the Canadian Ice Service website (<http://www.ec.gc.ca/glaces-ice/>) and the National Ice Center website (<http://www.natice.noaa.gov/>). The seasonal outlook is issued once yearly then updated twice monthly by 30-day forecasts.

For further information concerning these services please contact Canadian Ice Service by phone (877) 789-7733, facsimile (613) 947-9160 or e-mail at:

[ECWeather-meteo@ec.gc.ca](mailto:ECWeather-meteo@ec.gc.ca)

or the national ice centre:

[http://www.natice.noaa.gov/contact\\_us.html](http://www.natice.noaa.gov/contact_us.html)