

Prepared by the North American Ice Service

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

4 December 2007

**Seasonal Outlook
Great Lakes
Winter 2007-2008**



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Great Lakes

WINTER 2007-2008

Introduction

This outlook of the expected pattern, timing, and the extent of ice growth attempts to identify areas and periods where conditions should be more or less favourable than normal. It has been developed through an analysis of the oceanographic and meteorological parameters for the summer and the fall proceeding the ice season. These conditions are compared with earlier years, the December wind and temperature forecasts plus the seasonal temperature outlook. A prediction of the ice regime is then produced. **It should be noted that significant variations of these 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 30-day forecasts. These forecasts will also indicate the beginning of the spring break-up process throughout the area. Daily radio broadcasts of ice charts and forecasts will be made to support ongoing operations in the various areas where ice affects marine activity. For more information regarding the broadcast schedule, please consult the following Canadian Coast Guard web site (Appendix B - General information from the Canadian Coast Guard).

<http://www.ccg-gcc.gc.ca/mcts-sctm/ramn/docs/aa.ae/index.htm#part5>.

General Seasonal Outlook

The summer of 2007 was characterized by generally milder than normal temperatures over all of the lakes. That trend continued into September and October. However temperatures returned to near seasonal values for the month of November. La Nina conditions have developed during the fall and are expected to persist throughout the winter 2007-2008.

The general temperature trend for the coming winter will see near to slightly below normal temperatures over most of the lakes for the beginning of the winter. January and February will see slightly above normal temperatures for the southern lakes but Lake Superior and the northern Half of Lake Huron will experience near to slightly below normal temperatures.

The surface water temperature anomalies over the Great Lakes on November 28 are depicted in Figure 3. Water temperatures were near normal over Lake Superior, Lake Michigan and Lake Erie but were ranging from 0.5°C to 1.0°C above normal over Lake Ontario and Lake Huron.

At the beginning of December thin lake ice has already developed in Black Bay, western Nipigon Bay as well as in St Mary's River. At that time patchy areas of new ice were present along sections of the shores in Thunder Bay, Green Bay, Whitefish Bay, Saginaw Bay and Georgian Bay. During the first half of December coastal ice will occasionally develop in Lake St Clair and the Western Basin but will get destroyed rapidly by strong wind events. Otherwise generally ice free conditions prevailed over the Great Lakes

The forecast for December is for below normal air temperatures for the first half of the month over most of the lakes. Lake Michigan is the exception where temperatures during the first half of the month will be near normal. For the second half of December, generally near to above normal temperatures are expected.

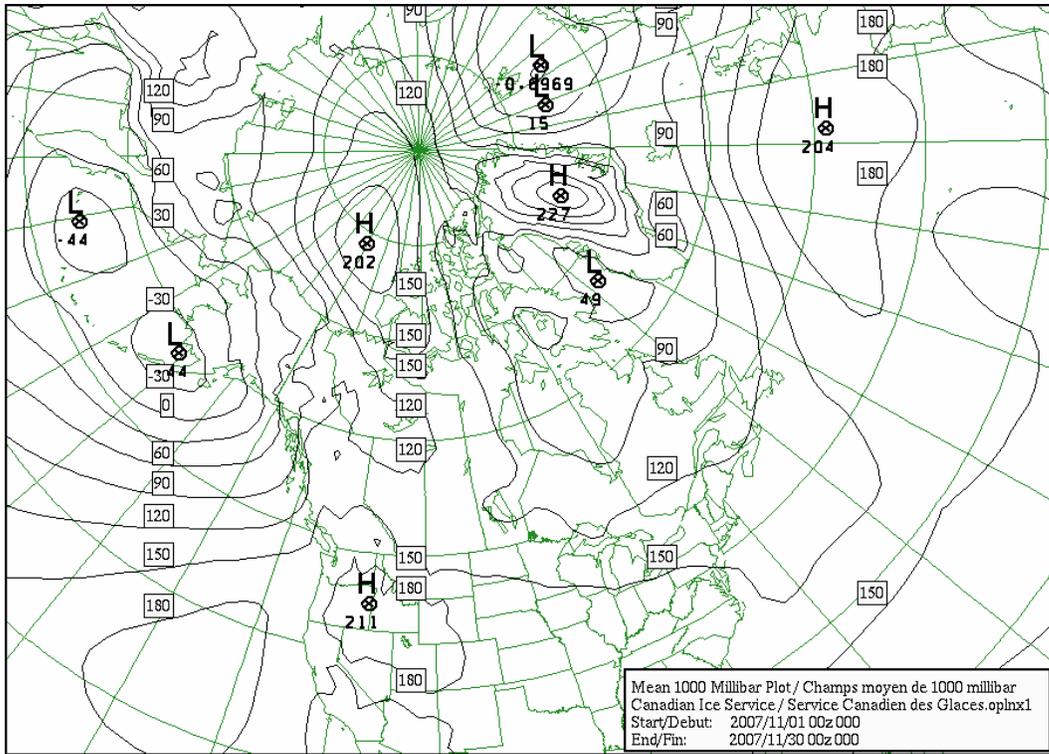


Figure 1: 1000 mb pressure pattern - November 2007

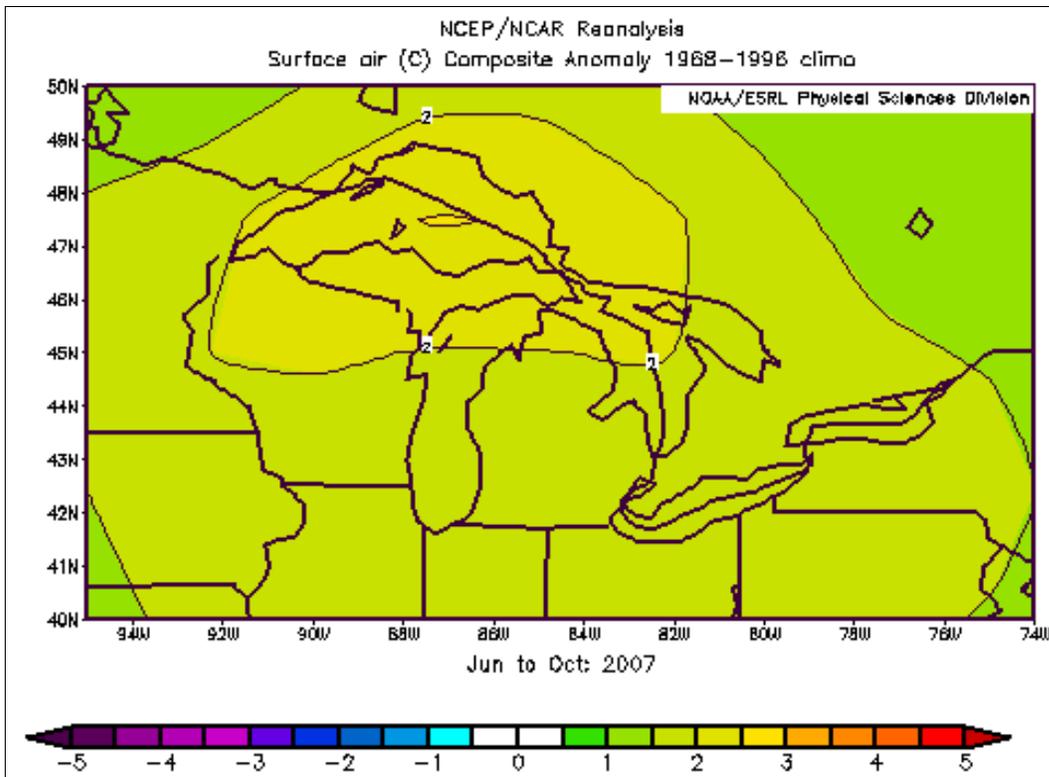


Figure 2: Air temperature anomalies over the Great Lakes – June 1 to October 31, 2007.

	Normal Temperatures	Observed	Departure
Duluth	-2.4	1.3	3.7
Thunder Bay	-2.9	-2.5	0.4
Gore Bay	1.6	1.3	-0.3
Sault Ste Marie	0.5	0	-0.5
Chicago	4.4	6.3	1.9
Wiaarton	2.6	1.9	-0.7
Windsor	4.6	4.7	0.1
Buffalo	4.6	5.2	0.6
Toronto	3.1	2.6	-0.5
Trenton	2.5	1.9	-0.6
Average	1.9	2.3	0.4

Table 1: Departure from Normal Temperatures - November 2007

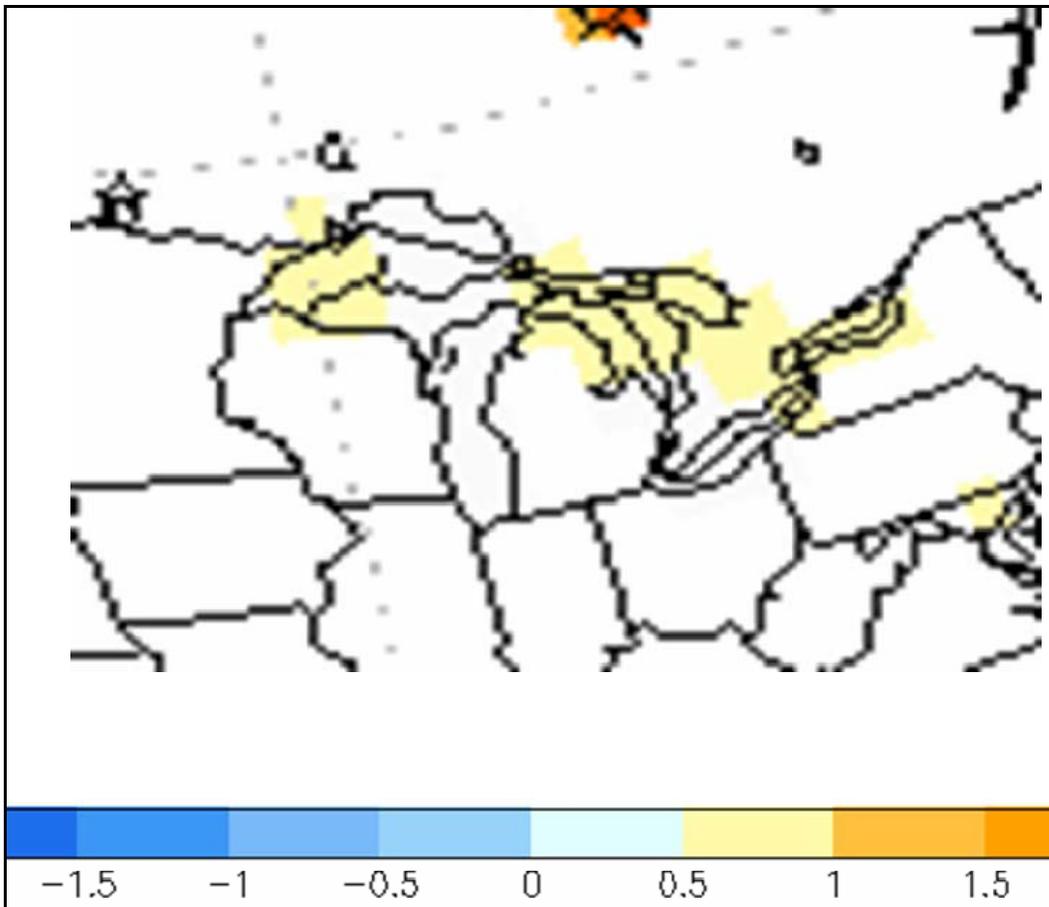


Figure 3: Sea surface temperature anomalies - 28 November 2007 (NCEP)

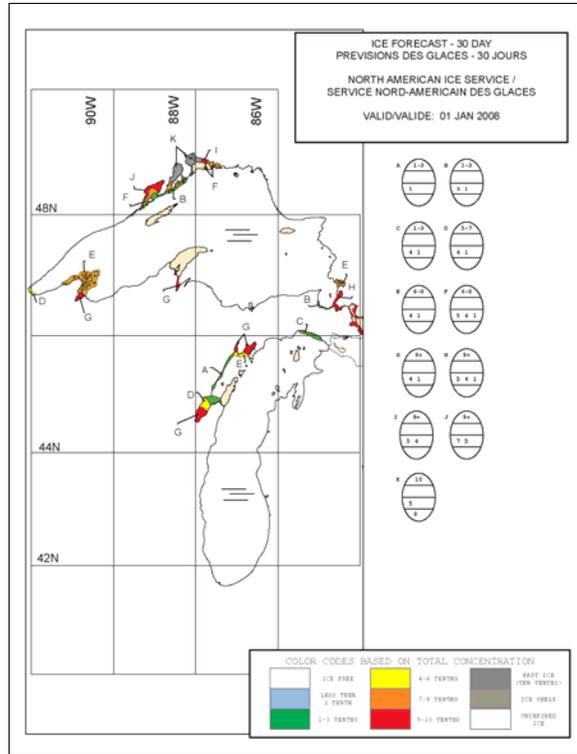


Figure 4: Expected ice Conditions - Western Great Lakes - 1 January 2008

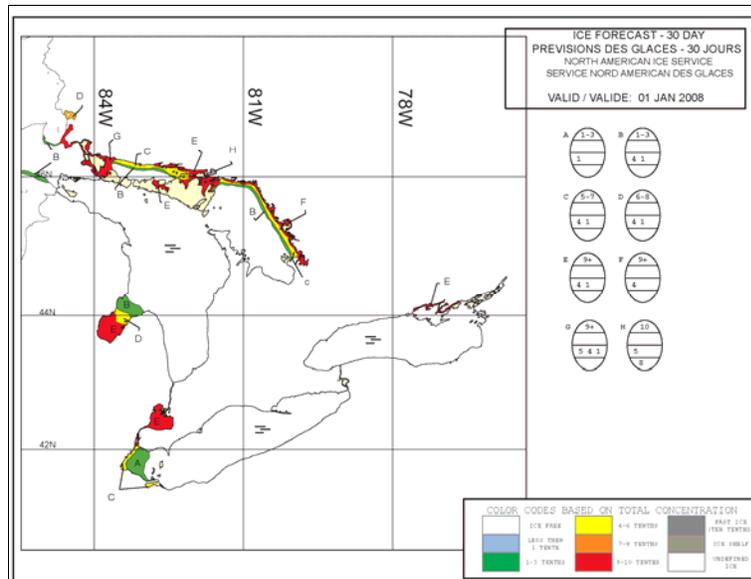


Figure 5: Expected ice Conditions - Eastern Great Lakes - 1 January 2008

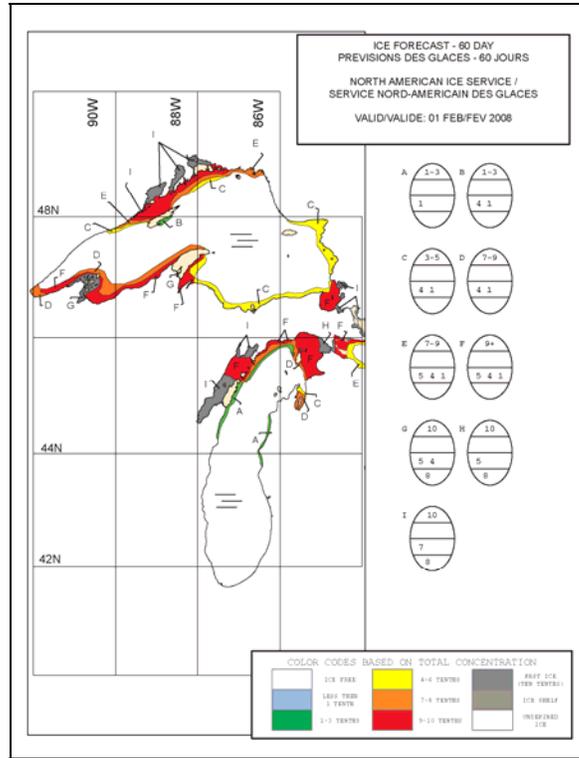


Figure 6: Expected ice Conditions - Western Great Lakes - 1 February 2008

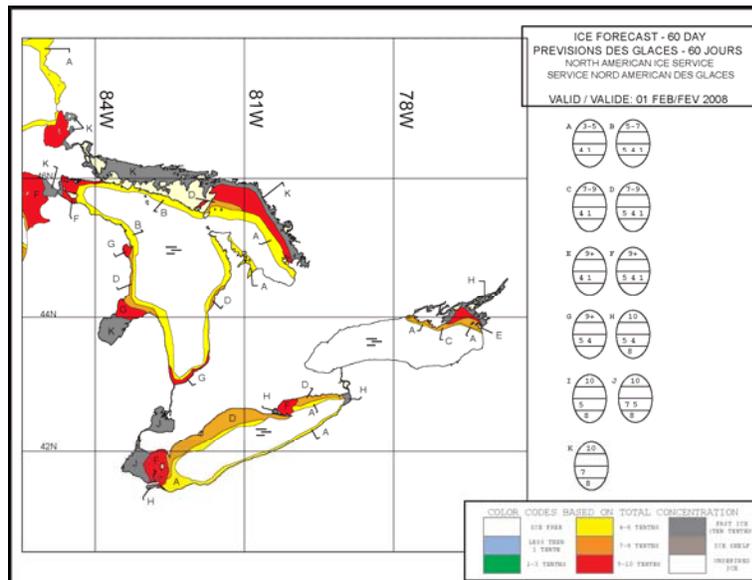


Figure 7: Expected ice Conditions - Eastern Great Lakes - 1 February 2008

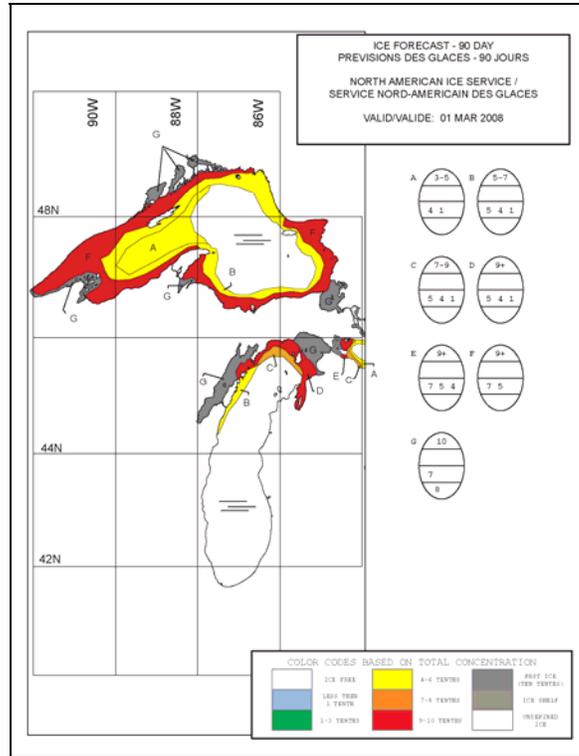


Figure 8: Expected ice Conditions - Western Great Lakes - 1 March 2008

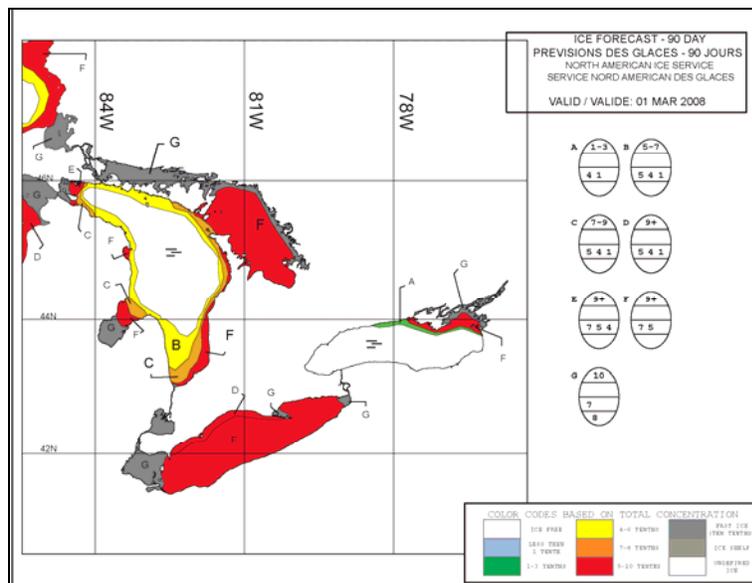


Figure 9: Expected ice Conditions - Eastern Great Lakes - 1 March 2008

Lake Superior

Near the end of November water temperatures were near normal over the eastern section of Lake Superior and between 0.5°C and 1.0°C above normal over the western section. Near to below normal air temperatures are generally forecast over the entire lake during the month of December.

At the beginning of December thin lake ice has already developed in Black Bay, western Nipigon Bay as well as in St Mary's River. At that time new lake ice was present along sections of the shore in Thunder Bay. Both Black Bay and Nipigon Bay will be consolidated a week or so before Christmas Day with medium lake ice. Ice will start to develop around the Apostle Islands and in shallow bays along the western shore of Whitefish Bay during the second week of December and near Duluth a week later. Coastal ice will continue to develop in Thunder Bay and spread to cover most of the bay a week or so before Christmas Day. At the end of December Thunder Bay will be covered with thin lake ice except for some medium lake ice in the northeastern end and right along the western shore. St Mary's River will be entirely covered with medium lake ice by New Year's Day. Otherwise at the end of December open water or ice free will prevail except for patchy new lake ice right along sections of the southern shore. Figure 4 indicates the expected ice conditions on January 1st, 2008.

The seasonal temperatures outlook for January and February indicate near to slightly above normal temperature over Lake Superior. Freeze-up will be near normal and overall thicknesses at the end of the season should also be close to normal. Most of Thunder Bay will be consolidated with medium and thick lake ice just before mid-January. The exception will be the south central section where ice will remain mobile and generally thinner. A band of new and thin lake ice will develop along the northern shore east of Grand Marais and along most of the southern shore during the first week of the year. At the end of January a 5 to 10 mile wide band of thin lake ice will be present along the northern shore east of Grand Marais and along the southern shore east of the Keweenaw Peninsula. Along the southern shore west of the Keweenaw Peninsula a 8 to 15 mile band of mostly medium lake ice will be present. St Mary's River will be consolidated with thick lake ice by the end of the first week of January and ice around the Apostle Islands will thicken to thick lake ice and be consolidated by mid-month. Thin lake ice will rapidly spread over Whitefish Bay especially during the second week of January. At month's end medium ice with some thick lake ice will be predominant in the bay. A 5 mile wide band of thin lake ice will develop during the second half of the month along the eastern shore south of Michipicoten Bay. The expected ice cover for February 1st is illustrated in figure 6.

During the first half of February a 10 mile wide band of medium and thin lake ice will develop along the northern shore between Duluth and Grand Marais. The band of ice along the eastern shore south of Michipicoten Bay will thicken to medium with some thick lake ice and extent to about 20 to 25 miles offshore at the end of February. At that time a 10 to 20 mile wide band of medium and thick ice will be present along the southern shore and in the approaches to Whitefish Bay. A 20 mile wide band of mostly thin lake ice will lie along the northern shore east of Grand Marais except for thicker ice north of Isle Royale. At month's end consolidated thick lake ice will be predominant in both Thunder Bay and whitefish Bay. The east central section of the lake at the end of February will be mainly open water while the west central

section will generally report loose medium and thin lake ice. At that time ice will have reached its maximum extent. The expected ice cover for March 1st is illustrated in figure 8.

Spring temperatures are forecast to be near to slightly above normal. Little decrease in the ice extent will occur during the first week of March. After, ice will retreat at a somewhat faster pace than normal.

Lake Michigan

Water temperatures over Lake Michigan were near normal near the end of November. December's air temperatures for Lake Michigan will be near normal.

At the beginning of December, new lake ice has already developed in little and Big Bay de Noc as well as along the southern shore of Green Bay. At the end of December Little and Big Bay de Noc as well as the southern third of Green Bay will be covered with thin and medium lake ice. At that time patchy new lake ice will be present in the rest of Green Bay.. Elsewhere at the end of the year in Lake Michigan ice free will prevail except open water near the shore and ice edges. The expected ice cover for January 1st is illustrated in Figure 4.

The seasonal forecast indicates near to above normal temperatures for January and February. However periods of below normal temperatures will occasionally occur. Thin lake ice will develop in the northeast end of the lake near the Straits of Mackinac and will gradually spread southwestward to reach Beaver Island by mid-January. Little westward expansion is expected during the second half of January but ice there will thicken to reach the medium lake ice stage by month's end. At that time the entrance to the Straits of Mackinac will become consolidated. Ice in Little and Big Bays de Noc and in southern Green Bay will become consolidated during the second week in January with thick lake ice. At the end of January most of Green Bay will be consolidated with thick lake ice. The exception is the entrance to the bay where the ice will remain mobile and generally thinner. New lake ice will occasionally form along the shores but most of it will melt rapidly as it moves towards the central section of the lake. At the end of January the remainder of the lake will be open water to ice free. The expected ice cover for February 1st is illustrated in Figure 6.

Little change is expected during the first three weeks of February except for a westward expansion of the consolidated thick lake ice near the Straits of Mackinac. A slow retreat of the ice is expected during the last week of February. A 5 to 10 mile wide band of thin lake ice could form along parts of the shore of Lake Michigan but most of it will melt before the end of the month. At the end of February the central portion of the lake will report ice free with open water prevailing along the shore and ice edges. The expected ice cover for March 1st is illustrated in.

With generally near to above normal temperatures forecast for the month of March clearing will occur a little faster than normal.

Lake Huron and Georgian Bay

Water temperatures near the end of November were generally 0.5°C to 1.0°C above normal over the entire lake. Air temperatures will be below normal for the first half of December increasing to near normal for the rest of the month.

New lake ice has already started to develop along the shore in Saginaw Bay, and along the northeastern shore of Georgian Bay. Ice will develop in shallow bays in the North Channel during the second week of December. By the end of the month Saginaw Bay will be covered with thin lake ice while medium lake ice prevails within 2 to 5 miles from the northeast shore of Georgian Bay and along the northern shore of the North Channel. The expected ice cover for January 1st is illustrated in Figure 5.

The seasonal outlook for January and February indicates near to above normal temperatures for the southern section of the lake and near to below normal for the northern section. The North Channel and Saginaw Bay will be completely ice covered during the first week of the year and will become consolidated with thick lake ice by mid-January. Ice will develop in the northwestern end of the lake near the Straits of Mackinac during the first week of January and thicken to thin and medium lake ice by mid-month. At that time a 5 to 10 mile wide band of thin and medium lake ice will be present along the eastern and northern shores of Georgian Bay. During the second week of January a 2 to 5 mile wide band of new and thin ice will develop along most of the shore of Lake Huron. During the second half of the month ice will further develop in Georgian Bay and at the end of January the northeastern half of the bay will be covered by thin and medium lake ice. At that time open water will prevail in the southwestern half of the bay with the exception of a narrow band of new and thin ice right along the shore. The band of ice along the shore of the lake will expand somewhat and thin lake ice will be predominant inside it except for medium lake ice along the southeastern shore. The expected ice cover for February 1st is illustrated in 7.

The northwestern end of the lake, from Bois Blanc Island westward to the Straits of Mackinac, will become consolidated with thick lake ice early in February. Further east to about 15 miles east of Bois Blanc Island thin and medium lake will predominate throughout February. Ice will slowly continue to expand in Georgian Bay and at the end of February medium and thick lake ice will completely cover the bay except for looser ice prevailing along the southwestern shore. Little change regarding the band of ice along the shore of the lake is expected except for areas of thick lake ice developing along the southeastern shore. Episodes of strong onshore winds could at times develop moderate to strong ice pressure along the southeastern shore. At the end of February the central portion of the lake will be open water or ice free. The expected ice cover for March 1st is illustrated in 9.

With generally near to above normal temperatures during the month of March, Lake Huron will clear a few days early.

Lake Erie and Lake St Clair

The water temperatures over Lake Erie, near the end of November, were close to normal. Below normal air temperatures are forecast for the first half of December increasing to near to slightly above for the last two weeks of the year.

During the first half of December, new ice will occasionally form along the shore of Lake St Clair and the western Basin but will get destroyed rapidly in strong wind events. Otherwise generally open water to ice free conditions will prevail over Lake St Clair and Lake at mid-month. Patches of new lake ice will form during the third week of December

along the coastal areas of Lake St Clair and the Western Basin. Ice will develop more rapidly in the latter part of December and at month's end Lake St Clair will be covered with thin lake ice. At that time loose areas of new and thin lake ice will prevail in the Western Basin. The remainder of Lake Erie will be open water or ice free. The expected ice cover for January 1st is illustrated in Figure 5.

The temperatures over Lake Erie for January and February are expected to be near to slightly above normal. Ice will continue to develop and at mid-January medium lake ice will be predominant in Lake St Clair and in the Western Basin. New and thin lake ice will begin to form just east of the Western Basin, in Long Point Bay and along most of the northern shore during the second week of the month and at mid-month a 5 to 10 mile wide band of new and thin lake ice will be present along the northern shore. At that time the portion of the lake west of Cleveland will be covered with mainly thin lake ice while the rest of the lake remains mainly open water. During the second half of January the band of ice along the northern shore will expand southward and medium lake ice will develop at the eastern end of the lake near Buffalo. At the end of the month, Lake St Clair and portions of the Western Basin will be consolidated with medium and thick lake ice. At that time open water will prevail over the southern section of the lake east of Cleveland except for a narrow band of new and thin lake ice along the southern shore. The area in the eastern end of the lake near Buffalo will become consolidated with thick lake ice late in January. The expected ice cover for February 1st is illustrated in Figure 7.

Ice in Lake St Clair and in the Western Basin will thicken to thick lake ice during the first and second week of February, respectively. Ice will further expand and by the end of the first week in February, most of Lake Erie will be covered with medium and thick lake ice except for thinner ice along the northern shore west of Long Point Bay. Occasional storms could cause ice destruction, lead developments as well as coastal pressure. Signs of break-up will appear during the last week of the month.

With generally near to above normal temperatures for March, ice melt will be somewhat faster than normal. The expected ice cover for March 1st is illustrated in Figure 9.

Lake Ontario

Water temperatures were generally 0.5°C to 1.0°C above normal over the entire lake near the end of November. Air temperatures over Lake Ontario will be below normal during the first half of the month but near to slightly above during the second half.

During the first half of December, ice free conditions will prevail over the entire area. New lake ice will start to form in Bay of Quinte during the third week of December and thicken to thin lake ice and become consolidated just before the end of the year. At that time ice free will predominate in Lake Ontario except for open water along the northeastern shore. The expected ice cover for January 1st is illustrated in 5.

Near to above normal temperatures are generally expected for January and February. During the first and second weeks of January ice will spread from the entrance to the St Lawrence River along the northeastern shore of the lake. At mid-January a 3 to 6 mile wide band of thin lake ice will be present from Prince Edward Point eastward to Stony Island. At that

time the entrance to the St Lawrence River will become consolidated with thin and medium lake ice. Little change will occur during the second half of the month with the exception of narrow bands of new and thin ice developing along the shore near month's end. Otherwise at the end of January Lake Ontario will be open water except ice free in the central section. The expected ice cover for February 1st is illustrated in Figure 7.

The band of thin and medium lake ice along the northeastern shore of the lake will expand to about 10 to 15 miles offshore during the first half of February. Little change is expected in the northeastern section of the lake during the second half of the month except for thick lake ice developing along the northeastern shore. Patchy new and thin lake ice areas will be present along the shore most of the month. Ice in Bay of Quinte will reach the thick lake ice stage by mid-February. Otherwise Lake Ontario will be mainly open water. The expected ice cover for March 1st is illustrated in Figure 9.

With generally near to above normal temperatures during the month of March, break-up will be somewhat faster than normal during the spring.

Appendix

Appendix A - Stages of Development of Lake Ice

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

<http://ice-glaces.ec.gc.ca/App/WsvPageDsp.cfm?ID=11040&LnId=78&Lang=eng>

or the one at the National Ice Center web site:

http://www.natice.noaa.gov/egg_code/index.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/mcts-sctm/ramn/docs/index_e.htm

Appendix C - WMO (World Meteorological Organization) Colour Code

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

<http://ice-glaces.ec.gc.ca/App/WsvPageDsp.cfm?ID=11500&LnId=19&Lang=eng>

<http://www.natice.noaa.gov/sigrid/index.htm>

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 Atmospheric Environment Service (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.

Twice-a-week Ice Analysis Charts and Regional Ice Chart covering a larger area are issued by the North American Ice Service. The Great Lakes Ice Analysis 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://ice-glaces.ec.gc.ca>) and the National Ice Center website (<http://www.natice.noaa.gov/products/gl-ches/index.htm>). The seasonal outlook is issued once yearly then updated twice monthly by 30-day forecasts.

For further information concerning these services please contact

North American Ice Service

Canadian Ice Service by phone (613) 996-1550, facsimile (613) 947-9160 or e-mail at:
cis-scq.client@ec.gc.ca.

Or

National Ice Center by phone (301) 394-3100, facsimile (301) 394-3200 or e-mail at:
liaison@natice.noaa.gov