

**NATIONAL WEATHER SERVICE INSTRUCTION 10-330**

**January 3, 2018**

**Operations and Services  
Marine and Coastal Weather Services, NWSPD 10-3**

**OCEAN AND GREAT LAKES ICE SERVICES**

**NOTICE:** This publication is available at: <http://www.nws.noaa.gov/directives/>

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**Certified by:** W/AFS26 (A. Allen)

**Type of Issuance:** Routine

**SUMMARY OF REVISIONS:** This directive supersedes NWSI 10-330, *Ocean and Great Lakes Ice Services*, dated October 28, 2014. Changes made to reflect the NWS Headquarters reorganization effective April 1, 2015. Additional changes include the following:

1. Changes made to update Alaska Sea Ice operations in Alaska.
2. Replaced the term 'customer' with 'user' in Sections 2, 3.1.1, 3.2.1, 3.3.1.1, 3.3.2.1, 3.3.3.1 and Appendix A, 1.2 Example.
3. Added “The NWS Ocean Prediction Center (OPC) will use the NIC generated sea ice data on all appropriate products and services.” in Section 3.3 to allow for the National Ice Center (NIC) transfer from NESDIS to the NWS.
4. Added, “and the National Ice Center (NIC)” in Section 6.1 to allow for the NIC transfer from NESDIS to the NWS.

Signed \_\_\_\_\_

12/20/2017

Andrew D. Stern

Date

Director

Analyze, Forecast and Support Office

**Ocean and Great Lakes Ice Services**

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## **1 Introduction**

This instruction describes the National Weather Service (NWS) Alaska Sea Ice Program (ASIP) and Great Lakes Ice Services.

## **2 NWS Alaska Sea Ice Program Services**

Sea ice analysis, forecast, and advisory products are produced routinely throughout the year by the NWS ASIP based out of the Anchorage Weather Forecast Office (WFO) for the sea waters surrounding Alaska. Lake ice, river ice, and icebergs, or glacier ice detached from glaciers and floating in seawater, are excluded.

These ASIP products are utilized by many entities around the state of Alaska and nationally for the safety of navigation and community strategic planning. The list of users include academia and research institutions, local and state federal agencies, resupply barges, coastal subsistence hunters, gold dredgers, fisheries, and the general public.

## **3 NWS Alaska Sea Ice Program Products**

**3.1 Sea Ice Advisory.** A five day Sea Ice Advisory text product will be issued three times a week on Mondays, Wednesdays, and Fridays.

**3.1.1 Mission Connection.** The Sea Ice Advisory is an alphanumeric product that provides a description of the current sea ice conditions and a forecast of changes to the pack ice, marginal ice zone, shorefast ice extent and sea ice free waters surrounding Alaska for the five day time period. The Sea Ice Advisory is critical for decision support to users and partners planning safe navigation through waters routinely impacted by sea ice movement. This product is intended to provide information to assist in the protection of life and property and enhance the nation's economy.

**3.2 Sea Ice Outlook.** The Sea Ice Outlook is a text product issued on the fourth Thursday of every month and covers the three month time frame following the issue date. For instance the January Sea Ice Outlook will include sea ice outlook information for the timeframe through the end of April.

**3.2.1 Mission Connection.** The objective of the outlook is to provide a three month sea ice outlook based on climate patterns and trends, current upper ocean and sea ice conditions, and historical sea ice conditions. This provides data for long-range decision support services for a diverse user base including commercial, government, and private users.

**3.3 Graphic Products.** Daily issued graphic analysis products include the Sea Ice Concentration Analysis for the full ASIP domain, the Sea Ice Stage Analysis for the full ASIP domain, the Sea Ice Concentration Analysis for Cook Inlet, the Sea Ice Stage Analysis for Cook Inlet, and the Sea Surface Temperature Analysis for the full ASIP domain. All color sea ice analysis maps are issued in WMO standard color format meeting international standards. The Five Day Sea Ice Forecast will be issued Monday, Wednesday and Friday.

Graphic products will be consistent with the concurrent Sea Ice Advisory text product. In addition, the NWS and the National Ice Center (NIC) should confer on difficult sea ice analyses and forecasts. The NWS Ocean Prediction Center (OPC) will use the NIC-generated sea ice data

on all appropriate products and services. Products are made available via various means of dissemination such as: the Internet, File Transfer Protocol (ftp) E-Mail, and Marine Radio Facsimile Broadcast.

**3.3.1 Ice Analysis.** A graphical analysis of the sea ice concentration and sea ice stage over the waters surrounding Alaska including Cook Inlet, the Bering Sea, the Chukchi Sea, and the Beaufort Sea. The domain of the analysis has a western boundary of 175E and the US Exclusive Economic Zone (EEZ) near the Western Aleutian Islands, a northern boundary of 80N, an eastern boundary of 135W, and a southern boundary of 50N. These graphics are produced daily in WMO standard color versions and also in greyscale for marinefax.

**3.3.1.1 Mission Connection.** The Ice Analysis graphical products depict sea ice concentrations, and thickness. These Ice Analysis maps are issued daily to assist the diverse user base making decisions and planning activities in the ice-covered waters surrounding Alaska. The information is critical for vessels in planning a safe route through waters routinely impacted by sea ice movement. This product is intended to provide information to assist in the protection of life and property and enhance the nation's economy.

**3.3.1.2 Cook Inlet Ice Analysis.** Detailed graphical analysis, produced daily, of the sea ice concentration and sea ice stage over the waters of the Cook Inlet.

**3.3.2 Sea Surface Temperature Analysis.** The analysis, produced daily, is a graphical depiction of sea surface water temperatures for the areas surrounding Alaska, which includes the latest sea ice coverage.

**3.3.2.1 Mission Connection.** The Sea Surface Temperature Analysis is a graphic depicting sea surface temperature contours for the waters surrounding Alaska. The product is issued daily to provide sea surface temperature information to a diverse user base ranging from fishing vessels to the US Coast Guard operating in the waters around Alaska. It complements the suite of sea ice graphics issued for this region. The Sea Surface Temperature Analysis product is intended to provide information to assist in the protection of life and property and enhance the nation's economy.

**3.3.3 Five Day Sea Ice Forecast.** A graphical five day forecast, produced Monday, Wednesday, and Friday, showing expected changes to the ice pack, the marginal ice zone, the shorefast ice extent, and sea ice free conditions across the waters surrounding Alaska.

**3.3.3.1 Mission Connection.** The Five Day Sea Ice Forecast is a graphic depicting forecast sea ice conditions over the waters surrounding Alaska valid at the day five period. The Five Day Sea Ice Forecast is issued routinely and updated when necessary, as a decision support tool.

#### **4 Marine Weather Statement.**

Ice also forms in various bays and coastal areas of the 48 contiguous states. Marine Weather Statements (MWS') may be used to alert mariners of such conditions in their marine area if, in the forecaster's judgment, they may be hazardous to shipping.

**4.1 Mission Connection.** MWS' provide the public with detailed marine weather information describing non-severe, but potentially hazardous conditions; and to provide information for a variety of conditions not covered by warnings or routine forecasts. WFOs

should issue MWS' if, in the forecaster's judgment, ice conditions are forecast to be hazardous to shipping.

**5 Great Lakes Ice Services.** Great Lakes ice services provide lake ice observations, forecasts, outlooks, and advisories during the months when ice cover on the lakes and their connecting passages impacts shipping; usually between December and April.

## **6 Great Lakes Products**

**6.1 Great Lakes Ice Outlook.** During the ice season, WFO Cleveland will issue a five day ice forecast / advisory product on Monday, Wednesday, and Friday of each week, between 4 and 5 p.m. local time. It will have a detailed ice discussion with a description of the formation, deterioration, coverage and movement of the ice fields, including a general description of the impact expected on shipping, shipping channels and access to ports. The ice outlook also includes a summary of the maximum forecast winds and wind direction for points on each lake for the next 60 hours as well as forecast high and low temperatures for selected port cities for the next five days. Supplemental data will include normal temperatures, accumulated freezing degree days, and observed ice conditions. Links will be provided to correlate graphical forecasts as well as supporting graphics from the Great Lakes Environmental Laboratories and the NIC. All forecast data should be pulled from the National Digital Forecast Database to ensure consistency.

**6.1.1 Mission Connection.** The Great Lakes Ice Outlooks are alphanumeric products that provide analysis, forecast, and climatological information pertaining to ice in the waters of the Great Lakes. They are critical for vessels in planning a safe route through waters routinely impacted by ice movement. These products are intended to provide information to assist in the protection of life and property and enhance the nation's economy.

## **6.2 Freeze-up Outlooks**

**6.2.1 Great Lakes Freeze-Up Outlook.** For Lakes above Lake Ontario, WFO Cleveland will issue a freeze-up outlook during the first and third week of each month from November through December depending on existing ice conditions. It will indicate whether ice conditions are expected to occur earlier, later, or about the normal times over the Lakes, and should be consistent with the 30 and 90 day outlooks of the NIC. The Outlook should include supporting data, such as selected water temperatures from water intakes and from National Oceanic and Atmospheric Administration (NOAA) data buoys.

**6.2.2 Outlook for Freeze-up on the St. Lawrence River.** WFO Buffalo will issue an outlook for freeze-up on the St. Lawrence River at Massena, NY, during the first and third week of each month from November through December depending on existing ice conditions. It may be issued at other times if, in the forecaster's judgment, conditions significantly differ from the current outlook. The outlook should be consistent with 30 and 90 day outlooks of the NIC. Other ice products are normally not needed for Lake Ontario and the St. Lawrence River because the Welland Canal and the river usually close in December.

**6.3 Great Lakes Break-up Outlook for the Opening of Navigation.** WFO Cleveland will issue this outlook once in the spring on or before March 15. A summary of current ice

thicknesses and a listing of dates when shipping is expected to be able to navigate an area without icebreaker assistance across all the Lakes should be included.

**6.4 Ice Advisories.** Forecasters will use the headline “Ice Advisory” in the ice forecast when, in their judgment, conditions are expected that could cause changes adversely affecting ships already underway or trapping ships that are not yet underway. MWS’ may be issued by each Great Lakes forecast office including the headline “Ice Advisory in effect...” to relay information in support of the ice advisory. Guidelines for the Ice Advisory headlines are:

- a. Sustained winds of 25 knots (KT) or greater for a minimum of 12 hours. (These conditions are a concern because of the strong ice pressures that they generate).
- b. The likelihood of rapid ice drifts closing active shipping areas. Rapid ice drift is defined as a drift speed of greater than 10 nautical miles (nm) per day for freely moving ice.
- c. A drop in temperatures which will result in rapid ice growth.

**6.4.1 Mission Connection.** The Ice Advisory is an alphanumeric product that provides current and forecast information pertaining to ice in the waters of the Great Lakes. The Ice Advisory is critical for vessels in planning a safe route through waters routinely impacted by lake ice movement. This product is intended to provide information to assist in the protection of life and property and enhance the nation’s economy.

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## 1 Examples of NWS Alaska Sea Ice Program Products

### 1.1 Example of Alaska Sea Ice Program Sea Ice Advisory

FZAK80 PAFC 032141  
ICEAFC

SEA ICE ADVISORY FOR WESTERN AND ARCTIC ALASKAN COASTAL WATERS  
NATIONAL WEATHER SERVICE ANCHORAGE ALASKA  
145 PM AKDT WEDNESDAY 03 AUGUST 2016

FORECAST VALID...MONDAY 8 AUGUST 2016

ANALYSIS CONFIDENCE...MODERATE

SYNOPSIS...HIGH PRESSURE OVER THE CHUKCHI AND BEAUFORT SEAS WILL  
SLOWLY MOVE EASTWARD THROUGH MONDAY.

-ARCTIC OCEAN-  
-BEAUFORT SEA-  
-CHUKCHI SEA-  
PKZ510-EASTERN US ARCTIC OFFSHORE-  
PKZ505-CENTRAL US ARCTIC OFFSHORE-  
PKZ245-FLAXMAN ISLAND TO DEMARCATION POINT-  
PKZ240-CAPE HALKETT TO FLAXMAN ISLAND-  
PKZ235-POINT FRANKLIN TO CAPE HALKETT-  
PKZ500-WESTERN US ARCTIC OFFSHORE-  
PKZ230-CAPE BEAUFORT TO POINT FRANKLIN-

ICE COVERED.

-BEAUFORT SEA-  
-CHUKCHI SEA-  
PKZ225-CAPE THOMPSON TO CAPE BEAUFORT-

THE MAIN ICE EDGE EXTENDS FROM NEAR POINT FRANKLIN TO 71N 164.9W TO  
71.8N 166W TO 70.7N 173W TO 67.7N 172.4W TO THE RUSSIAN COAST NEAR  
67.4N 174.7W. THE ICE EDGE IS MAINLY OPEN WATER.

FORECAST THROUGH MONDAY FOR THE BEAUFORT SEA...LIGHT AND VARIABLE  
WINDS WILL BECOME SOUTHERLY TO EASTERLY FRIDAY THROUGH  
SUNDAY...THEN  
BECOME LIGHT AND VARIABLE AGAIN ON MONDAY. IN THE NAVIGATIONAL  
WATERS JUST BEYOND THE BARRIER ISLANDS...AS WINDS BECOME EASTERLY TO  
SOUTHEASTERLY TOWARDS THE END OF THE WEEK THE BRASH SEA ICE WILL  
SLOWLY SHIFT BACK TO THE WEST NORTHWEST. IT IS LIKELY THAT THROUGH  
THIS TIME FRAME SEA ICE CONCENTRATIONS WITHIN 15 NM OF THE BARRIER

ISLANDS WILL CLEAR TO OPEN WATER OR 1 TO 3 TENTHS SEA ICE COVER TEMPORARILY.

FORECAST THROUGH MONDAY FOR THE CHUKCHI SEA...LIGHT AND VARIABLE WINDS WILL BECOME EASTERLY TO SOUTHEASTERLY LATE THURSDAY AND PERSIST THROUGH SATURDAY. A NARROW BAND OF HIGH CONCENTRATION BRASH

SEA ICE HAS GROUNDED IN THE SHALLOWS NEAR THE BARROW COASTLINE AND WILL LIKELY LOFT AND SHIFT BACK OUT TO SEA AS OFFSHORE WINDS INCREASE TOWARD THE END OF THE WEEK. SEA ICE IN THE NAVIGATIONAL WATERS OFFSHORE AND NEAR BARROW WILL START TO SHIFT FURTHER OFFSHORE

AS WINDS BECOME EASTERLY LATE THURSDAY...LEAVING BEHIND LOW CONCENTRATIONS OF SEA ICE DRIFTING WITH THE COASTAL CURRENT. THE MAIN SEA ICE PACK IS EXPECTED TO CONTINUE SLOWLY RETREATING THROUGH MONDAY.

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## 1.2 Example of Alaska Sea Ice Program Sea Ice Outlook

FZAK30 PAFC 262032

ICOAFC

SEA ICE OUTLOOK FOR WESTERN AND ARCTIC ALASKAN COASTAL WATERS  
NATIONAL WEATHER SERVICE ANCHORAGE ALASKA

1230 PM AKDT TUESDAY 26 JULY 2016

...JULY 2016 MONTHLY SEA ICE OUTLOOK...

FORECAST CONFIDENCE IS MODERATE. THIS TIME OF YEAR...THERE ARE MANY CHANGES WHICH CAN OCCUR IN A VERY SHORT PERIOD OF TIME REGARDING THE EVOLUTION OF SEA ICE BREAKUP IN BOTH THE BEAUFORT SEA AND CHUKCHI SEA.

SHOULD A CHANGE IN PERSISTENT WEATHER PATTERN OCCUR...TIMING OF BREAKUP EVENT EVOLUTION MAY SHIFT BY SEVERAL WEEKS.

WE ADVISE OUR USERS TO SEEK OUT THE LATEST DAILY SEA ICE ANALYSIS...5 DAY SEA ICE FORECAST...AND SEA ICE ADVISORY PRODUCTS AND TOOLS ON THE NWS ALASKA SEA ICE PROGRAM WEBPAGE TO FIND THE MOST CURRENT SEA ICE INFORMATION.

...OUTLOOK FOR THE CHUKCHI SEA...

GENERALLY SPEAKING...THE ALASKA COASTAL CURRENT CONTINUES TO MAKE ITS WAY INTO THE CHUKCHI SEA BASIN...AIDING IN THE BREAKUP THROUGH THE CENTRAL CHANNEL...AND ALASKA COASTAL REGION OF THE CHUKCHI SEA.

FOR COASTAL WATERS UP TO 20 NM OFFSHORE FROM ICY CAPE TO POINT BARROW...WE EXPECT BREAKUP THROUGH THIS COASTAL REGION TO PROGRESS SLOWLY THROUGH MID AUGUST. ANY TIME WE HAVE PERSISTENT SOUTHERLY WIND FLOW THE NARROW COASTAL REGION MAY TEMPORARILY CLEAR TO ONLY LOW CONCENTRATIONS OF SEA ICE...HOWEVER ANY TIME WE HAVE NORTHERLY OR ONSHORE WIND FLOW THE COASTAL REGION MAY TEMPORARILY CLOSE IN WITH HIGH CONCENTRATIONS OF SEA ICE. CONFIDENCE IS MODERATE AT THIS TIME THAT THE COASTAL REGION WILL CLEAR TEMPORARILY TO LESS THAN 3 TENTHS SEA ICE BY THE END OF JULY...AND REMAIN OPEN FOR THE SEASON BY THE THIRD WEEK IN AUGUST.

FOR THE OFFSHORE REGION FROM ICY CAPE TO BARROW ON WEST TO 170W... WE EXPECT BREAKUP THROUGH THIS OFFSHORE REGION TO PROGRESS SLOWLY THROUGH THE FIRST HALF OF AUGUST WITH THE SLOWEST MELT TAKING PLACE OVER THE HANNA SHOAL REGION. THE REGION IS EXPECTED TO HAVE ONLY ISOLATED REGIONS OF SEA ICE REMAINING BY LATE AUGUST...AND REMAIN OPEN FOR THE SEASON BY THE FIRST WEEK IN SEPTEMBER.

FOR THE OFFSHORE REGION FROM BARROW TO 75N AND 170W...THIS OFFSHORE REGION WILL CONTINUE TO BREAKUP THROUGH MID SEPTEMBER WITH HIGHER ICE CONCENTRATIONS REMAINING BETWEEN 72N AND 74N WHILE SEA ICE CONCENTRATIONS MAY DECREASE MORE RAPIDLY NORTH OF 74N DURING THIS TIME FRAME. NEW SEA ICE WILL START TO FORM WITHIN THE PACK ICE

AROUND THE THIRD WEEK IN SEPTEMBER AND CONTINUE TO FILL IN THROUGH EARLY OCTOBER.

...OUTLOOK FOR THE BEAUFORT SEA...

GENERALLY SPEAKING...BREAKUP IS WELL UNDERWAY IN THE BEAUFORT SEA ALREADY THIS SUMMER MELT SEASON. AT THIS TIME VERY LARGE ICE FLOES CONSISTING OF FIRST YEAR AND MULTIYEAR ICE ARE DRIFTING RAPIDLY...OWING TO WIND FORCING AND LOCAL OCEAN CURRENTS.

FOR COASTAL WATERS UP TO 20 NM OFFSHORE FROM POINT BARROW TO CAPE HALKETT...AS OF 26 JULY...REMNANT COASTAL ICE HAS BROKEN OFF AND IS DRIFTING NEAR THE COASTLINE AND HIGH CONCENTRATIONS OF FIRST YEAR SEA ICE AS WELL AS ISOLATED MULTIYEAR SEA ICE FLOES REMAIN. WE EXPECT BREAKUP THROUGH THIS COASTAL REGION TO PROGRESS SLOWLY THROUGH MID AUGUST. ANY TIME WE HAVE PERSISTENT SOUTHERLY OR EASTERLY WIND FLOW THE NARROW COASTAL REGION MAY TEMPORARILY CLEAR TO ONLY LOW CONCENTRATIONS OF SEA ICE...HOWEVER ANY TIME WE HAVE NORTHERLY OR WESTERLY WIND FLOW THE COASTAL REGION MAY TEMPORARILY CLOSE IN WITH HIGH CONCENTRATIONS OF SEA ICE. CONFIDENCE IS MODERATE AT THIS TIME THAT THE COASTAL REGION WILL CLEAR TEMPORARILY TO LESS THAN 3 TENTHS SEA ICE BY THE FIRST WEEK IN AUGUST...AND REMAIN OPEN FOR THE SEASON BY THE THIRD WEEK IN AUGUST.

FOR COASTAL WATERS UP TO 20 NM OFFSHORE FROM CAPE HALKETT TO FLAXMAN ISLAND...AS OF 26 JULY...REMNANT COASTAL ICE HAS BROKEN OFF AND IS DRIFTING NEAR THE COASTLINE. JUST BEYOND THE REMNANT COASTAL ICE LIES A REGION OF DETERIORATING FIRST YEAR SEA ICE THAT IS SHIFTING

WITH THE LOCAL CURRENTS AND WIND FORCING. WE EXPECT THIS COASTAL REGION TO CONTINUE BREAKING UP THROUGH THE FIRST WEEK IN AUGUST. WE EXPECT THIS COASTAL REGION TO HAVE ONLY VERY ISOLATED SECTIONS OF COASTAL ICE AND OFFSHORE BRASH ICE BY THE SECOND WEEK IN AUGUST...AND WE EXPECT THE REGION TO BE OPEN FOR THE SEASON BY LATE

AUGUST.

FOR COASTAL WATERS UP TO 20 NM OFFSHORE FROM FLAXMAN ISLAND TO DEMARCATION POINT...AS OF 26 JULY...ISOLATED SECTIONS OF DETERIORATING PREVIOUSLY SHOREFAST ICE REMAIN DRIFTING JUST BEYOND THE BARRIER ISLANDS. WE EXPECT THIS AREA TO BE OPEN FOR THE SEASON BY THE FIRST WEEK IN AUGUST.

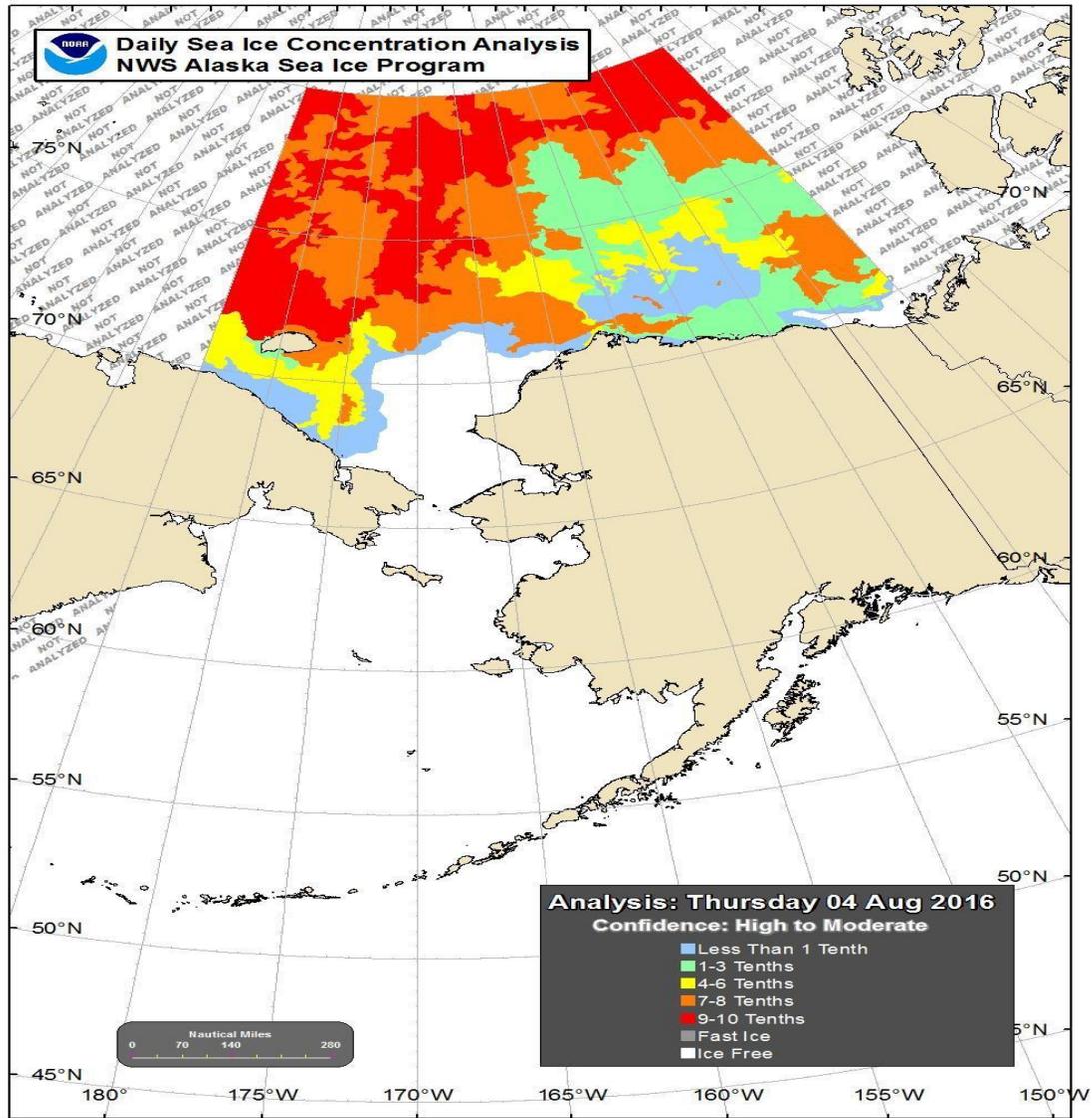
FOR THE OFFSHORE REGION FROM BARROW TO DEMARCATION POINT ON NORTH TO 75N...AS OF 26 JULY...THERE IS A BROAD AREA OF LESS THAN 3 TENTHS SEA ICE BETWEEN ROUGHLY 71N AND 73.5N FROM BARROW TO KAKTOVIK.

ELSEWHERE...THERE ARE HIGH CONCENTRATIONS OF FIRST YEAR SEA ICE AND MULTIYEAR SEA ICE FLOES THAT REMAIN HIGHLY MOBILE THROUGHOUT THE BEAUFORT SEA. WE EXPECT BREAKUP THROUGH THIS OFFSHORE REGION TO CONTINUE THROUGH AUGUST. THIS OFFSHORE REGION IS EXPECTED TO HAVE ONLY ISOLATED REGIONS OF FIRST YEAR AND MULTIYEAR SEA ICE REMAINING BY EARLY SEPTEMBER...AND MAY CLEAR TO OPEN WATER BY LATE SEPTEMBER.

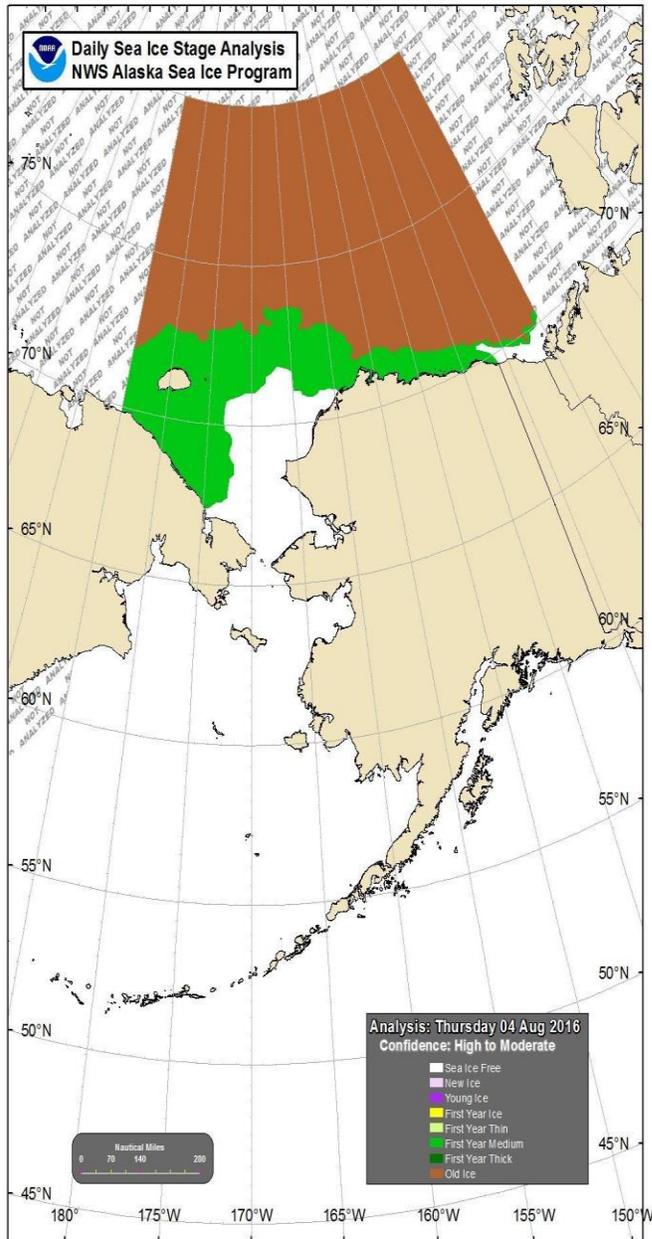
\$\$

### 1.3 Alaska Sea Ice Program Graphic Products

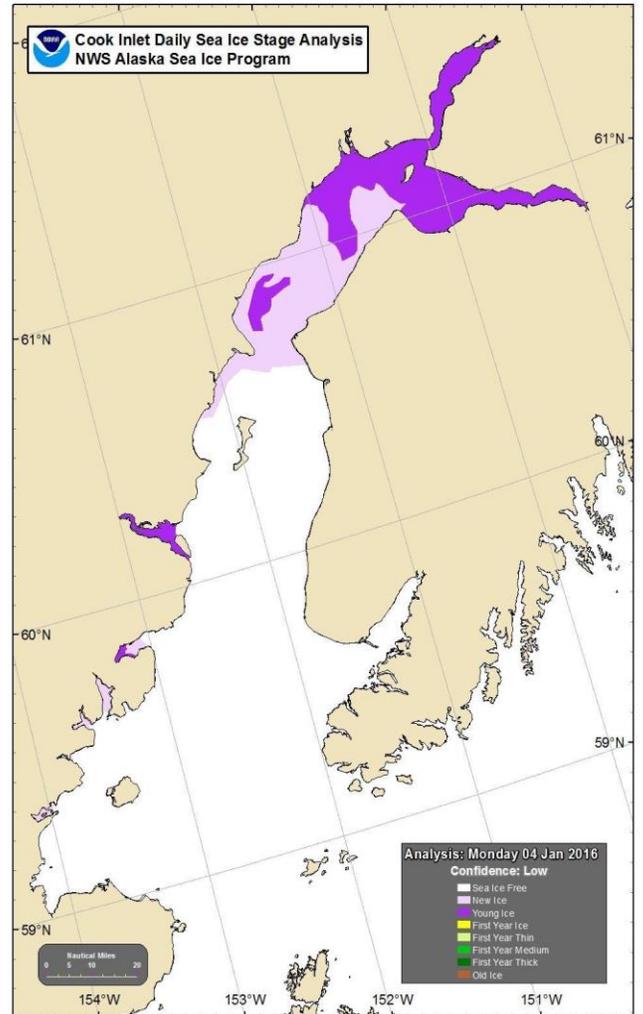
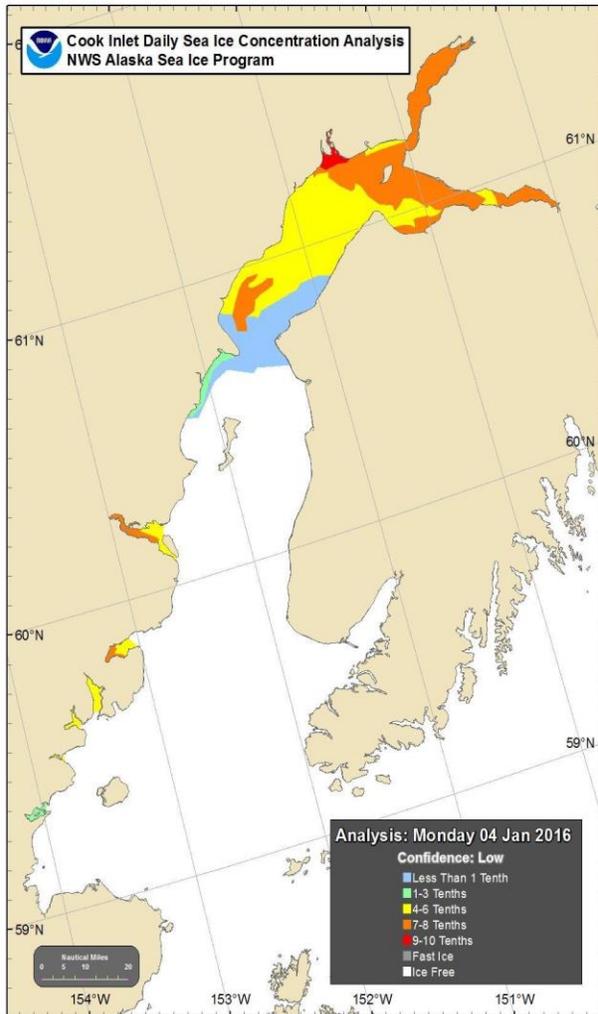
#### 1.3.1 Sea Ice Concentration Analysis



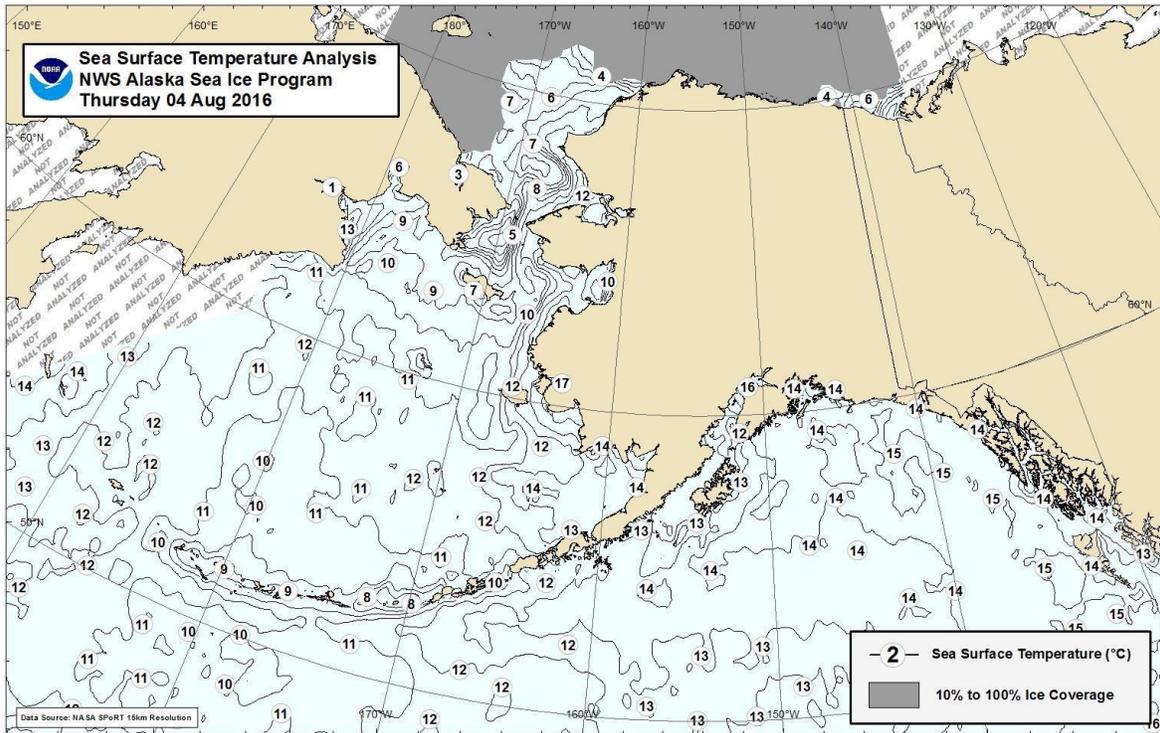
### 1.3.2 Sea Ice Stage Analysis



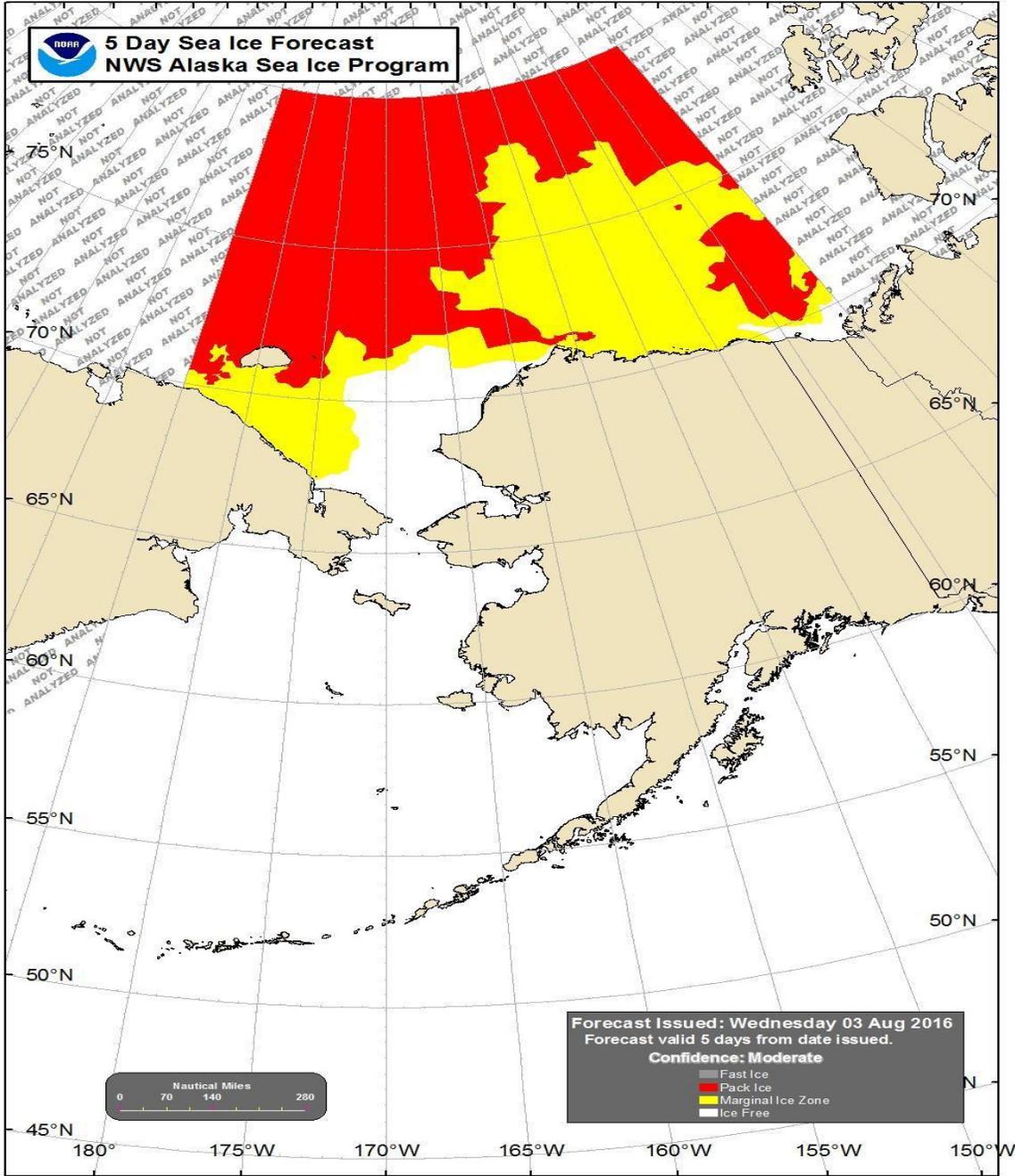
### 1.3.3 Cook Inlet Sea Ice Concentration and Stage Analysis



### 1.3.4 Sea Surface Temperature Analysis



1.3.5 Five Day Sea Ice Forecast



**2 Marine Weather Statement Example**

FZUS73 KDTX 072113

MWSDTX

LHZ421-070300-

MARINE WEATHER STATEMENT

NATIONAL WEATHER SERVICE DETROIT/PONTIAC MI

413 PM EST SUN 7 JAN 2001

...SEA ICE RAPIDLY DEVELOPING IN SAGINAW BAY...

A FRIGID ARCTIC HIGH ARRIVED A DAY EARLIER THAN EXPECTED ACROSS LAKE HURON. TEMPERATURES BELOW ZERO HAVE CAUSED EXTENSIVE ICE GROWTH AROUND BAY CITY ACCORDING TO THE UNITED STATES COAST GUARD HINDERING SHIPPING INTO THAT PORT. SHIPPERS IN THE BAY CITY AREA SHOULD BE ALERT AND CONTACT THE COAST GUARD FOR ASSISTANCE AND INSTRUCTIONS.

THIS STATEMENT WILL BE UPDATED AT 10 PM EST TONIGHT.

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**APPENDIX B – Examples of Great Lakes Products**

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**1 Great Lakes Ice Outlook**

FZUS81 KCLE 282249

ICELIO

GREAT LAKES ICE OUTLOOK

NATIONAL WEATHER SERVICE CLEVELAND OHIO

448 PM EST FRI FEB 28 2014

ACTIVE WATCHES...WARNINGS...AND ADVISORIES ON THE GREAT LAKES CAN BE FOUND AT...[WWW.CRH.NOAA.GOV/GREATLAKES/?C=HAZ&L=GL&P=A](http://WWW.CRH.NOAA.GOV/GREATLAKES/?C=HAZ&L=GL&P=A)

5 DAY ICE DISCUSSION...

MODERATE ICE GROWTH IS EXPECTED TO CONTINUE THROUGH EARLY NEXT WEEK ACROSS ALL OF THE GREAT LAKES AS UNSEASONABLY COLD ARCTIC HIGH PRESSURE REMAINS IN PLACE ACROSS THE NORTHERN STATES. TEMPERATURES WILL AVERAGE 10 TO 30 DEGREES BELOW NORMAL WITH NIGHT TIME LOW TEMPERATURES WELL BELOW ZERO AT TIMES. THE COLDEST AIR WILL BEGIN TO SHIFT EAST OF THE GREAT LAKES BY MID WEEK NEXT WEEK.

LITTLE OPEN WATER WILL EXIST EXCEPT ON LAKE MICHIGAN AND LAKE ONTARIO. ANY NAVIGATION ELSEWHERE WILL REQUIRE ICE BREAKER ASSISTANCE. ANY ICE BREAKING TRACKS WILL EXPERIENCE RAPID REFREEZING.

THE GREAT LAKES ICE ANALYSIS PRODUCTS CAN BE FOUND AT:

[WWW.NATICE.NOAA.GOV/PRODUCTS/GREAT\\_LAKES.HTML](http://WWW.NATICE.NOAA.GOV/PRODUCTS/GREAT_LAKES.HTML)

AND

[WWW.GLERL.NOAA.GOV/DATA/ICE/#CURRENTCONDITIONS](http://WWW.GLERL.NOAA.GOV/DATA/ICE/#CURRENTCONDITIONS)

TEMPERATURE FORECASTS FOR SELECTED CITIES (LOW HIGH EACH DAY):

| LOCATION  | 03/01  | 03/02 | 03/03 | 03/04 | 03/05 | 03/06 |
|-----------|--------|-------|-------|-------|-------|-------|
| DULUTH    | -14 -2 | -26 3 | -22 6 | -9 12 | -2 17 | 7 23  |
| MARQUETTE | 0 6    | -10 7 | -8 8  | -5 13 | 1 19  | 11 25 |
| GREEN BAY | 5 14   | -4 9  | -9 11 | -6 16 | 1 21  | 9 29  |
| MILWAUKEE | 16 21  | 10 17 | 5 16  | 4 19  | 9 23  | 16 30 |
| CHICAGO   | 20 25  | 12 20 | 7 17  | 4 19  | 9 25  | 16 33 |
| MUSKEGON  | 11 25  | 6 14  | 2 13  | -3 17 | 5 21  | 13 31 |
| ALPENA    | 8 18   | -3 11 | -4 9  | -5 15 | 2 18  | 9 28  |
| DETROIT   | 13 32  | 11 17 | 7 16  | 2 20  | 6 23  | 13 29 |
| TOLEDO    | 15 32  | 12 18 | 8 16  | -1 22 | 5 30  | 14 30 |
| CLEVELAND | 16 34  | 15 19 | 11 17 | 4 20  | 8 29  | 18 32 |
| BUFFALO   | 5 36   | 17 18 | 7 15  | 5 15  | 8 24  | 12 28 |

A FULL GRAPHICAL FORECAST OF GREAT LAKES FORECAST TEMPERATURES CAN BE FOUND AT:

[WWW.CRH.NOAA.GOV/GREATLAKES/?C=MAP&L=GL&P=A&M=TE](http://WWW.CRH.NOAA.GOV/GREATLAKES/?C=MAP&L=GL&P=A&M=TE)

MAXIMUM FORECAST WIND AT EACH SITE FOR THE 12 HOUR FCST PERIOD:

| LOCATION       | TONIGHT | SATURDAY | SAT NGT | SUNDAY | SUN NGT |
|----------------|---------|----------|---------|--------|---------|
| WEST SUPERIOR  | 310/10  | 300/10   | 300/10  | 290/10 | 250/16  |
| MID SUPERIOR   | 210/16  | 320/16   | 320/14  | 300/10 | 270/16  |
| EAST SUPERIOR  | 200/18  | 310/18   | 320/18  | 300/10 | 280/14  |
| NORTH MICHIGAN | 200/16  | 330/16   | 320/16  | 360/10 | 320/06  |
| SOUTH MICHIGAN | 180/16  | 320/16   | 330/16  | 010/10 | 070/08  |

|                 |        |        |        |        |        |
|-----------------|--------|--------|--------|--------|--------|
| NORTH HURON     | 160/12 | 300/12 | 310/14 | 310/12 | 310/08 |
| MID HURON       | 160/12 | 170/12 | 290/10 | 340/12 | 340/08 |
| SOUTH HURON     | 140/14 | 180/10 | 230/10 | 360/15 | 340/10 |
| WEST ERIE       | 140/10 | 200/10 | 240/10 | 350/14 | 020/10 |
| EAST ERIE       | 110/06 | 180/06 | 230/12 | 340/12 | 360/06 |
| CENTRAL ONTARIO | 150/16 | 170/16 | 190/14 | 310/20 | 340/10 |

A FULL GRAPHICAL FORECAST OF FORECAST WINDS ON THE GREAT LAKES CAN BE FOUND AT...[WWW.CRH.NOAA.GOV/GREATLAKES/?C=MAP&L=GL&P=A&M=WS](http://WWW.CRH.NOAA.GOV/GREATLAKES/?C=MAP&L=GL&P=A&M=WS).

ICE OBSERVATIONS BASED ON U.S. COAST GUARD REPORTS

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THE COAST GUARD AT DULUTH REPORTED 100 PERCENT COVERAGE WITH A THICKNESS OF 28 INCHES.

THE COAST GUARD CUTTER KATMAI BAY IN THE LOWER SAINT MARYS RIVER REPORTED 90 PERCENT COVERAGE OF ICE FROM PT. AUX FRENES TO SWEETS POINT WITH 18 INCH THICKNESS.

FREEZING DEGREE DAY ACCUMULATIONS AT SELECTED STATIONS COMPARED TO NORMAL CALCULATED ON FRI MAY 23:

| LOCATION      | DATE   | NORMAL | CURRENT |
|---------------|--------|--------|---------|
| DULUTH, MN    | FEB 27 | 1689   | 2467    |
| MARQUETTE, MI | FEB 27 | 1468   | 2178    |
| SAU_S_MAR, MI | FEB 27 | 1183   | 1884    |
| GREENBAY, WI  | FEB 27 | 1136   | 1910    |
| MILWAUKEE, WI | FEB 27 | 616    | 1281    |
| CHICAGO, IL   | FEB 27 | 498    | 1171    |
| MUSKEGON, MI  | FEB 27 | 389    | 877     |
| ALPENA, MI    | FEB 27 | 924    | 1678    |

|               |        |     |      |
|---------------|--------|-----|------|
| DETROIT, MI   | FEB 27 | 383 | 998  |
| TOLEDO, OH    | FEB 27 | 387 | 1027 |
| CLEVELAND, OH | FEB 27 | 194 | 604  |
| BUFFALO, NY   | FEB 27 | 512 | 961  |

NORMAL TEMPS FOR SELECTED LOCATIONS AROUND THE GREAT LAKES FOR FRI  
FEBRUARY 28:

| LOCATION      | HIGH | LOW |
|---------------|------|-----|
| -----         |      |     |
| DULUTH, MN    | 30   | 12  |
| MARQUETTE, MI | 30   | 14  |
| GREENBAY, WI  | 30   | 12  |
| MILWAUKEE, WI | 38   | 23  |
| CHICAGO, IL   | 42   | 25  |
| MUSKEGON, MI  | 38   | 23  |
| ALPENA, MI    | 30   | 12  |
| DETROIT, MI   | 41   | 24  |
| TOLEDO, OH    | 42   | 24  |
| CLEVELAND, OH | 42   | 26  |
| BUFFALO, NY   | 38   | 23  |

NOTE THAT ALL WEB SITES SHOULD BE ENTERED IN YOUR BROWSER LOWER  
CASE.

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**2 St. Lawrence Freeze Update Outlook**

FZUS81 KBUF 172041

ICEFBO

ST. LAWRENCE FREEZE UPDATE OUTLOOK  
NATIONAL WEATHER SERVICE BUFFALO NY  
341 PM EST SAT DEC 17 2011

THE DATE OF THE FIRST FREEZE UP OF THE ST. LAWRENCE RIVER NEAR  
MASSENA NEW YORK IS FORECAST TO BE JANUARY 7TH 2012.

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**3 Great Lakes Freeze Up Outlook**

FZUS81 KCLE 012055 RRA

ICEFBO

GREAT LAKES FREEZE UP OUTLOOK  
NATIONAL WEATHER SERVICE CLEVELAND OH  
400 PM EST WED 1 NOV 2000

FREEZE UP IN THE BAYS AND HARBORS AROUND LAKE SUPERIOR AND  
NORTHERN LAKE MICHIGAN WILL OCCUR A LITTLE EARLIER THAN NORMAL  
THIS YEAR. FREEZE UP AROUND SOUTHERN LAKE MICHIGAN AND  
NORTHERN LAKE HURON WILL OCCUR AROUND THE NORMAL TIMES WHILE  
FREEZE UP AROUND LAKE ERIE AND SOUTHERN LAKE HURON IS EXPECTED  
TO BE LATER THAN NORMAL THIS WINTER.

THE THIRTY DAY OUTLOOK FOR NOVEMBER IS FOR TEMPERATURES TO  
AVERAGE BELOW NORMAL AROUND THE LAKES REGION.

ANNUAL HARBOR WATER TEMPERATURES COMPARED TO PREVIOUS YEARS:

|                  | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 |
|------------------|------|------|------|------|------|------|------|
| DULUTH           | 46   | 42   | 45   | 46   | 48   | 46   | 43   |
| SAULT STE. MARIE | 48   | 48   | 46   | 46   | 50   | 46   | 44   |
| CHICAGO          | 50   | 53   | 54   | 50   | NA   | NA   | NA   |
| MUSKEGON         | 54   | 54   | 56   | 47   | 56   | 52   | 48   |
| ALPENA           | 51   | 49   | 51   | 47   | 49   | 45   | 44   |
| DETROIT          | 54   | 52   | 55   | 50   | 54   | 51   | 46   |
| CLEVELAND        | 61   | 59   | 61   | 55   | 57   | 53   | 52   |
| BUFFALO          | 55   | 57   | 57   | 54   | 55   | 50   | 49   |

ANNUAL WATER TEMPERATURES FOR THE MID LAKE AREAS AS RECEIVED FROM  
NOAA DATA BUOYS COMPARED TO PREVIOUS YEARS:

|               | 2000 | 1999 | 1998 | 1997 | 1996 |
|---------------|------|------|------|------|------|
| LAKE SUPERIOR |      |      |      |      |      |
| WEST          | 44   | 42   | 43   | 45   | 45   |
| NORTH CENTRAL | 43   | 43   | 44   | 44   | 42   |
| EAST          | 43   | 46   | 44   | 45   | 44   |
| LAKE MICHIGAN |      |      |      |      |      |
| NORTH         | 50   | 53   | 54   | 54   | 51   |
| SOUTH         | 55   | 52   | 55   | 54   | 48   |
| LAKE HURON    |      |      |      |      |      |
| NORTH         | 49   | 51   | 50   | 49   | 49   |
| SOUTH         | 52   | 50   | 53   | 50   | 50   |
| LAKE ERIE     |      |      |      |      |      |
| WEST          | 55   | NA   | 60   | 54   | 55   |

GARNET NOV 2000

**4 Great Lakes Break Up Outlook.**

FZUS81 KCLE 052055 RRA

ICEFBO

GREAT LAKES BREAK-UP OUTLOOK

NATIONAL WEATHER SERVICE CLEVELAND OH

400 PM EST MON 5 MAR 2001

THE FOLLOWING ARE THE LATEST ANNUAL ICE THICKNESS REPORTS:

|                   |  |
|-------------------|--|
| DULUTH            | 13 INCHES                              |
| MARQUETTE         | 12 INCHES                              |
| WHITEFISH BAY     | 15 INCHES                              |
| ST. MARYS RIVER   | 14-20 INCHES                           |
| GREEN BAY         |  |
| ESCANABA          | 30 INCHES, REMAINDER OF BAY NO REPORTS |
| STRAITS MACKINAC  | 12 INCHES                              |
| SAGINAW BAY       | 8 INCHES                               |
| LAKE ST. CLAIR    | 6-8 INCHES                             |
| WESTERN LAKE ERIE | 6-10 INCHES                            |
| BUFFALO           | 20 INCHES                              |

FOLLOWING ARE EXPECTED DATES WHEN ICE CONDITIONS BECOME SUCH THAT  
HIGH POWERED VESSELS CAN TRANSIT WITHOUT ICEBREAKERS:

|                 |          |
|-----------------|----------|
| DULUTH          | APRIL 20 |
| MARQUETTE       | APRIL 12 |
| WHITEFISH BAY   | APRIL 16 |
| ST. MARYS RIVER | APRIL 13 |
| GREEN BAY       |          |
| ESCANABA        | APRIL 7  |

|                     |          |
|---------------------|----------|
| REMAINDER OF BAY    | APRIL 10 |
| STRAITS OF MACKINAC | APRIL 8  |
| GRAND TRAVERSE BAY  | MARCH 20 |
| SAGINAW BAY         | MARCH 31 |
| SOUTHERN LAKE HURON | MARCH 25 |
| LAKE ST. CLAIR      | MARCH 28 |
| WESTERN LAKE ERIE   | MARCH 31 |
| BUFFALO             | APRIL 22 |

BROWN MAR 2001

**5 Great Lakes Ice Advisory.** The Ice Advisory headline is included in the Ice Outlook at the beginning of the 5 Day Ice Discussion.

FZUS81 KCLE 282249

ICELIO

GREAT LAKES ICE OUTLOOK

NATIONAL WEATHER SERVICE CLEVELAND OHIO

445 PM EST FRI DEC 21 2013

ACTIVE WATCHES...WARNINGS...AND ADVISORIES ON THE GREAT LAKES CAN BE FOUND AT...[WWW.CRH.NOAA.GOV/GREATLAKES/?C=HAZ&L=GL&P=A](http://WWW.CRH.NOAA.GOV/GREATLAKES/?C=HAZ&L=GL&P=A)

5 DAY ICE DISCUSSION...

...AN ICE ADVISORY HAS BEEN ISSUED FOR LAKE SUPERIOR AND NORTHERN LAKE MICHIGAN FOR SATURDAY THROUGH MONDAY...

...AN ICE ADVISORY HAS BEEN ISSUED FOR BAYS AND HARBORS ON SOUTHERN LAKE MICHIGAN... LAKE HURON AND LAKE ERIE FOR SUNDAY AND MONDAY...

ARCTIC AIR WILL SPREAD ACROSS THE GREAT LAKES FROM NORTHWEST TO SOUTHEAST THIS WEEKEND...*remainder of ice outlook*

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