

***NATIONAL WEATHER SERVICE INSTRUCTION 10-312
OCTOBER 18, 2012
Operations and Services
Marine and Coastal Weather Services, NWSPD 10-3***

GREAT LAKES MARINE SERVICES

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OPR: W/OS21 (R. May)

Certified by: W/OS21 (M. Tew)

Type of Issuance: Non Routine.

SUMMARY OF REVISIONS: This directive supersedes NWSI 10-312, Great Lakes Marine Services dated August 29, 2011. This directive includes the following changes:

1. Appendix A, footnote d (precipitation) was enhanced to work out inconsistencies between the W₁ Forecast Weather column, footnote d, and section 3.3.4b.

signed

October 4, 2012

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Director, Office of Climate,
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Date

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Appendix A

NWS MAFOR Code for the Great Lakes A-1

Appendix B

Examples of Great Lakes Marine Products.....B-1

1. Introduction. This procedural instruction provides product specifications for the main alphanumeric Great Lakes weather products issued by the National Weather Service (NWS) Weather Forecast Offices (WFOs).

2. Open Lake Forecast (product category GLF).

2.1 Mission Connection. The Open Lake Forecast is a text product issued by five primary Great Lake WFOs to state expected weather conditions within their marine forecast area of responsibility through Day 5. The primary offices responsible for issuing the GLF are: WFOs Marquette, MI (MQT); Detroit, MI (DTX); Chicago, IL (LOT); Cleveland, OH (CLE); and Buffalo, NY (BUF). The GLF is used by a variety of marine users and partners, and is primarily used as a tool for planning purposes to support and promote safe transportation across the Great Lakes.

2.2 Issuance Guidelines. Forecasters should ensure the values included within the GLF are consistent with the values from the associated gridded forecast elements.

2.2.1 Creation Software. WFOs will produce the GLF using the Advanced Weather Interactive Processing System (AWIPS) software formatters. The Interactive Forecast Preparation System (IFPS) Graphical Forecast Editor (GFE) and the Graphical Hazards Generation (GHG) application formatting tools should be used for generation of product content including headlines.

2.2.2 Issuance Criteria. The GLF will be issued four times a day with updates as necessary.

2.2.3 Issuance Time. The GLF is a routinely-scheduled product. Forecasters should make the GLF available to users no earlier than 1 hour before this scheduled issuance time. The issuance time is expressed in Coordinated Universal Time (UTC), while the mass media header is expressed in local time. WFOs should issue GLFs based on the following:

<u>Time Period</u>	<u>Scheduled Issuance Times (UTC)</u>			
Standard Time	0300	0900	1500	2100
Daylight Savings	0200	0800	1400	2000

In the GLF, include forecast periods as shown below. Forecast periods beyond the current day will be described by the day of the week. For example, a forecast issued Sunday evening will include: TONIGHT, MONDAY, MONDAY NIGHT, TUESDAY, TUESDAY NIGHT, WEDNESDAY, THURSDAY, and FRIDAY.

The 0900/0800 and 1500/1400 scheduled issuance times (UTC) will cover:

Today/This Afternoon (or equivalent)	(Issuance time to 6PM)	1st Period
Tonight	(6PM to 6AM)	2nd Period
(Next Day)	(6AM to 6PM)	3rd Period
(Next Day) Night	(6PM to 6AM)	4th Period
(Day 3)	(6AM to 6AM)	5th Period

(Day 3) Night (Optional)	(6PM to 6AM)	6th Period
(Day 4)	(6AM to 6AM)	Day 4
(Day 5)	(6AM to 6AM)	Day 5

The 2100/2000 and 0300/0200 scheduled issuance times (UTC) will cover:

Tonight/Rest of Tonight (or equivalent)	(Issuance time to 6AM)	1st Period
(Next Day)	(6AM to 6PM)	2nd Period
(Next Day) Night	(6PM to 6AM)	3rd Period
(Day 2)	(6AM to 6PM)	4th Period
(Day 2) Night	(6PM to 6AM)	5th Period
(Day 3)	(6AM to 6AM)	6th Period
(Day 3) Night (Optional)	(6PM to 6AM)	7th Period
(Day 4)	(6AM to 6AM)	Day 4
(Day 5)	(6AM to 6AM)	Day 5

2.2.4 Valid Time. The GLF product is valid from the time of issuance until the expiration time.

2.2.5 Product Expiration Time. The GLF product expiration time is not more than 8 hours from the initial issuance.

2.2.6 Universal Geographic Code (UGC). The GLF product will contain marine-based zone UGC codes.

2.3 Technical Description. The GLF product will follow the format and content described in this section.

2.3.1 Mass News Disseminator (MND) Broadcast Line. None.

2.3.2 MND Header. The GLF MND Header is “OPEN LAKE FORECAST FOR [LAKE SUPERIOR, LAKE MICHIGAN, LAKE HURON, LAKE ERIE, or LAKE ONTARIO]”.

2.3.3 Content. The GLF includes all required forecast parameters and forecast periods in each marine zone, and follows the format in section 2.4.

Forecasters should include applicable National Marine Sanctuaries, as noted in NWSI 10-302, *Marine and Coastal Services Area of Responsibility*, in the appropriate GLF.

Forecasters may combine periods if, based on forecaster discretion, the weather elements in each are consistent. In addition, forecasters may subdivide the first period of any GLF to account for rapid weather changes.

WFO Detroit-Pontiac forecasters will issue the Lake St. Clair Forecast following the format of the GLF. Exceptions: During the period when Nearshore Forecasts (NSHs) are issued, these

forecasts should also include sky conditions and Small Craft Advisories in the Lake St. Clair Forecast.

2.3.4 Synopsis. The synopsis for the GLF should be a concise, understandable description of the significant surface weather features that may cause significant winds and waves over the forecast area during the forecast period. At a minimum, it should identify the strength, trend and movement of each major weather system affecting the area. References to high pressure and low pressure should include a central pressure measurement in inches, to the nearest tenth. The synopsis is broadcast over the marine radio; therefore, it should contain complete and grammatically correct sentences. All synopses will be meteorologically consistent with other products issued by the WFO.

2.3.5 Headlines. Use headlines to describe hazard events likely to have a significant impact on mariners or marine operations. Marine warnings and advisories are only mandated in the first 12-hour forecast period. In most situations, to reduce multiple headlines, the forecaster can leave off the hazards after the upgrade and headline the most severe hazard only. However forecasters should use multiple headlines for events at the same significance level but different discrete criteria (e.g. Gale Warning and Heavy Freezing Spray Warning).

Refer to NWSI 10-303, *Marine and Coastal Services Standards and Guidelines* for definitions of Gale, Storm, Hurricane Force Wind, or Heavy Freezing Spray Warnings and Watches, and all advisories that may be included within the GLF.

a. Watch and Warning Headlines.

In the GLF, the following headlines for watches and warnings will be included if appropriate criteria are occurring or forecast to occur:

- Hurricane Force Wind Warning
- Storm Warning
- Gale Warning
- Heavy Freezing Spray Warning
- Tornado Watch
- Severe Thunderstorm Watch
- Gale Watch
- Storm Watch
- Hurricane Force Wind Watch
- Heavy Freezing Spray Watch

Gale Warnings/Storm Warnings/ Hurricane Force Wind Warnings/ Heavy Freezing Spray Warnings. WFOs with marine responsibility for the Great Lakes will issue warnings when criteria are met for the first period, and may issue warnings for the second and/or third period when forecaster confidence is high. Warnings that begin in the first, second or third period may extend beyond the third period.

In situations where sustained winds are below advisory/warning thresholds but wind gusts above these thresholds, forecasters should use their own discretion in issuing advisories or warnings as appropriate. Winds will be considered gusty when gusts are regularly observed over a time period of more than two hours.

Gale Watches/Storm Watches/ Hurricane Force Wind Watches/ Heavy Freezing Spray Watches. WFOs should issue Watches for the second, third, or occasionally fourth periods, when there is a 50 percent or greater chance of a hazardous marine weather event meeting or exceeding warning criteria.

b. Advisory Headlines.

Headlines for advisories within the GLF may be included when conditions over the Open Lakes are occurring or forecast where vessels will be impacted by ashfall or low water, or *reduced visibilities of 1 nm or less in dense fog and dense smoke.*

Great Lakes WFOs may issue advisories when criteria are met for the first period, and may issue advisories for the second period and third periods when forecaster confidence is high. Advisories beginning in the first, second, or third period may extend beyond the third period.

The following advisories may be issued within the GLF when sufficient observational data is available:

Dense Fog Advisory
Dense Smoke Advisory
Ashfall Advisory
Low Water Advisory

2.3.6 1-3 Day Forecast Periods. Except as noted below, include forecasts of wind and waves in each discrete forecast period in the GLF. Forecasters should also include forecasts of other weather significantly impacting the marine zone(s) (e.g., ice accretion, precipitation, low visibility, etc.). Emphasize the most critical conditions.

2.3.7 4-5 Day Forecast Periods. Include wind and wave conditions in each 24 hour period. Forecasters should also include forecasts of other weather significantly impacting the marine zone(s) (e.g., ice accretion, precipitation, low visibility, etc.). Emphasize the most critical conditions.

2.3.8 GLF - Forecast Parameters

a. Winds. Winds represent predominant conditions 10 meters above mean lake level. Give wind direction to eight points of the compass. Avoid such phrases as "N TO NE WINDS". Forecasters may indicate changes with terms such as BECOMING, or by dividing the forecast area into segments. Forecasters should round speeds to the nearest 5 KT in forecasting wind speeds and ranges in wind speeds. The terms "BECOMING", "INCREASING", AND "DIMINISHING" may be used when appropriate, but not "DECREASING."

b. Waves. The forecast wave heights should represent the significant wave height in the forecast area. Forecasters may either use one value or a small range in values.

Do not use terms such as ROUGH and MODERATE or open ended terms such as WAVES GREATER THAN 5 FEET.

Do not forecast waves when ice covers a major part (approximately 80 percent) of the marine zone. When this occurs, add the phrase “WAVES OMITTED FOR MOSTLY ICE COVERED AREAS” directly following the final forecast period. Similarly, append “WAVE HEIGHTS ARE FOR ICE FREE AREAS” when forecasting wave heights across marine zones with less ice coverage.

c. Significant Weather/Visibility. Forecasters should include significant weather posing a hazard to navigation when expected (e.g., fog or heavy precipitation lowering visibility to 1 NM or less, or thunderstorms). Forecasters may use precipitation probability terms "CHANCE", "OCCASIONAL", etc., as defined in NWSI 10-503, *WFO Public Weather Products Specification*. Forecasters may include obstructions to visibility ranging between 1 NM to 5 NM. However, forecasters should not include sky cover.

Forecasters may include specific visibility distances based on local or regional guidelines.

Forecasters should emphasize thunderstorms in the GLF product. They may include the phrase “WINDS AND WAVES HIGHER NEAR THUNDERSTORMS” but only with respect to the most significant thunderstorms. If a moderate or high risk of severe weather is indicated for a marine zone, forecasters should use phrases such as “STRONG THUNDERSTORMS ARE POSSIBLE” or “THUNDERSTORMS SOME POSSIBLY SEVERE”.

d. Icing. Forecasters should include a headline whenever ice accretion on exposed surfaces is likely. Because ice accumulation rates are ultimately dependent on individual ship characteristics and operating conditions, use only the following headlines:

Heavy Freezing Spray Warning
Heavy Freezing Spray Watch

e. Air Temperatures. Air temperatures are optional, and should only be included if they are forecast to be at or below freezing, and the forecaster considers this information to be significant.

2.4 Format. This product is available in industry standard encoding and languages, and may include, but not limited to, American Standard Code for Information Exchange (ASCII), Extensible Markup Language (XML), Wireless Markup Language (WML), File Transfer Protocol (FTP), and HyperText Markup Language (HTML).

(WMO ID)(UTC ISSUANCE DATE TIME)
(AWIPS ID)

OPEN LAKE FORECAST FOR (NAME OF GREAT LAKE)
NATIONAL WEATHER SERVICE (CITY)(STATE)
(ISSUANCE TIME) AM/PM (LOCAL TIME ZONE)(DAY)(DATE)

(Refer to section 2.4.a, Areal Descriptor, for inclusion of next line.)

LAKE (NAME) FORECAST BEYOND FIVE NAUTICAL MILES FROM SHORE

.SYNOPSIS...TEXT.

(AREAL UGC CODE[S])-(EXPIRATION TIME)-
(FORECAST AREA DESCRIPTOR[S])
(ISSUANCE TIME) AM/PM (LOCAL TIME ZONE) (DAY) (DATE)

...HEADLINE(S) (If needed)...

.PERIOD 1...
.PERIOD 2...
.PERIOD 3...
.PERIOD 4...
.PERIOD 5...
.PERIOD 6 (Optional period for the morning issuance)...
.PERIOD 7 (Optional period for the afternoon/evening issuance)...
(Day 4)...
(Day 5)...
(WAVES OMITTED FOR MOSTLY ICE COVERED AREAS-included in season)
(WAVE HEIGHTS ARE FOR ICE FREE AREAS-included in season)

\$\$
FORECASTER NAME (OPTIONAL)

Figure 1. Open Lake Forecast (GLF) Format

a. Areal Descriptor. To highlight the demarcation between the NSH and GLF, append the phrase "LAKE (NAME) FORECAST BEYOND FIVE NAUTICAL MILES FROM SHORE", as noted in Figure 1. Omit this phrase when the NSH is not issued.

2.4.1 GLF - Unscheduled Forecasts. As needed, append either "...UPDATED" or "...CORRECTED" to the product header whenever, respectively, an unscheduled GLF is issued or when an error in the GLF is corrected. Add a short description of the updated or corrected items just below the areal header to highlight the change.

OPEN LAKE FORECAST FOR (NAME OF GREAT LAKE)...**UPDATED**
NATIONAL WEATHER SERVICE (CITY)(STATE)
(ISSUANCE TIME) AM/PM (LOCAL TIME ZONE)(DAY)(DATE)

.SYNOPSIS...TEXT.

(AREAL UGC CODE[S])-(EXPIRATION TIME)-
(FORECAST AREA DESCRIPTOR[S])
(ISSUANCE TIME) AM/PM (LOCAL TIME ZONE) (DAY) (DATE)

REASON FOR UPDATE

...HEADLINE(S) (If needed)...

.PERIOD 1...
etc.

Figure 2. Unscheduled Open Lake Forecast (GLF) Format

2.5 Updates, Amendments, and Corrections. GLFs will be updated when the on-duty forecast team believes the current forecast is not representative. WFOs will correct GLFs for format and grammatical errors. Forecasters will update the GLF when a Tornado Watch or Severe Thunderstorm Watch has been issued.

3. Coded Marine Forecast (MAFOR; appended to product category GLF).

3.1 Mission Connection. The Coded Marine Forecast (MAFOR) is a text forecast appended to the Open Lake Forecast (GLF). The MAFOR, adapted from World Meteorological Organization (WMO) code FM-61-IV, is a coded version of the first 24 hours of the GLF. No MAFOR is done for Lake St. Clair.

3.2 Issuance Guidelines. Forecasters should ensure the values included within the MAFOR are consistent with the values from the associated gridded forecast elements.

3.2.1 Creation Software. WFOs produce the MAFOR and append it to the GLF using AWIPS software formatters.

3.2.2 Issuance Criteria. The MAFOR will be appended to every GLF issued four times a day with updates as necessary. Forecasters should make these forecasts available to users by the scheduled issuance time, but no earlier than 1 hour before this issuance time.

3.2.3 Issuance Time. MAFORs are routinely scheduled.

3.2.4 Valid Time. MAFORs are valid 1 hour after the issuance of the GLF.

3.2.5 Product Expiration Time. The MAFORs expiration time is the same as the GLF.

3.3 Technical Description. MAFORs will follow the format and content described in this section.

3.3.1 Mass News Disseminator (MND) Broadcast Line. None.

3.3.2 MND Header. The MAFOR will be appended to the Open Lake Forecast, MND Header “OPEN LAKE FORECAST FOR [LAKE SUPERIOR, LAKE MICHIGAN, LAKE HURON, LAKE ERIE, or LAKE ONTARIO]”.

3.3.3 Content. Forecasters may issue the MAFOR either for an entire Lake or for a Lake segment. It will reflect the predominant conditions over that area for the 24 hour period.

Usually only one headline is allowed in the MAFOR. See Appendix A, footnote b, for more information and exception.

3.3.4 GLF MAFOR - Forecast Parameters

a. Wind (sustained). Use the following for conversion from plain language to the MAFOR code:

1. Wind Direction: Forecasters should use a single wind direction as given in the plain language forecast. Periodically, since the minimum time period in the MAFOR code is 3 hours, the forecaster may have to show wind shifts with frontal passages using an additional group "9".
2. Wind Speed: Use the following to convert wind speed, in knots, from the narrative forecast to the MAFOR code:

<u>Narrative Forecast Value</u>	<u>MAFOR Code</u>
Light, less than 10, or 5-10 knots	0
5-15, 10-15 knots	1
10-20, 15-20 knots	2
15-25, 20-25 knots	3
30 knots	4
35 knots	5 GW
45 knots	6 GW
50-55 knots	7 SW
60 knots	8 SW
over 60 knots	9 HFW

GW = Gale Warning,
 SW = Storm Warning,
 HFW = Hurricane Force Wind Warning.

b. Forecast Weather. The MAFOR code will identify the most significant weather (based on Appendix A where the higher number is more significant). When precipitation is "categorical" or "likely", the forecaster should include it as the last digit of a main group. If other weather types are also forecast, they should be placed in the plain language section of the MAFOR or as a "9" (occasional) group of the MAFOR code. If a weather type is included in the coded portion of the MAFOR, it should not be included in the plain language section.

3.4 Format. Follow the NWS MAFOR Code for the Great Lakes shown in Appendix A. This product is available in industry standard encoding and languages, and may include, but not limited to, ASCII, XML, WML, FTP, and HTML.

3.4.1 MAFOR - Unscheduled Forecasts. Forecasters should update MAFORS when necessary to ensure consistency with the GLF. In such cases, since these products are subdivided into no less than 3 hour blocks, the MAFOR will be valid from the nearest 3 hour of the new issuance time to the ending valid time of the MAFOR being updated. For example, a MAFOR valid from 16 UTC to 16 UTC amended at or before 1729 UTC would still be valid from 16 UTC. However, this MAFOR amended at 1730 UTC to 2029 UTC would be valid at 19 UTC. In both cases, the MAFOR is valid until 16 UTC.

3.4.2 Updates, Amendments and Corrections. MAFOR forecasts will be updated when the forecaster decides the current forecast is no longer representative. WFOs will update MAFORS by adding the letters “AMD” following the effective starting time. WFOs will correct MAFORS for format and grammatical errors by adding the letters “COR” following the effective starting time.

4. Nearshore Marine Forecast (product category NSH)

4.1 Mission Connection. The Nearshore Marine Forecast (NSH) is a text product issued by Great Lakes WFOs to state expected weather conditions within their marine forecast area of responsibility through the fourth period. The NSH is used by a variety of marine users and partners, and is primarily used as a tool for planning purposes to support and promote safe transportation across the Great Lakes.

4.2 Issuance Guidelines. Forecasters should ensure the values included within the NSH are consistent with the values from the associated gridded forecast elements.

4.2.1 Creation Software. WFOs will produce the NSH using the AWIPS software formatters. The IFPS GFE application formatting tools will be used for generation of product content. All WFOs issuing the NSH will use the GHG application formatting tool to produce hazard headline.

4.2.2 Issuance Criteria. The NSH will be issued four times a day with updates as necessary.

The nearshore waters refer to the over water area extending to 5 NM perpendicular from the shore line. Larger bays are also included in the nearshore waters. Forecasters should ensure the NSH is consistent with their adjacent GLF.

Nearshore Marine Forecasts may be issued year round. At a minimum, the NSH will be issued throughout the boating season, dependent on ice conditions on the entrances to each individual Lake. Specific dates are determined by responsible Regions.

If needed, forecasters may include, below period 4 of the last NSH product of the year, a statement such as: "THIS IS THE LAST (AWIPS ID) ISSUANCE FOR (YEAR). THE (AWIPS ID) WILL AGAIN BE ISSUED AROUND APRIL 1 (YEAR)."

4.2.3 Issuance Time. Nearshore Marine Forecasts are routinely-scheduled products. The issuance time is expressed in UTC, while the mass media header is expressed in local time. The issuance time in the mass media header is the same time as the product was actually issued by the WFO. WFOs should issue NSHs based on the following schedule:

<u>Time Period</u>	<u>Scheduled Issuance Times (UTC)</u>							
Standard Time		0400		1000		1600		2200
Daylight Savings	0300		0900		1500		2100	

In the NSH, include forecast periods as shown below. All forecast periods beyond the current day will be described by the day of the week. For example, a forecast issued Thursday morning will include: TODAY, TONIGHT, FRIDAY, FRIDAY NIGHT.

The 1000/0900 and 1600/1500 scheduled issuance times (UTC) will cover:

Today/This Afternoon (or equivalent)	(Issuance time to 6PM)	1st Period
Tonight	(6PM to 6AM)	2nd Period
(Next Day)	(6AM to 6PM)	3rd Period
(Next Day) Night	(6PM to 6AM)	4th Period

The 2200/2100 and 0400/0300 scheduled issuance times (UTC) will cover:

Tonight/Rest of Tonight (or equivalent)	(Issuance time to 6AM)	1st Period
(Next Day)	(6AM to 6PM)	2nd Period
(Next Day) Night	(6PM to 6AM)	3rd Period
(Day 2)	(6AM to 6PM)	4th Period

4.2.4 Valid Time. Nearshore Marine Forecasts are valid from the time of issuance until the expiration time.

4.2.5 Product Expiration Time. The NSH product expiration time is not more than 8 hours from the initial issuance.

4.2.6 Universal Geographic Code (UGC). The NSH will contain marine-based zone UGC codes.

4.3 Technical Description. Nearshore Marine Forecasts will follow the format and content described in this section.

4.3.1 Mass News Disseminator (MND) Broadcast Line. None.

4.3.2 MND Header. The Nearshore Marine Forecast MND Header is "NEARSHORE MARINE FORECAST".

4.3.3 Content. The NSH includes all required forecast parameters and forecast periods in each marine zone, and follows the format in section 4.4.

Forecasters should include applicable National Marine Sanctuaries, as noted in NWSI 10-302, *Marine and Coastal Services Area of Responsibility*, in the specific zone(s) segment of the appropriate NSH.

Forecasters may combine periods if, based on forecaster discretion, the weather elements in each are consistent. In addition, forecasters may subdivide the first period of any NSH to account for rapid weather changes.

WFO Detroit-Pontiac forecasters will issue the Lake St. Clair Forecast following the format of the GLF. Exception: WFO Detroit-Pontiac forecasters should include sky conditions and Small Craft Advisories in the Lake St. Clair Forecast.

4.3.4 Headlines. Use headlines to emphasize weather events likely to have a significant impact on mariners or marine operations. The headlines generated by GHG software are sorted in chronological order by start time, then by action, by significance, and alphabetically by phenomena. These headlines should include the hazard, action, and timing phrases. Refer to NWSI 10-1701, *Text Product Formats and Codes*, for additional details.

Marine warnings and advisories are only mandated in the first 12-hour forecast period. In many situations (e.g. Gale Warning vs. Small Craft Advisory), to reduce multiple headlines, the forecaster can leave off the hazards after the upgrade and headline the most severe hazard only. However forecasters should use multiple headlines for events at the same significance level but different discrete criteria (e.g. Gale Warning and Heavy Freezing Spray Warning).

Refer to NWSI 10-303, *Marine and Coastal Services Standards and Guidelines*, for Small Craft Advisories (all types) and regional definitions, all other advisories that may be included in the NSH, as well as definitions for Gale, Storm, Hurricane Force Wind, and Heavy Freezing Spray Warnings and Watches.

a. **Warning headlines.** WFOs with marine responsibility for the Great Lakes will issue warnings when criteria are met for the first period, and may issue warnings for the second and third period when forecaster confidence is high. Warnings beginning in the first, second, or third period may extend as long as necessary.

Watch headlines. WFOs should issue watches for the second, third, or occasionally fourth periods, when there is a 50 percent or greater chance of a hazardous marine weather event meeting or exceeding warning criteria.

The following watch and warning headlines will be included in the NSH if appropriate criteria are occurring or forecast to occur:

- Hurricane Force Wind Warning

- Storm Warning
- Gale Warning
- Heavy Freezing Spray Warning
- Tornado Watch
- Severe Thunderstorm Watch
- Gale Watch
- Storm Watch
- Hurricane Force Wind Watch
- Heavy Freezing Spray Watch

b. Advisory headlines. Based on event significance, forecasters will include headlines for advisory events in the NSH when conditions over marine zones are occurring or forecast where small craft will be impacted by winds and/or waves, low water, ashfall, or *reduced visibilities to 1 nm or less in dense fog or dense smoke*.

Great Lakes WFOs will include advisory headlines when criteria are met for the first period, and may issue advisories for the second period and third periods when forecaster confidence is high. Advisories beginning in the first, second, or third period may extend as long as necessary.

Great Lakes WFOs will include a Small Craft Advisory in the NSH when criteria are met and where there is sufficient open water (ice-free lakes) to include wave forecasts.

Headlines for the following advisories should be issued when sufficient observational data is available.

Dense Fog Advisory
Dense Smoke Advisory
Ashfall Advisory
Low Water Advisory

c. Based on Local or Regional policy, WFOs may manually include cautionary statements (e.g., SMALL CRAFT SHOULD EXERCISE CAUTION) in situations below SCA criteria).

In situations where sustained winds are below advisory/warning thresholds but winds gust above these thresholds, forecasters should use their own discretion in issuing advisories or warnings as appropriate. Winds will be considered gusty when gusts are regularly observed over a time period of more than two hours.

4.3.5 Forecast Periods. Except as noted below, include forecasts of wind and waves in each discrete forecast period in the NSH. Forecasters should also include forecasts of other weather significantly impacting the marine zone(s) (e.g., sky cover or significant weather, ice accretion, precipitation, low visibilities, etc.). Emphasize the most critical conditions.

4.3.6 NSH - Forecast Parameters

a. Winds. Winds represent predominant conditions 10 meters above mean lake level. Give wind direction to eight points of the compass. Avoid such phrases as "N TO NE WINDS". Forecasters may indicate changes with terms such as BECOMING, or by dividing the forecast area into segments. Forecasters should round speeds to the nearest 5 KT in forecasting wind speeds and ranges in wind speeds. The terms "BECOMING", "INCREASING", AND "DIMINISHING" may be used when appropriate, but not "DECREASING."

b. Waves. The forecast wave heights should represent the significant wave height in the forecast area. Forecasters may either use one value or a small range in values.

Do not use terms such as ROUGH and MODERATE or open ended terms such as WAVES GREATER THAN 5 FEET.

Do not forecast waves when ice covers a major part (approximately 80 percent) of the marine zone. When this occurs, add the phrase "WAVES OMITTED FOR MOSTLY ICE COVERED AREAS" directly following the final forecast period. Similarly, append "WAVE HEIGHTS ARE FOR ICE FREE AREAS" when forecasting wave heights across marine zones with less ice coverage.

c. Significant Weather/Visibility. Forecasters should include significant weather posing a hazard to navigation when expected (i.e., fog or heavy precipitation lowering visibilities to 1 NM or less, or thunderstorms). Forecasters may use precipitation probability terms "CHANCE", "OCCASIONAL", etc., as defined in NWSI 10-503. Forecasters may include obstructions to visibility ranging between 1 NM and 5 NM. Forecasters should include sky cover if there is no significant weather forecast.

Forecasters may include specific visibility distances based on local or regional guidelines.

Forecasters should emphasize thunderstorms in NSHs. They may include the phrase "WINDS AND WAVES HIGHER NEAR THUNDERSTORMS" but only with respect to the most significant thunderstorms. If a moderate or high risk of severe weather is indicated for a Marine Zone, forecasters should use phrases such as "STRONG THUNDERSTORMS ARE POSSIBLE" or "THUNDERSTORMS SOME POSSIBLY SEVERE".

d. Icing. Forecasters should include a headline whenever ice accretion on exposed surfaces is likely. Because ice accumulation rates are ultimately dependent on individual ship characteristics and operating conditions, only use the following headlines:

Heavy Freezing Spray Warning
Heavy Freezing Spray Watch

e. Air Temperatures. Air temperatures are optional. However, they should only be included if they are forecast to be at or below freezing and if the forecaster considers this information to be significant.

f. Miscellaneous information. Based on local requirements, forecasters may include other pertinent information (e.g., water temperatures or water levels) at the end of the forecast.

4.4 Format. The following format will be used for the NSH. This product is available in industry standard encoding and languages, and may include, but not limited to, ASCII, XML, WML, FTP, and HTML.

(WMO ID)(UTC ISSUANCE DATE TIME)
(AWIPS ID)

NEARSHORE MARINE FORECAST (+ Optional descriptor)
NATIONAL WEATHER SERVICE (CITY)(STATE)
(ISSUANCE TIME) AM/PM (LOCAL TIME ZONE)(DAY)(DATE)

FOR WATERS WITHIN FIVE NAUTICAL MILES OF SHORE ON LAKE (NAME)

(AREAL UGC CODE[S])-(EXPIRATION TIME)-
(FORECAST AREA DESCRIPTOR[S])
(ISSUANCE TIME) AM/PM (LOCAL TIME ZONE)(DAY)(DATE)

...HEADLINE(S)... (If needed)

.PERIOD 1...
.PERIOD 2...
.PERIOD 3...
.PERIOD 4...

(WAVES OMITTED FOR MOSTLY ICE COVERED AREAS – included in season)
(WAVE HEIGHTS ARE FOR ICE FREE AREAS – included in season)

(LAST ISSUANCE STATEMENT) (if needed)
\$\$
FORECASTER NAME (OPTIONAL)

Figure 3. Nearshore Marine Forecast (NSH) Format

4.4.1 NSH – Unscheduled Forecasts. As needed, append either “...UPDATED” or “...CORRECTED” to the product header whenever, respectively, an unscheduled NSH is issued or when an error in the NSH is corrected. Add a short description of the updated or corrected items just below the areal header to highlight the change.

(WMO ID)(UTC ISSUANCE DATE TIME)
(AWIPS ID)

NEARSHORE MARINE FORECAST (+ Optional descriptor) **...UPDATED (or ...CORRECTED)**

NATIONAL WEATHER SERVICE (CITY)(STATE)
(ISSUANCE TIME) AM/PM (LOCAL TIME ZONE)(DAY)(DATE)

FOR WATERS WITHIN FIVE NAUTICAL MILES OF SHORE ON LAKE (NAME)

(AREAL UGC CODE[S])-(EXPIRATION TIME)-
(FORECAST AREA DESCRIPTOR[S])
(ISSUANCE TIME) AM/PM (LOCAL TIME ZONE)(DAY)(DATE)

REASON FOR UPDATE (or CORRECTION)

...HEADLINE(S)... (If needed)

.PERIOD 1...
etc.

Figure 4. *Unscheduled Nearshore Marine Forecast (NSH) Format*

4.5 Updates, Amendments and Corrections. NSHs will be updated when the on-duty forecast team believes the current forecast is not representative. WFOs will correct NSHs for format and grammatical errors. Forecasters will update NSHs when a Tornado Watch or Severe Thunderstorm Watch has been issued.

5.0 Watch County Notification (WCN). See NWSI 10-511 for more information about issuing WCNs. Great Lakes WFOs with Severe Thunderstorm/Tornado Watch responsibility for marine open lake zones will notify the responsible open lake WFO to ensure the GLF reflects the current status of watches. See NWSI 10-302 Great Lakes section for WFO marine areas of responsibility for Special Marine Warning/Severe Local Storm Watch purposes.

6.0 Hazardous Weather Outlook (HWO). See NWSI 10-517 for more information about issuing HWOs. See NWSI 10-302 Great Lakes section for WFO marine areas of responsibility for Hazardous Weather Outlooks.

7.0 Great Lakes Weather Broadcasts (LAWEB). The LAWEB is an automated round-up of all Great Lakes weather observations distributed every 3 hours by WFO Cleveland. The LAWEB follows the format as shown in Appendix B. This product is available in industry standard encoding and languages, and may include, but not limited to, ASCII, XML, WML, FTP, and HTML.

8.0 Centralized Dissemination Systems. See NWSI 10-303, *Marine and Coastal Services Standards and Guidelines.*

9.0 Surf Zone Forecast (SRF). Great Lakes WFOs may issue the SRF. In addition, the SRF may be issued on a seasonal basis (e.g., Memorial Day weekend through Labor Day). See NWSI 10-310 section 3 for more information about issuing SRFs.

APPENDIX A - NWS MAFOR Code for the Great Lakes
NWS MAFOR Code for the Great Lakes
MAFOR YYG₁G₁ (Name of Lake^a) (Watches/Warnings^b) 1GDFmW₁^c
(Precipitation^d) (Ice Coverage^e) (Wave Forecast^f)

MAFOR YYG₁G₁ (Name of Lake^a) (Watch/Warnings Headline^b) 1GDFmW₁^c										
Keywords (Indicates marine forecast)	Day of the Month	Time Forecast Period Begins (UTC)	Solidus	Name of Lake ^a	Watch/ Warning Headline ^b	@	Forecast Period	Wind Direction	Wind Speed	Forecast Weather
MAF	yy	G ₁ G ₁	/	XXXX	Plain Language	1	G	D	Fm	W ₁
(Precipitation^d) (Ice Coverage^e) (Wave Forecast^f)										
Precipitation ^d		Ice Coverage ^e		Wave Forecast ^f (feet)						
Plain Language		Plain Language		Plain Language						
G - Forecast Period		D - Wind Direction		Fm - Wind Speed		W₁ - Forecast Weather				
0 - Conditions at the beginning of the forecast period 1 - Valid for 3 hours 2 - Valid for 6 hours 3 - Valid for 9 hours 4 - Valid for 12 hours 5 - Valid for 18 hours 6 - Valid for 24 hours 9 - Occasional		0 - Calm 1 - Northeast 2 - East 3 - Southeast 4 - South 5 - Southwest 6 - West 7 - Northwest 8 - North 9 - Variable		0 - 5 to 10 Knots 1 - 10 to 15 Knots 2 - 10 to 20 Knots 3 - 15 to 25 Knots 4 - 20 to 30 Knots 5 - 35 to 40 Knots 6 - 40 to 45 Knots 7 - 50 to 55 Knots 8 - 56 to 63 Knots 9 - over 60 Knots		0 - Moderate or Good Visibility (VSBY) more than 3 nautical miles (n mi) 1 - Risk of accumulation of ice on superstructure (Temp 23° to 32°F) 2 - Strong risk of accumulation of ice on superstructure (Temp below 23°F) 3 - Mist (VSBY 5/8 to 3 NM) 4 - Fog (VSBY < 5/8 NM) 5 ^d - Drizzle 6 ^d - Rain 7 ^d - Snow or Rain/Snow mix 8 ^d - Squally weather with or without showers 9 ^d - Thunderstorms				

a - MAFORS are issued for Lakes Superior, Michigan, Huron, Erie, and Ontario.

b - Headlines are included in Hurricane Force, Storm, Gale, and Heavy Freezing Spray Warnings, and Tornado and Severe Thunderstorm Watches. Note that warning headlines take precedence over watch headlines. Two headlines may be used when one of the headlines is a Heavy Freezing Spray Warning.

c - The 1 group may be repeated as many times as necessary to describe changes in wind and weather conditions expected in a given area during a 24-hr forecast period.

d (1) If Probability of Precipitation (POP) $\geq 55\%$ then include precipitation in the code and leave it out of the plain language.

(2) If $25\% \leq \text{POP} < 55\%$ and precip is occurring or likely but lowered POP is based on coverage then include the precip in the code and leave out of the plain language. However if POP is based on uncertainty then leave out of code and put in plain language. If other weather types are also forecast then see section 3.3.4b.

(3) Outside of (2) above, do not use the occasional group for change (25-54%) POPs.

(4) If POP $< 25\%$ then leave out the code. Also leave out of plain language unless "significant" such as thunderstorm or showers (rain or snow) that could greatly reduce visibility.

e - Ice coverage is included as appropriate. If ice coverage is included then wave height information is omitted.

f - Forecast wave height range for valid period of MAFOR (24 hours).

Note: The MAFOR code is not an exact duplicate of the plain-language forecast issued in the Open Lake Forecasts issued for each lake. Mariners should refer to the Open Lake Forecast product for the complete forecast.

APPENDIX B - Examples of Great Lakes Marine Products

Table of Contents:

- 1. Open Lakes and Coded Marine Forecasts.....B-1
- 2. Nearshore Marine Forecasts.....B-2
- 3. Great Lakes Weather Broadcast.....B-3

1. Open Lakes and Coded Marine Forecasts.

FZUS61 KCLE 080725
GLFLE

OPEN LAKE FORECAST FOR LAKE ERIE
NATIONAL WEATHER SERVICE CLEVELAND OH
325 AM EDT SAT MAY 8 2010

FOR WATERS BEYOND FIVE NAUTICAL MILES FROM SHORE ON LAKE ERIE

.SYNOPSIS...A LARGE AREA OF HIGH PRESSURE...AVERAGING 30.3
INCHES...EXTENDING FROM THE MID ATLANTIC COAST ACROSS THE
EASTERN GREAT LAKES WILL REMAIN NEARLY STATIONARY THROUGH
SUNDAY. THE HIGH WILL MOVE EAST SUNDAY
NIGHT...ALLOWING A WEAK COLD FRONT TO CROSS LAKE ERIE
MONDAY NIGHT INTO TUESDAY.

LEZ162>166-081415-
MAUMEE BAY TO RENO BEACH OHIO BEYOND 5 NM FROM SHORE-
RENO BEACH TO THE ISLANDS OHIO BEYOND 5 NM FROM SHORE-
THE ISLANDS TO VERMILION OHIO BEYOND 5 NM FROM SHORE-
VERMILION TO AVON POINT OHIO BEYOND 5 NM FROM SHORE-
AVON POINT TO WILLOWICK OHIO BEYOND 5 NM FROM SHORE-
325 AM EDT SAT MAY 8 2010

.TODAY...SOUTH WINDS 5 TO 15 KNOTS BECOMING SOUTHWEST. WAVES
2 FEET OR LESS.

.TONIGHT...SOUTH WINDS 5 TO 15 KNOTS. WAVES 2 FEET OR LESS.

.SUNDAY...SOUTH WINDS 10 KNOTS OR LESS BECOMING EAST.
WAVES 2 FEET OR LESS.

.SUNDAY NIGHT...EAST WINDS 10 KNOTS OR LESS BECOMING
SOUTH. WAVES 2 FEET OR LESS.

.MONDAY...SOUTH WINDS 10 KNOTS OR LESS BECOMING NORTHWEST.
CHANCE OF SHOWERS AND THUNDERSTORMS. WAVES 2 FEET OR LESS.

.TUESDAY...NORTH WINDS 10 KNOTS OR LESS BECOMING NORTHEAST.
CHANCE OF SHOWERS AND THUNDERSTORMS. WAVES 2 FEET OR LESS.
.WEDNESDAY...NORTHEAST WINDS 10 TO 15 KNOTS. WAVES 2 FEET OR
LESS.

\$\$

LEZ061-167>169-081415-
WILLOWICK TO GENEVA-ON-THE-LAKE OHIO BEYOND 5 NM FROM SHORE-
GENEVA-ON-THE-LAKE TO CONNEAUT OHIO BEYOND 5 NM FROM SHORE-
CONNEAUT OHIO TO RIPLEY NY BEYOND 5 NM FROM SHORE-
RIPLEY TO BUFFALO NY BEYOND 5 NM FROM SHORE-
325 AM EDT SAT MAY 8 2010

.TODAY...SOUTH WINDS 5 TO 15 KNOTS BECOMING NORTHWEST. WAVES
2 FEET OR LESS.
.TONIGHT...SOUTHWEST WINDS 10 KNOTS OR LESS BECOMING SOUTH
10 TO 15 KNOTS. WAVES 2 FEET OR LESS.
.SUNDAY...SOUTH WINDS 10 KNOTS OR LESS BECOMING
NORTHWEST. WAVES 2 FEET OR LESS.
.SUNDAY NIGHT...NORTHEAST WINDS 10 KNOTS OR LESS BECOMING
SOUTHEAST. WAVES 2 FEET OR LESS.
.MONDAY...SOUTH WINDS 10 KNOTS OR LESS BECOMING NORTHWEST.
CHANCE OF SHOWERS AND THUNDERSTORMS. WAVES 2 FEET OR LESS.
.TUESDAY...NORTH WINDS 5 TO 10 KNOTS BECOMING NORTHEAST.
CHANCE OF SHOWERS AND THUNDERSTORMS. WAVES 2 FEET OR LESS.
.WEDNESDAY...NORTHEAST WINDS 10 TO 15 KNOTS. WAVES 2 FEET OR
LESS.

\$\$

LEZ161-081415-
MAFOR 0809/
ERIE WEST 1/2 12410 11400 11500 13400 11410. WAVES 2 FEET OR
LESS. 220002.
ERIE EAST 1/2 12410 11510 11710 12500 11400 11410. WAVES 2
FEET OR LESS. 220002.

\$\$

2. Nearshore Marine Forecasts:

FZUS53 KMKX 220222
NSHMKE

NEARSHORE MARINE FORECAST

NATIONAL WEATHER SERVICE MILWAUKEE/SULLIVAN WI
922 PM CDT THU APR 21 2011

FOR WATERS WITHIN 5 NAUTICAL MILES OF THE SHORE ON LAKE MICHIGAN

LMZ643>646-220940-
SHEBOYGAN TO WINTHROP HARBOR IL-
922 PM CDT THU APR 21 2011

...SMALL CRAFT ADVISORY REMAINS IN EFFECT THROUGH FRIDAY MORNING...

.TONIGHT...NORTHWEST WIND 15 TO 25 KNOTS BECOMING NORTH.
CLOUDY...THEN BECOMING PARTLY CLOUDY TOWARD MORNING. WAVES 2 FEET
BUILDING TO 2 TO 4 FEET BY MORNING.
.FRIDAY...NORTH TO NORTHEAST WIND 15 TO 25 KNOTS EARLY....THEN
NORTHEAST 10 TO 20 KNOTS. MOSTLY SUNNY. WAVES 3 TO 4 FEET.
.FRIDAY NIGHT...NORTH WINDS 10 TO 15 KNOTS. CLEAR. WAVES 2 TO 4
FEET.
.SATURDAY...NORTH WIND AROUND 10 KNOTS. PARTLY CLOUDY. WAVES 1 TO 3
FEET.

\$\$

SEE LAKE MICHIGAN OPEN LAKE FORECAST FOR SUNDAY THROUGH TUESDAY.

HENTZ

3. Great Lakes Weather Broadcast:

SXUS20 KCLE 071002
OMRGL2

GREAT LAKES MARINE WEATHER BROADCAST
NATIONAL WEATHER SERVICE CLEVELAND OH
459 AM EST WED MAR 7 2001

WIND SPEED IN KNOTS..WAVE HEIGHT IN FEET..VISIBILITY IN MILES
F=FOG H=HAZE R=RAIN S=SNOW L=DRIZZLE T=THUNDERSTORM D=DUST
Z=FREEZING LAKE

ST.CLAIR	0400 EST	0300 EST
STATION	WIND GUST WAVE VSBY/WX	WIND GUST WAVE VSBY/WX
LAKE ERIE	0400 EST	0300 EST
STATION	WIND GUST WAVE VSBY/WX	WIND GUST WAVE VSBY/WX
Dunkirk Beach NY	240/11 11	240/11 12

NWSI 10-312 OCTOBER 18, 2012

Clevlnd Lakeft AP OH	310/15	320/16
Lorain Lighthouse	MMM/MM 0	
South Bass Island OH	320/15 16	320/17 19
Fairport Lighthouse	MMM/MM 0	
Rondeau ONT	320/ 8	320/ 9
Long Point ONT	290/13	320/16
London ONT	330/ 8	310/ 8

LAKE ONTARIO	0400 EST	0300 EST
STATION	WIND GUST WAVE VSBY/WX	WIND GUST WAVE VSBY/WX
Galloo Island NY	360/16 20	020/14 17
Burlinton Pier ONT	250/ 4	240/ 4
Cobourg ONT	340/ 3	360/ 3
Trenton ONT	320/ 3	330/ 4
Point Petre ONT	350/10	360/10

...BUOY & SHIP OBSERVATIONS, 0400 EST...

LAT	LO	LOCATION	WIND	GUST	WAVE	VSBY	WX
43.8	76.9	11 WSW Main Duck Island	340/14	16	01	3/F	
\$\$							