



Safety Thursday – Weather Resources (pt. 2)
June 27, 2013

By Mark Thornton

Introduction

This *Safety Thursday* article, the second in a two part series, focuses on the challenges of monitoring weather conditions on the racecourse. A companion webpage containing hyperlinks to the resources presented in this and the previous article can be found [here](#). The first article was published on May 30, 2013. I hope that you found an opportunity to review the resources presented, familiarized yourself in their interpretation and have prepared a few practice forecasts.

Monitoring the evolution of weather patterns and reviewing updated forecast data after the race has started can help you adjust your strategy based upon whether an off-shore or in-shore route holds the best chance for a steady breeze. In addition to aiding your strategic goals, checking the weather regularly and remaining apprised of National Weather Service watches and warnings will spare you from being surprised by thunderstorms, a relatively common occurrence across the Great Lakes during July.

ACCESS TO DATA

Introduction

There is no shortage of weather data on the Internet. The sheer volume of data, combined with the ease of access, may contribute to a case of ‘data overload’ in the days preceding the Mac. However, once you are on the racecourse and your trusty Wi-Fi connection is no longer available, you will likely find yourself quickly transitioning from ‘data overload’ to ‘data deprivation’. There are technological solutions to address your data deprivation, but each possesses its own set of problems.

VHF Radios

VHF radios are a reliable and relatively inexpensive method of obtaining basic weather information. Modern marine VHF radios contain a “WX” button used to select the seven channels (WX1 to WX7) dedicated to receiving weather observations and forecasts.

Through its NOAA Weather Radio (NWR) program, the National Weather Service (NWS) continuously transmits NWS general and marine forecasts, regional weather observations, and severe weather

watches and warnings in the VHF range. The NWR transmissions are automatically rendered from typed text to audio and, unless interrupted by warnings of severe weather, cycle repeatedly through information of interest to mariners and non-mariners, these include:

- Synoptic Overview – a description of the large-scale weather pattern affecting the region where the NWR transmitter is located.
- General Forecast – a non-marine forecast for the next four days divided into 12-hour periods.
- General Observations – local and regional meteorological observations such as barometric pressure, temperature, wind speed, wind direction, etc.
- Near Shore Marine Forecast – a forecast for waters within five nautical miles from shore.
- Extended Forecast – a general forecast for the next five to seven days.
- Marine Observations – wind and wave observations from nearby buoys and waterfront stations.
- Climate Summary – a review of the local and regional climate data, such as high and low temperatures, total precipitation, etc.

Because this information is presented in a continuous loop, you may have to listen to the broadcast for several minutes or more until it returns to the marine-related portion of the program. I find that it is helpful to take notes as you listen to the forecast.

Several NWR transmitters, each operating on an assigned frequency so as not to interfere with nearby stations, serve the waters of Lake Michigan. The range of each transmitter is approximately 25 miles, however, this range may be diminished by the height or placement of the antennae, operational integrity of the station's equipment, or weather conditions. The distance at which you are able to receive a NWR broadcast is also dependent upon the equipment onboard your vessel. The height and quality of your antenna and condition of the coaxial cable and ancillary fittings connecting it to your fixed VHF radio all influence the quality of your reception. Handheld VHF radios have a much shorter effective range than fixed units.

There are six NWS offices with County Warning Areas (CWA) covering a portion of Lake Michigan -- -- Chicago, IL; Syracuse, IN; Milwaukee, WI; Green Bay, WI; Grand Rapids, MI; and Gaylord, MI. Each NWS office is responsible for preparing the weather information that is broadcast by the NWRs located in their CWA. The marine observations and forecasts you hear on your VHF radio are specifically prepared for the portion of Lake Michigan falling within the NWS's warning area.

Since the NWR system broadcasts weather information for a specific portion of the Lake, and the operational limit of the transmission is approximately 25 miles, you will need to select the WX channel associated with the NWR transmitter closest to your location. This is particularly important if a severe thunderstorm prompts the issuance of a watch or warning for a portion of the Lake. A map showing the location and associated WX channel of the NWR transmitters serving Lake Michigan can be found [here](#), while a map showing the marine zones for each NWS office is located [here](#).

Cellular Internet

Although your VHF radio is a reliable source of weather information, it does not provide the ability to access Doppler radar or the wide array of weather forecast graphics discussed in my previous *Safety Thursday* article (click [here](#)). Accessing the Internet or creating a Wi-Fi hotspot using a cellular connection, provides access to the weather resources and Doppler radar, but cellular access more than 10 miles offshore is typically unreliable. It is possible to improve cellular reception by installing an

external antennae and signal booster; however this technology only improves an existing signal and therefore provides limited value in areas where shore-based cellular access is spotty – such as northern Michigan.

Cellular Internet should not be your primary source of weather information. However, when it is available, Internet access provides the ability to view Doppler radar imagery – a particularly useful resource if severe thunderstorms are expected to impact the racecourse.

Satellite Weather Data

Accessing weather information via XM satellite offers many advantages over VHF and cellular, but at a relatively high cost. A typical XM setup requires a satellite antennae, receiver, a display device (such as laptop or chartplotter), and a monthly subscription from a provider of meteorological data. The cost of the antennae, receiver and software typically exceeds \$1,000, and data subscriptions can reach \$50 per month.

If cost isn't a barrier, satellite technology avoids the broadcast range limitations of both VHF and cellular Internet and assures reliable, consistent access to weather data – including Doppler radar -- regardless of your location on Lake Michigan. You'll be limited to the products and resources offered by your data provider, but this limitation is more than outweighed by reliable access.

MISCELLANEOUS TOPICS

Barometers

An accurate barometer, particularly a digital version, is a relatively-inexpensive, low-tech method of monitoring large-scale weather patterns and the potential for severe weather. Typically, falling barometric pressure, particularly rapidly-falling barometric pressure, announces the approach of a squall line or cluster of thunderstorms. Your on-board barometer may provide your first clue that the atmosphere is brewing some excitement.

National Weather Service Terminology

The National Weather Service uses a variety of terms to simplify the forecast process and warn the public about the potential for hazardous weather. Misunderstanding this terminology may lead to poor decision-making that places you and your crew at increased risk during inclement weather. Several terms of interest to the marine community are presented below:

- **Near Shore Marine Forecast:** Issued for the Great Lakes from the shoreline out to five nautical miles.
- **Offshore Marine Forecast:** A marine forecast for waters beyond five nautical miles from shore.
- **Small Craft Advisory:** There is no precise definition of a small craft. Thresholds governing the issuance of small craft advisories are specific to geographic areas. Any vessel that may be adversely affected by Small Craft Advisory criteria should be considered a small craft. Sustained winds or frequent gusts (on the Great Lakes) between 22 and 33 knots inclusive, and/or seas or waves greater than 4 feet may prompt the issuance of a Small Craft Advisory
- **Watch:** A watch is used when the risk of a hazardous weather event has increased significantly, but its occurrence, location, and/or timing is still uncertain. It is intended to provide enough lead time so that those who need to set their plans in motion can do so.

- **Warning:** A warning is issued when a hazardous weather or other event is occurring, is imminent, or has a very high probability of occurring. A warning is used for conditions posing a threat to life or property.
- **Marine Weather Statement:** A National Weather Service product that provides mariners with details on significant or potentially hazardous conditions not otherwise covered in existing marine warnings and forecasts. Marine weather statements are also used to supplement special marine warnings.
- **Special Marine Warning:** A warning product issued for potentially hazardous weather conditions usually of short duration (up to 2 hours) producing sustained marine thunderstorm winds or associated gusts of 34 knots or greater; and/or hail 3/4 inch or more in diameter; and/or waterspouts. Also used for short duration small-scale events such as a strong cold front, gravity wave, squall line, etc., lasting less than 2 hours and producing winds or gusts of 34 knots or greater.
- **Severe Thunderstorm:** A thunderstorm that produces a tornado, winds of at least 58 mph (50 knots), and/or hail at least 1" in diameter. A thunderstorm wind equal to or greater than 40 mph (35 knots) and/or hail of at least 1" is defined as approaching severe status.
- **High Wind Warning:** Issued when high winds may pose a hazard or are life threatening. The criteria vary from state to state. In Michigan, the criteria is sustained non-convective (not related to thunderstorms) winds greater than or equal to 40 mph lasting for one hour or longer, or winds greater than or equal to 58 mph for any duration.
- **Gale Warning:** A warning of sustained surface winds, or frequent gusts, in the range of 34 knots (39 mph) to 47 knots (54 mph) inclusive, either predicted or occurring, and not directly associated with a tropical cyclone.
- **Storm Warning:** A warning of sustained surface winds, or frequent gusts, in the range of 48 knots (55 mph) to 63 knots (73 mph) inclusive, either predicted or occurring, and not directly associated with a tropical cyclone.

Doppler Radar

There is no better tool for tracking the development and movement of thunderstorms than Doppler radar from the NWS. The NWS maintains the only nationwide network of radar stations and freely shares its raw data and imagery with the public. The stations are strategically located to ensure that all areas are served and to allow overlap in the event that a station fails. There are six NWS stations collecting data over Lake Michigan: Chicago, IL; Syracuse, IN; Grand Rapids, MI; Milwaukee, WI; Green Bay, WI; and Gaylord, MI (a map of these stations may be found [here](#)).

A few important facts about radar imagery:

- You will need a reliable cellular or satellite connection to view NWS radar data.
- Radar imagery can be viewed on each NWS office's webpage, or through a third-party application purchased for your smartphone.
- Radar imagery is NOT live. The process of scanning the atmosphere and organizing the data typically takes four to six minutes. A fast-moving thunderstorm or squall line can easily cover ten miles or more between image updates. A rapidly developing thunderstorm may strengthen dramatically between image updates. Most radar applications will display the time of the image to allow you to determine how 'stale' the data is. If you are using radar to monitor the approach of threatening weather, keep in mind it may be much closer and much different than it appears on the outdated image.

- The quality of a radar signal degrades as distance from the site increases. When you are monitoring approaching storms, select the radar site closest to the storms in question rather than the site closest to your location (click here for a map of the NWS radar sites).

CONCLUSION

With the 105th Mac just around the corner, I would like to wish you a safe and speedy trip to the Island. I would also like to thank the CYC Mac Committee for the opportunity to contribute to the *Safety Thursday* series.

About the Author

Mark Thornton began sailing on Lake Erie in 1994 and he currently owns Osprey, a 1985 C&C 35. His interest in weather forecasting grew from his experiences racing and cruising on the lake. In addition to sailing and weather forecasting, Mark maintains a website devoted to Great Lakes meteorology (www.LakeErieWX.com) and enjoys publishing [summaries of interesting Great Lake weather events](#) and [teaching basic weather forecasting skills to sailors](#).

Questions regarding this article are encouraged and should be directed to LakeErieWX@gmail.com.



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Note: The purpose of this article is to highlight some of the Mac Safety Regulations and how your crew can race the Mac as safely as possible. As always, ultimate responsibility for the safety of the crew and the decision whether to race or to stop racing is that of the skipper (RRS4, MSR2). This email is meant as a courtesy only and you should always refer to the Race Documents section of the website for the Notice of Race, Sailing Instructions and Mac Safety Regulations, which govern the race.