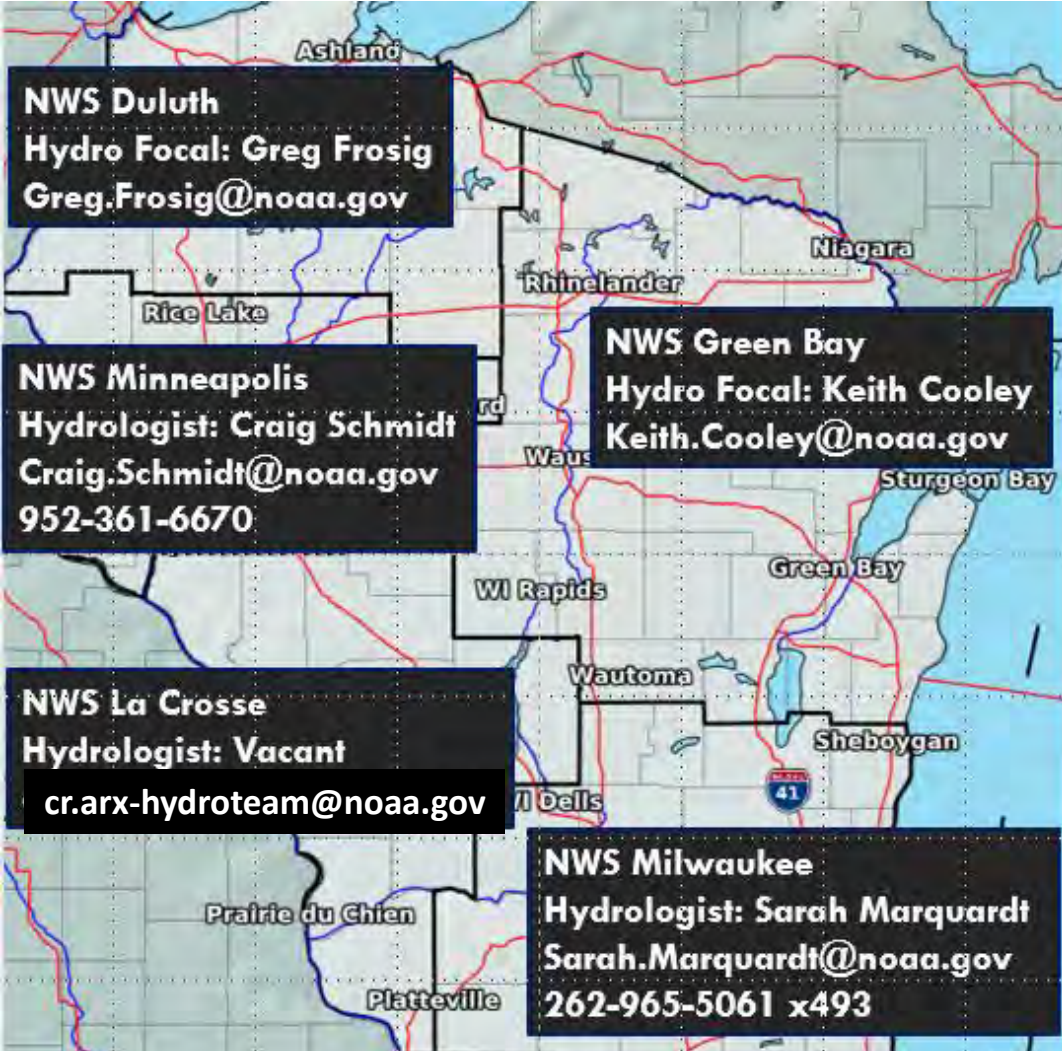




# National Weather Service

Spring Flood Outlook, HEFS, HYSPLIT and Radar!

## WI NWS Hydrologists/Hydro Focal Points



**NWS Operations Contacts:**  
 Milwaukee: 262-965-2906  
 nws.milwaukee@noaa.gov  
 Green Bay: 920-497-8771  
 nws.greenbay@noaa.gov  
 La Crosse: 608-784-8292  
 nws.lacrosse@noaa.gov  
 Minneapolis: 952-361-6671  
 nws.twincities@noaa.gov  
 Duluth: 218-729-0653  
 nws.duluth@noaa.gov

## WI Warning Coordination Meteorologists





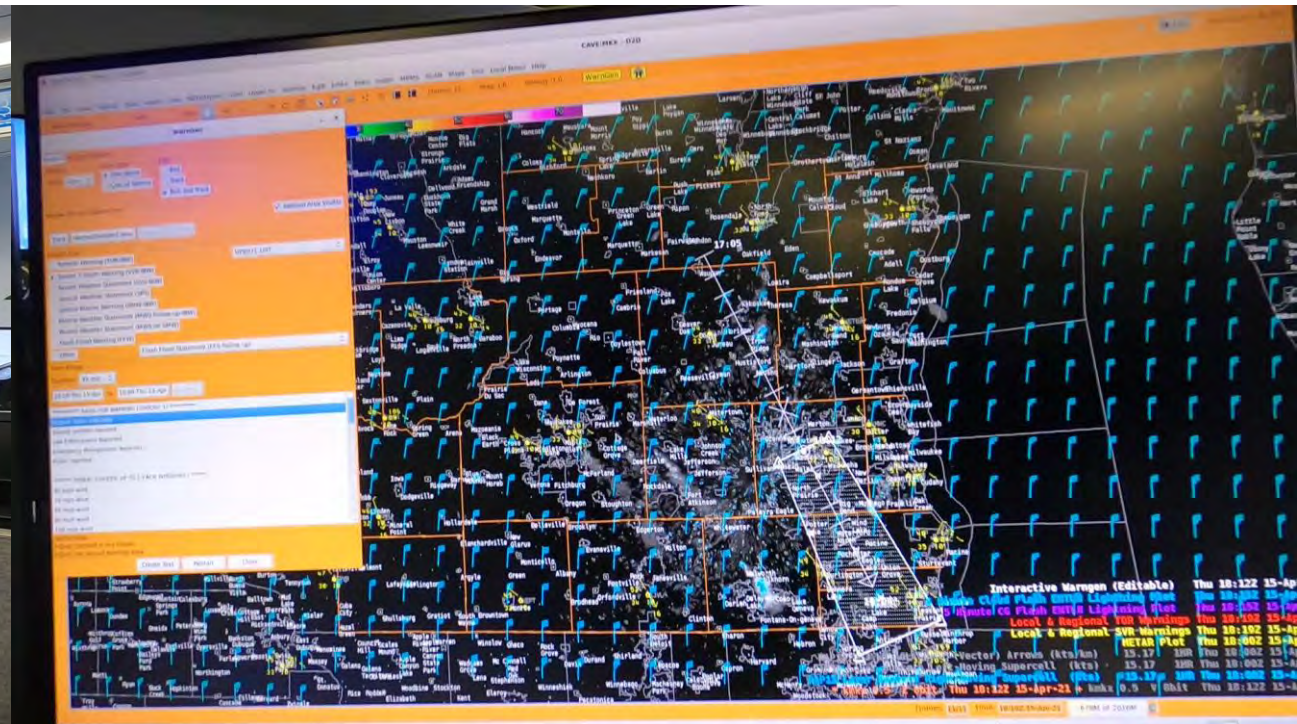
# National Weather Service

We're from the federal government, we're here to help!

**Provide weather, water and climate data, forecasts, warnings and impact-based decision support services for the protection of life and property and enhancement of the national economy.**

## **24/7/365 Operations**

- ❖ Severe Weather Warnings
- ❖ Public/Aviation/Marine/Hydrology/Fire Weather Forecasts
- ❖ Decision support for events, disasters, public safety





# weather.gov

/milwaukee

/lacrosse

/greenbay

/twincities

/duluth

- City/Point Specific Forecast
- Clickable City Forecast
- DSS Packet (Briefing PDF-Top Right)
- Outlooks
- Submit a Storm Report
- Weather Story
- Radar
- So much more!

## weather.gov/forecastpoints

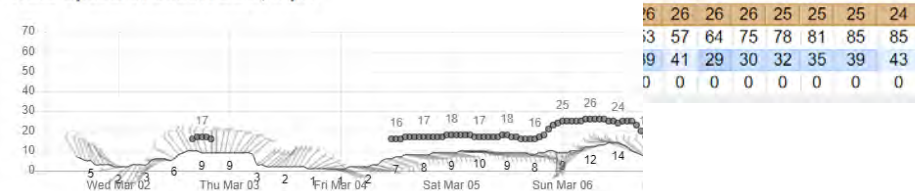
### Weekly Summary

|                         | Tue<br>Mar 1 | Wed<br>Mar 2 | Thu<br>Mar 3 | Fri<br>Mar 4 | Sat<br>Mar 5 | Sun<br>Mar 6 | Mon<br>Mar 7 |
|-------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Max Temp, °F            | 44           | 40           | 30           | 36           | 48           | 46           | 35           |
| Min Temp, °F            | 26           | 26           | 16           | 20           | 29           | 29           | 25           |
| Min Wind Chill, °F      | 25           | 17           | 9            | 18           | 22           | 23           | 18           |
| Max Wind, mph           | 7            | 10           | 9            | 9            | 10           | 14           | 10           |
| Min Wind, mph           | 2            | 2            | 1            | 1            | 8            | 6            | 6            |
| Max Wind Gust, mph      | 14           | 17           | 14           | 18           | 24           | 26           | 20           |
| Max Cloud Cover, %      | 43           | 88           | 75           | 86           | 90           | 81           | 82           |
| Min Cloud Cover, %      | 29           | 55           | 51           | 68           | 80           | 46           | 51           |
| Max Prob. of Precip., % | 6            | 31           | 8            | 38           | 86           | 38           | 36           |
| Max RH, %               | 85           | 88           |              |              |              |              |              |
| Min RH, %               | 49           | 70           |              |              |              |              |              |
| Max Dew Point, °F       | 26           | 31           |              |              |              |              |              |
| Min Dew Point, °F       | 24           | 19           |              |              |              |              |              |

### Hourly Table

| Day of week:          | Tuesday 3/1 |     |     |     |     |     |     |      |      |      |  |
|-----------------------|-------------|-----|-----|-----|-----|-----|-----|------|------|------|--|
| Time:                 | 2PM         | 3PM | 4PM | 5PM | 6PM | 7PM | 8PM | 9PM  | 10PM | 11PM |  |
| Weather:              |             |     |     |     |     |     |     |      |      |      |  |
| Temperature (°F):     | 44          | 44  | 42  | 40  | 37  | 33  | 31  | 30   | 29   | 28   |  |
| Wind Chill, °F:       | 40          | 40  | 38  | 37  | 33  | 30  | 28  | 26   | 25   | 28   |  |
| Wind Speed (mph):     | 7           | 7   | 6   | 5   | 5   | 3   | 3   | 3    | 2    |      |  |
| Wind Gust (mph):      | 13          | 14  | 13  | 10  | 8   | 8   | 7   | 7    | 6    | 5    |  |
| Wind Direction (°):   | 330         | 330 | 340 | 340 | 340 | 340 | 330 | 330  | 320  | 320  |  |
| Wind Direction:       |             |     |     |     |     |     |     |      |      |      |  |
| Prob. of Precip. (%): | 6           | 6   | 6   | 6   | 0   | 0   | 0   | 0    | 0    | 0    |  |
| Prob. of Thunder (%): | -           | -   | -   | -   | -   | -   | -   | -    | -    | -    |  |
| Precip. Amount (in.): | 0.00        |     |     |     |     |     |     | 0.00 |      |      |  |
| Snow (in.):           | 0.00        |     |     |     |     |     |     | 0.00 |      |      |  |

Wind Speed/Direction/Gust, mph



Local forecast by "City, ST" or ZIP code

Enter location:

Location Help

MY FORECAST  
3 Miles ESE Milwaukee WI

**71°F**  
22°C Get Detailed info

Today  
 Mostly Sunny  
High: 72°F

Tonight  
 Mostly Clear  
Low: 57°F

News Headlines

- Latest Drought Information for Wisconsin... Updated Aug 3
- Southern Wisconsin Historical Event Series/Story Maps
- Flood Level Changes and New Forecast Service for Black Earth

NWS Forecast Office Milwaukee/Sullivan, WI  
Weather.gov > Milwaukee/Sullivan, WI

Current Hazards | Current Conditions | Radar | Forecasts | Rivers and Lakes | Climate and Past Weather | Local Programs

Click a location below for detailed forecast.

Map locations: La Crosse, Wisconsin Dells, Beaver Dam, Sheboygan, Mineral Point, Madison, Milwaukee, Janesville, Rockford, Waubesa.

Watches, Warnings & Advisories

- Severe Thunderstorm Warning
- Severe Weather Statement
- Flood Warning
- Severe Thunderstorm Watch
- Heat Advisory
- Flood Watch
- Special Weather Statement
- Air Quality Alert
- Hazardous Weather Outlook

Last Map Update: Tue, Aug. 10, 2021 at 4:34:52 pm CDT

Weather Story

Severe Storms mainly after 9 PM

Key Messages:

- Clusters of one or more thunderstorms will track from the west through to the east into early morning hours on Tuesday.
- These storms of severe can and are having local hail impact.
- All severe weather hazards are possible, but a mode of damaging winds, possibly hurricane force, remains the primary threat west of the Rock Lake River in Wisconsin.

Possible Hazards

- Tornadoes
- Damaging Winds
- Hail

Weather Map

Local Radar

Follow us on Twitter | Follow us on Facebook | Follow us on YouTube | MKX RSS Feed

|   |   |   |  |   |                                       |
|---|---|---|--|---|---------------------------------------|
| <b>HAZARDS</b><br>National Briefing<br>Hazardous Weather Outlook<br>Skywarn<br>View Local Storm Reports<br>Submit A Storm Report<br>Winter Weather<br>Summer Weather<br>Beach Hazards | <b>CURRENT CONDITIONS</b><br>NWS MKX Observation<br>NWS MKX Tower Camera<br>Local Conditions<br>Local Text Products | <b>LOCAL FORECASTS</b><br>Marine<br>Aviation<br>Fire<br>Local Text Products<br>Local Precip Forecast<br>Hourly Forecast Graphics<br>Forecast Discussion | <b>CLIMATE</b><br>CoCoRaHS<br>Normals/Records MKX/MSN<br>Local Climate Products<br>Daily Climate Graphics<br>Historic Events For Sm WI | <b>DSS PROGRAMS</b><br>Milwaukee Extreme Heat Chances<br>Milwaukee Warning Shelter<br>DSS page<br>In-land Lake Forecasts<br>Lake Michigan Beach Hazards | <b>ABOUT US</b><br>Office Information |
|---|---|---|--|---|---------------------------------------|

# Wisconsin Spring Flood Potential and Probabilistic River Forecasts

**March 8, 2022**



**Presenter: Sarah Marquardt, Senior Service Hydrologist**

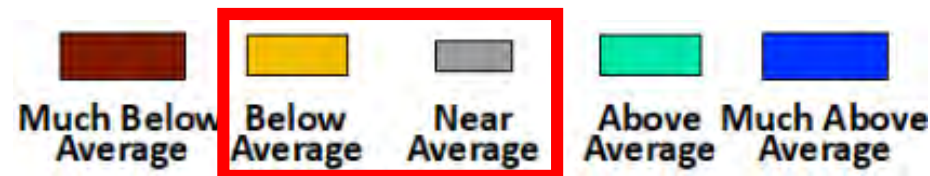


**National Weather Service Milwaukee**

# Show of Hands

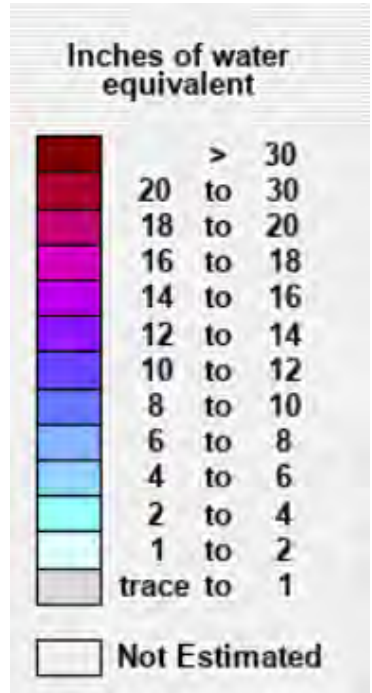
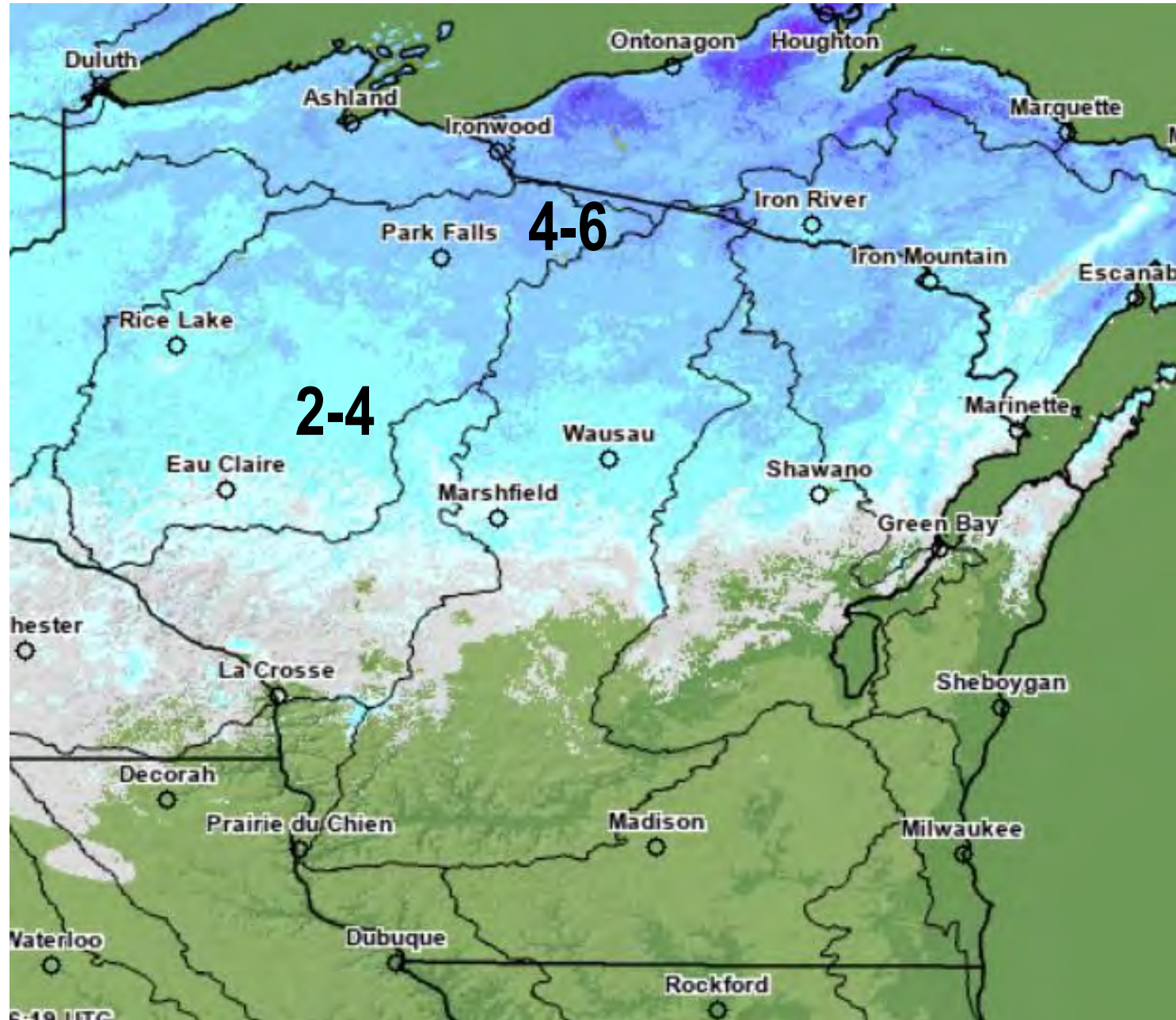


# Spring Flood Risk



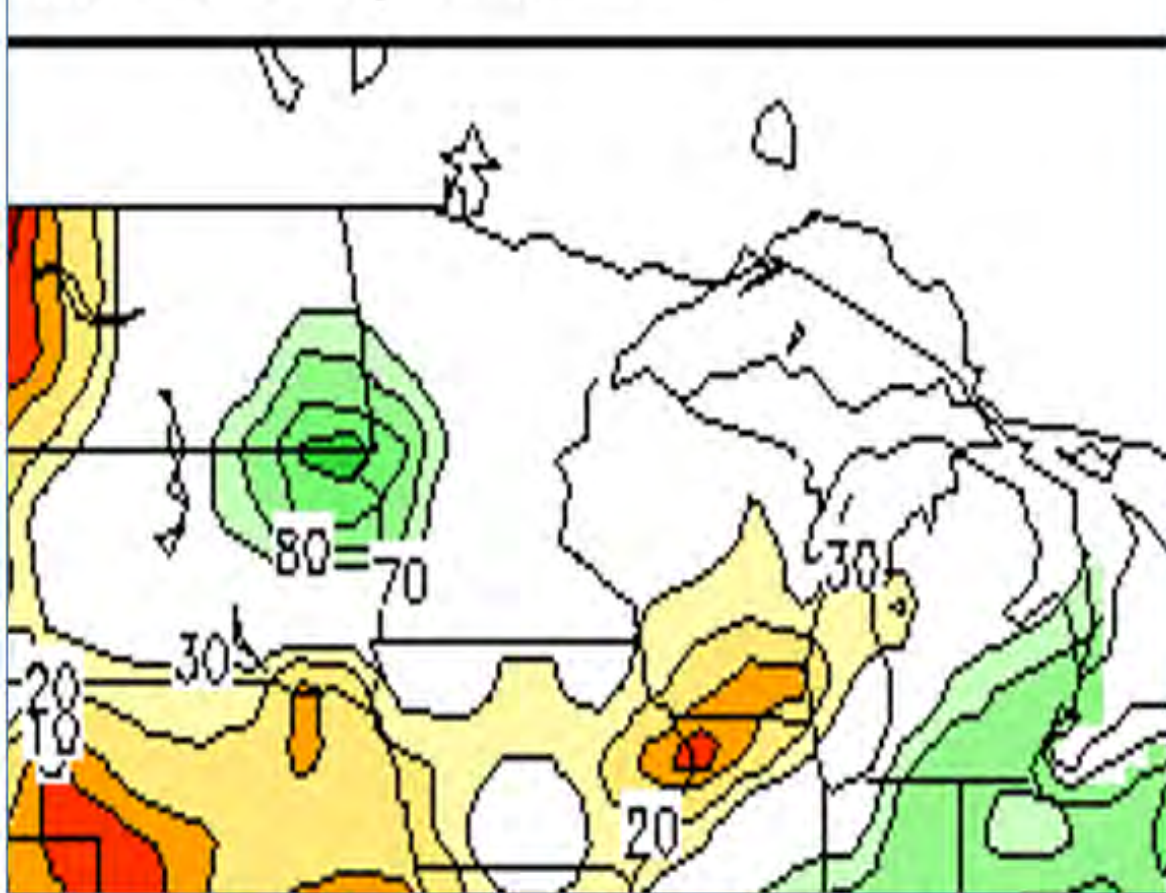
- **Spring flood risk is average in northern Wisconsin and below average in southern Wisconsin**
  - Additional snow pack could increase this risk
  - Flooding is possible with rain on frozen ground
  - Greatest risk of flooding occurs with snow melt and moderate to heavy rain
- **Break up ice jams**

# Snow Water Equivalent (inches) 3/6/2022



# Soil Moisture Percentile

MAR 06, 2022



## U.S. Drought Monitor

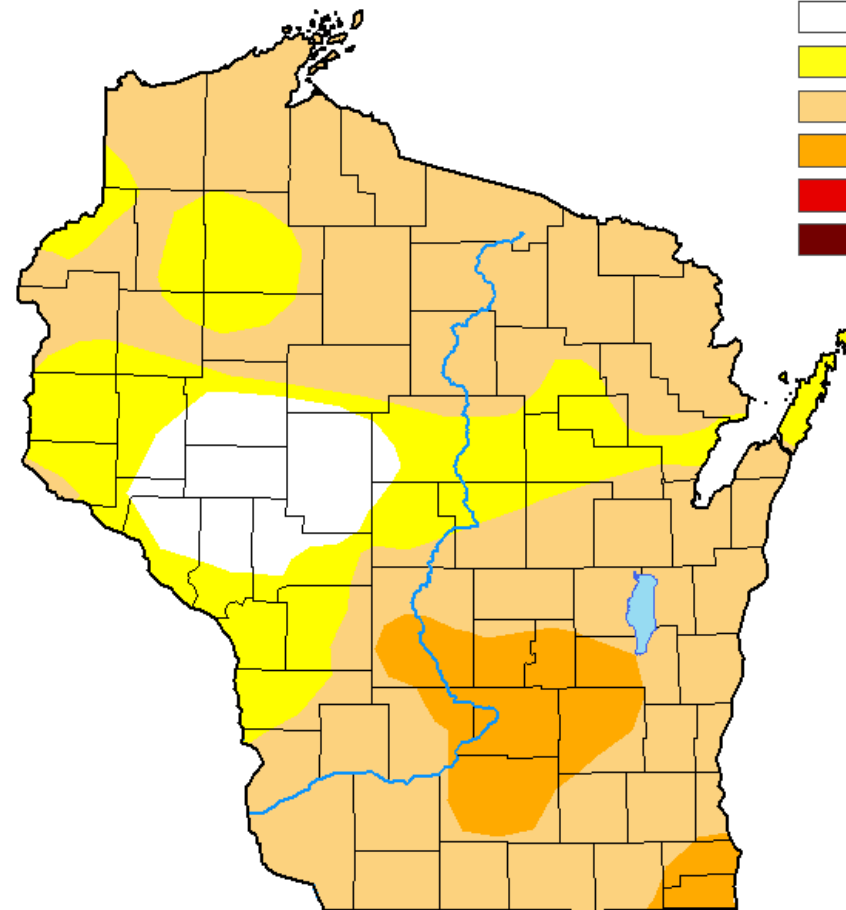
# Wisconsin

Map released: Thurs. March 3, 2022

Data valid: March 1, 2022 at 7 a.m. EST

Intensity:

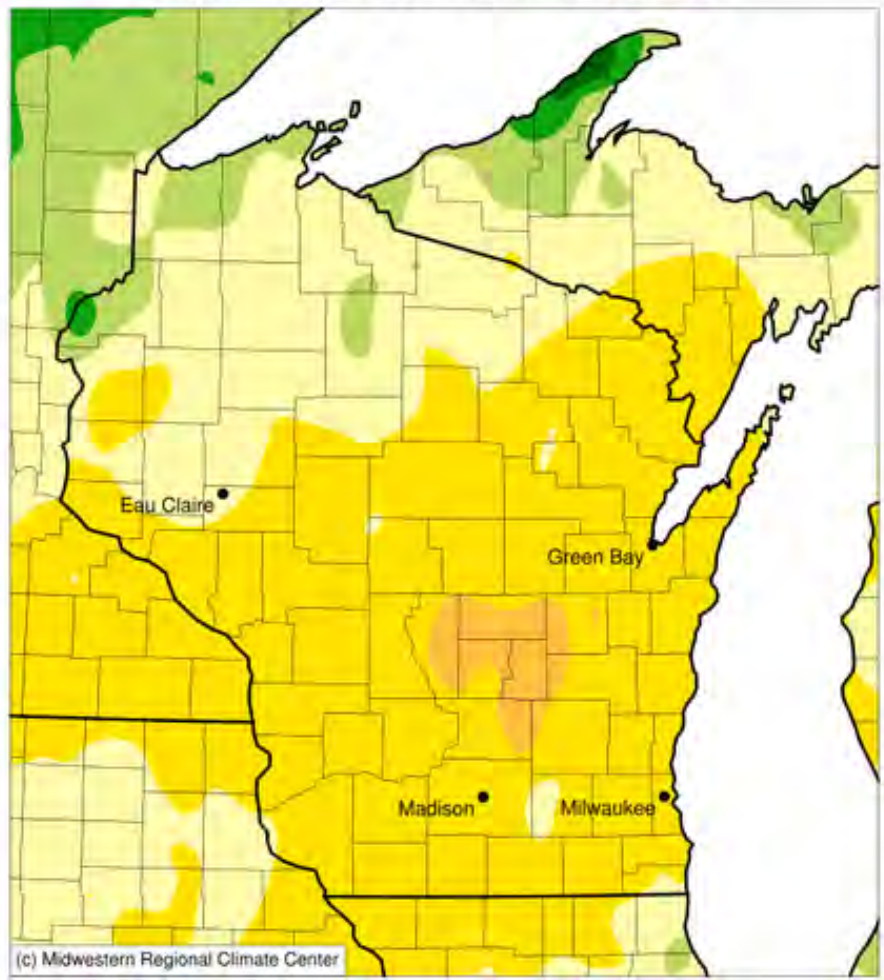
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought





Accumulated Precipitation (in): Percent of 1991-2020 Normals

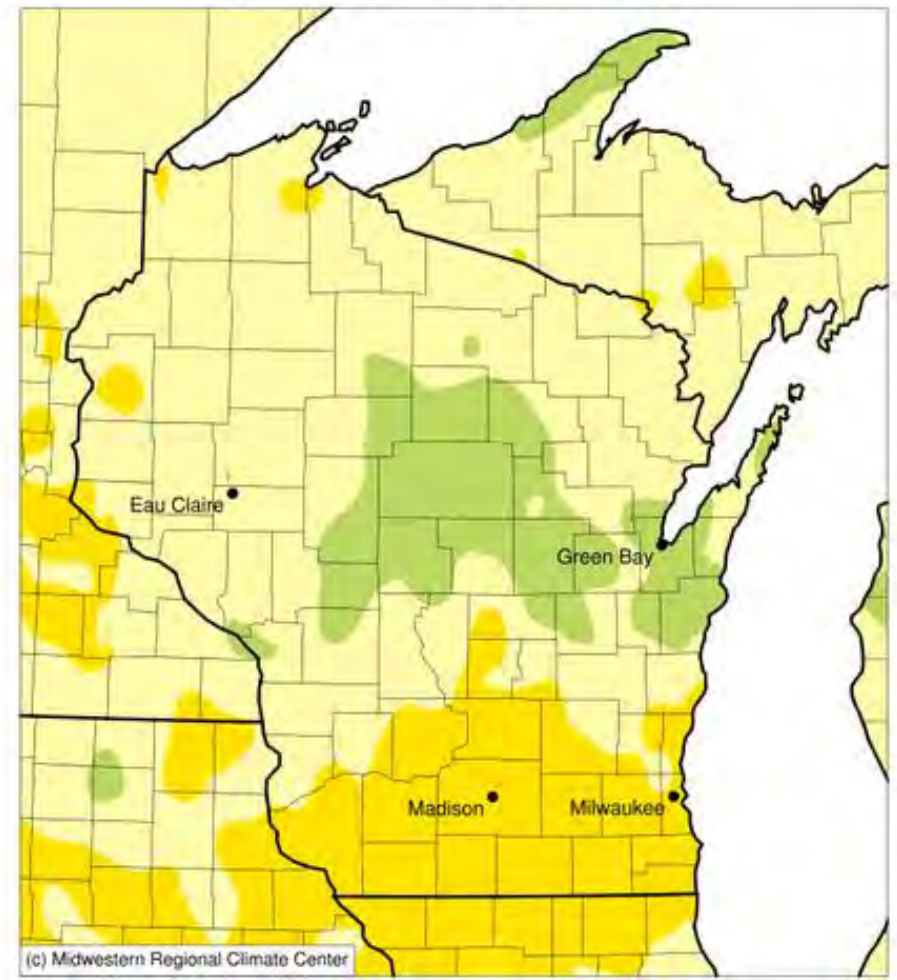
September 01, 2021 to March 07, 2022



50 75 100 125 150  
 Stations from the following networks used: WBAN, COOP, FAA, GHCN, ThreadEx, CoCoRaHS, WMO, ICAO, NWSLI,  
 Midwestern Regional Climate Center  
 cli-MATE: MRCC Application Tools Environment  
 Generated at: 3/7/2022 1:52:21 PM CST

Accumulated Precipitation (in): Percent of 1991-2020 Normals

April 01, 2021 to March 07, 2022



25 50 75 100  
 Stations from the following networks used: WBAN, COOP, FAA, GHCN, ThreadEx, CoCoRaHS, WMO, ICAO, NWSLI,  
 Midwestern Regional Climate Center  
 cli-MATE: MRCC Application Tools Environment  
 Generated at: 3/7/2022 1:53:08 PM CST

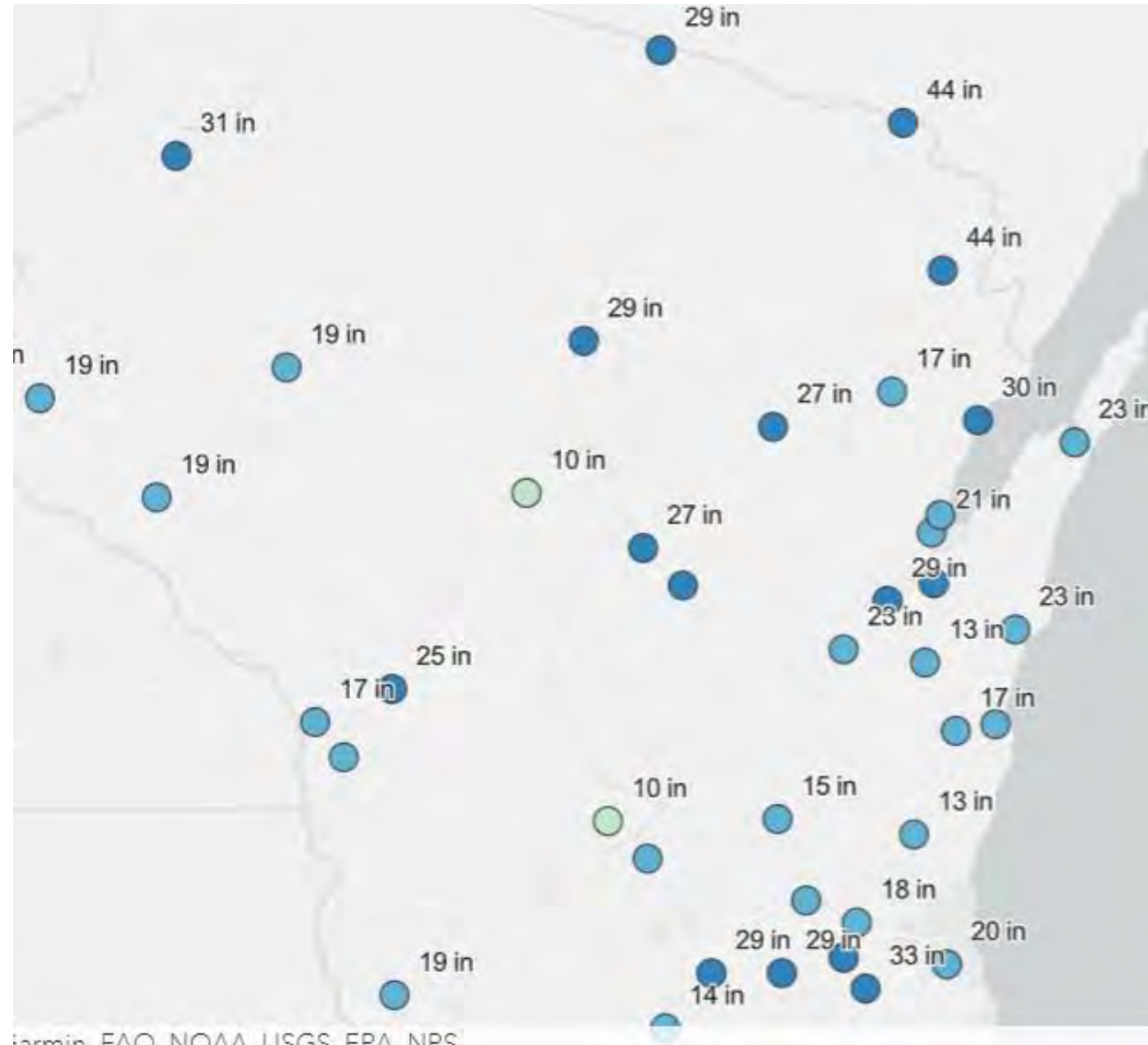


# Frost Depth 3/7/2022

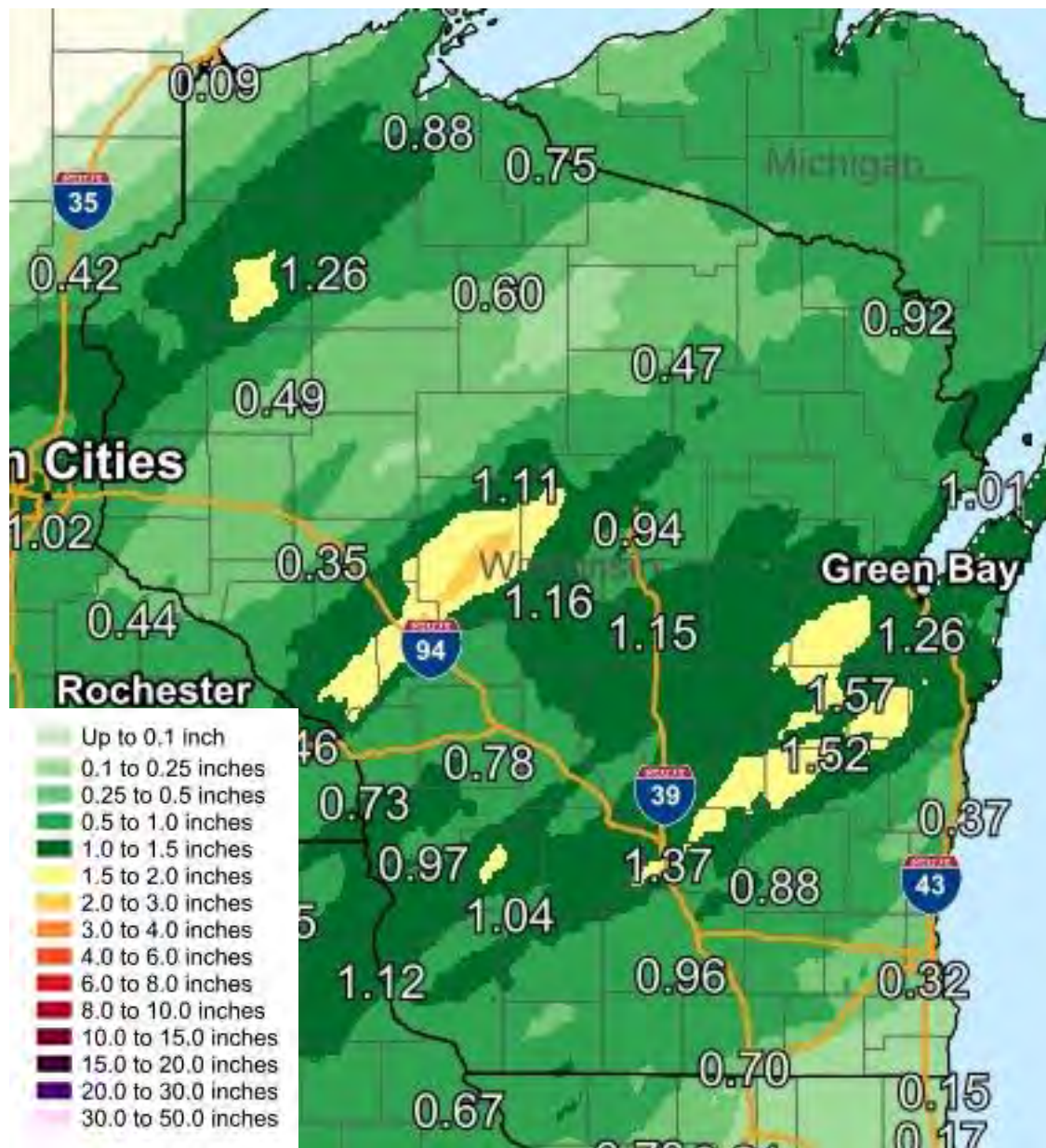
Soil Frost Depth (Inches)

FrostDepth

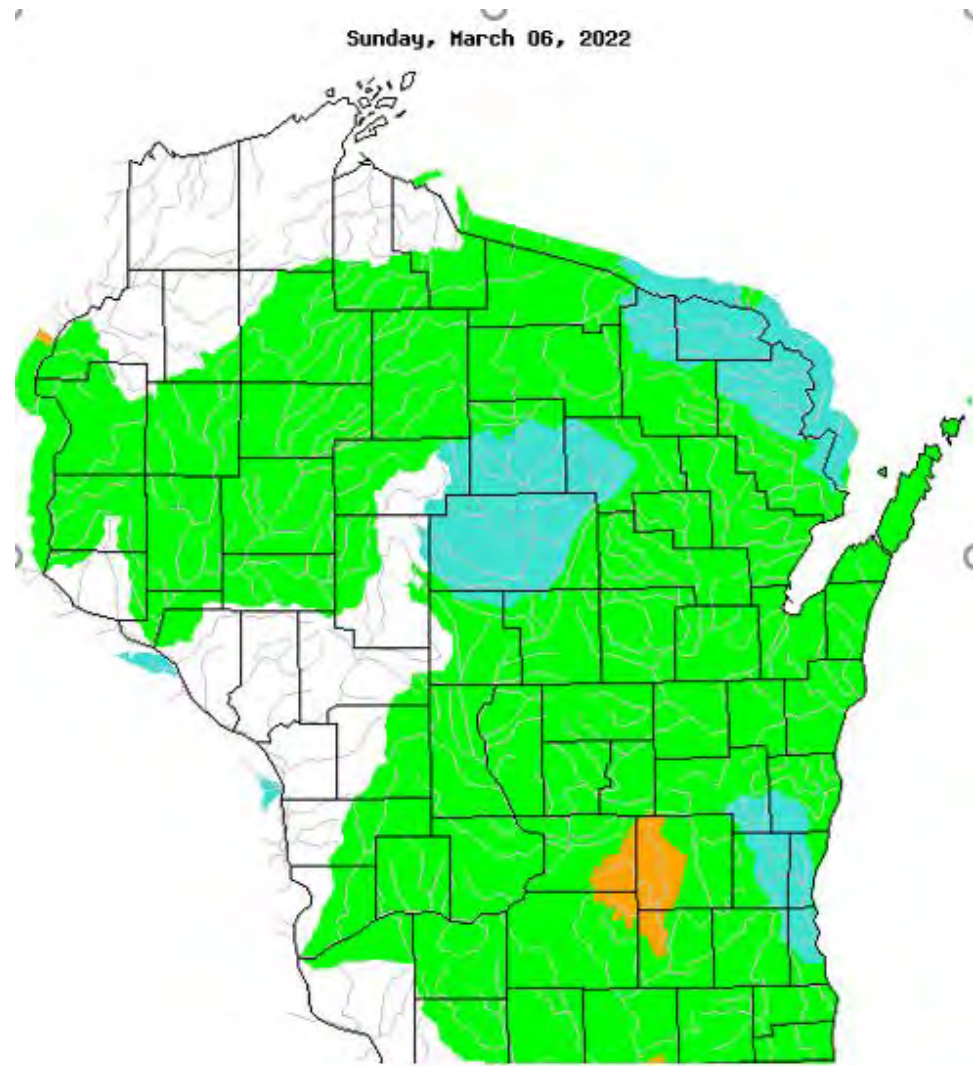
- > 24 - 60
- > 12 - 24
- > 12 - 12
- > 6 - 12
- 0 - 6



# Observed 2 Day Precipitation Friday Night to Saturday Night



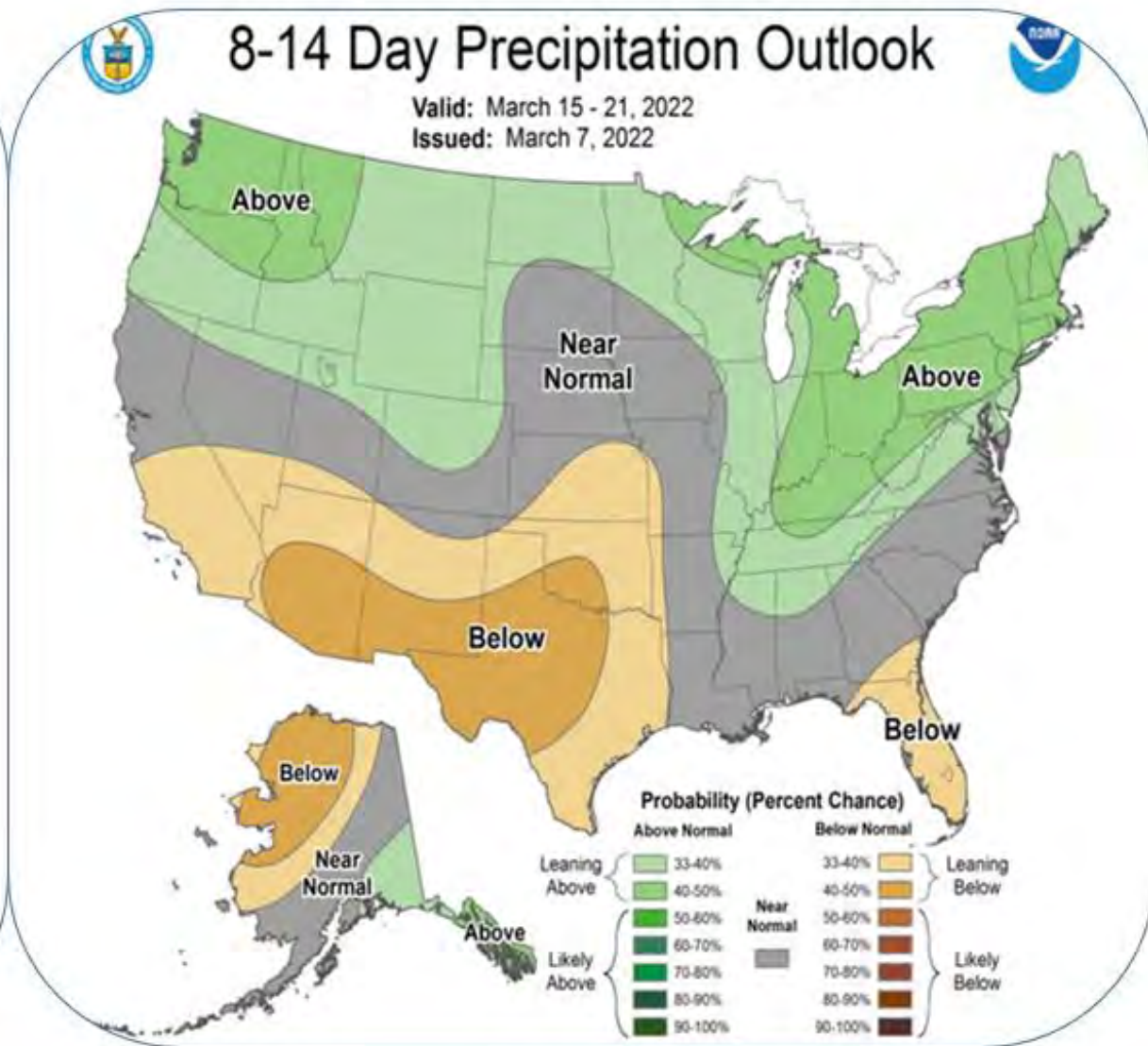
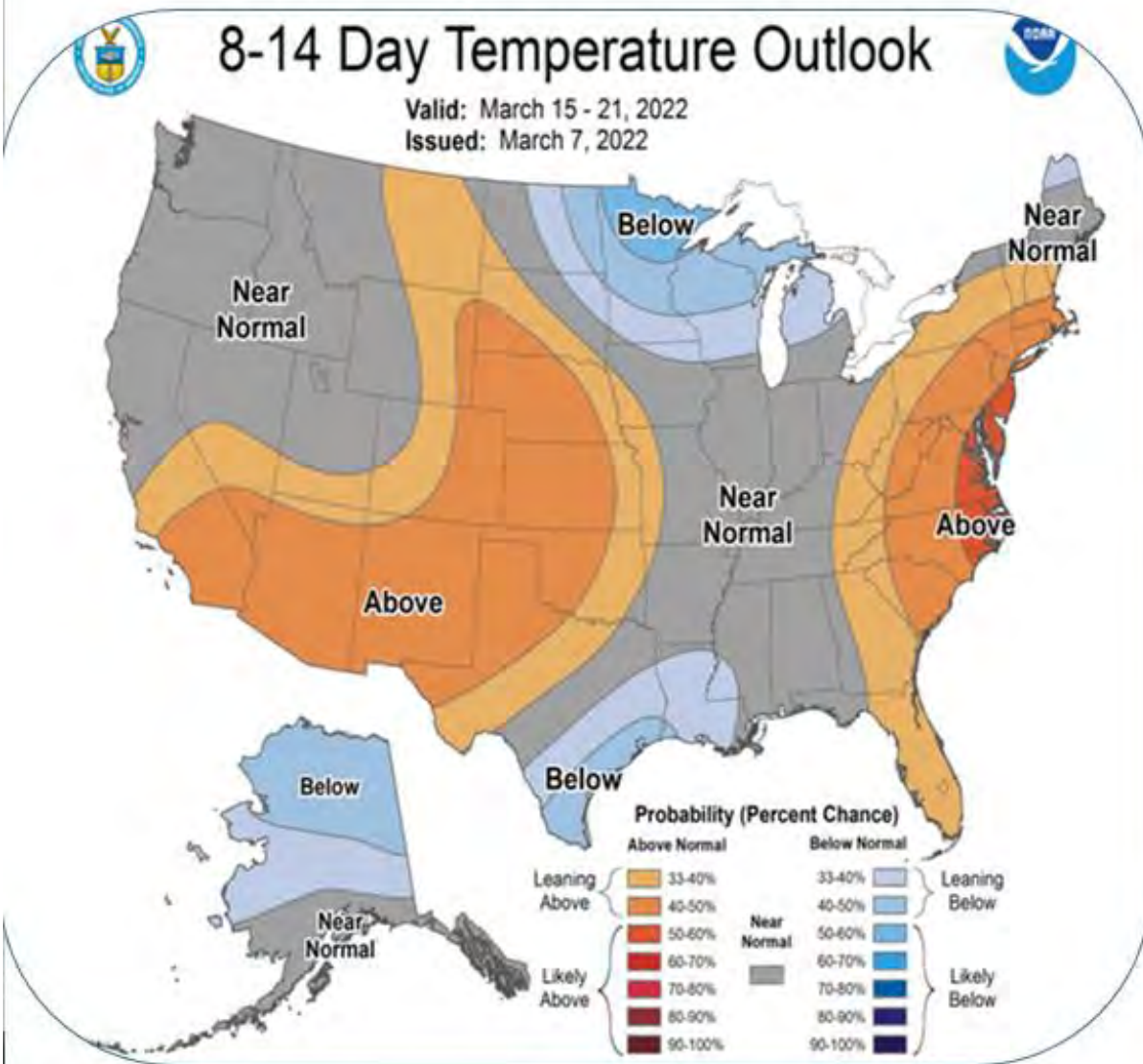
# 7 day Mean Streamflow Percentile

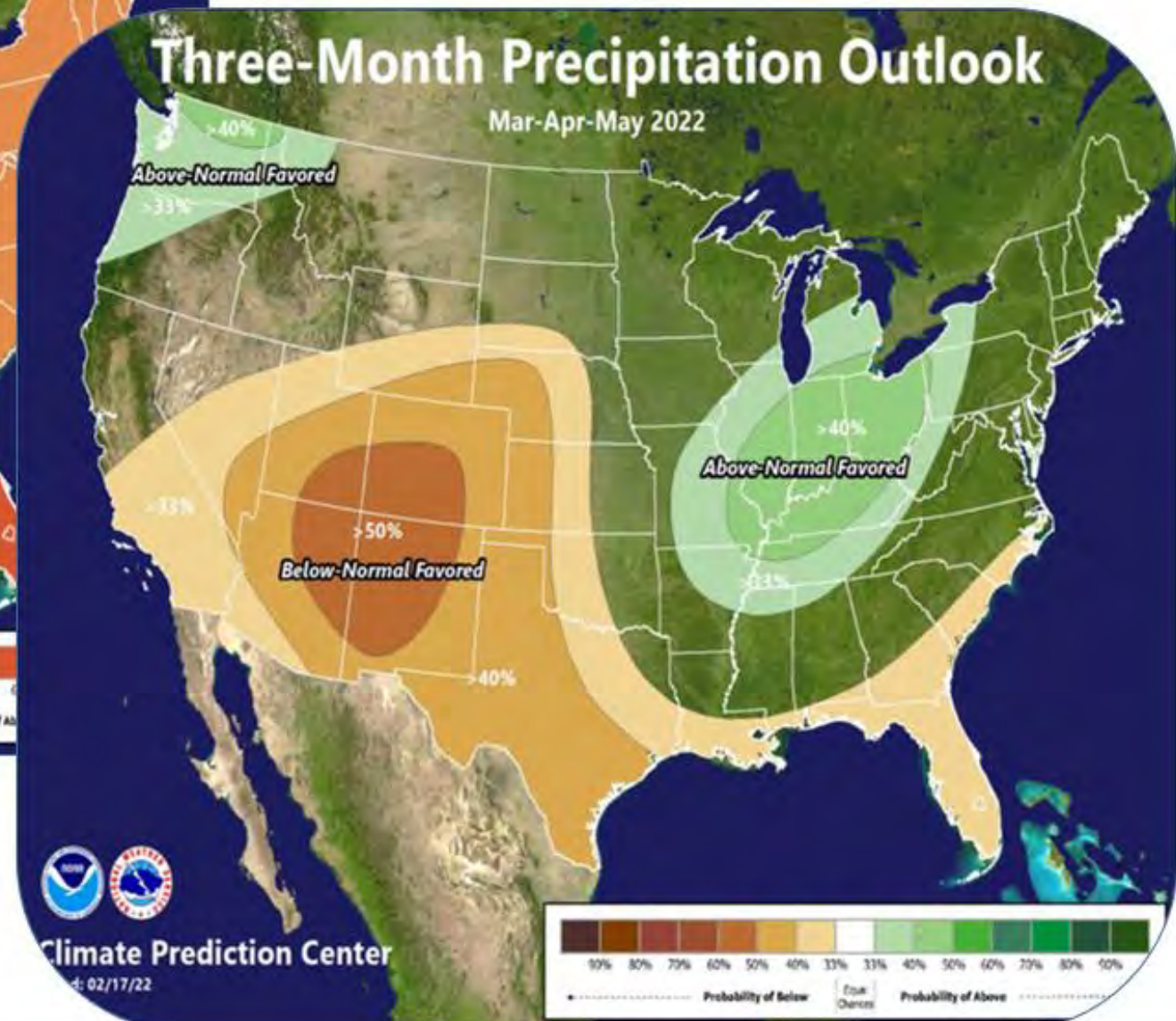
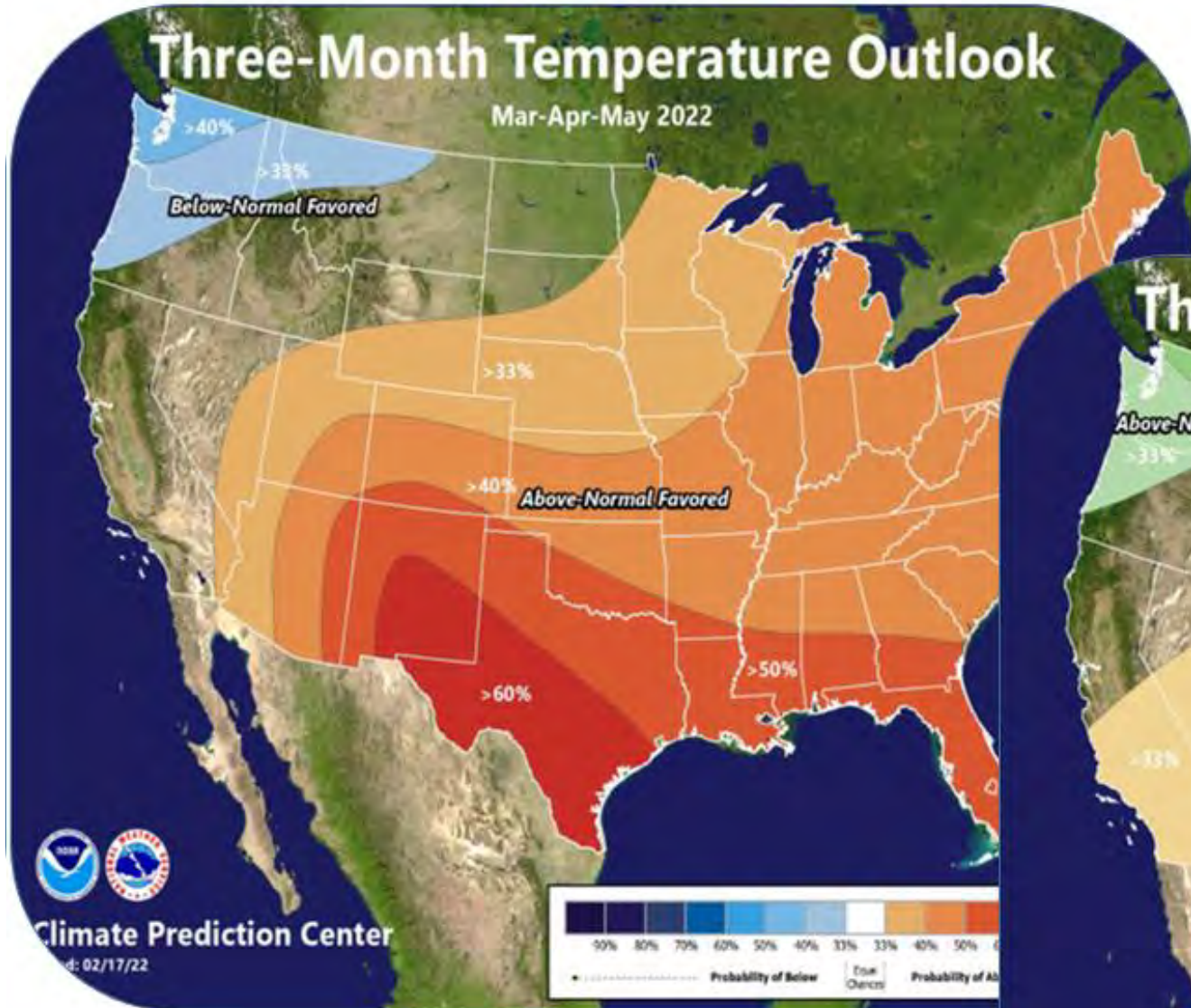


Explanation - Percentile classes

|     |                   |              |        |              |                   |      |         |
|-----|-------------------|--------------|--------|--------------|-------------------|------|---------|
|     |                   |              |        |              |                   |      |         |
| Low | <10               | 10-24        | 25-75  | 76-90        | >90               | High | No Data |
|     | Much below normal | Below normal | Normal | Above normal | Much above normal |      |         |







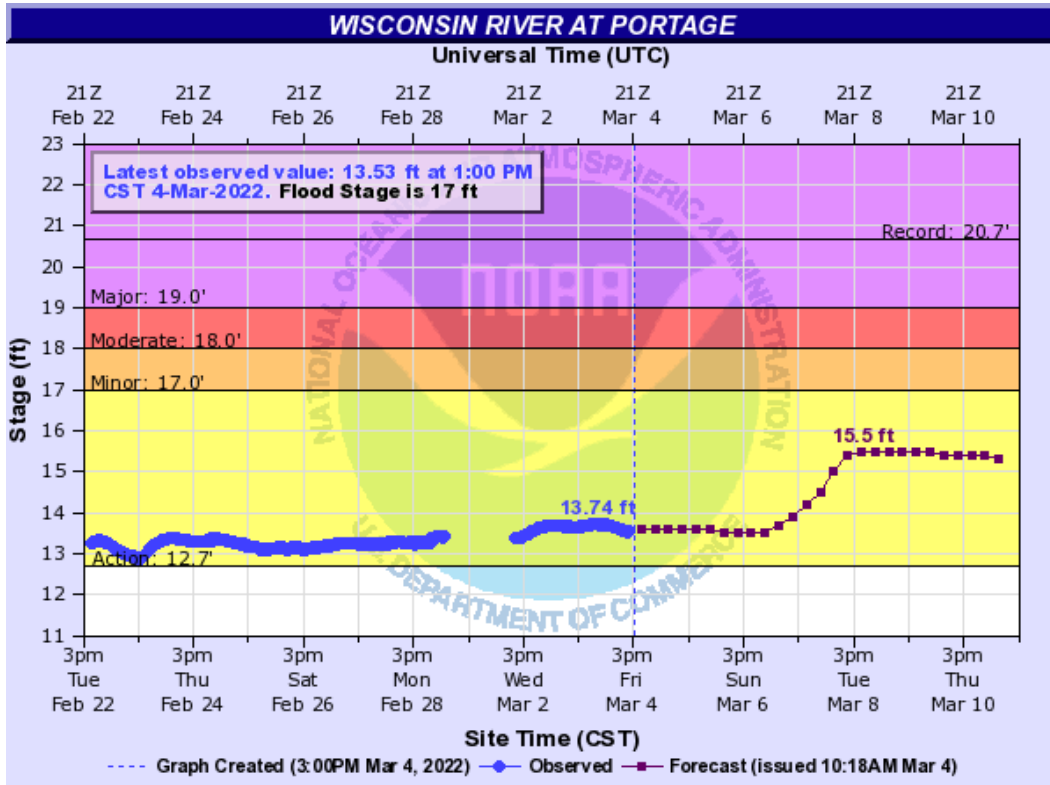
# New River Forecast Planning Tool



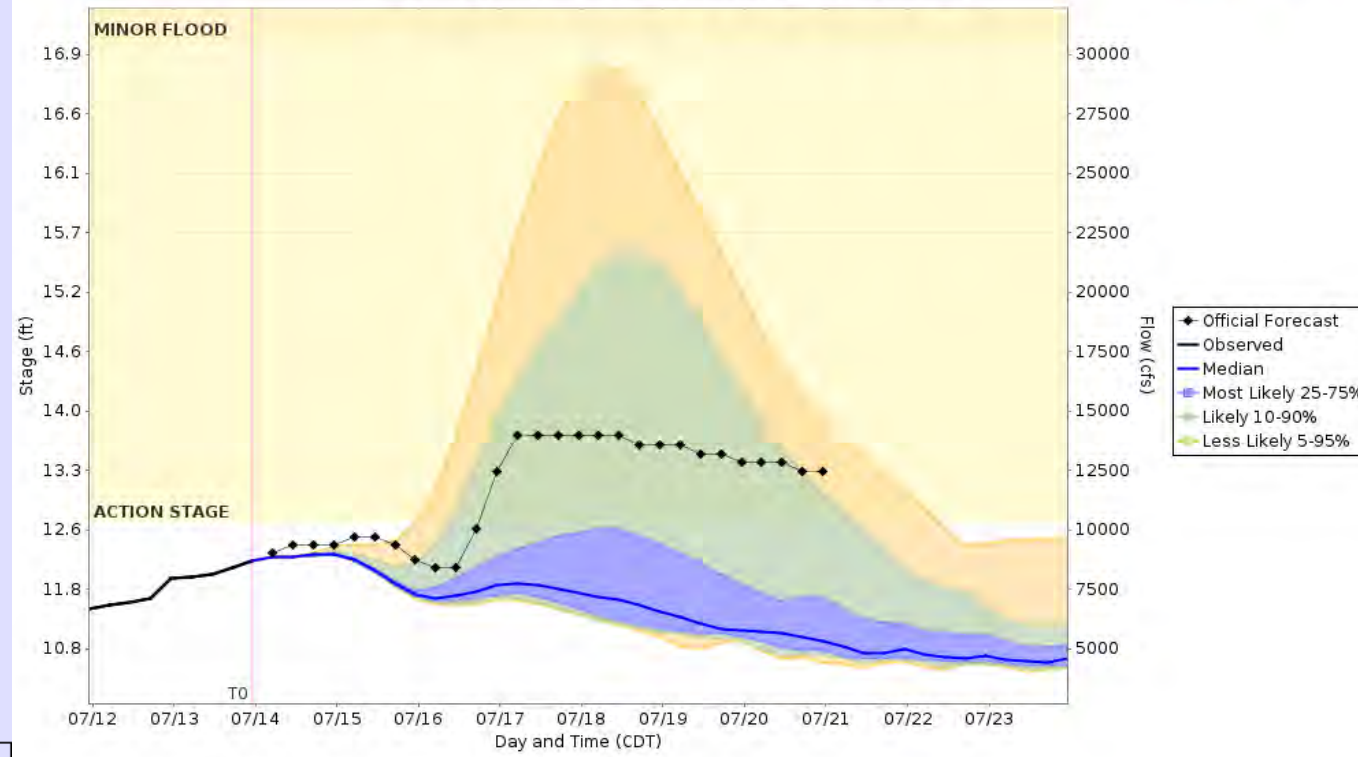
## 10 Day River Level Probabilities

Used to Estimate the Range of Possible River Levels  
[without ENSPOST (Experimental)]

Caution: Official forecast may be updated after this graph is generated.  
For the latest official forecast, go to <http://water.weather.gov/ahps>



PORW3(plotting HGIRP) "Gage 0" Datum: 774.3' | Observations courtesy of NWS, City/Portage, Columbia Co.



# Hydrologic Ensemble Forecast Service (HEFS) Probabilistic Forecast Hydrograph

Shaded area shows the range of possible river levels. There is a small chance the level could end up outside this range.



## 10 Day River Level Probabilities

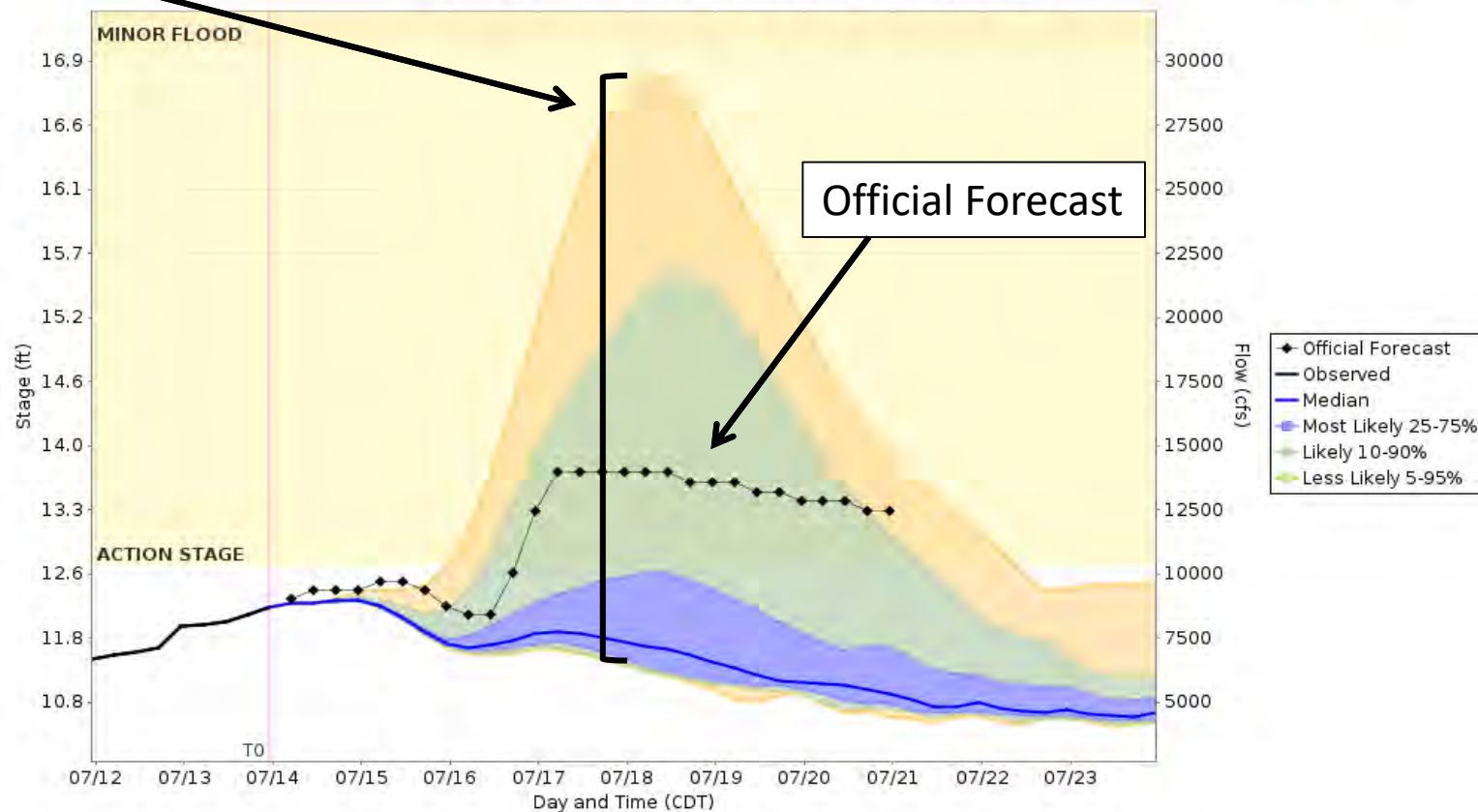
Used to Estimate the Range of Possible River Levels  
[without ENSPOST (Experimental)]

Caution: Official forecast may be updated after this graph is generated.  
For the latest official forecast, go to <http://water.weather.gov/ahps>



### Wisconsin River at Portage (PORW3)

- ◆ Official Forecast
- Observed
- Median
- Most Likely 25-75%
- Likely 10-90%
- Less Likely 5-95%



The hydrograph is based on 10 days of precipitation and temperature forecasts (including snow melt) applied to river forecast models. The official forecast includes 24-48 hours of precipitation.



# Hydrologic Ensemble Forecast Service (HEFS) Probabilistic Forecast Hydrograph

Shaded area shows the range of possible river levels. There is a small chance the level could end up outside this range.



## 10 Day River Level Probabilities

Used to Estimate the Range of Possible River Levels  
[without ENSPOST (Experimental)]

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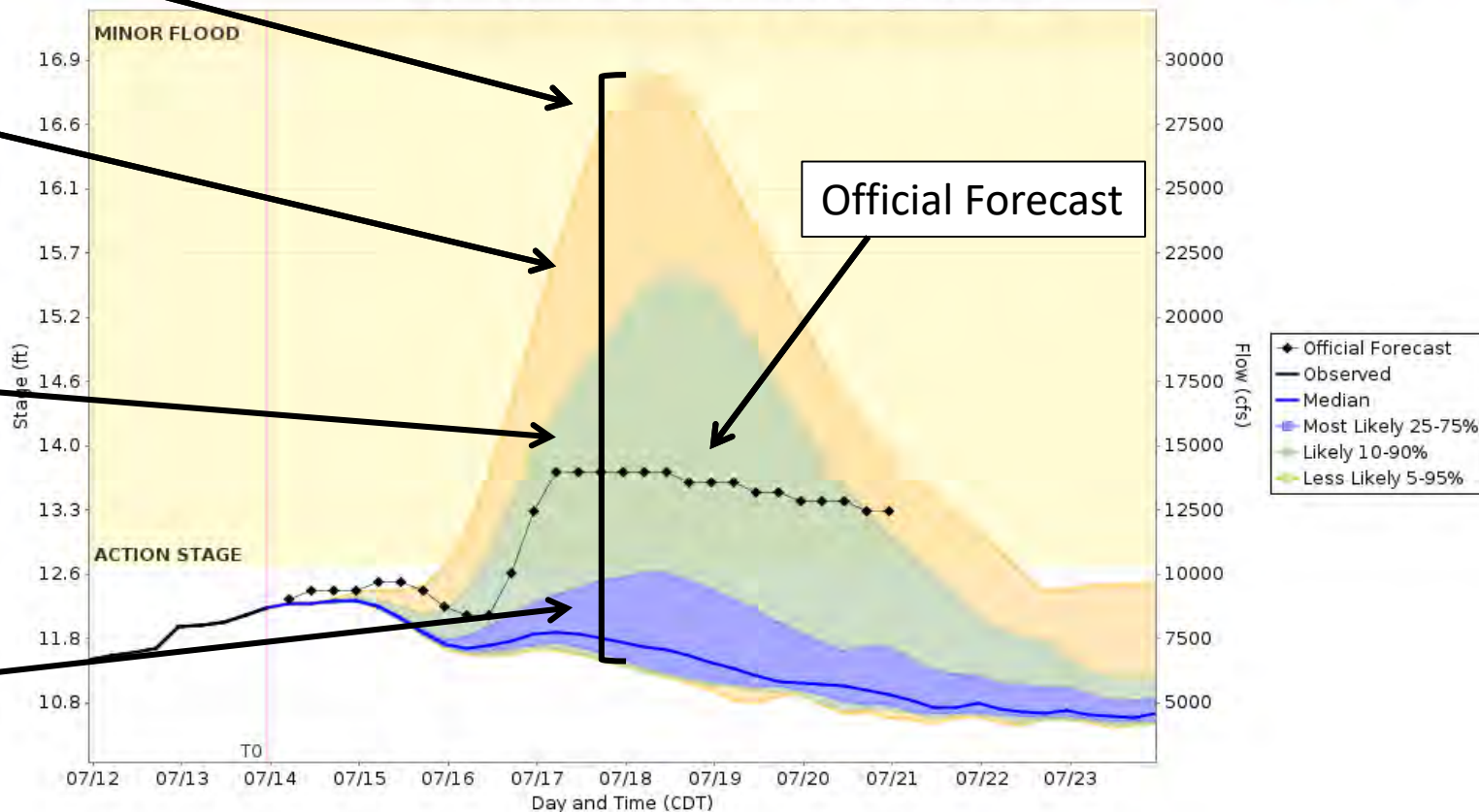


~90% of forecasts are within the blue, green, and tan ranges. ~5% forecasts are above and ~5% are below the tan range.

~80% of forecasts are within the blue and green ranges. ~10% of forecasts are above and ~10% are below the green range.

~50% of forecasts are within the blue shaded range. ~25% of forecasts are above and ~25% are below the blue range.

## Wisconsin River at Portage (PORW3)



The hydrograph is based on 10 days of precipitation and temperature forecasts (including snow melt) applied to river forecast models. The official forecast includes 24-48 hours of precipitation.







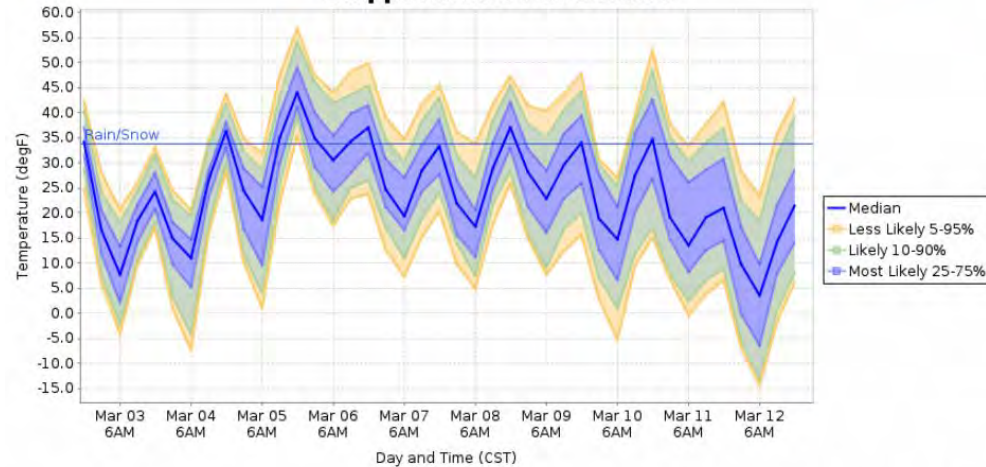
### 10 Day Temperature Probabilities

Used to Estimate the Range of Possible River Levels

Caution: Official forecast may be updated after this graph is generated. For the latest official forecast, go to <http://water.weather.gov/ahps>



#### Chippewa River at Durand



Model runtime: 06:00 PM CST Mar 02 2022



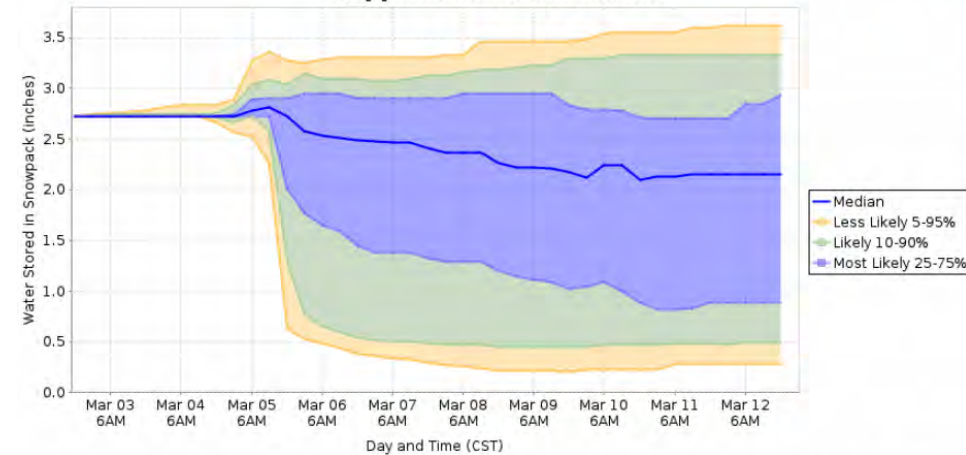
### 10 Day Simulated Stored Water in Snowpack Probabilities

Used to Estimate the Range of Possible River Levels

Caution: Official forecast may be updated after this graph is generated. For the latest official forecast, go to <http://water.weather.gov/ahps>



#### Chippewa River at Durand



Model runtime: 06:00 PM CST Mar 02 2022  
North Central River Forecast Center



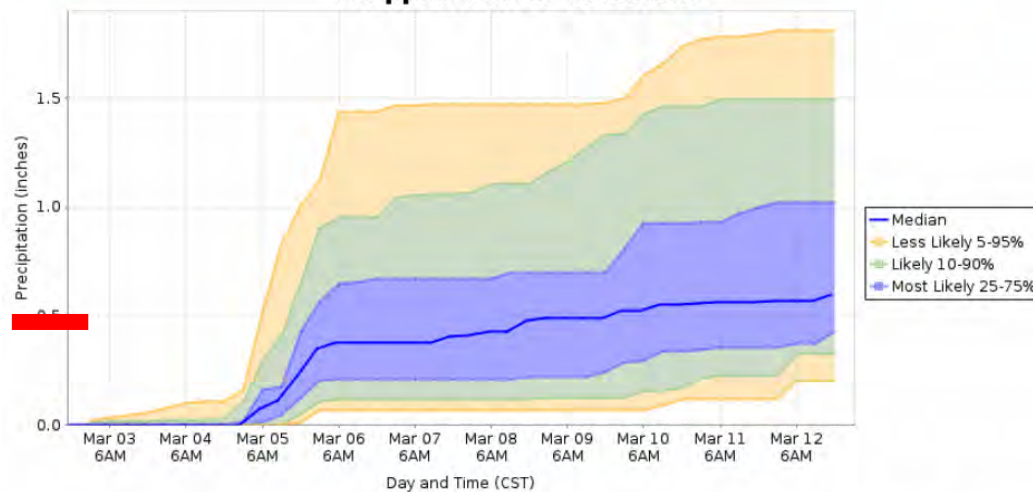
### 10 Day Accumulated Precipitation Probabilities

Used to Estimate the Range of Possible River Levels

Caution: Official forecast may be updated after this graph is generated. For the latest official forecast, go to <http://water.weather.gov/ahps>



#### Chippewa River at Durand



Model runtime: 06:00 PM CST Mar 02 2022  
North Central River Forecast Center



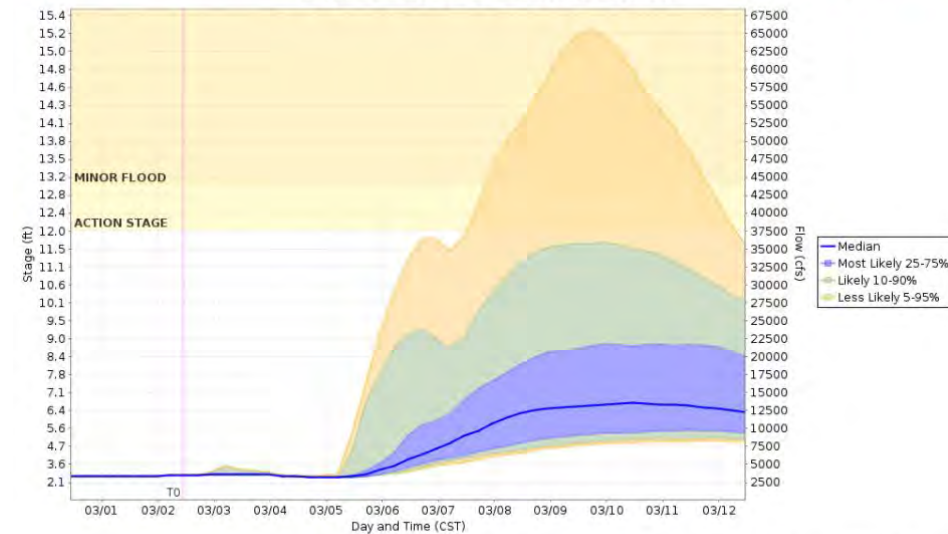
### 10 Day River Level Probabilities

Used to Estimate the Range of Possible River Levels  
[without ENSPOST (Experimental)]

Caution: Official forecast may be updated after this graph is generated. For the latest official forecast, go to <http://water.weather.gov/ahps>



#### Chippewa River at Durand (DURW3)



Model runtime: 06:00 PM CST Mar 02 2022  
North Central River Forecast Center





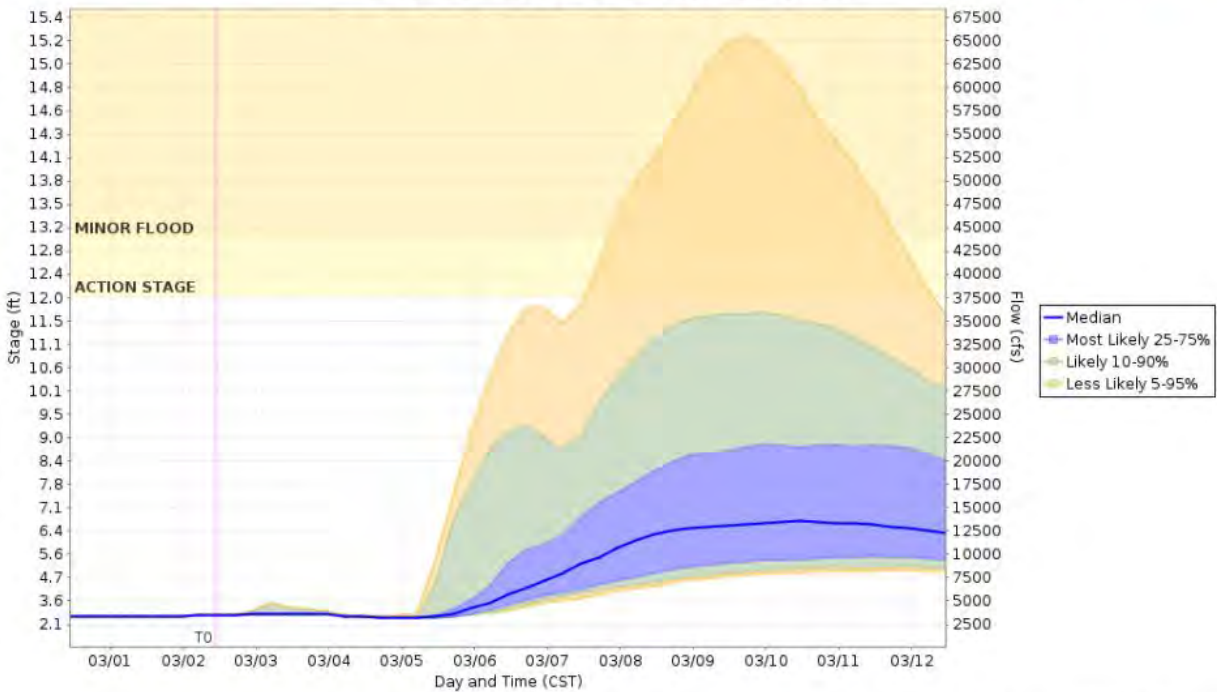
### 10 Day River Level Probabilities

Used to Estimate the Range of Possible River Levels  
[without ENSPOST (Experimental)]

Caution: Official forecast may be updated after this graph is generated.  
For the latest official forecast, go to <http://water.weather.gov/ahps>

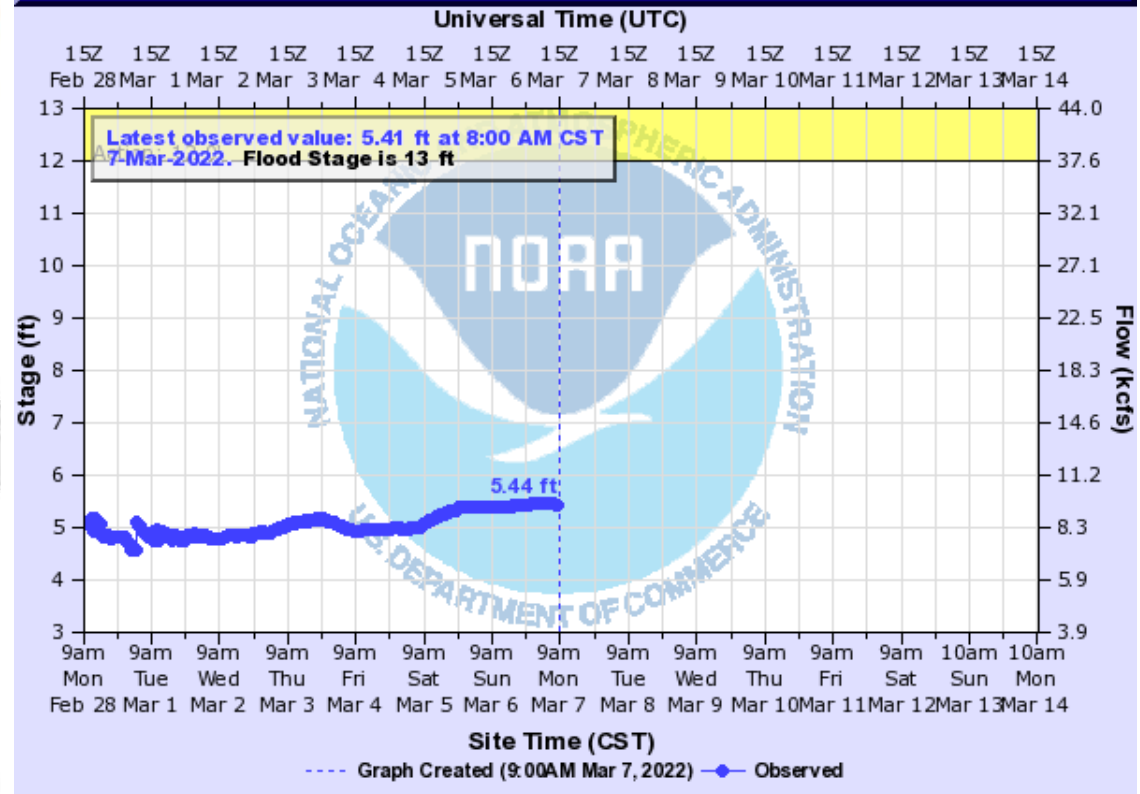


### Chippewa River at Durand (DURW3)



Model runtime: 06:00 PM CST Mar 02 2022  
North Central River Forecast Center

### CHIPPEWA RIVER (WI) AT DURAND



DURW3(plotting HGIRP) "Gage 0" Datum: 692.67'      Observations courtesy of the USGS (05369500)



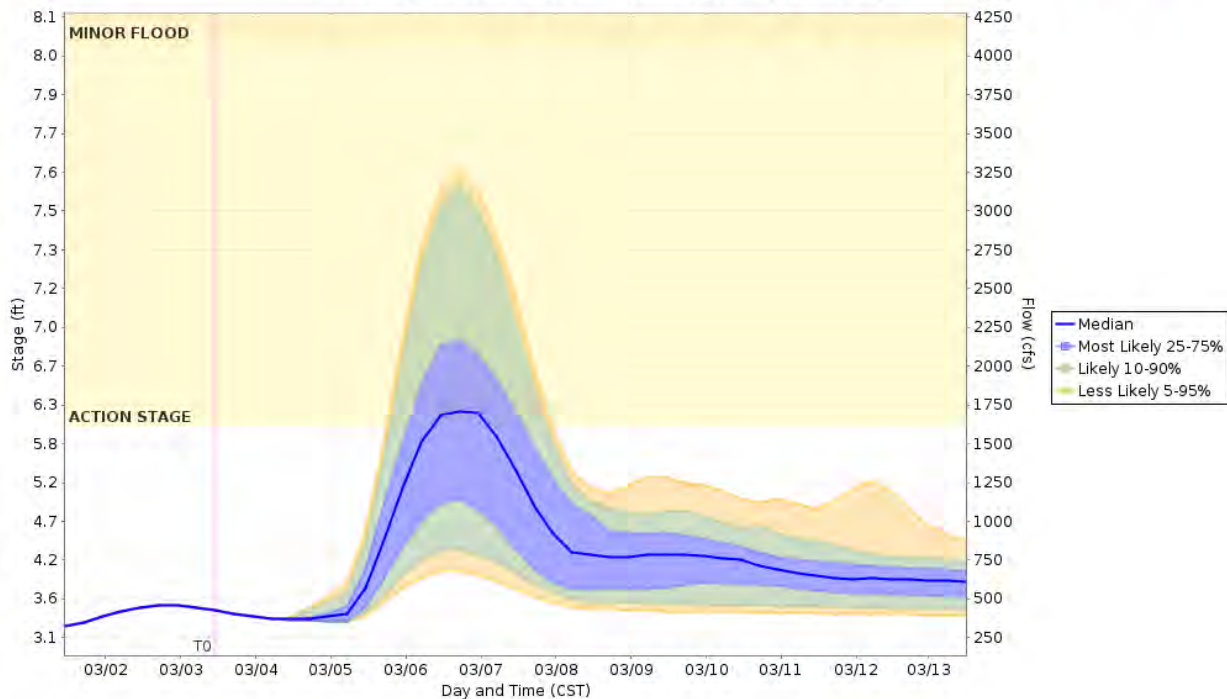


### 10 Day River Level Probabilities

Used to Estimate the Range of Possible River Levels  
[without ENSPOST (Experimental)]

Caution: Official forecast may be updated after this graph is generated.  
For the latest official forecast, go to <http://water.weather.gov/ahps>

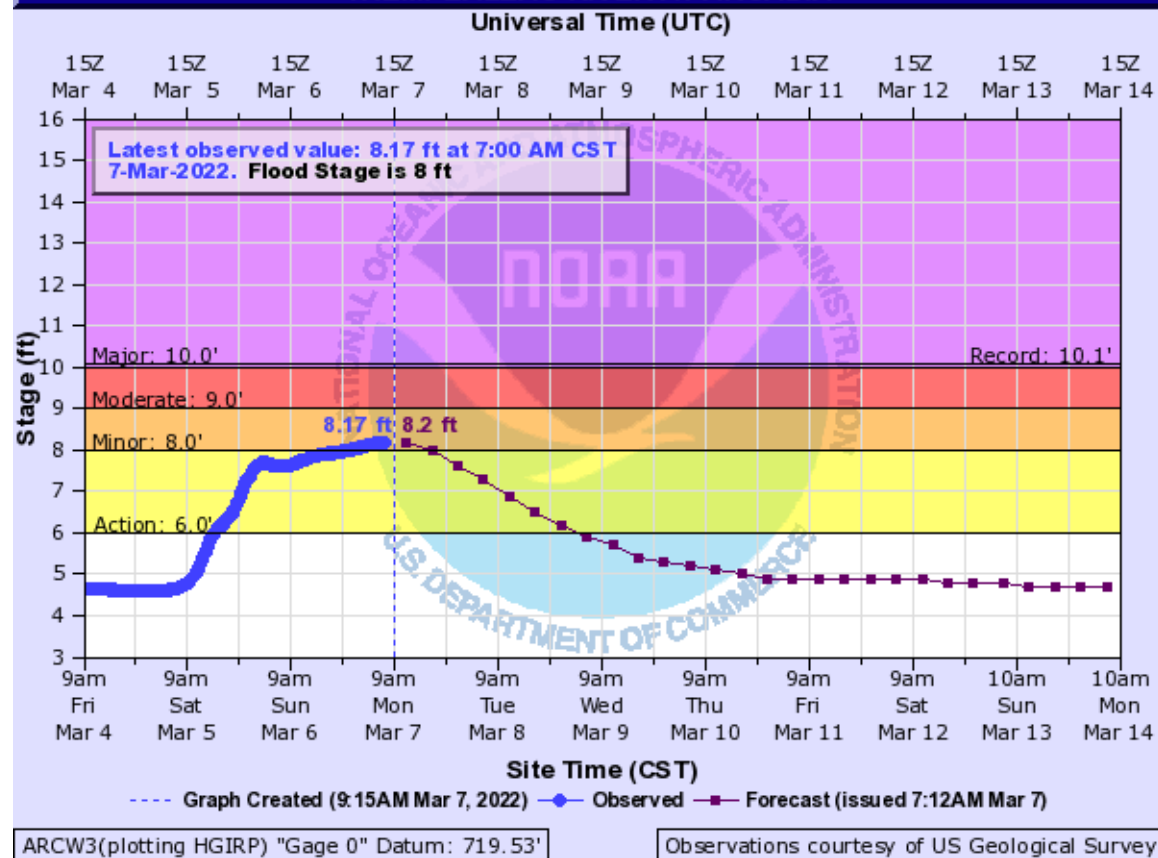
#### Trempealeau River at Arcadia (ARCW3)



Model runtime: 06:00 PM CST Mar 03 2022  
North Central River Forecast Center



#### TREMPEALEAU RIVER AT ARCADIA



ARCW3(plotting HGIRP) "Gage 0" Datum: 719.53'

Observations courtesy of US Geological Survey



# How To Find the Probability Info

## NWS Forecast Office Milwaukee/Sullivan, WI

[Weather.gov](#) > Milwaukee/Sullivan, WI

[Current Hazards](#) [Current Conditions](#) [Radar](#) [Forecasts](#) **[Rivers and Lakes](#)** [Climate and Past](#)



### RADAR UPDATE 7:25 AM

Snow starting to end from west to east. However, roads this morning morning commute. Only minor additional accumulations expected t

Click a location below for detailed forecast.



[Watches, Warnings & Advisories](#)

[Wind Chill Advisory](#)

[Special Weather Statement](#)

[Hazardous Weather Outlook](#)

Zoom Out

Weather Forecast Office Milwaukee/Sullivan, WI

North Central River Forecast Center

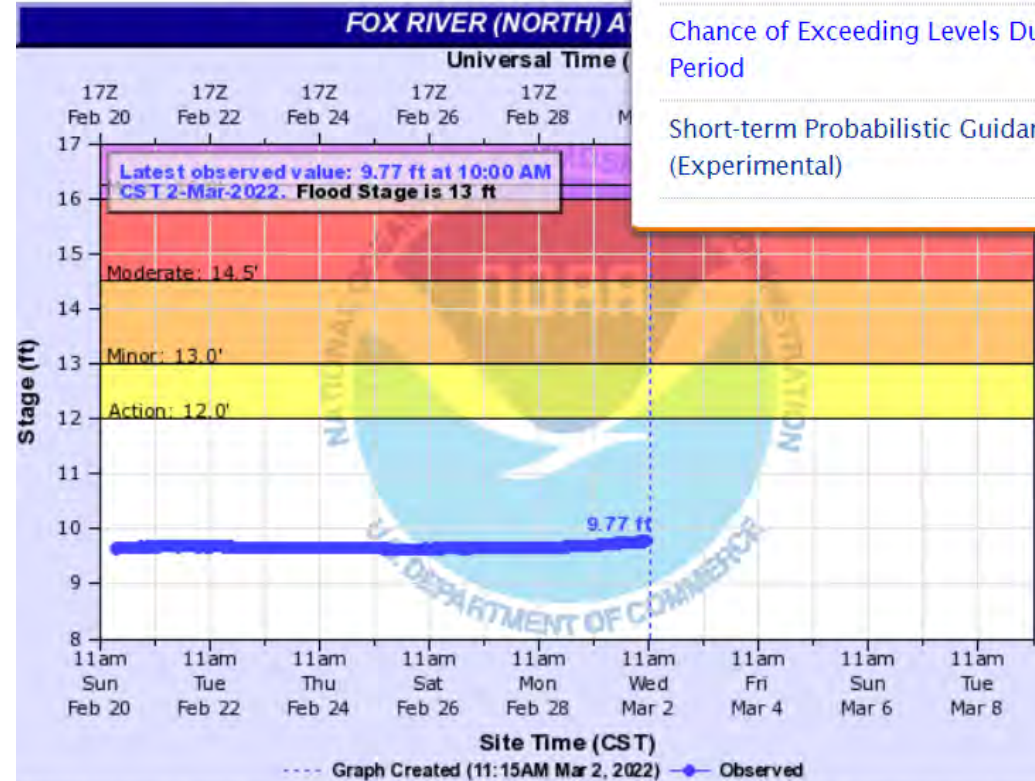
[Hydrograph](#)

[River at a Glance](#)

[Download](#)

**[Probability Information](#)**

Auto Refresh: OFF



Weekly Chance of Exceeding Levels

Chance of Exceeding Levels During Entire Period

Short-term Probabilistic Guidance (Experimental) ←

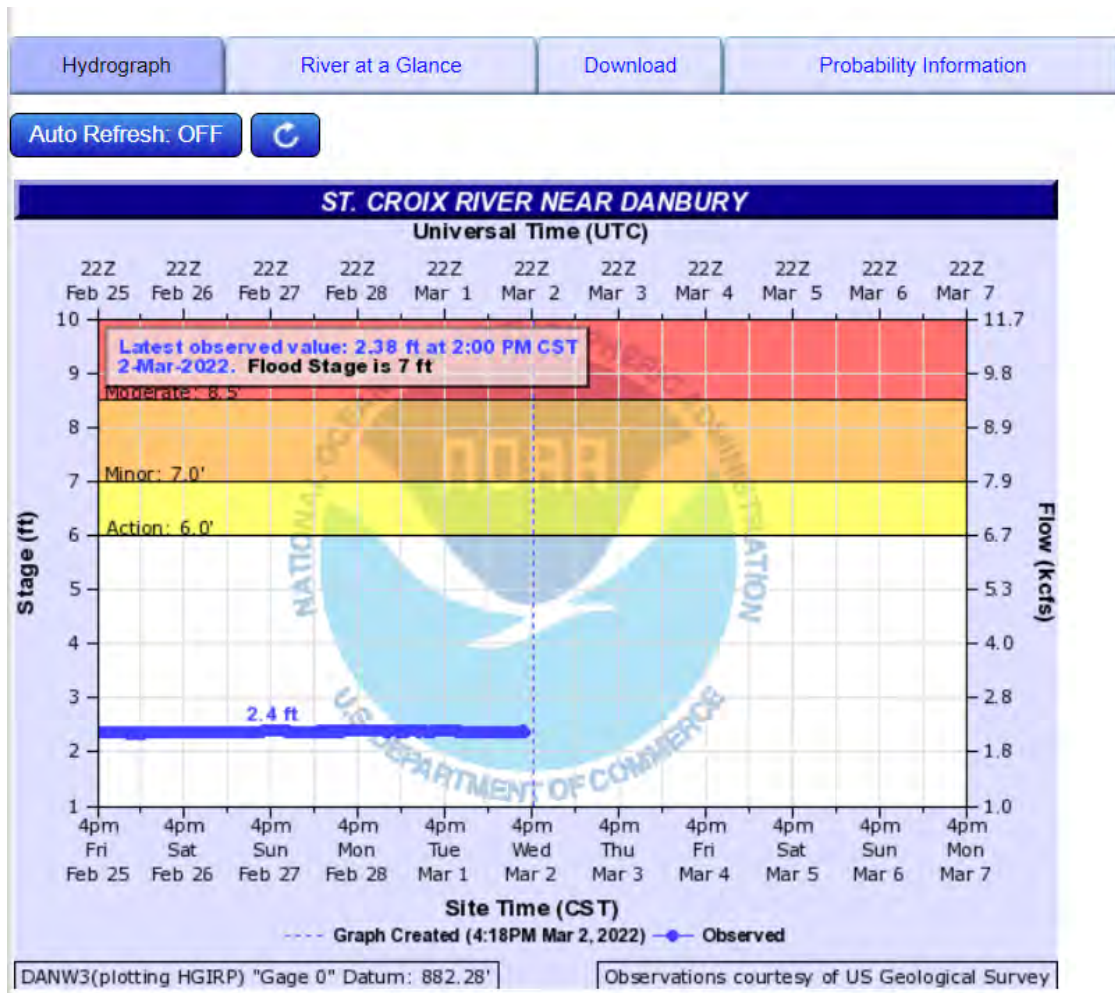


BERW3(plotting HGIRP) "Gage 0" Datum: 744.82'

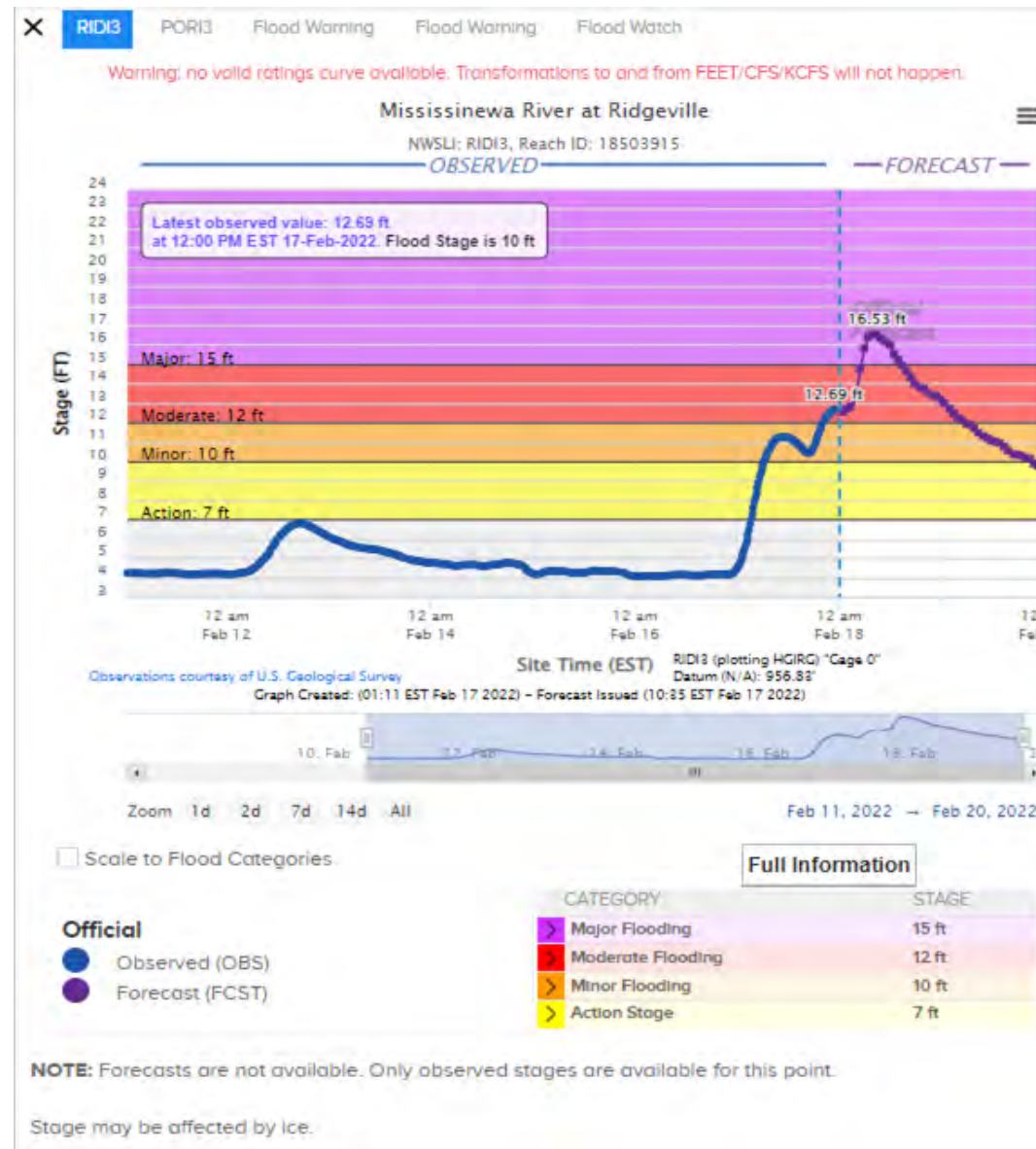
Observations courtesy of US Geological Survey

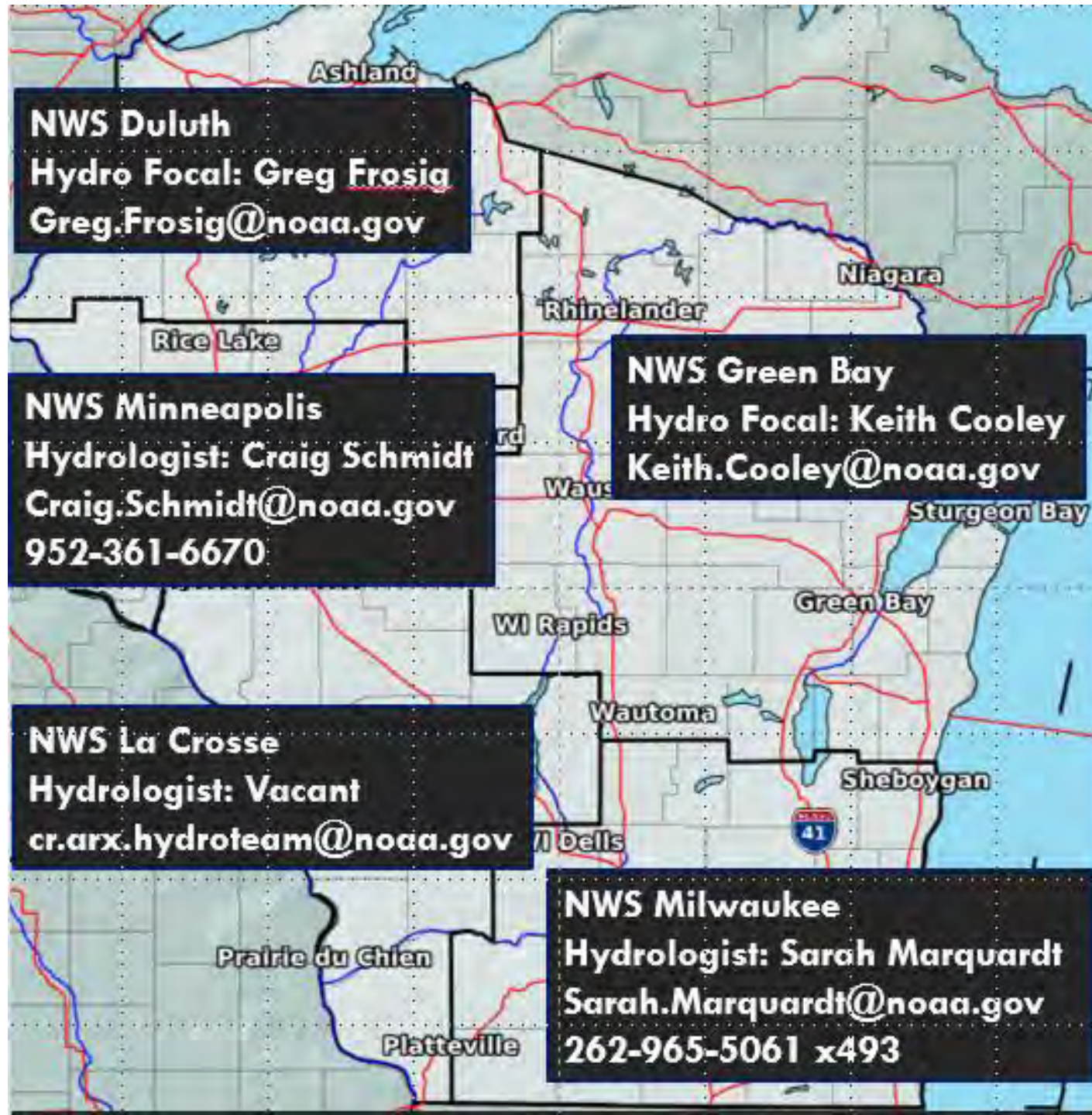
# New Website Sneak Peak

## Advanced Hydrologic Prediction Service



## National Water Prediction Service







# The HYSPLIT Model

Support to a Hazmat Incident



**Tim Halbach**  
**Warning Coordination Meteorologist**  
**NWS Milwaukee/Sullivan**

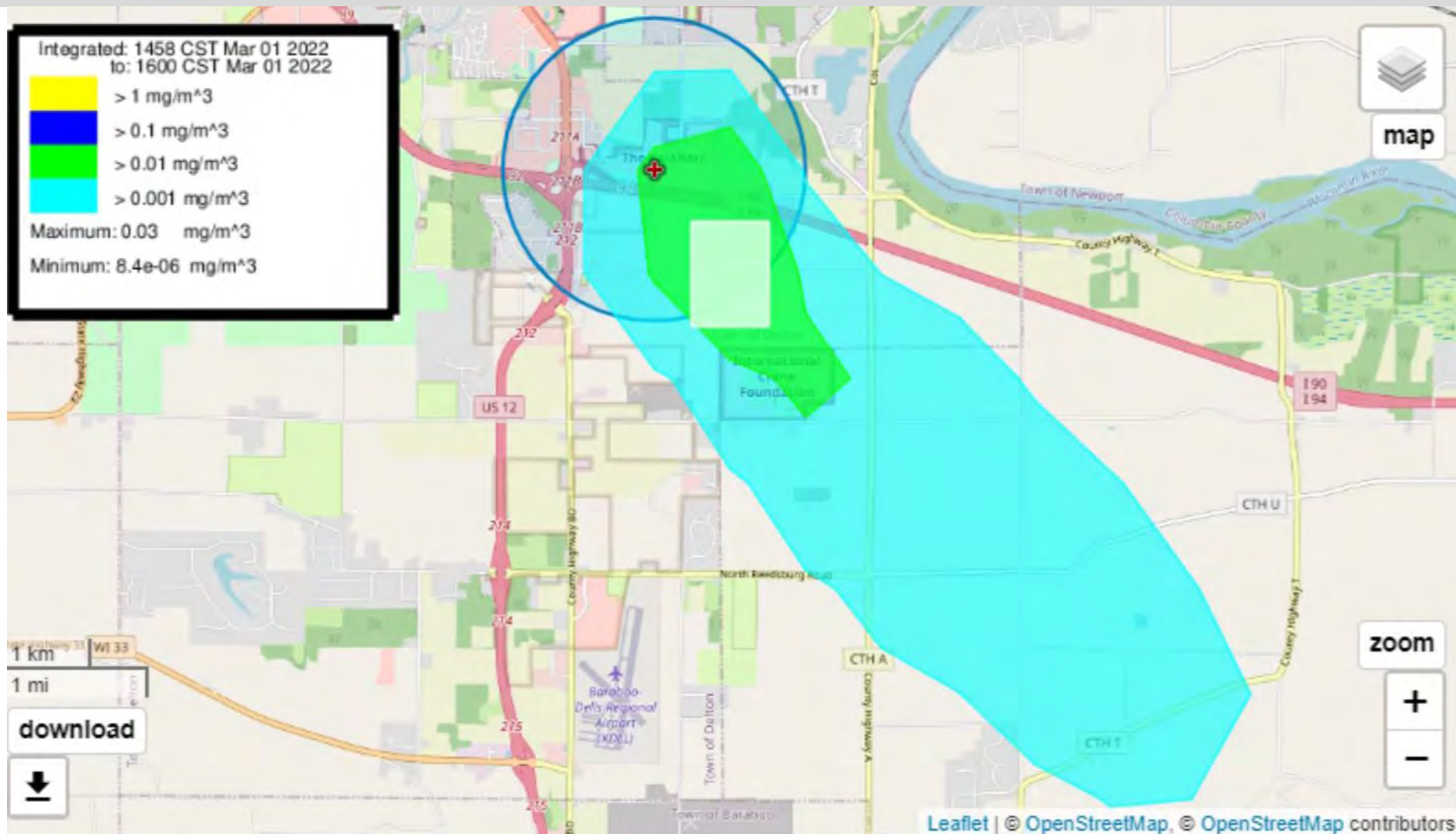


# HYSPLIT

## Support to a Hazmat Incident

**In the event of an incident that results in a release of pollutants or hazardous materials, NWS personnel can quickly run the "HYSPLIT" model that forecasts the dispersion, concentration and trajectory of the plume.**

**Based on current and forecast weather conditions, a forecast plume location will be generated.**







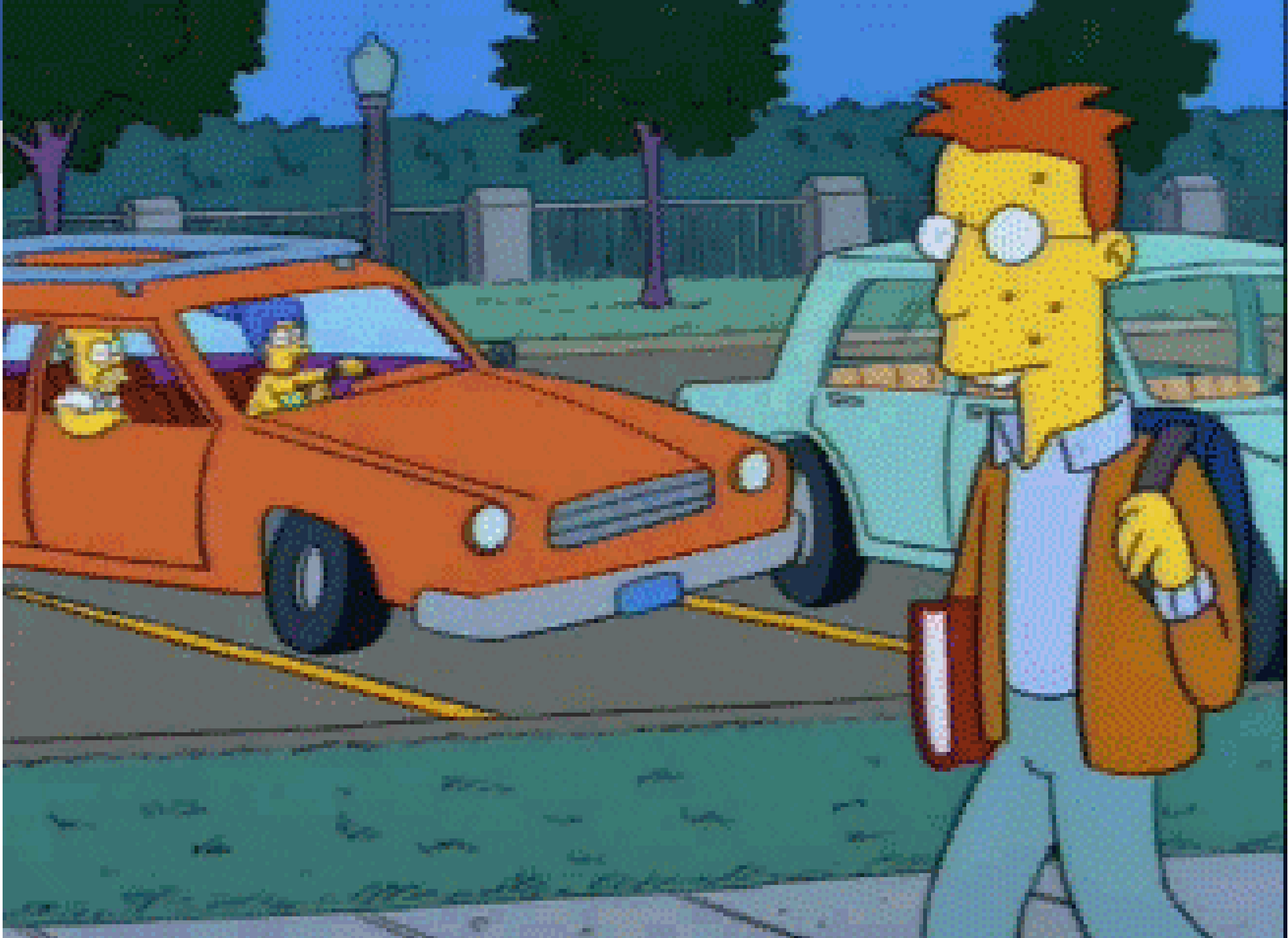
# HYSPLIT

What is it?

## Hybrid Single-Particle Lagrangian Trajectory Model

A complete system for computing simple air parcel trajectories as well as complex transport, dispersion, chemical transformation and deposition simulations.







# HYSPLIT

What is it?

## Hybrid Single-Particle Lagrangian Trajectory Model

Where's the bad stuff gonna go?





# How can you use this?

Real life and Table Top Exercises

## Husky Energy Oil Refinery-Duluth



## Cheese Factory TTX



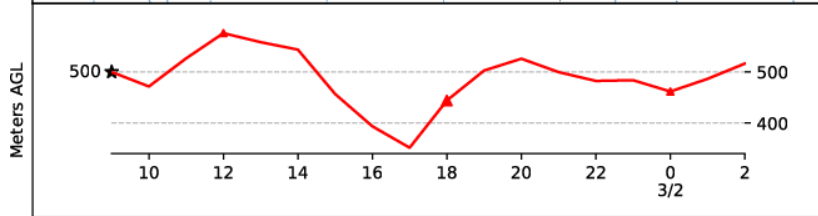
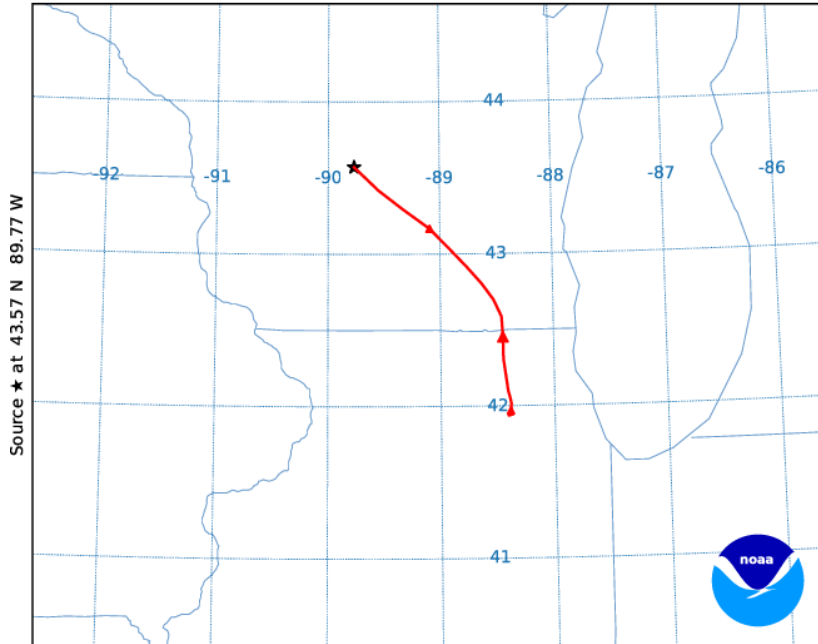


# Trajectory vs Dispersion

Two main options

## Trajectory is more for bigger picture

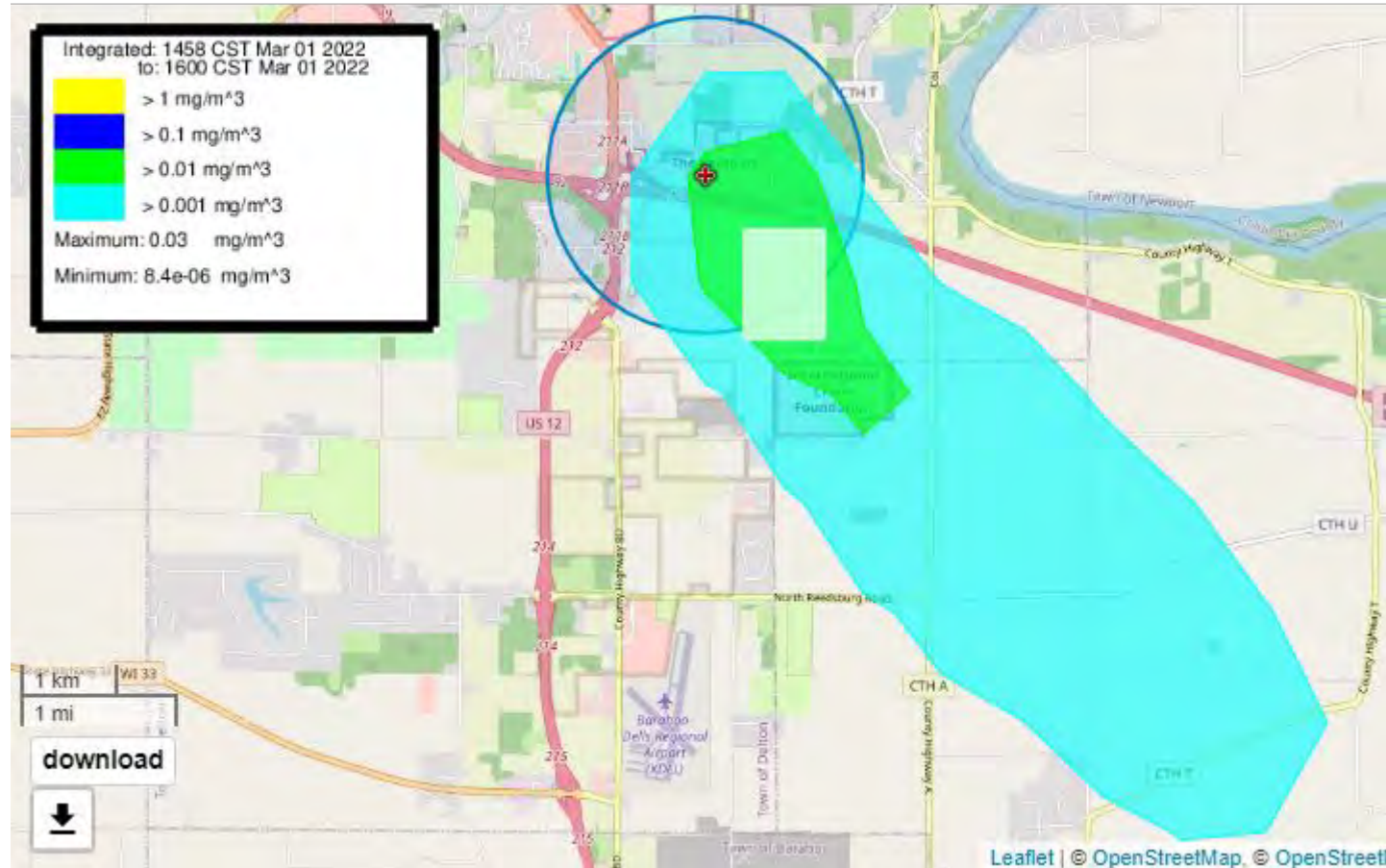
NOAA HYSPLIT MODEL  
Forward trajectory starting at 0900 CST 01 Mar 2022  
08 CST 01 Mar HRRR Forecast Initialization



Job ID: 13486      Job Start: Wed Mar 2 17:35:23 UTC 2022  
Source 1    lat.: 43.572059    lon.: -89.767571    height: 500 m AGL

Trajectory Direction: Forward    Duration: 18 hrs  
Vertical Motion Calculation Method: Model Vertical Velocity  
Meteorology: 1500Z 1 Mar 2022 - HRRR

## Dispersion is the main one you'd likely use





# What information do we need?

## Support to a Hazmat Incident

### Release Type

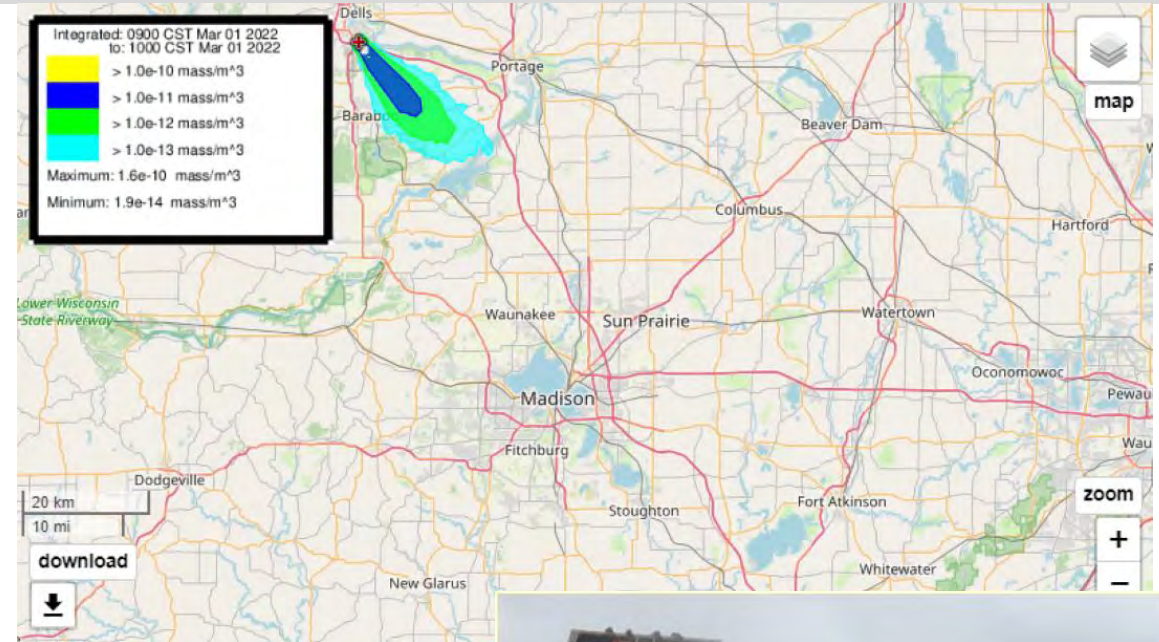
- ❖ Unknown Material (Generic Mass, <24 hrs)
- ❖ Unknown Material (Generic Mass, long duration)
- ❖ Chemical
- ❖ Radiological Multi-species Nuclear Detonation

### Location

- ❖ Address or Lat/Lon...need to be specific

### Release Details

- ❖ Top
- ❖ Bottom
- ❖ Quantity (lb, kg, mass)
- ❖ Duration (how long do you expect it to take?)



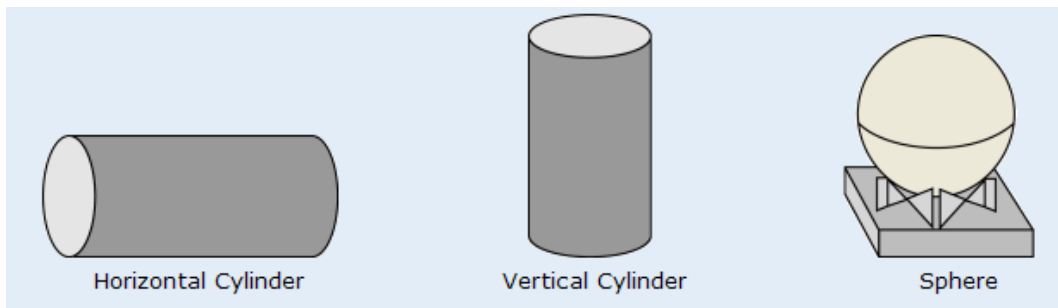


# What information do we need?

## Support to a Hazmat Incident

### If a Chemical Release:

- ❖ Hazmat? Industrial or Transportation
- ❖ Chemical Name or CAS Number
- ❖ Release Type: Tank, Puddle, Gas Pipeline, Direct
- ❖ Tank:



- ❖ Tank Size: Diameter, Length, Volume
  - ❖ Anhydrous Ammonia Nurse Tank

**Tank Type and Size**

Tank Type:

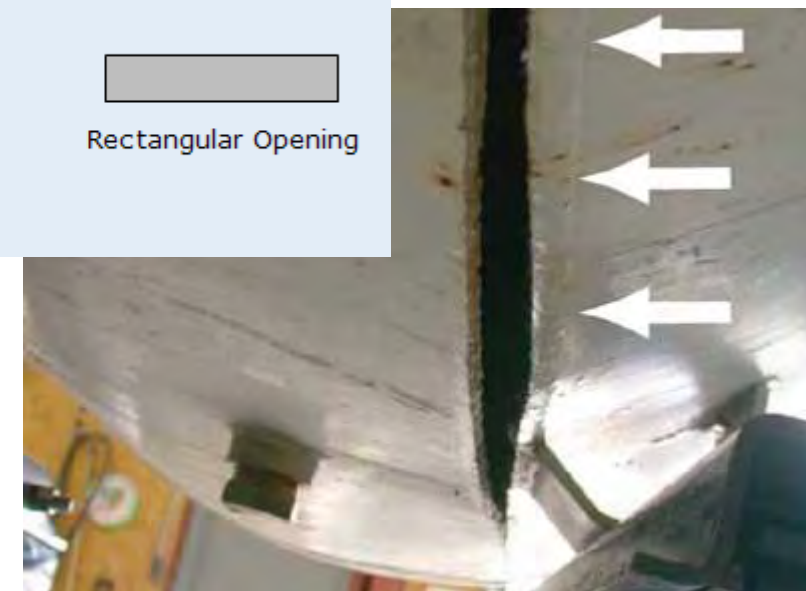
Tank Size: **enter any two values** [More info...](#)

Diameter:

Length:

Volume:

- ❖ Chemical Storage Temperature Inside of Tank
  - ❖ Outside air temperature?
- ❖ Mass of Chemical in Tank (lbs, tons, kgs)
- ❖ Dimensions of Opening in Tank
  - ❖ Shape of Opening-Circular or Rectangular
- ❖ Type of Leak: Hole or Pipe
- ❖ Height of Leak: Bottom of leak above bottom of tank)



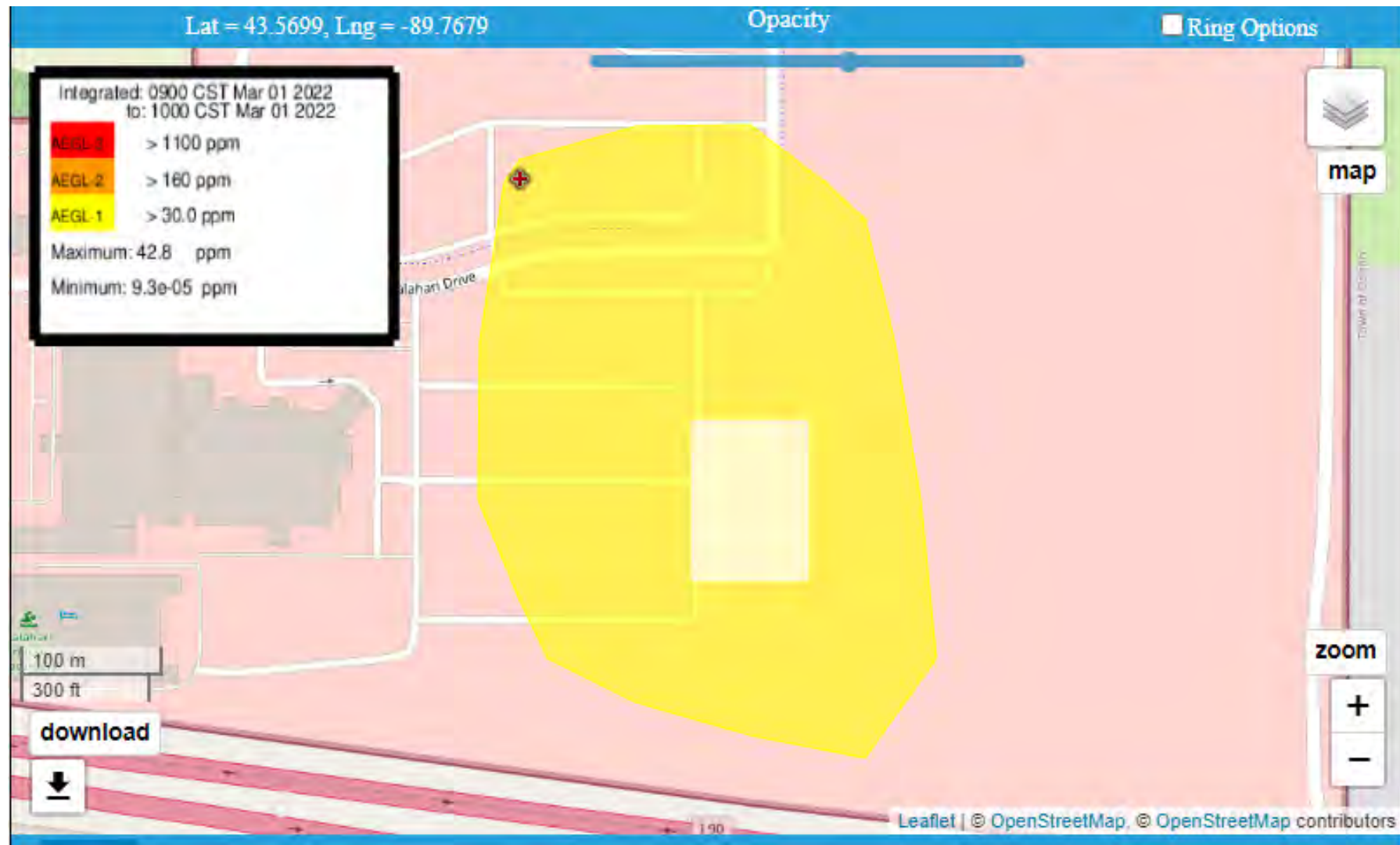


# What information do we need?

## Support to a Hazmat Incident

### If a Chemical Release:

- ❖ Different chemicals will respond differently depending on the current and forecast weather conditions







# HYSPLIT

## Support to a Hazmat Incident

### Real Life Incident:

Contact your local NWS office Operations (Phone)

### Table Top Exercise:

Contact your local NWS office Warning Coordination Meteorologist



**WFO:** WI: Milwaukee/Sullivan: 262-965-5061  
**Event Type:** Exercise - Hazmat\_Industrial  
**Release:** Unknown  
**Source Location:** Lat: 43.569944 Lon: -89.769888  
**Source Term:** User Entered - 1 mass  
**Meteorology:** HRRR  
**Output:** Concentration/deposition

#### Model Run Details

The current HRRR model has 18 hours of forecast data beginning at 03/1/22 1900 UTC.

#### Source Term Parameters

**Release starting time (UTC):** year: 22, month: 03, day: 01, hour: 20, minute: 57 [More info](#)  
**Source latitude:** 43.569944 degrees [More info](#)  
**Source longitude:** -89.769888 degrees (West is negative) [More info](#)  
**Release top:** 50 meters AGL [More info](#)  
**Release bottom:** 0 meters AGL [More info](#)  
**Release quantity:** 1 mass [More info](#)  
**Release duration:** 0 hour(s), 10 minutes [More info](#)

#### Runtime Parameters

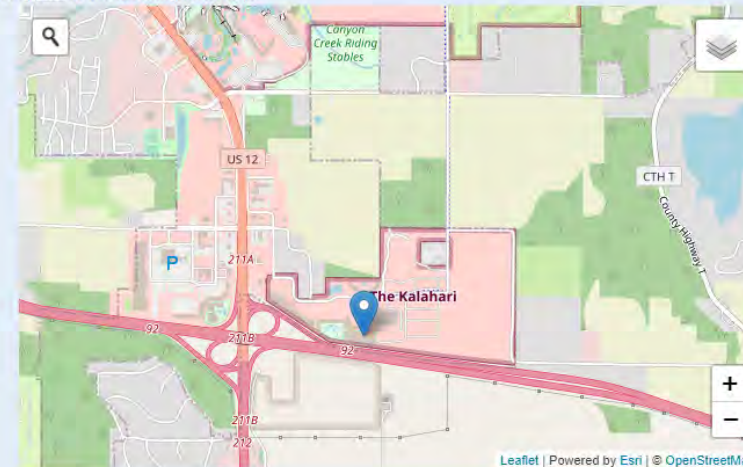
**Total duration:** 1 hour(s) [More info](#)  
**Averaging period/Output interval:** 1 hour(s) [More info](#)  
**Top of averaged layer:** 100 meters AGL (should be >= 100m) [More info](#)



### Release Type, Event, Meteorology & Source Location

**Release Type:** Unknown Material (Generic Mass, < 24 hrs) [More info](#)  
**Event Type:**  Exercise  Prescribed Burn  Real Event Unspecified type [More info](#)  
**WFO Location:** WI: Milwaukee/Sullivan: 262-965-5061 [More info](#)  
**Meteorology:** HRRR (18h fcst, 3 km, 1 hrly, CONUS, sigma) [More info](#)  
[View Current NAM Fire Weather Domains](#)  
 Use only the forecast file selected above.  
 Use only the previously created user-entered data file.  
 Use both the previously created user-entered data and chosen forecast file.  
 User-entered data type:  Surface Station  Upper-air Sounding

**Source Location** (enter using **one** of the following methods):



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