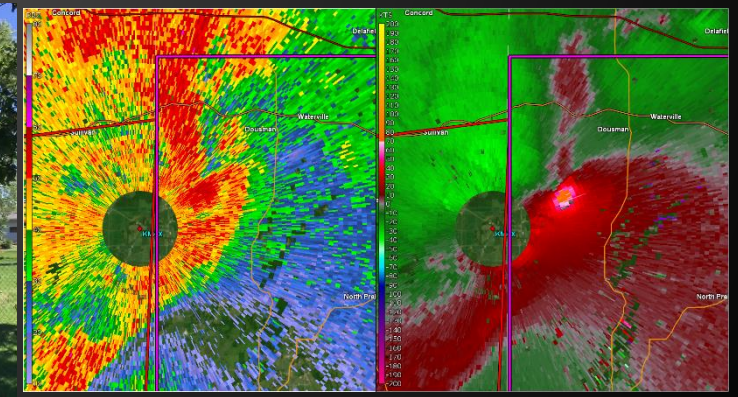
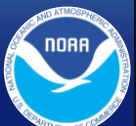


NWS Milwaukee Spotter Training 2021

National Weather Service Milwaukee



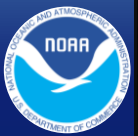
Tim Halbach, Warning Coordination Meteorologist

National Weather Service Milwaukee

Provide warning/forecast information for the protection of life and property

24/7/365 Operations

24 Dedicated Staff Members



Why are we here?

Severe weather occurs EVERY year in Wisconsin.

We need reports of severe weather to effectively warn the public of inclement weather.

Chippewa Falls, WI 7/21/20 EF-0

Video: Melanie Metz/Twister Sisters

@StormChasingVid

StormChasingVideo.com



Why are we here?

Severe weather impacts people.



**Oakfield, WI
F5 Tornado
July 18, 1996**

Training Goal: Improve storm spotter confidence and quality of reports

Storm Spotting

Prepare

Deploy

Observe

Communicate



Tornadoes: A Spotters Guide 1977
Video: NSSL/NWS

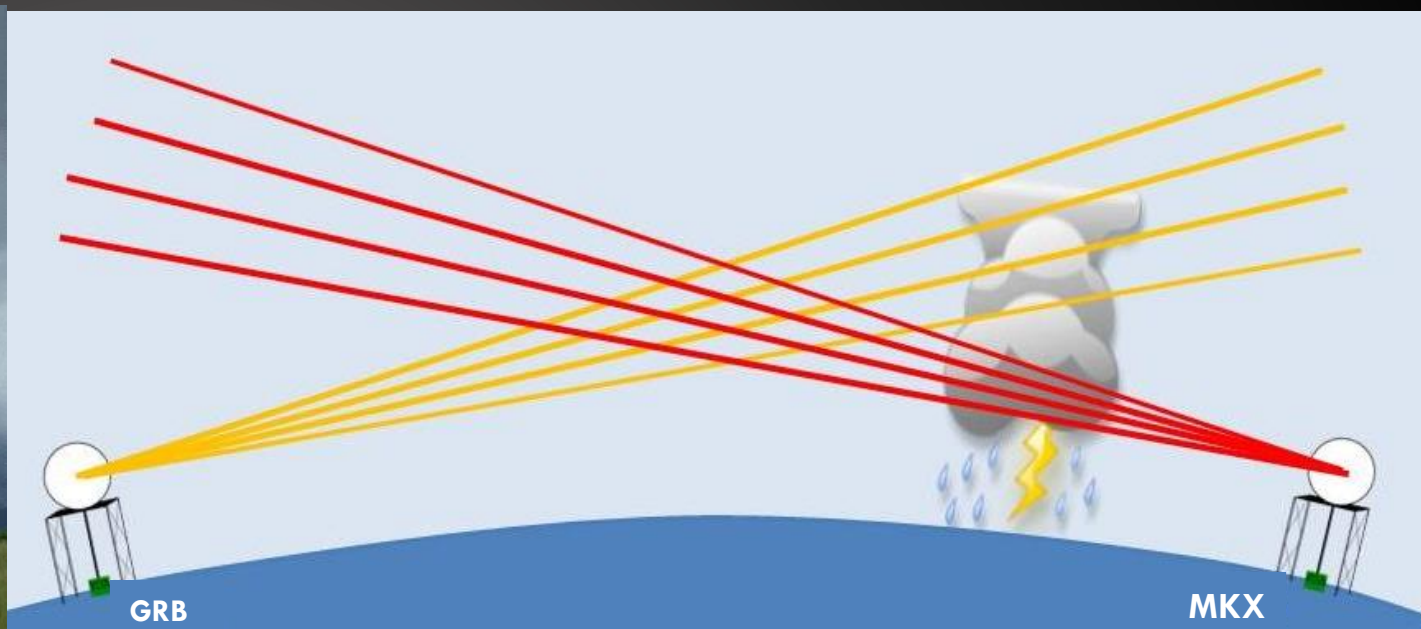
Who are storm spotters?

Volunteers that provide ground truth to what the NWS meteorologists interpret on radar



Weather enthusiasts with an interest in public safety

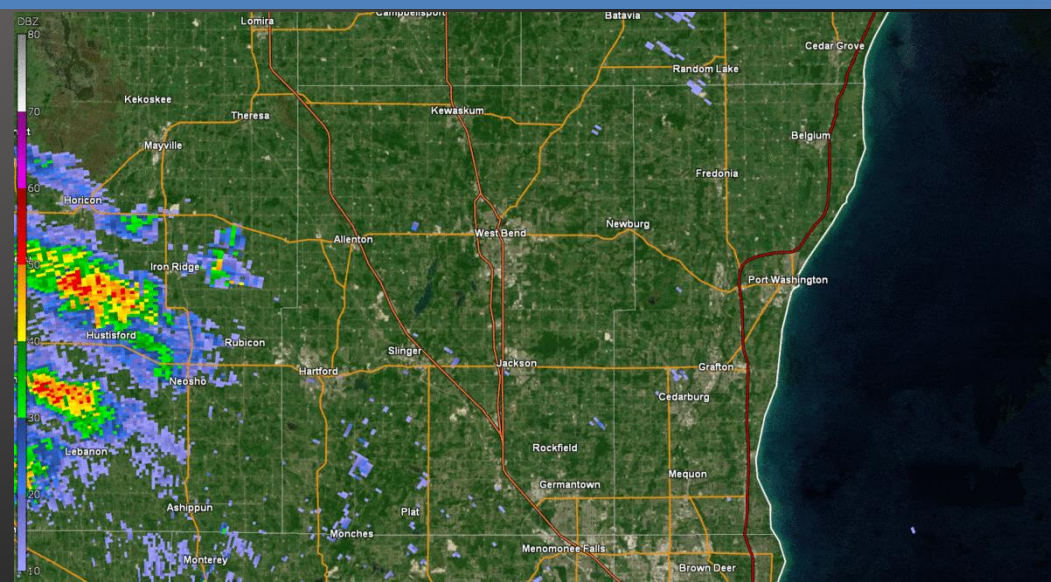
How do storm spotters help?



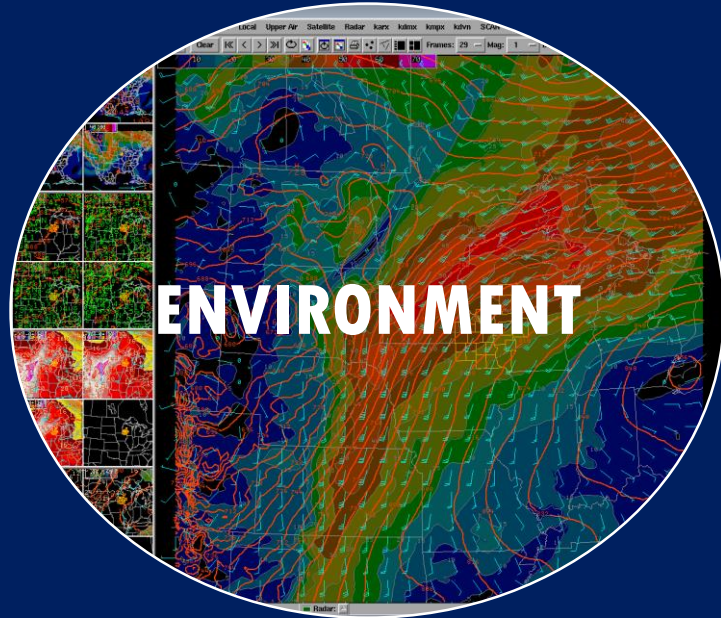
Ground truth

**Radar doesn't 'see' the actual
severe weather**

Radar analysis to trigger warning

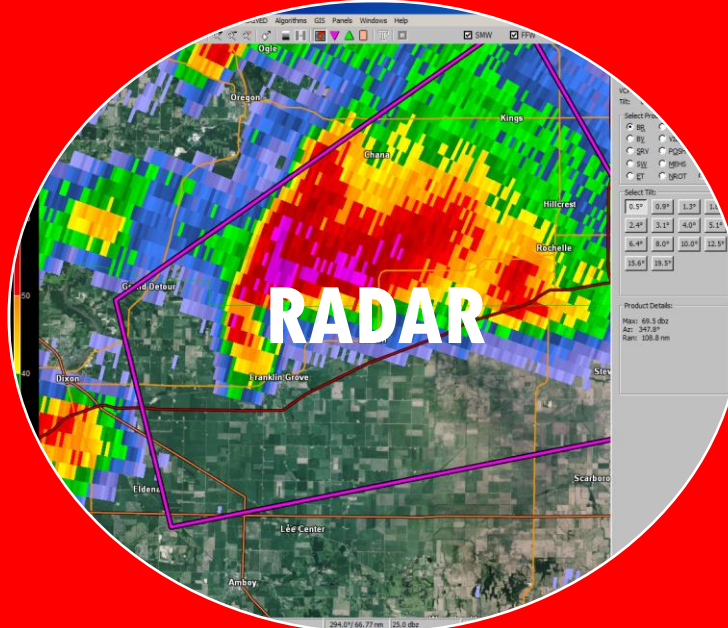


What triggers a Warning from NWS?



What conditions or thresholds need to be met

Baseline/Background

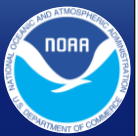


**Analysis of
reflectivity, velocity,
other fields**

Either one of these pushes us to issue the warning

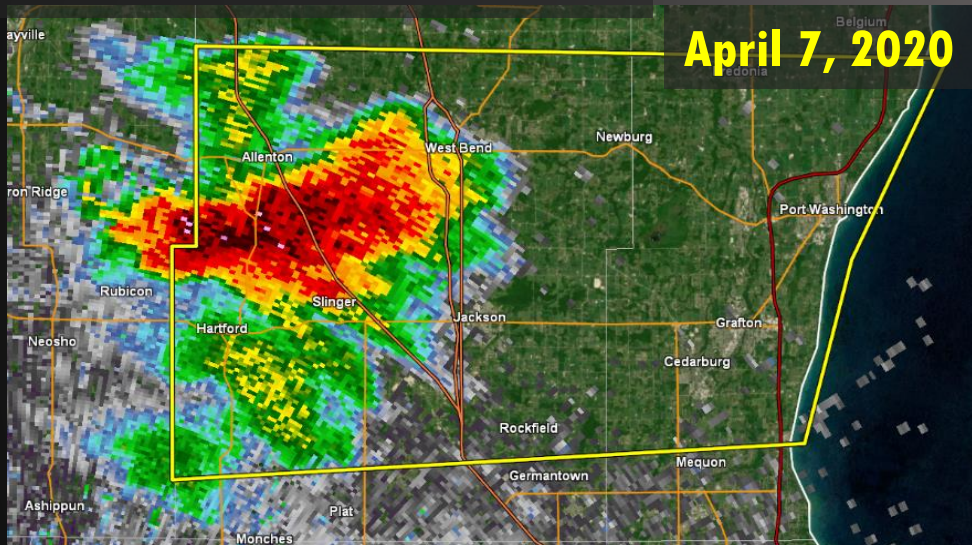


**What is actually
happening on the
ground**



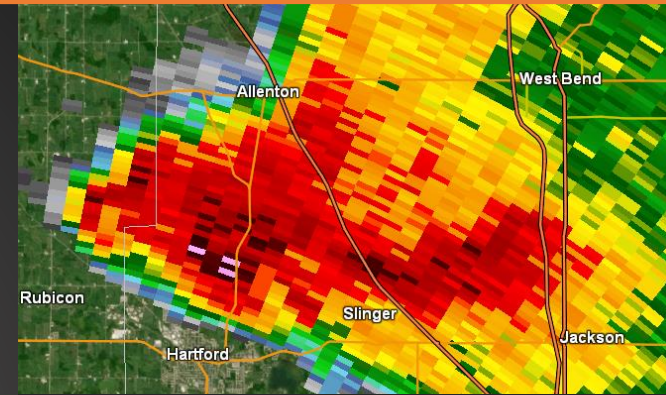
Example: Radar based Severe Thunderstorm Warning

Severe Thunderstorm Warning #1
Washington and Ozaukee Counties
3:40pm until 4:15pm
Hail: 1.00"
Wind: 60mph
Source: Radar Indicated



Severe Hail Thresholds for this event):
Freezing Level (65dBz): 7,000ft
-20C Level (60dBz): 13,000ft
"Donovan Heights" (50dBz): 21,000ft

Freezing Level
65dbz above 7,000ft



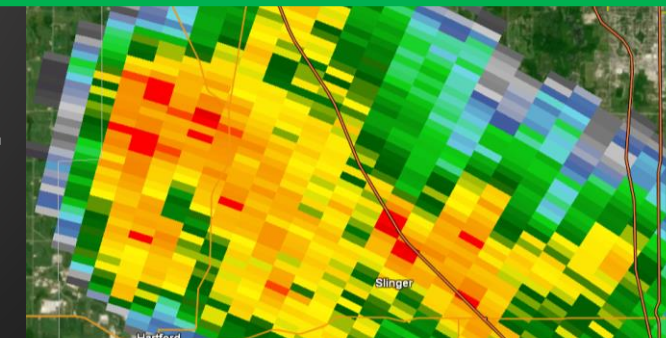
Few pink (65+) pixels at 17,000ft

-20C Level
60dbz above 13,000ft



Bunch of black (60+) pixels up to 22,000ft

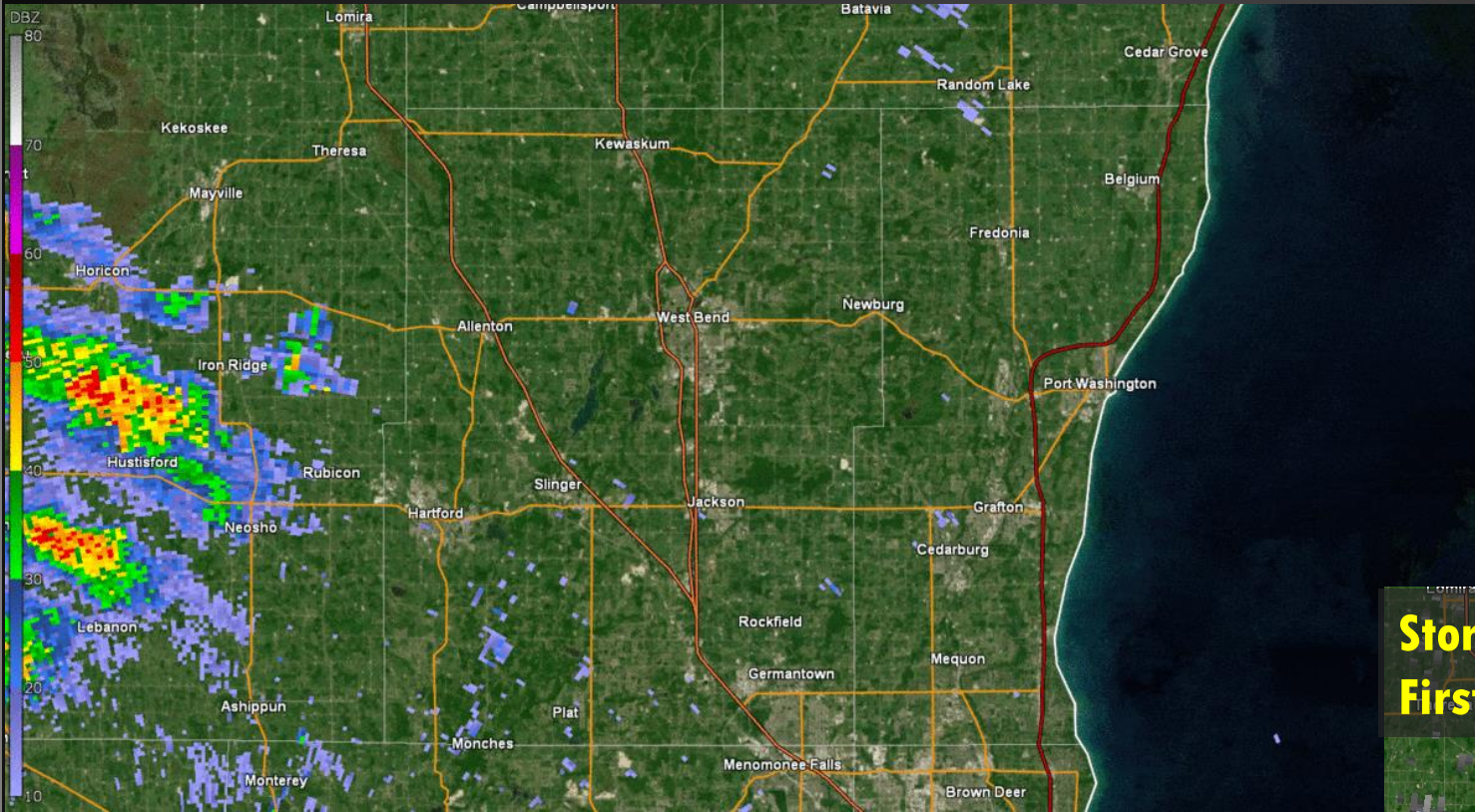
Donovan (50dBz)
50dbz above 21,000ft



Bunch of red (50+) pixels up to 35,000ft

What Happened? Tennis Ball Sized Hail

National Weather Service Milwaukee



2" Hail Jackson, WI
Matt Schoeneck



2" Hail Jackson, WI
Alan Grahl

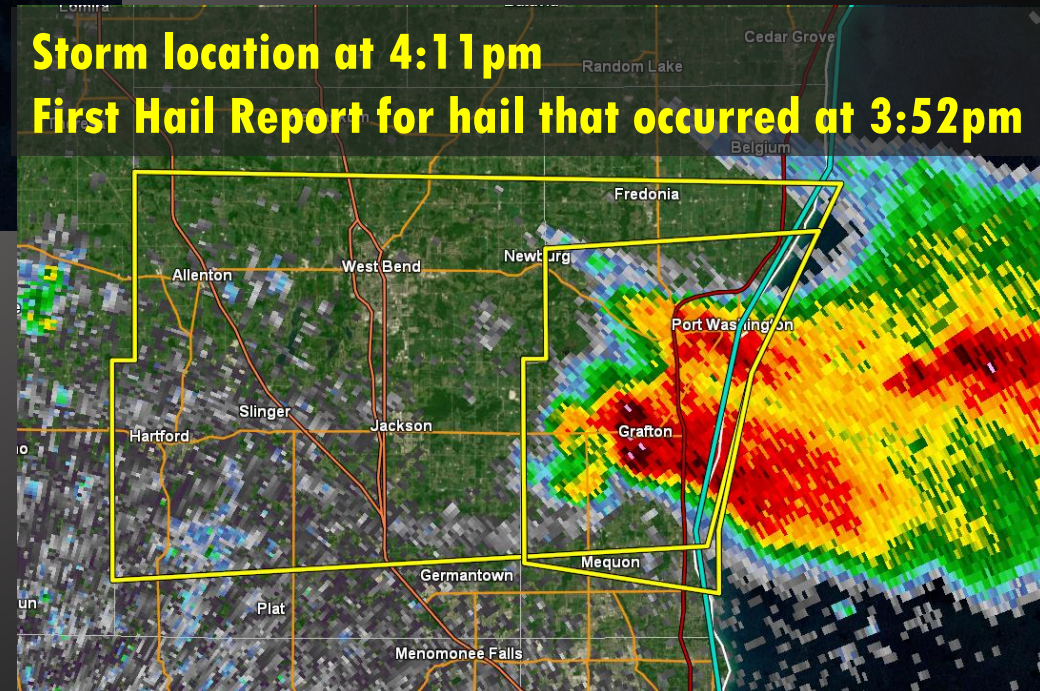


2.25" Hail Cedarburg, WI

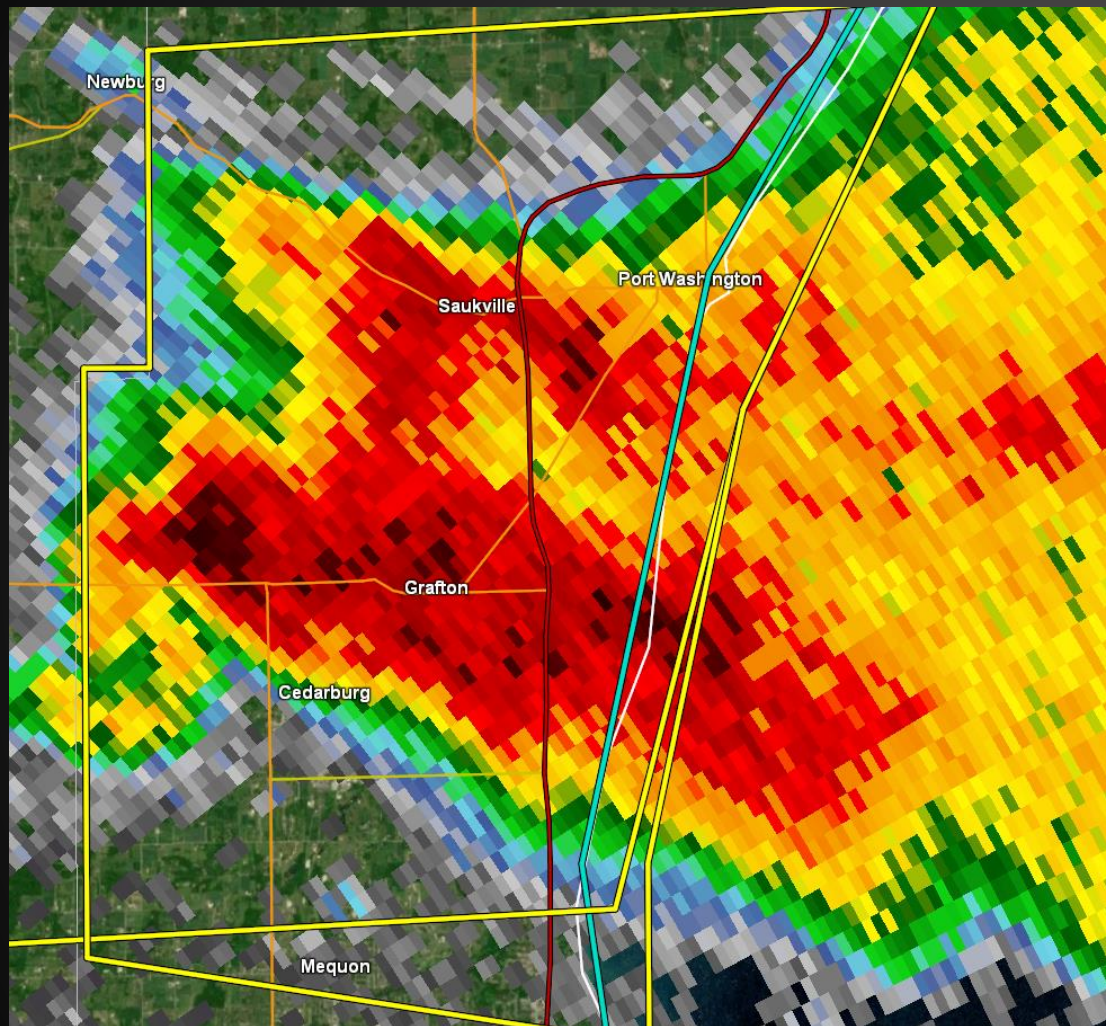


**Storm slowed down, had to re-issue warning
for Ozaukee County
First report came at 4:11pm
Most reports after storm went over Lake
Michigan**

**Storm location at 4:11pm
First Hail Report for hail that occurred at 3:52pm**



How do storm spotters help?



BULLETIN - IMMEDIATE BROADCAST REQUESTED
Severe Thunderstorm Warning
National Weather Service Milwaukee/Sullivan WI
406 PM CDT Tue Apr 7 2020

The National Weather Service in Milwaukee/Sullivan has issued a

- * Severe Thunderstorm Warning for...
Central Ozaukee County in southeastern Wisconsin...
- * Until 430 PM CDT.
- * At 405 PM CDT, a severe thunderstorm was located near Cedarburg, moving east at 40 mph.

HAZARD...Golf ball size hail and 60 mph wind gusts.

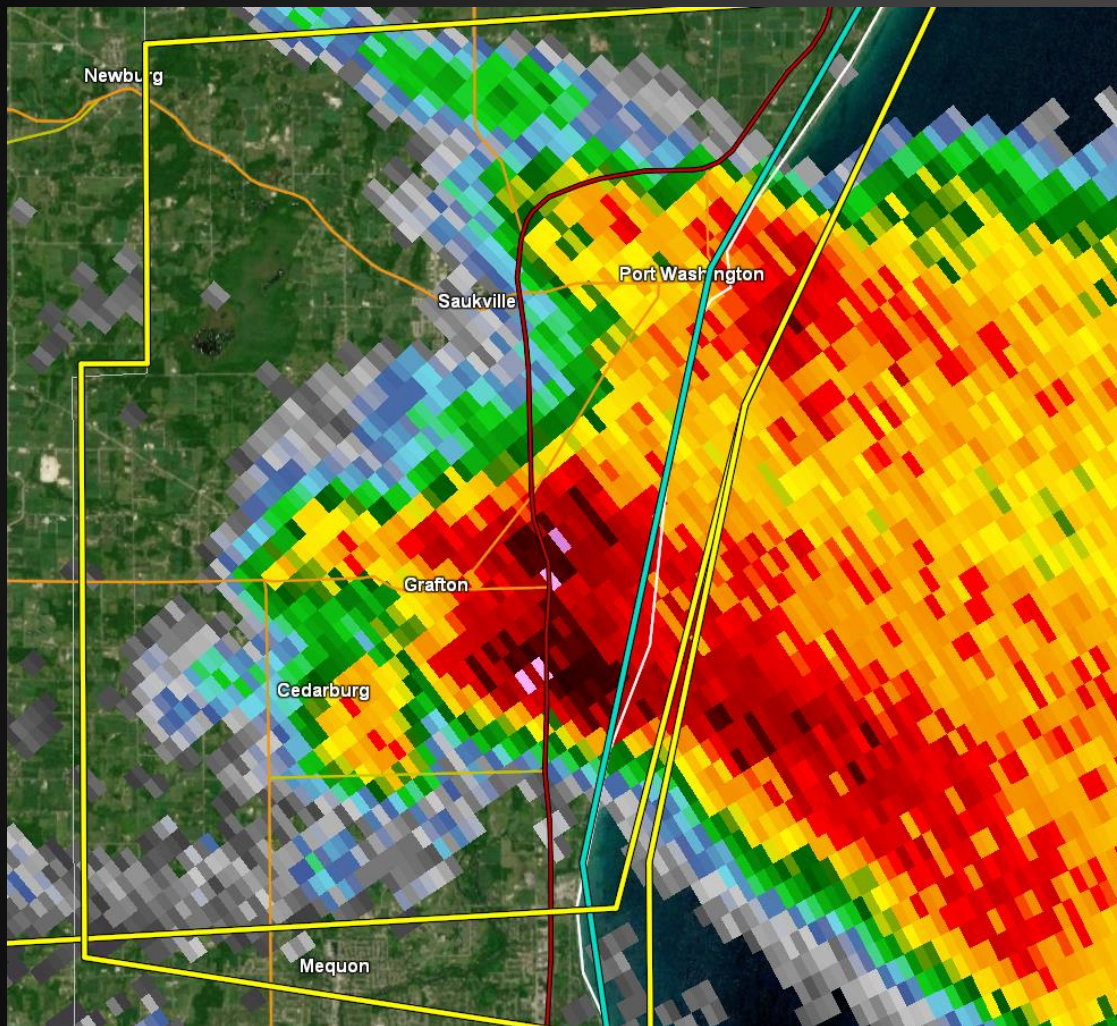
SOURCE...Radar indicated.

IMPACT...People and animals outdoors will be injured. Expect hail damage to roofs, siding, windows, and vehicles. Expect wind damage to roofs, siding, and trees.

- * Locations impacted include...
Mequon, Grafton, Cedarburg, Port Washington, Saukville, Thiensville and Newburg.

People **REACT** to reports! You're a confirmation source!

How do storm spotters help?



Severe Weather Statement
National Weather Service Milwaukee/Sullivan WI
413 PM CDT Tue Apr 7 2020

WIC089-072130-
/O.CON.KMKX.SV.W.0002.000000T0000Z-200407T2130Z/
Ozauchee WI-
413 PM CDT Tue Apr 7 2020

...A SEVERE THUNDERSTORM WARNING REMAINS IN EFFECT UNTIL 430 PM CDT
FOR CENTRAL OZAUCHEE COUNTY...

At 413 PM CDT, a severe thunderstorm was located over Grafton, moving
east at 40 mph.

HAZARD...Golf ball size hail.

SOURCE...Trained weather spotters.

IMPACT...People and animals outdoors will be injured. Expect damage
to roofs, siding, windows, and vehicles.

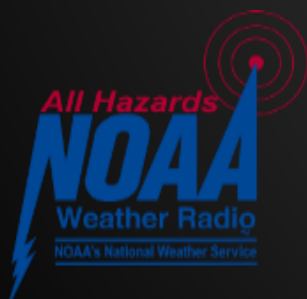
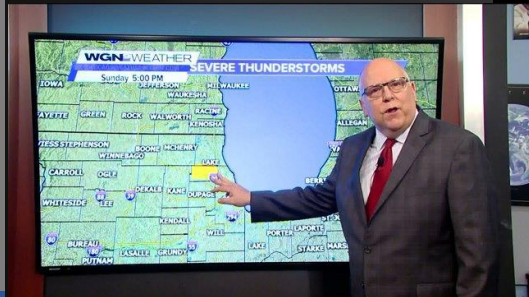
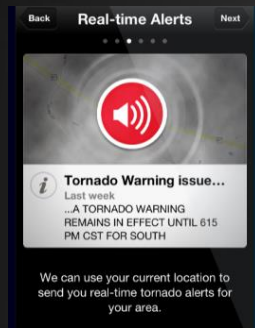
Locations impacted include...
Mequon, Grafton, Cedarburg, Port Washington, Saukville, Thiensville
and Newburg.

People **REACT** to reports! You're a confirmation source!

How do storm spotters help?

Your report may be what sends someone to shelter!

Have to get it in real-time or as soon as possible to include in warnings.



Storm Spotting Process Training

“A Day in the Life of a Storm Spotter”

Prepare

Deploy

Observe

Communicate



Stevens Point, WI
Sara Wiza



Lake Butte des Morts, WI
Hunter Bolssen



Andrew Muehr @andrewtornado11 · Nov 10, 2020

I have NEVER heard anything like that roar. Sounded like a freight train. Saw at least 3 small branches fall right in front of me in my backyard. Estimated 65-70 mph winds. [@NWSMilwaukee](#)



NOTE: Not all the same event/timeline

Storm Spotting Process: Prepare

“Is today a day where I may need to be a spotter?”



Etta Held
Oakfield F5
July 18, 1996

Prepare

Storm Spotting Process: Weather Sources

Have a professional source for weather information

- **National Weather Service (weather.gov)**
- **Local TV Meteorologists**
- **Private Sector**



Use Technology

- **Cell Phones (Apps, WEA)**
- **Social Media/Internet**
- **TV/Radio**

Watch for updates!

Prepare

weather.gov/milwaukee

Local focus on severe weather potential

City Forecast

Outlooks

Submit a Storm Report

Hazardous Weather Outlook

Skywarn

Local Storm Reports

Summer Weather Info

NATIONAL WEATHER SERVICE
NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION

HOME FORECAST PAST WEATHER SAFETY INFORMATION EDUCATION NEWS SEARCH ABOUT

Local forecast by City, SC or ZIP code
Enter location: Go

Location Help

MY FORECAST
3 Miles ESE Milwaukee WI

News Headlines

- 2010-2019 Top 10 Wisconsin Weather Events
- 2019 Top 10 Wisconsin Weather Events

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

SITUATION REPORT
Elevated fire weather conditions will develop on Monday as afternoon humidity builds. SP below 35. Read more

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

Click a location below for detailed forecast.

Overcast
32°F
0°C
Get Detailed Info

This Afternoon
Mostly Cloudy
High: 34°F

Tonight
20% → 60%
Slight Chance Snow then Snow
Low: 28°F

Watches, Warnings & Advisories

- Gale Warning
- Winter Weather Advisory
- Flash Flood Advisory
- Small Craft Advisory
- Hazardous Weather Outlook

Total Snowfall Through Saturday Morning

Local Radar | **Weather Map**

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

HAZARDS
National Briefing
Hazardous Weather Outlook
Skywarn
View Local Storm Reports
Submit A Storm Report
Winter Weather
Summer Weather
Beach Hazards

CURRENT CONDITIONS
NWS MJO Observation
NWS MJO Tower Camera
Local Conditions
Local Text Products

LOCAL FORECASTS
Marine
Aviation
Fire
Local Text Products
Local Precip Forecast
Hourly Forecast Graphics

CLIMATE
Local Climate Products
Daily Climate Graphics
Historic Events For Sim Val
CoCoRaHS
Normals/Records MJO/MSN

DSS PROGRAMS
Milwaukee Extreme Heat Chances
Milwaukee Warning Shelter
DSS page
In-land Lake Forecasts
Lake Michigan Beach Hazards

ABOUT US
Office Information

“Situation Report”

Clickable City Forecast

“Weather Story”

Active Weather Continues into Tomorrow
Severe storms and flash flooding threat for southern WI

TODAY
74-82°
Likely
Flash Flooding 100%

TONIGHT
53-59°
Likely
Flash Flooding 100%

WED
57-65°
Likely
Drizzling during morning 70%

Slight Severe Risk

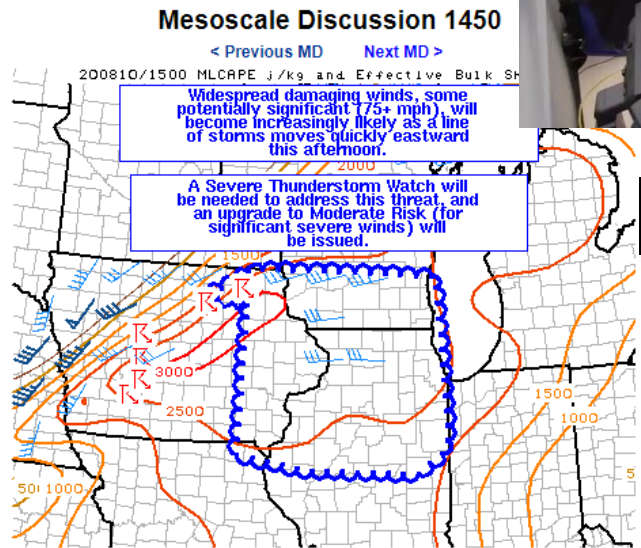
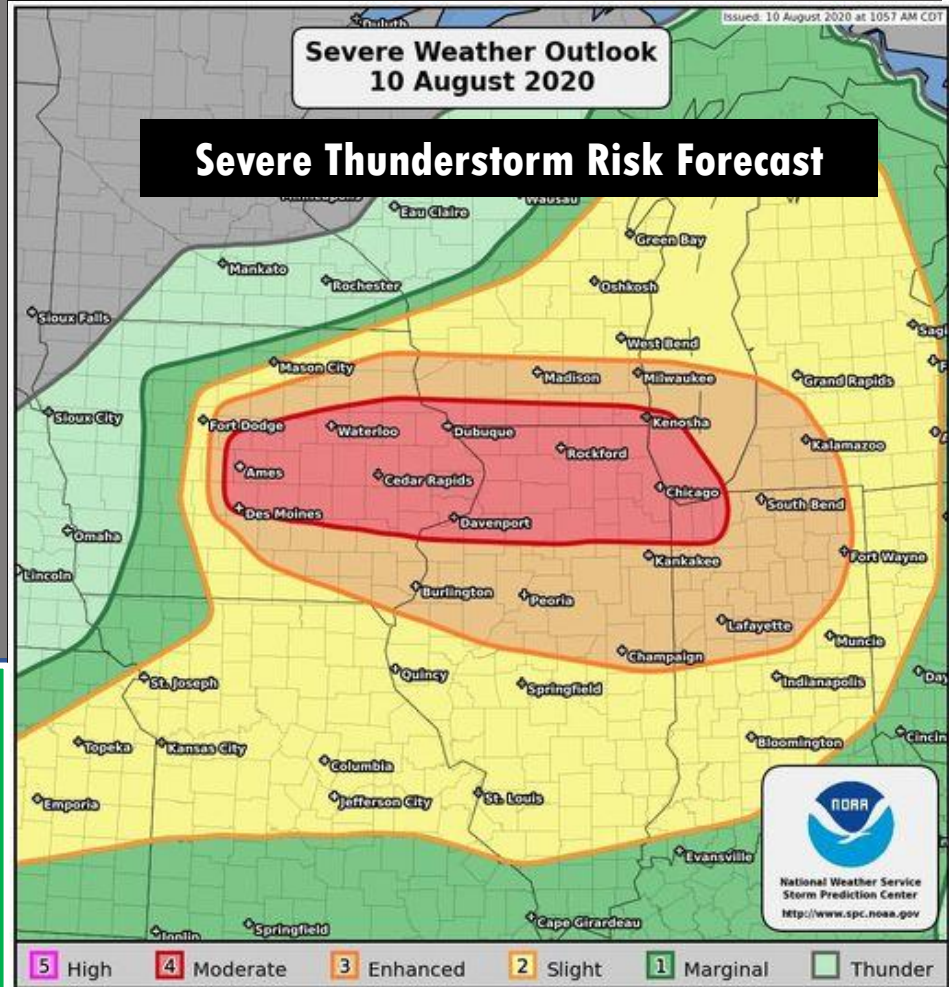
- Main threat is damaging winds. Isolated small hail also possible.
- Thunderstorms will develop during late afternoon.

Flash Flood Watch
A flash flood watch is in effect for all of southern WI.
Rainfall totals of 2-4 inches possible through Wed. afternoon.
If you are in low-lying areas or along rivers, pay attention to changing environmental conditions!

National Weather Service Milwaukee | Issued: Tuesday, October 1, 2019 1:44 PM

Storm Prediction Center

Watch and forecast products/information focusing on severe weather potential



Local Discussions

Mesoscale Discussion 1450
NWS Storm Prediction Center Norman OK
1042 AM CDT Mon Aug 10 2020

Areas affected...Portions of northern/eastern IA...southern WI...northern/central IL...and far northeastern MO

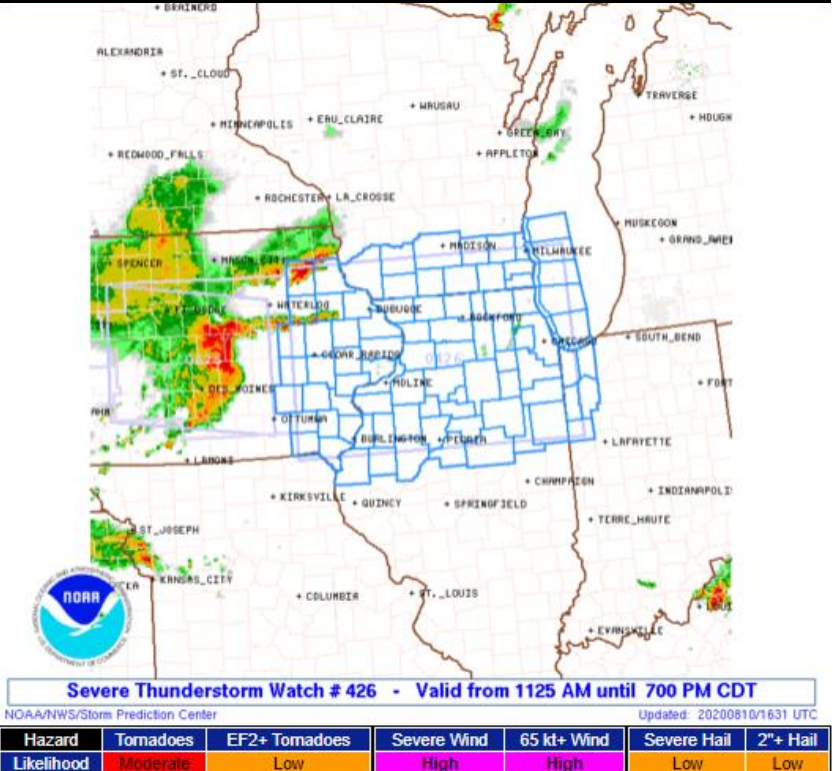
Concerning...Severe potential...Severe Thunderstorm Watch likely

Valid 101542Z - 101715Z

Probability of Watch Issuance...95 percent

SUMMARY...Widespread damaging winds, some potentially significant (75+ mph), will become increasingly likely as a line of storms m quickly eastward this afternoon. A Severe Thunderstorm Watch will be needed to address this threat, and an upgrade to Moderate Risk (significant severe/damaging winds) will be issued with the upcoming 1630Z update to the Day 1 Convective Outlook.

Severe Thunderstorm and Tornado Watches









SPC Severe Thunderstorm Risk Outlooks

spc.noaa.gov/public/cwa/images/MKX_swody1.png (Southern WI-Day 1)

spc.noaa.gov/public/cwa/images/MKX_swody2.png (Southern WI-Day 2)

spc.noaa.gov/public/cwa/images/MKX_swody3.png (Southern WI-Day 3)

Thunderstorms	1-Marginal	2-Slight	3-Enhanced	4-Moderate	5-High
<p>No severe thunderstorms expected</p> <p>Lightning & flooding threats exist with <u>all</u> thunderstorms</p>	<p>Isolated severe thunderstorms possible</p> <p>Limited in duration and/or coverage and/or intensity</p>	<p>Scattered severe storms possible</p> <p>Short-lived and/or not widespread, isolated intense storms possible</p>	<p>Numerous severe storms possible</p> <p>More persistent and/or widespread, a few intense</p>	<p>Widespread severe storms likely</p> <p>Long-lived, widespread and intense</p>	<p>Widespread severe storms expected</p> <p>Long-lived, very widespread and particularly intense</p>
					

General Thunderstorms (Non-severe): Risk Level-0 out of 5

0-General Thunderstorms

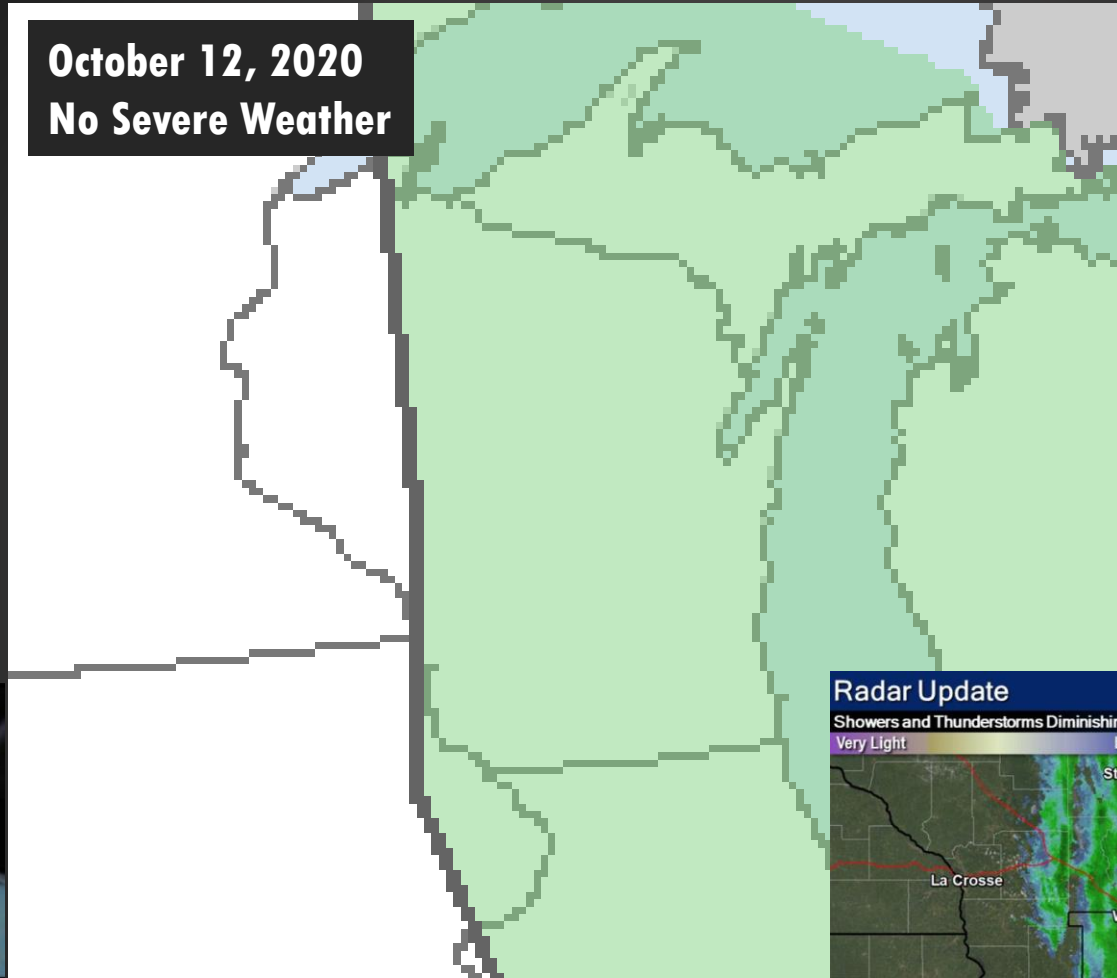
No severe thunderstorms expected.

Lightning & flooding threats exist with all thunderstorms.



- Winds to 40mph
- Hail up to 0.5"

October 12, 2020
No Severe Weather



Radar Update

Showers and Thunderstorms Diminishing This Afternoon

Issued October 12, 2020 12:15 pm CDT

Very Light Light Moderate Heavy Severe



Showers and a few thunderstorms will move through the area from Sheboygan to Milwaukee and Kenosha through 1 pm. Farther west, scattered showers and thunderstorms will come to an end over south central WI including Madison early this afternoon.

NWS Milwaukee/Sullivan

weather.gov/mkx

NWS Milwaukee

Showers and storms from Sheboygan to Milwaukee and Kenosha through 1 pm. Farther west, scattered showers will diminish through the early afternoon. Small hail possible from storms along with gusty winds. #swiwx

12:19 PM · Oct 12, 2020 · TweetDeck

2 Retweets 1 Quote Tweet 7 Likes

Share

Like

Reply

Retweet

Quote

Like

Share

More

Close

Twitter

Twitter

Marginal Risk Thunderstorms: Risk Level-1 out of 5

1-Marginal (MRGL)

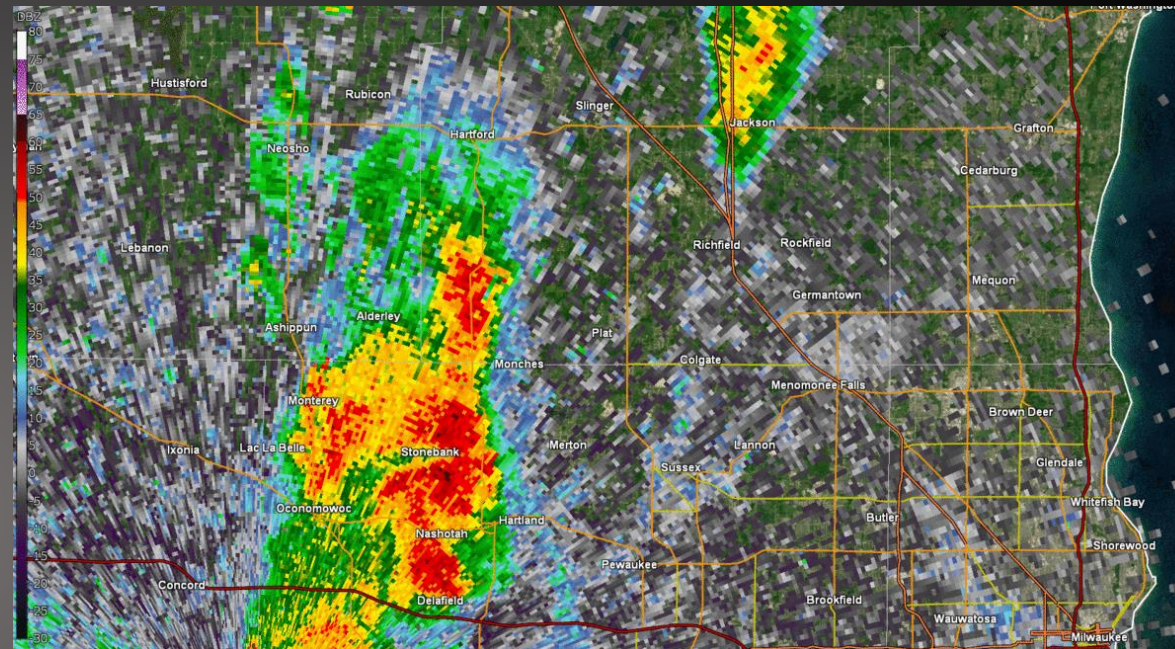
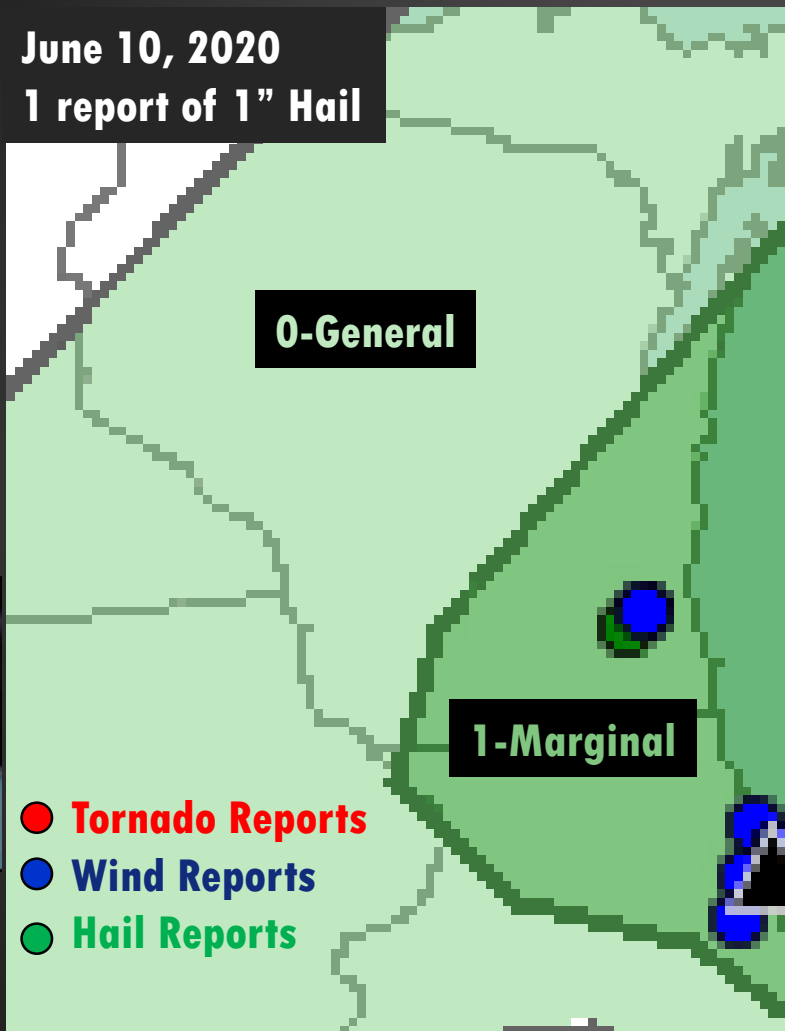
Isolated severe thunderstorms possible

Limited in duration and/or coverage and/or intensity



- Winds 40-60mph
- Hail up to 1"
- Low tornado risk

June 10, 2020
1 report of 1" Hail



1" Hail
Merton, WI
Marc Kavinsky

Slight Risk Thunderstorms: Risk Level-2 out of 5

2-Slight (SLGT)

Scattered severe storms possible

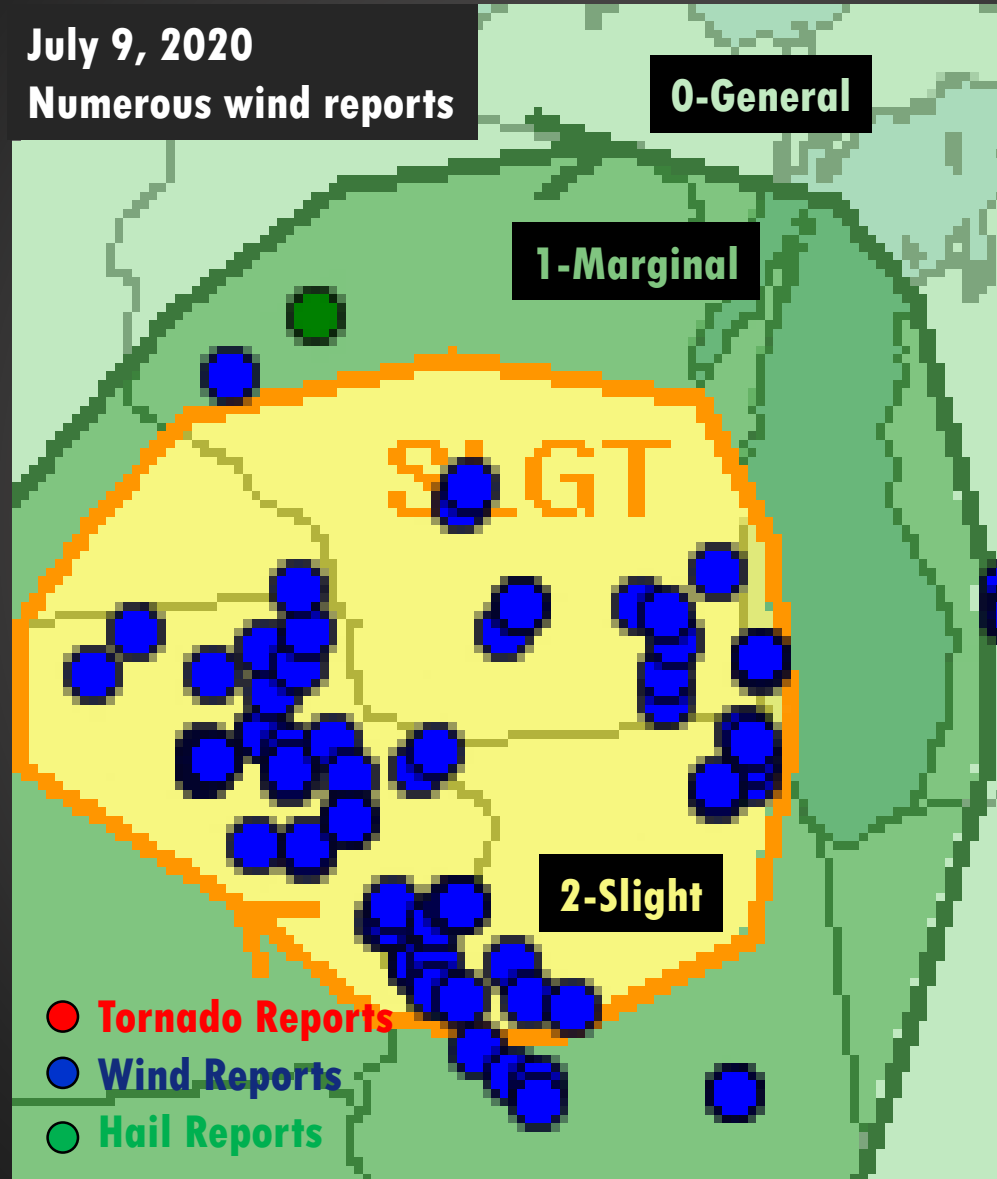
Short-lived and/or not widespread, isolated intense storms possible



- One or two tornadoes
- Reports of strong winds/wind damage
- Hail ~1", isolated 2"

July 9, 2020

Numerous wind reports

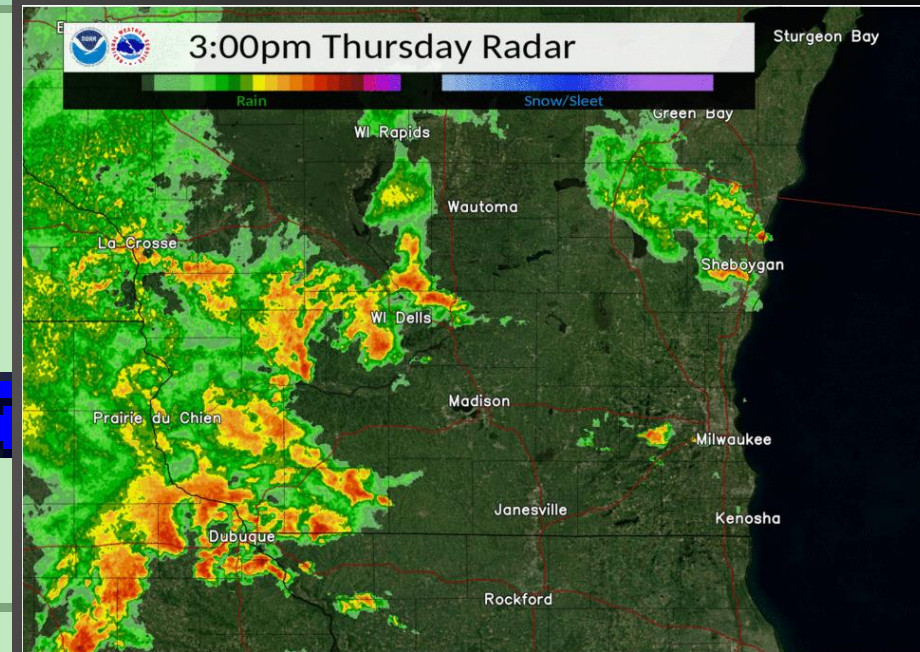


0-General

1-Marginal

2-Slight

- Tornado Reports
- Wind Reports
- Hail Reports

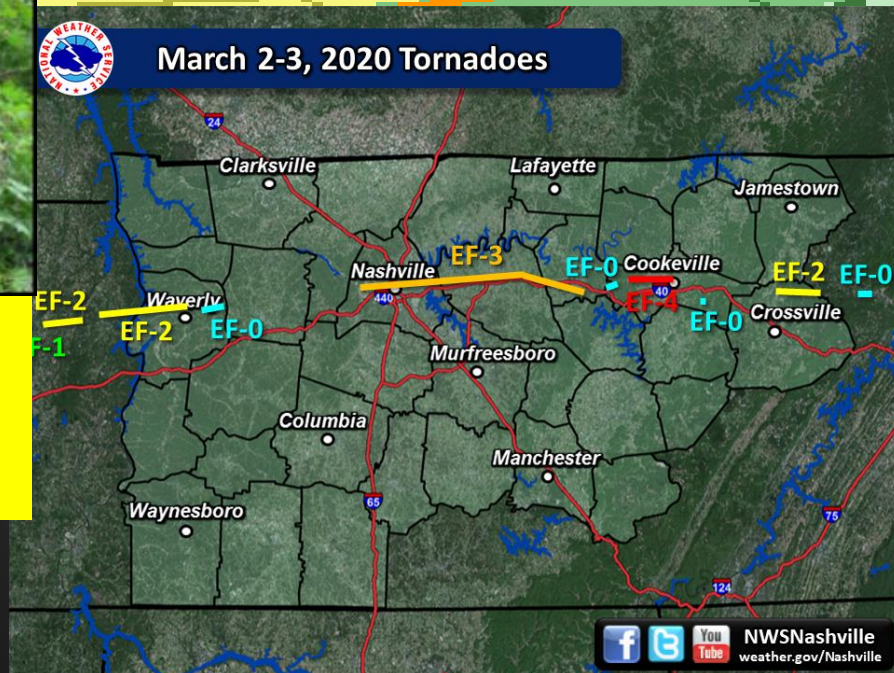
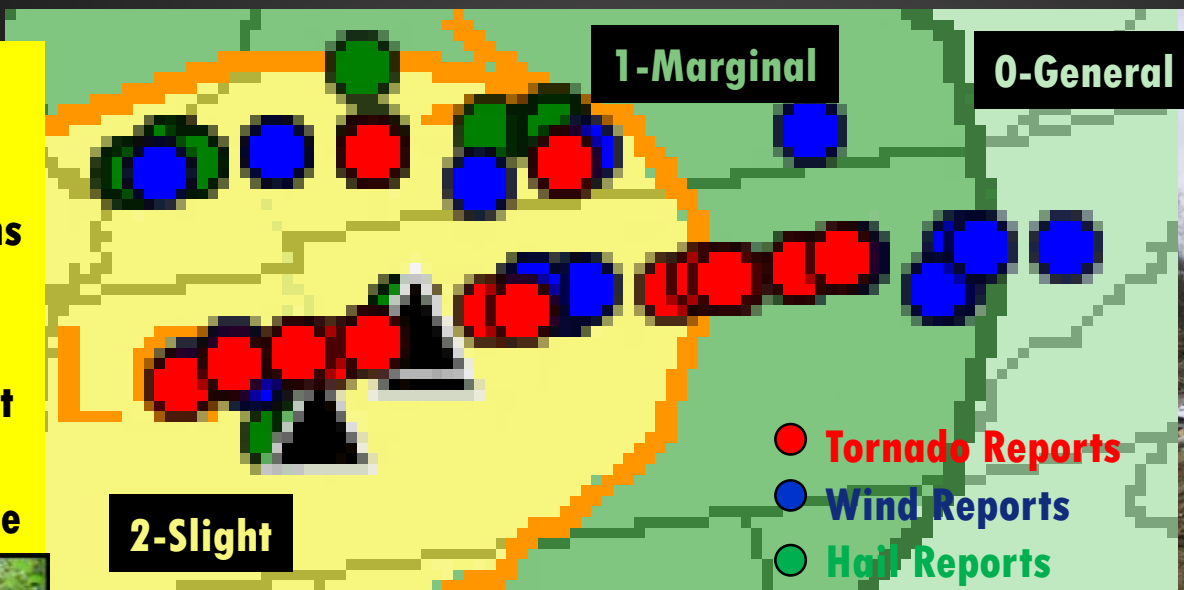


2-Slight (SLGT)

Short-lived and/or not widespread, isolated intense storms possible



- **One or two tornadoes**
- **Reports of strong winds/wind damage**
- **Hail ~1", isolated 2"**



Enhanced Risk Thunderstorms: Risk Level-3 out of 5

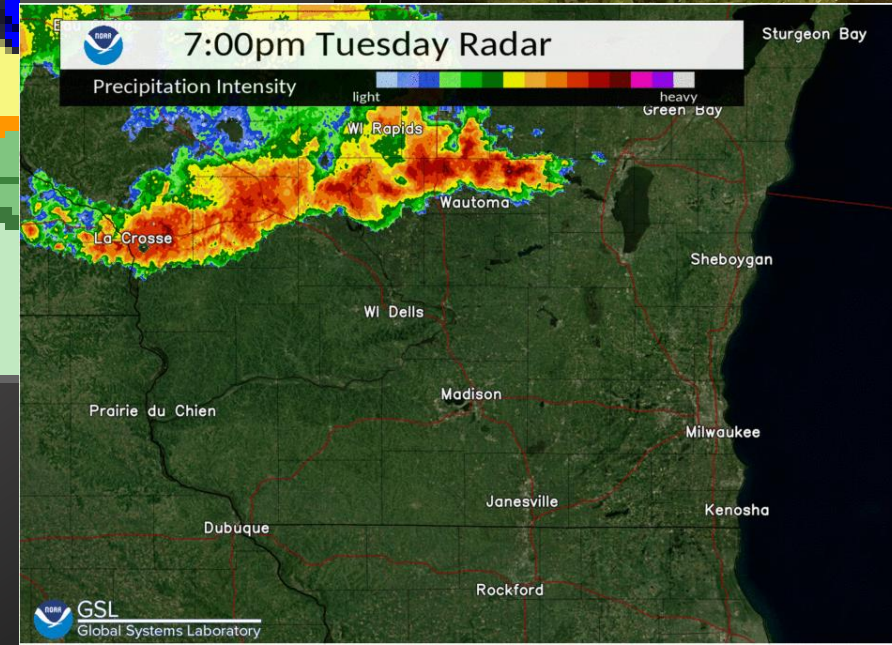
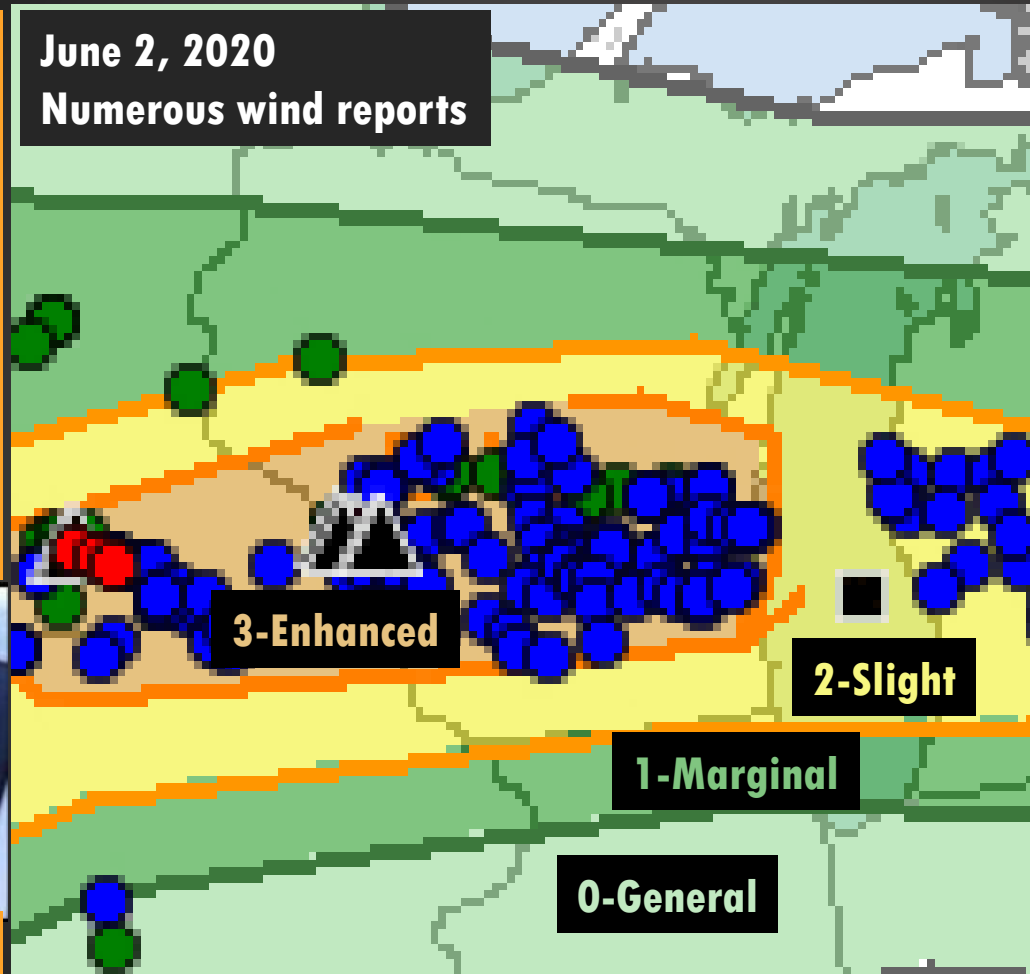
3-Enhanced (ENH)

Numerous severe storms possible

More persistent and/or widespread, a few intense



June 2, 2020
Numerous wind reports



Prepare

- A few tornadoes
- Several reports of wind damage
- Damaging hail, 1-2"

Moderate Risk Thunderstorms: Risk Level-4 out of 5

4-Moderate

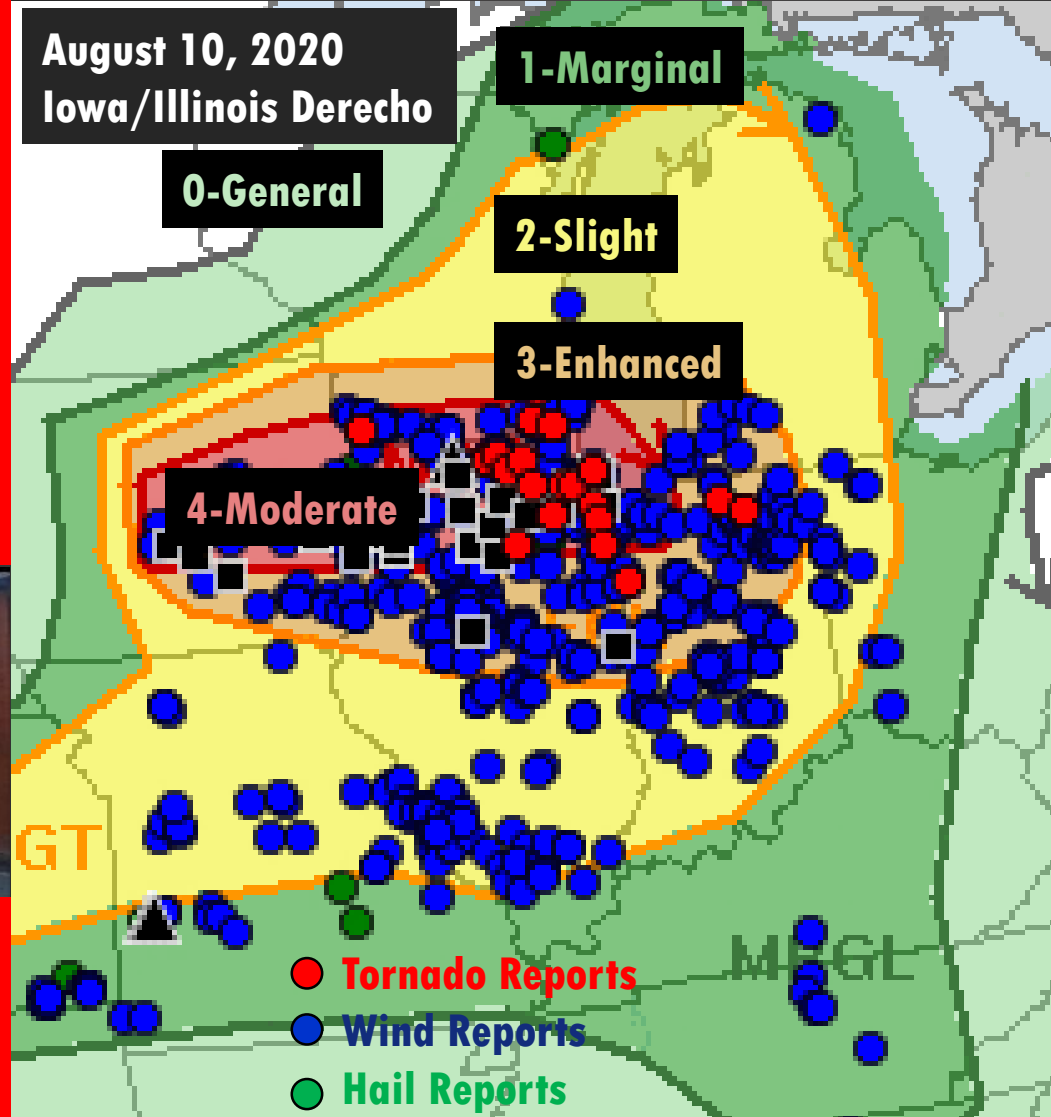
Widespread severe storms likely

Long-lived, widespread and intense

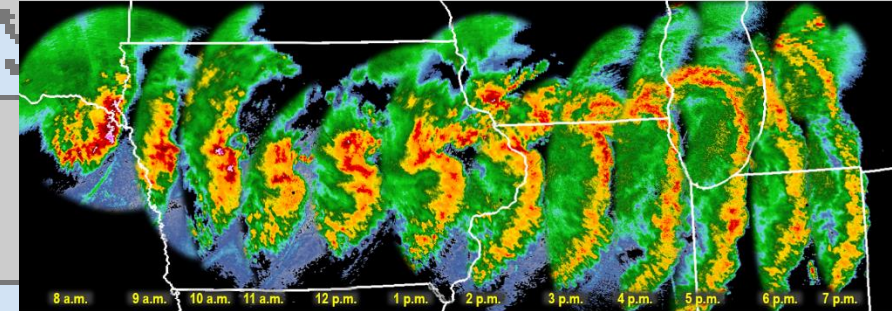


- Strong tornadoes
- Widespread wind damage
- Destructive hail, 2"+

August 10, 2020
Iowa/Illinois Derecho



August 10, 2020 Derecho: Lowest Angle NWS Radar Reflectivity at One-Hour Time Steps
All times in CDT



This long-lasting, severe wind thunderstorm complex (known as a derecho) produced hundreds of reports of damage along with likely a few tornadoes.
NWS Chicago | weather.gov Aug 11, 2020



Kip Ladage
Tama County, Iowa

Prepare

High Risk Thunderstorms: Risk Level-5 out of 5

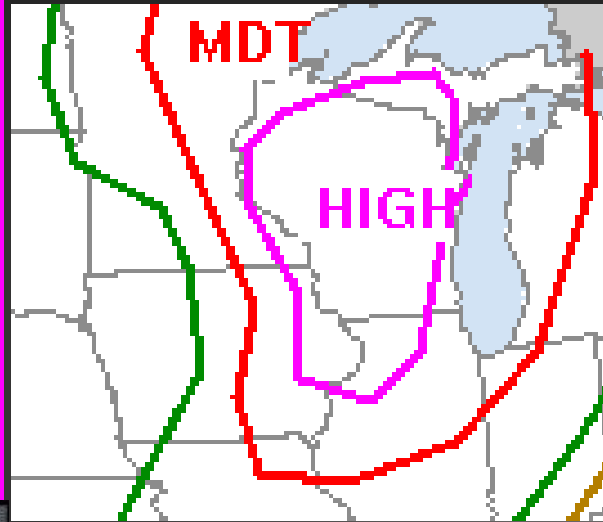
5-High

Widespread severe storms expected

Long-lived, very widespread and particularly intense

June 7, 2007

Long Track Tornado/Large Hail

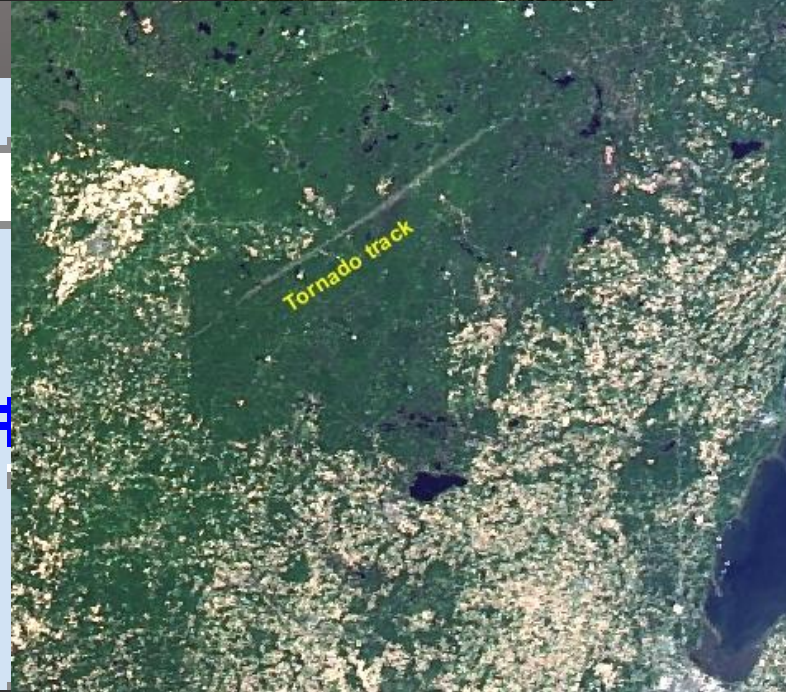


Jerome Wahleithner
White Lake

Jerome Wahleithner
White Lake, WI



Dept. of Natural Resources
Oconto Co.



Bart McCarthy
Port Edwards

- Tornado Outbreak
- Derecho

- Tornado Reports
- Wind Reports
- Hail Reports

Prepare

Local Hazardous Weather Outlook (HWO)

Local focus on severe weather potential

Spotter Outlook Hazard Risks

weather.gov/crh/ghwo?sid=mkx

National Weather Service Milwaukee/Sullivan, Wisconsin
01/27/2020 03:24 AM CST

Follow Us: [Facebook](#) [Twitter](#) [YouTube](#)
weather.gov/milwaukee

Hazardous Weather Outlook

National Weather Service Milwaukee/Sullivan WI
134 PM CDT Mon Aug 10 2020

WIZ046-047-051-052-056>060-062>072-111845-

Marquette-Green Lake-Fond du Lac-Sheboygan-Sauk-Columbia-Dodge-

Washington-Ozaukee-Iowa-Dane-Jefferson-Waukesha-Milwaukee-

Lafayette-Green-Rock-Walworth-Racine-Kenosha-

134 PM CDT Mon Aug 10 2020

This Hazardous Weather Outlook is for portions of east central Wisconsin, south central Wisconsin and southeast Wisconsin.

.DAY ONE...This Afternoon and Tonight

Thunderstorms have moved into southwest Wisconsin with additional isolated storms possible north of I-94 along the front. A Severe Thunderstorm Watch is in effect for most of our area except Sauk County. Hail up to one inch and wind gusts of 60 to 80 MPH are possible mainly along and south of I-94.

Heat index values may reach the middle 90s today in southeastern parts of the area.

Hazardous Weather Outlook

Weather Story Local Radar Weather Map

Follow us on Twitter Follow us on Facebook Follow us on YouTube

HAZARDS
National Briefing
Hazardous Weather Outlook
Storms

CURRENT CONDITIONS
NWS MKX Observation
NWS MKX Tower Camera
Local Conditions
Local Text Products

LOCAL FORECASTS
Marine Aviation
Fire
Local Text Products
Local Precip Forecast
Hourly Forecast Graphics

CLIMATE
Local Climate Products
Daily Climate Graphics
Historic Events For Snn WI
CoCoRaHS
Normals/Records MKE/MSN

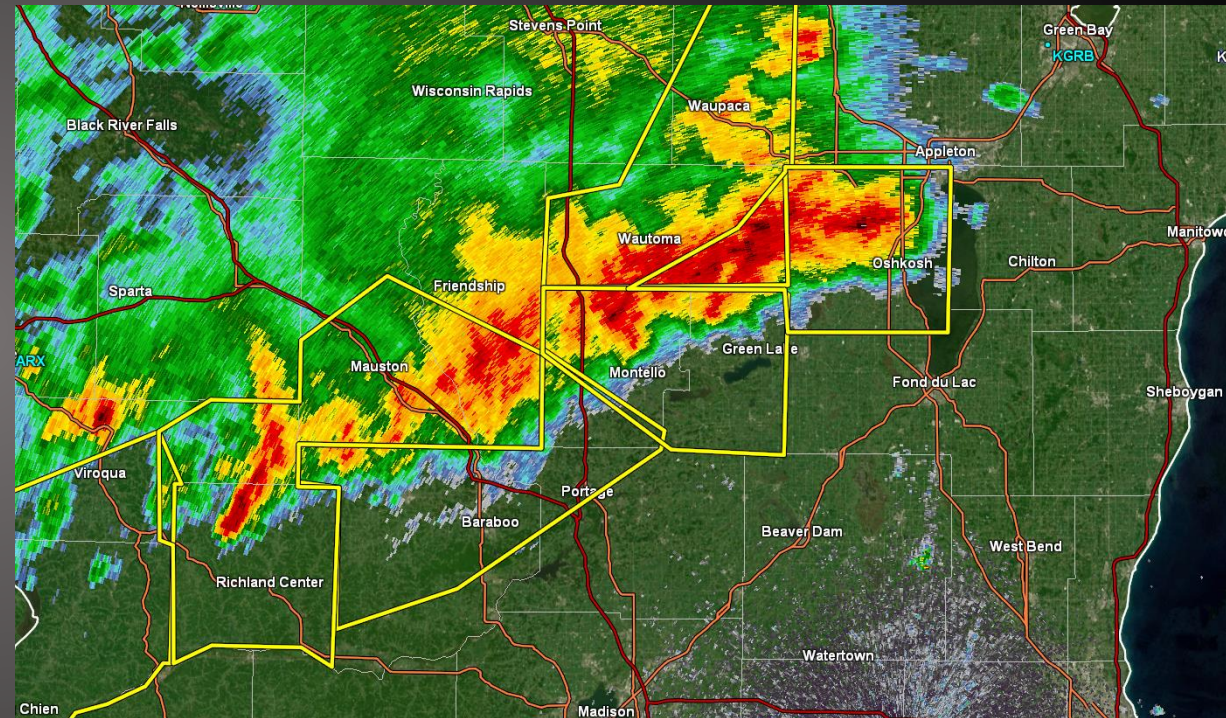
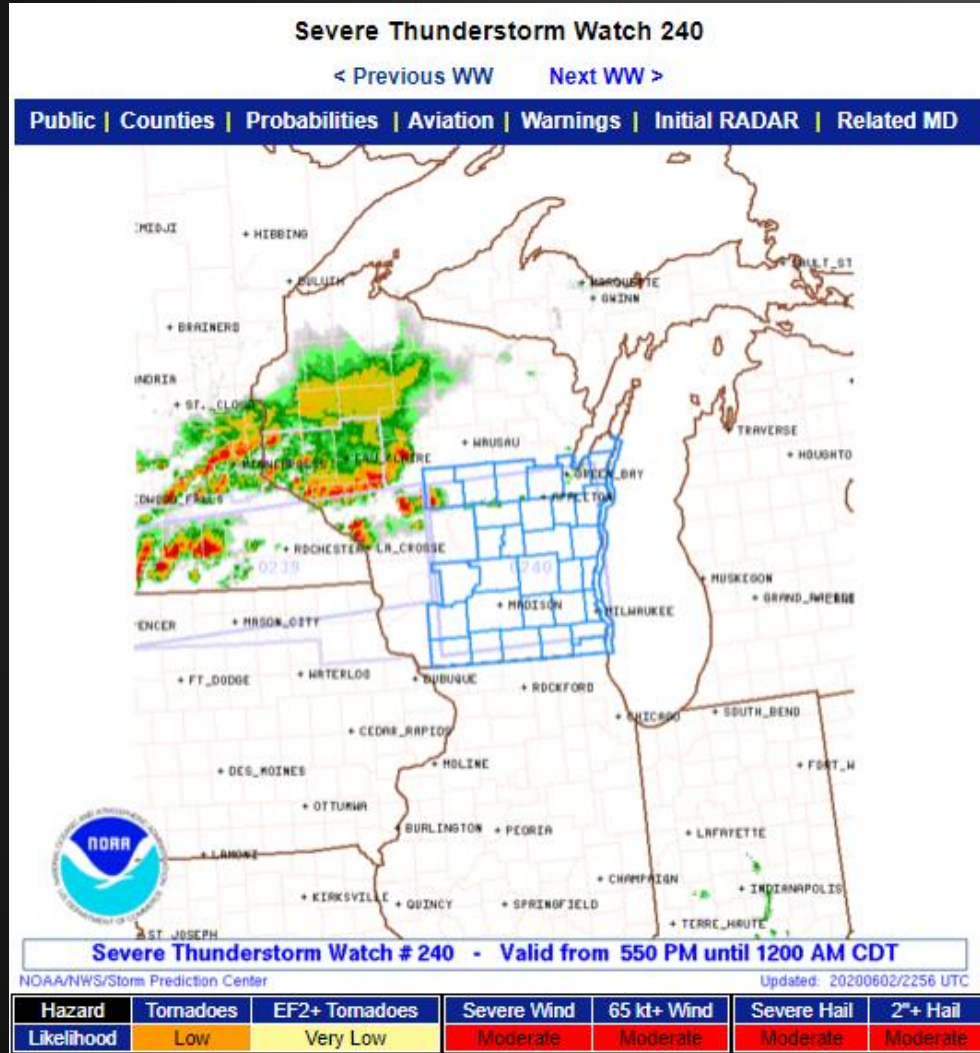
DSS PROGRAMS
Milwaukee Extreme Heat Chances
Milwaukee Warning Shelter
DSS page
In-land Lake Forecasts
Lake Michigan Beach Hazards

ABOUT US
Office Information

Prepare

Watch vs Warning

Lots of confusion on the difference

**Warning: It's there!****Watch: Ingredients are there for something**

BULLETIN - IMMEDIATE BROADCAST REQUESTED
Severe Thunderstorm Warning
National Weather Service Milwaukee/Sullivan WI
435 PM CST Tue Nov 10 2020

The National Weather Service in Milwaukee/Sullivan has issued a

- * Severe Thunderstorm Warning for...
Milwaukee County in southeastern Wisconsin...
- * Until 530 PM CST.
- * At 434 PM CST, severe thunderstorms were located along a line extending from near Mukwonago to Rochester to Silver Lake, moving east at 55 mph.

HAZARD...70 mph wind gusts.

SOURCE...Radar indicated.

IMPACT...Expect considerable tree damage. Damage is likely to mobile homes, roofs, and outbuildings.

- * Locations impacted include...
Milwaukee, West Allis, Wauwatosa, Greenfield, Oak Creek, South Milwaukee, Cudahy, Greendale, St. Francis, Hales Corners, West Milwaukee, Franklin, Milwaukee Hoan Bridge, State Fair Park, Marquette University, UW-Milwaukee, Mitchell Park Domes, Milwaukee Co Zoo, Miller Park and Maier Festival Park.

This includes the following Locations Milwaukee County Sports Complex, Milkman Stadium, Southridge Mall, Boerner Botanical Gardens, General Mitchell International Airport, Froedert & the Medical College, and Fiserv Forum.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A Tornado Watch remains in effect until 800 PM CST for southeastern Wisconsin.

Remain alert for a possible tornado! Tornadoes can develop quickly from severe thunderstorms. If you spot a tornado go at once into the basement or small central room in a sturdy structure.

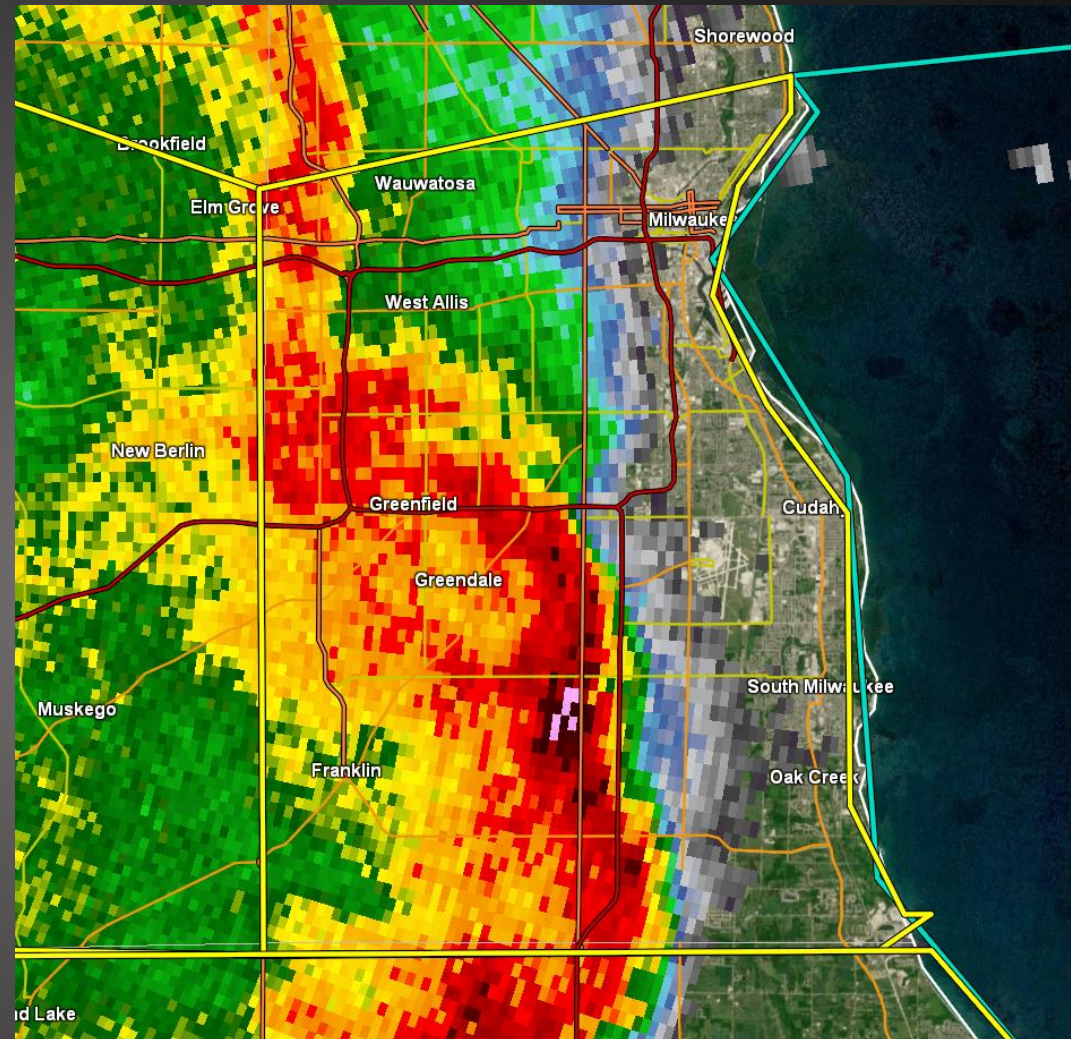
For your protection move to an interior room on the lowest floor of a building.

This is a DANGEROUS SITUATION. These storms have a history of producing widespread wind damage. SEEK SHELTER NOW inside a sturdy structure and stay away from windows!
&&

LAT...LON 4284 8784 4284 8807 4305 8807 4308 8787
4307 8787 4305 8789 4302 8790 4299 8788
4296 8785 4288 8785 4285 8783 4285 8782
TIME...MOT...LOC 2234Z 254DEG 46KT 4285 8829 4274 8819 4253 8819

TORNADO...POSSIBLE
HAIL...<.75IN
WIND...70MPH

Severe Thunderstorm Warning



Criteria: Wind: 58mph or higher
Hail: 1" diameter or larger

BULLETIN - EAS ACTIVATION REQUESTED
Tornado Warning
National Weather Service Milwaukee/Sullivan WI
421 PM CST Tue Nov 10 2020

The National Weather Service in Milwaukee/Sullivan has issued a

- * Tornado Warning for...
Northeastern Walworth County in southeastern Wisconsin...
Western Racine County in southeastern Wisconsin...
- * Until 445 PM CST.
- * At 420 PM CST, severe thunderstorms capable of producing both
tornadoes and extensive straight line wind damage were located near
Lake Geneva, moving northeast at 65 mph.

HAZARD...Tornado and quarter size hail.

SOURCE...Radar indicated rotation.

IMPACT...Flying debris will be dangerous to those caught without
shelter. Mobile homes will be damaged or destroyed.
Damage to roofs, windows, and vehicles will occur. Tree
damage is likely.

- * These dangerous storms will be near...
East Troy and Browns Lake around 425 PM CST.
Rochester and Potter Lake around 430 PM CST.
Waterford North around 435 PM CST.
Wind Lake around 440 PM CST.

Other locations impacted by this tornadic thunderstorm include Honey
Creek, Waterford, Springfield and Burlington.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

TAKE COVER NOW! Move to a basement or an interior room on the lowest
floor of a sturdy building. Avoid windows. If you are outdoors, in a
mobile home, or in a vehicle, move to the closest substantial shelter
and protect yourself from flying debris.

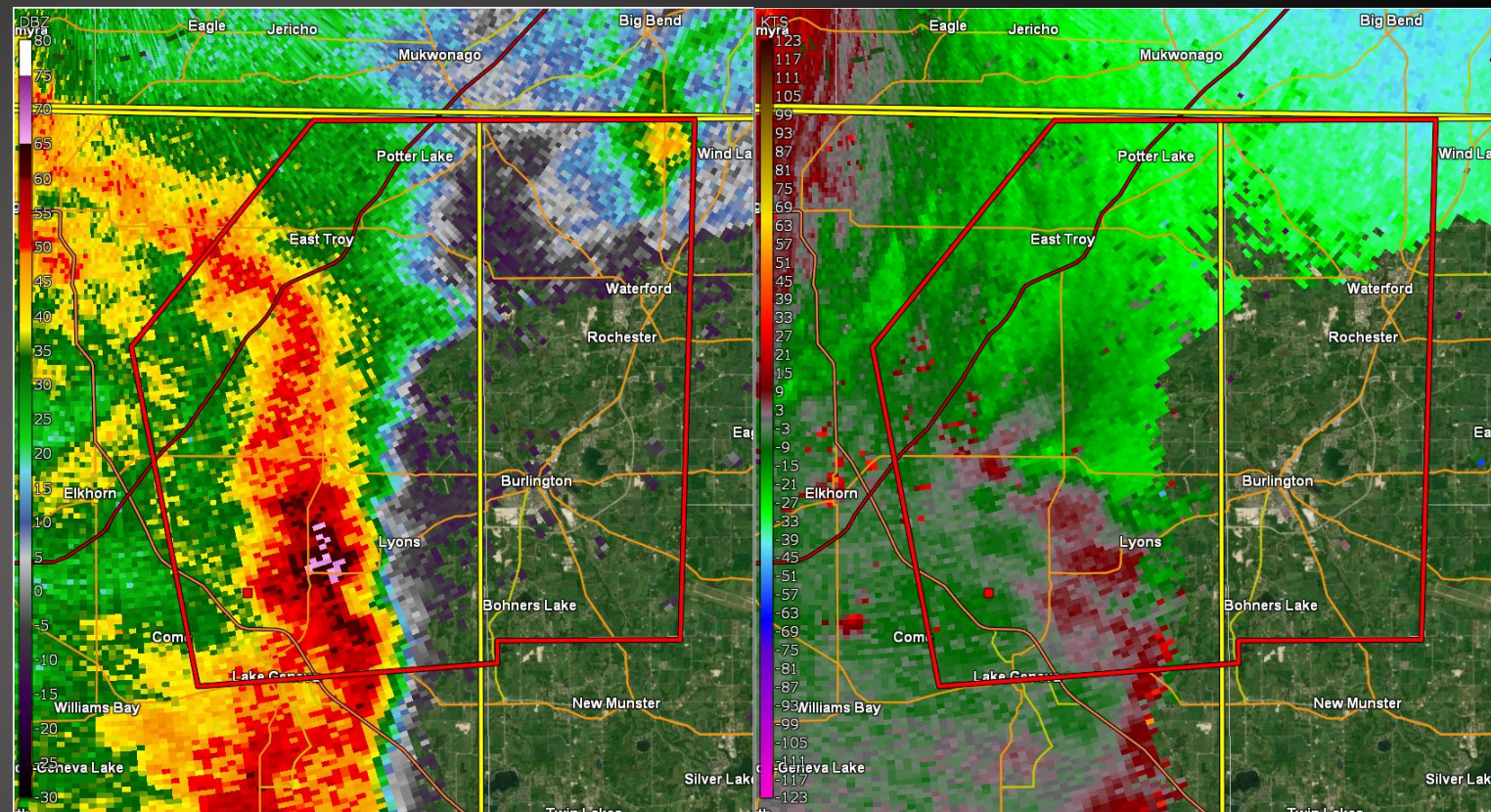
This cluster of thunderstorms is capable of producing tornadoes and
widespread significant wind damage. Do not wait to see or hear the
tornado. For your protection move to an interior room on the lowest
floor of a building.

&&

LAT...LON 4274 8852 4284 8841 4284 8818 4261 8819
4261 8830 4260 8830 4259 8848
TIME...MOT...LOC 2220Z 225DEG 55KT 4268 8840

TORNADO...RADAR INDICATED
HAIL...1.00IN

Tornado Warning



Criteria: Radar Indicated (via meteorologist)
Reported (Spotter, etc)

BULLETIN - EAS ACTIVATION REQUESTED
Flash Flood Warning
National Weather Service Milwaukee/Sullivan WI
923 PM CDT Thu Aug 27 2020

The National Weather Service in Milwaukee/Sullivan has extended the

- * Flash Flood Warning for...
Northeastern Columbia County in south central Wisconsin...
West Central Dodge County in southeastern Wisconsin...
- * Until 1230 AM CDT.
- * At 923 PM CDT, local law enforcement fast rising water trapping people in cars. Between 3 and 5 inches of rain have fallen. Flash flooding is already occurring.

HAZARD...Life threatening flash flooding. Thunderstorms producing flash flooding.

SOURCE...Law enforcement.

IMPACT...Life threatening flash flooding of creeks and streams, urban areas, highways, streets and underpasses.

- * Some locations that will experience flash flooding include...
Beaver Dam, Portage, Pardeeville, Cambria, Wyocena and South Beaver Dam.

Additional rainfall amounts up to 0.5 inches are possible in the warned area.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

Turn around, don't drown when encountering flooded roads. Most flood deaths occur in vehicles.

Be especially cautious at night when it is harder to recognize the dangers of flooding.

&&

LAT...LON 4353 8885 4342 8884 4342 8900 4354 8949
4363 8949 4363 8923 4353 8924

FLASH FLOOD...OBSERVED
FLASH FLOOD DAMAGE THREAT...CONSIDERABLE

Flash Flood Warning



Rapid rise of creeks/streams
Roads washed out or impassable

Criteria:

TNC035-141-185-030830-
/O.COR.KOHX.TO.W.0010.000000T0000Z-200303T0830Z/
Cumberland TN-White TN-Putnam TN-
205 AM CST Tue Mar 3 2020

...A TORNADO WARNING REMAINS IN EFFECT UNTIL 230 AM CST FOR
NORTHWESTERN CUMBERLAND...NORTHERN WHITE AND SOUTHERN PUTNAM
COUNTIES...

At 205 AM CST, a confirmed large and extremely dangerous tornado was
located near Cookeville, moving east at 45 mph.

This is a PARTICULARLY DANGEROUS SITUATION. TAKE COVER NOW!

HAZARD...Damaging tornado.

SOURCE...Radar confirmed tornado.

IMPACT...You are in a life-threatening situation. Flying debris may
be deadly to those caught without shelter. Mobile homes
will be destroyed. Considerable damage to homes,
businesses, and vehicles is likely and complete destruction
is possible.

The tornado will be near...
Monterey around 220 AM CST.

Other locations impacted by this tornadic thunderstorm include
Burgess Falls State Park, Hamptons Crossroads, Bakers Crossroads and
Pleasant Hill.

This includes Interstate 40 between mile markers 278 and 310.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

To repeat, a large, extremely dangerous and potentially deadly
tornado is on the ground. To protect your life, TAKE COVER NOW! Move
to a basement or an interior room on the lowest floor of a sturdy
building. Avoid windows. If you are outdoors, in a mobile home, or in
a vehicle, move to the closest substantial shelter and protect
yourself from flying debris.

Tornadoes are extremely difficult to see and confirm at night. Do not
wait to see or hear the tornado. TAKE COVER NOW!

&&

LAT...LON 3595 8522 3601 8565 3606 8568 3617 8566
3615 8521 3614 8510
TIME...MOT...LOC 2801Z 278DEG 40KT 3609 8550

TORNADO...OBSERVED
TORNADO DAMAGE THREAT...CONSIDERABLE
HAIL...1.00IN

TORNADO...OBSERVED
TORNADO DAMAGE THREAT...CONSIDERABLE
HAIL...1.00IN

Impact Based Warnings

Check the 'tags' at the bottom of the warning

Tornado and Flash Flood Warnings

- “OBSERVED” vs “RADAR INDICATED” line

Damage Threat:

- Base: Most Tornadoes/Flash Floods
- CONSIDERABLE: Unusual severity of impact
- CATASTROPHIC: Exceedingly rare, violent

Severe Thunderstorm Warnings (Coming 2021?)

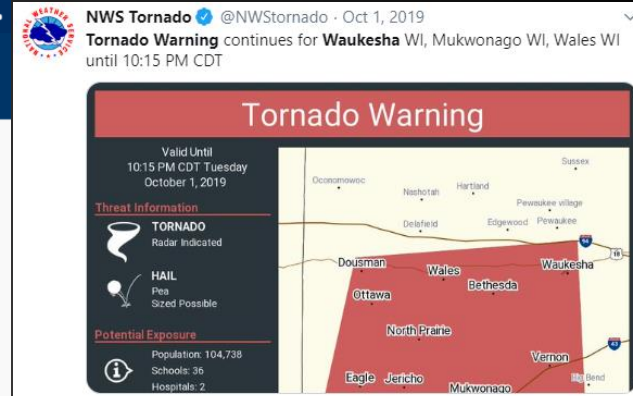
- CONSIDERABLE: 70-80mph, 1.75” (Golf Ball) to 2.75” (Baseball)
- DESTRUCTIVE: 80mph+, 2.75” (Baseball)+

Prepare**Impact Based Warnings****Tornado Warning****Catastrophic (Worst, Emergency)****Considerable****Base (Most, WEA Level)****Flash Flood Warning****Catastrophic (Worst, Emergency)****Considerable (WEA Level)****Base (Most)****Severe Thunderstorm Warning (Hail)****Destructive: >2.5" (WEA Level)****Considerable: 1.75" – 2.5"****Base: 1" – 1.75"****Severe Thunderstorm Warning (Wind)****Destructive: 90-100 mph (Rare)****Destructive: 80 mph (WEA Level)****Considerable: 70 mph****Base: 60 mph**

Prepare

How to receive warnings

- Mobile Phones:
 - Download a weather app
 - FEMA, TV station, etc
- WEA
- NOAA Weather Radio
- Watch your TV
- Listen to radio
- Outdoor Warning Sirens
- weather.gov/milwaukee
- Twitter: @NWSMilwaukee



Cell Phone Weather Apps

- NOAA and NWS do NOT have an app (mobile.weather.gov)
- Local TV Station and Private Weather Company Apps
- Apps we can recommend:

FEMA



Tornado: American Red Cross



Emergency Alerts: ARC

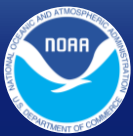
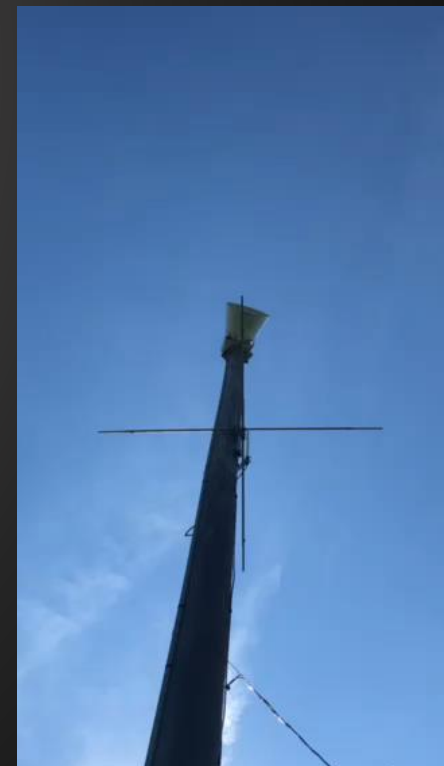


Flood: American Red Cross



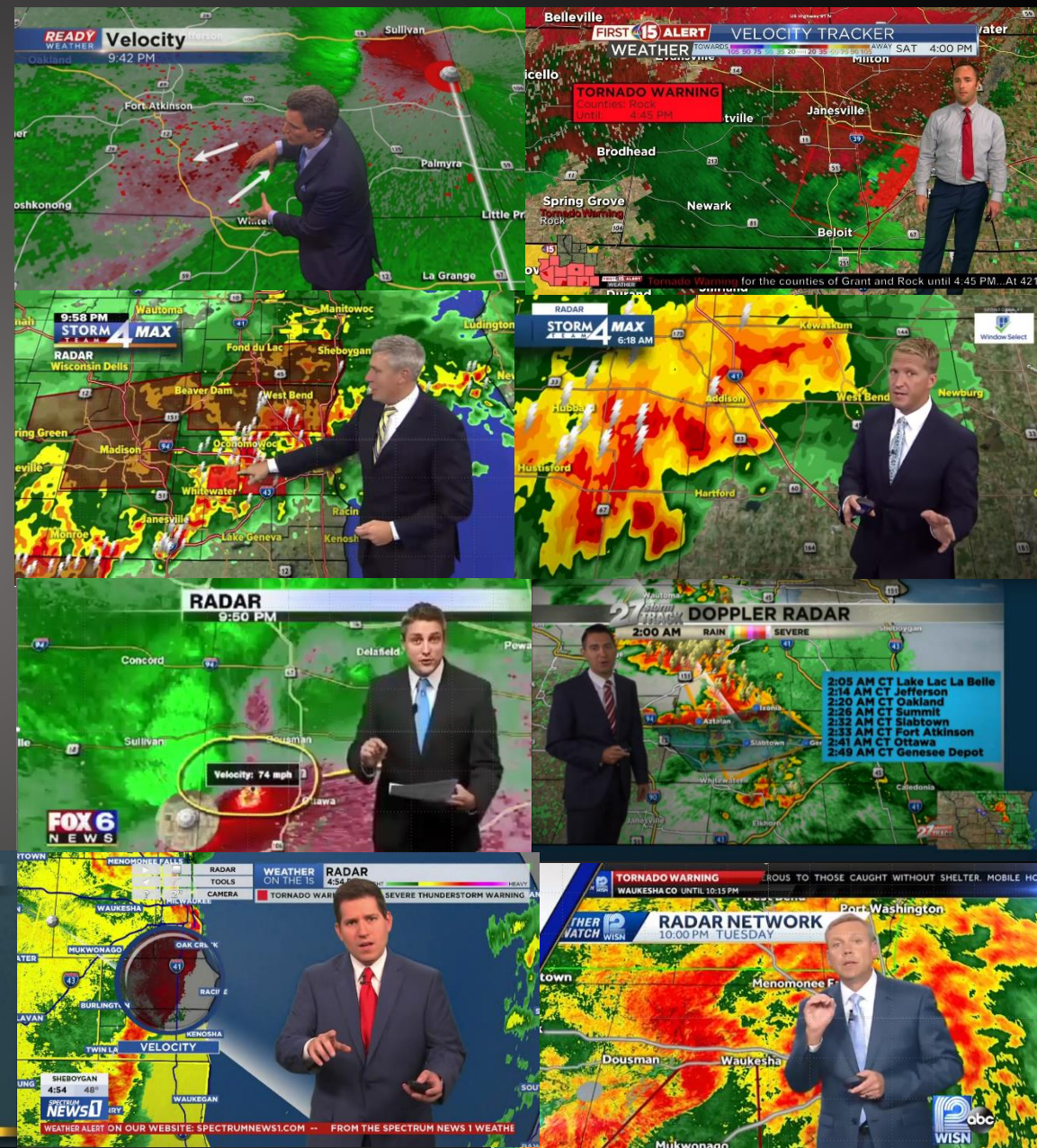
Outdoor Warning Sirens

- Sirens are for **OUTDOOR** warning purposes
- **NOT** meant to be heard indoors or wake you up at night
- Hearing a siren is a signal to get to a shelter and seek additional information
- If a siren stops, it **DOES NOT** mean the threat has ended!
- Sirens are activated by city and county officials, not the National Weather Service



Turn on your TV!!!

- Cut ins for ANY Tornado Warnings
- A main source for warning information
- Play by Play on storms
- Free weather apps!



Mobile Spotter? Pick some spotting locations.

- Upstream from city
 - Avoid high traffic areas
- Good visibility
 - High ground
 - No trees
 - No buildings
- Know your escape route
 - How long to get to shelter



Deploy

Spotter Safety

Your safety is more important than a report!



**Cailyn Lloyd
Oakfield F5
July 18, 1996**

If you feel unsafe, seek shelter!

If you're mobile spotting, don't run stop signs.

Deploy

Spotter Safety

Most reports come from people at home!



Hail and Damaging Wind events in particular.

Deploy

Spotter Safety

Mobile Spotting Used in Tornado Situations



**Trained spotters report in wall clouds, funnel clouds
and tornadoes to give us ground truth.**

Deploy

Spotter Safety: Lightning Biggest threat to spotters!

- Be careful in open areas
- Stay in vehicle
- No need to report

**When
Thunder
Roars,
Go Indoors!**

STOP all activities.

Seek shelter in a substantial building
or hard-topped vehicle.

Wait 30 minutes after storm to
resume activities.



www.lightningsafety.noaa.gov



(c) Hunter Anderson

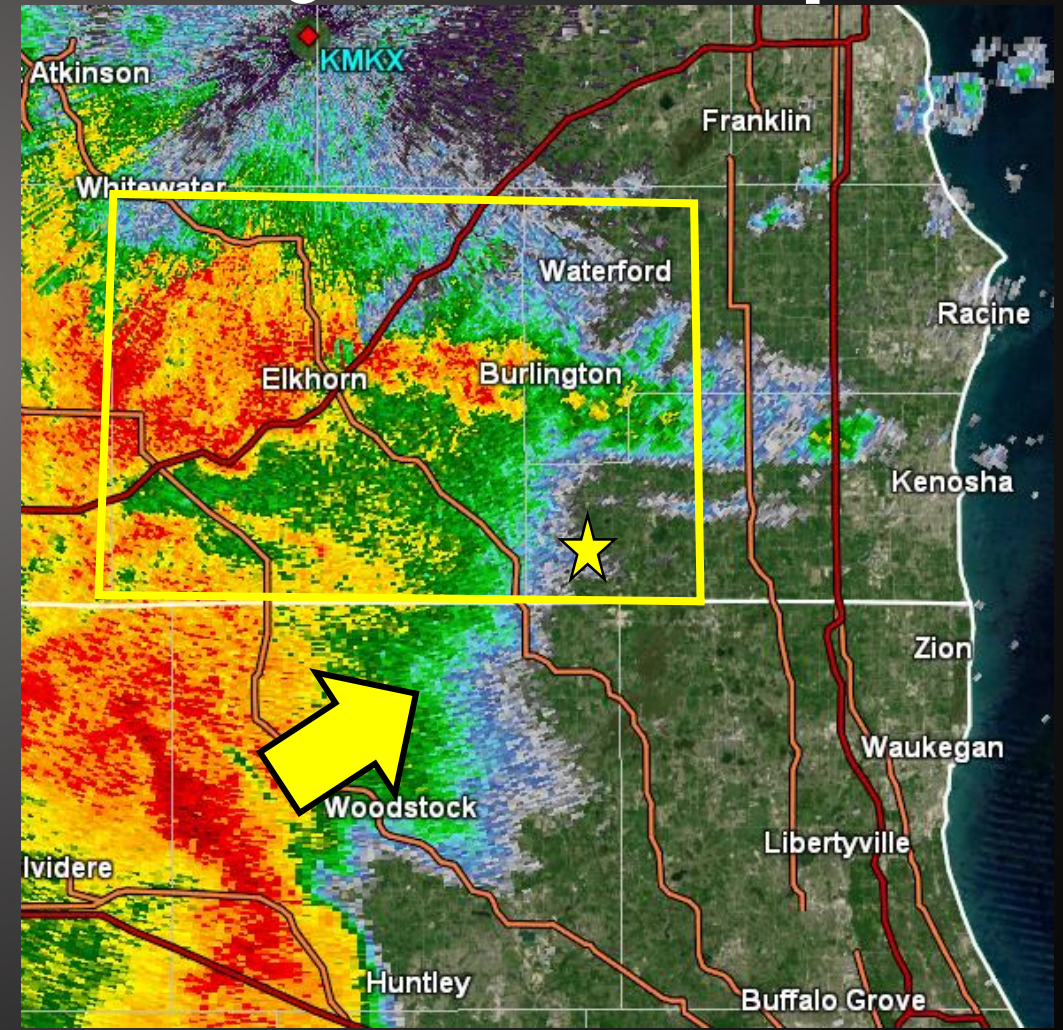
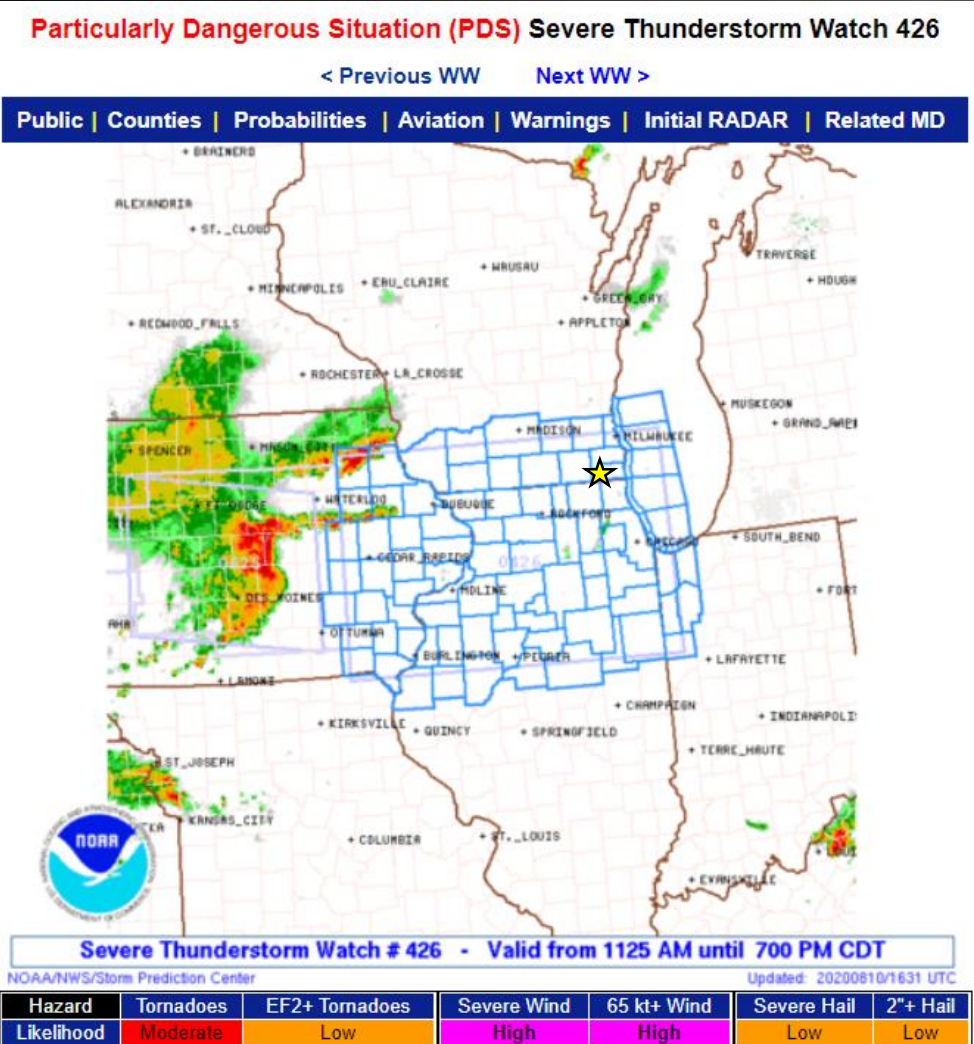
Deploy

Spotter Safety: Mobile Spotting

When should I go to my mobile spotting location?

Watch Issued: 11:25am

Warning Issued: 3:13pm



Deploy

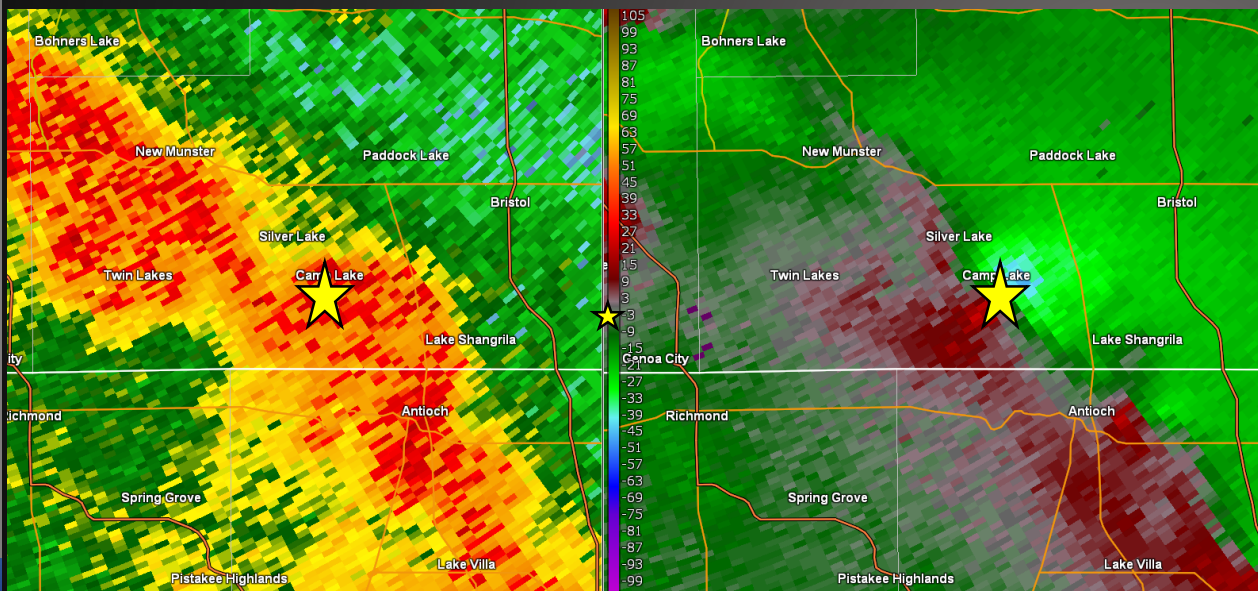
Spotter Safety: Mobile Spotting

When should I go to my mobile spotting location?

Tornado Warning: 3:44pm

Storm Arrived: 3:47pm

**Could you have made it back
to your shelter in time?**



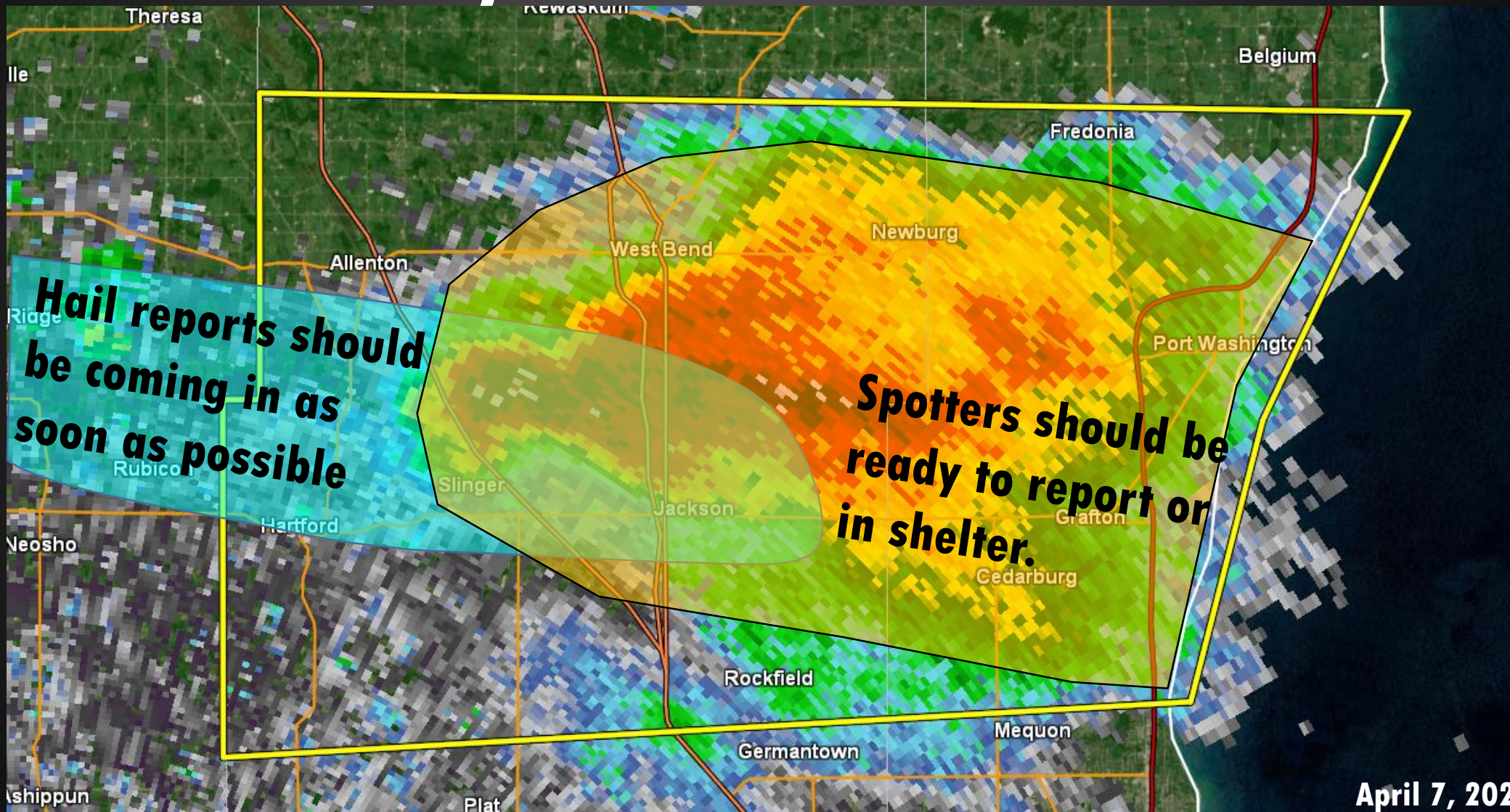
**Camp Lake, WI EF-1
Brant Vogel**

**Squall line tornadoes are next to impossible to
see. Better at your shelter.**

Deploy

When to Get Ready to Spot/Report

Every situation is different



April 7, 2020
Tennis Ball Hail

Deploy

Self Activating

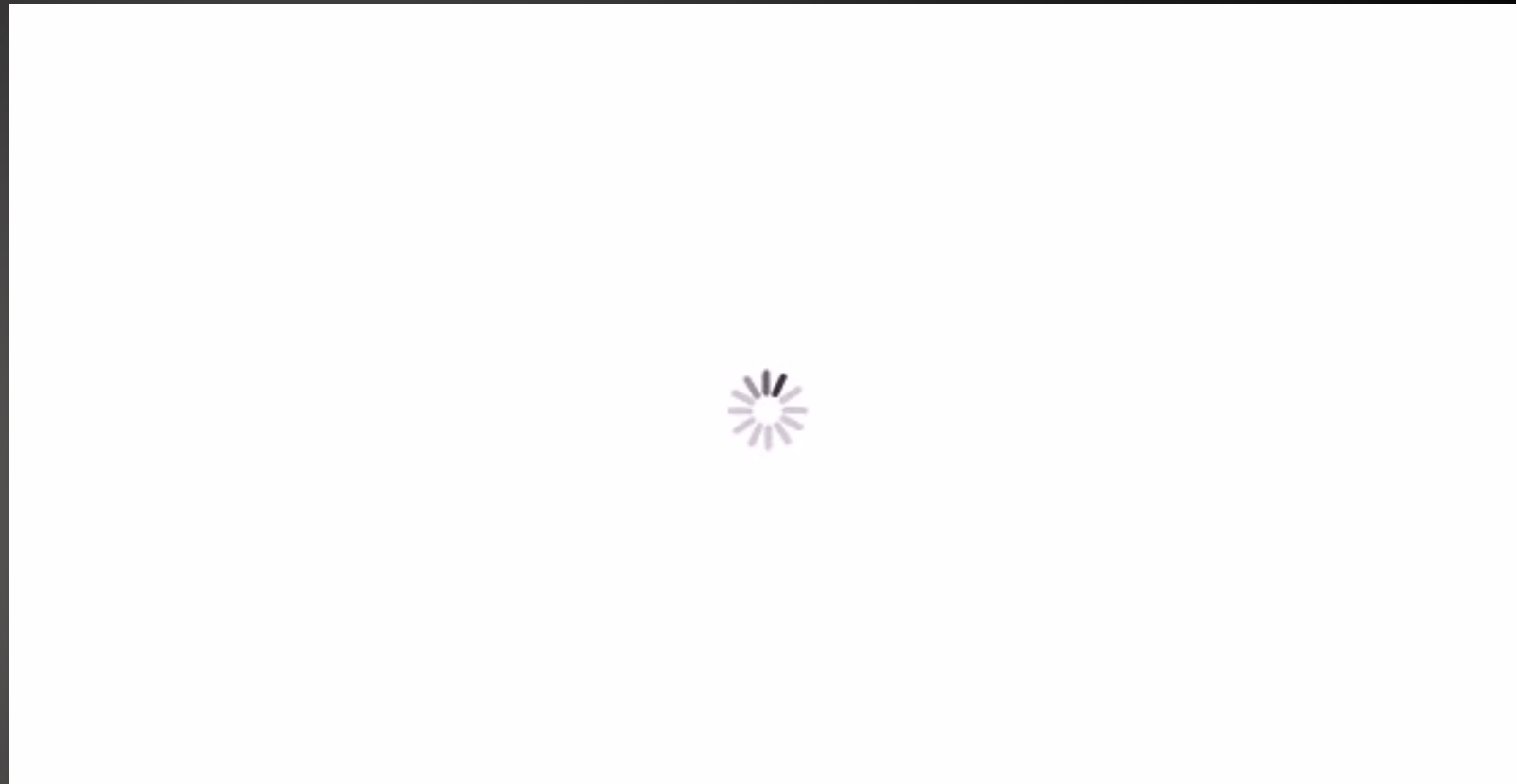
NWS Milwaukee does not tell spotters when to go out

**Chetek EF-3
83 mile long tornado
May 17, 2017**

- **Stay ahead of the storms**
- **Monitor conditions/radar/warnings in nearby counties**
- **Be pro-active! Some days may produce more than expected.**
- **You may not see anything.**

Deploy

Get to know RADAR!

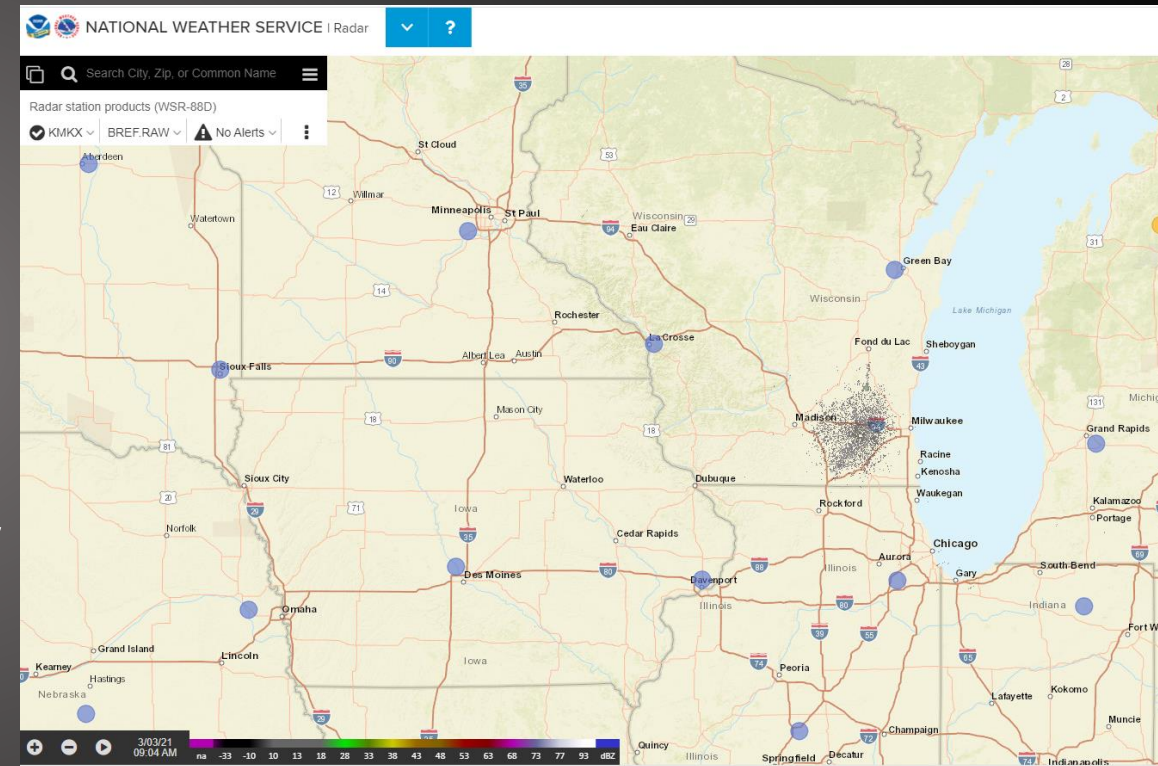


**Download a radar app that shows your location relative to the storms.
We can't recommend radar/weather apps.**

Deploy

Updated radar.weather.gov Page

- New page since Flash went away
- Has Dual Pol data on it
- Has Terminal Doppler (TMKE)
- weather.gov/radarfaq
- Latency issues
- Feedback:
nws.radarfeedback@noaa.gov

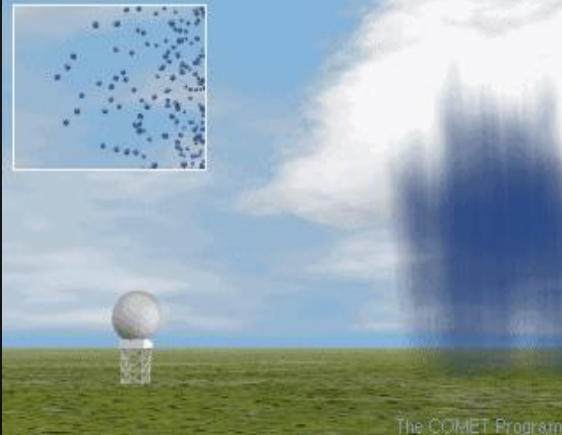
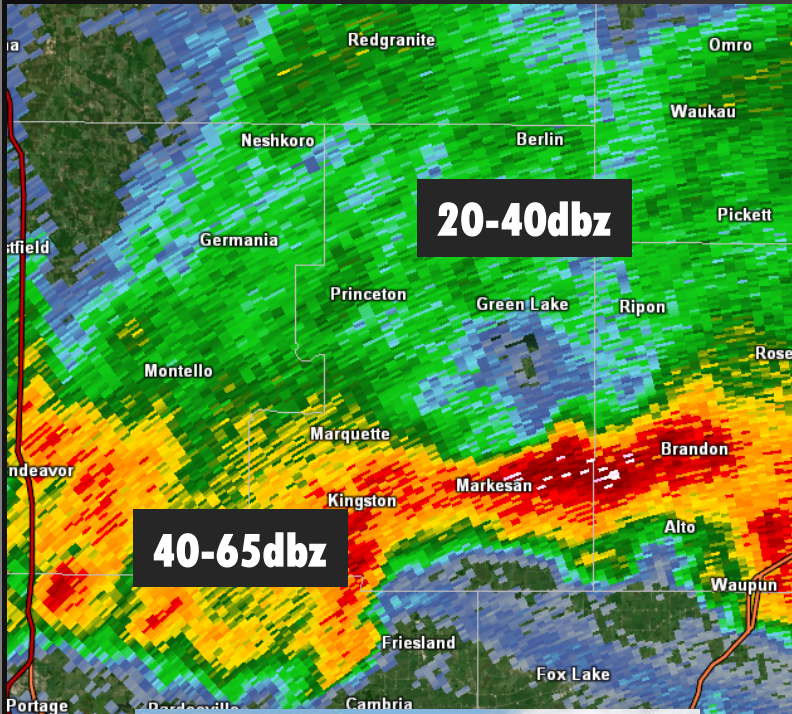


radar.weather.gov



Main Radar Field for Spotters: Reflectivity

“How much ‘stuff’ is there?”



70 dBZ

60 dBZ

50 dBZ

40 dBZ

30 dBZ

20 dBZ

10 dBZ

HAIL

HEAVY RAIN

MOD RAIN

LIGHT RAIN

Deploy

Storm Positioning: Using Reflectivity

Normally want to be on the south side of storm

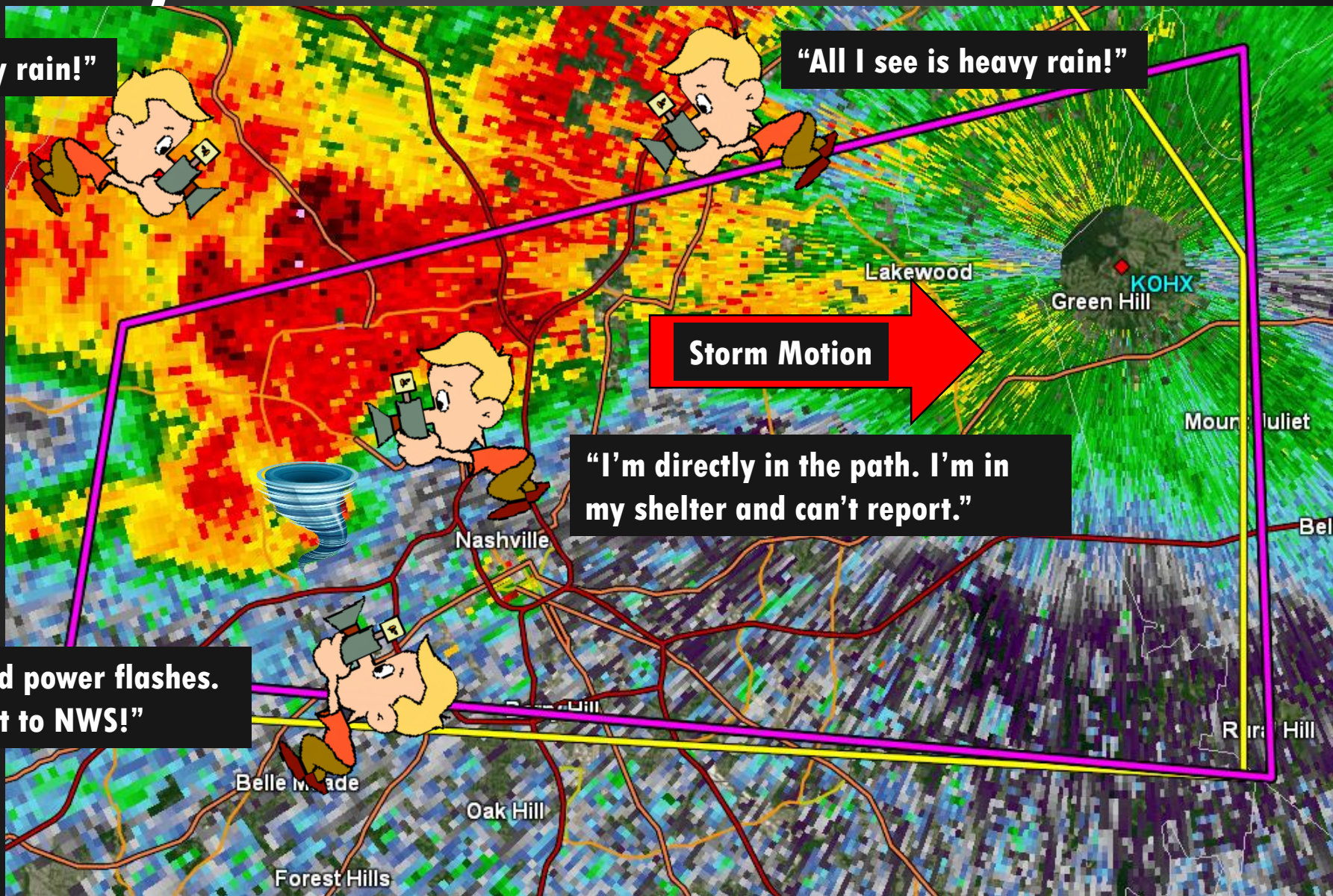
"All I see is heavy rain!"

"All I see is heavy rain!"

Storm Motion

"I'm directly in the path. I'm in my shelter and can't report."

"I see it and power flashes. Reporting it to NWS!"



Deploy**Situational Spotting****Best to Spot/Report at Home:**

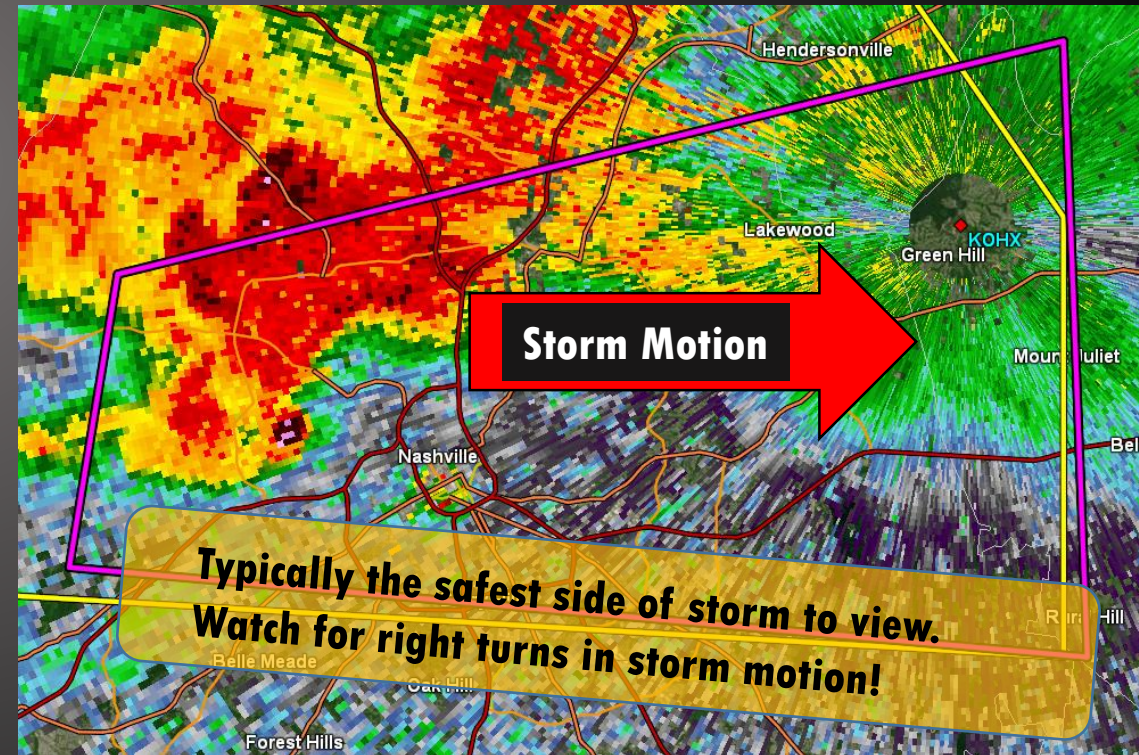
- **Squall line/Damaging Winds**
 - Storm motion is too fast
 - Chance of seeing a tornado is minimal (rain wrapped, brief)
- **Large Hail**
- **Heavy Rain/Flooding**
- **Direct path of tornado**

Keeps you close to shelter.

No damage to car or trapped by falling trees.

Main Time to Mobile Spot:

- **Staying south of tornadic, non-squall line storm (supercell)**



Storm Spotting Process: **Observe**

What weather needs to be reported to us?

- **Tornadoes**
- **Funnel Clouds**
- **Wall Clouds**
- **Hail**
- **Wind Damage**
- **Flooding**
- **Estimated Wind Speed**
- **Waterspouts**
- **High Rain measurements (not instantaneous)**



Cailyn Lloyd
Oakfield F5
July 18, 1996

Storm Spotting Process: **Observe**

What weather **DOES NOT** need to be reported to us?

- **Light Rain**
- **Shelf Clouds**
- **Lightning**
- **Thunder**
- **Second Hand /
Unconfirmed Info**



Shelf Cloud
NWS Milwaukee
Tim Snopek

Observe

Thunderstorm Ingredients

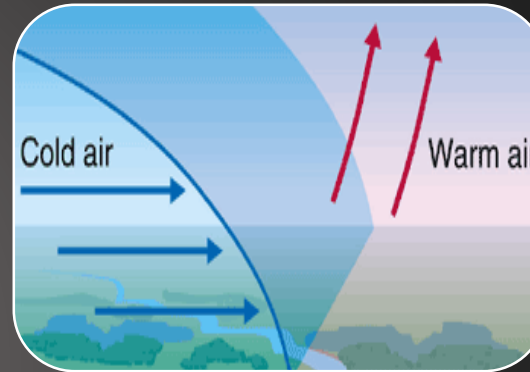
Moisture



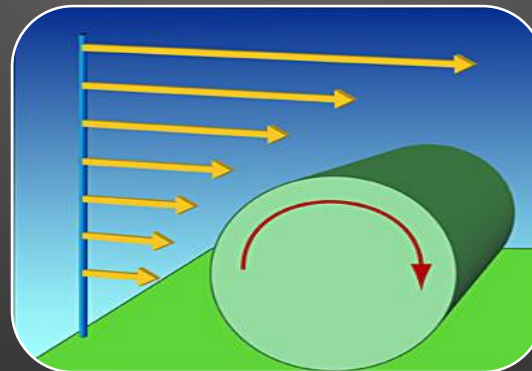
Instability



Lift



Wind Shear



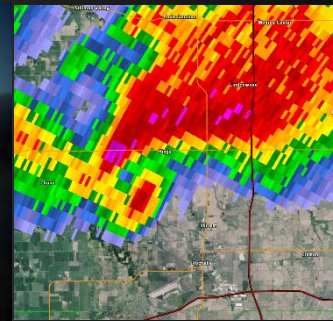
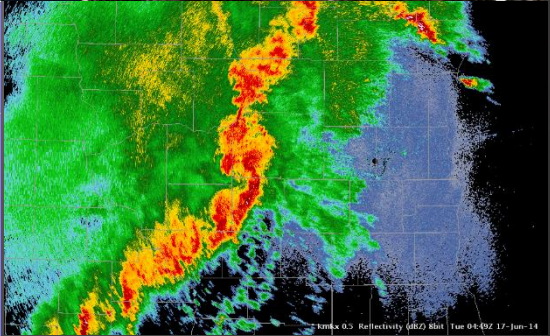
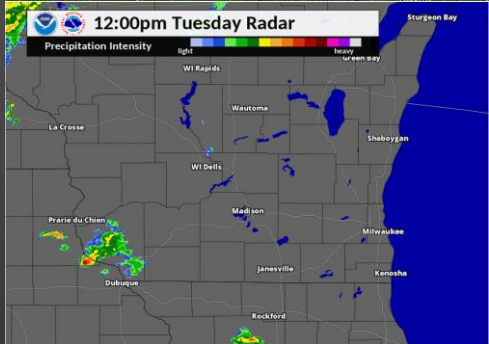
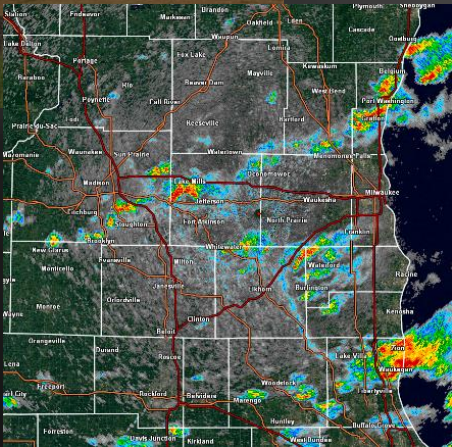
**For Severe
Thunderstorms:**

Observe

Storm Types (Mode)

WIND SHEAR

Single Cell Multicell Cluster or Line Supercell



Isolated/Brief/No Severe

Most Common Severe Weather

Less Frequent, but potential high end severe/tornadoes



Observe

Hail

Measure the largest hailstones, use a ruler/object

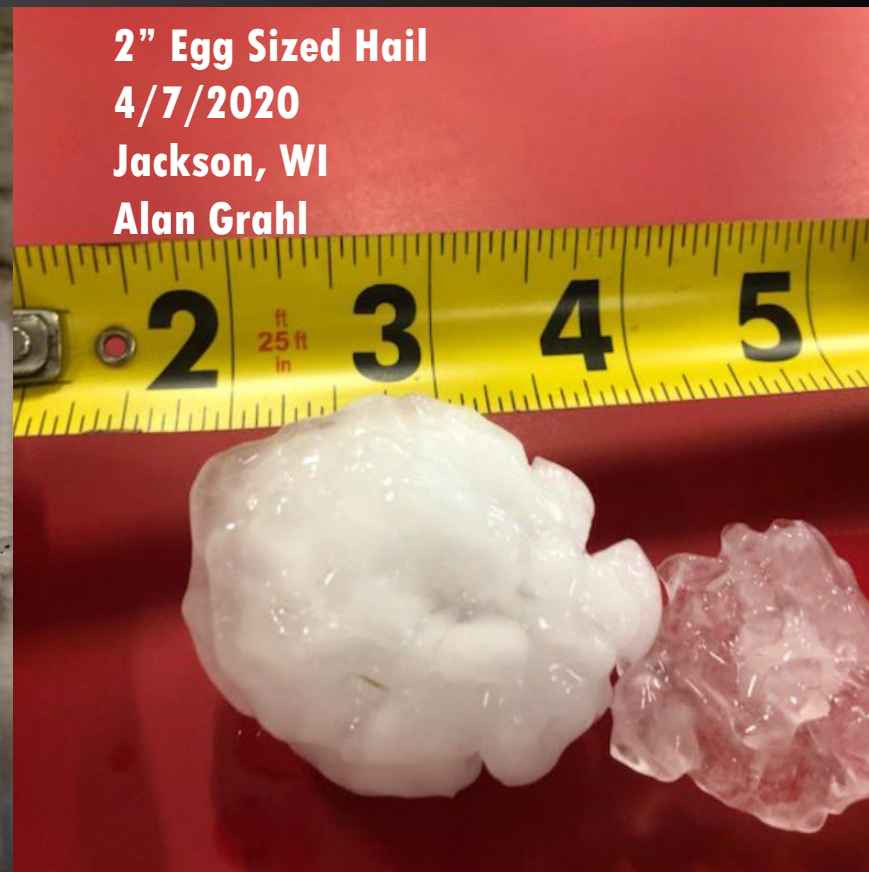
3" Baseball Sized Hail
4/7/2020
Browntown, WI
Amy Wuethrich



2" Egg Sized Hail
4/7/2020 Jackson, WI
Matt Schoeneck



2" Egg Sized Hail
4/7/2020
Jackson, WI
Alan Grahl

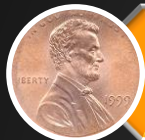


1" Diameter/Size of Quarter is Severe

Observe



PEA = 1/4"



PENNY = 3/4"



NICKEL = 7/8"

SEVERE



QUARTER = 1"



HALF DOLLAR=1 1/4"



WALNUT = 1 1/2"



GOLF BALL=1 3/4"

Hail



EGG = 2"



POOL BALL=2 1/4"



TENNIS BALL=2 1/2"



BASEBALL=2 3/4"



GRAPEFRUIT=4"



SOFTBALL = 4 1/2"

Observe

Flooding/Heavy Rain

- Impassable, Closed or Washed out: Roads, Bridges, Railroads
- Rivers/Creeks out of banks
- Flowing vs Standing Water
- What is being threatened?
- “It’s never reached this area”
- 1” of rainfall in short time



John Griswold

Observe

Flooding/Heavy Rain

Measuring Rain? Join and report through CoCoRaHS

View Data : List Daily Precipitation Reports US Units ▼

Search Daily Precipitation Reports

Station Fields: ☐ Station Number ☐ Station Name

Location: USA ▼ Wisconsin ▼ DA - Dane ▼

Date Range:

Start Date: 8/21/2018 End Date: 8/21/2018

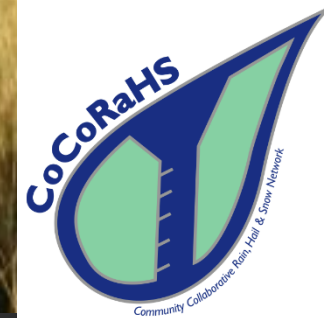
Precip Value: All Precip Values ▼ Operator ▼

Search

Searched: Stations in Dane, Wisconsin. Report date on 8/21/2018.

Showing 24 Records.

Date	Time	Station Number	Station Name	Total Precip in. ▲	New Snow in. ❄️💧		Total Snow in. ❄️💧				
8/21/2018	7:00 AM	WI-DA-45	Madison 6.1 W	11.63	NA	NA	NA	NA			
8/21/2018	7:00 AM	WI-DA-46	Madison 6.4 W	11.19	NA	NA	NA	NA			
8/21/2018	8:00 AM	WI-DA-63	Madison 7.0 WSW	11.02	NA	NA	NA	NA			
8/21/2018	7:00 AM	WI-DA-49	Verona 5.5 WNW	10.47	NA	NA	NA	NA			
8/21/2018	7:00 AM	WI-DA-3	Madison 5.0 SW	9.58	NA	NA	NA	NA			
8/21/2018	7:00 AM	WI-DA-39	Madison 4.0 W	9.31	0.0	NA	0.0	NA			
8/21/2018	7:00 AM	WI-DA-13	Madison 3.7 WSW	8.05	NA	NA	NA	NA			
8/21/2018	7:05 AM	WI-DA-60	Middleton 0.8 SSW	8.05	NA	NA	NA	NA			
8/21/2018	6:30 AM	WI-DA-59	Mount Horeb 0.7 S	7.32	NA	NA	NA	NA			
8/21/2018	7:00 AM	WI-DA-10	Mount Horeb 3.6 SSW	5.60	NA	NA	NA	NA			
8/21/2018	7:00 AM	WI-DA-29	Madison 4.8 NNW	5.32	NA	NA	NA	NA			
8/21/2018	6:45 AM	WI-DA-69	Maple Bluff 1.7 N	5.09	NA	NA	NA	NA			
8/21/2018	8:00 AM	WI-DA-35	Madison 5.5 N	4.84	NA	NA	NA	NA			
8/21/2018	8:00 AM	WI-DA-56	Madison 4.4 NE	4.58	NA	NA	NA	NA	WI	Dane	Classic New
8/21/2018	7:00 AM	WI-DA-33	Oregon 0.4 SSW	4.24	NA	NA	NA	NA	WI	Dane	Classic New
8/21/2018	7:30 AM	WI-DA-31	Deerfield 0.6 N	4.20	0.0	0.00	0.0	0.00	WI	Dane	Classic New
8/21/2018	6:00 AM	WI-DA-52	Madison 2.8 NE	4.14	0.0	0.00	0.0	0.00	WI	Dane	Classic New
8/21/2018	7:00 AM	WI-DA-44	Brooklyn 0.9 NNE	4.02	NA	NA	NA	NA	WI	Dane	Classic New



Logout Precip Report Details

CO-LR-610
Fort Collins 3.5 SW

Precipitation Report

Observation Date: 2015-05-13

Observation Time: 07:00

Rain/Melted Snow: 0.00

☐ Trace Precip [More Details](#)

☐ Metric Units (mm/cm)

Submit

cocorahs.org



Turn Around, Don't Drown

National Weather Service Milwaukee



2008 Flooding

Observe

Damaging Winds

Most people over-estimate

- **Measure or Estimate**
- **What part of the tree?**
- **Multiple trees?**
- **One rotted tree?**
- **Strongest winds can be ahead of rain (Outflow)**



Fontana-On-Geneva Lake
Fire Chief
November 10, 2020

30-50mph: Whole trees in motion, Twigs or small branches breaking

50-58mph: Branches/Small Limbs Breaking

58-75mph: Visible structural damage, large branches broken

Over 75mph: Loss of roof/materials, trees uprooted/trunk snapped

Most frequent type of severe weather, vulnerable if outside

- **Camping (Under a tree)**
- **Boating (Motor or Canoe)**
- **Note: Strong winds can come before rain starts**



**July 19, 2019
Pearson, WI
Julie Collins**

Observe

Damaging Winds: Safety

Most frequent type of severe weather, vulnerable if outside

- **Camping (Under a tree)**
- **Boating (Motor or Canoe)**
- **Note: Strong winds can come before rain starts**



July 19, 2019
Pearson, WI
Julie Collins

Observe

Shelf Clouds

No need to report, but could mark beginning of strong winds



**NWS Milwaukee
Dousman, WI
Tim Snopek**

Observe

Tornadoes

Spotters add the most value with their spotting of tornado formation and prompt reporting directly to the NWS.



Observe

Tornadoes: Enhanced Fujita Scale

EF-0

Up to 85 mph

EF-0/1: Weak
Tornadoes

EF-1

86-110 mph

EF-2

111-135 mph

EF-2/3: Strong
Tornadoes

EF-3

136-165 mph

EF-4

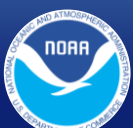
166-200 mph

EF-4/5: Violent
Tornadoes

EF-5

Over 200 mph

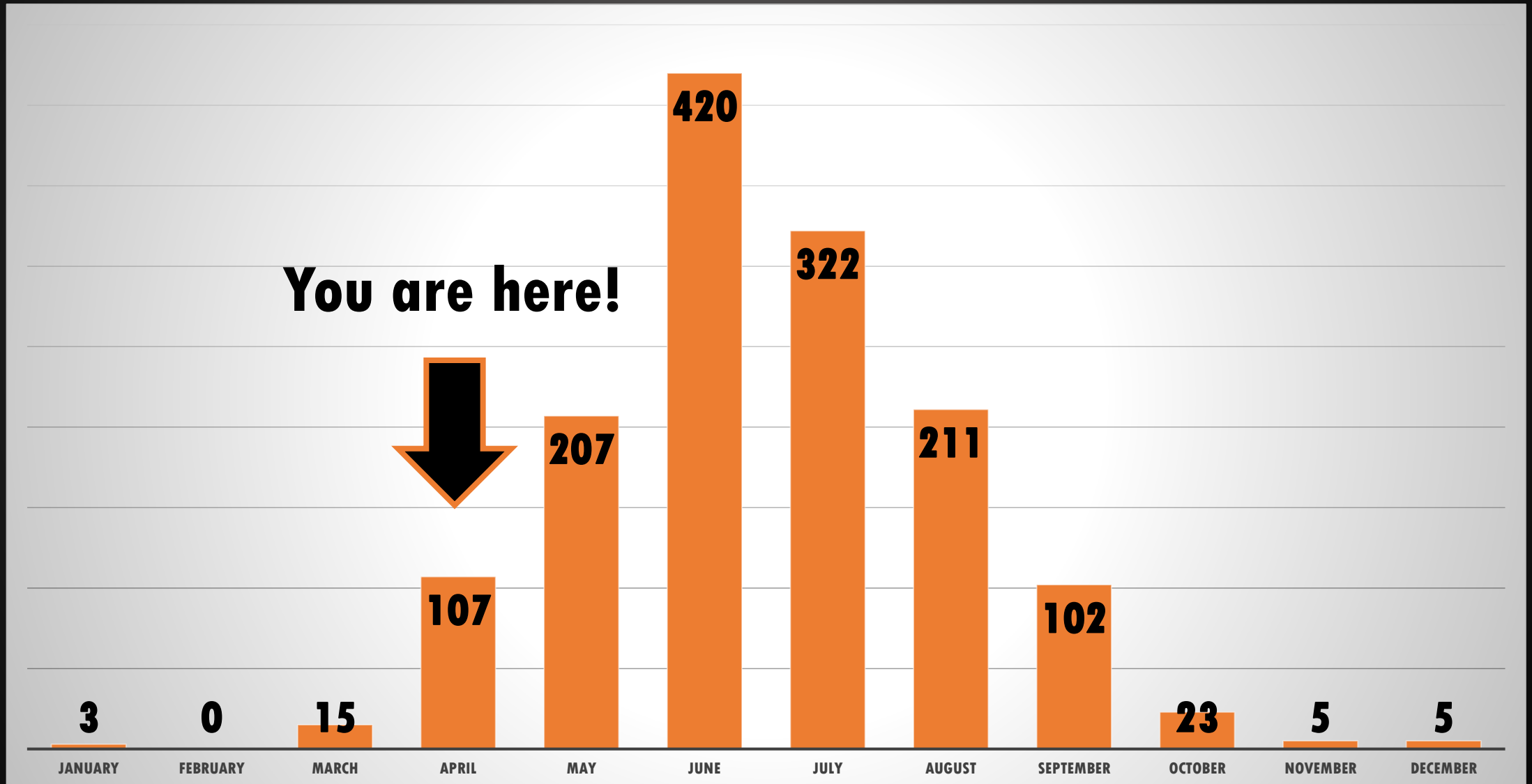
- Tornado rating based on damage
- 95% of Wisconsin Tornadoes are EF-0, EF-1, or EF-2s
- 75% of US Tornado fatalities occur with EF-3, EF-4 and EF-5s
- Last Wisconsin Tornado at each EF Rating:
 - EF-2-Brownsville 2018
 - EF-3-Elk Mound 2019
 - EF-4-Manitowoc Co. 1994
 - EF-5-Oakfield 1996
- Last Year (2020):
 - 20 Tornadoes
 - 11 EF-0
 - 9 EF-1



Observe

Wisconsin Tornadoes by Month

Peak Time: 3-9pm, but can happen at any time of the day



Observe**Tornadoes: What to look for**

- Look for debris at the base
- In contact with ground?
 - **YES:** Tornado
 - **NO:** Funnel Cloud
- Power Flashes
- Prior to Tornado
 - Wall Clouds
 - Funnel Clouds



Cailyn Lloyd
Oakfield F5
Initial Development

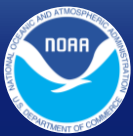
Tornadoes: In contact with the ground



Cailyn Lloyd
Oakfield F5
July 18, 1996

Observe**Wall Clouds**

- **Isolated lowering**
 - **Rear/SW portion of storm**
 - **Updraft area (Up and In)**
 - **Persistent? Rotation?**
 - **Movement \neq Rotation**
 - **Having a wall cloud does not always mean a tornado will form**
-
- **They are reportable!**



Funnel Clouds: NOT in contact with the ground

Not in contact with the ground
and will rotate strongly

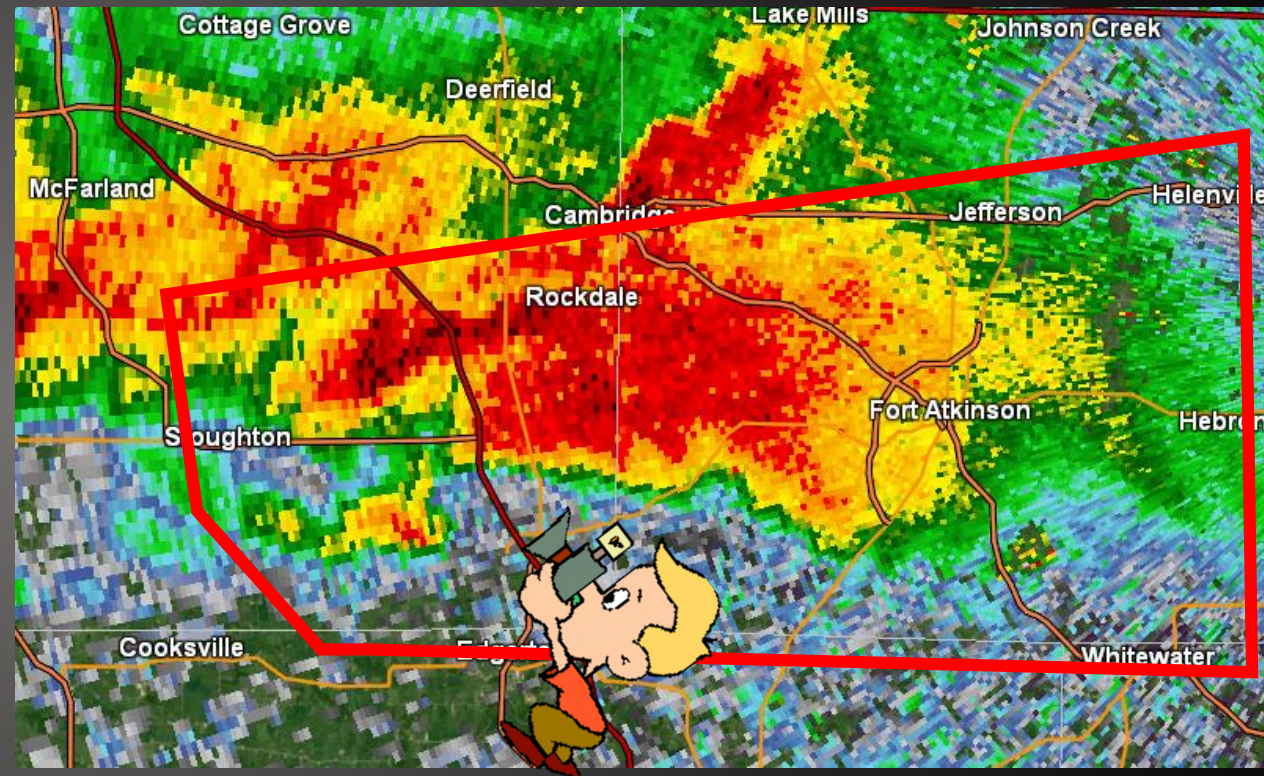
3:16:00



Observe

When is it okay to report 'nothing'?

- In a Tornado Warning?
- In the area where a wall cloud/funnel cloud/tornado would potentially develop?
- Not seeing anything?
- You can report that!



“I’m in the rain free base. Not seeing anything yet. Will keep an eye on it and report if that changes.”

Observe

Night Tornadoes

Caution!

Spotting storms at night is dangerous!

- **Need experience**
- **Radar support**

How to spot a tornado at night?

- **Power Flashes**
- **Lightning**
- **Roaring sound**



September 24, 2019
Elk Mound, WI EF-3



Tornado and Funnel Cloud Look-a-likes

Rain Shaft

Virga



Tornado and Funnel Cloud Look-a-likes

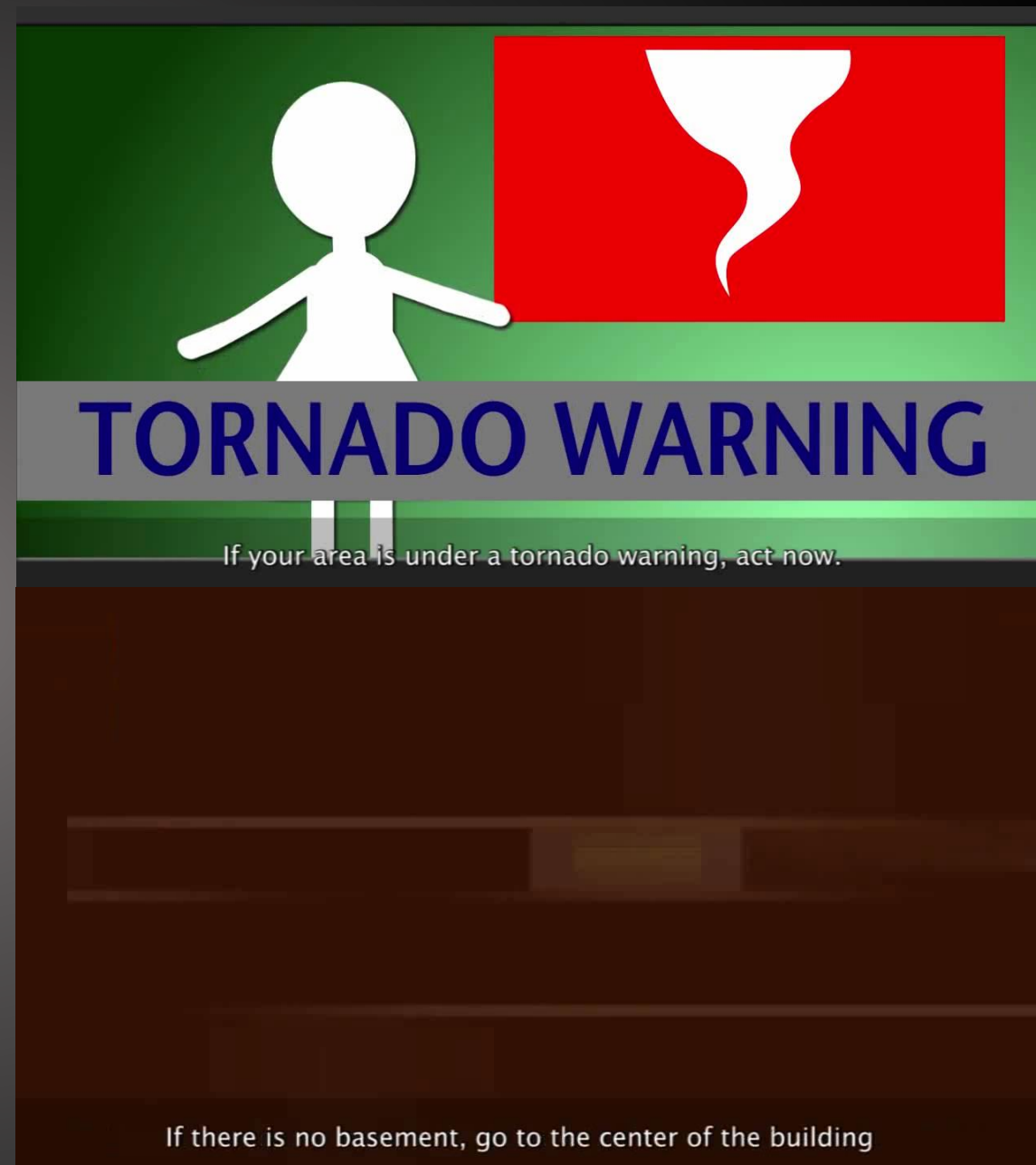
Jenni Francis
Columbus, WI
Aug 9, 2018



Scud Clouds

Tornado Safety

- Have a plan ahead of time
 - Where is the safe place?
- Basement/Lowest Level
- Away from Windows
- Center of Building
- Bonus:
 - Put on shoes/boots
 - Get under a table
 - Cover with pillows/blanket
 - Helmet (Bike, Hockey)



Observe

Tornado Safety



Lowest Level of House

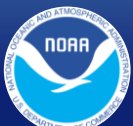
Interior Room

Storm Spotting Process:

Communicate

MOST IMPORTANT STEP!

- **Reports must get to the NWS as soon as possible**
- **Do not assume we know what is happening**
- **Call US! Not 911.**
 - Take a moment.**
 - Take a deep breath.**
 - Be calm.**



- **WHO are you?**
 - **Trained spotter, Sheriff, Fire...**
- **WHAT occurred?**
- **WHEN was it?**
- **WHERE was it?**

Communicate

REPORTS ONLY!

- Tornadoes
- Wall & Funnel Clouds
- Flash Flooding
- Structural Damage
- Hail over 2"
- Anything else considered severe if you can't use any of the following methods.

CALL US!

1-800-545-8197

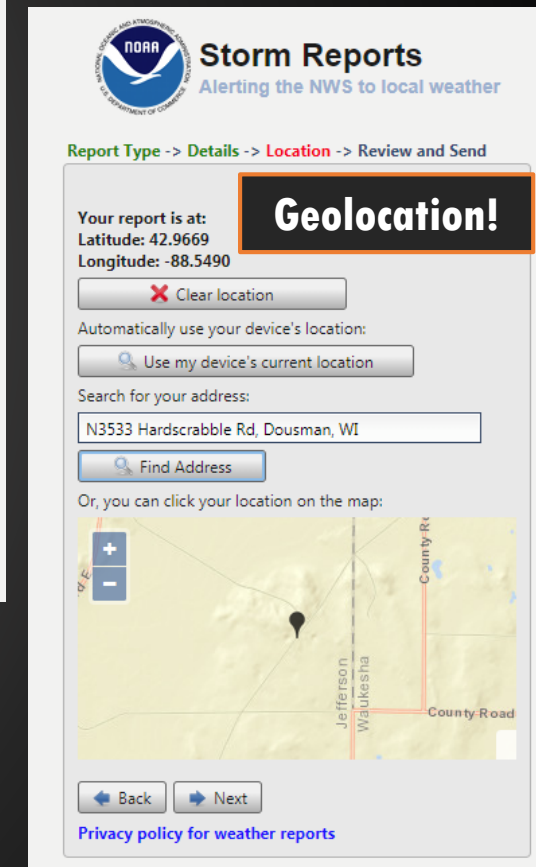
Communicate

Amateur Radio

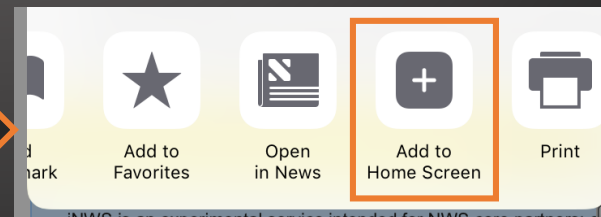
Columbia County ARES/RACES Richard Green: kc9fnm@gmail.com Tyler Letlebo: tletlebo@gmail.com	Dane County Midwest SSTRC Dale Bernstein: dale.bernstein@midwestsstrc.org	Dodge County ARES/RACES Ryan Klavekoske: ryantiff@charter.net	Fond du Lac County Sullivan Committee mkxsulcom@gmail.com
Green County Sullivan Committee mkxsulcom@gmail.com	Green Lake County Sullivan Committee mkxsulcom@gmail.com	Iowa County Midwest SSTRC Dale Bernstein: dale.bernstein@midwestsstrc.org	Jefferson County ARES/RACES Paul Marowsky: kd9pm.1@gmail.com
Kenosha County Racine/Kenosha Co ARES/RACES Randy Hansen: randallhansen@cs.com Lakeshore Repeater Club Dwayne Devore: n9pya@dstar.su	Lafayette County Sullivan Committee mkxsulcom@gmail.com	Marquette County ARES/RACES Richard Green: kc9fnm@gmail.com Tyler Letlebo: tletlebo@gmail.com	Milwaukee County Milwaukee Area Skywarn Association Rick Swierczynski: skywarn1@hotmail.com
Ozaukee County OZARES ARES/RACES Don Zank: aa9wp@arrl.net	Racine County Racine/Kenosha Co ARES/RACES Randy Hansen: randallhansen@cs.com Lakeshore Repeater Club Dwayne Devore: n9pya@dstar.su	Rock County Midwest SSTRC Dale Bernstein: dale.bernstein@midwestsstrc.org	Sauk County ARES/RACES Matt Noll: kc9upe@gmail.com
Sheboygan County OZARES/Washington County ARES/RACES	Walworth County Volunteer based spotter team Eli Larson: k9ilj.wx@gmail.com	Washington County ARES/RACES Steve Sundquist: realsnow@hotmail.com	Waukesha County MASA Rick Swierczynski: skywarn1@hotmail.com

Communicate**Web/Cell Phone****<https://inws.ncep.noaa.gov/report/>**

**Use to report:
Everything!**
(Please directly call
for tornadoes)

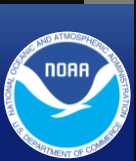
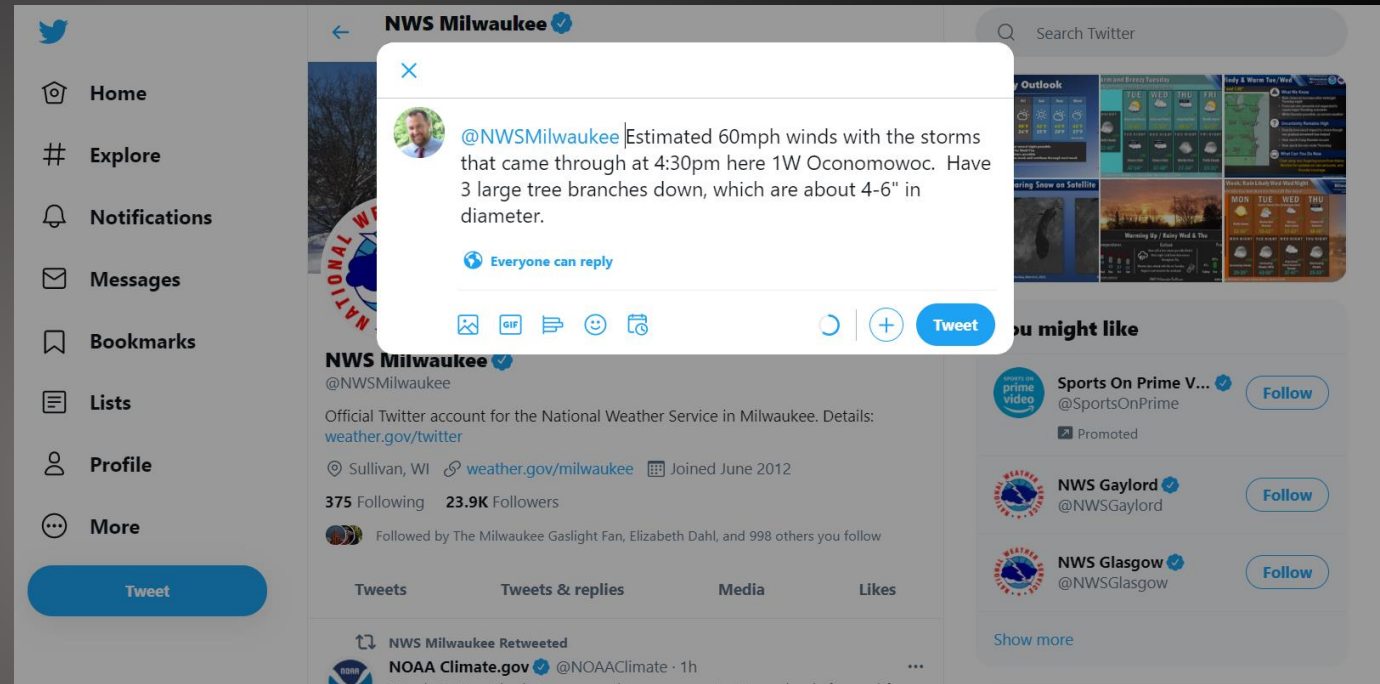


**Add to your home screen
via phone's browser**



Communicate**Twitter****@NWSMilwaukee****NOTE: Not @NWSMKX**

- **Best for social**
- **Pictures!**
- **Don't forget:**
 - **Who, What, When, Where**
 - **Mention @NWSMilwaukee**

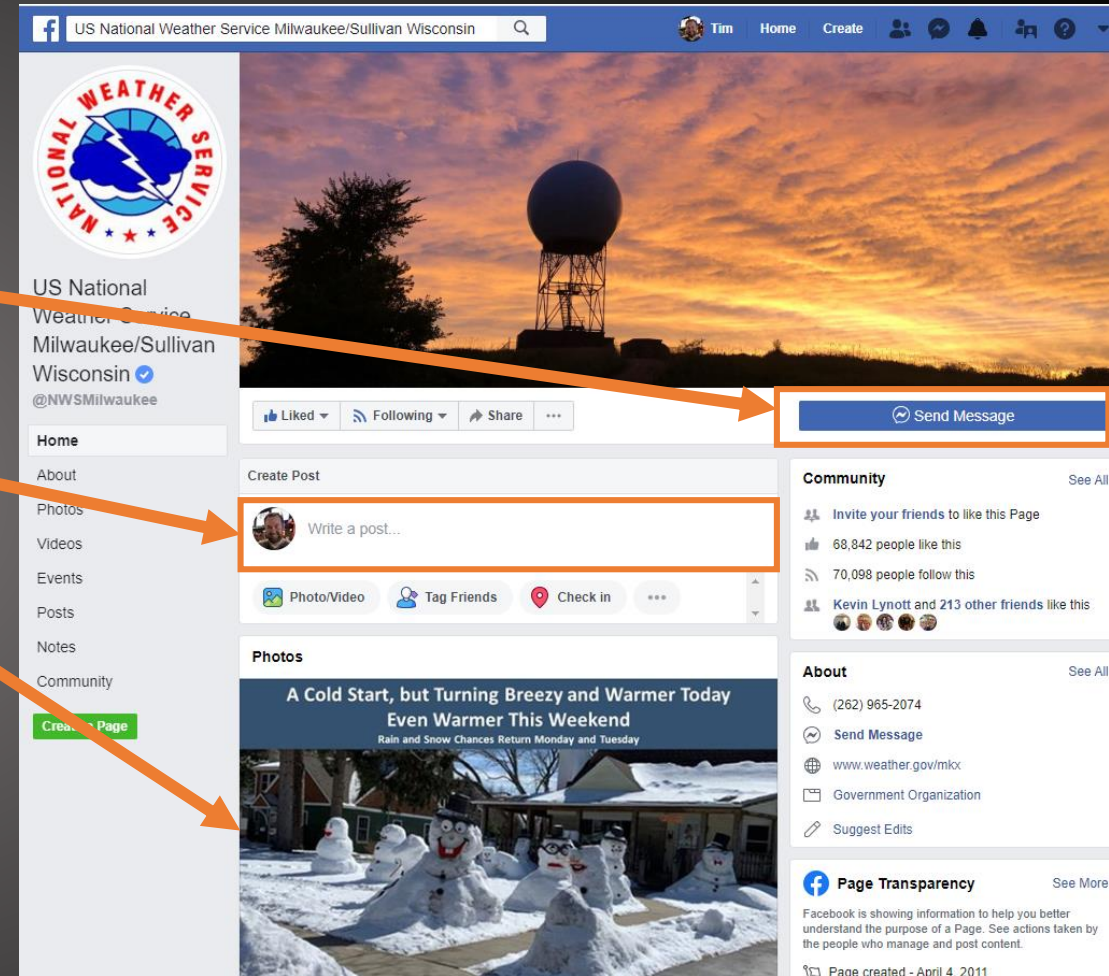


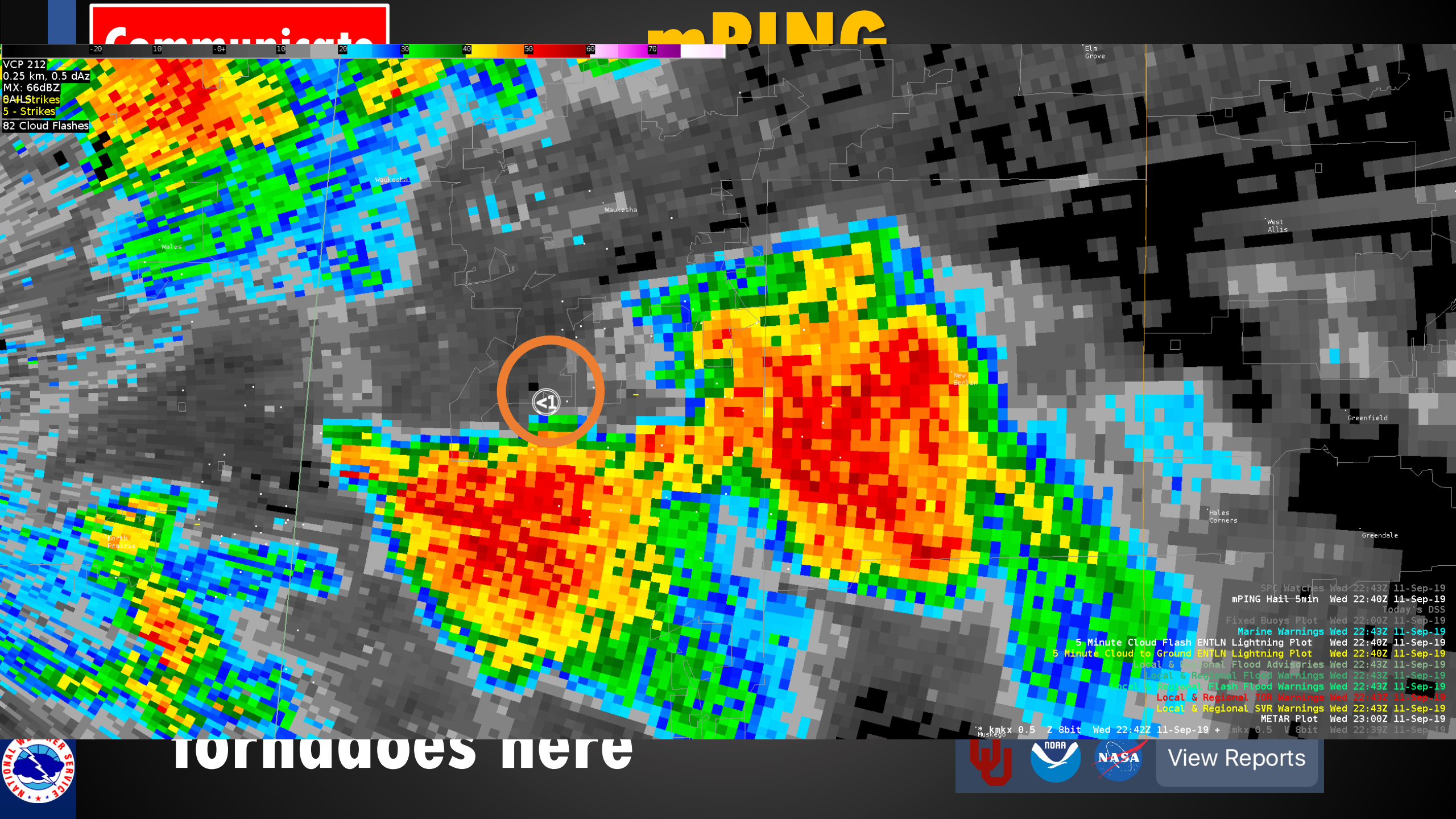
Communicate

Facebook

/nwsmilwaukee

- **Messenger**
- **Post to Page**
- **Comment on Post**
- **Pictures/Videos**
- **Don't forget:**
 - **Who, What, When, Where**





VCP 212
0.25 km, 0.5 daz
MX: 66dBZ
6AHLStrikes
5 - Strikes
82 Cloud Flashes

<1

SPC Watches	Wed 22:43Z	11-Sep-19
mPING Hail 5min	Wed 22:40Z	11-Sep-19
Fixed Buoys Plot	Wed 22:00Z	11-Sep-19
Marine Warnings	Wed 22:43Z	11-Sep-19
5 Minute Cloud Flash ENTLN Lightning Plot	Wed 22:40Z	11-Sep-19
5 Minute Cloud to Ground ENTLN Lightning Plot	Wed 22:40Z	11-Sep-19
Local & Regional Flood Advisories	Wed 22:43Z	11-Sep-19
Local & Regional Flood Warnings	Wed 22:43Z	11-Sep-19
Local & Regional Flash Flood Warnings	Wed 22:43Z	11-Sep-19
Local & Regional TWR Warnings	Wed 22:43Z	11-Sep-19
Local & Regional SVR Warnings	Wed 22:43Z	11-Sep-19
METAR Plot	Wed 23:00Z	11-Sep-19
	Wed 22:39Z	11-Sep-19

* kmx 0.5 Z 8bit Wed 22:42Z 11-Sep-19 + kmx 0.5 V 8bit Wed 22:39Z 11-Sep-19



Tornadoes here



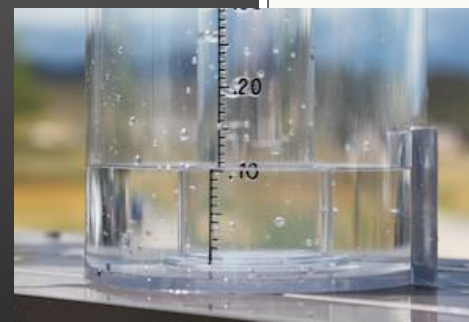
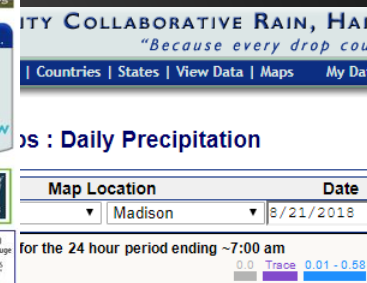
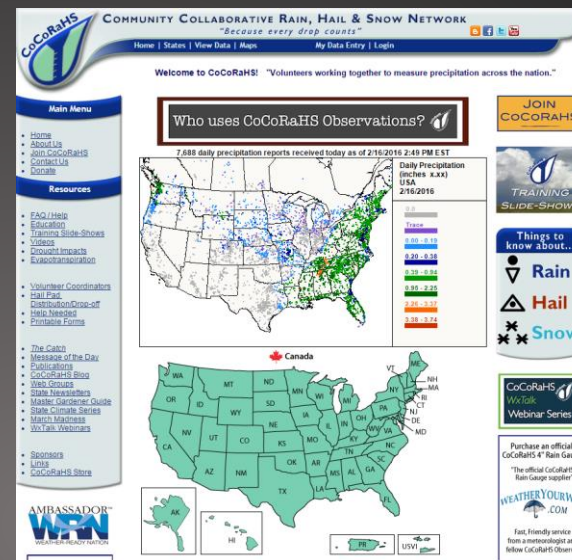
[View Reports](#)

Communicate

Rain Measuring: CoCoRaHS

cocorahs.org

- Official NWS approved rain gauges/observing network
- Don't use the small/cheap ones for reporting rainfall amounts to us
- \$44 cost for 4" diameter rain gauge



Remember: Safety is #1!

- Stay safe. Keep others safe.
- Obey the law!
- Know your escape route.
- How long does it take to get back?
- Communicate your whereabouts.



**Thank you for future
and past reports!**

