

National Weather Service Weather Watcher Guide



Purpose

This full-length guide is intended to provide background knowledge of the primary NWS products and services in support of public safety decisions. This full-length guide is part of a suite of resources that support effective use of a “weather watcher”. The full suite of resources includes:

- This Full Length Guide
- Weather Watcher Quick-Start Guide
- Outdoor Event Weather Watcher video tutorial: <https://youtu.be/ZmH6vnup92o>
- Weather Watcher Checklist (see Appendix C)
- Weather Watcher Briefing Page
- Additional training and a tabletop exercise may be available from your local NWS

Why a Weather Watcher?

Have you ever been responsible for safety of an outdoor event? If so, you have probably had concerns about the weather.

Weather is a key component of any effective outdoor event action plan. A thorough evaluation of weather hazards and continuous monitoring of evolving hazards can lead to more confident and effective decisions regarding the safety of event-goers.



The weather watcher is the person who is designated to maintain situational awareness of the weather both before and during your event and can activate your weather safety plan.

This guide will outline the functions of the weather watcher, outline a weather evaluation and monitoring process that the weather watcher can follow and provide an overview of key forecast and monitoring products and tools utilized by the weather watcher.

This guide was produced in collaboration with NWS Chicago and NWS Quad Cities.
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Planning for your Event

All event plans should address four primary questions:

1. *Which weather hazards could impact your event?*
2. *Where should people shelter or evacuate?*
3. *How will you alert people?*
4. *How long will it take to notify people and then evacuate or seek shelter?*

Which weather hazards could impact your event?

Potential weather hazards for outdoor events include lightning, flooding, high wind, thunderstorms, and tornadoes. Depending on the time of year and nature of your event, fog, heat, or winter weather may also be a concern. If your weather safety plan has well-defined action criteria, then activating the plan should be easy.

For most outdoor events, lightning will trigger your safety plan. Lightning is a threat to anyone outside of a solid, fully enclosed structure. Lightning occurs with all thunderstorms so every thunderstorm is a threat to anyone outside, whether there is a watch or warning or not. Lightning can also strike areas several miles away from a thunderstorm. All evacuation and sheltering should be completed by the time any thunderstorm reaches an 8 mile radius around the venue. A larger radius can be used if desired.

Where should people shelter?

Shelter locations and timing go hand-in-hand. We recommend that everyone be able to reach shelter in ***less than 3 minutes***. The logistics of and time required to evacuate or move people to the shelter areas must be considered. For example, congestion at stairwells and doorways may slow the sheltering process. Mobility-impaired people may require special assistance and more time.

To determine shelter locations within a building, we recommend that shelter areas be identified with the help of an engineer or architect familiar with each building's design. In general, you should look for areas that are:

- on the lowest floor
- have a roof span less than 30 feet
- without windows

Do not use these for shelter:

- tents
- open sided structures

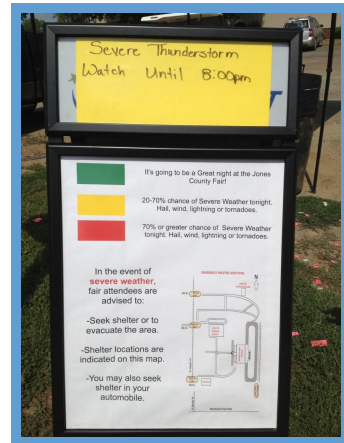


How will you alert people?

The Power of Pre-notification

When you know a particular risk exists, pre-notification allows people to prepare themselves for something unusual that may occur. For example, when event staff know that storms are expected, they may re-familiarize themselves with shelter areas and stay alert for PA announcements.

Response is enhanced when people are already aware that there may be a need to change their plans.



Pre-notification can be accomplished through any number of simple means and can also remind people of what they would be expected to do if the hazard occurs. Practical examples include: email to staff, sign on the bulletin board at a trailhead, tent-sign at a ticket booth, Twitter feed, etc.

Communication During the Event

Communication is key in any emergency situation. Poor communication will slow or even prevent response. To complicate matters further, human nature pushes people to confirm a hazard before they act. Thus it is always recommended to establish redundant communication with a consistent message. When redundancy isn't possible, then a backup plan should be in place in case the primary method fails.

Some common alert methods include: PA systems, two-way radios, social media feeds such as Twitter, TV monitors, large scoreboards, and sirens.

How long will it take to notify people and then evacuate or seek shelter?

It is critical to determine (1) how long it takes to alert everyone and (2) how long it takes for everyone to move to shelter or evacuate. These values can be measured during a drill or estimated based on experience.

Comprehensive Event Planning Information

Appendix A, B, C of this guide

DuPage Co., IL Event Ready Toolkit: www.dupageco.org/OHSEM/ProtectDupage/58683/

FEMA training: training.fema.gov/is/courseoverview.aspx?code=IS-15.b

FEMA event planning:

emilms.fema.gov/is15b/assets/SpecialEventsPlanning-JAManual.pdf

DOT planning guide: ops.fhwa.dot.gov/eto_tim_pse/preparedness/pse/index.htm

The Role of the Weather Watcher

A weather watcher is a trained individual that understands how to use basic weather information and monitors the weather forecast and current conditions. The purpose of the weather watcher is to maintain situational awareness and activate the events' safety plan if needed. Because of the time and logistics required to shelter people who are unfamiliar with the event's plan, *the designated weather watcher is particularly critical to special events.*

Who can be a Weather Watcher?

Anyone can be a weather watcher! It is recommended that this person complete the weather watcher tutorial which includes a video (link), Quick Start Guide and this handbook. The weather watcher should also have resources to monitor the weather. Ideally they should also have authority to activate an event's safety plan. When this is not feasible, it is critical that the decision-maker and designated weather watcher communicate seamlessly so that dangerous delays in response do not occur.

It is also important that the role of the designated weather watcher is always filled. In other words, the responsibility is best tasked to a position rather than an individual who might not be there when the hazard strikes. It doesn't matter as much **who** it is, as long as everyone knows they have responsibility for monitoring conditions.

The remainder of this guide will:

- provide background on the functions of the weather watcher
- outline a weather evaluation and monitoring process
- describe key forecast and monitoring tools

Weather Watcher Process and Resources

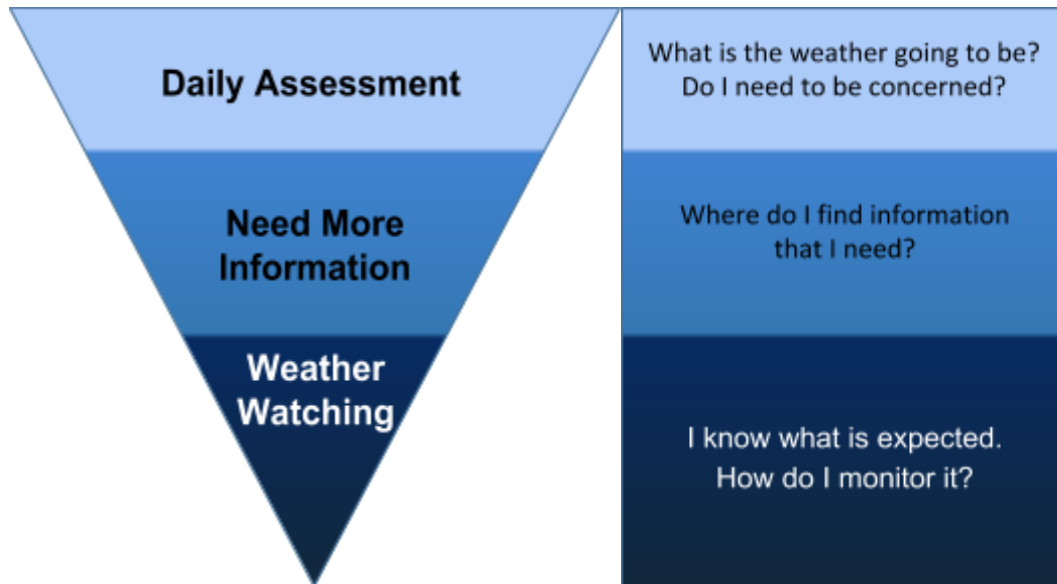
Weather monitoring should begin at least three days before the event begins. An effective weather watcher should:

- Understand event-specific weather thresholds and evacuation/sheltering time
- Have reliable internet access
- Have access to up-to-date radar information
- Complete the Weather Watcher Checklist
- Maintain continuous weather watch on event day (It is encouraged that they not be designated for any other responsibilities.)
- Communicate directly with incident command staff, especially when a threshold is expected to be met
- Have access to NWSChat (Request an account several weeks ahead of time) <https://nwschat.weather.gov/create.php>

Weather Evaluation Basics

For your weather evaluation to be effective, two pieces of information are vital: (1) what weather is expected and (2) which hazards are relevant to the event you are working.

Weather Evaluation Concept



Weather Watcher Checklist

The Weather Watcher Checklist (Appendix C) will guide the Weather Watcher through the key forecast and monitoring information available to assess weather hazards. It is divided into three sections:

The ***Days Leading Up to Event*** section should be followed each day leading up to the event. This allows the weather watcher to develop a general understanding of potential weather hazards.

The ***Day of Event*** section should be utilized early on the day of the event to assess in detail the potential for weather hazards.

The ***During Event*** section lists information that should be monitored throughout the day of the event assess how hazards are evolving. This will aid in determining when hazards will impact the event.

In addition, The Weather Watcher Checklist is designed to be used in conjunction with the Outdoor Event Weather Watcher Briefing Page associated with your local NWS office. Links to local weather watcher pages can be found at:

www.weather.gov/lot/weatherwatcher Be sure to periodically refresh the Briefing Page to ensure the latest information is displayed.

Key Weather Terms

Importance of Storm Speed

Storm speed is an indicator of the potential hazards and directly affects how you should respond to the storm. As a Weather Watcher, it is critical to know how fast storms are moving when they are approaching your location.

Very Slow Moving Storms

Thunderstorms that move very slowly can lead to heavy rain and flash flooding hazards.

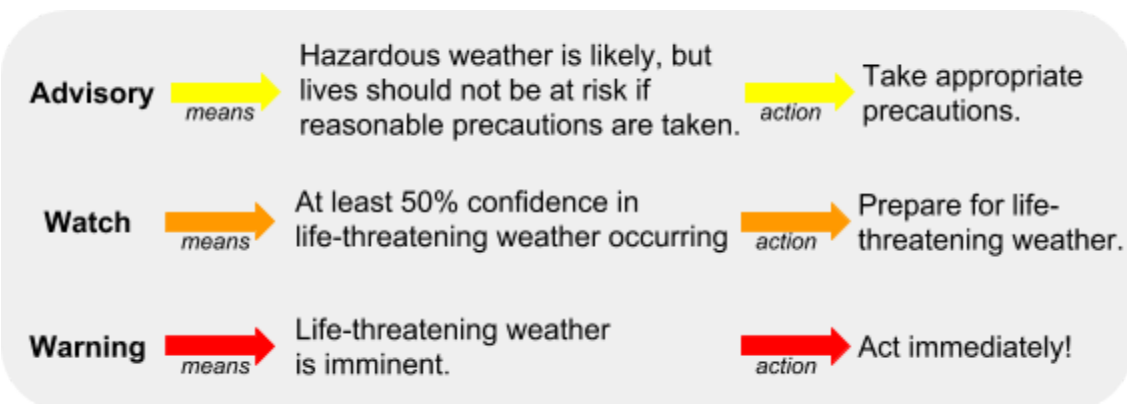
Fast Moving Storms

Thunderstorms that travel in excess of 50 mph have an enhanced risk of damage and injury. You must respond quickly to fast-moving storms, even when the sky is sunny. Extreme winds are possible, even before thunder is heard.

Time-to-Distance Calculation Tool

The Weather Watcher Briefing page includes a link to a calculation tool to help determine the approximate range of storms when your plan should be enacted. Form inputs include location of your event, time needed to enact your plan, and expected storm speed. Form output (distance in miles) is received via email.

Watches vs. Warnings



Definitions

<i>Outlook</i>	Overview of expected weather. Often includes information on storm type, specific hazards, and timing.
<i>Severe Weather Statement (SVS)</i>	Update on current severe storm or tornado warnings. Can be just as or more important than the initial warning. Includes expected wind speed, hail size, storm timing, etc. You can also find information about confirmed tornadoes, storm damage etc.
<i>Special Weather Statement (SPS)</i>	Issued when non-severe weather may impact activities. Fore example, a special weather statement can be issued for minor flooding, non-severe thunderstorms, dense fog, snow, rain, etc.
<i>Severe Thunderstorm</i>	A thunderstorm that produces hail the size of 1 inch in diameter or larger and/or wind in excess of 58 MPH.
<i>Pulse storm</i>	Short lived storms that typically produce lightning, small hail, winds usually below 60 mph, heavy rain. On a rare occasion, produce brief, weak tornadoes and minor damage.
<i>Squall Line/QLCS/Bow Echo</i>	Long line of storms that cover large areas. The main hazards from these storms are damaging winds, lightning, hail, and brief tornadoes. If slow moving, heavy rain and flash flooding are also common. These storms often occur in the evening or overnight but can occur at any time.
<i>Supercell</i>	The most severe of all thunderstorms, commonly producing damaging wind, lightning, tornadoes and very large hail. The tornadoes from supercells can be strong.
<i>MCS</i>	Mesoscale Convective System. Organized complex of thunderstorms that normally persists for several hours or more.
<i>Flood</i>	Typically associated with rivers, which rise and fall more slowly.
<i>Flash Flood</i>	Life-threatening flood that occurs quickly. Move to higher ground immediately!
<i>Instability</i>	The tendency for air to accelerate upward after being lifted. The greater the instability, the greater the potential for severe thunderstorms.
<i>Shear</i>	In storm forecasting, shear is the change in wind speed and direction with height. Shear is an indication of the potential for storms to rotate. The term is also sometimes used in Doppler radar to describe changes in short horizontal distances.

Daily Assessment Phase (Before the Event)

Generally speaking the daily assessment phase is any time before an event. It is important to understand that forecasts are subject to change, and that forecast confidence typically increases as the day approaches. On the day of the event, greater confidence will allow a more detailed forecast of specific hazards and expected timing.

Below is a description of each piece of information included on the Weather Watcher Checklist that should be evaluated leading up to an event.

Hazardous Weather Outlook

The Hazardous Weather Outlook (HWO) is issued in the early morning each day and includes detailed information about hazards for the current day and general information for the next seven days. **It is highly recommended that you read the HWO each day.**

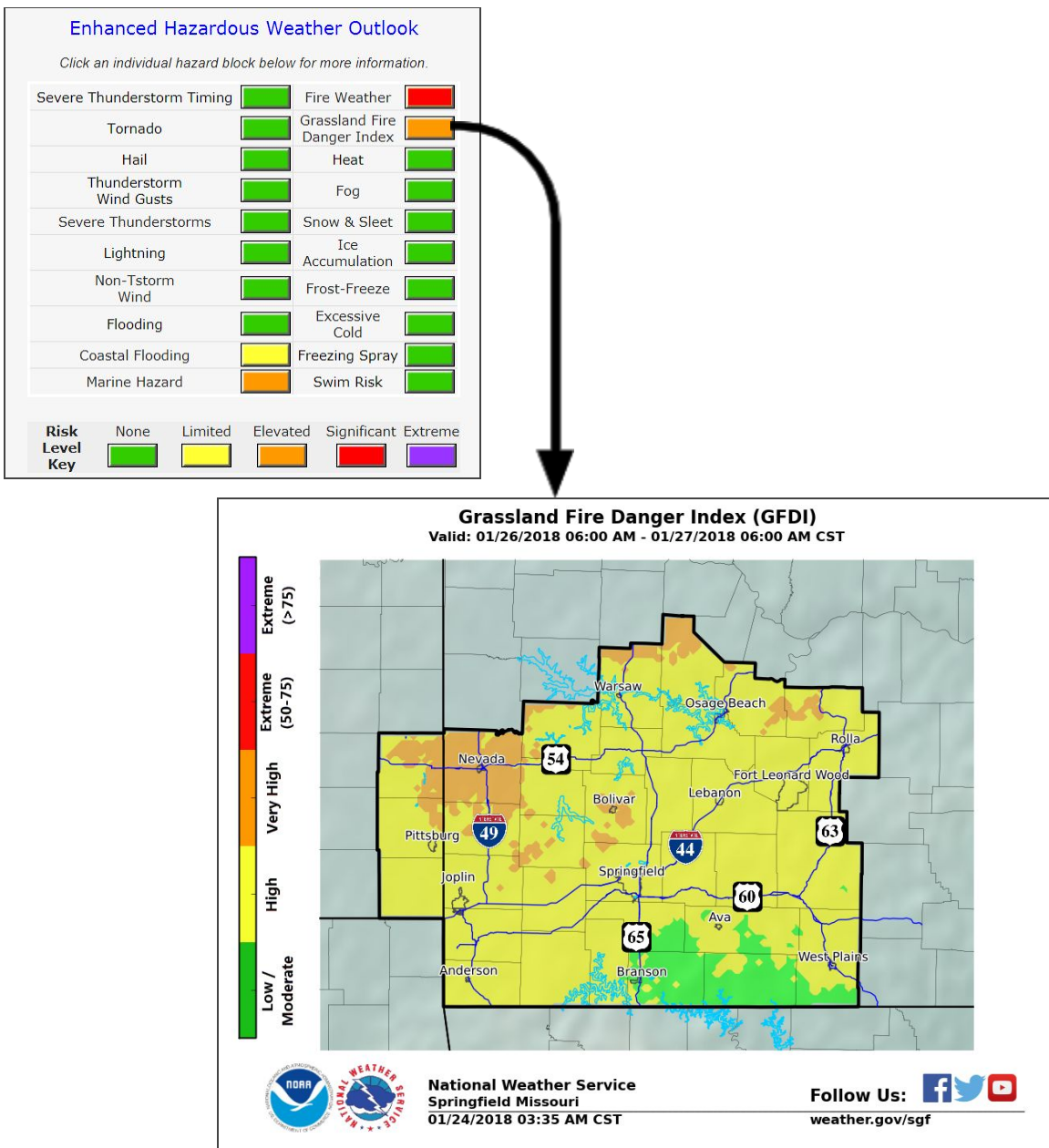
Hazardous Weather Outlook Example

<p>425 AM CST MON MAR 15 2016</p>	<p>Time of Issuance</p>
<p>This hazardous weather outlook is for portions of north central Illinois, northwest Illinois, west central Illinois, northeast Iowa, southeast Iowa and northeast Missouri.</p>	<p>Area Covered</p>
<p>.DAY ONE...TODAY AND TONIGHT</p> <p>The main threat of severe weather will be between 3pm and 10pm CDT. Some severe storms are possible with the main threats of hail up to the size of golf balls and isolated wind gusts of 60 mph. There is also potential for isolated tornadoes, especially south of Interstate 80.</p> <p>.DAYS TWO THROUGH SEVEN...TUESDAY THROUGH SUNDAY</p>	<p>Detailed explanation of any hazardous weather expected today and tonight</p>
<p>Thursday, winds will gust to 35 to 40 mph from the west. High profile vehicles will need to use extra caution on north-south oriented roads.</p> <p>.SPOTTER INFORMATION STATEMENT...</p>	<p>Overview of hazardous weather expected in days 2-7</p>
<p>Spotter activation may be needed today and tonight, mainly between 3pm and 10pm CDT.</p>	<p>Spotter activation expectations</p>

Enhanced Hazardous Weather Outlook (EHWO)

The Enhanced Hazardous Weather Outlook (EHWO) provides a color-coded, tabular overview of potential hazards. The colors in the table indicate when a hazard is possible. Green indicates no risk, then it progresses to yellow, orange, red, and purple as the risk increases. (Please note that the exact definition will change for each weather element.) Clicking on a box will show the map, so you can see how the risk for that hazard varies across the area. Updated by 5 am, 5 pm, and as needed at other times of the day.

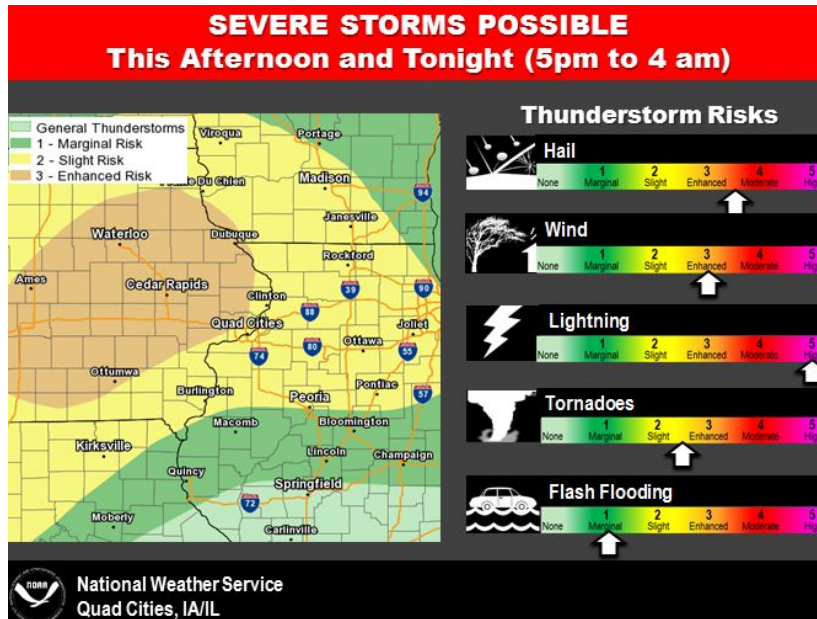
EHWO Example



Weather Story

Each day your local NWS office creates a graphic that communicates the main weather impacts expected for the local area today or through a period of days.

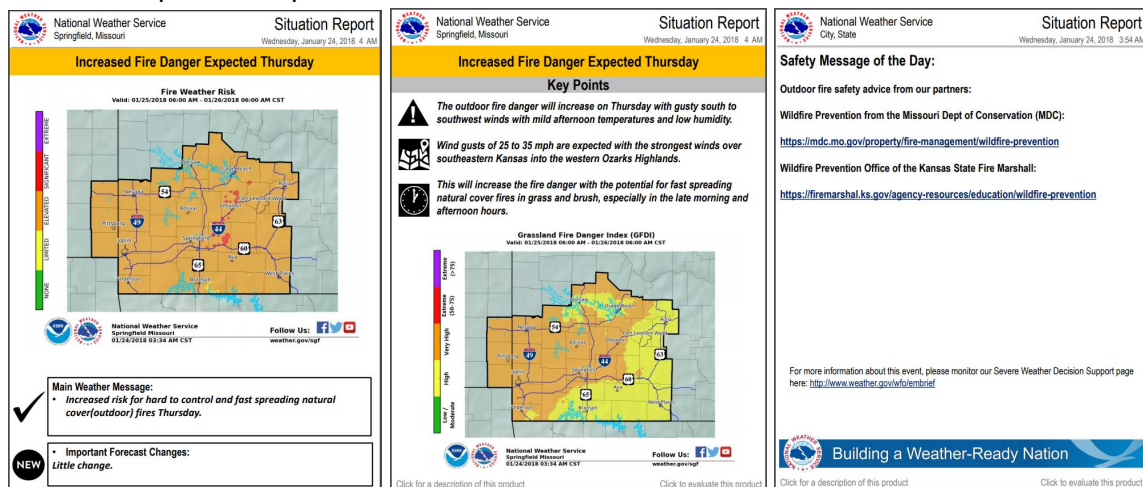
Weather Story Example



Situation Report

When hazardous weather is likely, your local NWS office creates a printable pdf that communicates the main weather impacts in greater detail. This situation report is easily shared via email or print.




Situation Report Example



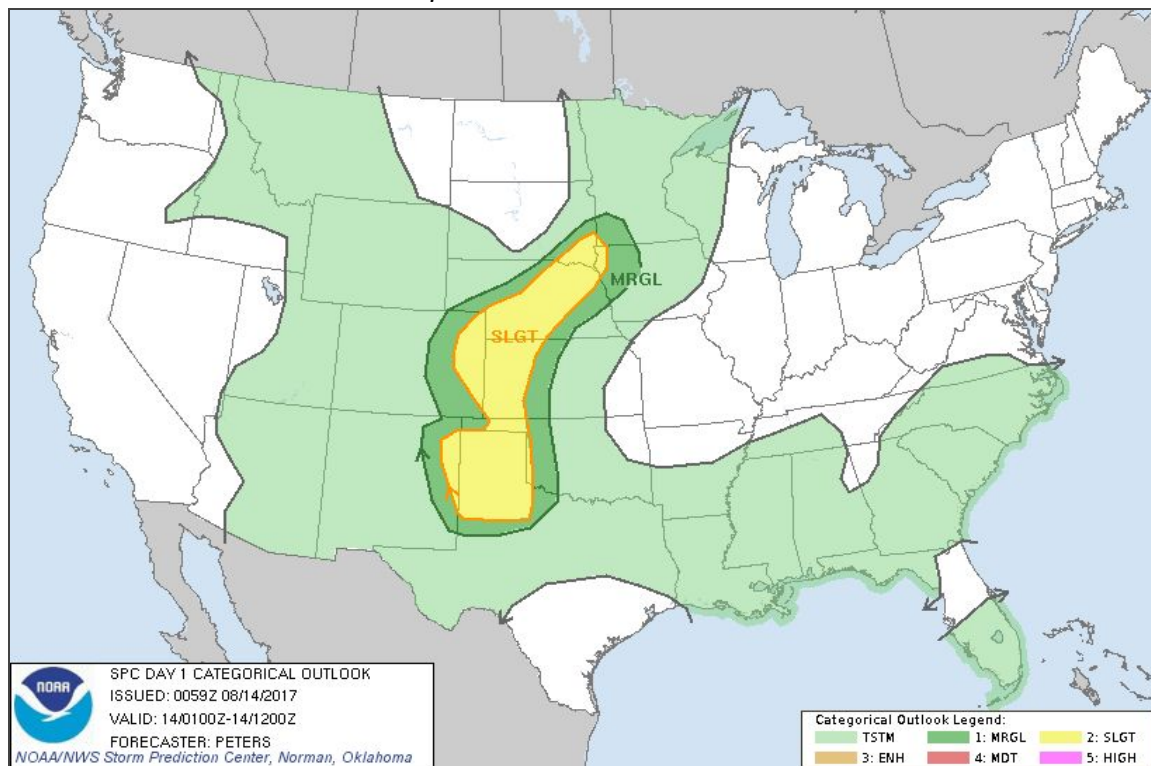
Storm Prediction Center Outlooks

The Storm Prediction Center (SPC) issues nationwide outlooks for thunderstorm and fire weather hazards. Generally, lower categories represent areas with the greatest uncertainty and smallest expected coverage of storm reports. Conversely, the higher categories represent the greatest perceived hazard, confidence, and coverage.

SPC Outlook Categories

THUNDERSTORMS (no label)	1 - MARGINAL (MRGL)	2 - SLIGHT (SLGT)	3 - ENHANCED (ENH)	4 - MODERATE (MDT)	5 - HIGH (HIGH)
No severe* thunderstorms expected	Isolated severe thunderstorms possible	Scattered severe storms possible	Numerous severe storms possible	Widespread severe storms likely	Widespread severe storms expected
Lightning/flooding threats exist with <u>all</u> thunderstorms	Limited in duration and/or coverage and/or intensity	Short-lived and/or not widespread, isolated intense storms possible	More persistent and/or widespread, a few intense	Long-lived, widespread and intense	Long-lived, very widespread and particularly intense
					

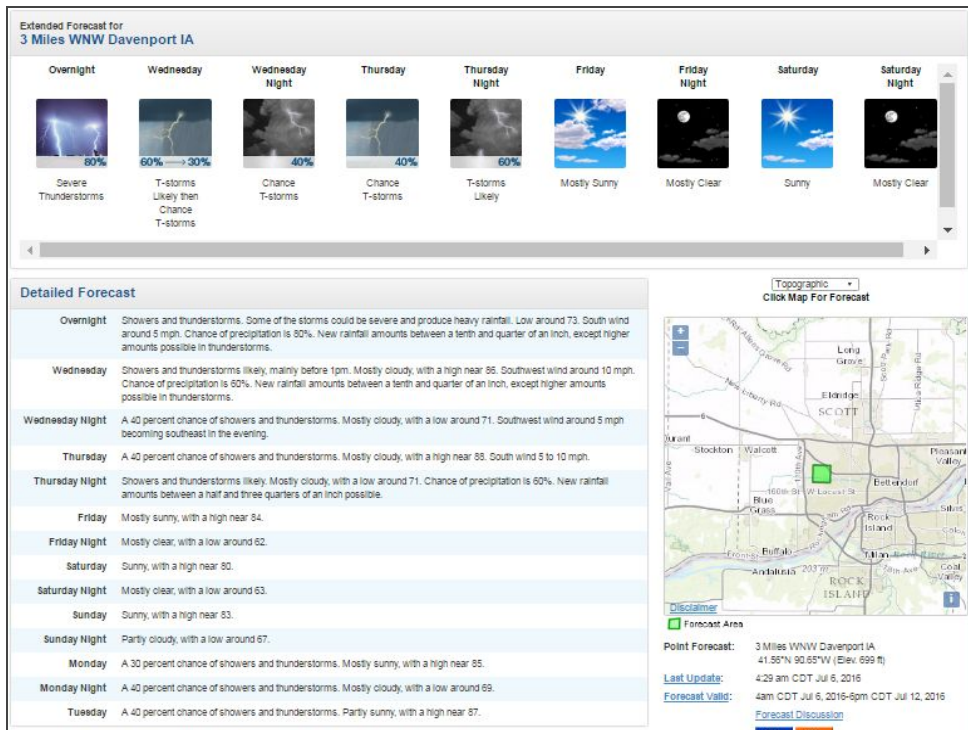
SPC Thunderstorm Outlook Example



Detailed Forecast

Also known as the Point and Click Forecast, the detailed forecast is specific to the location you enter in the search box, to a 1.5 miles by 1.5 miles square area centered on that point. Temperature and precipitation chance are included out to 7 days. Wind speed and direction are shown through the next 3 days.

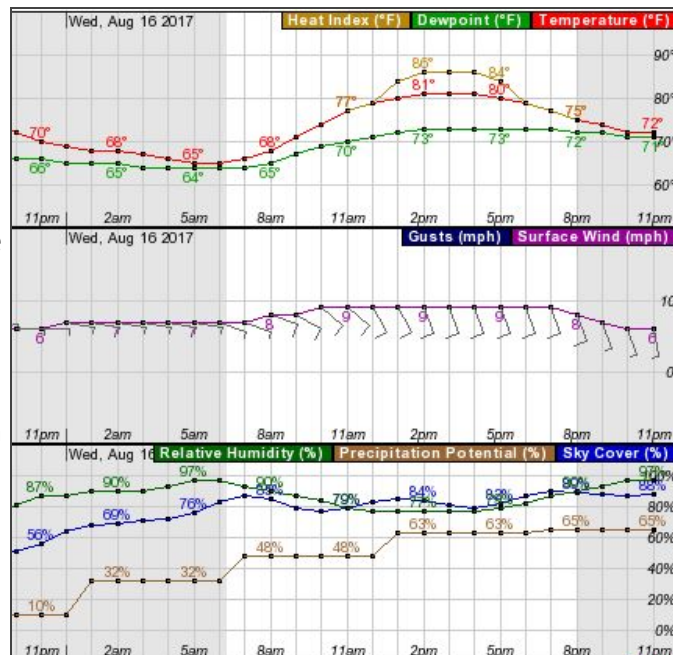
Detailed Forecast Example



Hourly Weather Graph

The Hourly Weather Graph provides a detailed forecast for your specific location in a graphical format, providing a quick look at all forecast elements (temperature, rain, chance of lightning, etc.). Many elements are available in hourly increments through 7 days. In general, the best way to interpret the graph is to look at trends over time versus relying on an individual value for each hour.

Hourly Weather Graph Example



Area Forecast Discussion

Technical in nature, the Area Forecast Discussion is a scientific explanation of the reasoning behind forecast decisions. The discussion may also indicate forecaster confidence or alternative scenarios if forecast confidence is low.

Area Forecast Discussion Example

Area Forecast Discussion
National Weather Service Quad Cities IA IL
325 PM CDT Wed Jun 26 2017

.SHORT TERM...(This Evening through Thursday)
ISSUED AT 325 PM CDT Wed Jun 26 2017

Tonight...The ongoing convection will look to continue to shift south and wane through 6-8 PM CDT. Then cellular CU to decay for a clear cool night with decreasing sfc winds.

.LONG TERM...(Thursday Night through next Wednesday)
ISSUED AT 325 PM CDT Wed Jun 26 2017

Overview: Stormy pattern in the extended with the potential for severe weather and torrential rainfall. Will need to monitor river levels as several heavy rain events in the extended may cause significant rises.

Friday and Friday night: Low pressure will track across MN and WI in the zonal flow. Models indicate strengthening deep layer shear with a 50 kt southwesterly low level jet and a 50 kt westerly mid level speed max. Storm relative helicity is progged at 400 m2/s2 with MUCAPES 2500-3000 J/KG. All modes of severe weather (damaging winds, large hail and a few tornadoes) are possible. SPC day3 has a slight risk over the entire cwa, and this may be upgraded in future outlooks. What will need to be monitored is the amount of cloud cover which may impact instability and the severity of the storms. PWAT's increase to 2 inches so any storms will also dump torrential rain.

Saturday: Weak cold front gradually settles into extreme northern MO and central IL with any thunderstorm activity in our southern cwa closer to the front. It is possible the front may hang up a bit farther north. Deep layer shear is rather weak but PWATs remain high so torrential rainfall in the stronger storms is the primary threat. However, can't rule out severe storms depending on instability.

Supplemental NWS Resources

NWSChat

NWSChat is a direct link for core partners to communicate with their local NWS office. The chat room is a venue for reporting non-life threatening conditions and to ask questions regarding the forecast. It also provides an automated feed of NWS products. The advantage of chat is that it allows people on both sides to ask questions without interrupting the other side. The disadvantage is that there may be a delays in responses, so urgent questions or information are best handled via phone call. Registration and approval are required to access NWSChat so please request an account several weeks prior to the event.

-NWSChat Bot Product Feed – **NO ACCOUNT NEEDED**: <http://weather.im/iembot>

-Request NWSChat access: <https://nwschat.weather.gov/create.php>

-NWSChat Live: <https://nwschat.weather.gov/live> (mobile friendly)

-NWSChat Live Demo: https://nwschat.weather.gov/NWSChat_Live_Demo.mp4

The screenshot displays the NWSChat Live web interface. At the top, there is a browser address bar showing the URL <https://nwschat.weather.gov/live/>. Below the address bar is a navigation menu with options like 'Map Panel', 'Actions', 'Available', 'Tools', and 'Opacity'. The main area is divided into three sections:

- Map Panel:** A map showing the region around Chicago, Illinois, and Cedar Rapids, Iowa. Several green shaded areas on the map indicate regions of interest or warnings.
- Chat Log:** A scrollable list of messages from various users. The messages include weather updates, warnings, and observations. For example:
 - [23:33:23] <nwsbot> Storm Prediction Center issues Mesoscale Discussion #1176 [watch probability: 80%]
 - [23:34:43] <nwsbot> DVN issues Severe Thunderstorm Warning [wind: 60 MPH, hail: 1.25 IN] for Delaware, Jones, Linn [IA] 8: 7:30 PM CDT
 - [23:36:20] <nwsbot> DVN issues Tornado Warning [tornado: RADAR INDICATED, hail: 1.25 IN] for Delaware, Jones, Linn [IA] 8: 7:15 PM CDT
 - [23:36:52] <nws-zach.urtuch> Severe storm in northern Linn Co. near Central City has consistent rotation associated with it. Tornado warning is based on the radar indicated rotation.
 - [23:39:15] <em-brad.a.ransford> Rotation with debris observed in Central City IA
 - [23:41:24] <media-justin.gehrts> looks like a wall cloud looking north on our camera
 - [23:41:39] <em-brad.a.ransford> Central City Fire confirms multiple funnel clouds on the ground South of central city, IA
 - [23:43:02] <nwsbot> DVN continues Tornado Warning [tornado: OBSERVED, tornado damage threat: CONSIDERABLE, hail: 1.25 IN] for Delaware, Jones, Linn [IA] 8: 7:15 PM CDT [23:44:26] <em-brad.a.ransford> Prairieburg Fire Spotters report funnel clouds near central city heading to Prairieburg, IA
 - [23:46:10] <media-justin.gehrts> looks like we can see a tornado on our camera
 - [23:46:59] <nws-ray.wolf> Funnel near Prairieburg may be on the ground.
 - [23:47:17] <em-brad.a.ransford> Tornado is entering prairieburg IA, at this time
 - [23:47:35] <nws-zach.urtuch> TQ5 confirmed near prairieburg, large tornado on ground
 - [23:48:25] <nwsbot> DVN continues Tornado Warning [tornado: OBSERVED, tornado damage threat: CONSIDERABLE, hail: 1.25 IN] for Delaware, Jones, Linn [IA] 8: 7:15 PM CDT [23:49:23] <em-brad.a.ransford> Tornado is north of springville at this time
 - [23:50:00] <nwsbot> DVN continues Severe Thunderstorm Warning [wind: 60 MPH, hail: 1.00 IN] for Jo Daviess, Stephenson [IL] 8: 7:15 PM CDT
 - [23:55:56] <nwsbot> DVN continues Severe Thunderstorm Warning [wind: 60 MPH, hail: 1.00 IN] for Delaware, Dubuque [IA] 8: 7:30 PM CDT
 - [23:56:56] <nws-zach.urtuch> tornado now in extreme NE Linn Co. northeast of Prairieburg will cross over into far NW Jones county in next few minutes, then south-central Delaware Co.
 - [23:56:58] <nwsbot> DVN issues Tornado Warning [tornado: OBSERVED, tornado damage threat: CONSIDERABLE, hail: 1.00 IN] for Delaware, Dubuque, Jones [IA] 8: 7:45 PM CDT
 - [23:58:16] <em-brad.a.ransford> Tornado went through prairieburg, houses down, grain bins down, garages down, semi's tipped over -Prairieburg Fire Department!
- Participants:** A list of 37 people currently in the chat room, including names like 'ice-mvt-Maren.Stoflet', 'em-kathryn.a.fajar', 'em-matthew.chambers', etc.

Social Media

Local NWS forecast offices are active on Facebook and Twitter. Local NWS office social media feeds are a good way to **supplement** the Weather Watcher Page. If you are running an event social media feed, it can also be a good resource for information about developing hazards to share quickly with your own followers. Warning information is available via twitter but this should *not* be the sole feed used for warning information. It is best for the Weather Watcher to monitor local office social media feeds in conjunction with the Weather Watcher website.

Video Briefing

When certain hazardous weather criteria are met, your local office may create a recorded video briefing on the expected weather. These are short in nature and meant to provide basic information about hazardous weather. Video briefings are typically posted at the top of your local office's homepage.

Call your local office

If all else fails, you can call your local office. On the bottom of your local office's home page, you will find a public phone number. If you are associated with an emergency management agency, you should have a preferred contact number.

Other NWS Resources in Partnership with Local Emergency Management

Conference call

In certain circumstances, your local office may host a conference call for Emergency Managers and other core partners. These calls usually focus on the specifics of the event and provide partners an opportunity to ask questions. Contact your local emergency manager for more information about what was included a call.

Monitoring Phase (During the Event)

Watching the weather successfully will require a few basic tools, including:

1. Computer with reliable internet access
2. Phone to contact the NWS
3. Communication method with key event decision makers
4. Way to activate the weather safety plan for your event

This section describes the information that should be monitored immediately before and during your event (third section of the checklist).

Determining Storm Speed

Knowing the expected storm speed is critical to effective implementation of your plan. For example, if you know it takes 30 minutes to alert and clear your venue, and storms are moving at 60 miles an hour, you will need to activate your plan when storms are 30 miles away from the edge of your 8 mile safety radius. If the storms are moving at 30 miles an hour, you will need to activate your plan when storms are 15 miles away from the 8 mile safety radius.

Time-to-Distance Calculation Tool

The Weather Watcher Briefing page includes a link to a calculation tool to help determine the approximate range of storms when your plan should be enacted. Form inputs include location of your event, time needed to enact your plan, and expected storm speed. Form output (distance in miles) is received via email.

Options for Determining Storm Speed

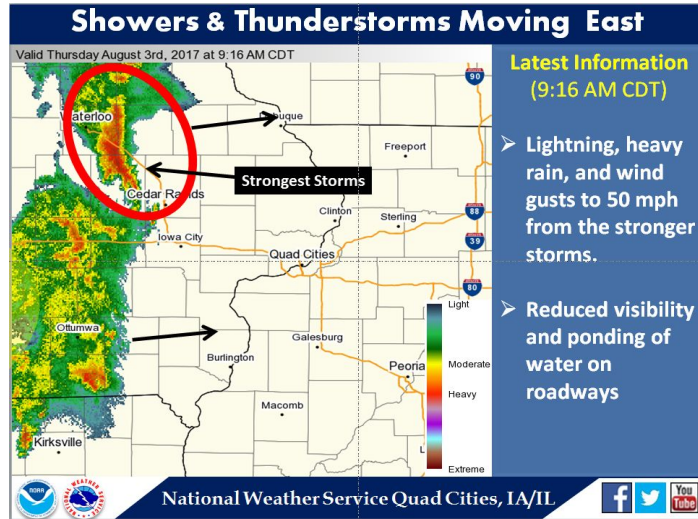
Warning text: Each severe weather warning and statement includes the storm's speed and direction of movement. For a starting point, check warnings that are nearby or upstream.

Estimate from radar: Note the begin and end time of a radar loop, then note where the storms were at the beginning and where they were at the end. Using this estimate for distance travelled, estimate where it will be in that same amount of time in the future. For example, if the loop is 60 minutes long and the storm travels 30 miles in that time, you would estimate that the storms would advance another 30 miles in the next hour.

Timing tools: Some radar apps for phone or computer include a timing tool to estimate time of arrival based on the current storm movement.

Graphiccast / Graphical NOWcast

In cases of active weather, your local weather service office may issue a graphical short term forecast called a “Graphical Nowcast” or “Graphiccast”. Typically this image will depict what is expected in the next few hours. When a Graphiccast is in effect, a special image will appear in the lower left of your local office’s web page, and the graphic will display on the first tab of the weather watcher briefing page.

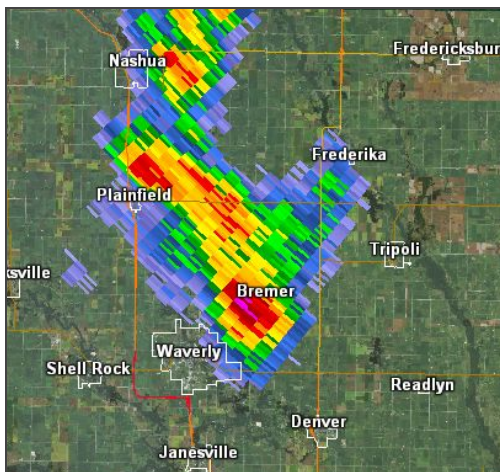


Radar

One of the best tools for observing weather for the next few hours is radar. There are many different sources for radar data, including www.weather.gov. There are also vendors that offer free or pay-for-service access to radar data. We recommend having two independent sources in case one of your options is down.

Important Things to Remember About Radar

1. **Be sure the radar data is current. Always check the timestamp.**
2. Know where you are located on the radar.
3. Some radar programs predict hail size, rotation in thunderstorms and potential tornadoes. Don’t rely on this data as it is highly prone to error.
4. Radar data does not always translate to what is actually happening at the surface. The farther you are from the radar, the larger the potential difference.



Base Reflectivity



Base Velocity

Types of Radar Images

Base Reflectivity – Best representation of what is happening near the ground. This is the image that should be used the most.

Composite Reflectivity - Depicts the strongest part of the storm through the whole atmosphere. Can show which storm is the strongest and storm trend if viewed in a loop. Does *not* reliably show what is happening on the ground.

Rainfall - Radar estimates of rainfall. This data can be prone to large errors and should be used with caution. If ground gauges agree with the radar, confidence in the radar estimate is higher.

Velocity – Depicts the speed of the wind toward and away from the radar.

Using Radar to Answer Common Questions

	What to use	What to do
<i>Where are the storms?</i>	Base Reflectivity	<ol style="list-style-type: none"> 1. Check the timestamp, is it current? 2. Determine where you are on the radar and where the storms are.
<i>Are the storms moving toward me?</i>	Base Reflectivity Loop	<ol style="list-style-type: none"> 1. Check the timestamp, is it current? 2. Determine where you are on the radar. 3. Loop the images to determine if the storms are moving toward or away from you.
<i>When will storms reach me?</i>	Base Reflectivity Loop	<ol style="list-style-type: none"> 1. Check the timestamp, is it current? 2. Loop the radar images. 3. Check the begin and end time of the loop. 4. Note where the storms were at the beginning, and where they were at the end. 5. Using this estimate for distance travelled, estimate where it will be in that same amount of time in the future. 6. For example, if the animation is 60 minutes long and the storm travels 30 miles in that time, you would estimate that the storms would advance another 30 miles in the next hour.
<i>Are more storms coming?</i>	Base Reflectivity (regional)	<ol style="list-style-type: none"> 1. Check radar from neighboring offices or a wider, regional view 2. Check the timestamp, is it current?

Watch

A watch means that conditions are becoming favorable for severe weather. This serves as your heads up to be prepared for severe weather occurring. If a watch is issued, you should:

- Begin monitoring radar and Graphical Nowcasts if not already doing so.
- Check storm speed to determine the range of storms when sheltering would be needed.
- Check your event’s severe weather plan for potential actions, such as notifying staff, unlocking buildings, updating public displays, posting on social media, etc.

Watch Example

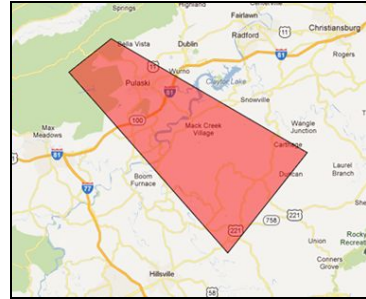
<p>URGENT - IMMEDIATE BROADCAST REQUESTED Severe Thunderstorm Watch Number 489 NWS Storm Prediction Center Norman OK 120 AM CDT Wed Sep 20 2017</p>	<p>Header with issuance time and date of the watch</p>
<p>The NWS Storm Prediction Center has issued a</p> <ul style="list-style-type: none"> * Severe Thunderstorm Watch for portions of East-central Minnesota Northwest Wisconsin 	<p>The type of watch and area affected</p>
<ul style="list-style-type: none"> * Effective this Wednesday from 120 AM until 500 AM CDT. 	<p>Valid time</p>
<ul style="list-style-type: none"> * Primary hazards include... Isolated damaging wind gusts to 70 mph Isolated large hail to 1 inch in diameter 	<p>Main hazards</p>
<p>SUMMARY...Line of strong to severe storms will progress east across the Saint Croix Valley, likely weakening towards daybreak.</p>	<p>Expected evolution</p>
<p>The watch area is approximately along and 55 miles east and west of a line from 20 miles north of Duluth MN to 5 miles east of St. Paul MN. For a complete depiction see the associated watch outline update (WOUS64 KWNS WOU9).</p>	<p>Specific description of the area covered by the watch</p>
<p>PRECAUTIONARY/PREPAREDNESS ACTIONS...</p> <p>REMEMBER...A Severe Thunderstorm Watch means conditions are favorable for severe thunderstorms in and close to the watch area. Persons in these areas should be on the lookout for hazardening weather conditions and listen for later statements and possible warnings. Severe thunderstorms can and occasionally do produce tornadoes.</p>	<p>What the watch means</p>

Warning

Important note: Warnings issued which include the event location likely do not provide enough lead time to be used as a trigger for executing evacuation/shelter plans.

Warnings issued upstream of the area can be useful in helping gauge the movement of storms and help determine when your event may be impacted.

Warnings indicate that life-threatening weather is imminent. It is recommended to view the warning in both text and graphic formats. The graphic (example at right) shows at a glance the area included in the warning.



The text describes the magnitude and timing of the hazards.

Warning Example

<p>Tornado Warning National Weather Service Quad Cities IA/IL 723 PM CDT FRI JUL 21 2017</p>	<p>Warning type and issuance time</p>
<p>The National Weather Service has issued a</p>	<p>Area included in warning</p>
<p>* Tornado Warning for... Eastern Whiteside County in Illinois...</p>	<p>Expiration time</p>
<p>* Until 745 PM CDT</p>	<p>Current location and movement</p>
<p>* At 723 PM CDT, a tornado was reported near Fulton, moving east at 40 mph.</p>	<p>Hazard(s) and expected impacts</p>
<p>HAZARD...Tornado.</p>	<p>Estimated arrival times</p>
<p>SOURCE...Radar indicated rotation.</p>	<p>Other affected locations</p>
<p>IMPACT...Flying debris will be dangerous to those caught without shelter. Mobile homes will be destroyed.</p>	<p>Calls to action</p>
<p>* This dangerous storm will be near... Morrison around 735 PM CDT.</p>	<p>Coordinates of warning area</p>
<p>Other locations impacted by this tornadic thunderstorm include Unionville and Morrison-Rockwood State Park.</p>	<p>Magnitude of risk(s)</p>
<p>PRECAUTIONARY/PREPAREDNESS ACTIONS...</p>	
<p>TAKE COVER NOW! Move to a basement or an interior room on the lowest floor of a sturdy building.</p>	
<p>LAT...LON 4180 8984 4183 9018 4185 9018 4185 9017 TIME...MOT...LOC 0023Z 255DEG 34KT 4189 9012</p>	
<p>TORNADO...RADAR INDICATED HAIL...1.75IN</p>	

Severe Weather Statement

A severe weather statement can be as important as the initial warning. Severe Weather Statements provide continuing information during a Tornado Warning or Severe Thunderstorm Warning, and provide the latest information on a storm’s strength, location, and movement.

Severe Weather Statement Example

<p>Severe Weather Statement National Weather Service Quad Cities IA/IL 701 PM CDT WED SEP 20 2017</p>	<p>Product type and issuance time</p>
<p>IAC045-163-210030- /O.CON.KDVN.SV.W.0189.000000T0000Z-170921T0030Z/ Scott IA-Clinton IA- 701 PM CDT WED SEP 20 2017</p>	<p>Some important coding for the computers</p>
<p>...A SEVERE THUNDERSTORM WARNING REMAINS IN EFFECT UNTIL 730 PM CDT FOR SCOTT AND CLINTON COUNTIES...</p>	<p>Warning Status</p>
<p>At 700 PM CDT, a severe thunderstorm was located near Donahue, or 8 miles northeast of Durant, moving east at 20 mph.</p>	<p>Storm location and movement</p>
<p>HAZARD...60 mph wind gusts and quarter size hail. SOURCE...Radar indicated. IMPACT...Hail damage to vehicles is expected. Expect wind damage to roofs, siding, and trees.</p>	<p>Hazard(s) and expected impacts</p>
<p>Locations impacted include... Eldridge, DeWitt, Walcott, Long Grove, Grand Mound, Sherman Park, Clinton County Fairgrounds, Scott County Park and Plainview. This includes Interstate 80 in Iowa between mile markers 280 and 284.</p>	<p>Locations still in the warning</p>
<p>PRECAUTIONARY/PREPAREDNESS ACTIONS... Continuous cloud to ground lightning is occurring with this storm. Move indoors immediately. Remember, if you can hear thunder, you are close enough to be struck by lightning.</p>	<p>Calls to action (safety information)</p>
<p>&& LAT...LON 4167 9042 4160 9087 4171 9087 4174 9082 TIME...MOT...LOC 0000Z 252DEG 18KT 4168 9077</p>	<p>Coordinates of area still in a warning</p>
<p>HAIL...1.00IN WIND...60MPH</p>	<p>Magnitude of hazards</p>

Supplemental Information

Special Weather Statement

Special Weather Statements are issued for thunderstorms, wind, floods, winter weather, and other phenomenon that do not meet warning levels.

Special Weather Statement Example

<p>Special Weather Statement National Weather Service Quad Cities IA/IL 834 PM CDT WED JUL 19 2017</p>	Product type and issuance time
<p>ILC011-155-200200- Putnam-Bureau- 834 PM CDT WED JUL 19 2017</p>	Included Counties and Issuance Time
<p>...A STRONG THUNDERSTORM WILL AFFECT EASTERN PUTNAM AND EASTERN BUREAU COUNTIES UNTIL 900 PM CDT...</p>	Headline
<p>At 832 PM CDT, a strong thunderstorm was located near Amboy, or 8 miles east of Walton, moving southeast at 60 mph.</p>	Current location and movement
<p>Wind gusts up to 50 mph are possible with this storm well out ahead of the storm, and any rainfall associated with it.</p>	Expected hazard(s)
<p>Locations impacted include... Spring Valley, DePue, Granville, Ladd, La Moille, Dalzell, McNabb, Mark, Ohio and Orin. This includes Interstate 80 in Illinois between mile markers 63 and 72.</p>	Specific Locations impacted
<p>LAT...LON 4159 8948 4158 8917 4111 8916 TIME...MOT...LOC 0132Z 314DEG 51KT 4169 8928</p>	Coordinates of affected area

Lightning Data

There are two types of lightning strikes: those that touch the ground and those that don't. Private vendors offer options for monitoring lightning data for a fee.

Things to remember about lightning:

- All thunderstorms produce lightning and are a threat to anyone outside.
- Warnings are not issued for lightning. If lightning is occurring within 8 miles, people should move indoors.
- If you can hear thunder, you are close enough to be struck by lightning.
- Lightning can occur when it is not raining.
- In fast moving storms, lightning and wind may arrive before thunder is heard.

Appendix A: Weather Considerations for Outdoor Events

Designate shelter areas if available

No one is safe outside of a solid enclosed structure during any thunderstorm; tents and pavilions are ***not*** suitable shelters

Establish weather thresholds to prompt activation of sheltering / evacuation plan

Examples/suggestions:

- Thunderstorms (lightning) within 8 mile radius
- Calculate sheltering/evacuation time utilizing 3 step decision guide
- Heat index of 95 degrees
- Non-thunderstorm wind gusts exceeding 45 mph

Designate a Weather Watcher

An effective weather watcher should:

- Understand event-specific weather thresholds and evacuation/sheltering time
- Have reliable internet access
- Have access to up-to-date radar information
- Complete the Weather Watcher Training Module and Checklist
- Maintain continuous weather watch on event day (It is encouraged that they not be designated for any other responsibilities.)
- Communicate directly with incident command staff, especially when a threshold is expected to be met
- Have access to NWSChat (Request an account several weeks ahead of time) <https://nwschat.weather.gov/create.php>
- Be aware of the basic suite of weather information available

Relay weather information ahead of potential hazardous weather

Examples/suggestions:

- General severe weather risk
- Severe Thunderstorm Watches or Tornado Watches
- Prior to possible evacuation, reminding what the evacuation plan is and where storm shelters are.

Appendix B: Time to Shelter

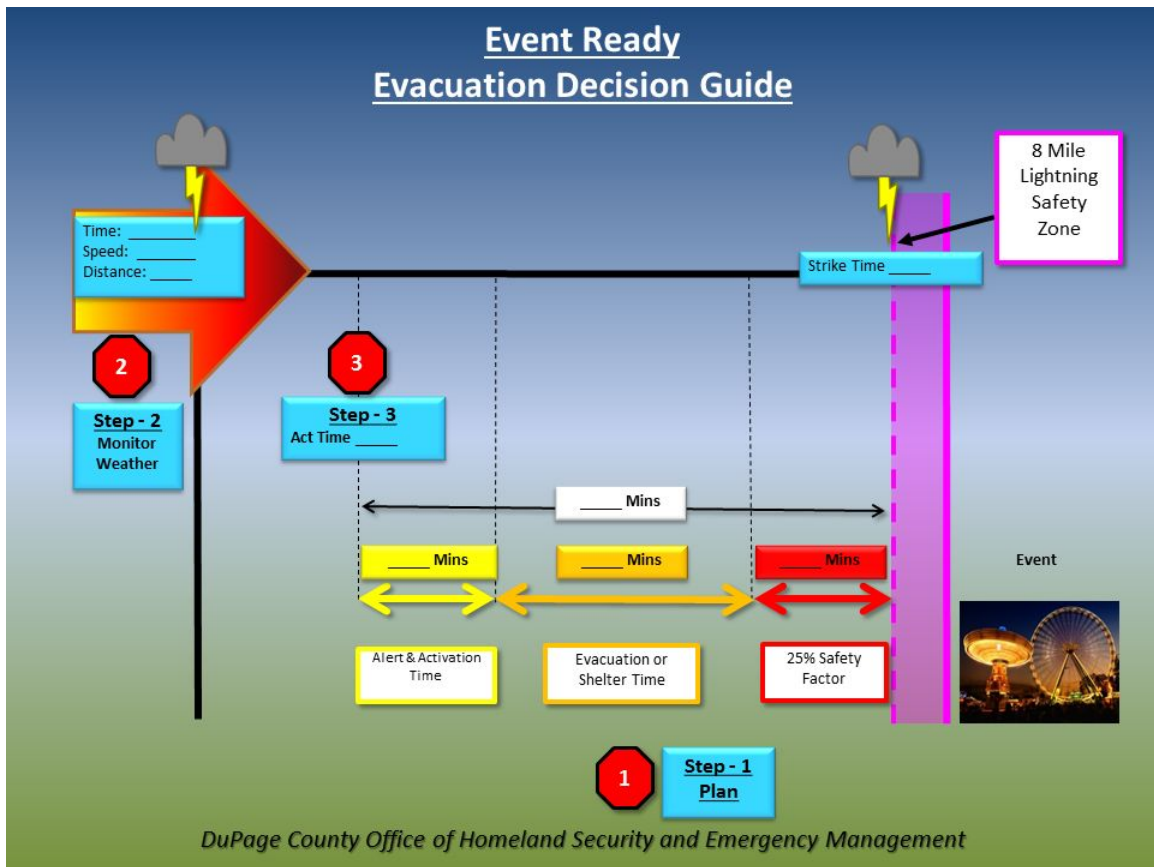
How much time do you need to shelter?

Alert and Activation Time (min)	Evacuation or Shelter Time (min)	25% Safety Factor	Total Time Needed (Minutes)
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$$(\text{_____} + \text{_____}) \times 1.25 = \text{_____}$$

It is suggested that the total time to evacuate and/or shelter and event be calculated before the event begins. There are three key components to the total time:

1. Alert and Activation Time - the time needed to mobilize staff and facility to conduct evacuation/sheltering and the time needed to make notify patrons.
2. Evacuation/Shelter Time - The time needed for movement of patrons once the evacuation/sheltering begins.
3. 25% Safety Factor - Combine the Alert and Activation Time with the Evacuation/Shelter Time and multiply by 1.25. This allows for unexpected delays in the movement of patrons, changes in storm arrival time and other unforeseen circumstances



This guide can be used by the weather watcher to track the predetermined time for evacuation/shelter and the current position and speed of approaching storms to determine when the plan needs to be enacted. A video tutorial on this chart can be found on the Planning and Resources Tab of the weather watcher website www.weather.gov/lot/weatherwatcher.

Appendix C: Weather Watcher Checklist

Days Leading Up To Event:

- Hazardous Weather Outlook
- EHWO
- Weather Story Graphic
- Situation Report (if available)
- SPC Outlooks
- Detailed Forecast and Hourly Weather Graph (enter location)

Day of Event: Storm Speed: _____ Storm Direction: _____

- Hazardous Weather Outlook including forecast storm motion
- EHWO
- Weather Story Graphic
- Situation Report (if available)
- SPC Day 1 Outlook
- Detailed Forecast and Hourly Weather Graph (enter location)
- Area Forecast Discussion
- Was an NWS conference call scheduled or briefing slides sent?

During Event Storm Speed: _____ Storm Direction: _____

- Radar (various sources)
- Graphical NOWcasts
- Watches and Warnings (enter location)
- Detailed Forecast and Hourly Weather Graph (enter location)
- NWSChat (<https://nwschat.weather.gov/live/>)

Weather Watcher Notes

Timing:

Hazards:

Impacts: