



Appendix B: Forecast Information Specifically Related to Thunderstorms, Flash Flooding, and Excessive Heat

While outdoor events occur year round, the overwhelming majority of events are going to be threatened the most by thunderstorm hazards (lightning, hail, wind, heavy rain, and tornadoes), especially during the summer months. This section covers the resources that specifically relate to thunderstorms, flash flooding and excessive heat.

Lightning Data:

Some lightning strikes touch the ground, while others remain in the cloud. The NWS will monitor the risk of lightning impacting an event as part of requested support. Additionally, America's Weather Enterprise offers options for monitoring lightning data for a fee. Here is a link to check out for these additional resources: <https://www.weather.gov/enterprise/>

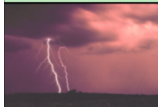





Things to remember about lightning:

- 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 impact your event before any thunder is heard.

Thunderstorm Outlooks:

The Storm Prediction Center (SPC) issues nationwide outlooks for thunderstorms, including the possibility of severe weather. These thunderstorm outlooks are separated into six categories. Generally, lower categories represent areas with the greatest uncertainty and smallest expected coverage of severe weather. Conversely, the higher categories represent greater confidence in the severe weather risk and coverage.

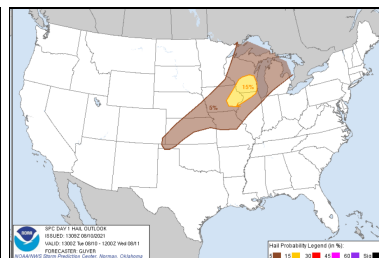
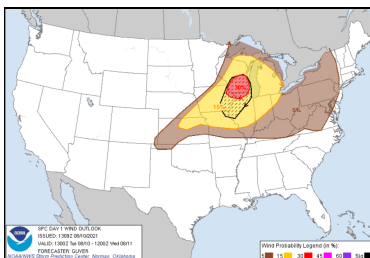
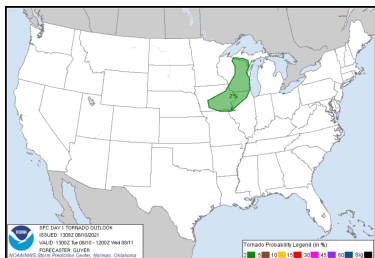
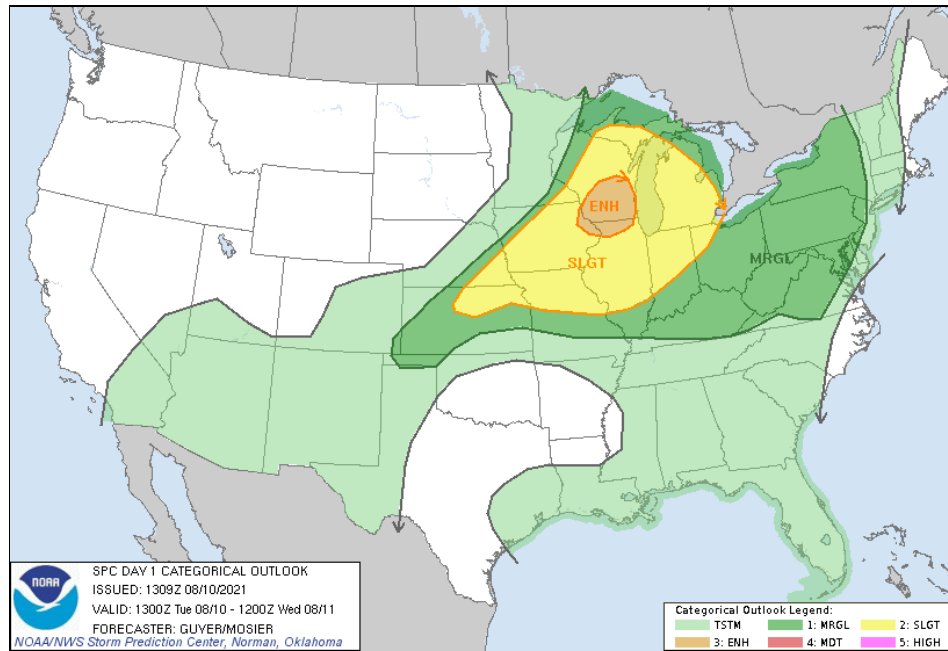
SPC Outlook Categories:

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
					



National Weather Service Event Ready Guide

Severe Weather Outlooks for large hail, damaging wind, and tornadoes are issued by the Storm Prediction Center, and relayed by your local weather service office. The Storm Prediction Center produces nation-wide outlooks for days 1, 2, and 3, and a general overview for days 4-7. The images below show the overall Day 1 outlook (top), and the thumbnails show the tornado, wind, and hail outlook (bottom).



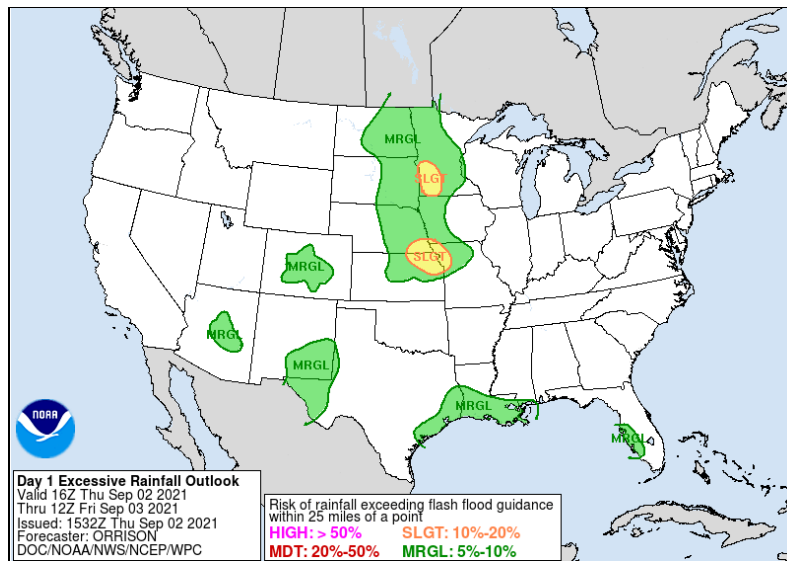


The Weather Prediction Center (WPC) issues nationwide outlooks for the likelihood of excessive rainfall which could lead to flooding. Generally, lower categories represent areas with the greatest uncertainty and smallest expected coverage of flash flooding (see chart below). Conversely, the higher categories represent the greatest perceived risk, confidence, and coverage for flash flooding. As with the Severe Weather Outlooks, your local weather service office will localize the risk from the Weather Prediction Center, often done in a Graphical Weather Story.

WPC Excessive Rainfall Risk Categories:

No Area/Label	MARGINAL (MRGL)	SLIGHT (SLGT)	MODERATE (MDT)	HIGH (HIGH)
Flash floods are generally not expected.	Isolated flash floods possible	Scattered flash floods possible	Numerous flash floods likely	Widespread flash floods expected
Flash floods are generally not expected. www.wpc.ncep.noaa.gov @NWSWPC	Localized and primarily affecting places that can experience rapid runoff with heavy rainfall.	Mainly localized. Most vulnerable are urban areas, roads, small streams and washes. Isolated significant flash floods possible.	Numerous flash flooding events with significant events possible. Many streams may flood, potentially affecting larger rivers.	Severe, widespread flash flooding. Areas that don't normally experience flash flooding, could. Lives and property in greater danger.
Flash flooding near me? Flash Flooding NO Flash Flooding	[Visual representation of risk levels using colored squares]			
 WEATHER PREDICTION CENTER				

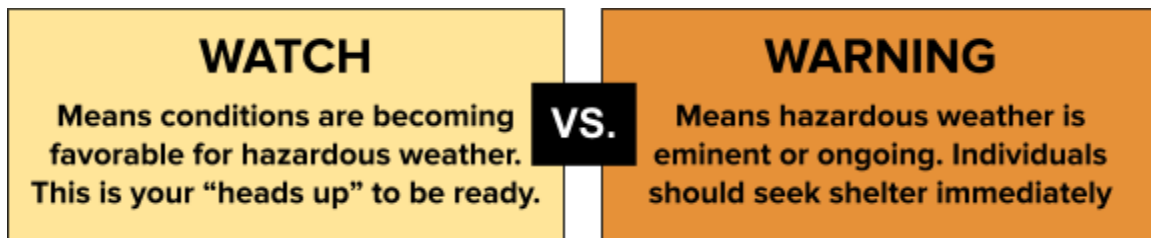
Excessive Rainfall Outlook for potential of flooding from heavy rainfall. The Weather Prediction Center produces nation-wide outlooks for days 1, 2, and 3.





Watches and Warnings:

As the likelihood in thunderstorm activity and the potential for severe weather or heavy rain increases, a Severe Thunderstorm Watch, Tornado Watch, or Flash Flood Watch might be issued. When there is high confidence in severe weather or heavy rain, a Severe Thunderstorm Warning, Tornado Warning, or Flash Flood Warning will be issued.



NOTE: Warnings will more than likely not provide enough lead time to be used as a trigger for outdoor events.

If a Severe Thunderstorm, Tornado, or Flash Flood **Watch** is issued, you should:

- Begin monitoring radar and Graphical Weather Stories if not already doing so.
- Check your event’s severe weather plan for potential actions, such as notifying staff, unlocking buildings, updating public displays, posting on social media, etc.
- Feel free to call your local NWS office if you have any questions related to the timing and potential impacts at your location.

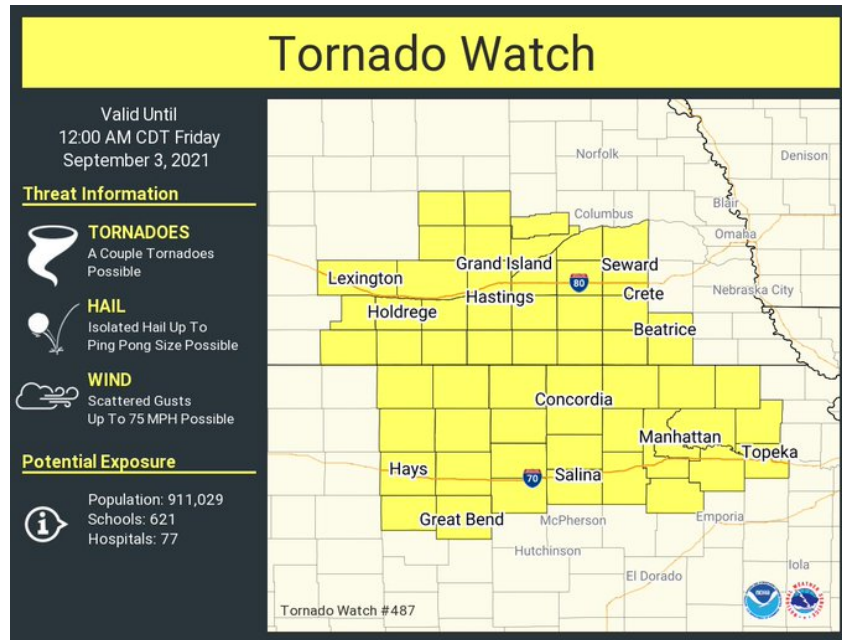
If a Severe Thunderstorm, Tornado, or Flash Flood **Warning** is issued, you should:

- Keep in mind that warnings for your event location likely do not provide enough lead time to be used as a trigger for executing evacuation/shelter plans.
- However, 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.
- Find out the main threats at the bottom of the warning text. There is also speed and direction of movement.
- ****IMPORTANT!** Storm motion can and does vary, so please contact your local weather service office if you are unsure when the storm will arrive at your location.

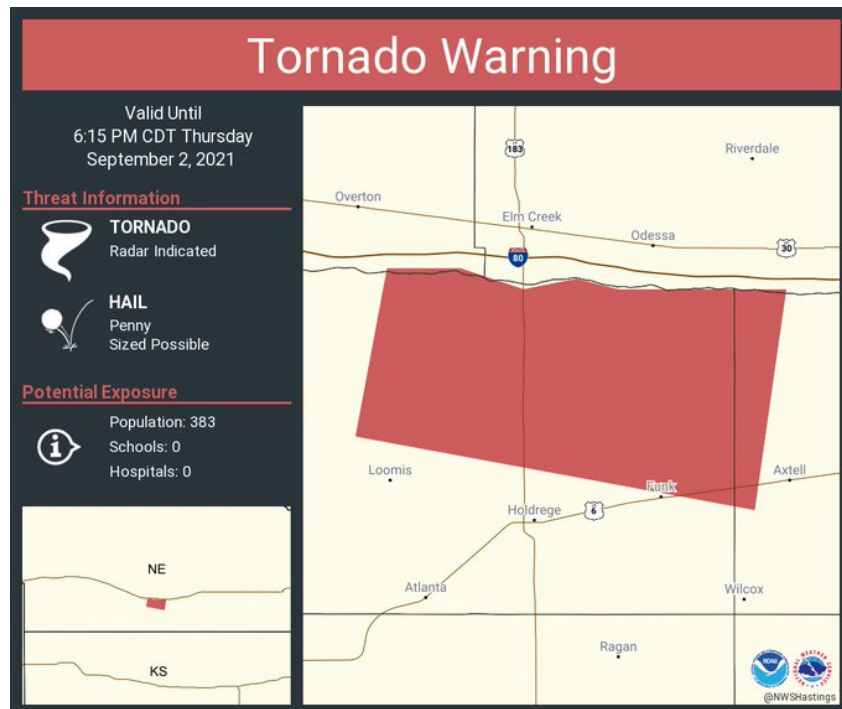
The following pages show an example of a Tornado Watch and Warning, Severe Thunderstorm Watch and Warning, and Flash Flood Watch and Warning.



Tornado Watch Graphic Example. Notice how the Tornado Watch covers many counties across southeast Nebraska and northeast Kansas. The entire watch area has the potential for storms to develop and produce tornadoes. However most locations will not experience a tornado.



Tornado Warning Graphic Example. Notice how the Tornado Warning covers a much smaller area where confidence is high that a tornado could (or in some cases already has) form. In this example the tornado was indicated by radar.





Tornado Warning Text Example

WFUS53 KGID 022252
 TORGID
 NEC099-137-022315-
 /O.NEW.KGID.TO.W.0002.210902T2252Z-210902T2315Z/

BULLETIN - EAS ACTIVATION REQUESTED
 Tornado Warning
 National Weather Service Hastings NE
 552 PM CDT Thu Sep 2 2021

The National Weather Service in Hastings has issued a

* Tornado Warning for... Northeastern Phelps County in south central Nebraska... West central Kearney County in south central Nebraska...
 * Until 615 PM CDT.

*** At 552 PM CDT, a severe thunderstorm capable of producing a tornado was located 8 miles south of Elm Creek, or 12 miles north of Holdrege, moving east at 15 mph.**

HAZARD...Tornado.

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.

*** This tornadic thunderstorm will remain over mainly rural areas of northeastern Phelps and west central Kearney Counties.**

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.

&&

LAT...LON 4068 9951 4068 9944 4066 9938 4067 9933 4066 9929 4066 9913 4045 9916 4052 9954
 TIME...MOT...LOC 2252Z 275DEG 15KT 4061 9943

**TORNADO...RADAR INDICATED
 MAX HAIL SIZE...<.75 IN**

What/Where/When

Current Location and Movement

Future Location

Quick Summary of Threats



Severe Thunderstorm Watch Example - Notice how the watch covers many counties across South Dakota and Nebraska. Large hail and damaging wind are the primary threats, along with frequent lightning.

Severe Thunderstorm Watch

Valid Until
5:00 AM CDT Tuesday
August 31, 2021

Threat Information

- HAIL**
Scattered Hail Up To Tennis Ball Size Likely
- WIND**
Scattered Gusts Up To 80 MPH Likely
- LIGHTNING**
Frequent Lightning Possible

Potential Exposure

Population: 515,671
Schools: 516
Hospitals: 51

Severe Thunderstorm #479

Severe Thunderstorm Warning Example - Notice how the Severe Thunderstorm Warning covers a much smaller area where confidence is high in the potential for wind up to 60 mph and golf ball sized hail.

Severe Thunderstorm Warning

Valid Until
11:15 PM CDT Monday
August 30, 2021

Threat Information

- WIND**
Up to 60 MPH
- HAIL**
Golf Ball Sized Possible

Potential Exposure

Population: 4,247
Schools: 5
Hospitals: 1

@NWSNorthPlatte



Severe Thunderstorm Warning Text Example

WUUS53 KLBK 310329
SVRLBF
NEC031-310415-
/O.NEW.KLBK.SV.W.0166.210831T0329Z-210831T0415Z/

BULLETIN - IMMEDIATE BROADCAST REQUESTED
Severe Thunderstorm Warning
National Weather Service North Platte NE
1029 PM CDT Mon Aug 30 2021

The National Weather Service in North Platte has issued a

Severe Thunderstorm Warning for... Northeastern Cherry County in north central Nebraska...

} What/Where/When

* Until 1115 PM CDT.

*** At 1028 PM CDT, a severe thunderstorm was located 7 miles west of Valentine, moving southeast at 15 mph.**

} Current Location and Movement

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... Valentine, Crookston, Highway 97 crossing the Niobrara River and Schlage! Creek State Wildlife Management Area. This includes the following highways... Highway 20 between mile markers 182 and 205. Highway 97 between mile markers 131 and 141. Highway 83 between mile markers 197 and 222. Highway 12 between mile markers 1 and 13.**

} Future Location

PRECAUTIONARY/PREPAREDNESS ACTIONS...

For your protection move to an interior room on the lowest floor of a building. To report severe weather, contact your nearest law enforcement agency. They will send your report to the National Weather Service office in North Platte.

&&
LAT...LON 4298 10033 4265 10054 4289 10087 4300 10078 4300 10050
TIME...MOT...LOC 0328Z 305DEG 15KT 4291 10069

THUNDERSTORM DAMAGE THREAT...CONSIDERABLE HAIL THREAT...RADAR INDICATED MAX HAIL SIZE...1.75 IN WIND THREAT...RADAR INDICATED MAX WIND GUST...60 MPH

} Quick Summary of Threats



Flash Flood Watch Example - The map on the right side of the graphic below shows the counties in the watch, and the text on the left describes the potential impacts.

Flash Flood Watch

Valid Midnight Tonight through 7 PM Saturday

Key Message

Conditions will be favorable for flash flooding tonight into Saturday with rounds of heavy rainfall within the Flash Flood Watch area. 1 to 3 inches of rain, with locally higher amounts, is possible.

Potential Hazards

Heavy Rainfall

Flash Flooding

Rapid rises along waterways

Actions

Have multiple ways to receive warning information.

Turn around, don't drown.

Outdoor plans? Remain weather aware.

FLASH FLOOD WATCH THROUGH SATURDAY

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

National Weather Service
Topeka, KS

Published on: 09/03/2021 at 3:11PM

Flash Flood Warning Example - The warning covers a much smaller area with the timestamp in the upper left corner.

Flash Flood Warning

Valid Until
9:15 AM CDT Friday
September 3, 2021

Safety Information

Move immediately to higher ground!

Avoid walking or driving through flood waters!

Potential Exposure

Population: 105,170
Schools: 22
Hospitals: 1

@NWSTopeka



Flash Flood Warning Text Example

WGUS53 KTOP 031021
 FFWTOP
 KSC045-031415-
 /O.NEW.KTOP.FF.W.0030.210903T1021Z-210903T1415Z/
 /00000.0.ER.000000T0000Z.000000T0000Z.000000T0000Z.OO/

BULLETIN - EAS ACTIVATION REQUESTED
 Flash Flood Warning
 National Weather Service Topeka KS
 521 AM CDT Fri Sep 3 2021

The National Weather Service in Topeka has issued a

- * Flash Flood Warning for... Central Douglas County in east central Kansas...
- * Until 915 AM CDT.
- * At 520 AM CDT, Doppler radar indicated thunderstorms producing heavy rain across the warned area. Up to three inches of rain have already fallen. Flash flooding is ongoing or expected to begin shortly.

HAZARD...Flash flooding caused by thunderstorms.

SOURCE...Radar indicated.

IMPACT...Flooding of small creeks and streams, urban areas, highways, streets and underpasses as well as other drainage and low lying areas.

- * Some locations that will experience flooding include... Lawrence.

Additional rainfall amounts of one to two inches are expected in the warned area.

This includes Kansas Turnpike between mile markers 196 and 205.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

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

&&

LAT...LON 3890 9515 3889 9535 3900 9538 3901 9519 3897 9519 3896 9518
 3898 9516 3897 9514

FLASH FLOOD...RADAR INDICATED

} What/Where/When

} Potential Impacts

} Location of Impacts

} Quick Summary of Threats

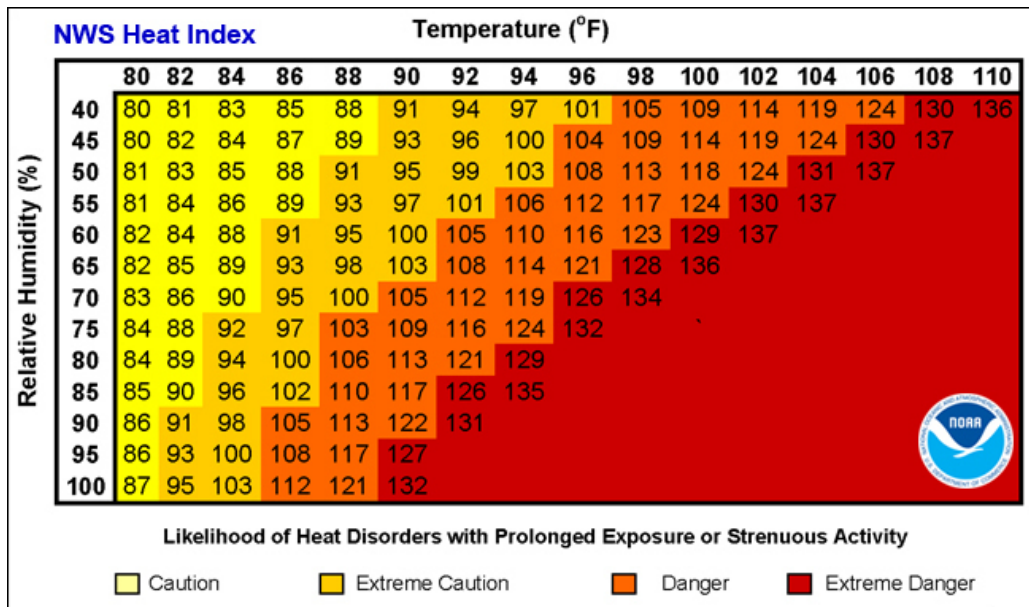


Excessive Heat:

The National Weather Service has multiple tools to assess the potential for heat stress due to extreme temperatures and other environmental factors. The following tools can inform the issuance of NWS official heat watches, warnings, and advisories. Each of these tools integrate other weather parameters to provide a deeper level of information beyond what the actual air temperature can tell us.

Heat Forecast Tools

The Heat Index is a measure of how hot it really feels when relative humidity is factored in with the actual air temperature. To find the Heat Index temperature, look at the Heat Index Chart above or check our [Heat Index Calculator](#). As an example, if the air temperature is 96°F and the relative humidity is 65%, the heat index—how hot it feels—is 121°F. The red area without numbers indicates extreme danger. The National Weather Service will initiate alert procedures when the Heat Index is expected to exceed 105°-110°F (depending on local climate) for at least 2 consecutive days.



Wet Bulb Globe Temperature (WBGT)

The Wet Bulb Globe Temperature (WBGT) is a particularly effective indicator of heat stress for active populations such as outdoor workers and athletes that uses temperature, humidity, wind, solar radiation, and other weather parameters. WBGT can be used to inform activity modifications during exercise or outdoor work. For instance, The American College of Sports Medicine bases its guidelines for the intensity of sport practices on WBGT, and it is therefore utilized by athletic programs in many school districts.



Heat Products

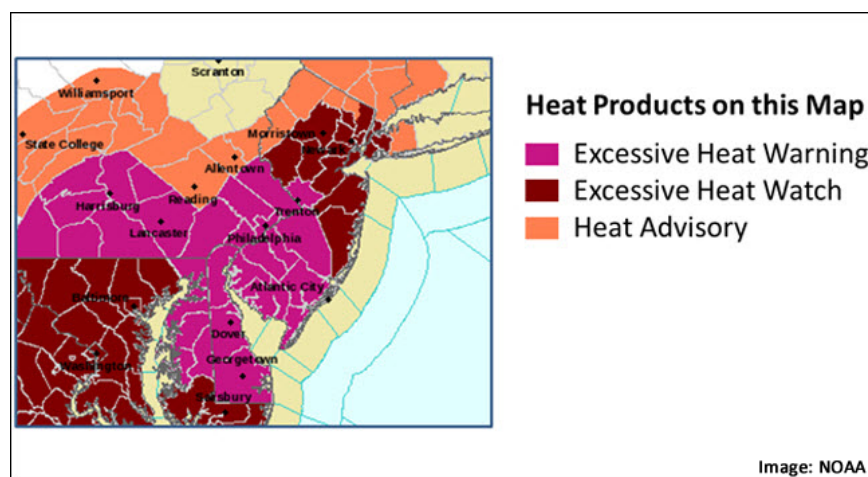
Each National Weather Service Forecast Office issues some or all of the following heat-related products as conditions warrant. NWS local offices often collaborate with local partners to determine when an alert should be issued for a local area.

Excessive Heat Warning—Take Action! An Excessive Heat Warning is issued within 12 hours of the onset of extremely dangerous heat conditions. The general rule of thumb for this Warning is when the maximum heat index temperature is expected to be 105° or higher for at least 2 days and night time air temperatures will not drop below 75°; however, these criteria vary across the country, especially for areas not used to extreme heat conditions. If you don't take precautions immediately when conditions are extreme, you may become seriously ill or even die.

Excessive Heat Watches—Be Prepared! A Heat Watch is issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. A Watch is used when the risk of a heat wave has increased but its occurrence and timing is still uncertain.

Heat Advisory—Take Action! A Heat Advisory is issued within 12 hours of the onset of extremely dangerous heat conditions. The general rule of thumb for this Advisory is when the maximum heat index temperature is expected to be 100° or higher for at least 2 days, and night time air temperatures will not drop below 75°; however, these criteria vary across the country, especially for areas that are not used to dangerous heat conditions. Take precautions to avoid heat illness. If you don't take precautions, you may become seriously ill or even die.

Excessive Heat Outlooks—Be Aware! The outlooks are issued when the potential exists for an excessive heat event in the next 3-7 days. An Outlook provides information to those who need considerable lead-time to prepare for the event.



For additional information on heat safety and heat forecast tools, please visit the NWS Heat Forecast Tools [webpage](#).