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Topic: Storm-Based Warning Fundamentals

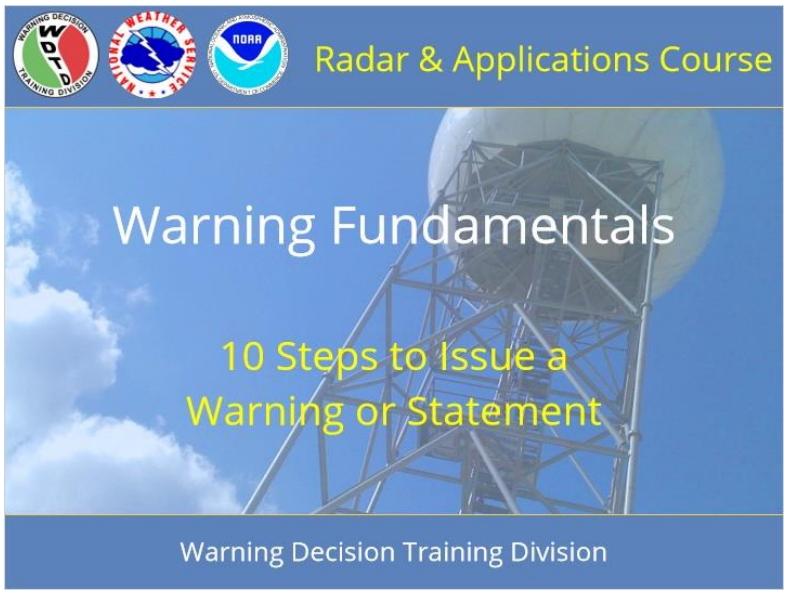
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10 Steps to Issue a Warning or Statement

10 Steps to Issue a Warning or Statement

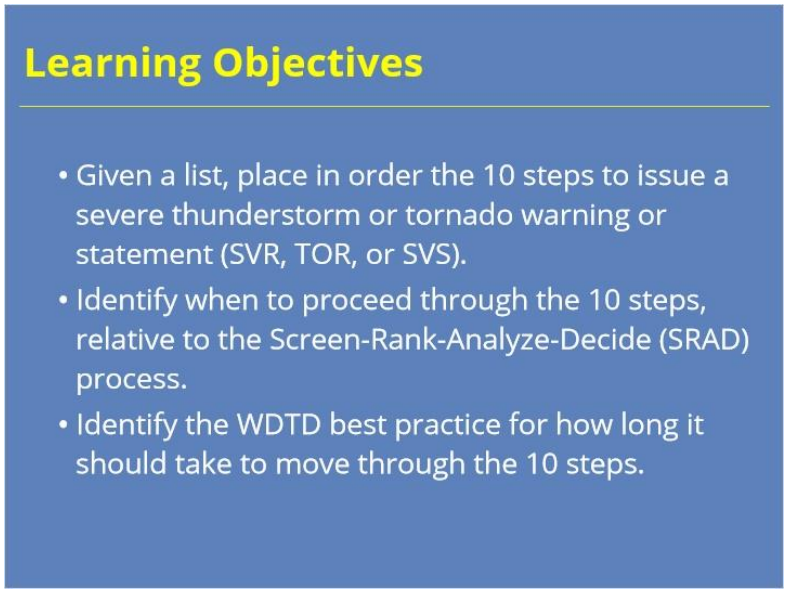


Notes:

Welcome to RAC Warning Fundamentals. This is the 10 Steps to Issue a Warning or Statement. I am Barb Mayes Boustead.

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Learning Objectives

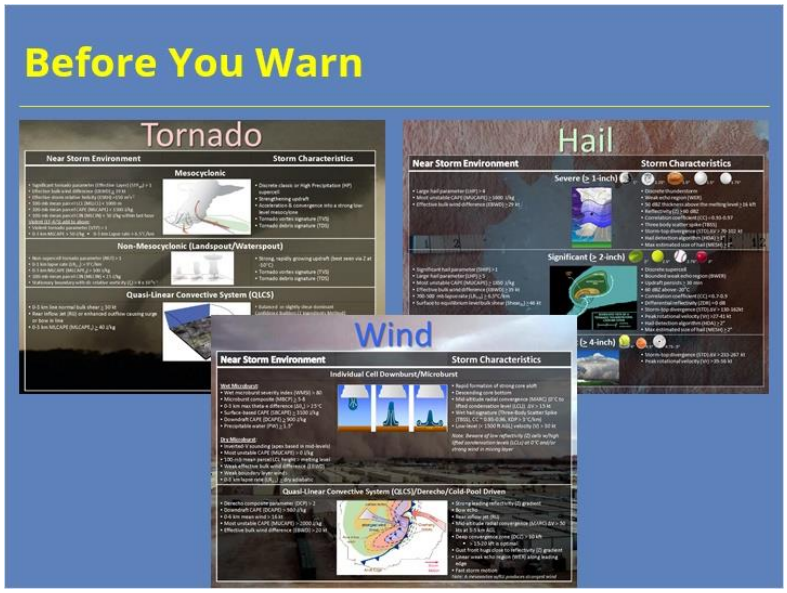


Notes:

After completing this module, you will be able to list, in correct order, the steps to issue a severe thunderstorm or tornado warning or statement, to identify when to proceed through the 10 steps relative to the SRAD process, and to note the goal for how long it should take to move through the 10 steps.

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Before You Warn

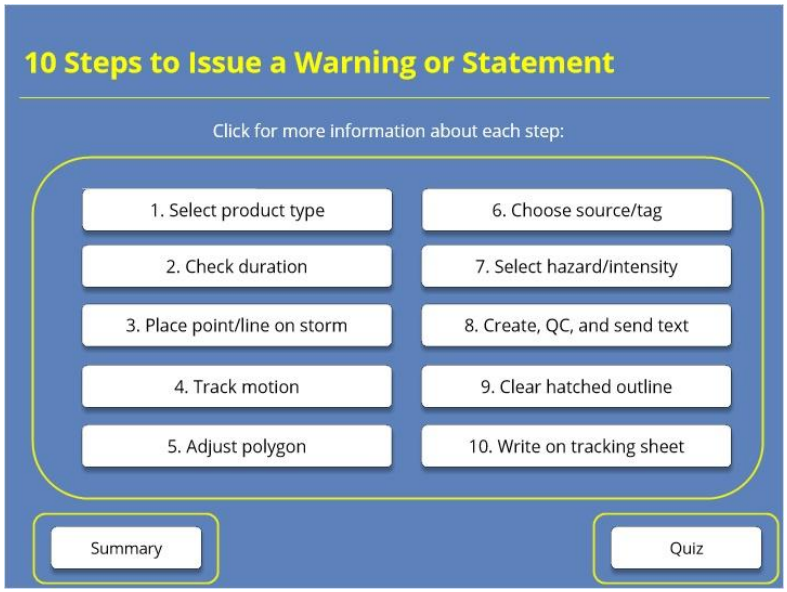


Notes:

Before you even begin the process of drawing a warning or update, your storm analysis should be complete. You should know what kind of warning you want to issue, what size hail you are including, and if it is a severe thunderstorm warning, what wind speeds to include. You should know if it's radar-indicated or reported, and that should only change if a report comes in while you are drawing up the warning. You should know what tags you intend to apply (with tornado warnings, for example, base, considerable, or catastrophic). Having all of this information together before you start to draw the warning will help the process flow seamlessly, and it will help you achieve a goal of doing the entire process is less than 2 minutes, which is our goal for you by the end of RAC workshops

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Homepage: 10 Steps to Issue a Warning or Statement

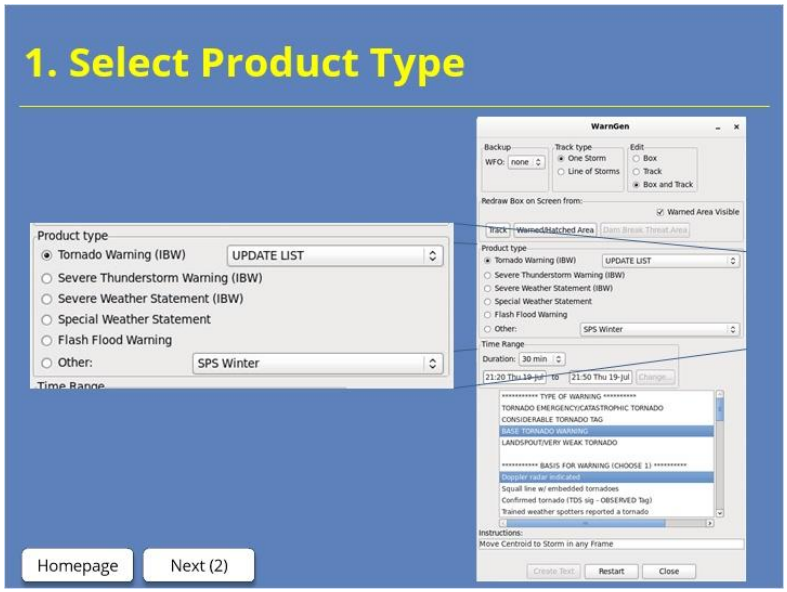


Notes:

Welcome to the homepage for this lesson on the ten steps to issue a severe thunderstorm or tornado warning or statement. In warning operations, you will go through these ten steps with every warning and statement that you issue. From this page, you can click on these ten buttons to see more information about each step in the process of creating a warning or statement. Watch the summary video to see the process come together. Then, once you feel comfortable with these materials, take the quiz by clicking the button at the bottom right of the screen.

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1. Select Product Type

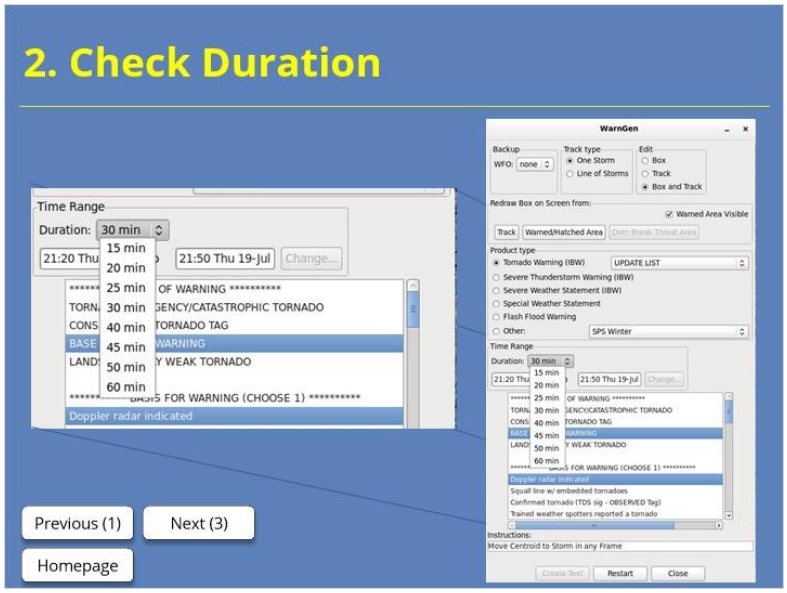


Notes:

Remember, before you begin the process of producing your warning, you should have completed the screen, rank, and analyze steps in the warning decision process, and you should have made the decision what kind of warning or statement you want to issue and where. The first step you should take in the process of creating the warning is to select the warning product type - tornado, severe thunderstorm, or severe weather statement.

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2. Check Duration

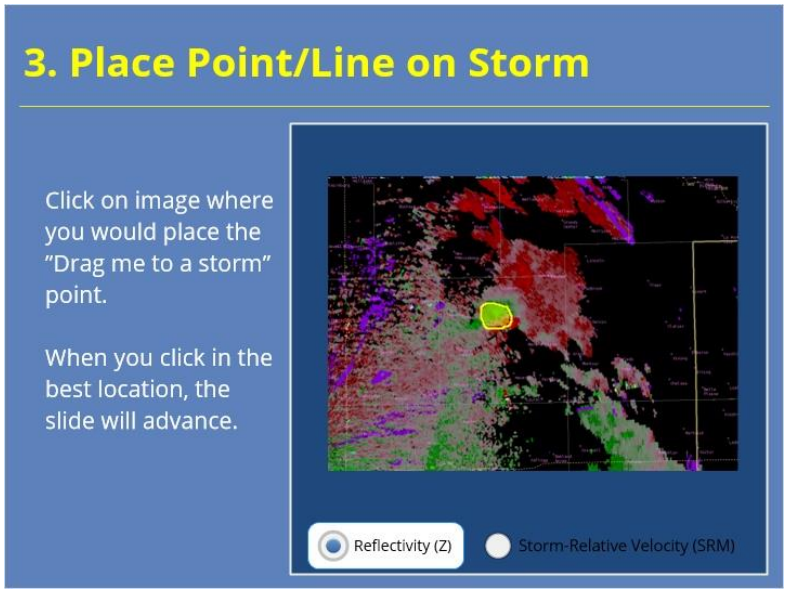


Notes:

Next, check the duration of the warning. In most offices, tornado warnings default to 30 minutes and severe thunderstorm warnings to 45 minutes, though this can be changed locally. If you wish to move away from your office's defaults, have an intentional reason to do so, such as lengthening a tornado warning for a cyclical tornado-producing supercell in a favorable environment, or shortening a severe thunderstorm warning for a storm that is close to exiting the CWA. SVSs will continue for the remainder of the initial warning, unless you are issuing a cancellation. Being aware of how much time is left in a warning you are updating will let you be sure about what SVS options will be available to you – continuation, cancellation, and/or expiration.

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3. Place Point or Line



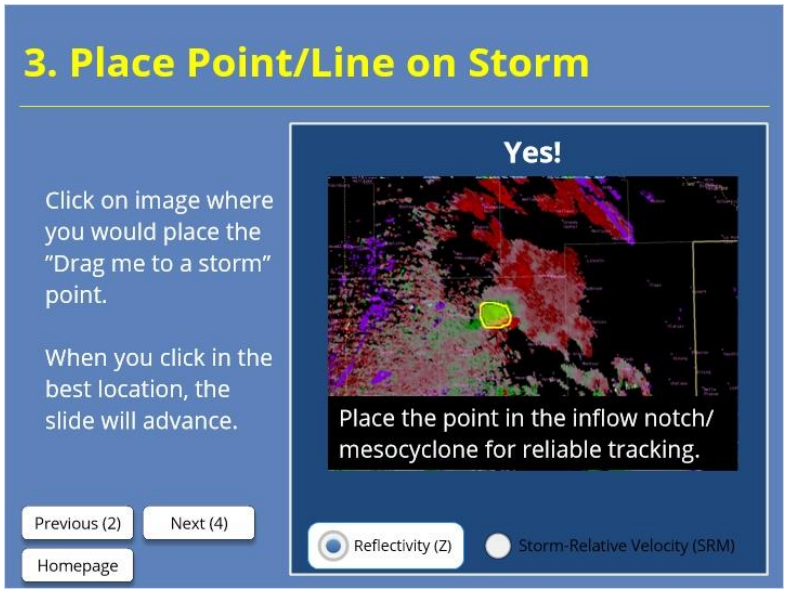
Notes:

Use a point to track supercells and pulse storms and a line to track some multicellular storm modes, including QLCSs and bow echoes. For a supercell, place the point on the inflow notch area of the storm or on the center of mesocyclonic rotation. Take care if you place it on a tornadic couplet; we will talk about that a little more on the next step. For a storm that does not have a mesocyclone or inflow notch, such as a pulse storm, place the point on the leading edge of the high reflectivity area or wind signature, whichever is farther ahead relative to storm motion. For linear convection, use a line with three vertex points and align with the leading edge of winds associated with the storm. We will cover issuing for wind events like lines more in depth in the module on advanced warning methodology for winds.

You can toggle between reflectivity and storm-relative velocity. On either image, click where you would place the "drag me to a storm" point to begin tracking the storm. When you've selected the correct area, you'll see a confirmation screen.

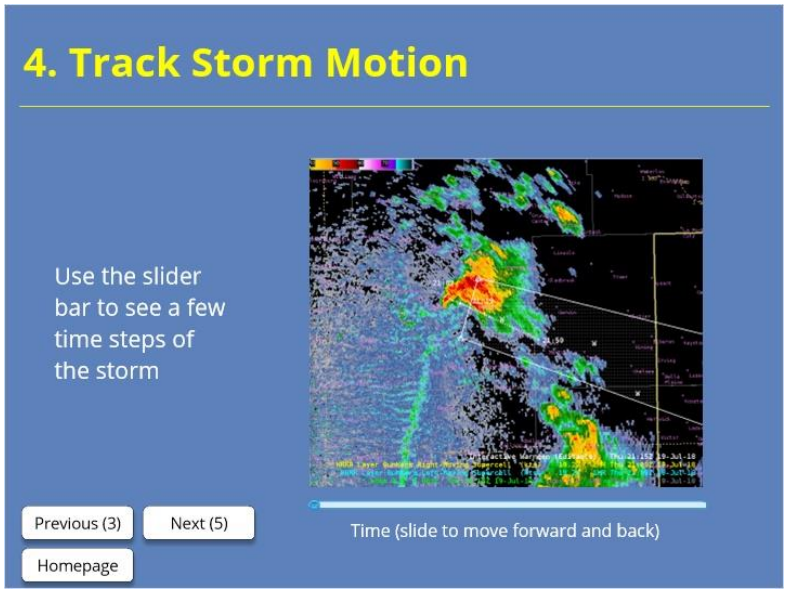
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Yes Point (Slide Layer)



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4. Track Storm Motion

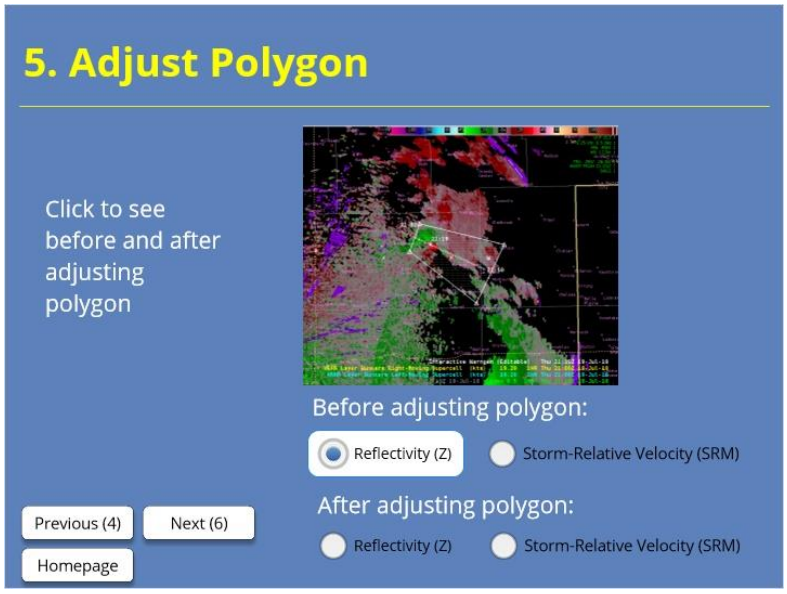


Notes:

For supercells with a defined inflow notch area and mesocyclone, you can track the storm with these. Take care with tracking a tornadic circulation. Sometimes that works well, but sometimes, the circulation makes irregular motions, such as occluding back into the mesocyclone as the tornado cycles, which will make the overall track of the tornado-producing area of the storm less accurate if you follow it. When you track with velocity or storm-relative velocity, flip back to reflectivity to make sure the track makes sense. For linear convection, use velocity to track the leading edge of the gust front. In most cases, you'll want to track the motion for just the last few frames. WarnGen only allows linear motion extrapolation, while most storms have some kind of nonlinear motion. If you track backwards too far, you may get unrepresentative motion. As with all steps, be intentional about the motion you set and aware of the direction and speed. At the end, when you are happy with the track, under the area near the top of the WarnGen interface that says "Redraw Box on Screen," click on the button that says "Track" – that will give you a first-guess polygon.

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5. Adjust Polygon

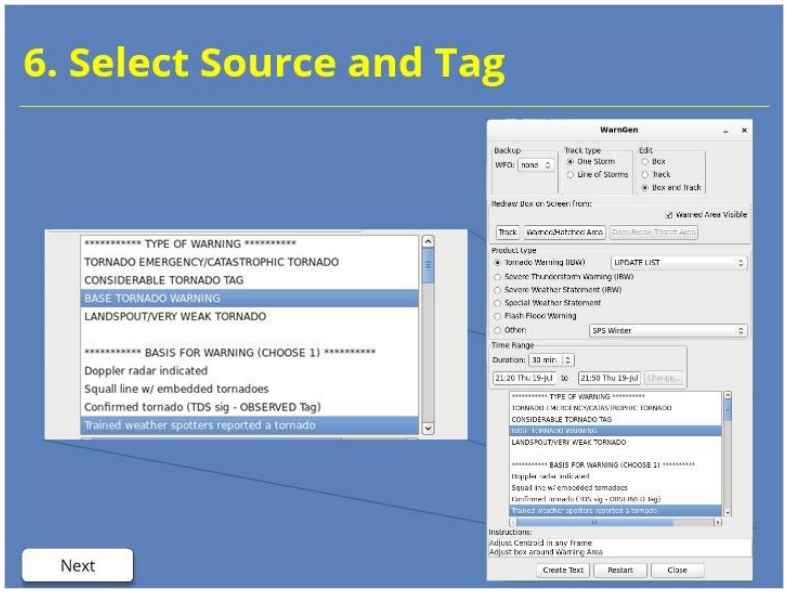


Notes:

Inevitably, the polygon WarnGen created from “Track” will need at least minor adjustment. That said, often the biggest time sink for creating a warning, especially with newer warning meteorologists, is tweaking and adjusting the polygon. Your goal is to intentionally adjust it to trim away excess counties or areas that will not be impacted by the hazards, expand it to account for such things as nonlinear motion or unusual size, and maybe add an extra vertex at the end to shape the flare. Ensure that all hazards are covered by the polygon, as we learned in part 1 of RAC Warning Fundamentals, but limit the coverage to only those areas that are at risk for a tornado, severe hail, or damanging winds. It is not worth the time spent to add multiple extra vertices. Be aware, as you adjust the polygon, that counties may automatically add in or drop out of the warning if you move past the thresholds set locally for percent of county allowed to be included in a polygon. Pay attention to where counties are or are not hatched or marked with a ”W” to know what will or will not be included. To see the final polygon shape that will result from your warning, under the area near the top of the WarnGen interface that says “Redraw Box on Screen From,” click on the button that says “Warned/Hatched Area” – the polygon will snap to what it will actually include. This is one way to check that it is shaped as you intended it. If you don’t like the outcome, click on the “Track” button and adjust the polygon again.

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6. Select Source and Tag

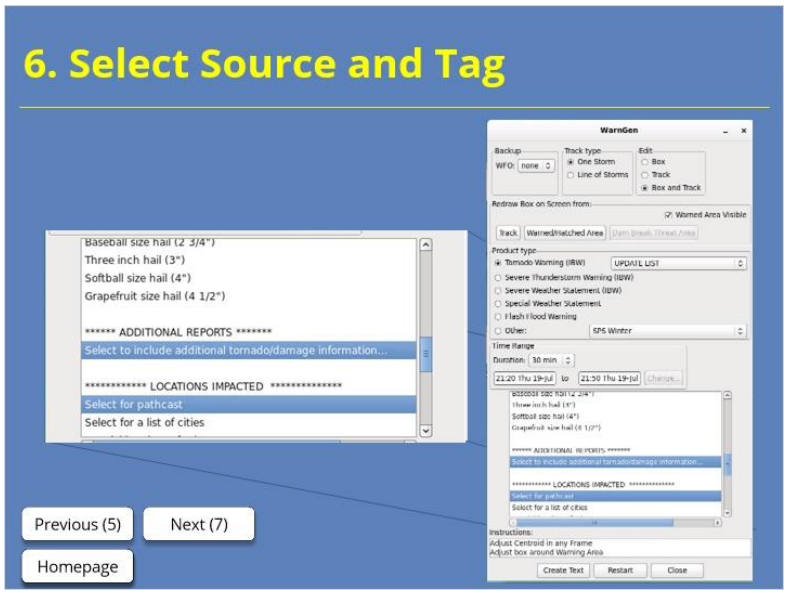


Notes:

As we work through the text interface of Warngen, we'll move through deliberately, from top to bottom. If it is a tornado warning, start by selecting the tag for the warning: base, considerable, or catastrophic. You will have made this decision before you start the warning process as you analyzed the storm. Next, in both tornado and severe thunderstorm warnings, select the basis of the warning – is it radar-indicated or spotter-reported, or in a tornado warning, radar-observed? If you select that the basis comes from any non-radar source, you must also select "Select to include additional information" – click on the "Next" button here to see that in the interface. We are showing an example of a tornado warning here, but it applies to severe thunderstorm warnings, too.

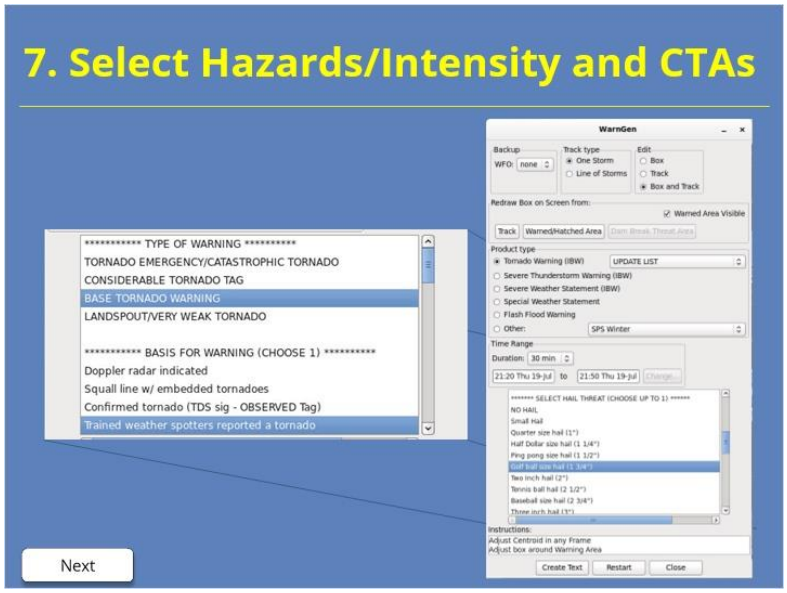
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Scroll down (Slide Layer)



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7. Select Hazards/Intensity and CTA

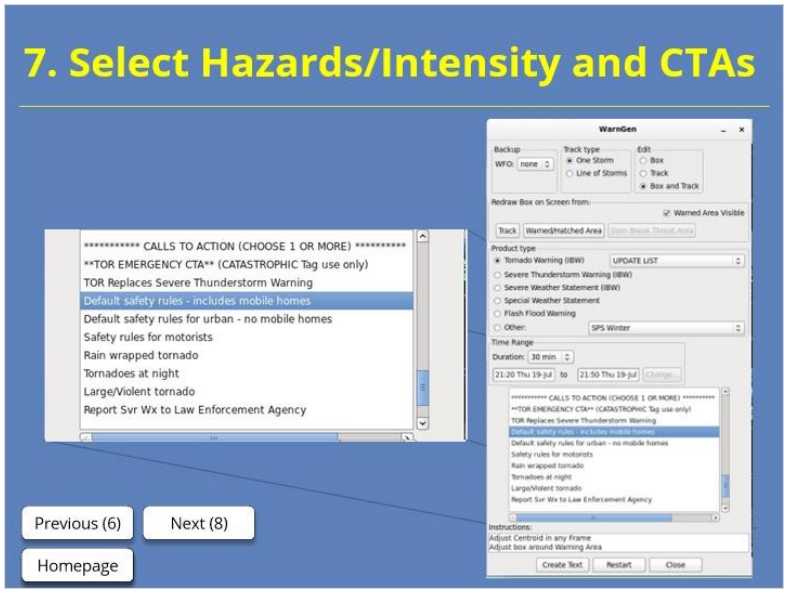


Notes:

Continue to work your way down the list of selections for the text of the warning, deliberately, from top to bottom. Choose the hail size to include in the warning or statement, whether it is tornado or severe thunderstorm. Remember, you should have the hail size in mind that you'd like to include before you begin creating the warning. This is often overlooked when analyzing a storm for a tornado warning. If you are issuing a severe thunderstorm warning or an SVS for a SVR, also choose the wind speed. Similarly, you should analyze and decide this before you begin to create the warning. Click "next" here to see the view as we scroll down through the options. Finally, choose 1 or 2 calls to action to fit the situation. If you have chosen a catastrophic tag for a tornado warning, this includes choosing the tornado emergency call to action.

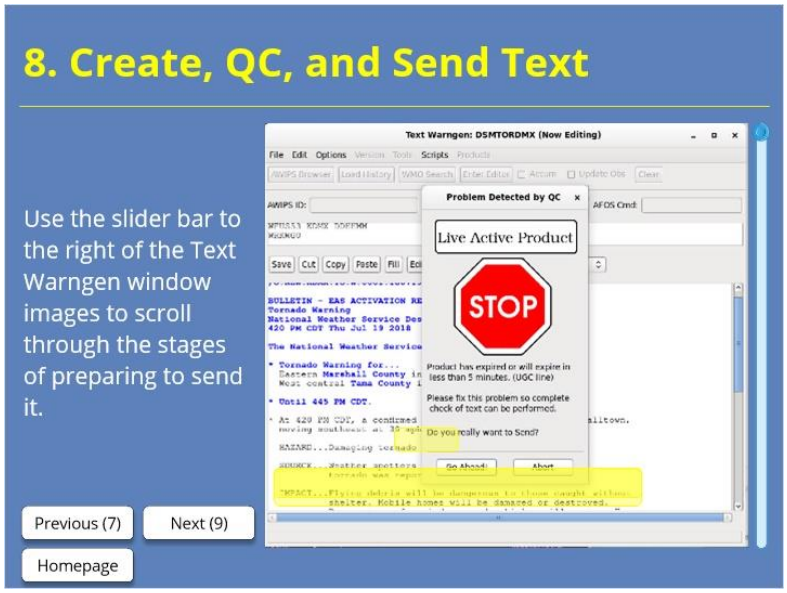
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Scroll down (Slide Layer)



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8. Create, QC, Send Text

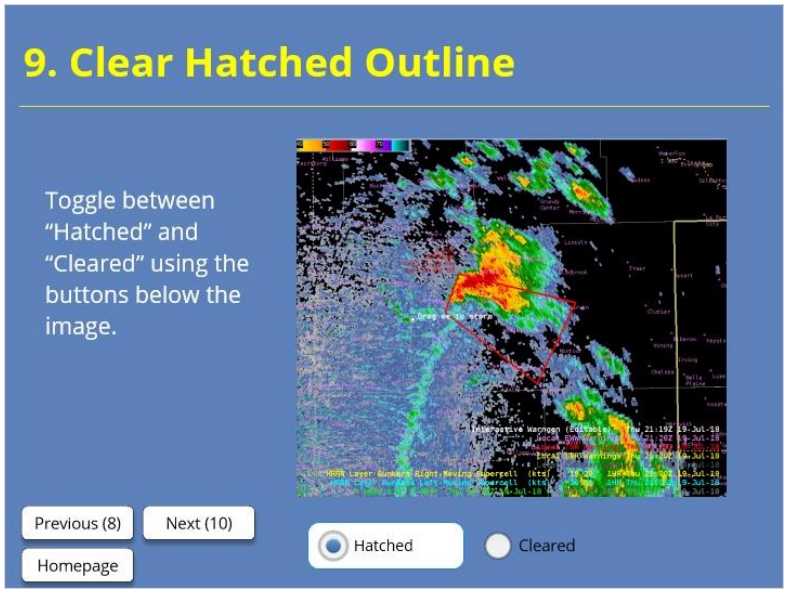


Notes:

Click on the button in the WarnGen interface to create the text. Then, look at it, top to bottom, section by section. Be sure to fill in any framing text, including the area framed to include reports in any warnings, as well as the text that is often framed in SVSs that include cancellation and expiration statements. Check to make sure that the source selected matches the report – for example, if there is a report, it should not be a radar-indicated warning, and if a spotter reported it, then "spotter" should be your source. Check the number of counties to ensure it is 12 or less and that all the counties included need to be included. Check that the locations included are what you intended, and that there aren't any locations missing from the list that you intended to include. Check the storm motion, both speed and direction, to make sure it makes sense. While very fast storm motions sometimes are justified, anything over about 50 kt should probably flag you to ensure it is what you intended. These are some of the most common spots for errors that often result from going too quickly and not quality-controlling your warning. After you have reviewed your text, replace the framing text at the bottom with your name, initials, number, or blank sign-off, and send it. But the task doesn't end here.

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9. Clear Outline

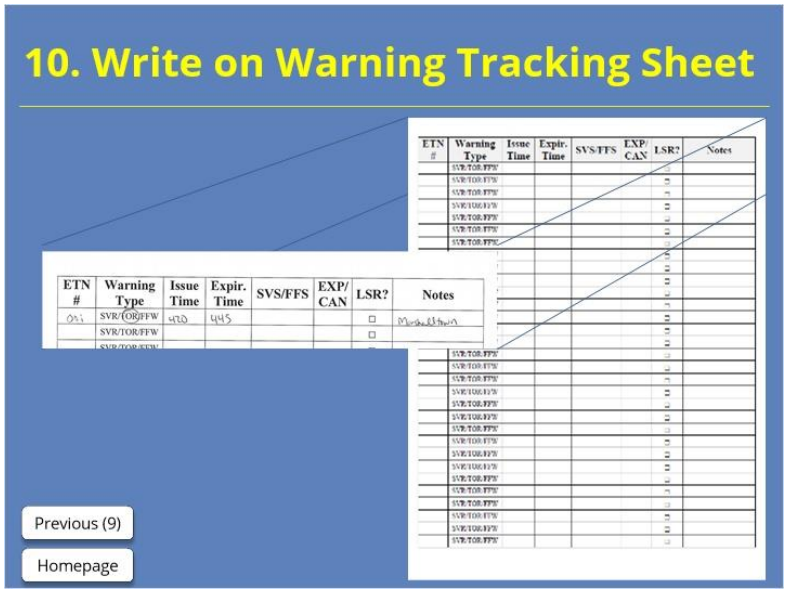


Notes:

Our next step prepares your WarnGen window for the next warning action and could save you some accidental errors later in your warning process. We recommend that you next hit "Restart" in the WarnGen interface. If you have just issued an SVS, you'll need to switch to tornado or severe thunderstorm warning and then hit "Restart." When you do that, it will clear away the hatched outline of the polygon you just issued, preventing you from accidentally reissuing the same polygon later and also giving you back your "Drag me to a storm" point or line.

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10. Write on Warning Tracking Sheet

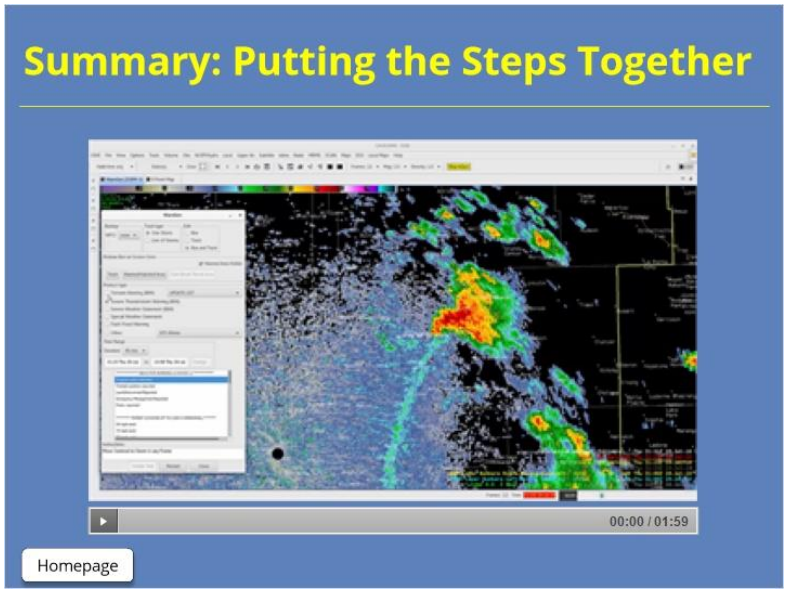


Notes:

Finally, the warning meteorologist – or the warning assistant, if your office has set up a 2-person warning team – should write down the warning on a warning tracking sheet. We have this template linked in the resources, but your office may have its own version, too. We strongly recommend each warning meteorologist has their own tracking sheet that they keep updated with their own warnings. This will allow you to see at a glance what warnings are in effect and when they expire, so that you can anticipate your workload. By putting a check in the SVS column each time you issue an SVS for a warning, you'll also have a better handle on what warnings need updated. The notes section can help cue you to see warnings that are impacting significant locations, have elevated tags, or otherwise need attention. We will cover using the warning tracking sheet more at the RAC Workshop.

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Summary: Putting the Steps Together

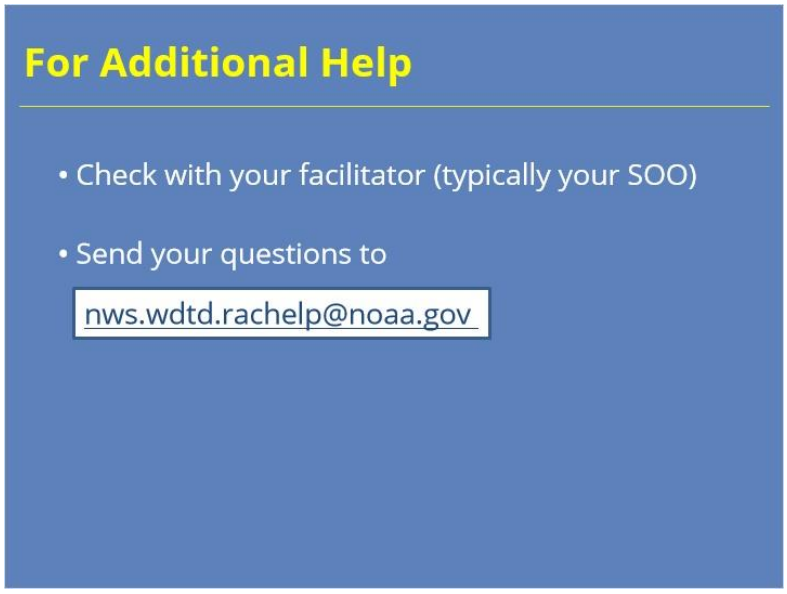


Notes:

In this video, watch all ten steps of the warning process come together as we issue a tornado warning. Note that the entire process takes under two minutes, which is a goal every warning meteorologist should have as you become more fluent in the warning process.

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For Additional Help



Notes:

For additional help, check with your facilitator (typically your SOO) or send your questions to the listserv e-mail address here.

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Warning Considerations: Storm Mode and Motion

Warning Considerations: Storm Mode and Motion

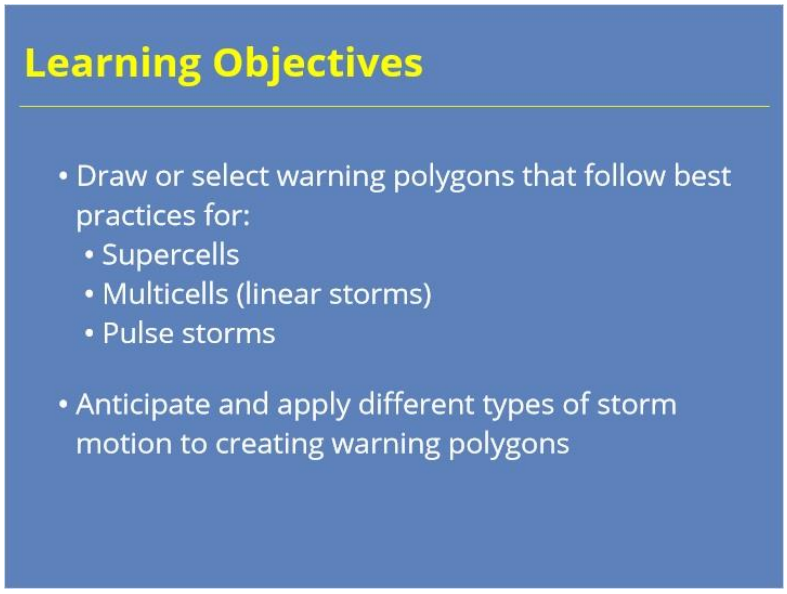


Notes:

Welcome to RAC Warning Fundamentals. This module is on storm mode and storm motion as warning considerations.

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Learning Objectives

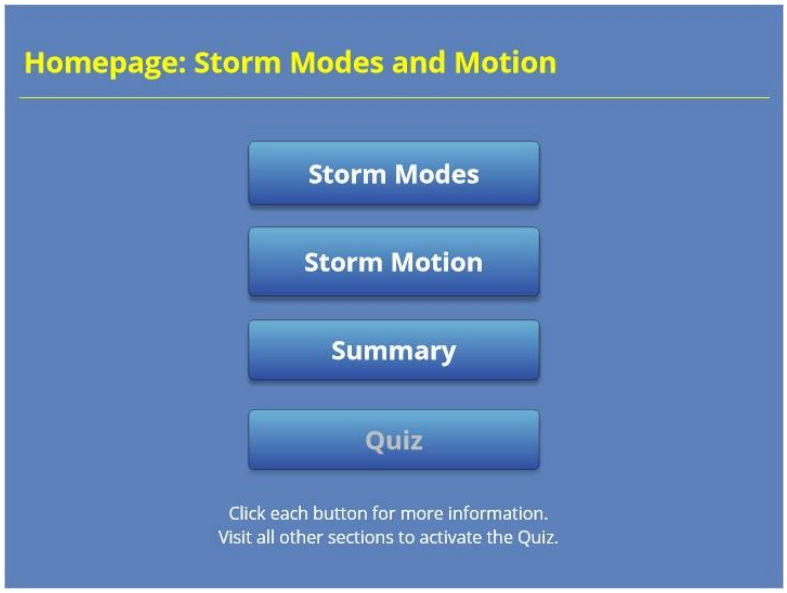


Notes:

After completing this module, you will be able to draw or select warning polygons that follow best practices for different storm modes, as well as anticipate and apply storm motion in creating warning polygons.

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Homepage: Storm Modes and Motion

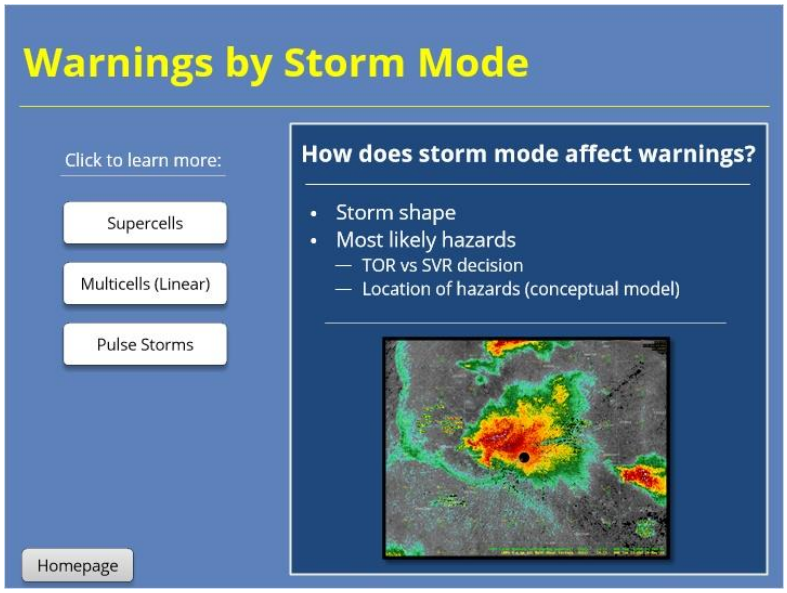


Notes:

Welcome to the home page for this lesson. Click on the buttons to move through the storm modes and storm motion sections. View the summary when you have gone through each section. Finally, take the quiz to get credit for completing the module. The quiz button will activate after you have visited all other sections.

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Warnings by Storm Mode

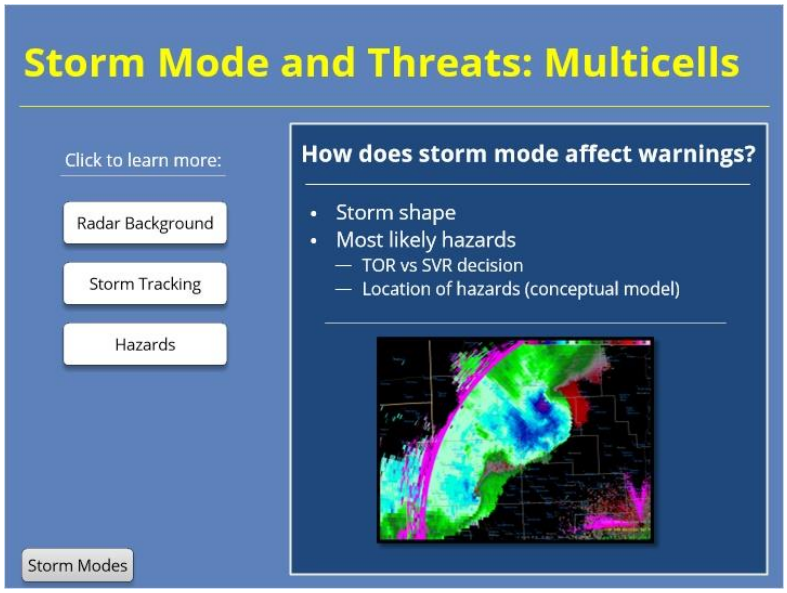


Notes:

Storm mode plays a role in the current and future shape of a thunderstorm, as well as the most likely hazards. Understanding conceptual models of storm modes can help a warning meteorologist anticipate where in the storm the hazards are likely to occur and, when combined with knowledge about the storm environment, how those hazards may persist, intensify, or decline over the next 30 to 60 minutes.

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Multicells (Linear)



Notes:

Let's address how linear multicell storm mode affects the warning process. We are focusing here on the severe thunderstorm warning process for linear multicells. For more information about the process when you are also issuing tornado warnings for QLCS tornadoes embedded in a line, continue on to the module "Warning Considerations: Complex Scenarios." Warning for winds can be tricky, so we also have an additional module on it that follows this one: "Advanced Warning Methodology: Winds from Linear Storm Modes."

RADAR BACKGROUND

When warning on multicells, especially linear multicells, you'll want the background radar image for severe thunderstorm warnings to be a Z/V toggle. Using velocity will allow you to sample and track the wind field associated with the multicell, which is particularly helpful in cases such as when the gust front runs ahead of the reflectivity of the line of storms. It also will help you make sure you've included the entire wind field of the storm in your polygon.

STORM TRACKING

With a linear multicell, you will track and draw your severe thunderstorm warning almost exclusively with the velocity field. Use the line tool and immediately add a vertex to the center of the line, so that it has three points. Drag the entire line (not just one vertex) until the middle vertex is at the apex of the line, or in the center if it is not a curved segment. Pull the top vertex to the edge of the wind area, then do the same with the bottom vertex. If your multicell has significant curvature, the straight lines in between the vertices won't be in perfect alignment with the wind, but that is OK as long as you are following the apex with the center vertex. From here, back up a few frames, and then move the entire line (NOT just one vertex at a time!) so that the center vertex is aligned with the apex. Toggle back and forth to make sure the line stays on the leading edge of the wind field and doesn't fall back or jump ahead.

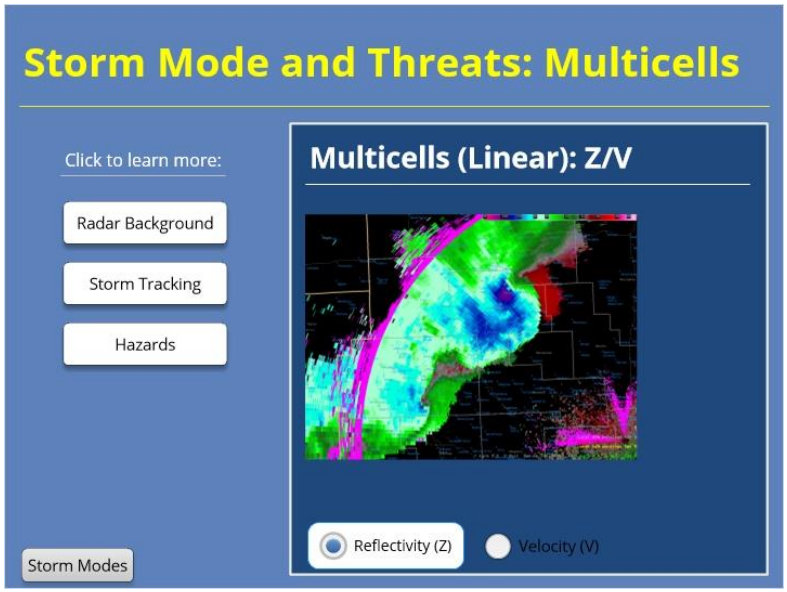
HAZARDS

Multicell thunderstorms often are in the shape of a line, line segment, or bow. The main risk tends to be damaging winds, with tornadoes as another potential risk (not so much the case shown here, but they can be a threat in many

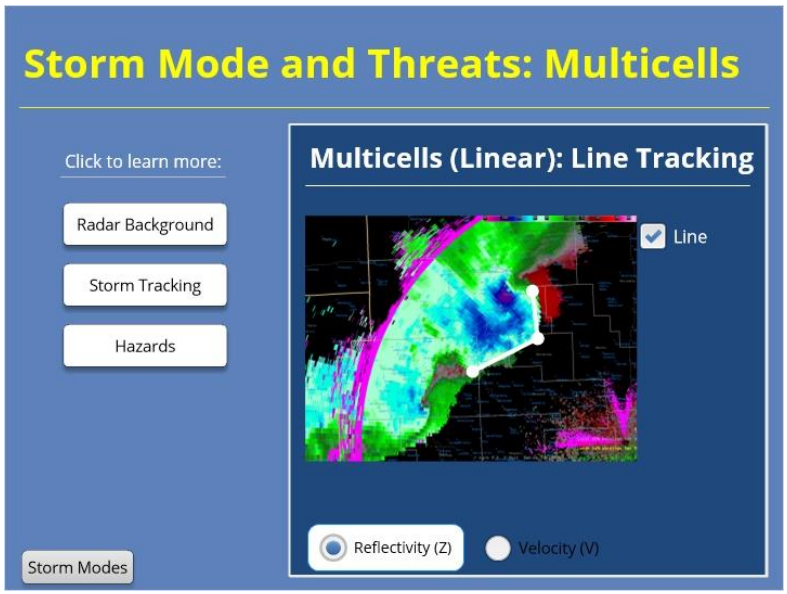
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cases). Though the risk of hail is not zero, it is usually more limited in nature. With a more widespread risk of winds than tornadoes, a larger severe thunderstorm warning would be needed to cover the risk of winds, with smaller embedded tornado warnings when QLCS spin-ups are possible. Again, we'll cover that more in the module "Warning Considerations: Complex Scenarios." It is especially important with multicells to make sure that the entire wind field is covered by your warning polygon. The AWIPS default will only place a polygon along and ahead of your tracking line, and you will almost certainly need to pull the polygon back so that it covers the convective line itself and its associated hazards.

Radar Background (Slide Layer)

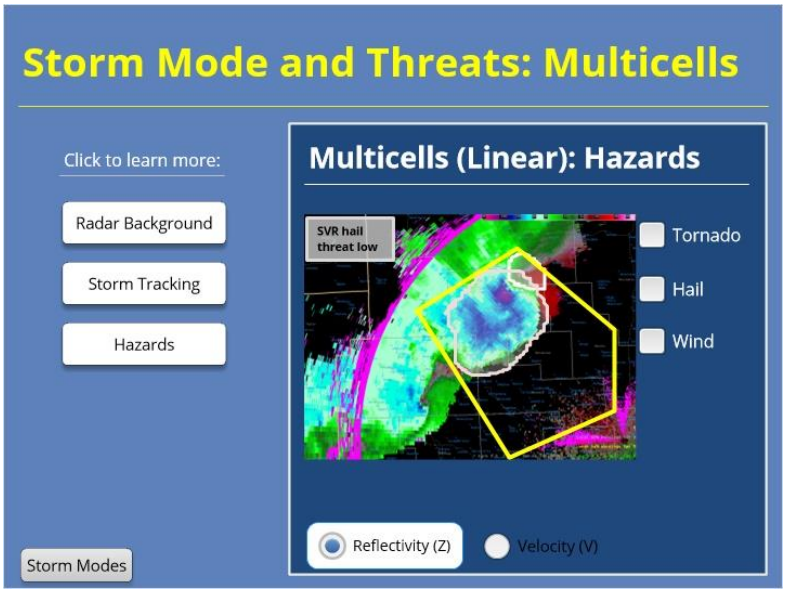


Storm Tracking (Slide Layer)



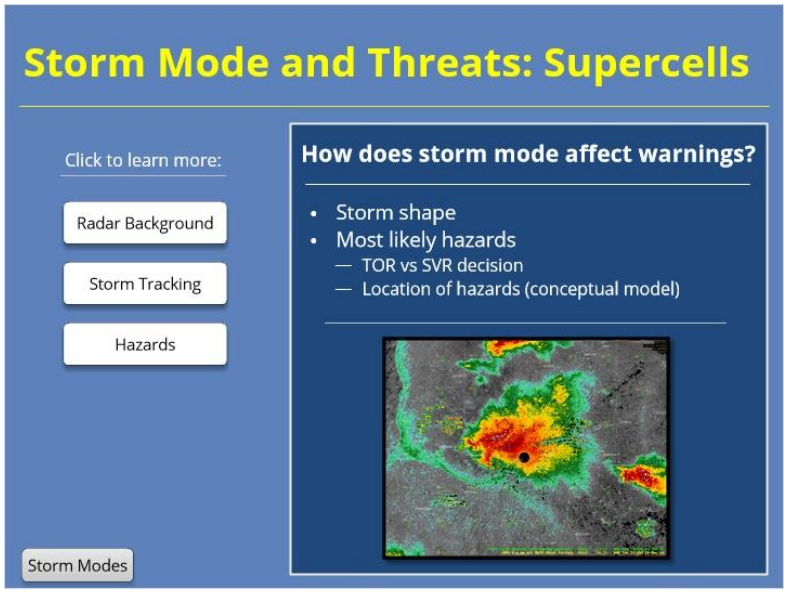
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Hazards (Slide Layer)



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Supercells



Notes:

Let's address how supercell storm mode affects the warning process.

RADAR BACKGROUND
When warning on supercells, you'll want the background radar image to be a Z/SRM toggle. Storm-relative motion allows you to view the rotational signature more clearly, with the storm motion subtracted out. Recall that you can set the storm motion in three ways: using the average storm motion from the storm track information (or STI), in the radar display controls, and by following WarnGen motion. Generally, it is recommended to use the motion that follows WarnGen, though setting the motion in the radar display controls is also acceptable if the storm motion is relatively stable and uniform across all storms in your sector. If you have storms with different motions, such as left- and right-moving supercells, be especially careful to use a representative motion. Note that it is not only normal but desired that as you update a track motion vector in WarnGen, the look of the SRM image will change if you are using WarnGen motion as the basis for SRM.

STORM TRACKING

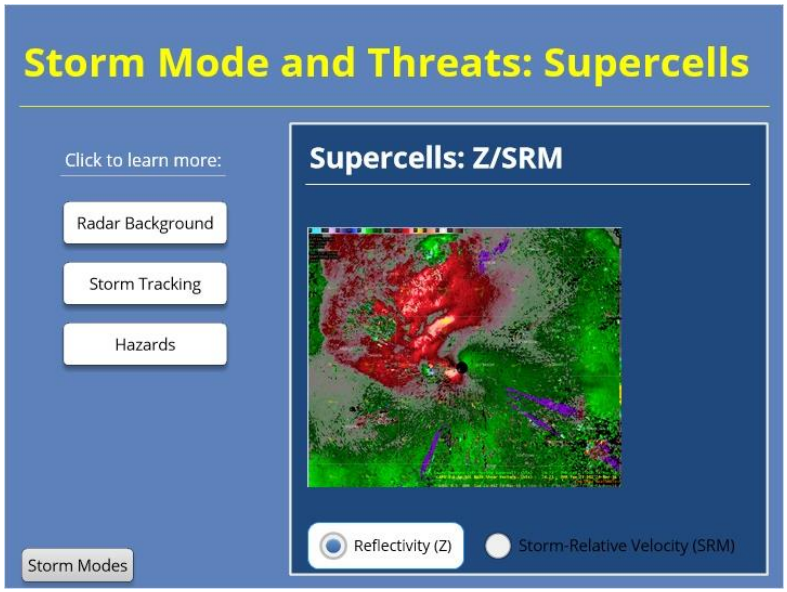
With a supercell, when you are tracking the storm with WarnGen, use both Z and SRM to place the "drag me to a storm" point and track the storm. Place the point as close as you can to the center of the mesocyclone with SRM, which is the most likely place for a tornado to develop and also near the hail-producing updraft. The feature is among the most stable storm features to track. Then, check it using reflectivity, noting that in most cases, the center of the mesocyclone will overlay with the reflectivity gradient of the inflow notch or, in some cases, the hook of a well-formed supercell. As you track the motion, go back just a few scans and then move the point to the same feature that you used to set it on the most recent frame – the center of the mesocyclone, along with the reflectivity gradient or hook. Do not set the motion at every frame – just the most recent one and then a few frames back. Toggle back and forth through several frames after setting the motion to ensure that the tracking point holds its position in the same part of the storm. If it wanders back too far, or jumps out ahead, then your motion is not accurate, and you need to track the storm again.

HAZARDS

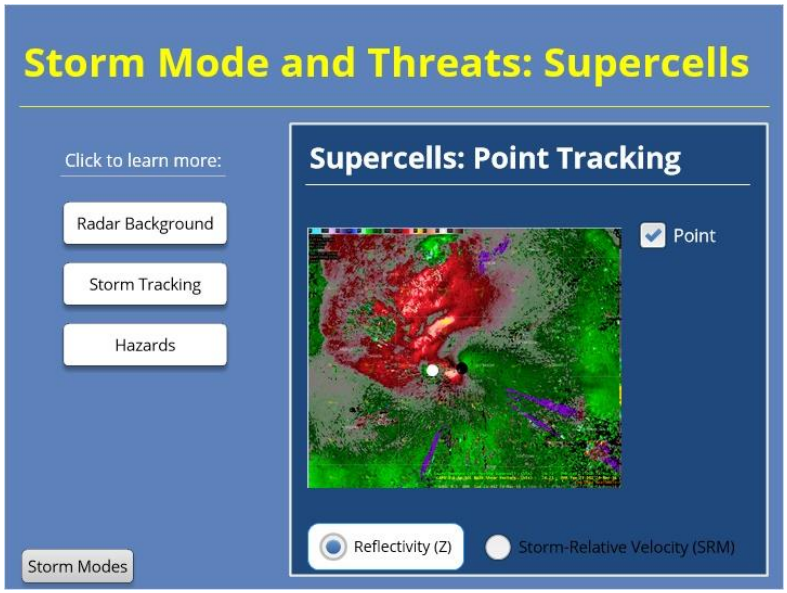
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Supercells can contain all hazards: tornadoes, hail, and winds. For most supercells, if a tornado warning is issued, the threats of damaging winds and hail are in close enough proximity that one warning should cover all of the hazards. Make sure you leave room with your warning polygons for the rear-flank downdraft (or RFD) winds, which are not always highly visible on radar even when they are severe.

Radar Background (Slide Layer)

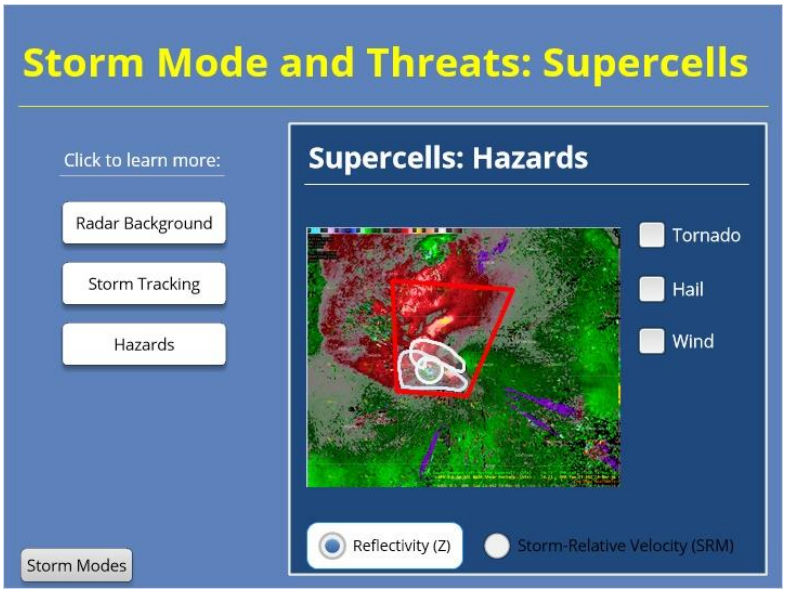


Storm Tracking (Slide Layer)



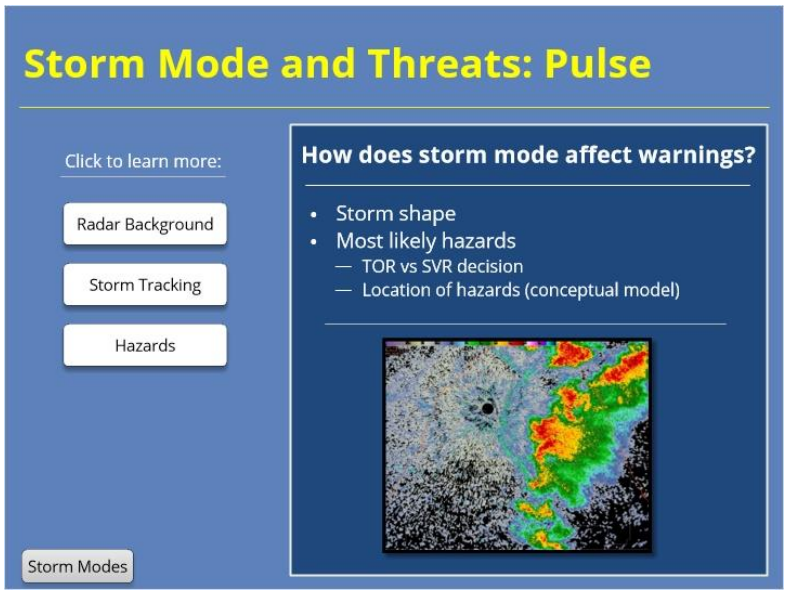
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Hazards (Slide Layer)



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Pulse Storms



Notes:

Let's address how pulse storm mode affects the warning process.

RADAR BACKGROUND
When warning on pulse thunderstorms, you'll usually want the background radar image to be a Z/V toggle. Pulse thunderstorms rarely rotate and are not likely to produce mesocyclonic tornadoes, which means that V will give you a more accurate sense of absolute wind speed and direction than SRM. They also do not usually move quickly, which means that you have less need to subtract out the storm's motion in order to discern its velocity features.

STORM TRACKING

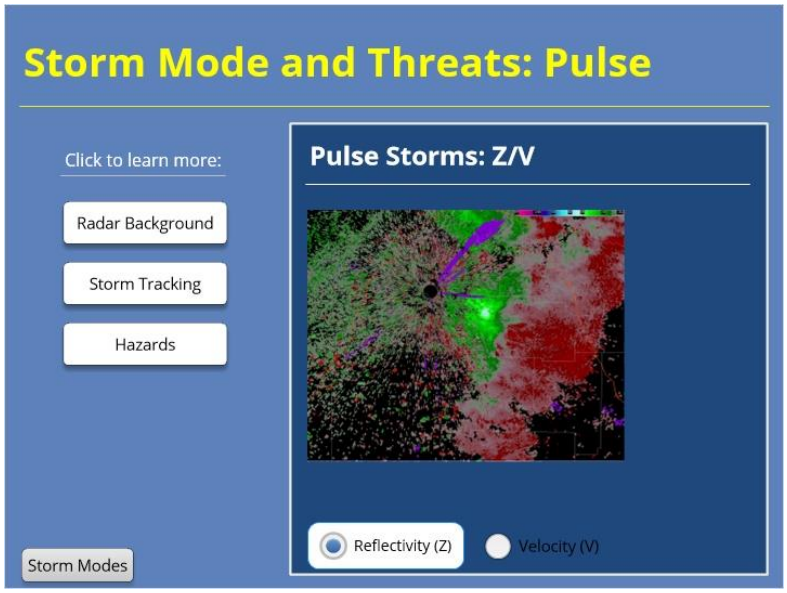
With pulse thunderstorms, when you are tracking the storm with WarnGen, use both Z and V to place the "drag me to a storm" point and track the storm. Place the point as close as you can to the hail core or on the advancing downburst wind surge, depending on which hazard is present. If both hail and wind signatures are present, track the one that will arrive first – typically the winds. Be sure to check both Z and V to discern storm motion, especially when tracking winds.

HAZARDS

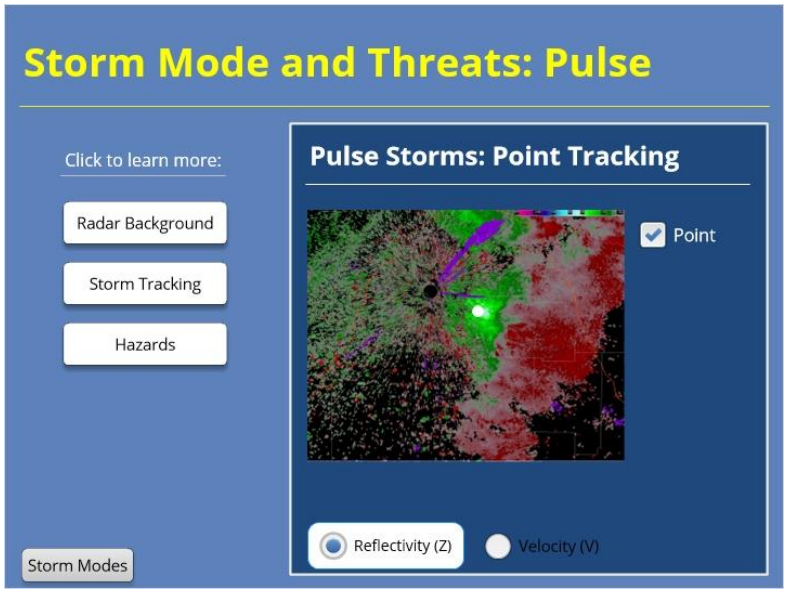
Pulse thunderstorms can contain a risk of hail, especially as they reach the mature phase, with the threat of wind increasing as storms pass maturity and in the early dissipation phase. Though the risk of tornadoes is not zero, it is rare for tornadoes to occur in pulse thunderstorms, and ones that do occur are typically non-mesocyclonic. Be a little generous with the polygon to allow for downburst winds and redevelopment of pulsing cores – if you draw the warnings too tightly, you might find yourself playing whack-a-mole with each core that goes up and down. Let the storm coverage and environment help guide your decisions for the warning size. Pulse storm motion can be weak or stationary, resulting in almost square polygons at times. You'll want to watch for favored directions of wind propagation and redevelopment as the event evolves.

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Radar Background (Slide Layer)

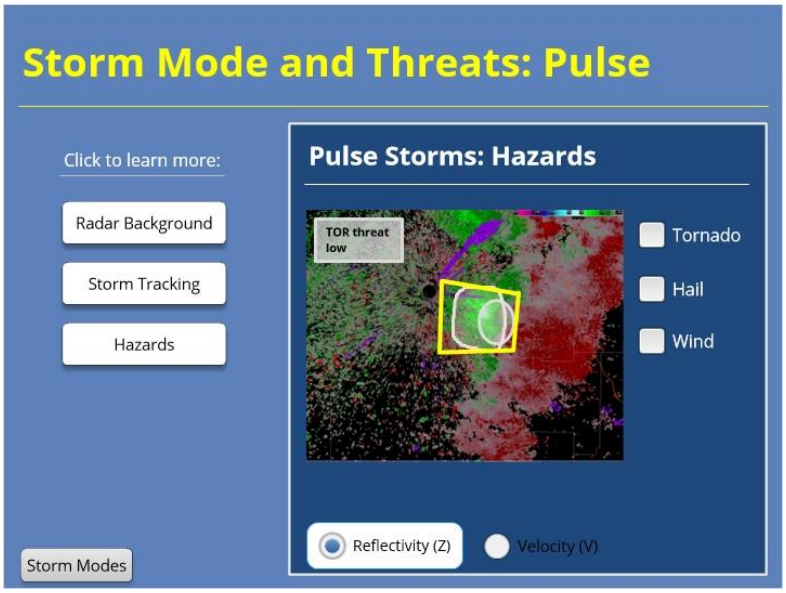


Storm Tracking (Slide Layer)



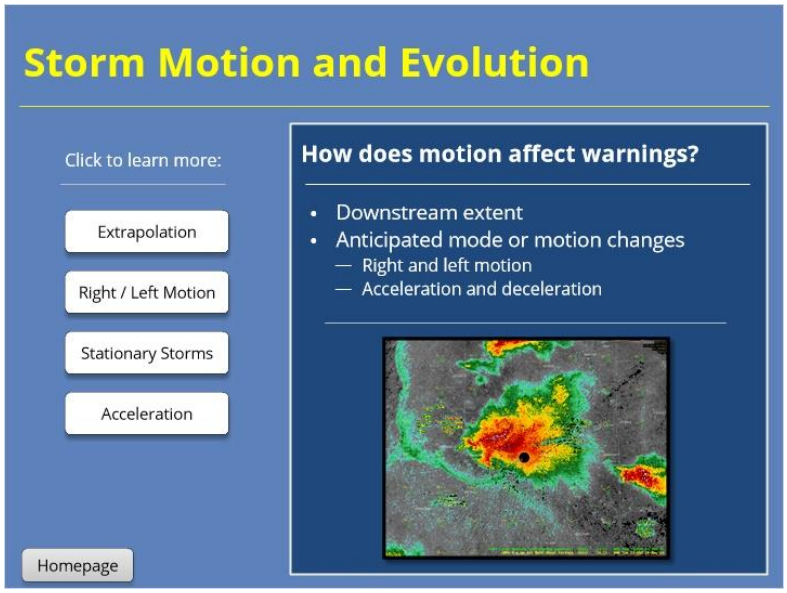
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Hazards (Slide Layer)



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Storm Motion and Evolution



Notes:

We take the motion and expected evolution of a storm into account when we draw a warning polygon. Doing so will help us better anticipate how far to extend a warning downstream and whether we need to account for deviant motion. Many factors influence a storm's motion, including wind shear profiles, boundary interactions, topography, and storm mergers. The uncertainty of future motion is why polygons are drawn larger at the end than the beginning.

EXTRAPOLATION

Extrapolation is the assumption that the recent motion of a storm will continue into the future. Linear extrapolation is how the speed and direction of a storm are anticipated using the AWIPS distance/speed tracking and is a first guess in anticipating the location of a storm through the duration of a warning.

RIGHT/LEFT MOTION 1
Supercells can take on motion that is either right or left of the mean wind, as you have learned earlier. A right-moving storm often will slow down in addition to propagating right of the mean wind. You can overlay Bunkers right-moving storm vectors as a first guess to help anticipate and account for the right turn, then stretch your polygon on its right side to account for the area of threat.

RIGHT/LEFT MOTION 2

A left-moving supercell often occurs after a storm has split. Left movers are notorious for their hail threats. Overlay Bunkers left-moving vectors to anticipate the direction of a left-mover, and turn your distance-speed indicator to match it.

STATIONARY STORMS 1

Stationary storms can occur for a couple of reasons. One common type of stationary storm is a pulse thunderstorm in a low-shear environment, in which the mean steering flow is weak. In the case of a nearly stationary pulse storm, downburst winds can spread in all directions, and the resulting polygon is square or symmetrical to capture the

threat.

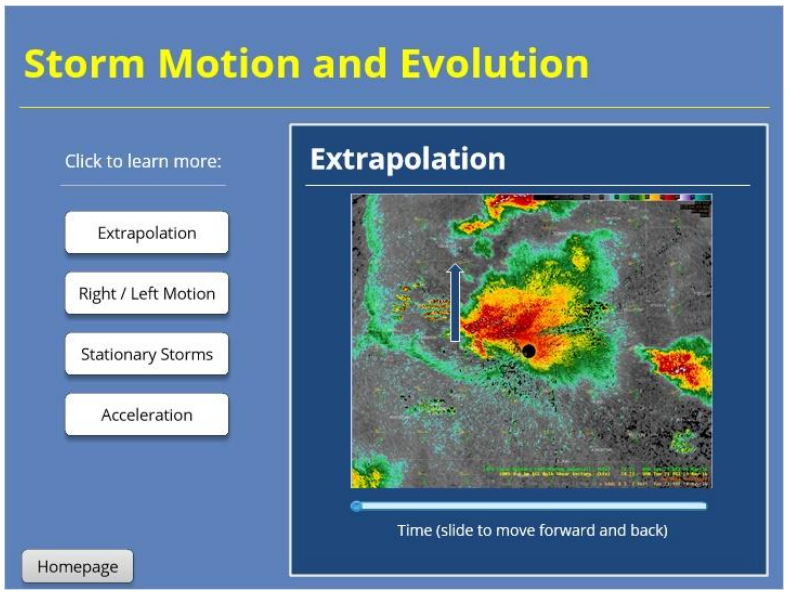
STATIONARY STORMS 2

Given a certain balance of mean winds and right-moving propagation, supercells also can become stationary, with nearly stationary tornadoes possible. The threat for a tornado, hail, and damaging winds in a stationary supercell is often confined to a very small area that, once established, can be warned with a small polygon that still captures the threats fully. Tornadoes can still wobble, retrograde, and anticyclonically wrap around the mesocyclone in an stationary storm, so while the polygon can be drawn tight to the threat, use care to not be overly aggressive in trimming its size.

ACCELERATION

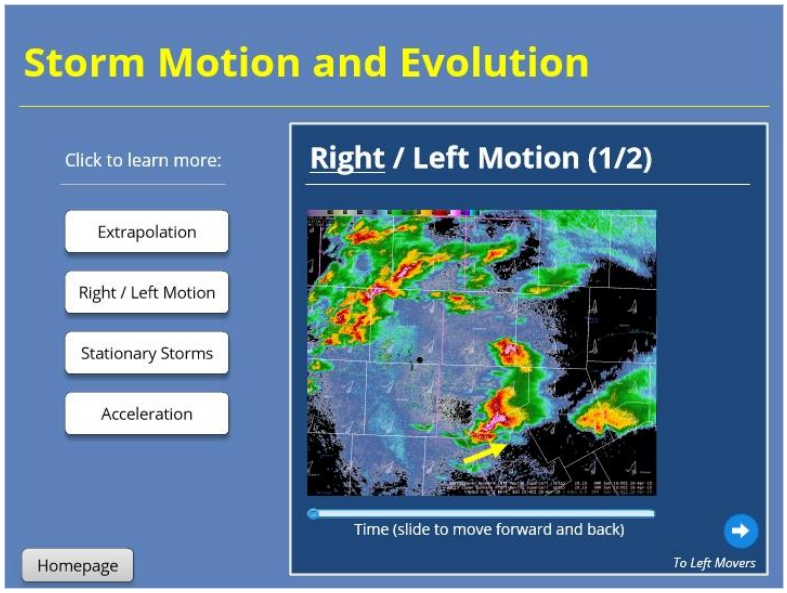
Especially in the case of multicells, such as linear convection or bowing segments, storms can accelerate with the development of a cold pool. Follow the apex of the bow to anticipate the direction in which storms are accelerating, and be mindful of the mesoscale environment to anticipate cold pool development. In these cases, take care to draw your polygons far enough downstream, and leave yourself enough time to issue the next warning downstream before the wind threat accelerates out of the polygon. You may want to overlay the downshear Corfidi vectors to help anticipate storm motion for linear events.

Extrapolation (Slide Layer)

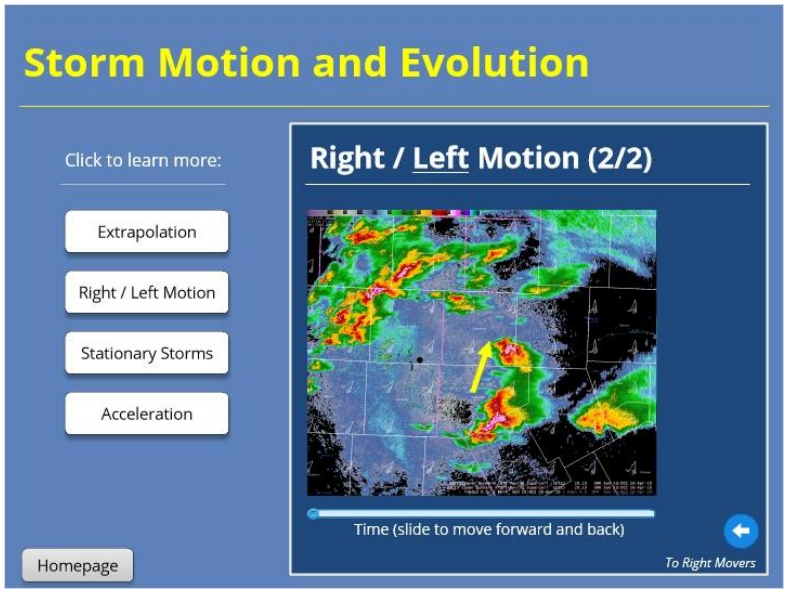


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Right/Left Motion 1 (Slide Layer)

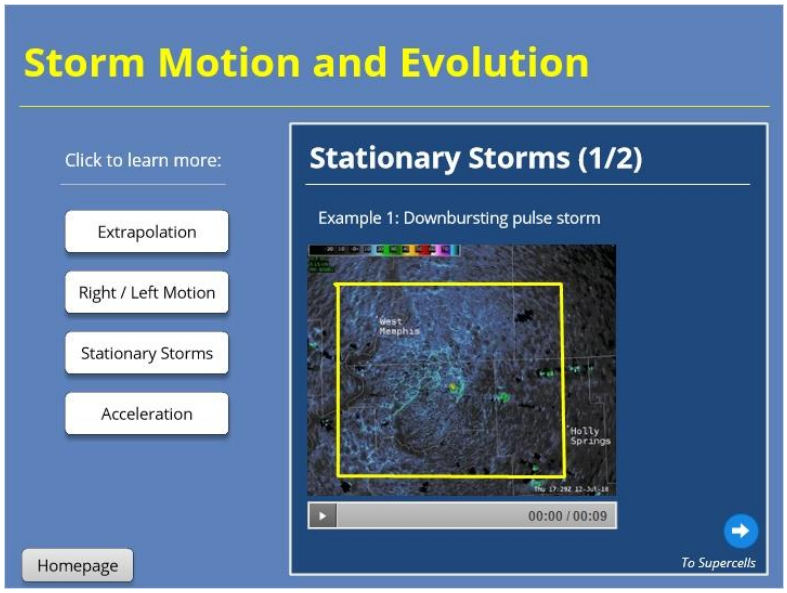


Right/Left Motion 2 (Slide Layer)

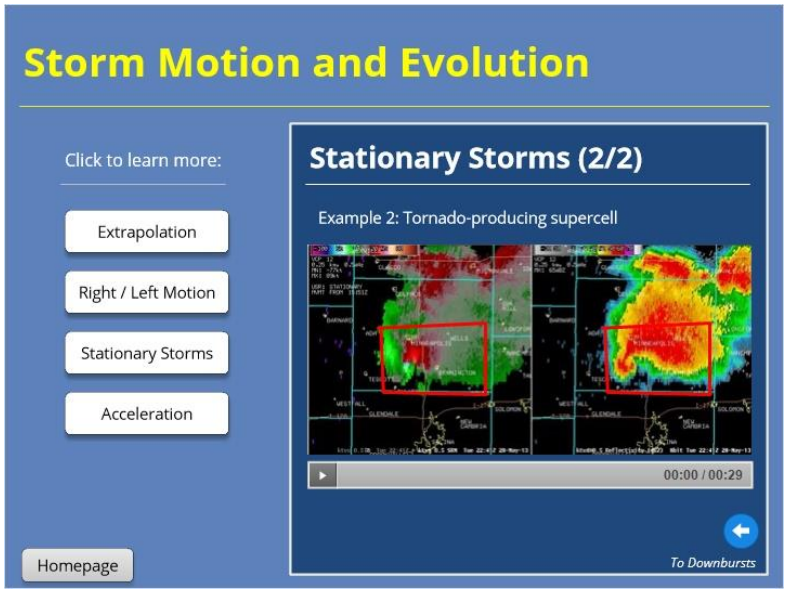


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Stationary Storms 1 (Slide Layer)

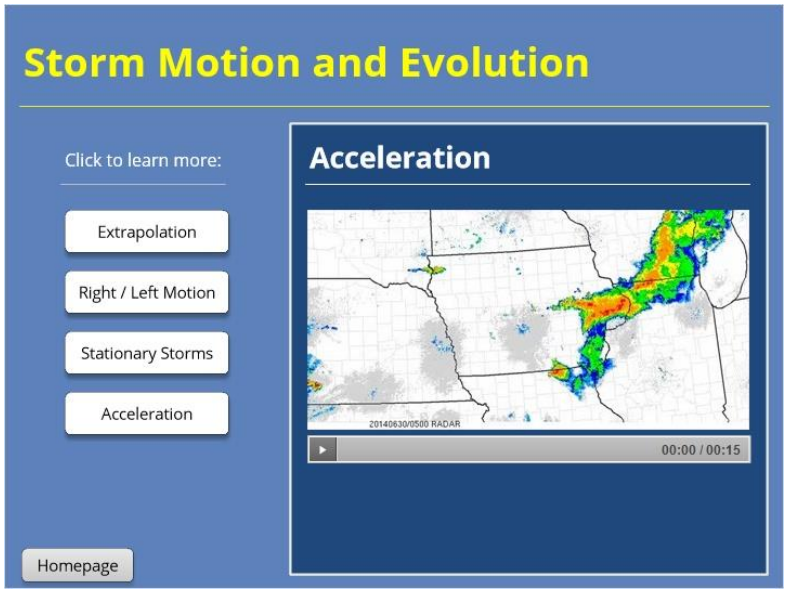


Stationary Storms 2 (Slide Layer)



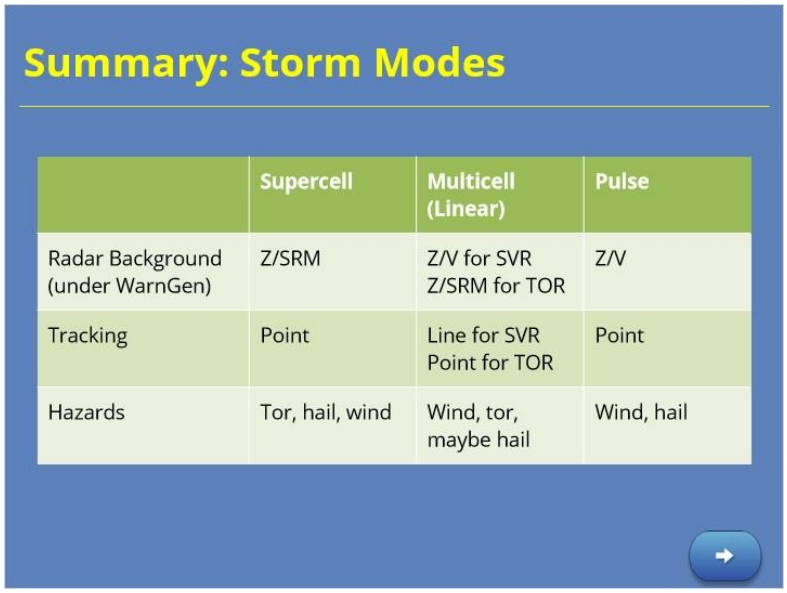
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Acceleration (Slide Layer)



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Summary: Storm Mode

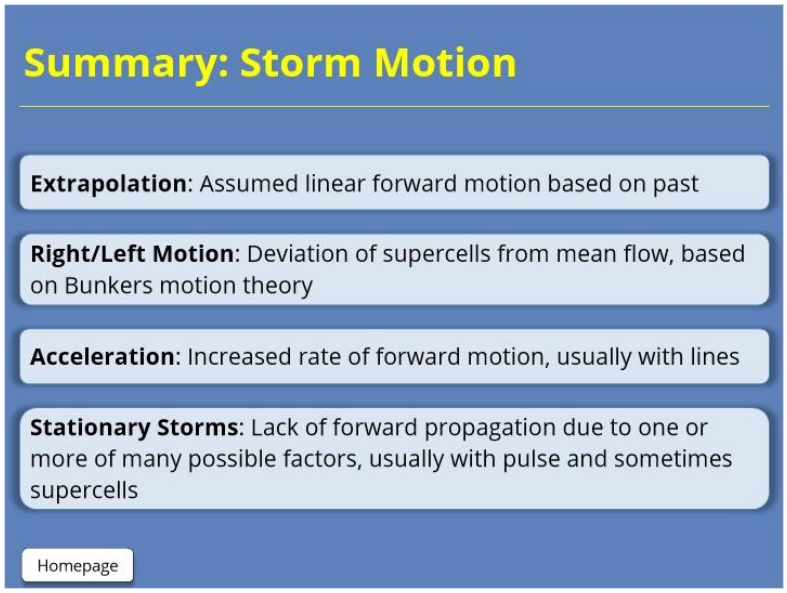


Notes:

Storm mode affects the mechanics of how we draw a warning. For rotating storms – that is, supercells – use Z/SRM as a radar background under WarnGen. When wind is a primary threat, such as multicell (or linear) and pulse storms, use Z/V. Track single-cell and smaller multicell storms using the point tool, and use the line tool to track linear multicells. Be sure all hazards of the storm are encompassed by the polygon that you draw.

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Summary: Storm Motion and Evolution



Notes:

Think ahead about the storm's motion as you are creating the warning polygon for it. Note that the default motion for AWIPS is linear extrapolation, and adjust your polygon accordingly for the characteristics of the storm. Supercells may deviate left or right of the mean motion and may slow down. Multicell (linear) storms can accelerate, especially as they develop a cold pool. Pulse storms can move slowly or be stationary, and some supercells also can be nearly stationary. Make sure the motion you set makes sense for your storm and its environment.

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For Additional Help



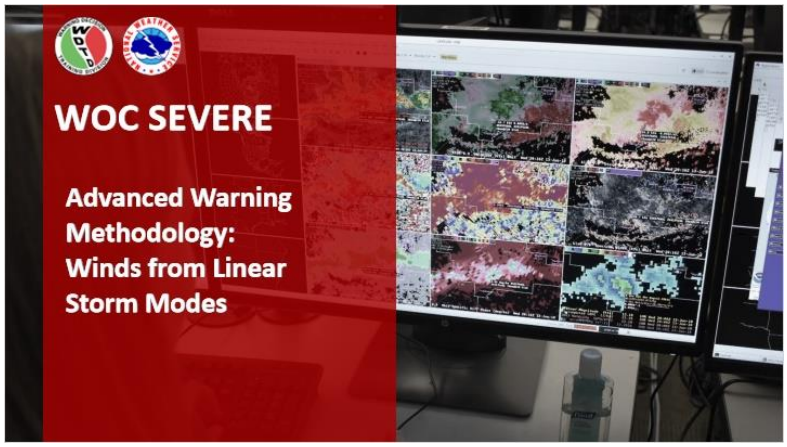
Notes:

For additional help, check with your facilitator (typically your SOO) or send your questions to the listserv e-mail address here.

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Advanced Warning Methodology: Winds from Linear Storm Modes

Advanced Warning Methodology: Winds from Linear Storm Modes



Notes:

Welcome to WOC Severe, Advanced Warning Methodology for Winds from Linear Storm Modes. I'm Barb Mayes Boustead, your instructor for this course.

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Learning Objectives



Notes:

After taking this module, you will be able to list several best practices for issuing severe thunderstorm warnings for winds from linear storm modes, as well as digging deeper into understand those best practices. You will be able to identify opportunities to improve warning services for wind-based severe thunderstorm warnings for linear storm modes.

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Wind Warnings Are Hard

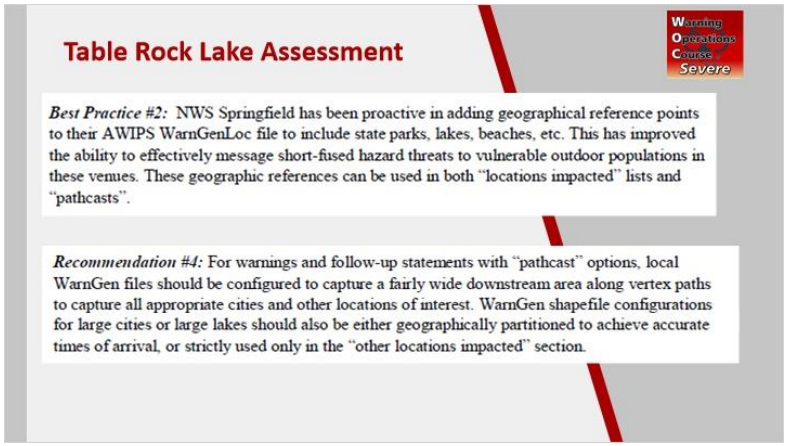


Notes:

I am here to validate your concerns: wind can be tricky to warn! It has the fewest radar indicators, compared to hail and tornadoes. It is most affected by radar beam angle and also very affected by the height of the beam. Wind swaths can cover a larger spatial area than either tornadoes or hail, creating impacts over larger areas.

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Table Rock Lake Assessment



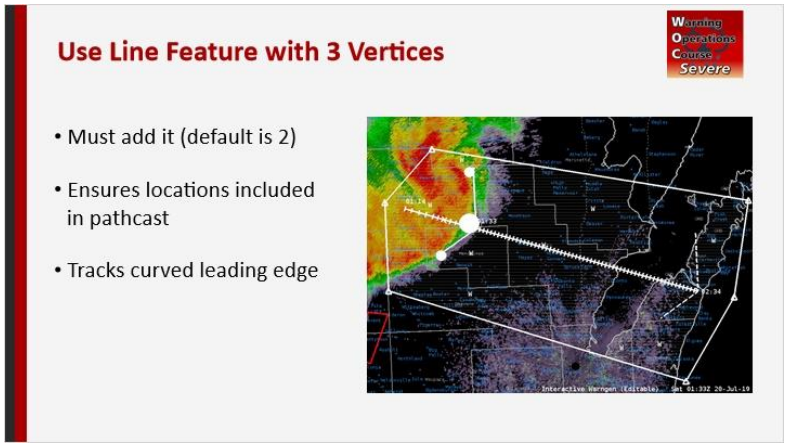
Notes:

The findings of the NWS Central Region's Table Rock Lake service assessment, linked in the resources, contained several best practices and recommendations related to severe thunderstorm warnings for wind. These are just two of several of those, for illustration.

We are going to wrap the findings of the Table Rock Lake assessment into other best practices as the foundation for our recommendations in this module.

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Use Line Feature with 3 Vertices

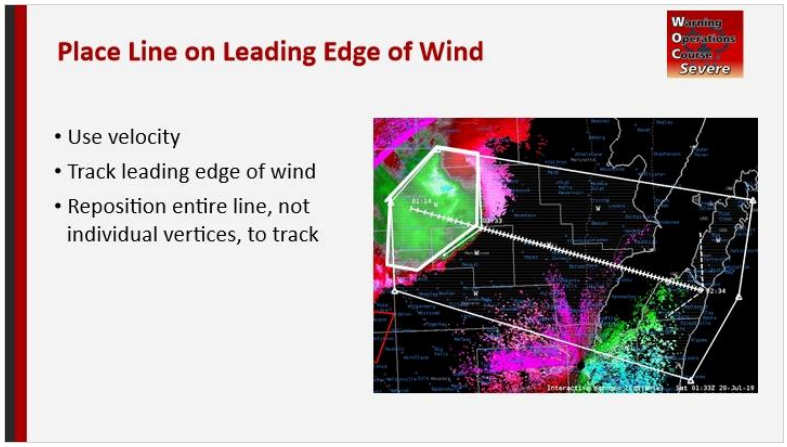


Notes:

When you are tracking an isolated storm, using the point feature in WarnGen makes sense. Many wind events are in the form of lines or complexes, though, and those are better tracked with the line feature. WarnGen will default to two points on the line, at each end. However, you also will want to add a third one, in the middle. The reasons for this get a little tricky and behind the curtains in WarnGen. The locations included in a pathcast in the warning are keyed to the points used in the line. By including a middle point, you will ensure that locations in the middle of the line are mentioned specifically in the warning. It also better tracks the often curved leading edge of a wind event, and the middle point should be at the apex of the line. With a convective complex or line, ensure you are tracking the line itself and not embedded cells or other features within the line.

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Place Line on Leading Edge of Wind

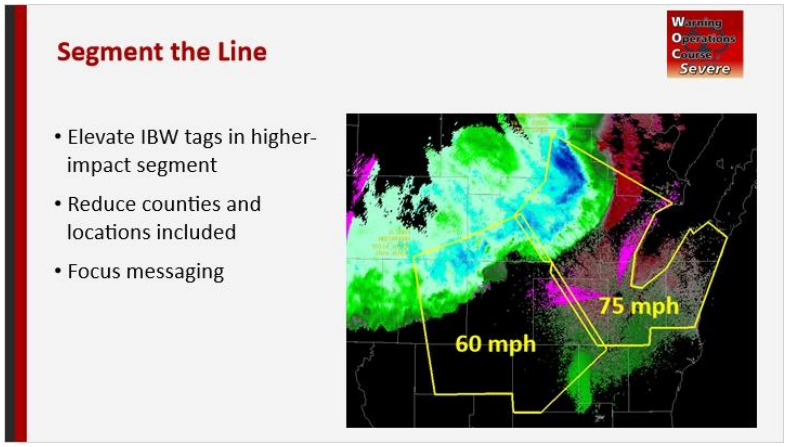


Notes:

When tracking a wind event, use velocity with WarnGen, and track the leading edge of the wind. This may be ahead of the line of convection on reflectivity. If that is the case, it is that much more important to track the leading gust front, as it will cause impacts before some people discern a threat. As you track the line, you'll want to grab and move the entire line, rather than moving each vertex, to reposition it when you toggle a few frames back. While we're here, I also want to mention that you should ensure you pull your polygon back far enough behind the line to capture all of the wind. The default polygon generated by WarnGen begins near the tracking line and typically does not encompass all of the wind-producing area of convection within the line or complex.

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Segment the Line



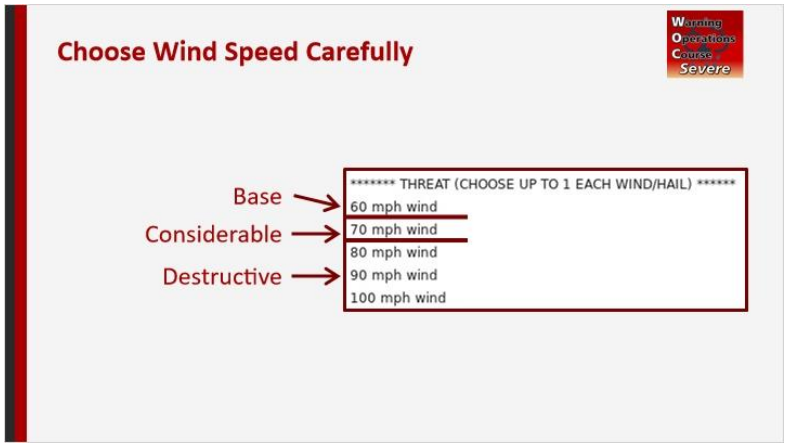
Notes:

Lines often extend for quite some distance, perhaps across several counties. The maximum winds do not typically extend along the entire length of a line or complex, though. Segmenting a long line has several benefits. First, you can focus on the higher-impact segment of the line and use elevated IBW tags for the wind speeds there without needlessly applying those tags to areas where the winds will be more marginal or low-end severe. Second, segmenting can limit the counties and cities included in the warning, ensuring compliance with directives and providing a more focused message to partners and users about the threats in their areas.

For example, consider this line that spans numerous counties. The winds on the northern segment may be as high as 70 to 80 mph, while the threat of 60-mph winds extends farther southwest along the line. In this case, you might want to issue one warning for the higher-end threat in the bowing segment to the north, with another warning for the lower-end severe threat to the south. Note the slight overlap in these polygons, as well. You can keep the workload manageable by keeping like threats grouped together, staggering end times, and limiting to a few warnings per line – in other words, by not going to an extreme of segmenting, such as issuing single-county warnings.

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Choose Wind Speed Carefully

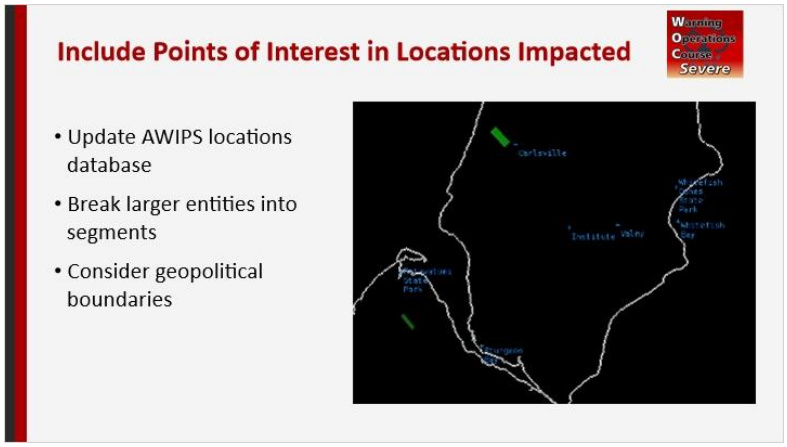


Notes:

When you choose the wind speed to include in your warning, as hard as it is, be intentional about your choice. The severe thunderstorm impact-based warnings are keyed to thresholds of wind speed, from base to considerable to destructive. Many municipalities also use straight-line wind speed thresholds to activate their outdoor warning sirens; you should be aware of these in your area, especially for the major population centers. As with hail, there can be a tendency to underplay higher magnitude events in our warnings – a bias toward the low-end defaults of quarters and 60. When you have the environmental, radar, and/or observational indicators for higher wind speeds, use those to add confidence to warnings with speeds higher than the default. After all, we are forecasting the maximum wind gust, just as we are forecasting the largest hail size. Finally, beware of false precision. We are rarely able to do better than intervals of about 10 mph for thresholds in our warnings and messaging, given the limitations of radar and even observational data in detecting maximum wind speeds.

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Include Points of Interest

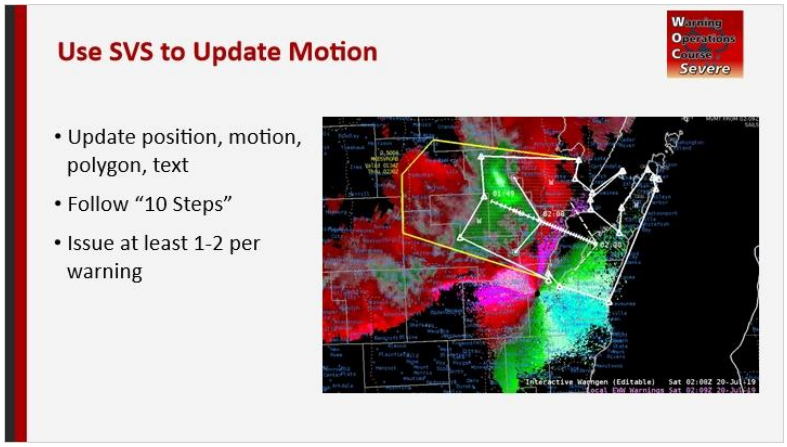


Notes:

Before an event even starts, examine your AWIPS locations database to ensure popular lakes, parks, and other recreational areas are included. For larger entities, consider breaking them into segments, such as "Eastern Big Lake" and "Western Big Lake," especially if there is a commonly used local description that users would recognize. Then, be intentional about whether these and other points are in or out of warnings when you draw the polygons. In addition, keep consideration of other geopolitical boundaries, such as bisecting metro areas or taking polygons to the edge of a county if it is close, as we've learned in modules under RAC Warning Fundamentals. Listing the names specifically is another best practice recommendation from the Table Rock Lake assessment and can heighten awareness that an event will impact someone directly.

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Use SVS to Update Motion

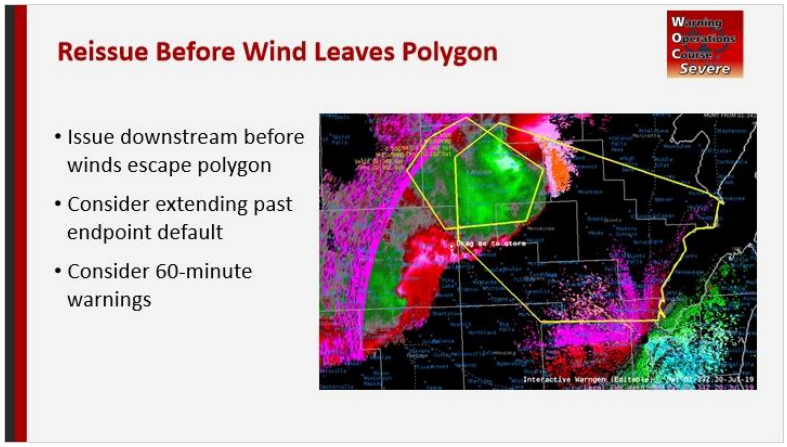


Notes:

Use the follow-up severe weather statement, or SVS, to diligently update the position and motion of the line or complex, in addition to all of the other updates it includes – spotter reports, polygon adjustments, wind speed potential, and impact statements. Ensure you follow all 10 steps referenced in earlier training when issuing SVSs and that you issue at least 1-2 SVSs during the warning, especially for longer duration warnings.

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Reissue Before Wind Leaves Polygon

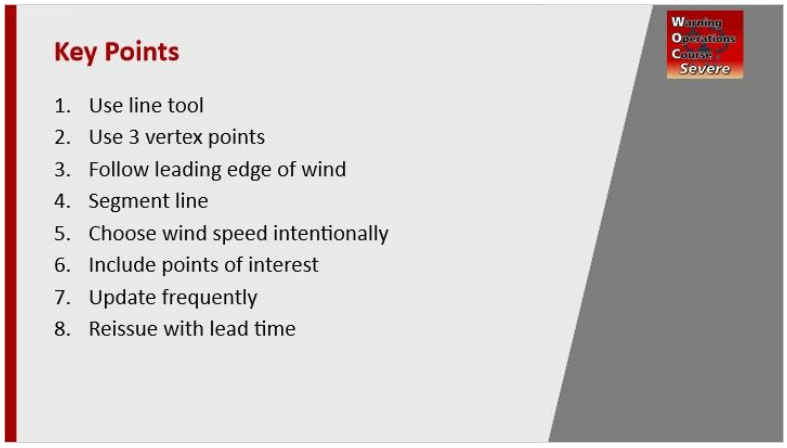


Notes:

Convective complexes and lines, especially ones with mature cold pools, can be marked by forward propagation and acceleration. You'll need to be vigilant to issue warnings downstream before the winds reach the edge of the polygon. If you find that you're running behind during the event, extend the polygon farther past the endpoint default created by WarnGen when issuing a warning to give yourself more cushion. Also, for mature and persistent events that will remain in a favorable environment, you may consider this an opportunity to use 60-minute warnings instead of the default 45-minute warning duration.

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Summary



Notes:

In summary, here are some key points about issuing warnings for wind in linear storm modes, based on best practices and service assessment documentation. Use the line tool with 3 vertex points to capture locations in the path of the winds. Follow the leading edge of wind to create the warning, especially when it is outrunning the reflectivity. Segment the line to group like threats together (for example, winds that would be in the considerable or catastrophic categories, separate from areas with base wind speeds). Choose your wind speeds with intent and awareness of important thresholds like those impact-based categories or municipal siren triggers. Include recreation points, lakes, and directional segments in AWIPS locations to help alert those who may be exposed to wind hazards. Update your warnings frequently, using all ten steps to create each severe weather statement, and reissue your warnings with ample lead time, before wind escapes the polygon, and with awareness that linear wind events can accelerate.

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Help and Information



Notes:

For additional help, check with your facilitator (typically your SOO) or send your questions to the listserv e-mail address here.

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Warning Considerations: Complex Scenarios

Complex Scenarios

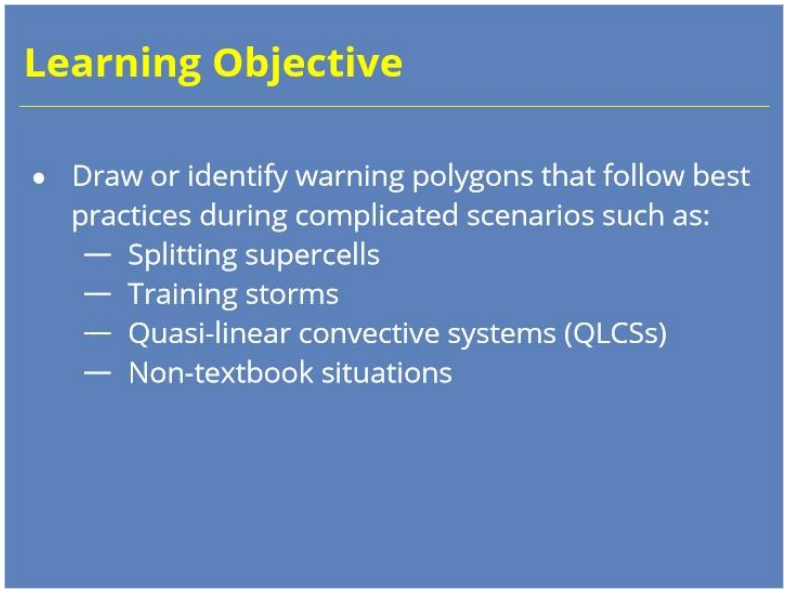


Notes:

Welcome to RAC Warning Fundamentals. This lesson is on some of the more complex warning scenarios you may encounter and how to navigate them.

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Learning Objectives

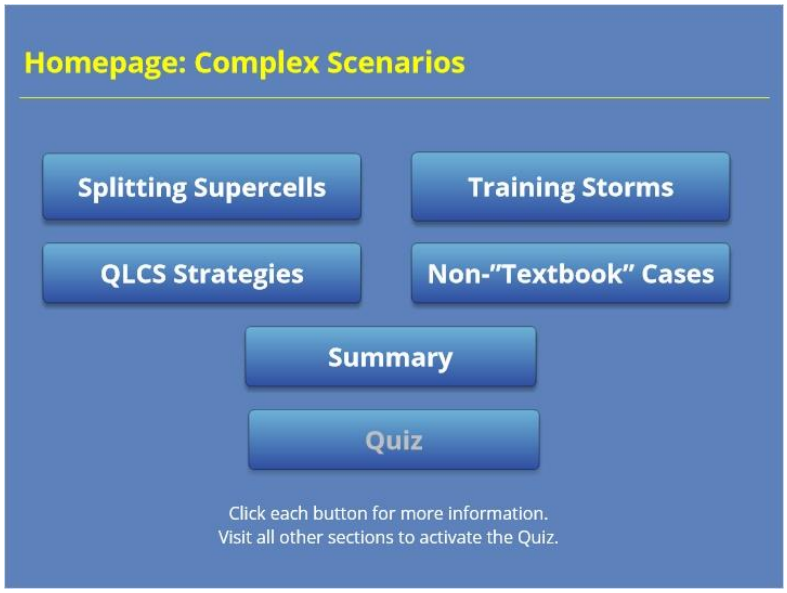


Notes:

After completing this module, you will be able to draw or identify warning polygons that follow best practices for situations that include splitting supercells, training storms, and QLCSs, as well as the non-textbook situations that you'll inevitably encounter throughout your career.

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Homepage: Complex Scenarios

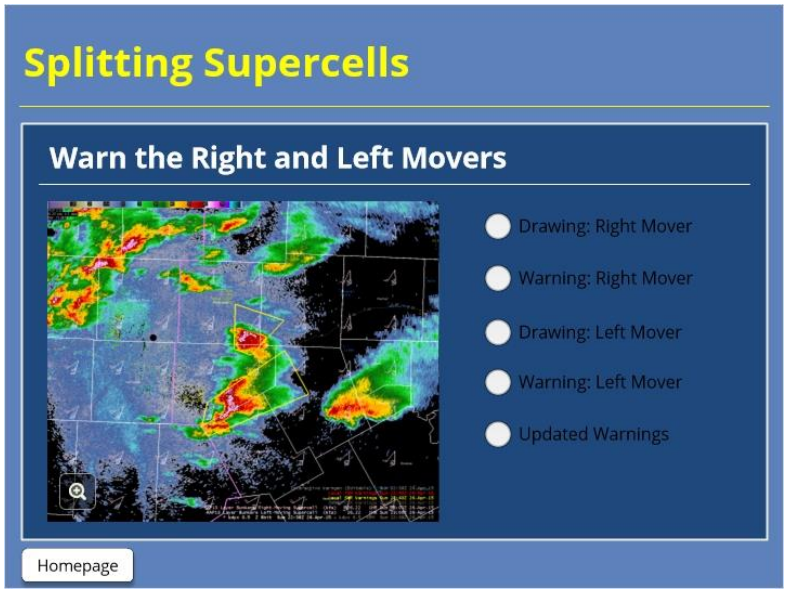


Notes:

Welcome to the home page for complex scenarios when drawing warnings. Click on the buttons to move through each section. View the summary when you have gone through each section. Finally, take the quiz to get credit for completing the module. The quiz button will activate after you have visited all the other sections.

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Splitting Supercells

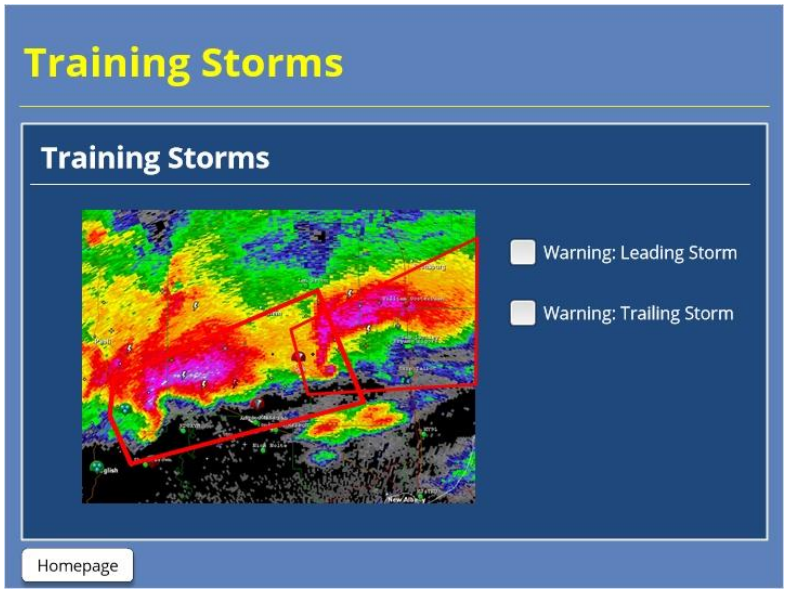


Notes:

As discussed in previous lessons, supercells can and do split into right and left movers. Keep in mind that you can diagnose left and right movement using near-storm environmental analysis and with overlays of motion barbs from numerical model output. A single warning doesn't typically split with them, of course, so what is the best strategy when you find yourself warning on a storm that you know is beginning the process of splitting? In most cases, you'll warn the right and left movers separately. The starting edges of your polygons are likely to overlap, but that overlap will decrease as the storms move apart. As you click through the steps, note the different speeds and directions of motion of each component of the split. As the warnings are updated to remove the back edges from the threat, the polygons separate.

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Training Storms

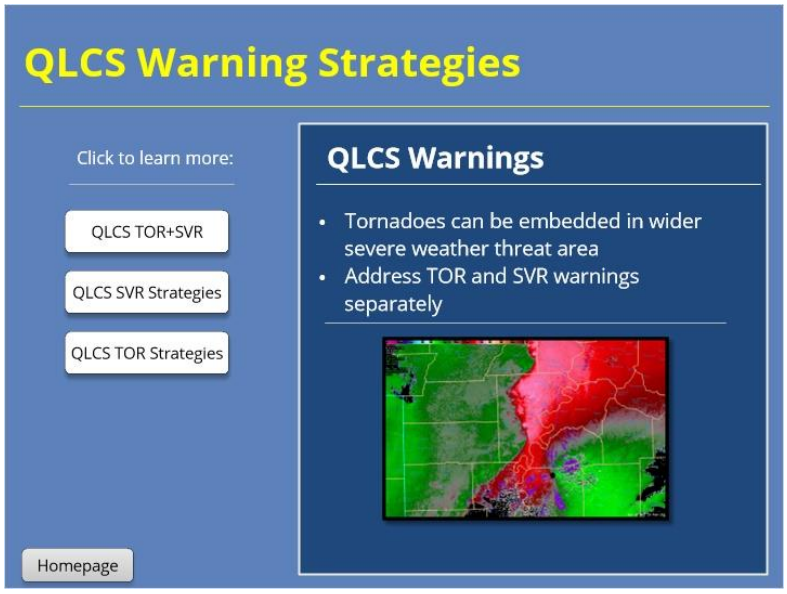


Notes:

Warning polygons get a little more complicated for training storms. In an example of training supercells or other mostly isolated convection, warn on each storm individually. Initially, the polygons will have a little overlap. Be sensitive about erasing the back edge of the polygon on the leading storm. If the trailing storm is going to move into that location, let the leading warning stay in place to prevent the mixed message of being in a warning, then out, then in again. You can trim the back edge of the trailing storm, though, as well as any part of the polygon for the leading storm that the trailing storm is not expected to move into. Alternatively, you could make the trailing polygon shorter in distance and duration so that it minimizes the overlap even more.

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QLCS Warning Strategies



Notes:

Tornadoes can be embedded in areas of more widespread severe weather threat. In particular, this can occur with a quasi-linear convective system, or QLCS. Let's cover some strategies and tips for dealing with QLCS warnings.

OVERALL WARNING STRATEGIES (SVR AND TOR)

Managing warnings for a QLCS is best done with two separate warning forecasters. Working with Z/V, one forecaster should issue severe thunderstorm warnings along the line. Then, a second forecaster should work with Z/SRM to issue the tornado warnings. Those warnings will be small and short-lived.

QLCS SVR STRATEGIES

The severe thunderstorm warning for a QLCS should follow best practices for lines: use Z/V with WarnGen, segment by intensity, use longer durations for warnings (like 45 to even 60 minutes), and ensure a new warning is issued downstream before the winds outrun the polygon. In addition, this is definitely the most appropriate time to use the "tornadoes possible" tag, which will communicate that the span of the line carries a tornado threat in addition to the severe thunderstorm threat.

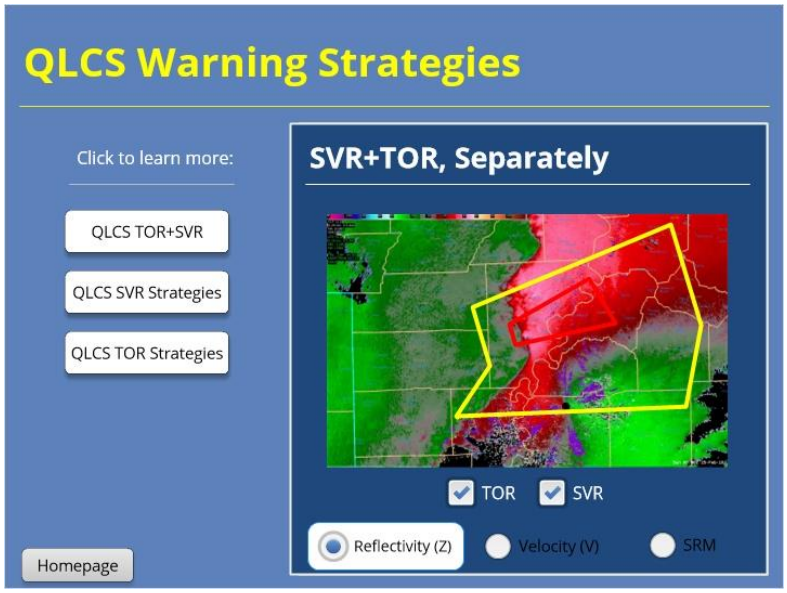
QLCS TOR STRATEGIES

QLCS tornadoes tend to spin up and spin down on the fast side. Tornado warnings for a QLCS do not need to be longer than a half hour. That is the default for tornado warnings in many offices, anyway. You can cancel warnings when the tornado threat for any one spin-up diminishes.

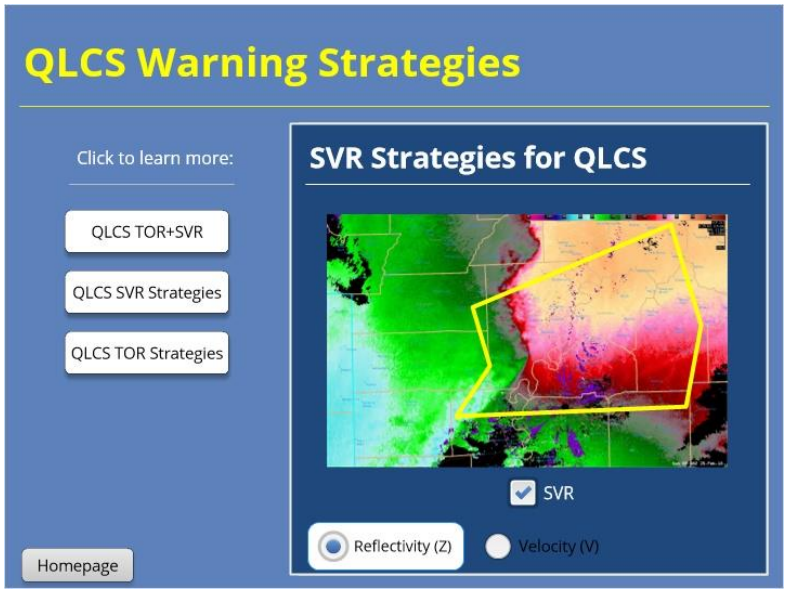
QLCS tornadoes will follow the forward translation speed of the line itself, and they also tend to translate leftward up the line. Polygons can be pretty tight to the rotational couplet, since they do not have to incorporate the broader severe thunderstorm threat of winds and perhaps hail. But do leave a little room for them to move a little leftward of the line's storm motion and also for the inherent uncertainty in exact tornado position due to beam width and storm wobbles.

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SVR+TOR (Slide Layer)

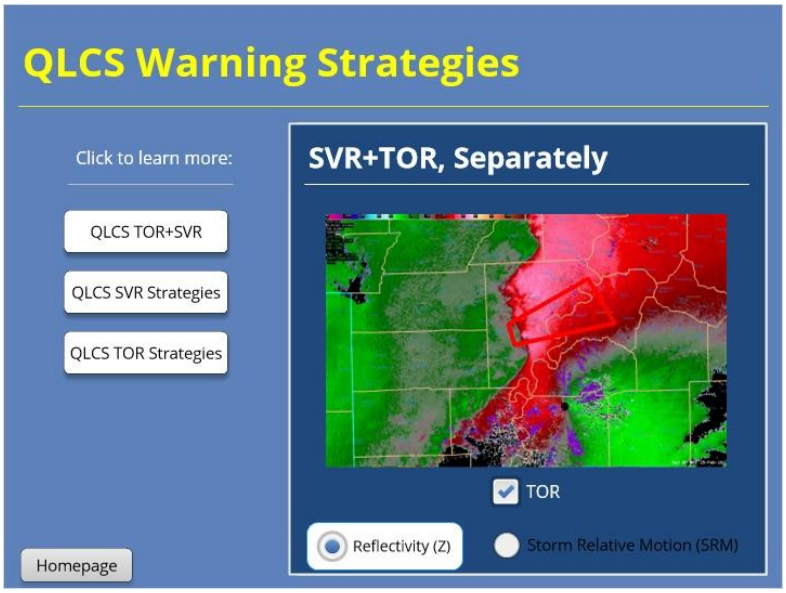


SVR Strategies (Slide Layer)



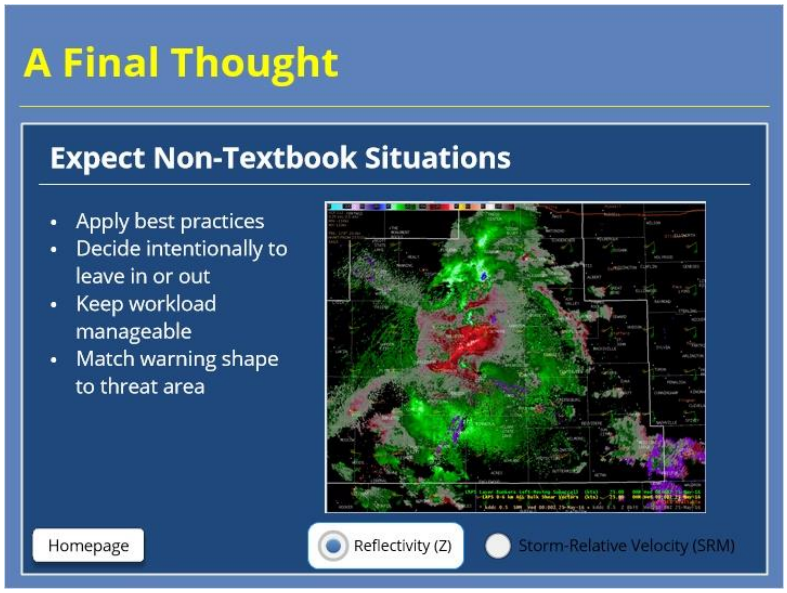
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TOR Strategies (Slide Layer)



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Non-Textbook Situations

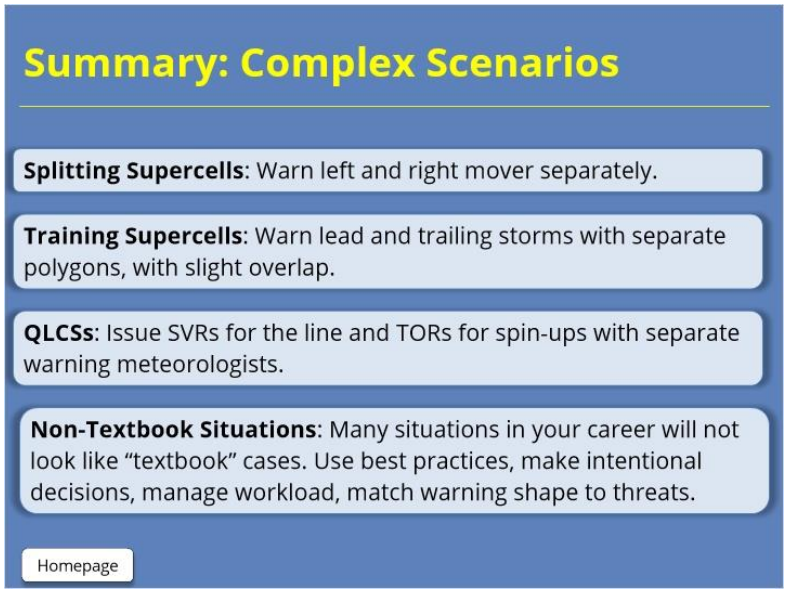


Notes:

You'll see things in your career that are not textbook storms. In fact, that will be the case more often than not. Use best practices to make the best warning polygons and construct the best messages for whatever scenario you encounter. The foundations will remain the same: Be intentional about what areas are and are not included in the warning. Keep your workload manageable. Match the warning shape to areas at risk of hail, damaging winds, or tornadoes.

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Summary: Complex Scenarios

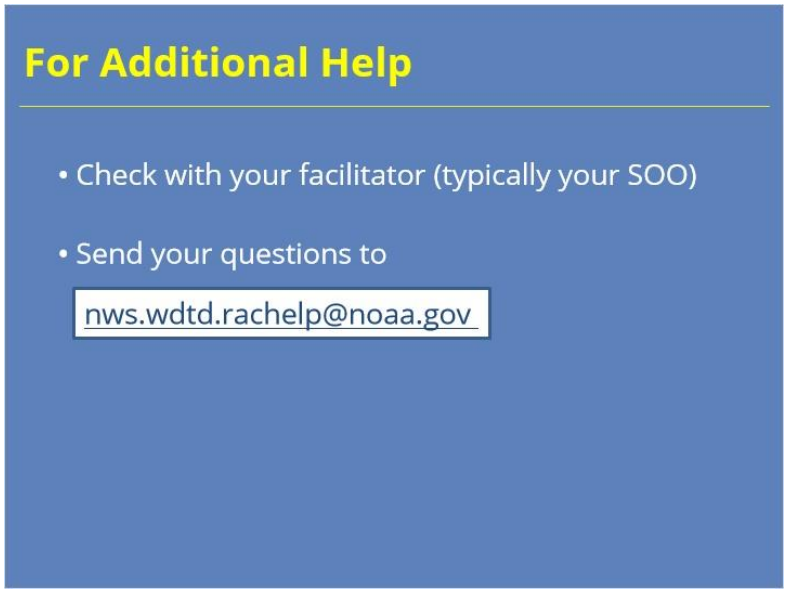


Notes:

In all cases of complex scenarios, including non-textbook cases, apply best practices and make intentional decisions that best handle the situation at hand. With splitting supercells, warn the left and right movers separately. With training supercells, also warn each storm separately, with a slight overlap, and take care with the overlap area to keep it minimal and maintain consistent messaging. With QLCSs, separate the severe thunderstorm and tornado warning duties to two separate warning meteorologists who can focus on each hazard. Issue larger severe thunderstorm warnings following best practices for winds, with small and short embedded tornado warnings.

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For Additional Help



Notes:

For additional help, check with your facilitator (typically your SOO) or send your questions to the listserv e-mail address here.

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Warning Considerations: Non-Meteorological Factors

Warning Considerations: Non-Meteorological Factors

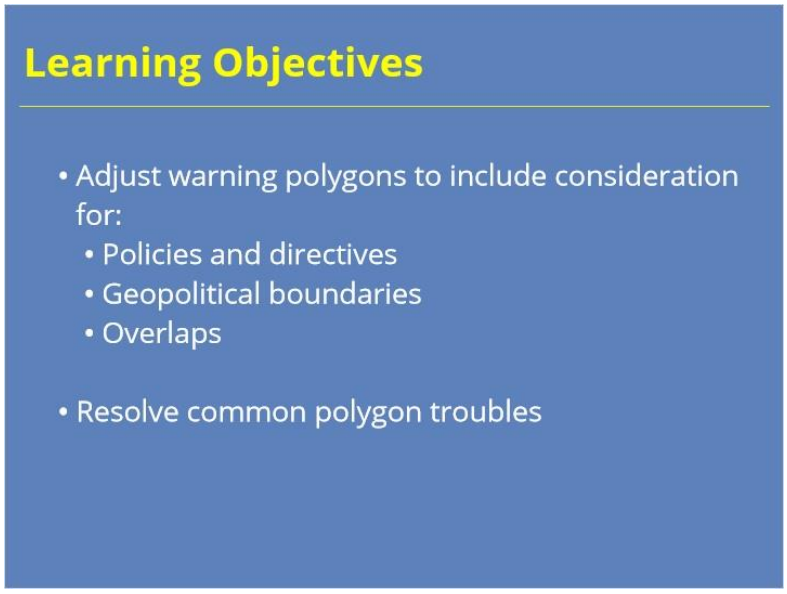


Notes:

Welcome to RAC Warning Fundamentals. This lesson covers non-meteorological warning considerations, such as policies and polygonology.

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Learning Objectives

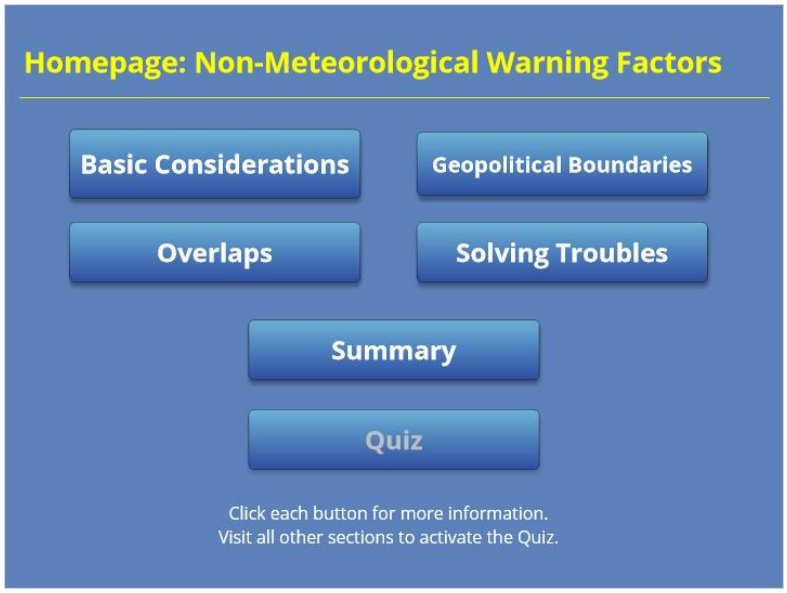


Notes:

After completing this module, you will be able to adjust your warning polygons to include consideration for policies and directives, geopolitical boundaries, and polygon overlaps. You also will be able to apply best practices to solve polygon troubles when things don't go quite how you expected.

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Homepage: Non-Meteorological Warning Factors

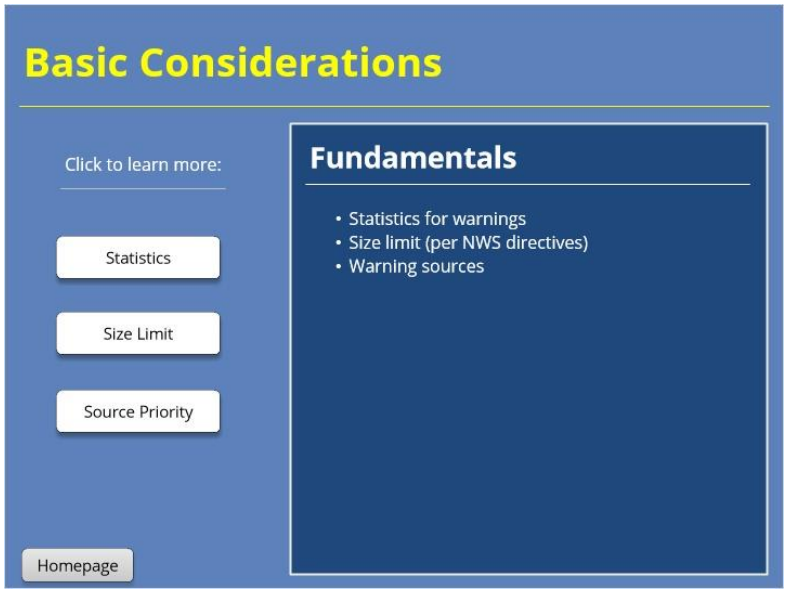


Notes:

Welcome to the home page for non-meteorological warning factors. Click on the buttons to move through each section. View the summary when you have gone through each section. Finally, take the quiz to get credit for completing the module. The quiz button will activate after you have visited all the other sections.

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Basic Considerations



Notes:

Let's go through some basic considerations for our warnings. Use the buttons on the left to navigate three topics: warning statistics, size limit, and source priority.

STATISTICS 1:

We don't want you to calculate your statistics as you're issuing warnings. Over time, statistics can show patterns about warning services that may uncover strengths to highlight and challenges to consider for additional training and practice. Would it make sense for the warnings to aim to maximize or minimize lead time?
STATISTICS 2:
Our goal is to maximize the reasonable lead time in a warning. Would it make sense for warnings to maximize or to minimize false alarms?

STATISTICS 3:
It makes more sense to minimize the false alarm area in our warnings. Finally, would it make sense for warnings to maximize or minimize the probability of detection?

STATISTICS 4:
It makes more sense for warnings to maximize the probability of detection. Ultimately, our goal is to cover the hazard fully in order to alert the public in a timely fashion about the impending threats, making intentional and scientifically defensible decisions on what to warn and what not to warn.
SIZE LIMIT 1:
Which of these is the maximum number of counties or parishes that can be included in a severe thunderstorm or tornado warning?

SIZE LIMIT 2:
The answer, provided in the NWS directives, is 12! Be sure that the maximum number of counties or parishes in your warnings is 12, at the most.

SOURCE 1:
Which source always takes highest priority when selecting the source of your warning?

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SOURCE 2:
Human observations carry greatest weight and always take priority! Which source would have the next highest priority as the source of a warning?

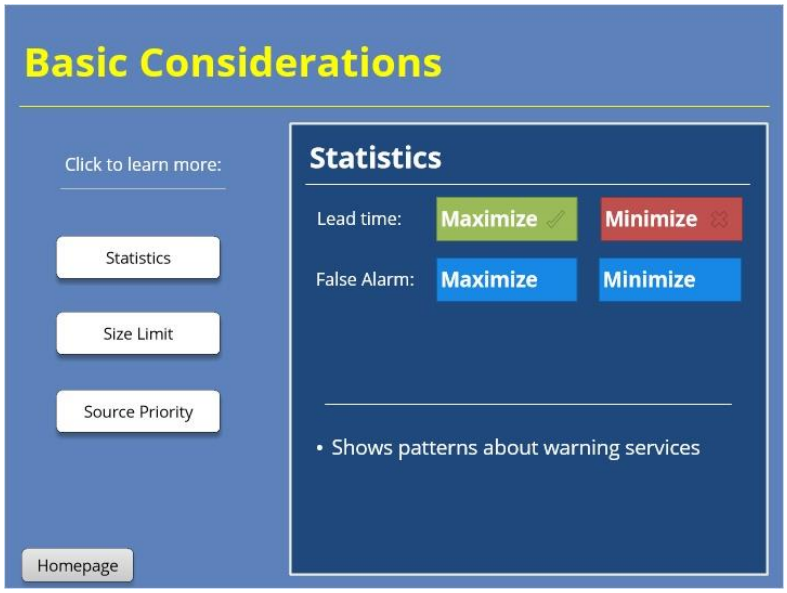
SOURCE 3:
Radar-observed carries more weight than radar-indicated. When choosing the source of a warning, a human observation, such as a trained spotter or member of the public, takes highest precedence over being radar-observed (which means that you've identified a tornado debris signature), which then takes precedence over being radar-indicated.

Statistics 1 (Slide Layer)

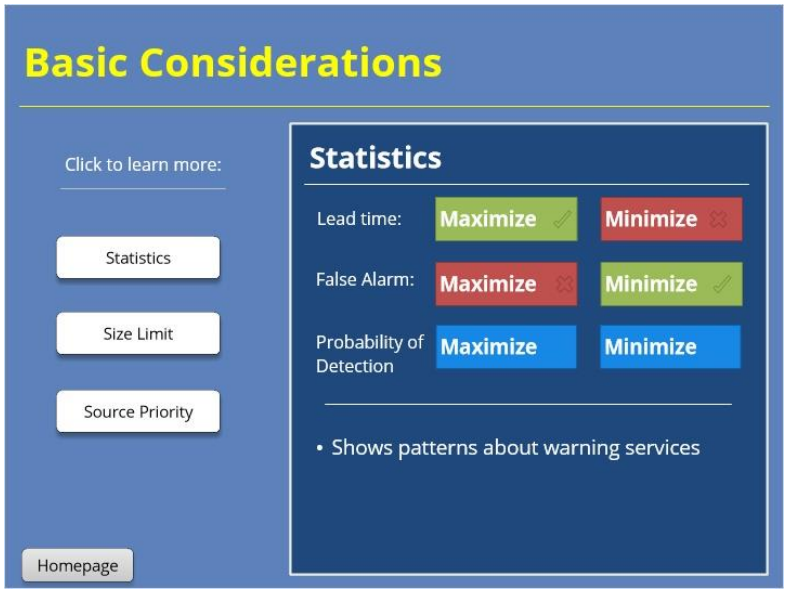


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Statistics 2 (Slide Layer)

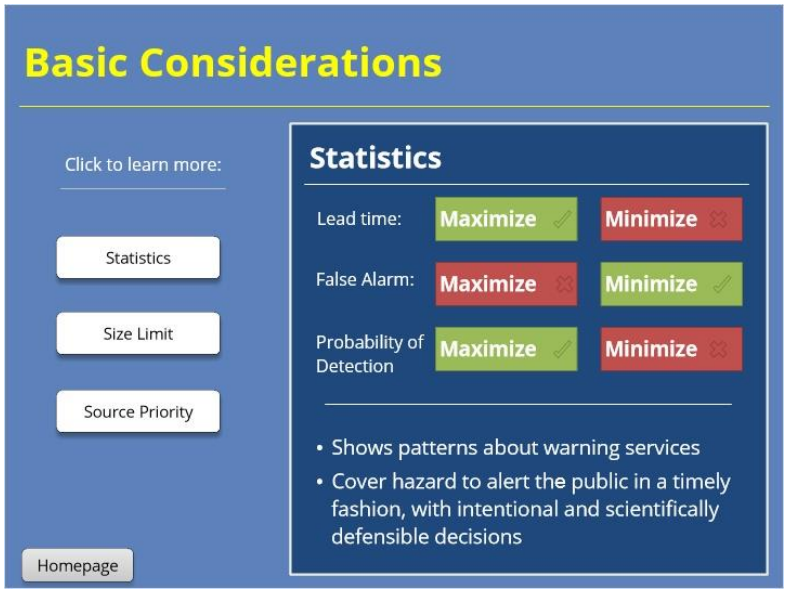


Statistics 3 (Slide Layer)

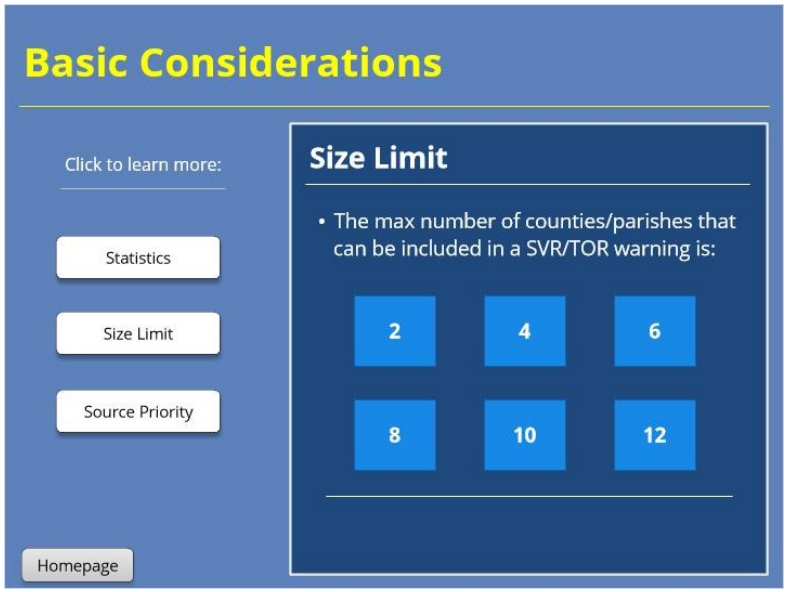


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Statistics 4 (Slide Layer)

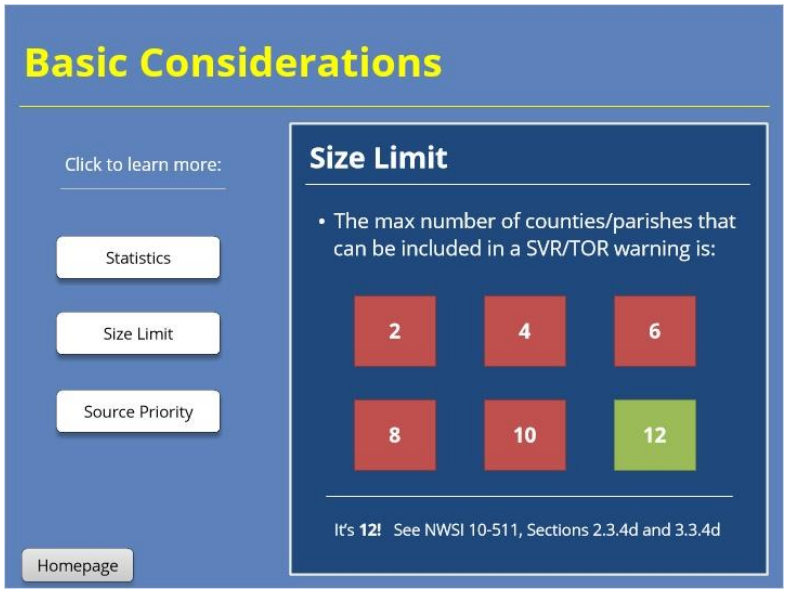


Size Limit 1 (Slide Layer)

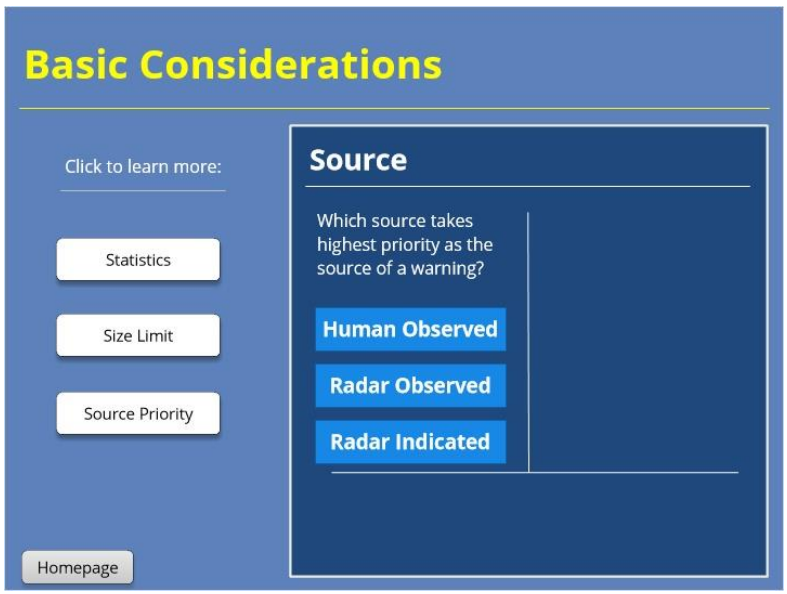


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Size Limit 2 (Slide Layer)

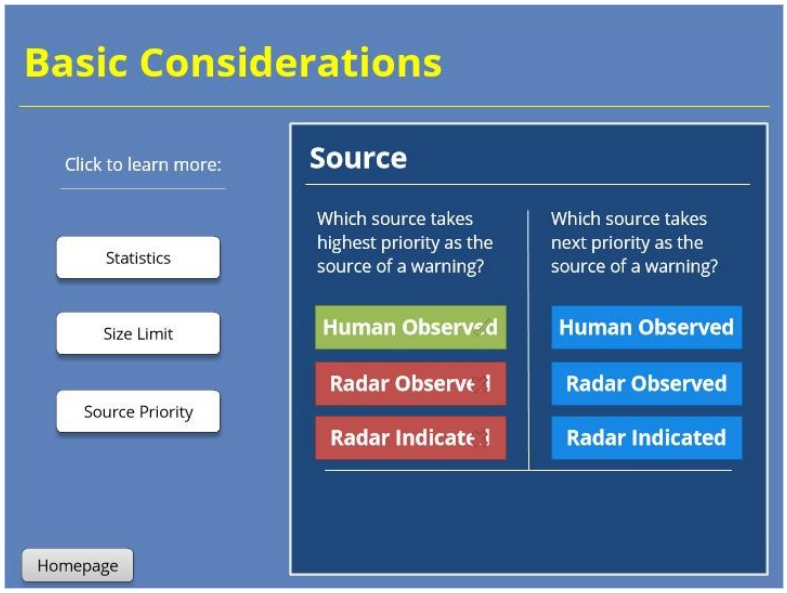


Source 1 (Slide Layer)

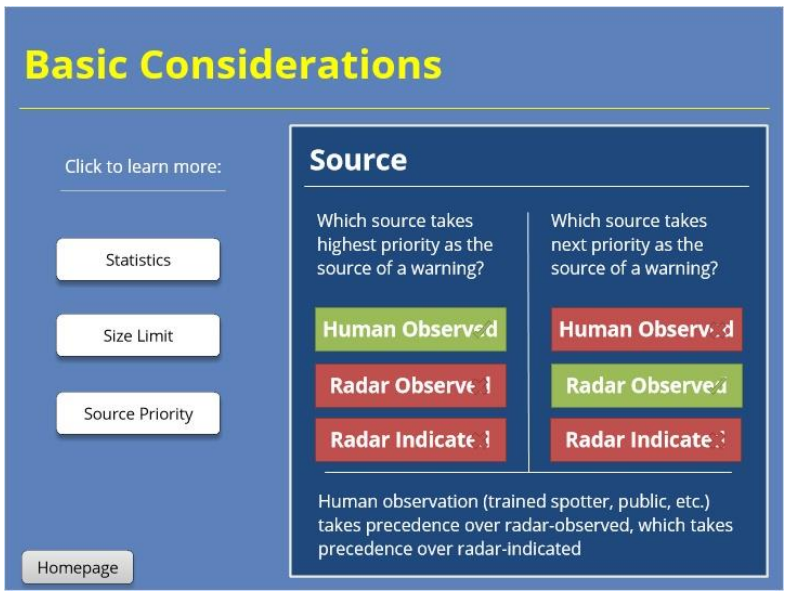


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Source 2 (Slide Layer)

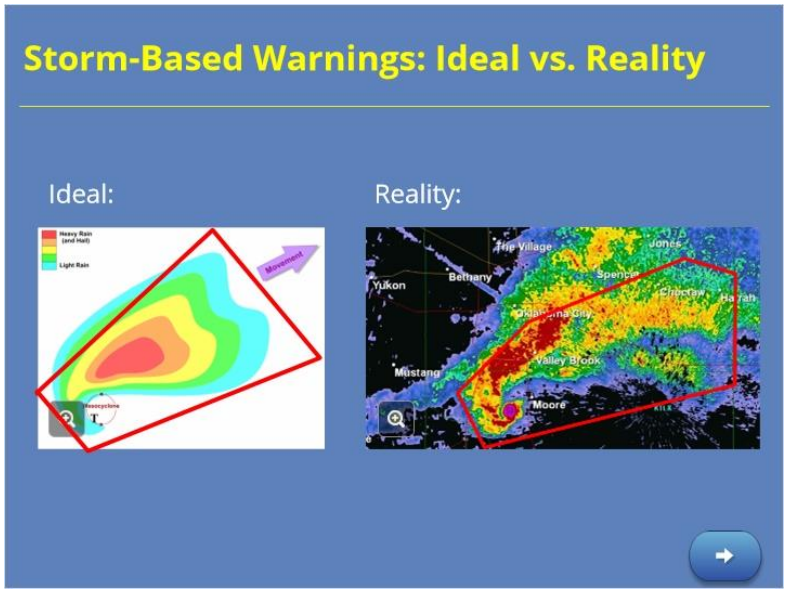


Source 3 (Slide Layer)



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Storm-Based Warnings: Ideal vs. Reality



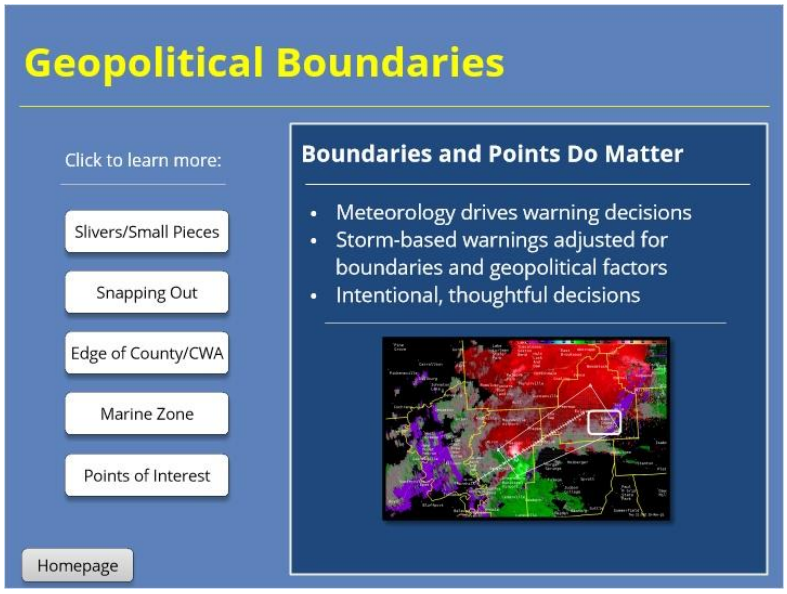
Notes:

In an idealized world, we would draw purely storm-based warning polygons as a practice. In reality, we realize that we don't operate in a bubble, and neither do our warnings. Many of our interactions are with officials at the county and city levels, and these boundaries are important for both our partners and the public. We also may be weighing decisions of whether or not to include decision support points, bodies of water, recreation areas, or other point locations of interest in a warning that we are drawing. Our warnings are more of a hybrid of considerations that range from meteorological to geopolitical and societal. As we balance these considerations, it is important to be aware of the impact of our warnings and make **intentional** decisions about what to include and what to leave out.

Image link: https://www.e-education.psu.edu/meteo3/sites/www.e-education.psu.edu.meteo3/files/images/lesson8/idealizedreflectivity_supercell.PNG

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Geopolitical Boundaries



Notes:

While warning decisions are driven primarily by the meteorology of the situation, we do have to account for the geopolitical boundaries that underlie the services we are providing. County and CWA boundaries, marine zone edges, and point locations of interest are all factors in adjusting the initial storm-based warning polygons. Most of all, make intentional and thoughtful decisions about areas that are and are not included in a warning.

SLIVERS/SMALL PIECES

As you draw your warning to be initially storm-based, you may find that the polygon just barely clips the edges of counties into the warning. Be cognizant of those edge pieces, and be sure that the decision of whether that segment is in or out of the warning is intentional. If that sliver will be threatened by severe hail, damaging winds, or a tornado, it should be included. If the sliver is far enough removed from the core of the storm, you can leave it out. A quick time-saving tip is to right-click on a county as you are drawing the warning to toggle it in or out. When you hit the button to redraw based on warned/hatched area, the vertices will adjust to keep that county in or out.

SNAPPING OUT

You might find that when you hit “warned/hatched area” (or create your warning, if you skipped this step), a piece of the warning is puzzle-pieced out along a county boundary. It turns out that a designated percentage of a county must be included in the polygon, by default, in order for that county to be included in the warning. That percentage is set locally via the Localization perspective – some WFOs have it set to always include a county no matter how small a segment is included, while others have a requirement set somewhere around 5 to 10 percent. If you are intentionally drawing a small area of a county into the warning and WarnGen snaps it back out again, move your vertex to include a slightly larger portion of the county. You might end up with a polygon that’s a little bigger than you wanted, but if it means making sure that an area threatened by a tornado, hail, or damaging winds stays in the warning, the extra few square miles are worth it.

EDGE OF COUNTY/CWA

When a warning polygon is close to the edge of a county, CWA, or important location, but not quite all the way there, go ahead and pull the warning to the edge of the county, CWA, or other location. This is especially true at the edge

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of a county warning area, where the next office downstream may wish to draw a polygon without leaving a gap between the warnings. In this example, the default from AWIPS didn't quite bring the polygon all the way to the coast. To extend the polygon in this case, I simply pulled the vertices past the edge of the coast and let it snap back when I pushed "warned/hatched area." Another way I could have extended the polygon would be to use a longer duration, such as 60 minutes.

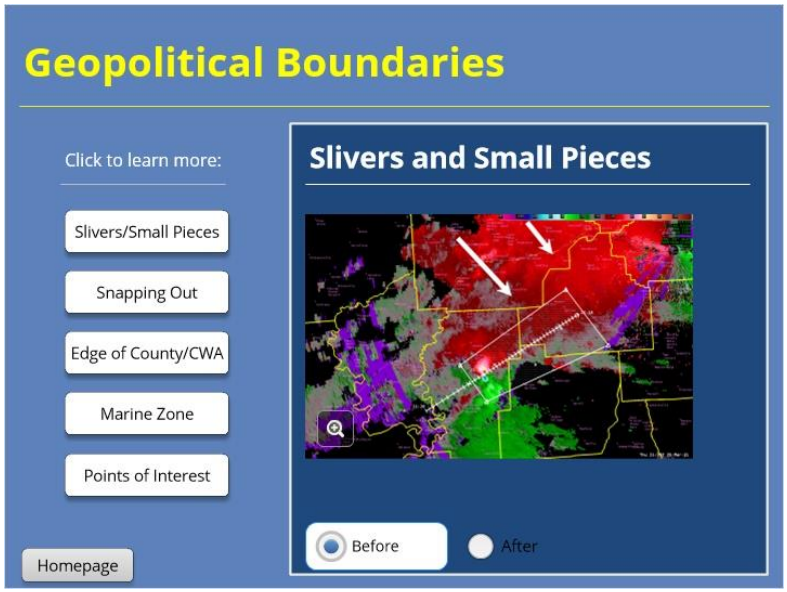
MARINE ZONE

If you have marine zones in your CWA, you will notice that the polygon snaps out of the marine zones when you hit that "warned/hatched area" button. The polygon will snap to the edge of the marine zone, which is pre-programmed in AWIPS and often very jagged and odd-looking. This is intentional, and it is OK to leave your polygon like that. If you need an adjacent marine warning, you'll handle that separately from your severe thunderstorm or tornado warning.

POINTS OF INTEREST

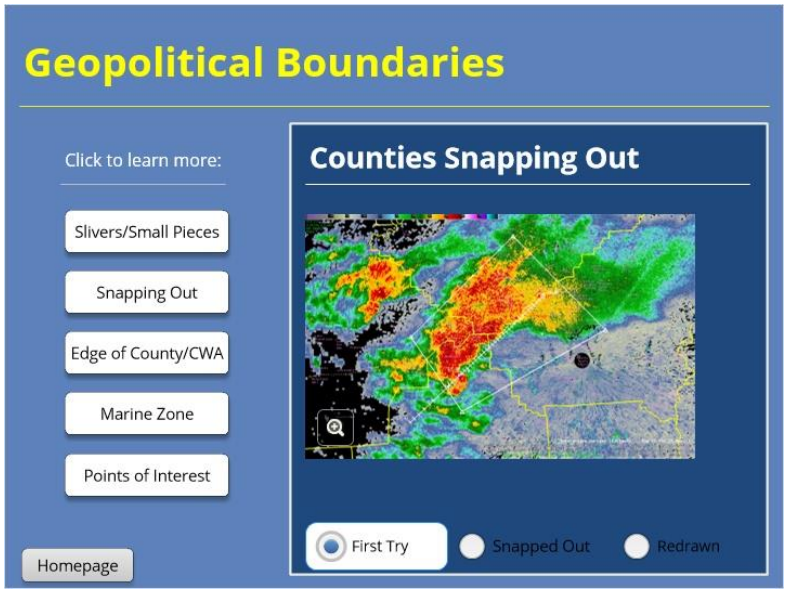
As you are drawing your polygon, you also should consider what locations are just inside or just outside the edges of your polygon, giving intentional thought to whether that location should be in or out of the warning. Some of these locations could include cities, bodies of water, recreational areas, airports, and IDSS points, just to name a few. In this example, in the white box, there is an airport location that lies just outside the first-guess polygon. Whether you expand a polygon slightly to include the point, or tighten it to exclude the point, is your decision to make based on the storm characteristics and hazards, the sensitivity of the point, and its distance from the storm. Just make sure that you are making the decision intentionally and in collaboration with others in the office who may be in communication with officials who represent these locations.

Slivers-Small Pieces (Slide Layer)

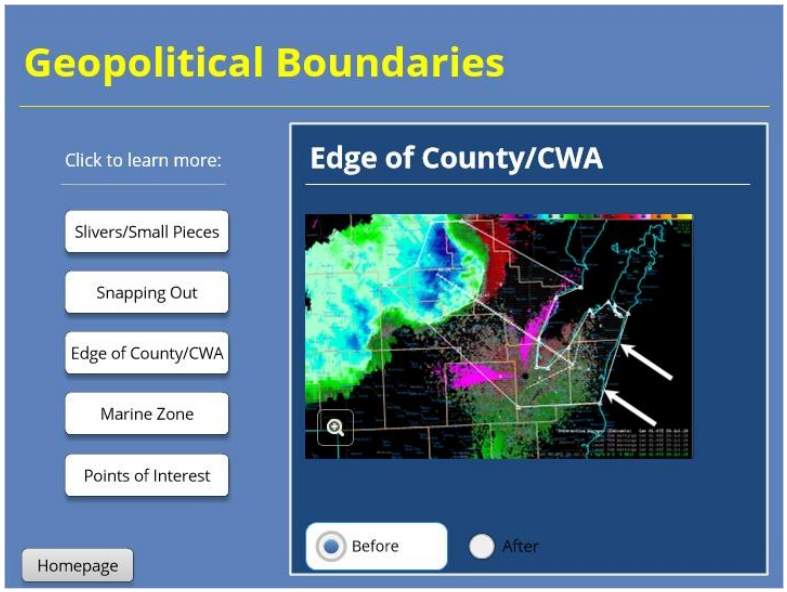


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Snapping Out (Slide Layer)

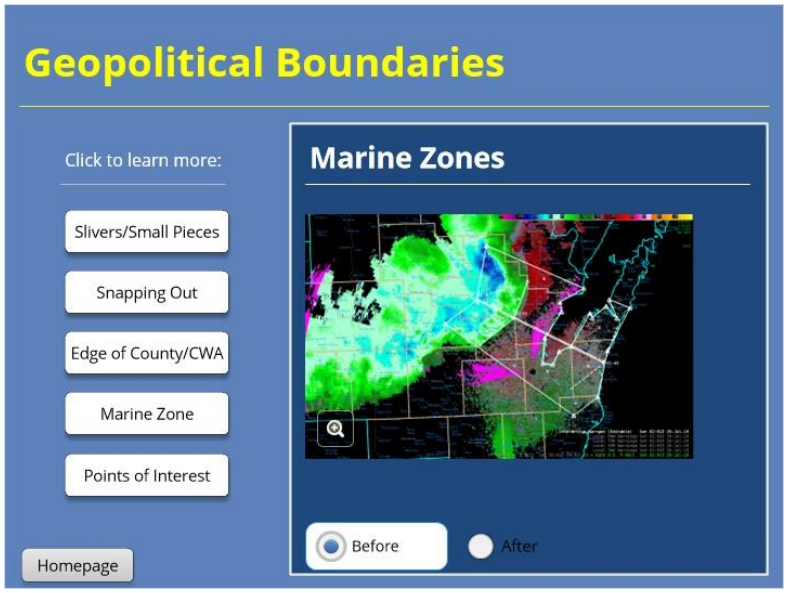


Edge of County-CWA (Slide Layer)

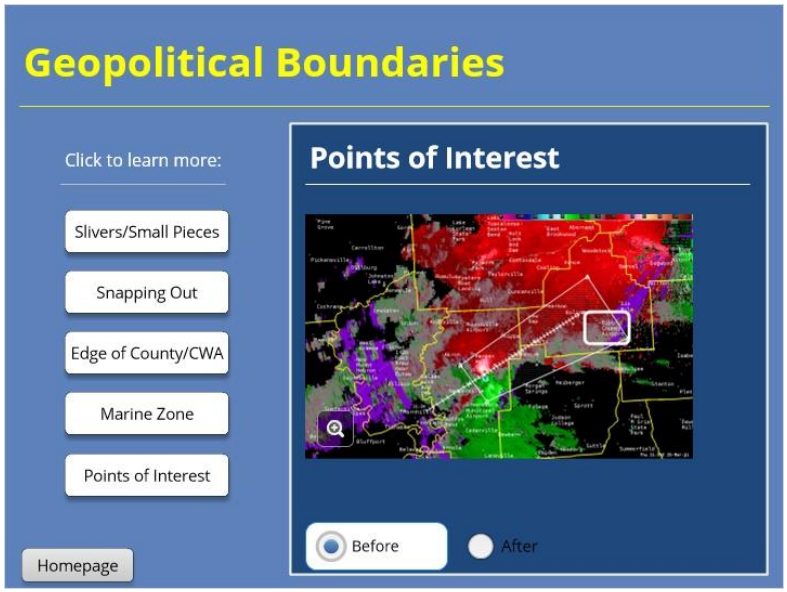


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Marine Zone (Slide Layer)

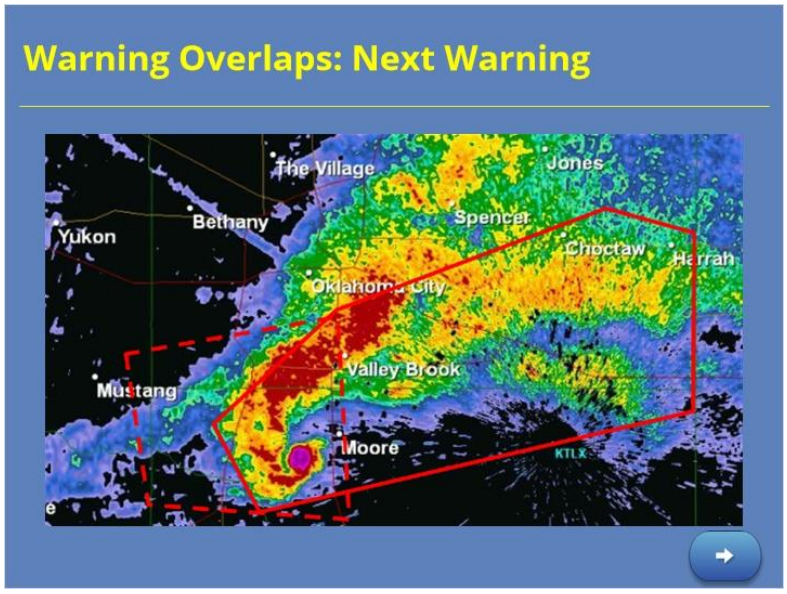


Points of Interest (Slide Layer)



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Warning Overlaps: Next Warning

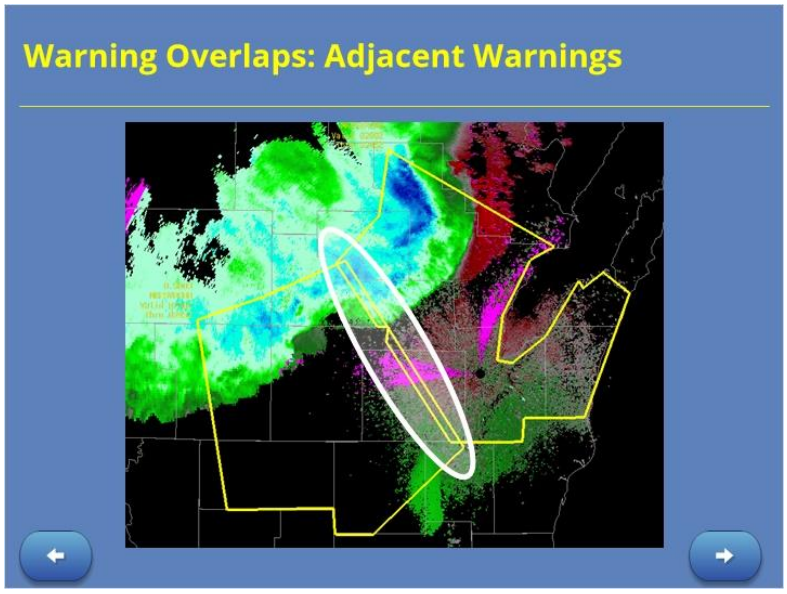


Notes:

Some overlap is desired as an active storm exits its previous warning and enters a new polygon. You do not want to match the edge of the old polygon to the edge of the new polygon. First, the odds of the storm crossing the line between polygons at exactly the time when the first warning expires and the second takes effect are very low. Second, storms cover an area even if the center of it did land perfectly on that line at expiration time. Keep a reasonable overlap to cover the time that both warnings are in effect, and concentrate on issuing the new warning for where the storm is now and will be for the duration of the warning. Keep in mind that faster-moving storms probably will need a little less overlap than slower-moving storms. Also, be ready to adjust your polygon sizes; if you find that your warnings have a large area left at the end of the valid warning time as you work through the event, then you should draw them a little shorter. If your storms are outrunning the polygons before their expiration, you should extend the warning sizes.

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Warning Overlaps: Adjacent Polygons

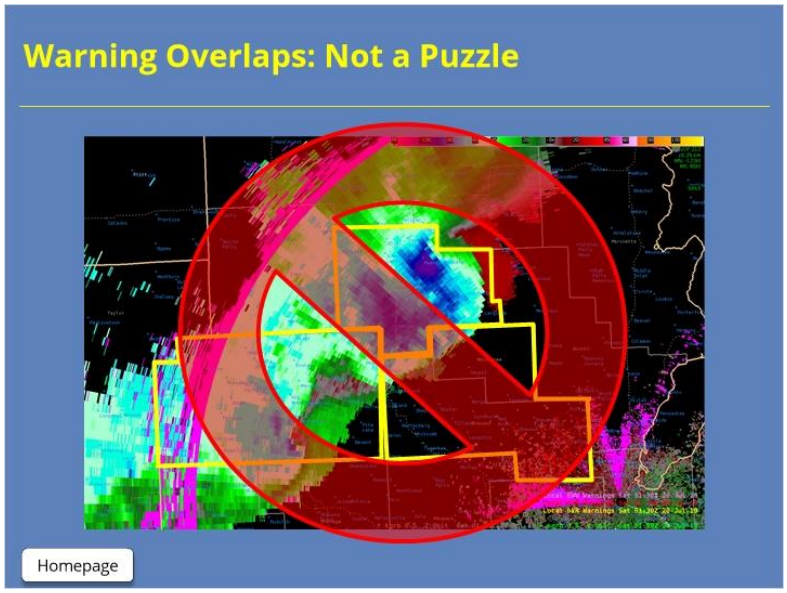


Notes:

Mind the gap! When you are issuing warnings that are adjacent, such as with a segmented line or with supercells that are close together, the warnings should have a slight overlap to ensure there are no unwarned gaps where severe weather may occur.

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Warning Overlaps: Not a Puzzle

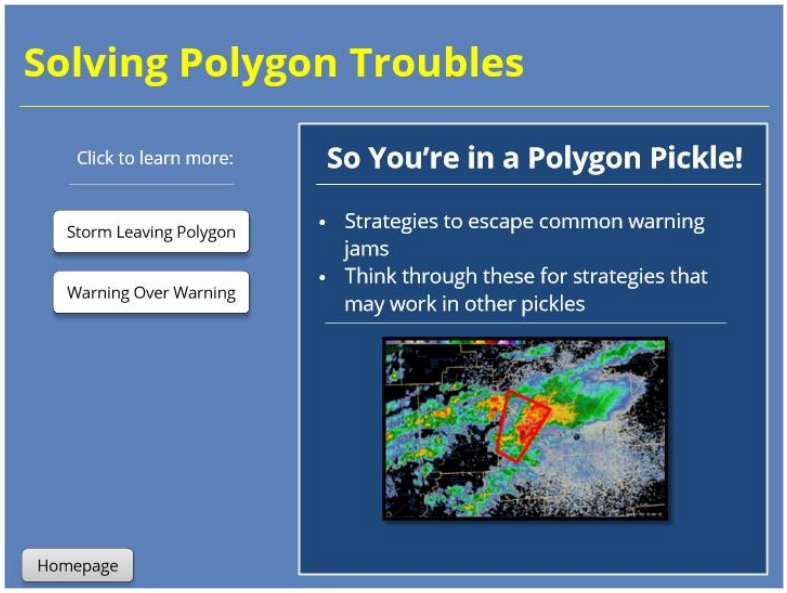


Notes:

Warnings should not be puzzle-pieced together, with matching edges. This is something we often see along county boundaries. Remember to address downstream warnings as if the previous warning is not in effect – because it will expire before the new warning takes effect. While our storm-based warnings do require some adjustment for geopolitical boundaries, they should not be dominated or driven by them. Slight overlaps maintain continuity of the warning and communicate the threats more clearly to our partners and public.

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Solving Polygon Troubles



Notes:

Even with intent and care, mistakes can happen. Someday, you will find yourself in a polygon pickle. Here are some strategies to escape some common warning jams. We can't cover every scenario you might encounter, but thinking about how to work through these examples can give you some strategies that may work in other scenarios, too. Take a deep breath when it happens, and then use intentional decisions to work through it.

STORM LEAVING POLYGON:

One common polygon pickle is when the storm starts to slip out of your box. To address the problem, we first want to address the root cause. The storm may be turning right, or it may be a left-moving supercell that was warned with right-moving or mean-flow motion. It is possible that the storm track for the initial warning was not representative of the true storm motion. The storm could be expanding or developing new updrafts on its flank. Whatever the cause, let it be a lesson learned that guides you when you are drawing future polygons for this storm and others during the event. Use an overlay of Bunkers storm motion for supercells to help you visualize storm motions – if you find that your storm track is moving far away from these, then re-assess and be sure you've used the most representative storm motion and aren't tracking the motion of individual deviant-motion tornadoes or other features.

There are two strategies to fix it when the storm is slipping out of your polygon. The first one works better if the initial warning is something like halfway through its time or more. In that case, it is probably best to draw an entirely new polygon for the warning, taking into account its full size and correct motion. As you are drawing the new warning, visualize its shape as if the initial warning is not there, to ensure your new warning gives full storm coverage throughout its duration. In this case, you might not need to update the initial warning again, as it may cause confusion, unless you can take counties out of the initial warning once the threat has passed. But do issue an expiration for it, using the option for "Tornado Warning Expiring – Will Reissue" to get the language that shows you've issued a new warning for the same storm.

The second strategy works better if the warning is newly issued, which is a more rare situation. In that rare case, it might be better to draw an adjacent polygon to give it the expanded shape that it needs, expiring at the same time as the initial warning. If you choose this strategy, remember to make sure to leave no gaps between the initial

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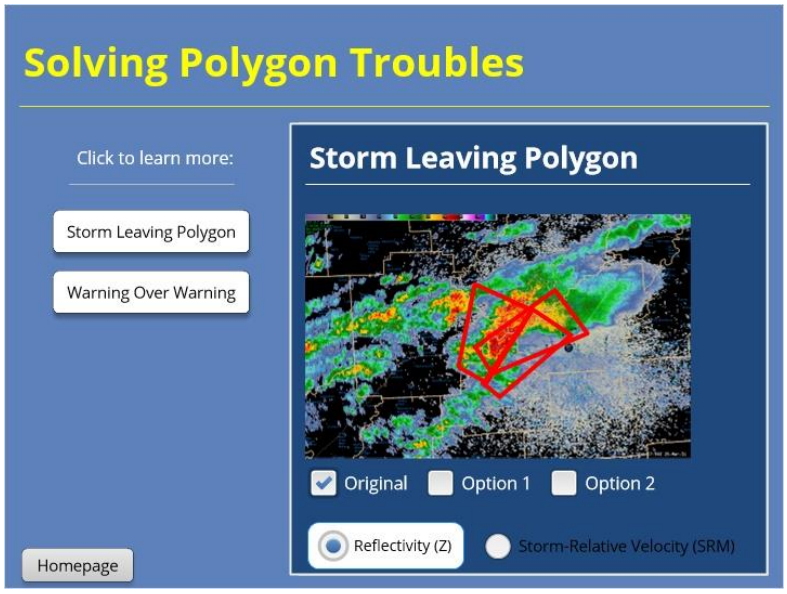
warning and the adjoining one. You'll then need to update both warnings, one right after the other, each time you issue an update. Then, when it comes time to issue a warning downstream to replace both of these, be sure to draw it carefully to prevent the issue again. Expire both the initial and second warnings, one right after the other.

WARNING OVER WARNING:

Another relatively common polygon pickle is when a warning meteorologist meant to issue an SVS and accidentally issues a new warning on top of an old one, covering almost exactly the same shape. When this occurs, the best strategy is to "ghost" the first warning and just update the second one through the rest of its duration. It's one of the rare times you'll hear us tell you to leave a warning alone after you issue it. Whatever you do, do not cancel one of the warnings, as it would give misleading information that a threat has passed when a warning does remain in place for the same areas.

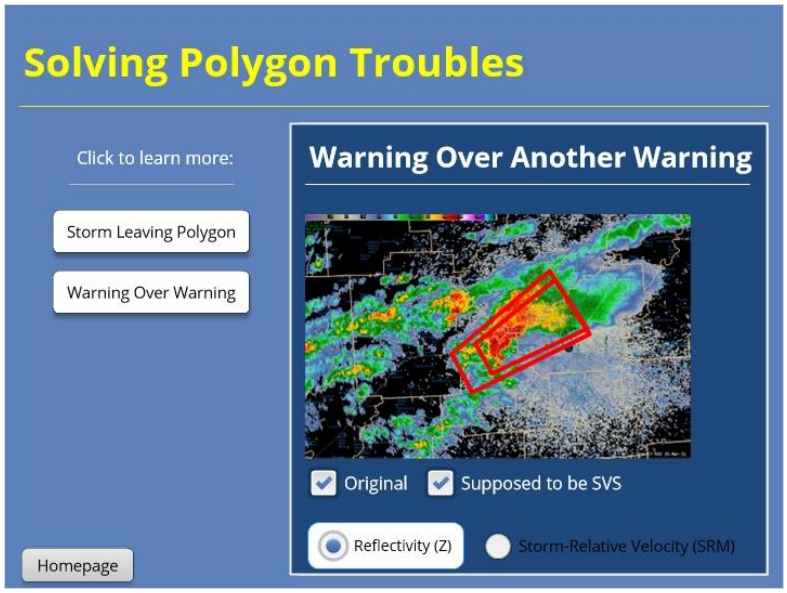
By the way, the same strategy applies when you intentionally issue a warning on top of a warning, such as when you issue a tornado warning over a supercell that you had initially warned with a severe thunderstorm warning. It's the same strategy there - you'll want to lay off of updates to the initial severe thunderstorm warning and just update the tornado warning, so that you don't cause confusion.

Storm Leaving Polygon (Slide Layer)

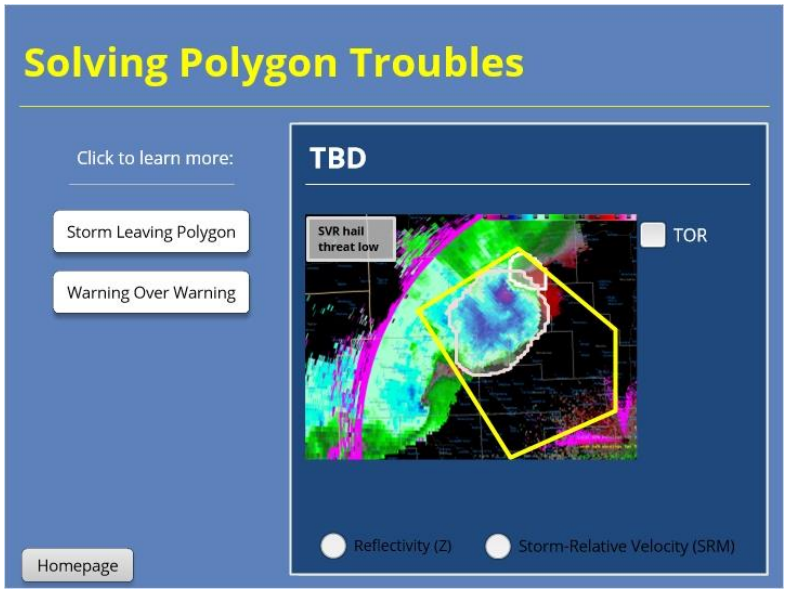


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Warning Over Warning (Slide Layer)

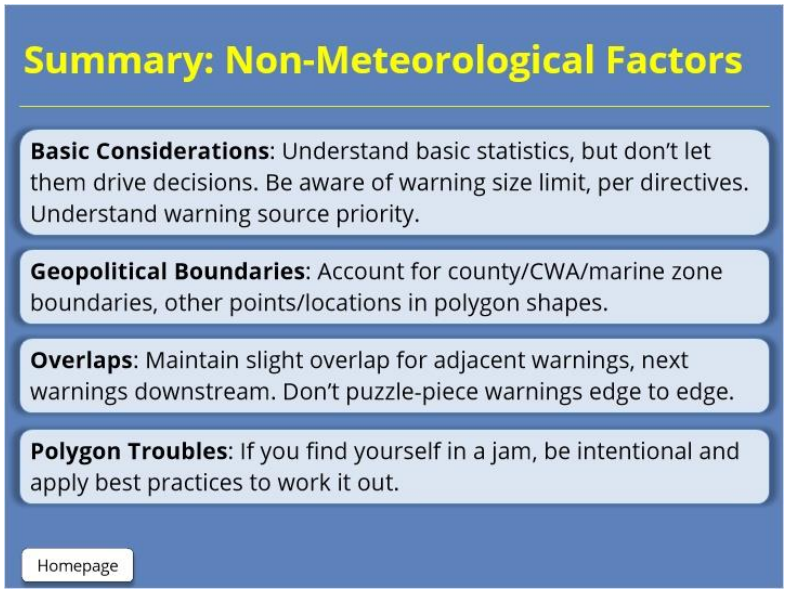


TBD (Slide Layer)



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Summary: Non-Meteorological Factors

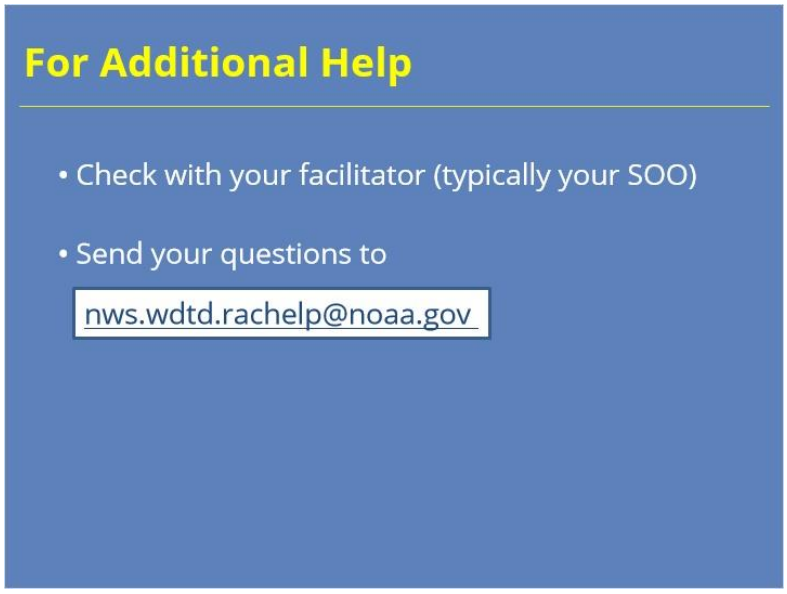


Notes:

In addition to storm features, non-meteorological factors do play into our warnings. Understand the basics of warning verification statistics, but don't let them drive any one warning decision. Be aware of the size limits set by directives, and understand how to prioritize sources for warnings. Take geopolitical boundaries and locations into consideration when drawing your polygons and adjust as needed to make intentional decisions about what is in or out of a warning. Maintain slight overlaps with adjacent warnings, rather than puzzle-piecing warnings together. And if you find yourself in a polygon jam, take a deep breath, then make intentional decisions and apply best practices to work your way out of it again.

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For Additional Help



Notes:

For additional help, check with your facilitator (typically your SOO) or send your questions to the listserv e-mail address here.

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Impact-Based Convective Warnings

Impact-Based Convective Warnings

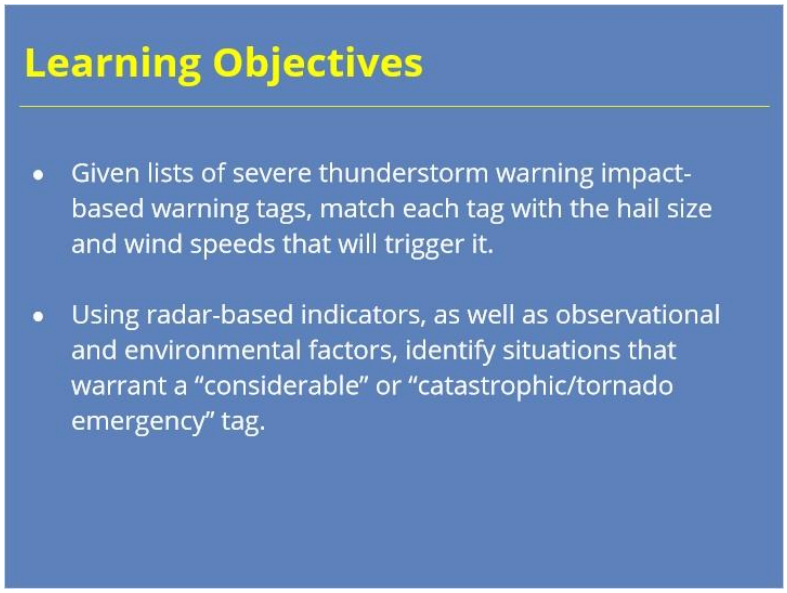


Notes:

Welcome to RAC Warning Fundamentals. This is Impact-Based Convective Warnings, and I am Barb Mayes Boustead.

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Learning Objectives

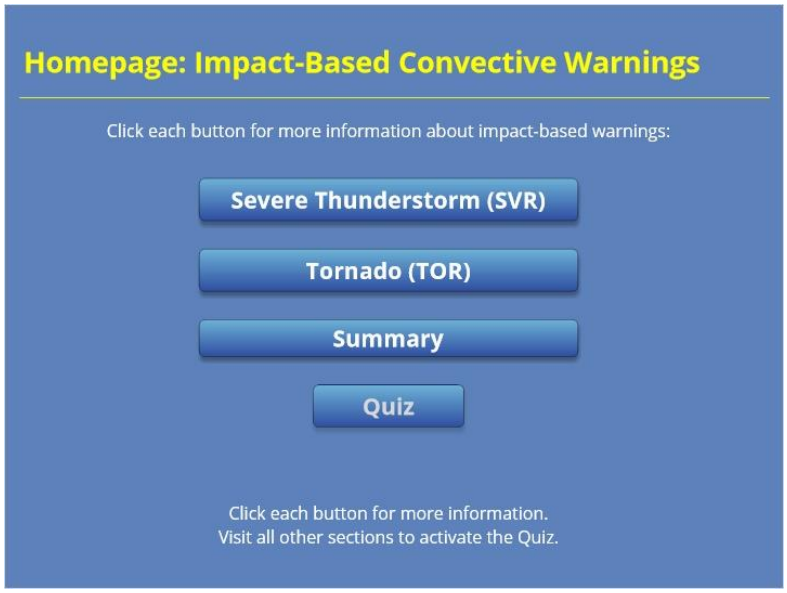


Notes:

After completing this module, you will be able to match severe thunderstorm and tornado warning tags with the hail, wind, and tornado intensity thresholds that trigger them, based on definitions in the NWS directives. We also will learn how to identify "considerable" and the rare "tornado emergency" situations.

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Homepage: Impact-Based Warnings (IBW)

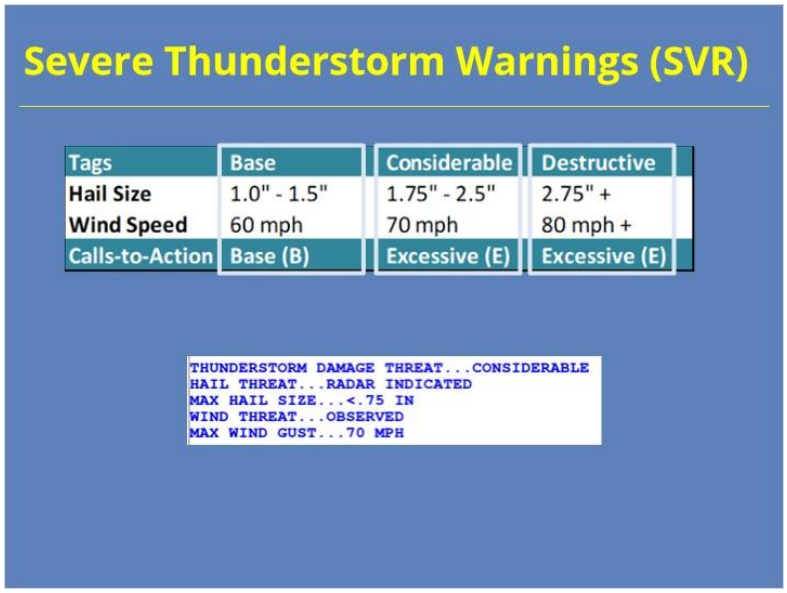


Notes:

Welcome to the homepage for this lesson on impact-based warning content. From this page, you can click on the severe thunderstorm and tornado warning buttons to learn how tags are applied for each type of warning. Then, view the summary. Click on the homepage button at the end of each section to return to this page. Once you feel comfortable with these materials, take the quiz by clicking the button at the bottom of the screen.

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Severe Thunderstorm Warnings (SVR)



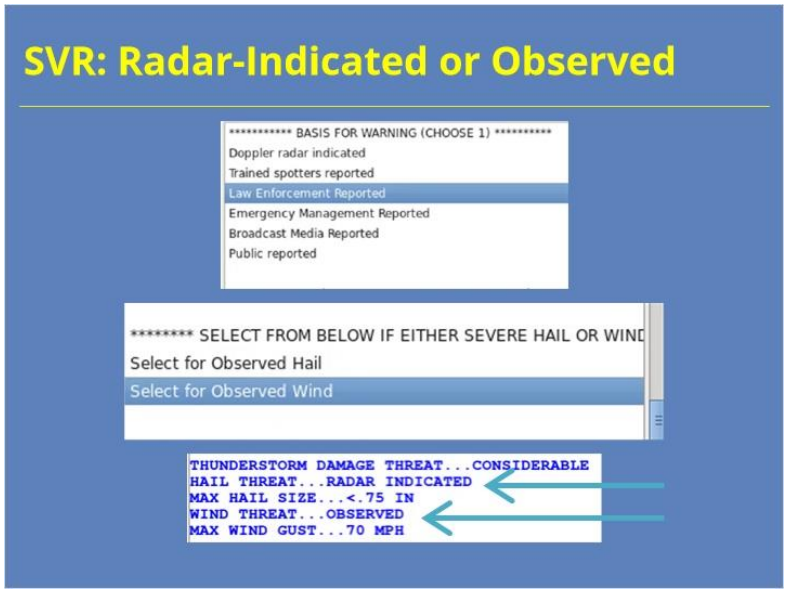
Notes:

Severe thunderstorm warnings contain impact-based tags, called thunderstorm damage threat tags, that categorize the hail and/or wind severity. The categories, or levels of severity, are base, considerable, and destructive. The hail size and wind speed that you choose in a severe thunderstorm warning will determine the tags that are automatically applied to your warning. This is an important distinction from tornado impact tags. Unlike tornado tags, you won't be deliberately selecting the categories. You will continue to focus on analyzing the storm and its environment to determine the maximum hail size and wind speed possible and then choose those in the warning or update, allowing the tag to come from your decisions. Of course, awareness of the category that will result from your decisions is important, too. Calls-to-action are now labeled with a (B) for base and an (E) for excessive, which covers the considerable and destructive categories. Select the calls-to-action that apply to the category you've warned and the characteristics of the storm.

The block of tags at the bottom of an impact-based severe thunderstorm warning can have at least four and up to six tags, depending on if a considerable or destructive tag is warranted and if a "tornado possible" tag is selected.

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SVR: Radar-Indicated or Observed



Notes:

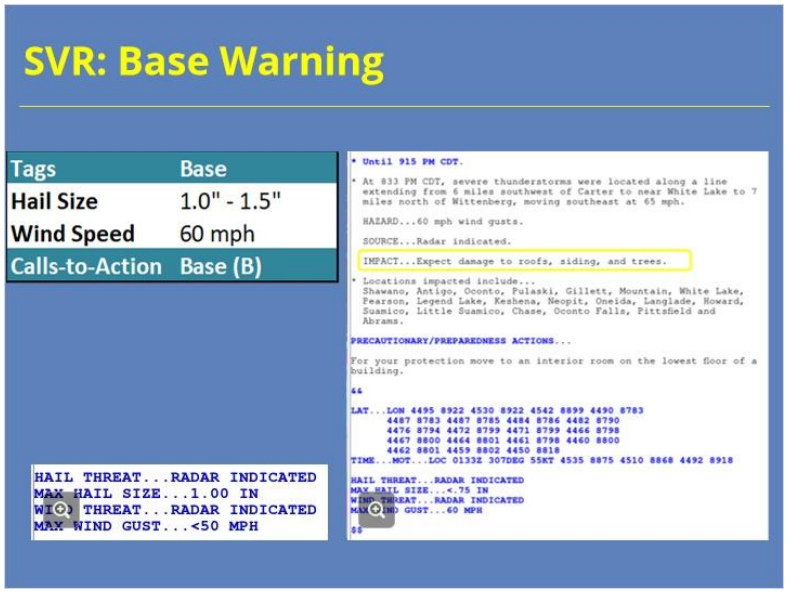
In addition to noting the source at the top of the WarnGen interface, you will need to select “observed” tags separately for hail and wind. Severe thunderstorm warnings will be tagged for whether both the hail and the wind threats were radar-indicated or observed, requiring attention from the warning meteorologist to ensure the correct source is noted for each. Any of the impact categories can be either radar-indicated or observed – just make sure you are consistent with the source of each throughout the warning. The source you have selected will be included in the tags at the bottom of the warning separately for each hazard. If you select a reported warning basis, you must also manually select that either the hail or wind is observed in order for the warning to be consistent.

In the example shown here, the hail threat is radar-indicated and sub-severe, while the wind threat is observed and at a threshold that warrants a considerable tag.

You may change the tags anytime for a warning by using SVS updates as well as by issuing new warnings. No warning is a “set it and forget it” product – they require continued monitoring and updating to provide the best and most recent information about the storm’s intensity and hazards, as well as its location and track.

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SVR: Base Warning

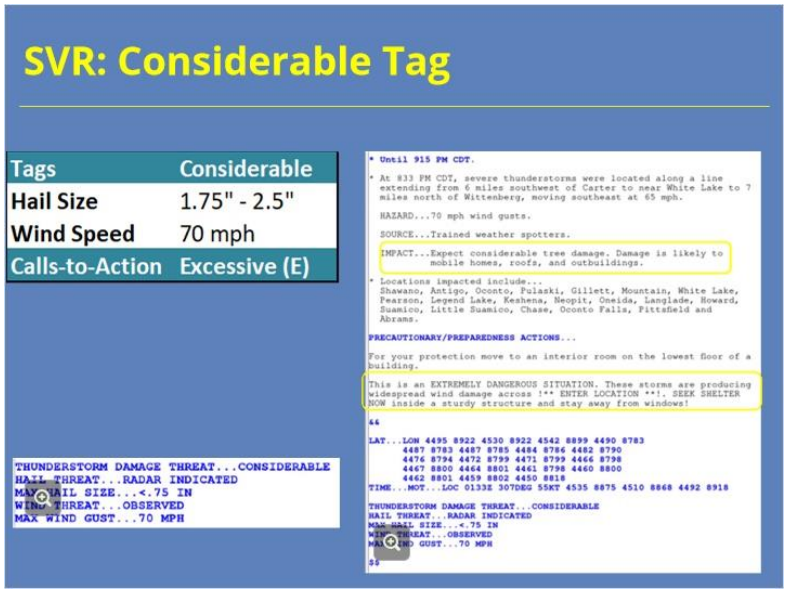


Notes:

Base severe thunderstorm warnings include hail sizes of 1 to 1.5 inches, or quarter to ping pong ball sized, or if you select a wind speed of 60 mph. When you select a call-to-action, use those that are marked with a (B) or, if needed, special calls-to-action that are not marked. There is no impact tag at the bottom of a base warning. Click on the images to see larger versions of them.

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SVR: Considerable Tag

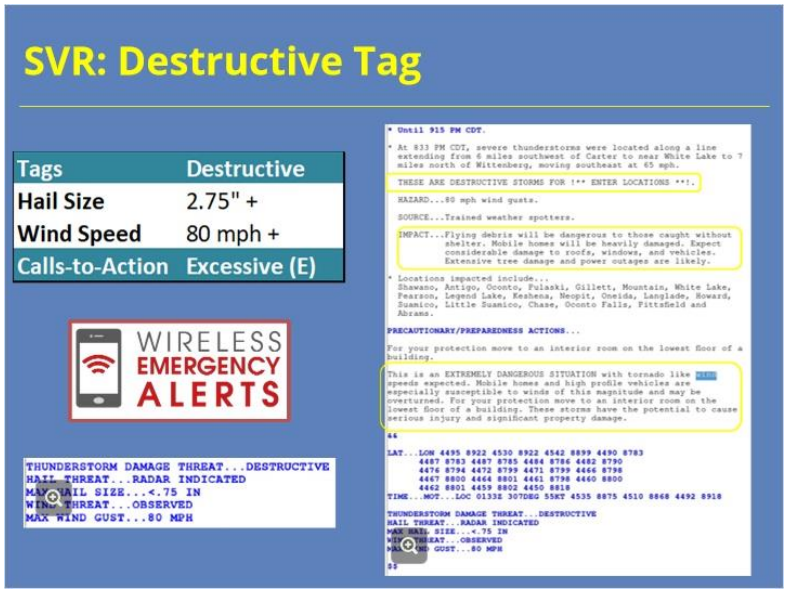


Notes:

Severe thunderstorm warnings will be assigned a considerable tag automatically if you select a hail size from 1.75 to 2.5 inches, or golf ball to tennis ball size, or if you select a wind speed of 70 mph. Select a call to action marked with an (E), or if needed, special calls-to-action that are not marked. Text in the some of the calls to action that you can select with the excessive (E) label will populate with the language, “This is an extremely dangerous situation,” and will prompt you to specify the location with framing text. Note at the bottom of the warning, in the tag block, that the considerable impact tag now appears.

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3. SVR: Destructive Tag

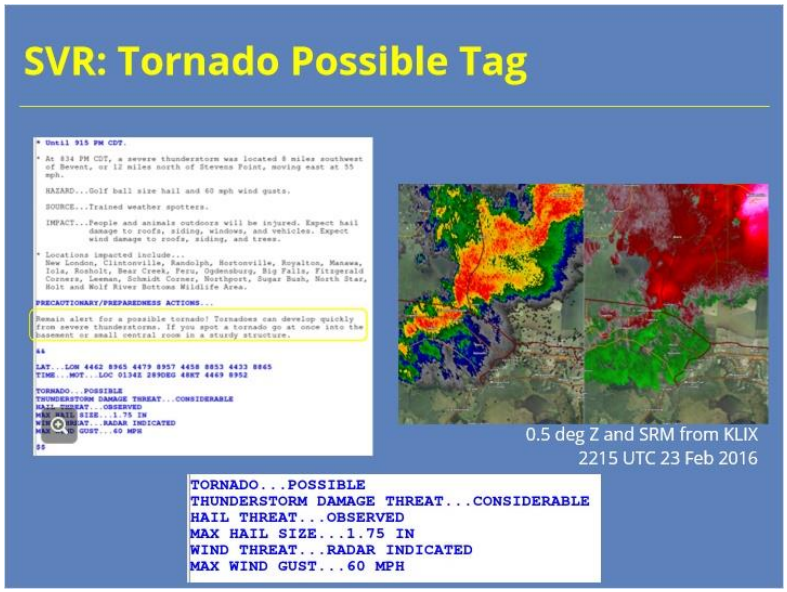


Notes:

Severe thunderstorm warnings will be assigned a destructive tag if you select a hail size of 2.75 inches (baseball size) or greater, or if you choose a wind speed of 80 mph or greater. As with the considerable impact level, choose a call to action with an (E), or if needed, special calls-to-action that are not marked. Text in the warning will populate with a leading headline that reads ”This is a destructive storm for” (if the warning is drawn with a point) or ”These are destructive storms for” (if the warning is drawn with a line) and prompts you to fill in the location. This is similar to a tornado emergency, where you should include the location or locations that you are most confident will be impacted by the destructive conditions. In some cases, such as a lone supercell producing large hail in remote areas, that might be a small town or tiny part of a county; in others, such as a high-end derecho, it could be most or all of a county or several counties. Again, text in some of the calls to action that you can select with the excessive (E) label can contain increasingly elevated wording, such as the example for wind here, or may need editing to replace framed text. At the bottom of the warning, in the tag block, the destructive impact tag now appears. Additionally, the destructive tag on a severe thunderstorm warning now will activate the Wireless Emergency Alert (or WEA) system the first time it is issued – that is, with a new warning or with the first SVS update that upgrades to include the tag. Because of the WEA activation, we encourage you to be especially careful to keep the polygon drawn close to the hazards and include as little false alarm area as possible. Segment your severe thunderstorm warnings, as we have learned in other training modules, to group together similar hazards.

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SVR: Tornado Possible Tag

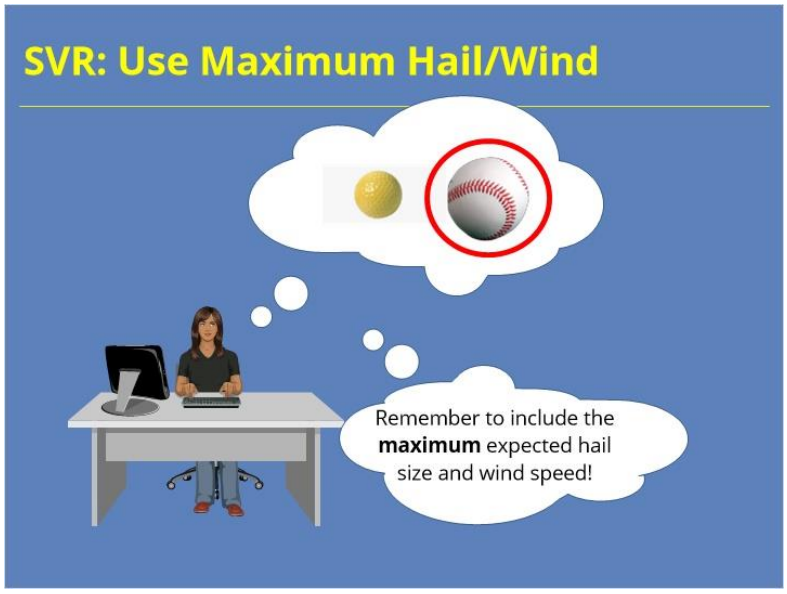


Notes:

The “tornado possible” tag is used in severe thunderstorm warnings for situations in which a severe thunderstorm has some potential for producing a tornado, but forecaster confidence is not high enough in having an imminent tornado risk to issue a tornado warning. It would make sense to apply the “tornado possible” tag, for example, when you are issuing a severe thunderstorm warning for a QLCS with smaller, embedded tornado warnings. You also could apply this tag with severe thunderstorms in an environment that you believe will be conducive to tornado development, such as initial supercell development within tornado watches before storms are mature enough to produce tornadoes. It is not a tag that is appropriate to apply to every severe thunderstorm warning, of course; many severe thunderstorms do occur in environments that are not conducive to tornadogenesis. There are only two places in the warning where a tornado will be mentioned with the “tornado possible” tag: in the call-to-action and in the tags. When a “tornado possible” tag is applied, you should also make sure you manually select the “tornado possible” call-to-action statement. Often, these warnings require especially careful monitoring and updating to be ready to issue a tornado warning if needed.

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SVR: Use Maximum Hail/Wind



Notes:

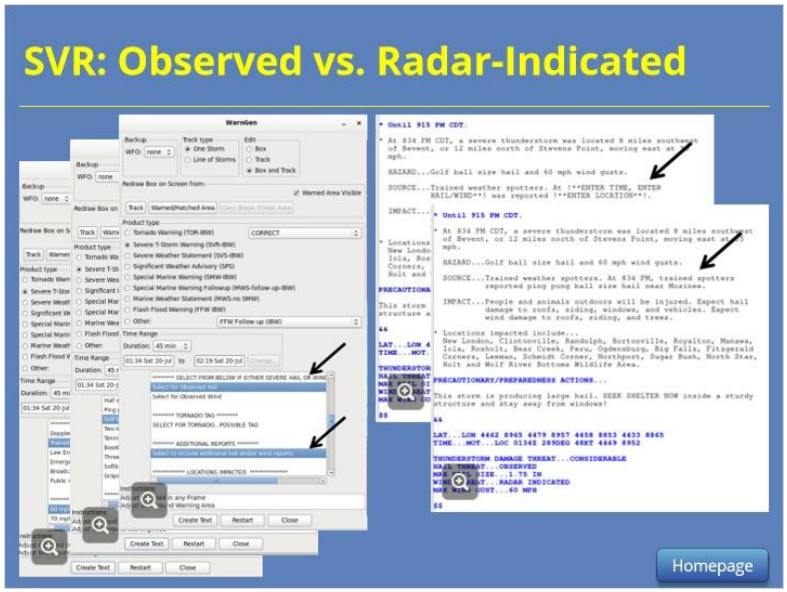
When you are making your choices for hail size and wind speeds, be sure to select the size and speed that you have assessed based on radar and environment. These will be the same as or higher than the reports you include, never lower. For instance, if you believe a storm has baseball size hail, but your latest report is for golf ball size hail, select baseball size in the options and then include the report for golf ball size hail in the "additional reports" section.

It is very rare that we actually sample the largest hail size or highest wind speed with the reports that we receive. Research by Blair et al. in 2017 also supports that we rarely receive reports for the actual largest hail size in a storm and that NWS warnings routinely underestimate maximum hail size, giving us more support to put the largest hail size that we think the storm could produce into the warning instead of "playing it safe" and using more conservative estimates – that is, of course, assuming that you have a supportive environment and storm structure.

And, if you receive a report that is between thresholds, such as a 65-mph wind gust, you'll want to round up to 70 mph rather than down to 60 mph as the wind gust potential in your warning.

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SVR: Observed vs Radar-Indicated



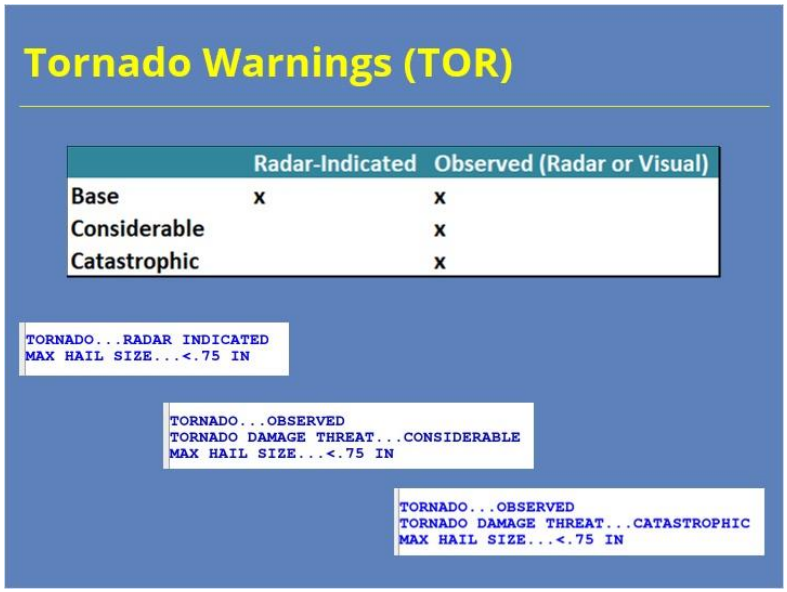
Notes:

Let's go through the warning interface to talk more about what to do when you receive a report that is a lower intensity than what you have in your warning - which, again, should usually be the case. You can and should communicate both the reported intensity and the maximum possible intensity in the text of a warning or statement. First, select the source of the report as the source of the warning, such as a trained spotter or law enforcement. Then, in the hazards, select the maximum hail size and wind speed you believe the storm is capable of producing. For example, if you received a report of ping pong ball size hail but believe the storm is capable of producing golf ball size, then select golf ball hail from among the hazards. Just below the hazards, you must select "Observed hail" or "Observed wind" to relay through the warning's tags when you have reports for hail or wind.

Below that is an option, "Include Additional Reports," that allows you to add text about the report; select this so that you can provide the specific report time, location, and observation. When you select "Include Additional Reports," WarnGen creates framed text in the warning in the location specified by the directives (NWSI 10-511), and you can edit the framed text in the report statement to indicate the source, time, location, and hazard reported. Note: selecting both "observed wind or hail" and "include additional reports" must be done manually after you've selected an observed source for the warning. WarnGen does not do these automatically, which means that it's possible that you could accidentally select "radar indicated" in the warning and provide observations. These would be contradictory and confusing, so be sure to take the time to work through these steps accurately.

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Tornado Warnings (TOR)



Notes:

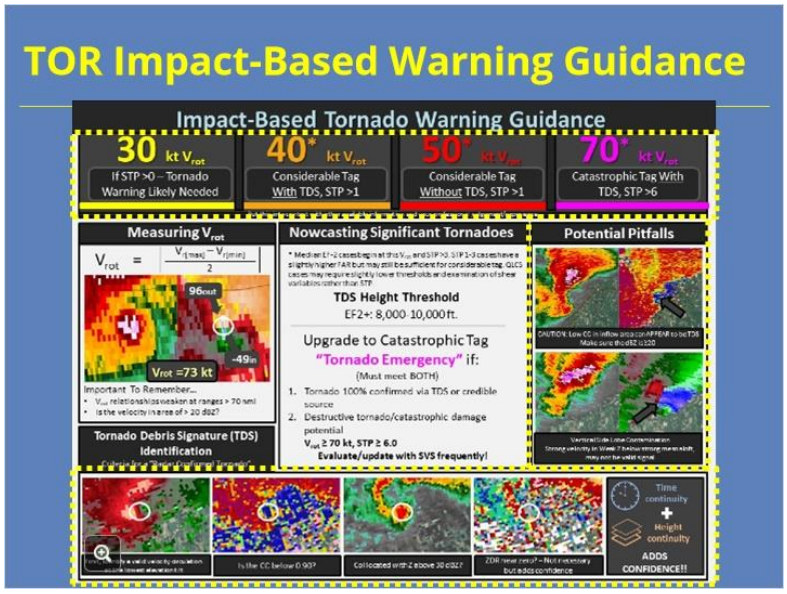
Let's move on to the tags that can be applied to tornado warnings. These are the tornado impact tags for tornado warnings and severe weather statements (or SVSs), as delineated in the NWS directives (NWSI 10-511).

There are three accepted tornado damage threat categories that provide information to partners and the public on the type of potential tornado damage and magnitude: base, considerable, and catastrophic.

Base-tagged warnings can be either radar-indicated or observed, and observed can be either radar-confirmed or visually observed. Considerable tags should be used when there is radar or visual observational evidence of a tornado capable of producing considerable damage – in other words, confidence should be high that a tornado is occurring. For a catastrophic tag, NWS directives specify it must be used only when there is direct observational evidence of a tornado - again, that can be a highly confident radar confirmation or a visual observation. You can issue either warnings or statements with any of the three tags, and you have the flexibility to change the tag (either up or down) by using update SVSs during a warning as well as by issuing a new warning.

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TOR IBW Guidance



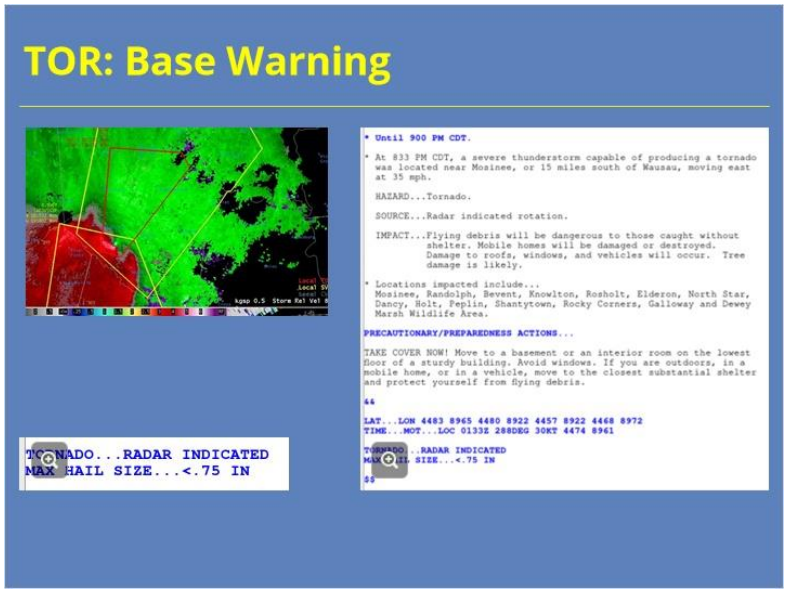
Notes:

The Impact-Based Tornado Warning Guidance graphic here will help support your warning decisions. At the top, notice the guidelines for rotational velocity thresholds: at 30 kts, a tornado warning may be needed if the environment also supports tornado development. If rotational velocity reaches 40 kts with a TDS, or 50 kts without one, then an upgrade to a considerable tag may be needed. At 70 kts of rotational velocity, with a confirmed tornado and in an environment that supports strong tornadoes, an upgrade to a tornado emergency may be needed. Keep in mind that the thresholds have fuzzy boundaries. Persistence of the features matters, as do storm history and the near-storm environment. Beware of pitfalls and look-alike signatures, including side-lobe contamination and low-CC signatures in the inflow notch. True tornado debris signature components include a velocity couplet, low CC (usually embedded within and surrounded by higher values), high spectrum width, and near-zero ZDR in the presence of reflectivity above 30 dBZ. Check the height of the tornado debris signature as a proxy for intensity.

A copy of this infographic is available in the “Resources” tab and also will be handed out during the RAC workshop.

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TOR: Base Warning



Notes:

Base tornado warnings are used in the majority of tornado warning situations. The warning can be radar-indicated, radar-confirmed, or observed. Part of the reason base tornado warnings are more common is that they are intended to be issued with lead time, before the tornado has formed – unlike considerable and catastrophic tags, which are issued with confidence of a tornado already on the ground. Remember, you can upgrade the tag with an SVS update or a new warning after a tornado develops and intensifies, if its conditions warrant an upgrade.

As with a base severe thunderstorm warning, the impact tag is not included at the base level. The tornado threat will be tagged as radar-indicated or observed, depending on what you select as a source. Note that both radar-confirmed and human-observed tornadoes will be tagged as observed.

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TOR Considerable Tag

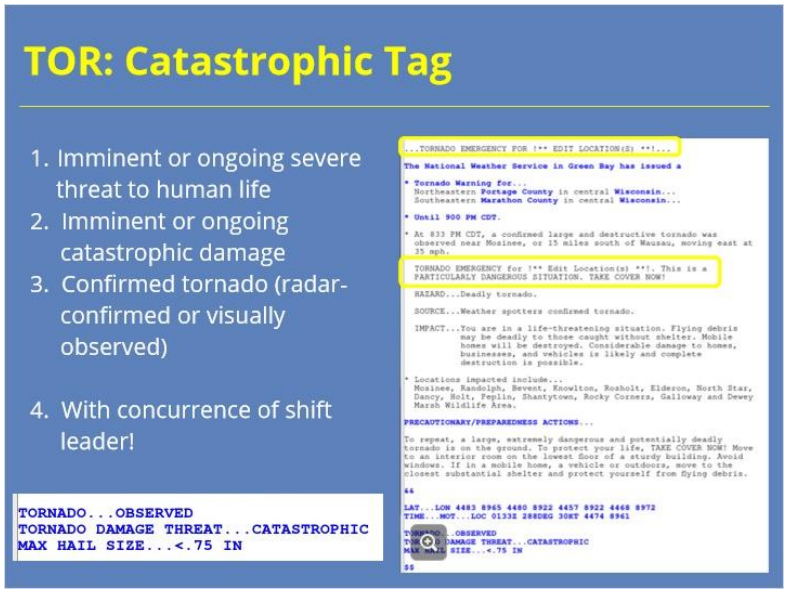


Notes:

The next level of impact tag for tornado warnings is the considerable tag. The intent of impact-based warning tags is to give forecasters a way to distinguish the potential for a high-impact event in warnings and follow-up statements. The considerable tag is targeted toward significant tornadoes, but don't try to pinpoint or forecast EF-scale ratings. The headline that “This is a particularly dangerous situation,” along with enhanced impact statements, provide high-intensity cues for partners and the public. There should be a preponderance of evidence that the tornado is on the ground. That confirmation can be visual, such as a report from a reliable source like trained spotters, trusted storm chasers, or live cameras. It also can be radar-based, with confidence in the presence of a tornado debris signature along with the higher rotational velocities that support the existence of a strong or violent tornado. The considerable tag should be selected only for those tornado warnings where the storm signatures and reports provide high confidence in the presence of a tornado, with the possibility of a significant tornado.

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TOR Catastrophic Tag



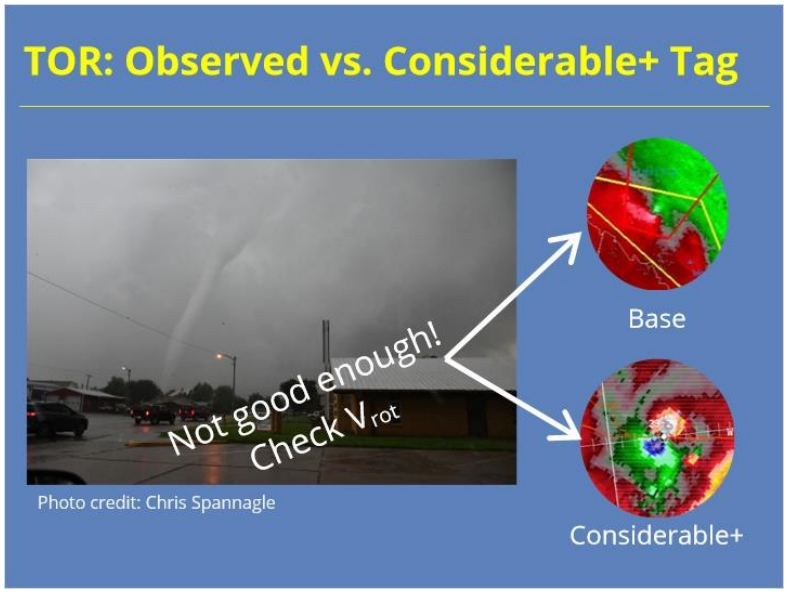
Notes:

In exceptional circumstances, the conditions might warrant issuing a catastrophic tag, which is also a tornado emergency. The label should be reserved for the most extreme of circumstances, the kind that rarely, if ever, happen in any one meteorologist's career. Before issuing a tornado emergency, all of the following criteria must be met, beyond a reasonable doubt. First, there must be an imminent or ongoing severe threat to human life. Second, catastrophic damage must be imminent or ongoing. Third, there must be confirmation of a tornado on the ground. As with a considerable tag, that confirmation can be either visual or radar-based. If confirmation is visual, the reports should be from trusted sources and substantiated by radar signatures. If it is radar-based, the forecasters should have absolute confidence in the diagnosis of a tornado debris signature combined with high-end rotational velocities in the tornado vortex signature. The decision to issue a tornado emergency requires concurrence from the shift leader on duty. Given the gravity of the tornado emergency label, it should never be a single forecaster's choice, but rather a team decision with input from all available and on-duty meteorologists and supervisors.

Put another way, you would issue a tornado emergency with high confidence of a likely violent tornado, in an environment that supports its persistence. You can apply the tornado emergency tag in both new warnings and in SVS updates. With a tornado emergency, you will use the catastrophic damage tag in addition to manually selecting tornado emergency from the options within the WarnGen interface. It is important to include both steps if you are issuing a tornado emergency. The wording within the warning elevates another step, with a headline at the top of the warning that reads "Tornado Emergency For" and requires you to specify a location. If you are on the fence and don't have that high confidence, keep in mind that a considerable tag does contain elevated wording and will provide a highly visible cue that you have confidence in a high-impact tornado. You should be absolutely sure that the situation warrants a tornado emergency when you issue it.

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TOR: Observed vs Considerable

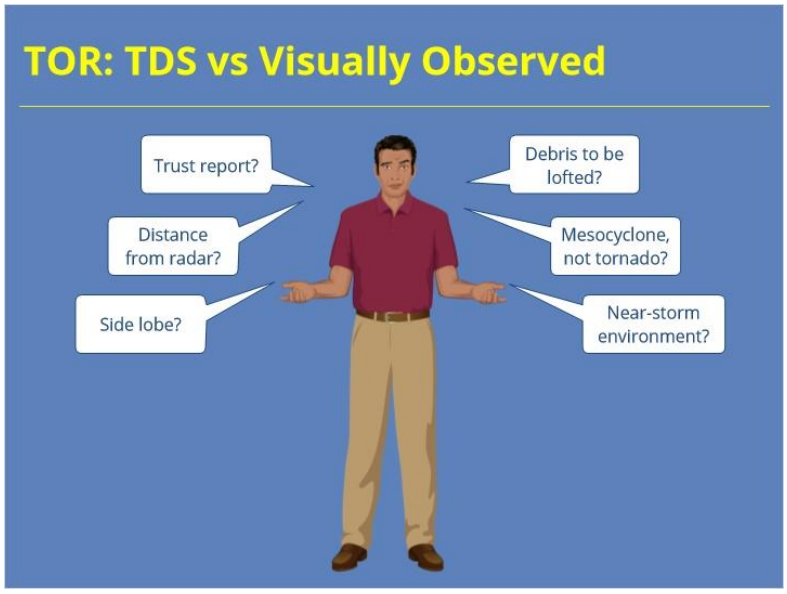


Notes:

I want to re-emphasize here that a tornado being observed either via TDS or visually does not, by itself, warrant a considerable or catastrophic tag, even if it is in a city or populated area. Make sure you check the rotational velocity and check for a TDS before making the decision to apply a higher tag to a tornado warning. Considerable and catastrophic tags are reserved for tornadic storms with rotational velocity above thresholds that are demonstrated by peer-reviewed research to support the likelihood of a significant to violent tornado. This does not apply in every situation or even in most situations when there is an observed tornado.

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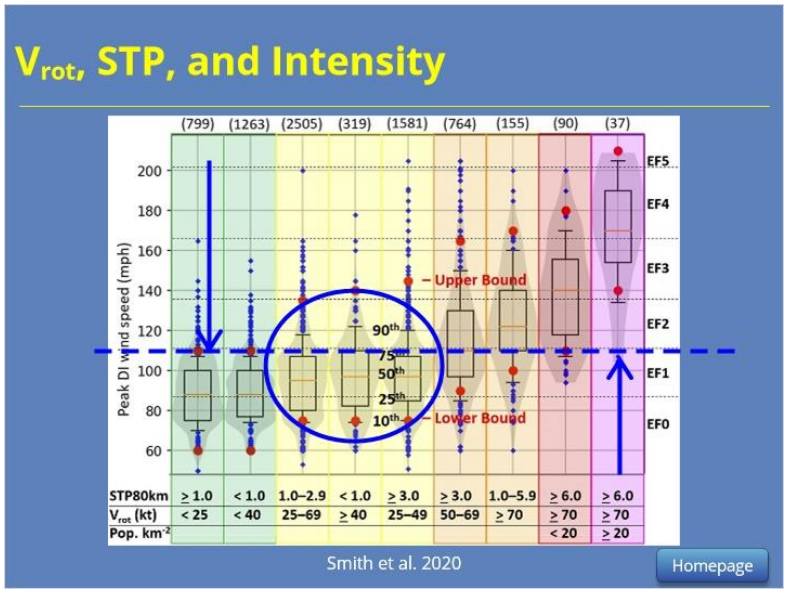
TOR IBW Guidance



Notes:

The IBW guidance does raise the question: If there is no TDS, but there is a tornado report, is that enough to warrant the considerable or catastrophic tags? The answer is that it depends. If the tornado is in an area where there might be little to create lofted debris, such as areas where there is a relative lack of trees or structures, then the report can be a sufficient substitute for confirmation. If the tornado is in an area where you would expect debris could be lofted, such as from trees, homes, or other buildings, then why isn't it appearing on radar? Do you trust the report, and how old is it? How far is the potential tornado from the radar? Are you looking at side lobing? Is it possible that the storm is producing a strong mesocyclone but not a tornado? What does the environment support? You'll need to dig deep and lean hard on environmental cues and radar presentation. In short, there is no clear yes-or-no answer. (Ref: Bentley et al. 2021)

Rotational Velocity and Intensity



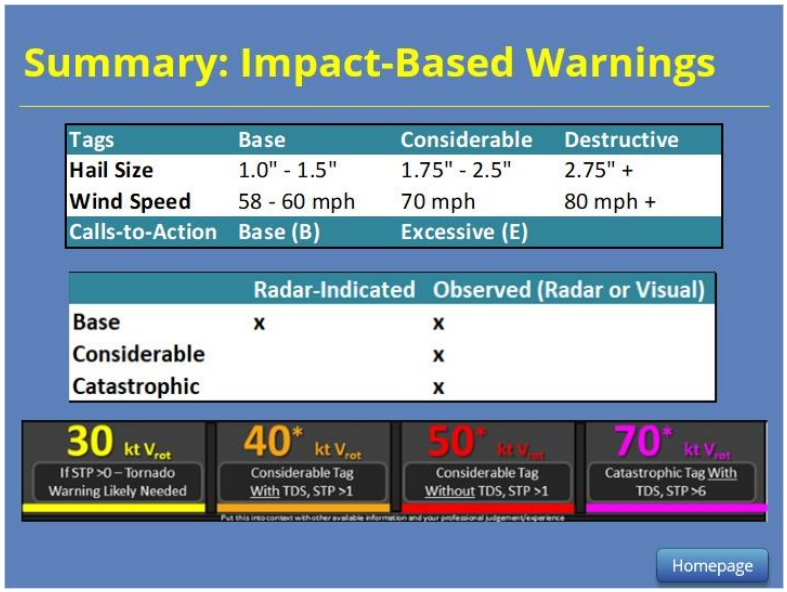
Notes:

We have talked about what the tags are and how to use them, so now let's talk about the "why" and the background a bit more. This climatology by Smith et al. in 2020 (which is linked in the resources) shows a relationship between increasing maximum 0.5-degree rotational velocity (or Vrot) and significant tornado parameter (or STP) on the EF-scale of occurring tornadoes. The violin plot we are showing here highlights the separation, especially as rotational velocities increase above 50kt with higher STP. Note that there is virtually no overlap between low-STP environments and high-STP, high-Vrot environments. There is, however, a fair amount of overlap in the middle, with mid-range STP and mid-range rotational velocity.

Again, we are not trying to pinpoint tornado intensity by EF scale. (For one thing, we can't forecast damage indicators in the path!) We are just trying to "ring the bell" a little louder for higher-impact tornado events. Keep in mind that the value of your role in the warning decision process is in staying situationally aware and considering a wide variety of factors to stay one step ahead of the tornado threat and to communicate the possible impacts.

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Summary



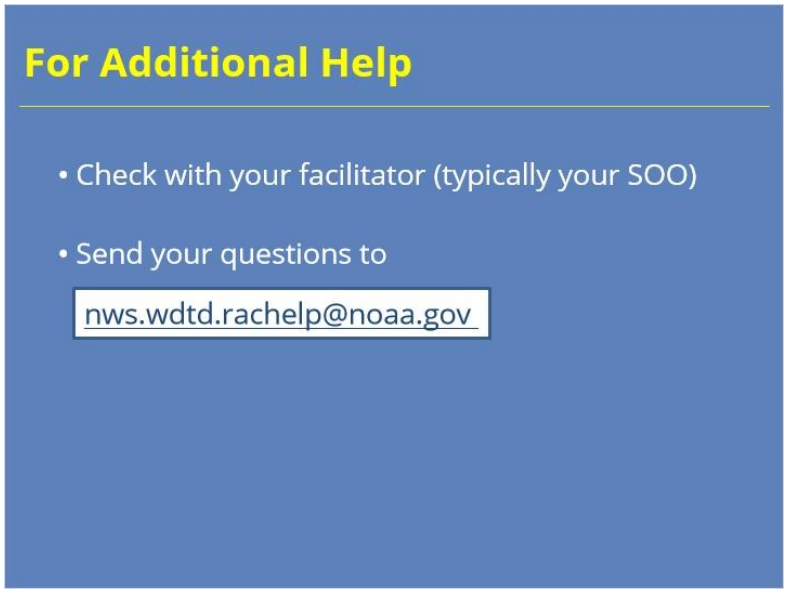
Notes:

To summarize, both severe thunderstorm and tornado warnings use impact-based tags to categorize the potential impacts of severe thunderstorms and tornadoes. Severe thunderstorm warnings are tagged as base, considerable, or destructive and are triggered by the hail size or wind speed selected in the warning, using whichever has a higher impact. These can be either radar-indicated or observed, which must be selected manually for both hail and wind threats while creating the warning text.

Tornado warnings are tagged as base, considerable, or catastrophic and are selected manually by the warning meteorologist. Considerable-tagged tornado warnings should have rotational velocities of 40 kt or greater with a TDS, or 50 kt or greater without one, with high confidence that a tornado is on the ground, either with radar confirmation or visual observation. Catastrophic-tagged tornado warnings, with tornado emergency wording, must pose an imminent danger to human lives and property. They must be either radar-confirmed or visually observed, with rotational velocity of 70 kt or greater and in an environment with STP of 6 or higher.

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For Additional Help



Notes:

For additional help, check with your facilitator (typically your SOO) or send your questions to the listserv e-mail address here.

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After the Warning Is Issued

After the Warning Is Issued

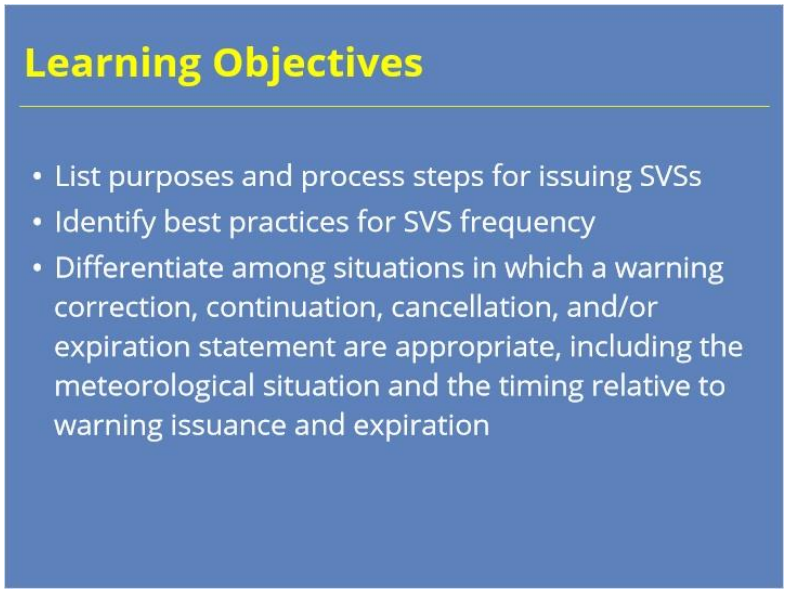


Notes:

Welcome to RAC Warning Fundamentals. This module covers products after the warning is issued, including severe weather statements and corrections.

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Learning Objectives

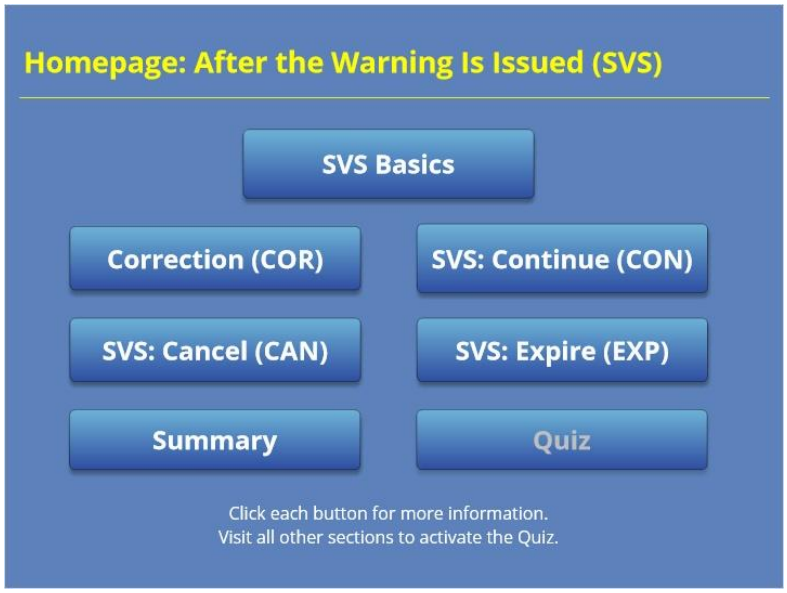


Notes:

After completing this lesson, you will be able to list the steps to issue a Severe Weather Statement (or SVS), identify best practices for frequency of issuing SVSs, and differentiate among situations that would require a correction or an SVS to continue, cancel, or expire the warning.

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Homepage: After the Warning Is Issued



Notes:

Welcome to the home page for this module. Click on the buttons to learn more about the various ways to follow up after a warning is issued. View the summary when you have gone through each product type. Finally, take the quiz to get credit for completing the module. The quiz button will activate after you have visited all other sections.

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SVS Purposes

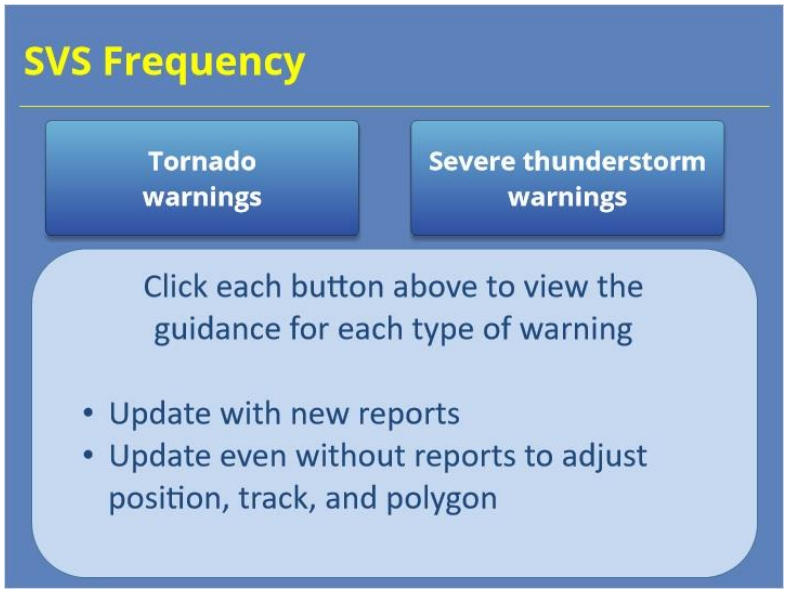


Notes:

SVSs are an integral part of the communication chain to our partners and the public. An SVS refreshes the message about the severe thunderstorm or tornado warning, which allows the media to update their messaging. Emergency managers and first responders can shift from shelter to response more quickly with updated messaging from their local NWS office. SVSs also refresh the message of the warning on NOAA weather radio and on our webpages, as well as to private sector vendors who are relaying the warnings. Additionally, issuing an SVS allows the office to remove areas no longer at risk, by taking areas out of the polygon where the threat has passed. SVSs automatically update the warning polygons and associated text on commonly used radar platforms. Even if a partner or user doesn't know what an SVS is, it is likely they are seeing the results of SVSs on their TV scrolls, phone apps, and websites. SVSs should be viewed as a decision support and communication tool, allowing the warning meteorologist to reach partners and the public directly and communicate clearly the changes in threat during a severe thunderstorm or tornado warning.

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SVS Frequency



Notes:

Directives provide a lower limit on the number of SVSs required during a warning, and additionally, there are some best practices to ensure the flow of information to our partners and the public. NWSI 10-511 stipulates that WFOs should issue an SVS at least once during a warning, and that WFOs should issue more frequent updates to keep the public informed of the progress of storms. Additionally, the directive adds that if an office is using the pathcast option, they should update the warning at least every 15 minutes.

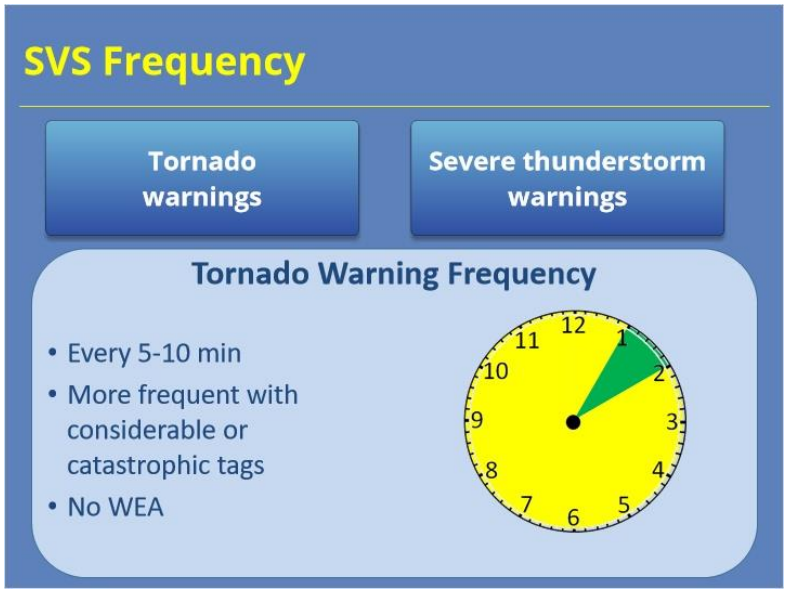
For tornado warnings, a good rule of thumb is to issue an SVS every 5 to 10 minutes during the warning. Consider the more frequent updates, as much as every 5 minutes, in high-impact situations, such as when a considerable or catastrophic tag is applied. An SVS on a tornado warning will not trigger the WEA system.

For severe thunderstorm warnings, aim for issuing an SVS at least every 10 to 15 minutes, with more frequent updates for severe thunderstorms that reach the criteria of a damaging tag. An SVS can trigger the WEA system if it upgrades to a “damaging” tag for the first time in that warning’s life cycle.

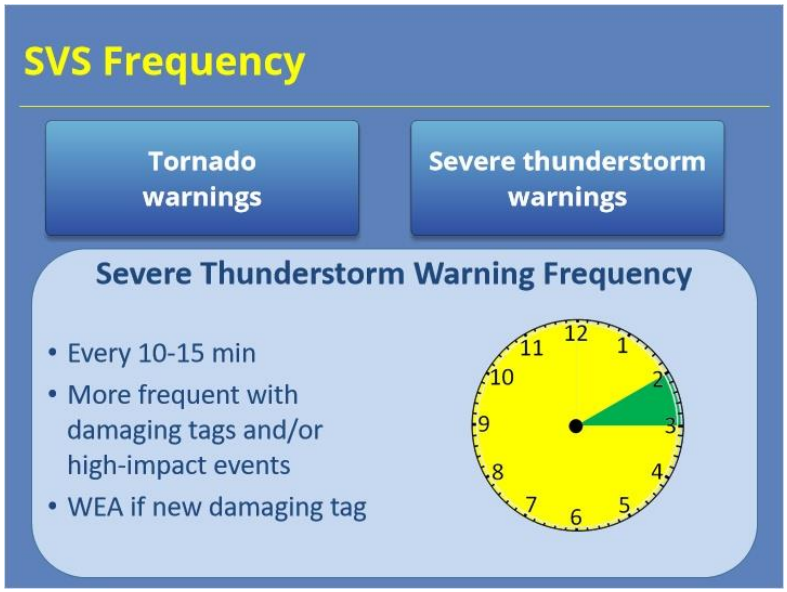
New reports of severe weather usually should prompt issuing an SVS right away, regardless of how long it has been since the warning or SVS issuance, and statements should include the new reports in their text. If more than one report comes in within a few minutes of the same type of hazard and in about the same location, it is OK to issue one SVS to update based on those reports. It’s also important to issue an SVS when the threat type or intensity changes, such as when radar signatures or reports indicate a bigger hail size than the initial warning or when a tornado goes from being radar-indicated to reported. That said, even without reports, the position of the storm changes and warrants updating the warning so that the tracking is more accurate and the warning polygon can be trimmed.

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Tornado warnings (Slide Layer)

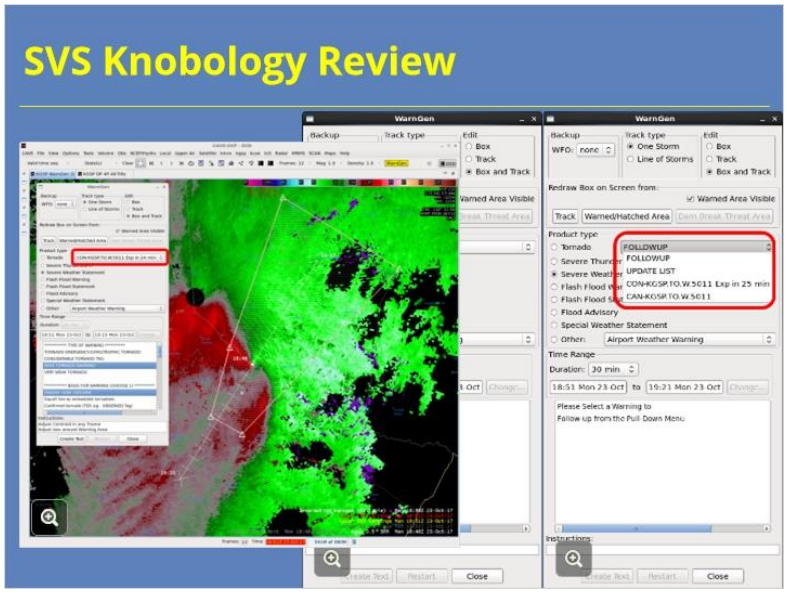


Severe thunderstorm warnings (Slide Layer)



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SVS Knobology Review



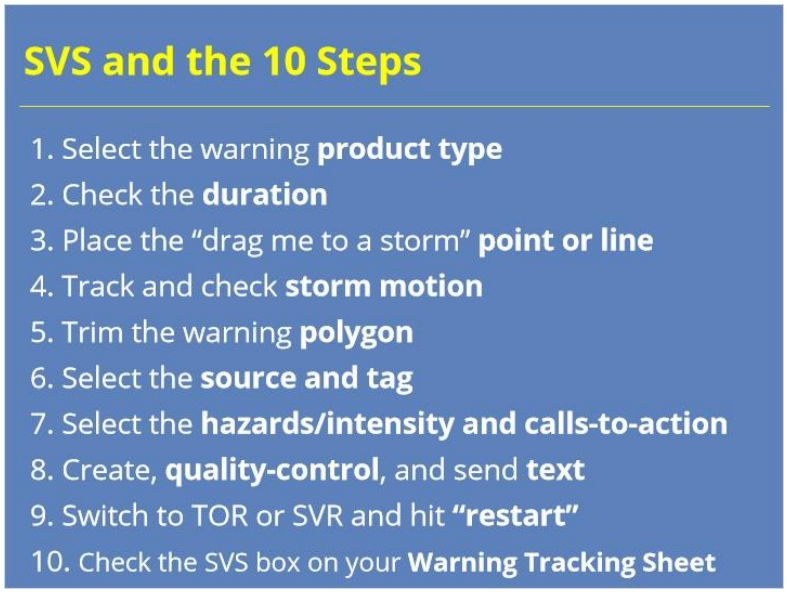
Notes:

When you are ready to issue an SVS, select “Severe Weather Statement” in the WarnGen product list. There are two ways you can select which warning you are updating. The first way is to use the drop-down menu and select using the warning number. This can be cumbersome if there are a lot of warnings issued at the time, though. The second way, which is often faster, easier, and more accurate, is to right-click in the polygon of the warning you wish to update. The correct warning will be selected automatically in the list in the WarnGen window. From there, possible SVS options may include continuing the warning, canceling it, or expiring it, depending on how much time is left until the warning expires.

Note: if you right-click while “Severe thunderstorm warning” or “Tornado warning” is the selected product type, the options will default to either a correction or a “reissue” for a new warning, depending on how long it has been since you issued the warning. This is why the first step in the “10 Steps to Issue a Warning or Statement” is critical: check the product type and make sure it’s what you intend!

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SVS and the 10 Steps



Notes:

When you issue an SVS, you will follow all of the steps in the "10 Steps to Issue a Warning or Statement." If you'd like a refresher on the 10 steps, the web module is linked in the resources. The PDF document of the 10 steps also is linked there.

Step 1 starts with choosing the correct product – "Severe Weather Statement" – and also the correct type of severe weather statement, just as we talked about on the previous page. Moving to step 2, the duration of the warning is the same as the original warning if you are correcting, continuing, or expiring the warning. A cancellation will end the warning as soon as you hit "send".

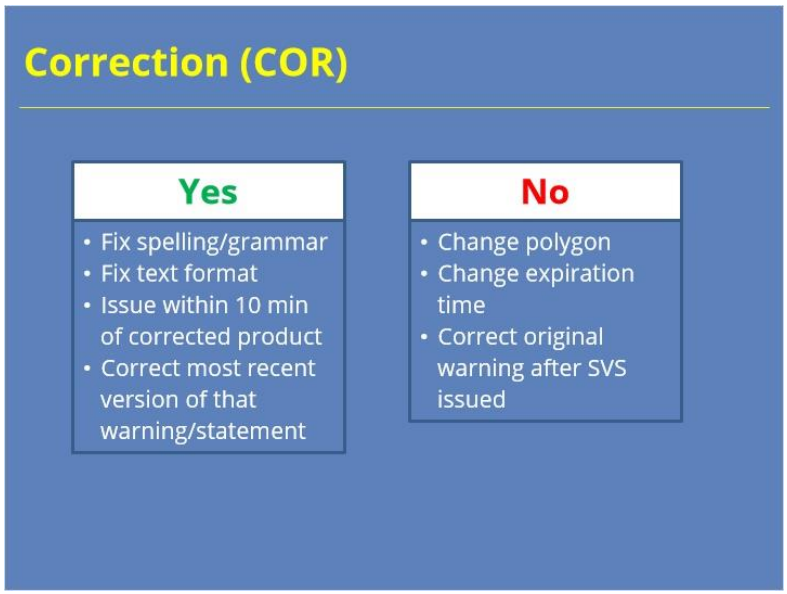
In step 3, you'll be able to move the "drag me to a storm" tracking point or line to the appropriate place on the storm, then go through step 4 and re-trace the motion of the storm. These are important steps, so please don't overlook them in your warning process! A correct track and position ensures an accurate list of locations impacted and, if you are using the pathcast option, also adjusts the timing. For step 5, trim the areas of the polygon that are no longer at risk for severe weather. Keep in mind that you cannot expand a warning in an SVS, so don't fuss too much about making sure your vertices are at the edges of your previous polygon - it'll snap back to the edges of your original polygon.

You'll need to check all of the selections in the text interface for steps 6 and 7, including tags on tornado warnings, source of the warning, "additional reports" if there is a new report to include in the warning, hail size, wind speed for severe thunderstorm warnings, and a call-to-action statement (maybe two tops, if there is a special case). Create your text, and do not skip the quality-control part of step 8 – it is the last chance to make sure the warning still states what you intend it to say!

After you send the statement, there is a difference in step 9 from creating a new warning: you have to click on either "tornado warning" or "severe thunderstorm warning" in the product type before you can hit "restart" to clear out the tracking line and polygon outline. Finally, at step 10, put a check in the "SVS" or "expire/cancel" column of your tracking sheet, so that you can see that you've come back to this warning.

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Correction (COR)



Notes:

A correction (or C-O-R, COR) allows you to correct the text of a severe thunderstorm or tornado warning or a follow-up severe weather statement. It is primarily there for fixing spelling and grammar mistakes and formatting errors. You may not change the shape of a polygon with a correction - you'll need to issue an SVS to shrink it, and no warnings can be expanded in size once they are issued. You also cannot change the expiration time of a warning via correction.

Within 10 minutes of issuing a warning, if you right-click on the warning with the "severe thunderstorm warning" or "tornado warning" product type selected, the default product in the drop-down menu will be a "COR," or correction. After 10 minutes, a correction is no longer possible; the best course of action would be to issue an SVS.

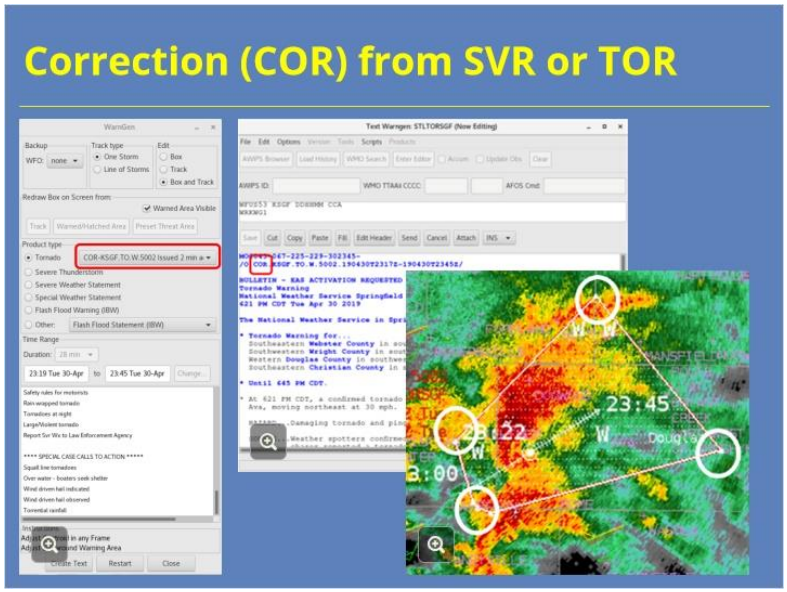
Within 10 minutes of issuing a statement, if you right-click on the warning with "severe weather statement" product type selected, COR will be one of the available product types in the drop-down menu. After 10 minutes, a correction is no longer possible; the best course of action would be to issue a new SVS.

You can only correct the most recent version of the severe thunderstorm or tornado warning. Once you have issued an SVS on a severe thunderstorm or tornado warning, you can no longer issue a correction on the original warning. You also can only correct the most recent SVS on a warning.

As long as you are not within 10 minutes of a warning expiring, you can always issue an SVS for the warning and forego issuing a correction.

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Correction (COR) from SVR or TOR



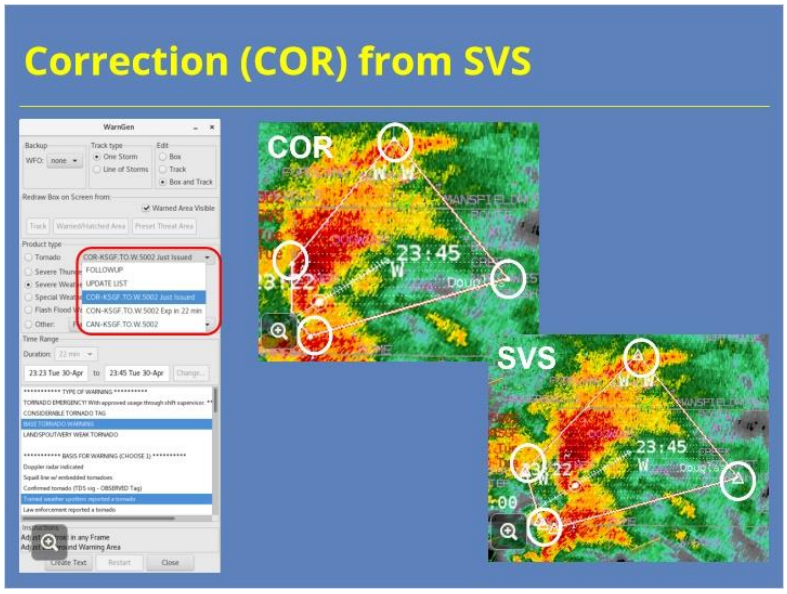
Notes:

Let's look at the correction process more closely. For a newly issued tornado or severe thunderstorm warning, when you right-click to select your warning, the default option in the drop-down menu will be a "COR." Because you cannot change the duration or the polygon with a COR, you will skip ahead to step 6 in the 10 steps, entering the text interface. You can make any changes here, then create and quality-control the text. Note that the label COR will appear in the VTEC code at the top of the warning.

Take note: a common stumbling point is to right-click on an active warning with TOR or SVR selected, when you meant to issue an SVS. You'll notice that the polygon vertices are not editable when you do that – they are small, solid triangles instead of larger, open triangles. To save yourself from the error, stick with the 10 steps process. Step 1 is making sure you have the correct product type selected from the WarnGen interface.

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Correction (COR) from SVS

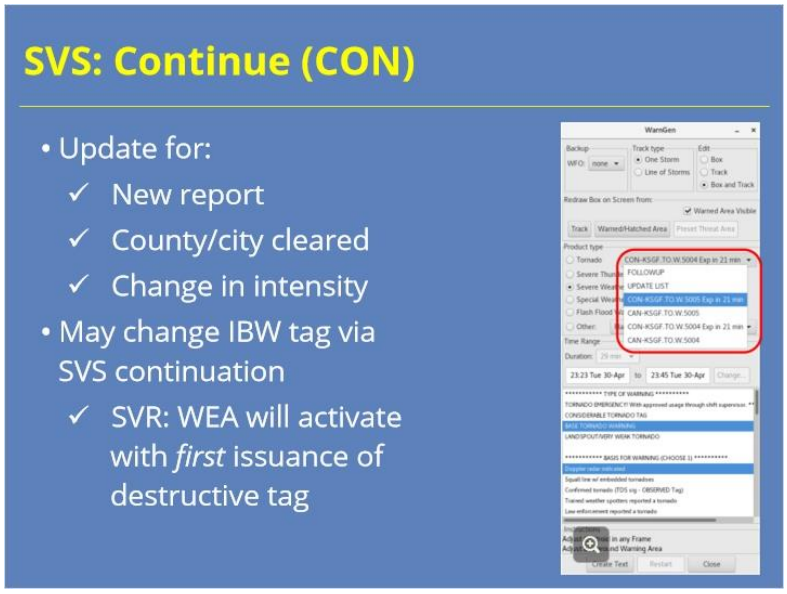


Notes:

For a severe weather statement, you again can correct it within 10 minutes, and a COR will be the default option when you right-click on the polygon. The vertices will not be editable with a correction, just as they are not editable when issuing a correction for a severe thunderstorm or tornado warning. Again, note the difference between the vertices of a correction, which are small solid triangles, and the vertices of an SVS update, which are larger, open triangles. Corrections to SVSs are not very common, as you are likely to just issue a new SVS in most cases if you notice an error in the product, but they are possible. The difference to the end user is almost not discernible, as most web pages and applications show the most recent update to the warning regardless of whether it was a correction or an SVS.

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SVS: Continue (CON)



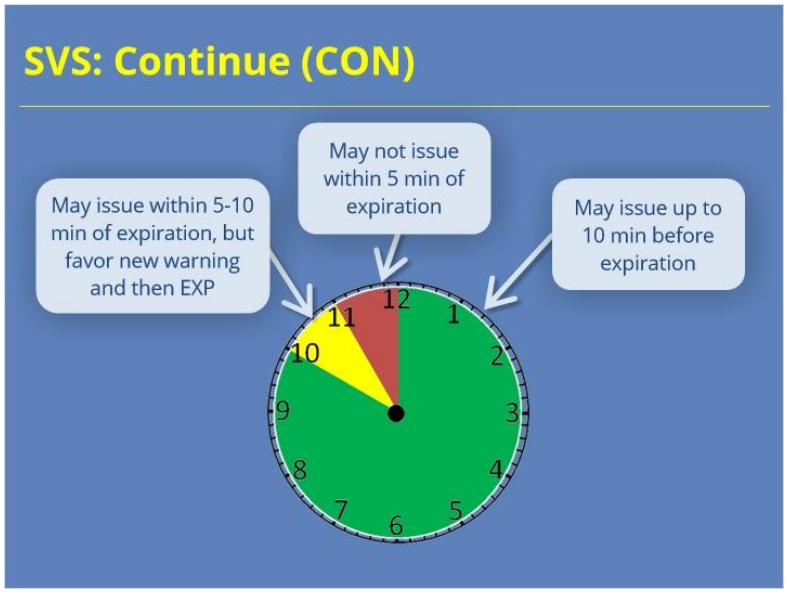
Notes:

Continuation (or C-O-N) statements communicate that the warning threat continues within the updated warning area. Remember, some of the things that might warrant an update include a new report, a county or city being cleared from the threat, or a change in the storm's intensity (either upward or downward), especially if it warrants a change in the storm's IBW tag. And yes, you may change the IBW tag of both severe thunderstorm and tornado warnings in an SVS continuation statement. Note that for severe thunderstorm warnings, the WEA system will activate with the first issuance of a destructive tag, whether that is in the initial warning or an SVS update.

In the process of issuing the continuation, remember to go through all 10 steps, and don't skip any steps in the process.

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SVS: Continue (CON)

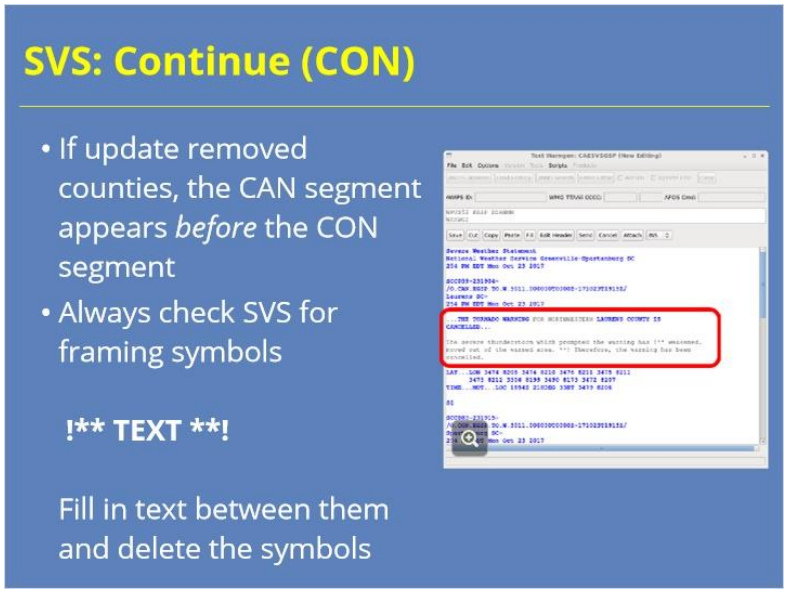


Notes:

You can issue an SVS to continue a warning anytime from as soon as it is issued through up to 5 minutes before expiration. That said, because you can also use an expiration statement starting 10 minutes before the expiration time, issuing a new warning and then an EXP will usually be your preferred option within 10 minutes.

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SVS: Continue (CON) with Cancellation (CAN) Segment



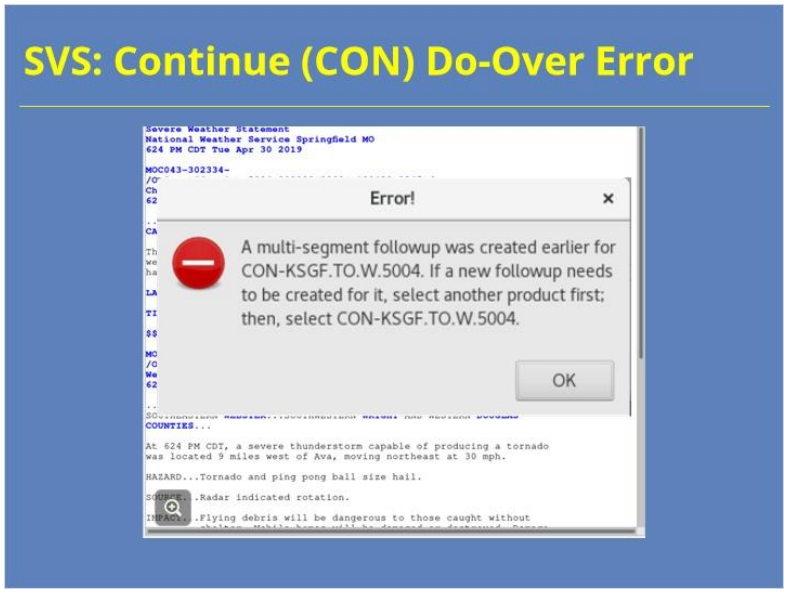
Notes:

As you update the warning, trimming the polygon may remove some counties from the threat. These will appear as the first group in the text of the SVS as a cancellation segment for just those counties, with a continuation for the remaining counties in the polygon as the second segment. If you meant to issue a continuation and see cancellations when you create your text, don't panic! Scroll down and look for the continuation segment. If it's not there, then you may have accidentally selected a cancellation when you meant to select a continuation. You can check the VTEC code for "CON" or "CAN" to verify what type of SVS you've created. If it's the wrong type, close the text window, check to make sure you've created a continuation, and then create the text again.

As with all SVS statements, make sure you check for framing symbols (!** **!), update the text between them, and delete those symbols. Otherwise, the SVS will not transmit.

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SVS: Continue (CON) Do-Over Error



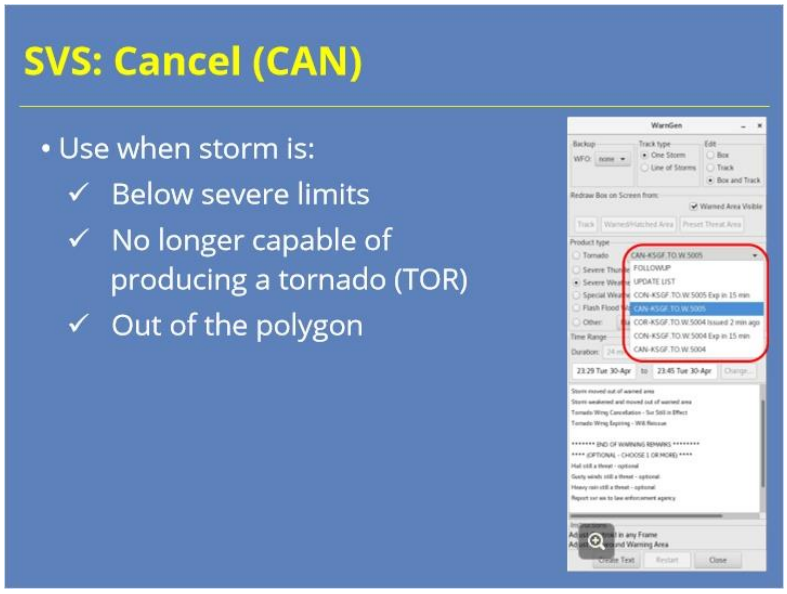
Notes:

Also, there is one “gotcha” here that is specific to the situation when your continuation also includes a cancellation, such as trimming a polygon in a way that takes a county out of the warning. Let’s say you created your continuation text, then found something you wanted to change when you quality-controlled the product, so you hit ”cancel” to close the text window and fix it.

When you hit “Create Text” again to create your continuation after you fixed it, WarnGen throws up this error banner and won’t let you create the text again. When that happens, I’m afraid you have to do one of two things: either select another product type in the WarnGen menu and then reselect the Severe Weather Statement, or unload WarnGen. Either way, you’ll have to start the 10-step process over, then go through the full 10 steps again to re-create the continuation statement. This is just one more reason why being intentional through the 10 steps process is so important, because it can help you ensure you don’t have to cancel and re-create your continuation statements.

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SVS: Cancel (CAN)

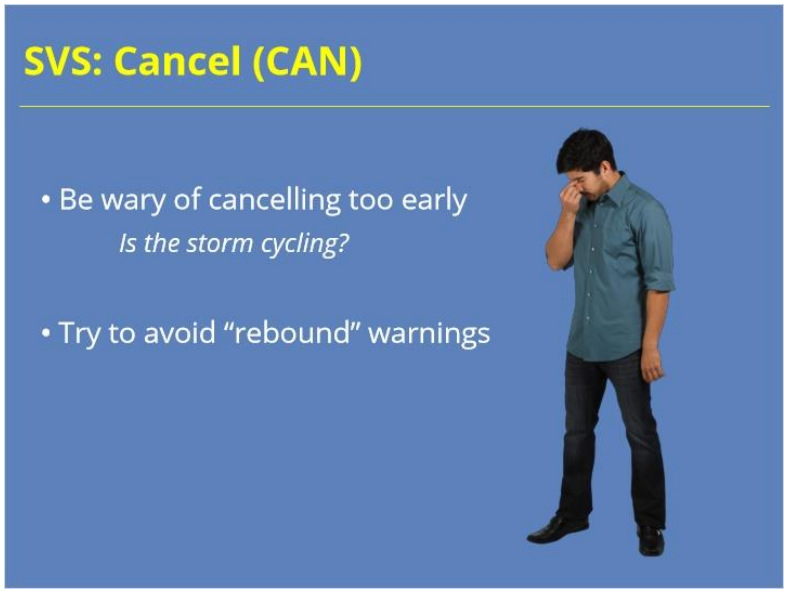


Notes:

You should proactively cancel a warning when you are confident that it no longer poses the risk indicated by the type of warning. Use an SVS to cancel when the storm has weakened below severe limits, such as a pulse storm that has dropped its core already. Cancel a tornado warning when a storm is no longer capable of producing a tornado, such as when a storm moves into stable air and rapidly loses its rotation in the low and mid levels. Finally, cancel a warning if the storm that prompted it has moved fully out of the polygon.

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SVS: Cancel (CAN) - Not Too Early



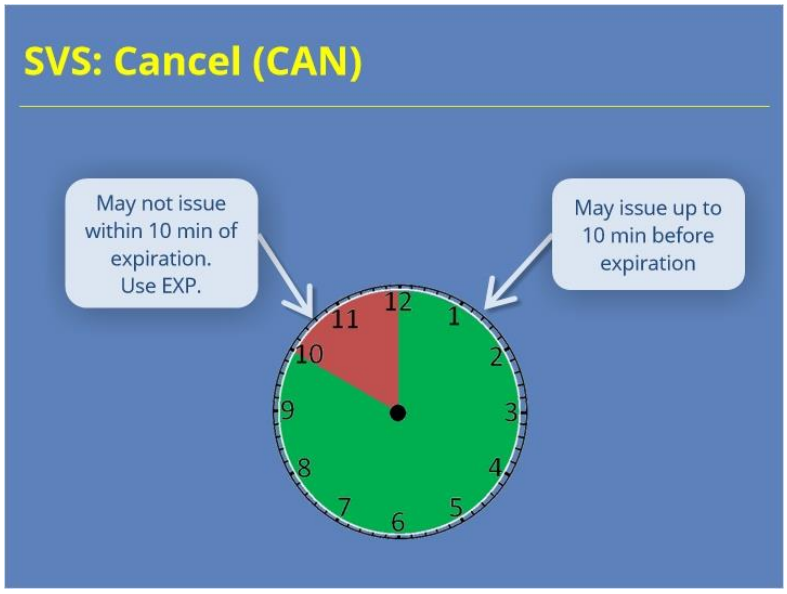
Notes:

The decision to cancel due to decreasing storm intensity is not always straightforward. Be wary of cancelling too early, when a storm is cycling, and make sure you are confident that the threat no longer exists to avoid the need for a "rebound" warning.

If you have a storm that has lost its ability to produce a tornado but may still be severe, you might opt to replace the tornado warning with a severe thunderstorm warning. If you do, make sure that the severe thunderstorm warning goes out before cancelling the tornado warning, so that there is not a gap in warning coverage. This scenario might not always be ideal for messaging, though, and you might sometimes need to let a tornado warning ride until its expiration time, when you then issue a new severe thunderstorm warning for the storm.

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SVS: Cancel (CAN)

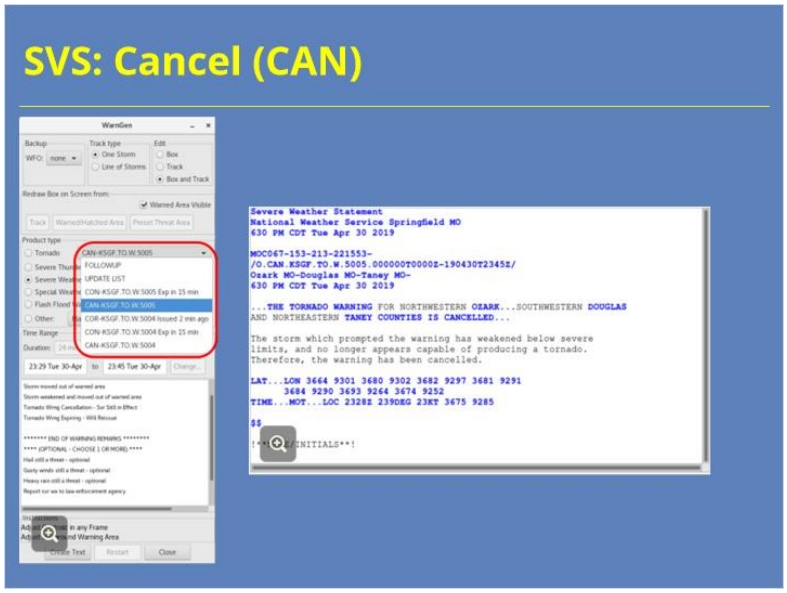


Notes:

You can issue an SVS to cancel a warning anytime from as soon as it is issued through up to 10 minutes before expiration. With 10 minutes or less on the warning, you will use an expiration statement instead of a cancellation.

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SVS: Cancel (CAN) Text

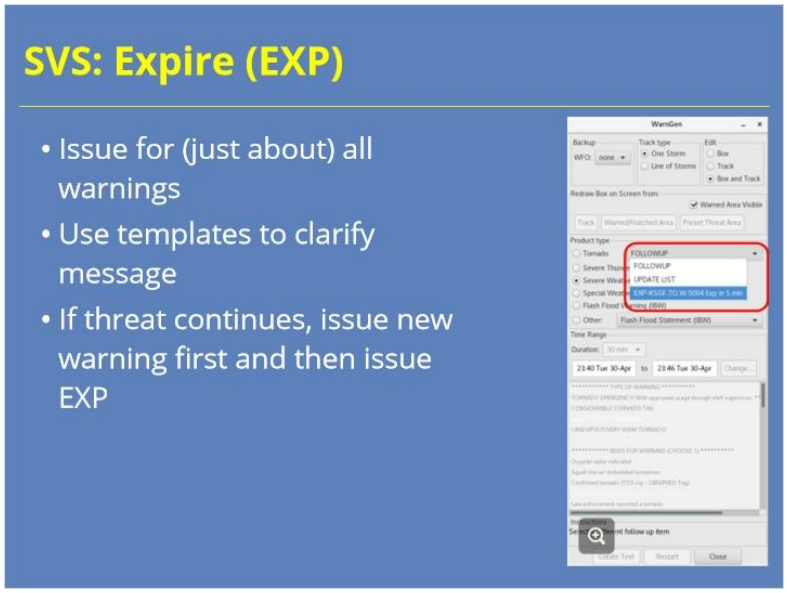


Notes:

As with all SVS statements, make sure you check for framing symbols (!** **!), update the text between them, and delete those symbols. Otherwise, the SVS will not transmit.

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SVS: Expire (EXP)



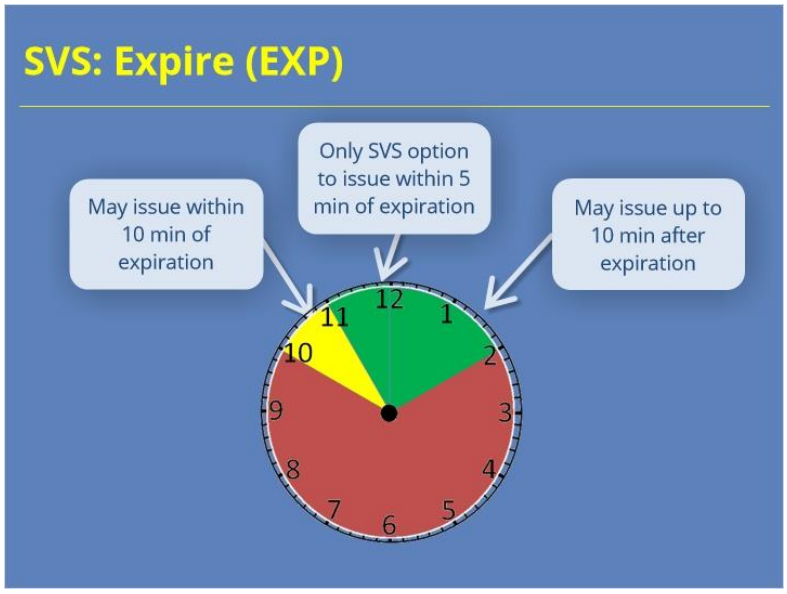
Notes:

In general, it is a recommended best practice to issue expiration statements for warnings in just about all cases. If the storm is no longer severe or tornadic, an expiration statement puts a period at the end of the sentence, letting partners and the public know that there will not be another warning on it. The SVS expiration templates include options for when a warning is being reissued and for when another warning remains in effect, both of which will let you clarify your intent as a warning forecaster for the storm if you did issue a new warning for that storm or if another warning is in effect for a nearby or overlapping area. Remember, if the threat continues, issue a new warning first and then issue the EXP, to make sure the storm is continuously covered and to make messaging clear.

Sometimes, an expiration statement may cause confusion, and in those rare situations, it may be better to not issue the expiration statement. One such scenario, for example, may be holding off on an expiration statement for a severe thunderstorm warning if a tornado warning was issued later on the same storm and remains in effect.

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SVS: Expire (EXP)

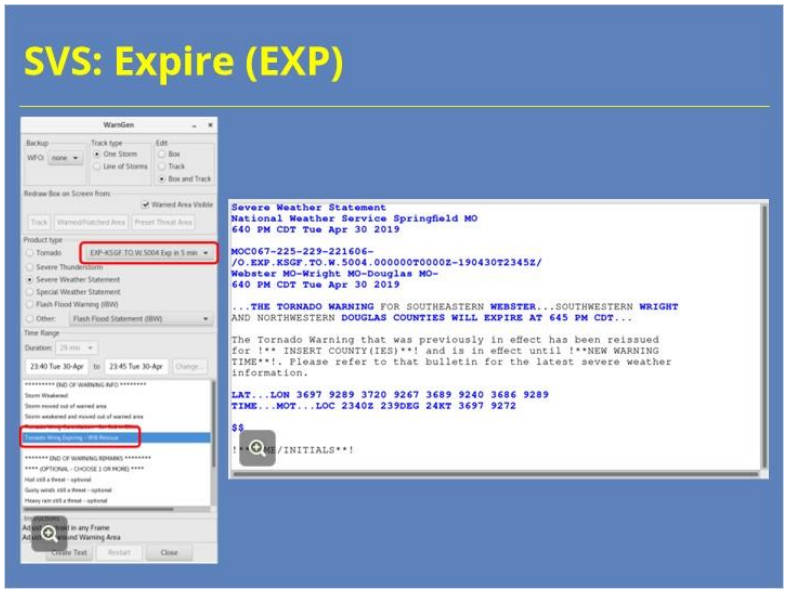


Notes:

An EXP may be issued within 10 minutes of expiration, and it is the only SVS type that can be issued within 5 minutes of expiration. You can issue an EXP up to 10 minutes after the expiration time of the warning.

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SVS: Expire (EXP)

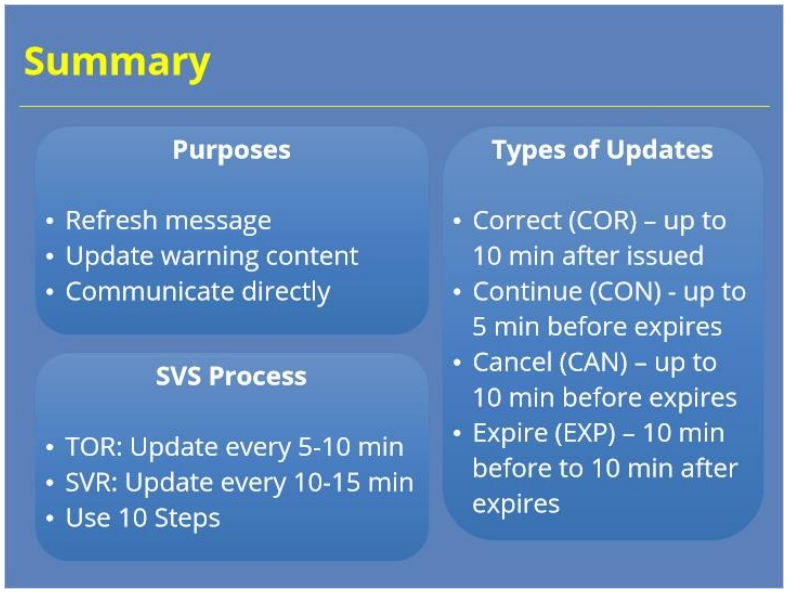


Notes:

Let's take a closer look at the common scenario in which a warning forecaster has issued the next warning for a storm and is now issuing the expiration statement on the expiring warning. The interface includes a template labeled "Tornado Wrng Expiring – Will Reissue", which is actually designed to be used AFTER reissuing the warning. Your priority should be issuing the new warning first, then expiring the old warning, to ensure there is an overlap in time. The template allows the warning meteorologist to communicate that the expiring warning has been reissued and the threat continues, specifying the counties from the expiring warning that have been included in the next warning as well as the expiration time of the next warning. It is a clear signal to partners and others that the threat continues and builds a bridge to the next warning. Again, note that most expiration statements require you to update the text inside the framing symbols (!** **!) and delete those symbols. Otherwise, the SVS will not transmit.

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Summary

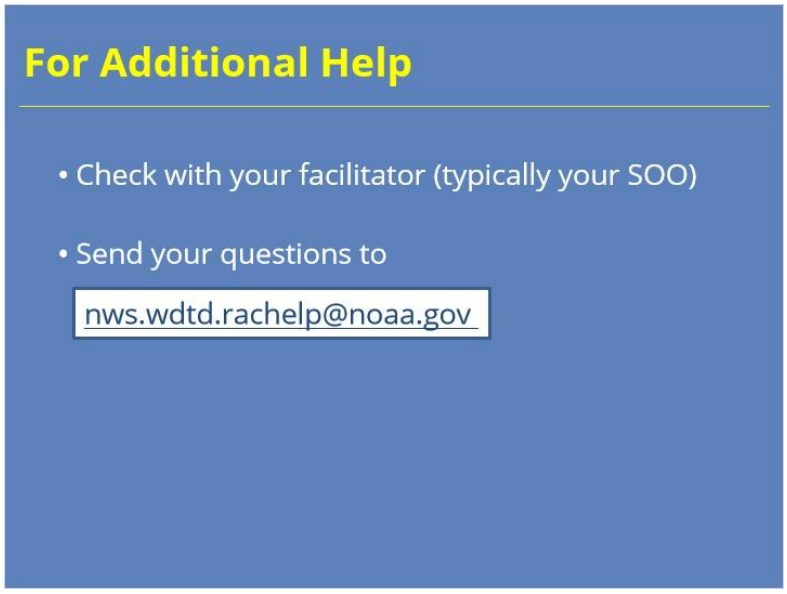


Notes:

We issue severe weather statements, or SVSs, as a communication tool in the warning process. SVSs keep fresh information in the hands of our partners and public, with the most recent information about storm intensity and location, offering a direct line of communication from the warning meteorologist to external users. If needed, the warning meteorologist can issue a correction to a warning or statement up to 10 minutes after the product is issued. Use the SVS to issue a continuation up to 5 minutes before the warning expires, a cancellation up to 10 minutes before the warning expires, or an expiration from 10 minutes before to 10 minutes after the warning expires. We recommend issuing updates every 5-10 minutes for tornado warnings and every 10-15 minutes for severe thunderstorm warnings, with the higher frequencies during the higher-impact events. Use the full 10 Steps process to issue the SVS to minimize errors in the end product and create a smooth workflow.

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For Additional Help



Notes:

For additional help, check with your facilitator (typically your SOO) or send your questions to the listserv e-mail address here.



Katy Christian

Warning Dissemination

How does your warning travel from the moment you hit "Send" in WarnGen or Hazard Services to triggering cell phones and interrupting TV broadcasts? Is there anything YOU can do operationally to maximize its reach before, during, and after warning issuance?

Beyond improving dissemination, this self-paced training deconstructs the "black box of dissemination." By understanding how these different dissemination systems are connected, you'll be better equipped to identify and troubleshoot points of failure during critical weather events.

Click **"Start Course"** to track your warning's path from AWIPS to the public.

WOC Severe Training Details:

- Duration: ~45 minutes - 1 hour
- Completion Method: Quiz (70% score)
- Questions/Technical Problems?

- nws.wdtd.wocsevere@noaa.gov
- katy.christian@noaa.gov

Dissemination Overview: From Sending to Receiving

FEMA's Dissemination System: Integrated Public Alert & Warning System (IPAWS)

NOAA's Dissemination System: NWR & NWWS

Legacy Dissemination: EAS

Modern Dissemination: WEA

WFO Dissemination: The Warning Itself

WFO Dissemination: "The Big Three"

WFO Dissemination: Office Phones/Email

Dissemination Failure: Who to Contact?

Dissemination Quiz

Acknowledgements

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Lesson 1 of 11

Dissemination Overview: From Sending to Receiving



Katy Christian

Before we begin...

If warning dissemination was a puzzle, it'd be a 1000-piece version that always feels like a few pieces are missing. To put it all together, you first need to see the picture on the box top - a high-level view of the entire dissemination system. **Click the red button below** to listen and watch an overview on how the individual components of the warning chain fit into the big picture. Once done, click "Next Section" below.

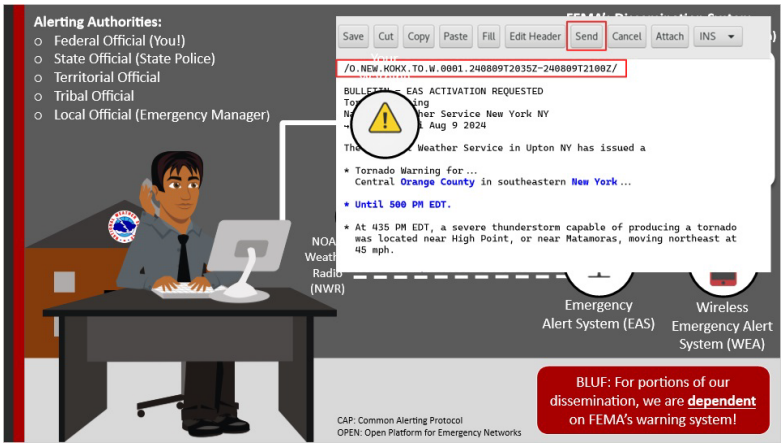
Click to view video



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Dissemination Overview

Dissemination Overview



Notes:

You're a forecaster who has just drawn up your tornado warning and hit “Send.” The minute you did that, you just became an alerting authority - surprise! Now, there are several other people who are also alerting authorities, including state, territorial, tribal, and local officials. What makes YOU unique is that you are the only alerting authority for all weather-related hazards.

The warning you just created was assigned a unique Valid Time Event Code, or VTEC, string that contains information within it for where and how it gets disseminated. Once you hit “send”, that warning information begins its journey through the Weather Service System platforms, with one of those pathways arriving at what’s known as the Common Alerting Protocol, or CAP, handler. The CAP handler is a piece of NWS software which essentially takes that VTEC product and formats it into a common and consistent digital format that is understood by FEMA’s national dissemination system, the Integrated Public Alert and Warning System, or IPAWS.

After being properly formatted, it is then posted to IPAWS-OPEN, or the Open Platform for Emergency Networks, where both the alerting authority and format are authenticated. Once authenticated, your warning is disseminated through multiple different pathways but for brevity here, which we’ll just mention the two most popular including:

- The Emergency Alert System, or EAS, which includes things like radio and TV broadcasts

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- And the Wireless Emergency Alert System, or WEA, which includes cell phones

Note this is true for our Tornado Warning example but not ALL warnings sound off the WEA - more on this later. Now there are other dissemination pathways that are separate from IPAWS, such as the NOAA Weather Radio, which is a secondary pathway to EAS as we'll discuss later, our NWS website, and many others. The main takeaway I want you to see from the above figure, though, is just how dependent we are on FEMA's national dissemination system. For portions of our dissemination, we are essentially leveraging and riding on a system we have very little control over.

However, the good news is that there are operational actions you can take with each of these separate dissemination systems to maximize your warning's reach and message to your public. Now that you have a big picture overview, let's dive into each of these dissemination systems to learn more about how they work and where you can have an impact.

Lesson 2 of 11

FEMA's Dissemination System: Integrated Public Alert & Warning System (IPAWS)



Katy Christian

History of IPAWS

Alright, I know at this point you could be thinking, "C'mon KrazyKaty, I'm a METEOROLOGIST, not a HISTORIAN - why is knowing this history relevant for my job?" By knowing the history and context of the warning dissemination system (i.e. IPAWS) that YOUR warnings go through, you will be equipped to know 1) at what points you DO or DO NOT have influence over your warnings and 2) WHO to contact when you do have a warning dissemination issue. With that being said, hang in there with me - this will all build to operational actions you can take and a quiz you will want to pass ;)

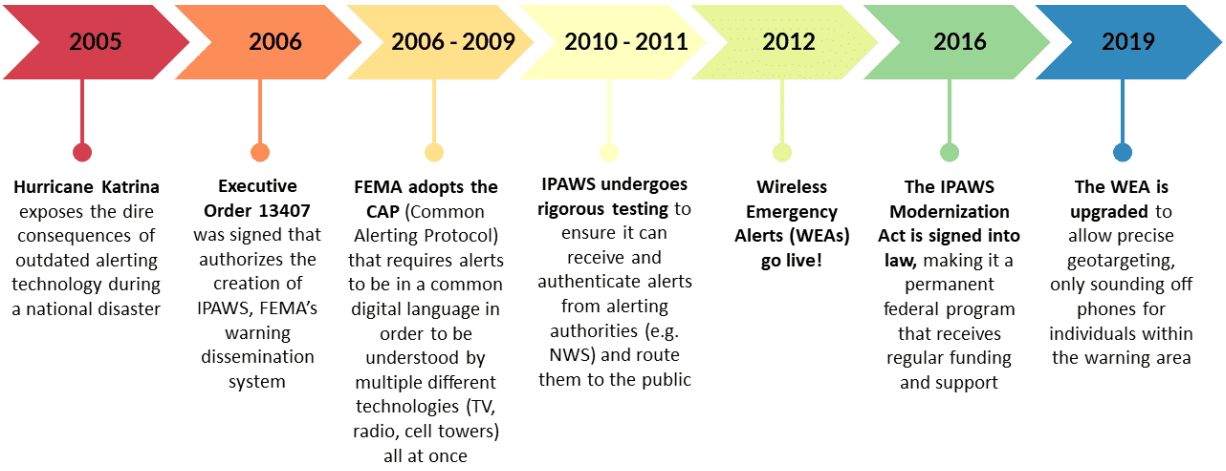
Prior to 2006, FEMA's national warning dissemination system, known as IPAWS, did not exist. There was only one national warning system in place known as the Emergency Alert System, or EAS, that was originally designed for the president to address the American people over the **radio and television.** This older alert system relied on FIPS codes which are used to identify entire counties or parishes. With the technological advancements of the internet and cell phone, something happened in 2005 which forced a dissemination reckoning. Can you guess what this catalyst was?



IPAWS was created in response to the dissemination and communication failures highlighted in 2005 by **Hurricane Katrina**, one of the most destructive and costliest natural disasters in U.S. history. Because alerts at that time only reached radio and TV broadcasts and were county-based, officials lacked the ability to send alerts to specific geographic areas or even sound off cell phones. However, it would take many years to implement IPAWS...



While Katrina was the instigator for the creation of the WEA and IPAWS, it would take **many years** of development and testing before implementation and rollout. Click on the image below to zoom in and read before moving on to a trivia question.



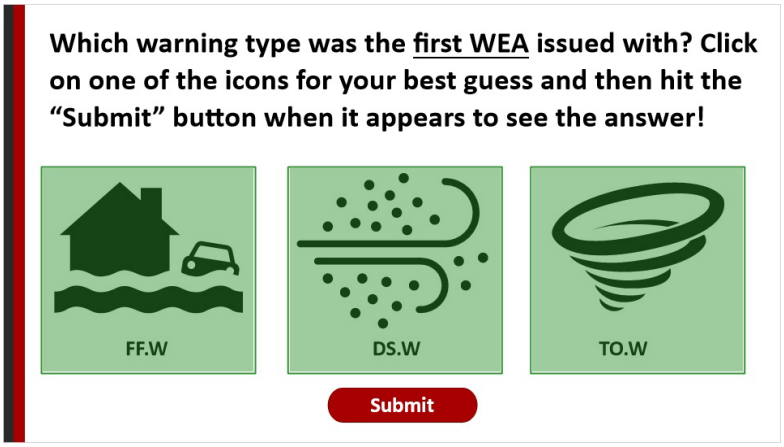
Trivia Break!

In the summer of 2012, the very first WEA was issued! Click on which warning type - Flash Flood, Dust Storm, or Tornado - you think it was associated with (Note: Audio is required below

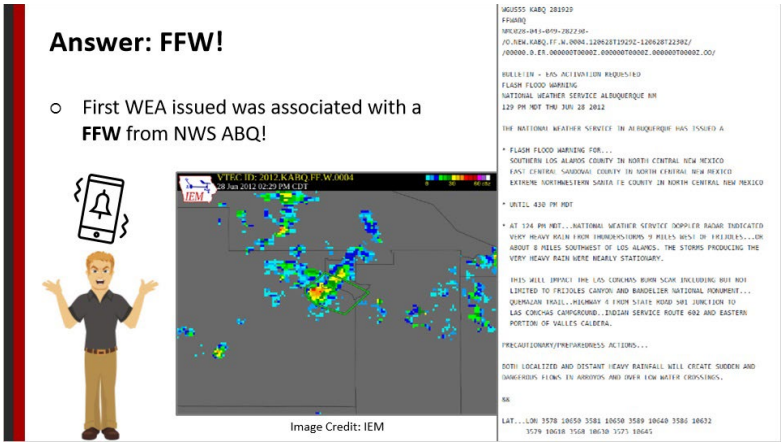
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Dissemination Overview

WEA Trivia Question



1.2 WEA Trivia Answer



Notes:

I'm sorry for that - I just couldn't pass up that good of an opportunity to WEA you! That aside, the first weather hazard WEA that went out to the public was associated with a flash flood warning issued by the Albuquerque, New Mexico WFO! It's interesting that to this day, flash flood warnings still remain one of most complained about warning types for sounding off the WEA by the public, despite the introduction of FF IBW tags in 2019 which greatly reduced this. Sometimes being the first at something means you are also the first to be criticized later on but that is a discussion for another day.

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Operational Takeaways

From the two previous sections, here's what **applies to you operationally:**

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1

You are the architect of the NWS-IPAWS "Digital Handshake":

While you don't control FEMA's dissemination system, you do control what it receives as input. For example, your choice of **IBW tags** (e.g. "Base" vs. "Destructive") acts as a digital trigger. If you don't select a tag that meets the mandatory threshold for a cellular alert, IPAWS will not authorize a broadcast to cell phones, and the public won't receive the alarm by WEA.

2

Understand the process; Know where to start:

By understanding the process of how these alert dissemination systems relate to and interact with your warning, you will know **where to start looking** and **who to ask for help** if certain parts of dissemination do fail. In the final section, you will see various examples of dissemination failure and who the appropriate contacts would be.

Next Section: NWR & NWWS

Lesson 3 of 11

NOAA's Dissemination System: NWR & NWWS



Katy Christian

While a portion of our alert dissemination relies heavily on FEMA's national alert system, there are other pathways for the NWS to disseminate those alerts. For brevity, we'll discuss two that fall directly under NOAA's dissemination system - the NOAA Weather Radio (NWR) and the NOAA Weather Wire Service (NWWS), more commonly referred to as the "Weather Wire." Both of these dissemination systems are completely **under NWS control** and **bypass having to go through IPAWS** before getting to the end-user.

NOAA Weather Radio (NWR)

NWR: NWS Got Beats!

Did you know that the NWS essentially has its own radio station? Top hits are performed by a single artist whose songs

are occasionally of impending weather doom and gloom and never fail to have that signature high frequency intro to catch the listener's attention - behold, the 1050 Hz shriller thriller! ;)

Alarming jokes aside, the NWR is a nationwide network of radio stations that broadcast continuous weather information. Across the CONUS and OCONUS, there are **over 1030 transmitter sites** that receive programming directly from their local WFO. These transmitter sites cover certain geographic areas and broadcast the NWS signal directly to anyone with a NWR receiver or tuned into the specific frequency.

Because NWR is radio-based legacy technology, it relies on what's known as Specific Area Message Encoding, or **S.A.M.E.**, to trigger receivers. This is a digital string of code that includes four pieces of critical information:

1. **Originator:** Identifies the source
2. **Event Type:** The 3-letter code for the phenomena (e.g. TOR)
3. **County Code:** The 6-digit geographic code for impacted county
4. **Duration:** How long the alert remains valid

Of these 4 pieces of information, the **County Code** is the one that must be pre-programmed by the user into a NWR receiver so it knows what county the user wants to be alerted for. Below is the required geographic format within the S.A.M.E. string that a user must manually add in order to receive the alert for their area:

S.A.M.E. Geographic Block: PSSCCC

P (Partition): In most NWS warnings, P = 0, telling the radio to alert the entire county
SS (State): The two-digit FIPS state identifier
CCC (County): The three-digit FIPS county identifier

Now that you have a big-picture overview, let's follow the NWR dissemination pathway starting the moment you hit "Send" in WarnGen or Hazard Services:

1. **Transmission:** When your WFO issues a warning, it is transmitted to the local tower

and broadcast over radio waves with the S.A.M.E. header.

2 **Recognition:** Any radio tuned to that transmitter's frequency will "hear" the signal. If the Event Type and County Code match what is programmed into the receiver, the radio prepares to alert!

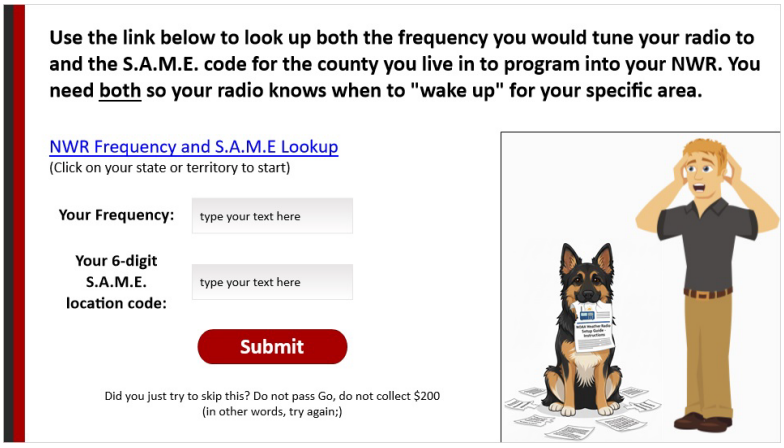
3 **Initial Activation (NEW Warning):** The transmission alert includes the digital S.A.M.E. header that tells the radio to open its speaker, followed by the 1050 Hz “shriller thriller” which is designed to audibly alert the listener before the voice message begins.

4 **"Silent" Update (SVS):** When an update to the initial warning is sent (e.g. SVS/FFS), the digital S.A.M.E. header is sent but the 1050 Hz “shriller thriller” is not included to prevent re-triggering an audible alarm for an event already in progress. This is why NEW warnings **audibly** trigger the NWR but SVSs/FFSs update silently.

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NWR Exercise

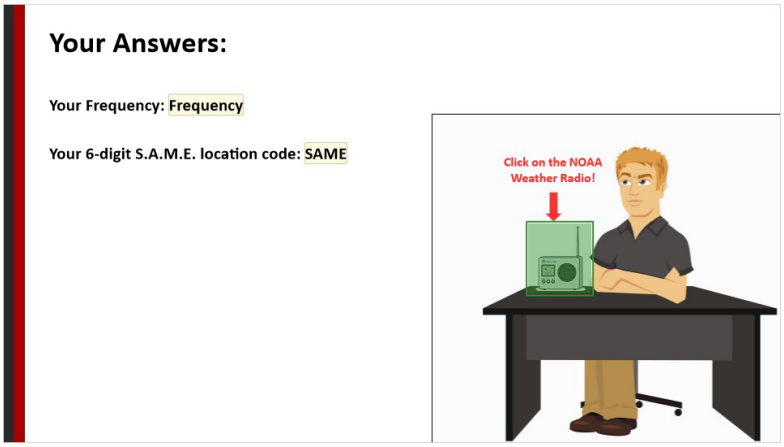
NWR Prompt



Notes:

You've just bought a NOAA Weather Radio, but your dog ate instructions for getting it set up - woofda! Use the below link to look up both the frequency you would tune your radio to and the exact S.A.M.E. code for the county you live in that you would program into your NWR so that it recognizes when to go off. Input the answers below and hit "Submit" once done.

NWR Answer

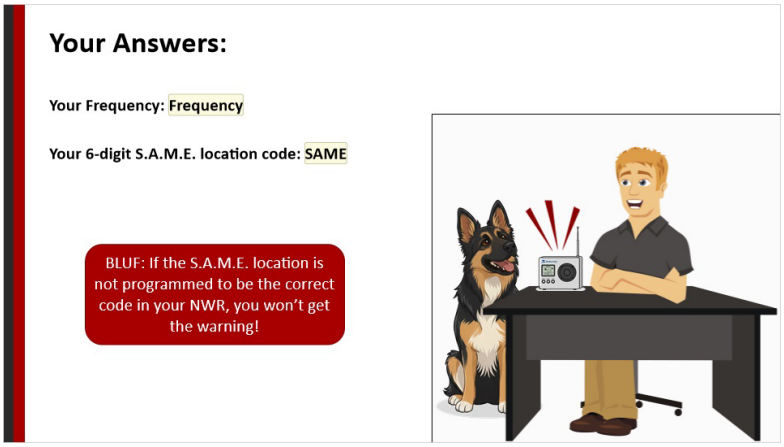


Notes:

Alright, you've successfully set up your NWR to be listening to the correct NWS channel and programmed it to sound off for warnings in just your county. The next day, your NWR goes off! I want you to click on the radio and listen specifically to the pattern of sound as there is digital meaning behind the noise.

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NWR Explanation



Notes:

So, those three digital chirps you heard at the start are actually the S.A.M.E. header being communicated three times in a row. This broadcast tells your radio that the code matches your county and it's time to 'wake up' from silent standby mode. The 1050 Hz alarm tone that follows is designed to catch your attention in the most piercing way possible before the audio message begins.

This is why getting the S.A.M.E. code programmed correctly in your NWR is critical for dissemination - if you don't get it right, you won't get the warning.

Complete the content above before moving on.

NWR Strengths

- **Public Infrastructure Independent:** Operates even when commercial cell towers and/or public internet services are down or congested
- **Resilient**: Works during power outages due to being battery powered
- **Direct Delivery:** Bypasses IPAWS dissemination system, allowing for a direct path from the WFO to the public

Weaknesses of NWR

- **Limited Signal & Reception:** Range is limited to ~ 40 miles and easily blocked by terrain, buildings, or electronic noise
- **Dependent on User Setup:** Requires correct programming of the S.A.M.E. geographic code block; if configured incorrectly, the user will not receive the warning
- **Maintenance & Vulnerability**: Transmitters can be knocked offline by the storm itself, and receivers require the user to

- **Comprehensive**: Provides the full warning text to the public, including Call-To-Action statements

maintain fresh batteries in case of a power outage

- **Audio Only:** The lack of visuals can make it difficult for the public to assess their specific threat location

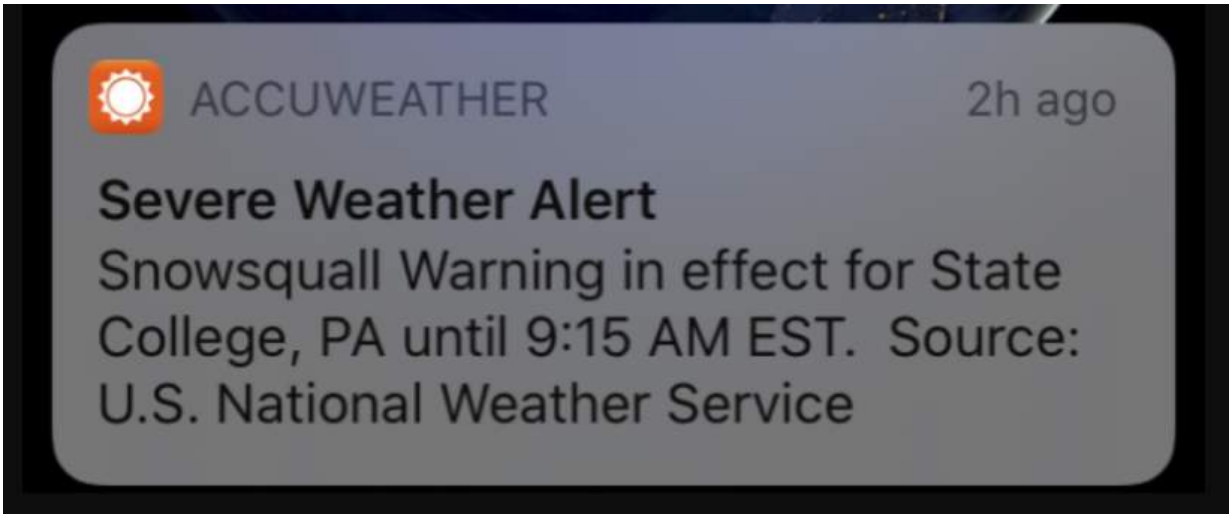
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NOAA Weather Wire Service (NWWS)

NWWS: Digital Bridge to Disseminators

Have you ever wondered how weather apps like The Weather Channel or AccuWeather know when the NWS issues a warning? Enter the **NWWS**—a satellite and internet broadcast system that acts as our **Digital Bridge to Disseminators.** Weather Wire is a high-speed 'firehose' of NWS warnings and weather alerts used by large organizations,

including commercial weather companies and TV/Radio broadcasters.



AccuWeather App Notification on a User's Cell Phone

(Image Credit: AccuWeather)

The NWWS shines in two specific areas:

- **Speed:** It is **THE FASTEST** way for organizations to receive NWS products. Warnings are delivered to subscribers in **10 seconds or less** because they bypass IPAWS's dissemination system and congestion of the public internet.
- **Reliability:** Because NWWS alerts are sent via two redundant paths - **Satellite and Internet** - it is the most

resilient way for organizations to stay connected to the NWS, even if the national power grid, terrestrial internet, or cellular networks are failing.

Operational Takeaways

From this section, here's what **applies to you operationally:**

1. **Take care of your radio:** NWR is one of the few dissemination systems directly under YOUR control - own your NWR beats!

    - **Regularly monitor your offices' NWR audio for any static or silence**
    - **Know how to dial into distant transmitters if needed to verify that audio is being clearly broadcast beyond your local signal range**

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- **Report any transmitter outages immediately to your ESA**

2 **Promote your radio:** Actively encourage your public and partners to use NWR! For those located in areas with poor cellular service, NWR may be their most reliable way of receiving warning information.

3 **Remember your alert reach:** The NWS operates multiple dissemination systems (e.g. Weather Wire and NWR to name a few) and your alerts are the primary content for our partners and customers! Your reach is broadened significantly through these systems. By knowing **what they are** and **how they work**, you will be better equipped to **field questions and troubleshoot issues if they arise.**

Next Section: EAS

Lesson 4 of 11

Legacy Dissemination: EAS



Katy Christian

EAS Overview

The EAS can be thought of as legacy dissemination as it existed before IPAWS. It was established in 1997 and was designed for the President to address the American people by the technological avenues of that time - **TV and radio stations.** Since the implementation of IPAWS, EAS has been integrated into FEMA's dissemination system. When an alert is sent through the EAS 'pipes', it reaches the following providers:

- Radio broadcasts (e.g. AM, FM, HD Radio)
- TV broadcasts (e.g. TV crawl, audio override)
- Satellite radio and television providers (e.g. SiriusXM, DIRECTV)
- Cable Systems (e.g. Xfinity, Spectrum)
- Video Wireline (e.g. AT&T Fiber)

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Now, there is a very important point that you need to be aware of from a warning dissemination perspective:

EAS providers deliver NWS alerts on a **VOLUNTARY BASIS.** They may or may not decide to break into a TV or radio broadcast based on their alert thresholds.

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From WarnGen/Hazard Services to the TV



Image Credit: WDIV Local 4

So what determines if your warning interrupts a TV or radio broadcast? Click through to learn more.

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Step 2

Monitoring the Feeds



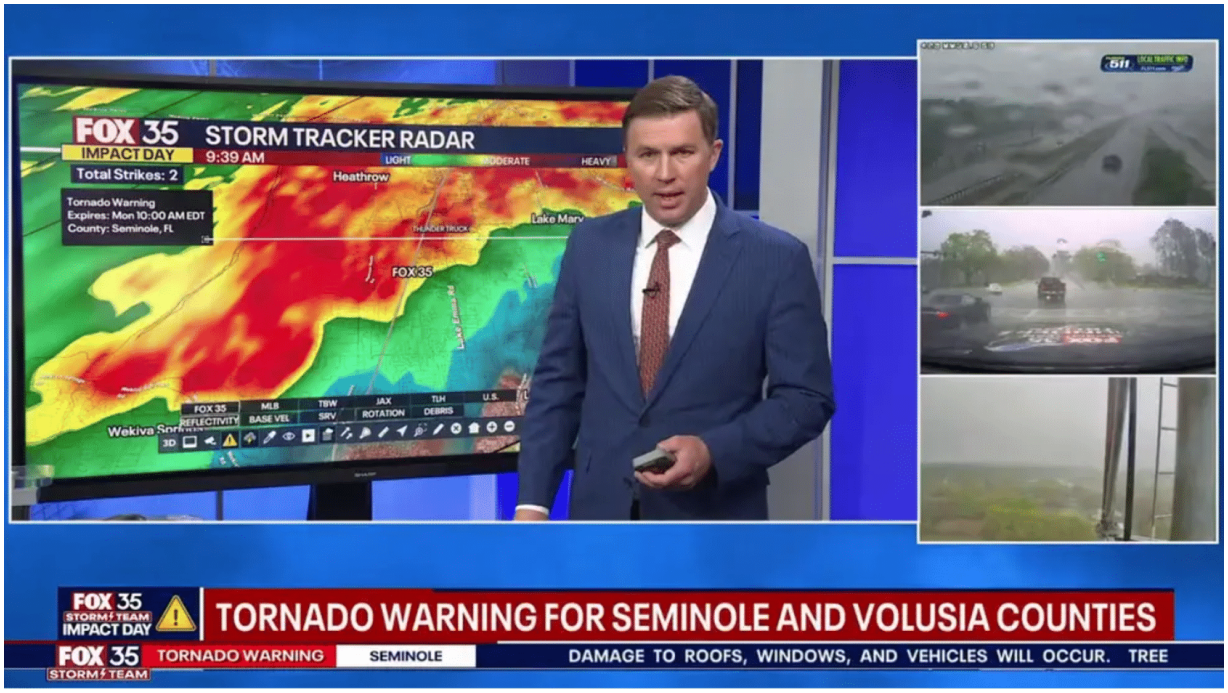
The Federal Communications Commission (FCC) requires EAS providers to monitor at least two sources for emergency alerts:

1. **IPAWS CAP:** the digital, internet-based feed
2. **NWR** or **Local Primary Stations**: the over-the-air broadcast feed (in case of internet failure)

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Step 3

Interrupting the Broadcast



Photo/Video Courtesy: FOX 35 Orlando

When an EAS provider's equipment receives an NWS alert from either of these feeds, a specialized device called an **EAS Decoder** automatically scans the message's header (i.e. the S.A.M.E codes) to identify the hazard type, location, and expiration time. If the pre-programmed alert thresholds are met, the decoder will then interrupt the broadcast. On television, this is an audio interruption paired with the crawl (text at the bottom of the screen as seen in the image) and on radio, it is a full audio takeover. So, what alert thresholds determine a broadcast interruption?

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Step 4

Determining Alert Thresholds



Image Credit: NWS

There are two separate thresholds that determine if a broadcast is interrupted - the 1st the result of humans; the 2nd the result of technology:

1. **Human-established thresholds:** The State Emergency Communication Committee (SECC) establishes which specific alerts codes (like Tornado vs. Flash Flood) will trigger the system. For nearly all EAS providers, a Tornado Warning (TOR) is programmed to “auto-forward”, triggering an automatic broadcast interruption. However, a Flash Flood Warning (FFW) may not - it all depends on the "auto-forward" settings the station has chosen to match their SECC's plan.

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2. **Technology-established thresholds:** Since EAS decoders rely on the S.A.M.E. radio technology as NWRs (pun alert), they also will typically NOT trigger an audio interruption for an SVS/FFS as they treat it as a duplicate message. EAS decoders are programmed to look for the initial warning issuance and do not interrupt if that event is already in progress.

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Main Takeaway

Just like we don't control FEMA's dissemination system, we **don't control** which NWS alerts end up interrupting a TV or radio broadcast - that is established at the SECC level and/or the result of how the EAS decoder is programmed. However, we can help **influence** those decisions as discussed below.

Operational Takeaways

From this section, here's what **applies to you operationally:**

1. **Influence the thresholds:** Since EAS providers deliver alerts on a voluntary basis, it is critical that your office knows what those alert thresholds are so that you know what warning types will or will not interrupt a live broadcast. Part of knowing this is having a seat

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at the table (i.e. the **State Emergency Communications Committee**) where those decisions are being made. Typically, the **Warning Coordination Meteorologist (WCM)** is the individual who participates in those meetings and can help influence what alerts are being disseminated by explaining the significance of different NWS products.

2

Improve the relationship: TV

broadcasters are a critical partner and continue to be a leading source of NWS tornado warning information for the public (Obermeier et al. 2023). Put another way, your local TV meteorologist is like the person at the parade with the microphone - you are giving them the message (i.e. your warning) and they have one of the loudest means to distribute it when it matters most. Here is where you come in: Does your office have an alive AND healthy relationship with your local TV meteorologists? (note: something can be alive but not healthy - see any common houseplant). If you don't have an alive and healthy relationship, reflect individually and start a conversation at your office about **what actionable steps your office can take to improve those relationships.**

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It's not us (NWS) vs. them (TV Mets).

It's **we** (NWS + TV Mets) FOR **them** (our public).

Next Section: WEA

Lesson 5 of 11

Modern Dissemination: WEA



Katy Christian

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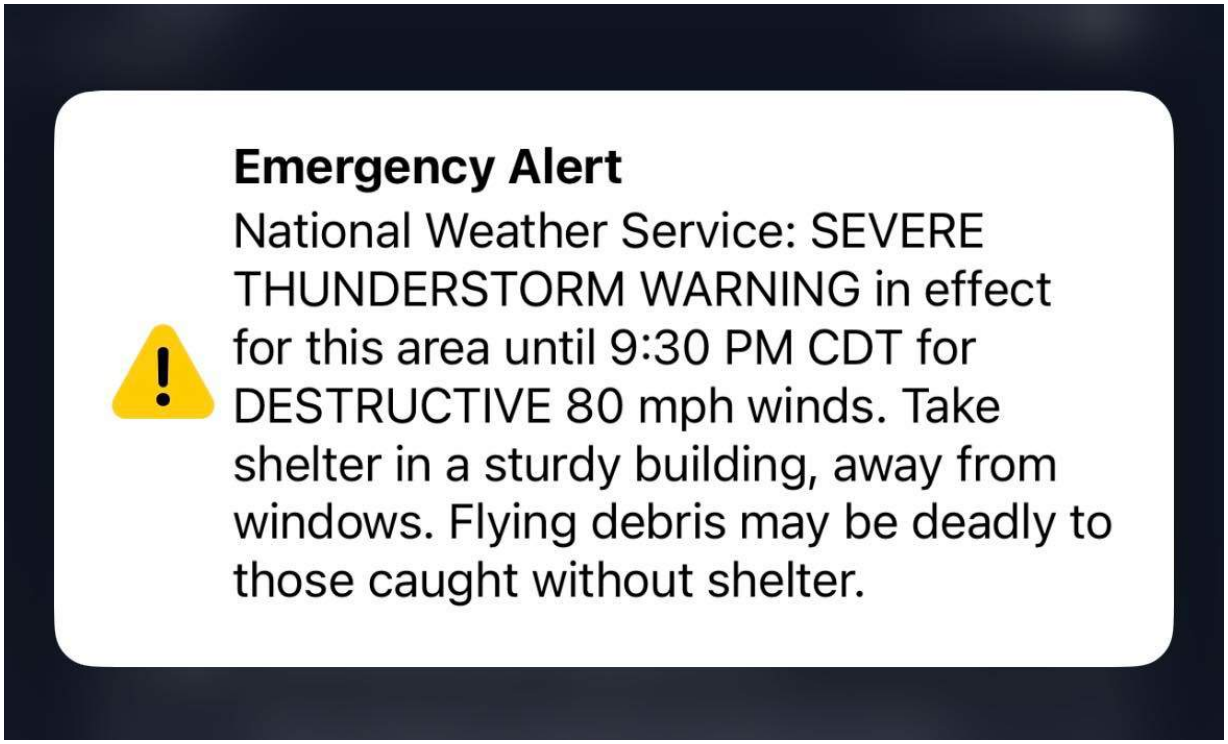
WEA: "The Pocket Siren"

Hurricane Katrina was the catalyst for the need of a national wireless emergency alert system and the implementation of IPAWS was that need fulfilled. Since the first WEA was sent out in 2012, the WEA has been utilized over 96,000 times to deliver life-saving information. What makes the WEA so effective is its **dissemination reach** - as of November 2025, over 90% of Americans own a smartphone, with the vast majority of those devices being WEA-capable.

What this means is that when YOU decide to issue a warning that meets the necessary WEA criteria (more on this below), YOU will be reaching an overwhelming majority of your population - let that sink in and alarm you with a healthy amount of fear and respect. As the saying goes (given this is **web-based** training): "With great power comes great responsibility."

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From WarnGen/Hazard Services to the Cell Phone



How does your warning travel from AWIPS to sounding off cell phones? Click through to find out!

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Step 2

Starting Point: Impact-Based Warning (IBW) Type

Wireless Emergency Alerts - what will trigger?

Product / Warning		Activates Wireless Emergency Alert (WEA)?	
Tornado Warning	***Activate for new warning or when warning is upgraded/updated with a 'catastrophic' tag***	**Initial**	**Update (SVS)**
Base (no IBW tag)		**Yes**	*No*
Considerable Tag		**Yes**	*No*
Catastrophic Tag	***This tag must be selected to invoke Tornado Emergency Wording***	**Yes** (with enhanced language)	**Yes** (with enhanced language)
Severe Thunderstorm Warning	***New, upgraded or updated warning IF threat tag is 'destructive'***	**Initial**	**Update (SVS)**
Base (no IBW tag)	Wind ≥ 58 MPH and/or Hail ≥ 1.00" (US quarter)	*No*	*No*
Considerable Tag	Wind ≥ 70 MPH and/or Hail ≥ 1.75" (golf ball)	*No*	*No*
Destructive Tag	**Wind ≥ 80 MPH** and/or **Hail ≥ 2.75" (baseball)**	**Yes**	**Yes**
Flash Flood Warning	***New, upgraded or updated warning IF threat tag is 'considerable' or 'catastrophic'***	**Initial**	**Update (FLS)**
Base (No IBW Tag)	Used most of the time, when flash flood impact damage is possible	*No*	*No*
Considerable Tag	Use rarely, when there are indications flash flooding capable of unusual severity or impact is imminent or ongoing and urgent action is needed to protect lives and property.	**Yes**	**Yes**
Catastrophic Tag	Use exceedingly rarely, when a flash flood threat to life and catastrophic damage is occurring or imminent and floodwaters have risen or will rise to levels rarely if ever seen.	**Yes**	**Yes**

This is likely one of the most confusing but most important points for you to understand:

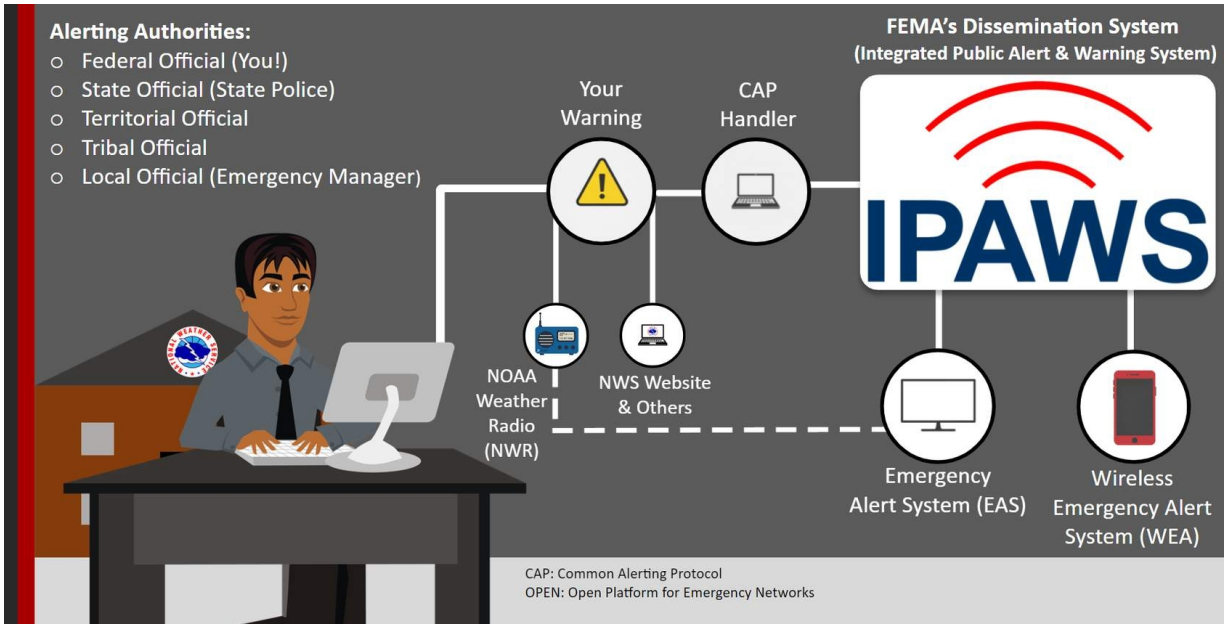
- What determines if a cell phone will trigger the WEA is dependent on the IBW type YOU select in WarnGen or Hazard Services. Because your decision to trigger the WEA directly impacts over 90% of the population, take an intentional pause to click on the above table to review (note: table only highlights convective warnings).

Image Credit: NWS Central Region

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Step 3

From IPAWS to Cell Phone Companies



Once you hit "Send" in WarnGen or Hazard Services, your warning makes its way through the dissemination pipes and arrives at IPAWS-OPEN. Once validated and authenticated, FEMA disseminates that alert to cell phone companies who then push it to their cell towers to broadcast in and around the alert area. But how does your phone know if it's in the alert area or not?

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Step 4

From Cell Towers to Cell Phones

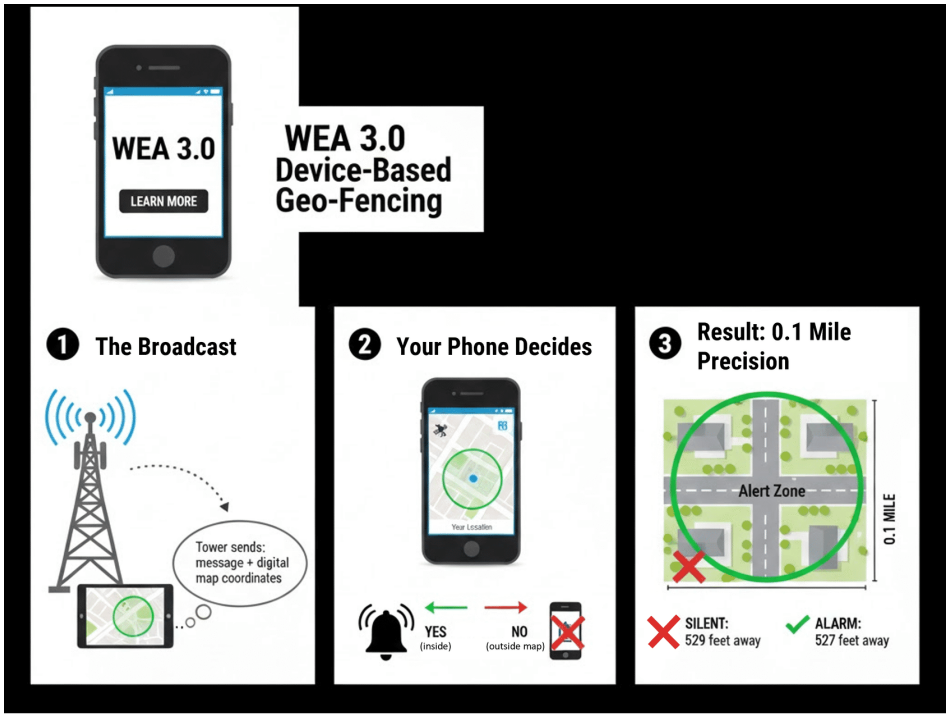


Image created by Gemini but backed by real scientific input.

In 2019, the WEA was upgraded to include what's known as "**Device-Based Geo-Fencing**" to improve alert precision. Use the above image to follow along with steps 1 - 3 (if needed, click to zoom).

1. Cell towers broadcast the alert with a "digital map" (i.e. your warning polygon coordinates).
2. A cell phone receives this data and compares its location with that of the "digital map"
3. If the cell phone's location is within the digital map or within 1/10th miles of it, the cell phone will sound off the WEA! (Note: for cell phones that are pre-WEA 3.0 (i.e. devices prior to 2019),

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these devices will still receive a WEA but do not have the 1/10th mile precision so there may be substantial overshoot and therefore over-alerting as a result).

Image Credit: Gemini (but backed by scientific input)

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From Alerting to Warning Fatigue



One of the biggest public complaints about the WEA stems from **over-alerting** and the resulting warning fatigue. The Federal Communications Commission (FCC) and the NWS have addressed this over the years in two key areas - see below for a timeline of both.

1st Improvement: Precision

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Over the years, the FCC has implemented improvements to the **geospatial accuracy** of the WEA.

2012 (WEA 1.0):

Alerts were sent **to the entire county**! Imagine being in San Bernardino County, CA (over 20,000 square miles) during monsoon season - no wonder FFWs got a bad rap!

2017 (WEA 2.0):

Carriers were required to target cell towers that best approximated the warning polygon. If a **tower's signal touched the polygon**, it triggered the WEA. Because cell signals can travel many miles, anyone connected to those towers received the alert, even if they were outside the warning polygon.

2019 - Present (WEA 3.0)

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Device-Based Geo-Fencing was implemented! The carrier passes your warning polygon coordinates directly to a user's cell phone which then uses its **internal location services to decide if it is inside the warning polygon**. This has eliminated overshoot for nearly all modern devices, with precision down to 1/10th of a mile.

2nd Improvement: Hazard Severity Levels

The NWS implementation of **IBW tags** ensures we now only alert the public for the most life-threatening events.

Before late 2019: FFWs

Prior to late 2019, **every FFW triggered a WEA**, which acted over time to desensitize the public to flash flooding. Since the implementation of FF IBW tags, only "Considerable" and "Catastrophic" FFWs trigger a WEA in an attempt to curb over-

alerting and reduce the complacent stigma against flash floods being "just watery things."

Mid-2021: SVRs

Conversely, the addition of the "Destructive" tag (80+ mph or 2.75"+ for hail) for Severe Thunderstorm Warnings in mid-2021 allowed forecasters to give the most dangerous thunderstorms the same "pocket siren" status as a tornado warning.

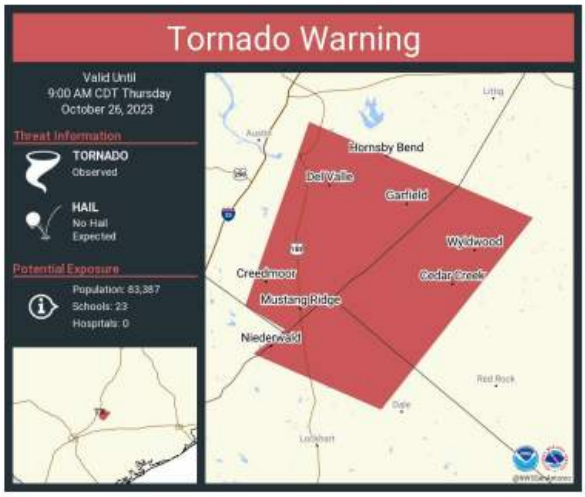
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Damage Threat Tags by Product

Damage threat tags with this symbol trigger Wireless Emergency Alerts.

Tornado Warning	**Flash Flood** Warning	**Severe Thunderstorm** Warning	**Extreme Wind** Warning*
"Base" (no tag)	"Base" (no tag)	"Base" (no tag)	IBW formatting coming soon with the possible use of Damage Threat tags.
Considerable	Considerable	Considerable	
Catastrophic "Tornado Emergency"	Catastrophic "Flash Flood Emergency"	Destructive	

Snow Squall Warning	**Special Marine** Warning	**Dust Storm** Warning
"Base" (no tag)	Use IBW unique formatting, but do not include Damage Threat Tags.	Use IBW unique formatting, but do not include Damage Threat Tags or Warning Tags.
Significant		



IBW warnings are depicted as polygons to display where the threat area is for an ongoing hazard. The above Impact Graphic is used by NWS offices on social media to convey some of the information in an IBW warning.

Enhanced Warnings

With the addition of valuable information, streamlined formatting, and tiered-risk levels, IBWs represent an enhanced Warning product from the National Weather Service. The goal is to facilitate improved public response and decision making by distinguishing situational urgency, and ultimately better meet societal needs in the most life-threatening weather events.

For more information on Impact-based Warnings, visit **weather.gov/impacts**.

IBW Overview Document (Image Credit: NWS)

"You get a one-pager, you get a one-pager, EVERYBODY GETS A ONE-PAGER!" :)

The image to the left is from a helpful one-pager you can click to download below that highlights which warnings have tags for WEA beyond just convective warnings.

PDF

IBW_Overview.pdf

866.3 KB

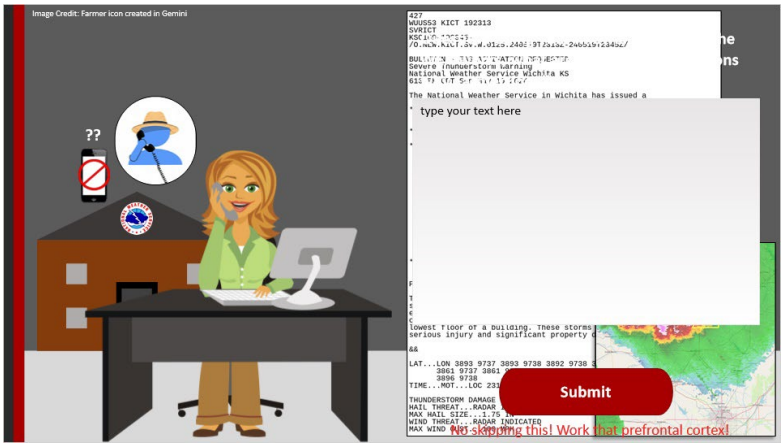
WEA Exercise: "I never got a warning alert!"

Click the button below to complete the exercise and once done, scroll down to read the operational applications from this section.

Click to view video

WEA Exercise

WEA Exercise

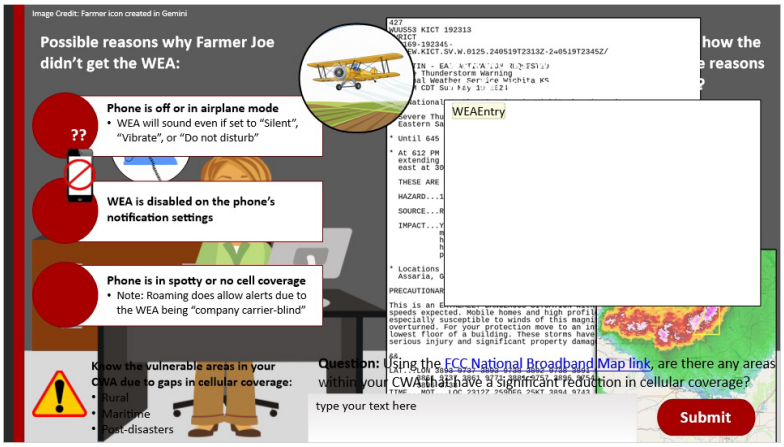


Notes:

Your CWA is very rural and you've just experienced a historic derecho with destructive winds of 90+ mph. The next day, your office gets a phone call from Farmer Joe who is concerned as he says he never got the warning alert on his phone! As he's explaining this, you begin to start thinking through some possible reasons why. Use what you just learned above about how WEA 3.0 works to hypothesize some possible reasons why his phone wouldn't have alerted him. Click submit once done.

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WEA Exercise



Notes:

Despite your office issuing a Severe Thunderstorm Warning with a “Destructive” tag over Farmer Joe’s house, his phone did not alert him. The exercise of you thinking through potential reasons why this happened helps us identify and understand common weaknesses of the WEA.

1) The first may seem obvious but if Farmer Joe’s phone is off or in airplane mode, he won’t get the warning alert (incoming bad dad joke: you did clarify that he was not in airplane mode while crop dusting). One myth I want to clarify is that your phone will still sound off the WEA even if it is set to "Silent", “Vibrate”, or “Do not disturb.”

2) This is perhaps the most common reason why someone won’t get an alert - if Farmer Joe has disabled WEA alerts on his phone’s notification settings, he won’t get the warning alert.

3) If Farmer Joe is in an area of spotty or no cellular coverage, he won’t get the warning alert. Note that no cellular coverage is different from roaming - the WEA was designed to be “company carrier-blind” so even if your phone is in roaming status, it will still receive an alert.

Now a little more on this last point - because there is such a great deal of reliance on cellular networks for warning dissemination in general, some of the worst impacts can occur in areas with gaps in cell phone coverage. It’s so important for you and your office to know if there are areas in your CWA that are particularly vulnerable due to gaps in cell phone coverage. This is especially relevant for you WFOs that are very rural or have large maritime footprints, where cellular coverage is often inconsistent or nonexistent.

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Remember too that this same outcome of inconsistent cellular coverage can happen during major disasters like a hurricane, where cell towers can be toppled and there is significant cellular network congestion.

I want you to practice identifying these areas now: go ahead and click on this link that will take you to the Federal Communications Commission National Broadband Map. Zoom in on your approximate county warning area and sample around. Are there any areas where there is a significant reduction in cellular coverage, such as those gray to white colors, that could prevent people there from receiving a potentially life-saving warning alert on their cell phones? Type what you find here and click “submit” once done.

You’re all done with this exercise - now you can discuss these reasons with Farmer Joe as to why his phone didn’t go off and ways he can mitigate this next time, such as possibly getting a NOAA Weather Radio!

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Operational Takeaways

From this section, here's what **applies to you operationally:**

1. **Know your triggers:** To use WEA effectively and strategically, you must master the IBW tags.

   For initial warnings, remember the following:

   - **TOR always triggers WEA**
   - **FFW triggers WEA for "Considerable" or "Catastrophic"**
   - **SVR triggers WEA for "Destructive"**

   For product updates (SVS/FFS): The WEA triggers above are exactly the same when issuing an update for SVR or FFW but with the important caveat that they are **"one-and-done."** Updating a warning that already has an elevated tag in place does not re-trigger the WEA. Below is an example:

   - You've issued a Flash Flood Statement and upgraded to "Considerable" -> the WEA

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sounds off! Twenty minutes later, you issue a second Flash Flood Statement to add in report details while maintaining that "Considerable" tag -> the WEA will NOT sound off again.

Note in the below table for TOR that an update does NOT sound off the WEA for "Base" or "Considerable." Only an upgrade to "Catastrophic" will trigger the WEA during an update for TOR. If needed, take more time to review the below table again.

Wireless Emergency Alerts - what will trigger?

Product / Warning		Activates Wireless Emergency Alert (WEA)?	
Tornado Warning	***Activate for new warning or when warning is upgraded/updated with a 'catastrophic' tag***	**Initial**	**Update (SVS)**
Base (no IBW tag)		**Yes**	*No*
Considerable Tag		**Yes**	*No*
Catastrophic Tag	***This tag must be selected to invoke Tornado Emergency Wording***	**Yes** (with enhanced language)	**Yes** (with enhanced language)
Severe Thunderstorm Warning	***New, upgraded or updated warning IF threat tag is 'destructive'***	**Initial**	**Update (SVS)**
Base (no IBW tag)	Wind ≥ 58 MPH and/or Hail ≥ 1.00" (US quarter)	*No*	*No*
Considerable Tag	Wind ≥ 70 MPH and/or Hail ≥ 1.75" (golf ball)	*No*	*No*
Destructive Tag	**Wind ≥ 80 MPH** and/or **Hail ≥ 2.75" (baseball)**	**Yes**	**Yes**
Flash Flood Warning	***New, upgraded or updated warning IF threat tag is 'considerable' or 'catastrophic'***	**Initial**	**Update (FLS)**
Base (No IBW Tag)	Used most of the time, when flash flood impact damage is possible	*No*	*No*
Considerable Tag	Use rarely, when there are indications flash flooding capable of unusual severity or impact is imminent or ongoing and urgent action is needed to protect lives and property.	**Yes**	**Yes**
Catastrophic Tag	Use exceedingly rarely, when a flash flood threat to life and catastrophic damage is occurring or imminent and floodwaters have risen or will rise to levels rarely if ever seen.	**Yes**	**Yes**

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Image Credit: NWS Central Region

2

Educate your public: While you as a forecaster know that "WEA for SVR = Bad Storm" your public and partners likely don't know the history of IBW hazard tiering for WEAs! Use briefings and social media to explain the significance of what it means for them (e.g. if their "pocket siren" sounds off for a severe warning, it is a high-end, life-threatening situation).

3

Mitigate "I never got the warning" beforehand: Leading up to a significant weather event, help educate your public on how to receive alerts:

- **Keep phones ON:** This is especially important during nocturnal events!
- **Check notification settings:** Ensure WEA alerts ARE enabled in their phone's notification settings. While the WEA can override "Silent" and "Do not disturb", it cannot sound if the user has manually disabled alerts in their settings.

- **Promote redundancy:** In areas of spotty cell coverage, remind them to have a NOAA Weather Radio, TV, or radio available.

A fantastic real-life example to illustrate this comes from the December 10-11, 2021 Service Assessment. Leading up to this historic severe weather outbreak, the NWS Louisville, Kentucky WFO (LMK) stressed in both their partner briefings and social media the importance of having multiple ways of receiving a warning. Better yet, they went the extra mile to even include instructions for their public and partners for how to ensure a smartphone had WEA alerting turned on as shown below. **Thanks for being a great example, LMK!**

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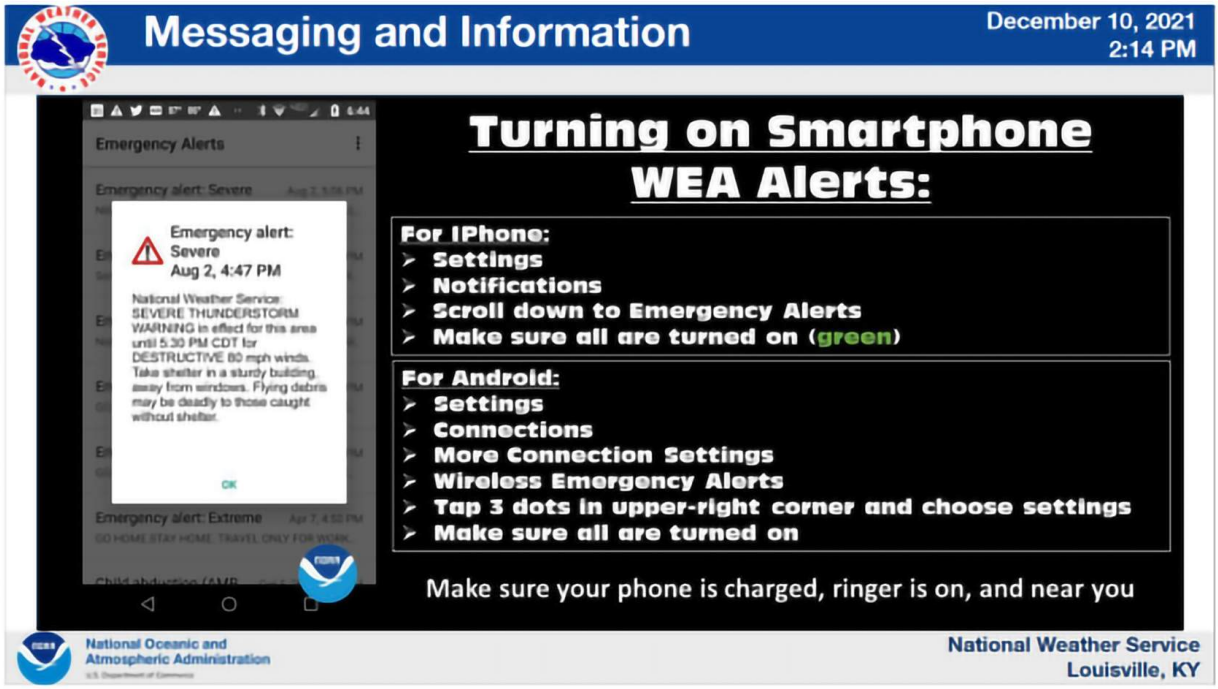


Image Credit: NWS Louisville, KY WFO (LMK)

Note: The above image serves as an example and text should not be directly copied due changes in phone settings since 2021 and office differences.

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Next Section: The Warning Itself

Lesson 6 of 11

WFO Dissemination: The Warning Itself



Katy Christian

I've saved the best for last because of all the dissemination systems discussed here, these next three sections cover operational dissemination tools directly within **YOUR CONTROL** which are some of the **MOST IMPACTFUL.** That said, brew a cup of coffee, buckle up, & lock in - **this stuff matters.**

The Warning Itself

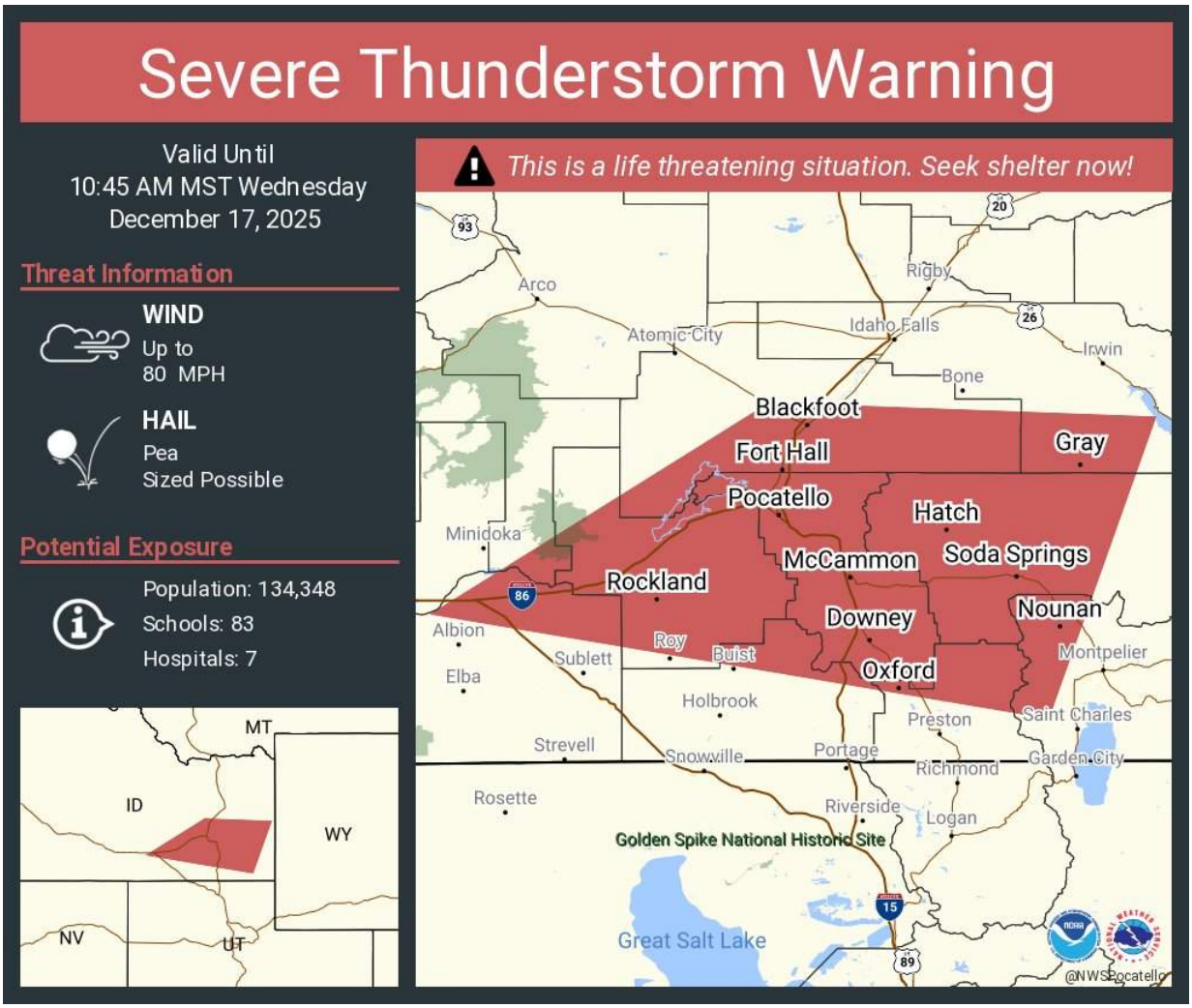


Image Credit: NWS Pocatello, Idaho WFO (PIH)

At the very heart of dissemination is **the warning itself** - nothing matters more than the decision to warn or not warn. Think of your warning as the rock that starts the ripple waves of dissemination. A warning MEANS something to people and IS an actionable threshold for some partners! With that said, what about your warning itself matters from a dissemination perspective?

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- **NEW vs. SVS/FFS:** Because you now understand how the NWR, EAS, and WEA work from a dissemination perspective, we can summarize what a New Warning vs. an Update means from an end-user alerting perspective. Because of the alerting differences highlighted in the below table for NEW vs. SVS/FFS, there may be times when it's more impactful from a dissemination perspective to **issue a NEW warning on top of an existing warning (especially when upgrading IBW tags)** to ensure that all communication channels are alerted. Take your time to review the below table and click on the table to zoom if needed.

	EAS (TV/Radio)	WEA (Cell Phones)	NOAA Weather Radio
New Warning	Alerts for all warnings	Alerts all TOR; alerts SVR and FFW **if** IBW tag thresholds are met!	Alerts for all warnings
Update (SVS/FFS)	Does **not** re-alert	Only re-alerts for **highest IBW tag thresholds** (exception: also alerts for "Considerable" FFS)	Does **not** re-alert

Dissemination Product Alerts

- **IBW Tags:** Out of all your warning text selections, the decision to trigger the WEA by choosing an IBW tag that matches higher-end

storms is the most impactful from a dissemination standpoint. It's that IBW selection in WarnGen or Hazard Services that alerts a device over 90% of people have! **Your decision to utilize IBW tags for WEA is the most powerful warning text option you have.**

Operational Takeaways

From this section, here's what **applies to you operationally:**

1. **Initiate a "New vs. SVS/FFS" Office Discussion:** Ask your office management what the local or regional warning recommendation is for issuing a New Warning versus an Update (SVS/FFS).

> **Remember:** A NEW warning acts as a "full-system" reset. It re-tones NWR and re-triggers

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the EAS on TV and Radio.

2

Leverage IBW tags: We've hit this hard but it bears repeating: by selecting an IBW type that matches the intensity and nature of the storm, and triggers the WEA, you are essentially hitting a "broadcast" button that reaches over 90% of the public through their smartphones!

Next Section: "The Big Three"

Lesson 7 of 11

WFO Dissemination: "The Big Three"



Katy Christian

"The Big Three"

Leading up to and primarily during an event, a large majority of WFO dissemination to partners comes through **“The Big Three”: Briefings/Webinars, Social Media/Our Webpage, and NWSChat/Slack.** "The Big Three” can fill the information gap between the watch-to-warning phase, ultimately strengthening the warnings themselves through increased reach, understanding, and context.

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Briefings & Webinars

In past NWS Service Assessments, webinars and briefings are routinely mentioned as a best practice for effective dissemination to your partners. When local WFO thresholds are met for hosting a webinar, this signals a heightened level of threat to our partners that the weather hazards are worth paying close attention to. The format of webinars gives you that extra margin to share detailed and targeted forecast/warning insights with your partners, which are critical to their decision-making and dissemination needs (see below quote). Additionally, **live webinars personalize dissemination** by allowing your partners to ask questions and hear the level of concern in your voice. For those not able to attend the live webinar, don't forget to send an "**Email Blast**" with your briefing slides afterwards - many partners use these to assist with their internal decision-making.

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NWS Atlanta Special Webinar for Severe Weather March 15-16, 2025

NWSPeachtreeCity 7.8K subscribers Subscribe 548 Share Ask Save Download

Image Credit: NWS Atlanta/Peachtree City, GA WFO (FFC)

"We are not weather people. We put out what the NWS gives us, plain and simple."

- Suffolk County, NY Emergency Manager (From the 2016 Northeast Blizzard Service Assessment)

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Social Media & Our Webpage

Tools such as GraphiDSS (Graphical Decision Support Services) and DSS Builder have streamlined how to pull forecast data into graphics for posting to our webpage and social media. Many of our partners do not have the resources like you do to create their own weather graphics! However, if you do not create and post those on social media, they have nothing to **amplify through reposting your graphics.** Many of our partners also rely on our NWS webpage for a quick look at the Weather Story and daily use. By posting visual updates to both your webpage and social media, you are giving them a quick and easy way to amplify and disseminate life-saving information to the public. **A good graphic is worth a thousand words and when reposted can reach a thousand people.**

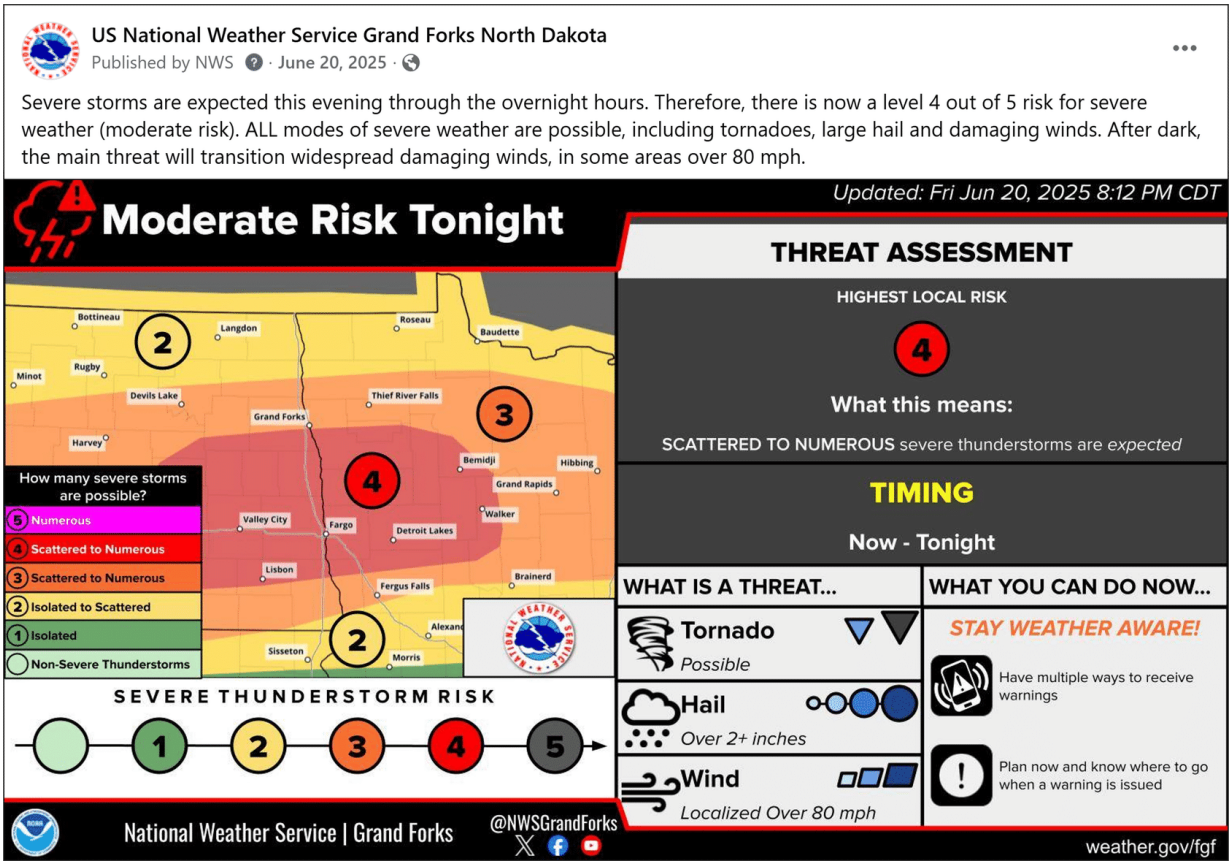


Image Credit: NWS Grand Forks, ND WFO (FGF)

3

NWSChat/Slack

Out of "The Big Three", NWSChat/Slack should be your most "alive and responding" dissemination tool. Slack has a narrower audience (i.e. emergency managers, public safety

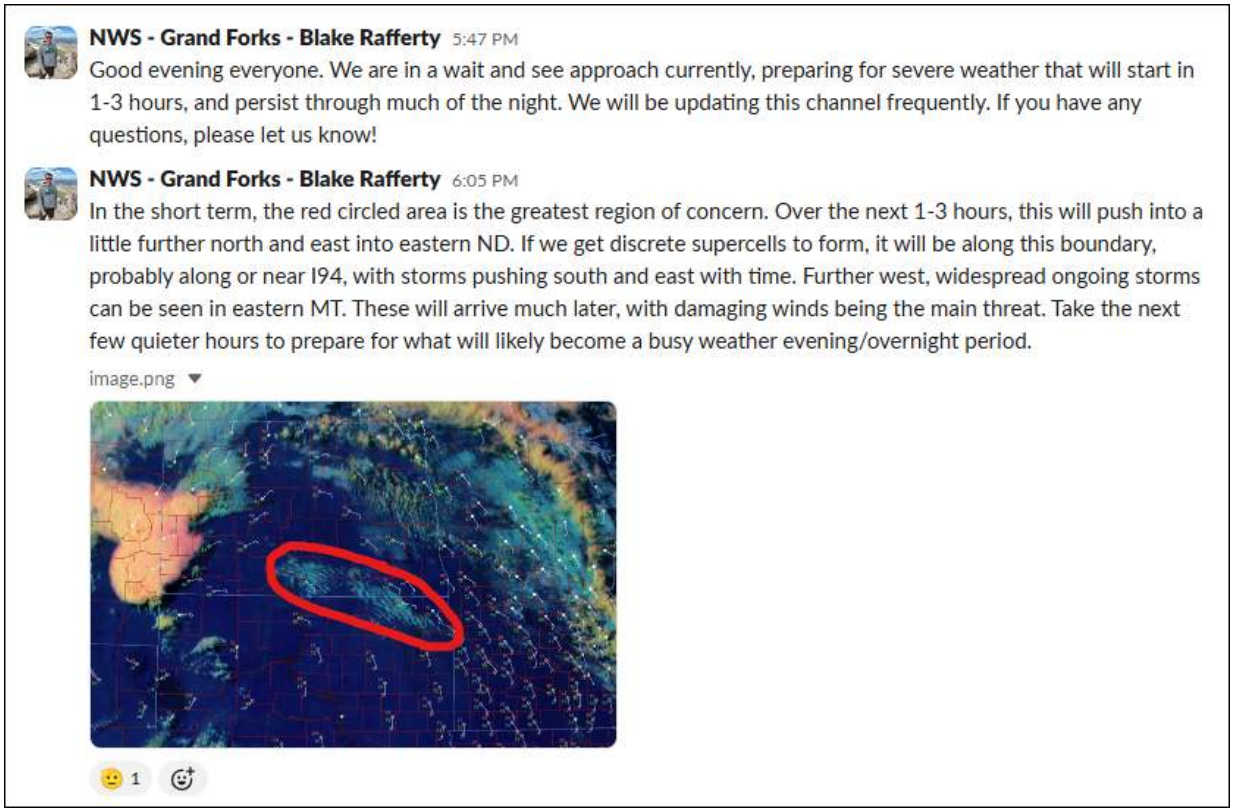
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officials, and media partners) so the content depth can be in between an AFD and IDSS Packet.

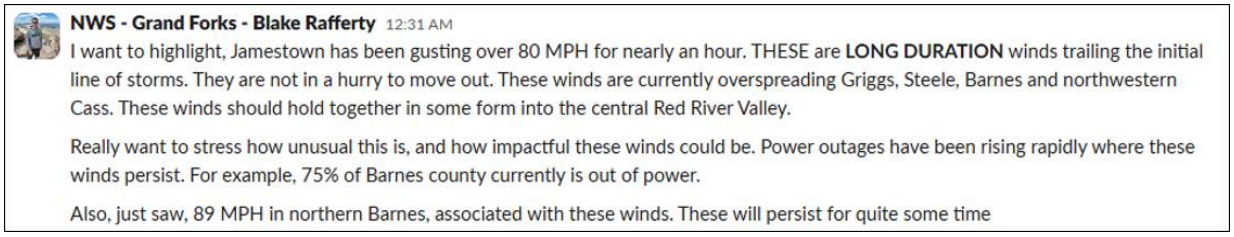
During an event, Slack is where you actively share with your partners things like radar analysis, storm reports, critical warning decisions, and initiation of service backup. While partners want to know **when things ARE happening**, partners also want to know when **things are NOT happening** (i.e. informing them during a winter event that the freezing line has shifted so you are no longer expecting impacts here) or **when the event has ENDED.**

Below is a real-life example from a historic severe weather event that highlights what effectively using Slack to communicate with partners before, during, and after an event looks like. Special thanks to **Blake Rafferty** and **Tyler Thomas (NWS FGF)** for letting me share!

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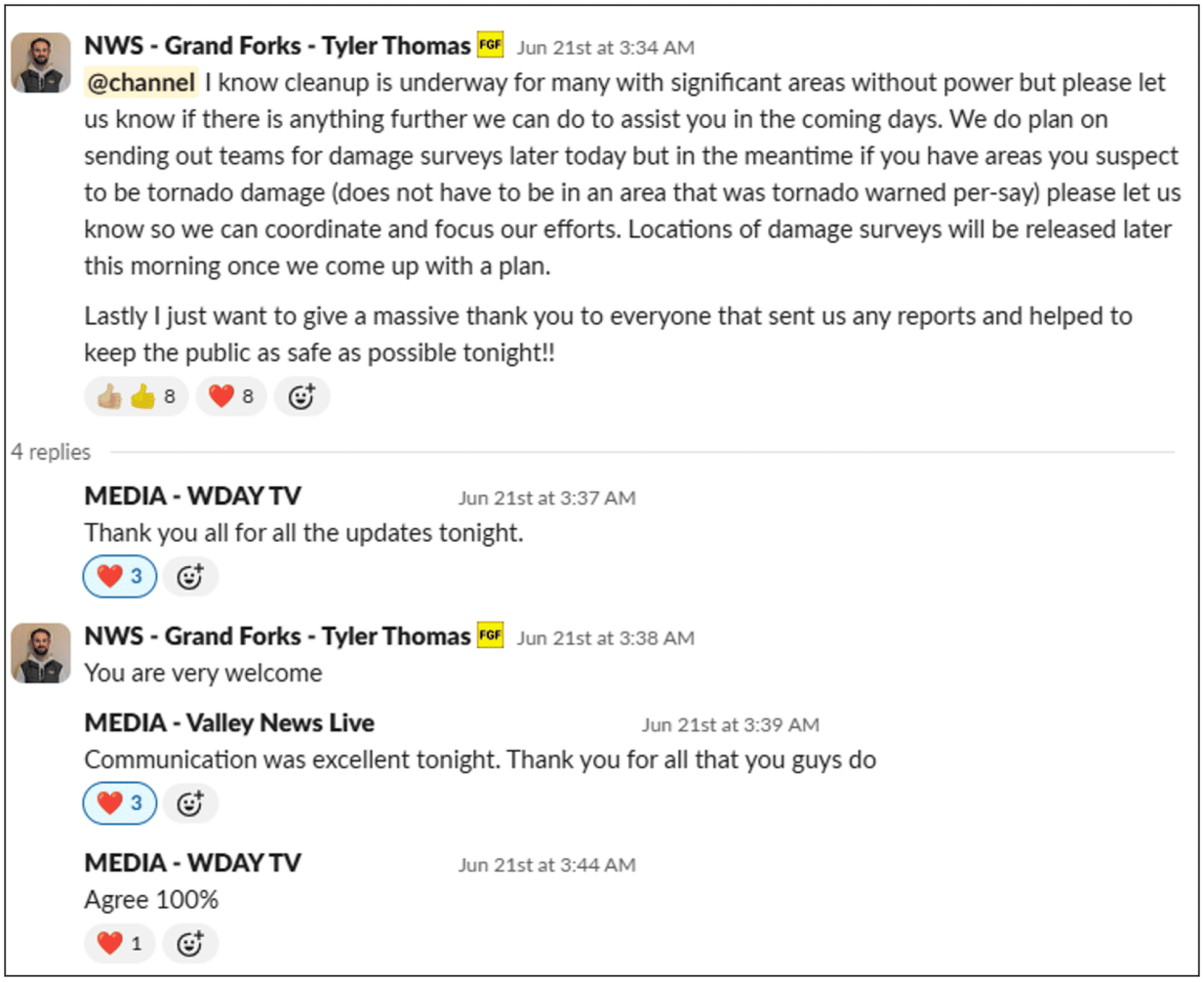


Before the event:
Gives partners advanced **heads up**, opens lines of communication, & fills the outlook-to-watch gap with helpful meteorological analysis **appropriate for audience**



During the event:
Gives quantifiable **examples of impacts** (e.g. 75% of Barnes County is without power) and uses dire language atypical of the forecaster so partners can "hear" **urgency through text!**

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After the event:
Gives partners an **all-clear** that the event is over and builds **positive partner relationships** by acknowledging their reports and crucial role in helping to keep our public safe.

Consistency of "The Big Three"

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In order to obtain a goal, you must be consistent. If the goal is for your partners and public to take protective action, you need to ensure consistency in not just using "The Big Three" but **consistency in messaging between** "The Big Three." While the way you message on these different platforms will look different (e.g. level of allowable detail), it should be a consistent underlying story. Is the story you're telling in your briefings before the event consistent with what you are putting out on social media? Is the messaging within your social media graphics (e.g. timing and threat area) **consistent** with what you are messaging on Slack? (Note that consistency does NOT mean refusing to update your forecasts as new data comes in - it means that when you DO update the messaging to reflect changes, you are consistent among all three).

We want to tell a story from beginning to end so that by the time the warning comes, it's not a surprise ending - everyone saw it coming.

Operational Takeaways

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From this section, here's what **applies to you operationally:**

1. **Post to Amplify:** Your social media and NWS webpage graphics are “fuel” for your partners. If you don’t post, they have nothing to share. A fresh, high quality graphic allows your EMs and media to amplify the message to the public.

2. **Don’t slack on Slack:**

   - **Don’t slack on Slack communication:** Your partners want interaction! Don’t just communicate during the event but also when the threat has ended or shifted away.
   - **Don’t slack on Slack recruitment:** Not every EM is signed up for Slack! Use partner meetings and briefings as an opportunity to give them the resources to get signed up. A partner not in Slack is a partner you can’t reach in real-time.

3. **Maintain Messaging Consistency:** Before you host a webinar or

post to social media, your webpage, or Slack, ensure the story you are telling is consistent between all three.

4

Assess Your Relationships: Good dissemination begins with good relationships.

- **Identify the gaps:** Who are the partners that you only hear from after a disaster? An "out of sight, out of mind" mentality leads to a relationship bust due to lack of trust. Make a list of who these people are and commit to reach out to them!
- **Expand your circle:** While it's easy to think of our partners as just EMs and broadcast Mets, there are many other potential partners in the dissemination circle - see the below exercise to reflect on this.

EXERCISE: Who from the below list can you expand your dissemination circle to include?

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Checkmark any below and start a conversation with your office about next steps for reaching out.

- [ ] **Tribal Nations & Indigenous Authorities** (e.g. tribal EMs, tribal public safety)
- [ ] **Transportation & Infrastructure** (e.g. state/local DOT, water resources management, including dam operators and hydropower utilities)
- [ ] **Outdoor Recreation & Events** (e.g. state/national parks, campgrounds/summer camps, fairgrounds)
- [ ] **Education & Healthcare** (e.g. school superintendents, campus EMs, the EM function of hospitals and nursing homes)
- [ ] **Agriculture Producers** (e.g. county extension agents, Ag Co-op managers)

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Good dissemination begins with good relationships. An "out of sight, out of mind" mentality leads to a relationship bust due to lack of trust.

Next Section: Offices Phones/Email

Lesson 8 of 11

WFO Dissemination: Office Phones/Email



Katy Christian

Office Phones/Email

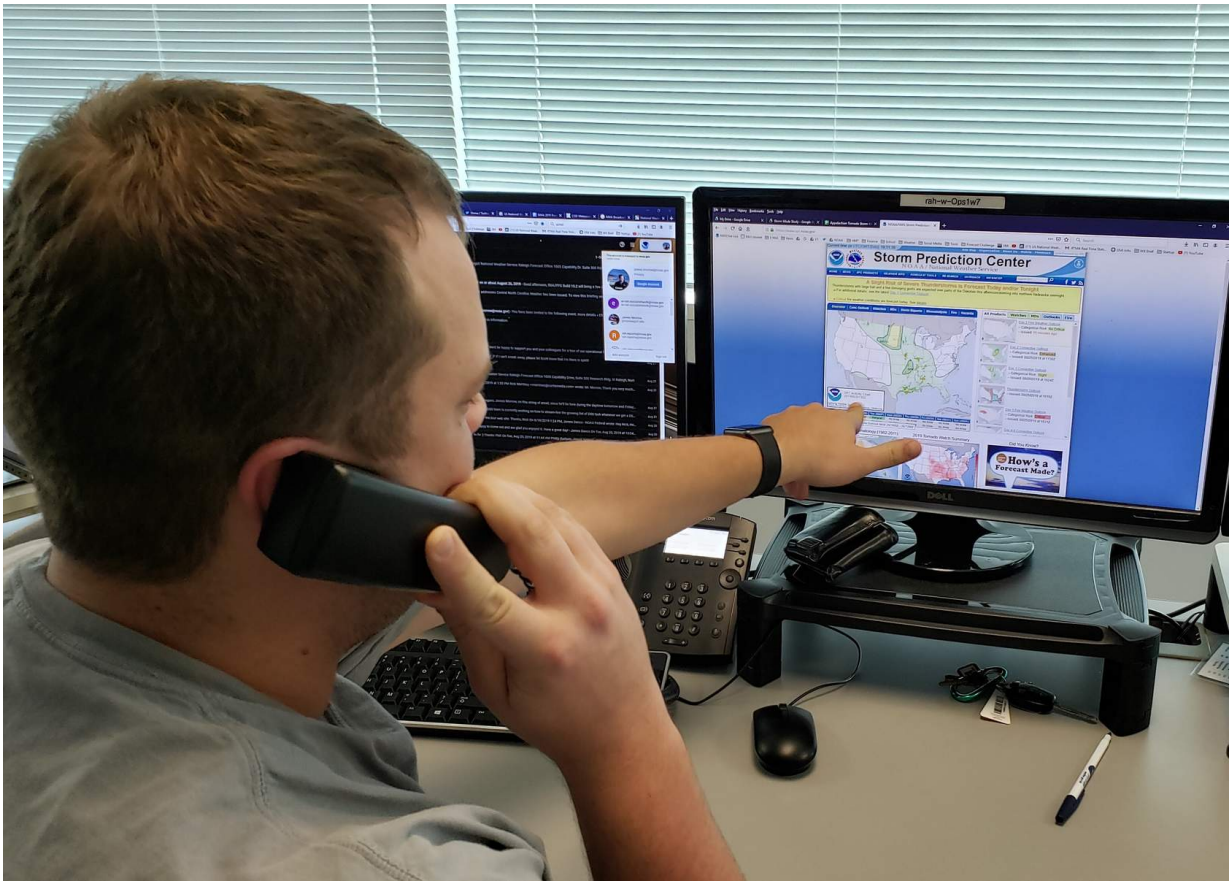


Image Credit: NWS Raleigh, NC WFO (RAH)

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Getting tasked with the phones during a severe weather event may feel dull and unglamorous compared to working radar - it's the proverbial "put me in, coach!" feeling! Yet as with many things in life - it becomes what you make of it. Every time you answer that office phone or reach out through a quick, coordinated email, **you are becoming direct dissemination.** Phones are uniquely powerful because they add an audible human element to urgency in a way that text can't.

> "Alabama has a statewide talk group over public safety radio systems, which allows emergency managers to **hear emotion in the WFO's voice.** Text isn't nearly as effective as hearing the **level of urgency in a voice**, especially a familiar voice."
>
> - Mobile, AL CWA partner (from the *National Water Center Flash Flood Focus Group* report)

Operational Takeaways

From this section, here's what **applies to you operationally:**

1. **Know WHO to contact:** During a severe weather event, it's not realistic to call every single EM, especially when you are short-staffed. When staff resources are limited, **prioritization** becomes an operational strategy you can implement even leading up to a severe weather event. Prioritize the following:

    - **Vulnerability:** Prioritize calling EMs in your most vulnerable areas (e.g. heavily populated centers, known flood-prone zones, or areas with large outdoor venues).
    - **Risk**: Prioritize calling EMs located within the **greatest hazard risk area** (e.g. a county that's in the bull's-eye of an SPC Moderate Risk) where high confidence in impacts may require the greatest amount of preparation by the EM. Additionally,

prioritize calling EMs within the **greatest uncertainty risk areas where a high-end scenario is possible but not yet certain** (e.g. a county that could either get minimal snowfall during a winter storm from being in the 'dry slot' vs. some short-range models showing the heaviest band setting up over the county and producing 6-8" of snow).

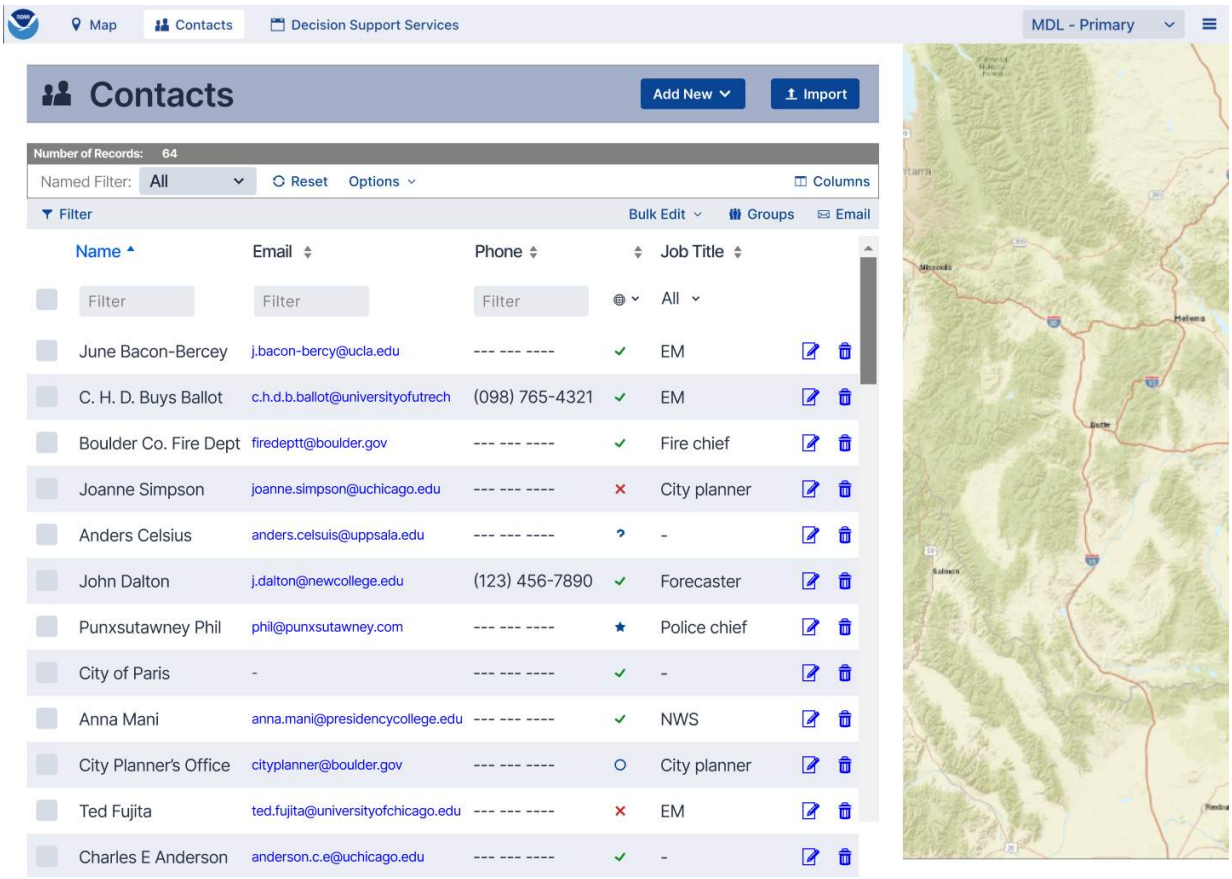
- **Availability:** In some counties, the EM may be unreachable or the person in charge of taking calls is overwhelmed and unavailable. Prior to an event, work with your partners to ask: "*Who is the best person to contact for immediate tactical decisions?*" If the EM or person in charge of taking calls is unreachable, **don't give up** - contact your State's Division of Emergency Management or local dispatch.

2

Know HOW to contact - the technology side:

During severe weather operations, time is of the essence. Just as knowing WHO to call, text, or email is vital, you also need to know HOW to do so from a technology side.

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Example of NWS Connect Contacts Page (Image Credit: NWS OSTI)

- **NWS Connect**: From a WFO to EM dissemination perspective, NWS Connect is your internal database for quickly finding phone numbers, emails, and the location of your EMs, spotters, and local media (Note: as a backup, your office typically maintains physical binders with EM contact info. Ensure you know where this binder is kept and that you regularly update the contact information within).

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3

Know HOW to contact - the human side:

Think of your communication style over the phone or email like a doctor's bedside manners. You don't want a doctor who is rude or abrasive. Likewise, you don't want a doctor who is like the classic "Google search" where every symptom is reason for panic and stress. You want a doctor who is empathetic and calm but also honest and direct. During a severe event, **be that type of doctor.** If it's bad, **let them hear that professional urgency in your voice**. The tone of your voice or email can act as the "Destructive" or "Catastrophic" human tag in real life. Research has shown that an empathetic and calm tone builds "cognitive trust" so that our partners on the other end of the line can focus on WHAT we're saying instead of being turned off by bad manners or panic - we need them to want to call back! Be urgent but polite.

Next Section: Dissemination Failure

Lesson 9 of 11

Dissemination Failure: Who to Contact?



Katy Christian

Dissemination Health

Some of the worst days in operations are the days where parts of dissemination begin to fail. When alerting systems do fail, every second matters. To diagnose a failure in real-time, you must understand the architecture of the primary dissemination systems we covered: **IPAWS, NWR, NWWS, EAS, and WEA.** Just as a doctor uses symptoms to diagnose a disease, you can use dissemination symptoms to isolate the source of a failure. By identifying **which part of the chain is broken**, you can bypass guesswork and immediately **contact the correct entity for technical support**. Refer to the "Dissemination Symptom, Diagnosis, and Doctor" checklist below to troubleshoot during an event. A PDF version is also attached below for you to download.

Warning Dissemination Health Checklist

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(Note: listings marked with an asterisk represent contacts who do not always provide 24/7 support)

Symptom	Diagnosis (likely culprit)	Doctor (primary contact)	Secondary Contact
Alert is missing from AWIPS, SBN, or NOAAPort	**System-wide outage:** Wide-area network or SBN outage	**NCF** (1-301-683-3893)	**NCO SDM** (sdm@noaa.gov)
Alert is on the web and NWR but WEA failed	**NWS to IPAWS "Handshake Failure":** NWS CAP Handler or IPAWS-OPEN	**NCO Ops** (nco.ops@noaa.gov)	**Your ROC and brian.miretzky@noaa.gov ***
Alert is missing from NWWS (e.g. Weather App disseminators aren't sending alerts)	**Uplink failure:** NWWS Server or satellite uplink issue	**NCO Ops** (nco.ops@noaa.gov)	**NWWS Support Desk*** (nwws.issue@noaa.gov) Use also for account questions
Alert is missing from NWS API	**Web failure:** Code issue	**NCO Ops** (nco.ops@noaa.gov	**NCO SDM** (sdm@noaa.gov)

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(api.weather.gov) or NWS Website (weather.gov)		)	
NWR is silent or broadcasting static	**Site link failure:** Local transmitter or phone line issue	**Your ESA or ET**	**NWR Outage Contacts*** 1-888-886-1227 1-888-697-7263 (nwroutage@noaa.gov)
Alert is on the web & NWR but NOT on local TV/radio	**Possible EAS decoder failure:** Local broadcast hardware failed to trip the alert header	**Local station chief engineer*** (preferable if they contact the NWS than vice versa)	**Your WCM and ROC*** (for awareness only)
Alert failed to auto-post to Slack	**API / Bot failure:** Automated script to post warning to Slack failed	**NCO Ops** (nco.ops@noaa.gov)	**NCO SDM** (sdm@noaa.gov)
Alert failed to auto-post to social media	**API / Bot failure:** Automated script to	**Your ROC***	**Your WCM***

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	post warning to X, or Facebook, failed		
Alert failed to reach iNWS subscribers	**iNWS failure:** Automated script failed to send alert to iNWS subscriber	**NCO Ops** (nco.ops@noaa.gov)	**NCO SDM** (sdm@noaa.gov)
Phone Issue	**System Outage:** Network issue	**NCO Ops** (nco.ops@noaa.gov)	**Your ESA or ET**
Email Issue	**System Outage:** Network issue	**Google Workspace Status Dashboard** (Google Dashboard)	**NOAA Unified Messaging Service*** (ums.support@noaa.gov)
NWS Connect Outage	**System Outage:** Software crash	**NCO Ops** (nco.ops@noaa.gov)	**NCO SDM** (sdm@noaa.gov)

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WarningDisseminationHealthChecklist.pdf
91.3 KB



Failure vs. Latency: There may be times when it's not a dissemination failure but increased latency due to external carrier traffic or network congestion. Rather than focusing on a strict clock, focus instead on the "vital signs" of each of the dissemination systems highlighted in the above table to determine the health of the alert. As a general rule of thumb, allow 2 minutes for downstream latency before declaring a failure and contacting the NCF (301-683-3893) or other technical support.

Next Section: Quiz (i.e. your favorite because it means the end is nigh!)

Lesson 11 of 11

Acknowledgements



Katy Christian

Acknowledgements

As with any training, it wouldn't have been possible without the selfless time shared and insightful feedback from the following individuals I'd like to thank from the bottom of my heart:

- **Kate Abshire**
- **Audra Bruschi**
- **Danielle Nagele**
- **Brian Miretzky**

Lastly, I'd like to personally thank **NWS Grand Forks, ND (FGF)**, who were the original inspiration behind this training. Thank you all for giving me something much better than just a cubicle to work out of each day - purpose.

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Contact Information

This training was presented in a different format from how we usually do things so your learning experience and feedback is **incredibly important** to me. If you have any comments or questions, please send me an email - I don't bite (unless there's a cookie nearby;)

katy.christian@noaa.gov

You are now done with this training. If viewing on the CLC, click on the "Exit Course" button in the upper right to close out.

SPS for Near-Severe Storms

SPS for Near-Severe Storms

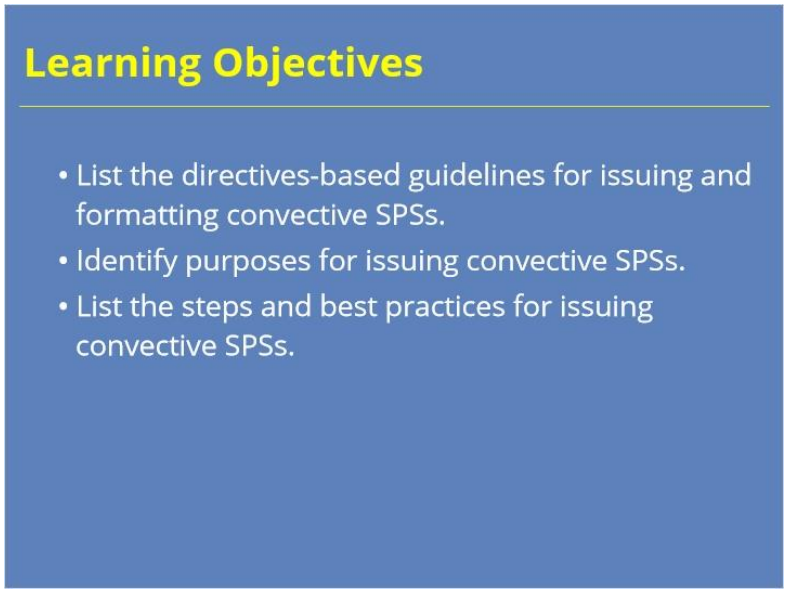


Notes:

Welcome to RAC Warning Fundamentals. This is a module on the Special Weather Statement (or SPS) for Near-Severe Storms. I am Barb Mayes Boustead.

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Learning Objectives

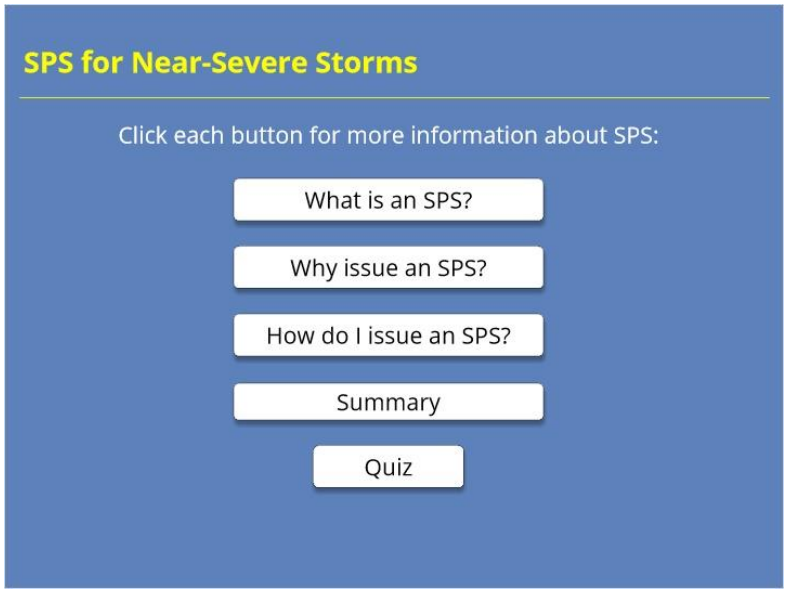


Notes:

After completing this module, you will be able to list the guidelines from the directives for issuing and formatting convective SPSs using WarnGen, identify reasons to issue convective SPSs, and list the steps and best practices for issuing convective SPSs.

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Homepage: SPS for Near-Severe Storms

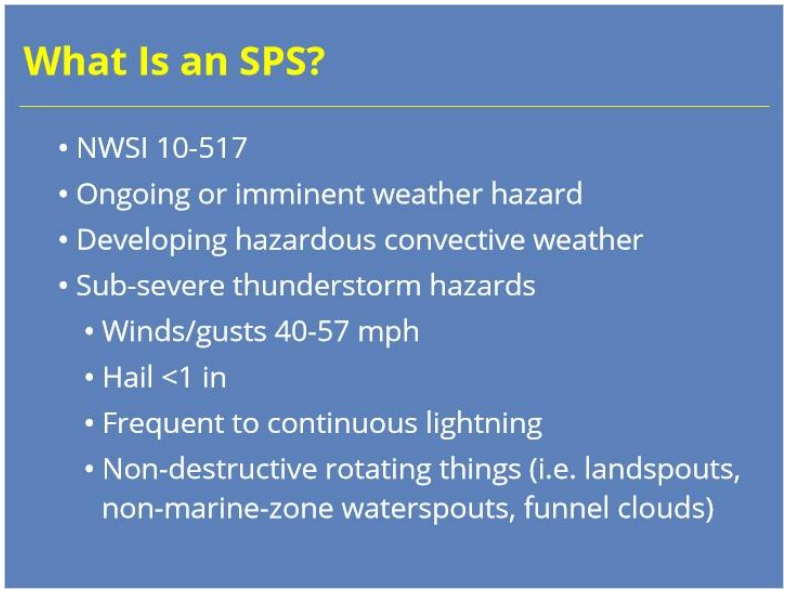


Notes:

Welcome to the homepage for SPS for near-severe-storms. Click on the what, why, and how buttons to learn more about the SPS product, its purposes, and the steps to issue the product. Then, click on the summary to put it all together. Finally, click to take the quiz for credit after you have viewed the other sections.

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What Is an SPS?

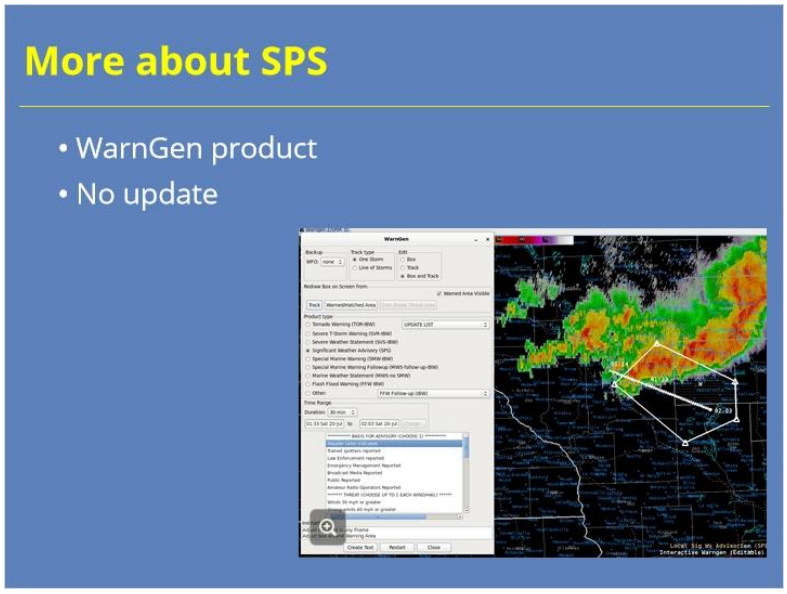


Notes:

The guidelines for the Special Weather Statement, or SPS, are outlined by NWS Instruction 10-517, section 3 – the directive is linked in the resources, as is the product description document (PDD). The directive specifies that an SPS should be issued to "provide the public with information concerning ongoing or imminent weather hazards, which require a heightened level of awareness or action." For convective weather, this includes developing hazardous convective weather and sub-severe thunderstorms. In a 2021 update to the directive, it also includes what we would call "non-destructive rotating things" – landspouts and non-marine-zone waterspouts, for instance. We'll talk more about this newer component of SPSs in the "why" section.

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More about SPS

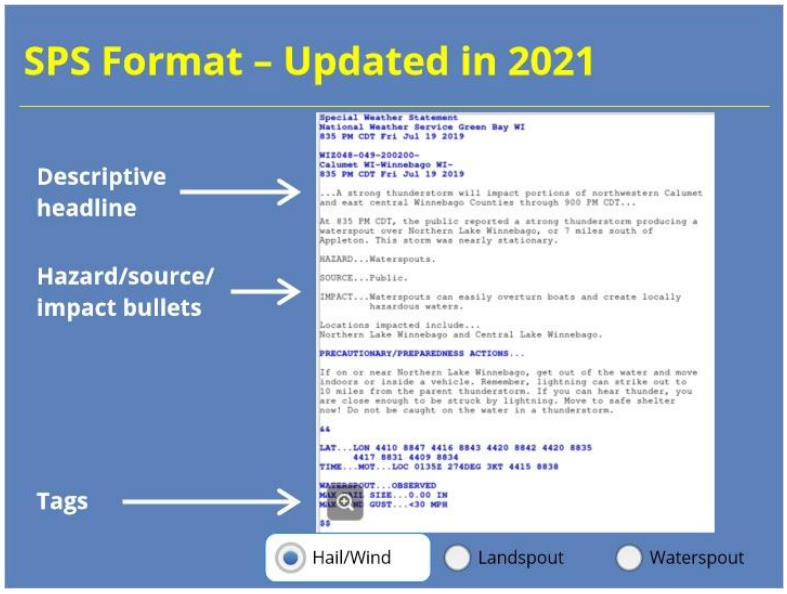


Notes:

We use WarnGen to issue convective SPSs, drawing them just like we would a tornado or severe thunderstorm warning. We will go through that process in the “How to issue an SPS” section. Unlike warnings, though, we cannot update an SPS once we issue it. For that reason, we recommend keeping SPS polygons small – tight to the hazard and short in duration.

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SPS Format



Notes:

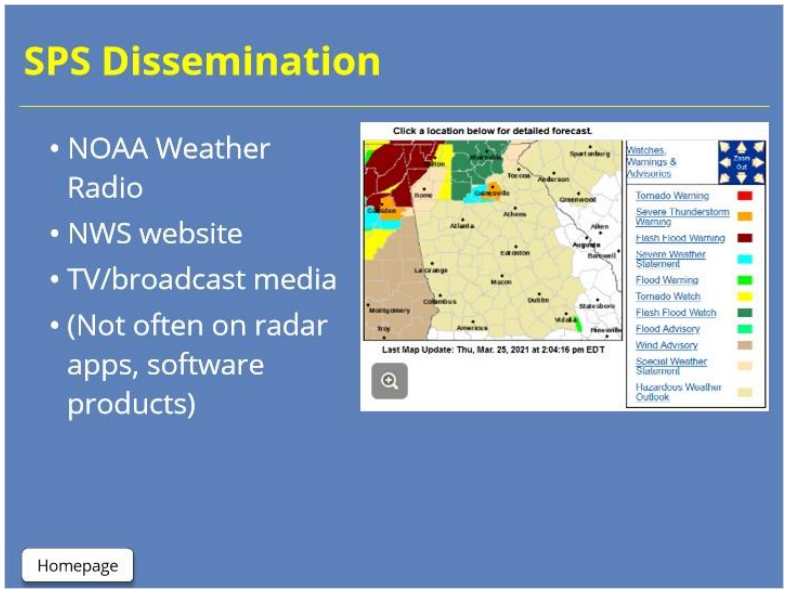
The SPS templates are being updated in 2021. The text is reformatted to look more like the IBW formats of severe thunderstorm and tornado warnings. This includes hazard, source, and impact bullets that are triggered by selections you make in WarnGen that should not be edited. Just as in severe thunderstorm warnings, SPSs will now include hail size and wind speed tags. If you select a landspout or waterspout, those will be tagged, as well.

The updated SPS also requires a descriptive headline of a strong thunderstorm, with the location and time of expiration – for example, “A strong thunderstorm will impact a portion of Wood County until 900 PM,” or “A line of strong thunderstorms…” if you use the line tool. Most importantly, the phrase “Significant Weather Advisory” is no longer allowed as a headline.

You can click on the buttons to see formats for SPSs with hail and wind only, with a landspout in addition to hail and wind, and with a waterspout. Click to enlarge any of the images.

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SPS Dissemination

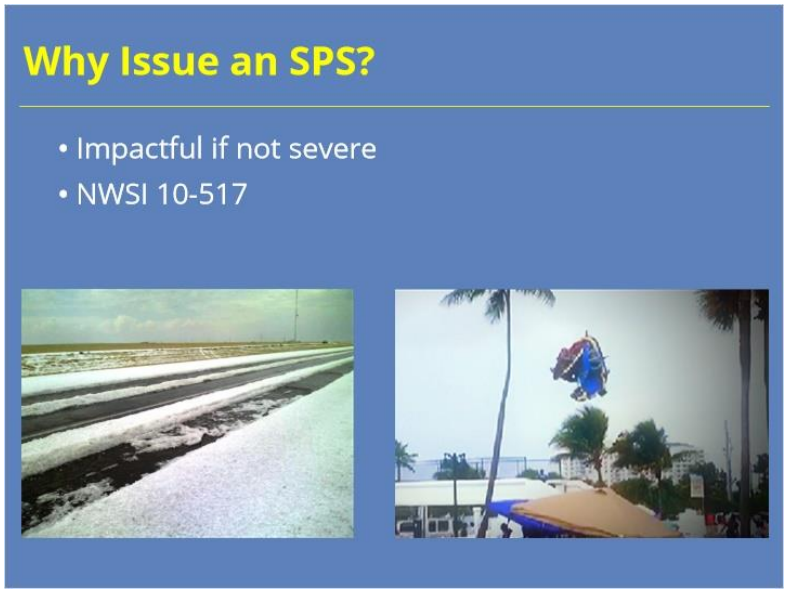


Notes:

SPSs do not have the visibility that severe thunderstorm and tornado warnings do. This is by design – they are intended to be a heads-up product that heightens awareness and not an alert-level product. Though they are played on NOAA weather radio, they do not have as much reach on the web and in applications. They are not often on commonly used radar apps and software products. They do, however, show up on the NWS website and on many TV media displays. Broadcast media partners, in particular, appreciate the SPS products, as it gives them information that they can relay on air.

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Why Issue an SPS?



Notes:

Some of you, or some of your offices, may not prioritize using the SPS, since it is not a warning product. Why do we have a product to tell people that a storm is not severe? Let's go through some key reasons that support using SPSs.

Storms that fall below severe limits can still be impactful. Small hail is disruptive, even if it is not destructive – it can cover roadways, damage gardens, and cause cars to pull over while driving. Non-severe-level gusty winds can blow over bounce houses or tents. Frequent lightning can endanger people who are using outdoor recreational areas. Also, the non-destructive rotating things like landspouts and waterspouts can garner media or public attention, even if they are not causing damage.

Also, keep in mind that NWSI 10-517 uses the strong language "should," as in, "WFOs should use an SPS for strong thunderstorms that approach, or are expected to approach, severe convective criteria." Directives set up an expectation of consistent services across all NWS forecast offices.

Pic.1: https://www.nssl.noaa.gov/education/svrwx101/hail/; https://www.nssl.noaa.gov/education/svrwx101/hail/img/PIC-0056.jpg

Pic. 2: Fort Lauderdale, FL, bounce house launched by waterspout. https://www.today.com/news/bounce-house-flies-away-injuring-teens-what-you-need-know-t153358; https://media2.s-nbcnews.com/i/MSNBC/Components/Video/150526/tdy_rossen_house3_150526.jpg

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Non-Destructive Rotating Things



Notes:

Let's go deeper into the guidance for non-destructive rotating things. The SPS allows you to fill that middle ground or gray area when you have a non-destructive rotating thing, like a landspout, a waterspout over non-marine zones, or a funnel cloud that is unlikely to reach the ground – the situations in which a tornado warning didn't quite apply, because the event wasn't destructive. These features may have captured some public attention, but if there is no destructive potential, then a warning might not be the best product. The SPS allows you to give a heads up about the feature.

There is no black-and-white decision tree that is going to delineate when to issue an SPS or a tornado warning in these situations. Apply your best meteorological and impact-based judgment. The SPS for these rotating things becomes a tool in your toolbox to use when you know you don't want to issue a tornado warning but also don't want to give the appearance that you are ignoring or unaware of the situation. It can provide a solution when you know that a tornado warning is not the best product for the situation. Knowing your area will help you know when it makes sense to use an SPS – for instance, knowing if you have locations that are prone to landspouts or inland lake waterspouts.

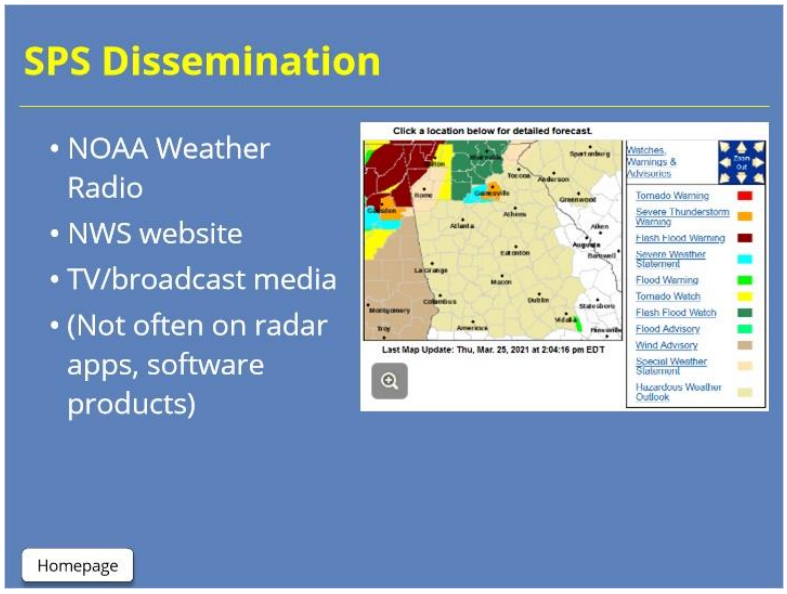
Pic 1: Weld Co., CO. https://www.9news.com/article/weather/weather-colorado/landspout-tornadoes-weld-county/73-ffdeb320-0488-4f6a-a1d9-41a375b6b666, https://media.9news.com/assets/KUSA/images/6fdfe414-899b-4c4d-b1d9-2c5a1fd21fef/6fdfe414-899b-4c4d-b1d9-2c5a1fd21fef_1140x641.jpg

Pic 2: Williamsburg, KS, (C) Jared Leighton (WFO EAX), 2011. https://kwwl.com/2019/07/07/gustnado-vs-tornado/; https://s3-ca-central-1.amazonaws.com/quincy-network/wp-content/uploads/sites/6/2019/07/JLgustnado.jpg

Pic 3: Lake Manawa, IA, . https://www.wowt.com/content/news/Rope-tornado-spotted-near-metro.html; https://gray-wowt-prod.cdn.arcpublishing.com/resizer/r_c9tM5_dYfMUbqXlRJxzPrdKyM=/1200x675/smart/cloudfront-us-east-1.images.arcpublishing.com/gray/YC77JJWW3ZMU5MS3A5ECYP5XOQ.jpg

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SPS Dissemination

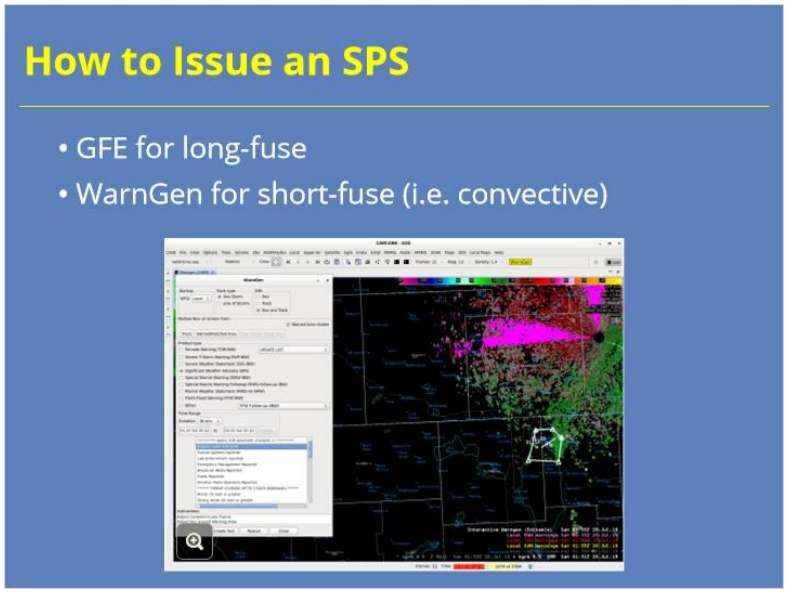


Notes:

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How to Issue an SPS



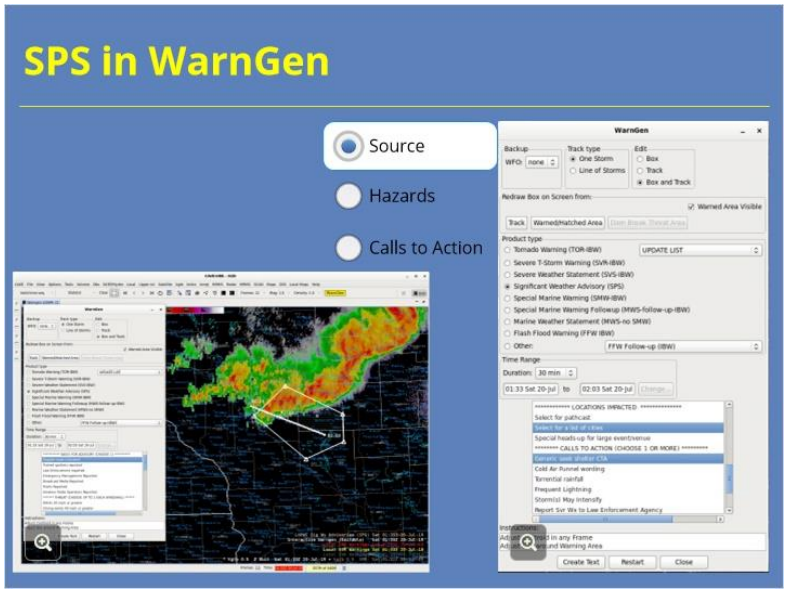
Notes:

There are two ways to issue an SPS. For longer-fuse, county-scale, grid-based events, on the scale of 2 to 6 hours, you should use the Graphical Forecast Editor (or GFE) to issue an SPS. For shorter-fused events on the scale of 15 to 60 minutes – including convective SPSs – you will use WarnGen to issue the product.

We want to emphasize keeping the polygon for a WarnGen-based SPS tight to the hazard, since you have no ability to trim or update the polygon after it is issued. This is especially true of the non-destructive rotating things. Waterspouts and landspouts that warrant an SPS are unlikely to be moving much and only impact a very small area. The polygons for these should be very tiny, limited to just the waterway being impacted by a waterspout or the very small convective area producing a landspout.

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SPS in WarnGen



Notes:

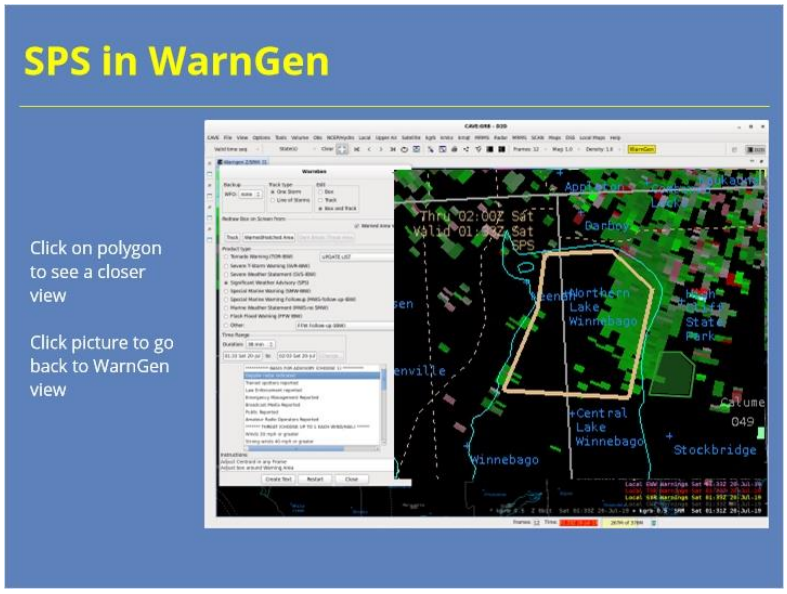
When issuing an SPS for convective hazards, you will use WarnGen very similarly to how you use it to draw severe thunderstorm or tornado warnings. Complete your storm diagnosis before beginning the process of creating the SPS product. Then, follow the 10 steps protocol introduced in an earlier module (and linked in the resources) to create and send the SPS.

As a reminder, after you select the product type – Special Weather Statement – you will choose a duration. We recommend keeping this short, as in 30 minutes or less - again, because you cannot update the SPS. Place your "drag me to a storm" dot or line on the feature, and then track it, keeping in mind that many features you would track in an SPS are stationary or nearly stationary. Adjust your polygon next, keeping it very tight to the impacted area, especially for landspouts and waterspouts.

In the WarnGen interface, choose the source, then choose the hazards, including hail size, wind speed, and if there is a landspout or waterspout, either reported or possible. Work through the calls-to-action, choosing one or two for the situation. Create your text, quality-control the product from top to bottom, fill in any framing text, and then send it. You do still want to keep the habit of clicking "restart" to clear the hatched area. Be sure you have a way to keep track of SPSs you have issued, as these should alert you to pay closer attention to those storms – that could be a warning tracking sheet or a visual reminder with polygons on a screen.

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SPS Example



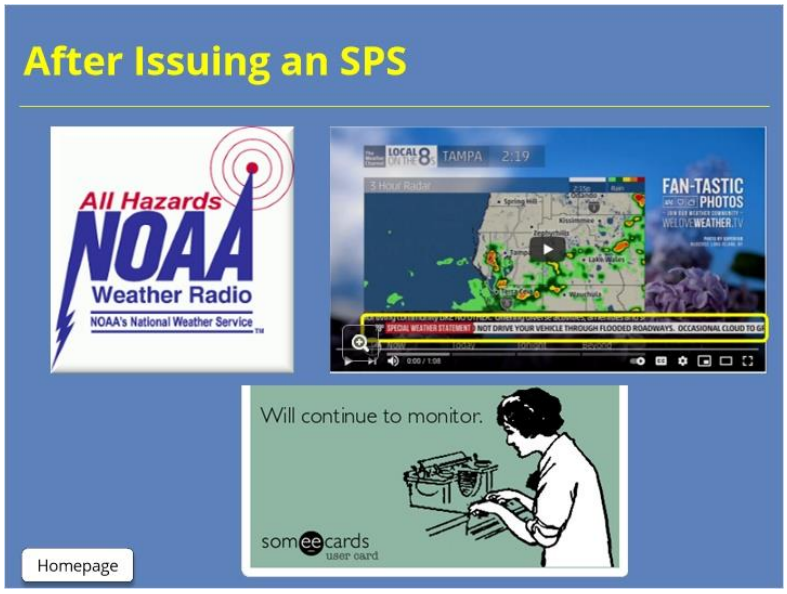
Notes:

For example, if you have a waterspout over a lake or a wide river, you would draw an SPS with a very small and tight polygon snapped right around the body of water, taking care to include as little land around it as possible. That way, your messaging that it is a waterspout is accurate for the polygon you draw. The calls-to-action in an SPS for a waterspout are specific toward boaters who will need to reach shore or safety. If the waterspout may move on land, then it likely warrants a tornado warning.

Click on the polygon in the WarnGen image to see a closer view of the area included. Click on the zoomed picture to go back to the WarnGen view. Note that this WFO has included lake names and even portions of lake names as point locations, a best practice that we encourage.

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After Issuing an SPS



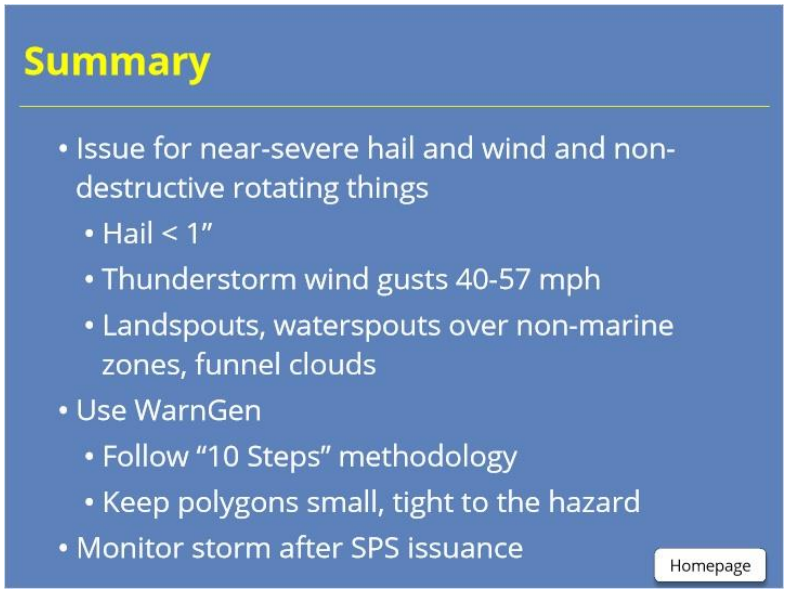
Notes:

After you issue an SPS, it will go onto NOAA weather radio, where you can manually remove it from the feed if there are a lot of products on higher-impact storms and you want to reduce clutter on the broadcast. It will appear on the NWS website, and it often appears in crawls on local TV stations.

Once the SPS is issued, use the screen-rank-analyze-and-decide (SRAD) process to continue to monitor the storm of interest closely. By definition, the storm is close to severe limits or is producing a rotating thing, both of which warrant continued analysis. If the storm intensifies to severe weather thresholds, or if you lose confidence that the rotating thing will not cause a threat to life or property, move quickly to issue a severe thunderstorm or tornado warning. The SPS should be a visual cue to you to pay closer attention to that storm, rather than a note that you've "dealt with it" and can leave it alone.

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Summary

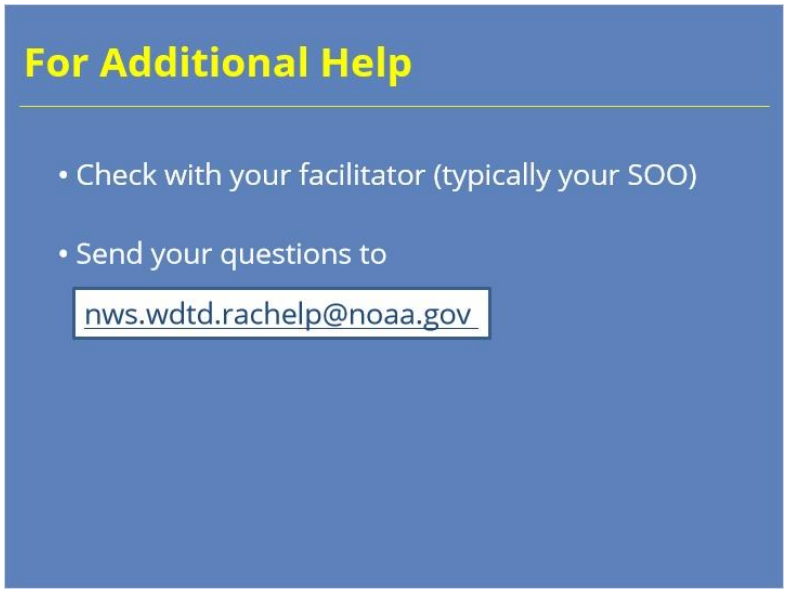


Notes:

In summary, SPSs are a tool in our toolbox to raise awareness about storms that are approaching severe limits or may garner media attention. These include storms with less than 1 inch size hail and/or gusty winds of 40 to 57 mph. It also includes non-destructive rotating things like landspouts and waterspouts over non-marine zones, as long as the warning forecaster is confident that the rotating thing will not threaten lives or property. Use WarnGen to issue convective SPSs, following the 10 steps methodology we've learned in other training modules, and keep polygon sizes tight to the hazard. After you issue the SPS, continue to monitor the storm of interest closely in case it intensifies and warrants an upgrade to a severe thunderstorm or tornado warning.

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For Additional Help



Notes:

For additional help, check with your facilitator (typically your SOO) or send your questions to the listserv e-mail address here.