



AWR-326

Tornado Awareness

Activity Handouts
October, 2019
Version 2.0



FEMA

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Acronyms and Abbreviations

ASOS:	Automated Surface Observing System
CDP:	Center for Domestic Preparedness
CWA:	County Warning Area
DOD:	Department of Defense
EF:	Enhanced Fujita
ELO:	Enabling Learning Objective
EMRTC:	New Mexico Tech's Energetic Materials Research and Testing Center
FAA:	Federal Aviation Administration
FEMA:	Federal Emergency Management Agency
FFD:	Forward-Flank Downdraft
GFS:	Global Forecasting System
NCBRT:	National Center for Biomedical Research and Training
NCERST:	The Transportation Technology Center's National Center for Emergency Response in Surface Transportation
NERRTC:	National Emergency Response and Rescue Training Center
NDPC:	National Domestic Preparedness Consortium
NDPTC:	National Disaster Preparedness Training Center
NOAA:	National Oceanic and Atmospheric Administration
NTS-CTOS:	Nevada Test Site/Counter-Terrorism Operations Support
NWFO:	National Weather Forecasting Office
NWS:	National Weather Service
PDS:	Particularly Dangerous Situation
POES:	Polar-Orbiting Satellites
QLCS:	Quasi-Linear Convective System



RFD:	Rear-Flank Downdraft
SAME:	Specific Area Messaging Encoding
SPC:	Storm Prediction Center
TLO:	Terminal Learning Objective
WEA:	Wireless Emergency Alerts
WFO:	Weather Forecasting Office



Activity Worksheets

List of Handouts:

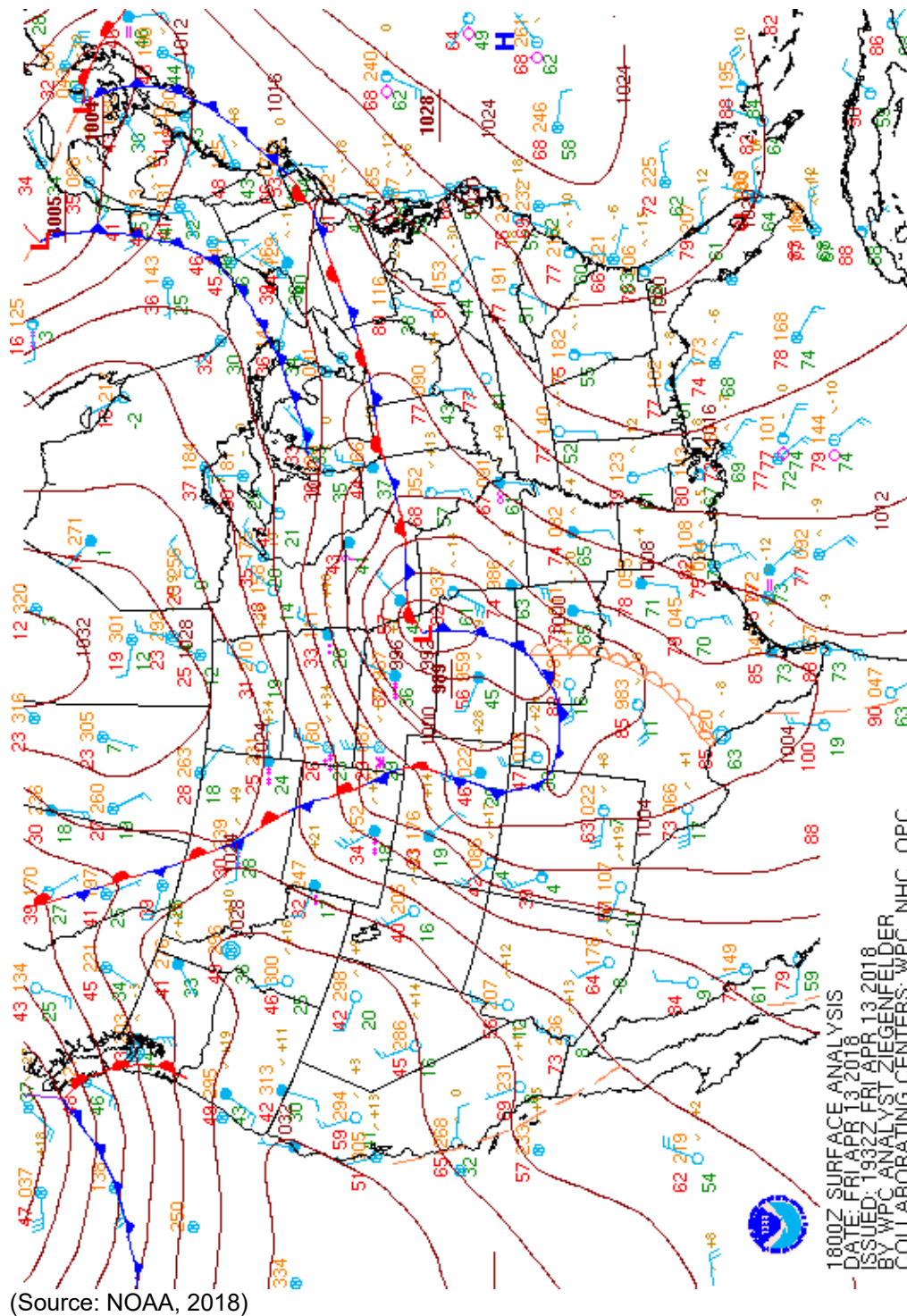
This handout includes the following:

- Module 3: Handout #1
- Module 5: Handout #1
- Module 5: Handout #2
- Module 5: Handout #3
- Module 5: Handout #4
- Module 5: Handout #5
- Module 5: Handout #6

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Module 3: Handout #1
Surface Analysis Map
(page 1 of 10)



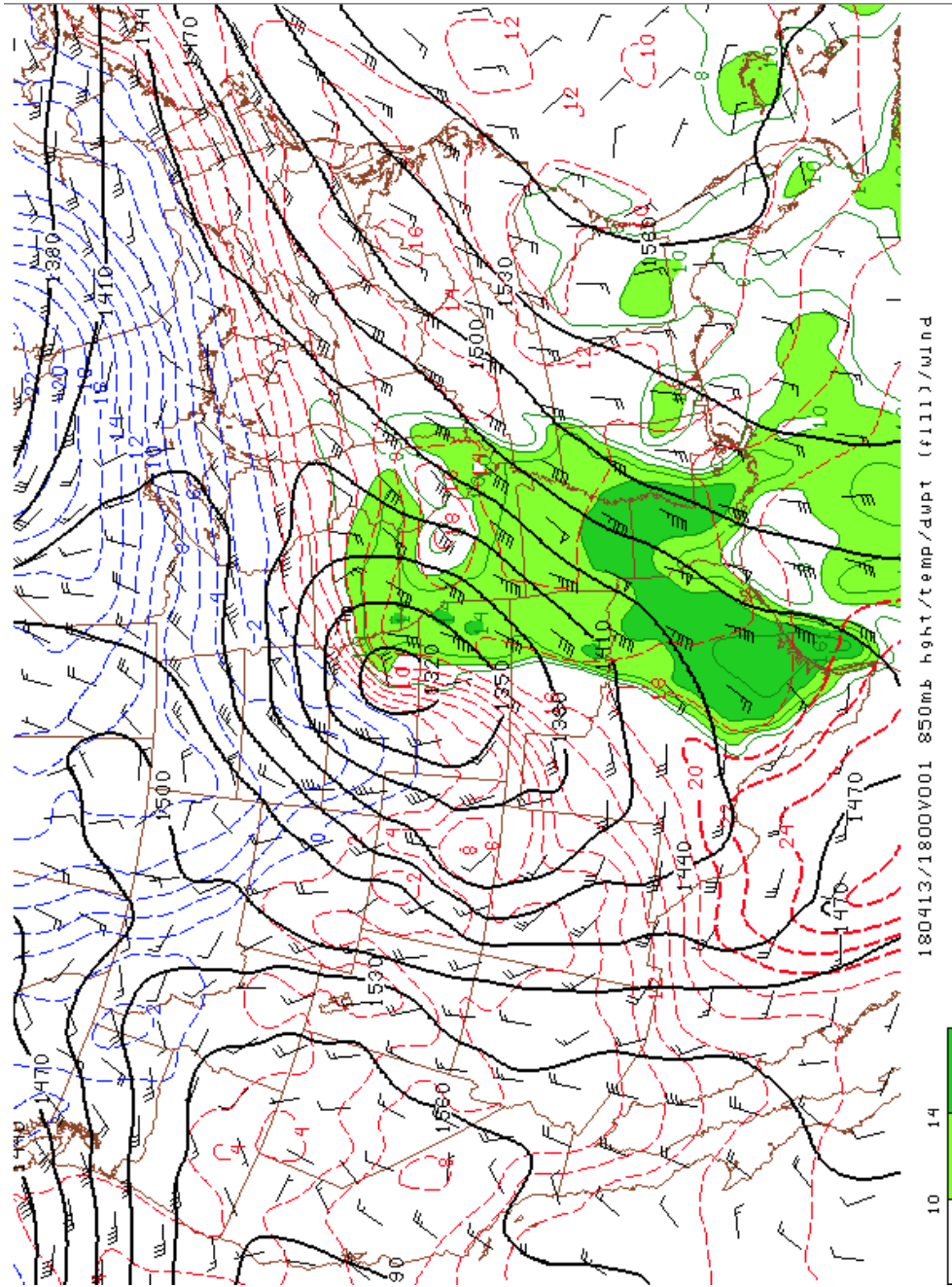


Module 3: Handout #1
Surface Analysis Map
(page 2 of 10)

This surface analysis map depicts the weather systems that were in place across the continental United States at 18Z on April 13, 2018. Note the mid-latitude cyclone over the northern Plains, with a frontal boundary draped through Kansas, Oklahoma, and Texas. Think about where severe weather is most likely in relation to these weather features.



Module 3: Handout #1
Low-Level Moisture (green contours)
(page 3 of 10)



(Source: NOAA, 2018)

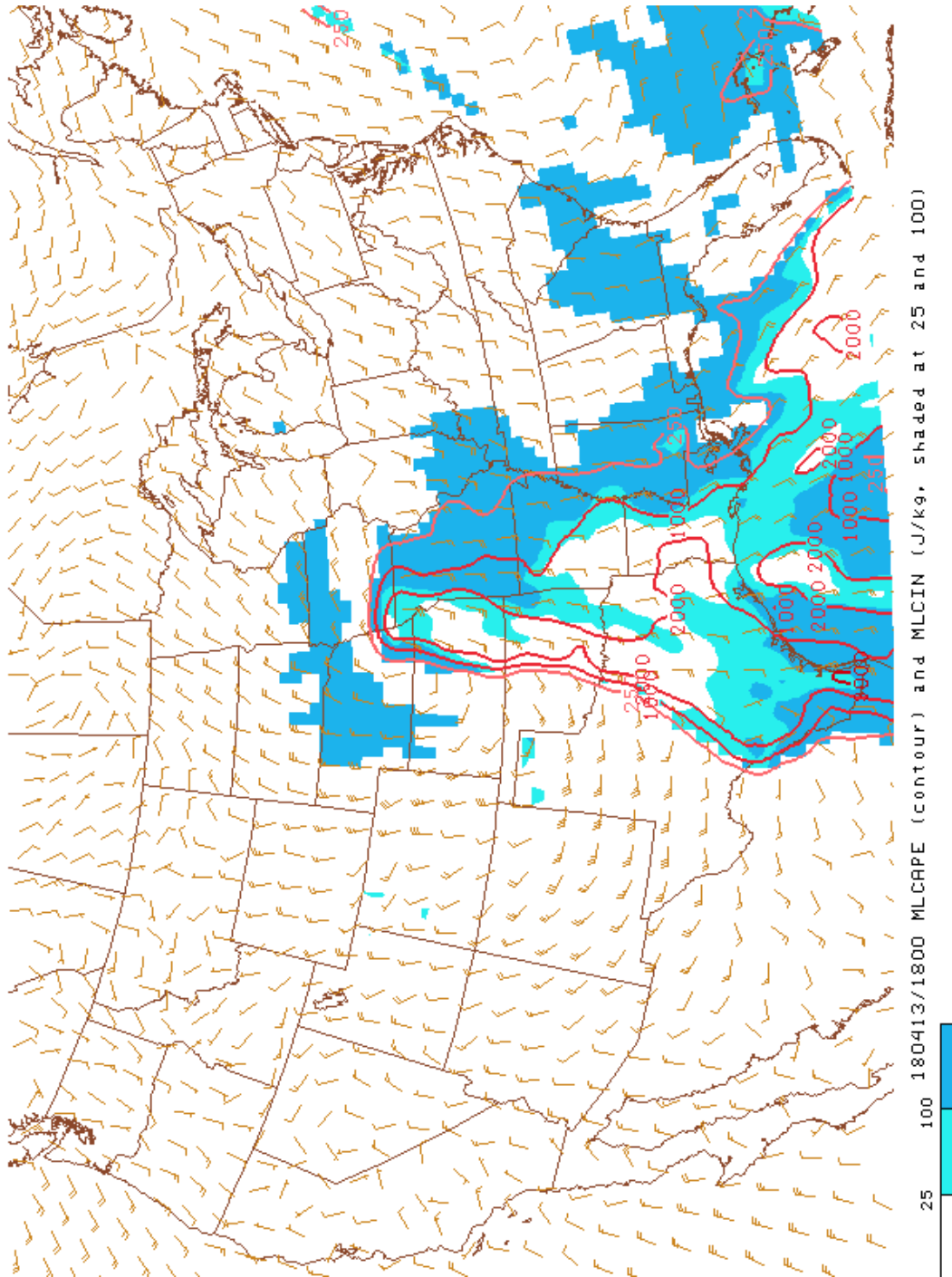


Module 3: Handout #1
Low-Level Moisture (green contours)
(page 4 of 10)

This is a map of low-level moisture, expressed as dewpoint temperature, valid at the same time as the surface map. For the purposes of this simplified exercise, the numerical values are not as important as the relative magnitude of the moisture: the darker the shade of green, the higher the moisture content of the air. Pay attention to areas of enhanced low-level moisture when considering severe weather risk.



Module 3: Handout #1
Atmospheric Instability (red contours)
(page 5 of 10)



(Source: NOAA, 2018)

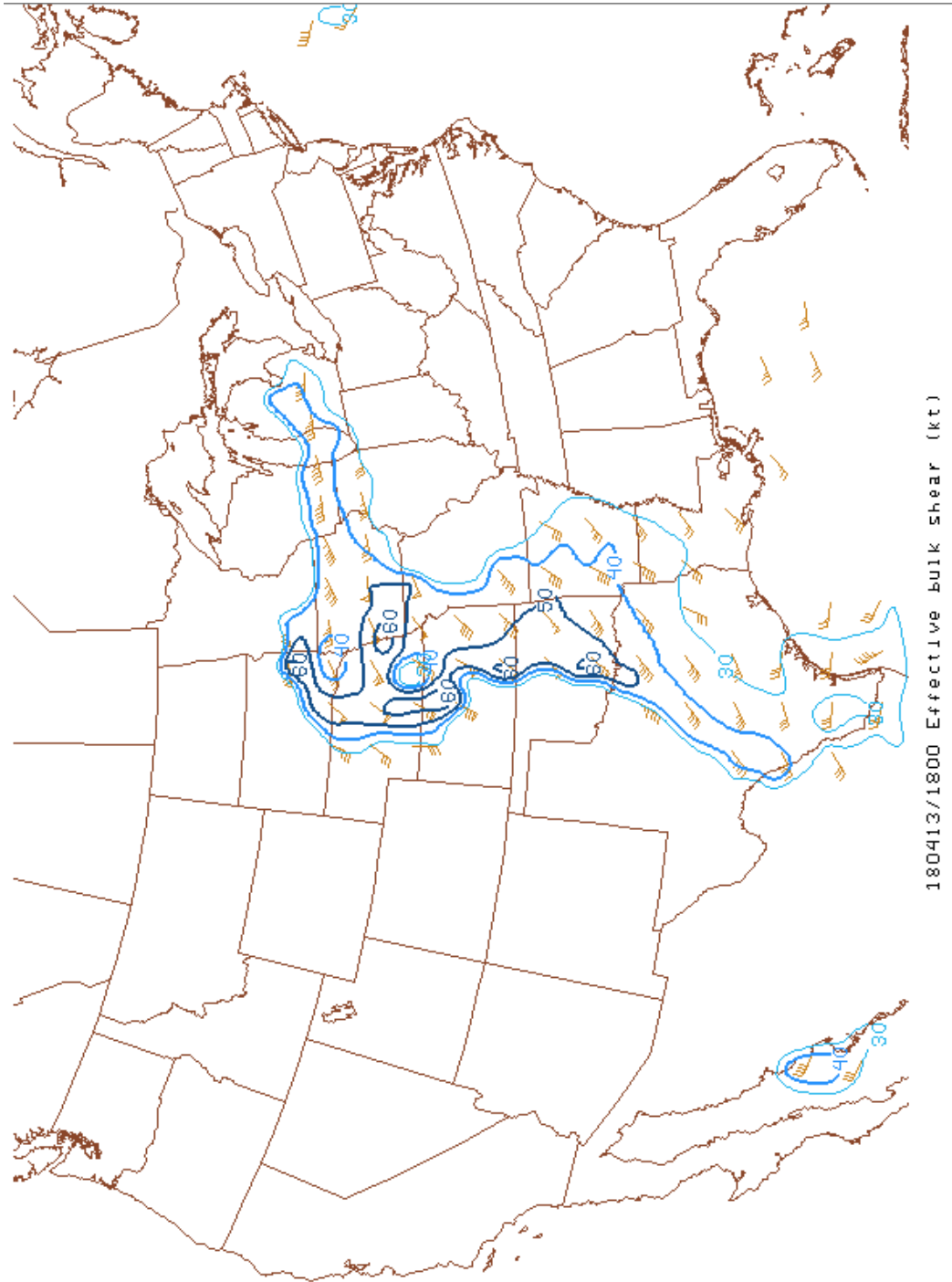


Module 3: Handout #1
Atmospheric Instability (red contours)
(page 6 of 10)

This is a map of instability, valid at the same time as the surface map, depicted by the red contours. For the purposes of this simplified exercise, the numerical values are not as important as the relative magnitude of the instability: the greater the contour value, the greater the instability. Pay attention to areas of enhanced instability when considering severe weather risk.



Module 3: Handout #1
Vertical Wind Shear (blue contours)
(page 7 of 10)



(Source: NOAA, 2018)

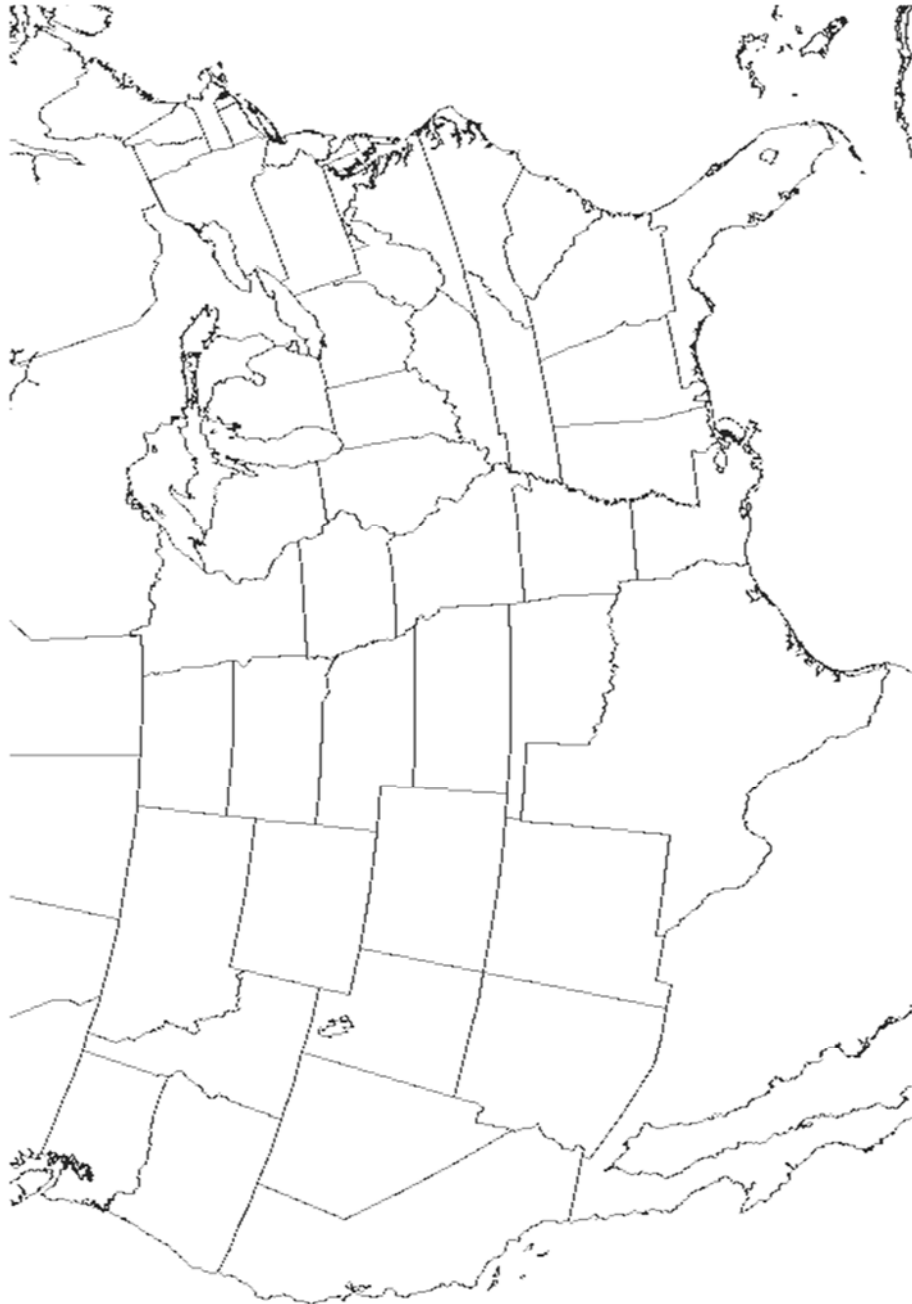


Module 3: Handout #1
Vertical Wind Shear (blue contours)
(page 8 of 10)

This is a map of effective bulk shear, which is an expression of wind shear, depicted by blue contours and valid at the same time as the surface map. For the purposes of this simplified exercise, the numerical values are not as important as the relative magnitude of the shear: the greater the contour value, the greater the shear. Pay attention to areas of enhanced shear when considering severe weather risk.

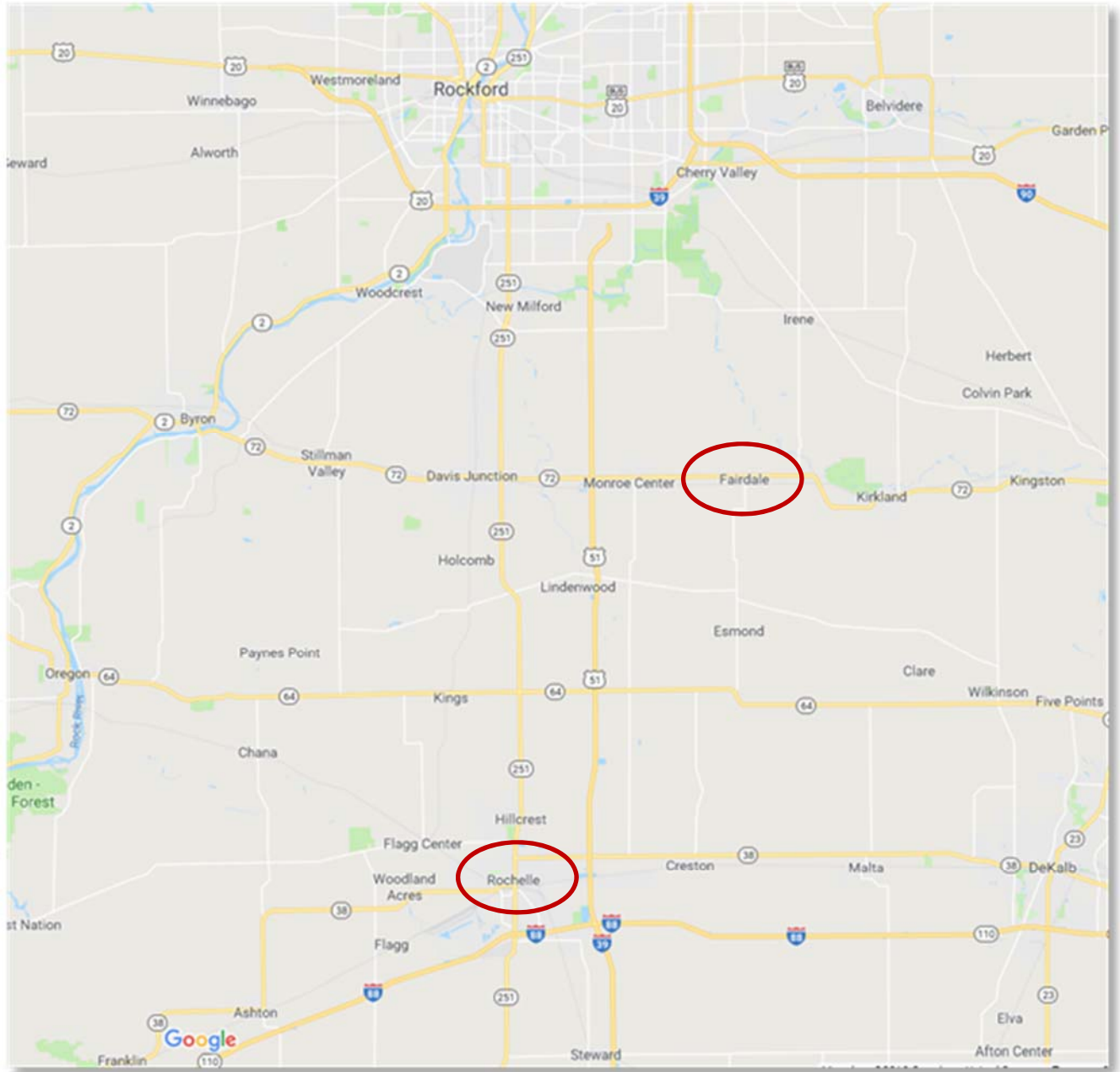


Module 3: Handout #1
Map of the Continental United States
(page 10 of 10)





Module 5: Handout #1
Map of Storm Area
(page 1 of 5)



(Source: Google Maps, 2013)

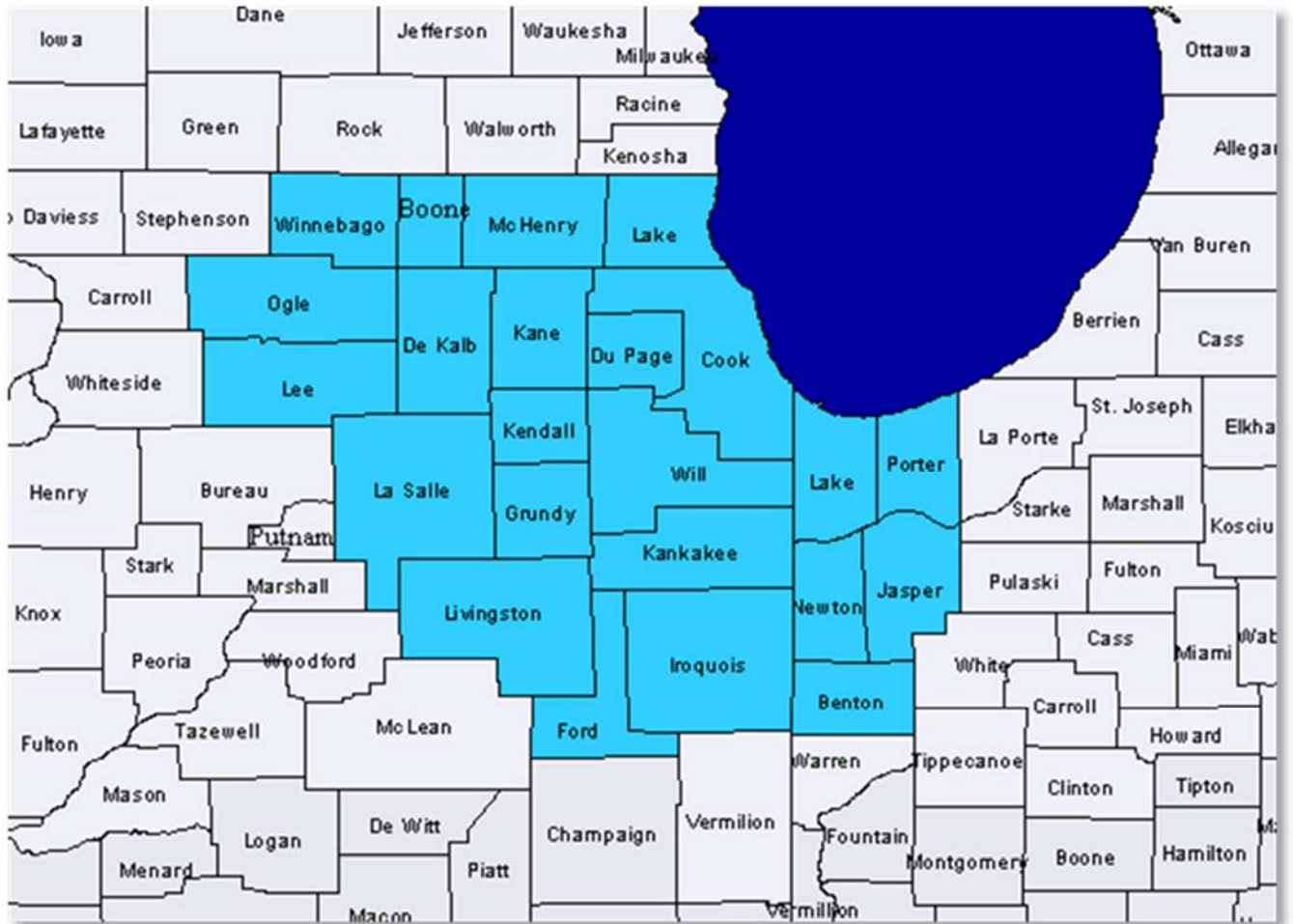


Module 5: Handout #1
Map of Storm Area
(page 2 of 5)

Map of the storm area of interest. The towns of Rochelle and Fairdale in Illinois are circled.



Module 5: Handout #1
County Warning Area of Chicago, Illinois
(page 3 of 5)



(Source: NOAA, 2015)



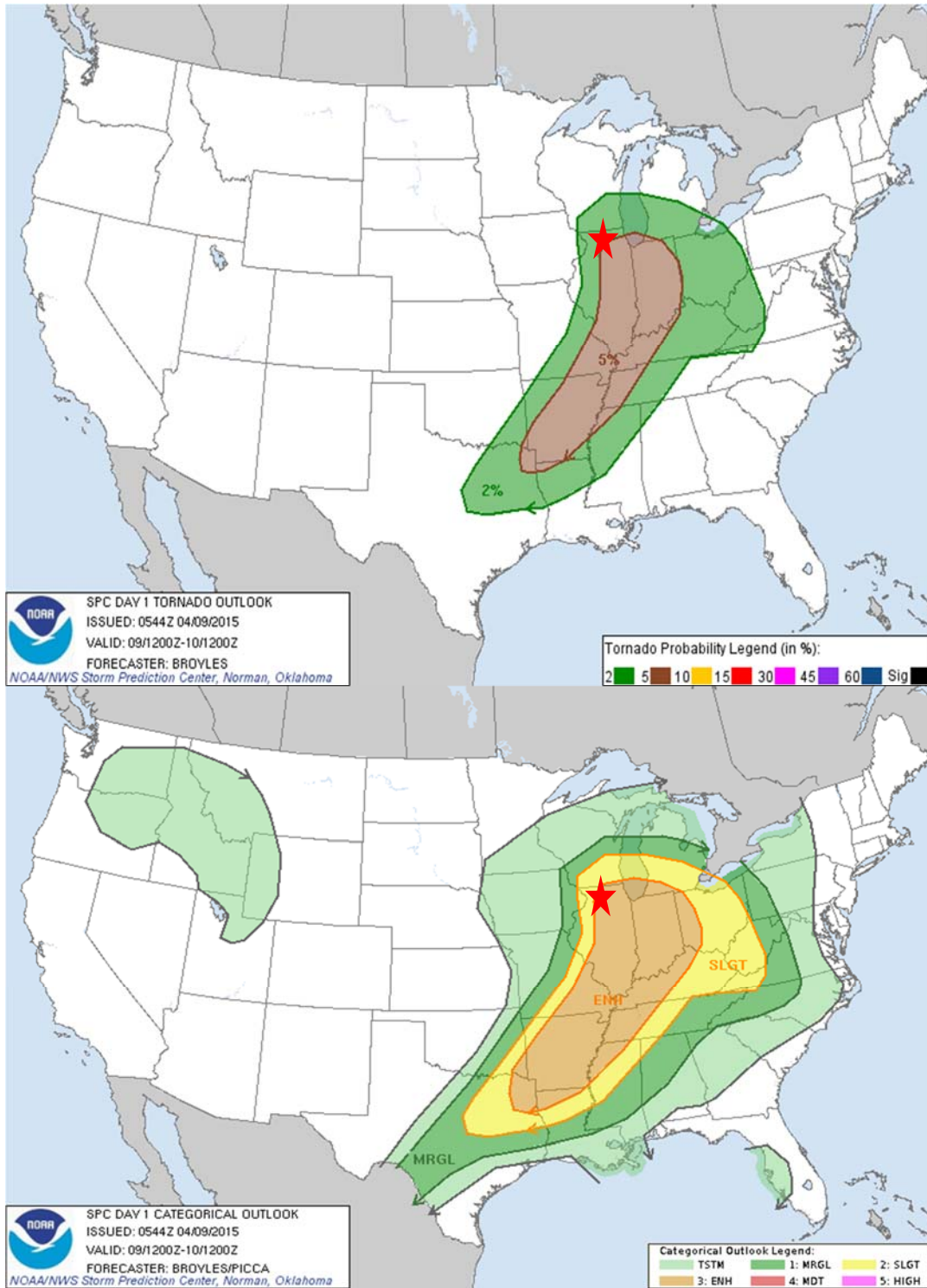
Module 5: Handout #1
County Warning Area of Chicago, IL
(page 4 of 5)

Map of NWS WFO Chicago, Illinois, county warning area (CWA), showing Ogle and DeKalb Counties located in the northwestern portion of the CWA.

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Module 5: Handout #2
SPC Convective Outlook (1300Z / 8:00 am CDT)
(page 1 of 4)



(Source: NOAA, 2015)



Module 5: Handout #2
SPC Convective Outlook (1300Z / 8:00 am CDT)
(page 2 of 4)

SPC Convective Outlook issued at 1300Z / 8:00 am CDT. The top figure shows the categorical outlook, with a slight severe weather risk (yellow) extending from Texas northeastward toward the upper Midwest. An enhanced severe weather risk (orange) extends from east Texas through Wisconsin.



Module 5: Handout #2 (page 3 of 4)

DAY 1 CONVECTIVE OUTLOOK

NWS STORM PREDICTION CENTER NORMAN OK
0800 AM CDT THU APR 09 2015

VALID 1300Z - 1400Z

...THERE IS AN ENH RISK OF SVR TSTMS ACROSS PARTS OF NE TX...FAR SE
OK...NRN LA...AR...NW MS...WRN TN...KY...SE MO...IL...FAR SRN
WI...IND AND WRN OH...

...THERE IS A SLGT RISK OF SVR TSTMS ACROSS PARTS OF THE SRN
PLAINS...LOWER TO MID MS VALLEY...OZARKS...OH VALLEY...SRN GREAT
LAKES AND CNTRL APPALACHIAN MTNS...

...THERE IS A MRGL RISK OF SVR TSTMS ACROSS PARTS OF THE SRN
PLAINS...LOWER TO MID MS VALLEY...OZARKS...TN VALLEY...OH
VALLEY...SRN GREAT LAKES AND CNTRL APPALACHIANS...

...SUMMARY...

SEVERE THUNDERSTORMS ARE LIKELY TODAY INTO TONIGHT FROM PARTS OF THE
SOUTHERN PLAINS...NORTHEASTWARD INTO THE LOWER TO MID MISSISSIPPI
VALLEY...OHIO VALLEY AND SOUTHERN GREAT LAKES REGION. THIS WILL
INCLUDE THE RISK FOR DAMAGING WIND GUSTS AND LARGE HAIL. A FEW
TORNADOES MAY OCCUR WITH A STRONG TORNADO POSSIBLE.

...OH VALLEY/SRN GREAT LAKES/CNTRL APPALACHIANS...

AN UPPER-LEVEL TROUGH WILL MOVE QUICKLY EWD ACROSS THE CNTRL AND NRN
PLAINS TODAY AS A SFC LOW MOVES NEWD INTO THE UPPER MS VALLEY. A
TRAILING COLD FRONT WILL MOVE EWD INTO THE MID MS VALLEY THIS
AFTERNOON. A WARM FRONT IS FORECAST TO MOVE NWD INTO THE SRN GREAT
LAKES...ALONG WHICH SCATTERED THUNDERSTORMS MAY BE ONGOING THIS
MORNING. CONVECTIVE COVERAGE SHOULD GRADUALLY INCREASE ACROSS THE OH
VALLEY AND SRN GREAT LAKES REGION DURING THE DAY AS A LOW-LEVEL JET
MOVES INTO THE REGION FROM THE SOUTHWEST. STRENGTHENING WARM
ADVECTION AND SFC HEATING MAY RESULT IN POCKETS OF MODERATE
INSTABILITY BY EARLY AFTERNOON. AS THE COLD FRONT SWEEPS EWD ACROSS
THE MID MS VALLEY THIS AFTERNOON...SFC-BASED THUNDERSTORMS SHOULD
DEVELOP ALONG AND AHEAD OF THE FRONT WITH OTHER CELLS INITIATING EWD
ACROSS THE WARM SECTOR IN THE OH VALLEY. THE DEVELOPMENT OF SEVERAL
LINE SEGMENTS OR A SEMI-CONTINUOUS SQUALL LINE MAY OCCUR FROM THE
LATE AFTERNOON INTO THE EVENING ACROSS THE REGION.

NAM FORECAST SOUNDINGS AT 00Z/FRIDAY FROM ST LOUIS NEWD TO
INDIANAPOLIS SHOW MLCAPE VALUES OF 1000 TO 1500 J/KG WITH SFC
DEWPOINTS IN THE LOWER 60S F. THIS COMBINED WITH 40 TO 50 KT OF FLOW
JUST ABOVE THE BOUNDARY LAYER SHOULD SUPPORT SEVERE STORMS WITH WIND
DAMAGE POTENTIAL. LINE SEGMENTS THAT CAN ORGANIZE IN AREAS WHERE
INSTABILITY BECOMES MAXIMIZED COULD DEVELOP AN ENHANCED WIND-DAMAGE
THREAT. THE SHEAR ENVIRONMENT SHOULD ALSO SUPPORT SUPERCELL
DEVELOPMENT BUT THIS WILL DEPEND UPON THE PREFERRED STORM MODE. THE
MOST FAVORABLE AREA FOR SUPERCELLS WOULD BE IN CNTRL AND NRN IL
WHERE THE LOW AND MID-LEVEL JET IS FORECAST TO COUPLE JUST AHEAD OF
A VORTICITY MAX. ANOTHER AREA OF POTENTIAL FOR SUPERCELLS COULD BE
ACROSS THE OH VALLEY WHERE CELLS MAY TEND TO BE DISCRETE AND MODELS
FORECAST A POCKET OF MODERATE INSTABILITY. ANY SUPERCELL THAT CAN
ORGANIZE WILL HAVE POTENTIAL FOR HAIL AND POSSIBLY TORNADOES. A
STRONG TORNADO CAN NOT BE RULED OUT ACROSS THE REGION BUT THIS
SHOULD DEPEND ON MESOSCALE FACTORS. DUE TO UNCERTAINTY CONCERNING
THE LOCATION...WILL DEFER TO LATER OUTLOOKS.



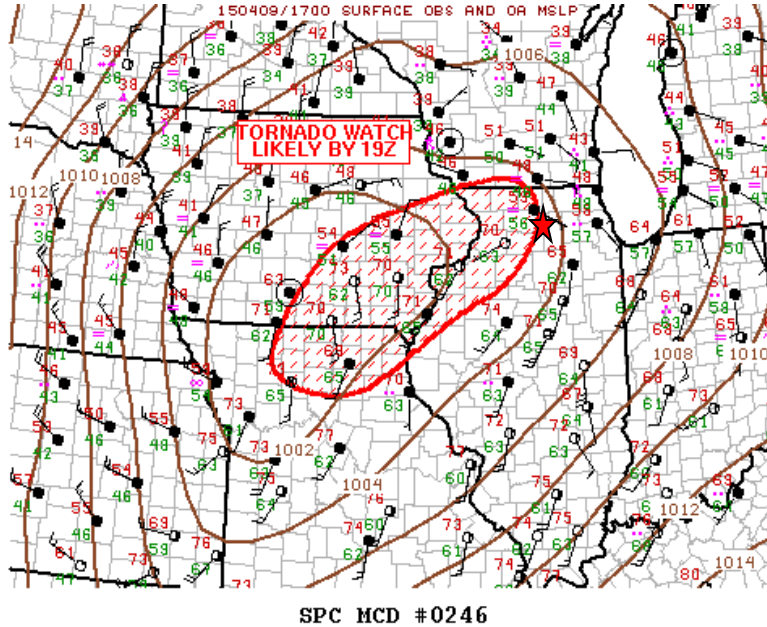
Module 5: Handout #2
Discussion Questions

(page 4 of 4)

1. Evaluate the severe weather threat. Based on the latest SPC Convective Outlook, what is the risk of tornadoes for your area?
2. What type of preparations should be made this morning for your profession?
3. There are no storms this morning, it is chilly and drizzly, and people are wondering why you are preparing for severe weather later. How do you respond?



Module 5: Handout #3
SPC Mesoscale Discussion (1729Z / 12:29 pm CDT)
(page 1 of 3)



(Source: NOAA, 2015)

Map showing the area of interest for the mesoscale discussion.

MESOSCALE DISCUSSION 0246
 NWS STORM PREDICTION CENTER NORMAN OK
 1229 PM CDT THU APR 09 2015

AREAS AFFECTED...NERN MO...SRN/ERN IA...NWRN IL

CONCERNING...SEVERE POTENTIAL...TORNADO WATCH LIKELY

VALID 091729Z - 091900Z

PROBABILITY OF WATCH ISSUANCE...95 PERCENT

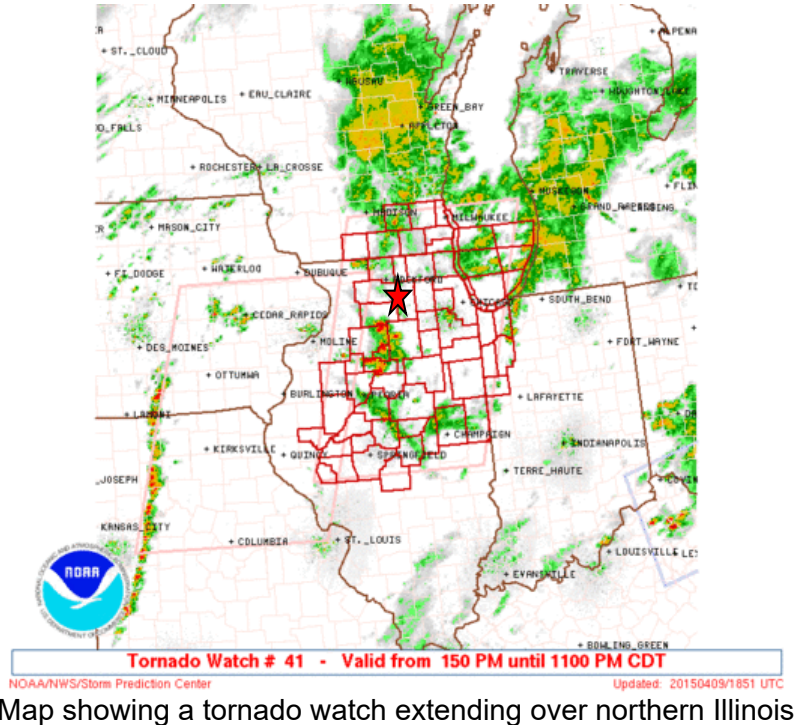
SUMMARY...TORNADO WATCH WILL LIKELY BE ISSUED BY 19Z FROM NORTHERN MO INTO NWRN IL.

DISCUSSION...INTENSE MID-LEVEL HEIGHT FALLS ARE EXPECTED TO DEVELOP/SPREAD ACROSS IA INTO SRN WI/NRN IL LATER THIS EVENING. THIS SHOULD ENCOURAGE/FOCUS ASCENT AHEAD OF DEEPENING SFC LOW AS IT TRACKS FROM NWRN MO...INTO SERN IA BY 21Z. LATEST VIS IMAGERY DEPICTS DEEPENING THERMALS ALONG N-S WIND SHIFT OVER IA/MO AND THIS IS SUPPORTED BY RECENT INCREASE IN SHOWERS FROM NORTH OF MCI TO NEAR LWD. AS BOUNDARY LAYER CONTINUES TO WARM THERE IS INCREASING CONFIDENCE THAT CONVECTION WILL DEEPEN AND TSTMS SHOULD DEVELOP. STRONG SHEAR WILL LEAD TO DISCRETE SUPERCELLS EARLY IN THE CONVECTIVE CYCLE. FORECAST STORM MOTIONS APPEAR FAVORABLE FOR CONVECTION TO UTILIZE SHEAR ALONG E-W BOUNDARY DRAPED ACROSS IA/NRN IL AND TORNADOES MAY BE NOTED WITH THE MOST INTENSE STRUCTURES.

TORNADO THREAT SHOULD INCREASE DOWNSTREAM ACROSS NRN IL LATER THIS AFTERNOON AND THIS THREAT WILL BE ADDRESSED WITHIN A FEW HOURS.



Module 5: Handout #3
SPC Tornado Watch (1850Z / 1:50 pm CDT)
(page 2 of 3)



URGENT - IMMEDIATE BROADCAST REQUESTED
TORNADO WATCH NUMBER 41
NWS STORM PREDICTION CENTER NORMAN OK
150 PM CDT THU APR 9 2015

THE NWS STORM PREDICTION CENTER HAS ISSUED A

- * TORNADO WATCH FOR PORTIONS OF
NORTHERN AND CENTRAL ILLINOIS
FAR NORTHWEST INDIANA
FAR SOUTHERN WISCONSIN
LAKE MICHIGAN
- * EFFECTIVE THIS THURSDAY AFTERNOON AND EVENING FROM 150 PM UNTIL
1100 PM CDT.
- * PRIMARY THREATS INCLUDE...
A FEW TORNADOES LIKELY WITH A COUPLE INTENSE TORNADOES POSSIBLE
SCATTERED DAMAGING WINDS LIKELY WITH ISOLATED SIGNIFICANT GUSTS
TO 80 MPH POSSIBLE
SCATTERED LARGE HAIL AND ISOLATED VERY LARGE HAIL EVENTS TO 2.5
INCHES IN DIAMETER POSSIBLE

DISCUSSION...TWO ROUNDS OF SEVERE CONVECTION ARE EXPECTED WITH
INITIAL STORMS IN CENTRAL ILLINOIS DEVELOPING E/NE AND ADDITIONAL
STORMS ALONG A FRONTAL ZONE. BOTH AREAS WILL HAVE STRONG DEEP-LAYER
SHEAR SUPPORTING RISKS FOR A FEW TORNADOES...LARGE HAIL AND DAMAGING
WINDS.



Module 5: Handout #3
Discussion Questions
(page 3 of 3)

1. Where is your area in relation to this potential Tornado Watch?
2. Based on knowledge of weather radar obtained during this course, can you tell whether thunderstorms have formed within the watch area when this bulletin was issued? Are storms already widespread within the tornado watch area?
3. What preparations does your profession need to make?
4. What is the next type of NWS alert that you should expect if the tornado risk becomes imminent?

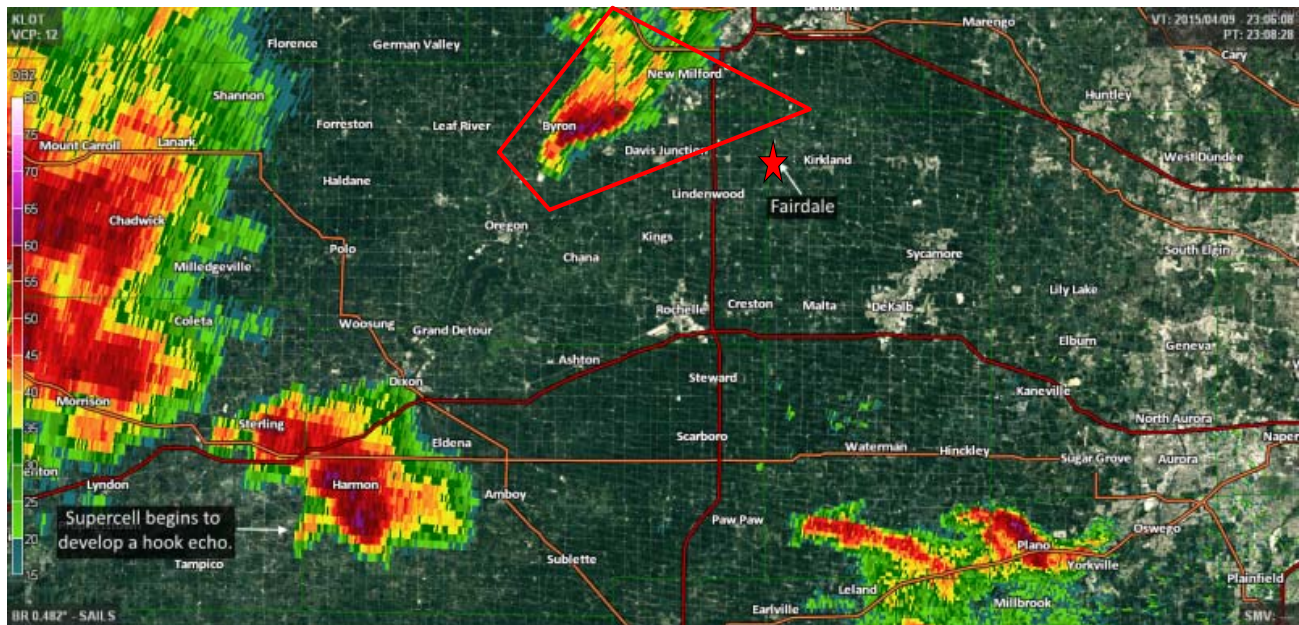
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Module 5: Handout #4
NWS LOT Tornado Warning #30
(6:09 pm CDT (2309Z))
(page 1 of 3)

Map showing radar reflectivity illustrates a tornado warning issuance by the National Weather Service. The warning polygon is located ahead of the supercell hook echo which was expected to pass to the north of the city of Fairdale.

(Source: NOAA/The Vane, 2015)





Module 5: Handout #4
NWS LOT Tornado Warning #30
(6:09 pm CDT (2309Z))
(page 2 of 3)

BULLETIN - EAS ACTIVATION REQUESTED

TORNADO WARNING

NATIONAL WEATHER SERVICE CHICAGO/ROMEOVILLE IL

609 PM CDT THU APR 9 2015

THE NATIONAL WEATHER SERVICE IN CHICAGO HAS ISSUED A

* TORNADO WARNING FOR...

NORTHWESTERN DE KALB COUNTY IN NORTH CENTRAL ILLINOIS...

SOUTHWESTERN BOONE COUNTY IN NORTH CENTRAL ILLINOIS...

NORTHEASTERN OGLE COUNTY IN NORTH CENTRAL ILLINOIS...

SOUTHEASTERN WINNEBAGO COUNTY IN NORTH CENTRAL ILLINOIS...

* UNTIL 645 PM CDT

* AT 608 PM CDT...A SEVERE THUNDERSTORM CAPABLE OF PRODUCING A
TORNADO WAS LOCATED OVER BYRON...OR 8 MILES NORTHEAST OF OREGON...
MOVING NORTHEAST AT 40 MPH.

HAZARD...TORNADO AND QUARTER SIZE HAIL.

SOURCE...RADAR INDICATED ROTATION.

IMPACT...FLYING DEBRIS WILL BE DANGEROUS TO THOSE CAUGHT WITHOUT
SHELTER. MOBILE HOMES WILL BE DAMAGED OR DESTROYED.

DAMAGE TO ROOFS...WINDOWS AND VEHICLES WILL OCCUR. TREE
DAMAGE IS LIKELY.

* THIS DANGEROUS STORM WILL BE NEAR...

ROCKFORD AIRPORT AROUND 620 PM CDT.

CHERRY VALLEY AROUND 635 PM CDT.

LOVES PARK AROUND 640 PM CDT.

OTHER LOCATIONS IMPACTED BY THIS TORNADIC THUNDERSTORM INCLUDE NEW
MILLFORD AND DAVIS JUNCTION.

INCLUDING THE FOLLOWING INTERSTATES...

I-39 BETWEEN MILE MARKERS 111 AND 123.

I-90 BETWEEN MILE MARKERS 61 AND 63.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

TAKE COVER NOW! MOVE TO A BASEMENT OR AN INTERIOR ROOM ON THE LOWEST
FLOOR OF A STURDY BUILDING. AVOID WINDOWS. IF YOU ARE OUTDOORS...IN A
MOBILE HOME...OR IN A VEHICLE...MOVE TO THE CLOSEST SUBSTANTIAL
SHELTER AND PROTECT YOURSELF FROM FLYING DEBRIS.



Module 5: Handout #4
Discussion Questions

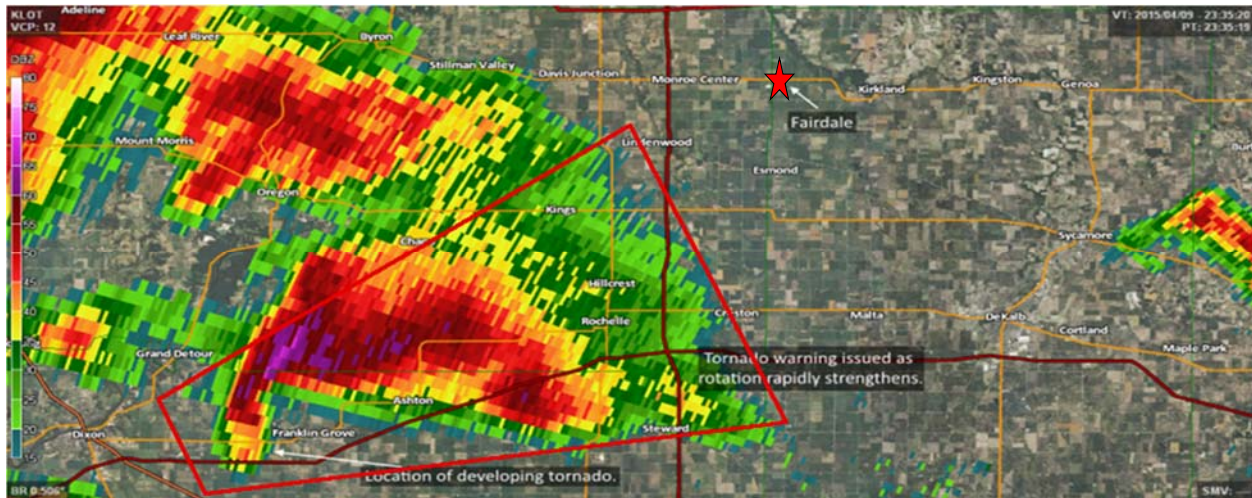
(page 3 of 3)

1. Now that a tornado warning is issued, it is critical to identify threats to your specific location. Where are you in relation to the tornado warning polygon?
2. What is the tell-tale sign in this radar reflectivity pattern that indicates the potential for a tornadic supercell thunderstorm?
3. Based on this tornado warning, where do you expect the tornado to move? Will you be affected in your area?
4. Based on all available data, warnings, and reports, what decisions will you make for your profession?

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Module 5: Handout #5
NWS LOT Tornado Warning #31
(2335Z / 6:35 pm CDT)
(page 1 of 4)



Radar image depicts a new tornado warning that was issued at 6:35 pm CDT (2335Z). This time, the warning includes the area of interest. The reflectivity shows a new hook echo developing to the southwest of the initial storm. Oftentimes, new updrafts and storms will develop to the southwest previous storms, because that is where fresh, warm, moist air and greater instability can often be found. This is an important behavior of storms to keep in mind when concerned with rapidly-evolving classic supercells during a tornado outbreak. (Source: NOAA/The Vane, 2015)



Module 5: Handout #5
NWS LOT Tornado Warning #31
(2335Z / 6:35 pm CDT)
(page 2 of 4)

BULLETIN - EAS ACTIVATION REQUESTED
TORNADO WARNING
NATIONAL WEATHER SERVICE CHICAGO/ROMEDEVILLE IL
635 PM CDT THU APR 9 2015

THE NATIONAL WEATHER SERVICE IN CHICAGO HAS ISSUED A

- * TORNADO WARNING FOR...
SOUTHEASTERN OGLE COUNTY IN NORTH CENTRAL ILLINOIS...
NORTHEASTERN LEE COUNTY IN NORTH CENTRAL ILLINOIS...
- * UNTIL 700 PM CDT
- * AT 635 PM CDT...A SEVERE THUNDERSTORM CAPABLE OF PRODUCING A
TORNADO WAS LOCATED OVER FRANKLIN GROVE...OR 9 MILES EAST OF
DIXON...MOVING NORTHEAST AT 45 MPH.

HAZARD...TORNADO AND HAIL UP TO TWO INCHES IN DIAMETER.

SOURCE...RADAR INDICATED ROTATION.

IMPACT...FLYING DEBRIS WILL BE DANGEROUS TO THOSE CAUGHT WITHOUT
SHELTER. MOBILE HOMES WILL BE DAMAGED OR DESTROYED.
DAMAGE TO ROOFS...WINDOWS AND VEHICLES WILL OCCUR. TREE
DAMAGE IS LIKELY.



Module 5: Handout #5
NWS LOT Tornado Warning -- UPDATES
(page 3 of 4)

SEVERE WEATHER STATEMENT

NATIONAL WEATHER SERVICE CHICAGO/ROMEOVILLE IL
643 PM CDT THU APR 9 2015

...A TORNADO WARNING REMAINS IN EFFECT UNTIL 700 PM CDT FOR
SOUTHEASTERN OGLE AND NORTHEASTERN LEE COUNTIES...

AT 643 PM CDT...A CONFIRMED TORNADO WAS LOCATED NEAR ASHTON...OR 9
MILES WEST OF ROCHELLE...MOVING NORTHEAST AT 40 MPH.

HAZARD...DAMAGING TORNADO AND TENNIS BALL SIZE HAIL.

SOURCE...WEATHER SPOTTERS CONFIRMED TORNADO.

IMPACT...FLYING DEBRIS WILL BE DANGEROUS TO THOSE CAUGHT WITHOUT
SHELTER. MOBILE HOMES WILL BE DAMAGED OR DESTROYED. DAMAGE
TO ROOFS...WINDOWS AND VEHICLES WILL OCCUR. TREE DAMAGE IS
LIKELY.

THIS TORNADO WILL BE NEAR...

ROCHELLE AND HILLCREST AROUND 700 PM CDT.

OTHER LOCATIONS IMPACTED BY THIS TORNADIC THUNDERSTORM INCLUDE
STEWART.

INCLUDING THE FOLLOWING INTERSTATES...

I-39 BETWEEN MILE MARKERS 92 AND 102.

I-88 BETWEEN MILE MARKERS 61 AND 81.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

TO REPEAT...A TORNADO IS ON THE GROUND. TAKE COVER NOW! MOVE TO A
BASEMENT OR AN INTERIOR ROOM ON THE LOWEST FLOOR OF A STURDY
BUILDING. AVOID WINDOWS. IF YOU ARE OUTDOORS...IN A MOBILE HOME...OR
IN A VEHICLE...MOVE TO THE CLOSEST SUBSTANTIAL SHELTER AND PROTECT
YOURSELF FROM FLYING DEBRIS.

Severe Weather Statement

SEVERE WEATHER STATEMENT

NATIONAL WEATHER SERVICE CHICAGO/ROMEOVILLE IL
647 PM CDT THU APR 9 2015

...A TORNADO WARNING REMAINS IN EFFECT UNTIL 700 PM CDT FOR
SOUTHEASTERN OGLE AND NORTHEASTERN LEE COUNTIES...

AT 646 PM CDT...A CONFIRMED LARGE AND DANGEROUS TORNADO WAS LOCATED
OVER ASHTON...OR 7 MILES WEST OF ROCHELLE...MOVING NORTHEAST AT 40
MPH.

THIS IS A PARTICULARLY DANGEROUS SITUATION.



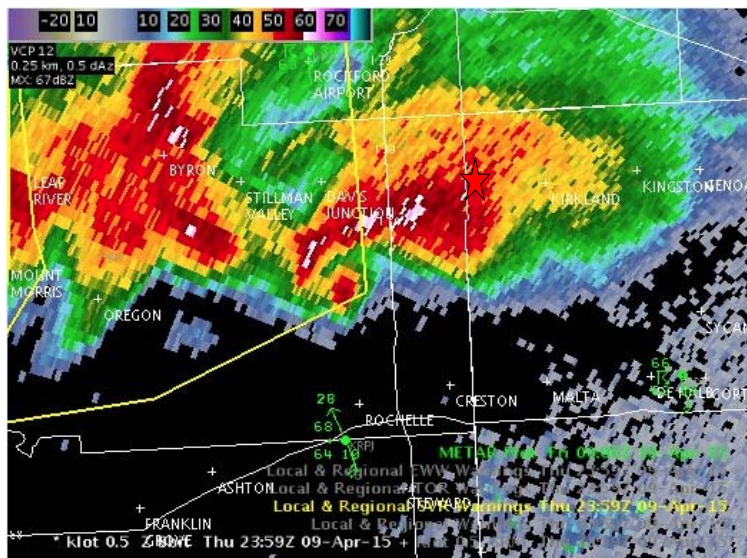
Module 5: Handout #5
Discussion Questions

(page 4 of 4)

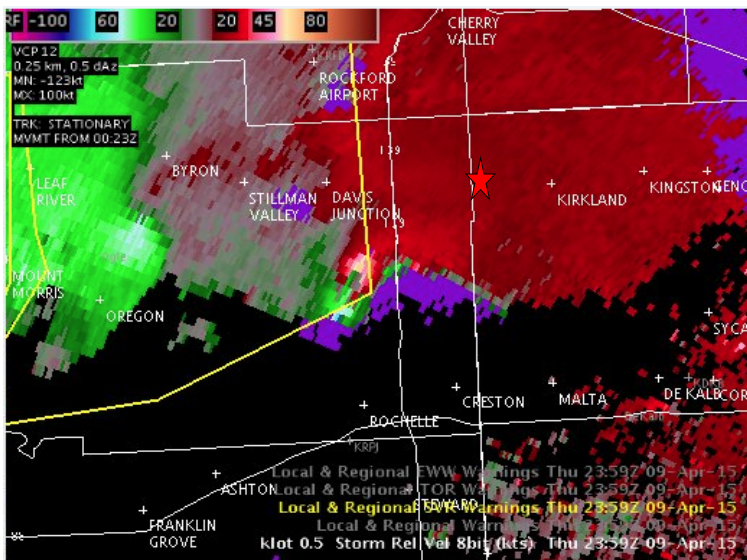
1. What points of confusion do you anticipate among your constituents and the general public in your area, given how this situation is evolving?



Module 5: Handout #6
NWS LOT Tornado Warning #32
(0005-0045Z / 7:05-7:45 pm CDT)
(page 1 of 4)



Radar reflectivity



Storm-relative velocity

(Source: NOAA/The Vane, 2015)



Module 5: Handout #6
NWS LOT Tornado Warning #32
(0005-0045Z / 7:05-7:45pm CDT)
(page 2 of 4)

Map showing radar reflectivity and storm-relative velocity. Both the radar reflectivity and storm-relative velocity maps indicate intense rotation as the tornado approached Fairdale.



Module 5: Handout #6
Discussion Questions
(page 3 of 4)

1. What is the defining characteristic of the radar representation of this supercell thunderstorm?

2. How do you know it is an extremely strong, tornadic storm?



Module 5: Handout #6
NWS LOT Tornado Warning #32
(0005-0045Z / 7:05-7:45 pm CDT)
(page 4 of 4)

BULLETIN - EAS ACTIVATION REQUESTED
TORNADO WARNING
NATIONAL WEATHER SERVICE CHICAGO/ROMEOVILLE IL
705 PM CDT THU APR 9 2015

THE NATIONAL WEATHER SERVICE IN CHICAGO HAS ISSUED A

- * TORNADO WARNING FOR...
SOUTHWESTERN BOONE COUNTY IN NORTH CENTRAL ILLINOIS...
NORTHEASTERN OGLE COUNTY IN NORTH CENTRAL ILLINOIS...
SOUTHEASTERN WINNEBAGO COUNTY IN NORTH CENTRAL ILLINOIS...
- * UNTIL 745 PM CDT
- * AT 705 PM CDT...A SEVERE THUNDERSTORM CAPABLE OF PRODUCING A
TORNADO WAS LOCATED OVER STILLMAN VALLEY...OR 8 MILES NORTHEAST OF
OREGON...MOVING EAST AT 40 MPH.

HAZARD...TORNADO.

SOURCE...RADAR INDICATED ROTATION.

IMPACT...FLYING DEBRIS WILL BE DANGEROUS TO THOSE CAUGHT WITHOUT
SHELTER. MOBILE HOMES WILL BE DAMAGED OR DESTROYED.
DAMAGE TO ROOFS...WINDOWS AND VEHICLES WILL OCCUR. TREE
DAMAGE IS LIKELY.

- * THIS DANGEROUS STORM WILL BE NEAR...
ROCKFORD AIRPORT AROUND 715 PM CDT.
CHERRY VALLEY AROUND 730 PM CDT.

OTHER LOCATIONS IMPACTED BY THIS TORNADIC THUNDERSTORM INCLUDE NEW
MILLFORD AND DAVIS JUNCTION.

INCLUDING THE FOLLOWING INTERSTATES...
I-39 BETWEEN MILE MARKERS 110 AND 123.
I-90 BETWEEN MILE MARKERS 61 AND 62.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

TAKE COVER NOW! MOVE TO A BASEMENT OR AN INTERIOR ROOM ON THE LOWEST
FLOOR OF A STURDY BUILDING. AVOID WINDOWS. IF YOU ARE OUTDOORS...IN A
MOBILE HOME...OR IN A VEHICLE...MOVE TO THE CLOSEST SUBSTANTIAL
SHELTER AND PROTECT YOURSELF FROM FLYING DEBRIS.



Best Practices for Outdoor Warning Sirens

Recommended Best Practices for the Activation of Outdoor Warning Sirens

Developed by the Workgroup for Warning Systems

Chair- Rob Dale rdale@skywatch.org

Best Practices

Siren Testing

- Warning Siren testing shall be done on a regular schedule (but not more than once a month) using the standard "ALERT" (steady) sound.
- Testing of Sirens should not be done if conditions in the area (non-severe storms, etc.) could confuse the public, and should not be rescheduled.
 - Notify the public of the cancellation as soon as possible.

Siren Alerting

- ONLY the "ALERT" (steady) Sound is to be used, lasting for at least 3 minutes.
- Only sirens in the path of the storm (within the National Weather Service warning polygon) should be activated, if the siren system is capable.
- An "all clear" time WILL NOT be used.

Siren Activation

- When the National Weather Service issues or re-issues a Tornado Warning.
 - *If a tornado is confirmed in the area, continue to sound the sirens at regular intervals. Use local guidance and siren manufacturer's suggestions to avoid damaging the equipment, with the goal of sounding as continuous as possible while the tornado is still in the area.*

Or...

- During a Severe Thunderstorm Warning ONLY IF:
 - Destructive winds of 80mph or greater are observed by a trained spotter or indicated in the National Weather Service warning statements.

Or...

- Without a warning, when reliable reports from TRAINED weather spotter or indicated in the National Weather Service warning statements.
 - Immediately notify the National Weather Service and local media.
 - Preferably use NWsChat to let all know why sirens were activated.

Source: "Best Practices for Outdoor Warning Sirens." *Developed by the Workgroup for Warning Systems*, [skywatch.org](http://skywatch.org/ows.pdf), n.d. Web. 2 Jun. 2015 <http://skywatch.org/ows.pdf>.



Purpose

The purpose of this document is to establish common guidelines for activation of outdoor warning sirens throughout the United States. The intent of this best practices list is to enhance decision making by citizens when outdoor warning sirens are activated. It is NO intended to remove a jurisdiction's obligation or responsibility to alert or warn its community if a situation falls outside of the parameters of these recommendations.

Outdoor warning sirens represent only one part of a broader public emergency notification system. Other components include: NOAA All-Hazards Weather Radio, Wireless Emergency Alerts (WEA), mass notification systems, emergency management, private sector meteorologists and the media. Sirens are used to alert citizens of an imminent hazard, which should prompt them to find shelter and seek further information.

Background

Research shows that confusion hinders public response during emergencies. Using common guidelines for outdoor warning sirens throughout the United States will minimize confusion in emergency situations. Establishing a standard will also enable communities to partner in area-wide public education campaigns regarding sirens.

Addendum

This project began as concerns over siren usage mounted in the meteorological community at large, due to extremely varying policies from county to county or even city to city. A call was made to the Weather & Society * Integrated Studies (WAS*IS) discussion list for volunteers to form a best practices committee, and it moved forward over the summer of 2011 with representatives from emergency management, the National Weather Service, and private sector/broadcast meteorologists. A draft policy was disseminated through various channels for review, and input was received from various professions from all across the country. Review comments were taken into consideration as the final version was developed. Some areas that were removed from the main document or that we felt needed clarification are included below.

In 2015 this project was incorporated into the International Association of Emergency Managers (IAEM) Caucus on Climate, Weather, and Water, as well as the American Meteorological Society (AMS) Committee on Emergency Management.

One of the primary goals is to get communities to use the "polygon" outline in the warning as the determination for which sirens to sound and which can remain silent. We understand that not all locations have that ability, but some do and simply don't utilize that feature. With the number of warnings being issued on a steady rise over the past decade, reducing the coverage of siren alerts to areas truly threatened by the storm is crucial. Additional information on the storm-based polygon warnings is available at <http://tinyurl.com/nws-polygon>.



Other Siren Uses

We realize that some communities have other uses for siren systems. This document was not intended to deal with those situations, such as alerts around nuclear plants, dam break flood sirens, and the like. Those are best handled locally, where the emergency manager can educate the community regarding these alternate uses.

Some communities use a different type of tone (usually an alternating high/low combination) for flash flood warnings in their area. Since that threat is not a widespread national issue, we did not want to try to incorporate it into these best practices. Do not let the absence here interfere with your alerting and educating regarding flash floods.

We originally considered using very large hail (2" or more) as a trigger point, but those hail sizes are often very isolated and short-lived, so by the time the report comes in and the decision is made to activate the siren the threat has passed. In areas where hail swaths are more common, using that criteria may be of use.

Bad Practices

Many "bad practices" exist in the alerting policies nationwide, and the intent of this document was just as much geared towards removing those as it was towards adding anything new.

Do not use an "all-clear" alert. This does nothing but add confusion to the public. Outdoor warning sirens are simply used to notify citizens that something hazardous could be approaching, so they need to go to a place of safety and find out that the storm has passed, so there is no reason for sounding an all-clear.

Some communities sound their sirens for warnings in neighboring counties (that do not include them directly) as an added level of protection. However, that adds no value and only causes confusion when people tune in for more information and find they are not really under any weather warning. Other jurisdictions alert for any severe thunderstorm warning issued during a tornado watch, because "xx years ago a tornado touched down with no warning." While that may be true, a very large majority of severe thunderstorm warnings do not contain tornadoes, and lowering the criteria means the sirens are sounded much more often than needed which desensitizes people to the siren tone. Many post-event surveys of the public conclude that they feel the sirens are used too frequently in those cases.

We understand that these are "your" sirens and you can activate them at any time you deem there is a threat to the public. However when activation is done outside of a NWS warning, and the reason for the alert is not communicated to the public, different messages will be delivered. A local spotter may see a funnel cloud approaching town, but if it's not evident on the radar and there is no warning, it is likely that the television stations will simply tell viewers that they don't know why the sirens are sounding. It's a true statement unless they are informed otherwise, and it leads to the public not responding. Using NWSChat lets you notify the NWS, media outlets and neighboring jurisdictions immediately, which allows one unified message to be disseminated and provides the confirmation that the public need to hear in order to respond.



Best Practices

In the NWS Service Assessment of the 2011 Joplin, Missouri tornado, many people commented that the first siren activation did not prompt them to shelter, but the second alert caught their attention and made them more likely to react. We suggest that if a tornado is actively causing damage in the community or approaching based on spotter reports, then the sirens be activated as often as possible until the threat passes. Older mechanical sirens have limitations that newer digital systems do not, so use the manufacturer's recommendations regarding the amount of time your system is activated, with the goal being simply as much as possible during an active threat.

A low end tornado can only have winds of 50-60 mph causing minor damage with minimal life threat. We felt that it didn't make sense to sound a siren for that event, yet not for extremely damaging straight-line winds. Therefore we deemed receiving reports of confirmed 80 mph winds and/or extreme damage from downburst winds as activation criteria. There is a proposal to automatically alert cellphones through the Wireless Emergency Alert (WEA) system when a severe thunderstorm warning indicates winds of 80 mph or higher are included, so this would match the two systems. We understand that spotter estimated winds are usually notably higher than actual wind speeds, so the concentration should be more on the damage reported versus actual wind speed numbers.

Feel free to contact us for any additional clarifications, or with suggestions for future revisions.



Changes to Storm Prediction Center (SPC) Convective Outlooks

Changes to Storm Prediction Center (SPC) Convective Outlooks

Background

The Storm Prediction Center (SPC) issues regional forecasts for thunderstorms and their expected severity. These forecasts are maintained and updated several times each day with projections as far as eight days in the future. Called “convective outlooks,” these forecasts are commonly used for mid- to long-term severe thunderstorm hazards planning.

Prior to October 22, 2014, the SPC utilized a risk mapping system that relied upon **four severe weather risk categories**:

0. General Thunderstorms (TSTM)
1. See Text
2. Slight (SLGT)
3. Moderate (MDT)
4. High (HIGH)

Current System

In October 2014, the SPC implemented a new system with **five severe weather risk categories**:

0. General Thunderstorms (TSTM)
1. Marginal (MRGL)
2. Slight (SLGT)
3. Enhanced Slight (ENH)
4. Moderate (MDT)
5. High (HIGH)

Improvements

The current convective outlook system improves upon the previous format in several ways, including the following:

1. Severe weather threat can now be visualized in **greater detail** with **risk more easily conveyed** in categories.
2. Geographic Information Systems (GIS) were not previously able to integrate the “See Text” category as it did not have any spatial characteristics. **“See Text” regions have been replaced with the “Marginal” area.**
3. The **five-tiered category system and number scale for severe weather risk** is now similar in appearance to other numbered hazardous weather scales (e.g., Saffir-Simpson Hurricane Wind Scale).

Additional Information and Resources

On the back of this page, you will find a more detailed comparison between the previous and current convective outlook system alongside a description of the criteria for forecasted threat categories.

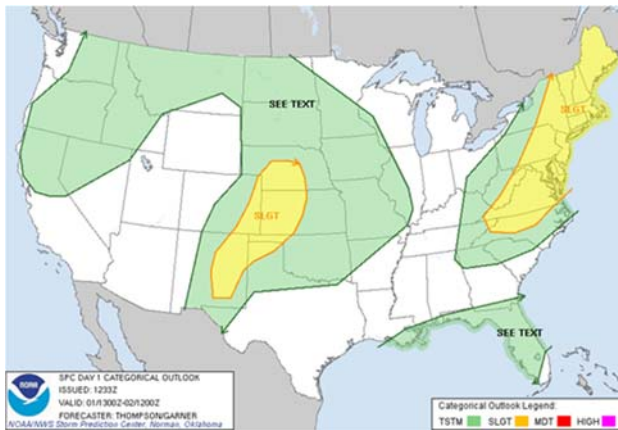
For the current convective outlook, please visit the SPC website: <http://www.spc.noaa.gov/>

For more detailed information regarding the SPC’s new Convective Outlook system, please refer to these websites: <http://www.spc.noaa.gov/exper/dy1-3example/> and <http://www.spc.noaa.gov/faq>

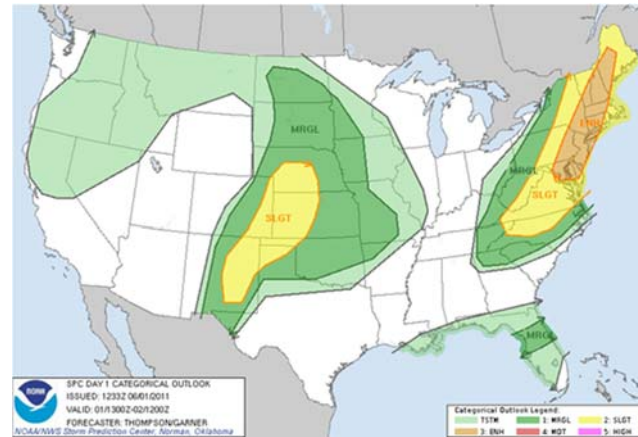
For a video overview of this product, please download the video file here:
<http://www.spc.noaa.gov/misc/2014OutlookChanges.mp4>



Visual Comparison to Prior System



(Source: SPC, 2014)



(Source: SPC, 2014)

Note the changes between the prior convective outlook system (left) and the current system (right). The most notable difference between the two systems is the added spatial detail. This detail is intended to allow users to better understand the level of severe thunderstorm risk in their region. The SPC's new system will also allow for the current system to be better integrated into GIS as the "See Text" regions have now been replaced with "Marginal" regions with spatial attributes. The probability maps (not shown) continue to accompany these maps and are available from the SPC website.

Visually Understanding the Threat Category

Day 1 Outlook Probability	TORN	WIND	HAIL
2%	MRGL	Not Used	Not Used
5%	SLGT	MRGL	MRGL
10%	ENH	Not Used	Not Used
10% with Significant Severe	ENH	Not Used	Not Used
15%	ENH	SLGT	SLGT
15% with Significant Severe	MDT	SLGT	SLGT
30%	MDT	ENH	ENH
30% with Significant Severe	HIGH	ENH	ENH
45%	HIGH	ENH	ENH
45% with Significant Severe	HIGH	MDT	MDT
60%	HIGH	MDT	MDT
60% with Significant Severe	HIGH	HIGH	MDT



The table shows the probabilities assigned to each risk category for the Day 1 Convective Outlook. Similar tables for Day 2 and 3 (not shown) are available from the SPC website.

Each probability on the graph represents “the probability of one or more events occurring within 25 miles of any point during the outlook period” (Source: SPC, 2014).

The “significant severe” parameter is assigned to a tornado, damaging wind, or hail event if the phenomena reaches or exceeds a certain threshold.

-A **significant severe tornado** is rated at EF-2 or stronger.

-A **significant severe damaging wind** is at least 74 mph.

-A **significant severe hailstone** is at least 2” in diameter.

Severe Weather Threat Categories:

0- General Non-Severe Thunderstorms (TSTM)
1- Marginal (MRGL)
2- Slight (SLG)
3- Enhanced (ENH)
4- Moderate (MDT)
5- (High (HIGH)

(Source: SPC, 2014)