



# 2017 Spotter Training Colorado Style!



Elbert Co Tornado 6/4/2015 , courtesy Eric Hurst



DIA-June 18, 2013



Last Chance, CO. 2010



Mt Evans, 2012, Sheila Gavin



# Skywarn Agenda

- Weather Safety
- Thunderstorm basics
- Spotting storms
  - Cloud features, tornadoes

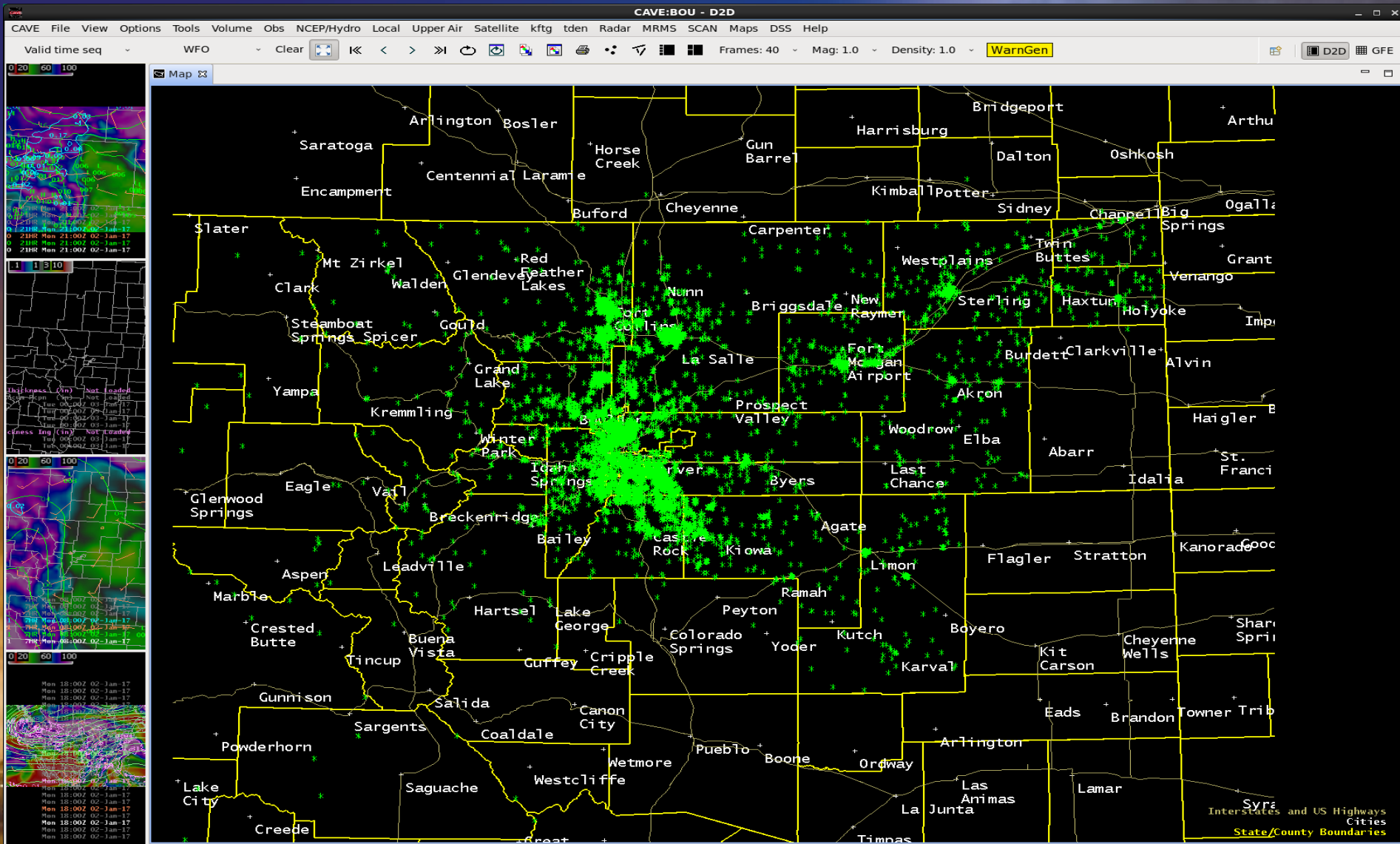
## *Break Time!*

- Reporting procedures
- Weather Radar, limitations
- Advanced Portion, Case Studies



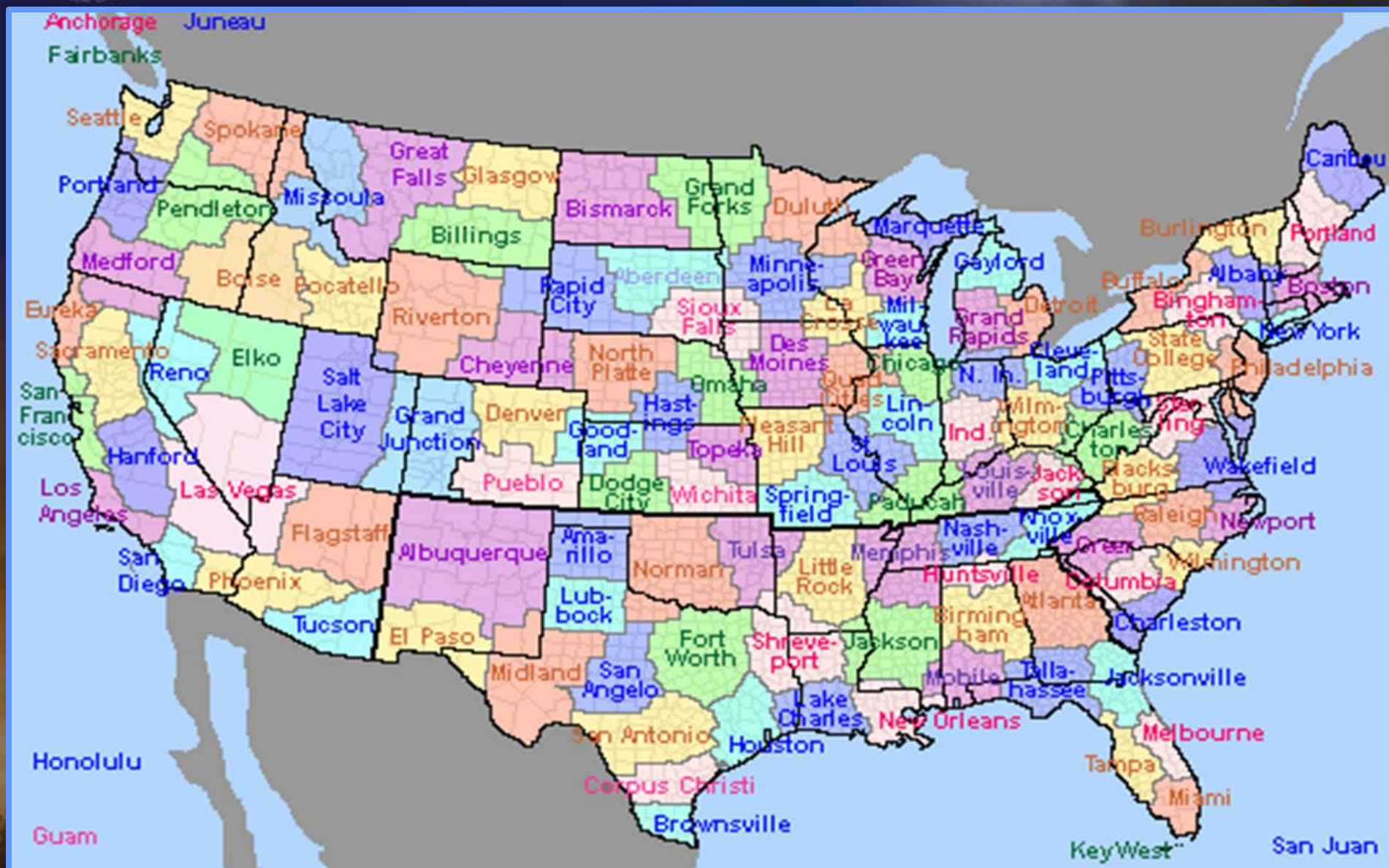
# Skywarn team Locations

## Over 8,400 strong, yet...





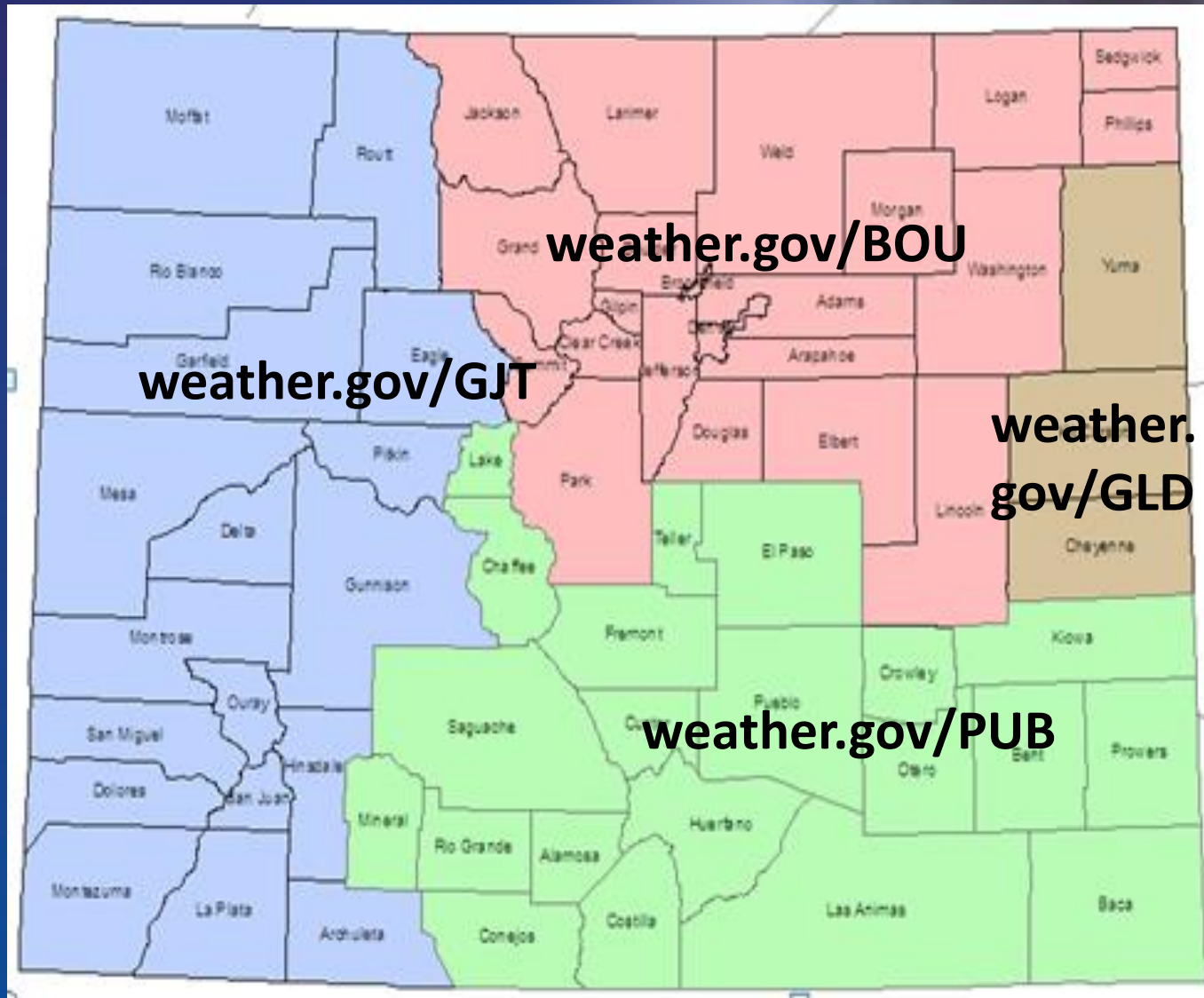
# 122 Offices in the NWS





# Colorado Forecast Offices

[weather.gov/BOU](http://weather.gov/BOU)  
[weather.gov/PUB](http://weather.gov/PUB)  
[weather.gov/GJT](http://weather.gov/GJT)  
[weather.gov/GLD](http://weather.gov/GLD)





# What do we do?

- weather forecasts for the next 7 days
- watches, warnings, advisories
- public forecasts
- fire weather forecasts
- aviation forecasts
- river forecasts
- text and graphics
- climate information
- outreach:
  - SKYWARN
  - Cooperative Observer Network (COOP)
  - weather training
  - school and group talks





# Our Mission...

Provide weather, water, and climate data, forecasts and **warnings** for the

Protection of  
Life  
and Property

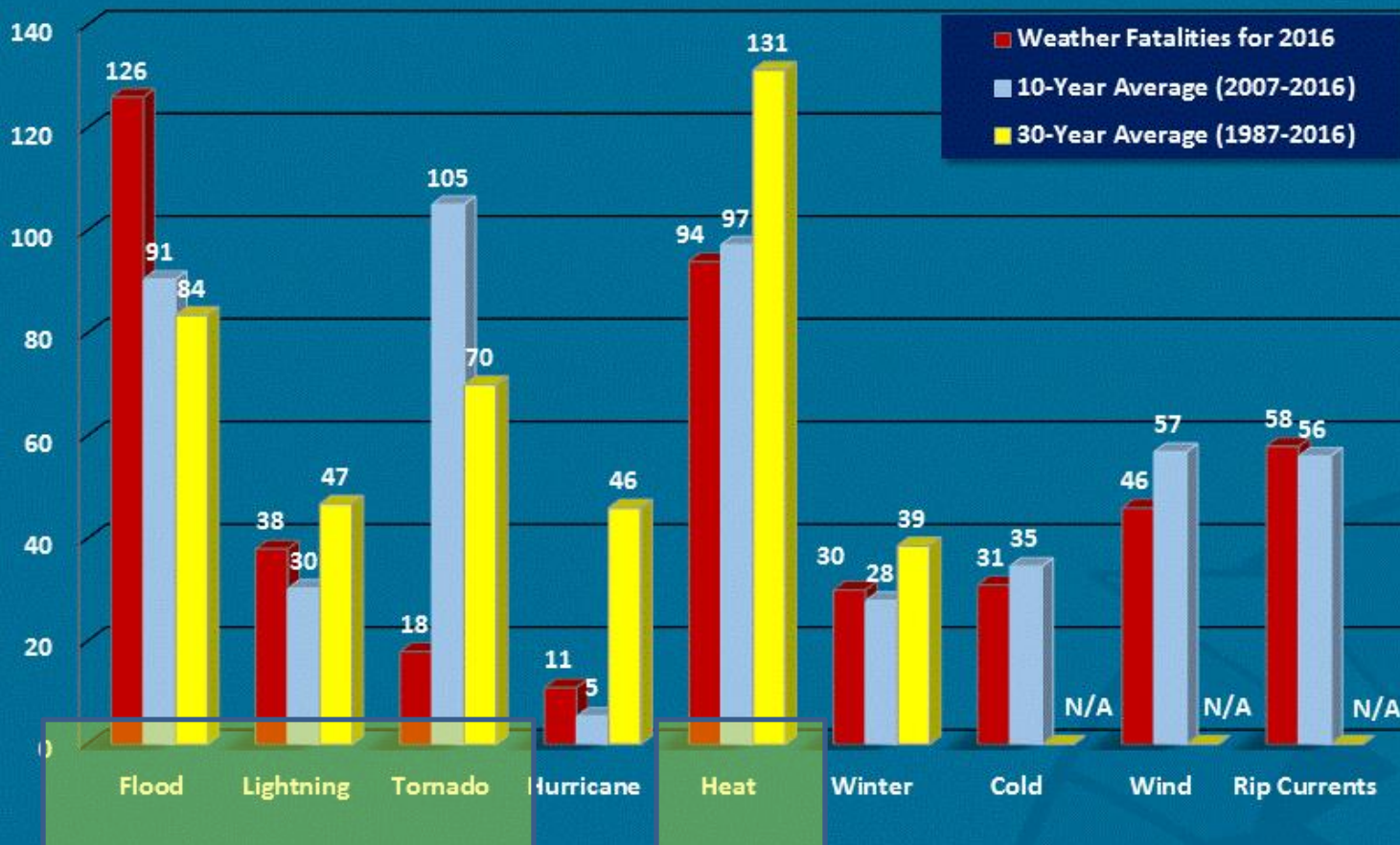
# Safety First!



# Where do you think Colorado ranks?



## Weather Fatalities 2016







# Lightning is unpredictable





# Lightning is unpredictable



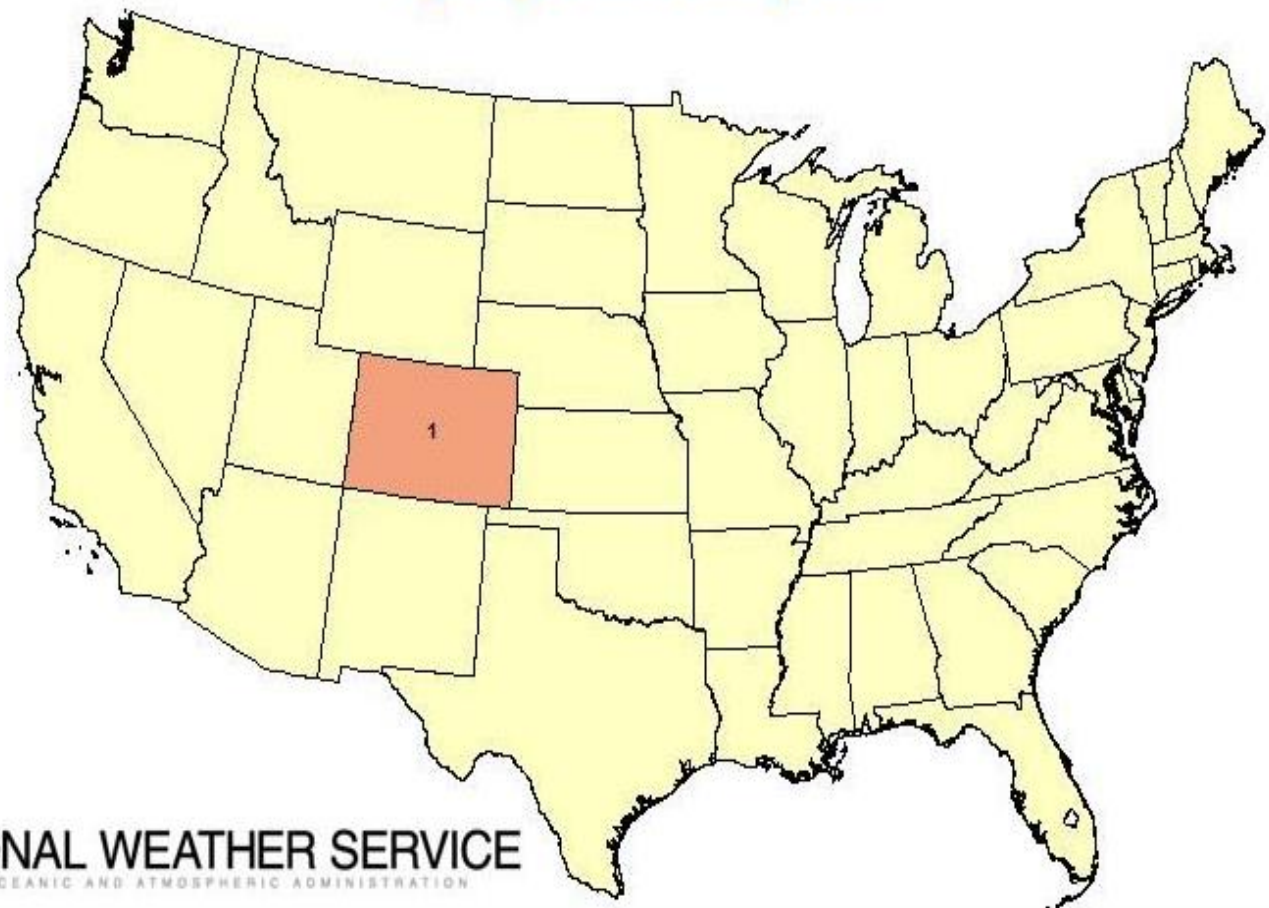


# Don't be another Statistic!

## 1 Fatality, 2 injuries in 2017

No.	Date	Day	ST	City	Age	Sex	Location	Activity	Victim
1	5/7	Sun	CO	Douglas County	37	F	Open Field Near Tree	Riding Horse	

Lightning Fatalities 2017 by State





# Lightning Statistics 2016

## 2 deaths in Colorado



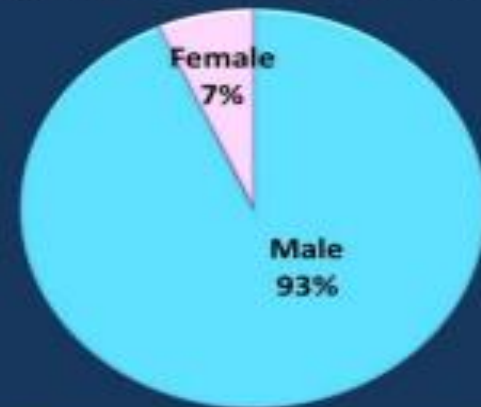
### U.S. Lightning Deaths in 2016: 38

No.	Date	Day	ST	City	Age	Sex	Location	Activity	Victim
1	3/18	Fri	LA	Larose	28	F	In tent	Attending music festival	<a href="#">Jacqui Stavis</a>
2	3/25	Fri	FL	Hobe Sound	41	M	Grassy field	Family picnic	<a href="#">Farooq Mohammad</a>
3	4/15	Fri	FL	Boynton Beach	23	M	Near tree	Working in yard	<a href="#">Bechelet Joseph</a>
4	4/27	Wed	MS	Mantachie	37	M	Outside barn	Riding horse	<a href="#">Tim Edge</a>
5	4/27	Wed	LA	Slidell	36	M	Construction site	Working	<a href="#">Elvin Arturo Castro-Santiago</a>
6	6/13	Mon	FL	Manatee County	47	M	Farm	Loading truck	<a href="#">Fleurdor Kercizan</a>
7	6/24	Fri	FL	Daytona Beach	33	F	Beach	Standing in water	<a href="#">Janika Gardner</a>
8	6/25	Sat	MO	Festus	72	M	Yard	Standing with dog	<a href="#">Daniel Kennedy</a>
9	6/27	Mon	MS	Lumberton	24	M	Yard	Standing	<a href="#">Thomas Whorton, III</a>
10	7/10	Sun	LA	Pineville	45	M	Parking lot	Walking to car	<a href="#">Scotty Rosier</a>
11	7/14	Thu	TN	Dover	65	F	Under tree	Camping	<a href="#">Franreen Crowl</a>
12	7/14	Thu	LA	Baton Rouge	70	M	Sheltering under tree	Roofing	<a href="#">Jose Humberto Vasconcelos</a>
13	7/14	Thu	AL	Redstone Arsenal	19	M	Outside building	Outdoor Maintenance	<a href="#">Jacob York</a>
14	7/14	Thu	VA	Bedford County	23	M	Along roadway	Walking	<a href="#">Robert Miller</a>
15	7/16	Sat	NC	Yancey County	54	M	Putting on rain gear	Riding Motorcycle	<a href="#">Scott Pasour</a>
16	7/19	Tue	CO	Arvada	23	M	Sheltering under tree	Golfing	<a href="#">Peter Hawkes</a>
17	7/19	Tue	AL	Lawrence County	20	M	In yard under tree	Watching storm	<a href="#">Hunter Blankenship</a>
18	7/20	Wed	AZ	Coconino County	17	M	Near mountain top	Hiking	<a href="#">Wade Young</a>
19	7/22	Fri	UT	Flaming Gorge Reservoir	14	F	On reservoir	Riding jetski	<a href="#">Brooklyn Reynolds</a>
20	7/25	Mon	FL	Bonita Springs	29	M	Lanai (6th floor)	Construction	<a href="#">Salomon Garcia-Martinez</a>
21	7/31	Sun	NC	Cumtuck County	5	M	Beach	Walking to vehicle	<a href="#">Stephen Little</a>
22	8/5	Fri	FL	Okaloosa Island	22	M	Beach	Attending umbrellas	<a href="#">Zachary Fordem</a>
23	8/10	Wed	NY	Batavia	34	M	Cemetery	not yet known	<a href="#">Richard Garlock</a>
24	8/10	Wed	NY	Batavia	32	F	Cemetery	not yet known	<a href="#">Jenea Macleod</a>
25	8/10	Wed	OH	Coshocton	8	M	Outside home	Bringing in horses	<a href="#">Noah Stutzman</a>
26	8/12	Fri	NY	Poughkeepsie	50	M	In park under tree	Sheltering from storm	<a href="#">Richard Harbstreet</a>
27	8/12	Fri	NY	Poughkeepsie	46	M	In park under tree	Sheltering from storm	<a href="#">Franklyn Mekeel</a>
28	8/13	Sat	PA	Carbon County	39	M	Lake at state park	Swimming	<a href="#">Jose Lopez-Hernandez</a>
29	8/14	Sun	FL	Charlotte County	22	M	Inter-coastal waterway	Jet skiing	<a href="#">William Coty Steffanni</a>
30	8/19	Fri	CO	Larimer County	45	M	Outside cabin under tree	Standing	<a href="#">Chad Trover</a>
31	8/19	Fri	MI	Presque Isle	21	F	Near beach house	Working as Lifeguard	<a href="#">Alyson Knenlein</a>
32	8/26	Fri	FL	Sarasota	50	F	In park	Sheltering under gazebo	<a href="#">Fontella Span</a>
33	8/26	Fri	MS	Granada	51	F	At lake	Searching for arrowheads	<a href="#">Donna Hendrix</a>
34	8/28	Sun	TX	Slaton	23	M	In park by lake	Walking	<a href="#">Gabriel Ramos</a>
35	9/6	Tue	MI	Manistee County	71	M	Trail	Hiking	<a href="#">Steven Olson</a>
36	9/6	Tue	WI	Minocqua	66	M	Outside Home	Walking dog	<a href="#">Bryan Jennings</a>
37	9/25	Sun	TX	Austin	37	F	Hiking trail	Hiking	<a href="#">Michelle Ann Wolfe</a>
38	12/12	Tue	FL	Molino	?	M	Outside home		not yet released

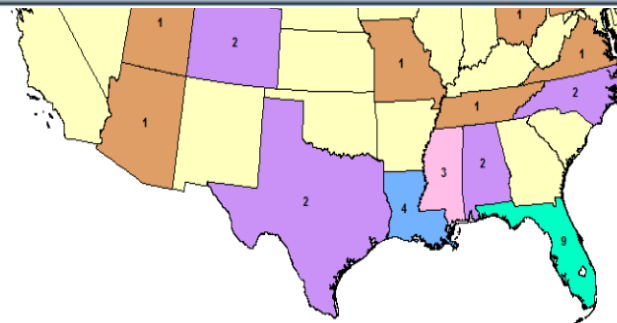
### U.S. Lightning Fatalities 2006-2016



### Lightning Fatalities Sports-Related Activities



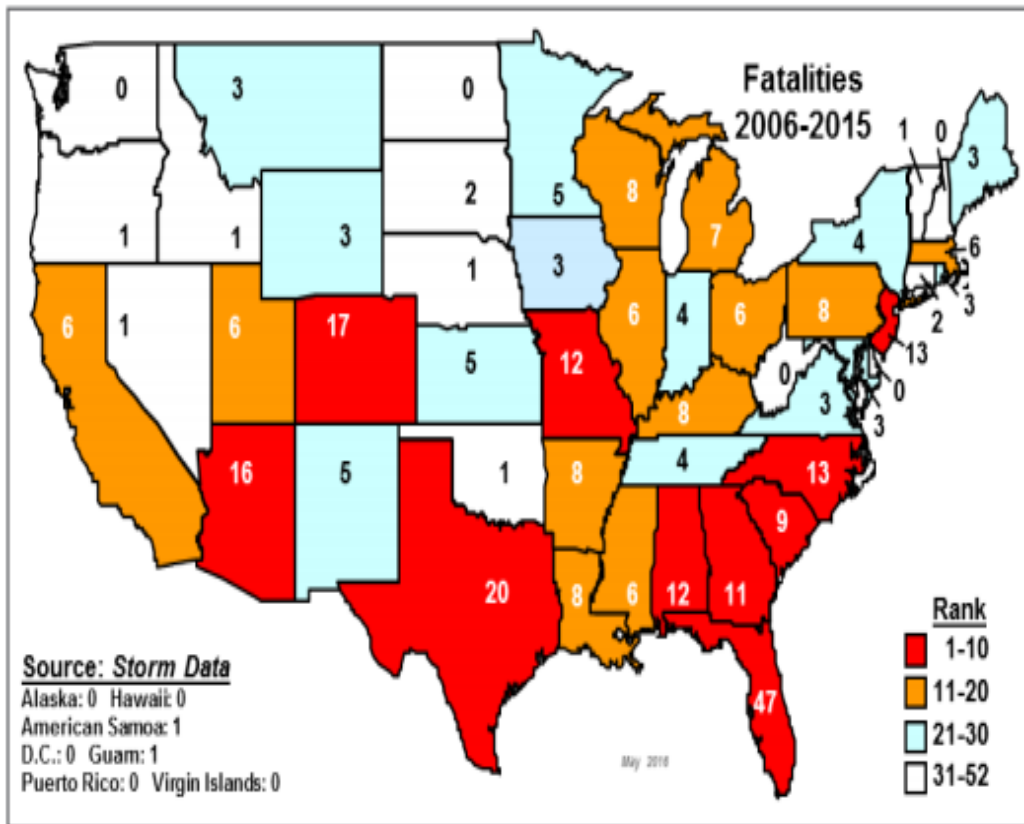
Based on 30 cases from 2006 through 2015





# Lightning Fatalities by State and Activity

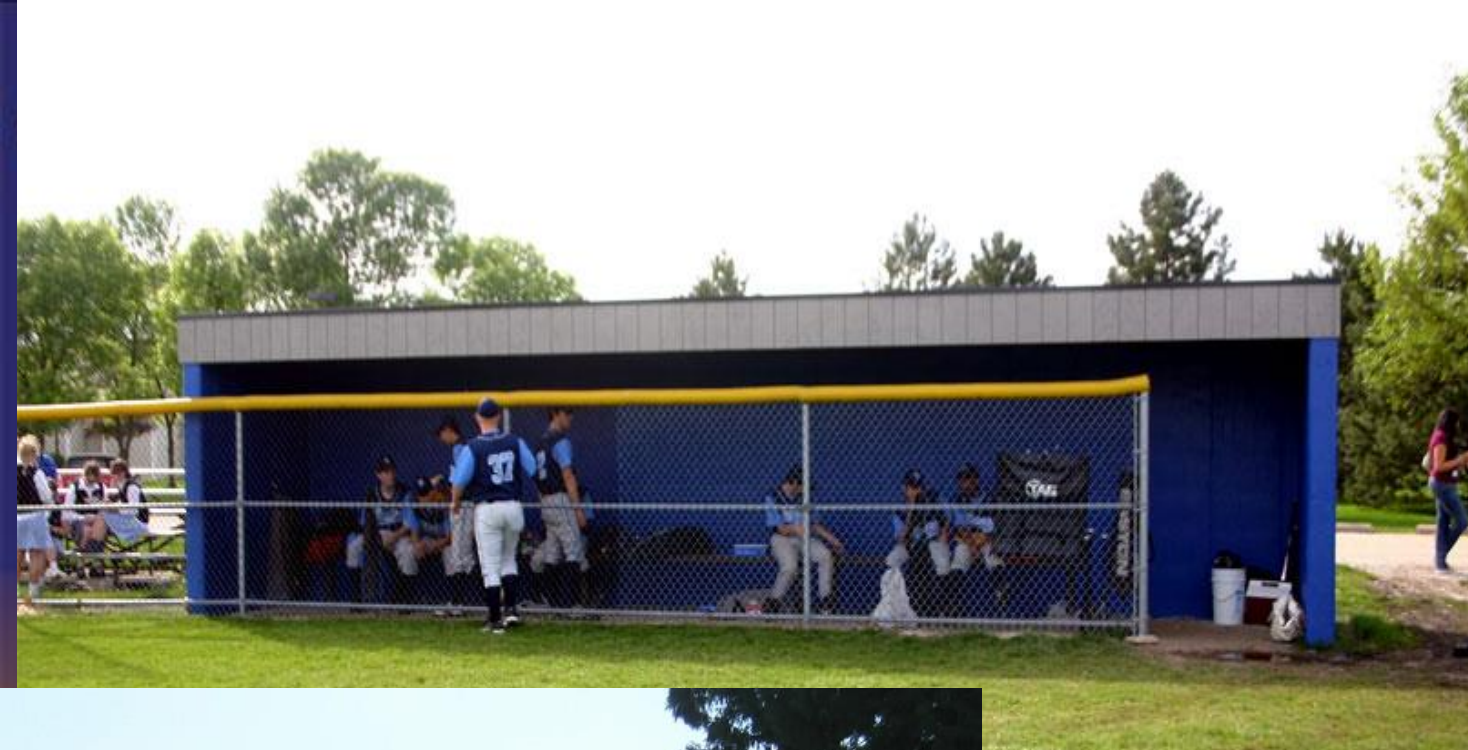
## Lightning Fatalities by State, 2006-2015



Activity	# of Deaths ( % )
Fishing	33 ( 11%)
Beach	18 ( 6%)
Camping	17 ( 5%)
Farming or ranching	16 ( 5%)
Boating	14 ( 4%)
Riding bike, motorcycle, or ATV	14 ( 4%)
Soccer	12 ( 4%)
Social gathering	11 ( 4%)
Walking to/from home	11 ( 4%)
Yard work	9 ( 3%)
Walking to/from or waiting for vehicle	8 ( 3%)
Golf	8 ( 3%)
Total	171 ( 55%)

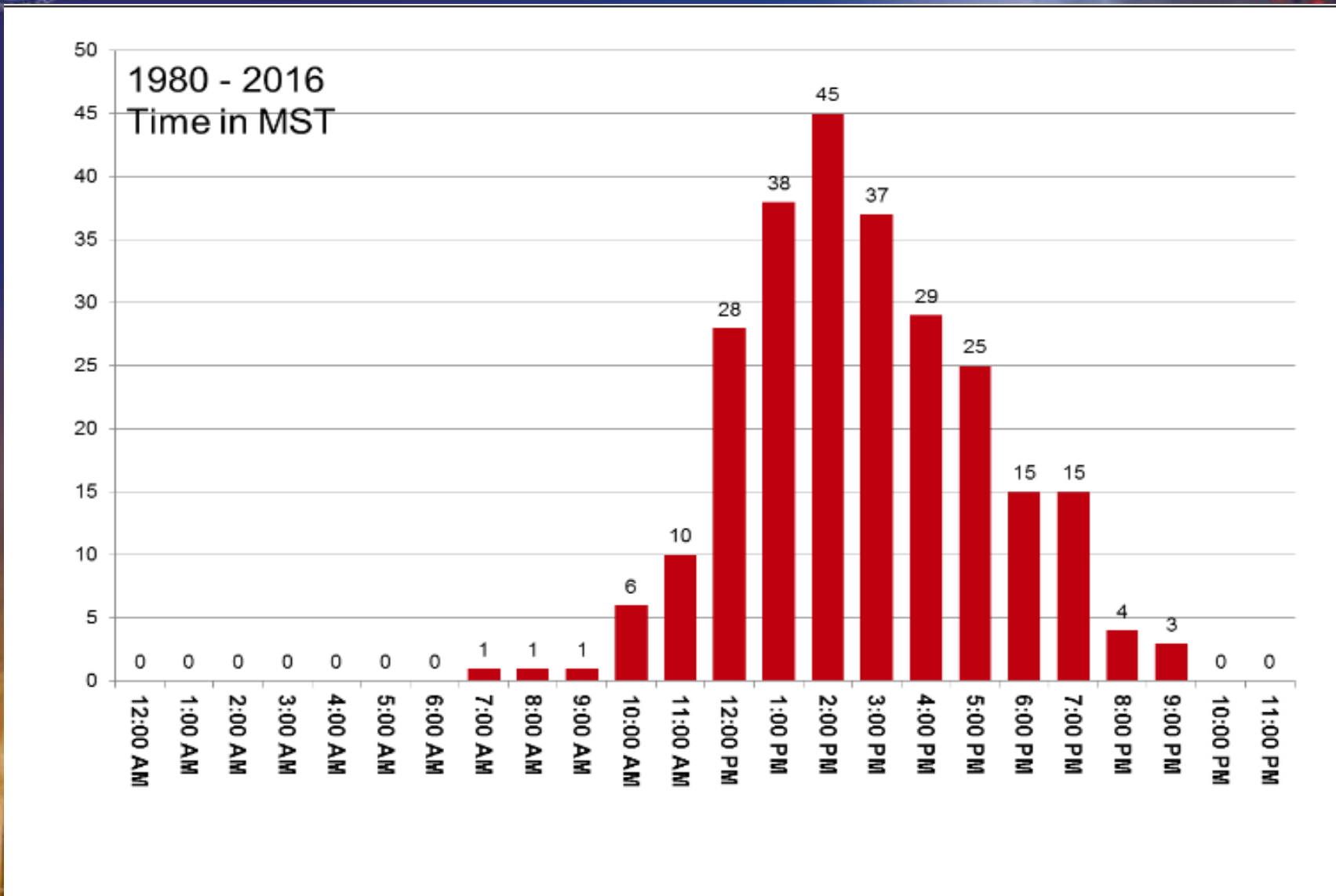
Table 3.6 The twelve activities that contribute most to lightning deaths.

John Jensenius, NWS





# Lightning Casualties in Colorado





# Just when you thought it was safe

❖ *15% off all strikes occur outside the rain area*







Example of ground current

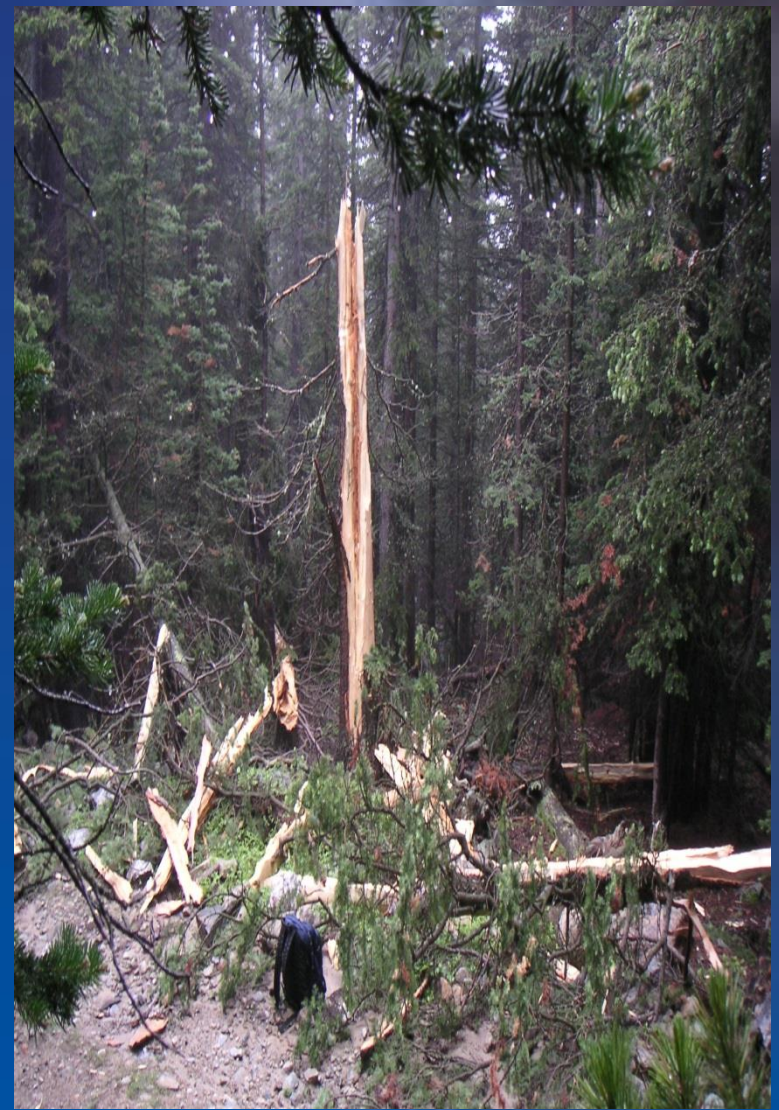


Lightning

Conduction example



Near Henry's Lake, Island Park ID, Ruth Lyon-Bateman





# Lightning Safety

**When Thunder Roars, Go Indoors!**

**STOP** all activities.

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

Wait 30 minutes after storm to resume activities.

 [www.lightningsafety.noaa.gov](http://www.lightningsafety.noaa.gov) 

- Plan ahead, Get Forecast, Monitor the sky
- Unsafe locations – golf courses, ball fields, water, higher exposed locations. Isolated tall objects, trees.
- Safer places—inside buildings, and metal roofed vehicles with windows rolled up.

### Safety Tips

- Stay off the telephone (landline)
- Use Cell phone for reporting!
- Stay out of the shower
- Don't use electrical appliances.
- **Lightning victims do not carry charge and are safe to touch**
- More information –
  - [www.lightningsafety.noaa.gov](http://www.lightningsafety.noaa.gov)





# Tornado weather safety

## When you're on the road

- Keep your distance from storm
- Always leave an avenue of escape
- Observe near an intersection,
  - so there are 4 possible routes of escape.
- Be prepared for storms to change direction of movement
- Never outrun a tornado,
  - get to a sturdy shelter
  - Stay way from underpasses/bridges
- Last resort: 2 options
  - Abandon vehicle, drop in low lying ditch and cover head
  - Stay in car/buckle seat belt, cover head with hands. Stay low.



Chapman, KS 2008



**Elbert County F2 tornado May 10, 2004**



# Storm Chasers Killed in Texas





# Tornado Safety

## In a home:

- Move to the basement and protect yourself from flying debris.
- If no basement, seek a small interior room.



## In a mobile home:

GO to a designated shelter, or go to a neighbor's house.



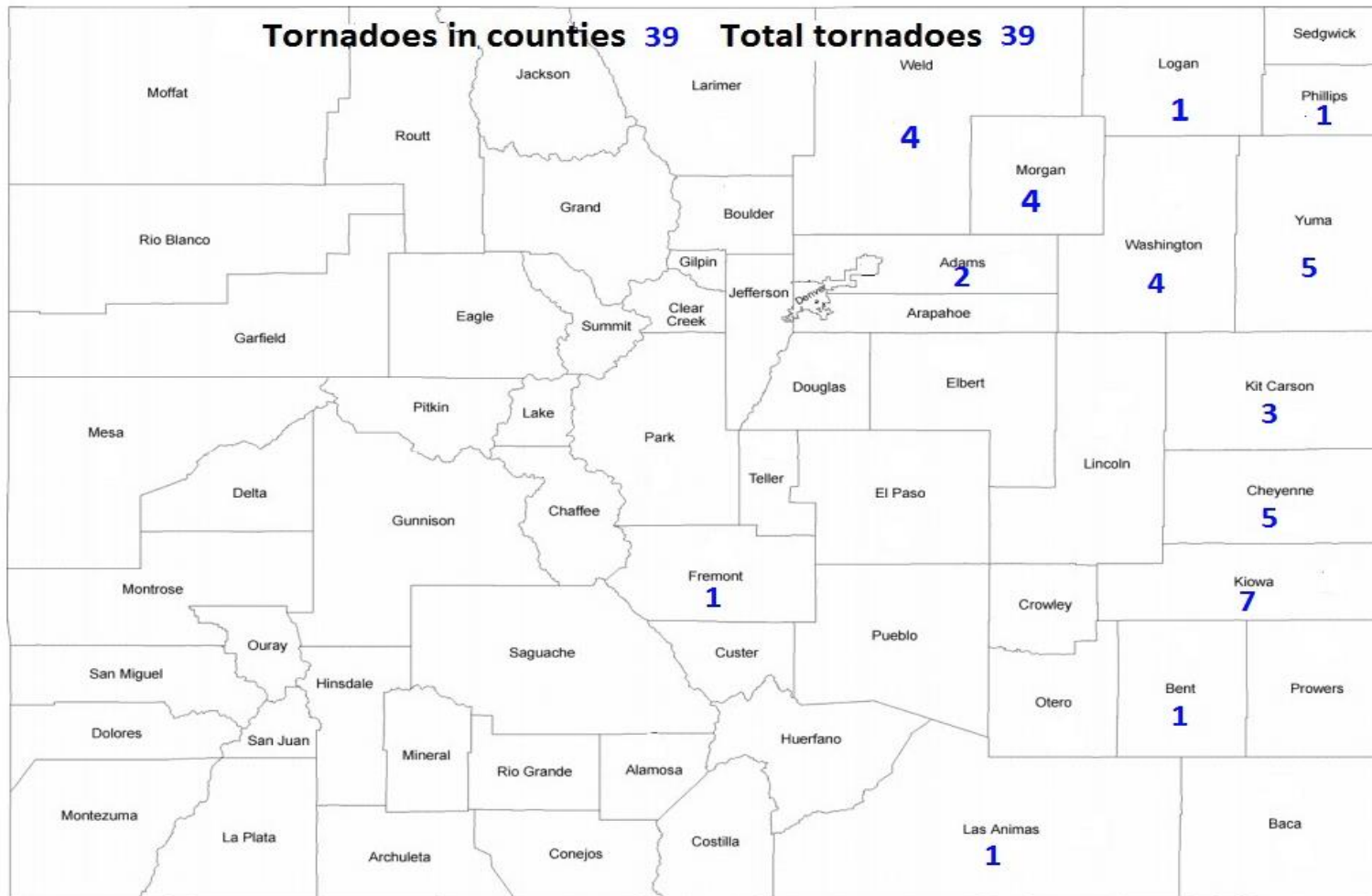
# Windsor Tornado Damage





# Tornadoes in Colorado 2016

## TORNADOES REPORTED IN COLORADO COUNTIES IN 2016

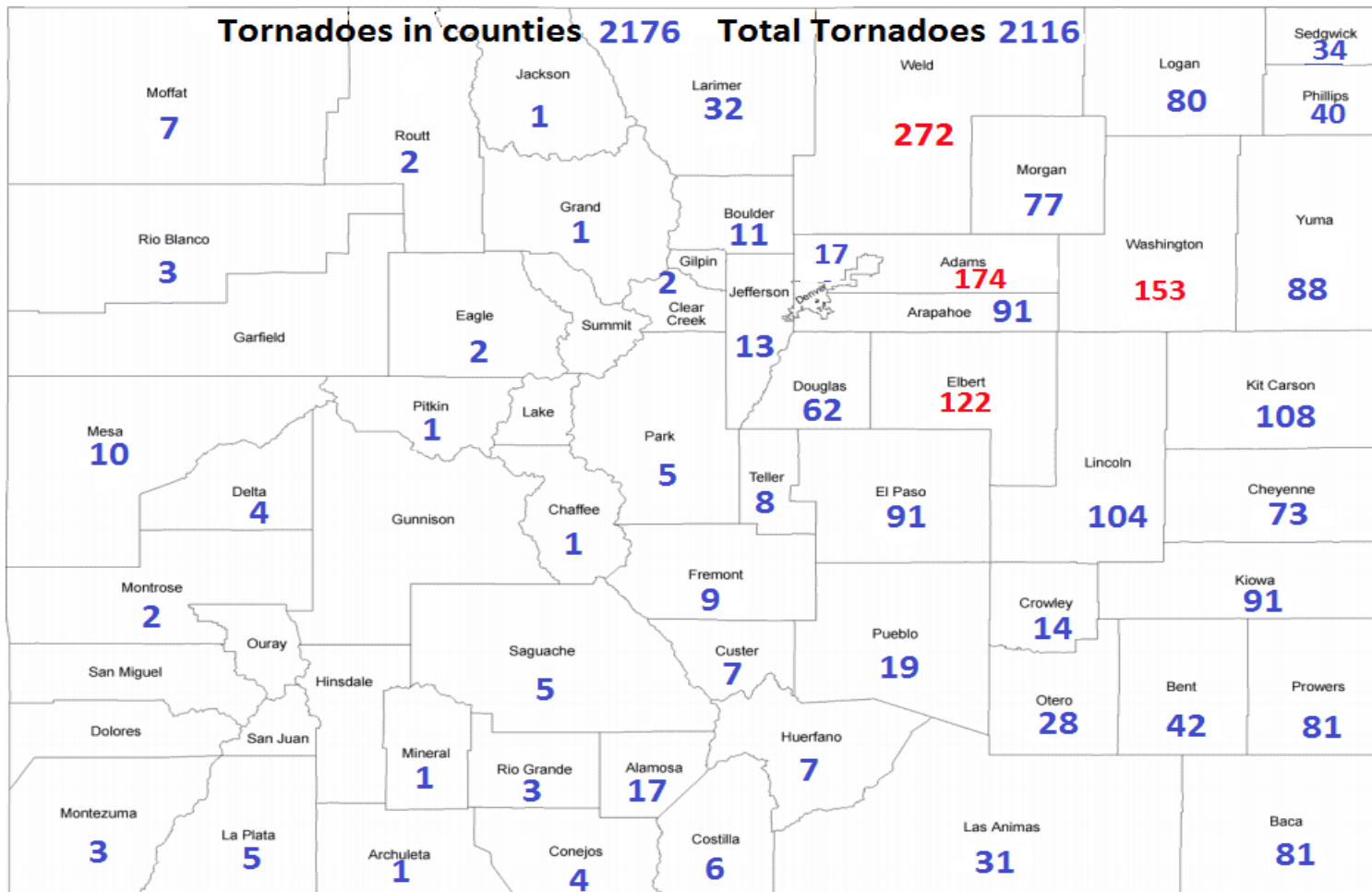






# Tornadoes in Colorado from 1950

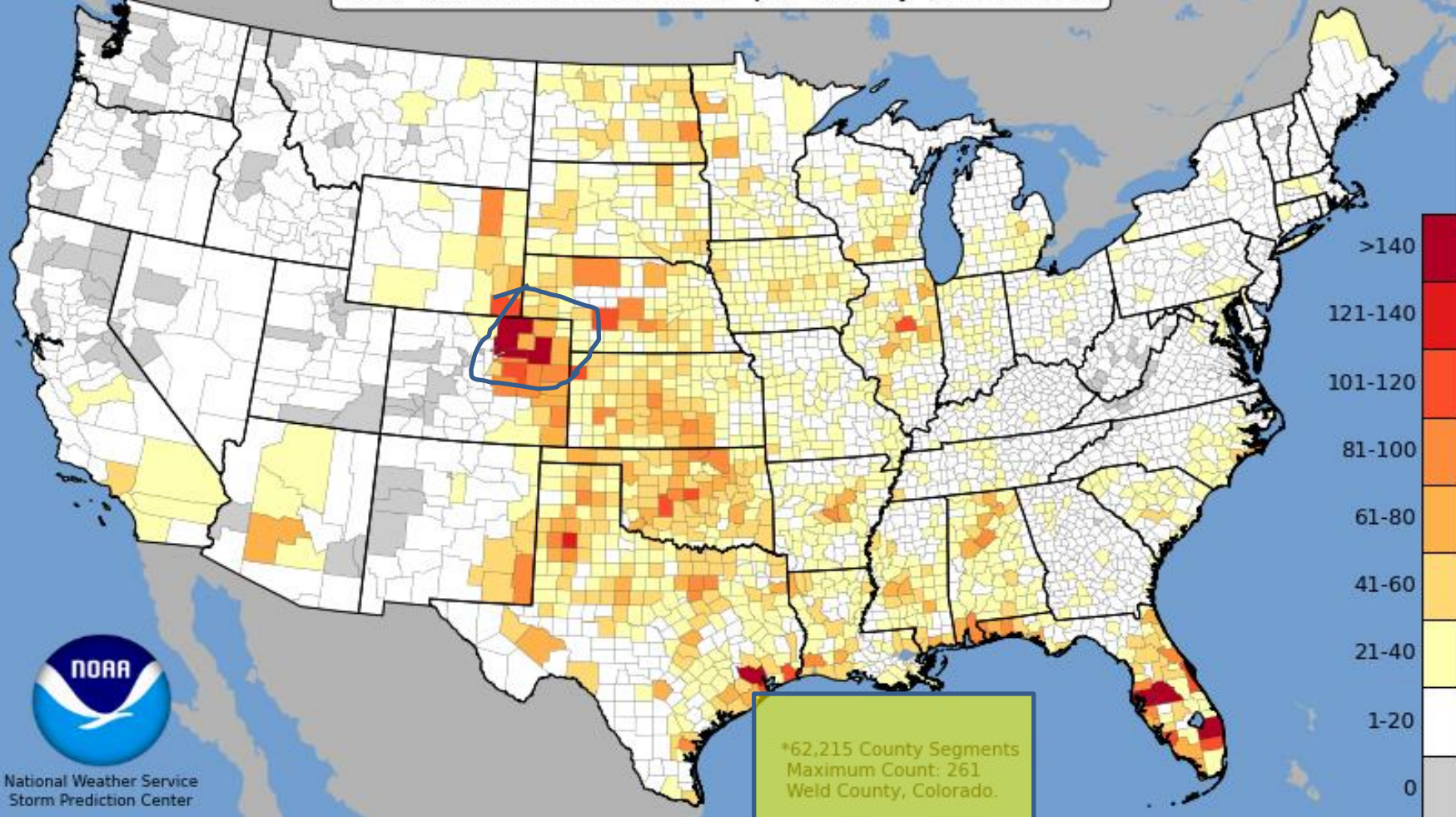
## TORNADOES REPORTED IN COLORADO FROM 1950 THROUGH 2016





# Total # of Tornadoes per county

Total Number of Tornadoes\* per County (1955-2014)



\*62,215 County Segments  
 Maximum Count: 261  
 Weld County, Colorado.



National Weather Service  
 Storm Prediction Center



# Flash Flooding in Colorado: 2013





# Flash Flooding



# FLASH FLOODS

## Fact

6 in. of swiftly flowing water can knock a person over.

## Fact

Less than 2 ft. of water will make most vehicles float.

## Fact

Flooding is the #1 cause of death associated with thunderstorms...more than 140 fatalities each year.

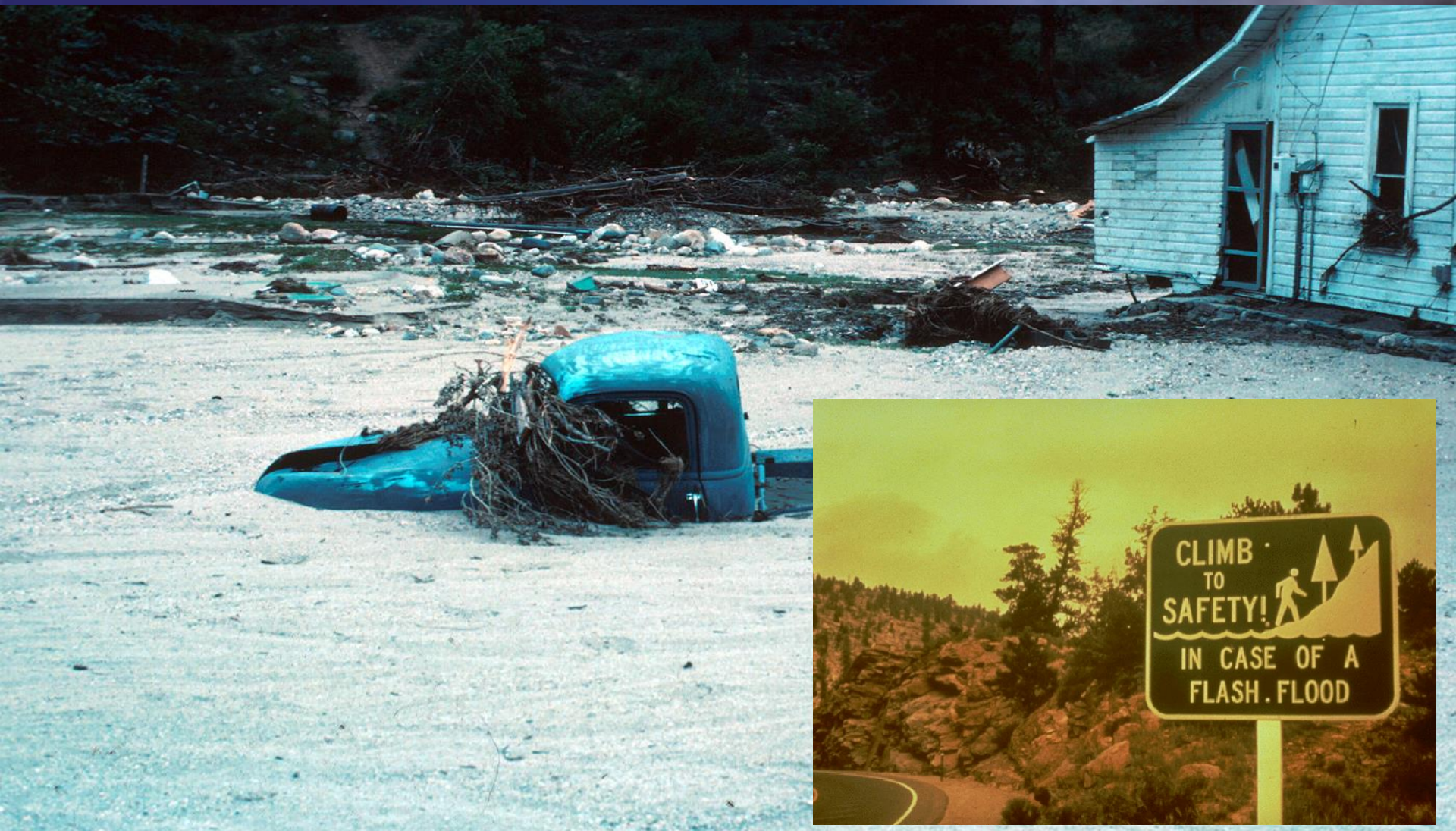
## What you should know!

- Flash Flood **Watch** means it is possible that weather conditions will cause flash flooding in the specified area. Be alert and prepared for a flood emergency.
- Flash Flood **Warning** means flash flooding is occurring or is imminent in the specified area. Move to higher ground immediately.
- Serious flooding can occur when heavy rains fall onto recently burned areas. Residents in these areas should take precautions and have a plan!





# Big Thompson Canyon Flash Flood 1976





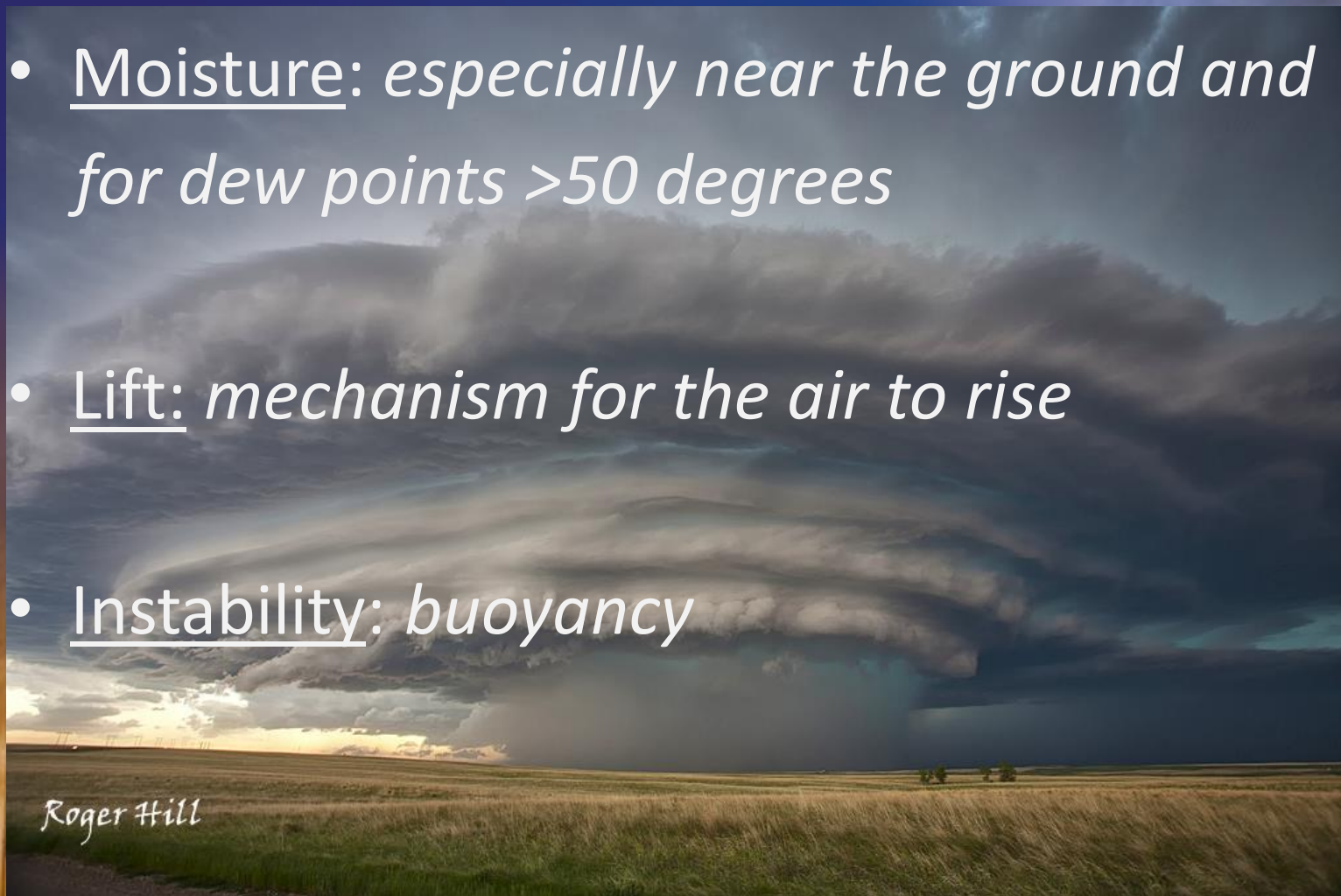
# The Power of Water





# How to cook up a Thunderstorm Ingredients Necessary!

- Moisture: *especially near the ground and for dew points >50 degrees*
- Lift: *mechanism for the air to rise*
- Instability: *buoyancy*

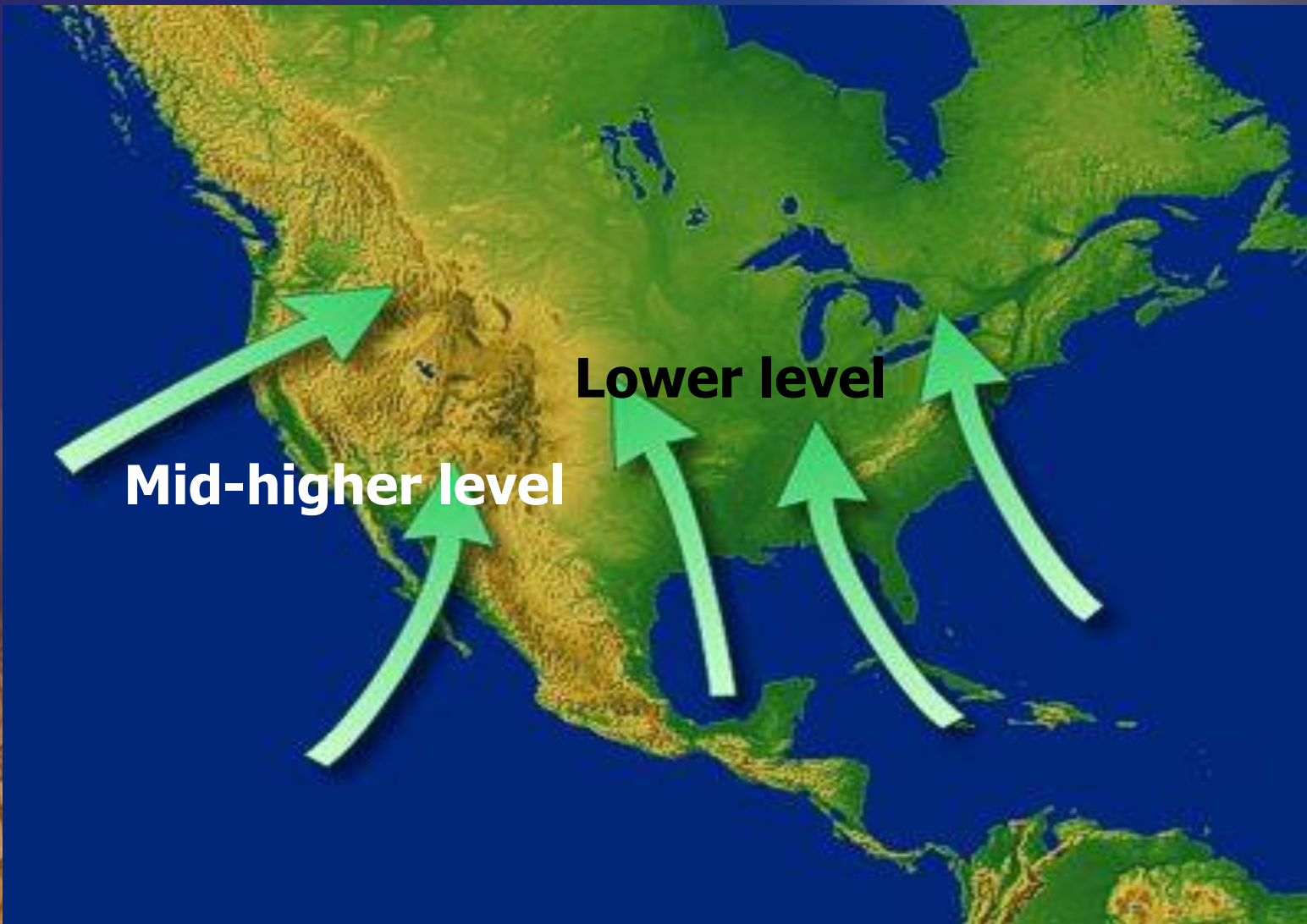


Roger Hill





# Moisture



**Mid-higher level**

**Lower level**



# Ways to make lift!

## Surface based...

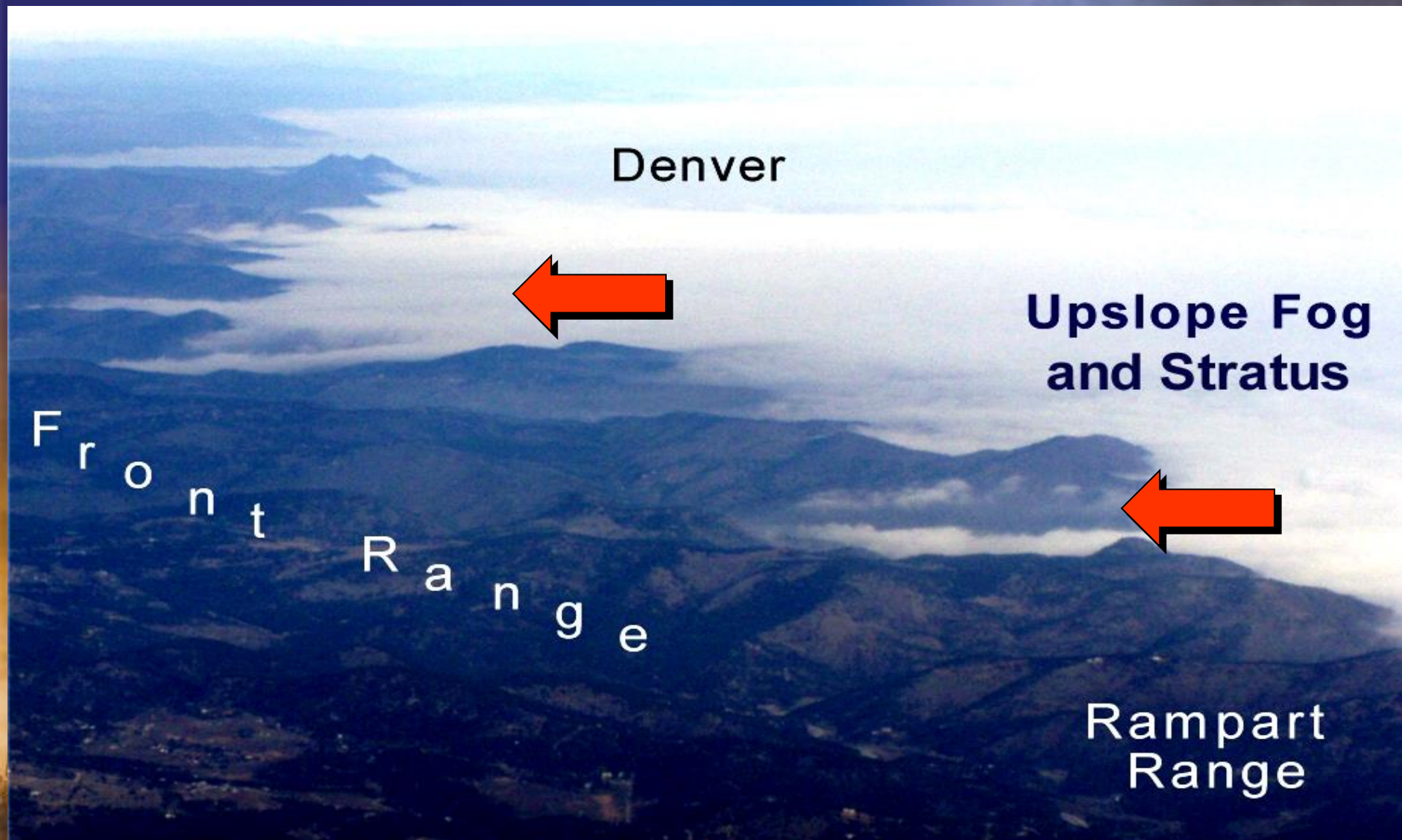
- Fronts or boundaries...
- (cold fronts, warm fronts, stationary fronts, gust fronts, wind convergence lines)
- Upslope
- heating differences (i.e. foothills vs plains)

## Aloft...

- Jet streams
- Upper atmospheric troughs



# Upslope Flow: East to Northeast



Denver

**Upslope Fog  
and Stratus**

F  
r  
o  
n  
t  
  
R  
a  
n  
g  
e

Rampart  
Range



# Source of Lift

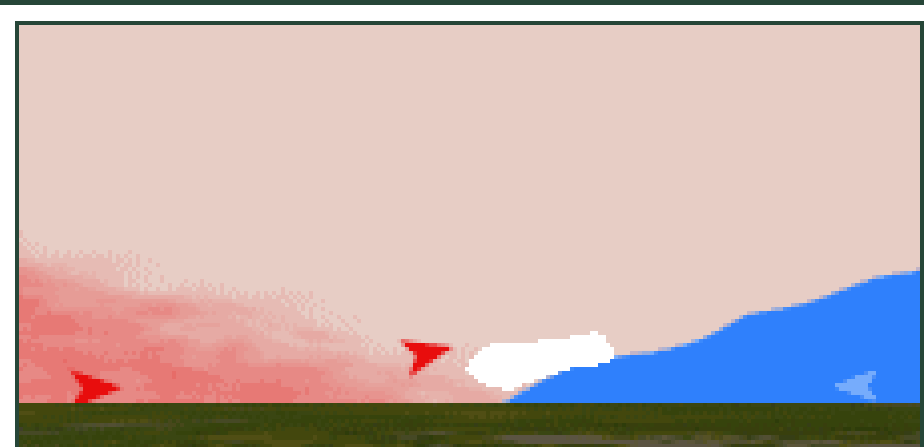
SOURCE OF LIFT – Agent which lifts the warm, moist air to create the thunderstorm



Cold Front

- Cold Air
- Warm Air
- Warmer Air

The COMET Program



Warm Front

- Cold Air
- Warm Air
- Warmer Air

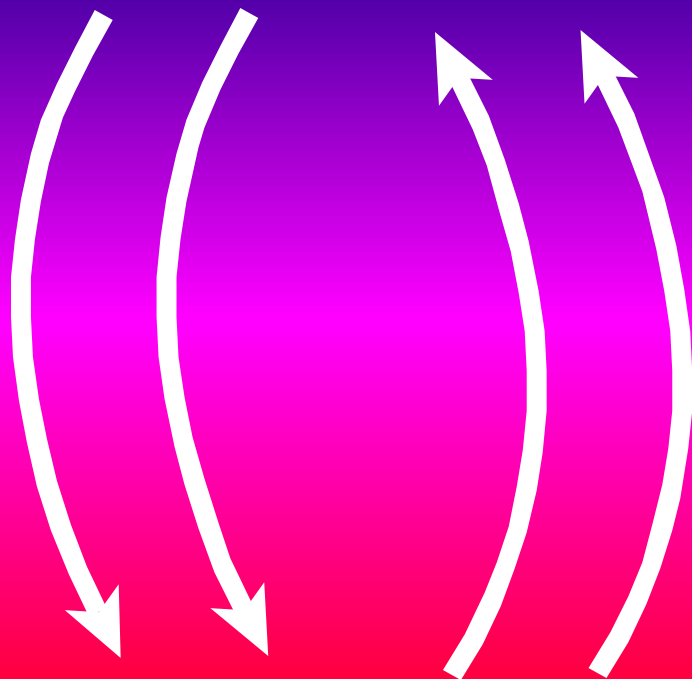
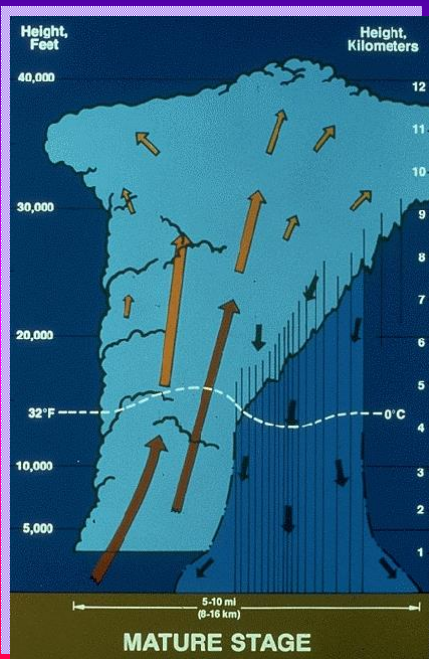
The COMET Program



# Instability

Leads to buoyancy as day heats up

**RELATIVELY** cold, dense air



**RELATIVELY** warm air, less dense



# Atmospheric stability



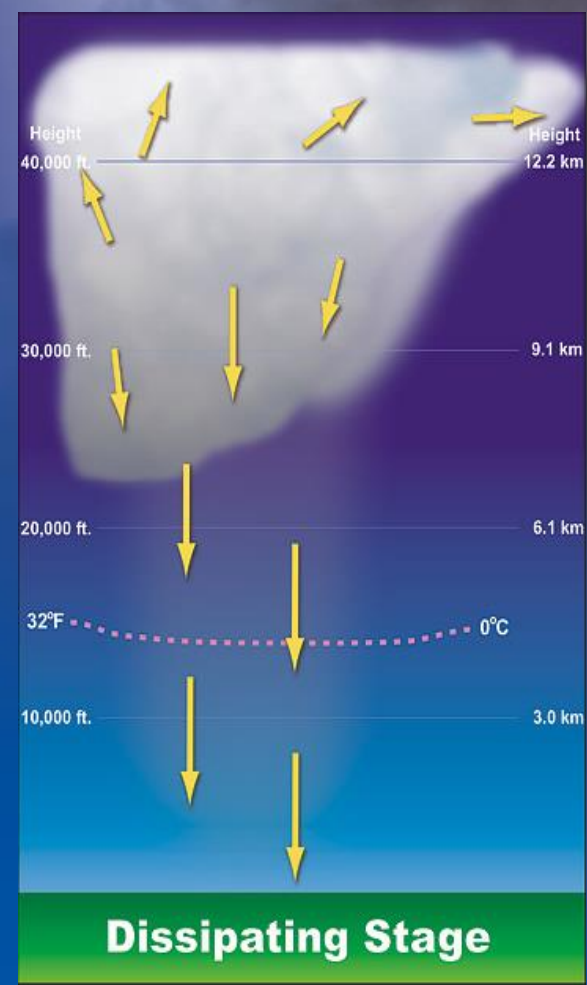
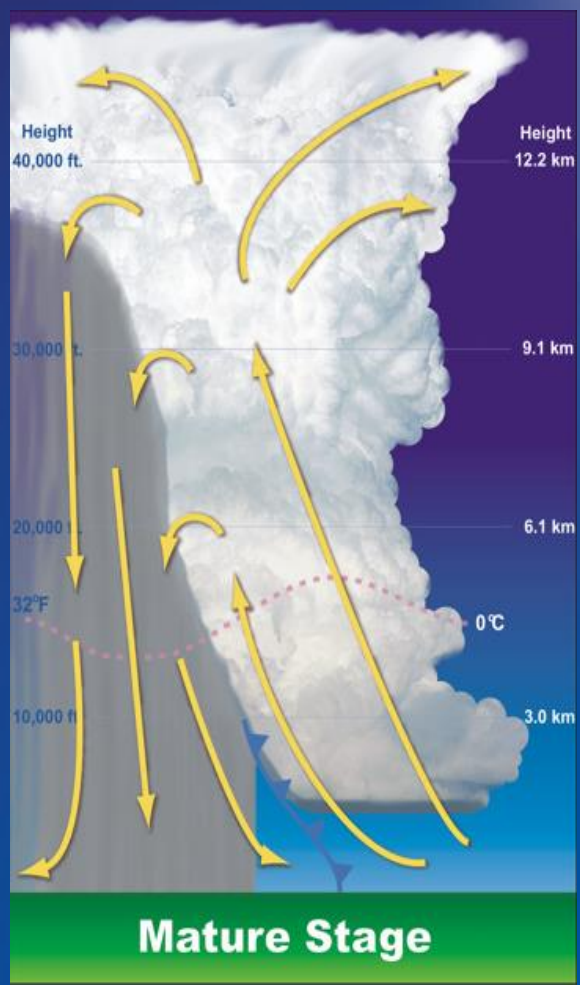
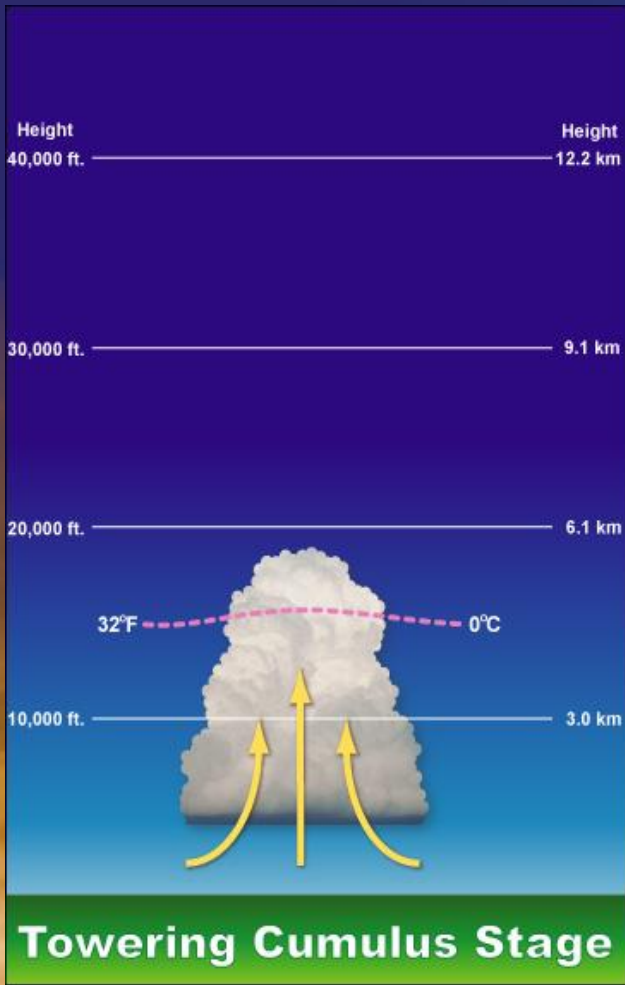
**Unstable**



**Stable**

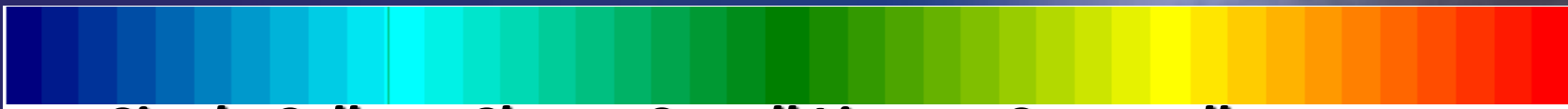


# Thunderstorm life cycle





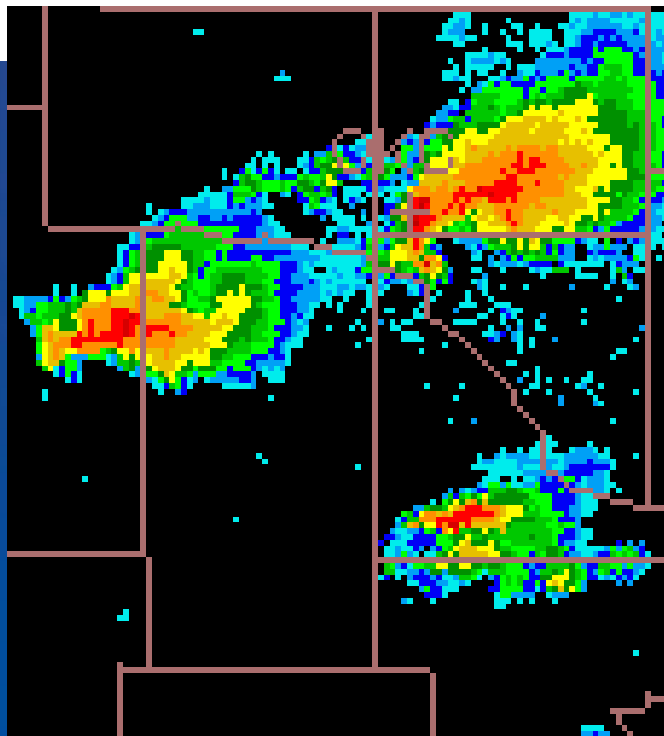
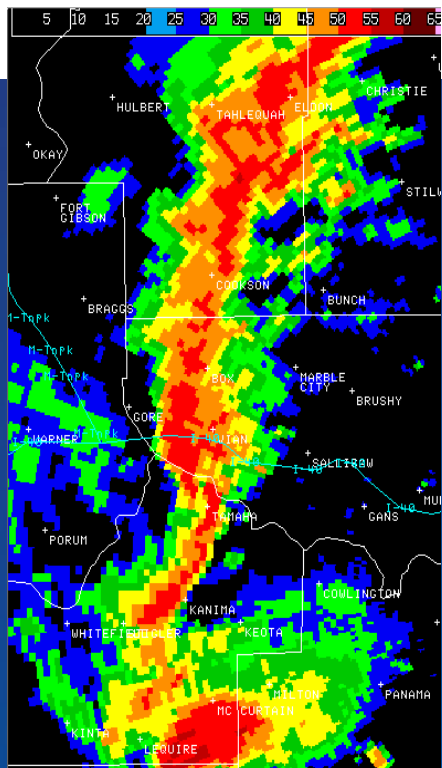
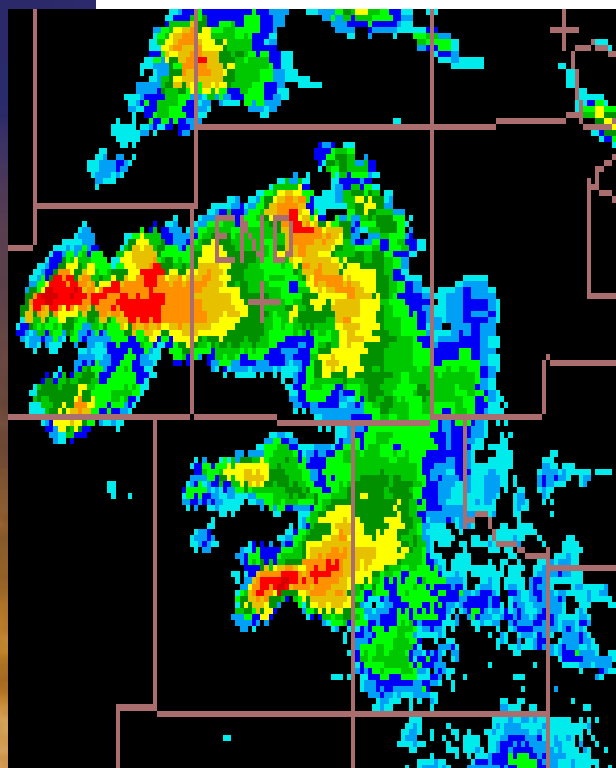
# Thunderstorm Spectrum



**Single Cell**

**Cluster Squall Line**

**Supercell**







# Single Cell Pulse Storms

- Weak winds aloft, unstable environment.
- Typically during, just after peak heating.
- Intense updrafts can result in extremely unstable air.
- As storm collapses, a 5- 10 minute period of intense rain, hail and wind may develop.





# Pulse Storms



The precip core (downdraft) expands into the area once occupied by the dark updraft base, then rains itself out after a short time.

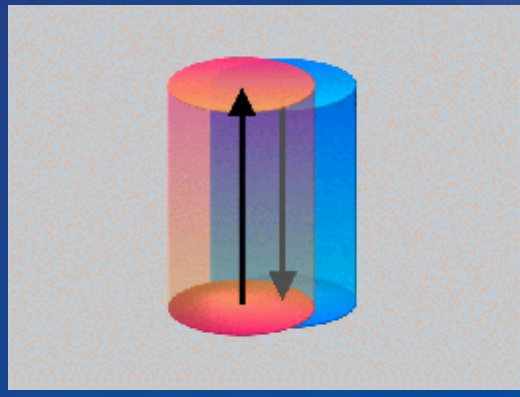
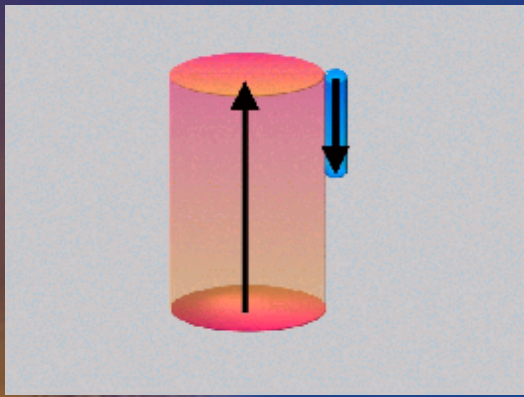


# Pulse Storm Evolution

## Towering Cu.

## Mature

## Dissipating



Storm initially dominated by updraft  
After a short time...downdraft overwhelms updraft



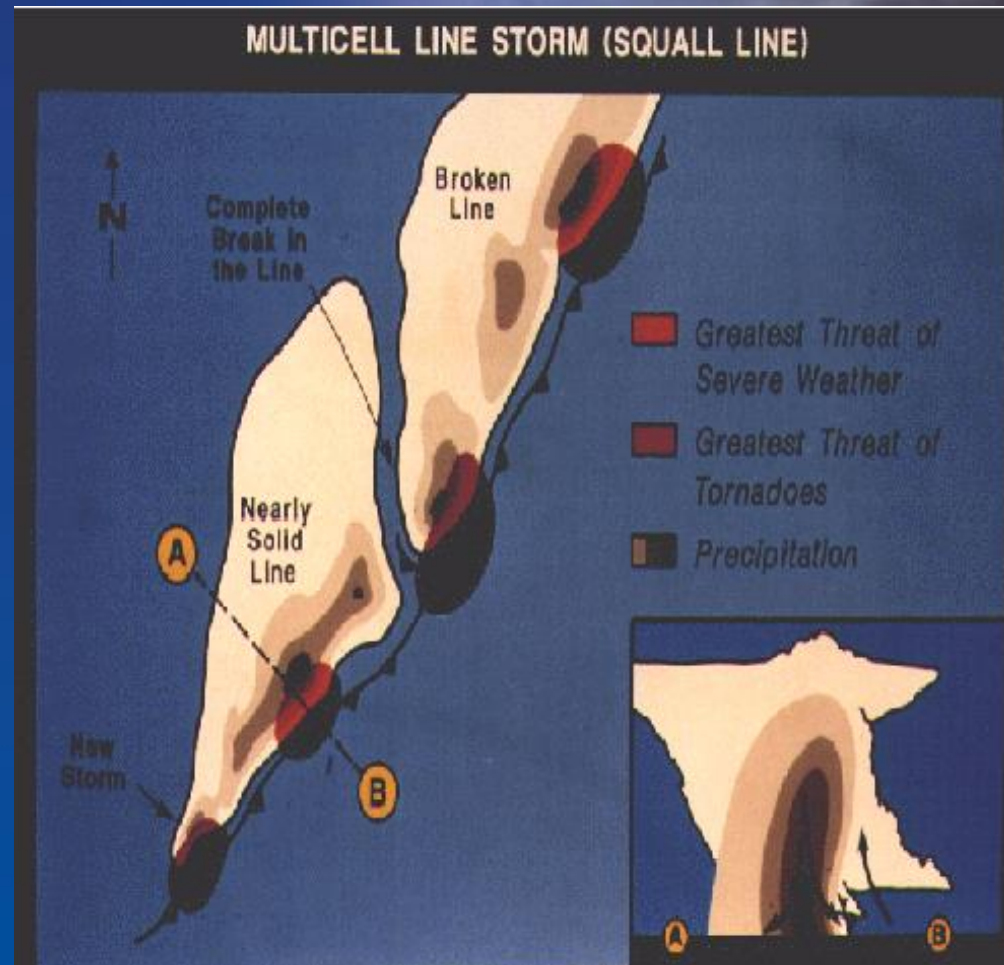
# Multi-cell cluster of storms





# Squall lines

- Storms organize into a linear structure
- Can be more than 100 miles long
- Primary threat is damaging winds
- Can produce hail and weak tornadoes.





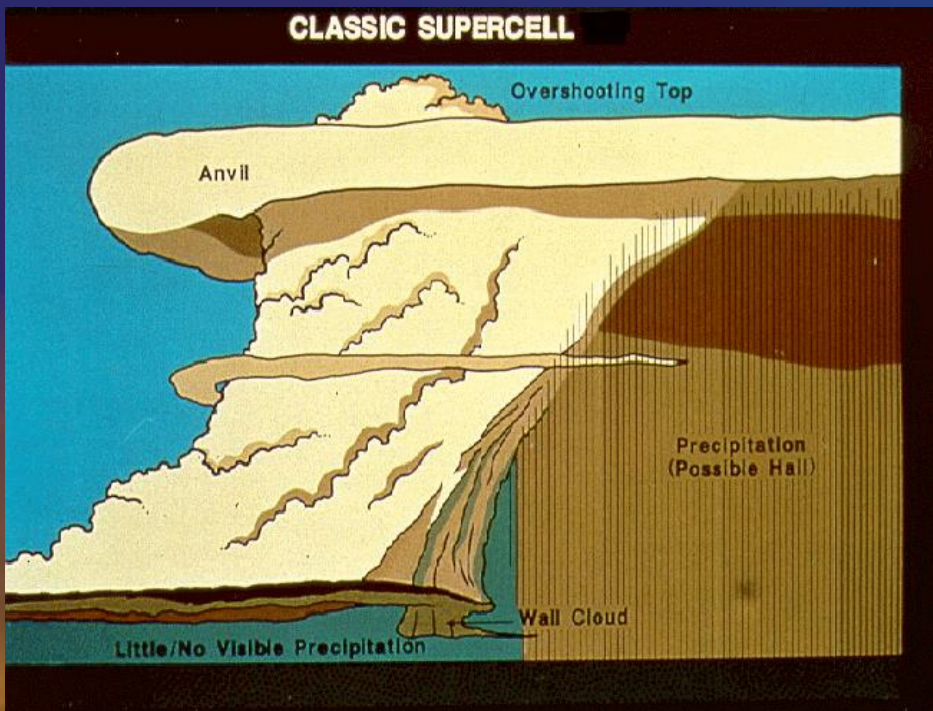
# Multi-cell line of storms



(Looking west, storm is approaching)



# Classic Supercell



Classic Supercell thunderstorm. Photo by Roger Hill.





# Spotting Storms

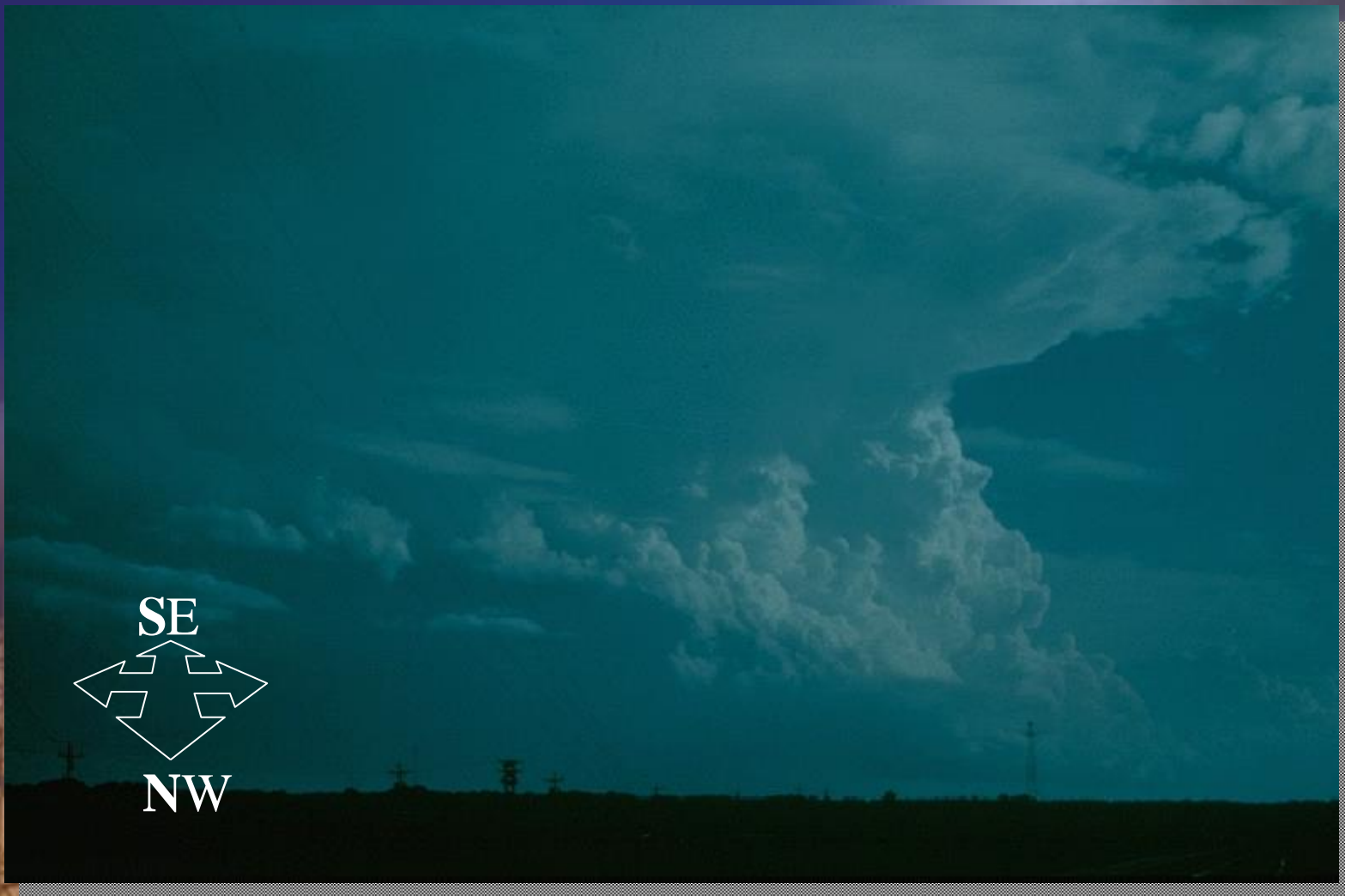
*What you see will be dependent on:*

- What side of storm you are on
- Distance to storm
- Visibility (humidity, haze, blowing dust)
- Trees, buildings, other storms
- Your primary goal – SAFELY determine the strength and rotation of the updraft.





# What do you see looking Southeast?





“Uh Oh...”





# Upper level storm clues

- Best seen 30-40 miles from storm
  - Look for sharp, well defined edges on cirrus anvil
  - Look for overshooting top

Overshooting  
Top





# Anvil clouds



- Indicating very strong updraft



Indicating weak updraft





# Mid level storm clues

- Main Storm Tower

- Best seen 10-20 miles from the storm
- As buoyancy increases, so does updraft strength



- Flanking Line:

a row of towering cumulus clouds clouds stair-stepping up to the main storm tower. Photo by Tom Warner





# Low level storm clues

- Best seen 3-8 miles from storm
- Multiple motions to track
  - Inflow to updraft
  - downdraft to outflow
- The Action area – the rain free cloud base
  - Here you can gage updraft strength and rotation!



# Updraft Characteristics

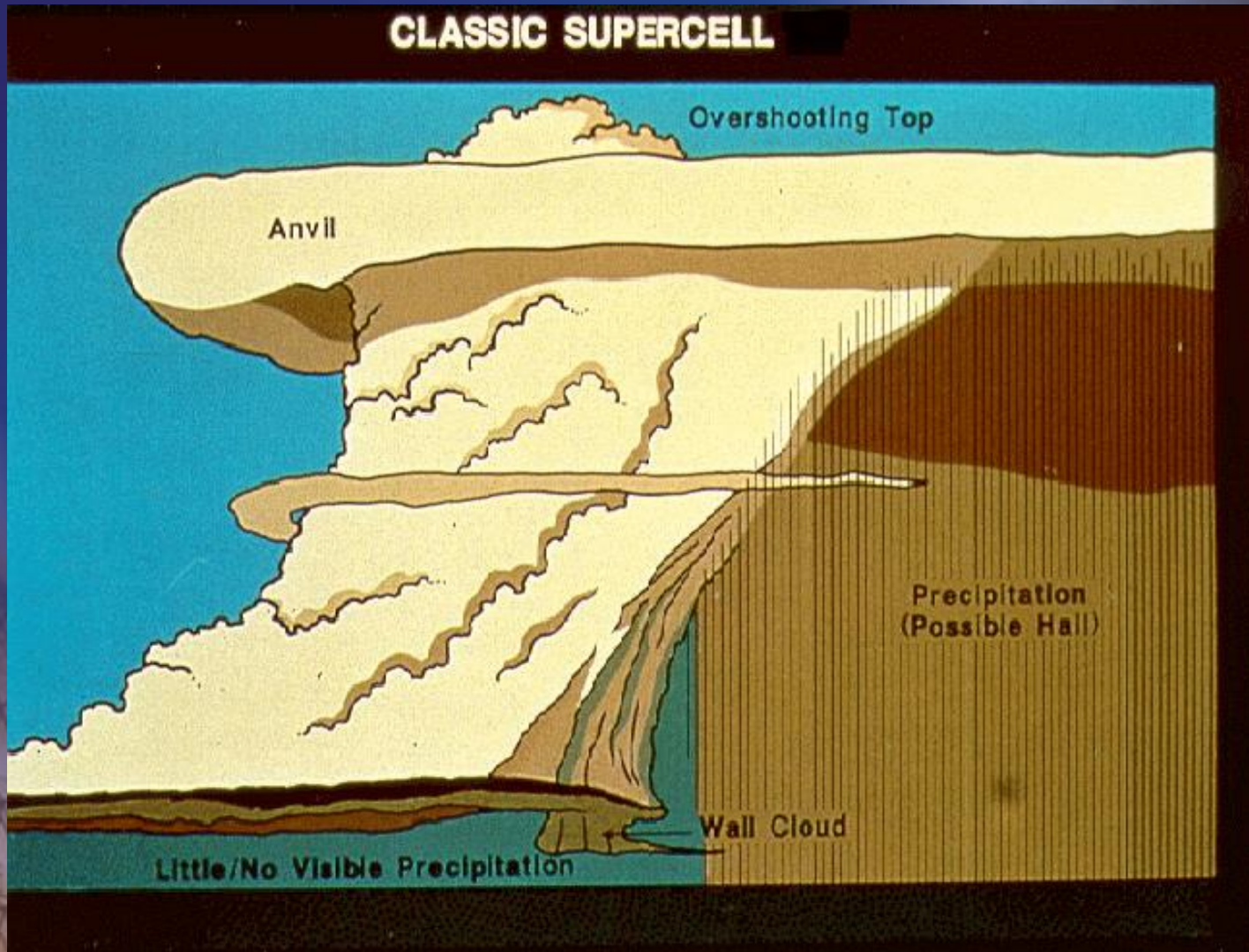
- Inflow side of storm
- Rain free base
- Upward cloud motion
- Wall cloud / tornado area
- Supercells have
- **rotating** updrafts



Courtesy Dave Chapman



# Classic Supercell







# Wall Cloud/ w Supercells

- Presence of a wall cloud indicates a strong updraft.
- Wall clouds usually slope down toward rain core.
- Look for rotation.
- Persistent, rotating wall clouds are important. Report these at once!

Watch entire wall cloud for persistent, organized rotation

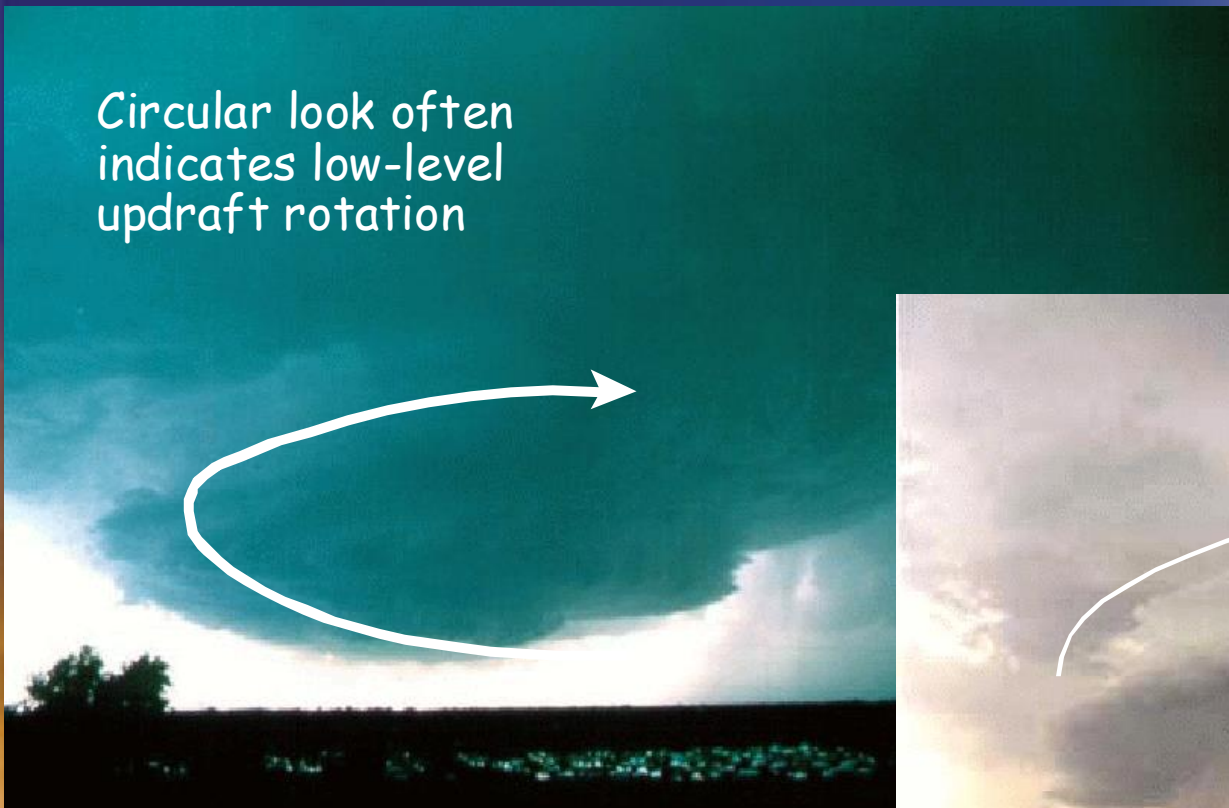
Watch this zone for violent rising motion



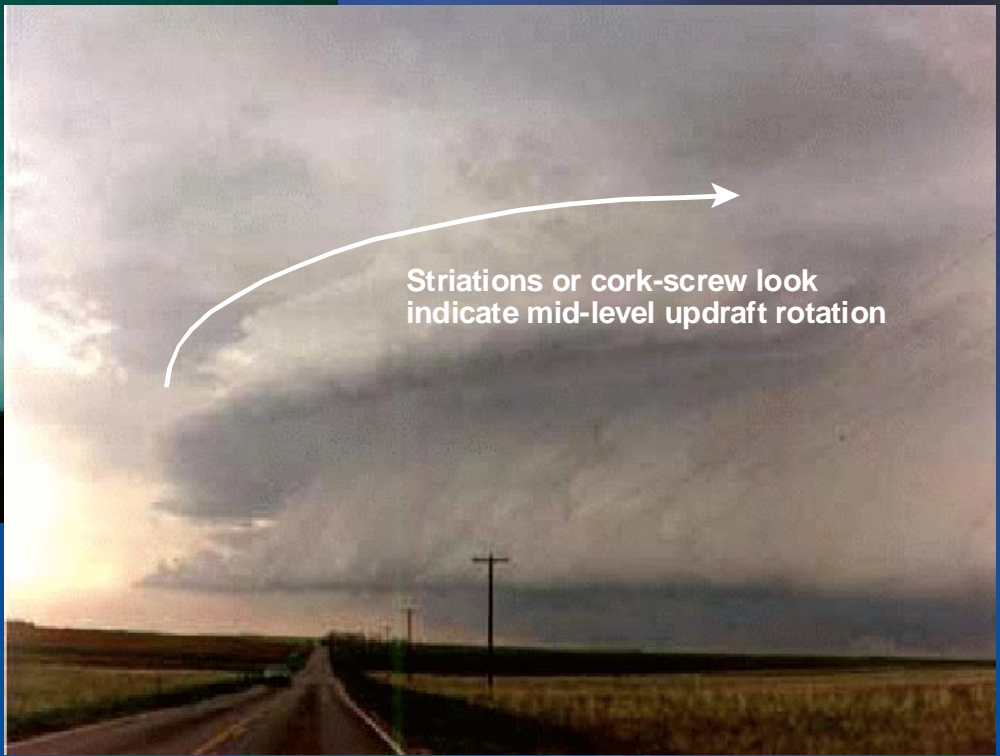


# Mesocyclone

Circular look often indicates low-level updraft rotation



Striations or cork-screw look indicate mid-level updraft rotation





# Weld County- June 12th



@charnick\_wx  
Michael Charnick 2017



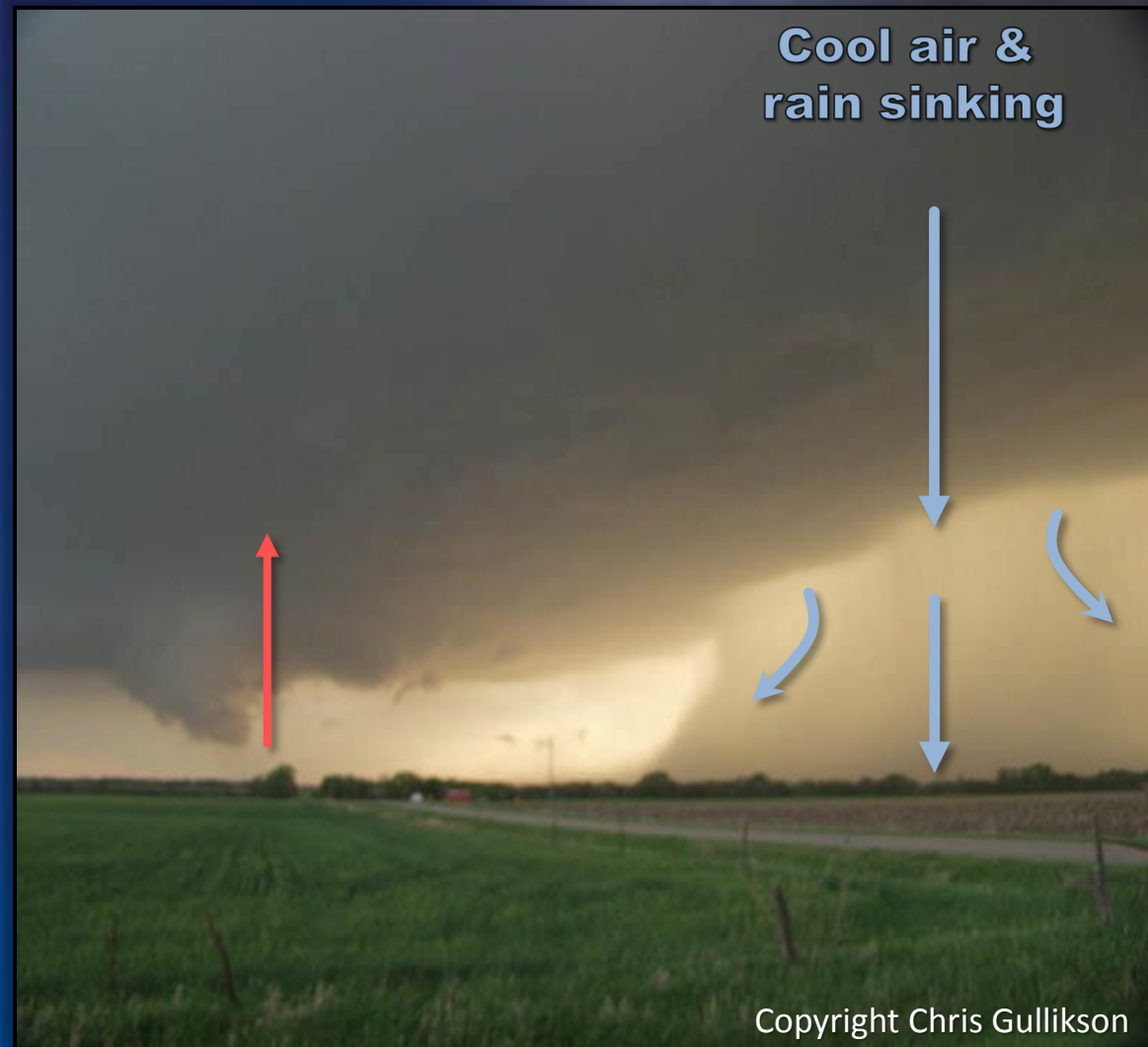
# Updrafts





# Downdraft Characteristics

- Dark area of the storm
- Rainfall region
- Downward motion
- Cooler air & rain are sinking out of the storm hence "down" draft
- Downburst & hail threat



Copyright Chris Gullikson



# Rain shaft vs. Hail shaft

Rain shaft (darker)

Hail Shaft (whiter)





# Downdraft: Shelf Cloud

- \* Marks the leading edge of the gust front (ahead of the storm)
- \* Produced by the rain-cooled air
- \* Cloud slopes down away from the rain
- \* Often associated with straight line wind damage (not tornadoes)



**Sloping away from rain**



# More Shelf Clouds







## Wall Cloud

Abrupt or “blocky” lowering

Associated with storm inflow

Slopes toward the rain

Moves along with storm



## Shelf Cloud

Linear feature

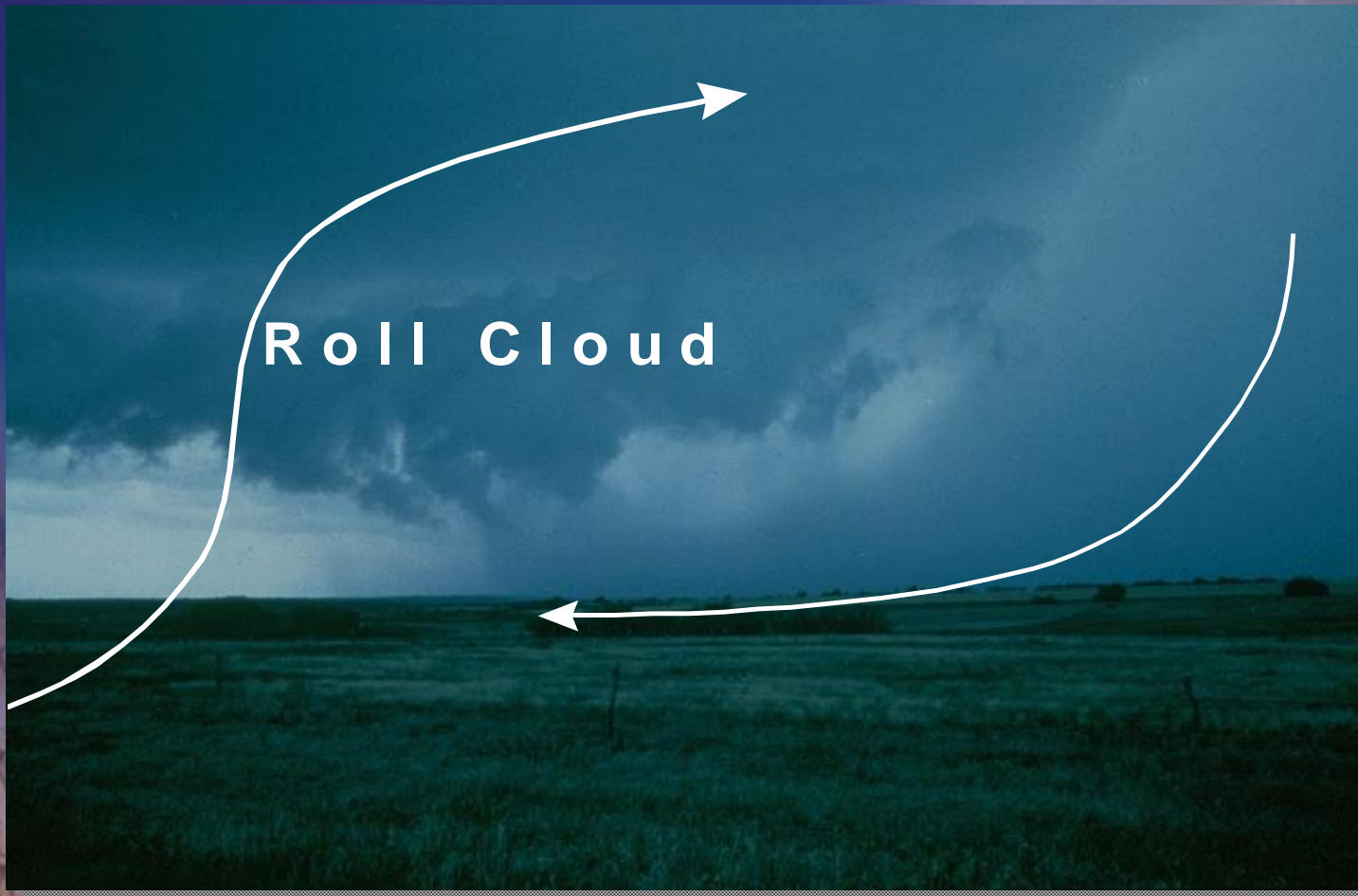
Associated with storm outflow

Slopes away from the rain

Moves ahead of rain area



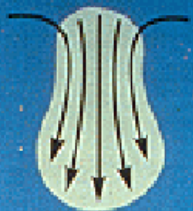
# Roll cloud with outflow





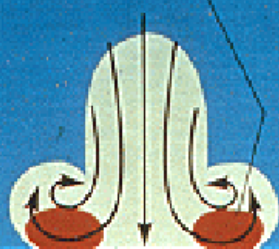
# Microbursts

## DESCENT OF A MICROBURST



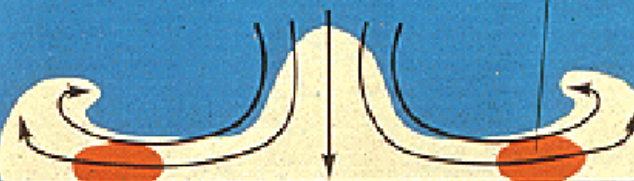
Formation

Greatest Threat of High Winds



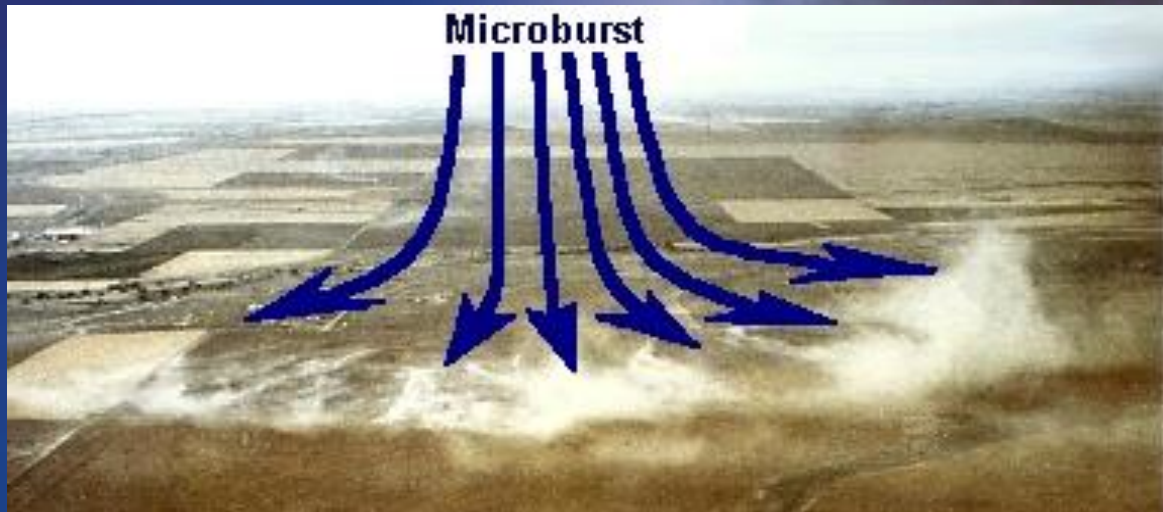
Impact

Diminishing Threat of High Winds



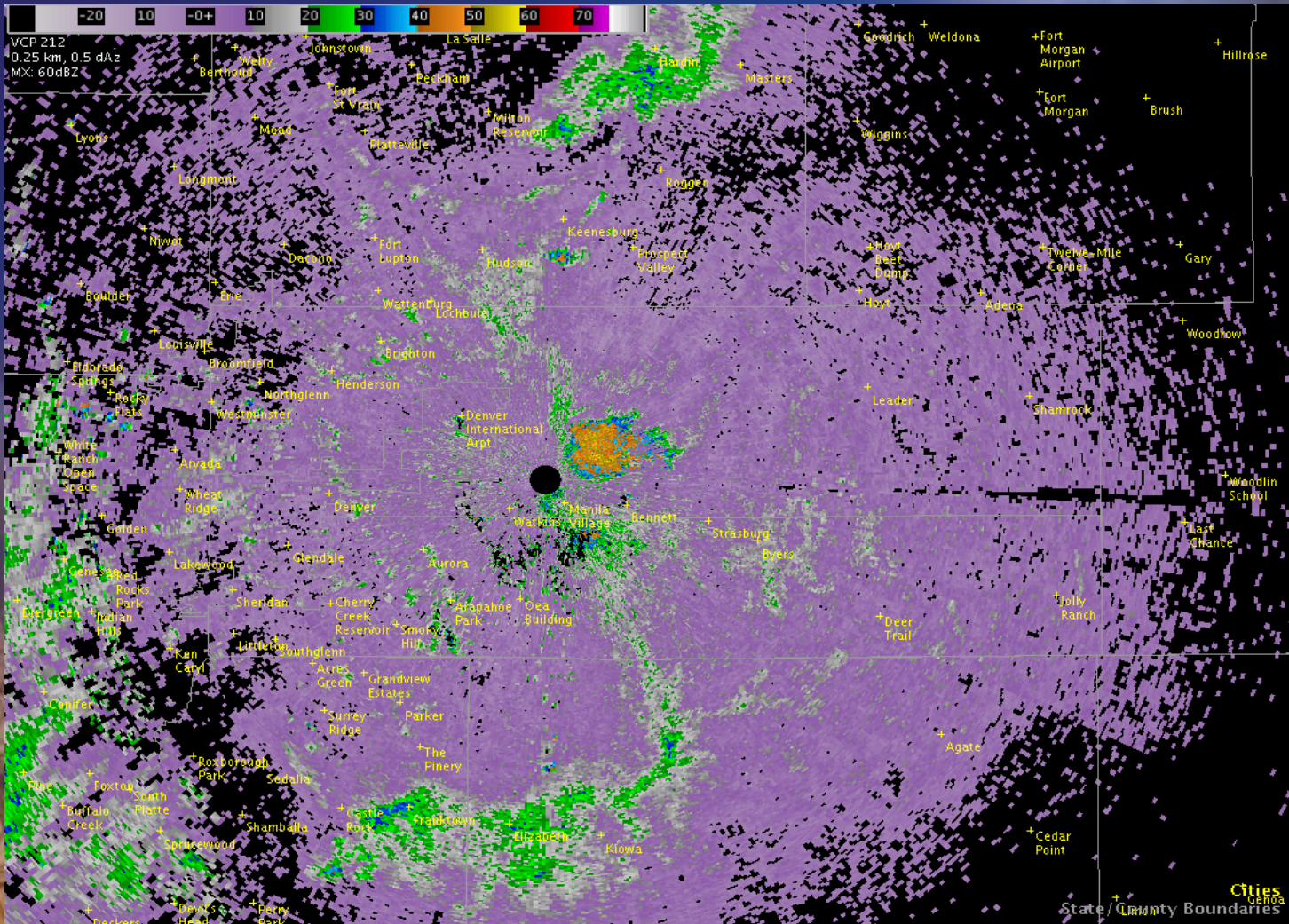
Dissipation

Adapted from Fujita, 1985





# Microburst: Radar Imagery





# Inflow/outflow and downdrafts

*Outflow or Inflow?*



# Is it really a tornado?

- Rotating column of air which extends from the convective cloud to the ground
- Mostly found in the updraft beneath the rain free cloud base.
- **Funnel cloud** does not extend to the ground so it is **NOT A TORNADO**
- **Gustnado** is a shallow rotation that does not extend to the cloud base so it is **NOT A TORNADO**



# Types of Tornadoes



"rope" tornado

Roger Hill, south of Ramah  
8/13/09



"cone" or "elephant trunk" tornadoes  
Verne Carlson 5/10/04, Elbert County





# Less common, harder to detect



The Wedge Tornado  
5/22/2008, Weld County  
Courtesy State Farm





# Funnel Clouds



2009 Aurora, Dave Radomski





# Funnel Cloud or Tornado?



Lake George (Park County) 6/6/14

© 2010 Raging Sky Media

Weather.gov

NOAA's National Weather Service



# Funnel Cloud, Tornado or?



© Verne Carlson





# Funnel Cloud, Tornado or?



Elbert Co., 6/15/2009. Photo by Kari Fleegel



# What is a gustnado?

- Small short-lived, low-level rotation along the storm's outflow winds.
- Can cause damage...but technically it is not a tornado because the circulation does **NOT** extend up to the base of the cloud.



# Scud Clouds





# Supercell Tornadoes



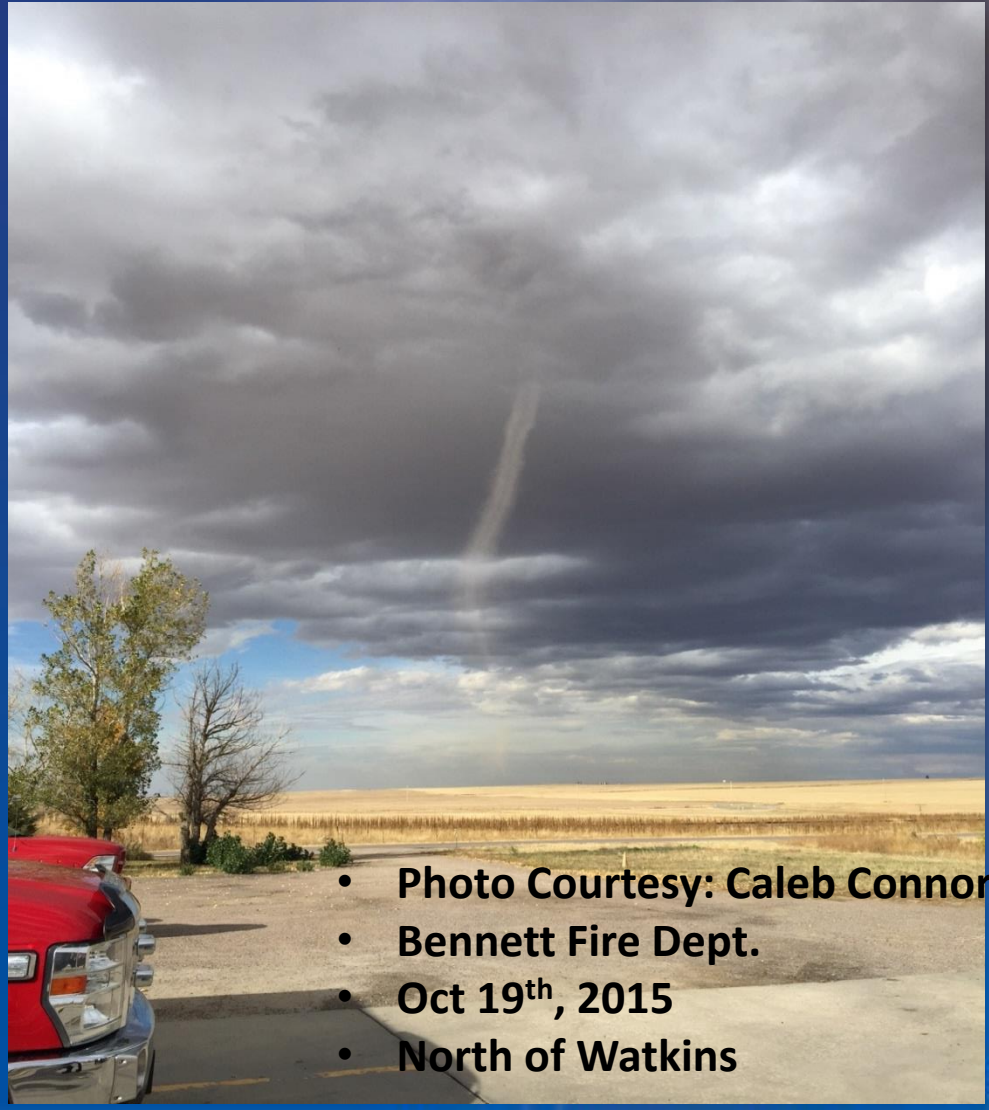


# Non-supercell storms can also produce Tornadoes



HORIZONS  
Wild  
IMAGING

© Mitch Farrell



- Photo Courtesy: Caleb Connor
- Bennett Fire Dept.
- Oct 19<sup>th</sup>, 2015
- North of Watkins





# These are both tornadoes

## *Supercell*

Stormscale rotation

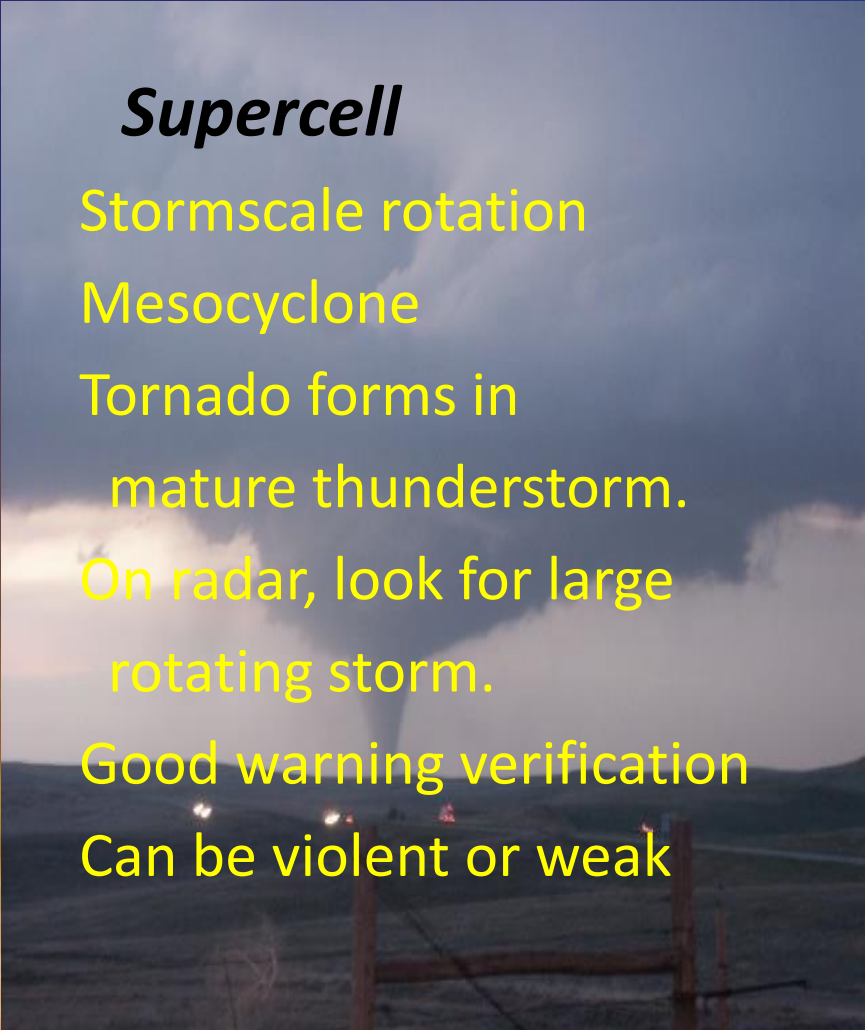
Mesocyclone

Tornado forms in  
mature thunderstorm.

On radar, look for large  
rotating storm.

Good warning verification

Can be violent or weak



## *Non supercell*

no storm rotation

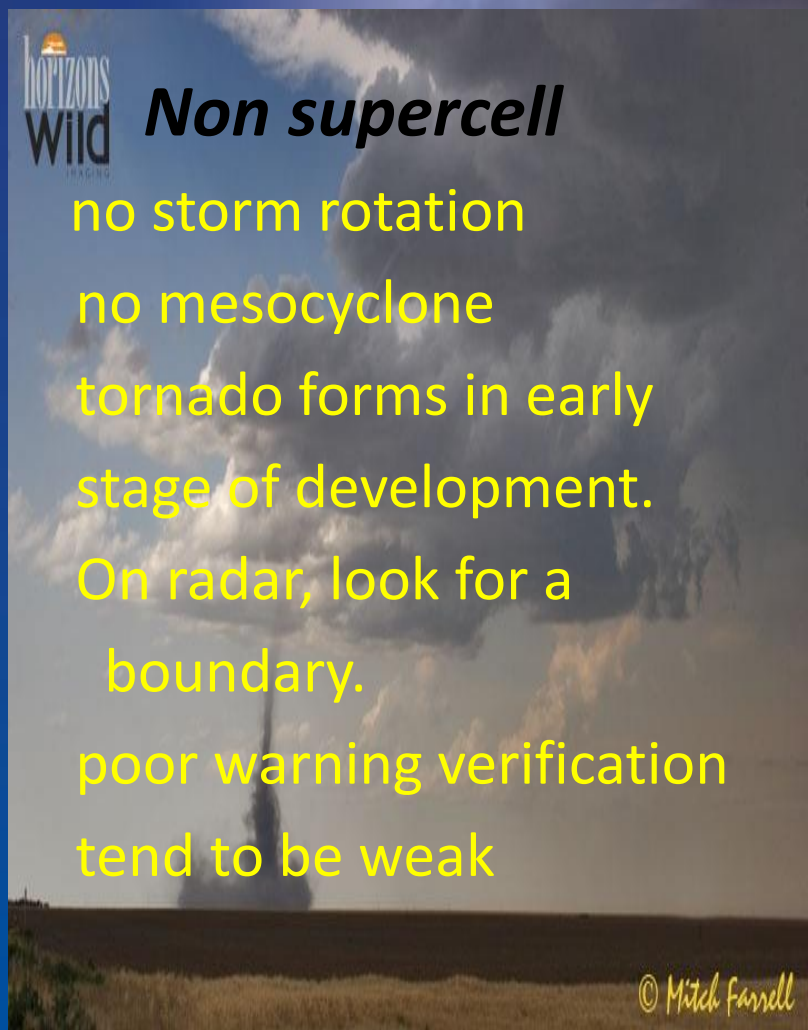
no mesocyclone

tornado forms in early  
stage of development.

On radar, look for a  
boundary.

poor warning verification

tend to be weak



© Mitch Farrell



# Enhanced Fujita Scale

<b>EF0</b> (Gale)	65-85 mph	3-second gusts
<b>EF1</b> (Weak)	86-110 mph	3-second gusts
<b>EF2</b> (Strong)	111-135 mph	3-second gusts
<b>EF3</b> (Severe)	136-165 mph	3-second gusts
<b>EF4</b> (Devastating)	166-200 mph	3-second gusts
<b>EF5</b> (Incredible)	over 200 mph	3-second gusts



# Denver Cyclone Terrain Effects

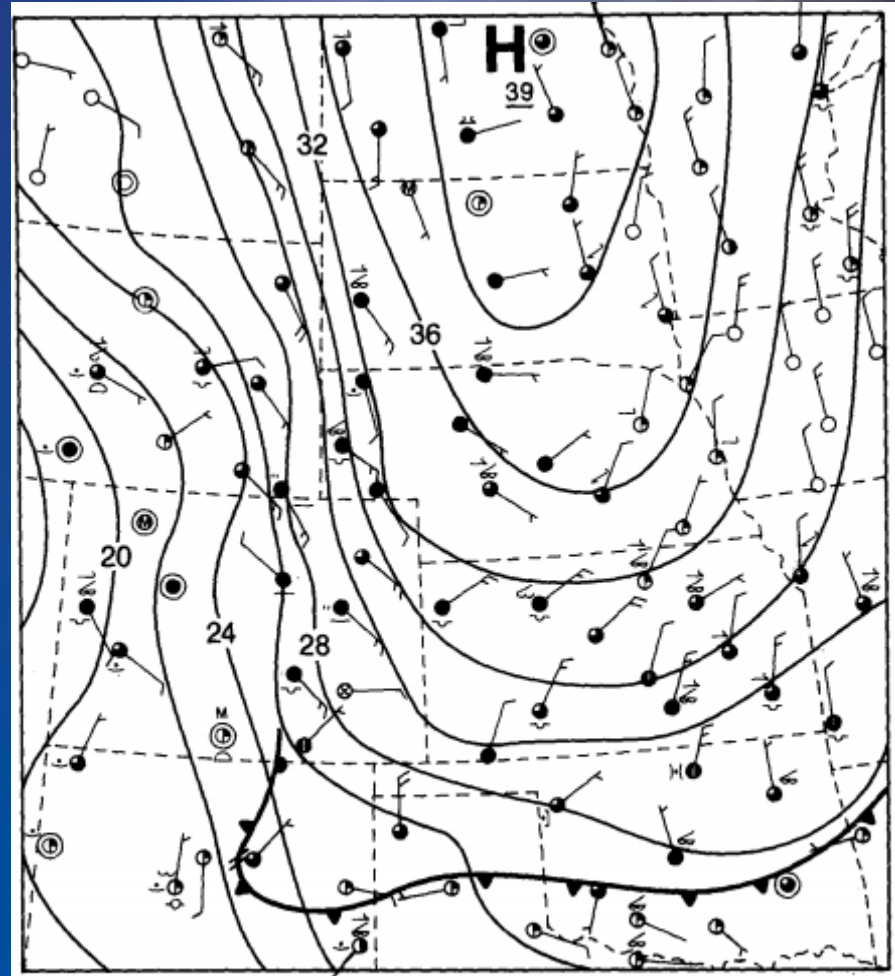
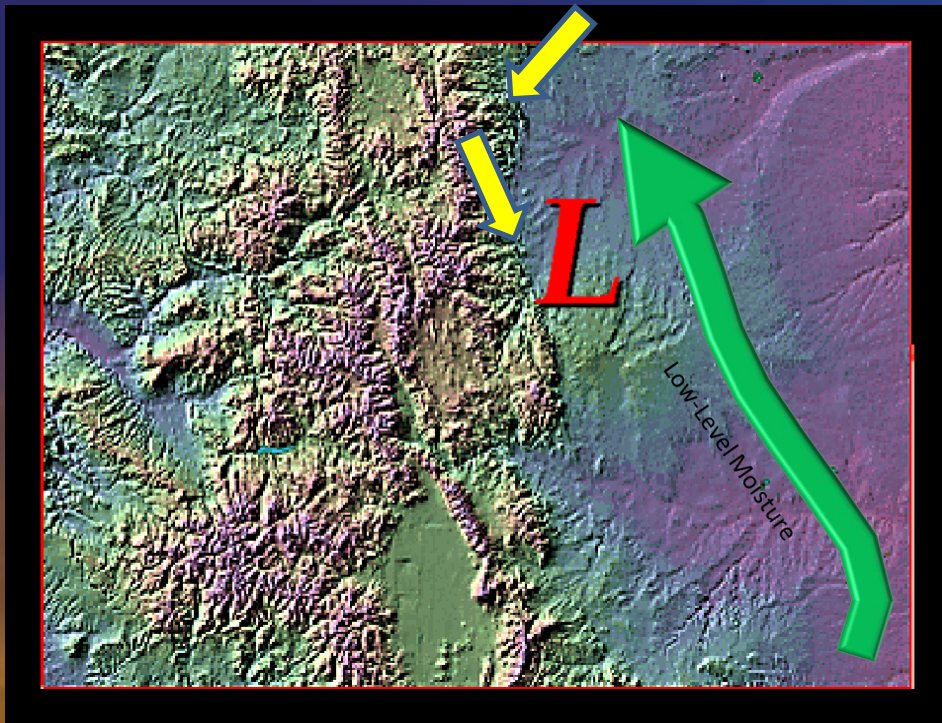
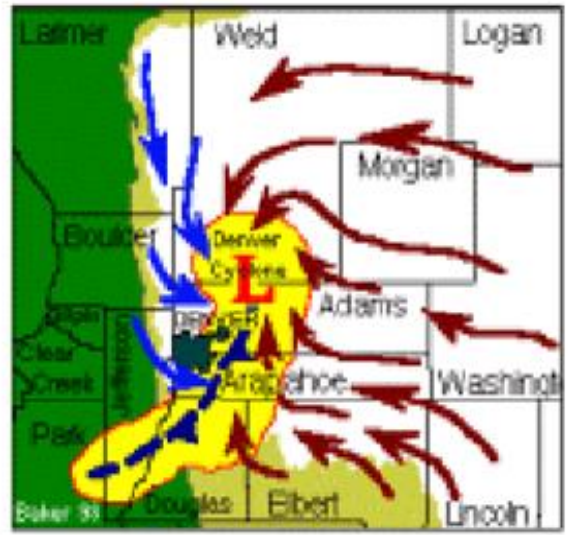


FIG. 2. Regional SAO plot for 1800 UTC on 4 October 1988. Included in the station model is cloud cover, cloud type, and wind (long barb =  $5 \text{ m s}^{-1}$ , short barb =  $2.5 \text{ m s}^{-1}$ ). Isobars, at 2-mb intervals (less 1000 mb), and surface fronts are analyzed.

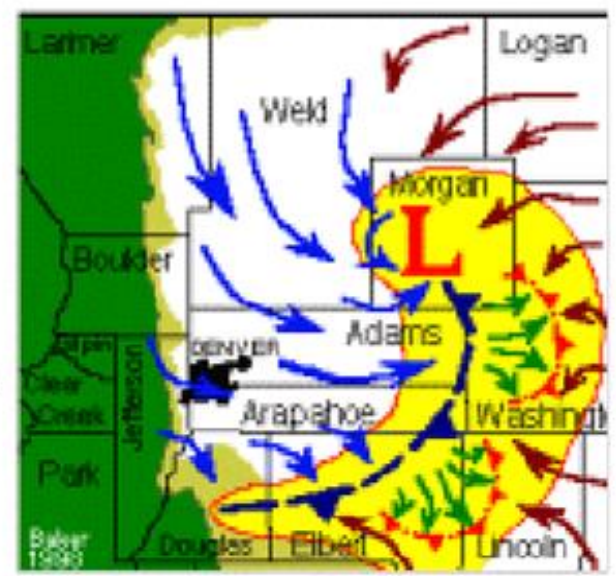
Dr. Edward Szoke  
Monthly Weather Review

# Denver Convergence Vorticity Zone (DCVZ)

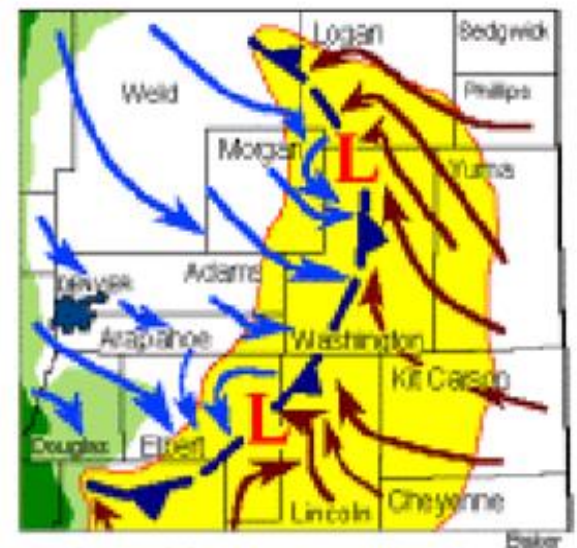
## The Eastward Progression of the Denver Cyclone and Its Trailing Wind Convergence Boundary



Late morning or early afternoon



Early to Mid-Afternoon



Late Afternoon or Evening



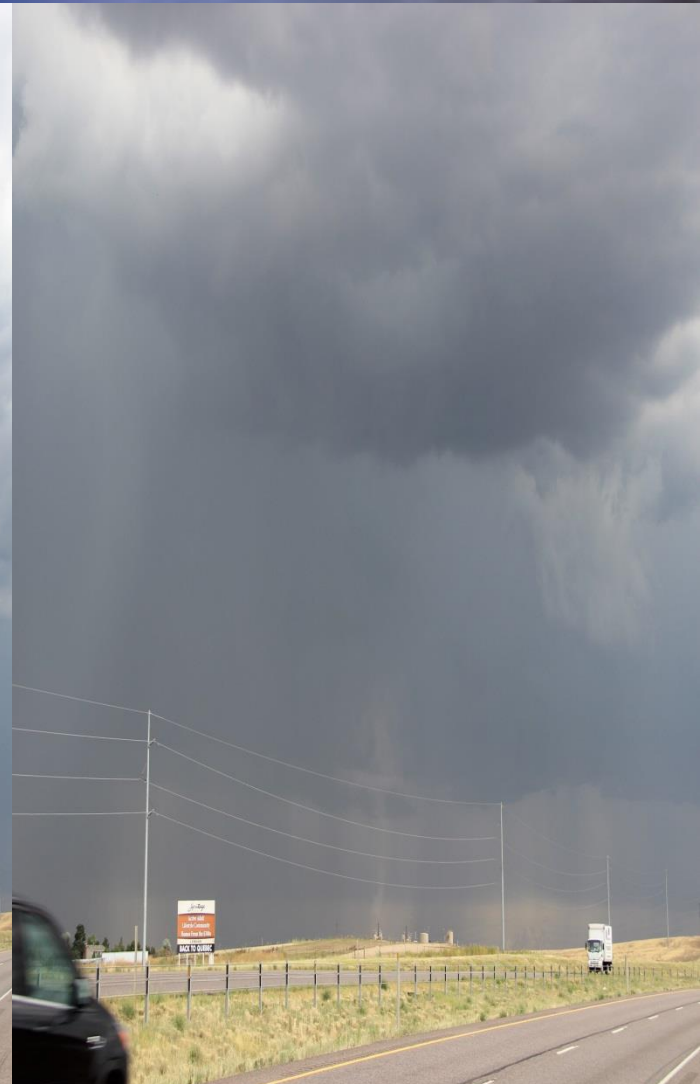
# Tornado? Aug 11, 2015

Photos: Ariel Cohen, SPC. Near DIA



First 2 left pics 414pm-417pm

Right pic: 419 pm





# Time for Tornado or Not?







# Watch and evaluate

- Start with small pieces of information...then build!
- Keep an eye on both the sky AND the ground.
- Rapid uplift at cloud base.
- Persistent and rotating wall cloud.
- Look for the “action area” at the surface:
- Rising or swirling dirt:
  - Moving toward or away from updraft?
- Note wind directions:
  - flags, smoke plumes, tractor dirt trails, throw grass.





# Stretch Break! Take 10





# Where do you get Warnings?

- Media
- NOAA Weather Radio
- WEA (wireless emergency alerts) to cell phones
- Area sirens
- Private vendors
- Reverse 911 capability from county or city
- Family or neighbors
- Social media (Facebook, Twitter)



# Where to Look...Local

- News Headlines
- Weather Story
- Hazard Map
- Point and Click
- Forecast Discussion
- Radar
- Rivers/Lakes
- Facebook
- Twitter

**NATIONAL WEATHER SERVICE**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HOME FORECAST **POINT AND CLICK WEATHER** SAFETY INFORMATION EDUCATION NEWS SEARCH ABOUT

Local forecast by "City, ST" or ZIP code  
Enter location ... Go

**News Headlines**  
• [2016 Spotter training schedule](#)

**NWS Forecast Office Boulder, CO**  
Denver/Boulder, CO  
Weather Forecast Office

Current Hazards Current Conditions Radar **Forecasts** **Rivers and Lakes** Climate and Past Weather Local Information

Click on the map below to zoom in

**Watches, Warnings & Advisories**  
Zoom In Zoom Out

- Winter Storm Warning
- Winter Weather Advisory
- Hazardous Weather Outlook

Last Map Update: Mon, Feb. 22, 2016 at 9:14:06 am MST

**Increasing Clouds Today - Cold & Snow Tonight & early Tues**  
Today  
Tonight

**Local Radar**

**Weather Map**

Follow us on Twitter Follow us on Facebook Follow us on YouTube BOU RSS Feed



# Weather on your mobile phone

**Weather-Ready Nation**  
National Oceanic and Atmospheric Administration

Weather Safety | Ambassadors | Education | News & Events | About

### Weather.gov on Your Mobile Phone

Take the weather with you on your mobile phone! Wherever you are, you can get the local weather forecast from the National Weather Service with one click on your home screen. Bookmark [mobile.weather.gov](http://mobile.weather.gov) to make sure that you have the latest weather news and information on the go.

How can you add mobile.weather.gov to your mobile phone's Home Screen?

It's easy! Learn how to add the mobile version of weather.gov to your iPhone or Android phone.

Follow these three steps for one-click access to your local forecast.

**If you have an iPhone...**

1. Visit [mobile.weather.gov](http://mobile.weather.gov) using Safari on your iPhone.
2. Click the Send button at the bottom of the screen.
3. Choose "Add to Home Screen" and tap "Add."

Click the screenshot below to enlarge the step-by-step instructions:



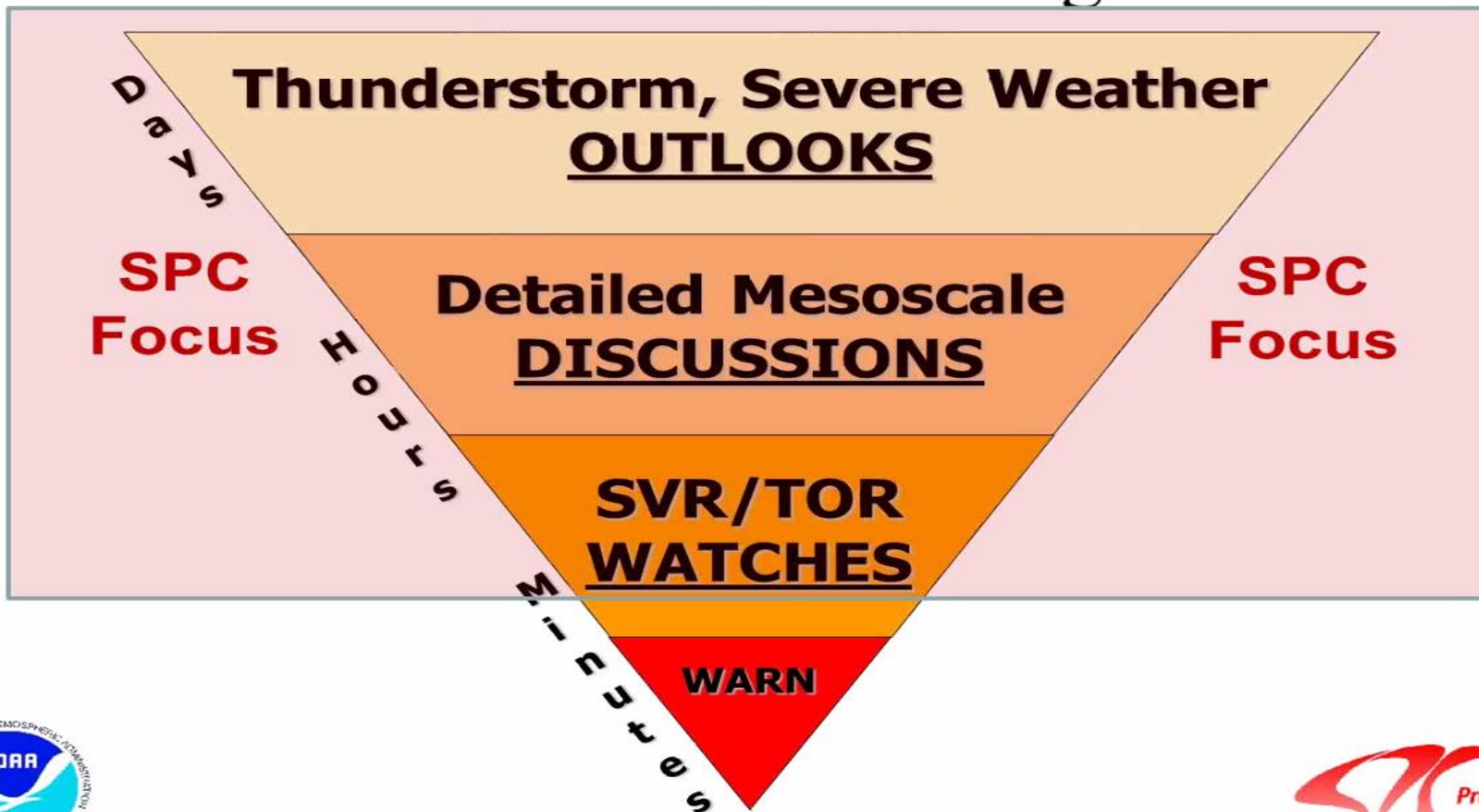
## Mobile.weather.gov

- Android
- Iphone



# Countdown to Convection

## Severe Thunderstorm and Tornado Watches and Warnings





# Storm Prediction Center (SPC)

## SPC.noaa.gov



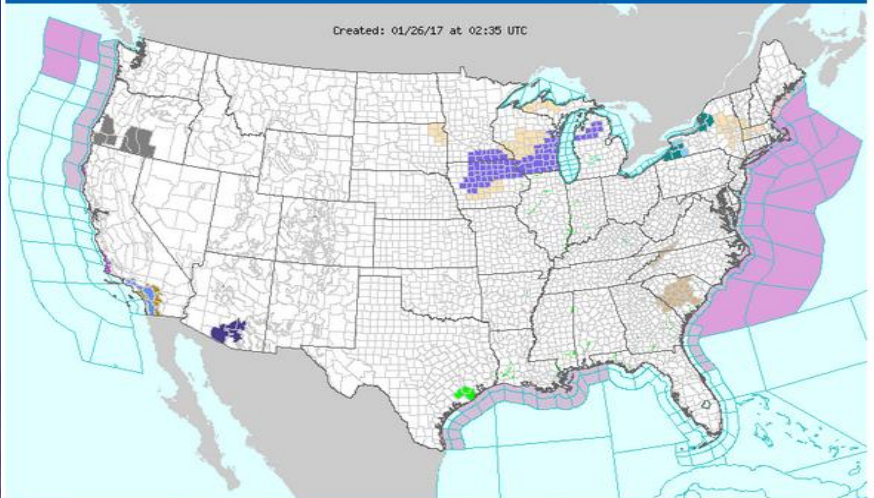
**Storm Prediction Center**  
NOAA / National Weather Service

HOME | NEWS | SPC PRODUCTS | WEATHER INFO | FORECAST TOOLS | RESEARCH | OUTREACH | NWS/NCEP

Search SPC...

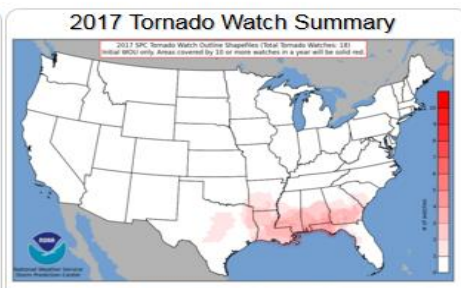
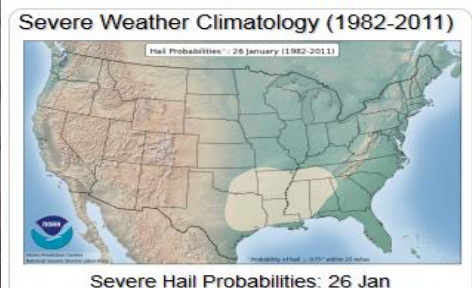
**Critical Fire Weather Conditions Today**  
...CRITICAL FIRE WEATHER AREA FOR PORTIONS OF SOUTHWEST TEXAS...EDWARDS PLATEAU...RIO GRANDE VALLEY...AND DEEP SOUTH  
» For additional details, see the latest [Day 1 Fire Weather Forecast](#).

Overview | Conv. Outlook | Watches | MDs | Storm Reports | Mesoanalysis | Fire | Hazards



**All Products** | Watches | MDs | Outlooks | Fire

- [Thunderstorm Outlook](#)  
- Issued: 01/26/2017 at 0102Z
- [Day 1 Convective Outlook](#)  
- Categorical Risk: **No Severe**  
- Issued: 01/26/2017 at 0057Z
- [Day 3-8 Fire Weather Outlook](#)  
- Categorical Risk: **No Areas**  
- Issued: 01/25/2017 at 2116Z
- [Day 2 Fire Weather Outlook](#)  
- Categorical Risk: **No Critical**  
- Issued: 01/25/2017 at 1746Z
- [Day 2 Convective Outlook](#)  
- Categorical Risk: **No Thunder**  
- Issued: 01/25/2017 at 1654Z
- [Day 1 Fire Weather Outlook](#)  
- Categorical Risk: **Critical**



**Did You Know?**

**Categorías de Riesgo de Tormentas Severas**

1 - BAJALTO (BMT)	2 - LEVE (LEVE)	3 - ELEVADO (ELEV)	4 - MODERADO (MOD)	5 - ALTO (ALTO)
Tormentas (en categorías) de severas a severas.	Tormentas severas a severas.	Tormentas severas a severas.	Tormentas severas a severas.	Tormentas severas a severas.
Se espera que las tormentas sean severas o más severas.	Se espera que las tormentas sean severas o más severas.	Se espera que las tormentas sean severas o más severas.	Se espera que las tormentas sean severas o más severas.	Se espera que las tormentas sean severas o más severas.

National Weather Service  
La tormenta factor de riesgo.

Weather.

ner Service



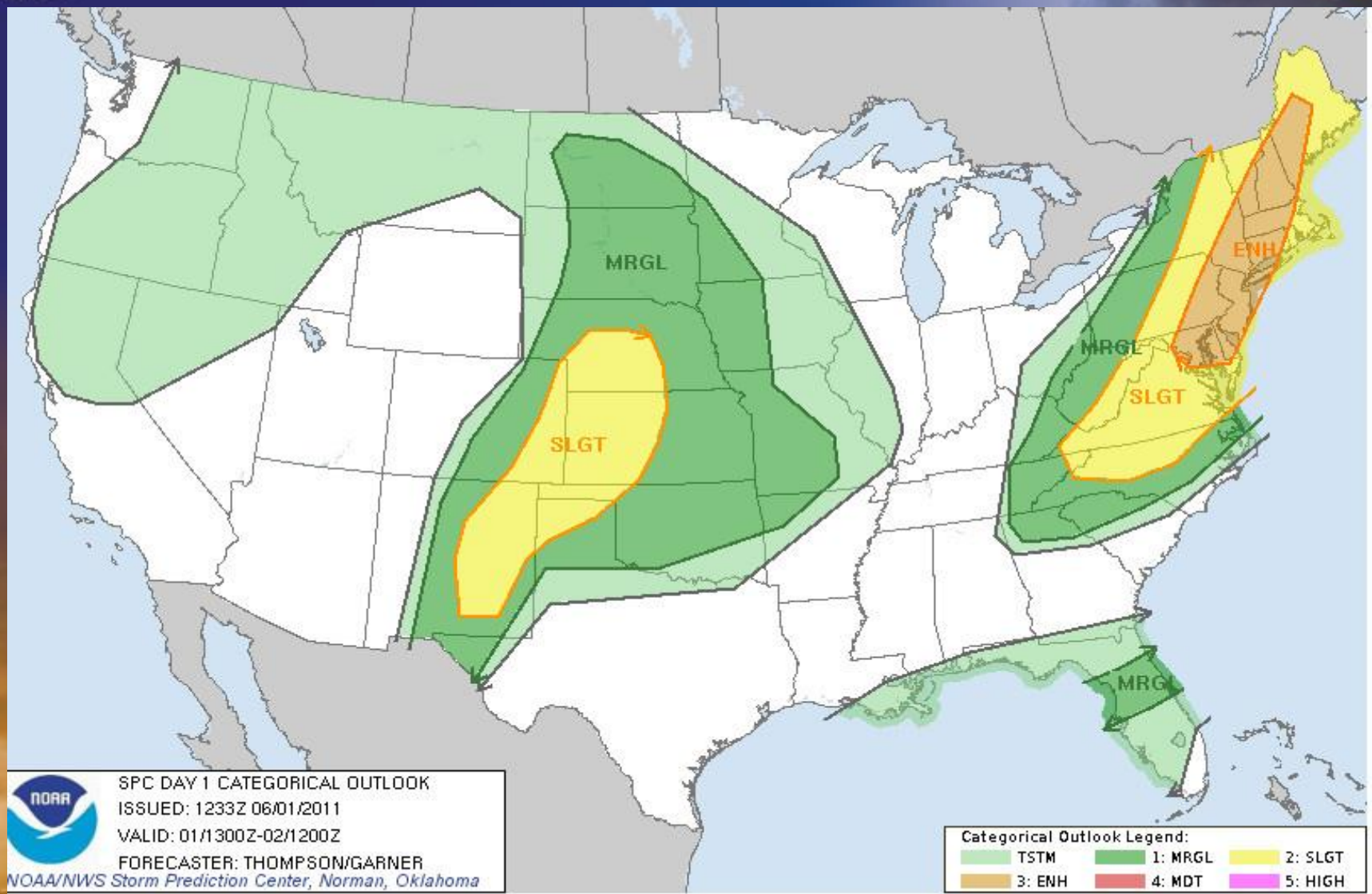
# SPC'S Thunderstorm Categories

<b>THUNDERSTORMS</b> (no label)	<b>1 - MARGINAL</b> (MRGL)	<b>2 - SLIGHT</b> (SLGT)	<b>3 - ENHANCED</b> (ENH)	<b>4 - MODERATE</b> (MDT)	<b>5 - HIGH</b> (HIGH)
<p><b>No severe* thunderstorms expected</b></p> <p>Lightning/flooding threats exist with <u>all</u> thunderstorms</p>	<p><b>Isolated severe thunderstorms possible</b></p> <p>Limited in duration and/or coverage and/or intensity</p>	<p><b>Scattered severe storms possible</b></p> <p>Short-lived and/or not widespread, isolated intense storms possible</p>	<p><b>Numerous severe storms possible</b></p> <p>More persistent and/or widespread, a few intense</p>	<p><b>Widespread severe storms likely</b></p> <p>Long-lived, widespread and intense</p>	<p><b>Widespread severe storms expected</b></p> <p>Long-lived, very widespread and particularly intense</p>
 <ul style="list-style-type: none"> <li>• Winds to 40 mph</li> <li>• Small hail</li> </ul>	 <ul style="list-style-type: none"> <li>• Winds 40-60 mph</li> <li>• Hail up to 1"</li> <li>• Low tornado risk</li> </ul>	 <ul style="list-style-type: none"> <li>• One or two tornadoes</li> <li>• Reports of strong winds/wind damage</li> <li>• Hail ~1", isolated 2"</li> </ul>	 <ul style="list-style-type: none"> <li>• A few tornadoes</li> <li>• Several reports of wind damage</li> <li>• Damaging hail, 1 - 2"</li> </ul>	 <ul style="list-style-type: none"> <li>• Strong tornadoes</li> <li>• Widespread wind damage</li> <li>• Destructive hail, 2" +</li> </ul>	 <ul style="list-style-type: none"> <li>• Tornado outbreak</li> <li>• Derecho</li> </ul>

\* NWS defines a severe thunderstorm as measured wind gusts to at least 58 mph, and/or hail to at least one inch in diameter, and/or a tornado. All thunderstorm categories imply lightning and the potential for flooding. Categories are also tied to the probability of a severe weather event within 25 miles of your location.



# Countdown to Convection







# Countdown to Convection

**A Slight Chance of Severe Thunderstorms over the Northeast Plains**

**Today**

- Hail up to one inch in diameter. Wind gusts up to 60 mph with storms on the far NE Plains
- Warmer on the plains. Highs upper 80s.

**Weekend Outlook**

- Cooler with a better chance of storms on Sunday.

National Weather Service – Denver/Boulder, Colorado

weather.gov/Denver | National Weather Service Denver /Boulder | @NWSBoulder | Updated: 6/20/2014 6:05 AM

THIS HAZARDOUS WEATHER OUTLOOK IS FOR NORTHEAST AND NORTH CENTRAL COLORADO.

.DAY ONE...TODAY AND TONIGHT

SCATTERED THUNDERSTORMS WILL DEVELOP AGAIN THIS AFTERNOON AND CONTINUE INTO THE EVENING HOURS. THE BEST MOISTURE AND INSTABILITY WILL BE EAST OF A LINE FROM NEAR GREELEY TO DIA WHERE SEVERE STORMS WILL BE POSSIBLE WITH GOLF BALL SIZE HAIL AND DAMAGING WINDS THE PRIMARY THREAT WITH A TORNADO ALSO POSSIBLE WITH STORMS THAT COULD BECOME MORE ORGANIZED AS THEY MOVE EAST. FARTHER WEST...BRIEF HEAVY RAIN...SMALL HAIL AND WIND GUSTS TO 50 MPH WILL BE POSSIBLE FROM THE THUNDERSTORMS. IN ADDITION...A WEAK DENVER CYCLONE HAS ALREADY FORMED AND THIS SHOULD STRENGTHEN INTO THE EARLY AFTERNOON WITH THE STRONGEST CONVERGENCE RUNNING SOUTH TO NORTH NEAR DIA. ALONG THIS BOUNDARY STORMS COULD BECOME LOCALLY MORE INTENSE WITH A NON SUPERCELL TORNADO POSSIBLE. STORMS WILL DEVELOP IN THE FOOTHILLS BY LATE MORNING AND THEN ON THE PLAINS DURING THE AFTERNOON.

.DAYS TWO THROUGH SEVEN...WEDNESDAY THROUGH MONDAY

DRY CONDITIONS WILL PREVAIL ACROSS THE OUTLOOK AREA THROUGH THE PERIOD WITH TEMPERATURES ABOVE SEASONAL NORMALS. THE DRY AND WARM CONDITIONS WILL HELP INCREASE THE FIRE DANGER.

.SPOTTER INFORMATION STATEMENT...

SPOTTER ACTIVATION MAY BE NEEDED OVER THE NORTHEAST PLAINS AFTER 2 PM.

## Weather Story

- Hazardous Weather Outlook (text product)

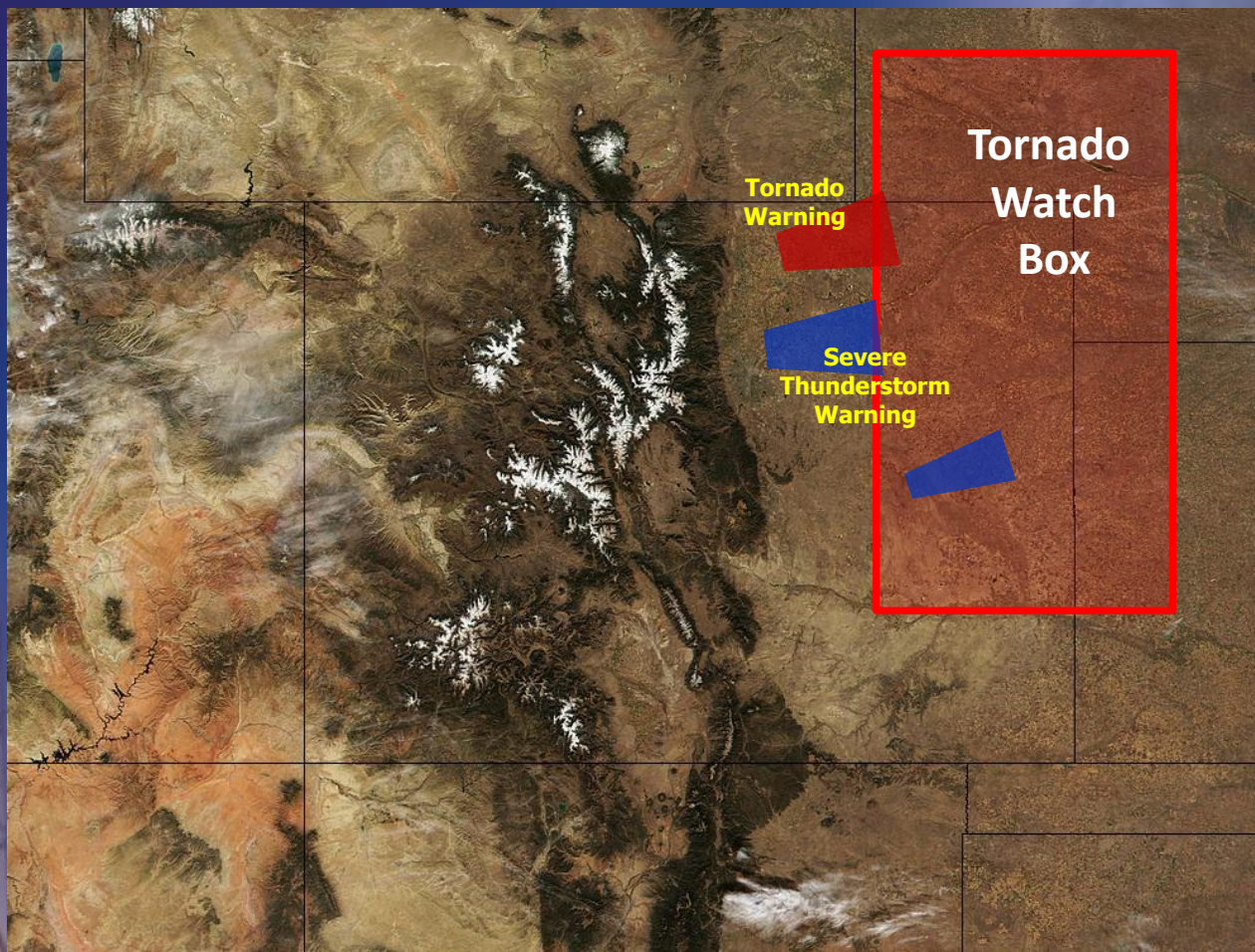


# On the day of storms

- **Watch** – Tornado, Severe thunderstorm
  - » (Issued by Storm Prediction Center)
  - Flood (Issued by forecast offices)
    - Issued for dozens of counties for 4-6 hours
    - In the watch area, the risk of severe weather is higher
- **Warning** – flash flood, tornado, severe thunderstorm.
  - Comes to you from the local National Weather Service Office
  - Severe weather is occurring or imminent.
  - Issued for one or two counties for an hour or less (longer for flooding)

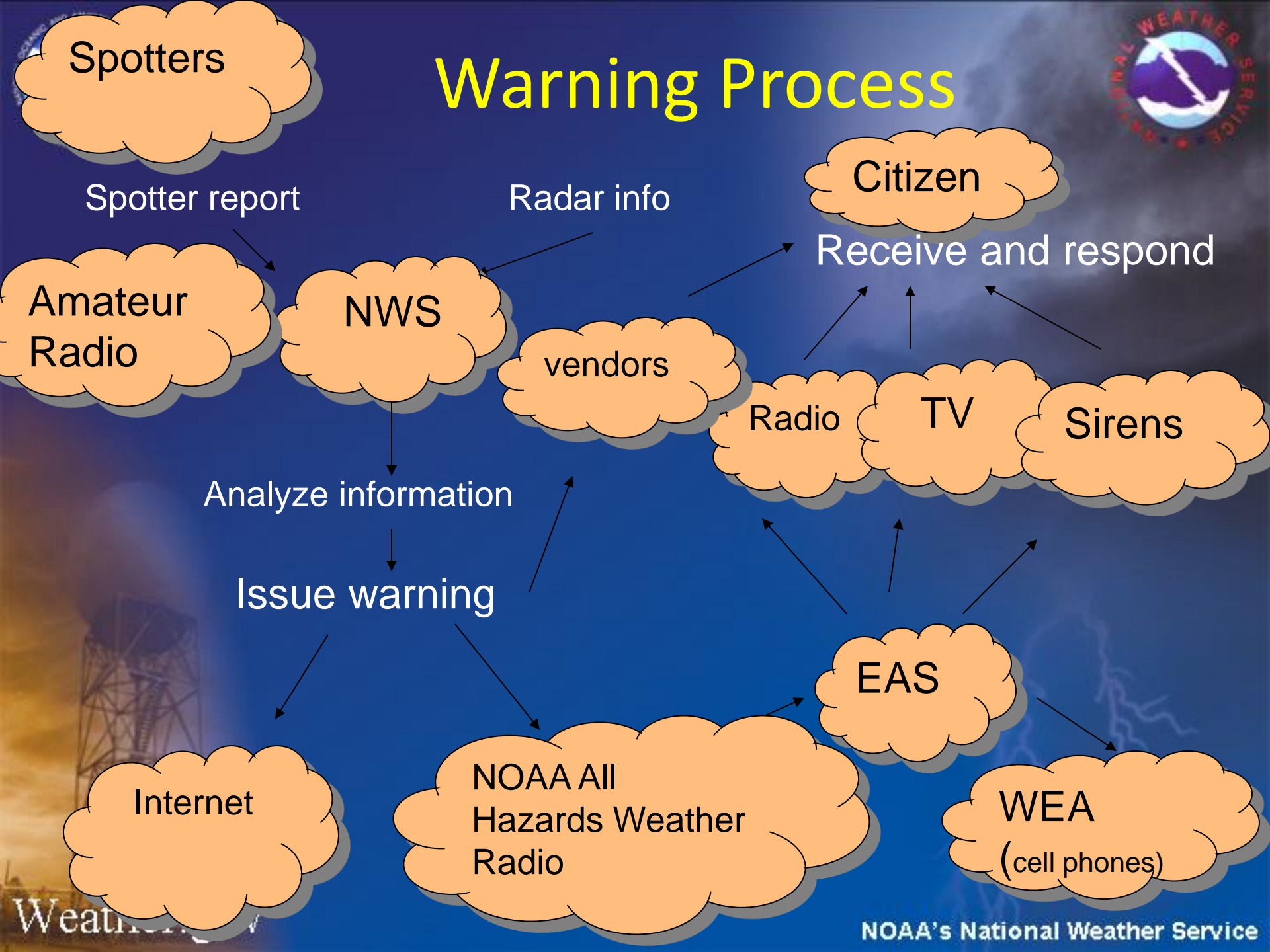


# NWS Watches/Warnings Size





# Warning Process





# Types of warnings

- Tornado
- Severe Thunderstorm
  - (58 mph wind, large hail)
- Flash Flood



Largest Hail Stone: 8" diameter: Vivian, SD: 7/23/2010



# Warning Example

- BULLETIN - IMMEDIATE BROADCAST REQUESTED
- SEVERE THUNDERSTORM WARNING
- NATIONAL WEATHER SERVICE DENVER CO
- 428 PM MDT THU JUN 4 2015
  
- THE NATIONAL WEATHER SERVICE IN DENVER HAS ISSUED A
  
- \* SEVERE THUNDERSTORM WARNING FOR...
- WESTERN ADAMS COUNTY IN NORTHEASTERN COLORADO...
- CENTRAL DENVER COUNTY IN NORTHEASTERN COLORADO...
  
- \* UNTIL 515 PM MDT
  
- \* AT 426 PM MDT...A SEVERE THUNDERSTORM WAS LOCATED NEAR COMMERCE CITY...OR 8 MILES NORTHEAST OF DENVER...MOVING NORTH AT 20 MPH.
  
- **HAZARD...** HALF DOLLAR SIZE HAIL.
  
- **SOURCE...** RADAR INDICATED. AT 425 PM...DIME TO NICKEL-SIZED HAIL WAS BEING REPORTED OVER THE NORTHEAST PARTS OF DENVER.
  
- **IMPACT...** DAMAGE TO VEHICLES IS EXPECTED.
  
- \* LOCATIONS IMPACTED INCLUDE...
- DENVER...NORTHERN AURORA...THORNTON...COMMERCE CITY...NORTHEASTERN NORTHGLENN...BRIGHTON...DENVER INTERNATIONAL AIRPORT...D.I.A.
- TERMINAL AND CONCOURSES AND BARR LAKE.



# One inch hail for Warnings

Severe Thunderstorm **Warning**  
one inch or greater

Special Weather  
Statements  
(SPS)





# Making your weather report

- 2 Ways!

1. **Dedicated Toll Free number:** 1-800-287-2498 (Reserved for severe reports only!) or local 303-494-2884

1. For general, non severe questions call us at 303-494-4221

2. **Internet web page** at [www.weather.gov/bou](http://www.weather.gov/bou)







# How to submit a report

**NATIONAL WEATHER SERVICE**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HOME FORECAST PAST WEATHER WEATHER SAFETY INFORMATION CENTER NEWS SEARCH ABOUT

Local forecast by "City, ST" or ZIP code  
 Enter location ...   
[Location Help](#)

**News Headlines**

- New 2015 Spotter training schedule
- NWS Flood and Wildfire Awareness 2015

**Home**  
[Weather.gov](#) > Denver/Boulder, CO

**Denver/Boulder, CO**  
 Weather Forecast Office

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

Customize Your Weather.gov  
 City, ST  
 Enter Your City, ST or ZIP Code  
 Remember Me  
  
[Privacy Policy](#)

Submit a Storm Report

Storm and Precipitation Reports

Watches, Warnings & Advisories  
 Fire Weather Watch  
 Hazardous Weather Outlook

Zoom Out

in the map below to zoom in.

Last Map Update: Sun, Mar. 22, 2015 at 3:49:09 pm MDT

**Denver/Boulder**  
 Northeast Colorado  
**Light Snow Mountains**

Today	Mon	Tue	Wed	Thu
69°/44°	72°/44°	63°/38°	58°/35°	58°/35°
Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy

5 Day Outlook - Denver, CO

Today	Mon	Tue	Wed	Thu
51°/33°	52°/34°	40°/25°	41°/25°	41°/25°
Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy

5 Day Outlook - Winter Park, CO

Weather Story

**Local Radar**

**Weather Map**



# Submit a Storm Report

## to the National Weather Service Denver/Boulder, Colorado

Local detailed forecast by "City, St" or ZIP code

This interface is intended to be used solely for the relay of storm information to the NWS. Other comments or information should be sent to the National Weather Service Denver/Boulder, Colorado.

### 1. Event Location

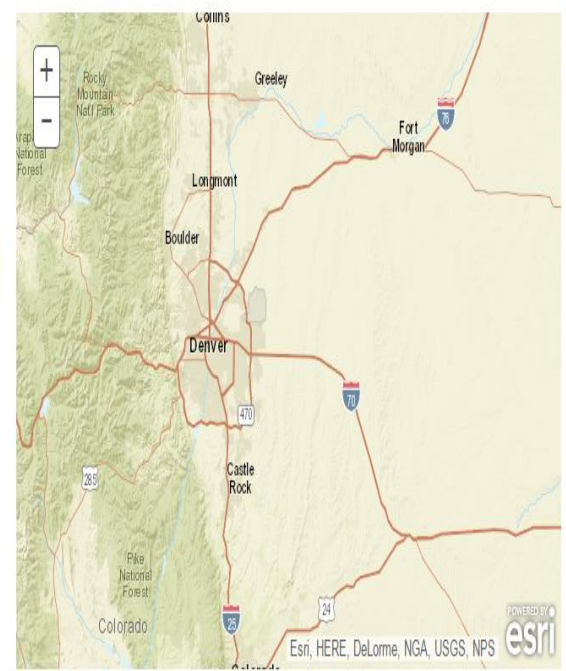
Enter date/time/location of event. Please reference to major roadway or intersection for events within towns/cities.

Date: Oct ▾ 23 ▾ 2016 ▾

Time: 09 ▾ 30 ▾ PM ▾ Mountain

Place: --Select a County-- ▾ Location (ex: 7 NW Mytown)

Unable to perform automatic geolocation.  
Error Message: [geolocation permission denied]



Click on the map to set your location for the report.

### 2. Event Type (Select all that apply)

- Dense Fog
- Flood
- Hail
- High Wind Speed
- Tornado/Funnel Cloud
- Wind Damage
- Snow
- Freezing Rain/Icing
- Heavy Rain

### 3. Additional Details

Provide any additional information that you feel is pertinent to your submission (500 ch

You may also pass along additional information by e-mailing them to the National Weat Denver/Boulder, Colorado separately. (WFO BOU)

### 4. Contact Information

**VOLUNTARY** and **WILL NOT** be distributed.

Your Name:

Spotter Id (if assigned):

E-mail address:

Phone number:

Observer Profile:

**NOTE:** If you have any questions about reporting weather and/or using this reporting form, please contact the [BOU Webmaster](#).



# Local Skywarn Page

[www.weather.gov/bou/skywarn](http://www.weather.gov/bou/skywarn)

## Severe Weather

- Tornadoes, funnel and wall clouds
- Hail size of half inch diameter or larger
- Winds sustained at 50 mph or higher and any gusts 58 mph or greater
- Heavy Rainfall and/or flooding
  - 1.0" rain/hr or greater for urban areas.
  - 1.5" rain/hr or greater for rural areas.
  - Also Call 911 for flooding
- Moderate to Heavy Snowfall, total snow depth, freezing rain/drizzle
- Significant damage
- River/creek flooding or flash flooding



# Reporting

- Who? Spotter #
- Where? Current location
  - Or looking elsewhere (distance away? Direction?)
  - Specify if not at your location designation
- What? Type of weather phenomena
  - Tornado, hail, wind, damage?
  - Be specific
- When? Current time
  - If event is in the past, be sure to note time, and if it is a past event when reporting



# Reporting Hail

- Average depth and size of hail (also report largest hailstone)
  - Measure with ruler
  - Compare to coin or ball.
- If 4.5" or larger it could be a record hailstone for Colorado...preserve it and report! Preserve stone in zip lock bag and freeze.



Hail Pictures Courtesy of Dan Mullin, W931





# Hail Sizes: What about marbles?

**NO marbles  
please!!**





You're odds of a hole in one just Improved on this course!!



Photo shot from Lincoln, Nebraska



Atmospheric and Oceanic Sciences  
UNIVERSITY OF COLORADO BOULDER



## NWS & University of Colorado - Joint study

Thunderstorms that produce large amounts of  
hail or...

“Plowable Hail”



Burdett, CO.

Photo Courtesy: Robert Frick







# Other Reporting Issues

- Tendency to under-estimate distance
- Tendency to over-estimate wind speed
- Rainfall Rates: home weather stations
  - Be careful with automated rainfall rates
  - Example: report of rainfall rate of 1.20"rain/1 hour
  - But actual recorded amount was only .10 of an inch which occurred in 5 minute rainfall
- Overuse of “wall clouds”, especially Front Range/Urban corridor.



# Estimating Wind Speeds

**Beaufort Wind Chart – Estimating Winds Speeds**

Beaufort Number	MPH		Terminology	Description
	Range	Average		
0	0	0	Calm	Calm. Smoke rises vertically.
1	1-3	2	Light air	Wind motion visible in smoke.
2	4-7	6	Light breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	11	Gentle breeze	Leaves and smaller twigs in constant motion.
4	13-18	15	Moderate breeze	Dust and loose paper is raised. Small branches begin to move.
5	19-24	22	Fresh breeze	Smaller trees sway.
6	25-31	27	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult.
7	32-38	35	Near gale	Whole trees in motion. Some difficulty when walking into the wind.
8	39-46	42	Gale	Twigs broken from trees. Cars veer on road.
9	47-54	50	Severe gale	<b>Light structure damage.</b>
10	55-63	60	Storm	<b>Trees uprooted. Considerable structural damage.</b>
11	64-73	70	Violent storm	<b>Widespread structural damage.</b>
12	74-95	90	Hurricane	<b>Considerable and widespread damage to structures.</b>



# Local Storm Report (LSR)

## Local Storm Report

Issued by NWS Denver/Boulder, CO

[Home](#) | [Current Version](#) | [Previous Version](#) | [Text Only](#) | [Print](#) | [Product List](#) | [Glossary On](#)  
Versions: [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [11](#) [12](#)

000  
NWUS55 KBOU 172314  
LSRBOU

PRELIMINARY LOCAL STORM REPORT...CORRECTED  
NATIONAL WEATHER SERVICE DENVER CO  
514 PM MDT MON OCT 17 2016

..TIME...	...EVENT...	...CITY LOCATION...	...LAT.LON...
..DATE...	...MAG....	..COUNTY LOCATION..ST..	...SOURCE....
	..REMARKS..		
0500 PM 10/17/2016	NON-TSTM WND GST M62.00 MPH	FORT MORGAN MORGAN	CO 40.27N 103.79W ASOS
0238 PM 10/17/2016	NON-TSTM WND GST M66.00 MPH	GREELEY WELD	CO 40.42N 104.74W AWOS
0158 PM 10/17/2016	NON-TSTM WND GST M72.00 MPH	BERTHOUD PASS CLEAR CREEK	CO 39.80N 105.78W ASOS
0130 PM 10/17/2016	NON-TSTM WND DMG WELD	N GREELEY WELD	CO 40.42N 104.74W LAW ENFORCEMENT
	POWER LINES DOWN DUE TO STRONG WINDS		
0115 PM 10/17/2016	NON-TSTM WND GST M62.00 MPH	6 ENE GREELEY WELD	CO 40.45N 104.64W AWOS
1245 PM 10/17/2016	NON-TSTM WND GST M65.00 MPH	8 W GREELEY WELD	CO 40.42N 104.90W TRAINED SPOTTER
1000 AM 10/17/2016	NON-TSTM WND GST M78.00 MPH	BERTHOUD PASS CLEAR CREEK	CO 39.80N 105.78W MESONET
0600 AM 10/17/2016	NON-TSTM WND GST M80.00 MPH	9 E DILLON SUMMIT	CO 39.62N 105.87W MESONET
0600 AM 10/17/2016	NON-TSTM WND GST M73.00 MPH	BERTHOUD PASS GRAND	CO 39.80N 105.78W MESONET

&&



# Social Media: Monitoring...

- <https://twitter.com/NWSBoulder>
- <https://www.facebook.com/NWSBoulder>
- <http://www.spotternetwork.org/>
- <http://severestudios.com/>

Home Moments Notifications Messages

Search Twitter

NWS Boulder  
@NWSBoulder  
Official Twitter account for the National Weather Service Denver/Boulder forecast office. Details: weather.gov/twitter  
Boulder Colorado  
weather.gov/bou  
Joined June 2012

4,996 Photos and videos

Tweets Tweets & replies Media

You Retweeted

NWS @NWS Oct 24  
Learn the difference between a Flood Warning and Watch  
floodsafety.noaa.gov/watch\_warning... #FloodSafety

**Flood Warning means Take Action**  
**Flooding is Expected**

- ✓ Move to higher ground immediately
- ✓ Use extra caution if driving
- ✓ Check forecast updates
- ✓ Stay weather ready

Weather-Ready Nation National Weather Service  
weather.gov/flood

Your Tweet activity  
Your Tweets earned 29,890 impressions over the last 24 hours

Who to follow

- Dr. Rick Knabb @NHCC
- NWS Southern Region
- TWC Breaking @TWC

Denver Trends Change

#REWANA  
The Game Lives Everywhere. Mountain Dew is back for this NBA Season.  
Promoted by Mountain Dew

NWS Boulder @NWSBoulder 11h  
Chance of mountain rain/showers

US National Weather Service Denver/Boulder Colorado

US National Weather Service Denver/Boulder Colorado  
@NWSBoulder

Home

About Photos Reviews Likes Videos Posts Manage Tabs

Create a Page

Status Photo / Video

Write something on this Page...

US National Weather Service Denver/Boulder Colorado  
11 hrs

Chance of rain and show showers in the mountains today. Showers over the foothills, I-25 corridor, and Palmer Divide this morning/afternoon. A weak frontal passage on Wednesday will lead to a much cooler day. Warmer temperatures Wednesday through Friday. #COWX

Denver/Boulder Rain & Snow in the Mountains

Maximum Temperature Forecast - October 21, 2018

Today  
Isolated/scattered rain & snow showers in the mountains  
Isolated showers over foothills, I-25, & Palmer Divide

Outlook  
Wednesday - Friday: Dry, with warming

Government Organization in Boulder, Colorado  
4.8 ★★★★★ Always Open

Search for posts on this Page

32,812 people like this

15 people have been here

Always Open  
Get additional info

Invite friends to like this Page

4.8 ★★★★★ 37 reviews  
View Reviews

ABOUT

TERURBAN PARK



# Monitoring the Tweet Deck

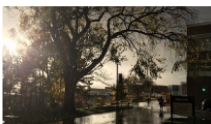
## #COWX, @NWSBOU Send Pics/videos

TweetDeck needs permission to show your desktop notifications in this browser [Let's go!](#)

**#COWx @NWSBoulder**


Filtered by:

**Joanna Bean** @jolbean 4m  
A delicious rain this afternoon. @UCCS. #cowx

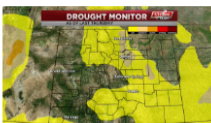


**Chris Spears** @ChrisCBS4 6m  
This is SOOOOO nice to see!! Even if just a little bit. #COWx #4wx

**NWS Pueblo** @NWSPueblo  
A pretty good shower just moved through I-25 and Garden of the Gods. CDOT image about 5:15 PM MDT. #cowx



**Greg Rule** @WXRules 14m  
Abnormally dry - moderate #drought for portions of Colorado #cowx




**Greg Rule** @WXRules 16m  
Impressive rain on the

**@ Mentions @NWSBoulder**

**April Parker** @GoGokuGirl 2h  
@ewillkg @JimCantore @ChrisCBS4 @NWSBoulder @TWCAlexWilson Omg Thats Cool

**D.W. FINTON** @dw5555 4h  
Retweeted NWS Boulder (@NWSBoulder):  
Jet stream plays a big role in our weather. During weak La Ninas the Polar... fb.me/W4PRCZUp

**John Orr** @CoyoteGulch 8h  
@NWSBoulder: Jet stream plays a big role in our weather. During weak La Ninas the Polar jet... coyotegulch.wordpress.com/2016/10/25/nws...




**William King** @ewillkg 18h  
@NWSBoulder if all of these weather features produce little, if any, snowfall, what jet-strem features cause BIG snow totals for FOCO? Den?

**William King** @ewillkg 19h  
@NWSBoulder Hoping 4 tapping of Gulf moisture poss. overriding & becoming involved in a strong

**Home @NWSBoulder**


**NWS Pueblo** @NWSPueblo now  
A rare sight these days - rain showers moving through the Pikes Peak Region. 30 minute loop ending about 5:30 PM. #cowx



**KRDO NewsChannel 13** @K... 2m  
Chipotles sales fall again as it tries to win back customers krdo.com/lifestyle/food...

**Chris Spears** @ChrisCBS4 6m  
This is SOOOOO nice to see!! Even if just a little bit. #COWx #4wx

**NWS Pueblo** @NWSPueblo  
A pretty good shower just moved through I-25 and Garden of the Gods. CDOT image about 5:15 PM MDT. #cowx



**Eibert County OEM** @Elbert... 11m  
Our Continuously Connected Lives - What's Your 'App'-itude? #CyberAware Internet of Things Tip Card ow.ly/eFep304TrV1

**Messages @NWS...**

**Danielle Grant** @theWXwo... Oct 15  
Thank you so much for catching that! I'll change that when I get in today. Have a great weekend!

**Kelly** @potterarchy Oct 4  
power to the peaceful!

**Amy D** @AmyD3315 Sep 15  
Great. Thank you! I agree with you. This is an incredibly beautiful place!

**Chris Spears** @ChrisCBS4 Aug 2  
No prob I deleted the tweet

**Kathy Sabine** @KathySabine9 Aug 2  
Thank you! Sorry our system triggered! Better safe than sorry I guess! Thanks for all you do!

**Mike Nelson** @MikeNelson... Jul 17  
Do you control of the Viero cameras? If so, can you point the Raymer one north? Thanks

**BoulderCAST Weather** @... Jul 14  
Sorry need more characters. It is from the Boulder climate station. On the NOWData page.


**Eibert County OEM** @Elb... Apr 29  
You bet. Thank you!

**Ariel Rivera Vázquez** @ri... Apr 14  
Ariel, you can call 303-494-4479, but I am leaving the office and will be back in later tomorrow morning.


**Lauren Whitney** @L... 29 Sep 2015  
Here is a list from a climate site. We count

**Adjacent NWS Offices...**

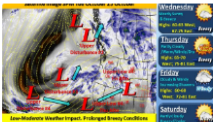
**NWS Pueblo** @NWSPueblo 17m  
A pretty good shower just moved through I-25 and Garden of the Gods. CDOT image about 5:15 PM MDT. #cowx



**NWS Pueblo** @NWSPueblo 31m  
Florissant Fossil Beds National Monument a little before 5 this evening. Some showers trying to make it to the ground. #cowx



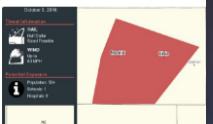
**NWS Cheyenne** @NWSCheye... 1h 25/4PM: Wind main concern for SE WY & NE Panhandle thru week. Strong winds possible Friday. #wywx #newx #wyroad



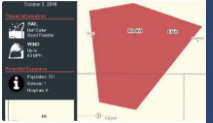
**NWS Pueblo** @NWSPueblo 4h  
Areas of clouds continue this PM, with a few mountain rain and snow showers and possibly a thunderstorm. #cowx

**from:NWSseveretstor...**

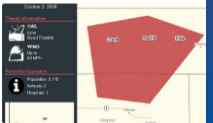
**NWS Severe Tstorm** @NW... Oc  
Take Cover! Severe Thunderstorm Warning continues for Madrid NE, Elsie NE until 4:30 PM MDT



**NWS Severe Tstorm** @NW... Oc  
Take Cover! Severe Thunderstorm Warning continues for Madrid NE, Elsie NE until 4:30 PM MDT



**NWS Severe Tstorm** @NW... Oc  
Take Cover! Severe Thunderstorm Warning continues for Grant NE, Madrid NE, Elsie NE until 4:30 PM MDT





# CoCoRaHS.org

## Community Collaborative Rain, Hail, & Snow Network

**CoCoRaHS** COMMUNITY COLLABORATIVE RAIN, HAIL & SNOW NETWORK  
*"Because every drop counts"*

Home | Countries | States | View Data | Maps | My Data Entry | Login

Welcome to CoCoRaHS! "Volunteers working together to measure precipitation across the nations."

**What is your landscape's current CONDITION?** WET? NORMAL? DRY?  
 Tell us by submitting a "CoCoRaHS Condition Report"

8,308 daily precipitation reports received today as of 10/25/2016 6:03 PM EDT

Daily Precipitation (inches x.xx) USA 10/25/2016

0.0
Trace
0.00 - 0.18
0.19 - 0.36
0.37 - 0.91
0.92 - 2.18
2.19 - 3.27
3.28 - 3.64

AMBASSADOR™ WRN WEATHER-READY NATION

NOAA

**COCORAHS BAHAMAS**

CoCoRaHS WxTalk Webinar Series

Purchase an official CoCoRaHS 4" Rain Gauge  
 "The official CoCoRaHS Rain Gauge supplier"

WEATHERYOURWAY.COM

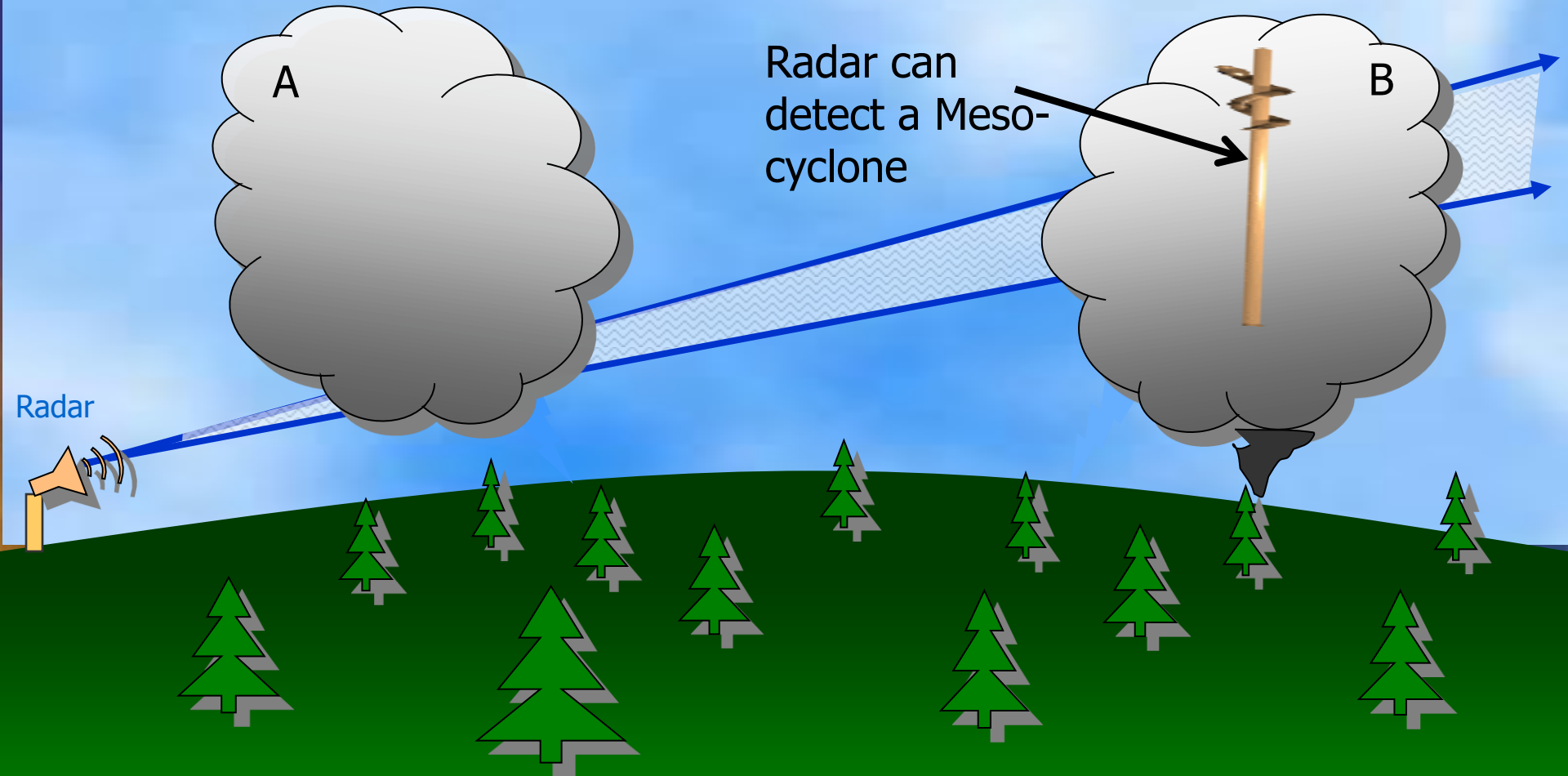
Fast, Friendly service from a meteorologist and



Photo: Jim Jones



# Why we need spotters



**Radar beam cannot see lower portion of storm "B"**



# Height with distance of center of radar beam above the ground level

<u>Location</u>	<u>Distance</u>	<u>0.5 degrees</u>	<u>1.5 degrees</u>
• Fort Morgan	44NM	4,942 ft.	9,700 ft.
• Akron	66NM	7,100 ft.	14,030 ft.
• Sterling	80NM	9,926 ft.	18,336 ft.
• Holyoke	114NM	16,265 ft.	28,307 ft.





# Base Reflectivity

National Weather Service Enhanced Radar Image

weather.gov

## Boston, MA Radar



Go to: [Standard Version](#)

Local weather forecast by "City, St"

[Radar Status Message](#)

Adjacent Radars:



Short Range Images

reflectivity:  
Composite Loop  
base Loop

Velocity:  
Storm Relative Loop  
base Loop

Rainfall:  
1-Hour Total Loop  
Storm Total Loop

MouseOver Off

Long Range Images

reflectivity:  
base Loop

U.S. Views

reflectivity:  
National Loop  
Alaska Loop  
Hawaii Loop  
Guam Loop  
Puerto Rico Loop

Radars by State

Additional Info:  
Radar FAQ

Downloading Images  
Mobile Users

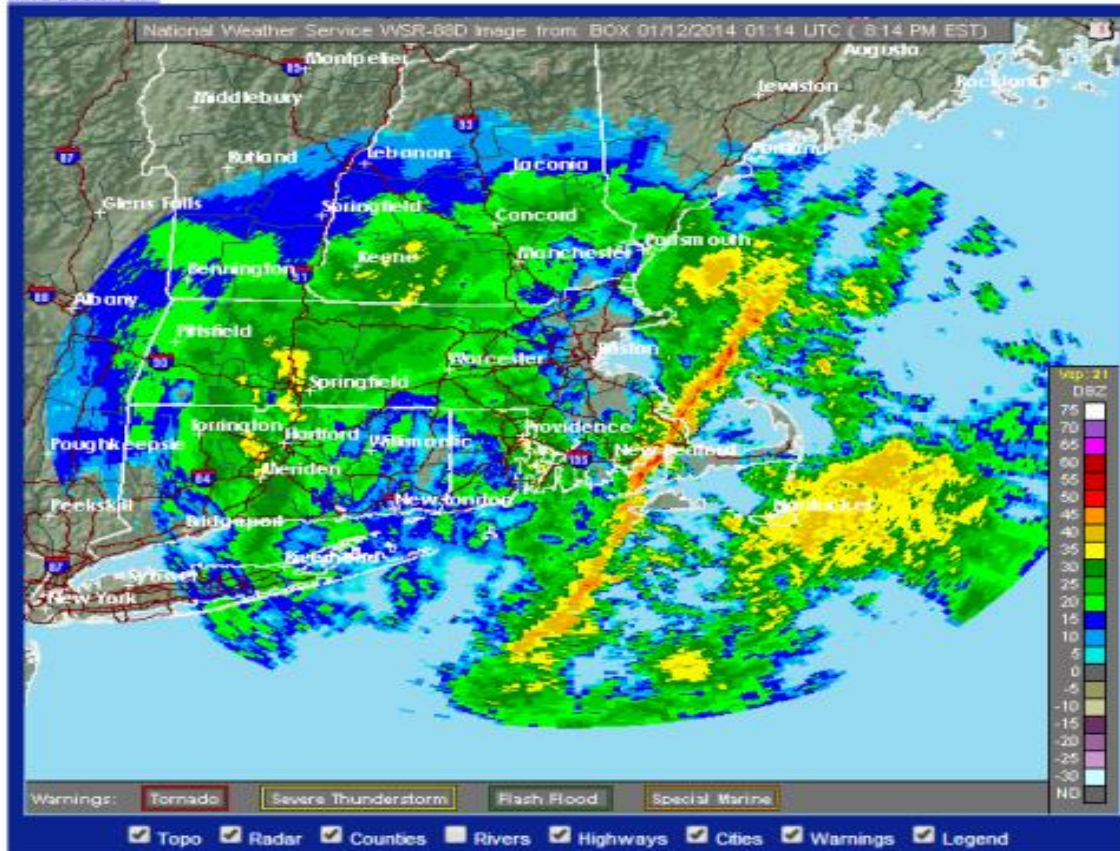
GIS Users [KML](#)

Poppler University

Color Blindness Tool  
Credits

### Base Reflectivity

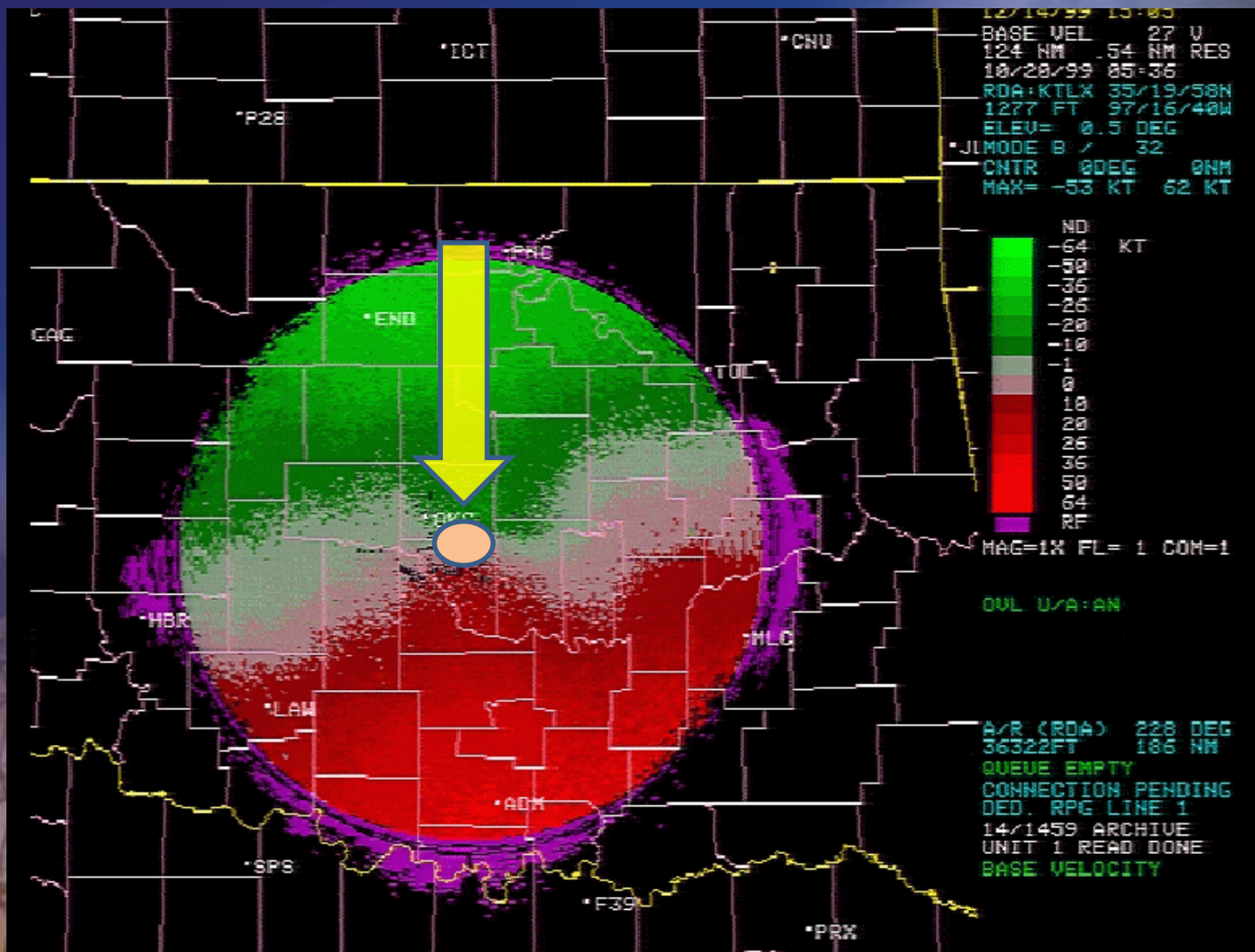
NWS Boston, MA



National Weather Service • Since 1870

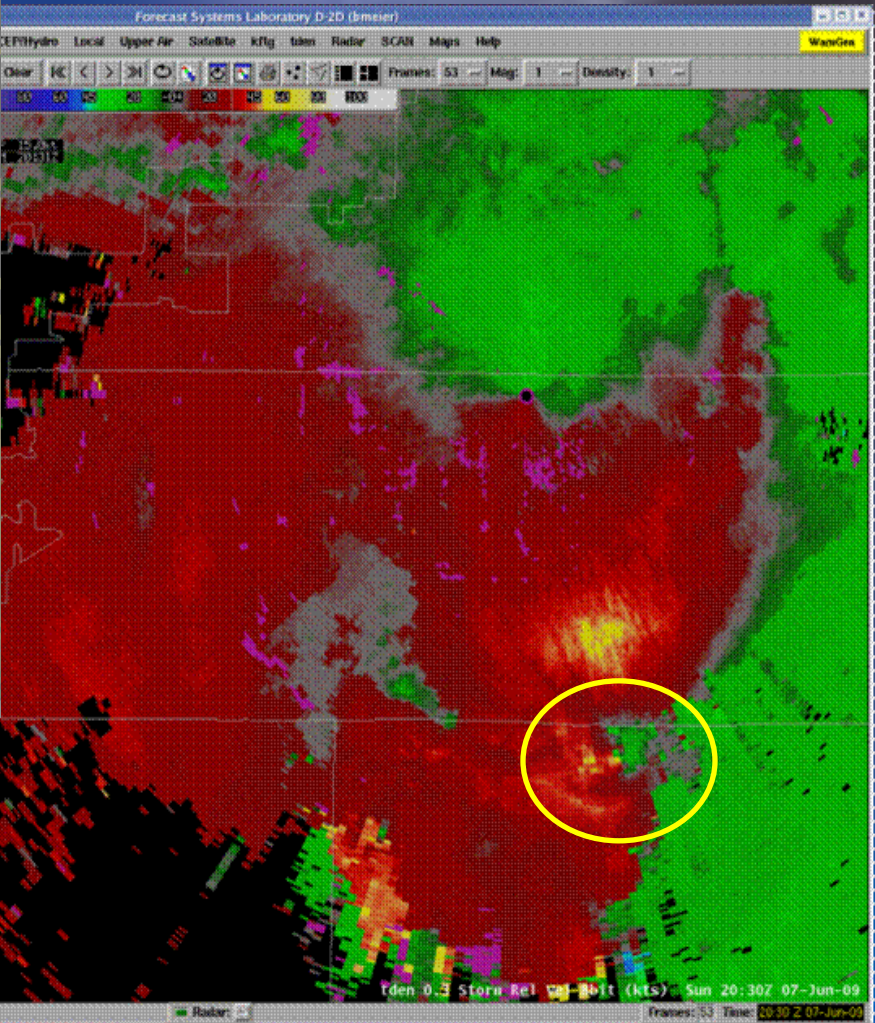
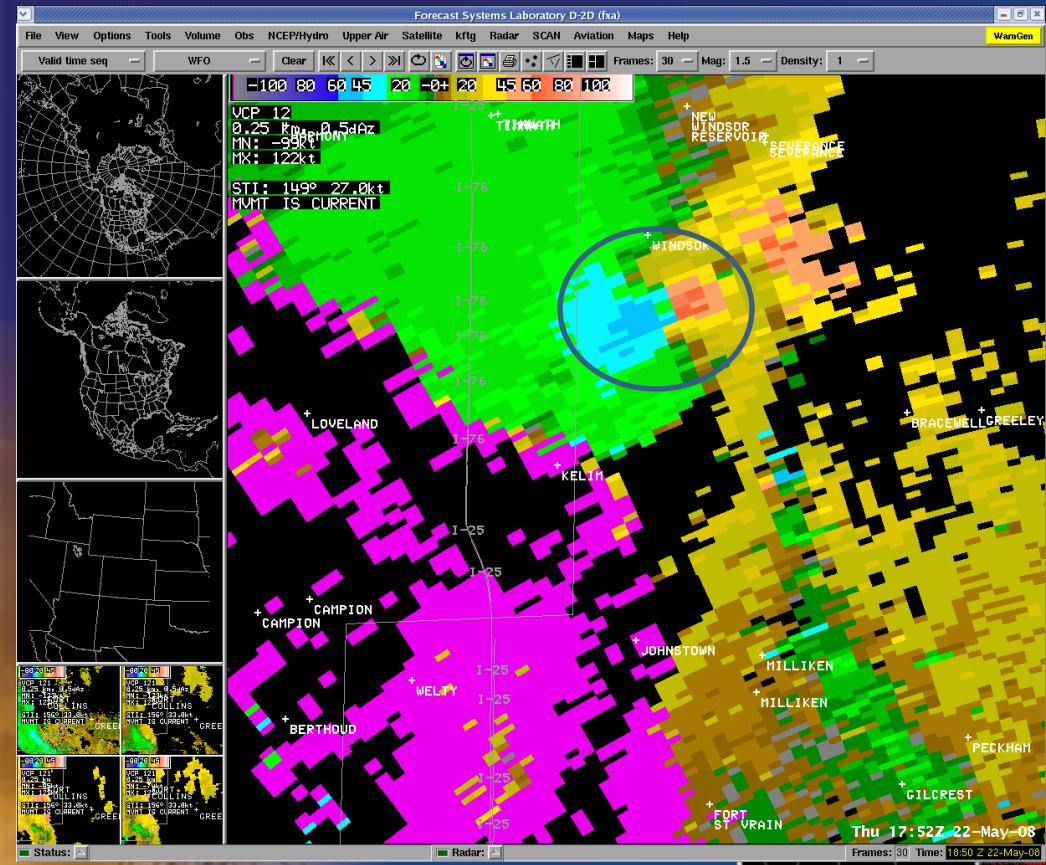


# Base Velocity



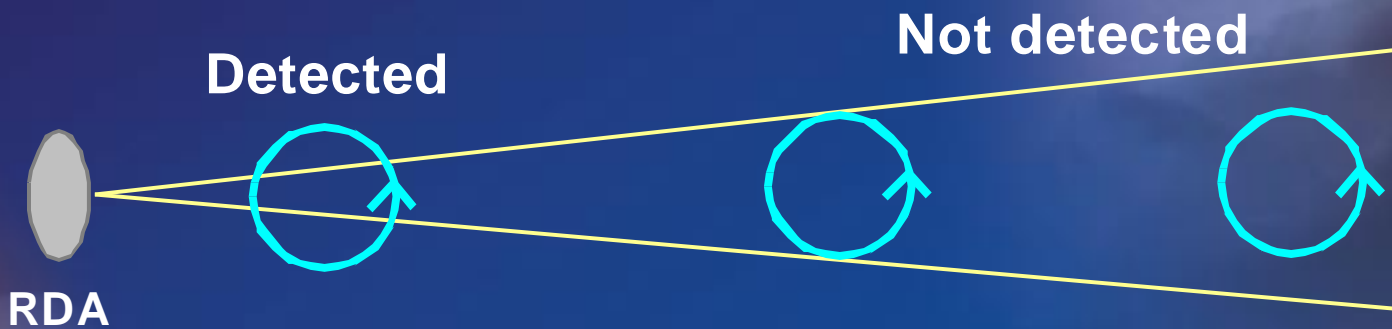


# Large vs. small rotations





# Radar Limitations: Circulations not detected



WSR-88D beam spreads with distance

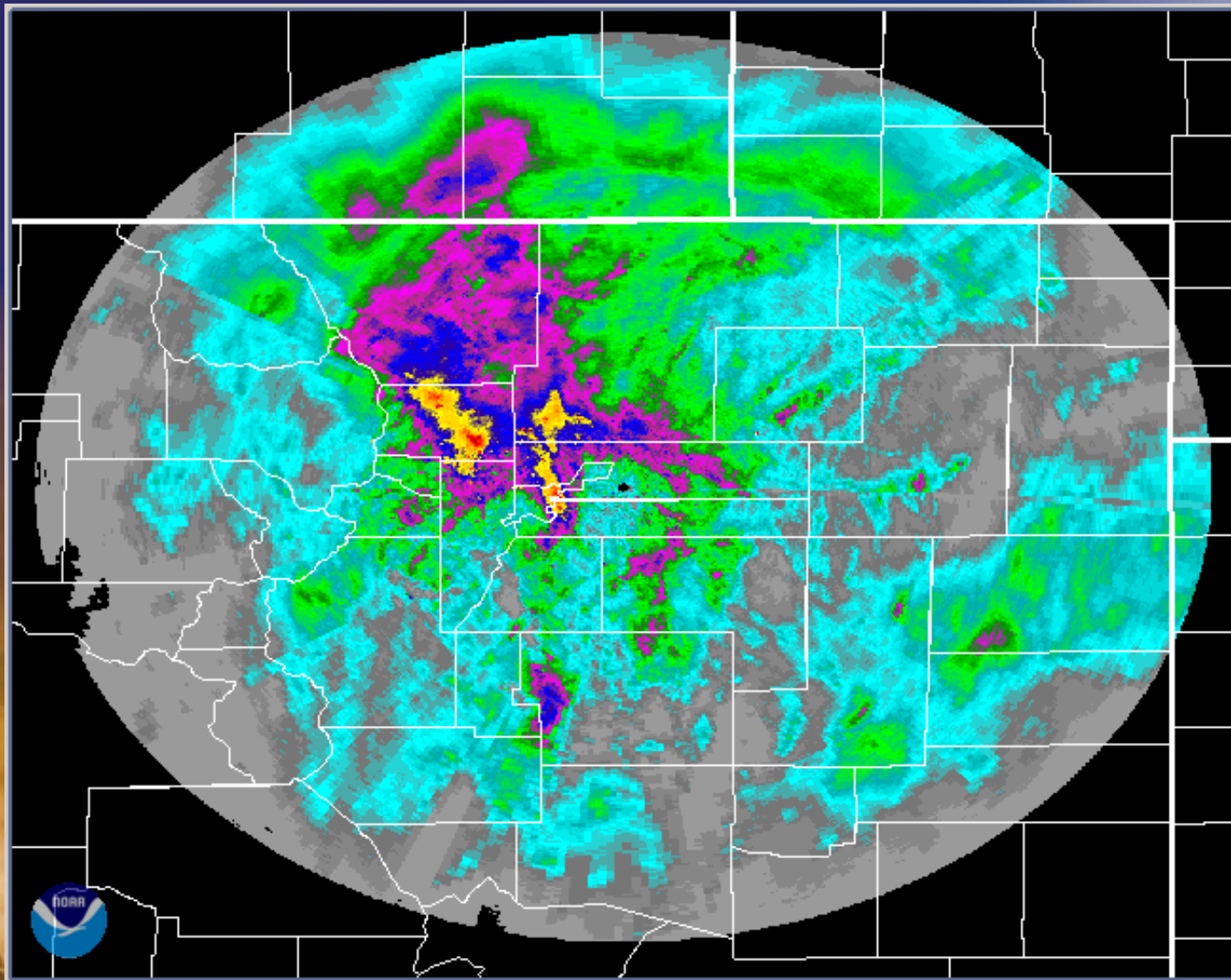
60 nm distance ... .5 nm wide (3040 ft)

120 nm distance ... 1 nm wide (6080 ft)

180 nm distance ... 1.5 nm wide (9120 ft)



# Precipitation products



NEXRAD LEVEL-III  
DIG. STORM TOT. (D.P.)  
KFTG - DENVER, CO  
09/12/2013 23:57:34 GMT  
LAT: 39/47/09 N  
LON: 104/32/45 W  
ELEV: 5610 FT  
MODE/VCP: A / 212

MAX: 29.50 IN  
BEG: 09/09/2013 17:39 GMT  
END: 09/12/2013 23:58 GMT

Legend: IN

15.0
12.0
10.0
8.0
6.0
5.0
4.0
3.0
2.5
2.0
1.5
1.0
0.6
0.3
0.01
0.0



# This Concludes Basic Training

*Stay Tuned for Advanced Portion*

## New Spotters:

- New spotter letters will be mailed to your location
- Make sure you have signed up on the sheets.
  - Include physical address if you have a P.O. Box
  - If you do not receive a welcome letter in 30 days, please email
    - *Scott.entrekin@noaa.gov*

## Existing, Re-trained spotters:

- Your information will be updated in our database
- No formal re-notification given
- Spotter guides are available online at: [weather.gov/os/brochures.shtml](http://weather.gov/os/brochures.shtml)
- On-line spotter training (for review)  
[meted.ucar.edu/training\\_course.php?id=23](http://meted.ucar.edu/training_course.php?id=23)



# Quick Stretch Break!

