

Weather Spotter Training 2009



NOAA's National Weather Service Salt Lake City

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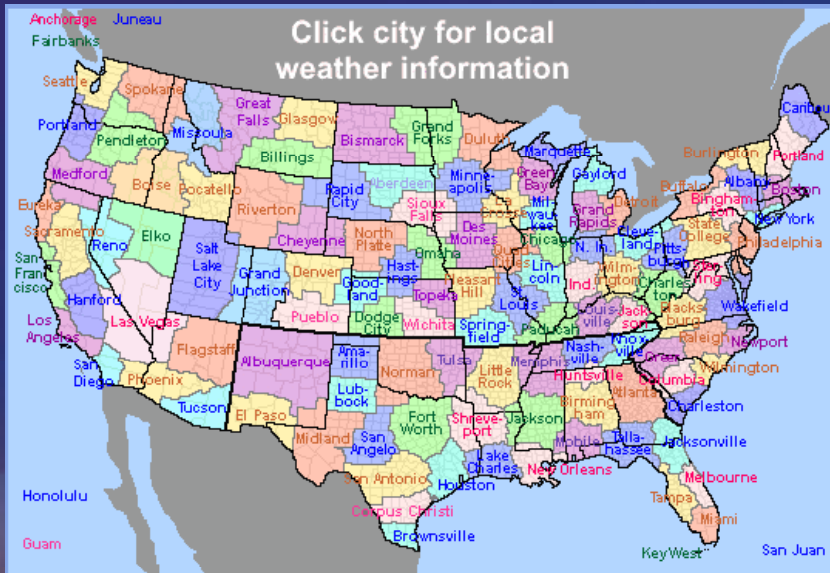
Goals of the Training

You will learn:

- **Definitions of important weather terminology and extreme weather criteria**
- **How to correctly identify significant weather features and events**
- **What information the spotter is to report and how to report it**
- **Ways to receive weather information before and during extreme weather events**
- **Spotter Safety**

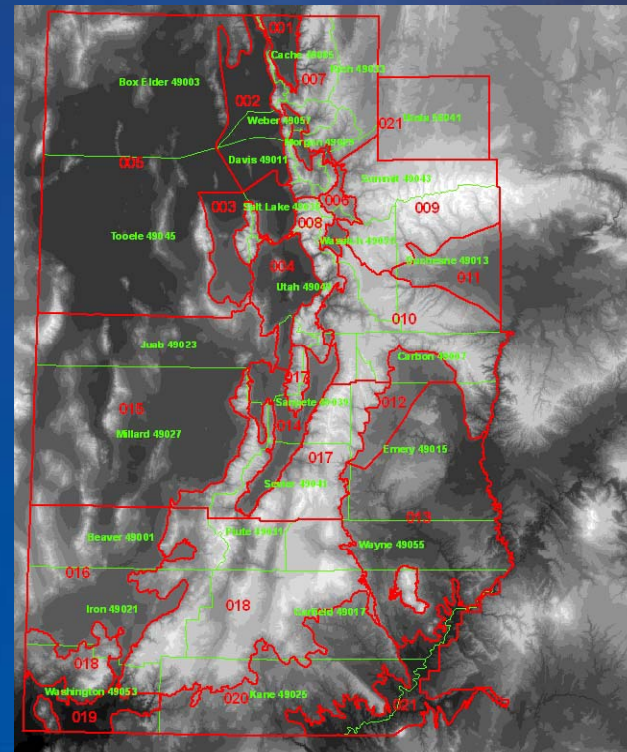
About the National Weather Service (NWS)

Provides weather, hydrologic, and climate forecasts and warnings for the protection of life and property and the enhancement of the national economy



Salt Lake City Weather Forecast Office (WFO) prepares and issues forecasts and warnings for 26 counties in Utah and extreme southwest Wyoming

24/7 Operation



2008 Weather



Delta - July 20, 2008

- Winter storms
- Wildland fires
- Southern Utah flash flooding
- Severe thunderstorms

Valentine's Day Blizzard

- Heavy snow (12" amounts common) and wind gusts to 70 mph produced near white-outs
- Students stranded at elementary schools, with buses also stranded
- Segments of Interstates I-15 and I-84 closed, along with numerous state and county roads
- Numerous multivehicle pileups



Corner Canyon Fire - August 25-28



Photo Courtesy KSL

- 808 acres
- Estimated cost of \$759,000



Photo Courtesy KSL



Photo Courtesy KSL

Flash Flooding



Photo courtesy
Tom Jones

Egypt 3

- **Egypt 3 Slot Canyon Flash Flood**
 - September 10
 - Glen Canyon National Recreation Area
 - Two fatalities, plus 2 injured



Cedar City - July 20, 2008

NWS Operations Before Weather Spotters



SKYWARN (Severe Weather) Spotters

Why are you critical to NWS operations?

- **Help overcome Doppler Radar limitations**
 - Extreme terrain leads to less than optimal radar coverage
 - Radar doesn't 'see' below cloud base
 - Radar is good at indicating circulations (mesocyclones), but most circulations are not associated with a tornado
- **Provide ground truth, which can help motivate people downstream to take action to protect lives and property**
 - Ground truth reports included in warnings heighten public awareness, add credibility to warnings, and allow forecasters to have confidence in warning decisions
- **Ground truth can be correlated with radar signatures *prior to, during, and after* severe weather to aid in warning decisions**
 - We archive severe weather events for research and verification and use a Weather Event Simulator for training with past weather events

Reporting...What We Want to Hear About

Don't assume we already know it's happening!

- Tornadoes, Funnel Clouds, and Wall Clouds
- Flooding/flash flooding and/or rapidly rising water
- Strong and/or damaging winds
- Hail
- Wildland fires
- Snowfall, snow depth, and freezing rain

Continue to monitor and report!

When You Report

4 Ws – who, what, when, and where

- Identify yourself as a trained spotter (**who**)
- Describe severe weather feature (**what**)
- Provide exact time feature was spotted (**when**)
 - This may or may not be the current time of your call
- Be as specific as possible with location (**where**)
 - Reference distance and direction from nearest city
 - Use interstate/state/county road information (intersection of..., mile marker..., etc.)

Continue to monitor and report!

Reporting Options

eSpotter

<http://espotter.weather.gov>

E-mail

Utah.Spotter@noaa.gov

eSpotter

- Enables online reporting of weather events (all hazards)
- Reports will alarm on operational workstations
- Create an account to get started
 - Go to <http://espotter.weather.gov>
 - Click on the “Register Here” link
 - Be sure to choose “Salt Lake City, UT (SLC)”
 - You will receive an email confirmation once account is approved

Severe Weather Terms

What to watch for

- **Watch** - Issued when conditions are **favorable** for a particular severe weather hazard to develop during the next several hours. Plan, prepare, and be aware.
- **Warning** - Issued when a particular severe weather hazard is either **imminent or occurring**, and poses a significant risk to life and/or property. Immediate action is necessary to protect life and/or property.
- **Advisory** – A low-impact event is imminent or occurring, which may result in inconvenience or nuisance weather conditions - primarily impacting travel. Reasonable precautions will prevent injury or property damage.

Anticipating Severe Weather

What to look and listen for

- Utilize <http://weather.gov/saltlakecity>, NOAA Weather Radio, and local media sources to stay informed!
- Hazardous weather products and services
 - Hazardous Weather Outlook
 - Event Driven - Issued 5:00 – 7:00 A.M. daily, updated as necessary, segmented into two periods
 - Flash Flood Potential Rating
 - Tornado, Severe Thunderstorm, and Flood/Flash Flood watches and warnings

What Makes a Thunderstorm Severe?

Price – September 15, 2006

- Tornado
- Winds at least 58 mph or reports of wind damage
- Hail at least 1 inch in diameter

Provo - August 1, 2006



Salt Lake City - August 11, 1999

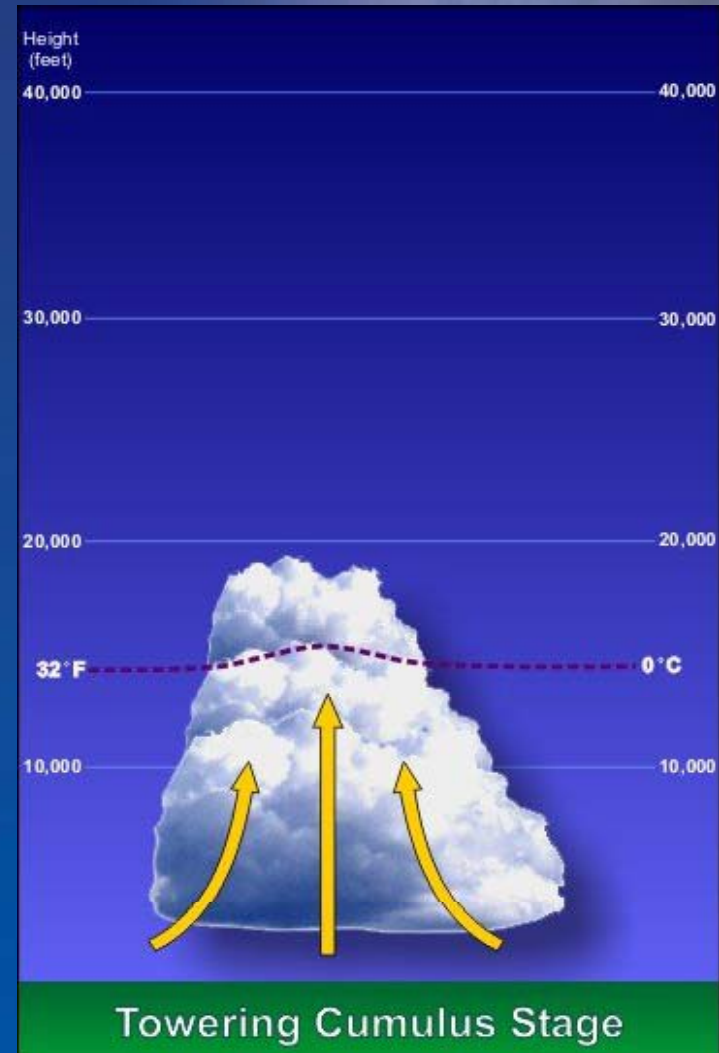


Photo courtesy KTVX

Thunderstorm Life Cycle

Developing

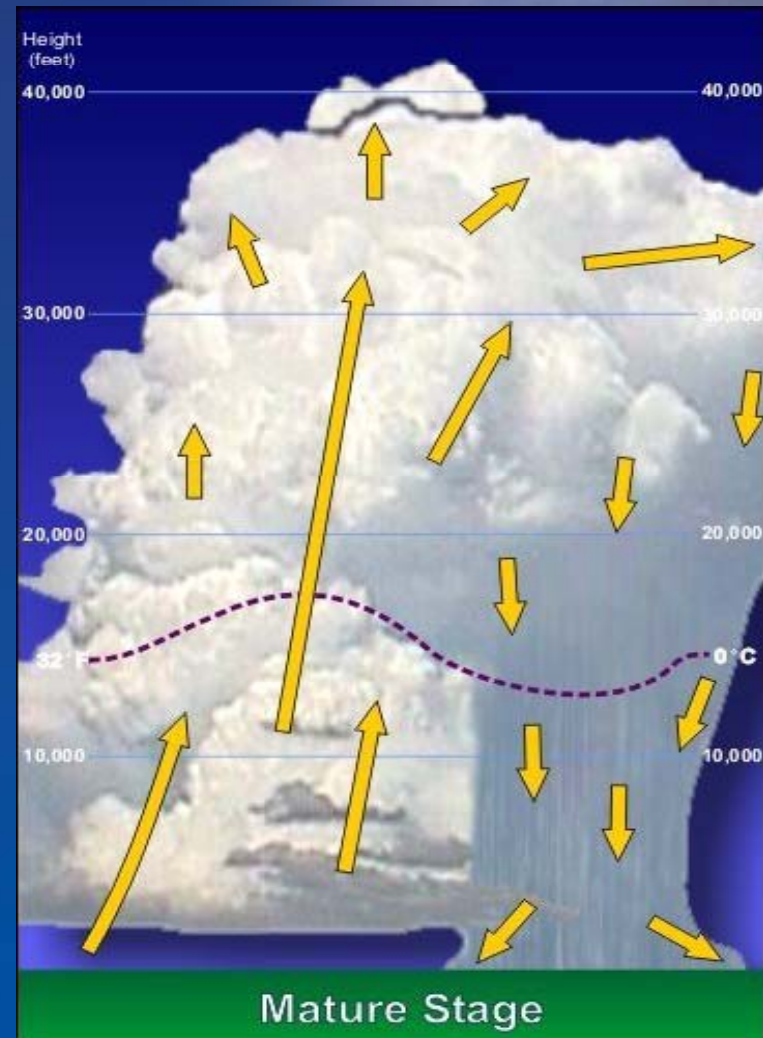
- Towering, billowy bright white clouds
- Dominated by updraft – rising air
- Lasts 10-15 minutes
- Little rain, but lightning possible



Thunderstorm Life Cycle

Mature Stage

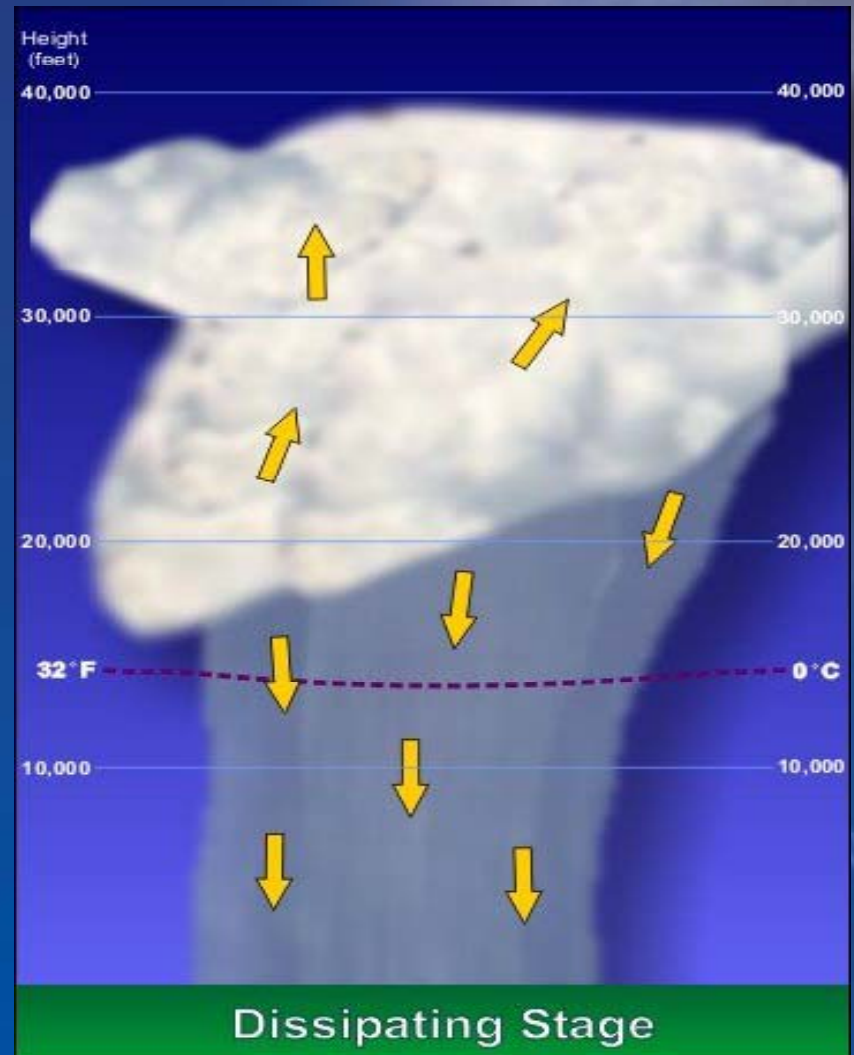
- The weather stage
- Hail, heavy rain, lightning, strong winds, tornadoes
- Anvil at storm top
- Rising air/falling rain (updraft/downdraft)
- Lasts 10-20 minutes



Thunderstorm Life Cycle

Dissipating Stage

- Tall, billowy updraft shrinking
- Mostly descending air
- Rainfall intensity decreases
- Strong wind and hail still possible from some storms
- Lightning can still be quite frequent
- Lifespan is 45-50 minutes



Supercell Depiction

Supercell thunderstorm

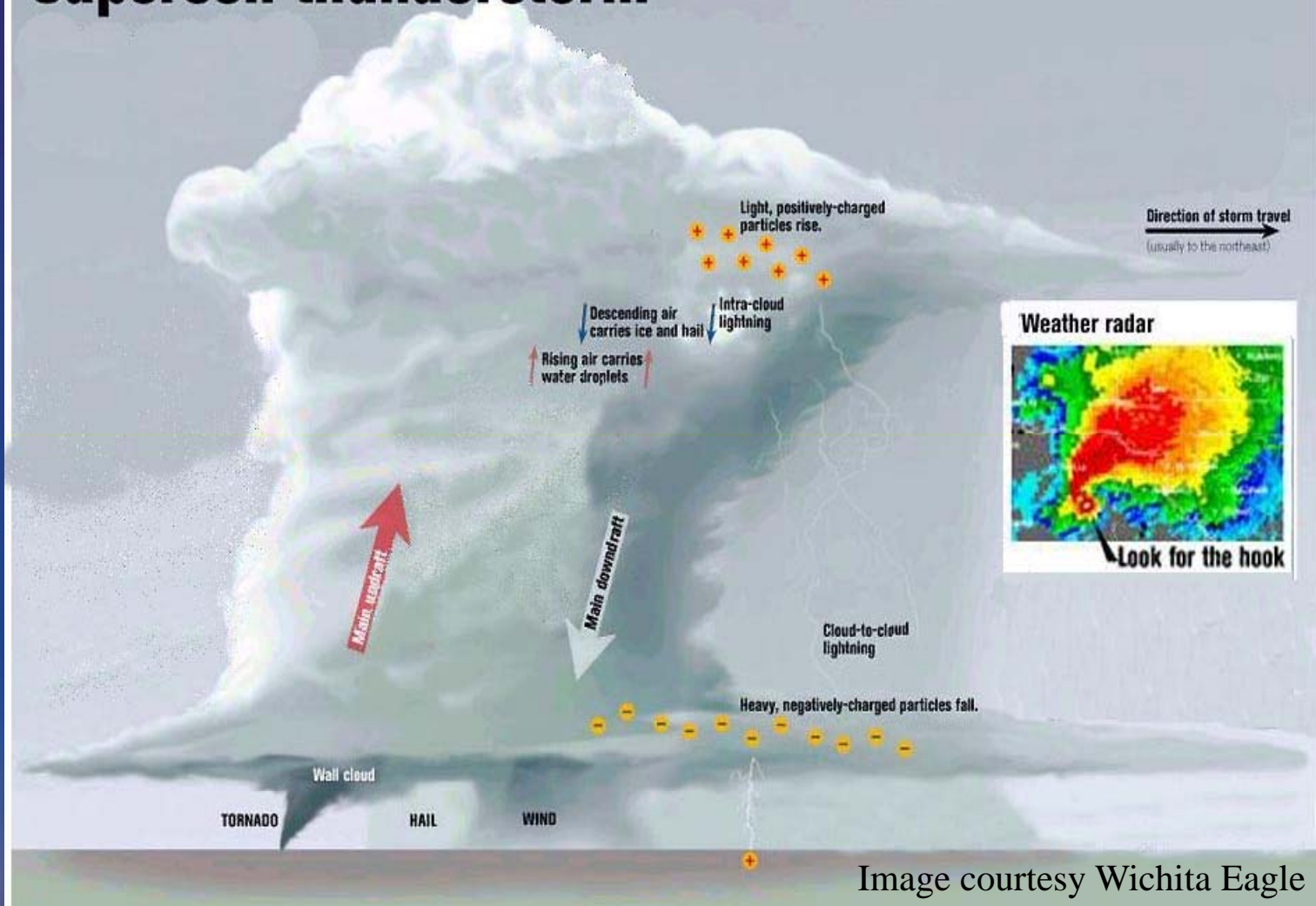


Image courtesy Wichita Eagle

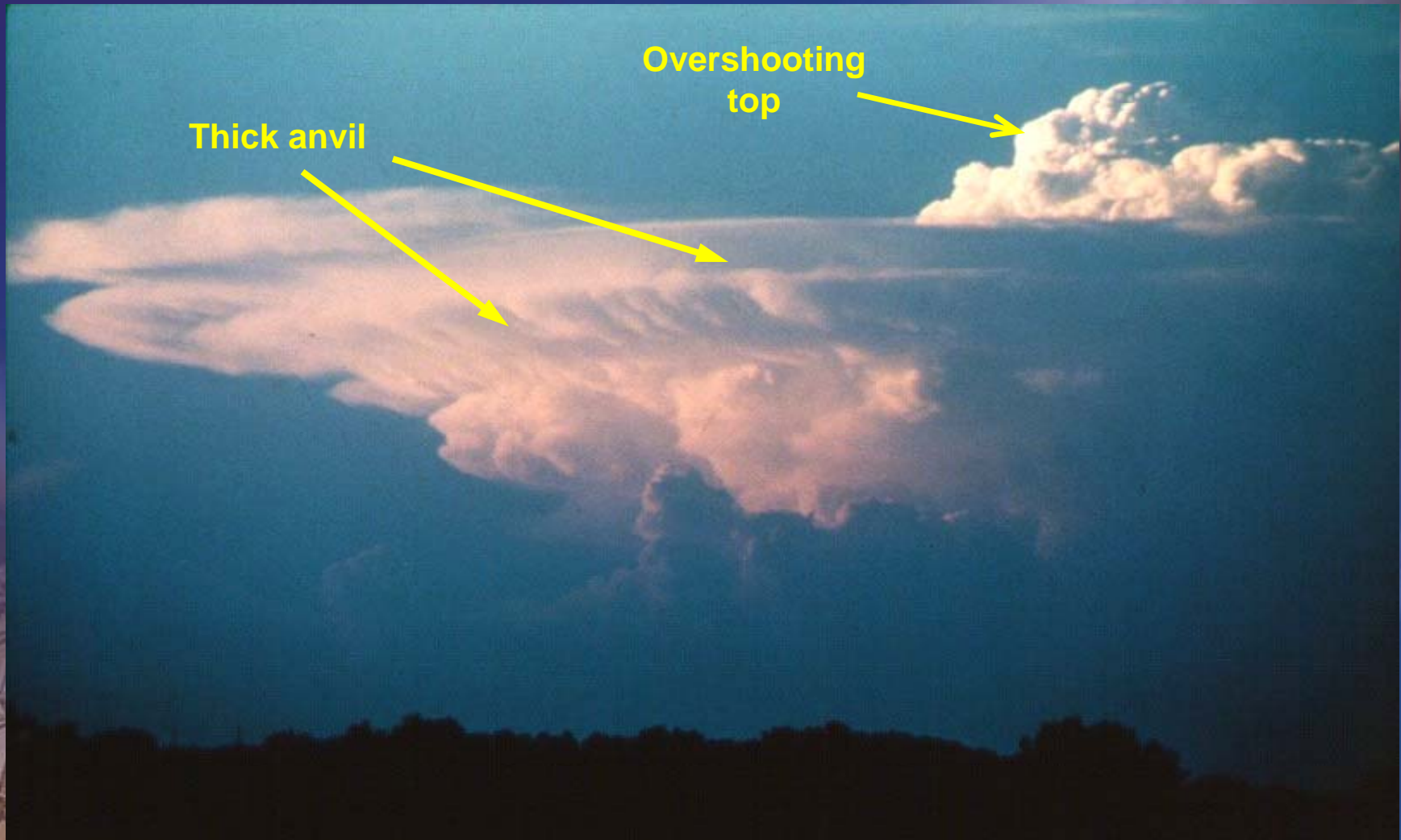
Observing Upper Level Storm Clues

Viewed 30-40 miles from storm

- **Overshooting Top**
 - Dome-like bubble of cloud extending above anvil and persisting for >10 minutes
 - Indicates strong updraft
- **Anvil characteristics**
 - Thick, cumuliform anvil with sharp, well-defined edges
 - ‘Bubbling’ look



Intensity clues – Overshooting Top



Intensity Clues - Anvil



Well defined anvil

Wispy anvil



Intensity clues - Updraft

Viewed 10-20 miles from the storm



Strong updraft

Hard cauliflower appearance

Vertically upright

Weak updraft

Soft, mushy appearance

Vertically tilted

Sunlight shining through



Observing Low Level Storm Clues

Viewed within 10 miles of storm

- **Wind clues**

- Shelf Cloud/Roll Cloud
- Downburst

- **Hail clues**

- White hail shaft
- Greenish tint to sky

- **Tornadoes, Funnel Clouds, and Wall Clouds**

- Rain-Free Base (Low, flat cloud base with little visible precipitation falling and updraft towers above)
- Wall Cloud (Isolated lowering of rain-free base, rotating, and usually near the north side of the updraft)

Fundamental Definitions

- **Shelf Cloud** – Low level, *horizontal*, wedge shaped cloud occurring on leading edge of a thunderstorm (Wind, rain, and hail may follow, but may not be severe).



Fundamental Definitions

- **Downburst** – An intense downdraft from a thunderstorm with an outrush of damaging wind.
- Winds can exceed 100 mph
- Wind damage spreads outward from the point of impact, creating a ‘starburst’ appearance in the damage



Reporting Winds/Wind Damage

- Use Beaufort Scale to estimate wind speeds
 - ~50 MPH - Slight structural damage and large branches may break
 - ~60 MPH - Moderate structural and tree damage
 - >65 MPH - Heavy to severe structural and tree damage
- Report immediately:
 - Wind damage
 - 50+ mph winds

Measure wind speeds when possible!

Hail Clues

- **Look for**
 - White hail shafts/streamers
 - Greenish tint to sky



Southern Utah – October 2006



- **Report any size hail**

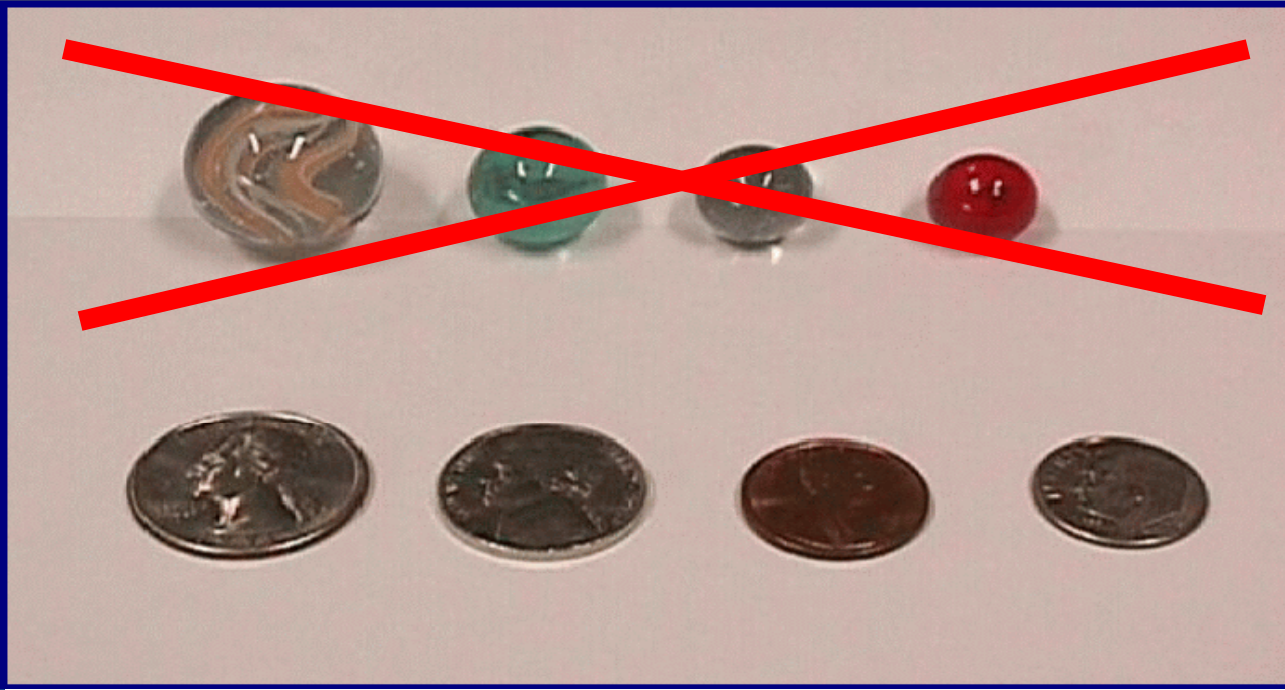
Measure the Hail

Aurora, NE - June 22, 2003



Measure the diameter of the largest stone

Do Not Report “Marble Size Hail”



A Closer Look

Supercells, Tornadoes, Funnel Clouds, and Wall Clouds



Dunlap, IN - April 11, 1965

Yes...Tornadoes Do Happen in Utah!

Salt Lake City - August 11, 1999



Manti – September 8, 2002



Fundamental Definitions

- **Mesocyclone** – A storm-scale region of rotation



Fundamental Definitions

- **Wall Cloud** - An isolated lowering from a cumulonimbus cloud base, resembles a pedestal.
- Develops under rain-free cloud base
- Persistent (5 to 10 minutes)
- Typically rotating
- Often precedes funnel cloud and tornado formation



Fundamental Definitions

- **Rear Flank Downdraft** – A region of dry air descending on the back side, and wrapping around, a mesocyclone.



Fundamental Definitions

- **Funnel Cloud** - A violently rotating column of air that does not reach the ground. No circulation is seen on the surface.

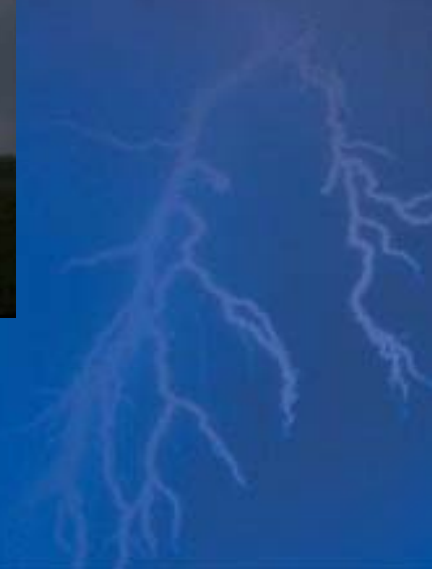
Photo courtesy Stephenie Gougar and Kayla Quarburg



Beaver County - September 29, 2004

Fundamental Definitions

- **Tornado** - A violent rotating column of air in contact with the ground, descending from the base of a severe thunderstorm.



Shelf Clouds vs. Wall Clouds

The Difference

Shelf Clouds

Suggest
downdraft/outflow

Move away from
precipitation areas

Horizontally orientated
and can extend for
miles, may 'roll' like a
rolling pin

Wall Clouds

Suggest updraft/inflow

Maintain position with
respect to
precipitation

Isolated, vertically
orientated, *and*
rotating, like a
spinning skater

Shelf Cloud

Slopes down and moves away from the rain

Storm movement



Shelf Cloud

Rain area

Shelf cloud movement



The Shelf Cloud is the leading edge of the wind shift



Wall Cloud

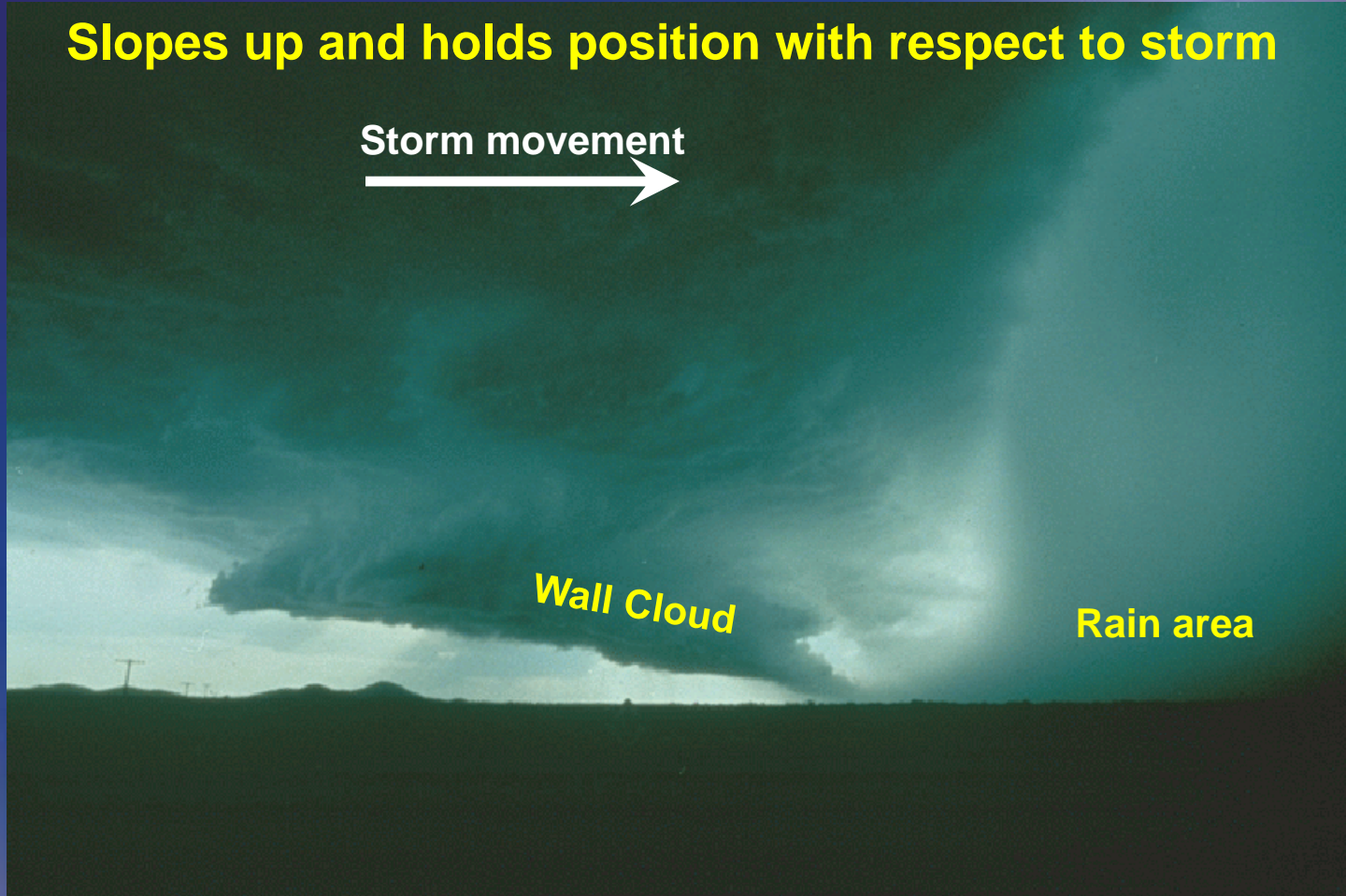
Slopes up and holds position with respect to storm

Storm movement
→

Wall Cloud

Rain area

The wall cloud does not move away from the rain



Funnel Cloud and Initial Tornado Development Stage

Duchesne, UT - June, 2005



Tornado – Mature Stage



Platte/Colfax Counties Nebraska

Look-alikes

Don't Be Fooled!

- Scud Clouds
- Virga



Fundamental Definitions

- **Scud Clouds** - Ragged edge clouds that do not rotate and are located below the main cloud base...may move up and into cloud base under an updraft



Fundamental Definitions

- **Virga** - Rain falling from clouds, but evaporating before reaching ground...NO rotation, but can imply microburst winds



Night Severe Weather Spotting

What to look and listen for

- Utilize illumination provided by lightning
- If experiencing large hail, you are near the portion of a storm where a tornado may form
- Search horizon for bright flashes of light from power lines and transformers being hit by a tornado



Herriman - 2007

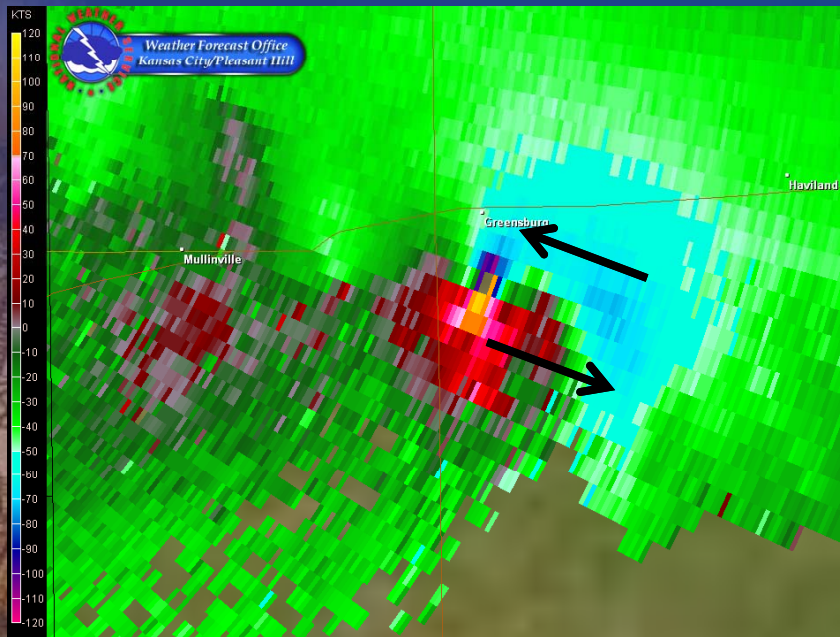
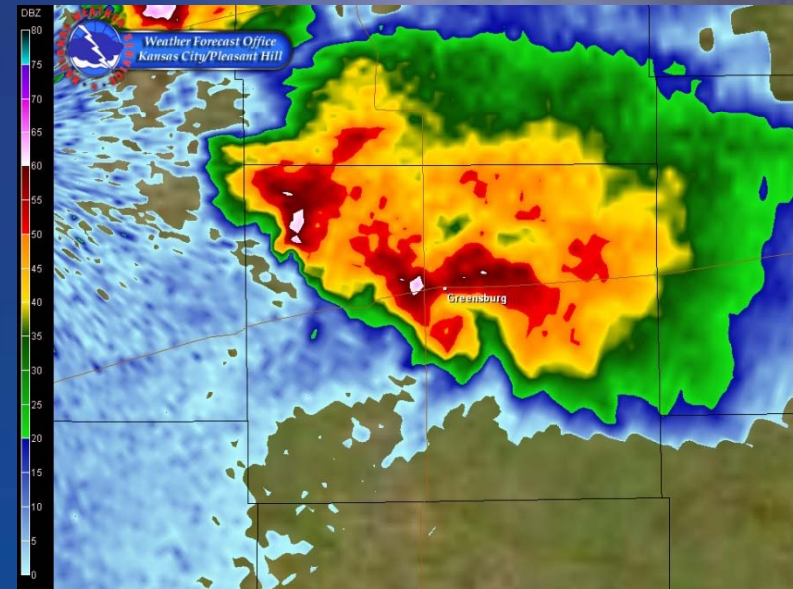
- Listen for a loud roaring sound (not present with all tornadoes and may be from straight line winds)

Radar Interpretation 101

Doppler radar data available from NWS web pages

Reflectivity - **Hot colors**
= more intense echoes

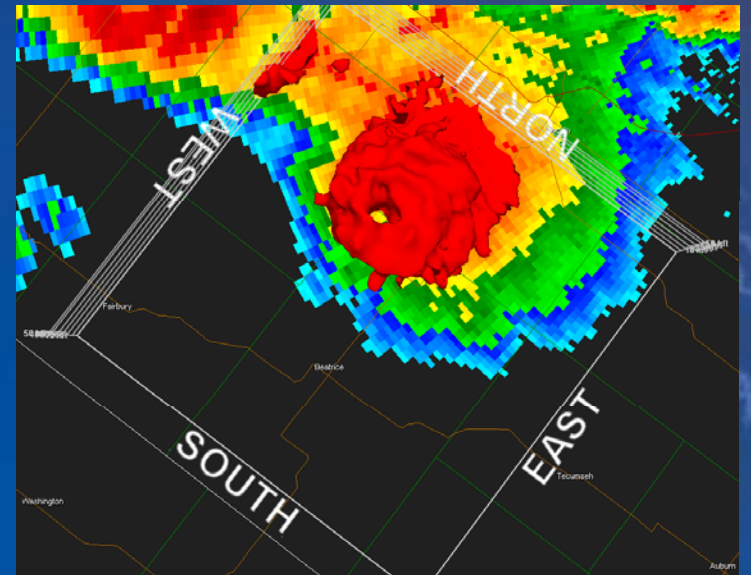
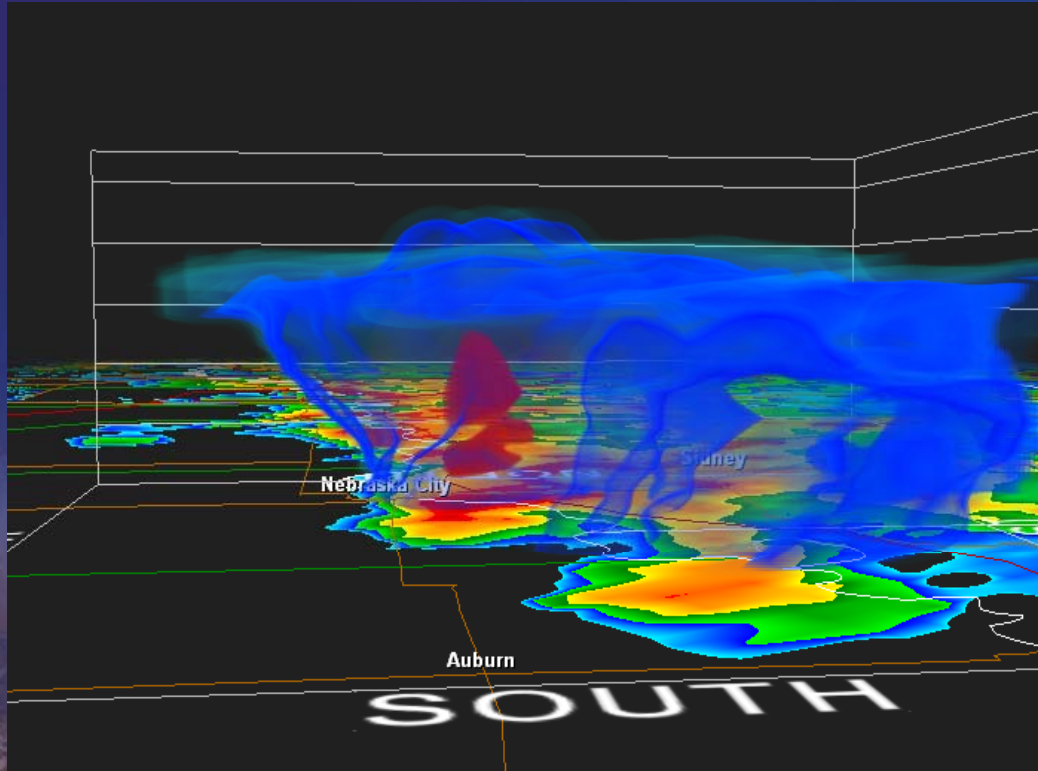
Greensburg, KS EF-5 May 4, 2007



Velocity – **Warm colors**
indicate winds directed
away from radar and
cool colors winds
directed toward radar

Radar Interpretation 101

Doppler in 3-D



A dark, stormy sky with a lightning bolt striking down on the right side. On the left, a metal tower structure is visible against the dark background.

Remember...

We Want To Hear From You When the Following Is Observed...

- Tornado
- Funnel Clouds and Wall Clouds
 - Rotating and persistent
- Strong or damaging winds
- Hail (any size)

Don't assume that we already know it's happening!

Flooding/Flash Flooding



Lower Enterprise Dam - January 13, 2005

Flooding/Flash Flooding

Respect the water...and think!



Near El Paso, Texas

Flooding/Flash Flooding Terms

What to watch for

- Hazardous Weather Outlooks/Special Weather Statements
- Flash Flood Potential Rating
- Watches
- Warnings
- Advisories



Washington County – August 1, 2007

Flooding/Flash Flooding Reporting

REPORT THE FOLLOWING IMMEDIATELY!

- Flooding or rapidly rising water
 - Unusually high or flowing faster than normal
 - Water approaching bankfull or nearing roads/structures
 - Inch or more of rainfall observed in a short duration
(less in steep/rocky terrain or in burn areas)
 - Any flooding observed
 - Debris flows or rock slides

Watch for extended periods of heavy rainfall from slow moving thunderstorms, or thunderstorms 'training' over the same locations

Report water as it begins to rise and before it starts to impact people's lives

Don't assume that we already know it's happening!

Fire Weather



Salt Creek Fire – July 2007

Fire Weather Terms

What to watch for

- Hazardous Weather Outlooks
- Watches
- Warnings



Salt Creek Fire – July 2007

Wildfire Reporting

REPORT THE FOLLOWING!

- New wildfire starts, especially if threatening life and property
- Smoke reducing visibility to less than 2 miles
- Weather pattern information (afternoon wind shifts) in wildfire locations (provides insight to forecasters)

Photo Courtesy KSL



**Corner Canyon Fire –
August 25, 2008**

Winter Weather



Elk Point Avalanche

Winter Weather Terms

What to watch for



**Cedar City Doppler Radar
Blowhard Mountain**

- Hazardous Weather Outlooks/Special Weather Statements
- **Watches**
- **Warnings**
- **Advisories**

Winter Weather Reporting

Report the following:

- **Snowfall accumulations**
 - How much total snow fell (period of time)
 - When snow began/ended
 - When snow total reached warning level
- **Snow depth**
- **Freezing rain accumulation**
- **Precipitation type changes**



Draper - February 2008

Spotting Safely and Effectively

Some “rules of thumb”

- 1) Always know where you are with respect to the storm and other storms in the area
- 2) Have a map and know potential escape routes should your location become threatened
- 3) Keep a buffer of at least 3 to 4 miles between you and the feature you’re spotting
- 4) Never drive through hail or flooded roadways just to get to a better vantage point
- 5) Optimally, you want the storm to pass in front of you, from your left to your right across your field of vision
 - Keeps you out of harm’s way
 - Offers best contrast and viewing angle

Share Your Information!

NOAA's National Weather Service (NWS) Salt Lake City

eSpotter

<http://espotter.weather.gov>

Spotter Reports E-mail:

Utah.Spotter@noaa.gov

Homepage Address:

www.weather.gov/saltlakecity

Weather Spotter Webpage:

www.weather.gov/saltlakecity/spotter

Call for Video and Photos

*If you are in a **SAFE** location and have the chance to shoot video/pictures, please share it with us for inclusion in future presentations*



Contact WFO SLC

Kevin Barjenbruch
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kevin.barjenbruch@noaa.gov



Salt Creek Fire - July 2007

National Weather Service Salt Lake City
2242 West North Temple
Salt Lake City, UT 84116
www.weather.gov/saltlakecity



Thank you for your interest!