

Weather Spotter Training 2010



Northern Wasatch Front - June 26, 2009

NOAA's National Weather Service Salt Lake City

Goals of the Training

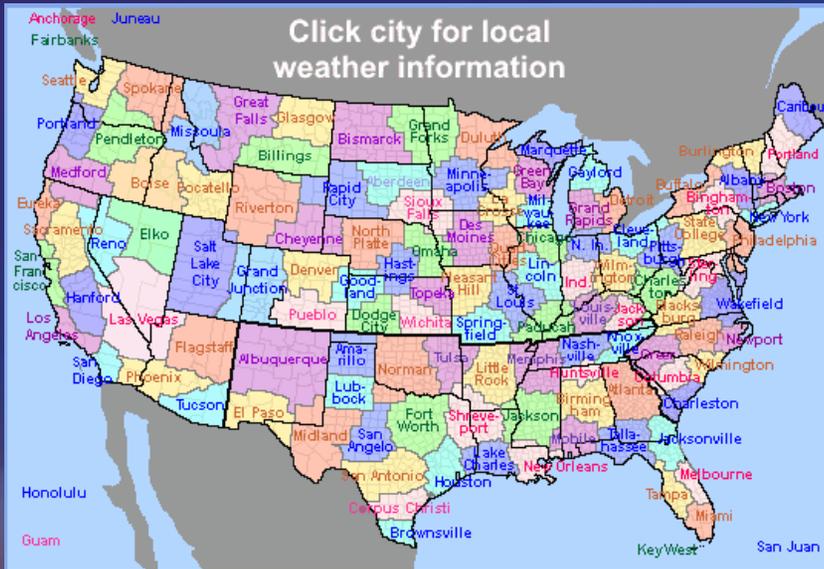
You will learn:

- 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



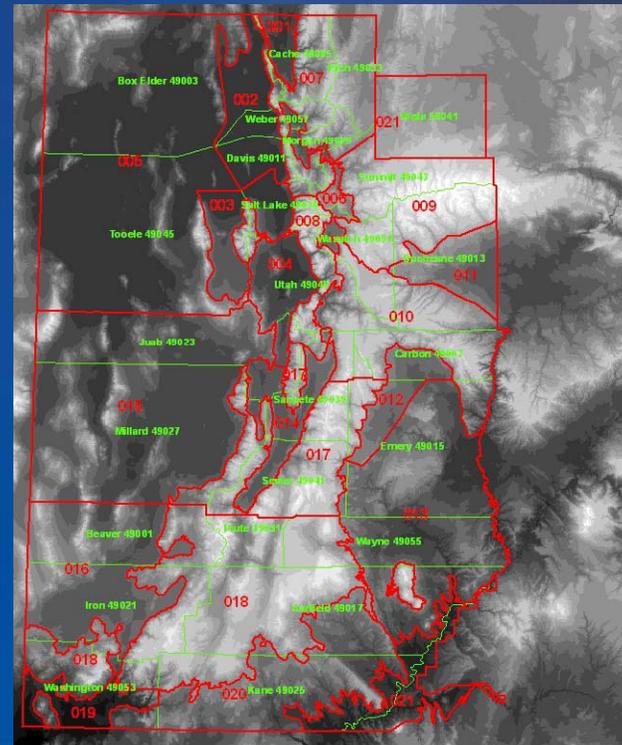
About the National Weather Service (NWS)

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



2009 – Another Active Year Across Utah

Severe Thunderstorms



Wasatch Front Heavy Snowfall



Capitol Reef Flash Flooding



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!

Online Reporting Options

eSpotter

<http://espotter.weather.gov>

E-mail

Utah.Spotter@noaa.gov

(also good for updating your contact info)

Twitter

www.wrh.noaa.gov/slc/twitter/twitter.php



Dust storm near Milford, UT

- 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

New for 2010 - Twitter Storm Reports

- You can now submit your significant weather observations via Twitter
- Twitter Storm Reports uses GeoTagging, which is the act of associating geographical information with something
 - This allows the NWS to correlate each Tweet to your location when it was sent
- This capability will help to enhance and increase timely and accurate weather reporting between the public and the NWS
- For more information visit:
 - <http://www.wrh.noaa.gov/slc/twitter/twitter.php>

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...be Informed

- Utilize WFO Salt Lake City web services
<http://weather.gov/saltlakecity>
 - Text Products
 - Hazardous Weather Outlook
 - Flash Flood Potential Rating
 - Tornado, Severe Thunderstorm, and Flood/Flash Flood watches and warnings
 - Web-based briefings
 - Radar imagery
- NOAA Weather Radio
- Local media sources

What Makes a Thunderstorm Severe?

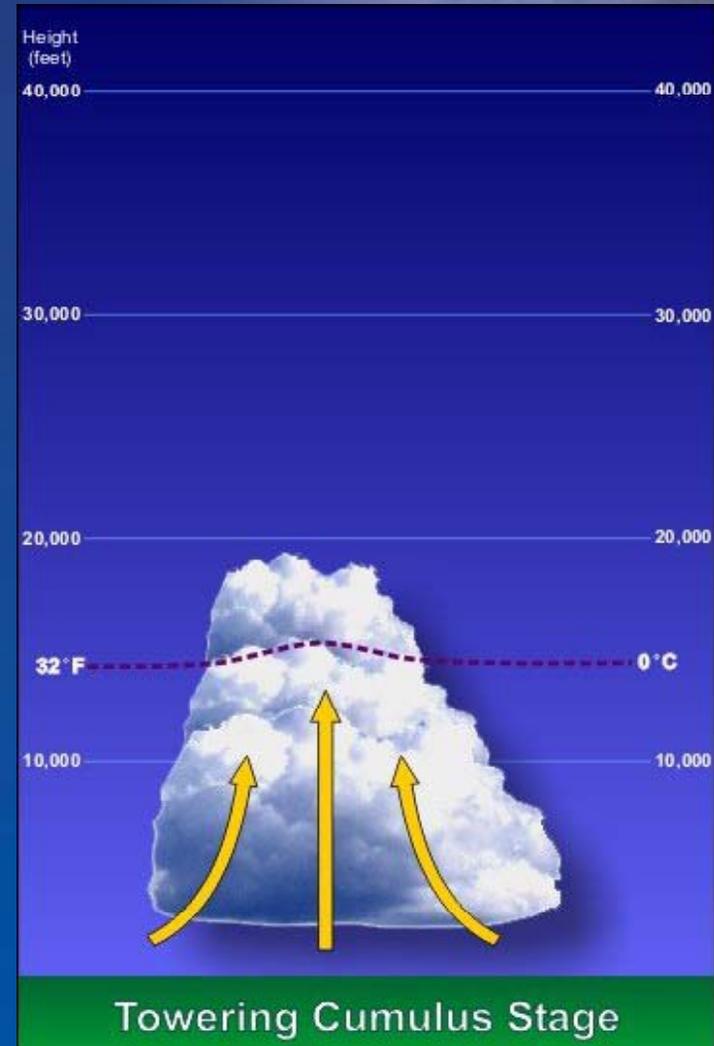
- Tornado
- Winds at least 58 mph or reports of wind damage
- Hail at least 1 inch in diameter



Thunderstorm Life Cycle

Towering Cumulus - Developing

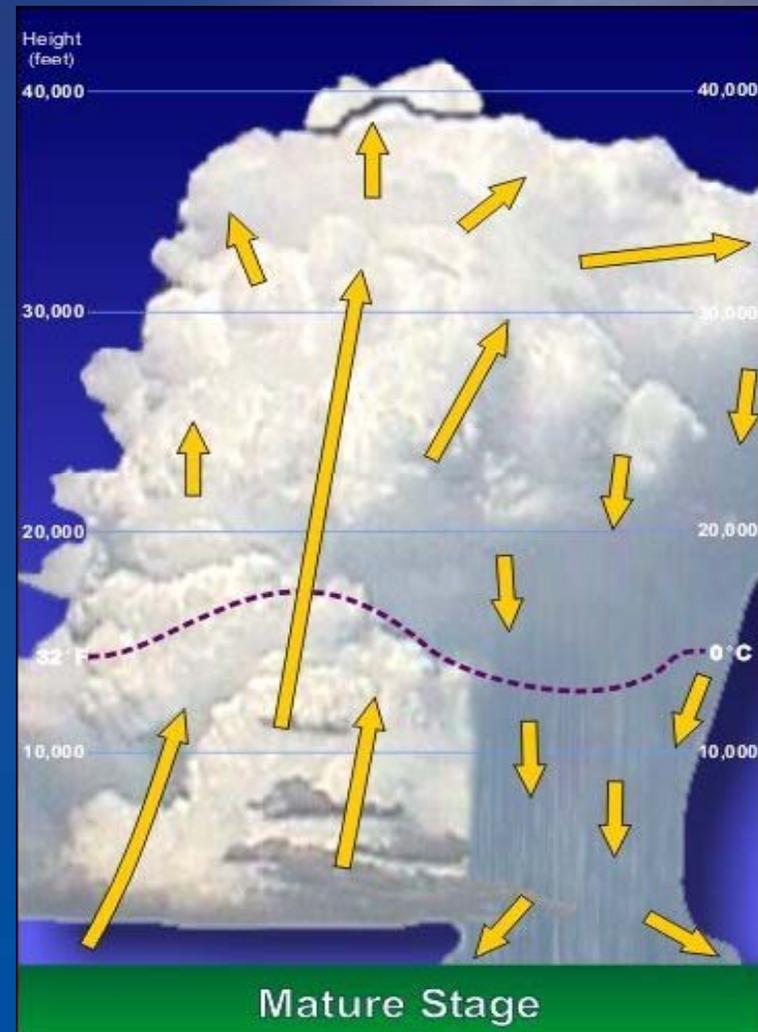
- Towering, billowy bright white clouds
- Dominated by updraft – rising air
- Lasts 10-15 minutes
- Little rain, but lightning possible



Thunderstorm Life Cycle

Mature Stage

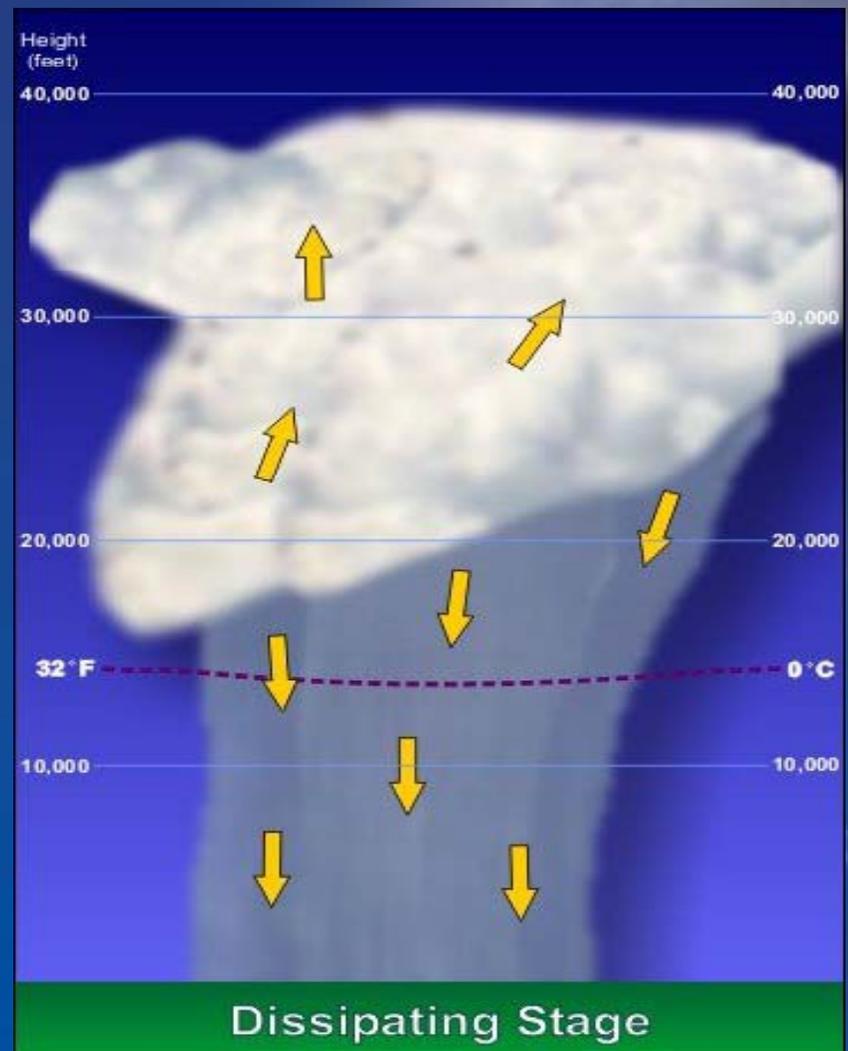
- The weather stage
- Hail, heavy rain, lightning, strong winds, tornadoes
- Anvil at storm top
- Rising air/falling rain (updraft/downdraft)
- Typically lasts 10-20 minutes



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



Observing Upper Level Storm Clues

Viewed 30-40 miles from storm

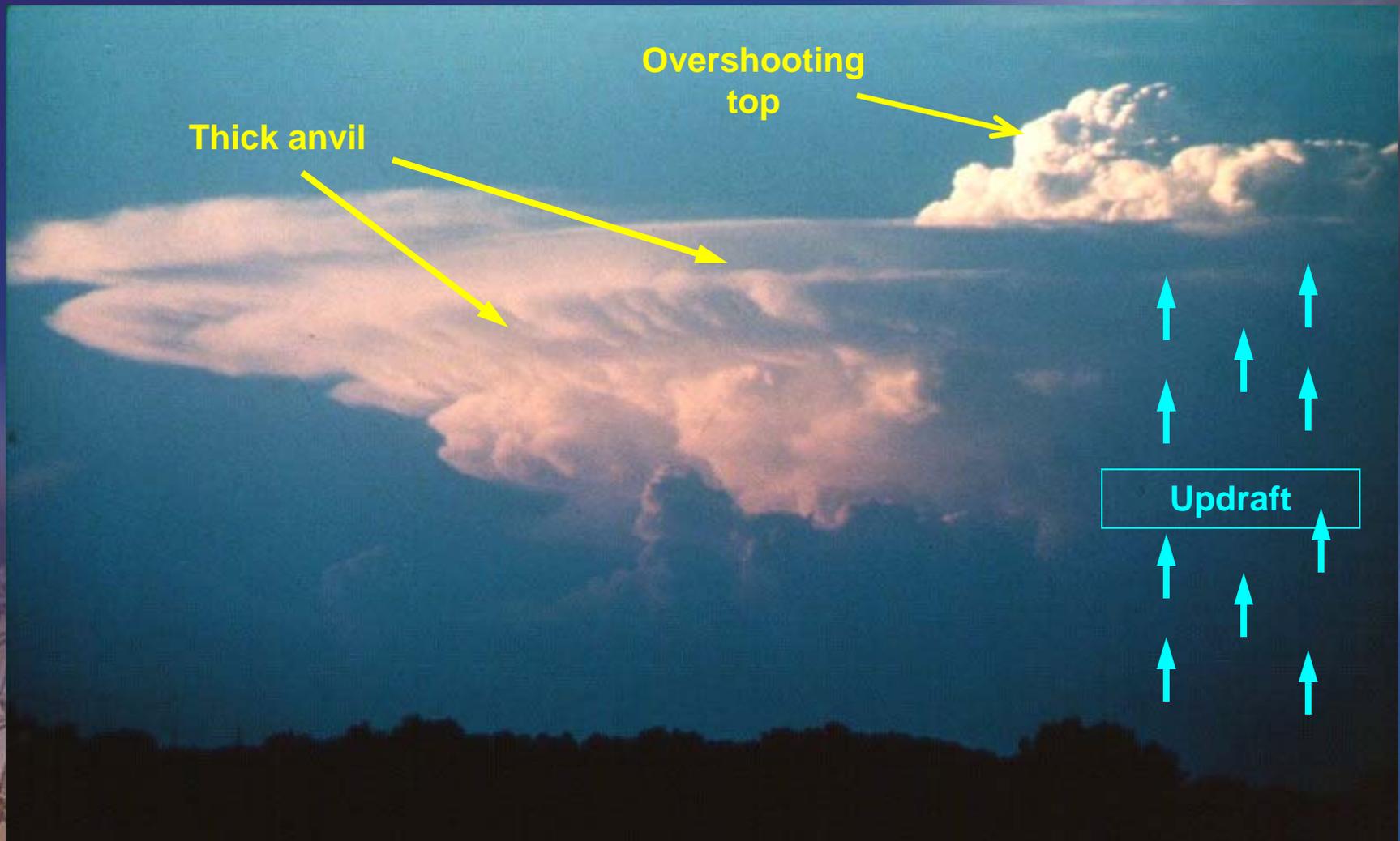
- **Overshooting Top**

- Dome-like bubble of cloud extending above anvil and persisting for >10 minutes
- Results from updraft punching through anvil
- Indicates strong to severe updraft

- **Anvil characteristics**

- Thick, cumuliform anvil with sharp, well-defined edges
- Results from air rapidly spreading away from updraft at summit of storm
- ‘Bubbling’ look

Intensity clues – Overshooting Top



Intensity Clues - Anvil



Well defined anvil

- Sharp edges
- Thick appearance
- Bubbly look

Wispy Anvil

- Ill-defined edges
- Thin appearance
- Sunlight shining through



Intensity clues - Updraft

Viewed 10-20 miles from the storm



Strong updraft

Hard cauliflower appearance

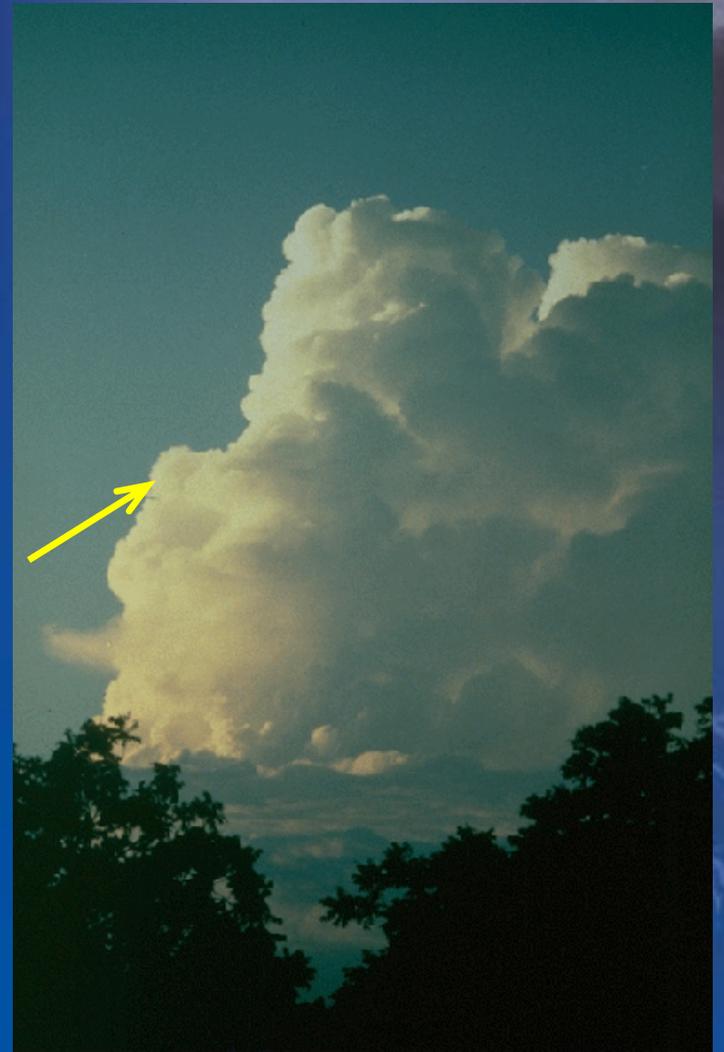
Vertically upright

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



- **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 - Microburst

- **Microburst** – An intense downdraft from a thunderstorm with an outrush of damaging wind
- Forms when a pocket of cold air develops within a thunderstorm, then rushes downward to the surface
- Winds can exceed 100 mph
- Frequently areas of virga indicate downburst potential



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
 - ~ 70 MPH - Heavy to severe structural and tree damage
- Report immediately:
 - Wind damage
 - 50+ mph winds



Salt Lake County - September 4, 2007

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”



Reference hail size in inches or relate it to the size of a coin.



**Quarter
(1 inch)**



Nickel



**Penny
(3/4
inch)**



**Dime
(11/16
inch)**

A Closer Look

Supercells, Tornadoes, Funnel Clouds, and Wall Clouds



Dunlap, IN - April 11, 1965

Yes...Tornadoes Do Happen in Utah!



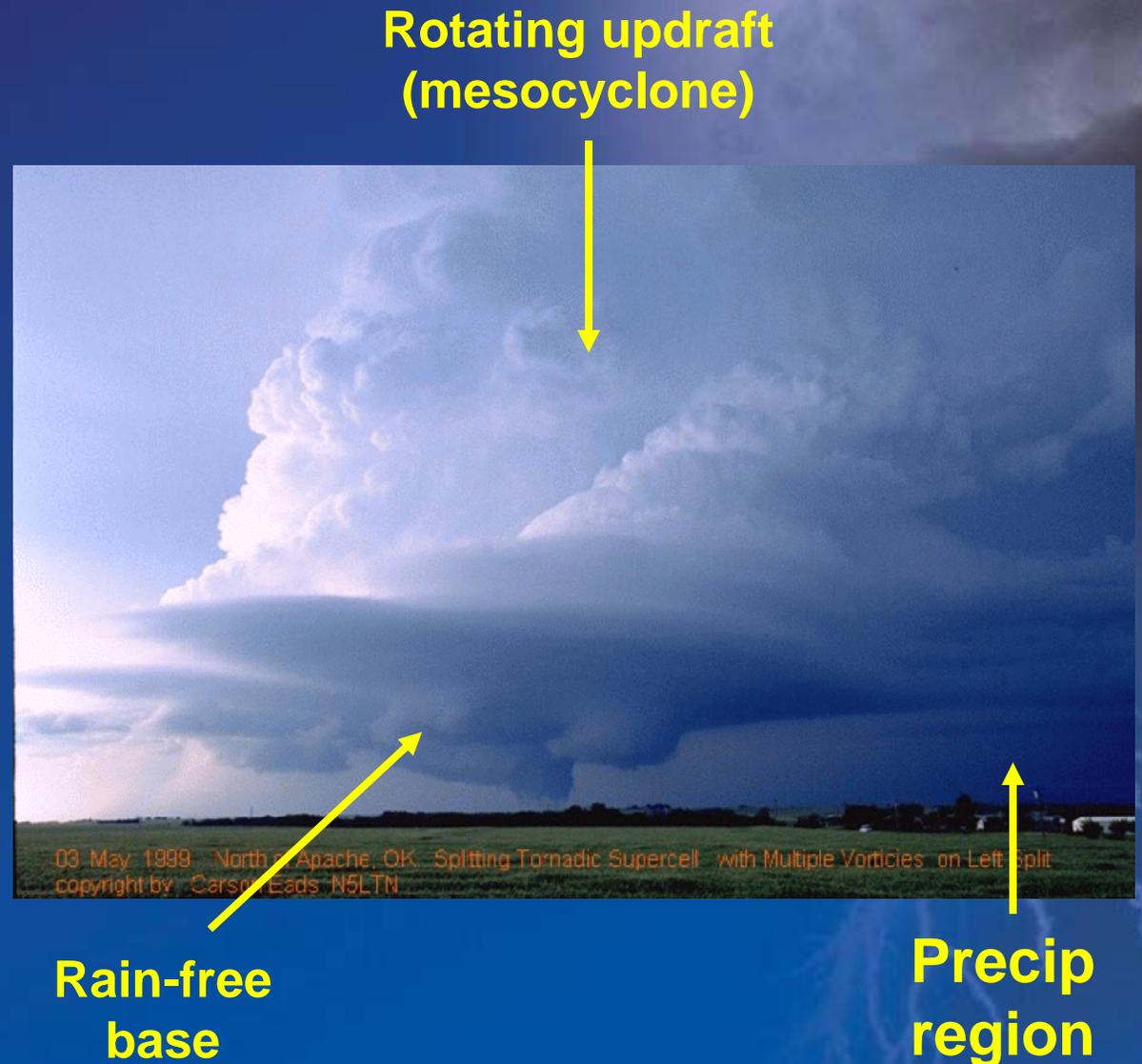
**Salt Lake City
August 11, 1999**



**Manti
September 8, 2002**

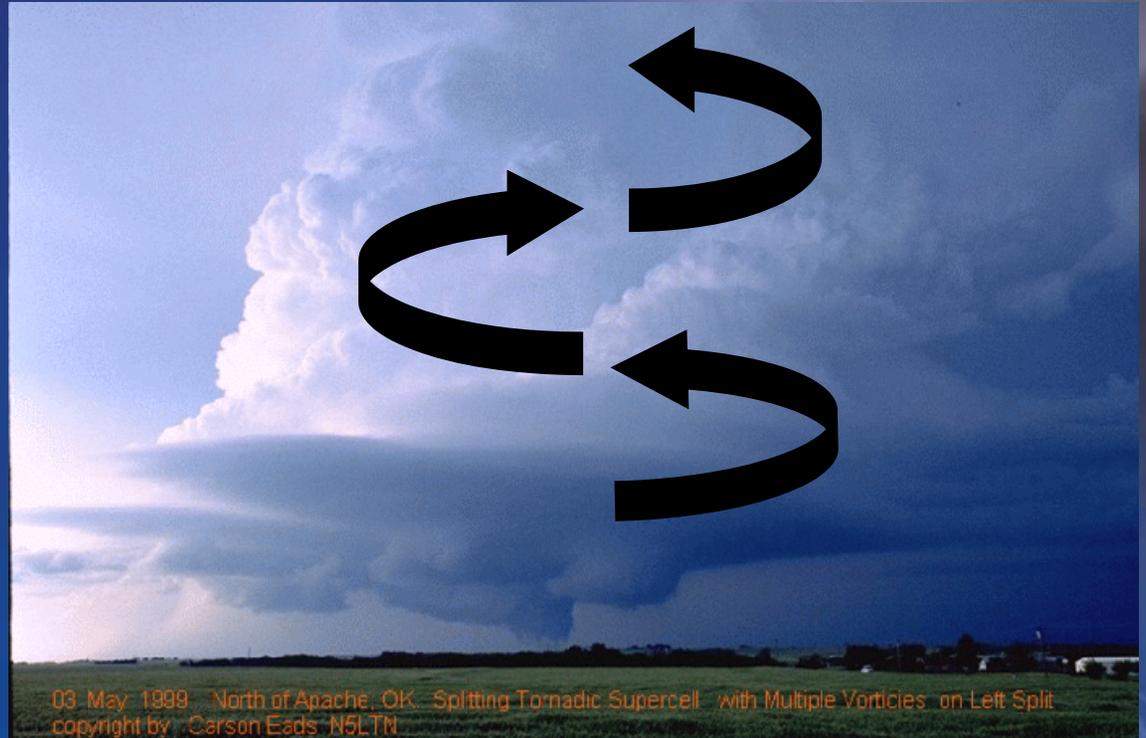
Fundamental Definitions – Supercell Thunderstorm

- **Supercell** – A thunderstorm with a persistent rotating updraft (mesocyclone)
- Almost always severe with large hail, damaging winds, and tornadoes
- Updraft separated from downdraft and precipitation, allowing storm to persist for an hour or more



Fundamental Definitions - Mesocyclone

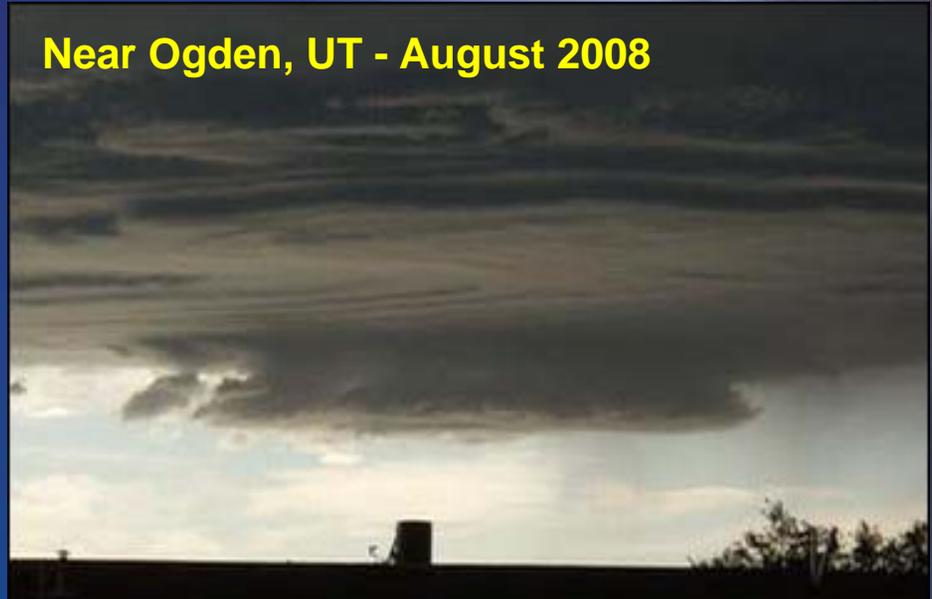
- **Mesocyclone** – A storm-scale region of rotation within the updraft region of a supercell thunderstorm



Fundamental Definitions – Wall Cloud

- **Wall Cloud** - An isolated lowering under a rain-free cumulonimbus cloud base, resembles a pedestal.
- Persistent (5-10 minutes) and often rotating
- Can precede funnel cloud and tornado formation

Near Ogden, UT - August 2008



Shelf Clouds vs. Wall Clouds

Shelf Clouds



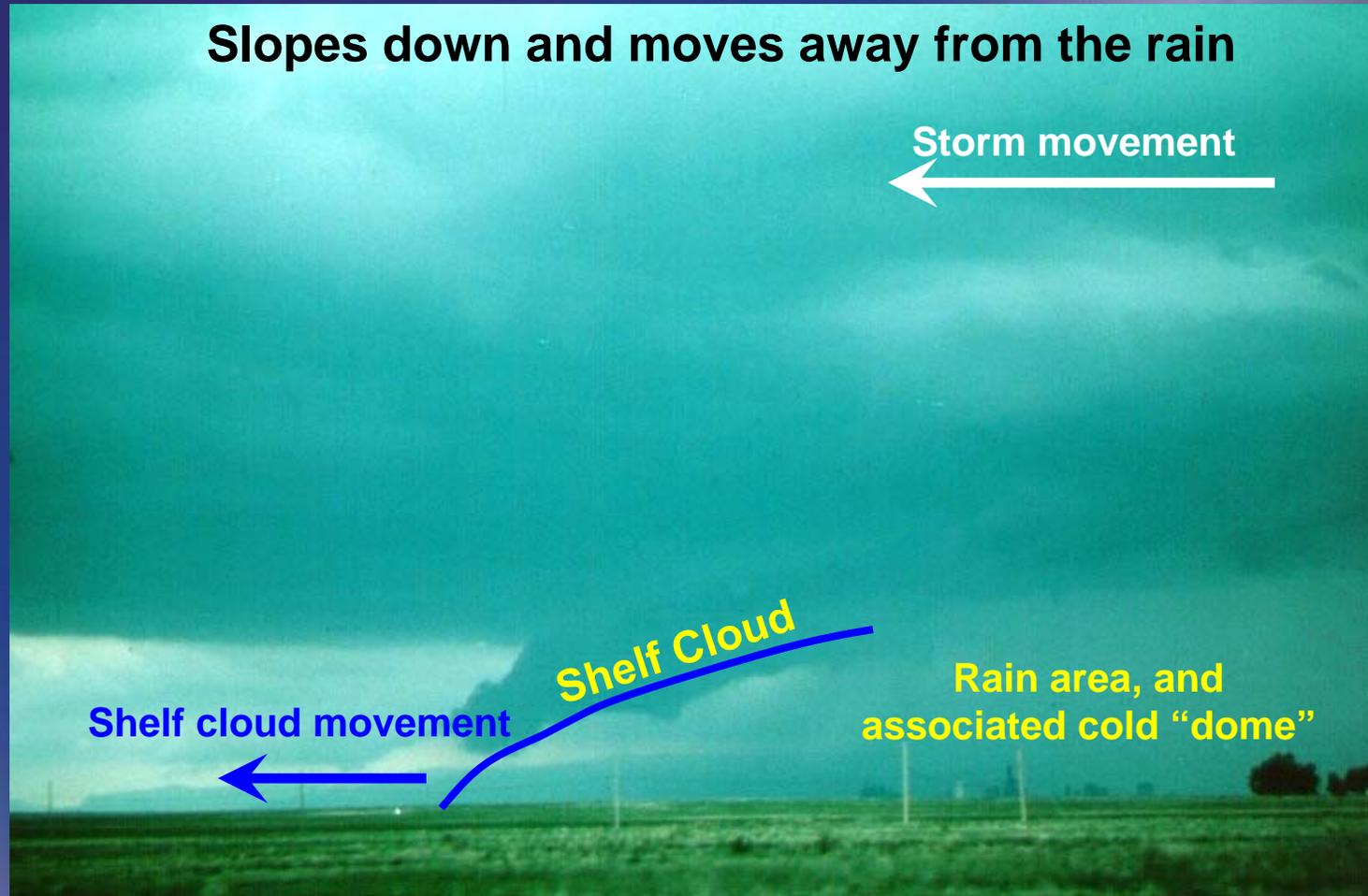
- Suggest downdraft/outflow
- Move away from precipitation areas
- Horizontally orientated and can extend for miles, may 'roll' like a rolling pin

Wall Clouds



- Suggest updraft/inflow
- Maintain position with respect to precipitation
- Isolated, vertically orientated, *and rotating, like a spinning skater*

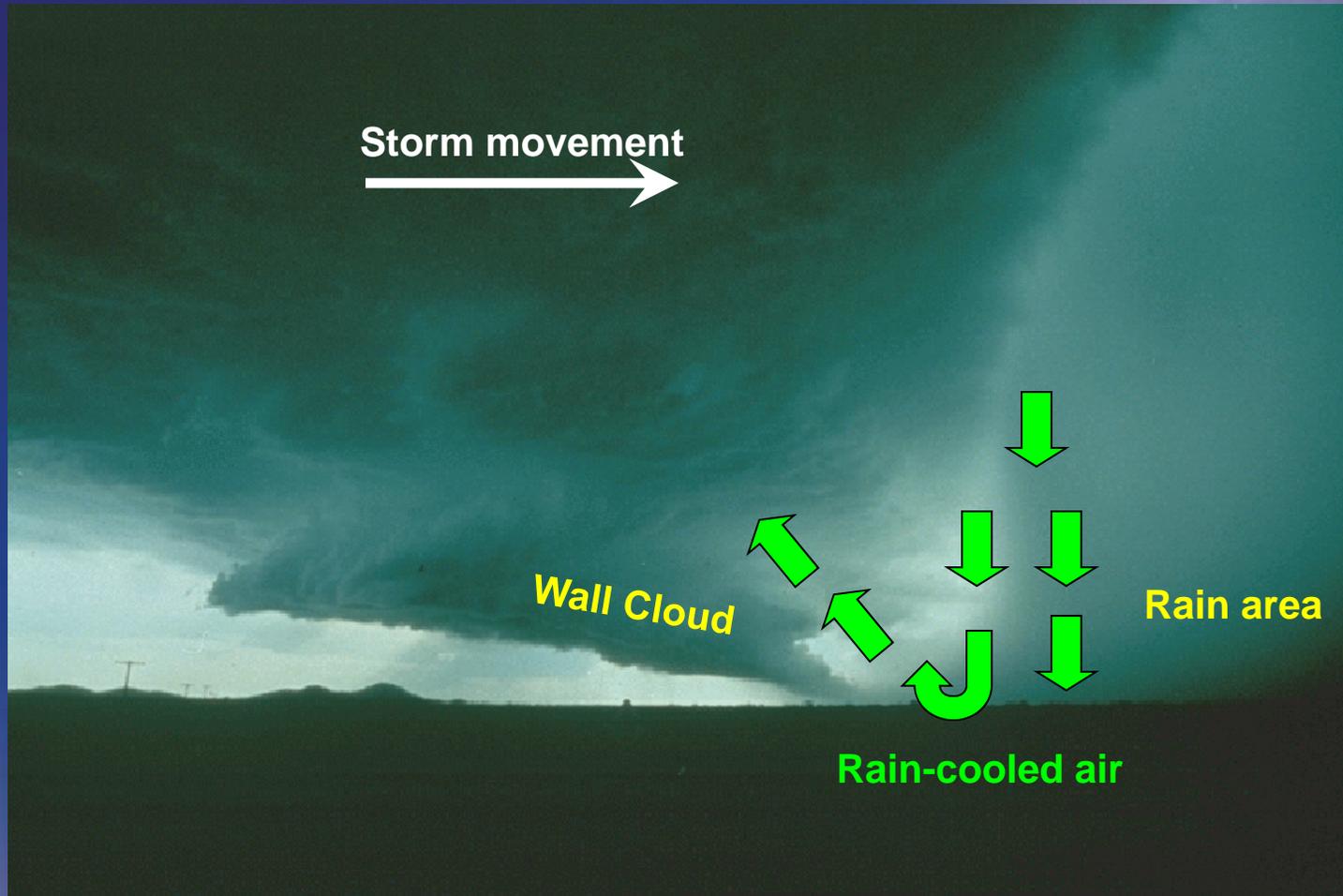
Shelf Cloud



The Shelf Cloud develops along the edge of a dome of rain-cooled air. It moves away from the area of rain, is the leading edge of the wind shift

Wall Cloud

Slopes up and holds position with respect to area of rain



The wall cloud develops from rain cooled air being lifted back into the updraft. It maintains its position with respect to the area of rainfall

Fundamental Definitions – Funnel Cloud

- **Funnel Cloud** - A violently rotating column of air, extending downward from the base of a thunderstorm that does not reach the ground
- No circulation is seen on the surface.

Near Milford, UT
May 2009



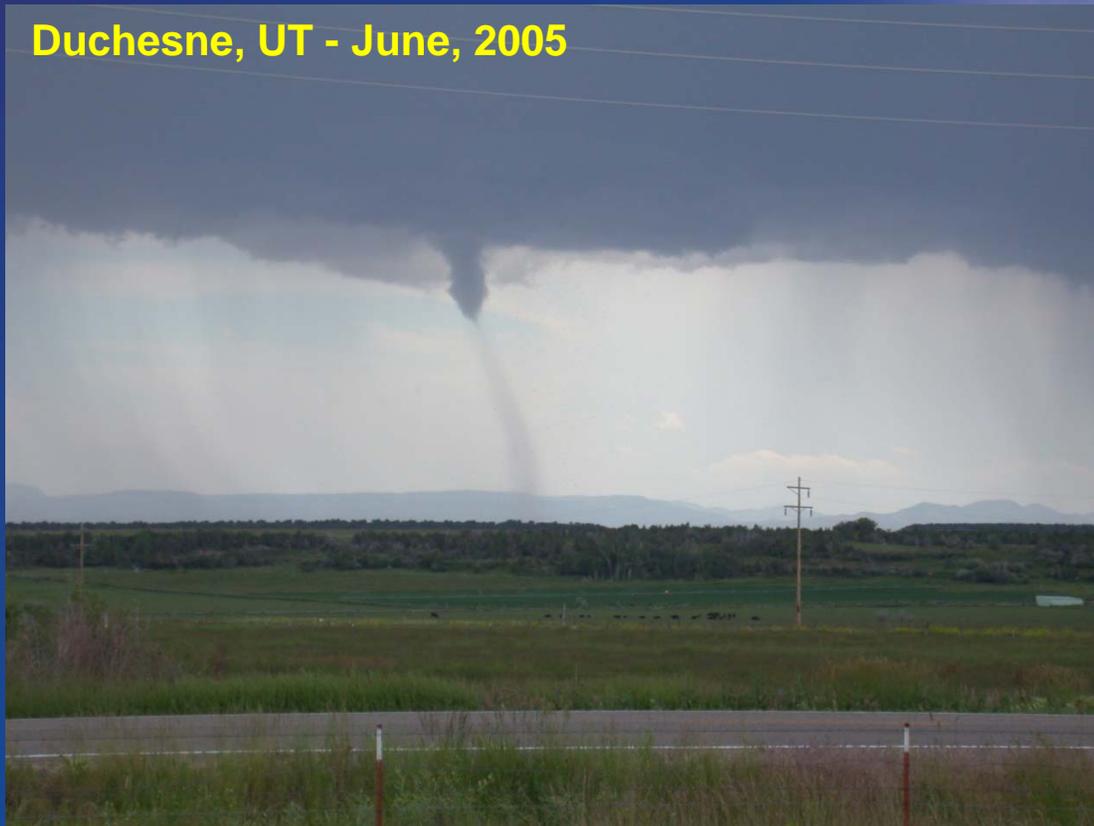
Fundamental Definitions - Tornado

- **Tornado** - A violently rotating column of air extending from the base of a severe thunderstorm to the ground



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** - 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



- **Virga** - Rain falling from clouds, but evaporating before reaching the 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, UT - 2007

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

Lightning Safety

- Monitor NOAA Weather Radio All Hazards, your favorite news source, and/or NWS web sites for vital weather information
- Keep an eye on the sky and listen for the sound of thunder

If you can hear thunder, go to a safe shelter immediately!

- If you can't get to a safe shelter, stay away from trees and other tall objects
- Avoid leaning against vehicles
- Get out of or off the water



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

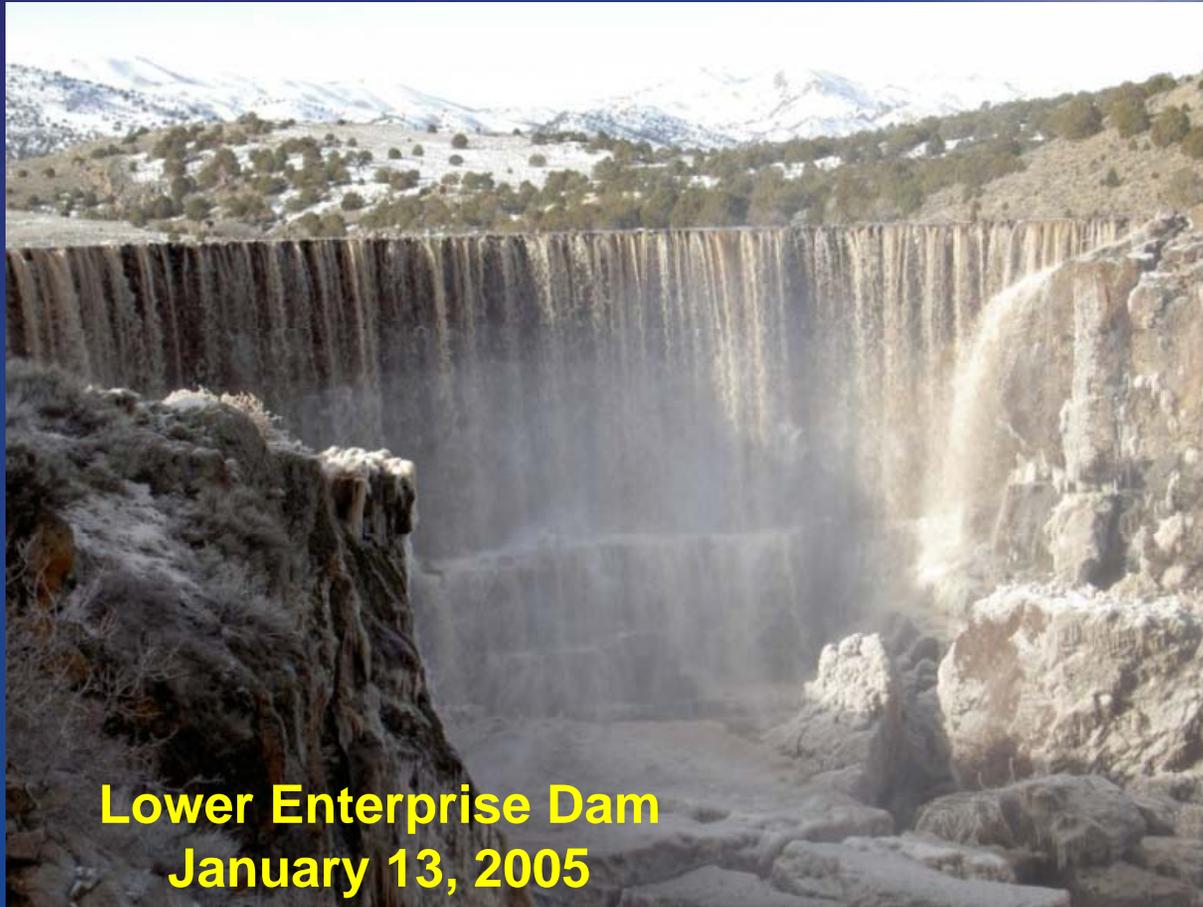
Remember...

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 Terms

What to watch for

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



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

Twitter

www.wrh.noaa.gov/slc/twitter/twitter.php

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*



Photo Courtesy Chris Maier

Contact WFO SLC

Kevin Barjenbruch
Warning Coordination Meteorologist
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

Thanks for coming – you've weathered the storm!



Questions?