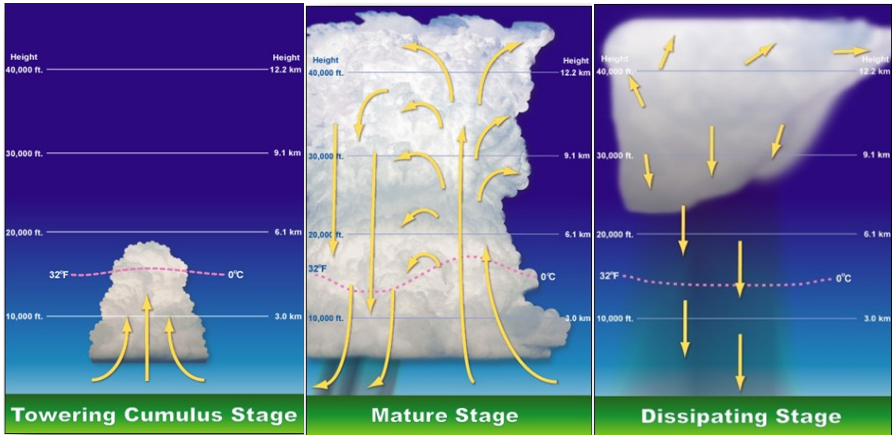
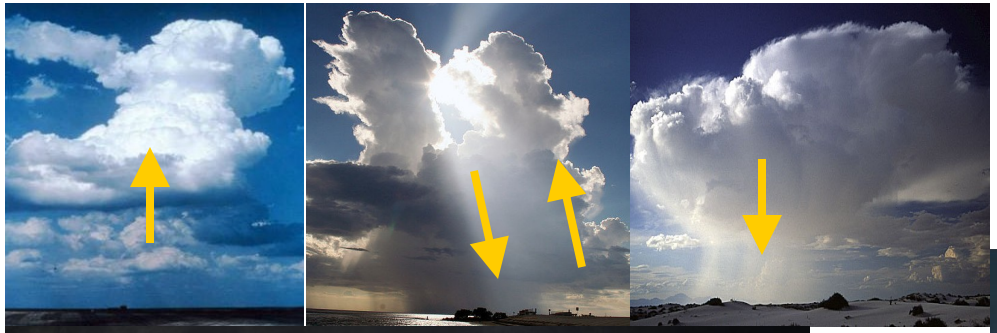
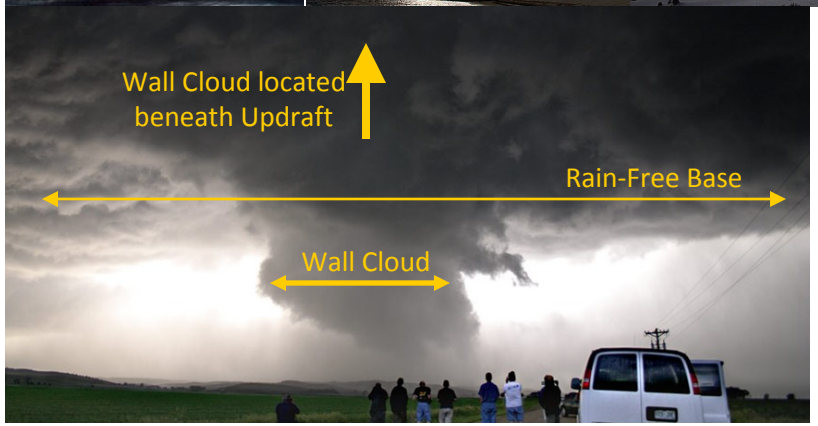
Spotter Reference Guide

Thunderstorm Basics



Updraft Dominant | **Downdraft/Updraft** | **Downdraft Dominant**

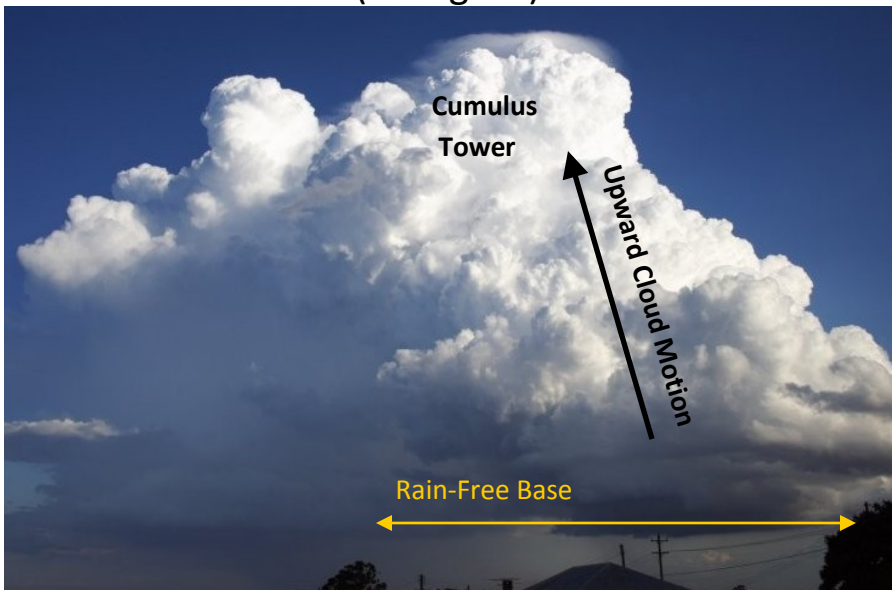




Wall Clouds Can Occur with
Severe and Non-Severe Storms

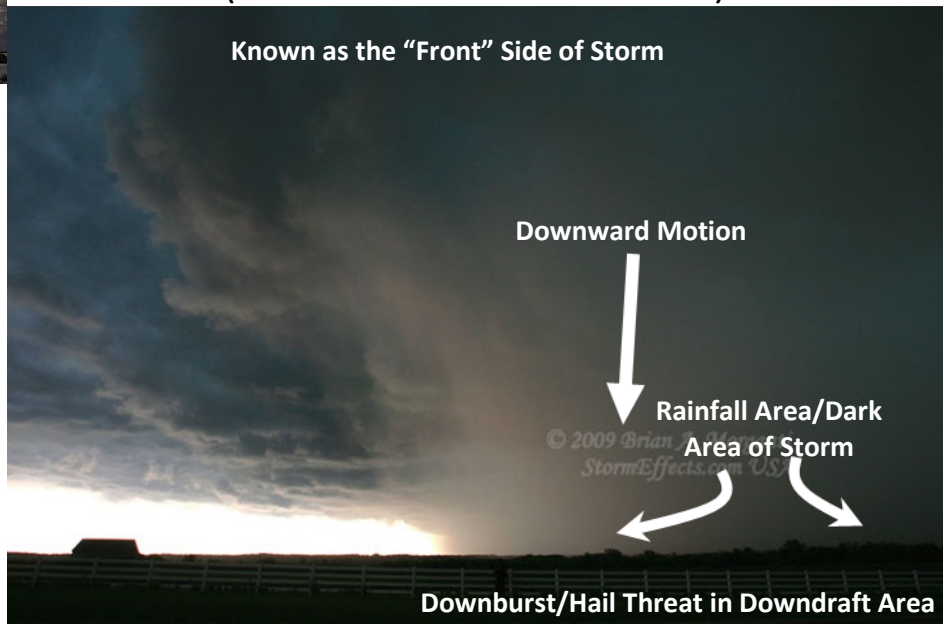
Updraft Characteristics

(Rising Air)

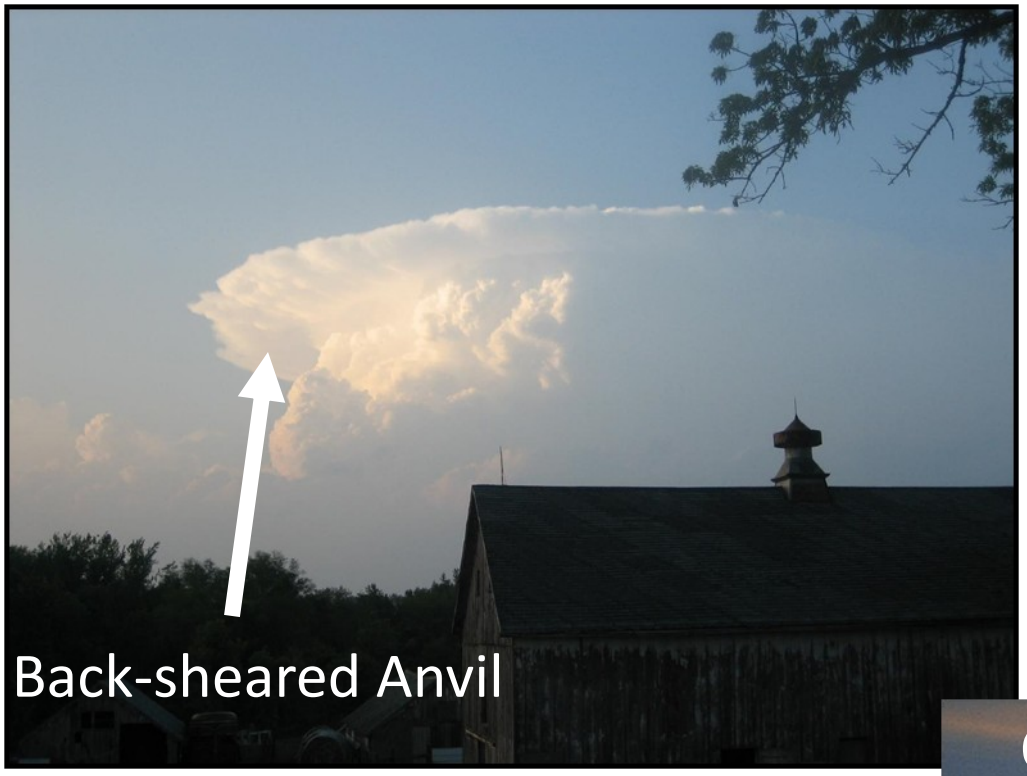


Downdraft Characteristics

(Air Descends to the Ground)



Severe Thunderstorm Updrafts at a Distance



- **Hard, Solid appearance**, ***not thin or wispy***
- ***Thunderstorm anvils (top of the storm) are often back-sheared***

- **Overshooting tops are often associated with severe thunderstorm anvils**

Thunderstorm Types which impact Iowa

Courtesy Rod Donavon

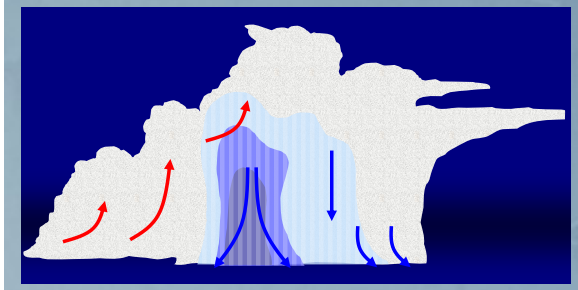
Courtesy Mindy Beerends

Shelf Cloud

- Wedge shape cloud (attached)
- Leading edge of storm
- Suggests outflow (downdraft)

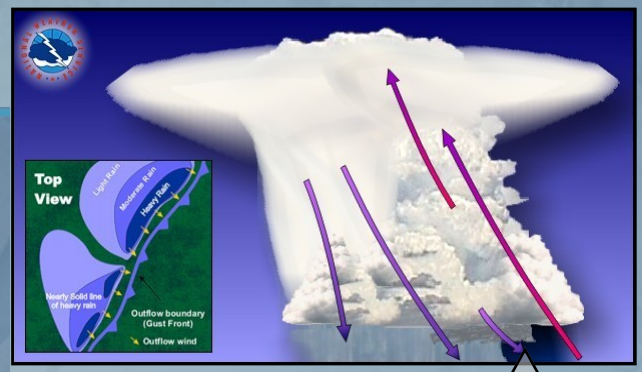
Multi-Cell Clusters

- Severe or non-severe
- Common in Iowa
- Updrafts tend to be concentrated on the south side of the complex
- Produce the most flash flood events



Multi-Cell Cluster Diagram

Squall Lines



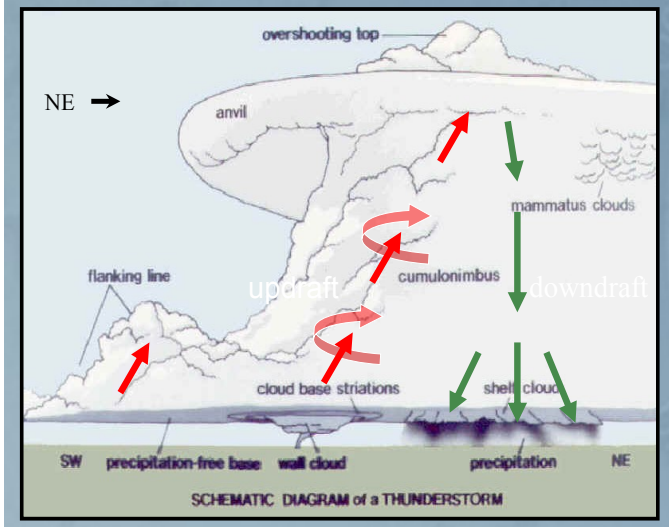
- Damaging winds (Primary threat)
- Heavy rain
- Hail
- Weak tornadoes

Storm Movement

Shelf Cloud

Thunderstorm Types which impact Iowa (cont.)

Courtesy Extreme Instability



Supercell Thunderstorm

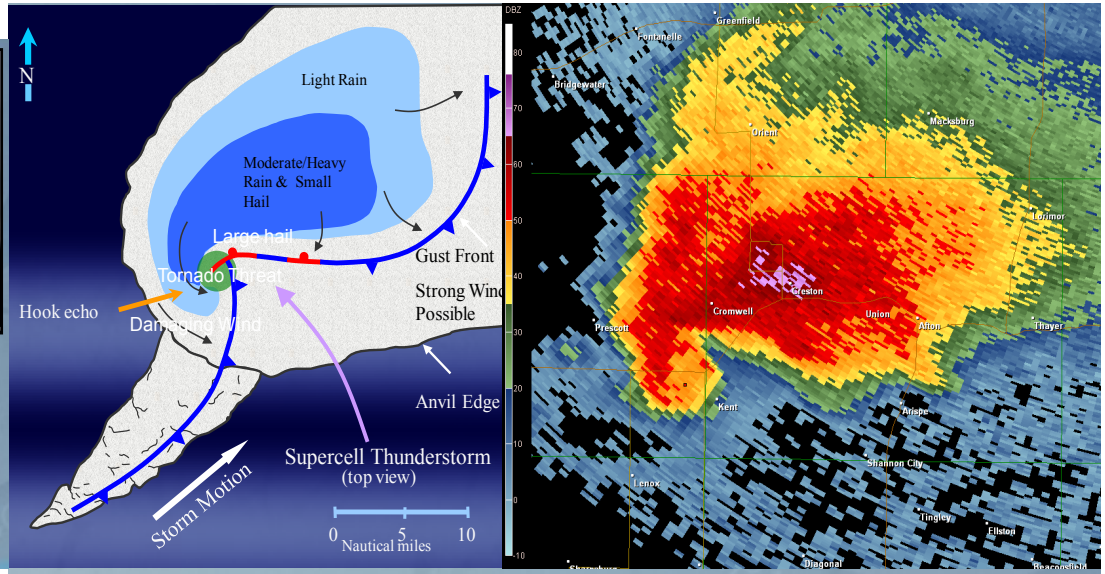
Supercell Characteristics

- Persistent rotating updraft through a great depth of the storm
- Typically counter-clockwise rotation looking into storm from some distance
- Responsible for a high percentage of severe weather

Courtesy extremeinstability.com

Visual Rotation Clues

Spiral bands and striations in updraft tower are clues that the updraft is rotating



"Classic" Supercell

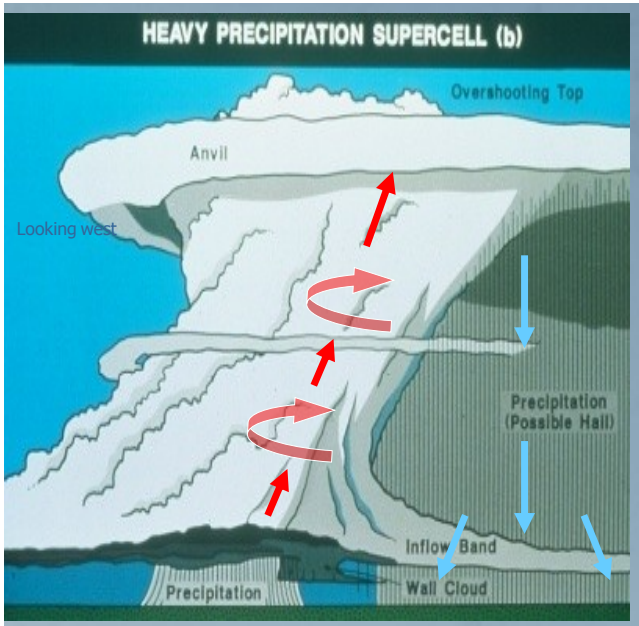
Rotating Updraft on the LEFT REAR Flank of the Storm

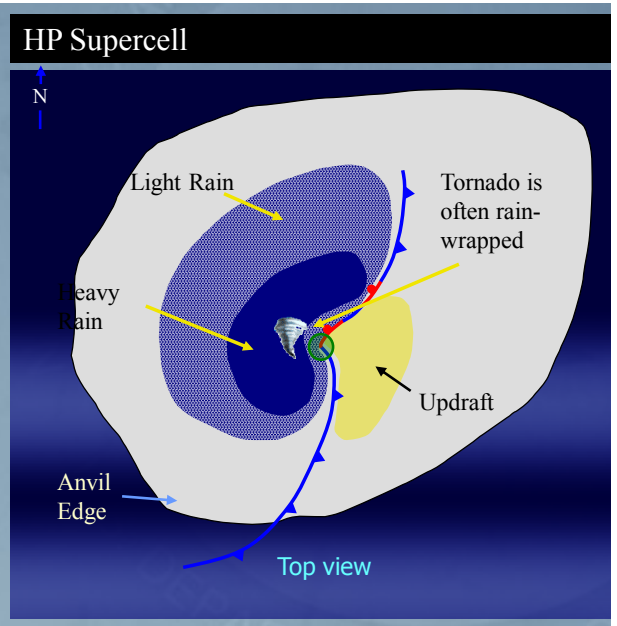
High Precipitation (HP) Supercell

Courtesy extremeinstability.com

Mid-level updraft striations are common in HP supercells

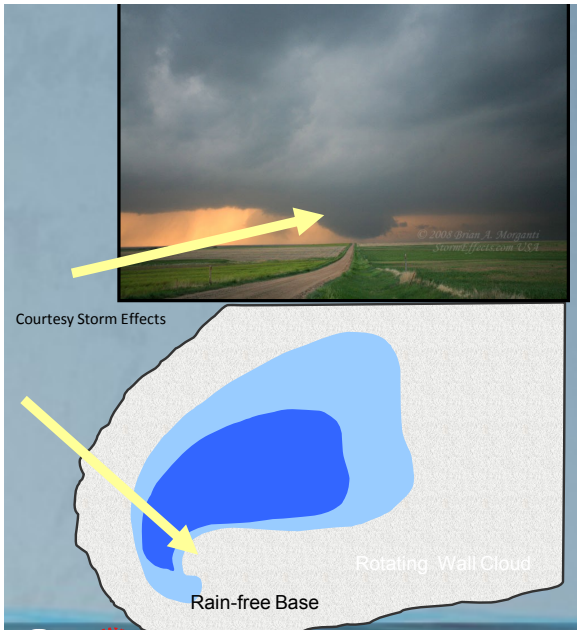
- **HP Supercells are common in Iowa**
- **HPs are difficult to spot due to large amount of precipitation**
- **Close observation dangerous due to obscuration**





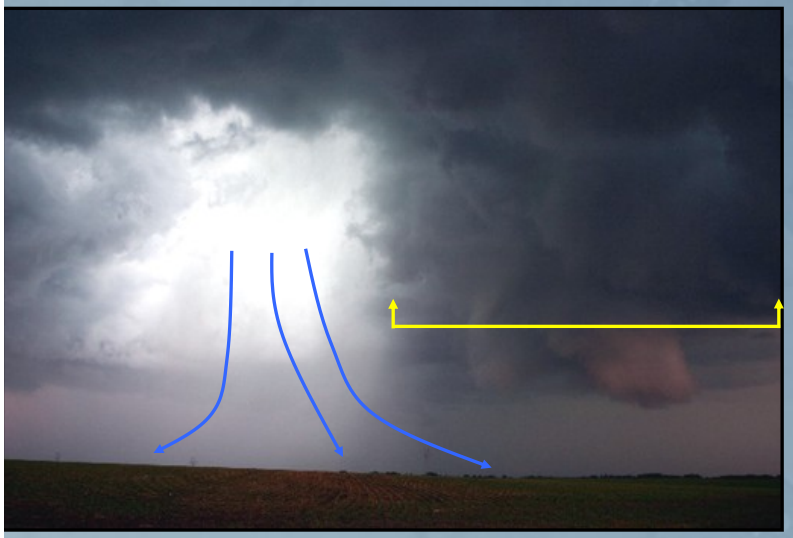
Generally, there is not a good spot to view this type of storm since important features are often rain-wrapped

Tornado Pre-cursors: Clouds and Conditions



Supercell Wall Cloud Characteristics

- Localized, persistent lowering of the rain-free base
- *Usually long lived and rotating*
- Upward vertical motion often present
- Usually forms close to the updraft/downdraft interface



Courtesy Simon Brewer

Rear Flank Downdraft or "Clear Slot"

Visually the RFD shows up as a "clear slot" southwest of the wall cloud

Often form just before a tornado!

- **Rotating Wall Clouds**
- **Clear Slot**
- **Funnel Clouds**

Funnel Clouds

- A rotating, funnel-shaped cloud extending downward from a thunderstorm base
- Attached to cloud base
- Exhibit rapid rotation and are most often laminar or smooth in appearance
- Do not reach the ground
- Usually vertically-oriented

Large Tornado - Large, violent tornadoes often resemble a “wedge.” They can be mistaken for a large cloud at close distances. (Parkersburg - May 2008)

Classic Tornado - easier to spot, these tornadoes are not rain-wrapped. They often resemble an elephant trunk.(Southern Iowa - June 2010)

Landspout Tornado - common in Iowa. These tornadoes tend to be small and short-lived. They are not associated with a supercell updraft.

Rain-Wrapped Tornadoes are especially dangerous. They are common with HP Supercell thunderstorms.

Tornado Reporting Guidelines

- Who? (spotter number/source)
- What? (funnel or tornado)
- Where? (reference nearest city):
  - Can use Latitude/Longitude
- When? (time of event)
- Movement (direction and speed)
- Damage?
- Use Proper Terms and be as specific as possible

Invisible Condensation Funnel - it is still a tornado! Watch for dust or debris under the funnel cloud

False Tornadoes

Scud - can occur under any thunderstorm base. Cloud fragments that can look ominous and can resemble a tornado.

Gustnado - are not attached to the cloud base (extend to the cloud base), they are not tornadoes. They occur along gust fronts.

- "Virga" - Rain not reaching the ground
- Rain Shafts - Downdrafts which can resemble tornadoes

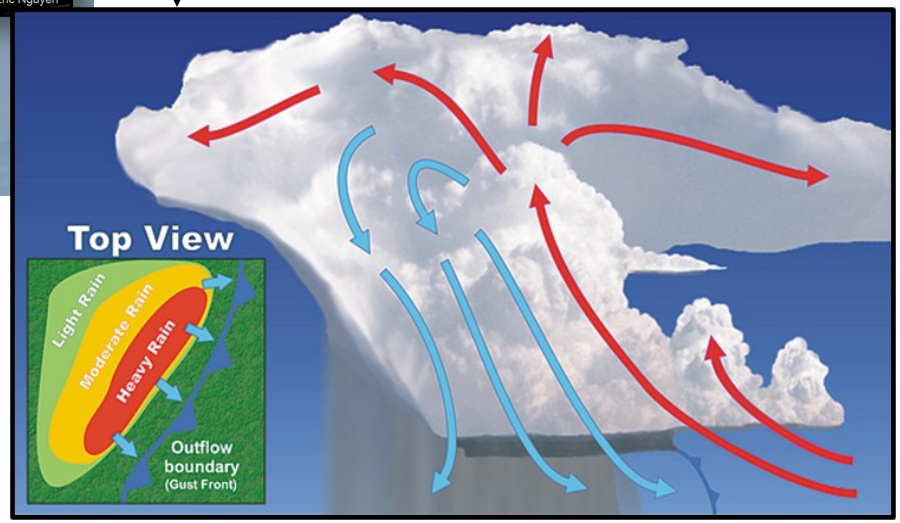
Courtesy Mike Zeamer

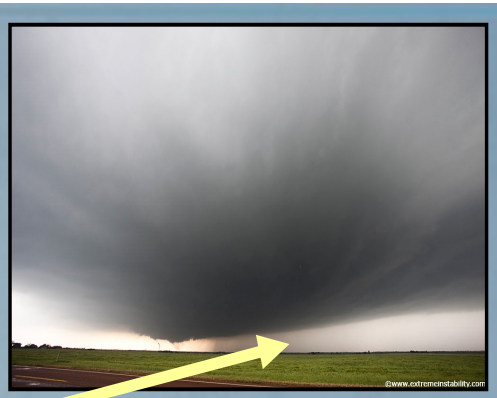
Rain or Dust Foot

A rain or dust foot suggest localized intense winds

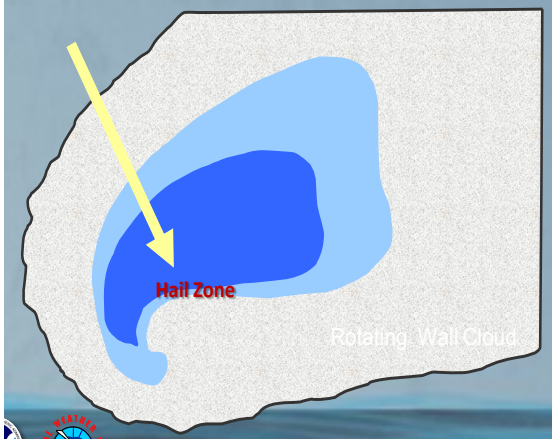
Damaging Winds:

- Small Scale (winds can exceed 80 mph):
  - Brief high winds events over a small area
  - Associated with small, but intense downdrafts
- Large Scale (winds can exceed 90 to 100 mph):
  - Extreme wind events over a large scale
  - Can cause widespread damage
  - Associated with "squall lines"





Courtesy Extreme Instability

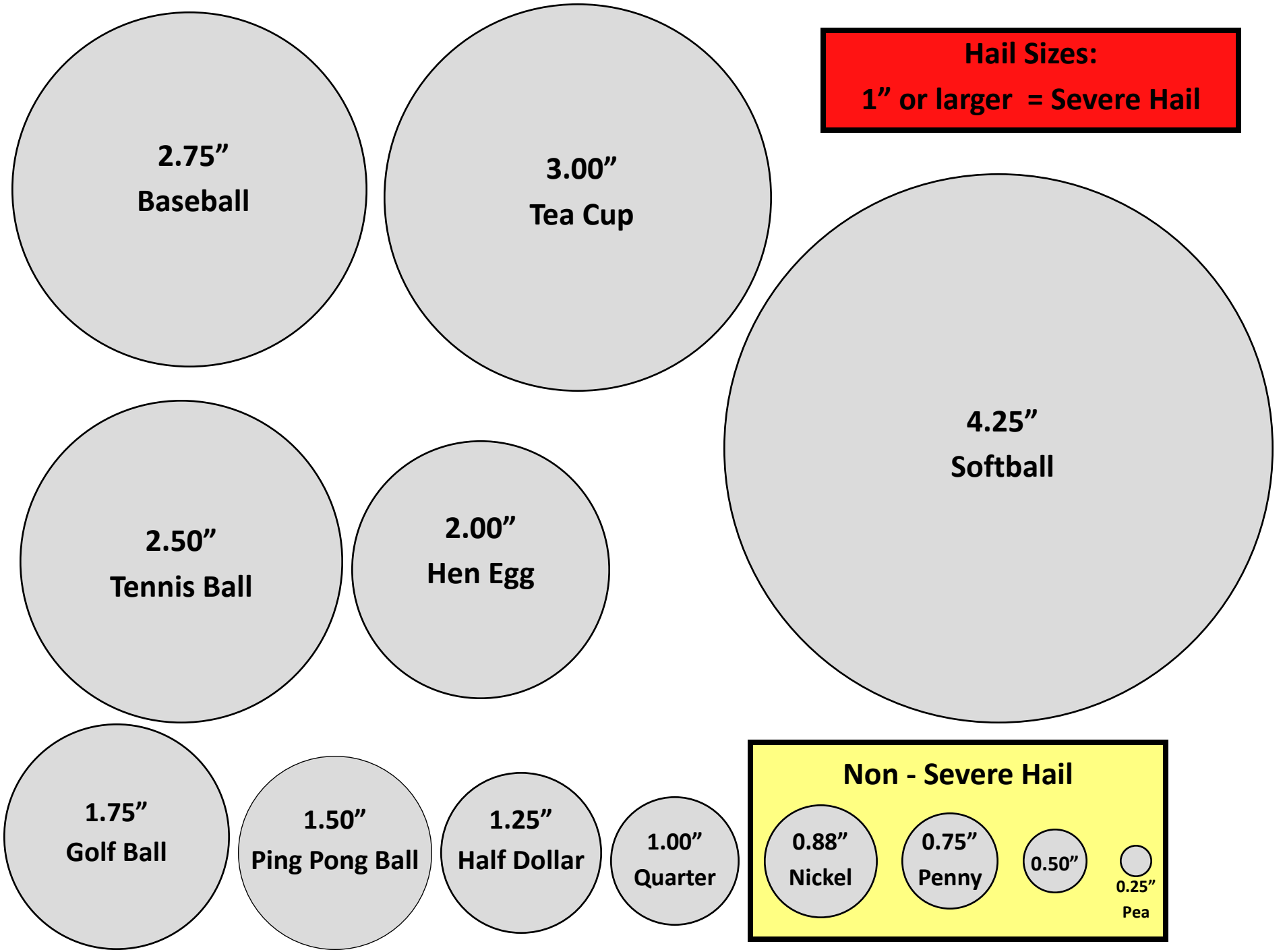


Large Hail:

- Large and destructive hail is almost always associated with a supercell thunderstorm
- Occurs in the downdraft
- Large hail is common near the updraft/downdraft interface

Courtesy Will Hark

A hail shaft can occasionally be seen as a white area in the downdraft


Hail Sizes:
1” or larger = Severe Hail
2.75”
Baseball
3.00”
Tea Cup
4.25”
Softball
2.50”
Tennis Ball
2.00”
Hen Egg
1.75”
Golf Ball
1.50”
Ping Pong Ball
1.25”
Half Dollar
1.00”
Quarter
Non - Severe Hail
0.88”
Nickel
0.75”
Penny
0.50”
0.25”
Pea

Severe Weather Reporting

Flash Flooding:

- Rainfall Measurements during heavy rain events
- Creeks, Rivers, or Streams out of their banks
- Water covering roads or affecting property
- Additional Details:
    - Is the water standing or flowing?
    - Estimated Depth of water

Damaging Winds/Hail*:

- Who?
- What? (damage and/or measured speeds over 40 mph)
- Where? (reference nearest city)
    - Can use latitude/longitude
- When? (time of event)

- * Do not use the term “marble” to report hail!

Additional Items to Report:

- Snow Amounts
- Ice Amounts
- Blizzard Conditions
- Bad Roads
- Ice Jams

Spotter Safety

Overall Spotter Safety:

- Keep an eye to the sky
- Prepare for all hazards
- Watch for lightning
- Watch for flash flooding
- Drive smart & safely
- Use common sense

Severe Thunderstorm Safety:

- Watch out for Severe Thunderstorm Winds
- Watch out for Large Hail
- Avoid downdraft area of storm
- Updraft/Downdraft interface is a dangerous location

Lightning Safety:

- Avoid tall objects
- Be careful on ridge tops or in open areas
- Stay in vehicle if mobile
- Hear Thunder? You are at risk!

Tornado Safety:

- Situational Awareness
- Seek sturdy structure
- Have an “escape” route
- Avoid “tunnel vision”
- Night spotting is very dangerous!
- If your car is struck by even a weak tornado your life is in danger!

Flash Flood Safety:

- #1 weather-related killer in the country!
- Turn Around, Don’t Drown!
- Be Mindful of:
    - Heavy thunderstorm rain
    - Wet, saturated soils
    - Quicker impact in steep terrain