

# Skywarn Storm Spotter Volunteer Training

NATIONAL WEATHER SERVICE PHOENIX

*Southeast California, Southwest Arizona, South-Central Arizona*



*Working Together to Protect Lives and Property*

Chris Frailey

# What You'll Learn From This Training

*NWS Services  
&  
Information Sources*

*How to Recognize  
Hazardous  
Weather in Your  
Community*

*How to Report  
These Conditions*

*Working Together to Protect Lives and Property*

# Who is the National Weather Service?



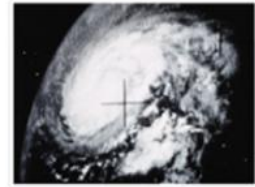
## Our Mission

Provide weather, water, and climate data, forecasts and warnings for the **protection of life and property** and enhancement of the national economy.

## Our Vision

A Weather-Ready Nation

*Protecting Life and Property for 150 Years.....*



*Established on  
October 1, 1890  
as the U. S. Weather Bureau*

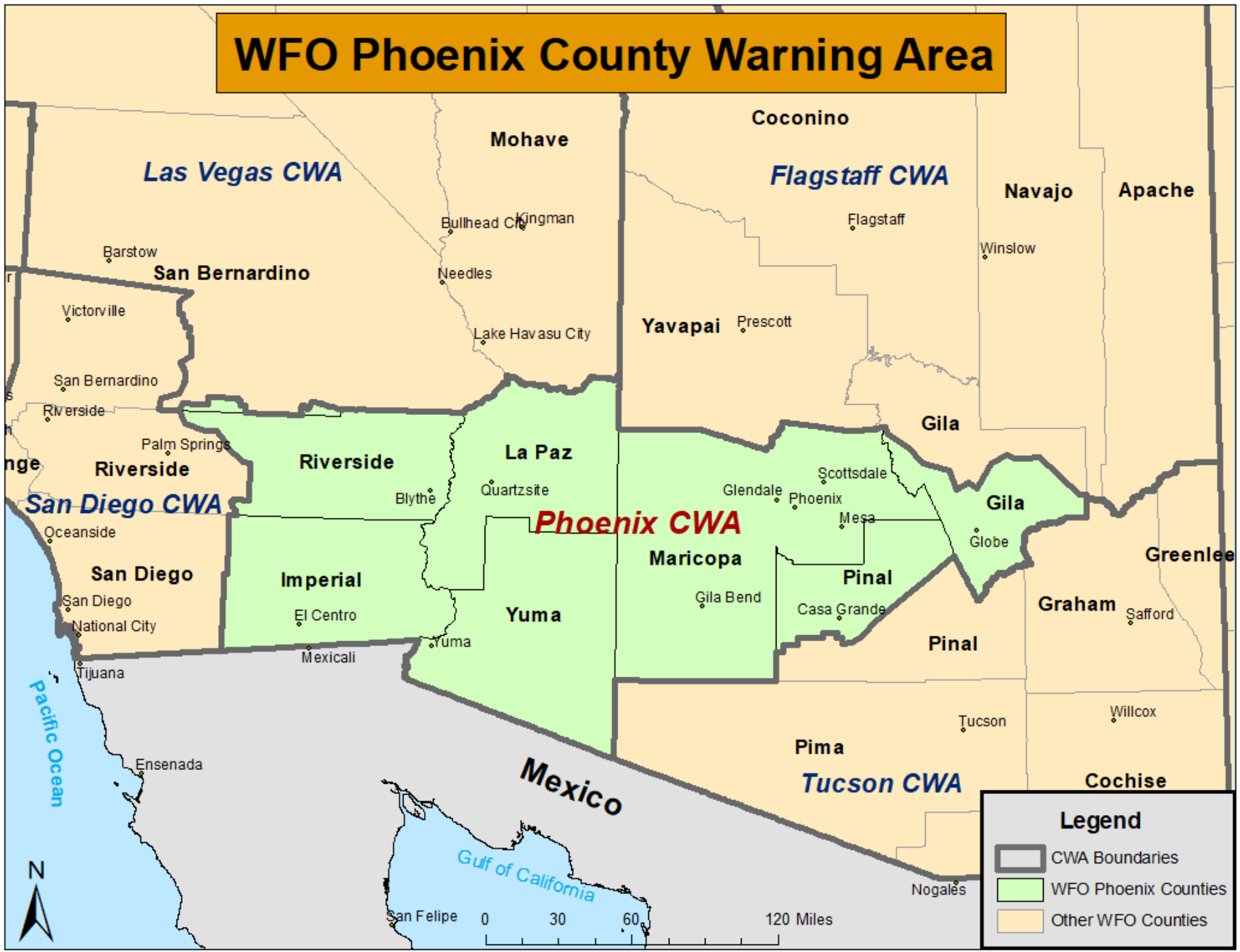
*Became National Weather  
Service on April 22, 1970*

# NWS Weather Forecast Offices

National Coverage 24/7 365



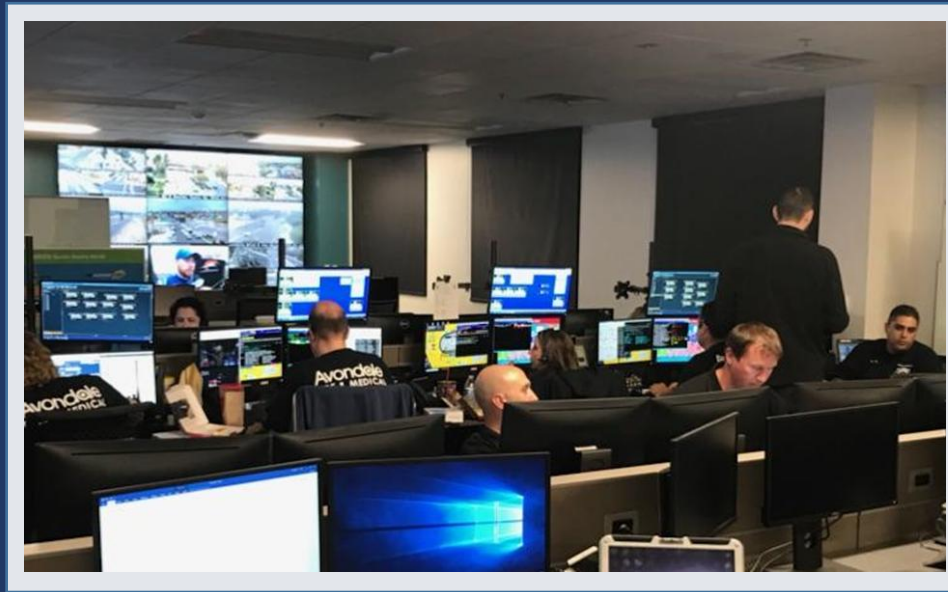
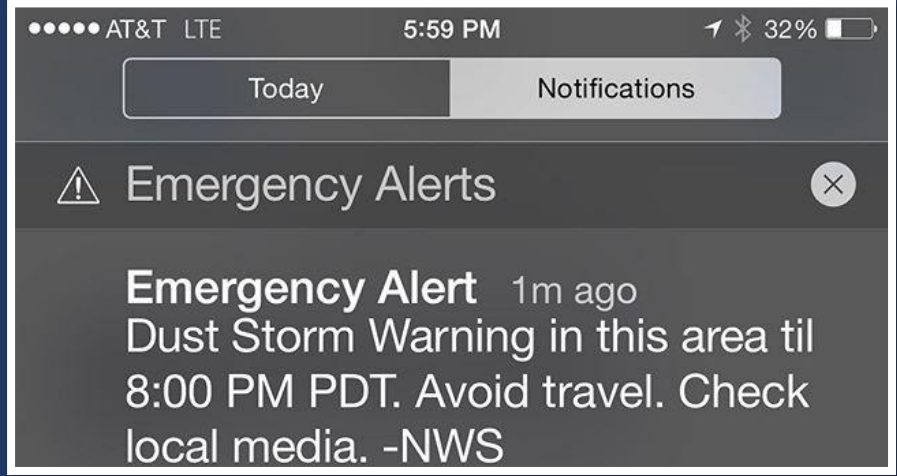
# WFO Phoenix County Warning Area



**Legend**

- CWA Boundaries
- WFO Phoenix Counties
- Other WFO Counties

# NWS Services



Tonight	Saturday	Saturday Night	Sunday	Sunday Night	Monday	Monday Night	Tuesday	Tuesday Night
Mostly Clear and Breezy then Mostly Clear	Sunny	Clear	Sunny	Partly Cloudy	Mostly Sunny	Partly Cloudy	Sunny	Clear
Low: 57 °F	High: 79 °F	Low: 58 °F	High: 85 °F	Low: 61 °F	High: 88 °F	Low: 61 °F	High: 86 °F	Low: 62 °F



# Ways to Stay Informed

[weather.gov/phoenix](https://weather.gov/phoenix)

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

Heat & Tropical Moisture Ahead   Hotter Temps Ahead

## Potential Impactful Weather Ahead

May 27, 2025  
7:27 AM

### Strong High Pressure Followed by Tropical Moisture

- ❑ A cutoff low will develop near the Baja California late this week, while strong high pressure shifts overhead, leading to unseasonably hot temperatures.
- ❑ The low then moves north this weekend, as the high shifts east, pulling tropical moisture into the Desert Southwest.

**Friday - Saturday**

- ❑ Temperatures forecast 4 - 8 degrees above normal
- ❑ Chance for 110+ °F: 10-30%

**Sunday - Monday**

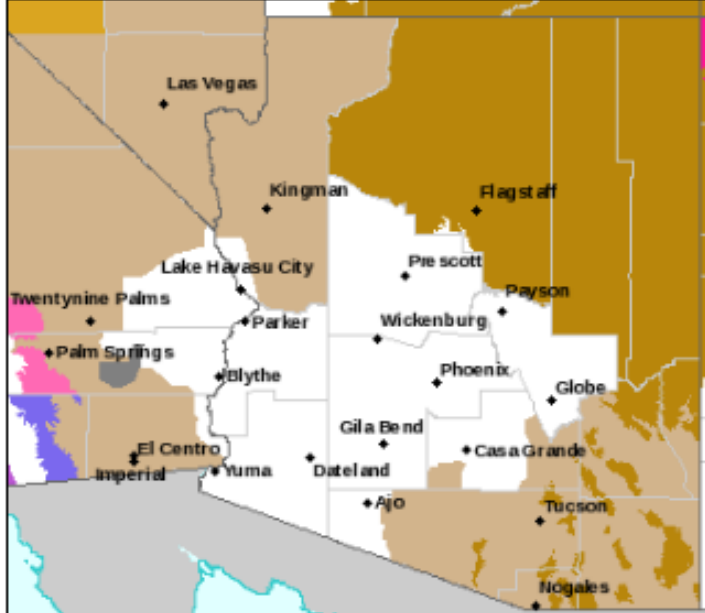
- ❑ Tropical moisture moves in from the south
- ❑ Increased rain chances
- ❑ 20-40% chances for measurable rain across portions of Southwest & South-Central AZ
- ❑ Low probability (5-10%) for areas of higher end rainfall totals (>0.50")



Tropical Moisture

National Weather Service  
Phoenix, AZ

Click a location below for detailed forecast.



Last Map Update: Thu, Apr. 4, 2024 at 9:06:45 am MST

Watches, Warnings & Advisories

- Winter Storm Warning
- High Wind Warning
- Red Flag Warning
- Winter Weather Advisory
- High Surf Advisory
- Wind Advisory
- High Wind Watch
- Air Quality Alert

MRMS Radar Imagery   Phoenix Radar   Yuma Radar   Regional Satellite   GOES-16 Satellite   Weather & Hazards Data Viewer

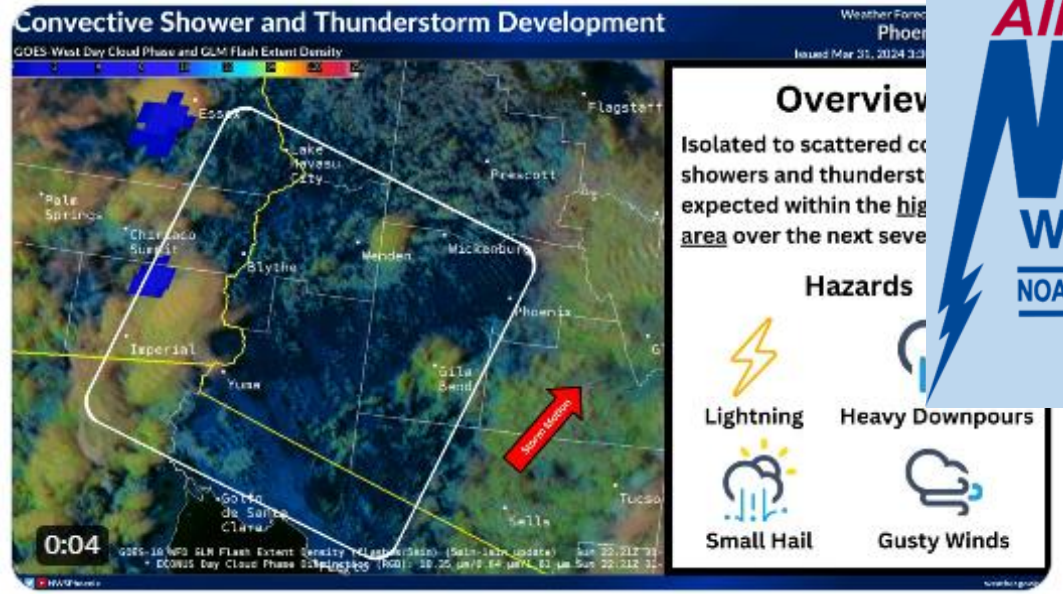
# Ways to Stay Informed

## Social Media

X: @NWSPhoenix

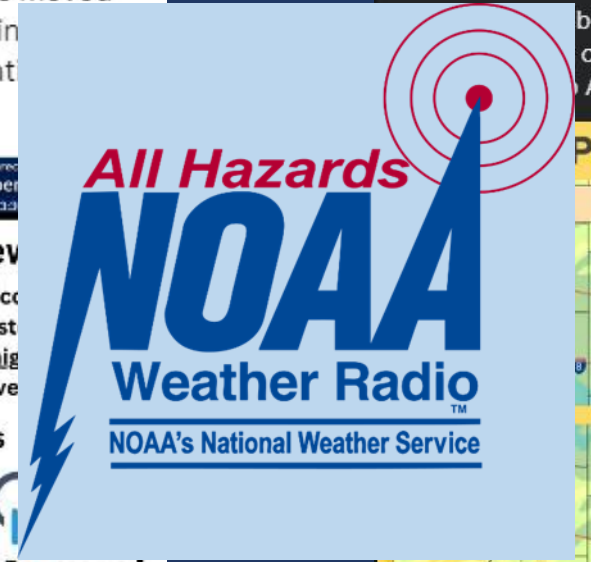
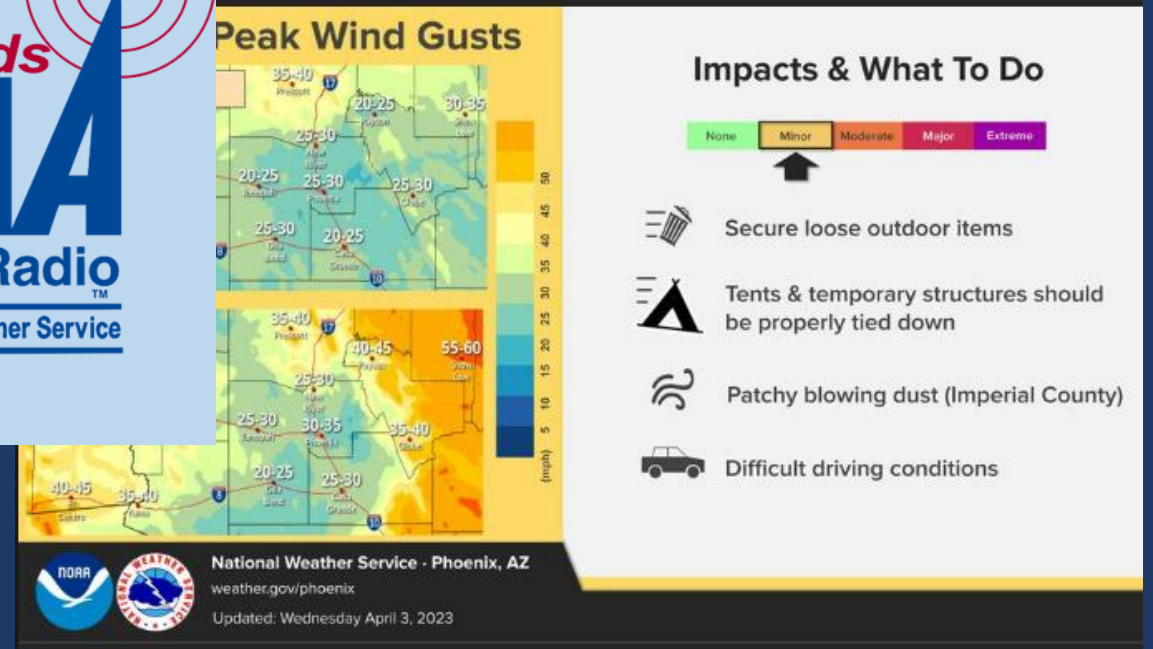
Facebook: NWSPhoenix

**NWS Phoenix** @NWSPhoenix · Mar 31  
The main band of rain impacting Phoenix through the morning has moved off to the east. Convective showers and storms are now firing up in to west and southwest of Phoenix. Convection is expected to continue to develop over the next several hours. #azwx #cawx



**US National Weather Service Phoenix Arizona**  
Published by Jeral Garcia · 23h · 🌐

begin increasing tomorrow afternoon across SE California where gusts locally over common. A Wind Advisory has been issued for parts of the area. Gusty winds will be common in AZ Friday along with much cooler temperatures.



# Watch? Warning? Advisory?

- Watch
  - Conditions are favorable for hazardous/severe weather to occur.
  - Issued anywhere from 2 hours in advance to 4 days in advance.
  - Get ready!
- Warning
  - Severe conditions already occurring or imminent.
  - It's a "done deal" → Take Action!
  - Typically valid for 30 min - 4 hrs (thunderstorm related); multiple days for excessive heat.
- Advisory
  - Significant, but sub-severe, conditions already occurring or imminent.

*Working Together to Protect Lives and Property*

# Watch vs. Warning



*Working Together to Protect Lives and Property*

Guy Letourneau

# Weather Warning

Seek Shelter Now!

## Warning

### Severe Thunderstorm

Expires in 42m

BULLETIN - IMMEDIATE BROADCAST REQUESTED  
Severe Thunderstorm Warning  
National Weather Service Phoenix AZ  
830 PM MST Tue Sep 12 2023

The National Weather Service in Phoenix has issued a

\* Severe Thunderstorm Warning for...  
Maricopa County in south central Arizona...  
Pinal County in southeastern Arizona...

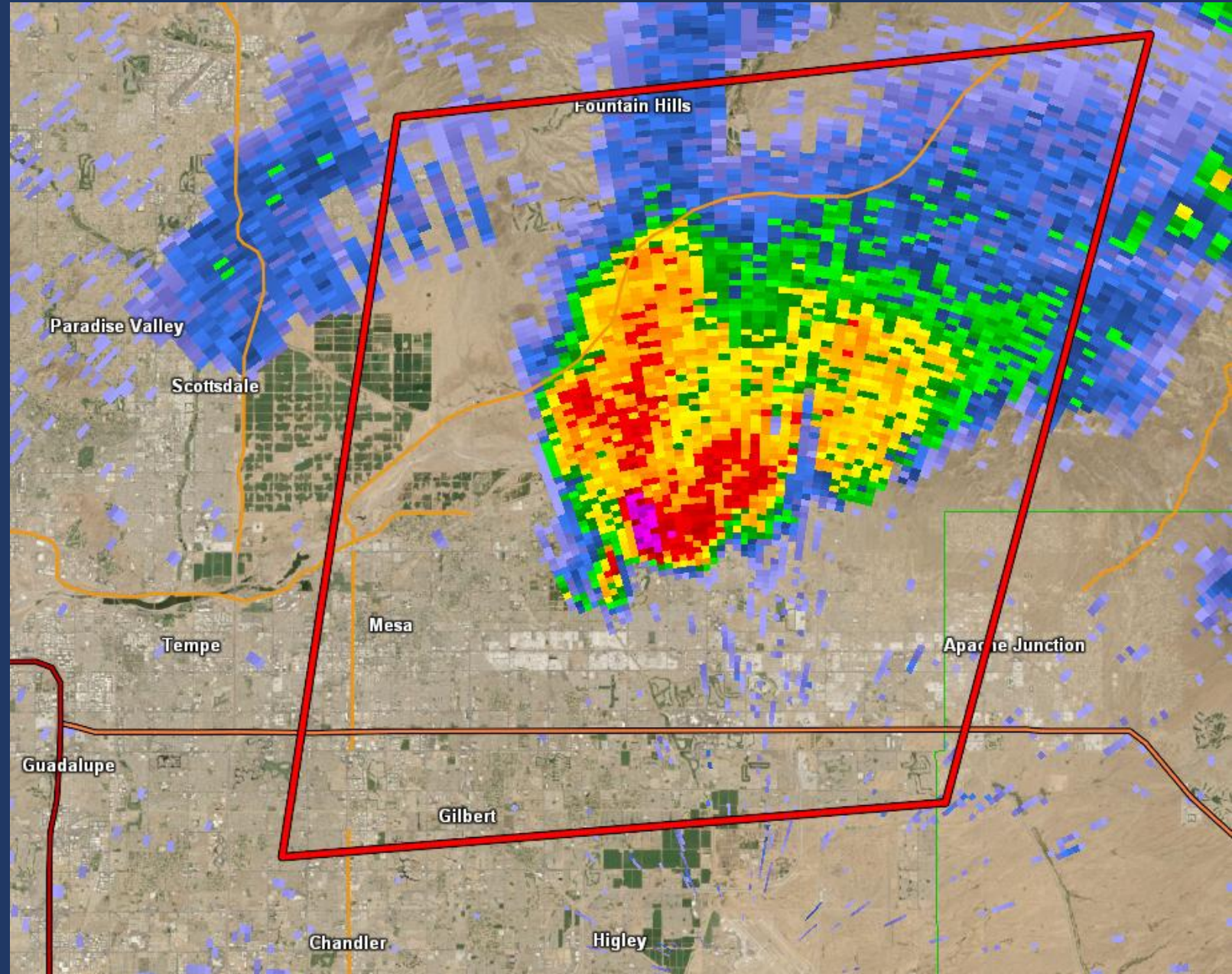
\* Until 915 PM MST.

\* At 829 PM MST, a severe thunderstorm was  
located over Downtown  
Scottsdale, or near Paradise Valley, moving east at  
25 mph.

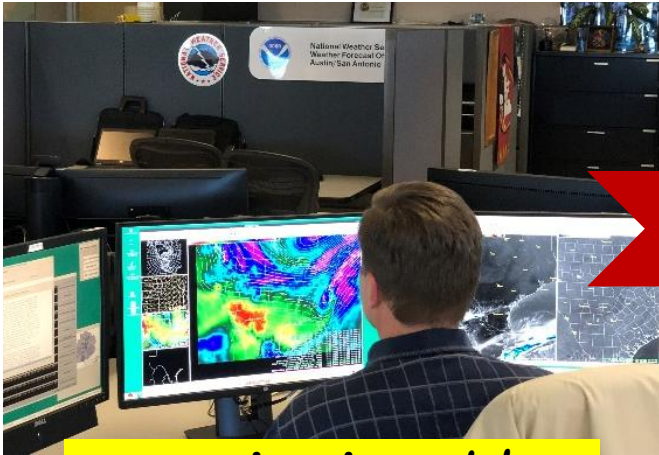
HAZARD...60 mph wind gusts.

SOURCE...Radar indicated.

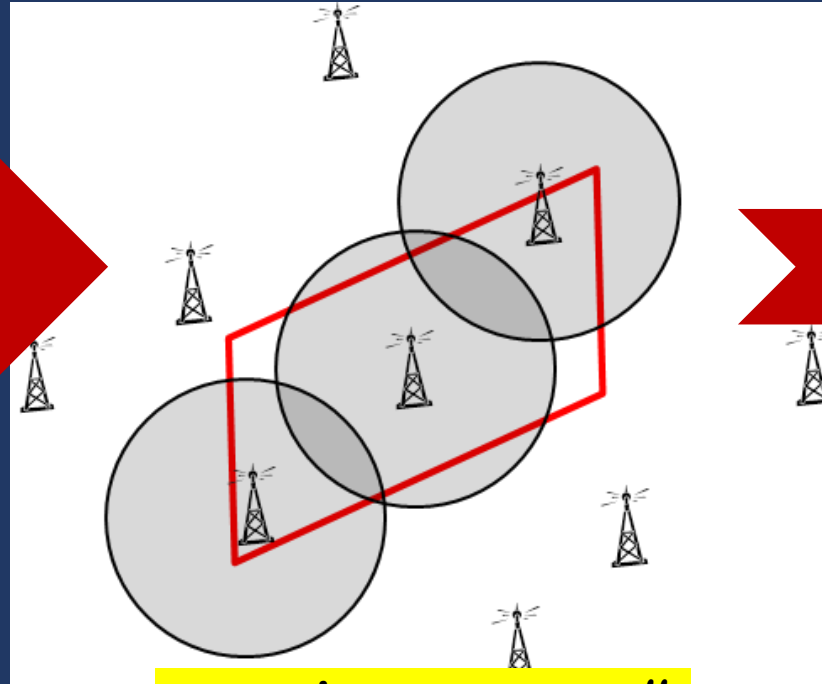
IMPACT...Expect damage to roofs, siding, and trees.



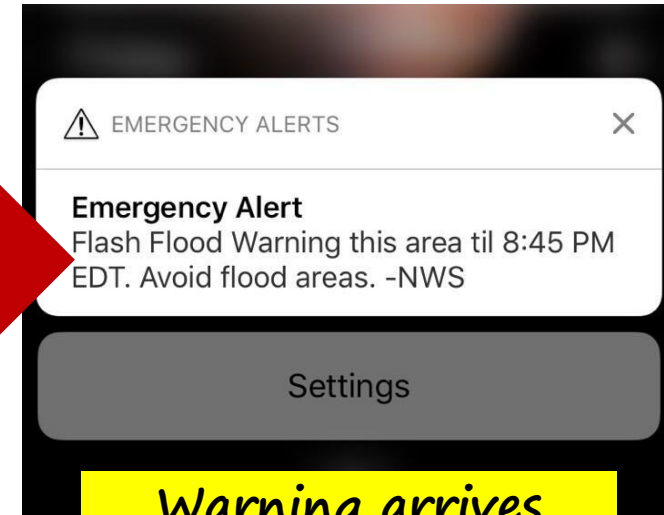
# Wireless Emergency Alerts (WEA)



Warning issued by  
NWS Forecaster



Warning sent to cell  
phone towers



Warning arrives  
within seconds

# What is a SKYWARN Storm Spotter?

*Working Together to Protect Lives and Property*

# SKYWARN Storm Spotter

A storm spotter's primary purpose is to observe and report severe weather within a local area.



Do: Report weather from home or other safe location

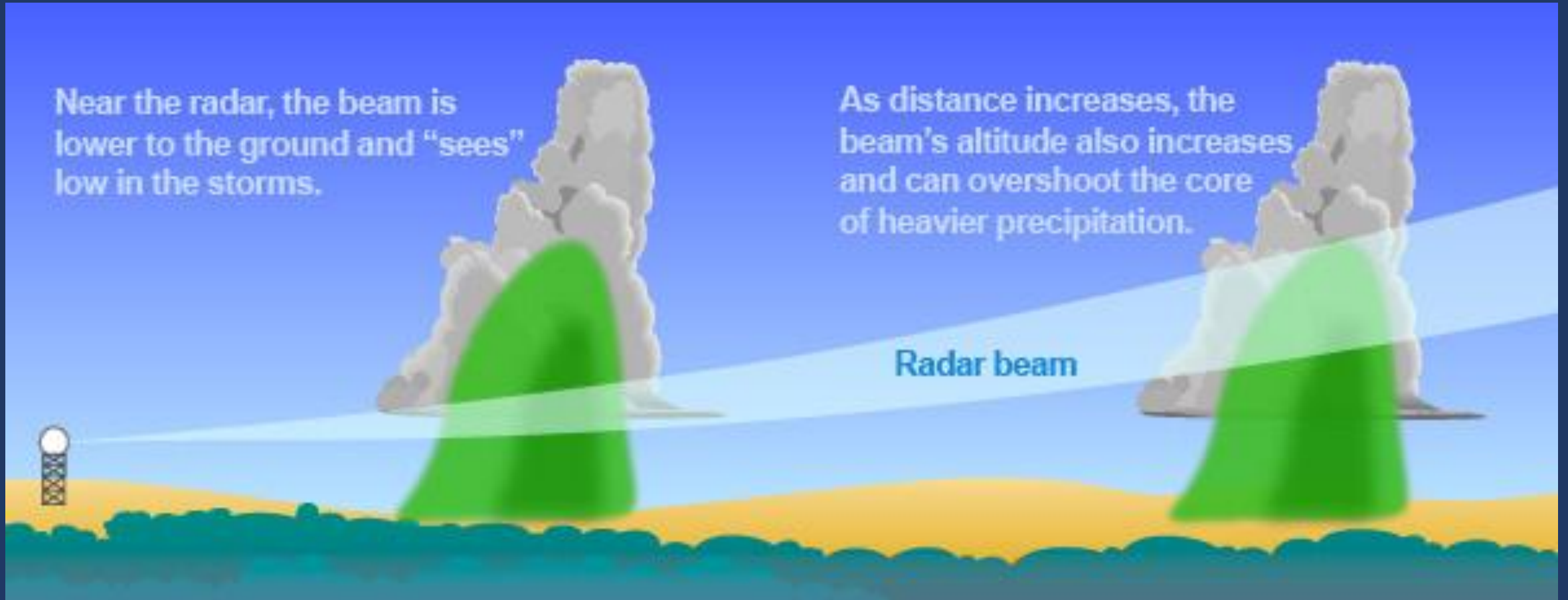


Don't: Storm Chase

# Why are Spotters Important?

*Working Together to Protect Lives and Property*

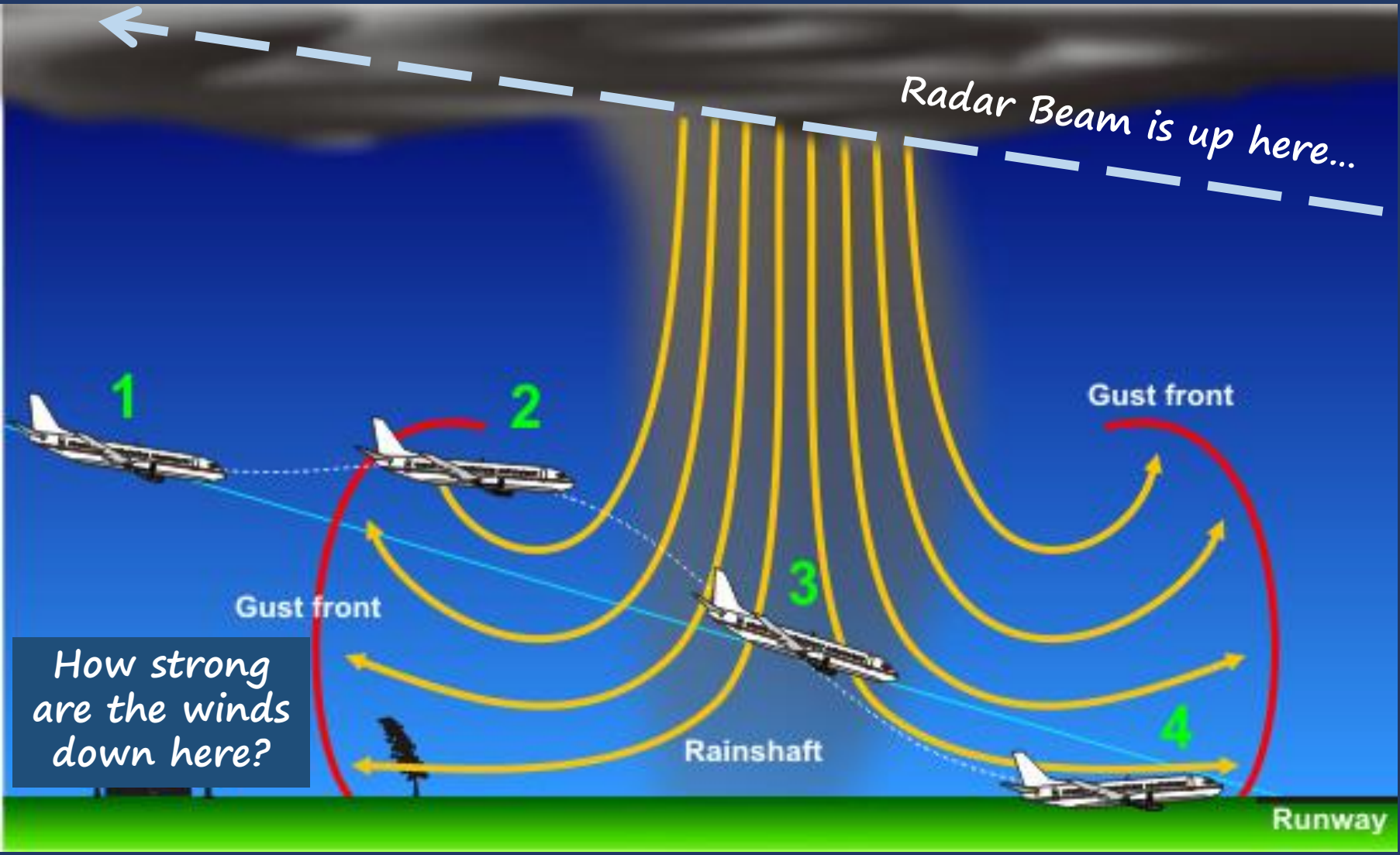
# Radar Can Only Tell Us So Much



*Working Together to Protect Lives and Property*

# How Do Spotters Help?

*Ground-truth information!*



How strong are the winds down here?

Runway

# How Does NWS Use These Reports?

## Warning Decision Process

- Confirm or revise existing NWS forecasts
- Prompt the issuance of new warnings and advisories
- Alerting the general public of weather hazards

*Passed along in timely statements to Emergency Management and Media*

*Becomes part of US Climate database*

*Working Together to Protect Lives and Property*

# Spotter Reports Add Credibility!

BULLETIN - EAS ACTIVATION REQUESTED

Flash Flood Warning

National Weather Service Phoenix AZ

1252 PM MST Sun Jul 25 2021

The National Weather Service in Phoenix has extended the

\* Flash Flood Warning for...

Maricopa County in south central Arizona...

\* Until 300 PM MST.

\* At 1252 PM MST, trained weather spotters reported heavy rain and washes flowing across the warned area. Between 1 and 2 inches of rain have fallen. Additional rainfall amounts of 0.5 are possible in the warned area. Flash flooding is ongoing or expected to begin shortly.

HAZARD...Life threatening flash flooding. Heavy rain producing flash flooding.

SOURCE...Trained spotters reported.

*Working Together to Protect Lives and Property*

# Spotter Reports Add Credibility!

100 AM MST Sun Oct 16 2022

...A SEVERE THUNDERSTORM WARNING REMAINS IN EFFECT UNTIL 130 AM MST FOR MARICOPA COUNTY...

At 1258 AM MST, a severe thunderstorm was located over Downtown Scottsdale, or near Paradise Valley, moving northwest at 20 mph.

HAZARD...Ping pong ball size hail.

SOURCE...Radar indicated and a storm spotter has reported quarter to golf ball sized hail with this storm.

IMPACT...People and animals outdoors will be injured. Expect damage to roofs, siding, windows, and vehicles.

*Working Together to Protect Lives and Property*

# Severe Weather: *Definitions*



*Working Together to Protect Lives and Property*

# Severe Thunderstorm

*Hail*

*Straightline Winds*

*Tornado*



*1 Inch in Diameter or Greater*

*58 mph or Greater*

*In Contact With Ground*

*Lightning is NOT included in this definition*

*Working Together to Protect Lives and Property*

# Flash Flood



An inundation of a normally dry area or rapid rise in a waterway that causes a direct threat to life or property.

Usually within 6 hours of the causative event.



CBS Evening News

# Hazardous Weather: *The Monsoon*



Eric Petrone

*Working Together to Protect Lives and Property*

# Monsoon

## Definition:

A seasonal reversal in the prevailing wind flow patterns.

## Tends to occur:

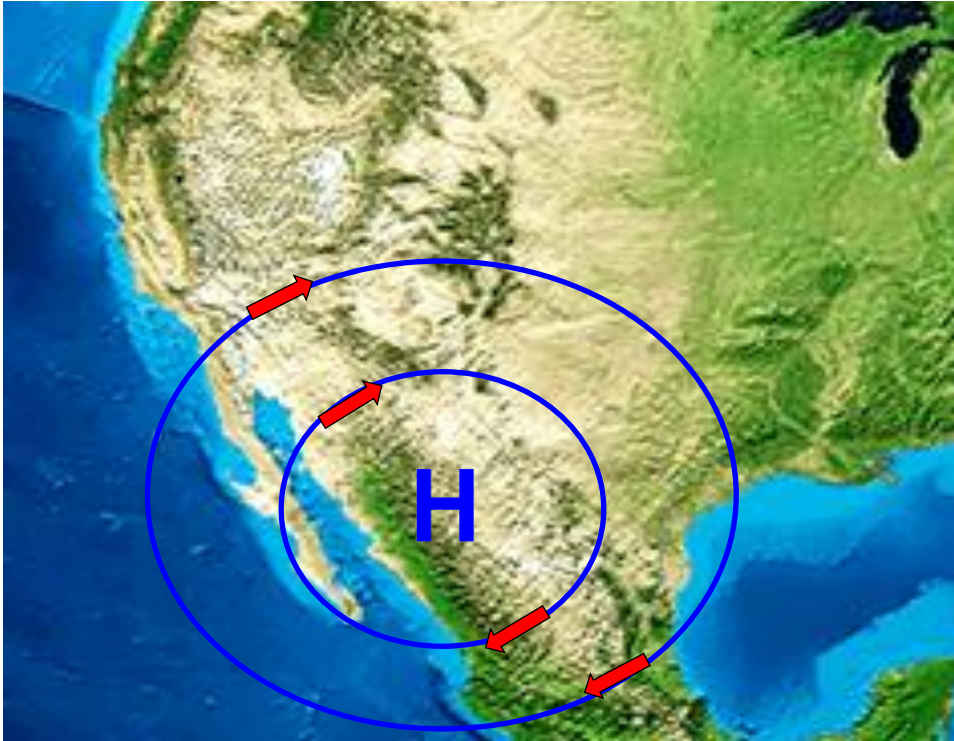
June 15<sup>th</sup> -  
September 30<sup>th</sup>

*calendar based definition*

The Arizona Monsoon is part of the North American Monsoon.

# Monsoon – Wind Pattern Change

June avg. flow pattern (18,000 feet ASL)



*Southwesterly Flow - Dry*

July avg. flow pattern (18,000 feet ASL)



- *Easterly flow over Mexico*
- *South-southeasterly flow over Arizona*
- *Winds bring moisture → thunderstorms*

# Monsoon – Lower Levels

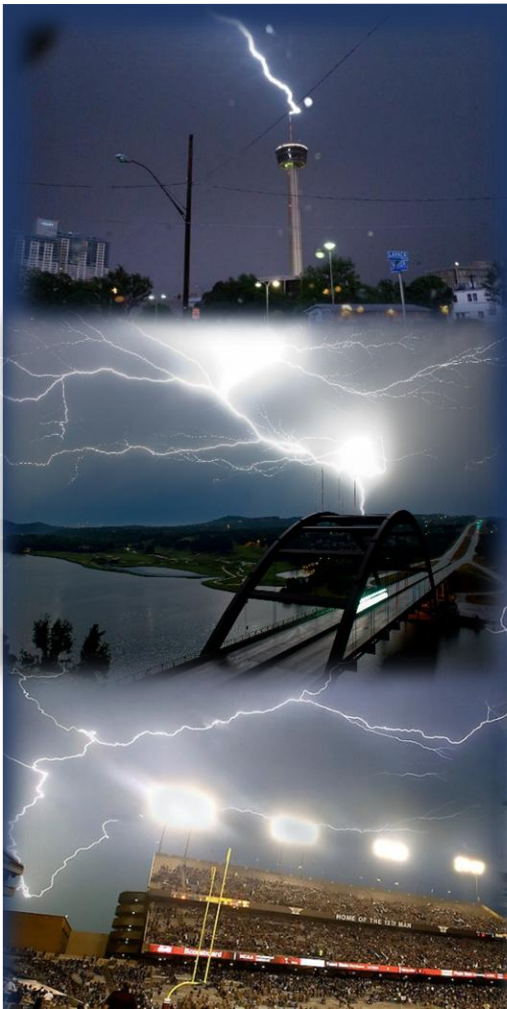


*Factors influencing  
day-to-day  
storm activity*

- Heating
- Rugged Terrain
- Complex Moisture Fluxes

# Thunderstorm Hazards

Lightning



Thunderstorm Winds



Hail



Tornadoes



Flash Flooding



# Thunderstorms: *The Basic Ingredients*



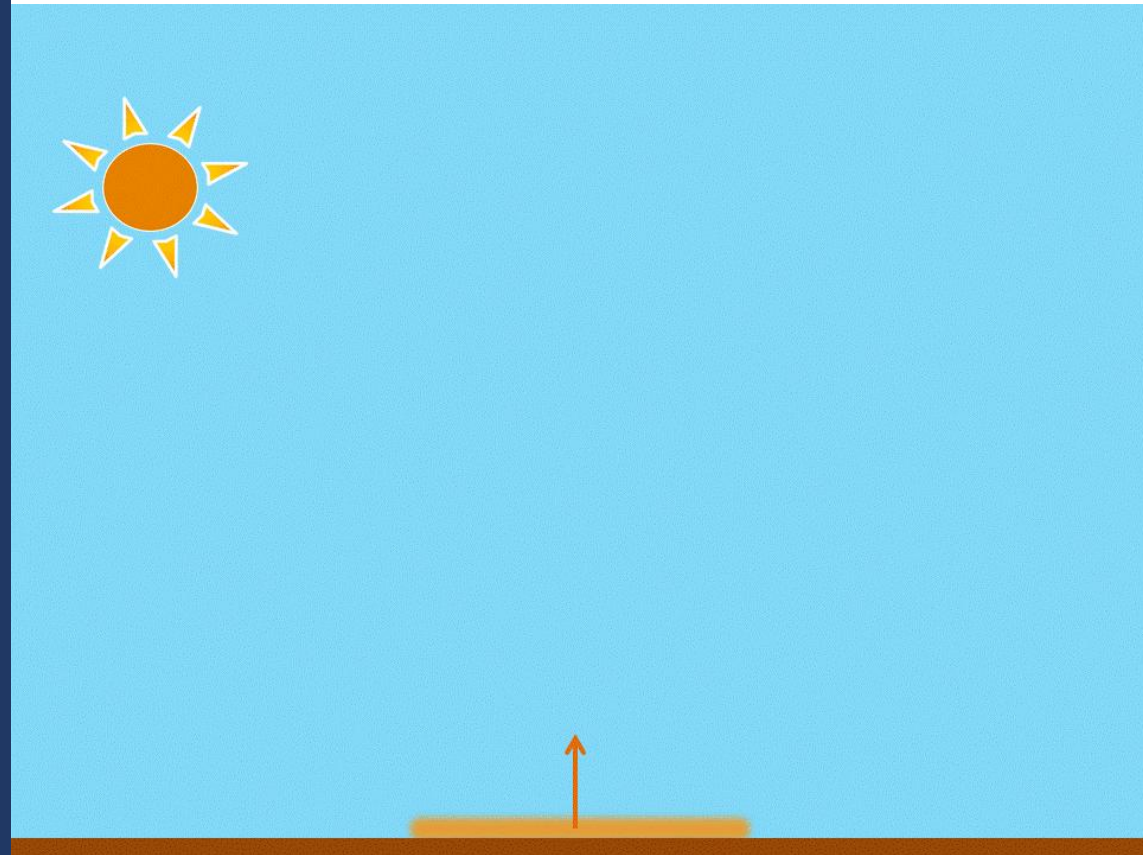
*Working Together to Protect Lives and Property*

# Moisture



# Instability

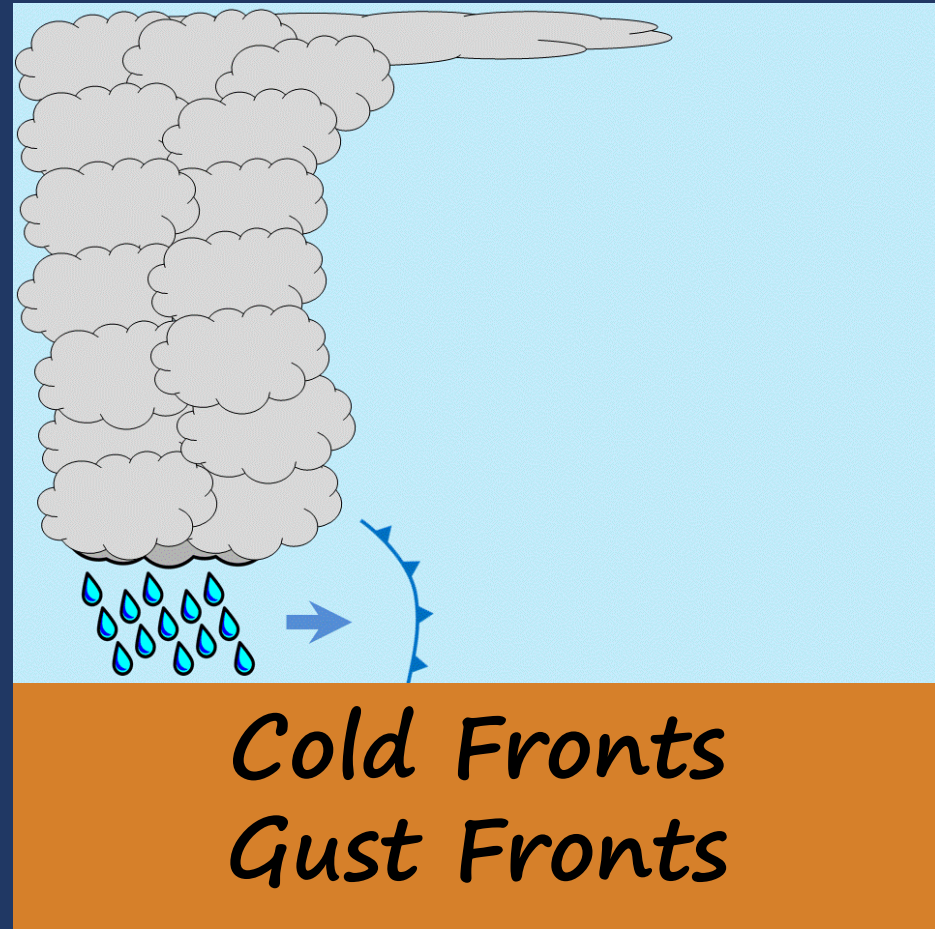
*Buoyant air rises*



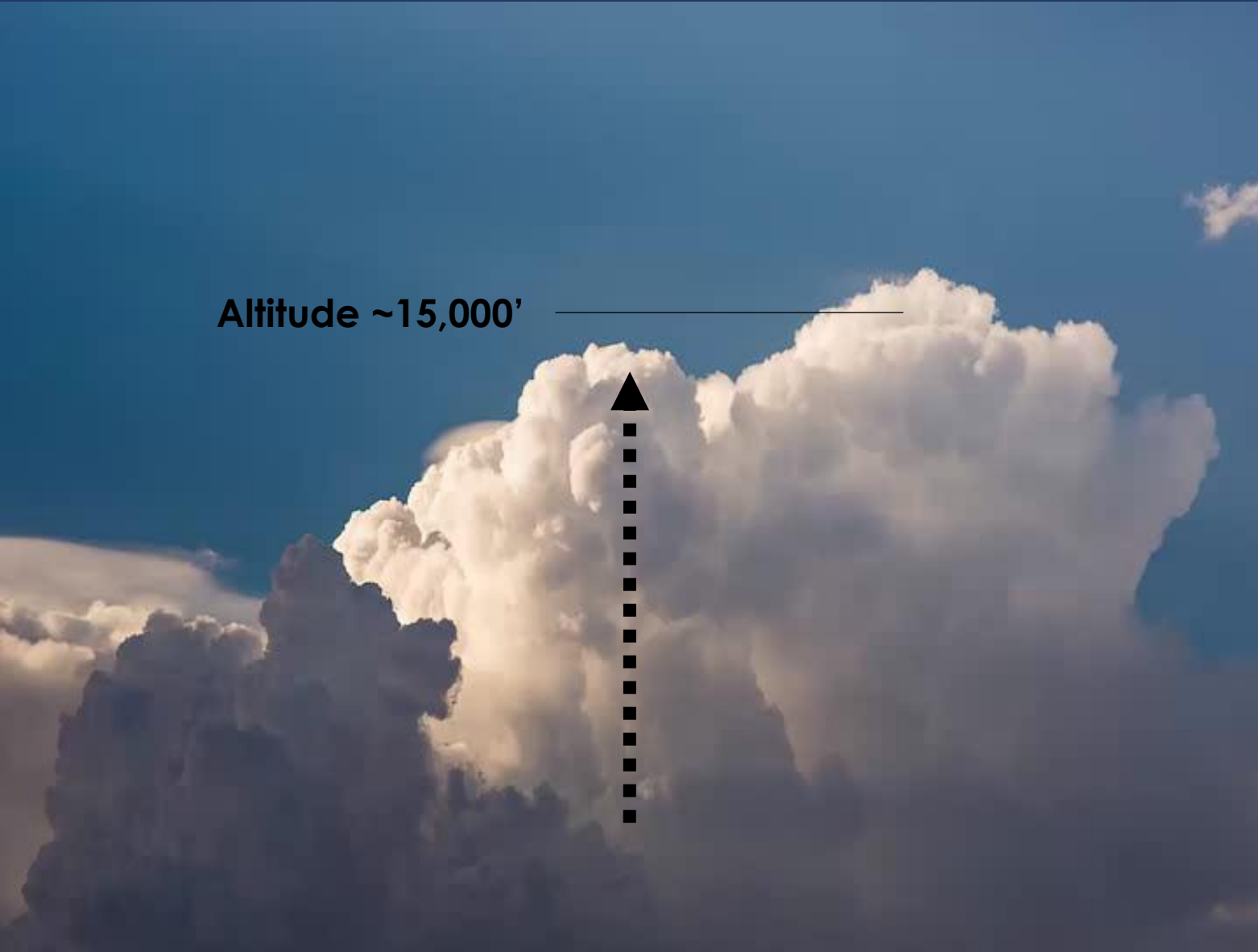
*Similar to boiling water*



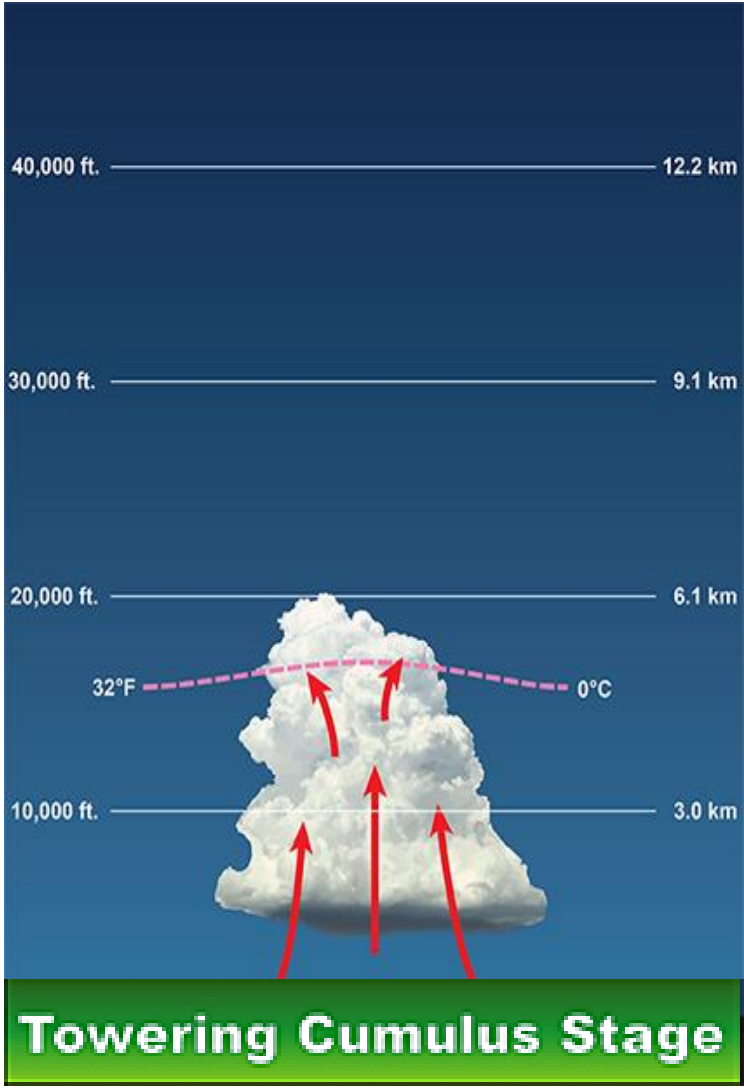
# A Lifting Mechanism



# Towering Cumulus Phase

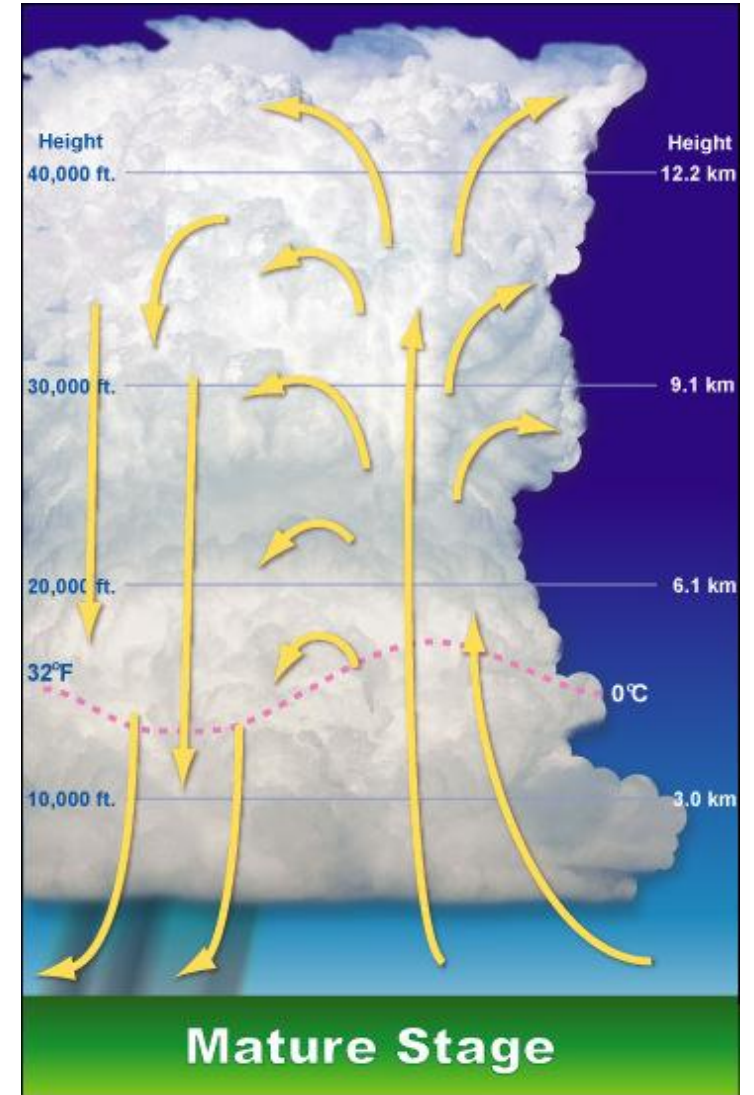
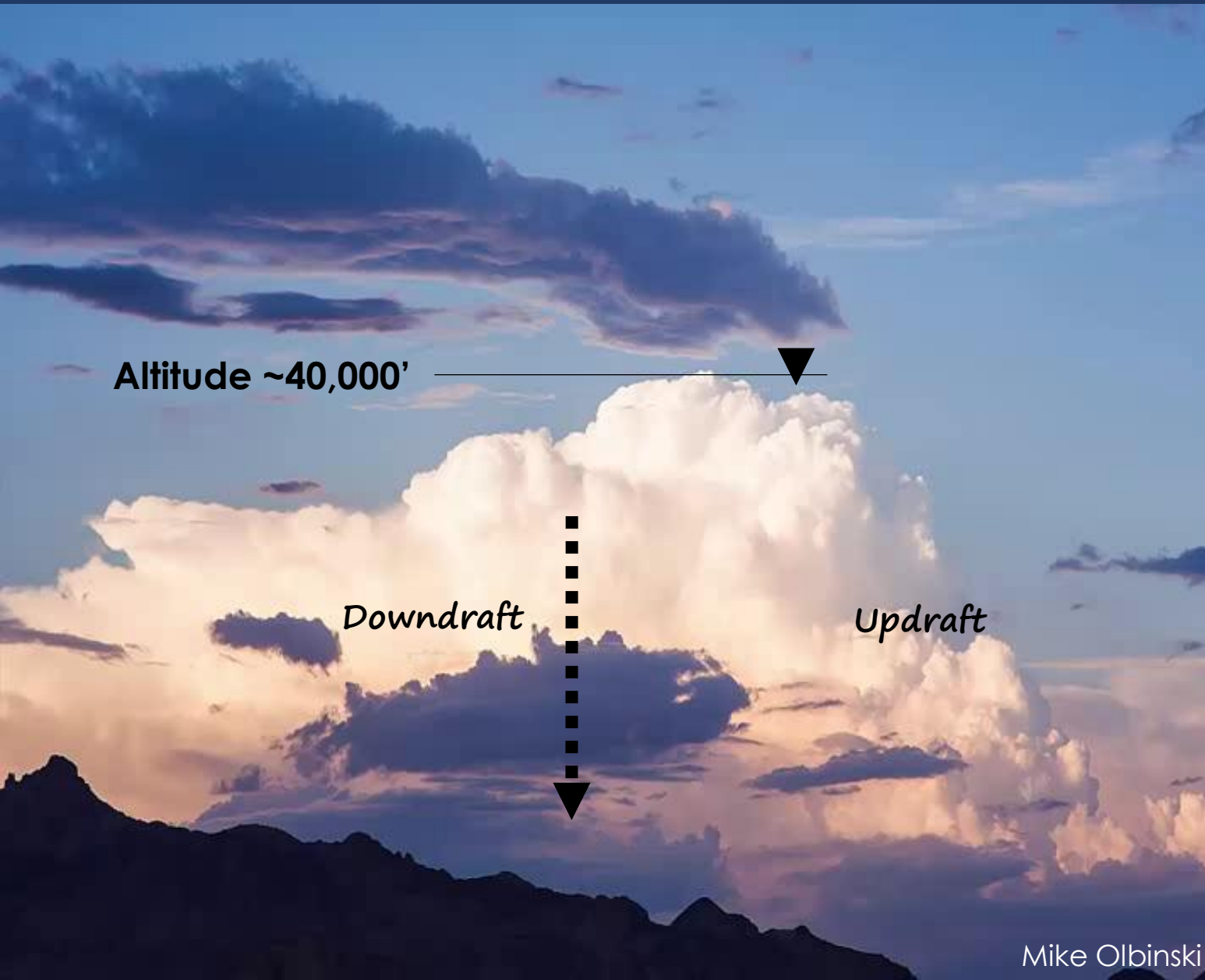


Altitude ~15,000'

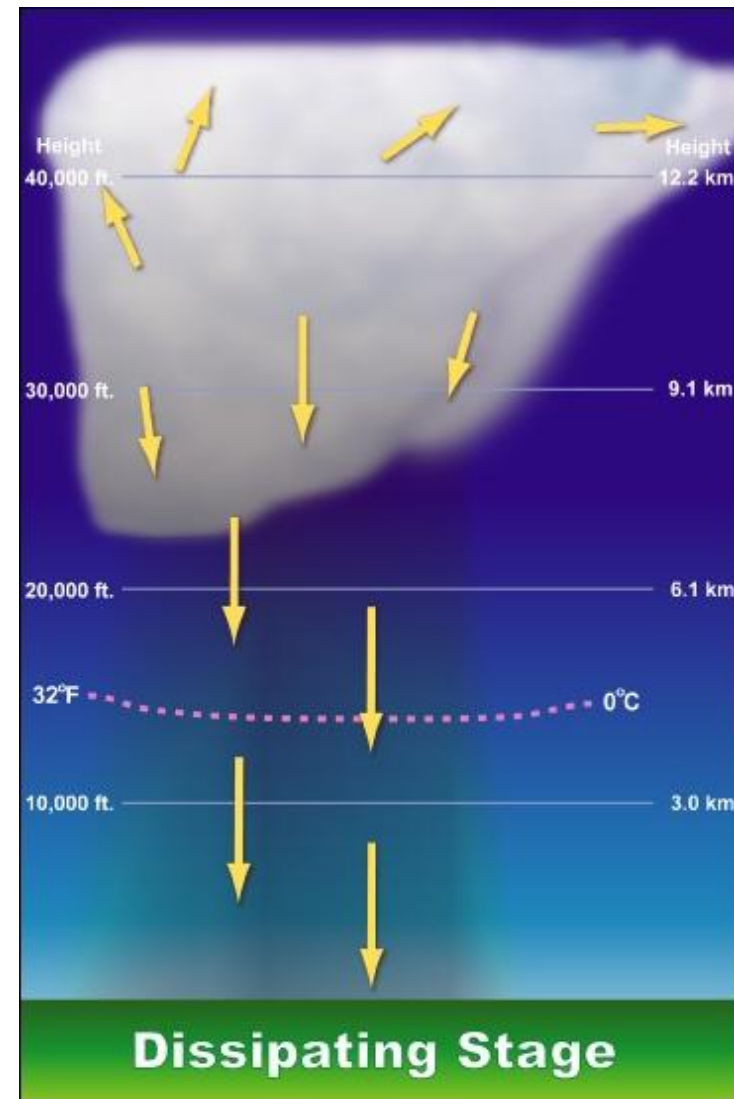


**Towering Cumulus Stage**

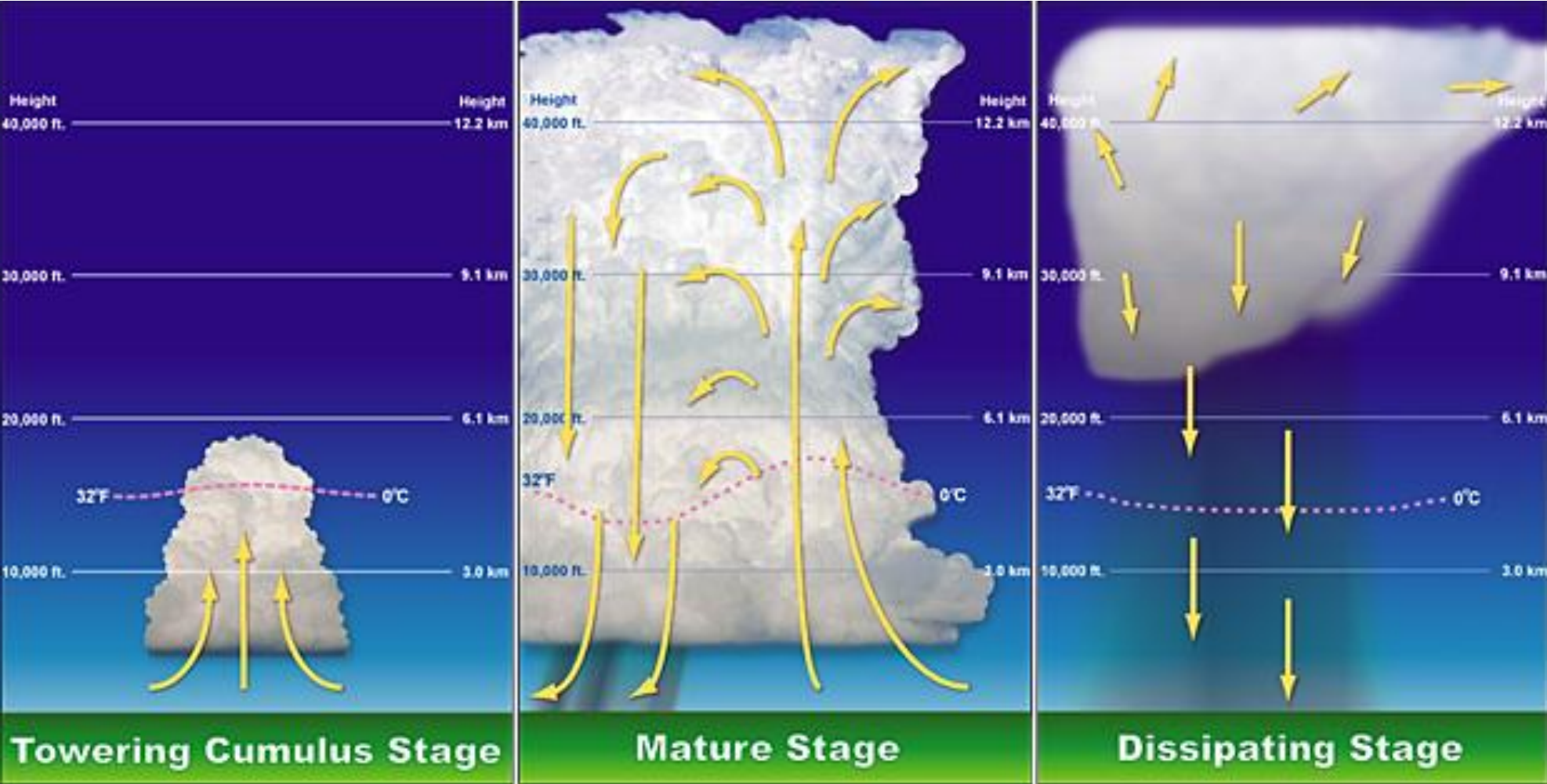
# Mature Phase



# Dissipating Phase



# Thunderstorm Lifecycle - Review



# Visual Characteristics

*Strong Thunderstorms, Downbursts, and Tornadoes*



*Working Together to Protect Lives and Property*

# Strong Updraft Visual Clues



*Billowy*

*Cauliflower Look*

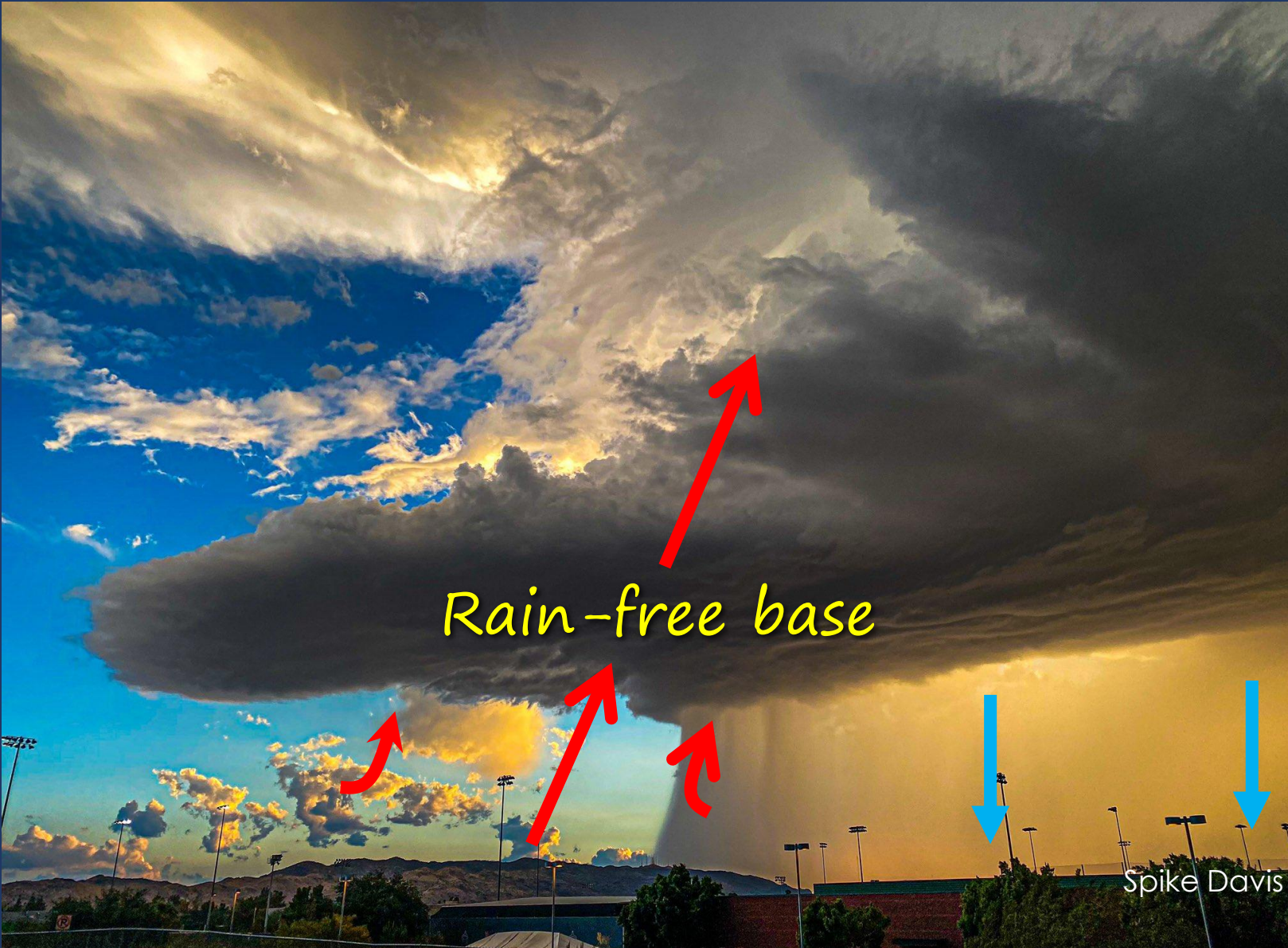
*Crisp, Distinct Edge*

*Thick, sharp-edged anvil*

# Strong Updraft Visual Clues



# Strong Updraft Visual Clues



Rain-free base

Flat/smooth cloud base

Little visible precipitation

May see updraft tower above

Spike Davis

# Strong Updraft Visual Clues



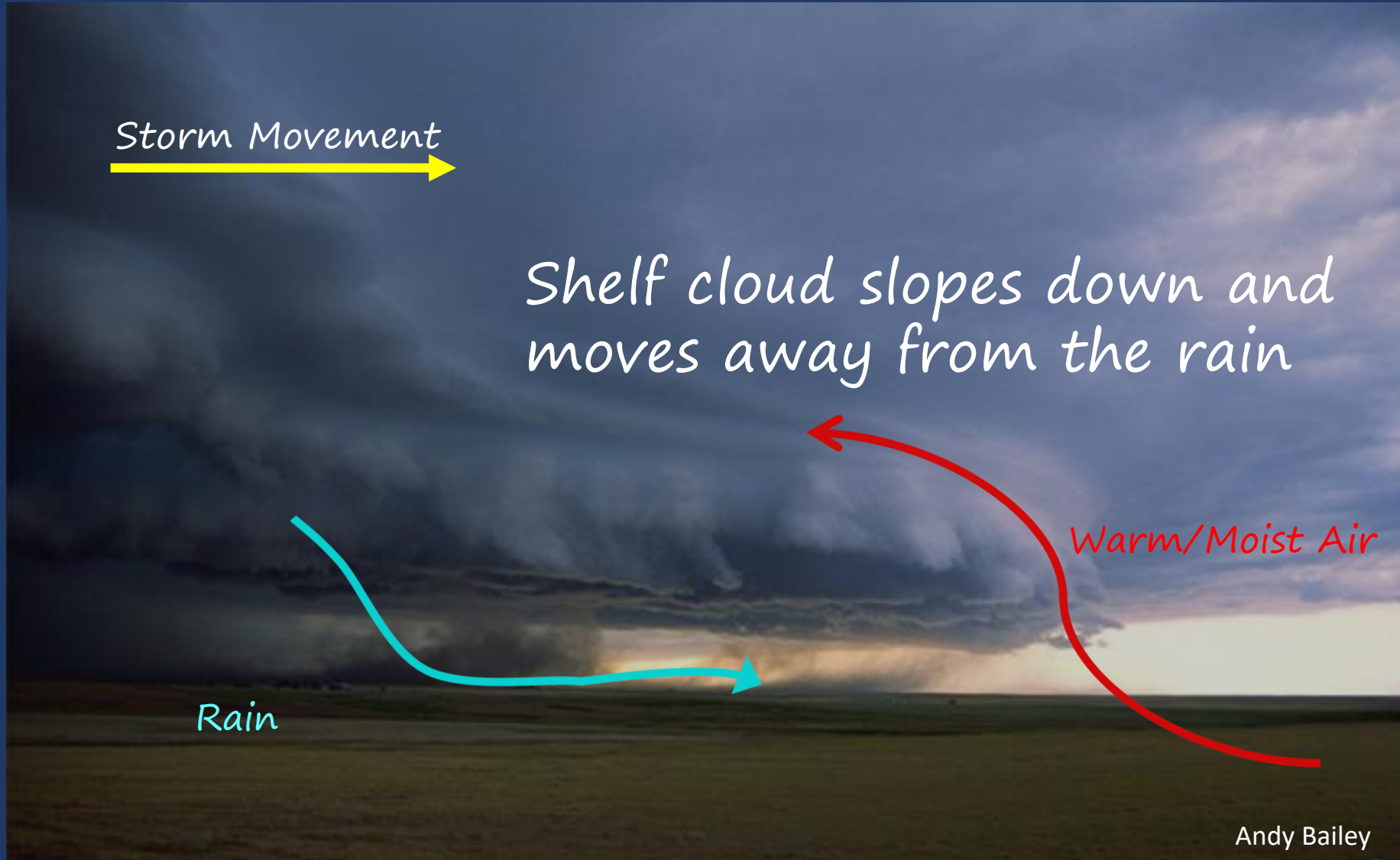
*Wall Cloud*

Sean Benedict



- *Enhanced lowering within rain free base*
- *Slow rotation may be present*
- *Persistent feature*

# Strong Downdraft Visual Clues



Shelf cloud more likely with faster moving storms

# Shelf Cloud



Kim Rendek

# Shelf Cloud



Mark Rebilas

# Shelf Cloud



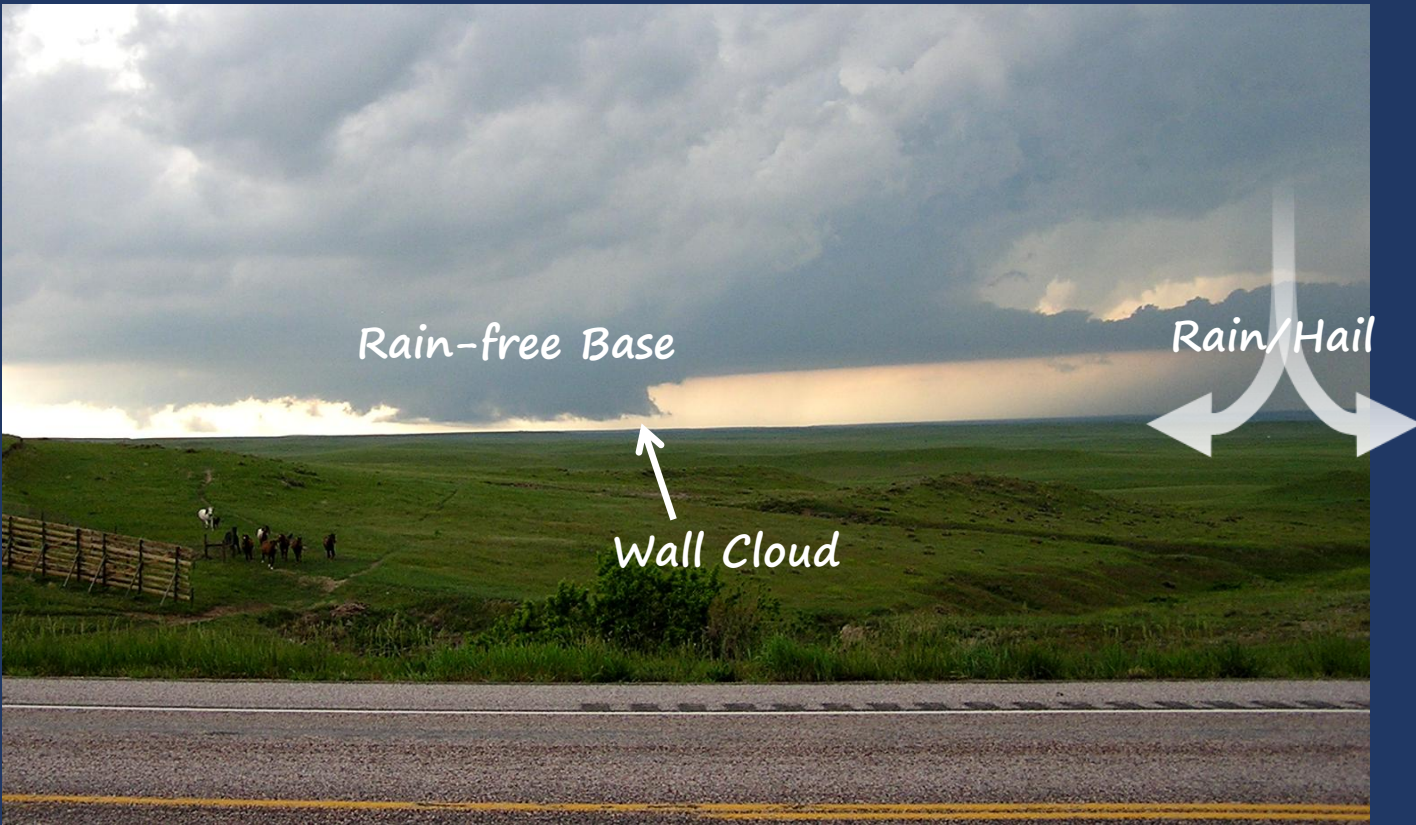
Tornado Crew Storm Chasers

# Shelf Cloud



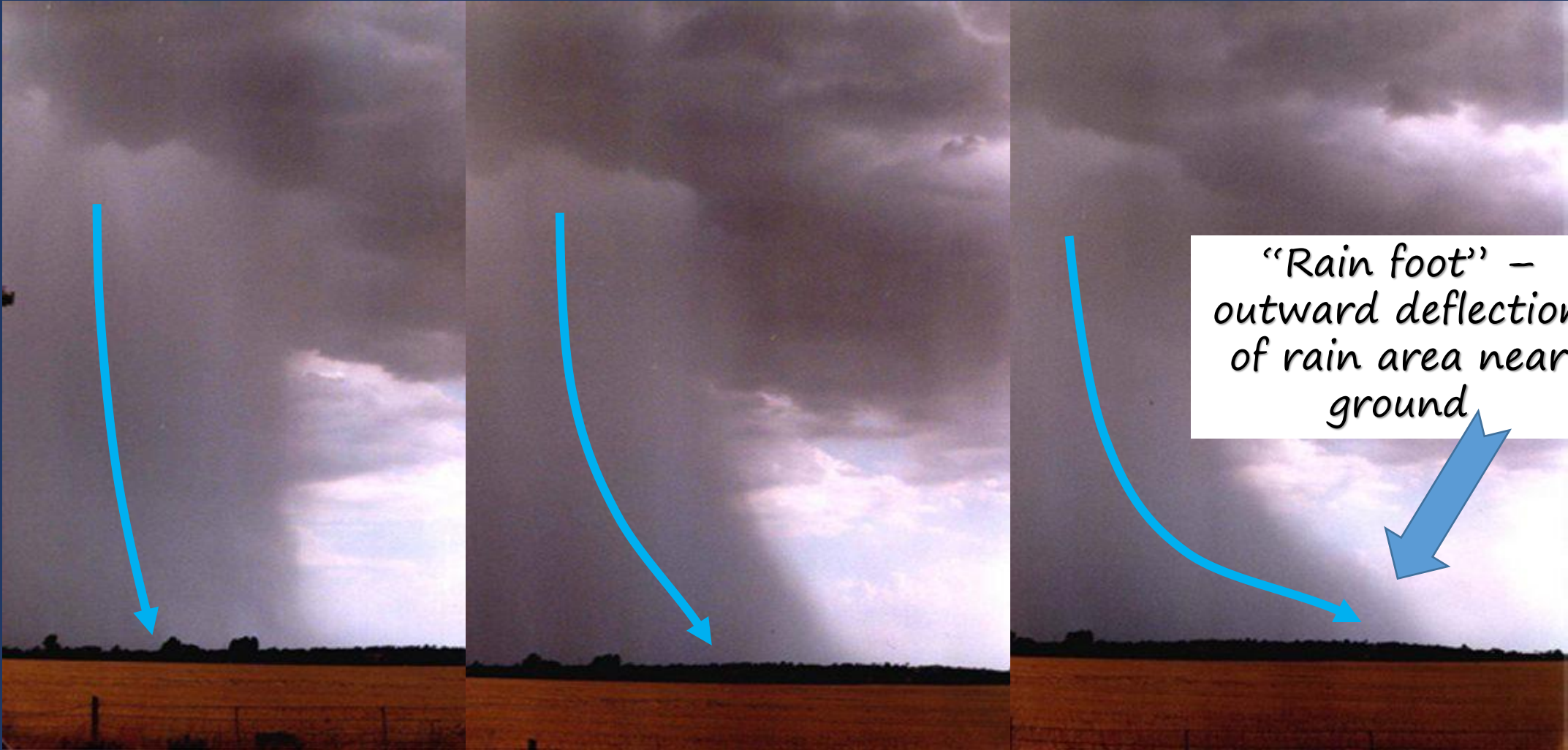
Mike Olbinski

# Wall Cloud or Shelf Cloud



- Shelf Clouds Point Away from Rain: **Downdraft & Straight-Line Winds**
- Wall Clouds can Point Towards Rain: **Updraft & Tornado Region**

# Strong Downdraft Visual Clues



“Rain foot” –  
outward deflection  
of rain area near  
ground

Beginning

1 Minutes Later

2 Minutes Later

# Downbursts

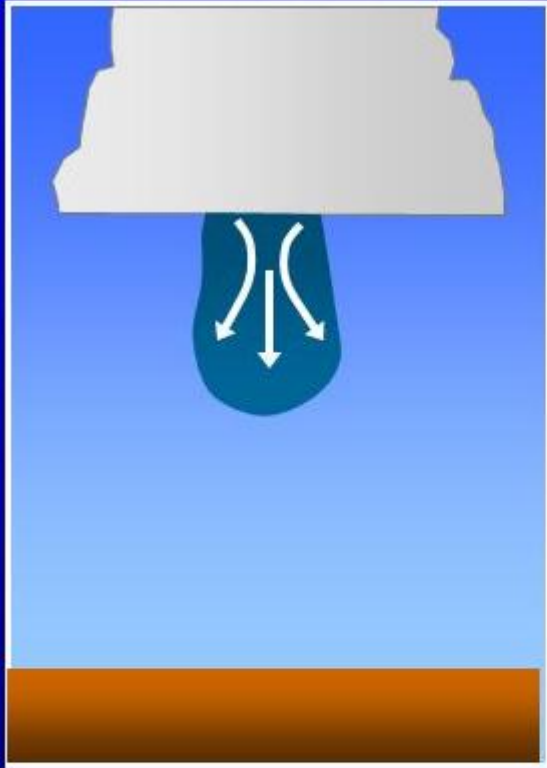


Mike Olbinski

A concentrated severe downdraft that induces an outward burst of damaging winds at the surface

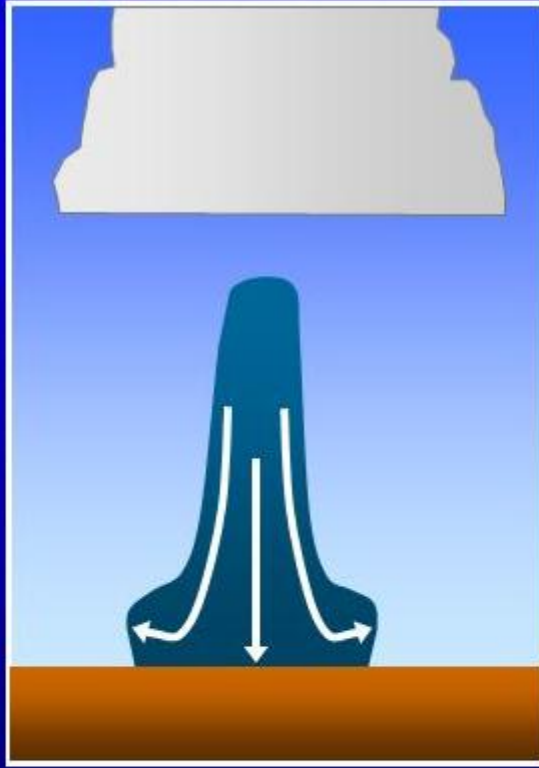
A microburst is a downburst over a very concentrated area (2.5 mi diameter).

# Downburst Lifecycle



## FORMATION

Evaporation and precipitation drag forms downdraft



## IMPACT

Downdraft quickly accelerates and strikes the ground



## DISSIPATION

Downdraft moves away from point of impact

# Dry Microburst



Marianna Benner

*Occurs when most or all of the rain evaporates from the downdraft*

*Can cause damaging wind without any rain falling*

# Tornadoes



- Violently rotating column of air in contact with the ground and a cloud base.
- Winds from 65 mph to greater than 200 mph!

# Funnel Clouds



- Funnel shaped cloud extending from the base of a thunderstorm cloud
- Rotation
- Circulation **NOT** on the ground
- More typical in winter and spring months across the deserts.

# Tornado or Funnel Cloud?



*If condensation (cloud material) does not extend all the way to the ground, look for dust/debris near the ground*

# Funnel Cloud or Tornado?



**What would you report?**

*Tornado or Funnel Cloud?*

**Neither!**

**No Rotation**

# Tornado & Funnel Cloud “Imposters”



- Scud Clouds
  - Ragged Low-Level Clouds
- Rain Shafts, Virga
- Steam Plumes
- Smoke Columns
- Gustnadoes
  
- Look For Rotation
  - no rotation: imposter
- Watch for Persistence of the feature
  - what initially looks like a funnel, may turn out to be scud

# Tornado & Funnel Cloud "Imposters"



# “Gustnadoes”

\*\*\*NOT FOR BROADCAST\*\*\*

FOR LICENSING CONTACT  
[brett@livestormsnow.com](mailto:brett@livestormsnow.com)



# “Gustnadoes”



Mike Olbinski

# Strong Storm Components - Review

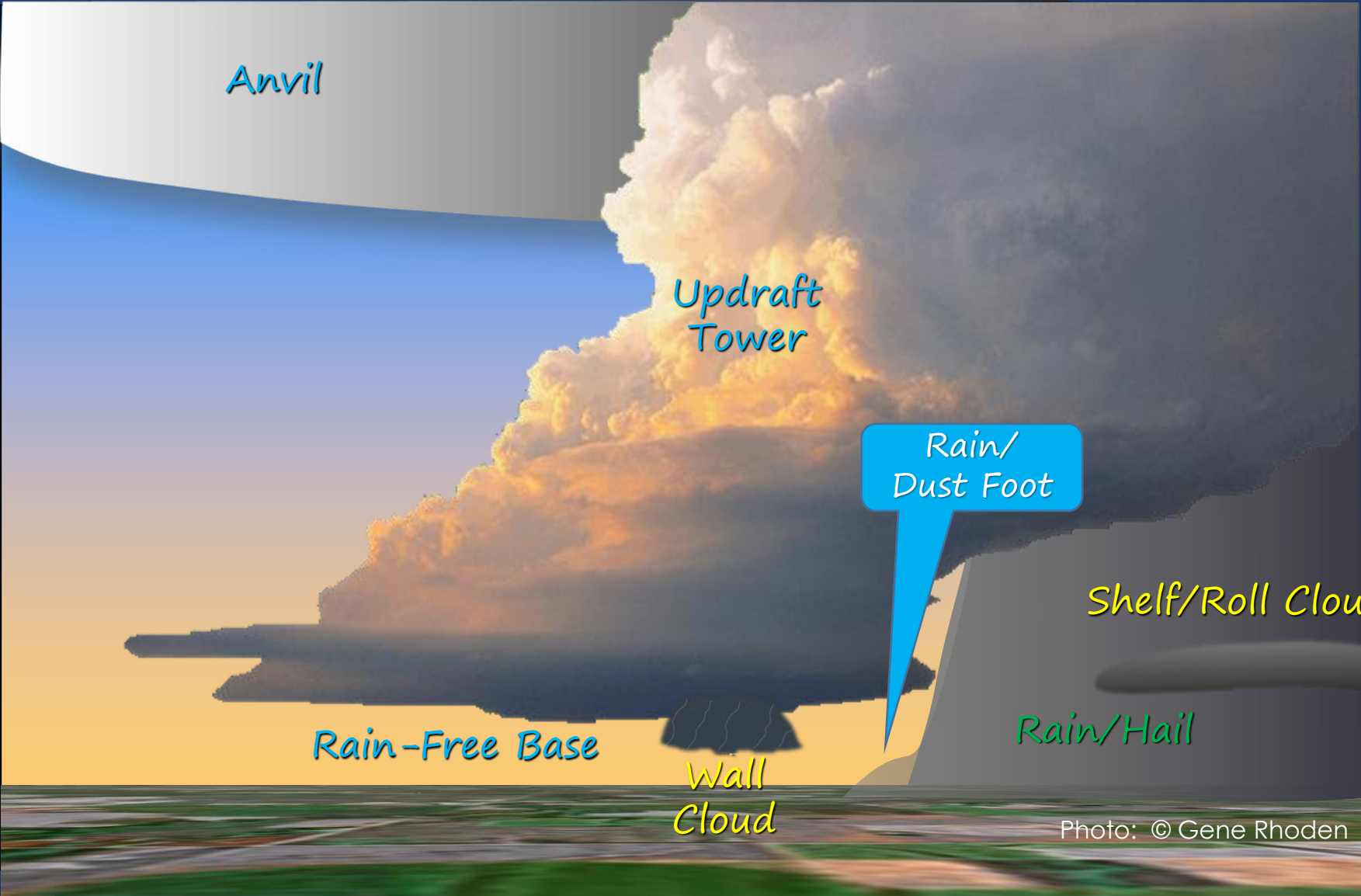


Photo: © Gene Rhoden

# Weather Hazards to Report

## Tornadoes & Funnel Clouds

- *must have rotation!*
- *persistence*
- *beware of imposters!*



# Weather Hazards To Report

## Flooding



- *Running washes*
- *Impeded traffic flow*
- *Water up to the sidewalk*



Kristen Mozzafari



Nancy Rollins



Monte Rollins



Jeff Weeks



Diane Dorsey





Michael Schwaner



Michael Schwaner



# Weather Hazards To Report

## *Low Visibility*



Kelly Presnell – AZ Daily Star



Mike Olbinski



Dann Niegocki

## *Dust Storms*

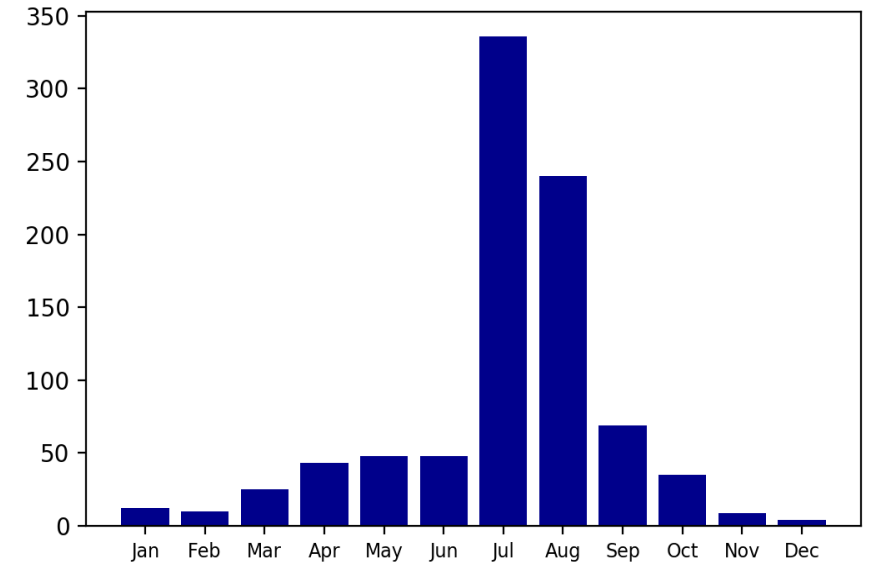
- Report when visibility below 1 mile

# Dust Storms



Mike Olbinski

Dust Storm LSRs Per Month - Arizona



- Dust storms peak in July and August across Arizona
- Typically travel at 15-30 mph.
- **Dust Storm Warning** –  $\frac{1}{4}$  of a mile or less visibility
- If you encounter one on the road – Pull Aside and Stay Alive!



Mark Rebilas

# Weather Hazards to Report

## Low Visibility



## Fog

- Report when visibility is below 1 mile

# Weather Hazards To Report



## 1 Wind Damage

- From any natural cause – thunderstorms, cold fronts, etc.
- Examples: tree limbs snapped, whole trees down, roof materials damaged, patio furniture blown from yard.
- *Provide details!*



# Weather Hazards to Report



*Report any sized hail*

- *Biggest stone?*
- *Piling up? How deep?*



10/5/2010

Tom Hormann



10/5/2010

Tracy Randall



# How to Report Hail Size



**Don't Compare Hail to Marbles!**  
*Why? Not all Marbles are Alike in Size!*



**Measure Hail With Common Objects**

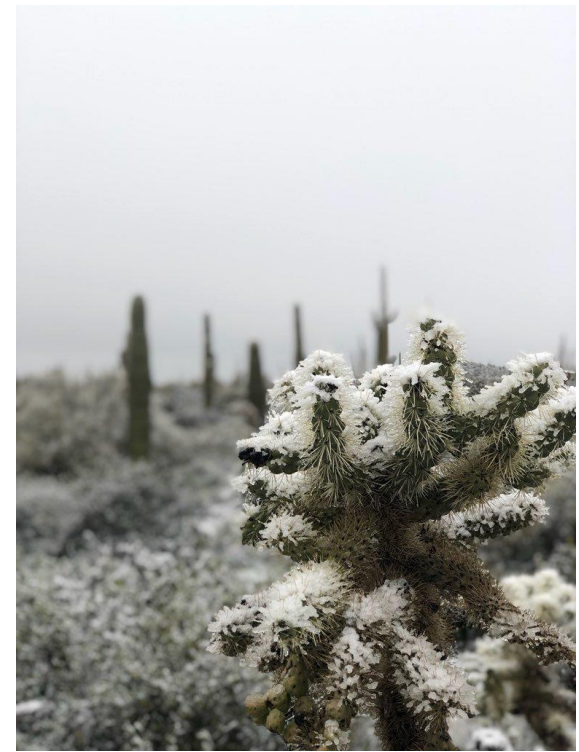


**Good Examples of Comparison**



Object	Size	Object	Size
Dime/Penny	0.75 inches	Hen Egg	2.00 inches
Nickel	0.88 inches	Tennis Ball	2.50 inches
Quarter	1.00 inches	Baseball	2.75 inches
Half Dollar	1.25 inches	Tea Cup	3.00 inches
Ping Pong Ball	1.50 inches	Grapefruit	4.00 inches
Golf Ball	1.75 inches	Softball	4.50 inches

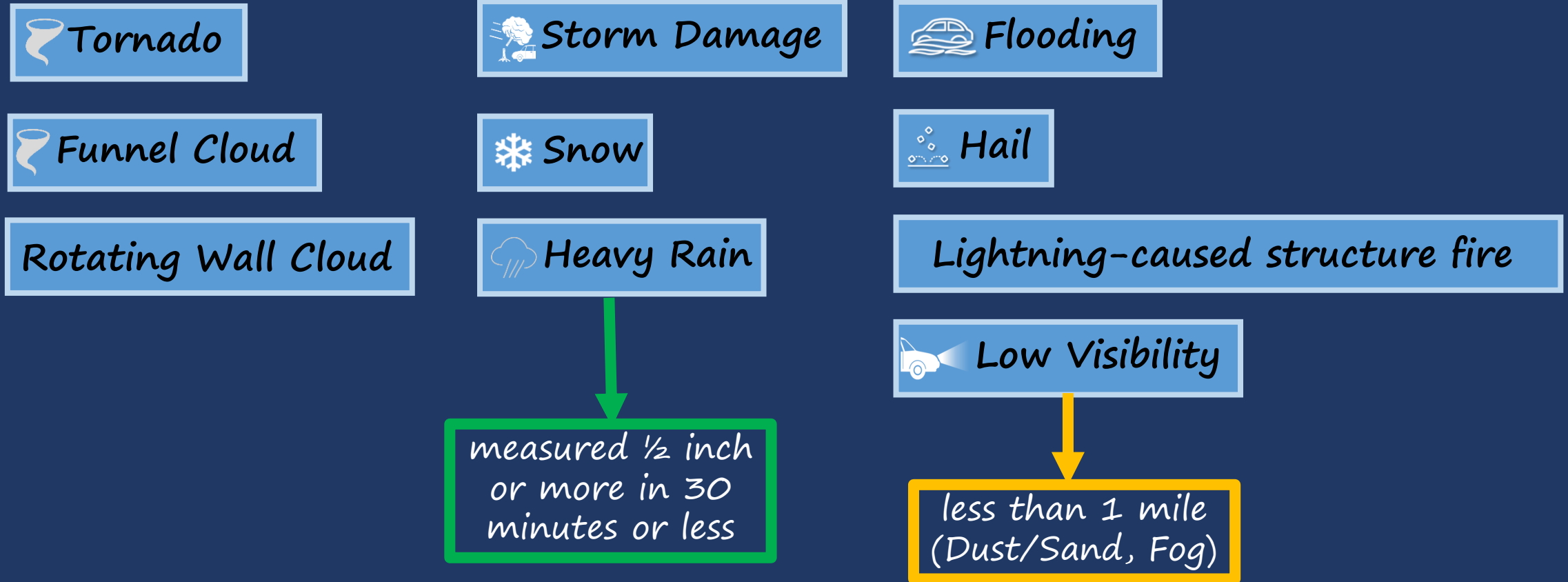
# Weather Hazards to Report



- even if it is not accumulating
- take multiple samples of snow depth if possible
- let us know about road conditions

# Reporting Procedures

## Criteria



Only report conditions meeting criteria

# Reporting Procedures

## Content Essentials

### Who?

spotter id

### What?

- Damage: trunk/limb diameter? roof material type?
- Flooding: streets? washes? depth? ponding vs. flowing?
- Low vis: how low (distance)? how widespread?

### Where?

at home? elsewhere?  
city, major cross-  
streets

### When?

time reportable  
criteria first began

Only report information you can confirm

# Reporting Procedures

## Examples

“Heavy rain, lightning, and  
thunder in XYZ.”

Good report?

# Reporting Procedures

## Examples

- Who: Spotter MAAXYYYY
- What: Flooding (water covering top of sidewalk).
- Where: Home (near Elm St. and Main St.)
- When: 10:05pm (rain started at 920pm)

Good report?

# Reporting Procedures

*In a Nutshell...*

*When you encounter something that meets criteria... Report it!*

*For HAMs, don't wait for radio Net to be activated.*

# Reporting Procedures

## Methods

### Spotters *ONLY*

Website (mobile friendly)

Email

Phone

Amateur Radio

### Social Media



X

@NWSPhoenix

#azwx #cawx



Facebook

[facebook.com/NWSPhoenix](https://facebook.com/NWSPhoenix)

*Working Together to Protect Lives and Property*



# Spotter Essentials

- *Stay Safe!*
- *Stay Informed*
- *Understand Weather Basics*
  - *Identify Weather Hazards*
- *Report Hazardous Weather*

# Contact Details

Ted Whittock & Gabriel Lojero

Skywarn Program Managers  
(notify of contact info changes)



[theodore.whittock@noaa.gov](mailto:theodore.whittock@noaa.gov)



[gabriel.lojero@noaa.gov](mailto:gabriel.lojero@noaa.gov)

Tom Frieders

Warning Coordination Meteorologist



[tom.frieders@noaa.gov](mailto:tom.frieders@noaa.gov)



[weather.gov/phoenix](https://weather.gov/phoenix)



[www.facebook.com/nwsphoenix](https://www.facebook.com/nwsphoenix)



[www.twitter.com/nwsphoenix](https://www.twitter.com/nwsphoenix)



602-275-7418 (public line)

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