



Skywarn Spotter Training

National Weather Service
Hanford, CA



Spotter Training

- Purpose
- Who We Are
- Weather Definitions and Terminology
- Thunderstorm Types
- Types of Severe Weather
- Severe Weather Cloud Identification
- Local Cases
- Severe Weather Safety and Reporting

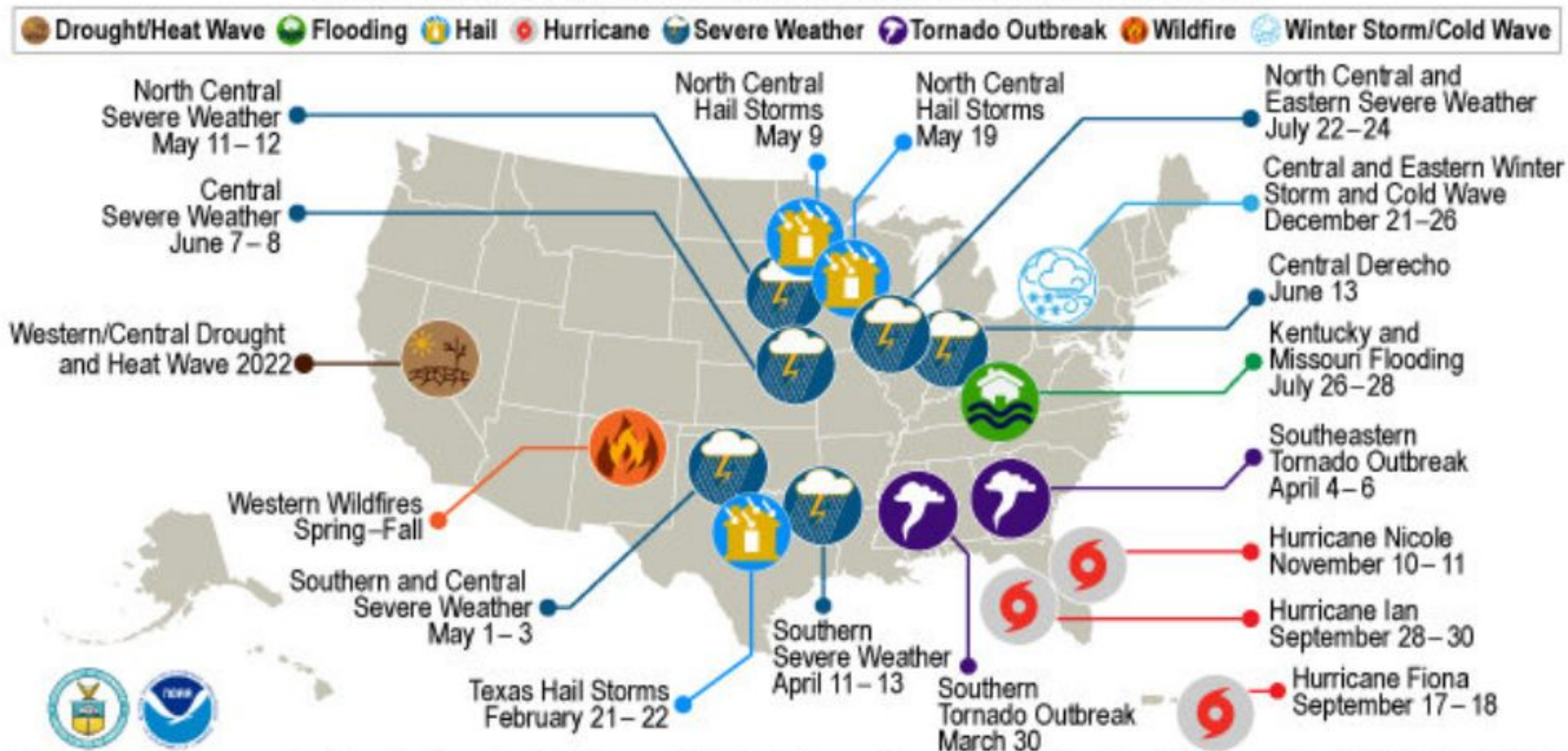


Owens Valley – 11/30/2012



Why do we need the NWS?

U.S. 2022 Billion-Dollar Weather and Climate Disasters

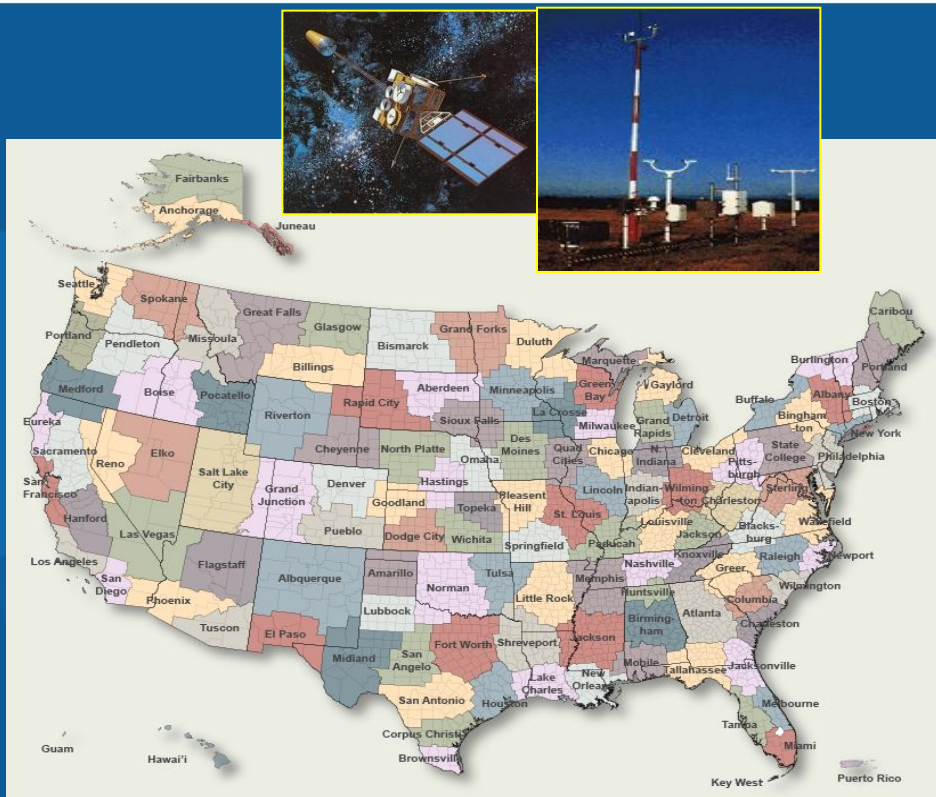


This map denotes the approximate location for each of the 18 separate billion-dollar weather and climate disasters that impacted the United States in 2022.

In 2022, the United States experienced 18 separate weather or climate disasters that each resulted in at least \$1 billion in damages. NOAA map by NCEI.



Today's NWS

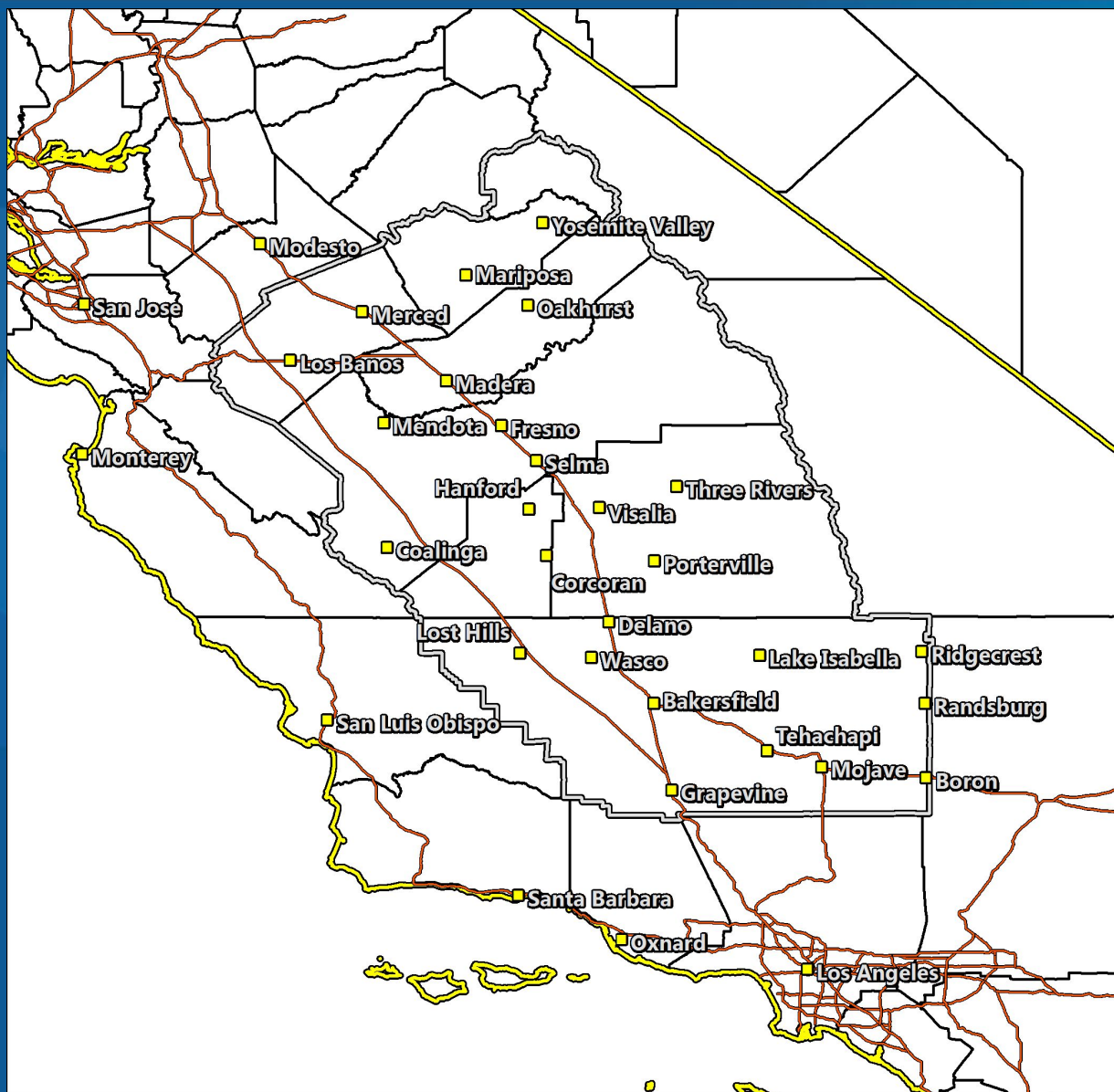


- Federal Agency
- Established in 1870 as a part of the War Department
- Changed names from Weather Bureau to National Weather Service in 1970
- Approx. 4800 employees
- 122 Forecast Offices
- 13 River Centers
- 9 Special Centers





NWS Hanford Forecast Area



One of the greatest myths in the weather warning program...

**The NWS is probably already aware of this
(hail, damage, flood, etc.),
so why should I report it?**

The reality...

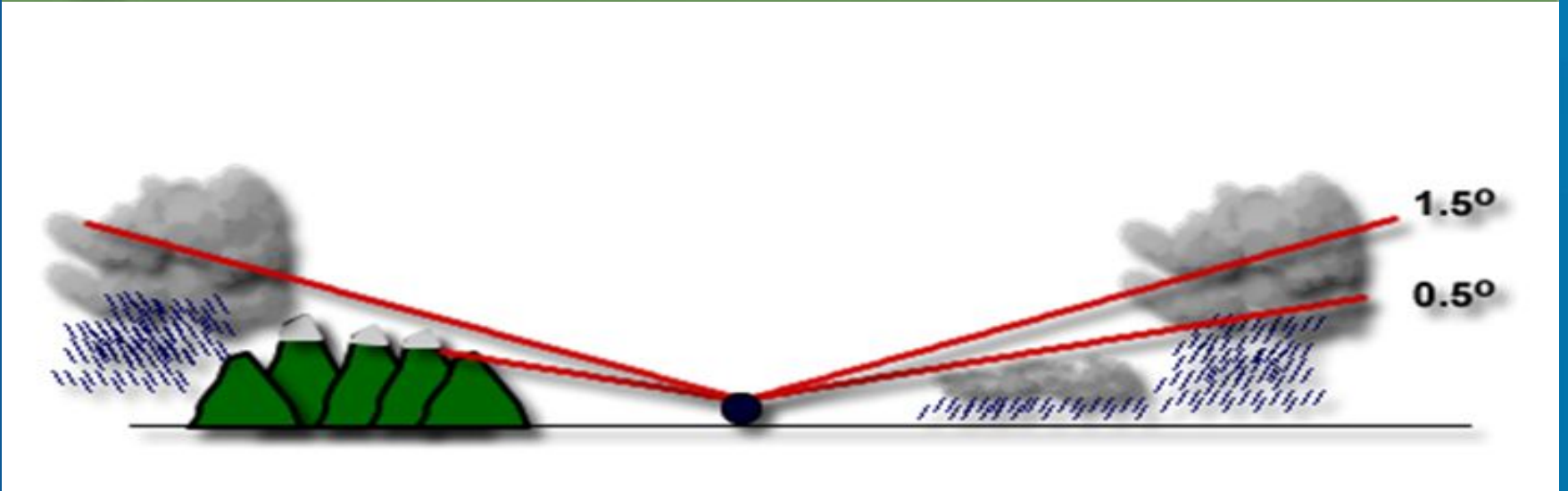
Many, many times we are not!

Do not assume that if a warning is issued, the NWS knows for certain that severe weather has occurred. (We want to hear from you!)

We would rather get several reports of the same weather phenomena, than none at all!



Doppler Radar





Thunderstorms





Thunderstorm Ingredients

NECESSARY INGREDIENTS

Moisture

- “Fuel” source for thunderstorms

Instability

- The tendency for air to rise on its own

Lift

- Mountains
- Fronts
- Thunderstorm outflow

NECESSARY FOR STRONG STORMS

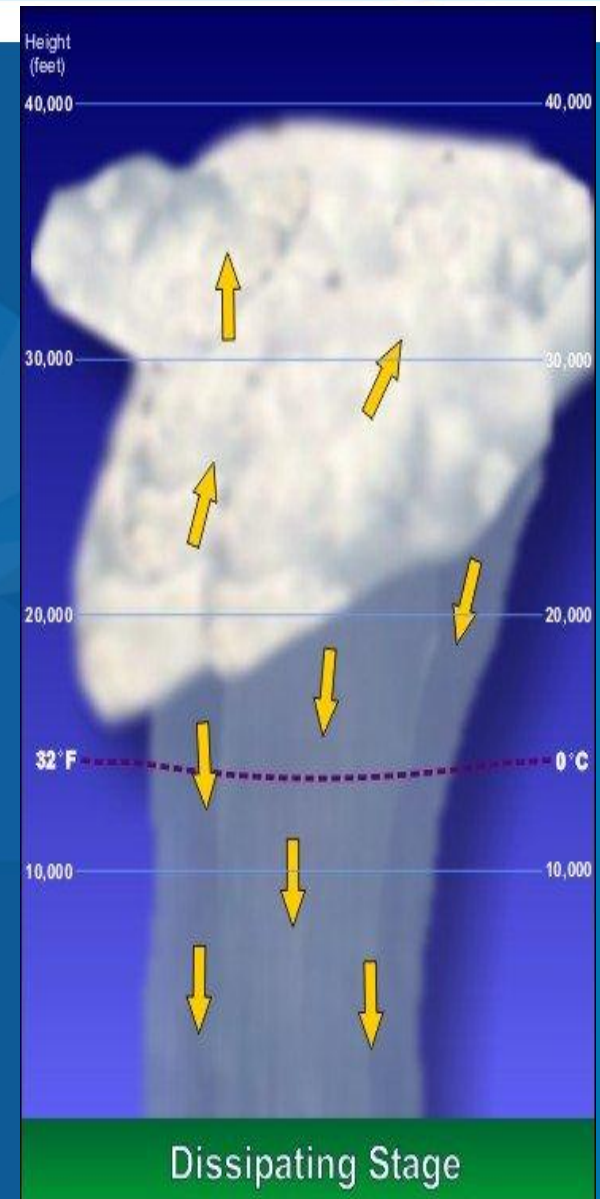
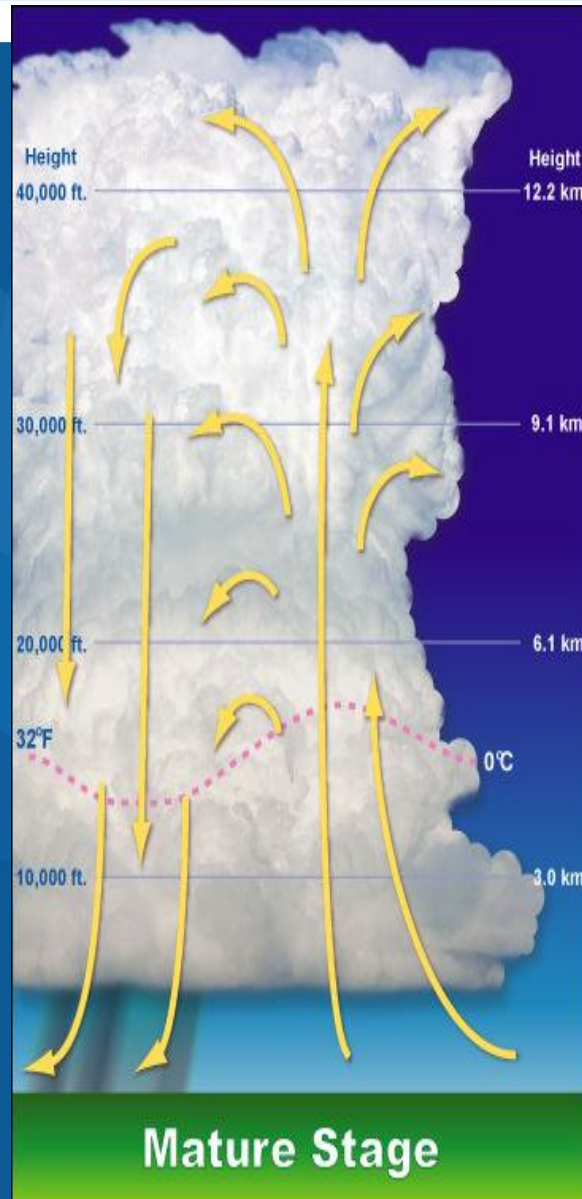
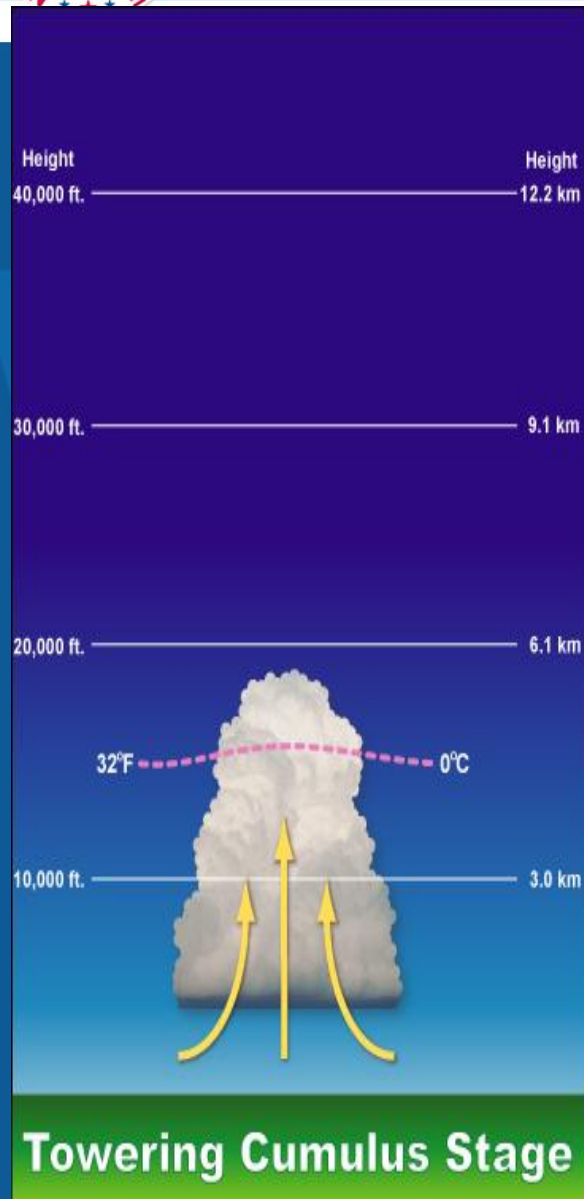
Wind Shear

- Difference in wind speed or direction with height





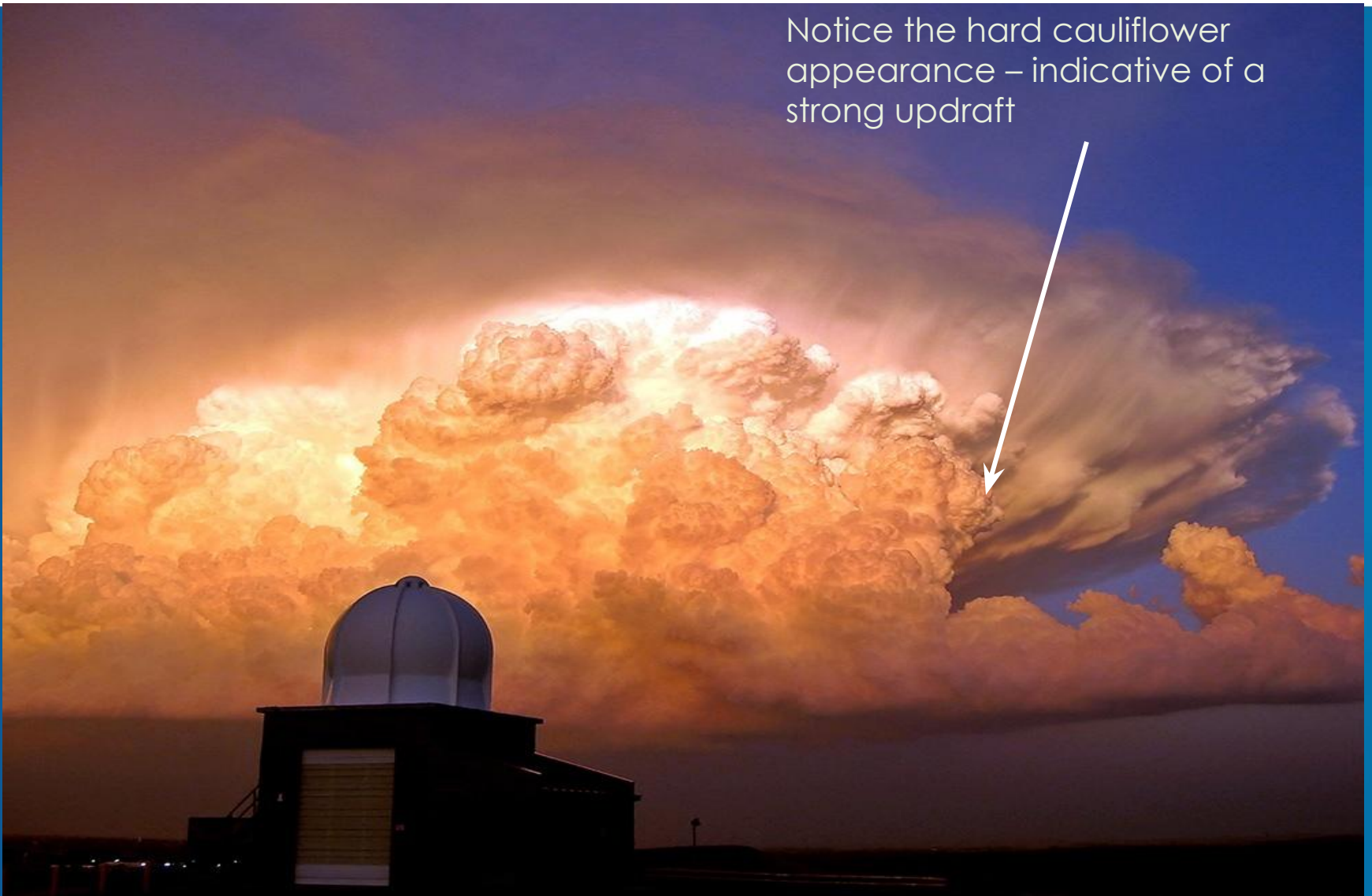
Thunderstorm Development





The Mature Thunderstorm

Notice the hard cauliflower appearance – indicative of a strong updraft





Thunderstorm Categories

SINGLE/PULSE CELL

- Short lifetime (20-30 min)
- Usually no or very brief severe weather
- In dry environments (e.g. here):
 - Strong to severe outflow winds

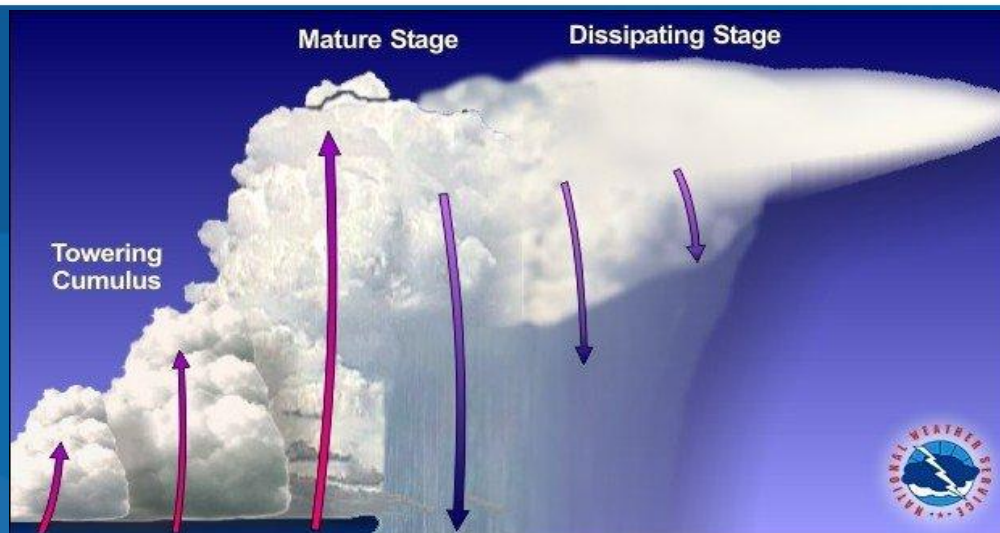




Thunderstorm Categories

MULTICELL CLUSTER

- Most common
- Moves as a single unit
- Multiple stages at one time
- Mature cells in the center
- Dissipating cells at the downwind edge





Thunderstorm Categories

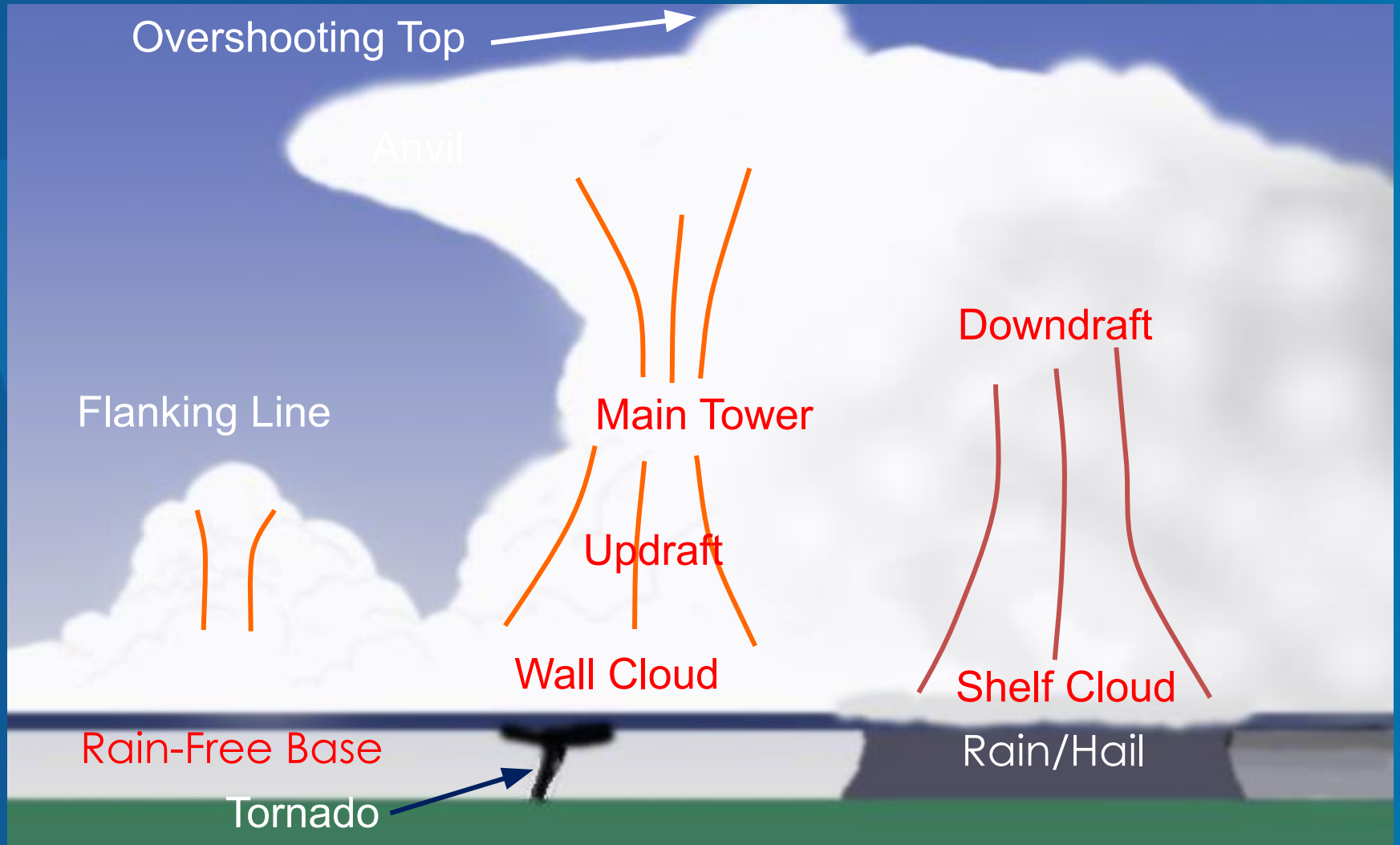
SUPERCELL

- Highly organized
- Rapidly rotating updraft (mesocyclone)
- Poses the greatest threat to human life and property
- Largest hail and tornado threat





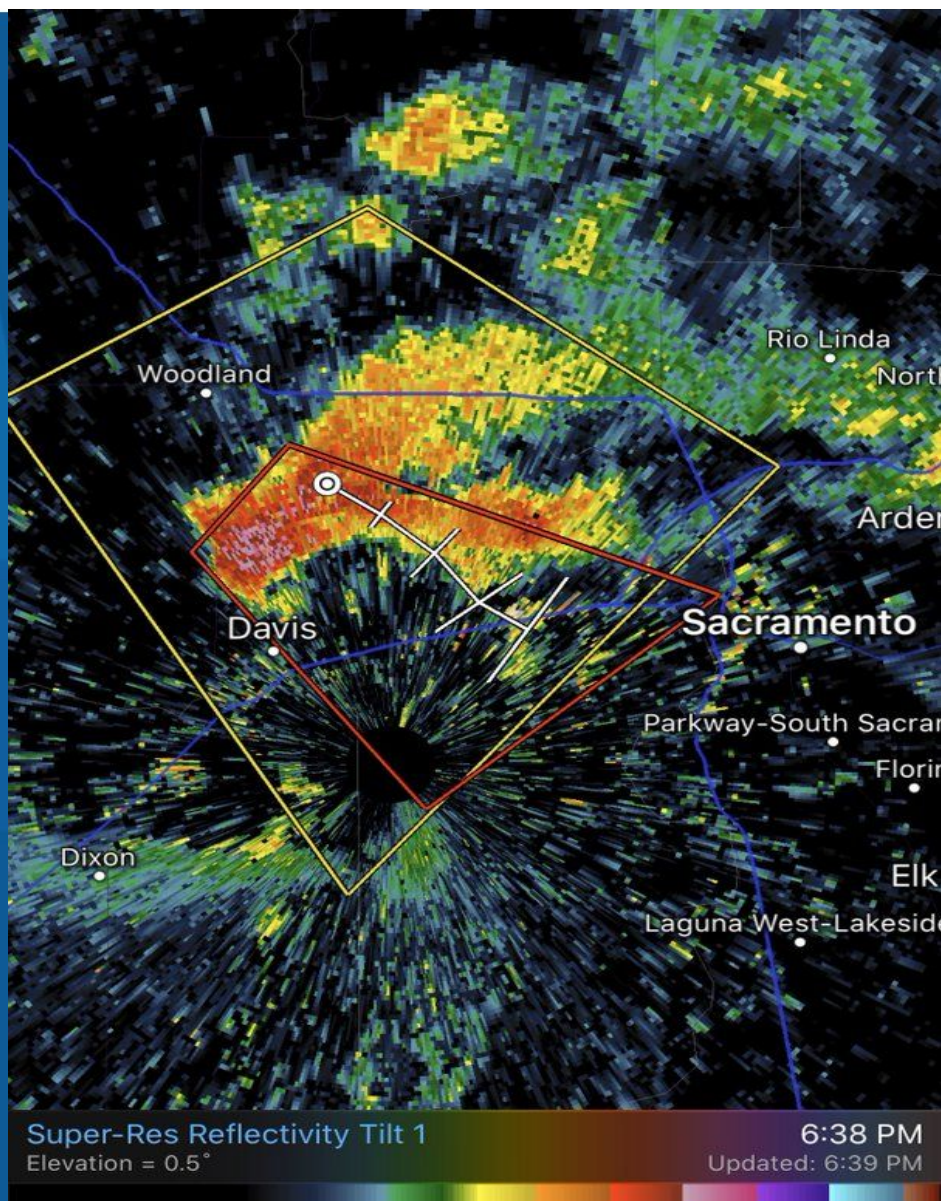
Supercell



Storm Motion □



Supercell on Radar





Mammatus Clouds

NWS Las Vegas 3/2/2015



Cellular pattern of pouches
hanging underneath the base
(usually the anvil)

Often indicative of a particularly
strong storm





Shelf Cloud

Lynne Dempsey
July, 2008
5 NNW Elkhorn, WI
Scary-looking Cloud



Near Genoa, MN - July 21, 2005
Photo by the Bob Oesterlin

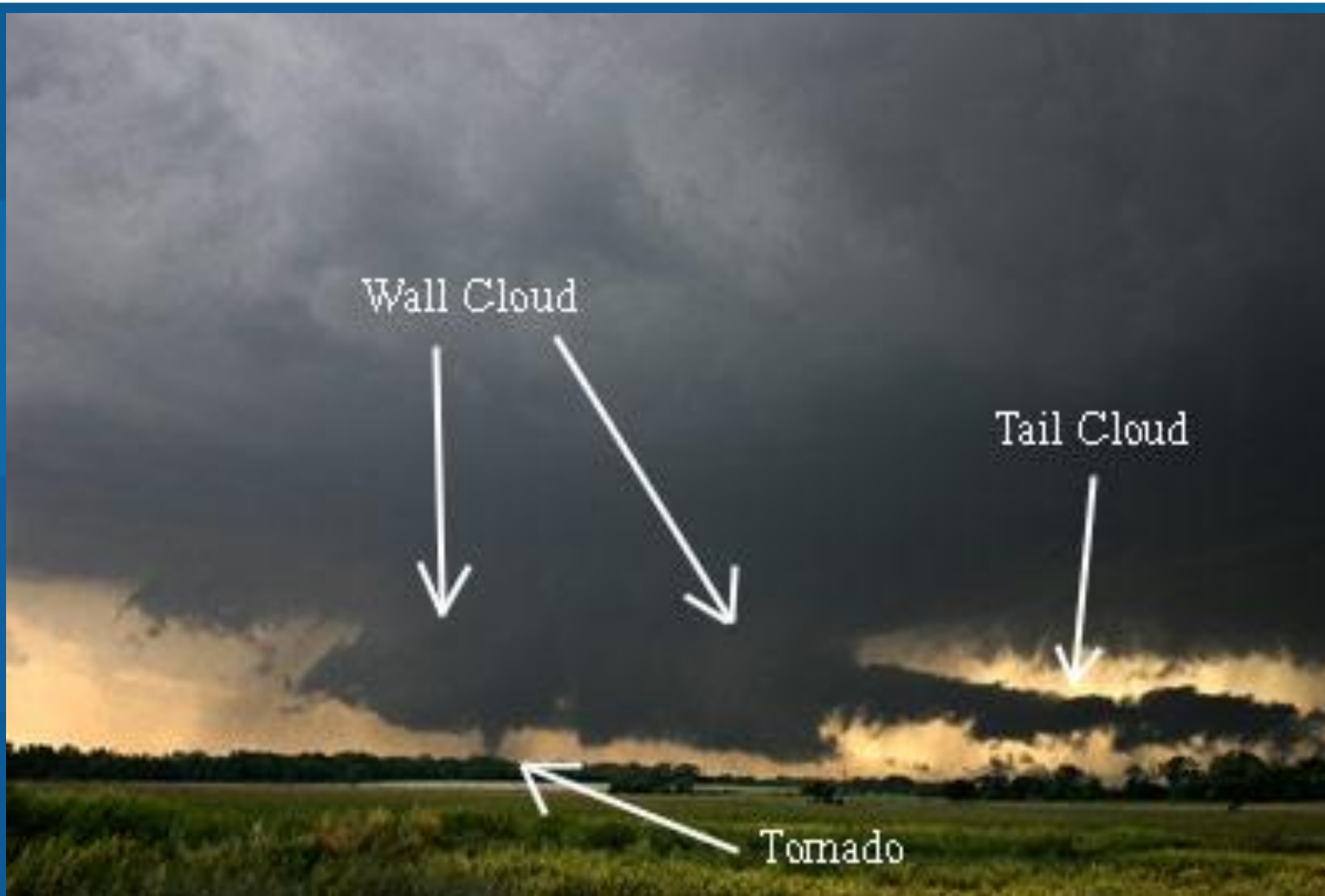
Low level, *horizontal*, wedge shaped cloud, occurring on leading edge of a thunderstorm

Points downward away from the area of rain





Wall Cloud





Tornadoes

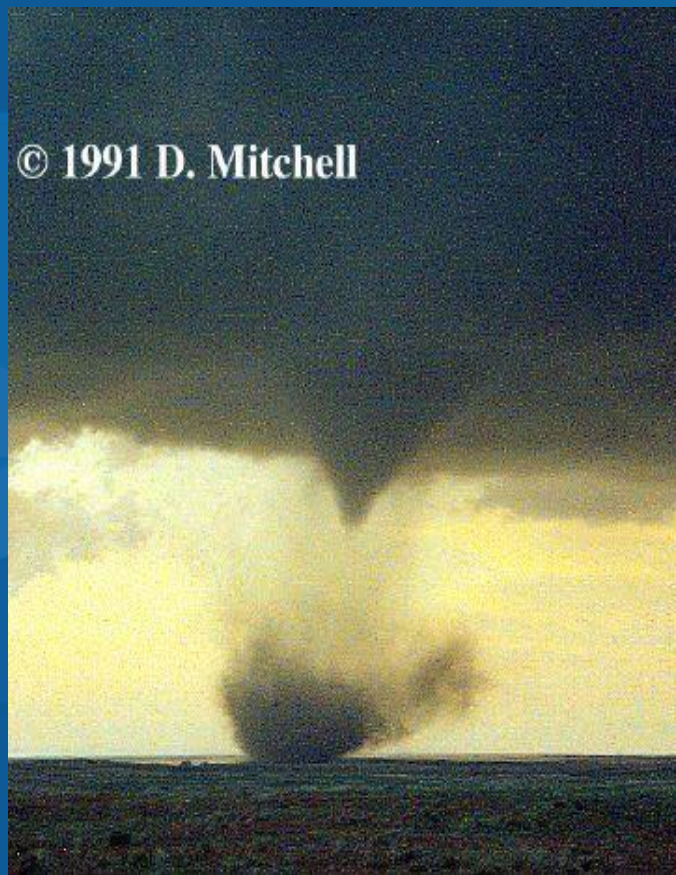
Definitions and Terminology



- **Tornado:** A Violently Rotating Column of Air Attached to a Thunderstorm and in Contact with the Ground.
- **Funnel Cloud:** A Rotating Funnel-Shaped Cloud Extending Downward from a Thunderstorm Base, but not in Contact with the ground.



Funnel Cloud (left) Tornado (right)



The condensation funnel does not have to be in contact with the surface for it to be a bona fide tornado, but rotating winds **MUST** reach the surface



Can Tornadoes Happen Here?

- Yes!
- While very rare, tornadoes do occur in the desert and the Valley
- Tornadoes in our area are normally weak but can still cause damage
- 7 confirmed tornadoes in 2019 in NWS Hanford's forecast area



Southern Clark County
08/04/2014



Highest Tornado in the US



- EF-0 Tornado occurred July 7th, 2004 in Sequoia National Park at Rockwell Pass. Base of the tornado was roughly 12,000 feet above sea level, making it the highest in US history.
- Photo by Scott Newton



July 7th, 2004 Storm Part 2



- Back view of the tornadic storm taken by Bill Hensley.



Dust Devils

A dust devil is a rotating column of air that forms as due to intense surface heating.

Tend to form around areas of thermal differences, such as dark and light soils.

Relatively weak winds < 70 mph



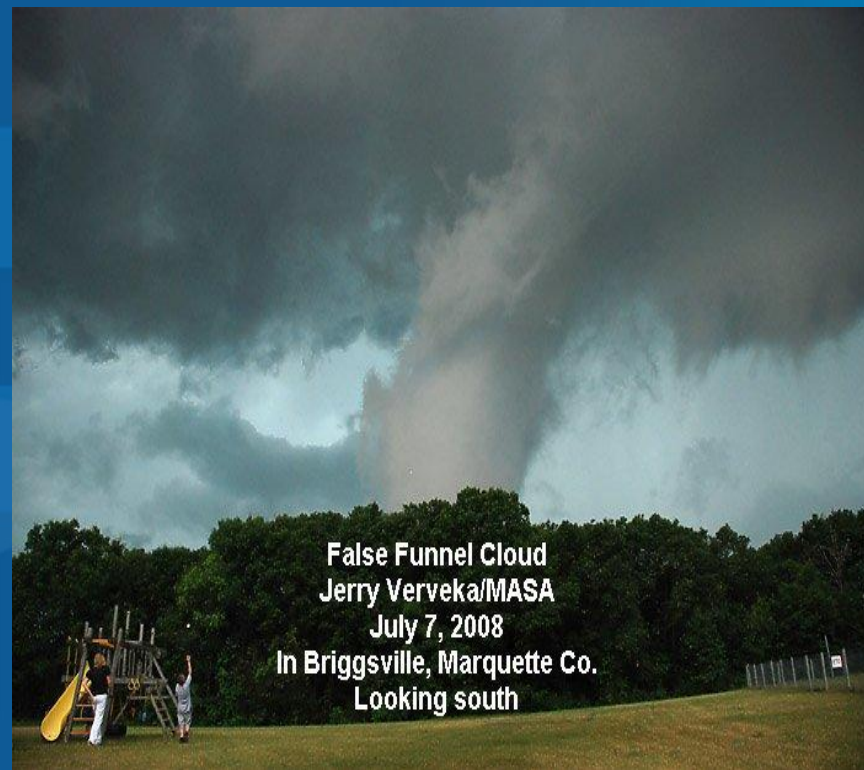


Look Alikes

Scud Clouds



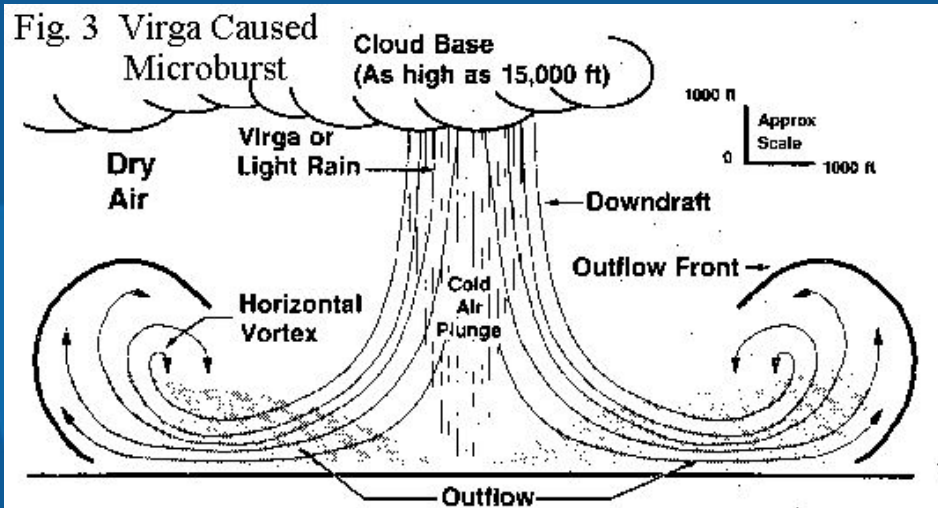
Tail cloud with characteristic funnel shape



Low hanging “scud” attaching to a possible non-rotating wall cloud



Microbursts



- Strong thunderstorm downdraft with an outrush of damaging wind
- Thunderstorms that produce microbursts in the western U.S. often are high-based and have very little associated precipitation
- Sometimes referred to as “dry thunderstorms”
- Virga can be a precursor of a microburst



Hail

- Rarely causes fatalities
- Causes nearly \$1 billion damage to property and crops annually
- Costliest single U.S. hail storm: St. Louis MO - April 10, 2001
Total damage: \$2.3 billion.
- Largest U.S. Hailstone:
Vivian, SD. July 23, 2010
8.0 inches diameter,
18.625 inches circumference
1.94 pounds
- Hailstones **one inch in diameter or larger (quarter size)** are one criteria that indicates that a thunderstorm is "severe."





Severe Weather

A **Severe Thunderstorm** will produce one or more of the following:



Wind gusts of 58 mph (50 kts) or greater



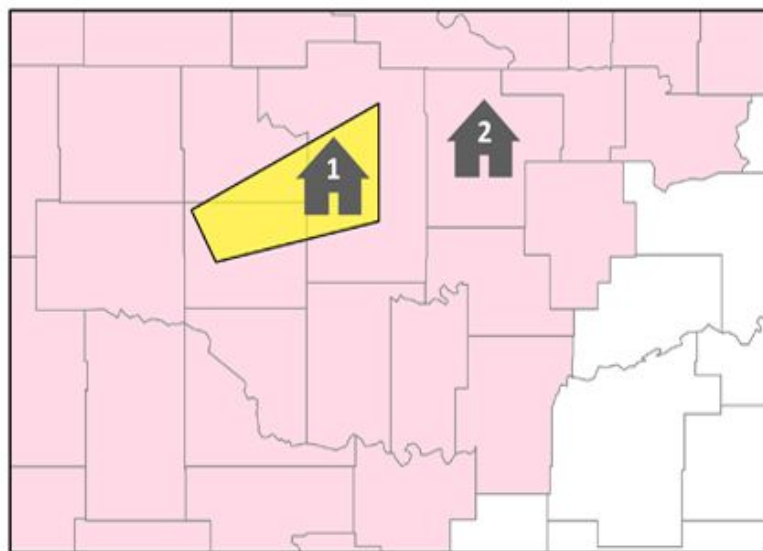
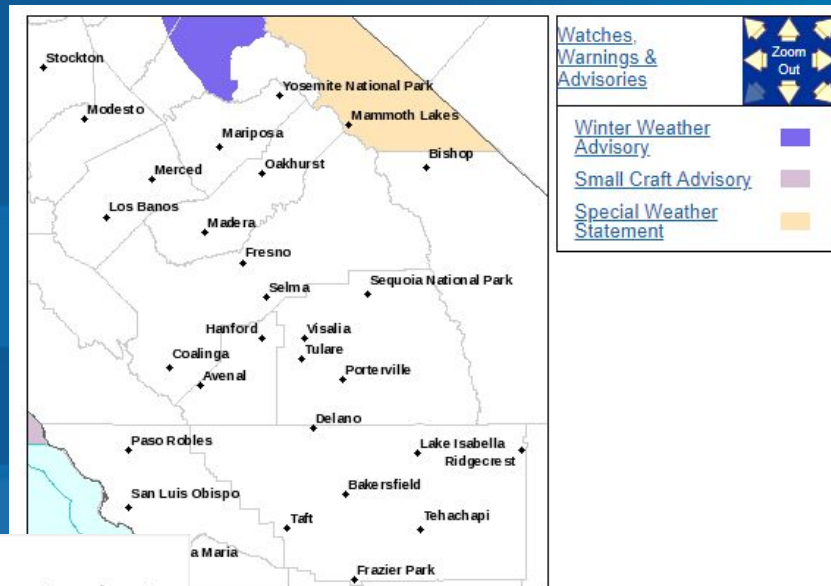
Tornado or Funnel Cloud



Hail 1 inch or larger in diameter



Watch, Warning, And Advisory



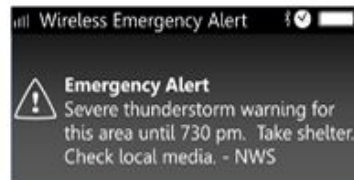
Severe Weather Products

1 Severe Thunderstorm Warning

Severe storms expected! Seek shelter. Large hail or damaging wind is occurring or will shortly at this location on the map.

2 Severe Thunderstorm Watch

Severe storms possible. Be prepared. Weather conditions favor thunderstorms capable of producing large hail or damaging wind at this location on the map.



te: Thu, Apr. 4, 2019 at 9:06:14 am PDT



Thunderstorm Review

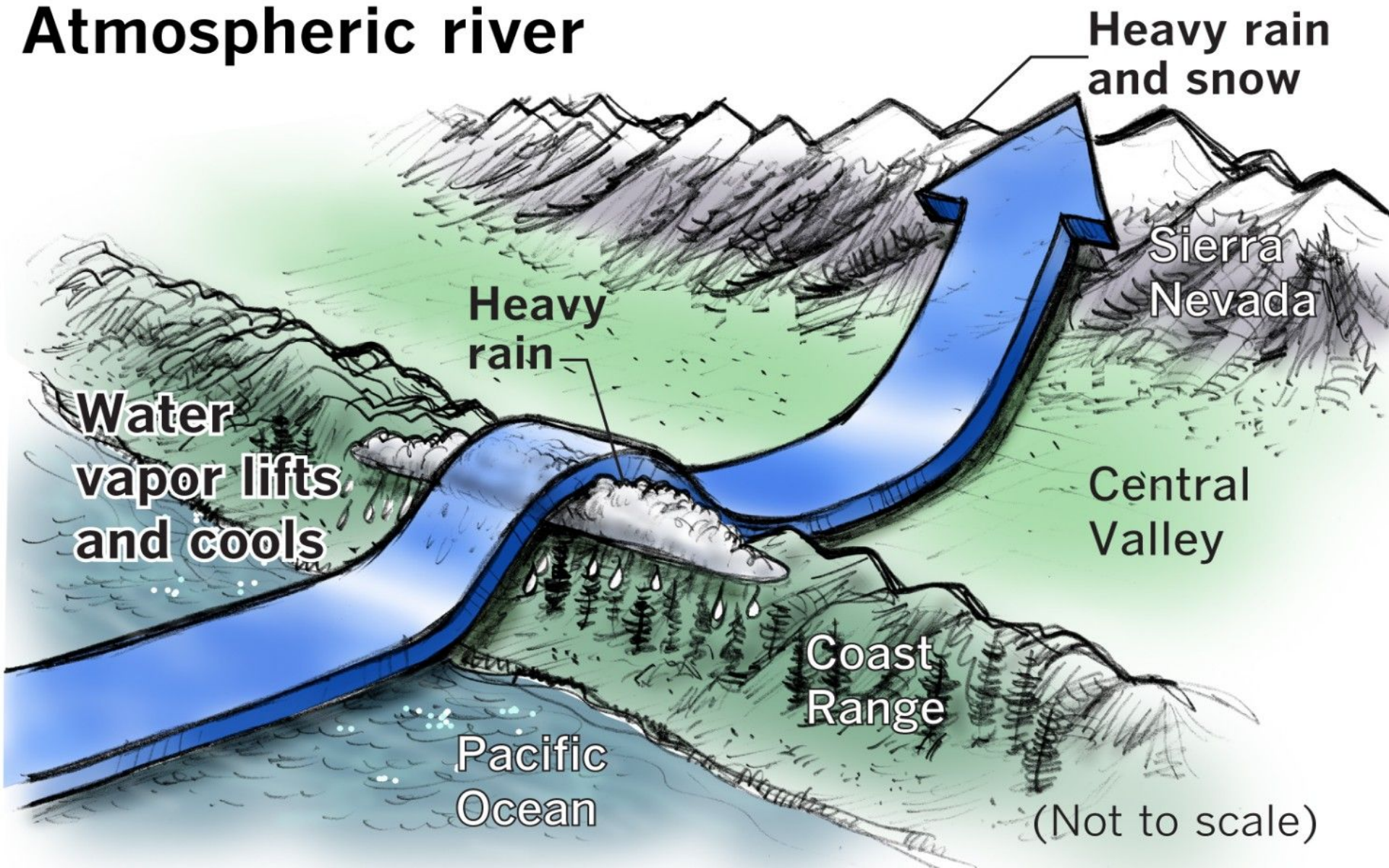
- Four main ingredients
 - Moisture
 - Instability
 - Lift
 - Wind Shear
- Three stages of Thunderstorm Life Cycle
 - Developing (Towering Cumulus)
 - Mature (Cumulonimbus)
 - Dissipating
- Thunderstorm is strengthened by:
 - Instability and wind shear
- Thunderstorm Categories:
 - Single Cell, Multicell Cluster, Supercell





Central California Wet Season

Atmospheric river



Heavy rain
and snow

Sierra
Nevada

Central
Valley

Coast
Range

Pacific
Ocean

(Not to scale)

Heavy
rain

Water
vapor lifts
and cools



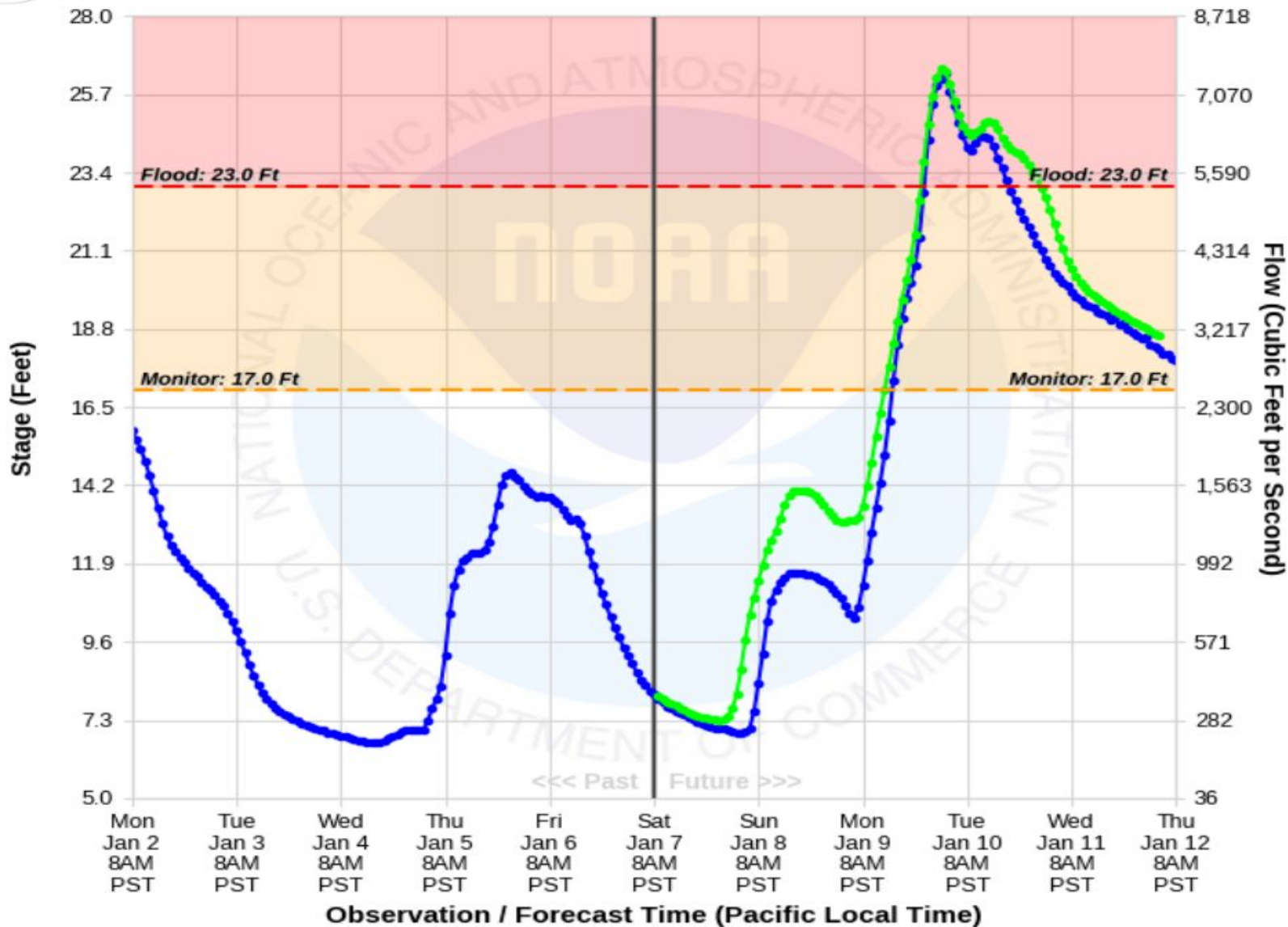
Catastrophic 2023 Floods



Planada Jan 2023
Bear Creek Levee Breach
Merced Co. FB Page



Extreme Hydrograph - Bear Creek



—●— Observed —●— Forecast — Monitor — Flood



Catastrophic 2023 Floods



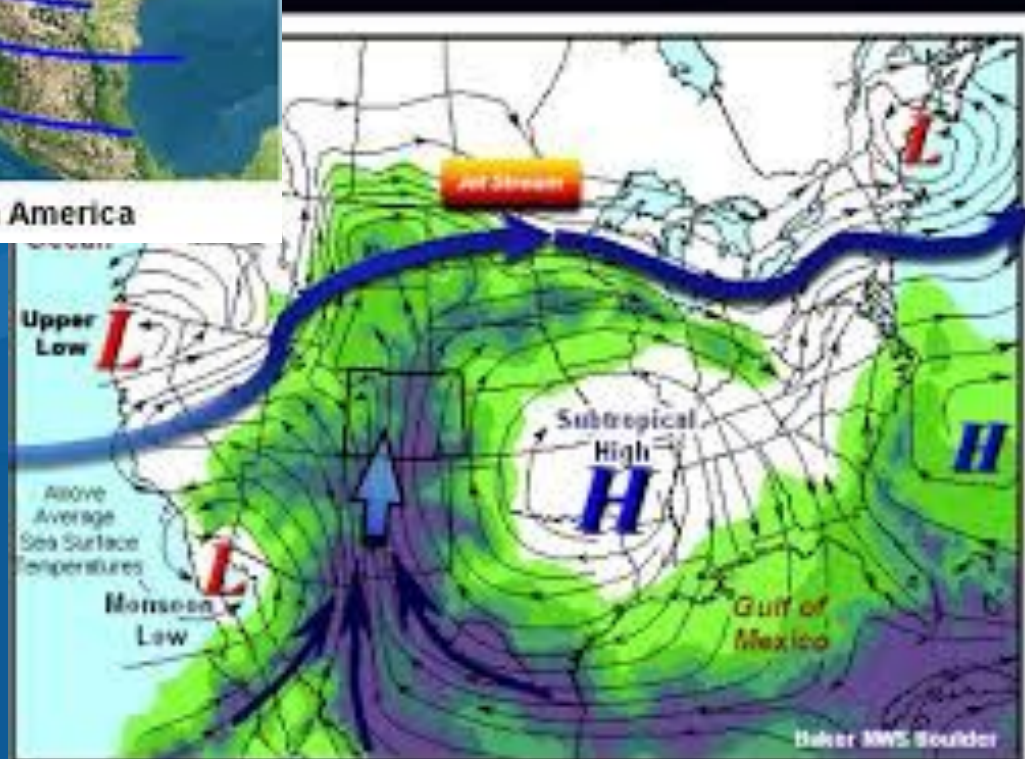
**Wonder Valley March 10th
2023 (Mill Creek)
Credit: KMPH**



North American Monsoon (NAM)



Mean 50 kPa Flow Patterns over SW North America





What is a Flash Flood?

- A flood which is caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours.
- Flash floods are usually characterized by raging torrents after heavy rains that rip through river beds, urban streets, or mountain canyons sweeping everything before them.
- No. 2 weather killer in Central California
- Deadliest thunderstorm hazard is Flash Flooding



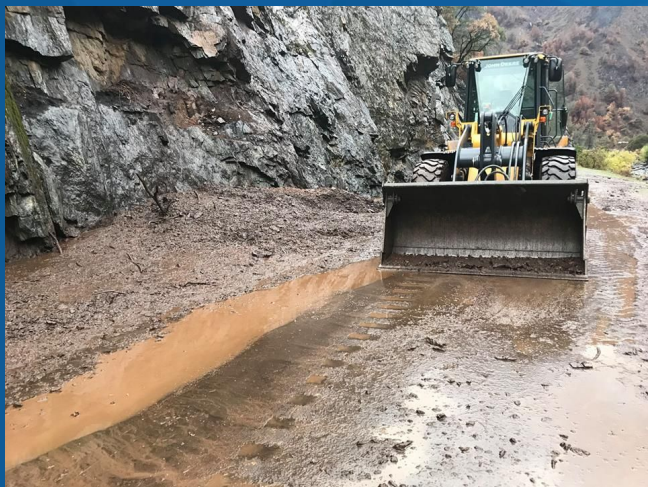
Courtesy of Meadview Fire Dept



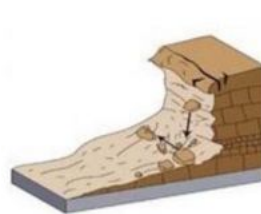
Courtesy of Meadview Fire Dept



Debris Flow



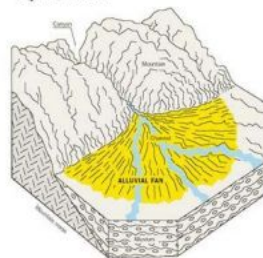
Processes and Landforms Sensitive to Wildfires



A) Rockfall



B) Post-fire debris flow



C) Alluvial fan



D) Floodplain



Winter Weather

What to Report

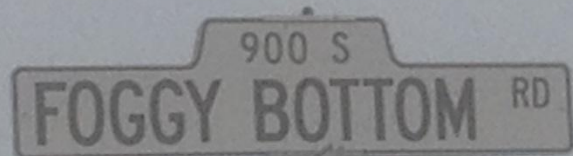
Snowfall accumulations

- How much total snow fell (period of time)
- When snow began/ended
- How much new snow fell (on top of previous depth)

Elevation of snow level

When rain changes to snow or snow changes to rain

- Any icing of roads or road closures.
- Very low temperatures
- Significant winds and wind chill
- Report injuries or damage



National Oceanic
and Atmospheric
Administration

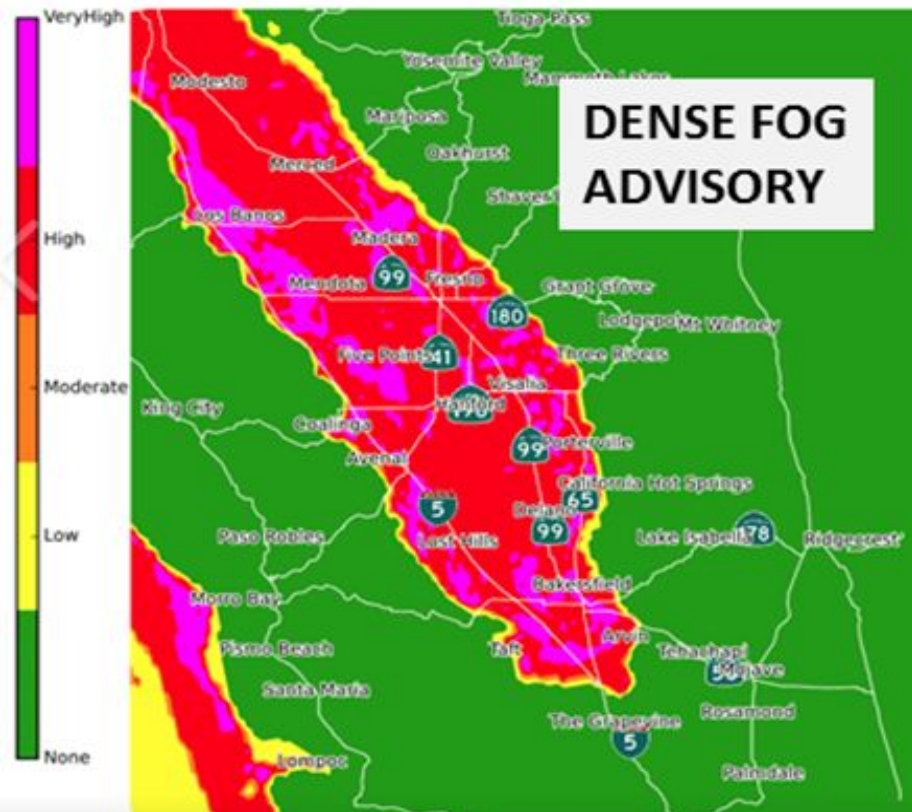


National
Weather Service



Fog Severity Index

Experimental Fog Severity Index
Valid: Wednesday, January 17, 2018 at 05 AM PST



Level 5	Very High Risk For Transportation Visibilities 200 feet or less average vehicle speed 15 mph Highest risk for chain reaction accidents
Level 4	High Risk For Transportation Visibilities 200-800 feet with average vehicle speed 25 mph Higher risk for chain reaction accidents
Level 3	Moderate Risk For Transportation Visibilities a quarter mile or less vehicle speed 45 mph Moderate risk for fog related accidents
Level 2	Low Risk For Transportation Isolated visibilities around a mile may cause travel delays Low risk for fog related accidents
Level 1	No impacts from visibility No risk for transportation



New Webpage

- Radar page has been revamped recently over the last two years
- Will show how to view the enhanced radar page on next few slides

Local forecast by
"City, St" or ZIP code

Enter location ...

Go

[Location Help](#)

News Headlines

- [New River Forecast Point: Kernville, Kern County](#)
- [River Flood Stage Change: Happy Isles](#)

Customize Your Weather.gov

City, ST

Enter Your City, ST or
ZIP Code

☐ Remember Me

Get Weather

[Privacy Policy](#)

NWS Forecast Office Hanford, CA

[Weather.gov](#) > San Joaquin Valley, CA

San Joaquin Valley, CA

Weather Forecast Office

[Current Hazards](#) [Current Conditions](#) [Radar](#) [Forecasts](#) [Rivers and Lakes](#) [Climate and Past Weather](#) [Local Programs](#)

Viewing the Annular

Don't have glasses

Remember - **NEVER** look

1. Grab two pieces of heavy paper or cardboard.
2. Poke a small, clean hole in one with a thumbtack.
3. If you hold that up to the sun and line up the second piece of paper or cardboard, an image of the eclipse will appear!
4. Happy and safe eclipse viewing!



[Show Caption](#)

Local KHXX
Standard Radar
(Low Bandwidth)

Local KEYX
Standard Radar
(Low Bandwidth)

Local Radar
Enhanced (KHXX)

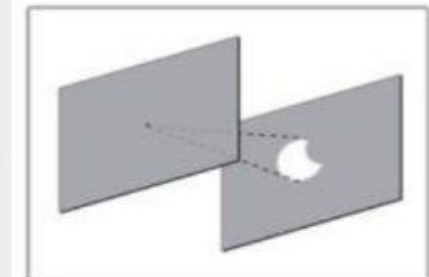
Local Radar
Enhanced (KEYX)

Regional Standard
Radar (Low
Bandwidth)

Slight Warming this Weekend

Eclipse tomorrow? No problem!
Hard eclipse viewer!

... unless you have proper eclipse viewing glasses!



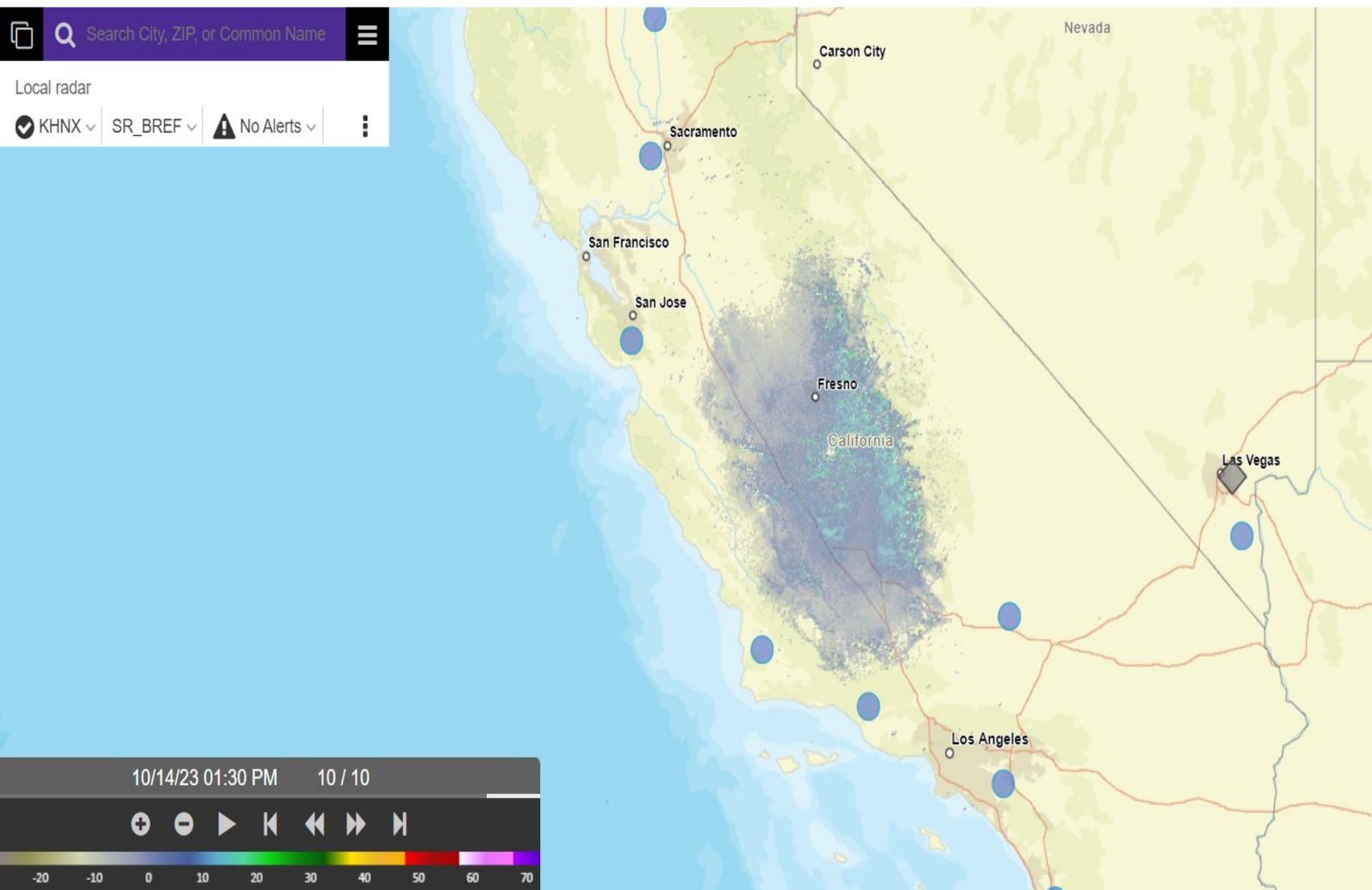
weather.gov/Hanford
National Weather Service - Hanford, CA
Updated: Fri Oct 13, 2023 2:50 PM PDT



Click a location below for detailed forecast.

Search City, ZIP, or Common Name

Local radar
KHNX ▼ SR_BREF ▼ No Alerts ▼



10/14/23 01:30 PM 10 / 10



-20 -10 0 10 20 30 40 50 60 70

Reporting Procedures

- Remember, if you see something weather-related that is unusual or out of the ordinary, the NWS would probably like to know.
- **IDENTIFY** yourself and your location – county and name.
- **WHAT** you have seen – funnel cloud, heavy rain, etc.
- **WHERE** you saw it – direction and distance. Try to be as specific as possible.
- **WHEN** you saw it – note the time.
- **WHAT** it was doing – size and intensity, damage.
- **DO NOT ASSUME WE ALREADY KNOW WHAT IS HAPPENING!**

Spotter Reporting Criteria

TORNADO - Circulation in contact with the ground

FUNNEL CLOUD - Circulation **NOT** in contact with the ground

WIND - Causing damage (such as broken tree limbs or power lines) or greater than 40 MPH

HAIL - Any size. Remember to specify the largest stone.

THUNDERSTORMS - With high winds and frequent cloud to ground lightning

RAINFALL - 0.25 inches or more per 1/2 hour, or any total over 0.50 inches

FLOODING - of ANY kind!

VISIBILITY - Under 1/2 mile, caused by anything (dust, snow, fog, etc.)

SNOWFALL - Accumulating one inch or more per hour, or any depth on desert floors. Knowing your elevation is very helpful.

ICING - of road surfaces caused by anything

WEATHER RELATED DAMAGE OR INJURIES



How to report...

- **Facebook/Twitter (X)**
#HNXSpotter
@NWSHanford
- **Online: [Weather.gov/Hanford](https://www.weather.gov/Hanford)**
 - Click the Submit Report Link on upper left.
 - nws.hanford@noaa.gov

[Location Help](#)

News Headlines

- [New River Forecast Point: Kernville, Kern County](#)
- [River Flood Stage Change: Happy Isles](#)

NWS Forecast Office Hanford, CA

[Weather.gov](#) > San Joaquin Valley, CA

San Joaquin Valley, CA

Weather Forecast Office

[Current Hazards](#) [Current Conditions](#) [Radar](#) [Forecasts](#) [Rivers and Lakes](#) [Climate and Past Weather](#) [Local Programs](#)

[Current Outlooks](#)

[Submit Report](#)

[Daily Briefing](#)

[Detailed Hazards](#)

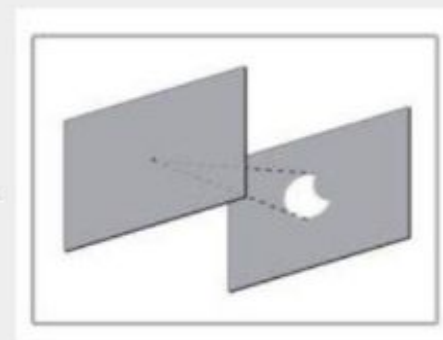
[Graphical
Hazardous
Weather Outlook](#)

Slight Warming this Weekend

have glasses for the eclipse tomorrow? No problem!
Make a cardboard eclipse viewer!

Remember - **NEVER** look at an eclipse directly unless you have proper eclipse viewing glasses!

1. Grab two pieces of heavy duty paper or cardboard.
2. Poke a small, clean hole in one with a thumbtack.
3. If you hold that up to the sun and line up the second piece of paper or cardboard, an image of the eclipse will appear!
4. Happy and safe eclipse viewing!



[Show Caption](#)

[weather.gov/Hanford](#)

National Weather Service - Hanford, CA
Updated: Fri Oct 13, 2023 2:50 PM PDT



Click a location below for detailed forecast.