

# CW3E Event Summary: 17–20 October 2024

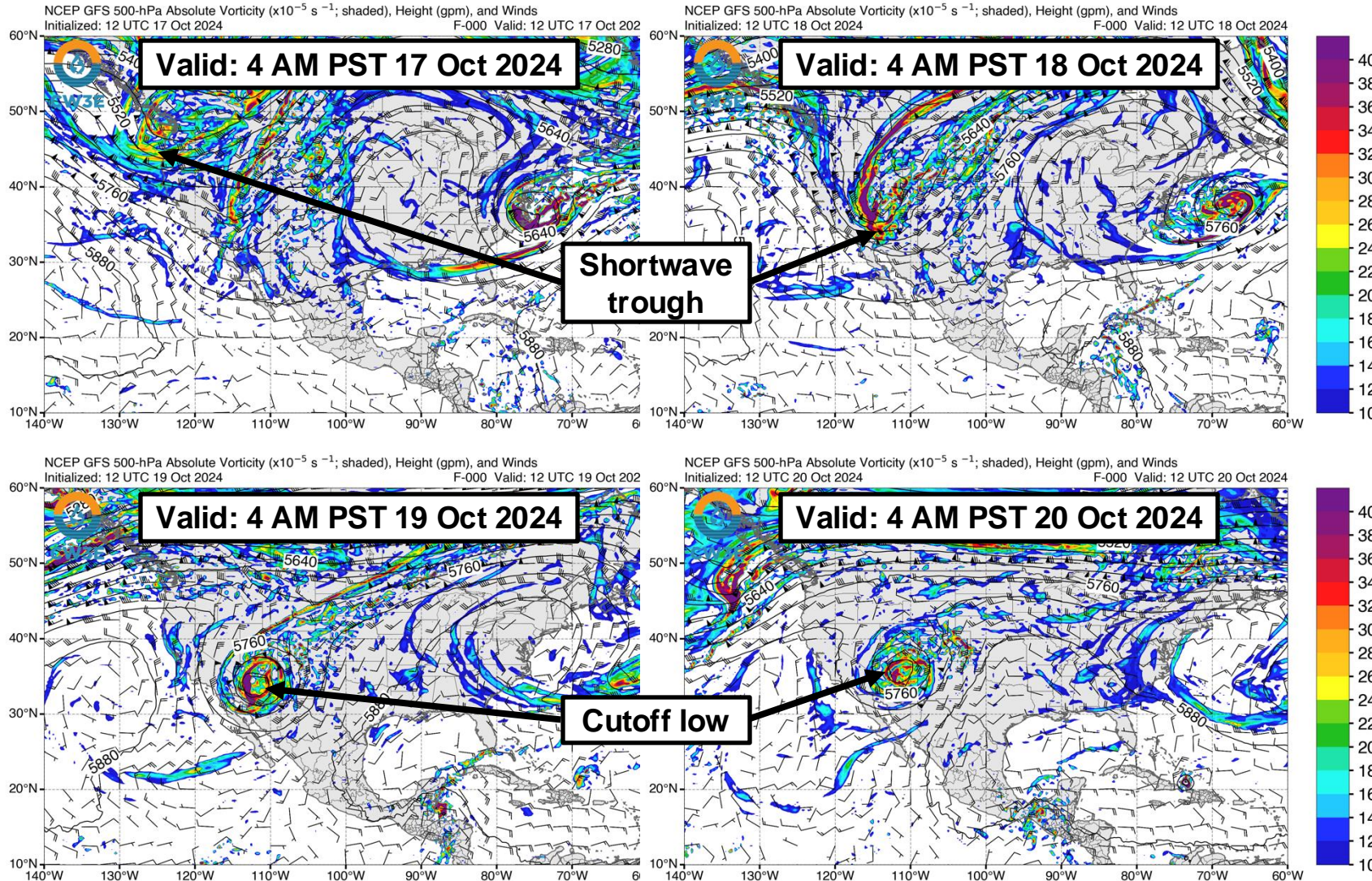
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## **Complex Storm Produces Heavy Snow in CO and Record-Breaking Rainfall in NM**

- An amplifying mid-level shortwave trough over the western US evolved into a cutoff low over AZ, setting the stage for widespread precipitation in the Four Corners region.
- The combination of strong synoptic-scale forcing, large instability, ample moisture, and strong vertical wind shear created favorable conditions for the development of organized convection over eastern NM on Sat 19 Oct.
- These thunderstorms produced very heavy rainfall, particularly in the vicinity of Roswell, NM (> 6 inches).
- Roswell received nearly 50% of its annual precipitation in a 6-hour period and set a new all-time daily precipitation record (5.78 inches).
- Based on NOAA Atlas 14, the observed 6-hour rainfall at Roswell exceeded the 500-year storm.
- Snowfall accumulations of 1–2 feet were also observed in the Uinta and San Juan Mountains.
- Some locations received the equivalent of ~15% of their typical annual peak snowpack during this event.
- Extremely heavy rainfall in southeastern NM caused flooding along the Pecos River south of Roswell.
- Life-threatening flash flooding occurred in Roswell and Chaves County, where more than 300 people were rescued from floodwaters.
- Nearly 40 people were hospitalized and two fatalities were reported.

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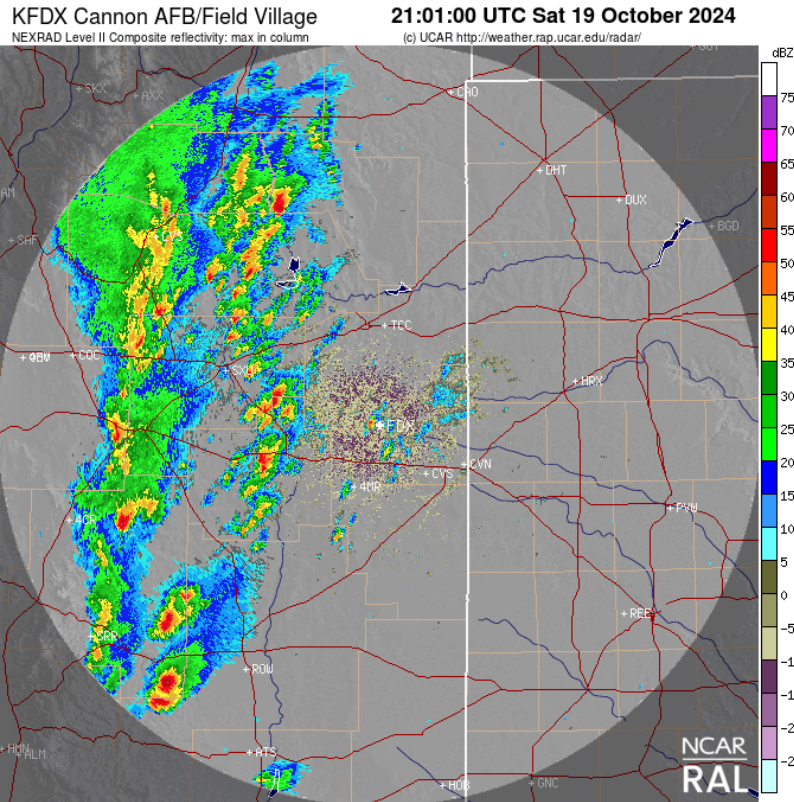
## GFS 500-hPa Vorticity, Height & Wind Analyses



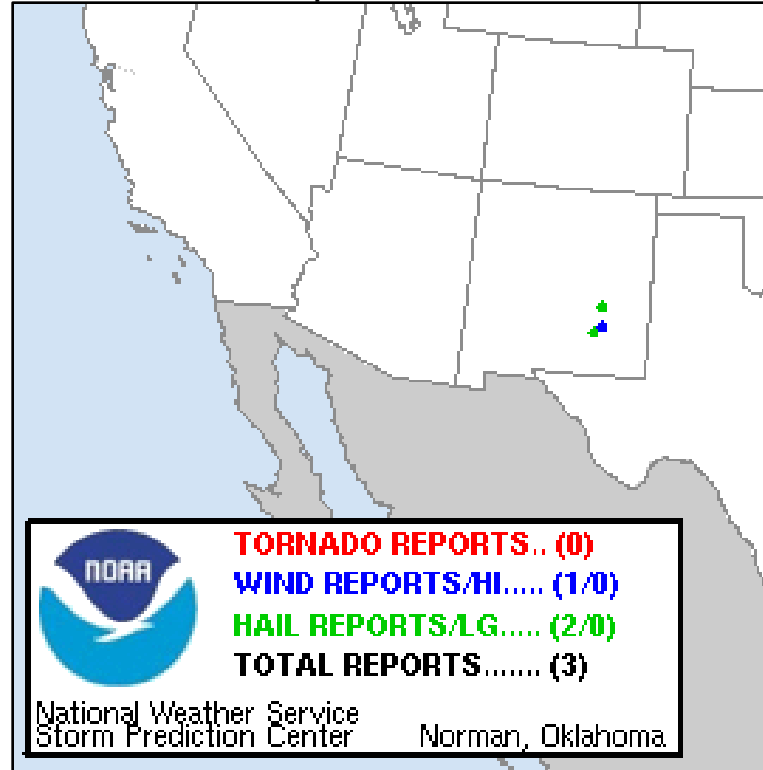
- This event was primarily driven by the evolution of a mid-level shortwave trough initially located over the Pacific Northwest on Thu 17 Oct.
- As time progressed, the trough propagated southeastward and deepened, eventually forming a cutoff low by Sat 19 Oct.
- The cutoff low remained nearly stationary over AZ for about 24 hours, prolonging precipitation over the Four Corners region.

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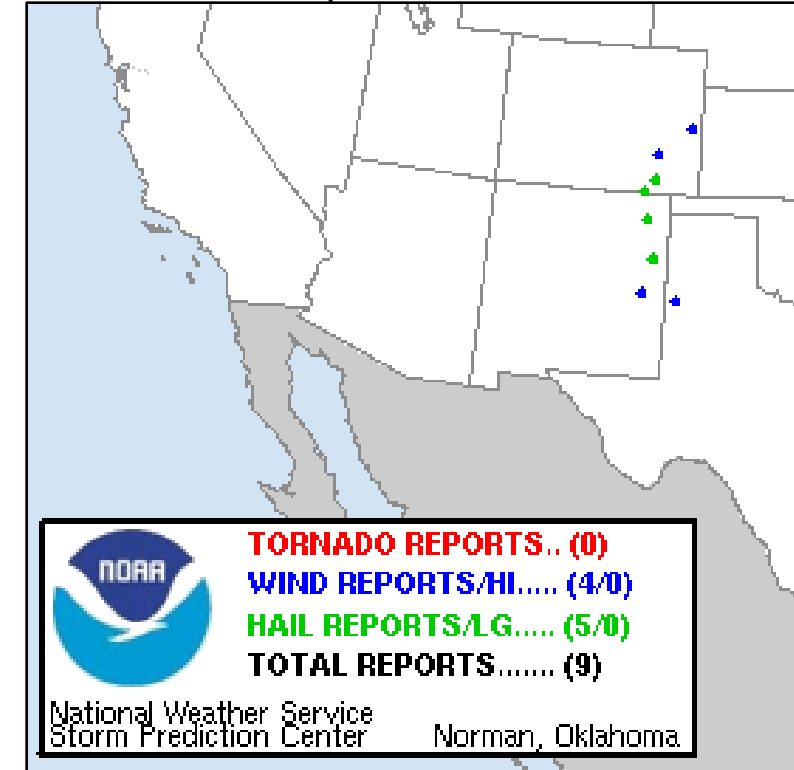
## Organized Convection



Storm Reports: 19 Oct 2024



Storm Reports: 20 Oct 2024

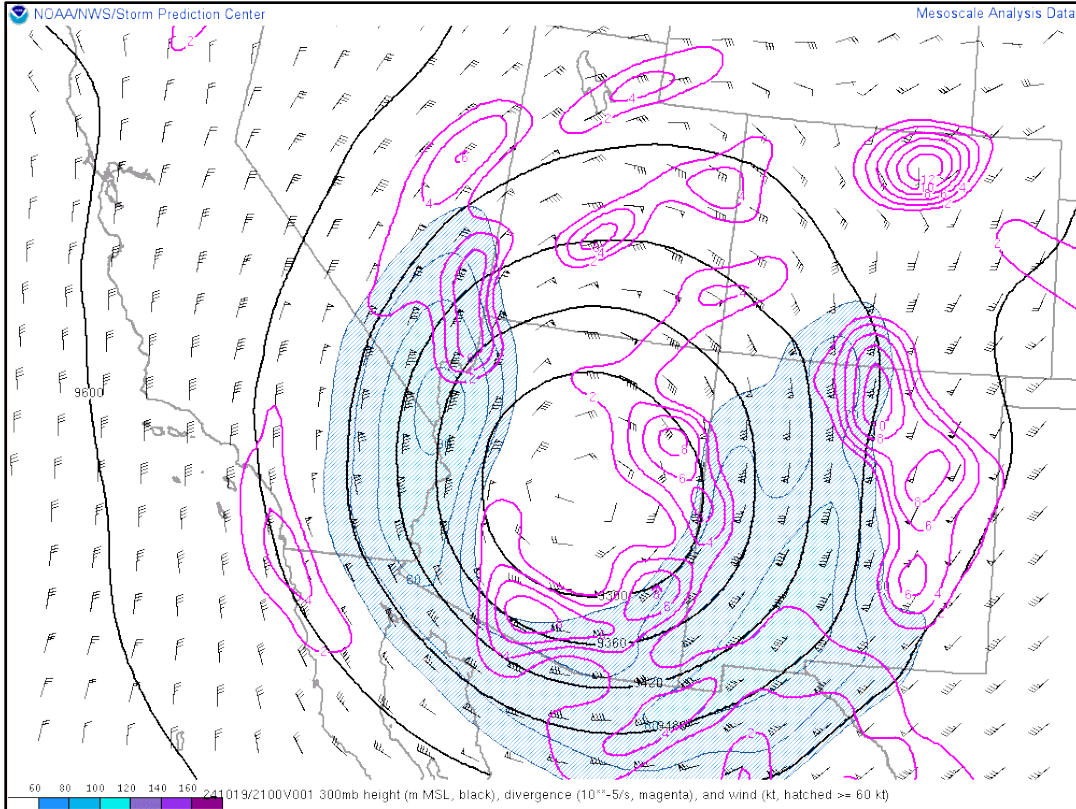


- Cannon AFB (KFDX) NEXRAD radar indicated the development of organized convection over eastern NM during the afternoon of Sat 19 Oct.
- These thunderstorms produced extremely heavy rainfall in the vicinity of Roswell, NM.
- Small hail and strong wind gusts were also reported in eastern NM and southeastern CO.

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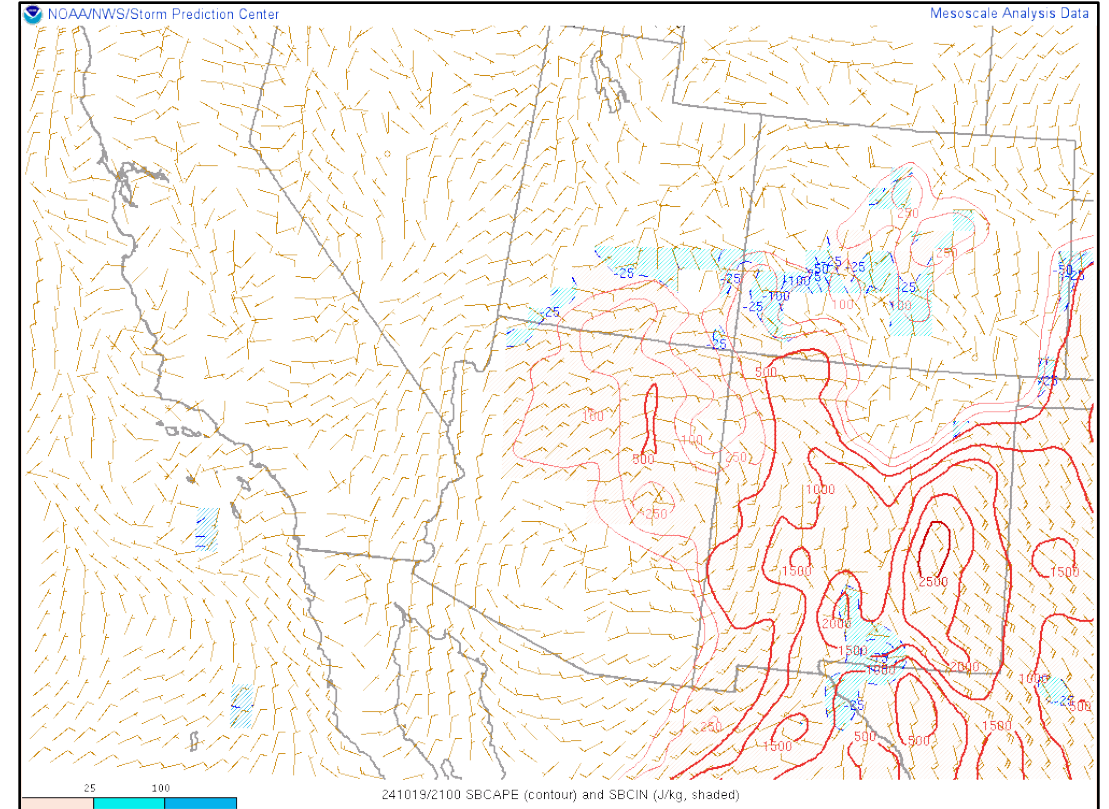
## Ingredients for Convection: Lift and Instability

SPC Mesoscale Analysis: Valid 1 PM PST 19 Oct 2024



300-hPa Geopotential Height (black contours), divergence (magenta contours), and winds (shading and barbs)

SPC Mesoscale Analysis: Valid 1 PM PST 19 Oct 2024



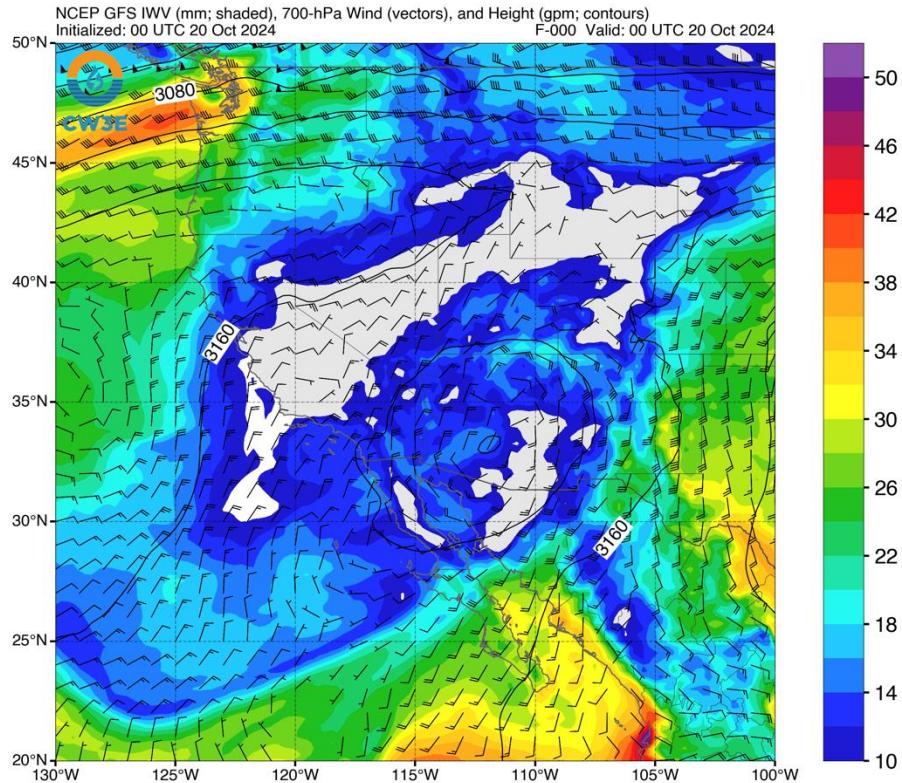
Surface-based CAPE (red contours), surface-based CIN (shading), and surface winds (barbs)

- The development of organized convection in eastern NM was supported by the following ingredients:
  - 1) synoptic-scale lift beneath a region of upper-level divergence east of the cutoff low
  - 2) instability, as indicated by CAPE values  $> 2000 \text{ J kg}^{-1}$

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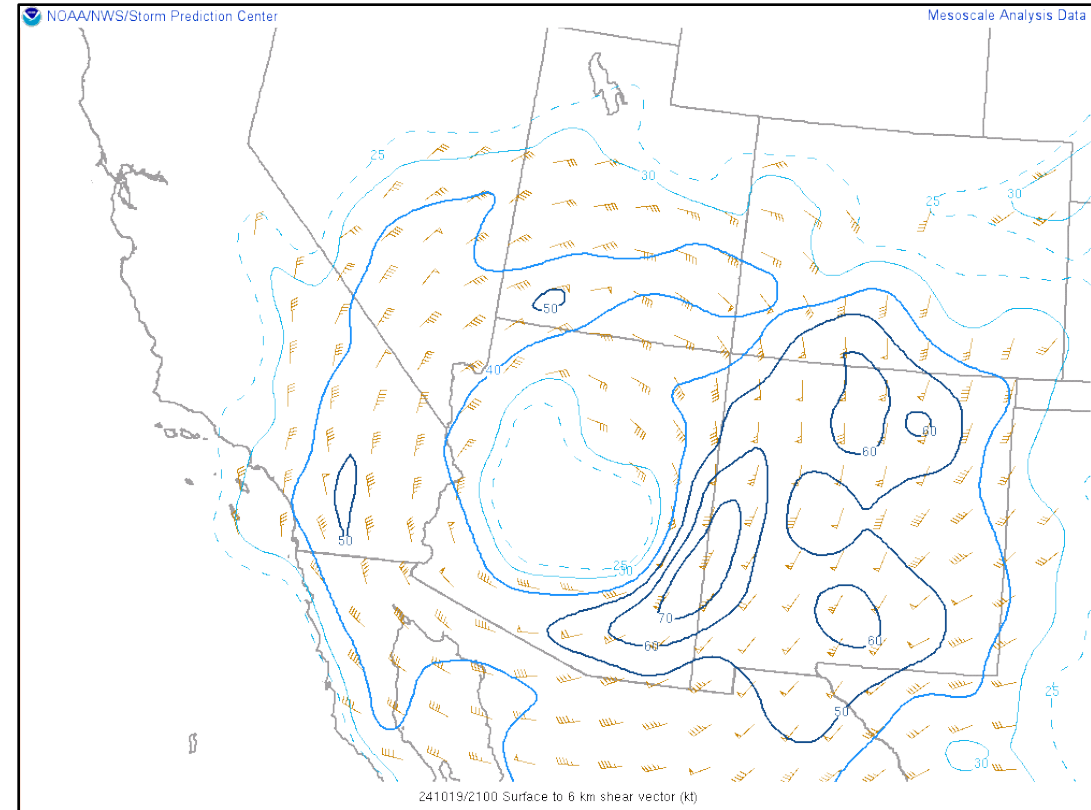
## Ingredients for Convection: Moisture and Wind Shear

GFS Analysis: Valid 4 PM PST 19 Oct 2024



700-hPa Geopotential Height (contours), IWV (shading), and 700-hPa Wind (barbs)

SPC Mesoscale Analysis: Valid 1 PM PST 19 Oct 2024



Surface to 6 km bulk wind shear (contours and barbs)

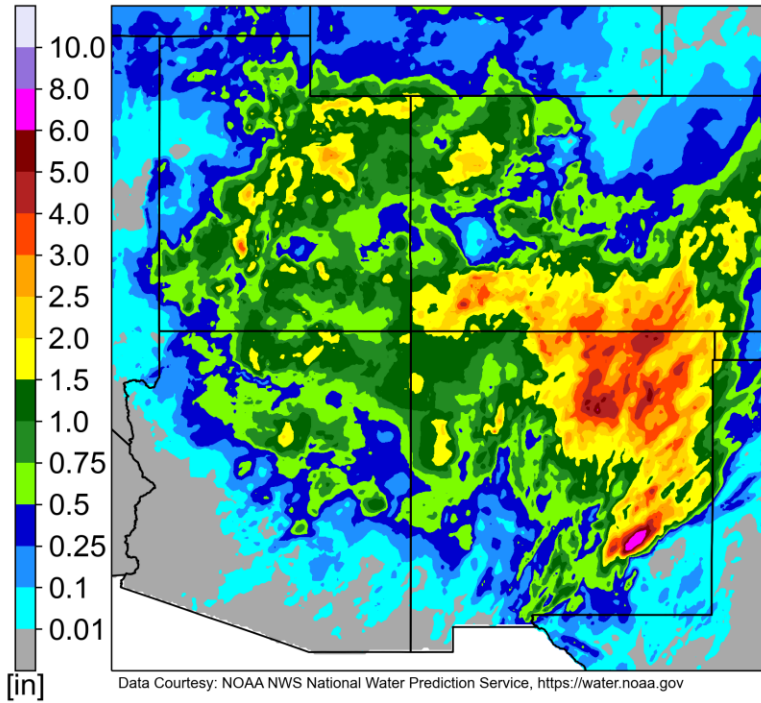
- The development of organized convection in eastern NM was supported by the following ingredients:
  - 3) the presence of very moist air (IWV > 25 mm) resulting from low-level moisture transport and moisture convergence
  - 4) strong vertical wind shear (> 50 kts), with winds veering from southeasterly near the surface to south-southwesterly aloft

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## Observed Precipitation

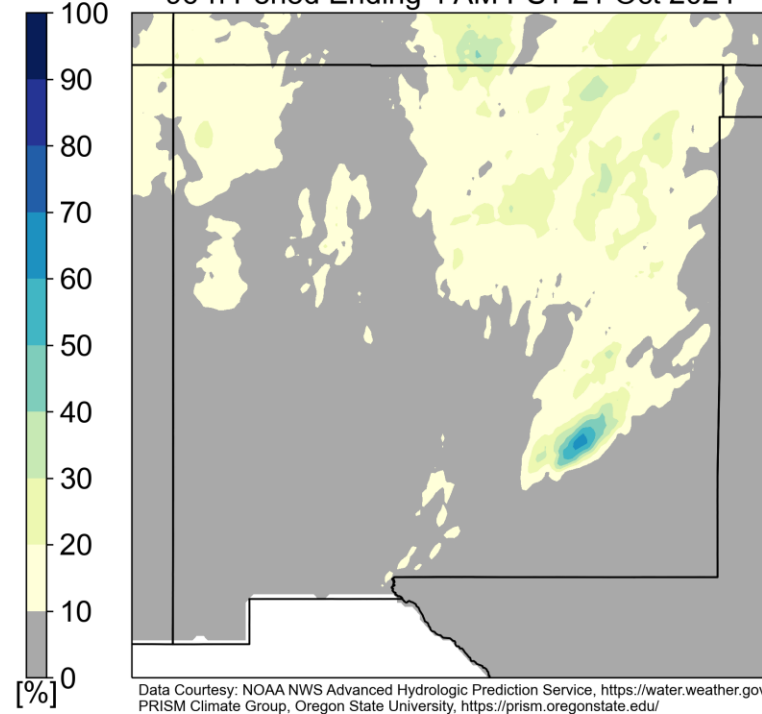
**NWS Stage IV 96-h QPE**

Valid: 4 AM PST 21 Oct 2024



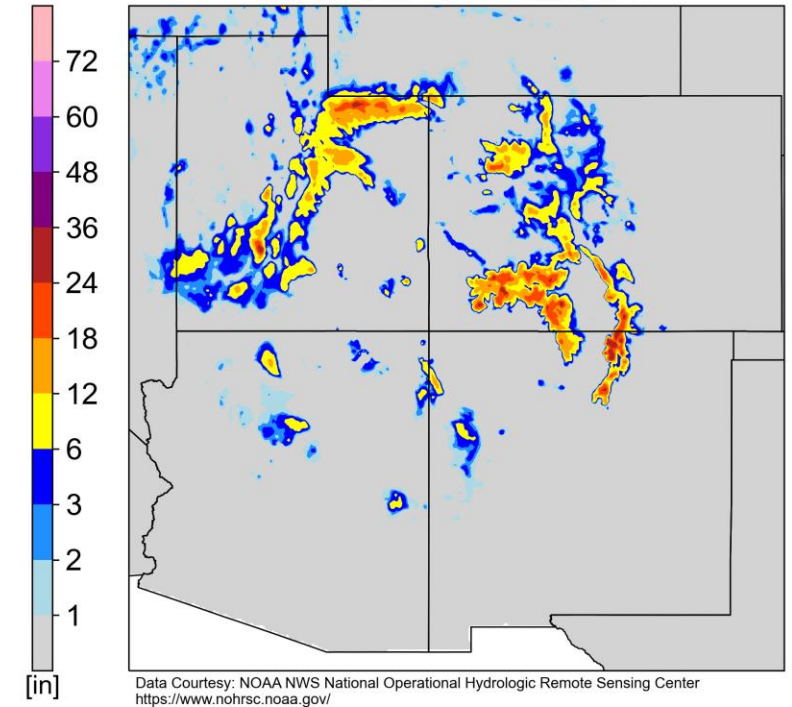
**Percent of Normal WY Precipitation**

96-h Period Ending 4 AM PST 21 Oct 2024



**NWS 96-h Snowfall Analysis**

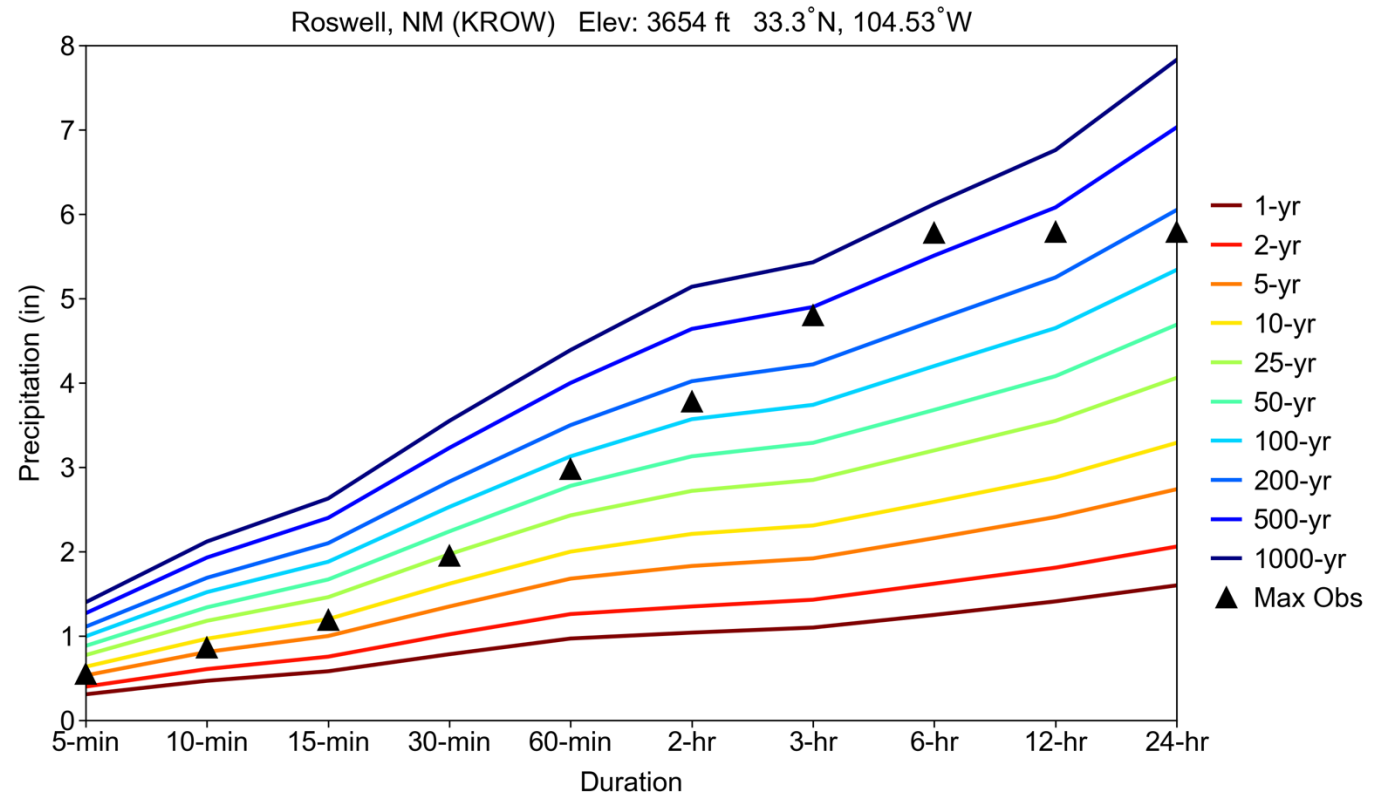
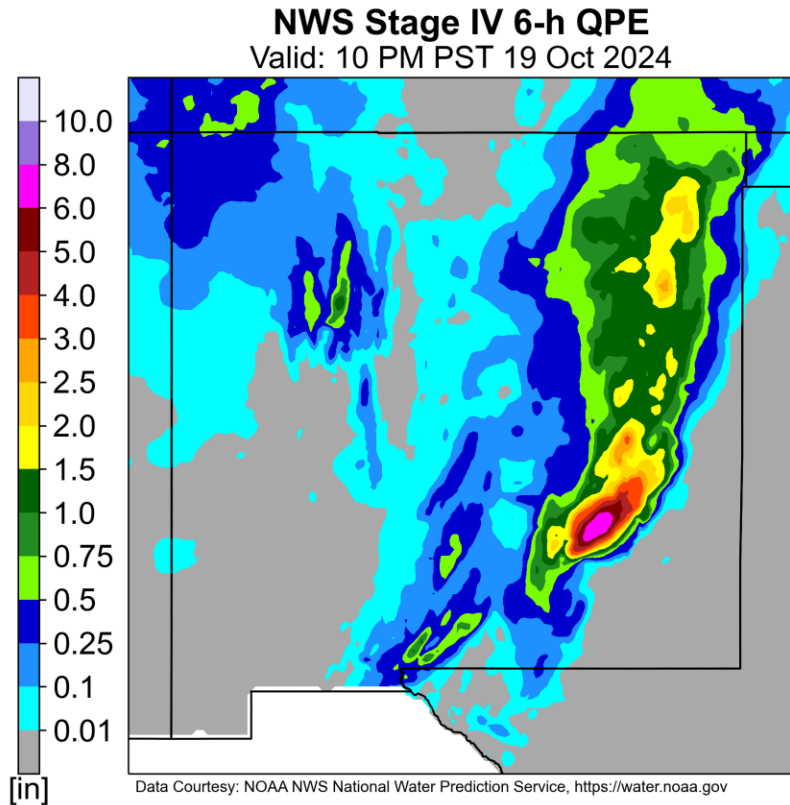
Valid: 4 AM PST 21 Oct 2024



- Widespread precipitation occurred over the Four Corners Region during 17–20 October.
- The heaviest storm-total precipitation was observed in northeastern NM (3–5 inches) and near Roswell, NM (> 6 inches).
- Roswell set a new all-time daily precipitation record on Sat 19 Oct. The 5.78 inches recorded on this day is ~50% of Roswell's normal annual precipitation (11.63 inches).
- An estimated 1–2 feet of snow fell in the higher terrain of the Uinta and San Juan Mountains.

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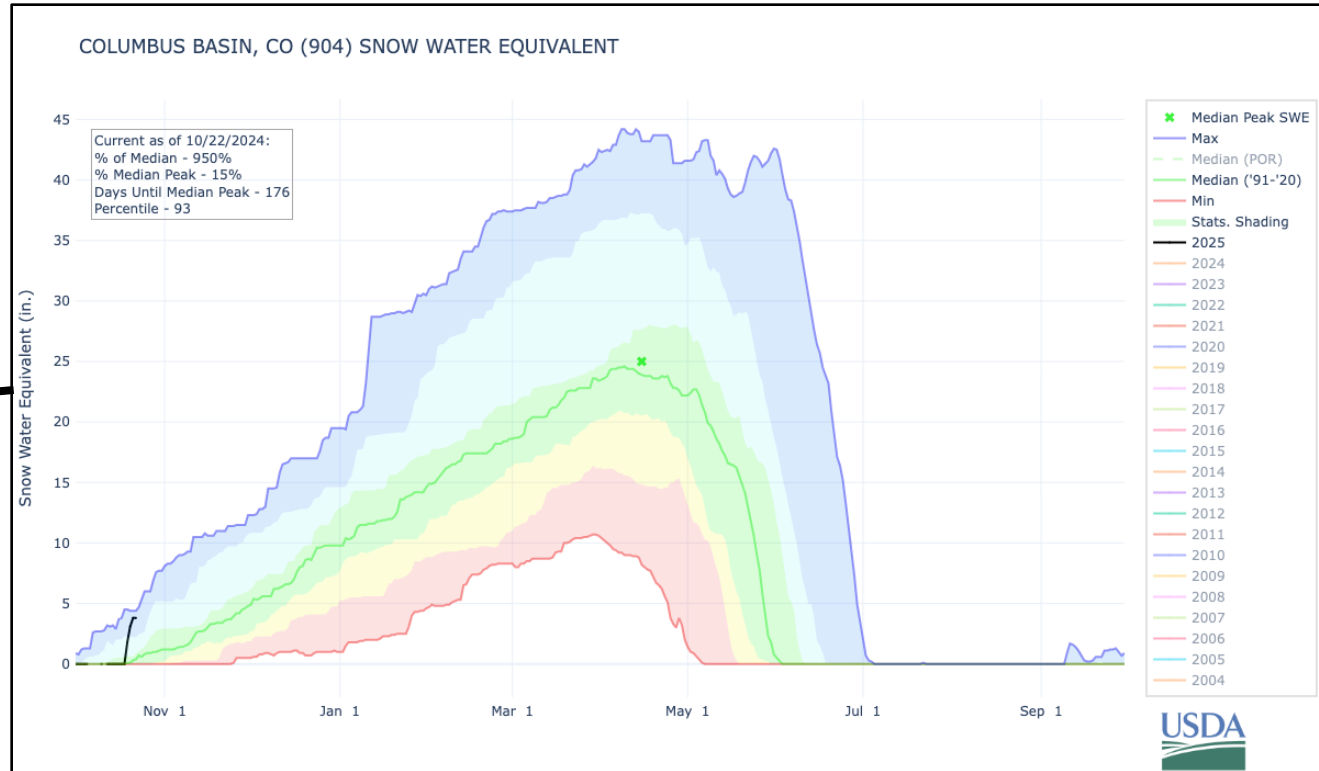
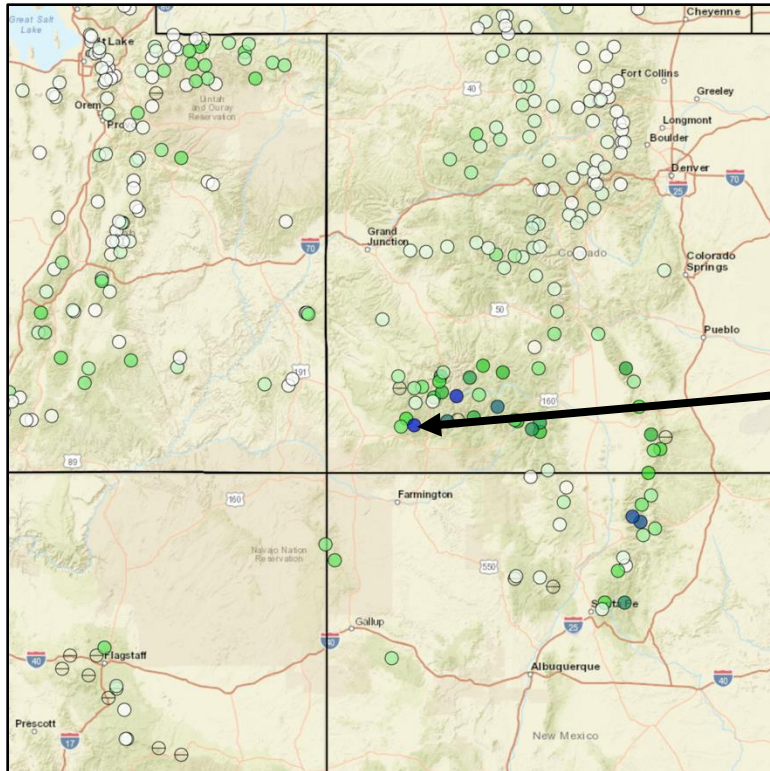
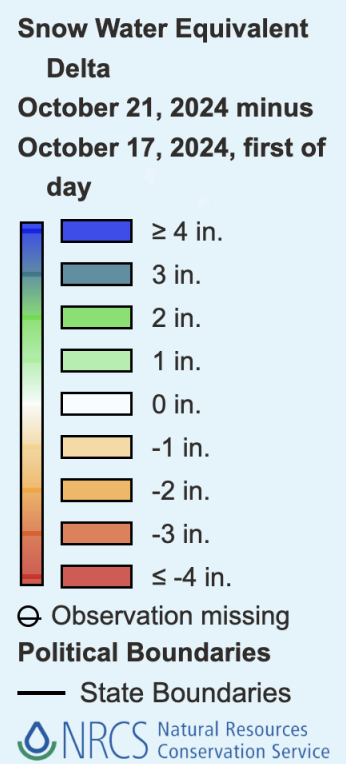
## Observed Precipitation



- Remarkably, nearly all the storm-total precipitation in Roswell occurred within a 6-hour period ending at midnight local time on Sat 19 Oct.
- Based on NOAA Atlas 14, the 5.76 inches of precipitation that fell in Roswell during this 6-hour period exceeded the 500-year storm.

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## Changes in Snowpack

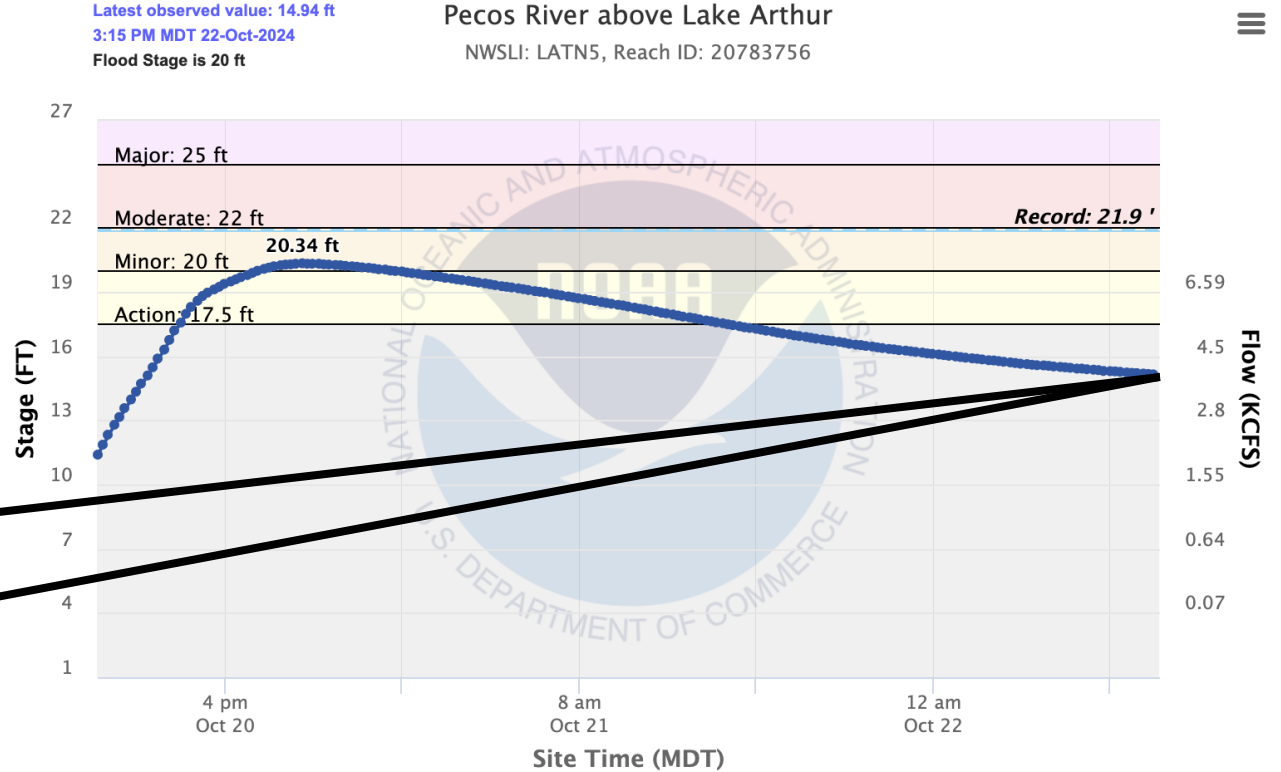
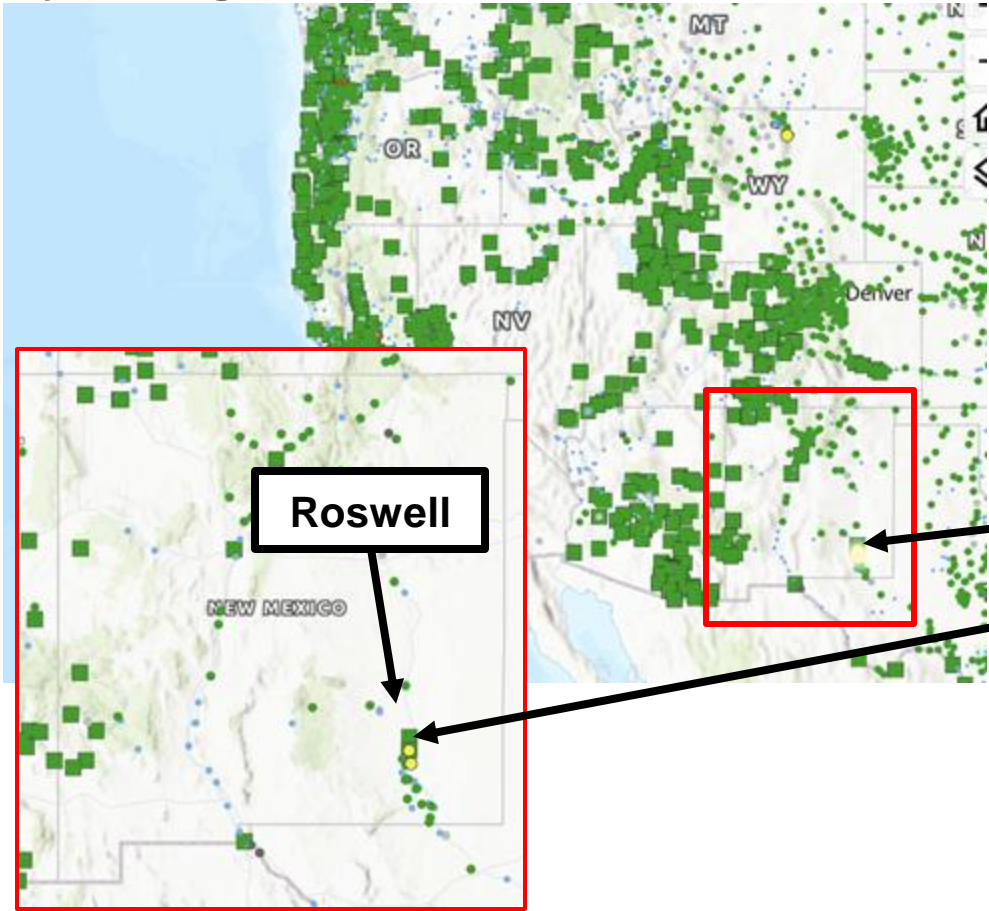


- Several SNOTEL stations in the San Juan Mountains recorded snow water equivalent (SWE) increases of 2–4 inches between 17 Oct and 21 Oct.
- Smaller increases in snowpack (1–2 inches of SWE) were observed in the Uinta Mountains.
- The 4-day increase in snowpack at Columbus Basin (3.9 inches) represents ~16% of the median peak SWE (25.0 inches).



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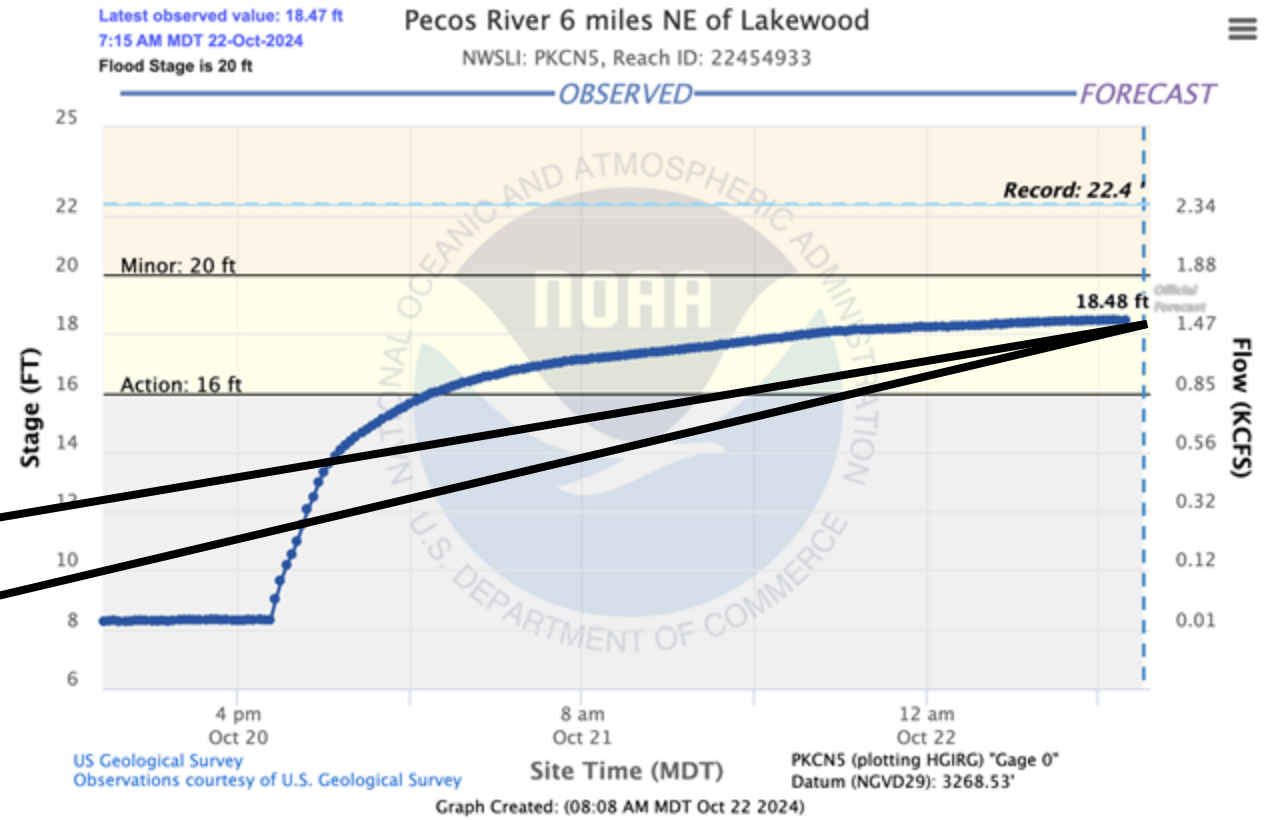
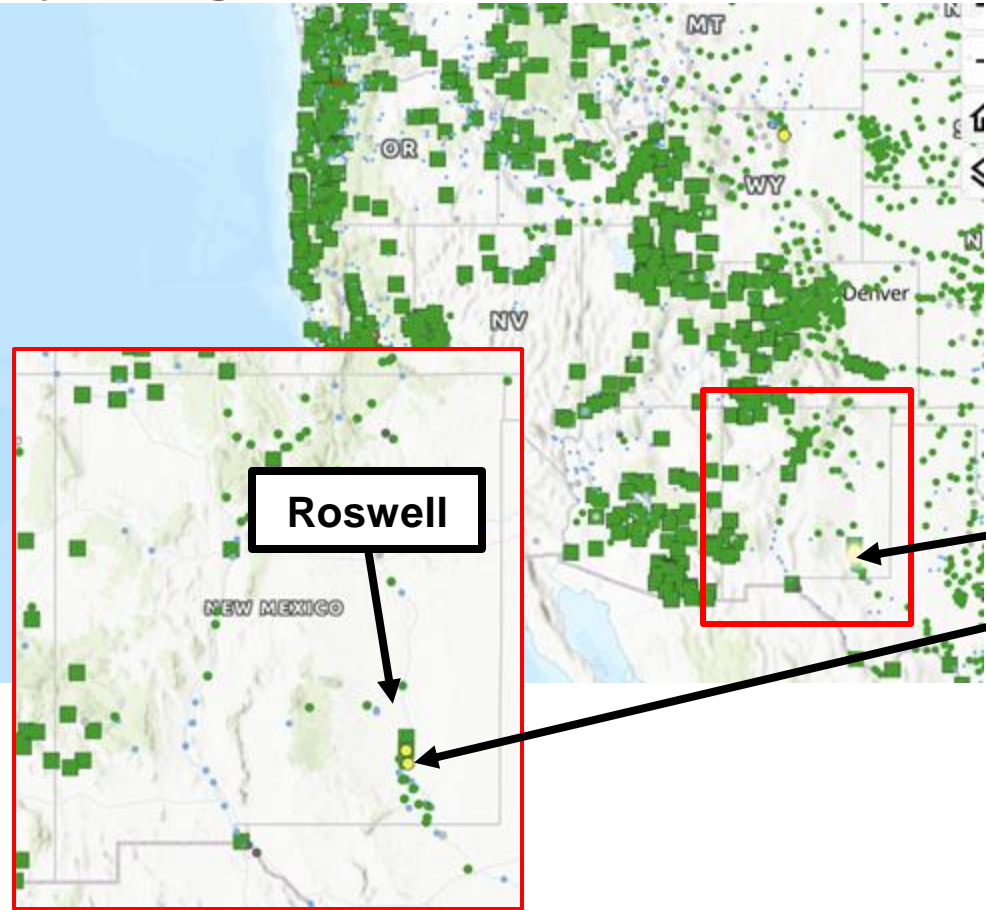
## Hydrologic Impacts



- A period of very intense rainfall during the evening of Sat 19 Oct caused flash flooding in Roswell, NM, with dangerous levels in the Spring River.
- The Pecos River at Lake Arthur rose above **minor flood stage** (20 feet) on Sun 20 Oct, reaching a peak stage of 20.34 feet.

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## Hydrologic Impacts



- High flows were also observed further downstream on the Pecos River.
- The Pecos River 6 miles NE of Lakewood, NM, rose above action stage (16 feet) on Sun 20 Oct, reaching a peak stage of 18.48 feet.

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## Impacts: Flash Flooding

- Record rainfall (~5.78 inches) produced severe flash flooding in Roswell, NM, and around Chaves County
- Over 300 people were rescued from the flood waters, about 40 people were taken to the hospital for injuries and 2 flooding-related fatalities occurred



**Floodwaters in Roswell**

Credit: Chaves County Sheriff's Office



**A truck is seen submerged in flood waters in Hagerman, New Mexico.**

Credit: Hagerman Police Department



**Flooding in Roswell, New Mexico**

Credit: Tom Hudgens/AP