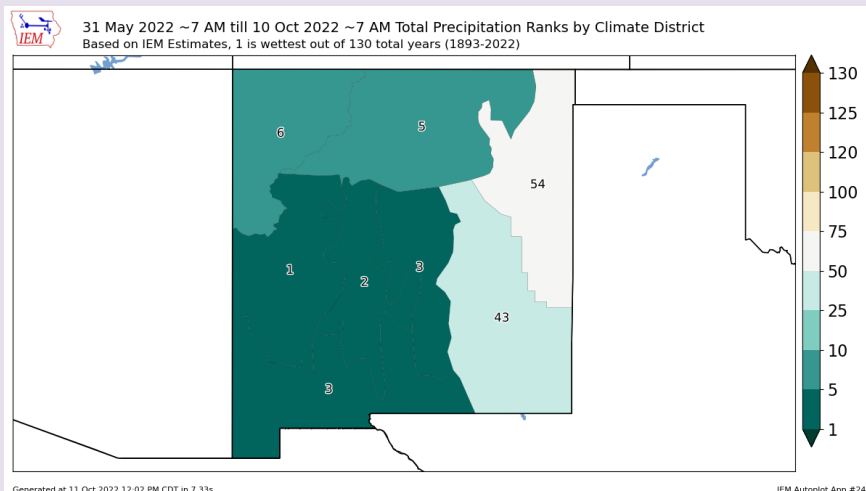
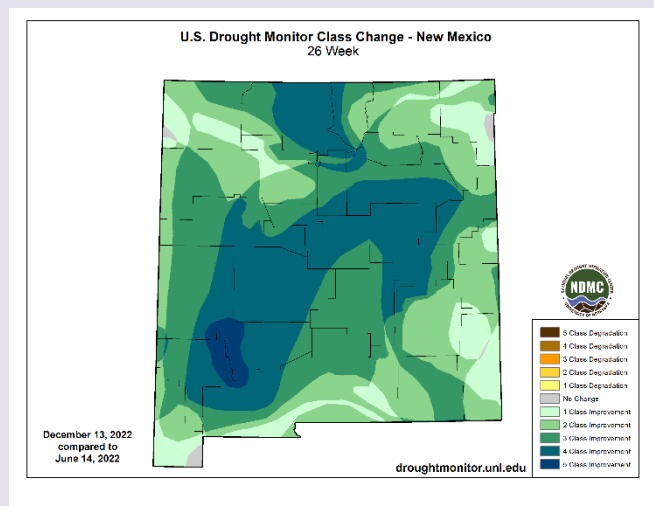


Hydrologic Summary: IT'S BEEN A YEAR



Record Setting Monsoon Season



Drastic Swings in Drought Conditions

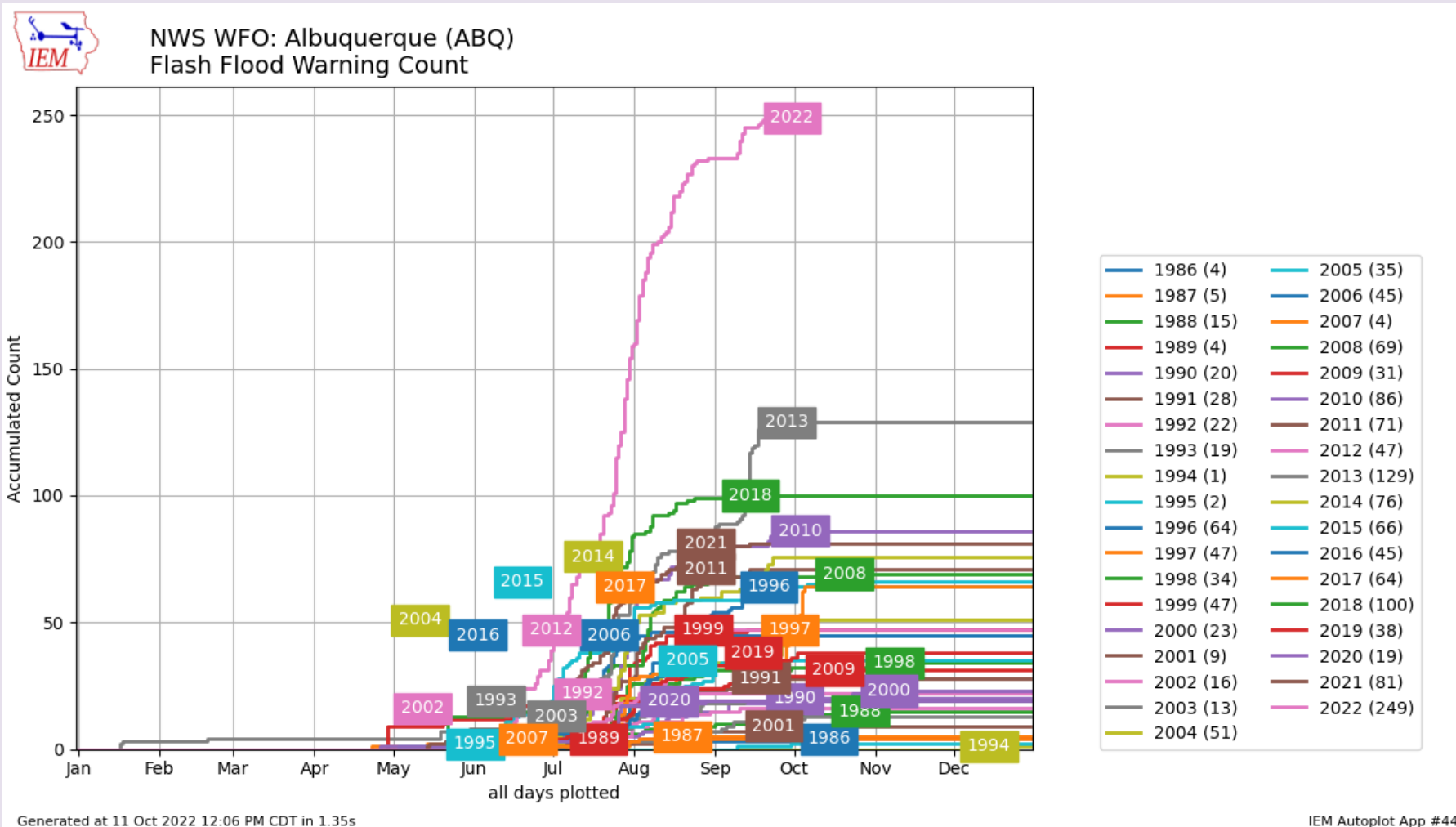


Deadly Flash Flooding



Record River Flooding on the Pecos

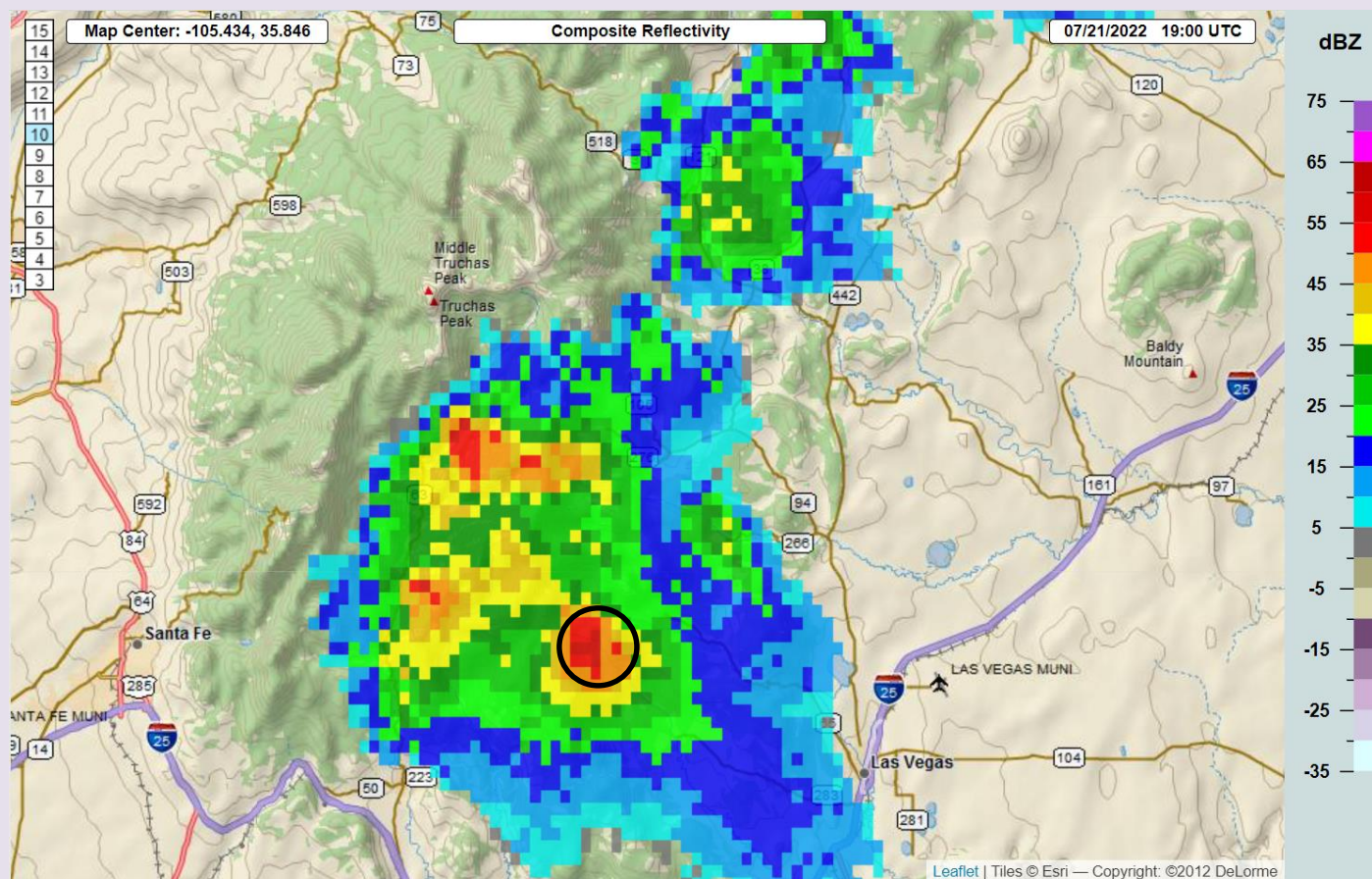
- After the worst fire season in NM history, the Monsoon came on strong
- Parts of NM saw the wettest Monsoon in 130 years
- WFO ABQ issued a record number of Flash Flood Warnings, 63% of which were focused on the burn scars
- One of the many flash floods was deadly, resulting in 3 fatalities
- The Pecos River at Acme exceeded the previous record crest by nearly 3'
- And as always: drought concerns were ever present



- ABQ's CWA is ~91,000 square miles
- This year we had ~1,400 square miles of burn scar
- 249 FFW's were issued in 2022, shattering previous records
- 157 FFW's were issued for burn scars

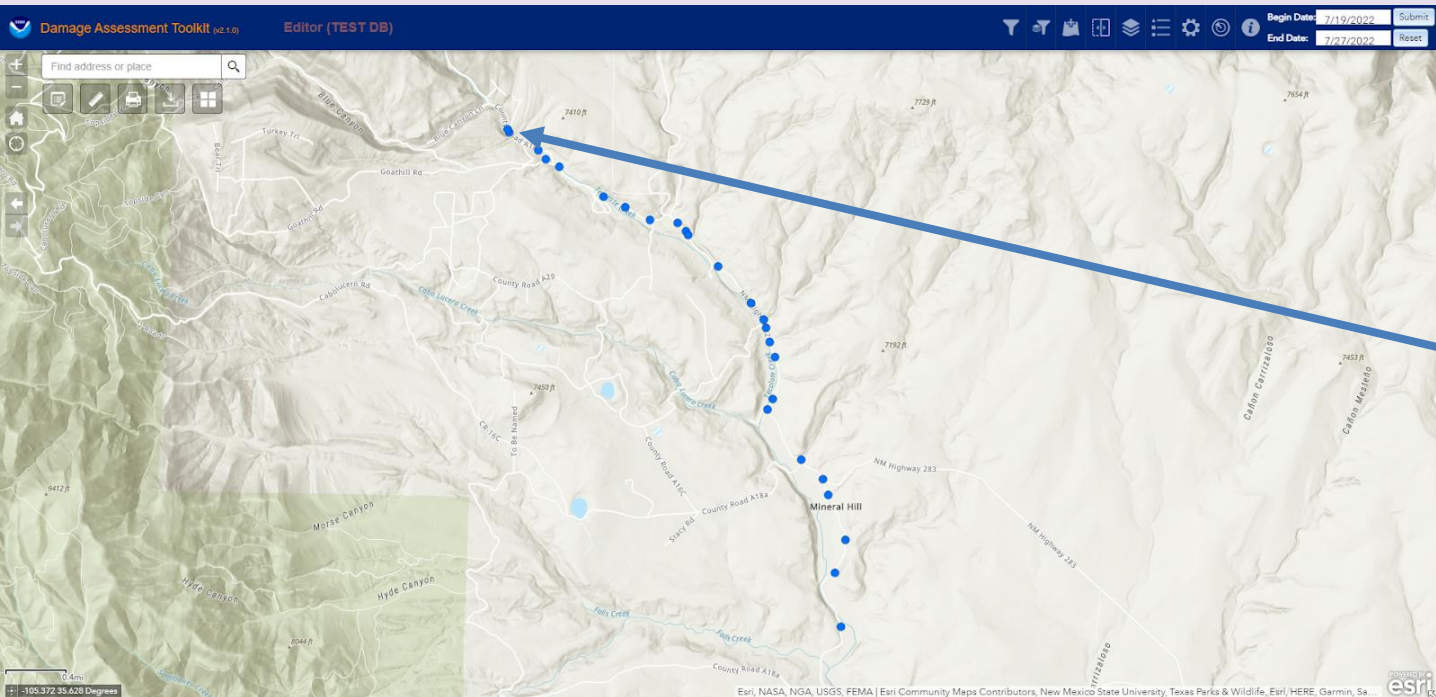
63% OF OUR FLASH FLOOD WARNINGS WERE DEDICATED TO 1.5% OF OUR TOTAL CWA

Composite Radar at 1pm MDT on 7/21/2022– at the height of the storm that resulted in 3 fatalities from a flash flood

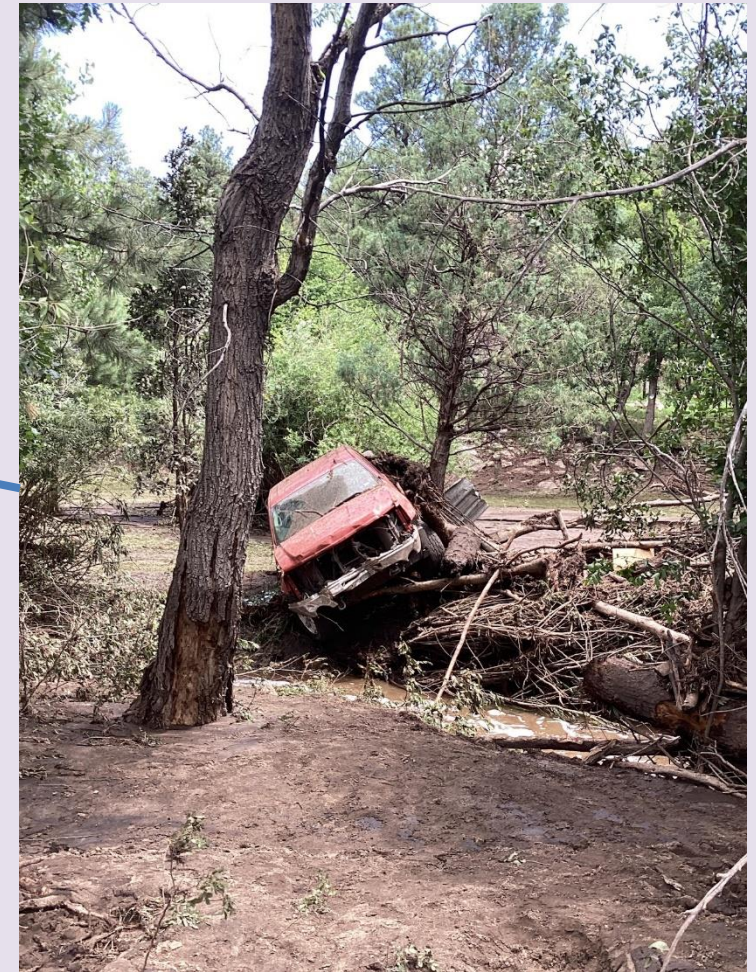
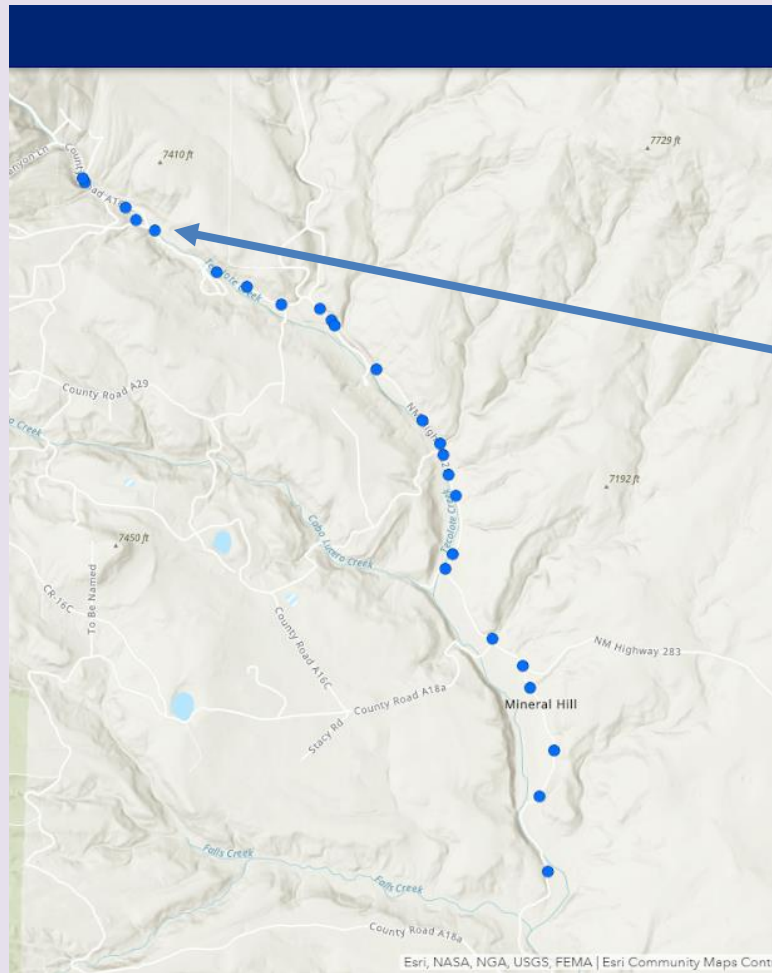


On 7/21, heavy monsoon rains fell on the SW side of the Hermit's Peak/Calf Canyon Burn Scar. The Blue Haven Youth Camp and its associated properties were located near the headwaters of Tecolote Creek. The storm occurred under normal monsoon conditions for NM and would most likely have produced a flash flood with out any burn scar present. However, the hydrophobicity of the soils in the burn area drove a much stronger response to the rains producing catastrophic flash flooding and debris flow. ***This event claimed three lives.***

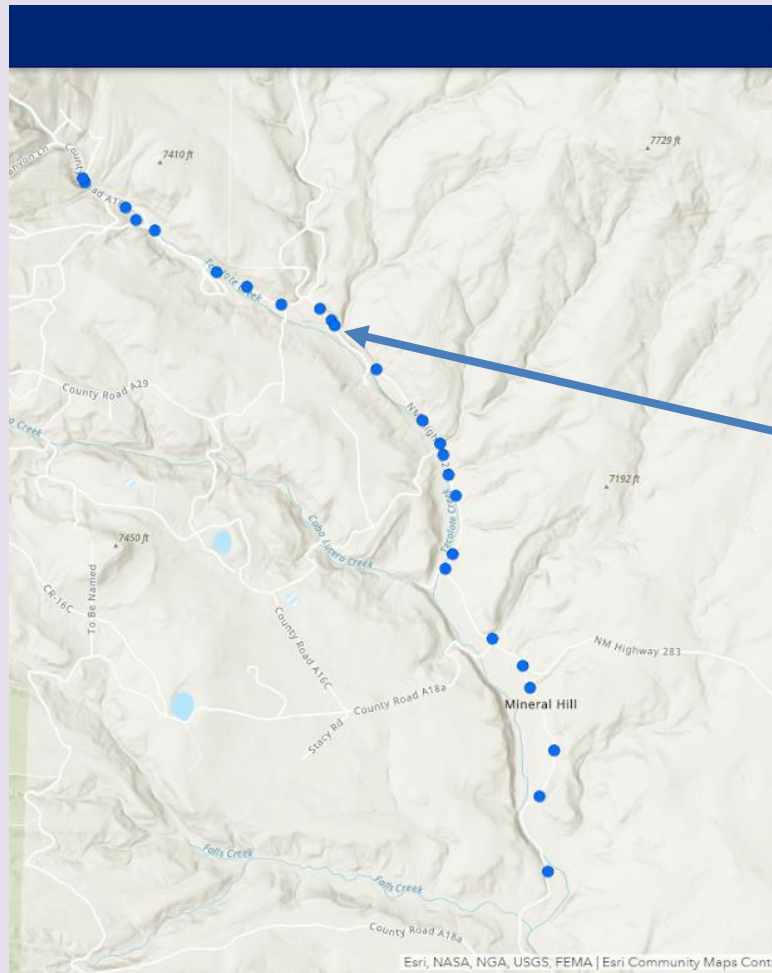
Damage surveys carried out two days after the storm showed the extent of destruction



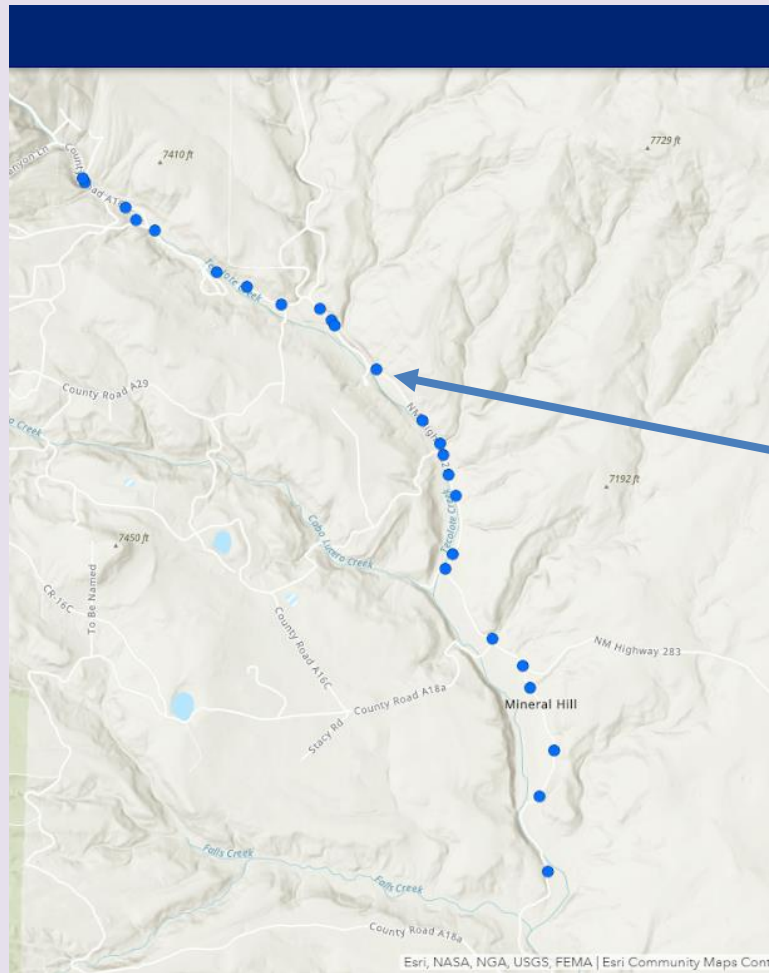
- Several cabins leased from the Blue Haven Youth Camp are located just upstream of the camp itself. These are seasonally occupied and were occupied at the time of the flood event.
- 1 cabin was completely destroyed, 2-3 others sustained some degree of damage.
- The cabin was leased by one of the women killed in the flooding event, though it is unclear if she and the other two fatalities, who were related to her, were in the cabin at the time of the flood.



- At least two vehicles were washed away. One theory is that the three people killed were in one of these vehicles when the debris flow hit.



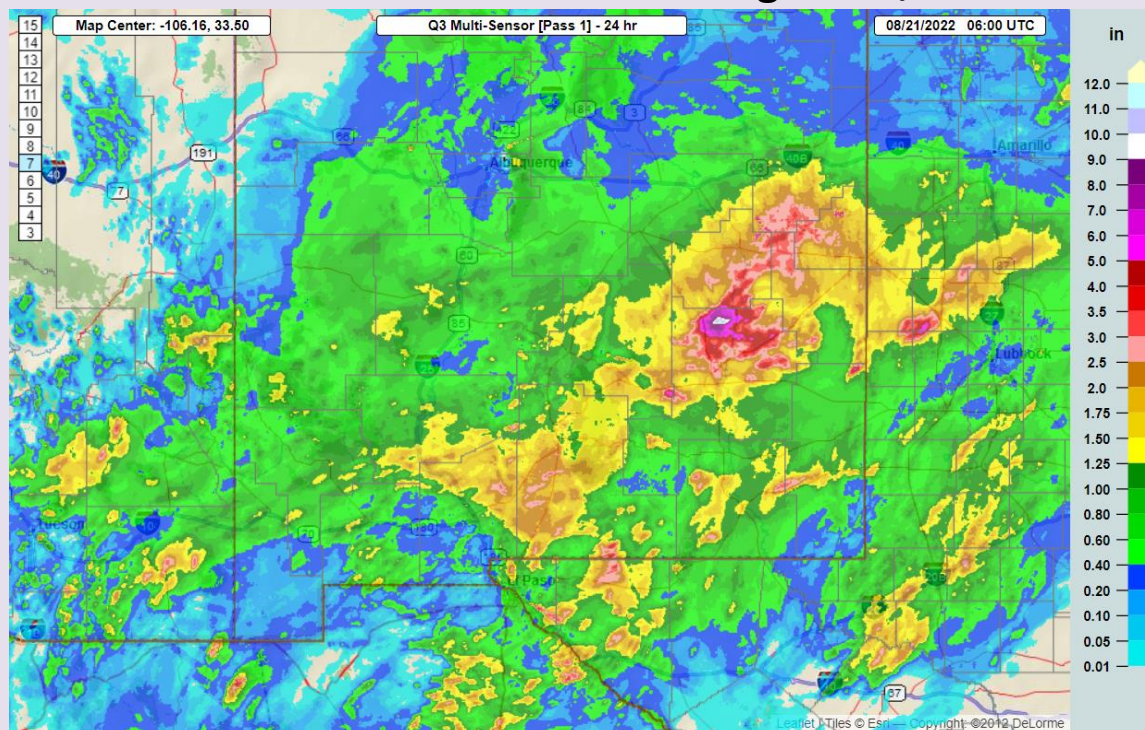
- Multiple low water crossings along roads A16C and 283 were damaged by the floodwaters



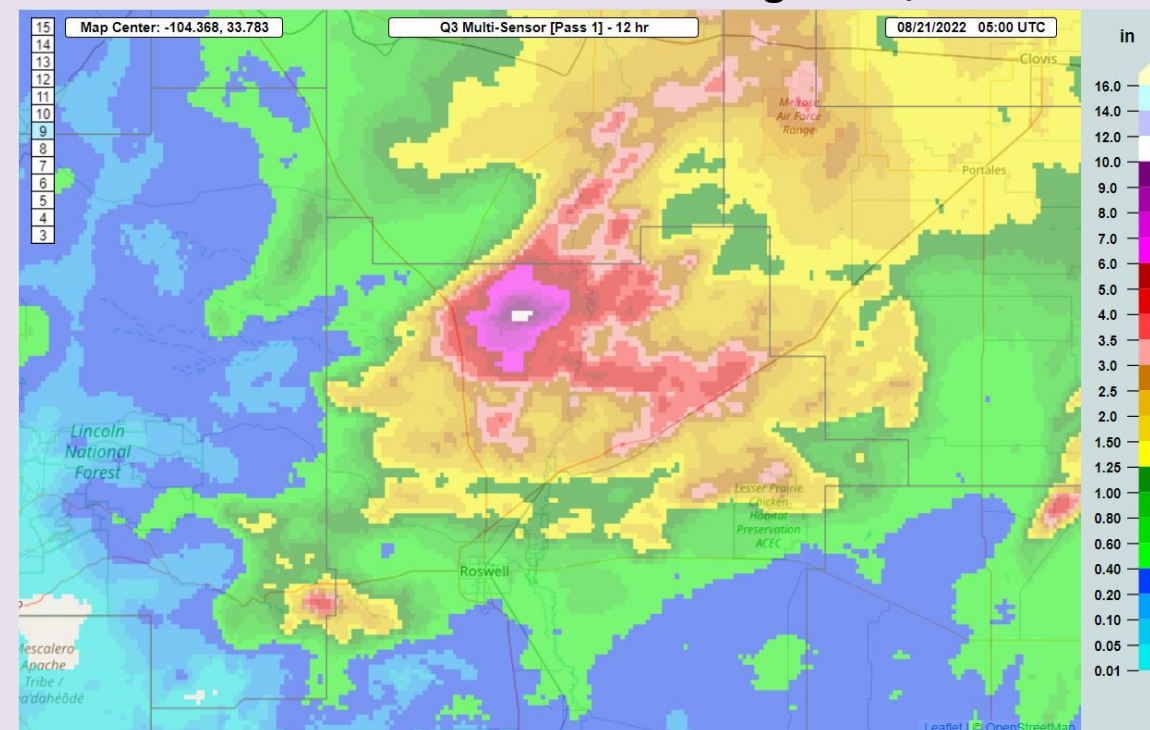
- Estimates taken by examining high water marks suggest the floodwaters were more than 6' over bridges and low water crossings and the debris flow extended as much as 5 miles down stream, stretching out to nearly $\frac{1}{4}$ mile wide as they spread out into the valley downstream

Heavy rains on August 20 drove record flooding on the Pecos River near Roswell, NM

24 hour QPE from MRMS Dataset August 20, 2022

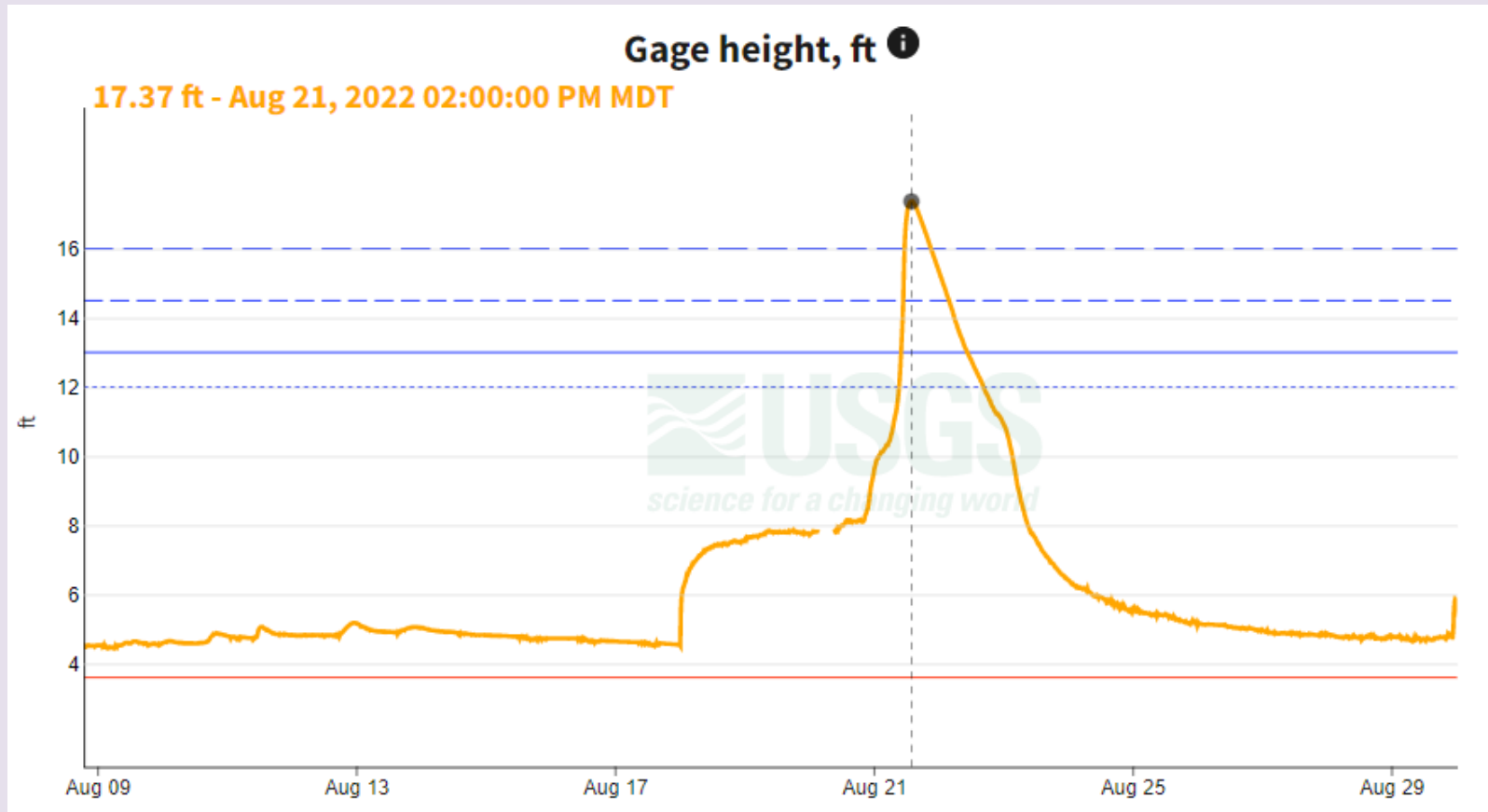


12 hour QPE from MRMS Dataset August 20, 2022

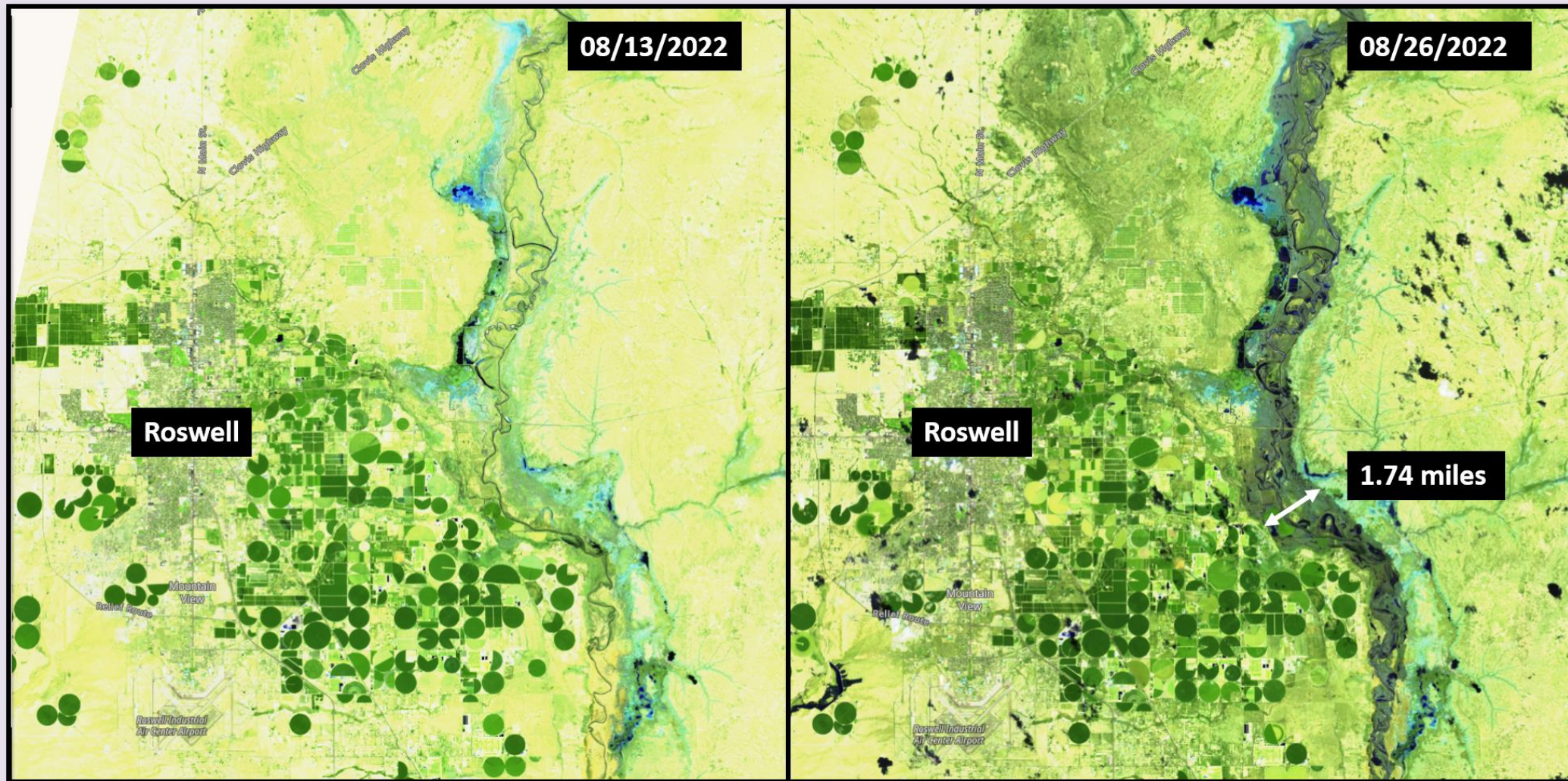


- Between 8/19 and 8/21 a stalled cold front combined with Pacific moisture and the remnants of a tropical system from the Gulf of Mexico to produce heavy rains across southern new Mexico.
- CoCoRAHs networks recorded 2-4" of rainfall in some areas, agreeing well with MRMS estimates.
- In northern Chaves County, MRMS suggested 8-10" of rainfall in an area with no rain gage reports, between 285 and the Pecos River.
- The west to east storm track fed tributaries of the Pecos River, including the Rio Hondo and Salt Creek before dumping the worst of the rain directly on the Pecos north of Roswell.

Heavy rains on August 20 drove record flooding on the Pecos River near Roswell, NM



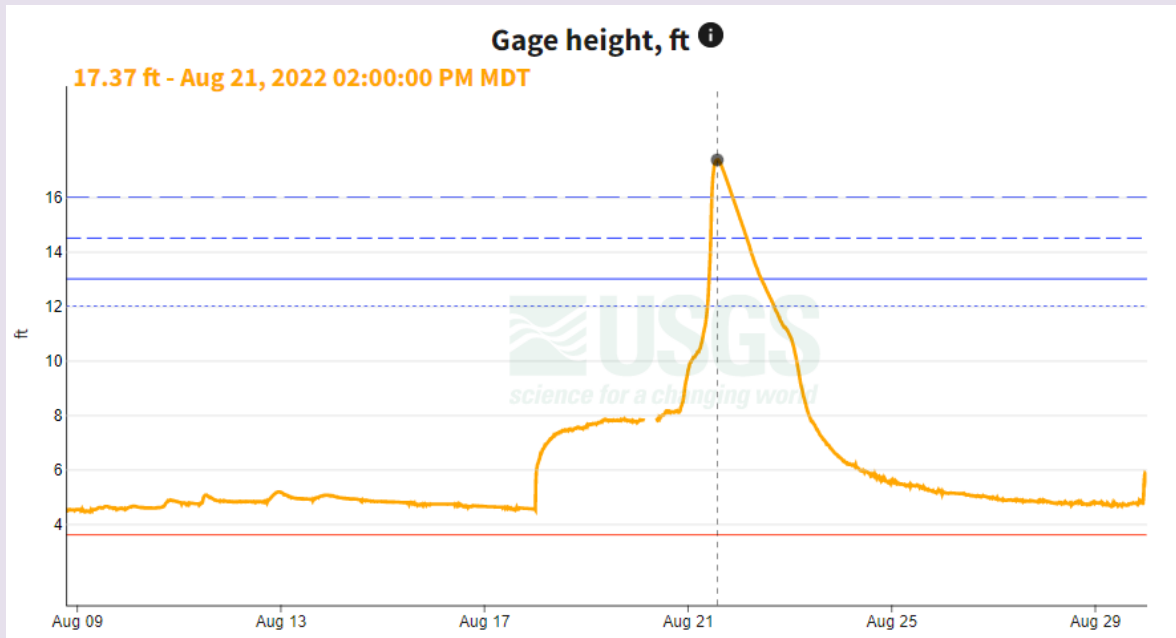
- After an initial rise of nearly three feet from rains to the west, the pulse of water coming in from Salt Creek and the mainstem Pecos River drove a rapid rise to 17.37'
- The previous record at this gage was 14.89' in 1947, so this flood was nearly 2.5" above the previous record.
- Forecasting the flooding downstream of Acme was complicated by the fact that this flood drastically exceeded the rating curve used by the WGRFC, driving an enormous amount of uncertainty around the amount of water headed down stream



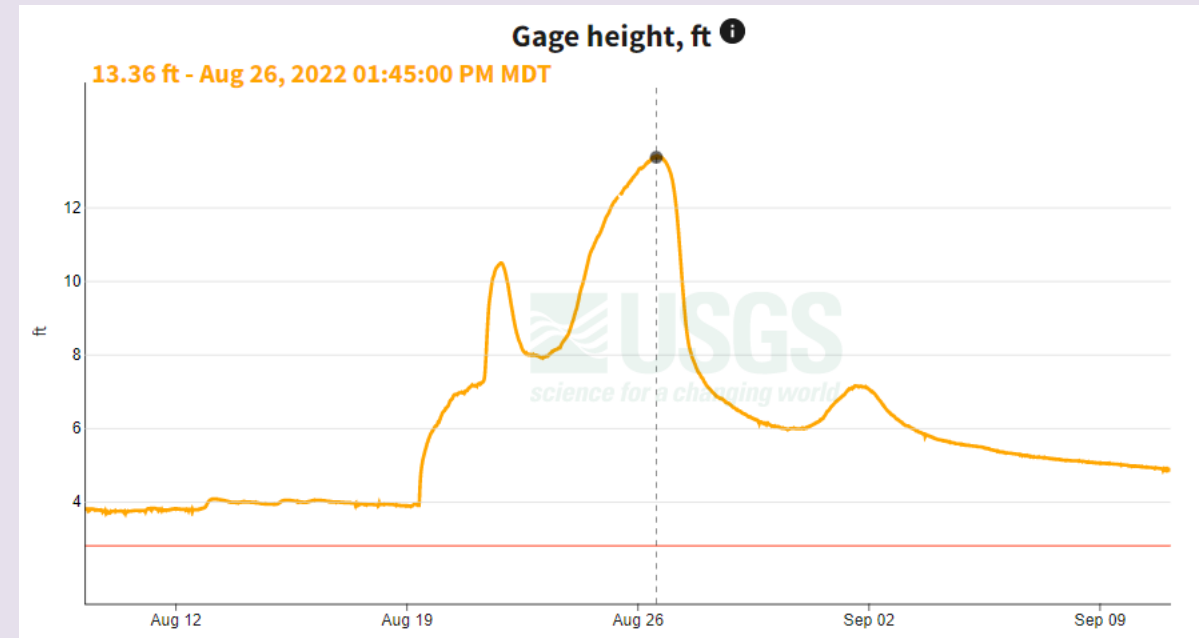
- Sentinel Satellite imagery before and after the crest of the flood shows the extent of the water running along the Pecos.
- The low grade of the land allowed the water to spread out into neighboring fields and farmlands, with the extent of flooding reaching nearly 2 miles wide at some points

An ambulatory lake: slow moving floodwaters on the Pecos

Pecos River at Acme



Pecos River at Lake Arthur



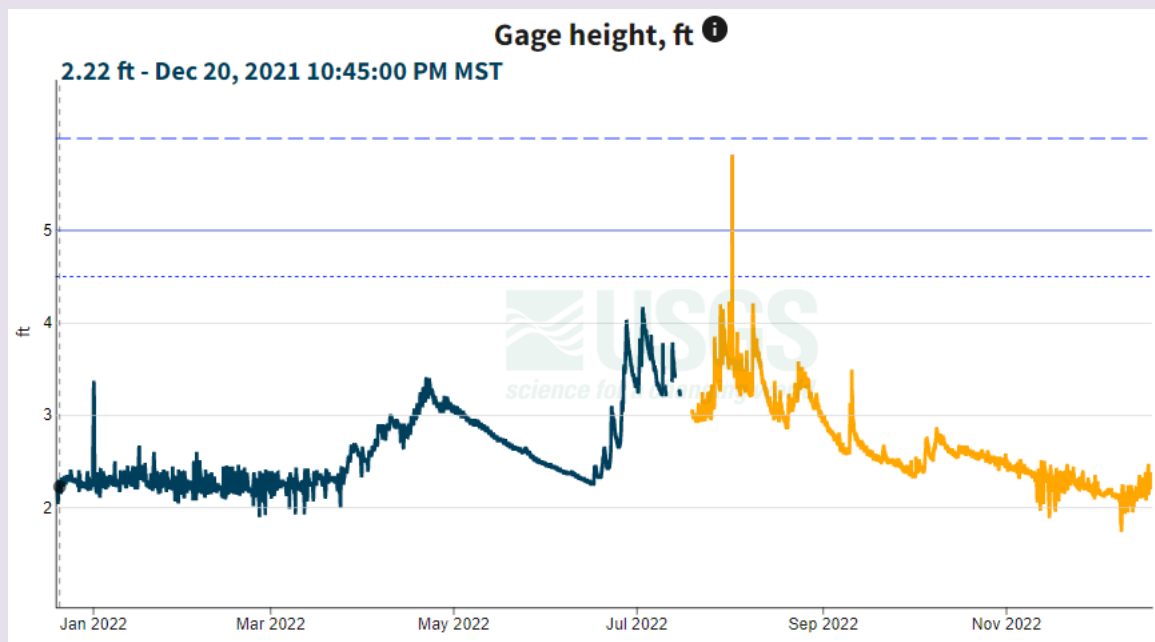
- The low relief of the Pecos River channel in this area drove floodwaters to spread out and work their way slowly downstream.
- As previously mentioned forecasting crest height at the downstream point of Lake Arthur was complicated by the exceedance of the rating curve used in the forecasting models.
- Forecasting the timing was also an issue as the RFC had never seen this much water move through the channel before.
- It took 5 days for the crest observed at Acme to arrive in Lake Arthur, some 30 miles south.



- Fortunately no lives were lost. However a reluctance to evacuate the homes near the river resulted in numerous water rescues by local emergency services. Some by foot but eventually some by boat.

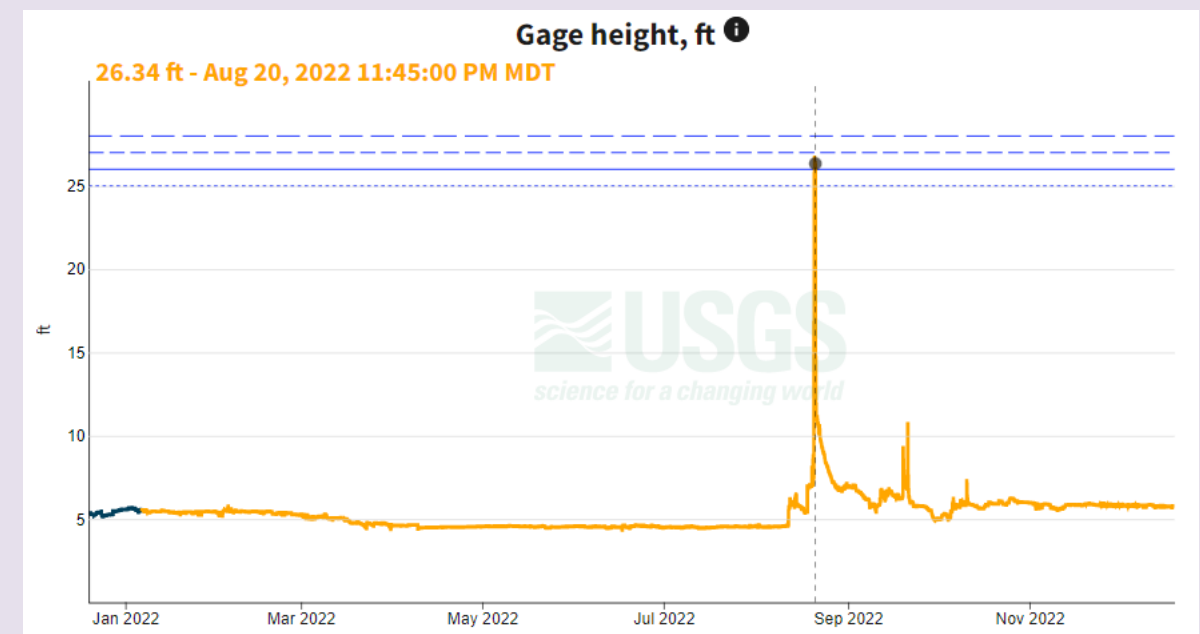
Pecos River Basin

PCON5 – Pecos River Near Pecos



5.82' August 1: Minor

DARN5 - Rio Hondo above Roswell

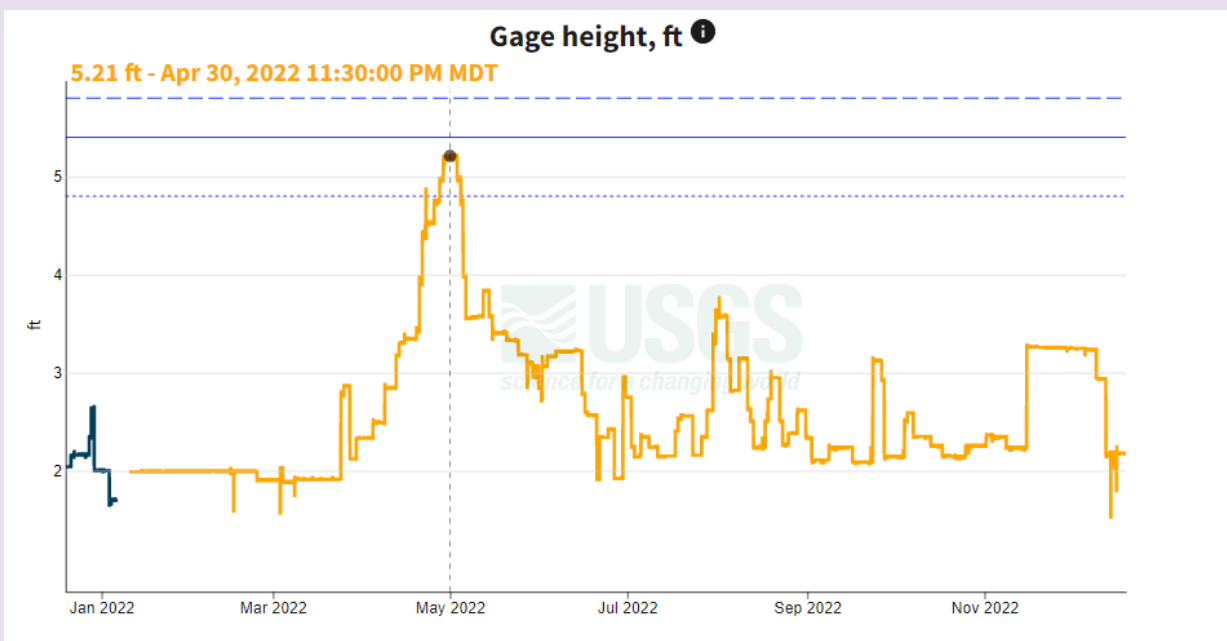


26.8' August 20th: Minor

No Levee break this year but this was driven by the storm that led to record flooding in Roswell.

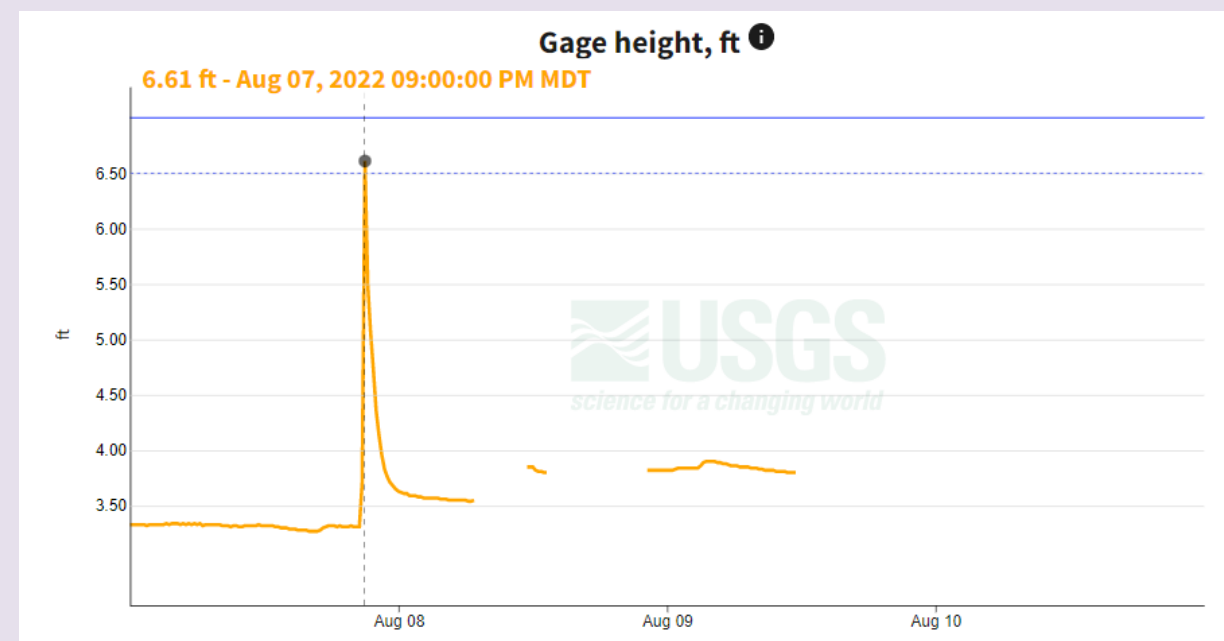
Rio Grande Basin

AICN5 – Rio Chama below Abiquiu



5.2' April 30th: Action

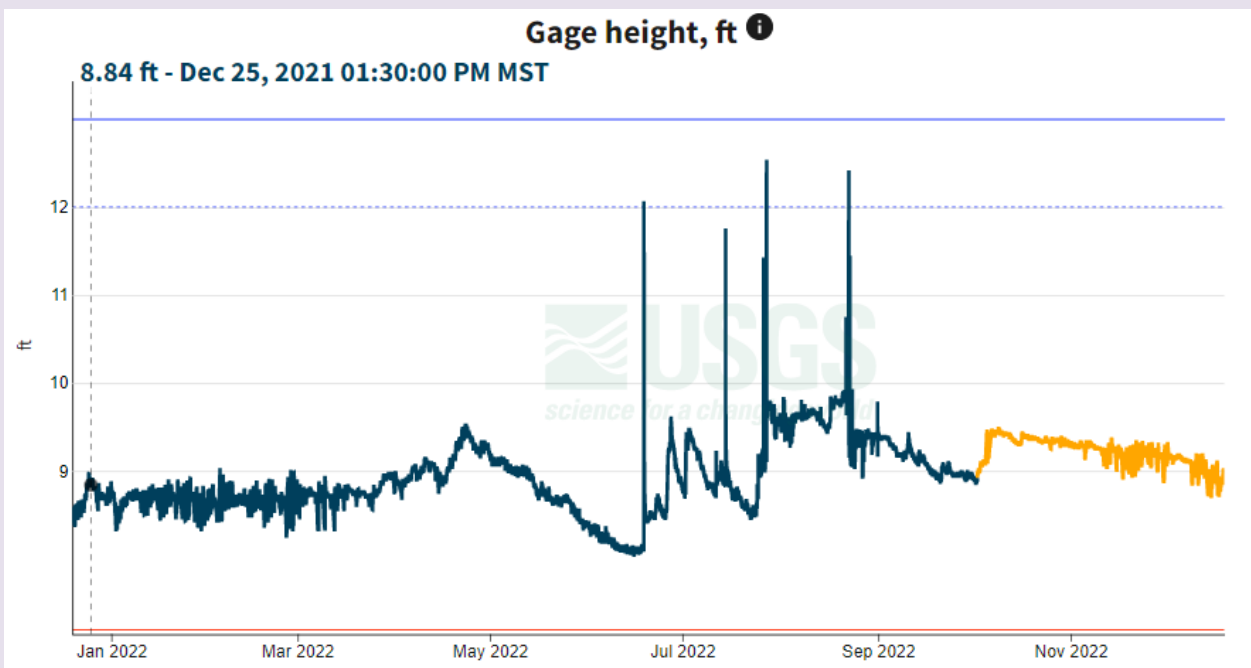
LMDN5- Rio Ojo Caliente below La Madera



6.61' August 7th: Action

Rio Grande Basin

DIXN5 – Embudo Creek below Dixon



Several Action Rises

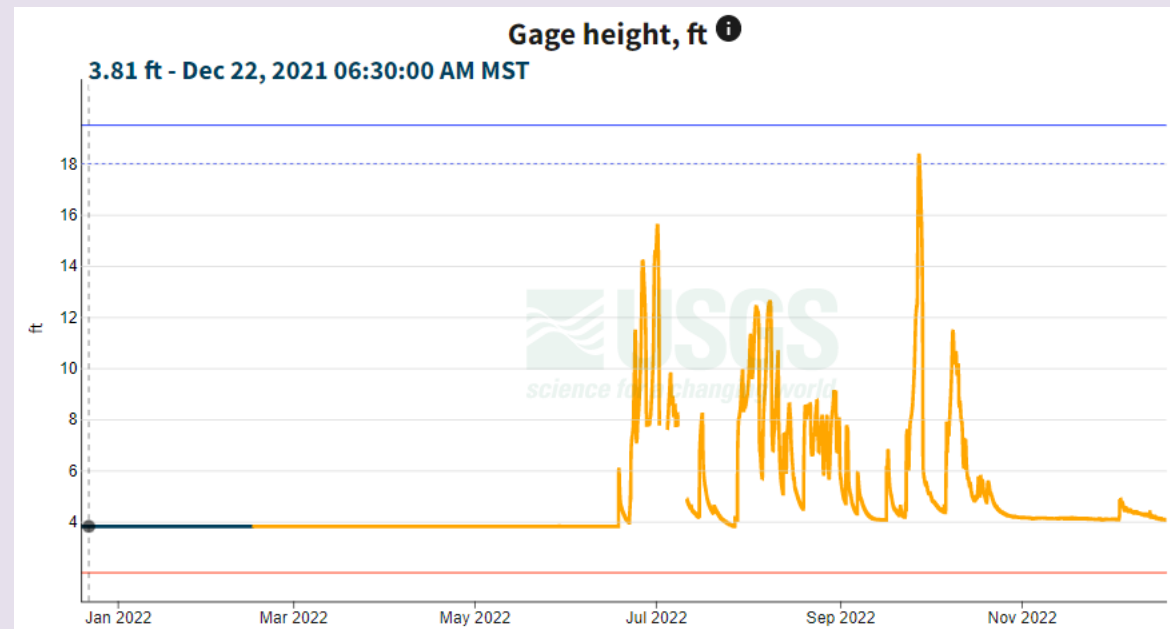
ABQN5 – Rio Grande at Albuquerque



Rio Grande at Albuquerque went dry in July.
First time since the 80's.

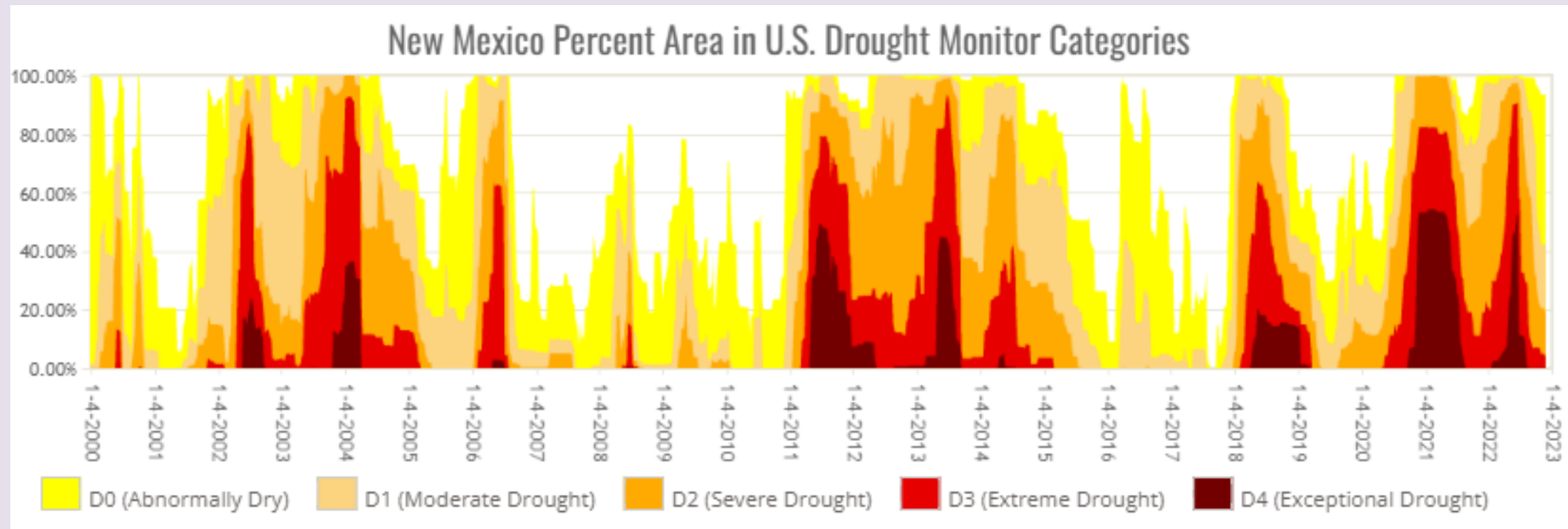
Rio Grande Basin

BNDN5 – Rio Puerco Near Bernardo

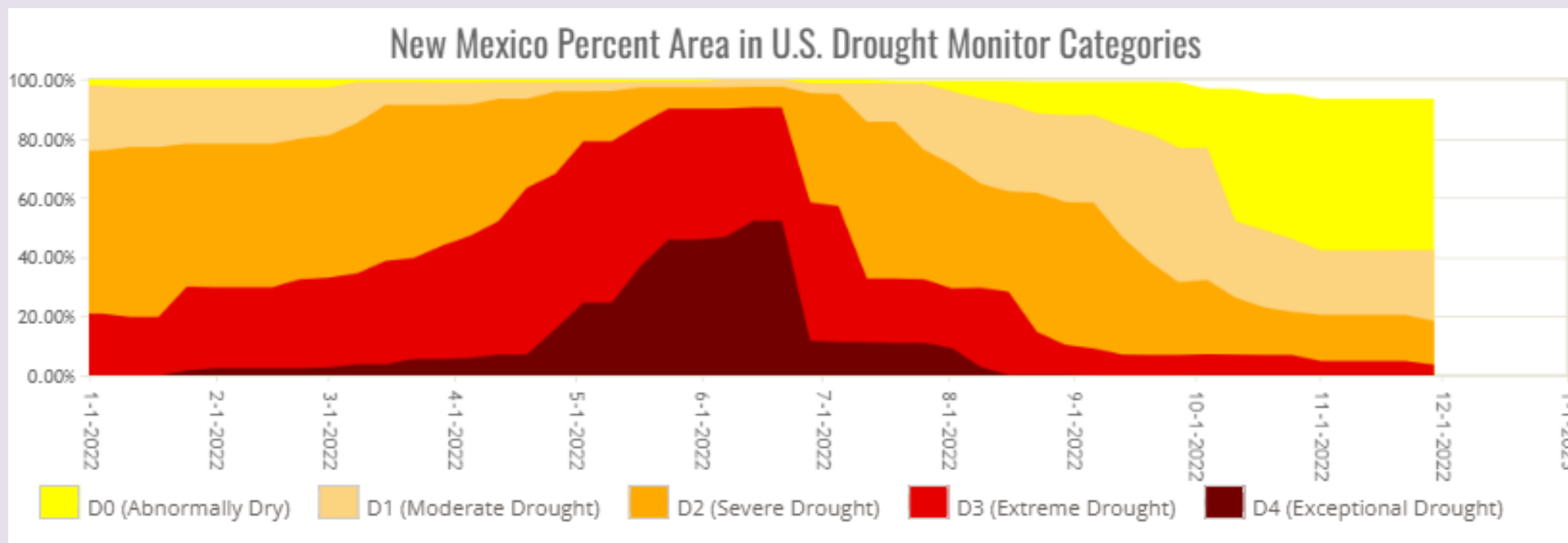


18.27' September 27: Action

The chart below illustrates the progression of drought within New Mexico dating back to 2000. The coverage of exceptional drought conditions was greatest in 2011-2012 and during 2020-2022. Over the course of 2022 the coverage of exceptional drought approached these previous highs, with the coverage of extreme to exceptional drought rivalling any time in the past 22 years. However, the robust monsoon season of 2022 brought rapid improvement throughout NM.

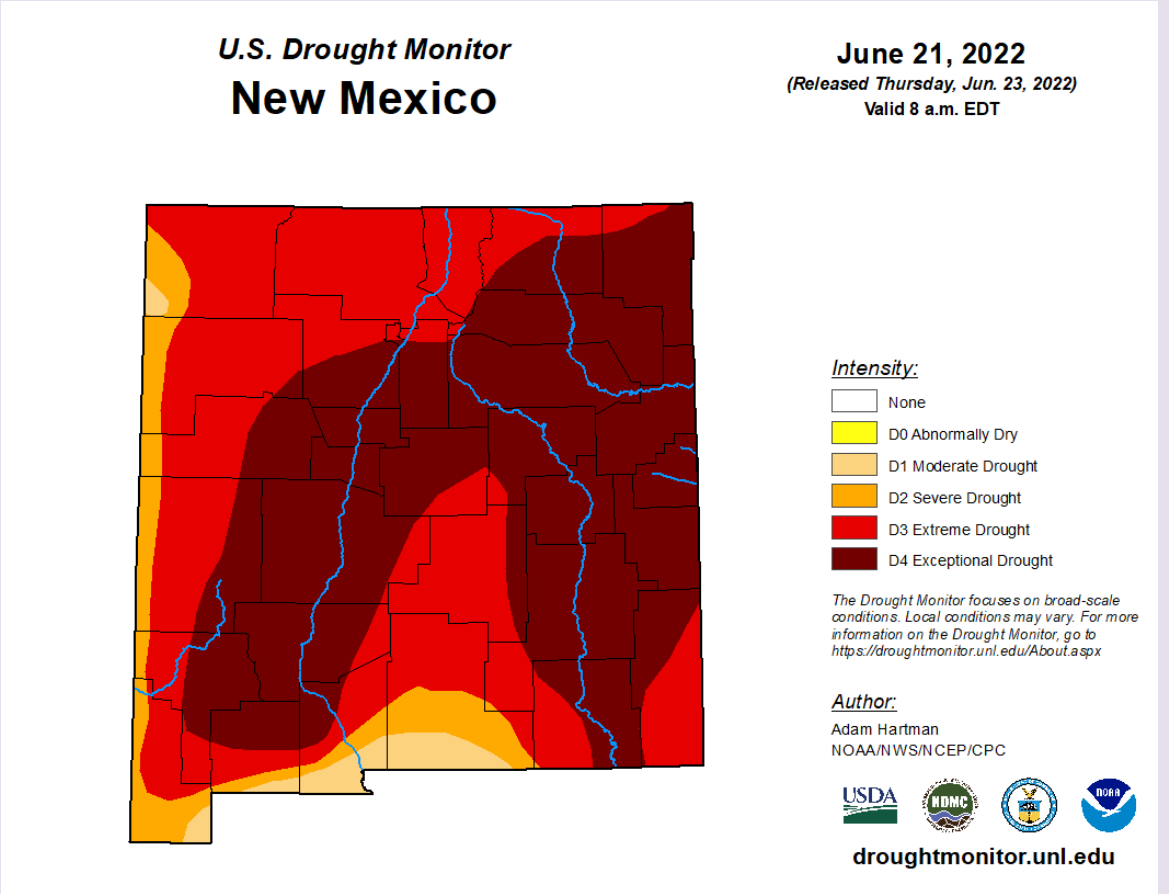


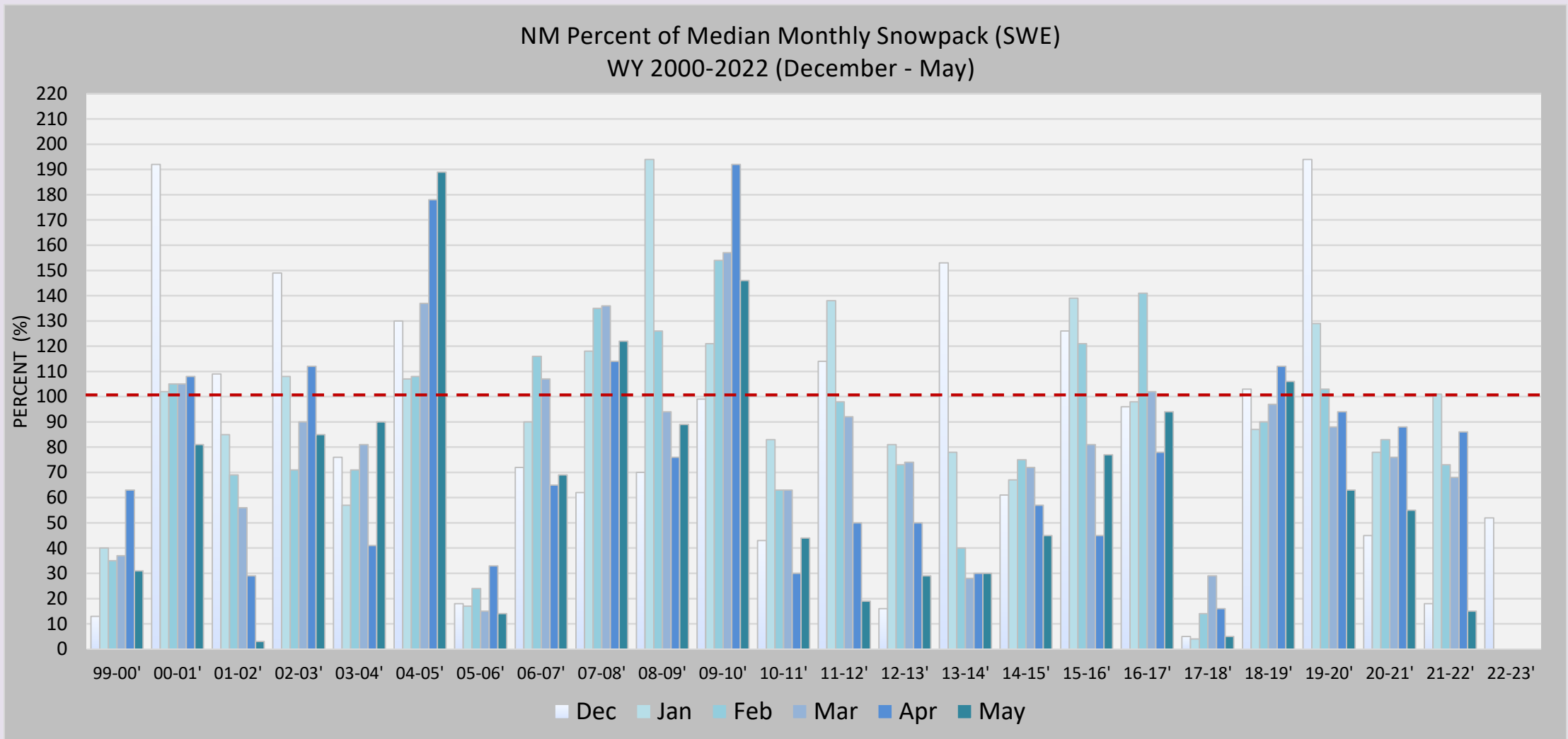
The chart below illustrates the progression of drought within NM during 2022 for the 5 drought categories. Greater than 50% of the state was in the worst category, exceptional drought, by mid June, with 90% of the state in extreme to exceptional drought. The rapid improvement seen in late June is directly attributable to the onset of the monsoon.



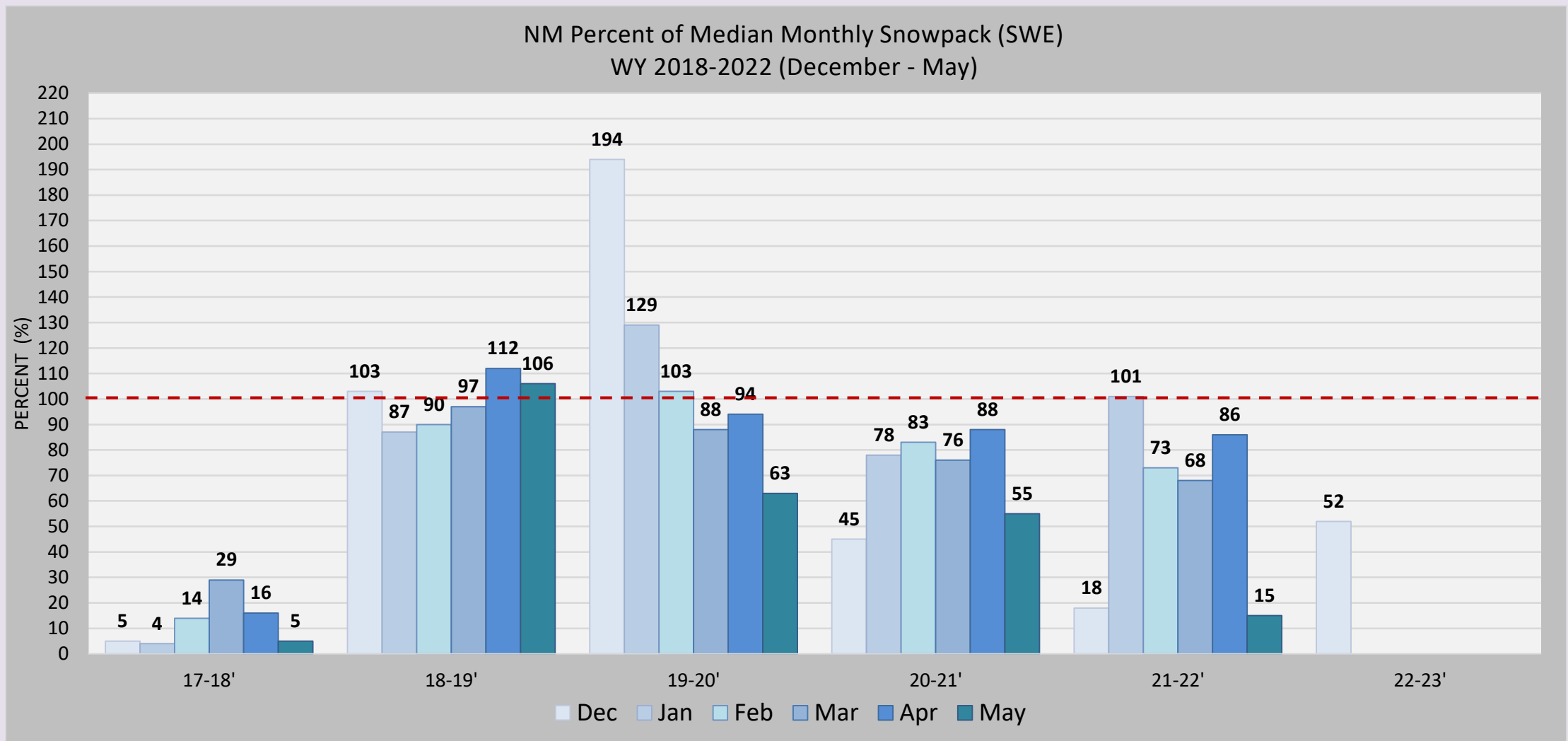


In the beginning of the year, no part of the state was experiencing exceptional drought conditions. However, extremely dry, hot and windy conditions through April and May drove rapid expansion of exceptional drought, peaking in mid June. Strong summer and fall rains have dramatically improved conditions in the state, with some areas experiencing no drought at all for the first time in over a year.

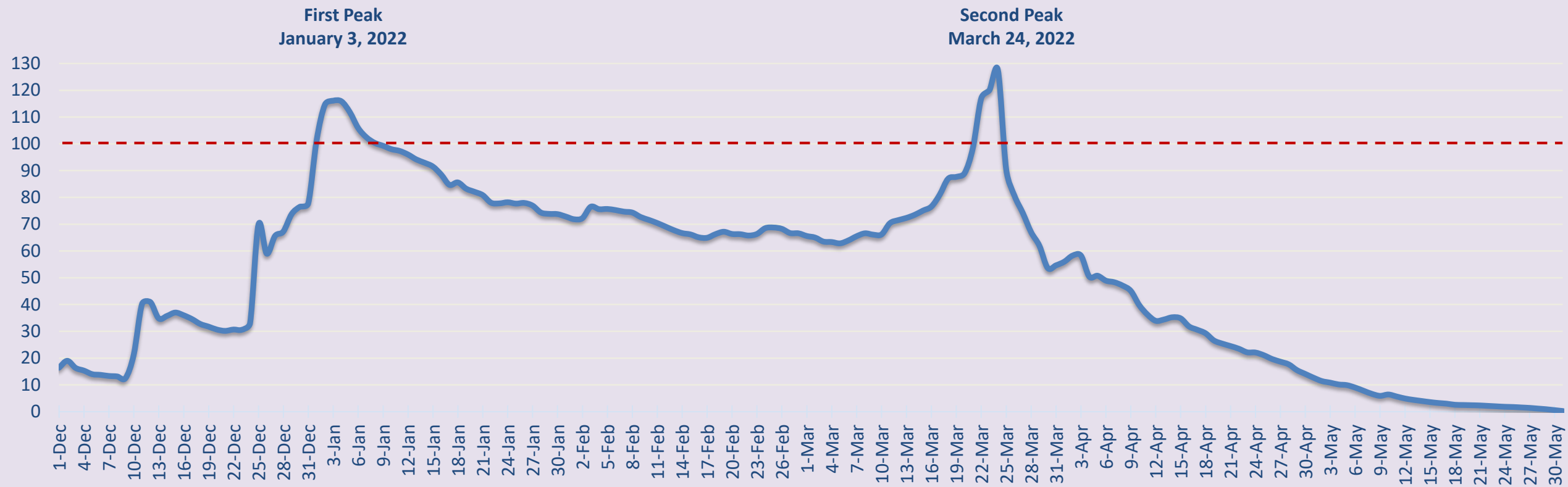




The chart above shows the percent of median monthly snow water equivalent (SWE) since 2000 for NM (1981-2010 climatology). The past 23 winter seasons have seen considerable variability with overall below median snowpack most years. Of the 138 months illustrated above, only 31% have seen above median SWE. This expansive snow drought has resulted in significant drawdown of New Mexico reservoirs. Several back-to-back heavy snow years will be needed for a notable recovery.



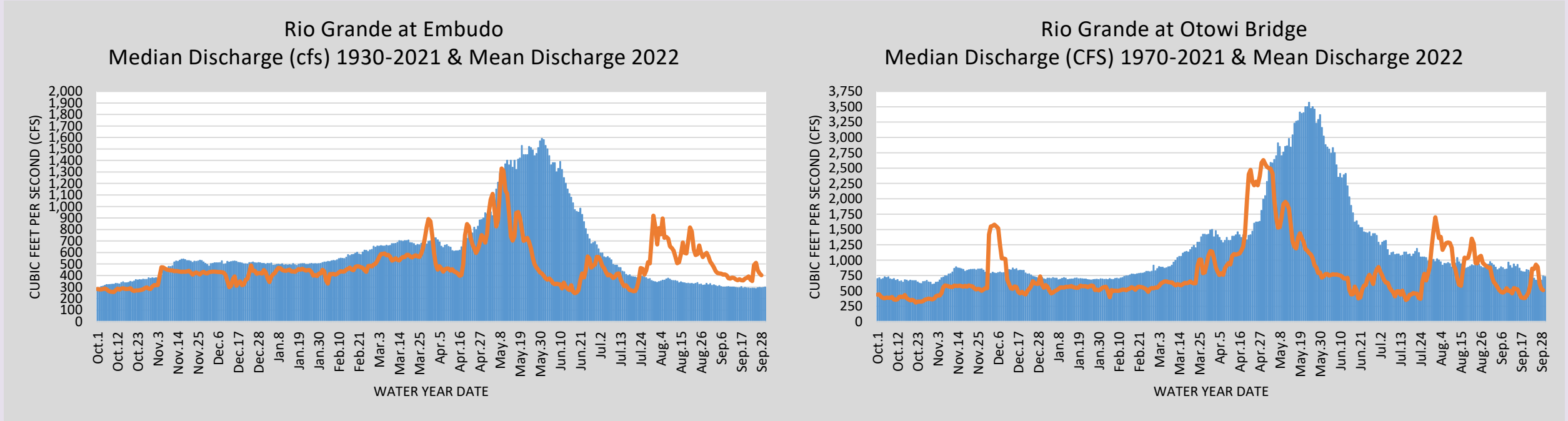
The chart above is the same as slide five but for 2018 to 2022. The 2017-2018 season was practically snow-free. The following 2018-2019 season made a big comeback with close to median snowpack through the entire season. 2019-2020 started out great then trailed off by late spring. 2020-2021 was fair followed by more struggles in 2021-2022. The 2022-2023 season is already off to a poor start. At this point, notable reservoir recovery will require several back-to-back years with robust snowfall.



The 2021-2022 seasonal snowpack for New Mexico experienced an initial peak on January 3, 2022 after several robust storm systems crossed the region in December. A quieter weather pattern through January and February led to a slow decline in snowpack with statewide percent of median falling to near 60% through early March. A brief return to active winter weather in mid March created a second peak on March 24, 2022. The initial and secondary peaks were notably higher than the median but did not persist long enough to support healthy runoff. Snowpack was decimated during April and May with exceptionally dry and warm conditions prevailing over the region.

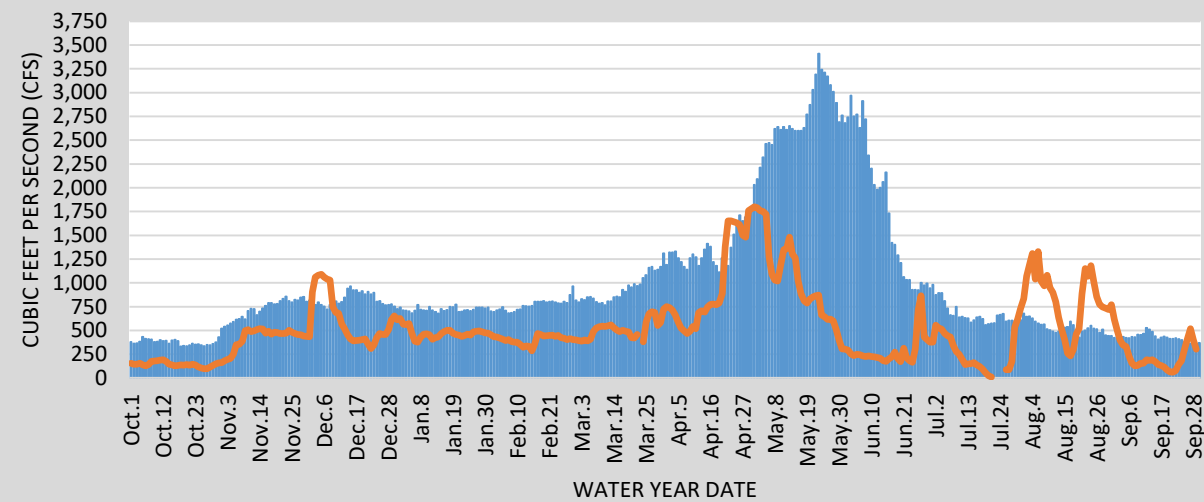


The charts below shows the median daily discharge (shaded blue) at select river gages compared to the 2022 discharge (orange line). The area under the curve is analogous to the overall volume of water passing by the gage throughout the season. A “skinnier” discharge curve like 2022 indicated a much lower volume of water passed by the gage compared to the long-term median. A secondary peak was observed at several gage locations in late July during the heart of the active 2022 monsoon season. The Pecos River runoff during the summer of 2022 far outpaced the lackluster runoff from the spring season. (It is worth noting to pay special attention to the scale of the vertical axis on each chart as the peak discharge varies considerably between the various stations shown on slides 23 and 24.)

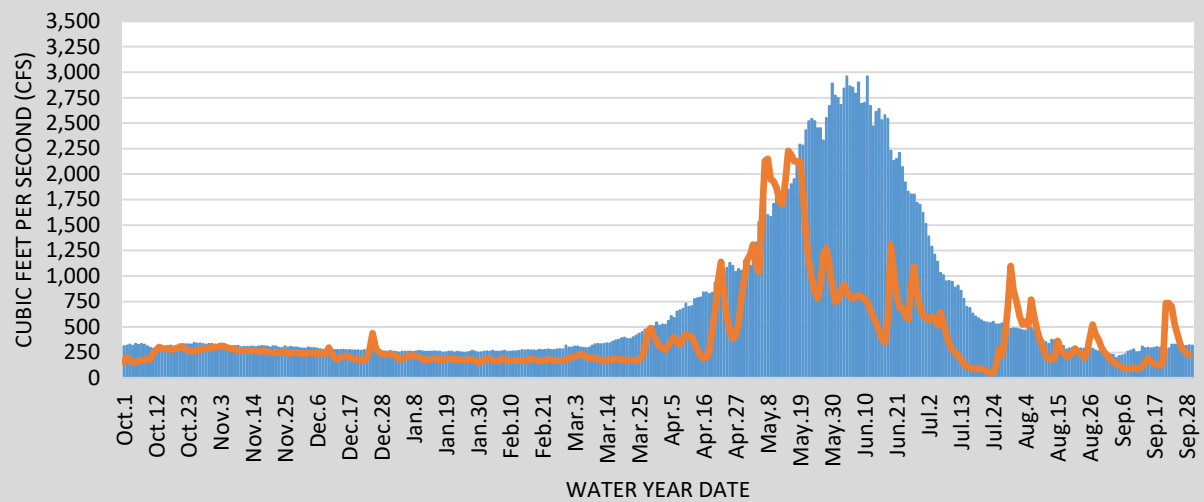




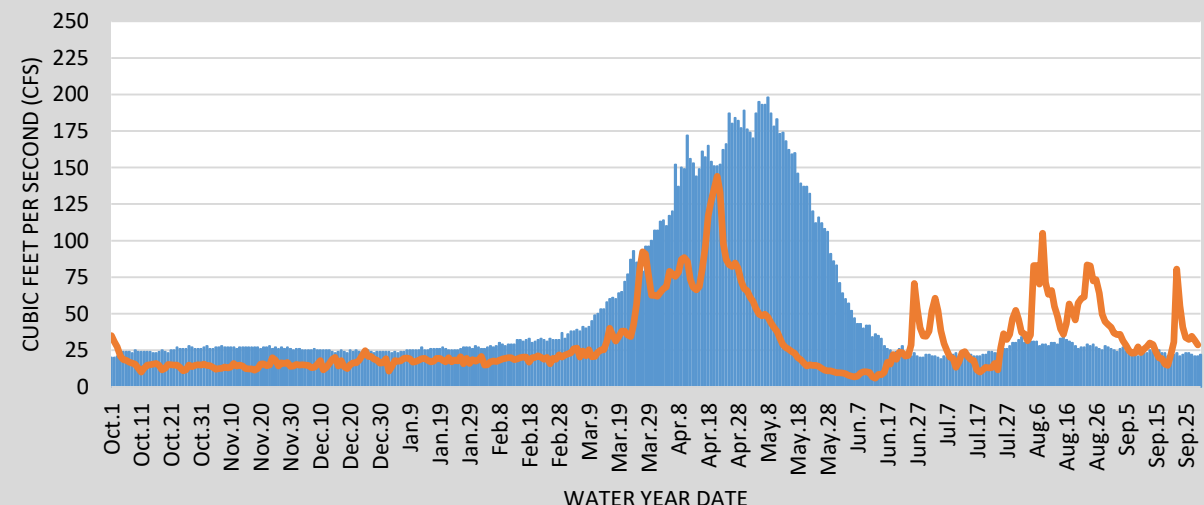
Rio Grande at Albuquerque
Median Discharge (cfs) 1973-2021 & Mean Discharge 2022



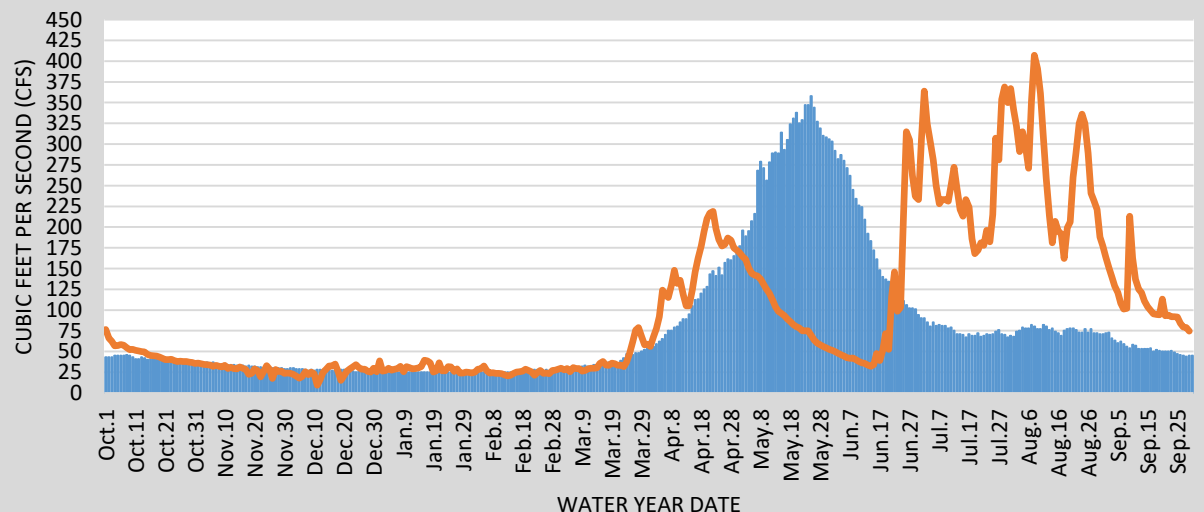
Animas River at Farmington
Median Discharge (CFS) 1913-2020 & Mean Discharge 2022

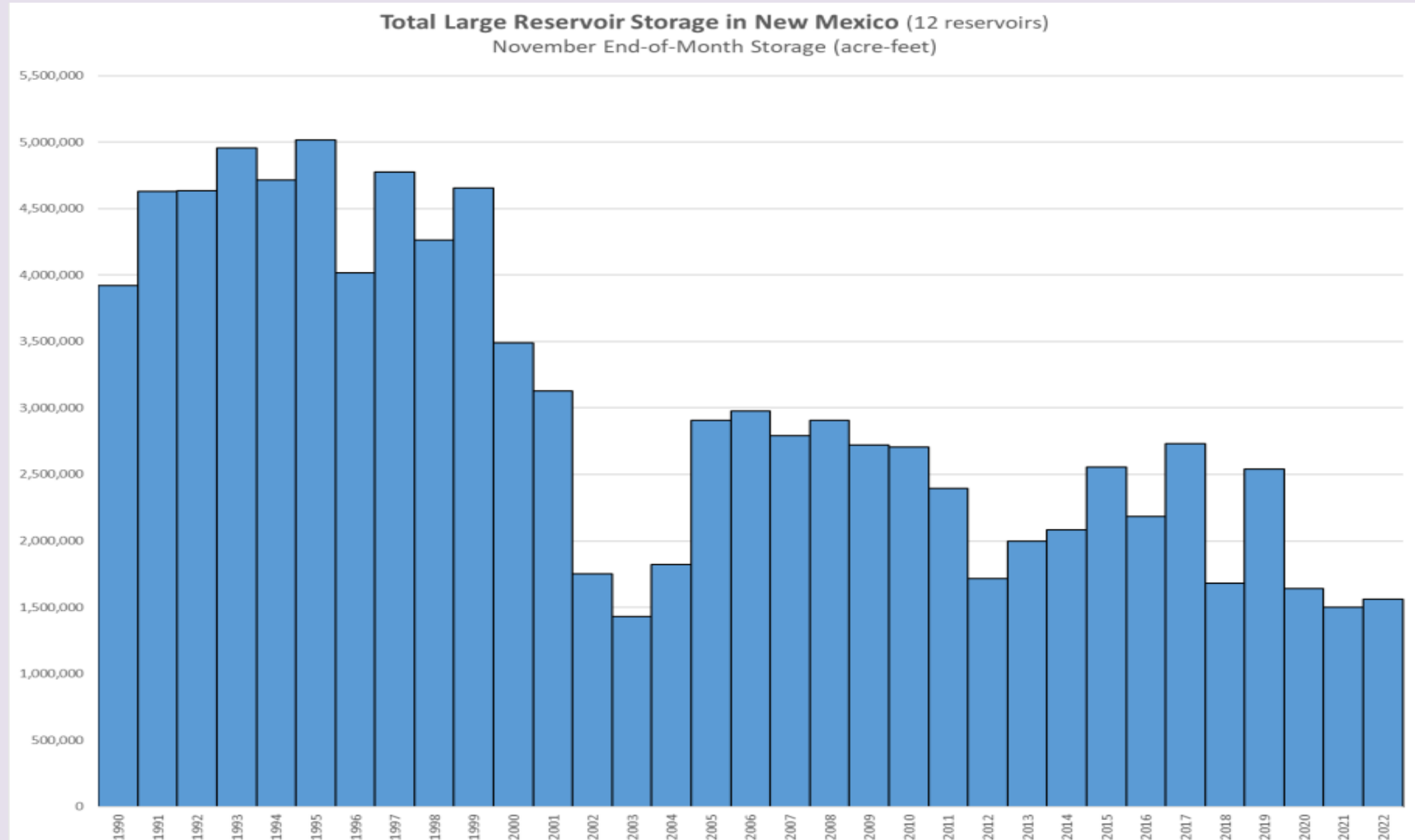


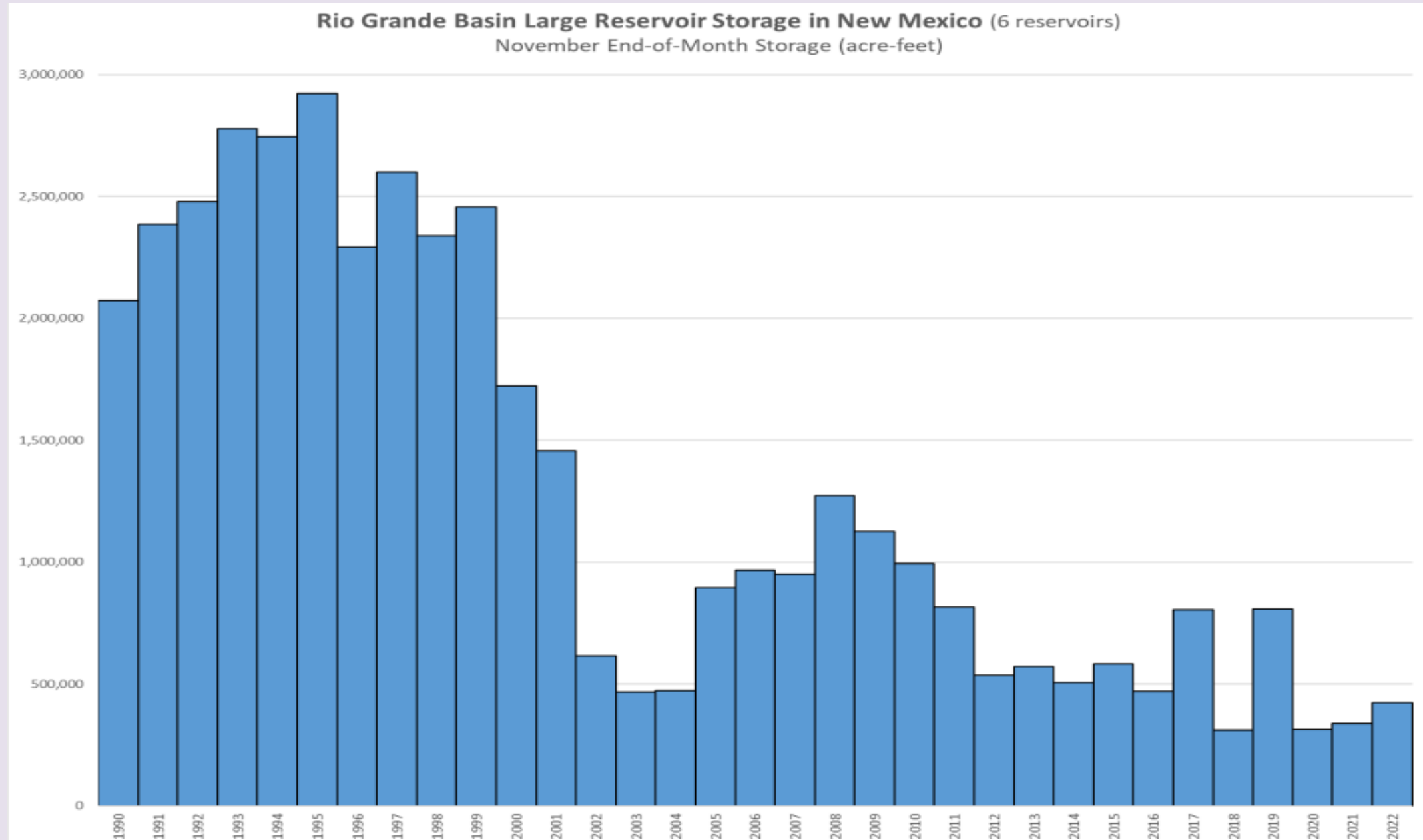
Jemez River near Jemez
Median Discharge (cfs) 1953-2021 & Mean Discharge 2022



Pecos River near Pecos
Median Discharge (cfs) 1919-2021 & Mean Discharge 2022









[USGS Water Dashboard](#)



[NM Water Data Dashboard](#)



[US Drought Monitor](#)



[NM Drought Status](#)



[USGS Water Data](#)



[USGS Groundwater Watch](#)



[City of Albuquerque Groundwater Monitoring](#)



[NRCS Basin Data Reports](#)



[Office of the State Engineer – Hydrology Bureau](#)



[Healy Collaborative Groundwater Monitoring Network](#)



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