# CW3E Analysis – Hurricane Hilary: 18 August 2023

## Hurricane Hilary To Impact Southern California and Nevada This Weekend

- Hurricane Hilary has rapidly intensified over the past 24 hours, reaching Category 4 strength as of the 8 am PT advisory from the National Hurricane Center (NHC)
- Hilary is expected to begin weakening tonight as it turns northward and passes over colder ocean temperatures
- The NHC has issued the first ever Tropical Storm watch for Southern California
- Hilary is expected to move up the coast of the Baja Peninsula Saturday night before making its way into Southern California by Sunday night into Monday morning
- A predecessor rain event (PRE) is forecast to occur north of Hilary, potentially bringing heavy rainfall to portions of California and Nevada Saturday into Sunday
- Additional heavy rainfall and high winds are likely as the storm center approaches Southern California late Sunday
- The highest rainfall amounts (> 5 inches) are expected in the vicinity of the Peninsular Ranges and San Bernardino Mountains, with 3–5 inches forecast in portions of the Sonoran and Mojave Deserts
- The NWS Weather Prediction Center (WPC) has issued a moderate-to-high risk of rainfall exceeding flash flooding guidance over much of Southern California
- Stay alert to official NWS forecasts, watches, and warnings from the NHC at nhc.noaa.gov, information from local NWS weather forecast offices at weather.gov, and follow guidance from local emergency management officials

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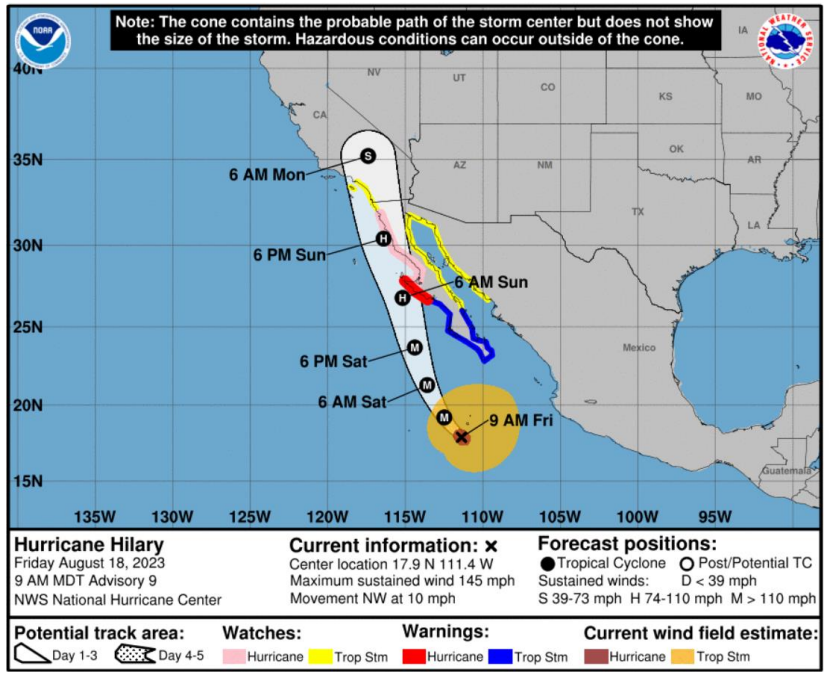
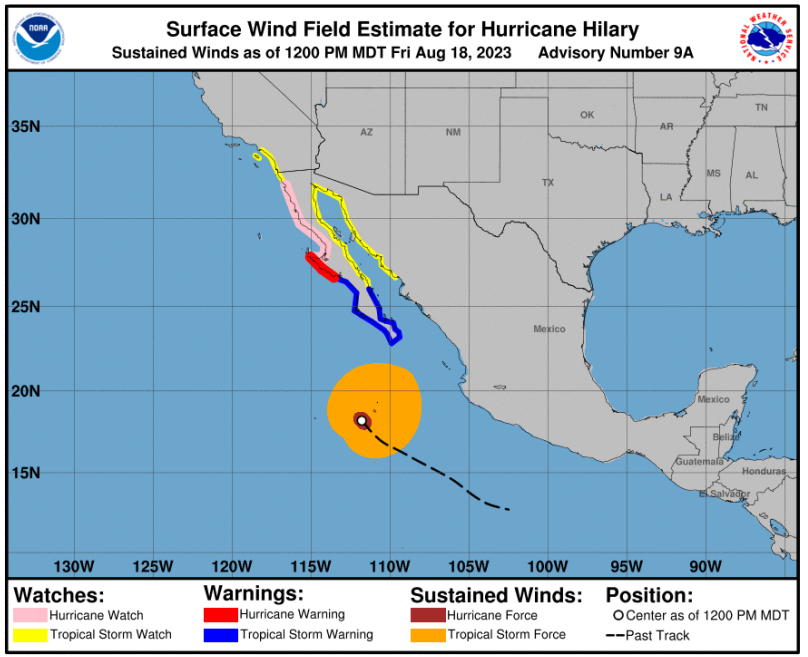
## 3-Day Forecast Cone and Current Watches and Warnings

### A) Advisory 9 - Issued 9 AM MDT 18 Aug




### B) Watches and Warnings as of 12 PM MDT 18 Aug




- Advisory 9 shows Hilary maintaining hurricane force winds of 74–110 mph through 5 pm PT on Sunday 20 Aug (Figure A)
- The storm is forecast to weaken quickly as it makes its way into Southern California
- Hilary underwent rapid intensification over the 24-hour period ending 8 am PT Aug 18, with minimum central pressure dropping 41 mb, and maximum sustained winds increasing from 75 kt to 125 kt
- The NHC has posted Hurricane and Tropical Storm Watches and Warnings for the Baja Peninsula. The NHC also issued the very first Tropical Storm Warning for Southern California

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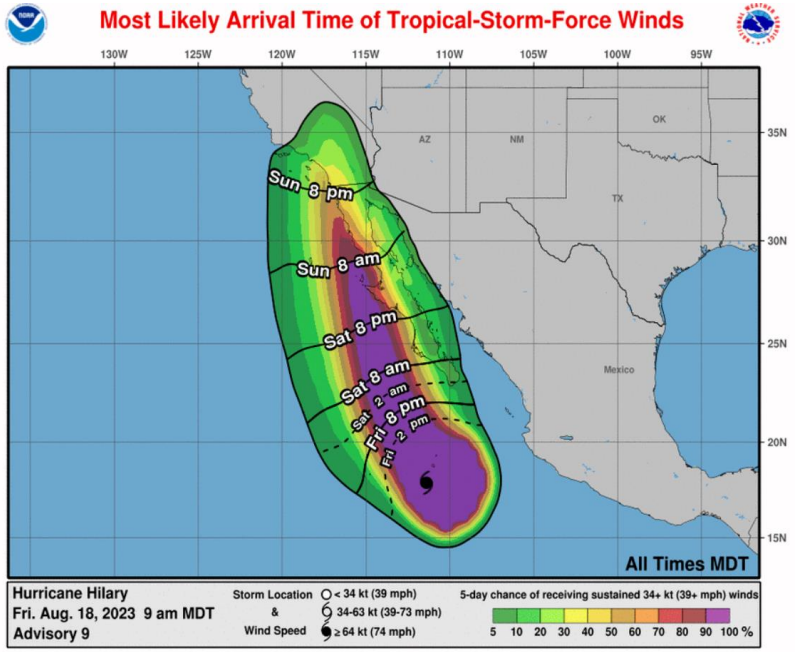
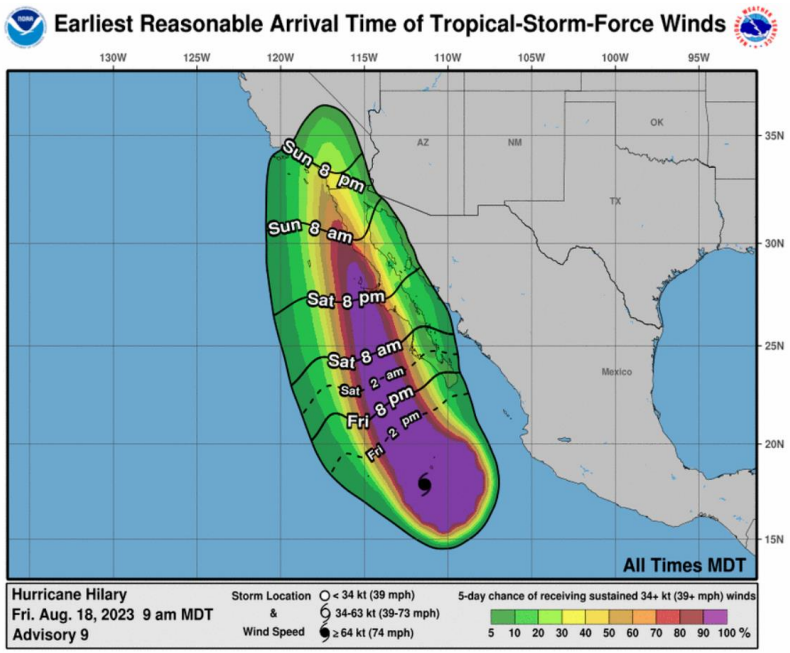
## Forecast Arrival Time of Storm Winds

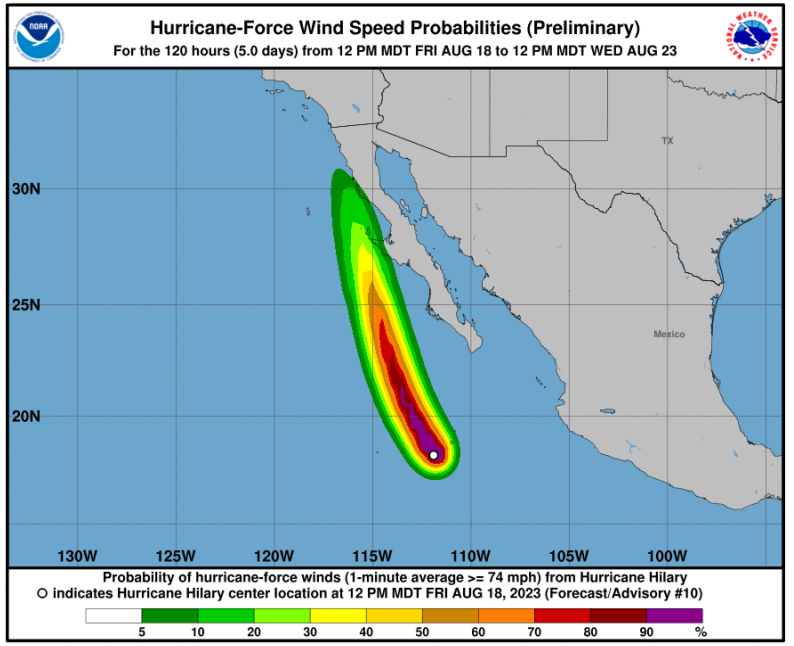
### A) Advisory 9 - Issued 9AM MDT 18 Aug Most Likely Arrival Time of Tropical-Storm-Force Winds




### B) Advisory 9 - Issued 9AM MDT 18 Aug Earliest Reasonable Arrival Time of Tropical-Storm-Force Winds




### C) Probability of Hurricane-Force Wind Speeds for 12 PM MDT 18 Aug to 12 PM MDT 23 Aug




- As of Advisory 9, the **most likely** arrival time of **tropical-storm-force winds** in Southern California is 8pm on Sunday 20 Aug (Figure A). However, tropical storm force winds could arrive a few hours earlier (Figure B)
- Probabilities of Southern California experiencing sustained tropical storm force winds (>39 mph), shown by the shading in figures A and B, is between 30% and 40%
- The probability of hurricane force winds in Southern California over the next 5 days is less than 5% (Figure C)

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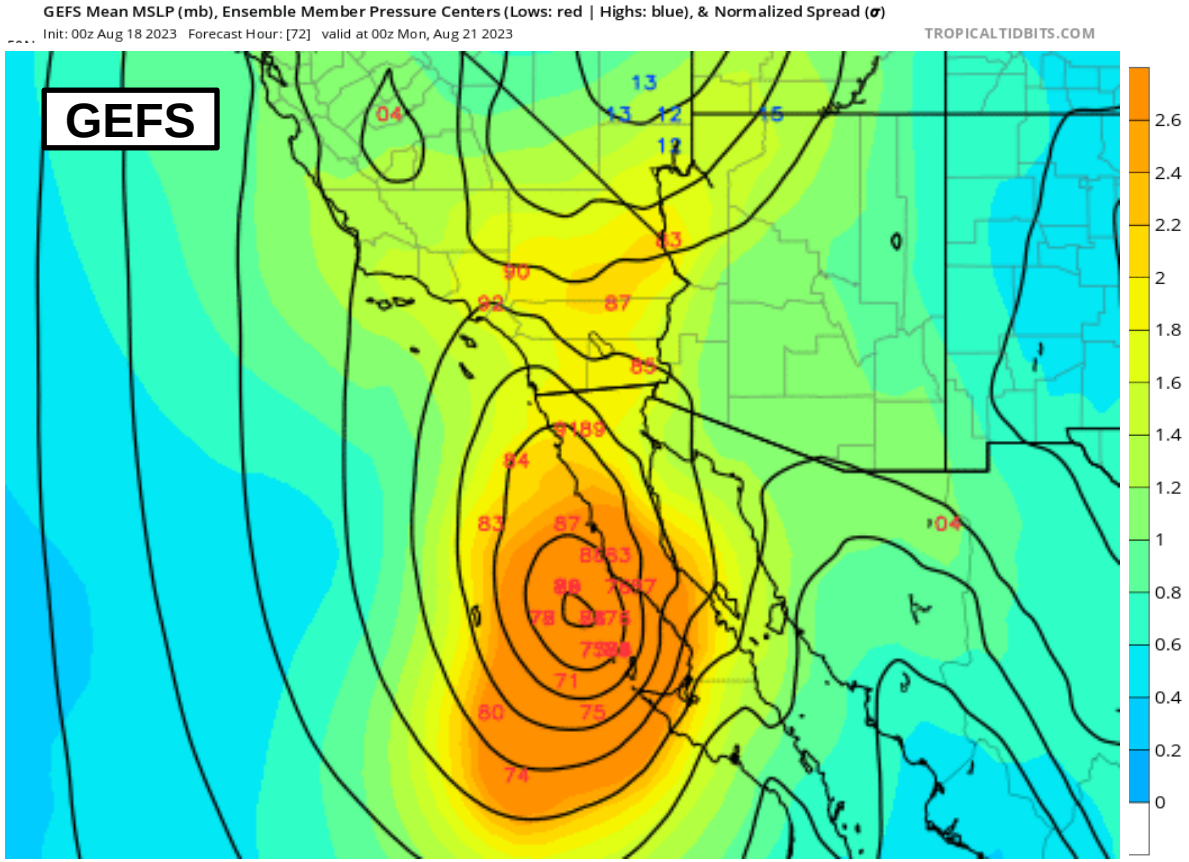
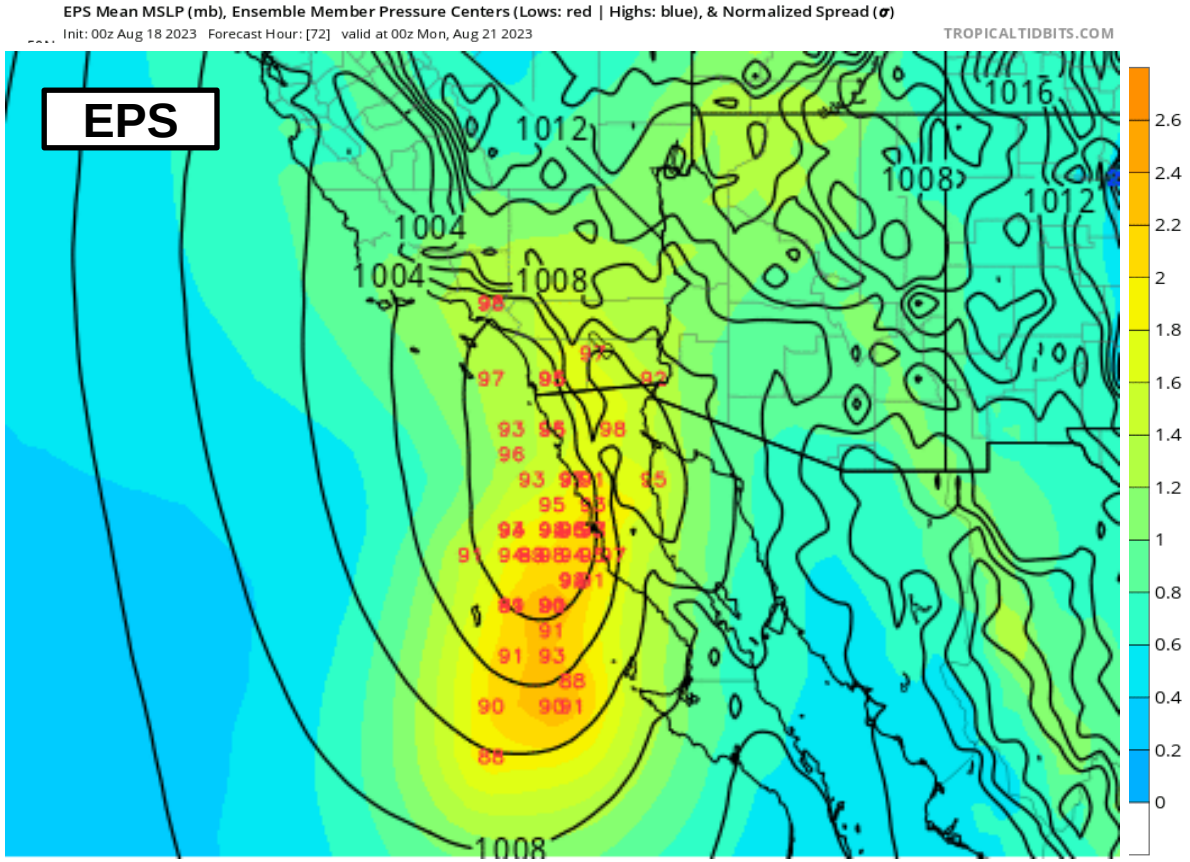
## GEFS and EPS MSLP Forecasts: Valid: 5 PM PT 21 Aug (Initialized 00Z 18 Aug)




Source: Levi Cowan, Tropical Tidbits



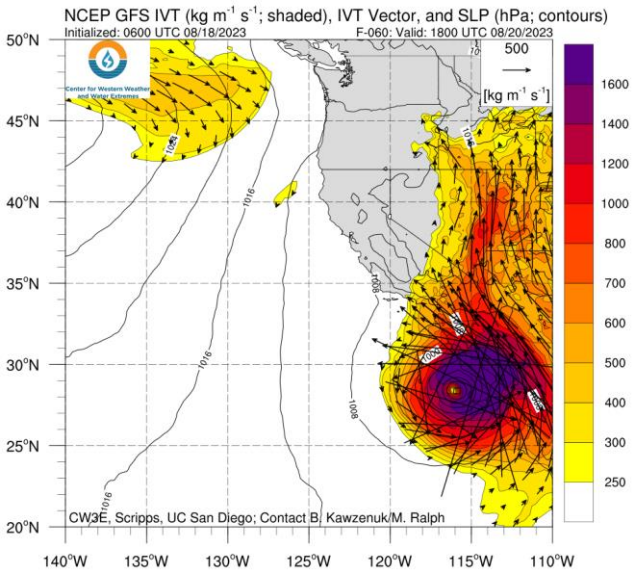

Source: Levi Cowan, Tropical Tidbits

- While forecast models have come into better agreement regarding the track of Hilary, there was still considerable uncertainty in the timing and intensity of the storm as of early this morning
- Compared to NCEP's Global Ensemble Forecast System (GEFS), many members of the ECMWF's Ensemble Prediction System (EPS) were forecasting Hilary to move northward and weaken more rapidly

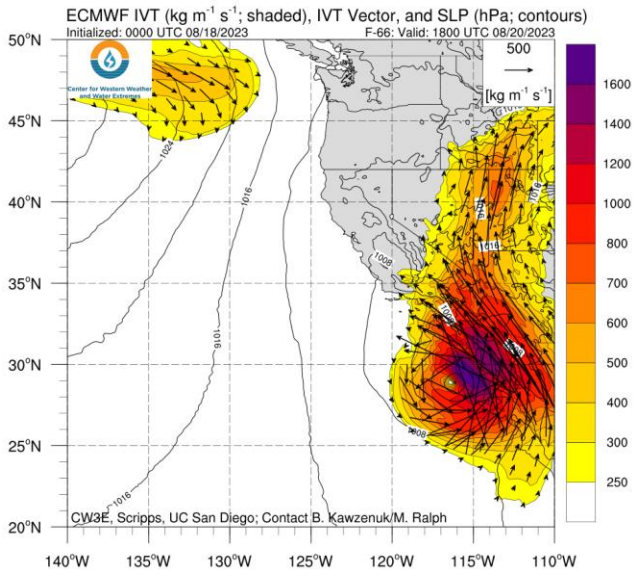
# CW3E Analysis – Hurricane Hilary: 18 August 2023

## GFS and ECMWF Model IVT and IWF Forecast: Valid: 11 AM PDT 20 Aug

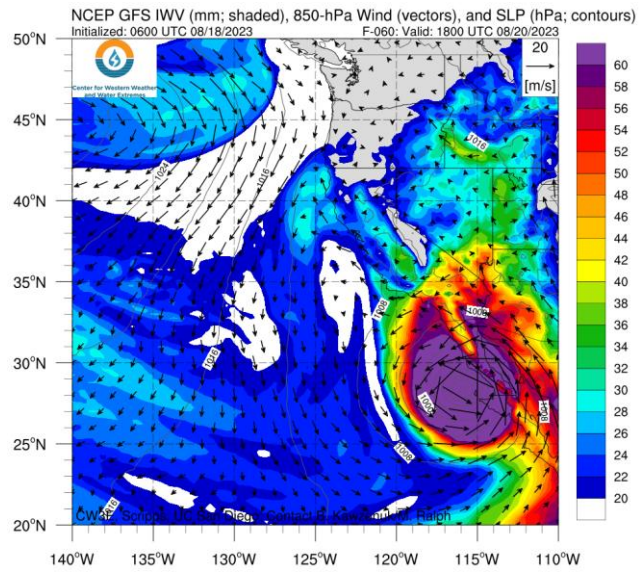
### A) GFS IVT



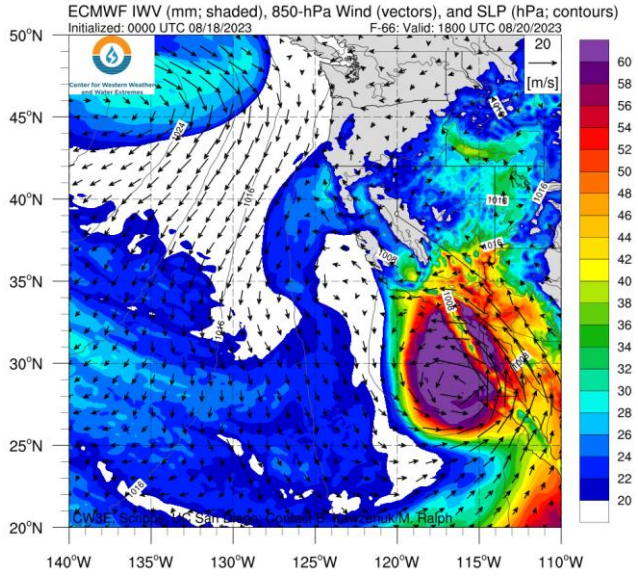

### B) ECMWF IVT




### C) GFS IWV




### D) ECMWF IWV




- The GFS and ECMWF are more aligned now on the forecast track of Hurricane Hilary than two days ago
- Despite the general agreement in track, the GFS still is showing greater IVT values around much of the storm compared to the ECMWF (Figures A and B)
- Both models are showing large regions of IWV > 60 mm with the center of the system, this area being slightly larger in the GFS than the ECMWF. Both models also show regions of IWV > 60 mm being brought into San Diego County late Sunday into Monday

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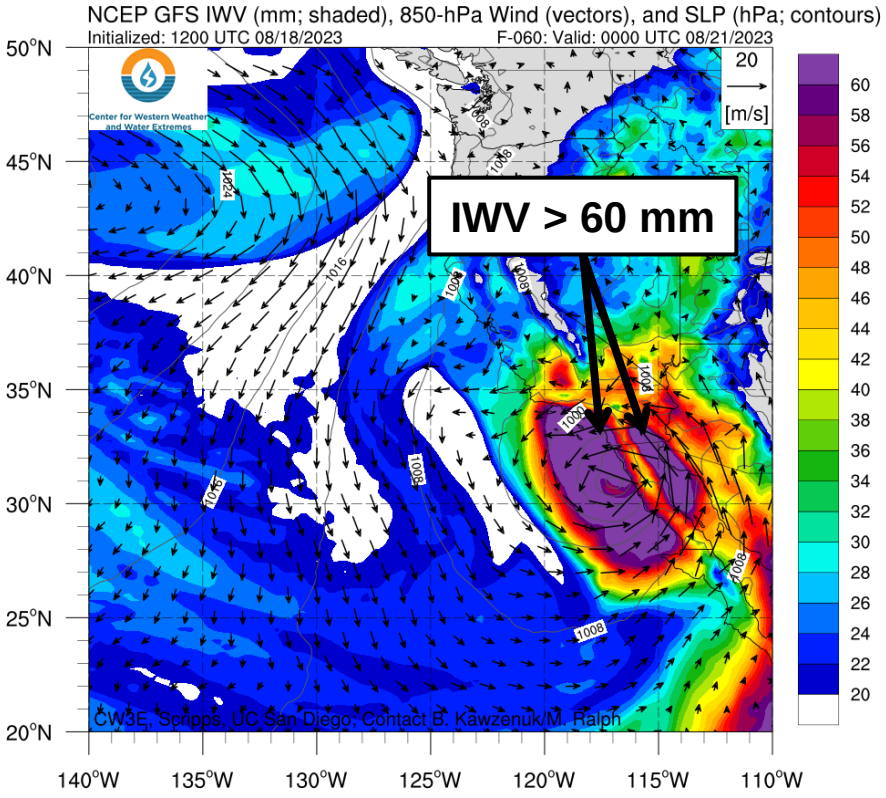
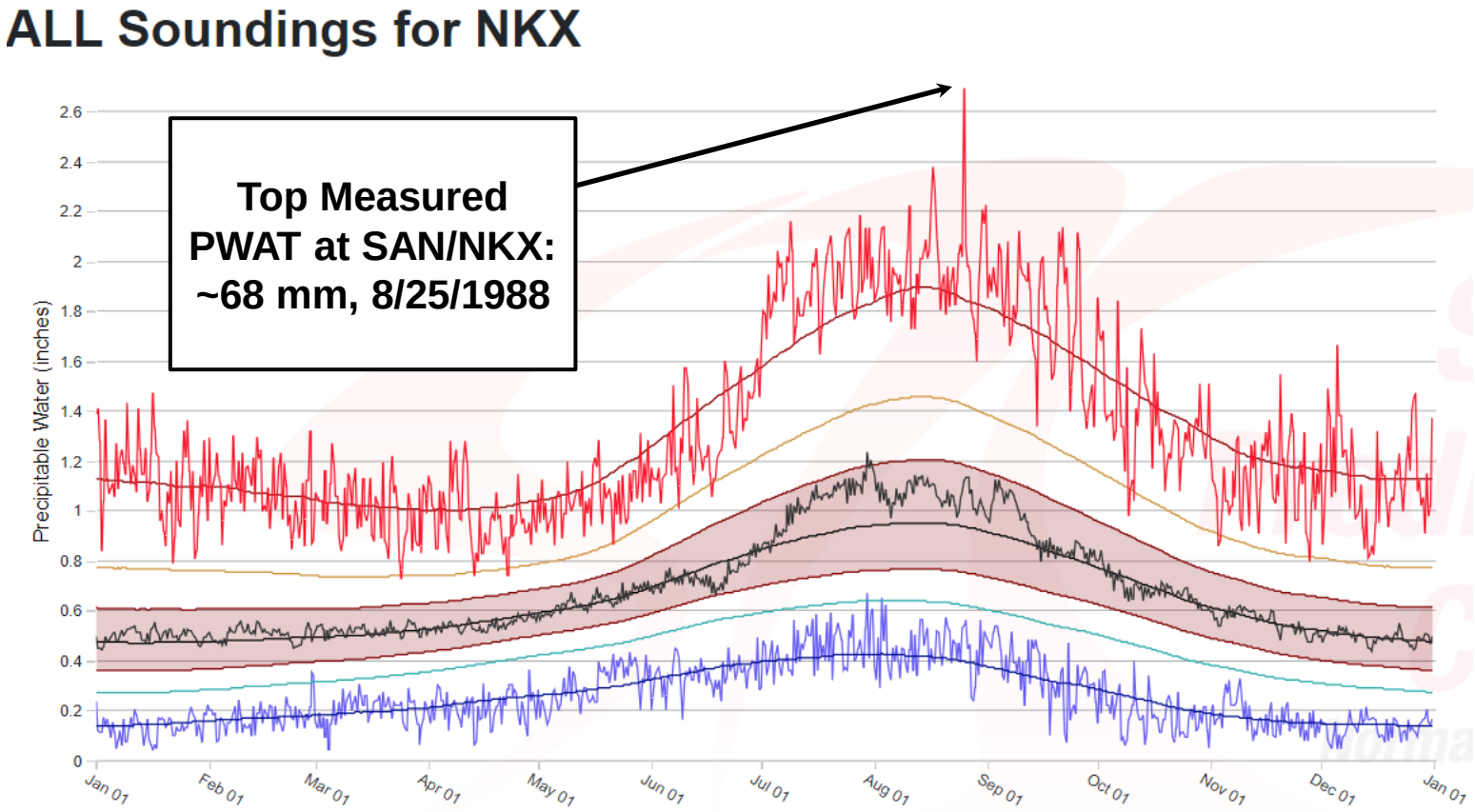
## Precipitable Water Sounding



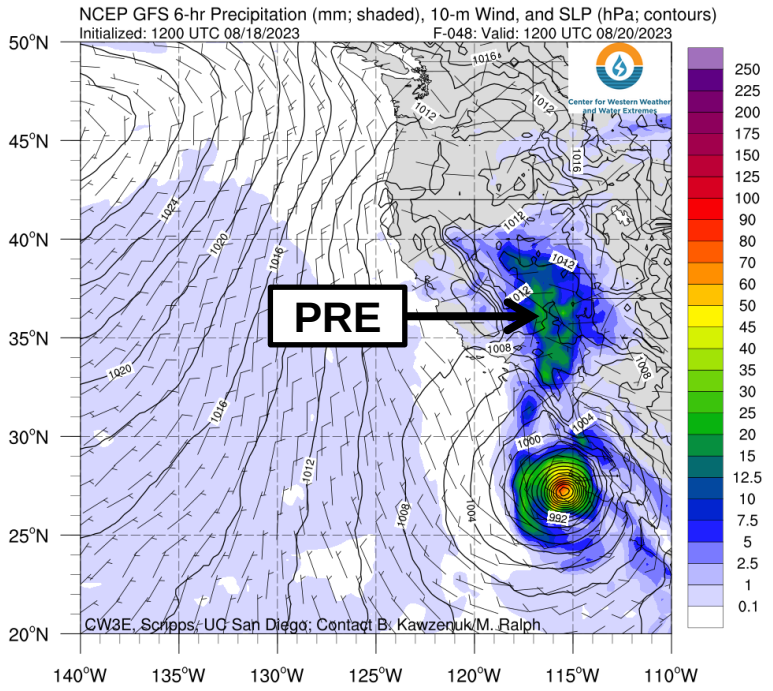

Source: NOAA NWS Storm Prediction Center

- The GFS and ECMWF are still forecasting maximum IWV values > 60 mm over parts of Southern California on Sunday
- These forecast IWV values will approach and potentially exceed the record levels of precipitable water observed over Southern California, with the highest value on record of ~68 mm in the San Diego (NKX) upper air sounding observed on 25 August 1988

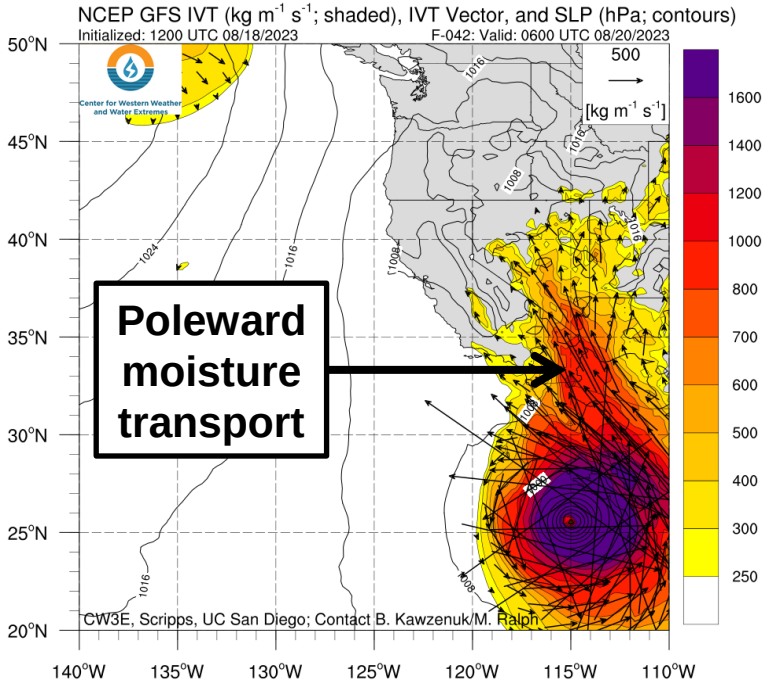
# CW3E Analysis – Hurricane Hilary: 18 August 2023

## Potential for a Predecessor Rain Event (PRE)

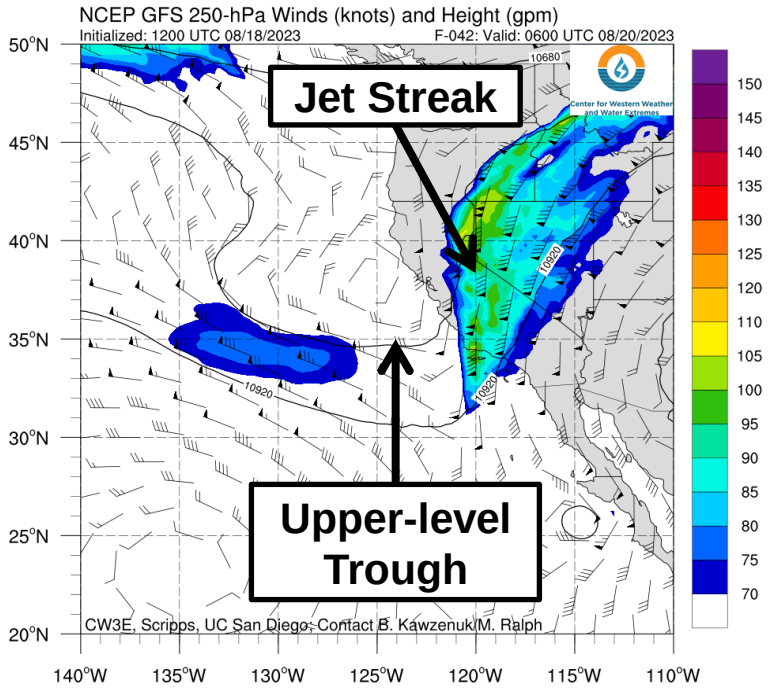
### A) GFS SLP and 6-h Precipitation
### Valid: 5 AM PT 20 Aug (F-48)




### B) GFS IVT and SLP
### Valid: 11 PM PT 19 Aug (F-42)




### C) GFS 250-hPa Winds and Heights
### Valid: 11 PM PT 19 Aug (F-42)




- Forecast models are still indicating the potential for a predecessor rain event (PRE) north of Hilary on Saturday into Sunday over portions of California and Nevada (Figure A)
- PREs are areas of heavy rainfall fed by moisture from a tropical cyclone that can occur as much as 1000 km away
- The 12Z GFS is showing conditions favorable for a PRE, with strong moisture transport (Figure B) forecast to occur on the poleward side of Hilary below the right entrance region of a 250-hPa jet streak and east of an amplifying upper-level trough along the coast (Figure C)

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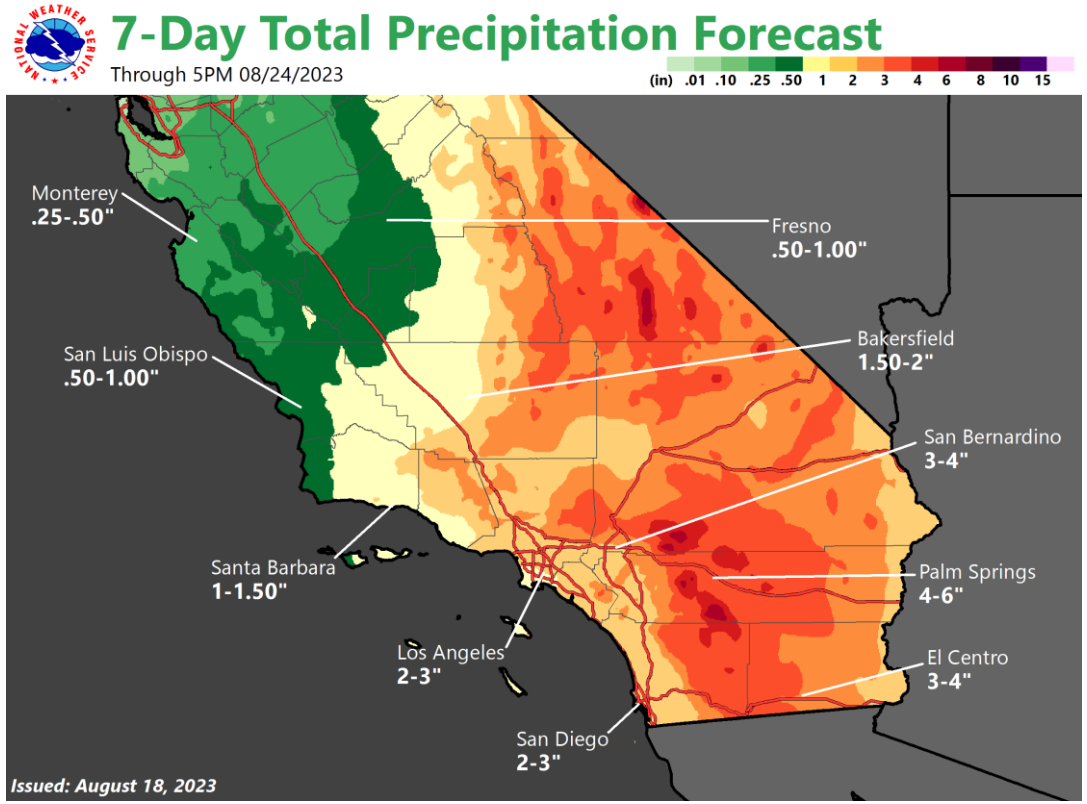
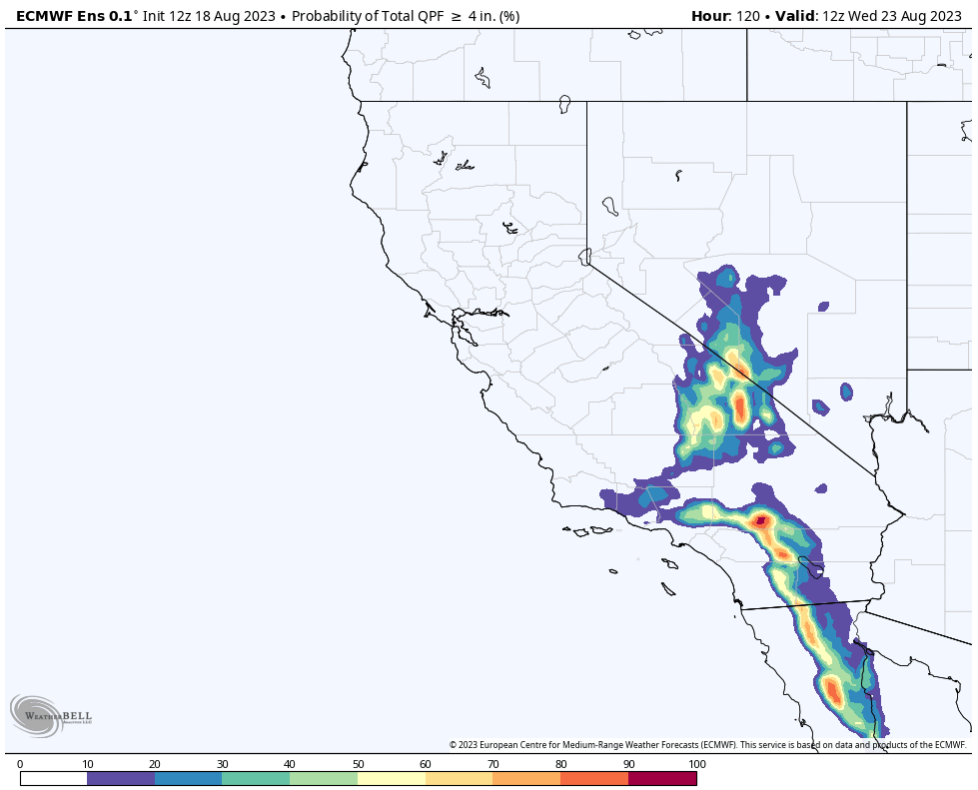
## WPC 7-day QPF and ECMWF EPS Probability of QPF > 4 inches




Source: NOAA NWS Weather Prediction Center




Source: WeatherBELL Analytics

- The WPC is forecasting at least 3 inches of total precipitation across much of Southern California during the next 7 days
- The highest rainfall amounts (6–10 inches) are expected in the Peninsular Ranges and San Bernardino Mountains, with 3–6 inches forecast in the Sonoran and Mojave Deserts
- The latest forecasts from the EPS are showing a greater than 70% probability of total precipitation exceeding 4 inches in parts of the Peninsular Ranges, the eastern Transverse Ranges, and the higher terrain of the Mojave Desert

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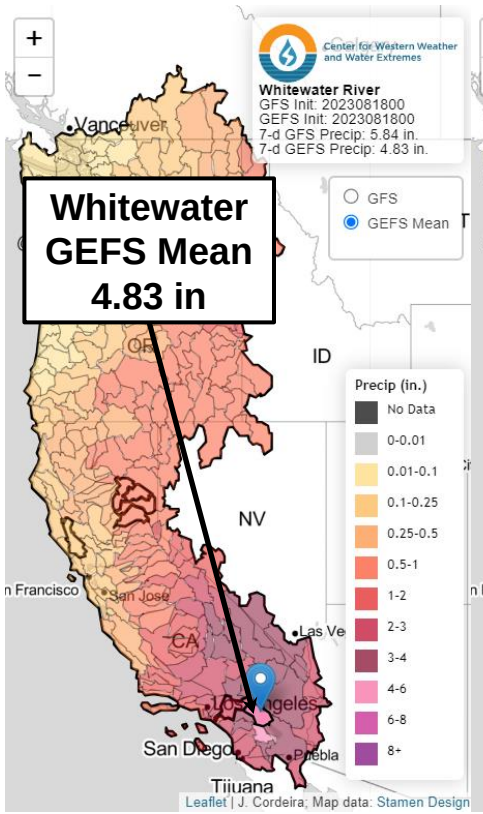
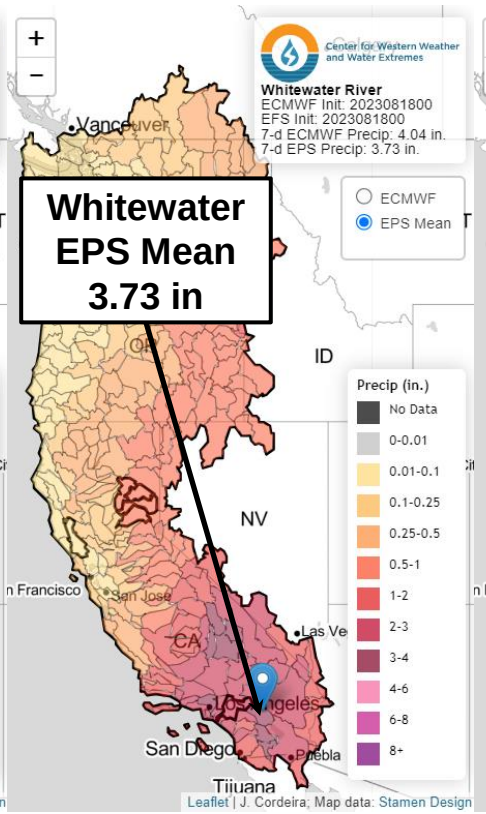
## 7-day Watershed Precipitation Forecasts

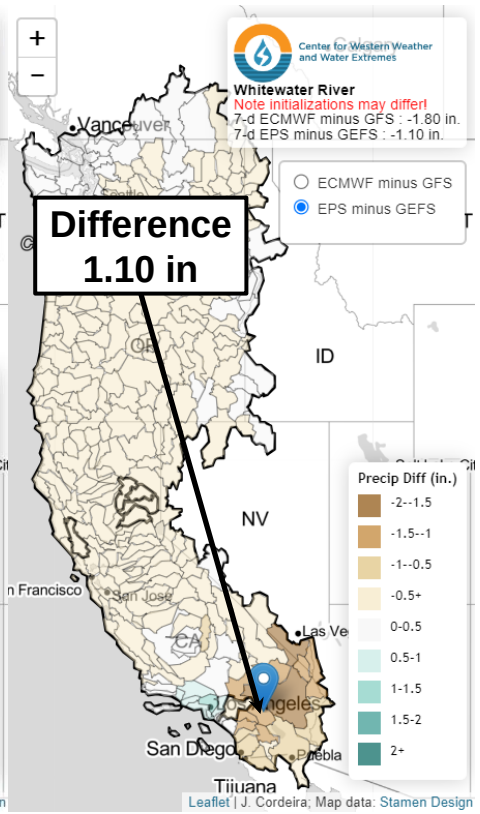
### GEFS Mean

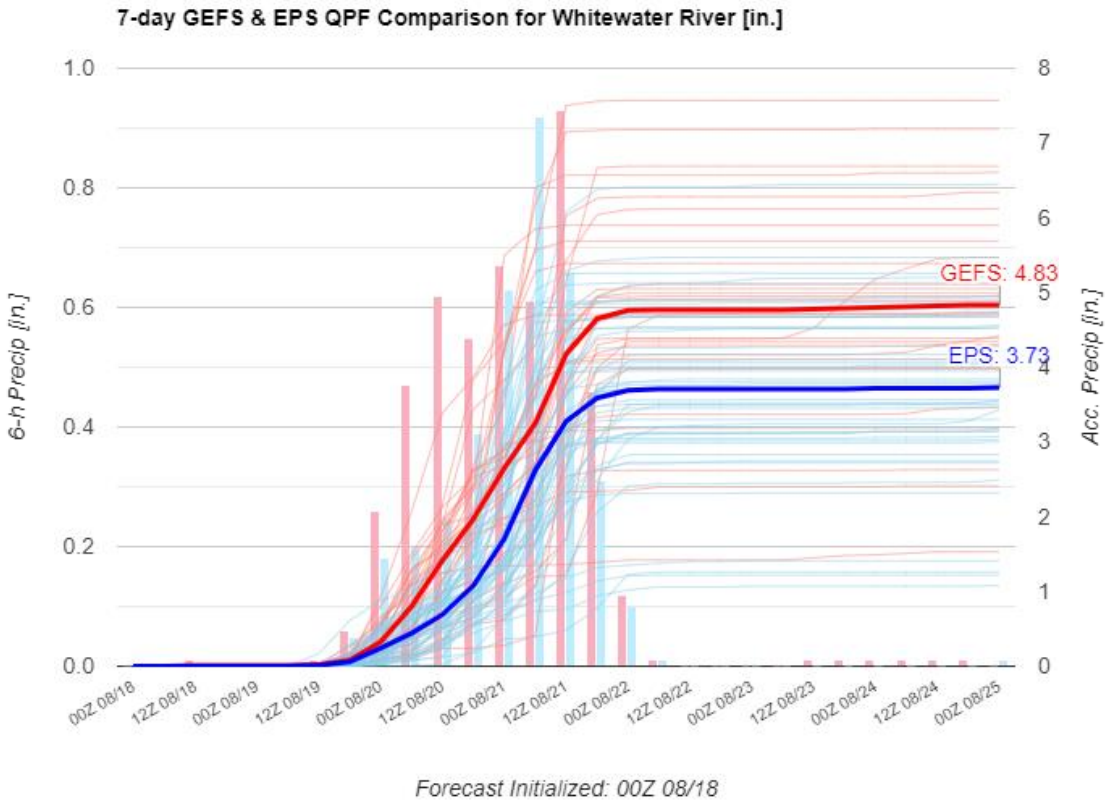



### EPS Mean




### Difference




- As of last night, there were still large model differences in precipitation, with the 00Z GEFS forecasting higher precipitation amounts over the Peninsular Ranges and California deserts than the 00Z EPS
- Compared to the EPS ensemble, the GEFS ensemble was forecasting heavier precipitation Saturday night and Sunday morning in association with the PRE, as well as a later timing of peak rainfall intensity due to a slower storm track

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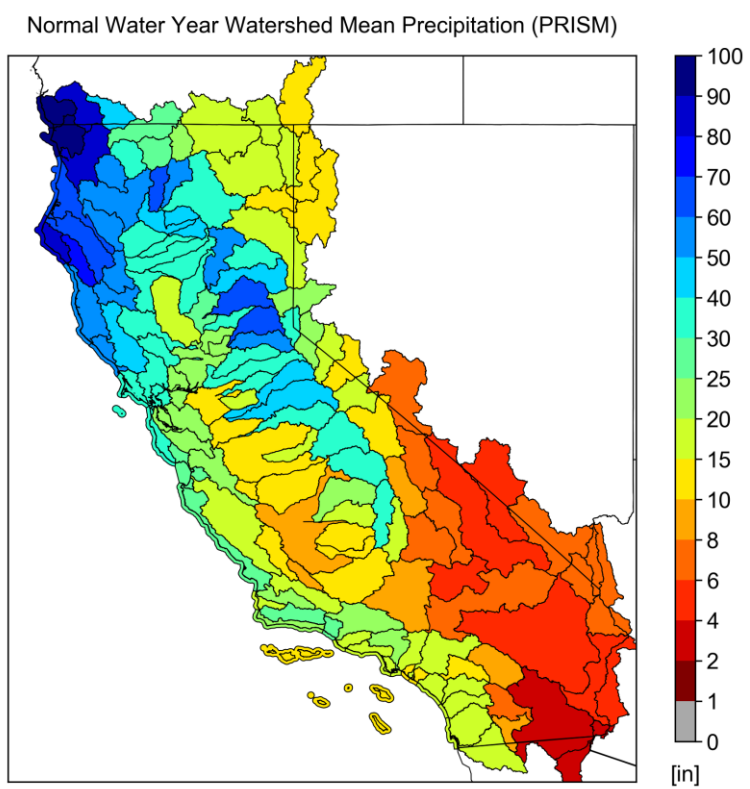
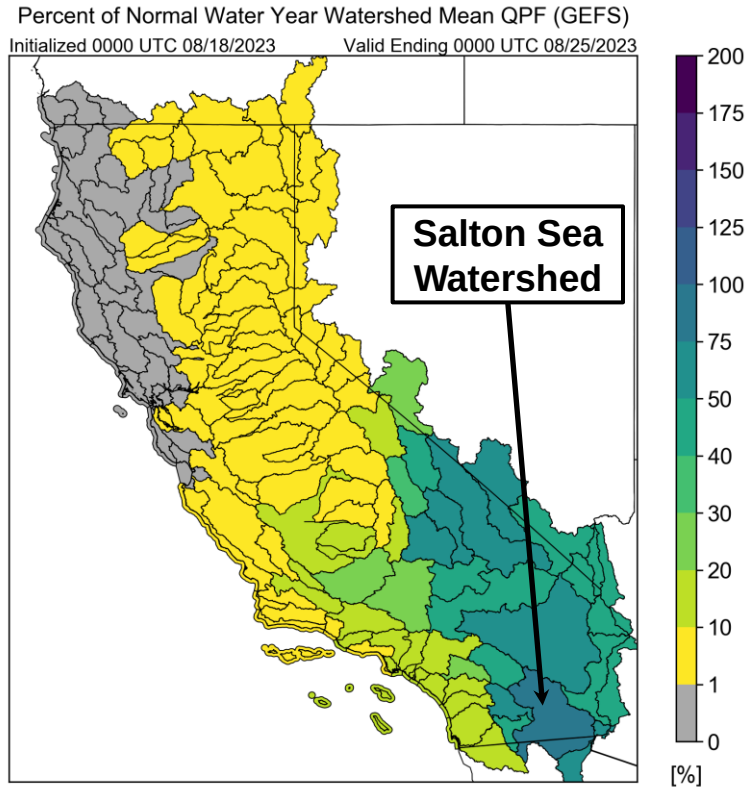
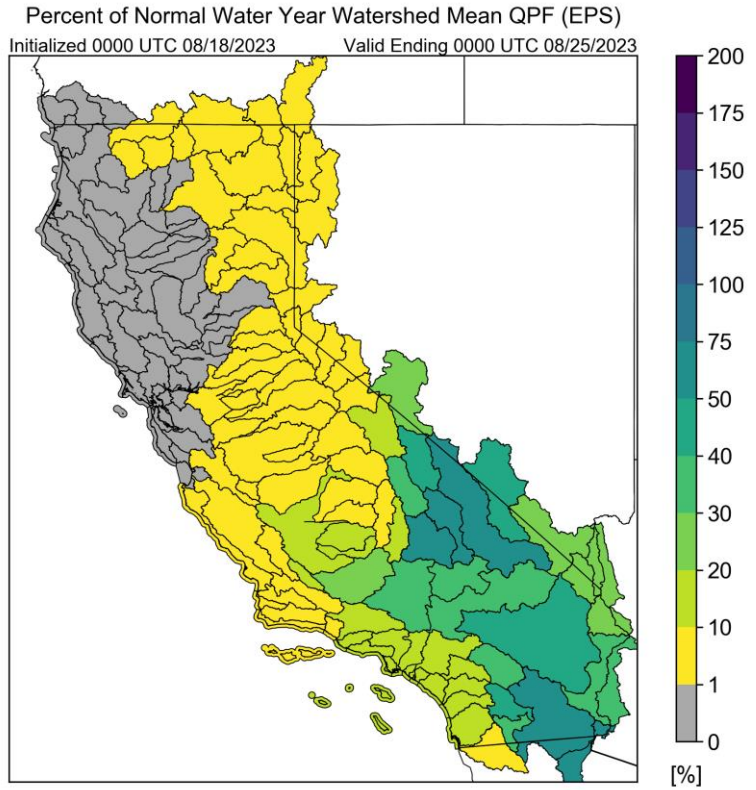
## 7-day Watershed Precipitation Forecasts: Climatological Perspective




- Compared to climatology, the amount of precipitation forecast in portions of Southern California is quite extreme
- Both the GEFS and EPS ensembles are showing the potential for several watersheds to receive more than 50% of their normal total water year precipitation (relative to the 1991–2020 PRISM climatology) over the next 7 days
- For example, the 7-day GEFS ensemble mean QPF averaged over the entire Salton Sea watershed is 3.06 inches, which is 94% of the watershed mean normal total water precipitation (3.27 inches)

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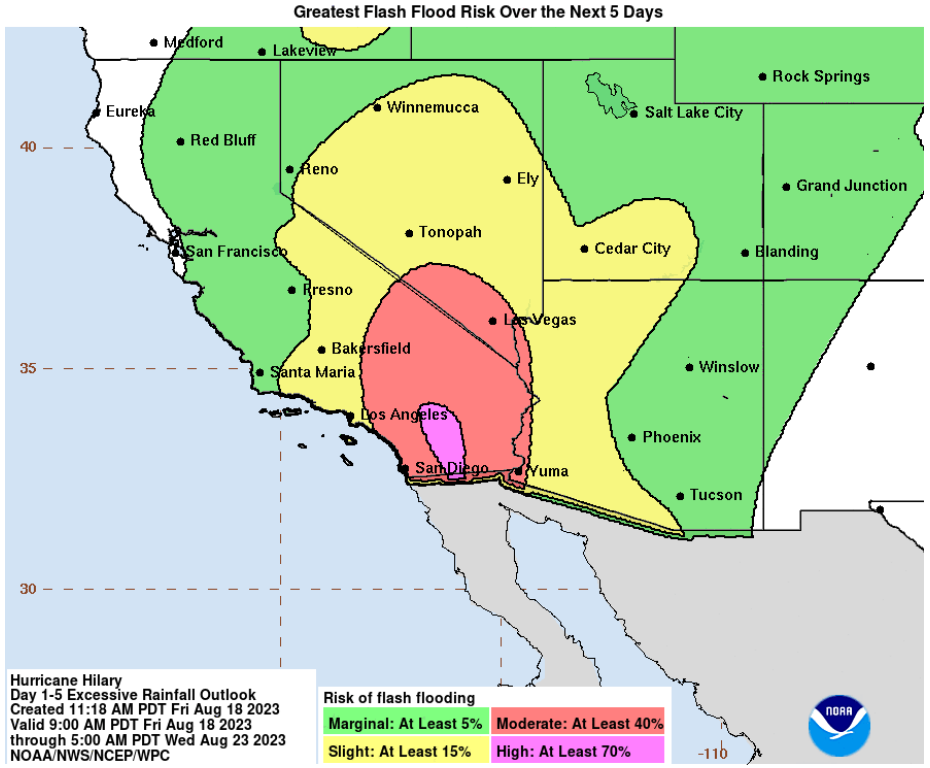
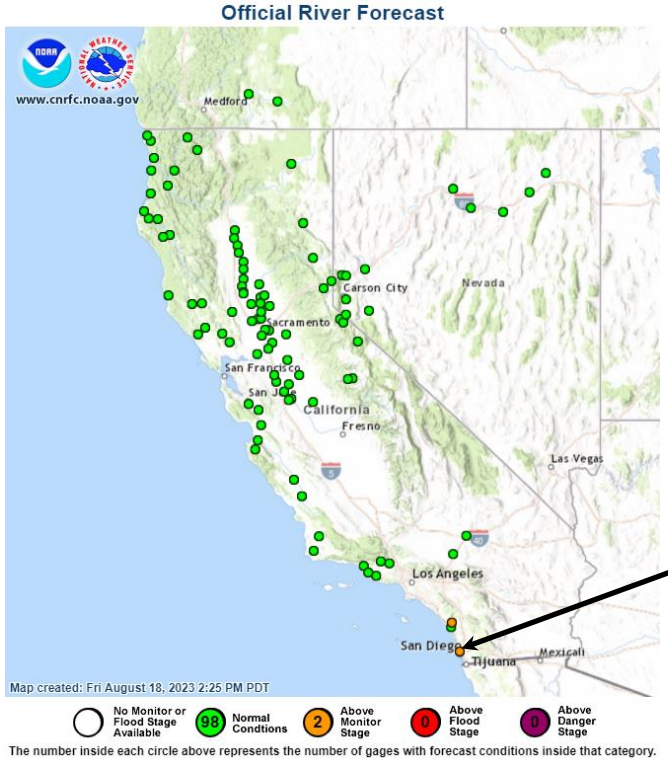
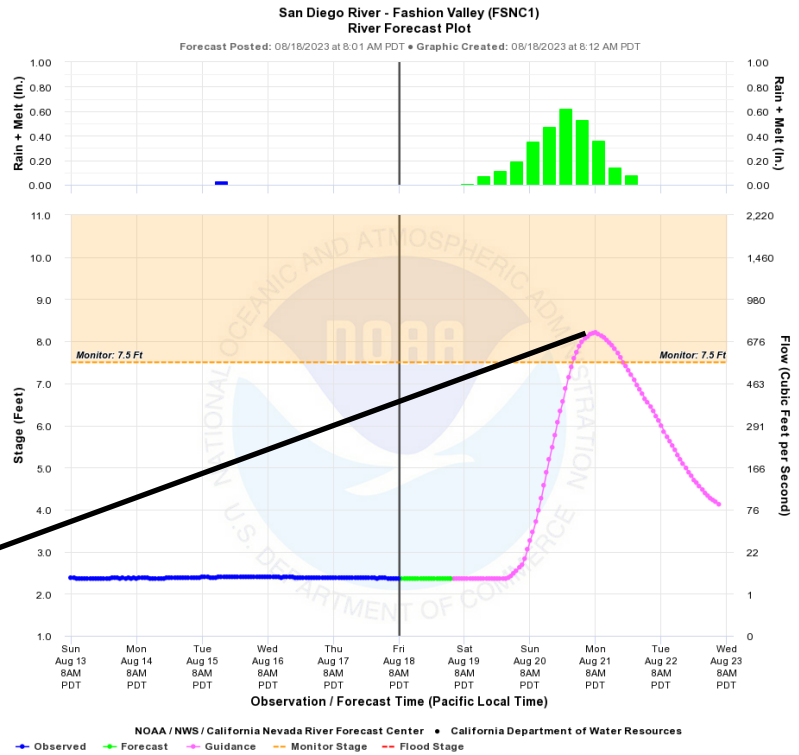
## GEFS and EPS MSLP Forecasts: Valid: 5 PM PT 21 Aug




Source: NOAA NWS Weather Prediction Center




Source: NOAA NWS California–Nevada River Forecast Center

- The WPC has issued a moderate-to-high risk of rainfall exceeding flash flood guidance over much of Southern California and southern Nevada, with peak rainfall rates > 0.5 inches/hour possible in mountain and desert locations
- This is the first time the WPC has issued a high risk of excessive rainfall in the low deserts of Southern California
- Despite the elevated risk of flash flooding, significant riverine flooding is not expected in Southern California
- The San Diego River at Fashion Valley is forecast to crest slightly above monitor/action stage Sunday night

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