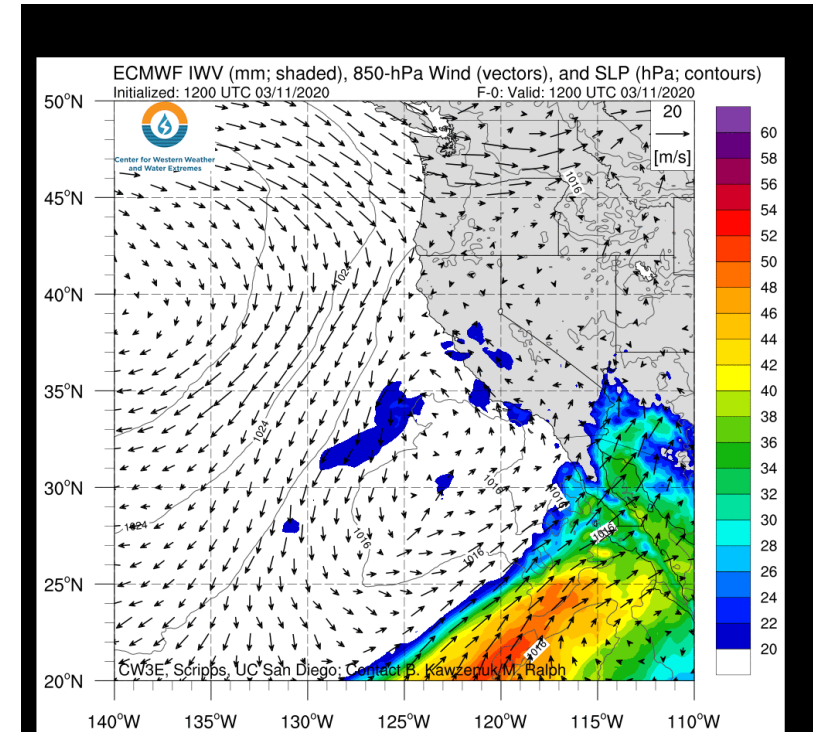
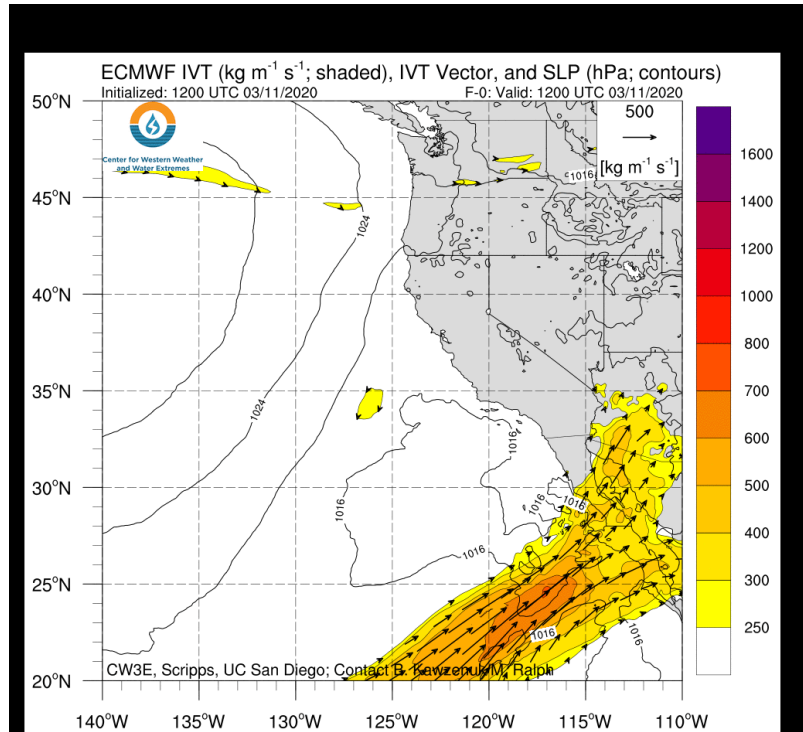




## A cutoff low and landfalling AR will bring heavy rainfall to the Desert Southwest

- A cutoff low that has been impacting California since Monday will strengthen and interact with a remnant atmospheric river (AR) over the Baja Peninsula
- This interaction will result in heavy rainfall across Southern California, southern Nevada, and west-central Arizona
- Some areas in southern Arizona may experience another round of AR1 conditions
- An additional 3+ inches of precipitation are possible over the eastern Transverse Ranges
- Portions of the Sonoran and Mojave Deserts may receive 15–30% of average annual rainfall over the next 48 hours



# AR Outlook: 11 Mar 2020

For California DWR's AR Program



Center for Western Weather and Water Extremes

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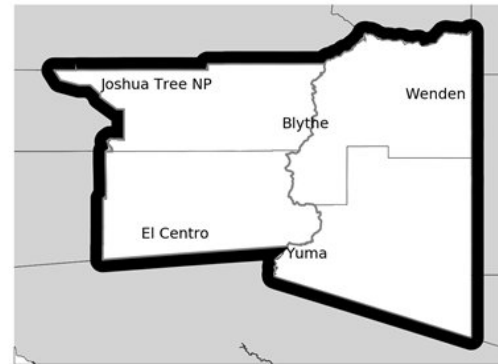


## Weather Threat Matrix

Created at 08:11 AM on Wednesday, March 11

- EXTREME  
WIDESPREAD
- MAJOR  
NUMEROUS
- MODERATE  
SCATTERED
- MINOR  
ISOLATED
- LOW  
FEW / NONE

Threat	WED 03/11	THU 03/12	FRI 03/13	SAT 03/14	SUN 03/15	MON 03/16	TUE 03/17
Extreme Temps							
Blowing Dust							
Lightning							
Flooding							
Winds							
Hail							
Snow							
Fog/Haze/Smoke							



Southeast California & Southwest Arizona



Last Map Update: Wed, Mar. 11, 2020 at 4:05:21 pm MST

[Watches, Warnings & Advisories](#)



- [Flood Warning](#)
- [Flash Flood Watch](#)
- [Flood Advisory](#)
- [Flood Watch](#)
- [Hazardous Weather Outlook](#)

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Source: NOAA/NWS Phoenix WFO, <https://www.weather.gov/psr/>

# AR Outlook: 11 Mar 2020

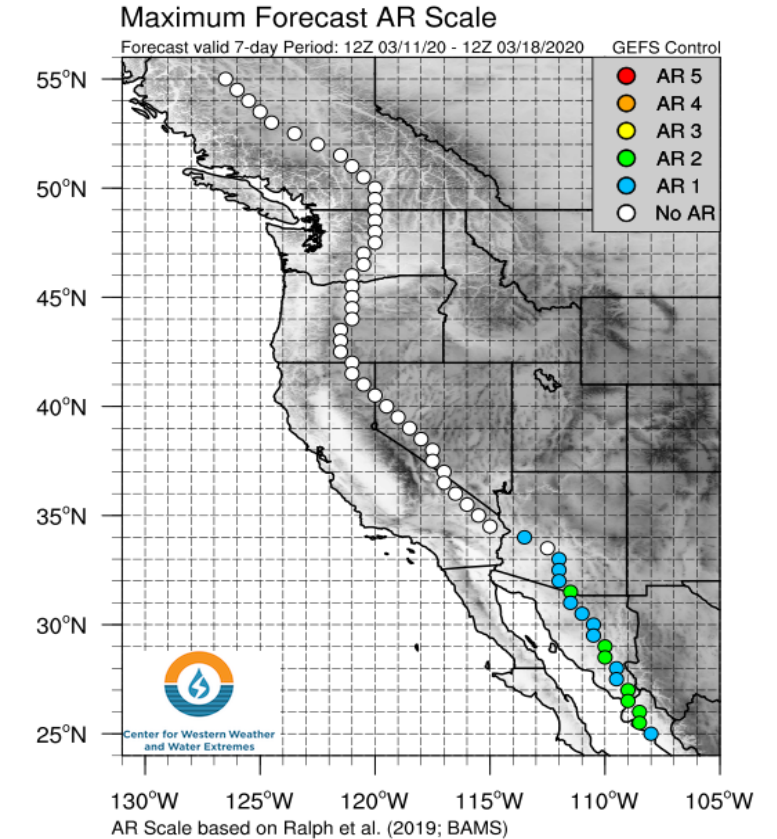
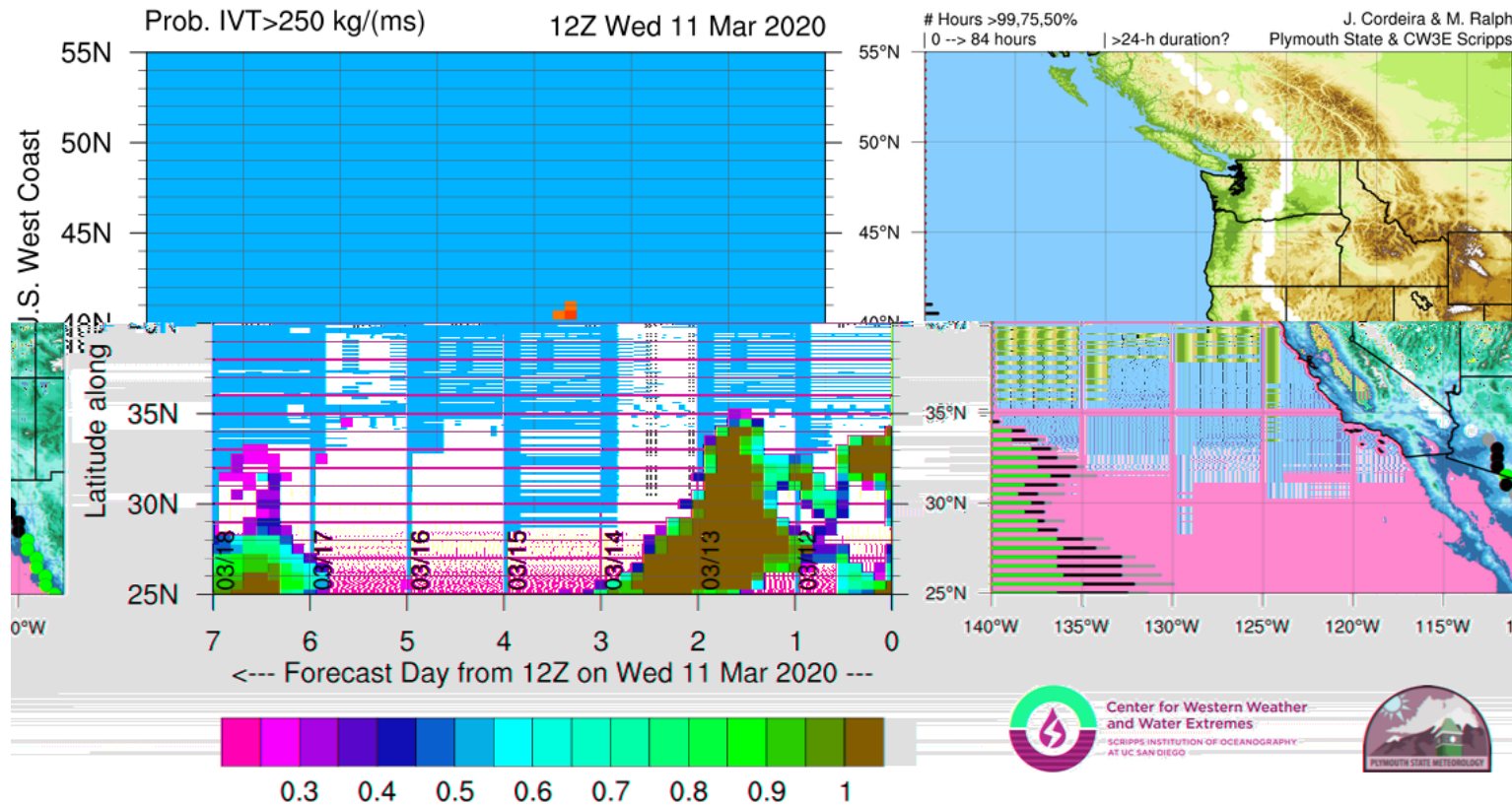
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## GEFS AR Landfall Probabilities & AR Scale (Inland)



- Inland AR landfall tool shows high confidence (> 90%) in another period of AR conditions over southern Arizona, but there is some uncertainty in the timing and duration
- GEFS control run is currently forecasting AR1 conditions over southern Arizona

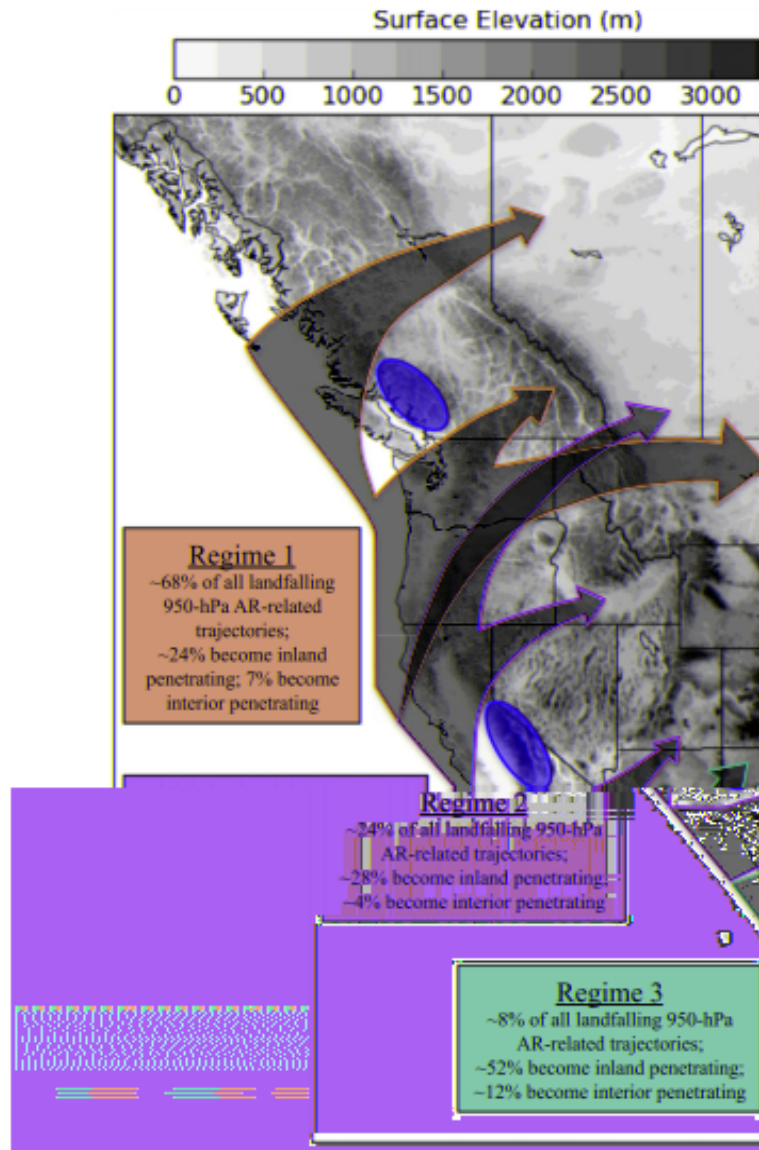


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## The Inland Penetration of Atmospheric Rivers over Western North America: A Lagrangian Analysis

J.J. Rutz, J. W. Steenburgh and F.M. Ralph  
*Mon. Wea. Rev.*, 2015

- Work by Rutz et al. 2015 identified that southwesterly oriented ARs that make landfall over the Mexican Baja are able to penetrate inland through gaps of lower terrain and bring AR conditions and impacts to Arizona
- While landfalling ARs are rare over the Mexican Baja compared to northern West Coast ARs, they tend to be more efficient at penetrating inland and impacting the Desert Southwestern States
- ~52% and ~12% of ARs that make landfall over the Mexican Baja become inland and interior penetrating respectively, a proportion much higher (~2 times more) than ARs that make landfall at higher latitudes along the North American coast (Regime 1; Green and Regime 2; Orange)

# AR Outlook: 11 Mar 2020

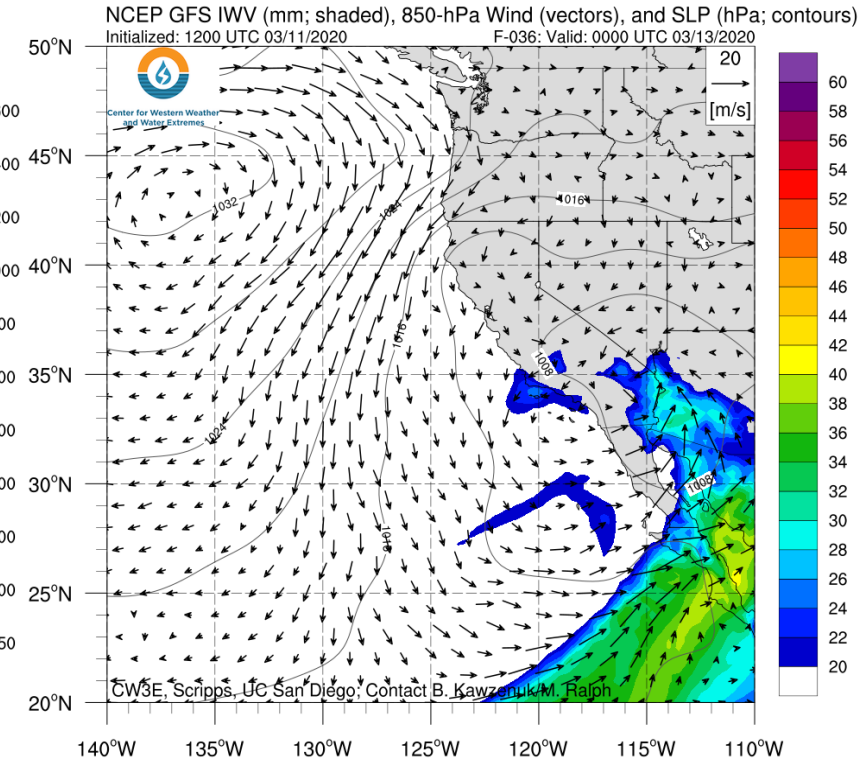
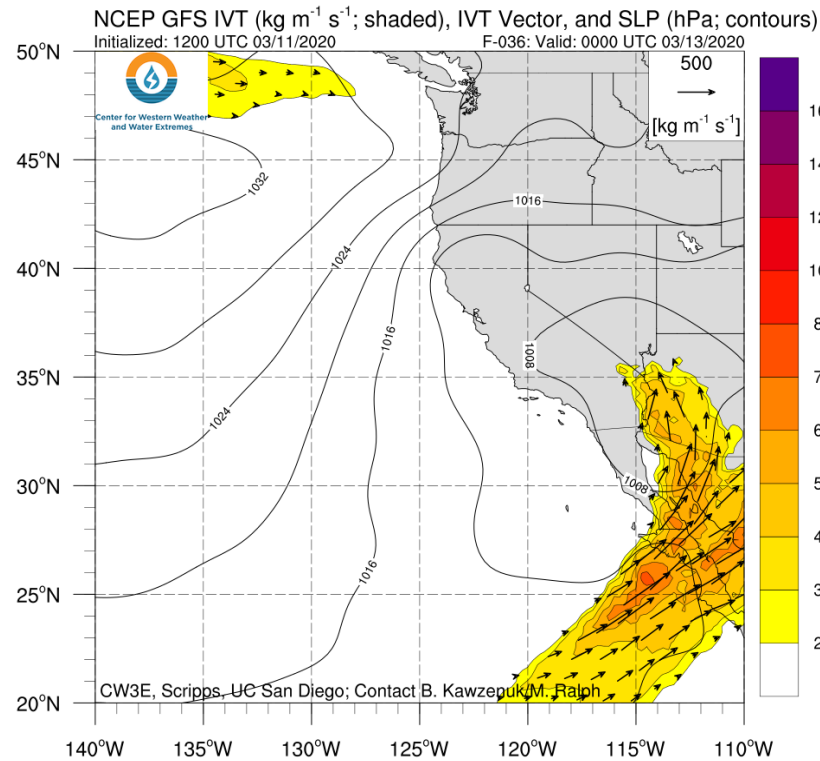
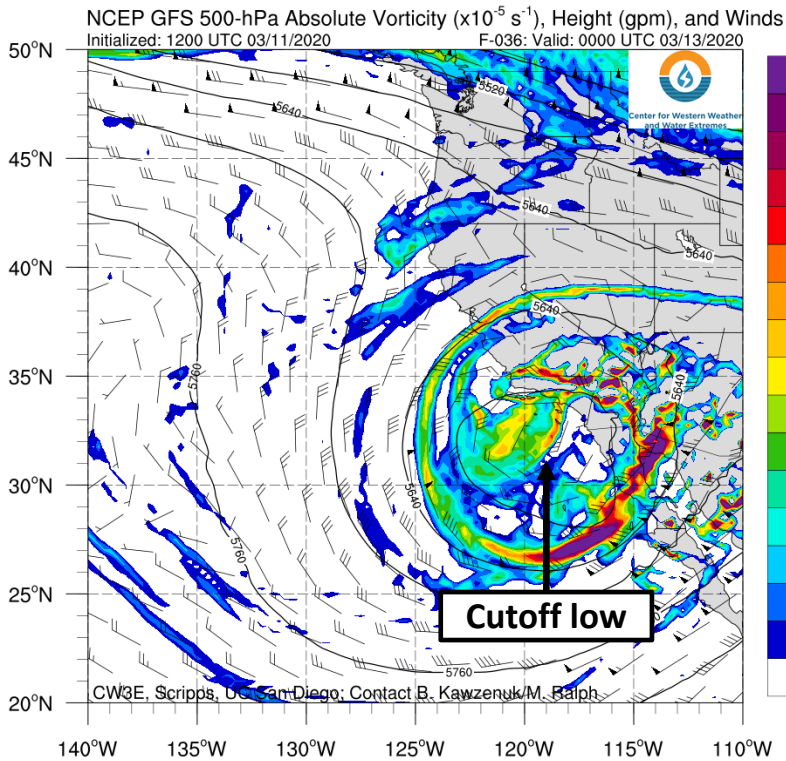
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## GFS Forecasts: Valid 0000 UTC 13 Mar



- The cutoff low that has been impacting California since Monday will deepen and slowly drift eastward over the next 36 hours
- As the cutoff low approaches Southern California, a remnant AR over the Baja Peninsula will intensify and become cyclonically curved
- Strengthening low-to-midlevel flow will allow higher IVT and IWV values to spread northward into western Arizona, setting the stage for a period of heavy rainfall Thursday into early Friday

# AR Outlook: 11 Mar 2020

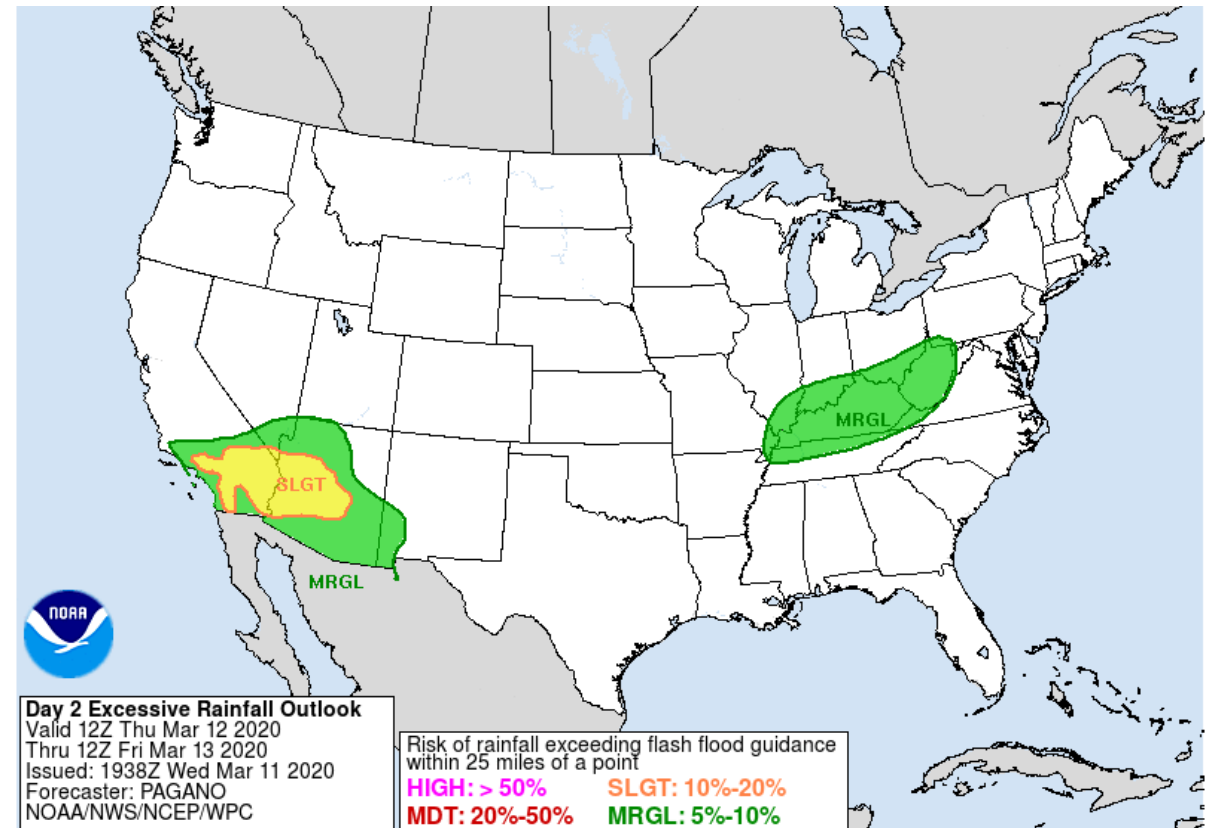
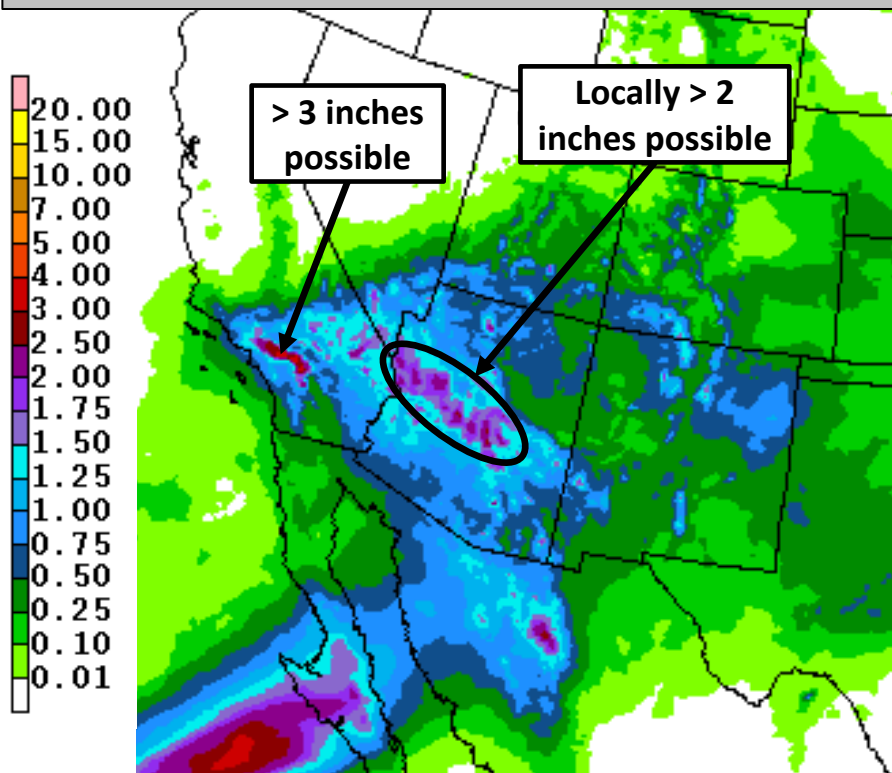
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WPC 48-hour QPF: Valid 0000 UTC 12–14 Mar



Source: NOAA/NWS Weather Prediction Center, <https://www.wpc.ncep.noaa.gov/>

- The heaviest precipitation is forecast in Southern California, southern Nevada, and west-central Arizona
- More than 3 inches of precipitation are possible over the eastern Transverse Ranges in Southern California
- NWS WPC has issued a slight risk of excessive rainfall for interior Southern California and west-central Arizona
- Portions of the Sonoran and Mojave Deserts are expected to receive at least 15–30% of average annual rainfall during a 48-hour period
- Average annual rainfall: 1) Barstow, CA: 4.06 inches, 2) Lake Havasu City, AZ: 3.84 inches, 3) Bullhead City, AZ: 5.98 inches



# AR Outlook: 11 Mar 2020

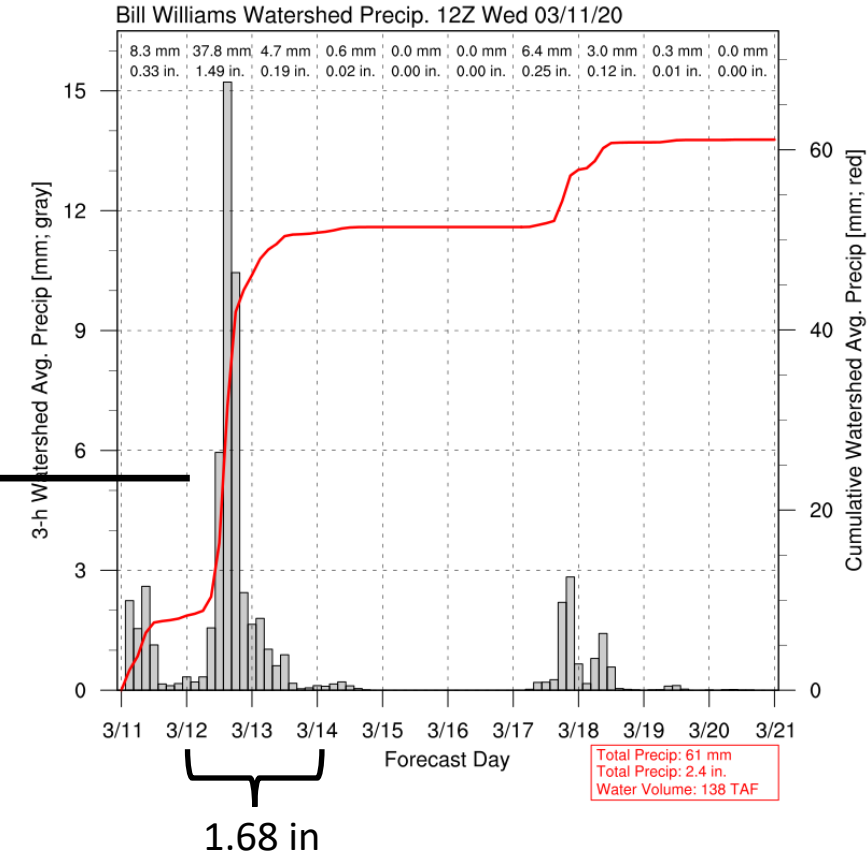
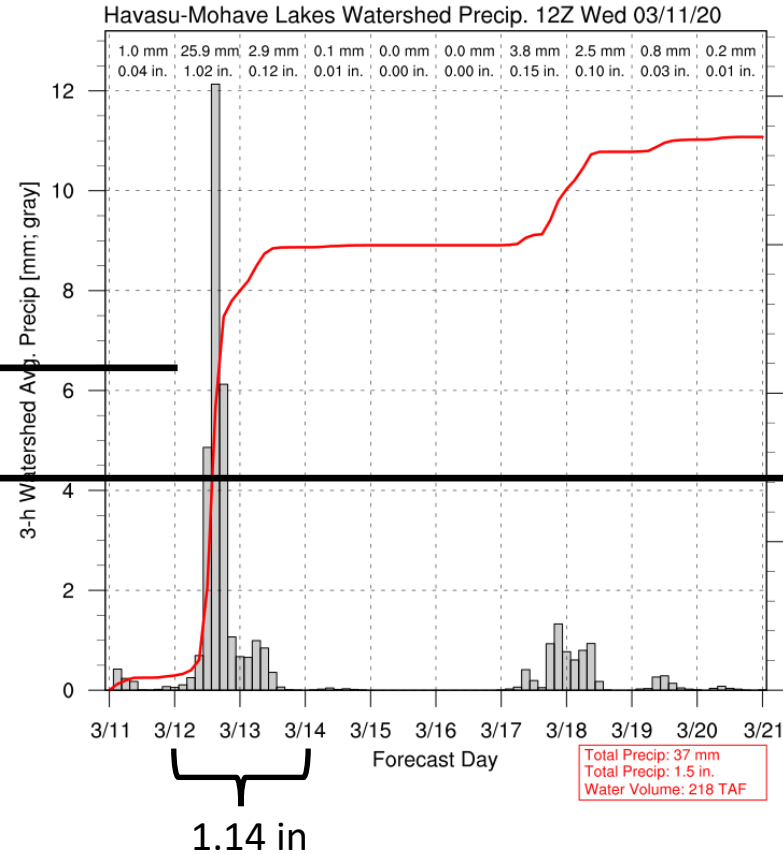
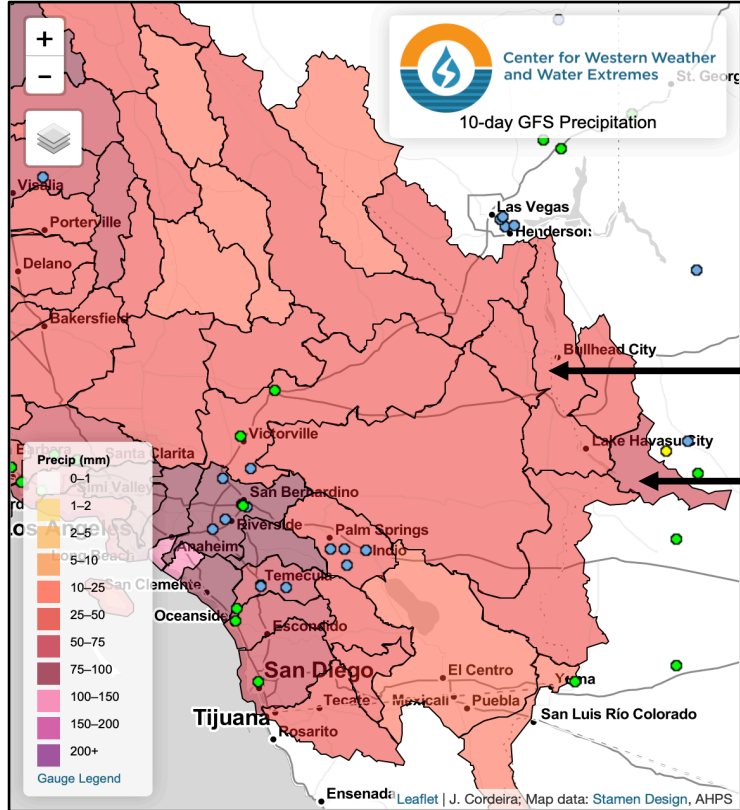
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## GFS 10-day Watershed Precipitation Forecasts



- 12Z 11 Mar GFS run is forecasting more than 1 inch of rainfall (aerial mean over the entire watershed) in the Havasu-Mohave Lakes and Bill Williams watersheds between 1200 UTC 11 Mar and 1200 UTC 13 Mar

# AR Outlook: 11 Mar 2020

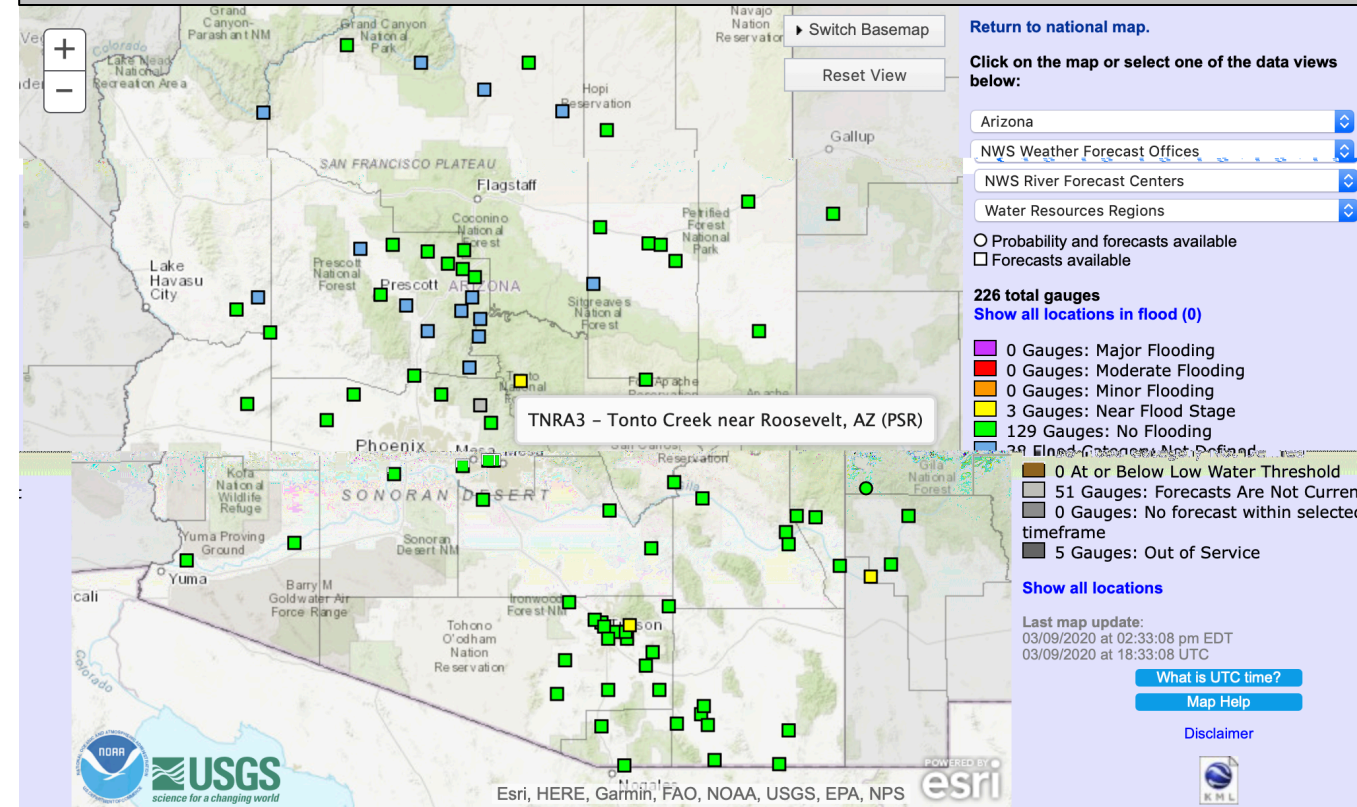
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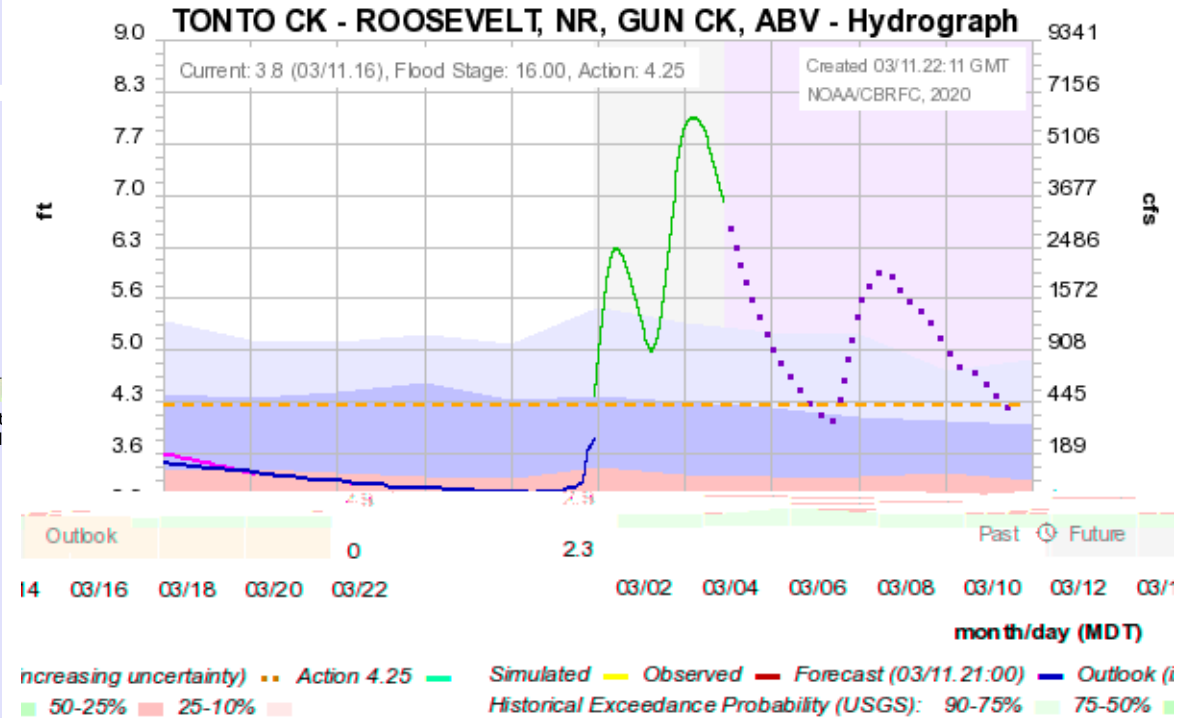
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## 6-day Maximum Forecast Flood Category



Source: NOAA/NWS Advanced Hydrologic Prediction Service, <https://water.weather.gov/ahps/>

## Colorado Basin River Forecast Center



Source: NOAA/NWS CBRFC, <https://www.cbrfc.noaa.gov>

- Heavy rainfall in west-central Arizona will lead to rising rivers and creeks over the next 48 hours
- Tonto Creek (near Roosevelt, AZ) is expected to remain several feet above action stage (4.25 ft) through the weekend
- Elevated streamflow levels may lead to localized flooding, especially in areas with low-water crossings



# AR Outlook: 11 Mar 2020

For California DWR's AR Program



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## \*Significant Changes Expected for California Over the Next 10 Days\*

- After a prolonged period of dry conditions, a series of cutoff lows are forecast to bring significant precipitation to portions of California
- The first cutoff low will bring heavy rainfall to Southern California during 12–14 Mar
- A second cutoff low is now likely to produce the first major precipitation event in the Sierra Nevada since January starting this weekend and continuing into next week

## GFS 10-day Watershed Precipitation Forecasts

