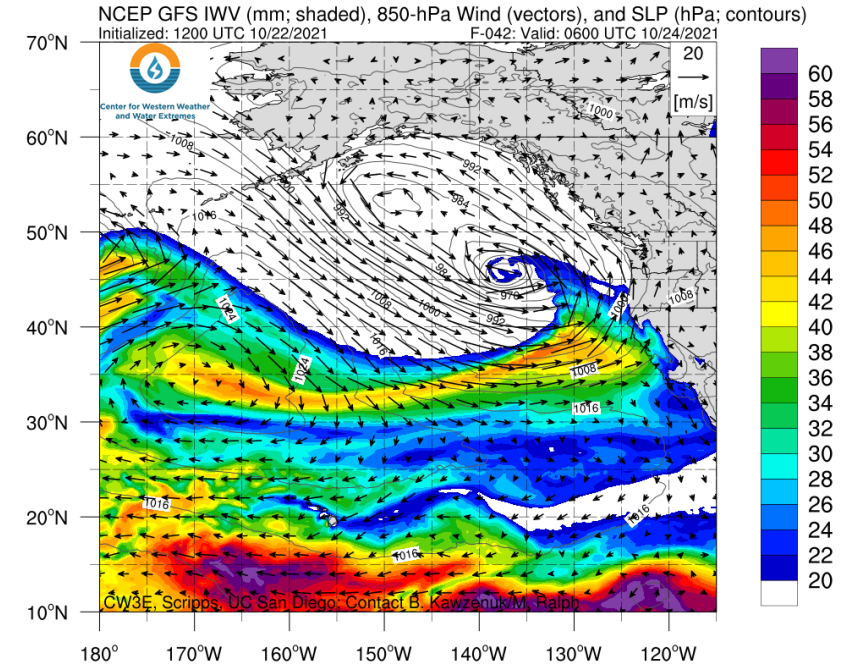
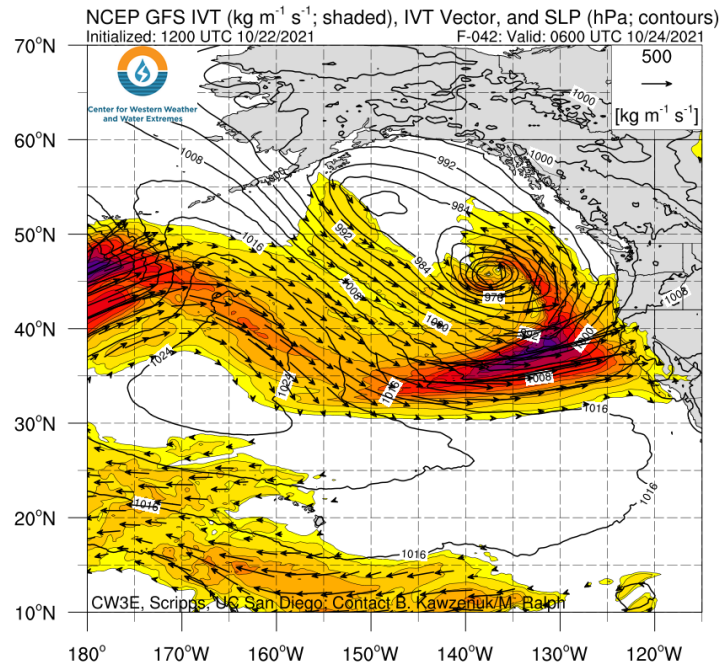


CW3E Atmospheric River Outlook

As atmospheric river conditions begin to dissipate from the current AR, focus turns to extreme AR over Weekend

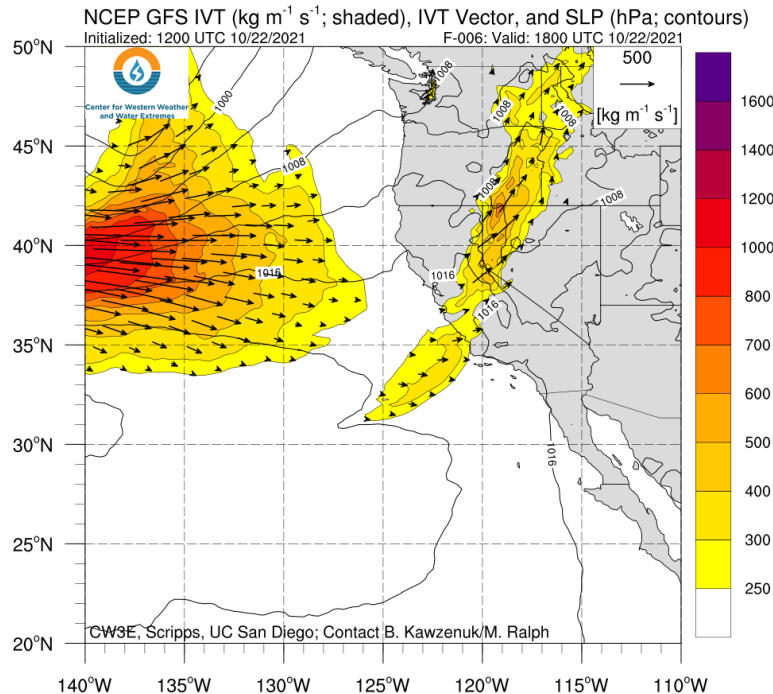
- AR conditions associated with the current AR bringing precipitation to California are forecast to end in the late morning and early afternoon
- A much stronger AR is forecast to make landfall over California Saturday night
- Models continue to forecast AR 5 conditions over the San Francisco Bay Area with AR 3 to 4 over a majority of the North and Central CA Coast
- The California-Nevada River Forecast Center (CNRFC) is forecasting as much as 13 inches of precipitation to fall across the high-elevations in the Northern Sierra
- While soils are currently dry due to extensive drought, the National Weather Service has issued numerous flash flood and flood watches due to the potential for high rain rates and post-fire debris flows



Atmospheric River Outlook: 22 October 2021

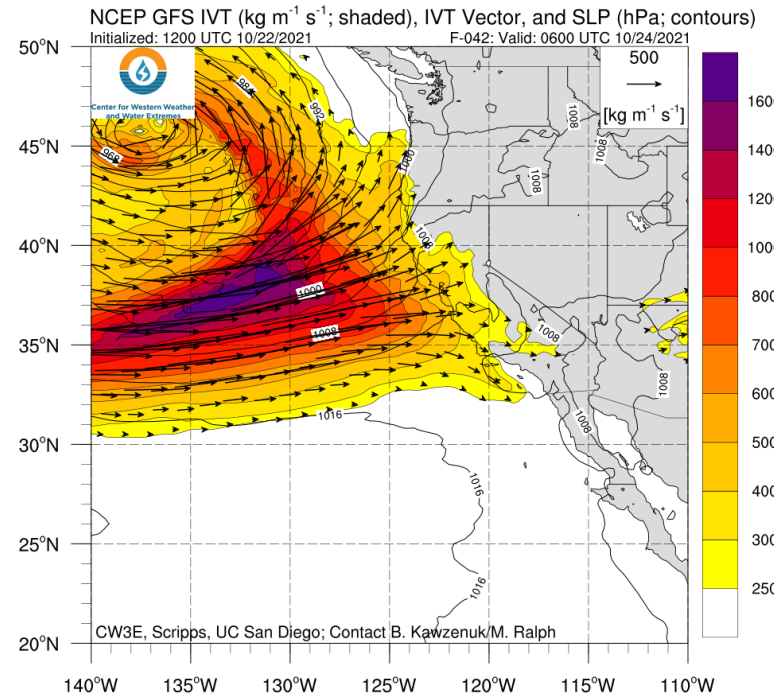
For California DWR's AR Program

Valid: 1800 UTC 22 Oct (F-6)



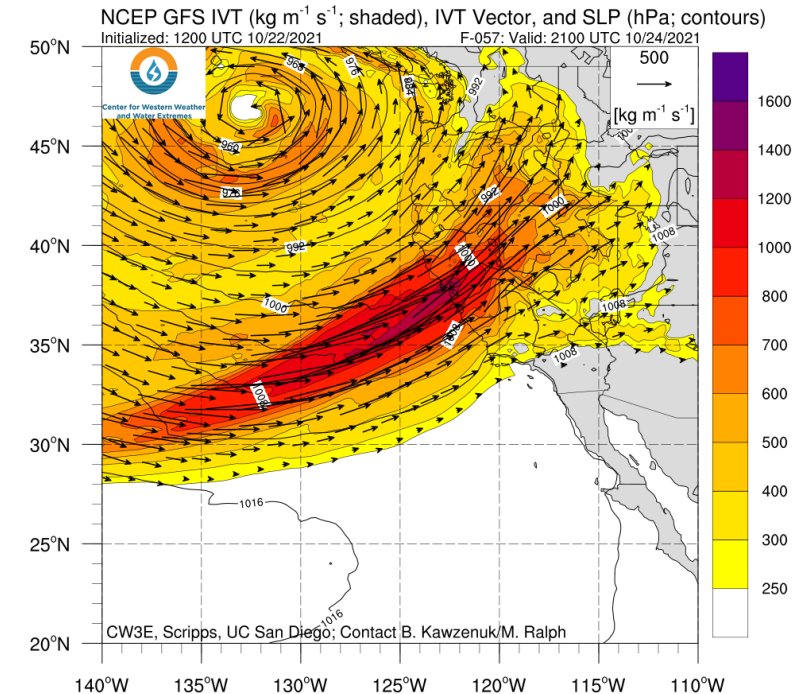
- The AR that is currently impacting California is forecast to dissipate around noon today before the AR makes it south of Point Conception

Valid: 0600 UTC 24 Oct (F-42)



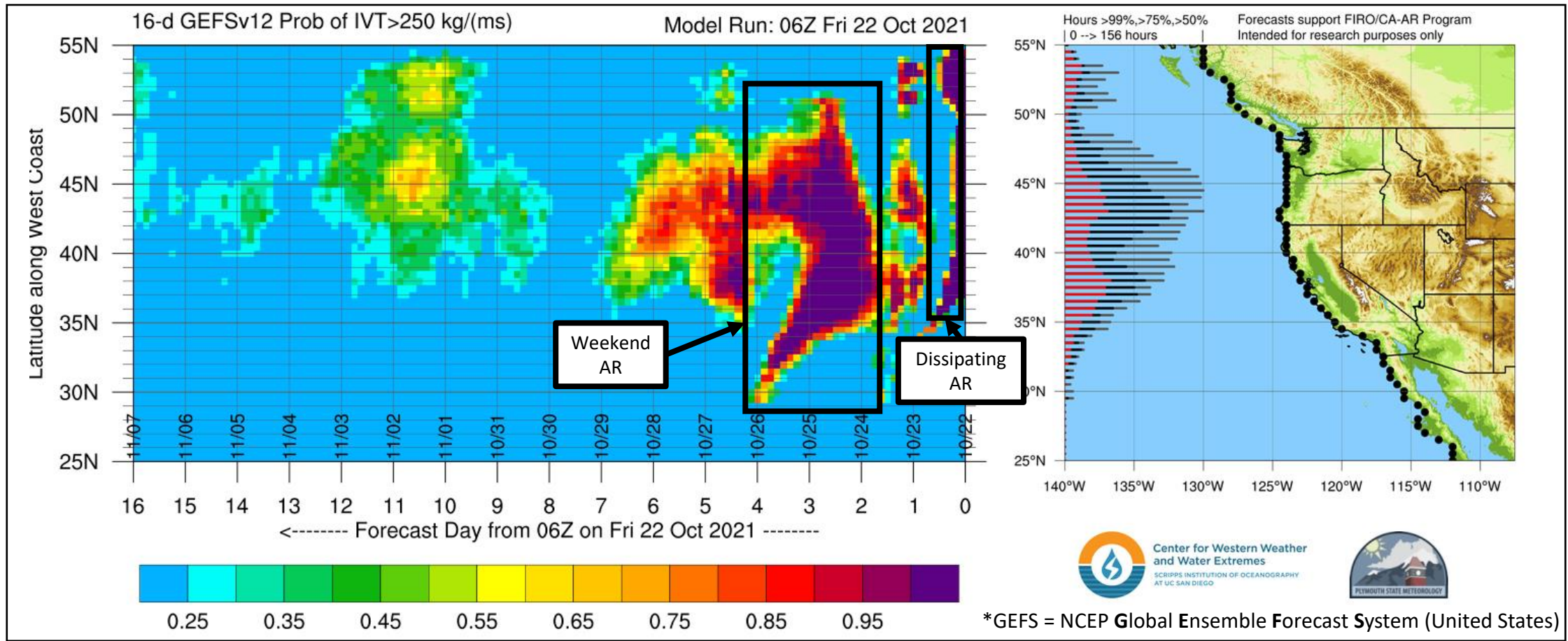
- The weekend AR, and the focus of this outlook, is forecast to make landfall at ~11 PM PT on Saturday, 23 October

Valid: 0000 UTC 25 Oct (F-57)



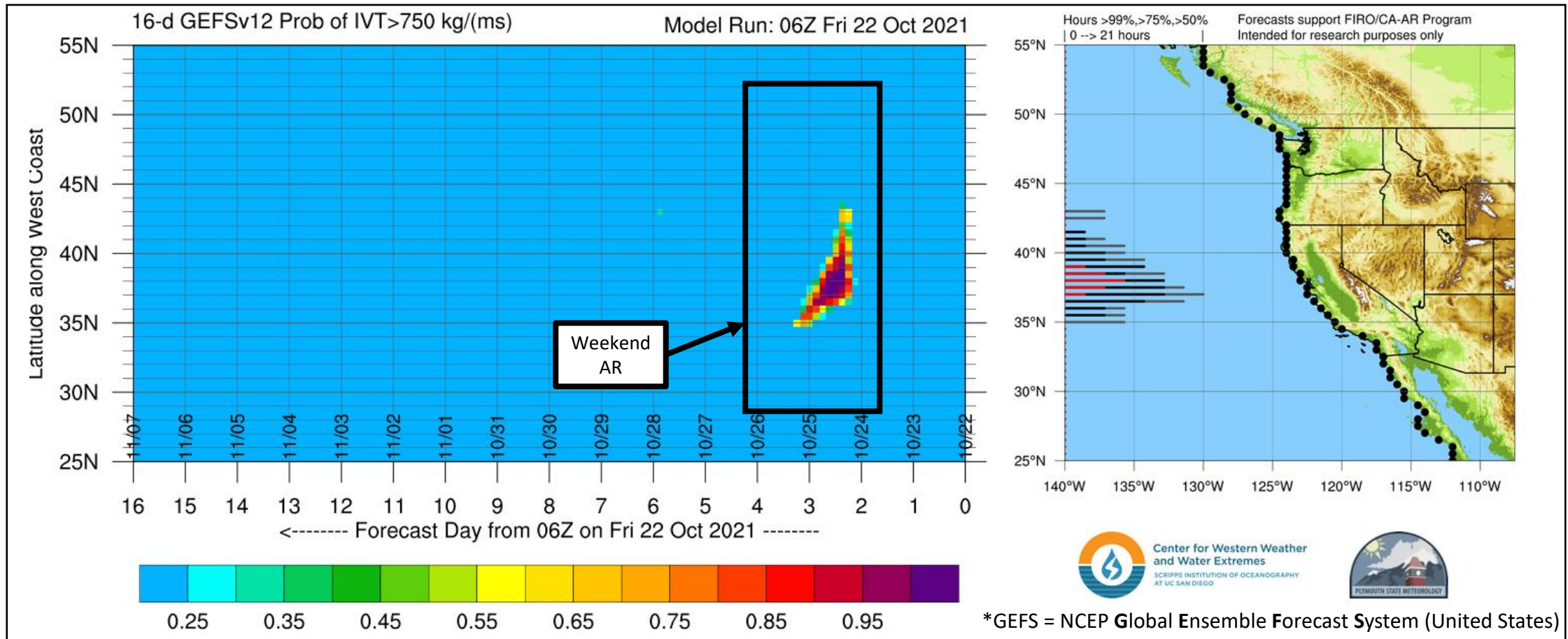
- The GFS is currently forecasting this AR to bring IVT magnitudes >1200 kg/(ms) to the San Francisco Bay Area at ~2 PM PT on Sunday 24 October

Probability of AR Conditions Along Coast



- The 06 UTC GEFS is showing high probabilities (100%) of AR conditions (IVT > 250 kg/(ms)) in association with the very strong AR over the weekend
- There is currently low ensemble agreement pertaining to the exact start and end time, as well as how quickly the AR will dissipate as it moves southward over Southern California

Probability of Strong AR Conditions Along Coast



- There is also high ensemble agreement (100%) that this AR will produce strong AR conditions (IVT > 750 kg/(ms)) for at least 6 hours from ~37N to 39N over Coastal California.
- There is some ensemble disagreement surrounding the timing and overall duration of the strong AR conditions, indicated by the lower probabilities (oranges & greens) encompassing the high probabilities (purples).

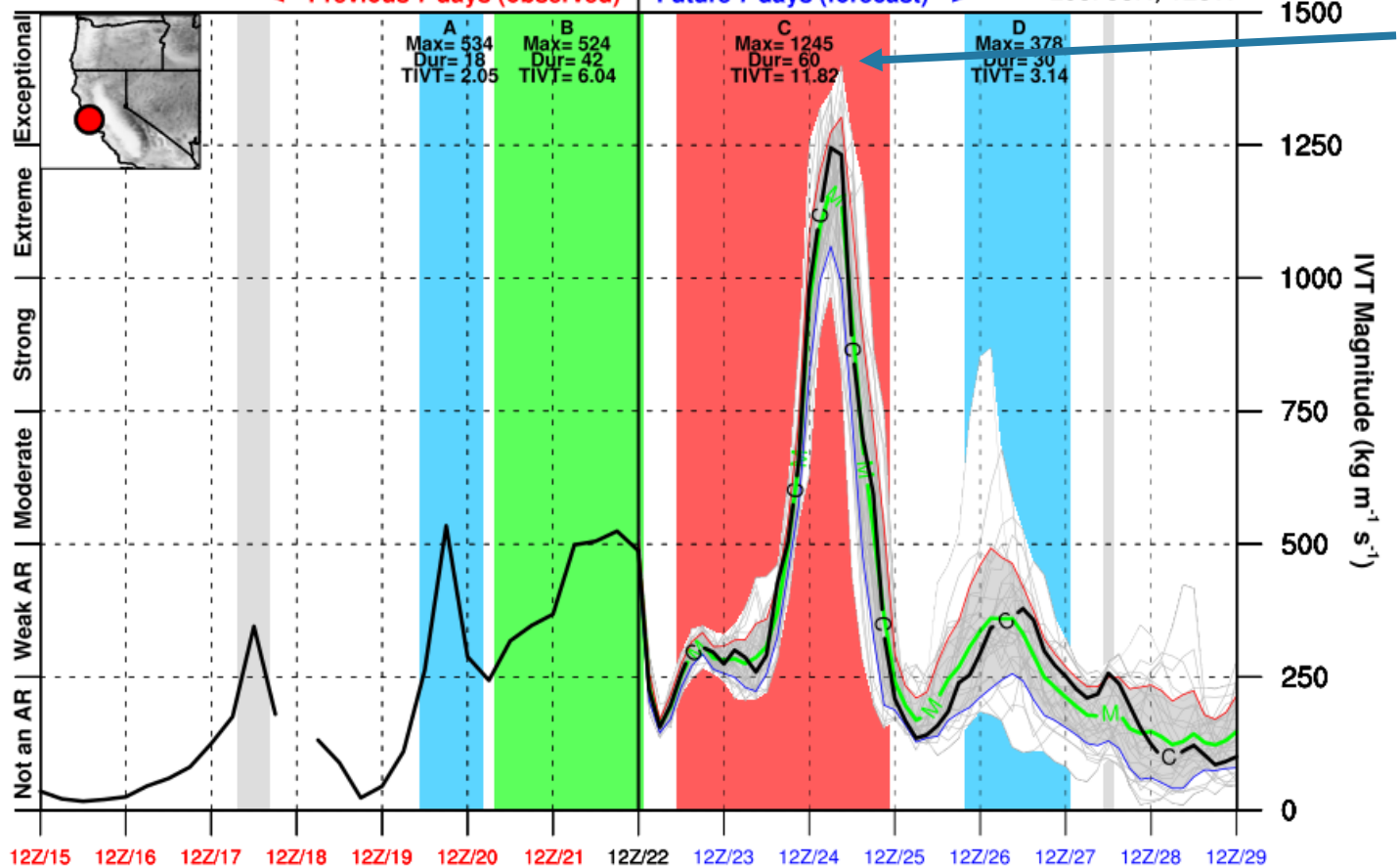
Atmospheric River Outlook: 22 October 2021

For California DWR's AR Program

GEFS AR Scale & IVT Analysis/Forecast Initialized 12Z Fri 10/22/21

<-- Previous 7 days (observed) | Future 7 days (forecast) -->

Loc: 38N, 123W



Analysis and Forecast Time Centered on 12Z Fri 10/22/21

— Ensemble Control (C) — Ensemble Mean (M) — Ensemble +1 Std. Dev.
 ... Ensemble Members ... Ensemble -1 Std. Dev.

AR 1 (blue) AR 2 (green) AR 3 (yellow) AR 4 (orange) AR 5 (red)

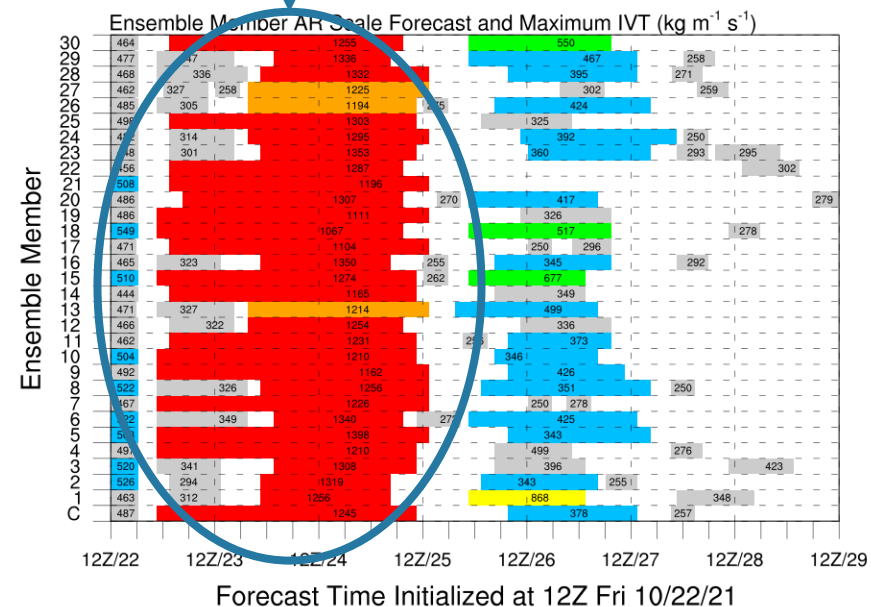


Image created: 16 UTC 10/22/2021

More information: <http://cw3e.ucsd.edu> AR Scale based on Ralph et al. (2019; BAMS), contact M. Ralph

The GEFS control member is predicting a maximum IVT of 1245 kg/(ms) and a total duration of AR conditions of 60 hours over the San Francisco Bay Area, resulting in AR 5 conditions on the AR Scale

28 of the 31 GEFS ensembles are predicting AR 5 conditions over the Bay Area, the other 3 are predicting AR 4



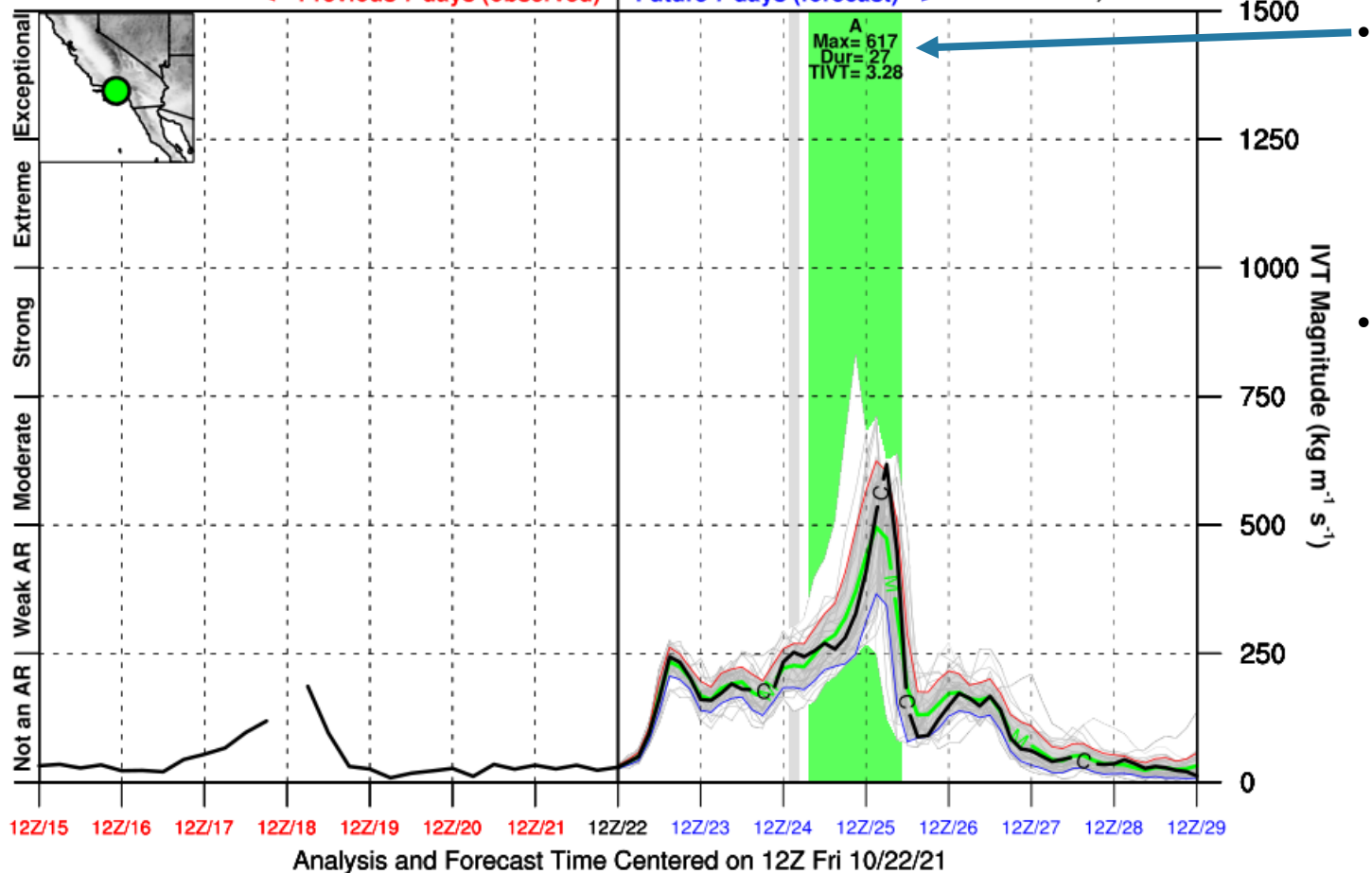
Atmospheric River Outlook: 22 October 2021

For California DWR's AR Program

GEFS AR Scale & IVT Analysis/Forecast Initialized 12Z Fri 10/22/21

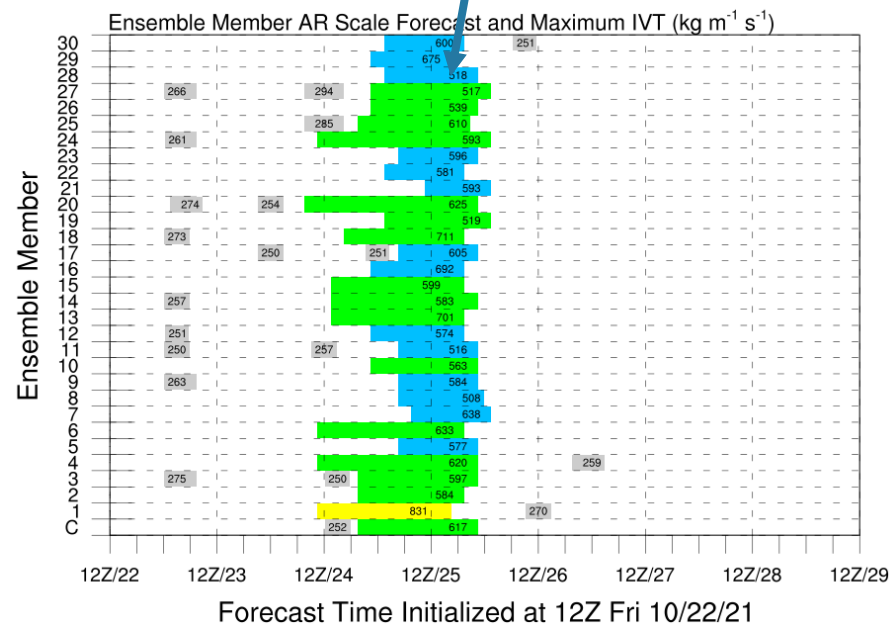
<-- Previous 7 days (observed) | Future 7 days (forecast) -->

Loc: 34N, 118.5W



The GEFS control member is predicting the AR will weaken substantially while moving down the CA Coast before bring maximum IVT magnitudes of 617 kg/(ms) and AR 2 conditions to the Los Angeles Coast

There is currently more ensemble spread in association with AR Scale forecasts over the LA coast, with 14 ensemble members predicting AR 1, 16 AR 2, and 1 AR 3 conditions



— Ensemble Control (C) — Ensemble Mean (M) — Ensemble +1 Std. Dev.
 — Ensemble Members — Ensemble -1 Std. Dev.

■ AR 1 ■ AR 2 ■ AR 3 ■ AR 4 ■ AR 5

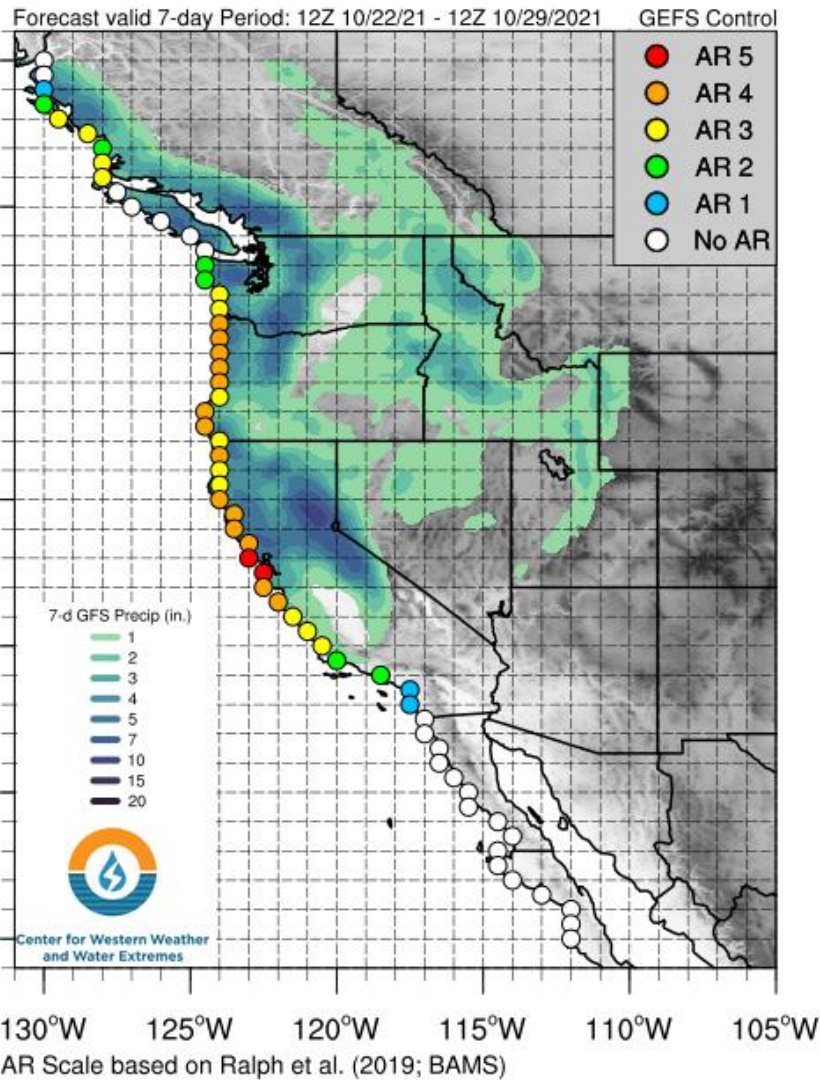
Image created: 16 UTC 10/22/2021

More information: <http://cw3e.ucsd.edu> AR Scale based on Ralph et al. (2019; BAMS), contact M. Ralph

Atmospheric River Outlook: 22 October 2021

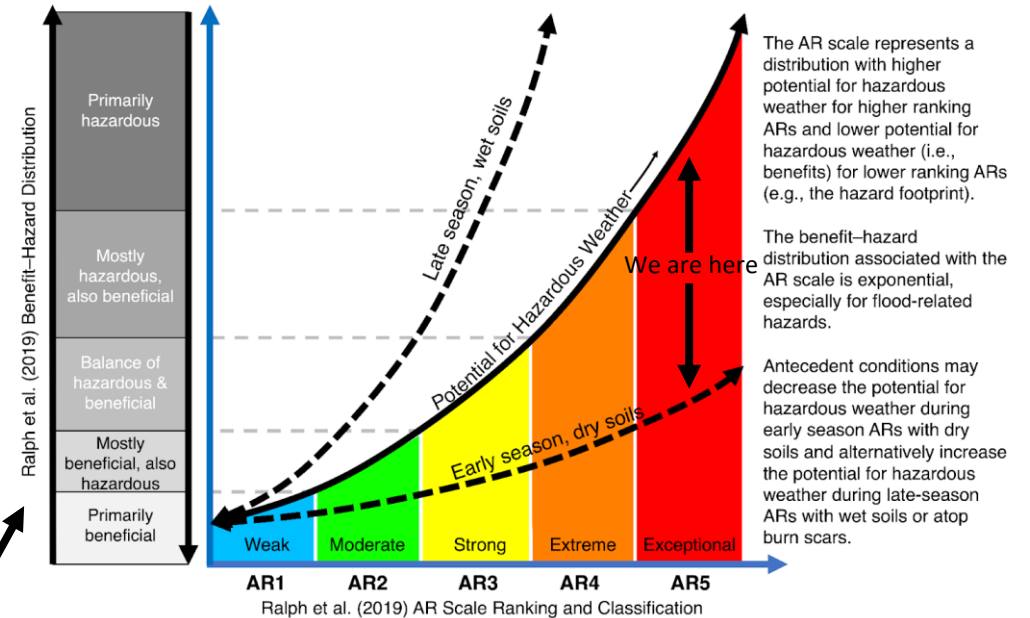
For California DWR's AR Program

Maximum Forecast AR Scale



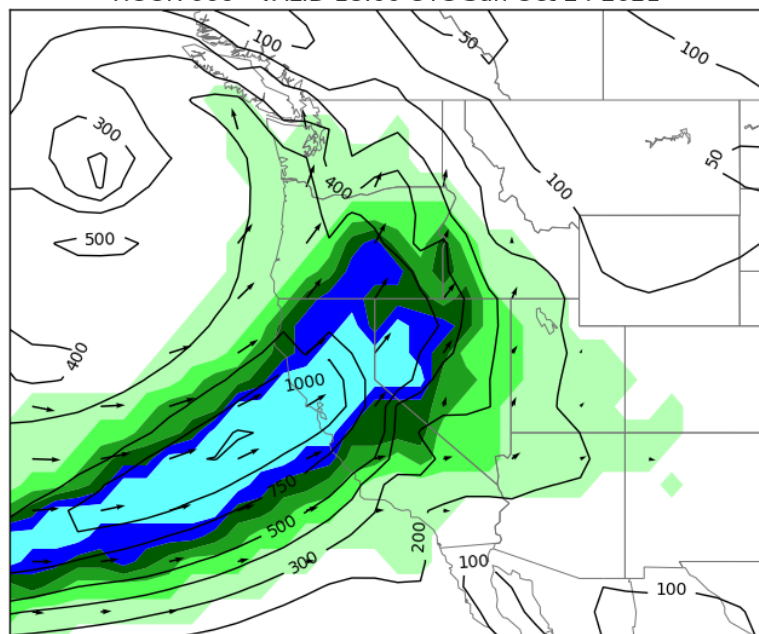
- The GEFS control is forecasting AR 5 conditions for 37.5 and 38N over the Bay Area
- A majority of the other Coastal locations on the Northern and Central California Coast are forecast to experience AR 3 to 4 conditions
- While AR 5 conditions tend to be more hazardous than beneficial, the extremely dry conditions that California has been experience will result in this AR being both hazardous (primarily due to the threat of debris flows in and near burn scars) and beneficial

Atmospheric River Scale: Benefit–Hazard Distribution

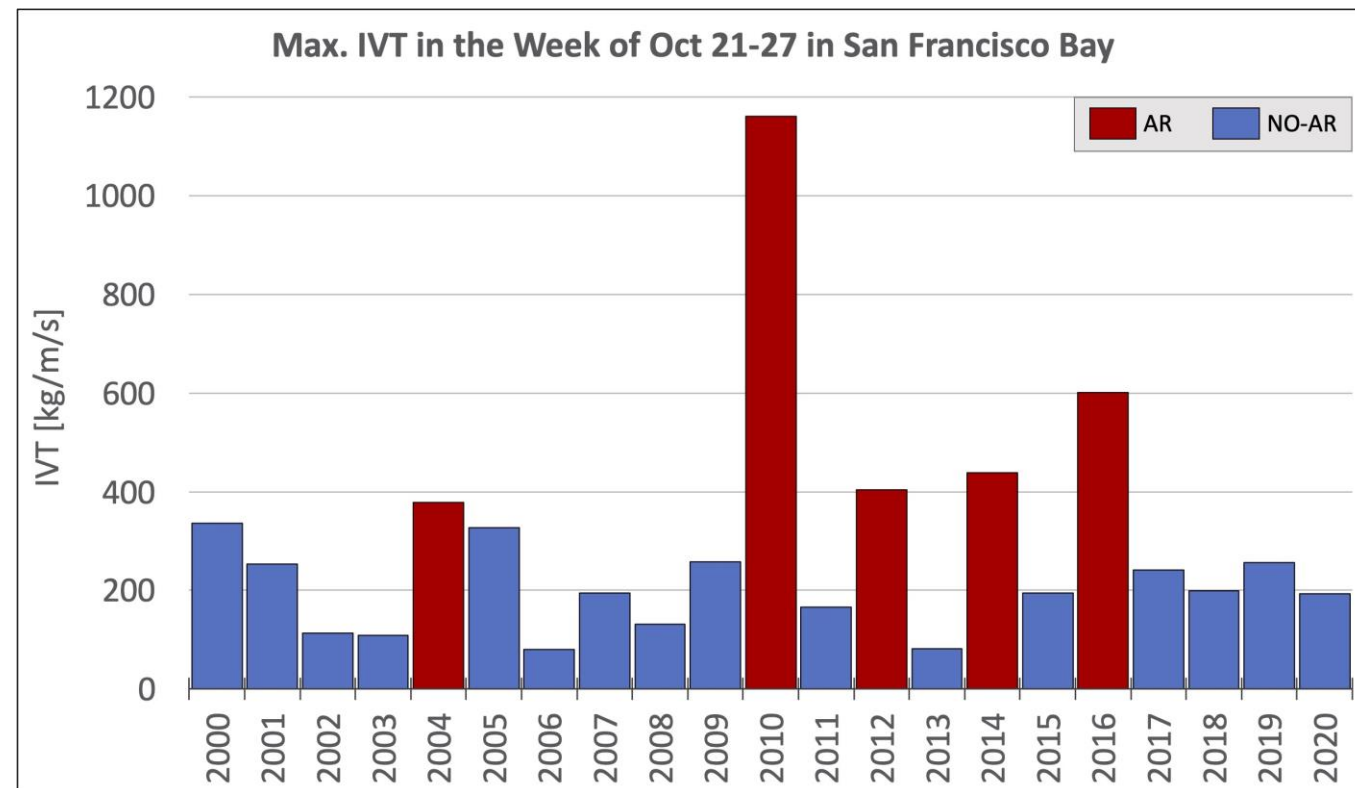
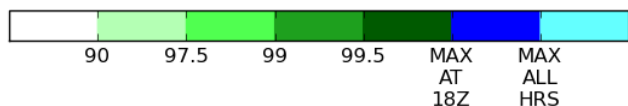


How rare are these IVT magnitudes?

NAEFS Mean Integrated WV Transport ($\text{kg m}^{-1} \text{ s}^{-1}$) and Climatological Percentile
 HOUR 066 - VALID 18:00 UTC Sun Oct 24 2021



Relative to the 14-Oct to 04-Nov 1979-2009 CFSR climatology

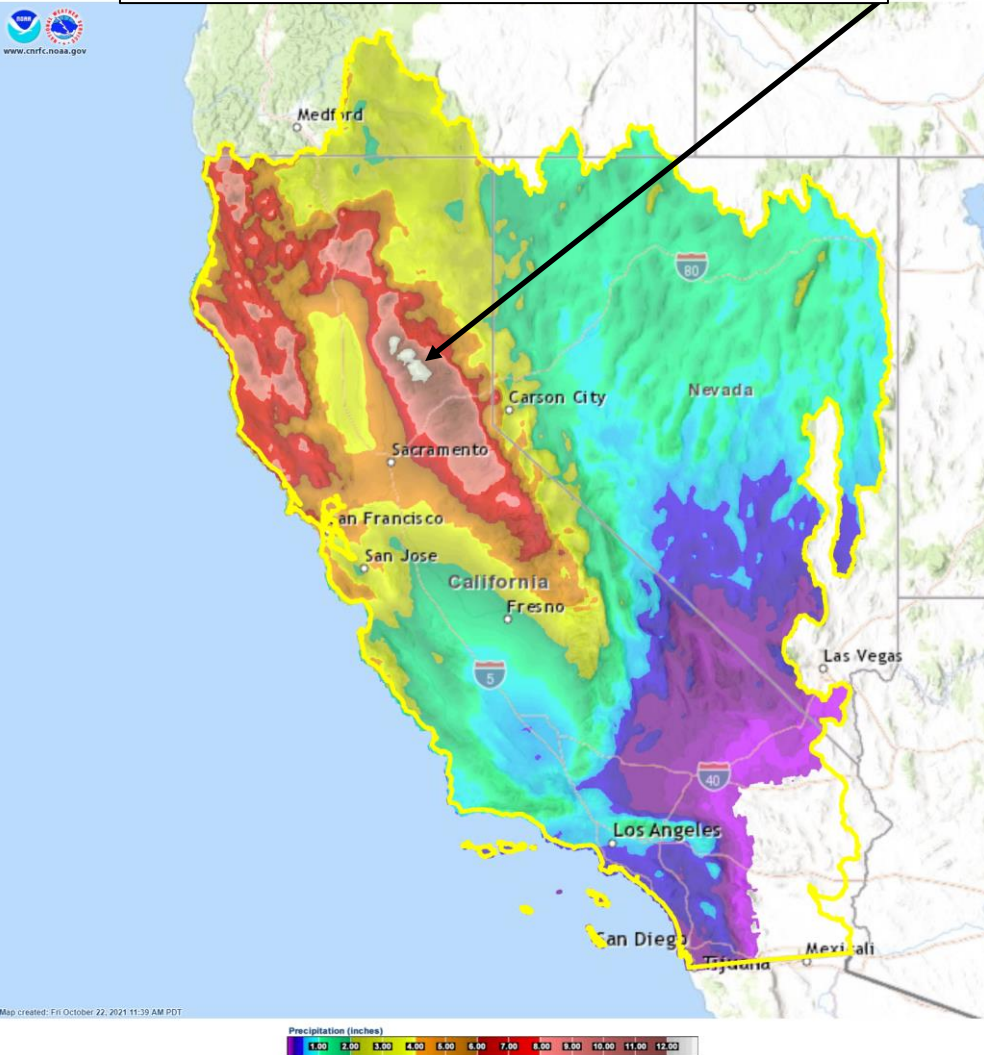


- An ensemble mean IVT magnitude $>1000 \text{ kg/ms}$ in October is the highest magnitude in reanalysis and reforecast datasets for a large swath over the Eastern Pacific (NWS Situational Awareness)

- The last time the San Francisco Bay Area experienced IVT $>1000 \text{ kg/(ms)}$ during the week of October 21 to 27 was in 2010 where an AR brought maximum IVT magnitudes of $\sim 1150 \text{ kg/ms}$, according to CFSR data. Max IVT $>1200 \text{ kg/ms}$ are currently forecast by GEFS.

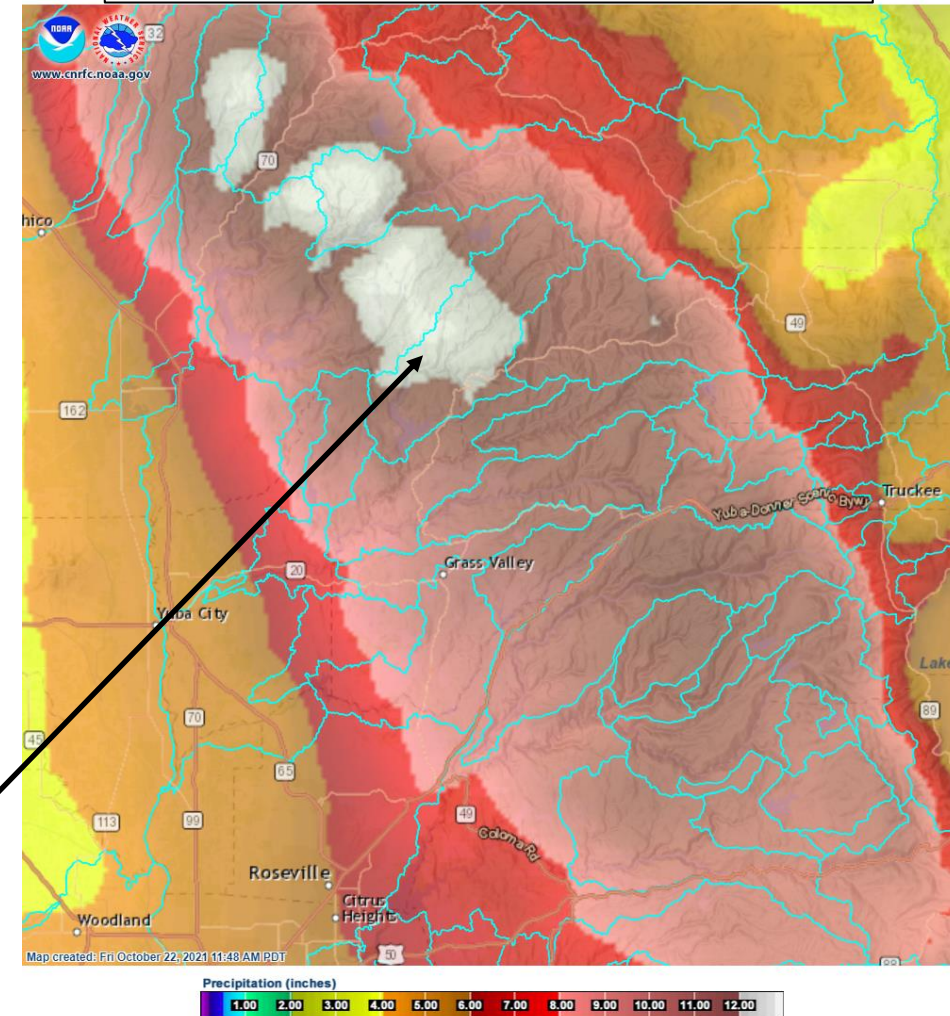
Atmospheric River Outlook: 22 October 2021

CNRFC 6-Day Precipitation Forecast
Fri Oct 22 05 AM PDT to Thu Oct 28 05 AM



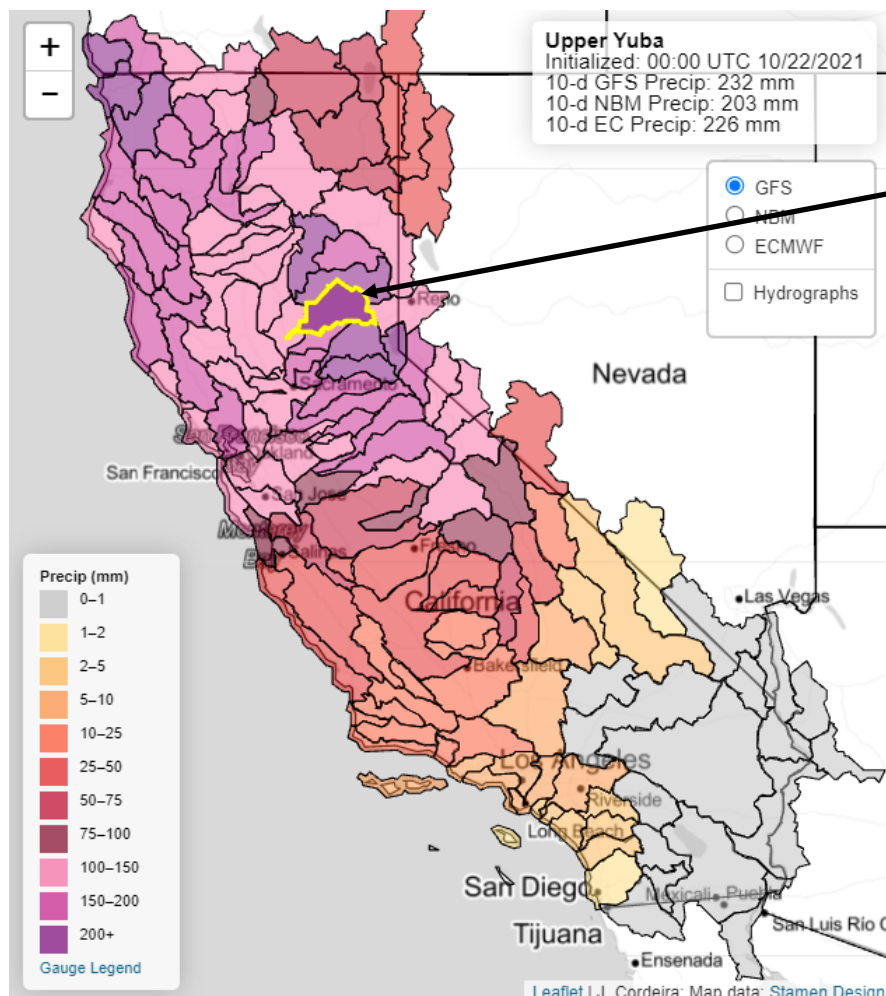
- The CNRFC is currently forecasting the most precipitation (>12 inches) to fall over the high elevations of the Northern Sierra during the next 6 days.
- Locations in the Coastal Mountains could see as much as 10 in.
- Other lower-elevation locations, like the Sacramento river valley could receive 3–5 in.
- The CNRFC is forecasting the Yuba River Watershed to receive 7–10 in. over the foothills and as much as 13 in. in the North Fork subbasin

CNRFC 6-Day Precipitation Forecast
Fri Oct 22 05 AM PDT to Thu Oct 28 05 AM

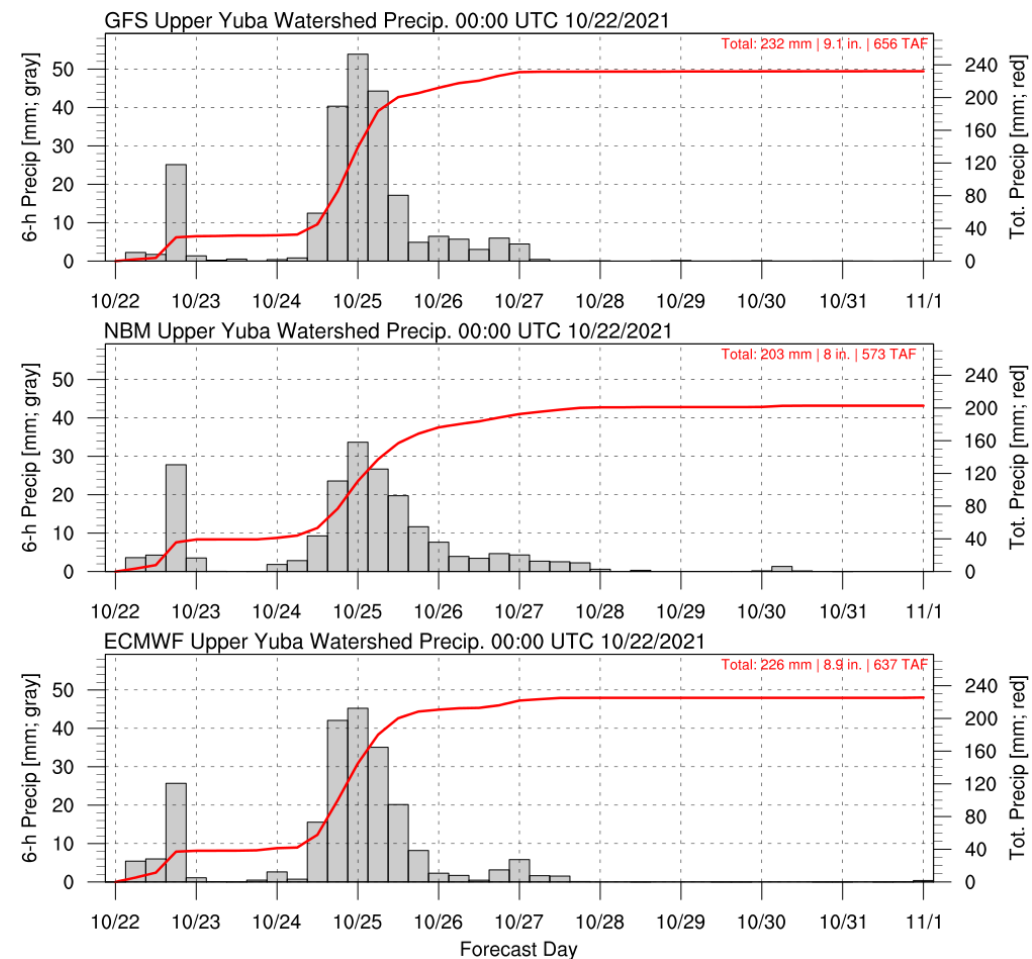


Atmospheric River Outlook: 22 October 2021

For California DWR's AR Program

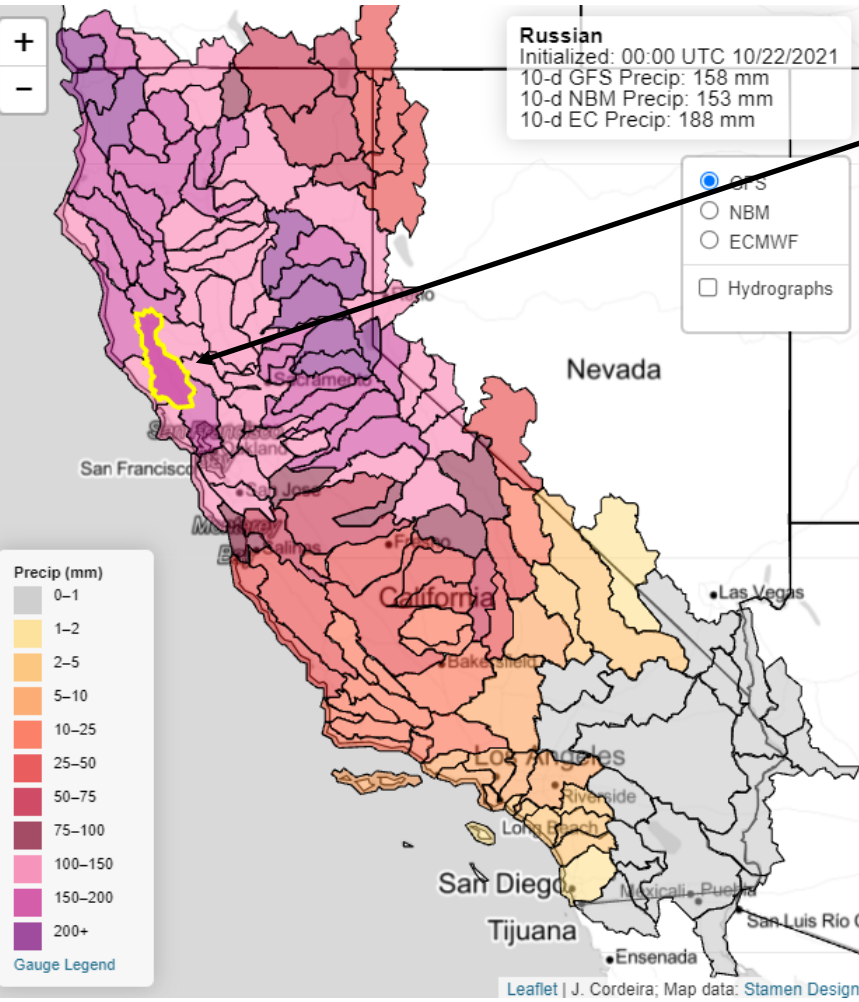


- The Upper Yuba Watershed in Northern California is forecast to receive 9.1 and 8.9 inches of watershed average precipitation over the next 10 days by the GFS and ECMWF, respectively
- Watershed average precipitation accumulations of 9.1 inches and 8.9 inches is ~656 and 637 thousand acrefeet of water, though a large portion of that water will likely be absorbed by the very dry soils in the watershed



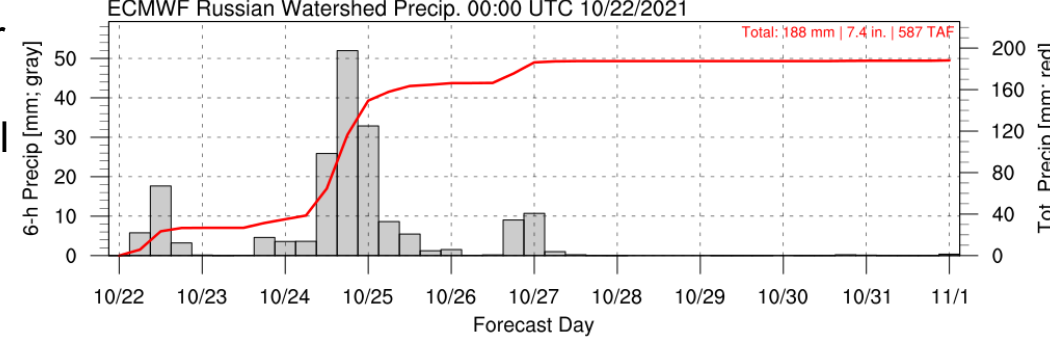
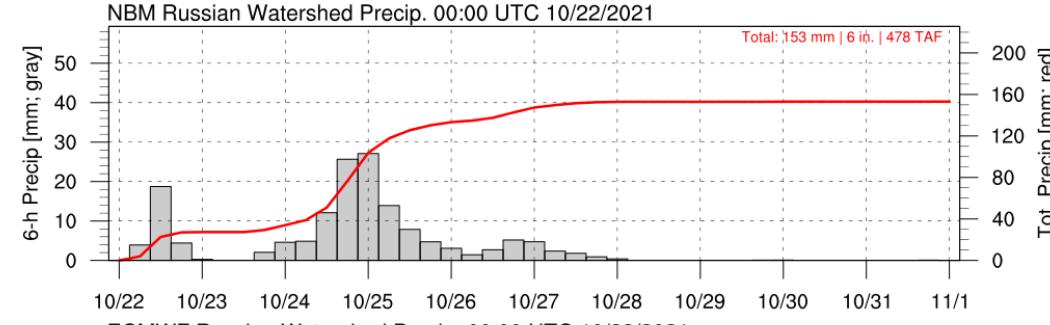
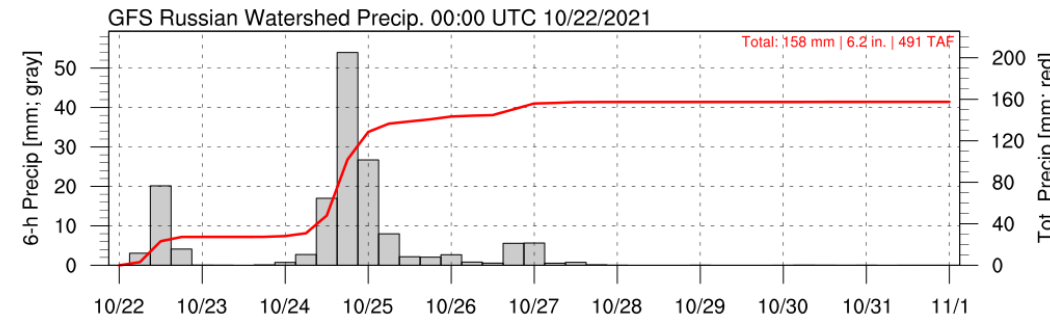
Atmospheric River Outlook: 22 October 2021

For California DWR's AR Program



- The Russian River watershed in Sonoma and Mendocino Counties is forecast to receive 6.2 and 7.4 inches of watershed average precipitation by the GFS and ECMWF, respectively

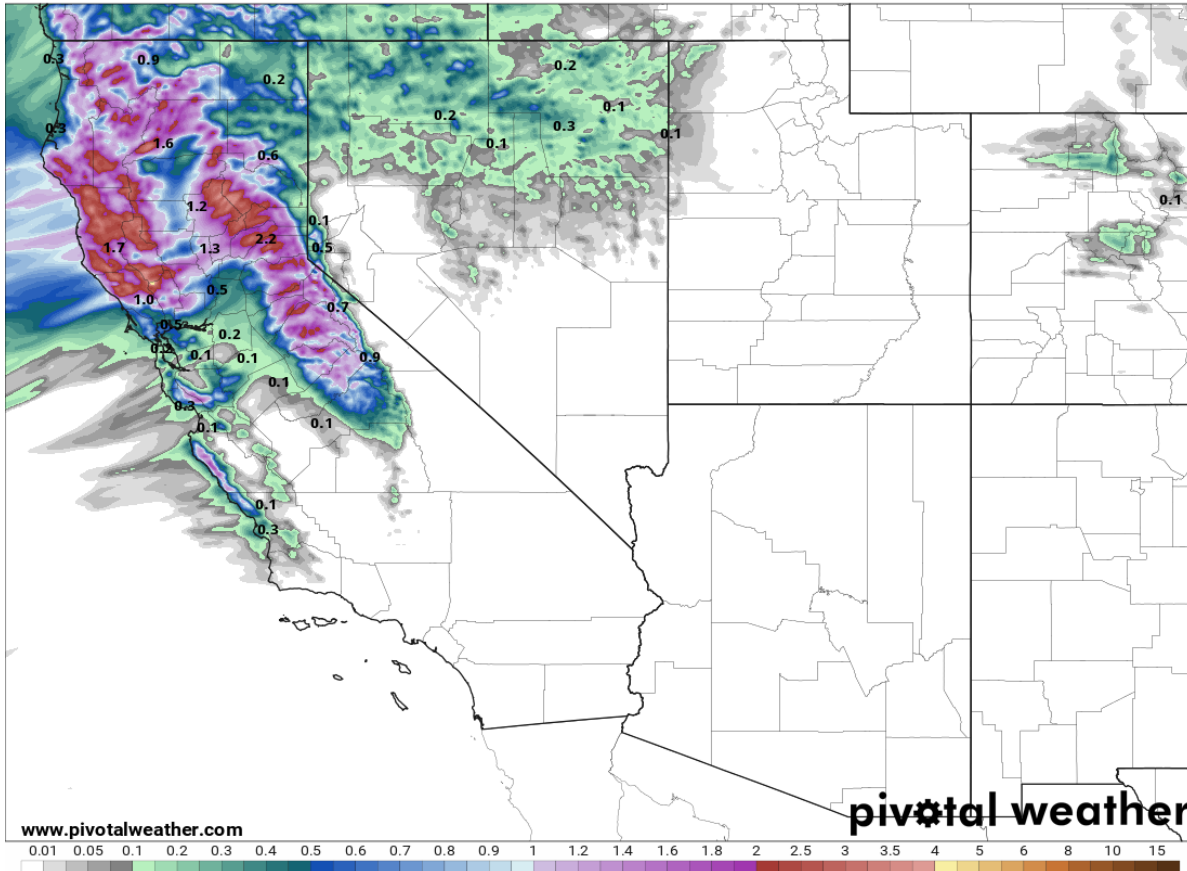
- Lake Mendocino, on the East Fork of the Russian, is currently at 22.9% of capacity, so any inflow into the reservoir will help increase the low water supply that has been impacted by the ongoing and exceptional drought



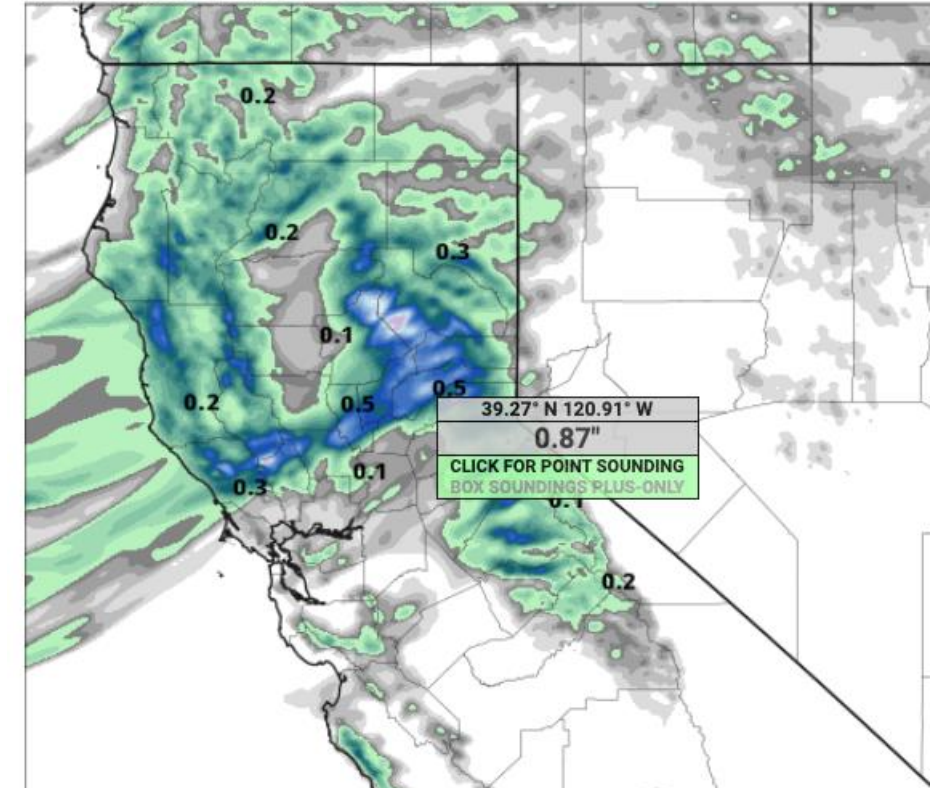
Atmospheric River Outlook: 22 October 2021

6-hr Accumulated QPF (in)
F048 Valid: Sun 2021-10-24 18z

Init: Fri 2021-10-22 18z HRRR



1-hr Accumulated QPF (in)
F048 Valid: Sun 2021-10-24 18z

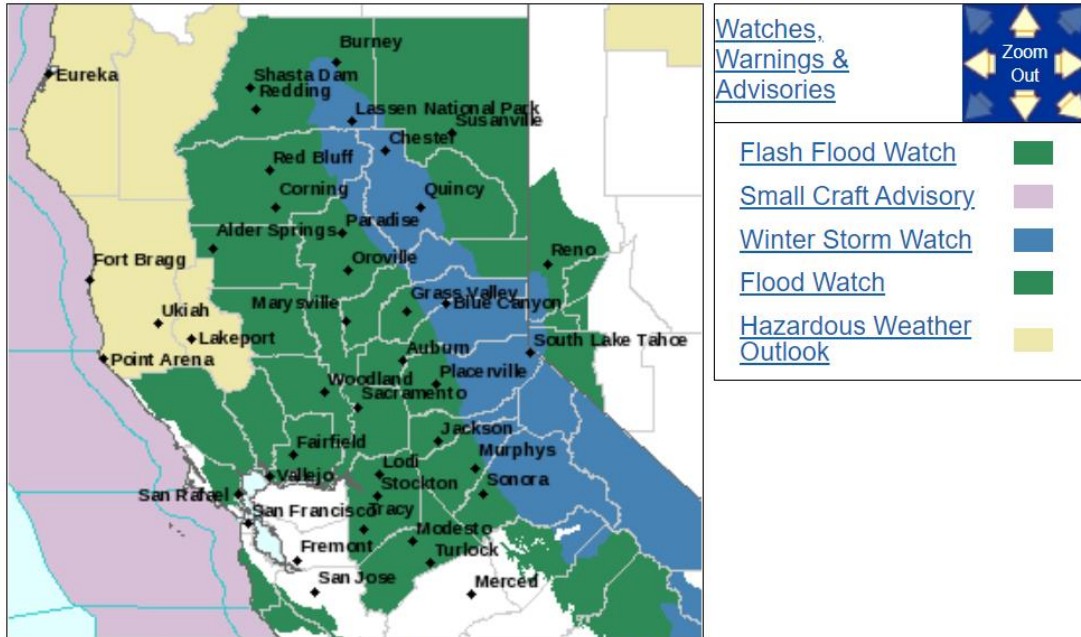


*HRRR = High-Resolution Rapid Refresh Model

- Mesoscale NWP guidance is in good agreement with medium-range models on the timing and intensity of rainfall for Sunday morning over Yuba City Watershed
- Rain begins midnight Saturday night, becoming heavy by morning, with 2-4 inches likely by 12 pm Sunday along the western slopes of the Sierra Nevada
- Intense rainfall rates of an inch or more per hour could occur between 10 am and 6 pm Sunday
- HRRR ensemble mean total rainfall is approximately 9 inches between midnight Saturday and midnight Sunday

Atmospheric River Outlook: 22 October 2021

Click a location below for detailed forecast.



Last Map Update: Fri, Oct. 22, 2021 at 11:58:49 am PDT

- The National Weather Service Forecast Office's across Northern California have issued numerous Flash Flood, Winter Storm, and Flood Watches
- *Visit [weather.gov](https://www.weather.gov) for point specific forecasts, watches, and warnings as the event continues to evolve*

Winter Storm Watch

Valid 11 PM Sunday October 24th - 5 AM Tuesday October 26th, 2021

⚠ Impacts

- Significant reductions in visibilities at times
- Difficult to impossible driving conditions
- Chain controls possible
- Mountain passes above 6000 feet

🕒 Timing

- Sunday night – early Tuesday morning

❄ Forecast

- 8-24 inches of snow, with localized amounts up to 3 feet

WNS Sacramento

Issued: October 21, 2021

- While freezing levels are forecast to be relatively high throughout the event (>8000 feet before dropping to ~5000 feet towards the end of the event), locations along the Sierra Crest are forecast by the NWS to receive 8–24 inches of snow with localized amounts up to 3 feet