

# CW3E Atmospheric River Outlook: 28 Feb 2024

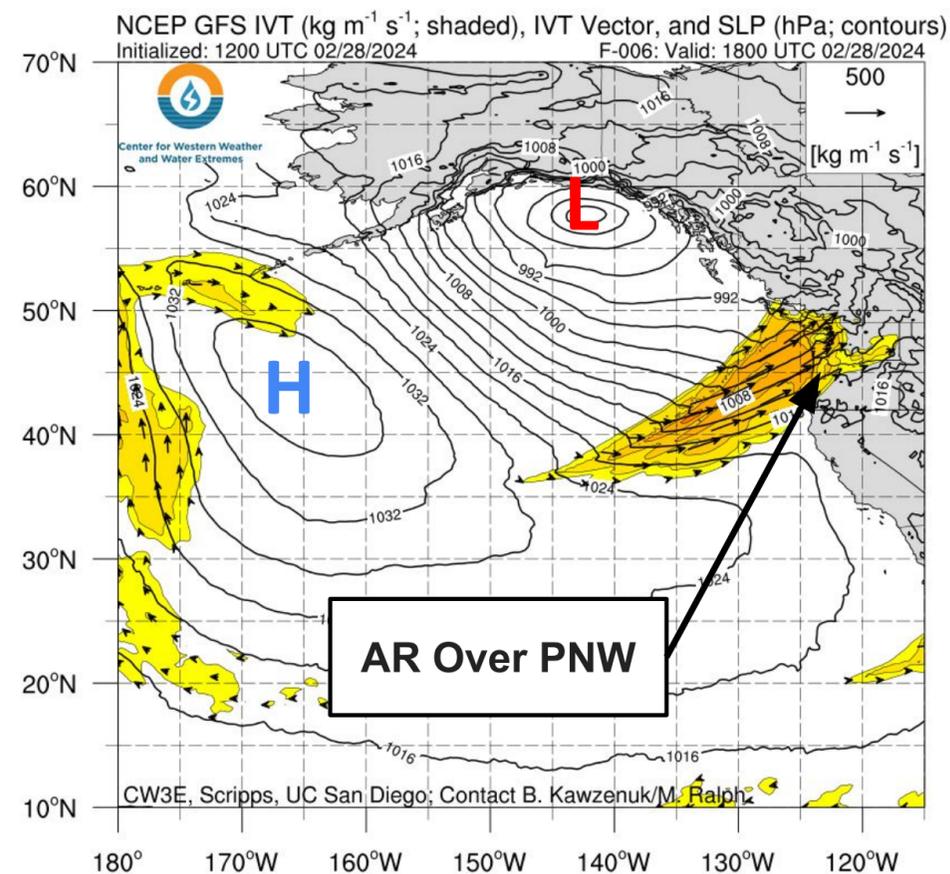
## AR and Low Pressure-System to Produce Heavy Rain and Snow over USWC

- An atmospheric river (AR) and low-pressure system will bring widespread precipitation to the US West Coast over the next several days, including very heavy snowfall in the Sierra Nevada.
- The AR has made landfall over the PNW and is forecast to move down the USWC through Fri 1 Mar.
- Behind this AR, the associated low pressure system and a mid-level trough will help continue this precipitation event over CA through Sun 3 Mar.
- There is potential for a pulse of IVT from the central Pacific to reach the USWC and extend AR conditions and precipitation duration over northern and central CA.
- The NWS Weather Prediction Center (WPC) is forecasting significant precipitation over the next 5 days along the WA through N. CA coasts and over the Cascades and Sierra Nevada.
- The National Blend of Models (NBM) is showing very high probabilities (>90%) of snowfall exceeding 48 inches for portions of the Sierra Nevada, with accumulations forecast to potentially exceed 80 inches.
- West-WRF Ensemble meteograms are also showing very high probabilities of significant snowfall (totals > 48 inches) in the Sierra Nevada.
- The WPC Excessive Rainfall Outlooks include a Marginal Risk (level 1 of 4, or at least 5% chance) for flooding for the WA/OR/N. CA/S. CA coasts and the Sierra Nevada foothills with the the AR as it moves down the coast.
- Stay alert to official NWS forecasts, watches, and warnings at [weather.gov](https://www.weather.gov) and follow guidance from local emergency management officials.

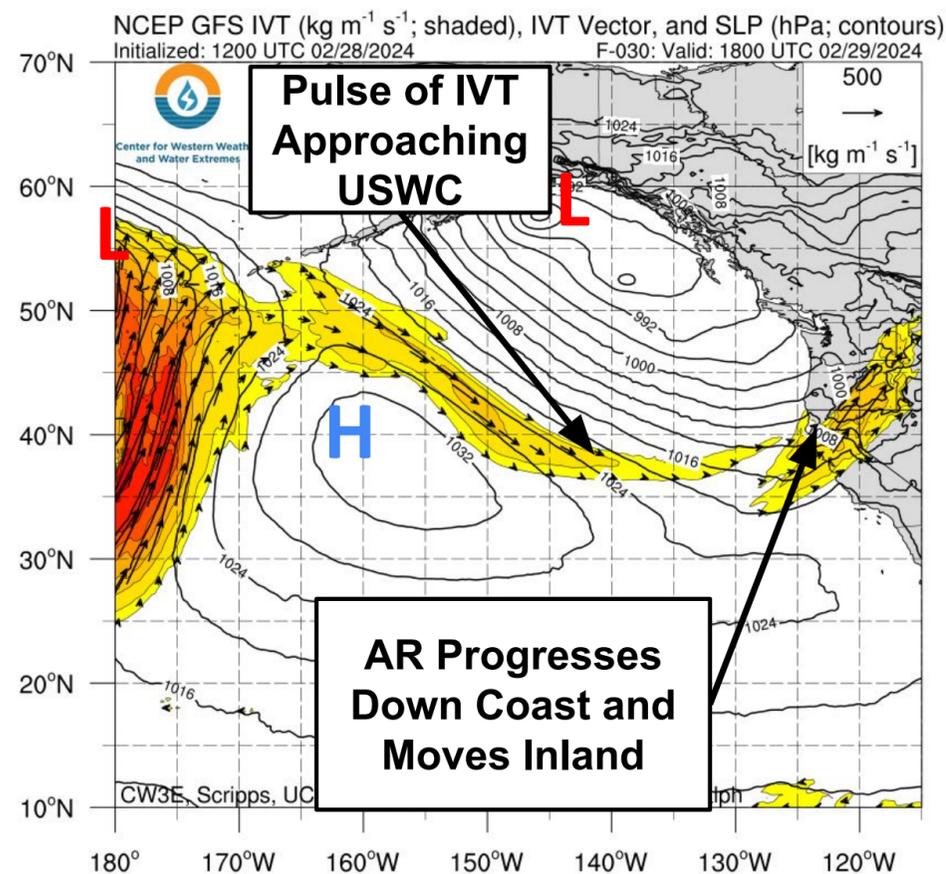
# CW3E AR Outlook: 28 Feb 2024

GFS Initialized: 12Z Wed 28 Feb 2024

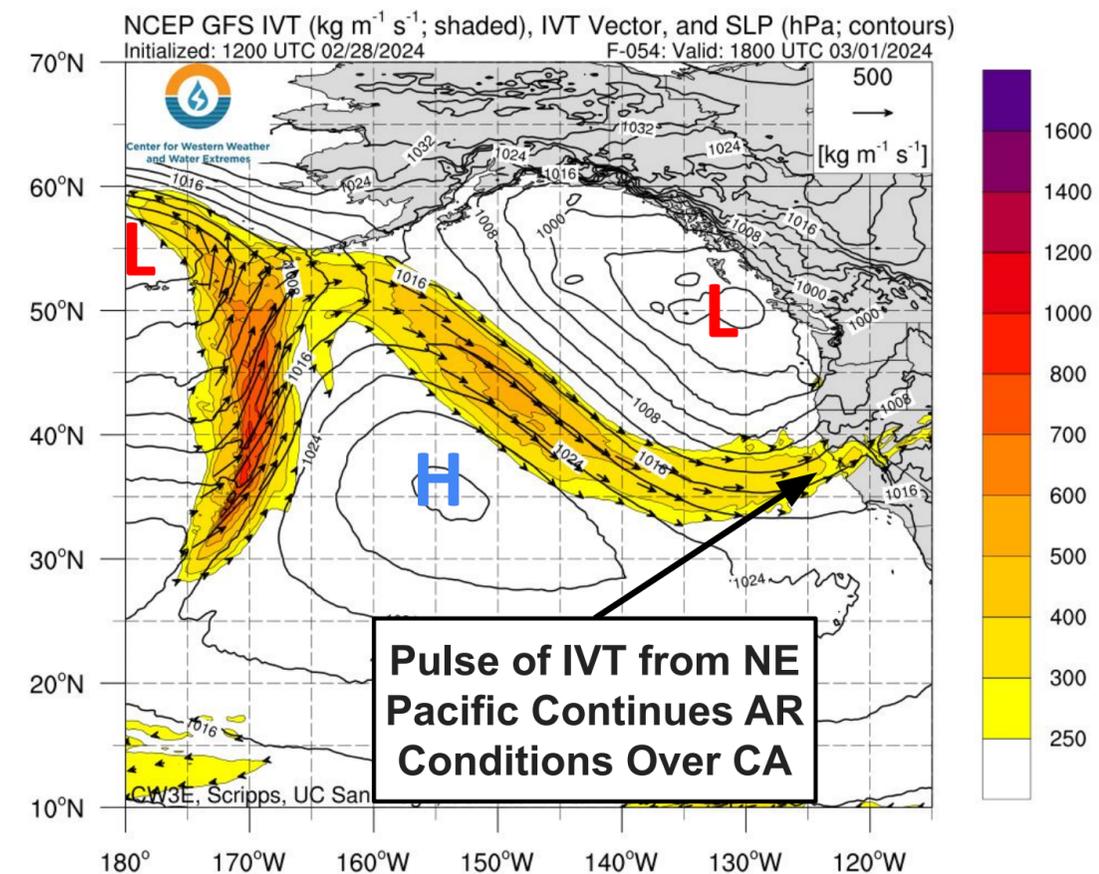
10AM PT Wed 28 Feb 2024



10AM PT Thu 29 Feb 2024



10AM PT Fri 1 Mar 2024



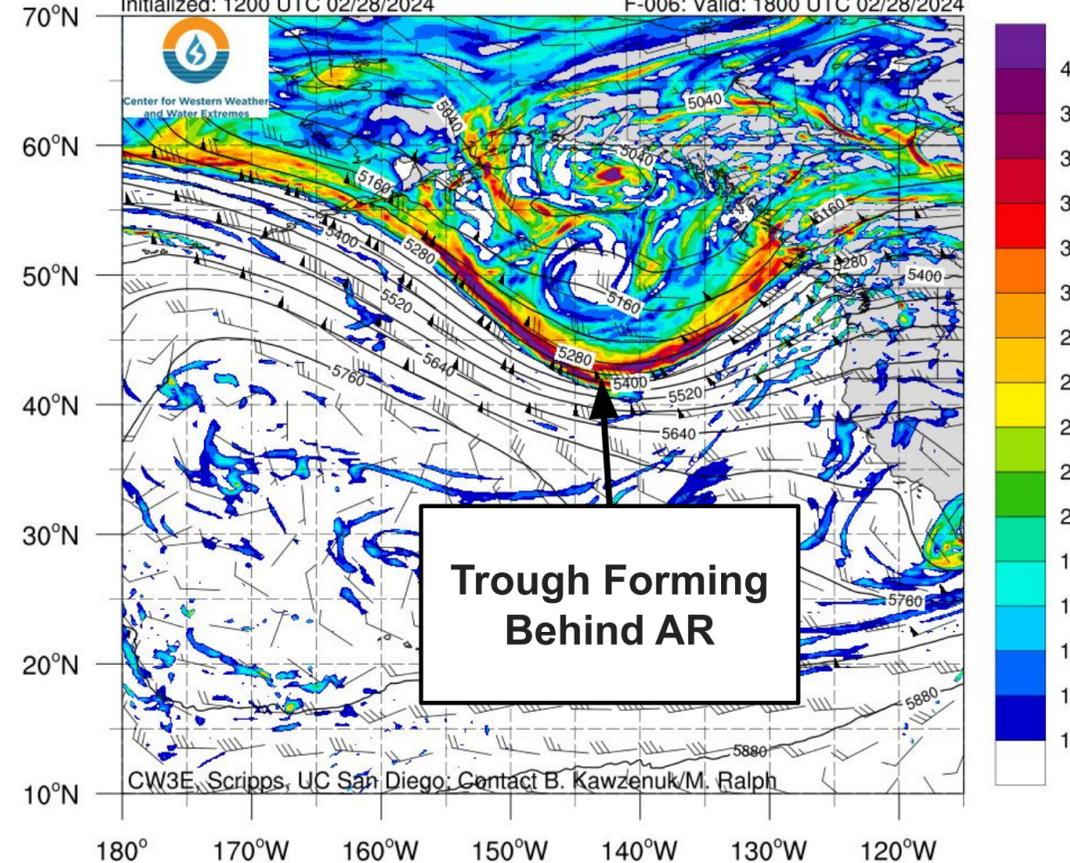
- The AR has made landfall over the PNW and will progress down the US west coast through Thu 29 Feb, fueling a major precipitation event for the western US.
- A pulse of IVT from the central Pacific extends toward the USWC Thu 29 Feb before reaching the USWC Fri 1 Mar. This pulse shortly follows the initial AR and has the potential to continue AR conditions over central CA.

# CW3E AR Outlook: 28 Feb 2024

GFS Init 12Z Wed 28 Feb 2024

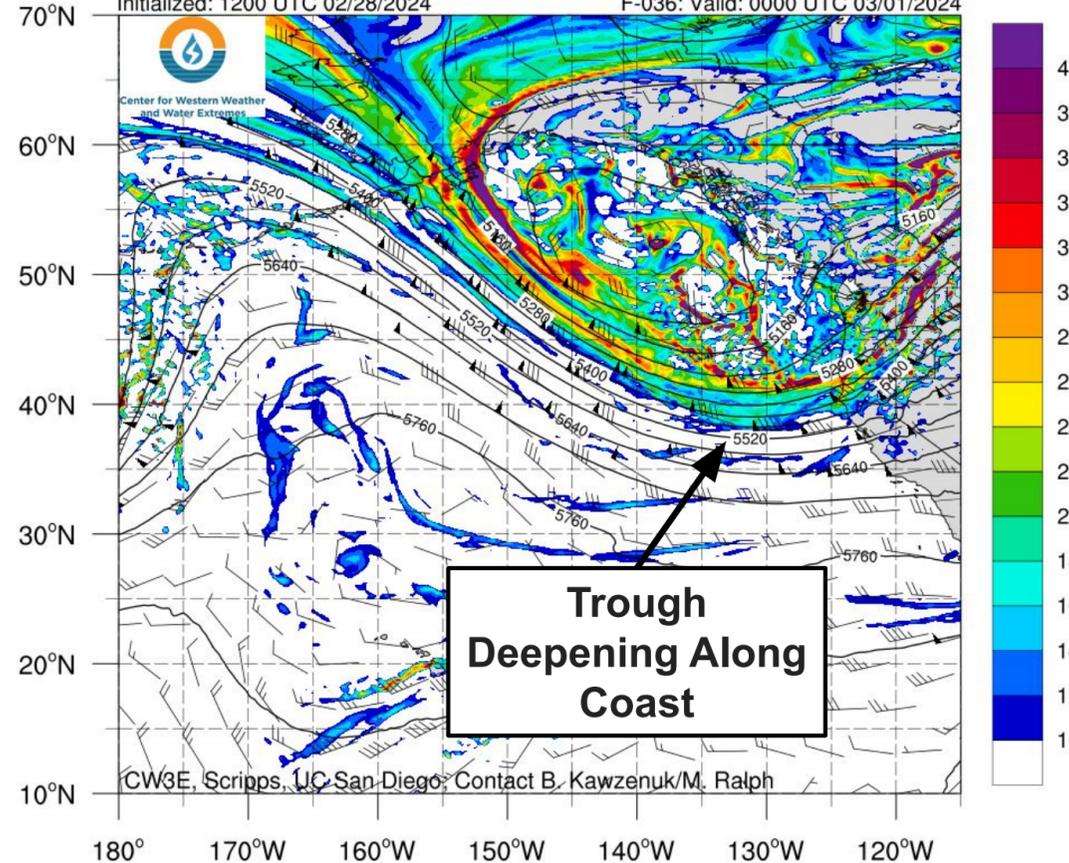
10AM PT Wed 28 Feb 2024

NCEP GFS 500-hPa Absolute Vorticity ( $\times 10^{-5} \text{ s}^{-1}$ ), Height (gpm), and Winds  
Initialized: 1200 UTC 02/28/2024 F-006: Valid: 1800 UTC 02/28/2024



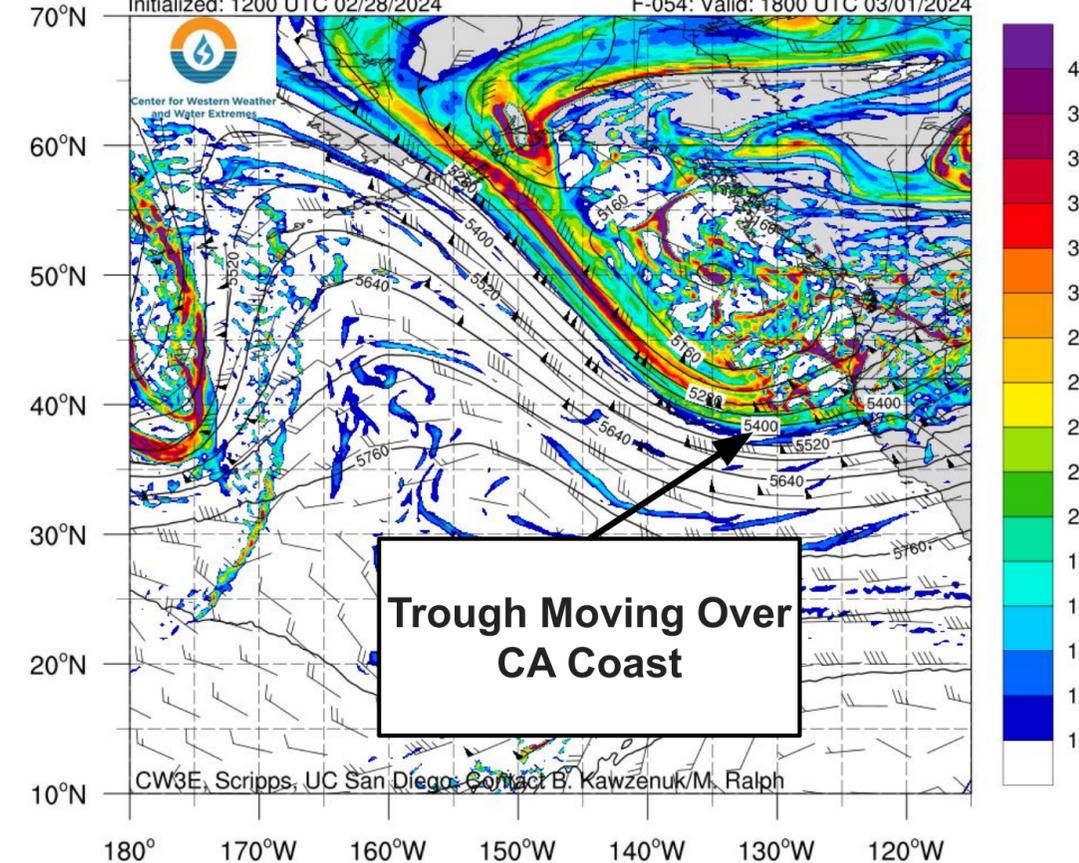
10AM PT Thu 29 Feb 2024

NCEP GFS 500-hPa Absolute Vorticity ( $\times 10^{-5} \text{ s}^{-1}$ ), Height (gpm), and Winds  
Initialized: 1200 UTC 02/28/2024 F-036: Valid: 0000 UTC 03/01/2024



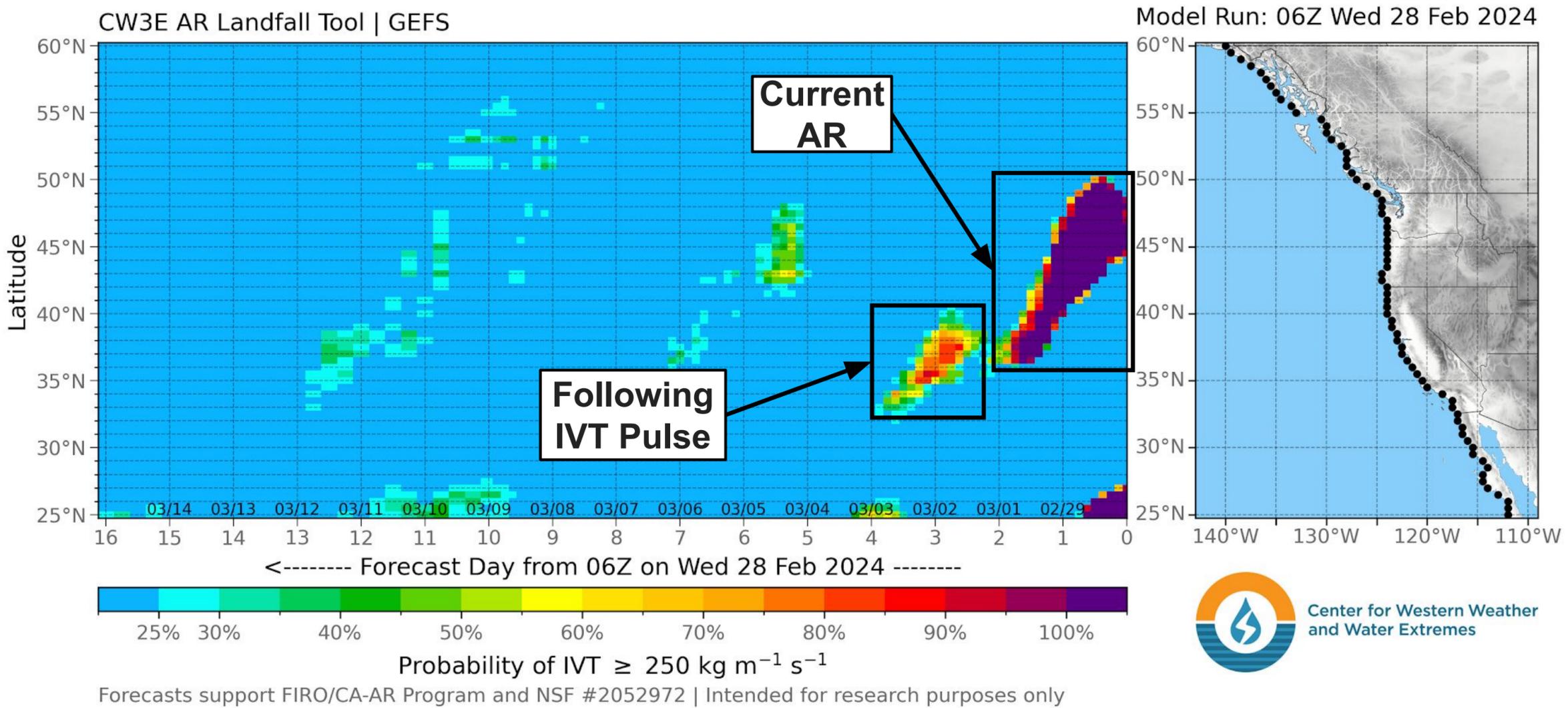
10AM PT Fri 1 Mar 2024

NCEP GFS 500-hPa Absolute Vorticity ( $\times 10^{-5} \text{ s}^{-1}$ ), Height (gpm), and Winds  
Initialized: 1200 UTC 02/28/2024 F-054: Valid: 1800 UTC 03/01/2024



- A mid-level trough that developed over the Aleutian Islands is forecast to continue to deepen in the Gulf of Alaska and move over the USWC by Fri 1 Mar.
- This trough alongside the low pressure system are likely to help extend the precipitation event over CA due to favorable forcing for ascent associated with the feature.

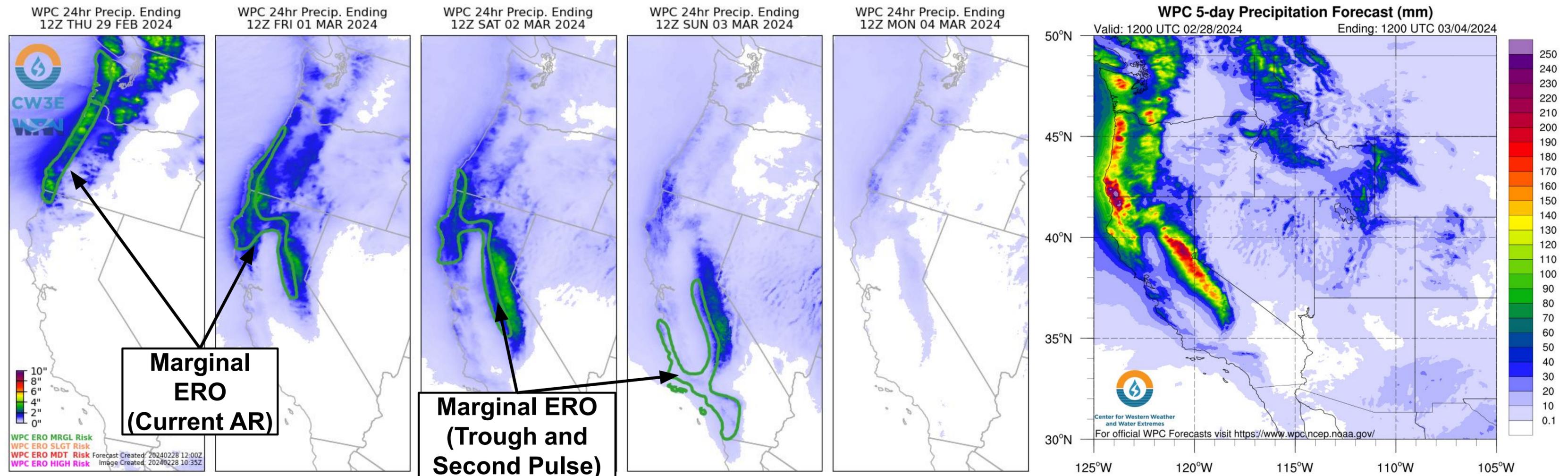
# CW3E AR Outlook: 28 Feb 2024



- CW3E's ensemble AR Landfall tool illustrates the timing and location of the IVT associated this AR and following IVT pulse as they move onshore and shift to the south along the West Coast into California.
- All 31 GEFS members show  $IVT > 250 \text{ kg m}^{-1} \text{ s}^{-1}$  making landfall from the PNW to C. CA with the AR for 28 Feb through 1 Mar.

# CW3E AR Outlook: 28 Feb 2024

\*Excessive Rain Outlook (ERO)

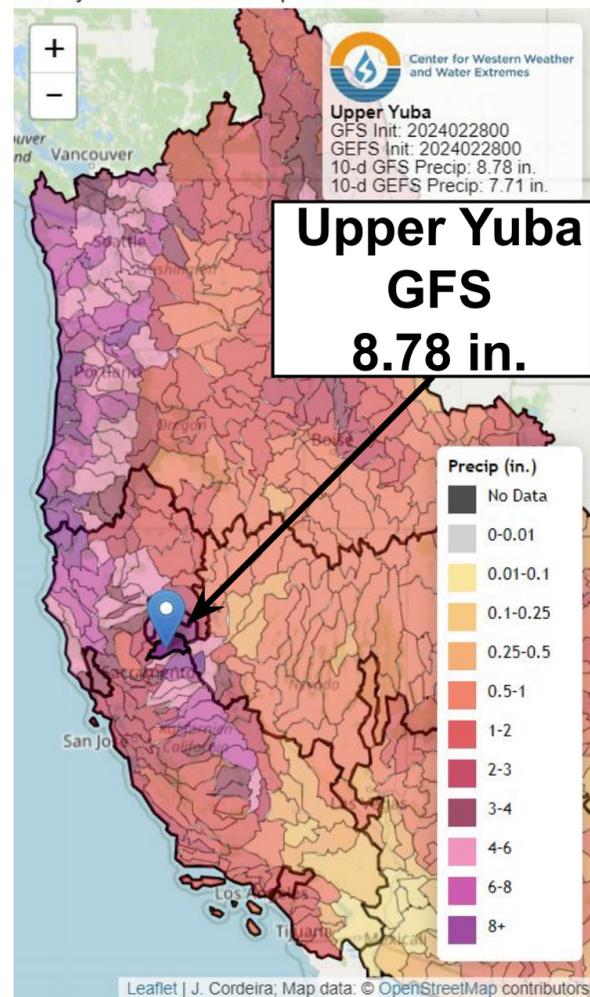


- The heaviest precipitation is expected in the Olympic Mountains, OR Coast Ranges, Northern CA Coast Ranges, and Sierra Nevada.
- The WPC is forecasting more than 5 inches of total precipitation in these areas during the next 5 days, with more than 10 inches possible in the southern OR Coast Ranges.
- A Marginal Risk (level 1 of 4, or at least 5% chance) for flash flooding is forecast by WPC along the coastal mountains of Washington, Oregon, and Northern and Southern California as well as around the Sierra Nevada at times from 4 AM PT Wed 28 Feb through 4 AM PT Sun 3 Mar.

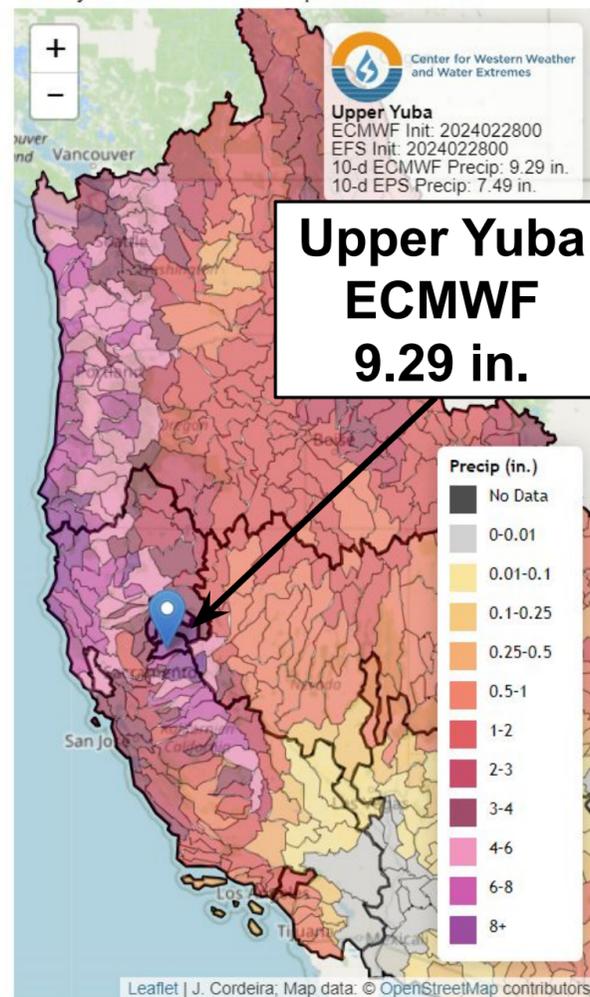
# CW3E AR Outlook: 28 Feb 2024

## 10-day Watershed Precipitation Forecasts (Initialized 00Z 28 Feb)

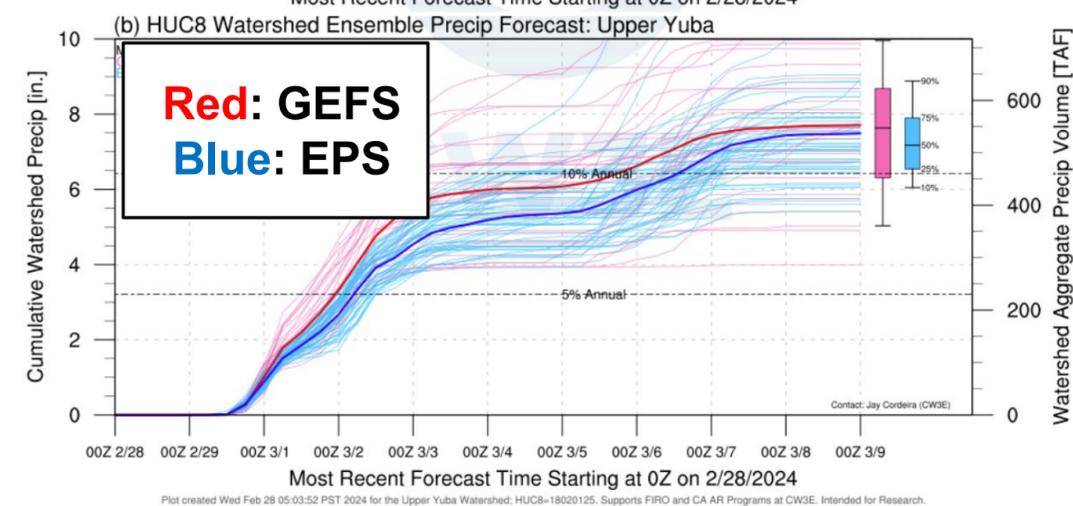
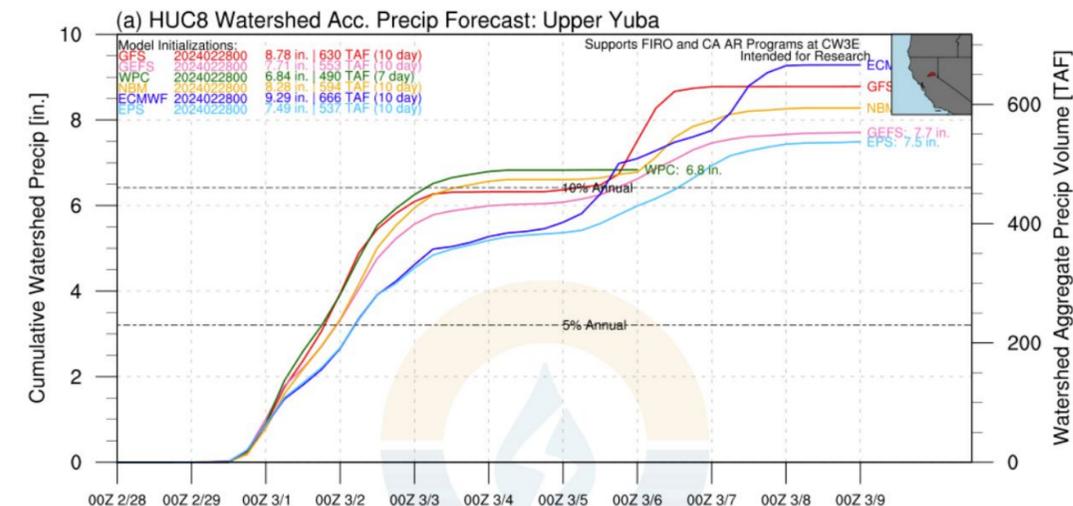
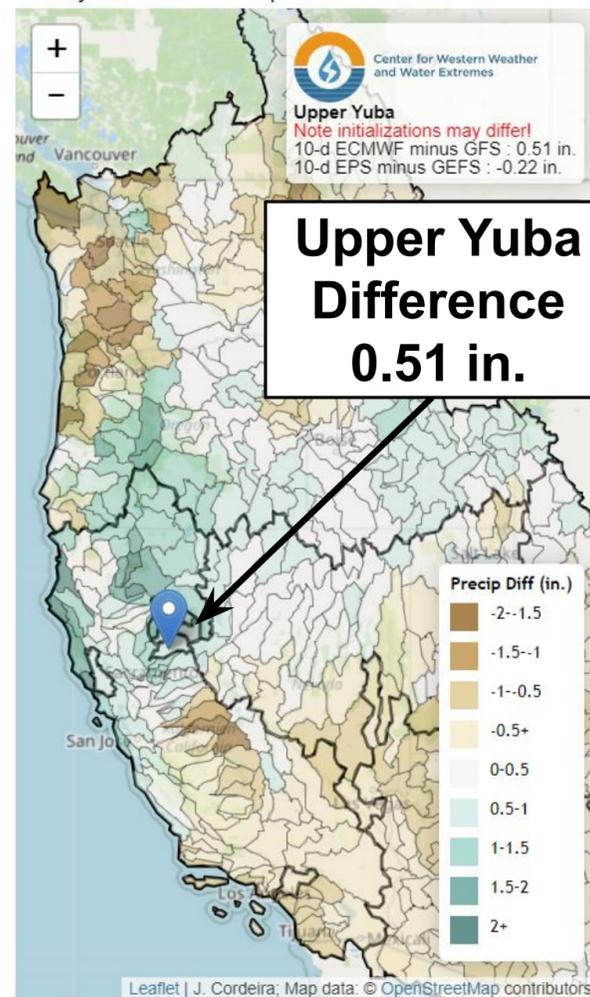
10-day GFS/GEFS Precipitation Forecasts



10-day ECMWF/EFS Precipitation Forecast



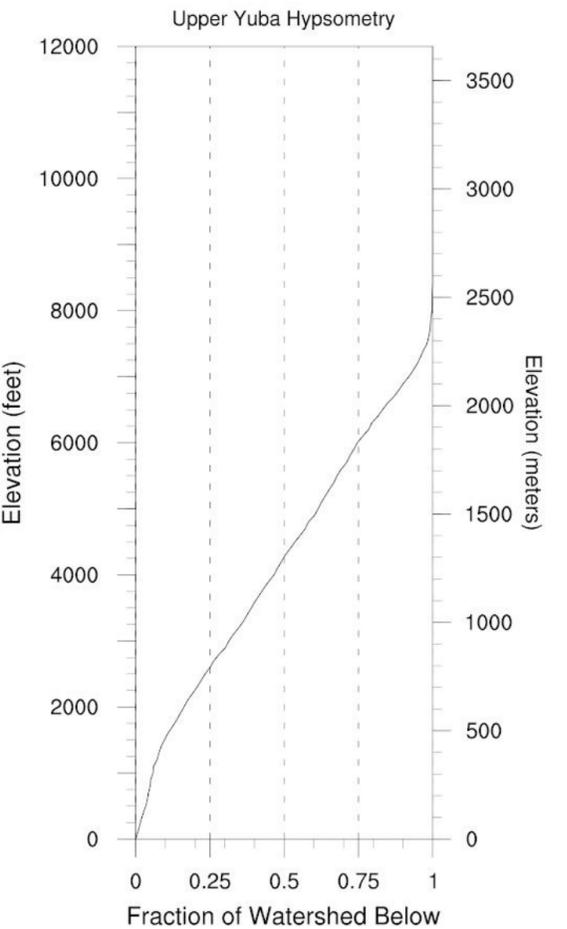
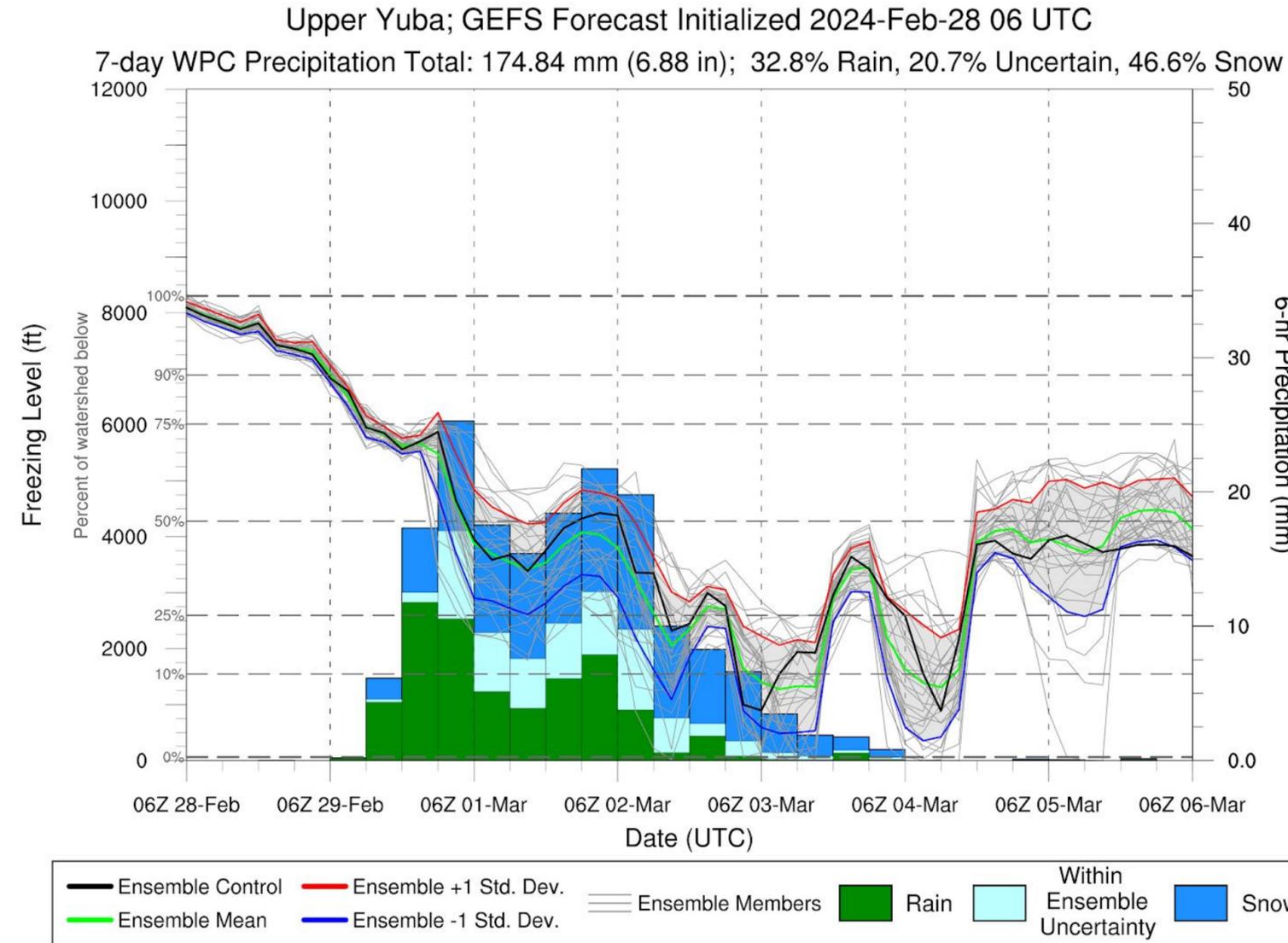
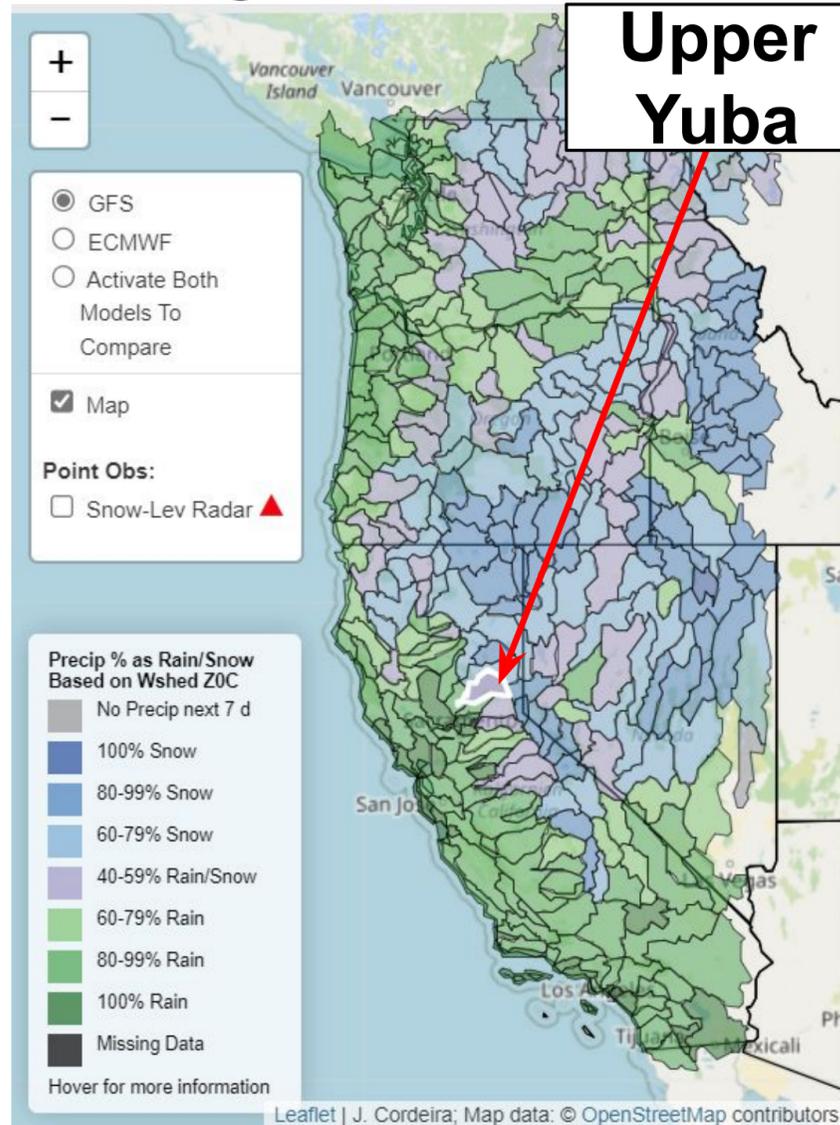
10-day Difference Precipitation Forecast



- The 00Z GFS is forecasting higher precipitation totals in the Southern Sierra Nevada and coastal WA/OR watersheds during the next 10 days, whereas the 00Z ECMWF is forecasting higher precipitation totals in the OR Cascades and Northern CA.
- Both models are forecasting more than 8 inches of mean areal precipitation in the Upper Yuba River watershed over the next 10 days. The GFS forecast is higher for the the incoming AR, whereas the ECMWF is forecasting more precipitation later in the period.
- The GEFS ensemble members are also showing higher forecast spread compared to the EPS.

# CW3E AR Outlook: 28 Feb 2024

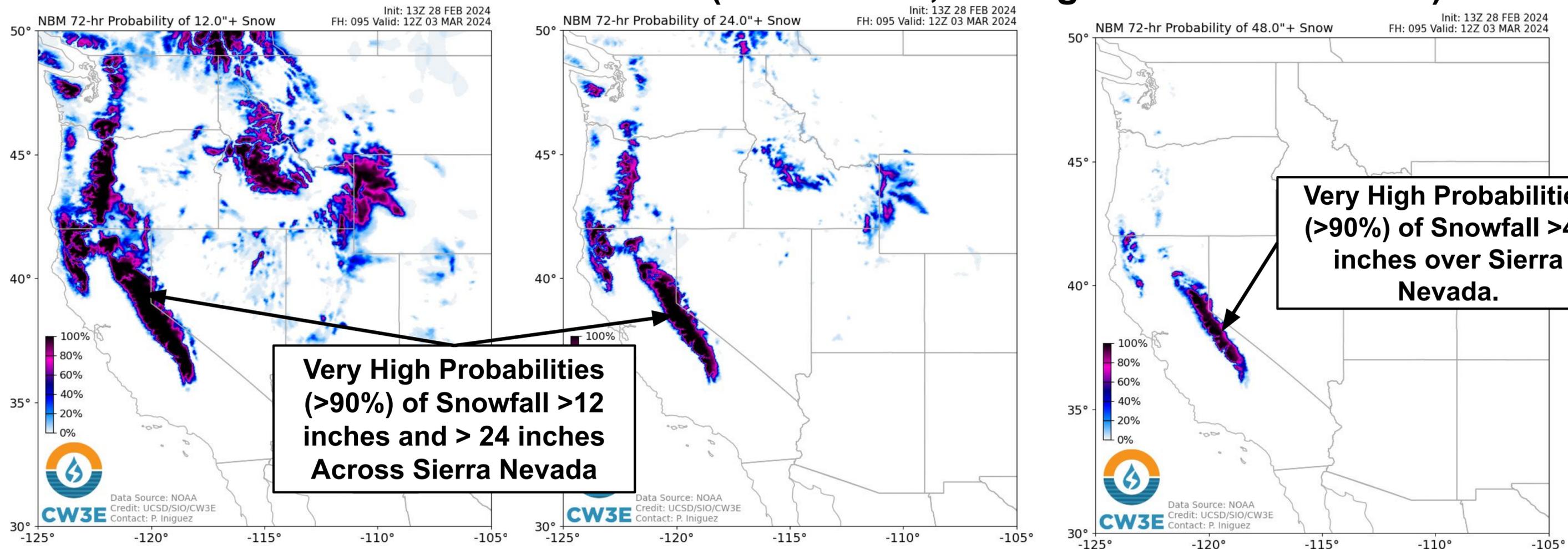
## Freezing Level Forecast



- The GEFS is forecasting freezing levels to steadily drop from ~8000 to ~1000 feet above mean sea level in the Upper Yuba watershed during the next several days, creating favorable conditions for significant snow accumulations in the Sierra foothills.
- There is some uncertainty in freezing level during this event, with ensemble spread exceeding 2000 feet.
- Nearly 50% of total precipitation in the Upper Yuba during the next 7 days is forecast to fall as snow.

# CW3E AR Outlook: 28 Feb 2024

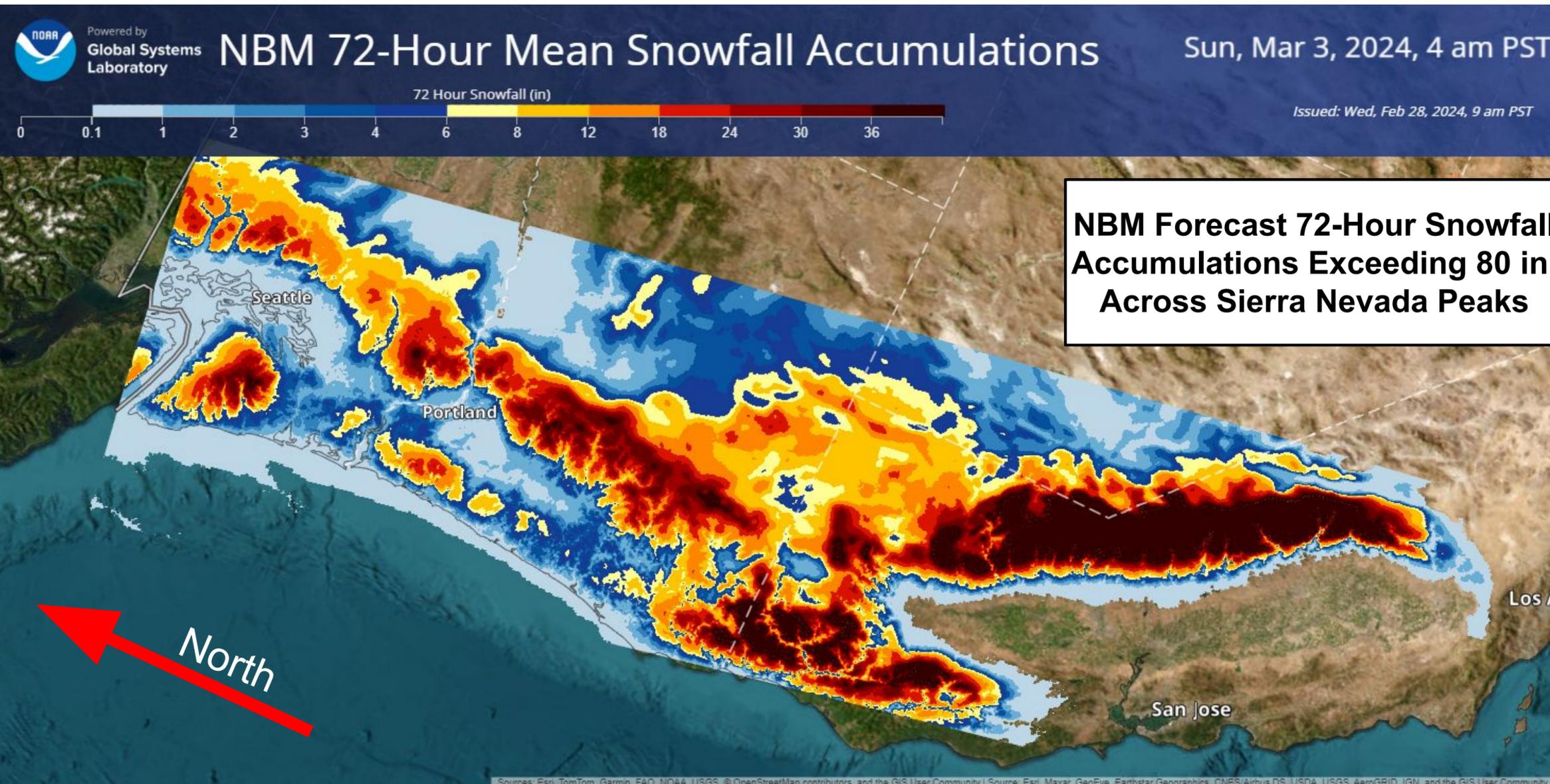
## NBM Snowfall Accumulation Probabilities (72-h Period, Ending 4 AM PT Sun 3 Mar)



- The AR and following trough are forecast to bring heavy snowfall to the Cascades and Sierra Nevada.
- Currently, the NBM is forecasting very high probabilities (>90%) of 72 hour snowfall accumulations exceeding 24 inches across much of the Sierra Nevada and OR Cascades for 72 hour period ending 4 PM PT Mon 4 Mar.
- The NBM also has very high probabilities of snowfall exceeding 48 inches in the Sierra Nevada.

# CW3E AR Outlook: 28 Feb 2024

## NBM Snowfall Accumulation (72-Hour Period Ending 4 AM PT Sun 3 Mar)



- The heaviest snowfall during this event is expected over the Sierra Nevada, where the NBM is forecasting large regions of snowfall totals greater than 80 inches, with possibility to exceed 100 inches in the highest peaks.
- The OR Cascades are forecast to receive another 20-30+ inches and the WA Cascades receive 18-24 inches at the highest elevations during this period.
- With this period, there is also again large regions of low-level snowfall, with regions of 1-6 inches throughout WA, OR and CA.

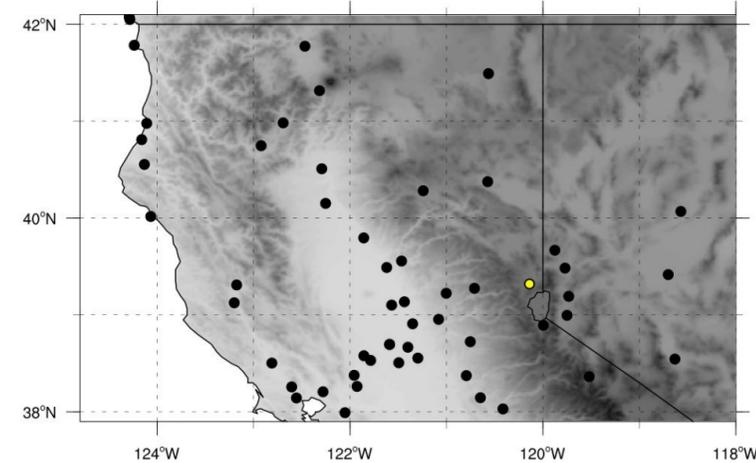
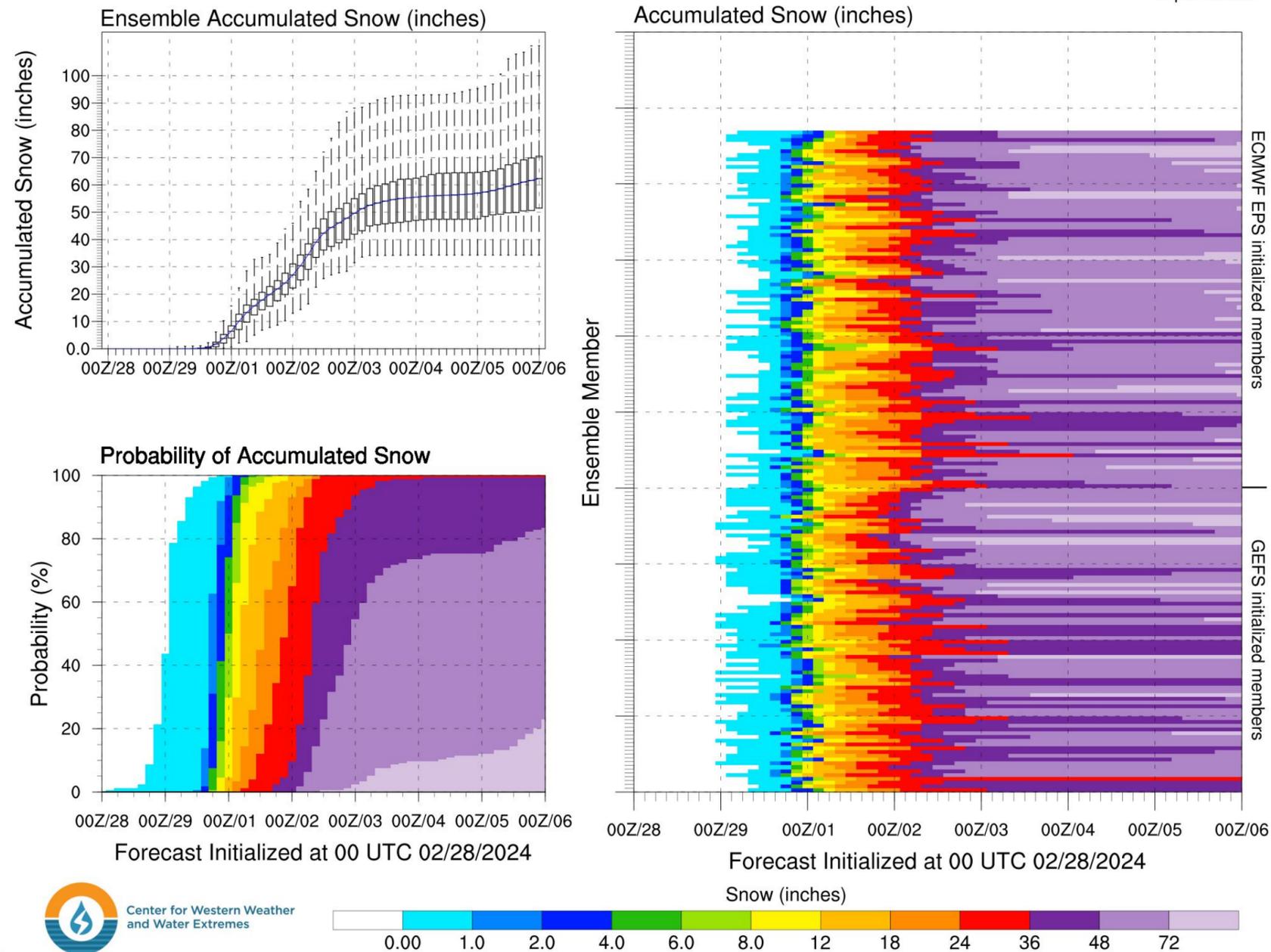
# CW3E AR Outlook: 28 Feb 2024

## West-WRF Ensemble Meteogram

West-WRF Ensemble Initialized: 00 UTC 02/28/2024

Truckee-Tahoe (39.32°N, 120.14°W)

\*Experimental

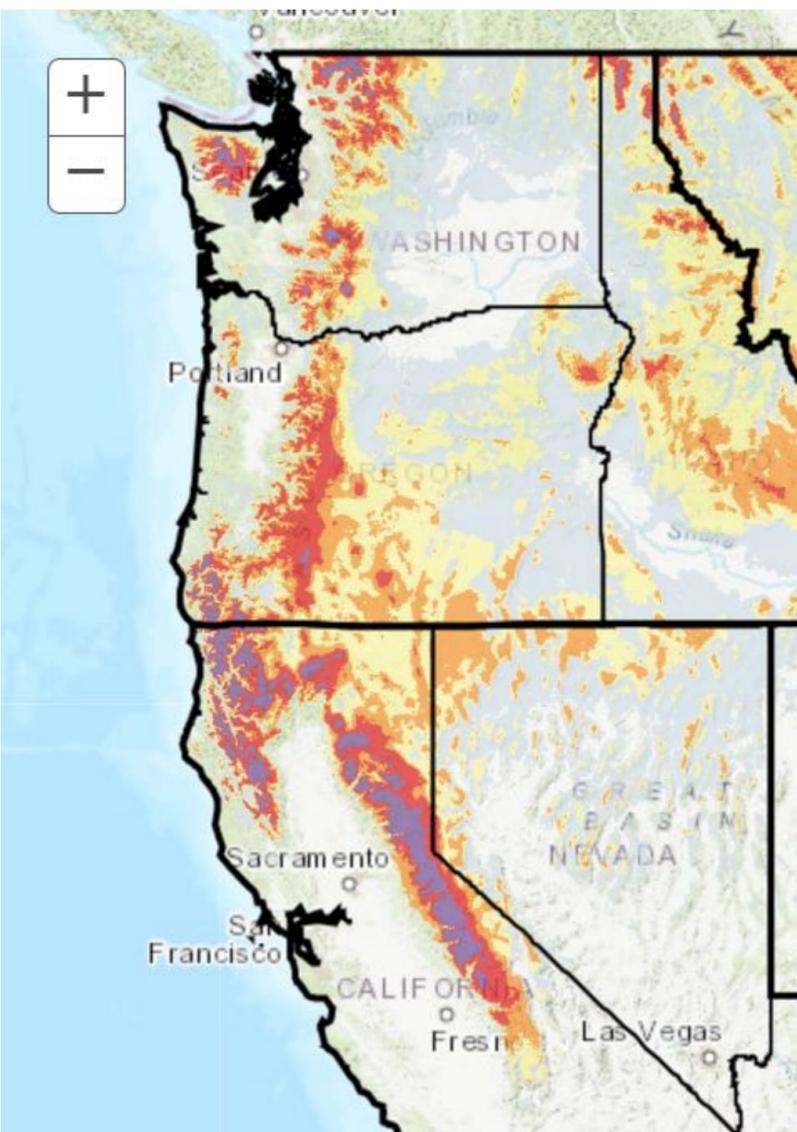


- For this location at Truckee-Tahoe in the Northern Sierra Nevada, the West-WRF ensemble is showing >95% likelihood of total snowfall exceeding 36 inches by 4 AM PT Sun 3 Mar.
- A majority of ensemble members (~70%) are forecasting >48 inches of total snow during this period, with ~10% forecasting >72 inches.

# CW3E AR Outlook: 28 Feb 2024

## WPC Winter Storm Severity Index (WSSI)

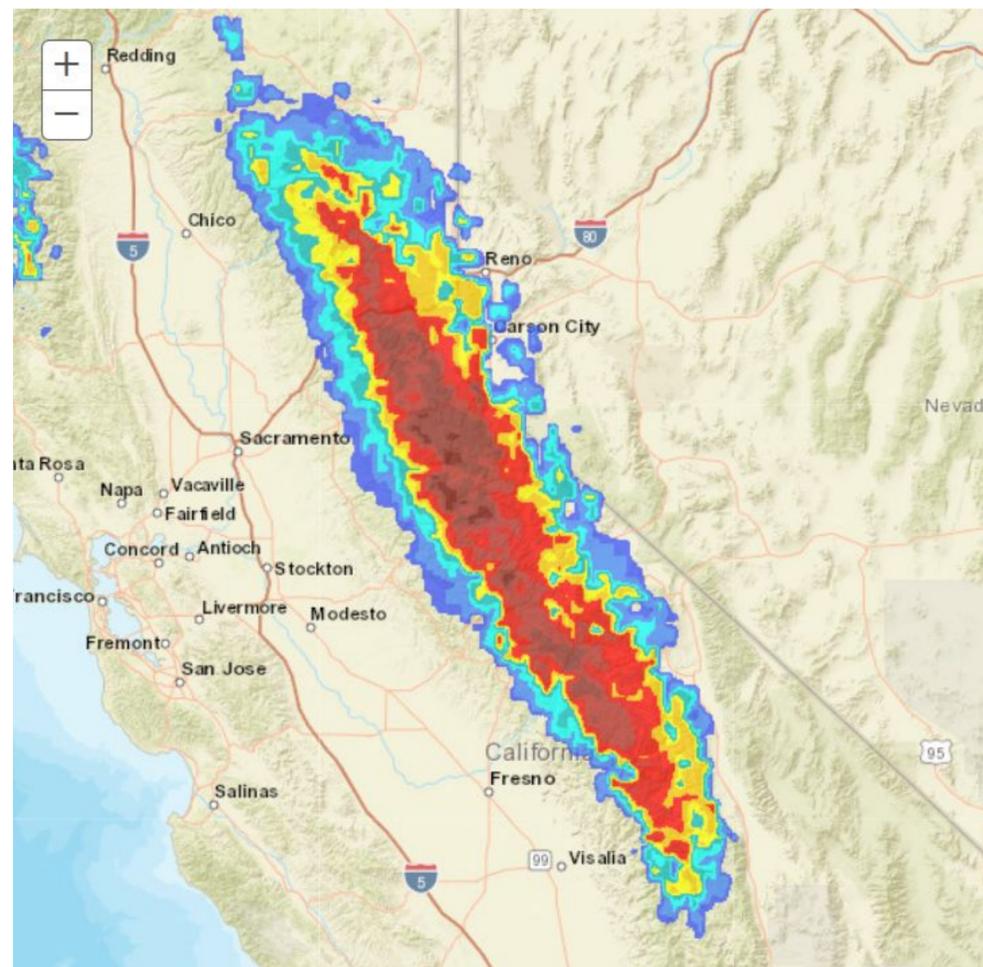
Days 1-3 WSSI: Valid 9 AM PT  
28 Feb - 4 AM PT 2 Mar



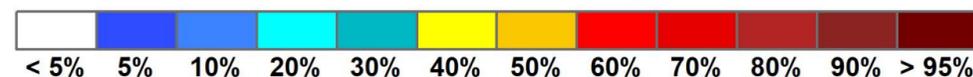
Potential Winter Storm Impacts	
	<b>Winter Weather Area</b> Expect Winter Weather. • Winter driving conditions. <b>Drive carefully.</b>
	<b>Minor Impacts</b> Expect a few inconveniences to daily life. • Winter driving conditions. <b>Use caution while driving.</b>
	<b>Moderate Impacts</b> Expect disruptions to daily life. • Hazardous driving conditions. <b>Use extra caution while driving.</b> • Closures and disruptions to infrastructure may occur.
	<b>Major Impacts</b> Expect considerable disruptions to daily life. • Dangerous or impossible driving conditions. <b>Avoid travel if possible.</b> • Widespread closures and disruptions to infrastructure may occur.
	<b>Extreme Impacts</b> Expect substantial disruptions to daily life. • Extremely dangerous or impossible driving conditions. <b>Travel is not advised.</b> • Extensive and widespread closures and disruptions to infrastructure may occur. • Life-saving actions may be needed.

Source: NWS Weather Prediction Center

## Probability of Extreme Impacts: 24-h Period Ending 4 AM PT 2 Mar



### Likelihood of Impact

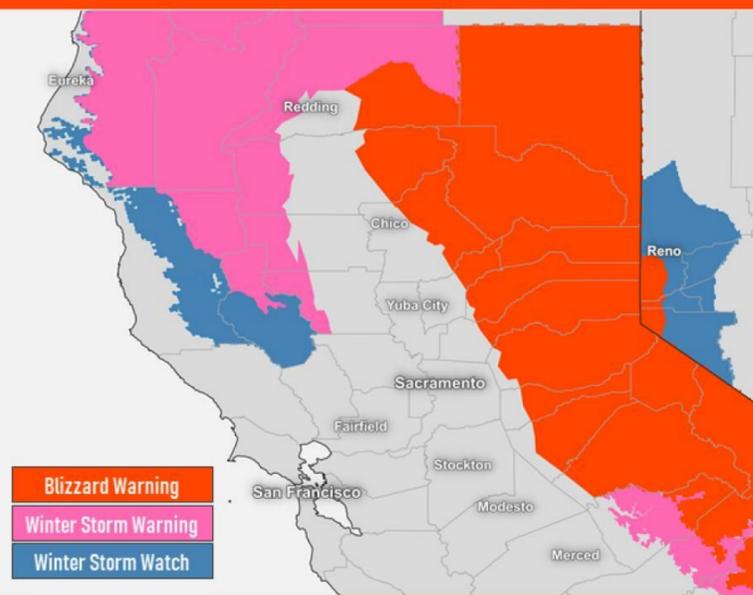


- The WPC's Winter Storm Severity Index (WSSI) is indicating major-to-extreme winter storm impacts across the Olympic Mountains, Cascades, Klamath Mountains, and Sierra Nevada during the next 3 days.
- The worst impacts are expected in the Sierra Nevada beginning Friday, continuing into Saturday.
- The probabilistic WSSI tool is showing a high likelihood (>70%) of extreme impacts in the Sierra Nevada during the 24-hour period ending 4 AM PT Sat 2 Mar.

# CW3E AR Outlook: 28 Feb 2024

## Blizzard Warnings for Sierra Nevada

### Blizzard Conditions



#### Timing

- Thursday February 29 – Sunday Morning, March 3
- Blizzard conditions Friday – Saturday Morning



#### Forecast

- 5 to 10 feet above 5000 feet
- 1 to 4 feet above 3000 feet
- Lighter accumulations down to 2000 feet
- Wind gusts up to 65 mph



#### Impacts

- ✓ Extremely difficult to impossible travel, white out conditions, & near zero visibility
- ✓ Excessive travel delays & chain controls
- ✓ Road closures likely
- ✓ Downed trees, tree branches and extended power outages
- ✓ Travel is HIGHLY discouraged

### Blizzard Warning

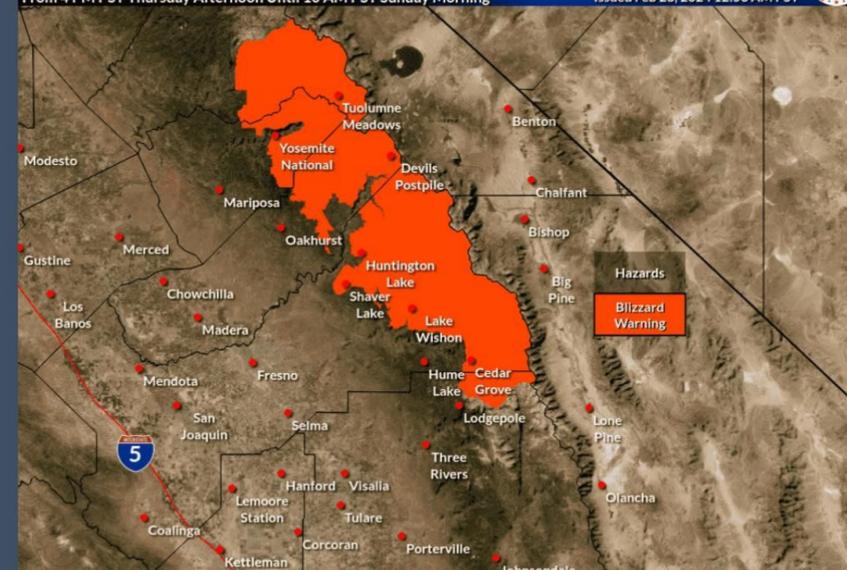
Information as of Wednesday, February 28th, 2024 at 1:40 AM PST

#### Blizzard Warning

From 4 PM PST Thursday Afternoon Until 10 AM PST Sunday Morning

Weather Forecast Office  
Hanford, CA

Issued Feb 28, 2024 12:53 AM PST



#### BOTTOM LINE

- Snowfall 5 to 8 feet above 6,000 feet
- Winds gusting as high as 65 mph on exposed ridgetops and along the crest
- Blowing snow will cause whiteout conditions at times
- 4 PM Thursday until 10 AM Sunday

#### WHAT TO DO

- Travel should be restricted to emergencies only
- If you must travel, carry a winter survival kit with you
- If stranded, stay with your vehicle



Hanford, CA  
WEATHER FORECAST OFFICE

<http://www.weather.gov/hnx>

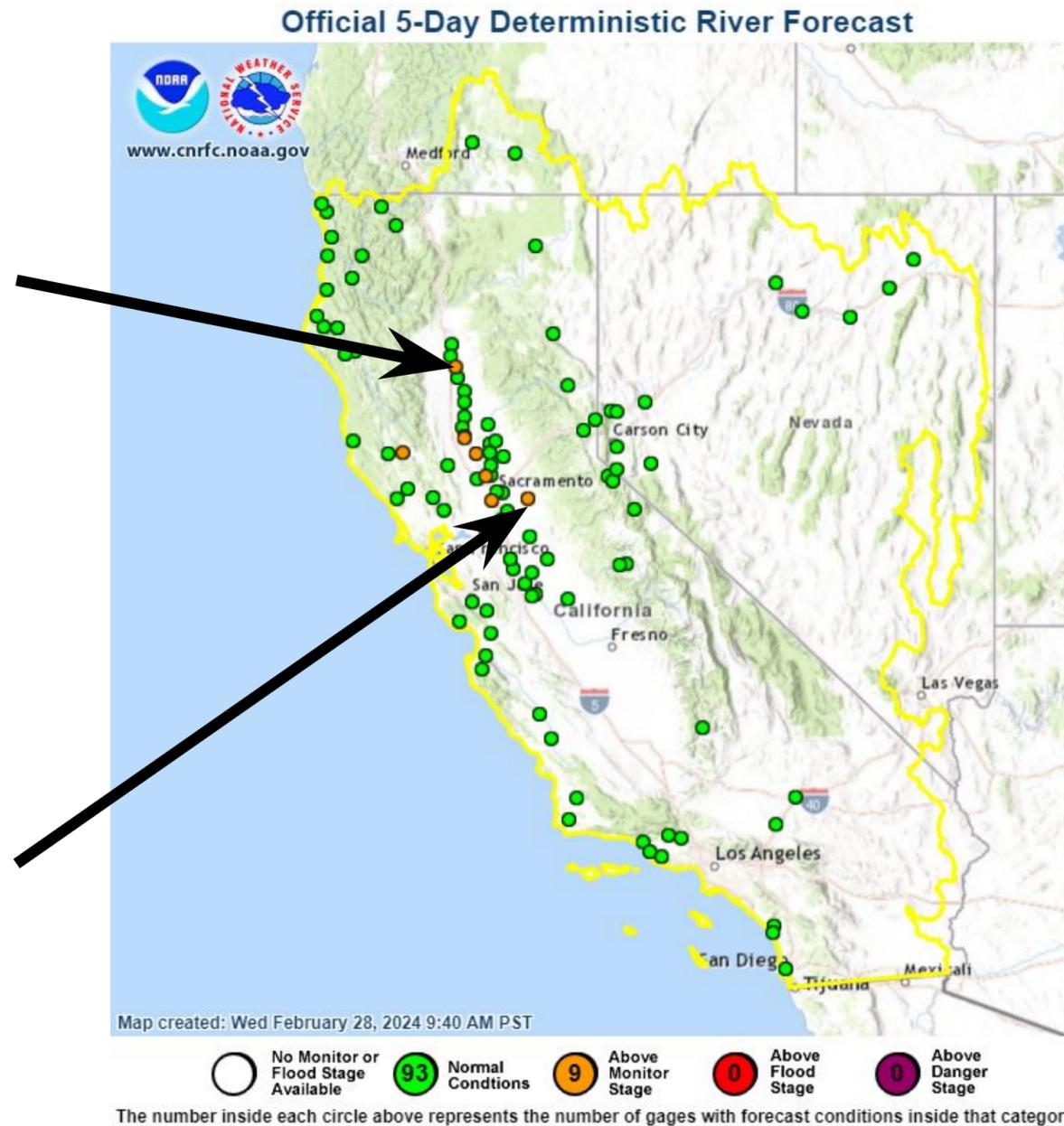
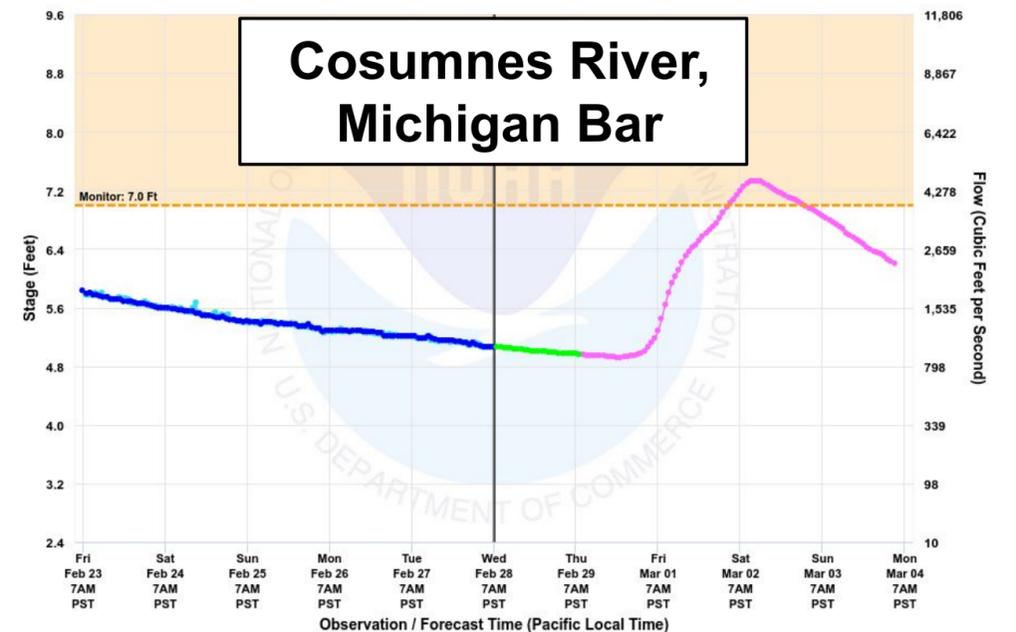
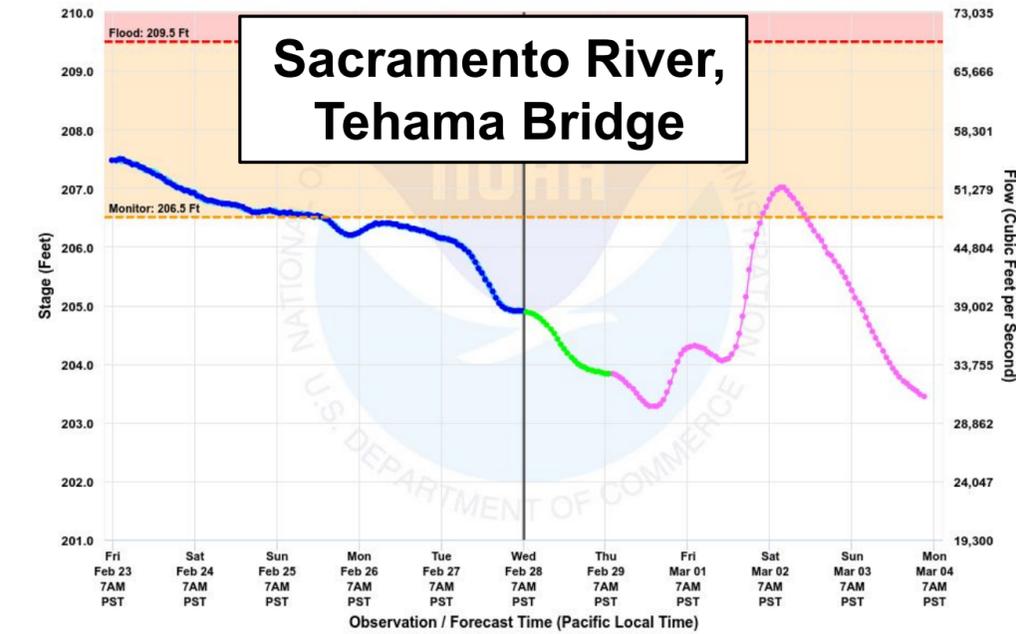
[facebook.com/NWSHanford](https://www.facebook.com/NWSHanford) [@NWSHanford](https://twitter.com/NWSHanford)

February 28, 2024

- The National Weather Service has issued a Blizzard Warning over much of the Sierra Nevada due to a combination of heavy snow and high winds.
- NWS Sacramento is forecasting 5-10 feet of snow above 5,000 feet and 1-4 feet of snow between 3,000 and 5,000 feet in the Northern and Central Sierra Nevada.
- NWS Hanford is forecasting 5-8 feet of snow above 6,000 feet in the Southern Sierra Nevada.

# CW3E AR Outlook: 28 Feb 2024

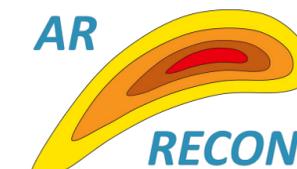
## NWS CNRFC River Stage Forecasts



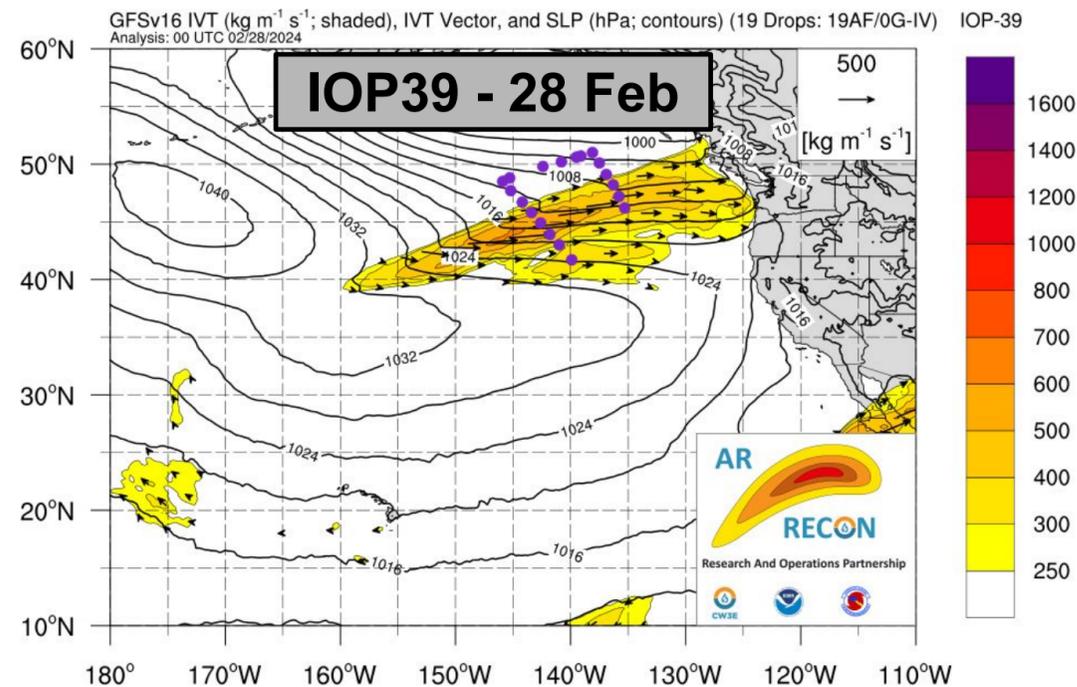
- Although river levels are forecast to rise in Northern CA, major flooding is not anticipated given the moderate rainfall intensities and a substantial portion of the precipitation expected to fall as snow.
- CNRFC is currently forecasting 9 stream gages to exceed monitor stage in the next 5 days.
- The Sacramento River at Tehama Bridge (top left) and Cosumnes River at Michigan Bar are both forecast to reach monitor stage on Sat 2 Mar.

# CW3E AR Outlook: 28 Feb 2024

## Current AR Recon Planned Flight Sequence



Research And Operations Partnership



*The AR Recon team has planned the first flight of this sequence sampling the incoming event. The team has planned one additional flight sampling this system*

- CW3E's Atmospheric River Reconnaissance (AR Recon) field campaign continues in WY2024, with the ongoing sequence of flights focusing on the current AR.
- The US Air Force 53rd Weather Reconnaissance Squadron deployed 19 dropsondes in yesterday's flight (IOP39).
- Today's scheduled flight (IOP40) will sample the AR and essential atmospheric features within the upstream mid-level trough.
- These sampling missions provide data in near real-time to the global forecast models to improve weather forecasts. Data from these missions are archived for future AR research.

