

CW3E Atmospheric River Outlook: 22 September 2023

Atmospheric River Forecast to Impact Pacific Northwest and Northern California

- An atmospheric river (AR) is forecast to make landfall in the Pacific Northwest early Sun 24 Sep with the greatest IVT making landfall along the Oregon-California Border late Sun 24 Sep. IVT values above $250 \text{ kg m}^{-1} \text{ s}^{-1}$ are forecast to persist in the Pacific Northwest through Wed 27 Sep
- AR 4 conditions (based on the Ralph et al. 2019 AR Scale) are forecast along the Oregon coast while AR3 conditions are forecast along the Washington and northern California coasts in both the GFS and ECMWF
- The 00Z GFS is forecasting 5.28 inches of precipitation over the next 10 days in the Chetco Watershed, located in SW Oregon along the Oregon-California border, while the 00Z ECMWF is forecasting 2.97 inches over the same period. Some of the precipitation is forecast to fall after this AR
- The NWS Weather Prediction Center (WPC) is forecasting 5-day precipitation totals >3 inches over the Olympic Peninsula and the Oregon-California border with >1.5 inches along the Oregon and Washington coasts. WPC excessive rainfall outlooks have a marginal risk for rainfall exceeding flash flooding guidance along the Oregon-California Border for 12Z Mon 25 Sep -12Z Tues 26 Sep
- Despite higher amounts of precipitation along much of the Pacific Northwest Coast, both the CNRFC and NWRFC do not forecast any river stage locations to pass above action stage. This is largely tied to much of the Pacific Northwest currently experiencing Severe Drought conditions or worse

CW3E AR Outlook: 22 September 2023

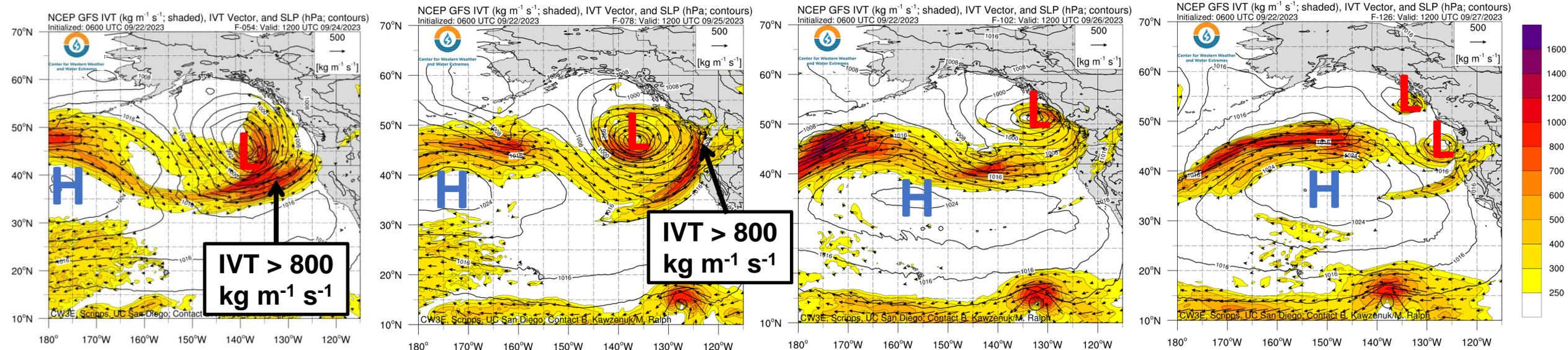
GFS Model IVT Forecast: Initialized 06Z 22 Sep

A) Valid 12Z Sun
24 Sep (F-54)

B) Valid 12Z Mon
25 Sep (F-78)

C) Valid 12Z Tue
26 Sep (F-102)

D) Valid 12Z Wed
27 Sep (F-126)



- A strong AR is forecast to make landfall along the Oregon-California border in the on Sun 24 Sep
- The 06Z GFS deterministic model forecast IVT magnitudes $> 800 \text{ kg m}^{-1} \text{ s}^{-1}$ in the core of this AR as it makes landfall on Sun 24 Sep (Figure A).
- IVT magnitudes $> 800 \text{ kg m}^{-1} \text{ s}^{-1}$ in the core are forecast to persist through Mon 25 Sep as the low-pressure system stalls off the West Coast (Figure B).
- AR conditions are forecast to continue through early Wed 27 Sep in the Pacific Northwest before dissipating. The low-pressure system is still present in the Gulf of Alaska and the high pressure has progressed into the central Pacific.

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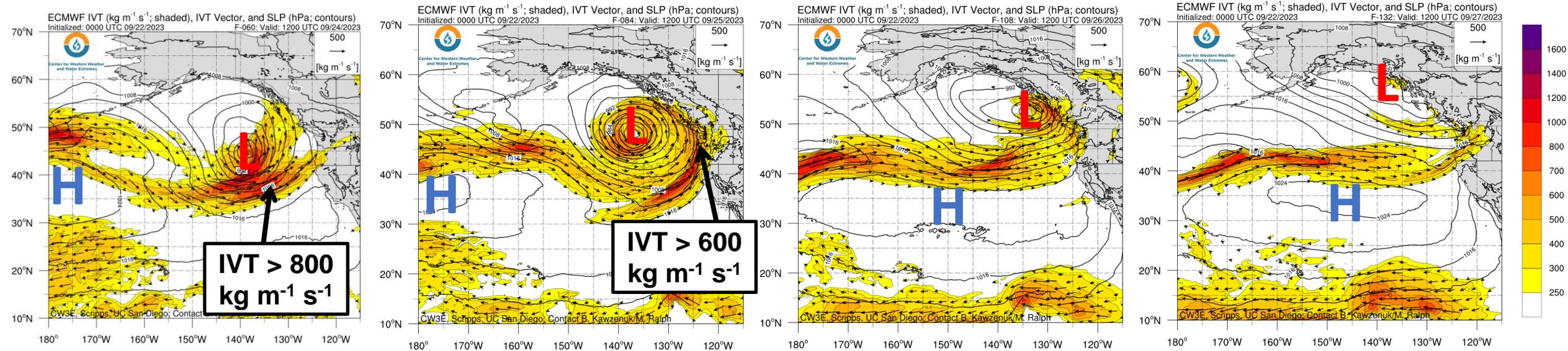
ECMWF Model IVT Forecast: Initialized 00Z 22 Sep

A) Valid 12Z Sun
24 Sep (F-60)

B) Valid 12Z Mon
25 Sep (F-84)

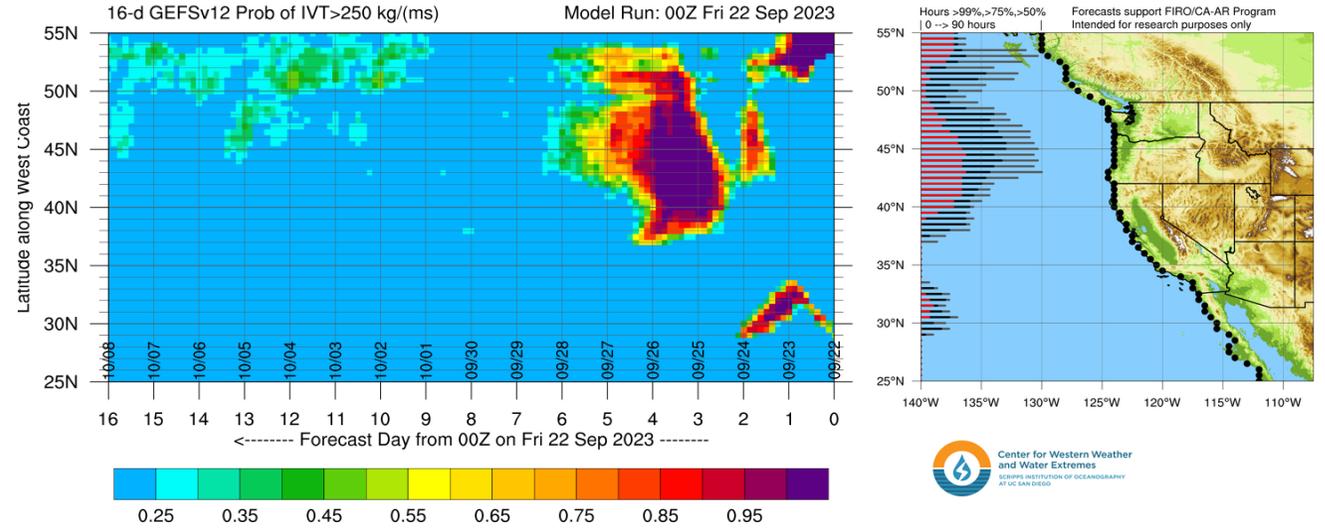
C) Valid 12Z Tue
26 Sep (F-108)

D) Valid 12Z Wed
27 Sep (F-132)

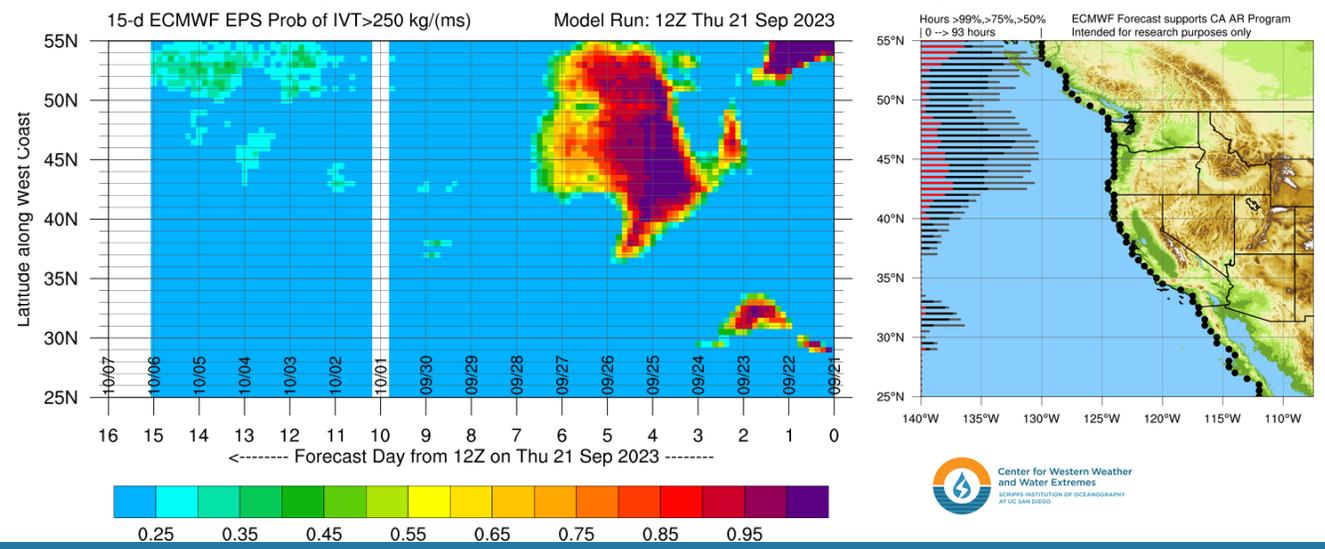


- Compared to the 06Z GFS deterministic, the 00Z ECMWF shows the core of the AR slightly further west and slightly weaker on Sun 24 Sep (Figure A). It shows the AR persisting in the Pacific Northwest on Mon 25 Sep. The leading edge of the AR is weaker ($500\text{--}600 \text{ kg m}^{-1} \text{ s}^{-1}$ in ECMWF, $800 \text{ kg m}^{-1} \text{ s}^{-1}$ in the GFS over coastal Oregon) and does not penetrate as far inland (Figure B)
- AR conditions are forecast to continue through early Wed 27 Sep in the Pacific Northwest before dissipating. The low-pressure system is forecast to move north into the Gulf of Alaska between 26 and 27 Sep

Probability of AR Conditions Along Coast (GEFS)



Probability of AR Conditions Along Coast (EPS)

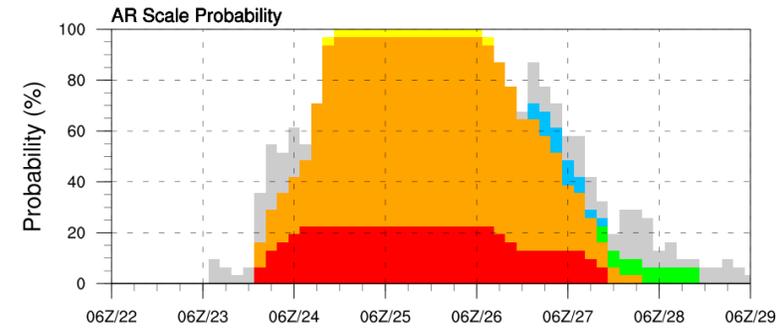
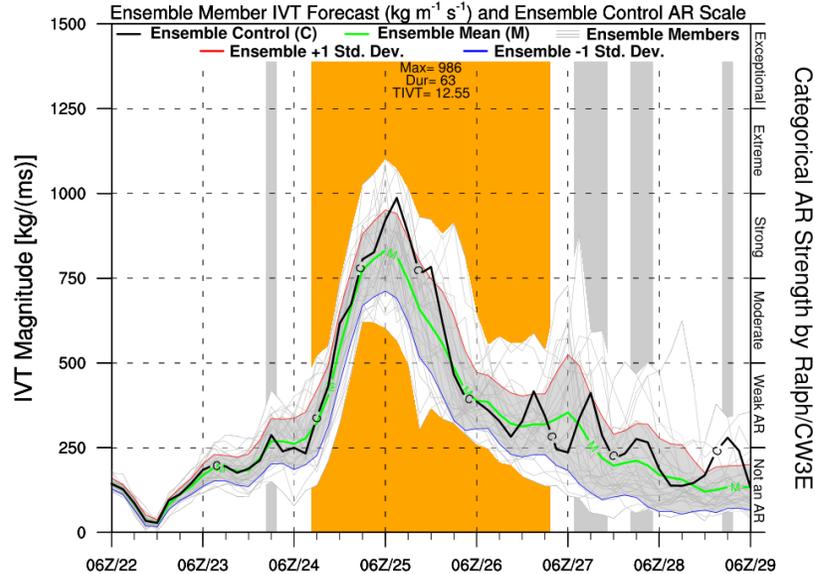


- The 00Z GEFS is showing very high confidence (> 95%) in a period of AR conditions (IVT > 250 kg m⁻¹ s⁻¹) forecast along coastal Pacific Northwest and Northern California beginning on Sun 24 Sep
- The 12Z EPS shows higher confidence in AR conditions occurring further north and for longer than in the 00Z GEFS
- The duration of high confidence AR conditions is greater (~30 hours / ~24 hours), extends further south and begins later (25th/24th) in the GEFS vs the EPS, respectively

7-day AR Scale and IVT Forecast: GFS & ECMWF Ensembles

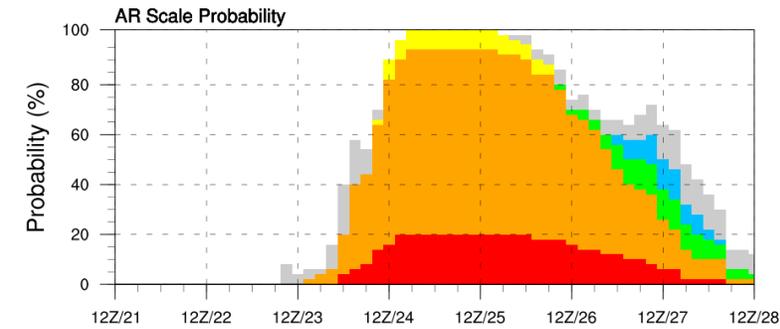
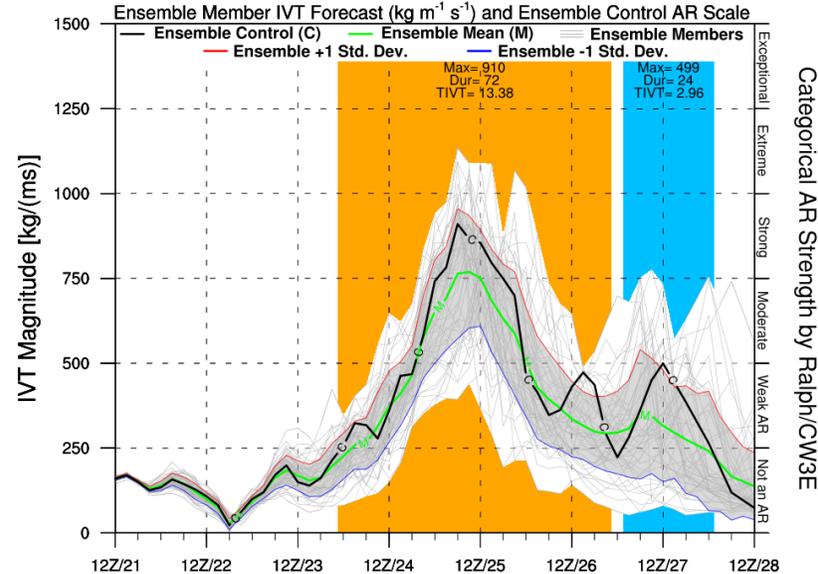
GEFS Ensemble

GFS Ensemble Initialized: 06Z Fri 09/22/23



ECMWF Ensemble

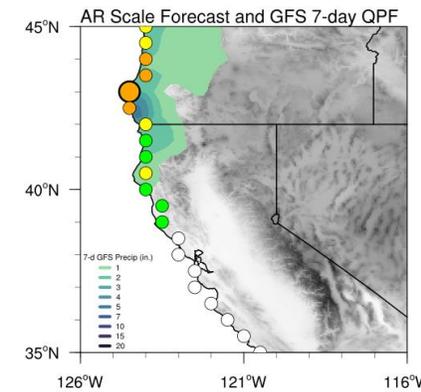
ECMWF Ensemble Initialized: 12Z Thu 09/21/23



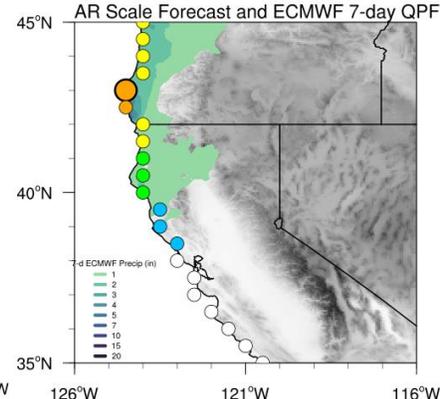
AR Ensemble Forecast

- 31/31 (100%) **GEFS** ensemble members are forecasting at least AR3 conditions with 7/31 (23%) forecasting AR5 conditions
- 51/51 (100%) **ECMWF** ensemble members are forecasting at least AR3 conditions with 10/51 (20%) forecasting AR5 conditions
- The GEFS and ECMWF are showing high confidence of at least AR3 conditions along the Oregon Coast

GEFS Ensemble

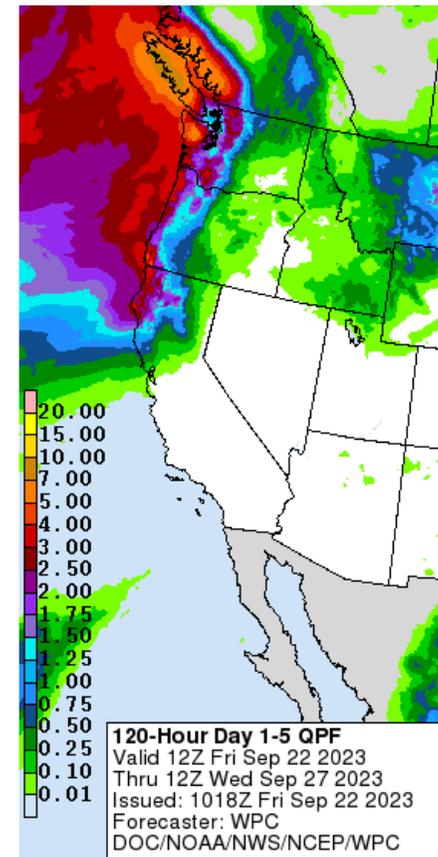
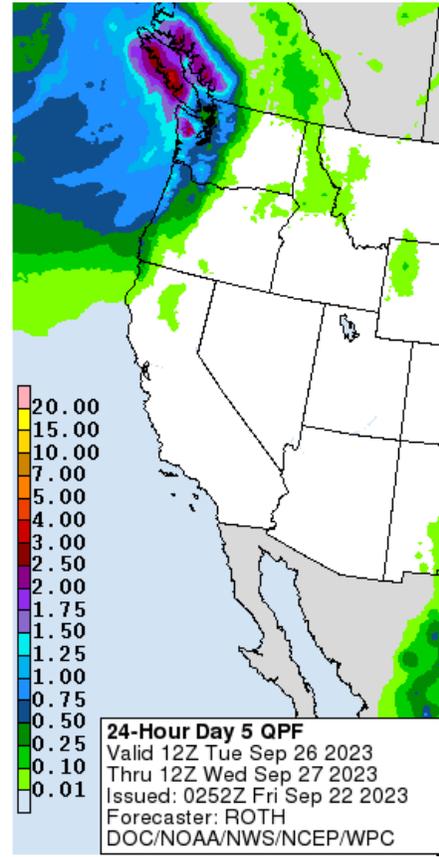
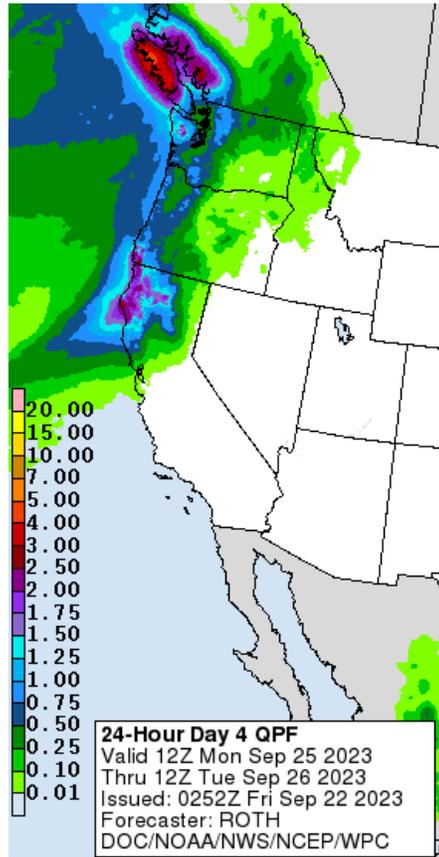
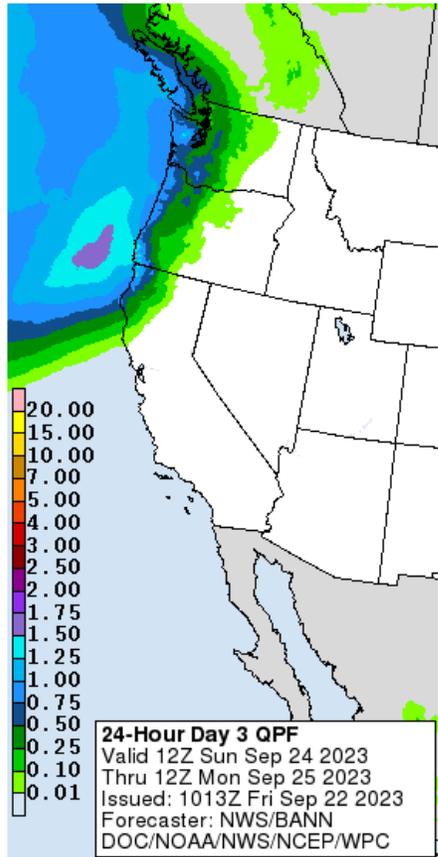


ECMWF Ensemble



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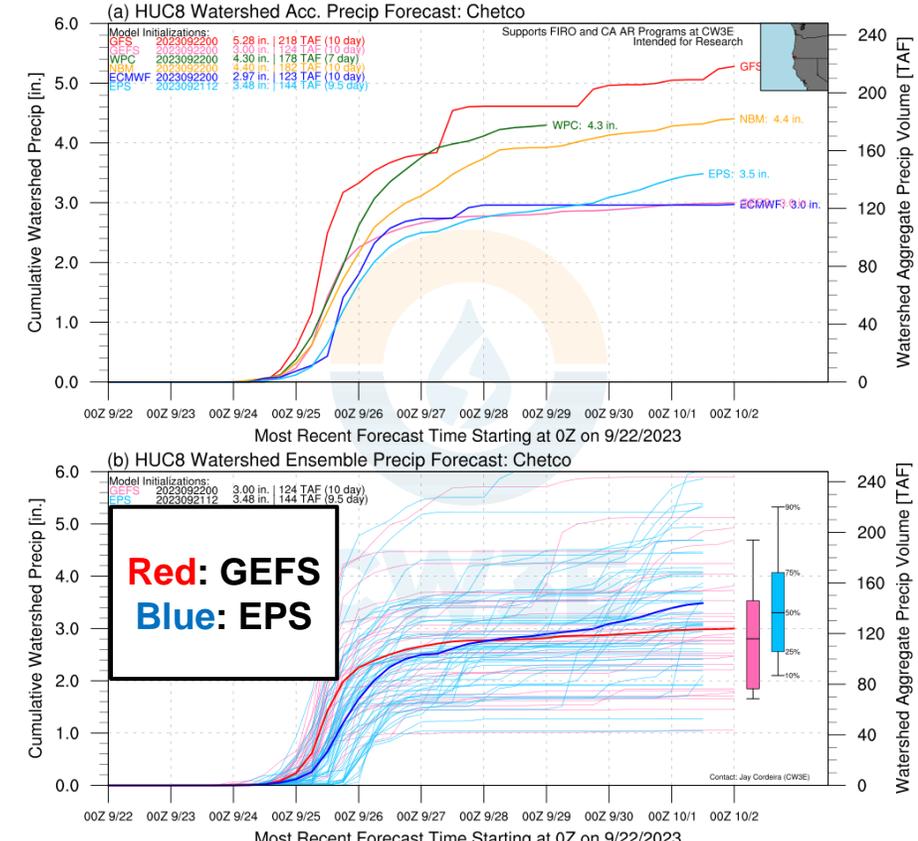
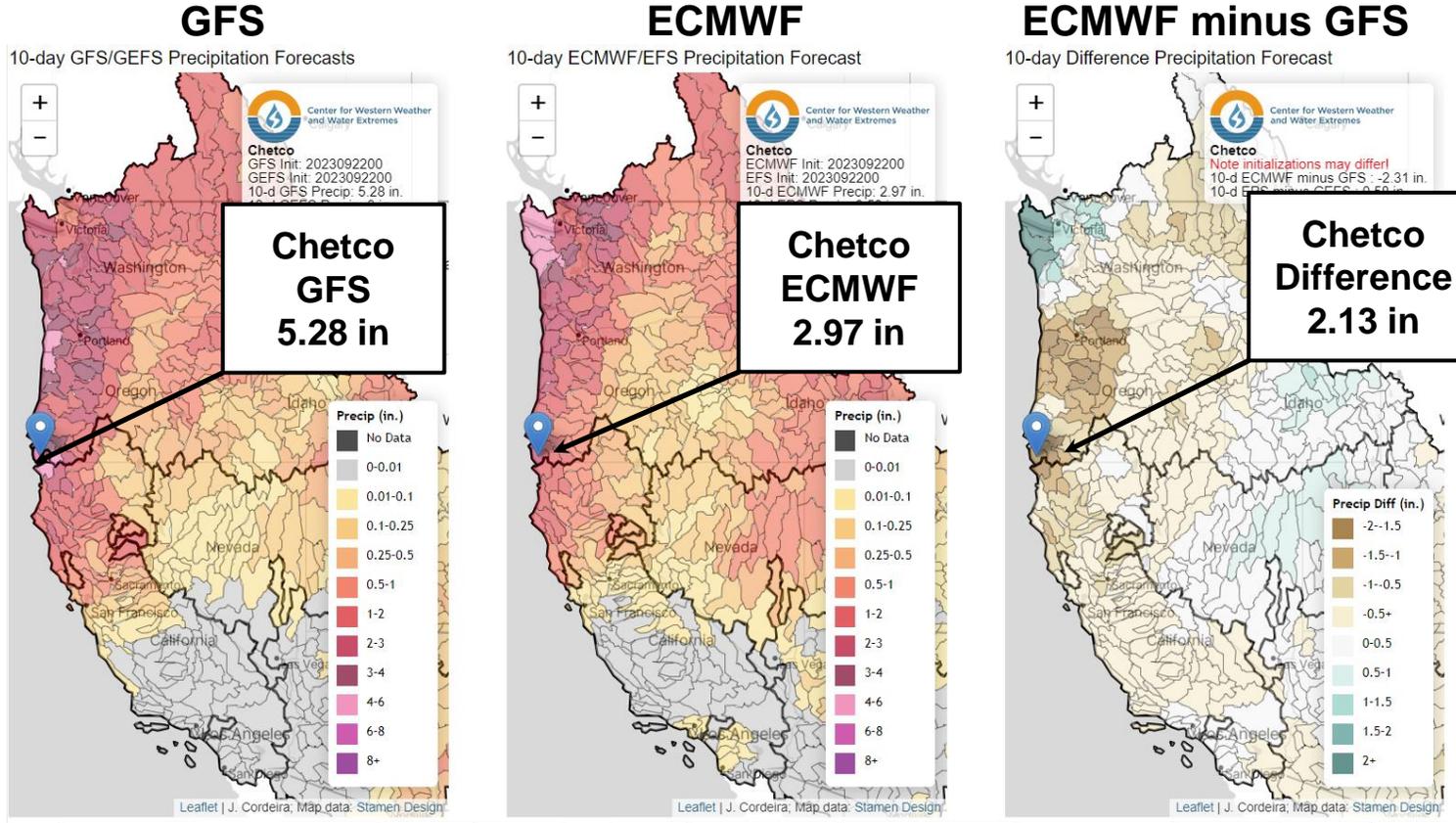
WPC Quantitative Precipitation Forecasts and Excessive Rainfall Outlook



- The NWS WPC forecast precipitation totals >1.5 inches along the Oregon-California border, Olympic Peninsula and Vancouver Island on Monday into Tuesday (12Z 25-26 Sep) during the most intense portion of the storm
- The NWS WPC Excessive Rainfall Outlook (issued 06Z Fri 22 Sep) indicates a marginal risk (10%) for flash flooding Monday (25 Sep) and Monday night near the Oregon-California border.

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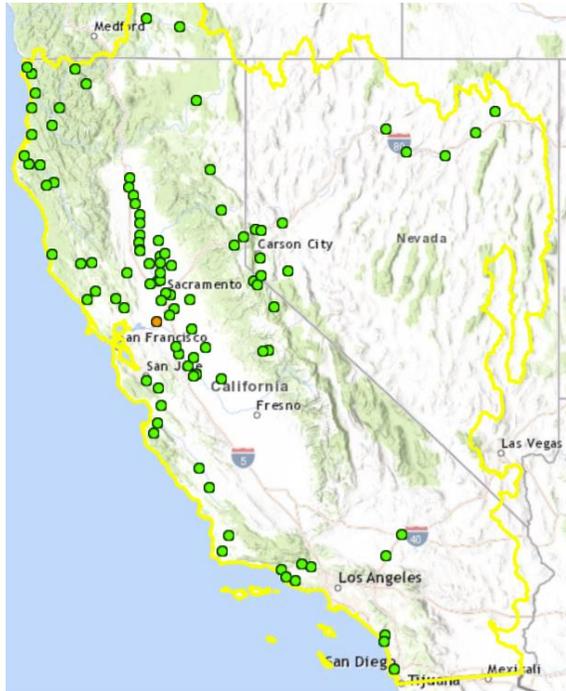
10-day Watershed Precipitation Forecasts (Initialized 5 PM PT 20 Sep)



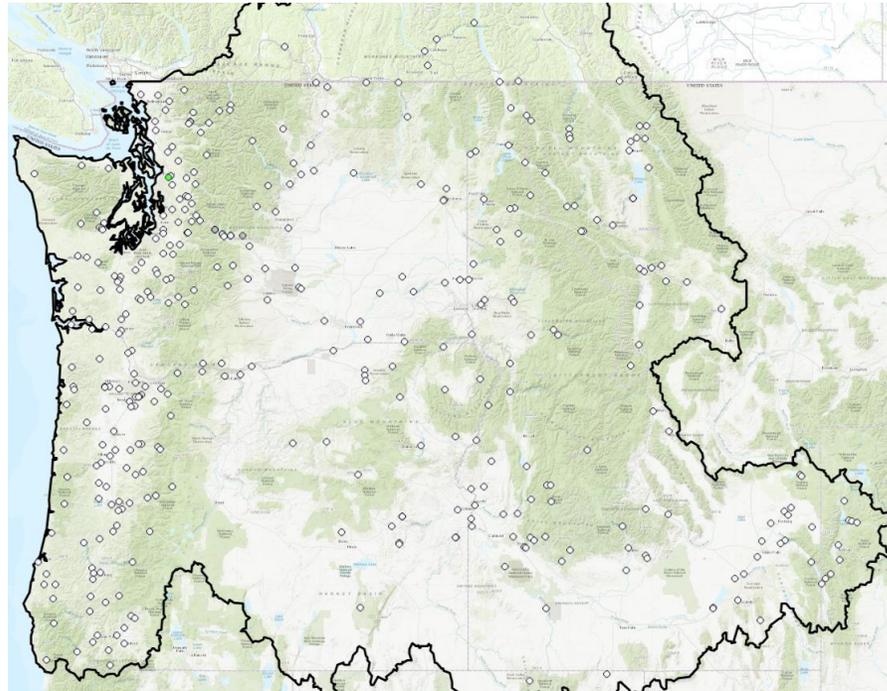
- The 00Z GFS is forecasting higher 10-day watershed precipitation totals in Southern Oregon and Northern California while ECMWF has slightly higher precipitation in the Olympic Peninsula
- The 00Z GFS is forecasting 5.28 inches of mean areal precipitation in the Chetco watershed over the next 10 days, while the 00Z ECMWF is forecasting 2.97 inches over the same watershed
- 10-day watershed precipitation forecasts include rainfall beyond what is expected with the current AR event.

NMWS River Stage Forecasts and Drought Monitor

NWS CNRFC



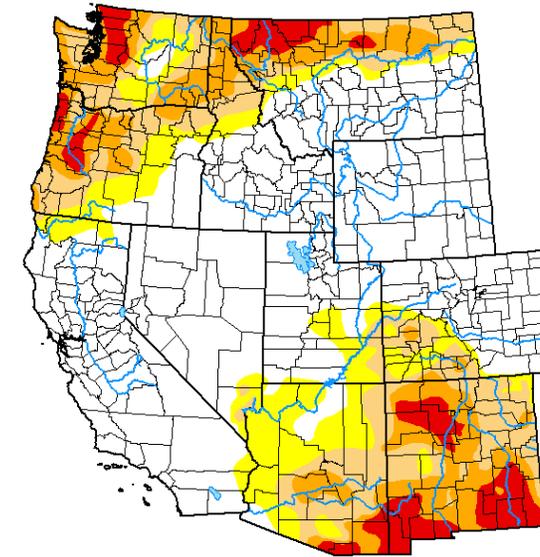
NWS NWRFC



US Drought Monitor

U.S. Drought Monitor West

September 19, 2023
(Released Thursday, Sep. 21, 2023)
Valid 8 a.m. EDT



Intensity:
None
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <http://droughtmonitor.unl.edu/About.aspx>

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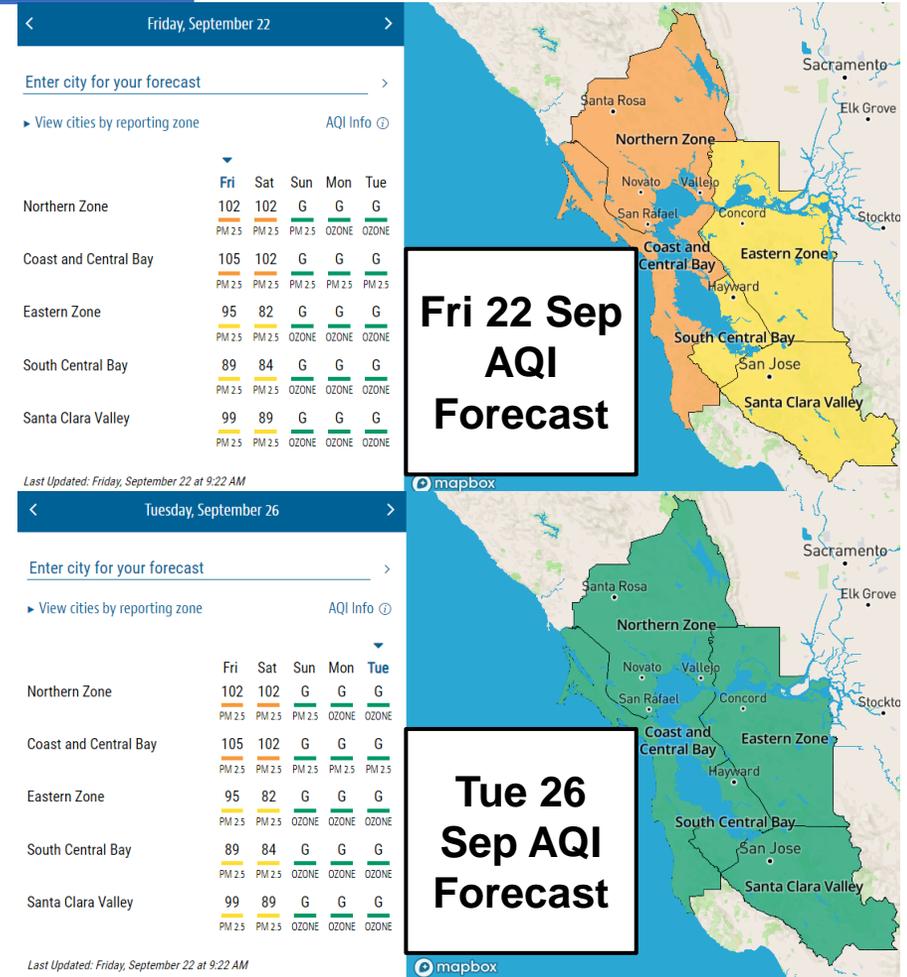


droughtmonitor.unl.edu

- Drought conditions are located over much of the Pacific Northwest, with a broad region of Severe Drought along the windward (west) side of the Cascades and Coast Ranges of Washington and Oregon, with embedded regions of Extreme Drought
- Almost all stations within the NWS CNRFC and NWRFC boundaries are forecast to remain below monitor or action stage.

Current Wildfires and Air Quality Forecast

InciWeb US Wildfire Map



Source: <https://www.sparetheair.org/understanding-air-quality/air-quality-forecast>

- The precipitation resulting from this AR should bring much needed help to much of the West Coast currently dealing with wildfires
- An associated benefit of wildfire help is improved air quality. Spare the Air's AQI forecast for the Bay Area shows improvements from unhealthy on Fri 22 Sep and Sat 23 Sep to good for Sun 24 Sep and beyond.