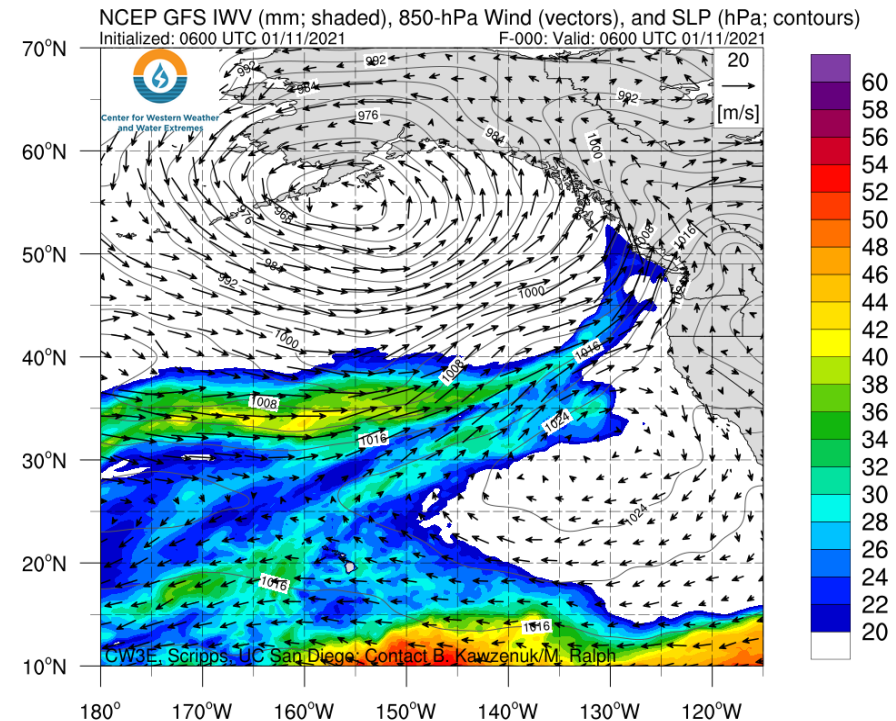
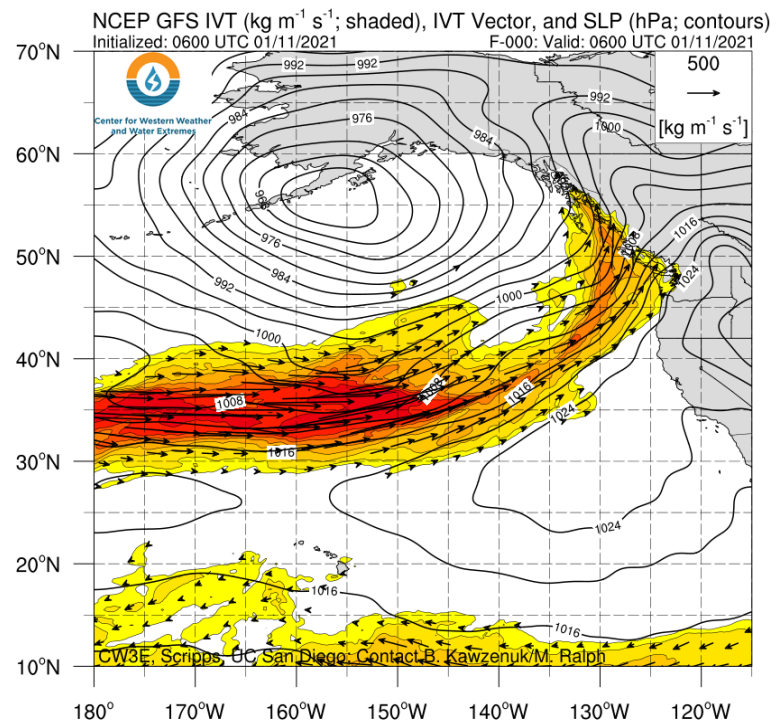


Strong atmospheric river to impact the Pacific Northwest this week

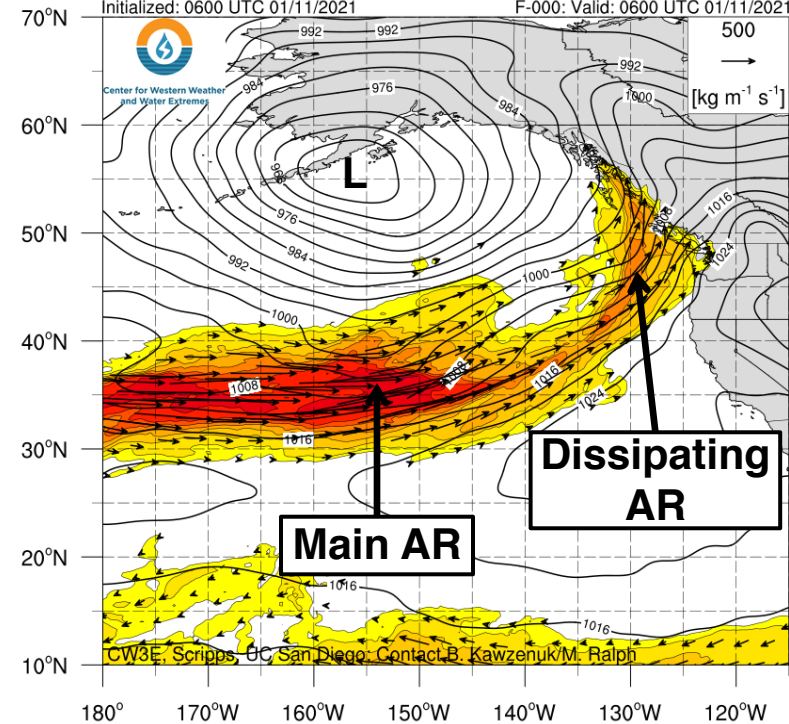
- A strong and zonally elongated atmospheric river (AR) is forecast to make landfall across Washington, Oregon, and Northern California today
- AR 4 conditions (based on the Ralph et al. 2019 AR Scale) are possible over coastal Oregon and Washington
- At least 3–7 inches of precipitation are expected in the Pacific Coast Ranges and Cascades
- More than 2 feet of snow is forecast in the higher terrain of the Olympic Mountains and Washington Cascades
- Intense precipitation falling in areas with saturated soils and existing burn scars from the 2020 wildfires may result in flooding and debris flows in western Washington and Oregon



GFS IVT & SLP Forecasts

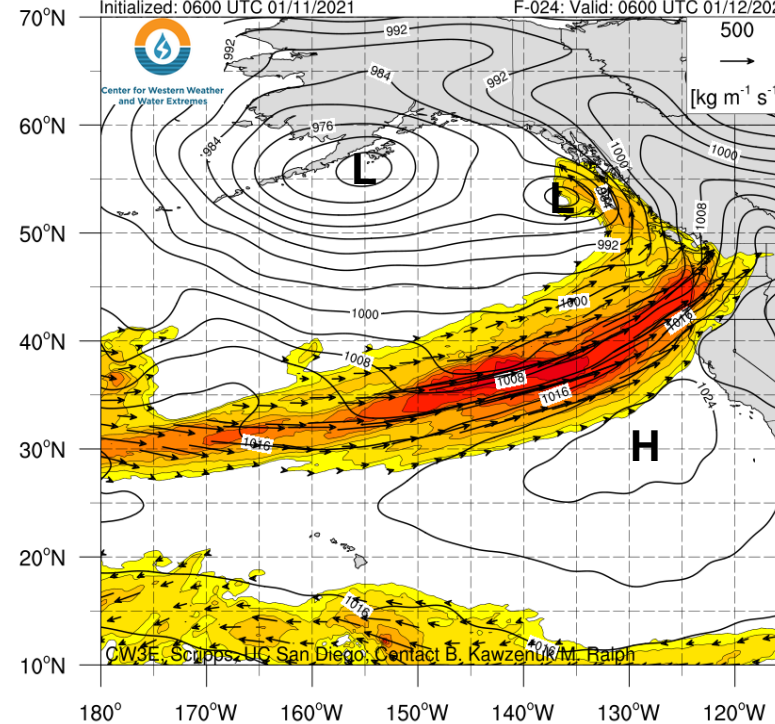
(A) Valid: 0600 UTC 11 Jan (F-0)

NCEP GFS IVT ($\text{kg m}^{-1} \text{s}^{-1}$; shaded), IVT Vector, and SLP (hPa; contours)
Initialized: 0600 UTC 01/11/2021 F-000: Valid: 0600 UTC 01/11/2021



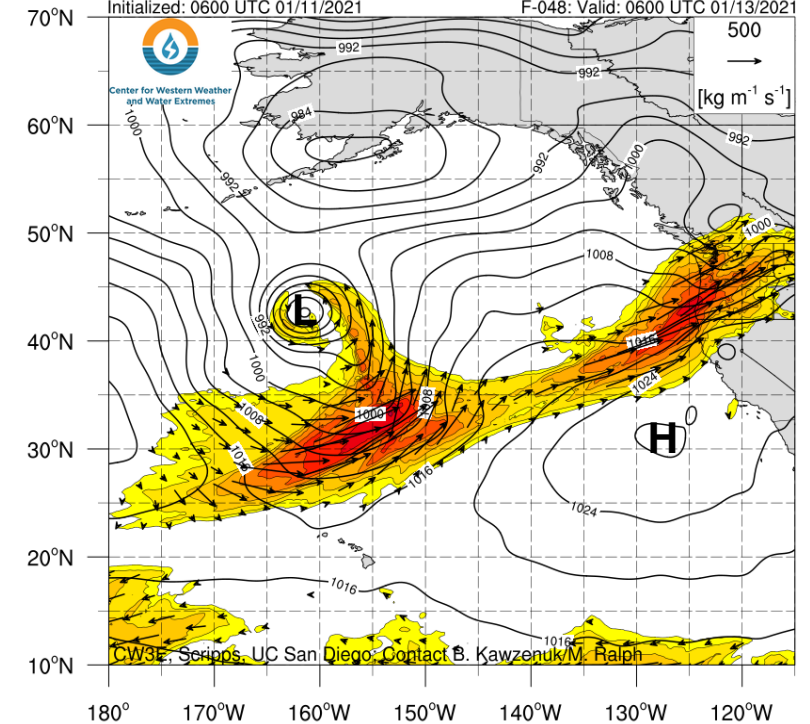
(B) Valid: 0600 UTC 12 Jan (F-24)

NCEP GFS IVT ($\text{kg m}^{-1} \text{s}^{-1}$; shaded), IVT Vector, and SLP (hPa; contours)
Initialized: 0600 UTC 01/11/2021 F-024: Valid: 0600 UTC 01/12/2021



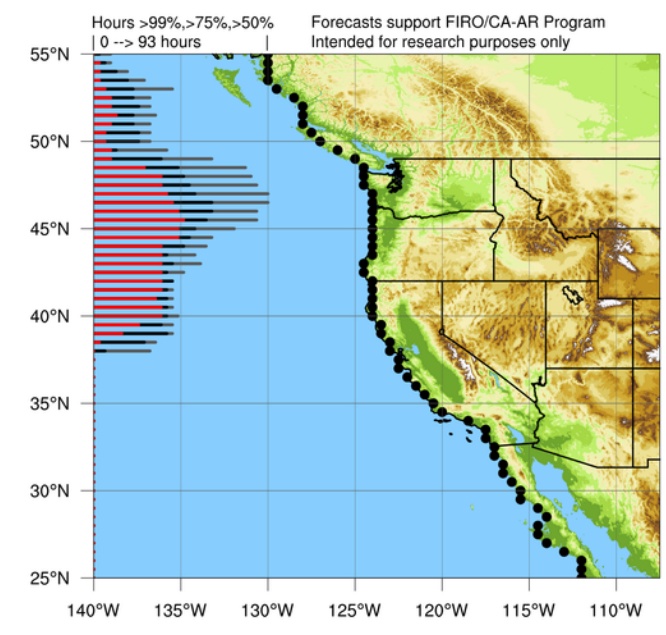
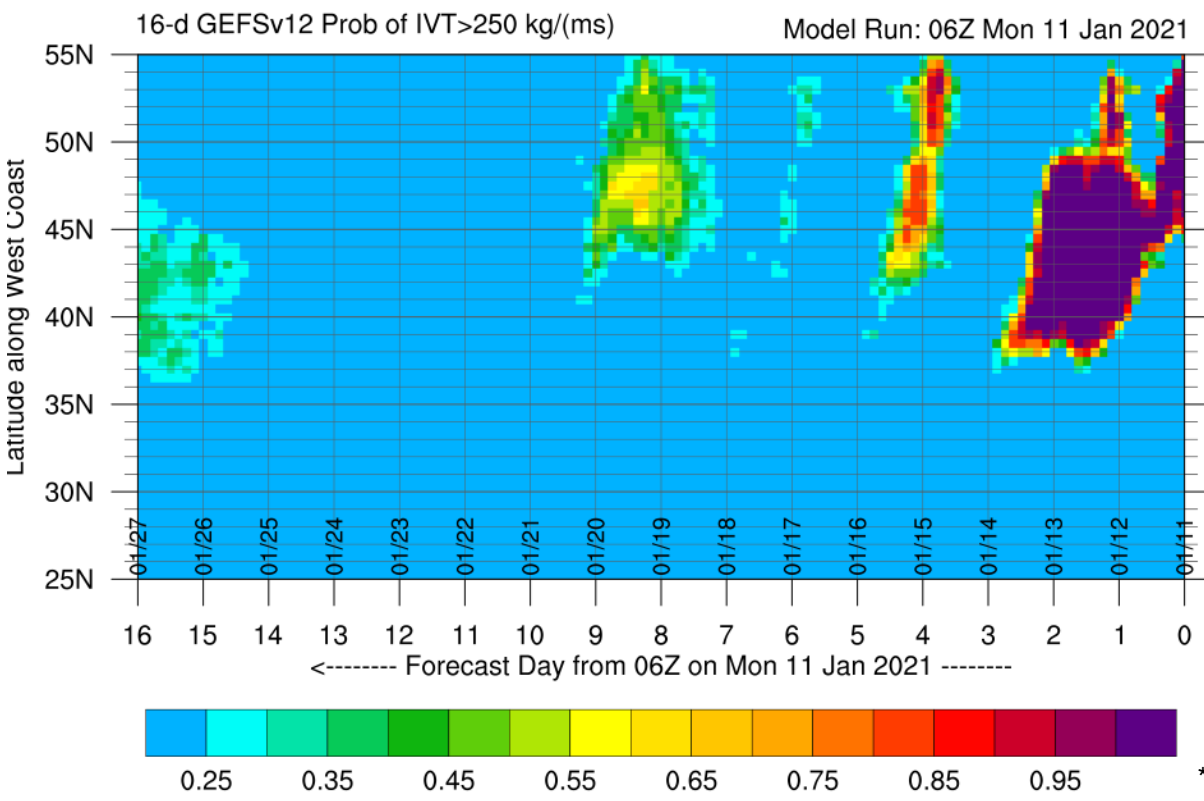
(C) Valid: 0600 UTC 13 Jan (F-48)

NCEP GFS IVT ($\text{kg m}^{-1} \text{s}^{-1}$; shaded), IVT Vector, and SLP (hPa; contours)
Initialized: 0600 UTC 01/11/2021 F-048: Valid: 0600 UTC 01/13/2021

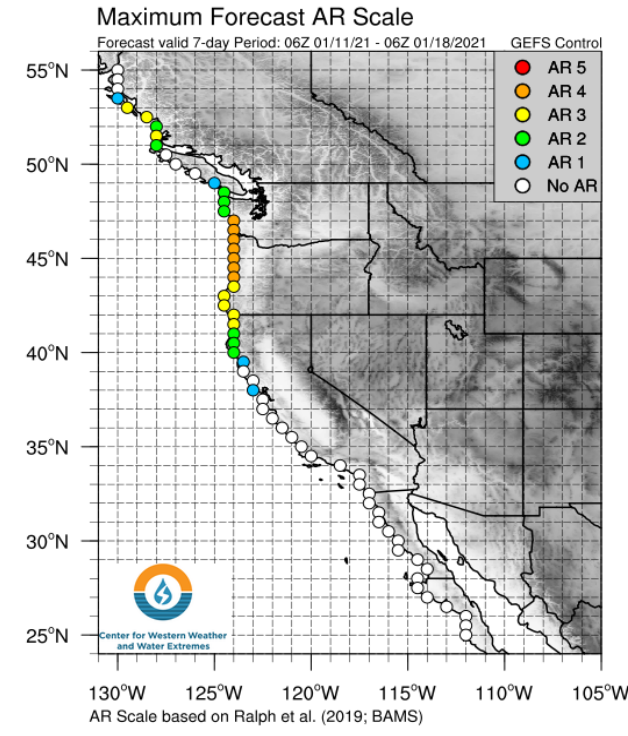


- The 06Z 11 Jan GFS analysis shows a dissipating AR over coastal British Columbia and a strong, zonally elongated AR over the Northeast Pacific Ocean (Figure A)
- The core of the second AR will make landfall along the U.S. West Coast late today as a frontal wave undergoes cyclogenesis on the poleward side of the AR (Figure B)
- Multiple pulses of higher IVT are possible in association with a series of frontal waves over the next 48 hours
- The strongest moisture transport may occur during this last burst of IVT around 06Z 13 Jan (Figure C)

Probability of AR Conditions Along Coast



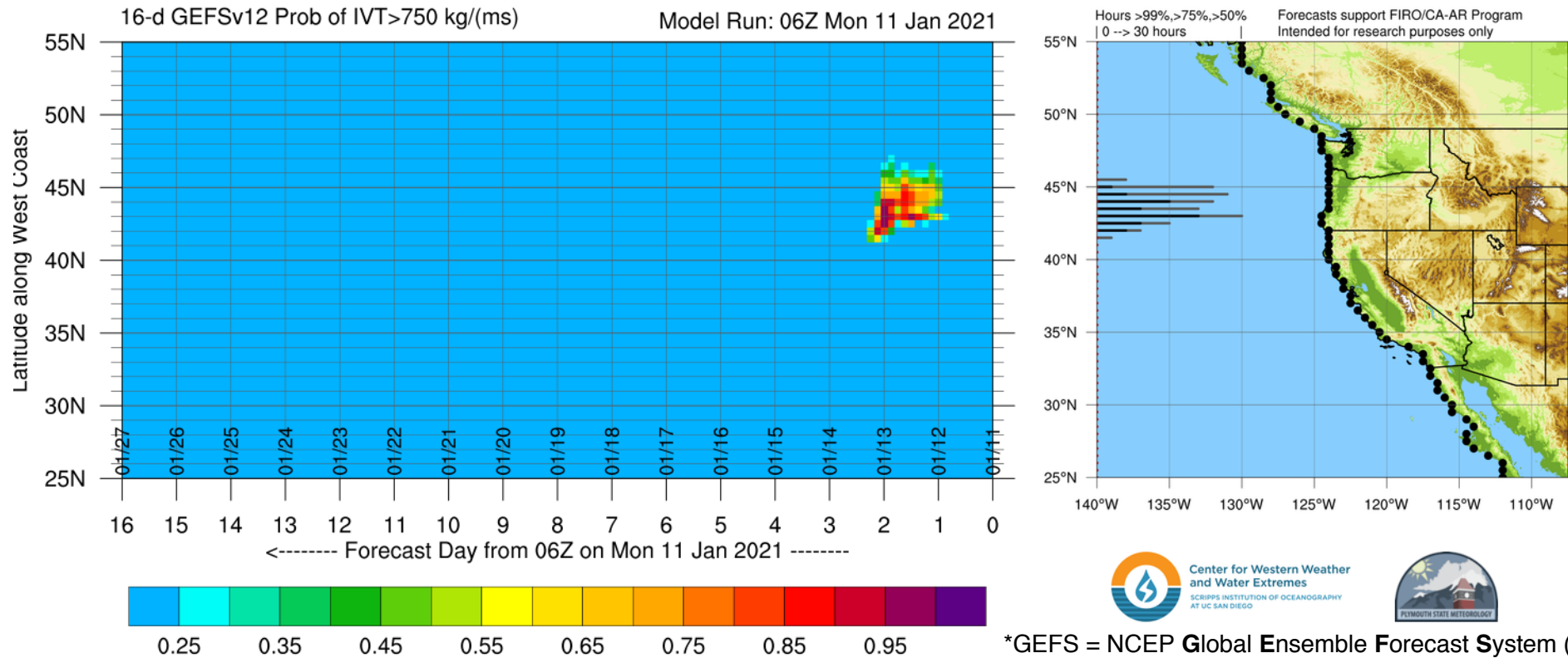
AR Scale



*GEFS = NCEP Global Ensemble Forecast System (United States)

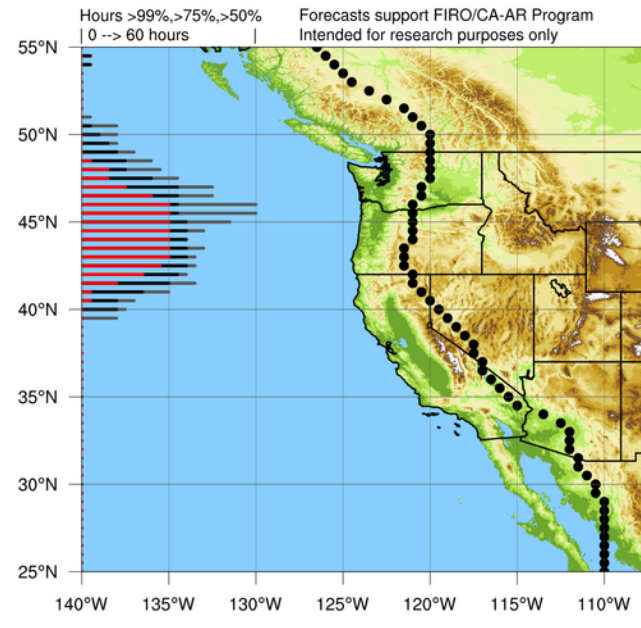
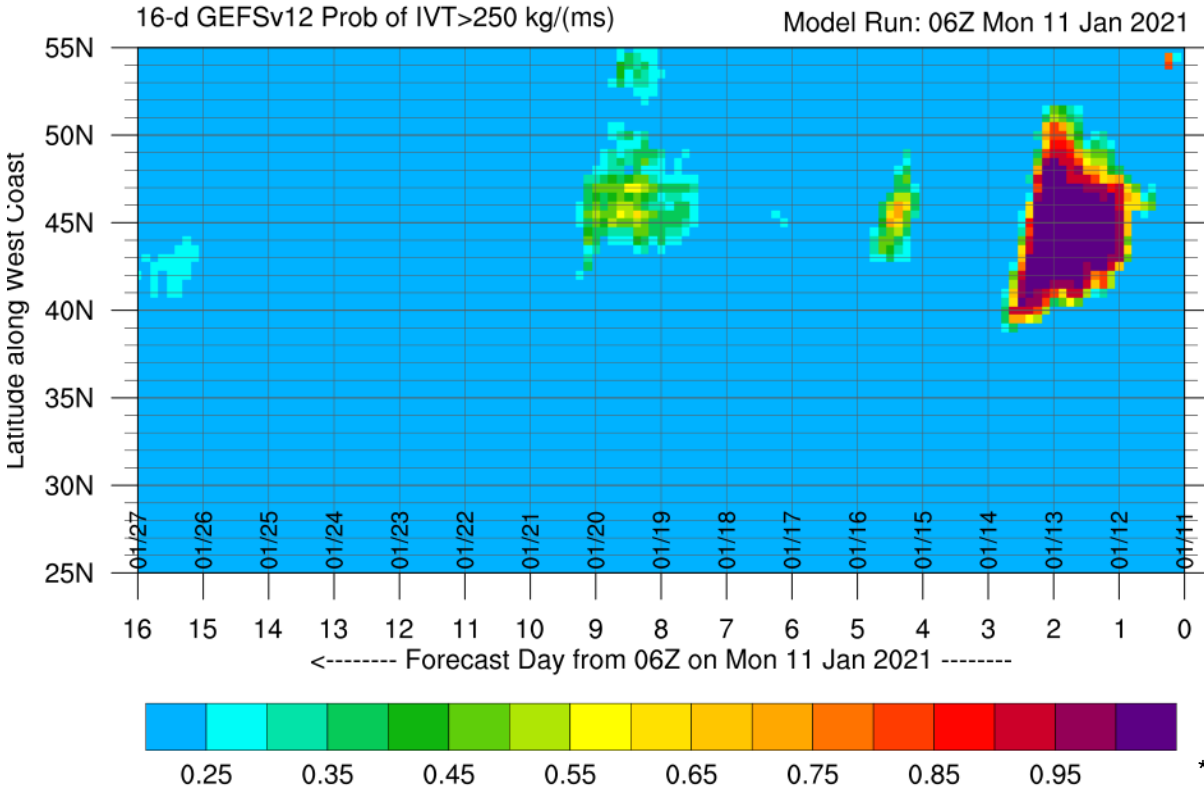
- The 06Z GEFS is showing very high confidence (> 95% probability) in a period of AR conditions (IVT > 250 kg m⁻¹ s⁻¹) along the U.S. West Coast on 11–13 Jan
- Some locations in coastal Oregon and Washington may experience AR conditions for more than 48 consecutive hours
- AR 4 conditions (based on the Ralph et al. 2019 AR Scale) are possible in these areas
- Another brief period of AR conditions is likely (> 70% probability) over coastal Oregon and Washington on 15 Jan

Probability of Strong AR Conditions Along Coast

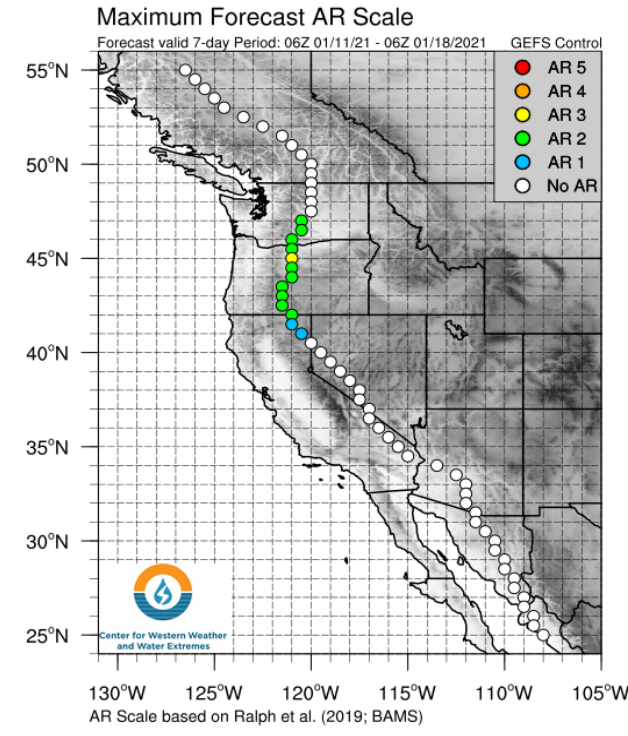


- Parts of coastal Oregon will likely experience a period of strong AR conditions ($IVT > 750 \text{ kg m}^{-1} \text{ s}^{-1}$)
- The highest probability of strong AR conditions coincides with a pulse of moisture transport that some ensemble members are forecasting to occur around 06Z 13 Jan

Probability of AR Conditions Inland



AR Scale

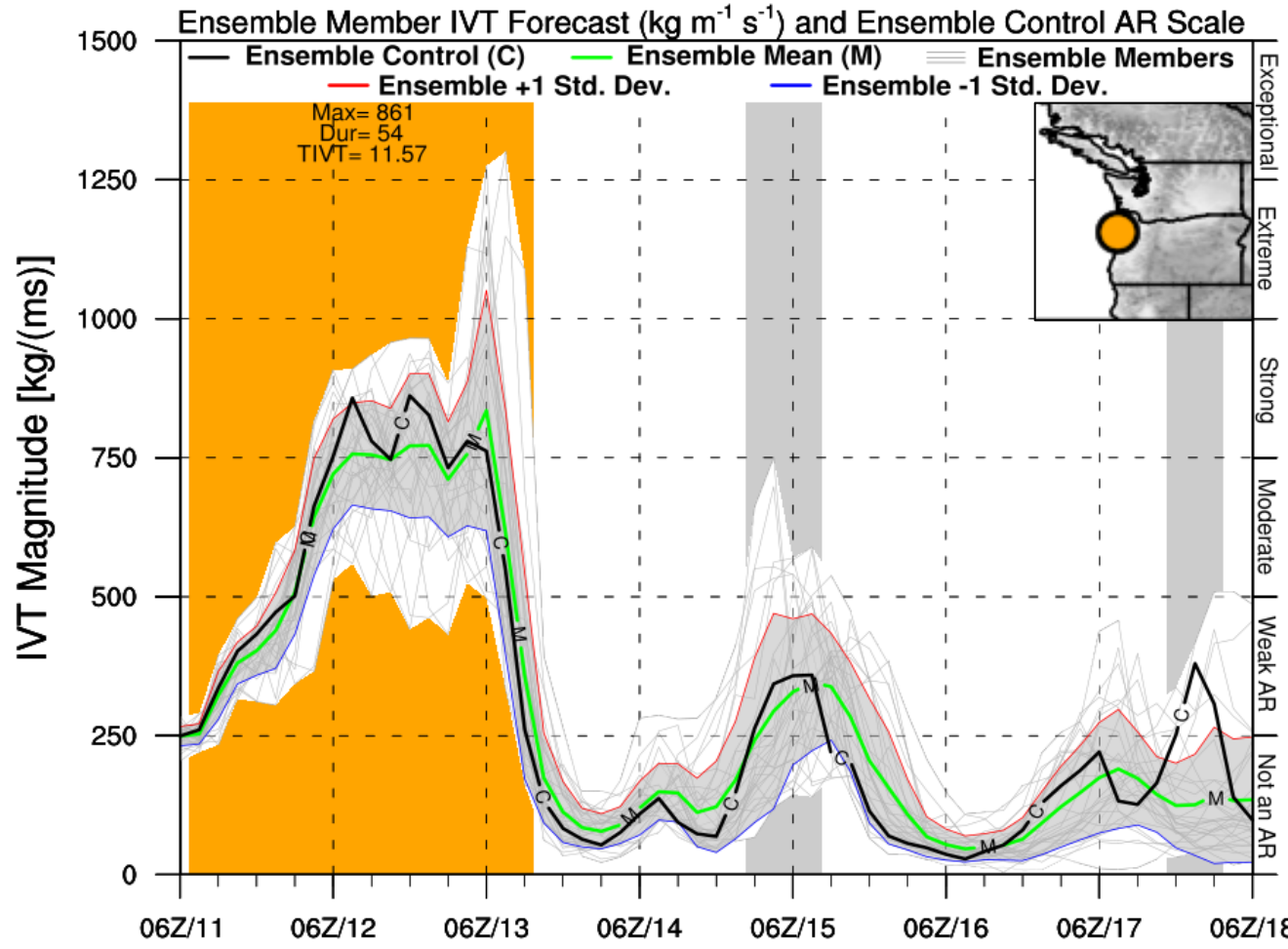


*GEFS = NCEP Global Ensemble Forecast System (United States)

- The 06Z GEFS is also showing very high confidence (> 95% probability) in a period of AR conditions over interior portions of the Pacific Northwest during 11–13 Jan
- AR 2/AR 3 conditions are possible over interior Oregon and interior southern Washington

GEFS IVT/AR Scale Forecasts

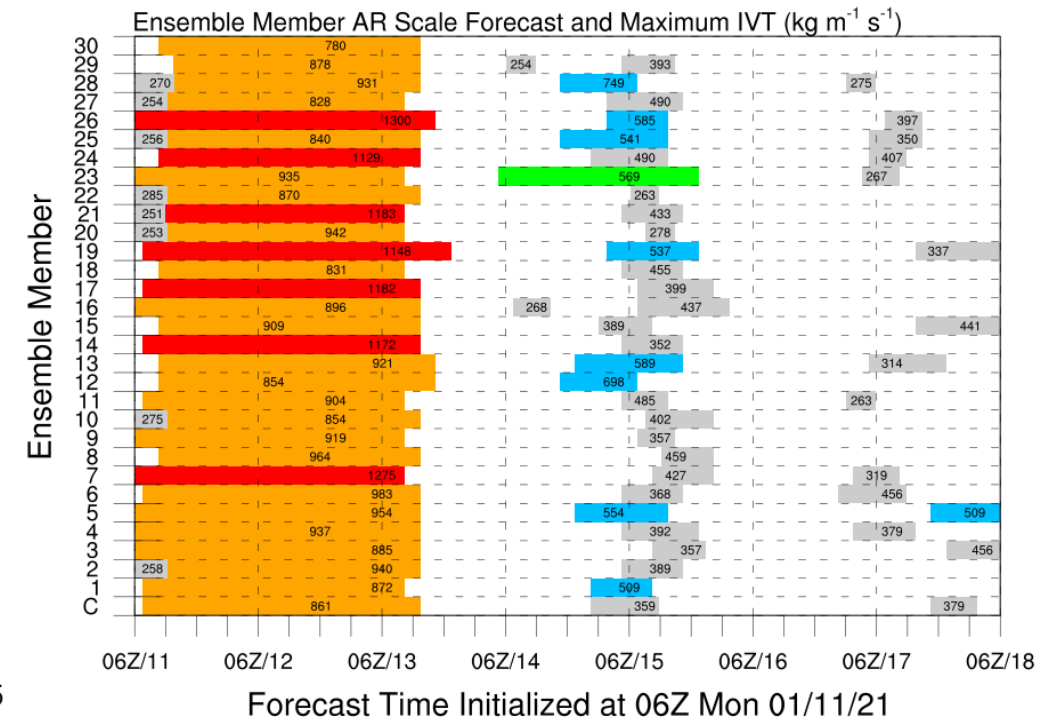
GFS Ensemble Initialized: 06Z Mon 01/11/21



AR 1 (Blue), AR 2 (Green), AR 3 (Yellow), AR 4 (Orange), AR 5 (Red)

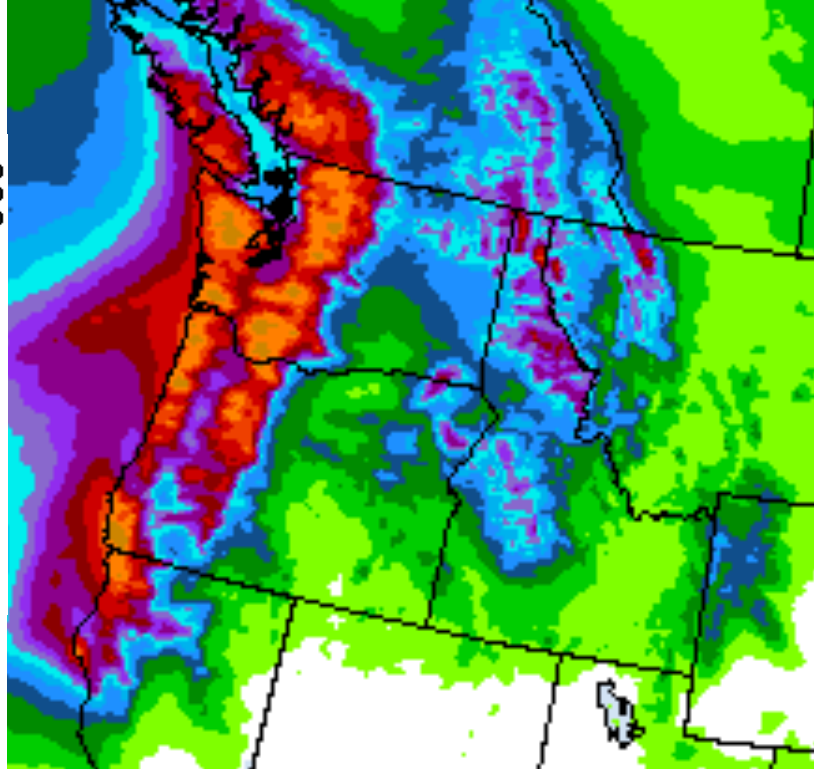
Categorical AR Strength by Ralph/CW3E

- 06Z GEFS control run is currently forecasting an AR 4 at 45°N, 124°W (near Lincoln City, OR) based on the Ralph et al. 2019 AR Scale
- All ensemble members are forecasting at least AR 4 conditions at this location
- There is some uncertainty in the IVT magnitude, with 7 ensemble members forecasting a maximum IVT > 1000 kg m⁻¹ s⁻¹

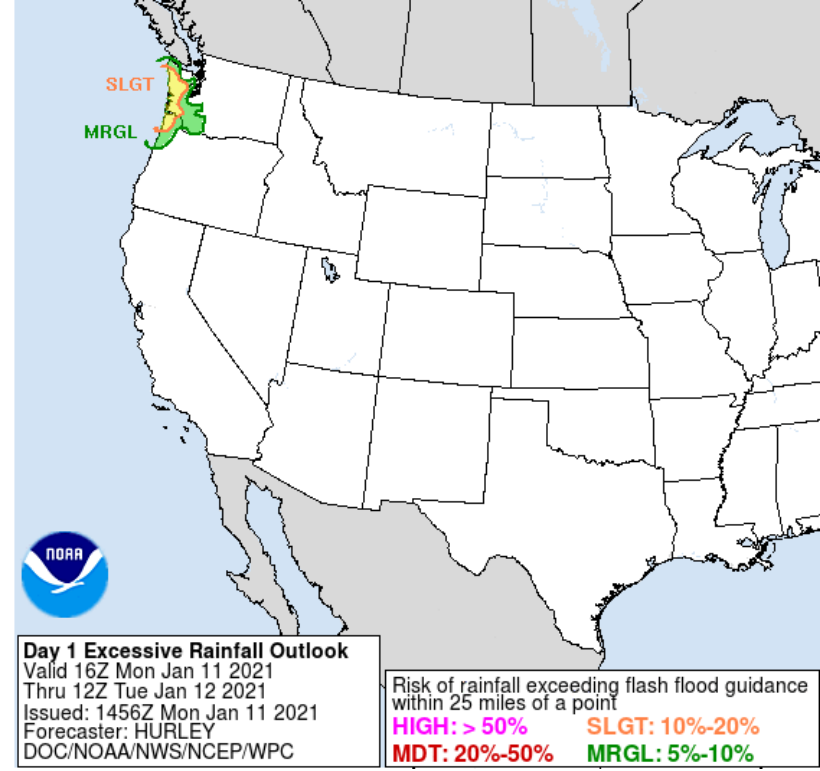


Precipitation Impacts

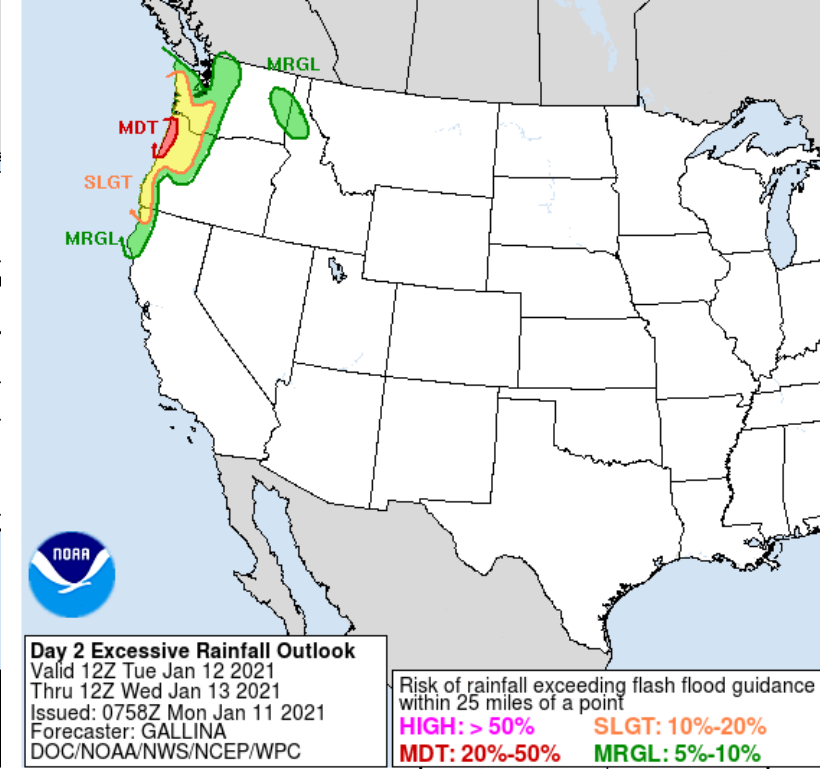
WPC 72-h QPF: Valid 12Z 11–14 Jan 2021



WPC Day 1 Excessive Rainfall Outlook



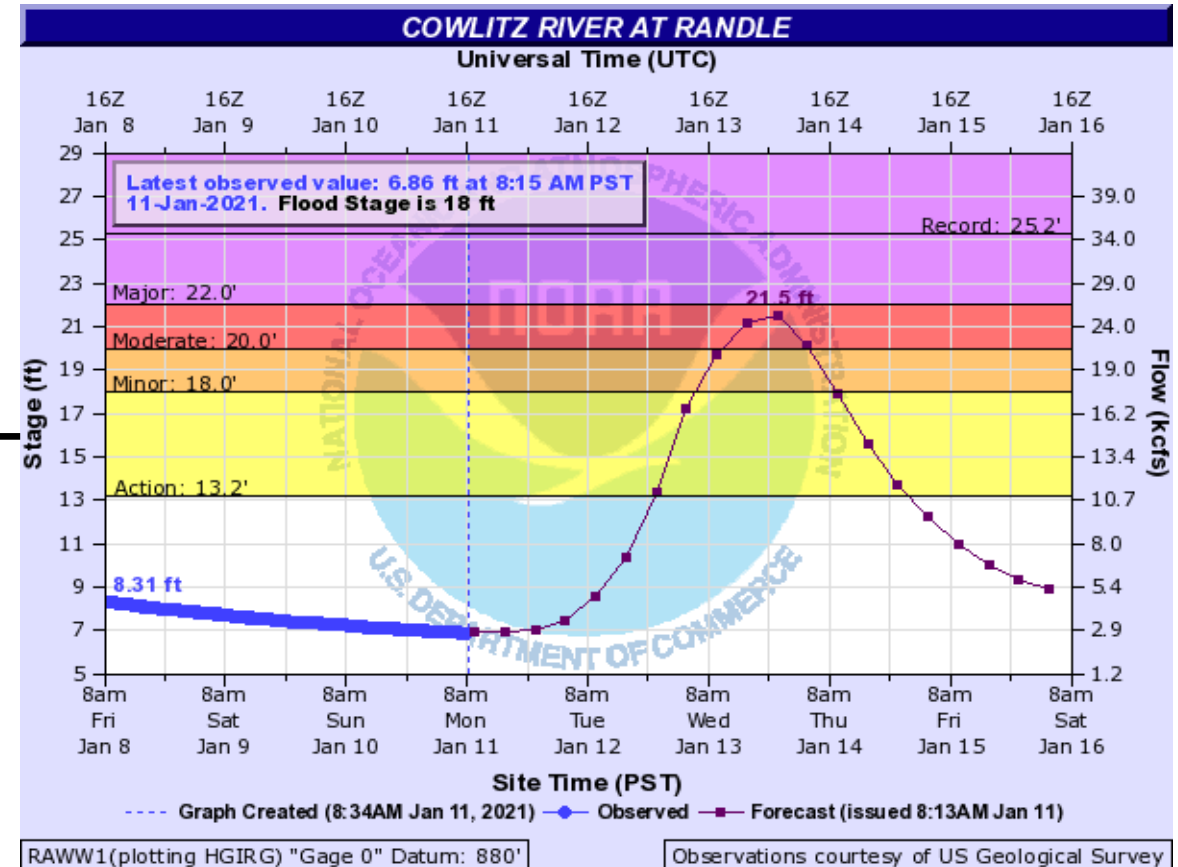
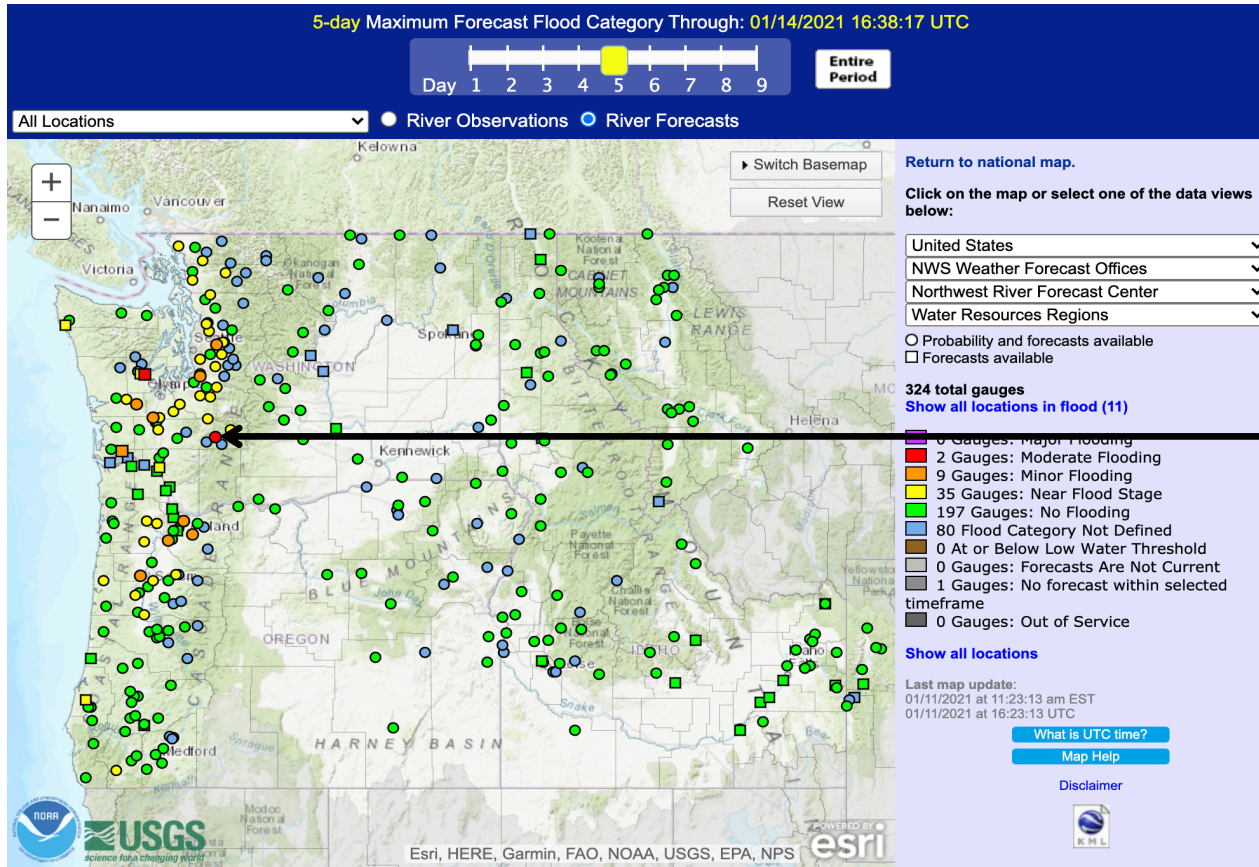
WPC Day 2 Excessive Rainfall Outlook



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

- The NWS Weather Prediction Center (WPC) is currently forecasting at least 3–7 inches of total precipitation in the Pacific Coast Ranges and Cascades during the next 3 days, with more than 7 inches possible in some areas
- The combination of strong upslope moisture flux and dynamical forcing for ascent is expected to produce rainfall rates in excess of 0.50 inches/hour in western Washington and Oregon
- Given the saturated soil conditions in these areas, the WPC has issued a slight-to-moderate risk of excessive rainfall

Precipitation Impacts

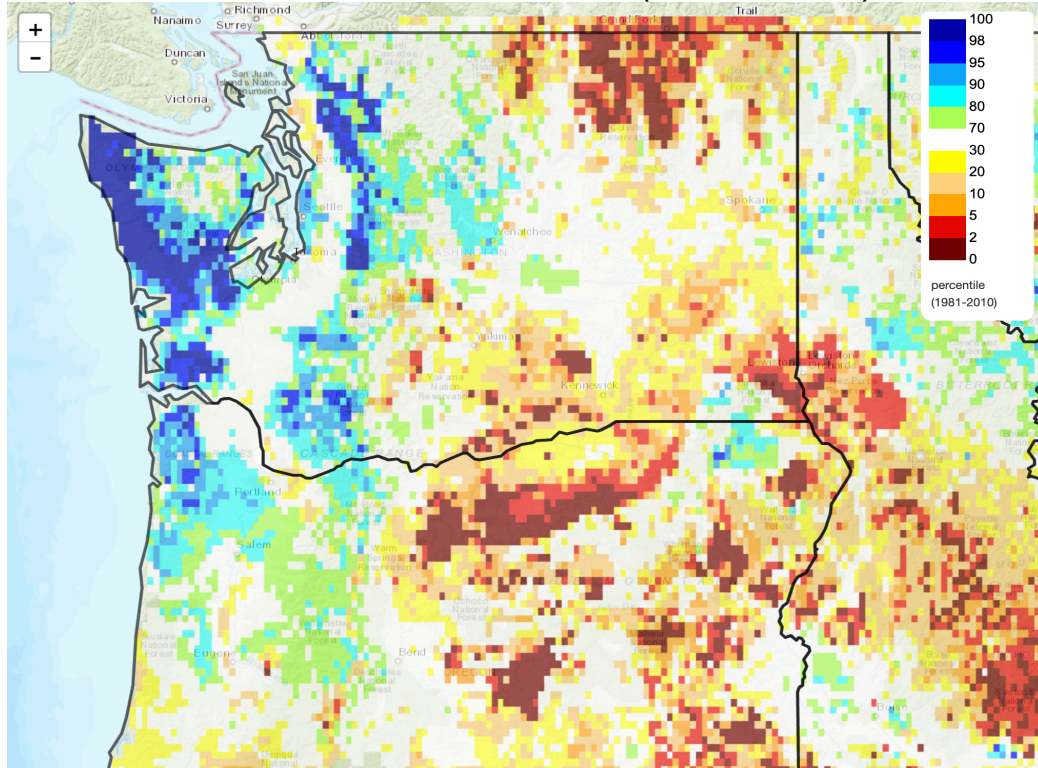


Source: NOAA/NWS Advanced Hydrologic Prediction Service, <https://water.weather.gov/ahps/>

- Several rivers in western Washington and northwestern Oregon are forecast to exceed flood stage during the next 5 days
- The Cowlitz River (at Randle, WA), is forecast to rise more than 14 feet between Monday morning (11 Jan) and Wednesday night (13 Jan), reaching a maximum stage of 21.5 feet (moderate flood stage)

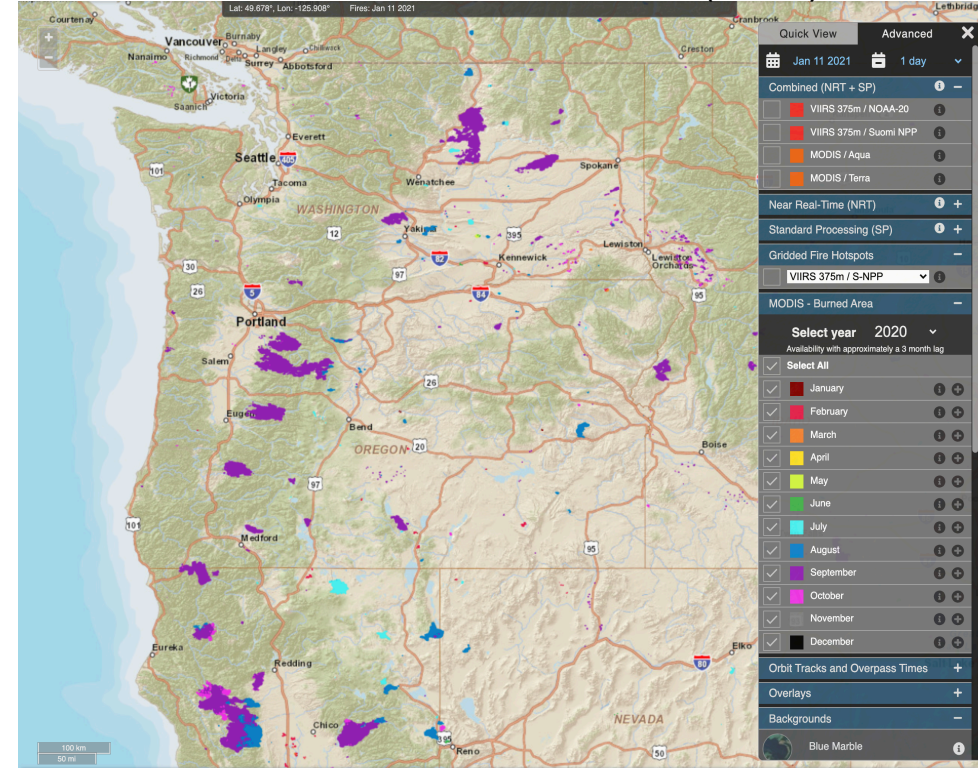
Precipitation Impacts

Soil Moisture Percentile (5 Jan 2021)



Source: UC Merced Climate Toolbox, <https://climatetoolbox.org/>


NASA MODIS Burned Area (2020)



Source: NASA FIRMS, <https://firms2.modaps.eosdis.nasa.gov/org/>

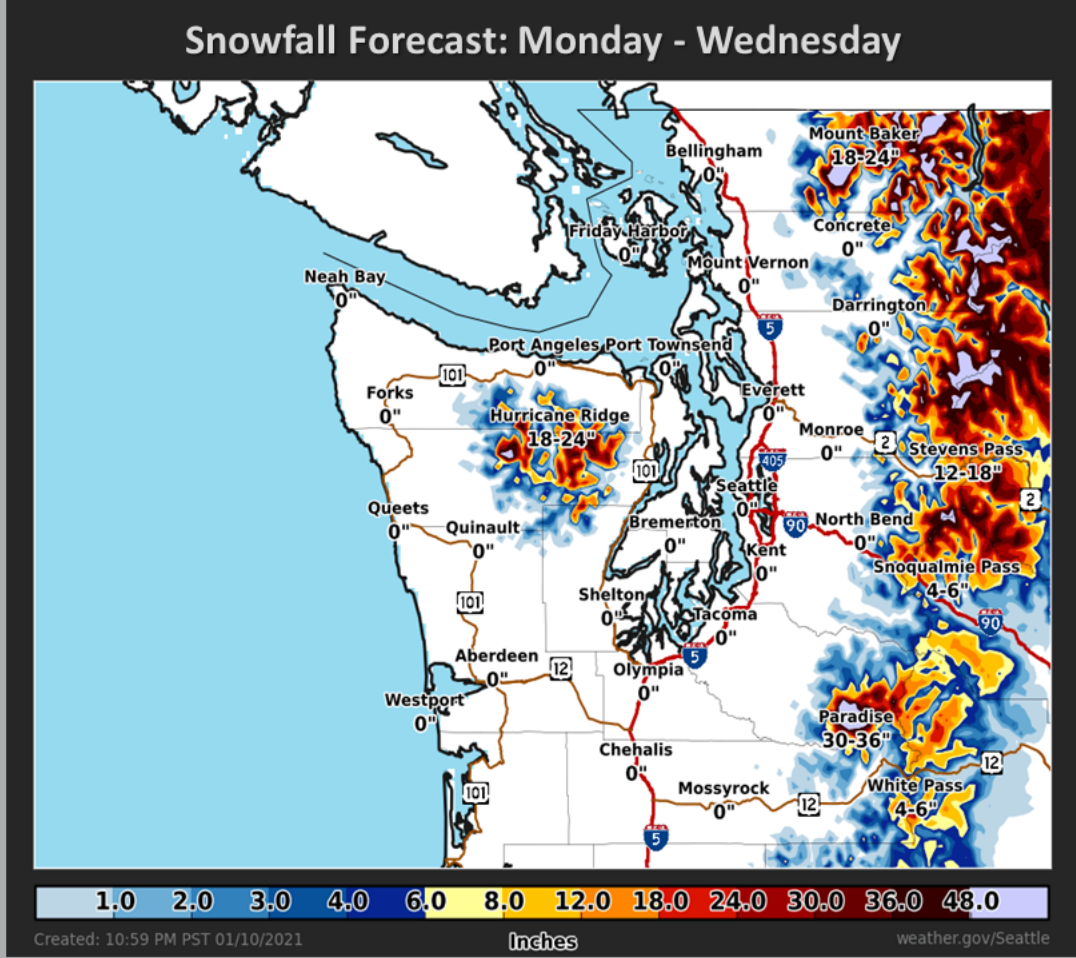
- As of 5 Jan, soils in western Washington and northwestern Oregon were anomalously wet, with soil moisture exceeding the 95th percentile of climatology (based on 1981–2010) in some areas
- Heavy precipitation on saturated or nearly saturated soils will likely produce flooding in these areas
- Intense precipitation in areas with existing burn scars from the 2020 wildfires may create a favorable situation for debris flows in parts of western Oregon, particularly in the western foothills of the Cascades

Monday – Wednesday Timeline


NATIONAL WEATHER SERVICE
NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION | *Seattle*

Monday	<ul style="list-style-type: none"> Snow begins in the morning, continues throughout the day. Snow levels 3500-4500 feet.
Monday Night	<ul style="list-style-type: none"> Snow levels rise steadily to 6000+ feet in the Olympics and 4500-6000 feet in the Cascades. Rain at Snoqualmie Pass.
Tuesday	<ul style="list-style-type: none"> Rain below 5000-7000 feet. Cold air could linger longer at Stevens Pass in the morning for more snow.
Wednesday	<ul style="list-style-type: none"> Snow levels drop back down to the pass levels. Snow tapers off by the evening.

Snow Levels Tricky forecast remains with timing of switch from rain to snow at the Cascade passes. Check WSDOT road conditions before you go!



Source: NWS Seattle, <https://www.weather.gov/sew/>

- This AR will also produce significant snowfall accumulations in the Olympic Mountains and the Washington Cascades
- Locations above 6,000 ft are forecast to receive at least 2–4 feet of snow during the next 3 days