

Washington Water Supply Availability Committee
Hosted by Jeff Marti



<https://watech.webex.com/watech/j.php?MTID=m2f550fdef5a573c1cdb27dc706ffbfd9>

Friday, Jul 23, 2021 10:00 am | 1 hour 30 minutes | (UTC-07:00) Pacific Time (US & Canada)

Meeting number: 177 989 9504

Password: clearSkies1

Agenda: The Washington State Water Supply Availability Committee (WSAC) meets periodically to monitor water supply conditions and forecasts for Washington State.

Join by video system

Dial 1779899504@webex.com

You can also dial 173.243.2.68 and enter your meeting number.

Join by phone

+1-415-655-0001 US Toll

+1-206-207-1700 United States Toll (Seattle)

Access code: 177 989 9504

Washington Water Supply Availability Committee

July 23, 2021

Join by phone

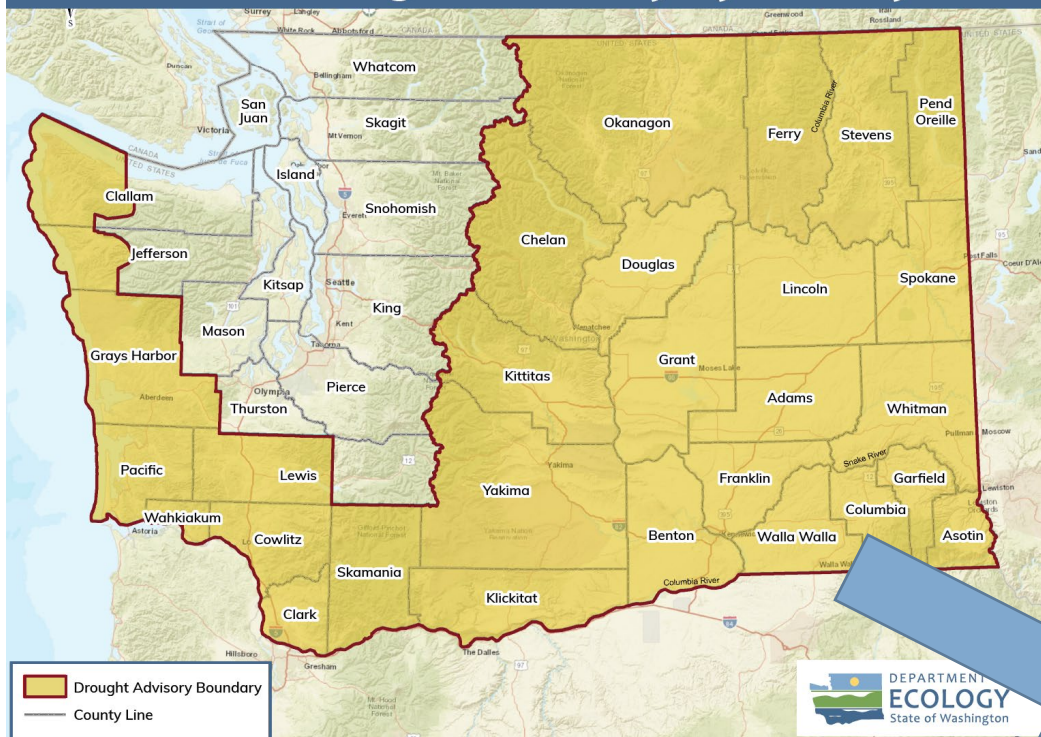
+1-415-655-0001 US Toll

+1-206-207-1700 United States Toll (Seattle)



Time	Subject	Responsible	Representing
10:00– 10:10	Welcome Drought Declaration Overview	Jeff Marti	Ecology
10:10-10:20	Mountain report	Scott Pattee	NRCS
10:20-10:35	Regional Climate Perspective 1. Recent precipitation and temperature 2. Seasonal forecasts/ENSO	Karin Bumbaco Nick Bond	Office of Washington State Climatologist
10:35-10:45	Streamflow Conditions	Rick Dinicola Dan Restivo	USGS
10:45-11:00	Mid season retrospective on streamflow forecasts	Amy Burke, NWS NWRFC	NWS-NWRFC
11:00-11:10	Yakima Basin	Chris Lynch	BOR
11:10-11:30	Reports from Other Water Managers Impact reports	All	
	Next Meeting: Propose Friday August 13 th at 10:00 am		

2021 Drought Advisory by County



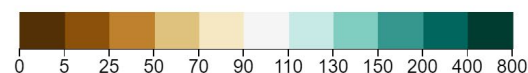
Washington Drought Declaration Areas



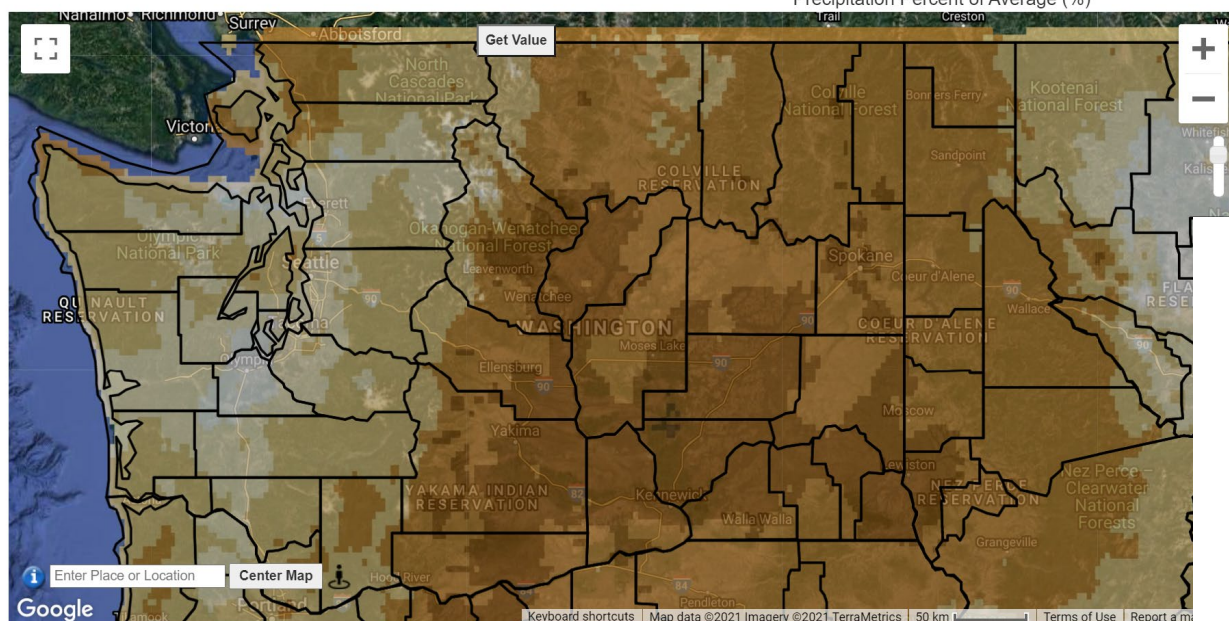
90 Day Precip, Percent of Average

Precipitation Percent Of Average (gridMET)

2021-04-21 to 2021-07-19, Total, vs. 1981 - 2010



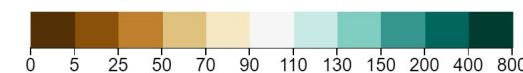
Precipitation Percent of Average (%)



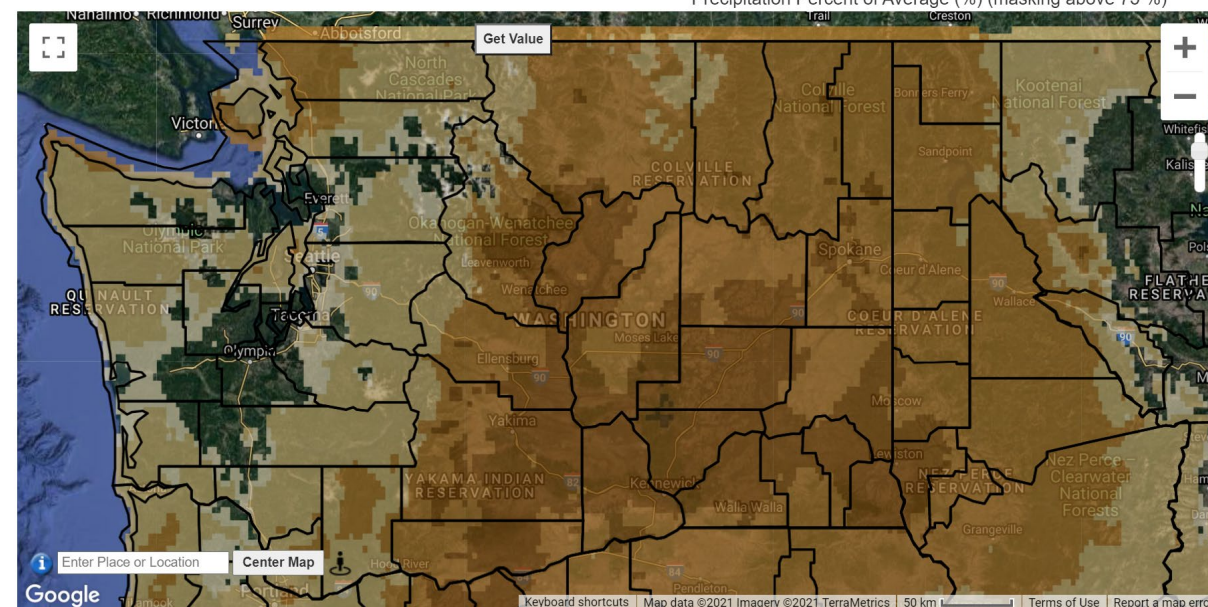
Masking applied >75%

Precipitation Percent Of Average (gridMET)

2021-04-21 to 2021-07-19, Total, vs. 1981 - 2010



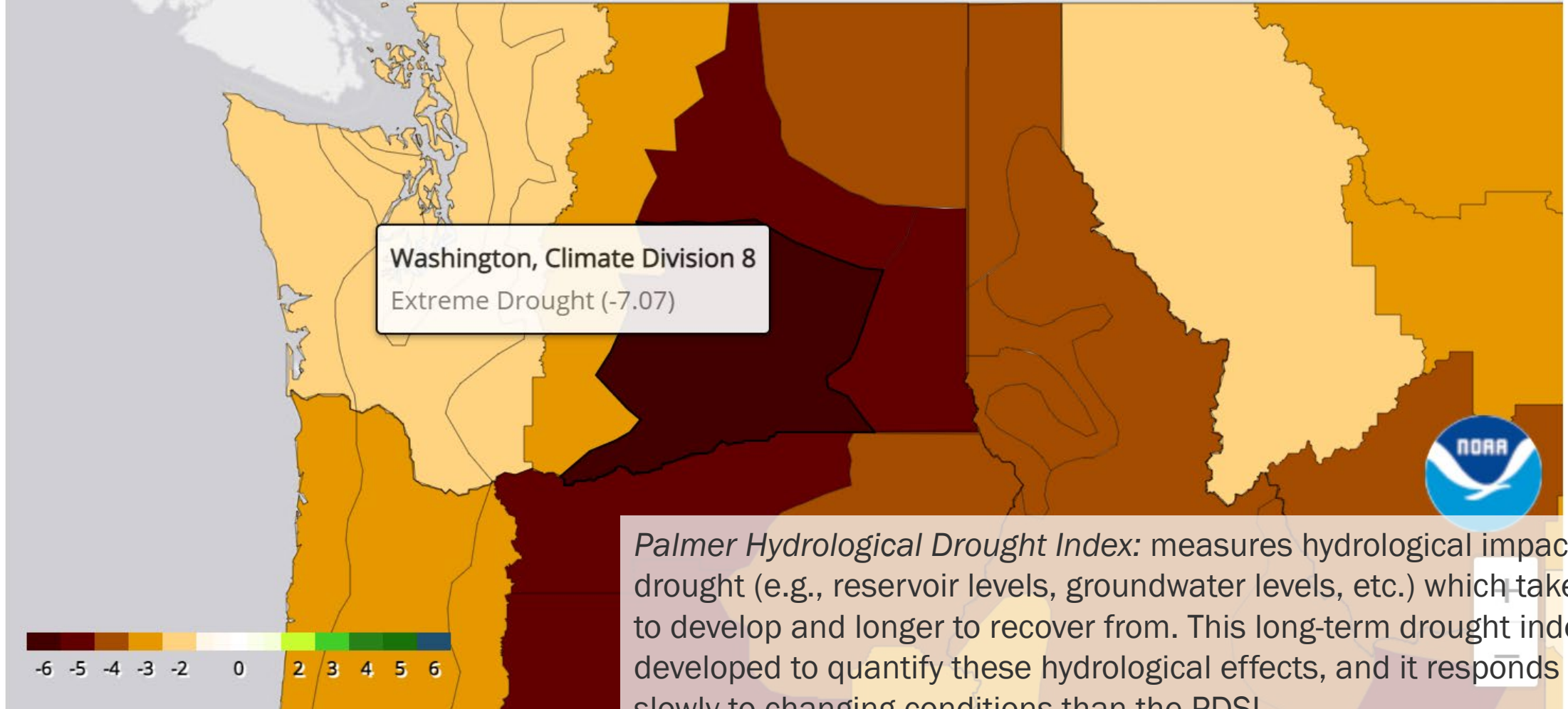
Precipitation Percent of Average (%) (masking above 75 %)



Palmer Hydrological Drought Index

Climatological Conditions
20 Jul 2021

OF
Y
on

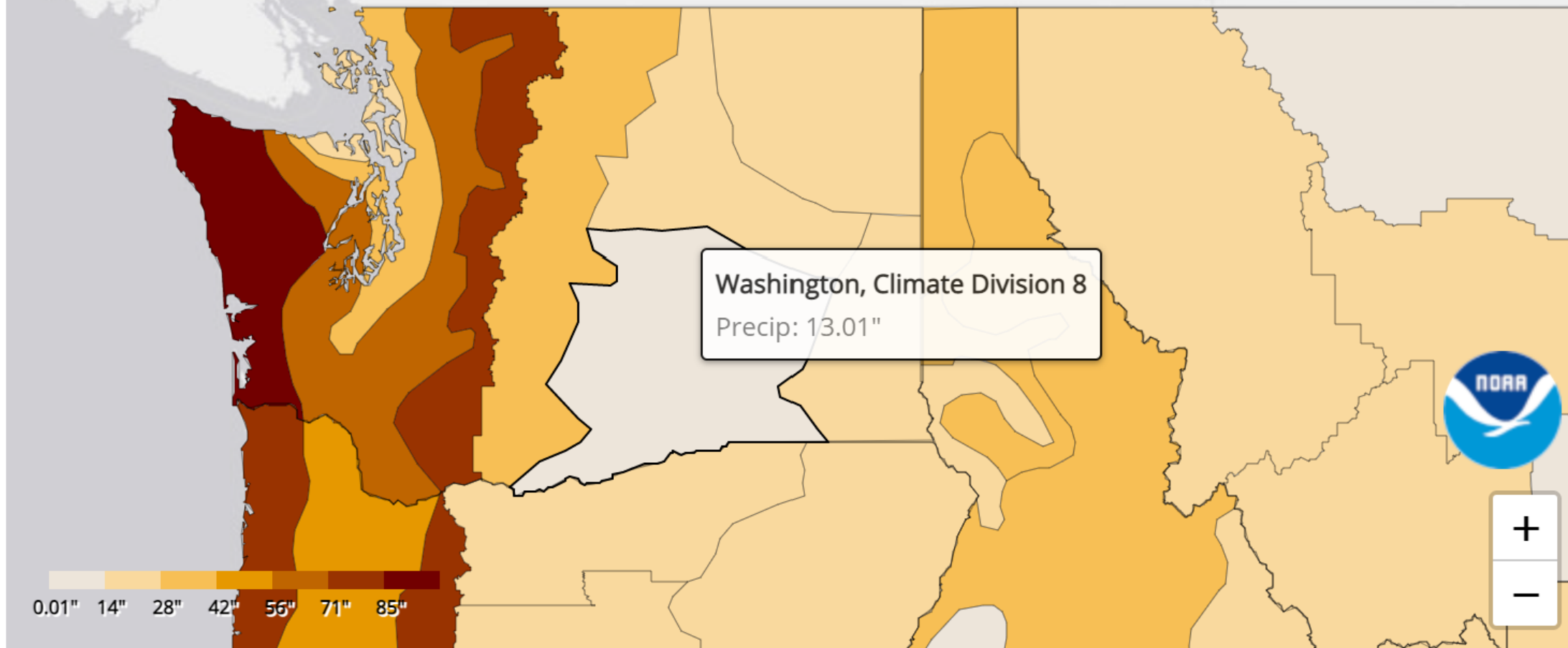


A drought is considered to be ameliorated when the PHDI is raised to -2.0, and ended when above -0.5.

Save as PNG

Precip Needed to End Drought Conditions in 9 Months

Climatological Conditions
20 Jul 2021



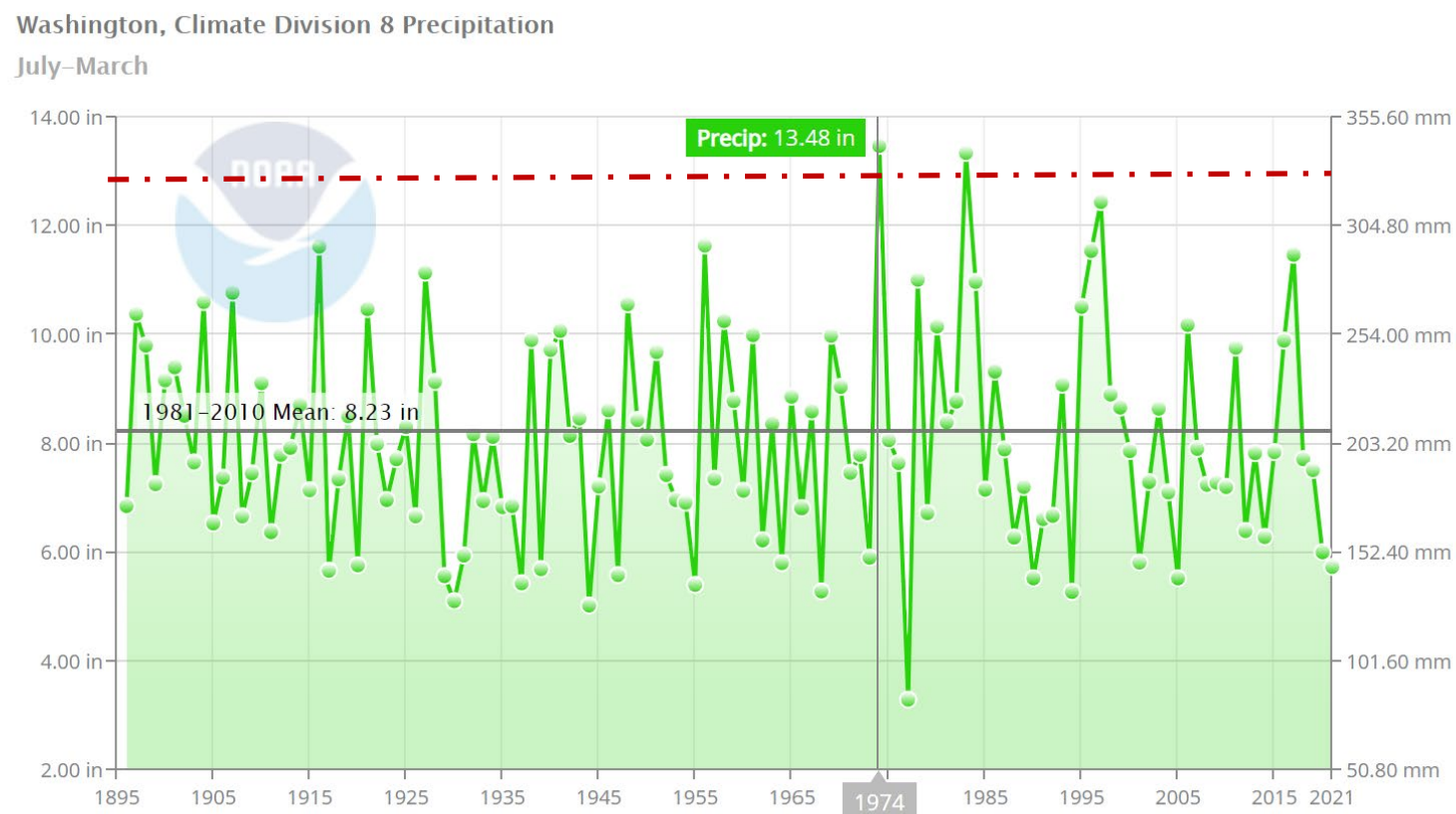
Based on the PHDI. PHDI is a primary measure of long-term drought but may not apply to all areas, including those with heavily managed surface water. No additional precipitation is needed for white areas.

What is the average 9-month precipitation for the Central Basin Climate Division from July – March?

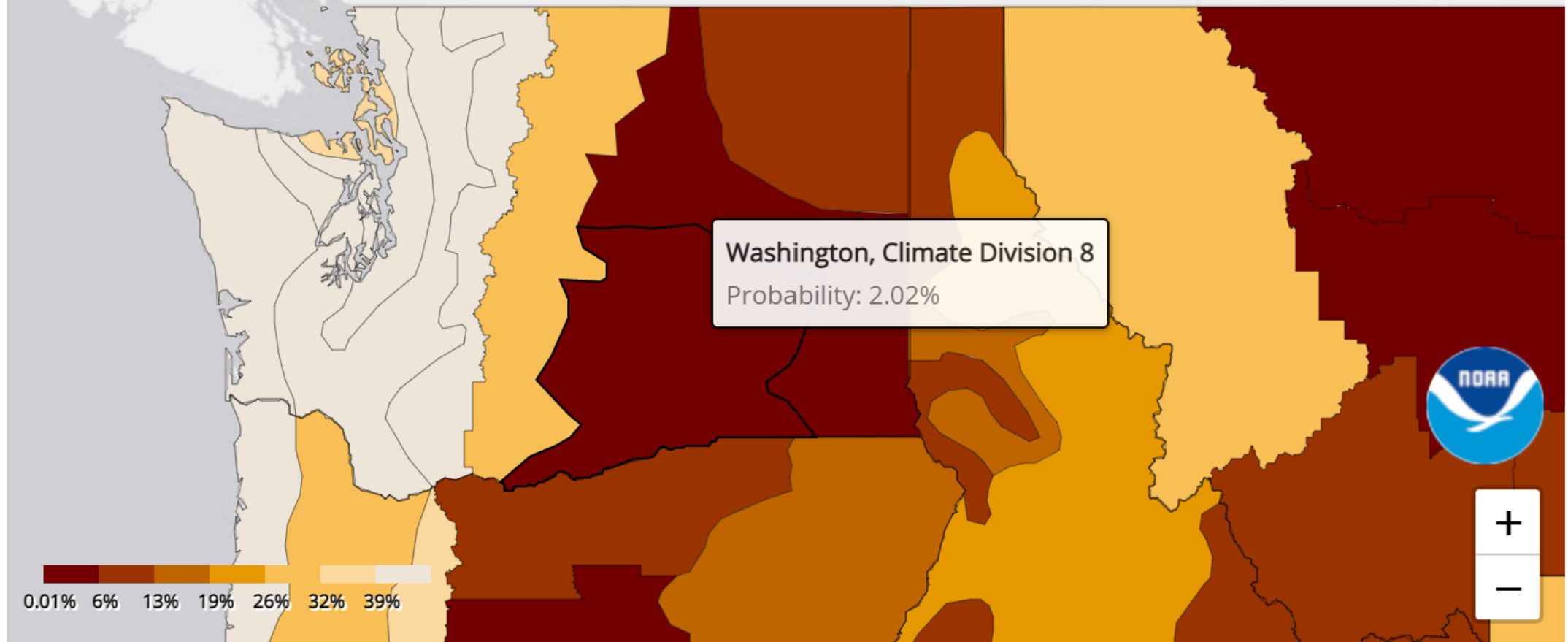
8.23 inches (1981-2010)

In how many years since 1895, has the July – March amount exceeded 13.01 inches (our “need” amount)?

2 years. 1982-1983 (El Nino), and 1973-1974 (La Nina)



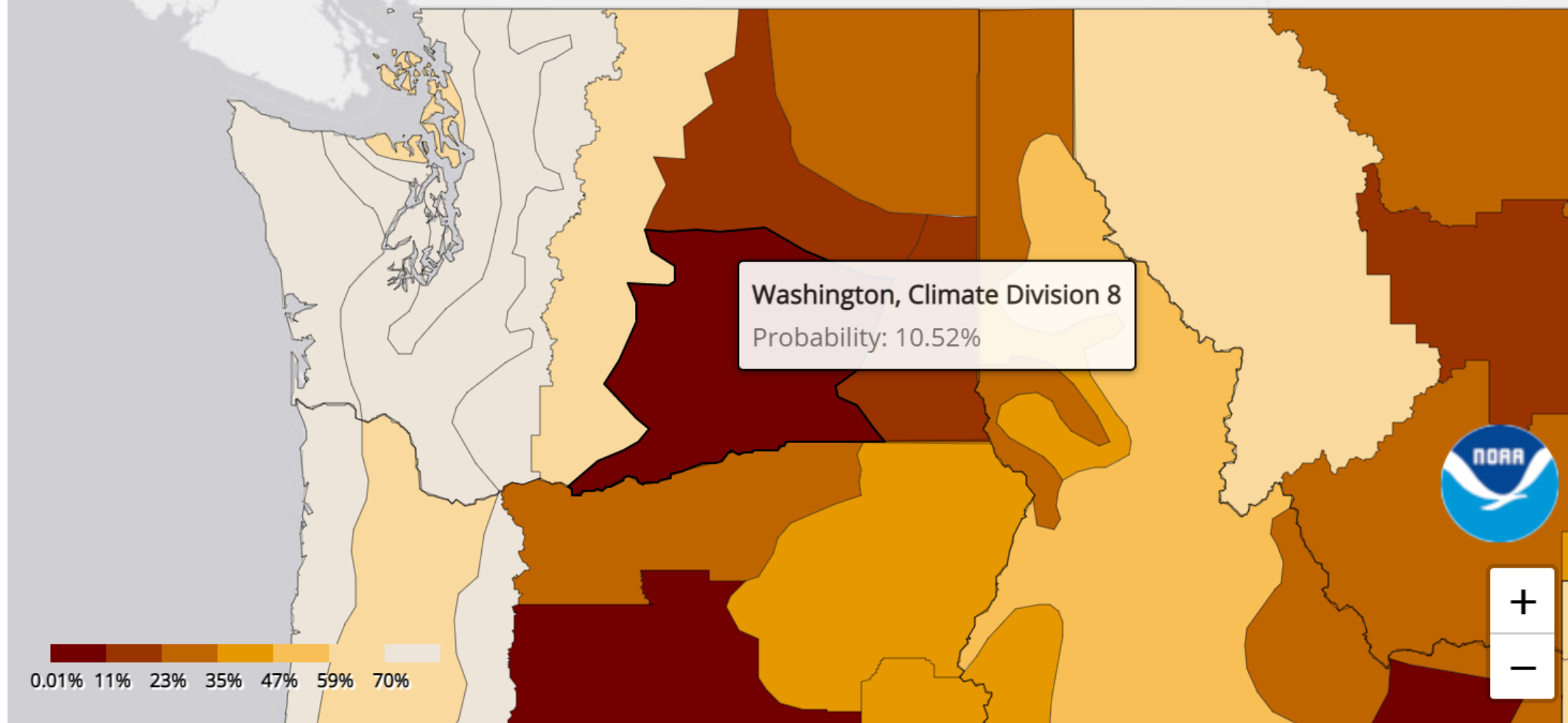
Probability of Ending Drought Conditions in 9 Months



Based on the PHDI. PHDI is a primary measure of long-term drought but may not apply to all areas, including those with heavily managed surface water. No additional precipitation is needed for white areas.

Probability of Ameliorating Drought Conditions in 9 Months

Climatological Conditions
20 Jul 2021

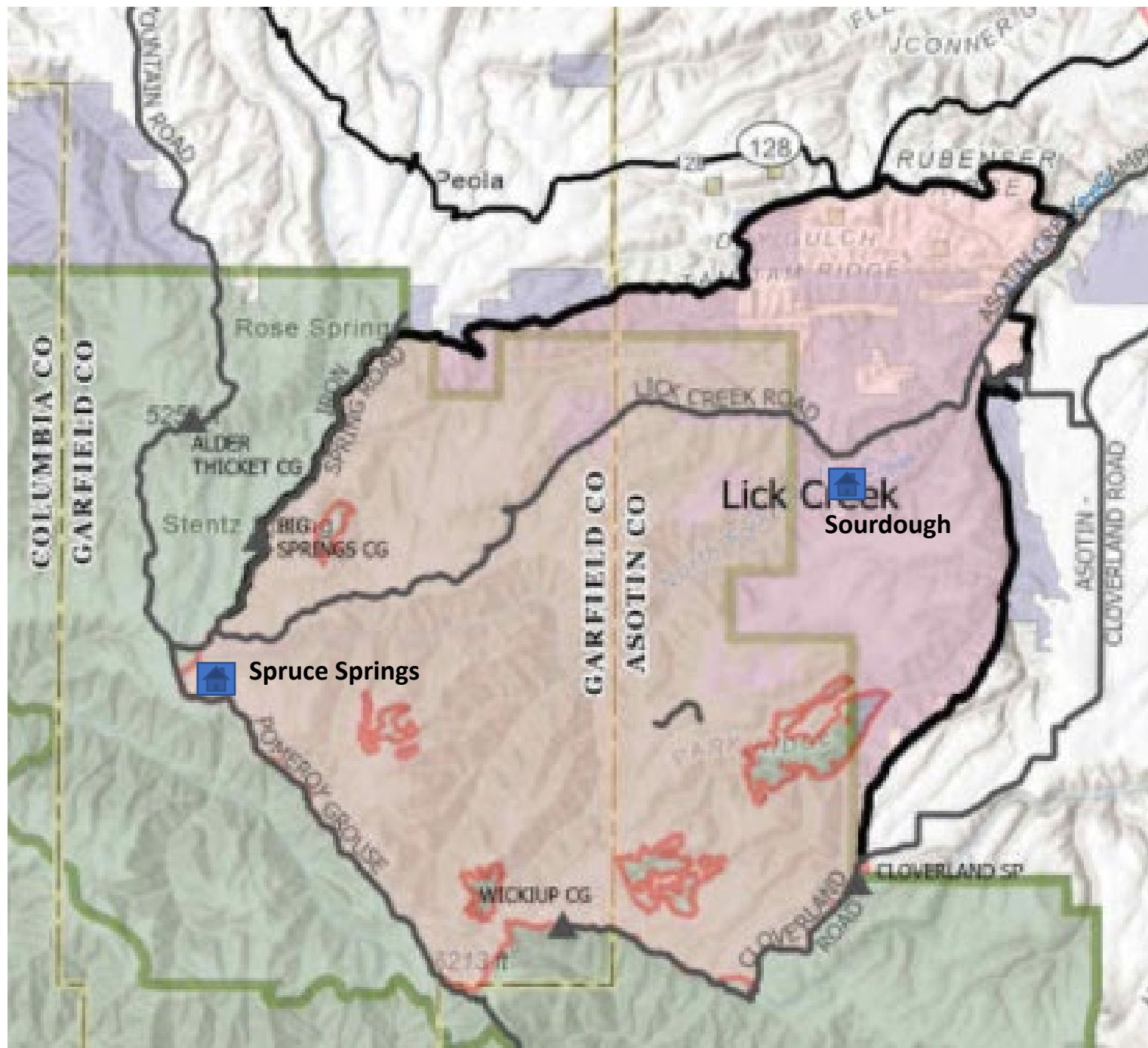


Based on the PHDI. PHDI is a primary measure of long-term drought but may not apply to all areas, including those with heavily managed surface water. No additional precipitation is needed for white areas.

[Save as PNG](#)



Fire -VS- SNOTEL



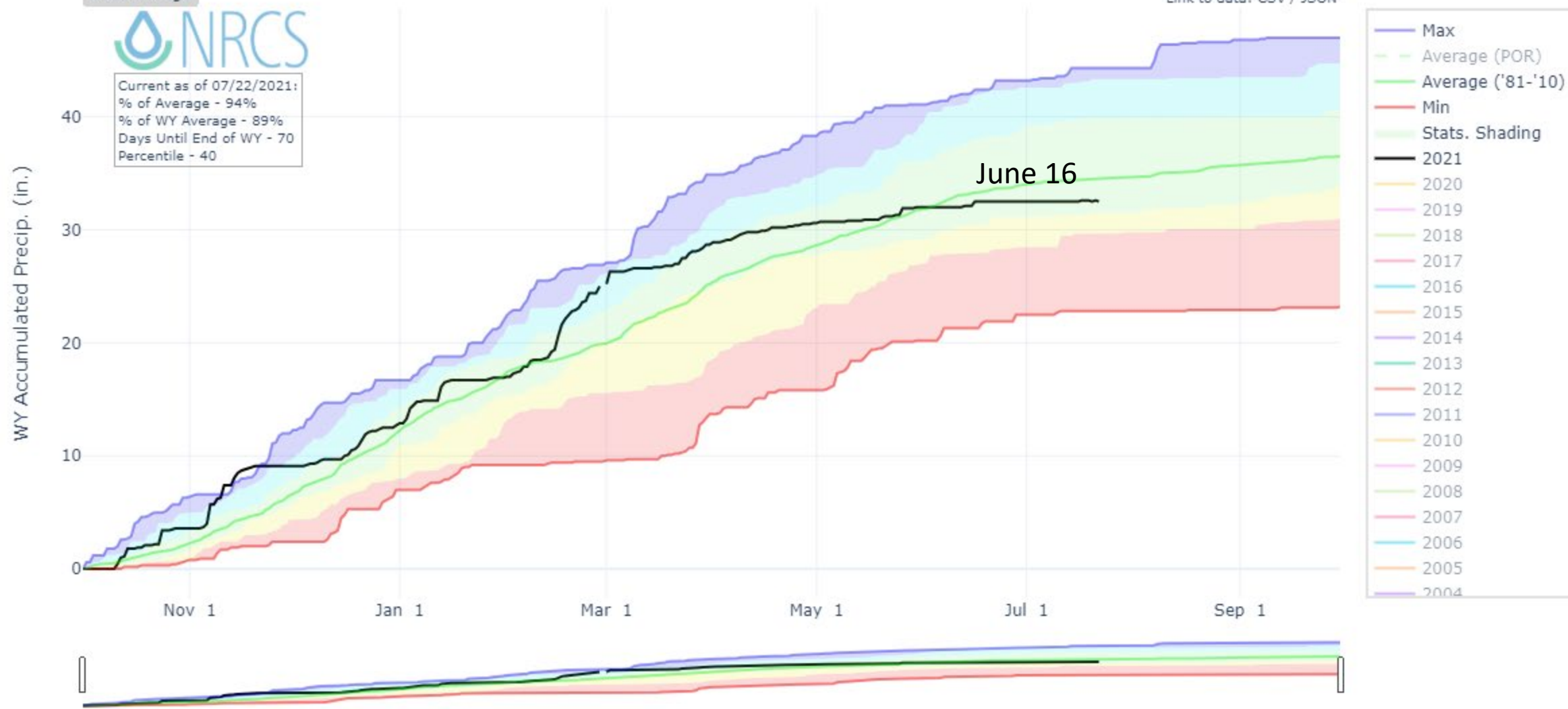
PRECIPITATION AT SPRUCE SPRINGS

Reset Range



Current as of 07/22/2021:
% of Average - 94%
% of WY Average - 89%
Days Until End of WY - 70
Percentile - 40

Link to data: CSV / JSON

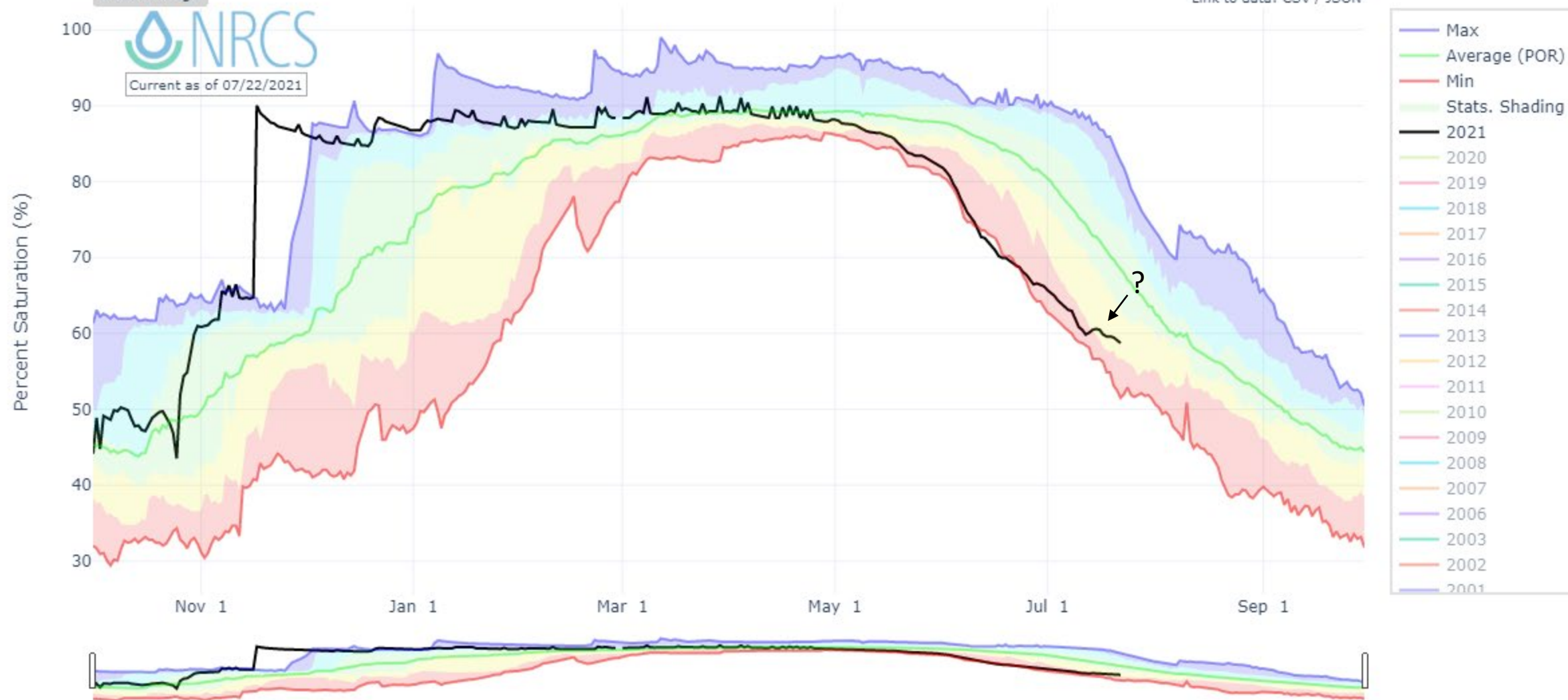


Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th Percentiles.
For more information visit: 30 year normals calculation description.

DEPTH AVERAGED SOIL SATURATION AT SOURDOUGH GULCH

Reset Range

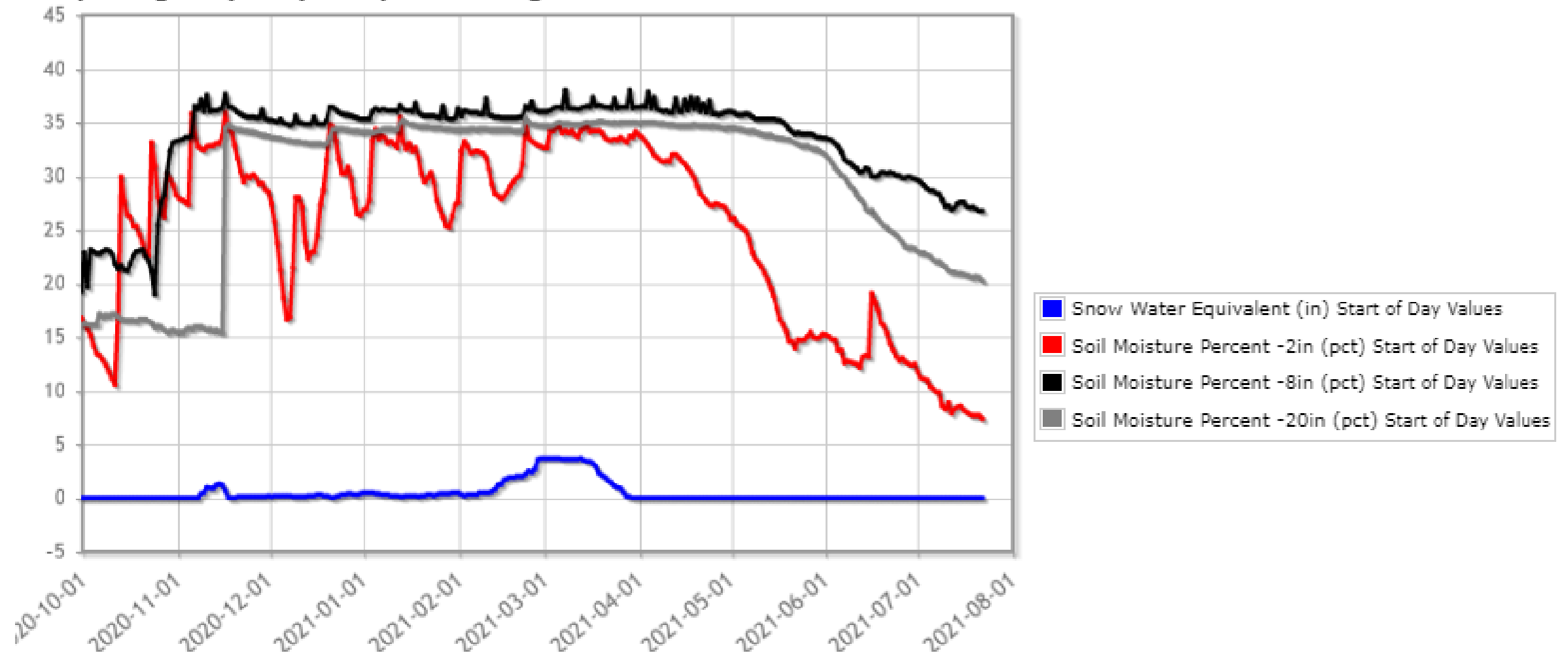
[Link to data: CSV / JSON](#)



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th Percentiles.
For more information visit: [30 year normals calculation description](#).

Sourdough Gulch (985) Washington SNOTEL Site - 4000 ft

Reporting Frequency: Daily; Date Range: 2020-10-01 to 2021-09-30



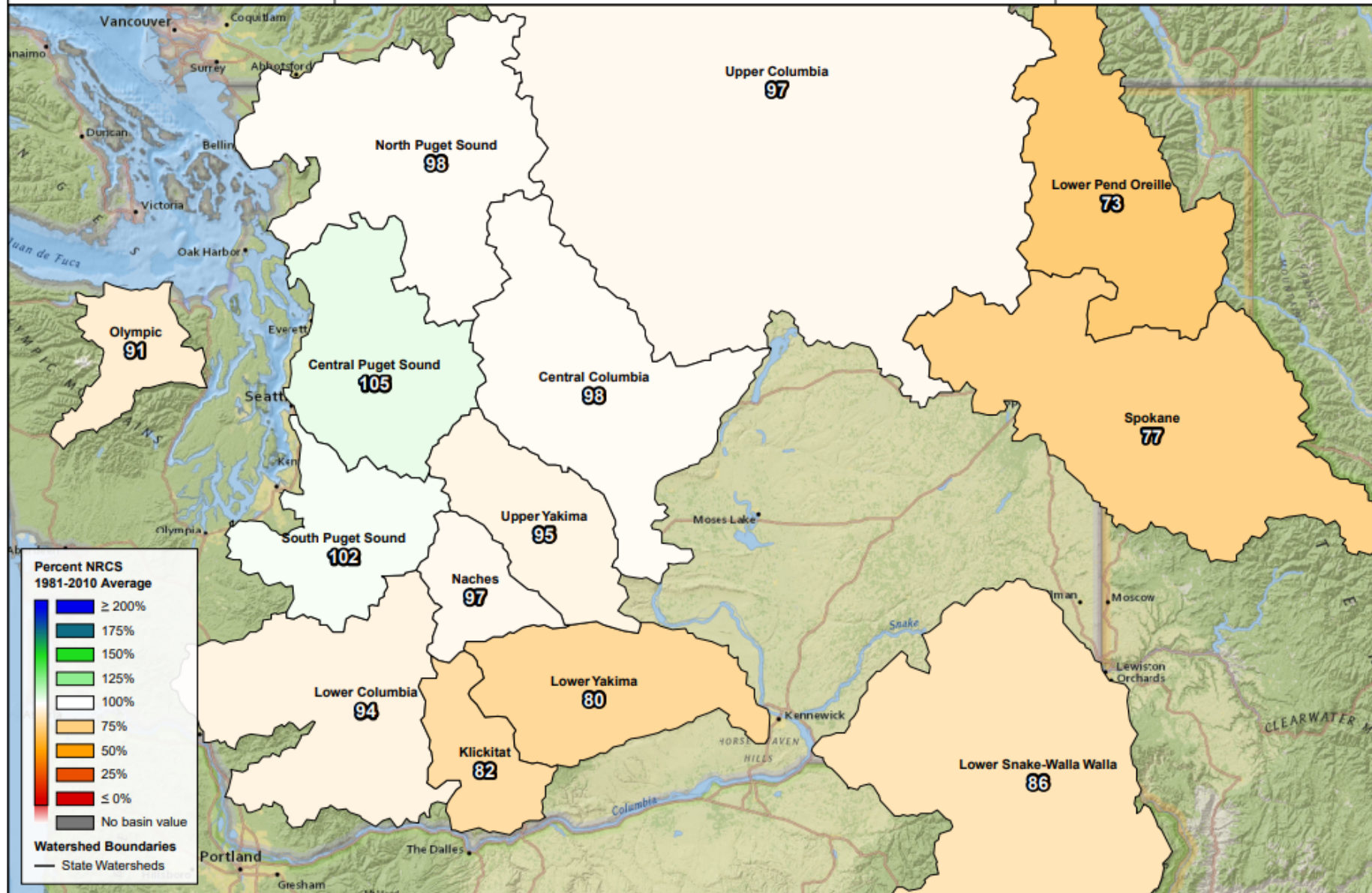


PRECIPITATION

Water Year to Date Precipitation

Percent NRCS 1981-2010 Average

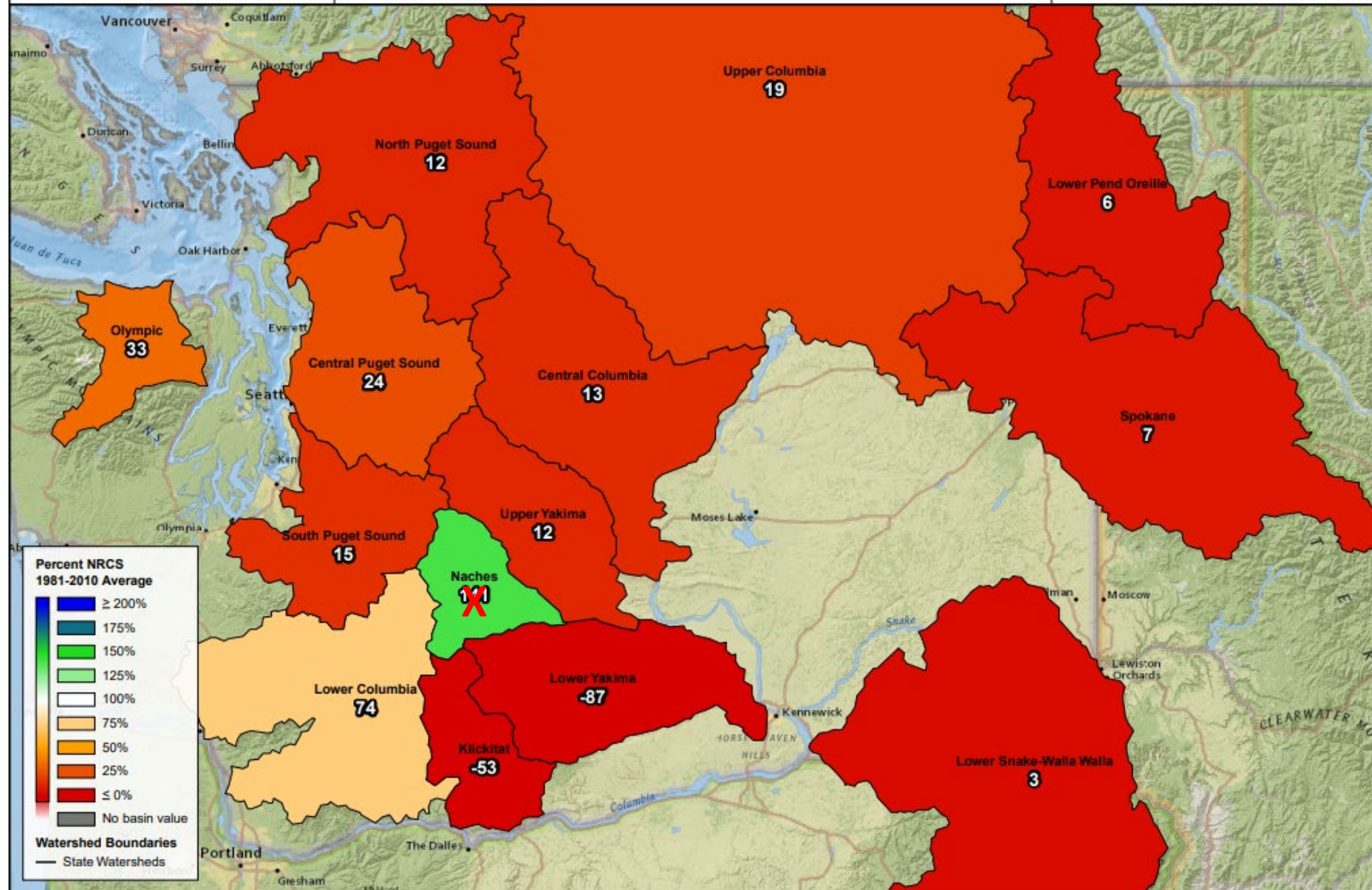
October 1, 2020 - July 21, 2021



Month to Date Precipitation

Percent NRCS 1981-2010 Average

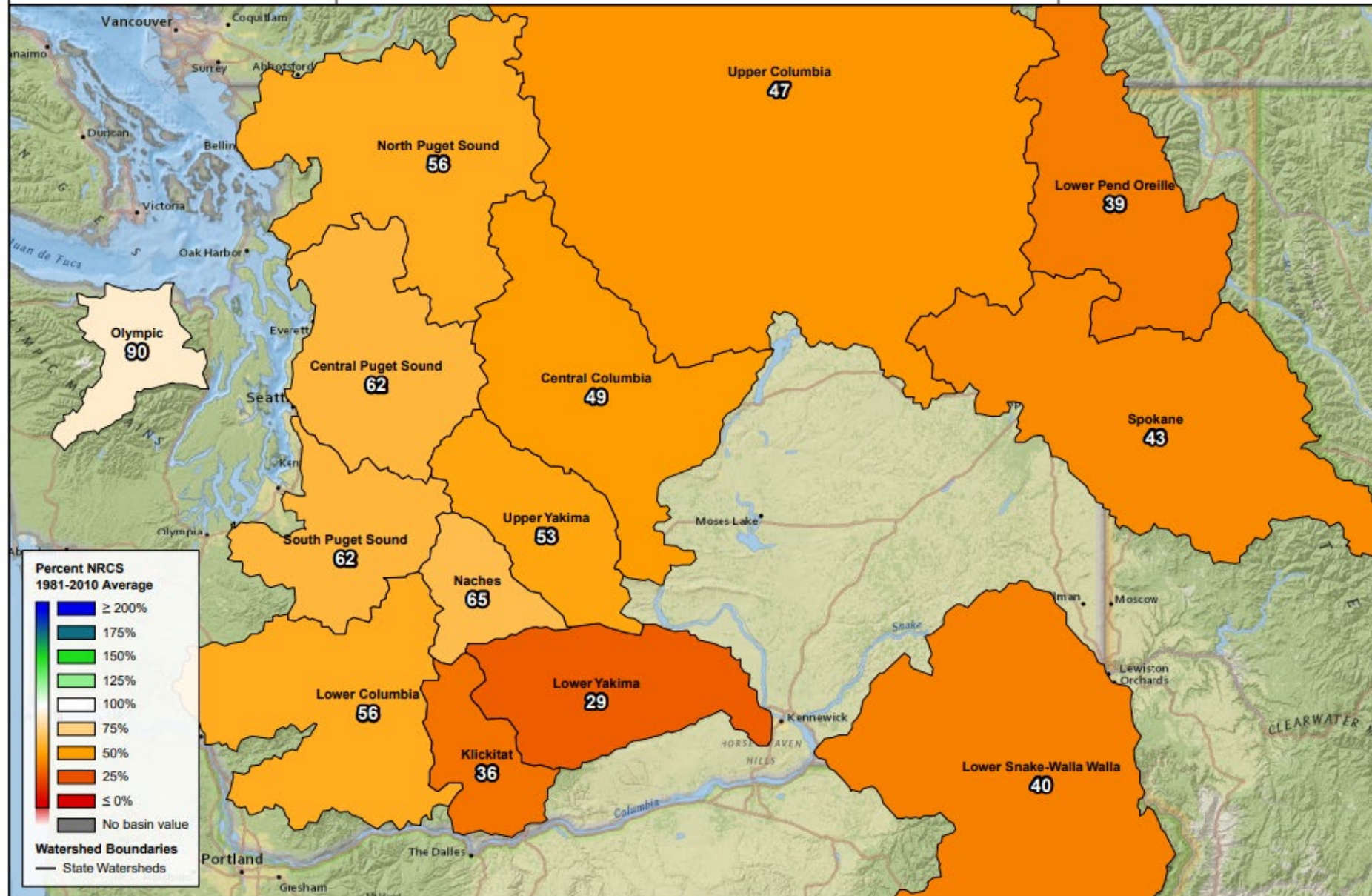
July 1, 2021 - July 21, 2021



143 day Precipitation

Percent NRCS 1981-2010 Average

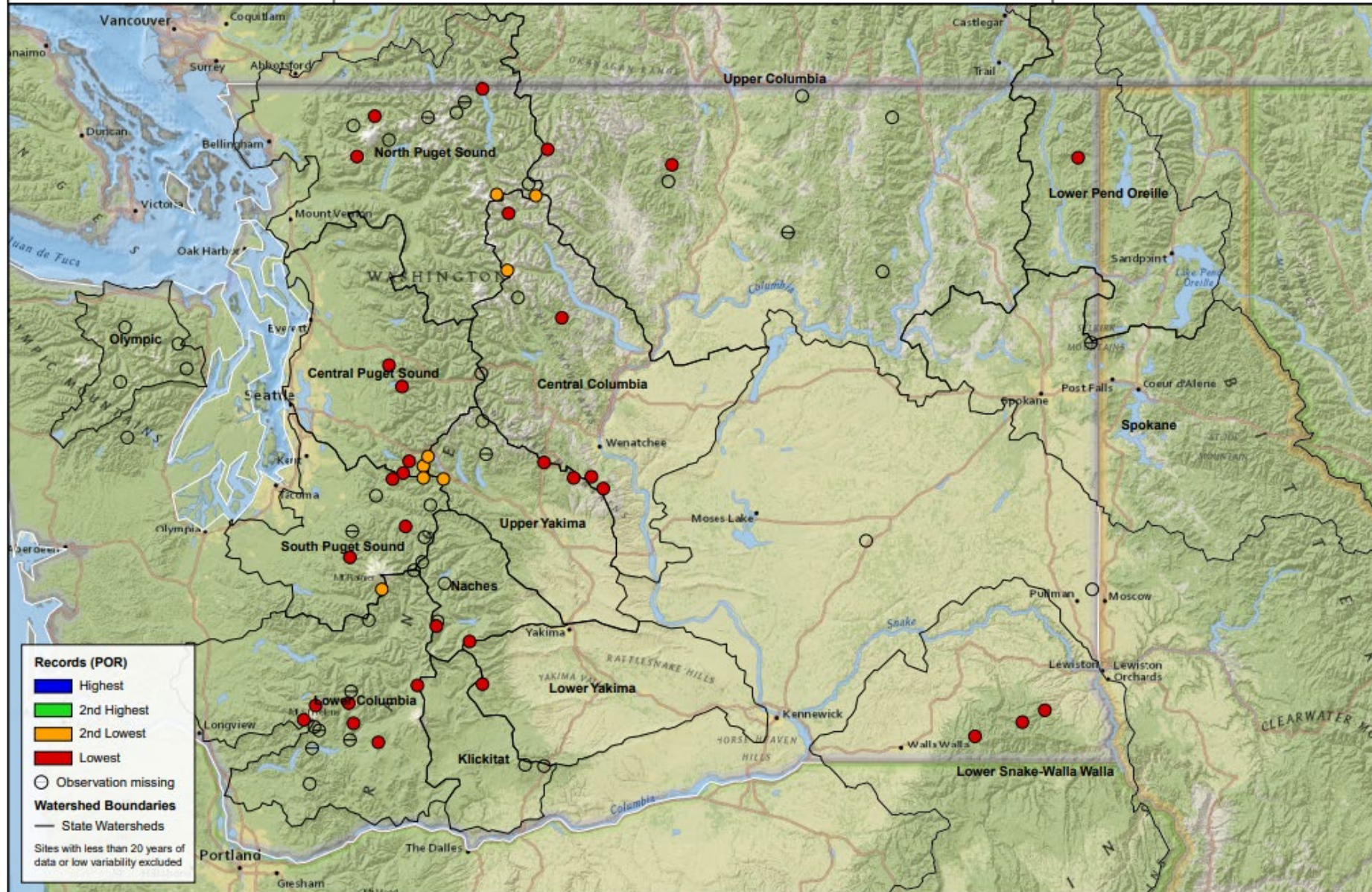
March 1, 2021 - July 21, 2021



143 day Precipitation

Records (POR)

March 1, 2021 - July 21, 2021



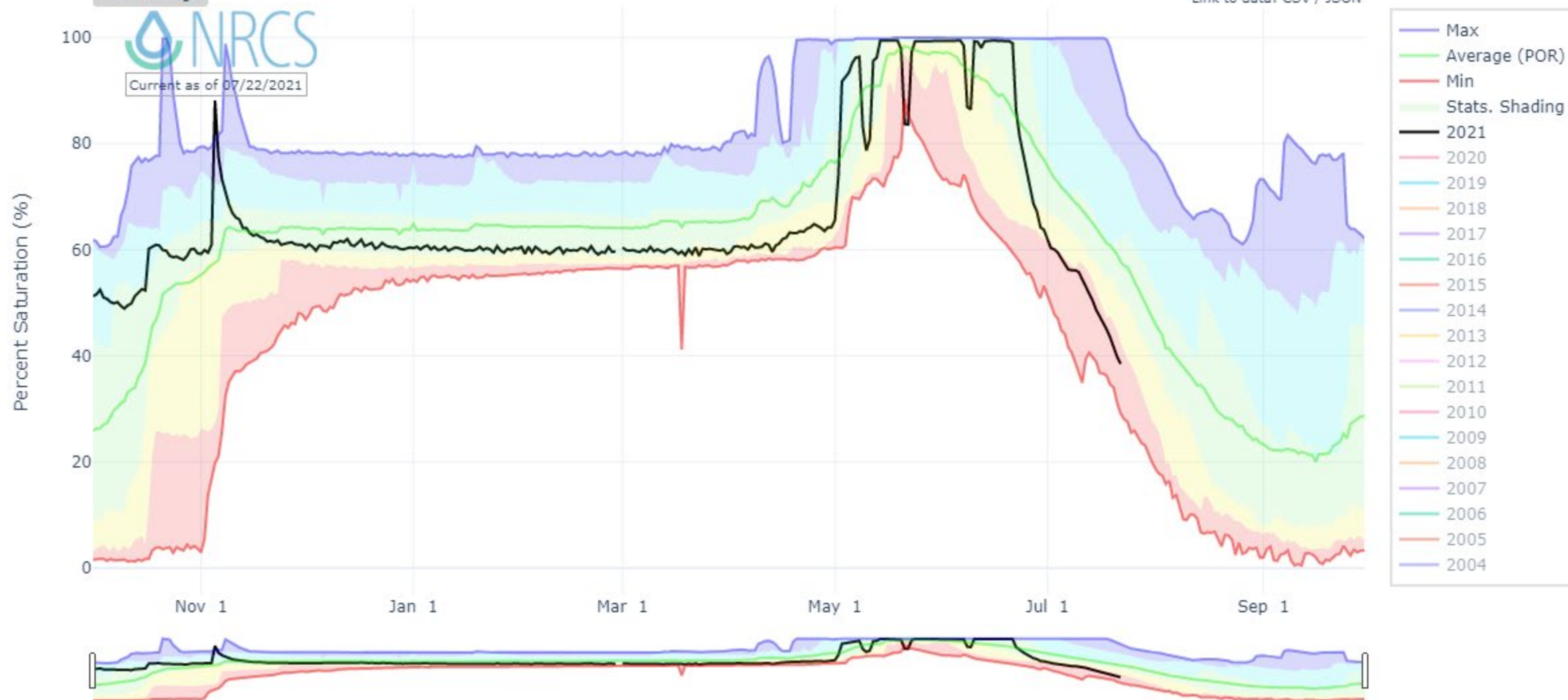
A large, dark blue ink splatter or blotch is centered on a white background. The splatter has irregular, feathered edges with some smaller droplets and speckles trailing off from the main mass. The text 'SOIL MOISTURE' is written in white, uppercase letters across the center of the dark blue area.

SOIL MOISTURE

DEPTH AVERAGED SOIL SATURATION AT HARTS PASS

Reset Range

[Link to data: CSV / JSON](#)

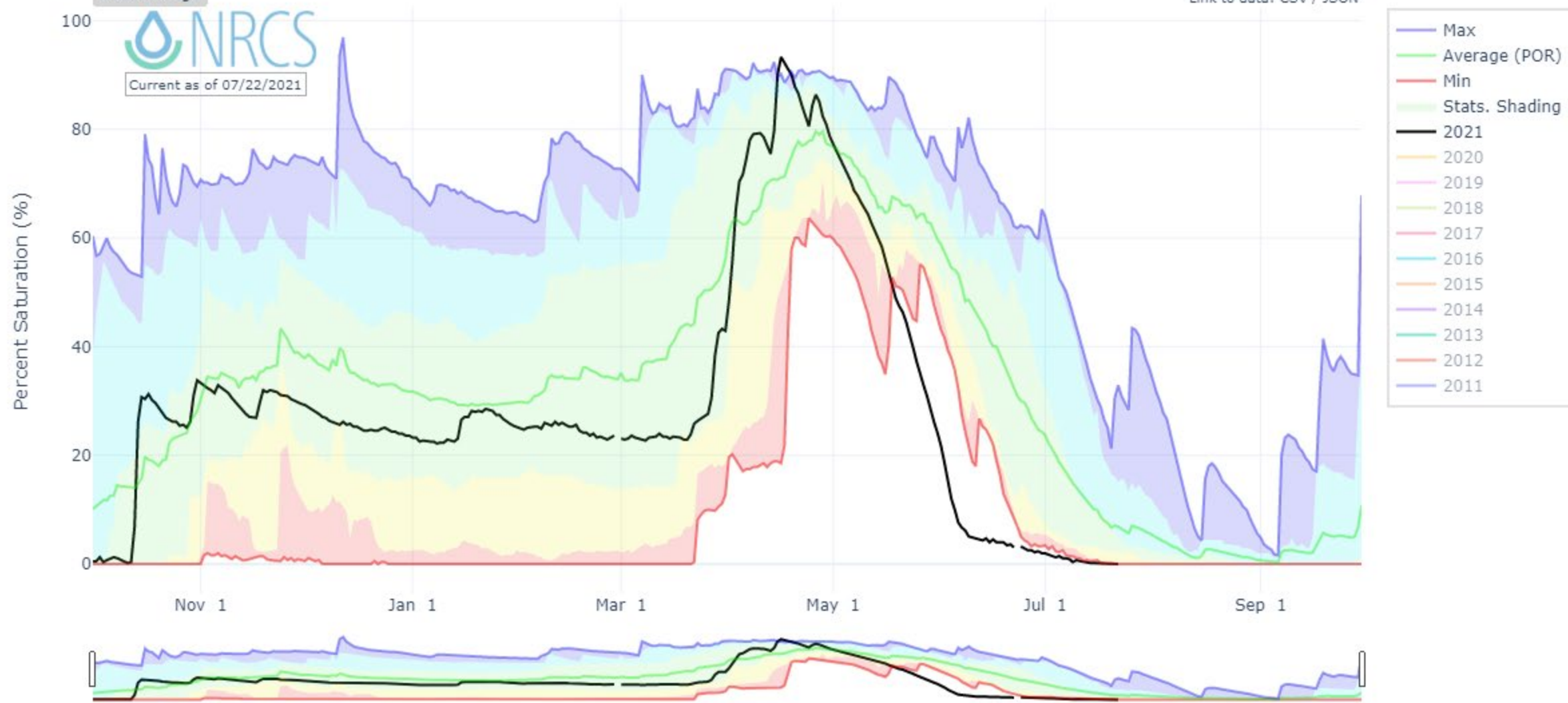


Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th Percentiles.
For more information visit: [30 year normals calculation description](#).

DEPTH AVERAGED SOIL SATURATION AT SALMON MEADOWS

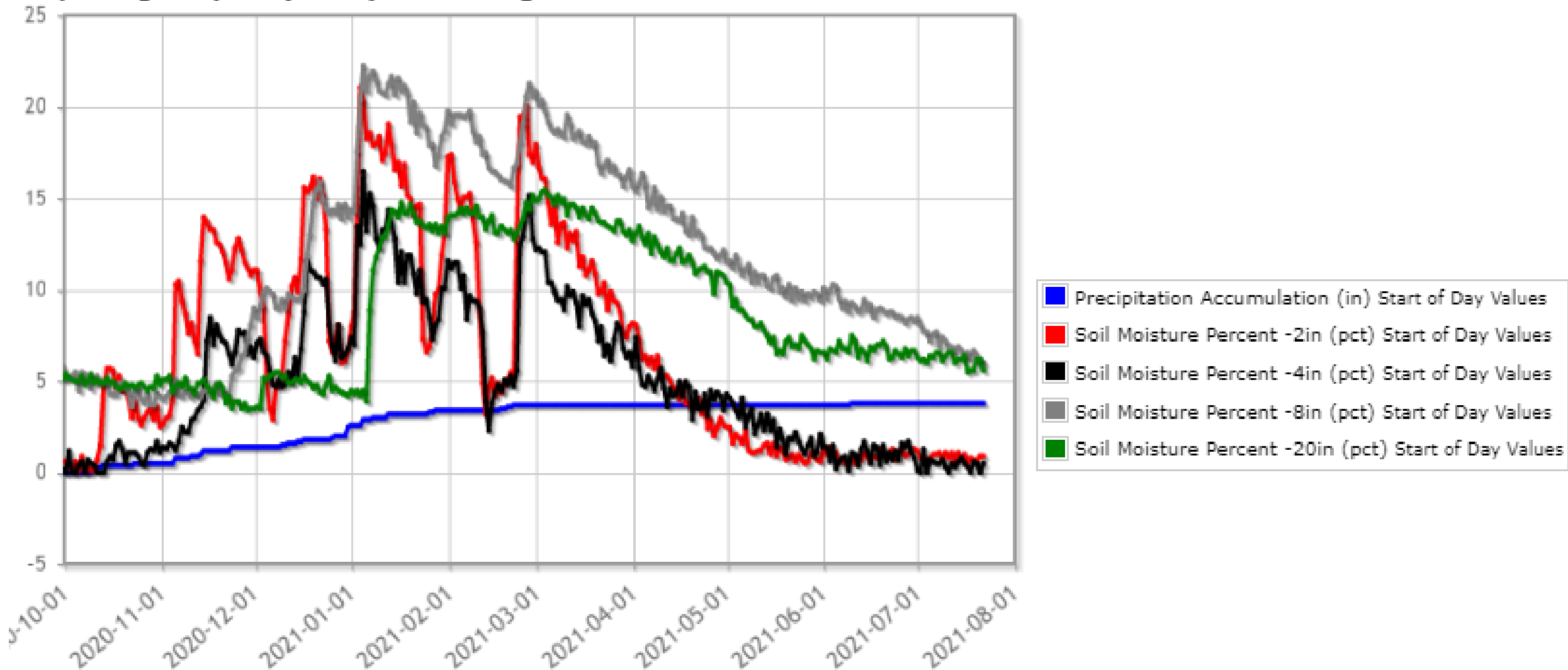
Reset Range

[Link to data: CSV / JSON](#)



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th Percentiles.
For more information visit: [30 year normals calculation description](#).

Lind #1 (2021) Washington SCAN Site - 1640 ft
Reporting Frequency: Daily; Date Range: 2020-10-01 to 2021-09-30



Questions?



Regional Climate Perspective

Nick Bond & Karin Bumbaco

Office of the Washington State Climatologist

Cooperative Institute for Climate, Ocean, and Ecosystem Studies

University of Washington

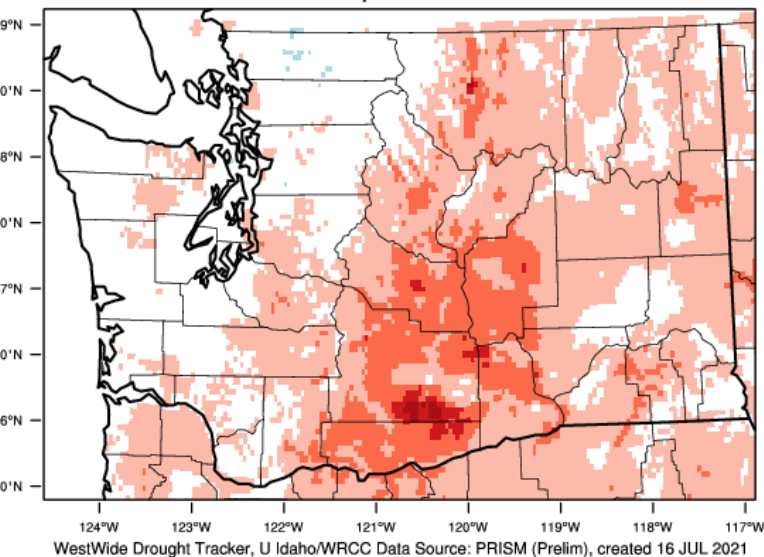
23 July 2021

2021 Water Year

Temperature

Washington - Mean Temperature

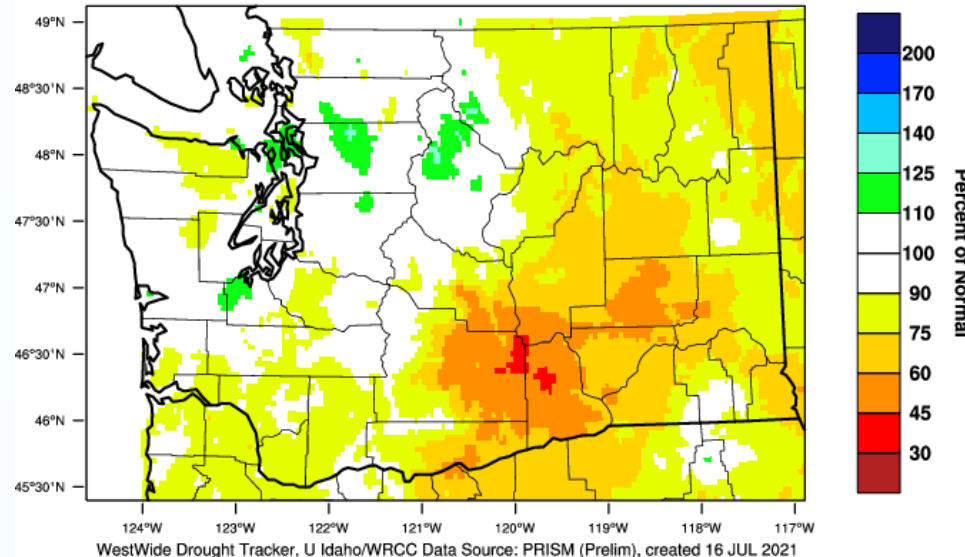
October-June 2021 Departure from 1981-2010 Normal



Precipitation

Washington - Precipitation

October-June 2021 Percent of 1981-2010 Normal



- Averaged statewide, WY 2021 warmer than normal (+1.5°F), tying as 9th warmest*
- Averaged statewide, below normal precipitation for WY 2021 (-3.29")

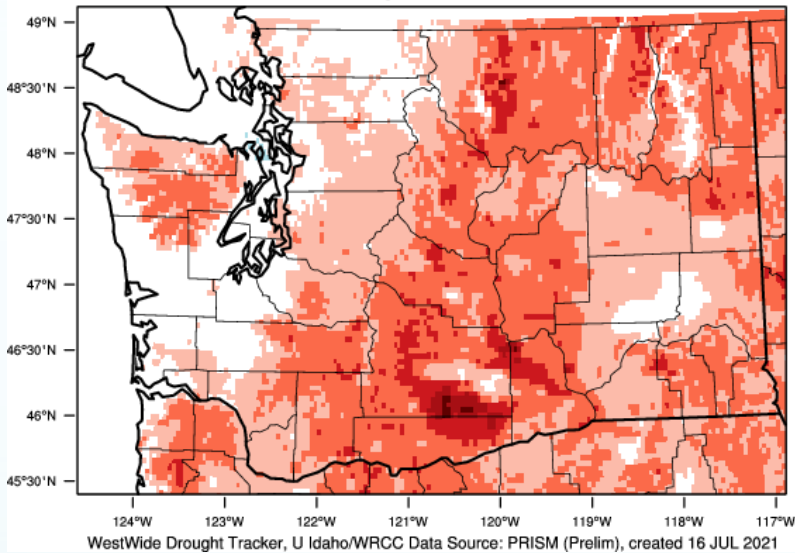
*Records since 1895

March-June 2021

Temperature

Washington - Mean Temperature

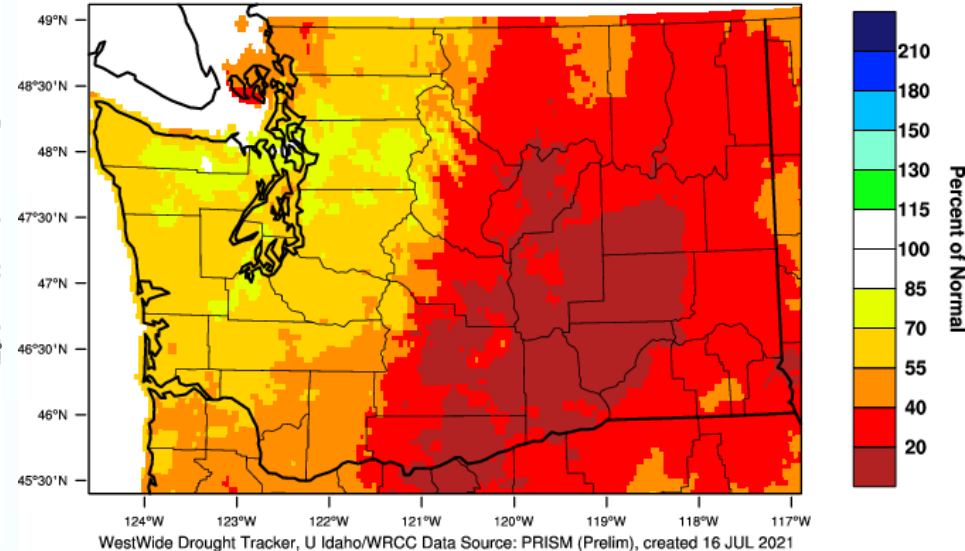
March-June 2021 Departure from 1981-2010 Normal



Precipitation

Washington - Precipitation

March-June 2021 Percent of 1981-2010 Normal

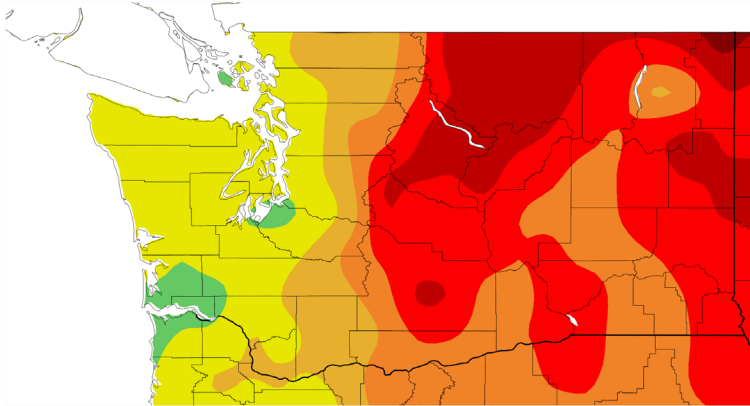


- Averaged statewide, 9th warmest Mar-Jun on record (+2.1°F)
- Averaged statewide, tied 1926 for 2nd driest Mar-Jun on record (-5.87")

July 2021

Temperature

Departure from Normal Temperature (F)
7/1/2021 – 7/21/2021

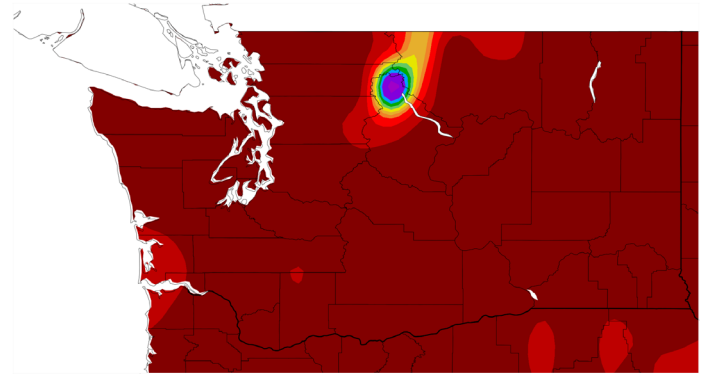


Generated 7/22/2021 at HPRCC using provisional data.

NOAA Regional Climate Centers

Precipitation

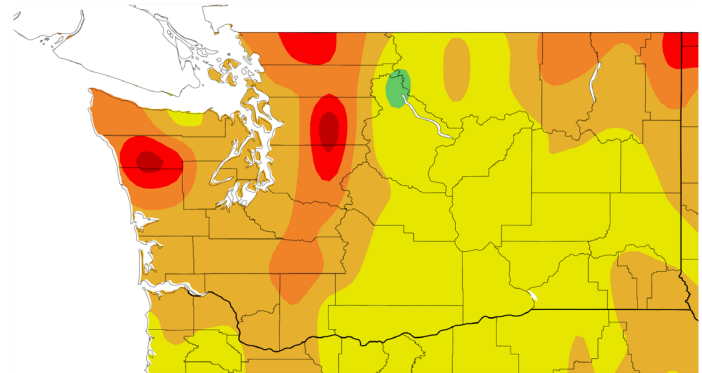
Percent of Normal Precipitation (%)
7/1/2021 – 7/21/2021



Generated 7/22/2021 at HPRCC using provisional data.

NOAA Regional Climate Centers

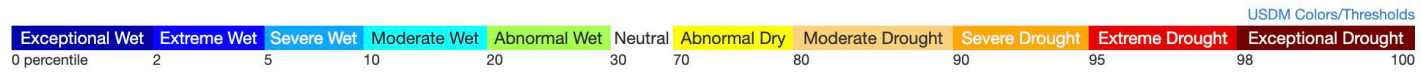
Departure from Normal Precipitation (in)
7/1/2021 – 7/21/2021



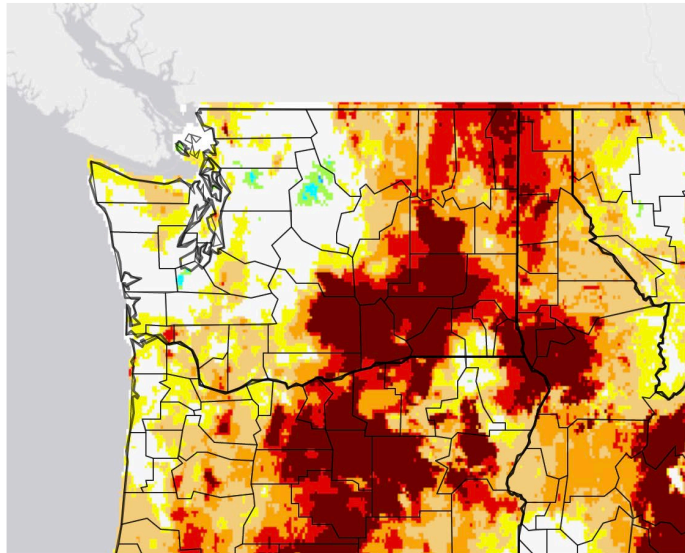
Generated 7/22/2021 at HPRCC using provisional data.

NOAA Regional Climate Centers

Classification of Water Extremes: Wet-to-Dry

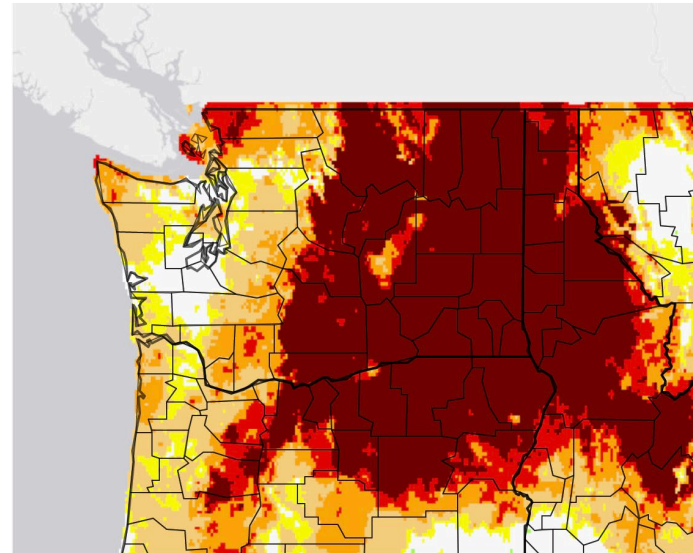


Precipitation
Oct. 1, 2020 - Jul. 20, 2021



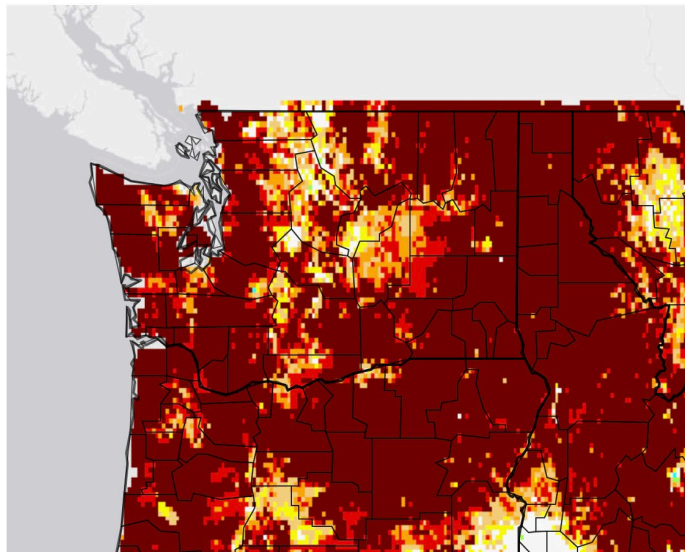
Data Source: gridMET - UC Merced

Precipitation
Apr. 22, 2021 - Jul. 20, 2021



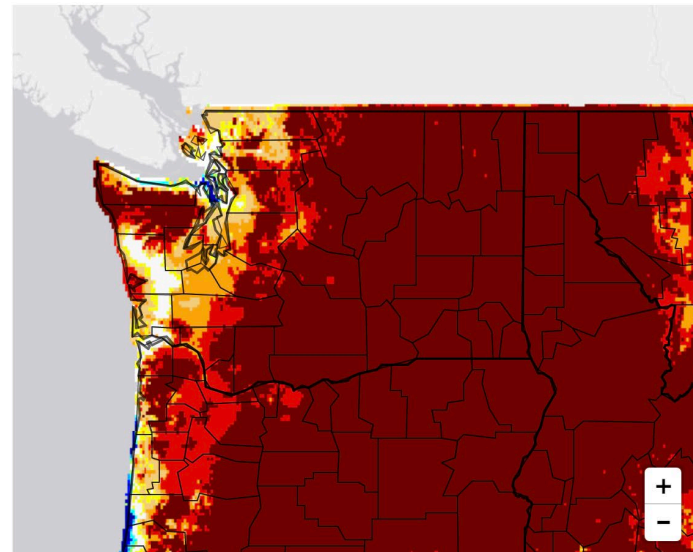
Data Source: gridMET - UC Merced

Soil Moisture
Jul. 19, 2021



Data Source: VIC-gridMET - University of Washington

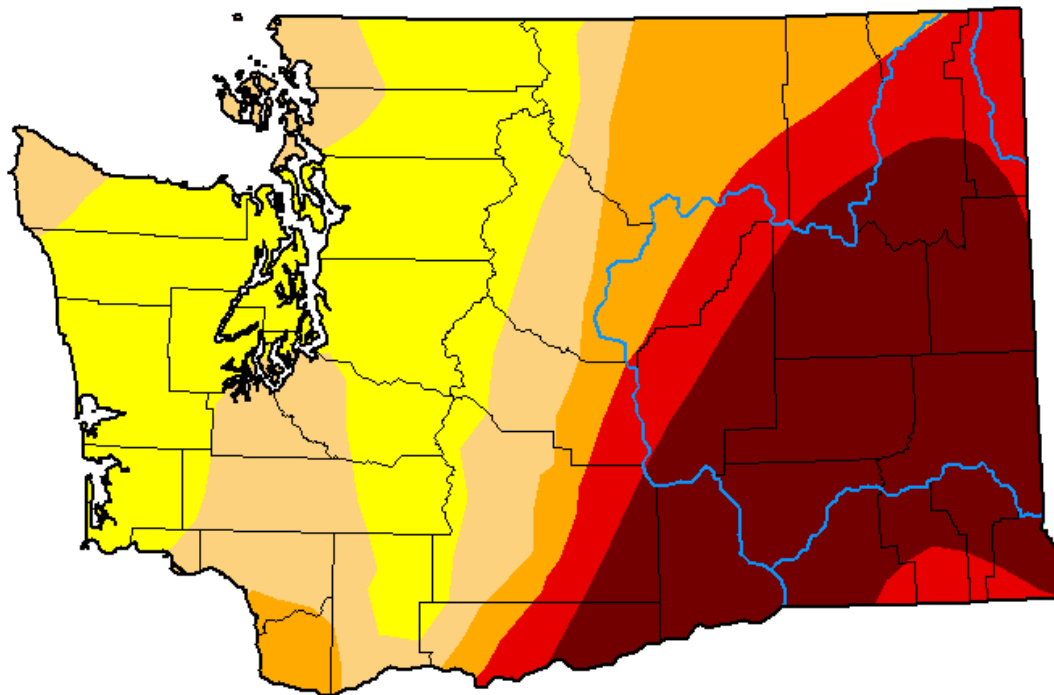
Vapor Pressure Deficit
Jun. 21, 2021 - Jul. 20, 2021









Data Source: gridMET - UC Merced

U.S. Drought Monitor Washington

July 20, 2021
(Released Thursday, Jul. 22, 2021)
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 <https://droughtmonitor.unl.edu/About.aspx>

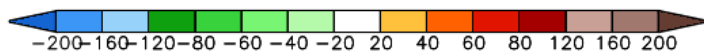
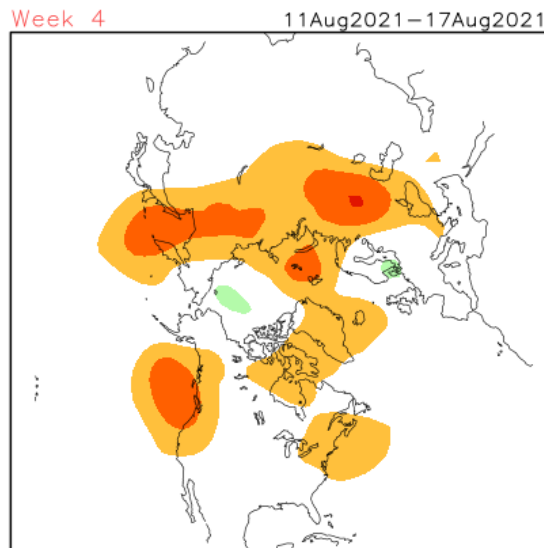
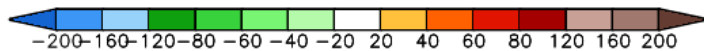
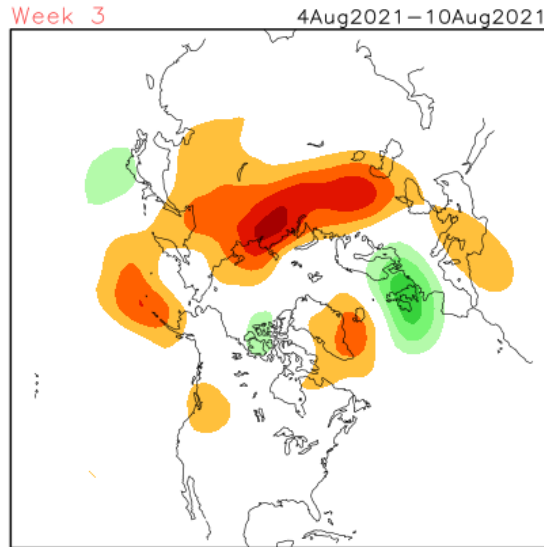
Author:

Brad Rippey
U.S. Department of Agriculture



droughtmonitor.unl.edu

CFSv2 Weeks 3 & 4 500 hPa Z Anomalies (m)
16 Member Ensemble Mean Forecast from 20Jul2021



Latest Set of Week 3-4
Forecasts from CFSv2

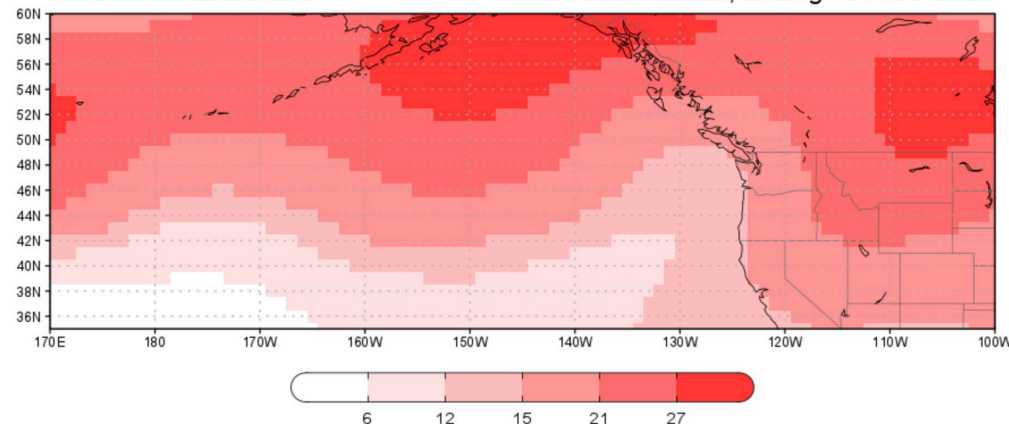
Positive 500 hPa height
anomalies over the Pac NW
and then offshore indicate
warm and probably dry
weather

Model Runs
from last week

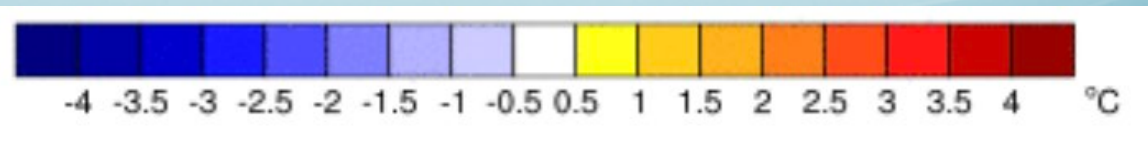
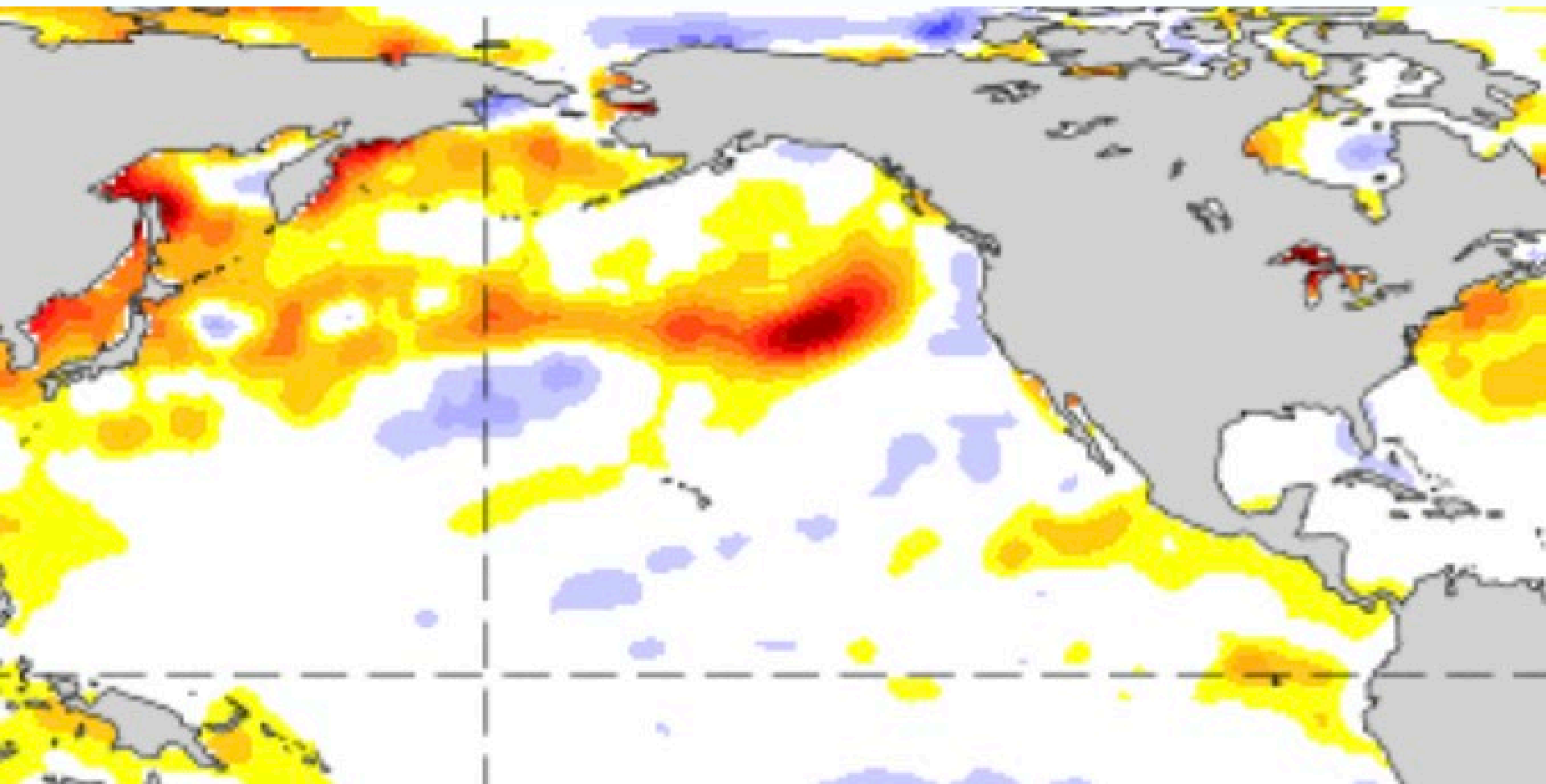
SubX Forecast of 500mb Height Anomaly [m]

Multi Model Ensemble

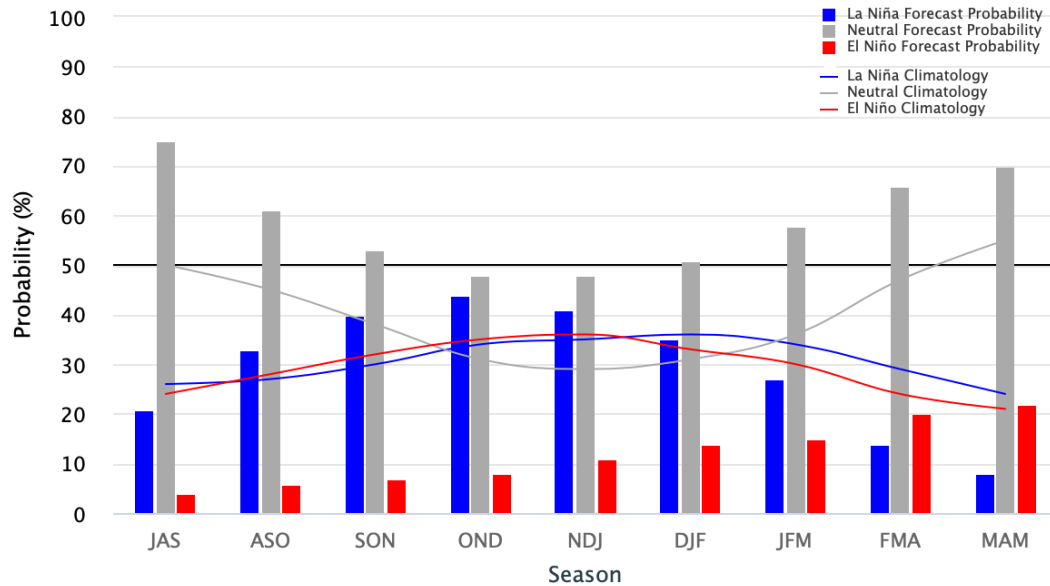
Week 3-4 Mean, ending 13-AUG-2021



SST Anomalies: 11-17 July 2021

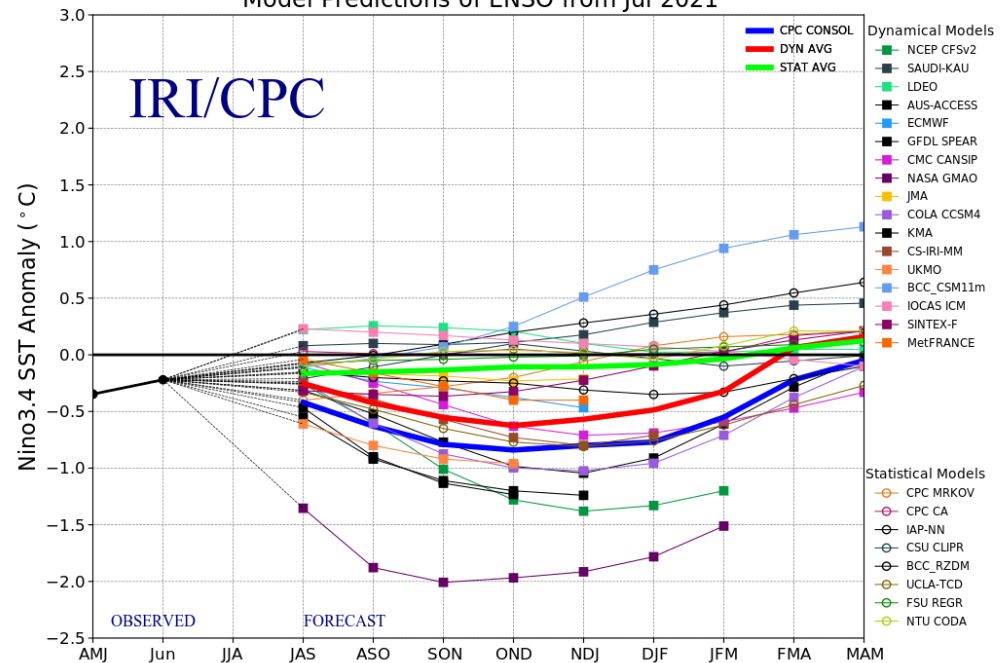


ENSO state based on NINO3.4 SST Anomaly

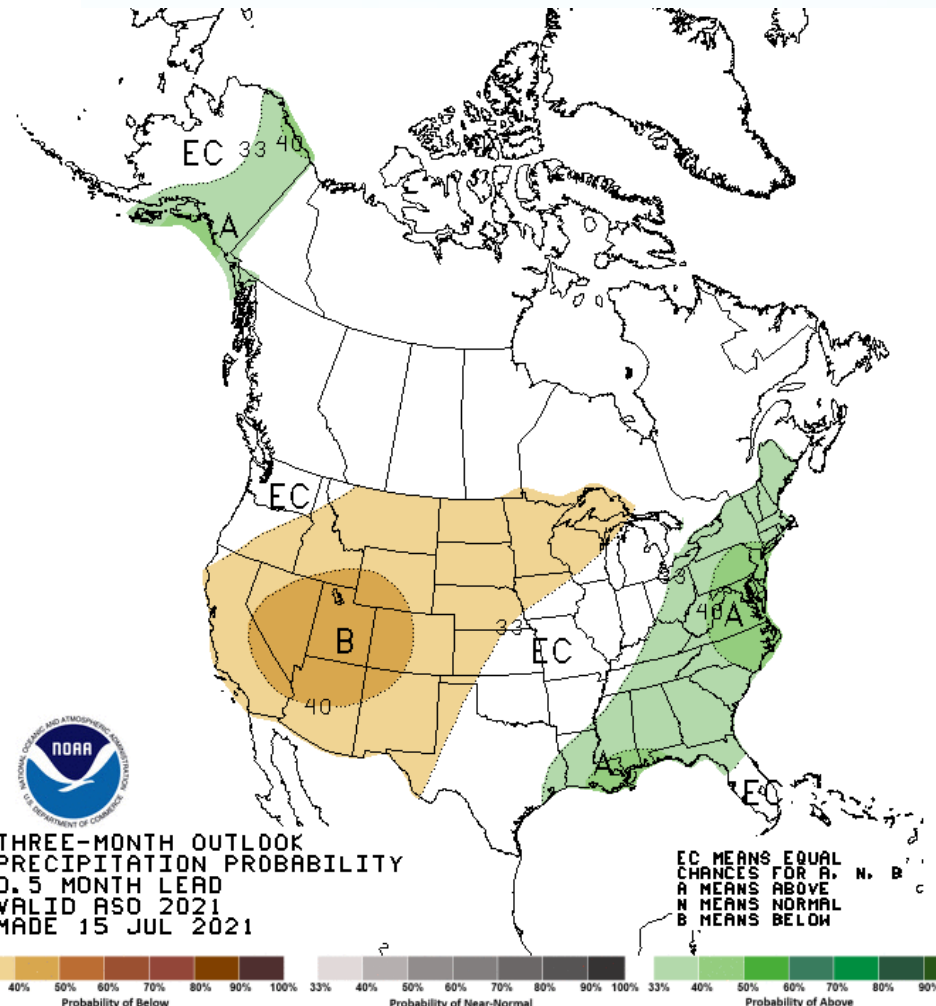
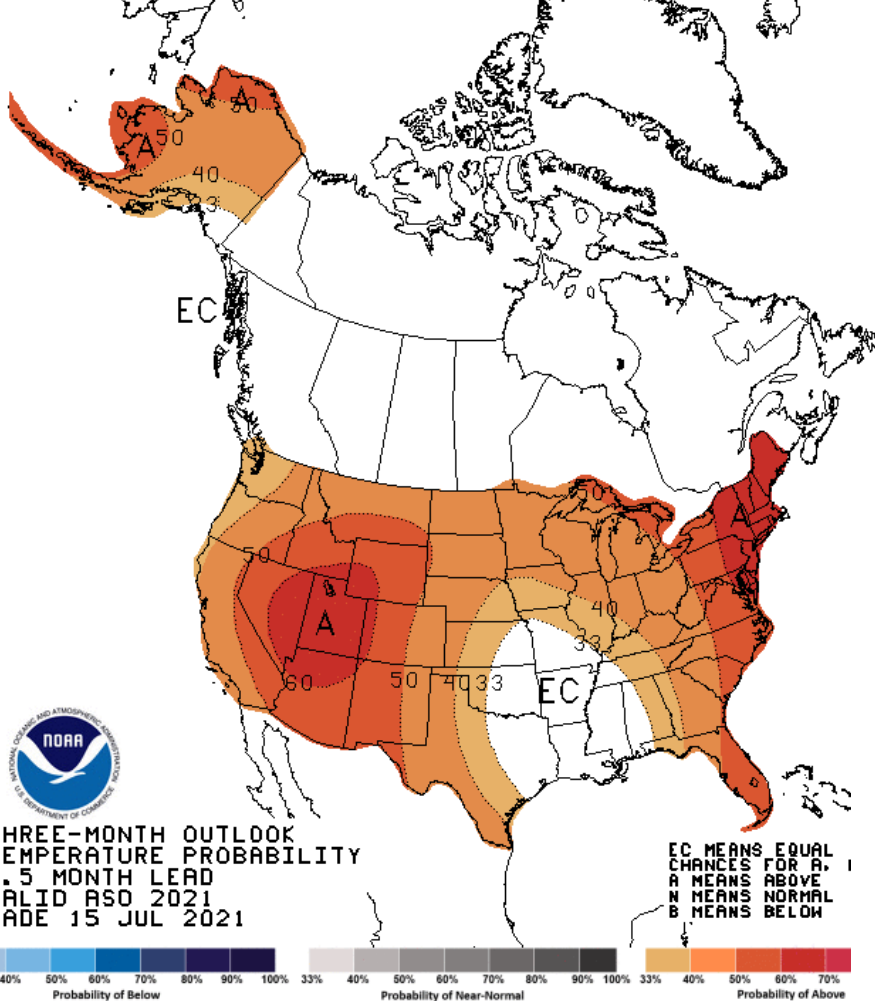
Neutral ENSO: -0.5°C to 0.5°C 

ENSO Predictions

Model Predictions of ENSO from Jul 2021



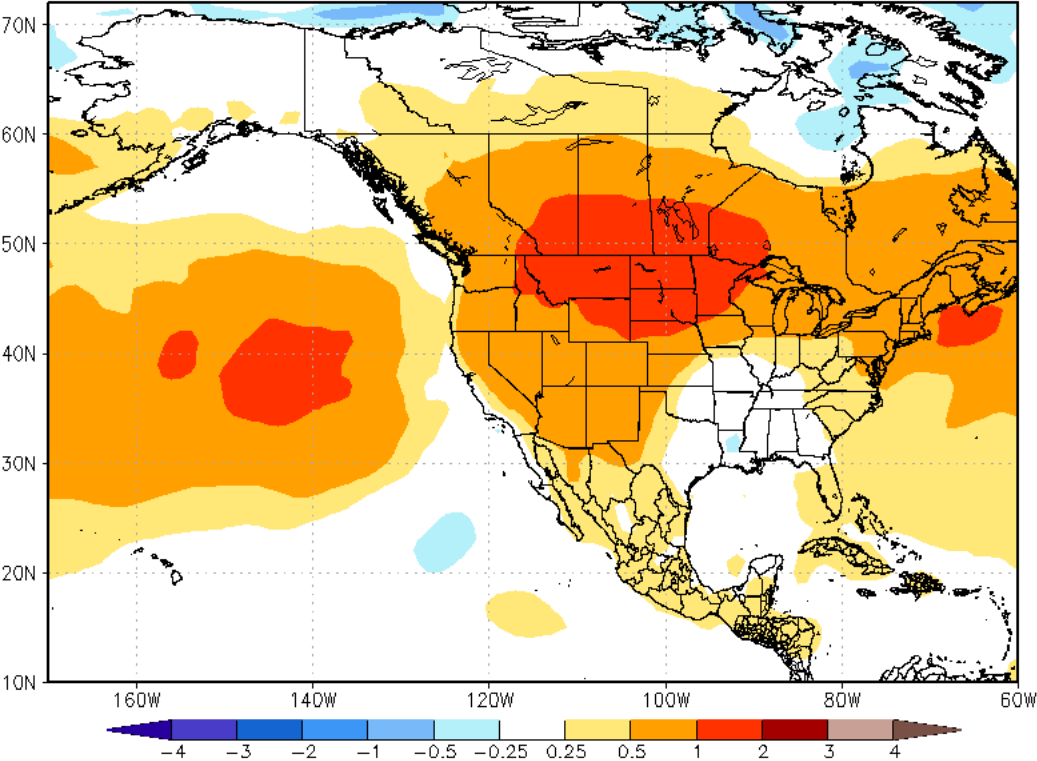
NOAA/CPC Forecasts for Aug-Oct 2021



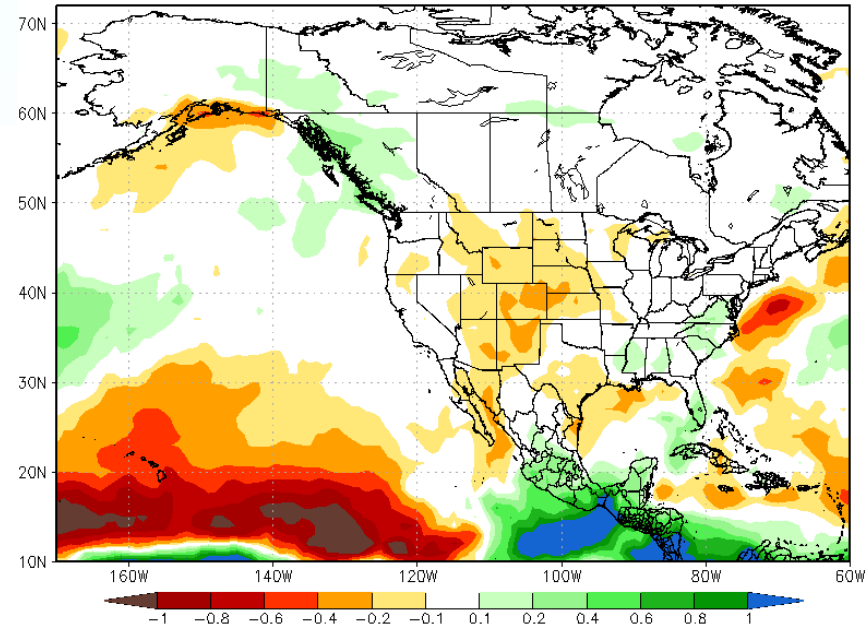
Composite Maps from the International Multi-Model Ensemble - ASO 2021

Air Temperature

IMME Forecast of TMP2m Anom IC=202107 for 2021ASO

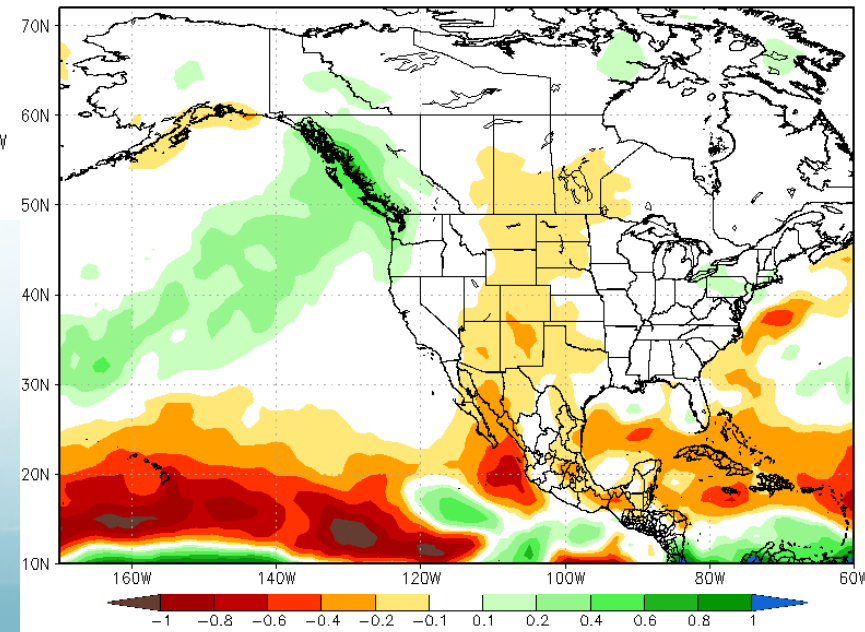


NMME Forecast of Prec. rate Anom IC=202107 for Lead 1 2021ASO

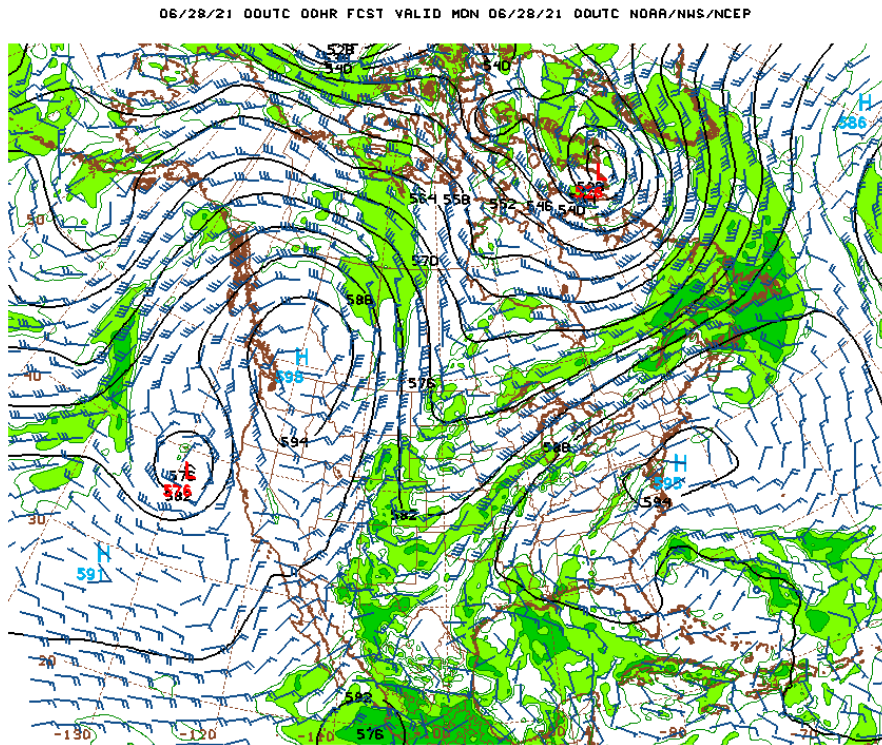


Precipitation

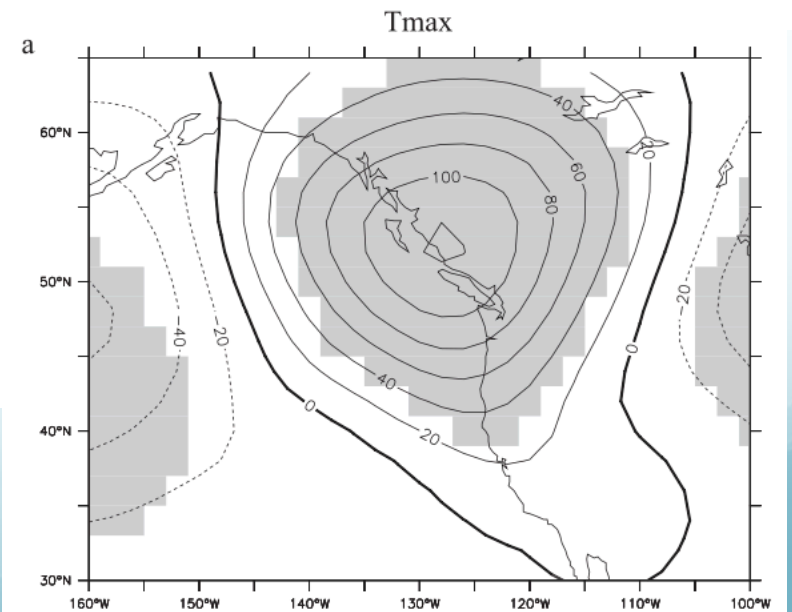
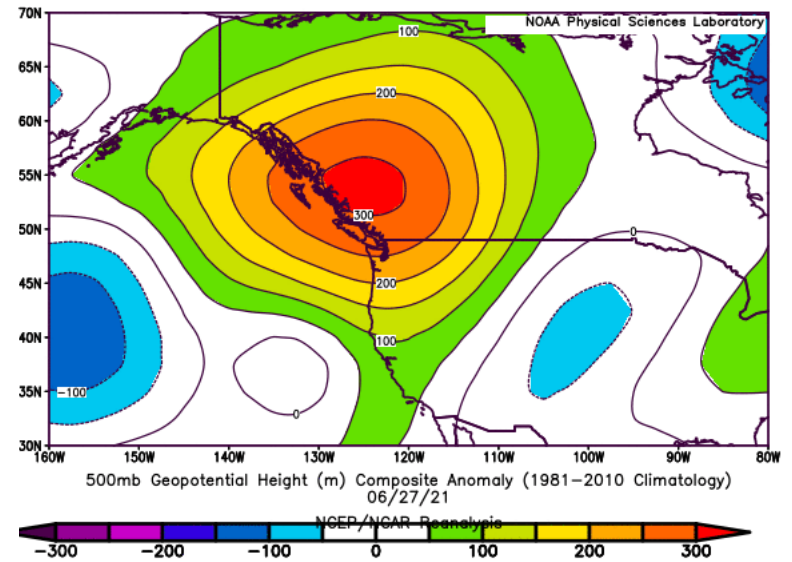
IMME Forecast of Prec. rate Anom IC=202107 for 2021ASO



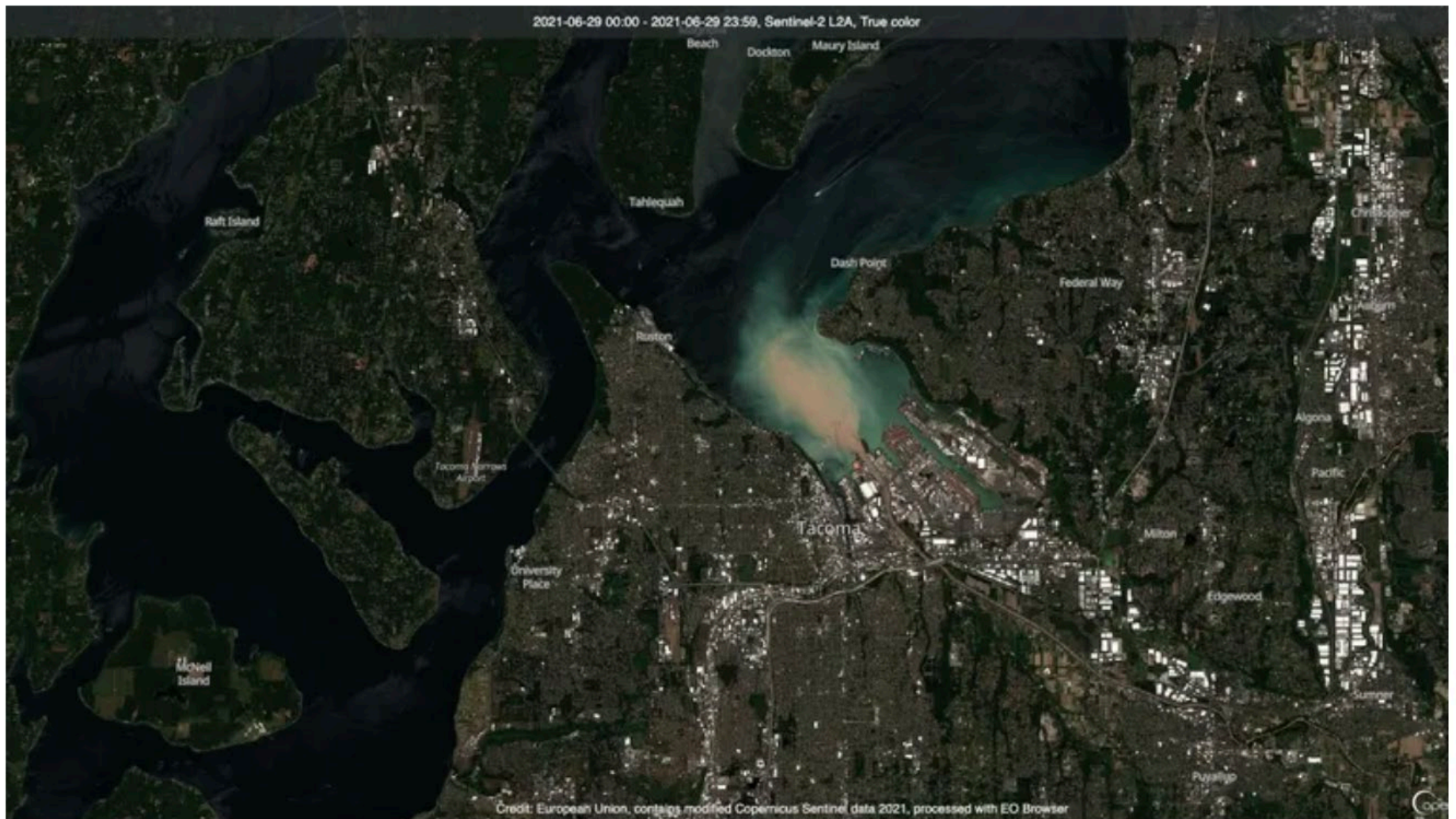
June 2021 Heatwave



Sunday 6/27 5 pm



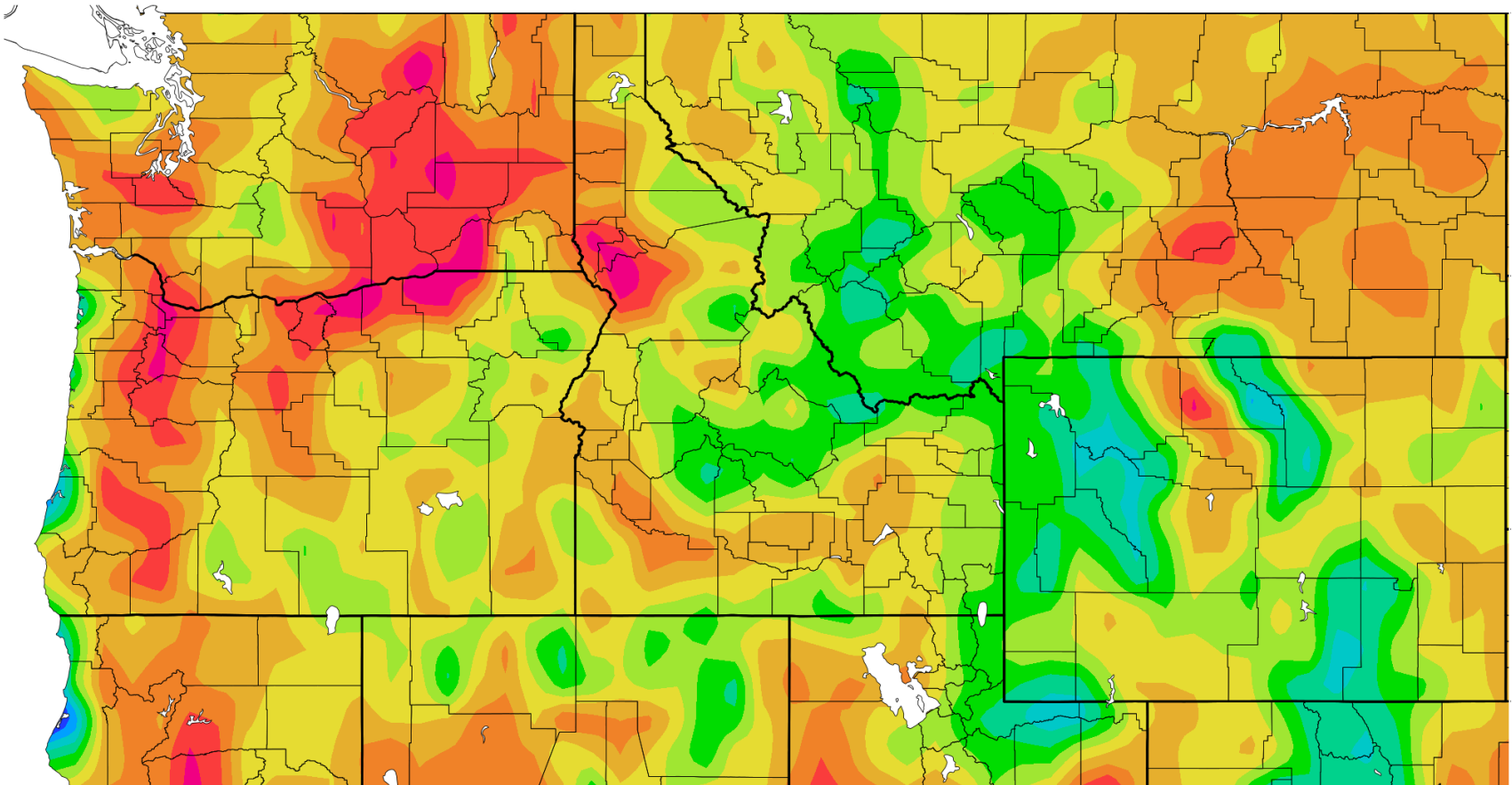
Bumbaco, Dello, & Bond 2013



Sediment flows into Puget Sound from the Puyallup River on June 30, 2021. (Image courtesy: Sentinel Hub EO Browser with contributions by ESA)

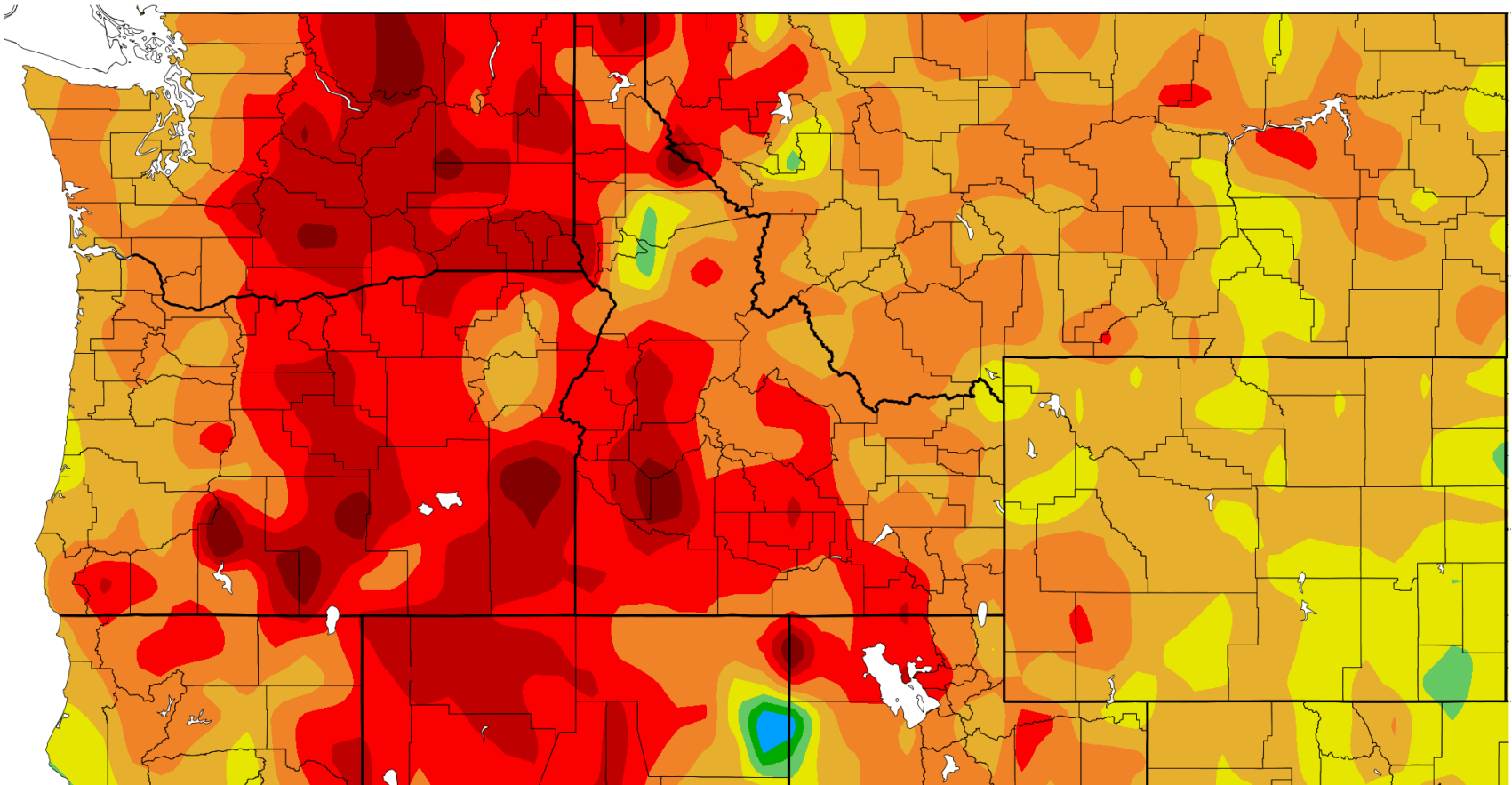
Highest 1-Day Maximum Temperature (F)

6/21/2021 – 7/20/2021

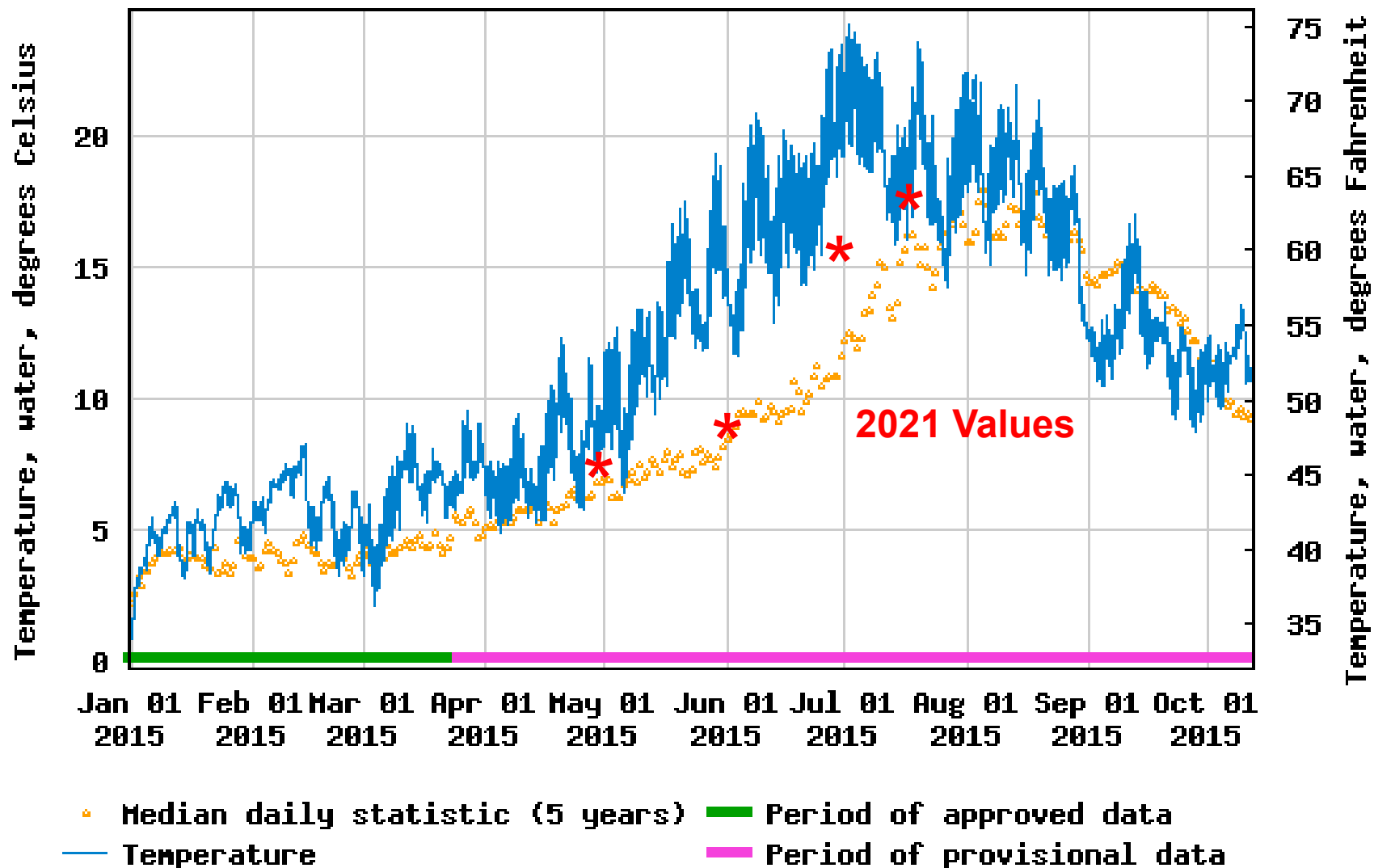


Departure from Normal Average Minimum Temperature (F)

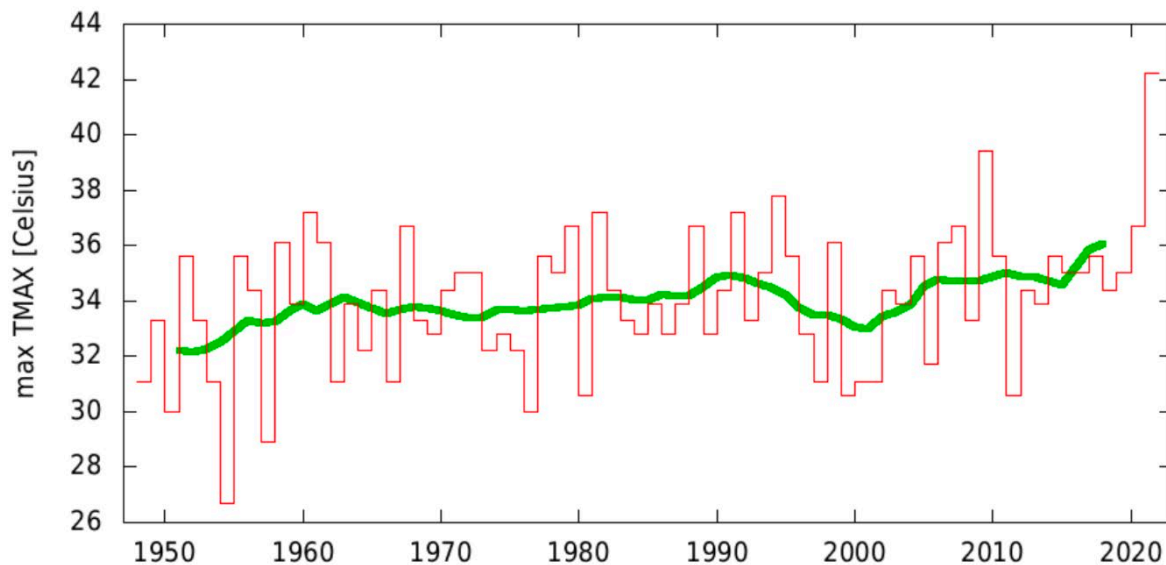
6/21/2021 – 7/20/2021



USGS 12210000 SF NOOKSACK RIVER AT SAXON BRIDGE, WA

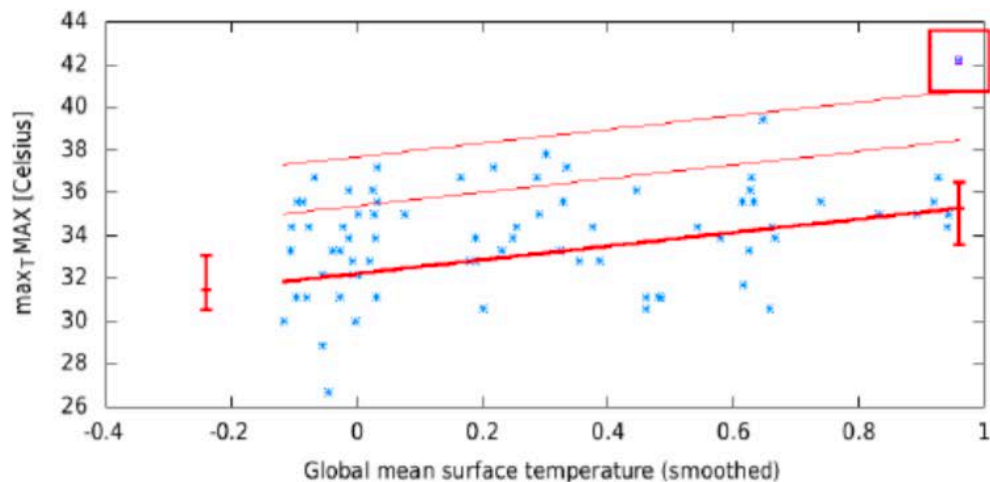


max daily maximum temperature SEATTLE TACOMA INTL AP, WA (USW00024233 max1 anom 30)



World Weather
Attribution
Philip et al. (2021)

annual max daily maximum temperature SEATTLE TACOMA INTL AP, WA 1948:2021 (95% CI)



annual max daily maximum temperature SEATTLE TACOMA INTL AP, WA 1948:2021 (95% CI)

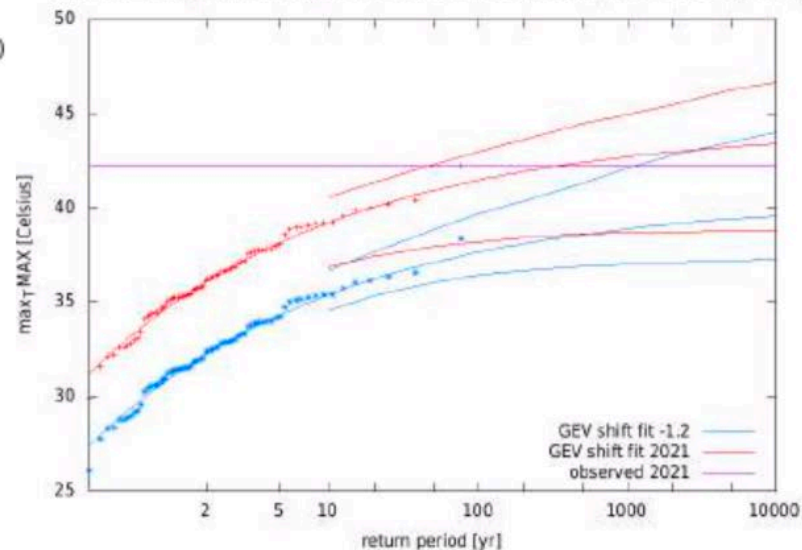


Figure 10: as Figure 9 but for the station data at Seattle-Tacoma International Airport. Source: data GHCN-D, fit: KNMI Climate Explorer.

Excerpt from the “Main Findings” of Philip et al. (2021)

- With this assumption and combining the results from the analysis of climate models and weather observations, an event, defined as daily maximum temperatures (TXx) in the heatwave region, as rare as 1 in a 1000 years would have been at least 150 times rarer without human-induced climate change.
- Also, this heatwave was about 2°C hotter than it would have been if it had occurred at the beginning of the industrial revolution (when global mean temperatures were 1.2°C cooler than today).
- Looking into the future, in a world with 2°C of global warming (0.8°C warmer than today which at current emission levels would be reached as early as the 2040s), this event would have been another degree hotter. An event like this – currently estimated to occur only once every 1000 years, would occur roughly every 5 to 10 years in that future world with 2°C of global warming.

Final Remarks

- Water year 2021 has had above-average temperatures for most of WA, with below normal precipitation
- Extremely dry spring conditions have led to exceptional drought in the lower elevations of eastern WA
- Understatement of the year from the last WSAC meeting: “I am concerned that we may be in for an extended interval of hot temperatures across the Pacific NW”
- By one measure the heat wave was on the order of a 1000-year event for the Pacific NW, and based on accepted methods involving extreme events, it was made much more likely by climate change.

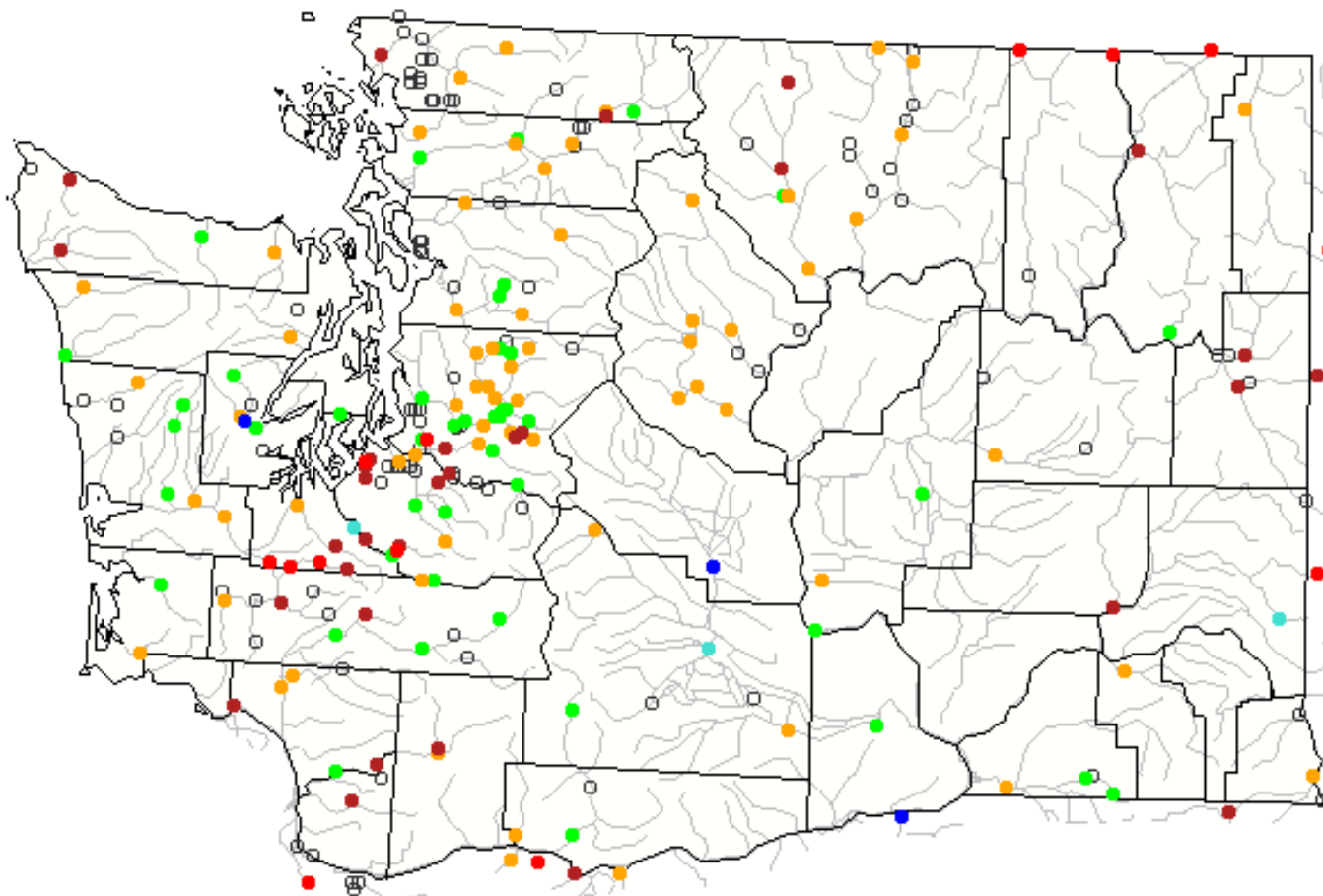
Streamflow Conditions in Washington State as of July 21-22, 2021

**Presented
to
The Washington State
Water Supply Availability Committee
on
July 23, 2021**

**by
Dan Restivo,
Acting Surface Water Specialist**

7-day Average Streamflow

Wednesday, July 21, 2021

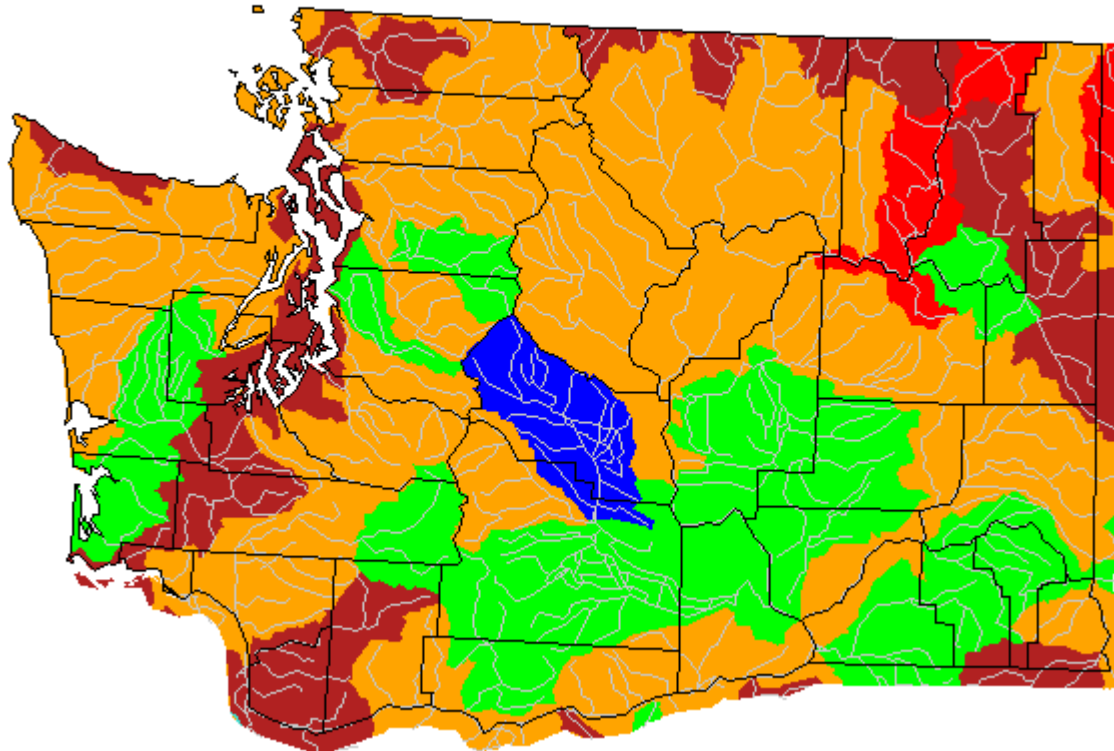


Explanation - Percentile classes

Low	<10	10-24	25-75	76-90	>90	High	Not-ranked
	Much below normal	Below normal	Normal	Above normal	Much above normal		

7-day Average Streamflow by HUC

Thursday, July 22, 2021

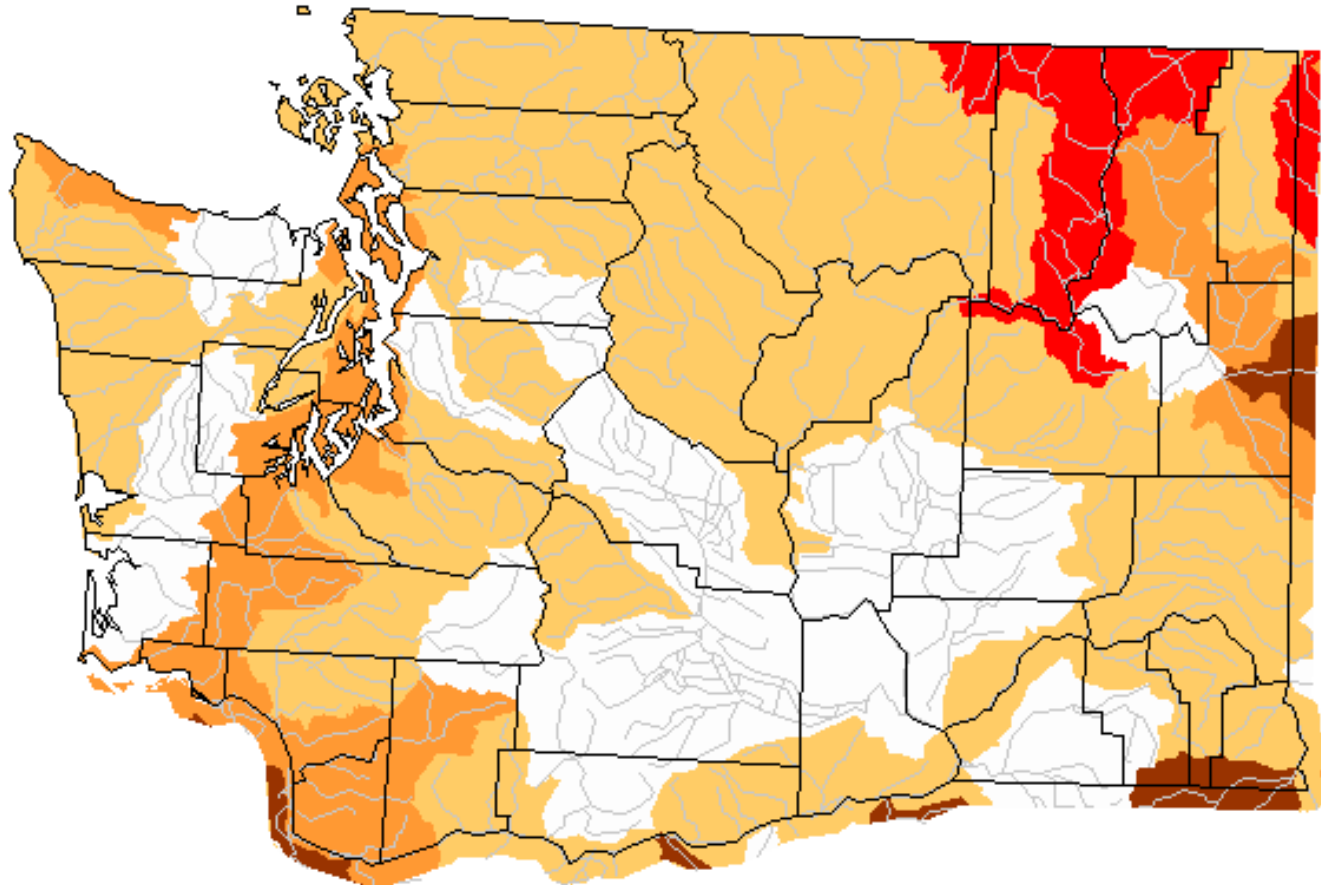


Explanation - Percentile classes

Low	<10	10-24	25-75	76-90	>90	High	No Data
	Much below normal	Below normal	Normal	Above normal	Much above normal		

Below Normal 7-day Average Streamflow by HUC

Wednesday, July 21, 2021



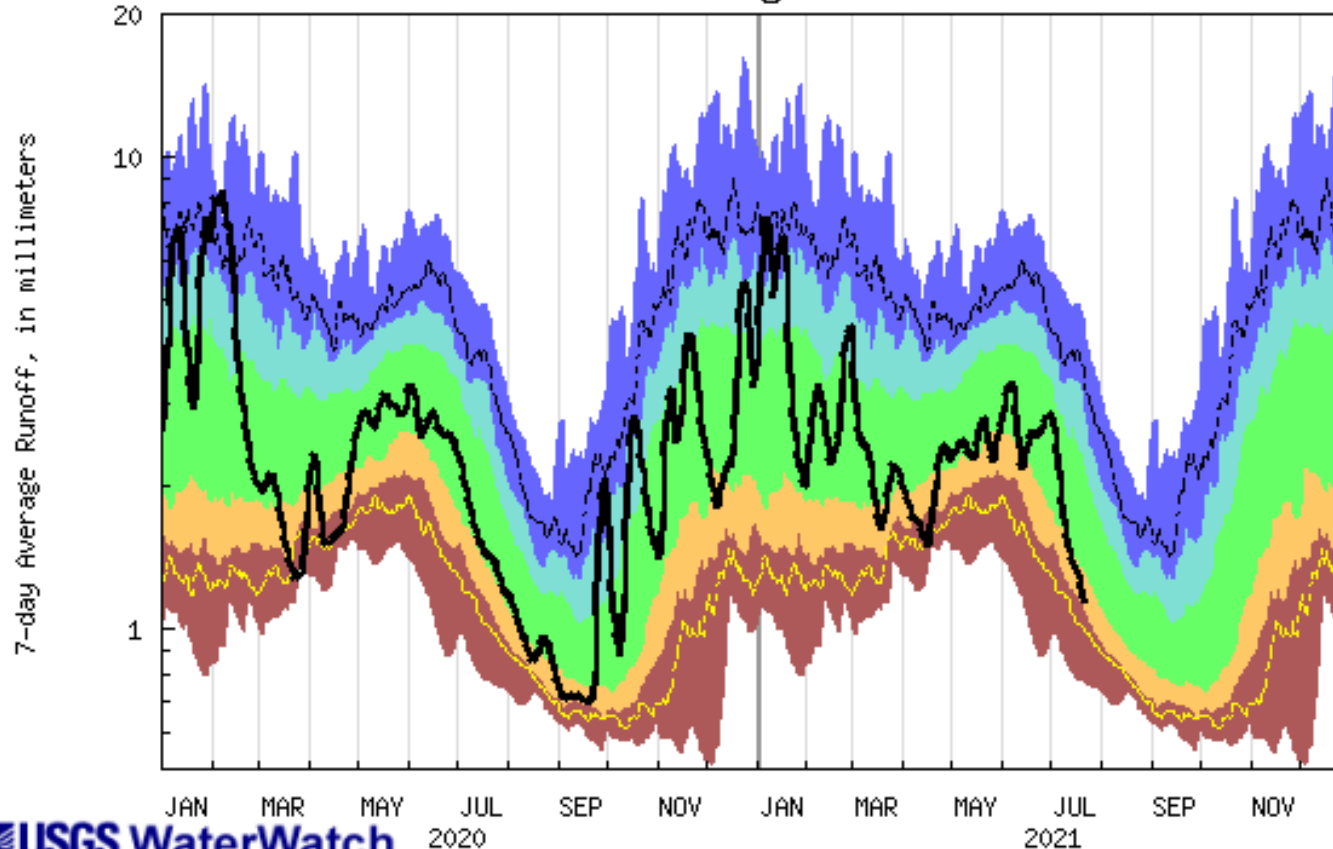
Explanation - Percentile classes

Low	<=5	6-9	10-24
Extreme hydrologic drought	Severe hydrologic drought	Moderate hydrologic drought	Below normal

Duration Hydrograph, Washington State

7-day Average Streamflow

Duration hydrograph of 7-day average runoff for Washington

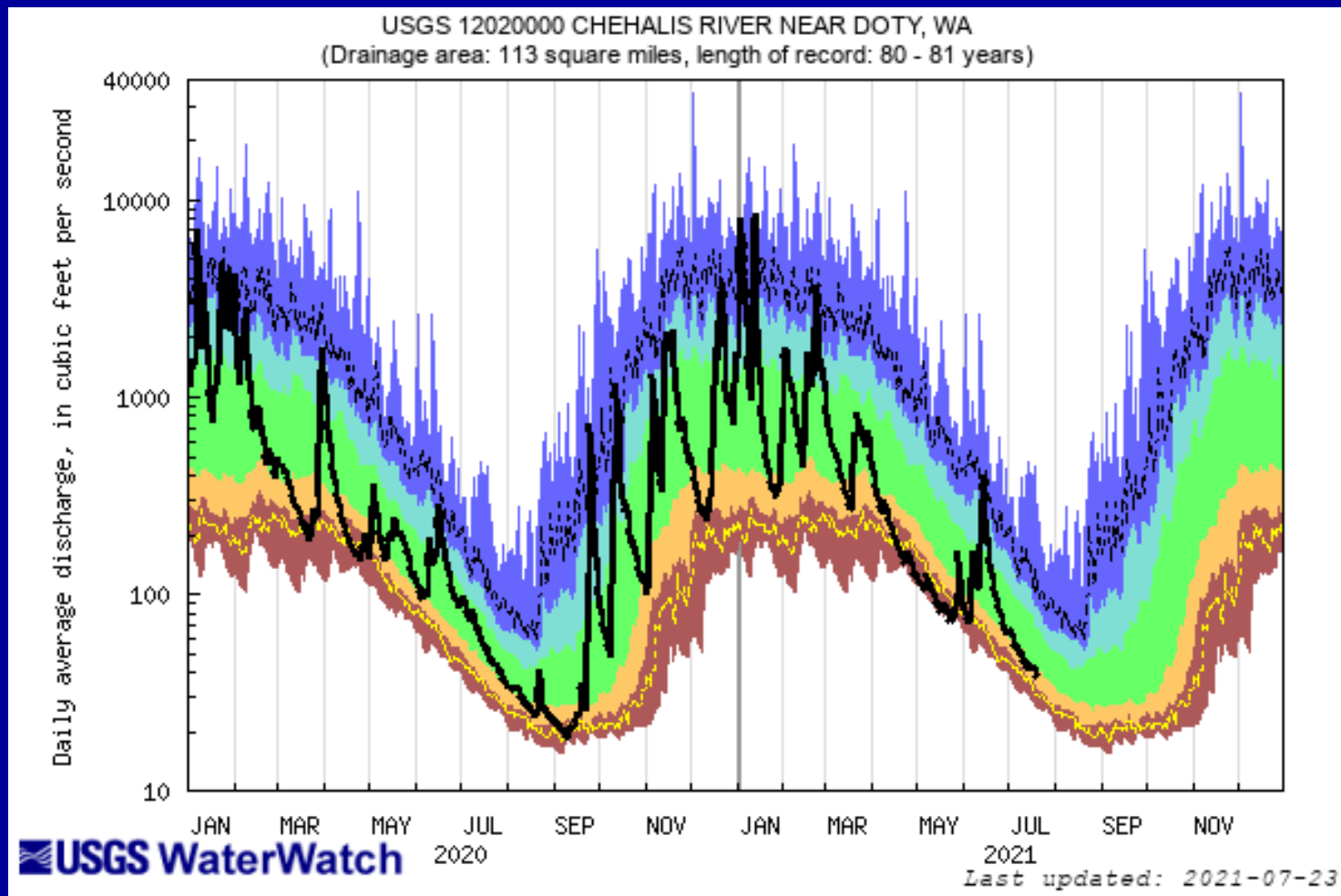




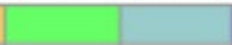




As of July 22, 2021, statewide 7-day average flows are between the 10th and 24th percentile, which is Below Normal.

Explanation - Percentile classes

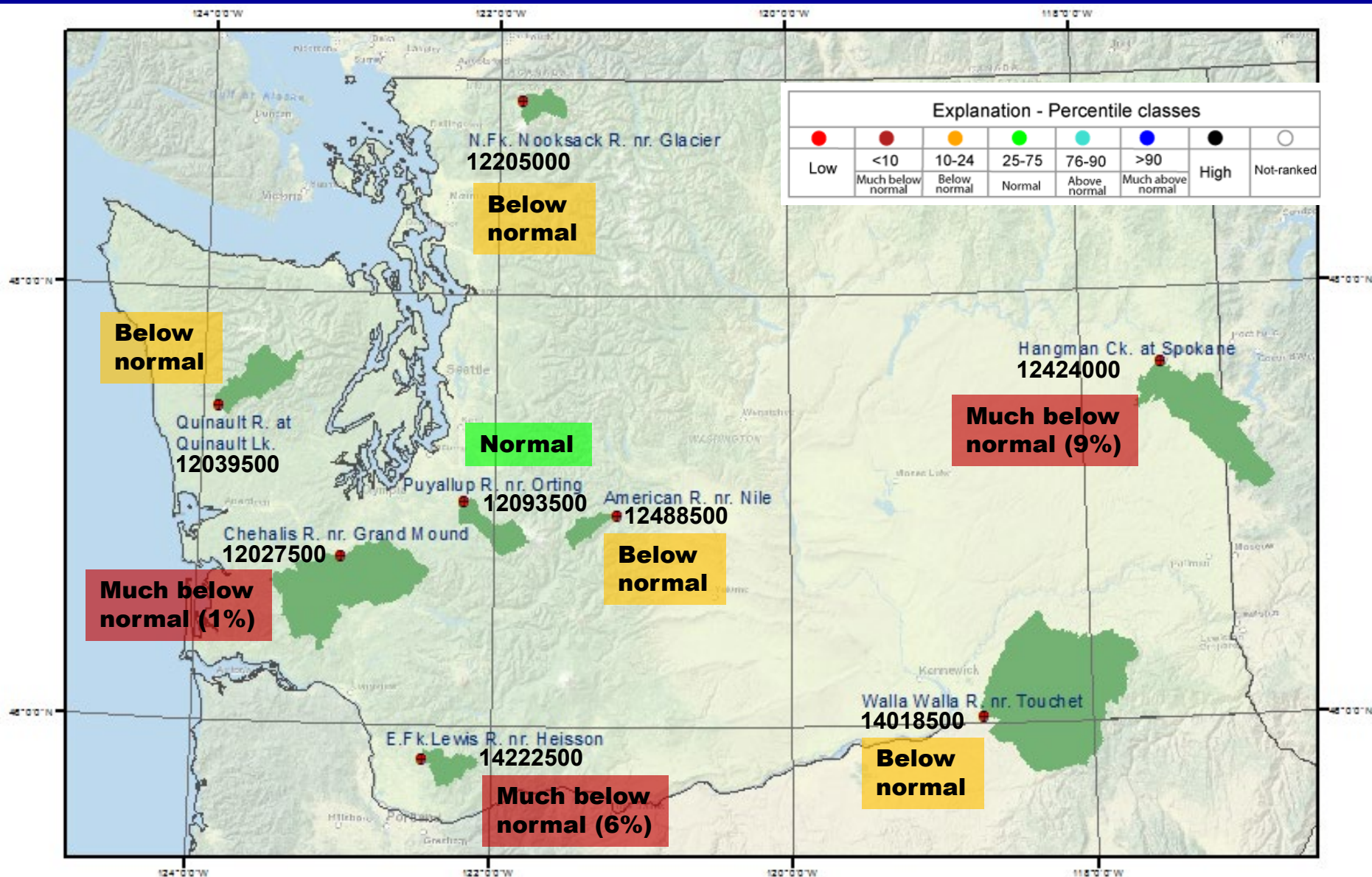
lowest-10th percentile	5	10-24	25-75	76-90	95	90th percentile-highest	Flow
Much below Normal	Below normal	Normal	Above normal	Much above normal			

Chehalis River near Doty

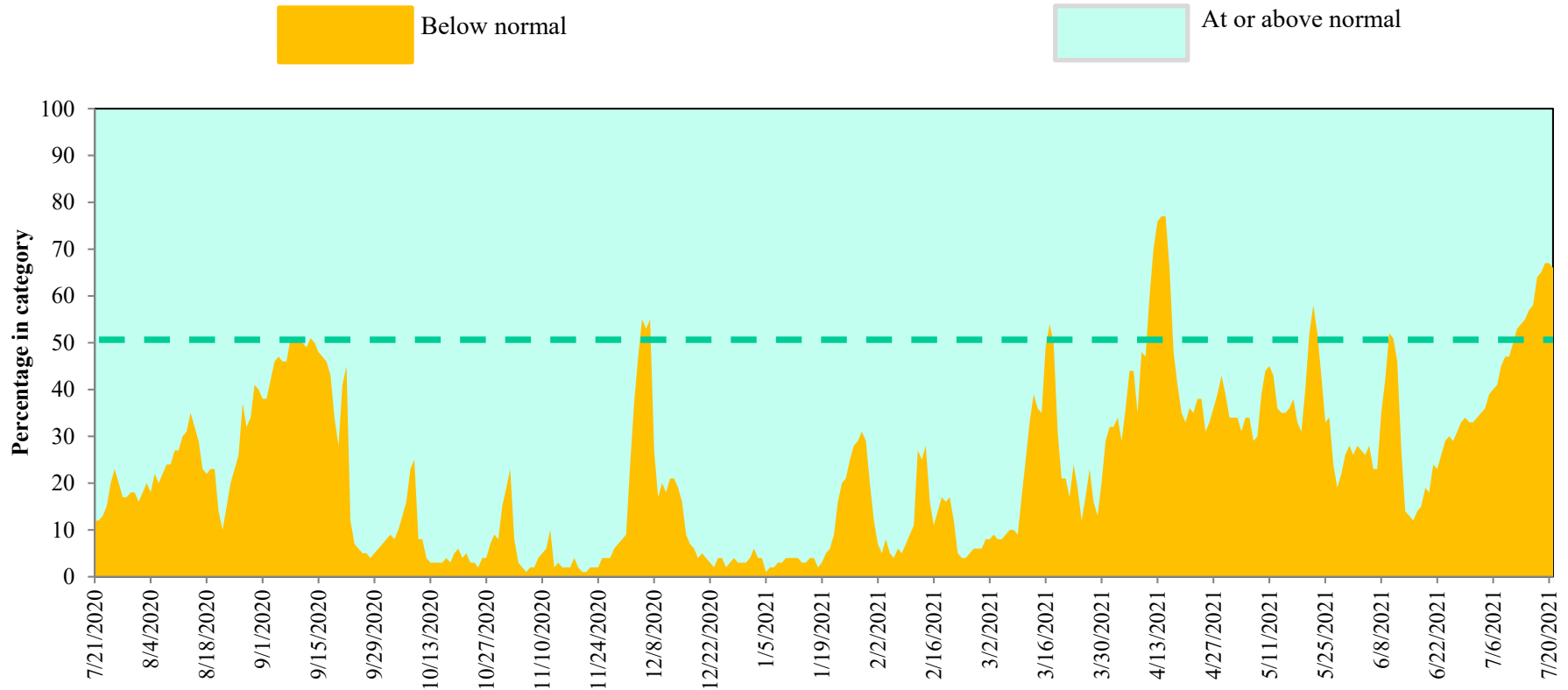


Explanation - Percentile classes							
							
lowest-10th percentile	5	10-24	25-75	76-90	95	90th percentile-highest	Flow
Much below Normal	Below normal	Normal	Above normal	Much above normal			

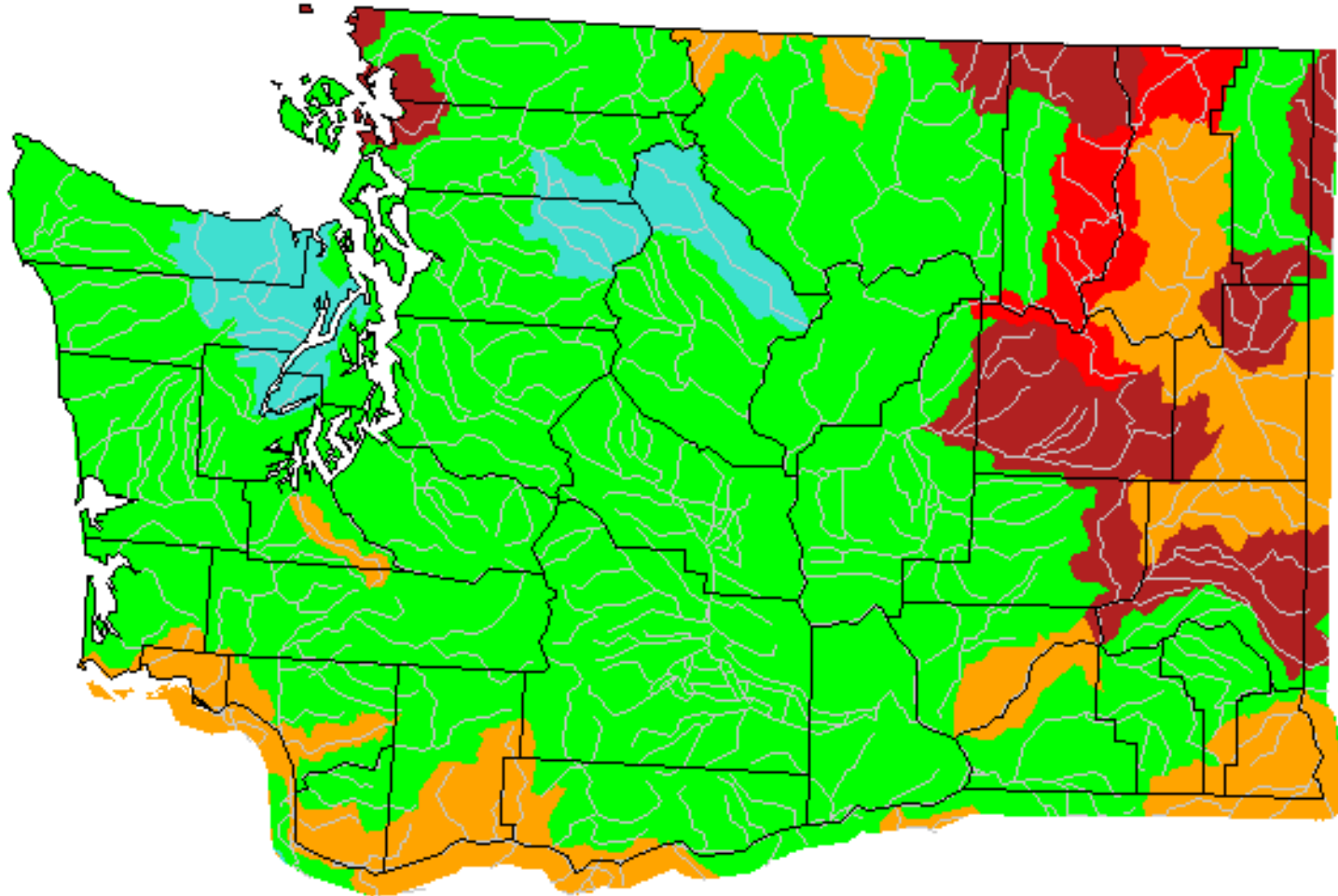
Index Gaging Stations, 7-day average streamflow (as of July 21, 2021)









Daily streamflow in Washington Rivers compared to historical streamflow on that date, July 21, 2020 – July 21, 2021



Average June 2021 Streamflow



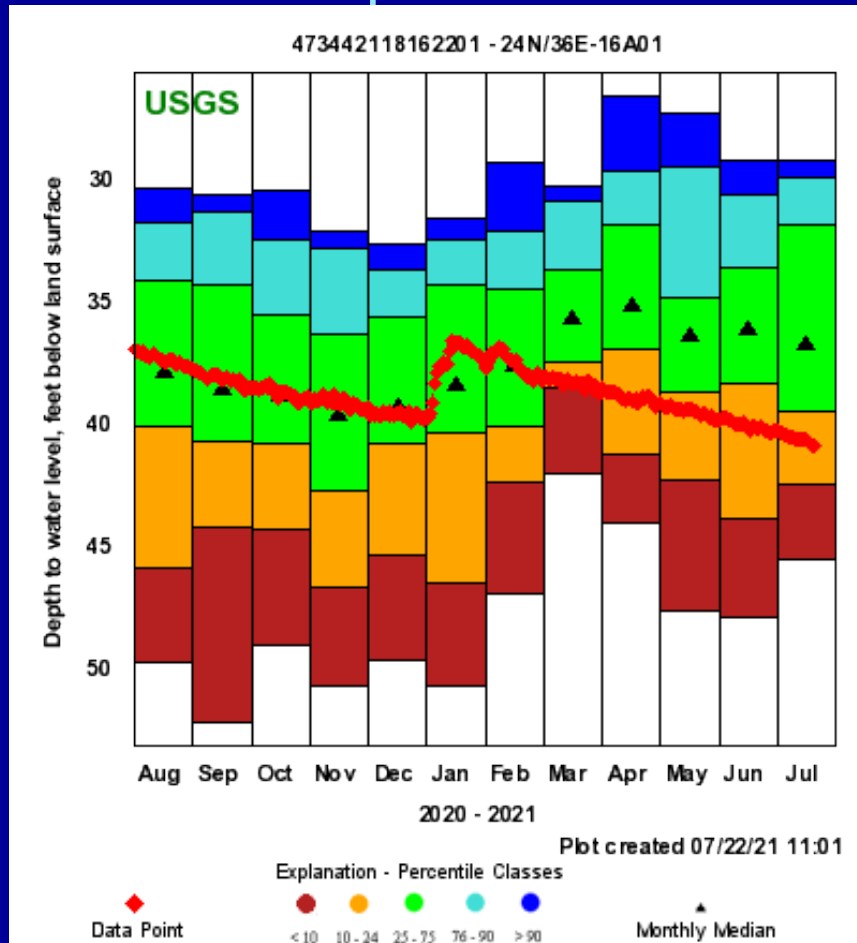
Explanation - Percentile classes						
						
Low	<10	10-24	25-75	76-90	>90	High
	Much below normal	Below normal	Normal	Above normal	Much above normal	

Index Groundwater Conditions as of July 22, 2021

Groundwater Watch:

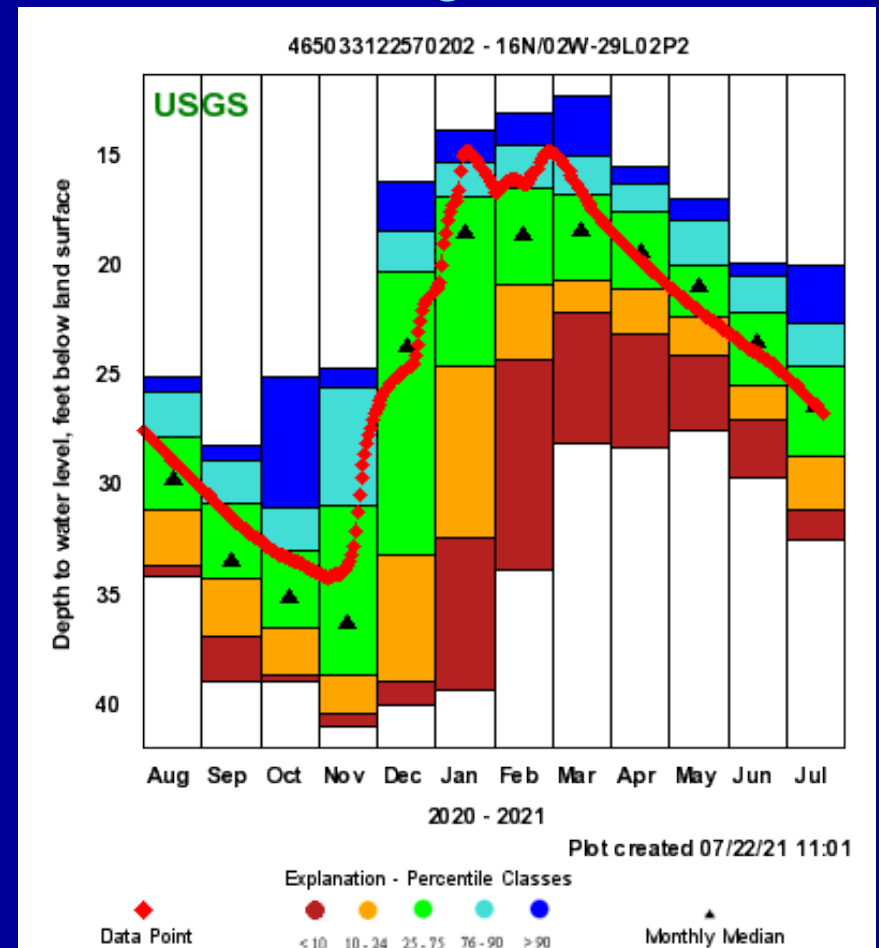
Davenport well (east)

- 117-ft deep
- Wanapum Basalt



Scatter Creek well (west)

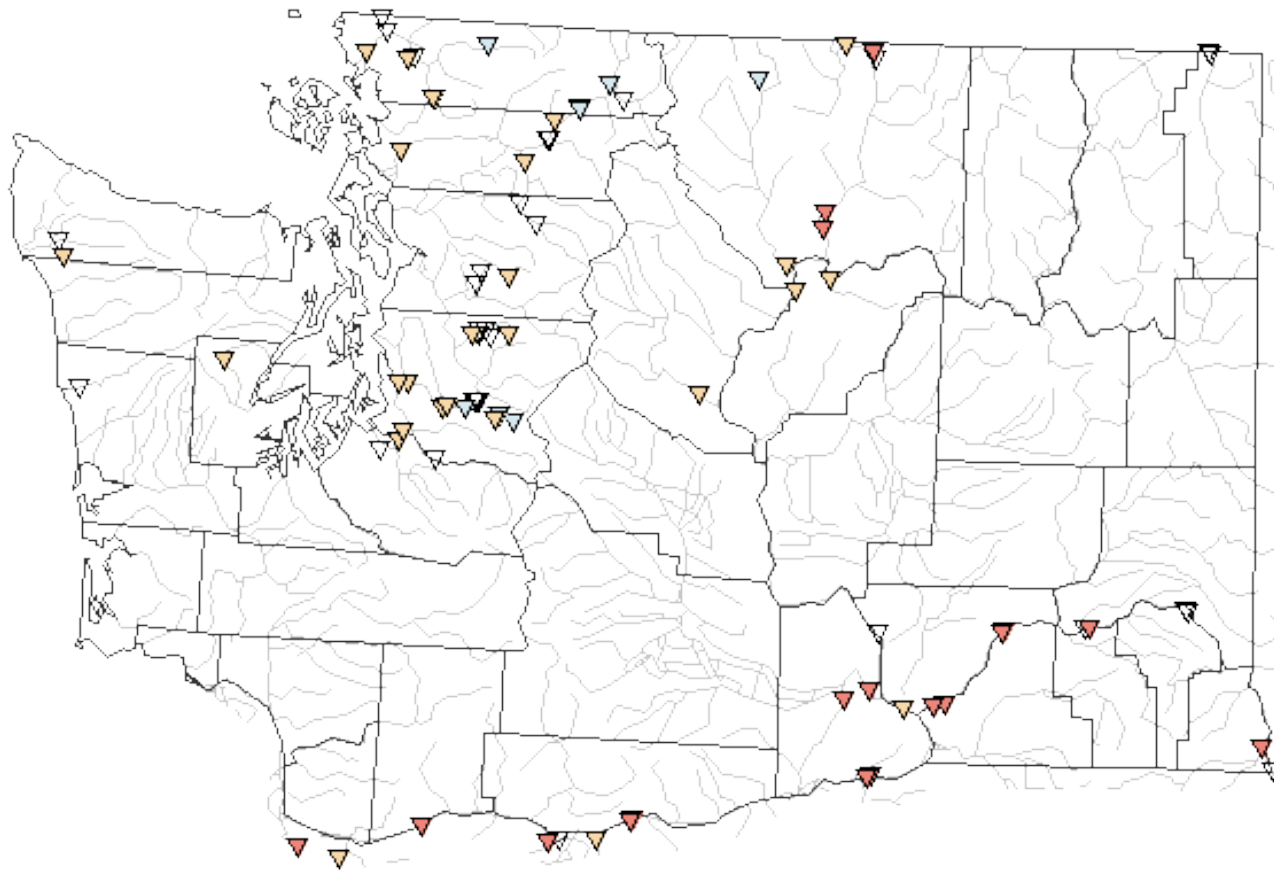
- 82-ft deep
- Sand and gravel



Real-time Water Temperature (degrees C)

Water Quality Watch:

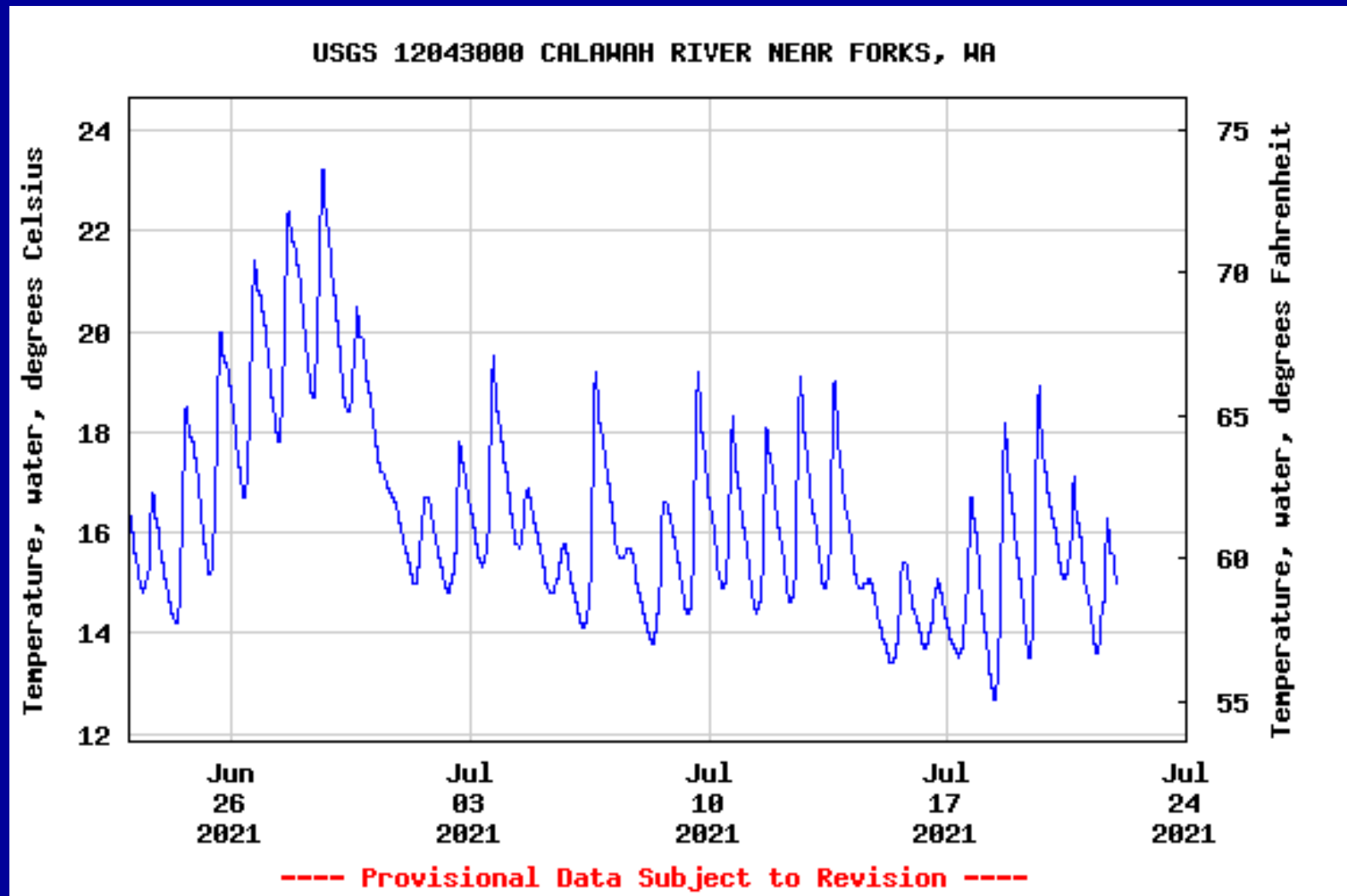
July 23, 2021 09:30ET



Explanation

<1	1-4.9	5-9.9	10-19.9	20-29.9	30-35	>35	No Data *

Water Temperature – Calawah River near Forks

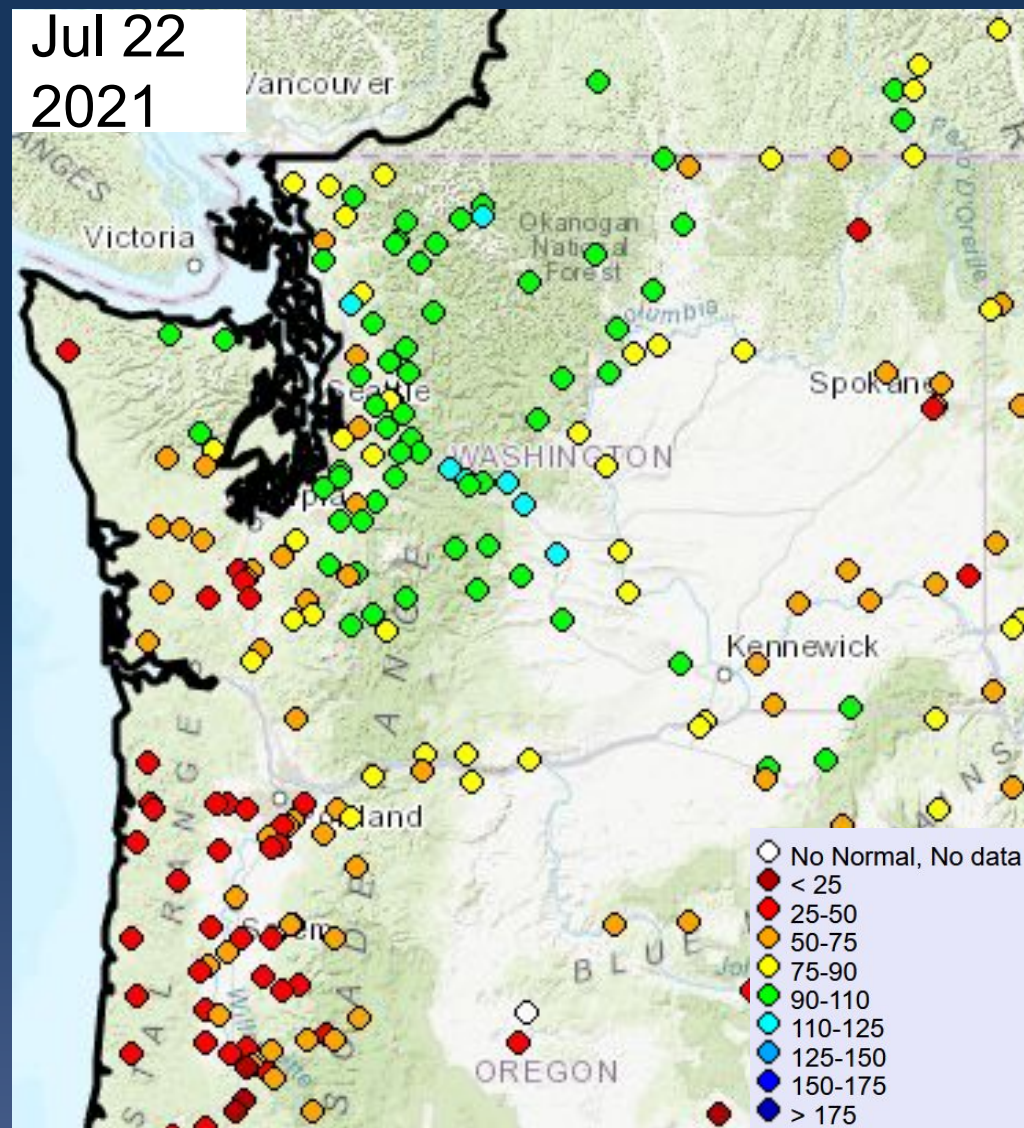
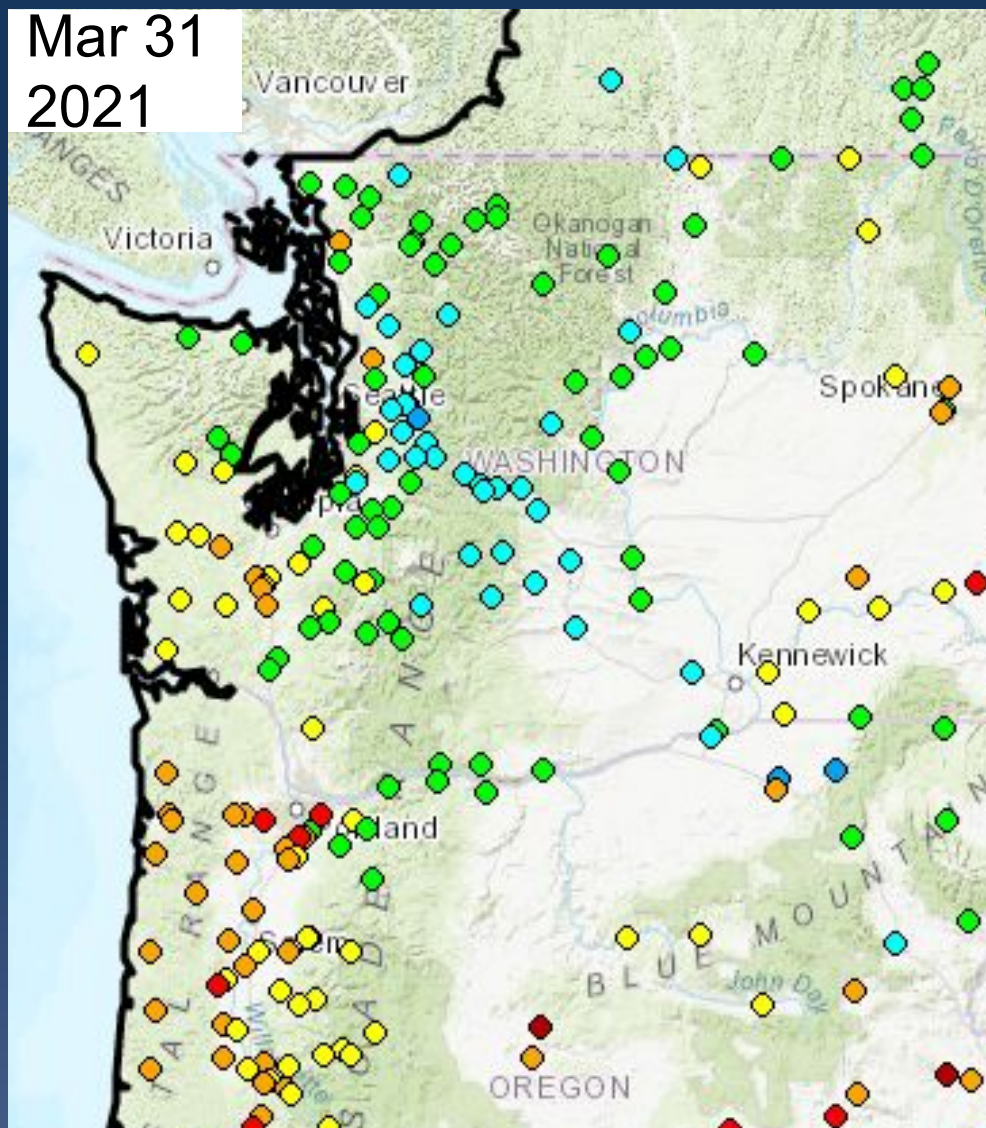


Summary

Streamflow Conditions as of July 21-22, 2021

- 7-day average streamflow statewide overall is **below normal** (between 10th and 24th percentile). **Much below normal** (<10th percentile) conditions are prevalent in the southwest, the north side of the Olympic Peninsula, Puget Sound lowlands, and the far eastern and northern sides of the state.
- 99 of the 151 reporting stream gages (66%) are Below normal daily streamflow levels.
- 7-day average streamflow at eight index gaging stations:
 - West side:
 - Chehalis River nr. Grand Mound and EF Lewis River – **Much below normal**
 - Quinault River and NF Nooksack River – **Below normal**
 - Puyallup River nr. Orting - **Normal**
 - East side:
 - Walla Walla River and American River – **Below normal**
 - Hangman Creek – **Much below normal**
- Index groundwater sites:
 - Davenport well (east) – **Below normal**
 - Scatter Creek well (west) – **Normal**

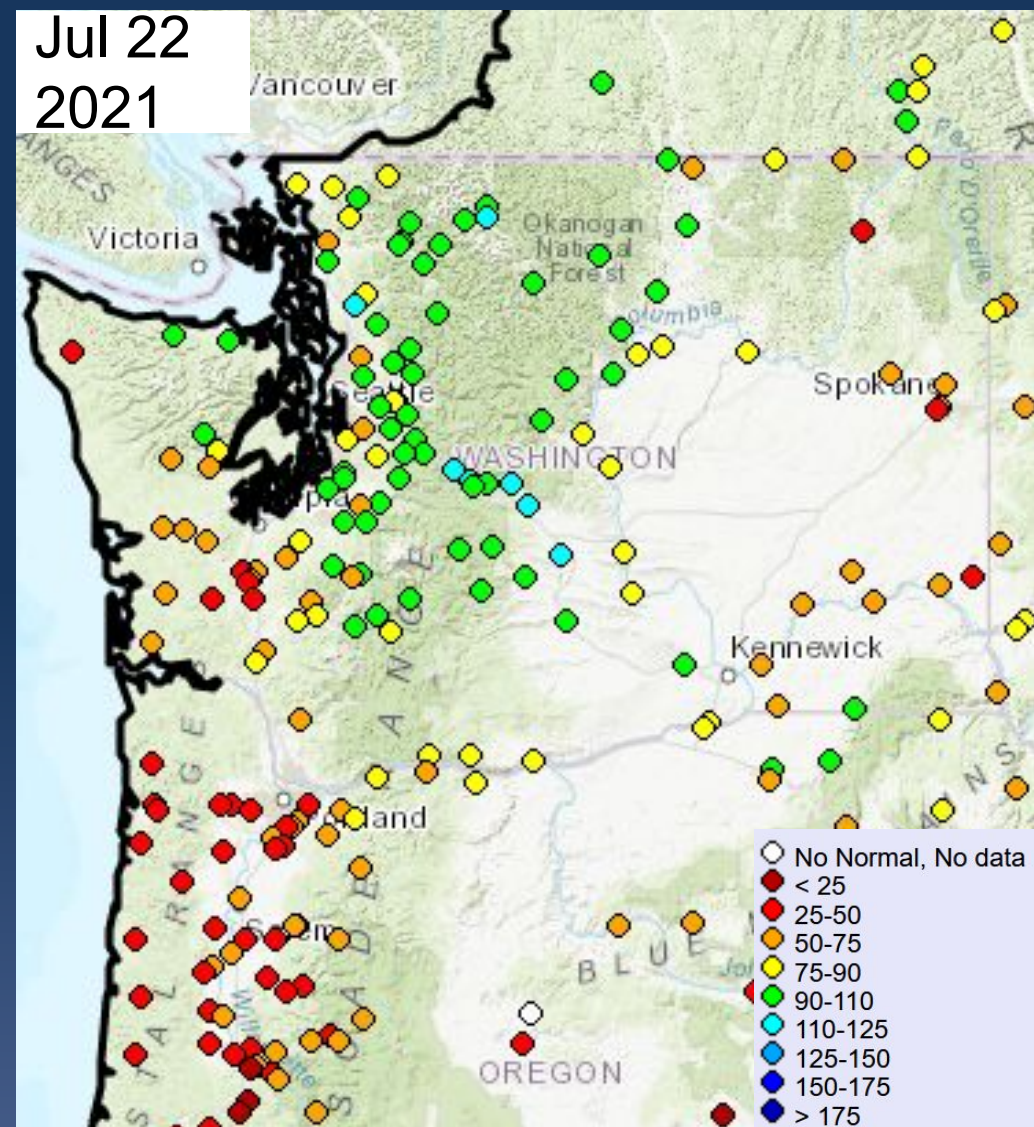
ESP10 Natural Forecasts - WA





ESP10 Natural Forecasts - WA

Jul 22
2021



% Normal Apr -Sep Vol

Mar 31

July 23

Δ

Skagit nr Mt Vernon

105

102

-3

Dungeness nr Sequim

96

94

-2

Chehalis at Porter

73

59

-14

Okanogan at Malott

104

95

-9

Methow nr Pateros

110

101

-9

Yakima at Parker

113

105

-8

Walla Walla nr Touchet

84

50

-34