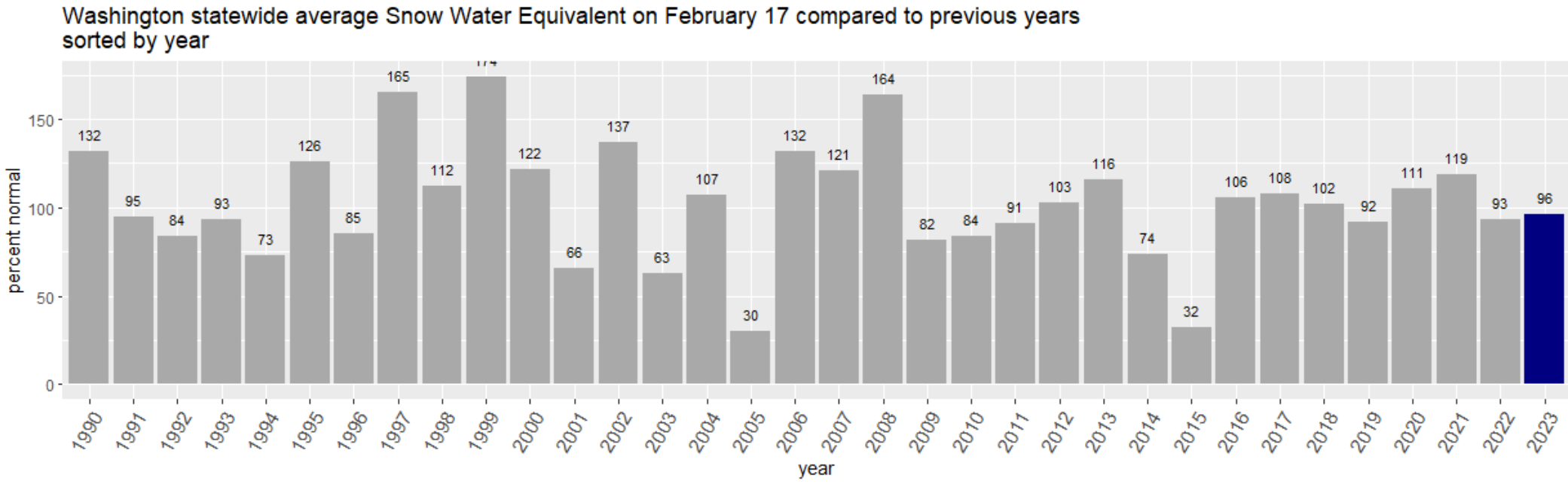
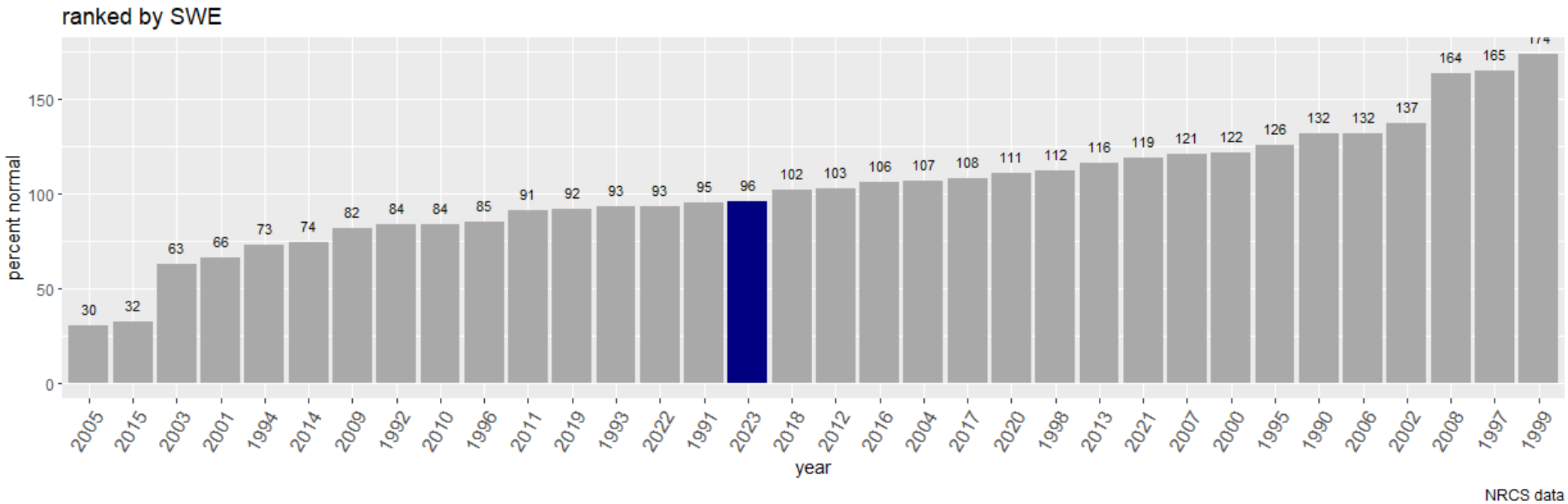
# Water Supply Availability Committee

| Friday, February 17, 2023 | | | | |
|---|---|---|---|---|
| Start Time | End Time | Duration, min | Description | |
| 10:00 | 10:10 | 10 | Welcome & Introductions | Jeff Marti, Ecology |
| 10:10 | 10:25 | 15 | Regional Climate Setting/ ENSO | Karin Bumbaco, OWSC<br>Nick Bond, OWSC |
| 10:25 | 10:40 | 15 | Mountain Conditions | Scott Pattee, NRCS |
| 10:40 | 10:50 | 10 | Streamflow and Groundwater | Nick Sutfin, USGS |
| 10:50 | 11:05 | 15 | Water Supply Forecasts | Amy Burke, NWRFC<br>Brent Bower, NWS |
| 11:05 | 11:25 | 20 | All | All |

BOR releases official Yakima Forecast on March 9th

Next WSAC Meeting:  Friday, March 24th


Washington statewide average Snow Water Equivalent on February 17 compared to previous years
sorted by year
percent normal
year
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
132 95 84 93 73 126 85 165 112 174 122 66 137 63 107 30 132 121 164 82 84 91 103 116 74 32 106 108 102 92 111 119 93 96
NRCS data


ranked by SWE
percent normal
year
2005 2015 2003 2001 1994 2014 2009 1992 2010 1996 2011 2019 1993 2022 1991 2023 2018 2012 2016 2004 2017 2020 1998 2013 2021 2007 2000 1995 1990 2006 2002 2008 1997 1999
30 32 63 66 73 74 82 84 84 85 91 92 93 93 95 96 102 103 106 107 108 111 112 116 119 121 122 126 132 132 137 164 165 174
NRCS data

Oct. 1 Snow Storage:
**483,442 af**

**Nov. 17, 2022 :**
**6,171,010 af**

**January 1, 2023**
**24,175,516 af**

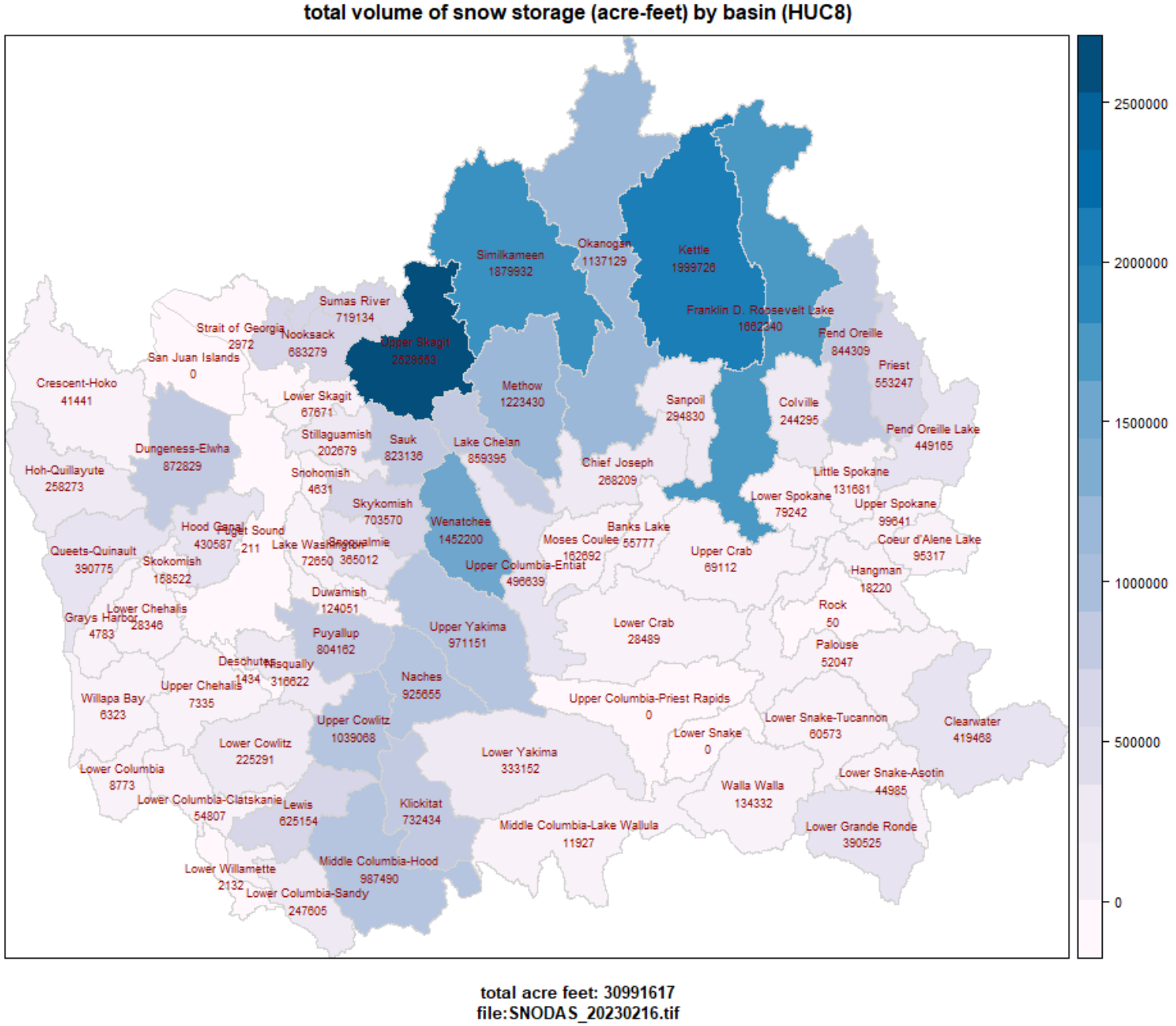
**January 18, 2023**
**26,397,974 af**

**February 16, 2023:**
**30,991,617**

**February 16, 2015:**
**12,610,187 af**

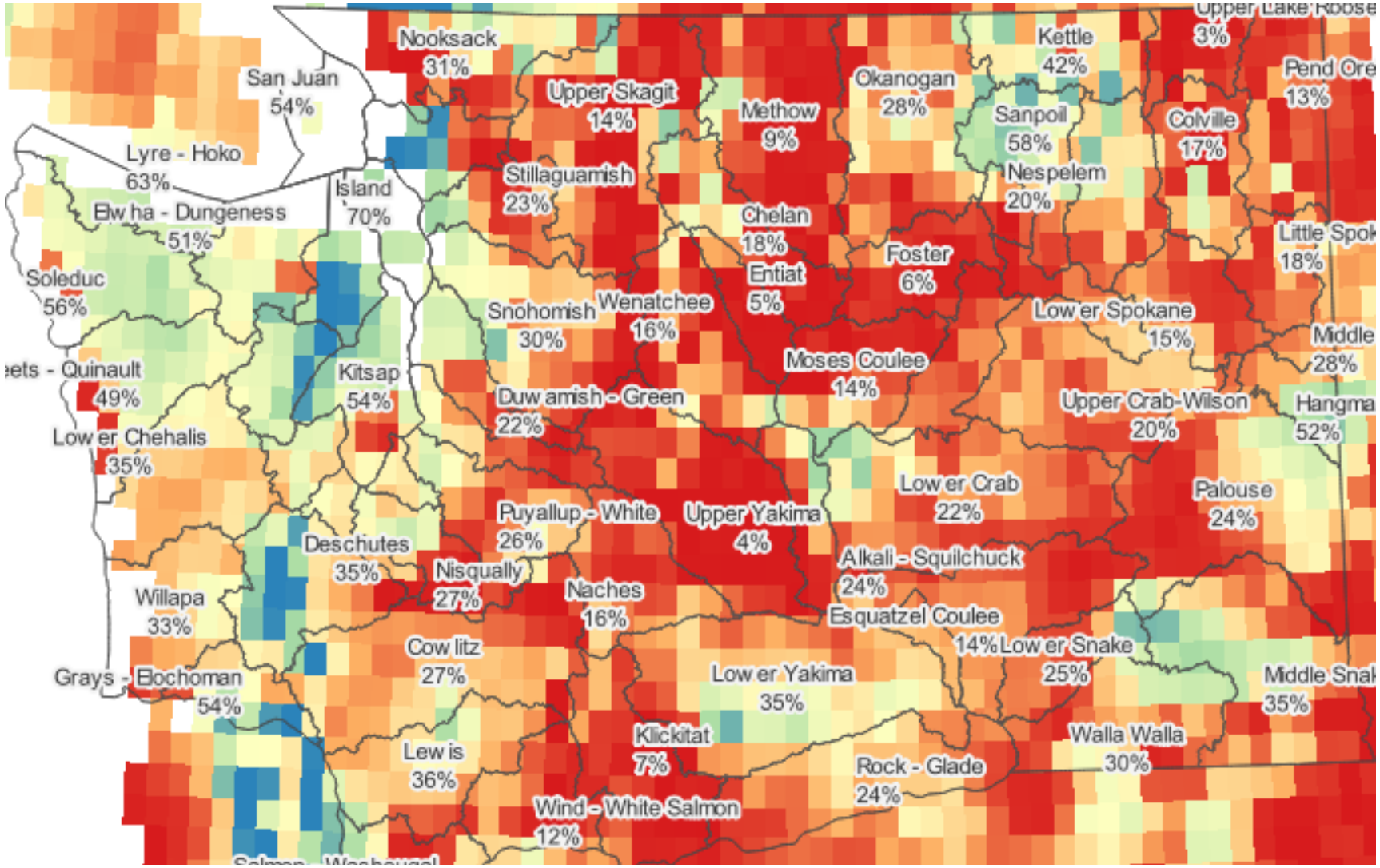
Total Yakima Snow Storage: 2,229,958 af
+
Reservoir Storage: 509,579 af

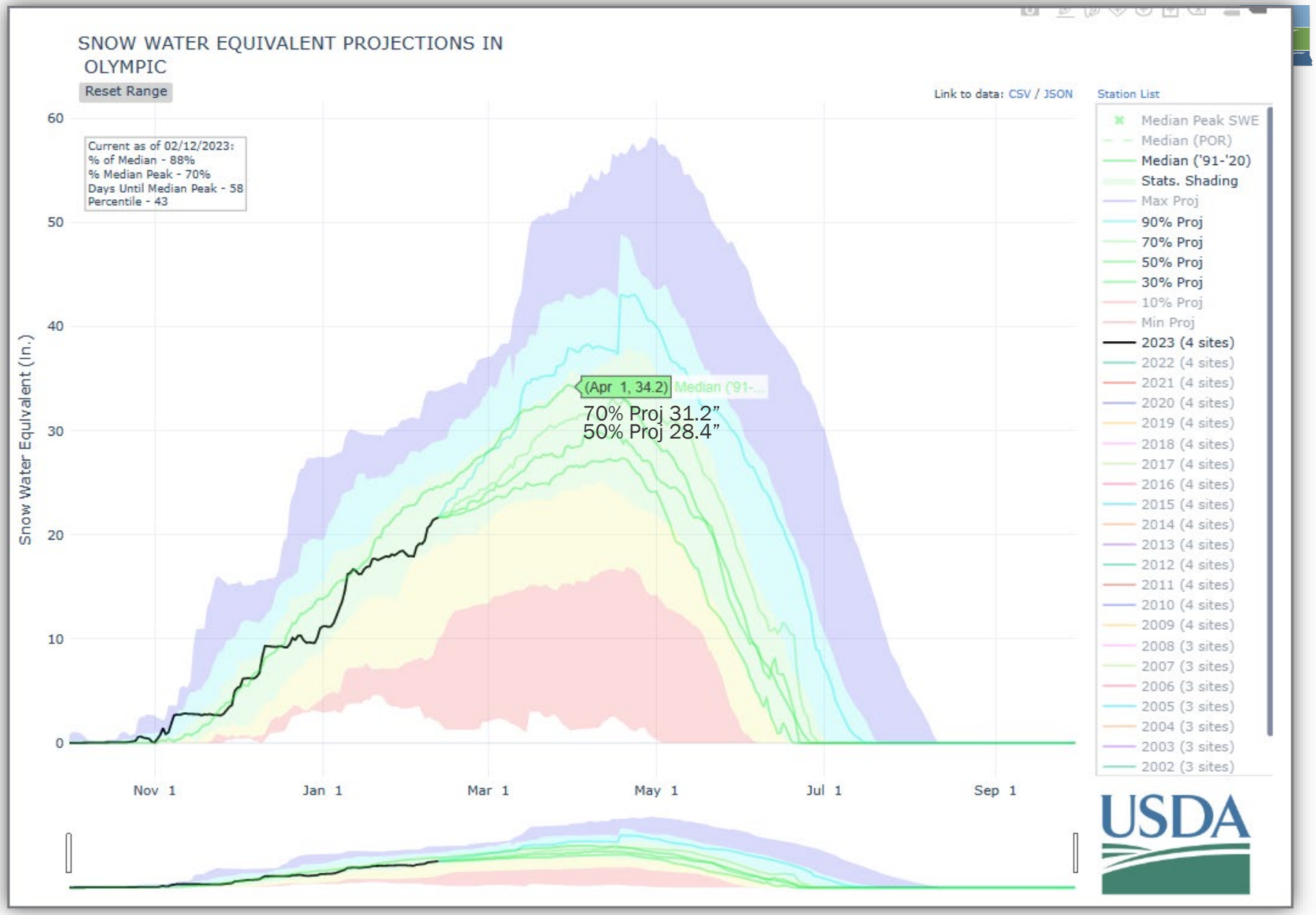
= Total of 2,739,537 af



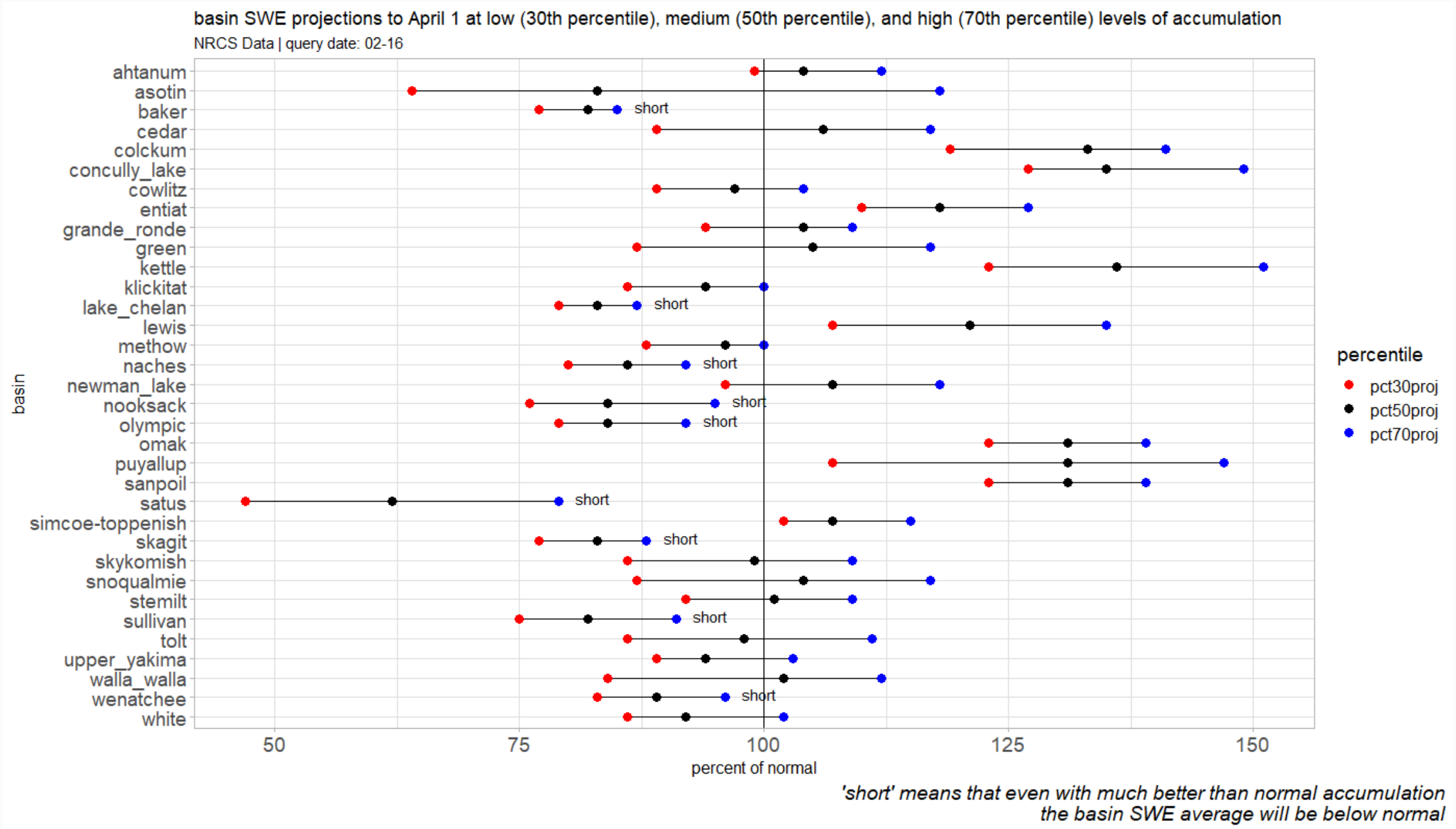
# End

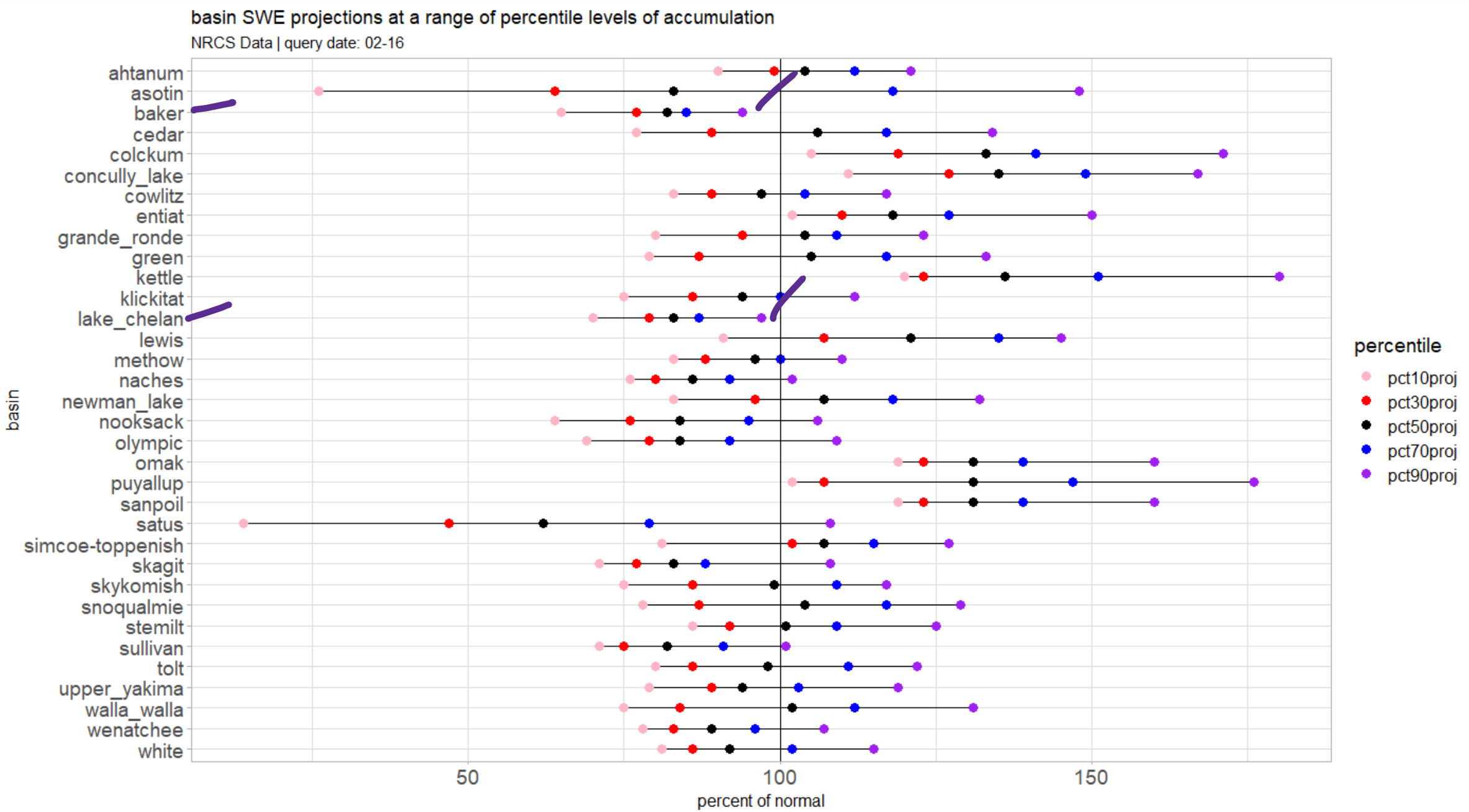
GRACE Root Zone Soil Moisture (1 Meter); Feb 14, 2023

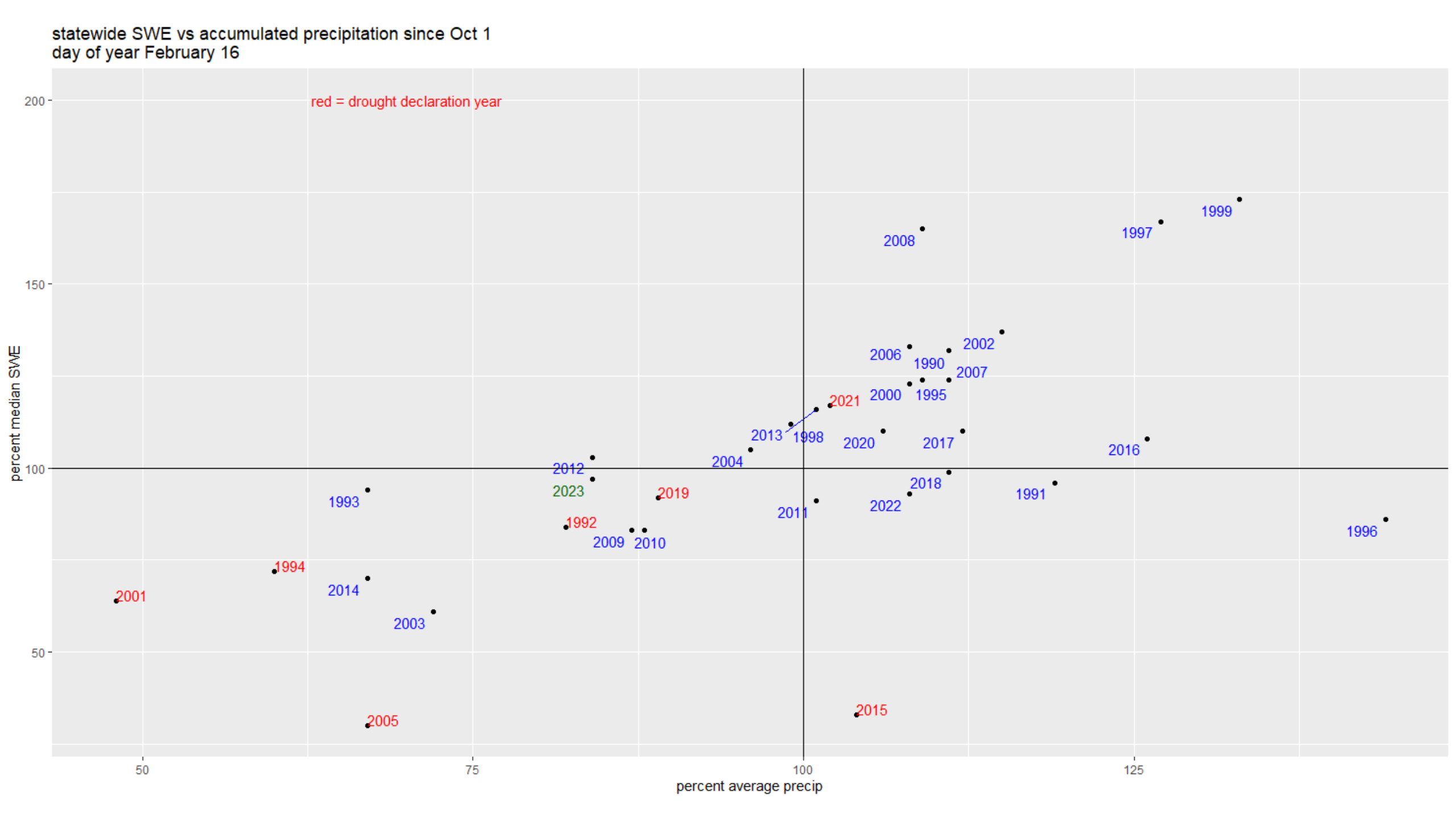


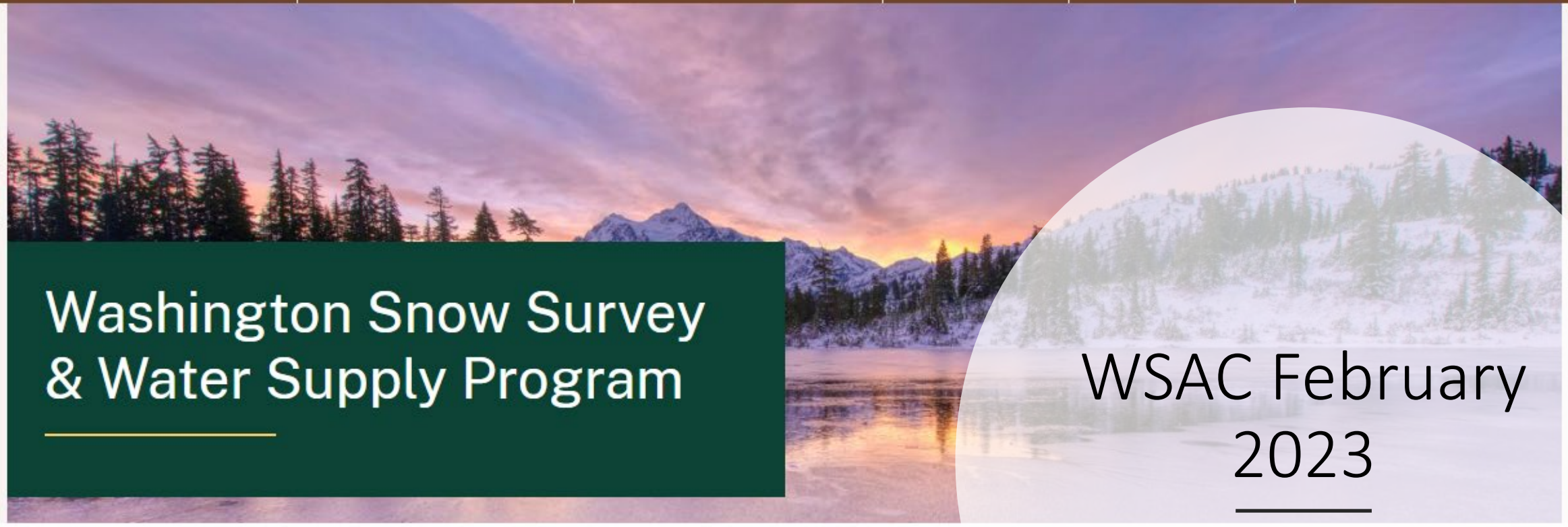



https://www.nrcs.usda.gov/Internet/WCIS/AWS_PLOTS/basinCharts/Proj/WTEQ/


basin SWE projections to April 1 at low (30th percentile), medium (50th percentile), and high (70th percentile) levels of accumulation
NRCS Data | query date: 02-16
basin
ahtanum
asotin
baker
cedar
colckum
concully_lake
cowlitz
entiat
grande_ronde
green
kettle
klickitat
lake_chelan
lewis
methow
naches
newman_lake
nooksack
olympic
omak
puyallup
sanpoil
satus
simcoe-toppenish
skagit
skykomish
snoqualmie
stemilt
sullivan
tolt
upper_yakima
walla_walla
wenatchee
white
short
50
75
100
125
150
percent of normal
percentile
pct30proj
pct50proj
pct70proj
'short' means that even with much better than normal accumulation
the basin SWE average will be below normal


basin SWE projections at a range of percentile levels of accumulation
NRCS Data | query date: 02-16
basin
ahtanum
asotin
baker
cedar
colckum
concully_lake
cowlitz
entiat
grande_ronde
green
kettle
klickitat
lake_chelan
lewis
methow
naches
newman_lake
nooksack
olympic
omak
puyallup
sanpoil
satus
simcoe-toppenish
skagit
skykomish
snoqualmie
stemilt
sullivan
tolt
upper_yakima
walla_walla
wenatchee
white
50
100
150
percent of normal
percentile
pct10proj
pct30proj
pct50proj
pct70proj
pct90proj


statewide SWE vs accumulated precipitation since Oct 1
day of year February 16
red = drought declaration year
percent median SWE
percent average precip
200
150
100
50
50
75
100
125
1999
1997
2008
2002
2006
1990
2007
2000
1995
2021
2013
1998
2020
2017
2016
2004
2012
2023
2019
2018
1991
1993
2011
2022
1992
2009
2010
1996
1994
2001
2014
2003
2005
2015



# Washington Snow Survey & Water Supply Program

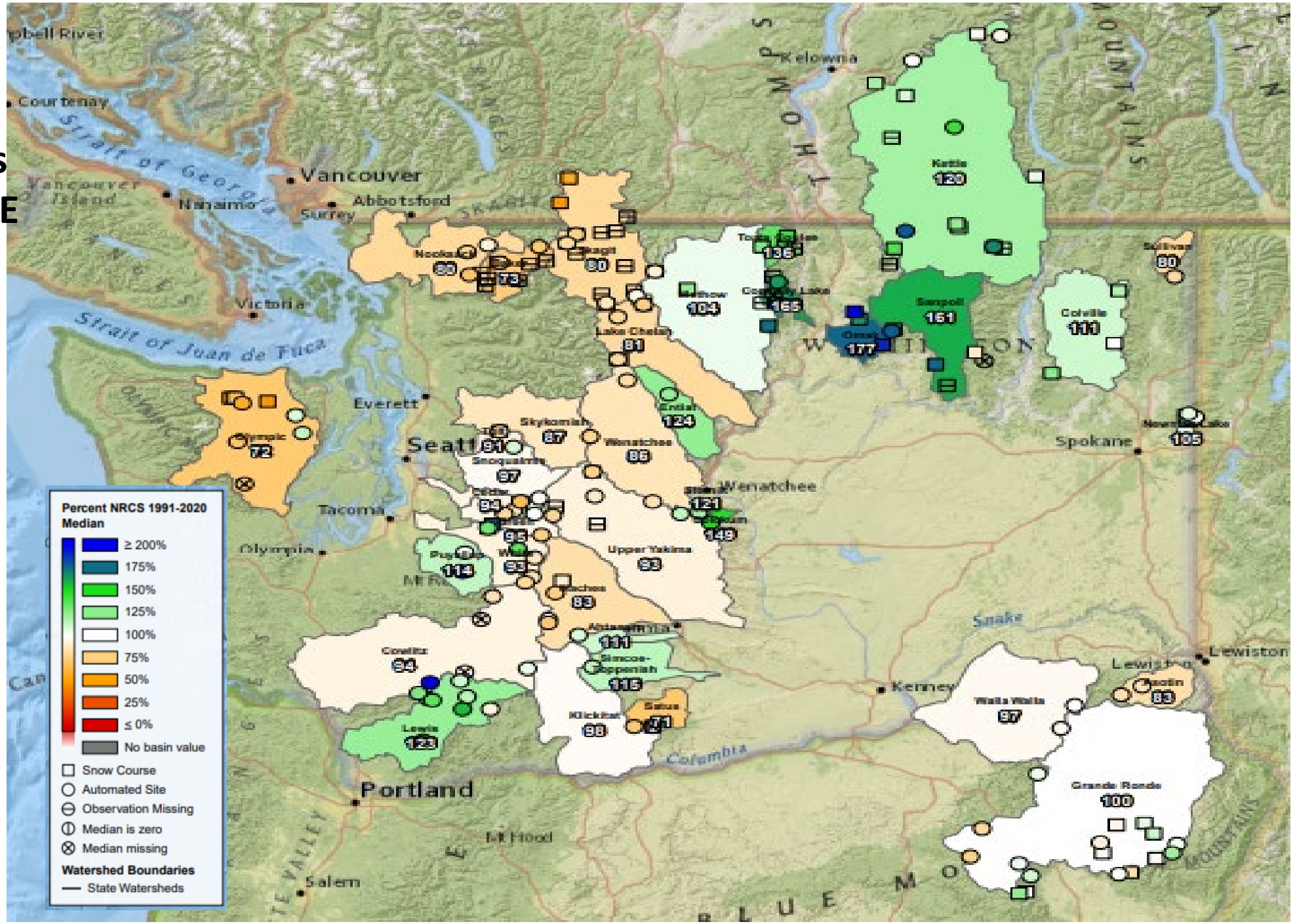
# WSAC February 2023

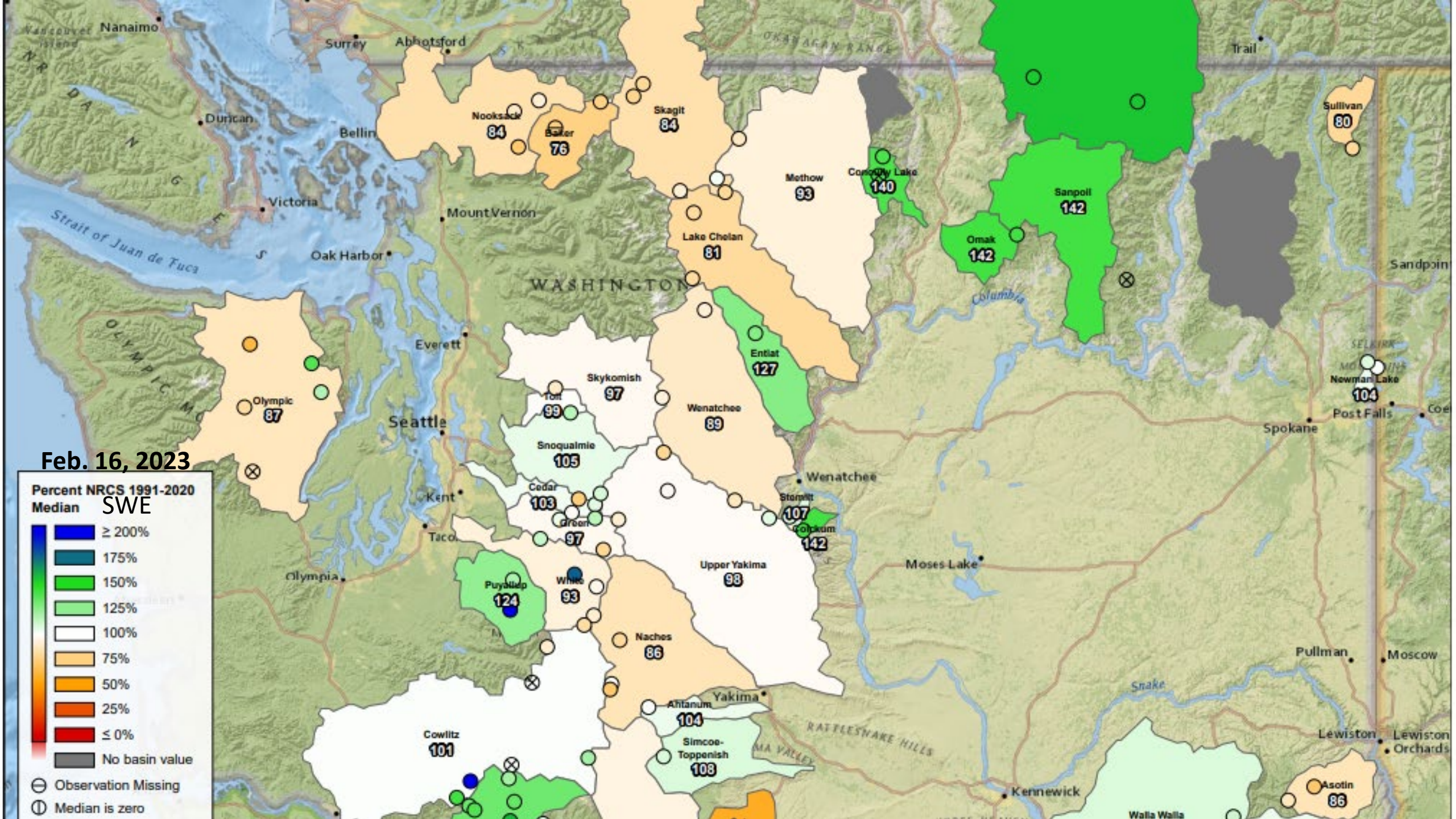


The NRCS Snow Survey Program provides mountain snowpack data and streamflow forecasts for the western United States. Applications of snow survey products include water supply management, flood control, climate modeling, recreation, and

NRCS Natural Resources Conservation Service

**End of January all inclusive**
**snow survey results**
**Percent normal SWE**



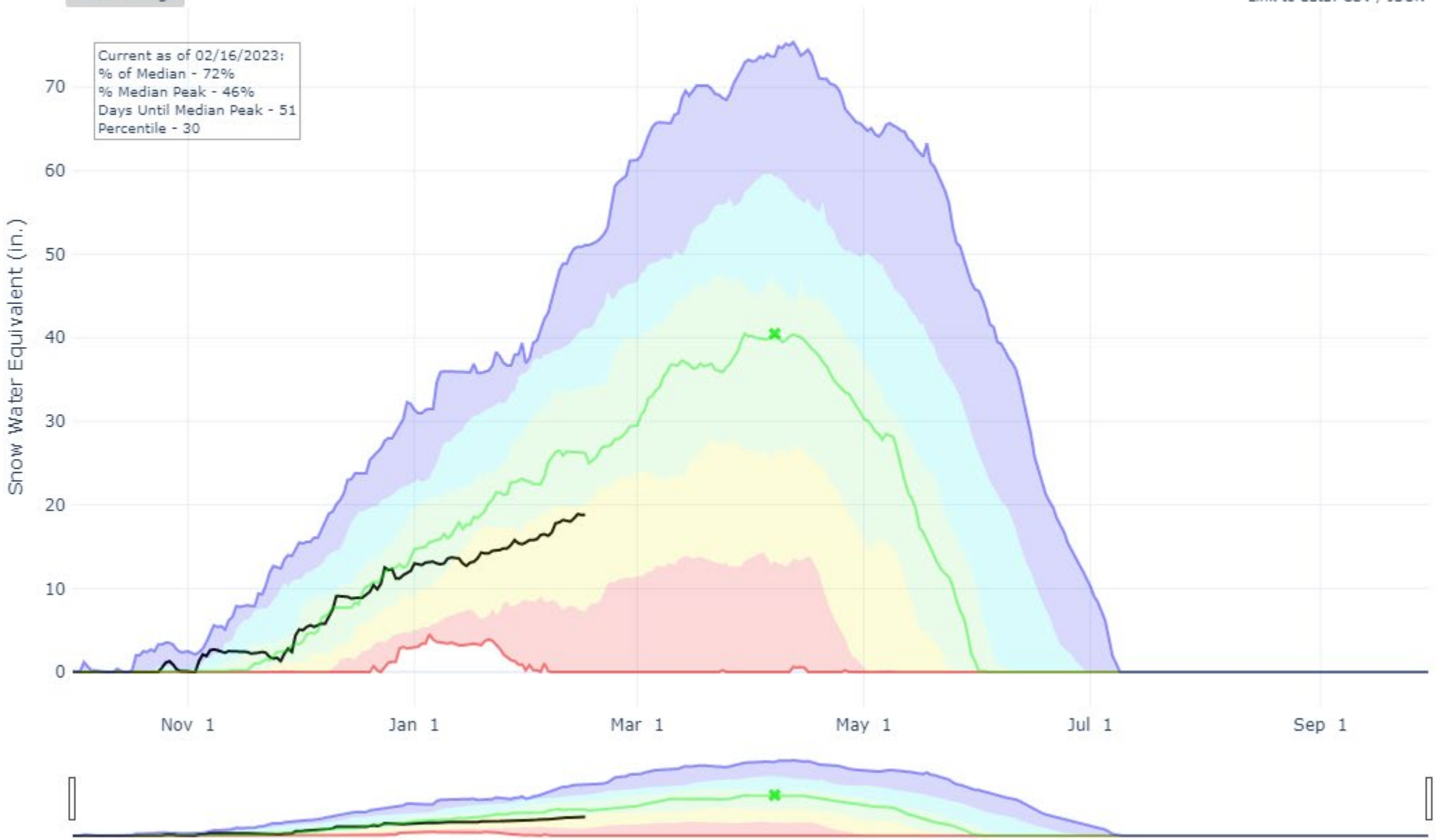

Feb. 16, 2023
Percent NRCS 1991-2020 Median SWE
≥ 200%
175%
150%
125%
100%
75%
50%
25%
≤ 0%
No basin value
Observation Missing
Median is zero
Nanaimo
Surrey
Abbotsford
Trail
Durican
Bellin
Victoria
Mount Vernon
Oak Harbor
Strait of Juan de Fuca
WASHINGTON
Everett
Seattle
Kent
Olympia
Moses Lake
Wenatchee
Spokane
Post Falls
Newman Lake
Pullman
Moscow
Lewiston
Lewiston Orchards
Yakima
Kennewick
Asotin
Snake
Columbia
Nooksack 84
Baker 76
Skagit 84
Methow 93
Conconully Lake 140
Sullivan 80
Sanpoil 142
Omak 142
Lake Chelan 81
Entiat 127
Olympic 87
Skykomish 97
Wenatchee 89
Snoqualmie 105
Cedar 103
Stemilt 107
Colockum 142
Upper Yakima 98
Puyallup 124
White 93
Naches 86
Ahtanum 104
Simcoe-Toppenish 108
Cowlitz 101
Newman Lake 104
Asotin 86

# SNOW WATER EQUIVALENT AT ELBOW LAKE

Reset Range

Link to data: CSV / JSON

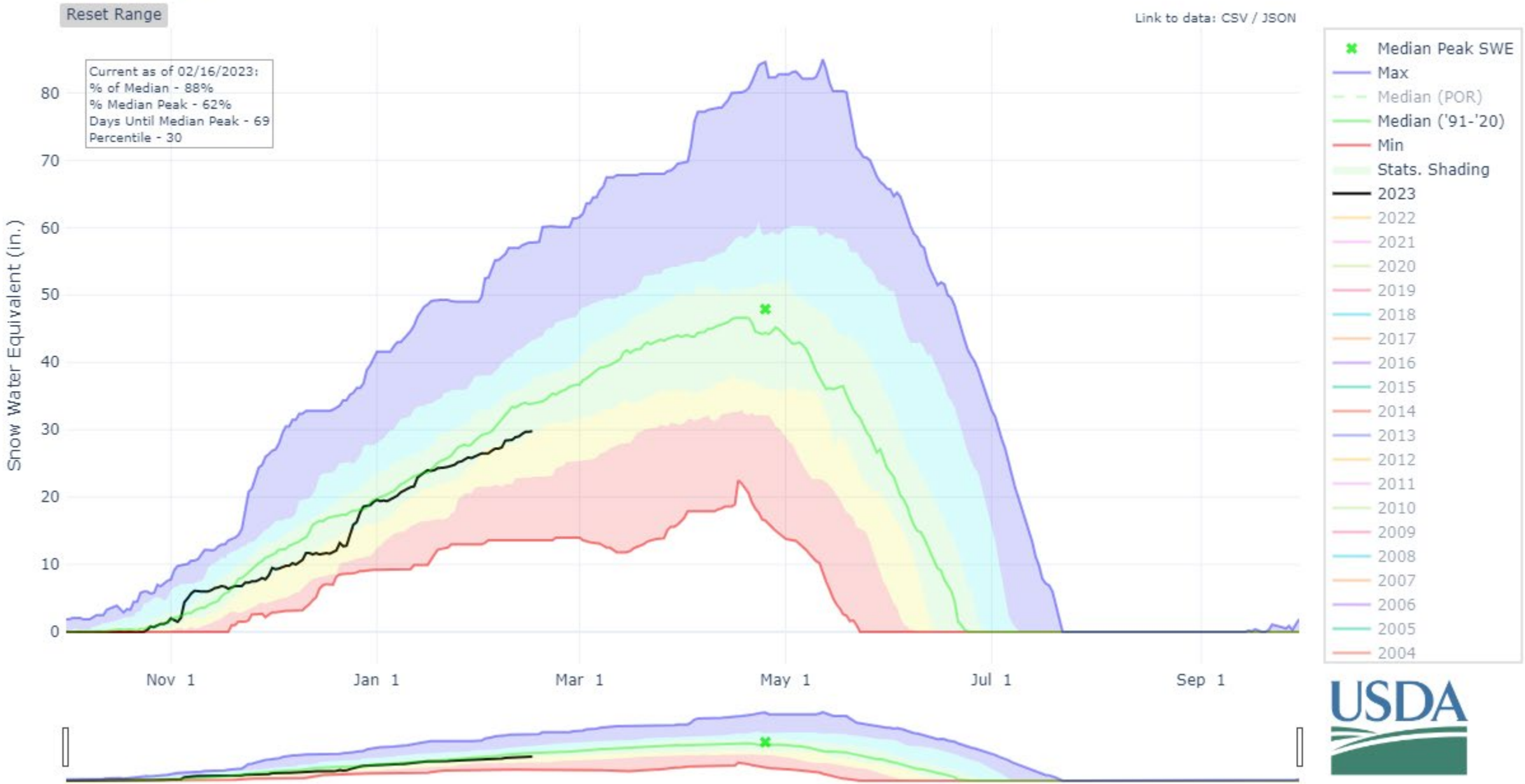
Current as of 02/16/2023:
% of Median - 72%
% Median Peak - 46%
Days Until Median Peak - 51
Percentile - 30

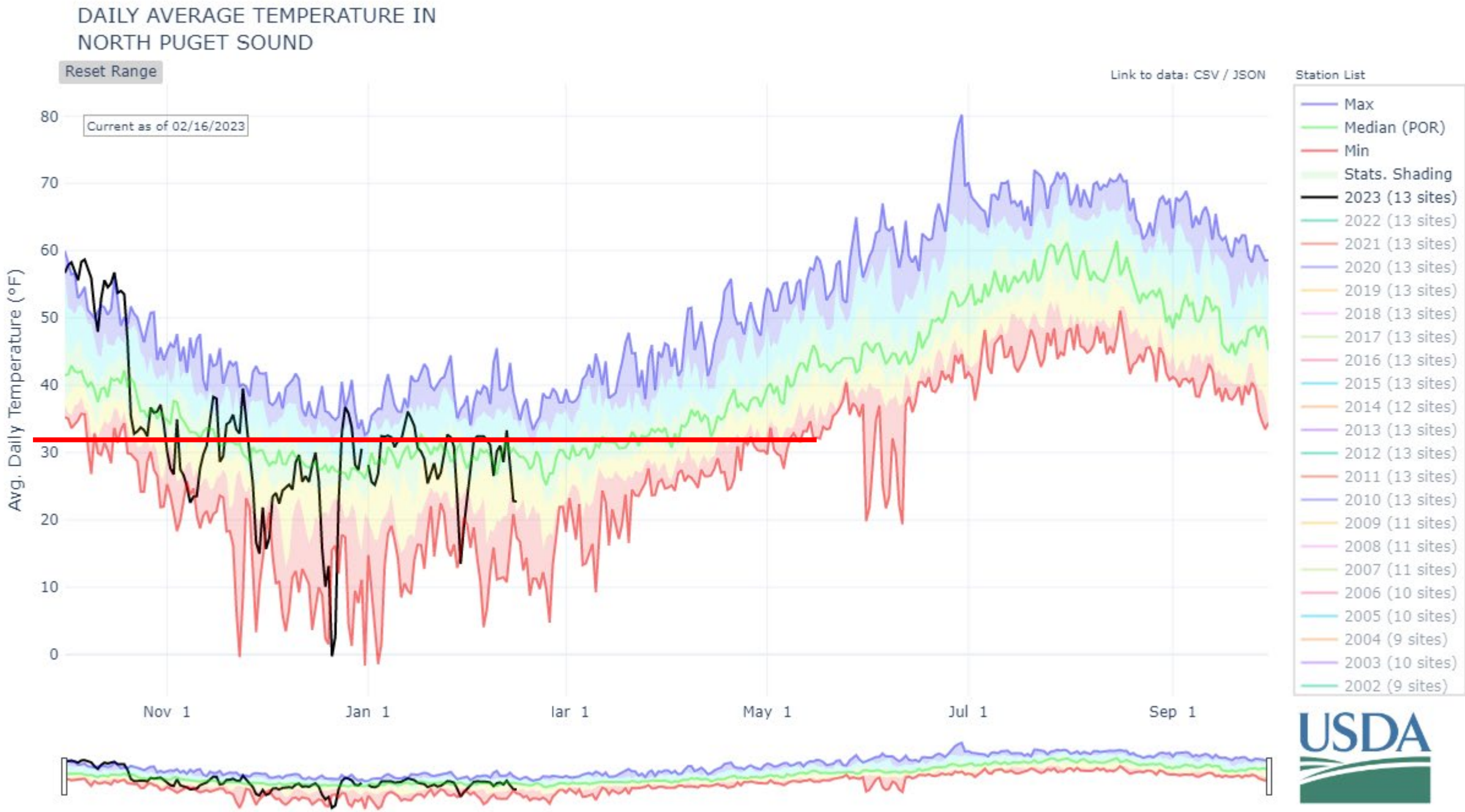



- Median Peak SWE
- Max
- Median (POR)
- Median ('91-'20)
- Min
- Stats. Shading
- 2023
- 2022
- 2021
- 2020
- 2019
- 2018
- 2017
- 2016
- 2015
- 2014
- 2013
- 2012
- 2011
- 2010
- 2009
- 2008
- 2007
- 2006
- 2005
- 2004

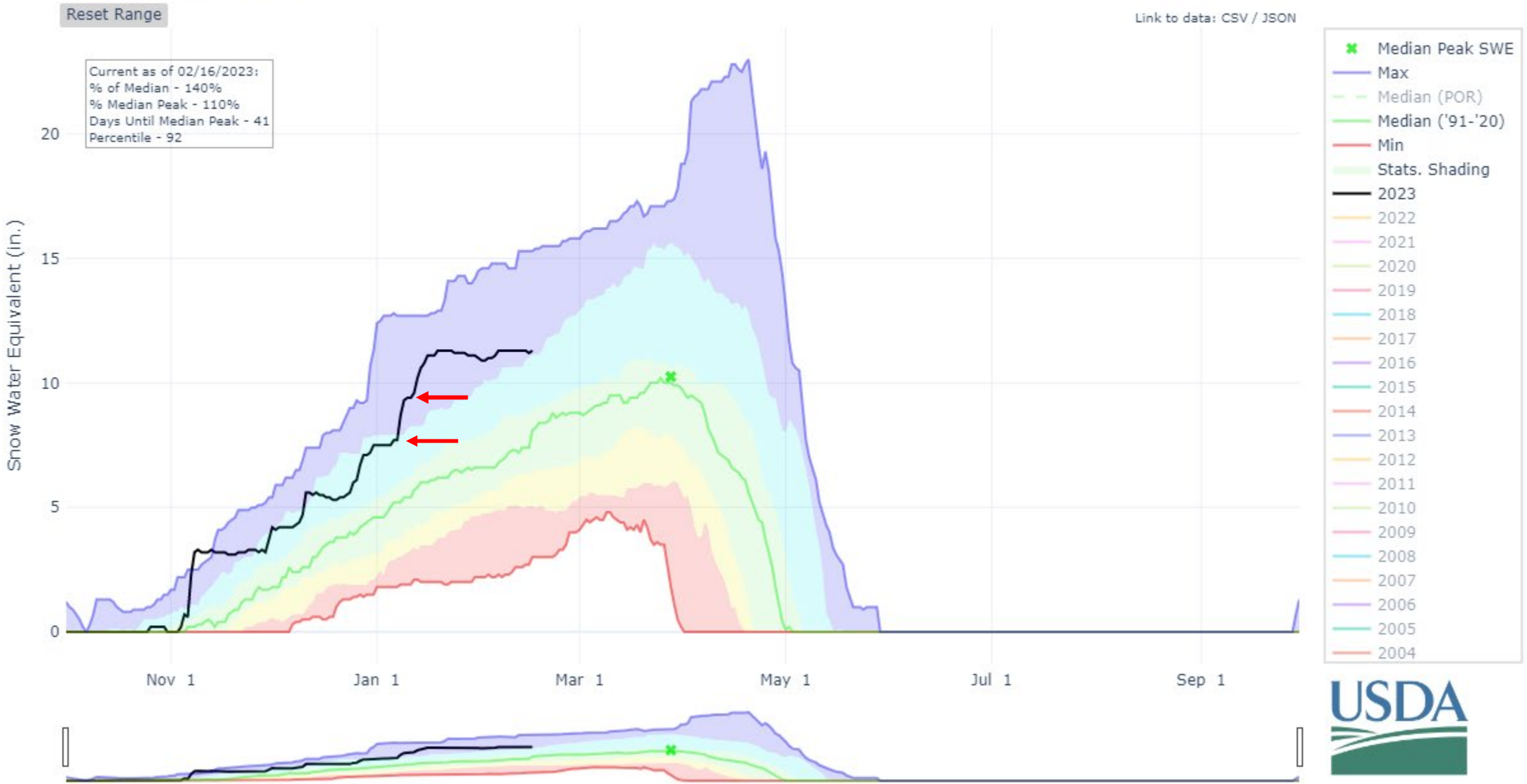
USDA

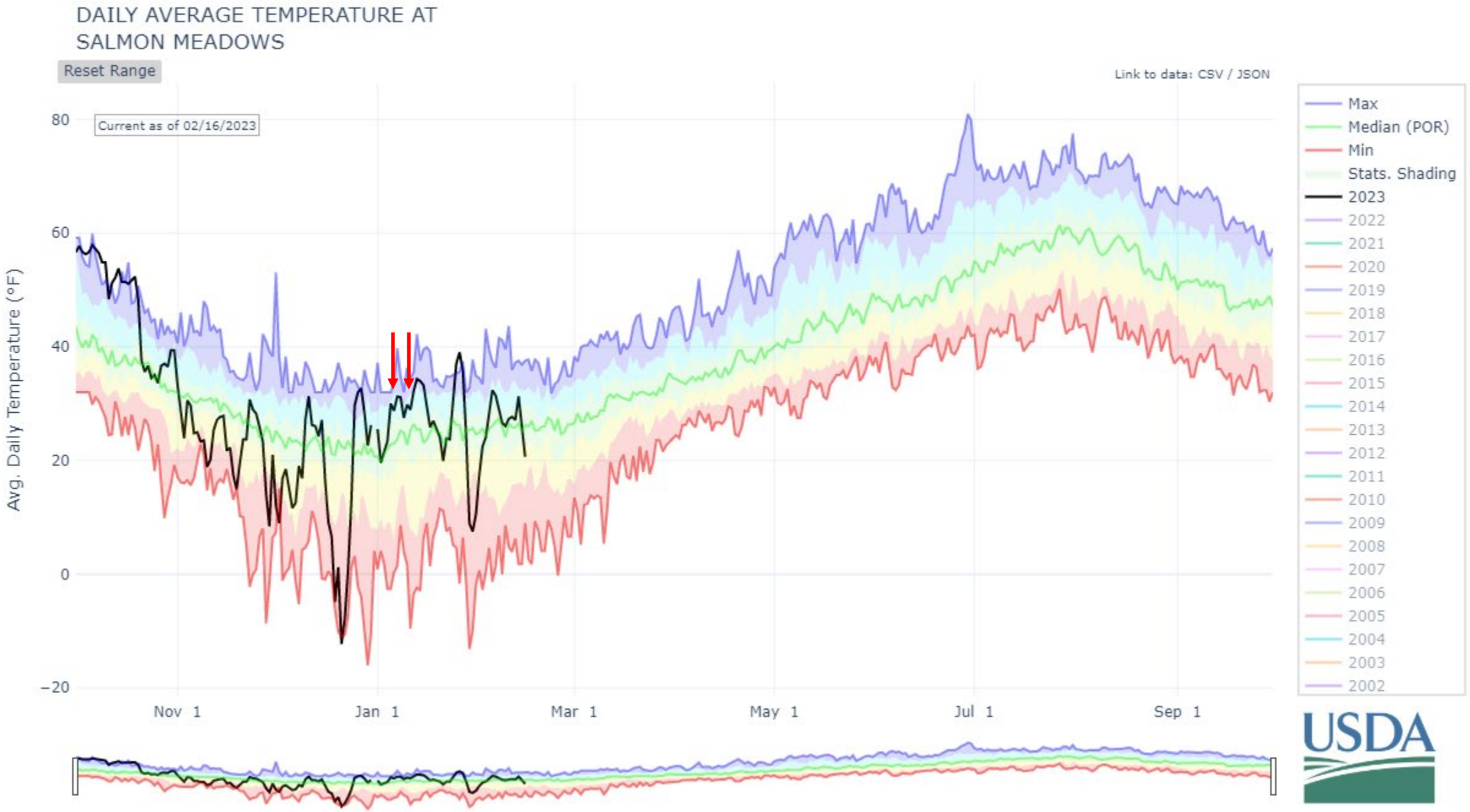
# SNOW WATER EQUIVALENT AT HARTS PASS



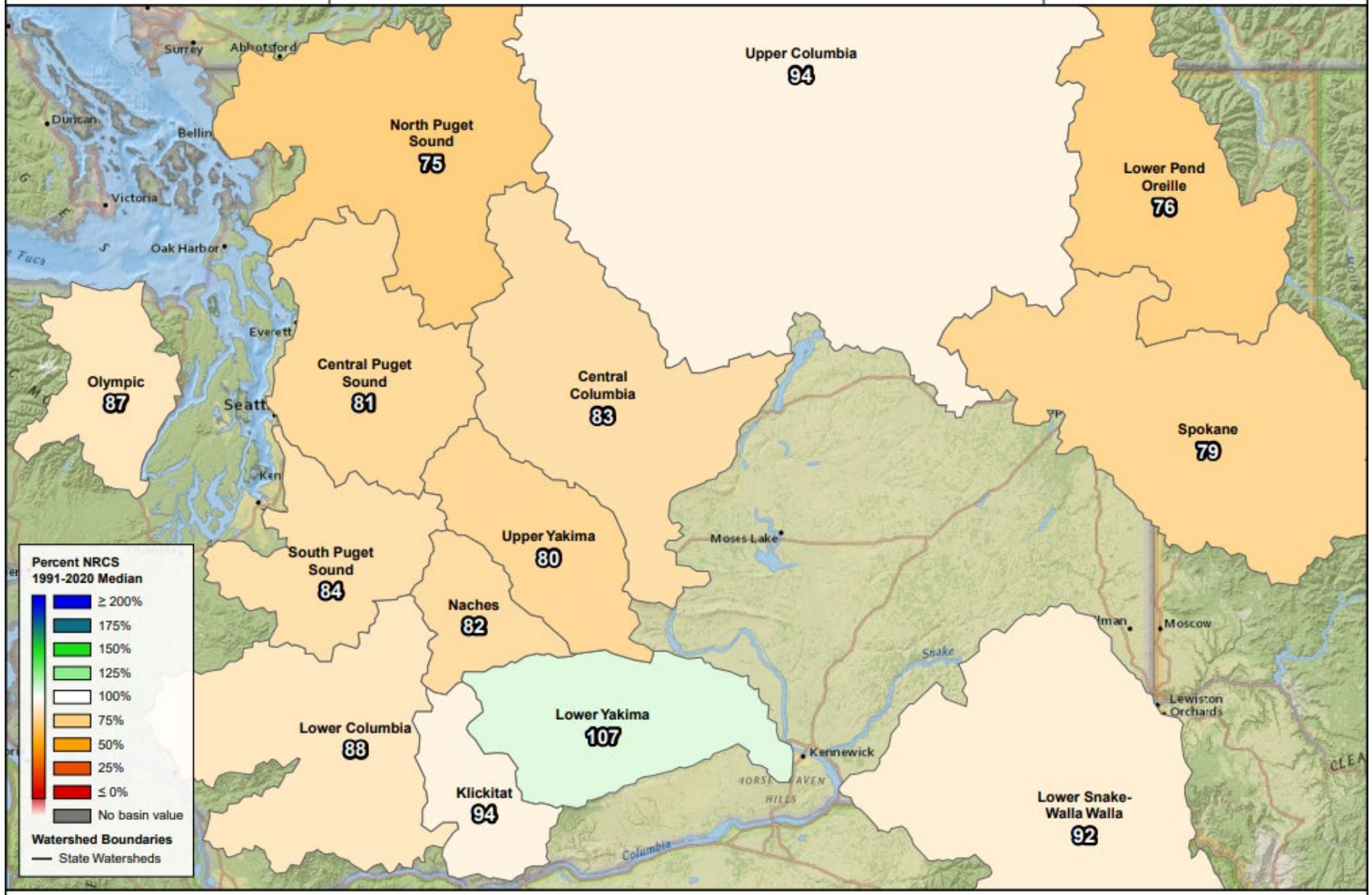

DAILY AVERAGE TEMPERATURE IN
NORTH PUGET SOUND
Reset Range
Link to data: CSV / JSON
Station List
Current as of 02/16/2023
Avg. Daily Temperature (°F)
80
70
60
50
40
30
20
10
0
Nov 1
Jan 1
Mar 1
May 1
Jul 1
Sep 1
Max
Median (POR)
Min
Stats. Shading
2023 (13 sites)
2022 (13 sites)
2021 (13 sites)
2020 (13 sites)
2019 (13 sites)
2018 (13 sites)
2017 (13 sites)
2016 (13 sites)
2015 (13 sites)
2014 (12 sites)
2013 (13 sites)
2012 (13 sites)
2011 (13 sites)
2010 (13 sites)
2009 (11 sites)
2008 (11 sites)
2007 (11 sites)
2006 (10 sites)
2005 (10 sites)
2004 (9 sites)
2003 (10 sites)
2002 (9 sites)
USDA

# SNOW WATER EQUIVALENT AT SALMON MEADOWS




DAILY AVERAGE TEMPERATURE AT
SALMON MEADOWS
Reset Range
Link to data: CSV / JSON
Current as of 02/16/2023
Avg. Daily Temperature (°F)
80
60
40
20
0
−20
Nov 1
Jan 1
Mar 1
May 1
Jul 1
Sep 1
Max
Median (POR)
Min
Stats. Shading
2023
2022
2021
2020
2019
2018
2017
2016
2015
2014
2013
2012
2011
2010
2009
2008
2007
2006
2005
2004
2003
2002
USDA

| Water Year to Date Precipitation | Percent NRCS 1991-2020 Median | October 1, 2022 - February 15, 2023 |
|---|---|---|

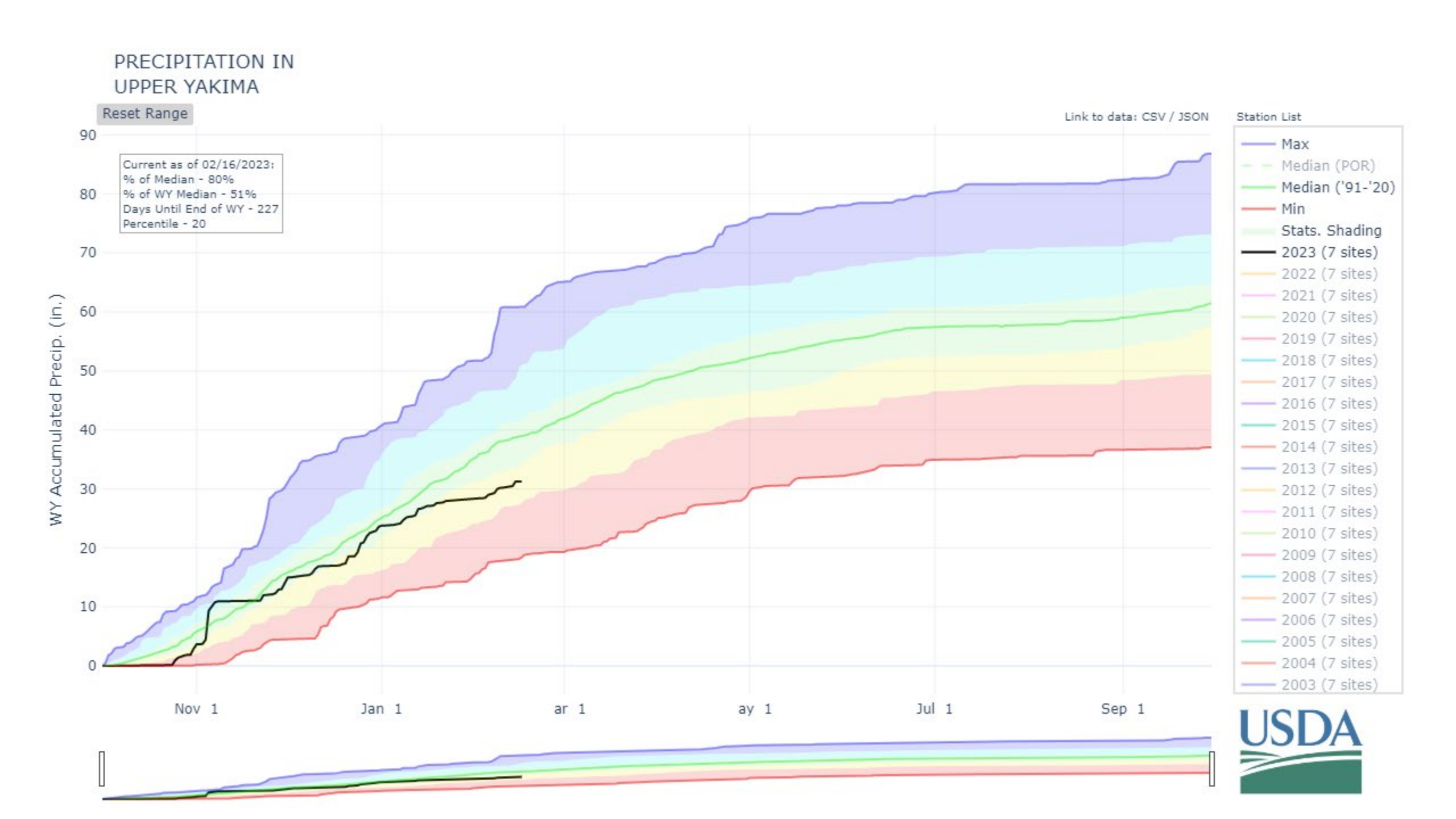


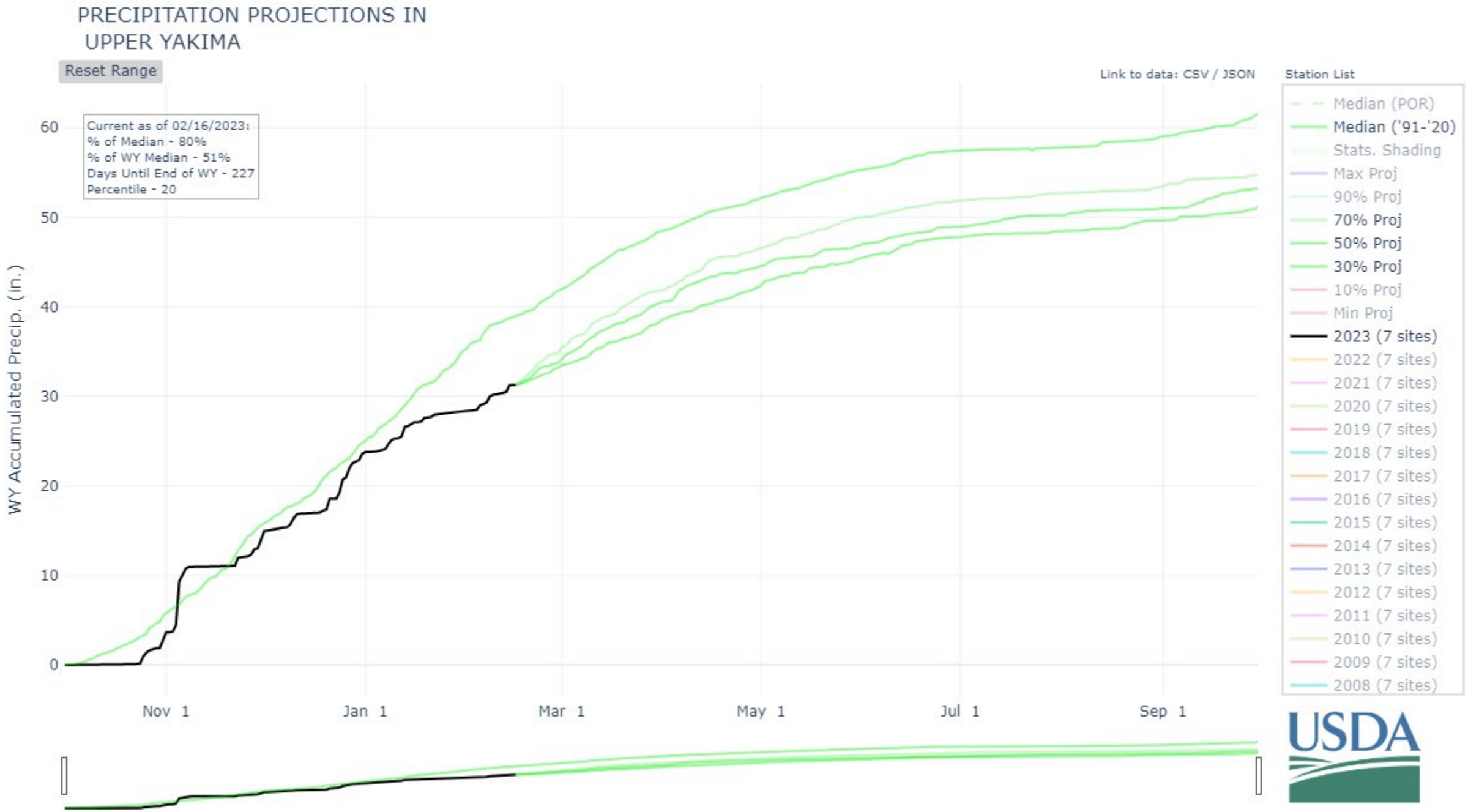

USDA Natural Resources Conservation Service
United States Department of Agriculture

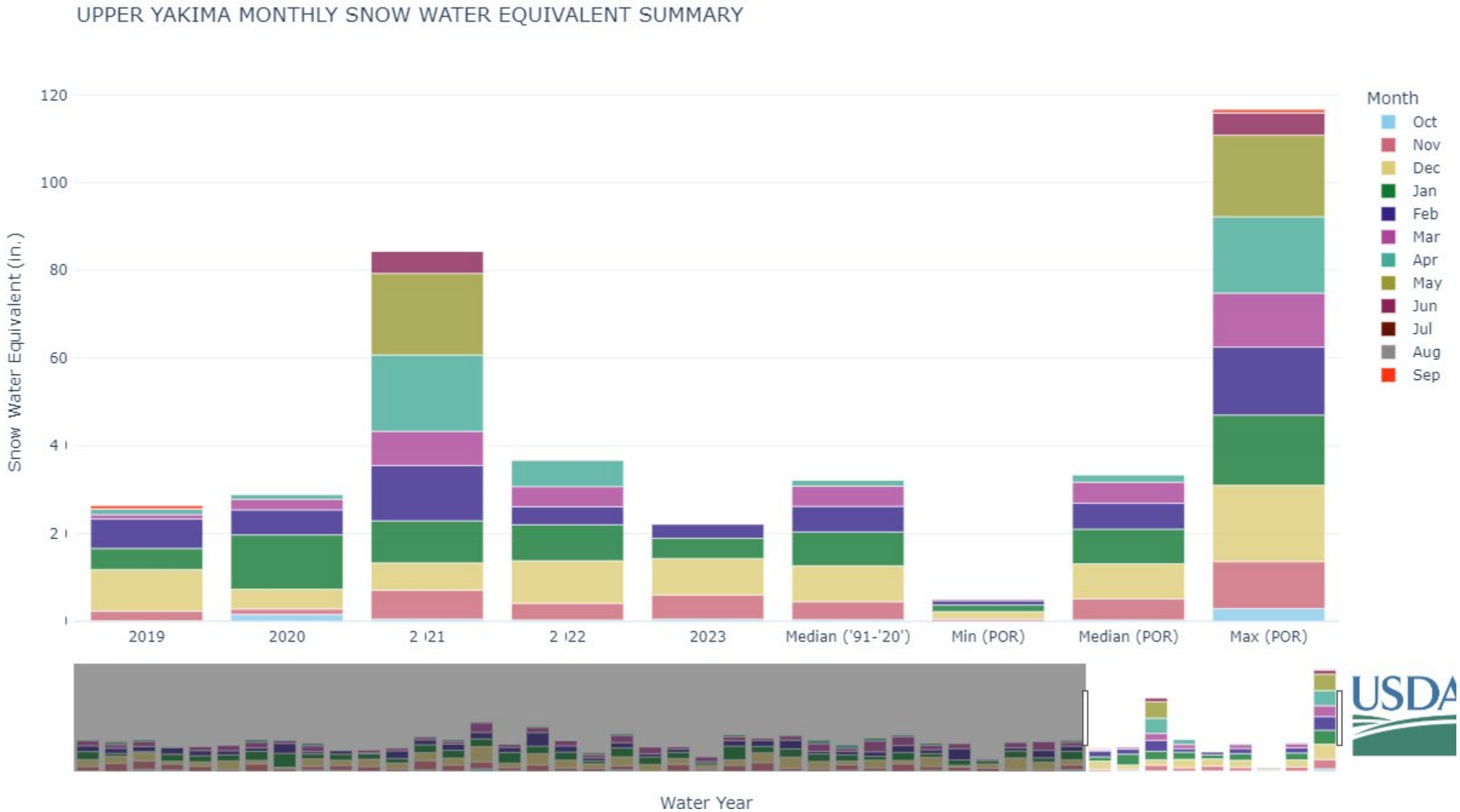
N

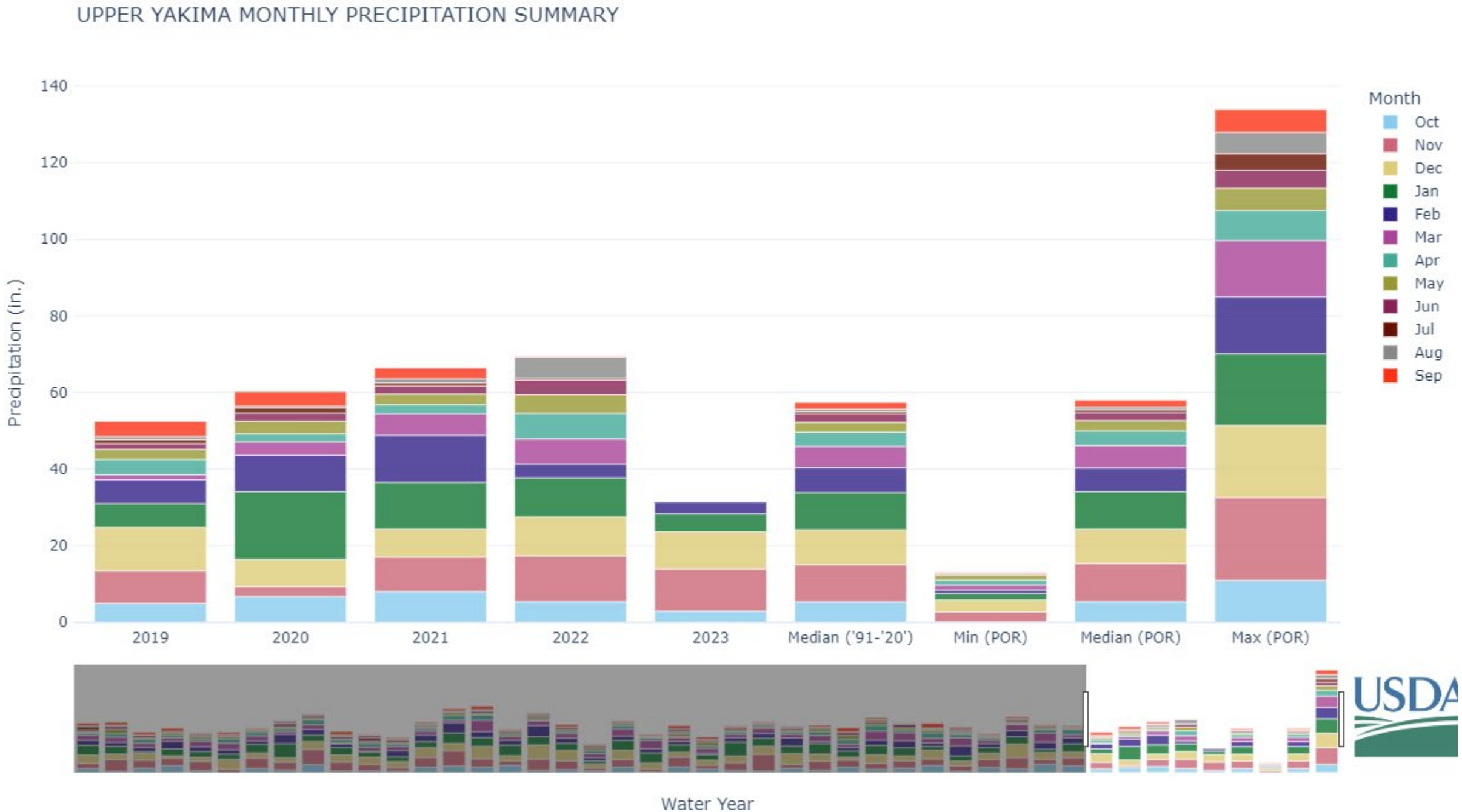
0 10 20 40 60 80 100 Miles

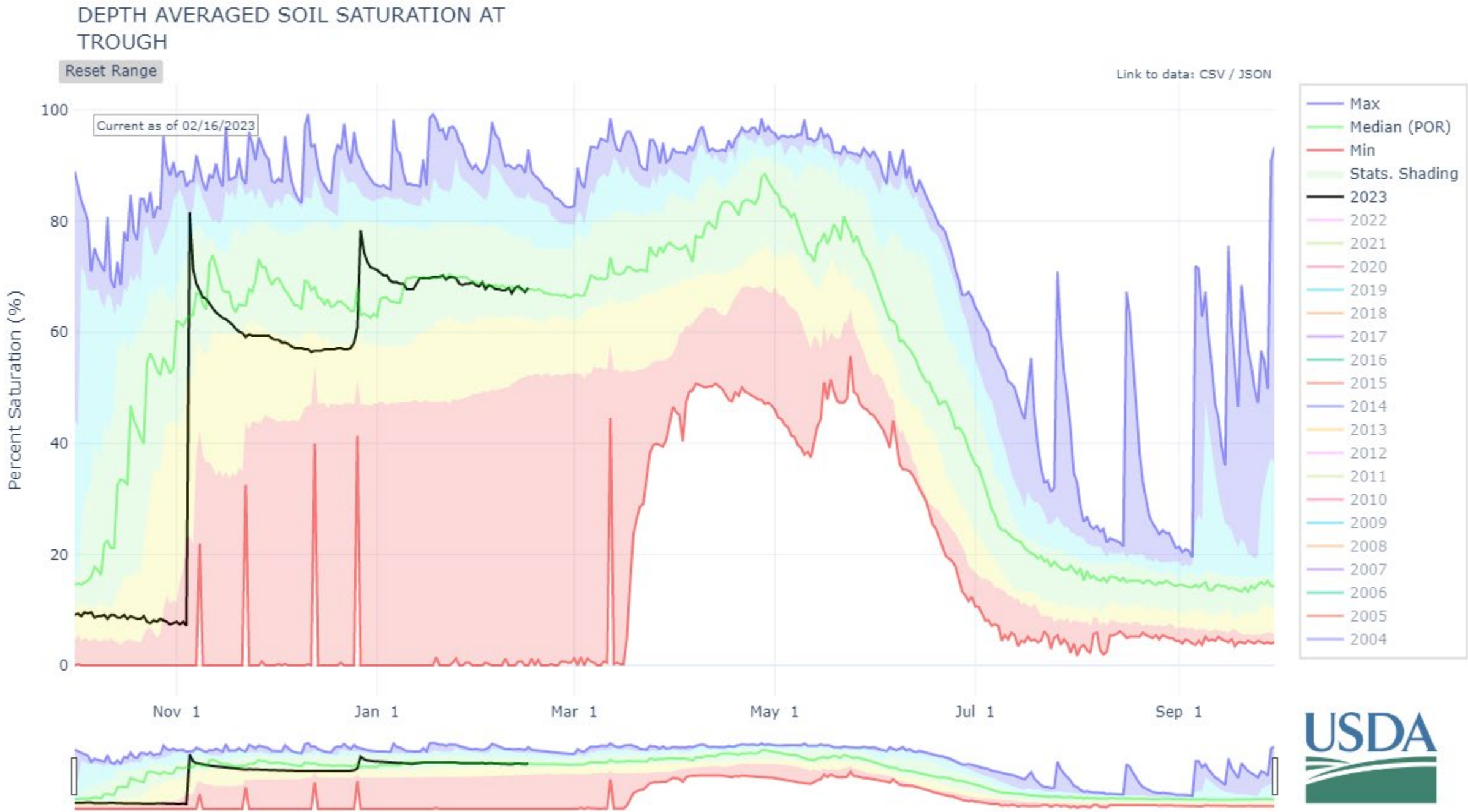
Created 2-16-2023

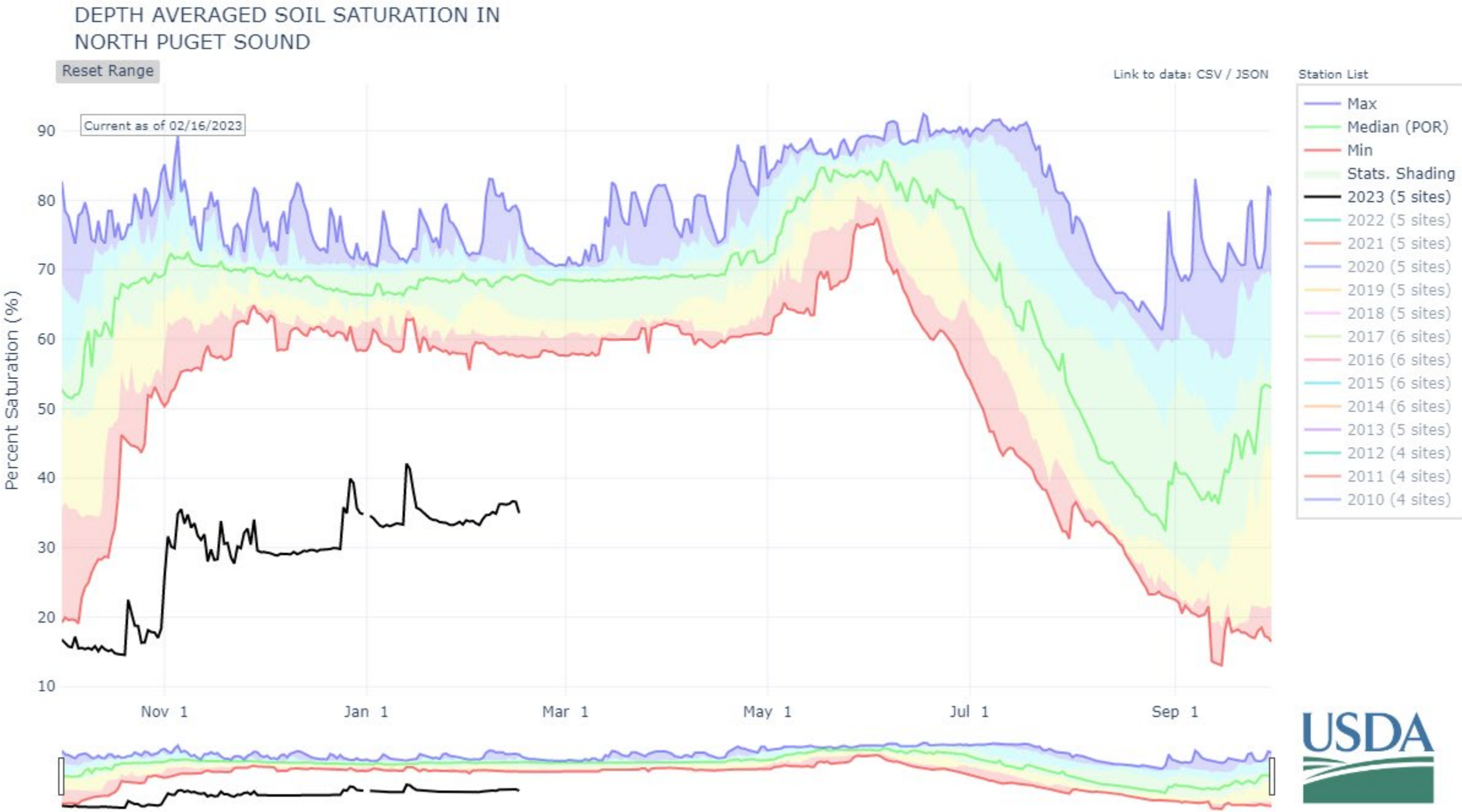

PRECIPITATION IN
UPPER YAKIMA
Reset Range
Link to data: CSV / JSON
Station List
Current as of 02/16/2023:
% of Median - 80%
% of WY Median - 51%
Days Until End of WY - 227
Percentile - 20
WY Accumulated Precip. (in.)
0
10
20
30
40
50
60
70
80
90
Nov 1
Jan 1
ar 1
ay 1
Jul 1
Sep 1
Max
Median (POR)
Median ('91-'20)
Min
Stats. Shading
2023 (7 sites)
2022 (7 sites)
2021 (7 sites)
2020 (7 sites)
2019 (7 sites)
2018 (7 sites)
2017 (7 sites)
2016 (7 sites)
2015 (7 sites)
2014 (7 sites)
2013 (7 sites)
2012 (7 sites)
2011 (7 sites)
2010 (7 sites)
2009 (7 sites)
2008 (7 sites)
2007 (7 sites)
2006 (7 sites)
2005 (7 sites)
2004 (7 sites)
2003 (7 sites)
USDA

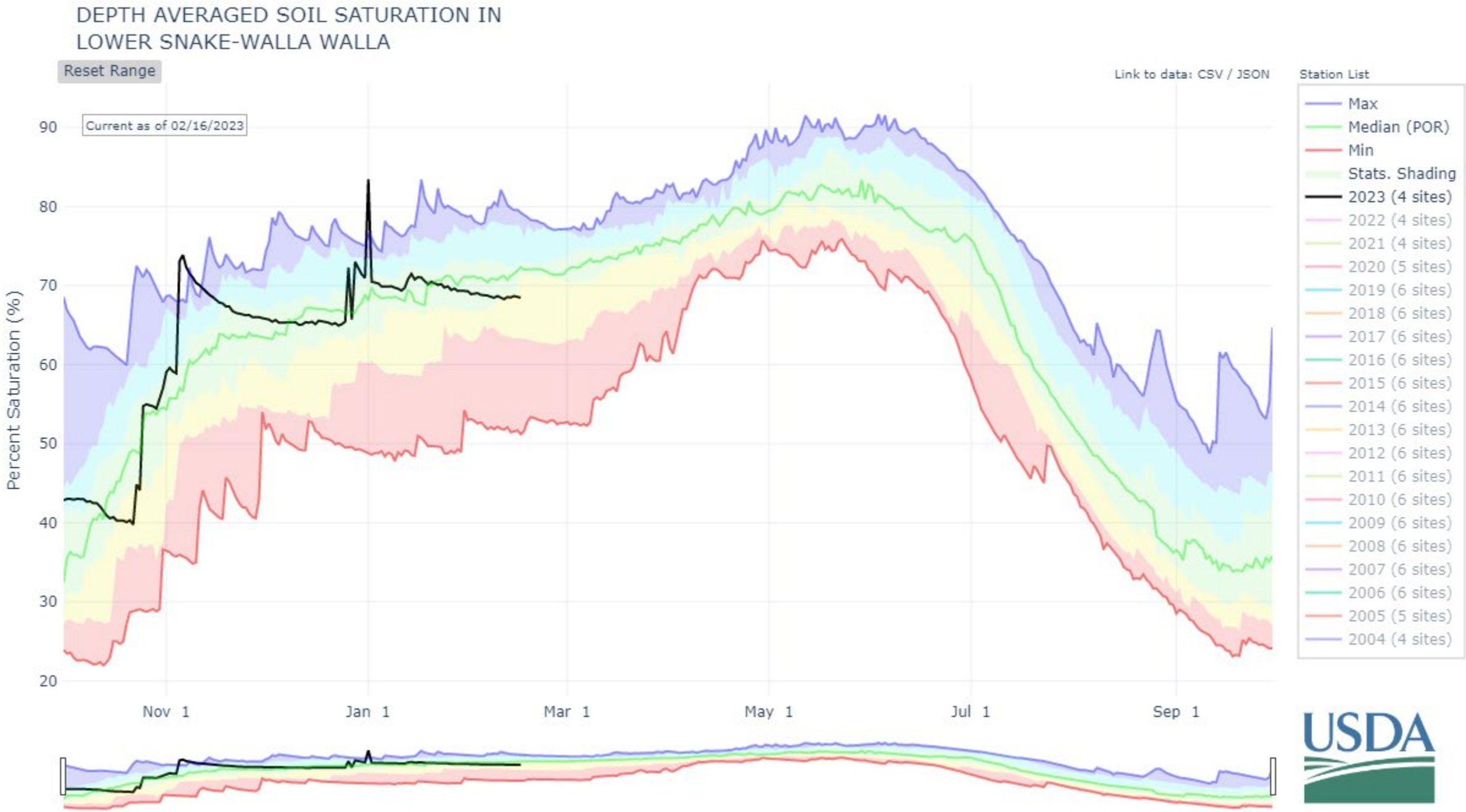

PRECIPITATION PROJECTIONS IN
UPPER YAKIMA
Reset Range
Link to data: CSV / JSON
Station List
Current as of 02/16/2023:
% of Median - 80%
% of WY Median - 51%
Days Until End of WY - 227
Percentile - 20
WY Accumulated Precip. (in.)
0
10
20
30
40
50
60
Nov 1
Jan 1
Mar 1
May 1
Jul 1
Sep 1
Median (POR)
Median ('91-'20)
Stats. Shading
Max Proj
90% Proj
70% Proj
50% Proj
30% Proj
10% Proj
Min Proj
2023 (7 sites)
2022 (7 sites)
2021 (7 sites)
2020 (7 sites)
2019 (7 sites)
2018 (7 sites)
2017 (7 sites)
2016 (7 sites)
2015 (7 sites)
2014 (7 sites)
2013 (7 sites)
2012 (7 sites)
2011 (7 sites)
2010 (7 sites)
2009 (7 sites)
2008 (7 sites)
USDA

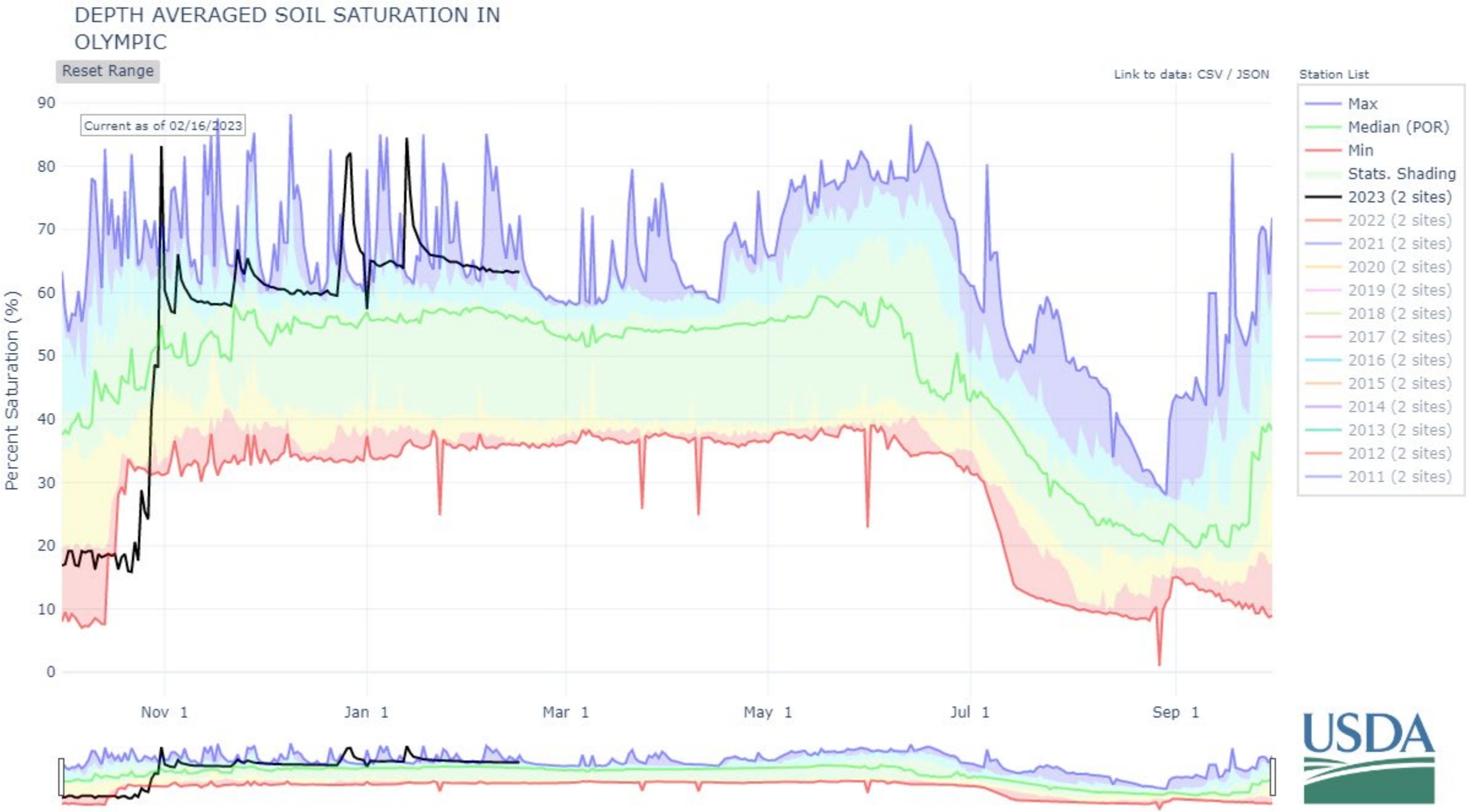

UPPER YAKIMA MONTHLY SNOW WATER EQUIVALENT SUMMARY
Snow Water Equivalent (in.)
120
100
80
60
4
2
0
2019
2020
2 021
2 022
2023
Median ('91-'20')
Min (POR)
Median (POR)
Max (POR)
Month
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Water Year
USDA

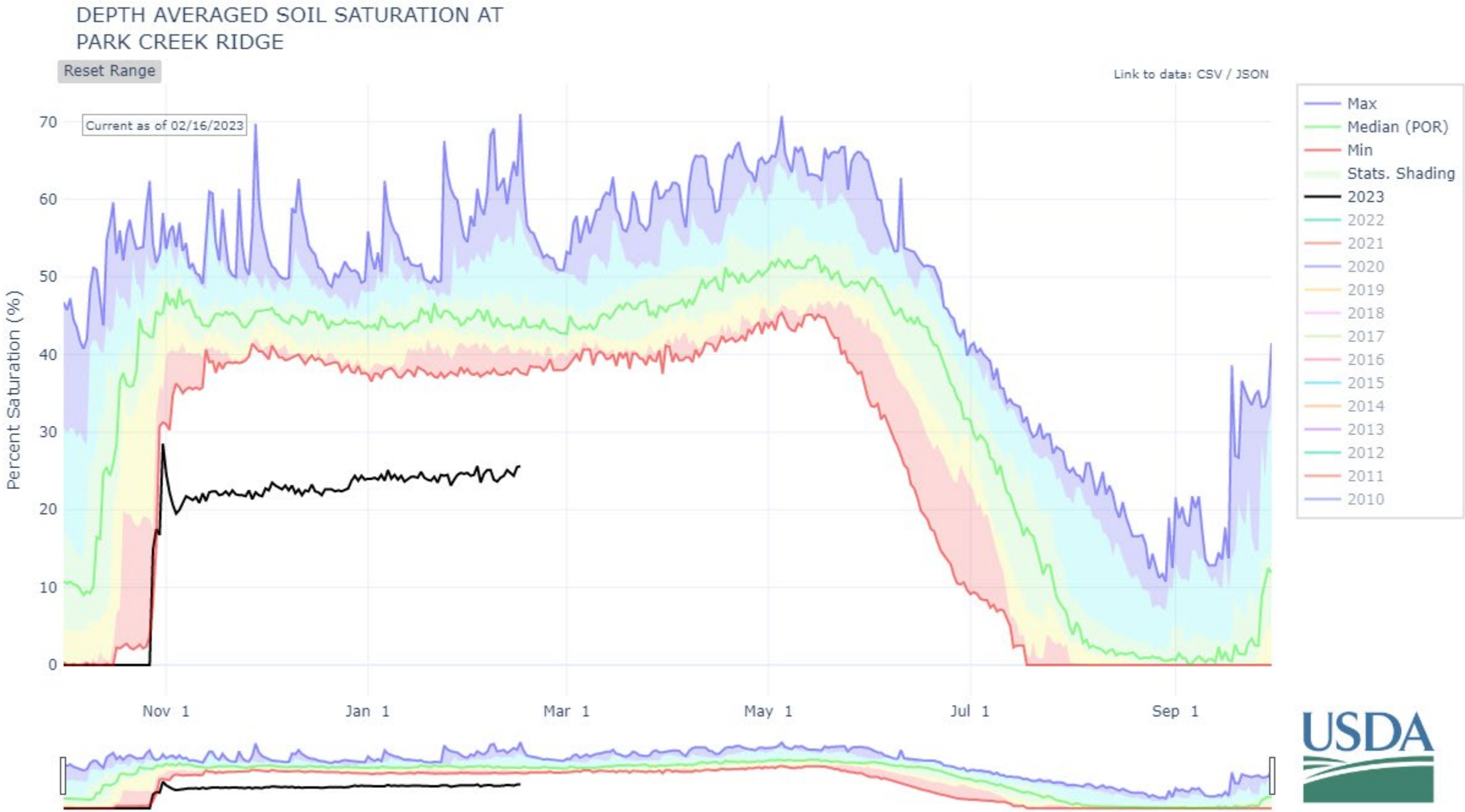

UPPER YAKIMA MONTHLY PRECIPITATION SUMMARY
Precipitation (in.)
140
120
100
80
60
40
20
0
2019
2020
2021
2022
2023
Median ('91-'20')
Min (POR)
Median (POR)
Max (POR)
Month
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Water Year
USDA


DEPTH AVERAGED SOIL SATURATION AT TROUGH
Reset Range
Link to data: CSV / JSON
Current as of 02/16/2023
Percent Saturation (%)
100
80
60
40
20
0
Nov 1
Jan 1
Mar 1
May 1
Jul 1
Sep 1
Max
Median (POR)
Min
Stats. Shading
2023
2022
2021
2020
2019
2018
2017
2016
2015
2014
2013
2012
2011
2010
2009
2008
2007
2006
2005
2004
USDA

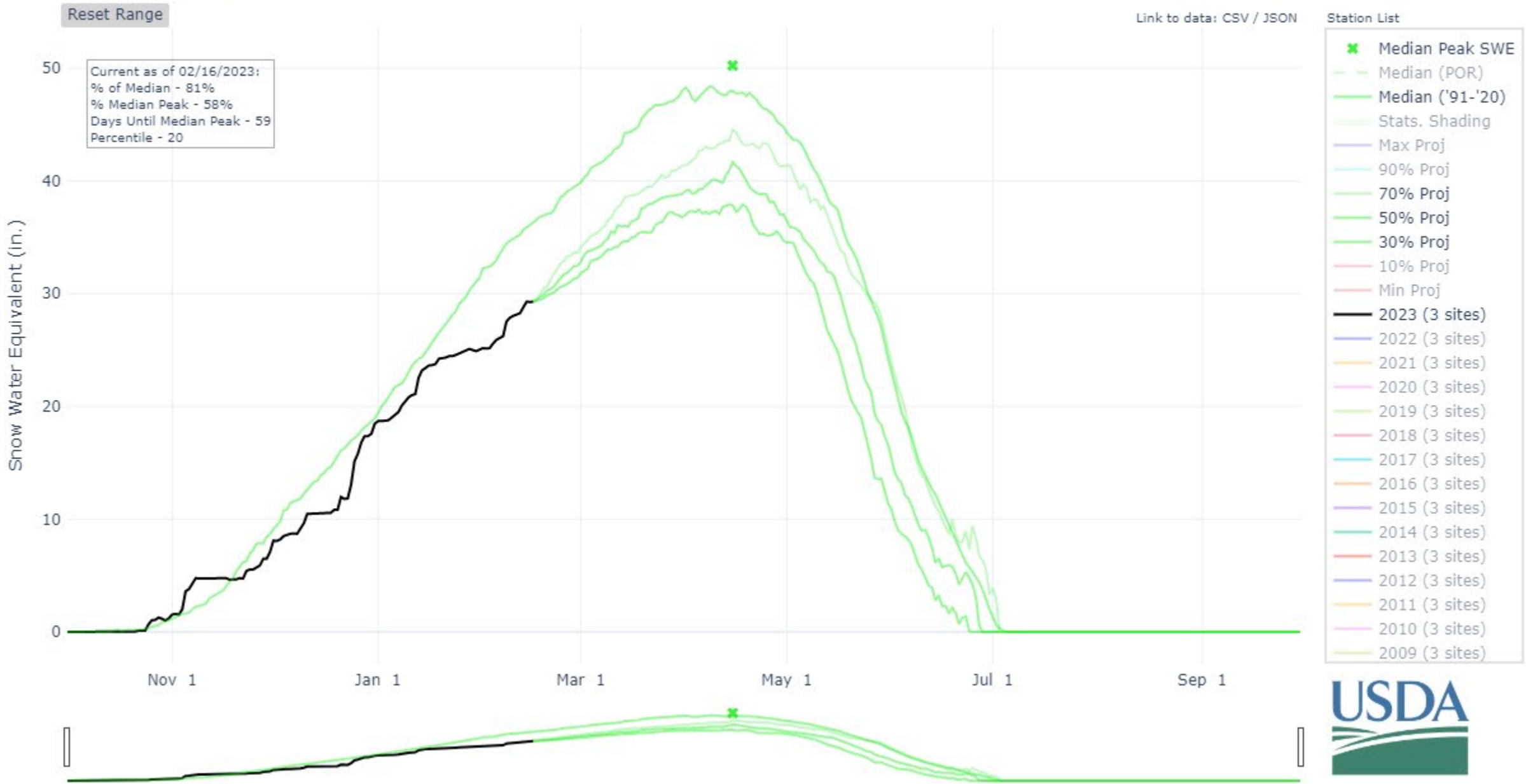

DEPTH AVERAGED SOIL SATURATION IN NORTH PUGET SOUND
Reset Range
Link to data: CSV / JSON
Station List
Max
Median (POR)
Min
Stats. Shading
2023 (5 sites)
2022 (5 sites)
2021 (5 sites)
2020 (5 sites)
2019 (5 sites)
2018 (5 sites)
2017 (6 sites)
2016 (6 sites)
2015 (6 sites)
2014 (6 sites)
2013 (5 sites)
2012 (4 sites)
2011 (4 sites)
2010 (4 sites)
Current as of 02/16/2023
Percent Saturation (%)
90
80
70
60
50
40
30
20
10
Nov 1
Jan 1
Mar 1
May 1
Jul 1
Sep 1
USDA


DEPTH AVERAGED SOIL SATURATION IN
LOWER SNAKE-WALLA WALLA
Reset Range
Link to data: CSV / JSON
Station List
Current as of 02/16/2023
Percent Saturation (%)
90
80
70
60
50
40
30
20
Nov 1
Jan 1
Mar 1
May 1
Jul 1
Sep 1
Max
Median (POR)
Min
Stats. Shading
2023 (4 sites)
2022 (4 sites)
2021 (4 sites)
2020 (5 sites)
2019 (6 sites)
2018 (6 sites)
2017 (6 sites)
2016 (6 sites)
2015 (6 sites)
2014 (6 sites)
2013 (6 sites)
2012 (6 sites)
2011 (6 sites)
2010 (6 sites)
2009 (6 sites)
2008 (6 sites)
2007 (6 sites)
2006 (6 sites)
2005 (5 sites)
2004 (4 sites)
USDA

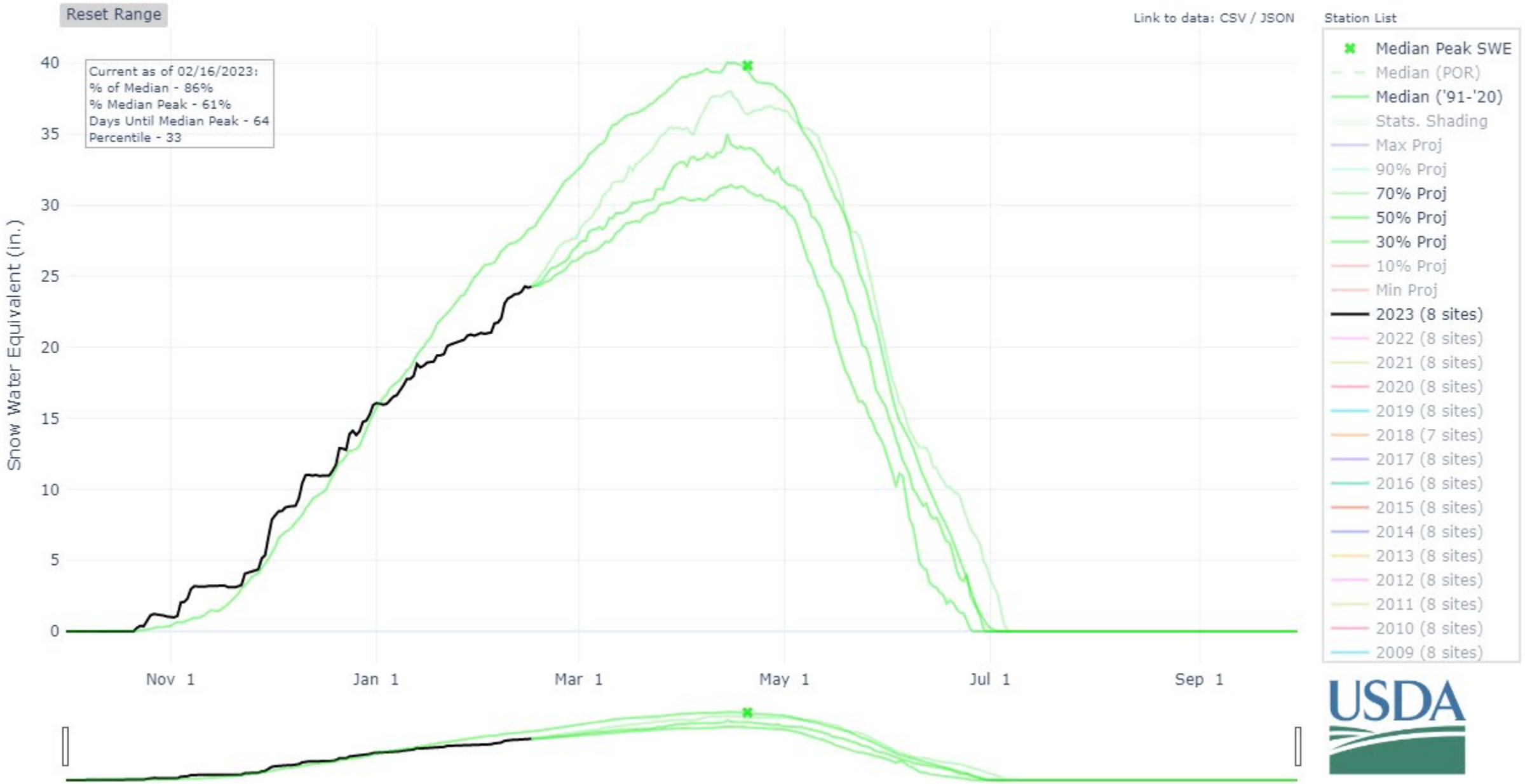

DEPTH AVERAGED SOIL SATURATION IN OLYMPIC
Reset Range
Link to data: CSV / JSON
Station List
Current as of 02/16/2023
Percent Saturation (%)
90
80
70
60
50
40
30
20
10
0
Nov 1
Jan 1
Mar 1
May 1
Jul 1
Sep 1
Max
Median (POR)
Min
Stats. Shading
2023 (2 sites)
2022 (2 sites)
2021 (2 sites)
2020 (2 sites)
2019 (2 sites)
2018 (2 sites)
2017 (2 sites)
2016 (2 sites)
2015 (2 sites)
2014 (2 sites)
2013 (2 sites)
2012 (2 sites)
2011 (2 sites)
USDA


DEPTH AVERAGED SOIL SATURATION AT
PARK CREEK RIDGE
Reset Range
Link to data: CSV / JSON
Current as of 02/16/2023
Percent Saturation (%)
0
10
20
30
40
50
60
70
Nov 1
Jan 1
Mar 1
May 1
Jul 1
Sep 1
Max
Median (POR)
Min
Stats. Shading
2023
2022
2021
2020
2019
2018
2017
2016
2015
2014
2013
2012
2011
2010
USDA

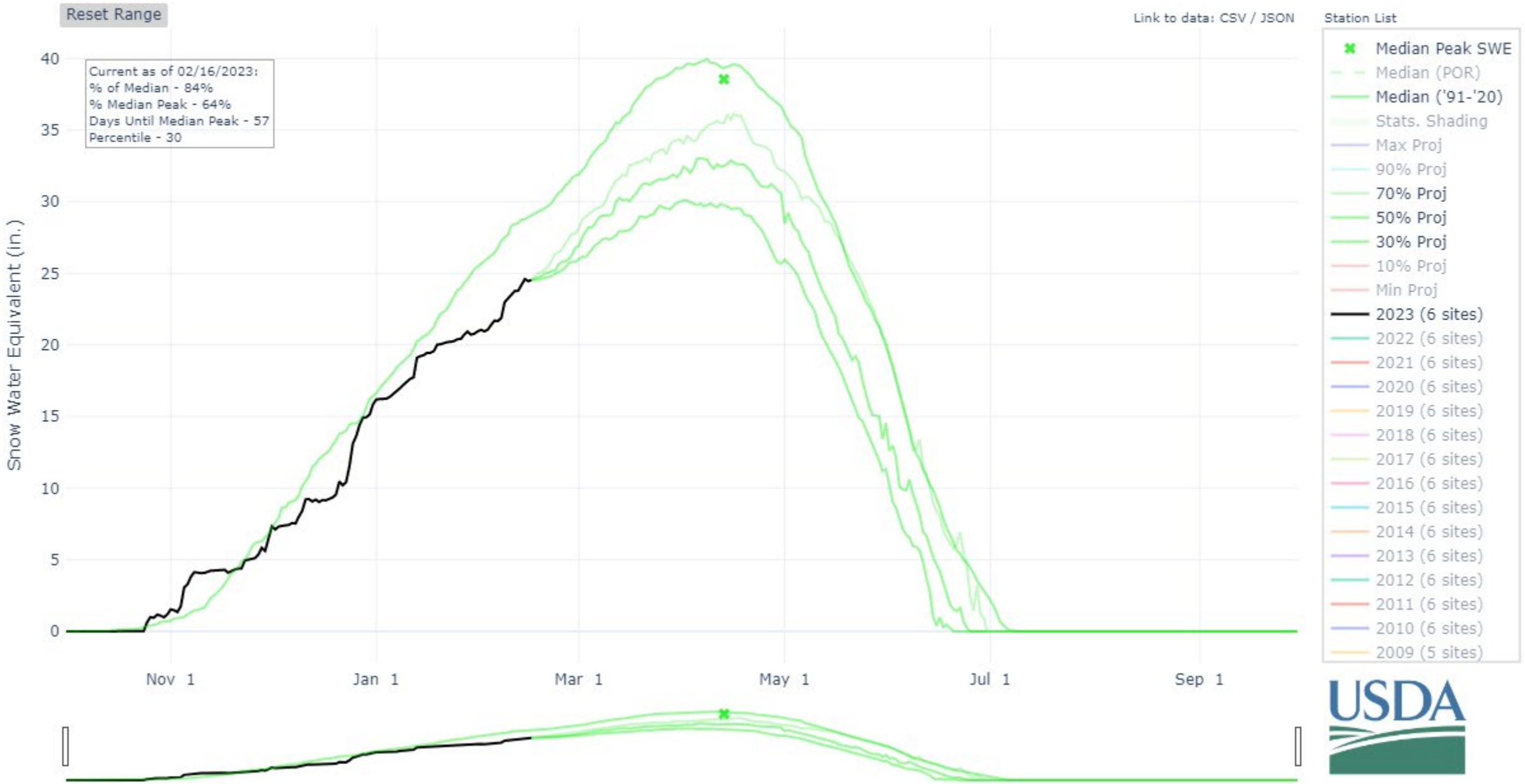
# SNOW WATER EQUIVALENT PROJECTIONS IN LAKE CHELAN



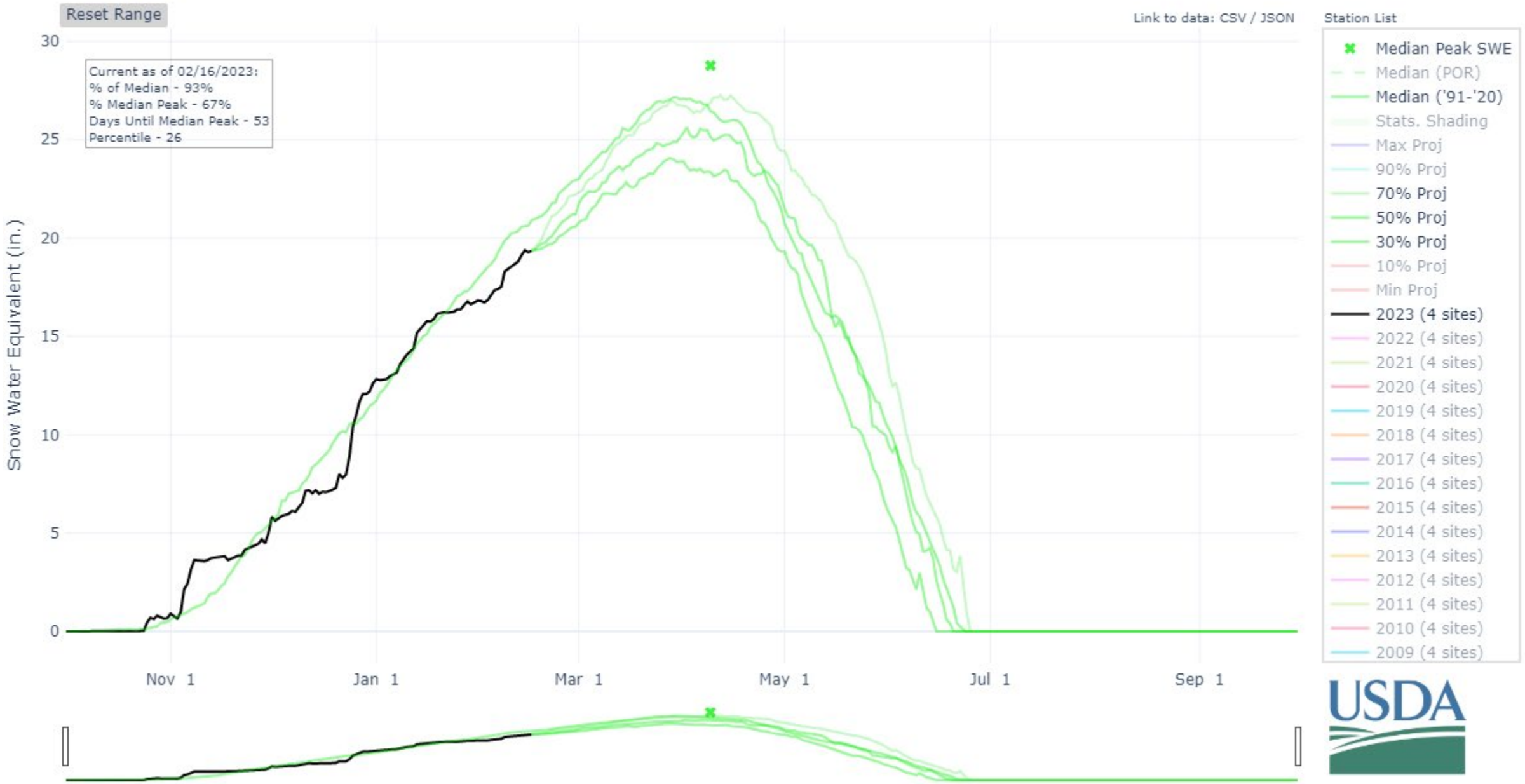
# SNOW WATER EQUIVALENT PROJECTIONS IN NACHES

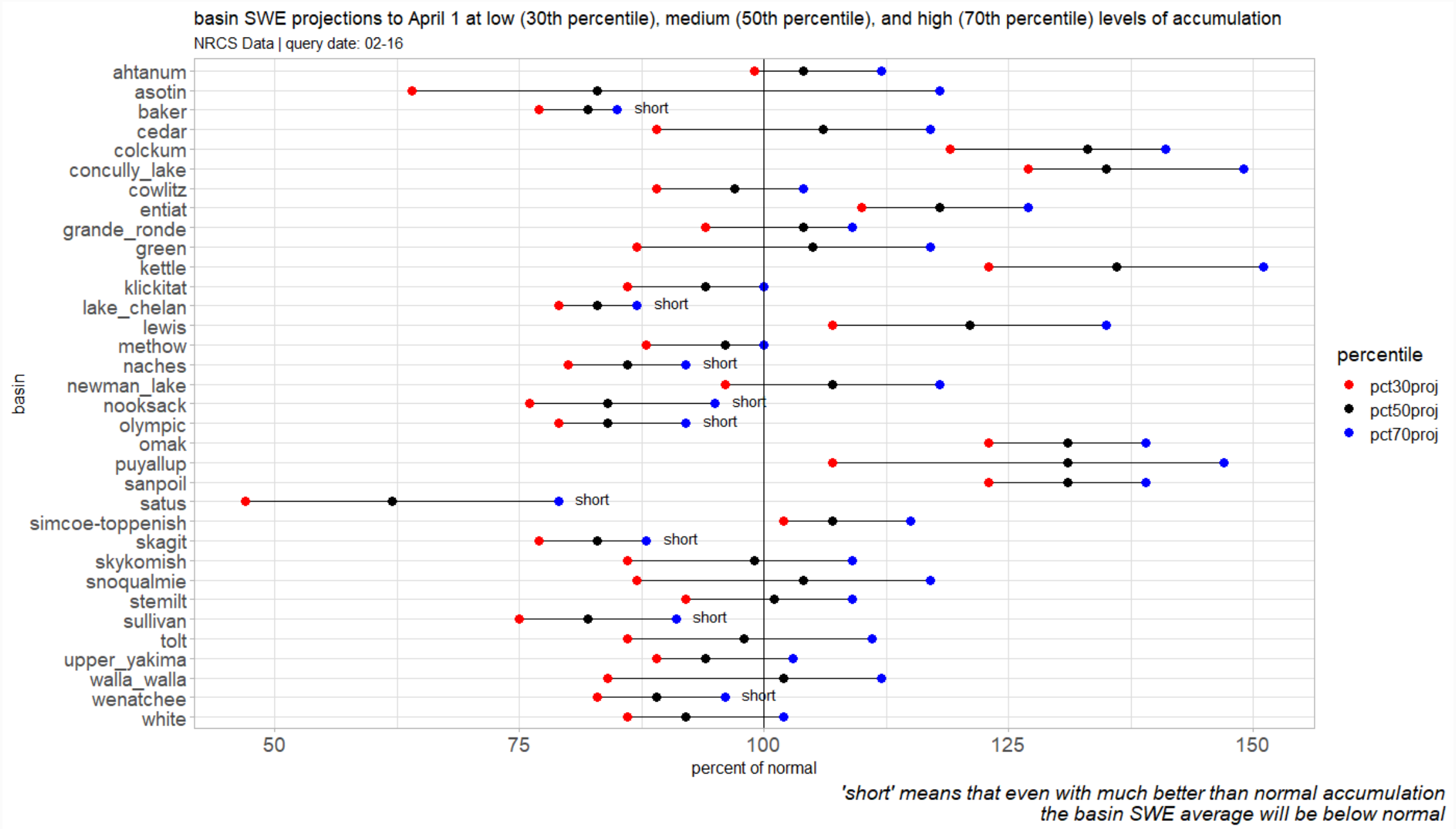


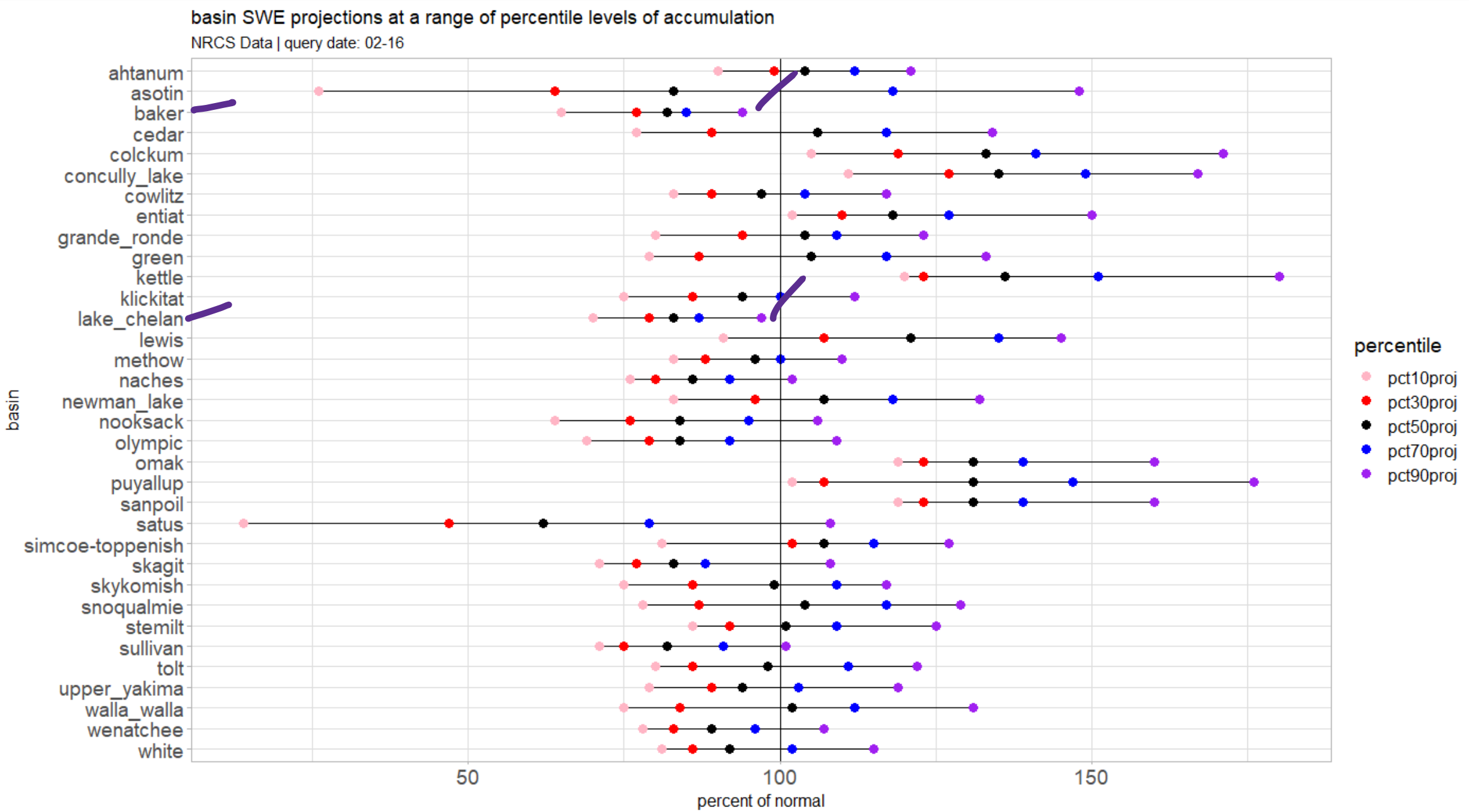
# SNOW WATER EQUIVALENT PROJECTIONS IN SKAGIT

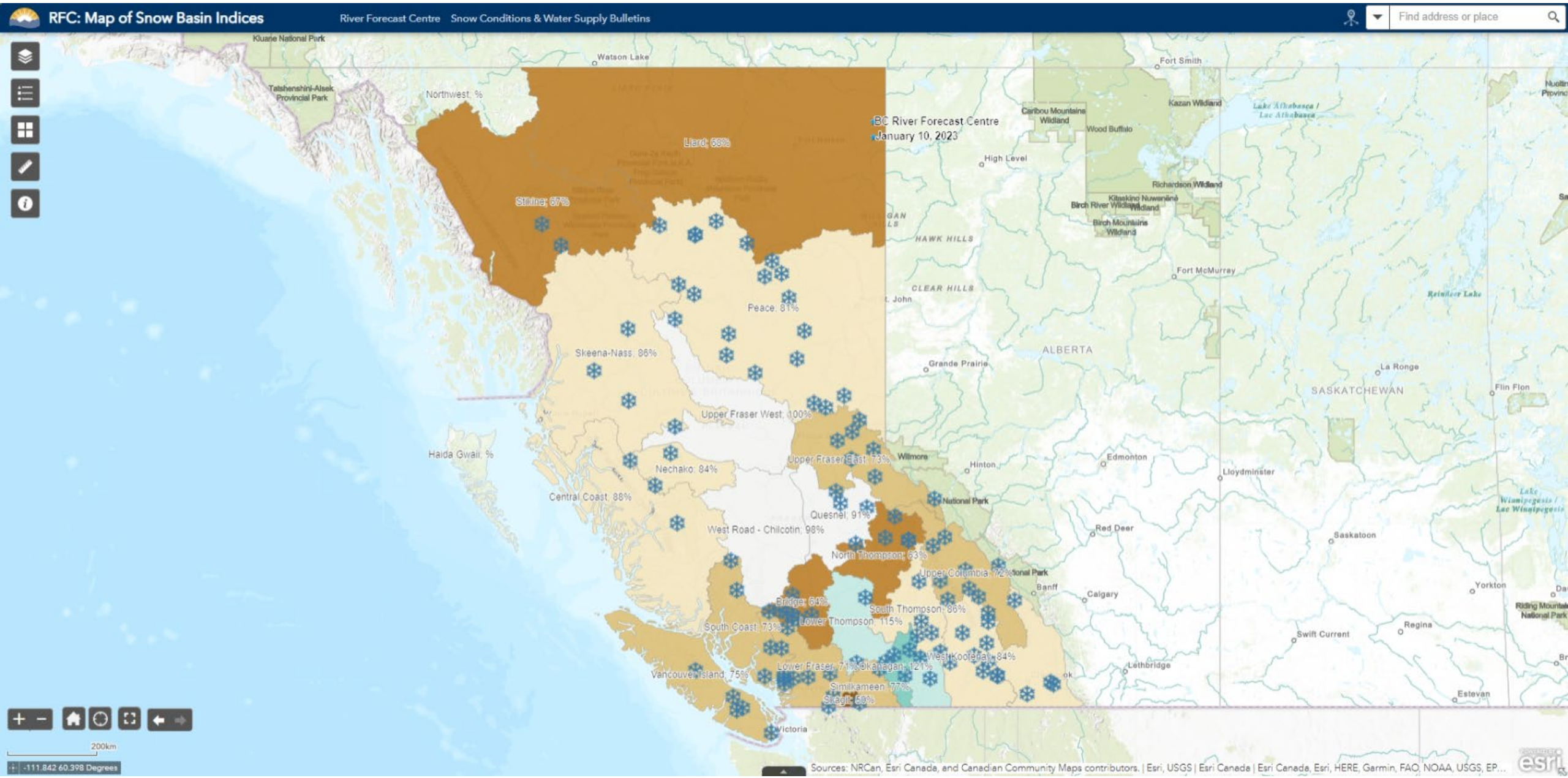


# SNOW WATER EQUIVALENT PROJECTIONS IN METHOW




basin SWE projections to April 1 at low (30th percentile), medium (50th percentile), and high (70th percentile) levels of accumulation
NRCS Data | query date: 02-16
basin
ahtanum
asotin
baker
cedar
colckum
concully_lake
cowlitz
entiat
grande_ronde
green
kettle
klickitat
lake_chelan
lewis
methow
naches
newman_lake
nooksack
olympic
omak
puyallup
sanpoil
satus
simcoe-toppenish
skagit
skykomish
snoqualmie
stemilt
sullivan
tolt
upper_yakima
walla_walla
wenatchee
white
short
50
75
100
125
150
percent of normal
percentile
pct30proj
pct50proj
pct70proj
'short' means that even with much better than normal accumulation
the basin SWE average will be below normal


basin SWE projections at a range of percentile levels of accumulation
NRCS Data | query date: 02-16
basin
ahtanum
asotin
baker
cedar
colckum
concully_lake
cowlitz
entiat
grande_ronde
green
kettle
klickitat
lake_chelan
lewis
methow
naches
newman_lake
nooksack
olympic
omak
puyallup
sanpoil
satus
simcoe-toppenish
skagit
skykomish
snoqualmie
stemilt
sullivan
tolt
upper_yakima
walla_walla
wenatchee
white
50
100
150
percent of normal
percentile
pct10proj
pct30proj
pct50proj
pct70proj
pct90proj


RFC: Map of Snow Basin Indices
River Forecast Centre
Snow Conditions & Water Supply Bulletins
Find address or place
BC River Forecast Centre
January 10, 2023
Liard; 68%
Stikine; 67%
Northwest; %
Peace; 81%
Skeena-Nass; 86%
Upper Fraser West; 100%
Upper Fraser East; 73%
Nechako; 84%
Central Coast; 88%
Haida Gwaii; %
Quesnel; 91%
West Road - Chilcotin; 98%
North Thompson; 63%
Upper Columbia; 72%
Bridge; 64%
South Thompson; 86%
Lower Thompson; 115%
South Coast; 73%
Lower Fraser; 71%
Okanagan; 121%
West Kootenay; 84%
Vancouver Island; 75%
Similkameen; 77%
Skagit; 50%
Victoria
Kluane National Park
Watson Lake
Tatshenshini-Alsek Provincial Park
Fort Smith
Caribou Mountains Wildland
Kazan Wildland
Wood Buffalo
High Level
Richardson Wildland
Birch River Wildland
Birch Mountains Wildland
HAWK HILLS
CLEAR HILLS
Fort McMurray
Reindeer Lake
ALBERTA
Grande Prairie
La Ronge
SASKATCHEWAN
Flin Flon
Wilmore
Hinton
Edmonton
Lloydminster
National Park
Red Deer
Saskatoon
Banff
Calgary
Yorkton
Swift Current
Regina
Lethbridge
Estevan
200km
-111.842 60.398 Degrees
Sources: NRCan, Esri Canada, and Canadian Community Maps contributors. | Esri, USGS | Esri Canada | Esri Canada, Esri, HERE, Garmin, FAO, NOAA, USGS, EP...
esri


Questions?

Office of the Washington State Climatologist

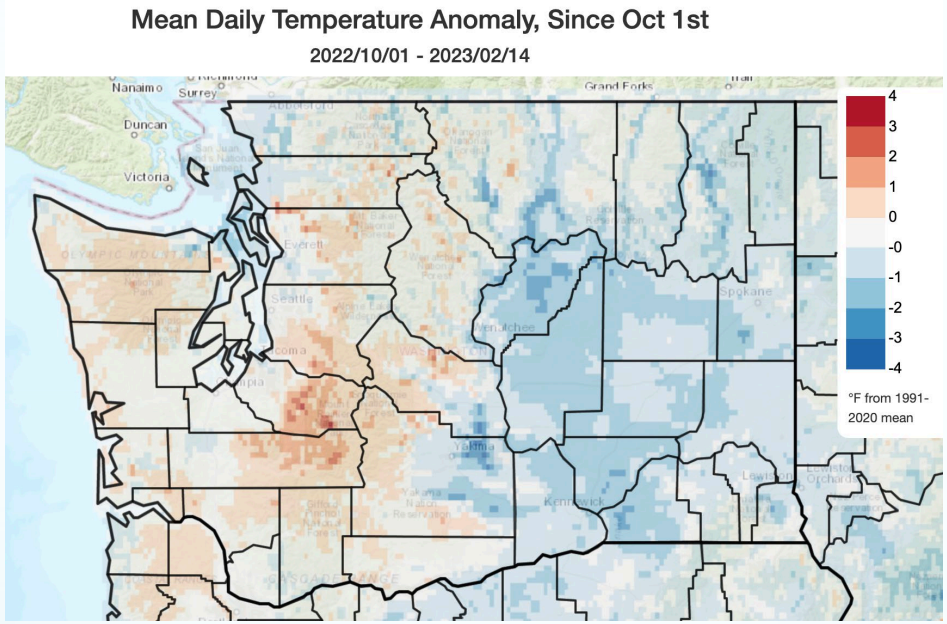
Cooperative Institute for CLIMATE, OCEAN & ECOSYSTEM STUDIES

# Current Conditions and Seasonal Outlook

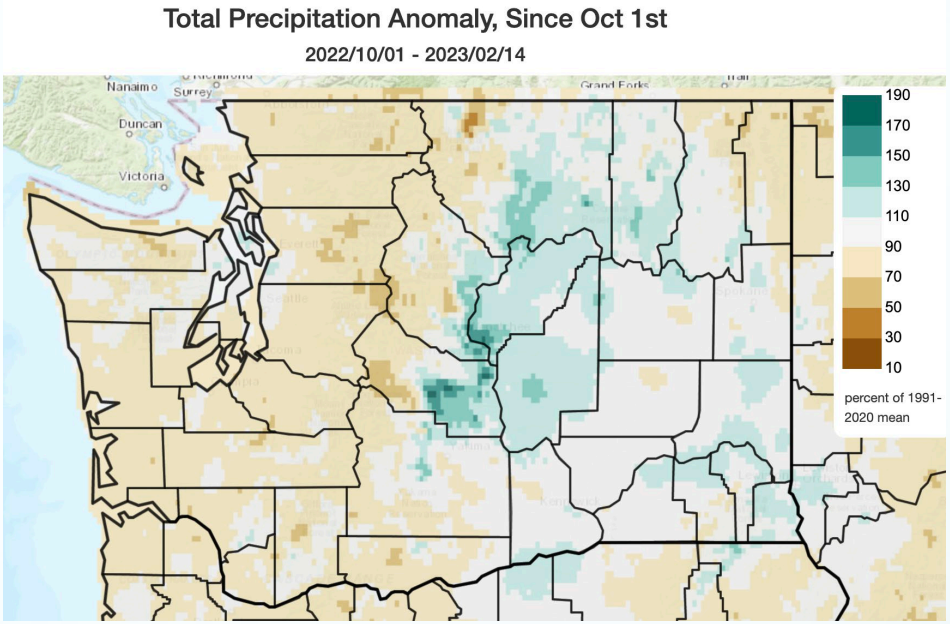
Nick Bond & Karin Bumbaco
Office of the Washington State Climatologist
Cooperative Institute for Climate, Ocean, and Ecosystem Studies
University of Washington
17 February 2023

# Water Year 2023

## Temperature




## Precipitation



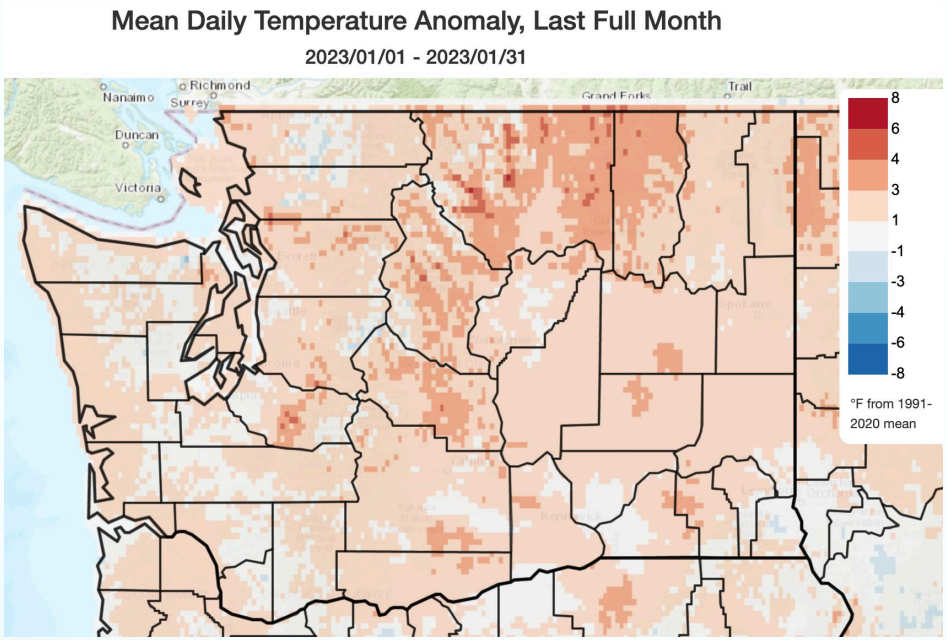

Climate Toolbox

- Oct-Jan averages to cooler than normal* (-0.5°F) when averaged statewide
- Averaged statewide, Oct-Jan precipitation ranks as the 39th driest (-3.26")*

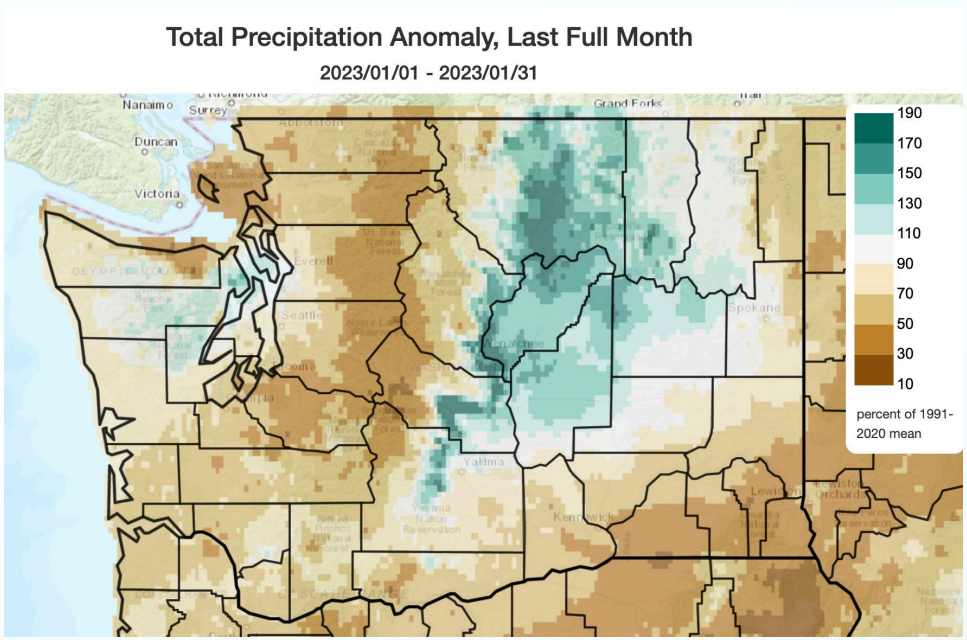
*Records since 1895; 1991-2020 normal

# January 2023

## Temperature




## Precipitation



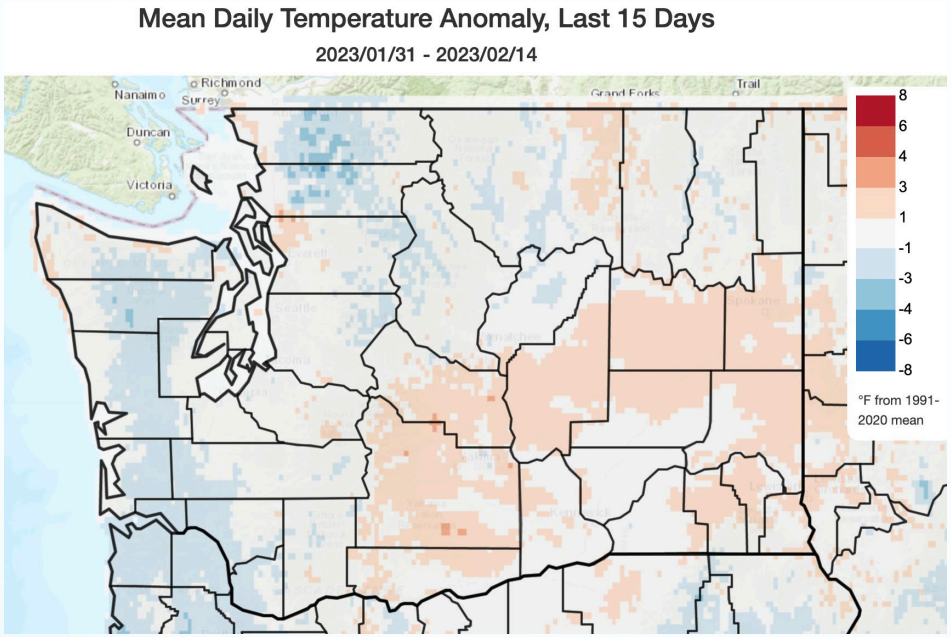

Climate Toolbox

- Averaged statewide, January was the 23rd warmest on record (+1.4°F)*
- Averaged statewide, January was was 26th driest (-2.06”) on record*

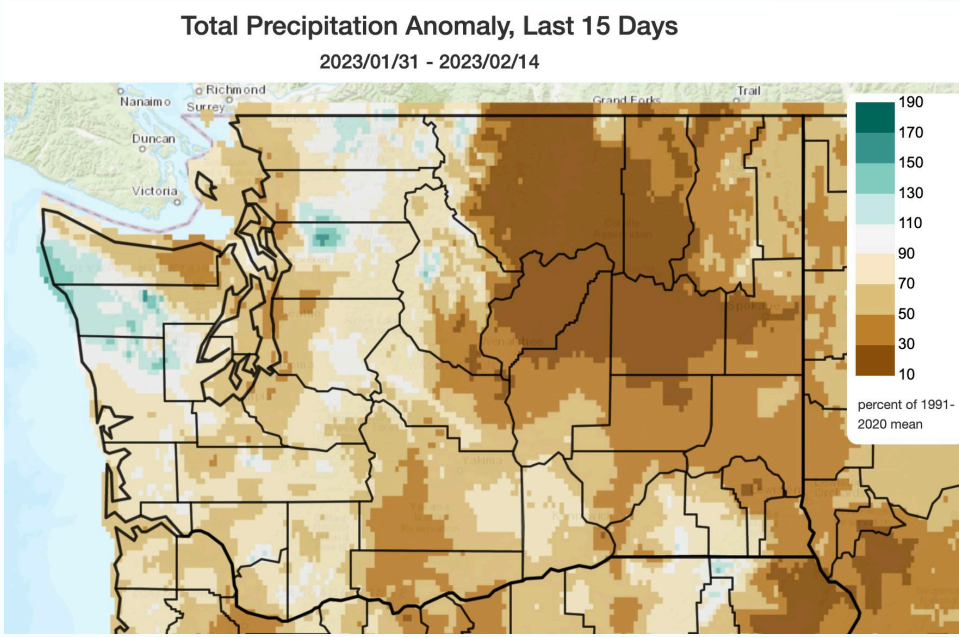
*Records since 1895

# February 2023 so far

## Temperature

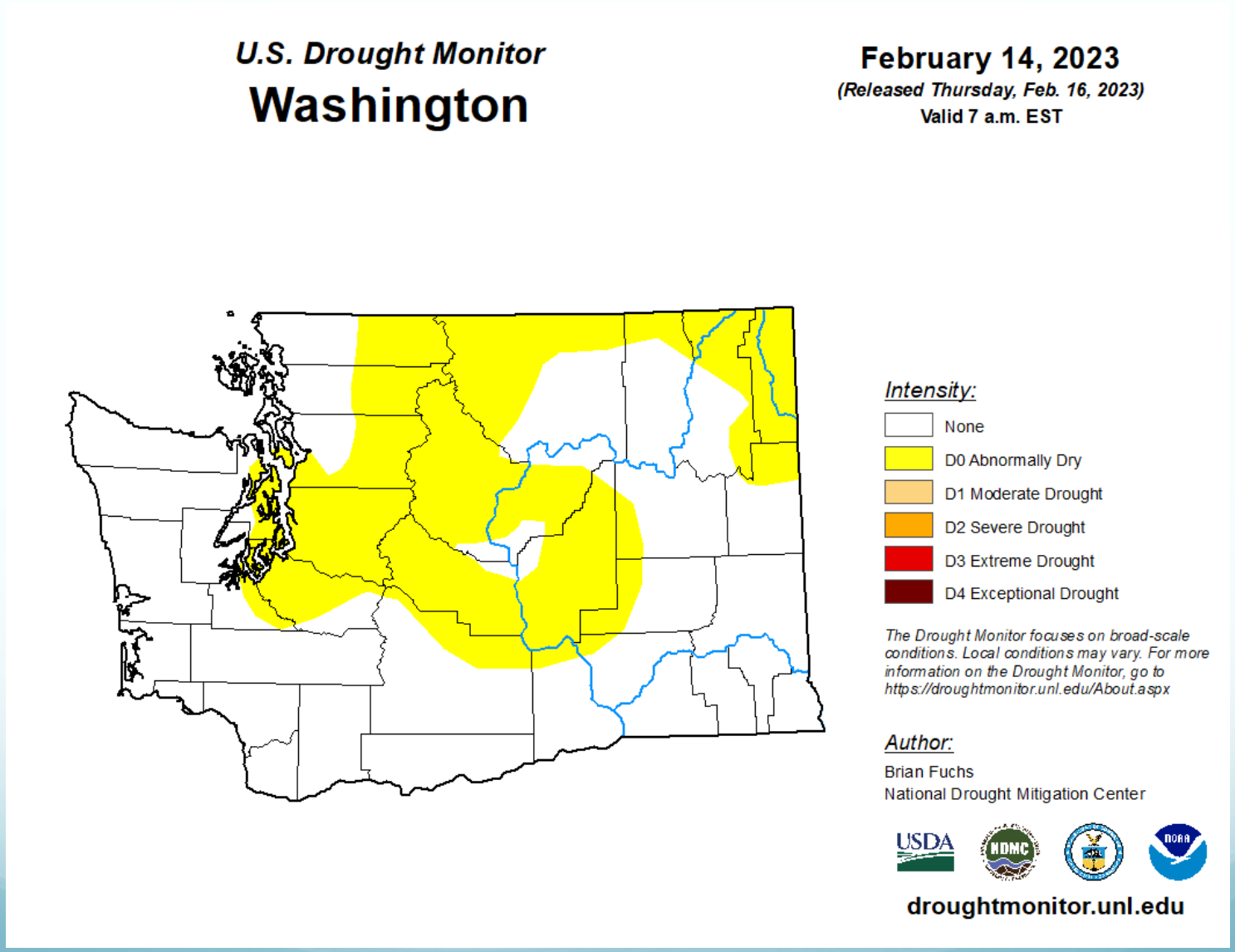



## Precipitation




Climate Toolbox

# U.S. Drought Monitor

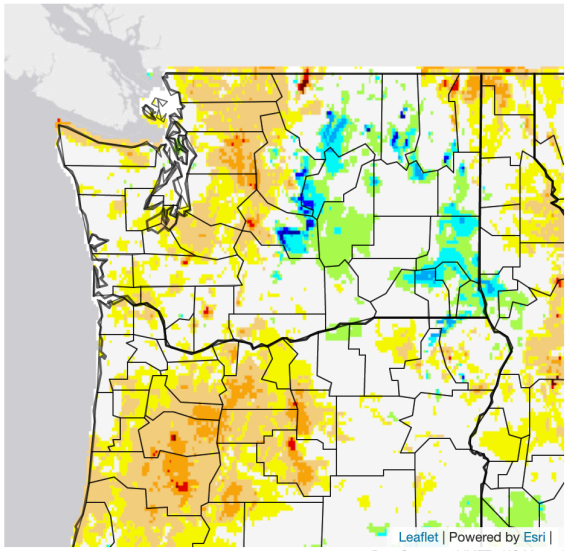


## Classification of Water Extremes: Wet-to-Dry

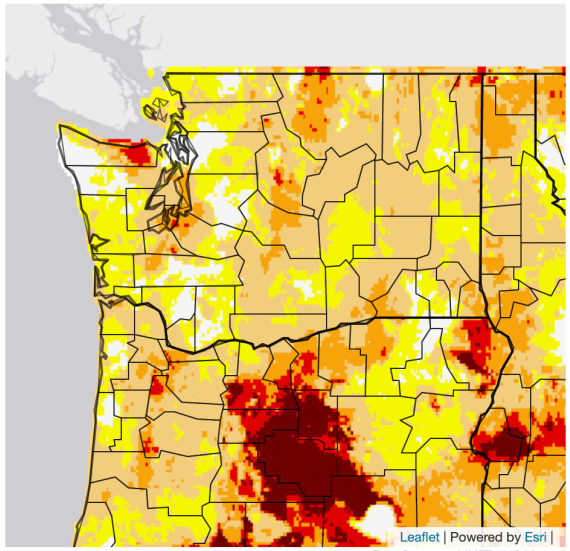
USDM Colors/Thresholds

| Exceptional Wet | Extreme Wet | Severe Wet | Moderate Wet | Abnormal Wet | Neutral | Abnormal Dry | Moderate Drought | Severe Drought | Extreme Drought | Exceptional Drought |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 percentile | 2 | 5 | 10 | 20 | 30 | 70 | 80 | 90 | 95 | 98 | 100 |

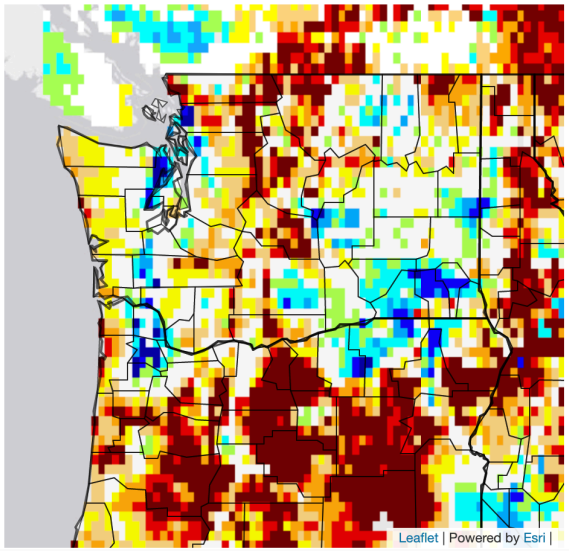
### Precipitation
Oct. 1, 2022 - Feb. 14, 2023



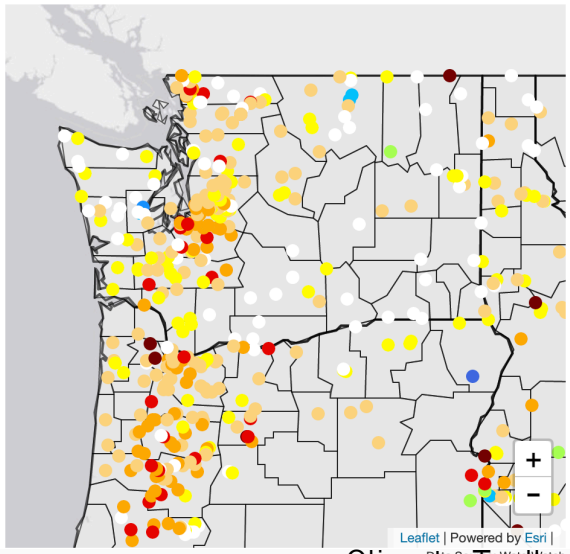

### Precipitation
Jan. 16, 2023 - Feb. 14, 2023




### Soil Moisture (Surface)
Feb. 6, 2023

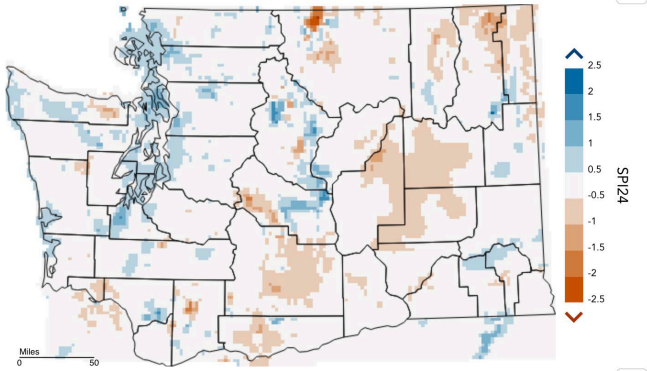



### Streamflow
Jan. 20, 2023 - Feb. 16, 2023

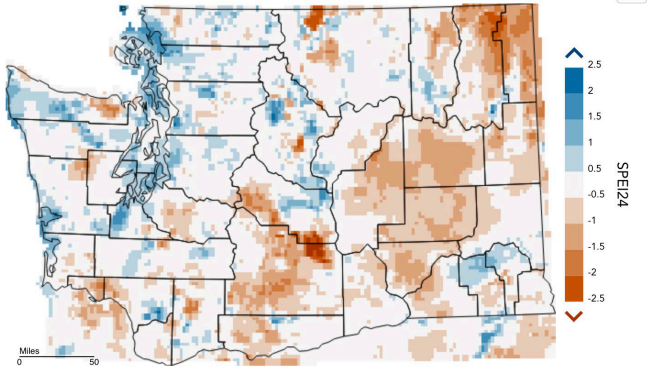



## 24-month SPI and SPEI

SPI



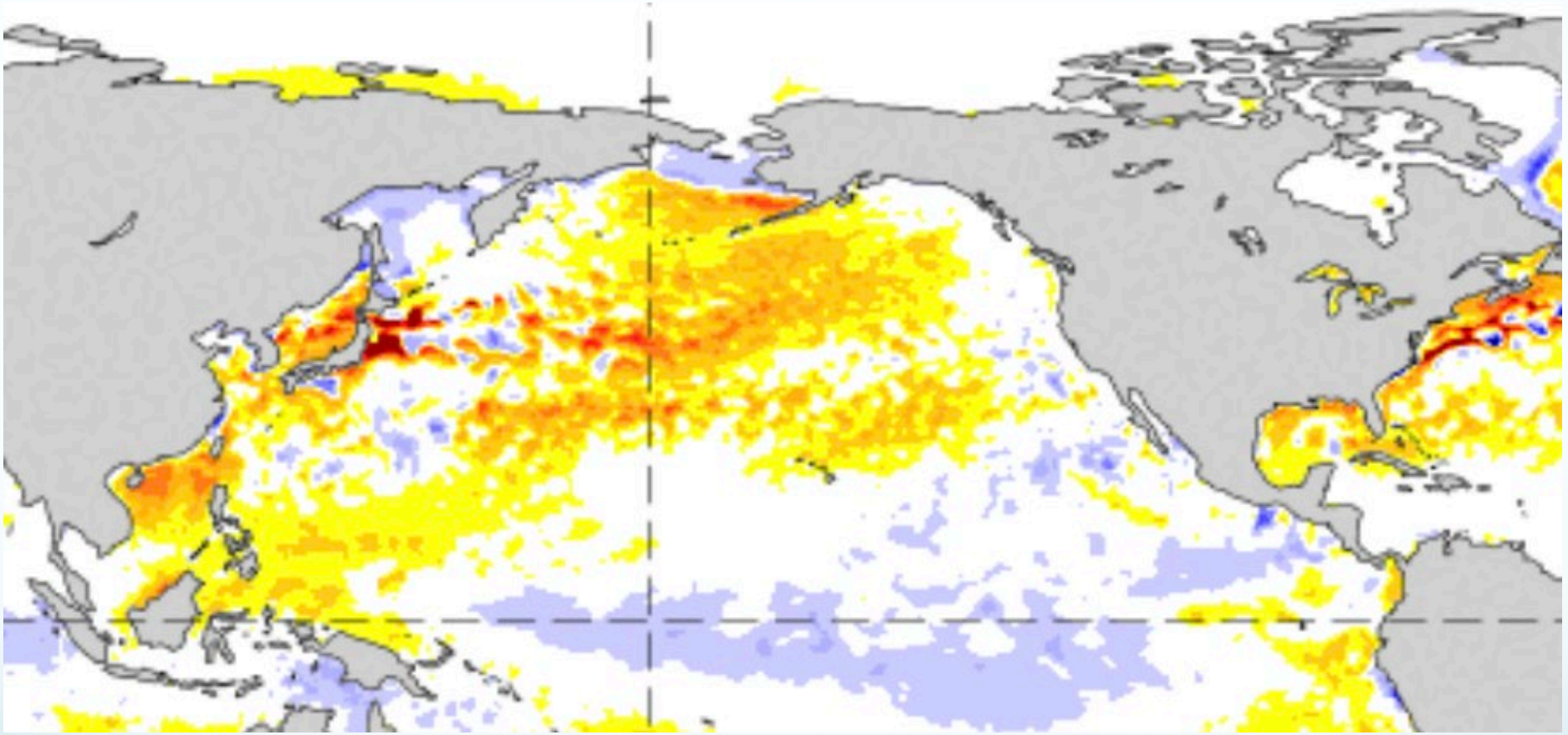

SPEI

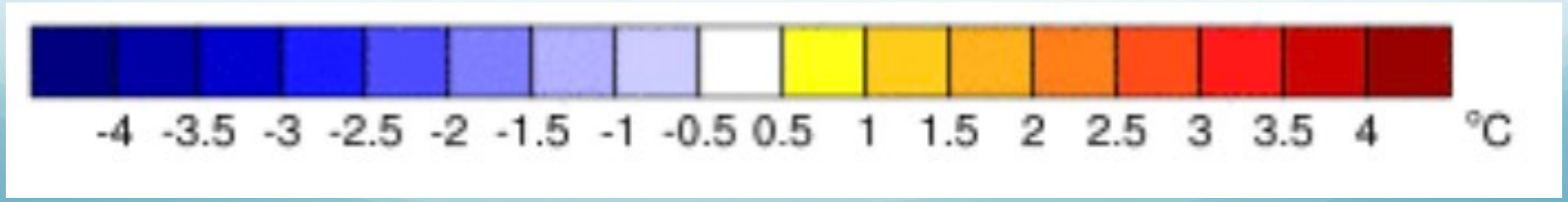


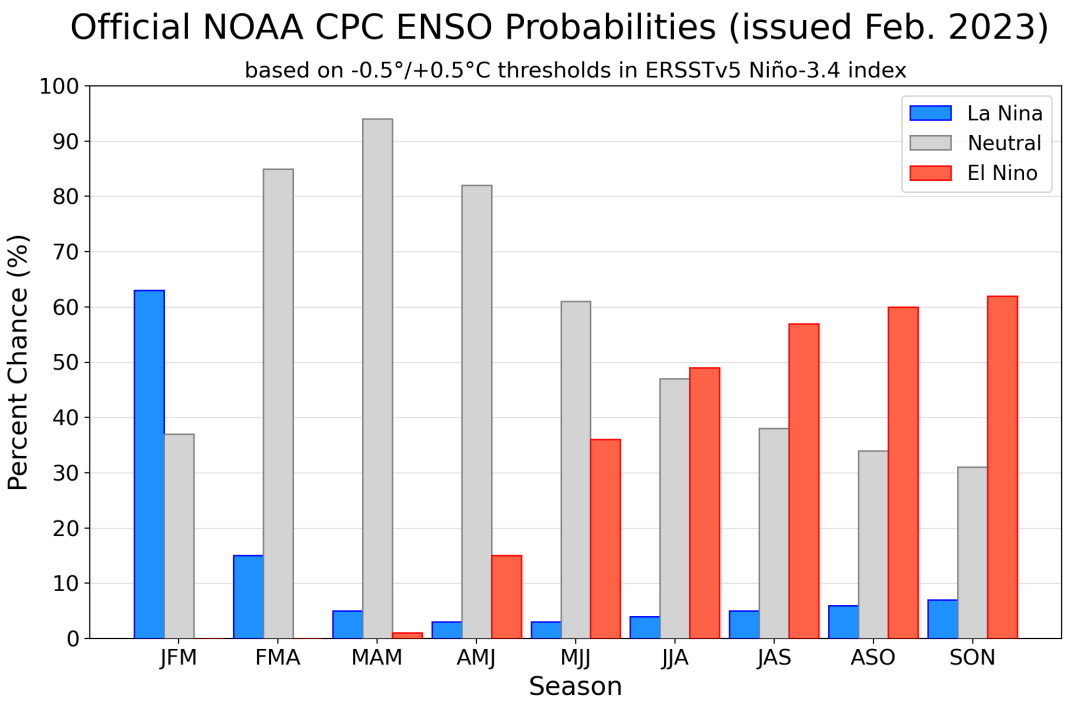

WestWide Drought Tracker

Climate Toolbox

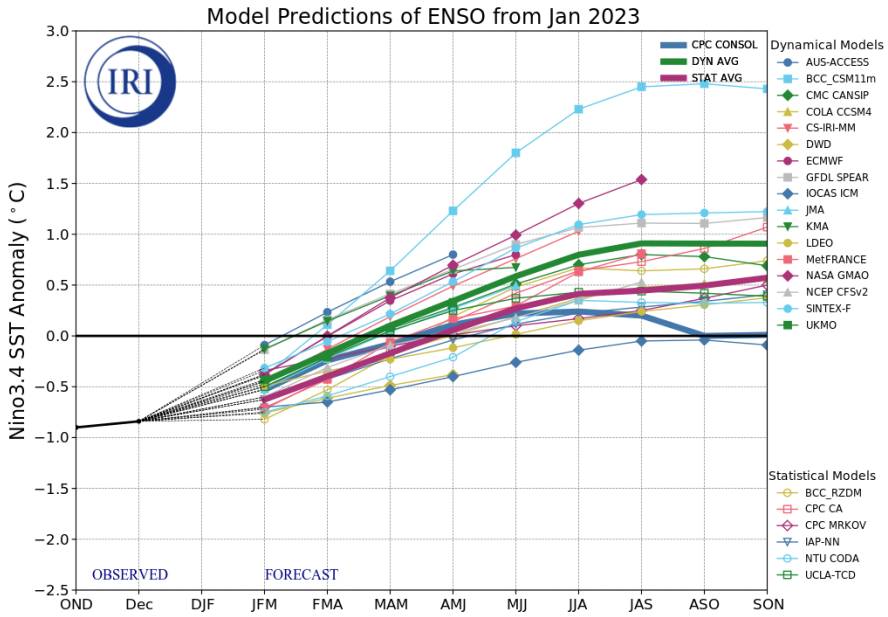
# Sea Surface Temperature Anomalies: 05-11 Feb 2023

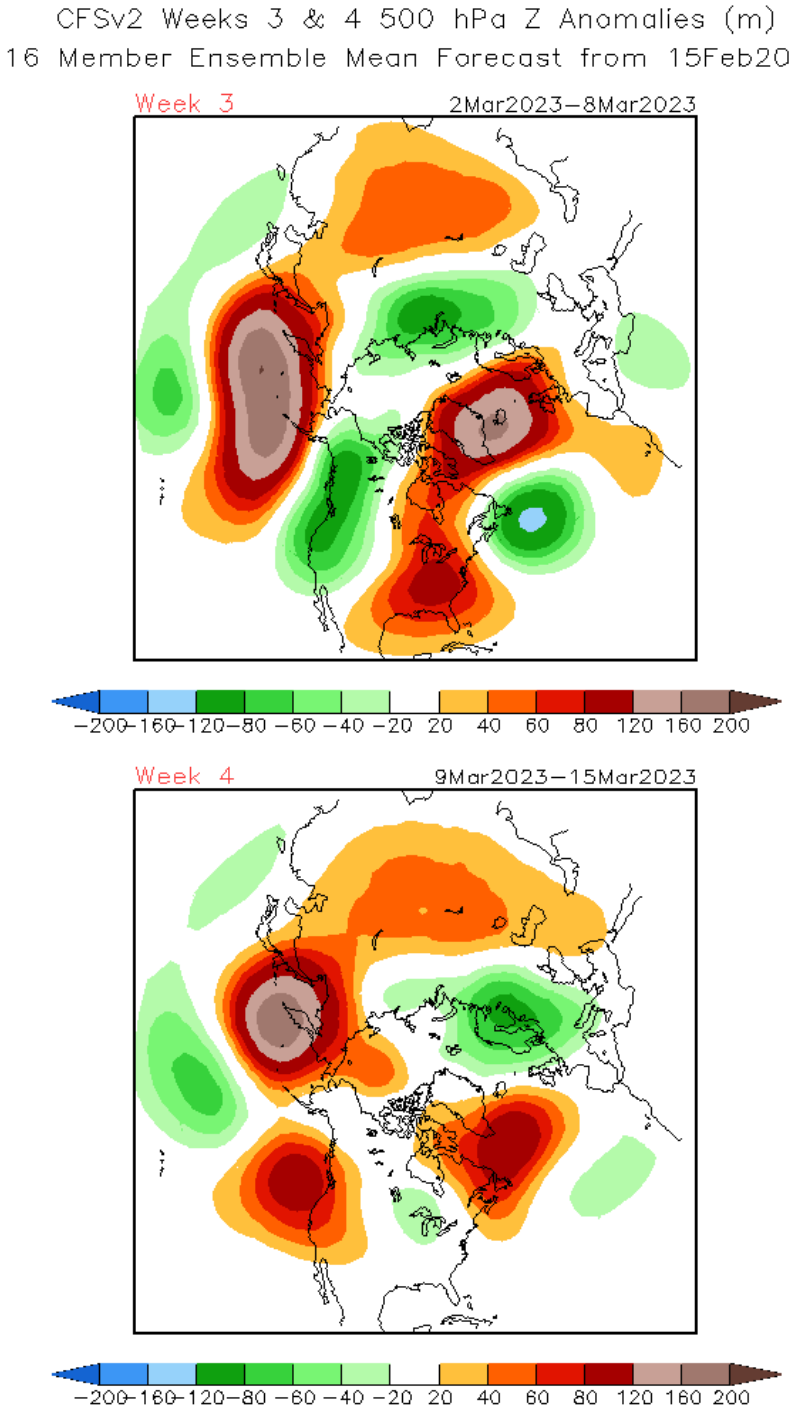







**Latest ENSO predictions indicate that La Nina will be ending any minute**



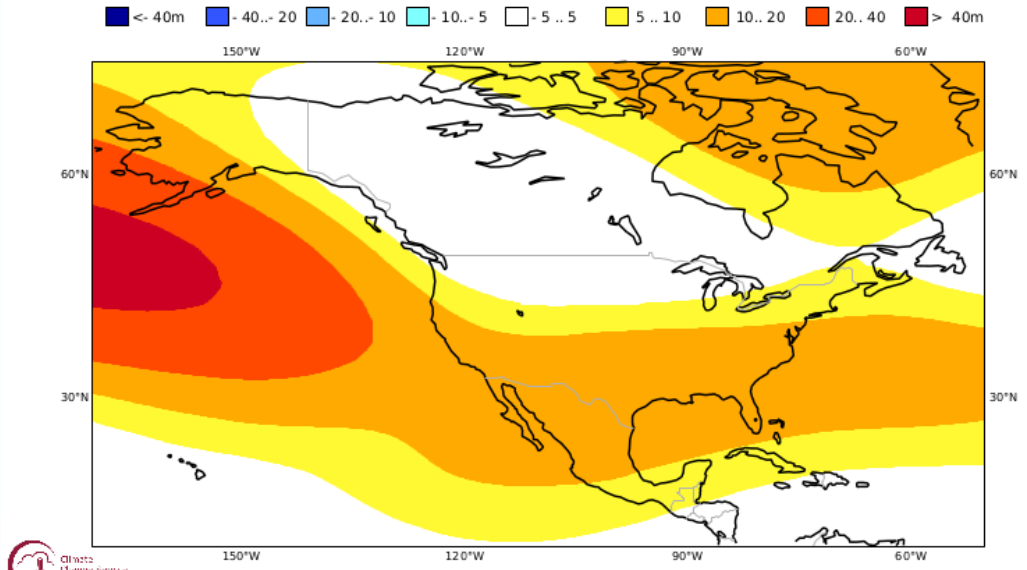



# CFS 3 & 4 Week 500 hPa Model Projections: Wet and Cool in Early March and then Drying Out in WA State

C3S multi-system seasonal forecast
Mean Z500 anomaly
Nominal forecast start: 01/02/23
Variance-standardized mean

ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/ECCC
MAM 2023

## 500 hPa Z

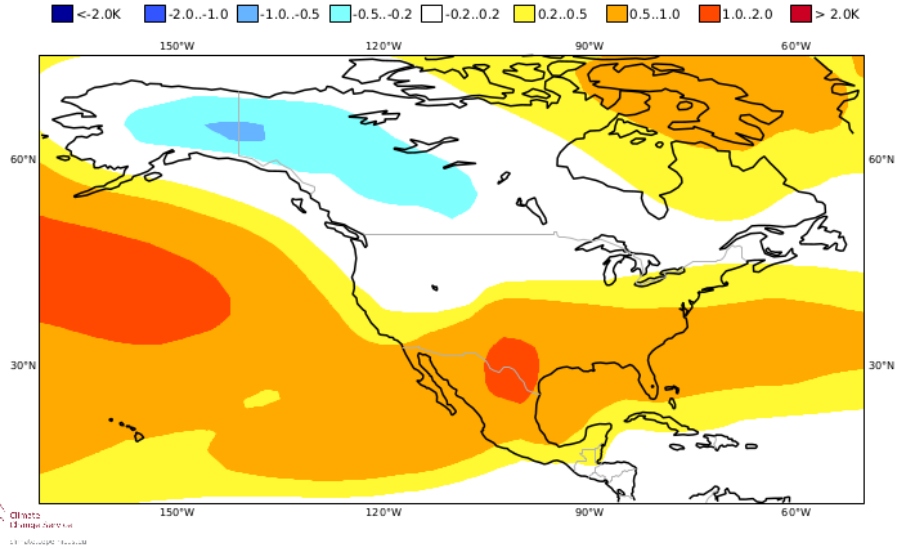



**IMME Projections for Mar-May: Consistent with the Demise of La Nina**

C3S multi-system seasonal forecast
Mean T850 anomaly
Nominal forecast start: 01/02/23
Variance-standardized mean

ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/EC
MAM 2(

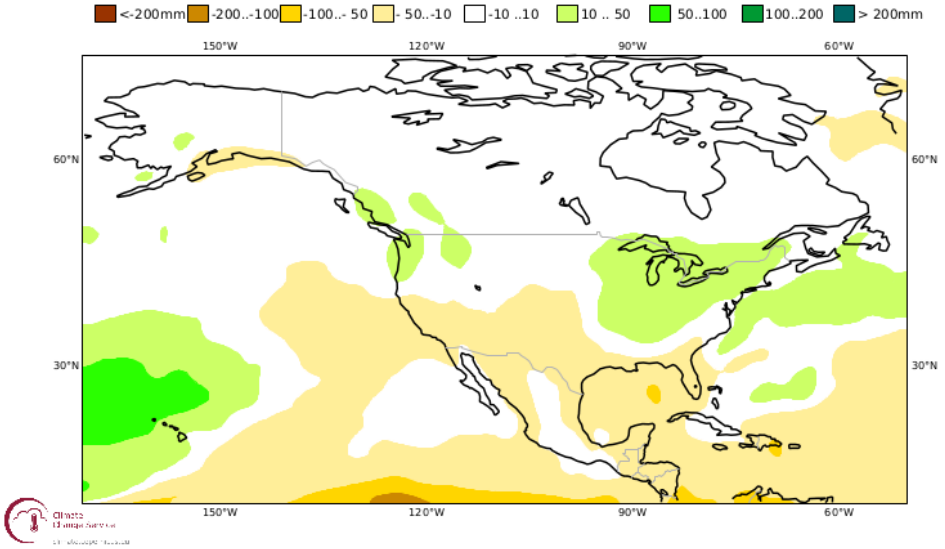
## Temperature at 850 hPa



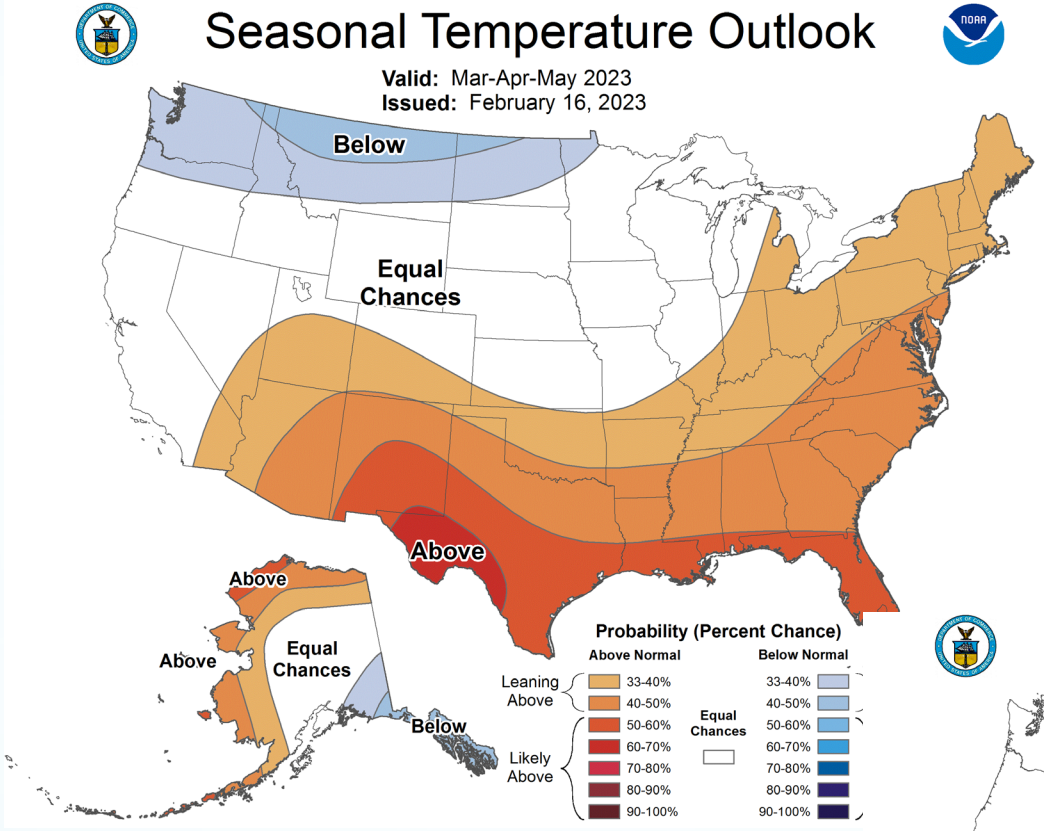

C3S multi-system seasonal forecast
Mean precipitation anomaly
Nominal forecast start: 01/02/23
Variance-standardized mean

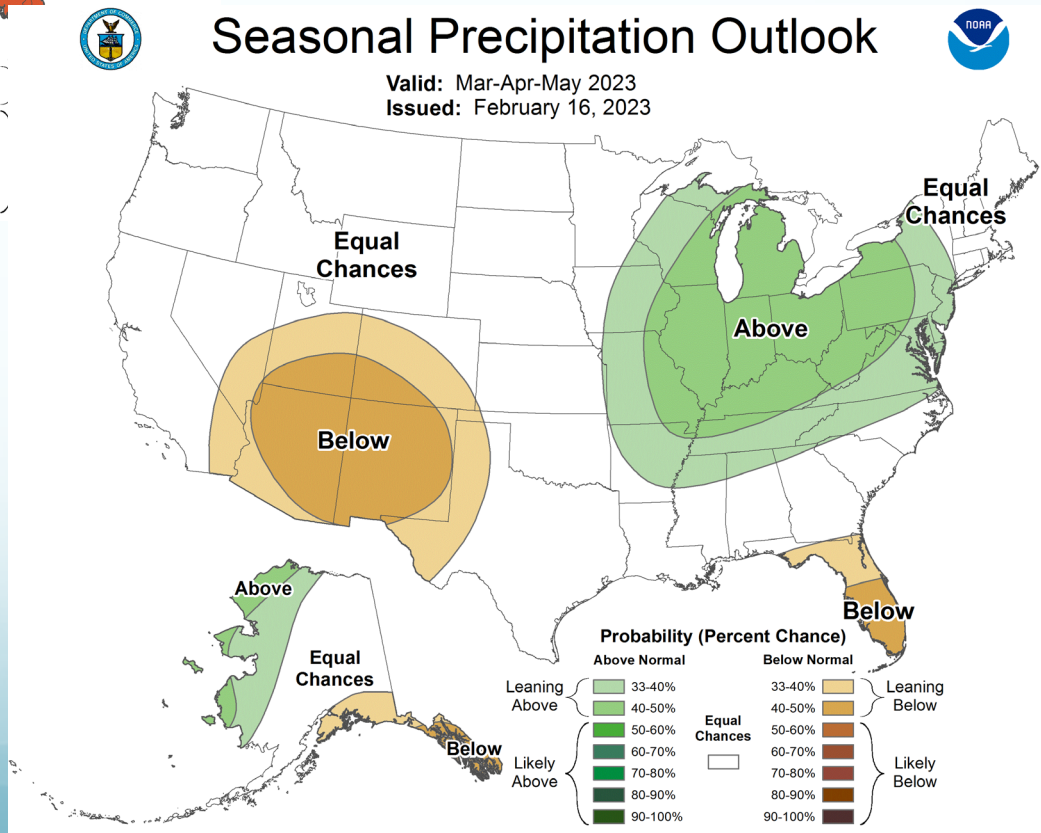
ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/ECCC
MAM 2023

## Precipitation



# NOAA/CPC Forecasts for March-May 2023

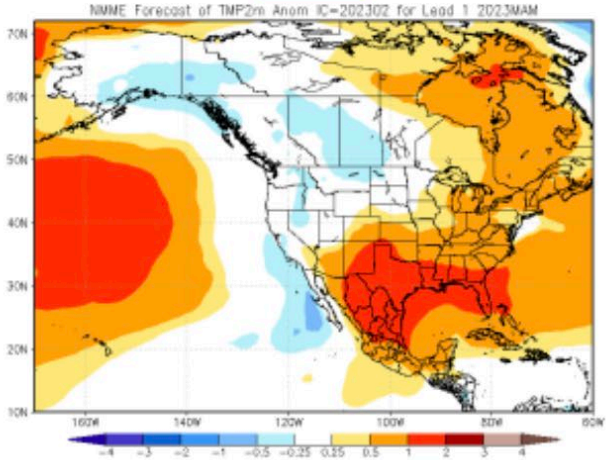


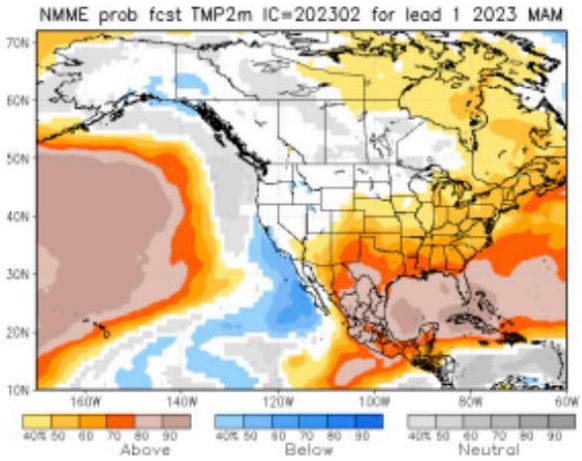
# NMME Temperature Projections

## Spring (MAM) 2023

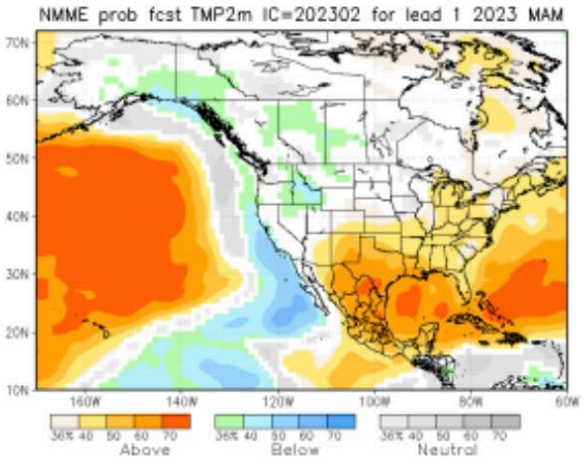
**NMME**




**Prob fcst**

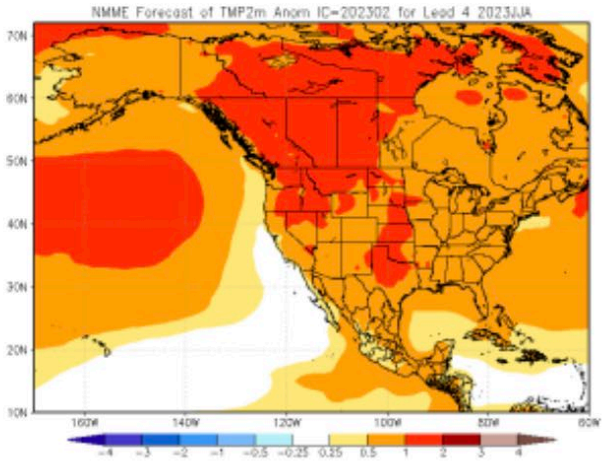



**PAC calib. prob fcst**

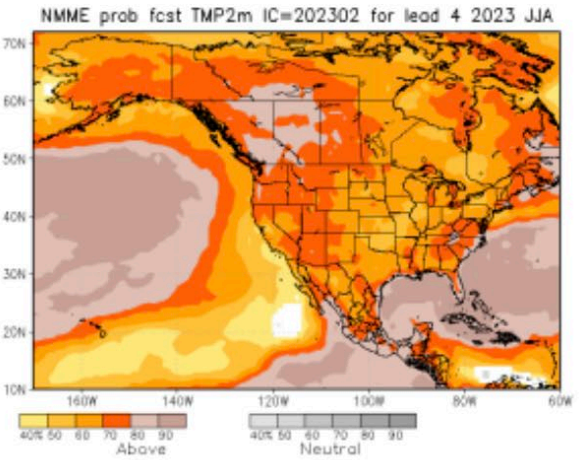



## Summer (JJA) 2023

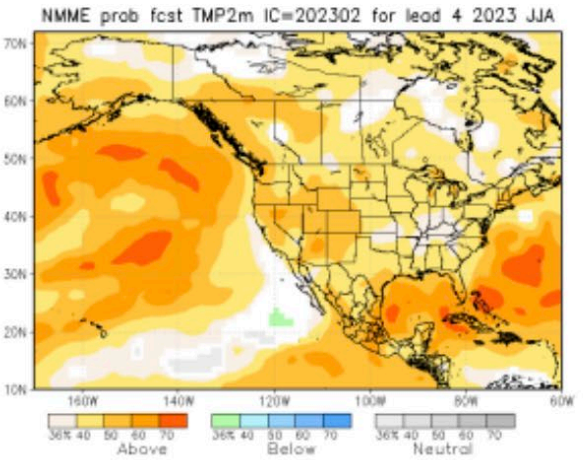
**NMME**




**Prob fcst**

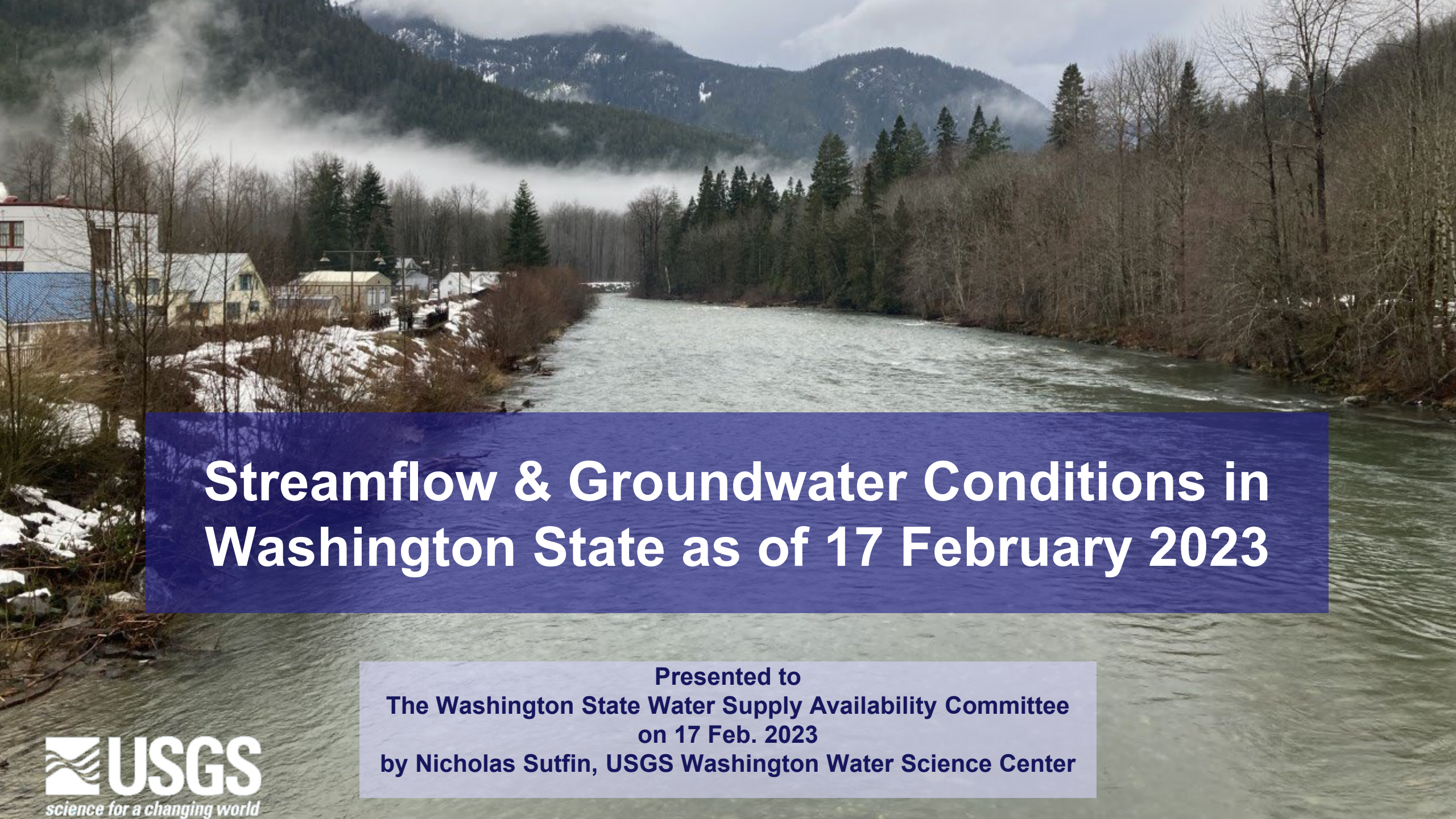



**PAC calib. prob fcst**



# Summary

- Water year on average has generally been drier and warmer in western WA and wetter and cooler in eastern WA
- Long-term eastern WA precipitation deficits improving, but there is a recent pause
- Growth in the winter snowpack is anticipated over the next couple of months
- Spring 2023: *Probably* a warm-up relative to seasonal norms
- Don’t pack away the long johns quite yet

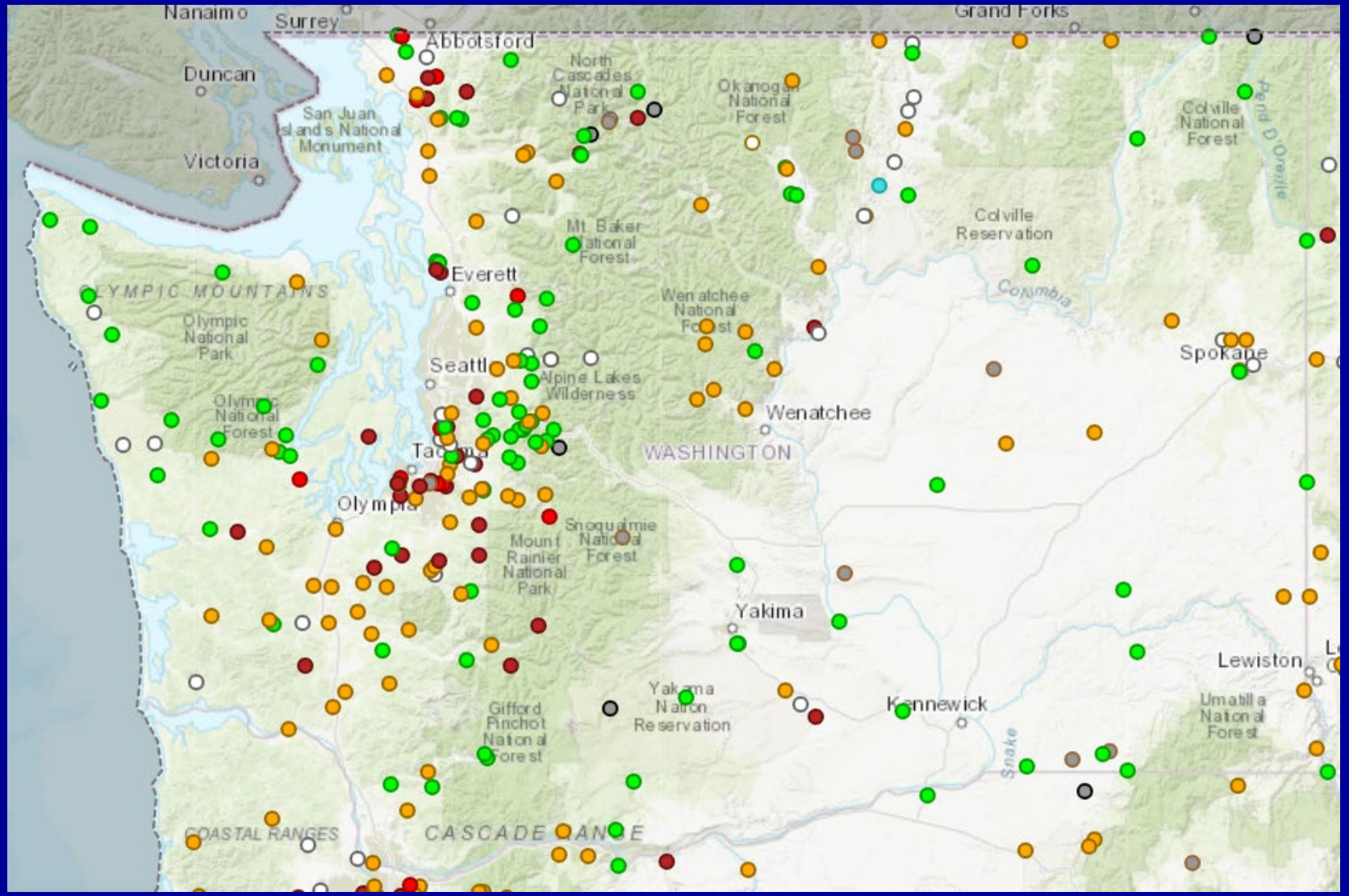


# Streamflow & Groundwater Conditions in Washington State as of 17 February 2023

Presented to
The Washington State Water Supply Availability Committee
on 17 Feb. 2023
by Nicholas Sutfin, USGS Washington Water Science Center

USGS
science for a changing world

# WA Current Streamflow Conditions, 17 Feb. 2023

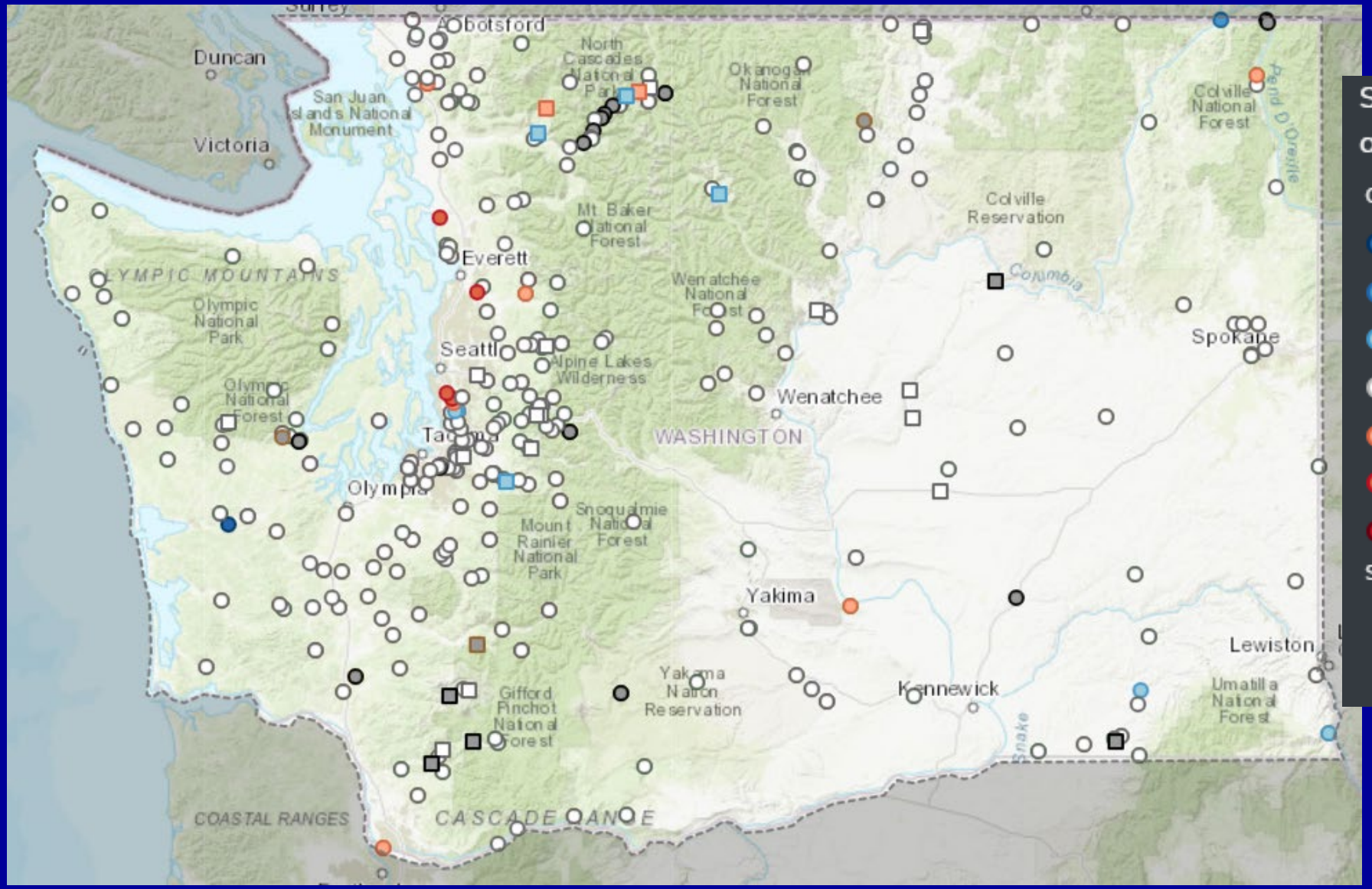




USGS
science for a changing world

USGS | National Water Dashboard

# Rising and Falling conditions of WA streams on 17 Feb. 2023




**Surface-Water Levels: Rising and falling**

COLOR – CHANGE

- Water level rising ≥ 1 foot/hour
- Water level rising ≥ 0.5 – 1 foot/hour
- Water level rising ≥ 0.05 – 0.5 foot/hour
- Water level changing < 0.05 foot/hour
- Water level falling ≥ 0.05 – 0.5 foot/hour
- Water level falling ≥ 0.5 – 1 foot/hour
- Water level falling ≥ 1 foot/hour

SHAPE – SITE TYPE

Stream  Lake  Wetland  Estuary  Coastal

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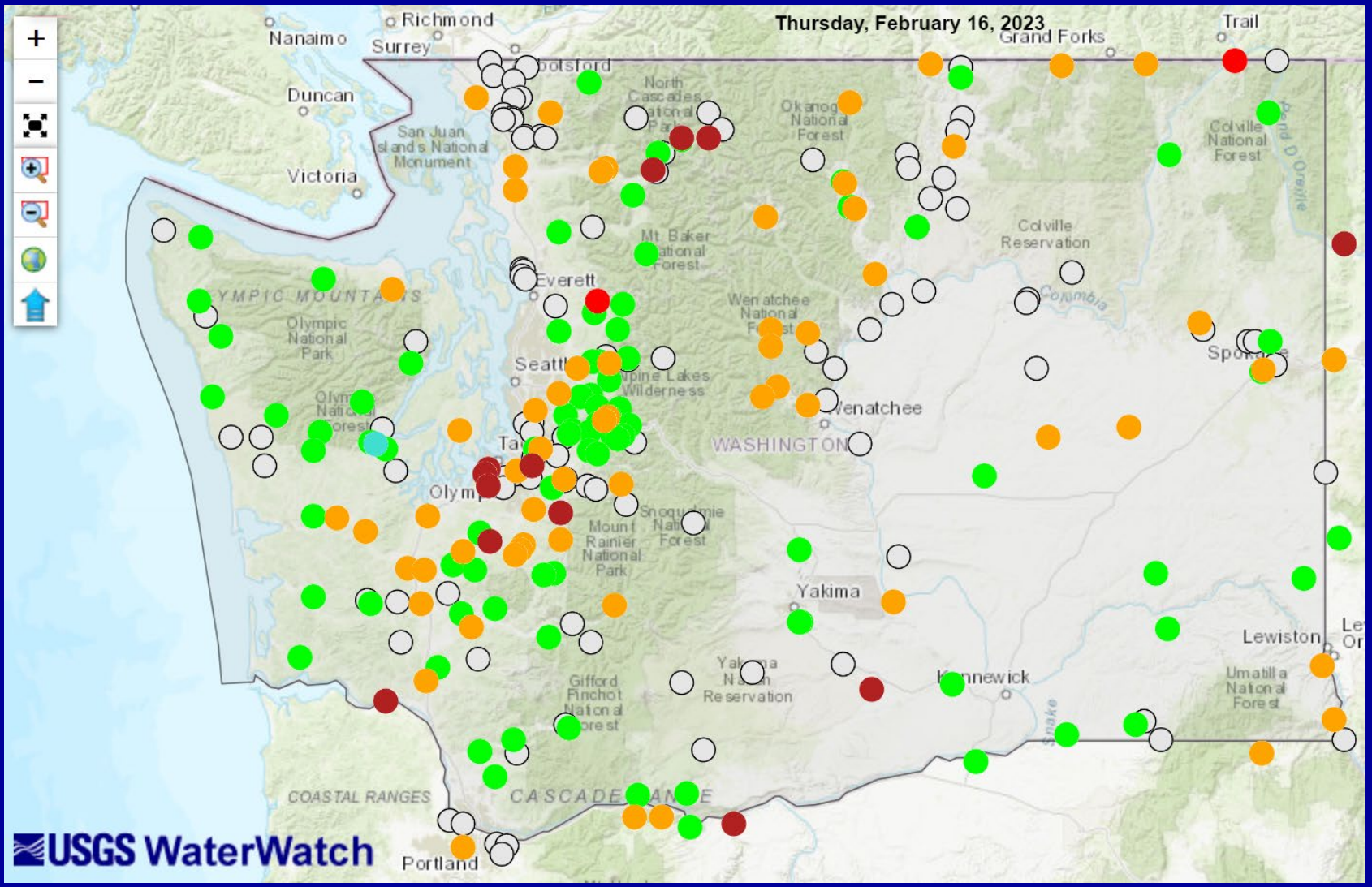
# WA 7-day Average Streamflow Conditions as of 17 Feb. 2023





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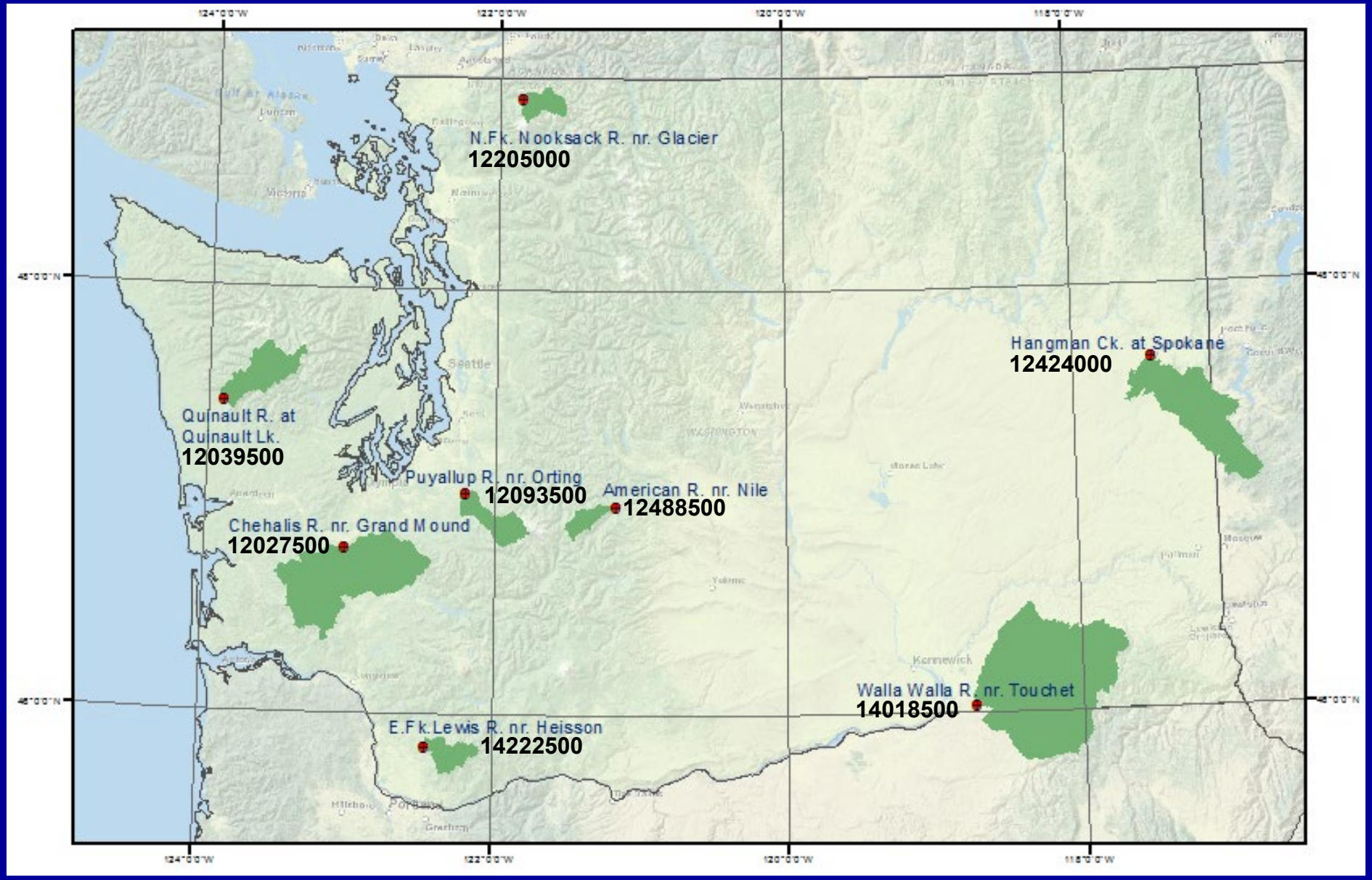
# Index Gaging Stations

## (Stations that measure natural or near-natural streamflow)

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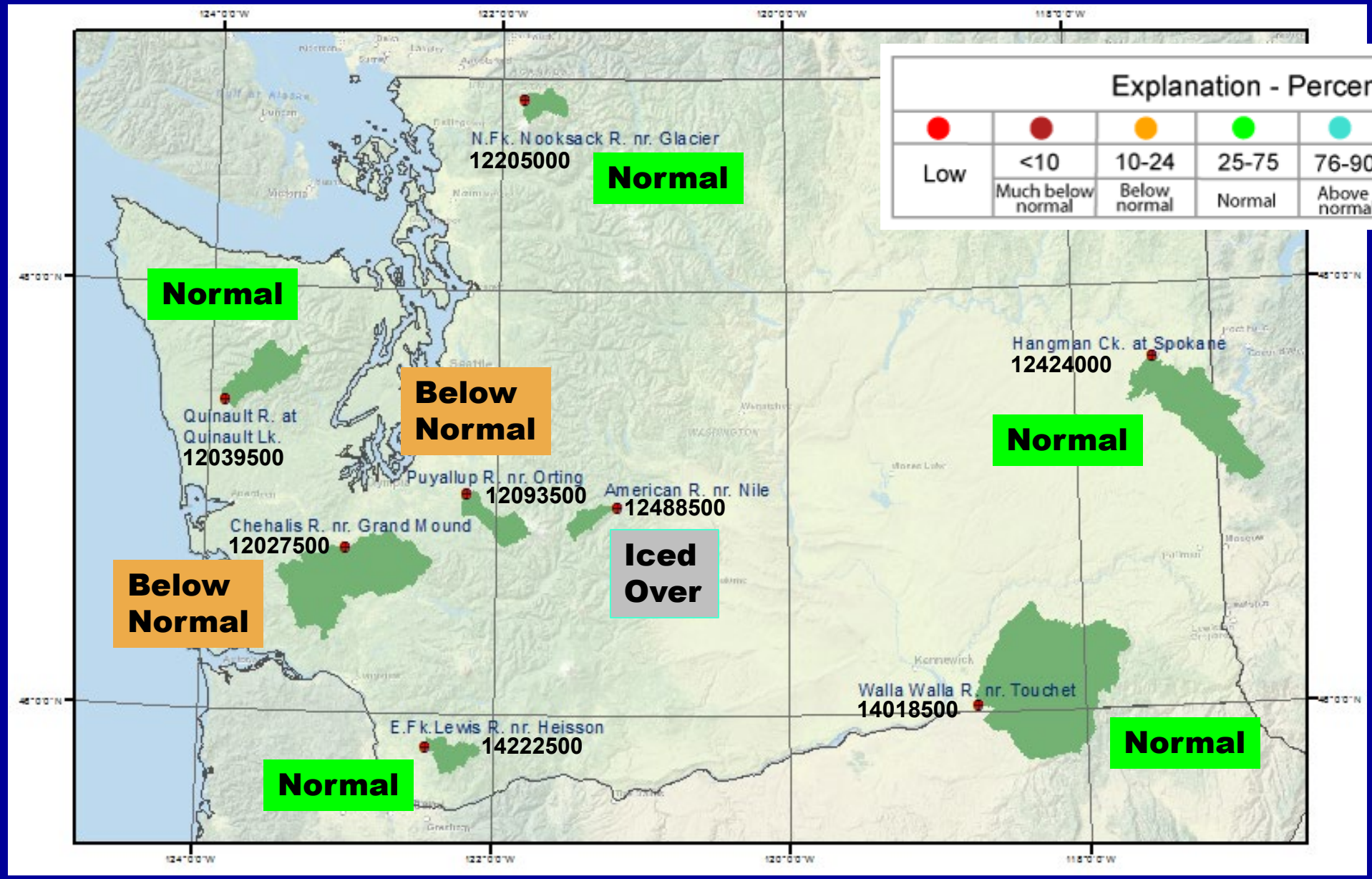
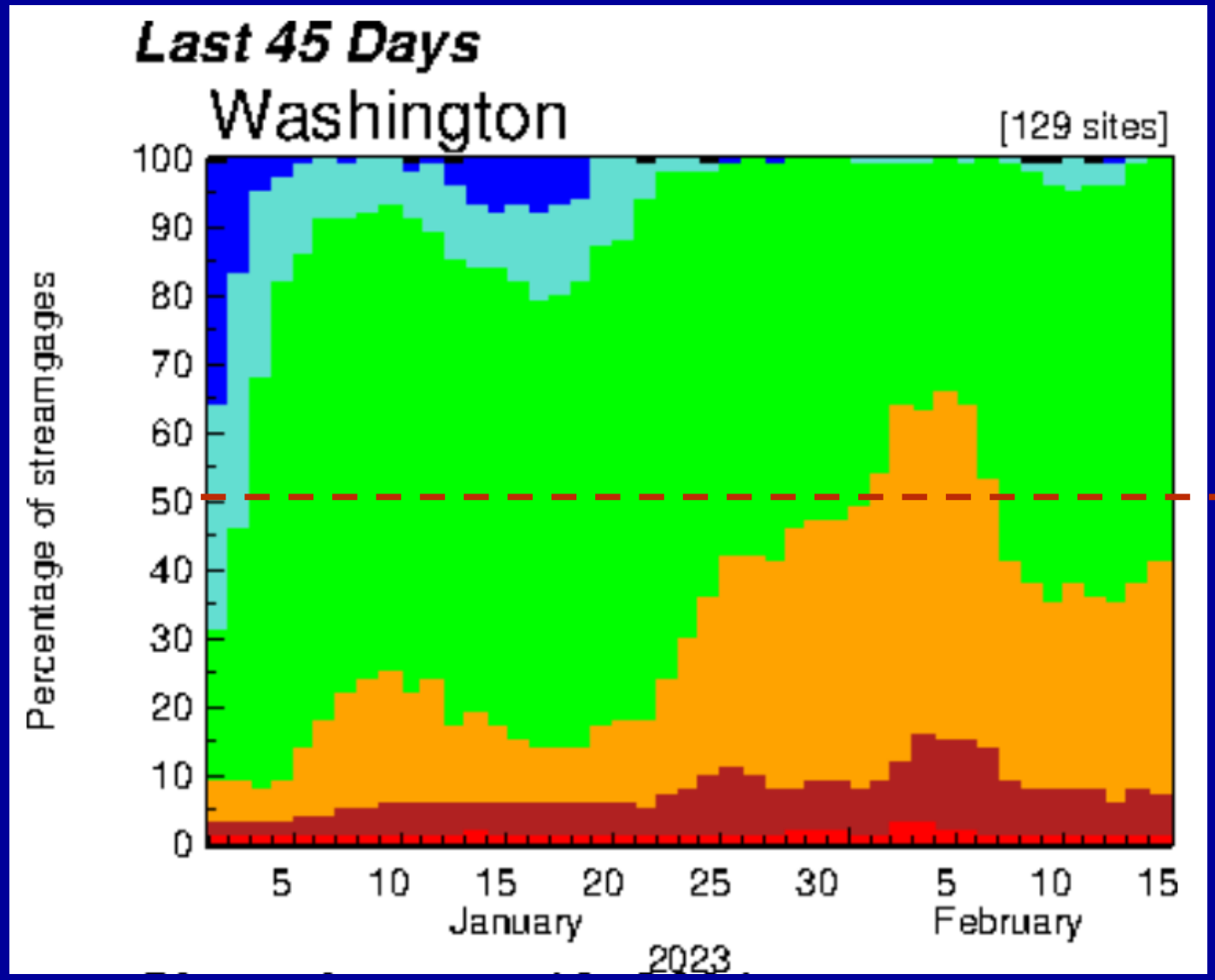
# Index Gaging Stations, 7-day average streamflow (as of 17 Feb. 2023)

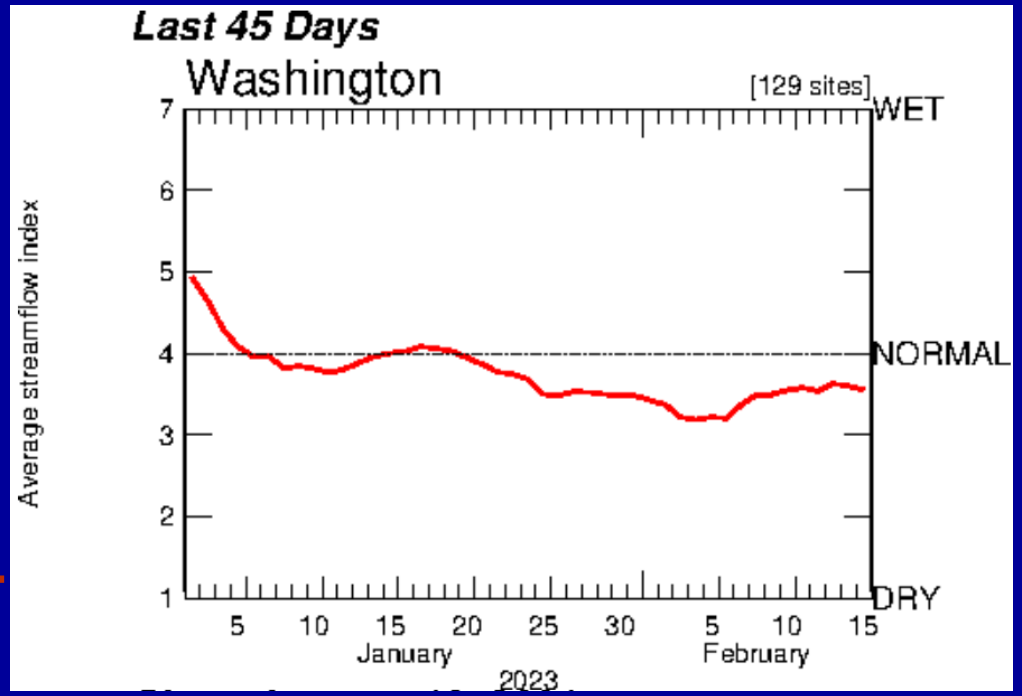



USGS science for a changing world

USGS WaterWatch -- Streamflow conditions

# Daily streamflow in Washington Rivers compared to historical streamflow, Jan. 2023 to Feb. 2023



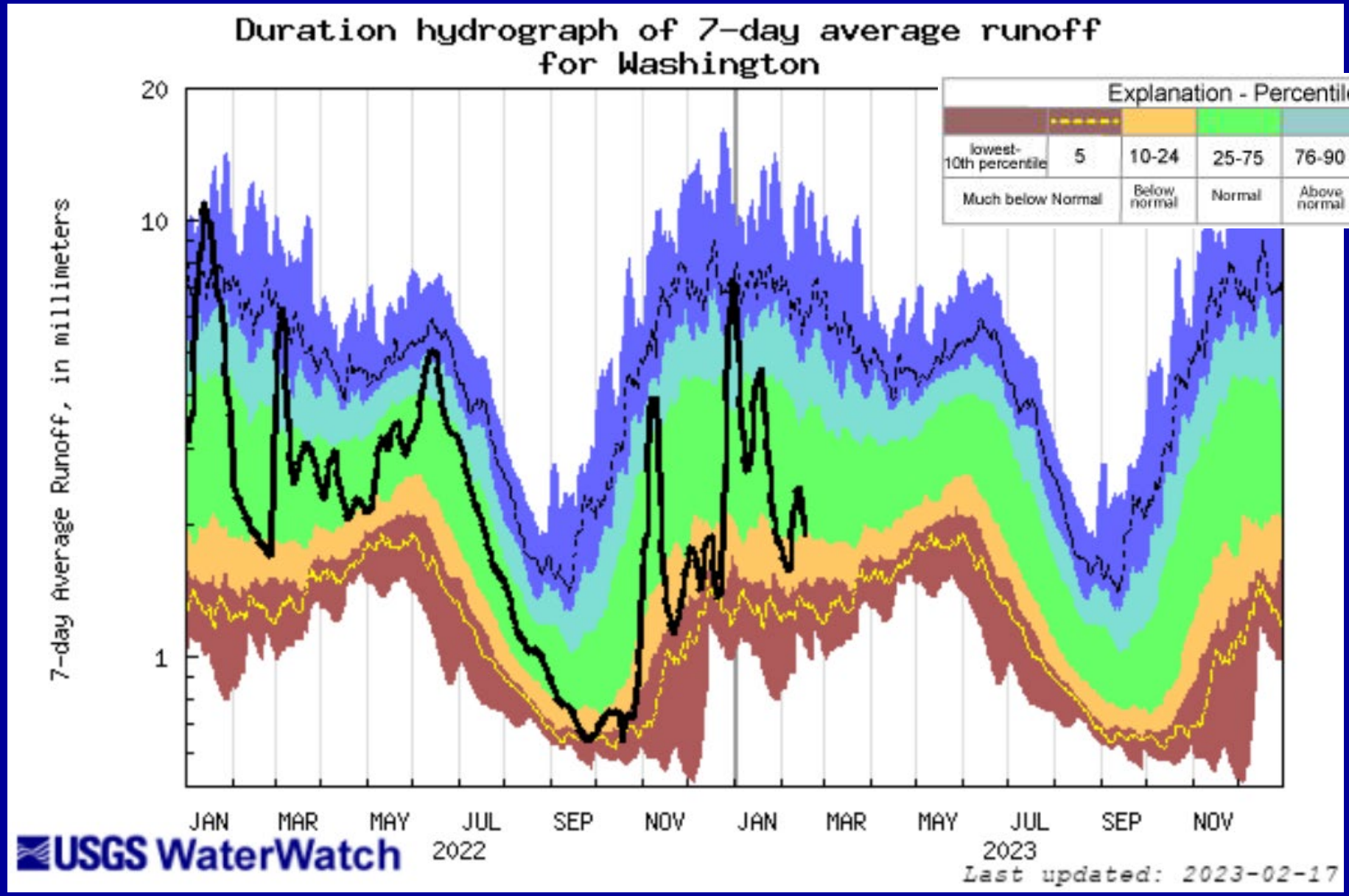

| Explanation - Percentile classes | | | | | | |
|---|---|---|---|---|---|---|
| Low | <10 | 10-24 | 25-75 | 76-90 | >90 | High |
| | Much below normal | Below normal | Normal | Above normal | Much above normal | |

USGS science for a changing world

[USGS WaterWatch -- Streamflow conditions]

# Duration Hydrograph, Washington State

7-day Average Streamflow (as of **17 Feb. 2023**) is normal/below normal

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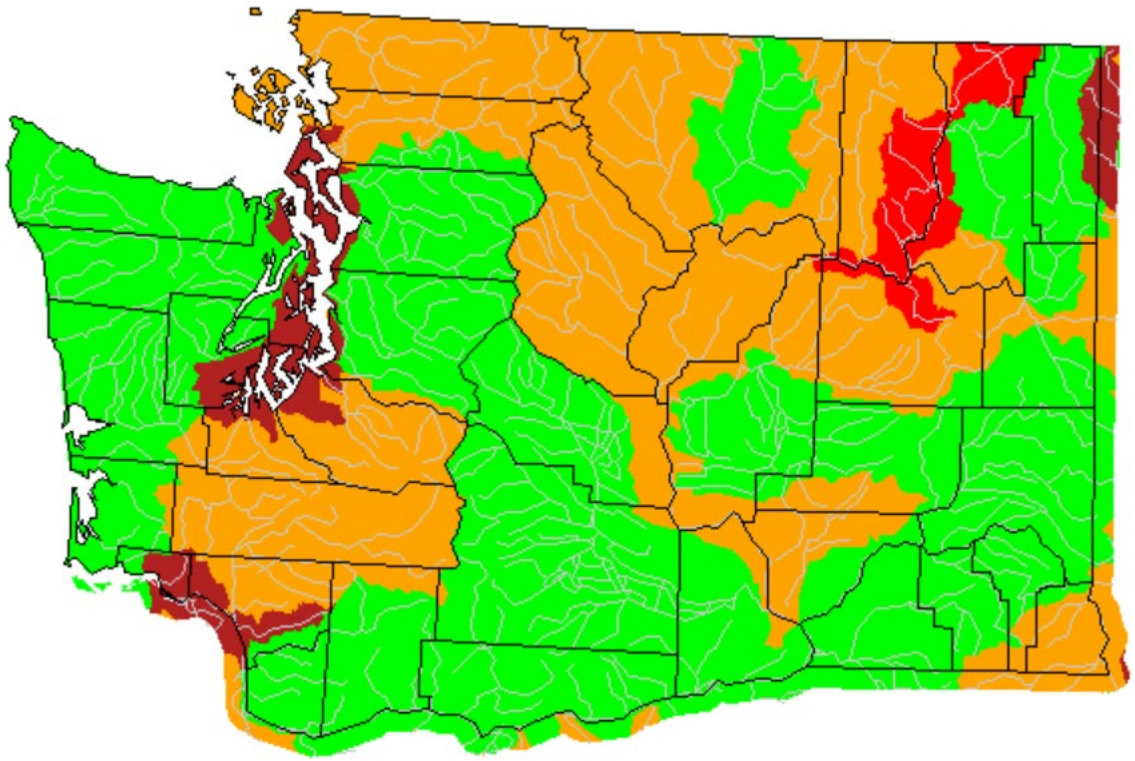
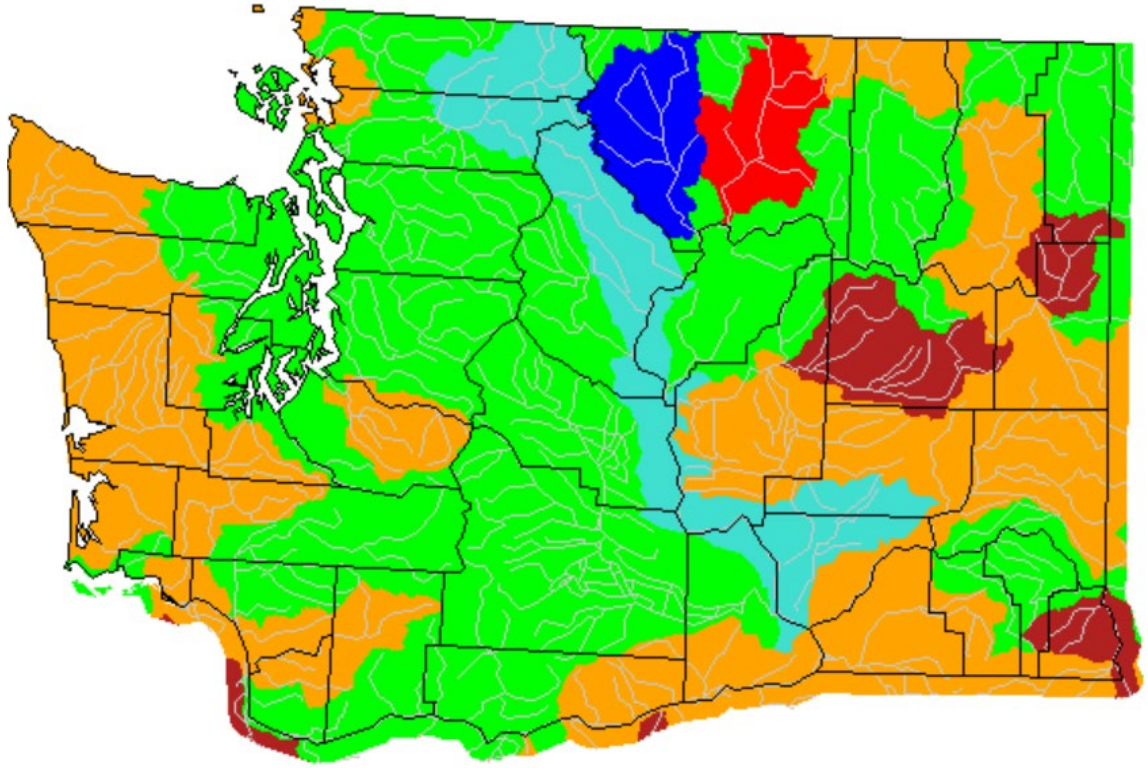
# WA 14-day average streamflow

## as of 17 January 2023, compared to February 2022

### Last 14 days



### February 2022



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

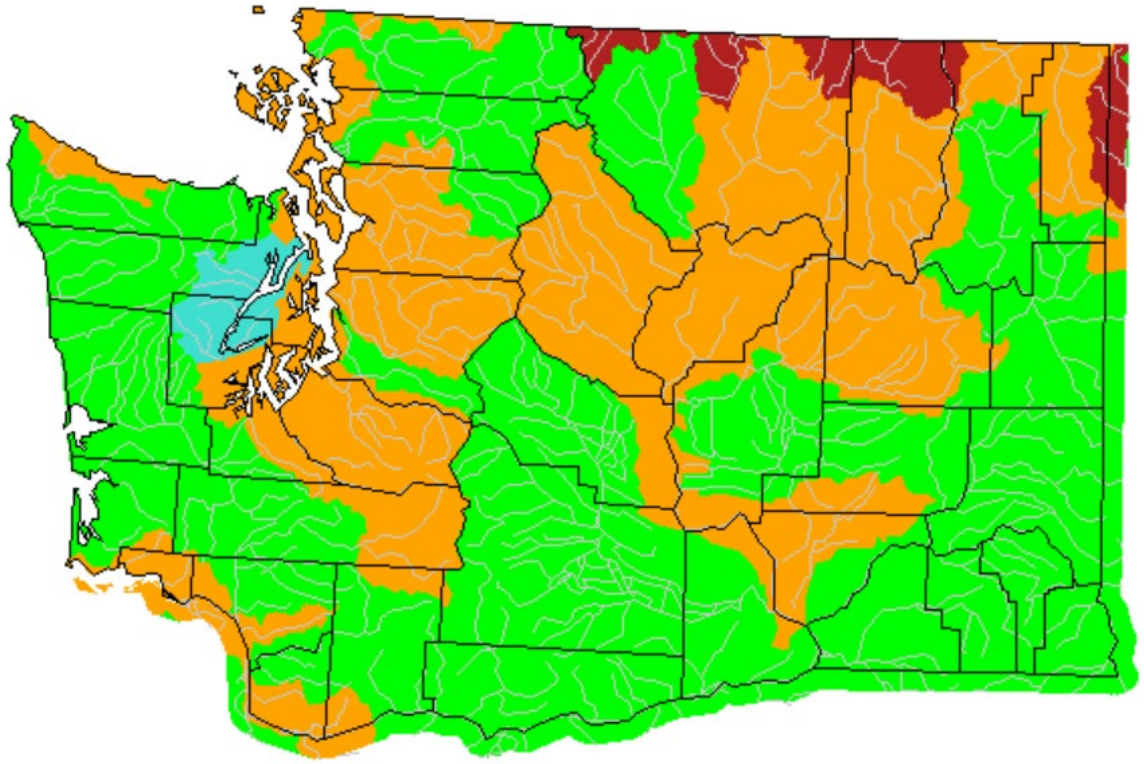
USGS science for a changing world

[USGS WaterWatch -- Streamflow conditions]

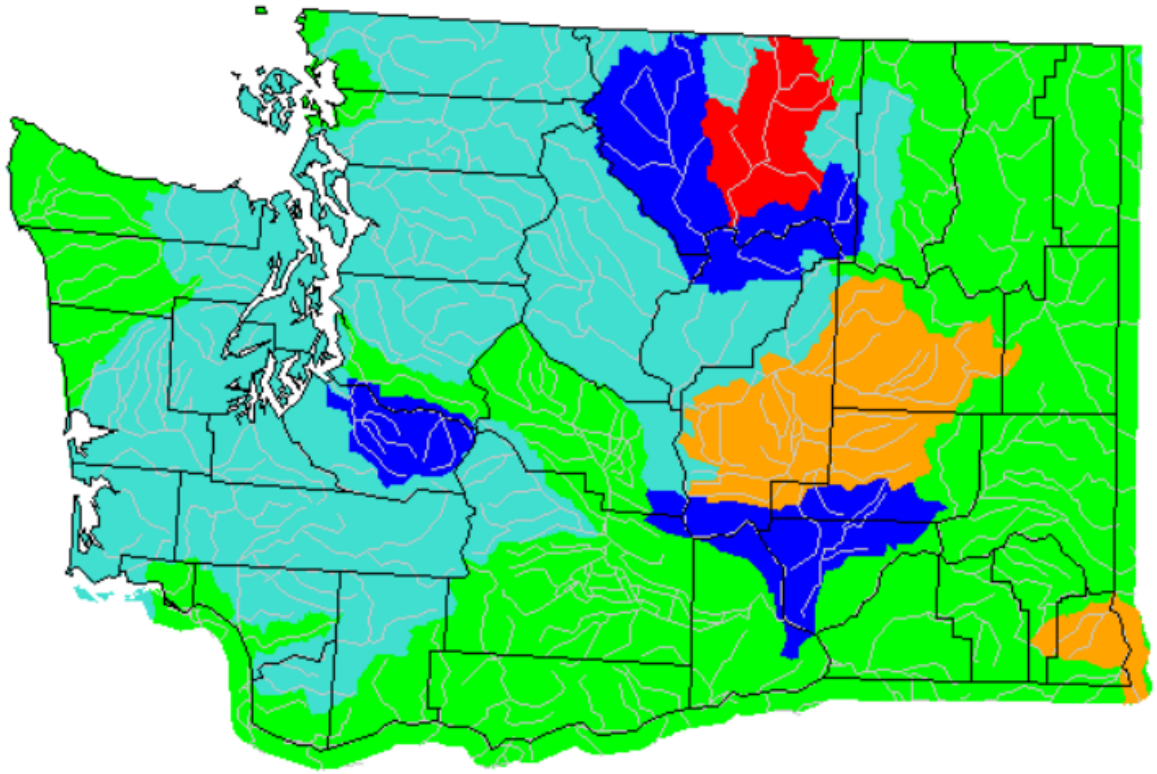
# Monthly average streamflow compared to historical

## January 2023 compared to January 2022

### January 2023



### January 2022



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

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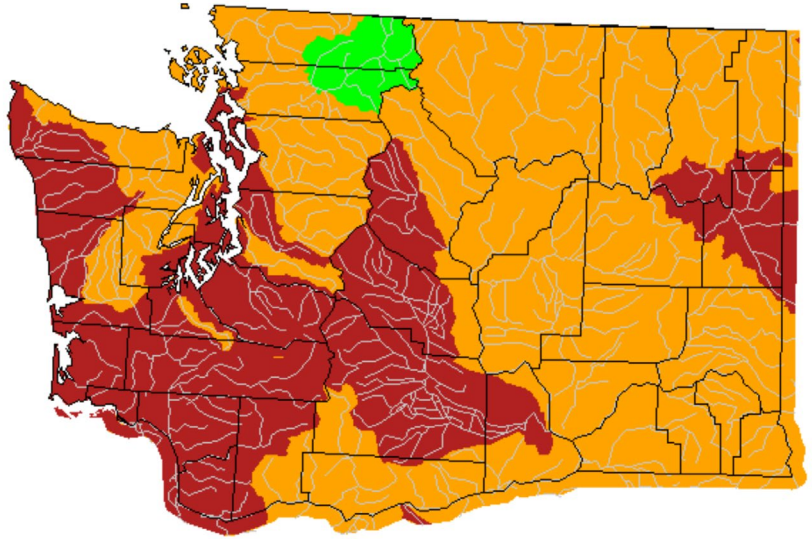
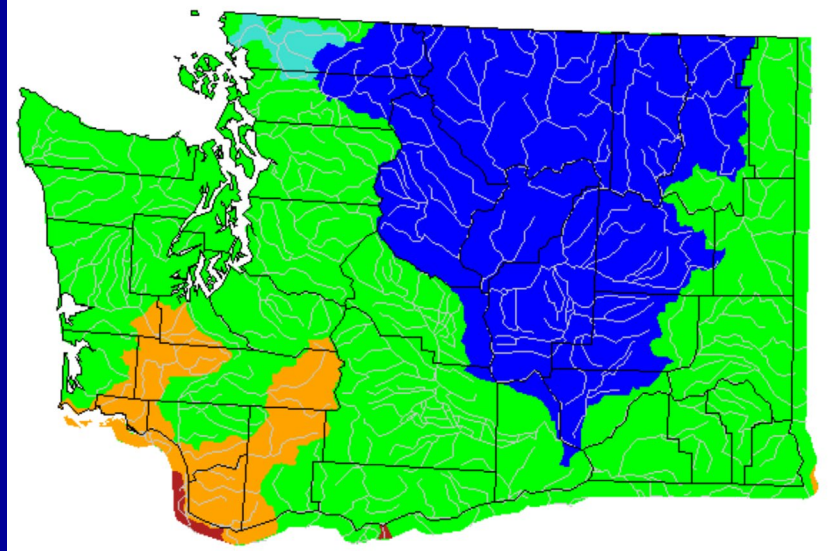
[USGS WaterWatch -- Streamflow conditions]

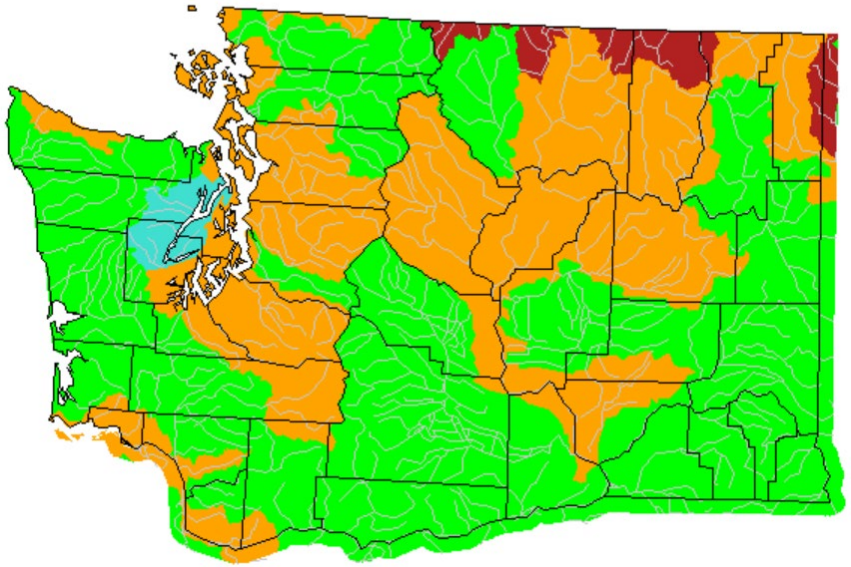
## January 2001



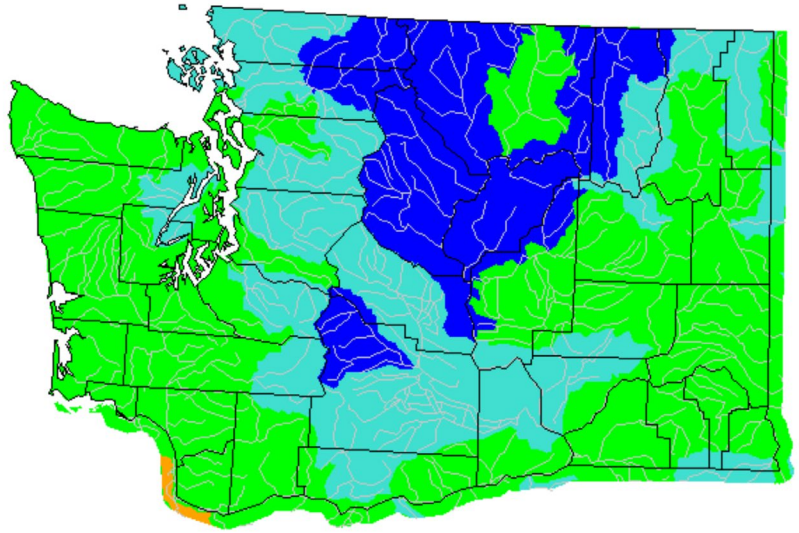
## January 2005



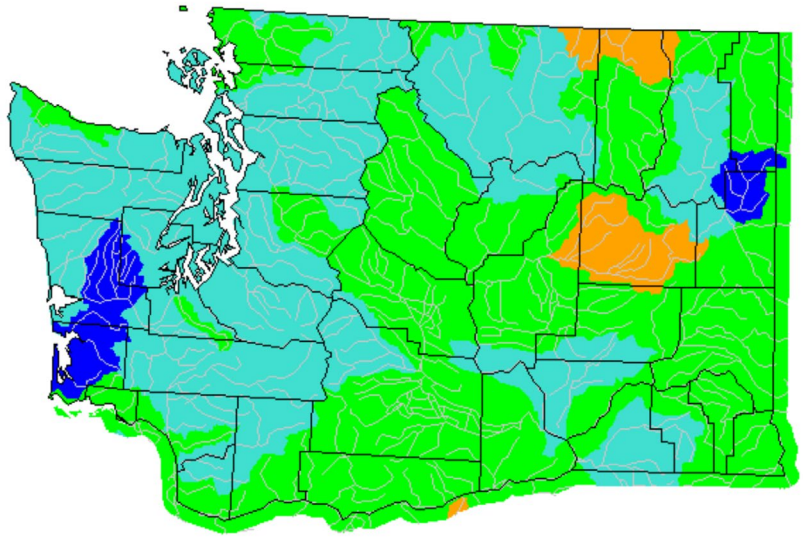
## January 2023



## January 2015



## January 2021

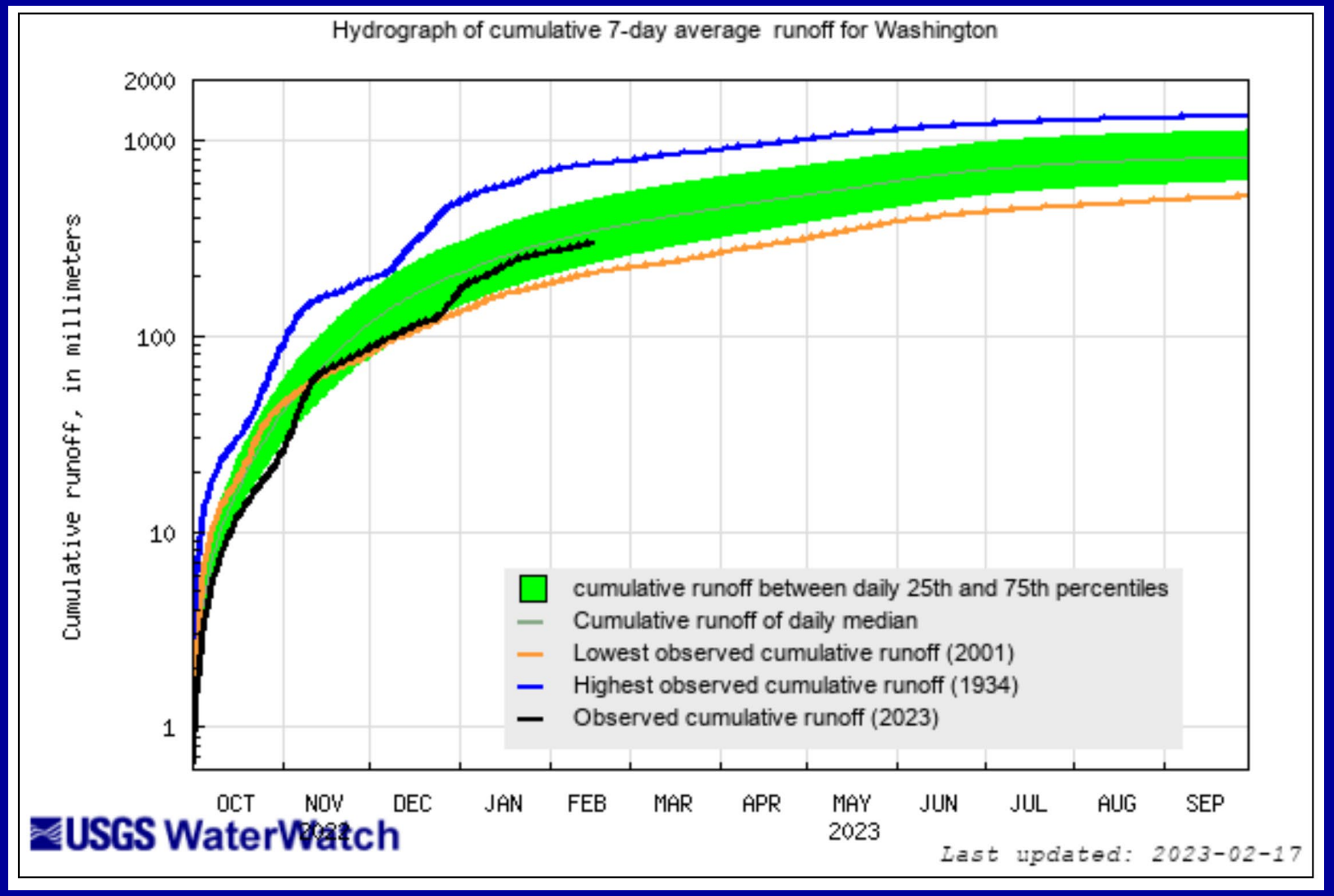


Explanation - Percentile classes

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

# Hydrograph of cumulative 7-day average Area-based Hydrograph, Washington State

2023 Water year (as of **17 Feb. 2023**) is normal

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[USGS WaterWatch -- Streamflow conditions]

# WA Current Groundwater Conditions (17 Feb. 2023)


**Davenport well**
in Lincoln County

**Scatter Creek well**
in Thurston Co.

**Whetstone well**
in Columbia County

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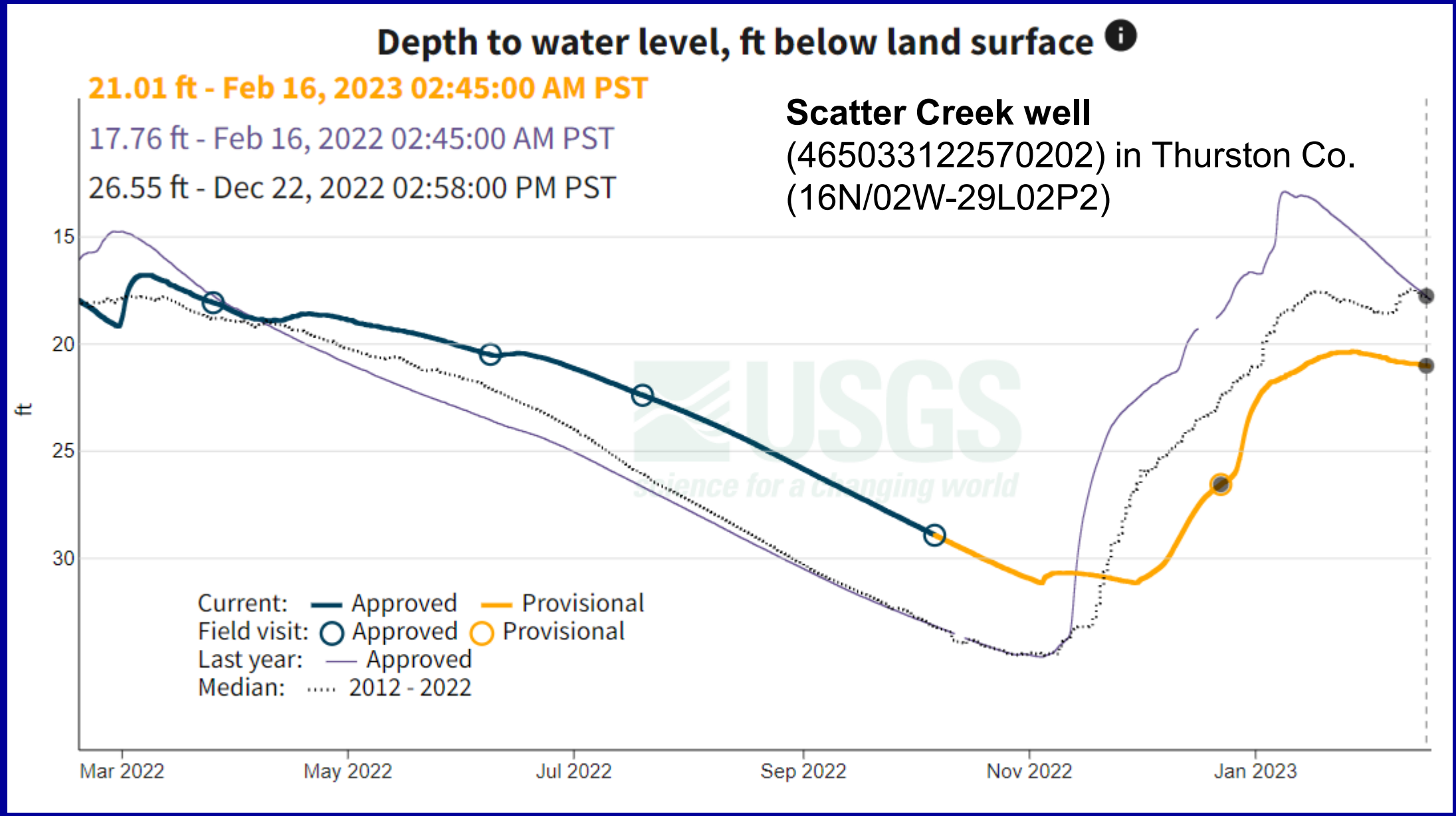
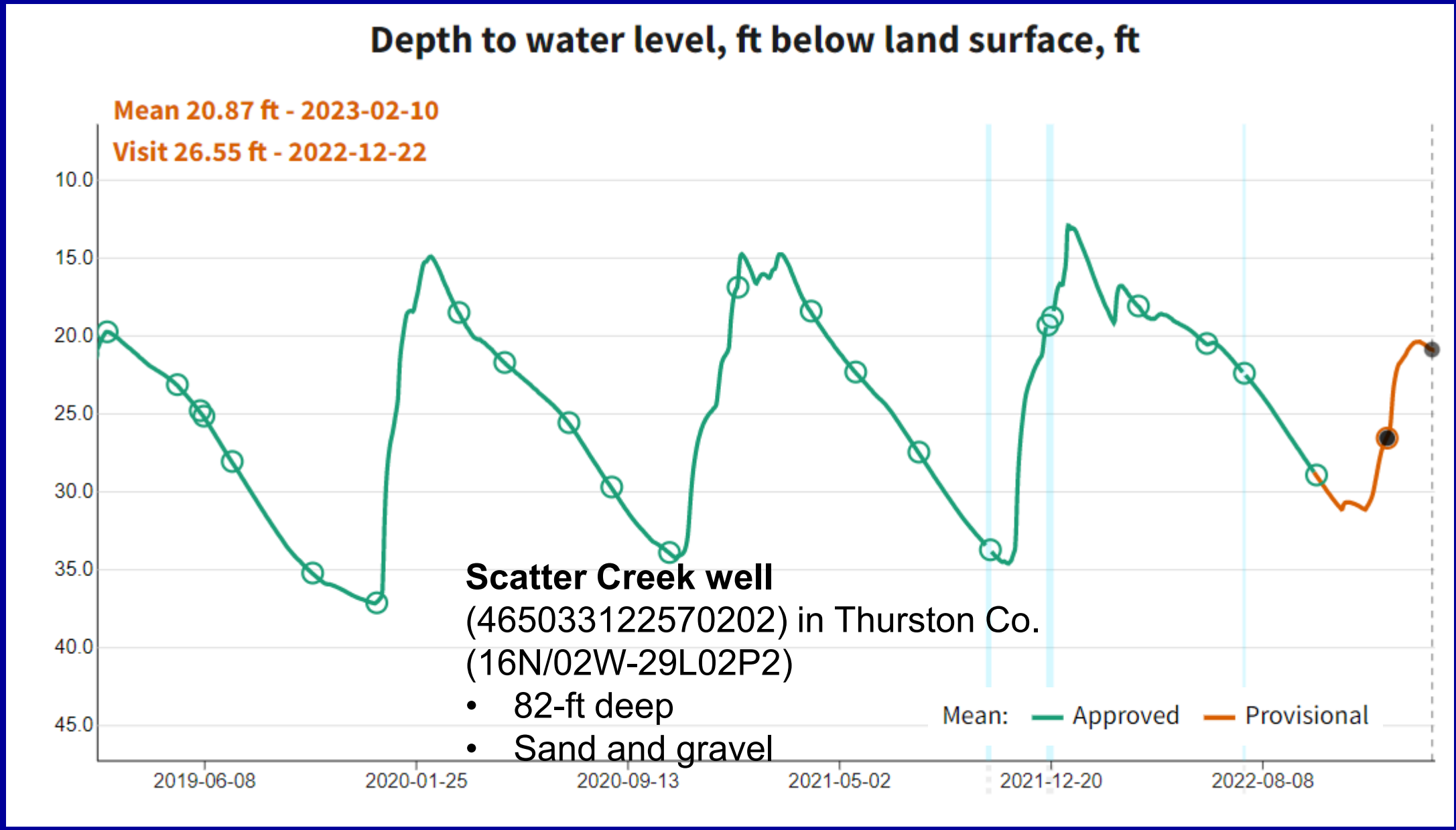
# Scatter Creek Well Groundwater Conditions (17 Feb. 2023)



# Scatter Creek Well Groundwater Conditions (17 Feb. 2023)




**Scatter Creek well**
(465033122570202) in Thurston Co.
(16N/02W-29L02P2)

- 82-ft deep
- Sand and gravel

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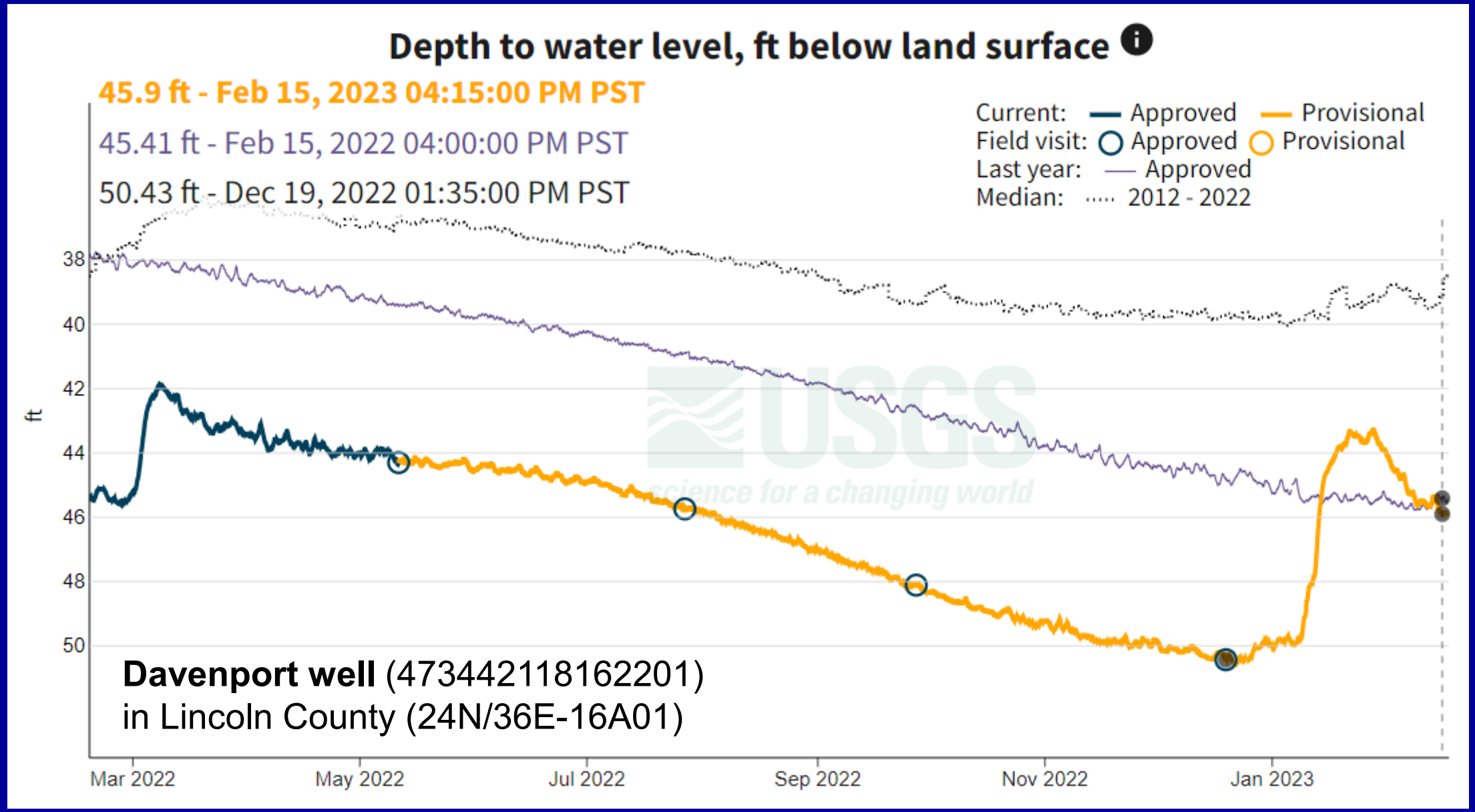
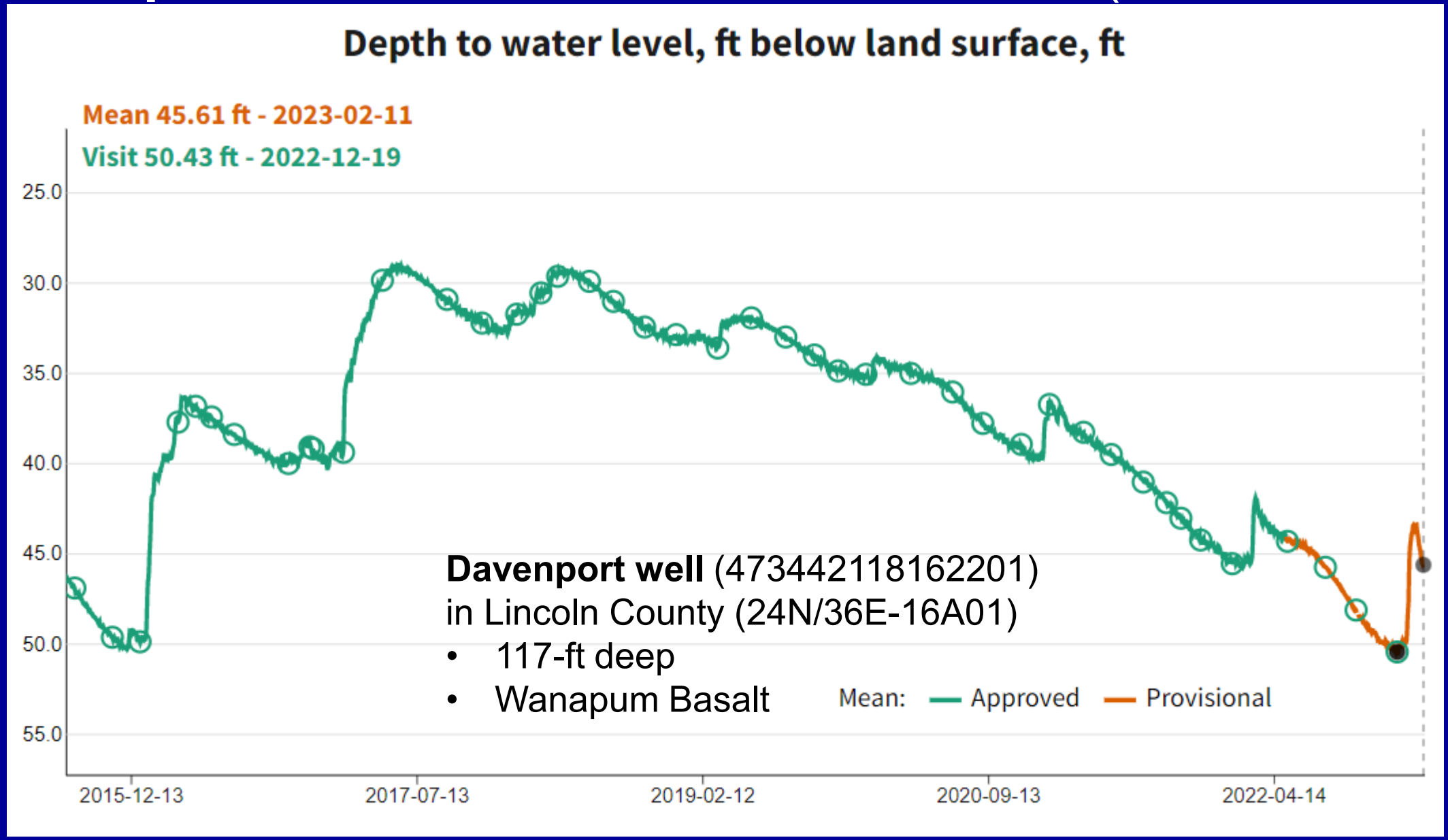
Climate Response Network - USGS Water Data for the Nation

# Davenport Well Groundwater Conditions (17 Feb. 2023)



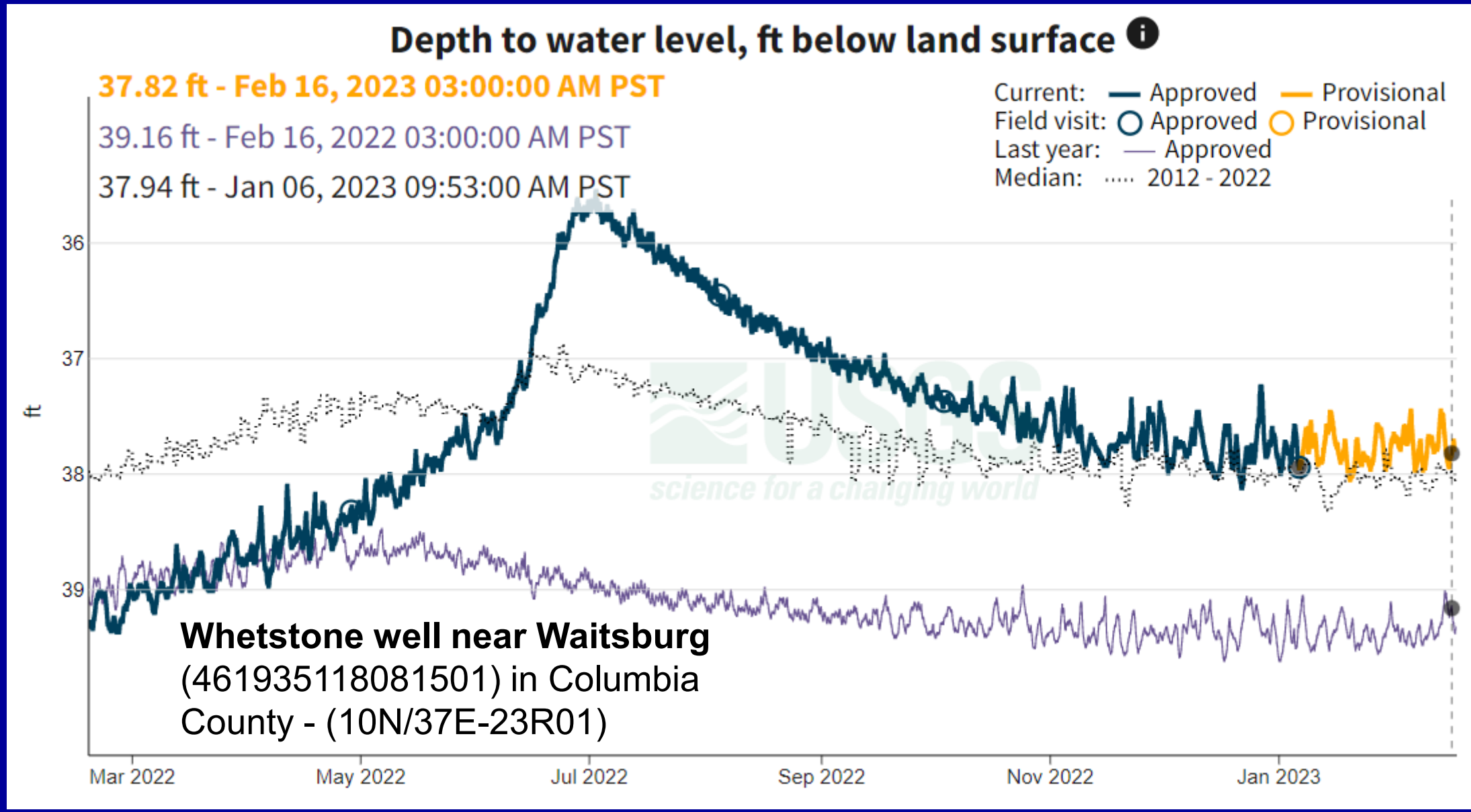
# Davenport Well Groundwater Conditions (17 Feb. 2023)




USGS science for a changing world

Climate Response Network - USGS Water Data for the Nation

# Whetstone Well Groundwater Conditions (17 Feb. 2023)

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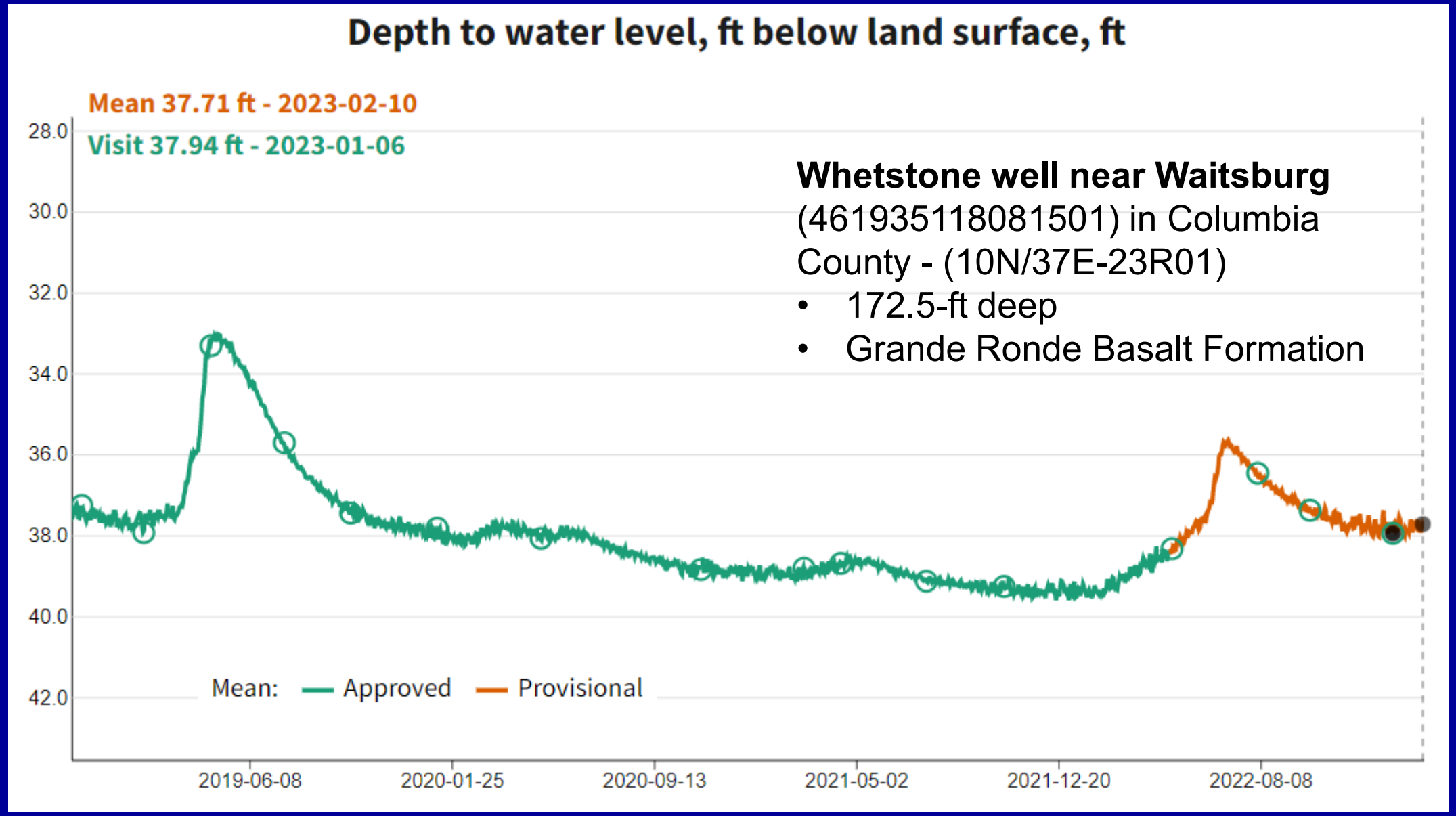
# Whetstone Well Groundwater Conditions (17 Feb. 2023)




**Whetstone well near Waitsburg** (461935118081501) in Columbia County - (10N/37E-23R01)

- 172.5-ft deep
- Grande Ronde Basalt Formation

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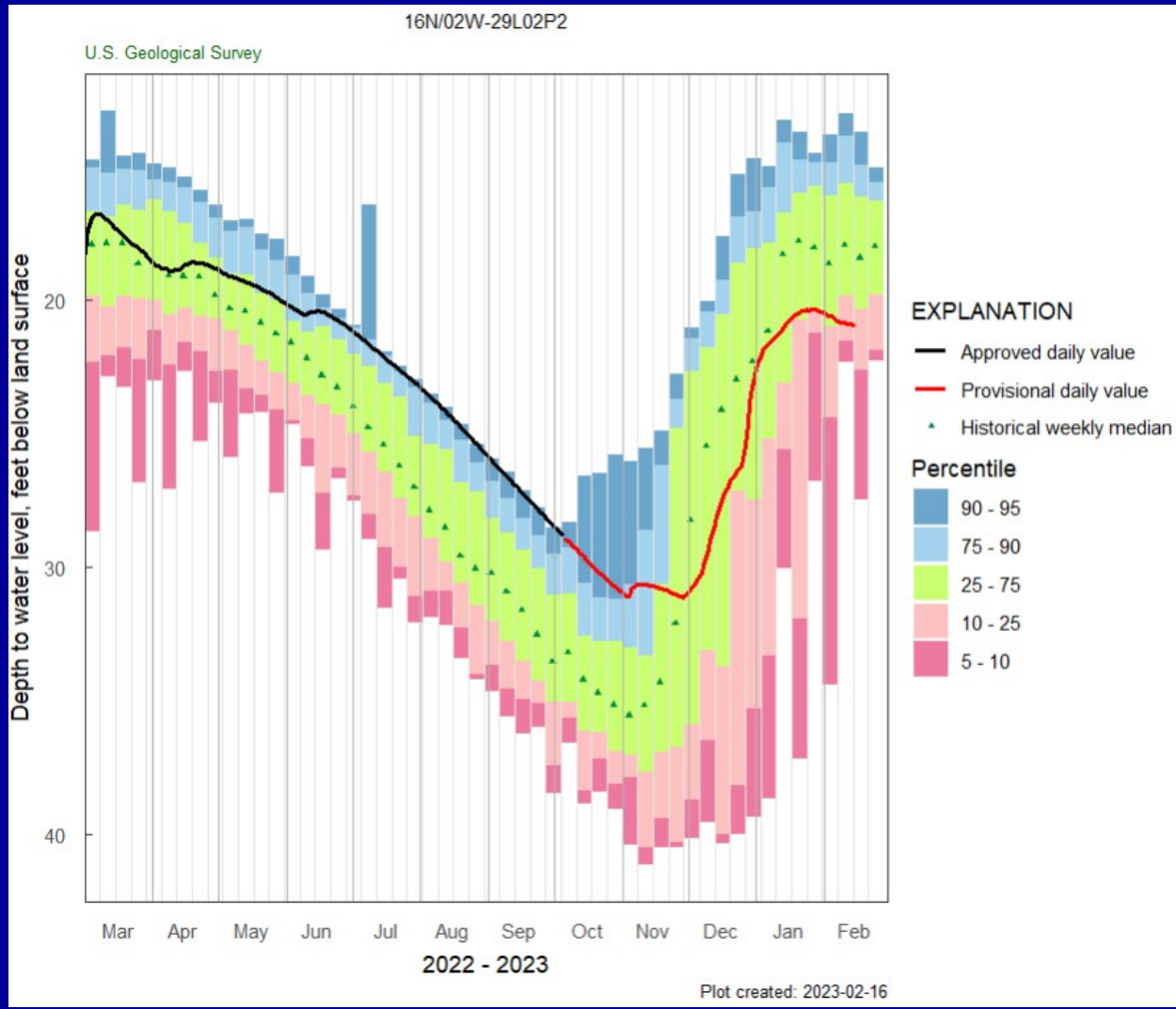
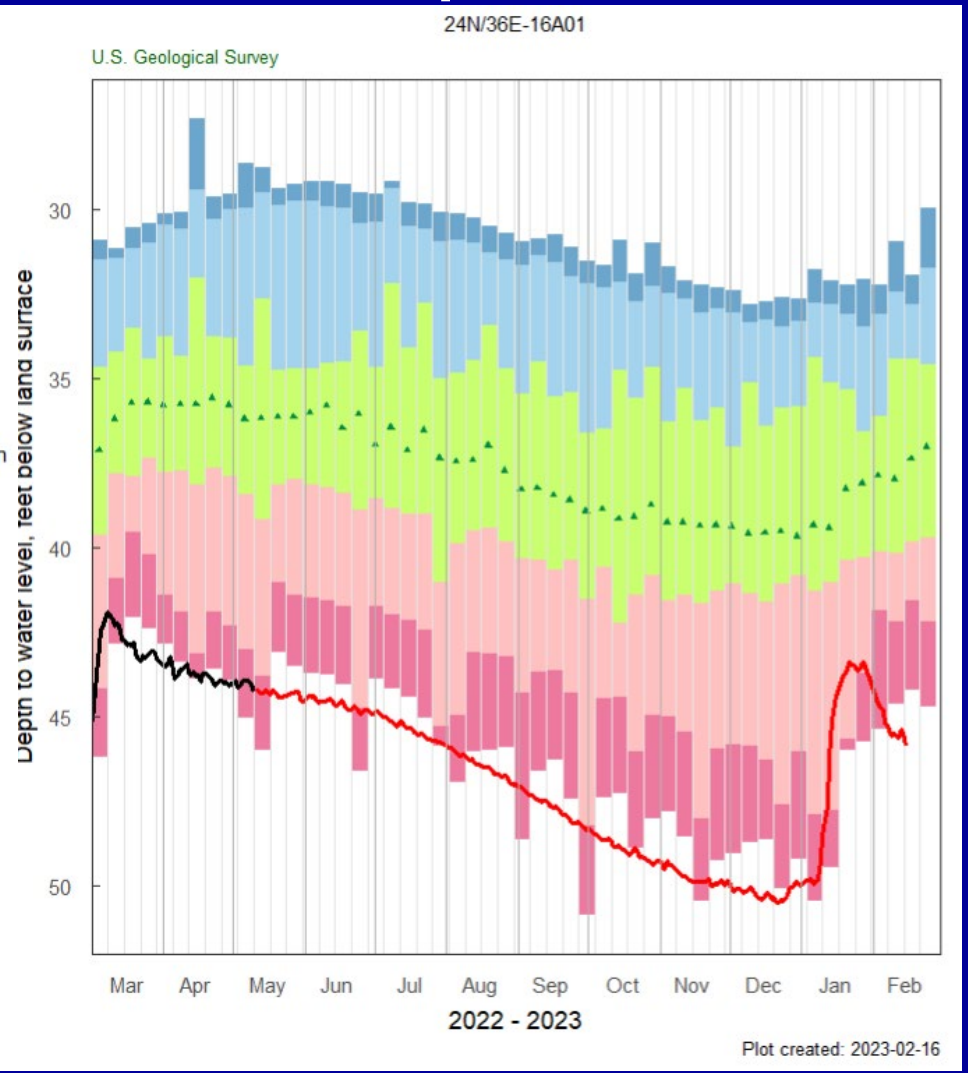
# WA Current Groundwater Condition (17 Feb. 2023)

## Scatter Creek well




## Davenport well

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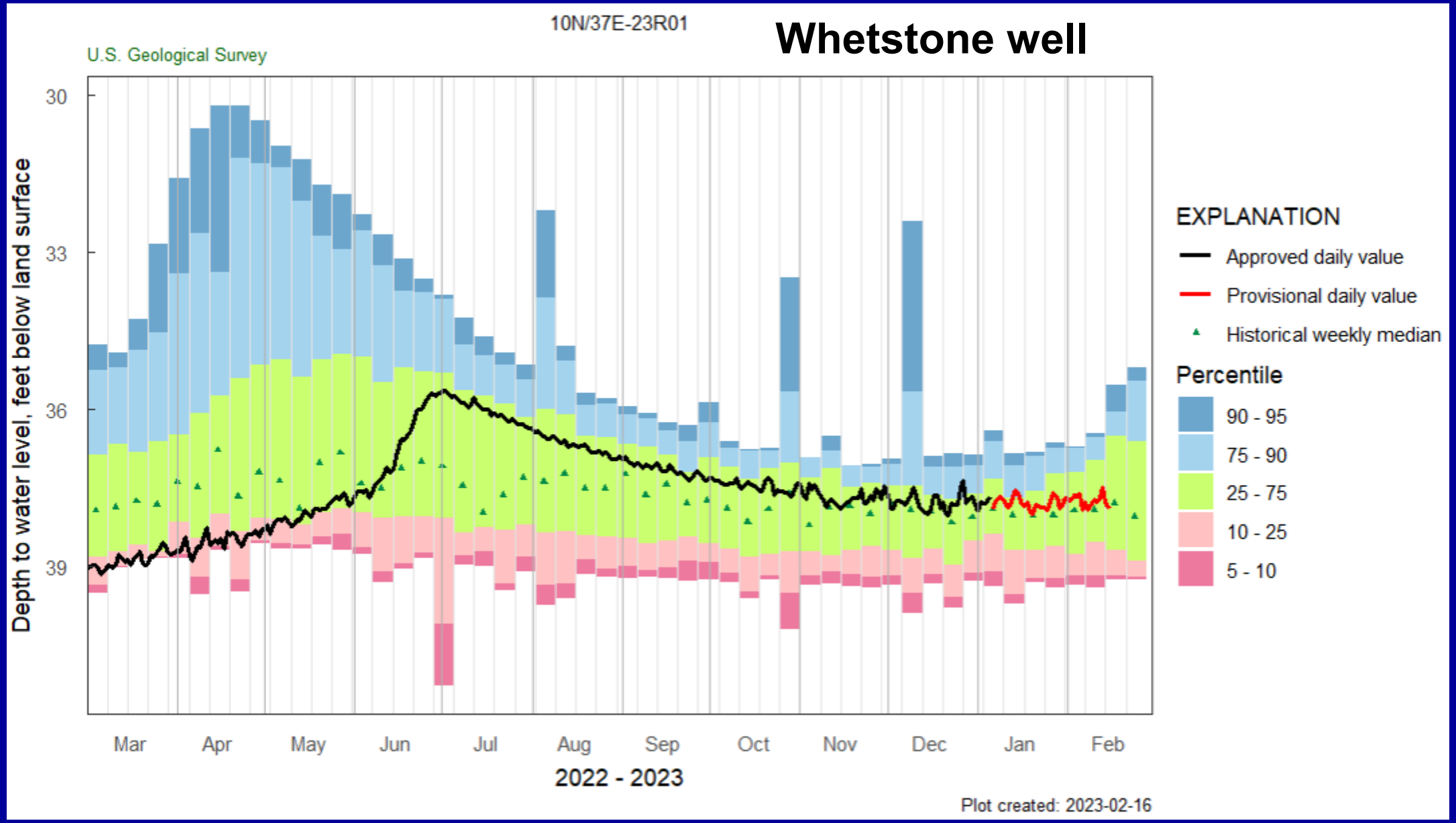
# WA Current Groundwater Conditions (17 Feb. 2023)

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# Summary of Washington Streamflow & GW conditions as of 17 Feb. 2023

- **7-day average streamflow statewide is normal/below normal**
- 7-day average streamflow at eight index gaging stations:
  Northern WA
    - Quinault River –**Normal**
    - NF Nooksack River –**Normal**
    - Hangman Creek –**Normal**
    - Chehalis River nr. Grand Mound – **Below Normal**
    - Puyallup River nr. Orting – **Below Normal**
    - Walla Walla River –**Normal**
    - EF Lewis River – **Normal**
    - American River - **Iced Over**

- Index groundwater sites: **(below normal)**
  - Scatter Creek well (west) – **Below Normal**
  - Davenport well (east) – **Much Below normal**
  - Waitsburg well (southeast) - **Normal**

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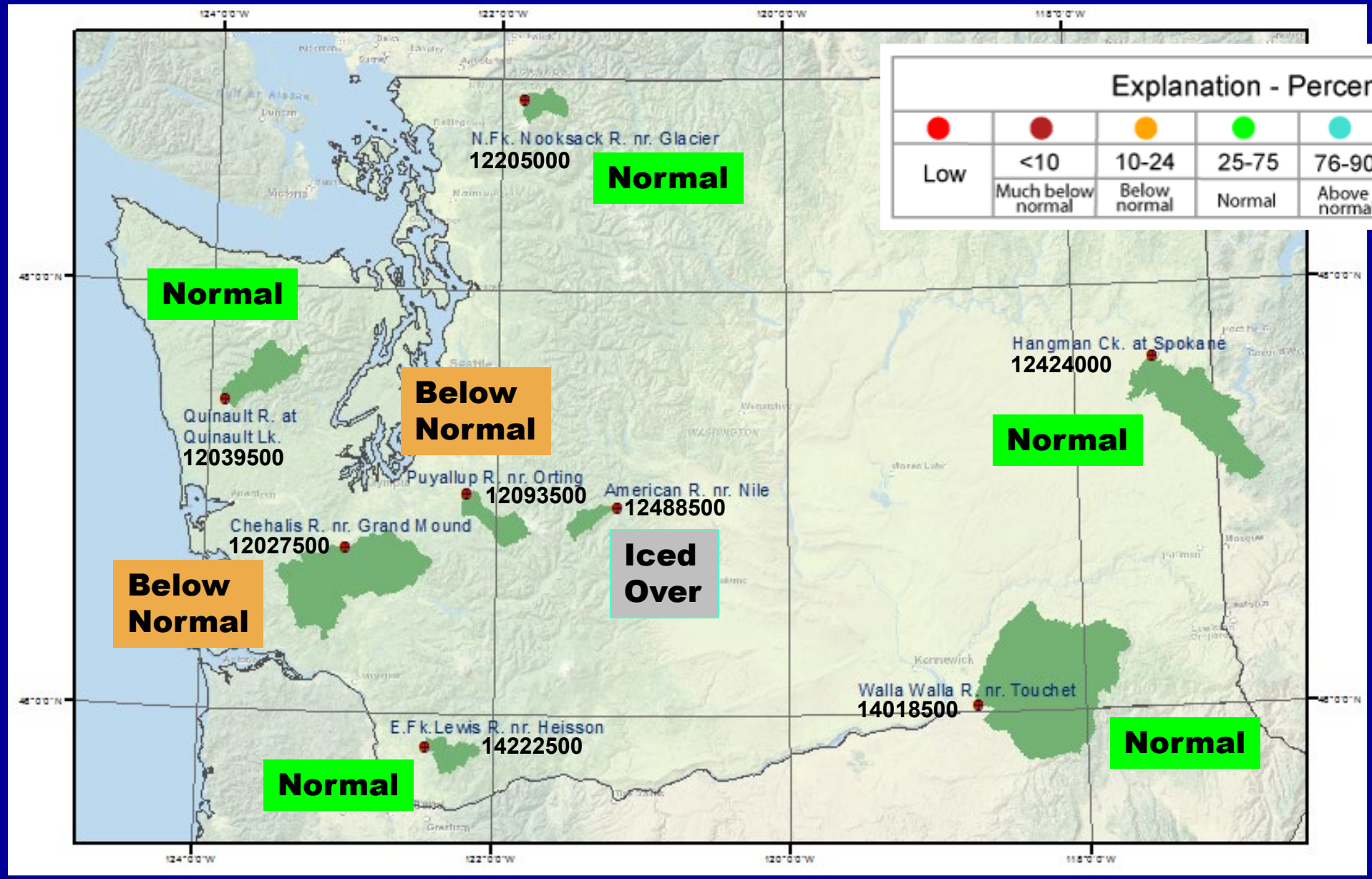
# Index Gaging Stations, 7-day average streamflow (as of 19 Jan. 2023)

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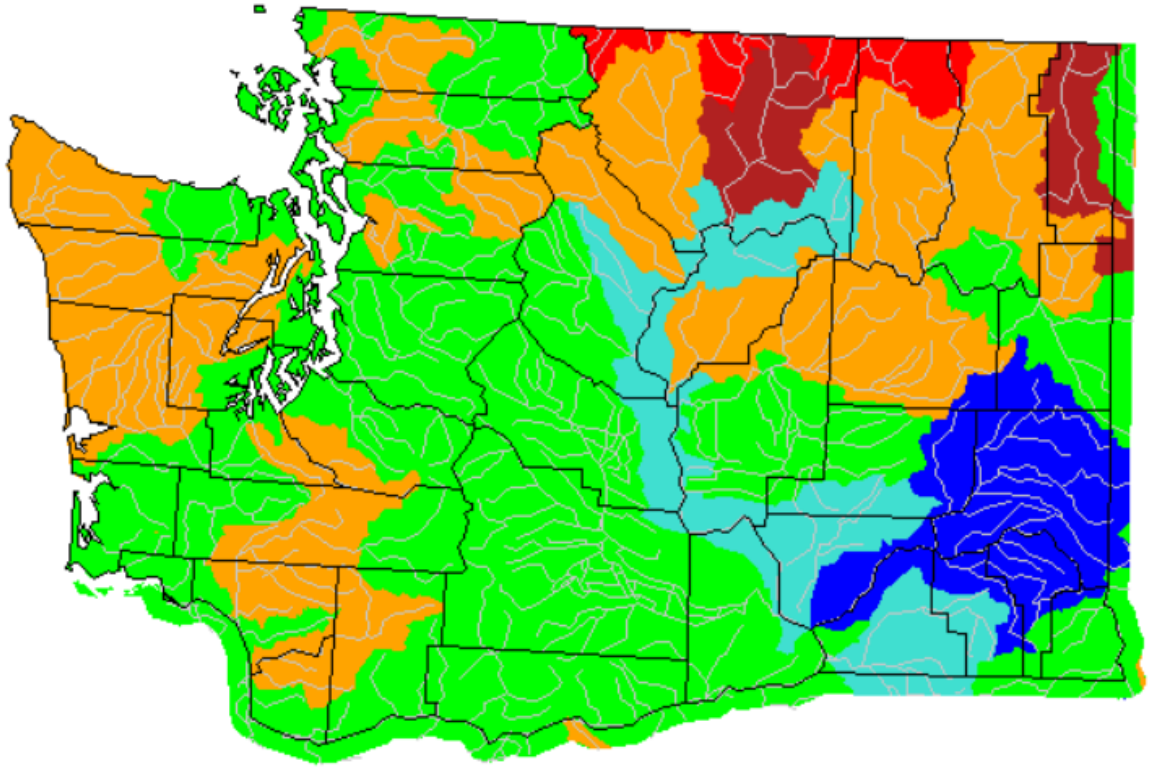
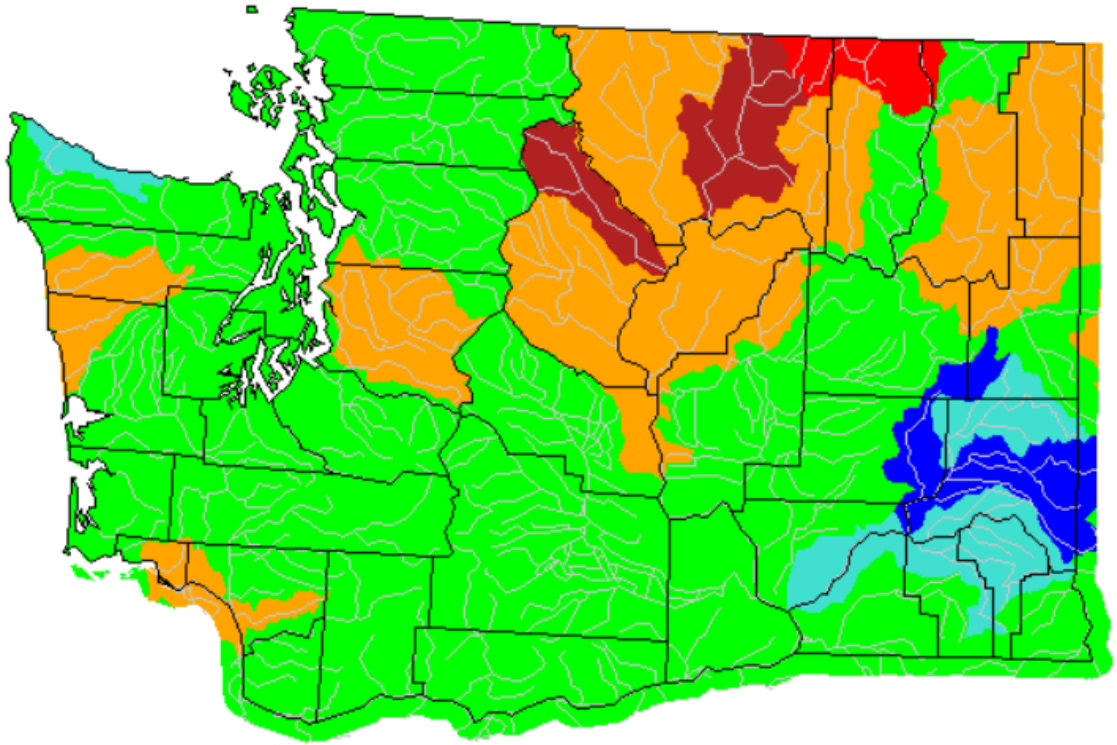
USGS WaterWatch -- Streamflow conditions

# Monthly average streamflow compared to historical record for Nov. 2022 & Dec. 2022

November 2022



December 2022



Explanation - Percentile classes

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

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USGS WaterWatch -- Streamflow conditions

# Northwest River Forecast Center

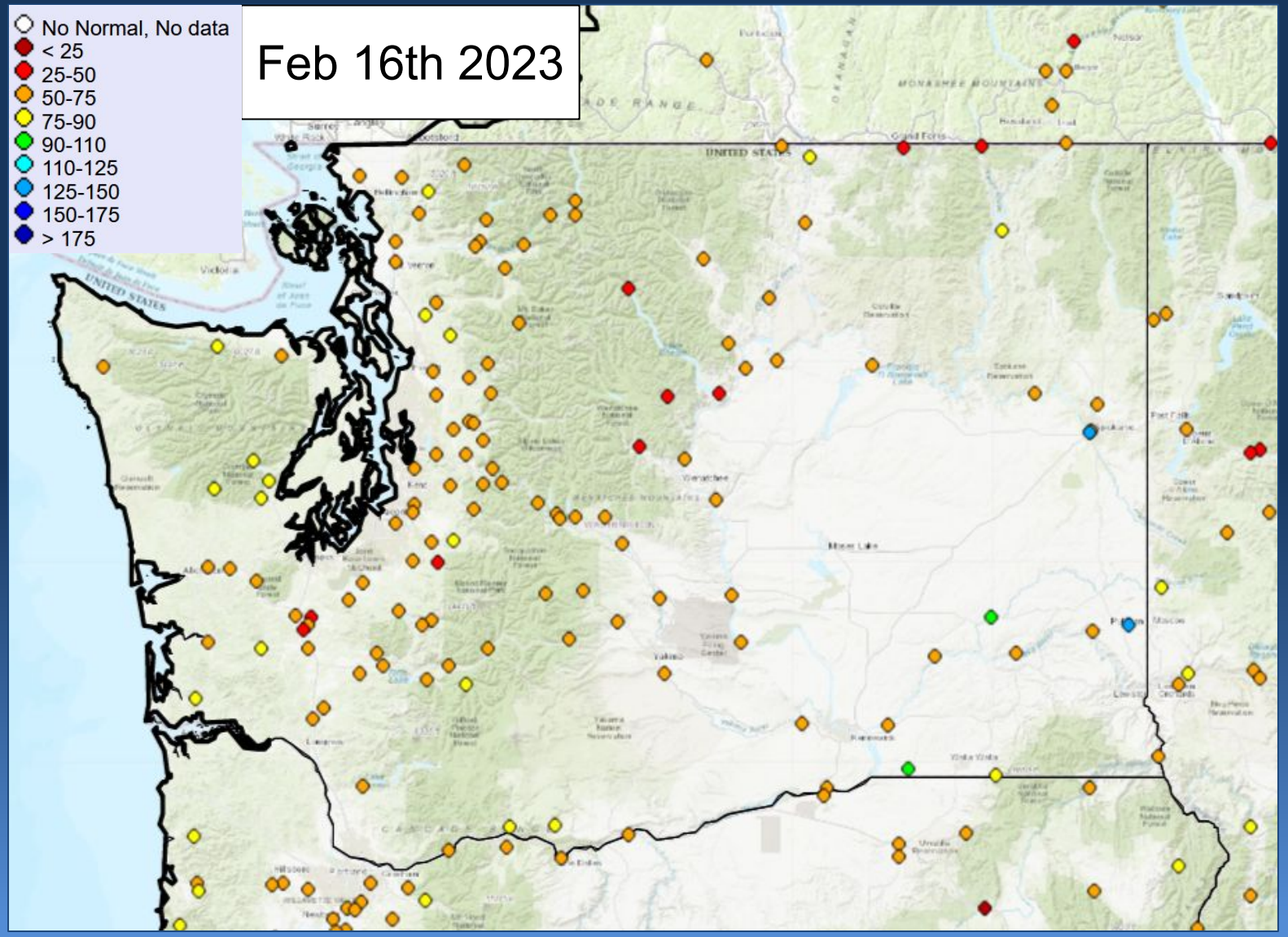
## Feb 17, 2023 Washington Water Supply Availability Meeting

Amy Burke
NWRFC.watersupply@noaa.gov

# Take Home Messages

- Adjusted Runoff to date is below normal
- 10 day QPF forecast is above normal for the west slope of the Cascades
- ESP10 Natural Water Supply is a mix of normals and below normal

# YTD Adjusted Runoff

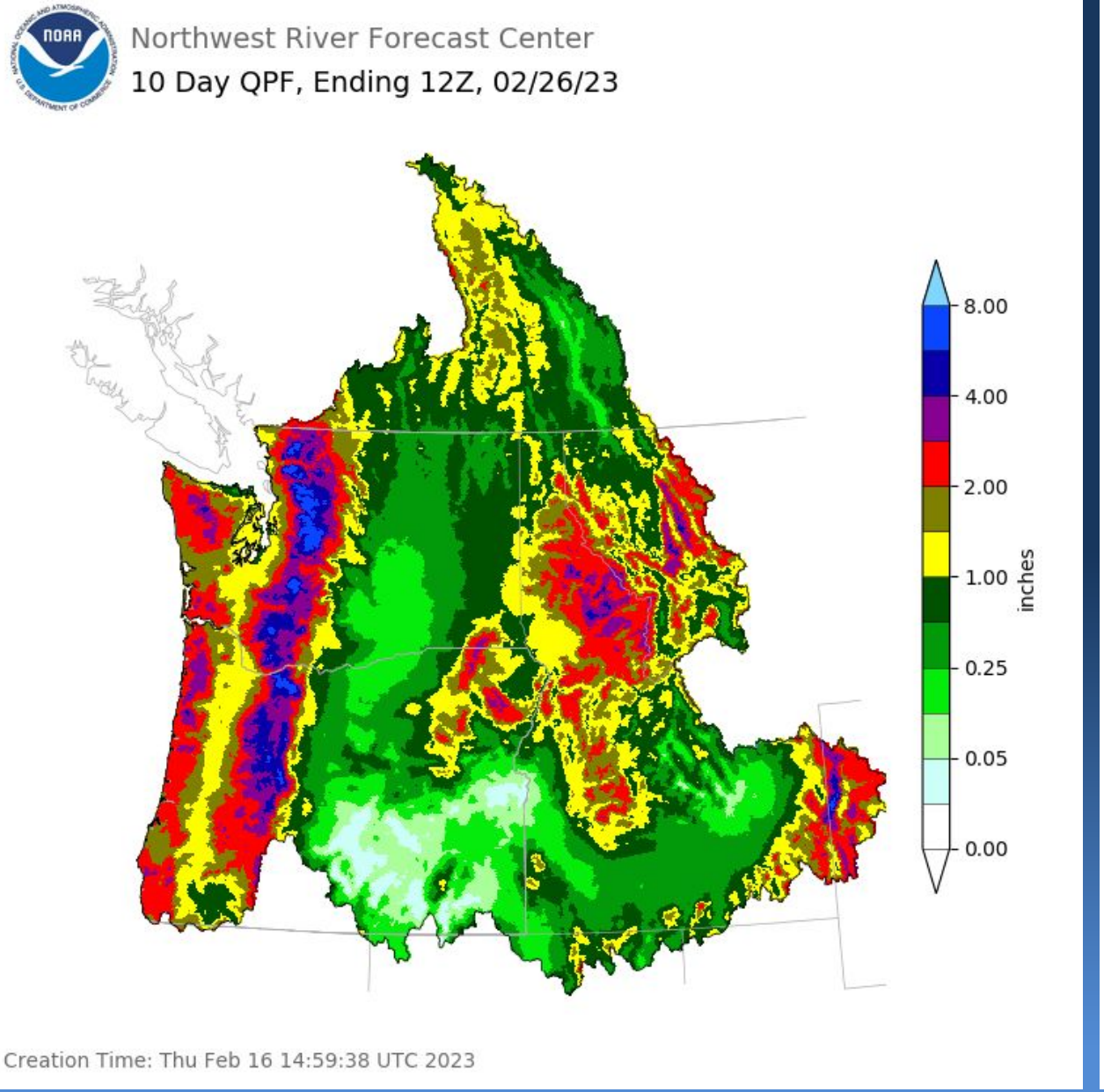


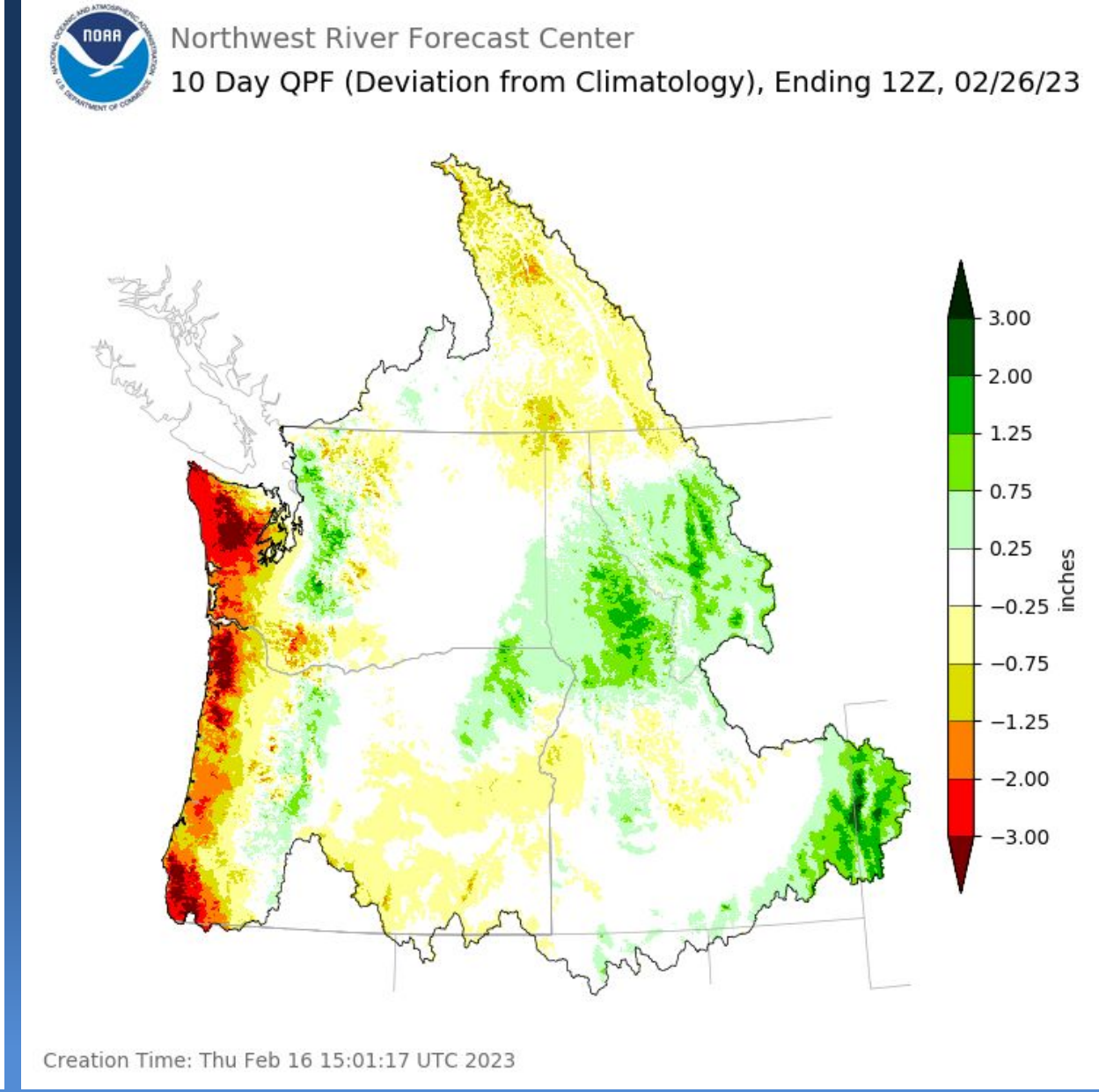

**% Normal Runoff Oct 1st – Feb 16th**

**Washington**

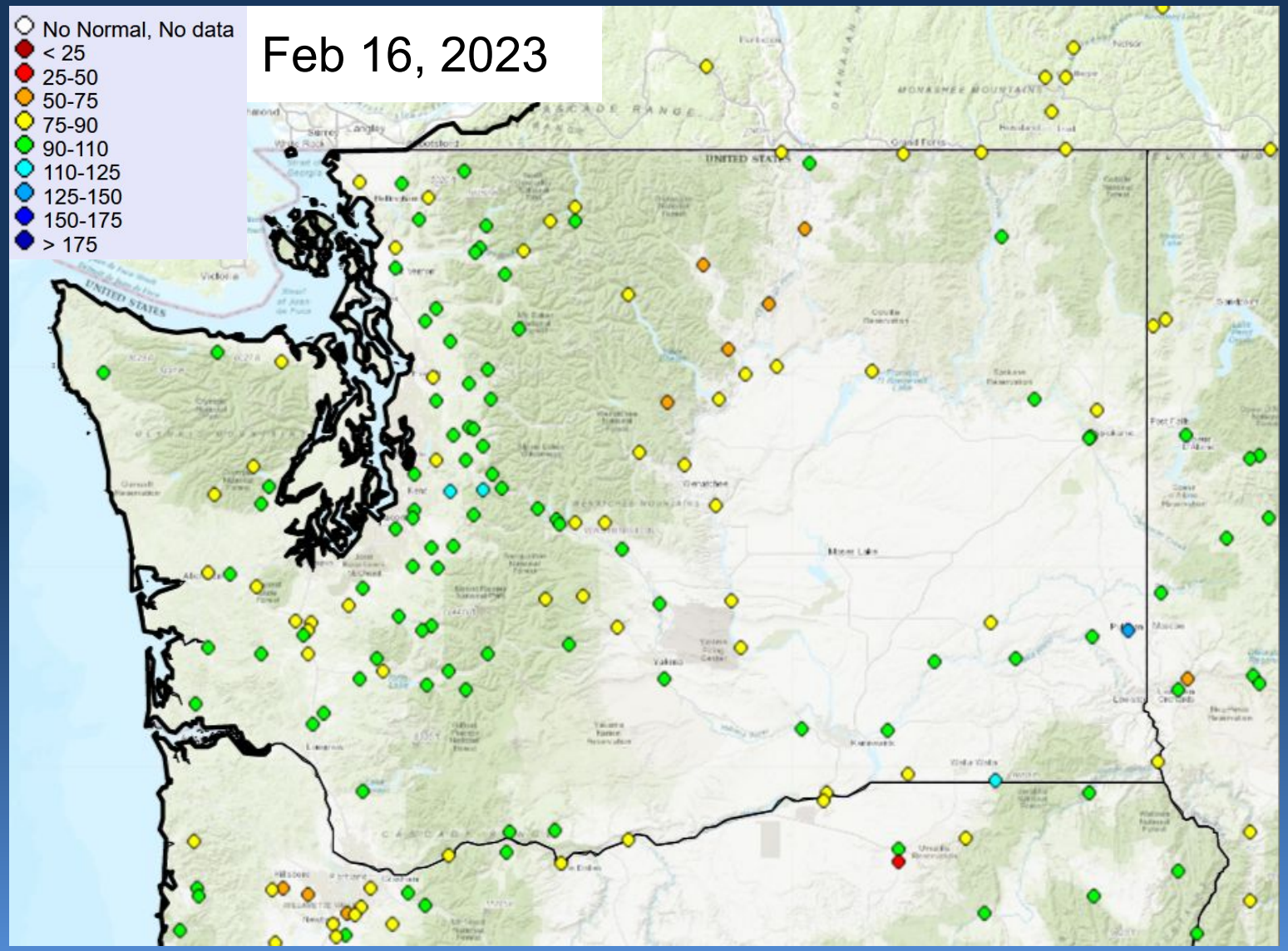
| | |
|---|---|
| Skagit nr Mt Vernon | 62 |
| Dungeness nr Sequim | 63 |
| Chehalis at Porter | 65 |
| Okanogan at Malott | 61 |
| Methow nr Pateros | 63 |
| Yakima at Parker | 68 |
| Walla Walla nr Touchet | 99 |

# Precipitation Forecast (Feb 17-26)



# ESP10 Natural Water Supply Forecasts




**% Normal Apr -Sep Volume**

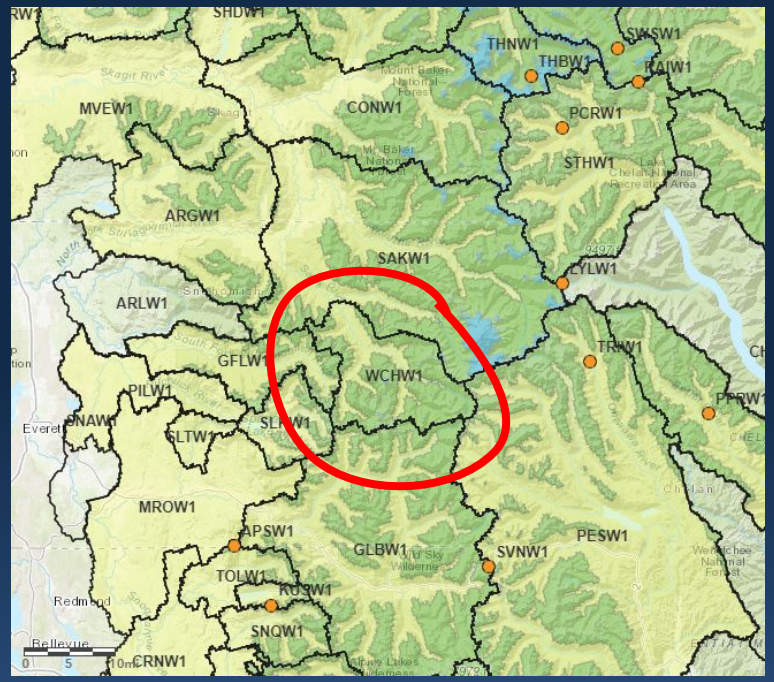
**Washington**

| | |
|---|---|
| Skagit nr Mt Vernon | 92 |
| Dungeness nr Sequim | 84 |
| Chehalis at Porter | 87 |
| Okanogan at Malott | 71 |
| Methow nr Pateros | 67 |
| Yakima at Parker | 94 |
| Walla Walla nr Touchet | 88 |

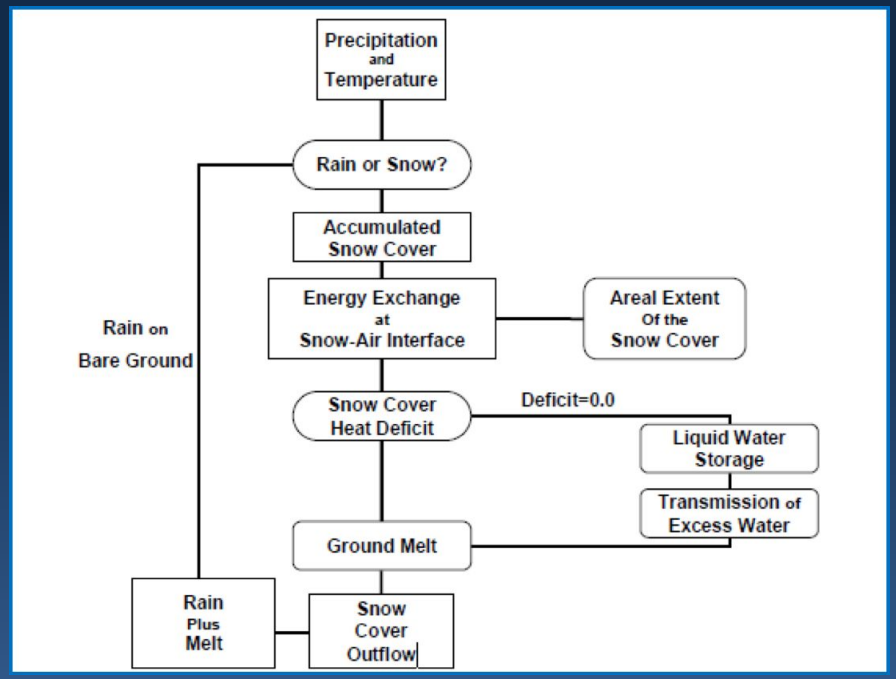
# Take Home Messages

- Adjusted Runoff to date is below normal
- 10 day QPF forecast is above normal for the west slope of the Cascades
- ESP10 Natural Water Supply is a mix of normals and below normal

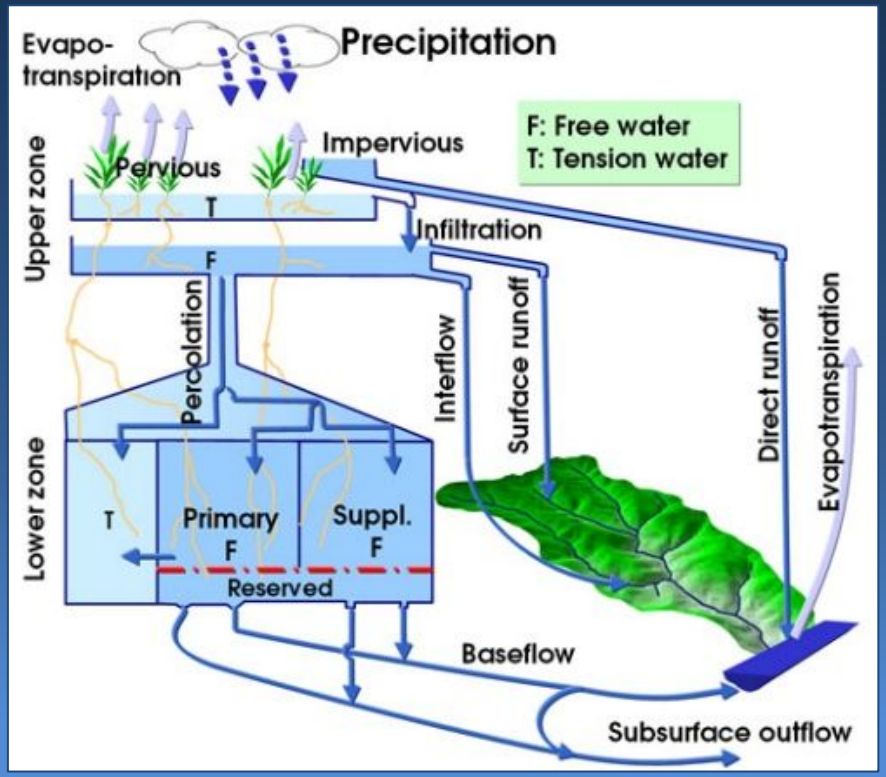
# NWRFC Forecast Technique



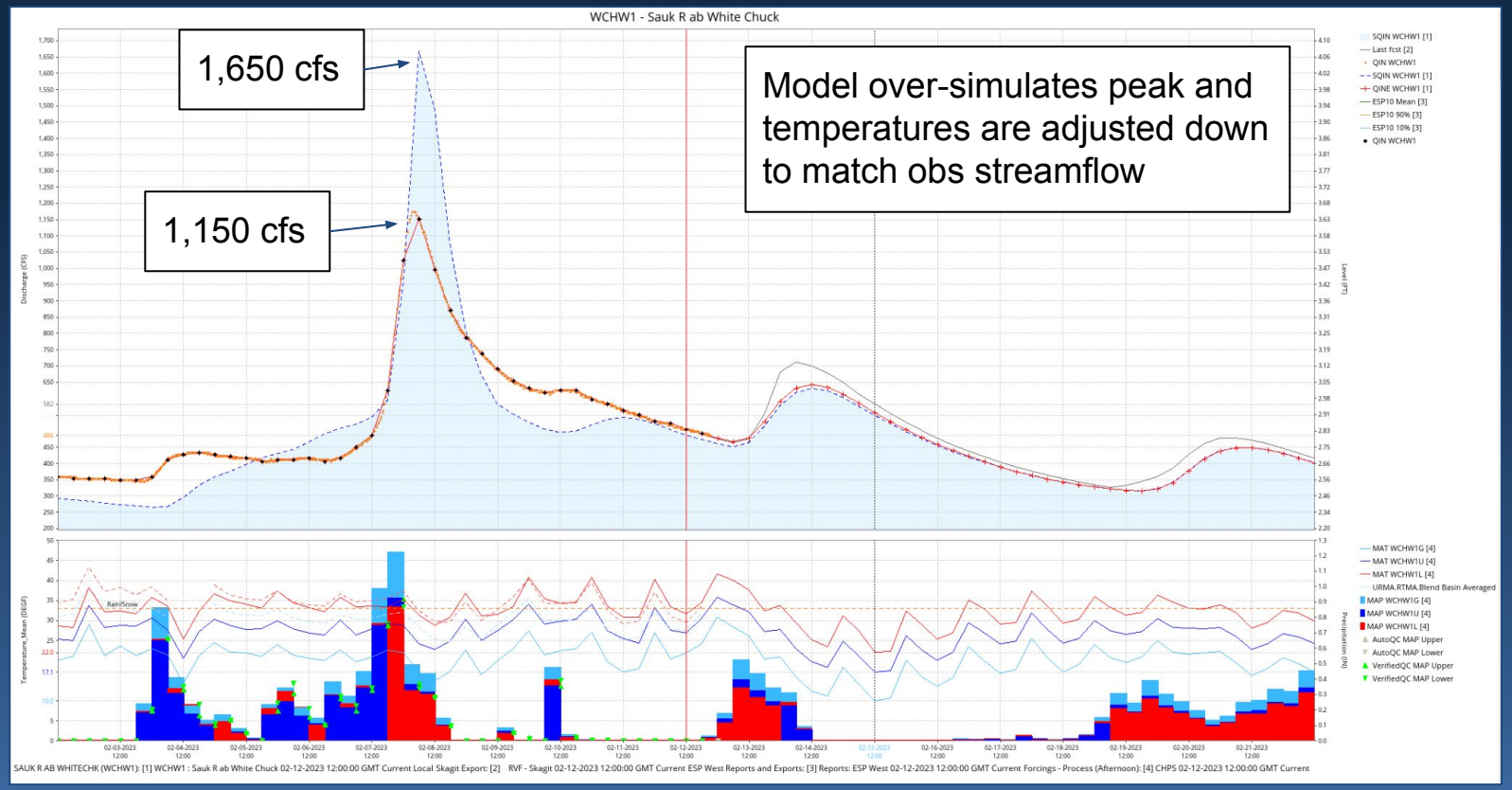

## Snow17 Model



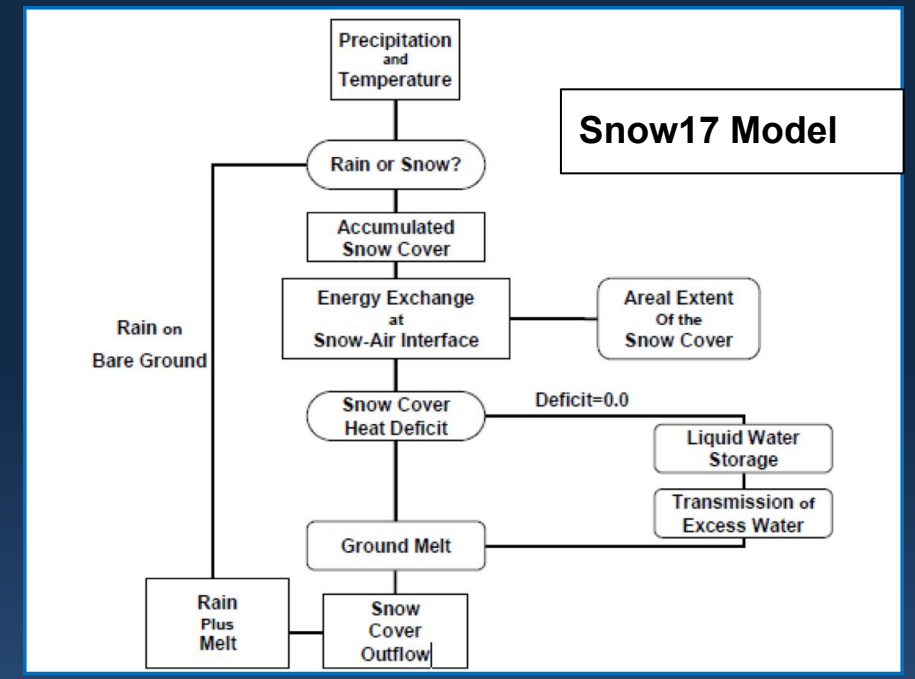

## SAC SMA Model

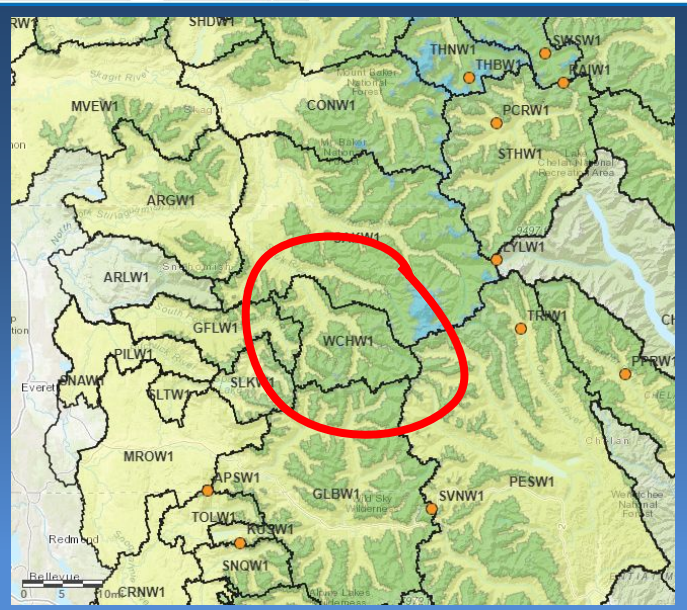


# Adjusting Snow States



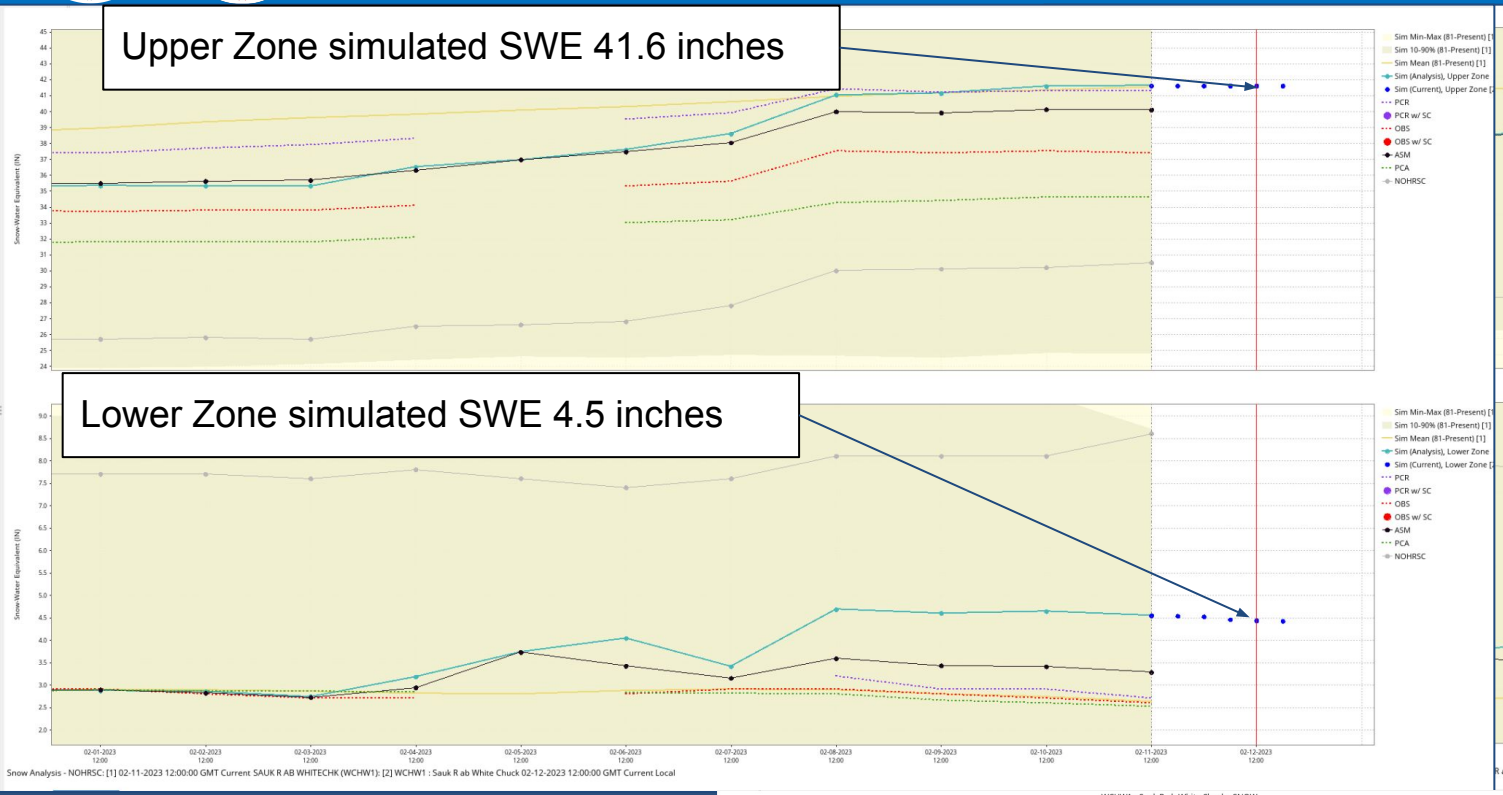

The bottom plot shows the forcings that drive the model



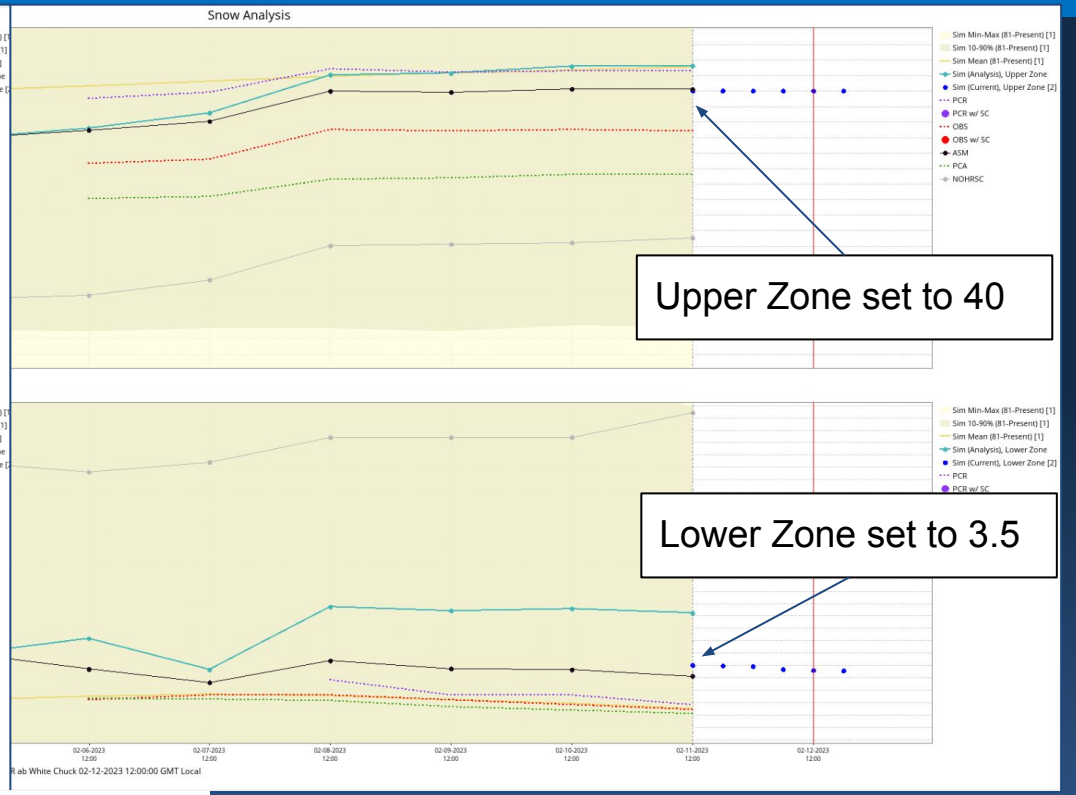
# Adjusting Snow States

Upper Zone simulated SWE 41.6 inches



Lower Zone simulated SWE 4.5 inches





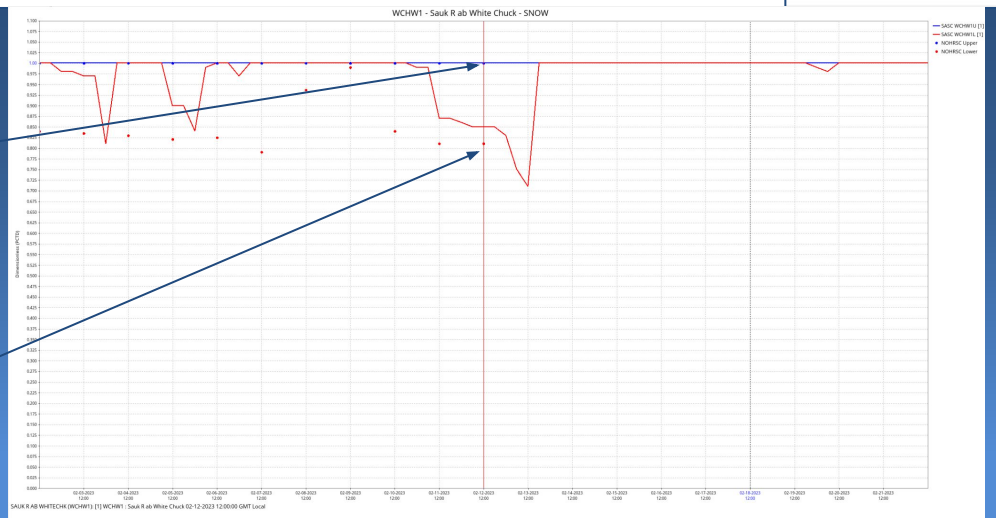

Upper Zone set to 40



Lower Zone set to 3.5

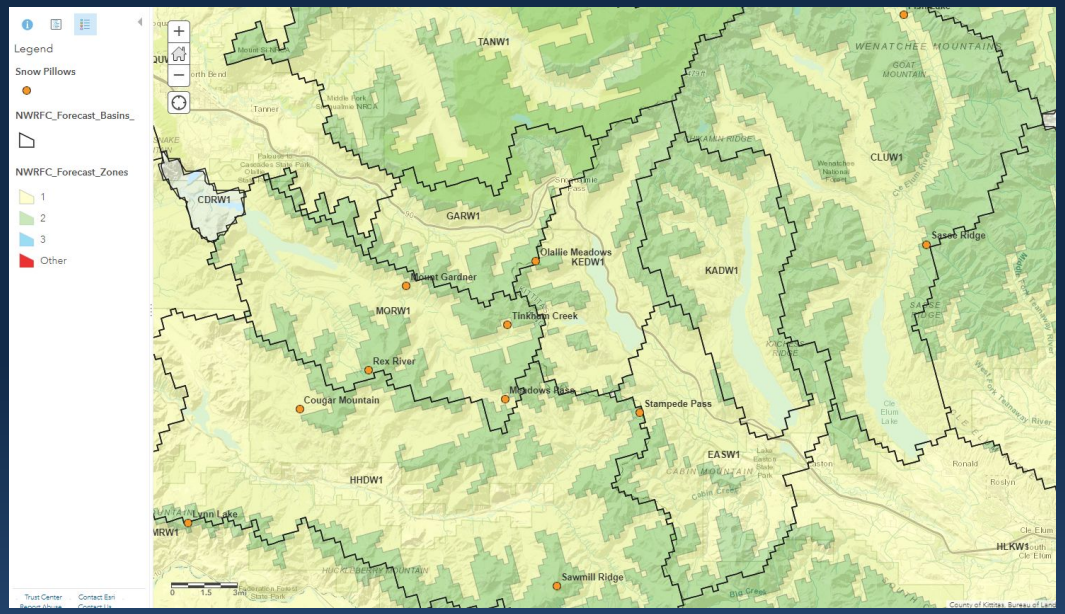
Upper Zone simulated SCA is 100%
Blue line

Lower Zone simulated SCA is 81%
Red line




SWE guidance is NOT station data.
It is calculated from station data using statistical procedures (PCA).

# Adjusting Snow States




SWE guidance is NOT station data.
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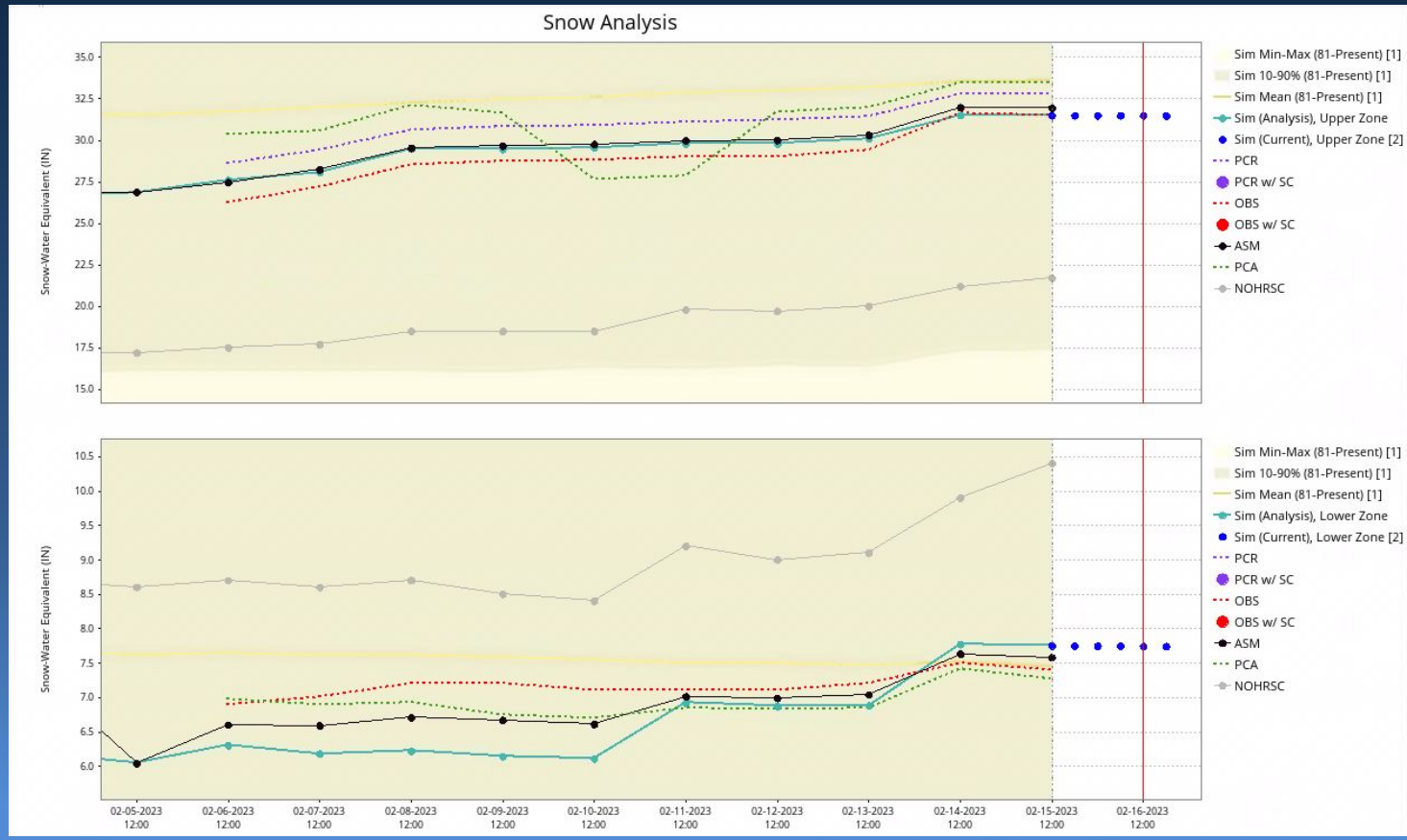
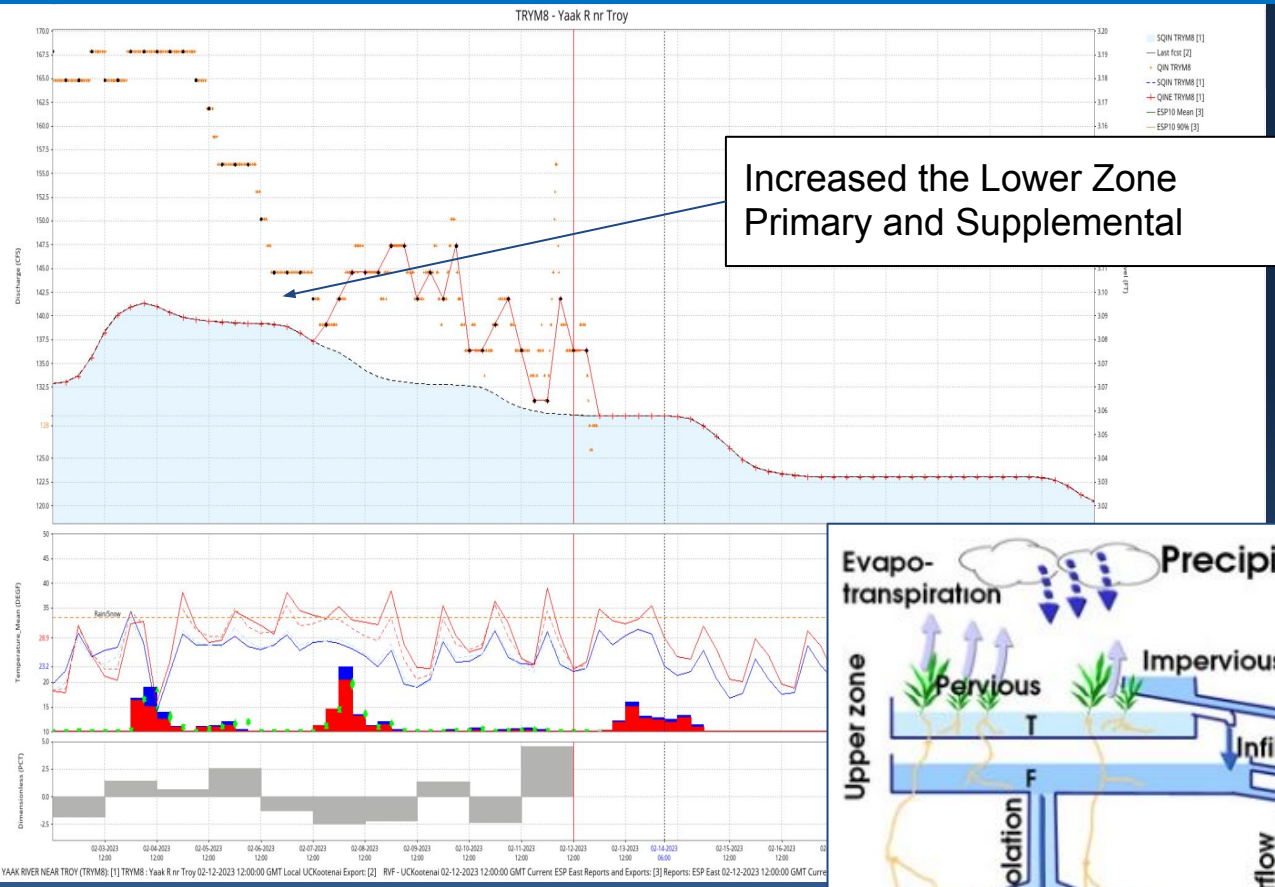
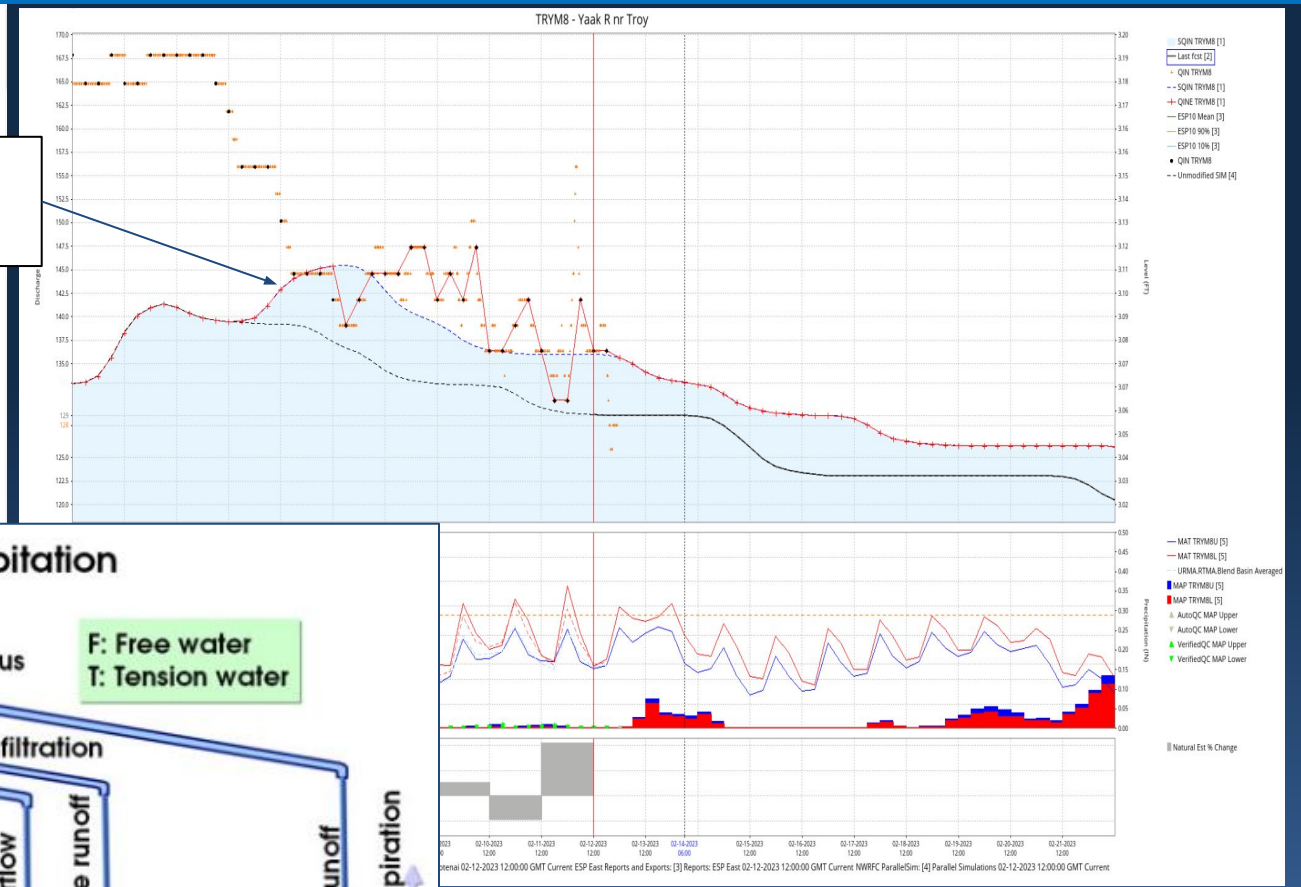
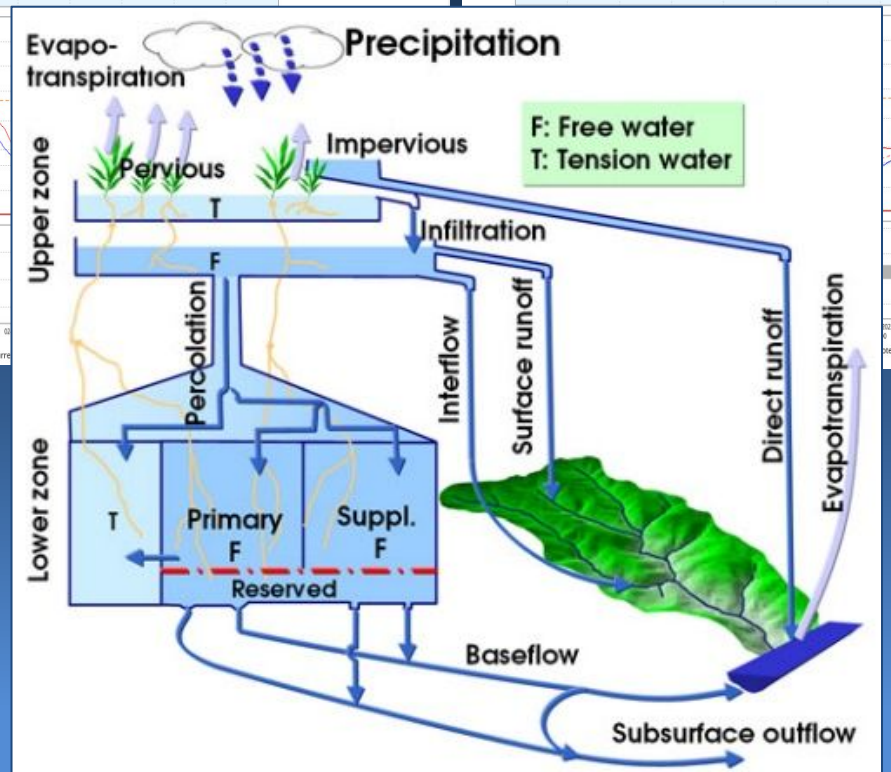


# Adjusting Soil States




Increased the Lower Zone Primary and Supplemental



# NWRFC Forecast Technique