

YAKIMA BASIN INTEGRATED PLAN



YRBWEP WORKGROUP – LOWER RIVER FOCUS PART 2
MARCH 8, 2023

PART 2 OVERVIEW



- Continuation of Part 1 presentation (Habitat, Temps, Fish Passage - Dec 2022)
- History
- Water Management – Flow and Supply Objectives
- Hydrologic Conditions
- Conservation, Water Management and Minimum Flows
- Storage Opportunities and Flow/Supply Benefits
 - Middle/Lower River
 - New Zealand Case Study

HISTORY BEFORE YBIP



- **YRBWEP Phase 1** (1980s)
- **Title XII/YRBWEP Phase II** (Program provides for additional flows - 1994)
- **Lower Yakima TMDL** (for sediment/turbidity -1998)
- **Lower Yakima Assessment** (Benton CD)

LOWER RIVER AND YBIP



- 2015
 - Lower River Subgroup formed to **develop comprehensive lower Yakima strategy**
- 2017 - 2022
 - Meetings to develop draft action plans and strategies
 - Water supply options
 - Flow enhancement strategies
 - Cold water refugia

OBJECTIVES - SUPPLY



- Storage projects to support supply and flows needs/increase drought resiliency
 - Surface water
 - Groundwater
- Manage conserved water for supply and flow needs, and drought resiliency

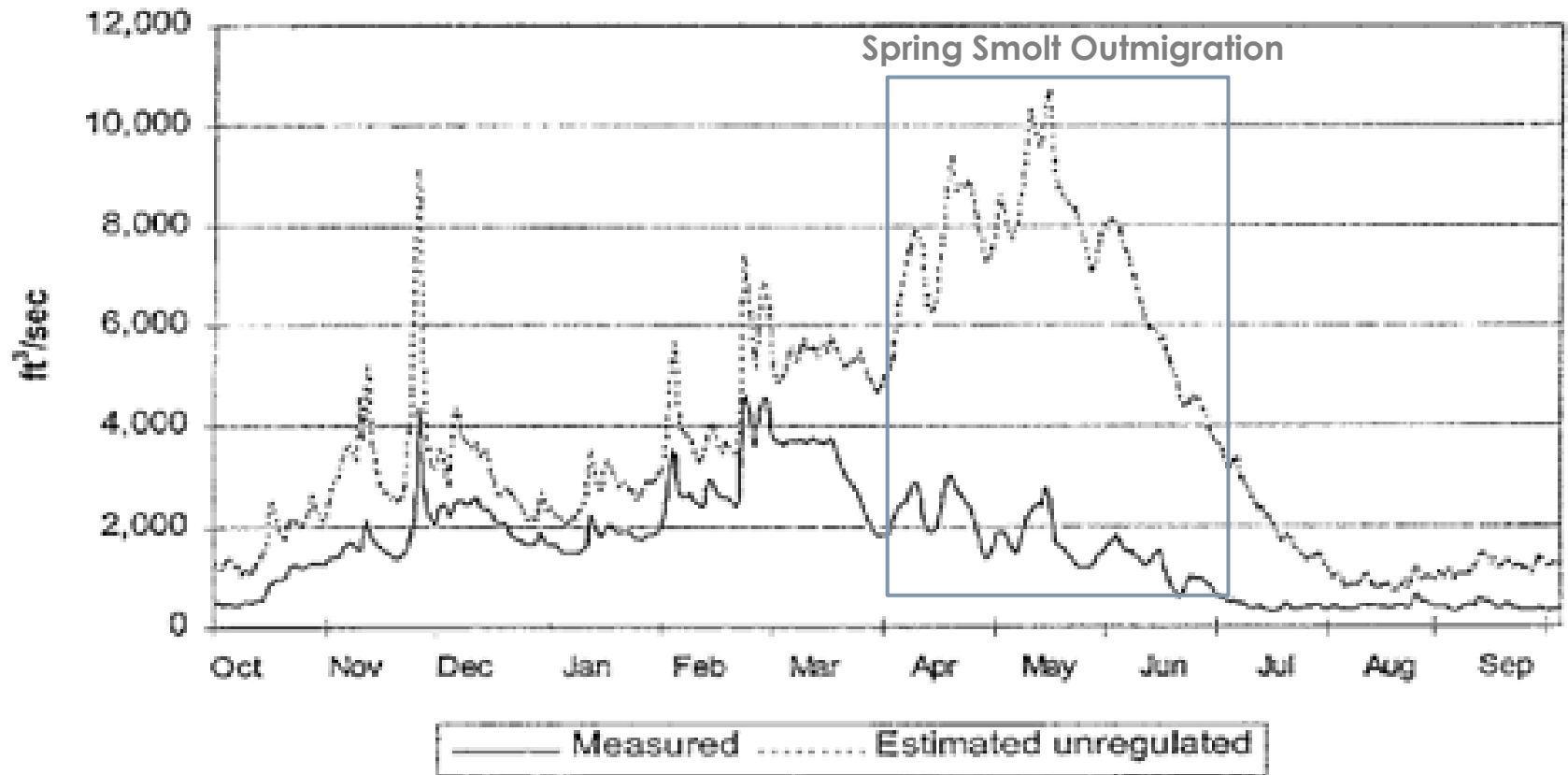
OBJECTIVES - FLOW



- Every year is a low flow/high temperature condition in the Lower River
- Improved flows at key times (well beyond minimums)
 - Higher March through June flows to improve juvenile survival
 - Adult sockeye and summer chinook return conditions (flow pulses)
- Improve flow conditions/reduce predation opportunities and conditions to improve juvenile survival
- Cottonwood regeneration
- Support channel forming conditions

LOWER BASIN HYDROLOGY

Yakima River at Parker

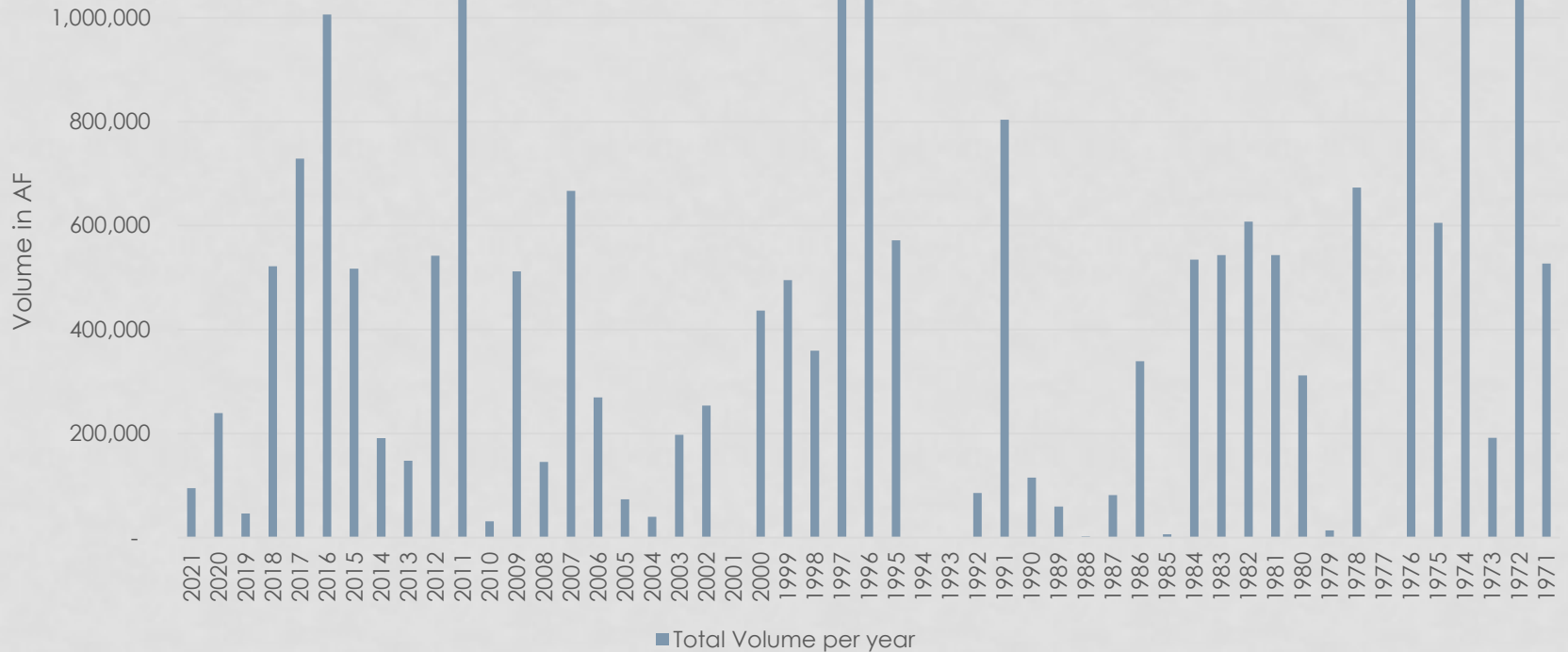


LOWER BASIN HYDROLOGY



- Key Takeaways
 - Lower mainstem much different from upper tributaries
 - Wide variation in flows in lower river
 - High spring flows
 - Low summer flows
 - Title XII – regulatory flow minimums
 - Wide variation in magnitude and number of flow events – yet location for largest amount of water available for storage
 - Winter events becoming more frequent; need additional storage capacity/capability to capture these events (possibly over multiple years)

POTENTIAL HISTORICALLY AVAILABLE VOLUME OF WATER AVAILABLE FOR STORAGE AT PARKER (11/1-10/31 ANNUALLY)
(For Illustration Purposes Only)



WATER CONSERVATION

WATER CONSERVATION



- Key Takeaways related to Lower River
 - Conservation and modernization – retimes existing water
 - Drought strategy
 - Efficiency within an irrigation system
 - Conservation projects can
 - Reduce base flows and associated water supplies in the lower river
 - Provide opportunity for flows at key times for helping with fish survival

WATER CONSERVATION GOALS



- 1994 Yakima River Basin Water Enhancement Project (YRBWEP) Section 1203 BCP
 - **Goal:** 165,000 acre-feet conserved
 - **Cost Share:**
 - Reclamation 65%; State 17.5%; District 17.5%
 - Districts retain 1/3; Instream flow 2/3
 - **Conserved Water:**
 - 70,000 acre-feet (shapeable water)

2022 YRBWEP PHASE II BCP, CONSERVATION & PULSE FLOWS



- Approximately 49,000 acre-feet of water for 2022 instream flows
- Shapeable conservation water varies from year to year
- Over 19,000 acre-feet available for use in pulse flows or other purposes (storable water) WY2022 (Shapeable)
- Discussions with Systems Operations Advisory Committee (SOAC) advise on best use of conserved water

YAKIMA BASIN CONSERVATION WATER 2022

19,154 AF storable July 8 – Sep 30

+ 3,831 AF storable Oct 1-17

= 22,984 AF

- 9,415 AF used July 8-14 (lower river temperature study)

= 13,569 Balance WY22

Tributary supplementation after Oct 17 used 4,812 AF

Conservation balance = 8,757

YAKIMA BASIN - CURRENT MINIMUM REGULATORY FLOWS

Minimum Flow Targets, September, WY2022

<u>Location</u>	<u>Target Flow (cfs)</u>
Keechelus (KEE)	100
Easton (EASW)	250
Cle Elum (CLE)	220
Tieton River (TICW)	100
Rimrock	75
Bumping (BUM) 170+)	130 (range: inflow to
Parw	455 (TXII+added waters)
Yrpw	501 (TXII+added waters)

Yrpw subordination is 536 in August (1000 Apr-Jun, TXII+tbid in Jul-Oct, 800 Oct-Nov, 600 Dec-Mar)

Rbdw subordination 500 (1300 Apr-May, 500 Jun-Oct, 500 Oct-Mar,)

ENHANCED WATER CONSERVATION ELEMENT



- 2013 RCW 90.38/2019 Dingell Act
 - **Enhanced Conservation Goal:** 170,000 acre-feet
 - **Initial Development Phase:** (2013-2029)
 - **Goal:** 85,000 acre-feet
 - **To Date:** 70% of IDP goal met

OPPORTUNITIES TO FURTHER
IMPROVE LOWER YAKIMA FLOWS

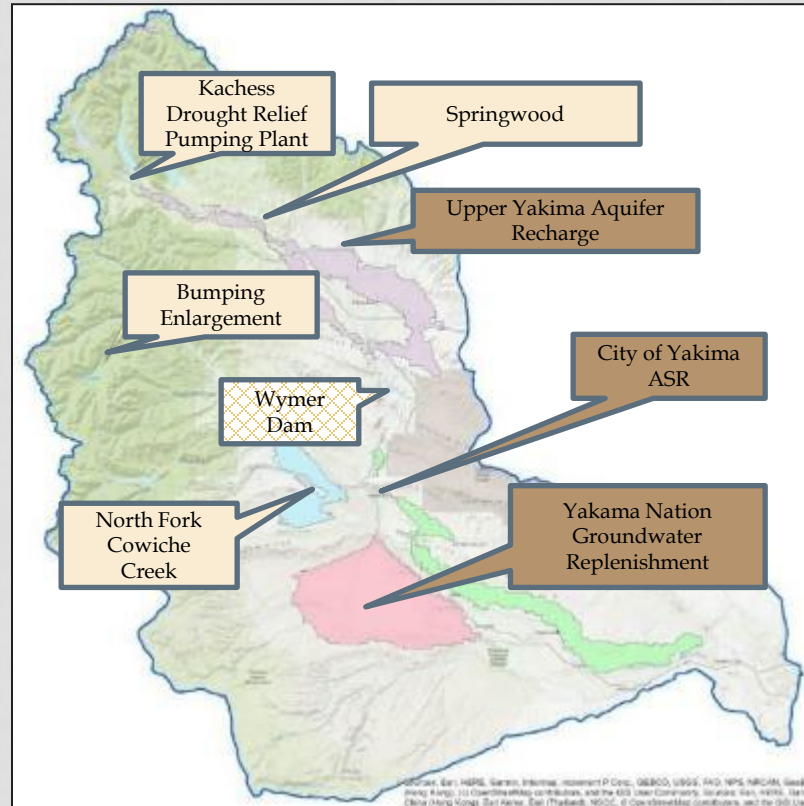
THE CASE FOR ADDITIONAL STORAGE

- Conservation is not enough in drought years
- Additional storage for augmenting instream flows and water supply in Lower River is needed
- Opportunistically take water from the river when river flows are high enough

WATER SUPPLY RELIABILITY



- **Conservation** - System level conservation 70% of Initial Development Phase goal of 85,000 acre-feet
- **Kachess Drought Relief Pumping Plant** - Existing Reservoir: Access up to 200,000 acre-feet from inactive storage pool in dry years
- **Springwood**- New off-channel reservoir, 68,000 to 20,000 acre-feet
- **Bumping Dam & Reservoir Enlargement** - Replace existing dam to add 165,000 acre-feet
- **Wymer Dam and Reservoir** - New off-channel reservoir, 163,000 acre-feet (On Hold)
- **North Fork Cowiche Creek Reservoir** - New off-channel reservoir 30,000 to 35,000 acre-feet
- **Groundwater Storage/Aquifer Replenishment**
- **Water Marketing**

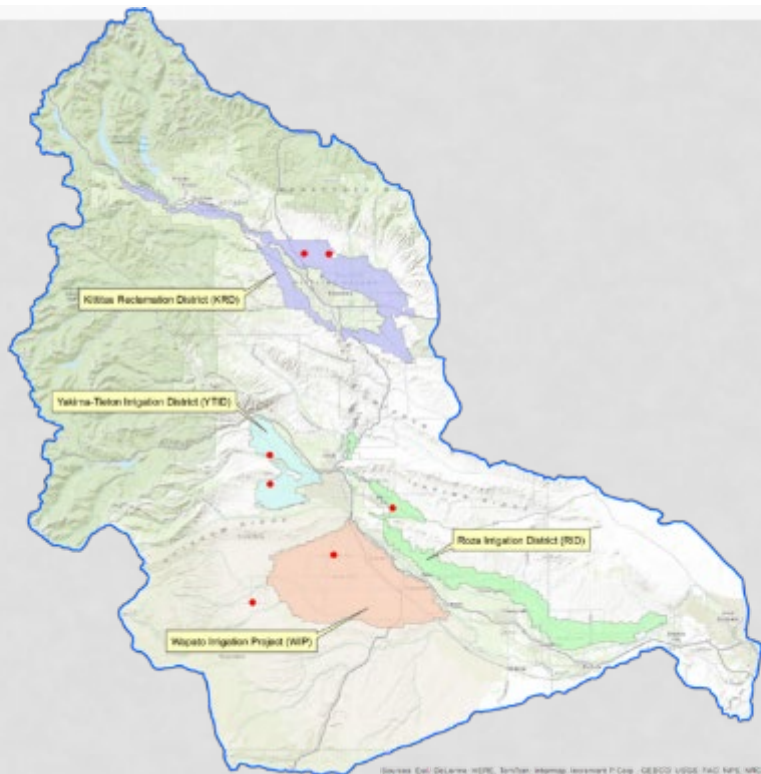


LOWER RIVER INSTREAM FLOW



Instream Flow Projects Phase 1	Schedule	Benefits
Cle Elum Pool Raise	Operational by 2028	Flow – 14.6K AF
Upper Yakima River Storage	TBD	Flow – 20 to 30K AF
Water Marketing/Acquisition	TBD	Flow – 5K to 10K AF
North Fork Cowiche YTID**	TBD	Flow – 35K AF
Water Conservation	Ongoing	Provides reach instream flow benefits. Providing additional Storage can enhance & stabilize benefits.
Middle/Lower Yakima System Storage	Value Planning in 2023	TBD – Flows and water supply benefits

GROUNDWATER REPLENISHMENT

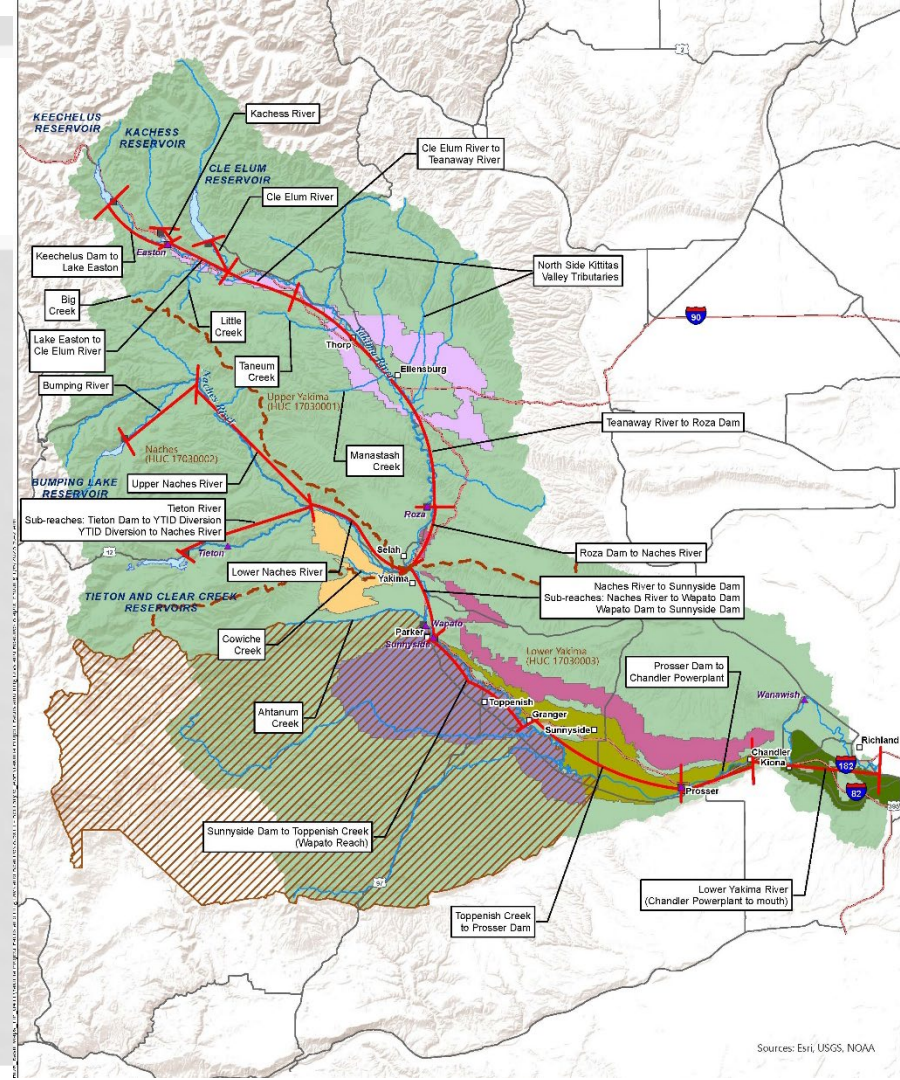


- Groundwater Storage Subcommittee has identified storage sites throughout the Yakima Basin
- Operating Projects
 - City of Yakima (14K afy)
 - Toppenish Fan (2K afy)
- Future Projects (mid to lower basin)
 - Yakama Nation Groundwater Replenishment Program (50K afy)
 - City of Prosser
 - Badger Canyon
 - Rattlesnake Ridge
- Provides the opportunity to retime water

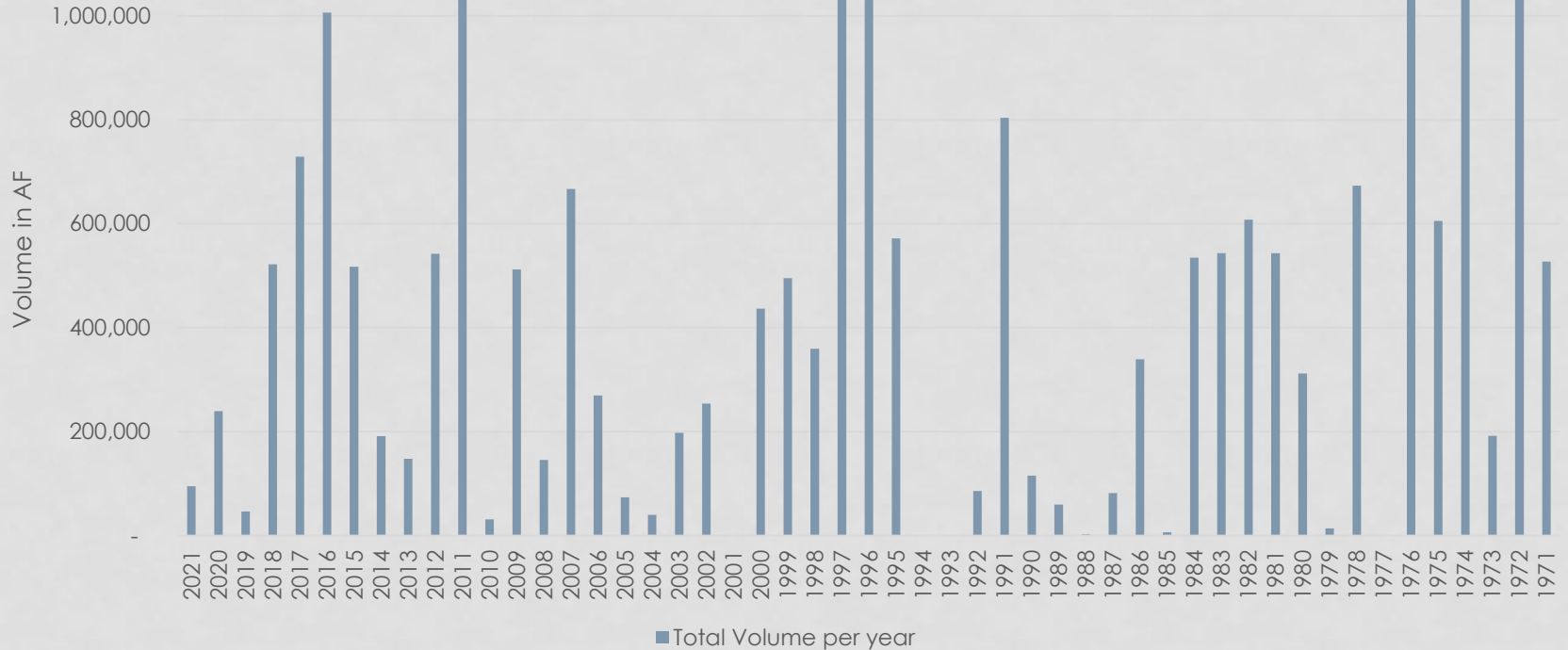
Sources: East, DeLorme; HDR; Sanborn; Intermap; Intermark P Corp.; GEBCO; USGS; TAG; NPS; NRCAN; GeoBase; IGN; Karlsruhe; H.; Ordnance Survey; East; Jochen; BRT; DMI; China; Hong Kong; Swireair; and the GIS User Community.

STORAGE CONSIDERATIONS

- Watershed production above diversions
- Type and frequency of events
- Diversion sizes
- Size of available storage opportunities
- Water supply and flow needs that can be served by storage
- Others

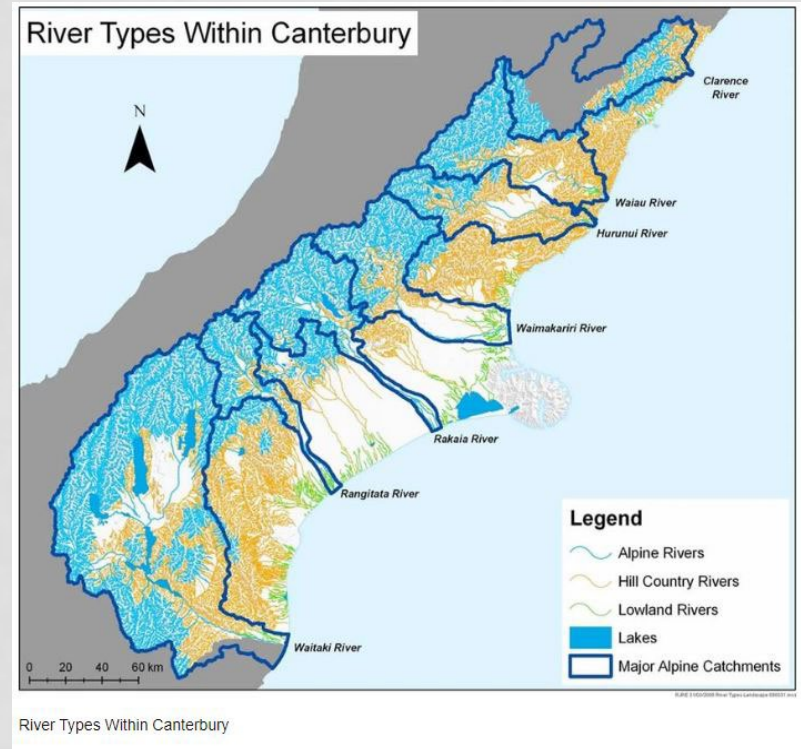


POTENTIAL HISTORICALLY AVAILABLE VOLUME OF WATER AVAILABLE FOR STORAGE AT PARKER (11/1-10/31 ANNUALLY)
(For Illustration Purposes Only)

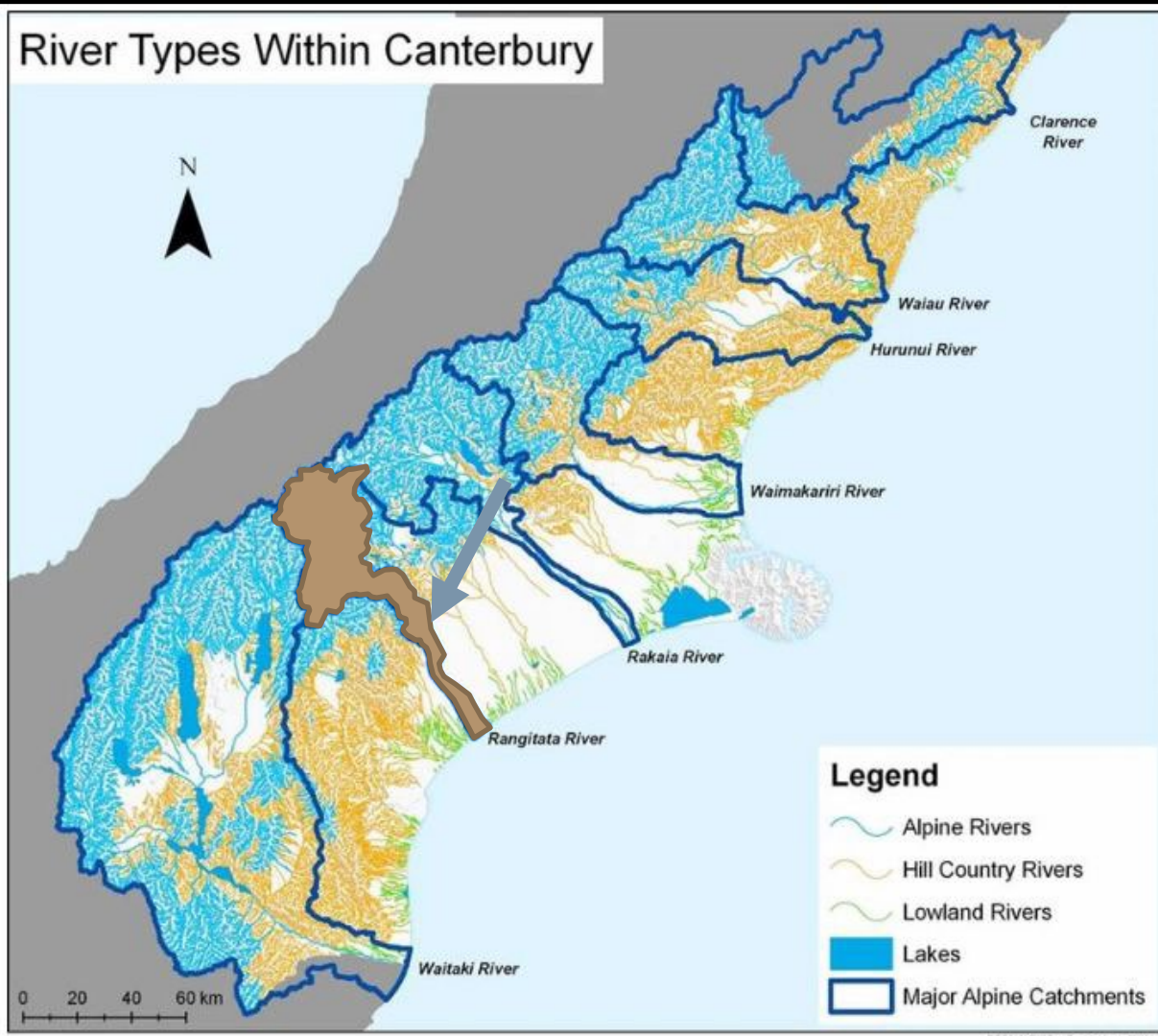


CASE STUDY FOR ADDITIONAL LOWER BASIN STORAGE OPPORTUNITIES

- South Island of New Zealand
 - Background
 - Fairly good rainfall (25+ in/year), irrigation is supplemental
 - Rainfall inconsistent, irrigation critical during summer months as they grow higher value crops
 - Rain events are heavy and happen in the upper watershed but quickly flow out to the Ocean
 - Fairly Steep Plain from Mountains to Ocean

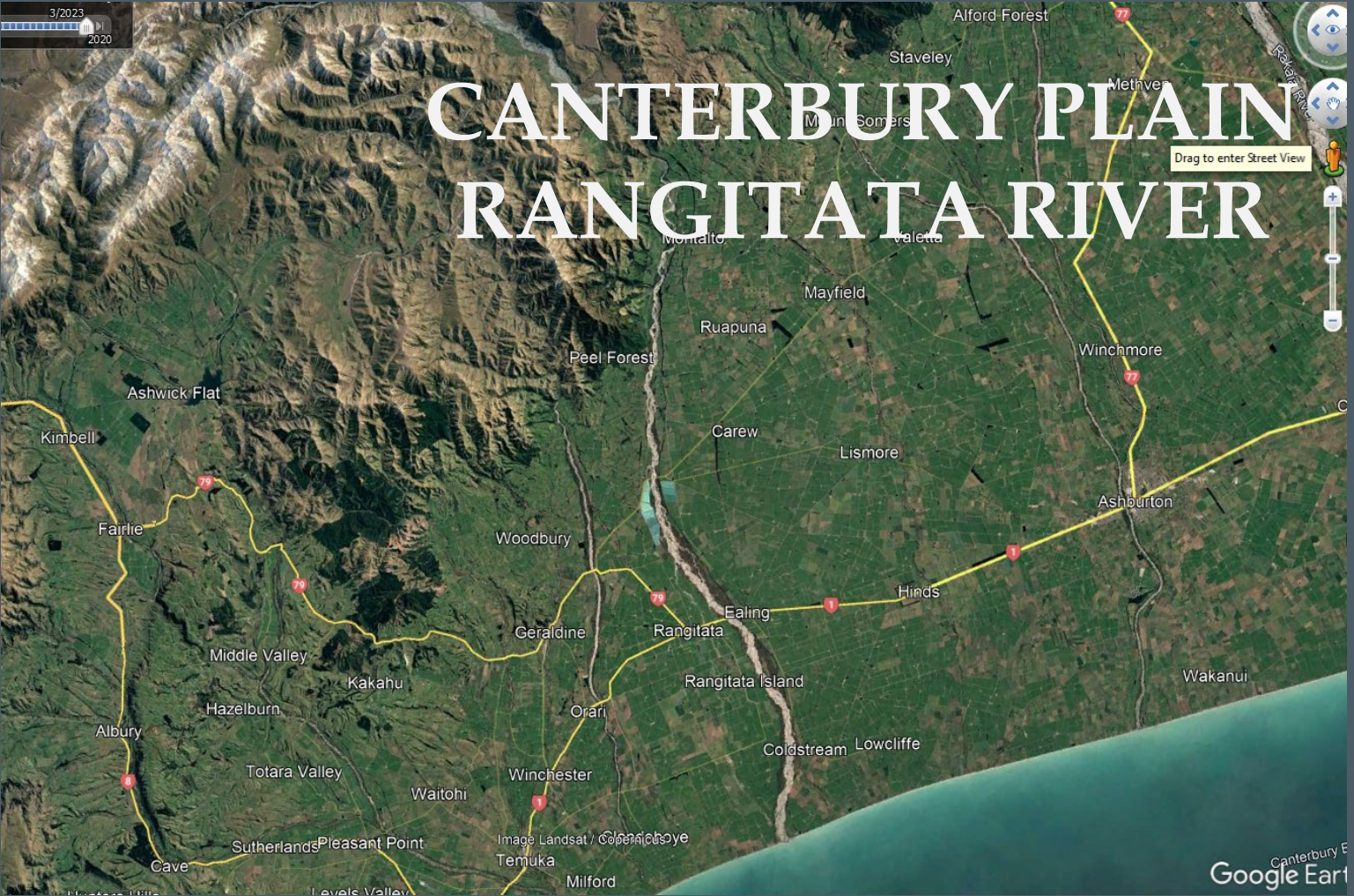


River Types Within Canterbury



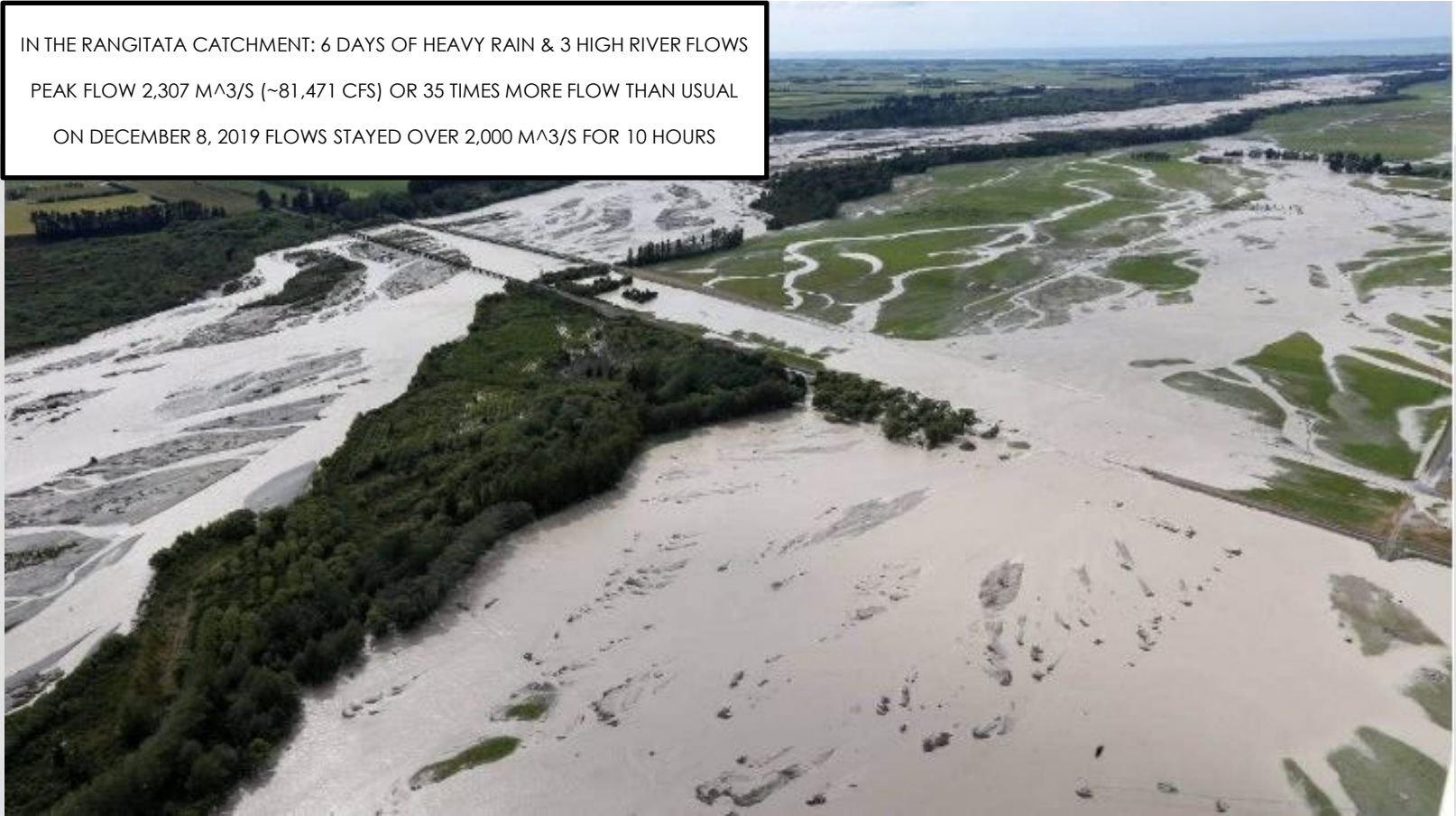
CANTERBURY PLAIN RANGITATA RIVER

3/2023
2020



Drag to enter Street View

IN THE RANGITATA CATCHMENT: 6 DAYS OF HEAVY RAIN & 3 HIGH RIVER FLOWS
PEAK FLOW 2,307 M³/S (~81,471 CFS) OR 35 TIMES MORE FLOW THAN USUAL
ON DECEMBER 8, 2019 FLOWS STAYED OVER 2,000 M³/S FOR 10 HOURS

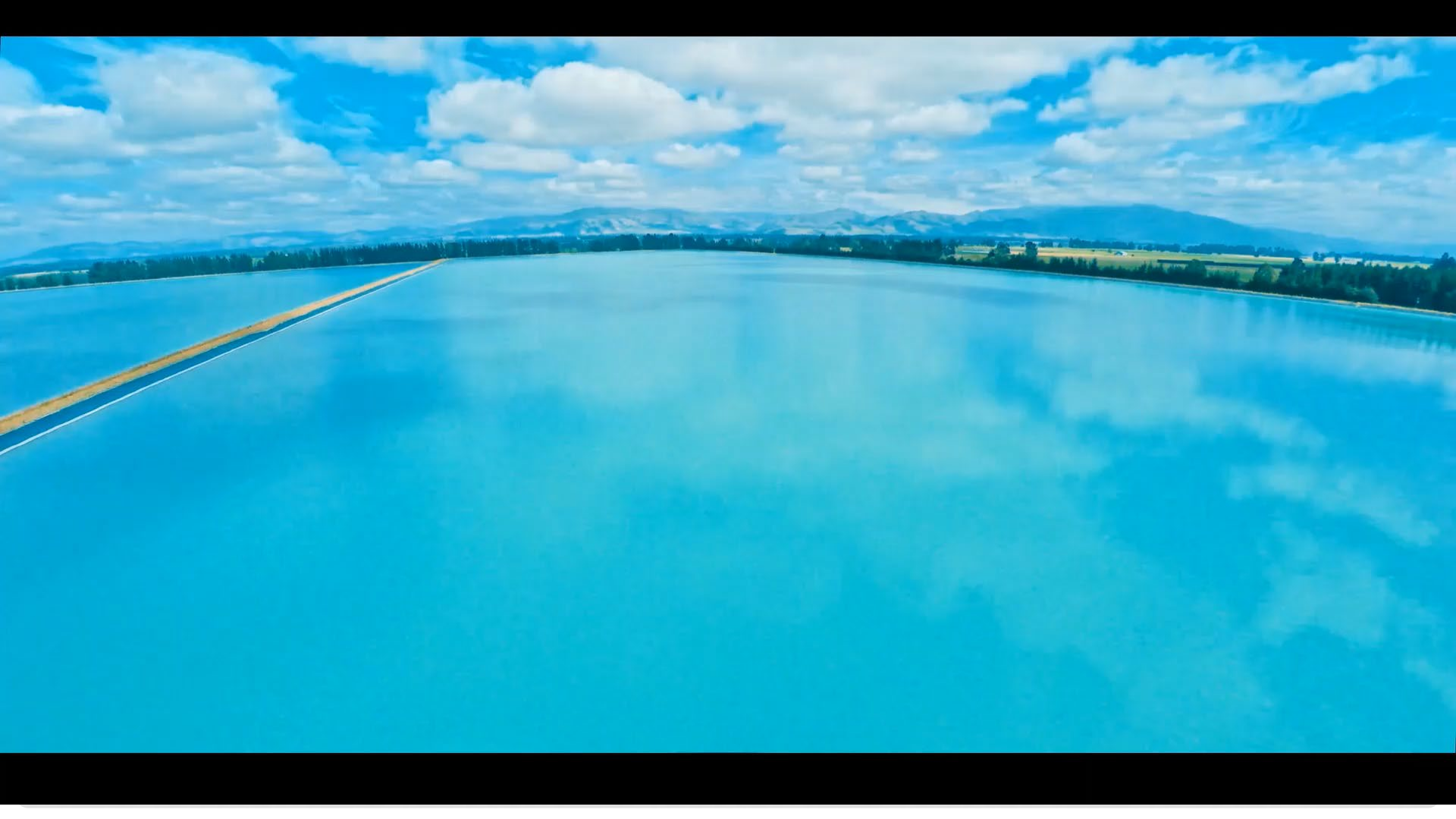




CAREW
PONDS
(MHV)

Rangitata
South
Irrigation
Scheme







CONCLUSIONS



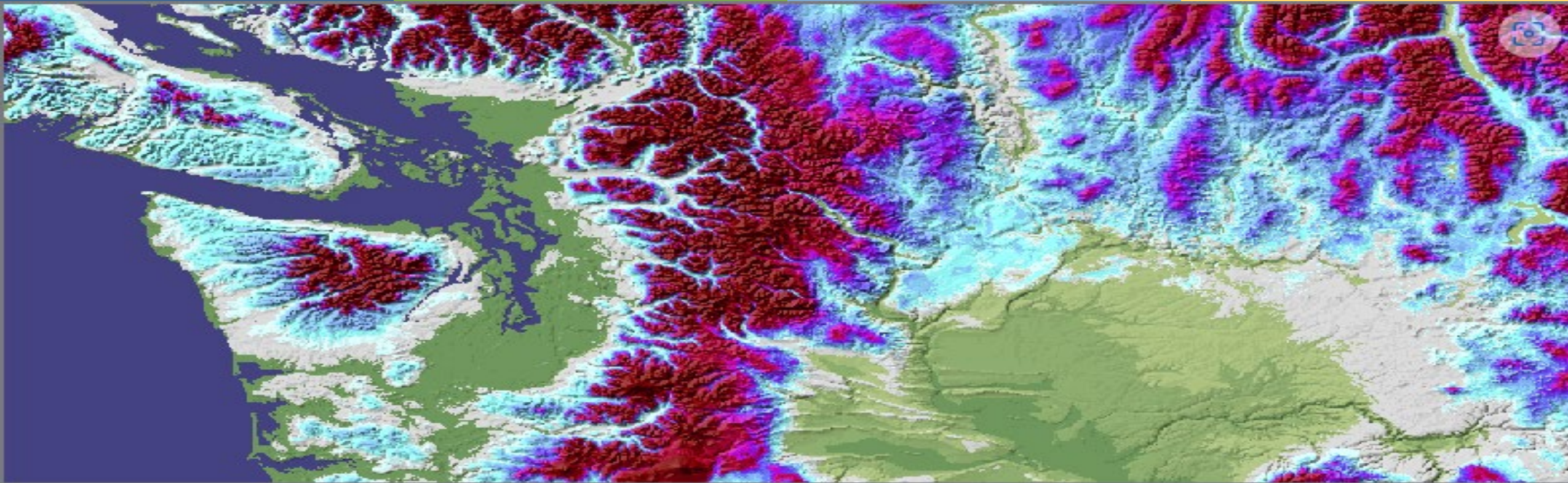
- Flow and water supply challenges exist in the lower Yakima
- Working to figure out how conservation **and** storage can help in solving these problems
- Upper and lower basins are connected and require an “integrated approach” to achieve management goals
- Solutions developed through partnerships and collaboration

THANK YOU!



Questions?

Website: www.yakimabasinintegratedplan.org



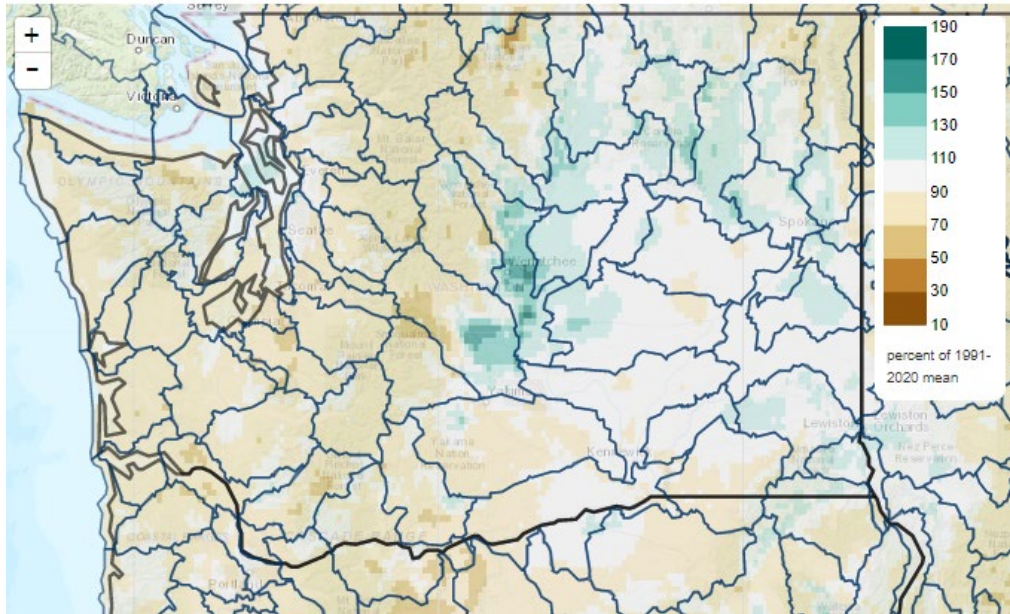
DEPARTMENT OF
ECOLOGY
State of Washington

Water Supply Update

Yakima River Basin Water Enhancement Project
March 08, 2023

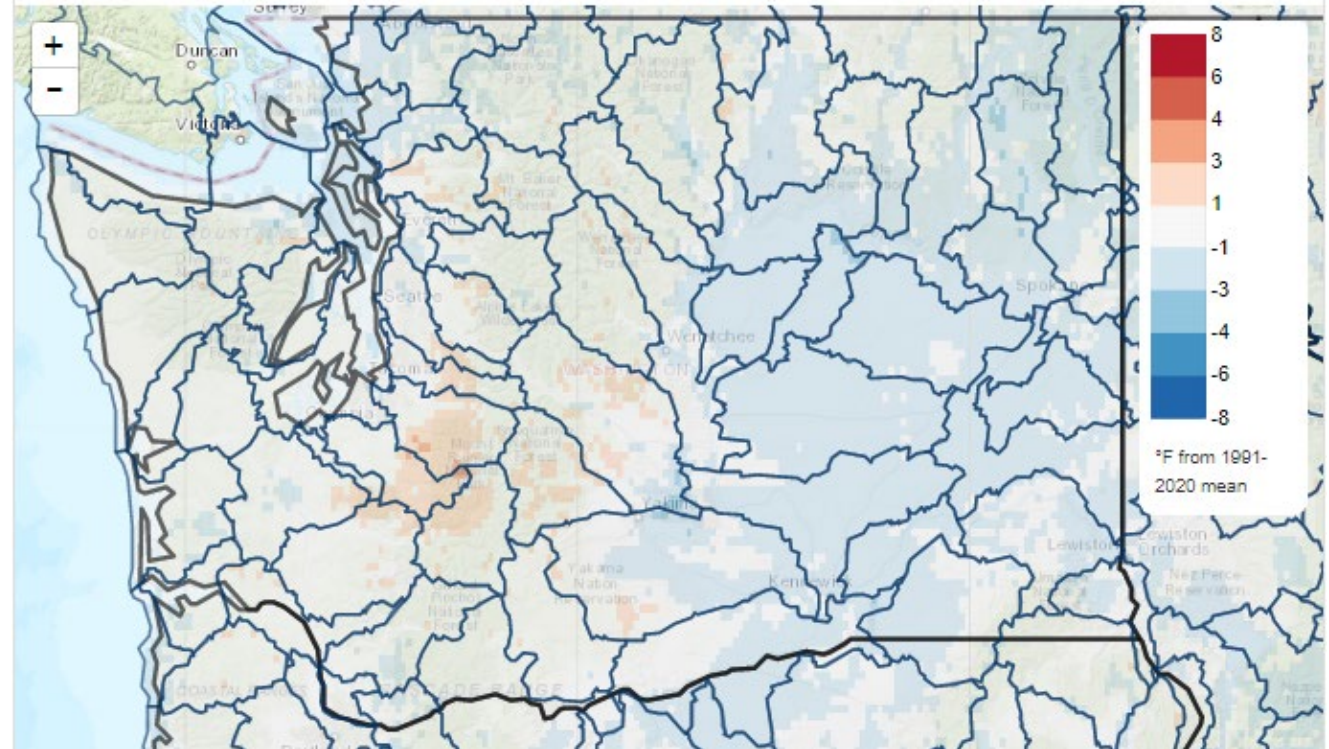
Jeff Marti, Water Resources Planner

Total Precipitation Anomaly, Last Oct to Last Full Month
2022/10/01 - 2023/02/28



87 percent of normal; 31st driest OCT-FEB since 1895;

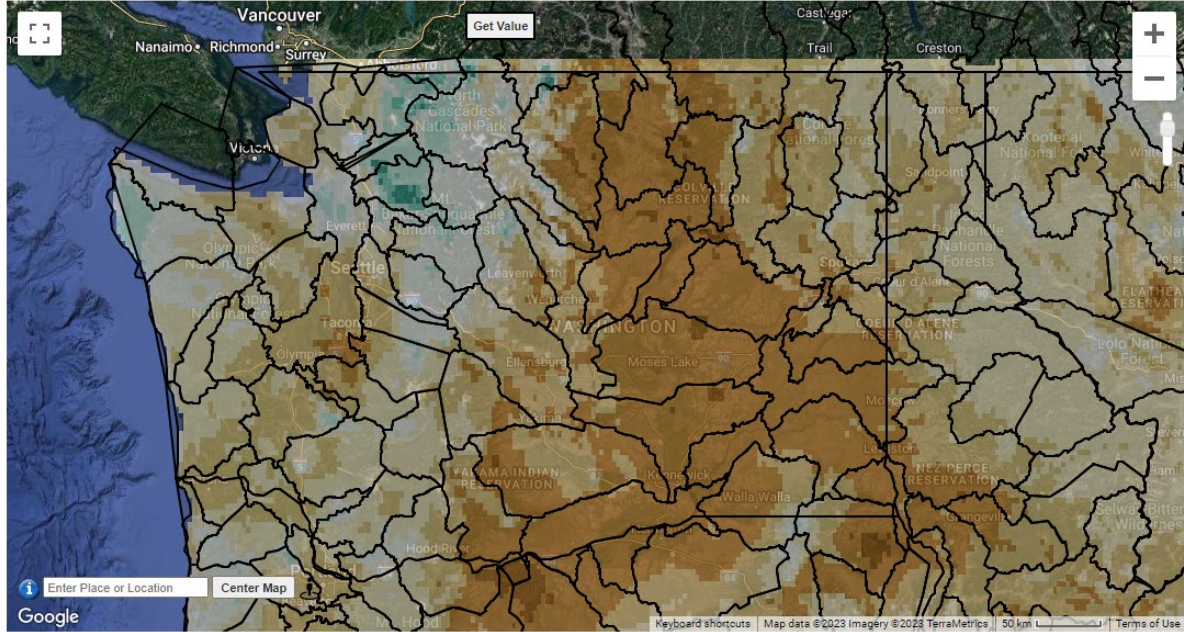
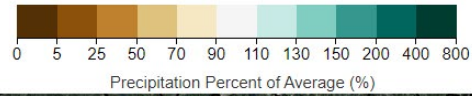
Mean Daily Temperature Anomaly, Last Oct to Last Full Month
2022/10/01 - 2023/02/28



54th coldest/75 warmest OCT-FEB since 1895; -0.53°F

Precipitation Percent Of Average (gridMET)

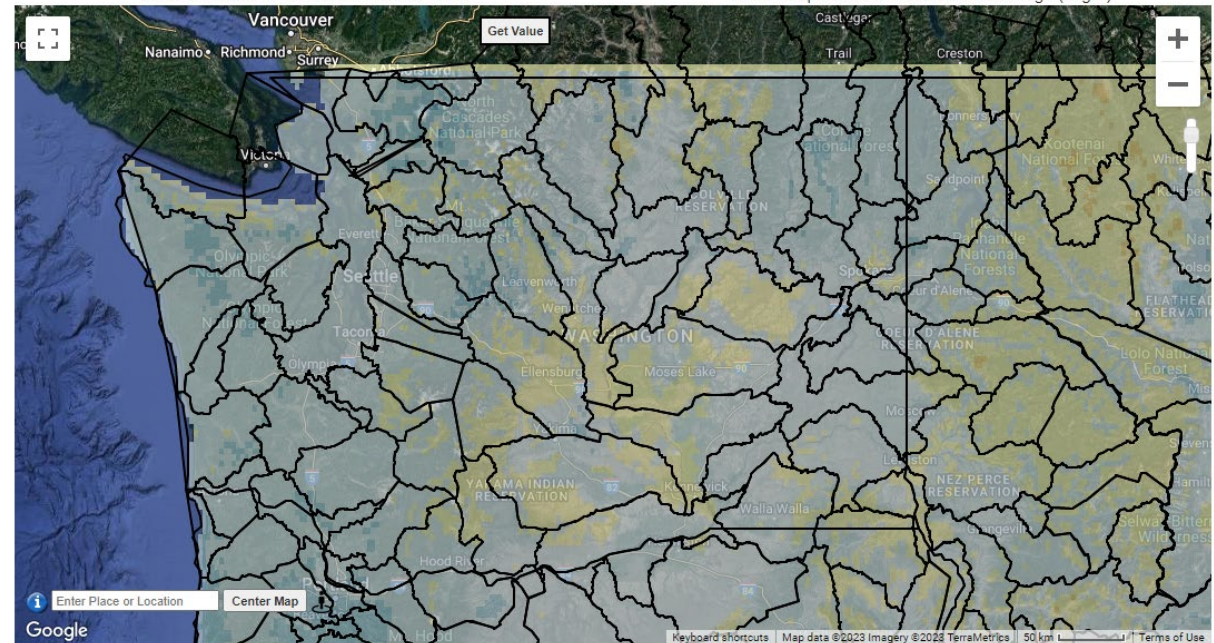
2023-02-01 to 2023-02-28, Total, vs. 1991 - 2020



Generated by ClimateEngine.org

Mean Temperature Difference from Average (gridMET)

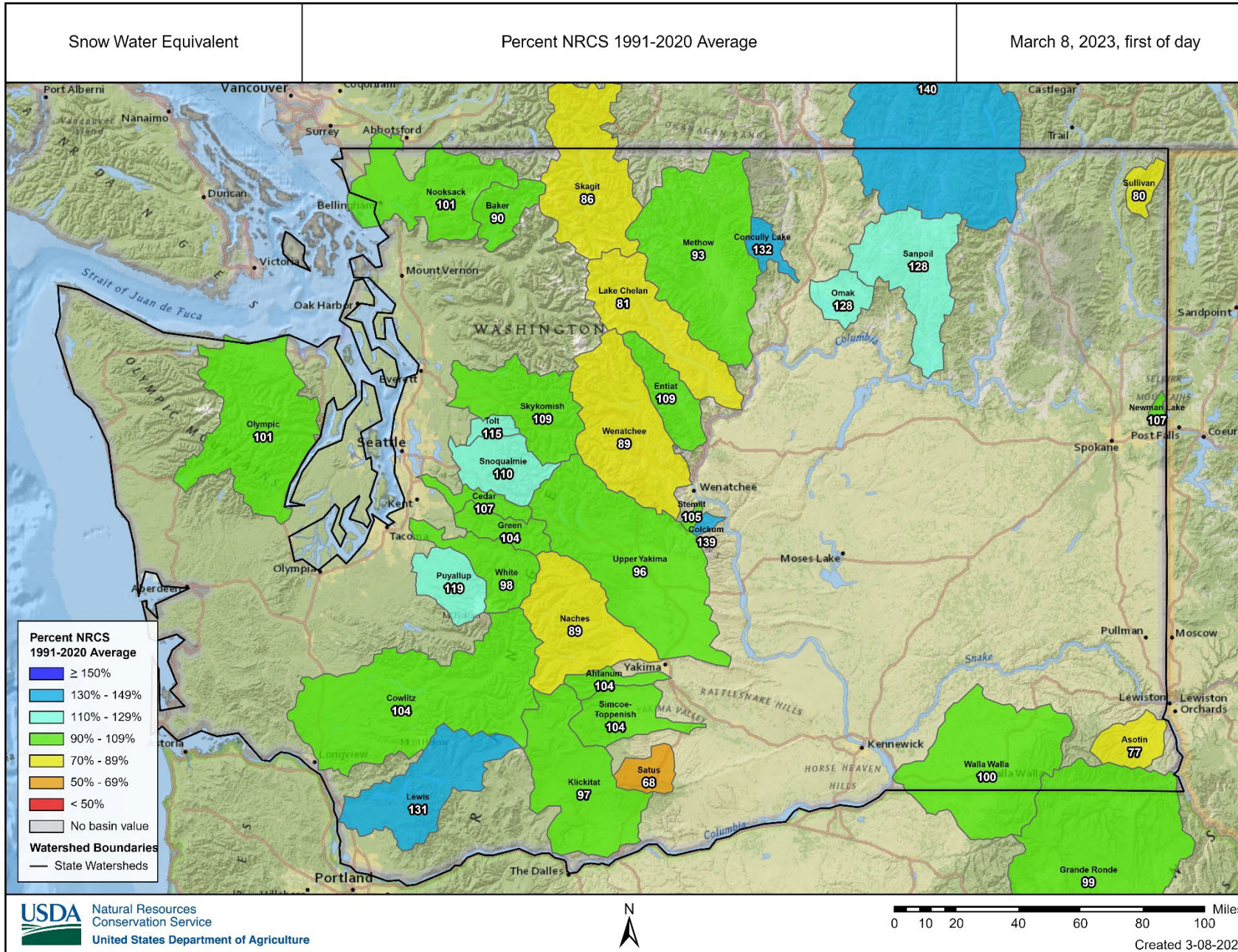
2023-02-01 to 2023-02-28, Mean, vs. 1991 - 2020



Generated by ClimateEngine.org

February: 38th driest; 79 percent of normal

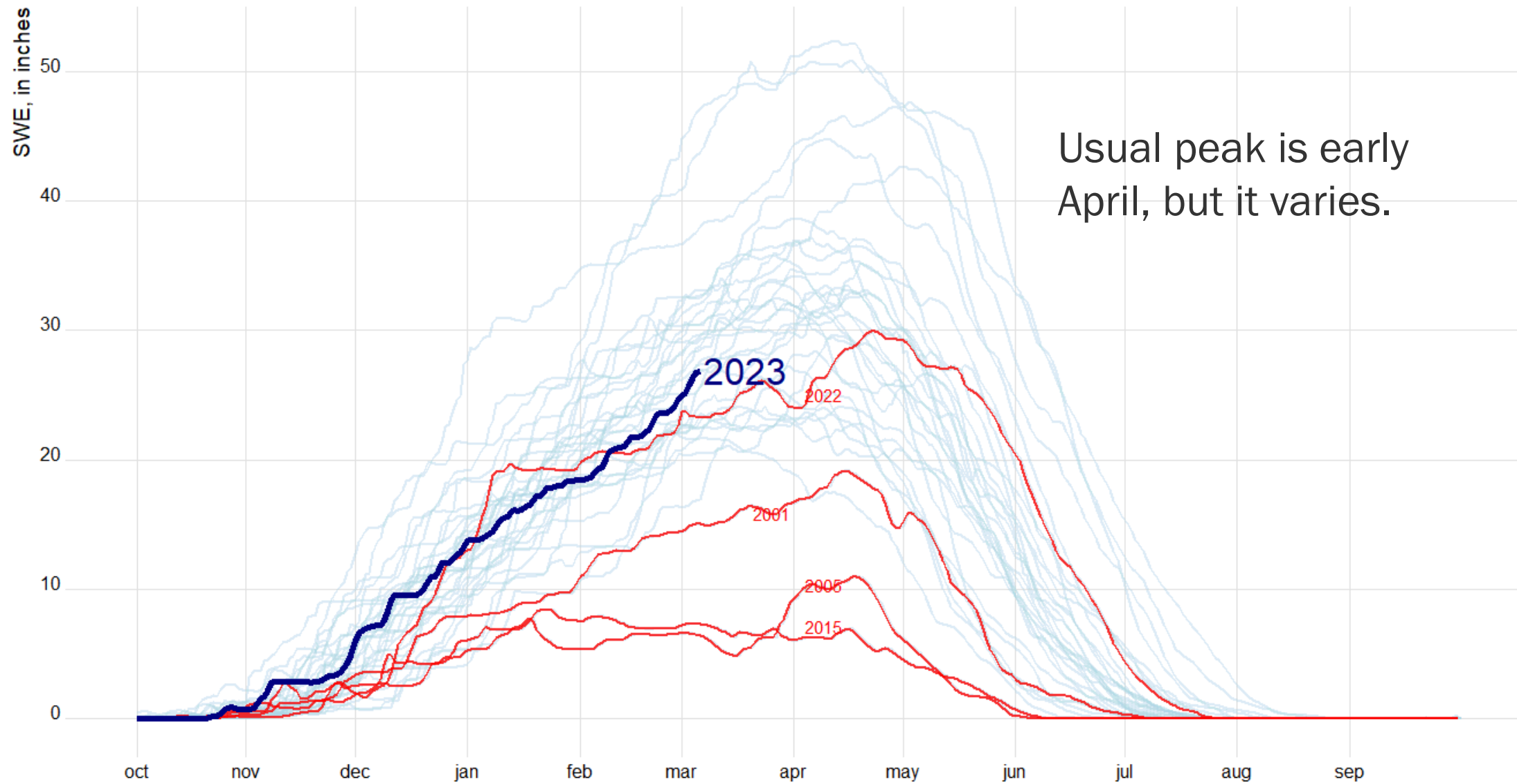
February: 43rd coldest; -2.12 °F



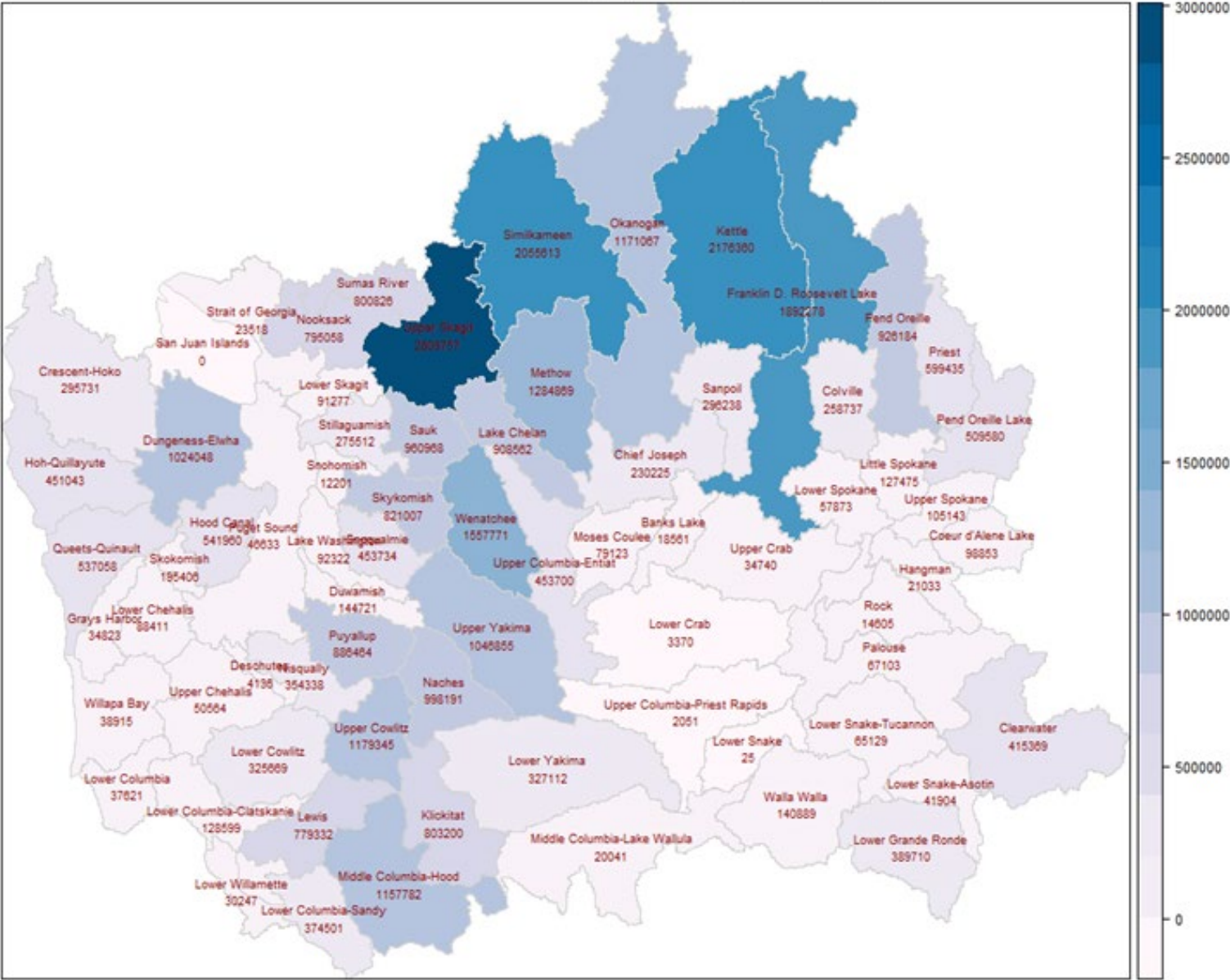
Statewide Average:
98 Percent of
Normal (March 08)

Average Washington State SWE (SNOTEL)

Water Years: 1990 - 2023 Created on: 2023-03-06



total volume of snow storage (acre-feet) by basin (HUC8)



total acre feet: 35042501
file:SNODAS_20230301.tif

March 1 Statewide Snow Storage: 35 million AF

Upper Yakima Snow Storage: 1,045,855 AF

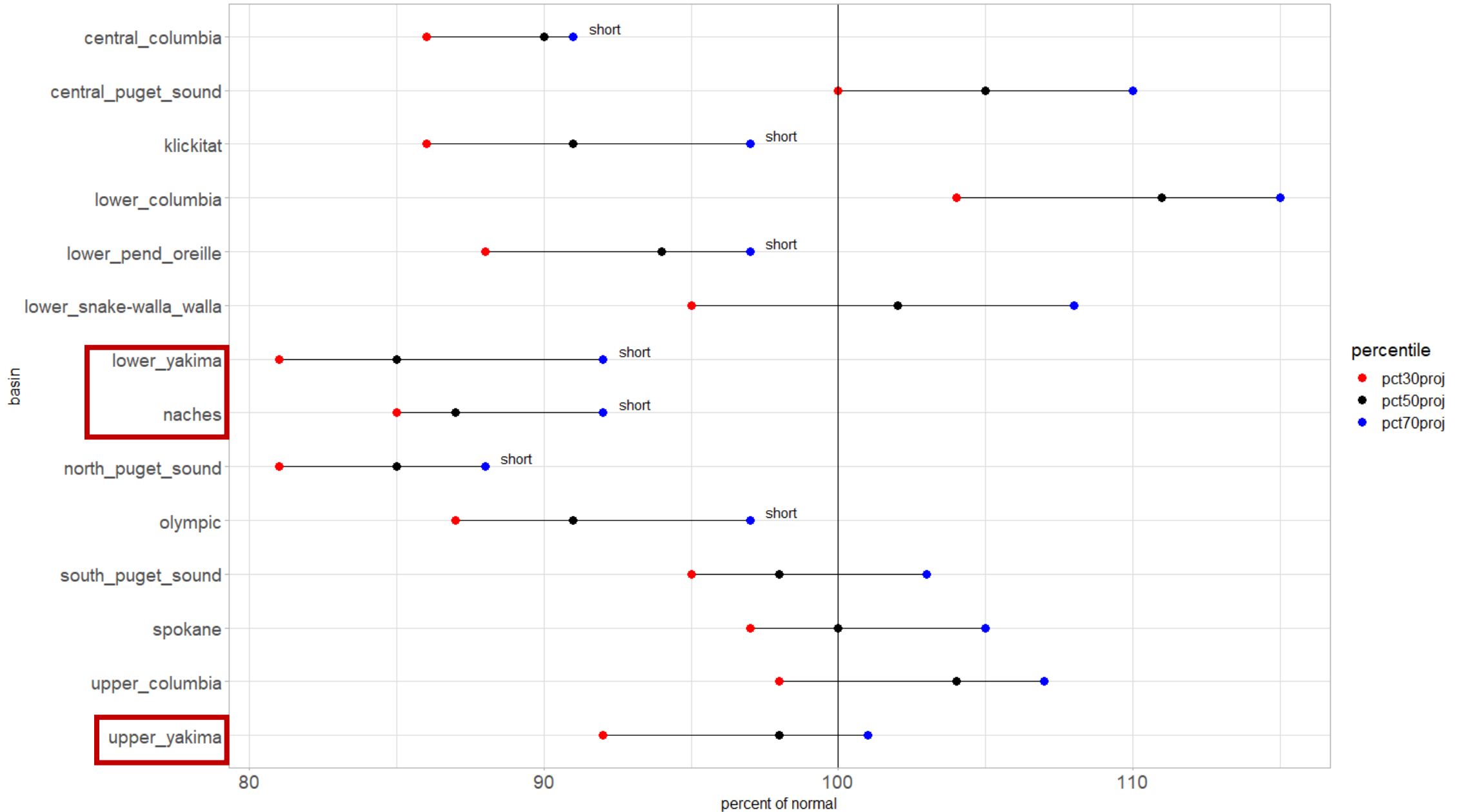
Naches: 998,191 AF

Lower Yakima: 327,112 AF

Total Yakima Snow Storage: **2,371,158 AF**

basin SWE projections to April 1 at low (30th percentile), medium (50th percentile), and high (70th percentile) levels of accumulation

NRCS Data | query date: 03-07



'short' means that even with much better (70th percentile) than normal accumulation the basin SWE average will be below normal



Northwest River Forecast Center ESP Natural Forecast



River and Hydrology

Water Supply

Observations

Weather Forecasts

Climate

NWRFC

Home

Zoom Out

--- Quick Zooms ---

ESP Issued: 2023-03-05

Ensemble Date: 2023-03-05

Permalink

Search

Enter NWS ID:

GO

Map Overlays

- NWRFC Boundary
- NWRFC Basins
- NWS HSAs
- Counties
- States

ESP Natural Forecast

- Natural Status
- Natural % of Normal
- Rank (ASC)
- Rank (DESC)
- Exceedance (%)
- Percentile (%)

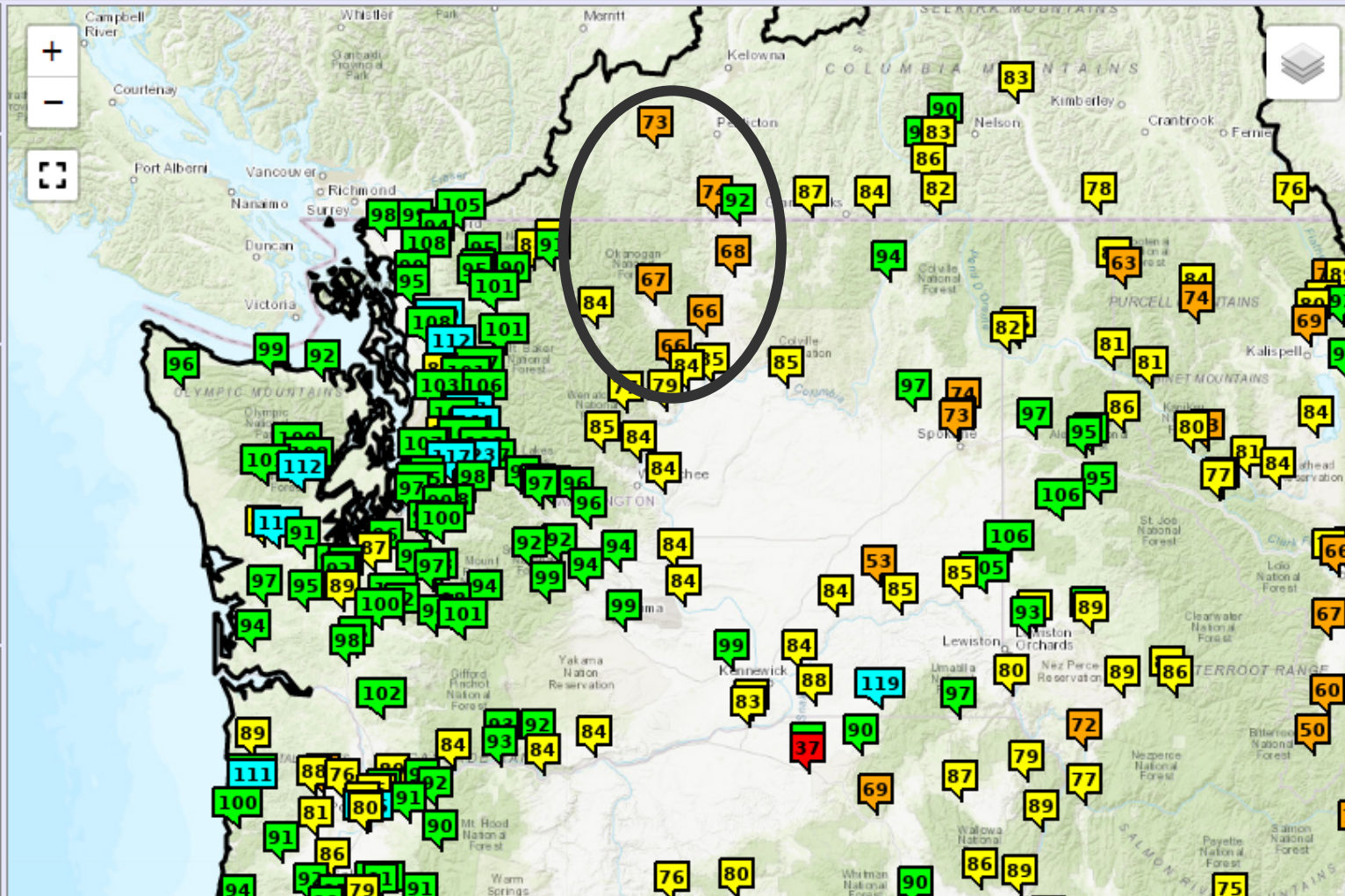
Natural Runoff

- Runoff Status
- Runoff % of Normal

ESP Natural Forecast

Period: APR-SEP
Forecast (% Normal)

- No Normal, No Data
- < 25
- 25-50
- 50-75
- 75-90
- 90-110



Median (APR-SEP)
forecast:
95 percent of normal

Columbia River Instream Flow Rule

Curtailment if March 1st forecast for Apr-Sept runoff falls below 60 million acre feet (MAF).

Median March 1 Forecast was 82 MAF

Currently, there is a greater than 99 percent chance of staying above 60 MAF.

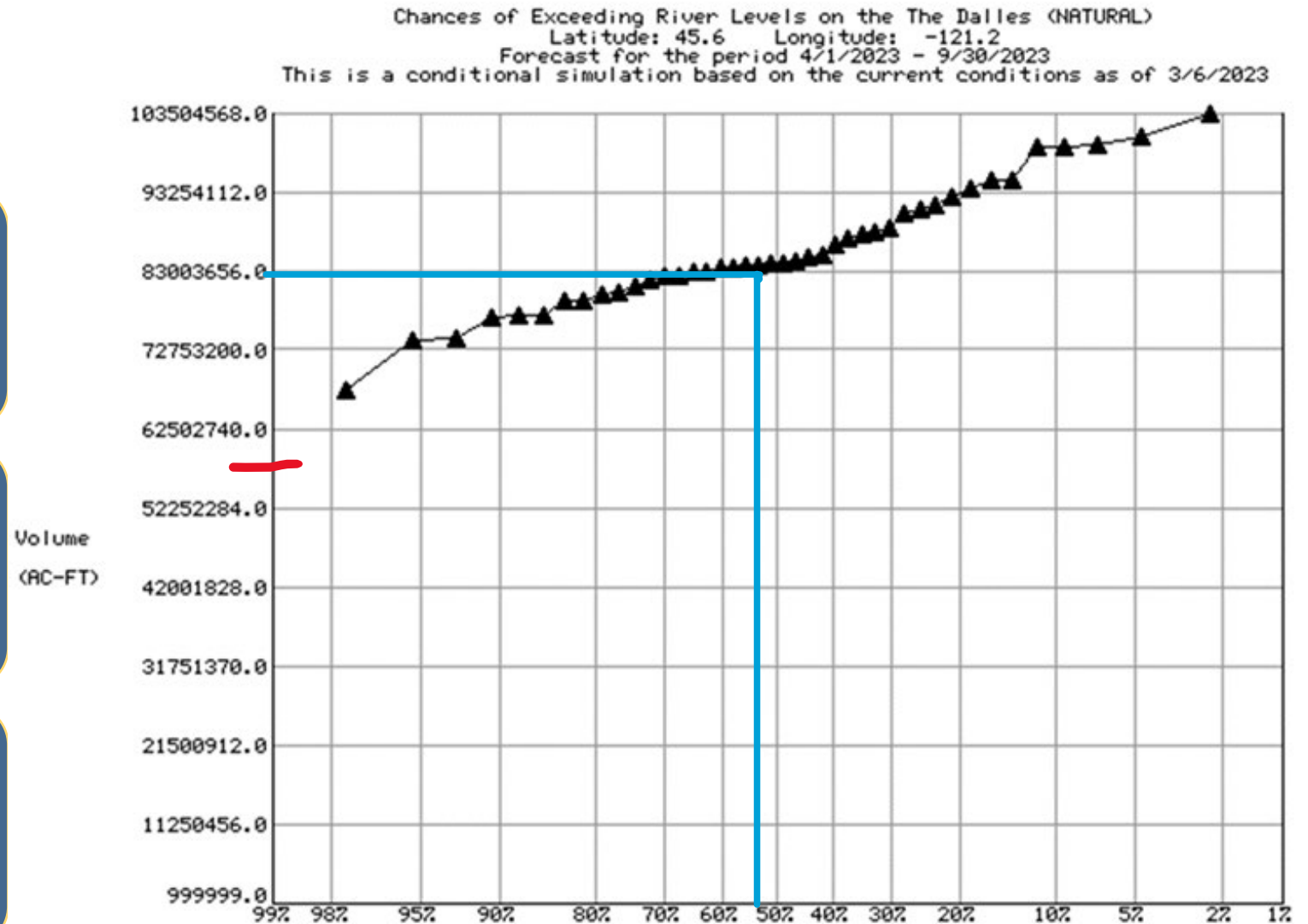
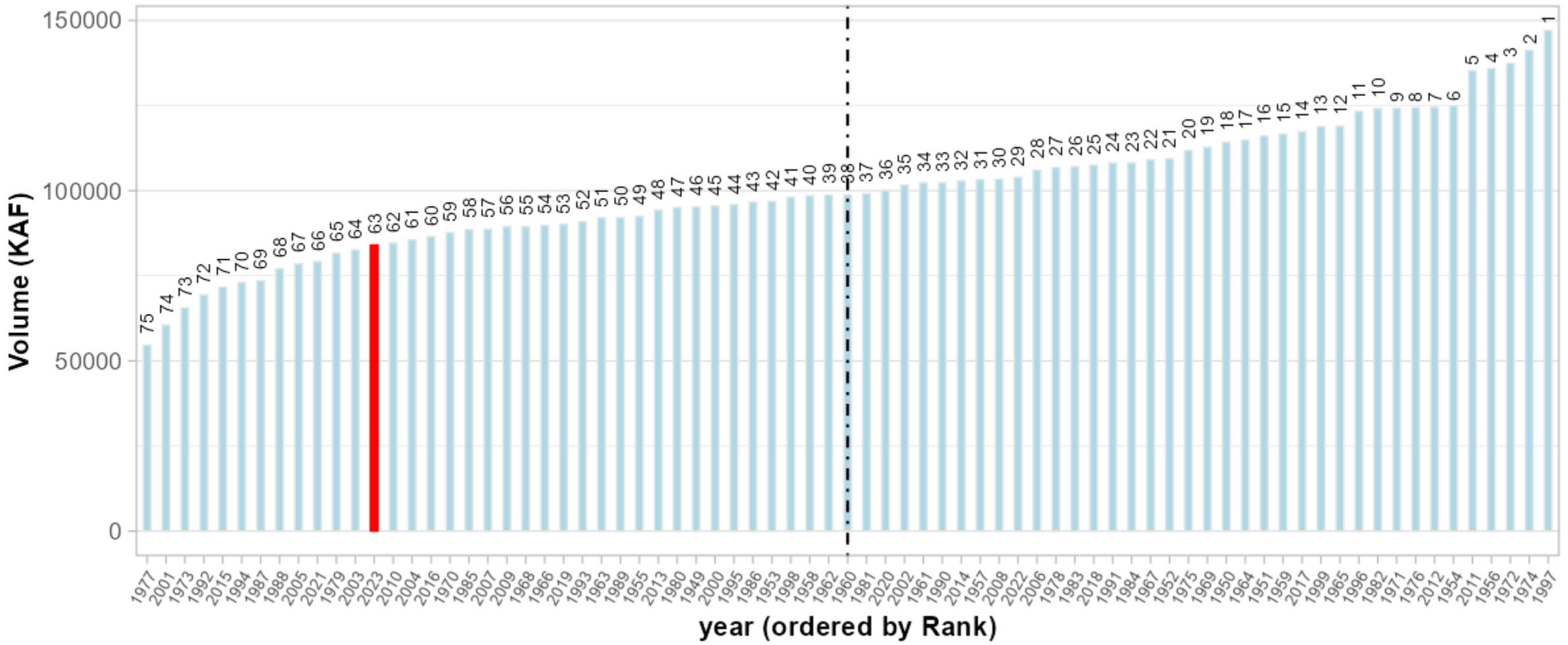


Chart Date: March 6th

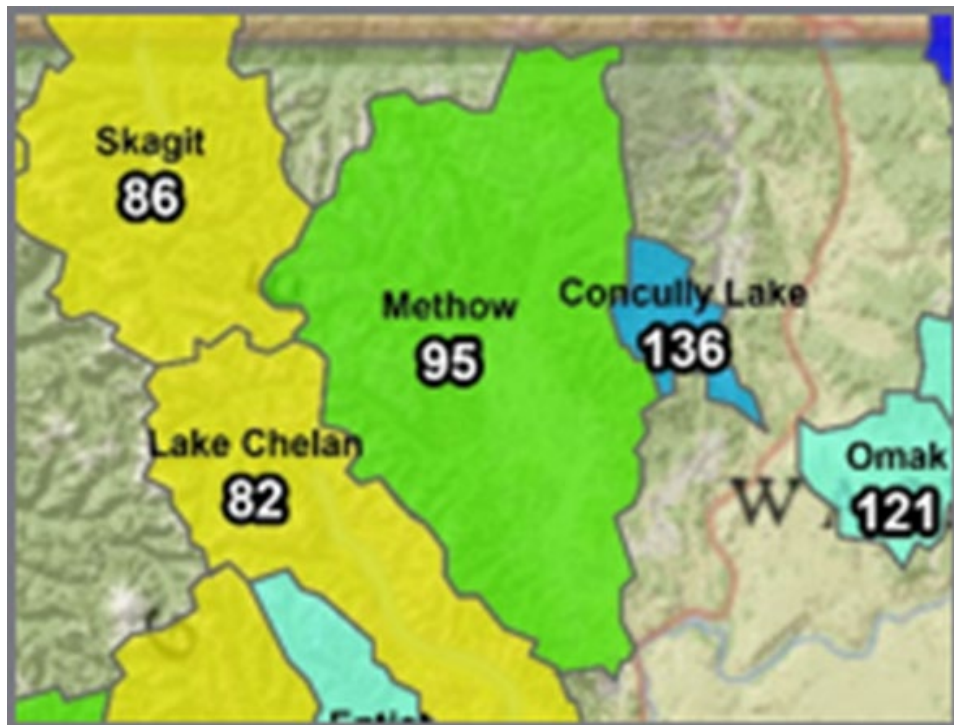
COLUMBIA - THE DALLES DAM | 2023 FORECASTED RUNOFF (APR-SEPT) COMPARED TO HISTORIC RUNOFF (1949-2022)



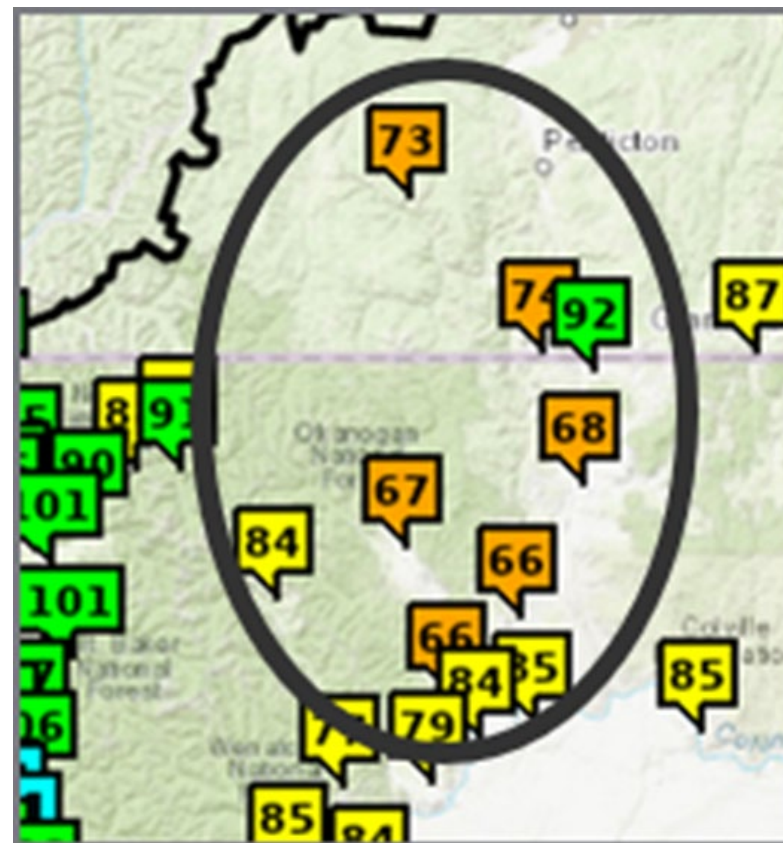
NWRFC DATA 2023-03-06

Methow Mystery

Decent Snowpack



Below Normal Forecast

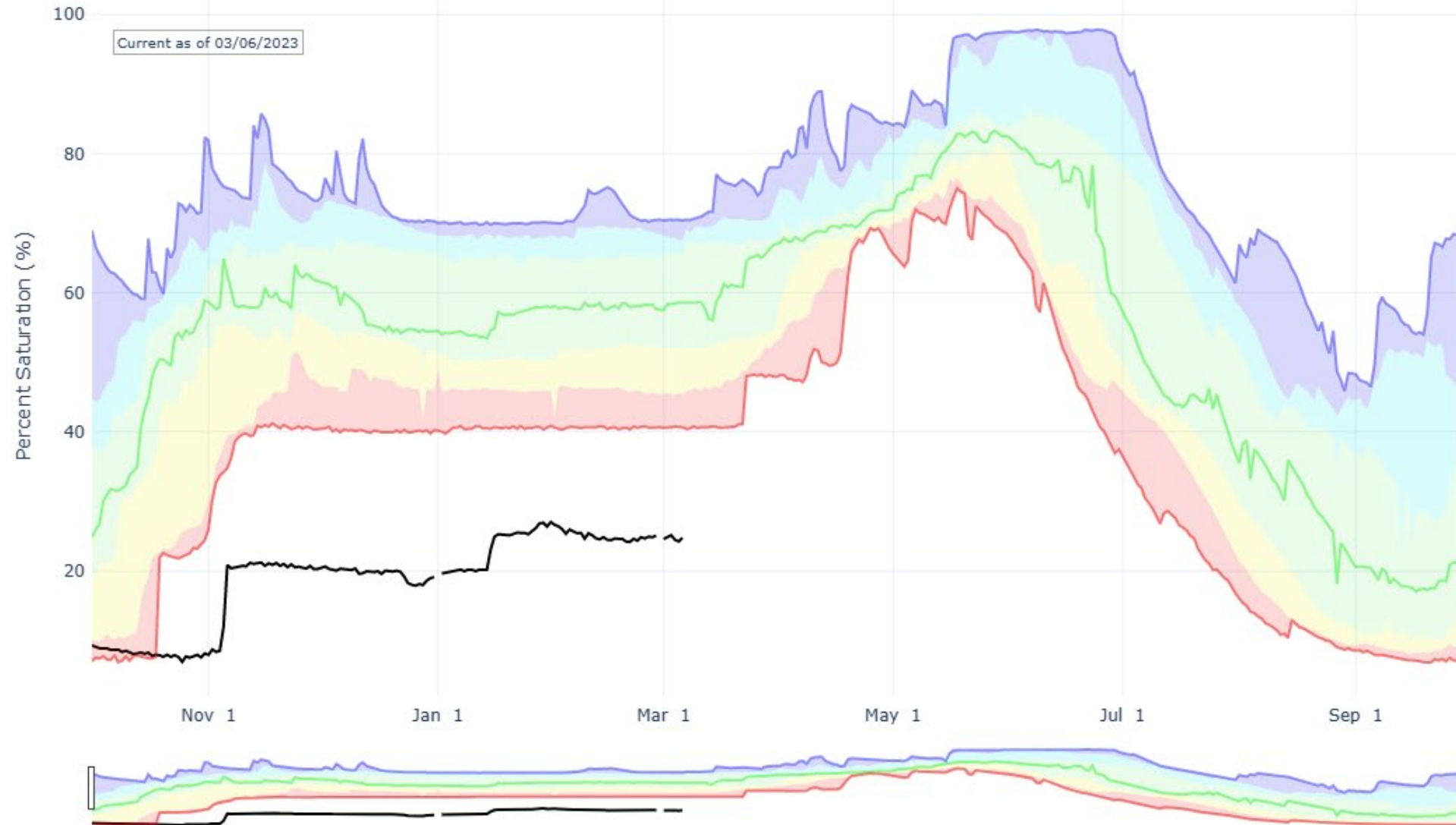


DEPTH AVERAGED SOIL SATURATION IN METHOW

Reset Range

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

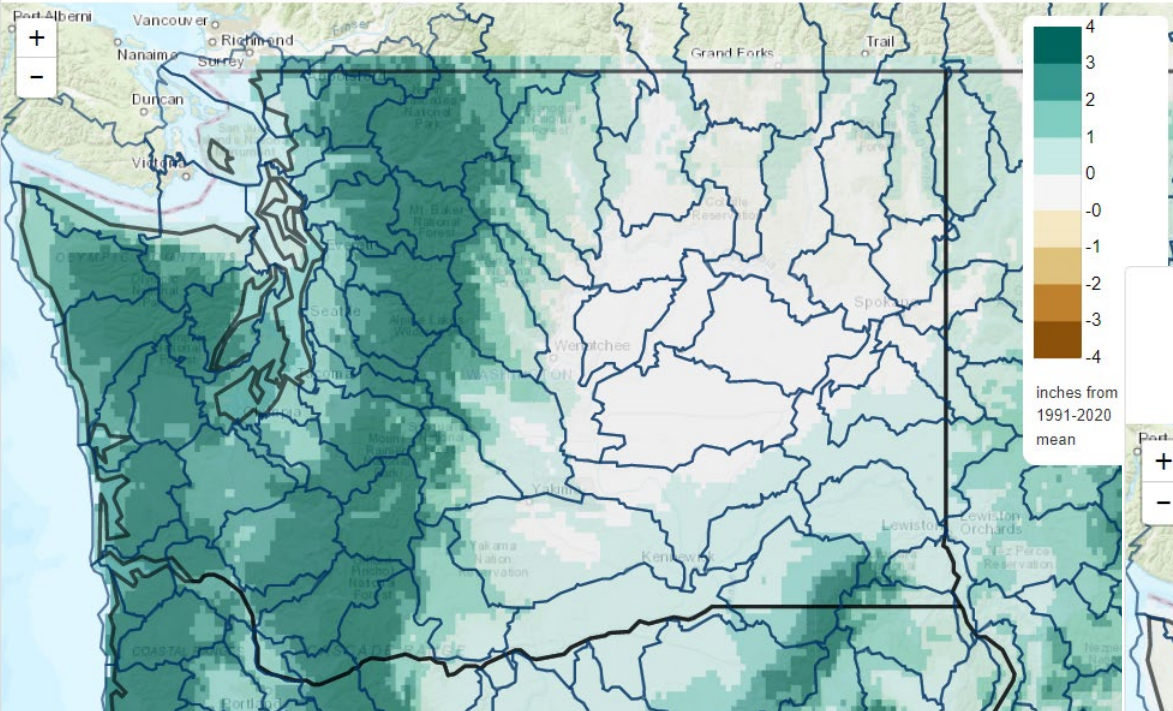
Station List



Precipitation Anomaly, Week 1-3, Next 1-21 Days

2023/03/08 - 2023/03/28

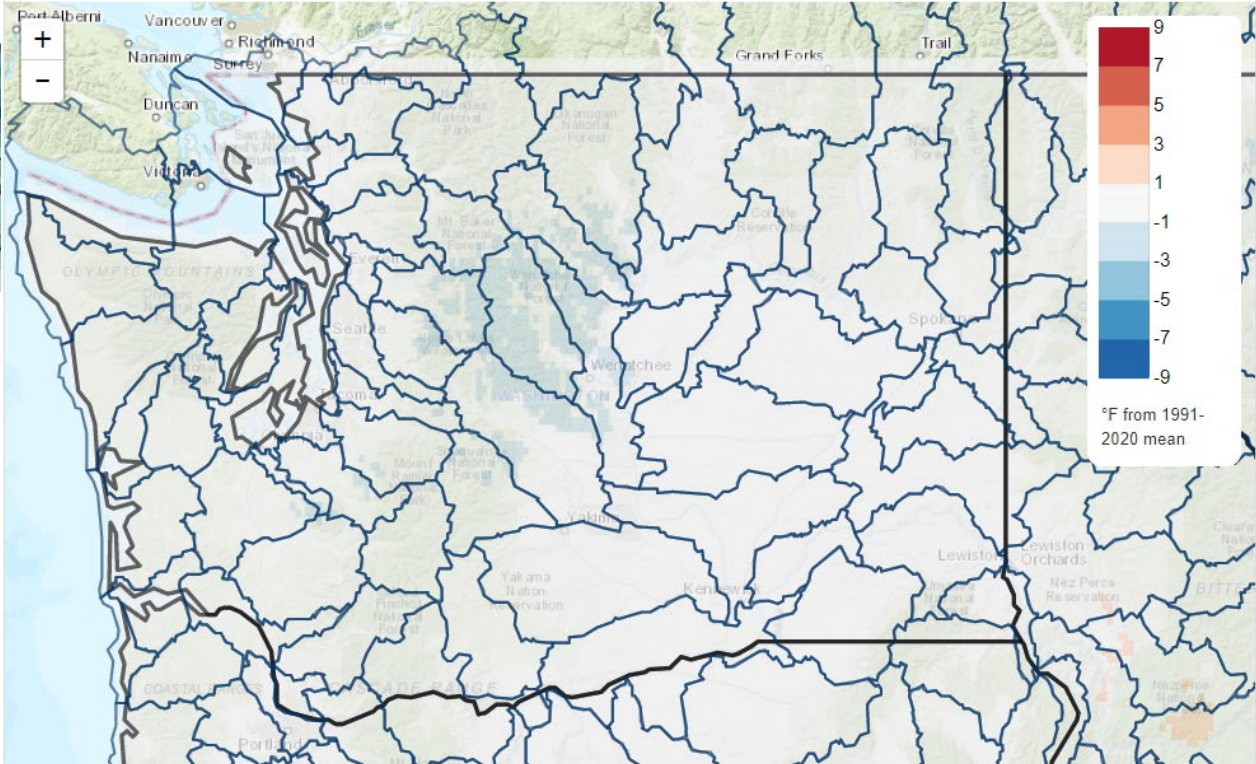
Multi-ensemble median from 48 downscaled CFSv2 ensemble forecasts - forecast made 12Z-05-Mar-2023 to 6Z-08-Mar-2023



Mean Temperature Anomaly, Week 1-3, Next 1-21 Days

2023/03/08 - 2023/03/28

Multi-ensemble median from 48 downscaled CFSv2 ensemble forecasts - forecast made 12Z-05-Mar-2023 to 6Z-08-Mar-2023



Summary

- Drier than normal since the start of the water year.
- Cool weather has helped build snowpack, but some areas are slightly low and will likely finish the year below normal.
- The Methow Basin stands out as an area of concern, based upon soil moisture and forecasted runoff.
- Near-term forecasts hold out promise for positive precipitation anomalies, but not game-changing.
- Lack of a surplus snow cushion means no room for complacency.
- And the Yakima TWSA Forecast will come in at.....

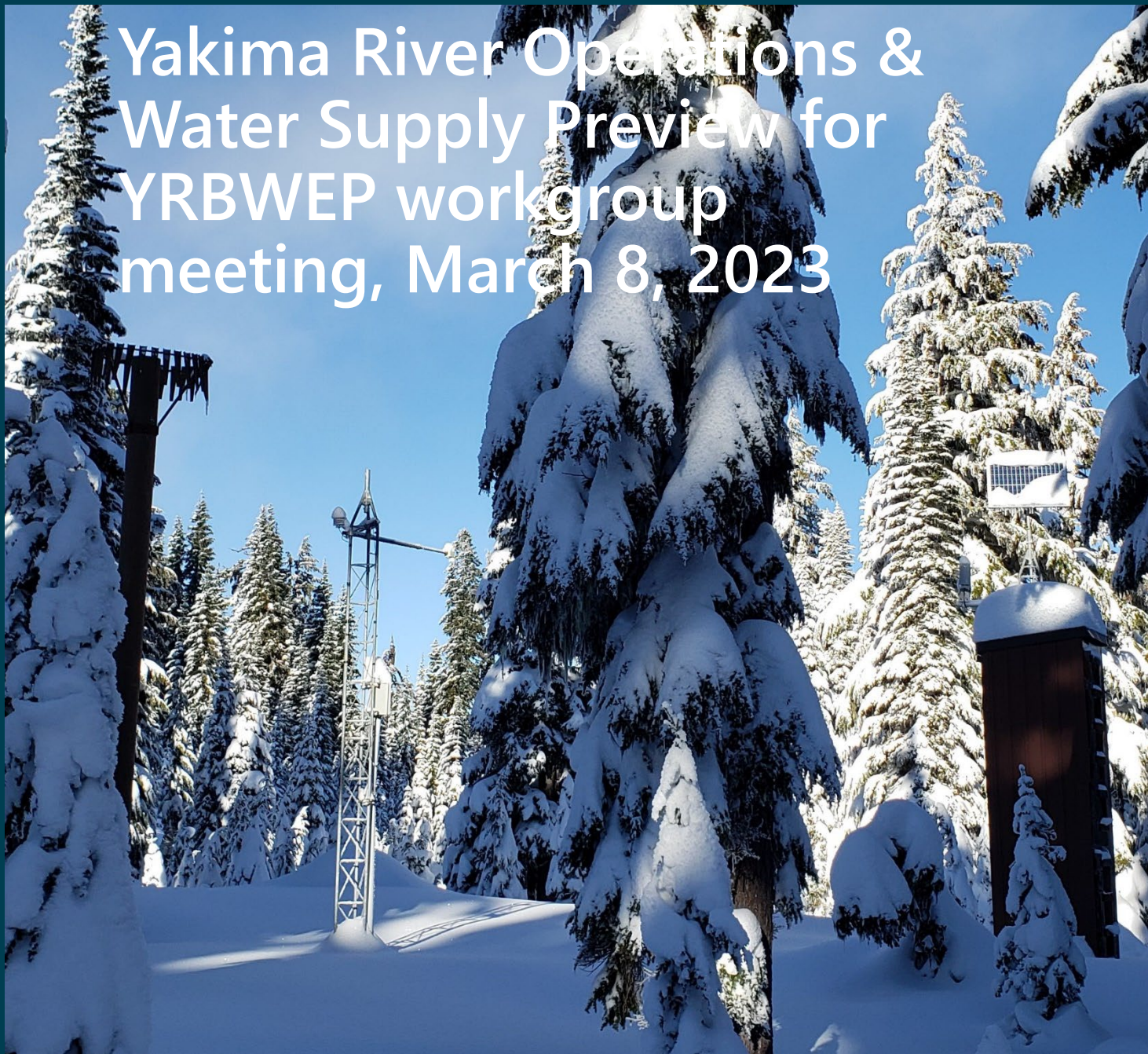
Thank you

Jeff Marti

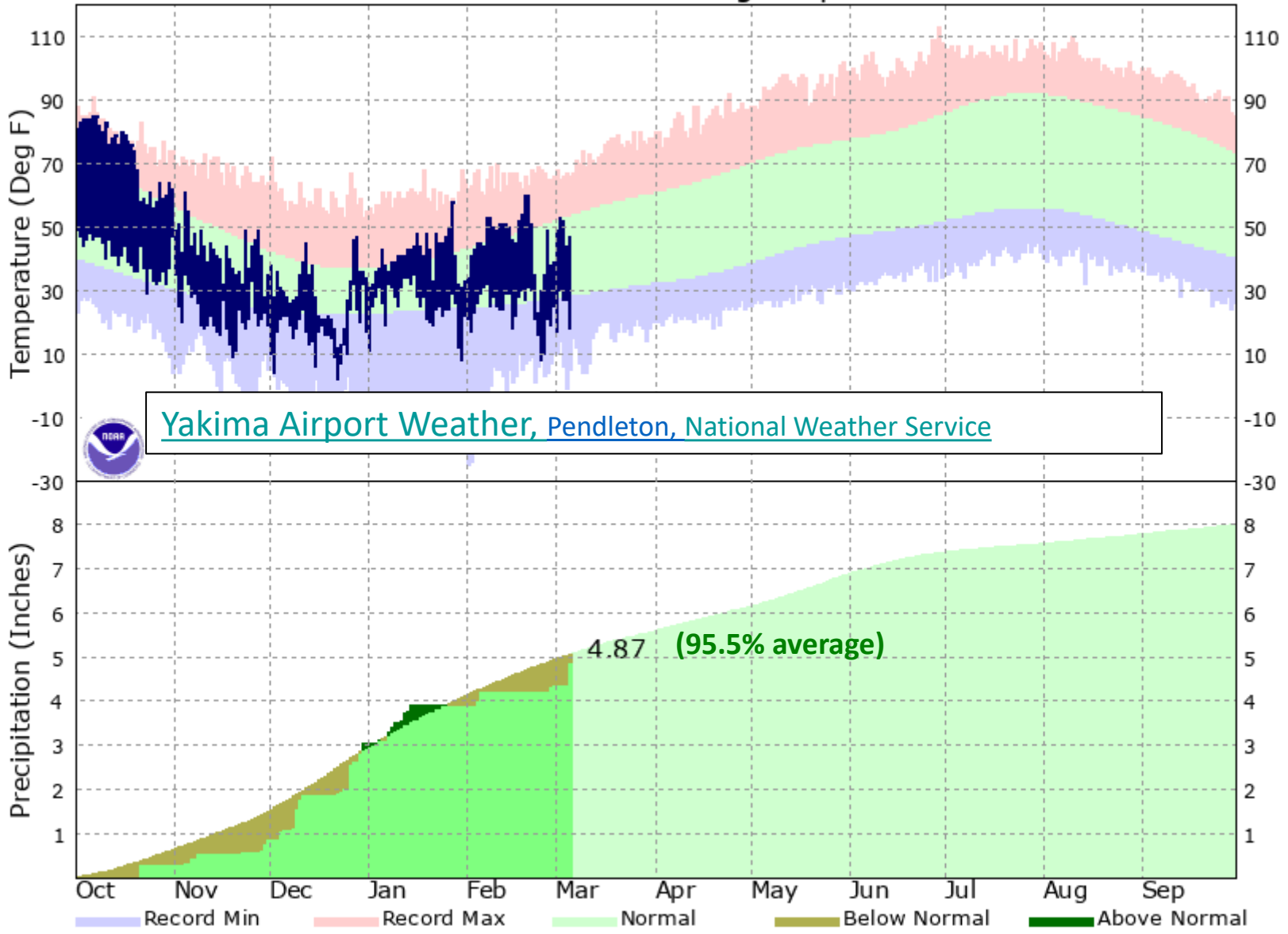
jeff.marti@ecy.wa.gov

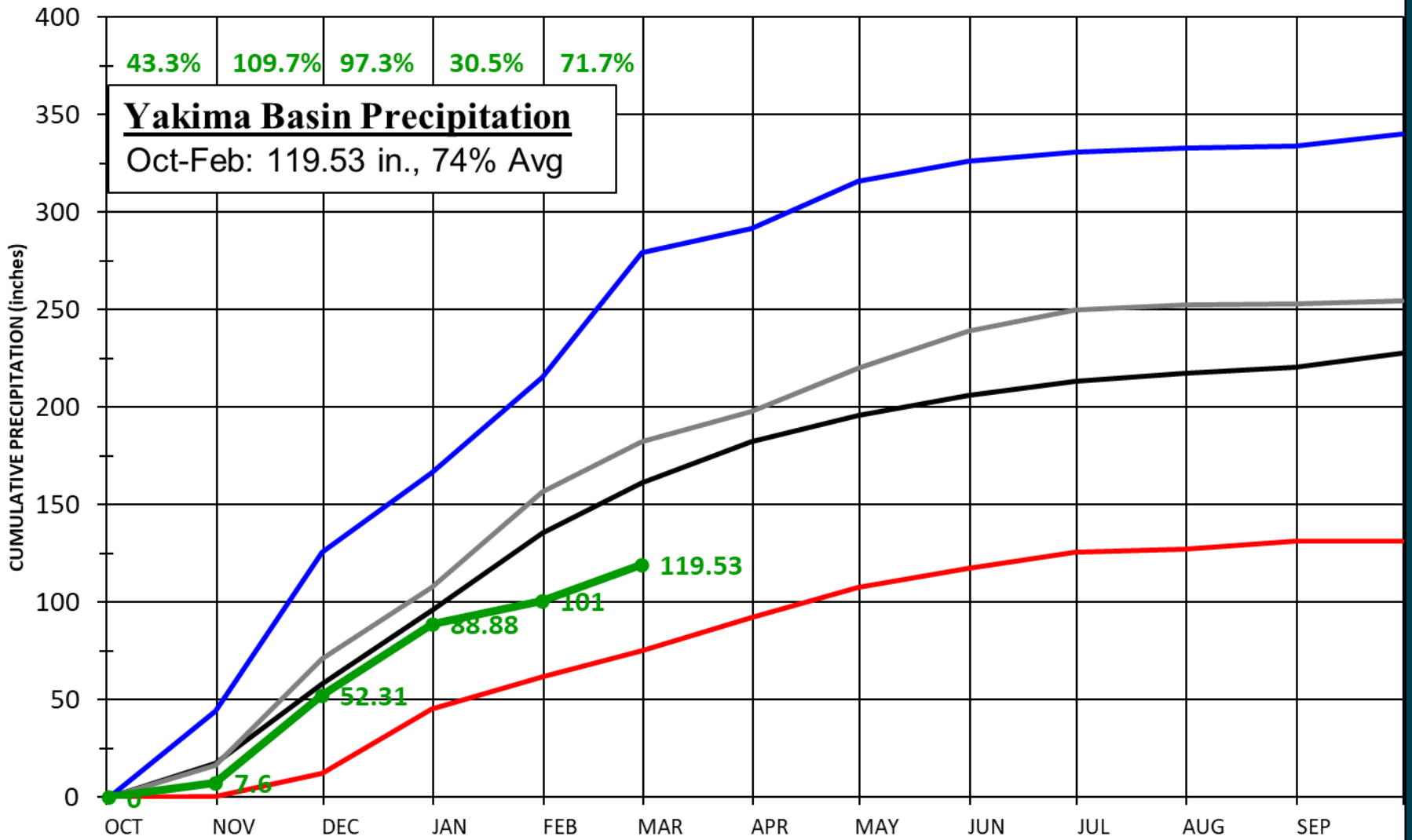


Yakima River Operations & Water Supply Preview for YRBWEP workgroup meeting, March 8, 2023



KYKM - Oct 2022 Through Sep 2023

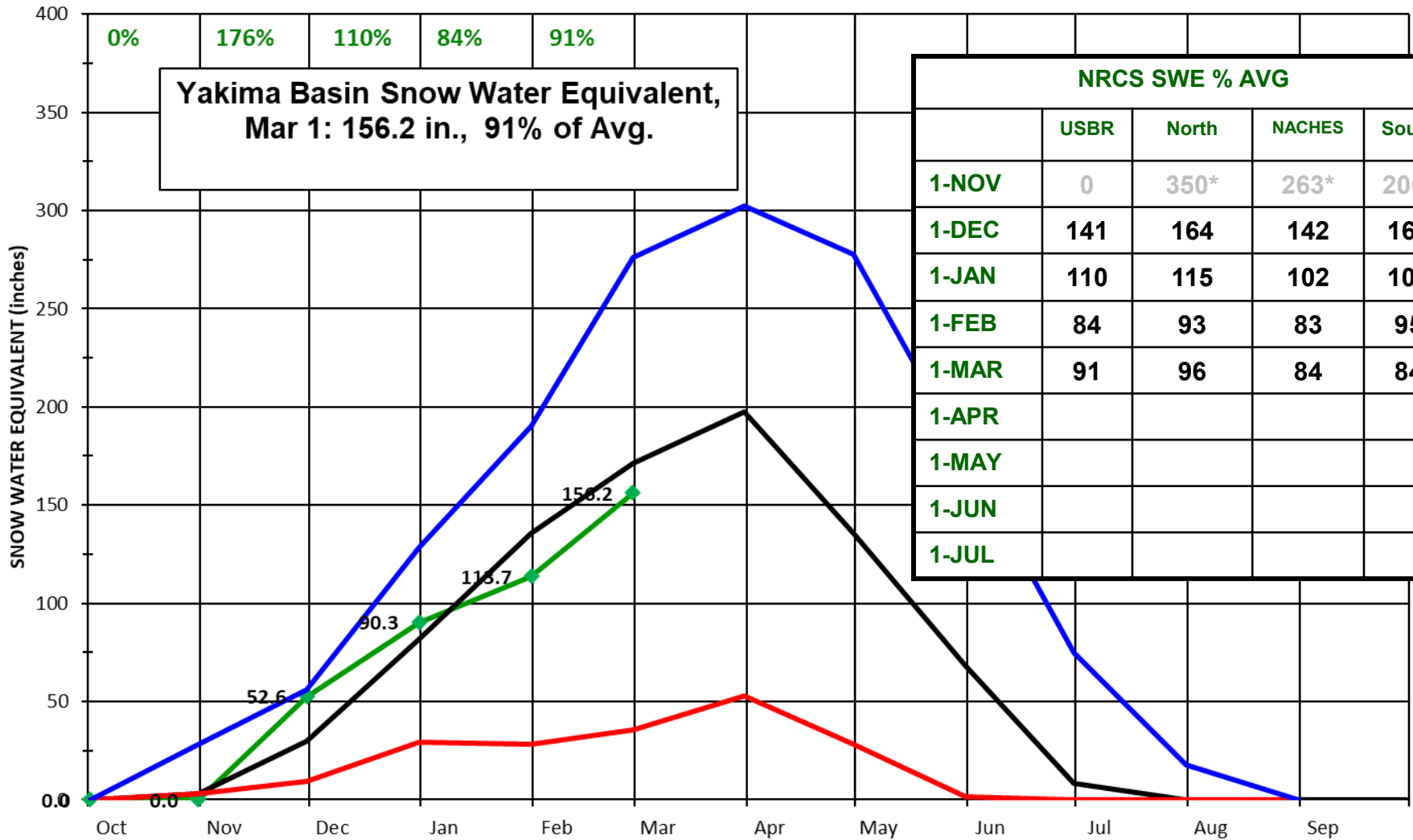




— Maximum — Average
— Minimum — WY2022
—●— WY 2023

YAKIMA BASIN
Combined Cumulative Precipitation
5 Reservoir Sites
WATER YEARS 1981-2010

UNITED STATES
 DEPARTMENT OF THE INTERIOR
 BUREAU OF RECLAMATION
 YAKIMA FIELD OFFICE
 1917 MARSH ROAD
 YAKIMA, WA 98901



- ◆ Water Year 2023
- Average
- Low Year (2005)
- High Year (1999)

**YAKIMA BASIN WATER YEAR
SNOW WATER EQUIVALENT**

Average based on greater of 1981-2010 or POR-1995
 Totals derived from 8 Yakima forecast sites
 Corral, Stampede, Olallie, Fish, Bumping, Domerie, & Tunnel Avenue

UNITED STATES
 DEPARTMENT OF THE INTERIOR
 BUREAU OF RECLAMATION
 YAKIMA FIELD OFFICE
 1917 MARSH ROAD
 YAKIMA, WA 98901

SNOW WATER EQUIVALENT IN YAKIMA

Reset Range

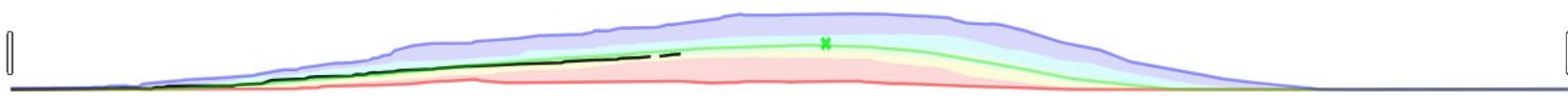
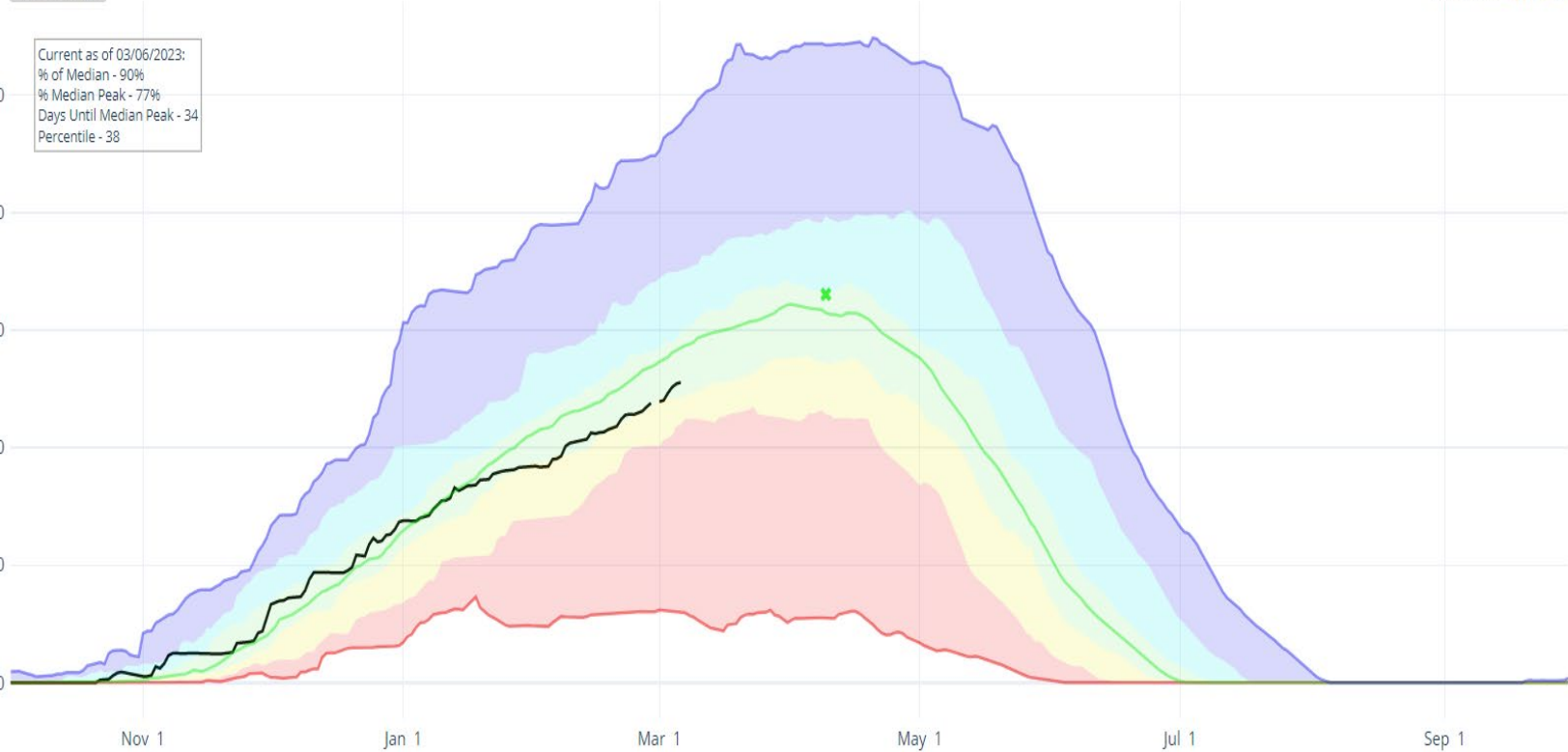
[Link to data: CSV / JSON](#)

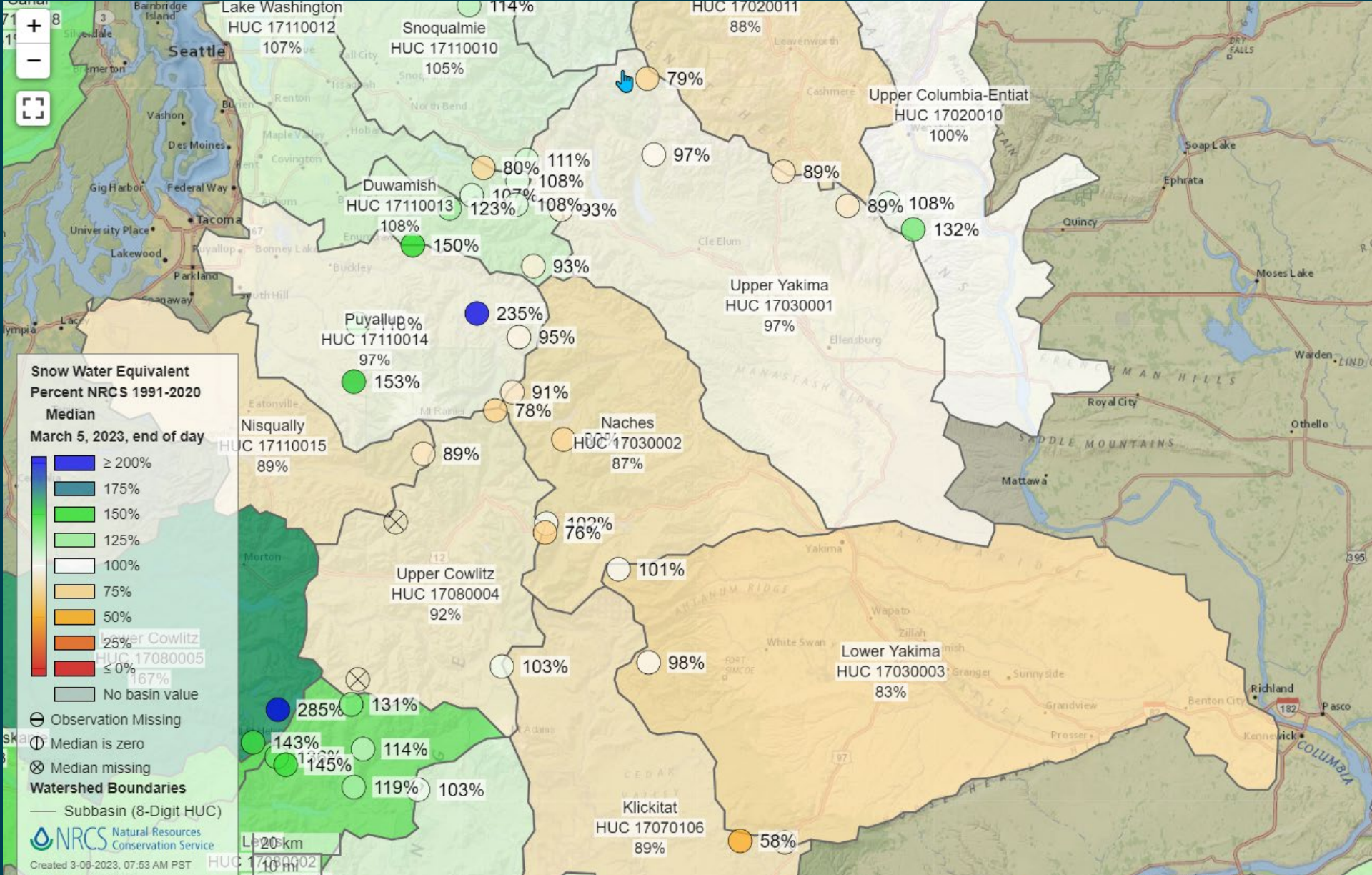
Station List

Current as of 03/06/2023:
% of Median - 90%
% Median Peak - 77%
Days Until Median Peak - 34
Percentile - 38

- ✖ Median Peak SWE
- Max
- - - Median (POR)
- Median ('91-'20)
- Min
- Stats. Shading
- 2023 (17 sites)
- 2022 (17 sites)
- 2021 (16 sites)
- 2020 (17 sites)
- 2019 (17 sites)
- 2018 (16 sites)
- 2017 (17 sites)
- 2016 (17 sites)
- 2015 (17 sites)
- 2014 (17 sites)
- 2013 (17 sites)
- 2012 (17 sites)
- 2011 (17 sites)
- 2010 (17 sites)
- 2009 (16 sites)
- 2008 (16 sites)
- 2007 (16 sites)

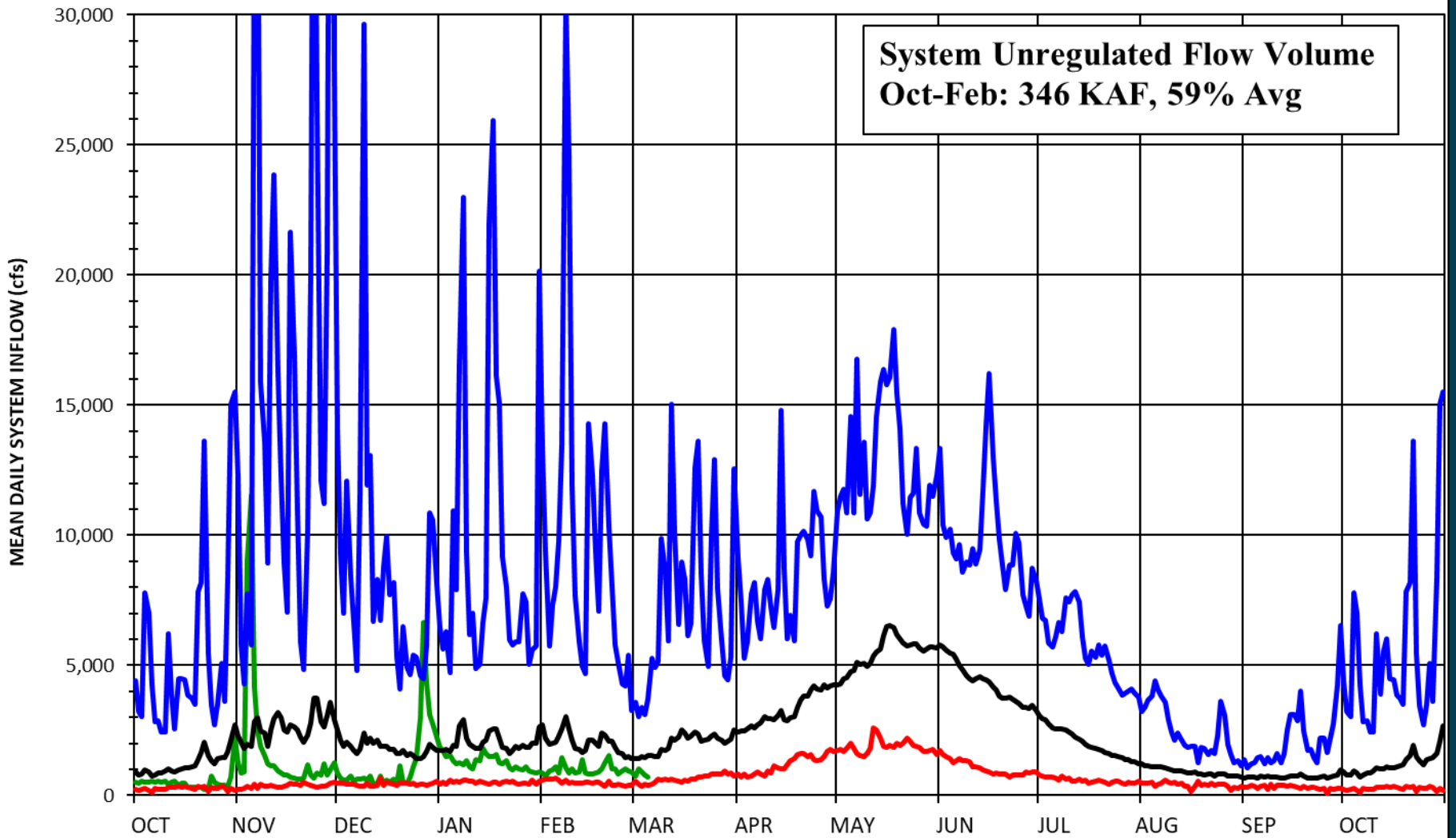
Snow Water Equivalent (in.)





Created 3-06-2023, 07:53 AM PST



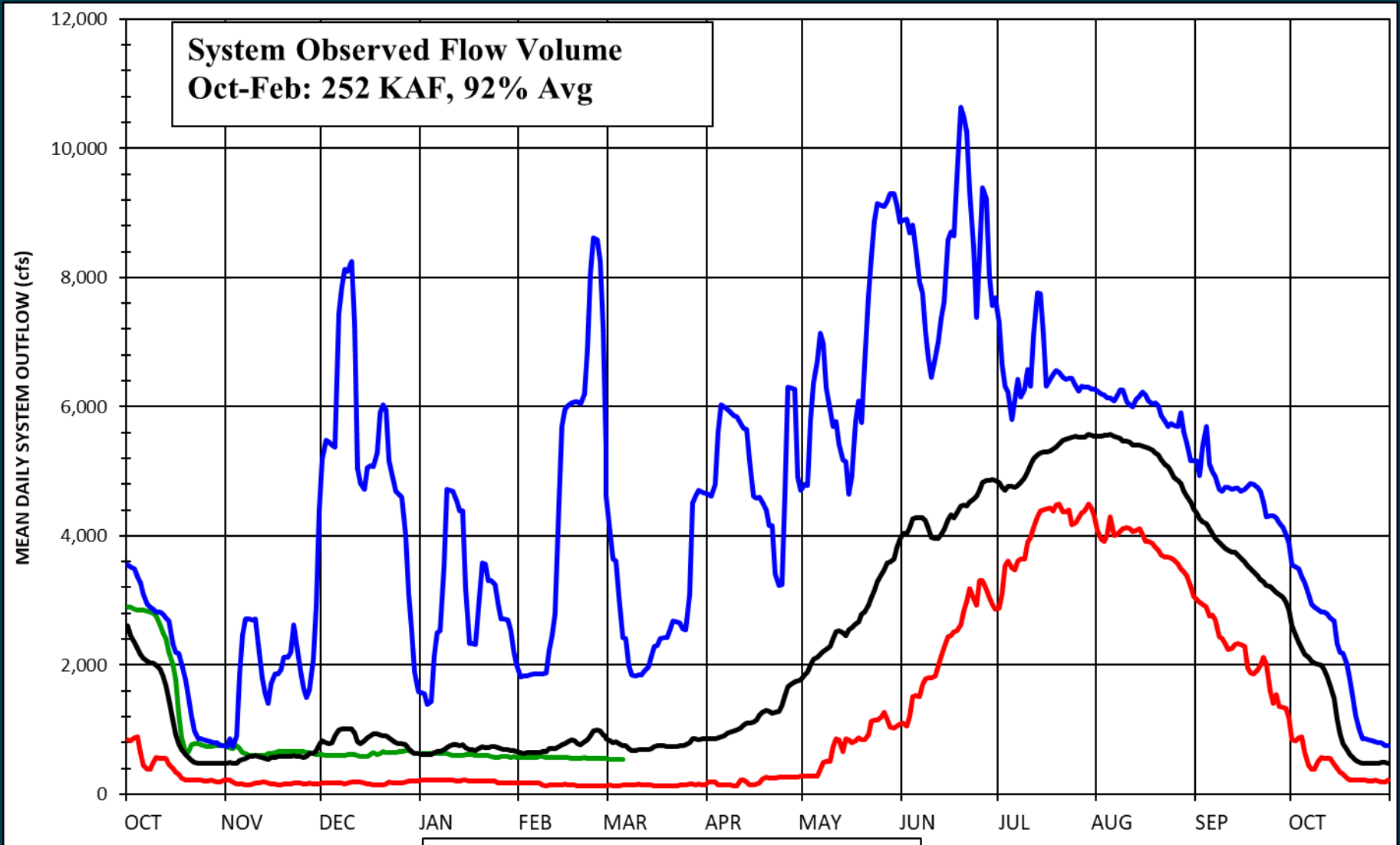


- Water Year 2023
- Min
- Avg
- max

**YAKIMA PROJECT
 SYSTEM RESERVOIRS
 SUM OF INFLOWS
 SUMMARY HYDROGRAPH
 WATER YEARS 1991-2020**

UNITED STATES
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 BUREAU OF RECLAMATION
 YAKIMA FIELD OFFICE
 1917 MARSH ROAD
 YAKIMA, WA 98901

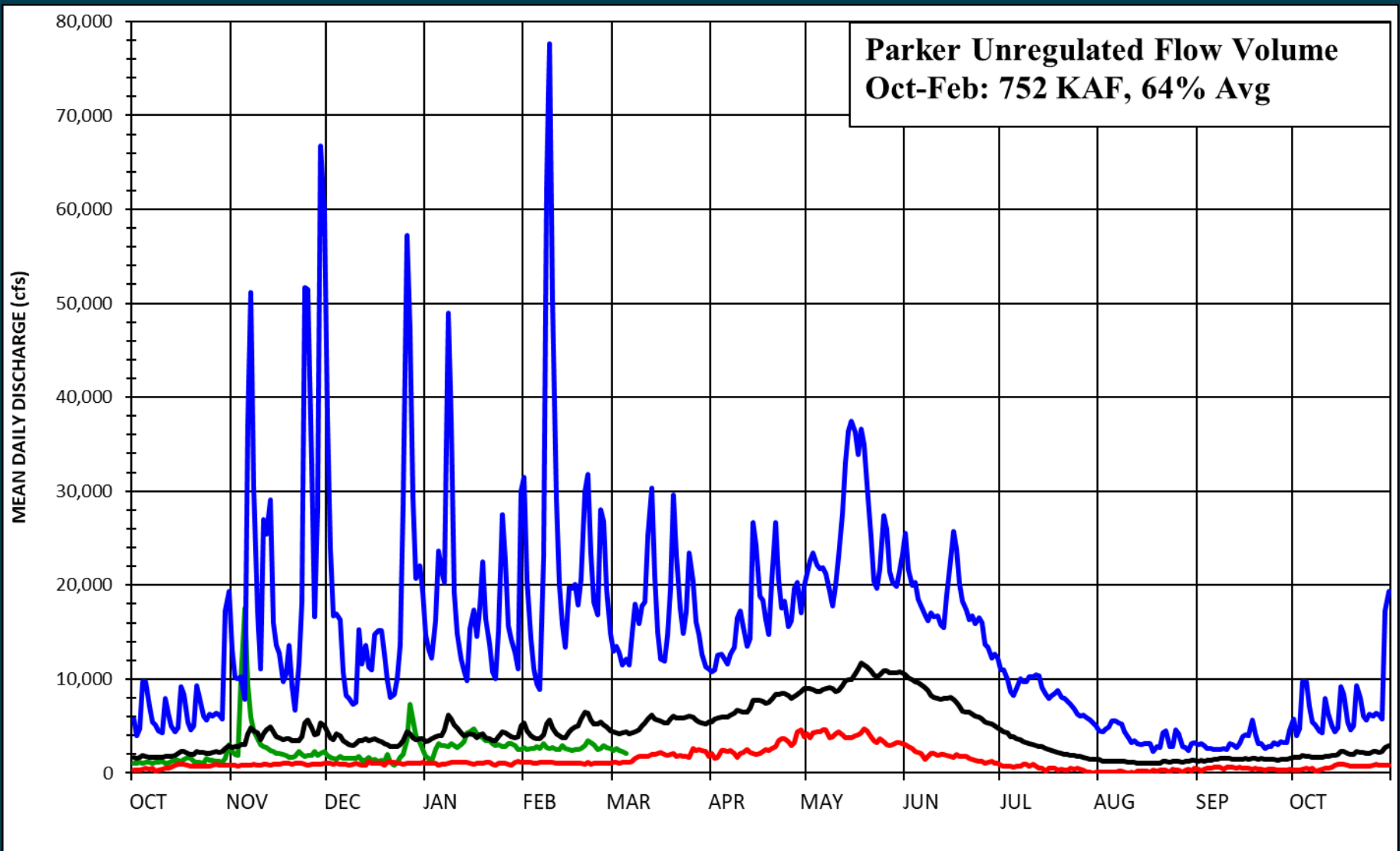
**System Observed Flow Volume
Oct-Feb: 252 KAF, 92% Avg**



— QD, WY 2023 — Minimum
— Average — Maximum

**YAKIMA PROJECT
 SYSTEM RESERVOIRS
 SUM OF OUTFLOWS
 SUMMARY HYDROGRAPH
 WATER YEARS 1981-2010**

**UNITED STATES
 DEPARTMENT OF THE INTERIOR
 BUREAU OF RECLAMATION
 YAKIMA FIELD OFFICE
 1917 MARSH ROAD
 YAKIMA, WA 98901**

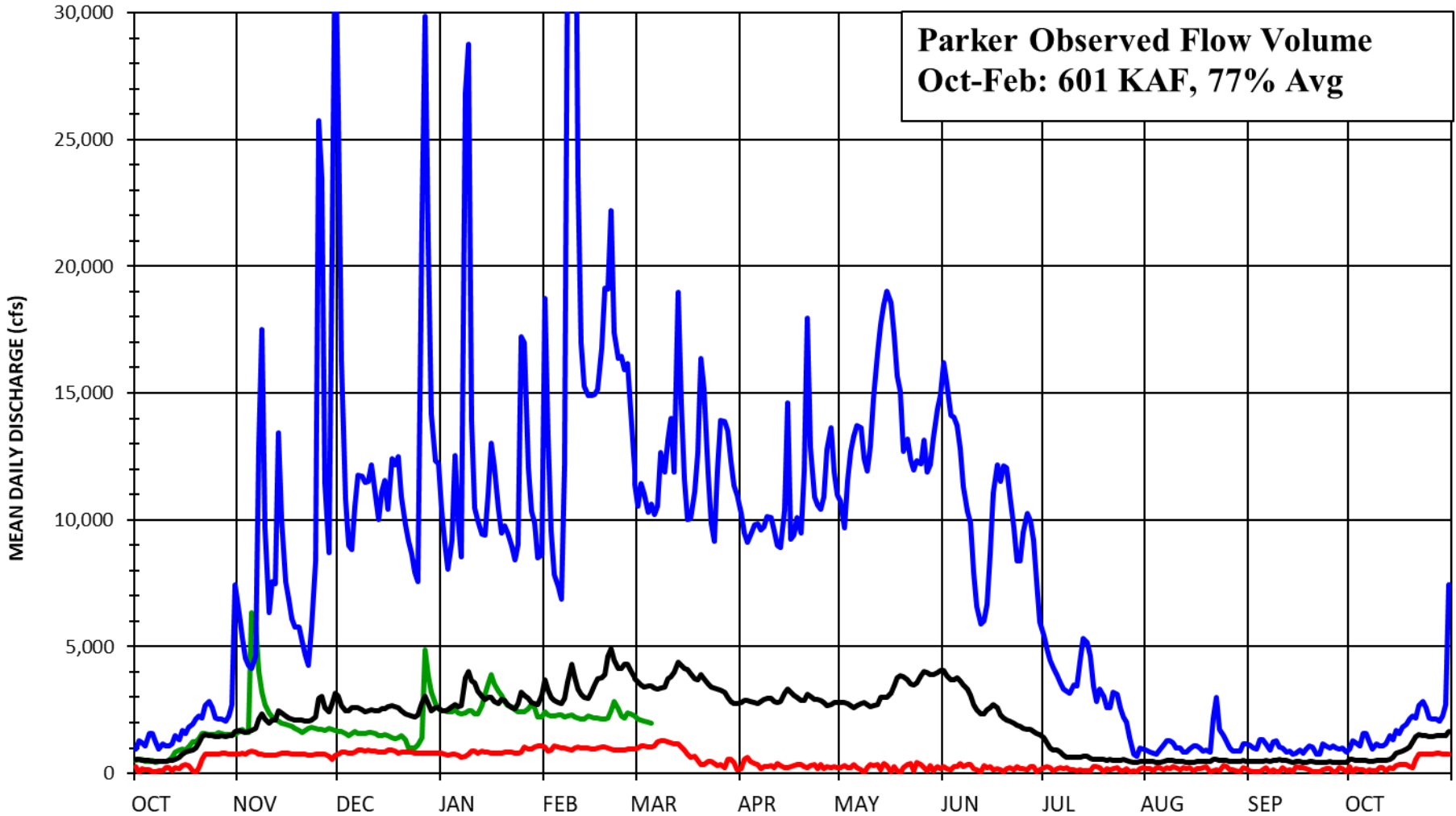


- Water Year 2023
- Minimum
- Average
- Maximum

**YAKIMA RIVER NEAR PARKER
MEAN DAILY UNREGULATED DISCHARGE
SUMMARY HYDROGRAPH
WATER YEARS 1991-2020**

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YAKIMA FIELD OFFICE
1917 MARSH ROAD
YAKIMA, WA 98901

**Parker Observed Flow Volume
Oct-Feb: 601 KAF, 77% Avg**

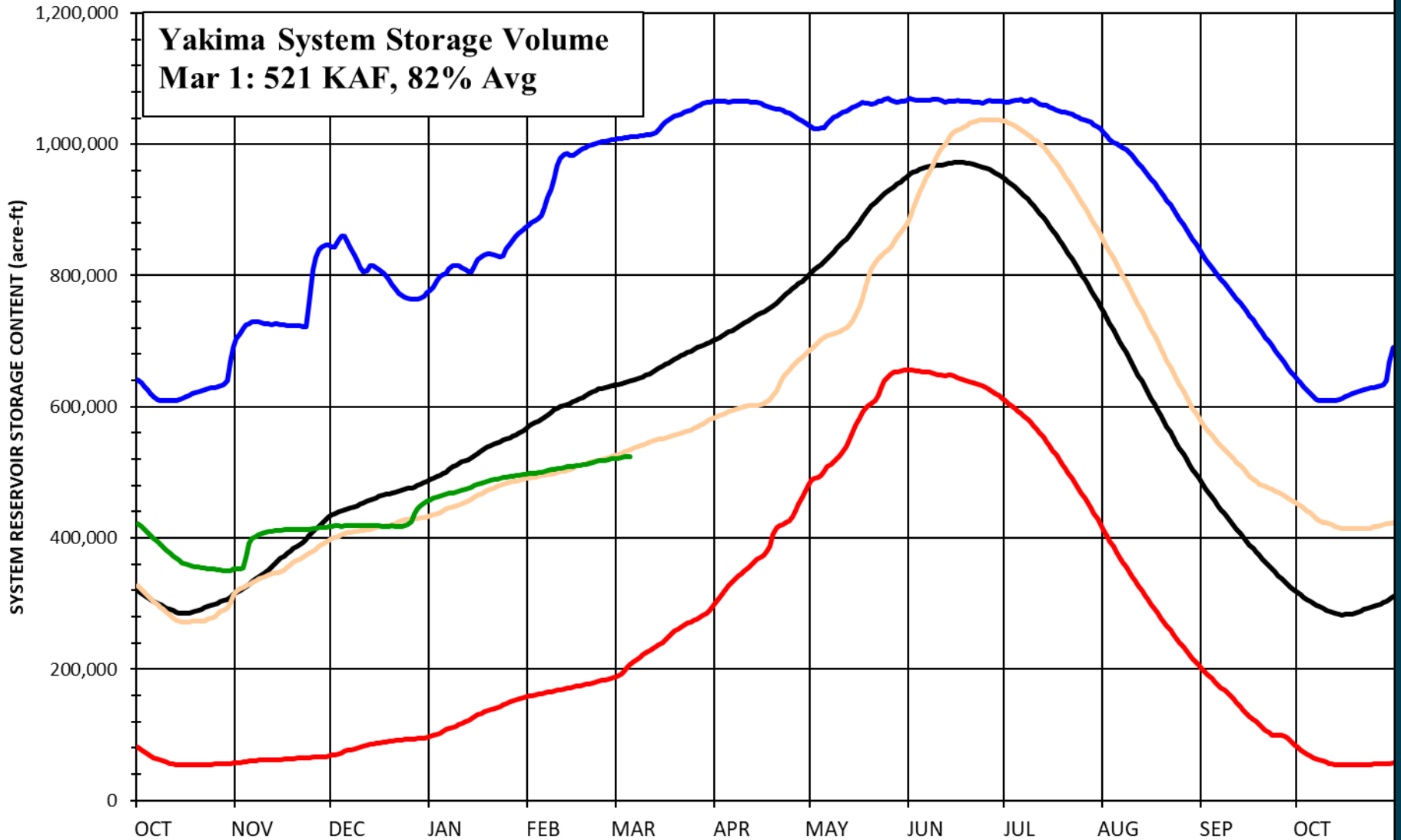


- Water Year 2023
- Minimum
- Average
- Maximum

**YAKIMA RIVER NEAR PARKER
MEAN DAILY REGULATED DISCHARGE
SUMMARY HYDROGRAPH
WATER YEARS 1991-2020**

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
YAKIMA FIELD OFFICE
1917 MARSH ROAD
YAKIMA, WA 98901

Yakima System Storage Volume
Mar 1: 521 KAF, 82% Avg

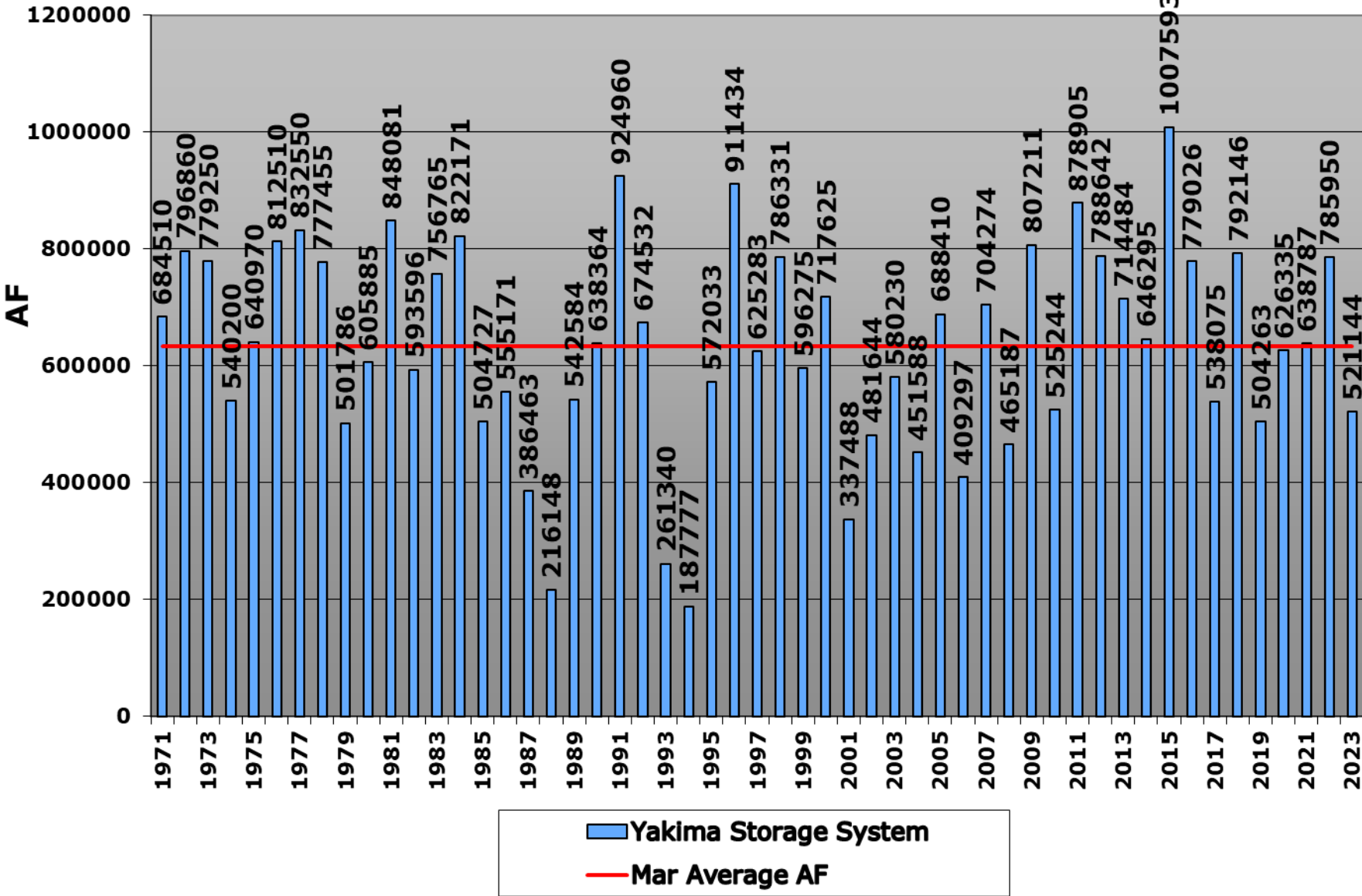


- Min
- Avg
- max
- 2010
- Water Year 2023

YAKIMA PROJECT STORAGE
MEAN DAILY RESERVOIR VOLUME
SUMMARY HYDROGRAPH
WATER YEARS 1991-2020

UNITED STATES
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 1917 MARSH ROAD
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Yakima Basin Storage, Historical Comparison



Climate Prediction Center

<u>Period</u>	<u>Temperature</u>	<u>Precipitation</u>
6-10 day (Mar 11 to 15)	Below Normal	Above Normal
8-14 day (Mar 13 to 19)	Below Normal	Above Normal
Seasonal Outlook (date issued)		
Winter (Feb 16)	Below Normal	Normal
Spring (Feb 16)	Normal	Below Normal

“ENSO-neutral conditions are expected to begin within the next couple of months, and persist through the Northern Hemisphere spring and early summer.” Feb 9 2023

<https://www.cpc.ncep.noaa.gov/>

<http://www.cpc.ncep.noaa.gov/products/predictions/610day/>

<http://www.cpc.ncep.noaa.gov/products/predictions/814day/>

<http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/enso.shtml>

<http://www.nws.noaa.gov/climate/outlook.php?wfo=pdf&site=459465>

http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/

http://www.cpc.ncep.noaa.gov/products/predictions//multi_season/13_seasonal_outlooks/color/churchill.php

<https://www.cpc.ncep.noaa.gov/products/predictions/90day/>



Yakima Subbasin forecasts

Yakima Basin Forecasts, Mar-Jul, AF

Mar, 2023	Low	Composite	High	Low	Adopted	High
Parw	1397428	1803852	2222884	70%	91%	112%
kee	99841	126067	157656	74%	93%	117%
kac	87560	112969	136054	71%	92%	111%
cle	323376	394710	459740	75%	92%	107%
bum	92951	117001	142983	73%	92%	112%
rim	159167	193735	233311	75%	91%	109%
Yumw	640013	815323	966148	73%	93%	110%
Nacw	552691	705228	898448	69%	88%	112%
System	762896	944483	1129746	74%	92%	110%



Hydrologic Summary

- January and February were “dry”
- Snowpack is below average at 91%.
- System storage has not kept up with average.
 - 120% average on Nov 7, 2022.
 - 82% average on Mar 1, 2023. Not quite half full.
- Natural stream flows have been below 60% avg.