Water Year 2023 Snow Season Recap California Experience

NWS Webinar, August 8, 2023

Michael L. Anderson, State Climatologist

Talk Overview

- Antecedent Conditions
- Highlights of the Season
- Observations/Models/Expectations

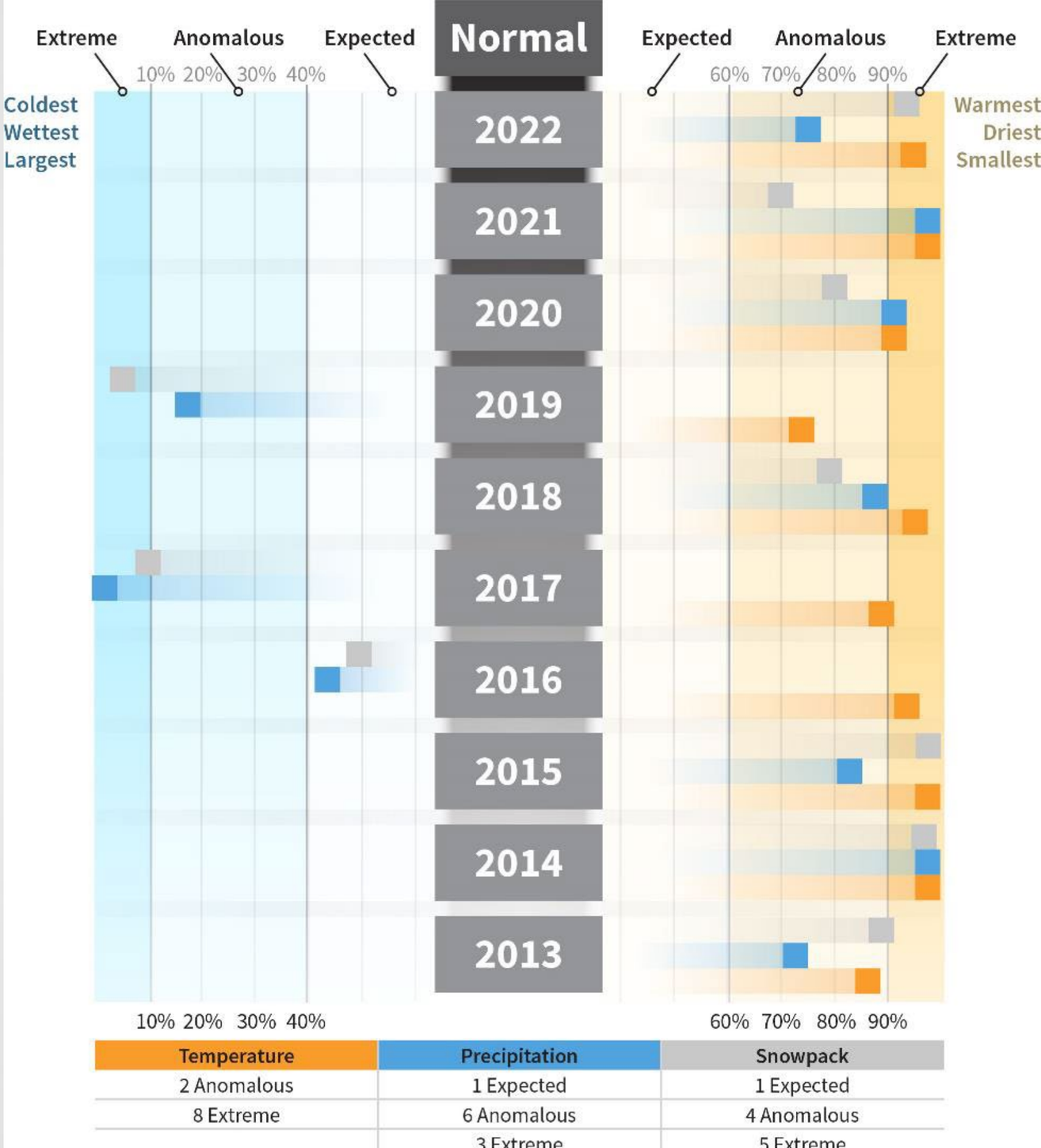
Building the Water Year

- Fall (October/November)
  - Precipitation Onset
  - Temperature Anomaly
  - Soil Moisture State with Snowpack Initiation
- Winter (December/January/February)
  - Wet/Dry
  - Notable Anomalies
- Spring (March/April/May)
  - Late-Season Bailout or Early Shutoff?
  - Peak Snowpack Timing and Magnitude
- Summer (June/July/August/September)
  - Drying Pace and Scale
  - Heat Events
  - Tropical Activity
- Multi-Year Prediction – What about next year?

Climate Change: How much different will the next decade be?

A Decade of Extremes

- WY2023 adding to extremes narrative
  - Dry to Wet shift
  - Multiple Extremes
  - New Records
- New opportunities for adaptation



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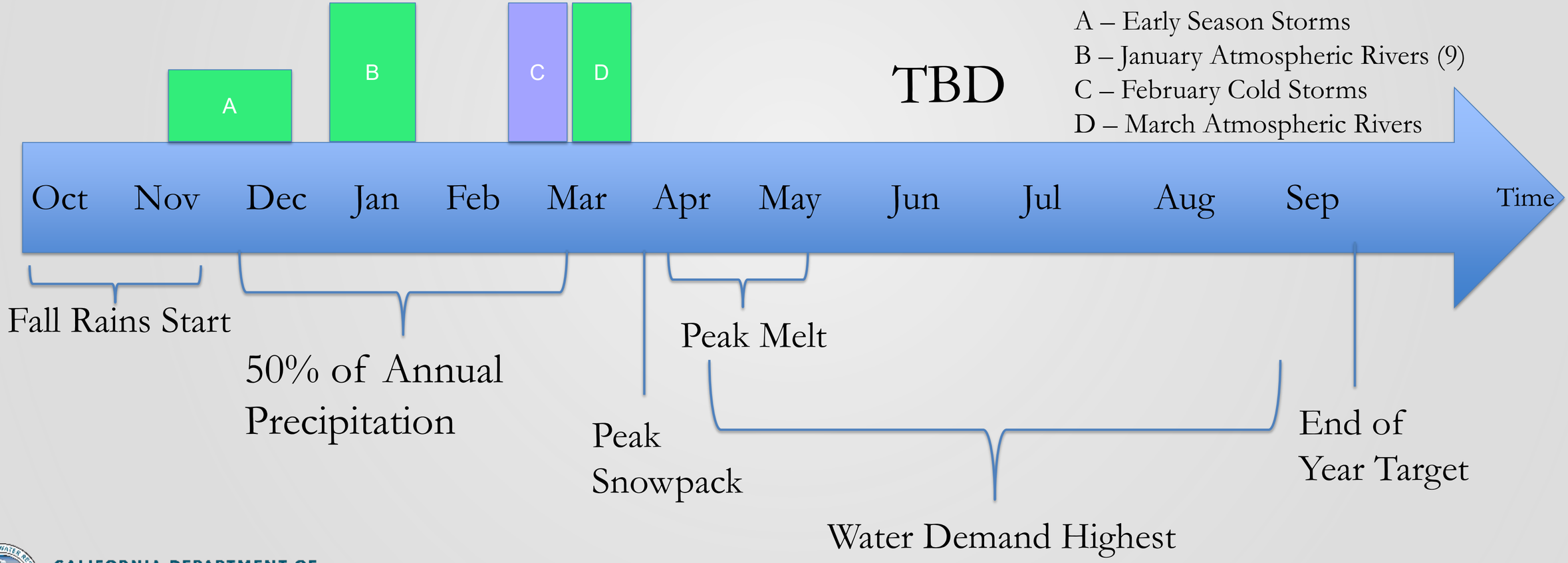
Building a Water Year 2023

Oct-Mar: 153% of Average Statewide – 6th wettest

Oct-Mar: 199% of Average San Joaquin Climate Division – wettest

April 1 Snowpack: Only 4th year since 1950 with more than 200% of average; 1st since 1983



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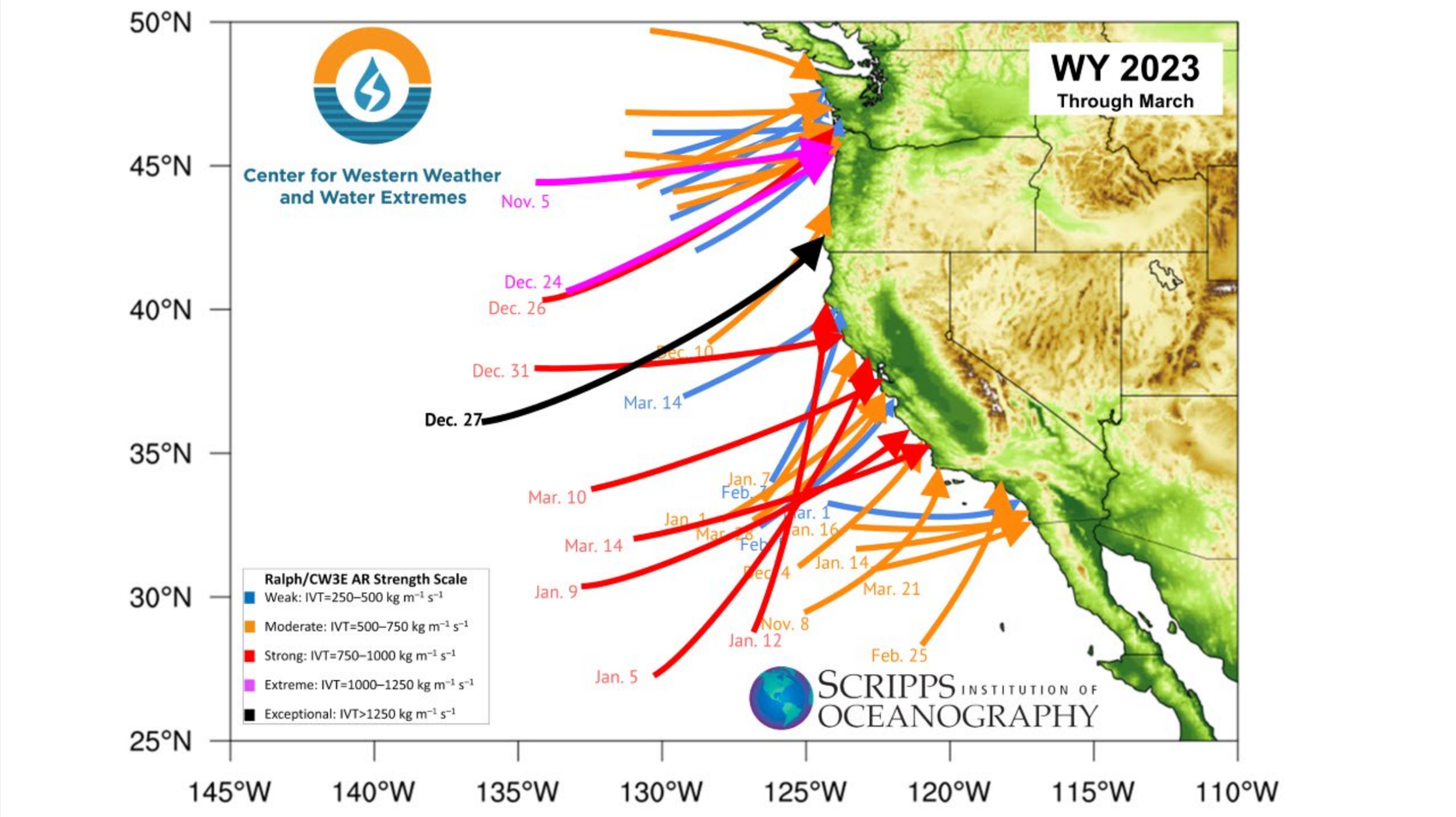
Water Year 2023 Atmospheric Rivers



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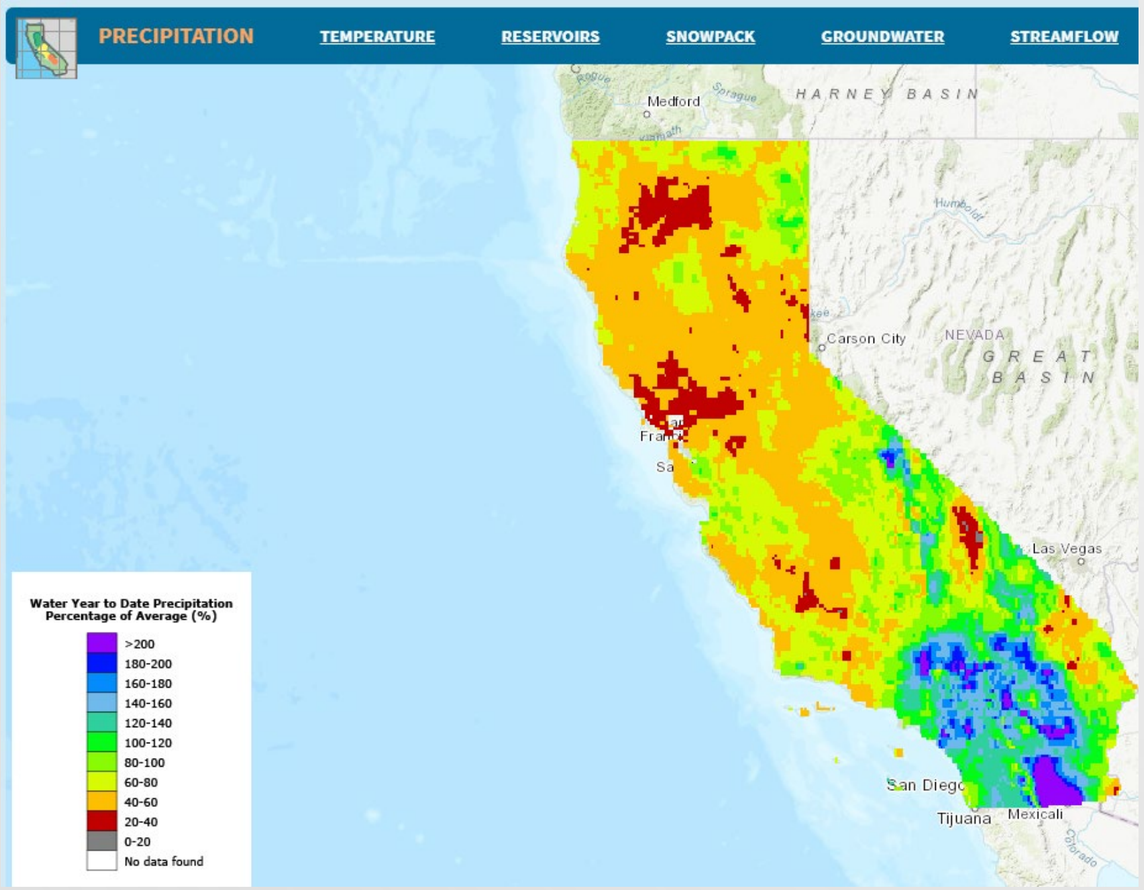
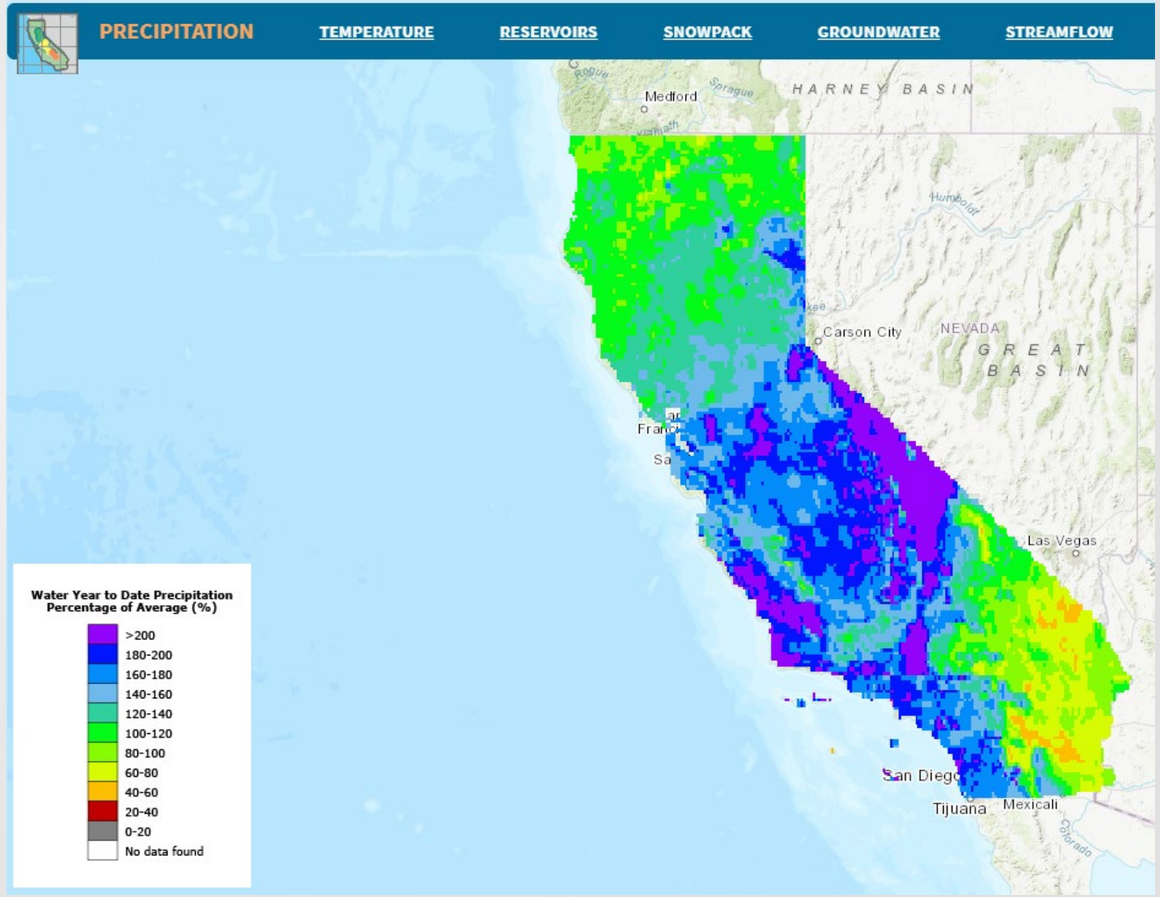
Within-Year Variability Water Year 2023

December 1, 2022



April 22, 2023



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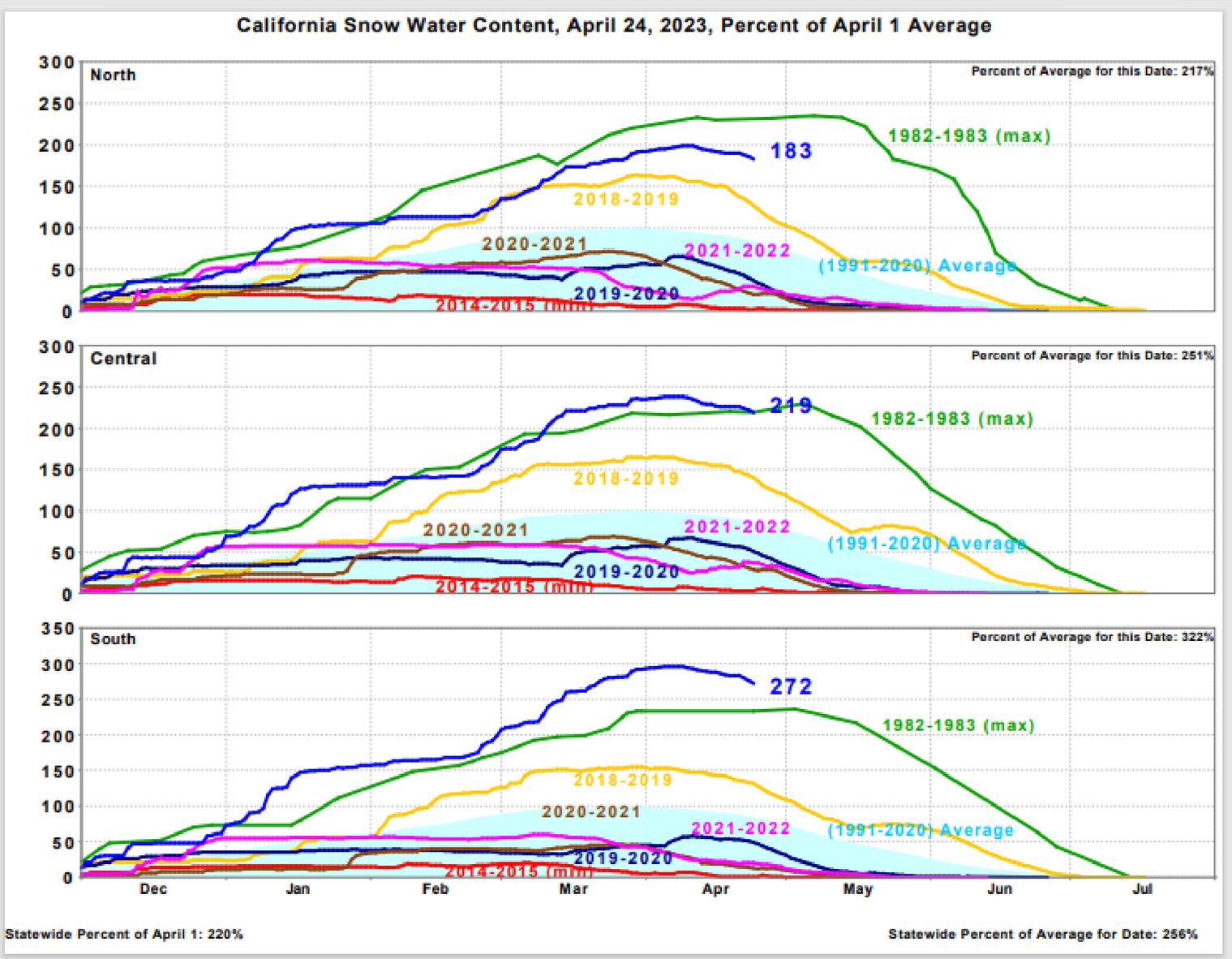
Regional Snowpack Comparisons



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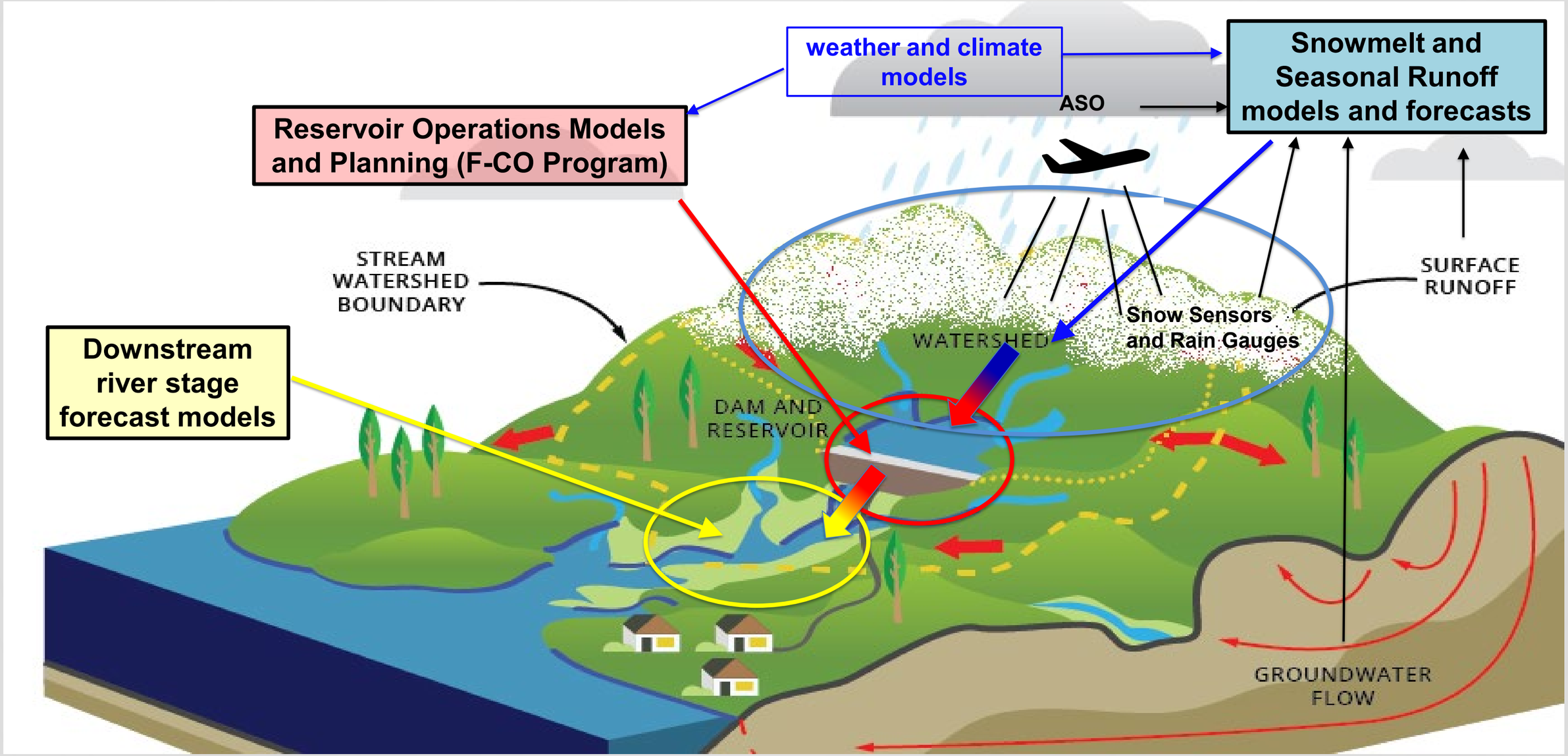
DWR and the CNRFC generate snowmelt and seasonal runoff forecasts, reservoir inflow and operations models, and river stage forecasts



Sentinel View of Tulare Lakebed

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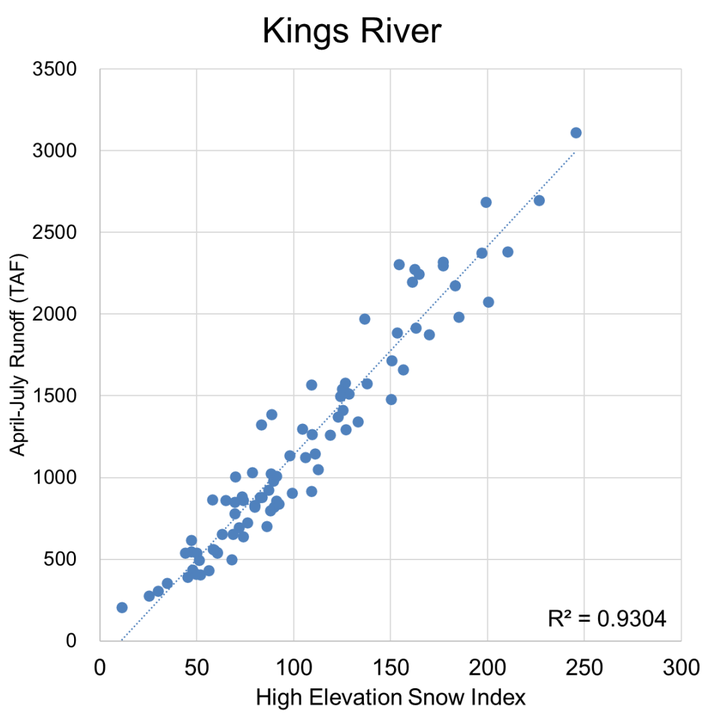
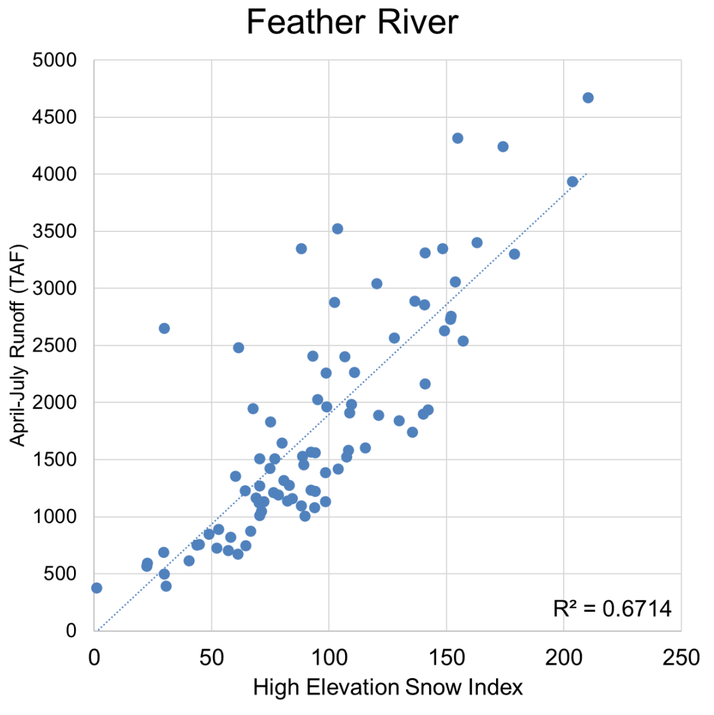
Bulletin 120 Legacy Forecasting Procedure

- Water supply forecasts are based on multiple linear regression equations that relate April-July unimpaired runoff to:
  - Snow
  - Precipitation
  - Runoff





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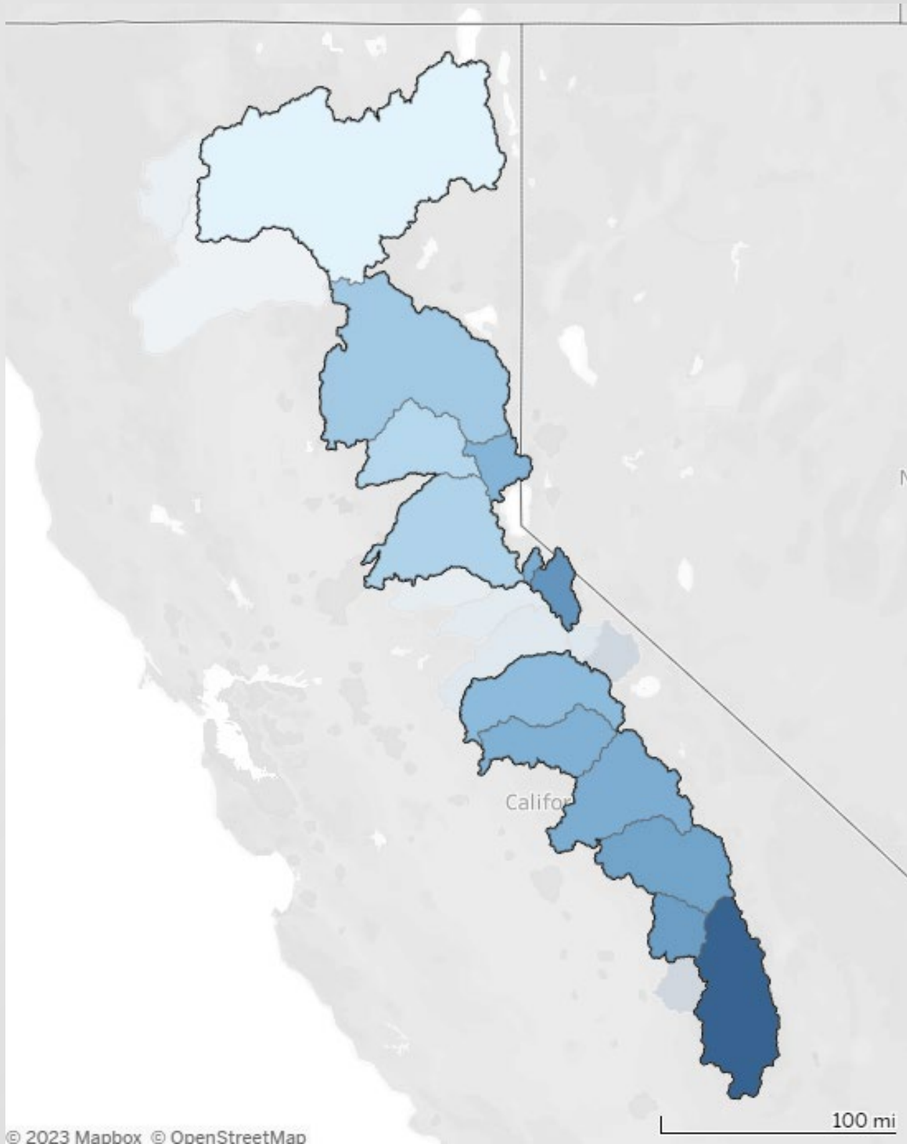
Water Year 2022-2023: A peek into the ARSS Program

- First WY with ~$10.25M baseline funding from State budget
  - Includes three new Water Resources Engineer positions
- As of July 2, completed 65 of 65 ASO data acquisition flights on the following watersheds

Lake Shasta drainage (Sac, McCloud, Pit)	San Joaquin
Feather	Kings
Yuba	Kaweah
American	Kern
Tuolumne	Truckee
Merced	Carson

- iSnobal modeling through M3Works for 11 watersheds
- WRF-Hydro modeling through NCAR for Feather, Merced, Tuolumne, San Joaquin, and Kings watersheds



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AIRBORNE SNOW OBSERVATORIES, INC

M3Works

NCAR

Aerial Remote Sensing of Snow Program (ARSS)

KINGS RIVER BASIN
MARCH 31 - APRIL 2, 2023 SURVEY

Survey Date: March 31 - April 2, 2023
Survey # of Water Year 2023: 3
Report Delivery Date: April 6, 2023

Full basin SWE: 3772 ± 132 TAF
Change in SWE since Mar 16-17, 2023: + 280 TAF
Estimated snowline: 4600 feet

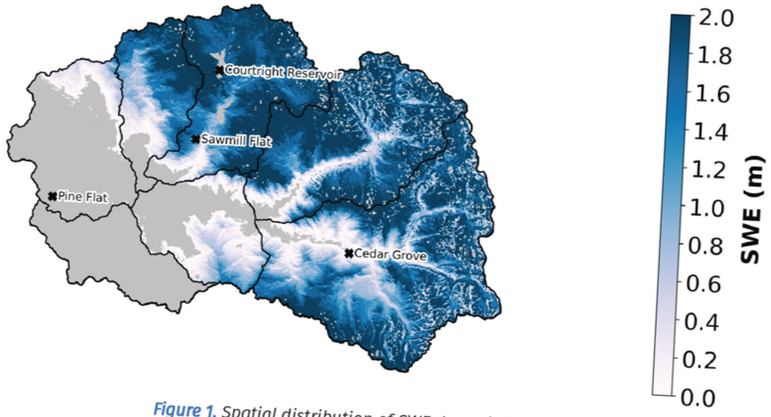
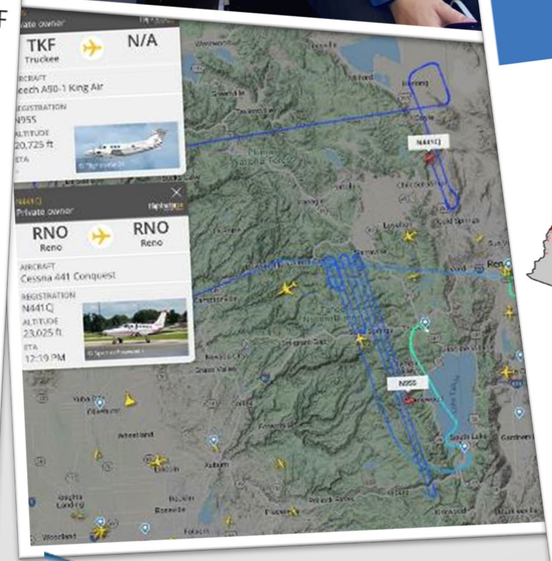
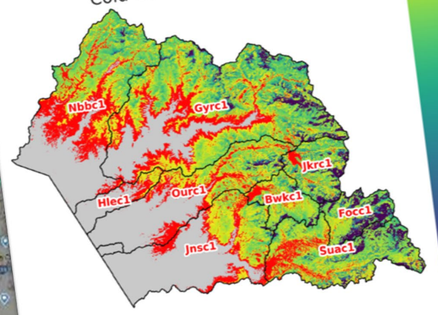


Figure 1. Spatial distribution of SWE depth (m).



YUBA RIVER BASIN
APRIL 18, 2023 MODELING REPORT



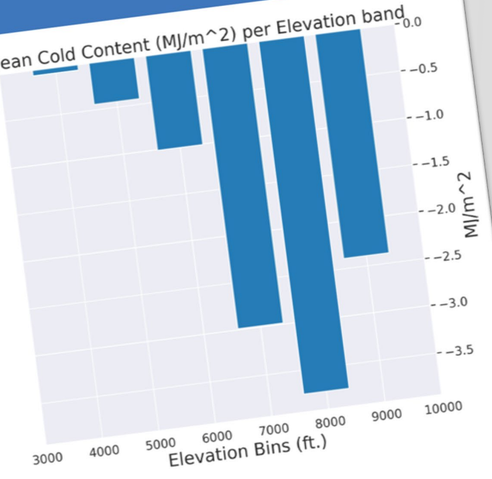


Fig.8 Cold Content as of 2023-04-18

The un-ripe snow represents approximately 92.50% of the basin SWE.

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M3Works

NCAR

Dr. Anderson's WY2023 Outlook 10/7/22

- Precipitation onset bolstered by September rains arriving over the weekend.
- High pressure will be in eastern Pacific for at least part of the winter – dry conditions are associated with this pattern leading to a below average seasonal precipitation outcome.
- La Nina decay timing important for potential wet extremes in late December through January.
- Below-Average spring precipitation; warmer than average temperatures
- Below 70% of average snowpack likely on April 1

Closing Thoughts

- Water year 2023 has proven to be a dynamic year with multiple forms of extremes.
- Pivoted from the driest 3-year period to the one of the wettest 3-week periods and one of the largest snowpacks in the observed record.
- Expectations to managing novel extremes with El Niño are strong

Questions?

- Email: Michael.L.Anderson@water.ca.gov

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