Animas Consolidated Ditch Company

Water Supply Outlook

April 10, 2021

Eric Bikis
Principal Water Resources Consultant

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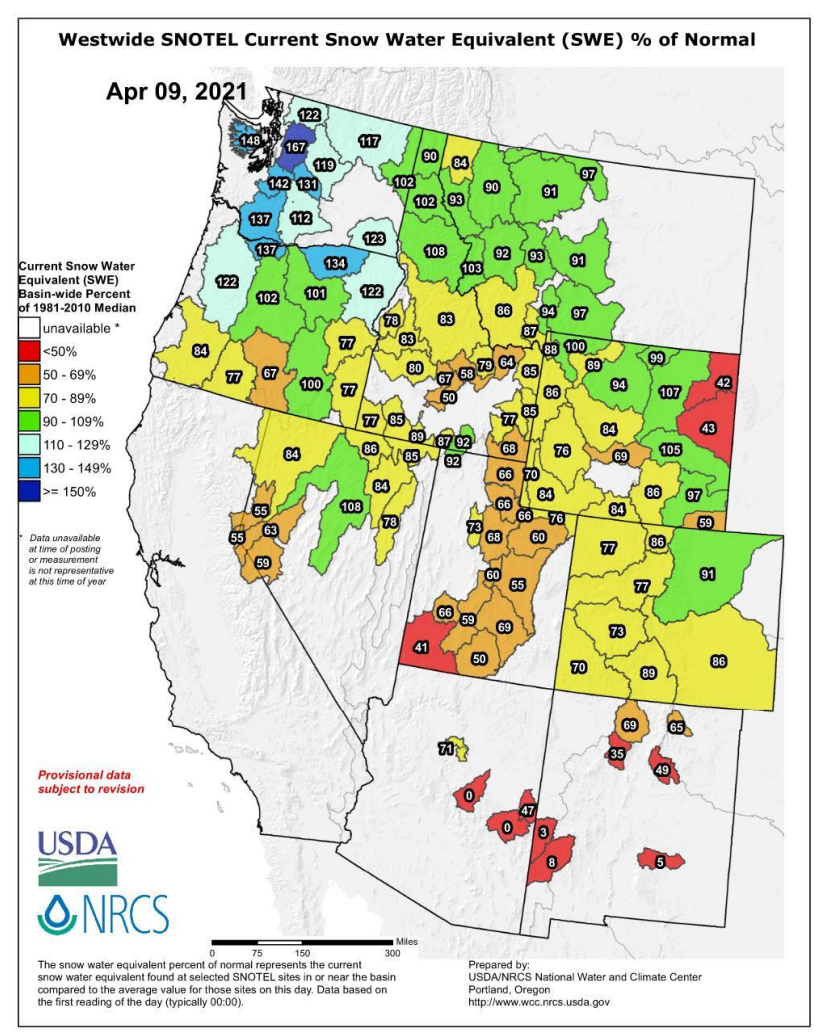
Westwide SNOTEL Current SWE % of Normal



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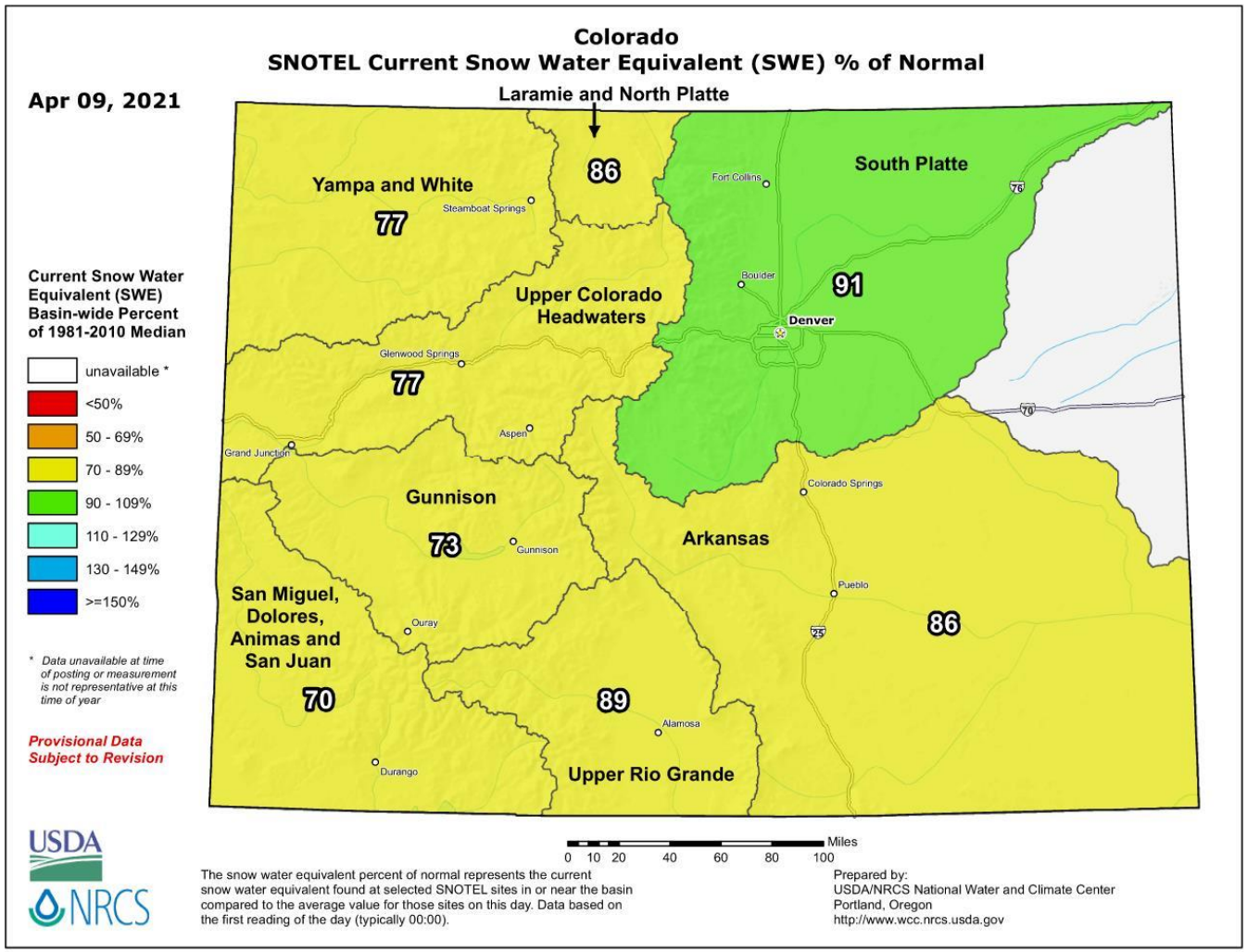
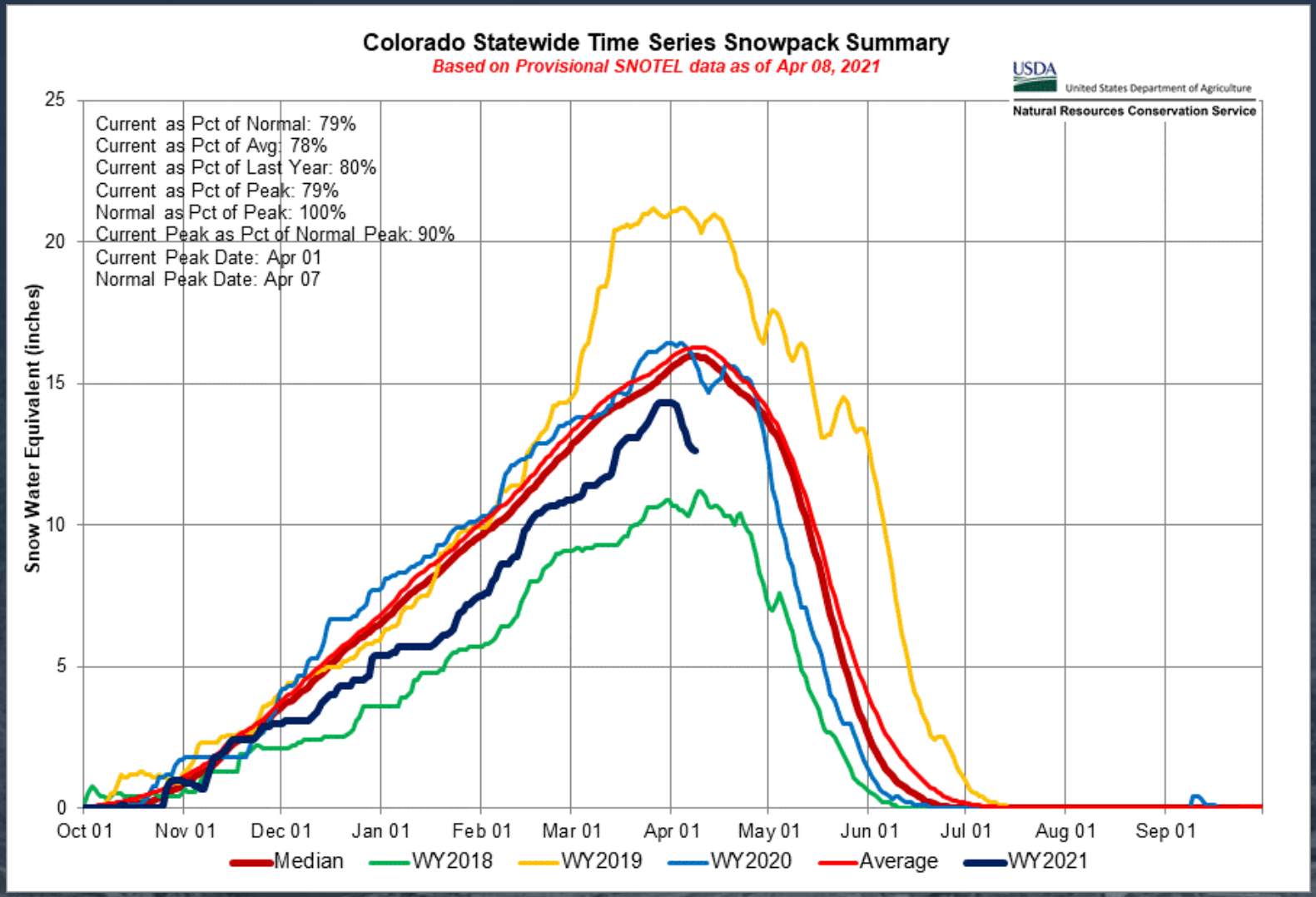
Colorado Current SNOTEL SWE % of Normal



Colorado Statewide Time Series Snowpack



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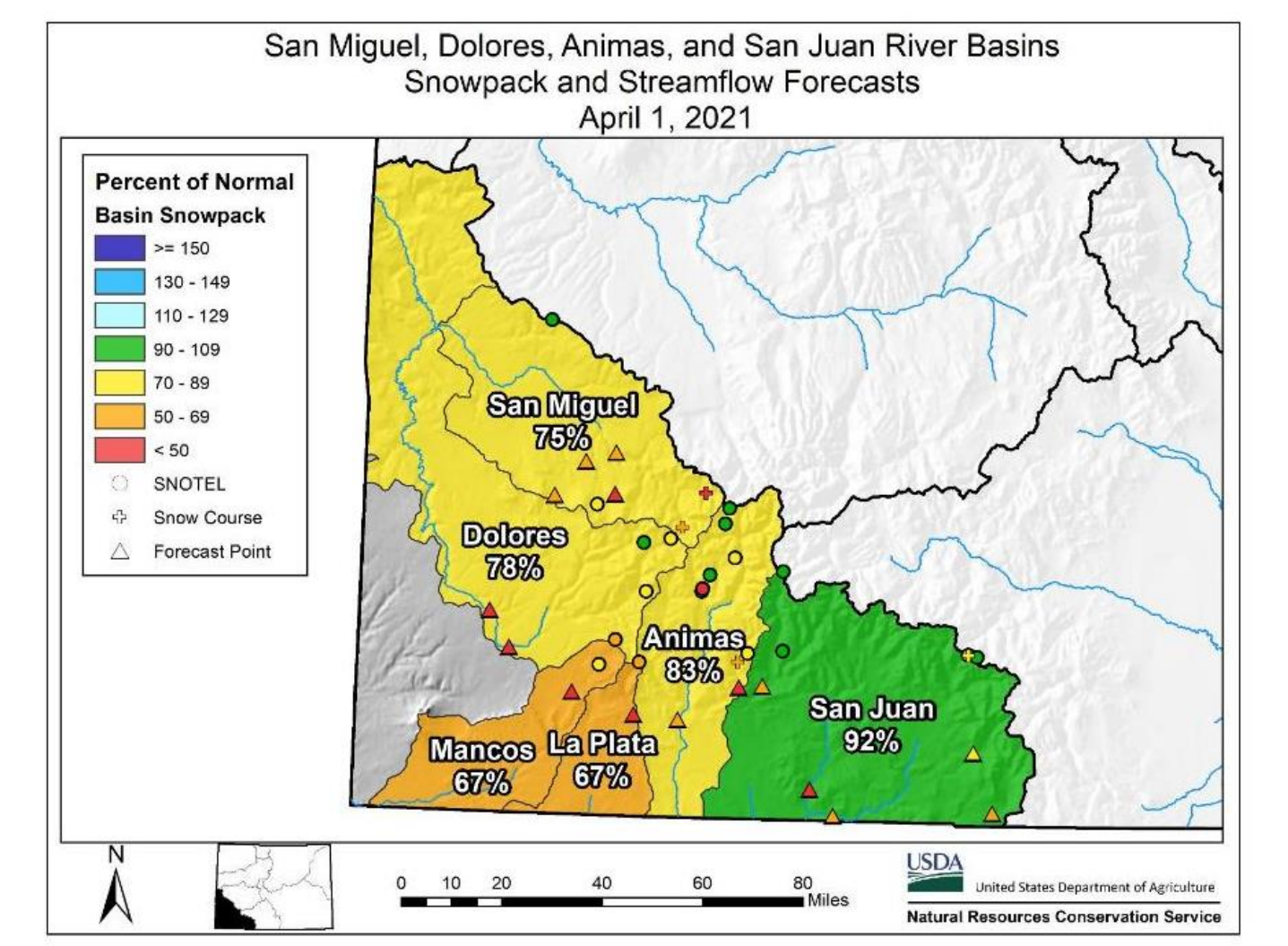
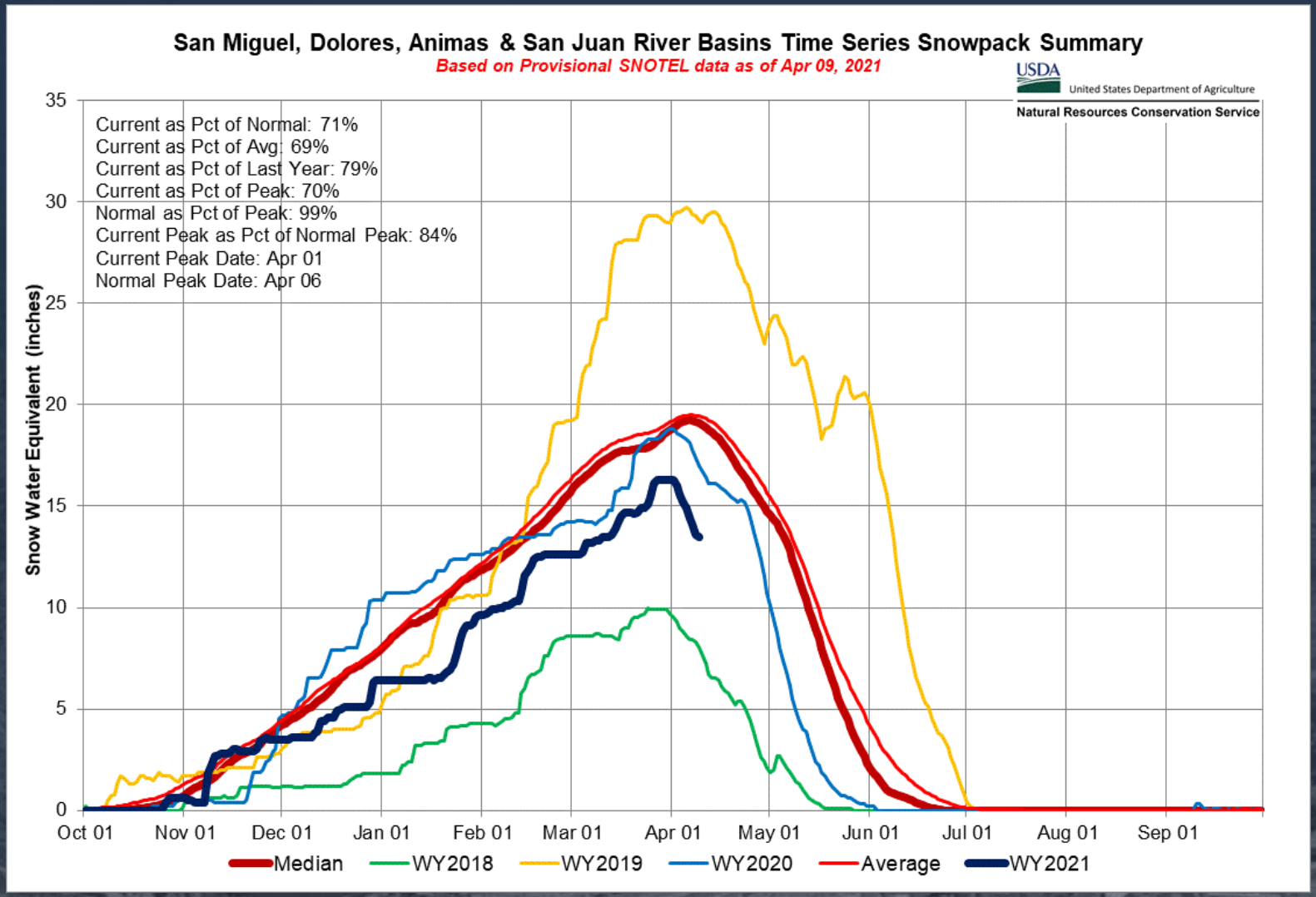
Snowpack and Streamflow Forecasts



SW Colorado Time Series Snowpack



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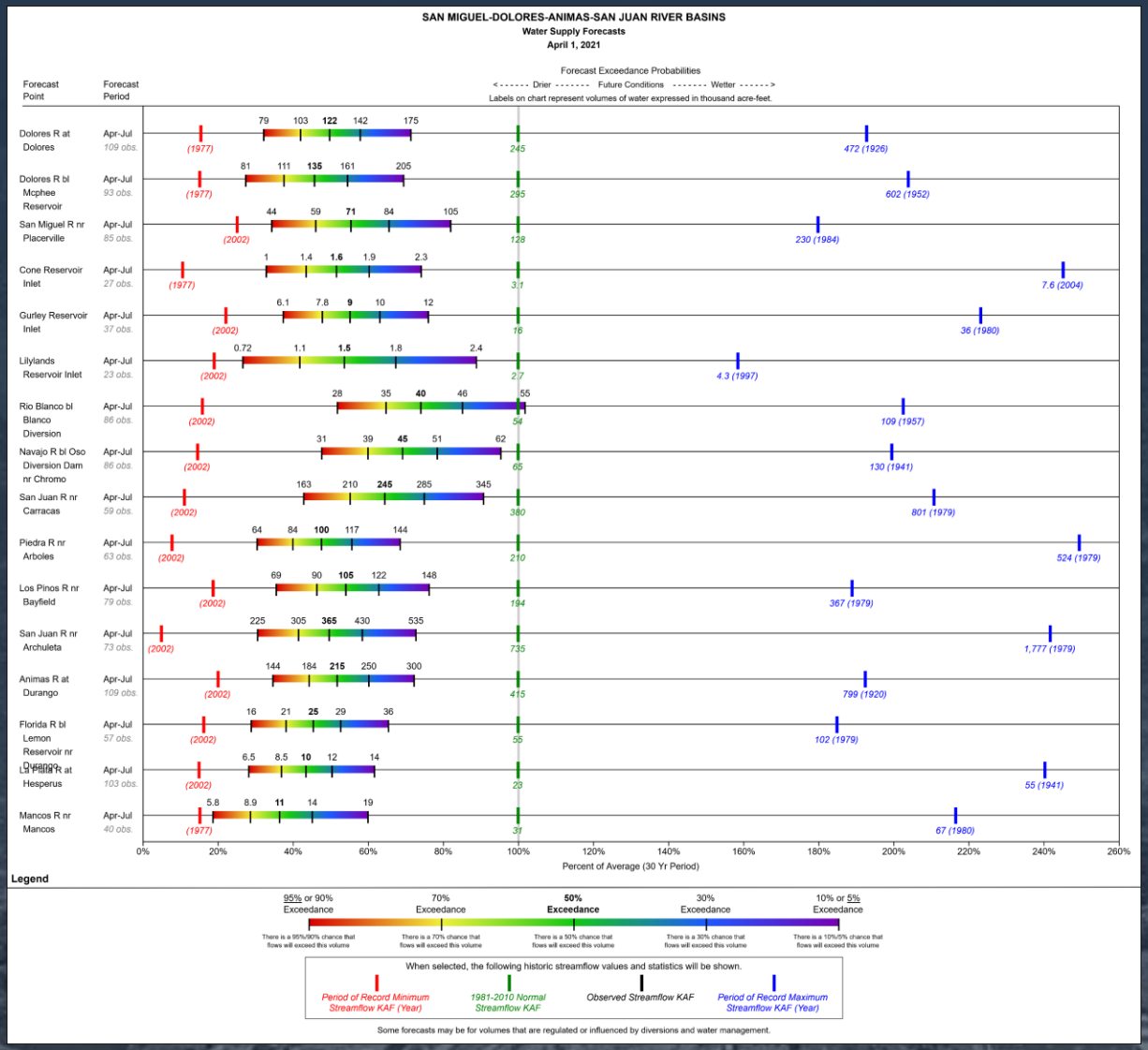
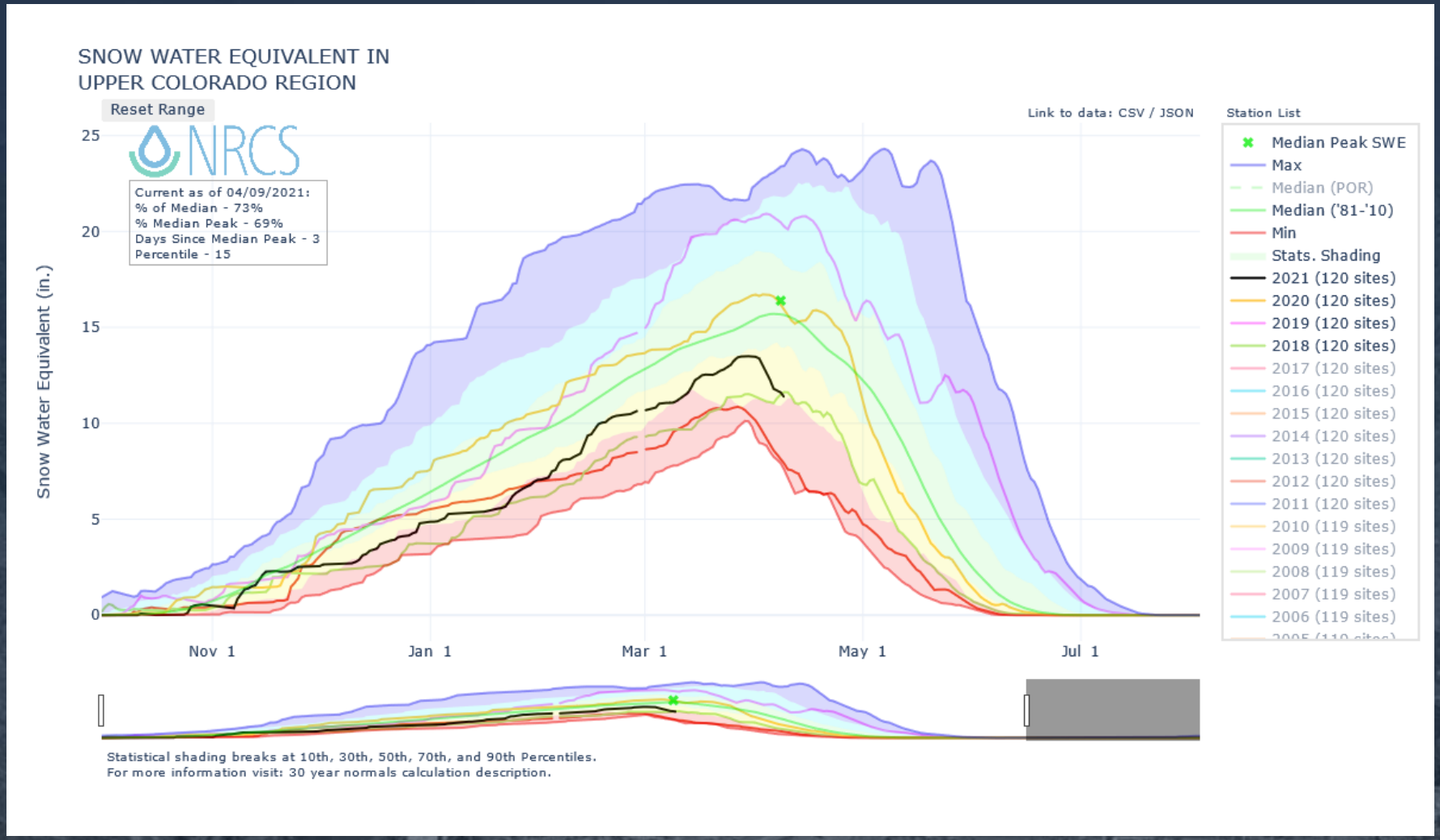
SW Colorado Water Supply Forecasts



Upper Colorado Above Lake Powel (120 Sites) Time Series Snowpack



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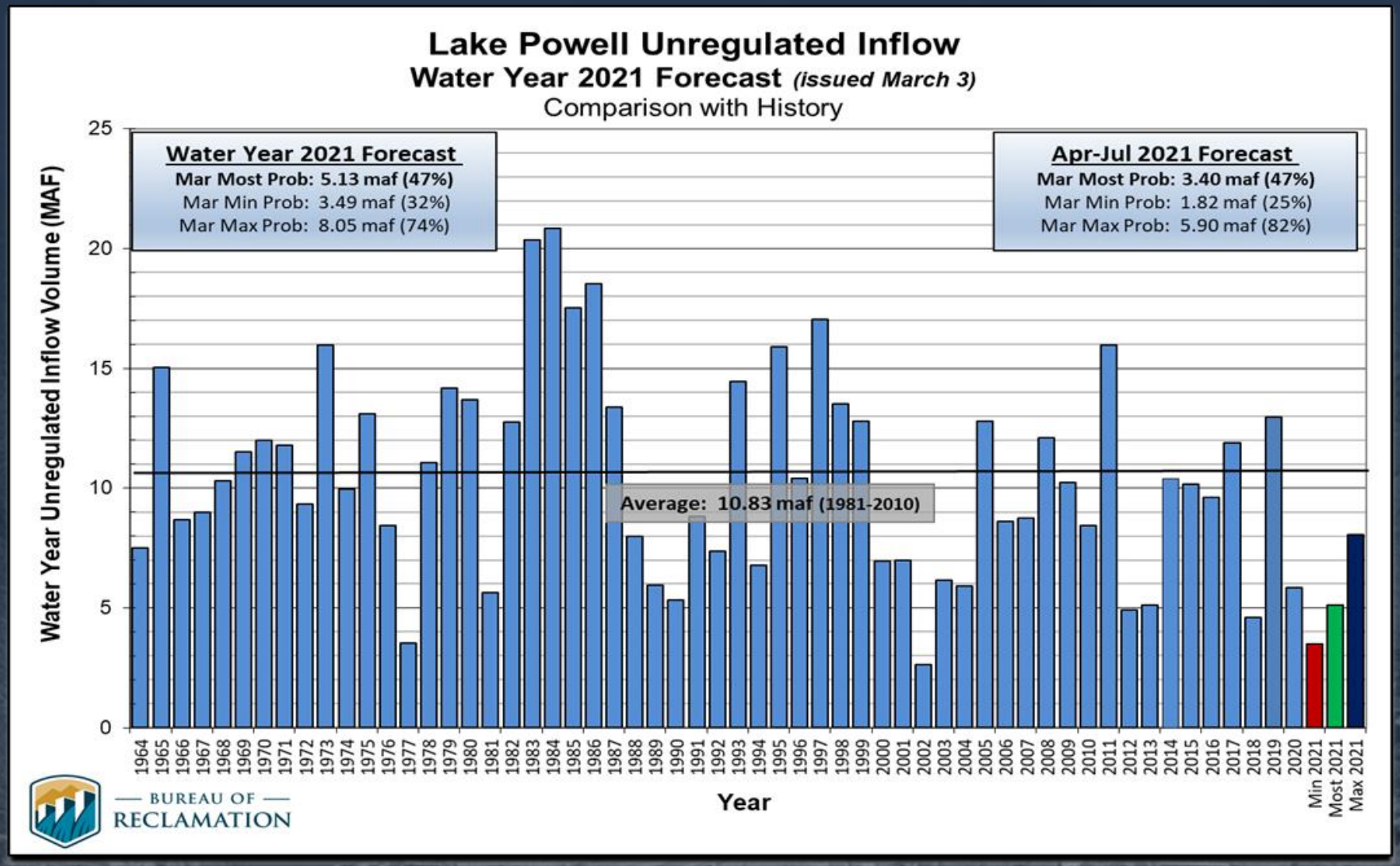
Lake Powell Unregulated Flow



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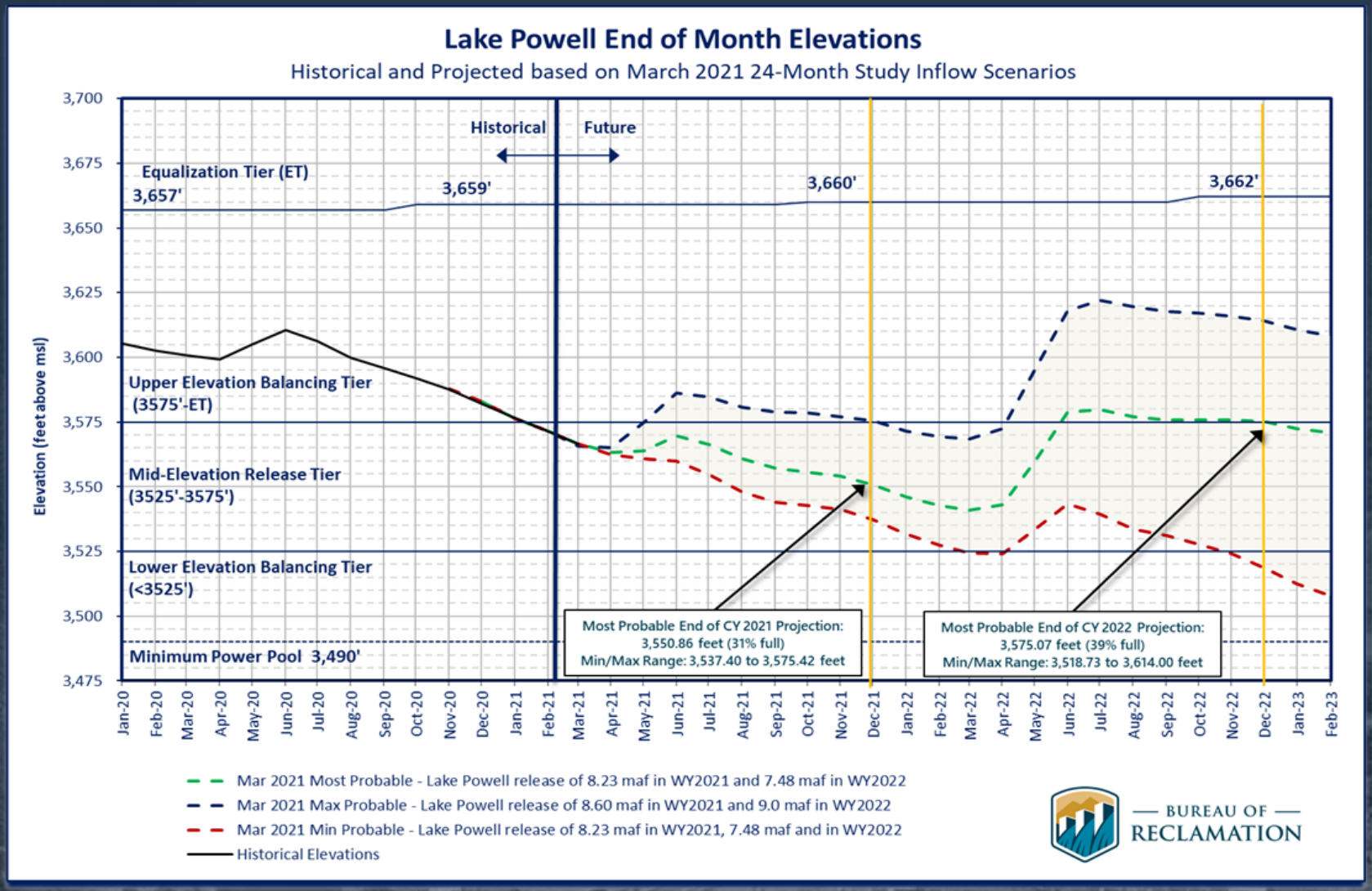
Lake Powell End of Month Elevations



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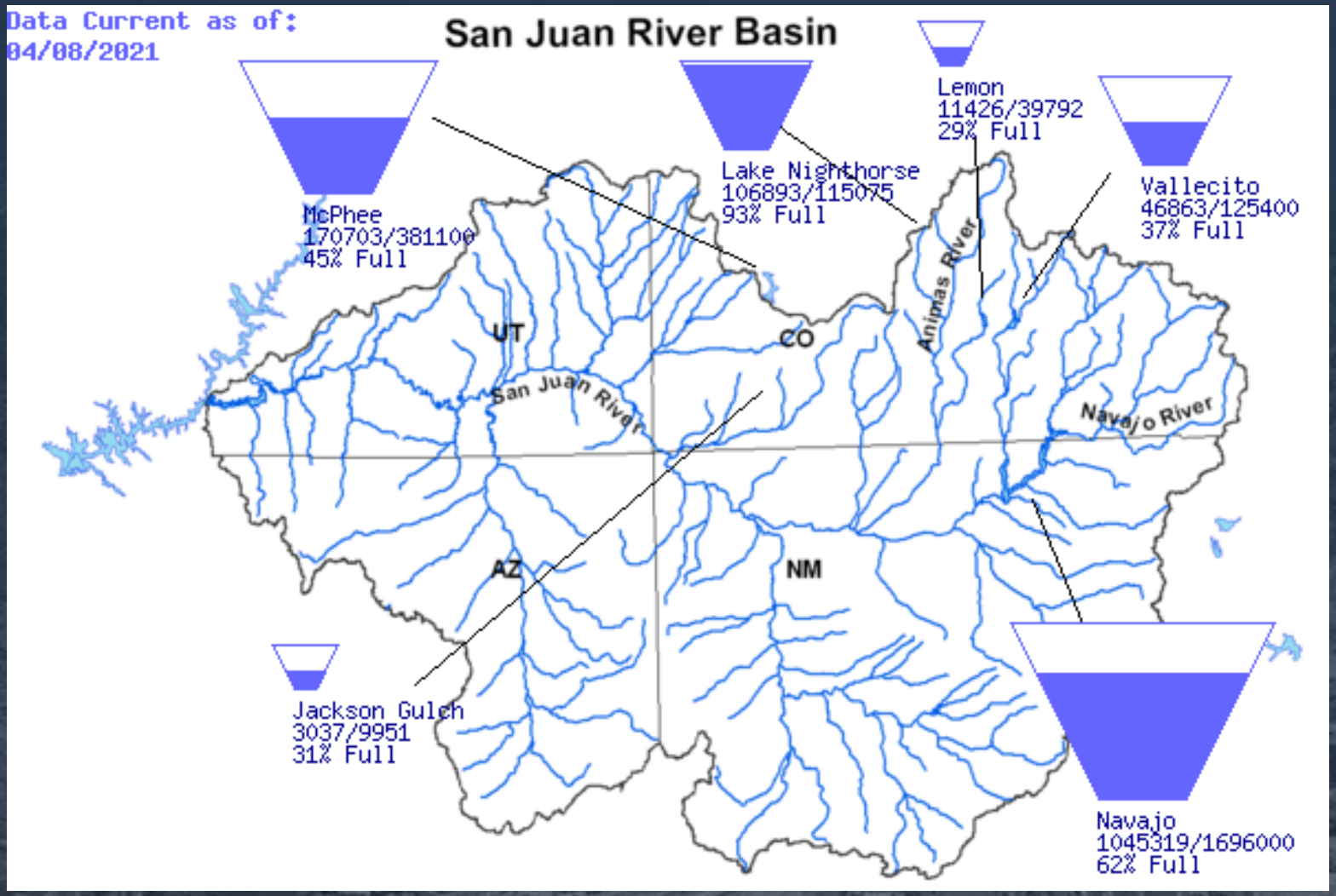
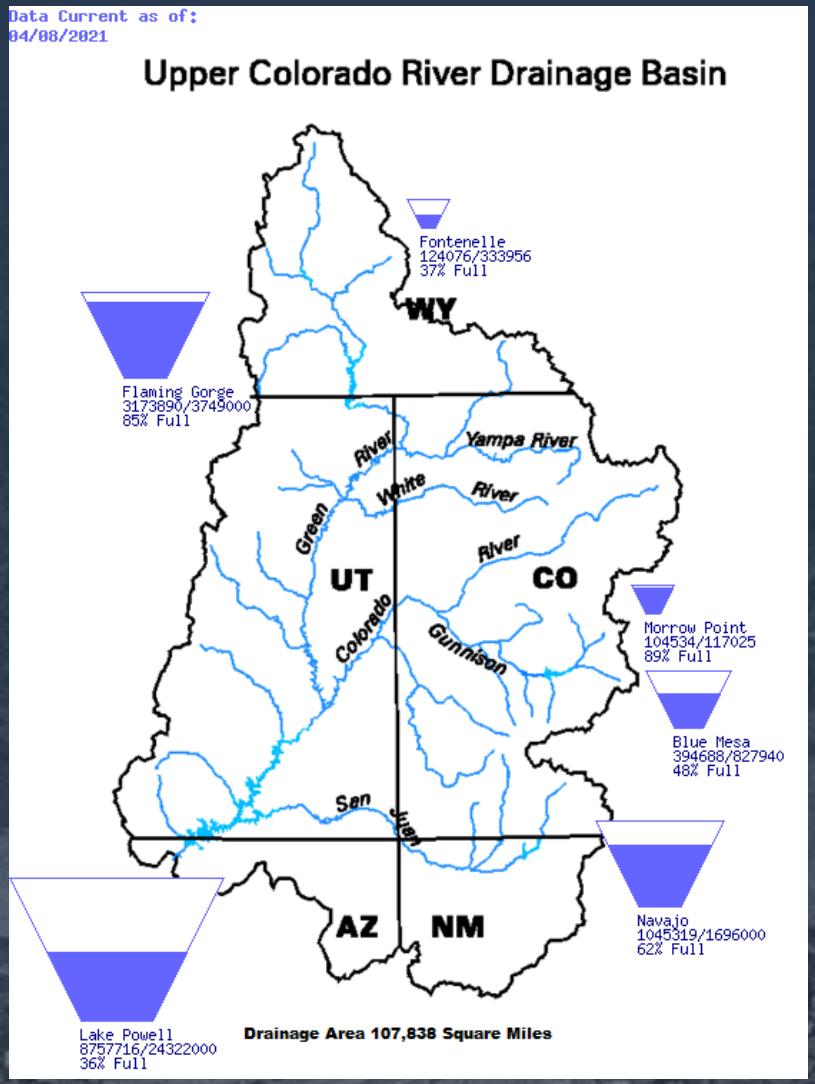
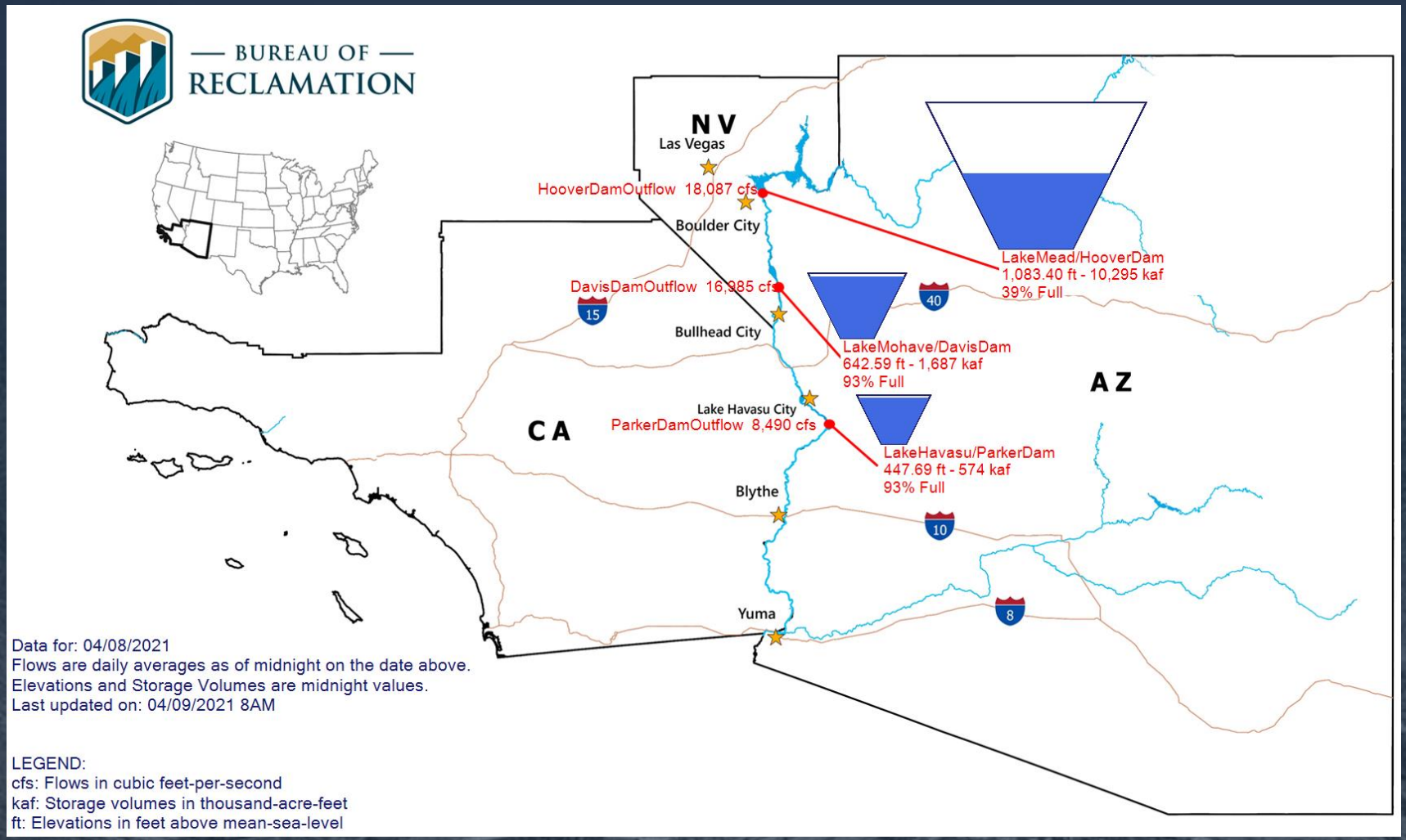
San Juan River Drainage Basin Tea Cup Diagram



Upper Colorado River Drainage Basin Tea Cup Diagram



Lower Colorado River Basin Tea Cup Diagram



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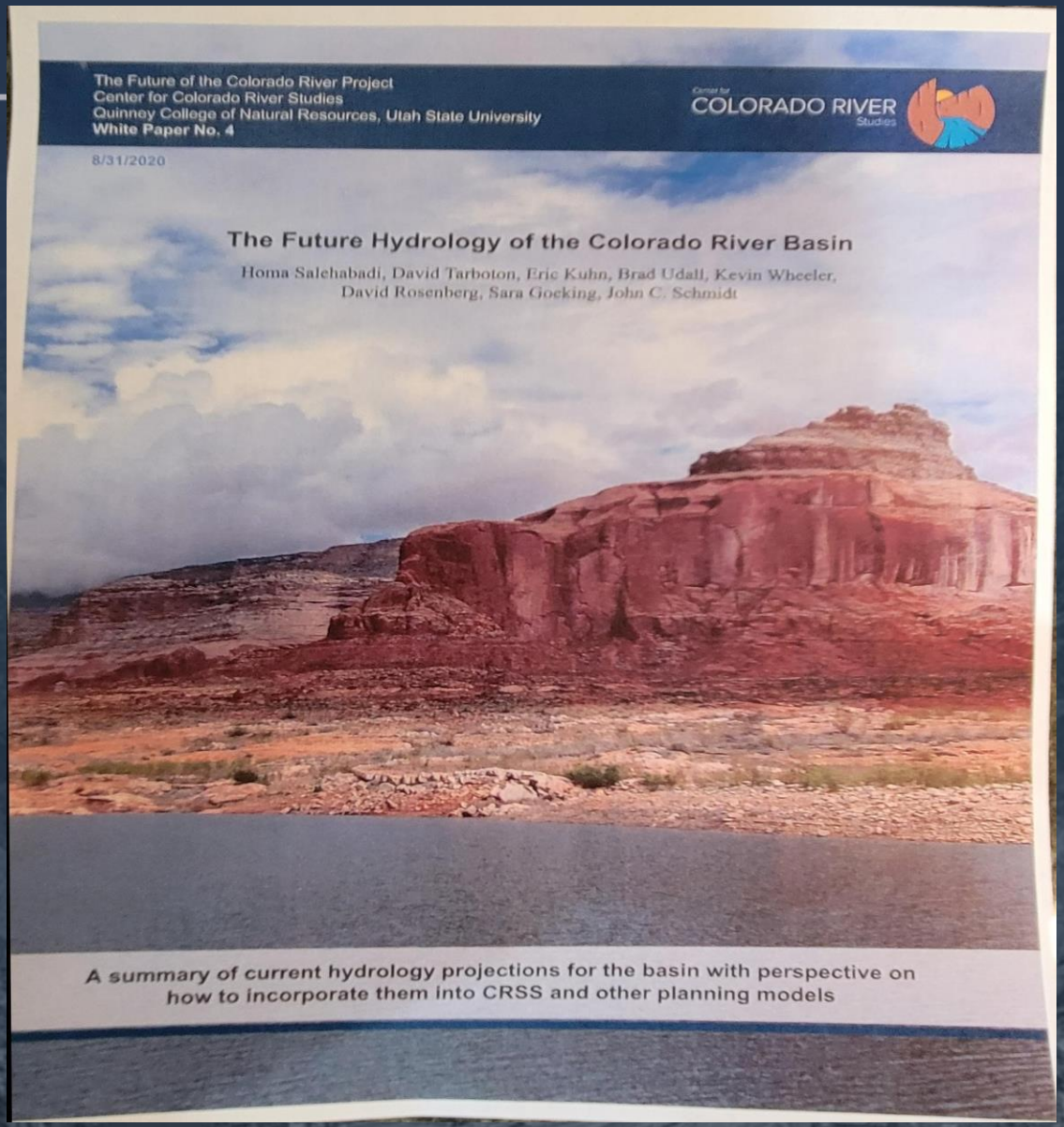
The Future of the Colorado River Project
Center for Colorado River Studies
Quinney College of Natural Resources, Utah State University
White Paper No. 4
Center for COLORADO RIVER Studies
8/31/2020
The Future Hydrology of the Colorado River Basin
Homa Salehabadi, David Tarboton, Eric Kuhn, Brad Udall, Kevin Wheeler,
David Rosenberg, Sara Goeking, John C. Schmidt
A summary of current hydrology projections for the basin with perspective on
how to incorporate them into CRSS and other planning models

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Key Points

5. Severe Droughts in the Colorado River Basin

Key points

- We defined the following drought scenarios based on the observed and tree-ring reconstructed flows:
- **Millennium drought**: the 19-year drought during 2000-2018 recorded in the observed natural flow with the annual mean flow of 12.44 maf/yr.
- **Mid-20th century drought**: the 25-year drought during 1953-1977 recorded in the observed natural flow with the annual mean flow of 12.89 maf/yr.
- **Paleo tree ring severe drought**: the 25-year drought during 1576-1600 estimated by the tree-ring flow reconstruction with the annual mean flow of 11.76 maf/yr.

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Colorado River Watershed

Figure 1. Map showing the watershed, or hydrologic basin, of the Colorado River and areas beyond the watershed that are served by trans-basin diversions (adapted and revised from U.S. Bureau of Reclamation, 2012).

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Colorado River Basin Cont.

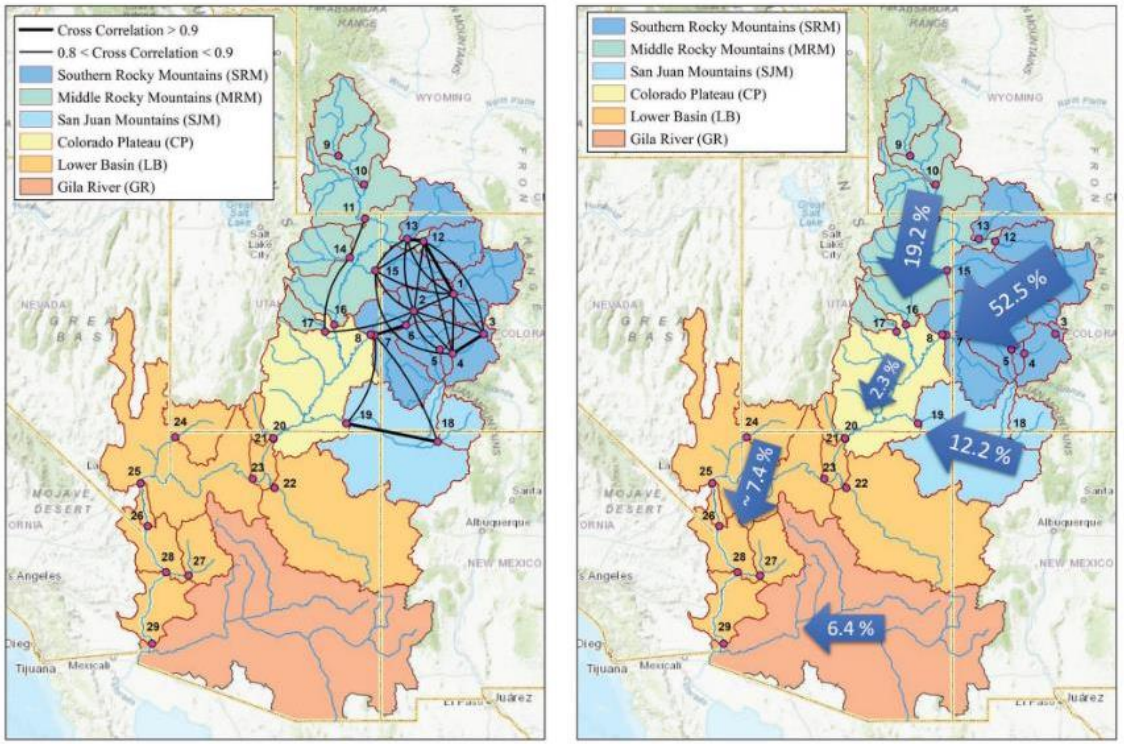

Figure 6. Maps showing hydrologically related parts of the Colorado River Basin, based on statistical correlation of local inflow for each year between 1906 and 2018. The black lines between gages in the left figure indicate the strength of the correlations used to decide on the grouping of local watersheds upstream of each CRSS inflow node. Cross correlations greater than 0.8 are shown in black lines, and bold black lines are those cross correlations greater than 0.9. These correlations are the basis for defining regions of hydrologic similarity. The percent of the total natural runoff originating from each region is shown in the right figure. These percentages are based on Reclamation's Natural flow record from 1906 to 2018 and the estimate by Lukas et al. (2012) of 1.1 maf/yr mean annual natural flow for Gila River from 1915-2010.

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Key Points

4. Climate and Hydrologic Trends

Key points

- The most precipitation occurs in the southern Rocky Mountain. The southern Rockies, middle Rockies, and San Juan Mountain regions are the three most productive in terms of runoff.
- When streamflow trends are examined from the start of the record of estimated natural flow (1906 to present), there is a statistically significant downward trend.
- When streamflow trends are examined starting in 1930 after the Early 20th century Pluvial, there is no statistically significant downward trend in natural streamflow.
- Thus, trend analysis does not indicate whether the on-going 21st drought that began in 2000 is an extension of a downward trend or may be regarded as the most recent cycle within a persistent climate regime that has existed since 1930.
- Neither perspective challenges the expectation that future runoff in the Colorado River basin will decrease in the 21st century as the climate warms.

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Water Year Annual Precipitation

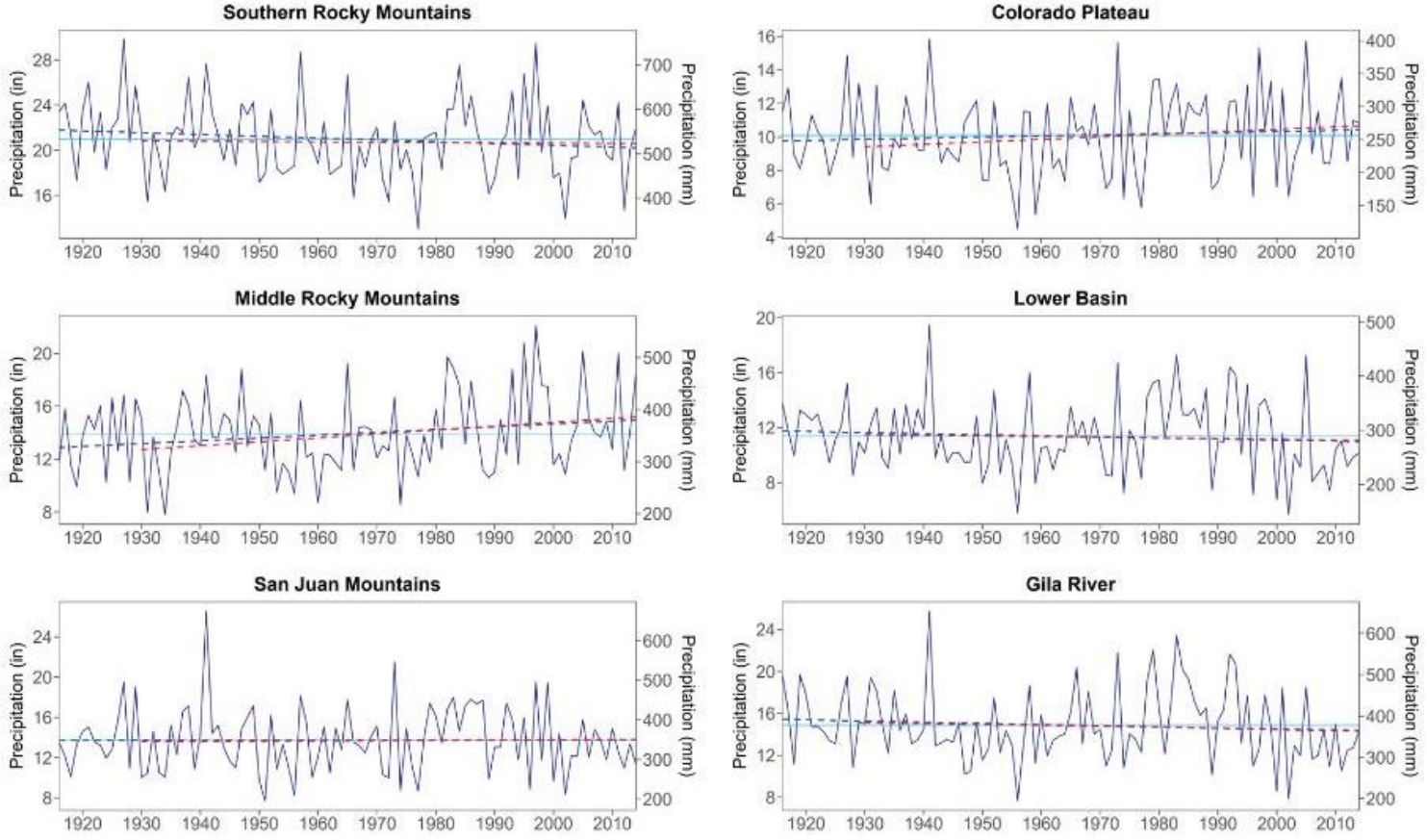

Figure 8. Water year annual precipitation from 1916 to 2014 in each region. The light blue line represents the long-term average over the full period. Blue and red dashed lines are trends over the full period and post-pluvial period, respectively.

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Water Year Annual Temperature

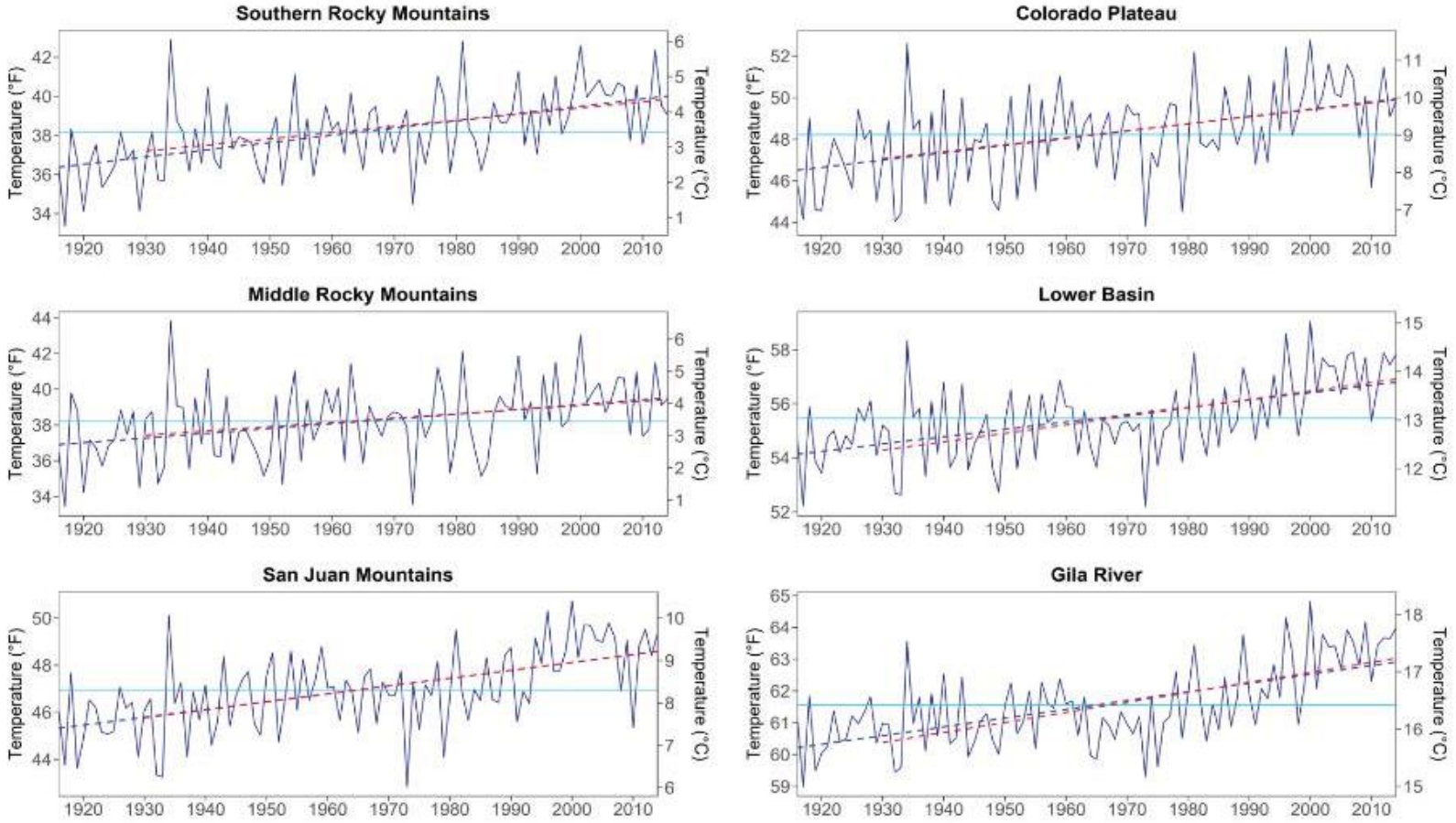

Figure 9. Water year annual temperature from 1916 to 2014 in each region. See Figure 8 caption for further details.

Water Year Annual Streamflow

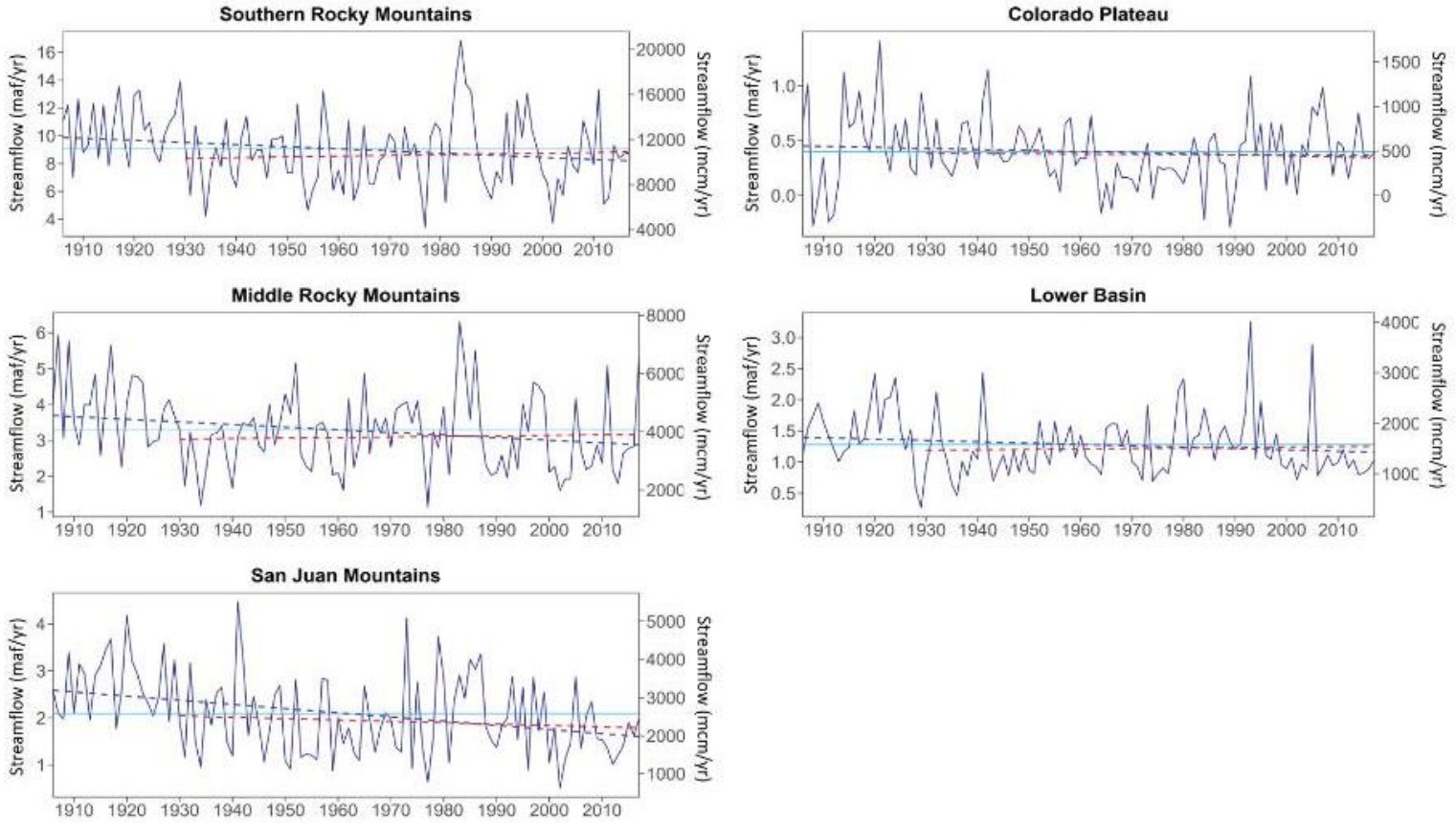

Figure 10. Water year annual streamflow from 1906 to 2018 in each region. See Figure 8 caption for further details.

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Tree Ring Reconstructed Flow

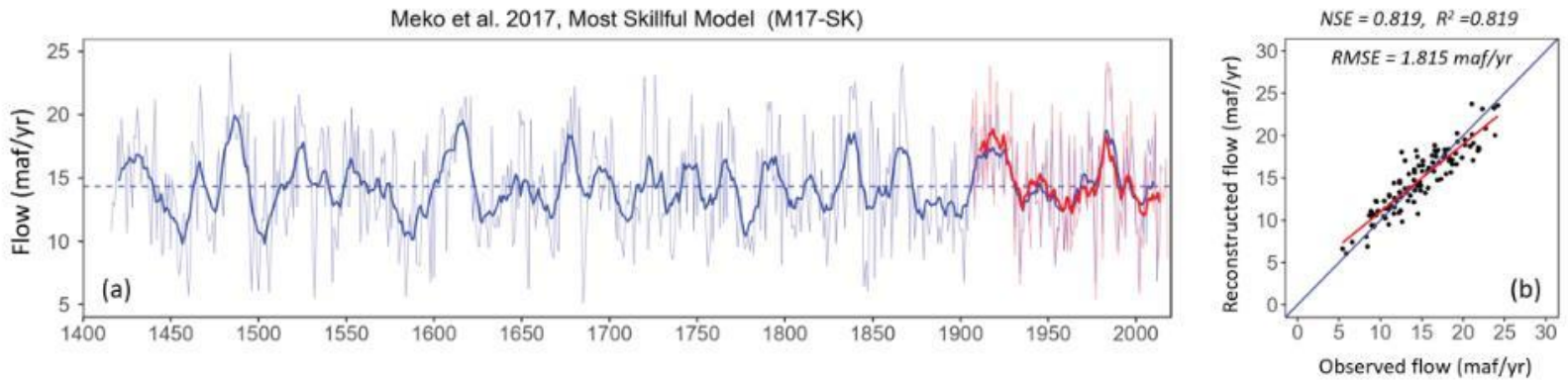

Figure 11. Tree-ring reconstructed flow of the Colorado River at Lees Ferry estimated by the most skillful model of Meko et al. (2017). (a) Annual time series of the reconstruction (light blue line) and its 10-year moving average (blue line), along with annual time series of the observed natural flow (light red line) and its 10-year moving average (red line). (b) Relationship between observed and reconstructed flow of the Colorado River at Lees Ferry (R^2, Nash Sutcliffe Efficiency (NSE), and RMSE).

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- Questions?
- Comments?