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# Climate and Resiliency

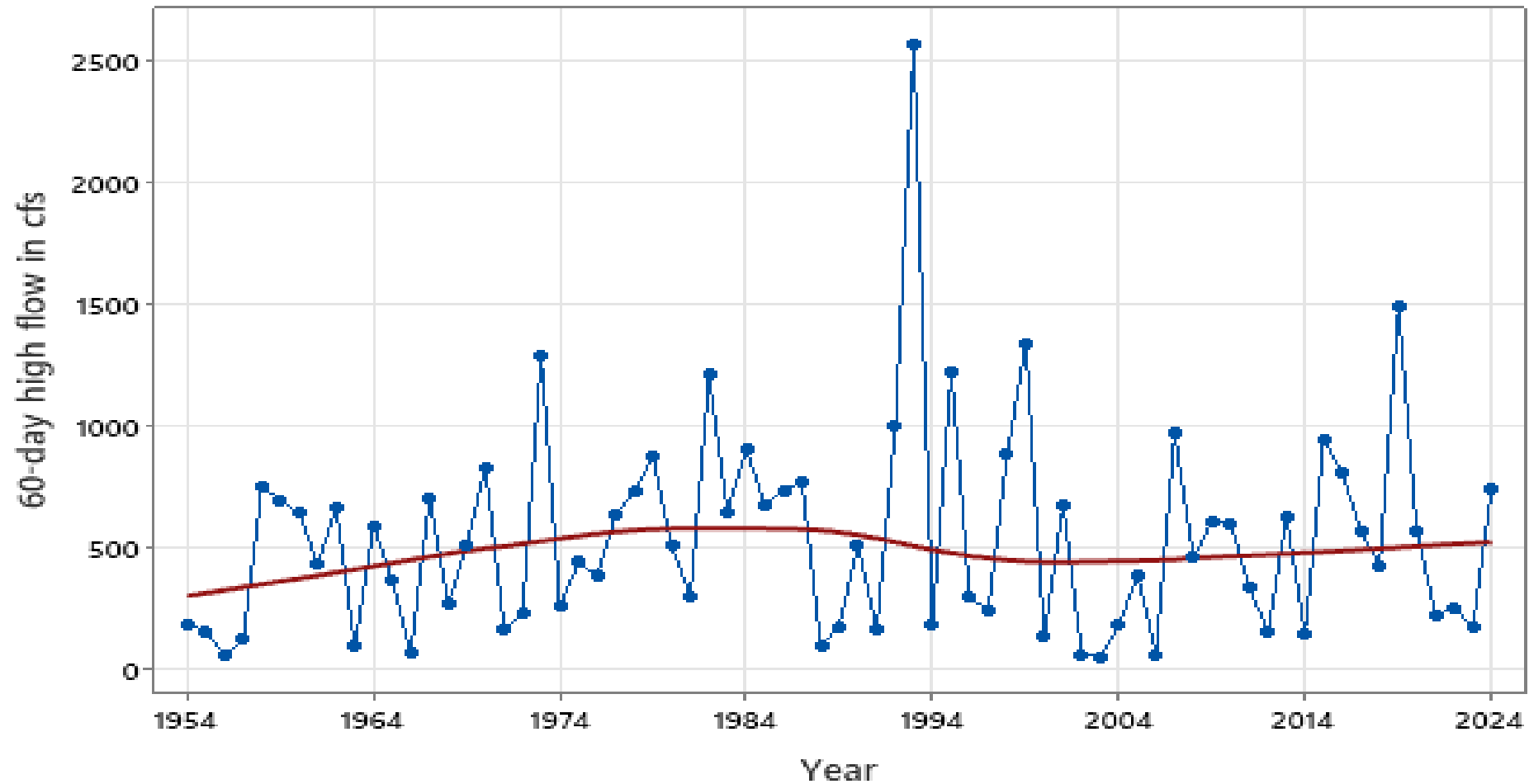
Tom Stiles, BOW

# Baseline Suppositions on Resiliency

- Climate Variability Manifested by More Energy in Atmosphere
- Conventional Wisdom Sees Less Frequent, More Intense Rains
- Conventional Wisdom Sees Longer, Warmer Periods Between Rains
- Resiliency Should Buffer These Extremes
- Storage Begets Resiliency
- Storage Sometimes Presents Policy Tradeoffs Between Quantity & Quality

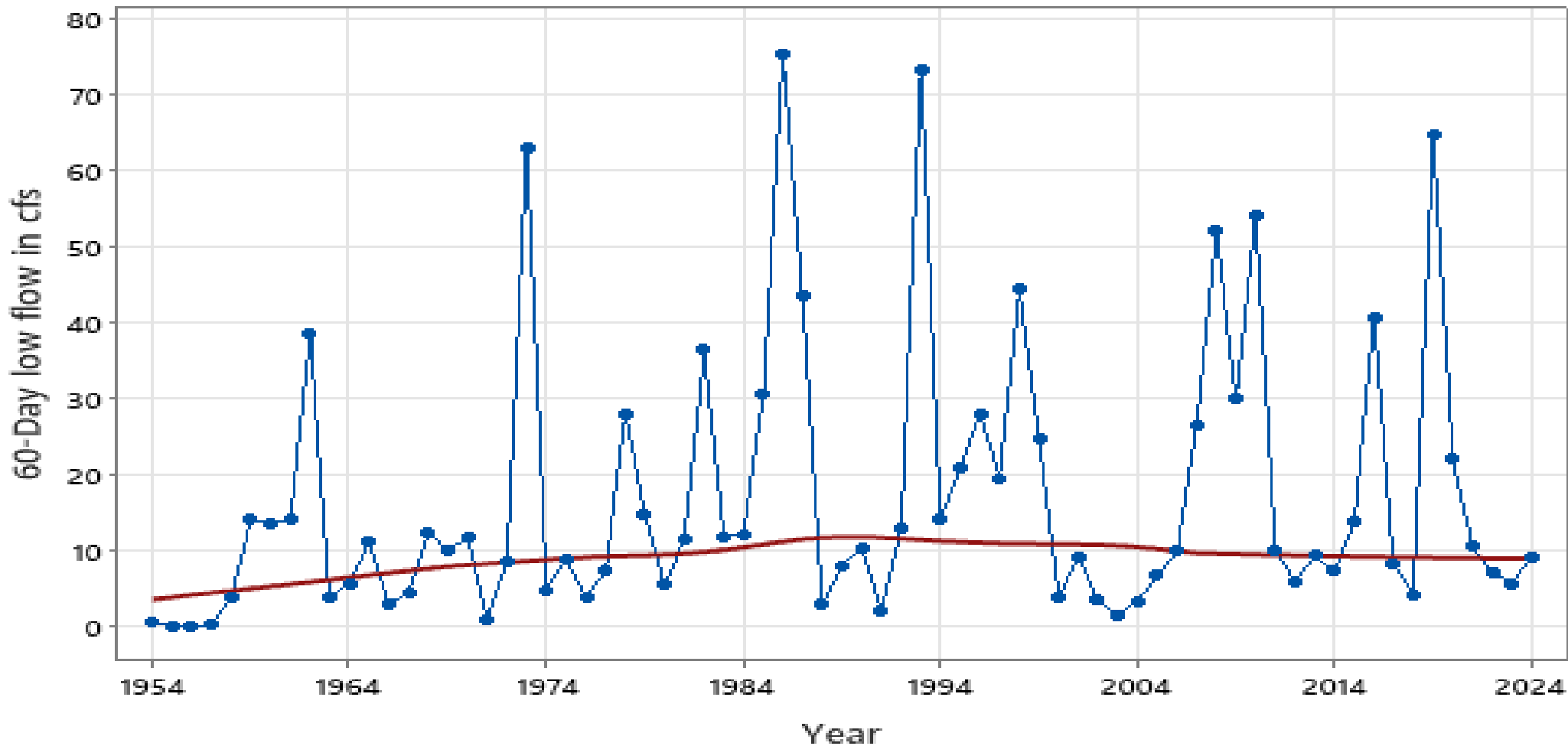
# Are High Flows Becoming Greater?

Highest 60-day Flow on Black Vermillion River

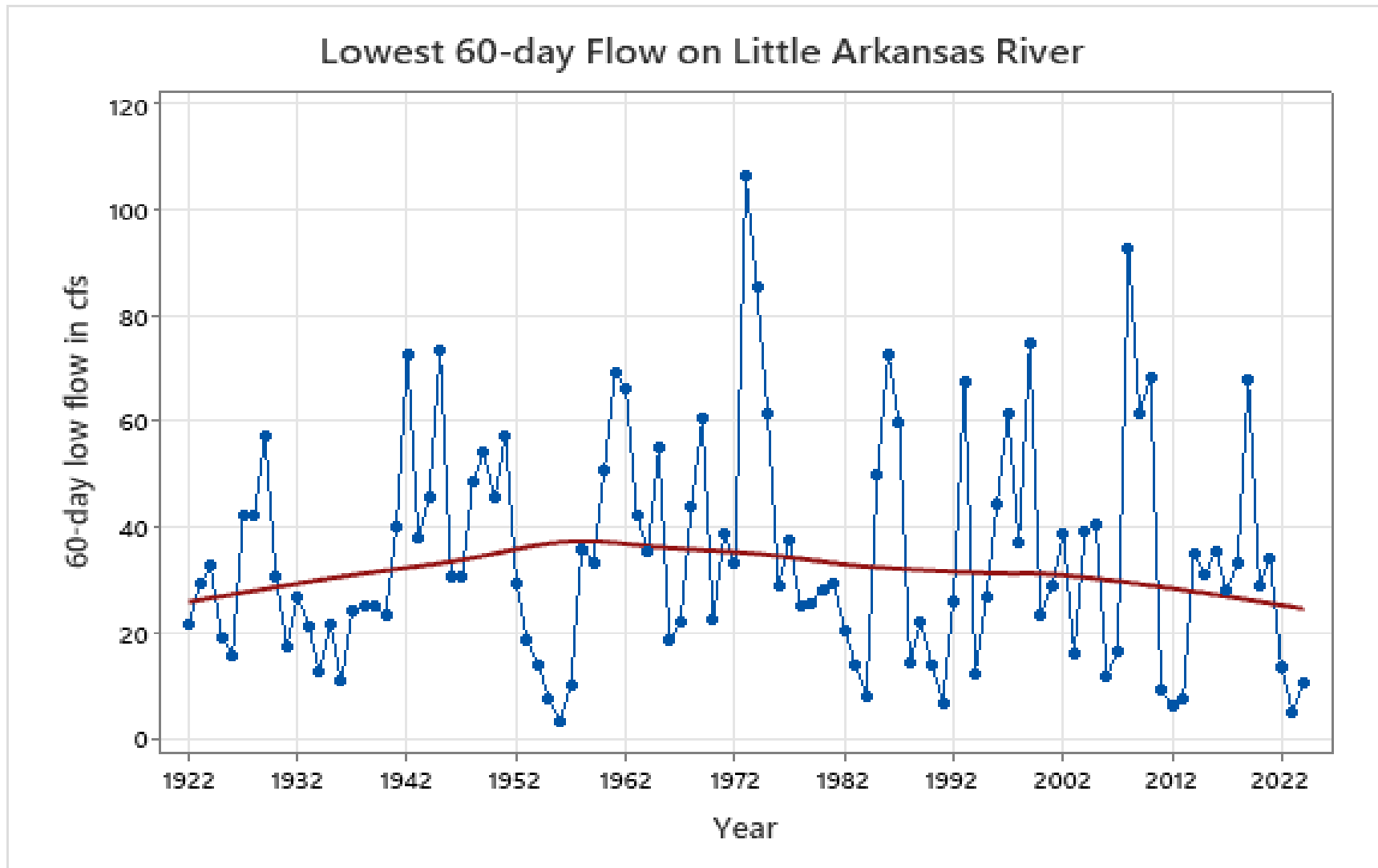


# Are Low Flows Becoming Lower?

## Lowest 60-day Flow on Black Vermillion River

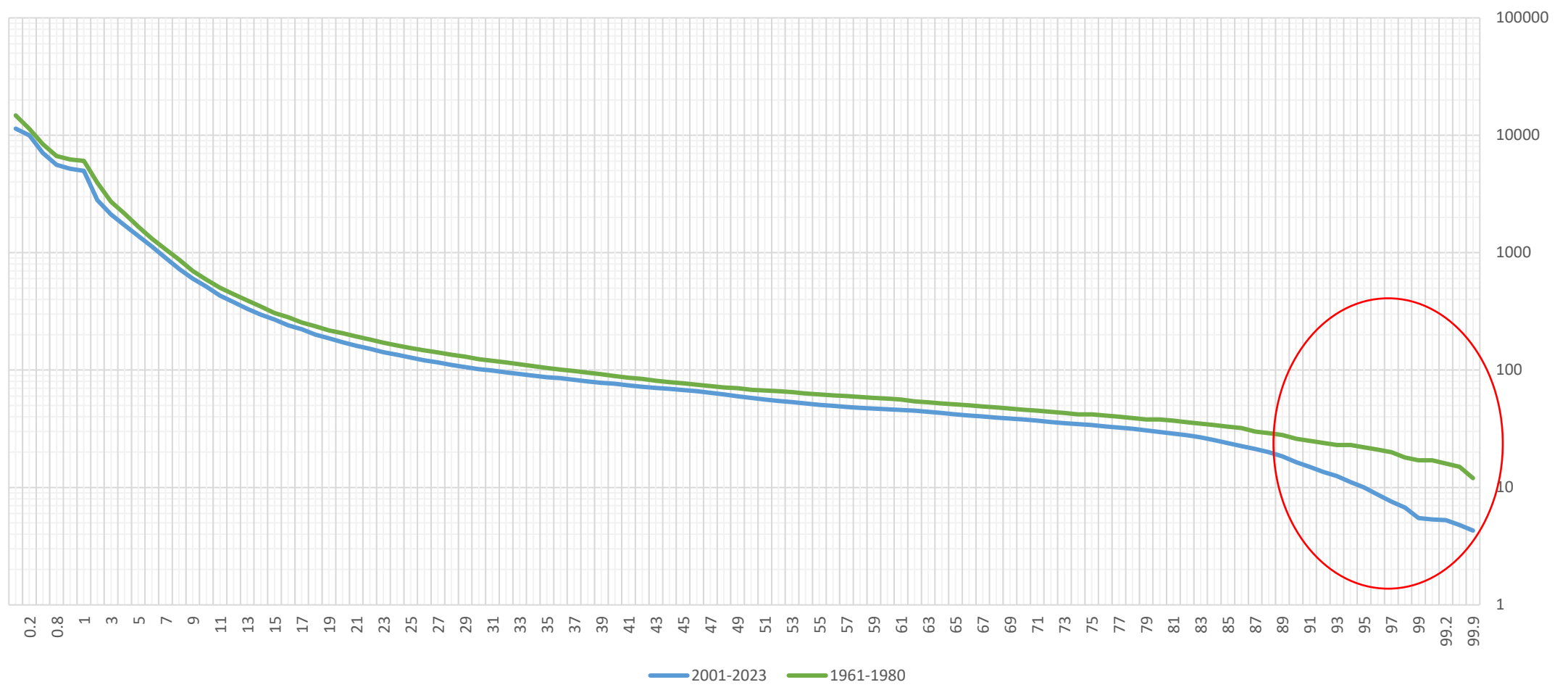


# Are Low Flows Buffered by Aquifers?



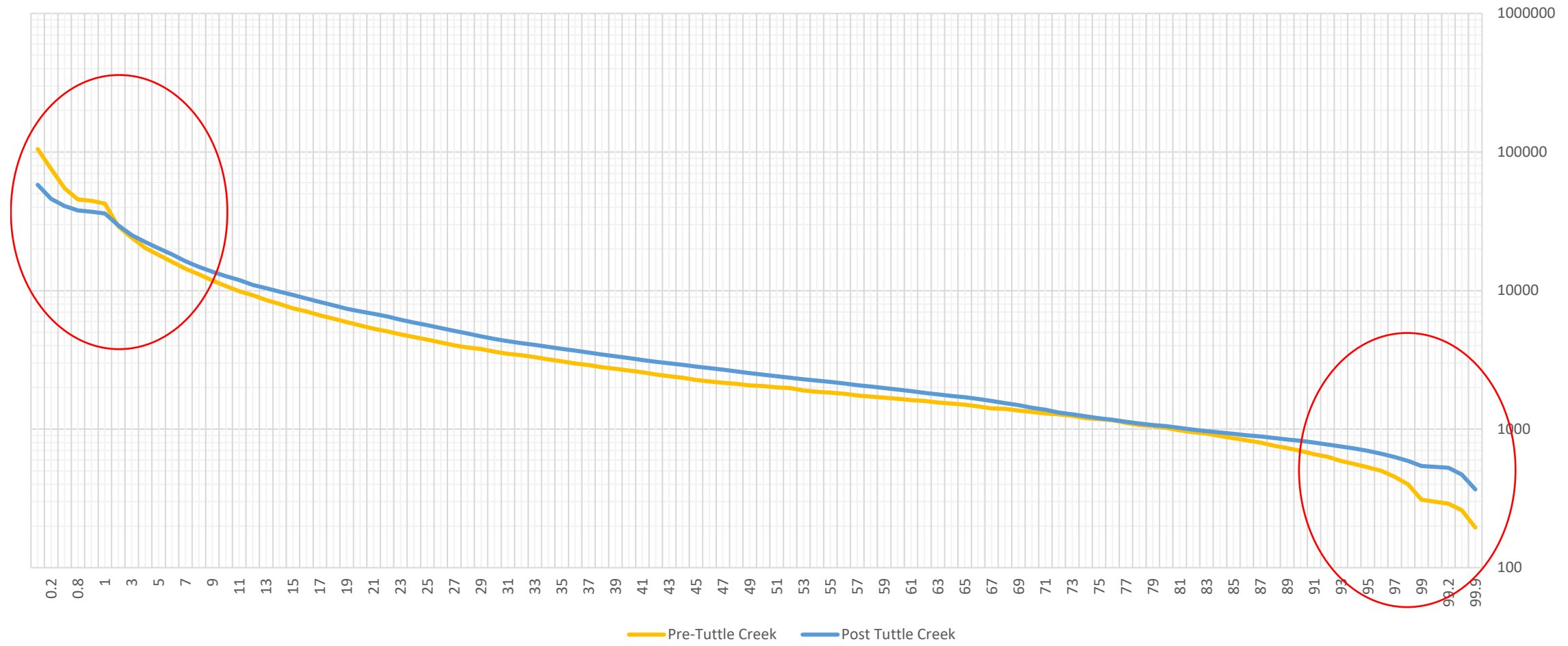
# Diminished Supply Seen at the Extreme

Little Arkansas River at Valley Center Flow Duration



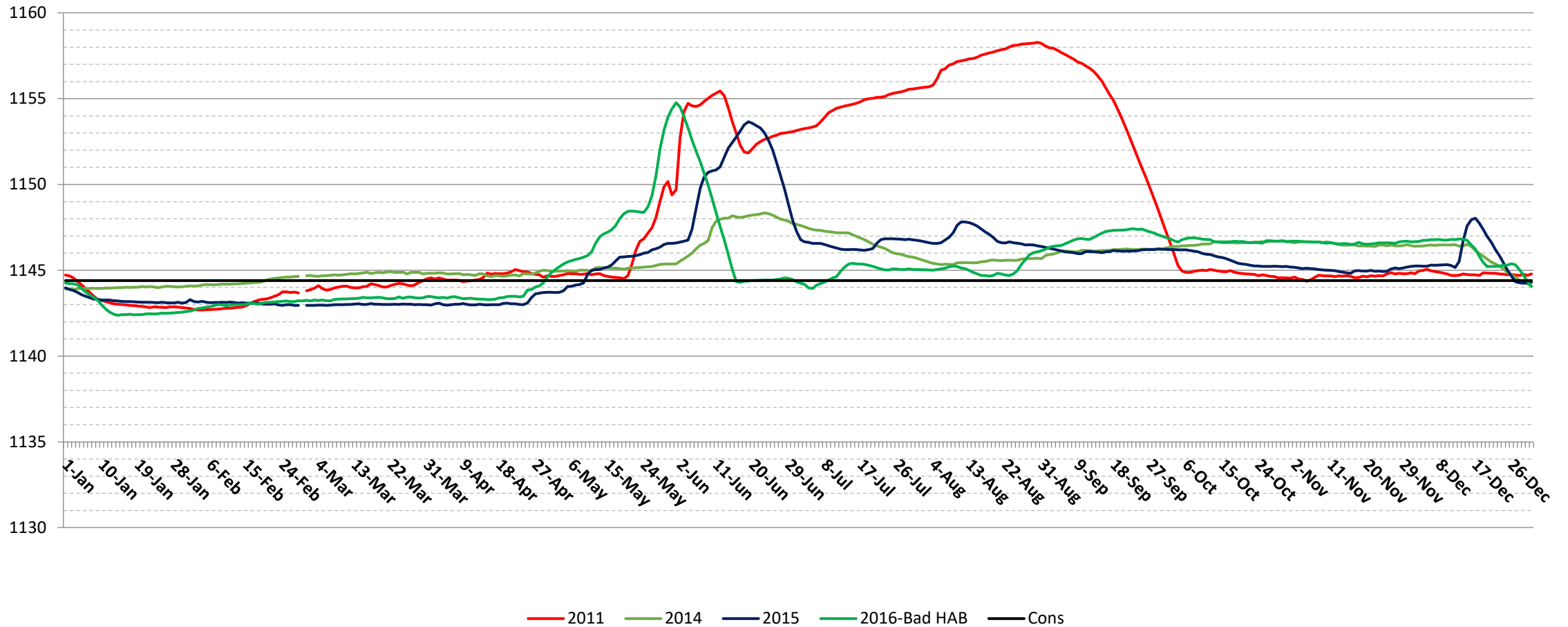
# Reservoirs Provide Resiliency at the Extremes

Kansas River at Wamego Flow Duration



# Conserving Storage Has WQ Tradeoffs (HABs)

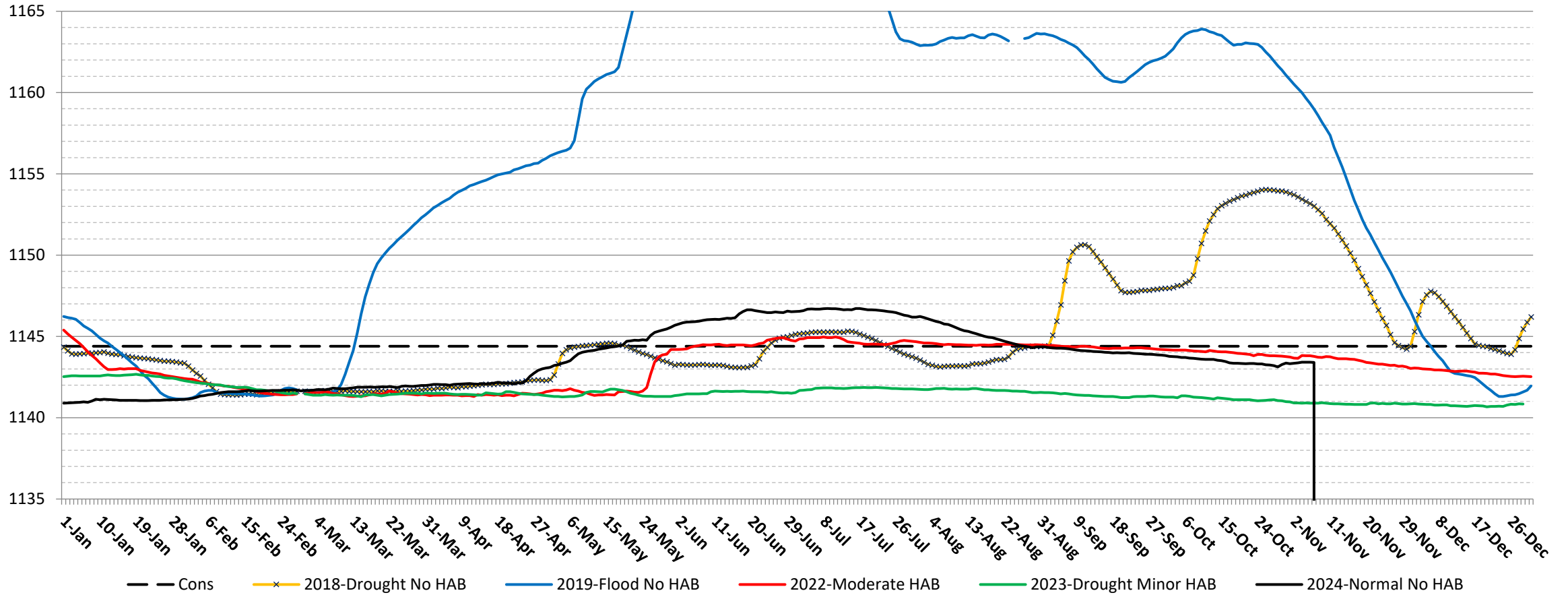
**Milford Lake Historic Bad HABs and Pool Levels**





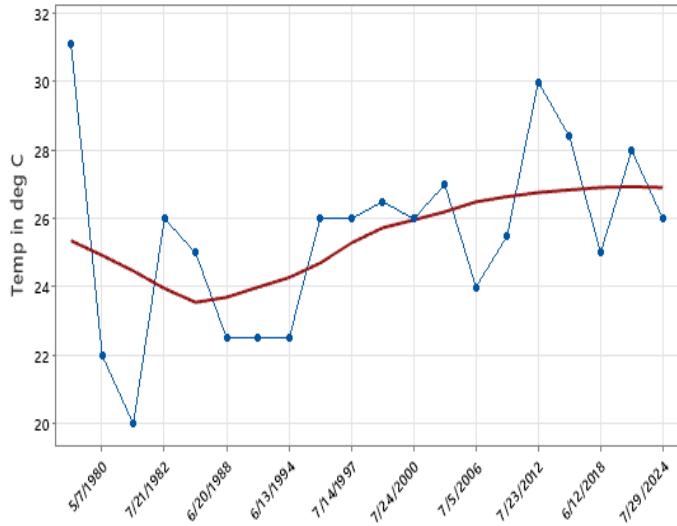
# Manipulating Storage Mitigates HABs

Milford Lake Recent HABs and Pool Levels

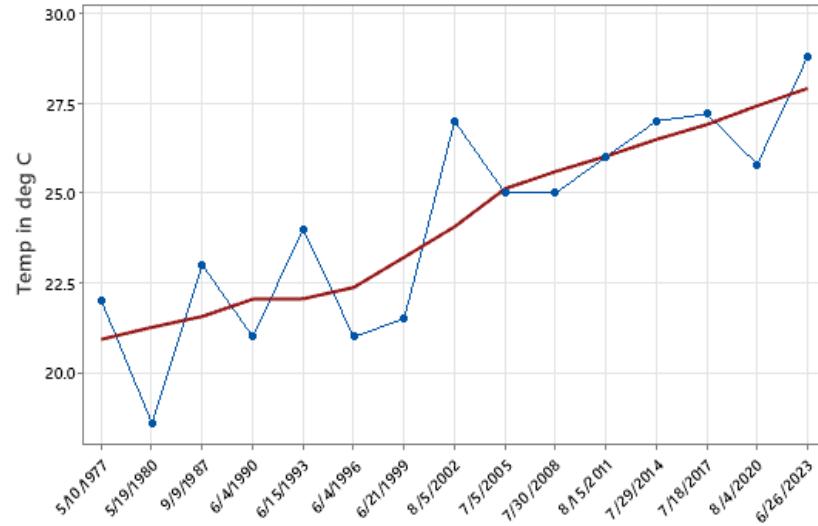


# Added Complication – Warmer Water

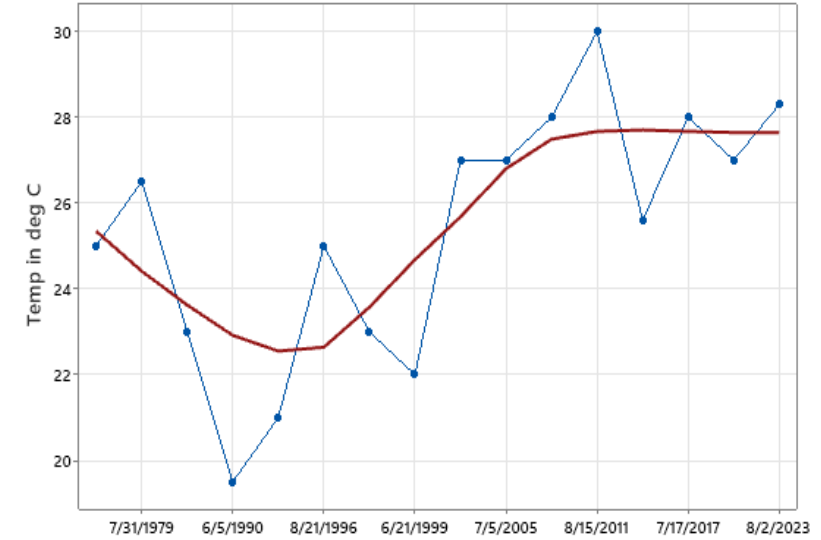
Surface Temperature at Milford Lake



Surface Temperature at Marion Lake



Surface Temperature at Cheney Lake



# Working Hypotheses

- Extremes in weather have always occurred
- Long-Term Resiliency is not about magnitude, but rather frequency and duration
- Storage provides some resiliency buffer to weather
- Management of that storage creates policy tradeoffs
- Impacts on supply create quality consequences

## Thank you and Questions



**Tom Stiles**

Director, Bureau of Water

Tom.stiles@ks.gov