

Effects of California WaterFix Operations on Folsom and Shasta Reservoirs and American River Water Deliveries

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WaterFix Operation Effects

Overview

- Modeled WaterFix operations at Folsom Reservoir injure American River water users
- Modeled WaterFix operations at Shasta Reservoir do not meet 2009 BO RPA requirements
- Reoperation of Shasta Reservoir to comply with 2009 RPA storage requirements would reduce Folsom Reservoir storage and further injure American River water users
- Operations criteria to protect storage in Folsom Reservoir are needed in the WaterFix permit terms to protect American River water users

Folsom Reservoir Storage Effects

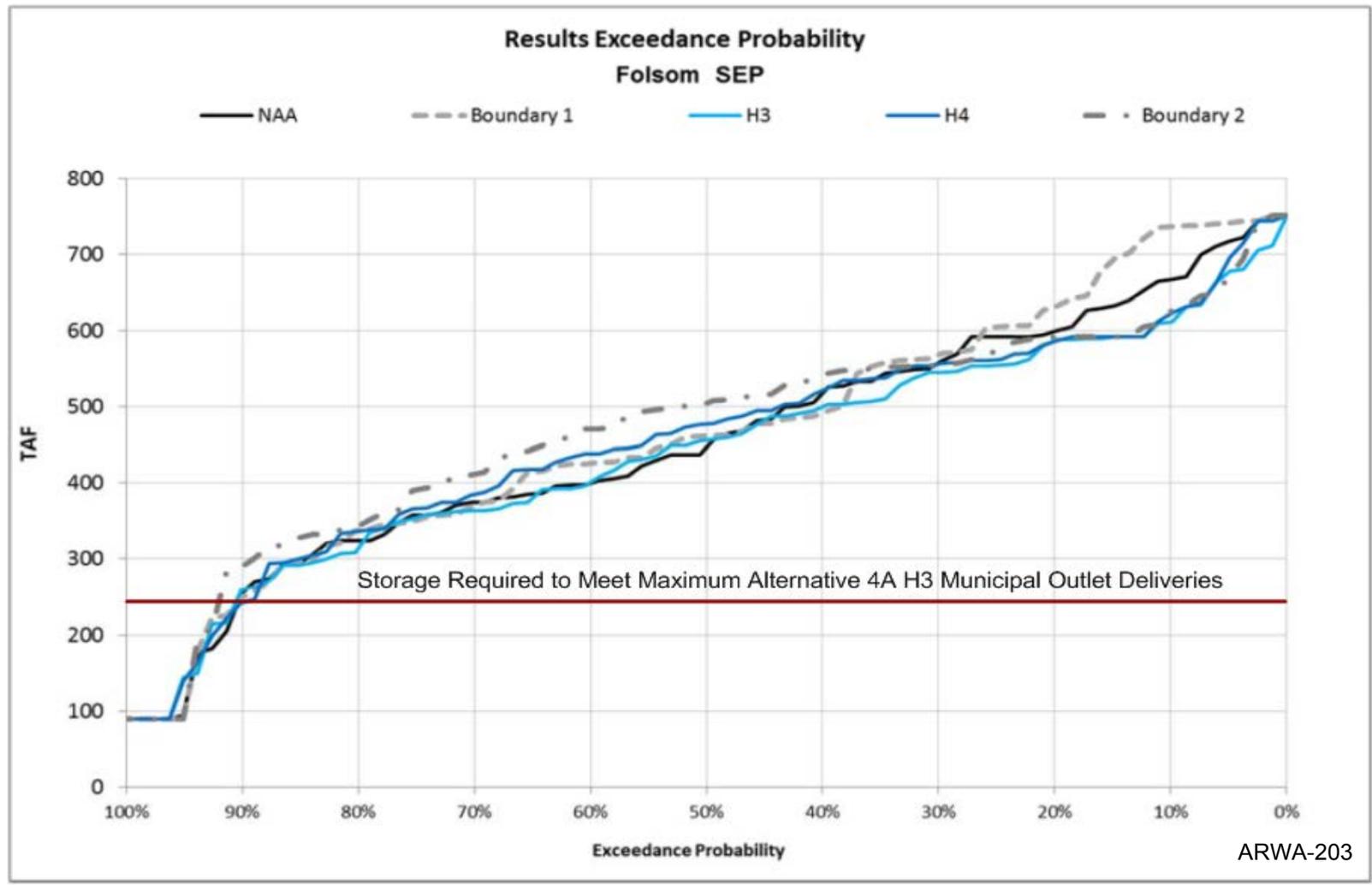
Overview

- WaterFix operations result in:
 - Critically low end-of-September (EOS) Folsom storage in 10% of years
 - Serious M&I delivery deficits in 11% of years
 - Extremely low Folsom Reservoir EOS carryover storage (10% yrs) would increase the likelihood that a subsequent severe drought year (e.g., 1977, 2015) could result in serious water supply consequences

Folsom Reservoir Storage Effects

WaterFix Modeled Folsom Storage

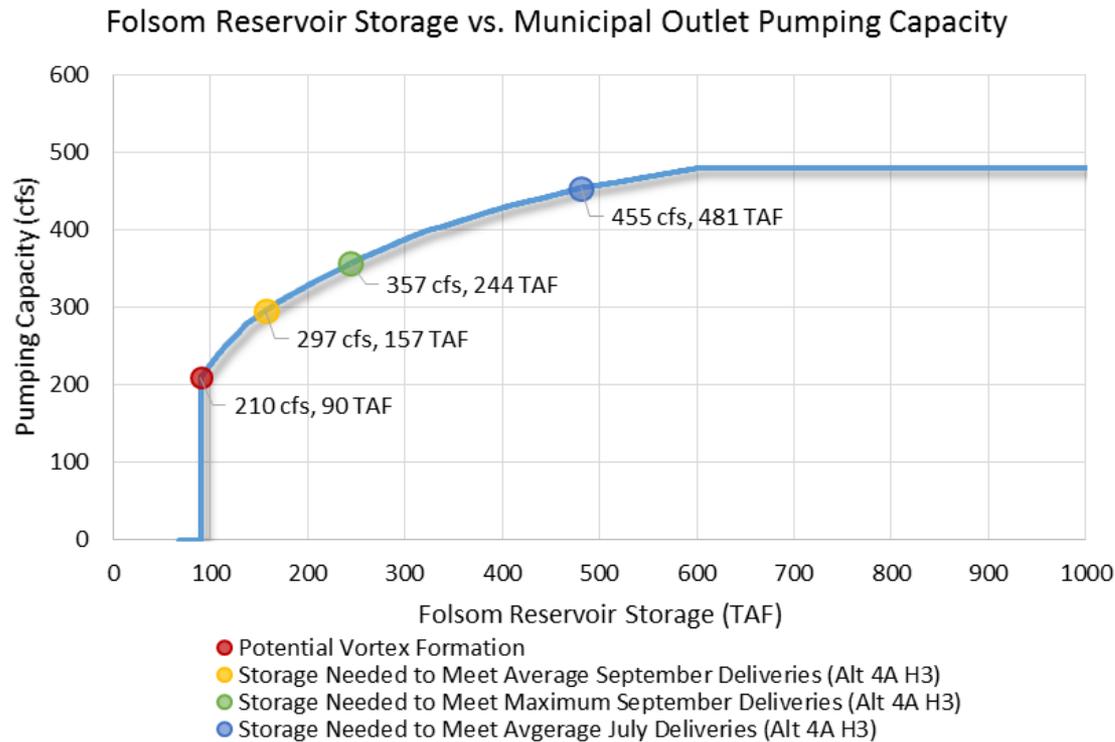
Figure 14. Simulated End of September Folsom Storage Exhibit DWR-514



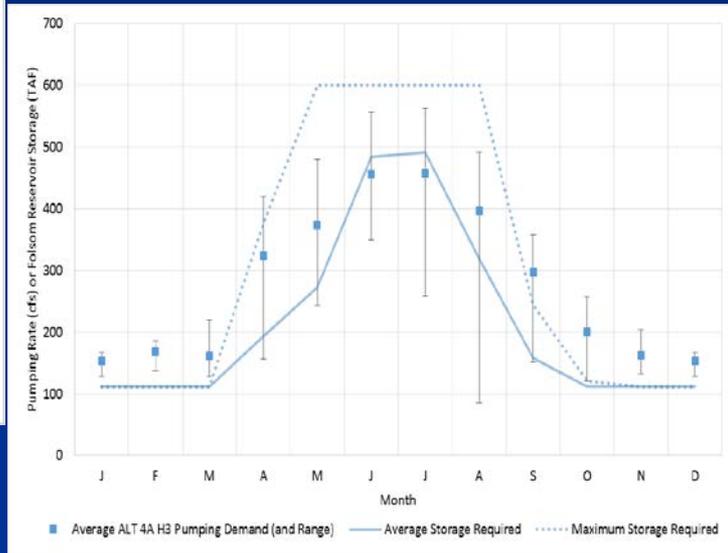
Folsom Reservoir Storage Effects

Municipal Outlet Pump Curve

- Folsom Reservoir Municipal Outlet pump curve



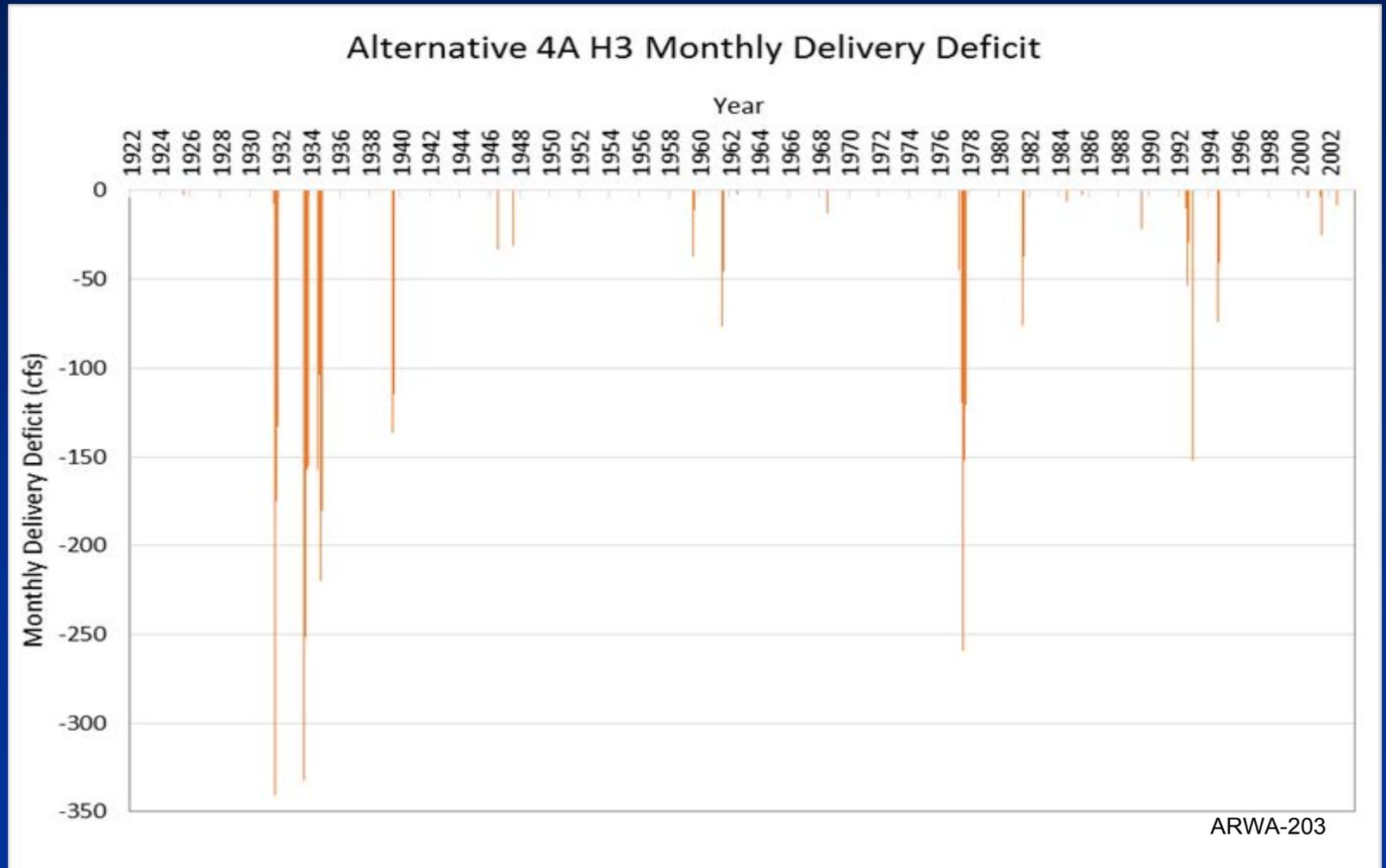
- WaterFix Alt 4A H3 Municipal Outlet “deliveries”



Folsom Reservoir Storage Effects

Delivery Deficits

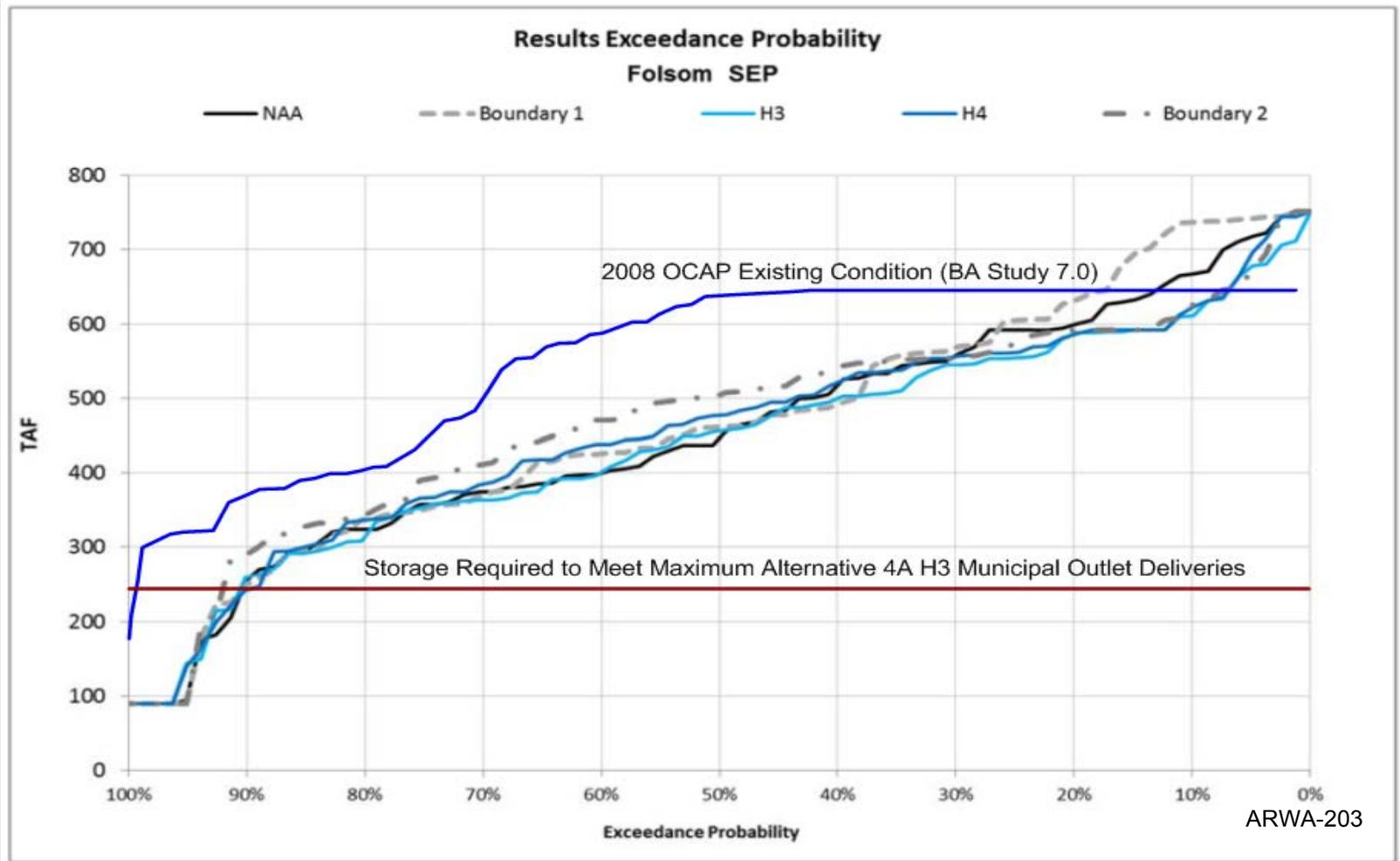
- Folsom municipal supply deficits due to low reservoir storage (Alt 4A H3)



Folsom Reservoir Storage Effects

WaterFix Operations Result in American River Water User Injury

Figure 14. Simulated End of September Folsom Storage Exhibit DWR-514



Shasta Reservoir Storage

Overview

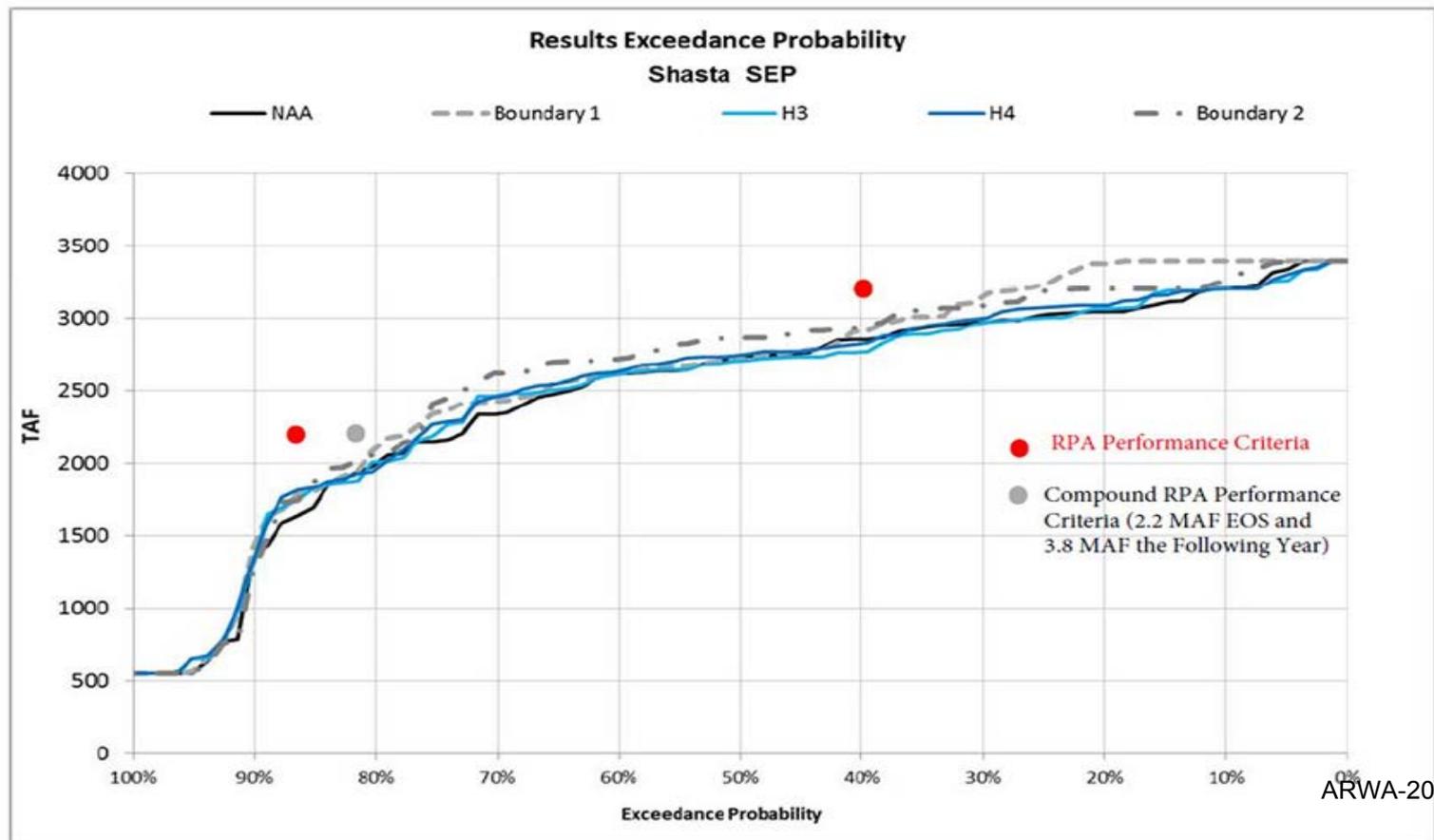
- WaterFix scenarios Shasta Reservoir operations do not meet NMFS 2009 biological opinion RPA
 - Large deficit between the 2009 BO RPA criteria and modeled Shasta storage (average >400 TAF)
 - 10-year running average performance criteria that “shall be attained” are not met
 - Water temperature implications
 - The NAA scenario does not appear to be a technically appropriate environmental baseline

Shasta Reservoir Storage

Storage Does Not Meet RPA Criteria

- WaterFix operations result in an average deficit of >400 TAF compared to the 2009 BO storage RPA (87% and 40% exceedance)

Figure 12. Simulated End of September Shasta Storage

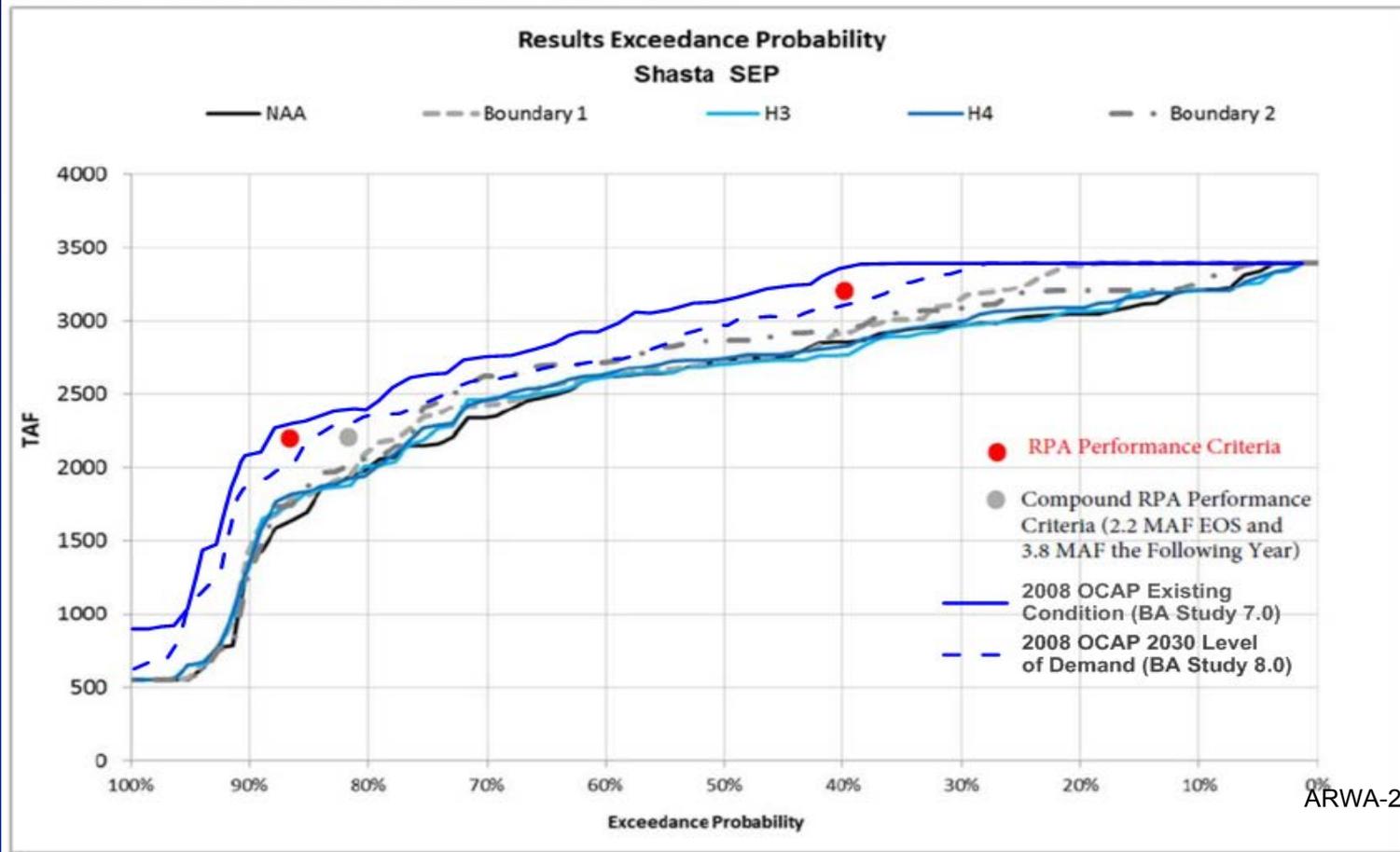


Shasta Reservoir Storage

Storage Does Not Meet RPA Criteria

- WaterFix operations and 2009 BO RPA criteria compared to 2008 BA modeling

Figure 12. Simulated End of September Shasta Storage



Shasta Reservoir Storage

2009 BO RPA Text

- “Shall Be Attained”
- 10-YR running average
- NMFS June 28, 2016 letter

Action 1.2.1 Performance Measures.

Objective: To establish and operate to a set of performance measures for temperature compliance points and End-of-September (EOS) carryover storage, enabling Reclamation and NMFS to assess the effectiveness of this suite of actions over time. Performance measures will help to ensure that the beneficial variability of the system from changes in hydrology will be measured and maintained.

Action: The following long-term performance measures shall be attained. Reclamation shall track performance and report to NMFS at least every 5 years. If there is significant

Action: The following long-term performance measures shall be attained. Reclamation shall track performance and report to NMFS at least every 5 years. If there is significant deviation from these performance measures over a 10-year period, measured as a running average, which is not explained by hydrological cycle factors (e.g., extended drought), then Reclamation shall reinitiate consultation with NMFS.

Performance measures for EOS carryover storage at Shasta Reservoir:

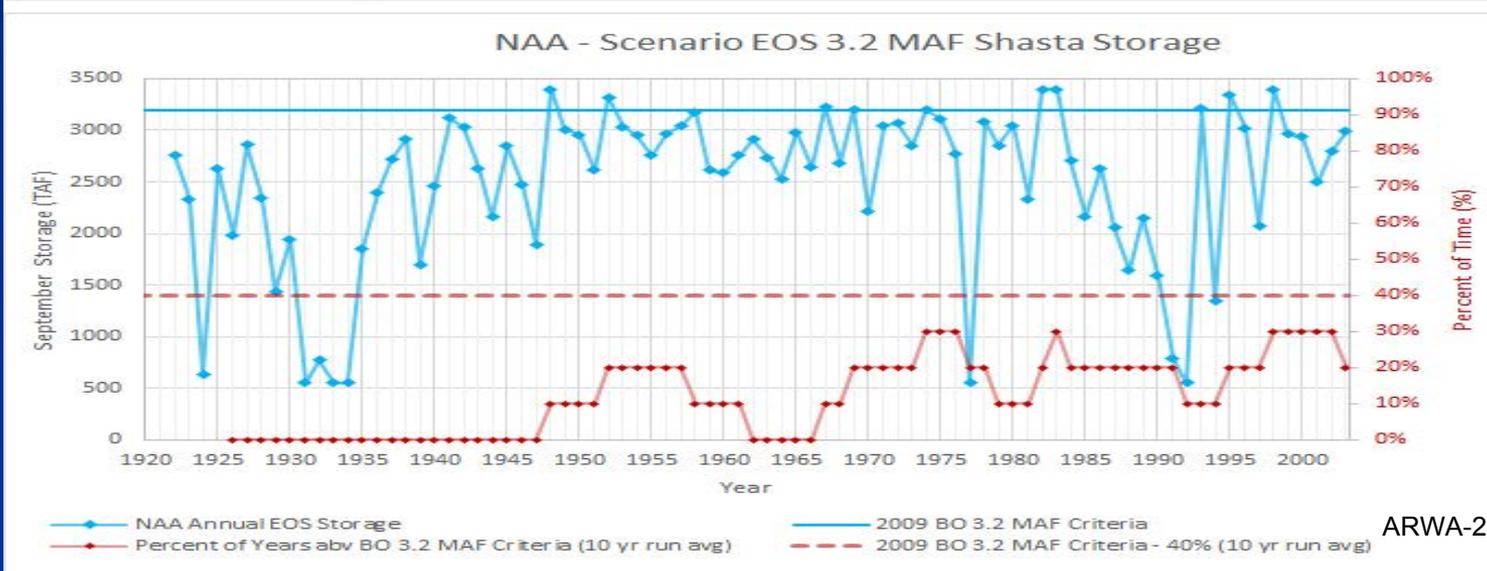
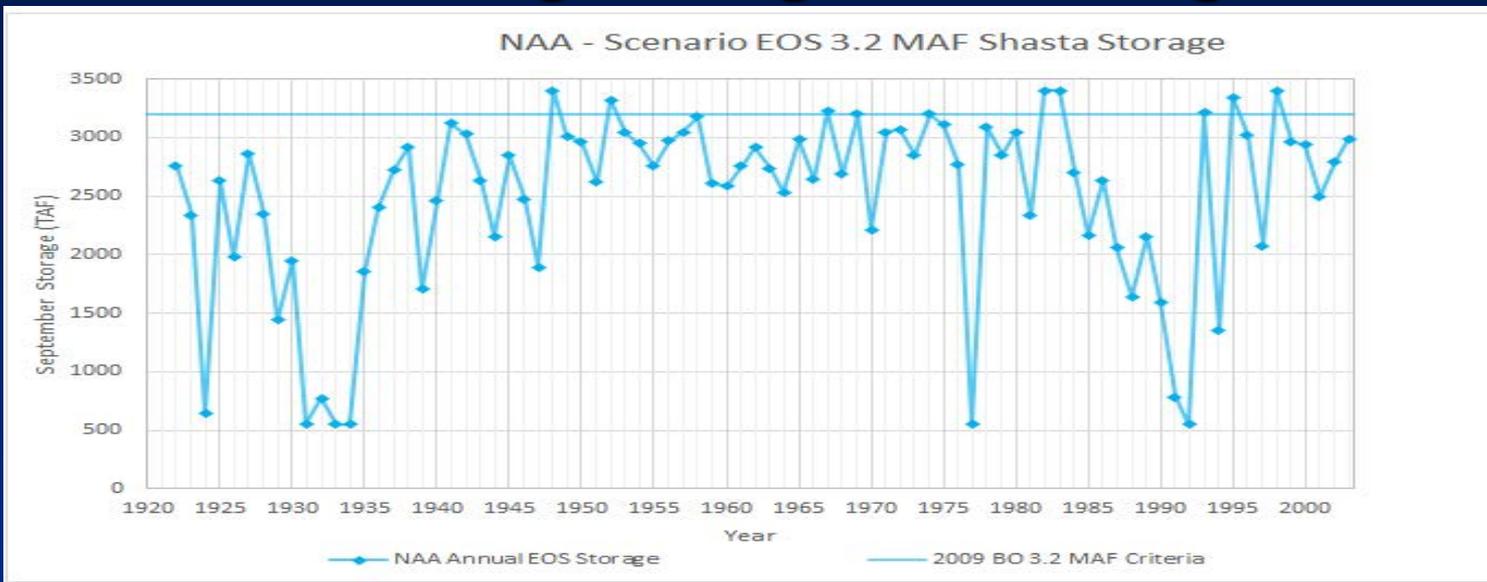
- 87 percent of years: Minimum EOS storage of 2.2 MAF
- 82 percent of years: Minimum EOS storage of 2.2 MAF and end-of-April storage of 3.8 MAF in following year (to maintain potential to meet Balls Ferry compliance point)
- 40 percent of years: Minimum EOS storage 3.2 MAF (to maintain potential to meet Jelly’s Ferry compliance point in following year)

ensure that diversity is preserved when feasible. The percentages are taken from those presented in the CVP/SWP operations BA, effects analysis in the Opinion and NMFS technical memo on historic Shasta operations.

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Shasta Reservoir Storage

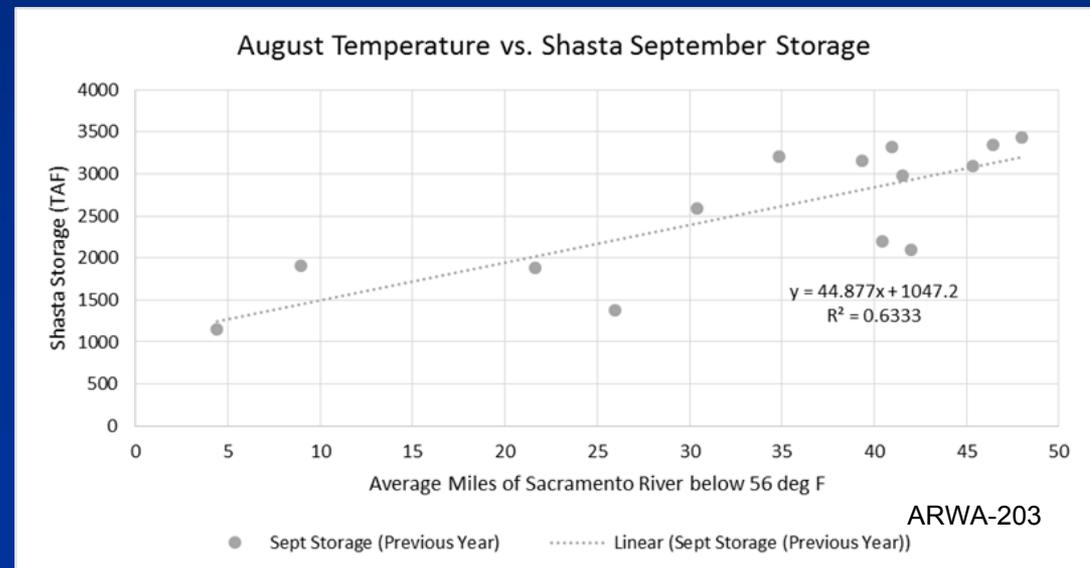
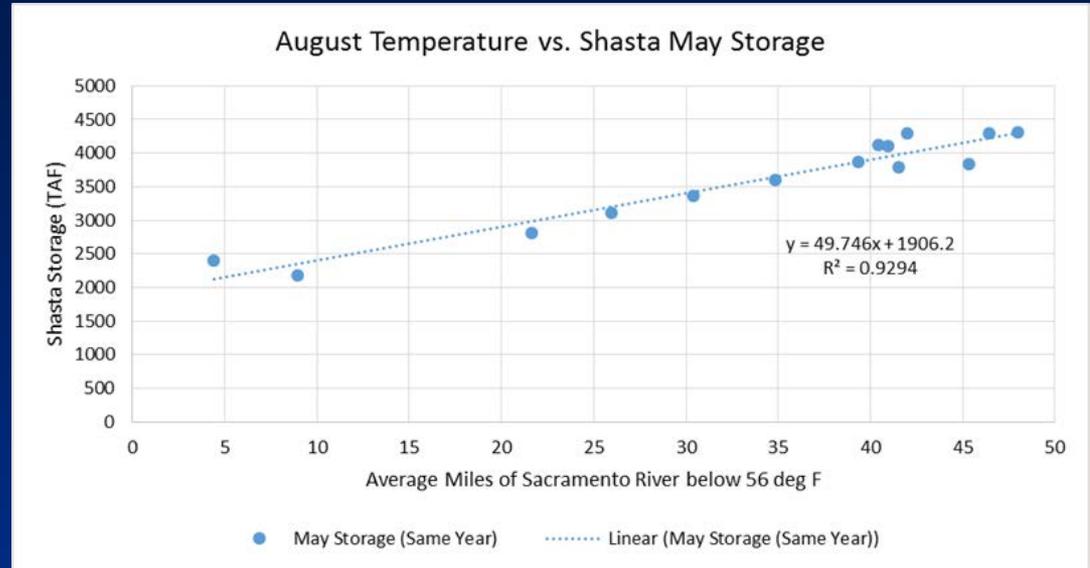
10-Year Running Average EOS Storage - NAA



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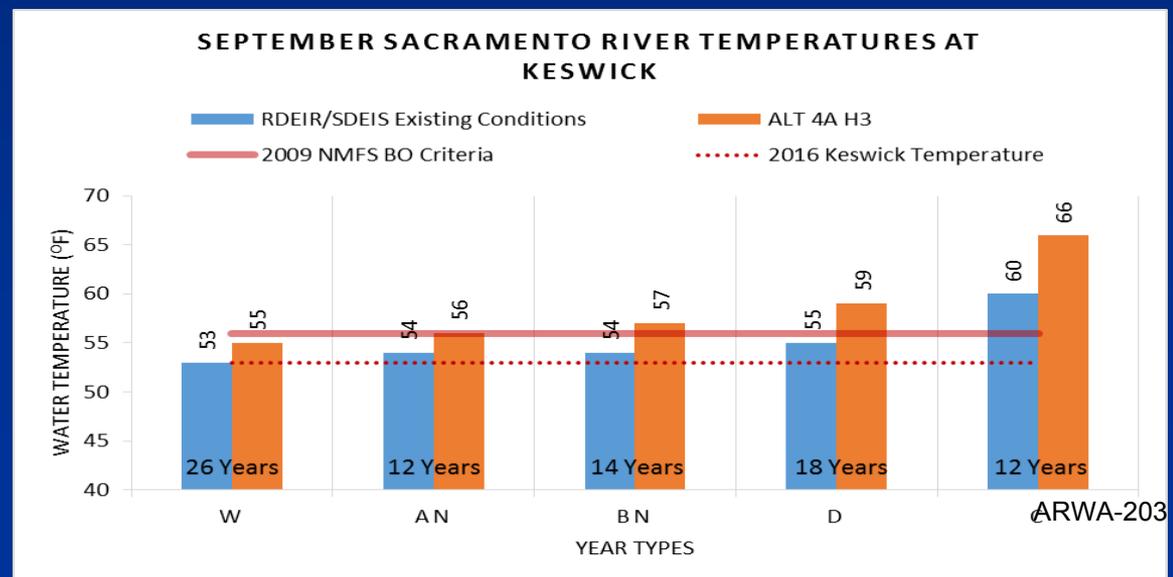
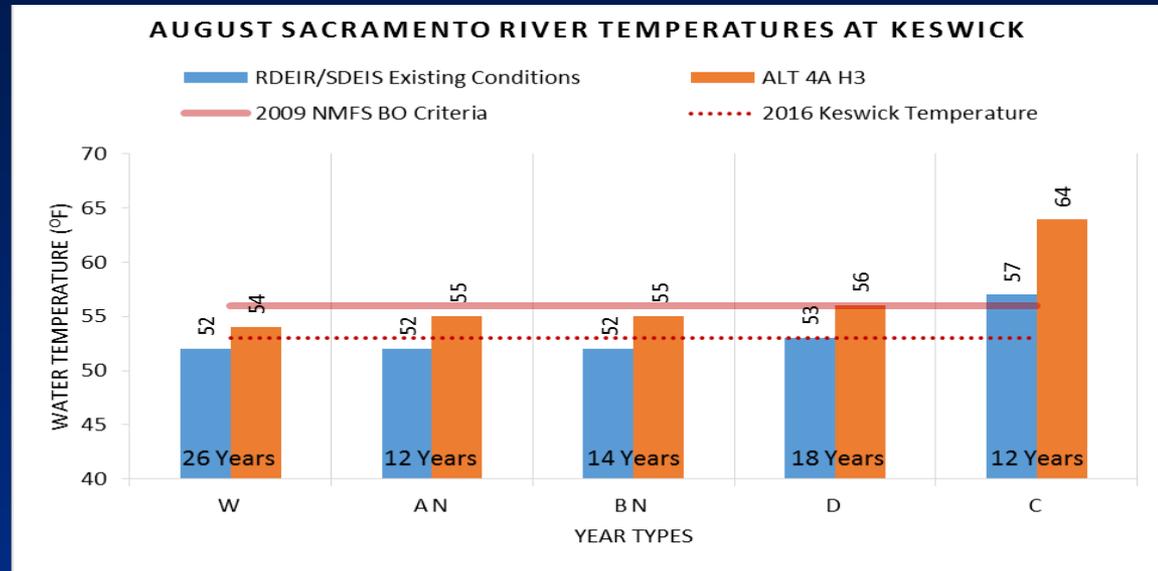
Shasta Reservoir Storage Temperature Implications

- Shasta storage is correlated to Sacramento River water temperature (miles of river below 56 °F)



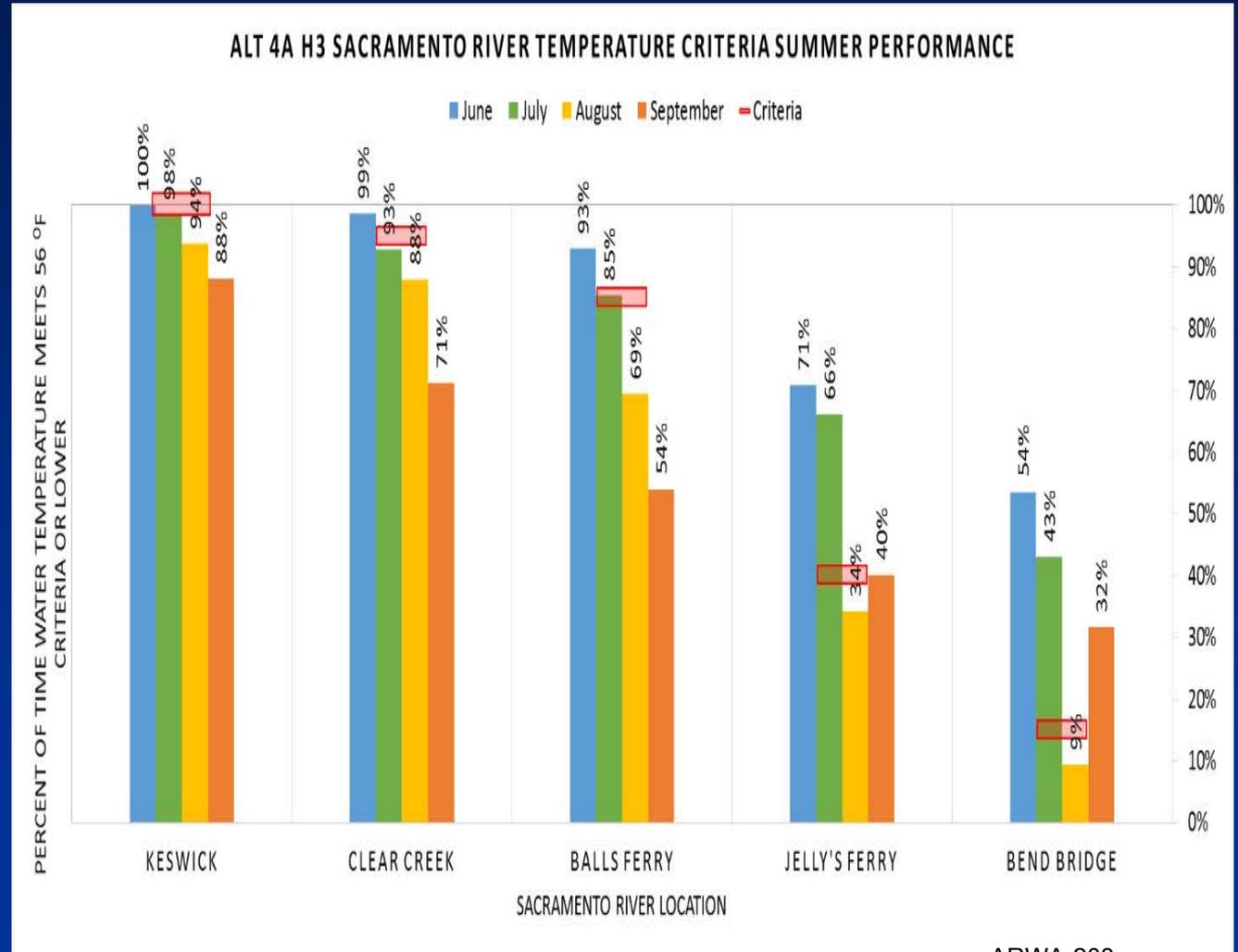
Shasta Reservoir Storage Temperature Implications

- Water temperatures under Alt 4A H3 are always higher and often much higher than WaterFix Existing Conditions modeling



Shasta Reservoir Storage Temperature Implications

- WaterFix Alt 4A H3 does not meet the Sacramento River 2009 BO RPA temperature performance criteria (red bars)

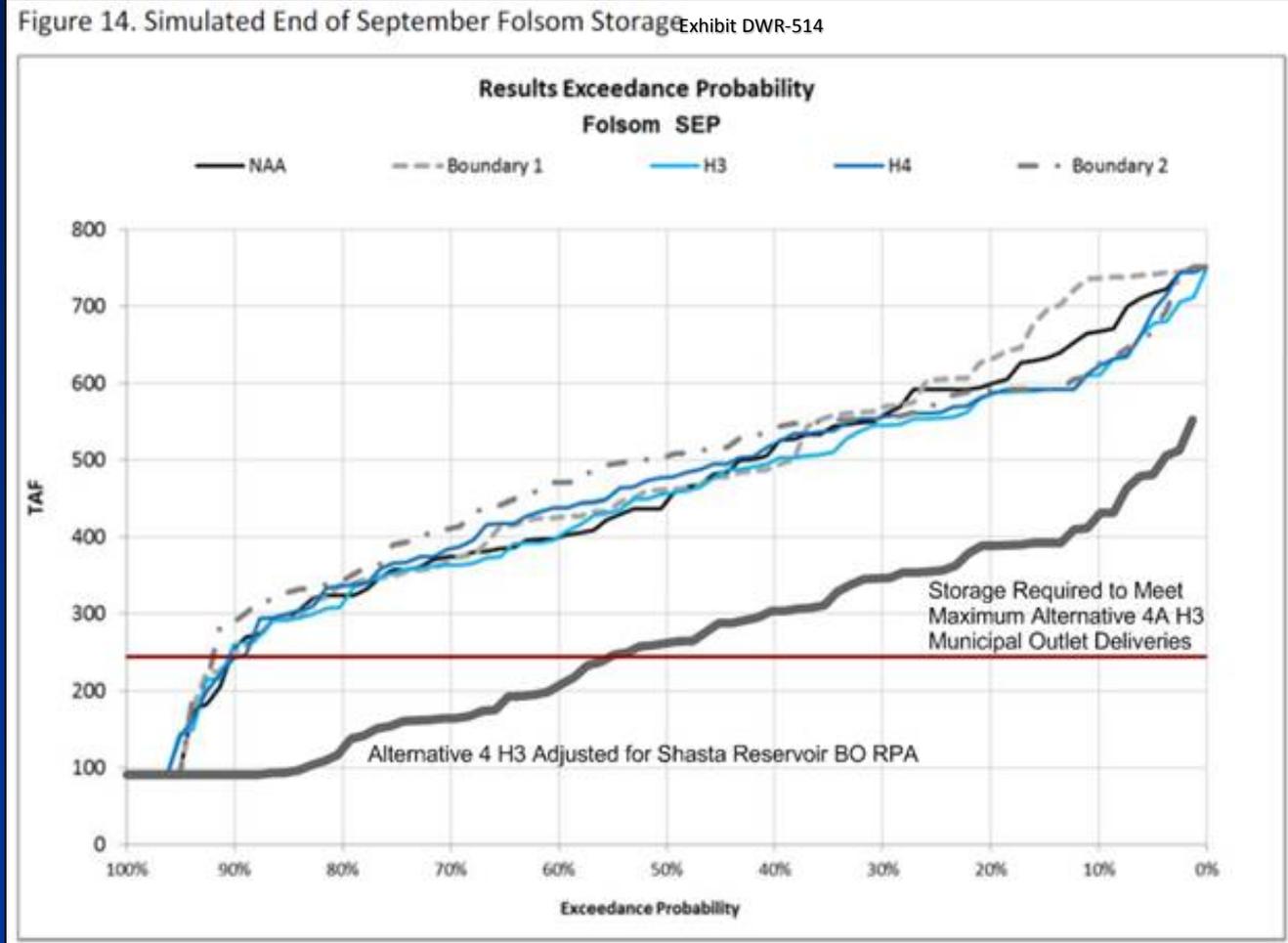


Modeled Shasta Operations & Resulting Effects on Folsom Reservoir

- Re-operation of Shasta Reservoir in Water Fix modeling to comply with 2009 RPA requires > 400,000 AF of additional storage
- Removing 400,000 AF from balance of CVP/SWP system results in injury to American River water users.
 - Even conservatively assuming 200 TAF from Folsom Reservoir results in large undisclosed injury

Modeled Shasta Operations & Resulting Effects on Folsom Reservoir

- Grey line illustrates reoperation of Folsom by 200 TAF to help meet Shasta Reservoir 2009 BO RPA



Modeled Shasta Operations & Resulting Effects on Folsom Reservoir

WaterFix Permit Terms Needed

- Modeled operations of WaterFix injure American River water users. Folsom Reservoir operations permit terms are needed to protect Folsom Reservoir storage
 - Folsom Reservoir storage should be maintained above a level needed to meet future M&I demands (with a safety factor)
 - End-of-year carryover should be maintained at a level needed to protect against a single and/or multi-year drought sequence

Summary / Conclusions

- Modeled WaterFix storage operations at Folsom Reservoir injure American River water users
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