



— BUREAU OF —  
RECLAMATION

# Shasta Temperature Management & Trinity River Modeling

Coordinated Long-Term Operation of the CVP and SWP

Trinity Management Council

July 21, 2019

# Agenda

- Shasta Cold Water Pool Management
- Trinity River Division Modeling and Operations



# Shasta Cold Water Pool Management



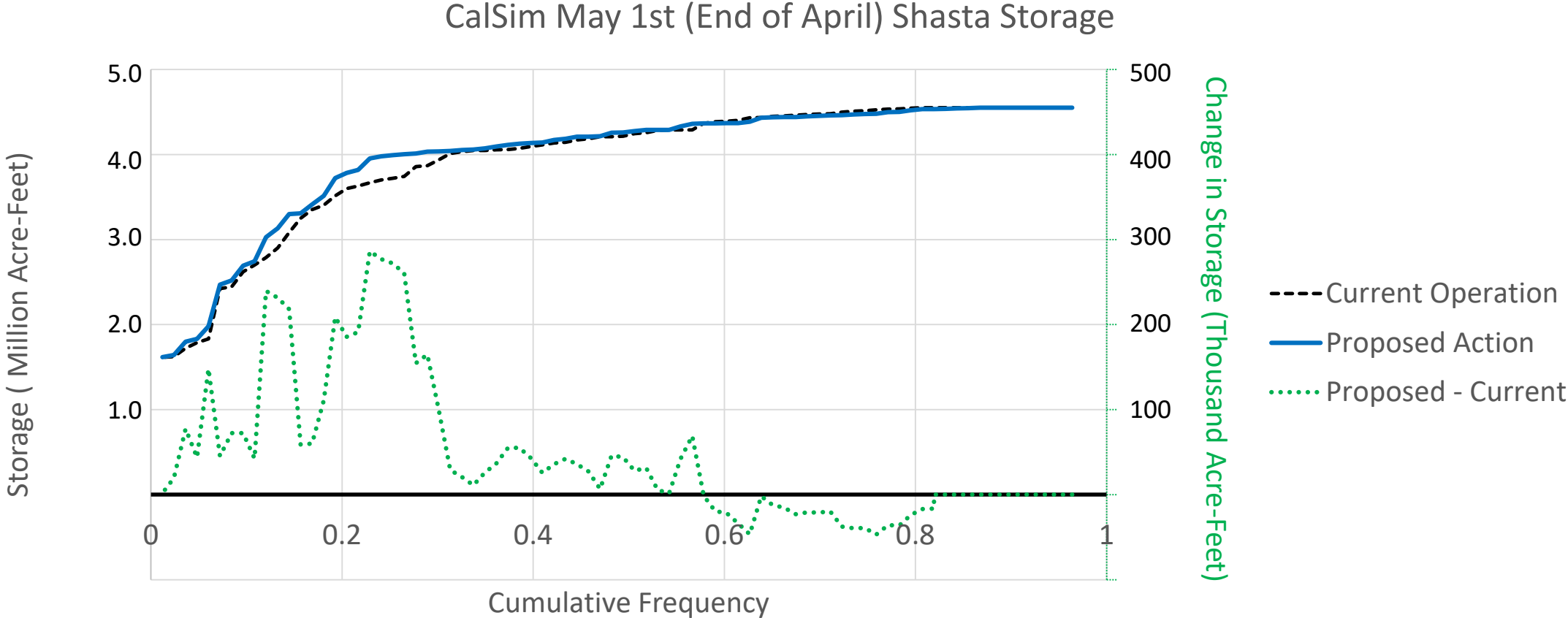


# Upper Sacramento River Actions

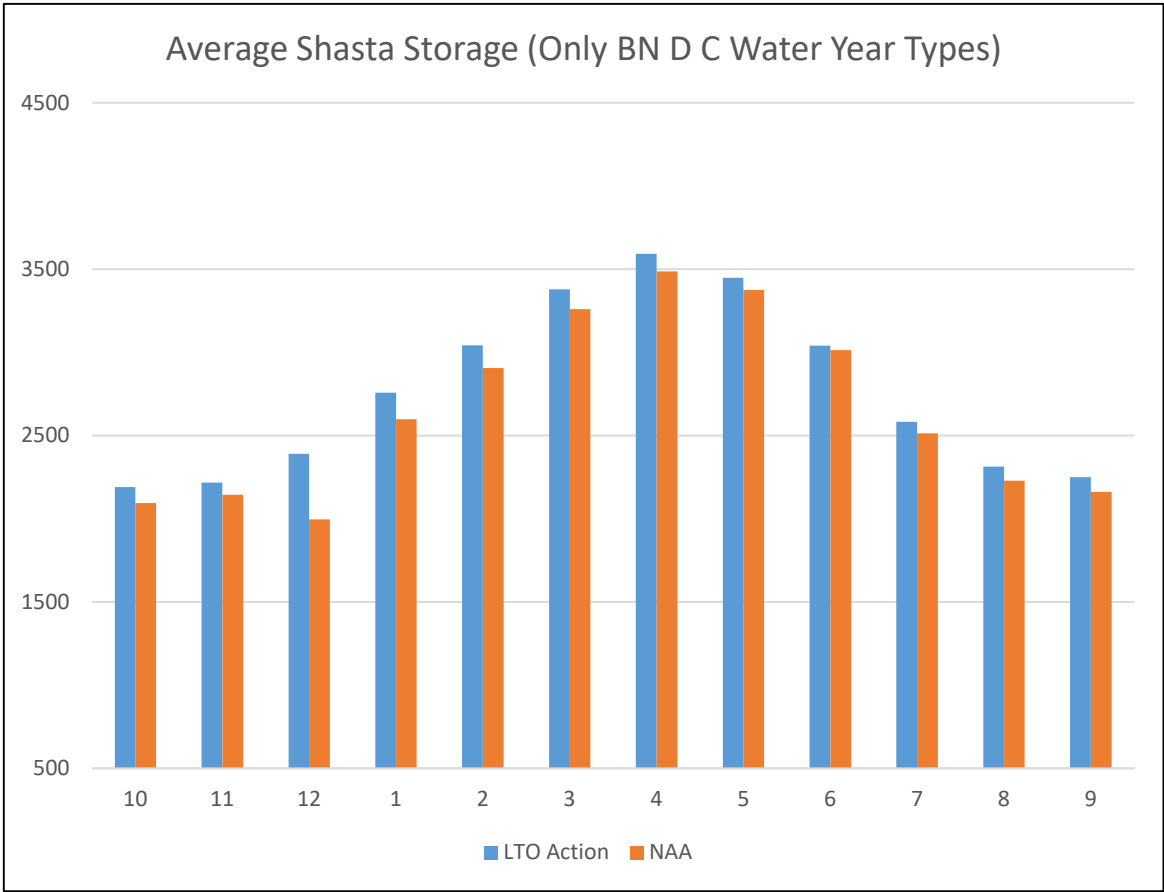
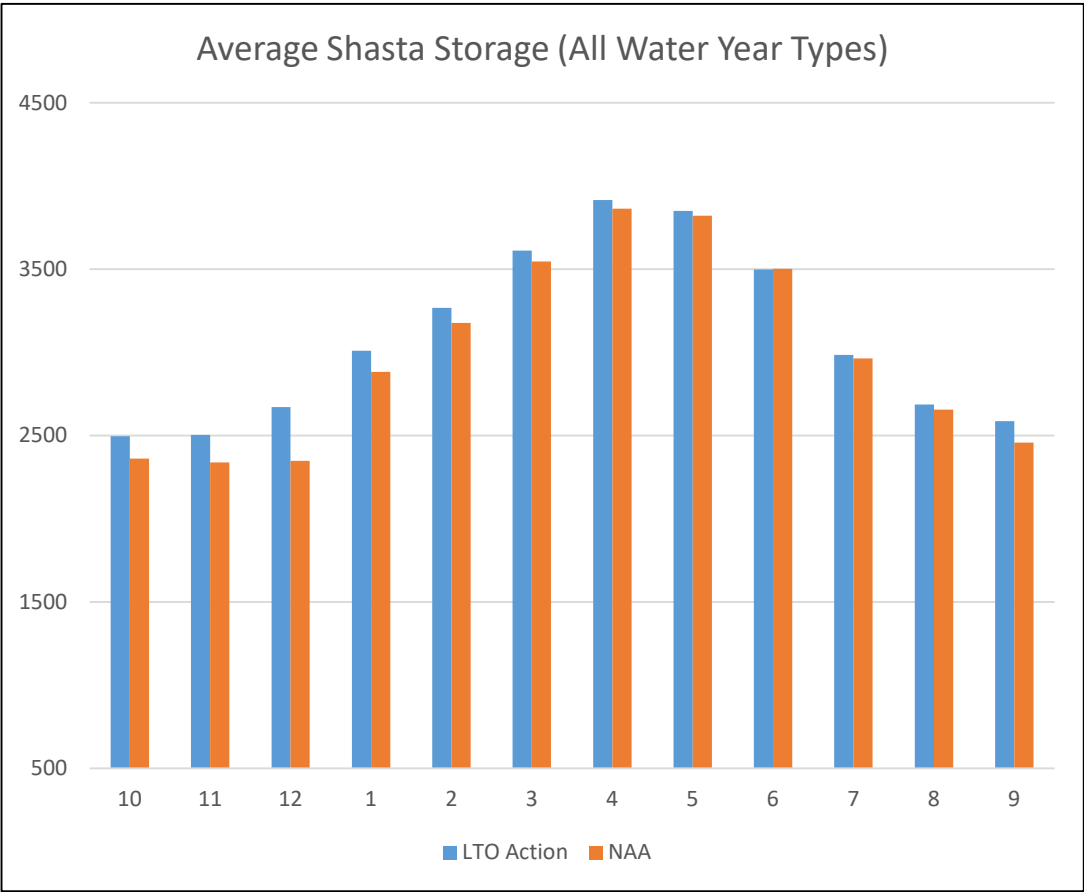
- Shasta Cold Water Pool Management
- Fall and Winter Refill and Redd Maintenance
- Spawning and Rearing Habitat Restoration
- Battle Ck Salmon and Steelhead Restoration Project and Reintroduction Plan
- Winter-run Chinook Livingston Stone Production
- Juvenile Trap and Haul
- Directors Meeting



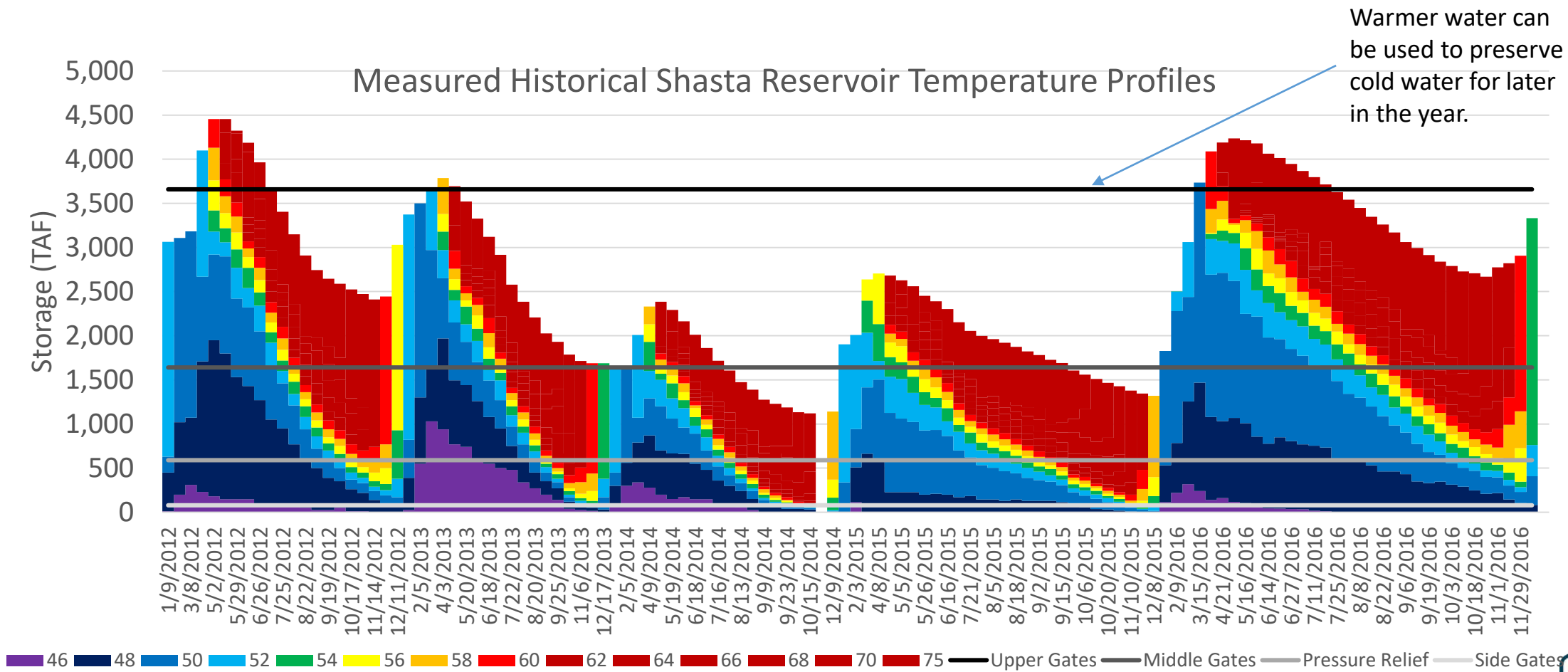
# Shasta Reservoir Storage - Drier Years



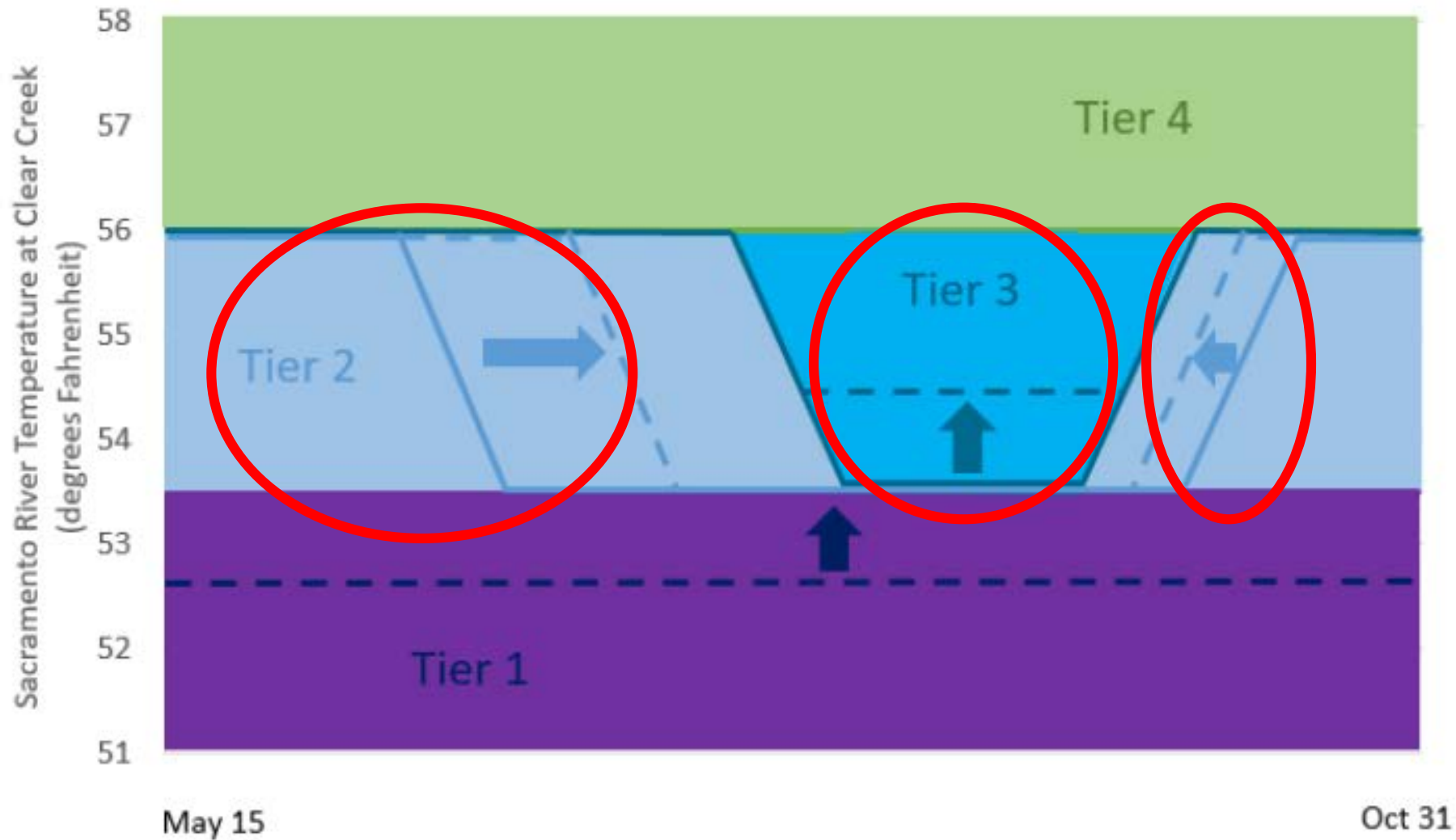
# Shasta Reservoir - Monthly Average Storage



# Coldwater Availability Differs by Year



# Cold Water Pool Management - Tiers





# Upper Sacramento Performance Metrics

| Category                                                                                          | Two Consecutive Years Of:       |                         |
|---------------------------------------------------------------------------------------------------|---------------------------------|-------------------------|
|                                                                                                   | Temperature Dependent Mortality | AND Egg to Fry Survival |
| Tier 1                                                                                            | >15%                            | <29%                    |
| Tier 2                                                                                            | >31%                            | <21%                    |
| Tier 3                                                                                            | >65%                            |                         |
| Tier 4                                                                                            | >77%                            | NA                      |
| Reinitiate on 2 consecutive years of Red Bluff ETF survival <15% and a 3 <sup>rd</sup> year <21%. |                                 |                         |



# Uncertainty in predicting performance metrics

- Uncertainty in adult escapement
- Uncertainty in juvenile production
- Uncertainty in background mortality estimates
- Poor accuracy of multi-season hydrologic forecasts (May-October)



# Four Year Review – Independent Panel

1. Review management drivers of cold water within the tiers
2. Review performance objectives & methods for determining temperature dependent mortality and total survival
3. Review Tier types that occurred and the performance within each tier as compared to expected performance
4. Recommend potential modifications to operations that improve cold water management and within agencies' authorities
5. Review the effectiveness of habitat restoration, facility improvements, intervention, and research measures.



# Trinity River Division Modeling



# Trinity Division- LTO Description

## Seasonal Operations

- Best use of limited export volume to conserve Trinity River and upper Sacramento CWP, meet water temperature objectives, as well as power production economics
- Maintain >600TAF in Trinity Reservoir, except 10-15% of WYs when Shasta Reservoir is also drawn down. End-of-year Carryover during D and CD WYs will be addressed in the proposed Water Operations Governance process(p 85-90)

## 2000 Trinity ROD Flows

- Reduced transbasin diversions intended to increase Trinity Reservoir storage

## Trinity Fall Augmentation Flows

- Preventative Base Flows component
- Preventative Pulse Flow component
- Emergency Flow component





# Trinity Division- Modeling Approach

Flow requirements on Trinity have priority over any exports to CVP system

## Modeled in BA

| North Coast Region                    | No Action Alternative                                | Alternative 1<br>(LTO Alternative) |
|---------------------------------------|------------------------------------------------------|------------------------------------|
| <b>Trinity River</b>                  |                                                      |                                    |
| Minimum Flow below Lewiston Dam       | Trinity EIS Preferred Alternative (369-815 TAF/yr)   | Same as NAA                        |
| Trinity River Fall Augmentation Flows | Additional 420 cfs Aug 1-Sep 30 in all but wet years | Same as NAA                        |
| Trinity Reservoir EOS minimum storage | Trinity EIS Preferred Alternative (600TAF)           | Same as NAA                        |

## Not Modeled in BA

- 50 TAF Second Proviso instream flow (Is not modeled because release and timing of the water is undetermined)

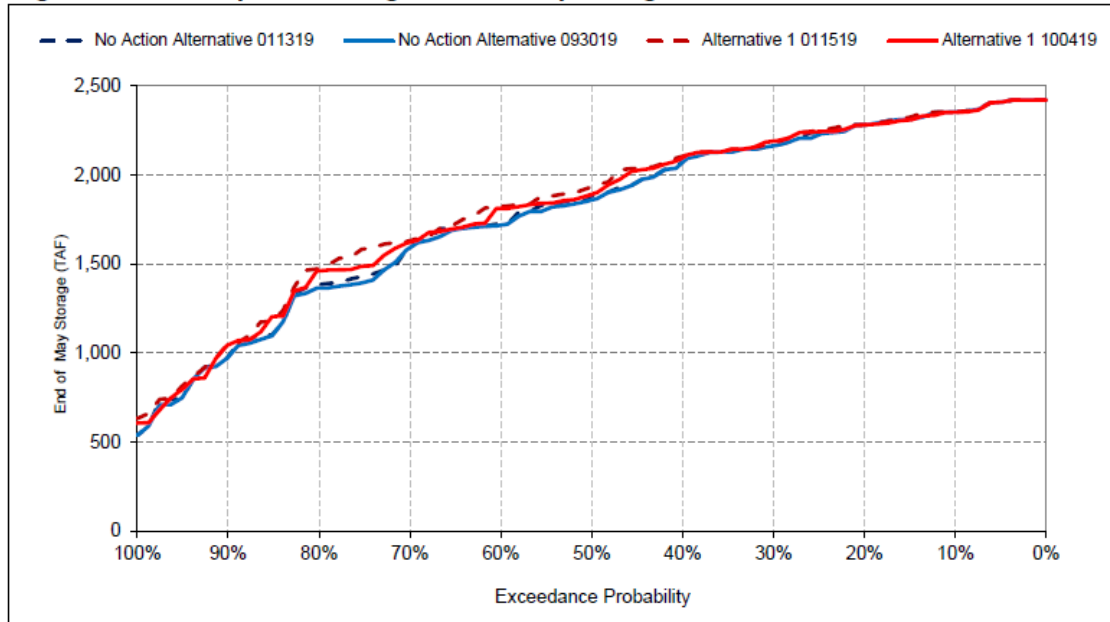
BA Appendix F1  
Revised Alternative  
Sensitivity Analysis,  
Section F1.1.2



# Trinity Lake Storage

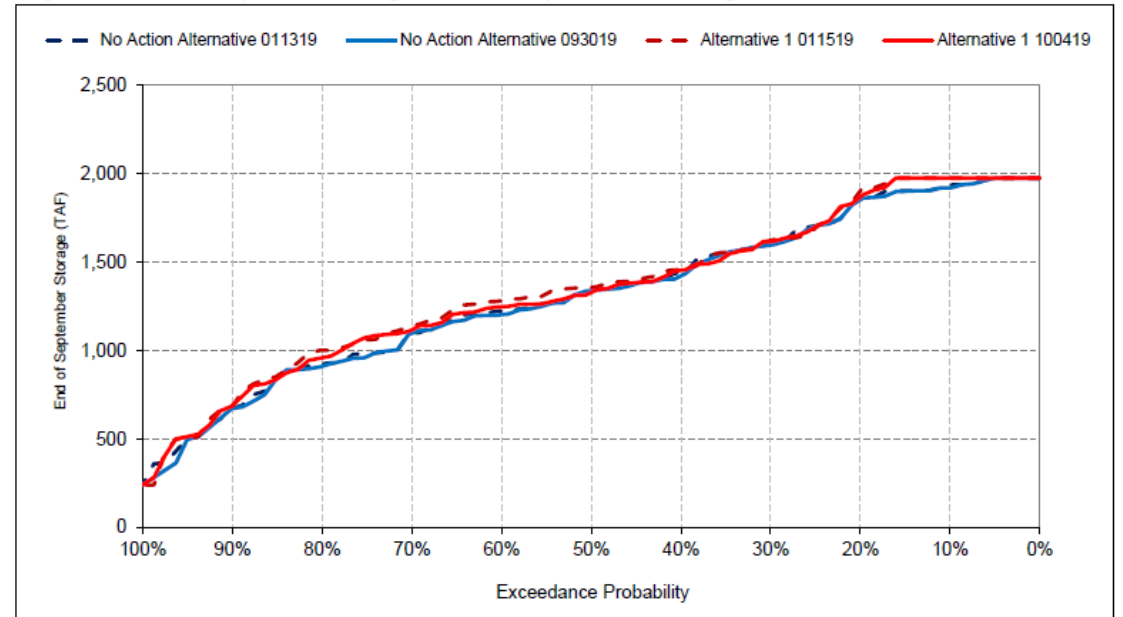
- Similar or increases a bit under LTO (Alt 1) compared to NAA

Figure 1-14. Trinity Lake Storage, End of May Storage



\*All scenarios are simulated at ELT (Early Long-Term) Q5 with 2025 climate change and 15 cm sea level rise.

Figure 1-18. Trinity Lake Storage, End of September Storage



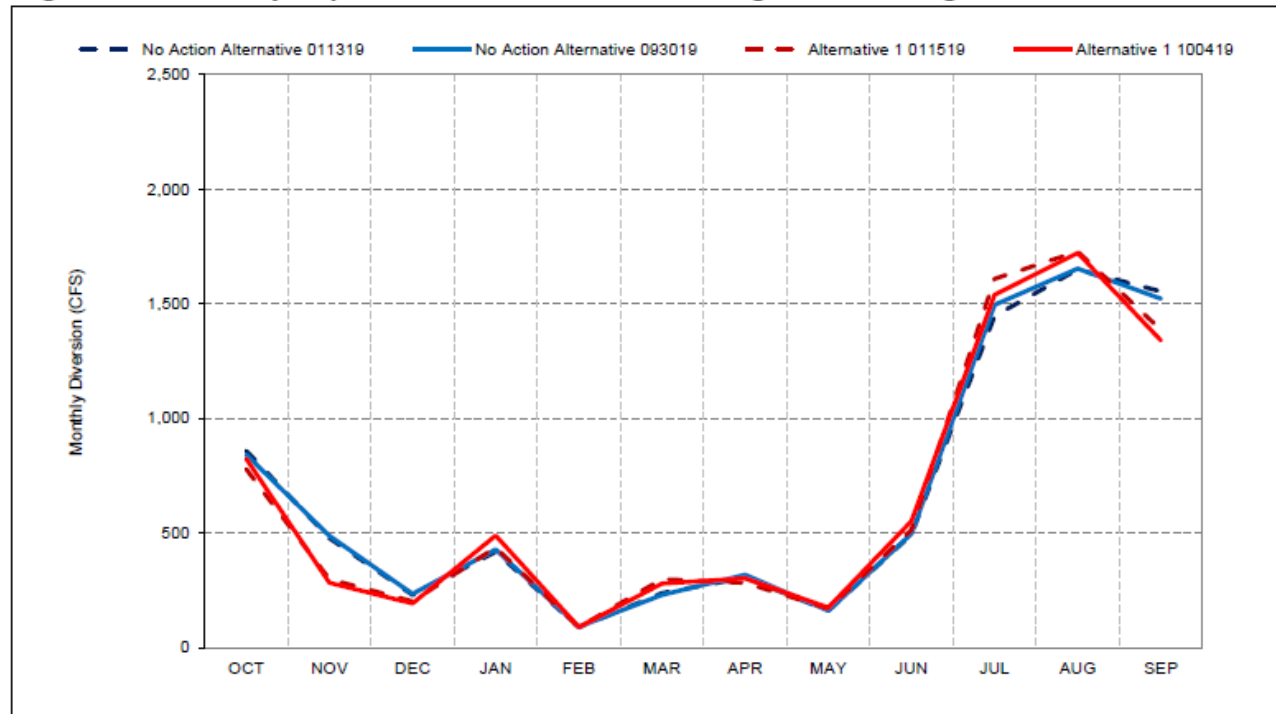
\*All scenarios are simulated at ELT (Early Long-Term) Q5 with 2025 climate change and 15 cm sea level rise.



# Trinity River Exports through Clear Ck tunnel

- Overall, average annual export falls from 480 to 470 TAF/yr due to Trinity and Shasta storage balancing
- LTO exports lower than NAA in fall (0 to -500cfs less based on WYT)
- LTO exports greater than NAA in summer (0 to 540 cfs more based on WYT)

Figure 46-1. Trinity Import - Clear Creek Tunnel, Long-Term Average Diversion



\*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999).

\*These results are displayed with calendar year - year type sorting.

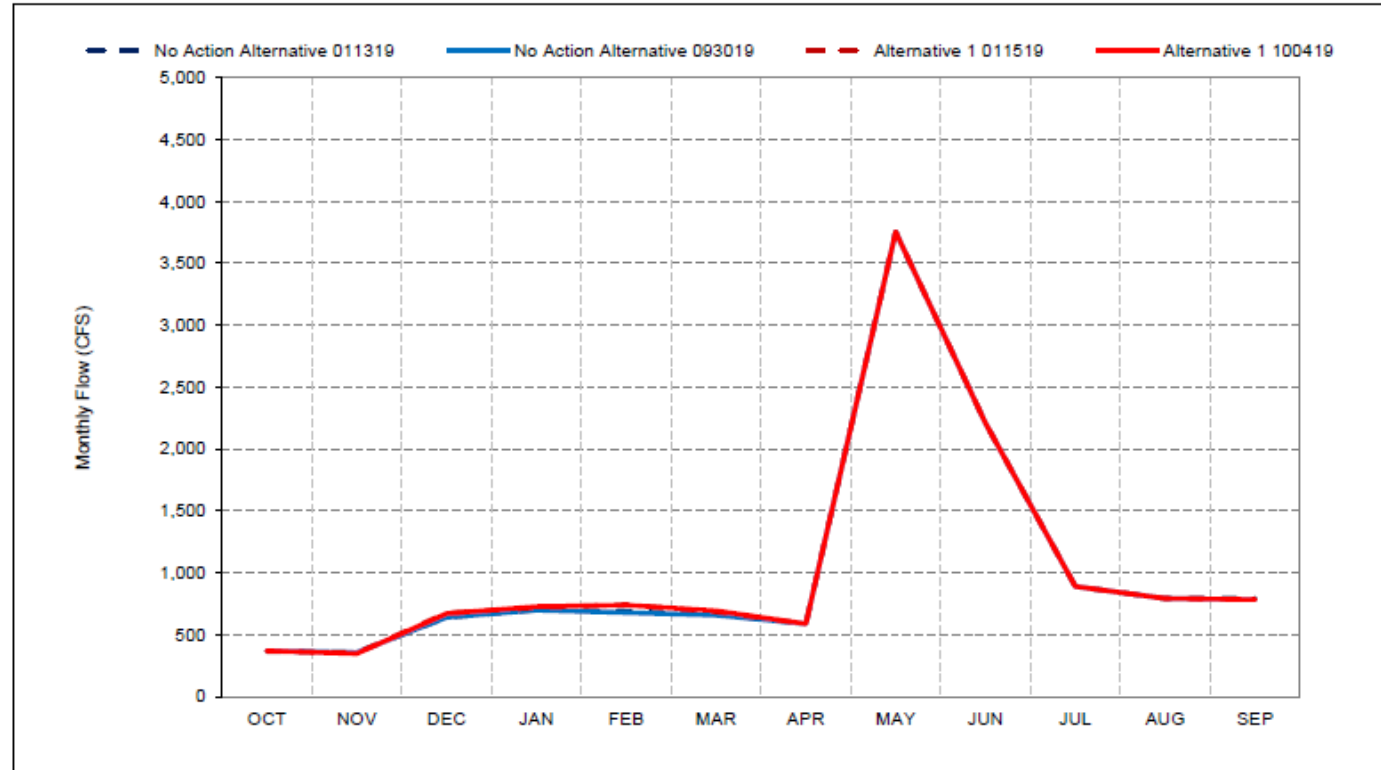
\*All scenarios are simulated at ELT (Early Long-Term) Q5 with 2025 climate change and 15 cm sea level rise.



# Trinity River Flows

- Occasional, minimal flow increases due to differences in late fall-winter spill in W and AN WYs.

Figure 12-1. Trinity River Flow below Lewiston, Long-Term Average Flow



\*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999).

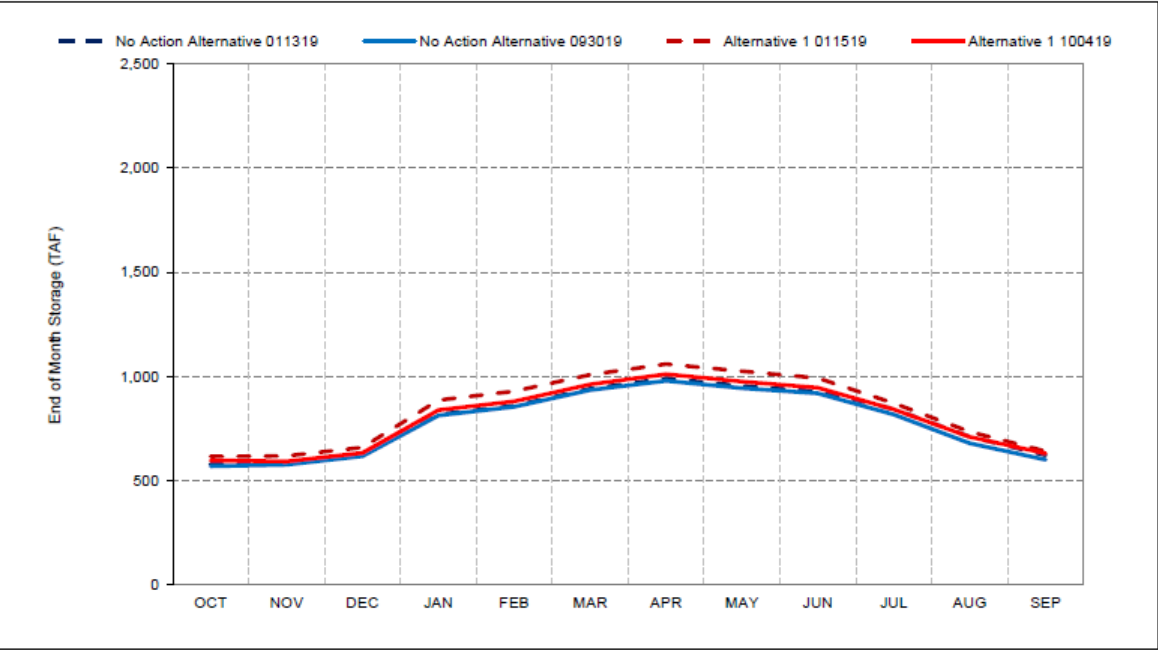
\*These results are displayed with calendar year - year type sorting.

\*All scenarios are simulated at ELT (Early Long-Term) Q5 with 2025 climate change and 15 cm sea level rise.



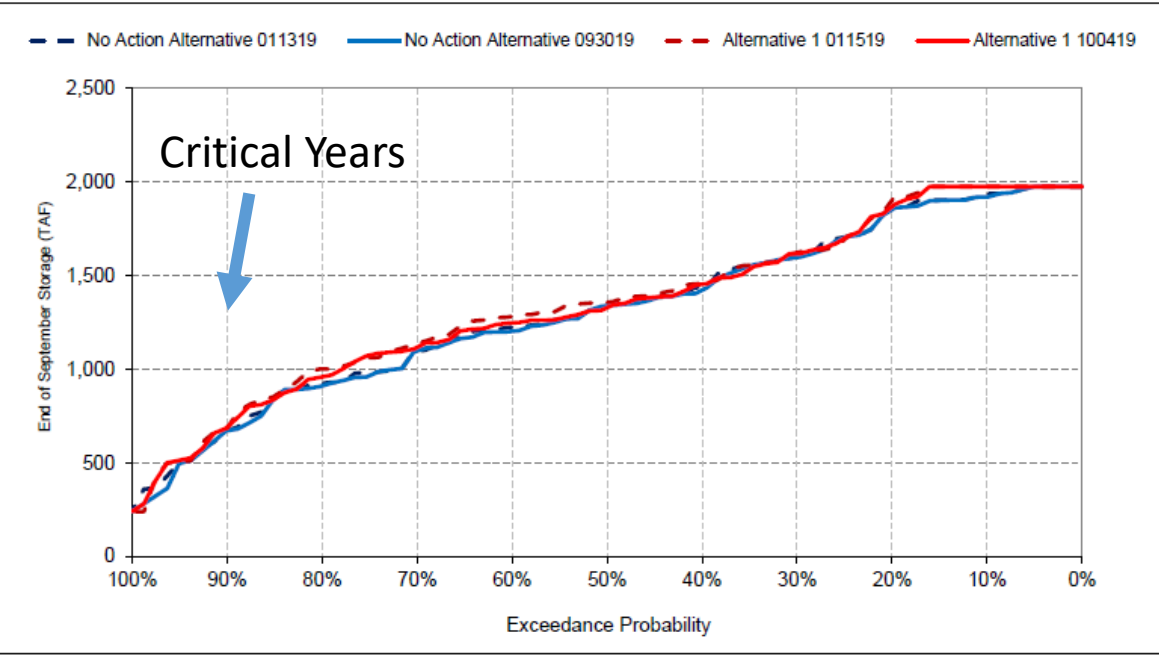
# Trinity Operations in Critical years (Storage)

Figure 1-6. Trinity Lake Storage, Critical Year Average Storage



\*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999).  
\*These results are displayed with calendar year - year type sorting.  
\*All scenarios are simulated at ELT (Early Long-Term) Q5 with 2025 climate change and 15 cm sea level rise.

Figure 1-18. Trinity Lake Storage, End of September Storage

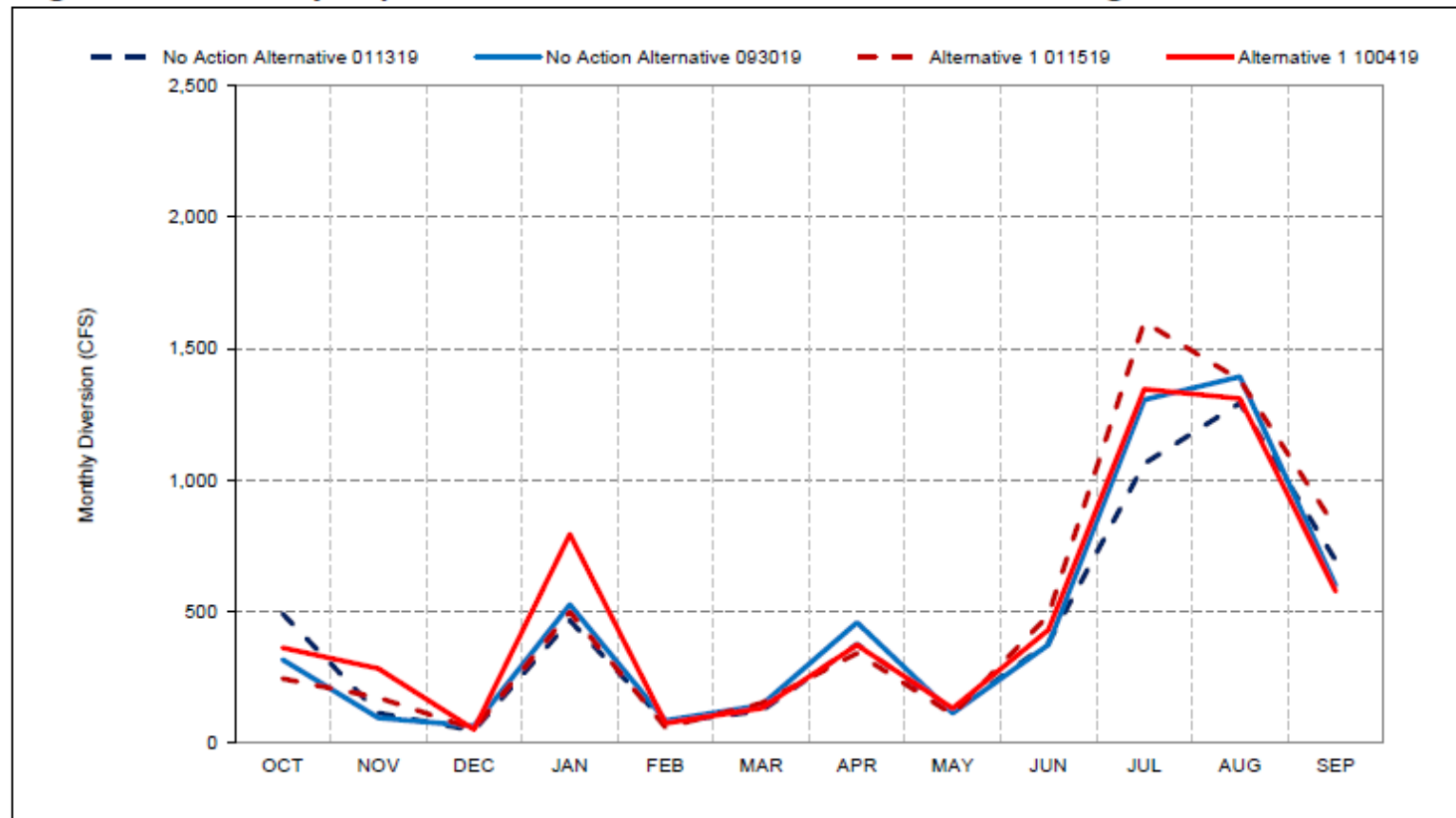


\*All scenarios are simulated at ELT (Early Long-Term) Q5 with 2025 climate change and 15 cm sea level rise.



# Trinity Operations in Critical years (Exports)

Figure 46-6. Trinity Import - Clear Creek Tunnel, Critical Year Average Diversion



\*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999).

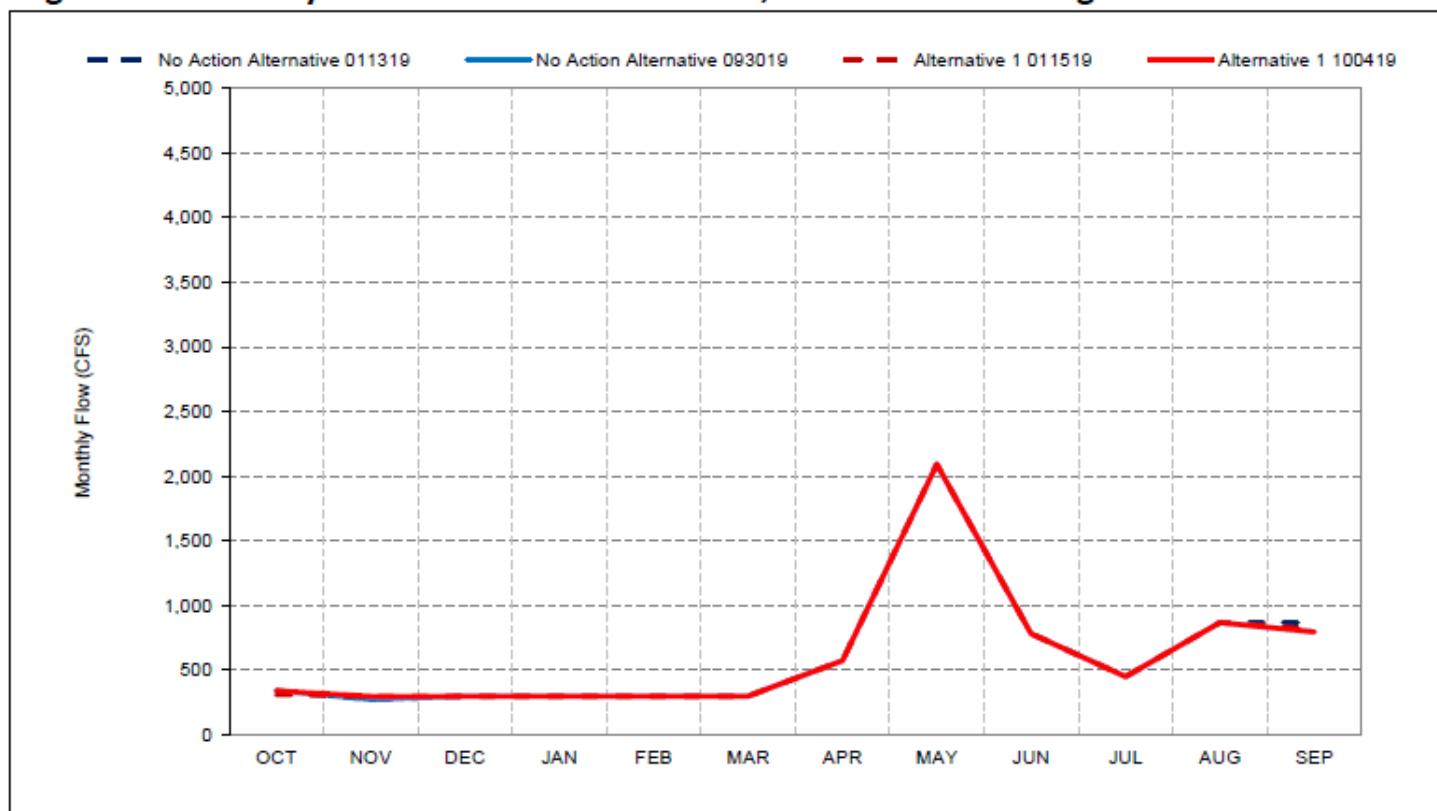
\*These results are displayed with calendar year - year type sorting.

\*All scenarios are simulated at ELT (Early Long-Term) Q5 with 2025 climate change and 15 cm sea level rise.



# Trinity Operations in Critical years (Flows)

Figure 12-6. Trinity River Flow below Lewiston, Critical Year Average Flow



\*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999).

\*These results are displayed with calendar year - year type sorting.

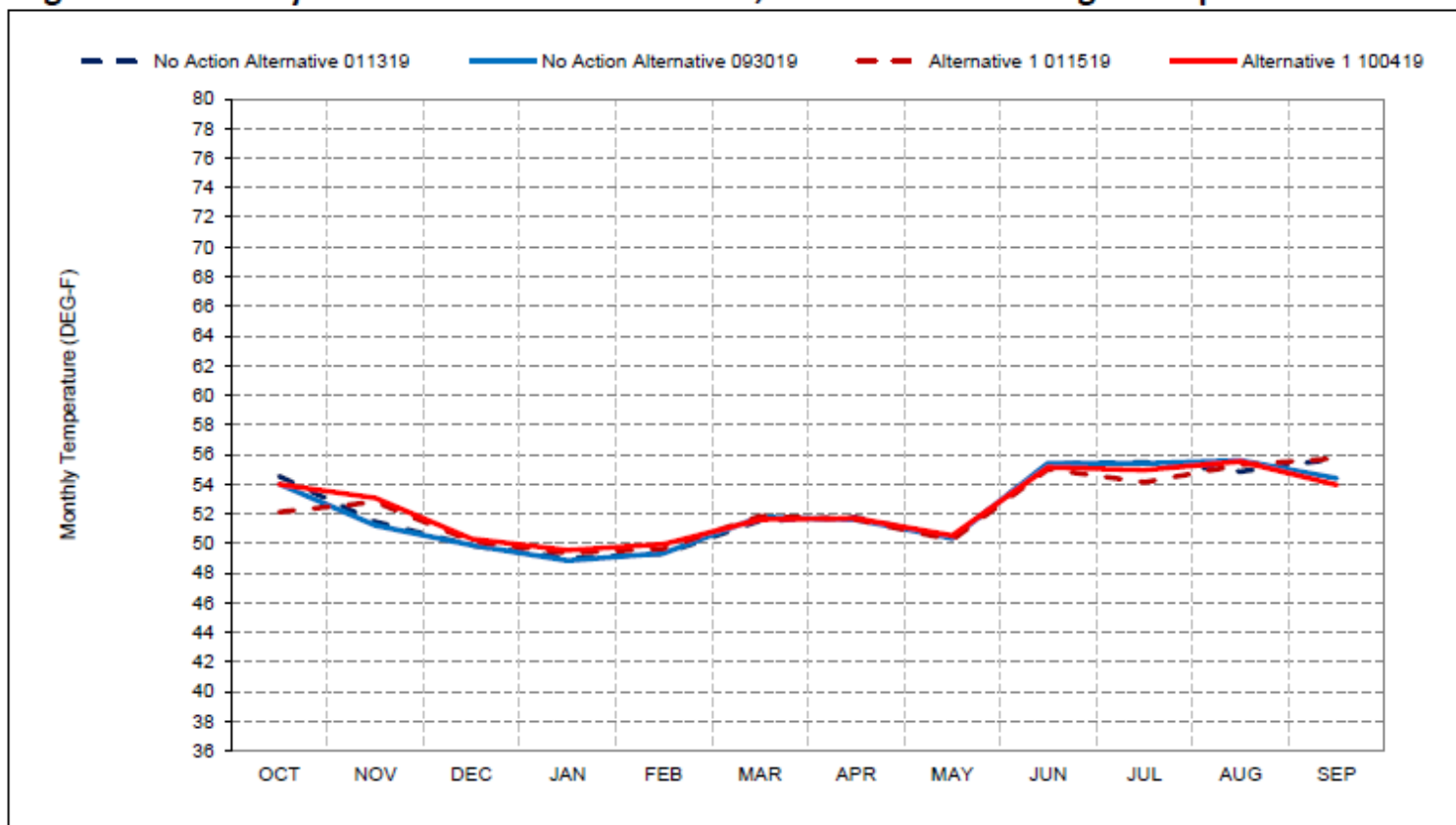
\*All scenarios are simulated at ELT (Early Long-Term) Q5 with 2025 climate change and 15 cm sea level rise.





# Trinity Operations in Critical years (Temp)

Figure 1-6. Trinity River below Lewiston Dam, Critical Year Average Temperature



\*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999).

\*These results are displayed with calendar year - year type sorting.

\*All scenarios are simulated at ELT (Early Long-Term) Q5 with 2025 climate change and 15 cm sea level rise.



# Trinity River modeling summary

- Flow requirements to Trinity have priority over export to CVP system
- CalSim modeling of Trinity exports to CVP relies on reservoir balancing
- Preferred Alternative builds storage in Shasta, thus predict increased storage in Trinity
- Change in flow downstream of Lewiston compared to baseline due to changes in flood releases related to storage.





## Additional Discussion?

- [www.usbr.gov/mp/bdo](http://www.usbr.gov/mp/bdo)
- [www.usbr.gov/mp/cvo](http://www.usbr.gov/mp/cvo)



— BUREAU OF —  
RECLAMATION