2085 Climate Change Operational Impacts and Baseline Assumptions

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Baseline for Future Conditions Studies

Existing Baseline

Future Baseline

Future With Proposed Project

Current Climatic Conditions

Meeting full Regulatory and Contractual Obligations

Future Climatic Conditions

Meeting full Regulatory and Contractual Obligations

Future Climatic Conditions

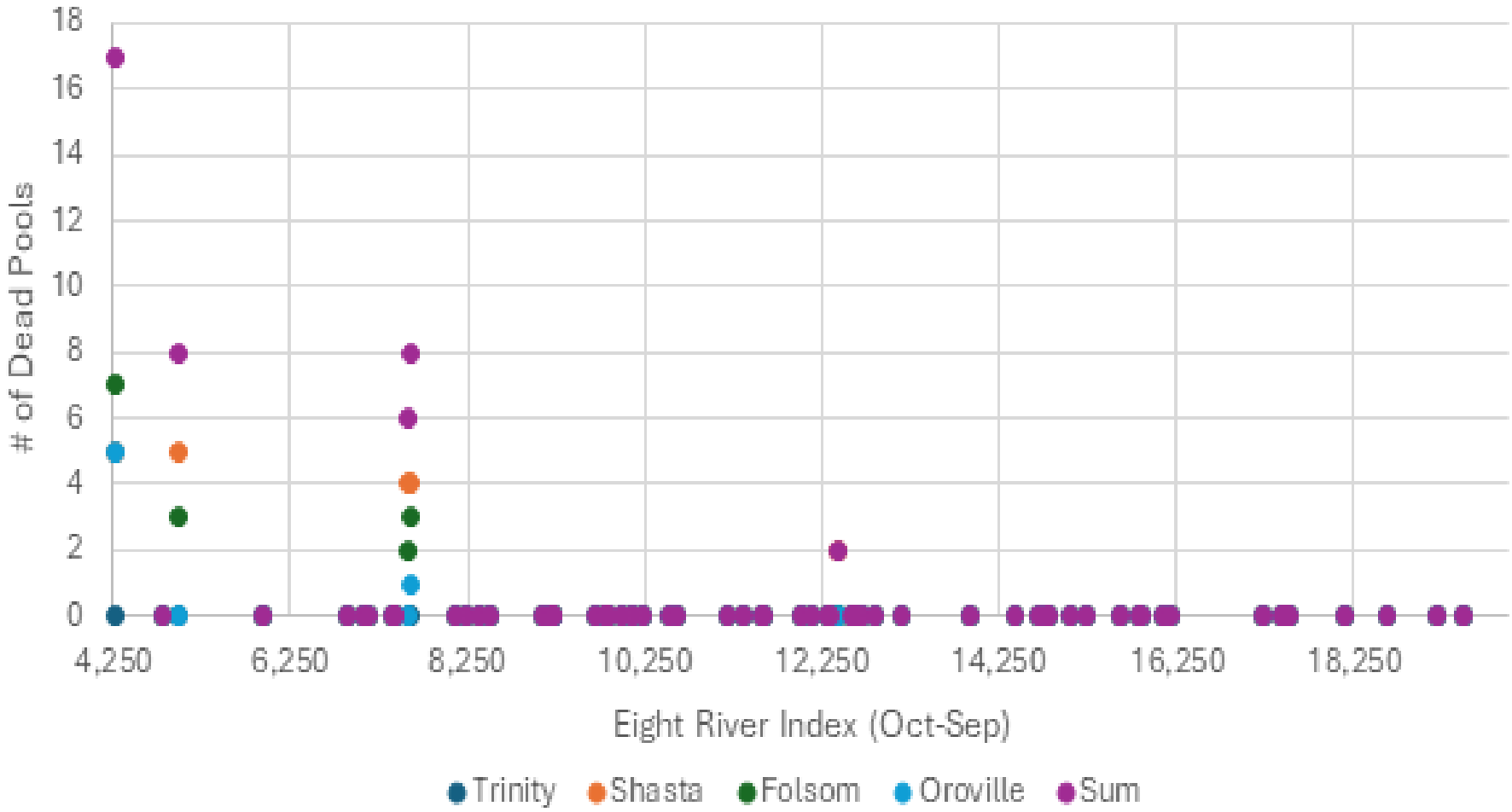
Meeting full Regulatory and Contractual Obligations

Proposed Project Operations

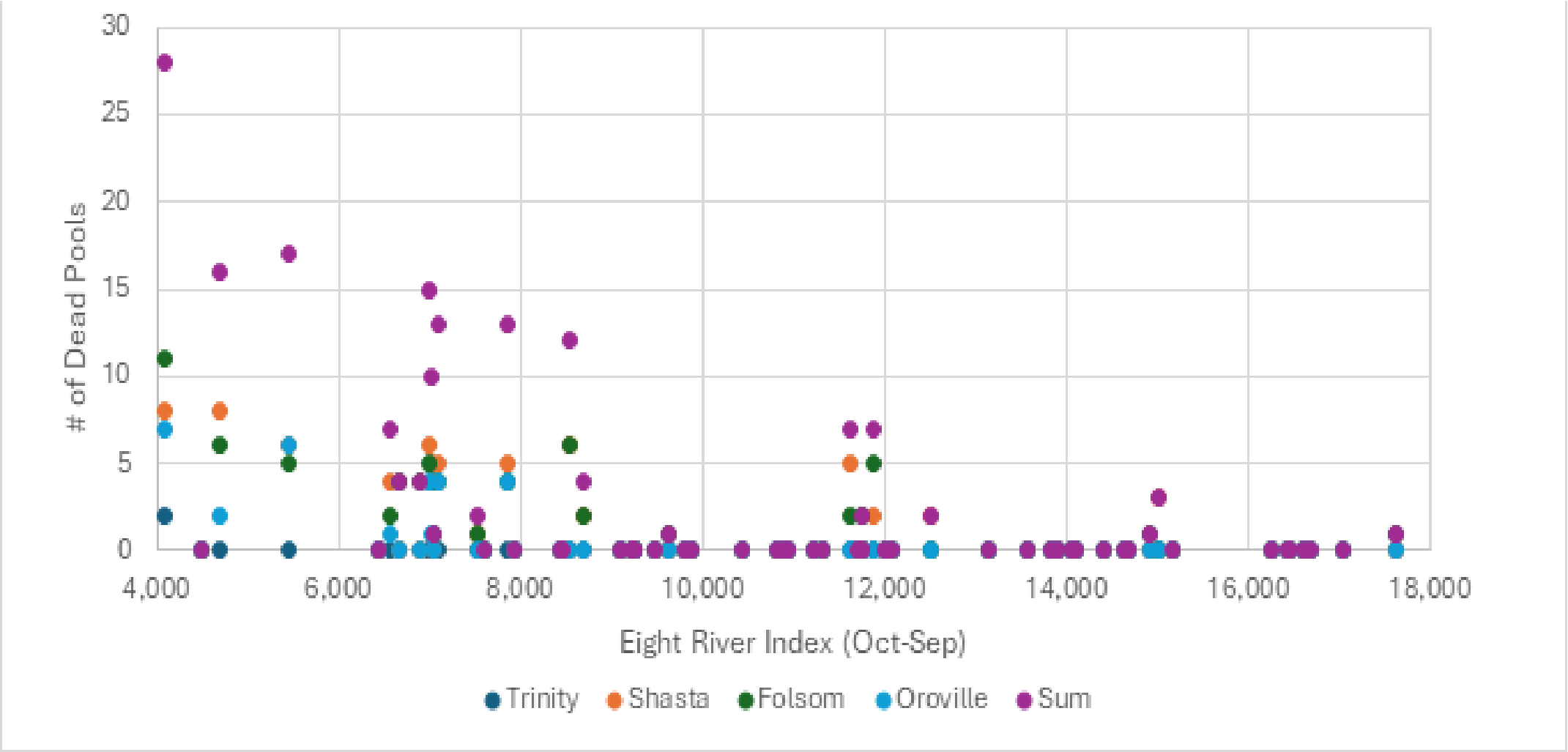
Long Term Future Climatic Conditions

Year	Level of Concern	Basin-area Wide Average Temp Increase (degree C)	Basin-area wide Average Precip Change (%)	Increase in Extreme Precip (%)	Sea Level Rise (ft)	Change in Average Annual 8 River Index Flow (TAF)	Change in Average April to July 8 River Index Flow (TAF)
2043	50th	1.5	1.5	10.5	0.5	-156	-1,852
2043	95th	1.8	-1.8	12.6	1	-1,261	-2,474
2085	50th	3.4	3.3	23.8	1.8	-284	-3,293
2085	75th	3.9	0.4	27.3	3.5	-1,258	-3,835

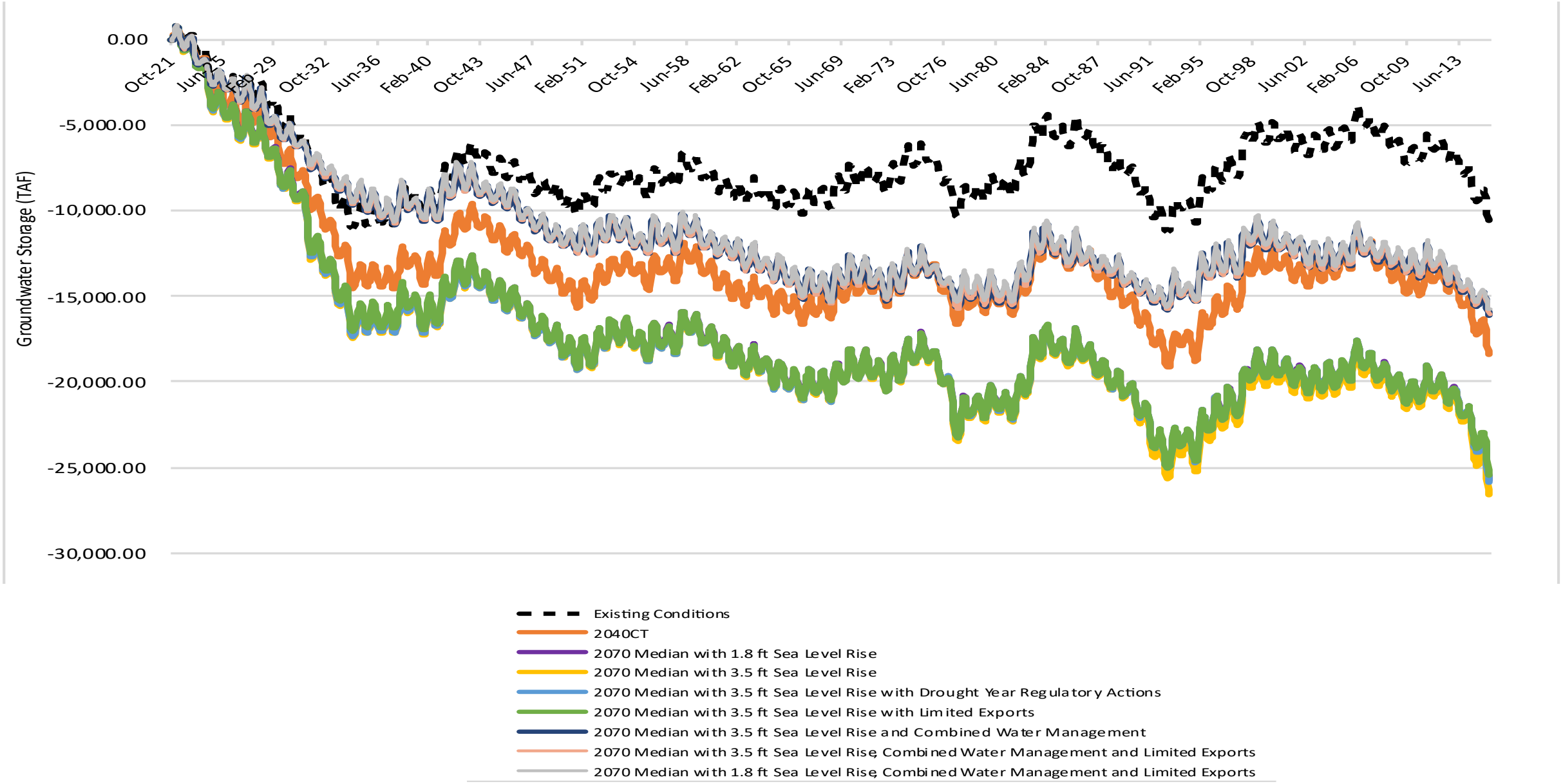
Occurrence of Reservoir Dead Pools – 2085 – 50 LOC



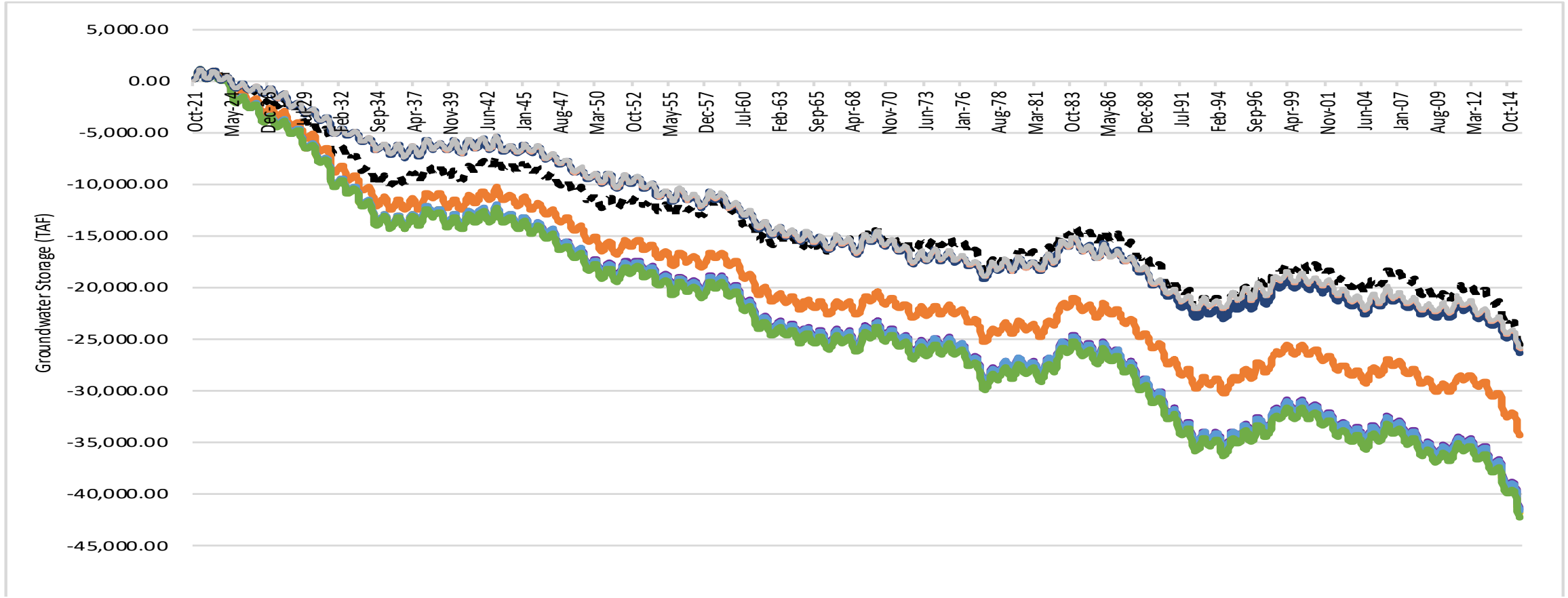
Occurrence of Reservoir Dead Pools – 2085 – 75 LOC



Sacramento Valley Groundwater Storage



San Joaquin Valley Groundwater Storage



Adjusted Baseline Paradigm

Existing Baseline

Adjusted Future Baseline

Adjusted Future With Proposed Project

Current Climatic Conditions

Meeting full Regulatory and Contractual Obligations

Future Climatic Conditions

Regulatory and Contractual Obligations relaxed during Extreme conditions

Future Climatic Conditions

Regulatory and Contractual Obligations relaxed during Extreme conditions

Proposed Project Operations

Example: Climate Adaptation Plan (CAP) Measures

Structural Measures

- **Delta Conveyance Project**
- **California Aqueduct Subsidence Project**
- **Increased South of Delta Storage**
- Delta barriers
- Pumped storage and other energy benefits identified in flexible resource study

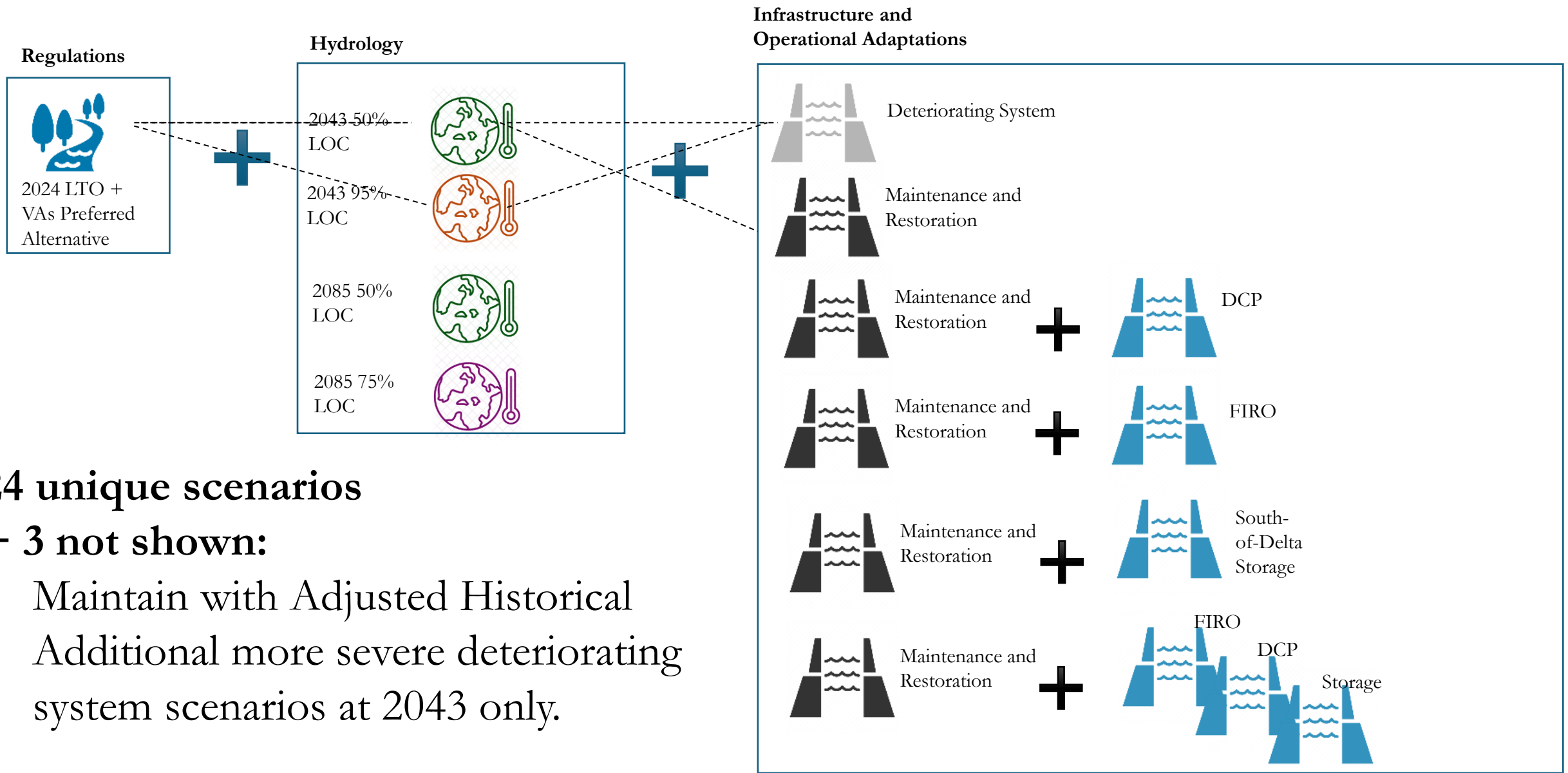
Operations and Management Measures

- **Forecast Informed Reservoir Operations/Lake Oroville Flood Control Manual Update**
- **SWP Enhanced Asset Management**
- Improved seasonal forecasting
- Revised carryover storage targets
- Shaping SWP power load and generation
- Enhanced financial management and contract extensions
- SWP Delta islands management
- WSIP project integration
- Reservoir temperature management

Nature Based Solutions

- Recreation development
- Feather river watershed management
- Environmental restoration

Example: Climate Adaptation Plan (CAP)



24 unique scenarios

+ 3 not shown:

- Maintain with Adjusted Historical
- Additional more severe deteriorating system scenarios at 2043 only.

Why are Baseline Adjustments are needed for Long Term Future Climate Conditions?

- Operations in long term future conditions (like 2085) would be significantly different for adaptation to future hydrologic conditions
- Project impacts are analyzed by comparing the ‘with project alternative’ with the Baseline
- Adaptation strategy benefits will not be realistic if the baseline operation is constrained to existing regulatory and contractual obligations during extreme conditions
- Unrealistically low storages could reduce simulated benefits of projects (like FIRO)
- Baseline export operations will affect benefits of CASP and asset management. This effect will become more prevalent with DCP.

Baseline Adjustments

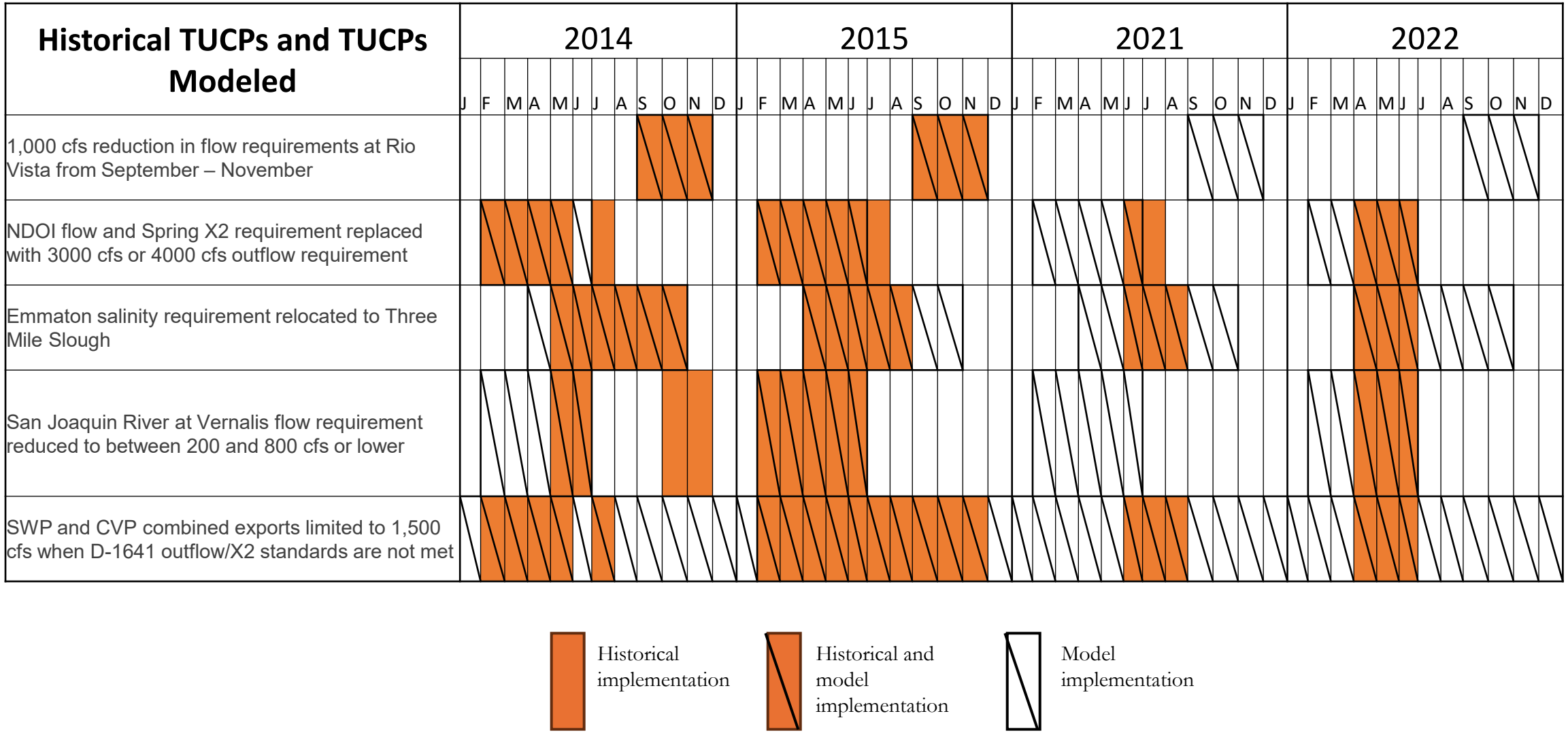
Broadly classified into following categories:

1. Possible State Water Resources Control Board Actions
2. Water Demand Assumptions
3. South of Delta Export Limitations

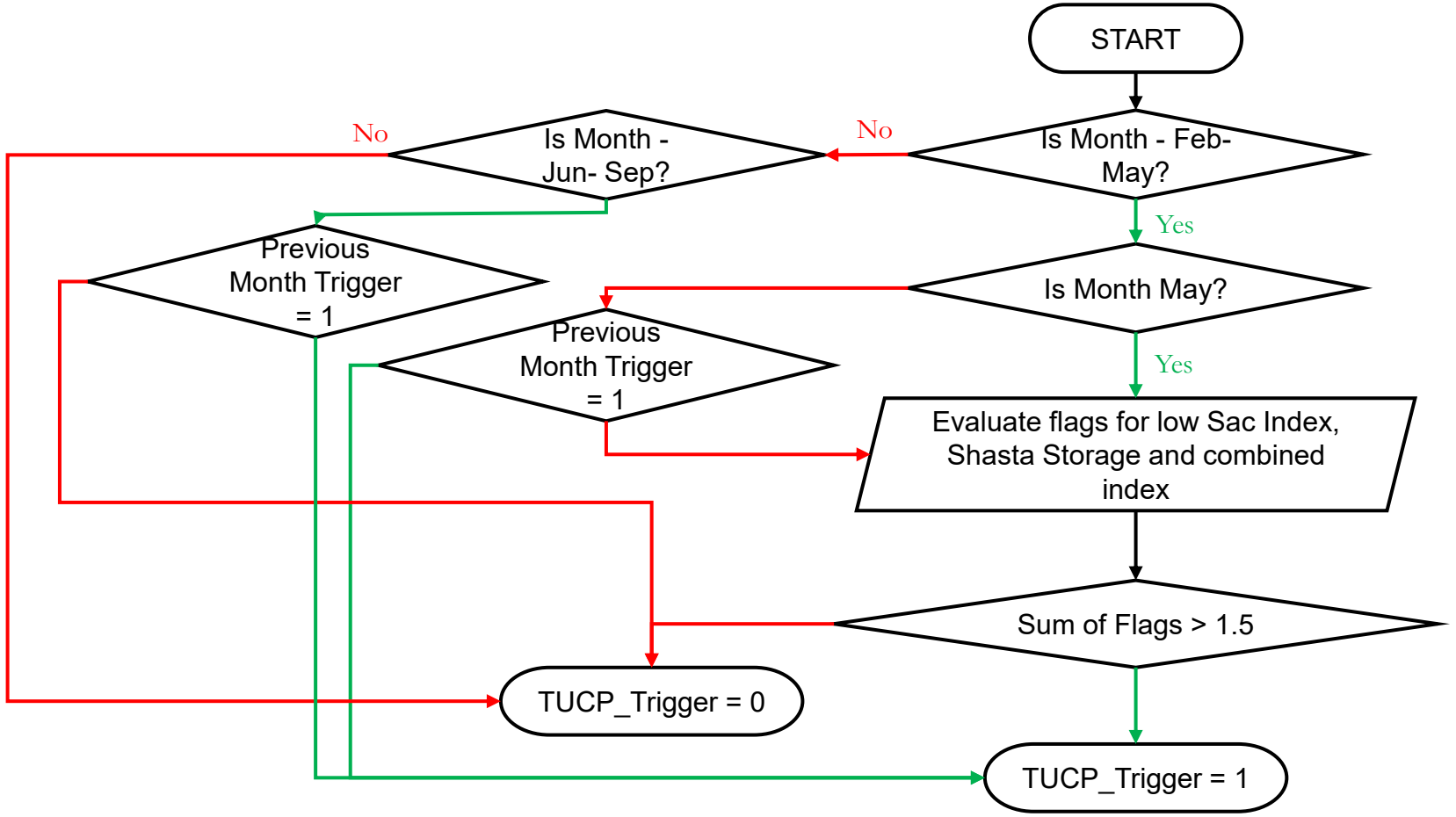
State Water Resources Control Board Actions – Order Approving TUCPs

- Temporary Urgency Change Petitions (TUCP) allow water right holders to request temporary modifications to existing water rights permits or licenses to ensure more flexible water use in response to extreme conditions.
- Orders approving TUCPs is an action implemented by the California State Water Resources Control Board (SWRCB) to address critical water management challenges, particularly during emergencies such as droughts or natural disasters.

Historical Implementation of TUCPs



TUCP Trigger used in LTO 2024 Reclamation Studies



TUCP Hydrologic Triggers in CalSim3 Model for CAP

The following combination of triggers was found suitable for 2085-50cc and 2085-75cc models based on sensitivity analysis to cover all the months with dead pools observed in each of the scenarios.

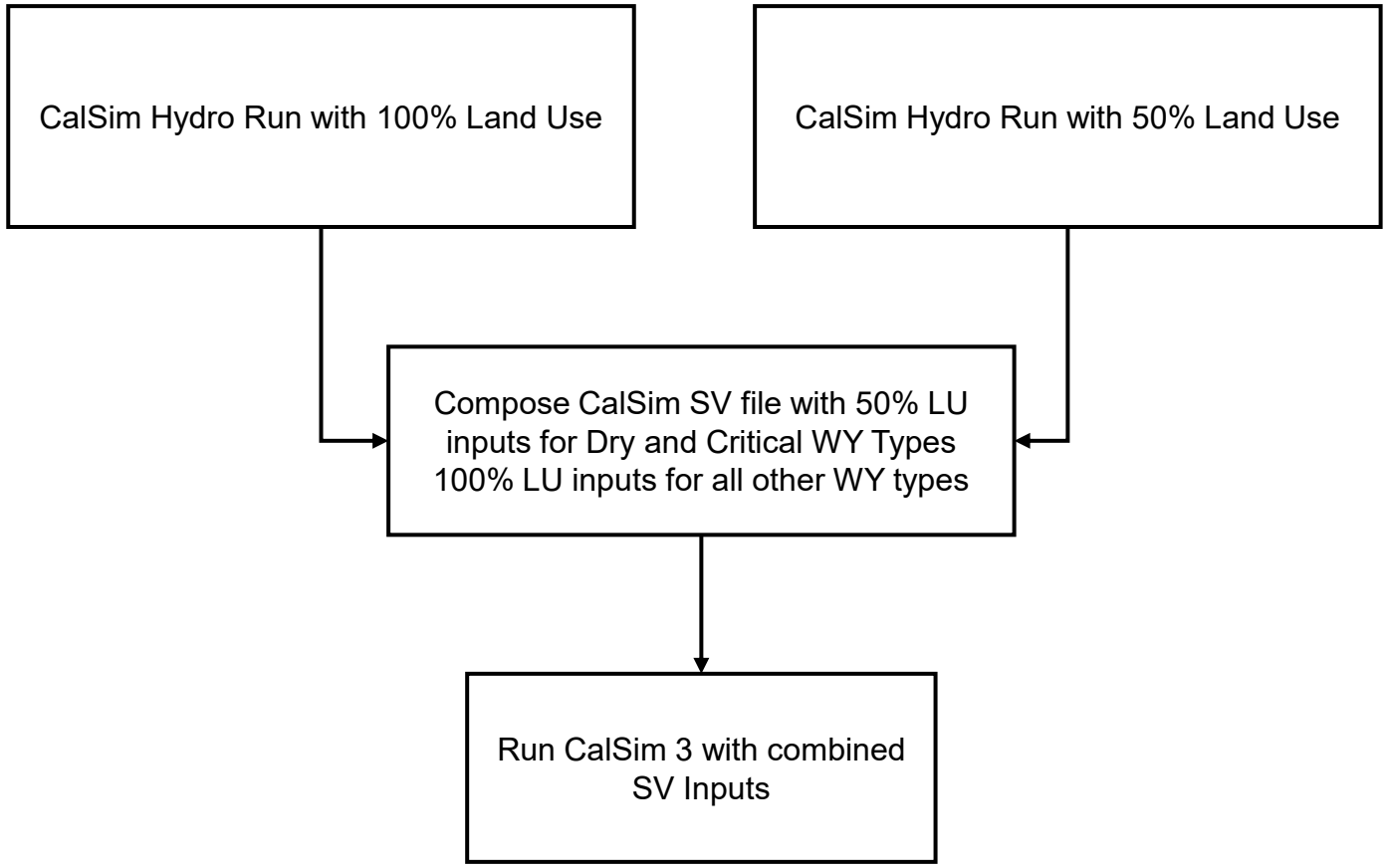
Condition	Trigger 1	Trigger 2
2085-50cc	Eight River Index Value < 9,220 AND Previous Year's Eight River Index Value < 20,000	Previous Year's Trigger Value = 1 AND Eight River Index Value < 20,000
2085-75cc	Eight River Index Value < 9,500 AND Previous Year's Eight River Index Value < 35,000	Previous Year's Trigger Value = 1 AND Eight River Index Value < 18,000

These triggers were based only on Eight River Index (unlike the trigger used in LTO 2024 studies that includes simulated storages) to provide for a stable and comparable baseline for each of the project and adaptation strategies implemented

Agricultural Demand Reduction in Drought Years

- Reductions in Agricultural water demands may also be achieved through water rights cuts, increases in irrigation efficiency, and reduction in groundwater pumping from SGMA
- For CAP - 50% cuts were implemented for irrigated acreage for certain crop types (Annual, Alfalfa and Pastures) in Dry/Critical years
- Substantially reduced dead storages and groundwater declines in the baseline operations
- These cuts are less drastic than PPIC (2019) studies which predict fallowing in all water year types and also include fallowing of Vines and Trees under SGMA

Implementation of Agricultural Demand Reduction (Land Use Cuts) in CalSim Modeling Framework



Ongoing developments in CalSim 3 to dynamically change Land Use during model runs would greatly enhance model utility for extreme future scenarios

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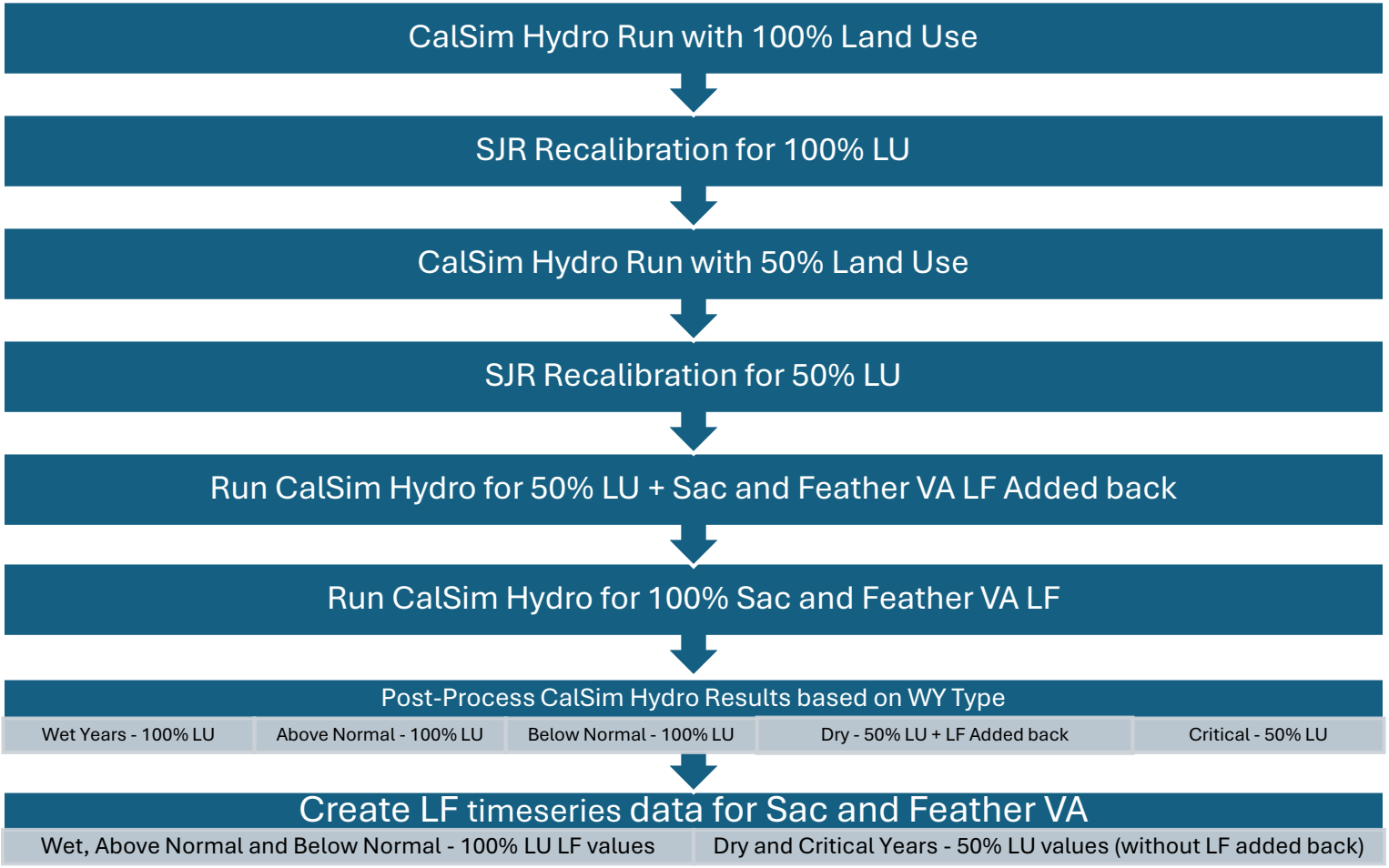

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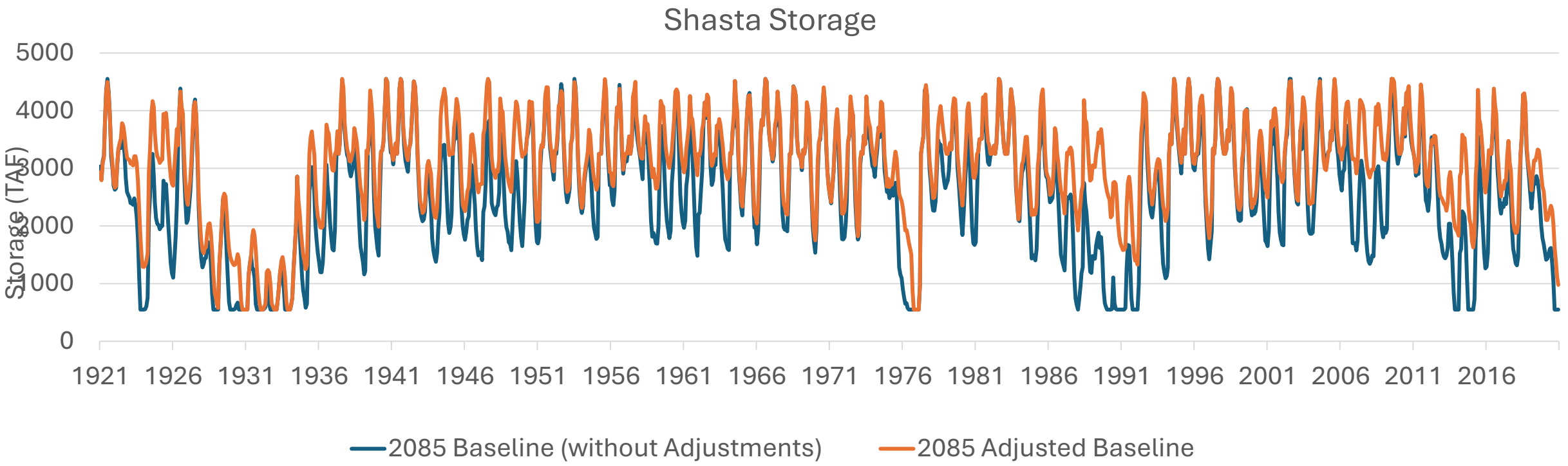
Urban Conservation in Drought Years in Sacramento Basin

- Represents increased efficiency and re-use, and primarily affects American River Basin M&I
- Implement through increased efficiency in all years, and removing outdoor water use in driest years (same trigger as TUCP actions)
- Helped reduce dead storages (mainly in Folsom) and groundwater declines in CAP
- Urban Water Management Plans and PPIC (2019) discuss a 50% shortage in the future

SOD Exports Limited to UWFE in Dry/Critical Years

- Significant improvement in Oroville dead storages when added to the 50% land use cut scenario
- Used in model to make NOD/SOD delivery cuts more equitable, so that storage saved from land use cuts does not go to SOD exports
- Justification: NOD users have higher priority water rights compared with SOD

Effects of Adjustments to Baseline



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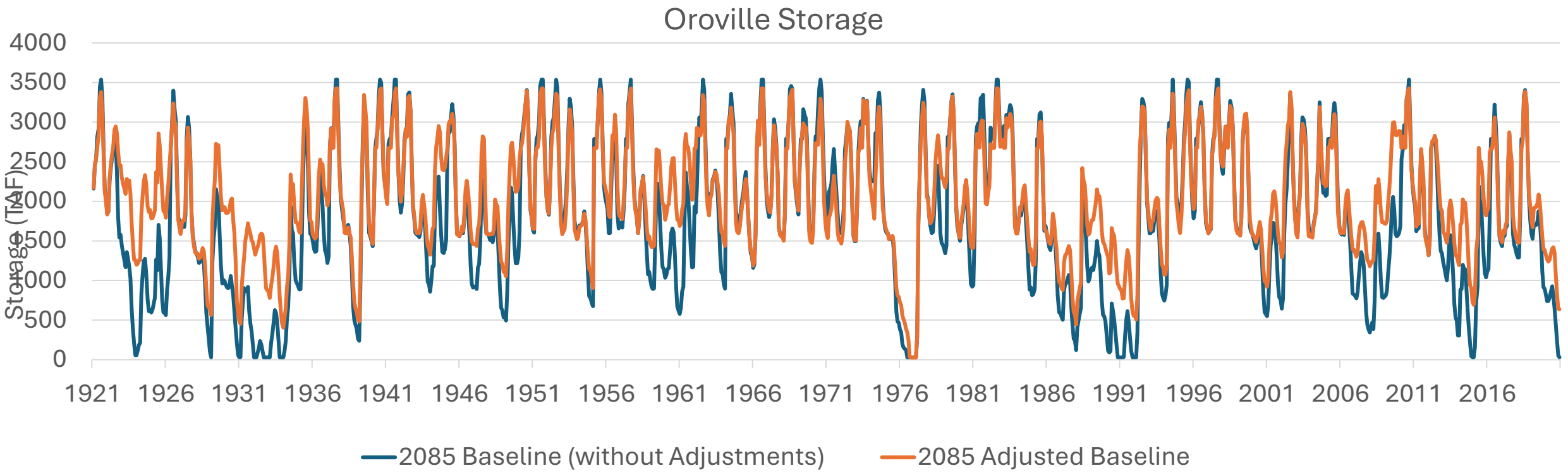

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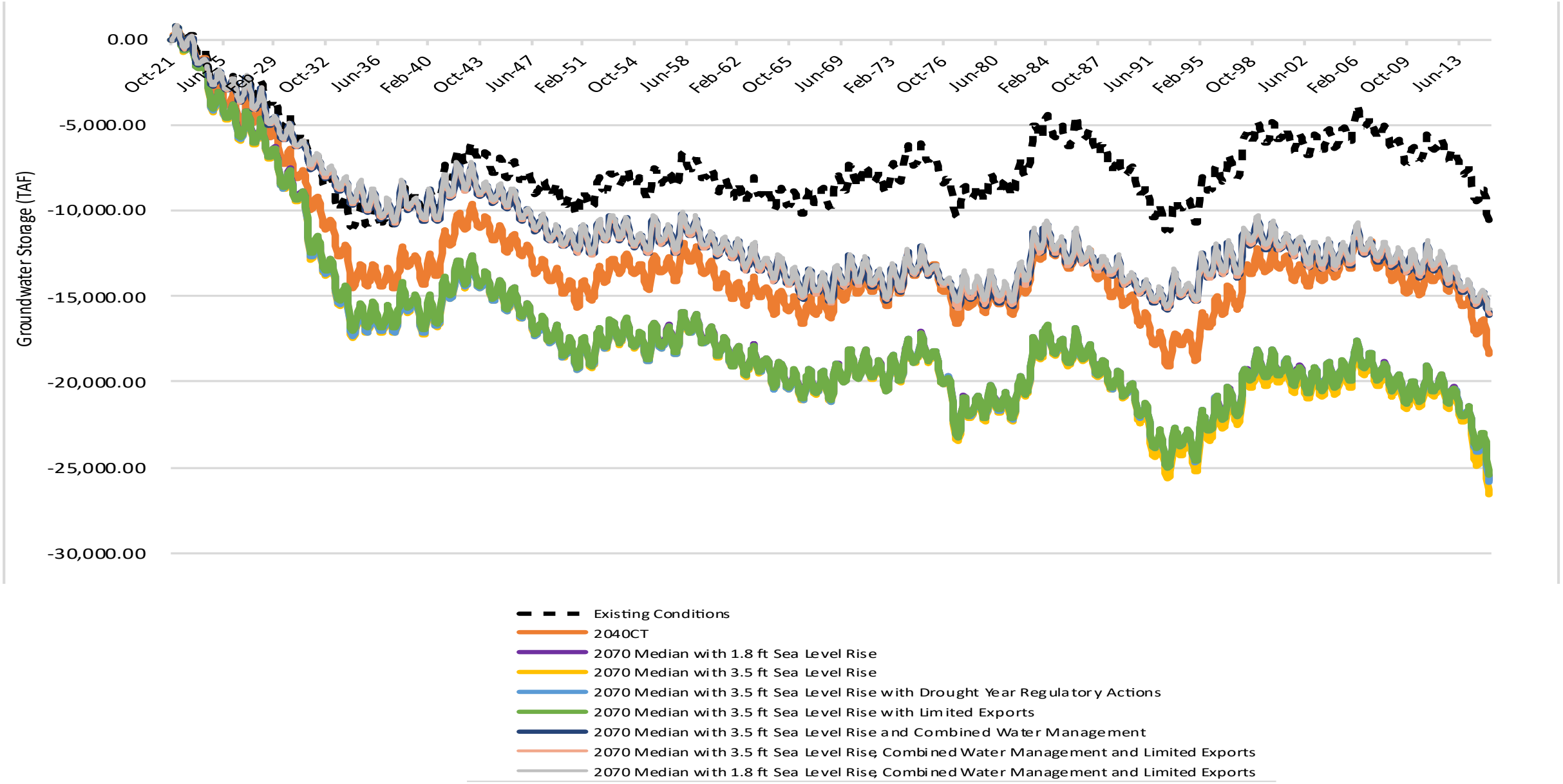

San Joaquin Valley Groundwater Storage