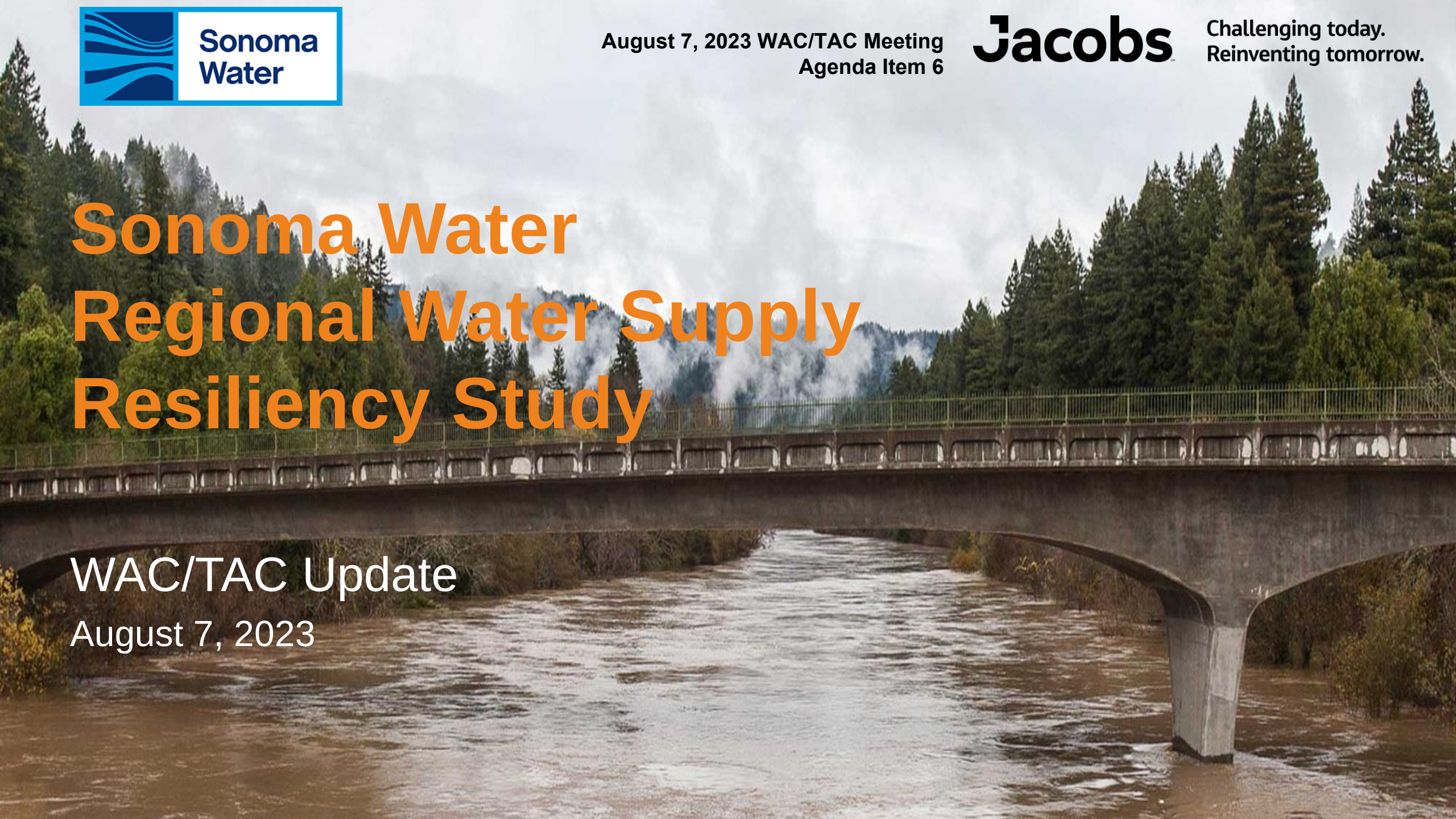
Challenging today.
Reinventing tomorrow.



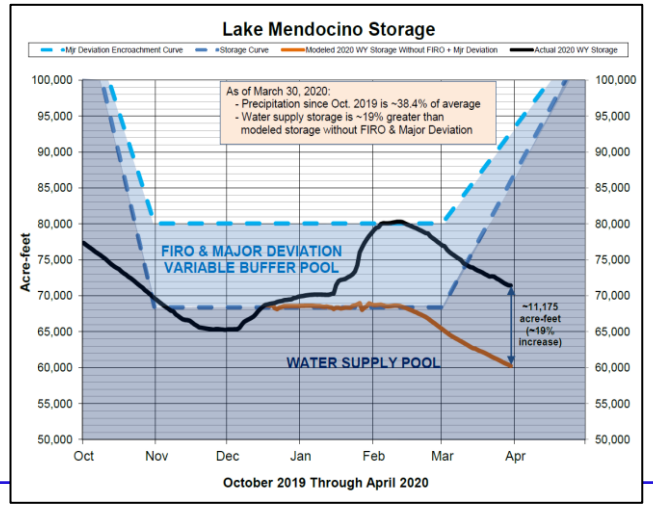
Sonoma Water Regional Water Supply Resiliency Study

WAC/TAC Update

August 7, 2023

Sonoma Water's On-Going Efforts on Climate Adaptation and Resiliency

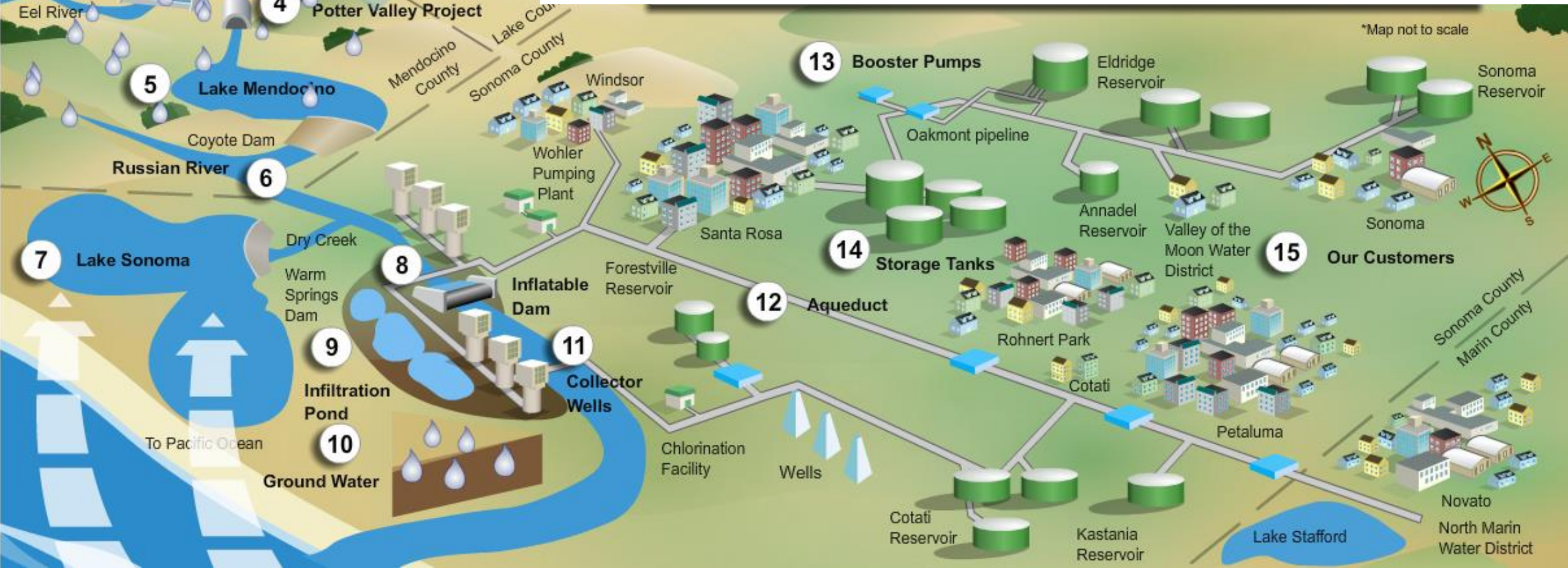
- Partner in Center for Western Weather and Water Extremes (CW3E) for Atmospheric River Forecasting
- Forecast Informed Reservoir Operations (FIRO)
- Advanced Quantitative Precipitation Information (AQPI)
- Fire Camera Alert System (AlertWildfire)
- NOAA Habitat Blueprint Adaptive Management and Restoration
- Local Hazard Mitigation Plan (LHMP)
- Climate Adaptation Plan (CAP)
- Regional Water Supply Resiliency Study



Sonoma Water Regional Water Supply Resiliency Study

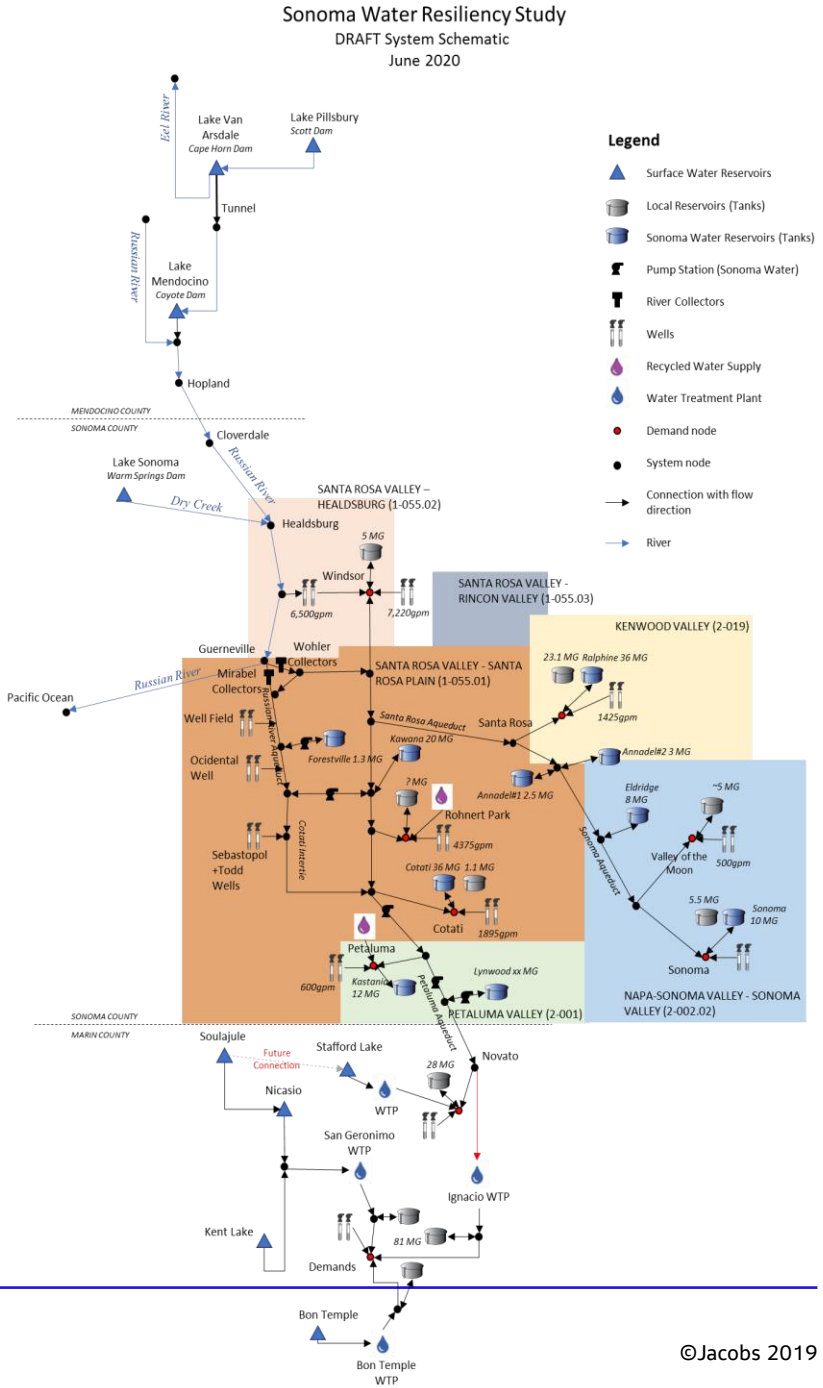
Complex Inter-Connected Regional Water Supply System

- Sonoma Water system serves as backbone of water supply for Sonoma and Marin counties
- Retail providers have growing local supplies and demands
- Systems are connected, but only loosely integrated … especially in times of shortage
- Multiple individual, specific models



Sonoma Water Resiliency Study

- Resiliency Study seeks to:
  - identify the key factors impacting regional water supply resiliency,
  - evaluate the current levels of resiliency,
  - develop a decision support framework model and process, and
  - identify promising opportunities for Sonoma Water and its retail customers to improve regional resilience in the future
- First of a kind look at the Integrated Regional System
  - Russian River & Potter Valley Project (Eel River)
  - Sonoma Water "backbone" system
  - 9 retail customer systems
  - 6 groundwater basins
  - local supplies and recycled water
  - multiple risk drivers
  - decision support model



Work Plan for Phase 2 Outlines Tasks

- Task 1 - Confirm and Develop Scenarios
- Task 2 - Develop Regional and Sub-Regional Resiliency Metrics
- Task 3 - Develop Decision Support Model
- Task 4 - Conduct Baseline Model Simulations
- Task 6 - Develop Adaptation Strategies
- Task 7 - Conduct Model Simulations with Adaptation Strategies
- Task 8 - Evaluate and Prioritize Adaptation Strategies
- Task 9 - Prepare Resiliency Study Report
- Task 10 - Stakeholder Engagement
- Task 11 - Project Management

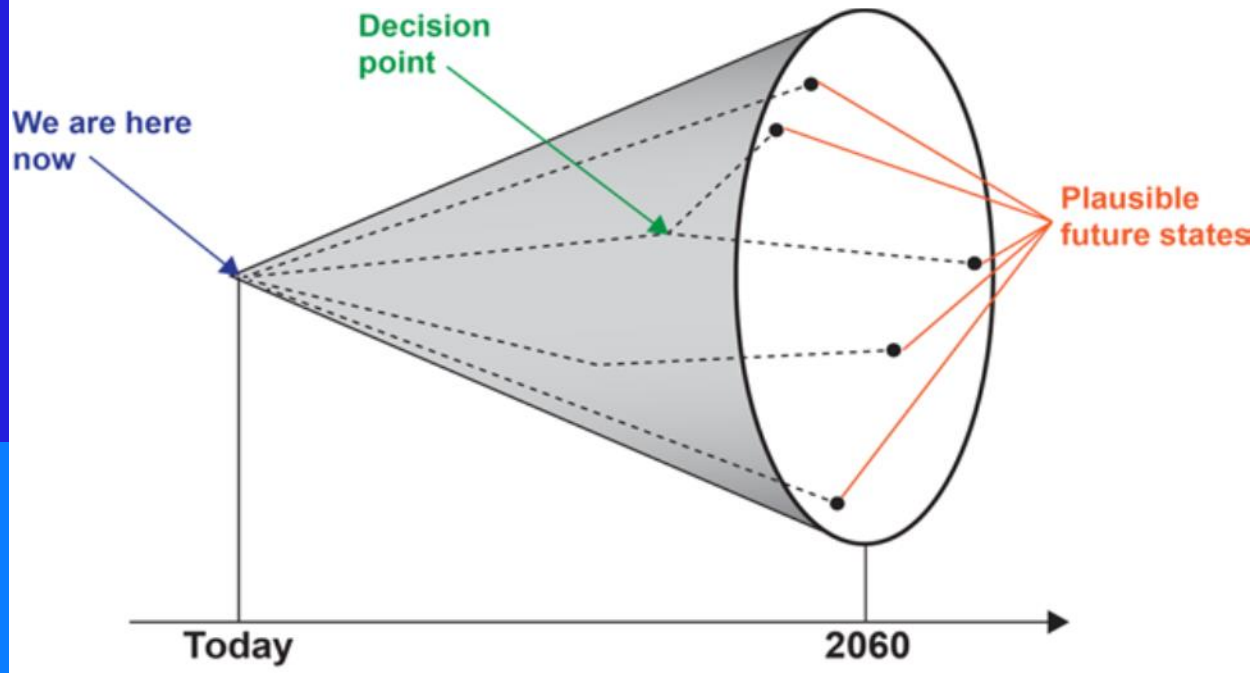
Preparing scenarios, metrics, and DSM development

Evaluating baseline level of resilience

Developing and evaluating adaptation strategies to improve resilience

Report preparation, stakeholder engagement, and project management

Envisioning and Evaluating Future Risks

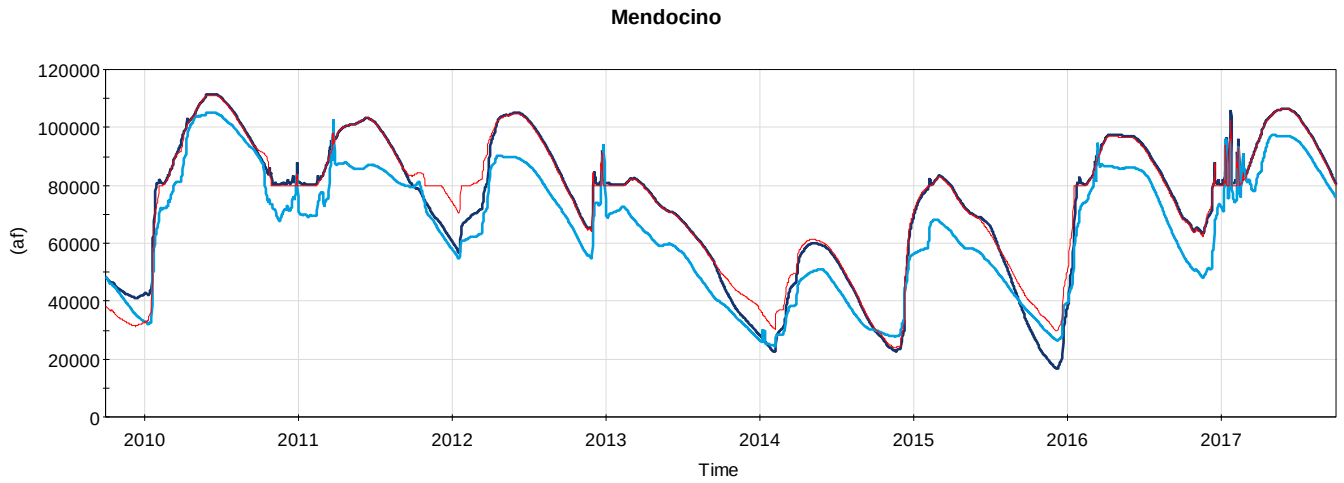


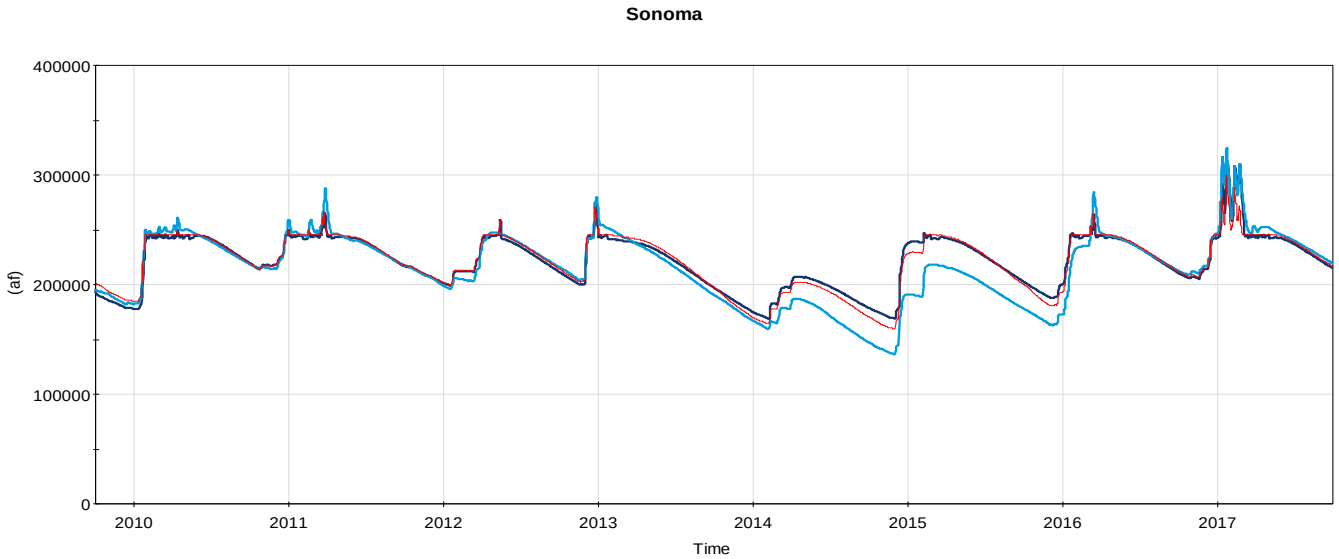
No.	Risk Driver	Risk Type	Phase of Study
N1	Wildfire	Sudden	Phase 2
N2	Earthquake	Sudden	Phase 2
N3	Drought	Sudden/Gradual	Phase 2
N4	Russian River Water Quality Contamination	Sudden	Phase 2
N5	Power Loss	Sudden	Phase 2
N6	Flooding	Sudden	Phase 2
N7	Sea Level Rise	Gradual	TBD
N8	Local Source Water Quality Contamination	Sudden	Phase 2
P3	Rapid Demand Growth	Sudden/Gradual	Phase 2 (TBD)
R1	Potter Valley Project Uncertainty (seismic/regulatory)	Sudden/Gradual	Phase 2
R2	New Russian River Treatment Regulations	Gradual	TBD
R5	SGMA Impacts on Groundwater Supply (City of Sonoma/VOMWD)	Gradual	Phase 2 (TBD)
R6	Changing Biological Opinions	Gradual	TBD
I5	Groundwater Well Operational Failures	Sudden	Phase 2
I6	Aging Infrastructure	Sudden/Gradual	Phase 2
I11	COVID-19 Workforce Response	Sudden/Gradual	TBD
I12	Operational Control Systems Disruption	Sudden	Phase 2

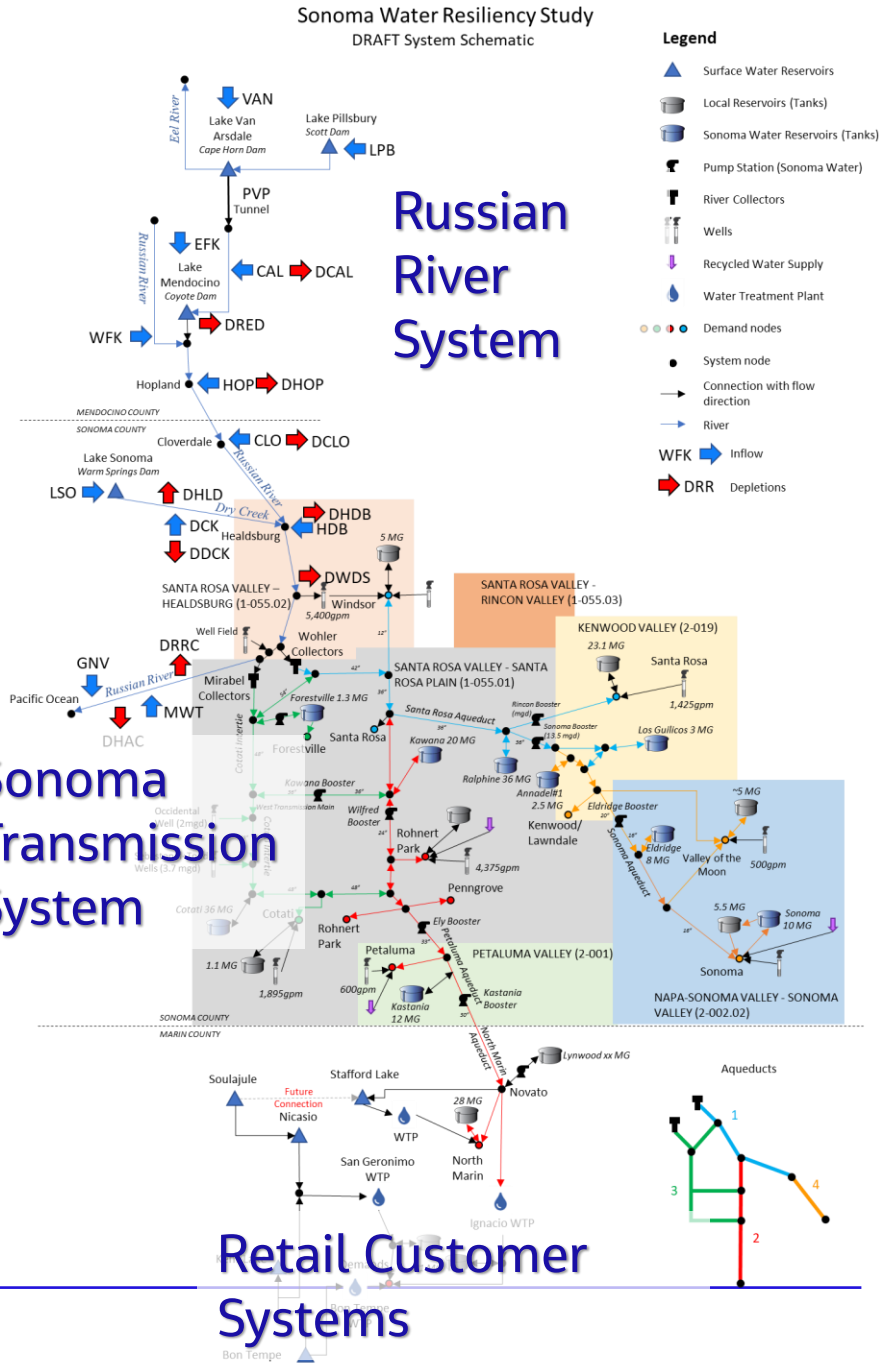
Decision Support Model

- Model that Integrates 3 major components
  - Russian River System
  - Sonoma Water Transmission System
  - Retail Customer Systems
- Main Model Inputs
  - Reservoir and river flows
  - Member agency demands
  - Maximum Member Agency local supplies available
- Model rules deliver supplies to member agencies
  - Rules decide priority of supplies used by member agencies

Model Representation and Validation





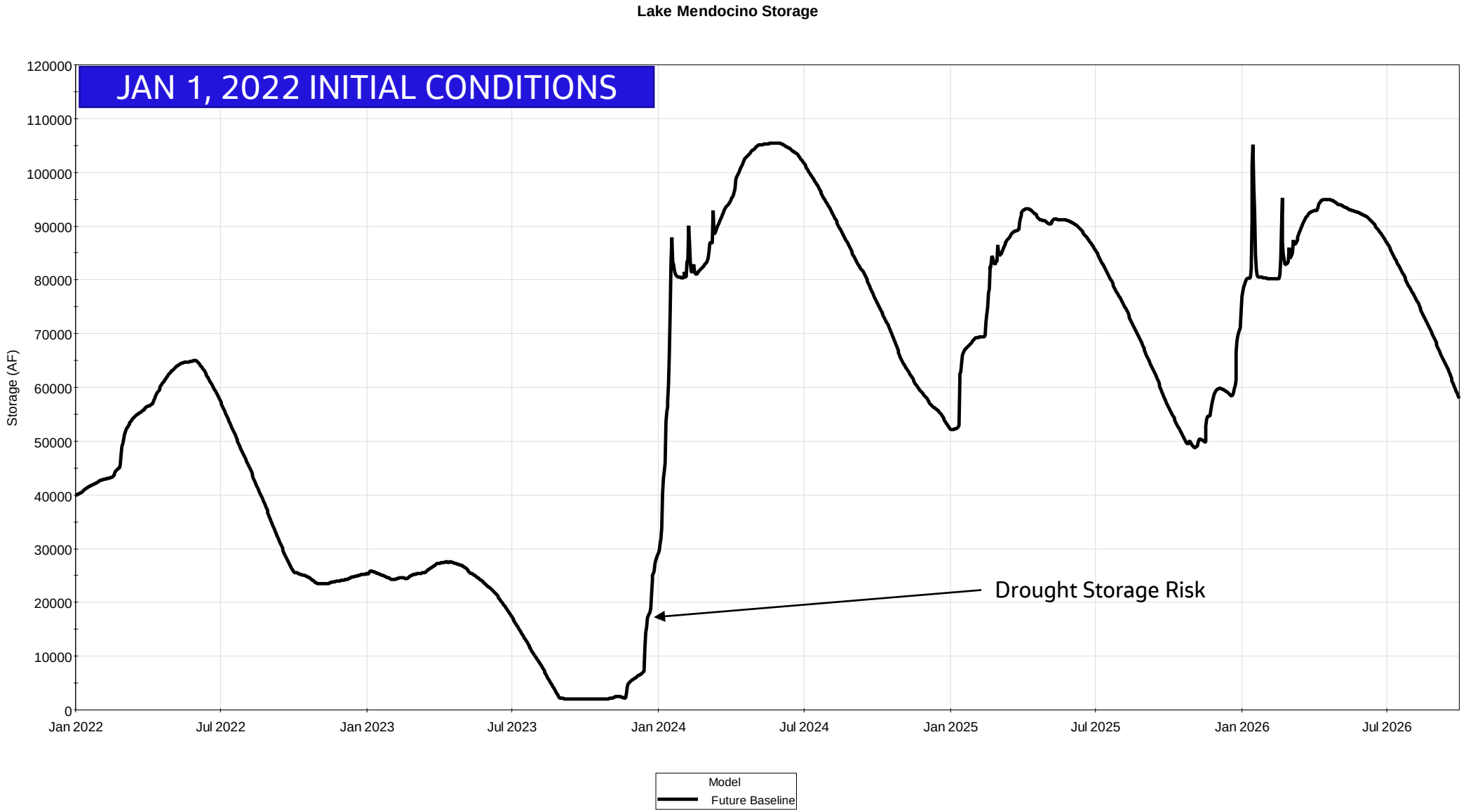


Accelerated 2021-2022 Drought Resiliency Analysis

Drought Baseline Simulations

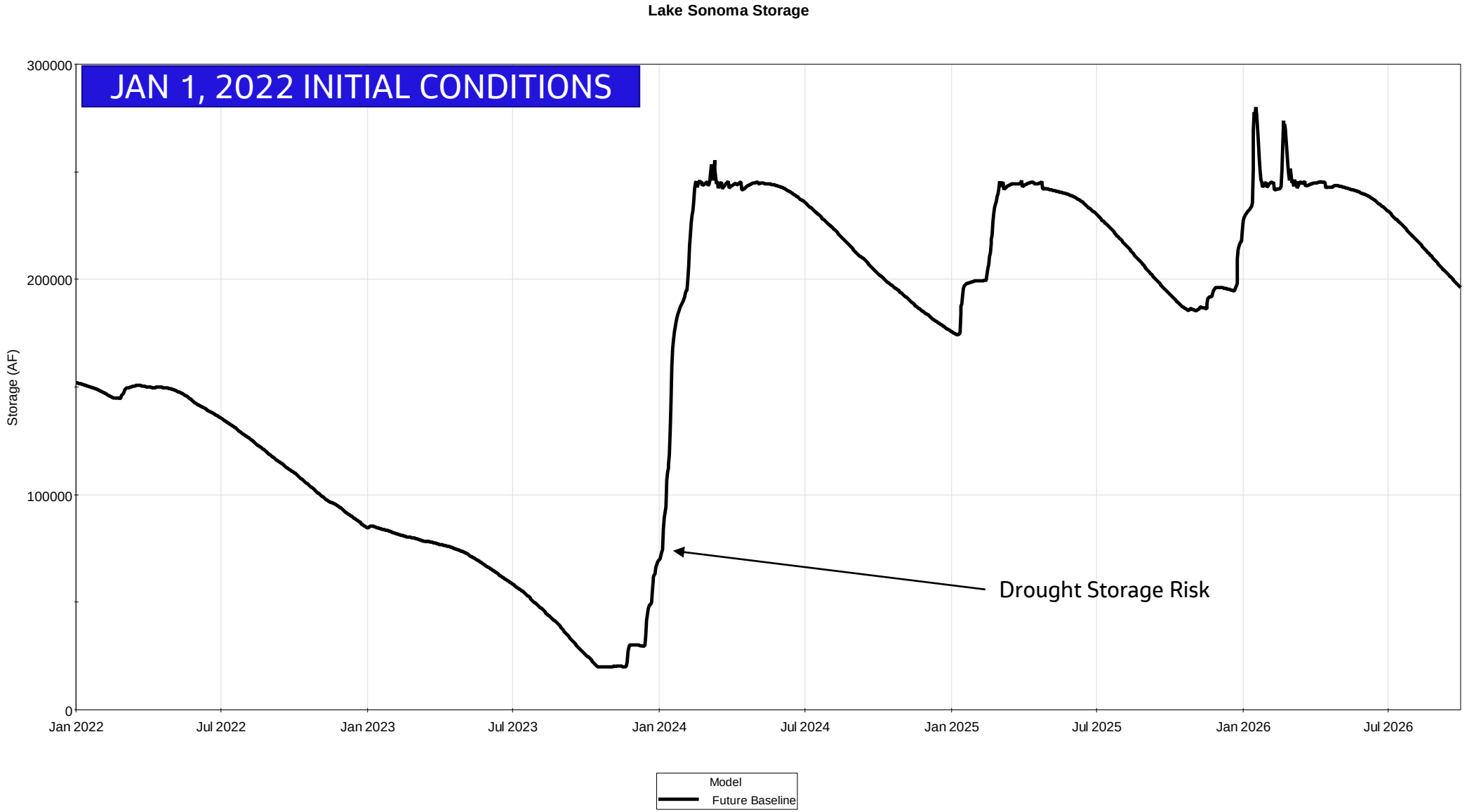
- Assumptions
  - Conditions as of Nov 1, Dec 1, and Jan 1
  - No Actions taken to mitigate drought impacts
  - UWMP demand assumptions
  - Historical hydrology 1912-2016
  - 5-year future simulations: WY 2022-2026
- Stochastic Simulations
  - Simulations using 108 traces of historical hydrology
  - Index sequential method maintains the hydrological sequences of the past
  - Probabilities of storage and shortage conditions derived from traces
- Stress Test Hydrology
  - WY 1976-1980 hydrology represents the most severe conditions in the historical record
  - Represents a severe 2-year drought following the current drought
  - Used as stress test hydrology for evaluating the resilience of the system and management actions

Lake Mendocino Storage – WY 1976-1980 Stress Test Hydrology



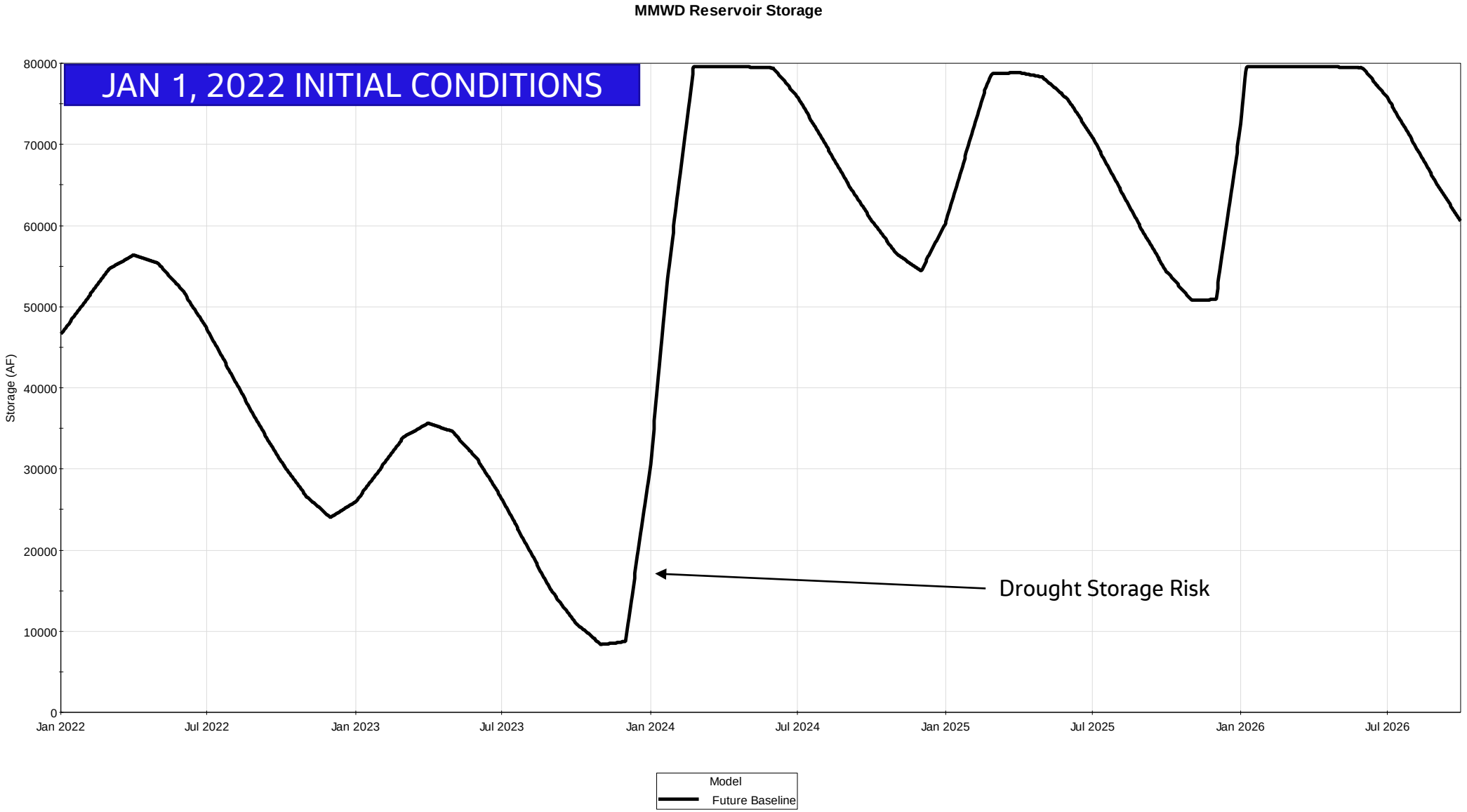
Scenario does NOT include any actions to mitigate drought impacts

Lake Sonoma – WY 1976-1980 Stress Test Hydrology



Scenario does NOT include any actions to mitigate drought impacts

MMWD Storage – WY 1976-1980 Stress Test Hydrology



Scenario does NOT include any actions to mitigate drought impacts

Sensitivity to Initialized Storage Conditions (as of January 2022)

- Fall and winter hydrology outlook is improving
- Outlook for remaining weeks in December suggests a changing drought risk profile
- Action is still needed to address residual risks of a continued dry seasonal outlook

Initial Storage Conditions	NO ACTION Projected 5-Year Shortage Total
Nov 1, 2021	25,600 AF
Dec 1, 2021	23,200 AF
Jan 1, 2022	5,200 AF

Synthesis of Drought Water Management Options

- **Increase Supply**
  - Increase groundwater production (new or rehabilitated wells)
  - Winter water diversion
  - Regional groundwater bank (Santa Rosa Plain, Sonoma Valley, Petaluma)
  - Alexander Valley FloodMAR
  - Sonoma Developmental Center water supply and forebay for groundwater recharge
  - Expand recycled water supply
  - Ocean desalination and/or brackish water desalination
  - Interconnection with Bay Area supplies (water transfers)
- **Reduce Demand**
  - Water conservation and water use efficiency in agricultural, municipal, and CII sectors
- **Improve Operations**
  - Kastania Pump Station improvements
  - Expand surface storage (Lake Stafford weir, sediment removal)
  - Lake Sonoma Forecast Informed Reservoir Operations (FIRO)
  - Increase recycled water storage
  - Storage operational management levels
  - Lake Mendocino variable gates and outlet channel improvements
- **Modify Policy and Regulations**
  - Regulatory flexibility through TUCPs

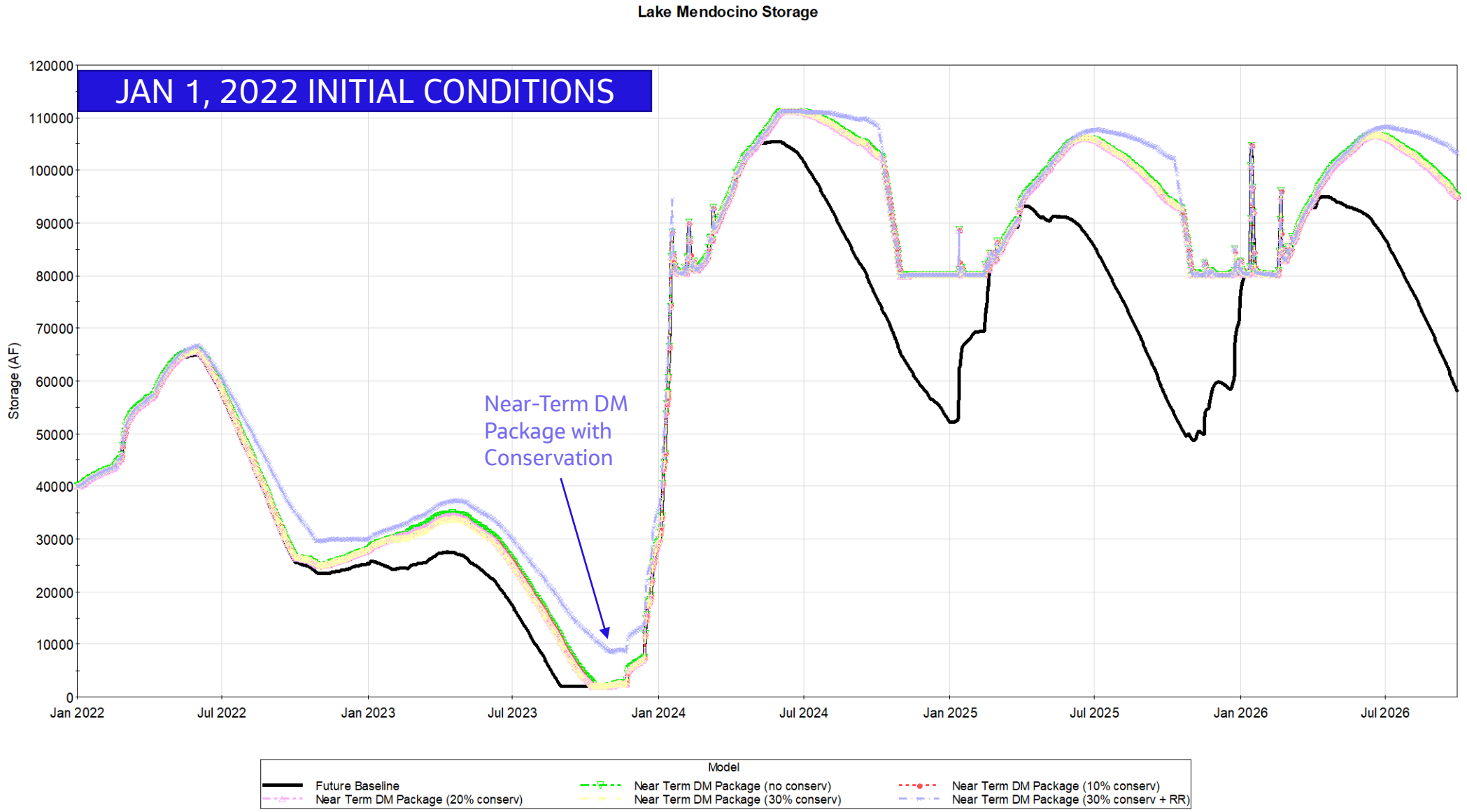
Near-Term Drought Resiliency/Response Actions

- Maximize delivery of natural flows from Russian River system
- Kastania Booster Station rehabilitation
- Increase groundwater production (Sonoma Water)
- Increase groundwater production (Retail Customers)
- Regulatory flexibility through TUCPs
- Water conservation and water use efficiency (Retail Customers and diverters)

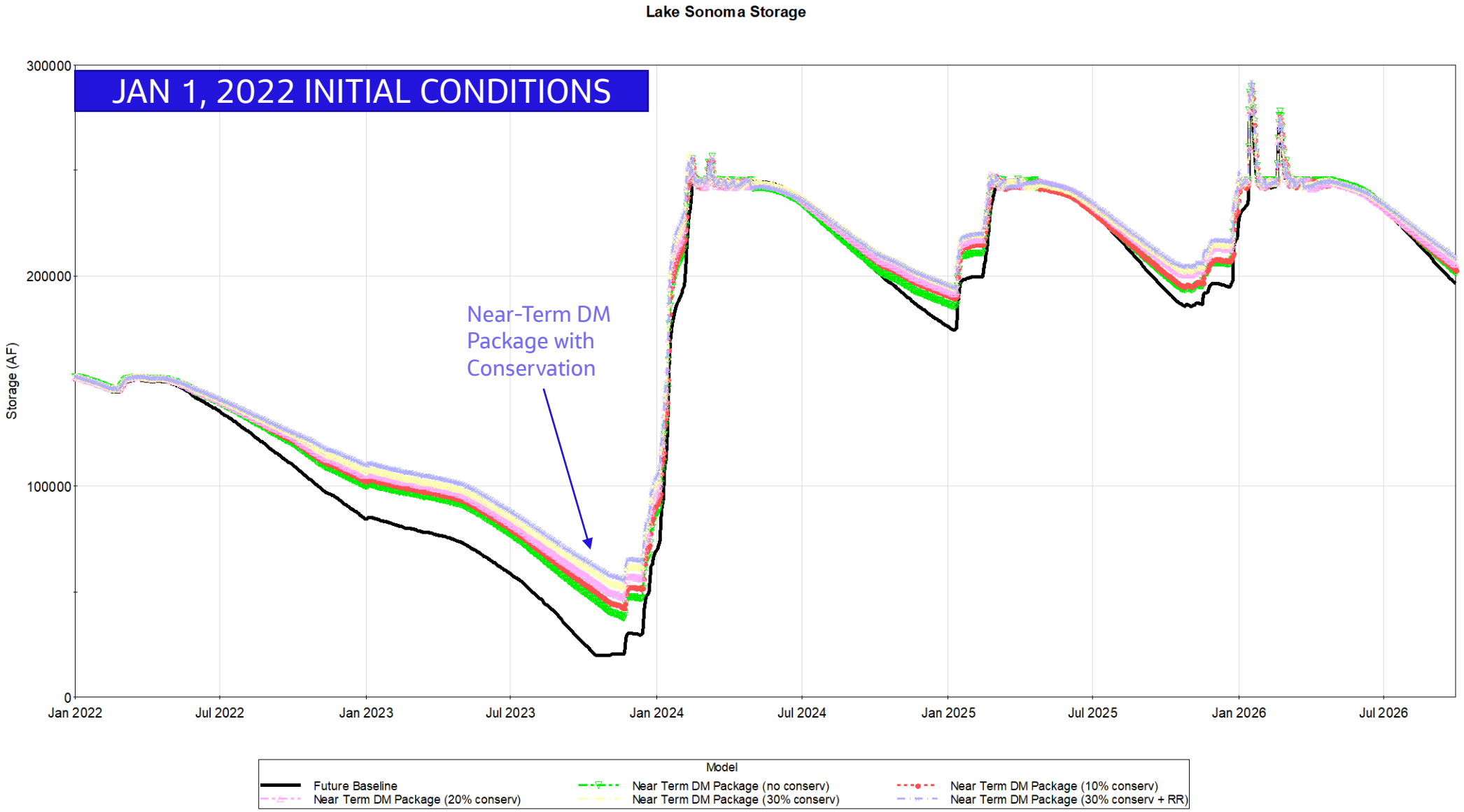
Sensitivity of Projected Shortage to Initialized Storage Conditions

Initial Storage Conditions	NO ACTION Projected 5-Year Shortage Total	NEAR-TERM PACKAGE w/ 20% CONSERVATION Projected 5-Year Shortage Total
Nov 1, 2021	25,600 AF	4,200 AF
Dec 1, 2021	23,200 AF	2,900 AF
Jan 1, 2022	5,200 AF	< 100 AF

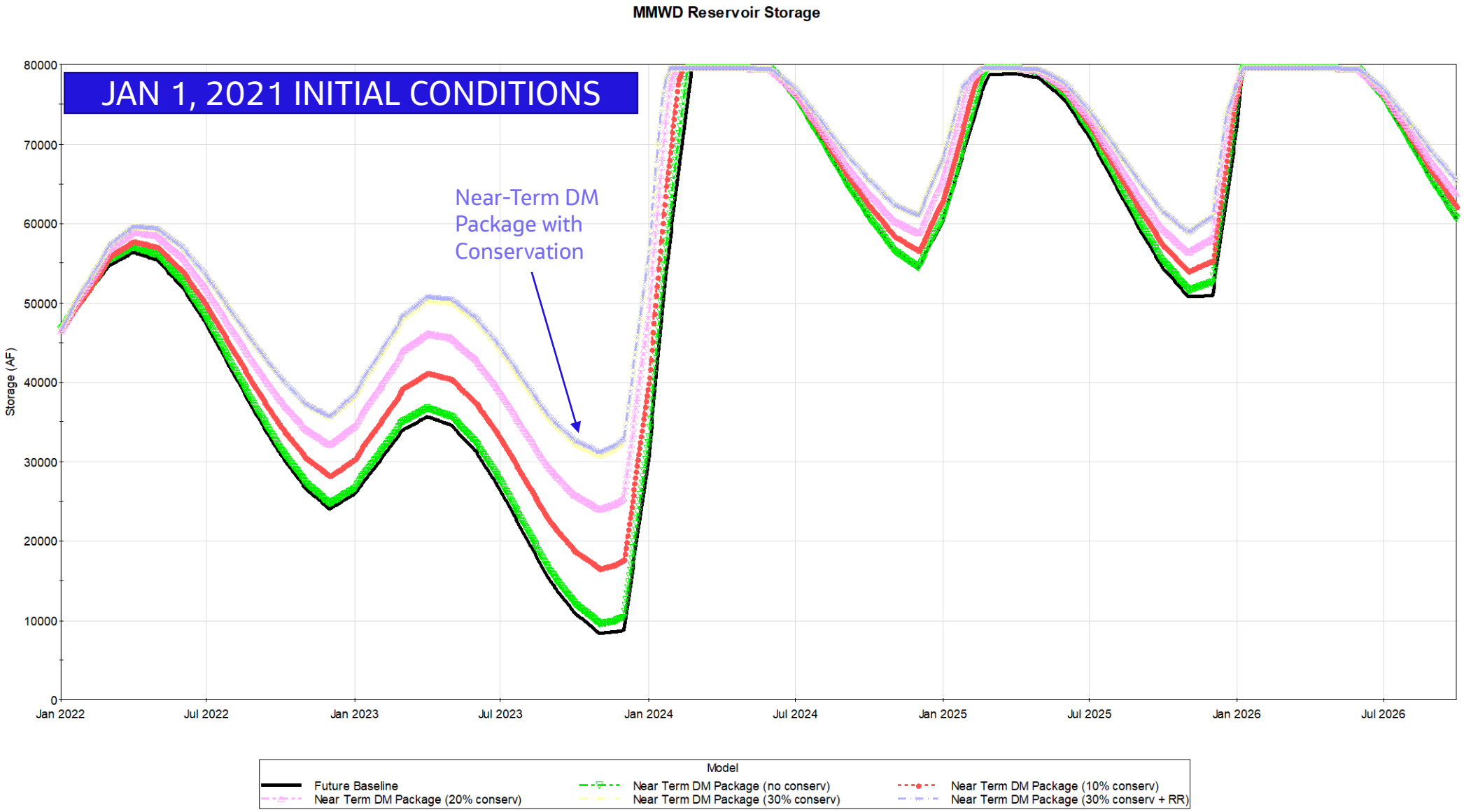
Lake Mendocino Storage – WY 1976-1980 Stress Test Hydrology



Lake Sonoma – WY 1976-1980 Stress Test Hydrology



MMWD Storage – WY 1976-1980 Stress Test Hydrology

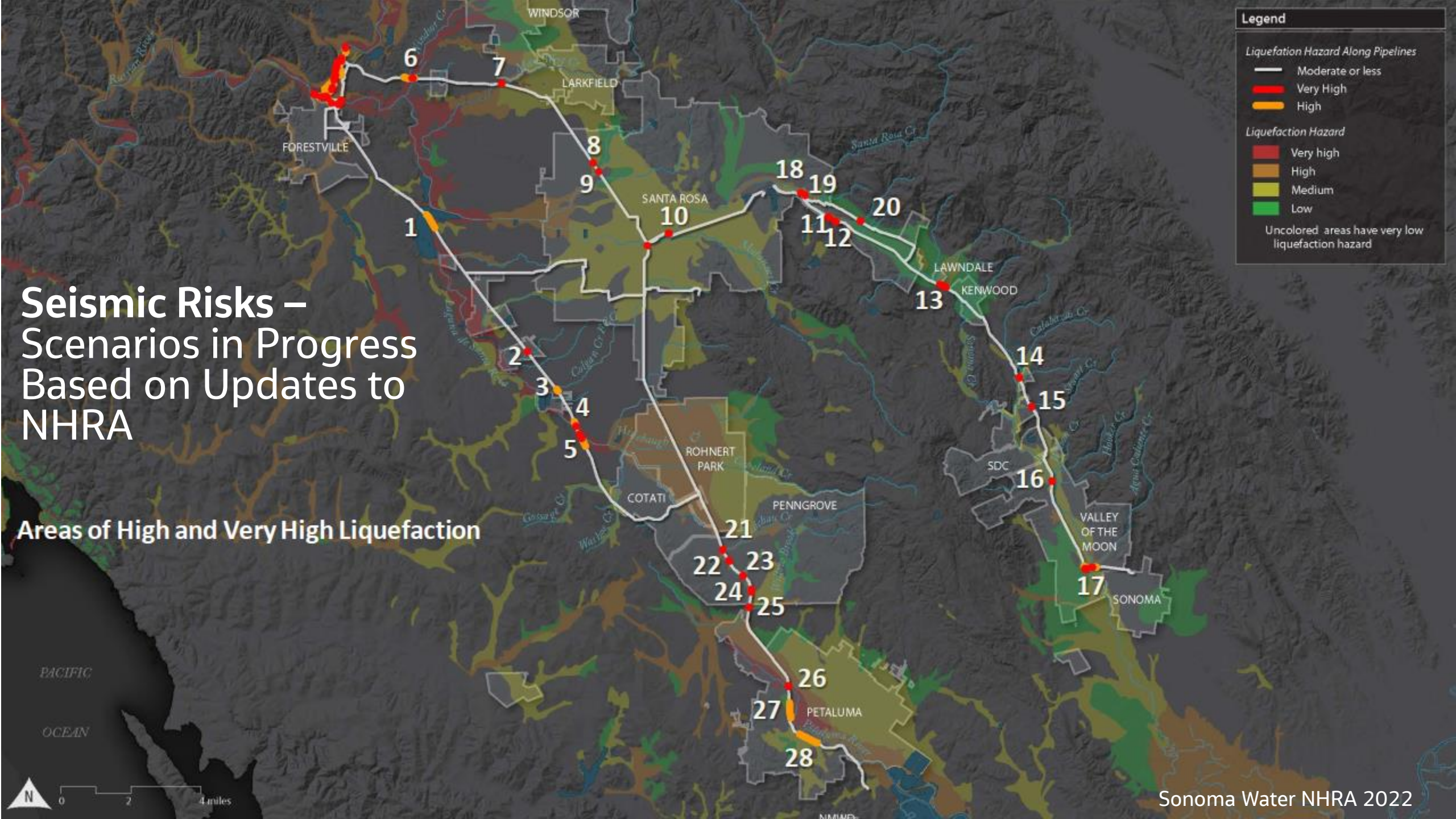


Near-Term Drought Observations

- Near-term package of options resolves stress test shortages
- *Winter water diversions* and *groundwater production* helps resolve shortages
- *Conservation* and *regulatory flexibility under TUCPs* is most important in bolstering Lake Sonoma and Mendocino storage
- Longer-term actions of *regional groundwater bank* and *Lake Sonoma FIRO* will provide benefit for future droughts but require initial wet period to begin storage phase

Other Risks to be Evaluated in 2023

- Seismic
- Wildfires
- Power Loss
- Flooding
- Potter Valley Project Uncertainty

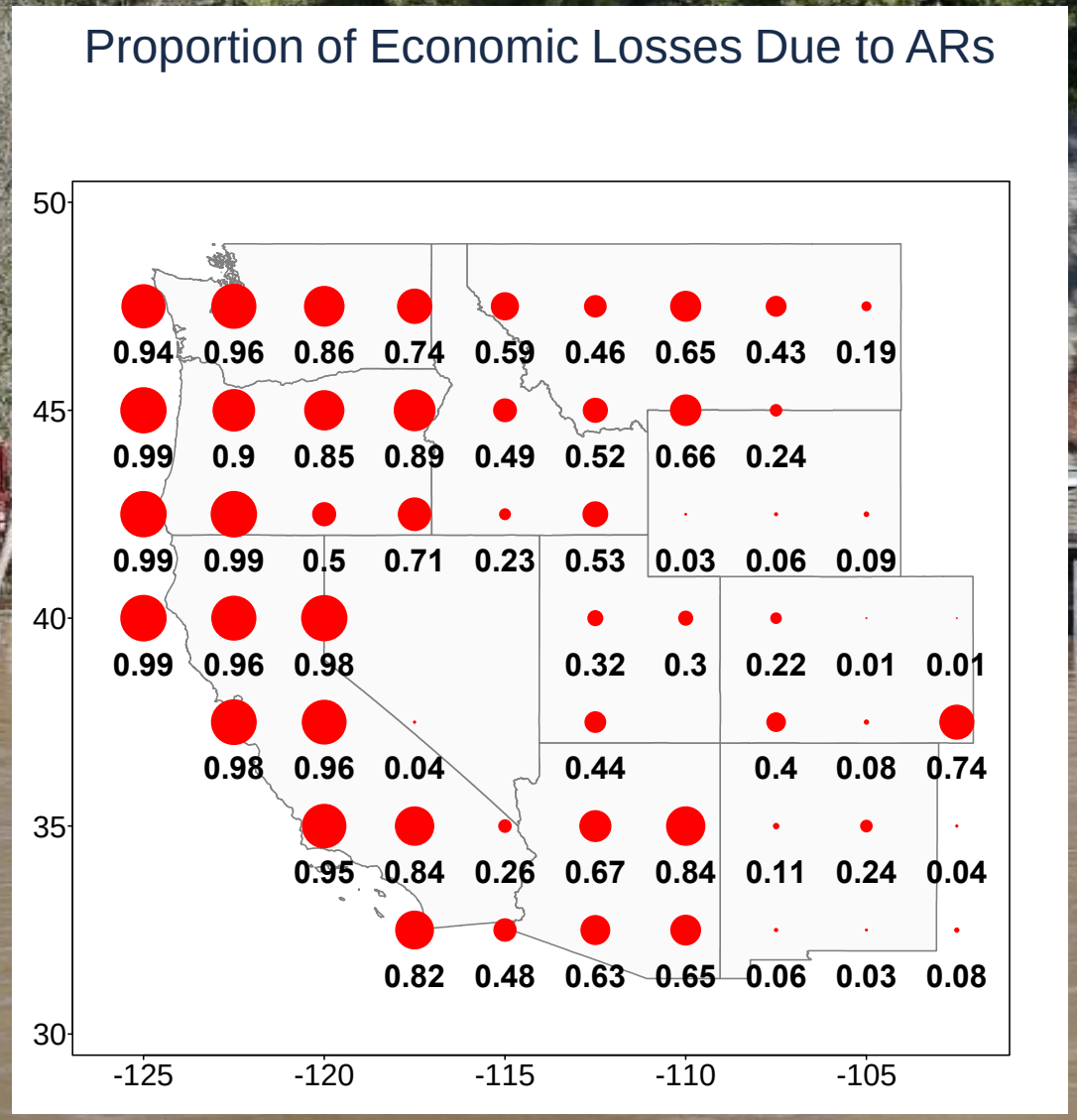


Sonoma Water NHRA 2022

WILDFIRES – North Coast is Highly Vulnerable to Wildfires

Wildfire Risks –
Scenarios in Progress
Based on Projected
Burn Probability in
Critical Watersheds

FLOODING – Atmospheric Rivers Drive Flood Damages



County	AR proportion of insured losses	Claims	Insured losses ($m)	Total damages ($b)	AR damages ($b)
Sonoma, CA	**0.998**	**6650**	**172.0**	**5.2**	**5.2**

T. Corringham, 2018

Next Steps

- Completion of Additional Risk Scenarios
- Cascading Risk Scenarios
- Summarize and Recommend Regional Strategies
- Prepare Study Report

Questions?

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