

San Joaquin Basin Watershed Studies

ADVANCING SUSTAINABLE WATER MANAGEMENT THROUGH FLOOD MANAGED AQUIFER RECHARGE:
INSIGHTS FROM THE SAN JOAQUIN FLOOD-MAR WATERSHED STUDIES

DEVELOPMENT OF A HEADWATER-TO-GROUNDWATER INTEGRATED MODELING TOOLSET

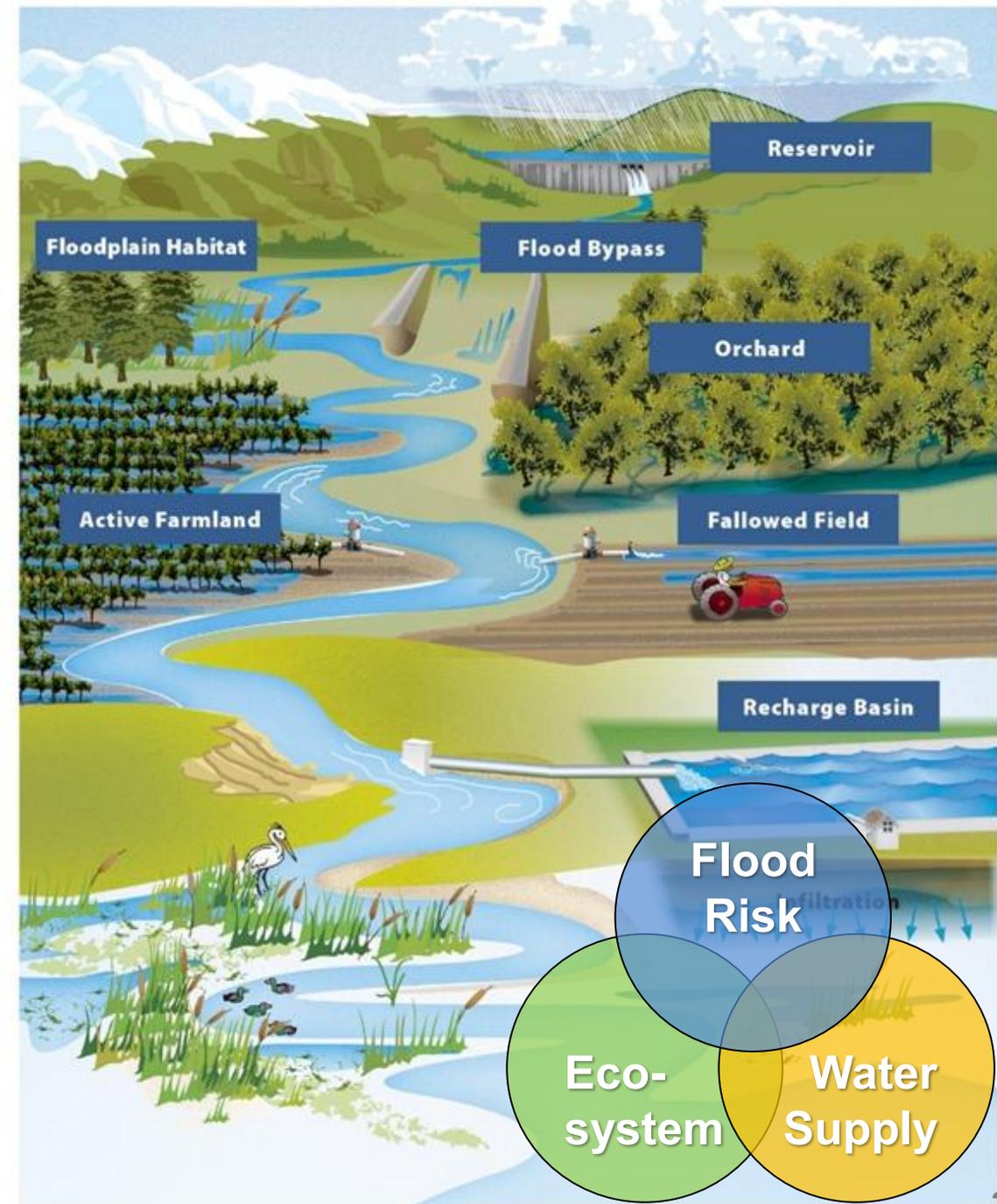
MAY 14TH, 2025



What is Flood-MAR?

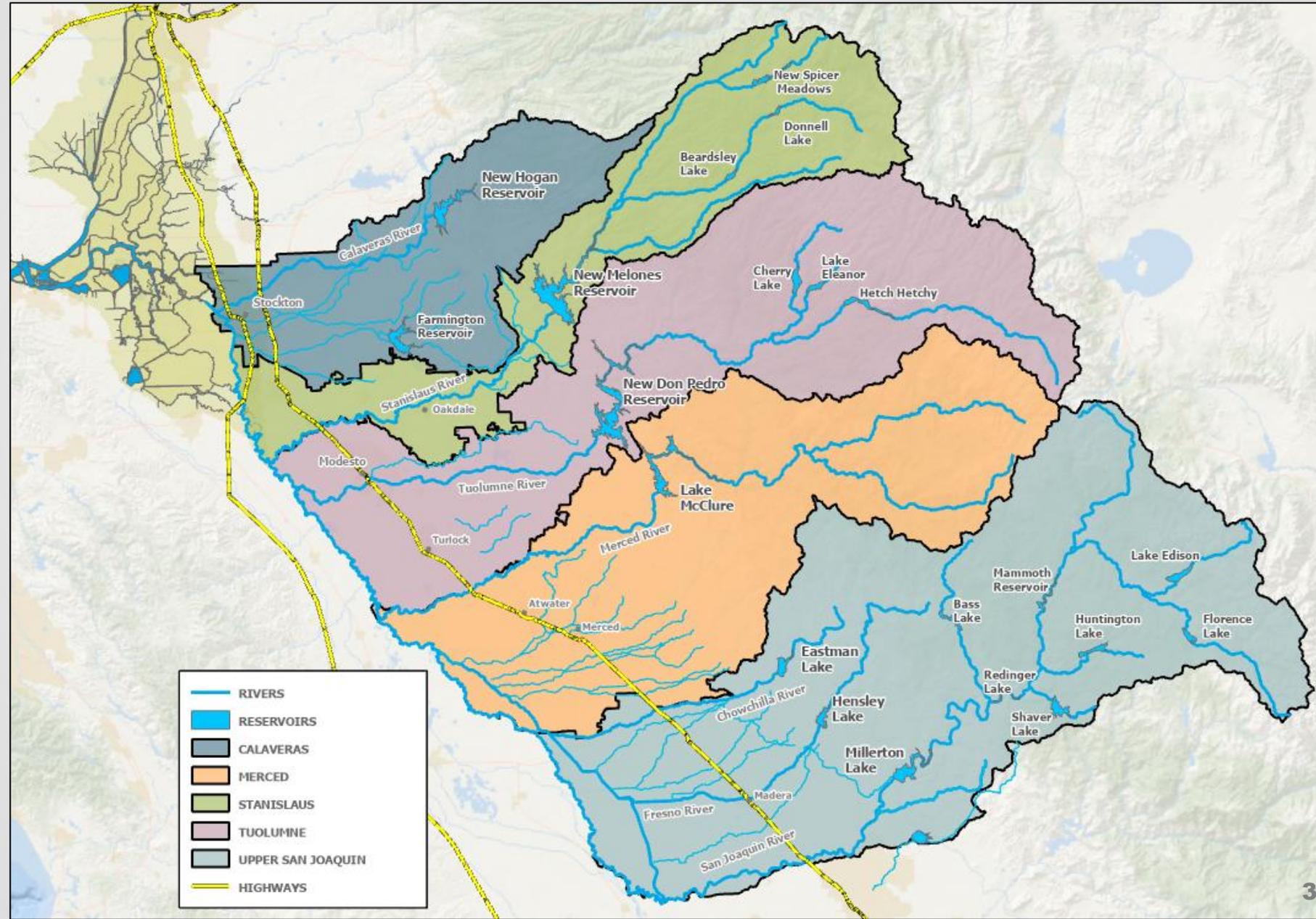
Integrated water management strategy using high flows for managed aquifer recharge of agricultural lands, working landscapes, and natural managed lands

- Leverages natural and built infrastructure
- Recharges depleted aquifers
- Can reduce flood risk
- Can support broad, diverse beneficiaries
- Promotes conjunctive management
- Adaptive and climate resilient solution



San Joaquin Basin Watershed Studies

- Calaveras
- Stanislaus
- Tuolumne
- Merced
- Upper SJ
 - Chowchilla
 - Fresno
 - San Joaquin



Objectives of the Watershed Studies

**ASSESS AND QUANTIFY
MULTI-SECTOR VULNERABILITY
TO CLIMATE CHANGE**

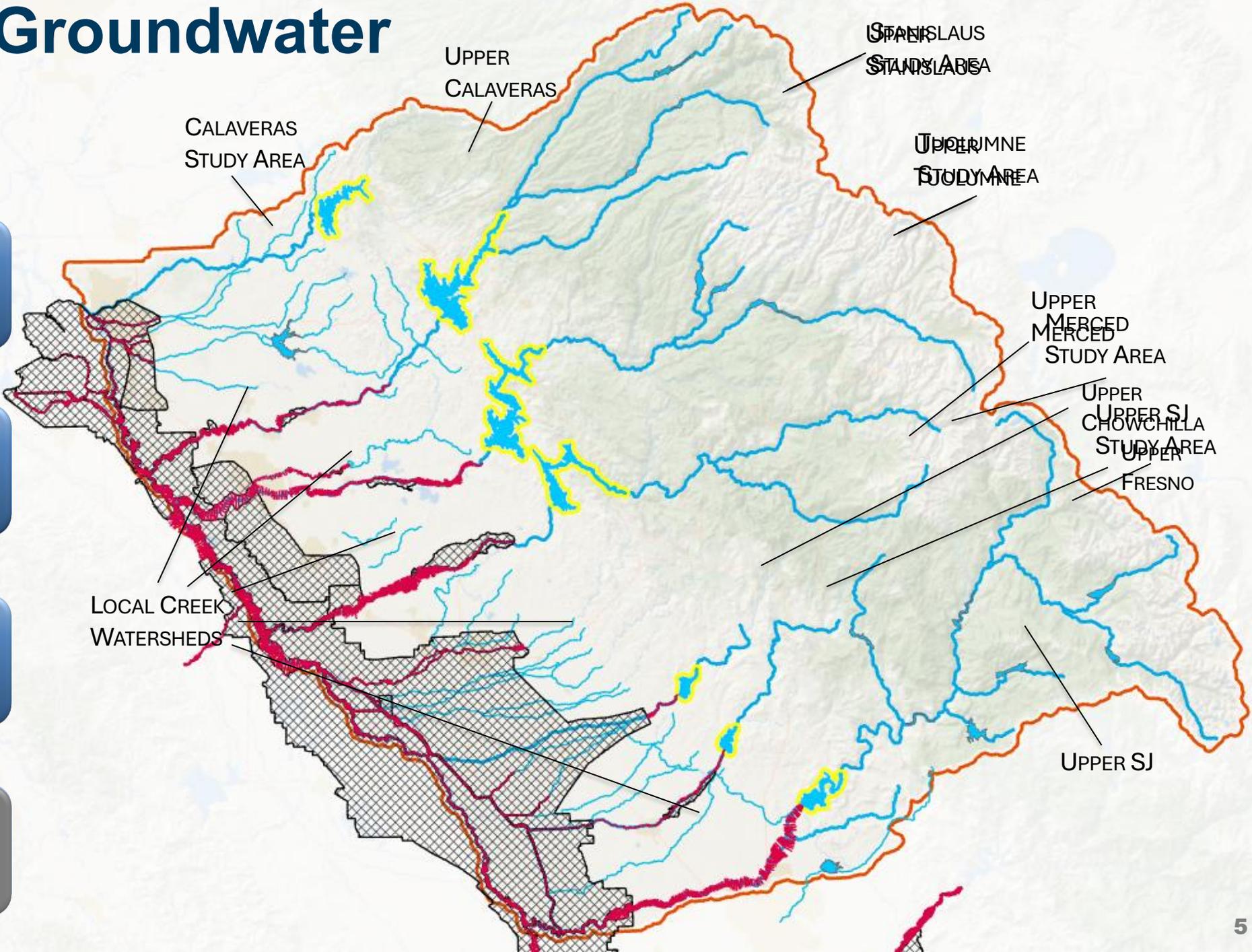
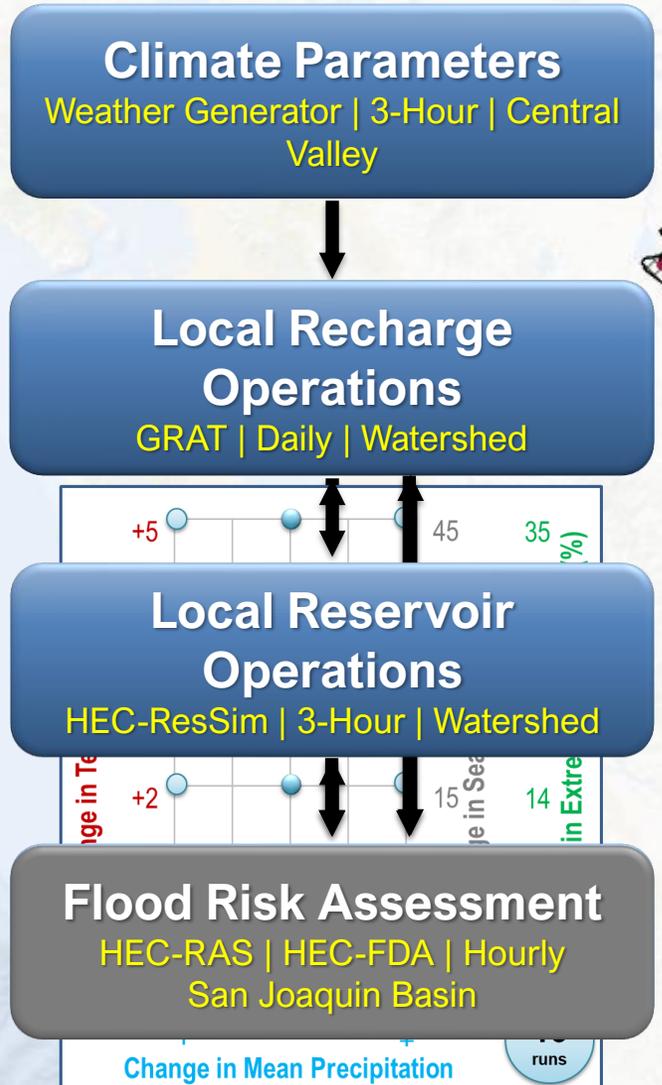
**ASSESS AND QUANTIFY
MULTI-SECTOR FLOOD-MAR
ADAPTATION PERFORMANCE**

**WATERSHED
STUDIES**

**REPORT RESULTS FROM THE
LOCAL-WATERSHED-
BASINWIDE SCALE**

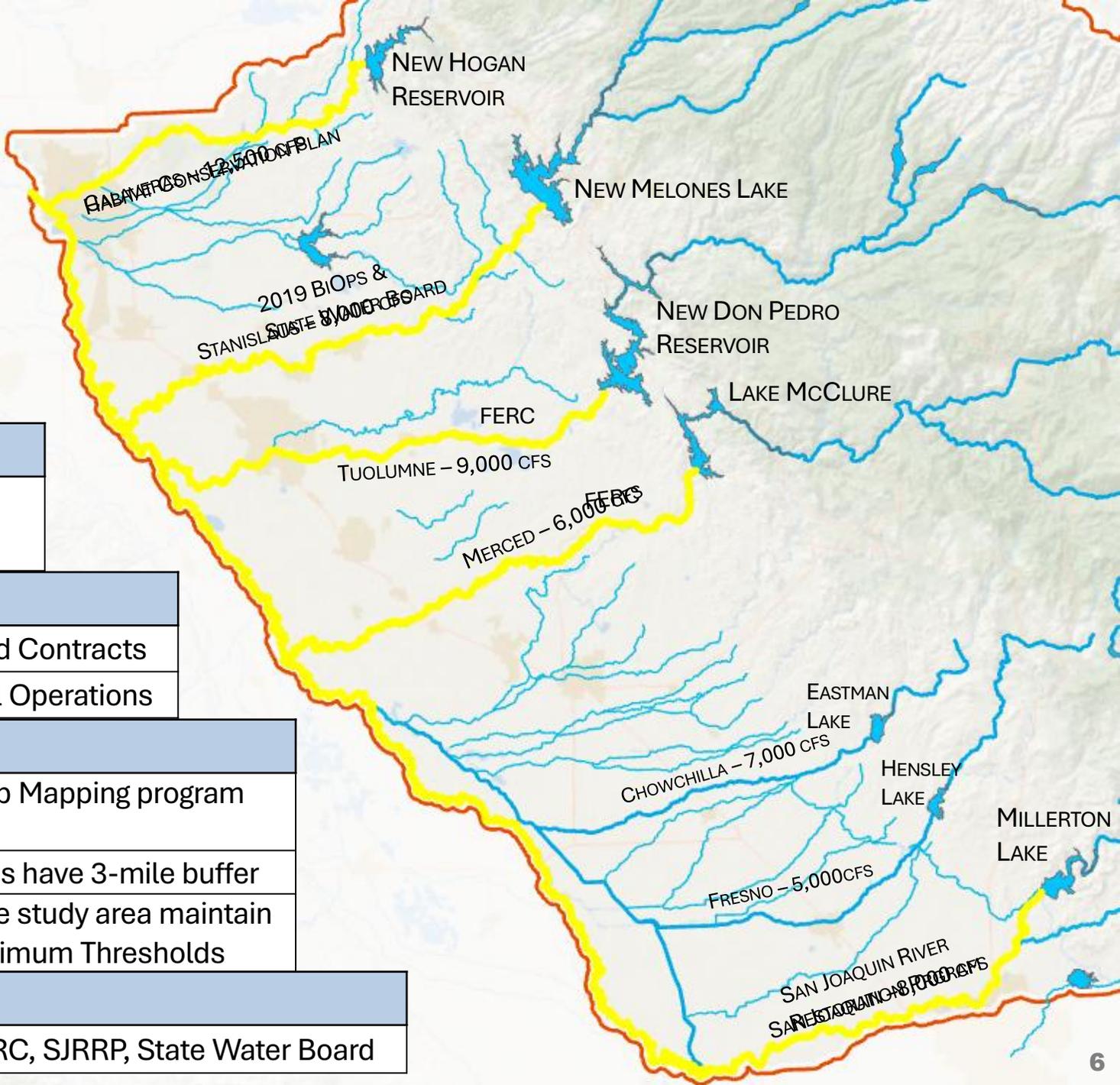
**FOUNDATION TO SUPPORT
COORDINATION, ALIGNMENT,
AND IMPLEMENTATION**

Headwater to Groundwater Modeling



Baseline Assumptions

Watershed Conditions	
Hydrology	Simulated historical WY1918 – 2018
Flood Risk Management Operations	
Release Capacity	USACE Water Control Manual
Rule Curve	
Surface Water Supply	
Deliveries	Varies by Watershed: Local Operations and Contracts
Irrigation Season	Varies by Watershed: Determined by Local Operations
Groundwater Supply	
Land Use and Cropping Patterns	DWR Statewide and Regional Crop Mapping program WY 2018
Initial GW Levels	Fall 2018-2020 levels and subbasins have 3-mile buffer
Groundwater Boundary Conditions	Neighboring subbasins outside of the study area maintain groundwater levels at SGMA Minimum Thresholds
Ecosystem Flow Management	
Ecosystem Management Release	Based on MIF: HCP, FERC, SJRRP, State Water Board



Flood-MAR Adaptation Strategies

Streamlined Flood-MAR (“MAR 90/20”)

- The MAR-90/20 strategy is derived from the diversion criteria under the State Water Board’s streamlined permitting process

Integrated Forecast-Informed Resources Management (“I-FIRM”)

- The I-FIRM adaptation strategy reflects a watershed-scale, multi-sector resource management approach to integrating MAR with FIRO and expanded infrastructure

+ Reoperate Reservoirs

Recharge Using High Flows



MAR-90/20

Requires partnership among local water managers and users

Provides some water supply benefits, but limited flood risk reduction

Recharge Using High Flows



I-FIRM

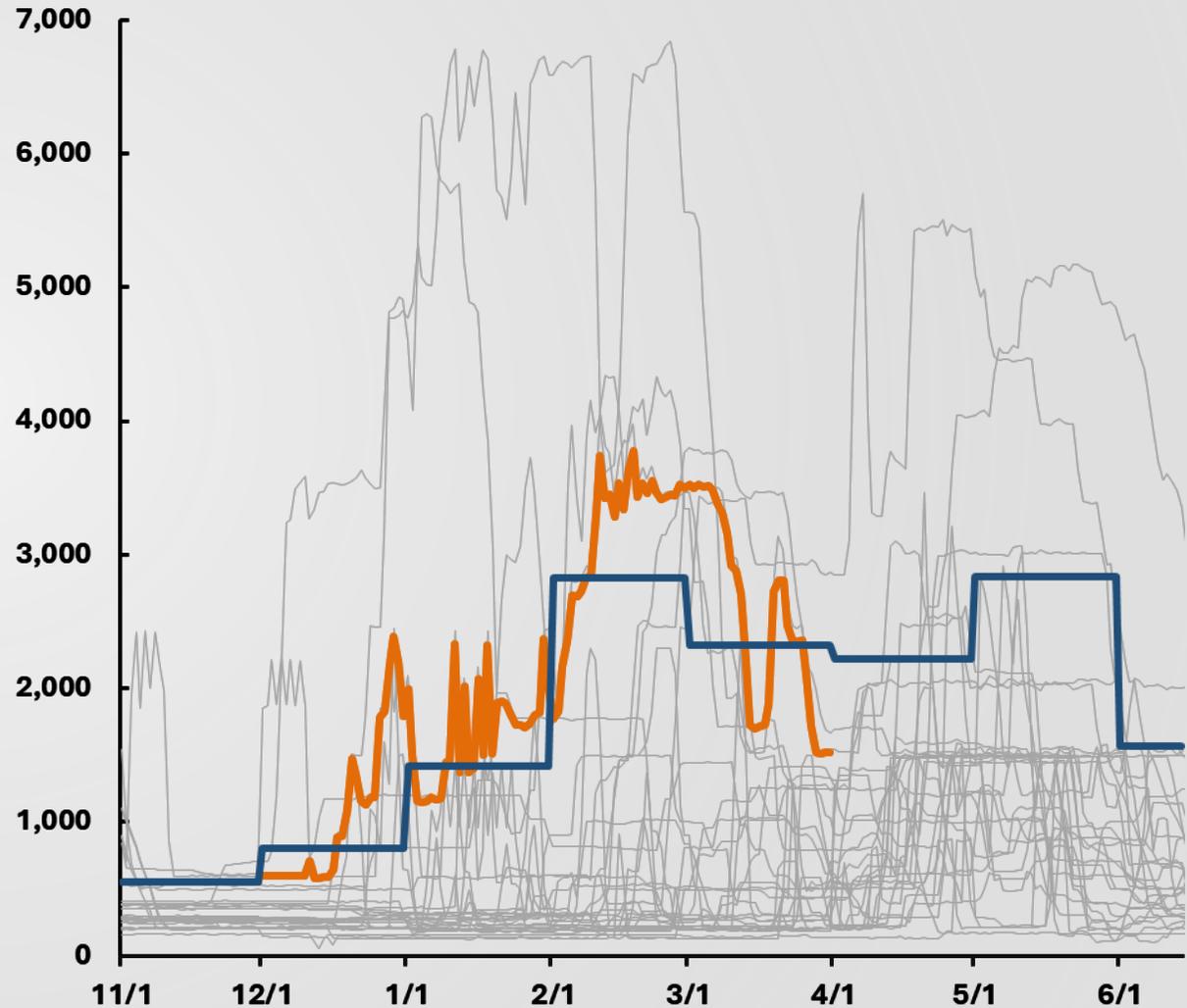
Requires local, state, and federal partnership

Provides significant water supply, flood, and ecosystem benefits

Flood-MAR Adaptation Strategies

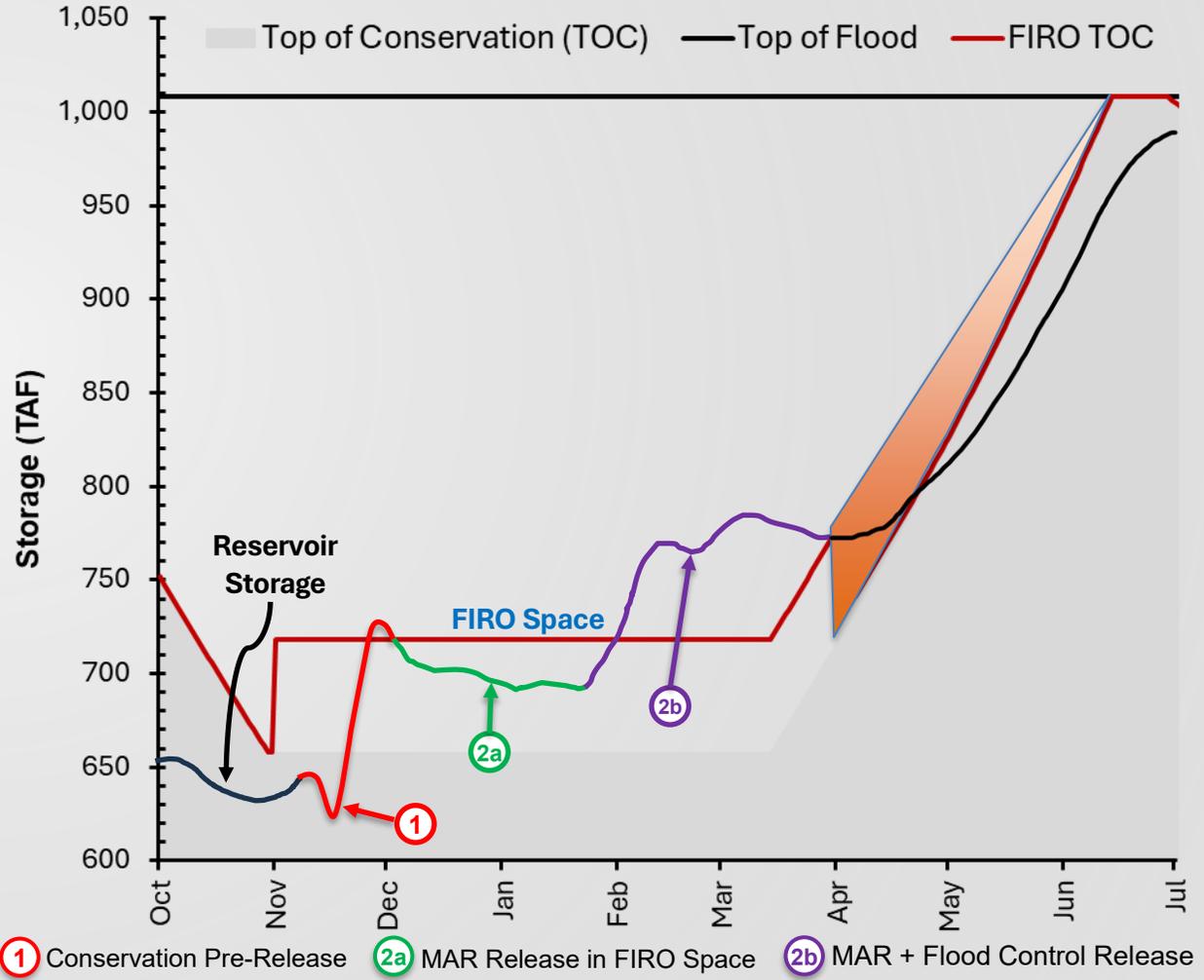
	MAR 90/20	I-FIRM
High Flow Management	90th percentile daily up to 20% of total daily flow	90th percentile monthly
	Dec 1st – Mar 31st	Nov 1st – Jun 14 th
	when Delta is in Excess	when Delta is in Excess

30 Years Flow Data – 90th Percentile Flow



Flood-MAR Adaptation Strategies

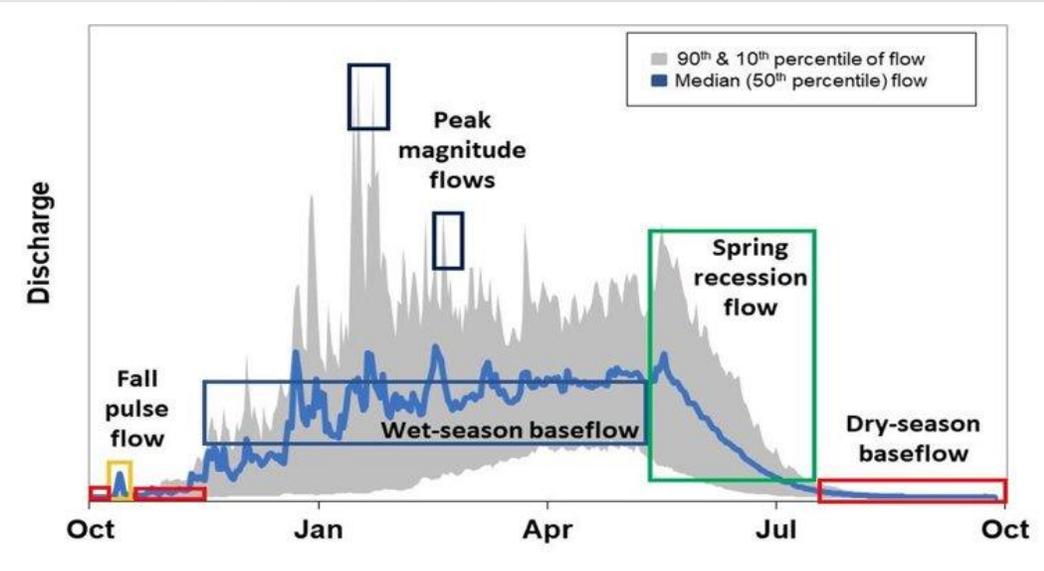
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Reservoir Reoperation	<i>None</i>	FIRO-MAR



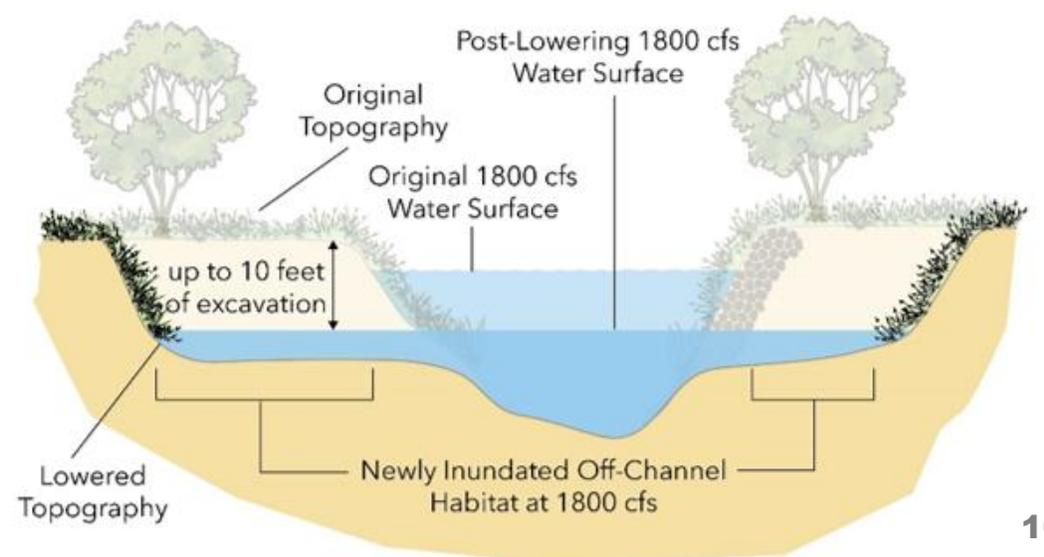
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Ecosystem Flow Management	Maintain Existing Operations	Flow and non-flow actions to limit impacts

CEFF - Functional Flow Components

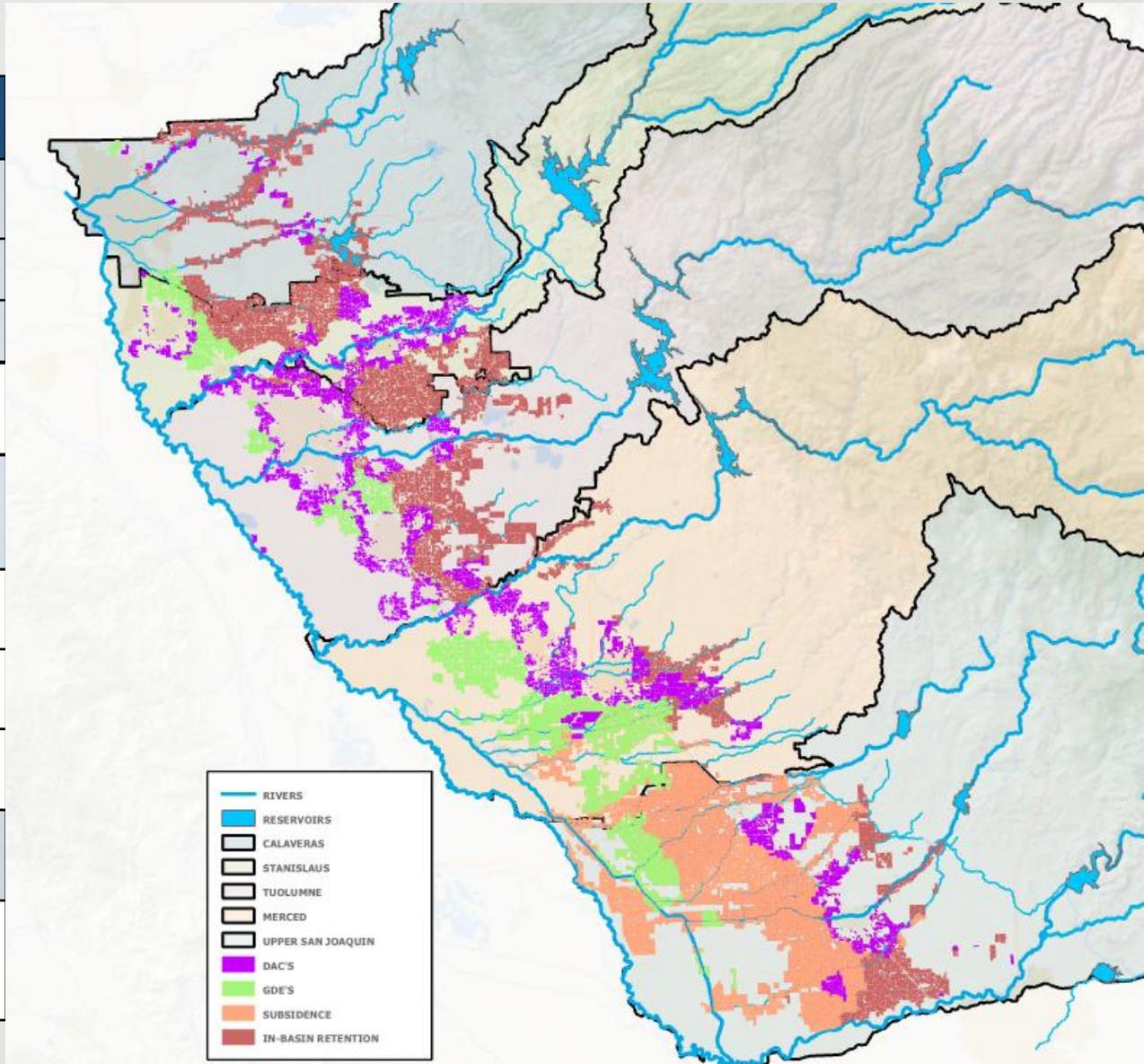


Off-Channel Habitat



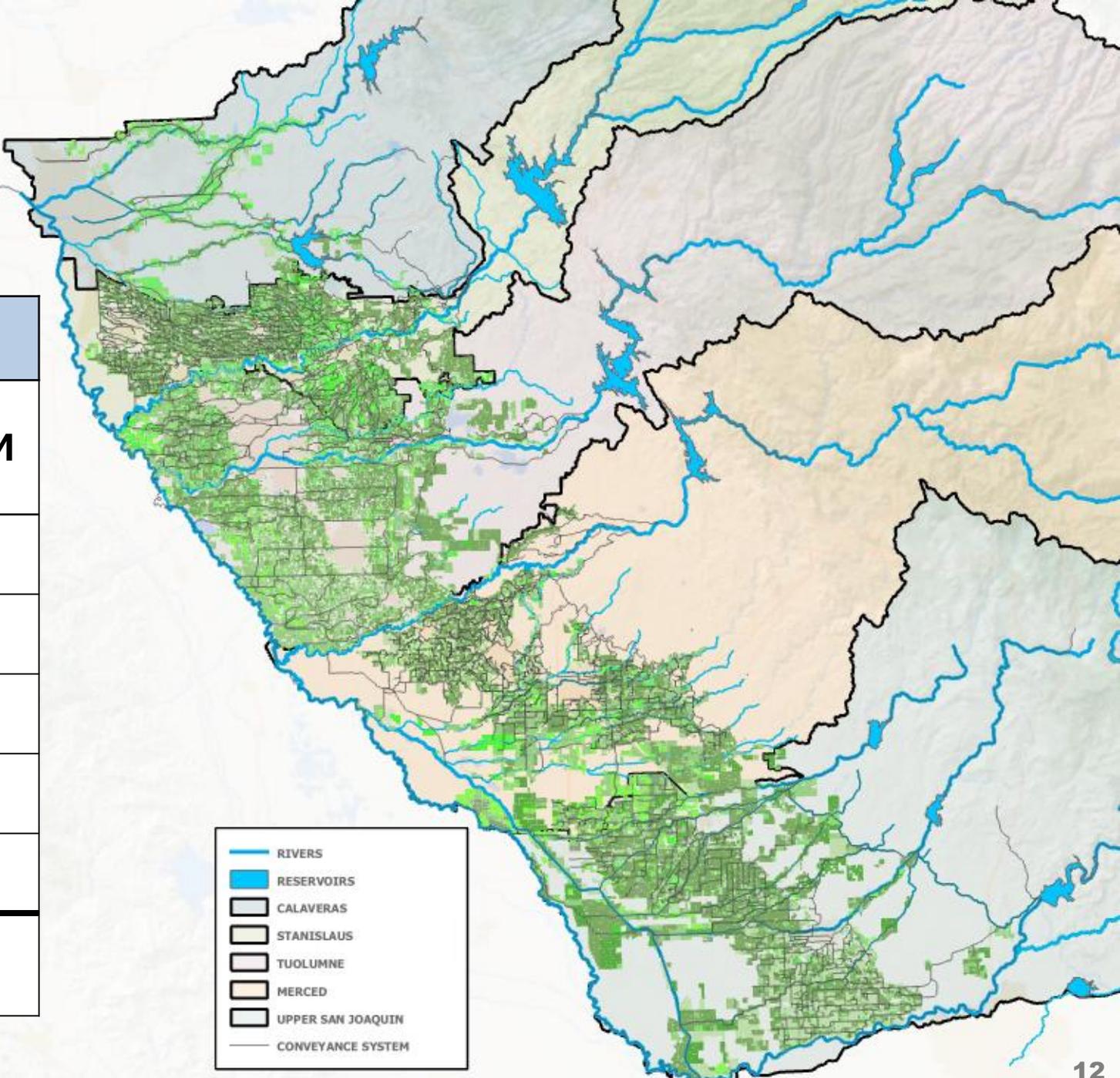
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Reservoir Reoperation	<i>None</i>	FIRO-MAR
Ecosystem Flow Management	Maintain Existing Operations	Flow and non-flow actions to limit impacts
Infrastructure Improvements	<i>None</i>	Reoperate Regulating Reservoirs
	<i>None</i>	Expand Bottlenecks/Turnouts
	Recharge white areas with existing conveyance	Recharge white areas with existing/new conveyance
Multi-Purpose Recharge Projects	<i>None</i>	Shorebird habitat Flow-Through-Basins
Recharge Management Areas	Targeted recharge to maximize in-basin retention and improve GW conditions near disadvantaged communities, GDE's, and subsidence-prone areas	



Flood-MAR Adaptation Strategies

Available Fields (Acres)			
Watershed Study Area	All Fields	MAR 90/20	I-FIRM
Calaveras	147,690	10%	23%
Stanislaus	155,470	63%	67%
Tuolumne	291,760	49%	66%
Merced	269,780	40%	51%
Upper San Joaquin	410,090	48%	55%
SJ Basin Study Area Total	1,274,790	44%	54%



13 Performance Metrics

Sector/Theme	Indicator
Surface Water Supply	
Conservation pool management	Average annual reservoir storage at the beginning of the irrigation season
	Average annual reservoir storage at the end of the irrigation season
Applied surface water	Average annual applied surface water
Groundwater Supply	
Applied groundwater	Average annual applied groundwater
Groundwater budget	Average annual change in subsurface storage
Groundwater levels	Average difference in the groundwater levels relative to baseline current conditions
Gain to stream	Average annual net gain to stream from groundwater aquifer
Flood Risk	
Flood flow management	Maximum flow over 100-years
	Number of years flow exceeds the operational threshold
Ecosystem	
Instream salmonid spawning habitat	Average annual instream salmonid spawning habitat (November – February)
Off-channel salmonid rearing habitat	Average annual potential off-channel salmonid habitat (December – May)