Water Blueprint
for the San Joaquin Valley

Blueprint Paper[1] #25

THE WATER RESILIENCY PROJECTS – DELIVERING THE PROMISE

On July 28th, 2020, Governor Gavin Newsom released a final version of the Water Resilience Portfolio, the Administration's blueprint for equipping California to cope with more extreme droughts and floods, rising temperatures, declining fish populations, over-reliance on unsustainable groundwater, and other challenges. That was followed in August of 2022 with a water supply strategy CA-Water-Supply-Strategy.pdf for the state to ensure California has the water needed for generations to come.

The Governor's initiatives present a fresh paradigm in water management in California: a focus on abundance. It involves using the state's water resources more effectively by increasing reliable supplies through water re-use and desalination as well as increasing resilience by storing water in times of plenty to ensure there is enough in times of shortage.

California has always been a favored land with its rich natural resources and unique climate where people have come to pursue their dreams. Within its wildly fluctuating climate, deep snows on the Sierras have always brought hope. The ever-increasing challenge is to utilize infrastructure and wise management to transform erratic climatic variability into a stable water supply. The Newsom administration has begun to implement the Water Resilience Portfolio and the Water Supply Strategy. Here we add critical elements to the state plan and present a series of identifiable, high-profile projects that work together to deliver the promise to make the Governor's vision a reality. Some of these projects can be planned and implemented at the local level, while other projects require coordinated, inter-regional cooperation.

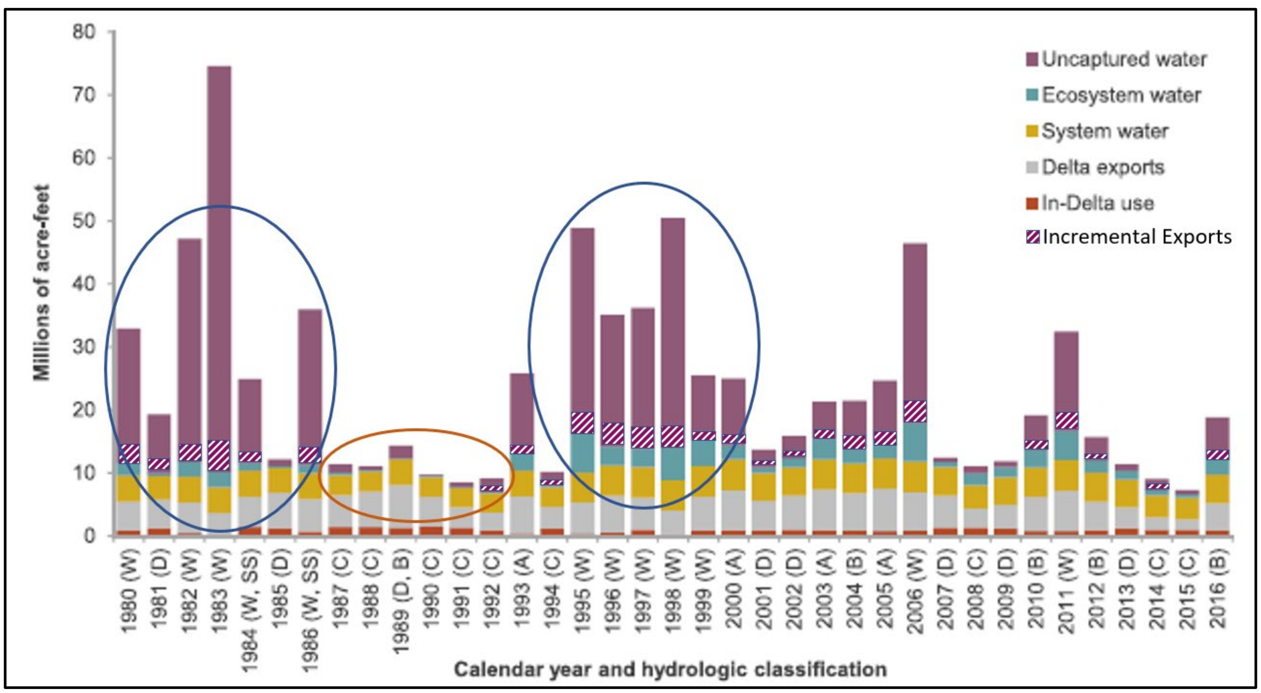
What distinguishes these projects from previous planning efforts is that collectively they provide a state-wide, integrated solution to a complex set of water issues. A high level overview is provided here to explain why that integration is needed and how it meets California needs.

[1]Blueprint Papers summarize topic-specific information – typically a potential component of a water solution for California. It is hoped that these papers stimulate discussion and lead to new ideas and better solutions. To provide input, please call Scott Hamilton at (661) 303 1540 or email comments and suggestions to *Scott@ResourceEconomics.net*.

Crazy Hydrologic Cycles

Recognizing the wild and cyclical variability of California's hydrology is fundamental to developing a water solution for the State. It is typical for the State to experience several wet years followed by several years of drought. That is significant because, in order to achieve resiliency, it requires a shift from the use of surface reservoirs, which have limited capacity, to groundwater storage which essentially has unlimited capacity. The groundwater storage capacity in the San Joaquin Valley is estimated to exceed 50 million acre feet. Surface reservoirs are expensive and nearly all of the good sites have already been utilized. The role for new surface reservoirs in the future is to reregulate supply within years, particularly for wildlife benefits, and to provide flood protection and recreation.

Figure 1. *Uses of Delta water highlighting the variability and cyclical nature of California's hydrology. There was very little surplus water (burgundy columns) during the 1987 to 1992 drought, but it was followed by a series of very wet years from 1995 through 1999. Source: PPIC. Shaded bars show incremental exports that would be made possible with Environmentally Friendly Diversions and other system improvements.*



The Big Picture

True resiliency requires long-term storage of precipitation during very wet periods to meet needs during dry periods. Effective long-term storage requires the development of groundwater storage facilities – presented conceptually in Figure 2.

Figure 2. *True resiliency requires long-term storage of precipitation during very wet periods to meet needs during dry periods. The map below is conceptual. Multiple regions throughout California require supplemental supplies during droughts- more than just the shaded ovals shown, and multiple groundwater basins can store such water.*

Multiple regions throughout California require supplemental supplies during droughts and there are numerous groundwater basins in California can store that water. Preliminary estimates put the unused groundwater storage capacity in the San Joaquin Valley at 75 million acre feet (15 times the capacity of Shasta Reservoir).

In the winter and spring, after San Luis Reservoir has filled and prior to peak irrigation demands in the summer, most of the capacity of the California Aqueduct and the Delta Mendota Canal is unused and available to move high flow Delta water into groundwater storage. In drought years, surplus canal capacity is available to move water from groundwater storage to fulfill unmet needs due to shortages of surface water.

Necessary Infrastructure

Currently California can only capture a small portion of the Delta's surplus high flow water due to the need to protect endangered fish that reside in or migrate through it. As a result of investment in California water infrastructure, only a few additions are needed to provide statewide resiliency (Figure 3):

- new diversion systems in the Delta that can divert water without harming fish (Environmentally Friendly Diversion Project),
- new bidirectional conveyance systems in the San Joaquin Valley to open up storage opportunities and facilitate delivery of new supplies for groundwater sustainability and wildlife benefits (The Southern San Joaquin Water Resiliency Project),
- new multi-benefit recharge ponds and other mechanisms for recharging groundwater and providing wildlife benefits (GSP Implementation Projects),
- restoration of capacity in existing conveyance facilities that has been eroded due to subsidence (the Infrastructure Restoration Project), and
- with the above facilities in place, the development of new water banking programs between willing partners that will provide mutual benefits – reliable supplies for urban areas and increased supply and reduced water costs for water bankers.

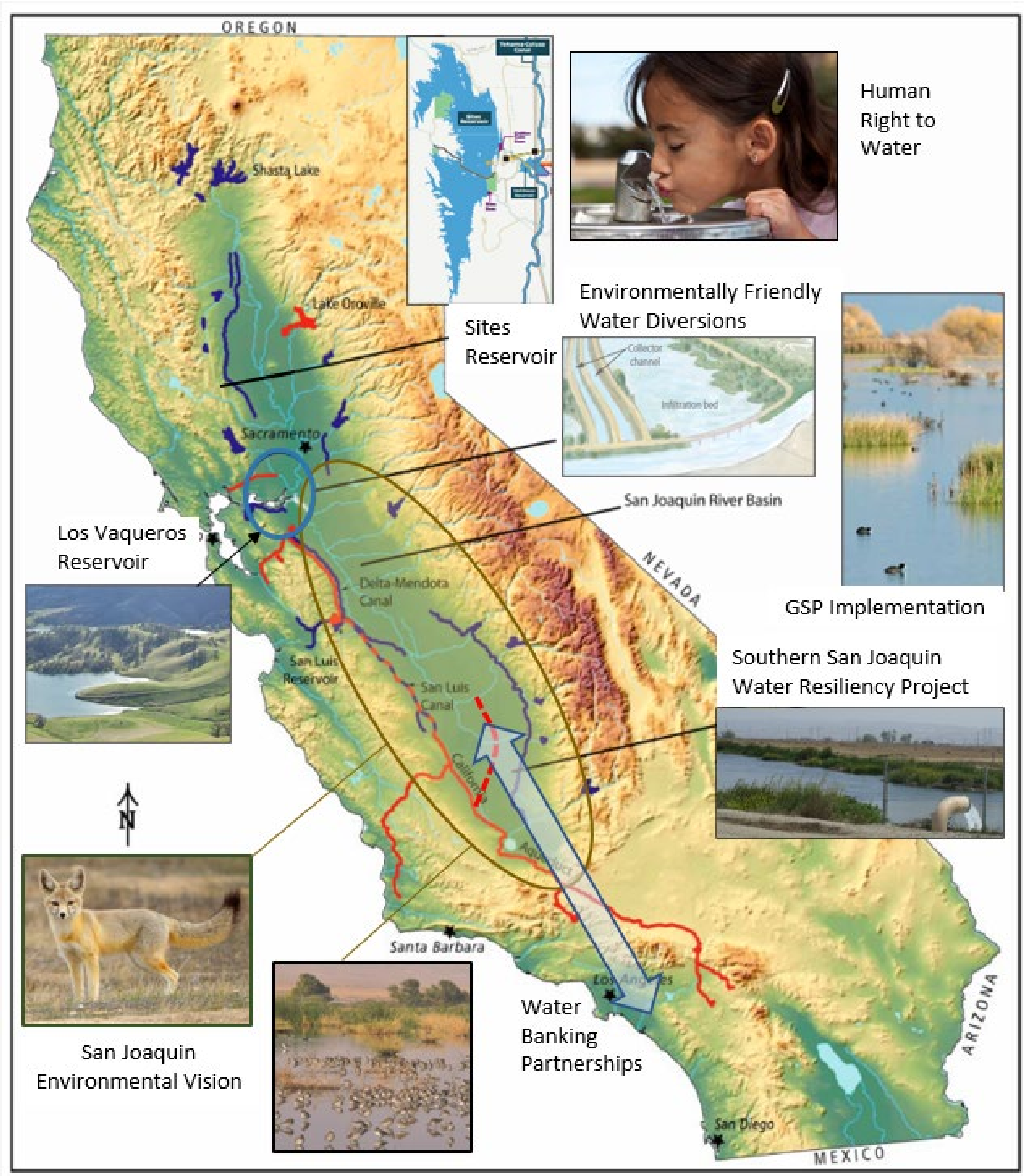
Even with full development of this infrastructure, Delta outflow, surplus to all other needs, will still exceed 8 million acre feet per year on average.

Added to this is the need for continued investment in urban areas for storm water capture, water recycling, and water purification projects (Urban Water Initiatives)

The Environmental Vision

Public Water Agencies and environmental organizations have frequently differed on how scarce water supplies should be allocated. New projects will reduce that conflict and give the environmental managers their own resources to manage water for the environment. The primary, but not necessarily the sole purpose, of new surface reservoirs would be to provide dedicated environmental supplies. Environmental water managers can then deliver, trade, and exchange their water supplies to provide necessary water for fish and waterfowl (The Environmental Reservoirs Project) which would free up existing reservoir supplies for their originally-intended purposes.

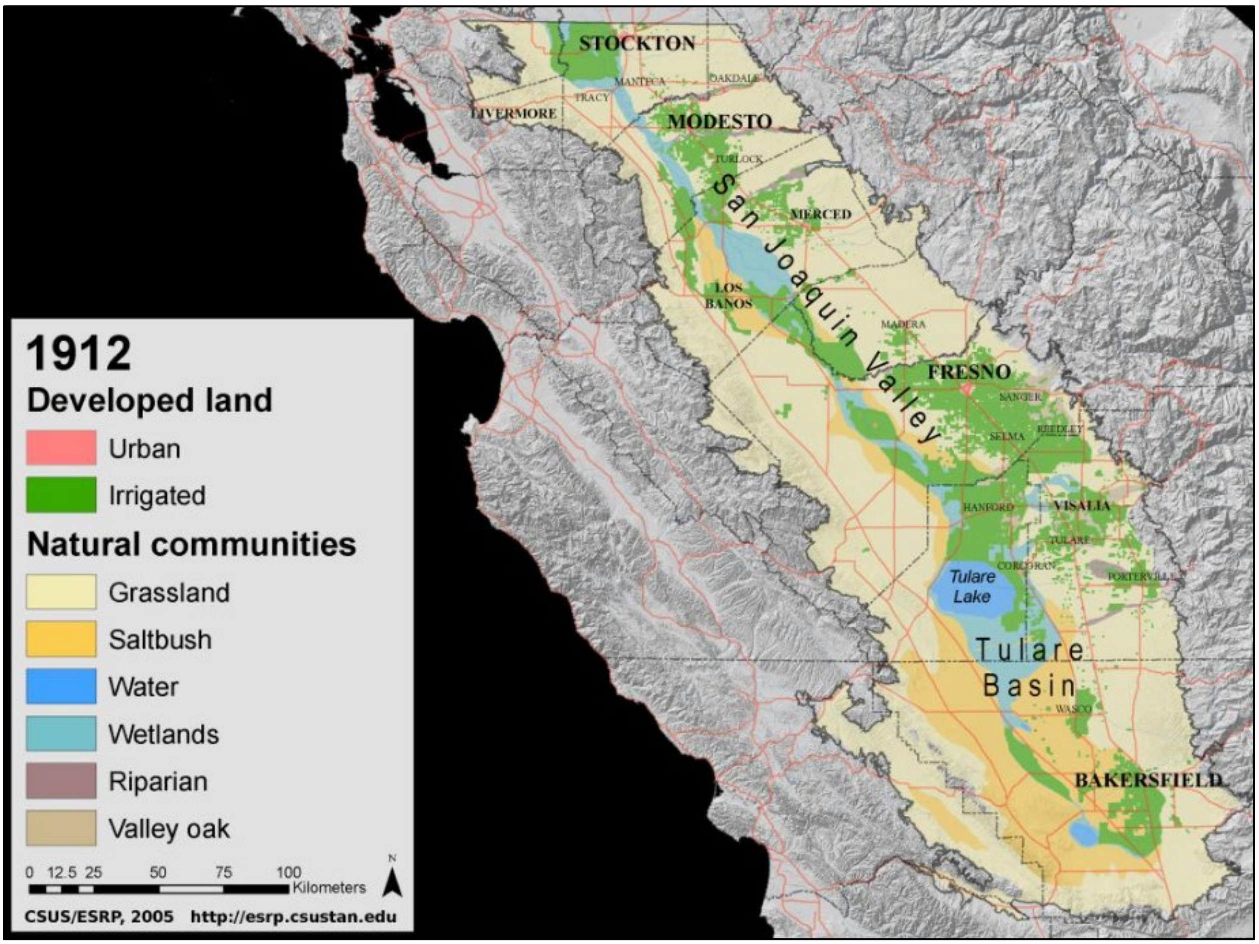
Figure 3. *Locations of some of the new infrastructure projects.*



With large areas of agricultural land likely to come out of production in the San Joaquin Valley to meet groundwater sustainability objectives, an exciting range of environmental enhancement opportunities emerge to restore hundreds of thousands of acres to native conditions (see Figure 4). The San Joaquin Environmental Vision Project involves restoration of:

- floodplain habitat that provides environmental benefits and can mitigate increased flooding likely to occur as a result of climate change,
- grasslands and upland habitat to provide protected habitat for endangered desert species, and
- seasonal wetlands for shorebirds and migrating waterfowl, which would also provide flood protection.

Figure 4. *It is likely that SGMA will result in the repurposing of between 200,000 and 500,000 acres of agricultural land in the San Joaquin Valley. This map depicts the location of natural communities in the San Joaquin Valley in 1912 and provides insight into the type of ecosystem restoration that might be most successful in any particular area.*



This project, however, needs to be coordinated across the whole Valley, working in partnership with willing landowners. Much effort has already been devoted by numerous environmental organizations as to where and how this restoration should occur. Restoration efforts are frequently focused on restoring original ecosystems. Figure 4 depicts land use in the San Joaquin Valley in 1912. If some farmland must be retired, Figure 4 also provides insight into the type of ecosystem restoration that might be most successful in any particular area.

Figure 5. *Development of the Governor's Water Resilience Portfolio (left column) into the Water Resiliency Projects.*

The Water Resiliency Projects

Objectives	Project Elements	Benefits
Maintain and diversify water supplies	GSP Implementation Projects: 50,000 ac of multi-benefit recharge basins to capture high flow water	Flood protection, wildlife benefits, groundwater sustainability
	Urban Water Initiatives: Water Re-use & purification, Storm water capture	Urban water reliability & resiliency
Protect and enhance natural ecosystems	San Joaquin Valley Environmental Vision Project:	Ecosystem protections, migratory fish habitat, flood protection, streamlined permitting
	Environmentally Friendly Delta Diversions	Protect endangered fish, improve water supply
	Environmental Reservoirs Project: Sites Reservoir, Los Vaqueros Expansion	Flexibility of water management for the environment, infrastructure equity
Build connections	Southern San Joaquin Water Resiliency Project	Water supplies & conveyance for wetlands, DACs, groundwater sustainability
	Infrastructure Restoration Project	Restore canal capacities impacted by subsidence
Be prepared	Water Banking Partnerships: 5 million acre feet of water stored	Drought proof communities
	Human Right to Water	Safe, clean affordable water
	Inter-regional planning	Emergency preparedness, effective water management

The Projects

SGMA and GSP Implementation Projects: GSAs in severely over-drafted basins have identified more than 200 local projects costing more than $1.5 billion to capture water for 50,000 acres of multipurpose recharge ponds, providing seasonal habitat for wildlife and groundwater recharge. In addition to recharge ponds, it includes the infrastructure to interconnect the new facilities to existing distribution systems as well as greatly increasing on-farm recharge capacity needed to prevent flooding and achieve groundwater sustainability.

Urban water initiatives are intended to provide reliable supplies through water recycling and enhance groundwater supplies through storm water capture.

The San Joaquin Valley Environmental Vision is the restoration and enhancement of historic ecosystems by strategically retiring agricultural land to improve air quality, provide permanent protections for endangered species, and restore the functionality of floodplains to improve the productivity of fish habitat. The preliminary goals articulated here were a derivative of the Collaborative Action Program for the San Joaquin Valley and include the restoration of 70,000 acres of floodplain habitat, 5,000 acres of riparian habitat, 100,000 acres of upland habitat, and migratory corridors for salmonids. These numbers will change as land use and environmental planning continue.

Environmentally Friendly Delta Diversions will prevent the entrainment of endangered fish and enable the diversion of up to 15,000 cfs of water from the Delta without harming fish though a series of perforated pipes buried in gravel below the water column.

While *Environmental Reservoir Projects* meet a variety of needs, they are intended primarily to provide environmental water managers with water supplies that can be managed to meet specific environmental purposes and to reduce conflict over management of existing reservoirs that were built and financed for other purposes.

The Southern San Joaquin Water Resiliency Project would interconnect the California Aqueduct to the southern San Joaquin Valley through a new bi-directional canal allowing surplus delta water to replenish groundwater supplies in the Valley and open the door to improved water supplies for disadvantaged communities, new water for seasonal wetlands and wildlife refuges, and mutually beneficial water banking programs to provide increased resiliency to southern California.

The Infrastructure Restoration Project restores conveyance capacity in canals impacted by subsidence.

Water Banking Partnerships throughout the state provide the means by which California can withstand long periods of drought by enabling long-term groundwater storage and recovery.

The *Human Right to Water* program ensures all communities have safe, clean, affordable, and reliable drinking water.

A comprehensive long-term solution to California water problems cannot be implemented with recognizing the need for integrating the above projects through continued *Inter-regional planning.*

The Water Blueprint for the San Joaquin Valley has prepared additional supplemental information on many of these projects.

Figure 6. *The integration of the Water Resiliency Projects to achieve multiple benefits.*

Following the flow		Environemtnal Reservoirs	DCP, FFD	Infrastructure Restoration	SSJWRP	Seasonal Wetlands	Water Banking	Human Right to Water	Urban Water Initiatives
1	Runoff								
2	Reservoir Sorage								
3	Downstream River Flow								
4	Delta Diversions		X						
5	Delta Outflow								
6	Conveyance to Storage	X	X	X	X				
7	South of Delta Storage				X	X	X		
8	Conveyance from storage			X	X				
9	Benefits/Delivery to								
	DACs			X	X	X		X	
	Urban			X			X		X
	Agriculture & Food Security			X	X	X	X		
	Environmental	X	X	X	X	X			

Table 1. *Water Supply Projects – Yield and Costs*

Foundational Project	Implementing Projects	New Supply (taf/year) by 2030	by 2040	Total Cost/State Share ($ billion)
Environmentally Friendly Delta Diversions	GSP implementations & the Southern San Joaquin Water Resiliency Project	897 (e)		Convey. $1.2/$0.6 Wetlands $0.5/$0.5 Other $1.0/$0.5
	Water Banking Partnerships	82 (e)	82	$0.4/$0.1
	SWP [DWR]	574 (e)	574	FFD $1.0/$0.5
	CVP [USBR]	185 (e)	185	FFD $0.6/$0.3
Infrastructure Restoration Project	Friant-Kern Canal California Aqueduct Delta-Mendota Canal	110+ (f)	110+	?
San Joaquin Environmental Vision			500 (g)	?
Environmental Reservoirs	Sites (1.5 maf capacity)	240 (d)	240	$4/$3
	Los Vaqueros Expansion (115 taf capacity increase)	?		$0.80/$0
Human Right to Water		150 (h)		SAFER $0.73/year
Urban Water Initiatives	Recycling	800 (a)	1,800 (a)	State/Fed/Local Cost Share
	Desalination	28 (a)	84 (a)	
	Stormwater Capture	250 (a)	500 (a)	
	Conservation	500 (a)	500 (a)	
Total		3,666	5,472	$9.4/$5.5

Shaded numbers not yet included in the total

The sources below will likely not be included in the final document but are helpful as development of the table continues.

Sources:

(a) CA-Water-Supply-Strategy.pdf

(b) Sites Project (ca.gov)

(c) Includes: Chino Basin Conjunctive Use Program, Harvest Water Program, Willow Springs Water Bank, Aquaterra Water Bank, and other programs in the San Joaquin Valley and other groundwater basins

(d) Value Planning for a Better Sites Reservoir - Sites Reservoir (sitesproject.org)

(e) Assumes 12% increase in Table A (480 taf) and an increase in Article 21

   a. of 348 taf based, on studies produced by MBK Engineers, with 25% of Table A Increase going to existing and new water banking projects and 75% going to within-year uses. Art 21 is assumed split 75% to water banking projects and 25% to within-year uses wetlands. Increase in CVP yield of 350,000 af is assumed to be 100% to within year uses and 153,000 af of excess

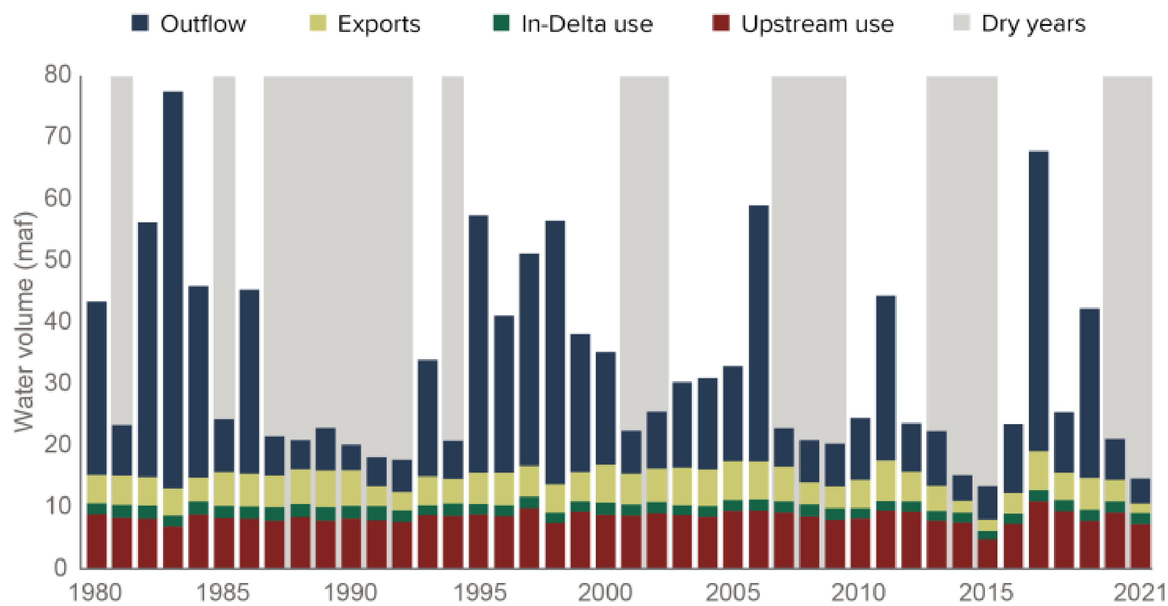
(f) Friant's 2018 Sustainability Plan that indicates an average yield of about 88% Class 1 and 12% Class 2 long-term average, and also about 190 TAF of Paragraph 16(b) water (e.g. $10 flood water that essentially replaces Section 215 water) under a future 2030 scenario. Friant contracts impacted by subsidence total 353,500 Class 1 and 509,000 Class 2. A 30% impact on yield is a loss of 110,000 af of yield. Estimates of yield impacts for Delta-Mendota Canal and California Aqueduct are not yet available.

(g) Assumes that creation of a South Delta fish passage eliminates the need for the San Joaquin I/E Ratio which would allow an increase in Delta Exports of around 500,000 af/year.

(h) 1.2 million people live in disadvantaged communities in the San Joaquin Valley. Most of these communities rely on groundwater, having no surface supply. With SGMA, their rights to groundwater are limited although their needs are addressed through GSPs. Assuming a family of 4 needs half an acre foot of water per year, the water needs for disadvantaged communities in the San Joaquin Valley alone would be 150,000 af. This quantity is not included in the total because it is a need, not a supply.

Appendix A

Changing water availability and uses in the Delta watershed



Sources: Uses and outflow: Technical Appendix to this report and *PPIC Delta Water Accounting* spreadsheets; dry years: Department of Water Resources.

Notes: Upstream and in-Delta uses (or "depletions") include net water diversions, water consumed by natural vegetation, channel evaporation, and net increases in groundwater storage. In-Delta uses include the legal Delta and diversions by the North Bay Aqueduct and the Contra Costa Canal. Exports are diversions by the Central Valley Project and the State Water Project. Upstream uses include out-of basin diverters in the Tulare Lake basin (Friant project) and the Bay Area (East Bay Municipal Utilities District and San Francisco Public Utilities Commission). Dry years are those classified as critical or dry in the Sacramento Valley based on the California Cooperative Snow Survey. Because this classification factors in the amount of runoff from the previous year, a single below-average year is often not classified as dry.

Figure A-1. *An update of version of Figure 1 from PPIC. While more current, this version does not differentiate "System Water".*

Source: PPIC (2022) Tracking Where Water Goes in a Changing Sacramento–San Joaquin Delta. p.2

Notes:

Available water storage capacity in the Central Valley was estimated using the following assumptions:
For the Tulare Lake Hydrologic Region:

2.6 million acres of agricultural land (DWR 2020, Bulletin 118, p 7-64)
average depth to groundwater: 350 feet
storage capacity per foot: 10%
percent lost to poor quality groundwater: 30% (see DWR 2020, Bulletin 118, p 7-69)
existing water banking capacity: 3maf
Available capacity: 2.6 mill ac * 350 ft * 10% * (1-0.3) usable quality – 3 maf existing = 60 maf

San Joaquin Hydrologic Region
1.8 million acres of agricultural land (DWR 2020, Bulletin 118, p 7-54)
average depth to groundwater: 150 feet
storage capacity per foot: 8%
percent lost to poor quality groundwater: 30% (see DWR 2020, Bulletin 118, p 7-59)
existing water banking capacity: 0 maf
Available capacity: 1.8 mill ac *150 ft * 8% * (1-0.3) usable quality - 0 maf existing = 15 maf

Total = 75 maf