

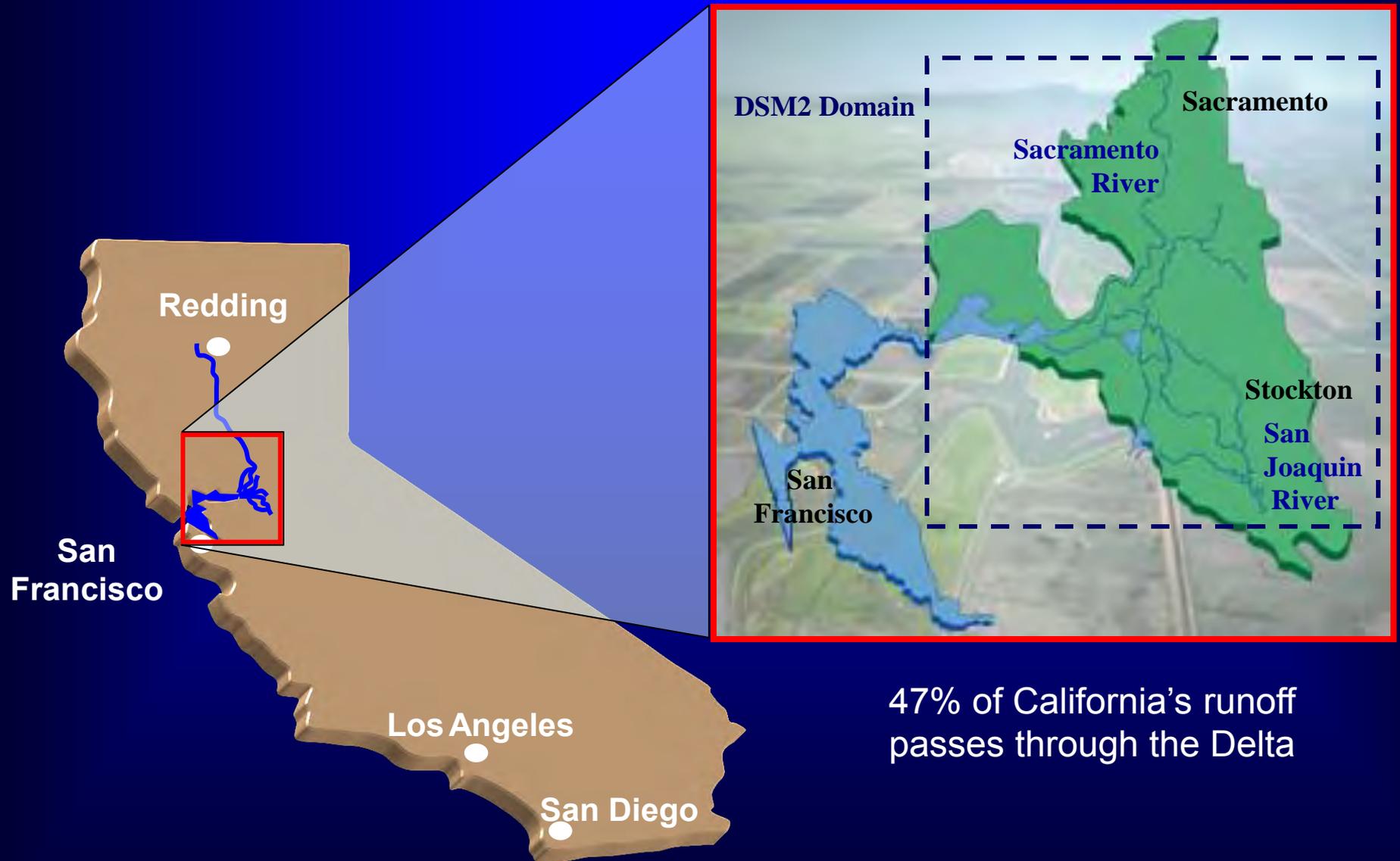
Constraints in the Sacramento-San Joaquin Delta

Paul A. Marshall, Chief
Bay Delta Office
February 23, 2016



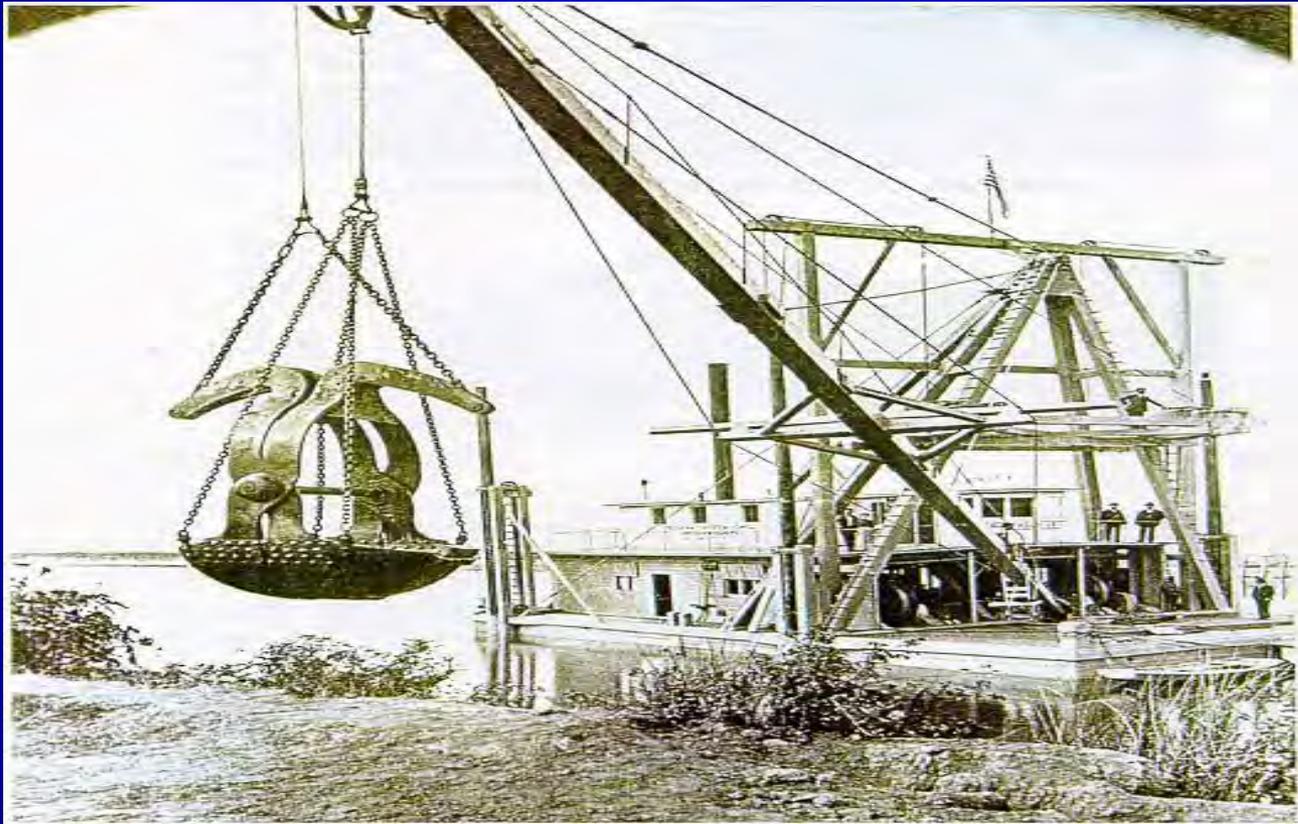
Adapted from Jaime Anderson, PhD, PE
Bay Delta Office

Bay-Delta System



47% of California's runoff passes through the Delta

1850's Levee Construction



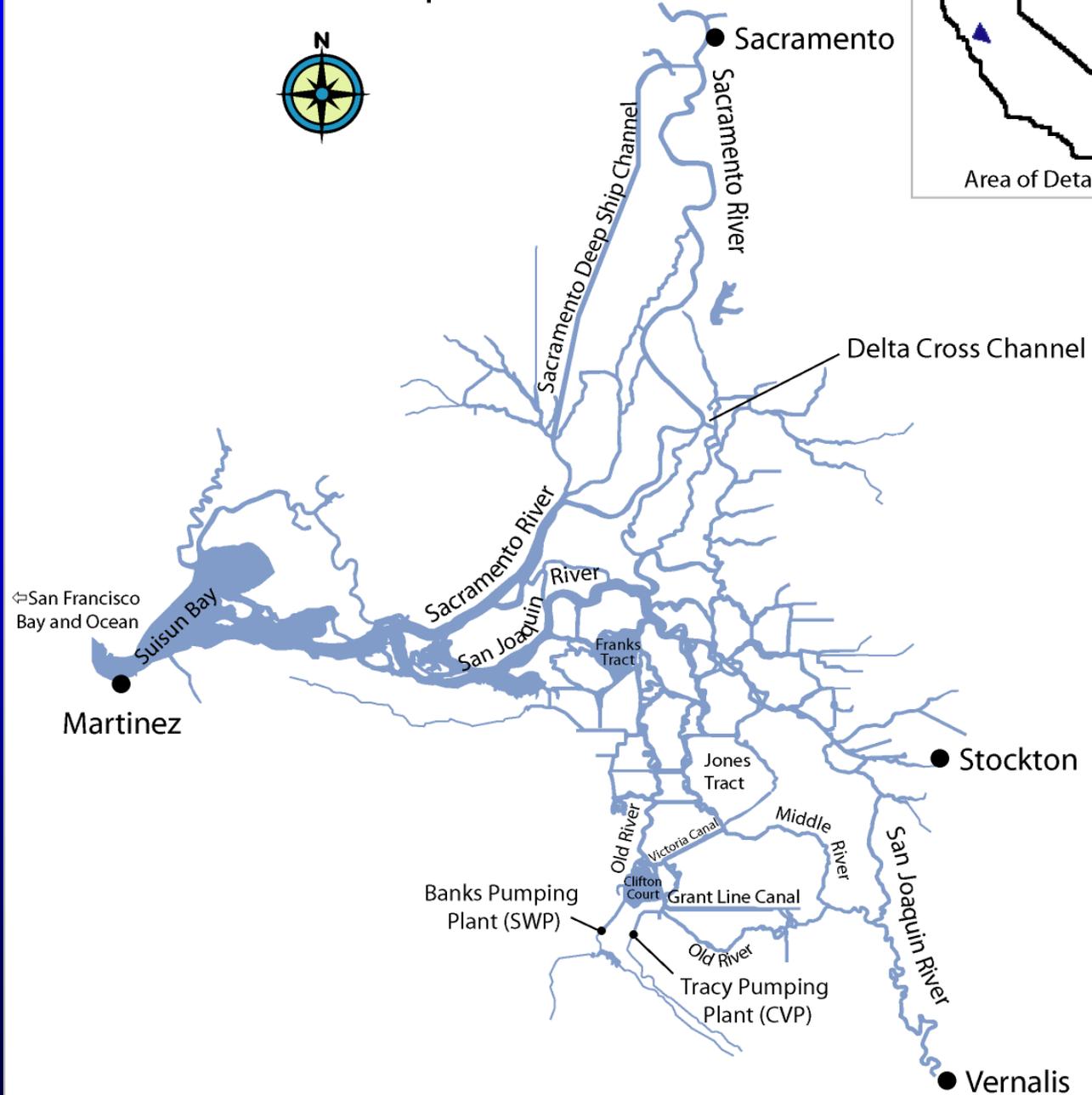
Physical modifications (dredging, levees, pumps, gates, resevoirs, etc)

Modern Delta

Highly managed

- Reservoirs
- Gates & barriers
- Pumps
- Levees

Sacramento San Joaquin Delta



Human Influences

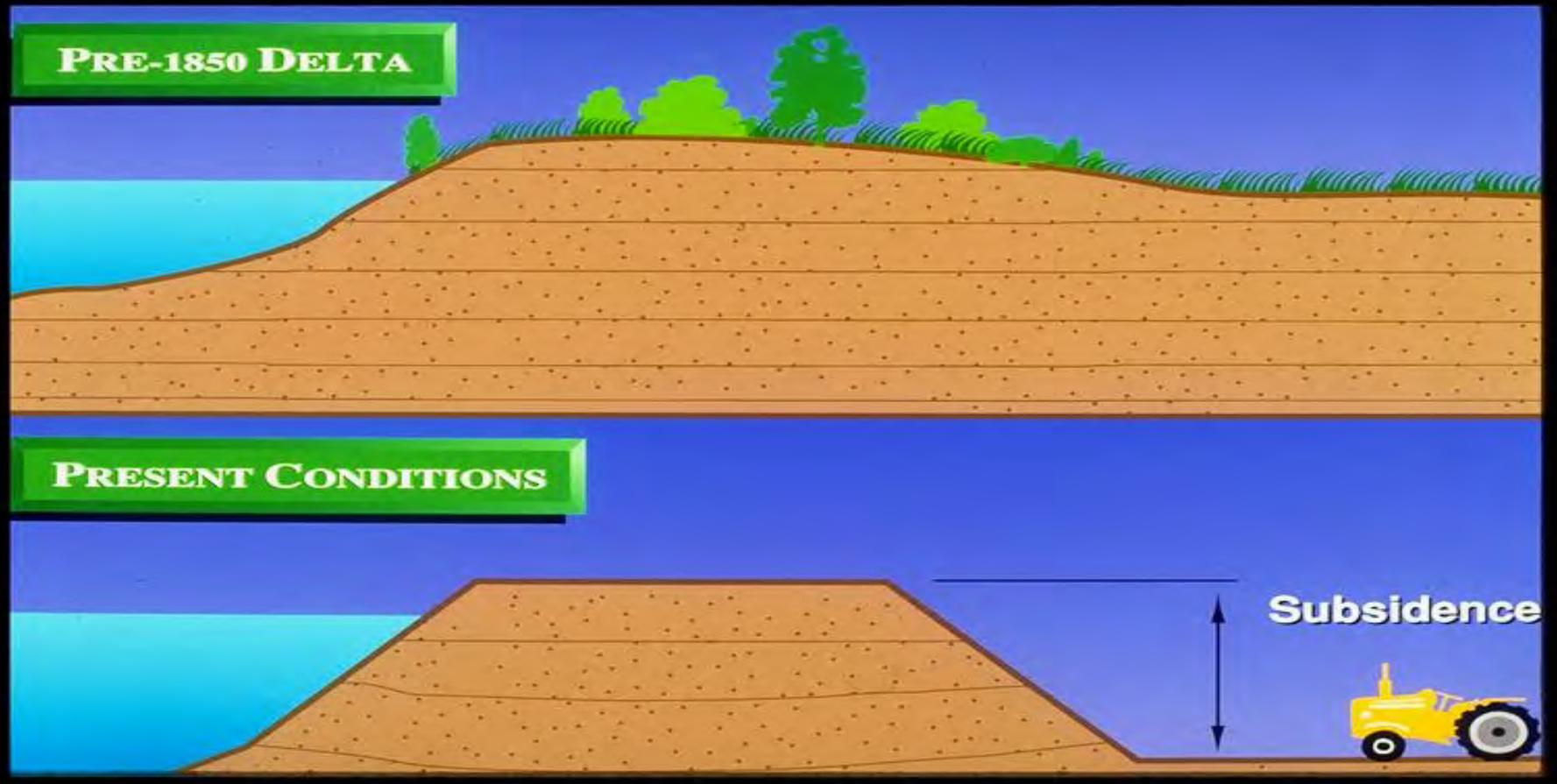
Commercial shipping:
Sacramento and San-
Joaquin Deepwater Ship
Channels



Recreation:

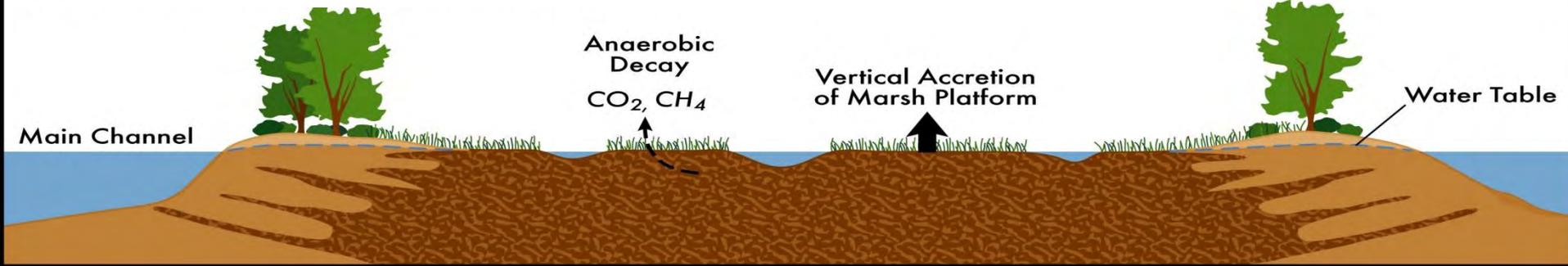
fishing, hunting,
boating, passive
enjoyment

Subsidence

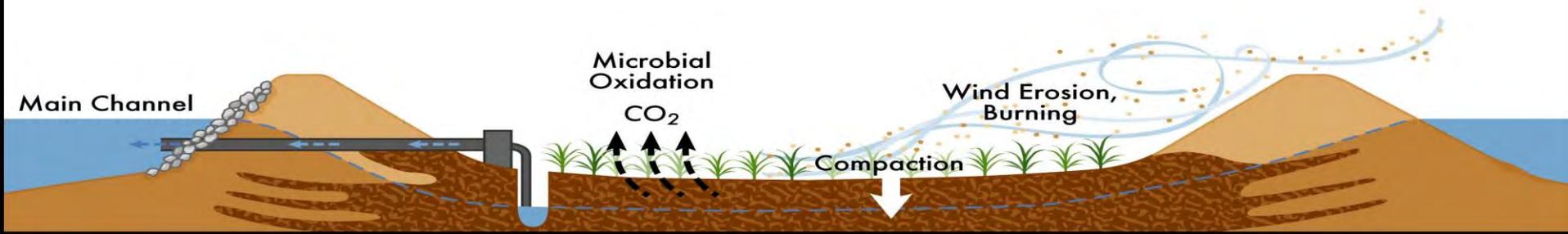


Land Subsidence: a historical fact

Pre-1880's



Present Time



Levee Failure



Land Subsidence

Due to Farming & Peat Soil Oxidation

- 25 ft.

- 20 ft.

- 15 ft.

- 5 ft.

Below Sea Level

-30 -20 -10 -5 ft

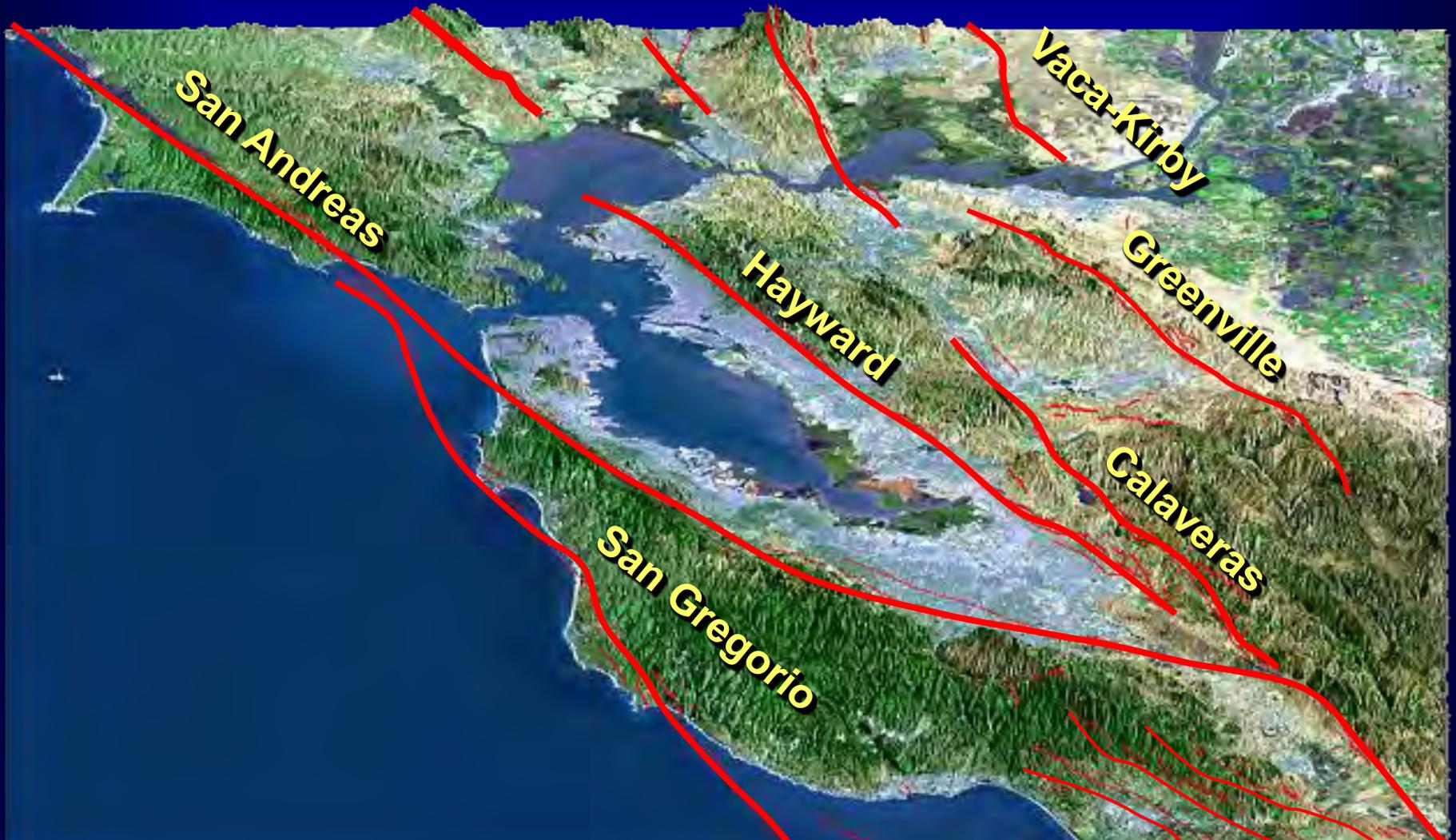


Physical Processes

- **Hydrodynamics**
 - **Hydraulics:**
flood flows,
tidal action
 - **Sedimentation**
 - **Erosion**



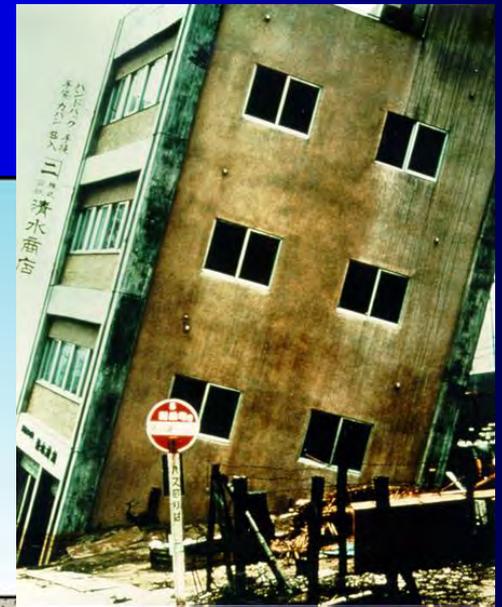
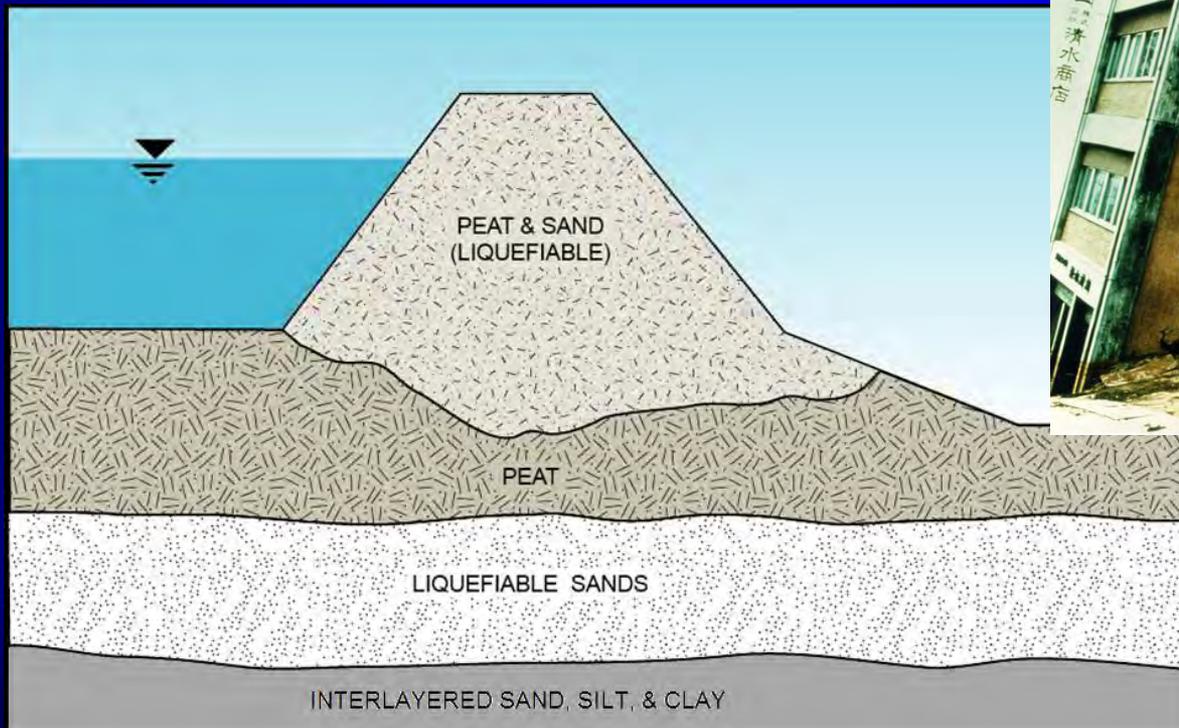
Seismic Risk



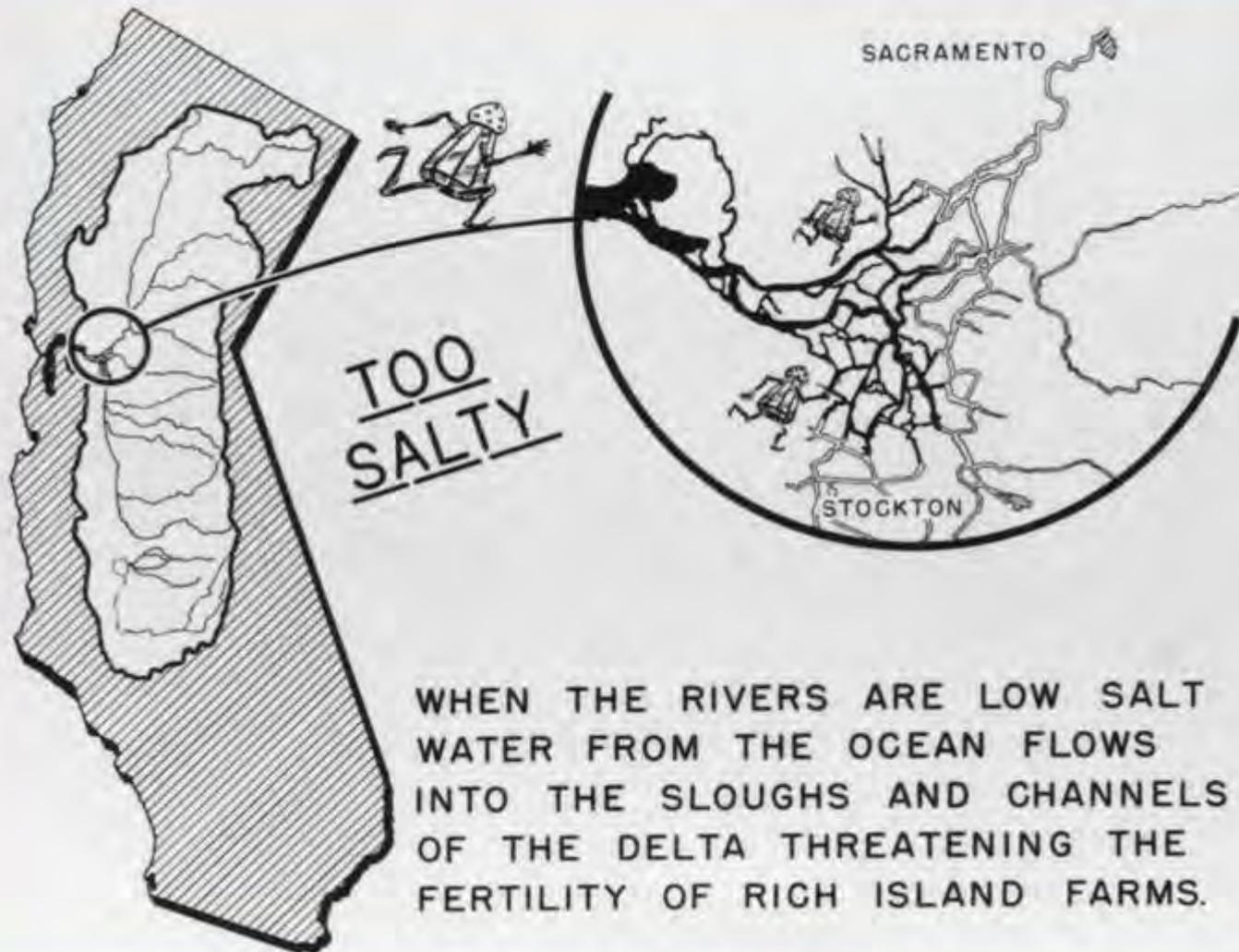
Bay Delta Region Major Faults

Levees have risk of failure during a seismic event

- Levees remain susceptible to earthquakes even after PL84-99 improvements are made



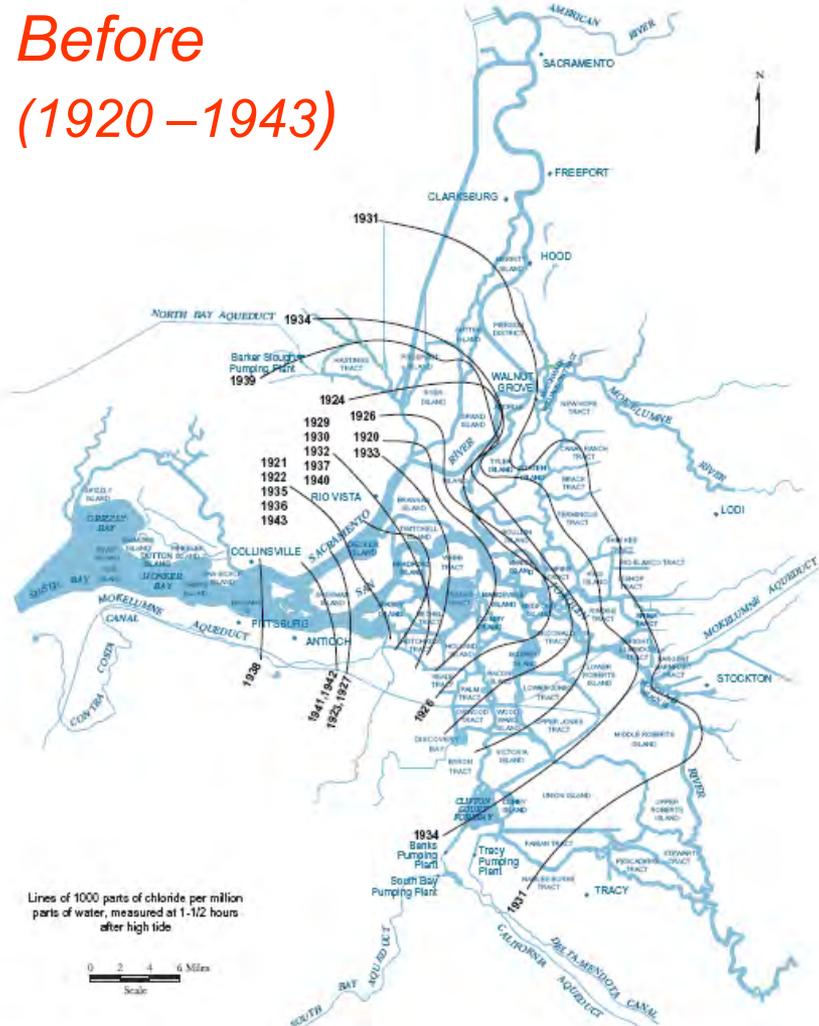
1930's Propaganda for CVP



Salinity Intrusion Before and After Managed Upstream Reservoirs

Figure 4-26 Maximum Salinity Intrusion, 1921-1943

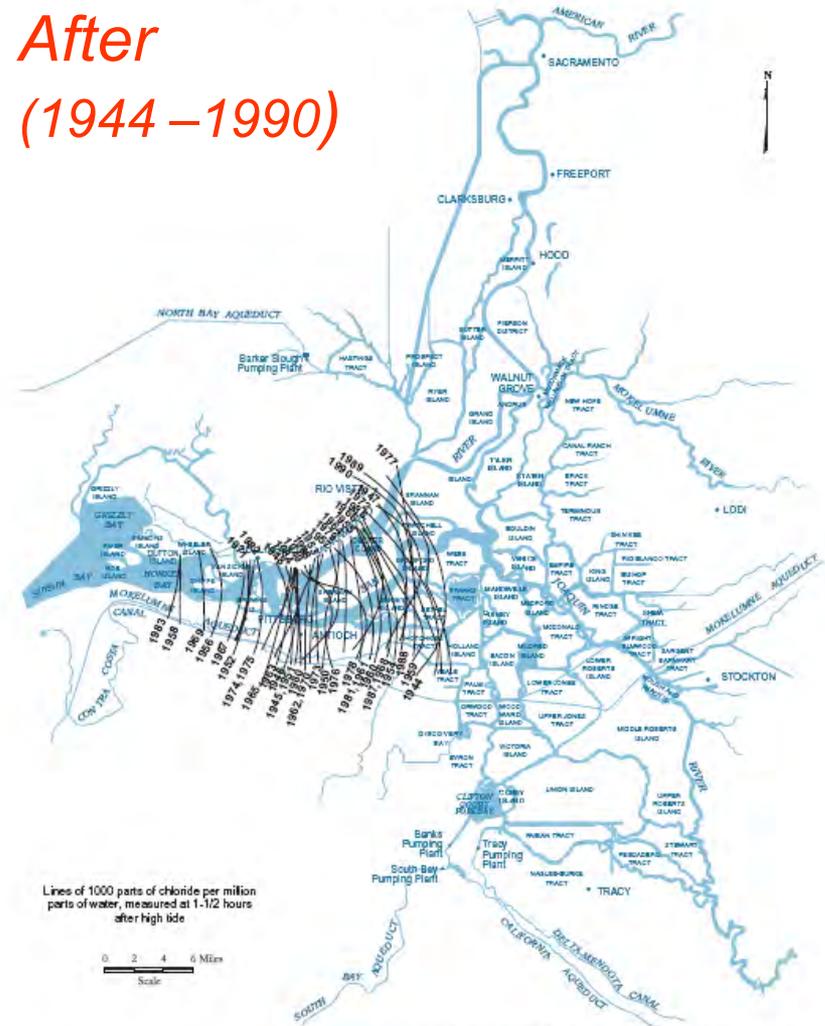
Before
(1920-1943)



Source: Department of Water Resources, Sacramento - San Joaquin Delta Atlas, 1993

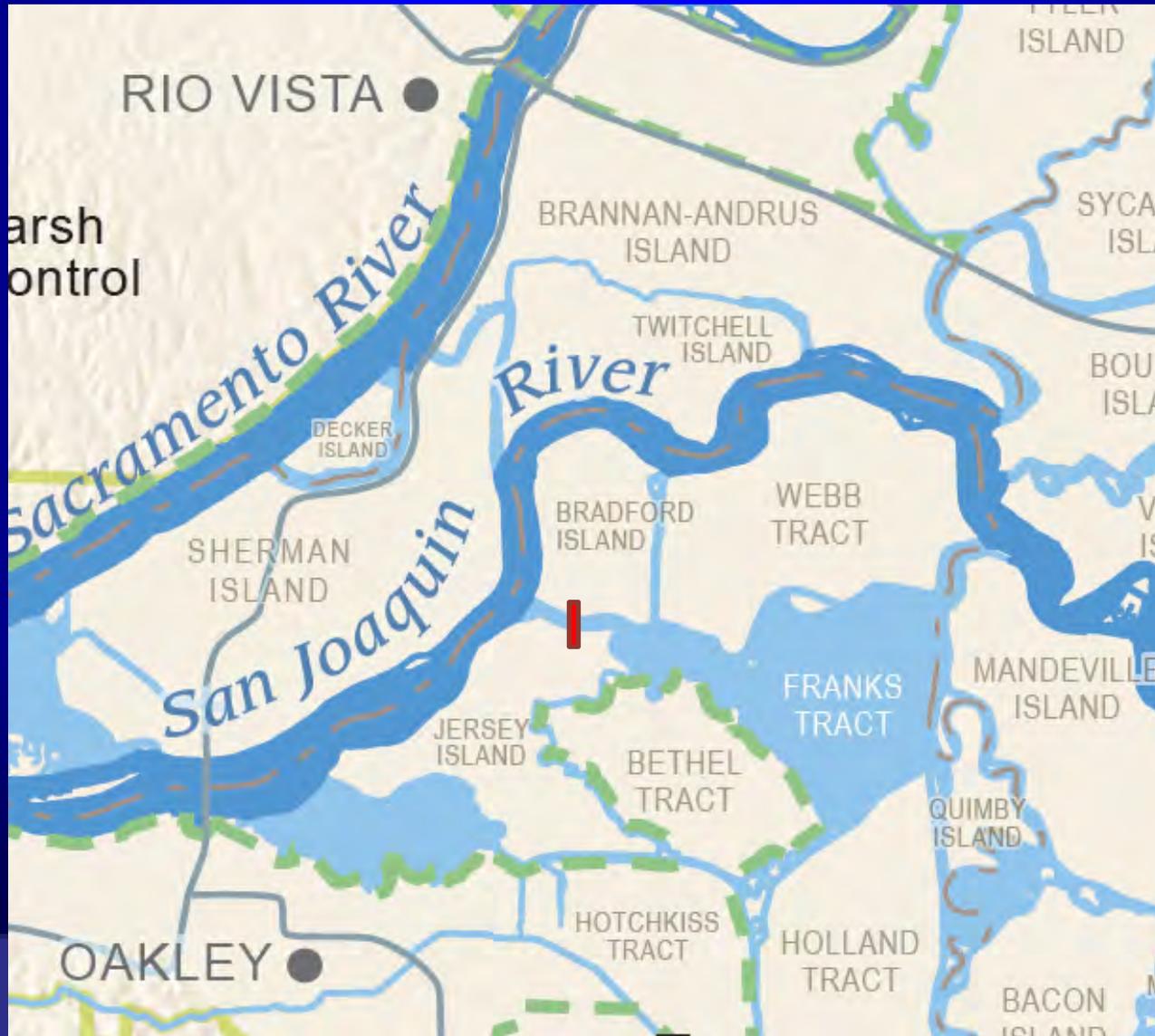
Figure 4-27 Maximum Salinity Intrusion, 1944-1990

After
(1944-1990)

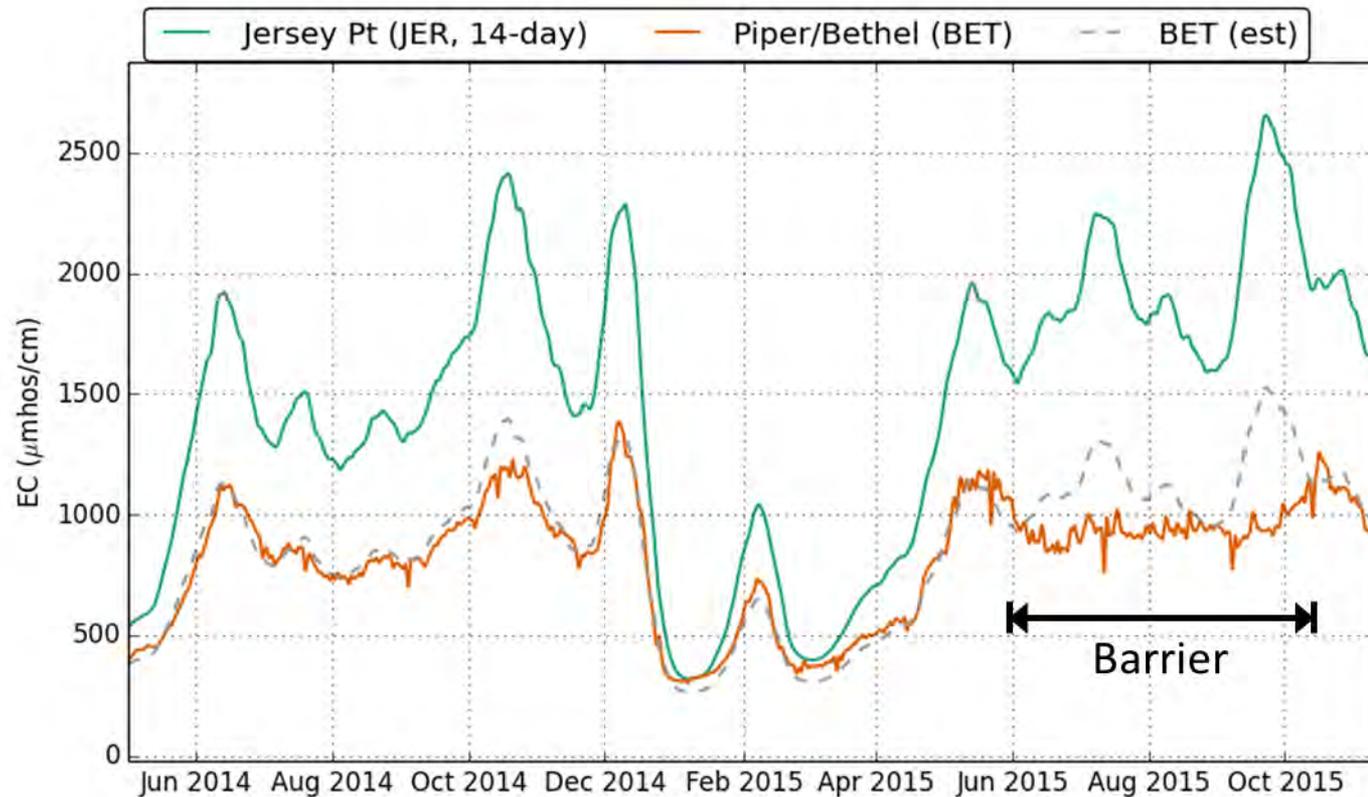


Source: Department of Water Resources, Sacramento - San Joaquin Delta Atlas, 1993

Emergency Salinity Barrier Location

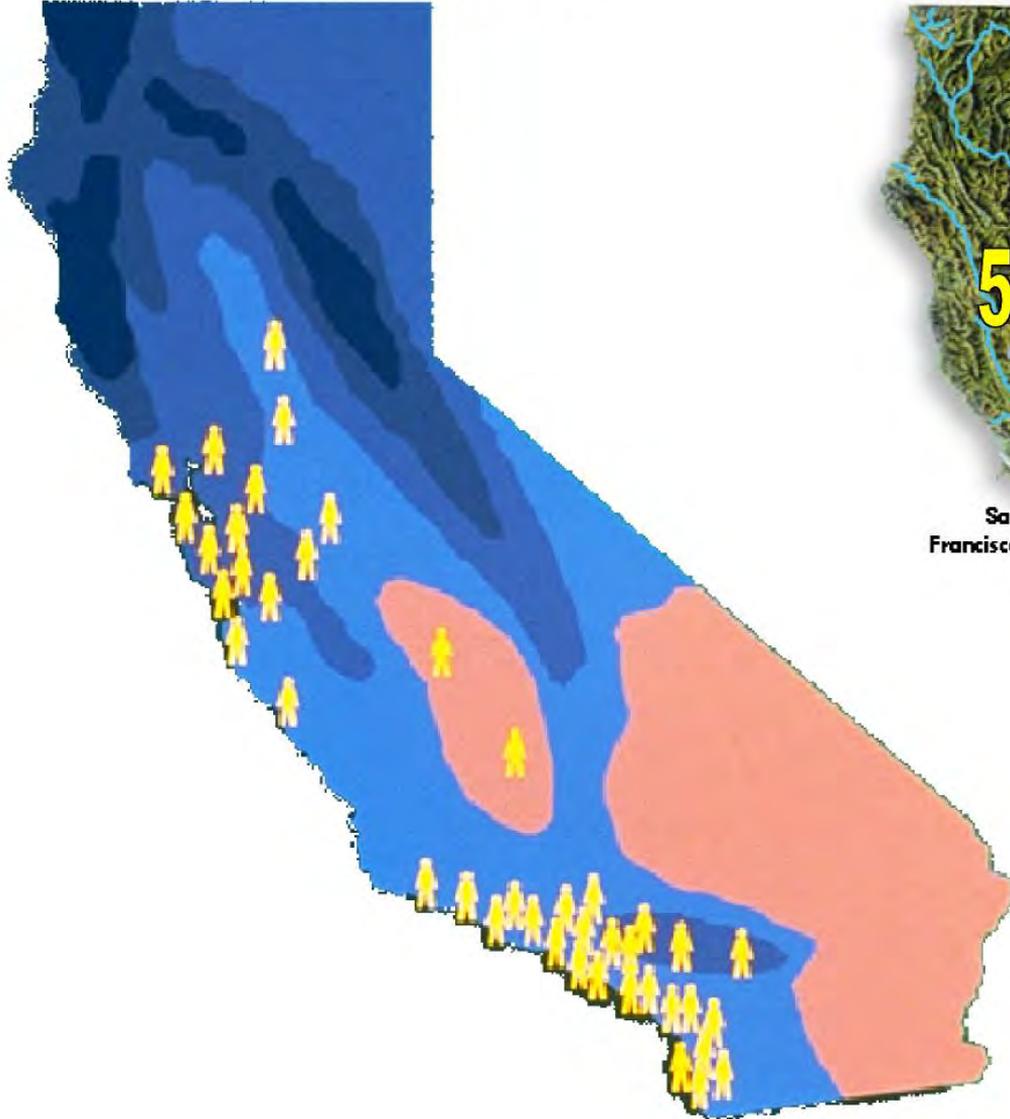


Drought Barrier Efficacy



California's Water Resources

Precipitation (blue contours)
vs Population (yellow icons)



Total Annual
Runoff = 70.8 MAF



Delta Inflow Refresher

Sacramento River

~80% Inflow; good quality

East Side Rivers

~5% Inflow; good quality

Ocean/Tidal

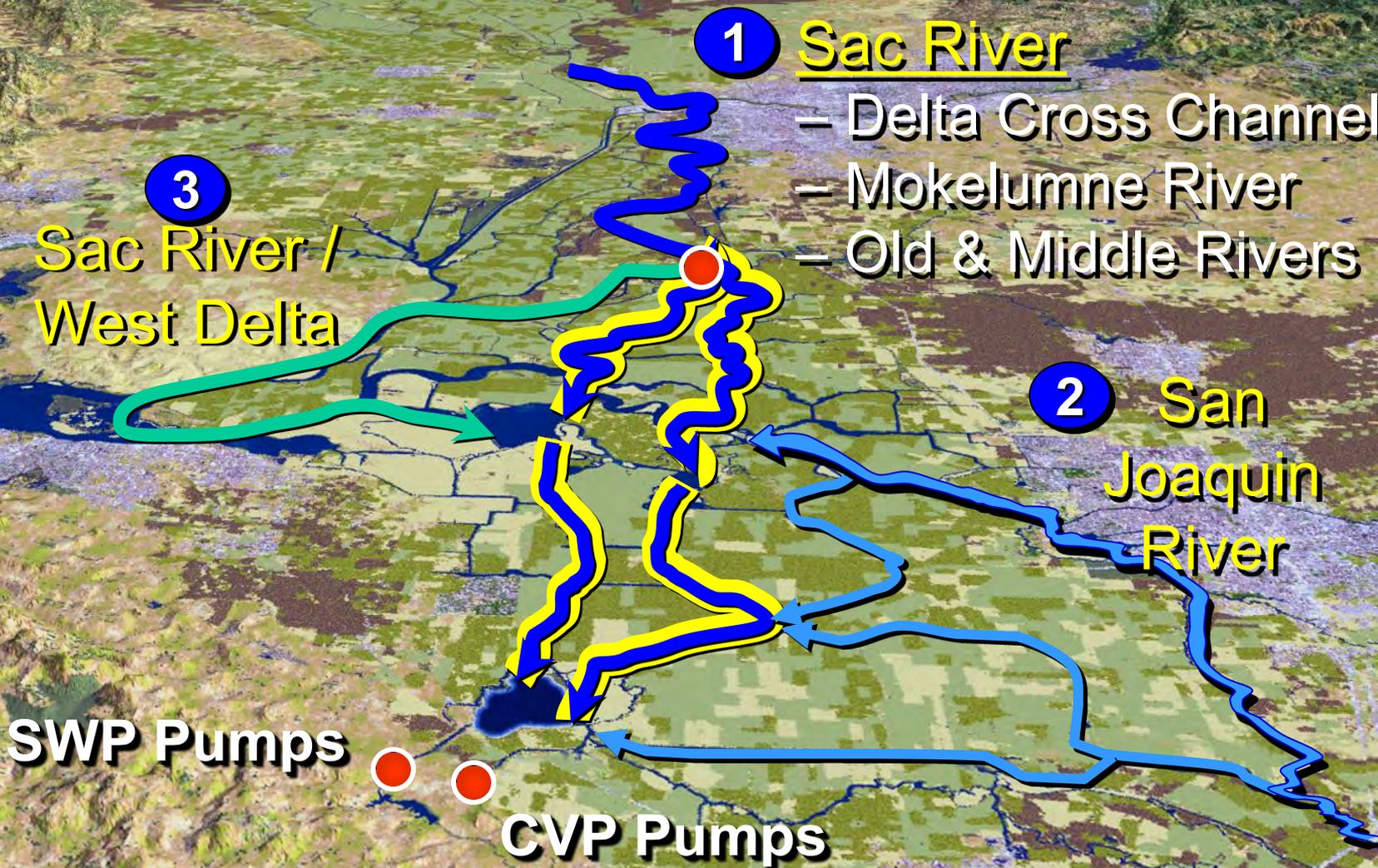
High salinity

San Joaquin River

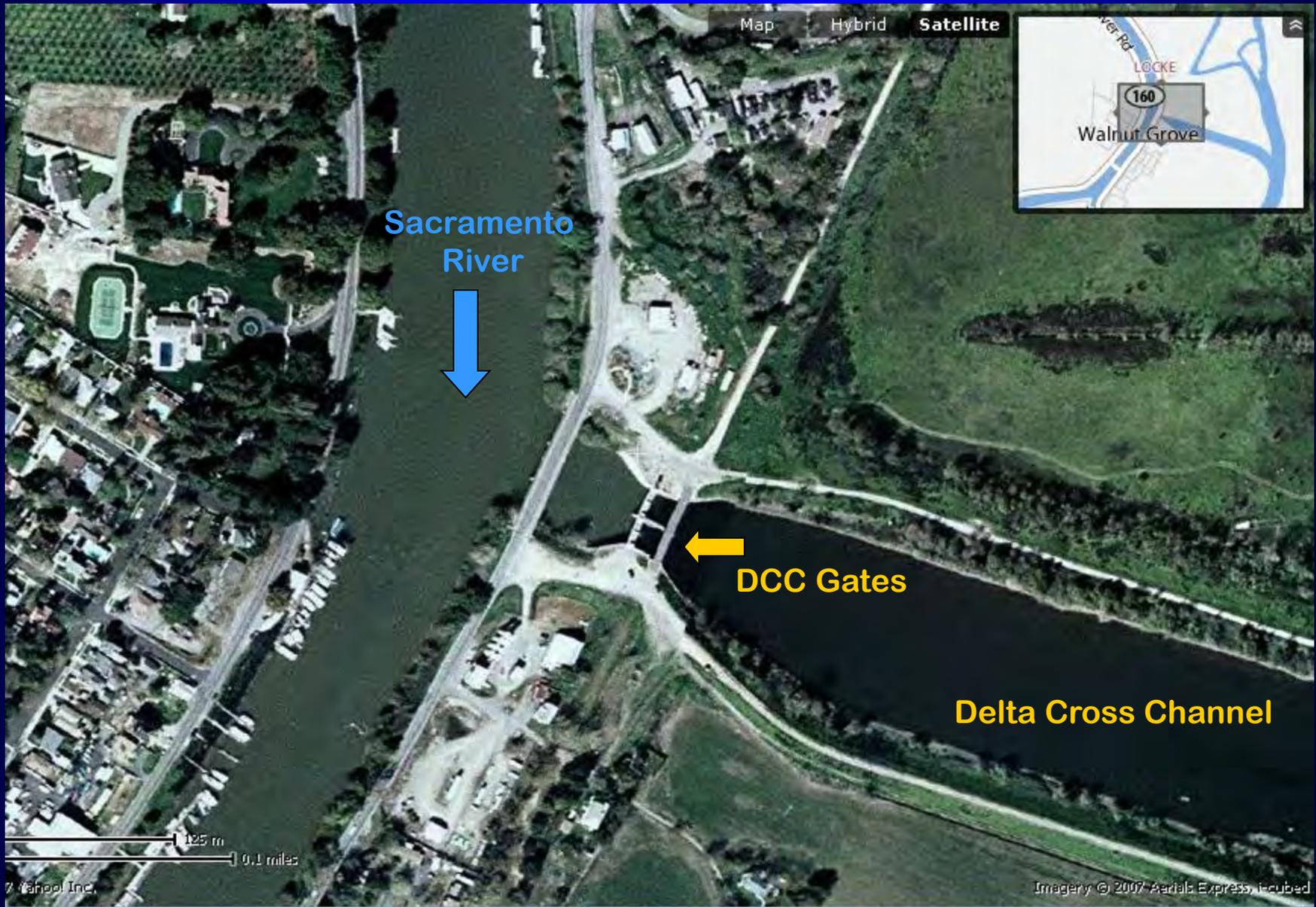
~15% Inflow; poor quality



Flow of Water for State and Federal Projects



Delta Cross Channel





Skinner FF



Clifton Court Forebay

CCF Intake

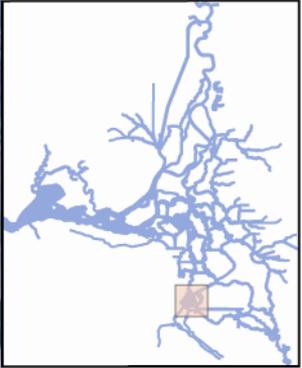
Banks PP



Tracy PP

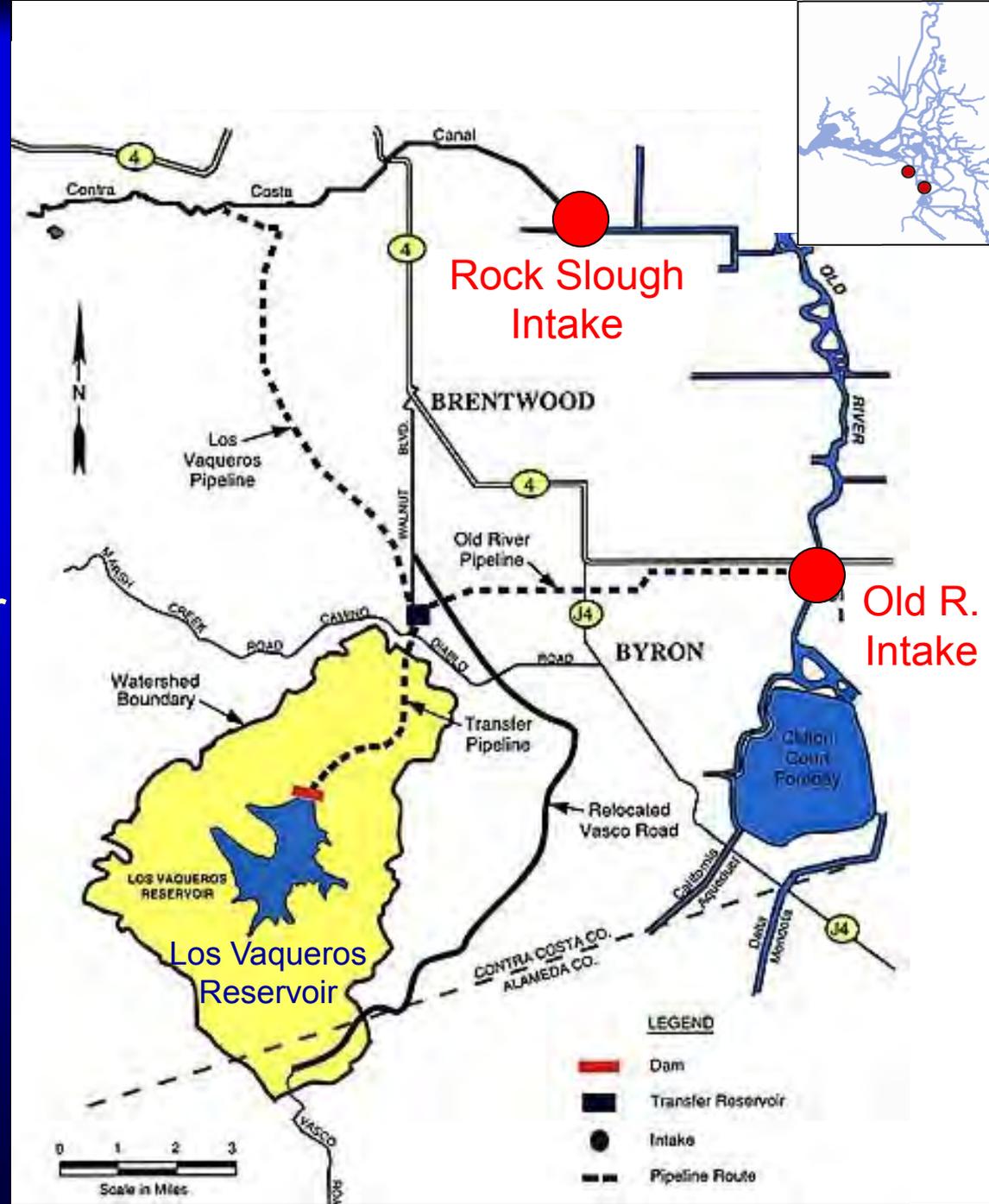


Tracy Fish Collection Facility

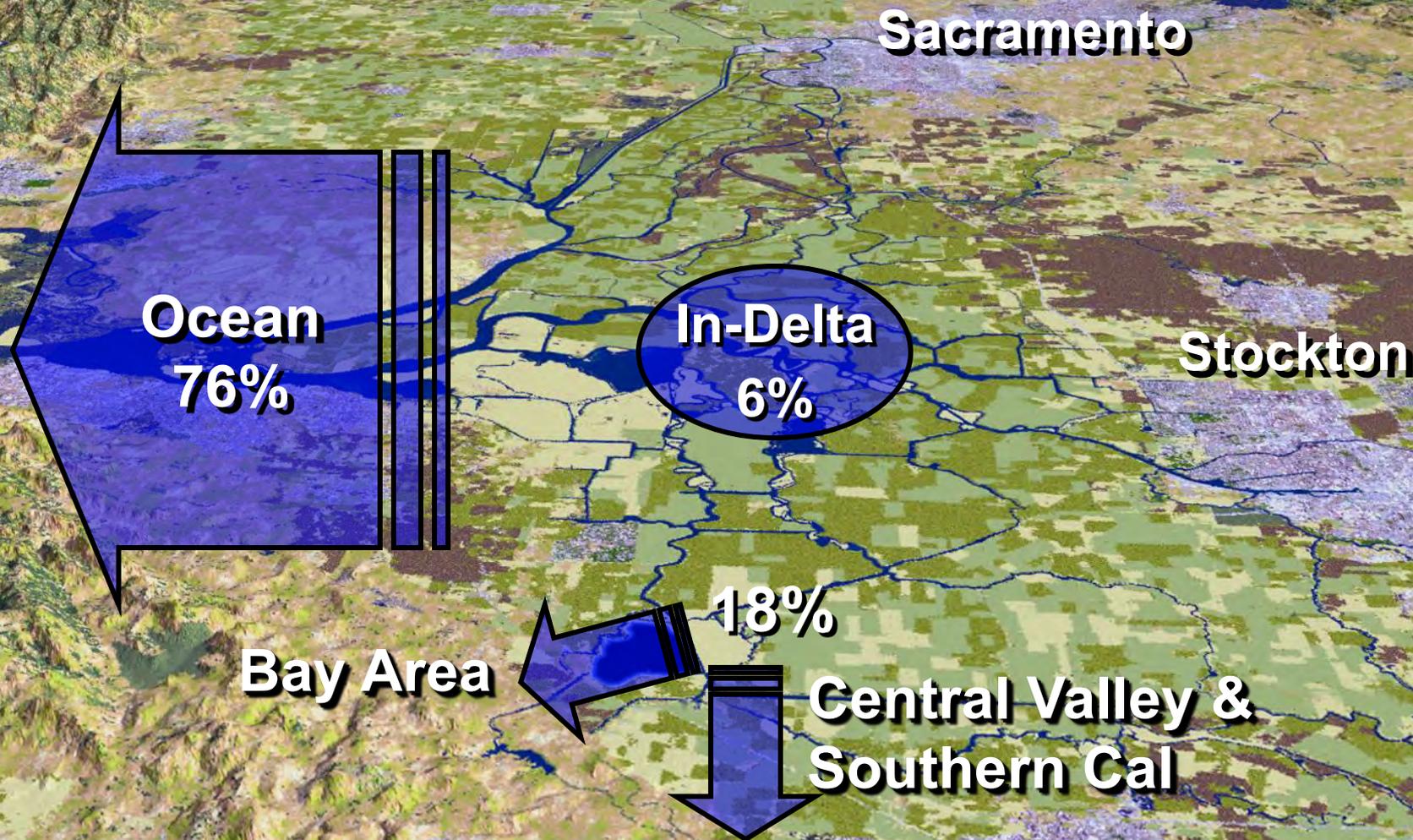


Contra Costa Water District

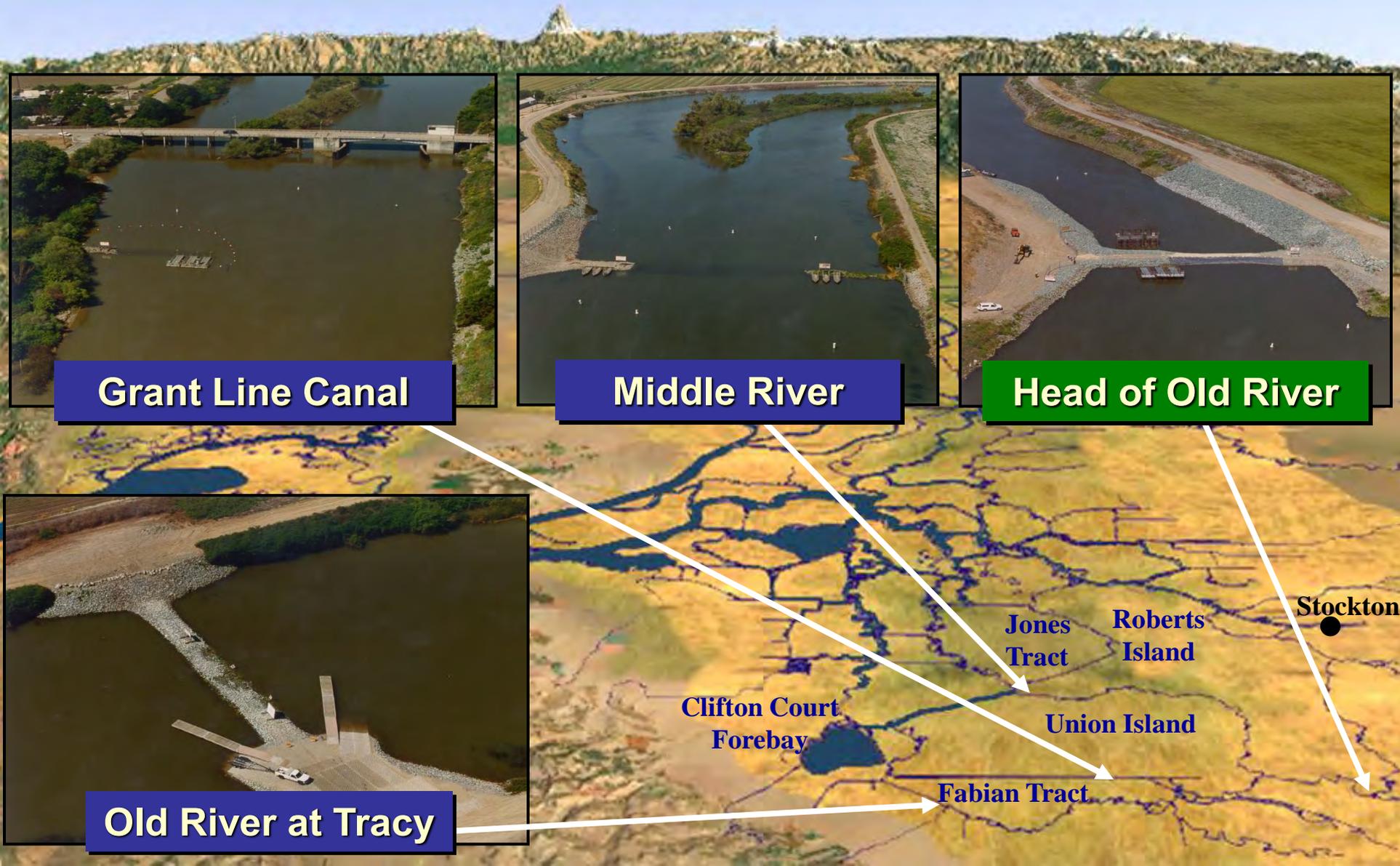
- 550,000 customers
- Contra Costa Canal
 - Rock Slough Intake (350 cfs)
- Los Vaqueros Reservoir
 - Old River Intake (250 cfs)
 - 100,000 ac-ft storage
 - Completed 1997



Delta Water Use



South Delta Temporary Barriers



Grant Line Canal

Middle River

Head of Old River

Old River at Tracy

Jones
Tract

Roberts
Island

Stockton

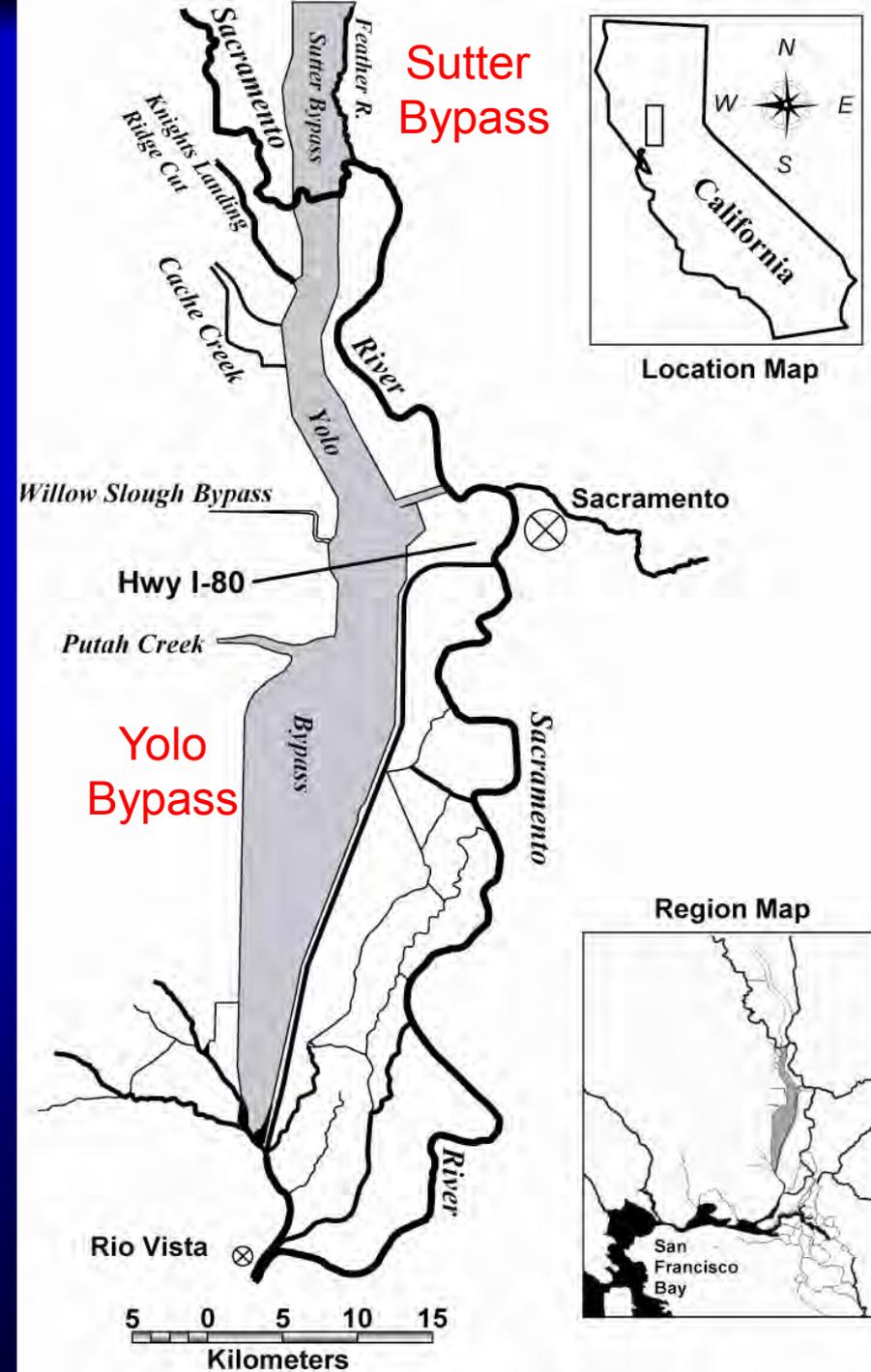
Clifton Court
Forebay

Union Island

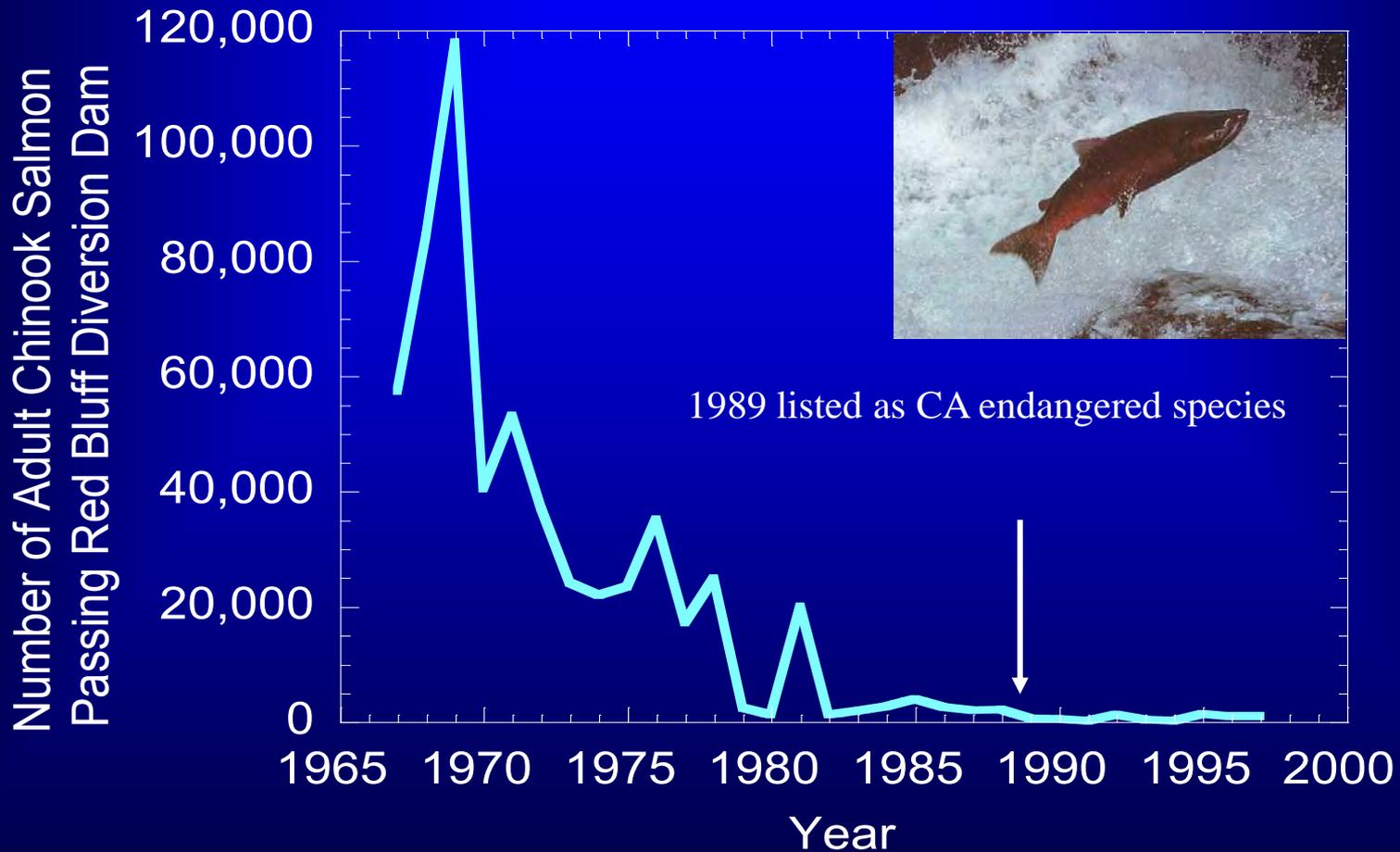
Fabian Tract

Flood Control and Fish

- Sutter Bypass
 - Tisdale Weir
- Yolo Bypass
 - 59,000 acres
 - Fremont Weir
33.5 ft crest elev.
 - Vic Fazio Yolo Wildlife Area



Winter Run Chinook Salmon



Habitat (water, food, spawning)

- Fish listed under Endangered Species Act
 - Chinook Salmon
 - Delta Smelt



- Protecting listed fish
 - Reverse Flow controls
 - Biological opinions restrict other DWR activities
 - Predation studies and reduction activities

Invasive Species



- Competition for plankton
- Increases water clarity
- Changes water chemistry

- Increased predation on native species
- Aided by clear water



- Invasive Aquatic Plants reduce nutrients for phytoplankton
- Increases water clarity
- Provides ambush habitat for predators

Bay-Delta Standards

Contained in D-1641

DRAFT

CRITERIA	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
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FLOW/OPERATIONAL

<ul style="list-style-type: none"> Fish and Wildlife 													
SWP/CVP Export Limits					1,500cfs ^[1]								
Export/Inflow Ratio ^[2]	65%	35% of Delta Inflow ^[3]					65% of Delta Inflow						
Minimum Delta Outflow	[4]									3,000 - 8,000 cfs ^[4]			
Habitat Protection Outflow		7,100 - 29,200 cfs ^[5]											
Salinity Starting Condition ^[6]		[6]											
River Flows:													
@ Rio Vista								3,000 - 4,500 cfs ^[7]					
@ Vernalis - Base		710 - 3,420 cfs ^[8]				[8]							
- Pulse				[9]								+28TAF	
Delta Cross Channel Gates	[10]	Closed				[11]							Conditional ^[10]

WATER QUALITY STANDARDS

<ul style="list-style-type: none"> Municipal and Industrial 														
All Export Locations	≤ 250 mg/l Cl													
Contra Costa Canal	150 mg/l Cl for the required number of days ^[12]													
<ul style="list-style-type: none"> Agriculture 														
Western/Interior Delta	Max. 14-day average EC mmhos/cm ^[13]													
Southern Delta ^[14]	1.0 mS		30 day running avg EC 0.7 mS						1.0 mS					
<ul style="list-style-type: none"> Fish and Wildlife 														
San Joaquin River Salinity ^[15]	14-day avg: 0.44 EC													
Suisun Marsh Salinity ^[16]	12.5 EC	8.0 EC	11.0 EC									19.0 EC	[17]	15.5 EC