EAST BAY MUNICIPAL UTILITY DISTRICT

Bay-Delta Hub
Connecting All Things Water

The EBMUD Bay-Delta Nexus

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Senior Civil Engineer

WATER EDUCATION FOUNDATION

EBMUD

WRPD

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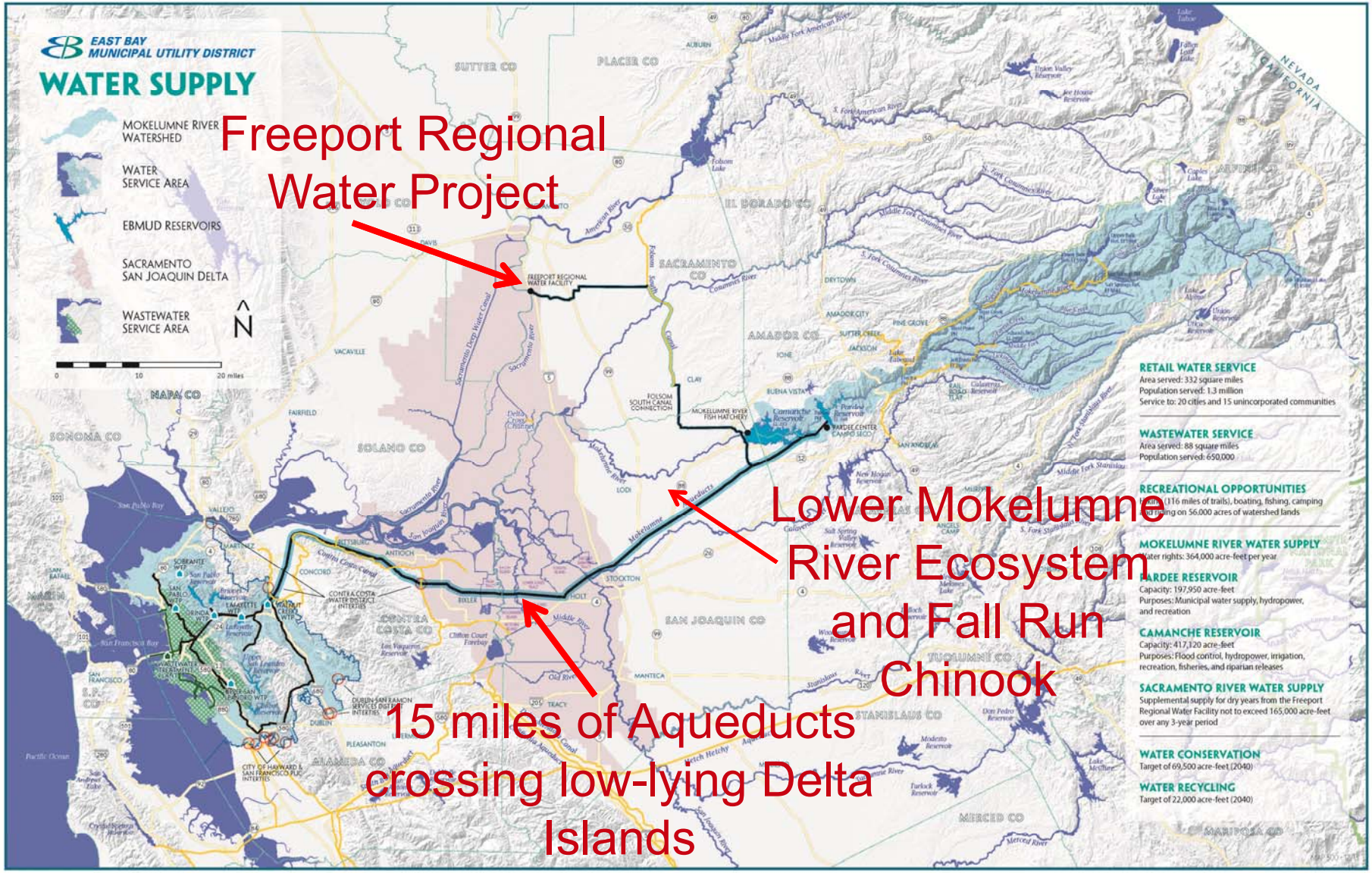
Where are We going (*Content*)?

- A little about EBMUD
- EBMUD's Lifeline
- EBMUD Diversifies Water Supplies
- Striking the Balance: Public Trust & Beneficial Use

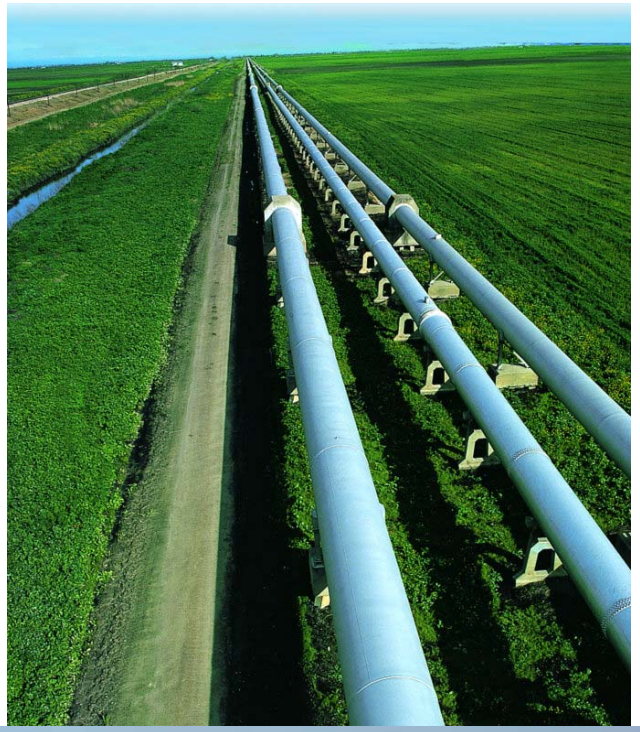
A Little Bit About the **East Bay Municipal Utility District** (EBMUD)



EAST BAY MUNICIPAL UTILITY DISTRICT

Nexus Topic #1
Mokelumne Aqueducts

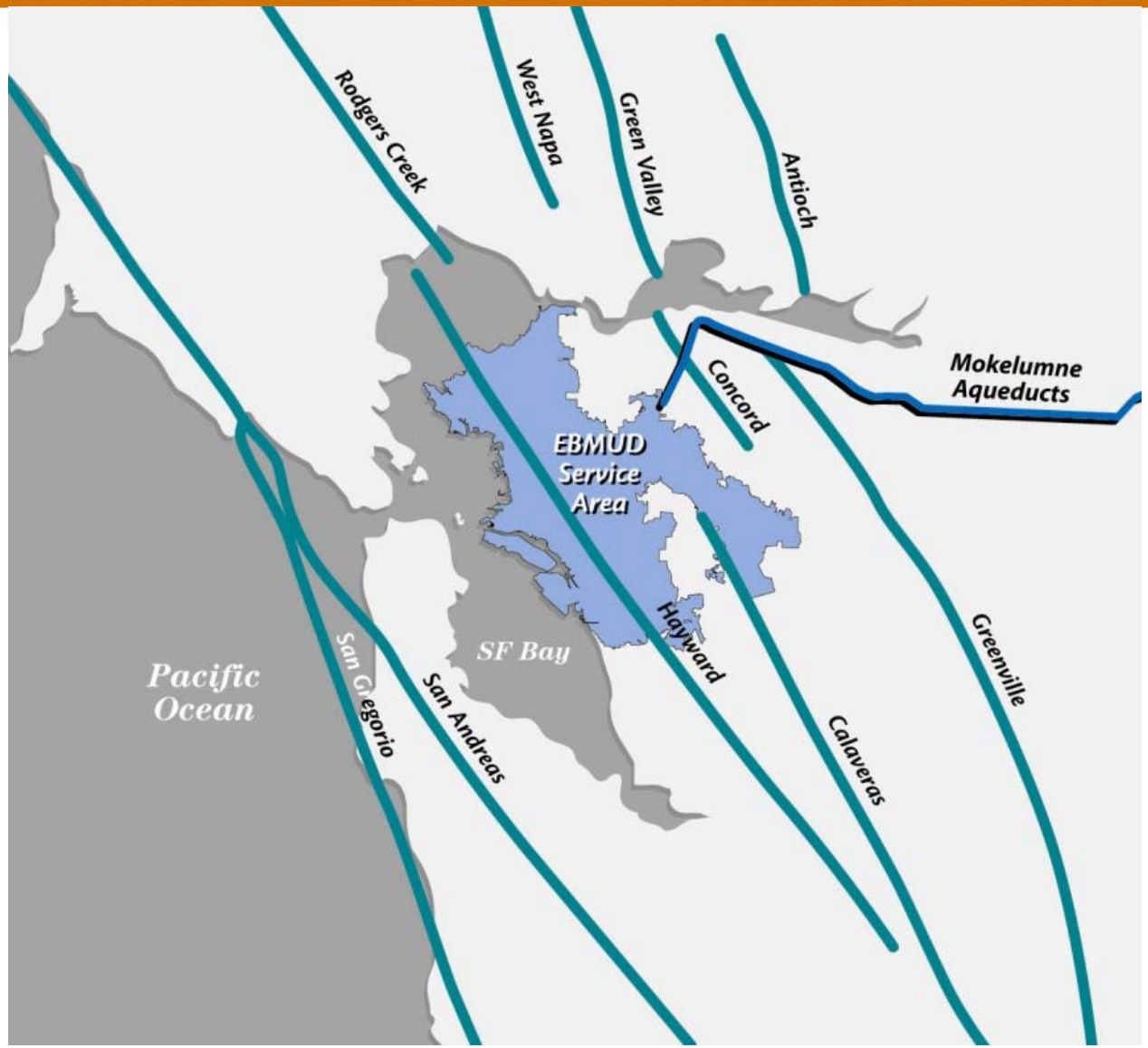
EBMUD's Lifeline: Mokelumne Aqueducts



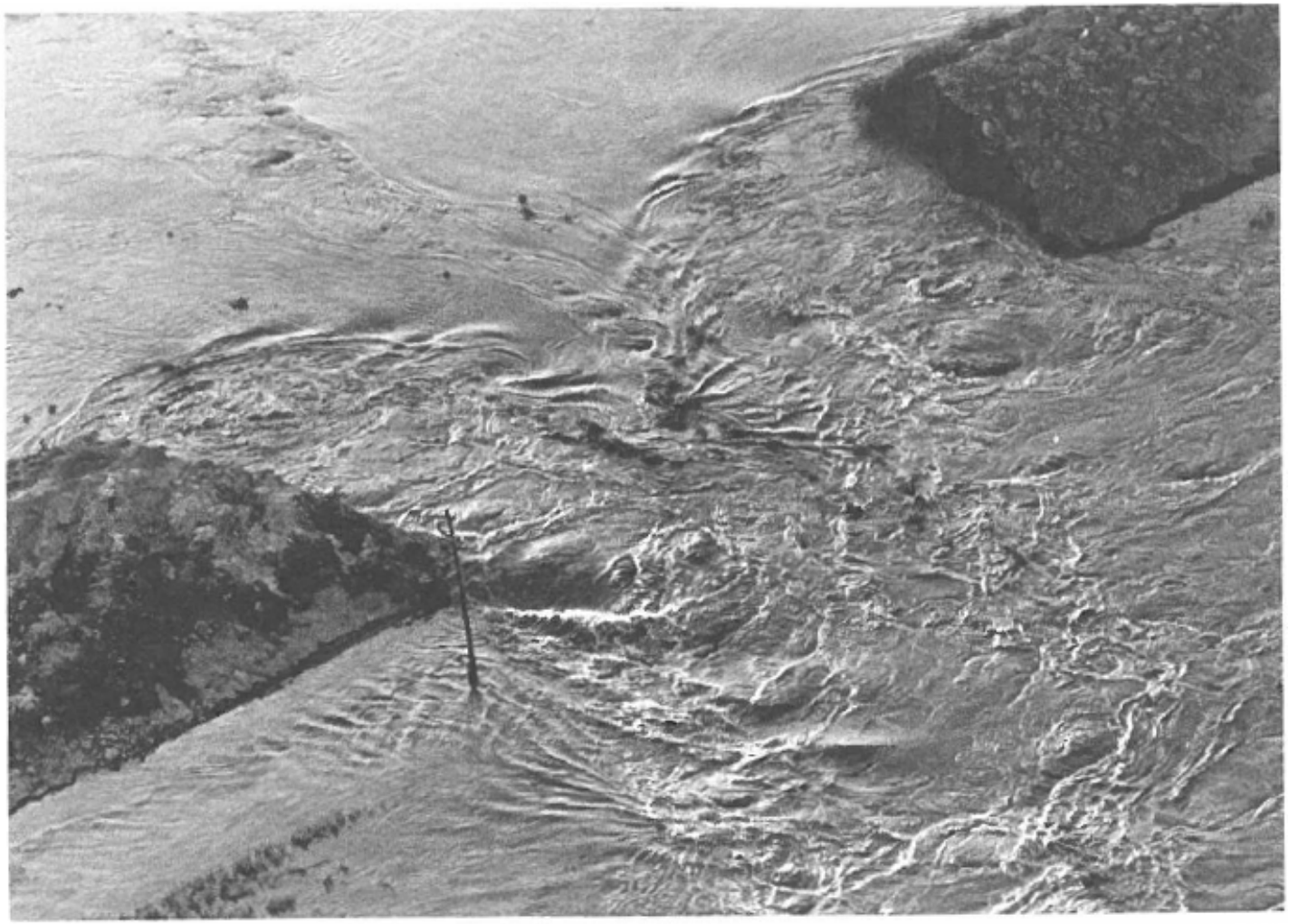
AQ#	Online	Size	Grav. Capacity	Pump Capacity
1	1929	65"	41MGD	67MGD
2	1949	67"	54MGD	87MGD
3	1963	68"	107MGD	172MGD
		Totals:	202MGD	326MGD

EBMUD's Lifeline: Mokelumne Aqueducts

EBMUD's Lifeline: Mokelumne Aqueducts



Example of Levee Failure



(September 26, 1980)

"At low tide on a calm Delta afternoon, this Lower Jones Tract levee failed, flooding the island up to the railroad embankment separating it from the Upper Jones Tract."

Levee Failure Contd.

“A month after the Lower Jones Tract Levee failure, a railroad embankment collapsed, dumping a freight train and endangering the Mokelumne Aqueducts.”

Levee Failure Contd.

Levee Failure Contd.

Pursuing Fixes: EBMUD's Aqueduct Levee Security Program

- Began in 1997
- Support Reclamation District's effort to restore and improve the levees
- EBMUD contributed over **$15 million**

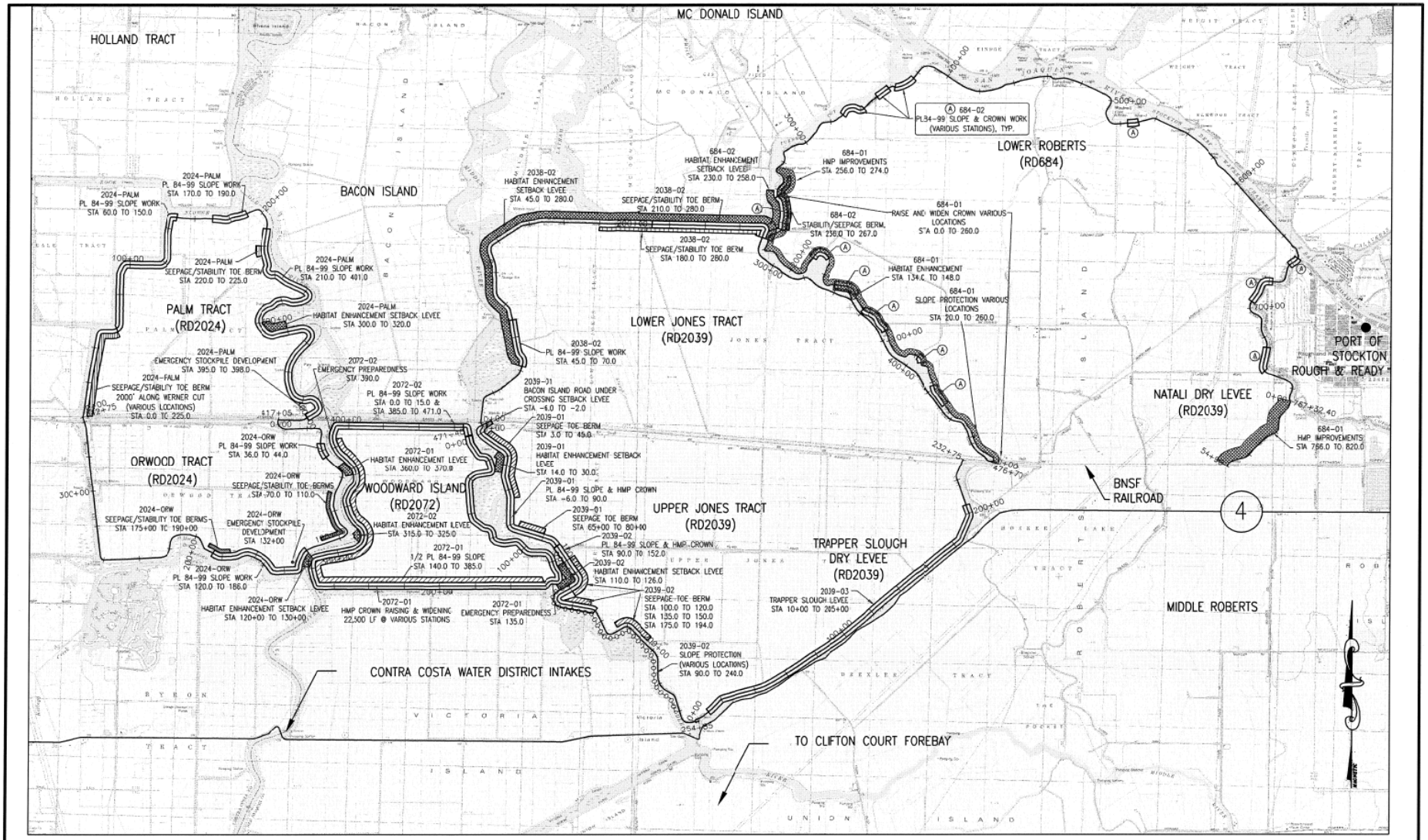
Pursuing Fixes: SB2X - 1 (Perata) Bond Fund Appropriations

- Bill allocated funding to reduce the risk of levee failures in the Delta
- Purpose is to protect assets of Statewide importance
- Reinforce levee sections near aqueducts
- Goal is to improve Delta levees to Public Law 84-99, Army Corps. of Engineers Standard

Pursuing Fixes: Department of Water Resources Recommendations

- Fund Ten Projects
- Total Project Cost = $41.3 million
- State Cost Share - $35.2 million*
- Local Cost Share = $6.1 million*
- Total Levee Miles Improved = 41 mi

* Reclamation District's receive funding



SCALE: 1"=5000'

REVISIONS		
REV.	DATE	DESCRIPTION

GREEN MOUNTAIN ENGINEERING
1314 Paloma Ave Stockton, CA 95209 209.478.5525

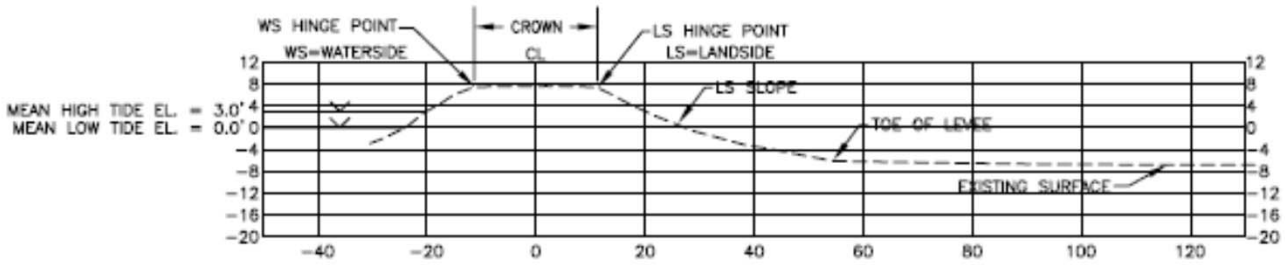
DELTA LEVEES
2009
VICINITY MAP
SAN JOAQUIN COUNTY & CONTRA COSTA COUNTY, CALIFORNIA

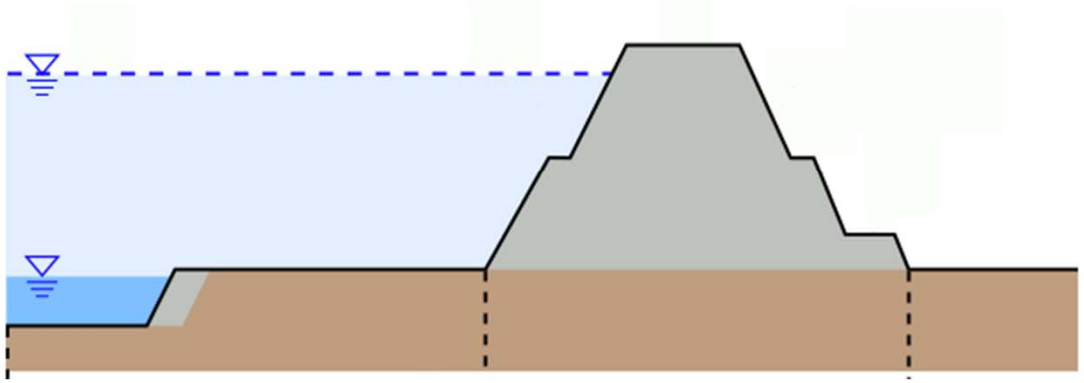
PROJECT NO:	---
DRAWN BY:	GNE
DESIGN BY:	DJL
CHECK BY:	DC
SCALE:	AS SHOWN
DATE:	6/9/2010
CAD FILE:	P:\312 EBMUD...\dwg\
	ADB_100609_WR_OVERALL.DWG

APPROVED BY:
DATE

SHEET NO. V-1
OF 1 SHEETS

LEVEE TYPICAL X-SECTION





SCALE: 1"=20'

REVISIONS

NO.	DATE	DESCRIPTION

GREEN MOUNTAIN ENGINEERING
1314 Paloma Ave. Stockton, CA 95209 209.478.6525

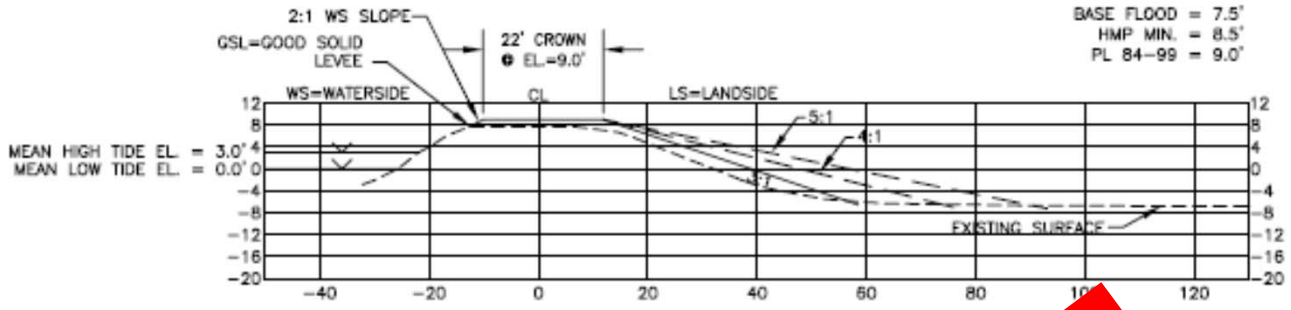
DELTA LEVEES
STANDARD LEVEE
TYPICAL DETAIL
SAN JOAQUIN COUNTY & CONTRA COSTA COUNTY, CALIFORNIA

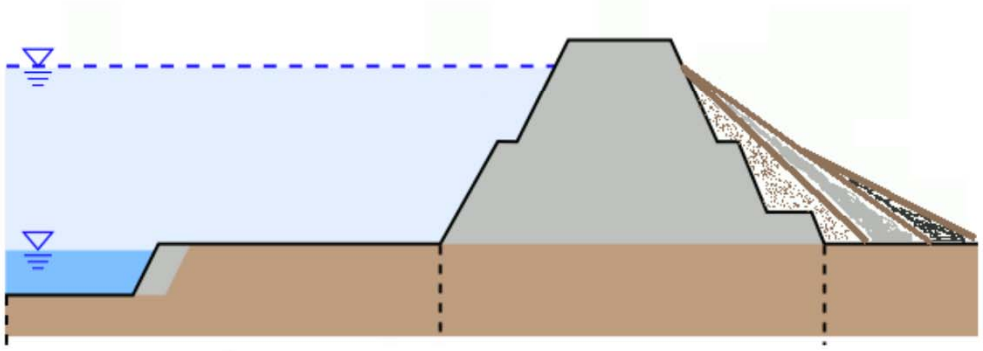
PROJECT NO: 312
DRAWN BY: DME
DESIGN BY: DJL
CHECK BY: DJ
SCALE: AS SHOWN
DATE: 3/24/2010
CAD FILE:
ADE_100304_MASTER.DWG

APPROVED BY:
DATE:

SHEET NO.
TYP
OF
1
SHEETS

PL 84-99 (PUBLIC LAW 84-99, ARMY CORPS OF ENGINEERS)
TEMPLATE WITH 3:1, 4:1, 5:1 LANDSIDE SLOPE
TYPICAL X-SECTION





SCALE: 1"=20'

REVISIONS		
NO.	DATE	DESCRIPTION

GREEN MOUNTAIN ENGINEERING
1314 Paloma Ave Stockton, CA 95209 209.478.6525

DELTA LEVEES
PL 84-99 TEMPLATE
TYPICAL DETAIL
SAN JOAQUIN COUNTY & CONTRA COSTA COUNTY, CALIFORNIA

PROJECT NO: 312
DRAWN BY: TME
DESIGN BY: DA
CHECK BY: DO
SCALE: AS SHOWN
DATE: 3/24/2010
CAD FILE:
ADE_12X24_MASTER.DWG

APPROVED BY:
DATE:

SHEET NO.
TYP
OF
1
SHEETS

Lower Jones Tract

Lower Jones Tract

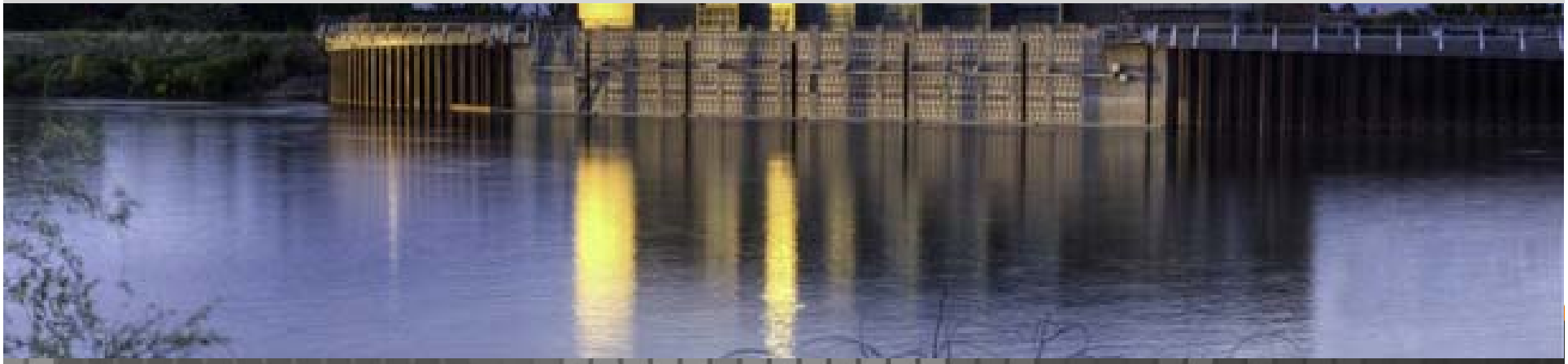
Upper Jones Tract

Woodward Island

Woodward Island

EAST BAY MUNICIPAL UTILITY DISTRICT

Nexus Topic #2: Freeport Regional Water Project



Freeport Regional Water Project: Project Background and History

- 1970 - EBMUD contract with USBR
- 1997 - American River joint project effort
- 1999 - SCWA contract
- 2001 - EBMUD amendatory contract
- 2001 - Memorandum of Understanding
- 2002 - Joint Powers Agreement
- 2005 - FIER/FEIS Completed

Freeport Regional Water Authority (FRWA)

Membership:

- Sacramento County Water Agency
- East Bay Municipal Utility District
- City of Sacramento (Associate Member)
- US Bureau of Reclamation (Supporting Agency)

February 14, 2002 JPA Signing

FRWA Mission: Guide the financing, ownership, development, construction and operation of the Freeport Project

Freeport Regional Water Project (FRWP)

FRWA INTAKE

Partners

- Freeport Regional Water Authority (FRWA)
- Sacramento County Water Agency (SCWA)
- East Bay Municipal Utility District (EBMUD)
- US Bureau of Reclamation (USBR)

Project

- 185 MGD Regional Facility
  - 100 MGD EBMUD
  - 85 MGD SCWA
- 3 Pumping Plants
- 36 miles of transmission pipelines
- Project complete November 2011

Supplemental Supply Delivery

Freeport Regional Water Project

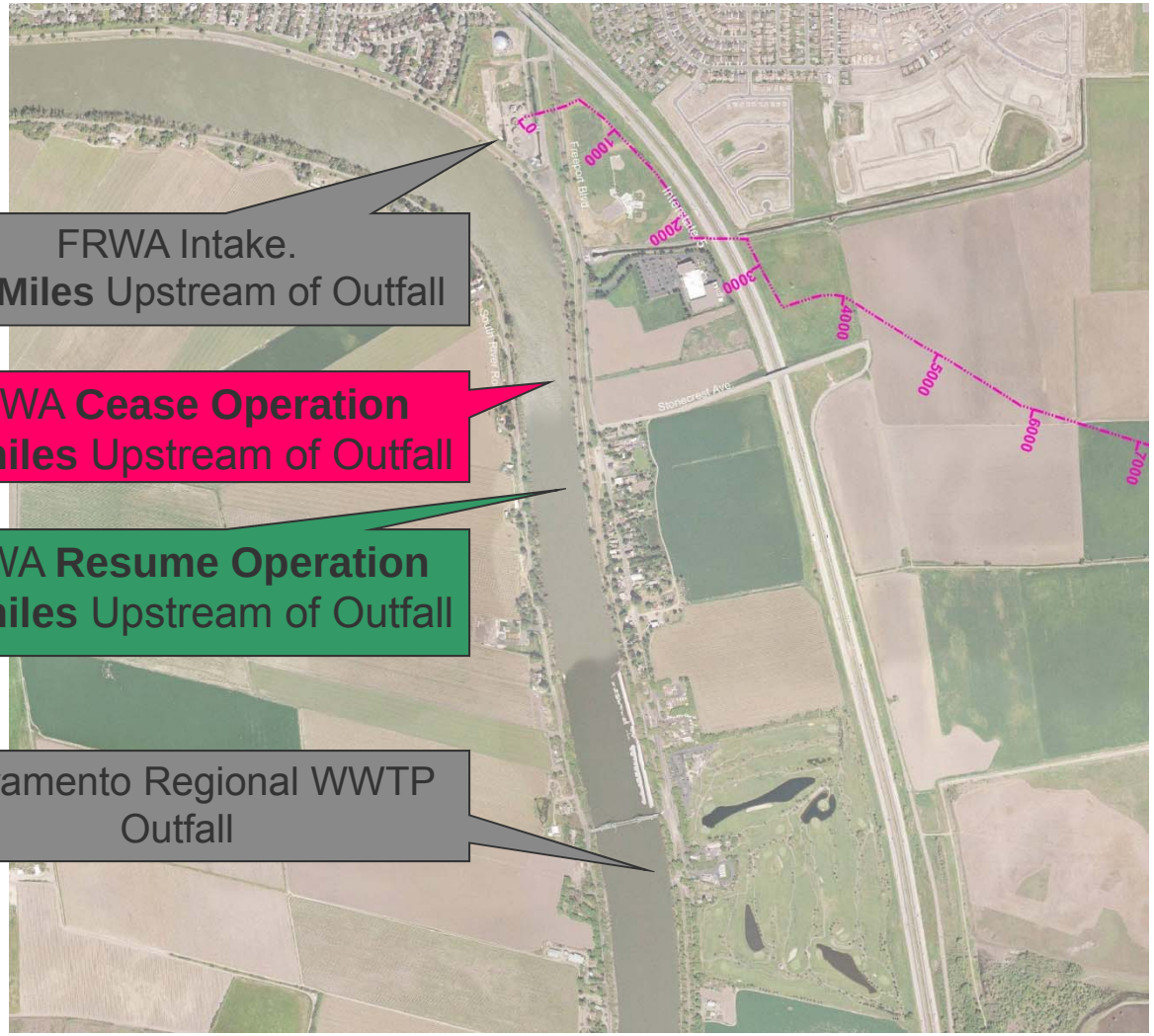
Operational Considerations

Sacramento River Reverse Flows

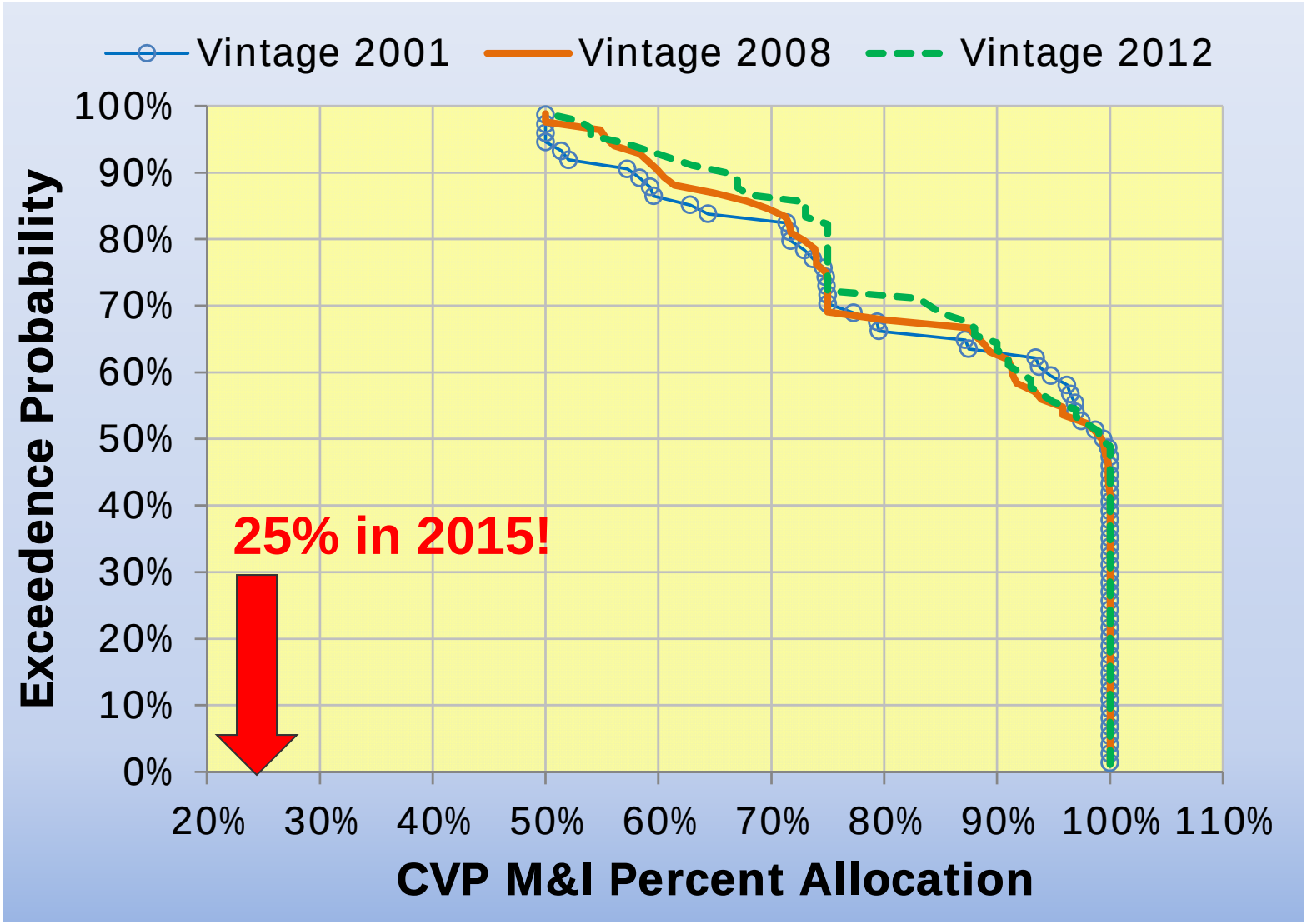
Challenge:

Sacramento River reverse flows trigger Freeport pumps to shutdown due to downstream waste-water discharges

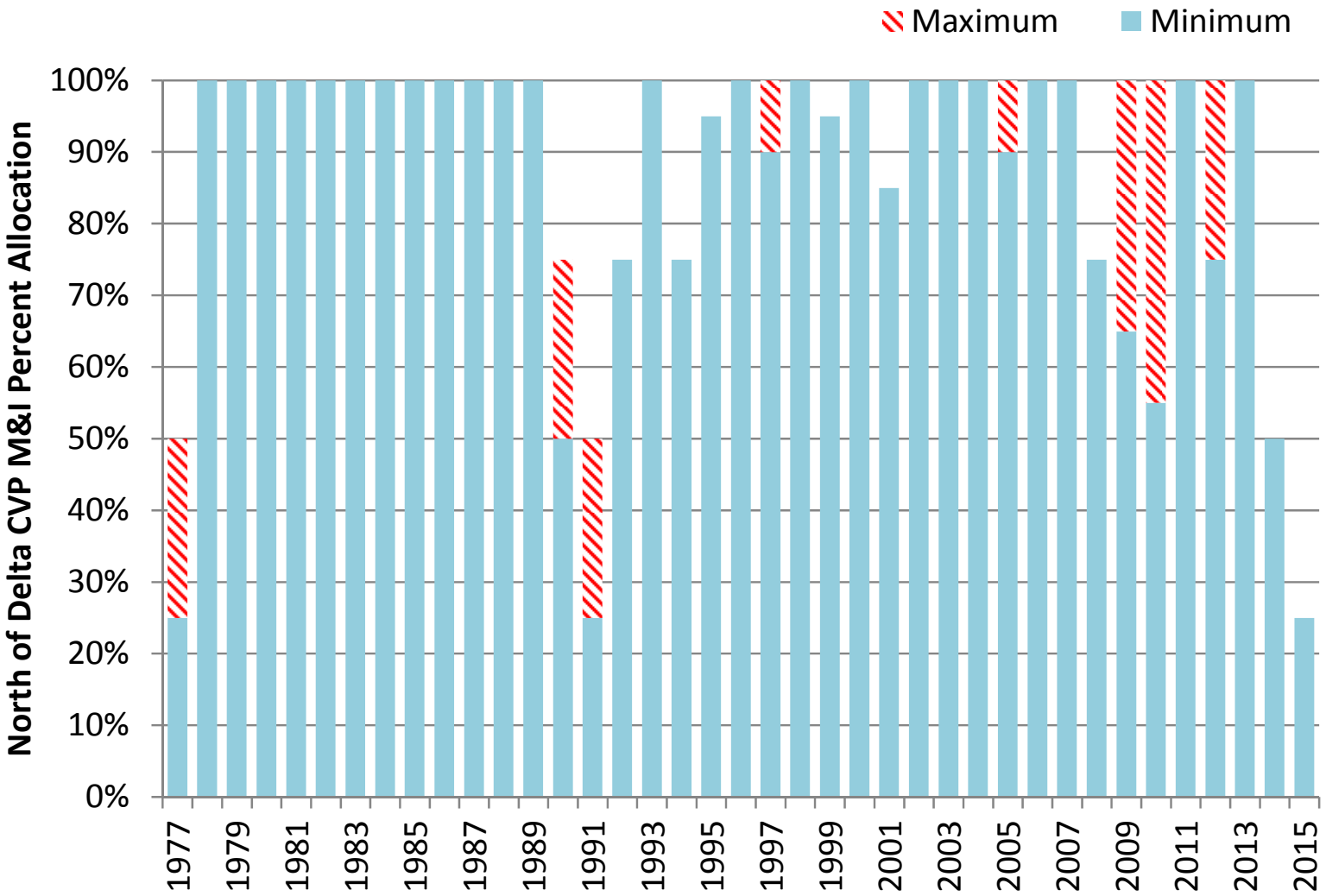
Reverse Flow Operation



Reliability Challenge



Reliability Challenge

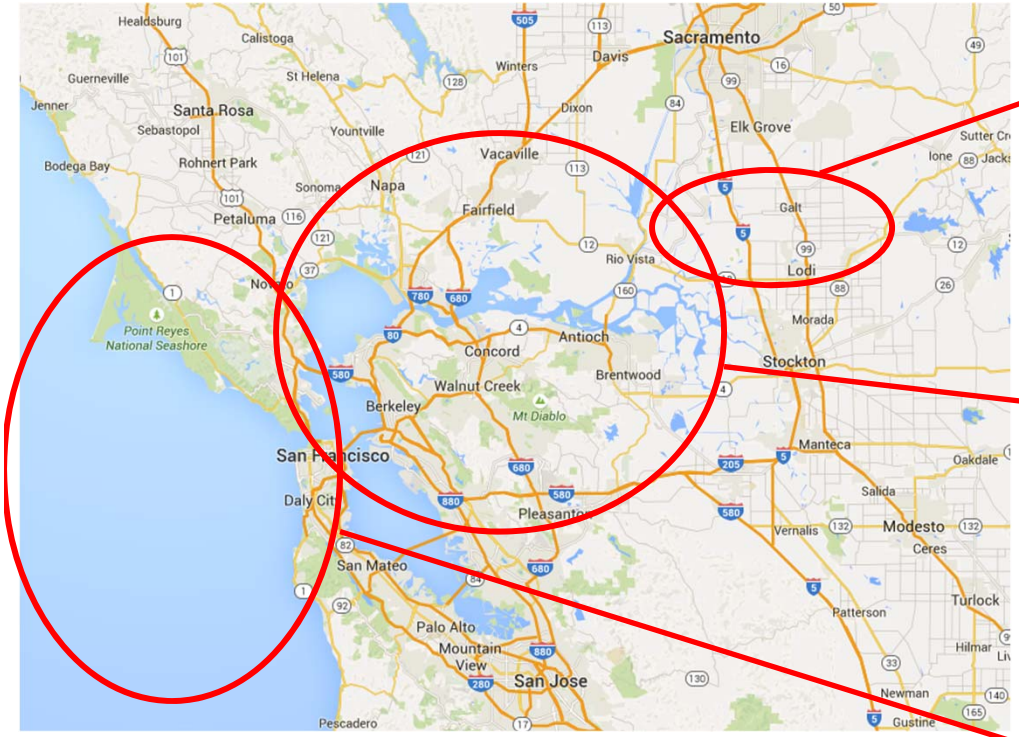


Source: CVO, water_allocations_historical.pdf, www.usbr.gov/mp/cvo.index.html

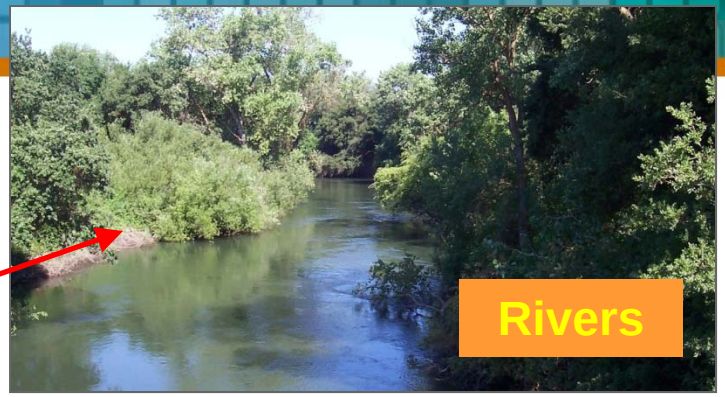
EAST BAY MUNICIPAL UTILITY DISTRICT

Nexus Topic # 3: Public Trust Resources: The Balancing Act

Geographic Scope



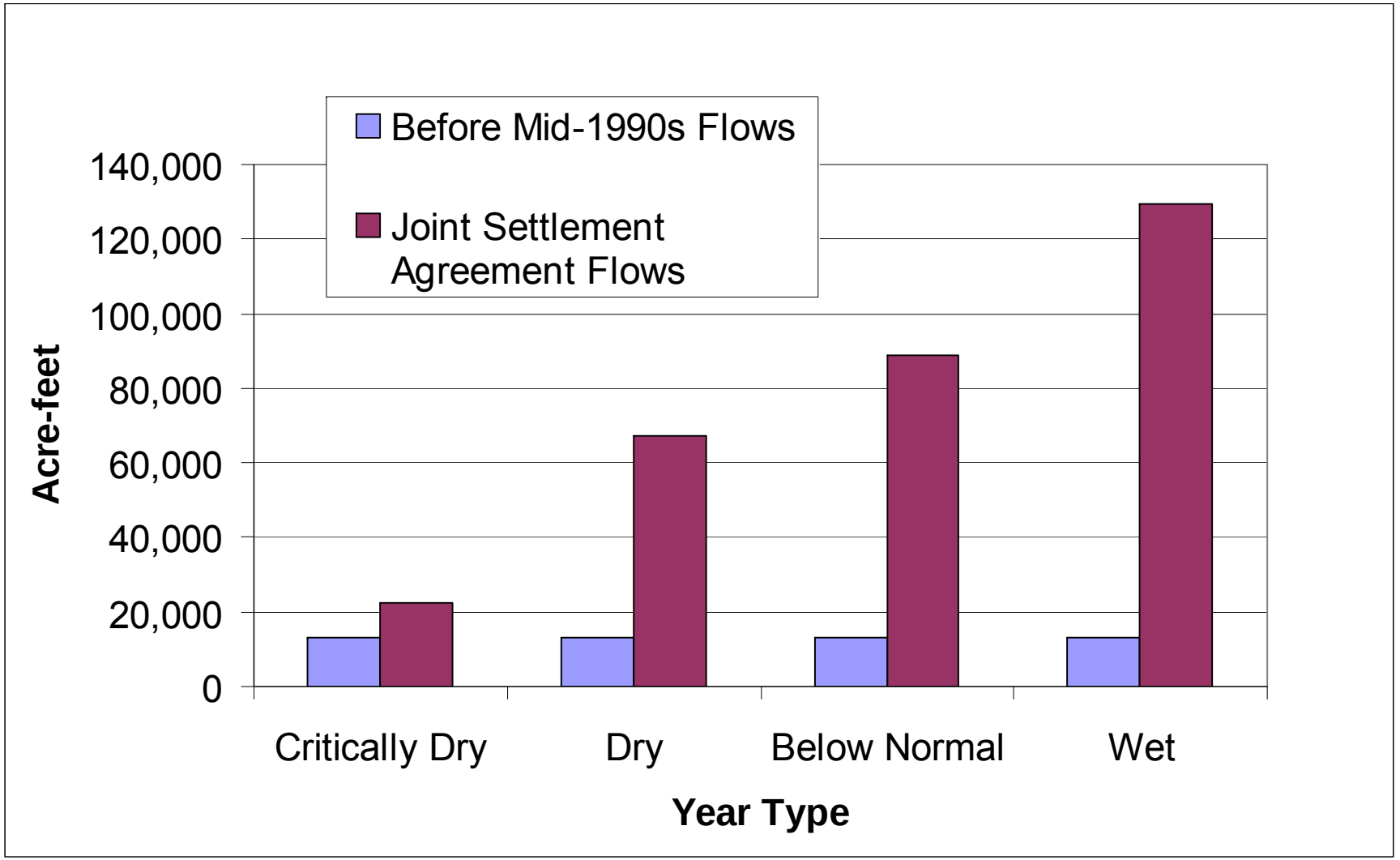
Source: google maps



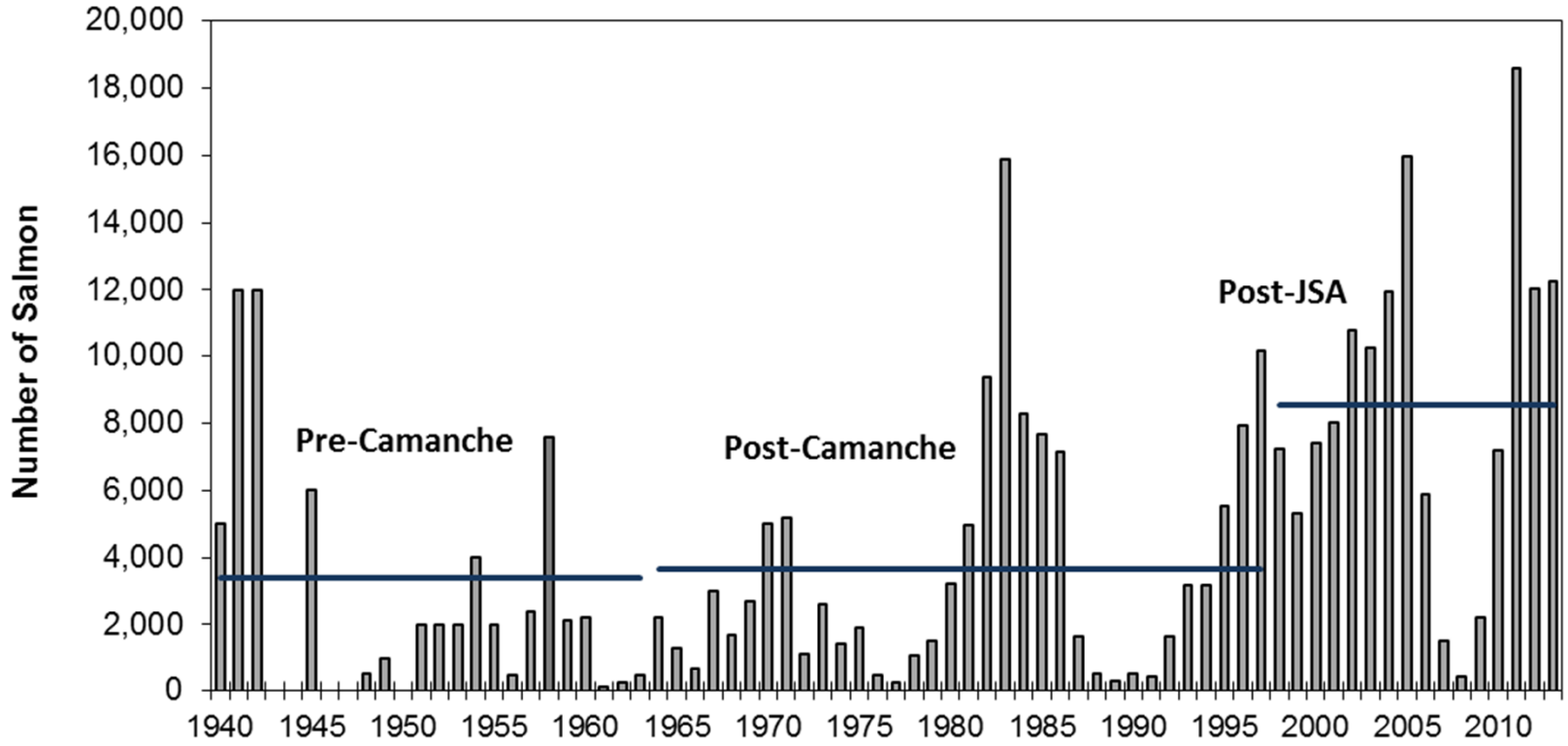
EBMUD's Mokelumne River Fish Restoration Program

- Integrated approach to ecosystem management
- Codified in 1998 Joint Settlement Agreement
- 10-fold increase in dry-year flows from early 1990s
- A portion of newly acquired supplies provided to further increase Mokelumne flows
- *Formal collaboration with resource agencies and stakeholders to optimize river management*
- $2 million Endowment for habitat improvements
- $12.5 million in improvements to upgrade hatchery

Water Release *Pre* vs. *Post* JSA



Returns 1940 - 2013



Horizontal lines indicate pre-Camanche, post-Camanche, and post-JSA periods, respectively.

1. "Pre-Camanche" escapement (3,374) is the average estimate at Woodbridge Dam for the period from 1940 through 1963 (excluding years when no data were recorded: 1943, 1944, 1946, 1947, and 1950).
2. "Post-Camanche" escapement (3,636) is the average estimate at Woodbridge Dam for the period 1964 through 1997.
3. "Post-JSA" escapement (8,564) is the average estimate at Woodbridge Dam since implementation of the JSA in 1998.

Escapement Monitoring

Escapement Monitoring

Escapement Monitoring

Video Monitoring Summary

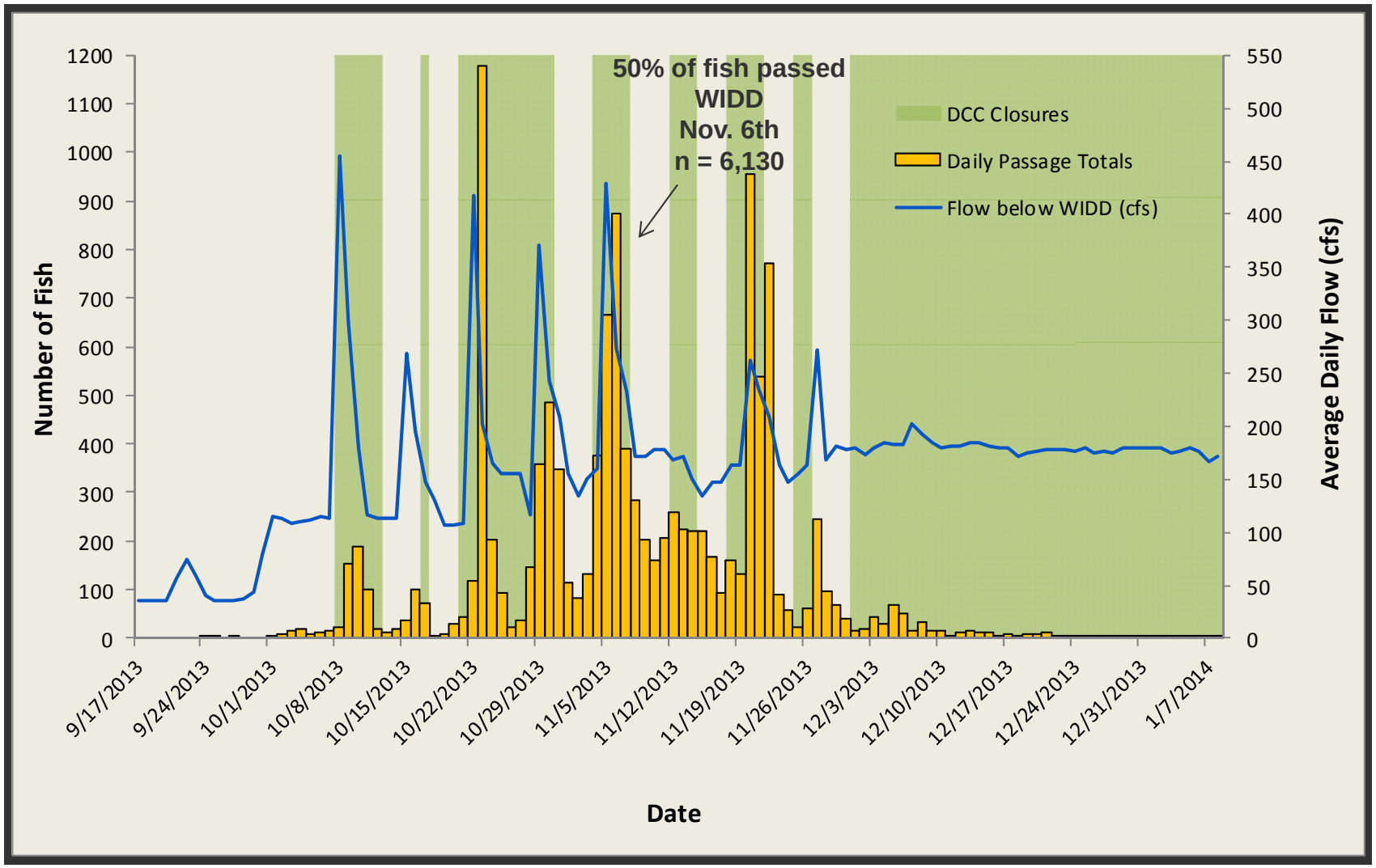
EBMUD and WID continued to coordinate operations to facilitate fish passage and conduct video monitoring

Fourth consecutive year that Lodi Lake remained full throughout the Chinook salmon run

Management actions:

- Adaptive management of CAM Reservoir allowed for fall pulse flows which provided AD CS attraction flows
- WID coordinated releases and augmented pulse flows
- DCC gates were closed multiple times to meet Rio Vista flow standards

Chinook Salmon Passage and Flow Below WIDD



Delta Migration Stressors

- Predation
- Angling Pressure
- Environmental Variables
- **Delta Flow Operation**

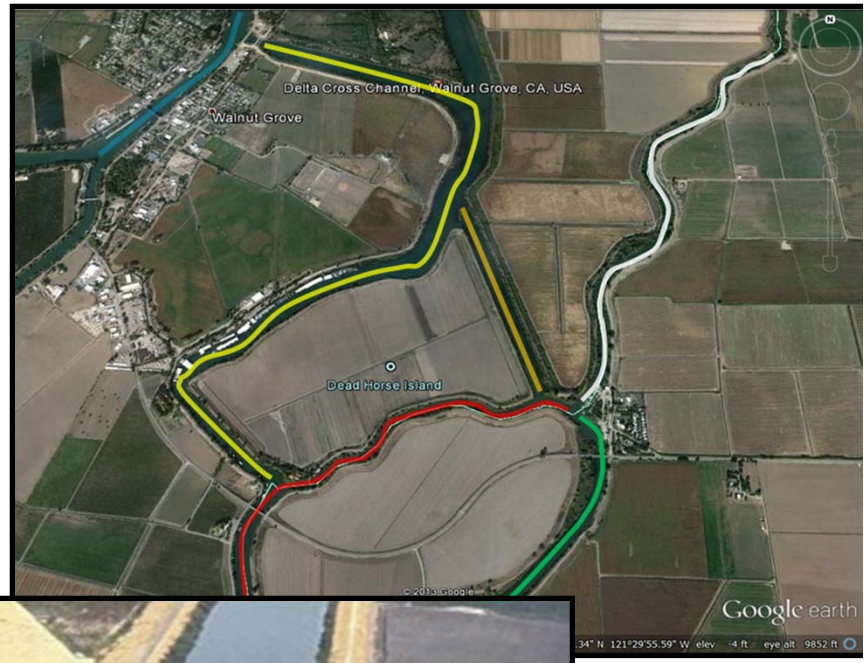
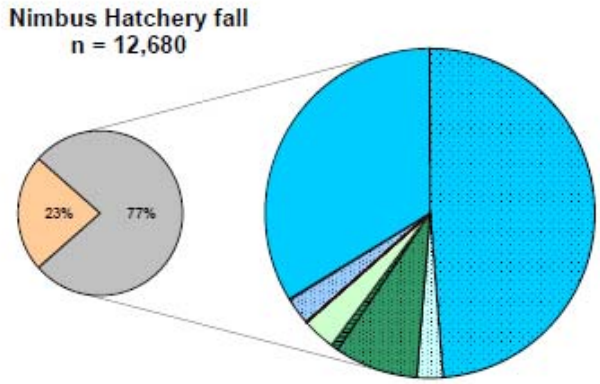


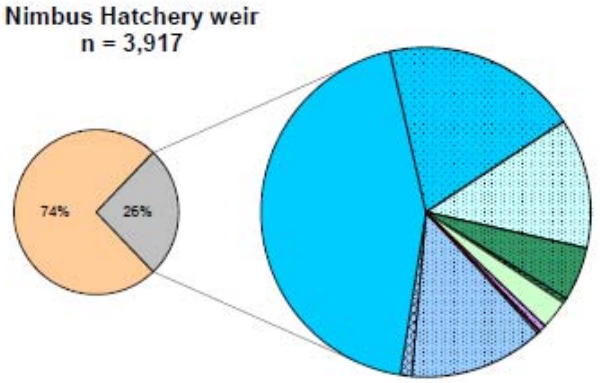
Image: theoregonangler.com

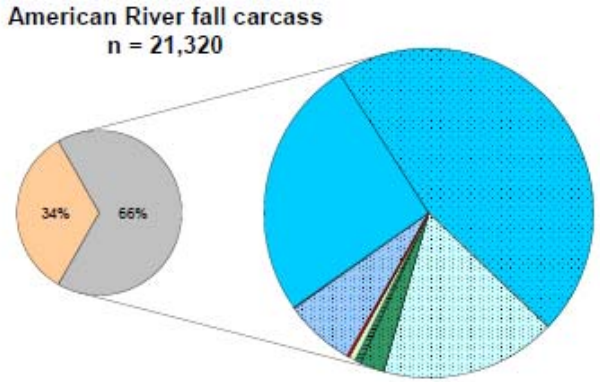
Pulse Flows, DXC OPERATIONS & Salmon Returns

RETURN YEAR	SALMON	STRAYING RATES	OCTOBER FLOWS	DCC CLOSURE (Days)
2008	412	~75%	No Pulse 80 CFS	0
2009	2,230	>50%	600, 1000 CFS	0
2010	7,192	>25%	1200, 2400 CFS	2
2011	18,589	~19%	1280, 2150, 1330 CFS	10
2012	12,091	~21%	397, 269, 321, 235, 289 CFS	0
2013	12,772	UNK	7 pulses ranging 450 to 250cfs	30+

2011 American River CWT Recoveries





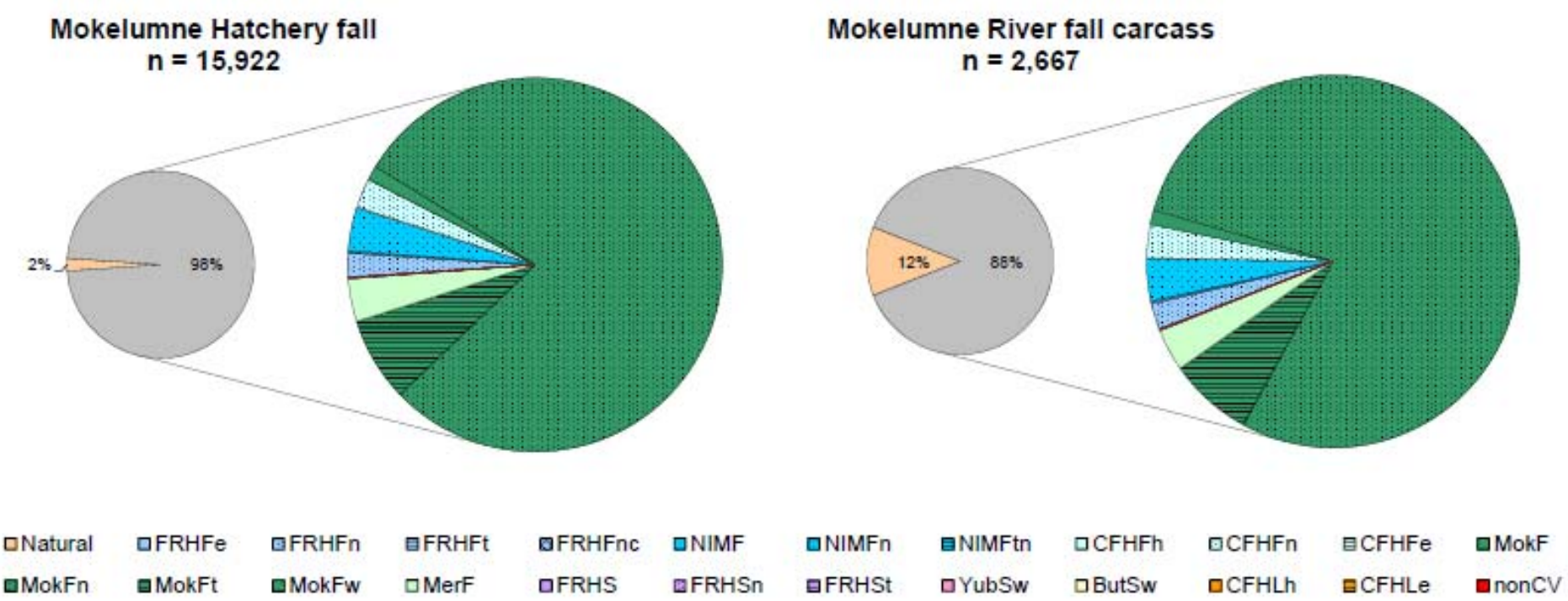


Recovery of Coded-Wire Tags from Chinook Salmon in California's Central Valley Escapement and Ocean Harvest in 2011
Melodie Palmer-Zwahlen and Brett Kormos
CDFW Fisheries Branch Administrative Report 2013-02
December 2013

Natural FRHFe FRHFn FRHFt FRHFnc NIMF NIMFn NIMFtn CFHFh CFHFn CFHFe MokF
MokFn MokFt MokFw MerF FRHS FRHSn FRHSt YubSw ButSw CFHLh CFHLe nonCV

Figure 9. Proportion of hatchery- and natural-origin fish in the American River Basin.

2011 Mokelumne River CWT Recoveries



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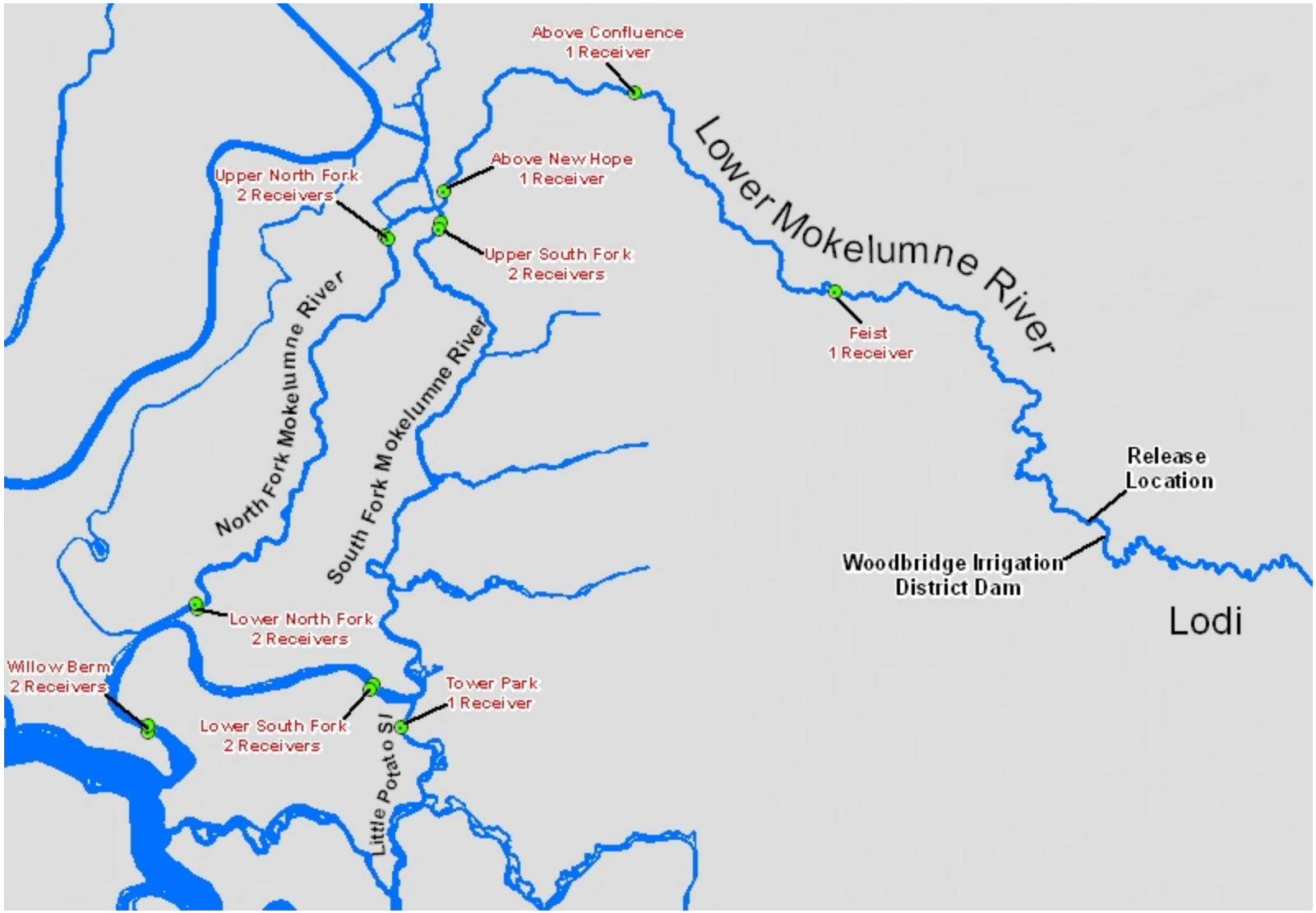
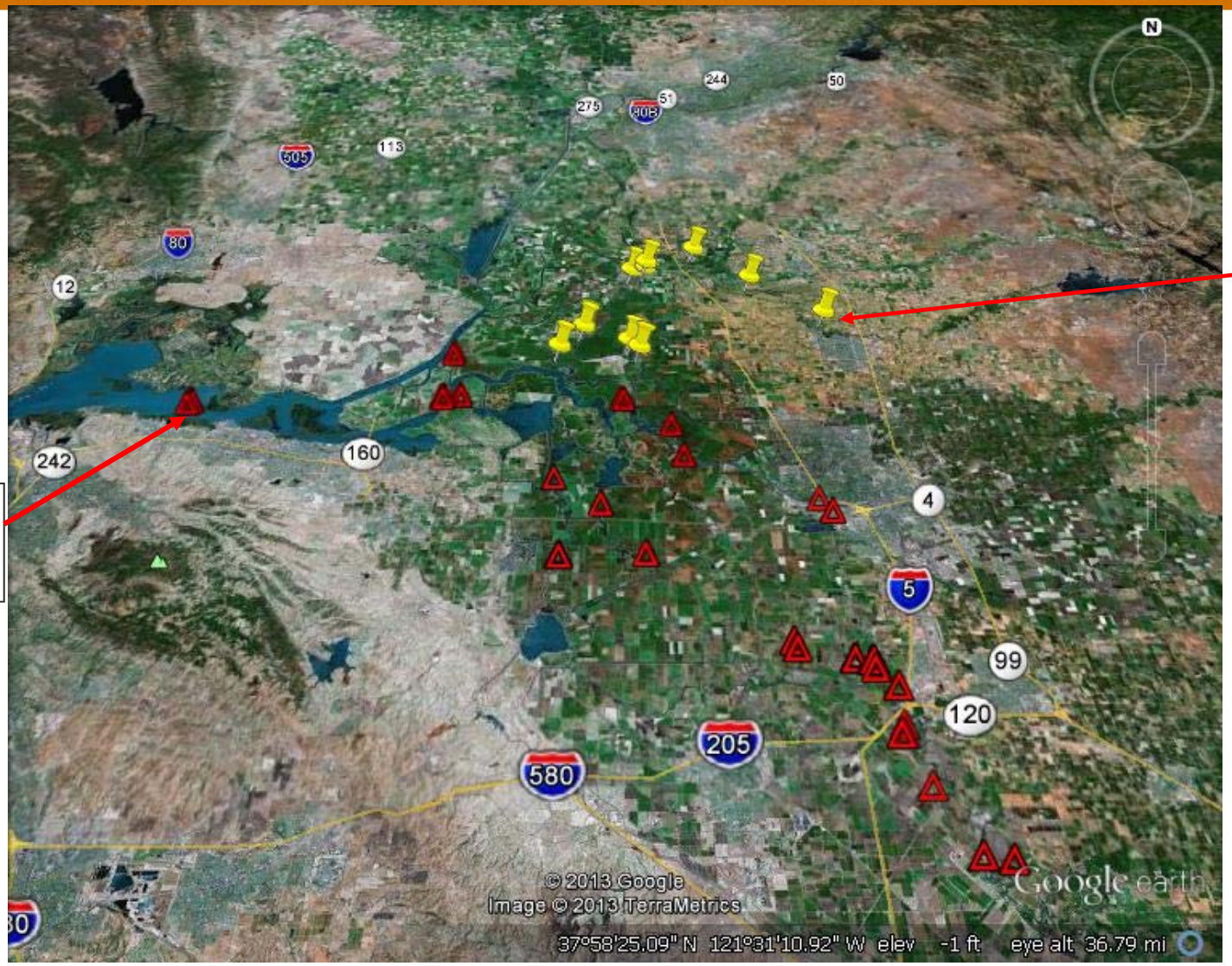
December 2013

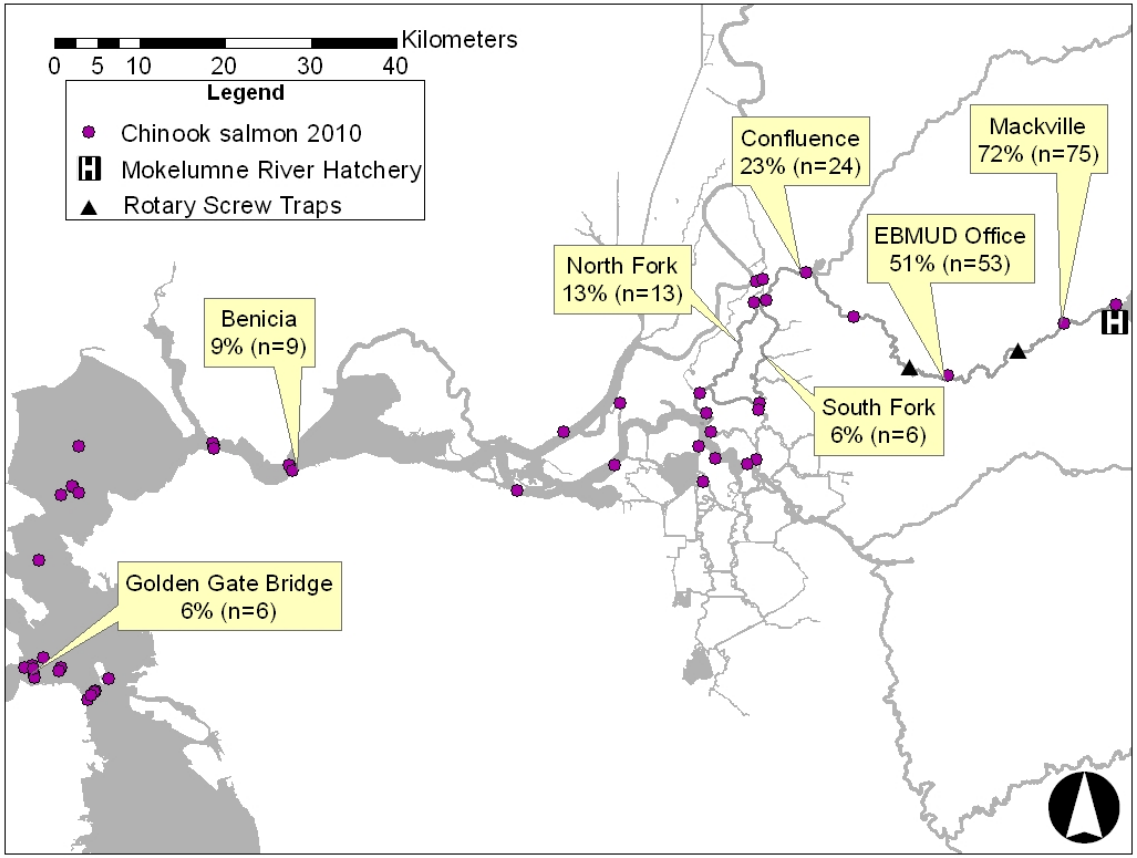
LMR 180 kHz Receiver Locations



EBMUD & USBR Receiver Locations



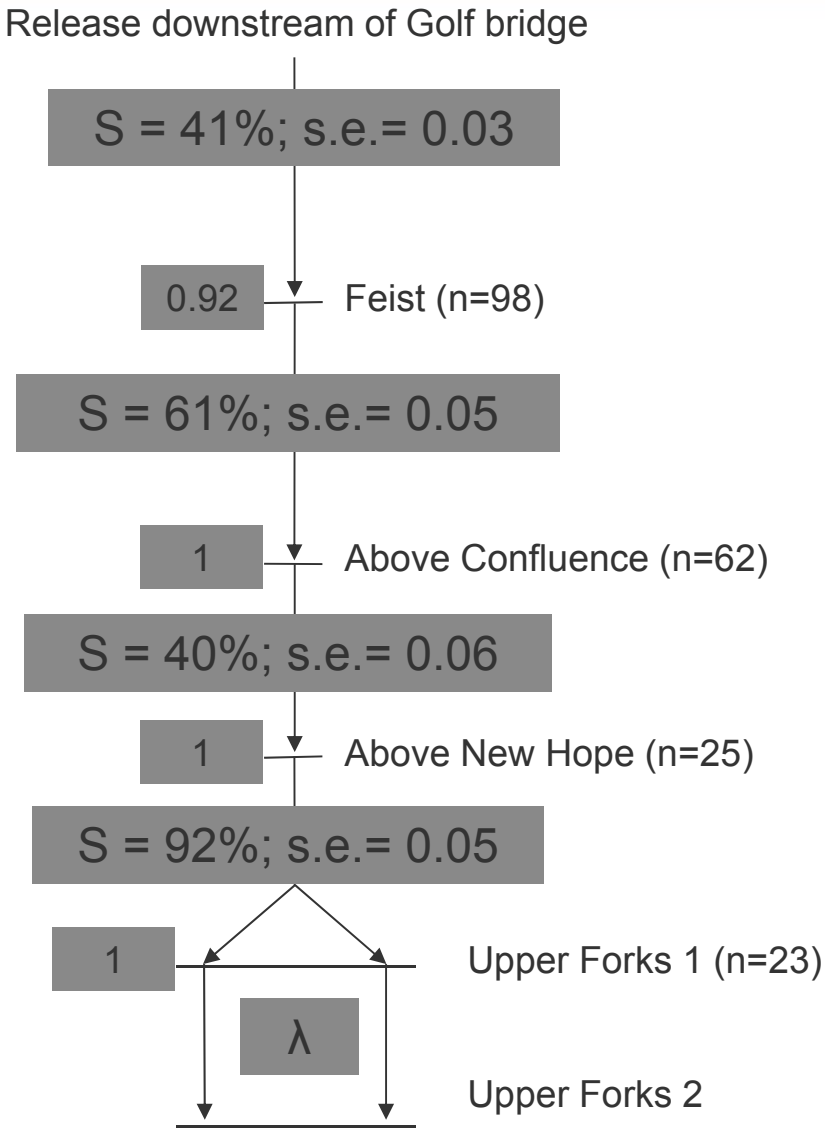
Acoustic Telemetry



Reach-Specific Survival (All) (program MARK)

Overall survival

S = 9%; s.e.=0.02



Reach-Specific Survival (Program MARK)

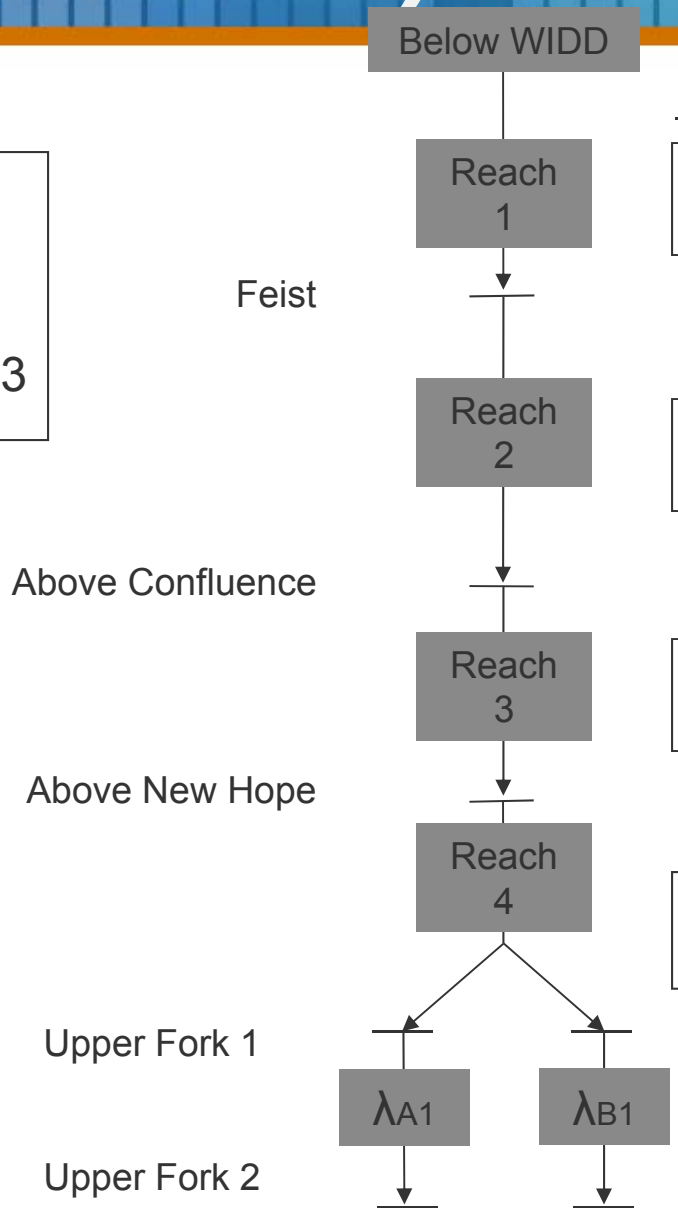
Overall survival

Release 1

S = 3%; s.e.=0.02

Release 2

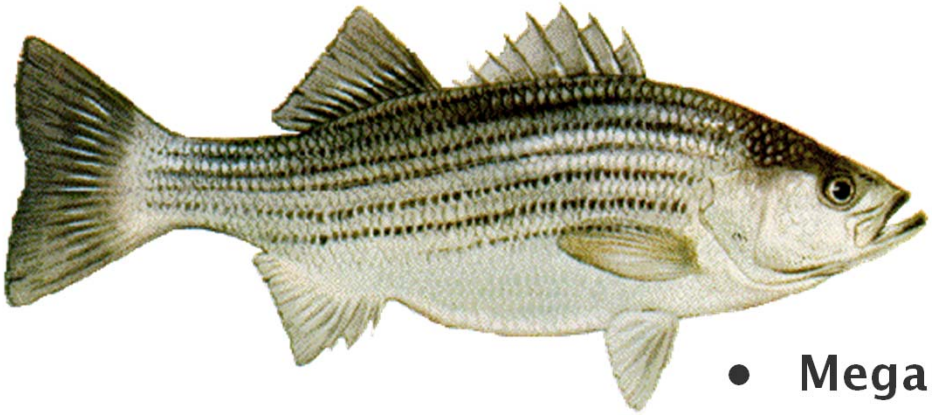
S = 15%; s.e.=0.03

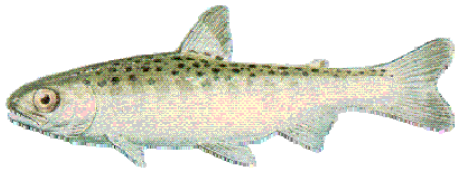


	Release 1	Release 2
Reach 1	S = 33% s.e.=0.04	S = 47% s.e.=0.05
Feist	n=41 p=1	n=57 p=0.9
Reach 2	S = 32% s.e.=0.07	S = 85% s.e.=0.05
Above Confluence	n=13 p=1	n=49 p=1
Reach 3	S = 46% s.e.=0.14	S = 39% s.e.=0.07
Above New Hope	n=6 p=1	n=19 p=1
Reach 4	S = 67% s.e.=0.19	S = 100% s.e.=2E-10
Upper Fork 1	n=4 p=1	n=19 p=1

Other Ongoing Activities

Interactive effects of a non-native predator and anthropogenic habitat alterations on native juvenile salmon



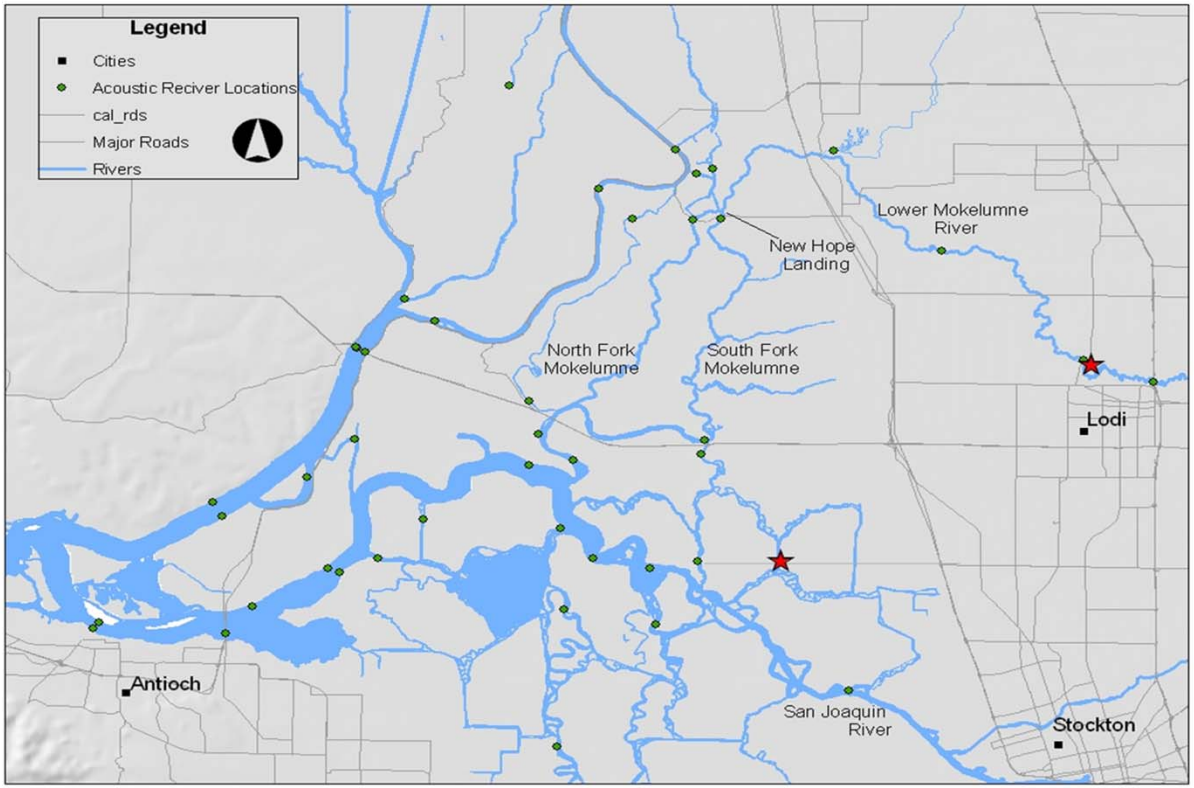


- **Megan Sabal**
- Mark Carr (UCSC), Sean Hayes (NMFS), Joe Merz (Cramer), Jose Setka (EBMUD)

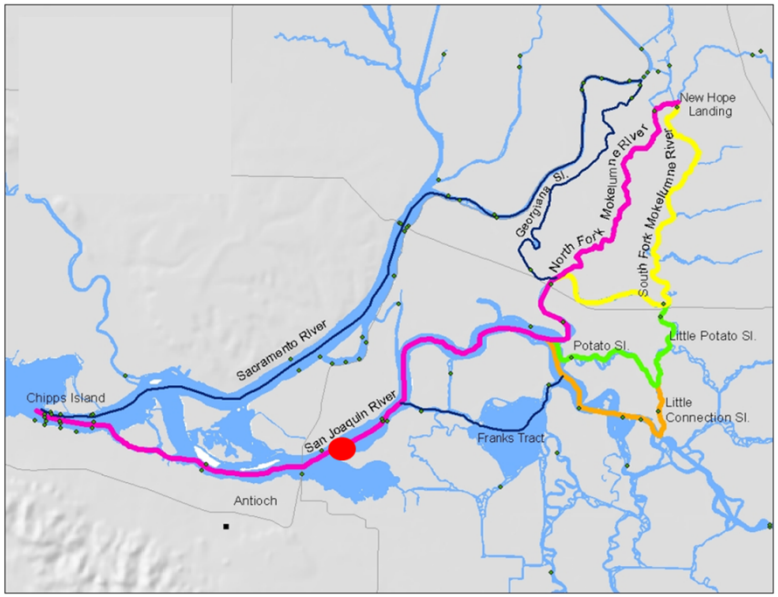
Predator Removal Project

1)Remove predators below WIDD to reduce predation on outmigrating Chinook salmon and steelhead smolts

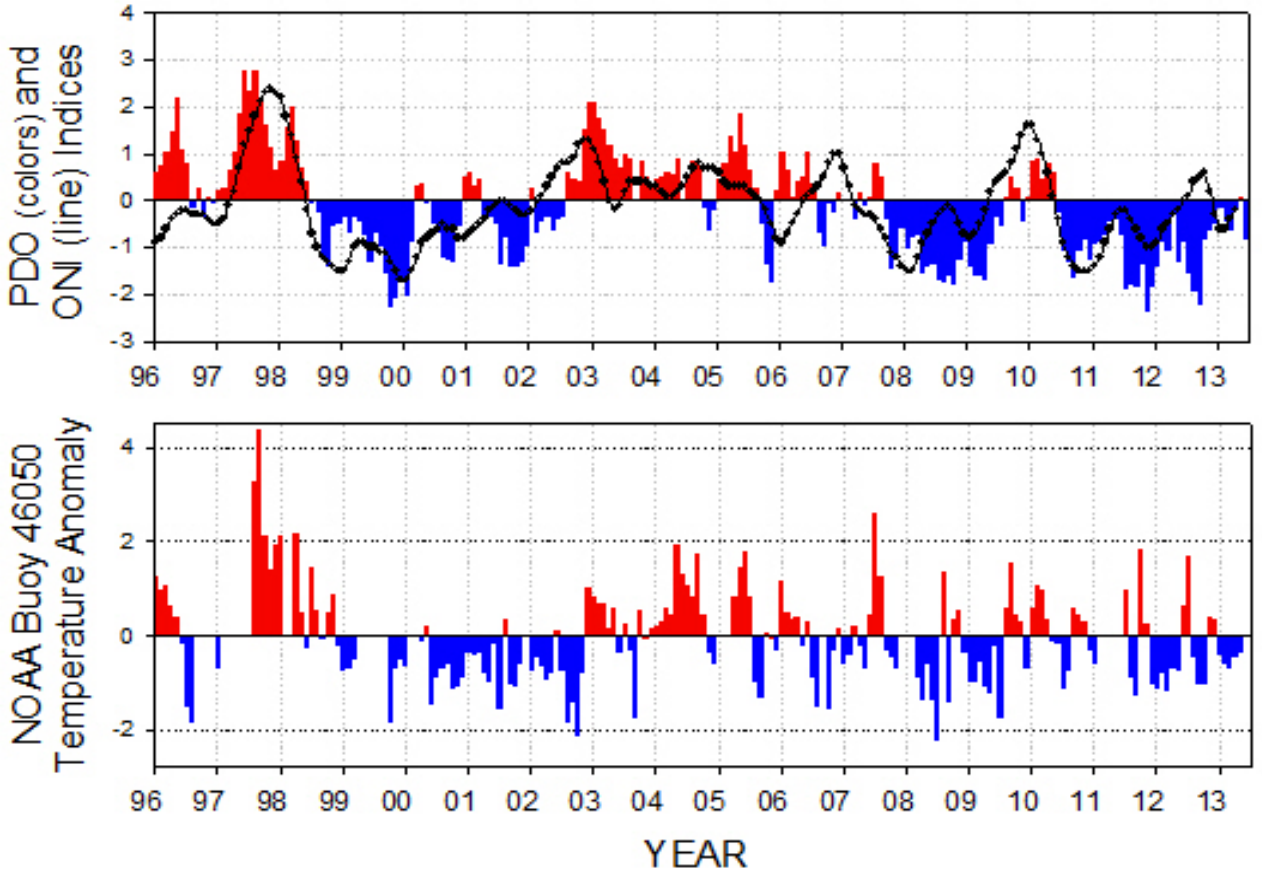
2)Track striped bass movement through the use of acoustic telemetry technology



Hatchery Releases



Pacific Decadal Oscillation PDO



2015 Salmon Outlook

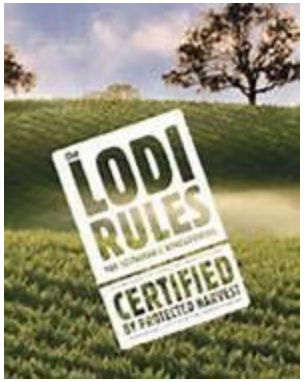
	Juvenile Migration Year				Adult Return Outlook	
	2011	2012	2013	2014	coho 2015	Chinook 2015
Large– scale ocean and atmospheric indicators						
PDO (May - Sept)	■	■	■	■	●	●
ONI (Jan - Jun)	■	■	■	■	●	●
Local and regional physical indicators						
Sea surface temperature anomalies	■	■	■	■	●	●
Coastal upwelling	■	■	■	■	●	●
Deep water temperature and salinity	■	■	■	■	●	●
Local biological indicators						
Copepod biodiversity	■	■	■	■	●	●
Northern copepod anomalies	■	■	■	■	●	●
Biological spring transition	■	■	■	■	●	●
Winter Ichthyoplankton	■	■	■	■	●	●
Juvenile Catch – June	■	■	■	■	●	●

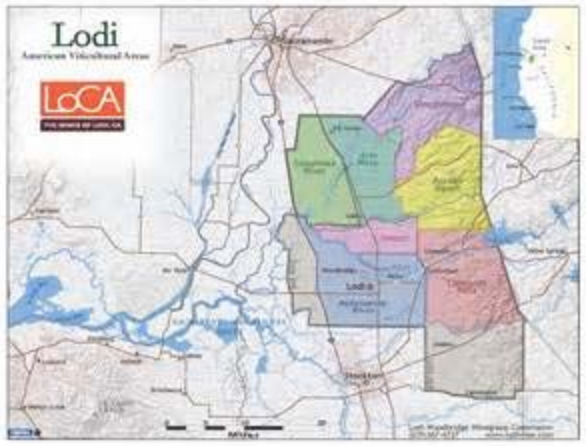
Key
■ good conditions for salmon
■ intermediate conditions for salmon
■ poor conditions for salmon
● good returns expected
-- no data
● poor returns expected

Source: management team briefing with NMFS

Acknowledgements

Woodbridge Irrigation District
CDFW
USFWS AFRP
NMFS
USBR
Many Landowners Along Mokelumne
UC Davis
UC Santa Cruz
Golden Gate Salmon Association






Quod Erat
Demonstrandum