

City of Antioch Testimony
Bay-Delta Workshop 1 – Ecosystem
Changes and LSZ

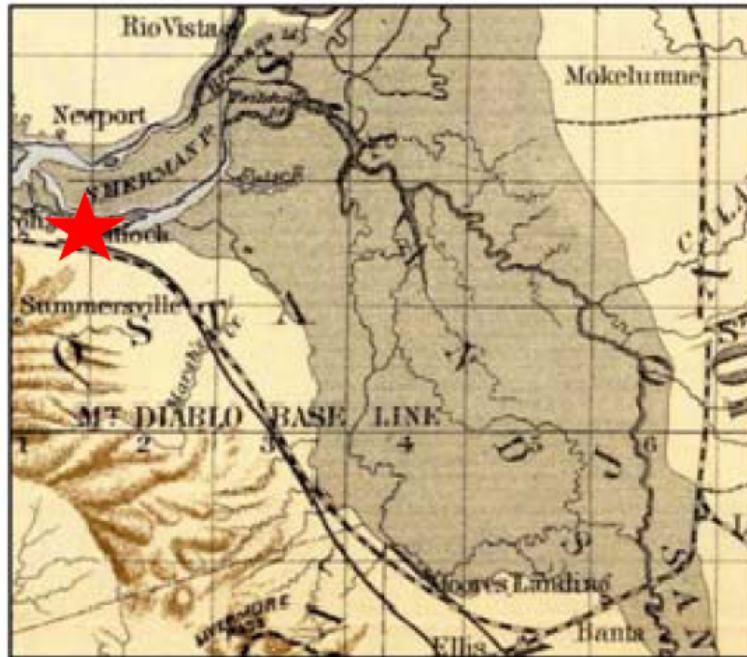
Presented by
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Flow Science Incorporated

Outline of testimony

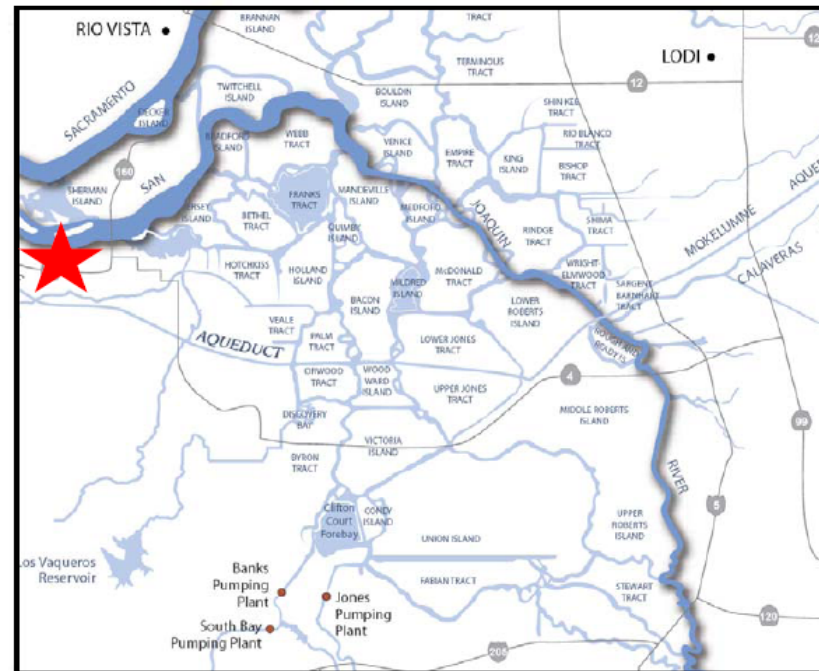
- About the City of Antioch
- BDCP will likely increase salinity in western Delta significantly
- The “historical Delta” was far fresher than today’s Delta
- Considerations for revising flow and salinity criteria
- Antioch’s requests

City of Antioch

1873



2010



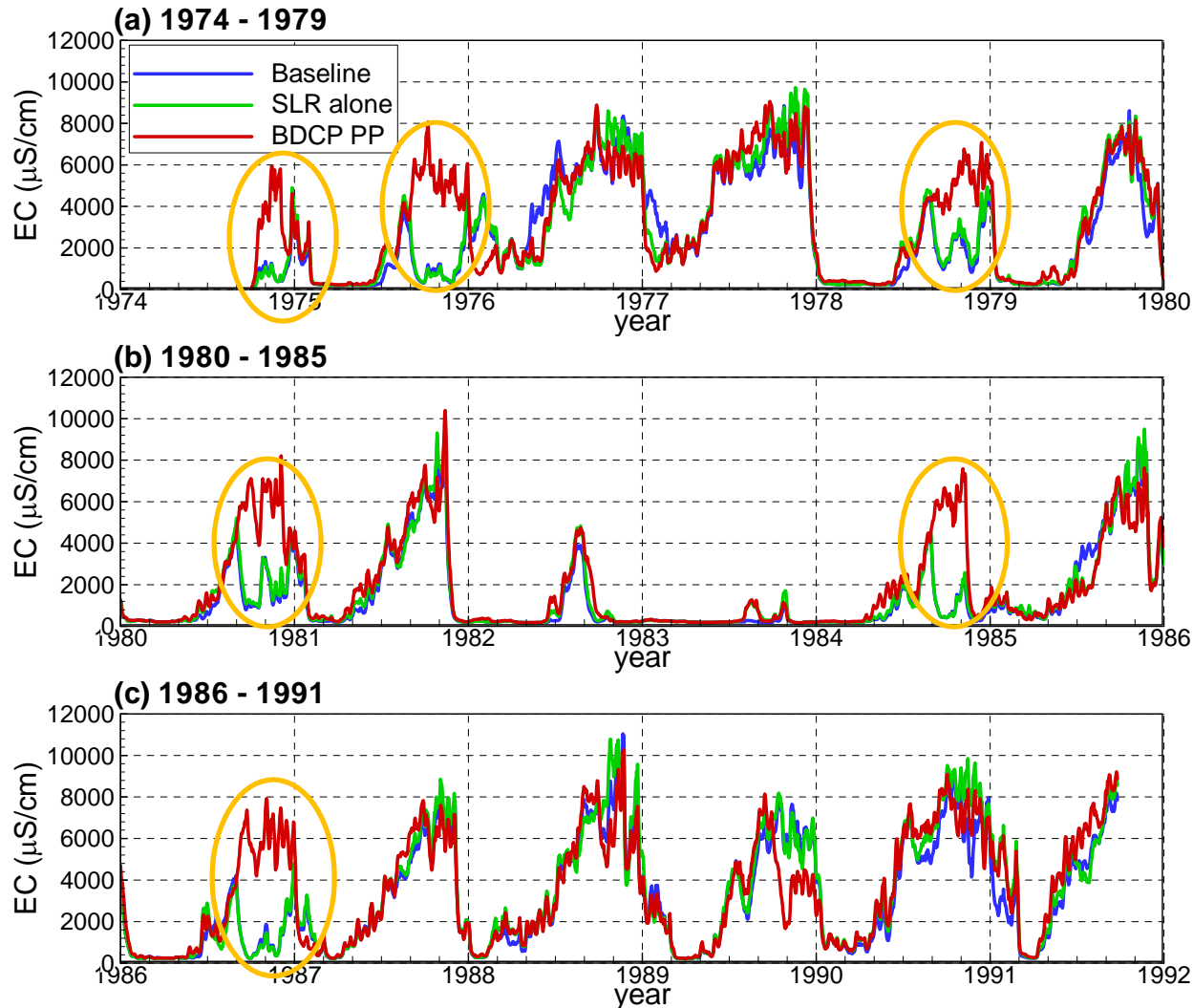
★ Approximate location of City of Antioch's water intake

- City has obtained freshwater supply directly from the river since the 1860s

Impacts of BDCP on Delta salinity

- Previous “preliminary proposal”:
 - 15,000 cfs diversion
 - Habitat restoration
 - Change in compliance point
 - [Current/future BDCP proposal(s) may differ]
- Modeling considered both sea level rise (SLR) and BDCP “preliminary proposal” over 16-year period
- BDCP model results showed significant increases in Delta salinity as a result of BDCP proposal

Prior BDCP “PP” model results show periods of higher salinity at Antioch



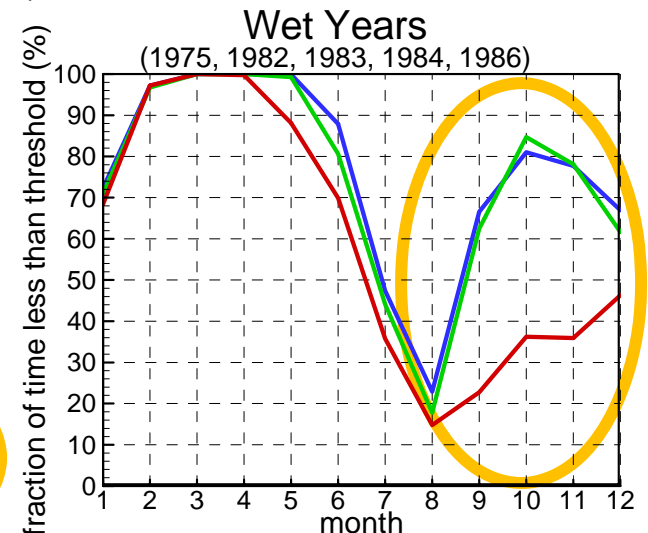
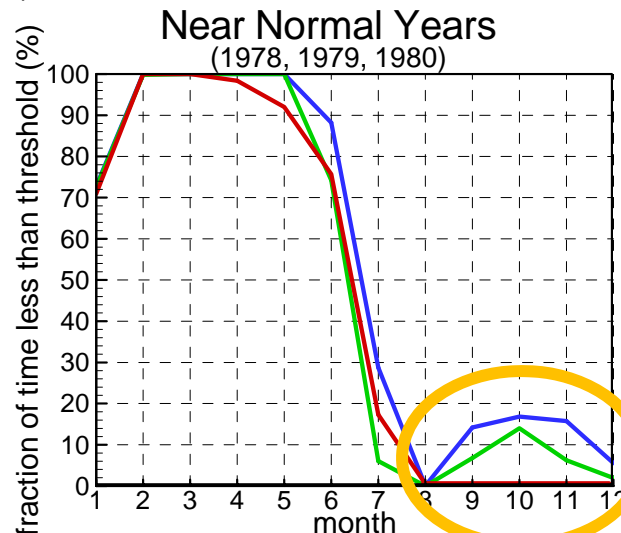
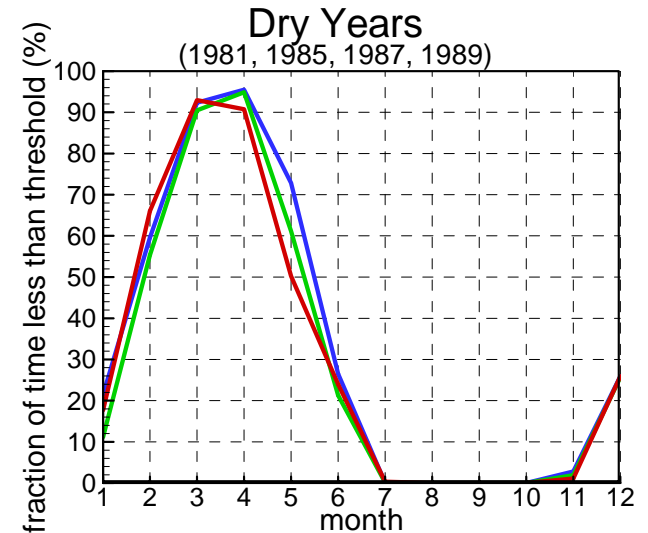
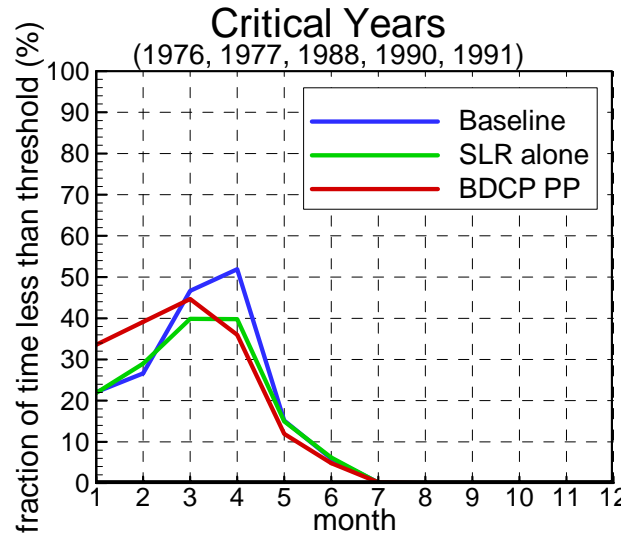
- Increases in salinity are due to BDCP “pp”
- SLR has less effect

[Results are for Preliminary Proposal (Alternative 1), for “Early Long Term” with 15 cm SLR]

Prior BDCP “PP” results show less “usable water” at Antioch

- Salinity impact is largest in late summer and fall of wet and near-normal years
- Usable water has salinity below about 1000 $\mu\text{S}/\text{cm}$

[Results are for Preliminary Proposal (Alternative 1), for “Early Long Term,” with 15 cm SLR; usable water threshold is from Antioch’s contract with DWR]



BDCP impacts may result from:

- Diversion of water from north Delta (reduction in Delta outflow) and project operations
- Move of compliance point from Emmaton to Three Mile Slough*
- Habitat restoration (design and location are important)

* Would require SWRCB change in WQ objectives

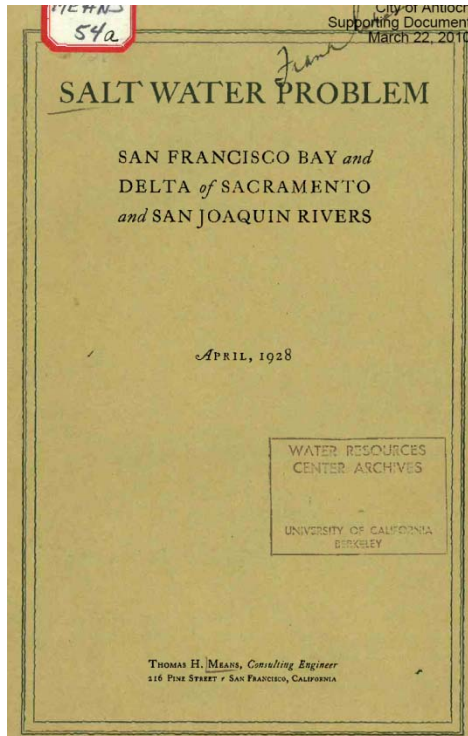
BDCP salinity impacts result from project operations, WQ objectives

- Even smaller project (prior BDCP 6,000-cfs alternative) has significant salinity impacts in Delta (similar to 15,000-cfs PP)
- City looks forward to evaluating the future proposed BDCP project, and will supplement testimony to SWRCB when new model results are available
- Based on information available to date, City anticipates that salinity impacts may occur in western Delta

The “historical Delta” was a different place

- Since the 1850s, tidal marsh has been filled and permanent river channels have been constructed
- Reservoir storage in upstream watersheds is more than 30 MAF
- Water exports have been steadily increasing since 1950s: from about 0.5 MAF/yr to about 5 MAF/yr

The “historical Delta” was a freshwater estuary

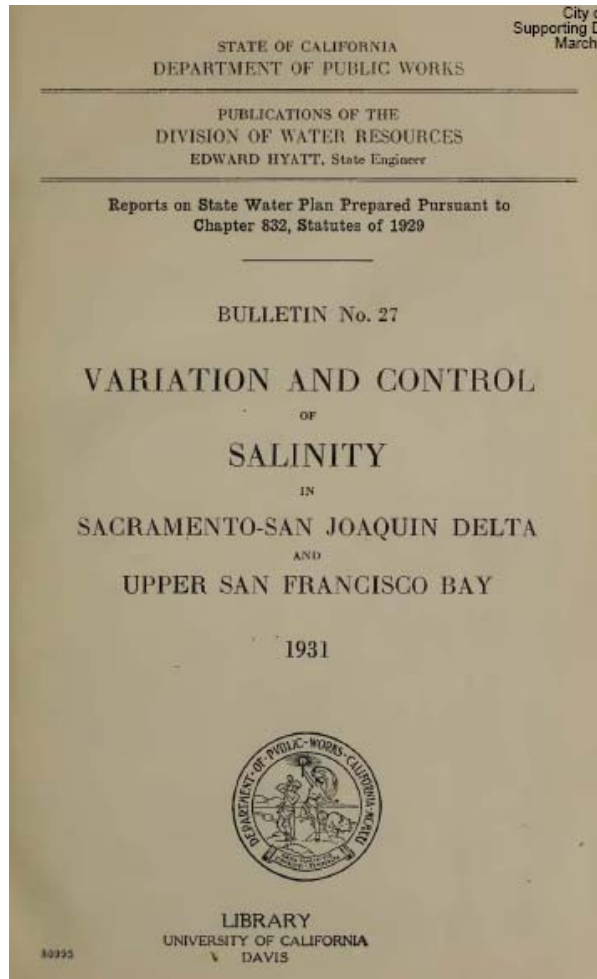


Excerpts from the Summary (emphasis added):

1. Carquinez Strait marked approximately the boundary between salt and fresh water under natural conditions.
2. Prior to diversions for irrigation, Suisun Bay was brackish in late summer and salt water may have penetrated as far as Antioch, but only for a few days at a time in years of lowest runoff.
3. If the water now diverted for irrigation and held in storage were released, natural conditions would again be brought about.
4. The dry year of 1918, in which the urge of war had encouraged heavy plantings of rice and other crops in the Sacramento Valley, resulted in penetration of salt water into the Delta for a longer time and to a greater distance upstream than every known before.

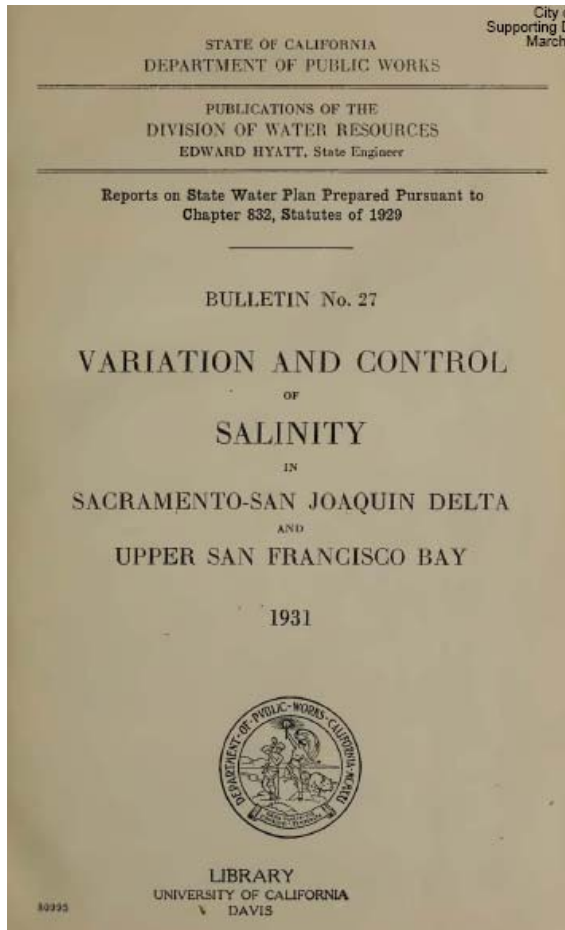
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The “historical Delta” was a freshwater estuary



“The dry years of 1917 to 1919, combined with increased upstream irrigation diversions, especially for rice culture in the Sacramento Valley, had already given rise to invasions of salinity into the upper bay and lower delta channels of greater extent and magnitude than had ever been known before.”

The “historical Delta” was a freshwater estuary

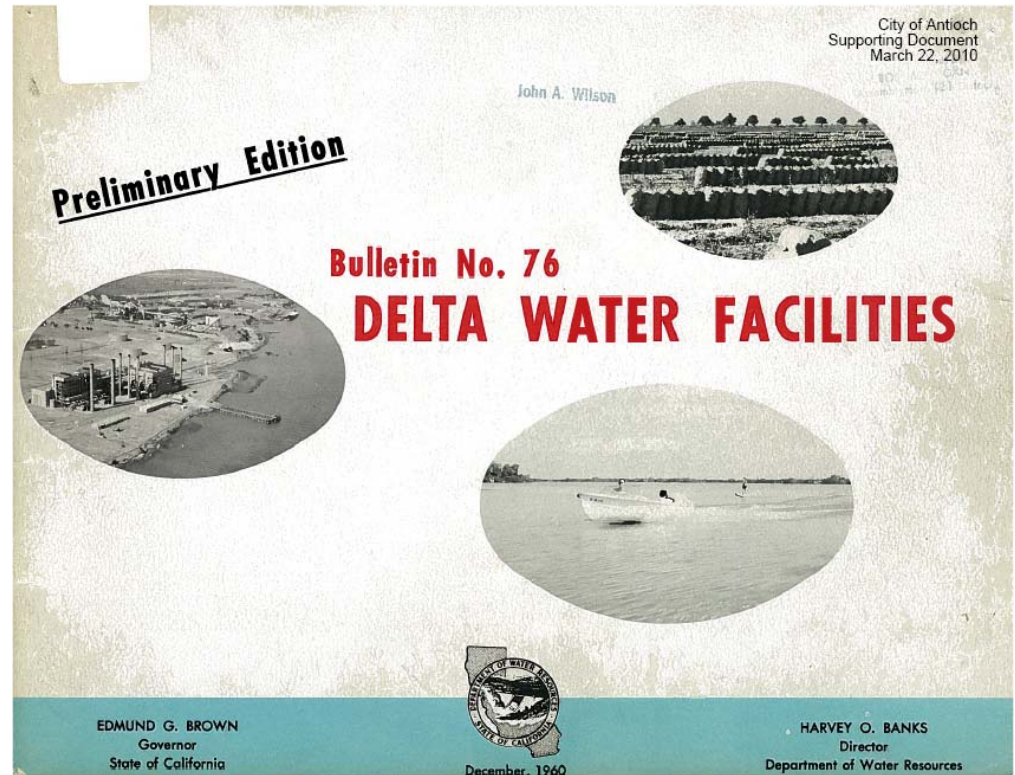


“From early days, Antioch has obtained all or most of its domestic and municipal supply from the San Joaquin River immediately offshore from the city. This supply has always been affect to some extent by saline invasion with the water becoming brackish during certain periods in the late summer and early fall months. However, conditions were fairly satisfactory in this respect until 1917, when the increased degree and duration of saline invasion began to result in the water becoming too brackish for domestic use during considerable periods in the summer and fall.” (emphasis added)

The “historical Delta” was a freshwater estuary

DWR (1960) found that freshwater was available at Antioch:

- 88% of time under “natural” conditions
- 73% of time in 1920
- 49% of time in 1960



Recent studies: water operations increase Delta salinity

- Cloern and Jassby (2012) show changes in X2 resulting from water management (Sept – Dec timeframe)

Table 2. Decadal averages of X2 (km) for September-December:
X2, estimated from outflow.

X2*, estimated from unimpaired outflow

Decade	X2	X2*
1950-1959		73.7
1956-1959	73.2	75.9
1960-1969	71.3	73.3
1970-1979	73.3	73.7
1980-1989	75.1	72.5
1990-1999	78.6	75.9
2000-2003	79.9	74.2
2000-2010	80.5	

Considerations in establishing flow and salinity criteria

- WQ criteria will govern project operations
- Long-term average measures (e.g., salinity, flow) are less informative than time series model results or data
- Salinity and flow should be analyzed using a pre-1918 condition (1920s, 1930s, 1960s do not represent 'baseline')
- The Delta ecosystem and native species are adapted to a historical freshwater condition

Antioch's requests

- Salinity should not be allowed to rise (nor outflows decline) beyond current D-1641 and X2 operations criteria.
- Compliance points (e.g., Emmaton) should not be moved landward.
- Consider using gauging station at Antioch as point of interest for salinity (and flow) in western Delta.
- Ensure that mitigation is provided for impacts to beneficial uses that occur as a result of BDCP.