Nine Decades of Salinity Observations in Suisun Bay & Western Delta

Oct 1921 – Jul 2012

CWEMF Annual Meeting
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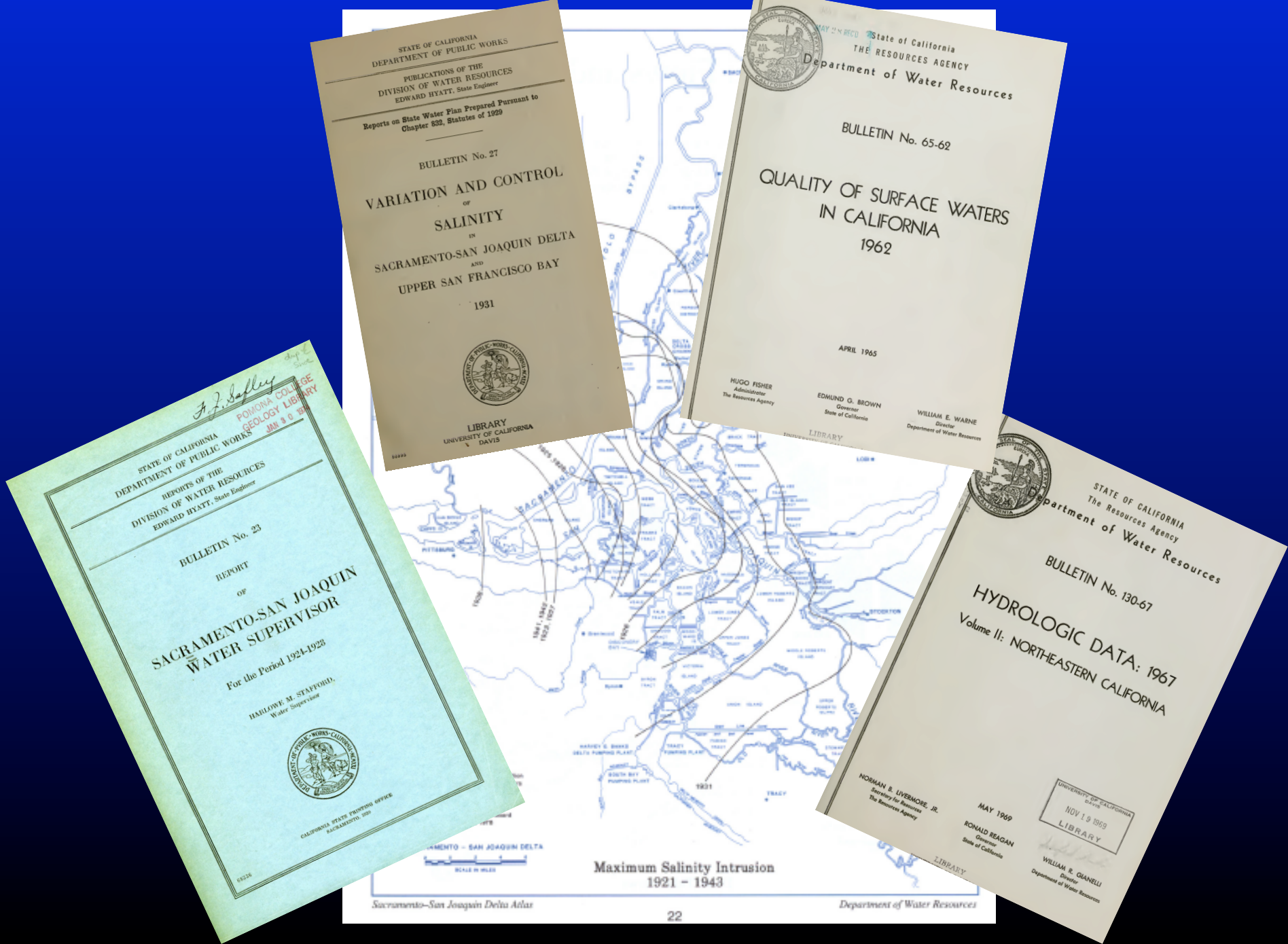
Raw Salinity Data Sources

- Chloride (Grab Samples) 1921-1971
- Conductance (Continuous) 1964-2012


STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
PUBLICATIONS OF THE
DIVISION OF WATER RESOURCES
EDWARD HYATT, State Engineer
Reports on State Water Plan Prepared Pursuant to Chapter 832, Statutes of 1929
BULLETIN No. 27
VARIATION AND CONTROL
OF
SALINITY
IN
SACRAMENTO-SAN JOAQUIN DELTA
AND
UPPER SAN FRANCISCO BAY
1931
LIBRARY
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THE RESOURCES AGENCY
Department of Water Resources
BULLETIN No. 65-62
QUALITY OF SURFACE WATERS
IN CALIFORNIA
1962
APRIL 1965
HUGO FISHER
Administrator
The Resources Agency
EDMUND G. BROWN
Governor
State of California
WILLIAM E. WARNE
Director
Department of Water Resources
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DIVISION OF WATER RESOURCES
EDWARD HYATT, State Engineer
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GEOLOGY LIBRARY
BULLETIN No. 23
REPORT
OF
SACRAMENTO-SAN JOAQUIN
WATER SUPERVISOR
For the Period 1924-1925
HARLOWE M. STAFFORD,
Water Supervisor
CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO, 1926
STATE OF CALIFORNIA
The Resources Agency
Department of Water Resources
BULLETIN No. 130-67
HYDROLOGIC DATA: 1967
Volume II: NORTHEASTERN CALIFORNIA
NORMAN B. LIVERMORE, JR.
Secretary for Resources
The Resources Agency
MAY 1969
RONALD REAGAN
Governor
State of California
WILLIAM R. GIANELLI
Director
Department of Water Resources
UNIVERSITY OF CALIFORNIA
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NOV 19 1969
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Maximum Salinity Intrusion
1921 - 1943
Sacramento–San Joaquin Delta Atlas
Department of Water Resources
22

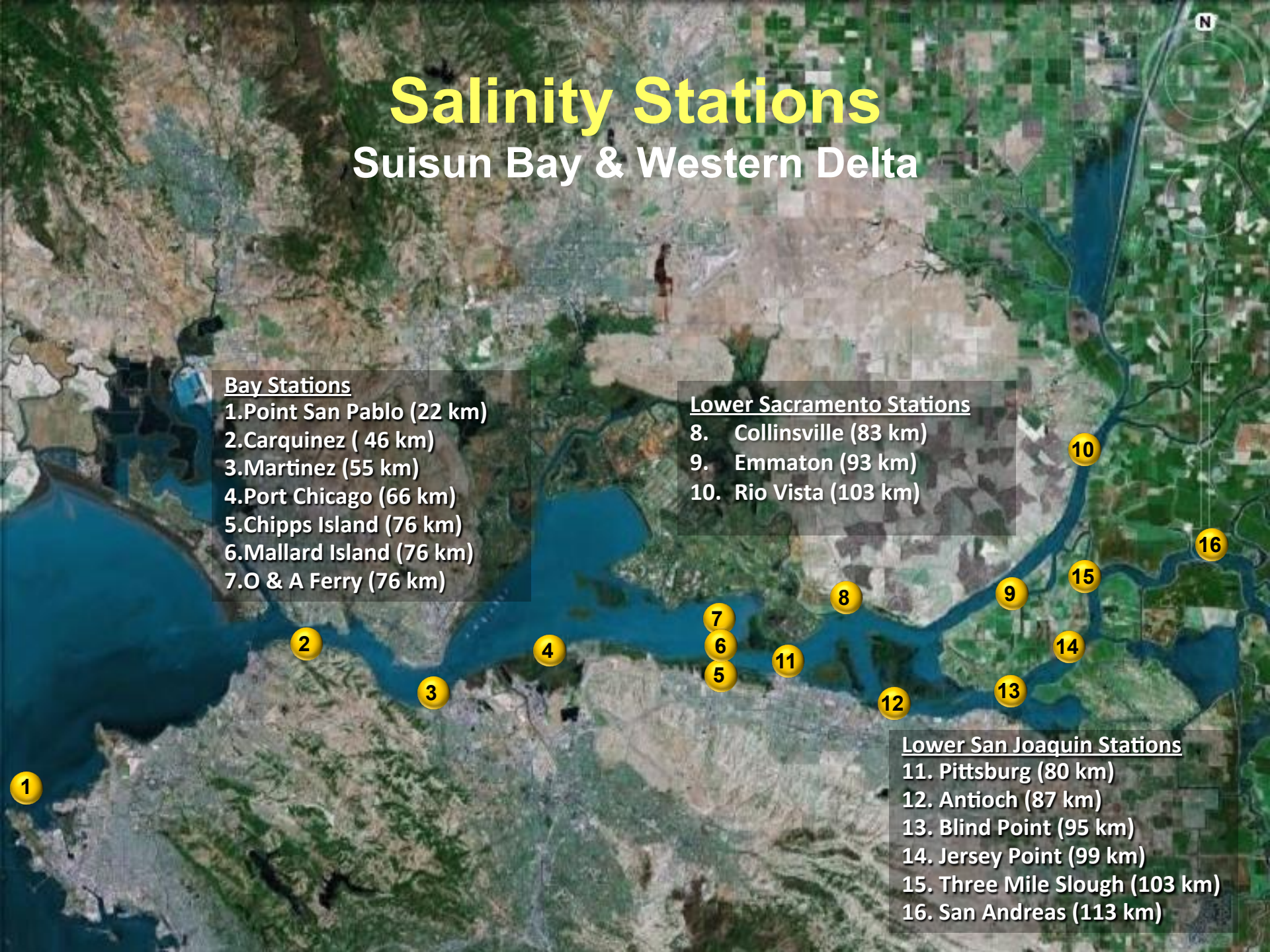
Sample Bulletin 23 Data

TABLE B-39

SALINITY OBSERVATIONS AT BAY AND DELTA STATIONS*

In parts of chloride per million parts of water

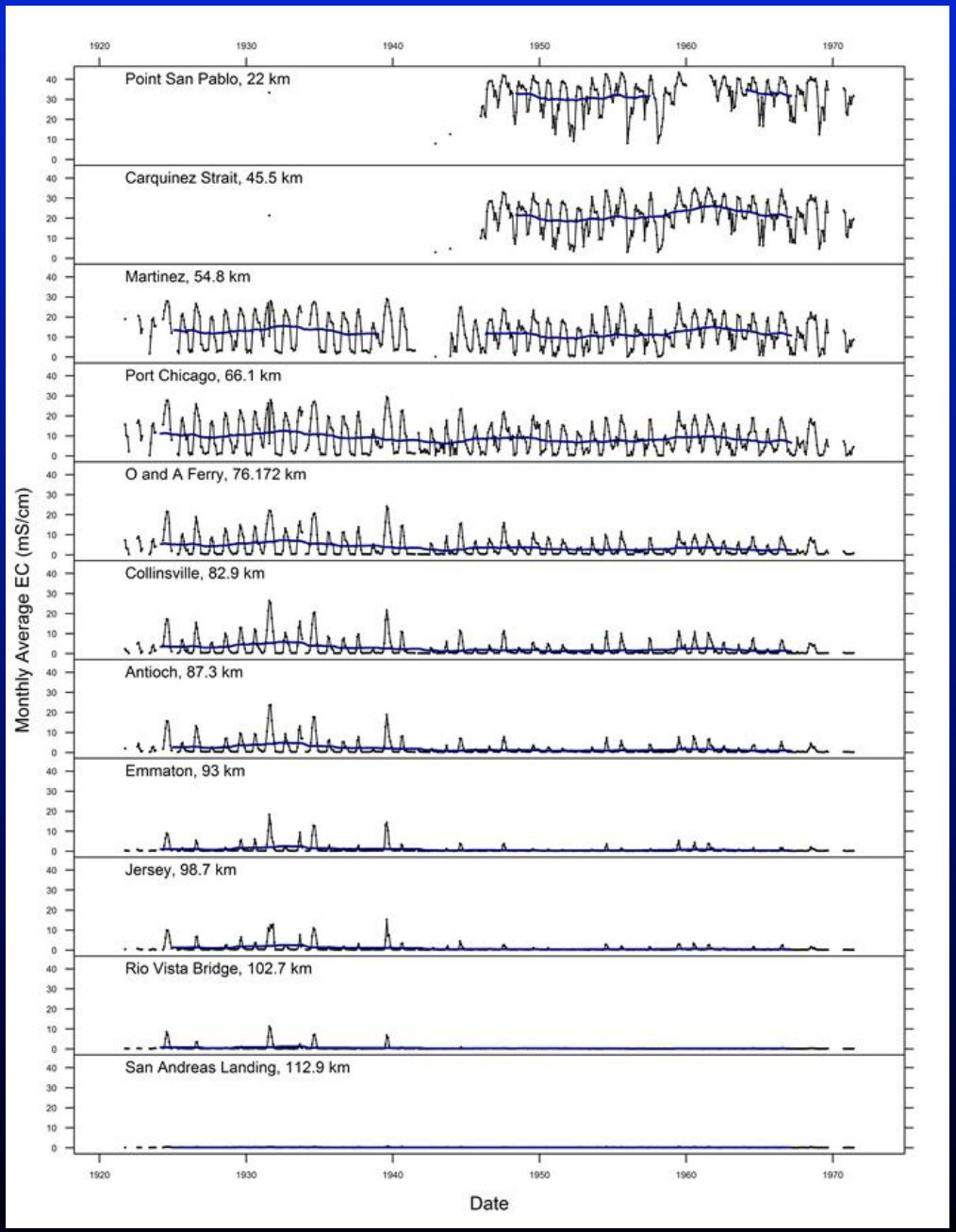
Station	October 1961							
	2	6	10	14	18	22	26	30
			San Francisco, San Pablo, and Suisun Bays					
Sobrante Beach								
Crockett		12200	12900	12200	12700	13800	13900	11300
Benicia	11100	10800	10800		12100	10600	11400	7650
Martinez	10900	12700	11400	12100	11400	12500	12700	10200
West Suisun	8940		a 8910		10300	7480	10300	
Innisfail Ferry	a 5540	5000	d 5250	5000	a 5240	d 5420	4260	a 5470
Port Chicago	7180	7640	8580	9090		7490	8260	6400
Spoonbill Creek	3540	2980	2940	2980	3520	2960	3440	3140
Pittsburg	a 1690	2300	c 2180		ab 3980		2850	d 1090
			Sacramento River Delta					
Collinsville		1950	2100	a 1660	a 2180		a 1870	1690
Emmaton	a 310	470	535	a 468	a 677	841	a 771	207
Threemile Slough Bridge	b 95	91	a 82	173	b 209	150	232	80
Rio Vista Bridge	b 14	19	13	16			13	11
Isleton Bridge	b 17	13	14	11	b 12	12	10	9
			San Joaquin River Delta					
Antioch	a 836	1180	1140	1270	a 1770	1520	1690	535
Antioch Bridge	a 126	208	199	237	a 273	229	214	156
Jersey Island								
Threemile Slough			80	a 47				67
Oulton Point	a 64		81	a 59	a 109	b 92	a 63	
San Andreas Landing	a 23	17	23	a 21	a 22	14	27	23
Opposite Central Landing	a 16	15	14	a 12		14	a 14	12
Dutch Slough	a 126	114	a 116	a 104	a 105	124	a 112	92
East Contra Costa Irrigation District	a 113	96	a 100	109	a 107	121	a 107	111
Clifton Court Ferry	a 63	58	a 60	a 58	a 61	a 77	a 55	59
Mossdale Bridge	a 283	a 308	a 300	a 292	a 264	a 280	a 251	234
Vernalis (g)	a 292	304	a 290	b 243	a 309	a 262	a 244	233


Salinity Stations
Suisun Bay & Western Delta
N
Bay Stations
1.Point San Pablo (22 km)
2.Carquinez (46 km)
3.Martinez (55 km)
4.Port Chicago (66 km)
5.Chipps Island (76 km)
6.Mallard Island (76 km)
7.O & A Ferry (76 km)
Lower Sacramento Stations
8. Collinsville (83 km)
9. Emmaton (93 km)
10. Rio Vista (103 km)
Lower San Joaquin Stations
11. Pittsburg (80 km)
12. Antioch (87 km)
13. Blind Point (95 km)
14. Jersey Point (99 km)
15. Three Mile Slough (103 km)
16. San Andreas (113 km)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

Monthly Average Salinity Time Series

Bulletin 23 Data
Oct 1921 – Jun 1971

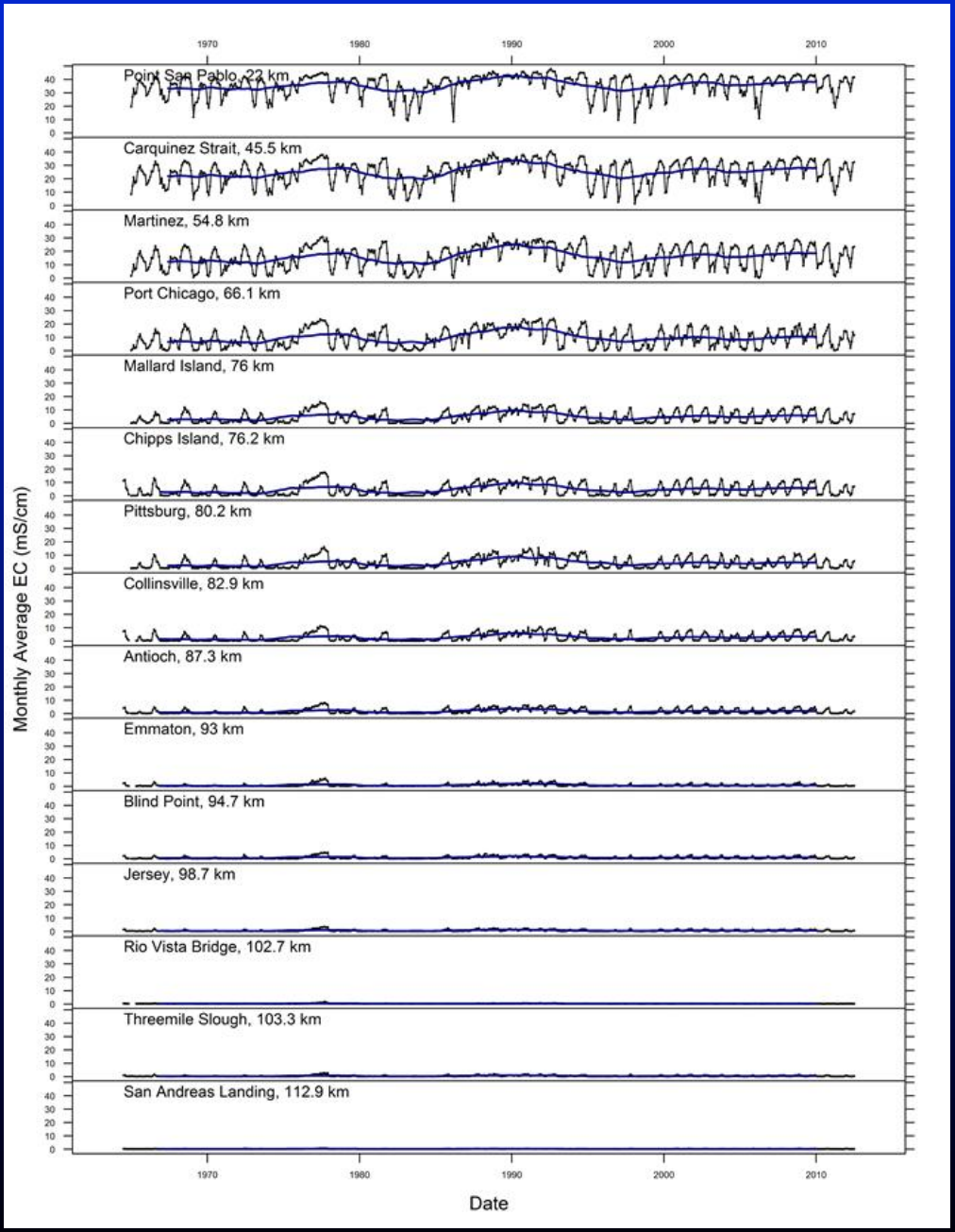
Pt San Pablo	n=277 (46%)
Carquinez	n=297 (50%)
Martinez	n=528 (88%)
Port Chicago	n=561 (94%)
O&A Ferry	n=561 (94%)
Collinsville	n=560 (94%)
Antioch	n=557 (93%)
Emmaton	n=560 (94%)
Jersey Pt	n=557 (93%)
Rio Vista	n=559 (94%)
San Andreas	n=555 (93%)



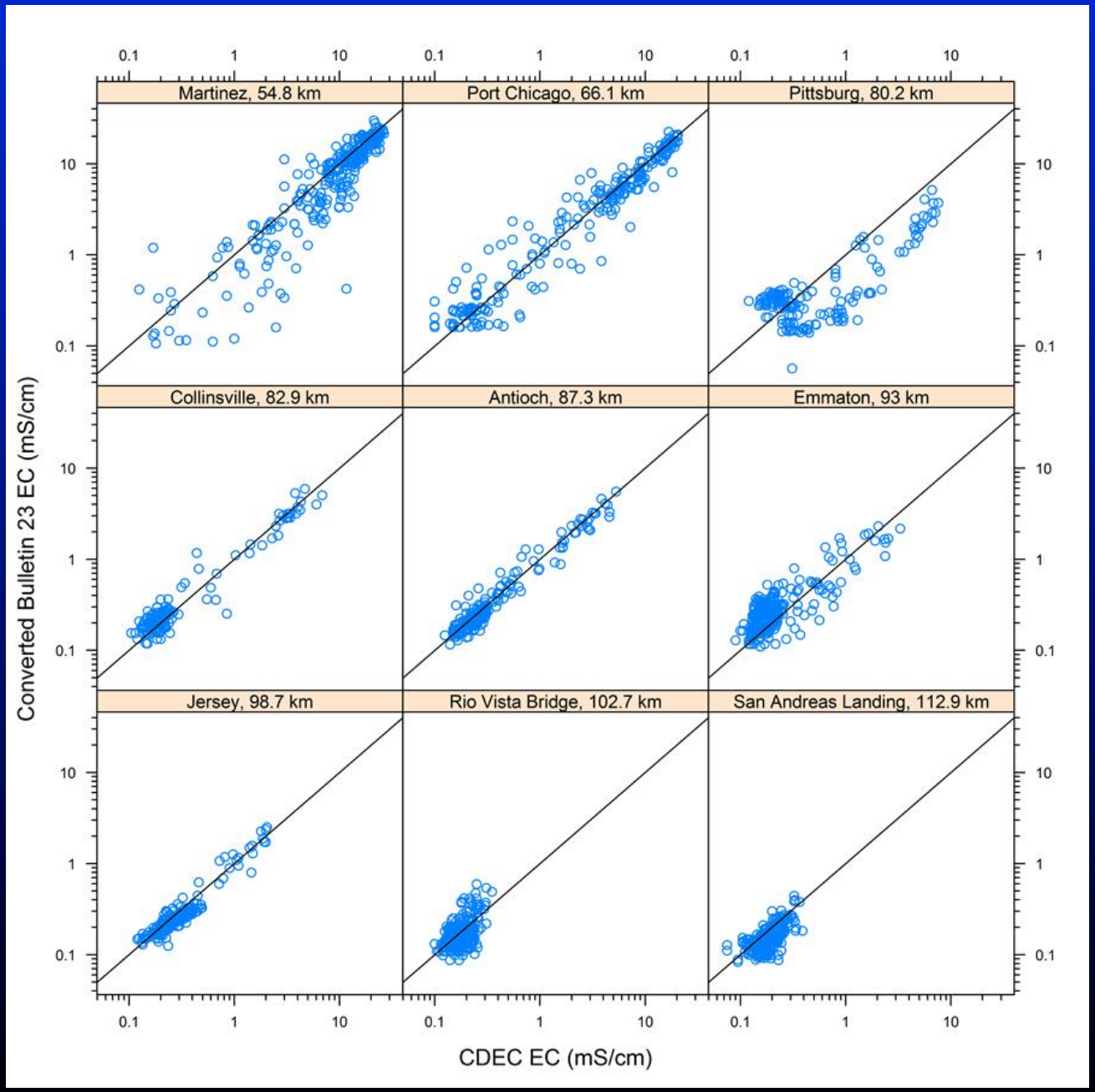
Monthly Average Salinity Time Series

CDEC Data
Jan 1964 – Jul 2012

Pt San Pablo	n=571 (99%)
Carquinez	n=571 (99%)
Martinez	n=571 (99%)
Port Chicago	n=571 (99%)
Mallard Island	n=571 (99%)
Chipps Island	n=576 (99%)
Pittsburg	n=571 (99%)
Collinsville	n=572 (99%)
Antioch	n=576 (99%)
Emmaton	n=572 (99%)
Blind Point	n=576 (99%)
Jersey Pt	n=577 (100%)
Rio Vista	n=572 (99%)
3-Mile Slough	n=577 (100%)
San Andreas	n=577 (100%)



Validation of Bulletin 23 Daily Data Conversion



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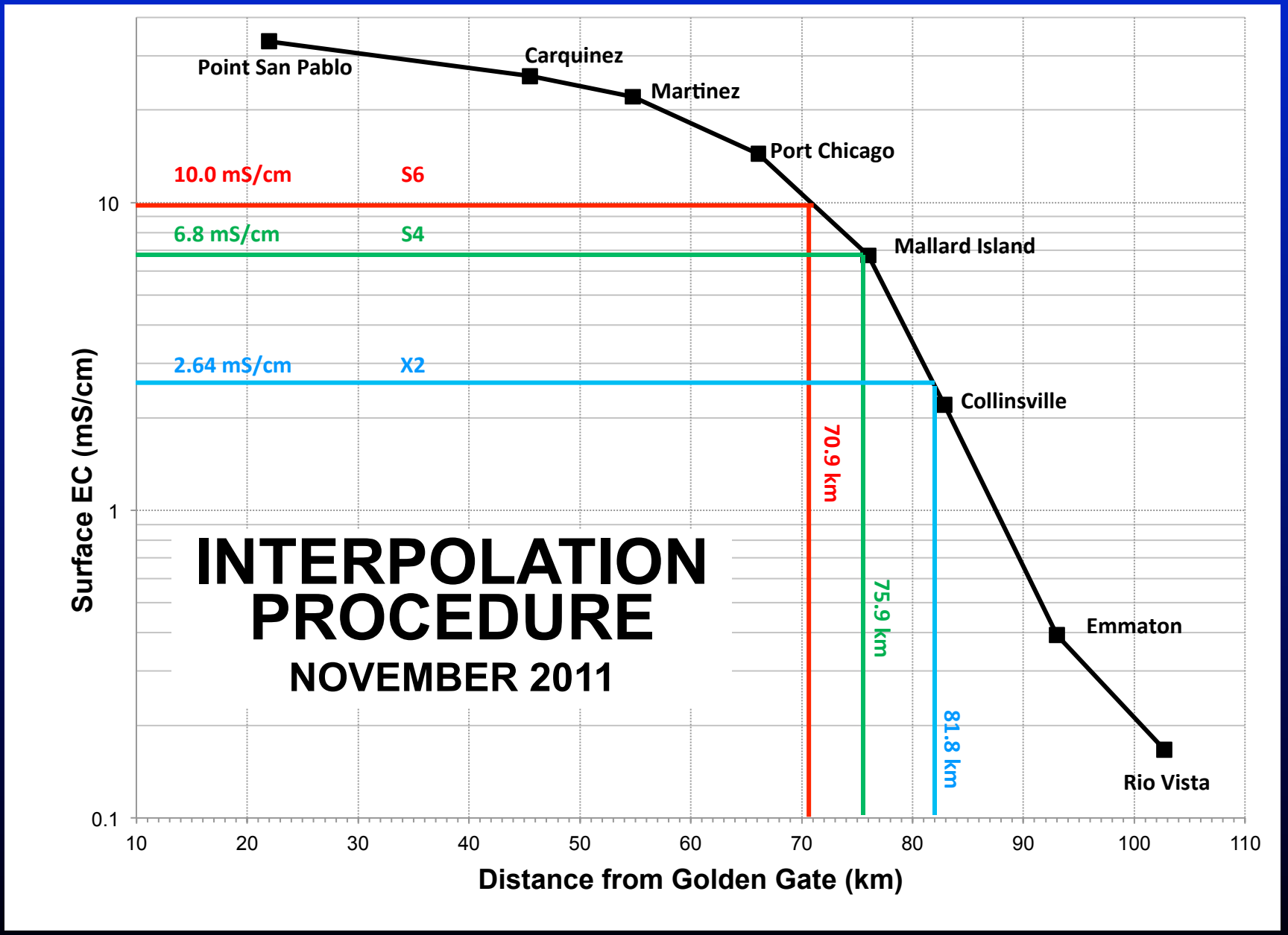
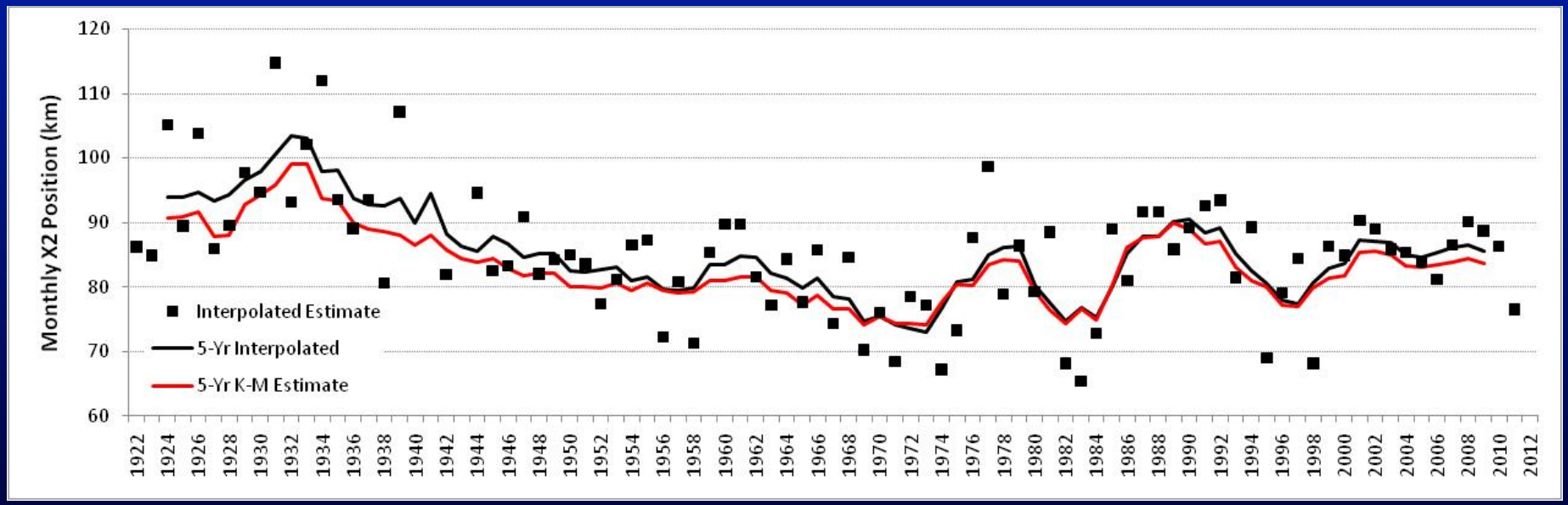

Point San Pablo
Carquinez
Martinez
Port Chicago
Mallard Island
Collinsville
Emmaton
Rio Vista
10.0 mS/cm
S6
6.8 mS/cm
S4
2.64 mS/cm
X2
70.9 km
75.9 km
81.8 km
INTERPOLATION PROCEDURE
NOVEMBER 2011
Surface EC (mS/cm)
10
1
0.1
10
20
30
40
50
60
70
80
90
100
110
Distance from Golden Gate (km)

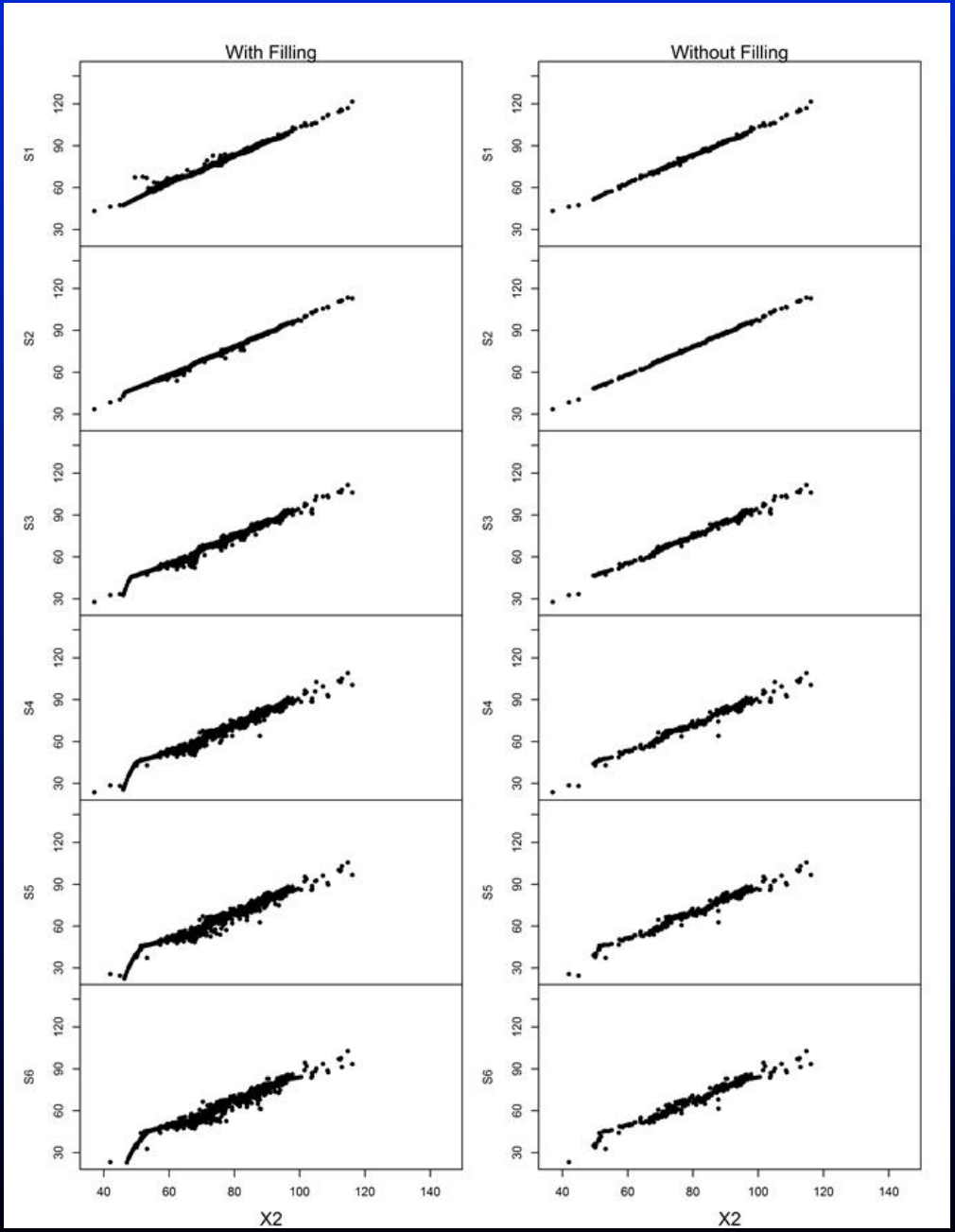
Sample Time Series Trend

September X2 Position



Salinity Field as a Function of X2

(Sacramento River transect in km)



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- A wealth of salinity data are available to characterize the low salinity zone in Suisun Bay and western Delta. However,
  - raw data sets are generally noisy
  - frequent occurrence of erroneous values and gaps
  - frequent lack of inter-station consistency
- The data are considered to be:
  - adequate to train a salinity artificial neural network
  - insufficiently “clean” to evaluate long-term trends
- Next Steps: Refined data flagging and cleaning

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