STATE WATER RESOURCES CONTROL BOARD

San Joaquin River Flow and Southern Delta Water Quality Scoping meeting

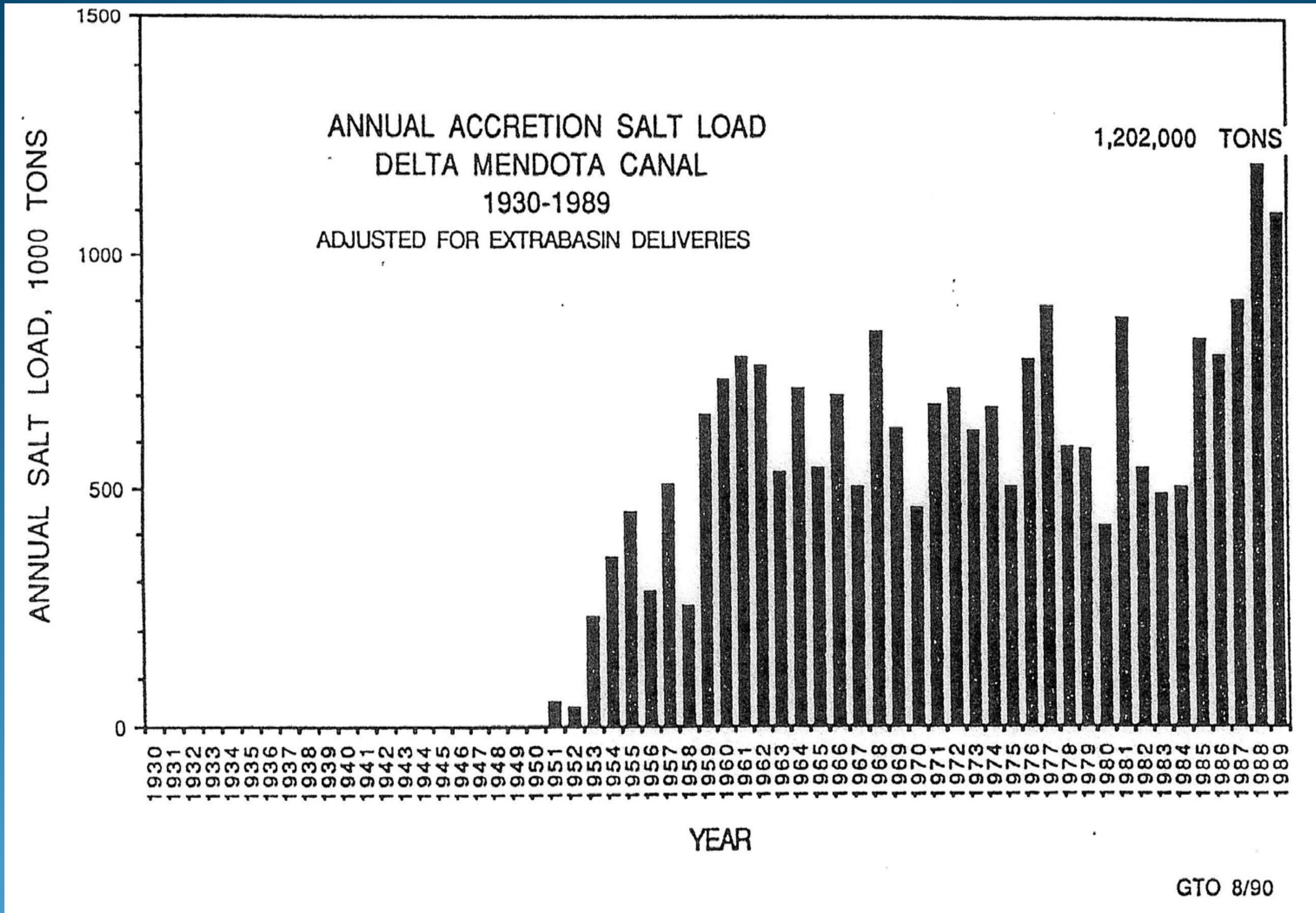
June 6, 2011

Presentation by South Delta Water Agency

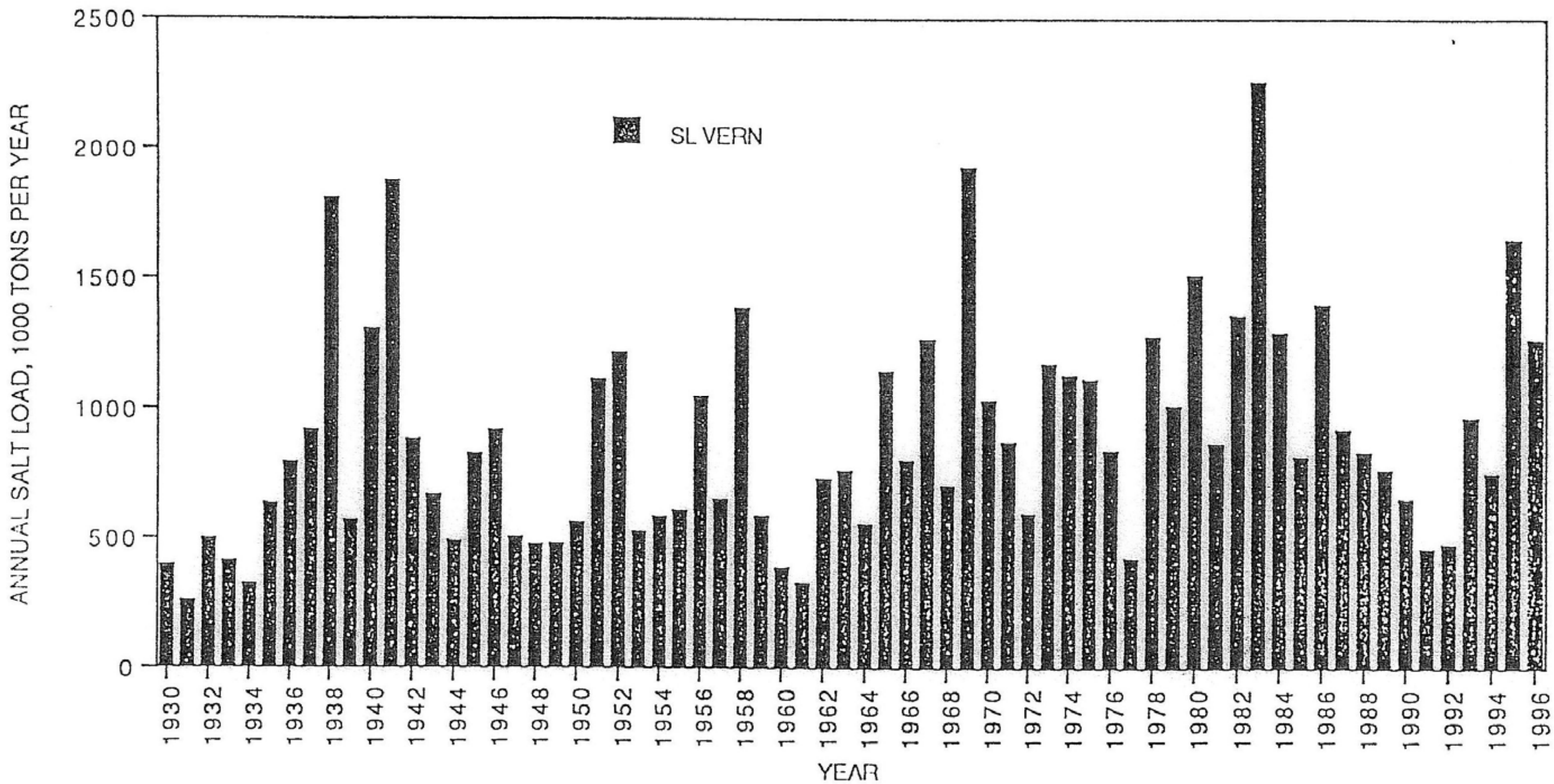
WHERE DOES THE SALT ORIGINATE?

Based on the above discussion, the SWRCB finds that the actions of the CVP are the principal cause of the salinity concentrations exceeding the objectives at Vernalis. The salinity problem at Vernalis is the result of saline discharges to the river, principally from irrigated agriculture, combined with low flows in the river due to upstream water development. The source of much of the saline discharge to the San Joaquin River is from lands on the west side of the San Joaquin Valley which are irrigated with water provided from the Delta by the CVP, primarily through the Delta-Mendota Canal and the San Luis Unit. The capacity of the lower San Joaquin River to assimilate the agricultural drainage has been significantly reduced through the diversion of high quality flows from the upper San Joaquin River by the CVP at Friant. The USBR, through its activities associated with operating the CVP in the San Joaquin River basin, is responsible for significant deterioration of water quality in the southern Delta.

Page 83 Revised Water Right Decision 1641 March 15, 2000



Prepared by Dr. Jerry Orlob



ANNUAL SALT LOAD
SAN JOAQUIN RIVER NEAR VERNALIS, 1930 TO 1996

Figure 4

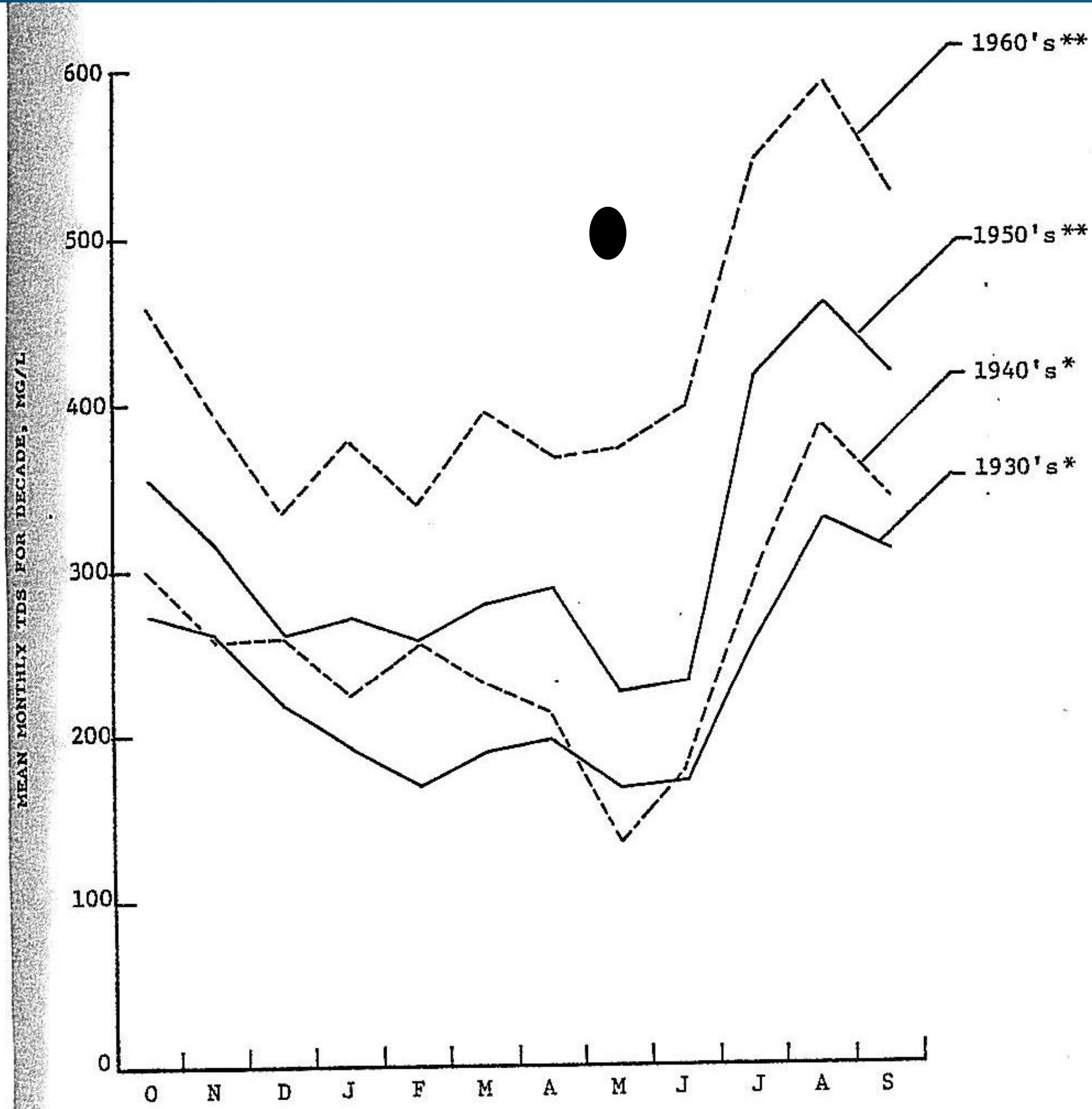


Figure VI-25 MEAN MONTHLY TDS AT VERNALIS BY DECADES 1930-1969
*Based on Mossdale chloride data
**Based on actual observations

Report of the Effects of the CVP Upon the Southern Delta Water Supply Sacramento-San Joaquin River Delta, California June 1980

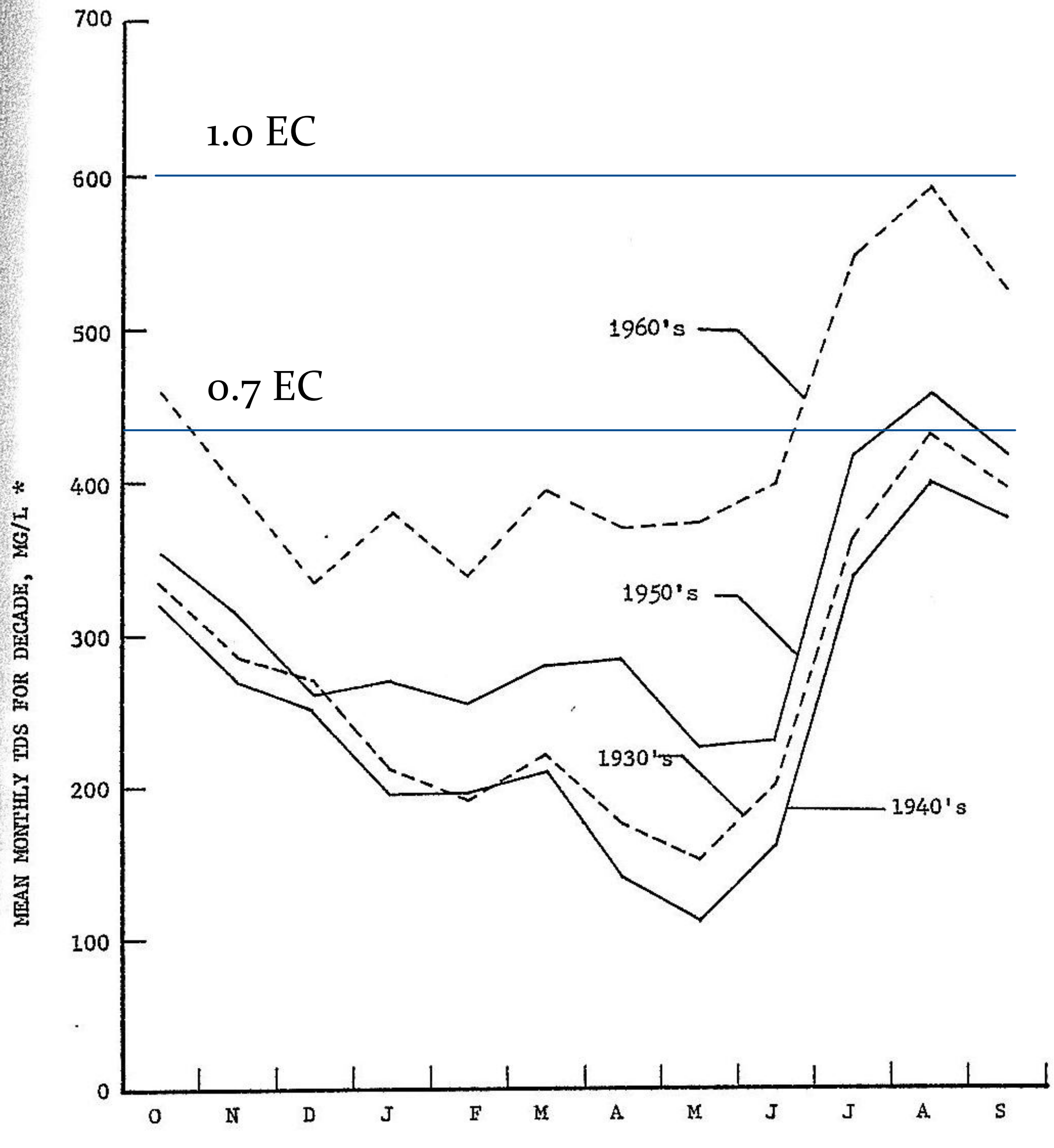


Figure VI-27 MEAN MONTHLY TDS AT VERNALIS BY DECADES 1930-1969

* Estimated by chloride load-flow regressions for 30's and 40's.

Report of the Effects of the CVP Upon the Southern Delta Water Supply Sacramento-San Joaquin River Delta, California June 1980

ARE SALTS ADDED TO SOUTHERN DELTA CHANNELS VIA AGRICULTURAL DRAINAGE?

1. **AMOUNTS CONTRIBUTED BY CHEMICAL APPLIED TO CROPS AND SOILS**

   Unknown; no reports or tests are part of SWRCB or CVRWQCB records.

2. **SOILS DERIVED FROM MARINE DEPOSITS**

   "After over 100 years of irrigation and water passing through soil profile, the amount of salts which remain and can leach out are minimal if any." Alex Hildebrand

   "These types of soils, when saturated, could still leach out some small amounts of salts." Terry Prichard

WHAT HAPPENS TO THE SALT WHEN IT REACHES THE SOUTHERN DELTA?

Conclusion

The Delta Lowlands act as a salt reservoir, storing salts obtained largely from the channels during the summer, when water quality in such channels is most critical and returning such accumulated salts to the channels during the winter when water quality there is least important. Therefore agricultural practices in that area enhanced rather than degraded the good quality Sacramento River water enroute to the Tracy Pumping Plant.

Department of Water Resources, Investigation of the Sacramento-San Joaquin Delta, Report No. 4, Quantity and Quality of Water Applied to and Drained From the Delta Lowlands, July 1956, Page 30.

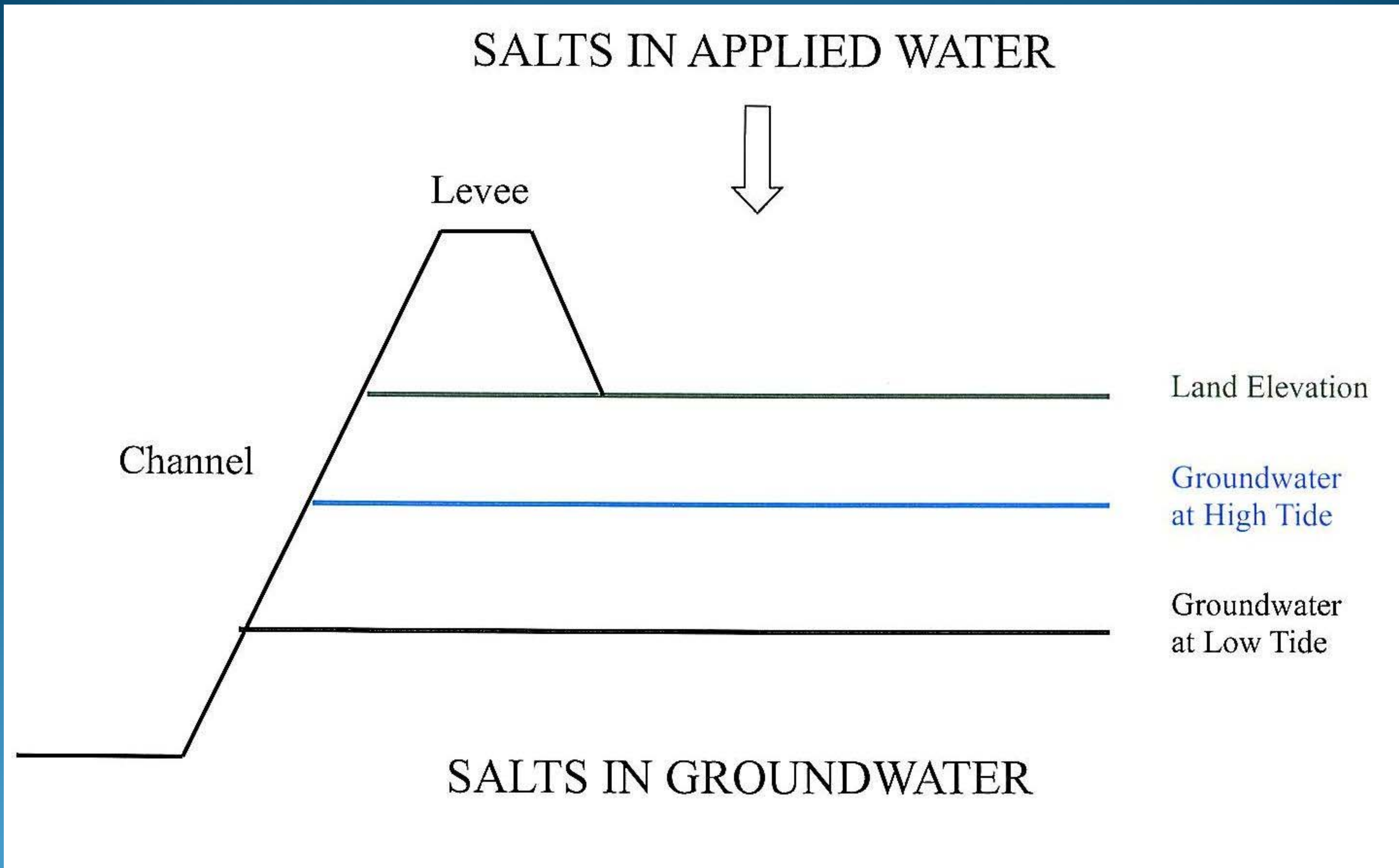

SALTS IN APPLIED WATER
Levee
Channel
Land Elevation
Groundwater at High Tide
Groundwater at Low Tide
SALTS IN GROUNDWATER

Figure A5

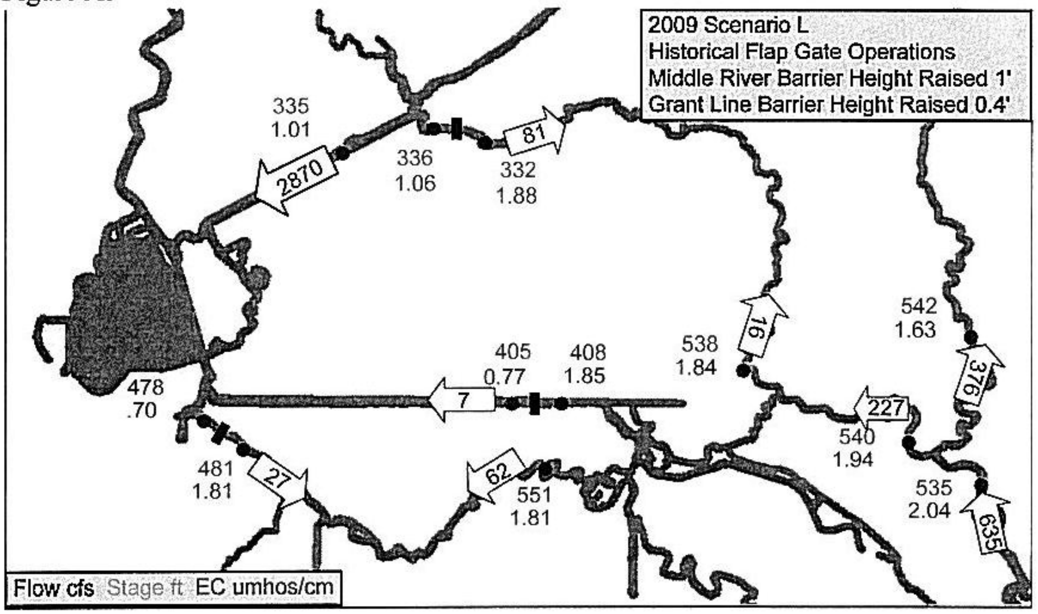
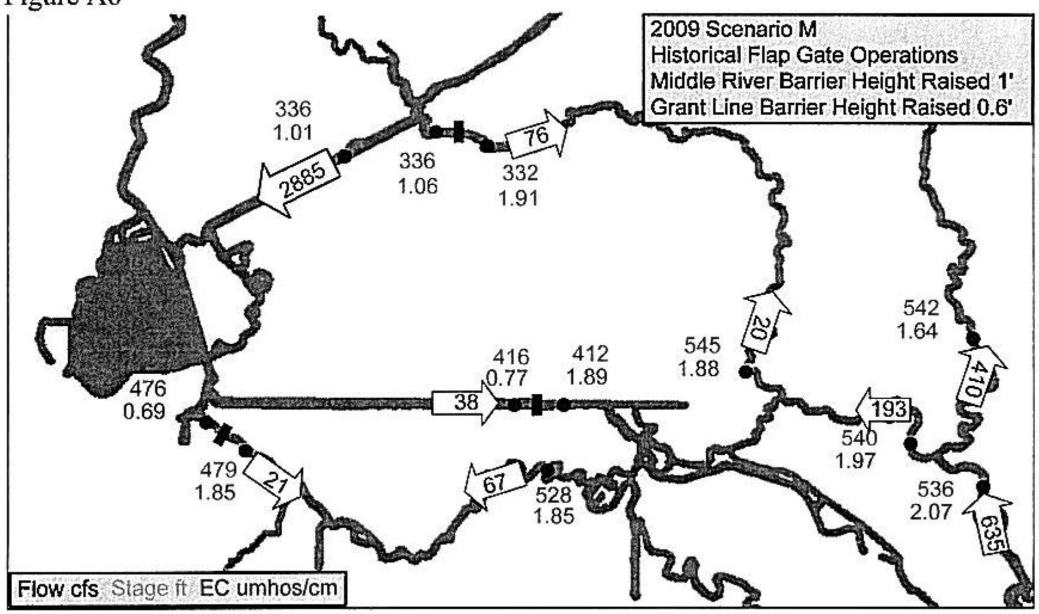


Figure A6



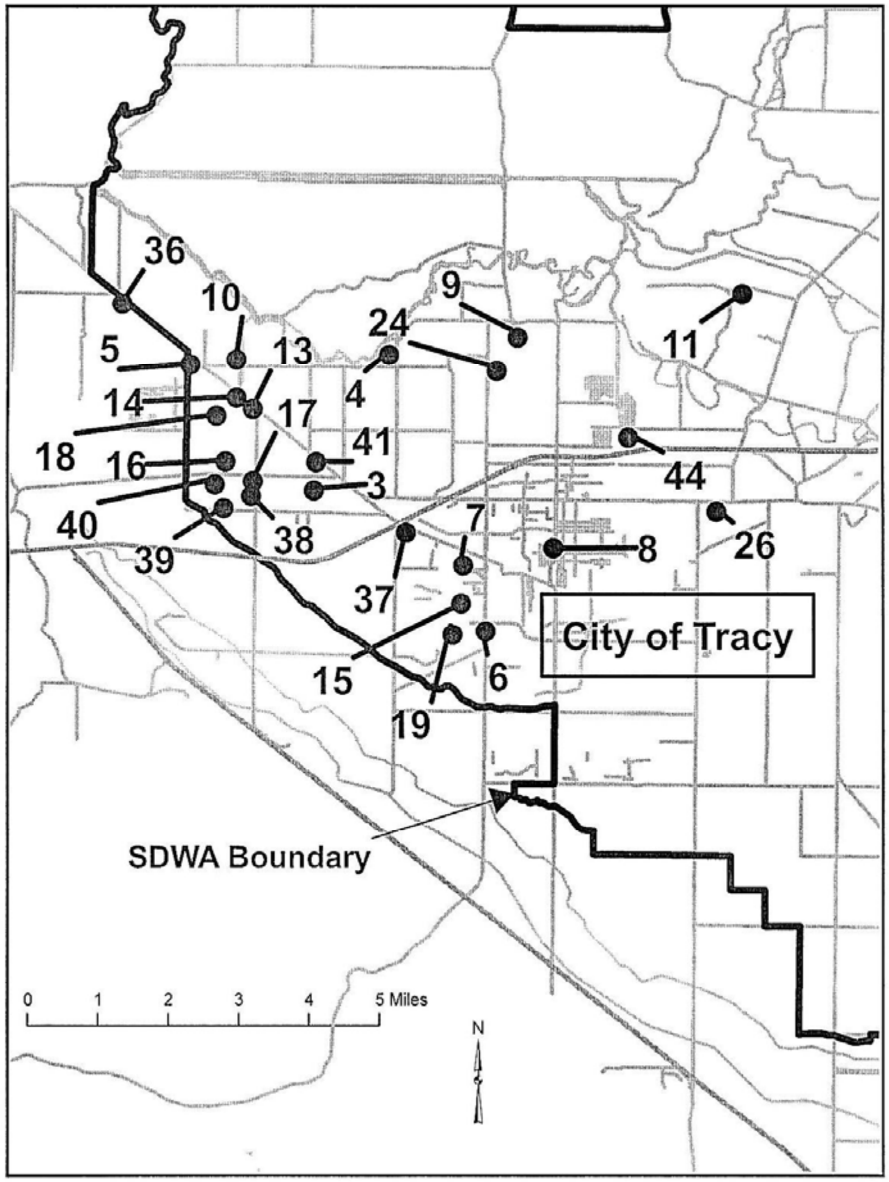
DWR barrier ops modeling

Southern Delta Channels need circulation to establish net flows. Creating such net flows does not mean more water.

DWR's Low-Lift Pump Study requires further consideration. What happens to the water quality in the null zones with the additional pumping? Why doesn't an additional 1,000 cfs create a net flow ?

The Hoffman Report calculated leaching fractions based on drain water samples from upland areas only.

Figure 3.18. Location of subsurface tile drains sampled on the west side of the SDWA (Chilcott, et al., 1988).



Salt Tolerance of Crops in the Southern Sacramento-San Joaquin Delta, Final Report January 5, 2010, by Dr. Glenn J. Hoffman, Page 55

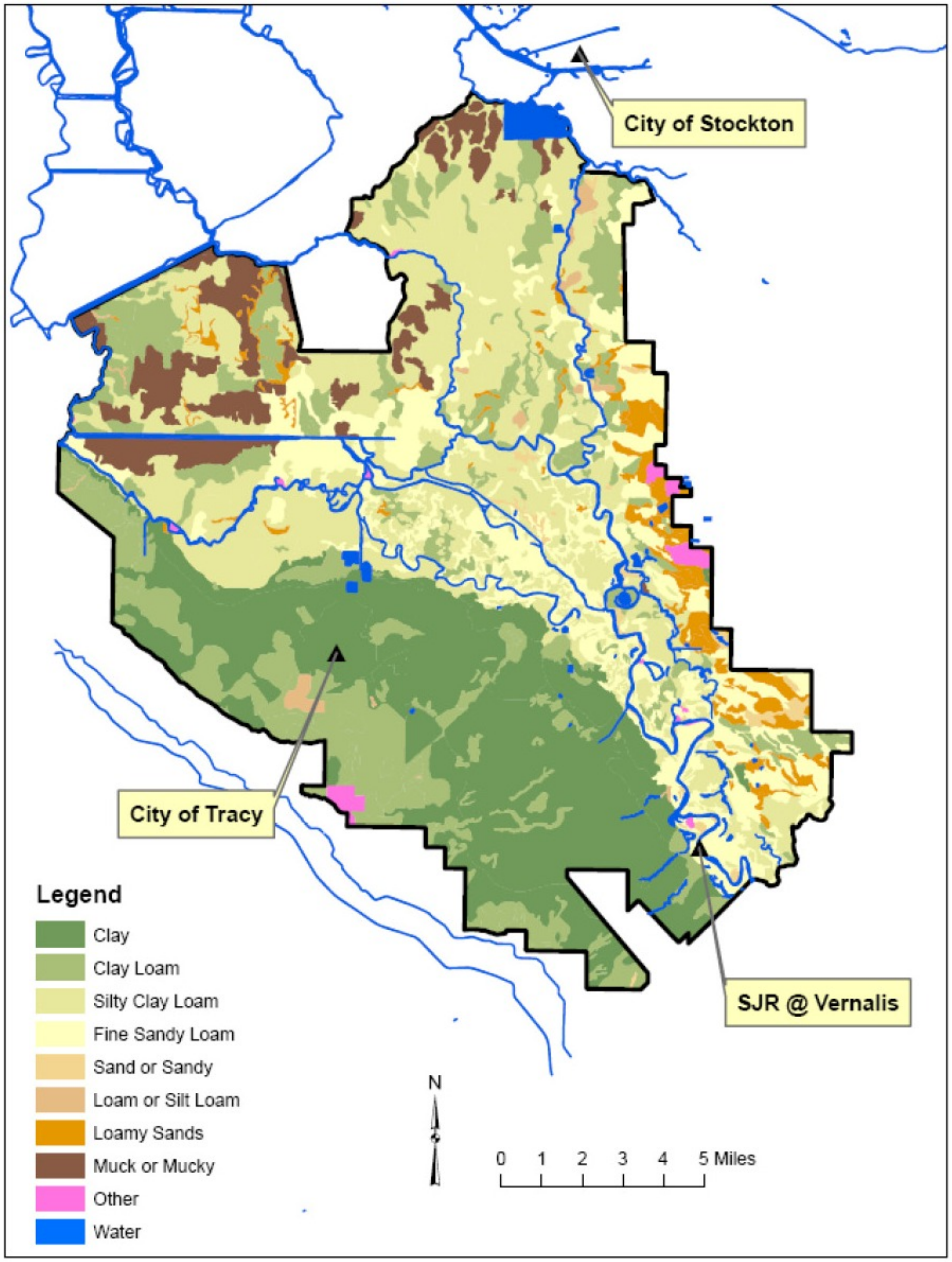
Paine Slough. The average electrical conductivity of the 26 outlets was 1.5 dS/m. If the salinity of the applied water was 0.7 dS/m then the leaching fraction would be 0.7/1.5 = 0.47. This is a very high leaching fraction and based on these data one would surmise that the irrigation efficiency, on average, is low and/or a great deal of low salinity water was entering the drains without passing through the crop root zone. If the main drains were open surface drains then it is possible that much of the discharge from these drains was irrigation return flow rather than subsurface drainage.

Table 3.10. Electrical conductivity (EC) and calculated leaching fraction (L), assuming EC of applied water is 0.7 dS/m for subsurface tile drains during 1986 and 1987. (Chilcott et al., 1988.).

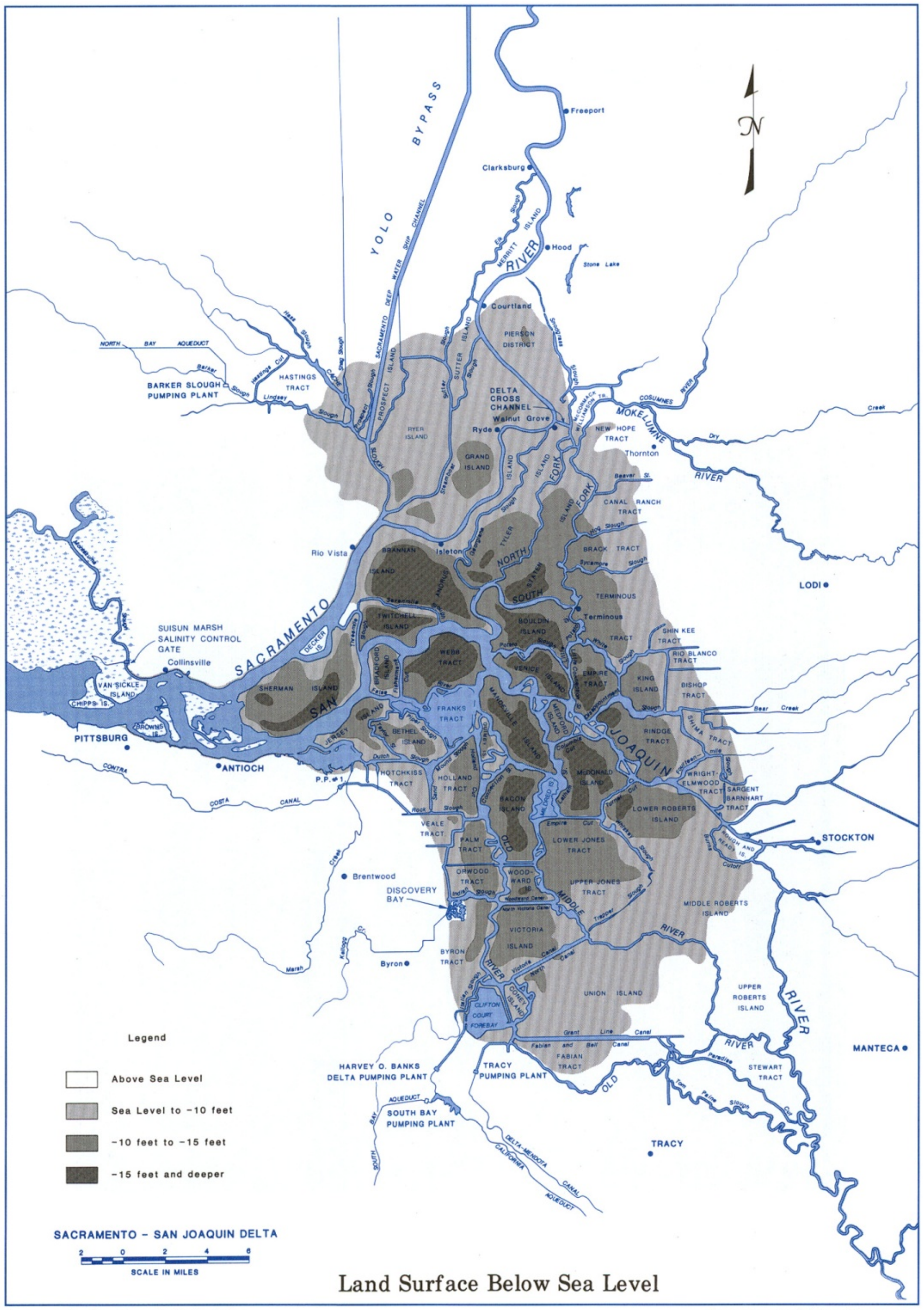
Drain Location	No. of Samples	EC (dS/m)	L assuming EC_i=0.5 dS/m	L assuming EC_i=0.7 dS/m
3, Grant Line Rd. Sump	3	2.7	0.19	.26
4, Bethany / Lammers	3	2.1	0.24	.33
5, Patterson Pass Rd.	6	2.5	0.20	.28
6, Moitose	3	1.6	0.31	.44
7, Krohn Rd.	4	2.1	0.24	.33
8, Pimentel	2	2.2	0.23	.32
9, Lammers / Corral Hollow	4	4.4	0.11	.16
11, Delta Ave.	6	2.4	0.21	.29
13, Costa Brothers East	2	4.1	0.12	.17
14, Costa Brothers West	4	3.6	0.14	.19
15, Castro	3	2.4	0.21	.29
16, Earp	4	2.8	0.18	.25
17, Freeman	4	3.9	0.13	.18
18, Costa	5	3.4	0.15	.21
19, Moitoso and Castro	4	2.0	0.25	.35
24, Corral Hollow / Bethany	5	6.2	0.08	.11
26, Chrisman Rd.	3	2.0	0.25	.35
36, Kelso Rd. / Byron Hwy.	6	2.4	0.21	.29
37, Spirow Nicholaw	4	3.1	0.16	.23
38, JM Laurence Jr. East	4	3.5	0.14	.20
39, JM Laurence Jr. West	4	2.4	0.21	.29
40, Sequeira	3	3.6	0.14	.19
41, Reeve Rd.	3	3.8	0.13	.18
44, Larch Rd.	4	2.8	0.18	.25
Number of Drains Sampled: 24				
	Average:	3.0	0.18	0.23
	Median:	2.8	0.18	0.25
	Minimum:	1.6	0.08	0.11
	Maximum:	6.2	0.31	0.44

Salt Tolerance of Crops in the Southern Sacramento-San Joaquin Delta, Final Report January 5, 2010, by Dr. Glenn J. Hoffman, Page 52

Figure 2.4. Map of soil textures in the southern Delta using GIS data from the NRCS-SSURGO Database.



Salt Tolerance of Crops in the Southern Sacramento-San Joaquin Delta, Final Report January 5, 2010, by Dr. Glenn J. Hoffman, Page 9



Sacramento–San Joaquin Delta Atlas

Department of Water Resources

Sacramento-Delta San Joaquin Delta Atlas July 1995 fraction can be achieved is soil hydraulic conductivity, the ability to transmit water through a unit cross section of soil in unit time under specified temperature and hydraulic conditions. In the absence of precise measurements, soils may be placed into relative hydraulic conductivity or permeability classes through studies of structure, texture, porosity, cracking, and other characteristics of the horizons in the soil profile in relation to local experience. The 84 soil series in the South Delta were grouped into five permeability classes by the Soil Conservation Service based upon the percolation rate of the least permeable horizon in the profile. They are as follows:

	Permeability, in./hr
Slow	<0.2
Moderately slow	0.2 to 0.6
Moderate	0.6 to 2.0
Moderately rapid	2.0 to 6.0
Rapid	>6.0

To aid in visualizing how the permeability of soils varies, a generalized soil permeability map was made based on the previously stated soil series permeability ratings. The approximate percent of land in each rating, and the series which comprise each permeability rating are as follows:

Water Quality Considerations For The South Delta Water Agency by G. J. Hoffman, T. Prichard, and J. Meyer December 22, 1981

Map Symbol	Soil Series
Slow (40%) - less than 0.2 inches per hour	
AD	Finrod clay loam
AO	Archerdale very fine sandy loam, overwash
AR	Archerdale clay loam
CL	Stockton clay
CP	Capay clay, 0 to 2 percent slopes
CPB	Capay clay, 2 to 5 percent slopes
CS	Capay clay, saline alkali
CW	Capay clay, wet
EG	Peltier mucky clay loam, drained
ES	Peltier mucky clay loam, organic substratum
PD	Pescadero clay loam, drained
RM	Rincon clay loam
RW	Rincon clay loam, wet
TC	Colusa variant clay loam, drained
WA	Willows clay, drained
XD	Hollenbeck silty clay
Moderately slow (34%) - 0.2 to 0.6 inches per hour	
BC	Blancho clay loam, drained
BR	Brentwood clay loam
BZ	Bronzan sandy clay loam, drained
CD	Eightmile variant clay loam
CH	Bronzan clay loam, drained
CI	Bronzan clay loam
EA	Egbert mucky clay loam, partially drained
EB	Egbert silty clay loam, partially drained
EF	Egbert silty clay loam, sandy substratum
KI	Kingile muck, drained
KL	Kingile-Ryde complex
LR	Los Robles gravelly clay loam
LS	Los Robles clay loam
ME	Merritt silty clay loam, partially drained
MF	Merritt silty clay loam, flooded
OD	Chualar variant coarse sandy loam
RH	Ryde clay loam, drained
RS	Ryde clay loam, organic substratum
SI	Shinkee muck, drained
VJ	Veritas silty clay loam, overwash
VL	Veritas sandy loam, saline-alkali
VM	Veritas variant sandy loam
VR	Vernalis clay loam
VW	Vernalis clay loam, wet
VY	Vina loam
VZ	Valdes silt loam, drained
WB	Webile muck, drained

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Map Symbol	Soil Series
Moderate (17%) - 0.6 to 2.0 inches per hour	
FC	Fluvaquents
GC	Grangeville clay loam, drained
MN	Manteca sandy loam
RF	Ryde clay loam, sandy substratum
RI	Ryde-Peltier complex
SC	Timor loamy sand
SH	Shima muck, drained
XV	Galt clay
Moderately rapid (6%) - 2.0 to 6.0 inches per hour	
CB	Columbia fine sandy loam
CC	Columbia fine sandy loam, clayey substratum
CE	Columbia fine sandy loam, channelled
CF	Columbia fine sandy loam, flooded
CJ	Eightmile loam
CO	Eightmile fine sandy loam, overwash
CT	Cortina gravelly loam
DN	Escalon sandy loam
DV	Devries sandy loam, drained
GV	Grangeville fine sandy loam, drained
GS	Grangeville fine sandy loam, flooded
HA	Honcut fine sandy loam
HG	Escalon sandy loma
HL	Honcut gravelly sandy loam
RK	Reiff loam
VF, VG	Veritas fine sandy loam, very deep
VH	Veritas sandy loam
VK	Devries variant sandy loam
Rapid (3%) - greater than 6.0 inches per hour	
DB	Dello sandy loam, clay substratum
DC	Dello loamy sand, drained
DD	Dello clay loam, overwash
DE	Dello loamy sand, moderately wet
DF	Dello sand, flooded
DH	Delhi loamy coarse sand
RC	Rindge mucky silt loam, overwash
RN	Rindge muck, drained
TG	Tujunga gravelly loamy coarse sand
TS	Tinnin loamy coarse sand, drained
TT	Tinnin loamy coarse sand, loamy substratum
TW	Bisgani loamy coarse sand, partially drained
VC	Venice mucky silt loam, overwash
VE	Venice muck, drained

Water Quality Considerations For The South Delta Water Agency by G. J. Hoffman, T. Prichard, and J. Meyer December 22, 1981

With this background information, it is hoped that the concerned parties can decide upon an adequate water quality standard for the South Delta. The biggest uncertainty in this information is the leaching fractions which can reasonably be achieved for the various combinations of soils, crops, and management options suitable for the South Delta. Therefore, this committee recommends that the concerned parties sponsor a more extensive field study of the leaching fractions being achieved in the South Delta. The leaching fraction for at least ten sites for soils having an SCS permeability rating of 0 to 0.2 inches per hour and ten for soils with a rating of 0.2 to 0.6 inches per hour should be determined by measuring the soil salinity at the bottom of the root zone in at least five locations at each site. A study of this magnitude would require several months and cost about $15,000.

Water Quality Considerations For The South Delta Water Agency by G. J. Hoffman, T. Prichard, and J. Meyer December 22, 1981

CONCLUSIONS/RECCOMENDATIONS

1. Keep standards at the same 0.7/1.0 EC level. Until net flows are established, water quality will be higher in null zones than allowed by any standard.

2. Conduct studies to determine the actual leaching fractions which are achievable in southern Delta .

3. Require efforts to identify and implement actions which will create net flows in channels.

4. Enforce standards so that incentives to correct the problems exist.

San Joaquin River Flows

SDWA has no current recommendation as to what level of flow is necessary to recover and protect fisheries. However, previous presentations suggested that in-stream habitat was virtually non-existent in the southern Delta. To the contrary, significant habitat and habitat opportunities exist in southern Delta channels.

Old River near Tracy Blvd.


Old River upstream of Barrier

Salmon Slough

Grant Line Canal near Salmon Slough


East end Grant Line Canal


Middle River

Middle River near the Pocket

Middle River upstream of Pocket


Middle River at Undine Road


Secret BDCP Plans for Delta